GE VERNOVA

UR Family

Communications Guide



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DISTRIBUTED NETWORK PROTOCOL level 2 dnp PASSED Level Two Conformance Tested

REGISTERED ISO 9001

WORLDWIDE 10 YEAR WARRANTY

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UR Family

Chapter 1: Introduction

This document outlines the communications protocols for the Universal Relay (UR) family of products. It is intended for customers who need detailed knowledge of the UR implementation of the communications protocols, for example to design a client or to troubleshoot an interoperability issue. Use this guide with the appropriate Instruction Manual for the product. Network and IP address configuration, passwords, and user roles, for example, are explained in the Instruction Manual.

This chapter outlines general, safety, and technical support information.

1.1 Products

This document applies to the following UR products: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The communications protocols that apply depend on those ordered. Check the order code of the device.

1.2 Features per product

The table outlines the theoretical maximums.

Features also can be viewed in the EnerVista software under **Settings > Protection Summary**.

Table 1-1: Maximum number of elements per product

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Accidental Energization		1										1	1							

1

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Automatic Voltage Regulator	# of elements if voltage banks present; 0 if Enhanced Capacitor Bank Control software option not ordered	3					3													
Autoreclose	# of current banks; 0 for L30 when Three-Pole Auto-Reclose not ordered	6	6					1		6	4			3						
Autoreclose 1P 3P		1				1			1						1	1				
Auxiliary Overvoltage	# of elements; 1 per voltage bank and 3 if C70 or T60 has voltage banks	6	6			2	3	1	2	3	2	2	2	1	1	2	2			3
Auxiliary Undervoltage	#of elements if at least one voltage bank	6	6			3		3	3	3	3	3	3	3	3	3	3			3
B90 Breaker Failure	# of feeders from software option	24		24																
B90 Bus Differential	# of zones from software option	6		6																
	Bus configuration	6		6																
	Saturation detector	6		6																
B90 IOC	# of current terminals	24		24																

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
B90 TOC	# of current terminals	24		24																
B90 Undervoltage	# of voltage terminals	12		12																
Basic UR Features	Clock	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Control pushbuttons	7																		
	Display properties	1																		
	Default messages	1																		
	LED test	1																		
	Setting file template	1																		
	Security	1																		
	Trip and Alarm LEDs	1																		
	Flex state parameters	256																		
	User programmable self-tests	1																		
	Installation	1																		
	Voltage rail monitor	1																		
	Temperature monitor	1																		
Breaker Arcing Current (I2t)	# of current banks; 2 if current banks < 2	6	6			4	3	2	2	6	4	2	2	2	2	4	2		6	6
Breaker Control	# of current banks; 2 if current banks < 2	6	6		6	4	3	2	4	6	4	2	2	2	2	4	2	6	6	6
(Disconnect) Breaker Switch	# of elements	24	24		24	24	12	8	16	24	16	8	8	8	8	24	8	24	24	24
Breaker Failure	# of elements; 2 if current banks < 2	20	20			4	3		4		4		2	2	2	4	2			6

1

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Breaker Flashover	# of elements; 2 if current banks < 2	2	2			2	1		2	2	2		2		2	2	2			2
Breaker Restrike	# of elements	3	3			3	3		2	3	3		2		2	2	2			3
Broken Conductor Detection	# of sources	6						2	2	6	2			2	2	2				
Broken Rotor Bar		1															1			
Bus Differential		6	6																	
	Bus configuration	2	2																	
	Saturation detector	2	2																	
Bus Replica Isolator		72	72	48																
Capacitor Bank Overvoltage	# of elements	3					3													
Capacitor Control	# of elements	3					3													
Change Phase Rotation		1										1	1							
Charging Current Compensation		1													1					
Cold Load Pickup	# of elements	6								6	2									
Compensated Bank Neutral Unbalance	# of current banks	3					3													
Compensated Overvoltage		1							1						1	1				
Cont. Monitor		1														1				
Contact Inputs	# of inputs	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Contact Outputs	Latching can be only 14	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
CT Fail	# of current banks	6						2	4		4	4	4	2	4	4	4	6	6	6
CT Trouble	# of zones from software option; 2 on B30	6	2	6																
Current CT settings	# of CT banks	24	24			4	6	1	3	6	3	3	3	2	2	4	3	6	6	6

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Current Terminal Metering		24		24																
Current Unbalance		2															2			
Data Logger		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Demand	# of sources	6	6			4			4	6	4		4		4	4		6		6
Digital Counters		8	8		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Digital Elements		96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Digitizer		5																5		
Direct Inputs/ Outputs		1												1		1				
Disturbance Detection	# of sources	30	30			4	6	2	4	6	4	4	4	2	4	4	4	6	6	6
Downed Conductor Detection (Hi-Z)	Available for 8Z DSP only; # of HIZ records is 4; # of RMS records is 4										1									
EGD Protocol	Fast production = 1; slow production = 2	1	1		1	1				1	1	1	1				1		1	1
End of Fault Protection	# of elements; 1 per CT terminal	24	20	24																
Energy Metering	# of sources	6	6			4			4	6	4	4	4			4	4	6		6
Event Recorder	1024 events	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fault Location	# of elements; 1 per current bank	5				1		1	1	5	2			1	1	1				
Field Ground Protection		1											1							

1

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Field Resources			1		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1
	Field unit brick types	1																		
	Field unit contact inputs	40																		
	Field unit contact outputs	8																		
	Field unit CT/VT settings	6																		
	Field unit I/O states	1																		
	Field unit latching outputs	8																		
	Field unit raw data actuals	8																		
	Field unit raw data settings	1																		
	Field unit RTDs	8																		
	Field unit shared inputs	16																		
	Field unit shared outputs	16																		
	Field unit transducers	8																		
	Field units	8																		
FlexElements		16	16		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
FlexLogic Equations	1024 lines		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	FlexLogic timers	64																		
FlexMath																		1		
	Direct analogs	32																32		
	Direct integers	16																16		
	Summator	6																6		
Frequency Rate of Change		4						2	4		4	4	4	2		4		4		4
Generator Unbalance		1										1	1							
Generic Comparator	8-bit comparator	6																6		

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Ground Distance	Fast distance is not available on L60	5						5	5						3	5				5
Ground Instantaneous Overcurrent	# of elements if at least one CT bank	20	20			8	12	2	6	12	6	1	1	4	4	8	6	12	12	12
Ground Time Overcurrent	# of elements if at least one CT bank	20	20			4	6	2	4	6	4	1	1	2	2	4	4	6	6	6
IEC 61850 Communications			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Configurable GOOSE Rx	16																		
	Configurable GOOSE Tx	8																		
	GGIO2 configuration	64																		
	GGIO4 analog points	32																		
	GGIO5 unsigned integer points	16																		
	MMXU deadbands	6																		
	Received analogs	32																		
	Received integers	16																		
	XCBR configuration	6																		
	XSWI configuration	24																		
	IPv4 Routes	6																		

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Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
IEC 61850 Remote I/O (Fixed GOOSE/ GOOSE)			1	1		1	1	1	1	1	1	1	1	1	1	1	1		1	1
	Rx GOOSE	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64
	Rx GOOSE Boolean	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256
	Rx GOOSE DPS	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Rx GOOSE I/ O states	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Rx GOOSE status	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64
IEC 103 Communicati ons		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Incipient Cable Fault	# of elements	6						1		6	2			1						
L60 Channel Tests		1													1					
Line Differential (87L) In-Zone Transformer		1												1		1				
Line Differential (87L) L90		1														1				
	L90 Power system	1																		
	87L trip logic	1																		
	L90 phase select	1																		
	L90 channels tests	1																		
Line Differential (87L)	No multi-end fault location													1						
Line Pickup		1						1	1						1	1				
Load Encroachmen t		1						1	1		1				1	1				1
Loss of Excitation		1										1	1							
Modbus Communicati ons		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Modbus User Map		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Motor Acceleration Time		1															1			
Motor Mechanical Jam		1															1			

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Motor Start Supervision		1															1			
Negative Sequence Directional OC	# of elements if at least one CT bank and one VT bank	3					2	2	2		2	2	2		2	2				3
Negative Sequence Instantaneous Overcurrent	# of elements if at least one CT bank	3					2	2	2	2	2			2	2	2				3
Negative Sequence Overvoltage C70	# of voltage banks if at least one	3					3													
Negative Sequence Overvoltage	# of elements if at least one voltage bank	3						3	3		3	3	3	3	3		3			3
Negative Sequence Time Overcurrent	# of elements if at least one CT bank	3					2	2	2	2	2			2	2	2				3
Neutral Current Unbalance	# of current banks	3					3													
Neutral Directional Overcurrent		6	6				1	2	2		2	2	2	2	2	2	2	3		3
Neutral Instantaneous Overcurrent	# of CT banks if at least one	6	6									1	1							
Neutral Instantaneous Overcurrent	# of elements if at least one CT bank	20	20			8	6	2	6	12	8			4	4	8	8	12		12
Neutral Overvoltage	# of elements if at least one VT bank	6	6			3	3	3	3	3	3	3	3	3	3	3	3			3
Neutral Time Overcurrent	# of elements if at least one CT bank	20	20			6	6	2	4	6	6	2	2	4	4	6	6	6		6
Neutral Voltage Unbalance	# of voltage banks	3					3													
Non Volatile Latches		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Open Pole Detect (supervisory)		1																1		

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Oscillography		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Over Under Frequency Accumulation	Frequency out of band	1										1	1							
Overfrequency		4				4			4		4	4	4			4	4	4		4
Phase Comparison		1													1					
Phase Current Unbalance	# of current banks	3					3													
Phase Directional	# of elements if at least one CT and one VT bank	6	6				2	2	2		2	1	1	2	2	2	2	3		3
Phase Distance	L60 does not support fast distance (L60 must become fast distance)	5						5	5				3		3	5				5
Phase Instantaneous Overcurrent	# of elements if at least one CT bank	40	40			8	12	2	6	12	8	4	4	4	4	8	8	12	12	12
Phase Overvoltage	# of elements if at least one VT bank	6	6			3	3	3	3	3	3	3	3	3	3	3	3	3		3
Phase Time Overcurrent	# of elements if at least one CT bank	20	20			6	6	2	4	6	6	2	2	4	4	6	6	6	6	6
Phase Undervoltage	# of elements if at least one VT bank	6	6			3	3	3	3	3	3	3	3	3	3	3	3	3		3
PID Regulator		4			4					4										

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Pilot Schemes		1																		
	Pilot blocking (1P)																			
	Pilot blocking 1 (1P)								1							1				
	Pilot DCUB								1							1				
	Pilot DUTT (1P)								1							1				
	Pilot Hybrid POTT (1P)								1							1				
	Pilot POTT (1P)								1							1				
	Pilot POTT1 (1P)								1							1				
	Pilot PUTT (1P)								1							1				
	Pilot POTT														1					
	Pilot POTT3										1									
	Pilot blocking 3 (DCB3)										1									
Platform Direct I/O		256	32	256	64	32	32	32	32	32	32	32	32		32		32	64	32	32
Power Swing Detect		1						1	1				1		1	1		1		1
Precision Time Protocol (1588)		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Reduced Voltage Starting		1															1			
Restricted Ground Fault	# of elements; 0 if L90 has no inzone transformer	6									4	4	4			4			6	6
RRTD Protection		12											12				12			12
RTD Protection		48											48				48			48
Security		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Selector Switch		2	2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Sensitive Directional Power	# of elements if at least one VT bank	2				2			2		2	2	2			2	2	2		2
Setting Groups		6	6	6		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Simple Network Time Protocol		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Single Pole Tripping		1				1			1						1	1				
	Open pole detect (1P)																			
	Phase selection																			
	Trip output																			
Sources (1 per CT/VT bank)	# of sources	30	30			4	6	2	4	6	4	4	4	2	4	4	4	6	6	6
Split Phase Protection		1										1	1							
Stator Differential		1											1				1			
	Saturation detector	1																		
Stator Ground		1										1	1							
Stub Bus		1												1		1				
Subharmonic Stator Ground		1											1							
Switch		6			6					6								6		
Synchrocheck		10	6			10		4	10		4	4	4	4	4	10		6		6
Synchrophasors	# of PMUs; software option	6				2			1		1		1	1		1		6		1
	# of Aggregators	4				2			1		1		1	1		1		4		1
Teleprotection I/O		1	1		1	1	1	1	1	1	1	1	1		1		1	1	1	1
Thermal Model		1															1			
	Motor setup	1																		
Thermal Overload Protection		2	2			2	2	2	2	2	2	2	2	2	2	2		2	2	2
Third Harmonic Neutral Undervoltage		1										1	1							
Time of Day Timer		5					5													
Transducer I/O			1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	DCMA inputs	24																		
	DCMA outputs	24																		
	Ohm inputs	2																		
	RTD inputs	48																		

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Transformer Instantaneous Differential		1																	1	1
Transformer Percent Differential		1										1							1	1
Transformer windings		6										2							6	6
Transformer Thermal Model		1										1							1	1
Trip Bus		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Undercurrent		1															1			
Underfrequency		12	12					6	6	6	6	6	6	6		6	6	6	6	6
Underpower		2															2			
User-Programmable Fault Report		2	2	2			2					2	2				2	2	2	2
User-Programmable LEDs		48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
User-Programmable Pushbuttons	# of pushbuttons: 6, 12, 16, or 48		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	control push-buttons	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
User-Definable Displays		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Virtual Inputs		128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128
Virtual Outputs		128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128
Voltage Differential	# of VT banks	3					3													
Volts Per Hertz	# of elements if at least one VT bank	2										2	2			2				2
VT Fuse Failure	# of sources if CT bank or VT bank	6	6			4	6	2	4	6	4	4	4	2	4	4	4	6		6
Wattmetric Ground Fault	# of elements	5						2	2	5	2				2	2				

1.3 Communication ports

URs are equipped with a front RS232 port, a rear RS485 port, an IRIG-B input port, and three Ethernet ports. The Ethernet ports are a combination of 100Base-TX and 100Base-FX depending on the order code option. See the relevant Instruction Manual for information on these ports.

1

1.4 Safety symbols and definitions

Before attempting to install or use the device, review all safety indicators in this document to help prevent injury, equipment damage, or downtime.

The following safety and equipment symbols are used in this document.



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Indicates practices not related to personal injury.

See the Instruction Manual for safety information.

1.5 For further assistance

For product support, contact the information and call center as follows:

GE Grid Solutions
650 Markland Street
Markham, Ontario
Canada L6C 0M1
Worldwide telephone: +1 905 927 7070
Europe/Middle East/Africa telephone: +34 94 485 88 54
North America toll-free: 1 800 547 8629
Fax: +1 905 927 5098
Worldwide e-mail: multilin.tech@ge.com
Europe e-mail: multilin.tech.euro@ge.com
Website: http://www.gegridsolutions.com/multilin

UR Family

Chapter 2: Modbus communication

This chapter outlines the Modbus protocol, which is a standard protocol used for communication among devices. Use the Modbus memory map provided when designing a client to access the UR device using Modbus.

2.1 Modbus RTU protocol

2.1.1 Introduction

The UR family supports several communications protocols to allow connection to equipment such as personal computers, remote terminal units (RTUs), supervisory control and data acquisition (SCADA) masters, and programmable logic controllers. The Modicon Modbus protocol is the most basic protocol supported by the UR. Modbus RTU is available via the RS232, RS485, or USB link (for graphical front panel), and Modbus TCP/IP is available over Ethernet. The following description is intended primarily for users who want to develop their own master communication drivers. Note that:

- The UR always acts as a slave device, meaning that it never initiates communications. It listens and responds to requests issued by a master computer.
- A subset of Modbus RTU and Modbus TCP/IP protocol format is supported that allows extensive monitoring, programming, and control functions using read and write register commands

2.1.2 Configuration

The Modbus slave address and TCP port number are configured during installation. See the Modbus Protocol section in the Settings chapter of the Instruction Manual.

The number of remaining Modbus TCP connections available can be viewed in the **Actual Values > Status > Comm Status Remaining Connect** option. The value is 4 when the EnerVista software is closed. See the Remaining Connection Status section in the Actual Values chapter of the Instruction Manual.

2.1.3 Physical layer

The Modbus RTU protocol is hardware-independent so that the physical layer can be any of a variety of standard hardware configurations including RS232, RS485, and USB (for graphical front panel). The relay includes a front panel RS232 port and a rear terminal RS485 port. Data flow is half-duplex in all configurations. See chapter 3 of the Instruction Manual for communications wiring.

Each data byte is transmitted in an asynchronous format consisting of 1 start bit, 8 data bits, 1 stop bit, and possibly 1 parity bit. This produces a 10 or 11 bit data frame. This can be important for transmission through modems at high bit rates (11 bit data frames are not supported by many modems at baud rates greater than 300).

The RS232 port is intended for local use, with baud rate set at 115200 or 19200 bps under **Settings > Product Setup > Communications > Serial Ports**. The rear terminal RS485 port can be set for baud rates of 300, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 33600, 38400, 57600, or 115200 bps, and even, odd, and no parity options are available. The USB port is intended for local use and is included with the graphical front panel. See the Communications section of chapter 5 in the Instruction Manual for details.

The Modbus TCP/IP protocol is available on each of the rear Ethernet ports. These ports are 100Base-FX.

2.1.4 Data link layer

Modbus RTU communications takes place in packets that are groups of asynchronously framed byte data. The master transmits a packet to the slave and the slave responds with a packet. The following information describes the general format for both transmit and receive packets. For details on packet formatting, see subsequent sections describing each function code.

Table 2-1: Modbus RTU packet format

Description	Size
SLAVE ADDRESS	1 byte
FUNCTION CODE	1 byte
DATA	N bytes
CRC	2 bytes
DEAD TIME	3.5 bytes transmission time

SLAVE ADDRESS — This is the address of the slave device that is intended to receive the packet sent by the master and to perform the desired action. Each slave device on a communications bus must have a unique address to prevent bus contention. All of the relay's ports have the same address which is programmable from 1 to 254; see chapter 5 in the Instruction Manual for details. Only the addressed slave will respond to a packet that starts with its address. Note that the front panel port is an exception to this rule; it acts on a message containing any slave address.

A master transmit packet with slave address 0 indicates a broadcast command. All slaves on the communication link take action based on the packet, but none respond to the master.

FUNCTION CODE — This is one of the supported functions codes of the unit which tells the slave what action to perform. See the Supported function codes section on page 2-4 for details. An exception response from the slave is indicated by setting the high order bit of the function code in the response packet. See the Exception responses section on page 2-7 for details.

DATA — This is a variable number of bytes depending on the function code. It can include actual values, settings, or addresses sent by the master to the slave or by the slave to the master.

CRC — This is a two byte error checking code. The RTU version of Modbus includes a 16-bit cyclic redundancy check (CRC-16) with every packet which is an industry standard method used for error detection. If a Modbus slave device receives a packet in which an error is indicated by the CRC, the slave device does not act upon or respond to the packet thus preventing any erroneous operations. See the Modbus RTU CRC-16 algorithm section on page 2-3 for details on calculating the CRC.

DEAD TIME — A packet is terminated when no data is received for a period of 3.5 byte transmission times (about 15 ms at 2400 bps, 2 ms at 19200 bps, and 300 µs at 115200 bps). Consequently, the transmitting device must not allow gaps between bytes longer than this interval. Once the dead time has expired without a new byte transmission, all slaves start listening for a new packet from the master except for the addressed slave.

Modbus-TCP/IP communications takes place in application data units (ADUs), which are wrapped in the TCP/IP/Ethernet protocols. Ethernet provides layer 2 addressing and CRC-32 error checking. IP provides layer 3 addressing. TCP provides communication establishment and ending and manages data flow. The Parallel Redundancy Protocol (PRP) also can be used to provide seamless data flow in case of a single failure in the network, by using a combination of LAN duplication and frame duplication. See chapter 5 in the instruction manual for information on setting up TCP for Modbus (in the Modbus section), IP and PRP (Network section).

The ADU is described as follows.

Table 2-2: Modbus TCP/IP format

Description		Size
MBAP header	Transaction identifier	2 bytes
	Protocol identifier	2 bytes
	Length	2 bytes
	Unit identifier	1 byte
FUNCTION CODE		1 byte
DATA		N bytes

MBAP header — This Modbus Application Protocol header contains the following fields:

- Transaction Identifier: Used for transaction pairing. The Modbus server copies in the response the transaction identifier of the request.
- Protocol Identifier: Used for intra-system multiplexing. The Modbus protocol is identified by the value 0.
- Length: The length field is a byte count of the following fields, including the Unit Identifier and data fields.
- Unit Identifier: For the purposes of the UR, this field is equivalent to the Modbus RTU SLAVE ADDRESS field. The client must use the same value here as programmed in the UR setting **MODBUS SLAVE ADDRESS**.

FUNCTION CODE — This is the same as the Modbus RTU function code field described above.

DATA — This is the same as the Modbus RTU data field described above.

2.1.5 Modbus RTU CRC-16 algorithm

The Modbus TPC/IP CRC-32 algorithm is universally executed in hardware, so there is no need to describe it here.

The Modbus RTU CRC-16 algorithm essentially treats the entire data stream (data bits only; start, stop and parity ignored) as one continuous binary number. This number is first shifted left 16 bits and then divided by a characteristic polynomial (1100000000000101b). The 16-bit remainder of the division is appended to the end of the packet, MSByte first. The resulting packet including CRC, when divided by the same polynomial at the receiver will give a zero remainder if no transmission errors have occurred. This algorithm requires the characteristic polynomial to be reverse bit ordered. The most significant bit of the characteristic polynomial is dropped, since it does not affect the value of the remainder.

A C programming language implementation of the CRC algorithm can be provided upon request.

Table 2-3: Modbus RTU CRC-16 algorithm

Symbols	-->	data transfer
	A	16 bit working register
	Alow	low order byte of A
	Ahigh	high order byte of A
	CRC	16 bit CRC-16 result
	i,j	loop counters
	(+)	logical EXCLUSIVE-OR operator
	N	total number of data bytes
	Di	i-th data byte (i = 0 to N-1)
	G	16 bit characteristic polynomial = 1010000000000001 (binary) with MSbit dropped and bit order reversed
	shr (x)	right shift operator (th LSbit of x is shifted into a carry flag, a '0' is shifted into the MSbit of x, all other bits are shifted right one location)

Algorithm	1.	FFFF (hex) --> A	
	2.	0 --> i	
	3.	0 --> j	
	4.	Di (+) Alow --> Alow	
	5.	j + 1 --> j	
	6.	shr (A)	
	7.	Is there a carry?	No: go to 8; Yes: G (+) A --> A and continue
	8.	Is j = 8?	No: go to 5; Yes: continue
	9.	i + 1 --> i	
	10.	Is i = N?	No: go to 3; Yes: continue
	11.	A --> CRC	

2.2 Modbus function codes

2.2.1 Supported function codes

Modbus officially defines function codes from 1 to 127 though only a small subset is generally needed. The relay supports some of these functions, as summarized in the following table. Subsequent sections describe each function code.

Table 2-4: Function codes

Function code		Modbus definition	GE Multilin definition
Hex	**Dec**		
03	3	Read input registers	Read settings
04	4	Read input registers	Read actual values
05	5	Force single coil	Execute operation
06	6	Preset single register	Store single setting
10	16	Preset multiple registers	Store multiple settings

2.2.2 Read actual values or settings (function code 03/04h)

These function codes allow the master to read one or more consecutive data registers (actual values or settings) from a relay. Data registers are always 16-bit (two-byte) values transmitted with high order byte first. The maximum number of registers that can be read in a single packet is 125.

Up to firmware version 7.8x, actual values and settings are located in the same Modbus map and are read with either function code 0x3h or 04h interchangeably. That is, the two function codes function identically.

Starting in firmware version 7.90, settings and actual values have separate Modbus tables, or maps. Each Modbus table can use the entire available Modbus space of 65,536 data items. A Modbus master must read settings with function code 03h (read holding registers) and it must read actual values with function code 04h (read input registers). The same numeric value of a Modbus address can be located in the settings table or in the actual values table, and the function code used for reading the data determines if data from the settings or actual values map is read.

Table 2-5: Modbus address space explained

Address	Actual values map	Settings map
0x0000 to 0xFFFF	Read with function code 04h	Read with function code 03h

The following two examples show the format of the master and slave packets in Modbus RTU. Modbus TCP/IP ADUs have a MBAP instead of slave address, and CRC is in another stack layer.

The example in the table shows a master device reading two actual values registers starting at address 3000h in the actual values Modbus map from slave device 11h (17 decimal). The slave device responds with the values 5 and 3 from registers 3000h and 3001h, respectively.

Table 2-6: Modbus read actual values example function code 04h - Master/slave device packet transmission example

Master transmission	
Packet format	**Example (hex)**
SLAVE ADDRESS	11
FUNCTION CODE	04
DATA STARTING ADDRESS - high	30
DATA STARTING ADDRESS - low	00
NUMBER OF REGISTERS - high	00
NUMBER OF REGISTERS - low	02
CRC - low	7C
CRC - high	5B

Slave response	
Packet format	**Example (hex)**
SLAVE ADDRESS	11
FUNCTION CODE	04
BYTE COUNT	04
DATA #1 - high	00
DATA #1 - low	05
DATA #2 - high	00
DATA #2 - low	03
CRC - low	BA
CRC - high	45

The next example shows a master device reading three settings registers starting at address 1F36h in the settings Modbus map from slave device 11h (17 decimal). The slave device responds with the values 3, 0, and 50 from registers 1F36h, 1F37h, and 1F38h, respectively.

Table 2-7: Modbus master settings value function code 03h - Master/slave device packet transmission example

Master transmission	
Packet format	**Example (hex)**
SLAVE ADDRESS	11
FUNCTION CODE	03
DATA STARTING ADDRESS - high	1F
DATA STARTING ADDRESS - low	36
NUMBER OF REGISTERS - high	00
NUMBER OF REGISTERS - low	03
CRC - low	E0
CRC - high	81

Slave response	
Packet format	**Example (hex)**
SLAVE ADDRESS	11
FUNCTION CODE	03
BYTE COUNT	06
DATA #1 - high	00
DATA #1 - low	03
DATA #2 - high	00
DATA #2 - low	00
DATA #3 - high	00
DATA #3 - low	32
CRC - low	29
CRC - high	60

2.2.3 Execute operation (function code 05h)

This function code allows the master to perform various operations in the relay. Available operations are shown in the summary table below.

The following table shows the format of the master and slave packets in Modbus RTU. Modbus TCP/IP ADUs have a MBAP instead of slave address, and CRC is in another stack layer. The example shows a master device requesting the slave device 11h (17 decimal) to perform a reset. The high and low code value bytes always have the values "FF" and "00" respectively and are a remnant of the original Modbus definition of this function code.

Table 2-8: Master and slave device packet transmission example

Master transmission	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
FUNCTION CODE	05

Slave response	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
FUNCTION CODE	05

Master transmission	
Packet format	**Example (Hex)**
OPERATION CODE - high	00
OPERATION CODE - low	01
CODE VALUE - high	FF
CODE VALUE - low	00
CRC - low	DF
CRC - high	6A

Slave response	
Packet format	**Example (Hex)**
OPERATION CODE - high	00
OPERATION CODE - low	01
CODE VALUE - high	FF
CODE VALUE - low	00
CRC - low	DF
CRC - high	6A

Table 2-9: Summary of operation codes for function 05h

Operation code (Hex)	Definition	Description
0000	NO OPERATION	Does not do anything
0001	RESET	Performs the same function as the front panel **RESET** key
0005	CLEAR EVENT RECORDS	Performs the same function as the front panel **CLEAR EVENT RECORDS** menu command
0006	CLEAR OSCILLOGRAPHY	Clears all oscillography records
1000 to 103F	VIRTUAL IN 1 to 64 ON/OFF	Sets the states of Virtual Inputs 1 to 64 either "ON" or "OFF"

2.2.4 Store single setting (function code 06h)

This function code allows the master to modify the contents of a single setting register in an relay. The following table shows the format of the master and slave packets in Modbus RTU. Modbus TCP/IP ADUs have a MBAP instead of slave address, and CRC is in another stack layer. The example shows a master device storing the value 200 at memory map address 4051h to slave device 11h (17 dec).

Table 2-10: Master and slave device packet transmission example

Master transmission	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
FUNCTION CODE	06
DATA STARTING ADDRESS - high	40
DATA STARTING ADDRESS - low	51
DATA - high	00
DATA - low	C8
CRC - low	CE
CRC - high	DD

Slave response	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
FUNCTION CODE	06
DATA STARTING ADDRESS - high	40
DATA STARTING ADDRESS - low	51
DATA - high	00
DATA - low	C8
CRC - low	CE
CRC - high	DD

2.2.5 Store multiple settings (function code 10h)

This function code allows the master to modify the contents of a one or more consecutive setting registers in a relay. Setting registers are 16-bit (two byte) values transmitted high order byte first. The maximum number of setting registers that can be stored in a single packet is 123. The following table shows the format of the master and slave packets in Modbus RTU. Modbus TCP/IP ADUs have a MBAP instead of slave address, and CRC is in another stack layer. The example shows a master device storing the value 200 at memory map address 4051h, and the value 1 at memory map address 4052h to slave device 11h (17 decimal).

Table 2-11: Master and slave device packet transmission example

Master transmission	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11

Slave response	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11

Master transmission	
Packet format	**Example (Hex)**
FUNCTION CODE	10
DATA STARTING ADDRESS - hi	40
DATA STARTING ADDRESS - lo	51
NUMBER OF SETTINGS - hi	00
NUMBER OF SETTINGS - lo	02
BYTE COUNT	04
DATA #1 - high order byte	00
DATA #1 - low order byte	C8
DATA #2 - high order byte	00
DATA #2 - low order byte	01
CRC - low order byte	12
CRC - high order byte	62

Slave response	
Packet format	**Example (Hex)**
FUNCTION CODE	10
DATA STARTING ADDRESS - hi	40
DATA STARTING ADDRESS - lo	51
NUMBER OF SETTINGS - hi	00
NUMBER OF SETTINGS - lo	02
CRC - lo	07
CRC - hi	64

2.2.6 Exception responses

Programming or operation errors usually happen because of illegal data in a packet. These errors result in an exception response from the slave. The slave detecting one of these errors sends a response packet to the master with the high order bit of the function code set to 1.

The following table shows the format of the master and slave packets in Modbus RTU. Modbus TCP/IP ADUs have a MBAP instead of slave address, and CRC is in another stack layer. The example shows a master device sending the unsupported function code 39h to slave device 11h.

Table 2-12: Master and slave device packet transmission example

Master transmission	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
FUNCTION CODE	39
CRC - low order byte	CD
CRC - high order byte	F2

Slave response	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
FUNCTION CODE	B9
ERROR CODE	01
CRC - low order byte	93
CRC - high order byte	95

2.3 File transfers

2.3.1 Obtaining relay files using Modbus

2.3.1.1 Description

The UR has a generic file transfer facility, meaning that you use the same method to obtain all of the different types of files from the unit. The Modbus registers that implement file transfer are found in the "Modbus File Transfer (Read/Write)" and "Modbus File Transfer (Read Only)" modules, starting at address 3100h in the Modbus Memory Map. To read a file from the UR, use the following steps:

1. Write the filename to the "Name of file to read" register using a write multiple registers command. If the name is shorter than 80 characters, you may write only enough registers to include all the text of the filename. Filenames are not case sensitive.
2. Repeatedly read all the registers in "Modbus File Transfer (Read Only)" using a read multiple registers command. It is not necessary to read the entire data block, since the UR remembers which was the last register you read. The "position" register is initially zero and thereafter indicates how many bytes (2 times the number of registers) you have

read so far. The "size of..." register indicates the number of bytes of data remaining to read, to a maximum of 244.

3. Keep reading until the "size of..." register is smaller than the number of bytes you are transferring. This condition indicates end of file. Discard any bytes you have read beyond the indicated block size.
4. If you need to re-try a block, read only the "size of.." and "block of data", without reading the position. The file pointer is only incremented when you read the position register, so the same data block is returned as was read in the previous operation. On the next read, check to see if the position is where you expect it to be, and discard the previous block if it is not (this condition would indicate that the UR did not process your original read request).

The UR retains connection-specific file transfer information, so files can be read simultaneously on multiple Modbus connections.

2.3.1.2 Other protocols

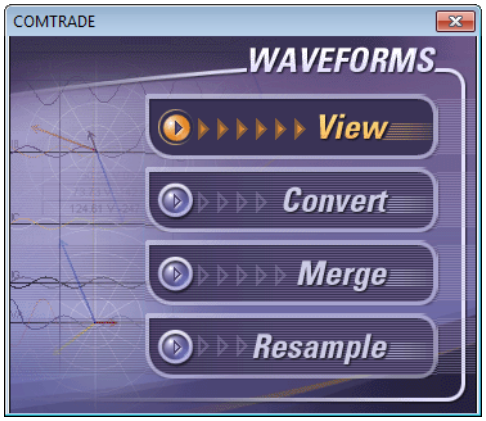
All the files available using Modbus can also be retrieved using the standard file transfer mechanisms in other protocols (for example, TFTP or Manufacturing Message Specification, MMS).

2.3.1.3 COMTRADE, oscillography, data logger, and PMU record files

Oscillography, data logger, and PMU record files are formatted using the COMTRADE file format per IEEE C37.111 (1999 or 2013) Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems. The files can be obtained in either text or binary COMTRADE format.

The EnerVista UR Setup software includes the ability to work with COMTRADE files. Access **File > COMTRADE Utility**. See the Waveforms chapter of the EnerVista Viewpoint Monitoring Instruction Manual for information on how to use the tool.

Figure 2-1: COMTRADE utility



Preferences are set within the EnerVista software in two windows.

To set COMTRADE waveform preferences:

1. With a waveform open in the EnerVista software, click the Preference icon on the toolbar.

   In the **Analog Channels** panel, ensure that similar analog channels have the same **Scale Group**.

   Put currents and voltages in different **Scale Groups** for proper scaling.

   For harmonics, ensure that the **Phasor** and **FFT** (harmonic analysis) check boxes are enabled, then click the **Harmonics** icon on the toolbar.

   In the **Digital Channels** panel, use the **Change Detected** check box to view which digital channels detected a change. Use the **Graph** check box to view a digital channel that did not detect a change.

To set COMTRADE waveform display preferences:

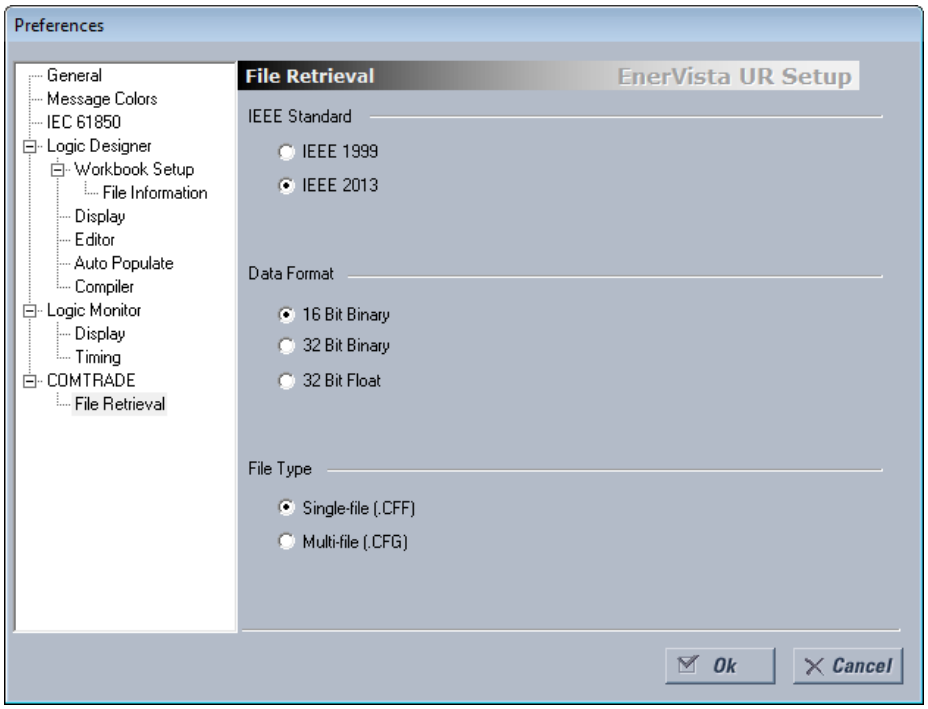
1. In the EnerVista software, click **File > Preferences**. If the option does not display, close any open waveform file. The preferences here affect only the type of file retrieved by the software from **Actual Values > Records**, by single-click in the software, or by oscillography. The same file can be retrieved in another format in the software under **Maintenance > Retrieve File** or some other means, such as TFTP or MMS, by requesting the file with the file name that reflects the

format wanted.

2. Open the lone **COMTRADE** panel and set the options.

   IEEE 1999 — All UR releases support this standard. When this option is selected, no other options are selectable and 16 bit binary data are used.

Figure 2-2: Select the COMTRADE format



   IEEE 2013 — UR 7.4 supports this standard.

   16 Bit Binary — UR 7.4 supports this.

   32 Bit Binary — UR 7.4 supports this.

   32 Bit Float — UR 7.4 supports this.

   Single-file (.CFF) — Supported by devices that support IEEE 2013, so UR 7.4 supports this. One file with .CFF extension instead of four separate .CFG, .INF, .HDR, and .DAT files.

   Multi-file (.CFG) — When IEEE 1999 is selected, this option is selected automatically. When IEEE 2013 is selected, choose between CFF or CFG format.

3. Click the **Ok** button to save and exit.

2.3.1.4 Reading oscillography files

Familiarity with the oscillography feature is required to understand the following description. See the Oscillography section in chapter 5 of the Instruction Manual for details.

The "Oscillography Number of Triggers" register increments by one every time a new oscillography file is triggered (captured) and cleared to zero when oscillography data is cleared. When a new trigger occurs, the associated oscillography file is assigned a file identifier number equal to the incremented value of this register; the newest file number is equal to the "Oscillography Number of Triggers" register. This register can be used to determine if any new data has been captured by periodically reading it to see if the value has changed; if the number has increased then new data is available.

The "Oscillography Number of Records" register specifies the maximum number of files (and the number of cycles of data per file) that can be stored in memory of the relay. The "Oscillography Available Records" register specifies the actual number of files that are stored and still available to be read out of the relay.

Writing "Yes" (that is, the value 1) to the "Oscillography Clear Data" register clears oscillography data files, clears both the "Oscillography Number of Triggers" and "Oscillography Available Records" registers to zero, and sets the "Oscillography Last Cleared Date" to the present date and time.

For the IEEE 2013 standard, the following four time fields are added at the end of the configuration (.cfg) file:

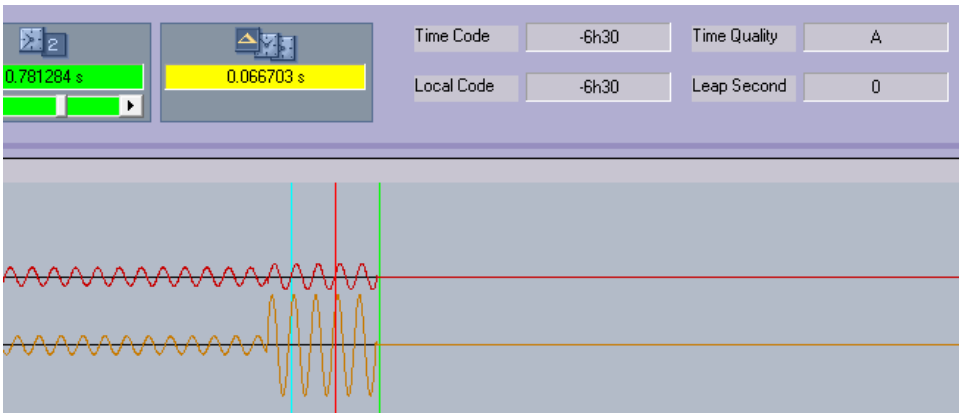
- Time Code (time_code) and Local Code (local_code) — The Time Code is the time difference between local time and UTC. The Local Code is the local time. Both are set to the same value as the **Local Time Offset from UTC** setting, and when this setting is 0, the time used is UTC time and the time zone is at UTC.
- Time Quality Indictor Code (tmq_code) and Leap Second Indicator (leapsec) — The quality indicator indicates the maximum time error between recorded time and the time synchronizing source. Examples: 0 means clock uses its source, 4 means time good within 1 ms, and F means unreliable. The leap second indicates when a second has been added or deleted, resulting in time stamps with a duplicate or missing second. Examples: 1 adds a leap second, 2 subtracts a leap second, and 3 means that time source cannot address leap seconds.

The fields are added in the file in two lines for time and time quality. An example is

-6h30, -6h30
A, 0

They display in the software.

Figure 2-3: Waveform image showing time fields



For the IEEE 2013 standard, to read binary COMTRADE oscillography files, read the following filenames, where # stands for 16B, 32B, or 32F, and nnn stands for the oscillography trigger number.

Table 2-13: Oscillography records for IEEE C37.111-2013, by data format

	BINARY	BINARY32	FLOAT32	ASCII
Multiple files	OSC16Bnnn.CFG OSC16Bnnn.DAT OSC16Bnnn.HDR	OSC32Bnnn.CFG OSC32Bnnn.DAT OSC32Bnnn.HDR	OSC32Fnnn.CFG OSC32Fnnn.DAT OSC32Fnnn.HDR	OSC###Annn.CFG OSC###Annn.DAT OSC###Annn.HDR
Single file	OSC16Bnnn.CFF	OSC32Bnnn.CFF	OSC32Fnnn.CFF	OSC###Annn.CFF

For the IEEE 1999 standard, to read binary COMTRADE oscillography files, read the following files.

Table 2-14: Oscillography records for IEEE C37.111-1999, by data format

	BINARY	ASCII
Multiple files	OSCnnn.CFG OSCnnn.DAT OSCnnn.HDR	OSCAnnn.CFG OSCAnnn.DAT OSCAnnn.HDR

For HiZ records, only the ASCII 1999 format is supported.

2.3.1.5 Reading data logger files

Familiarity with the data logger feature is required to understand this description. See the Data Logger section of chapter 5 in the Instruction Manual for details.

For IEEE 2013, to read the entire data logger in binary COMTRADE format, read the following files.

Table 2-15: Data logger records for IEEE C37.111-2013, by data format

	BINARY	BINARY32	FLOAT32	ASCII
Multiple files	`Datalog16B.CFG` `Datalog16B.DAT`	`Datalog32B.CFG` `Datalog32B.DAT`	`Datalog32F.CFG` `Datalog32F.DAT`	`Datalog###A.CFG` `Datalog###A.DAT`
Single file	`Datalog16B.CFF`	`Datalog32B.CFF`	`Datalog32F.CFF`	`Datalog###A.CFF`

For IEEE 1999, to read the entire data logger in binary COMTRADE format, read the following files.

Table 2-16: Data logger records for IEEE C37.111-1999, by data format

	BINARY	ASCII
Multiple files	`Datalog.CFG` `Datalog.DAT`	`DatalogA.CFG` `DatalogA.DAT`

To limit the range of records to be returned in the COMTRADE files, append the following to the filename before writing it:

- To read from a specific time to the end of the log: <space> startTime
- To read a specific range of records: <space> startTime <space> endTime
- Replace <startTime> and <endTime> with the number of seconds since Jan. 1 1970 as numeric text

2.3.1.6 Reading event recorder files

To read the entire event recorder contents in ASCII format (the only available format), use the following filename:

`EVT.TXT`

To read from a specific record to the end of the log, use the following filename:

`EVTnnn.TXT`

(replace nnn with the desired starting record number)

To read from a specific record to another specific record, use the following filename:

`EVT.TXT xxxxx yyyyy`

(replace xxxxx with the starting record number and yyyyy with the ending record number)

2.3.1.7 Reading fault report files

Fault report data has been available via the UR file retrieval mechanism since UR firmware version 2.00. The file name is `faultReport#####.htm`. The ##### refers to the fault report record number. The fault report number is a counter that indicates how many fault reports have ever occurred. The counter rolls over at a value of 65535. The last 15 fault reports are available for retrieval. It starts from 1 to 15, then if you have 18 reports, 3 to 18 are retrieved. A request for a non-existent fault report file yields a null file. The current value fault report counter is available in "Number of Fault Reports" Modbus register at location 3020h.

For example, if 14 fault reports have occurred then the files `faultReport5.htm`, `faultReport6.htm`, up to `faultReport14.htm` are available to be read. The expected use of this feature has an external master periodically polling the "Number of Fault Reports' register. If the value changes, then the master reads all the new files.

The contents of the file is in standard HTML notation and can be viewed via any commercial browser.

2.3.1.8 Reading PMU records

For URs that support PMU, familiarity with the PMU recording feature is required to understand the following description. For example, see the PMU Recording and later sections in the N60 instruction manual.

The "PMU Recording Number of Triggers" register increments by one every time a new PMU record is triggered (captured) on any of the PMU units in the relay (depending on the software option in the order code up to six PMUs can be available in a relay). When a new trigger occurs, the associated PMU record file is assigned a file identifier based on the number of the PMU module, the incremented value of this register module 1000 and the format of the COMTRADE file, as described here. This register can be used to determine if any new data has been captured by periodically reading it to see if the value has changed; if the number has increased then new data can be available.

The file "PMU_Records_List.txt" lists the available PMU records in the relay. This file can be retrieved by TFTP. This file includes information about the file name for every PMU record in the relay.

The PMU records can be retrieved using the EnerVista software or by TFTP. The file name has the format

`PMUp_xxxxn.eee`

where

p is the PMU recorder instance

xxxx is the COMTRADE format shown in the following tables

n is the file sequence number in integer format from 1 to 999. The file sequence number is unique among all PMUs.

eee is the extension (cfg, dat, hdr, cff)

For example, to retrieve file 7 from PMU 3 in binary 16 bit CFF format, retrieve the file `PMU3_16B7.cff`.

Table 2-17: PMU records for IEEE C37.111-2013, by data format

	Binary	Binary32	Float32	ASCII
Multiple files	PMUp_16Bn.cfg PMUp_16Bn.dat PMUp_16Bn.hdr	PMUp_32Bn.CFG PMUp_32Bn.DAT PMUp_32Bn.HDR	PMUp_32Fn.CFG PMUp_32Fn.DAT PMUp_32Fn.HDR	PMUp_###An.cfg PMUp_###An.dat PMUp_###An.hdr
Single file	PMUp_16Bn.CFF	PMUP_32Bn.CFF	PMUp_32Fn.CFF	PMUp_###An.cff

Table 2-18: PMU records for IEEE C37.111-1999, by data format

	Binary	ASCII
Multiple files	PMUp_n.cfg PMUp_n.dat PMUp_n.hdr	PMUp_An.cfg PMUp_An.dat PMUp_An.hdr

2.4 Memory map

Two tables provide the Modbus memory maps organized by settings and actual values. The registers actually present depend on the UR product and on the order codes software and module options.

The maps are viewable in a web browser. Enter the IP address of the UR and click the option.

In the table, "Grouped Setting" refers to content in the **Settings > Grouped Elements > Group** menus.

The data format tables that follow the memory maps provide more information for some entries.

2.4.1 Actual values map

Table 2-19: Actual values Modbus memory map

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Product Information (Read Only)						
All	0000	UR Product Type	0 to 65535	---	1	F001	0
"	0002	Product Version	0 to 655.35	---	0.01	F001	1
"	0003	Boot Configuration Register	0 to 65535	---	1	F001	0
G60	0100	GPM-F Version	0 to 655.35	---	0.01	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0101	GPM-F Compile Date	0 to 4294967295	---	1	F050	0
"	0103	GPM-F Order Code	---	---	---	F205	(none)
"	0109	GPM-F Serial Number	---	---	---	F205	(none)
"	010F	GPM-F Hardware Revision	0 to 65535	---	1	F001	0
All	0121	Main CPU Board HW ID	0 to 65535	---	1	F001	65535
"	0122	Main CPU Daughter Board HW ID	0 to 65535	---	1	F001	65535
All except B90, C30, L60	0123	Process Bus Module Bootloader Version	0 to 655.35	---	0.01	F001	0
"	0124	Process Bus Module Bootloader Compilation Date	0 to 4294967295	---	1	F050	0
"	0126	Process Bus Module Version	0 to 655.35	---	0.01	F001	0
"	0127	Process Bus Module Application Compilation Date	0 to 4294967295	---	1	F050	0
"	0129	Process Bus Module CVSOC FPGA Version	0 to 655.35	---	0.01	F001	0
"	0130	Process Bus Module CVSOC FPGA Compilation Date	0 to 4294967295	---	1	F050	0
"	0132	Process Bus Module CVFGPA Version	0 to 655.35	---	0.01	F001	0
"	0133	Process Bus Module CVFPGA Compilation Date	0 to 65535	---	1	F001	0
"	0135	Process Bus Module HW ID	0 to 65535	---	1	F001	0
	Self Test Targets (Read Only)						
All	0180	Self Test States (8 items)	0 to 4294967295	0	1	F143	0
"	0190	Reserved (120 items)	0 to 65535	---	1	F002	0
	Front Panel (Read Only)						
All	0208	LED Column n State, where n = 1 to 10 (10 items)	0 to 65535	---	1	F501	0
"	0220	Display Message	---	---	---	F204	(none)
"	0248	Last Key Pressed	0 to 47	---	1	F530	0 (None)
	Process Card / Process Bus Module Time Sync Actual Values (Read Only)						
All except B90, C30, L60	0284	Process Bus Module Clock Sync Source	0 to 3	---	1	F671	0 (None)
"	0285	Process Bus Module PTP Grandmaster ID	0 to 100	---	1	F073	0
"	0289	Process Bus Module Clock Accuracy	0 to 999999999	ns	1	F003	0
	Process Card / Process Bus Module Actual Values (Read Only)						
All except B90, C30, L60	0290	Process Bus Module Network Configuration Actual Value	0 to 3	---	1	F664	0 (INDEPENDENT)
"	0291	Process Bus Module Port 1a Status	0 to 2	---	1	F670	0 (Disabled)
"	0292	Process Bus Module Port 1b Status	0 to 2	---	1	F670	0 (Disabled)
"	0293	Process Bus Module Port 2a Status	0 to 2	---	1	F670	0 (Disabled)
"	0294	Process Bus Module Port 2b Status	0 to 2	---	1	F670	0 (Disabled)
"	0295	Process Bus Module Port 3a Status	0 to 2	---	1	F670	0 (Disabled)
"	0296	Process Bus Module Port 3b Status	0 to 2	---	1	F670	0 (Disabled)
"	0297	Process Bus Module Port 4a Status	0 to 2	---	1	F670	0 (Disabled)
"	0298	Process Bus Module Port 4b Status	0 to 2	---	1	F670	0 (Disabled)
"	0299	Process Bus Module All RxSV Online Status	0 to 1	---	1	F126	0 (No)
"	029A	Process Bus Module SV Stream Status (16 items)	0 to 3	---	1	F673	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Process Card / Process Bus Module SV Stream Actual Values (Read Only) (16 Modules)						
All except B90, C30, L60	02B2	Process Bus Module RxSV 1 Status	0 to 2	---	1	F686	2 (Not Configured)
"	02B3	Process Bus Module SV Stream 1 Sync Status	0 to 2	---	1	F685	0 (Local)
"	02B4	Process Bus Module SV Stream 1 Simulation Flag	0 to 1	---	1	F108	0 (Off)
"	02B5	Process Bus Module SV Stream 1 Delay	-2147483648 to 2147483647	us	1	F004	0
"	02B7	Process Bus Module SV Stream 1 Missed Frames	0 to 1	---	1	F126	0 (No)
"	02B8	Process Bus Module SV Stream 1 Channel Quality (16 items)	0 to 65535	---	1	F001	0
"	02C8	...Repeated for Process Bus Module SV Stream 2					
"	02DE	...Repeated for Process Bus Module SV Stream 3					
"	02F4	...Repeated for Process Bus Module SV Stream 4					
"	030A	...Repeated for Process Bus Module SV Stream 5					
"	0320	...Repeated for Process Bus Module SV Stream 6					
"	0336	...Repeated for Process Bus Module SV Stream 7					
"	034C	...Repeated for Process Bus Module SV Stream 8					
"	0362	...Repeated for Process Bus Module SV Stream 9					
"	0378	...Repeated for Process Bus Module SV Stream 10					
"	038E	...Repeated for Process Bus Module SV Stream 11					
"	03A4	...Repeated for Process Bus Module SV Stream 12					
"	03BA	...Repeated for Process Bus Module SV Stream 13					
"	03D0	...Repeated for Process Bus Module SV Stream 14					
"	03E6	...Repeated for Process Bus Module SV Stream 15					
"	03FC	...Repeated for Process Bus Module SV Stream 16					
	IEC 61850 GOOSE Simulation Actual Values (Read Only)						
All	0500	Simulation Mode Status	0 to 1	---	1	F102	0 (Disabled)
	Graphical Front Panel Actual Values (Read Only)						
All	050B	GFP Configurable Navigation Sequence Number (10 items)	0 to 65535	---	1	F001	0
"	050C	GFP Configurable Navigation Target Page	0 to 27	---	1	F647	0 (Product Information)
"	054D	GFP Mimic (Single-Line) Diagram Status Component Packed States	0 to 4294967295	---	1	F003	0
"	056F	GFP Tabular Metering Packed States	0 to 65535	---	1	F001	0
"	0570	GFP LED Packed States	0 to 65535	---	1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0571	GFP Miscellaneous Packed States (4 items)	0 to 15	---	1	F652	0 (CLOCK SYNC)
	Breaker Status Actual Values (Read Only) (20 Modules)						
B30	07A0	Bay 1 Breaker Status	0 to 3	---	1	F676	0 (Not Configured)
"	07A1	Bay 1 Breaker Status States Packed Bitfield	0 to 65535	---	1	F001	0
"	07A2	...Repeated for Bay 2					
"	07A4	...Repeated for Bay 3					
"	07A6	...Repeated for Bay 4					
"	07A8	...Repeated for Bay 5					
"	07AA	...Repeated for Bay 6					
"	07AC	...Repeated for Bay 7					
"	07AE	...Repeated for Bay 8					
"	07B0	...Repeated for Bay 9					
"	07B2	...Repeated for Bay 10					
"	07B4	...Repeated for Bay 11					
"	07B6	...Repeated for Bay 12					
"	07B8	...Repeated for Bay 13					
"	07BA	...Repeated for Bay 14					
"	07BC	...Repeated for Bay 15					
"	07BE	...Repeated for Bay 16					
"	07C0	...Repeated for Bay 17					
"	07C2	...Repeated for Bay 18					
"	07C4	...Repeated for Bay 19					
"	07C6	...Repeated for Bay 20					
	Digital Counter States Actual Values (Read Only Non-Volatile) (8 Modules)						
All except B90	0800	Digital Counter 1 Value	-2147483647 to 2147483647	---	1	F004	0
"	0802	Digital Counter 1 Frozen	-2147483647 to 2147483647	---	1	F004	0
"	0804	Digital Counter 1 Frozen Time Stamp	0 to 4294967295	---	1	F050	0
"	0806	Digital Counter 1 Frozen Time Stamp µs (microsecond part of time stamp)	0 to 4294967295	---	1	F003	0
"	0808	...Repeated for Digital Counter 2					
"	0810	...Repeated for Digital Counter 3					
"	0818	...Repeated for Digital Counter 4					
"	0820	...Repeated for Digital Counter 5					
"	0828	...Repeated for Digital Counter 6					
"	0830	...Repeated for Digital Counter 7					
"	0838	...Repeated for Digital Counter 8					
	FlexStates (Read Only)						
All	0900	FlexState Bits (16 items)	0 to 65535	---	1	F001	0
	Expanded Remote Input/Output Status (Read Only)						
All	0B12	Remote Device States, one per register (64 items)	0 to 1	---	1	F155	0 (Offline)
"	0B52	RxGOOSE Boolean x States, one per register (256 items)	0 to 1	---	1	F108	0 (Off)

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Element States (Read Only)						
All	1000	Element Operate States (89 items)	0 to 65535	---	1	F502	0
	User Displays Actuals (Read Only)						
All	1080	Formatted user-definable displays (16 items)	---	---	---	F200	(none)
	Modbus User Map Actuals (Read Only)						
All	1200	User Map Values (256 items)	0 to 65535	---	1	F001	0
	Element Targets (Read Only)						
All	14E0	Target Sequence	0 to 65535	---	1	F001	0
"	14E1	Number of Targets	0 to 65535	---	1	F001	0
"	14E3	Target Message	---	---	---	F200	"."
	Contact Input/Output States (Read Only)						
All	1500	Contact Input States (8 items)	0 to 65535	---	1	F500	0
"	1508	Virtual Input States (8 items)	0 to 65535	---	1	F500	0
"	1510	Contact Output States (5 items)	0 to 65535	---	1	F500	0
"	1518	Contact Output Current States (5 items)	0 to 65535	---	1	F500	0
"	1520	Contact Output Voltage States (5 items)	0 to 65535	---	1	F500	0
"	1528	Virtual Output States (8 items)	0 to 65535	---	1	F500	0
"	1530	Contact Output Detectors (5 items)	0 to 65535	---	1	F500	0
	RxGOOSE Input/Output States (Read Only)						
All	1540	Remote Device x States (4 items)	0 to 65535	---	1	F500	0
"	1544	RxGOOSE Boolean x States (16 items)	0 to 65535	---	1	F500	0
"	1554	Remote Devices Online	0 to 1	---	1	F126	0 (No)
"	1555	RxGOOSE Double-Point Status Input x State (16 items)	0 to 4	---	1	F605	3 (bad-state)
	Direct Input/Output States (Read Only)						
L30, L90	1570	Direct Input 1-1 State (8 or 32 items)	0 to 1	---	1	F108	0 (Off)
"	1590	Direct Input 1-2 State (8 or 32 items)	0 to 1	---	1	F108	0 (Off)
"	15B0	Direct Input 1 State (2 items)	0 to 65535	---	1	F500	0
"	15B2	Direct Input 2 State (2 items)	0 to 65535	---	1	F500	0
	Platform Direct Input/Output States (Read Only)						
All except L30, L90	15C0	Direct Input States (16 items)	0 to 65535	---	1	F500	0
"	15D0	Direct Outputs Average Message Return Time 1	0 to 65535	ms	1	F001	0
"	15D1	Direct Outputs Average Message Return Time 2	0 to 65535	ms	1	F001	0
"	15D2	Direct Inputs/Outputs Unreturned Message Count - Channel 1	0 to 65535	---	1	F001	0
"	15D3	Direct Inputs/Outputs Unreturned Message Count - Channel 2	0 to 65535	---	1	F001	0
"	15D4	Direct Device States	0 to 65535	---	1	F500	0
"	15D6	Direct Inputs/Outputs CRC Fail Count 1	0 to 65535	---	1	F001	0
"	15D7	Direct Inputs/Outputs CRC Fail Count 2	0 to 65535	---	1	F001	0
	Field Unit Input/Output States (Read Only)						
All except B90, L60	15E0	Field Unit Contact Input States (3 items)	0 to 65535	---	1	F500	0
"	15E3	Field Unit Contact Input Output Operand States (8 items)	0 to 65535	---	1	F500	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	15EB	Field Contact Output Physical States (8 items)	0 to 65535	---	1	F500	0
"	15F3	Field Contact Output Current States (8 items)	0 to 65535	---	1	F500	0
"	15FB	Field Contact Output Physical States (8 items)	0 to 65535	---	1	F500	0
"	1603	Field Shared Input States	0 to 65535	---	1	F500	0
"	1604	Field Shared Input Channel States	0 to 65535	---	1	F500	0
"	1605	Field Shared Input Test States	0 to 65535	---	1	F500	0
"	1606	Field Shared Output Operand States	0 to 65535	---	1	F500	0
"	1607	Field Latching Output Open Operand States	0 to 65535	---	1	F500	0
"	1608	Field Latching Output Close Operand States	0 to 65535	---	1	F500	0
"	1609	Field Latching Output Open Driver States	0 to 65535	---	1	F500	0
"	160A	Field Latching Output Close Driver States	0 to 65535	---	1	F500	0
"	160B	Field Latching Output Physical States	0 to 65535	---	1	F500	0
"	160C	Field Unit Online/Offline States	0 to 65535	---	1	F500	0
"	160D	Field RTD Input Trouble States	0 to 65535	---	1	F500	0
"	160E	Field Transducer Input Trouble States	0 to 65535	---	1	F500	0
	Ethernet Fibre Channel Status (Read Only)						
All	1610	Ethernet Primary Fibre Channel Status	0 to 2	---	1	F134	0 (Fail)
"	1611	Ethernet Secondary Fibre Channel Status	0 to 2	---	1	F134	0 (Fail)
"	1612	Ethernet Tertiary Fibre Channel Status	0 to 2	---	1	F134	0 (Fail)
	Data Logger Actual Values (Read Only)						
All except B90	1618	Data Logger Channel Count	0 to 16	channel	1	F001	0
"	1619	Time of Oldest Available Samples	0 to 4294967295	---	1	F050	0
"	161B	Time of Newest Available Samples	0 to 4294967295	---	1	F050	0
"	161D	Data Logger Duration	0 to 999.9	days	0.1	F001	0
	Channel Status (Read Only)						
L90	1620	Channel 1 Status	0 to 2	---	1	F134	1 (OK)
"	1621	Channel 1 Number of Lost Packets	0 to 65535	---	1	F001	0
"	1622	Channel 1 Local Loopback Status	0 to 2	---	1	F134	2 (n/a)
"	1623	Channel 1 Remote Loopback Status	0 to 2	---	1	F134	2 (n/a)
"	1626	Channel 1 Loop Delay	0 to 200	ms	0.1	F001	0
"	1627	Channel 2 Status	0 to 2	---	1	F134	2 (n/a)
"	1628	Channel 2 Number of Lost Packets	0 to 65535	---	1	F001	0
"	1629	Channel 2 Local Loopback Status	0 to 2	---	1	F134	2 (n/a)
"	162A	Channel 2 Remote Loopback Status	0 to 2	---	1	F134	2 (n/a)
"	162B	Network Status	0 to 2	---	1	F134	2 (n/a)
"	162E	Channel 2 Loop Delay	0 to 200	ms	0.1	F001	0
"	162F	Channel PFLL Status	0 to 2	---	1	F134	1 (OK)
	87L Channel Status Actual Values (Read Only)						
L30, L90	1638	Channel 1 Asymmetry	-65.535 to 65.535	ms	0.001	F004	0
"	163A	Channel 2 Asymmetry	-99.999 to 99.999	ms	0.001	F004	0
	L60 Test Mode (Read Only)						
L60	1641	L60 Trip Control Status	0 to 2	---	1	F134	2 (n/a)
"	1642	L60 Channel Status (4 items)	0 to 2	---	1	F134	2 (n/a)

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Stator Differential Actual Values (Read Only)						
G60, M60	1660	Generator Differential Iad	0 to 999999.999	A	0.001	F060	0
"	1662	Generator Restraint Iar	0 to 999999.999	A	0.001	F060	0
"	1664	Generator Differential Ibd	0 to 999999.999	A	0.001	F060	0
"	1666	Generator Restraint Ibr	0 to 999999.999	A	0.001	F060	0
"	1668	Generator Differential Icd	0 to 999999.999	A	0.001	F060	0
"	166A	Generator Restraint Icr	0 to 999999.999	A	0.001	F060	0
"	166C	Stator Differential CT Primary	0 to 50000	---	1	F060	1
	Stator Ground Actual Values (Read Only)						
G30, G60	1670	Stator Ground Vn 3rd	0 to 999999.999	V	0.001	F060	0
"	1672	Stator Ground Vn V0 3rd	0 to 999999.999	V	0.001	F060	0
"	1674	Stator Ground V0 3rd	0 to 999999.999	V	0.001	F060	0
	Subharmonic Stator Ground Actual Values (Read Only)						
G60	1678	Subharmonic Injection Voltage	0 to 999999.999	V	0.001	F060	0
"	167A	Subharmonic Injection Current	0 to 999999.999	A	0.001	F060	0
"	167C	Stator Ground Resistance	0 to 500	kOhm	0.001	F003	500000
"	167E	Stator Ground Resistance Exceeded	0 to 0.1	---	0.1	F208	(none)
"	167F	Subharmonic Injection Current Angle	-360 to 360	degrees	0.1	F002	0
	Sensitive Directional Power Actual Values (Read Only) (2 Modules)						
C60, D60, F60, G30, G60, L90, M60, N60, T60	1680	Sensitive Directional Power 1 Power	-2147483647 to 2147483647	W	1	F060	0
"	1682	Sensitive Directional Power 2 Power	-2147483647 to 2147483647	W	1	F060	0
	Restricted Ground Fault Currents (Read Only) (4 or 6 Modules)						
F60, G30, G60, L90, T35, T60	16A0	Differential Ground Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	16A2	Restricted Ground Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	16A4	...Repeated for Restricted Ground Fault 2					
"	16A8	...Repeated for Restricted Ground Fault 3					
"	16AC	...Repeated for Restricted Ground Fault 4					
T35, T60	16B0	...Repeated for Restricted Ground Fault 5					
"	16B4	...Repeated for Restricted Ground Fault 6					
	Field Unit RTD Actuals (Read Only) (8 Modules)						
All except B90, L60	16C0	Field RTD 1 Value	-32768 to 32767	°C	1	F002	0
"	16C1	...Repeated for Field RTD 2					
"	16C2	...Repeated for Field RTD 3					
"	16C3	...Repeated for Field RTD 4					
"	16C4	...Repeated for Field RTD 5					
"	16C5	...Repeated for Field RTD 6					
"	16C6	...Repeated for Field RTD 7					
"	16C7	...Repeated for Field RTD 8					
	Field Unit Transducer Actual Values (Read Only) (8 Modules)						
All except B90, L60	16C8	Field Transducer 1 Value	-32.768 to 32.767	---	0.001	F004	0
"	16CA	...Repeated for Field Transducer 2					
"	16CC	...Repeated for Field Transducer 3					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	16CE	...Repeated for Field Transducer 4					
"	16D0	...Repeated for Field Transducer 5					
"	16D2	...Repeated for Field Transducer 6					
"	16D4	...Repeated for Field Transducer 7					
"	16D6	...Repeated for Field Transducer 8					
	Frequency Rate of Change Actual Values (Read Only) (2 or 4 Modules)						
D30, D60, F60, G30, G60, L30, L90, N60, T60	16E0	Frequency Rate of Change 1	-327.67 to 327.67	Hz/s	0.01	F002	0
"	16E1	Reserved (3 items)	0 to 65535	---	1	F001	0
"	16E4	...Repeated for Frequency Rate of Change 2					
D60, F60, G30, G60, L90, N60, T60	16E8	...Repeated for Frequency Rate of Change 3					
"	16EC	...Repeated for Frequency Rate of Change 4					
	Source Voltage (Read Only) (2, 4, or 6 Modules)						
All except B90, C30	1A00	Source 1 Phase AG Voltage RMS	0 to 999999.999	V	0.001	F060	0
"	1A02	Source 1 Phase BG Voltage RMS	0 to 999999.999	V	0.001	F060	0
"	1A04	Source 1 Phase CG Voltage RMS	0 to 999999.999	V	0.001	F060	0
"	1A06	Source 1 Phase AG Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A08	Source 1 Phase AG Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	1A09	Source 1 Phase BG Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A0B	Source 1 Phase BG Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	1A0C	Source 1 Phase CG Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A0E	Source 1 Phase CG Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	1A0F	Source 1 Phase AB or AC Voltage RMS	0 to 999999.999	V	0.001	F060	0
"	1A11	Source 1 Phase BC or BA Voltage RMS	0 to 999999.999	V	0.001	F060	0
"	1A13	Source 1 Phase CA or CB Voltage RMS	0 to 999999.999	V	0.001	F060	0
"	1A15	Source 1 Phase AB or AC Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A17	Source 1 Phase AB or AC Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	1A18	Source 1 Phase BC or BA Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A1A	Source 1 Phase BC or BA Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	1A1B	Source 1 Phase CA or CB Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A1D	Source 1 Phase CA or CB Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	1A1E	Source 1 Auxiliary Voltage RMS	0 to 999999.999	V	0.001	F060	0
"	1A20	Source 1 Auxiliary Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A22	Source 1 Auxiliary Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	1A23	Source 1 Zero Sequence Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A25	Source 1 Zero Sequence Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	1A26	Source 1 Positive Sequence Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A28	Source 1 Positive Sequence Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	1A29	Source 1 Negative Sequence Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	1A2B	Source 1 Negative Sequence Voltage Angle	-359.9 to 0	degrees	0.1	F002	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1A2C	Reserved (20 items)	---	---	---	F001	0
"	1A40	...Repeated for Source 2					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	1A80	...Repeated for Source 3					
"	1AC0	...Repeated for Source 4					
B30, C70, F35, N60, T35, T60	1B00	...Repeated for Source 5					
"	1B40	...Repeated for Source 6					
	Source Power (Read Only) (2, 4, or 6 Modules)						
All except B90, C30	1C00	Source 1 Three Phase Real Power	-1000000000000 to 1000000000000	W	0.001	F060	0
"	1C02	Source 1 Phase A Real Power	-1000000000000 to 1000000000000	W	0.001	F060	0
"	1C04	Source 1 Phase B Real Power	-1000000000000 to 1000000000000	W	0.001	F060	0
"	1C06	Source 1 Phase C Real Power	-1000000000000 to 1000000000000	W	0.001	F060	0
"	1C08	Source 1 Three Phase Reactive Power	-1000000000000 to 1000000000000	var	0.001	F060	0
"	1C0A	Source 1 Phase A Reactive Power	-1000000000000 to 1000000000000	var	0.001	F060	0
"	1C0C	Source 1 Phase B Reactive Power	-1000000000000 to 1000000000000	var	0.001	F060	0
"	1C0E	Source 1 Phase C Reactive Power	-1000000000000 to 1000000000000	var	0.001	F060	0
"	1C10	Source 1 Three Phase Apparent Power	-1000000000000 to 1000000000000	VA	0.001	F060	0
"	1C12	Source 1 Phase A Apparent Power	-1000000000000 to 1000000000000	VA	0.001	F060	0
"	1C14	Source 1 Phase B Apparent Power	-1000000000000 to 1000000000000	VA	0.001	F060	0
"	1C16	Source 1 Phase C Apparent Power	-1000000000000 to 1000000000000	VA	0.001	F060	0
"	1C18	Source 1 Three Phase Power Factor	-0.999 to 1	---	0.001	F013	0
"	1C19	Source 1 Phase A Power Factor	-0.999 to 1	---	0.001	F013	0
"	1C1A	Source 1 Phase B Power Factor	-0.999 to 1	---	0.001	F013	0
"	1C1B	Source 1 Phase C Power Factor	-0.999 to 1	---	0.001	F013	0
"	1C1C	Reserved (4 items)	---	---	---	F001	0
"	1C20	...Repeated for Source 2					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	1C40	...Repeated for Source 3					
"	1C60	...Repeated for Source 4					
B30, C70, F35, N60, T35, T60	1C80	...Repeated for Source 5					
"	1CA0	...Repeated for Source 6					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Source Energy Metering (Read Only Non-Volatile) (4 or 6 Modules)						
B30, C60, D60, F35, F60, G30, G60, L90, M60, N60, T60	1D00	Source 1 Positive Watthour	0 to 1000000000000	Wh	0.001	F060	0
"	1D02	Source 1 Negative Watthour	0 to 1000000000000	Wh	0.001	F060	0
"	1D04	Source 1 Positive Varhour	0 to 1000000000000	varh	0.001	F060	0
"	1D06	Source 1 Negative Varhour	0 to 1000000000000	varh	0.001	F060	0
"	1D08	Reserved (8 items)	---	---	---	F001	0
"	1D10	...Repeated for Source 2					
"	1D20	...Repeated for Source 3					
"	1D30	...Repeated for Source 4					
B30, F35, N60, T60	1D40	...Repeated for Source 5					
"	1D50	...Repeated for Source 6					
	Source Frequency (Read Only) (2, 4, or 6 Modules)						
All except B90, C30	1D80	Frequency for Source 1	2 to 90	Hz	0.001	F003	0
"	1D82	Frequency for Source 2	2 to 90	Hz	0.001	F003	0
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	1D84	Frequency for Source 3	2 to 90	Hz	0.001	F003	0
"	1D86	Frequency for Source 4	2 to 90	Hz	0.001	F003	0
B30, C70, F35, N60, T35, T60	1D88	Frequency for Source 5	2 to 90	Hz	0.001	F003	0
"	1D8A	Frequency for Source 6	2 to 90	Hz	0.001	F003	0
	Source Demand (Read Only) (4 or 6 Modules)						
B30, C60, D60, F35, F60, G60, L60, L90, N60, T60	1E00	Source 1 Demand Ia	0 to 999999.999	A	0.001	F060	0
"	1E02	Source 1 Demand Ib	0 to 999999.999	A	0.001	F060	0
"	1E04	Source 1 Demand Ic	0 to 999999.999	A	0.001	F060	0
"	1E06	Source 1 Demand Watt	0 to 999999.999	W	0.001	F060	0
"	1E08	Source 1 Demand Var	0 to 999999.999	var	0.001	F060	0
"	1E0A	Source 1 Demand Va	0 to 999999.999	VA	0.001	F060	0
"	1E0C	Reserved (4 items)	---	---	---	F001	0
"	1E10	...Repeated for Source 2					
"	1E20	...Repeated for Source 3					
"	1E30	...Repeated for Source 4					
B30, F35, N60, T60	1E40	...Repeated for Source 5					
"	1E50	...Repeated for Source 6					
	Source Demand Peaks (Read Only Non-Volatile) (4 or 6 Modules)						
B30, C60, D60, F35, F60, G60, L60, L90, N60, T60	1E80	Source 1 Demand Ia Maximum	0 to 999999.999	A	0.001	F060	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1E82	Source 1 Demand Ia Maximum Date	0 to 4294967295	---	1	F050	0
"	1E84	Source 1 Demand Ib Maximum	0 to 999999.999	A	0.001	F060	0
"	1E86	Source 1 Demand Ib Maximum Date	0 to 4294967295	---	1	F050	0
"	1E88	Source 1 Demand Ic Maximum	0 to 999999.999	A	0.001	F060	0
"	1E8A	Source 1 Demand Ic Maximum Date	0 to 4294967295	---	1	F050	0
"	1E8C	Source 1 Demand Watt Maximum	0 to 999999.999	W	0.001	F060	0
"	1E8E	Source 1 Demand Watt Maximum Date	0 to 4294967295	---	1	F050	0
"	1E90	Source 1 Demand Var	0 to 999999.999	var	0.001	F060	0
"	1E92	Source 1 Demand Var Maximum Date	0 to 4294967295	---	1	F050	0
"	1E94	Source 1 Demand Va Maximum	0 to 999999.999	VA	0.001	F060	0
"	1E96	Source 1 Demand Va Maximum Date	0 to 4294967295	---	1	F050	0
"	1E98	Reserved (8 items)	---	---	---	F001	0
"	1EA0	...Repeated for Source 2					
"	1EC0	...Repeated for Source 3					
"	1EE0	...Repeated for Source 4					
B30, F35, N60, T60	1F00	...Repeated for Source 5					
"	1F20	...Repeated for Source 6					
	Source Voltage THD and Harmonics (Read Only) (2, 4, or 6 Modules) (For F60, if order code has HIZ DSP, then 0 modules)						
C70, D60, F35, F60, G30, G60, L30, L90, N60, T60	1F80	Source 1 Va THD	0 to 99.9	---	0.1	F001	0
"	1F81	Source 1 Va Harmonics - 2nd to 25th (24 items)	0 to 99.9	---	0.1	F001	0
"	1F99	Source 1 Vb THD	0 to 99.9	---	0.1	F001	0
"	1F9A	Source 1 Vb Harmonics - 2nd to 25th (24 items)	0 to 99.9	---	0.1	F001	0
"	1FB2	Source 1 Vc THD	0 to 99.9	---	0.1	F001	0
"	1FB3	Source 1 Vc Harmonics - 2nd to 25th (24 items)	0 to 99.9	---	0.1	F001	0
"	1FCB	...Repeated for Source 2					
C70, D60, F35, F60, G30, G60, L90, N60, T60	2016	...Repeated for Source 3					
"	2061	...Repeated for Source 4					
C70, F35, N60, T60	20AC	...Repeated for Source 5					
"	20F7	...Repeated for Source 6					
	Bus Actuals (Read Only) (6 Modules)						
B90	21D0	Bus Zone 1 Differential Magnitude	0 to 999999.999	A	0.001	F060	0
"	21D4	Bus Zone 1 Differential Angle	-359.9 to 0	degrees	0.1	F002	0
"	21D5	Bus Zone 1 Restraint Magnitude	0 to 999999.999	A	0.001	F060	0
"	21D7	Bus Zone 1 Restraint Angle	-359.9 to 0	degrees	0.1	F002	0
"	21D8	Bus Zone 1 Maximum CT	0 to 50000	---	1	F060	1
"	21DA	Reserved (4 items)	---	---	---	F001	0
"	21DE	...Repeated for Bus Zone 2					
"	21EC	...Repeated for Bus Zone 3					
"	21FA	...Repeated for Bus Zone 4					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	2208	...Repeated for Bus Zone 5					
"	2216	...Repeated for Bus Zone 6					
	Hi-Z Status (Read Only)						
F60	2250	Hi-Z Status	0 to 9	---	1	F187	0 (NORMAL)
"	2251	Hi-Z Phase A Arc Confidence	0 to 100	---	1	F001	0
"	2252	Hi-Z Phase B Arc Confidence	0 to 100	---	1	F001	0
"	2253	Hi-Z Phase C Arc Confidence	0 to 100	---	1	F001	0
"	2254	Hi-Z Neutral Arc Confidence	0 to 100	---	1	F001	0
	Hi-Z Records (Read Only) (4 Modules)						
F60	2260	Hi-Z Capture 1 Trigger Type	0 to 6	---	1	F188	0 (NONE)
"	2261	Hi-Z Capture 1 Time	0 to 1	---	1	F050	0
"	2263	...Repeated for Hi-Z Capture 2					
"	2266	...Repeated for Hi-Z Capture 3					
"	2269	...Repeated for Hi-Z Capture 4					
	Hi-Z RMS Records (Read Only) (4 Modules)						
F60	2270	Hi-Z RMS Capture 1 Trigger Type	0 to 6	---	1	F188	0 (NONE)
"	2271	Hi-Z RMS Capture 1 Time	0 to 1	---	1	F050	0
"	2273	...Repeated for Hi-Z RMS Capture 2					
"	2276	...Repeated for Hi-Z RMS Capture 3					
"	2279	...Repeated for Hi-Z RMS Capture 4					
	Source Current THD (Read Only) (6 Modules)						
L60	22A0	Source 1 Ia THD	0 to 100	%	0.1	F001	0
"	22A1	Source 1 Ib THD	0 to 100	%	0.1	F001	0
"	22A2	Source 1 Ic THD	0 to 100	%	0.1	F001	0
"	22A3	Source 1 In THD	0 to 100	%	0.1	F001	0
"	22A4	...Repeated for Source 2					
"	22A8	...Repeated for Source 3					
"	22AC	...Repeated for Source 4					
"	22B0	...Repeated for Source 5					
"	22B4	...Repeated for Source 6					
	Transformer Differential and Restraint (Read Only)						
G30, T35, T60	2300	Transformer Reference Winding	1 to 6	---	1	F001	1
"	2301	Transformer Differential Phasor Iad Magnitude	0 to 30	pu	0.001	F001	0
"	2302	Transformer Differential Phasor Iad Angle	-359.9 to 0	degrees	0.1	F002	0
"	2303	Transformer Restraint Phasor Iar Magnitude	0 to 30	pu	0.001	F001	0
"	2304	Transformer Restraint Phasor Iar Angle	-359.9 to 0	degrees	0.1	F002	0
"	2305	Transformer Differential 2nd Harm Iad Magnitude	0 to 999.9	% fo	0.1	F001	0
"	2306	Transformer Differential 2nd Harm Iad Angle	-359.9 to 0	degrees	0.1	F002	0
"	2307	Transformer Differential 5th Harm Iad Magnitude	0 to 999.9	% fo	0.1	F001	0
"	2308	Transformer Differential 5th Harm Iad Angle	-359.9 to 0	degrees	0.1	F002	0
"	2309	Transformer Differential Phasor Ibd Magnitude	0 to 30	pu	0.001	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	230A	Transformer Differential Phasor Ibd Angle	-359.9 to 0	degrees	0.1	F002	0
"	230B	Transformer Restraint Phasor Ibr Magnitude	0 to 30	pu	0.001	F001	0
"	230C	Transformer Restraint Phasor Ibr Angle	-359.9 to 0	degrees	0.1	F002	0
"	230D	Transformer Differential 2nd Harm Ibd Magnitude	0 to 999.9	% fo	0.1	F001	0
"	230E	Transformer Differential 2nd Harm Ibd Angle	-359.9 to 0	degrees	0.1	F002	0
"	230F	Transformer Differential 5th Harm Ibd Magnitude	0 to 999.9	% fo	0.1	F001	0
"	2310	Transformer Differential 5th Harm Ibd Angle	-359.9 to 0	degrees	0.1	F002	0
"	2311	Transformer Differential Phasor Icd Magnitude	0 to 30	pu	0.001	F001	0
"	2312	Transformer Differential Phasor Icd Angle	-359.9 to 0	degrees	0.1	F002	0
"	2313	Transformer Restraint Phasor Icr Magnitude	0 to 30	pu	0.001	F001	0
"	2314	Transformer Restraint Phasor Icr Angle	-359.9 to 0	degrees	0.1	F002	0
"	2315	Transformer Differential 2nd Harm Icd Magnitude	0 to 999.9	% fo	0.1	F001	0
"	2316	Transformer Differential 2nd Harm Icd Angle	-359.9 to 0	degrees	0.1	F002	0
"	2317	Transformer Differential 5th Harm Icd Magnitude	0 to 999.9	% fo	0.1	F001	0
"	2318	Transformer Differential 5th Harm Icd Angle	-359.9 to 0	degrees	0.1	F002	0
	Transformer Thermal Inputs Actual Values (Read Only)						
G30, T35, T60	2330	Transformer Top Oil Temperature	0 to 300	°C	1	F002	0
"	2331	Transformer Hottest Spot Temperature	0 to 300	°C	1	F002	0
"	2332	Transformer Aging Factor	0 to 6553.5	PU	0.1	F001	0
"	2333	Transformer Daily Loss of Life	0 to 500000	Hours	1	F060	0
	Transformer Thermal Inputs Actual Values (Read Only Non-Volatile)						
G30, T35, T60	2335	Transformer Loss of Life	0 to 500000	Hours	1	F060	0
	Fault Location (Read Only) (1, 2, or 5 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90	2340	Fault 1 Prefault Phase A Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2342	Fault 1 Prefault Phase A Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	2343	Fault 1 Prefault Phase B Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2345	Fault 1 Prefault Phase B Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	2346	Fault 1 Prefault Phase C Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2348	Fault 1 Prefault Phase C Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	2349	Fault 1 Prefault Phase A Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	234B	Fault 1 Prefault Phase A Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	234C	Fault 1 Prefault Phase B Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	234E	Fault 1 Prefault Phase B Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	234F	Fault 1 Prefault Phase C Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	2351	Fault 1 Prefault Phase C Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	2352	Fault 1 Phase A Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2354	Fault 1 Phase A Current Angle	-359.9 to 0	degrees	0.1	F002	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	2355	Fault 1 Phase B Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2357	Fault 1 Phase B Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	2358	Fault 1 Phase C Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	235A	Fault 1 Phase C Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	235B	Fault 1 Phase A Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	235D	Fault 1 Phase A Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	235E	Fault 1 Phase B Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	2360	Fault 1 Phase B Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	2361	Fault 1 Phase C Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	2363	Fault 1 Phase C Voltage Angle	-359.9 to 0	degrees	0.1	F002	0
"	2364	Fault 1 Type	0 to 11	---	1	F148	0 (NA)
"	2365	Fault 1 Location based on Line length units (km or miles)	-3276.7 to 3276.7	---	0.1	F002	0
C60, D60, F35, F60, L30, L60, L90	2366	...Repeated for Fault 2					
F35, F60	238C	...Repeated for Fault 3					
"	23B2	...Repeated for Fault 4					
"	23D8	...Repeated for Fault 5					
	Autoreclose Status (Read Only) (1, 3, 4, or 6 Modules)						
B30, C60, D30, D60, F35, F60, L30, L60, L90	2410	Autoreclose 1 Count	0 to 65535	---	1	F001	0
B30, F35, F60, L30	2411	Autoreclose 2 Count	0 to 65535	---	1	F001	0
"	2412	Autoreclose 3 Count	0 to 65535	---	1	F001	0
B30, F35, F60	2413	Autoreclose 4 Count	0 to 65535	---	1	F001	0
B30, F35	2414	Autoreclose 5 Count	0 to 65535	---	1	F001	0
"	2415	Autoreclose 6 Count	0 to 65535	---	1	F001	0
	87L Current Differential Actual Values (Read Only)						
L30, L90	2480	Local IA Magnitude	0 to 999999.999	A	0.001	F060	0
"	2482	Local IB Magnitude	0 to 999999.999	A	0.001	F060	0
"	2484	Local IC Magnitude	0 to 999999.999	A	0.001	F060	0
"	2486	Terminal 1 IA Magnitude	0 to 999999.999	A	0.001	F060	0
"	2488	Terminal 1 IB Magnitude	0 to 999999.999	A	0.001	F060	0
"	248A	Terminal 1 IC Magnitude	0 to 999999.999	A	0.001	F060	0
"	248C	Terminal 2 IA Magnitude	0 to 999999.999	A	0.001	F060	0
"	248E	Terminal 2 IB Magnitude	0 to 999999.999	A	0.001	F060	0
"	2490	Terminal 2 IC Magnitude	0 to 999999.999	A	0.001	F060	0
"	2492	Differential Current IA Magnitude	0 to 999999.999	A	0.001	F060	0
"	2494	Differential Current IB Magnitude	0 to 999999.999	A	0.001	F060	0
"	2496	Differential Current IC Magnitude	0 to 999999.999	A	0.001	F060	0
"	2498	Local IA Angle	-359.9 to 0	degrees	0.1	F002	0
"	2499	Local IB Angle	-359.9 to 0	degrees	0.1	F002	0
"	249A	Local IC Angle	-359.9 to 0	degrees	0.1	F002	0
"	249B	Terminal 1 IA Angle	-359.9 to 0	degrees	0.1	F002	0
"	249C	Terminal 1 IB Angle	-359.9 to 0	degrees	0.1	F002	0
"	249D	Terminal 1 IC Angle	-359.9 to 0	degrees	0.1	F002	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	249E	Terminal 2 IA Angle	-359.9 to 0	degrees	0.1	F002	0
"	249F	Terminal 2 IB Angle	-359.9 to 0	degrees	0.1	F002	0
"	24A0	Terminal 2 IC Angle	-359.9 to 0	degrees	0.1	F002	0
"	24A1	Differential Current IA Angle	-359.9 to 0	degrees	0.1	F002	0
"	24A2	Differential Current IB Angle	-359.9 to 0	degrees	0.1	F002	0
"	24A3	Differential Current IC Angle	-359.9 to 0	degrees	0.1	F002	0
"	24A4	Op Square Current IA	0 to 999999.999	A	0.001	F060	0
"	24A6	Op Square Current IB	0 to 999999.999	A	0.001	F060	0
"	24A8	Op Square Current IC	0 to 999999.999	A	0.001	F060	0
"	24AA	Restraint Square Current IA	0 to 999999.999	A	0.001	F060	0
"	24AC	Restraint Square Current IB	0 to 999999.999	A	0.001	F060	0
"	24AE	Restraint Square Current IC	0 to 999999.999	A	0.001	F060	0
"	24B0	Restraint Current IA	0 to 999999.999	A	0.001	F060	0
"	24B2	Restraint Current IB	0 to 999999.999	A	0.001	F060	0
"	24B4	Restraint Current IC	0 to 999999.999	A	0.001	F060	0
"	24B6	Differential Current IG Magnitude	0 to 999999.999	A	0.001	F060	0
"	24B8	Differential Current IG Angle	-359.9 to 0	degrees	0.1	F002	0
"	24B9	Restraint Current IG	0 to 999999.999	A	0.001	F060	0
"	24BB	Local IG Magnitude	0 to 999999.999	A	0.001	F060	0
"	24BD	Local IG Angle	-359.9 to 0	degrees	0.1	F002	0
"	24BE	Terminal 1 IG Magnitude	0 to 999999.999	A	0.001	F060	0
"	24C0	Terminal 1 IG Angle	-359.9 to 0	degrees	0.1	F002	0
"	24C1	Terminal 2 IG Magnitude	0 to 999999.999	A	0.001	F060	0
"	24C3	Terminal 2 IG Angle	-359.9 to 0	degrees	0.1	F002	0
	Current Differential 87L Composite Voltage Actuals (Read Only)						
L90	24C4	Line Current Differential (87L) Local Composite Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	24C6	Line Current Differential (87L) Local Composite Voltage Angle	–359.9 to 0	degrees	0.1	F002	0
"	24C7	Line Current Differential (87L) Terminal 1 Composite Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	24C9	Line Current Differential (87L) Terminal 1 Composite Voltage Angle	–359.9 to 0	degrees	0.1	F002	0
"	24CA	Line Current Differential (87L) Terminal 2 Composite Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	24CC	Line Current Differential (87L) Terminal 2 Composite Voltage Angle	–359.9 to 0	degrees	0.1	F002	0
	87L Second Harmonics Differential Current (Read Only)						
L30, L90	24CD	Line Current Differential (87L) Second Harmonic Iad Magnitude	0 to 999999.999	A	0.001	F060	0
"	24CF	Line Current Differential (87L) Second Harmonic Ibd magnitude	0 to 999999.999	A	0.001	F060	0
"	24D1	Line Current Differential (87L) Second Harmonic Icd Magnitude	0 to 999999.999	A	0.001	F060	0
	Fault Location Loop Impedance (Read Only) (5 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90	24D3	Fault Loop Resist	0 to 9999.99	ohm	0.01	F004	0
"	24D5	Fault Loop React	-9999.99 to 9999.99	ohm	0.01	F004	0
"	24D7	...Repeated for module 2					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	24DB	...Repeated for module 3					
"	24DF	...Repeated for module 4					
"	24E3	...Repeated for module 5					
	Fault Location Multiend (Read Only) (5 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90	24E7	Fault Resistance	0 to 9999.99	ohm	0.01	F004	0
"	24E9	Fault Segment	0 to 3	---	1	F001	0
"	24EA	...Repeated for module 2					
"	24ED	...Repeated for module 3					
"	24F0	...Repeated for module 4					
"	24F3	...Repeated for module 5					
	Phasor Measurement Unit Actual Values (Read Only) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	256D	PMU 1 Phase A Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	256F	PMU Unit 1 Phase A Voltage Angle	-180 to 180	°	0.01	F002	0
"	2570	PMU 1 Phase B Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	2572	PMU 1 Phase B Voltage Angle	-180 to 180	°	0.01	F002	0
"	2573	PMU 1 Phase C Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	2575	PMU 1 Phase C Voltage Angle	-180 to 180	°	0.01	F002	0
"	2576	PMU 1 Auxiliary Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	2578	PMU 1 Auxiliary Voltage Angle	-180 to 180	°	0.01	F002	0
"	2579	PMU 1 Positive Sequence Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	257B	PMU 1 Positive Sequence Voltage Angle	-180 to 180	°	0.01	F002	0
"	257C	PMU 1 Negative Sequence Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	257E	PMU 1 Negative Sequence Voltage Angle	-180 to 180	°	0.01	F002	0
"	257F	PMU 1 Zero Sequence Voltage Magnitude	0 to 999999.999	V	0.001	F060	0
"	2581	PMU 1 Zero Sequence Voltage Angle	-180 to 180	°	0.01	F002	0
"	2582	PMU 1 Phase A Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2584	PMU 1 Phase A Current Angle	-180 to 180	°	0.01	F002	0
"	2585	PMU 1 Phase B Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2587	PMU 1 Phase B Current Angle	-180 to 180	°	0.01	F002	0
"	2588	PMU 1 Phase C Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	258A	PMU 1 Phase C Current Angle	-180 to 180	°	0.01	F002	0
"	258B	PMU 1 Ground Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	258D	PMU 1 Ground Current Angle	-180 to 180	°	0.01	F002	0
"	258E	PMU 1 Positive Sequence Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2590	PMU 1 Positive Sequence Current Angle	-180 to 180	°	0.01	F002	0
"	2591	PMU 1 Negative Sequence Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2593	PMU 1 Negative Sequence Current Angle	-180 to 180	°	0.01	F002	0
"	2594	PMU 1 Zero Sequence Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	2596	PMU 1 Zero Sequence Current Angle	-180 to 180	°	0.01	F002	0
"	2597	PMU 1 Frequency	2 to 90	Hz	0.001	F003	0
"	2599	PMU 1 df/dt	-327.67 to 327.67	Hz/s	0.01	F002	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	259A	PMU 1 Configuration Change Counter	0 to 65535	---	1	F001	0
"	259B	Reserved (4 items)	0 to 1	---	1	F001	0
C60, N60	259F	...Repeated for PMU 2					
N60	25D1	...Repeated for PMU 3					
"	2603	...Repeated for PMU 4					
"	2635	...Repeated for PMU 5					
"	2667	...Repeated for PMU 6					
	Phasor Measurement Unit Actuals Integer (Read Only) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	2699	PMU 1 SOC Timestamp	0 to 4294967295	seconds	1	F003	0
"	269B	PMU 1 FRAMESEC Timestamp	0 to 4294967295	seconds	1	F003	0
"	269D	PMU 1 STAT Flags	0 to 4294967295	---	1	F003	0
C60, N60	269F	...Repeated for PMU 2					
N60	26A5	...Repeated for PMU 3					
"	26AB	...Repeated for PMU 4					
"	26B1	...Repeated for PMU 5					
"	26B7	...Repeated for PMU 6					
	Phasor Measurement Unit Aggregator Actual Values (Read Only) (1, 2, or 4 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	26BD	PMU 1 Aggregator PDU Size	---	---	---	F001	0
C60, N60	26BE	...Repeated for PMU 2					
N60	26BF	...Repeated for PMU 3					
"	26C0	...Repeated for PMU 4					
	Direct Integer Actual Values (Read Only) (16 Modules)						
N60	2730	Direct Integer Input 1 Actual Value	0 to 4294967295	---	1	F003	0
"	2732	Direct Integer Input 2 Actual Value	0 to 4294967295	---	1	F003	0
"	2734	Direct Integer Input 3 Actual Value	0 to 4294967295	---	1	F003	0
"	2736	Direct Integer Input 4 Actual Value	0 to 4294967295	---	1	F003	0
"	2738	Direct Integer Input 5 Actual Value	0 to 4294967295	---	1	F003	0
"	273A	Direct Integer Input 6 Actual Value	0 to 4294967295	---	1	F003	0
"	273C	Direct Integer Input 7 Actual Value	0 to 4294967295	---	1	F003	0
"	273E	Direct Integer Input 8 Actual Value	0 to 4294967295	---	1	F003	0
"	2740	Direct Integer Input 9 Actual Value	0 to 4294967295	---	1	F003	0
"	2742	Direct Integer Input 10 Actual Value	0 to 4294967295	---	1	F003	0
"	2744	Direct Integer Input 11 Actual Value	0 to 4294967295	---	1	F003	0
"	2746	Direct Integer Input 12 Actual Value	0 to 4294967295	---	1	F003	0
"	2748	Direct Integer Input 13 Actual Value	0 to 4294967295	---	1	F003	0
"	274A	Direct Integer Input 14 Actual Value	0 to 4294967295	---	1	F003	0
"	274C	Direct Integer Input 15 Actual Value	0 to 4294967295	---	1	F003	0
"	274E	Direct Integer Input 16 Actual Value	0 to 4294967295	---	1	F003	0
	Source Current THD and Harmonics (Read Only) (2, 4, or 6 Modules)						
C70, D60, F35, F60, G30, G60, L30, L90, N60, T60	2800	Ia THD for Source 1	0 to 99.9	---	0.1	F001	0
"	2801	Ia Harmonics for Source 1 - 2nd to 25th (24 items)	0 to 99.9	---	0.1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	2821	Ib THD for Source 1	0 to 99.9	---	0.1	F001	0
"	2822	Ib Harmonics for Source 1 - 2nd to 25th (24 items)	0 to 99.9	---	0.1	F001	0
"	283A	Reserved (8 items)	0 to 0.1	---	0.1	F001	0
"	2842	Ic THD for Source 1	0 to 99.9	---	0.1	F001	0
"	2843	Ic Harmonics for Source 1 - 2nd to 25th (24 items)	0 to 99.9	---	0.1	F001	0
"	285B	Reserved (8 items)	0 to 0.1	---	0.1	F001	0
"	2863	...Repeated for Source 2					
C70, D60, F35, F60, G30, G60, L90, N60, T60	28C6	...Repeated for Source 3					
"	2929	...Repeated for Source 4					
C70, F35, N60, T60	298C	...Repeated for Source 5					
"	29EF	...Repeated for Source 6					
	Synchrocheck Actual Values (Read Only) (4, 6, or 10 Modules)						
B30, C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60	2A60	Synchrocheck 1 Delta Voltage	-1000000000000 to 1000000000000	V	1	F060	0
"	2A62	Synchrocheck 1 Delta Phase	0 to 180 (not 0 to 359.9)	degrees	0.1	F001	0
"	2A63	Synchrocheck 1 Synchscope	0 to 360 (not 0 to 359.9)	degrees	0.1	F001	0
"	2A64	Synchrocheck 1 Delta Frequency	0 to 655.35	Hz	0.01	F001	0
"	2A65	Synchrocheck 1 V1 Mag	-1000000000000 to 1000000000000	V	1	F060	0
"	2A67	Synchrocheck 1 V1 Ang	-180 to 180 (not 0 to 359.9)	degrees	0.1	F001	0
"	2A68	Synchrocheck 1 V2 Mag	-1000000000000 to 1000000000000	V	1	F060	0
"	2A6A	Synchrocheck 1 V2 Ang	-180 to 180 (not 0 to 359.9)	degrees	0.1	F001	0
"	2A6B	Synchrocheck 1 V2 Projected Mag	-1000000000000 to 1000000000000	V	1	F060	0
"	2A6D	Synchrocheck 1 V2 Projected Ang	-180 to 180 (not 0 to 359.9)	degrees	0.1	F001	0
"	2A6E	Synchrocheck 1 Projected Delta Phase	0 to 180 (not 0 to 359.9)	degrees	0.1	F001	0
"	2A6F	Synchrocheck 1 Projected Synchscope	0 to 360 (not 0 to 359.9)	degrees	0.1	F001	0
"	2A70	...Repeated for Synchrocheck 2					
"	2A80	...Repeated for Synchrocheck 3					
"	2A90	...Repeated for Synchrocheck 4					
B30, C60, D60, L90, N60, T60	2AA0	...Repeated for Synchrocheck 5					
"	2AB0	...Repeated for Synchrocheck 6					
C60, D60, L90	2AC0	...Repeated for Synchrocheck 7					
"	2AD0	...Repeated for Synchrocheck 8					
"	2AE0	...Repeated for Synchrocheck 9					
"	2AF0	...Repeated for Synchrocheck 10					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Expanded FlexStates (Read Only)						
All	2B00	FlexStates, one per register (256 items)	0 to 1	---	1	F108	0 (Off)
	RxGOOSE Status (Read Only) (64 Modules)						
All	2C00	Remote Device 1 StNum	0 to 4294967295	---	1	F003	0
"	2C02	Remote Device 1 SqNum	0 to 4294967295	---	1	F003	0
"	2C04	...Repeated for Remote Device 2					
"	2C08	...Repeated for Remote Device 3					
"	2C0C	...Repeated for Remote Device 4					
"	2C10	...Repeated for Remote Device 5					
"	2C14	...Repeated for Remote Device 6					
"	2C18	...Repeated for Remote Device 7					
"	2C1C	...Repeated for Remote Device 8					
"	2C20	...Repeated for Remote Device 9					
"	2C24	...Repeated for Remote Device 10					
"	2C28	...Repeated for Remote Device 11					
"	2C2C	...Repeated for Remote Device 12					
"	2C30	...Repeated for Remote Device 13					
"	2C34	...Repeated for Remote Device 14					
"	2C38	...Repeated for Remote Device 15					
"	2C3C	...Repeated for Remote Device 16					
"	2C40	...Repeated for Remote Device 17					
"	2C44	...Repeated for Remote Device 18					
"	2C48	...Repeated for Remote Device 19					
"	2C4C	...Repeated for Remote Device 20					
"	2C50	...Repeated for Remote Device 21					
"	2C54	...Repeated for Remote Device 22					
"	2C58	...Repeated for Remote Device 23					
"	2C5C	...Repeated for Remote Device 24					
"	2C60	...Repeated for Remote Device 25					
"	2C64	...Repeated for Remote Device 26					
"	2C68	...Repeated for Remote Device 27					
"	2C6C	...Repeated for Remote Device 28					
"	2C70	...Repeated for Remote Device 29					
"	2C74	...Repeated for Remote Device 30					
"	2C78	...Repeated for Remote Device 31					
"	2C7C	...Repeated for Remote Device 32					
"	2C80	...Repeated for Remote Device 33					
"	2C84	...Repeated for Remote Device 34					
"	2C88	...Repeated for Remote Device 35					
"	2C8C	...Repeated for Remote Device 36					
"	2C90	...Repeated for Remote Device 37					
"	2C94	...Repeated for Remote Device 38					
"	2C98	...Repeated for Remote Device 39					
"	2C9C	...Repeated for Remote Device 40					
"	2CA0	...Repeated for Remote Device 41					
"	2CA4	...Repeated for Remote Device 42					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	2CA8	...Repeated for Remote Device 43					
"	2CAC	...Repeated for Remote Device 44					
"	2CB0	...Repeated for Remote Device 45					
"	2CB4	...Repeated for Remote Device 46					
"	2CB8	...Repeated for Remote Device 47					
"	2CBC	...Repeated for Remote Device 48					
"	2CC0	...Repeated for Remote Device 49					
"	2CC4	...Repeated for Remote Device 50					
"	2CC8	...Repeated for Remote Device 51					
"	2CCC	...Repeated for Remote Device 52					
"	2CD0	...Repeated for Remote Device 53					
"	2CD4	...Repeated for Remote Device 54					
"	2CD8	...Repeated for Remote Device 55					
"	2CDC	...Repeated for Remote Device 56					
"	2CE0	...Repeated for Remote Device 57					
"	2CE4	...Repeated for Remote Device 58					
"	2CE8	...Repeated for Remote Device 59					
"	2CEC	...Repeated for Remote Device 60					
"	2CF0	...Repeated for Remote Device 61					
"	2CF4	...Repeated for Remote Device 62					
"	2CF8	...Repeated for Remote Device 63					
"	2CFC	...Repeated for Remote Device 64					
	Expanded Contact Input/Output States (Read Only)						
All	2D00	Contact Input States, one per register (120 items)	0 to 1	---	1	F108	0 (Off)
"	2D80	Contact Output States, one per register (72 items)	0 to 1	---	1	F108	0 (Off)
"	2E00	Virtual Output States, one per register (128 items)	0 to 1	---	1	F108	0 (Off)
	Oscillography Values (Read Only)						
All	3000	Oscillography Number of Triggers	0 to 65535	---	1	F001	0
"	3001	Oscillography Available Records	0 to 65535	---	1	F001	0
"	3002	Oscillography Last Cleared Date	0 to 400000000	---	1	F050	0
"	3004	Oscillography Number Of Cycles Per Record	0 to 65535	---	1	F001	0
	Oscillography Analog Values (Read Only)						
All	3012	Oscillography Number of Triggers	0 to 32767	---	1	F001	0
	Fault Report Indexing (Read Only Non-Volatile)						
C60, D30, D60, F35, F60, L30, L60, L90	3020	Number of Fault Reports	0 to 65535	---	1	F001	0
	Fault Report Actual Values (Read Only Non-Volatile) (15 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90	3030	Fault Report 1 Time	0 to 4294967295	---	1	F050	0
"	3032	Fault Report 2 Time	0 to 4294967295	---	1	F050	0
"	3034	Fault Report 3 Time	0 to 4294967295	---	1	F050	0
"	3036	Fault Report 4 Time	0 to 4294967295	---	1	F050	0
"	3038	Fault Report 5 Time	0 to 4294967295	---	1	F050	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	303A	Fault Report 6 Time	0 to 4294967295	---	1	F050	0
"	303C	Fault Report 7 Time	0 to 4294967295	---	1	F050	0
"	303E	Fault Report 8 Time	0 to 4294967295	---	1	F050	0
"	3040	Fault Report 9 Time	0 to 4294967295	---	1	F050	0
"	3042	Fault Report 10 Time	0 to 4294967295	---	1	F050	0
"	3044	Fault Report 11 Time	0 to 4294967295	---	1	F050	0
"	3046	Fault Report 12 Time	0 to 4294967295	---	1	F050	0
"	3048	Fault Report 13 Time	0 to 4294967295	---	1	F050	0
"	304A	Fault Report 14 Time	0 to 4294967295	---	1	F050	0
"	304C	Fault Report 15 Time	0 to 4294967295	---	1	F050	0
	User Programmable Fault Report Actual Values (Read Only)						
B30, B90, C70, G30, G60, M60, N60, T35, T60	3070	Newest Record Number	0 to 65535	---	1	F001	0
"	3071	Cleared Date	0 to 4294967295	---	1	F050	0
"	3073	Report Date (10 items)	0 to 4294967295	---	1	F050	0
	Modbus File Transfer Values (Read Only)						
All	3200	Character Position of Current Block within File	0 to 4294967295	---	1	F003	0
"	3202	Size of Currently-available Data Block	0 to 65535	---	1	F001	0
"	3203	Block of Data from Requested File (122 items)	0 to 65535	---	1	F001	0
	Security Status (Read Only)						
All	328A	Administrator Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
"	329F	Supervisor Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
"	32B4	Engineer Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
"	32C9	Operator Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
"	32DE	Observer Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
"	3328	Security Status Indicator	0 to 65535	---	1	F618	0
"	3375	Address 0x3374 reserved for serial logout	0 to 5	---	1	F617	3 (Engineer)
	Event Recorder (Read Only)						
All	3400	Events Since Last Clear	0 to 4294967295	---	1	F003	0
"	3402	Number of Available Events	0 to 4294967295	---	1	F003	0
"	3404	Event Recorder Last Cleared Date	0 to 4294967295	---	1	F050	0
	Neutral Current Unbalance Actual Values (Read Only) (3 Modules)						
C70	3411	Neutral Current Unbalance Apply Magnitude	0 to 0.15	---	0.0001	F003	0
"	3413	Neutral Current Unbalance Apply Angle Actual Value	0 to 359	degrees	1	F003	0
"	3415	...Repeated for Neutral Current Unbalance 2					
"	3419	...Repeated for Neutral Current Unbalance 3					
	Neutral Voltage Unbalance Command Actual Values (Read Only) (3 Modules)						
C70	3431	Neutral Voltage Unbalance 59NU XA/XB Ratio Actual Value	0 to 9.9999	---	0.0001	F003	0
"	3434	Neutral Voltage Unbalance 59NU XA/XC Ratio Actual Value	0 to 9.9999	---	0.0001	F003	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3436	...Repeated for Neutral Voltage Unbalance 2					
"	343B	...Repeated for Neutral Voltage Unbalance 3					
	Phase Current Unbalance Command Actual Values (Read Only) (3 Modules)						
C70	3451	Phase Current Unbalance Ka Actual Value	–0.1 to 0.1	---	0.0001	F004	0
"	3454	Phase Current Unbalance Kb Actual Value	–0.1 to 0.1	---	0.0001	F004	0
"	3457	Phase Current Unbalance Kc Actual Value	–0.1 to 0.1	---	0.0001	F004	0
"	3459	...Repeated for Phase Current Unbalance 2					
"	3461	...Repeated for Phase Current Unbalance 3					
	Voltage Differential Command Actual Values (Read Only) (3 Modules)						
C70	3471	Voltage Differential Ka Actual Value	0 to 99.9999	---	0.0001	F003	0
"	3474	Voltage Differential Kb Actual Value	0 to 99.9999	---	0.0001	F003	0
"	3477	Voltage Differential Kc Actual Value	0 to 99.9999	---	0.0001	F003	0
"	3479	...Repeated for Voltage Differential 2					
"	3481	...Repeated for Voltage Differential 3					
	DCmA Input Values (Read Only) (24 Modules)						
All except B90	34C0	DCMA Inputs 1 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34C2	DCMA Inputs 2 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34C4	DCMA Inputs 3 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34C6	DCMA Inputs 4 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34C8	DCMA Inputs 5 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34CA	DCMA Inputs 6 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34CC	DCMA Inputs 7 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34CE	DCMA Inputs 8 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34D0	DCMA Inputs 9 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34D2	DCMA Inputs 10 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34D4	DCMA Inputs 11 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34D6	DCMA Inputs 12 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34D8	DCMA Inputs 13 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34DA	DCMA Inputs 14 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34DC	DCMA Inputs 15 Value	-9999.999 to 9999.999	---	0.001	F004	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	34DE	DCMA Inputs 16 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34E0	DCMA Inputs 17 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34E2	DCMA Inputs 18 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34E4	DCMA Inputs 19 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34E6	DCMA Inputs 20 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34E8	DCMA Inputs 21 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34EA	DCMA Inputs 22 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34EC	DCMA Inputs 23 Value	-9999.999 to 9999.999	---	0.001	F004	0
"	34EE	DCMA Inputs 24 Value	-9999.999 to 9999.999	---	0.001	F004	0
	RTD Input Values (Read Only) (48 Modules)						
All except B90	34F0	RTD Inputs 1 Value	-32768 to 32767	°C	1	F002	0
"	34F1	RTD Inputs 2 Value	-32768 to 32767	°C	1	F002	0
"	34F2	RTD Inputs 3 Value	-32768 to 32767	°C	1	F002	0
"	34F3	RTD Inputs 4 Value	-32768 to 32767	°C	1	F002	0
"	34F4	RTD Inputs 5 Value	-32768 to 32767	°C	1	F002	0
"	34F5	RTD Inputs 6 Value	-32768 to 32767	°C	1	F002	0
"	34F6	RTD Inputs 7 Value	-32768 to 32767	°C	1	F002	0
"	34F7	RTD Inputs 8 Value	-32768 to 32767	°C	1	F002	0
"	34F8	RTD Inputs 9 Value	-32768 to 32767	°C	1	F002	0
"	34F9	RTD Inputs 10 Value	-32768 to 32767	°C	1	F002	0
"	34FA	RTD Inputs 11 Value	-32768 to 32767	°C	1	F002	0
"	34FB	RTD Inputs 12 Value	-32768 to 32767	°C	1	F002	0
"	34FC	RTD Inputs 13 Value	-32768 to 32767	°C	1	F002	0
"	34FD	RTD Inputs 14 Value	-32768 to 32767	°C	1	F002	0
"	34FE	RTD Inputs 15 Value	-32768 to 32767	°C	1	F002	0
"	34FF	RTD Inputs 16 Value	-32768 to 32767	°C	1	F002	0
"	3500	RTD Inputs 17 Value	-32768 to 32767	°C	1	F002	0
"	3501	RTD Inputs 18 Value	-32768 to 32767	°C	1	F002	0
"	3502	RTD Inputs 19 Value	-32768 to 32767	°C	1	F002	0
"	3503	RTD Inputs 20 Value	-32768 to 32767	°C	1	F002	0
"	3504	RTD Inputs 21 Value	-32768 to 32767	°C	1	F002	0
"	3505	RTD Inputs 22 Value	-32768 to 32767	°C	1	F002	0
"	3506	RTD Inputs 23 Value	-32768 to 32767	°C	1	F002	0
"	3507	RTD Inputs 24 Value	-32768 to 32767	°C	1	F002	0
"	3508	RTD Inputs 25 Value	-32768 to 32767	°C	1	F002	0
"	3509	RTD Inputs 26 Value	-32768 to 32767	°C	1	F002	0
"	350A	RTD Inputs 27 Value	-32768 to 32767	°C	1	F002	0
"	350B	RTD Inputs 28 Value	-32768 to 32767	°C	1	F002	0
"	350C	RTD Inputs 29 Value	-32768 to 32767	°C	1	F002	0
"	350D	RTD Inputs 30 Value	-32768 to 32767	°C	1	F002	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	350E	RTD Inputs 31 Value	-32768 to 32767	°C	1	F002	0
"	350F	RTD Inputs 32 Value	-32768 to 32767	°C	1	F002	0
"	3510	RTD Inputs 33 Value	-32768 to 32767	°C	1	F002	0
"	3511	RTD Inputs 34 Value	-32768 to 32767	°C	1	F002	0
"	3512	RTD Inputs 35 Value	-32768 to 32767	°C	1	F002	0
"	3513	RTD Inputs 36 Value	-32768 to 32767	°C	1	F002	0
"	3514	RTD Inputs 37 Value	-32768 to 32767	°C	1	F002	0
"	3515	RTD Inputs 38 Value	-32768 to 32767	°C	1	F002	0
"	3516	RTD Inputs 39 Value	-32768 to 32767	°C	1	F002	0
"	3517	RTD Inputs 40 Value	-32768 to 32767	°C	1	F002	0
"	3518	RTD Inputs 41 Value	-32768 to 32767	°C	1	F002	0
"	3519	RTD Inputs 42 Value	-32768 to 32767	°C	1	F002	0
"	351A	RTD Inputs 43 Value	-32768 to 32767	°C	1	F002	0
"	351B	RTD Inputs 44 Value	-32768 to 32767	°C	1	F002	0
"	351C	RTD Inputs 45 Value	-32768 to 32767	°C	1	F002	0
"	351D	RTD Inputs 46 Value	-32768 to 32767	°C	1	F002	0
"	351E	RTD Inputs 47 Value	-32768 to 32767	°C	1	F002	0
"	351F	RTD Inputs 48 Value	-32768 to 32767	°C	1	F002	0
	Ohm Input Values (Read Only) (2 Modules)						
All except B90	3520	Ohm Inputs 1 Value	0 to 65535	Ohm	1	F001	0
"	3521	Ohm Inputs 2 Value	0 to 65535	Ohm	1	F001	0
	Expanded Direct Input/Output Status (Read Only)						
All except B90, L30, L90	3560	Direct Device States, one per register (16 items)	0 to 1	---	1	F155	0 (Offline)
"	3570	Direct Input States, one per register (64 items)	0 to 1	---	1	F108	0 (Off)
	Phase Current Unbalance Actual Values (Read Only) (3 Modules)						
C70	3600	Phase Current Unbalance 1 Raw Idiff A	0 to 99.9999	pu	0.0001	F004	0
"	3602	Phase Current Unbalance 1 Raw Idiff B	0 to 99.9999	pu	0.0001	F004	0
"	3604	Phase Current Unbalance 1 Raw Idiff C	0 to 99.9999	pu	0.0001	F004	0
"	3606	Phase Current Unbalance 1 Comp Iop A	0 to 99.9999	pu	0.0001	F004	0
"	3608	Phase Current Unbalance 1 Comp Iop B	0 to 99.9999	pu	0.0001	F004	0
"	360A	Phase Current Unbalance 1 Comp Iop C	0 to 99.9999	pu	0.0001	F004	0
"	360C	...Repeated for Phase Current Unbalance 2					
"	3618	...Repeated for Phase Current Unbalance 3					
	Voltage Differential Actual Values (Read Only) (3 Modules)						
C70	3640	Voltage Differential 1 Bus Phase A Voltage	0 to 99.9999	pu	0.0001	F003	0
"	3642	Voltage Differential 1 Differential Phase A Voltage	0 to 99.9999	pu	0.0001	F003	0
"	3644	Voltage Differential 1 Bus Phase B Voltage	0 to 99.9999	pu	0.0001	F003	0
"	3646	Voltage Differential 1 Differential Phase B Voltage	0 to 99.9999	pu	0.0001	F003	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3648	Voltage Differential 1 Bus Phase C Voltage	0 to 99.9999	pu	0.0001	F003	0
"	364A	Voltage Differential 1 Differential Phase C Voltage	0 to 99.9999	pu	0.0001	F003	0
"	364C	...Repeated for Voltage Differential 2					
"	3658	...Repeated for Voltage Differential 3					
	Neutral Current Unbalance Actual Values (Read Only) (3 Modules)						
C70	36C4	Neutral Current Unbalance 1 Raw INsp	0 to 9.9999	pu	0.0001	F003	0
"	36C6	Neutral Current Unbalance 1 Comp Iop	0 to 9.9999	pu	0.0001	F003	0
"	36C8	...Repeated for Neutral Current Unbalance 2					
"	36CC	...Repeated for Neutral Current Unbalance 3					
	Neutral Voltage Unbalance Actual Values (Read Only) (3 Modules)						
C70	36F0	Neutral Voltage Unbalance 1 Neutral Point Vx Angle	0 to 99999.9	degrees	0.1	F004	0
"	36F2	Neutral Voltage Unbalance 1 V0 Angle	0 to 99999.9	degrees	0.1	F004	0
"	36F4	Neutral Voltage Unbalance 1 V0 Magnitude	0 to 99.9999	pu	0.0001	F004	0
"	36F6	Neutral Voltage Unbalance 1 Neutral Point Vx Magnitude	0 to 99.9999	pu	0.0001	F004	0
"	36F8	Neutral Voltage Unbalance 1 Vop	0 to 99.9999	pu	0.0001	F004	0
"	36FA	Neutral Voltage Unbalance 1 Vrest	0 to 99.9999	pu	0.0001	F004	0
"	36FC	...Repeated for Neutral Voltage Unbalance 2					
"	3708	...Repeated for Neutral Voltage Unbalance 3					
	Time of Day Timer Actuals (Read Only)						
C70	3720	Seconds of Day	1 to 86400	---	1	F003	0
"	3722	Day of Month	1 to 31	---	1	F001	0
"	3723	Day of Year	1 to 366	---	1	F001	0
"	3724	Year	1970 to 3000	---	1	F001	0
	Time of Day Timer Status Actual Values (Read Only)						
C70	3730	Time of Day Timer 1 State	0 to 1	---	1	F108	0 (Off)
"	3731	Time of Day Timer 2 State	0 to 1	---	1	F108	0 (Off)
"	3732	Time of Day Timer 3 State	0 to 1	---	1	F108	0 (Off)
"	3733	Time of Day Timer 4 State	0 to 1	---	1	F108	0 (Off)
"	3734	Time of Day Timer 5 State	0 to 1	---	1	F108	0 (Off)
	Real Time Clock Synchronizing Actuals (Read Only)						
All	375F	RTC Sync Source	0 to 8	---	1	F624	0 (None)
"	3760	PTP GrandMaster ID	0 to 100	--	1	F073	0
"	3764	Real Time Clock Accuracy	0 to 999999999	ns	1	F003	0
"	3766	PTP Port 1 State (3 items)	0 to 4	--	1	F625	0 (Disabled)
"	3769	RTC Offset	0 to 999999999	ns	1	F004	0
"	376B	PTP - IRIG-B Delta	-500000000 to 500000000	ns	1	F004	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Real Time Clock Synchronizing FlexAnalogs (Read Only)						
All	376D	PTP-IRIG-B Delta FlexAnalog	-262143 to 262143	---	1	F004	0
	Capacitor Control Actual Values (Read Only) (3 Modules)						
C70	3780	Capacitor Control 1 Discharge Time	0 to 3600	s	1	F001	0
"	3781	Capacitor Control 2 Discharge Time	0 to 3600	s	1	F001	0
"	3782	Capacitor Control 3 Discharge Time	0 to 3600	s	1	F001	0
	Frequency Out-of-Band Accumulation Actual Values (Read Only)						
G30, G60	37A0	Frequency OOB Accumulator Band 1 Accumulation (OvUnFrecAccActualBand_1)	0 to 999.9	%	0.1	F001	0
"	37A1	Frequency OOB Accumulator Band 2 Accumulation (OvUnFrecAccActualBand_2)	0 to 999.9	%	0.1	F001	0
"	37A2	Frequency OOB Accumulator Band 3 Accumulation (OvUnFrecAccActualBand_3)	0 to 999.9	%	0.1	F001	0
"	37A3	Frequency OOB Accumulator Band 4 Accumulation (OvUnFrecAccActualBand_4)	0 to 999.9	%	0.1	F001	0
"	37A4	Frequency OOB Accumulator Band 5 Accumulation (OvUnFrecAccActualBand_5)	0 to 999.9	%	0.1	F001	0
"	37A5	Frequency OOB Accumulator Band 6 Accumulation (OvUnFrecAccActualBand_6)	0 to 999.9	%	0.1	F001	0
"	37A6	Frequency OOB Accumulator Band 7 Accumulation (OvUnFrecAccActualBand_7)	0 to 999.9	%	0.1	F001	0
	Phase Comparison Trip Scheme Actuals (Read Only)						
L60	37B0	CT Bank1 Compensated I1 Current	0 to 999999.999	A	0.001	F060	0
"	37B2	CT Bank1 Compensated I2 Current	0 to 999999.999	A	0.001	F060	0
"	37B4	CT Bank2 Compensated I1 Current	0 to 999999.999	A	0.001	F060	0
"	37B6	CT Bank2 Compensated I2 Current	0 to 999999.999	A	0.001	F060	0
	Motor Acceleration Actuals (Read Only Non-Volatile) (5 Modules)						
M60	37BE	Motor Acceleration 1 Time/Date	0 to 4294967295	---	1	F050	0
"	37C0	Motor Acceleration 1 Starting Time	0 to 655.35	s	0.01	F001	0
"	37C1	Motor Acceleration 1 Effective Current	0 to 999999.999	A	0.001	F060	0
"	37C3	Motor Acceleration 1 Peak Current	0 to 999999.999	A	0.001	F060	0
"	37C5	Reserved (8 items)	---	---	---	F001	0
"	37CD	...Repeated for Motor Acceleration 2					
"	37DC	...Repeated for Motor Acceleration 3					
"	37EB	...Repeated for Motor Acceleration 4					
"	37FA	...Repeated for Motor Acceleration 5					
	Field Unit Identifiers (Read Only) (8 Modules)						
All except B90, L60	3FB8	Attached Field Unit 1 Serial Number	---	---	1	F205	(none)
"	3FBE	Attached Filed Unit 1 Port Number	---	---	1	F001	0
"	3FBF	Attached Field Unit 1 Type	0 to 3	---	1	F243	0 (CC-05)
"	3FC0	Field Unit 1 Status	0 to 4	---	1	F262	0 (Disabled)
"	3FC1	...Repeated for Field Unit 2					
"	3FCA	...Repeated for Field Unit 3					
"	3FD3	...Repeated for Field Unit 4					
"	3FDC	...Repeated for Field Unit 5					
"	3FE5	...Repeated for Field Unit 6					
"	3FEE	...Repeated for Field Unit 7					
"	3FF7	...Repeated for Field Unit 8					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Passwords Actual Values (Read Only)						
All	4028	Command Password Status	0 to 1	---	1	F102	0 (Disabled)
"	4029	Setting Password Status	0 to 1	---	1	F102	0 (Disabled)
All	4034	Remote Setting Auth Status	0 to 1	---	1	F108	0 (Off)
"	4035	Local Setting Auth Status	0 to 1	---	1	F108	0 (Off)
	87L Channel Status (Read Only)						
L30	4059	Channel 1 Local Loopback Status	0 to 2	---	1	F134	2 (n/a)
"	405A	Channel 1 Loop Delay	0 to 200	ms	0.1	F001	0
"	405B	Channel 1 Number of Lost Packets	0 to 65535	---	1	F001	0
"	405C	Channel 1 Remote Loopback Status	0 to 2	---	1	F134	2 (n/a)
"	405D	Channel 1 Status	0 to 2	---	1	F134	1 (OK)
"	405E	Channel 2 Local Loopback Status	0 to 2	---	1	F134	2 (n/a)
"	405F	Channel 2 Loop Delay	0 to 200	ms	0.1	F001	0
"	4060	Channel 2 Number of Lost Packets	0 to 65535	---	1	F001	0
"	4061	Channel 2 Remote Loopback Status	0 to 2	---	1	F134	2 (n/a)
"	4062	Channel 2 Status	0 to 2	---	1	F134	2 (n/a)
"	4063	Channel PFLL Status	0 to 2	---	1	F134	1 (OK)
"	4064	87L Network Status	0 to 2	---	1	F134	2 (n/a)
	Communications Actual Values (Read Only)						
All	4160	Modbus Available TCP/IP Connections	0 to 4	---	1	F001	4
"	4161	DNP Available TCP/IP Connections	0 to 2	---	1	F001	2
"	4162	IEC Available TCP/IP Connections	0 to 2	---	1	F001	2
"	4163	MMS Available TCP/IP Connections	0 to 5	---	1	F001	5
"	4164	PMU Available TCP/IP Connections	0 to 4	---	1	F001	4
"	4165	SFTP Available Connections	0 to 4	---	1	F001	4
	PRP Status (Read Only)						
All	4363	Total Received Port A	0 to 4294967295	---	1	F003	0
"	4365	Total Received Port B	0 to 4294967295	---	1	F003	0
"	4367	Total Mismatches Port A	0 to 4294967295	---	1	F003	0
"	4369	Total Mismatches Port B	0 to 4294967295	---	1	F003	0
"	436B	Total Errors	0 to 4294967295	---	1	F003	0
	Bus Actuals (Read Only) (6 Modules)						
B30	4500	Bus Differential IA Magnitude	0 to 999999.999	A	0.001	F060	0
"	4502	Bus Differential IA Angle	-359.9 to 0	degrees	0.1	F002	0
"	4503	Bus Differential IB Magnitude	0 to 999999.999	A	0.001	F060	0
"	4505	Bus Differential IB Angle	-359.9 to 0	degrees	0.1	F002	0
"	4506	Bus Differential IC Magnitude	0 to 999999.999	A	0.001	F060	0
"	4508	Bus Differential IC Angle	-359.9 to 0	degrees	0.1	F002	0
"	4509	Bus Differential Rest IA Magnitude	0 to 999999.999	A	0.001	F060	0
"	450B	Bus Differential Rest IA Angle	-359.9 to 0	degrees	0.1	F002	0
"	450C	Bus Differential Rest IB Magnitude	0 to 999999.999	A	0.001	F060	0
"	450E	Bus Differential Rest IB Angle	-359.9 to 0	degrees	0.1	F002	0
"	450F	Bus Differential Rest IC Magnitude	0 to 999999.999	A	0.001	F060	0
"	4511	Bus Differential Rest IC Angle	-359.9 to 0	degrees	0.1	F002	0
"	4512	Bus Maximum CT Primary	0 to 50000	---	1	F060	1
"	4514	Reserved (9 items)	---	---	---	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	451D	...Repeated for Bus 2					
"	453A	...Repeated for Bus 3					
"	4557	...Repeated for Bus 4					
"	4574	...Repeated for Bus 5					
"	4591	...Repeated for Bus 6					
	Breaker Control Actual Values (Read Only) (2, 3, 4, or 6 Modules)						
All except B90	4870	Breaker 1 States Packed Bitfield	0 to 65535	---	1	F001	0
"	4871	...Repeated for Breaker 2					
B30, C30, C60, C70, D60, F60, F35, L90, N60, T35, T60	4872	...Repeated for Breaker 3					
B30, C30, C60, D60, F60, F35, L90, N60, T35, T60	4873	...Repeated for Breaker 4					
B30, C30, F35, N60, T35, T60	4874	...Repeated for Breaker 5					
"	4875	...Repeated for Breaker 6					
	Temp Monitor Actual Values (Read Only Non-Volatile)						
All	4942	Reserved Register T1	-55 to 125	C	1	F002	-55
"	4943	Reserved Register T2	-55 to 125	C	1	F002	125
"	4944	Reserved Register T3	-2147483647 to 2147483647	---	1	F004	0
"	4946	Reserved Register T4	0 to 4294967295	---	1	F003	0
"	4948	Reserved Register T5	0 to 4294967295	---	1	F003	0
"	494A	Reserved Register T6	0 to 4294967295	---	1	F003	0
"	494C	Reserved Register T7	0 to 4294967295	---	1	F003	0
"	494E	Reserved Register T8	0 to 4294967295	---	1	F003	0
	Field Unit Raw Data Actuals (Read Only) (8 Modules)						
All except B90, L60	4E00	Raw Field Data AC1 Mag	0 to 0.001	A	0.001	F003	0
"	4E02	Raw Field Data AC1 Angle	0 to 0.1	degree	0.1	F002	0
"	4E03	Raw Field Data AC2 Mag	0 to 0.001	A	0.001	F003	0
"	4E05	Raw Field Data AC2 Angle	0 to 0.1	degree	0.1	F002	0
"	4E06	Raw Field Data AC3 Mag	0 to 0.001	A	0.001	F003	0
"	4E08	Raw Field Data AC3 Angle	0 to 0.1	degree	0.1	F002	0
"	4E09	Raw Field Data AC4 Mag	0 to 0.001	A	0.001	F003	0
"	4E0B	Raw Field Data AC4 Angle	0 to 0.1	degree	0.1	F002	0
"	4E0C	Raw Field Data AC5 Mag	0 to 0.001	A/V	0.001	F003	0
"	4E0E	Raw Field Data AC5 Angle	0 to 0.1	degree	0.1	F002	0
"	4E0F	Raw Field Data AC6 Mag	0 to 0.001	A/V	0.001	F003	0
"	4E11	Raw Field Data AC6 Angle	0 to 0.1	degree	0.1	F002	0
"	4E12	Raw Field Data AC7 Mag	0 to 0.001	A/V	0.001	F003	0
"	4E14	Raw Field Data AC7 Angle	0 to 0.1	degree	0.1	F002	0
"	4E15	Raw Field Data AC8 Mag	0 to 0.001	A/V	0.001	F003	0
"	4E17	Raw Field Data AC8 Angle	0 to 0.1	degree	0.1	F002	0
"	4E18	Raw Field Data DC1	0 to 0.001	V	0.001	F002	0
"	4E19	Raw Field Data DC2	0 to 0.001	V	0.001	F002	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	4E1A	Raw Field Data DC3	0 to 0.001	V	0.001	F002	0
"	4E1B	Raw Field Data FCI States (2 items)	0 to 1	---	1	F500	0
"	4E1D	Raw Field Data SI States	0 to 1	---	1	F500	0
"	4E1E	Raw Field Data SI Test States	0 to 1	---	1	F500	0
"	4E1F	Raw Field Data Brick ADC Temperature	0 to 1	degree	1	F002	0
"	4E20	Raw Field Data Brick Transceiver Temperature	0 to 1	degree	1	F002	0
"	4E21	Raw Field Data Brick Transceiver Voltage	0 to 0.01	V	0.01	F001	0
"	4E22	Raw Field Data Brick Transceiver Current	0 to 1	mA	1	F001	0
"	4E23	Raw Field Data Brick Tx Power	0 to 0.1	dBm	0.1	F002	0
"	4E24	Raw Field Data Brick Rx Power	0 to 0.1	dBm	0.1	F002	0
"	4E25	Raw Field Data Brick Diagnostics (2 items)	0 to 65535	---	1	F500	0
"	4E27	Raw Field Data Local Transceiver Temperature	0 to 1	degree	1	F002	0
"	4E28	Raw Field Data Local Transceiver Voltage	0 to 0.01	V	0.01	F001	0
"	4E29	Raw Field Data Local Transceiver Current	0 to 1	mA	1	F001	0
"	4E2A	Raw Field Data Local Tx Power	0 to 0.1	dBm	0.1	F002	0
"	4E2B	Raw Field Data Local Rx Power	0 to 0.1	dBm	0.1	F002	0
"	4E2C	Repeated for Field Unit 2					
"	4E58	Repeated for Field Unit 3					
"	4E84	Repeated for Field Unit 4					
"	4EB0	Repeated for Field Unit 5					
"	4EDC	Repeated for Field Unit 6					
"	4F08	Repeated for Field Unit 7					
"	4F34	Repeated for Field Unit 8					
	Source Current (Read Only) (2, 4, 6, or 30 Modules)						
All except B90, C30	4F60	Source 1 Phase A Current RMS	0 to 999999.999	A	0.001	F060	0
"	4F62	Source 1 Phase B Current RMS	0 to 999999.999	A	0.001	F060	0
"	4F64	Source 1 Phase C Current RMS	0 to 999999.999	A	0.001	F060	0
"	4F66	Source 1 Neutral Current RMS	0 to 999999.999	A	0.001	F060	0
"	4F68	Source 1 Phase A Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	4F6A	Source 1 Phase A Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	4F6B	Source 1 Phase B Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	4F6D	Source 1 Phase B Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	4F6E	Source 1 Phase C Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	4F70	Source 1 Phase C Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	4F71	Source 1 Neutral Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	4F73	Source 1 Neutral Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	4F74	Source 1 Ground Current RMS	0 to 999999.999	A	0.001	F060	0
"	4F76	Source 1 Ground Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	4F78	Source 1 Ground Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	4F79	Source 1 Zero Sequence Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	4F7B	Source 1 Zero Sequence Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	4F7C	Source 1 Positive Sequence Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	4F7E	Source 1 Positive Sequence Current Angle	-359.9 to 0	degrees	0.1	F002	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	4F7F	Source 1 Negative Sequence Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	4F81	Source 1 Negative Sequence Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	4F82	Source 1 Differential Ground Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	4F84	Source 1 Differential Ground Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	4F85	Reserved (27 items)	---	---	---	F001	0
"	4FA0	...Repeated for Source 2					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	4FE0	...Repeated for Source 3					
"	5020	...Repeated for Source 4					
B30, C70, F35, N60, T35, T60	5060	...Repeated for Source 5					
"	50A0	...Repeated for Source 6					
B30	50E0	...Repeated for Source 7					
"	5120	...Repeated for Source 8					
"	5160	...Repeated for Source 9					
"	51A0	...Repeated for Source 10					
"	51E0	...Repeated for Source 11					
"	5220	...Repeated for Source 12					
"	5260	...Repeated for Source 13					
"	52A0	...Repeated for Source 14					
"	52E0	...Repeated for Source 15					
"	5320	...Repeated for Source 16					
"	5360	...Repeated for Source 17					
"	53A0	...Repeated for Source 18					
"	53E0	...Repeated for Source 19					
"	5420	...Repeated for Source 20					
"	5460	...Repeated for Source 21					
"	54A0	...Repeated for Source 22					
"	54E0	...Repeated for Source 23					
"	5520	...Repeated for Source 24					
"	5560	...Repeated for Source 25					
"	55A0	...Repeated for Source 26					
"	55E0	...Repeated for Source 27					
"	5620	...Repeated for Source 28					
"	5660	...Repeated for Source 29					
"	56A0	...Repeated for Source 30					
	Incipient Cable Fault Detector Actual Values (Read Only) (1, 2, or 6 Modules)						
D30, F35, F60, L30	5EC0	Incipient Cable Fault Detector 1 Phase A Counter	0 to 65535	---	1	F001	0
"	5EC1	Incipient Cable Fault Detector 1 Phase B Counter	0 to 65535	---	1	F001	0
"	5EC2	Incipient Cable Fault Detector 1 Phase C Counter	0 to 65535	---	1	F001	0
F35, F60	5EC3	...Repeated for Incipient Cable Fault Detector 2					

Products	Hex address	Register name	Range	Units	Step	Format	Default
F35	5EC6	...Repeated for Incipient Cable Fault Detector 3					
"	5EC9	...Repeated for Incipient Cable Fault Detector 4					
"	5ECC	...Repeated for Incipient Cable Fault Detector 5					
"	5ECF	...Repeated for Incipient Cable Fault Detector 6					
	Setting Groups Actual Values (Read Only)						
All except C30	5F7F	Current Setting Group	0 to 5	---	1	F001	0
	Capacitor Bank Overvoltage Actual Values (Read Only) (3 Modules)						
C70	6390	Bank Overvoltage 1 Phase A Operate Voltage	0 to 65.535	pu	0.001	F001	0
"	6391	Bank Overvoltage 1 Phase B Operate Voltage	0 to 65.535	pu	0.001	F001	0
"	6392	Bank Overvoltage 1 Phase C Operate Voltage	0 to 65.535	pu	0.001	F001	0
"	6393	...Repeated for Bank Overvoltage 2					
"	6396	...Repeated for Bank Overvoltage 3					
	Thermal Model Actual Values (Read Only)						
M60	6630	Thermal Model Motor Status	0 to 3	---	1	F098	1 (Starting)
"	6631	Thermal Model Capacity Used	0 to 100	%	1	F001	0
"	6633	Trip Time On Overload	0 to 10000	---	1	F001	0
"	6634	Thermal Model Lockout Time	0 to 65000	min	1	F001	0
"	6638	Thermal Model Load	0 to 40	x FLA	0.01	F001	0
"	663A	Thermal Model Motor Unbalance	0 to 100	%	1	F001	0
"	663B	Thermal Model Biased Motor Load	0 to 40	x FLA	0.01	F001	0
"	663C	Start/Hour Lockout Time	0 to 65000	min	1	F001	0
"	663D	Time-Between-Starts Lockout Time	0 to 65000	min	1	F001	0
"	663E	Restart Delay Lockout Time	0 to 65000	s	1	F001	0
"	663F	Total Motor Lockout Time	0 to 65000	min	1	F001	0
	Field Ground Actual Values (Read Only)						
G60	6640	Field Ground Resistance	0 to 20000	kOhm	0.001	F003	20000000
"	6642	Field Ground Current	0 to 655.35	mA	0.01	F001	0
"	6643	Field Ground Injected Voltage	-32.767 to 32.767	V	0.001	F002	0
"	6644	Field Ground Fault Location	-30000 to 30000	%	1	F002	-10
"	6645	Field Ground Field Voltage	-3276.8 to 3276.7	V	0.1	F002	0
"	6646	Field Current	-9999.999 to 9999.999	---	0.001	F004	0
"	6648	Field Current Units	---	---	---	F206	"A"
	IEC 618510 Server Configuration Actual Values (Read Only Non-Volatile)						
All	6714	IEC 61850 Edition Actual Value	0 to 1	---	1	F663	1 (Edition 2)
	Motor Learned Data Actual Values (Read Only)						
M60	6963	Motor Learned Data Records Number	0 to 250	---	1	F001	0
"	6964	Motor Learned Data Last Cleared Date	0 to 4294967295	---	---	F050	0
"	6966	Motor Learned Data Last Acceleration Time	0 to 655.35	s	0.01	F001	0
"	6967	Motor Learned Data Last Starting Current	0 to 40	x FLA	0.01	F001	0
"	6968	Motor Learned Data Last Thermal Capacity Used	0 to 65535	%	1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	6969	Motor Learned Data Last Average Motor Load	0 to 40	× FLA	0.01	F001	0
"	696A	Motor Learned Data Last Run Time After Start	0 to 4294967295	hr	1	F050	0
	Terminal Current (Read Only) (24 Modules)						
B90	6F00	Terminal Current 1 Magnitude	0 to 999999.999	A	0.001	F060	0
"	6F02	Terminal Current 1 Angle	-359.9 to 0	degrees	0.1	F002	0
"	6F03	...Repeated for Terminal Current 2					
"	6F06	...Repeated for Terminal Current 3					
"	6F09	...Repeated for Terminal Current 4					
"	6F0C	...Repeated for Terminal Current 5					
"	6F0F	...Repeated for Terminal Current 6					
"	6F12	...Repeated for Terminal Current 7					
"	6F15	...Repeated for Terminal Current 8					
"	6F18	...Repeated for Terminal Current 9					
"	6F1B	...Repeated for Terminal Current 10					
"	6F1E	...Repeated for Terminal Current 11					
"	6F21	...Repeated for Terminal Current 12					
"	6F24	...Repeated for Terminal Current 13					
"	6F27	...Repeated for Terminal Current 14					
"	6F2A	...Repeated for Terminal Current 15					
"	6F2D	...Repeated for Terminal Current 16					
"	6F30	...Repeated for Terminal Current 17					
"	6F33	...Repeated for Terminal Current 18					
"	6F36	...Repeated for Terminal Current 19					
"	6F39	...Repeated for Terminal Current 20					
"	6F3C	...Repeated for Terminal Current 21					
"	6F3F	...Repeated for Terminal Current 22					
"	6F42	...Repeated for Terminal Current 23					
"	6F45	...Repeated for Terminal Current 24					
	Terminal Voltage (Read Only) (12 Modules)						
B90	6F48	Terminal Voltage 1 Magnitude	0 to 999999.999	V	0.001	F060	0
"	6F4A	Terminal Voltage 1 Angle	-359.9 to 0	degrees	0.1	F002	0
"	6F4B	...Repeated for Terminal Voltage 2					
"	6F4E	...Repeated for Terminal Voltage 3					
"	6F51	...Repeated for Terminal Voltage 4					
"	6F54	...Repeated for Terminal Voltage 5					
"	6F57	...Repeated for Terminal Voltage 6					
"	6F5A	...Repeated for Terminal Voltage 7					
"	6F5D	...Repeated for Terminal Voltage 8					
"	6F60	...Repeated for Terminal Voltage 9					
"	6F63	...Repeated for Terminal Voltage 10					
"	6F66	...Repeated for Terminal Voltage 11					
"	6F69	...Repeated for Terminal Voltage 12					
	Terminal Frequency (Read Only)						
B90	6FD0	Terminal Frequency	2 to 90	Hz	0.01	F001	0
"	6FD1	Terminal Tracking Frequency	2 to 90	Hz	0.01	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Disconnect (Breaker) Switch Actual Values (Read Only) (8, 12, 16, or 24 Modules)						
All except B90	7720	Disconnect Switch 1 States Packed Bitfield	0 to 65535	---	1	F001	0
"	7721	...Repeated for Disconnect Switch 2					
"	7722	...Repeated for Disconnect Switch 3					
"	7723	...Repeated for Disconnect Switch 4					
"	7724	...Repeated for Disconnect Switch 5					
"	7725	...Repeated for Disconnect Switch 6					
"	7726	...Repeated for Disconnect Switch 7					
"	7727	...Repeated for Disconnect Switch 8					
B30, C30, C60, C70, D60, F35, F60, L90, N60, T35, T60	7728	...Repeated for Disconnect Switch 9					
"	7729	...Repeated for Disconnect Switch 10					
"	772A	...Repeated for Disconnect Switch 11					
"	772B	...Repeated for Disconnect Switch 12					
B30, C30 C60, D60, F35, F60, L90, N60, T35, T60	772C	...Repeated for Disconnect Switch 13					
"	772D	...Repeated for Disconnect Switch 14					
"	772E	...Repeated for Disconnect Switch 15					
"	772F	...Repeated for Disconnect Switch 16					
B30, C30, C60, F35, L90, N60, T35, T60	7730	...Repeated for Disconnect Switch 17					
"	7731	...Repeated for Disconnect Switch 18					
"	7732	...Repeated for Disconnect Switch 19					
"	7733	...Repeated for Disconnect Switch 20					
"	7734	...Repeated for Disconnect Switch 21					
"	7735	...Repeated for Disconnect Switch 22					
"	7736	...Repeated for Disconnect Switch 23					
"	7737	...Repeated for Disconnect Switch 24					
	Bus Replica Isolator Values (Read Only) (48Modules)						
B30, B90	7750	Isolator 1 States Packed Bitfield	0 to 65535	---	1	F001	0
"	7751	...Repeated for Isolator 2					
"	7752	...Repeated for Isolator 3					
"	7753	...Repeated for Isolator 4					
"	7754	...Repeated for Isolator 5					
"	7755	...Repeated for Isolator 6					
"	7756	...Repeated for Isolator 7					
"	7757	...Repeated for Isolator 8					
"	7758	...Repeated for Isolator 9					
"	7759	...Repeated for Isolator 10					
		...					
"	777F	...Repeated for Isolator 48					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Phasor Measurement Unit Recording Values (Read Only)(1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	7890	PMU 1 Available Records	0 to 65535	---	1	F001	0
"	7891	PMU 1 Second Per Record	0 to 6553.5	---	0.1	F003	0
"	7893	PMU 1 Last Cleared Date	0 to 400000000	---	1	F050	0
C60, N60	7895	...Repeated for PMU 2					
N60	789A	...Repeated for PMU 3					
"	789F	...Repeated for PMU 4					
"	78A4	...Repeated for PMU 5					
"	78A9	...Repeated for PMU 6					
	Distance Loop Impedance Actual Values (Read Only)						
D30, D60, G60, L60, L90, T60	7E94	AB Loop Resistance	-2147483647 to 2147483647	ohm	1	F060	0
"	7E96	AB Loop Reactance	-2147483647 to 2147483647	ohm	1	F060	0
"	7E98	AB Loop Impedance Magnitude	0 to 2147483647	ohm	1	F060	0
"	7E9A	AB Loop Impedance Angle	-359.9 to 0	degrees	0.1	F002	0
"	7E9B	BC Loop Resistance	-2147483647 to 2147483647	ohm	1	F060	0
"	7E9D	BC Loop Reactance	-2147483647 to 2147483647	ohm	1	F060	0
"	7E9F	BC Loop Impedance Magnitude	0 to 2147483647	ohm	1	F060	0
"	7EA1	BC Loop Impedance Angle	-359.9 to 0	degrees	0.1	F002	0
"	7EA2	CA Loop Resistance	-2147483647 to 2147483647	ohm	1	F060	0
"	7EA4	CA Loop Reactance	-2147483647 to 2147483647	ohm	1	F060	0
"	7EA6	CA Loop Impedance Magnitude	0 to 2147483647	ohm	1	F060	0
"	7EA8	CA Loop Impedance Angle	-359.9 to 0	degrees	0.1	F002	0
"	7EA9	AG Loop Resistance	-2147483647 to 2147483647	ohm	1	F060	0
"	7EAB	AG Loop Reactance	-2147483647 to 2147483647	ohm	1	F060	0
"	7EAD	AG Loop Impedance Magnitude	0 to 2147483647	ohm	1	F060	0
"	7EAF	AG Loop Impedance Angle	-359.9 to 0	degrees	0.1	F002	0
"	7EB0	BG Loop Resistance	-2147483647 to 2147483647	ohm	1	F060	0
"	7EB2	BG Loop Reactance	-2147483647 to 2147483647	ohm	1	F060	0
"	7EB4	BG Loop Impedance Magnitude	0 to 2147483647	ohm	1	F060	0
"	7EB6	BG Loop Impedance Angle	-359.9 to 0	degrees	0.1	F002	0
"	7EB7	CG Loop Resistance	-2147483647 to 2147483647	ohm	1	F060	0
"	7EB9	CG Loop Reactance	-2147483647 to 2147483647	ohm	1	F060	0
"	7EBB	CG Loop Impedance Magnitude	0 to 2147483647	ohm	1	F060	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7EBD	CG Loop Impedance Angle	-359.9 to 0	degrees	0.1	F002	0
	Distance Loop Impedance (Read Only)						
D30, D60, G60, L60, L90, T60	7EC0	Dist Zab Mag	0 to 655.35	ohm	0.01	F001	0
"	7EC1	Dist Zab Ang	-359.9 to 0	degrees	0.1	F002	0
"	7EC2	Dist Zbc Mag	0 to 655.35	ohm	---	F001	0
"	7EC3	Dist Zbc Ang	-359.9 to 0	degrees	0.1	F002	0
"	7EC4	Dist Zca Mag	0 to 655.35	ohm	0.01	F001	0
"	7EC5	Dist Zca Ang	-359.9 to 0	degree	0.1	F002	0
"	7EC6	Dist Zag Mag	0 to 655.35	ohm	0.01	F001	0
"	7EC7	Dist Zag Ang	-359.9 to 0	degree	0.1	F002	0
"	7EC8	Dist Zbg Mag	0 to 655.35	ohm	0.01	F001	0
"	7EC9	Dist Zbg Ang	-359.9 to 0	degree	0.1	F002	0
"	7ECA	Dist Zcg Mag	0 to 655.35	ohm	0.01	F001	0
"	7ECB	Dist Zcg Ang	-359.9 to 0	degree	0.1	F002	0
	Frequency (Read Only)						
All except B90, C30	8000	Tracking Frequency	2 to 90	Hz	0.01	F001	0
	Generic Comparator Actual Values (Read Only) (6 Modules)						
N60	8150	Comparator 1 Argument A Value	-12700 to 12700	---	0.01	F004	0
"	8152	Comparator 1 Argument B Value	-12700 to 12700	---	0.01	F004	0
"	8154	Comparator 1 Output Value	-25400 to 25400	---	0.01	F004	0
"	8156	...Repeated for Comparator 2					
"	815C	...Repeated for Comparator 3					
"	8162	...Repeated for Comparator 4					
"	8168	...Repeated for Comparator 5					
"	816E	...Repeated for Comparator 6					
	Direct Analog Input Actual Values (Read Only) (32 Modules)						
N60	8180	Direct Analog Input 1 Value	0 to 2147483647	---	1	F060	0
"	8182	Direct Analog Input 2 Value	0 to 2147483647	---	1	F060	0
"	8184	Direct Analog Input 3 Value	0 to 2147483647	---	1	F060	0
"	8186	Direct Analog Input 4 Value	0 to 2147483647	---	1	F060	0
"	8188	Direct Analog Input 5 Value	0 to 2147483647	---	1	F060	0
"	818A	Direct Analog Input 6 Value	0 to 2147483647	---	1	F060	0
"	818C	Direct Analog Input 7 Value	0 to 2147483647	---	1	F060	0
"	818E	Direct Analog Input 8 Value	0 to 2147483647	---	1	F060	0
"	8190	Direct Analog Input 9 Value	0 to 2147483647	---	1	F060	0
"	8192	Direct Analog Input 10 Value	0 to 2147483647	---	1	F060	0
"	8194	Direct Analog Input 11 Value	0 to 2147483647	---	1	F060	0
"	8196	Direct Analog Input 12 Value	0 to 2147483647	---	1	F060	0
"	8198	Direct Analog Input 13 Value	0 to 2147483647	---	1	F060	0
"	819A	Direct Analog Input 14 Value	0 to 2147483647	---	1	F060	0
"	819C	Direct Analog Input 15 Value	0 to 2147483647	---	1	F060	0
"	819E	Direct Analog Input 16 Value	0 to 2147483647	---	1	F060	0
"	81A0	Direct Analog Input 17 Value	0 to 2147483647	---	1	F060	0
"	81A2	Direct Analog Input 18 Value	0 to 2147483647	---	1	F060	0
"	81A4	Direct Analog Input 19 Value	0 to 2147483647	---	1	F060	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	81A6	Direct Analog Input 20 Value	0 to 2147483647	---	1	F060	0
"	81A8	Direct Analog Input 21 Value	0 to 2147483647	---	1	F060	0
"	81AA	Direct Analog Input 22 Value	0 to 2147483647	---	1	F060	0
"	81AC	Direct Analog Input 23 Value	0 to 2147483647	---	1	F060	0
"	81AE	Direct Analog Input 24 Value	0 to 2147483647	---	1	F060	0
"	81B0	Direct Analog Input 25 Value	0 to 2147483647	---	1	F060	0
"	81B2	Direct Analog Input 26 Value	0 to 2147483647	---	1	F060	0
"	81B4	Direct Analog Input 27 Value	0 to 2147483647	---	1	F060	0
"	81B6	Direct Analog Input 28 Value	0 to 2147483647	---	1	F060	0
"	81B8	Direct Analog Input 29 Value	0 to 2147483647	---	1	F060	0
"	81BA	Direct Analog Input 30 Value	0 to 2147483647	---	1	F060	0
"	81BC	Direct Analog Input 31 Value	0 to 2147483647	---	1	F060	0
"	81BE	Direct Analog Input 32 Value	0 to 2147483647	---	1	F060	0
	Summator Actual Values (Read Only) (6 Modules)						
N60	81D0	Summator 1 Actual Value	-9999999999 to 9999999999	---	1	F060	0
"	81D2	Summator 2 Actual Value	-9999999999 to 9999999999	---	1	F060	0
"	81D4	Summator 3 Actual Value	-9999999999 to 9999999999	---	1	F060	0
"	81D6	Summator 4 Actual Value	-9999999999 to 9999999999	---	1	F060	0
"	81D8	Summator 5 Actual Value	-9999999999 to 9999999999	---	1	F060	0
"	81DA	Summator 6 Actual Value	-9999999999 to 9999999999	---	1	F060	0
	Digitizer Actual Values (Read Only) (5 Modules)						
N60	82A0	Digitizer 1 Output	-127 to 127	---	1	F004	0
"	82A2	Digitizer 2 Output	-127 to 127	---	1	F004	0
"	82A4	Digitizer 3 Output	-127 to 127	---	1	F004	0
"	82A6	Digitizer 4 Output	-127 to 127	---	1	F004	0
"	82A8	Digitizer 5 Output	-127 to 127	---	1	F004	0
	EGD Fast Production Status (Read Only Non-Volatile and Read Only)						
B30, C30, C60, F35, F60, G30, G60, M60, T35, T60	83E0	EGD Fast Producer Exchange 1 Signature	0 to 65535	---	1	F001	0
"	83E1	EGD Fast Producer Exchange 1 Configuration Time	0 to 4294967295	---	---	F003	0
"	83E3	EGD Fast Producer Exchange 1 Size	0 to 65535	---	1	F001	0
	EGD Slow Production Status (Read Only and Read Only Non-Volatile) (2 Modules)						
B30, C30, C60, F35, F60, G30, G60, M60, T35, T60	83F0	EGD Slow Producer Exchange 1 Signature	0 to 65535	---	1	F001	0
"	83F1	EGD Slow Producer Exchange 1 Configuration Time	0 to 4294967295	---	---	F003	0
"	83F3	EGD Slow Producer Exchange 1 Size	0 to 65535	---	1	F001	0
"	83F4	...Repeated for EGD Slow Producer Exchange 2					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Remote RTD Inputs (Read Only Actual Values) (12 Modules)						
G60, M60, T60	87C0	Remote RTD 1 Value	0 to 200	°C	1	F002	0
"	87C1	Remote RTD 2 Value	0 to 200	°C	1	F002	0
"	87C2	Remote RTD 3 Value	0 to 200	°C	1	F002	0
"	87C3	Remote RTD 4 Value	0 to 200	°C	1	F002	0
"	87C4	Remote RTD 5 Value	0 to 200	°C	1	F002	0
"	87C5	Remote RTD 6 Value	0 to 200	°C	1	F002	0
"	87C6	Remote RTD 7 Value	0 to 200	°C	1	F002	0
"	87C7	Remote RTD 8 Value	0 to 200	°C	1	F002	0
"	87C8	Remote RTD 9 Value	0 to 200	°C	1	F002	0
"	87C9	Remote RTD 10 Value	0 to 200	°C	1	F002	0
"	87CA	Remote RTD 11 Value	0 to 200	°C	1	F002	0
"	87CB	Remote RTD 12 Value	0 to 200	°C	1	F002	0
	FlexElement Actual Values (Read Only) (8 or 16 Modules)						
All except B90	9900	FlexElement 1 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	9902	FlexElement 2 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	9904	FlexElement 3 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	9906	FlexElement 4 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	9908	FlexElement 5 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	990A	FlexElement 6 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	990C	FlexElement 7 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	990E	FlexElement 8 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
C70, F35, G30, G60, M60, N60, T35, T60	9910	FlexElement 9 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	9912	FlexElement 10 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	9914	FlexElement 11 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	9916	FlexElement 12 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	9918	FlexElement 13 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	991A	FlexElement 14 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	991C	FlexElement 15 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
"	991E	FlexElement 16 Actual	-2147483.647 to 2147483.647	---	0.001	F004	0
	Teleprotection Channel Tests (Read Only)						
All except B90, L30, L90	9AA0	Teleprotection Channel 1 Status	0 to 2	---	1	F134	1 (OK)
"	9AA1	Teleprotection Channel 1 Number of Lost Packets	0 to 65535	---	1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	9AA2	Teleprotection Channel 2 Status	0 to 2	---	1	F134	2 (n/a)
"	9AA3	Teleprotection Channel 2 Number of Lost Packets	0 to 65535	---	1	F001	0
"	9AA4	Teleprotection Network Status	0 to 2	---	1	F134	2 (n/a)
"	9AA5	Teleprotection Channel 1 Input States	0 to 1	---	1	F500	0
"	9AA6	Teleprotection Channel 2 Input States	0 to 1	---	1	F500	0
"	9AA7	Teleprotection Input 1 States, 1 per register (16 items)	0 to 1	---	1	F108	0 (Off)
"	9AB7	Teleprotection Input 2 States, 1 per register (16 items)	0 to 1	---	1	F108	0 (Off)
	Setting File Template Actual Values (Read Only Non-Volatile)						
All	9ADA	Last Settings Change Date	0 to 4294967295	---	1	F050	0
	Broken Rotor Bar Detection Actual Values (Read Only)						
M60	A020	Broken Rotor Bar Component Level	–100 to 0	dB	0.1	F002	–1000
"	A021	Broken Rotor Bar Component Frequency	0 to 76	Hz	0.01	F001	0
"	A022	Motor Load at Broken Rotor Bar Calculation	0 to 1.5	× FLA	0.01	F001	0
"	A023	Motor Load Deviation at Broken Rotor Bar Calculation	0 to 1.5	× FLA	0.01	F001	0
"	A024	Time Stamp at Broken Rotor Bar Calculation	0 to 4294967295	---	1	F050	0
"	A026	Maximum Broken Rotor Bar Component Level	–100 to 0	dB	0.1	F002	–1000
"	A027	Maximum Broken Rotor Bar Component Frequency	0 to 76	Hz	0.01	F001	0
"	A028	Motor Load at Broken Rotor Bar Maximum	0 to 1.5	× FLA	0.01	F001	0
"	A029	Motor Load Deviation at Broken Rotor Bar Maximum	0 to 1.5	× FLA	0.01	F001	0
"	A02A	Time Stamp at Broken Rotor Bar Maximum	0 to 4294967295	---	1	F050	0
	VT Fuse Failure Actual Values (Read Only) (2, 4, or 6 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60	A0B2	VTFF x V0 3rd harmonic	0 to 999999.999	V	0.001	F060	0
"	A0B4	...Repeated for Source 2					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T60	A0B6	...Repeated for Source 3					
"	A0B8	...Repeated for Source 4					
B30, C70, F35, N60, T60	A0BA	...Repeated for Source 5					
"	A0BC	...Repeated for Source 6					
	Selector Switch Actual Values (Read Only)						
All except B90	A210	Selector Switch 1 Position	1 to 7	---	1	F001	0
"	A211	Selector Switch 2 Position	1 to 7	---	1	F001	1
	Current Unbalance Actual Values (Read Only) (2 Modules)						
M60	A212	Current Amp Unbalance 1	0 to 100	%	0.1	F001	0
"	A213	...Repeated for Current Amp Unbalance 2					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Expanded B90 Direct Input/Output Status (Read Only)						
B90	A300	Direct Device States, one per register (16 items)	0 to 1	---	1	F155	0 (Offline)
"	A310	Direct Input States, one per register (256 items)	0 to 1	---	1	F108	0 (Off)
	PID Regulator Actual Values (Read Only) (4 Modules)						
C30, F35	A560	PID 1 Out	0 to 999999	---	1	F004	0
"	A562	PID 1 Delta Out	0 to 999999	---	1	F004	0
"	A564	PID 1 Setpoint	-99999.99 to 99999.99	---	0.01	F004	0
"	A566	...Repeated for PID 2					
"	A56C	...Repeated for PID 3					
"	A572	...Repeated for PID 4					
	Volts Per Hertz Actual Values (Read Only) (2 Modules)						
G30, G60, L90, T60	A5A0	Volts Per Hertz 1	0 to 65.535	pu	0.001	F001	0
"	A5A1	Volts Per Hertz 2	0 to 65.535	pu	0.001	F001	0
	Annunciator Actual Values (Read Only Non-Volatile)						
All	A7D0	Annunciator Latched States (3 items)	0 to 4294967295	---	1	F003	0
"	A7D6	Annunciator Flashing States (3 items)	0 to 4294967295	---	1	F003	0
	Annunciator Actual Values (Read Only)						
"	A7DC	Annunciator Input States (3 items)	0 to 4294967295	---	1	F003	0
	IEC 61850 Files (Read Only)						
All	AB36	IEC 61850 CID Filename	---	---	---	F209	(none)
	IEC 61850 Received Analogs (Read Only) (32 Modules)						
All	B210	IEC 61850 Received Analog 1	-1000000000000 to 1000000000000	---	0.001	F060	0
"	B212	...Repeated for Received Analog 2					
"	B214	...Repeated for Received Analog 3					
"	B216	...Repeated for Received Analog 4					
"	B218	...Repeated for Received Analog 5					
"	B21A	...Repeated for Received Analog 6					
"	B21C	...Repeated for Received Analog 7					
"	B21E	...Repeated for Received Analog 8					
"	B220	...Repeated for Received Analog 9					
"	B222	...Repeated for Received Analog 10					
"	B224	...Repeated for Received Analog 11					
"	B226	...Repeated for Received Analog 12					
"	B228	...Repeated for Received Analog 13					
"	B22A	...Repeated for Received Analog 14					
"	B22C	...Repeated for Received Analog 15					
"	B22E	...Repeated for Received Analog 16					
"	B230	...Repeated for Received Analog 17					
"	B232	...Repeated for Received Analog 18					
"	B234	...Repeated for Received Analog 19					
"	B236	...Repeated for Received Analog 20					
"	B238	...Repeated for Received Analog 21					
"	B23A	...Repeated for Received Analog 22					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	B23C	...Repeated for Received Analog 23					
"	B23E	...Repeated for Received Analog 24					
"	B240	...Repeated for Received Analog 25					
"	B242	...Repeated for Received Analog 26					
"	B244	...Repeated for Received Analog 27					
"	B246	...Repeated for Received Analog 28					
"	B248	...Repeated for Received Analog 29					
"	B24A	...Repeated for Received Analog 30					
"	B24C	...Repeated for Received Analog 31					
"	B24E	...Repeated for Received Analog 32					
	Wattmetric Ground Fault Actual Values (Read Only) (2 or 5 Modules)						
D30, D60, F35, F60, L60, L90	B360	Wattmetric Ground Fault 1 Operating Power	0 to 999999.999	W	0.001	F060	0
"	B362	...Repeated for Wattmetric Ground Fault 2					
F35	B364	...Repeated for Wattmetric Ground Fault 3					
"	B366	...Repeated for Wattmetric Ground Fault 4					
"	B368	...Repeated for Wattmetric Ground Fault 5					
	Mandatory Actual Values (Read Only)						
All	C305	DSP Advanced Diagnostics Active	0 to 1	---	1	F126	0 (No)
"	C306	Synchrophasor Feature Active	0 to 1	---	1	F126	0 (No)
"	C307	IED Behavior	0 to 2	---	1	F678	0 (On)
"	C309	CID File Status	0 to 4	---	1	F632	0 (None)
"	C31D	Graphical Front Panel Setting File CRC	0 to 4294967295	---	1	F003	0
	Breaker Arcing Current Actual Values (Read Only Non-Volatile) (2, 3, 4, or 6 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60	D000	Breaker 1 Arcing Acc Arcing Amp Phase A	0 to 99999999	kA2-cyc	1	F060	0
"	D002	Breaker 1 Arcing Acc Arcing Amp Phase B	0 to 99999999	kA2-cyc	1	F060	0
"	D004	Breaker 1 Arcing Acc Arcing Amp Phase C	0 to 99999999	kA2-cyc	1	F060	0
"	D006	Breaker 1 Arcing Operating Time Phase A	0 to 65535	ms	1	F001	0
"	D007	Breaker 1 Arcing Operating Time Phase B	0 to 65535	ms	1	F001	0
"	D008	Breaker 1 Arcing Operating Time Phase C	0 to 65535	ms	1	F001	0
"	D009	Breaker 1 Arcing Operating Time	0 to 65535	ms	1	F001	0
"	D00A	Breaker 1 Arcing Amp Phase A	0 to 99999999	kA2-cyc	1	F060	0
"	D00C	Breaker 1 Arcing Amp Phase B	0 to 99999999	kA2-cyc	1	F060	0
"	D00E	Breaker 1 Arcing Amp Phase C	0 to 99999999	kA2-cyc	1	F060	0
"	D010	Breaker 1 Arcing Amp Max Phase A	0 to 99999999	kA	1	F060	0
"	D012	Breaker 1 Arcing Amp Max Phase B	0 to 99999999	kA	1	F060	0
"	D014	Breaker 1 Arcing Amp Max Phase C	0 to 99999999	kA	1	F060	0
"	D016	...Repeated for Breaker 2					
B30, C60, C70, F35, F60, L90, T35, T60	D02C	...Repeated for Breaker 3					
B30, C60, F35, F60, L90, T35, T60	D042	...Repeated for Breaker 4					

Products	Hex address	Register name	Range	Units	Step	Format	Default
B30, F35, T35, T60	D058	...Repeated for Breaker 5					
"	D06E	...Repeated for Breaker 6					
	Phasor Measurement Unit Records (Read Only)						
C60, D60, F60, G60, L30, L90, N60, T60	EFFF	PMU Recording Number of Triggers	0 to 65535	---	1	F001	0

2.4.2 Settings map

Table 2-20: Settings Modbus memory map

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Product Information (Read Only -- Written by Factory)						
All	0010	Serial Number	---	---	---	F203	"0"
"	0020	Manufacturing Date	0 to 4294967295	---	1	F050	0
"	0022	Modification Number	0 to 65535	---	1	F001	0
"	0040	Order Code	---	---	---	F204	"Order Code x"
"	0090	Ethernet MAC Address	---	---	---	F072	0
"	0093	Reserved (13 items)	---	---	---	F001	0
"	00A0	CPU Module Serial Number	---	---	---	F203	(none)
"	00B0	CPU Supplier Serial Number	---	---	---	F203	(none)
"	00C0	Ethernet Sub Module Serial Number (8 items)	---	---	---	F203	(none)
"	0110	FPGA Version	---	---	---	F206	(none)
"	0113	FPGA Date	0 to 4294967295	---	1	F050	0
	Product Information (Read/Write Setting)						
All	0120	Compatible Diagnostics Mode	0 to 1	---	1	F102	0 (Disabled)
	Bus Differential (Read/Write Grouped Setting) (2 or 6 Modules)						
B30, B90	0121	Bus Zone 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	0122	Bus Zone 1 Pickup	0.05 to 6	pu	0.001	F001	100
"	0123	Bus Zone 1 Low Slope	15 to 100	%	1	F001	25
"	0124	Bus Zone 1 Low Breakpoint	1 to 30	pu	0.01	F001	200
"	0125	Bus Zone 1 High Slope	50 to 100	%	1	F001	60
"	0126	Bus Zone 1 High Breakpoint	1 to 30	pu	0.01	F001	800
"	0127	Bus Zone 1 High Set	0.1 to 99.99	pu	0.01	F001	1500
"	0128	Bus Zone 1 Seal In	0 to 65.535	s	0.001	F001	400
"	0129	Bus Zone 1 Block	0 to 4294967295	---	1	F300	0
"	012B	Bus Zone 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	012C	Bus Zone 1 Target	0 to 2	---	1	F109	0 (Self-reset)
B90	012D	Bus Zone 1 Supervision	0 to 4294967295	---	1	F300	1
B90	012F	Bus Zone 1 Trip	0 to 4294967295	---	1	F300	0
B30, B90	0131	Bus Zone 1 Check Zone	0 to 1	---	1	F126	0 (No)
"	0132	Bus Zone 1 Aux Zone Trip	0 to 4294967295	---	1	F300	0
"	0134	Bus Zone 1 Supervision Voting	0 to 2	---	1	F264	0 (OFF)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0135	Bus Zone 1 Supervision 1	0 to 4294967295	---	1	F300	0
"	0137	Bus Zone 1 Supervision 2	0 to 4294967295	---	1	F300	0
"	0139	Bus Zone 1 ID	0 to 2	---	1	F202	(none)
"	0143	...Repeated for Bus Zone 2					
"	0165	...Repeated for Bus Zone 3					
"	0187	...Repeated for Bus Zone 4					
"	01A9	...Repeated for Bus Zone 5					
"	01CB	...Repeated for Bus Zone 6					
	CT Trouble (Read/Write Grouped Setting) (6 Modules)						
B30	01ED	CT Trouble 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	01EE	CT Trouble 1 Pickup	0.02 to 2	---	0.001	F001	100
"	01EF	CT Trouble 1 Delay	1 to 60	---	0.1	F001	100
"	01F0	CT Trouble 1 Block	0 to 4294967295	---	1	F300	0
"	01F2	...Repeated for module 2					
"	01F7	...Repeated for module 3					
"	01FC	...Repeated for module 4					
"	0201	...Repeated for module 5					
"	0206	...Repeated for module 6					
	Keypress Emulation (Read/Write)						
All	020B	Simulated keypress -- write zero before each keystroke	0 to 46	---	1	F190	0 (No key -- use between real keys)
	Phase Instantaneous Overcurrent (Read/Write Grouped Setting) (2, 4, 6, 8, 12, or 40 Modules)						
All except B90, C30	020C	Phase Instantaneous Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	020D	Phase Instantaneous Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	020E	Phase Instantaneous Overcurrent 1 Pickup	0.005 to 30	pu	0.001	F001	1000
"	020F	Phase Instantaneous Overcurrent 1 Delay	0 to 600	s	0.01	F001	0
"	0210	Phase Instantaneous Overcurrent 1 Reset Delay	0 to 600	s	0.01	F001	0
"	0211	Phase IOC1 Block For Each Phase (3 items)	0 to 4294967295	---	1	F300	0
"	0217	Phase Instantaneous Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	0218	Phase Instantaneous Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	0219	Reserved (6 items)	0 to 1	---	1	F001	0
"	021F	...Repeated for Phase Instantaneous Overcurrent 2					
B30, C60, C70, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	0232	...Repeated for Phase Instantaneous Overcurrent 3					
"	0245	...Repeated for Phase Instantaneous Overcurrent 4					
B30, C60, C70, D60, F35, F60, L90, M60, N60, T35, T60	0258	...Repeated for Phase Instantaneous Overcurrent 5					
"	026B	...Repeated for Phase Instantaneous Overcurrent 6					

Products	Hex address	Register name	Range	Units	Step	Format	Default
B30, C60, C70, F35, F60, L90, M60, N60, T35, T60	027E	...Repeated for Phase Instantaneous Overcurrent 7					
"	0291	...Repeated for Phase Instantaneous Overcurrent 8					
B30, C70, F35, N60, T35, T60	02A4	...Repeated for Phase Instantaneous Overcurrent 9					
"	02B7	...Repeated for Phase Instantaneous Overcurrent 10					
"	02CA	...Repeated for Phase Instantaneous Overcurrent 11					
"	02DD	...Repeated for Phase Instantaneous Overcurrent 12					
B30	02F0	...Repeated for Phase Instantaneous Overcurrent 13					
"	0303	...Repeated for Phase Instantaneous Overcurrent 14					
"	0316	...Repeated for Phase Instantaneous Overcurrent 15					
"	0329	...Repeated for Phase Instantaneous Overcurrent 16					
"	033C	...Repeated for Phase Instantaneous Overcurrent 17					
"	034F	...Repeated for Phase Instantaneous Overcurrent 18					
"	0362	...Repeated for Phase Instantaneous Overcurrent 19					
"	0375	...Repeated for Phase Instantaneous Overcurrent 20					
...		...					
"	04F1	...Repeated for Phase Instantaneous Overcurrent 40					
	Graphical Front Panel Settings (Read/Write Setting)						
All	0634	GFP Home Page Content (10 items)	0 to 27	---	1	F647	0 (Product Information)
"	063E	GFP Date Format	0 to 7	---	1	F648	0 (yyyy-mm-dd)
"	063F	GFP Time Format	0 to 1	---	1	F649	0 (hh:mm:ss)
"	0640	GFP Rolling Mode Delay	0 to 900	seconds	1	F001	300
"	0641	GFP Rolling Mode Pages (10 items)	0 to 27	---	1	F647	0 (Product Information)
"	064B	GFP Number of Rolling Mode Pages	1 to 10	---	1	F001	1
"	064C	GFP Automatic Annunciator Recall	0 to 1	---	1	F102	1 (Enabled)
"	064D	GFP Screen Saver Delay	0 to 900	seconds	1	F001	300
"	064E	GFP Screen Saver Intensity	0 to 3	---	1	F650	3 (30 %)
"	066F	GFP Configurable Navigation Condition (64 items)	0 to 4294967295	---	1	F300	0
"	06CF	GFP Configurable Navigation Activate Page (64 items)	0 to 27	---	1	F647	0 (Product Information)
"	070F	GFP Mimic (Single-Line) Diagram Status Component Operand (32 items)	0 to 4294967295	---	1	F300	0
"	074F	GFP Tabular Metering Status Operand (16 items)	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Graphical Front Panel (Read/Write Command)						
All	076F	GFP Reset Command	0 to 1	---	1	F126	0 (No)
	IEC103 Protocol Settings (Read/Write Setting)						
All	0770	IEC103 Common ASDU Address	0 to 254	---	1	F001	0
"	0771	IEC103 Sync Timeout	1 to 1440	min	1	F001	1
	IEC103 Binary Inputs (Read/Write Setting) (96 Modules)						
All	0772	IEC103 Binary Input 1 FUN	0 to 255	---	1	F001	0
"	0773	IEC103 Binary Input 1 INF	0 to 255	---	1	F001	0
"	0774	IEC103 Binary Input 1 Operand	0 to 4294967295	---	1	F300	0
"	0776	...Repeated for Binary Input 2					
"	077A	...Repeated for Binary Input 3					
"	077E	...Repeated for Binary Input 4					
"	0782	...Repeated for Binary Input 5					
"	0786	...Repeated for Binary Input 6					
"	078A	...Repeated for Binary Input 7					
"	078E	...Repeated for Binary Input 8					
"	0792	...Repeated for Binary Input 9					
"	0796	...Repeated for Binary Input 10					
"	079A	...Repeated for Binary Input 11					
"	079E	...Repeated for Binary Input 12					
"	07A2	...Repeated for Binary Input 13					
"	07A6	...Repeated for Binary Input 14					
"	07AA	...Repeated for Binary Input 15					
"	07AE	...Repeated for Binary Input 16					
"	07B2	...Repeated for Binary Input 17					
"	07B6	...Repeated for Binary Input 18					
"	07BA	...Repeated for Binary Input 19					
"	07BE	...Repeated for Binary Input 20					
"	07C2	...Repeated for Binary Input 21					
"	07C6	...Repeated for Binary Input 22					
"	07CA	...Repeated for Binary Input 23					
"	07CE	...Repeated for Binary Input 24					
"	07D2	...Repeated for Binary Input 25					
"	07D6	...Repeated for Binary Input 26					
"	07DA	...Repeated for Binary Input 27					
"	07DE	...Repeated for Binary Input 28					
"	07E2	...Repeated for Binary Input 29					
"	07E6	...Repeated for Binary Input 30					
"	07EA	...Repeated for Binary Input 31					
"	07EE	...Repeated for Binary Input 32					
"	07F2	...Repeated for Binary Input 33					
"	07F6	...Repeated for Binary Input 34					
"	07FA	...Repeated for Binary Input 35					
"	07FE	...Repeated for Binary Input 36					
"	0802	...Repeated for Binary Input 37					
"	0806	...Repeated for Binary Input 38					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	080A	...Repeated for Binary Input 39					
"	080E	...Repeated for Binary Input 40					
"	0812	...Repeated for Binary Input 41					
"	0816	...Repeated for Binary Input 42					
"	081A	...Repeated for Binary Input 43					
"	081E	...Repeated for Binary Input 44					
"	0822	...Repeated for Binary Input 45					
"	0826	...Repeated for Binary Input 46					
"	082A	...Repeated for Binary Input 47					
"	082E	...Repeated for Binary Input 48					
"	0832	...Repeated for Binary Input 49					
"	0836	...Repeated for Binary Input 50					
"	083A	...Repeated for Binary Input 51					
"	083E	...Repeated for Binary Input 52					
"	0842	...Repeated for Binary Input 53					
"	0846	...Repeated for Binary Input 54					
"	084A	...Repeated for Binary Input 55					
"	084E	...Repeated for Binary Input 56					
"	0852	...Repeated for Binary Input 57					
"	0856	...Repeated for Binary Input 58					
"	085A	...Repeated for Binary Input 59					
"	085E	...Repeated for Binary Input 60					
"	0862	...Repeated for Binary Input 61					
"	0866	...Repeated for Binary Input 62					
"	086A	...Repeated for Binary Input 63					
"	086E	...Repeated for Binary Input 64					
"	0872	...Repeated for Binary Input 65					
"	0876	...Repeated for Binary Input 66					
"	087A	...Repeated for Binary Input 67					
"	087E	...Repeated for Binary Input 68					
"	0882	...Repeated for Binary Input 69					
"	0886	...Repeated for Binary Input 70					
"	088A	...Repeated for Binary Input 71					
"	088E	...Repeated for Binary Input 72					
"	0892	...Repeated for Binary Input 73					
"	0896	...Repeated for Binary Input 74					
"	089A	...Repeated for Binary Input 75					
"	089E	...Repeated for Binary Input 76					
"	08A2	...Repeated for Binary Input 77					
"	08A6	...Repeated for Binary Input 78					
"	08AA	...Repeated for Binary Input 79					
"	08AE	...Repeated for Binary Input 80					
"	08B2	...Repeated for Binary Input 81					
"	08B6	...Repeated for Binary Input 82					
"	08BA	...Repeated for Binary Input 83					
"	08BE	...Repeated for Binary Input 84					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	08C2	...Repeated for Binary Input 85					
"	08C6	...Repeated for Binary Input 86					
"	08CA	...Repeated for Binary Input 87					
"	08CE	...Repeated for Binary Input 88					
"	08D2	...Repeated for Binary Input 89					
"	08D6	...Repeated for Binary Input 90					
"	08DA	...Repeated for Binary Input 91					
"	08DE	...Repeated for Binary Input 92					
"	08E2	...Repeated for Binary Input 93					
"	08E6	...Repeated for Binary Input 94					
"	08EA	...Repeated for Binary Input 95					
"	08EE	...Repeated for Binary Input 96					
	IEC103 ASDU Settings (Read/Write Setting) (4 Modules)						
All	08F2	IEC103 ASDU1 TYP	0 to 1	---	1	F630	1(9)
"	08F3	IEC103 ASDU 1 FUN	0 to 255	---	1	F001	0
"	08F4	IEC103 ASDU 1 INF	0 to 255	---	1	F001	0
"	08F5	IEC103 ASDU 1 Scan Timeout	0 to 1000	---	1	F001	0
"	08F6	IEC103 ASDU 1 Analog Parameter 1	0 to 4294967295	---	1	F600	0
"	08F8	IEC103 ASDU 1 Analog Factor 1	0 to 65.535	---	0.001	F001	1000
"	08F9	IEC103 ASDU 1 Analog Offset 1	-32768 to 32767	---	1	F002	0
"	08FA	IEC103 ASDU 1 Analog Parameter 2	0 to 4294967295	---	1	F600	0
"	08FC	IEC103 ASDU 1 Analog Factor 2	0 to 65.535	---	0.001	F001	1000
"	08FD	IEC103 ASDU 1 Analog Offset 2	-32768 to 32767	---	1	F002	0
"	08FE	IEC103 ASDU 1 Analog Parameter 3	0 to 4294967295	---	1	F600	0
"	0900	IEC103 ASDU 1 Analog Factor 3	0 to 65.535	---	0.001	F001	1000
"	0901	IEC103 ASDU 1 Analog Offset 3	-32768 to 32767	---	1	F002	0
"	0902	IEC103 ASDU 1 Analog Parameter 4	0 to 4294967295	---	1	F600	0
"	0904	IEC103 ASDU 1 Analog Factor 4	0 to 65.535	---	0.001	F001	1000
"	0905	IEC103 ASDU 1 Analog Offset 4	-32768 to 32767	---	1	F002	0
"	0906	IEC103 ASDU 1 Analog Parameter 5	0 to 4294967295	---	1	F600	0
"	0908	IEC103 ASDU 1 Analog Factor 5	0 to 65.535	---	0.001	F001	1000
"	0909	IEC103 ASDU 1 Analog Offset 5	-32768 to 32767	---	1	F002	0
"	090A	IEC103 ASDU 1 Analog Parameter 6	0 to 4294967295	---	1	F600	0
"	090C	IEC103 ASDU 1 Analog Factor 6	0 to 65.535	---	0.001	F001	1000
"	090D	IEC103 ASDU 1 Analog Offset 6	-32768 to 32767	---	1	F002	0
"	090E	IEC103 ASDU 1 Analog Parameter 7	0 to 4294967295	---	1	F600	0
"	0910	IEC103 ASDU 1 Analog Factor 7	0 to 65.535	---	0.001	F001	1000
"	0911	IEC103 ASDU 1 Analog Offset 7	-32768 to 32767	---	1	F002	0
"	0912	IEC103 ASDU 1 Analog Parameter 8	0 to 4294967295	---	1	F600	0
"	0914	IEC103 ASDU 1 Analog Factor 8	0 to 65.535	---	0.001	F001	1000
"	0915	IEC103 ASDU 1 Analog Offset 8	-32768 to 32767	---	1	F002	0
"	0916	IEC103 ASDU 1 Analog Parameter 9	0 to 4294967295	---	1	F600	0
"	0918	IEC103 ASDU 1 Analog Factor 9	0 to 65.535	---	0.001	F001	1000
"	0919	IEC103 ASDU 1 Analog Offset 9	-32768 to 32767	---	1	F002	0
"	091A	...Repeated for IEC103 ASDU 2					
"	0942	...Repeated for IEC103 ASDU 3					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	096A	...Repeated for IEC103 ASDU 4					
	IEC103 Commands (Read/Write Setting) (32 Modules)						
All	0992	IEC103 Command 1 FUN	0 to 255	---	1	F001	0
"	0993	IEC103 Command 1 INF	0 to 255	---	1	F001	0
"	0994	IEC103 Command 1 Param ON	0 to 64	---	1	F631	0 (OFF)
"	0995	IEC103 Command 1 Param OFF	0 to 64	---	1	F631	0 (OFF)
"	0996	...Repeated for IEC103 Command 2					
"	099A	...Repeated for IEC103 Command 3					
"	09AE	...Repeated for IEC103 Command 4					
"	09A2	...Repeated for IEC103 Command 5					
"	09A6	...Repeated for IEC103 Command 6					
"	09AA	...Repeated for IEC103 Command 7					
"	09AE	...Repeated for IEC103 Command 8					
"	09B2	...Repeated for IEC103 Command 9					
"	09B6	...Repeated for IEC103 Command 10					
"	09BA	...Repeated for IEC103 Command 11					
"	09BE	...Repeated for IEC103 Command 12					
"	09C2	...Repeated for IEC103 Command 13					
"	09C6	...Repeated for IEC103 Command 14					
"	09CA	...Repeated for IEC103 Command 15					
"	09CE	...Repeated for IEC103 Command 16					
"	09D2	...Repeated for IEC103 Command 17					
"	09D6	...Repeated for IEC103 Command 18					
"	09DA	...Repeated for IEC103 Command 19					
"	09DE	...Repeated for IEC103 Command 20					
"	09E2	...Repeated for IEC103 Command 21					
"	09E6	...Repeated for IEC103 Command 22					
"	09EA	...Repeated for IEC103 Command 23					
"	09EE	...Repeated for IEC103 Command 24					
"	09F2	...Repeated for IEC103 Command 25					
"	09F6	...Repeated for IEC103 Command 26					
"	09FA	...Repeated for IEC103 Command 27					
"	09FE	...Repeated for IEC103 Command 28					
"	0A02	...Repeated for IEC103 Command 29					
"	0A06	...Repeated for IEC103 Command 30					
"	0A0A	...Repeated for IEC103 Command 31					
"	0A0E	...Repeated for IEC103 Command 32					
	RxGOOSE Boolean (Read/Write Setting) (256 Modules)						
All	0A12	RxGOOSE Boolean 1 Default State	0 to 3	---	1	F086	0 (Off)
"	0A13	RxGOOSE Boolean 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	0A14	...Repeated for RxGOOSE Boolean 2					
"	0A16	...Repeated for RxGOOSE Boolean 3					
"	0A18	...Repeated for RxGOOSE Boolean 4					
"	0A1A	...Repeated for RxGOOSE Boolean 5					
"	0A1C	...Repeated for RxGOOSE Boolean 6					
"	0A1E	...Repeated for RxGOOSE Boolean 7					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0A20	...Repeated for RxGOOSE Boolean 8					
"	0A22	...Repeated for RxGOOSE Boolean 9					
"	0A24	...Repeated for RxGOOSE Boolean 10					
"	0A26	...Repeated for RxGOOSE Boolean 11					
"	0A28	...Repeated for RxGOOSE Boolean 12					
"	0A2A	...Repeated for RxGOOSE Boolean 13					
"	0A2C	...Repeated for RxGOOSE Boolean 14					
"	0A2E	...Repeated for RxGOOSE Boolean 15					
"	0A30	...Repeated for RxGOOSE Boolean 16					
"	0A32	...Repeated for RxGOOSE Boolean 17					
"	0A34	...Repeated for RxGOOSE Boolean 18					
"	0A36	...Repeated for RxGOOSE Boolean 19					
"	0A38	...Repeated for RxGOOSE Boolean 20					
"	0A3A	...Repeated for RxGOOSE Boolean 21					
"	0A3C	...Repeated for RxGOOSE Boolean 22					
"	0A3E	...Repeated for RxGOOSE Boolean 23					
"	0A40	...Repeated for RxGOOSE Boolean 24					
"	0A42	...Repeated for RxGOOSE Boolean 25					
"	0A44	...Repeated for RxGOOSE Boolean 26					
"	0A46	...Repeated for RxGOOSE Boolean 27					
"	0A48	...Repeated for RxGOOSE Boolean 28					
"	0A4A	...Repeated for RxGOOSE Boolean 29					
"	0A4C	...Repeated for RxGOOSE Boolean 30					
"	0A4E	...Repeated for RxGOOSE Boolean 31					
"	0A50	...Repeated for RxGOOSE Boolean 32					
"	0A52	...Repeated for RxGOOSE Boolean 33					
"	0A54	...Repeated for RxGOOSE Boolean 34					
"	0A56	...Repeated for RxGOOSE Boolean 35					
"	0A58	...Repeated for RxGOOSE Boolean 36					
"	0A5A	...Repeated for RxGOOSE Boolean 37					
"	0A5C	...Repeated for RxGOOSE Boolean 38					
"	0A5E	...Repeated for RxGOOSE Boolean 39					
"	0A60	...Repeated for RxGOOSE Boolean 40					
"	0A62	...Repeated for RxGOOSE Boolean 41					
"	0A64	...Repeated for RxGOOSE Boolean 42					
"	0A66	...Repeated for RxGOOSE Boolean 43					
"	0A68	...Repeated for RxGOOSE Boolean 44					
"	0A6A	...Repeated for RxGOOSE Boolean 45					
"	0A6C	...Repeated for RxGOOSE Boolean 46					
"	0A6E	...Repeated for RxGOOSE Boolean 47					
"	0A70	...Repeated for RxGOOSE Boolean 48					
"	0A72	...Repeated for RxGOOSE Boolean 49					
"	0A74	...Repeated for RxGOOSE Boolean 50					
"	0A76	...Repeated for RxGOOSE Boolean 51					
"	0A78	...Repeated for RxGOOSE Boolean 52					
"	0A7A	...Repeated for RxGOOSE Boolean 53					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0A7C	...Repeated for RxGOOSE Boolean 54					
"	0A7E	...Repeated for RxGOOSE Boolean 55					
"	0A80	...Repeated for RxGOOSE Boolean 56					
"	0A82	...Repeated for RxGOOSE Boolean 57					
"	0A84	...Repeated for RxGOOSE Boolean 58					
"	0A86	...Repeated for RxGOOSE Boolean 59					
"	0A88	...Repeated for RxGOOSE Boolean 60					
"	0A8A	...Repeated for RxGOOSE Boolean 61					
"	0A8C	...Repeated for RxGOOSE Boolean 62					
"	0A8E	...Repeated for RxGOOSE Boolean 63					
"	0A90	...Repeated for RxGOOSE Boolean 64					
"	0A92	...Repeated for RxGOOSE Boolean 65					
"	0A94	...Repeated for RxGOOSE Boolean 66					
"	0A96	...Repeated for RxGOOSE Boolean 67					
"	0A98	...Repeated for RxGOOSE Boolean 68					
"	0A9A	...Repeated for RxGOOSE Boolean 69					
"	0A9C	...Repeated for RxGOOSE Boolean 70					
"	0A9E	...Repeated for RxGOOSE Boolean 71					
"	0AA0	...Repeated for RxGOOSE Boolean 72					
"	0AA2	...Repeated for RxGOOSE Boolean 73					
"	0AA4	...Repeated for RxGOOSE Boolean 74					
"	0AA6	...Repeated for RxGOOSE Boolean 75					
"	0AA8	...Repeated for RxGOOSE Boolean 76					
"	0AAA	...Repeated for RxGOOSE Boolean 77					
"	0AAC	...Repeated for RxGOOSE Boolean 78					
"	0AAE	...Repeated for RxGOOSE Boolean 79					
"	0AB0	...Repeated for RxGOOSE Boolean 80					
"	0AB2	...Repeated for RxGOOSE Boolean 81					
"	0AB4	...Repeated for RxGOOSE Boolean 82					
"	0AB6	...Repeated for RxGOOSE Boolean 83					
"	0AB8	...Repeated for RxGOOSE Boolean 84					
"	0ABA	...Repeated for RxGOOSE Boolean 85					
"	0ABC	...Repeated for RxGOOSE Boolean 86					
"	0ABE	...Repeated for RxGOOSE Boolean 87					
"	0AC0	...Repeated for RxGOOSE Boolean 88					
"	0AC2	...Repeated for RxGOOSE Boolean 89					
"	0AC4	...Repeated for RxGOOSE Boolean 90					
"	0AC6	...Repeated for RxGOOSE Boolean 91					
"	0AC8	...Repeated for RxGOOSE Boolean 92					
"	0ACA	...Repeated for RxGOOSE Boolean 93					
"	0ACC	...Repeated for RxGOOSE Boolean 94					
"	0ACE	...Repeated for RxGOOSE Boolean 95					
"	0AD0	...Repeated for RxGOOSE Boolean 96					
"	0AD2	...Repeated for RxGOOSE Boolean 97					
"	0AD4	...Repeated for RxGOOSE Boolean 98					
"	0AD6	...Repeated for RxGOOSE Boolean 99					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0AD8	...Repeated for RxGOOSE Boolean 100					
"	0ADA	...Repeated for RxGOOSE Boolean 101					
"	0ADC	...Repeated for RxGOOSE Boolean 102					
"	0ADE	...Repeated for RxGOOSE Boolean 103					
"	0AE0	...Repeated for RxGOOSE Boolean 104					
"	0AE2	...Repeated for RxGOOSE Boolean 105					
"	0AE4	...Repeated for RxGOOSE Boolean 106					
"	0AE6	...Repeated for RxGOOSE Boolean 107					
"	0AE8	...Repeated for RxGOOSE Boolean 108					
"	0AEA	...Repeated for RxGOOSE Boolean 109					
"	0AEC	...Repeated for RxGOOSE Boolean 110					
"	0AEE	...Repeated for RxGOOSE Boolean 111					
"	0AF0	...Repeated for RxGOOSE Boolean 112					
"	0AF2	...Repeated for RxGOOSE Boolean 113					
"	0AF4	...Repeated for RxGOOSE Boolean 114					
"	0AF6	...Repeated for RxGOOSE Boolean 115					
"	0AF8	...Repeated for RxGOOSE Boolean 116					
"	0AFA	...Repeated for RxGOOSE Boolean 117					
"	0AFC	...Repeated for RxGOOSE Boolean 118					
"	0AFE	...Repeated for RxGOOSE Boolean 119					
"	0B00	...Repeated for RxGOOSE Boolean 120					
"	0B02	...Repeated for RxGOOSE Boolean 121					
"	0B04	...Repeated for RxGOOSE Boolean 122					
"	0B06	...Repeated for RxGOOSE Boolean 123					
"	0B08	...Repeated for RxGOOSE Boolean 124					
"	0B0A	...Repeated for RxGOOSE Boolean 125					
"	0B0C	...Repeated for RxGOOSE Boolean 126					
"	0B0E	...Repeated for RxGOOSE Boolean 127					
"	0B10	...Repeated for RxGOOSE Boolean 128					
"	0B12	...Repeated for RxGOOSE Boolean 129					
"	0B14	...Repeated for RxGOOSE Boolean 130					
"	0B16	...Repeated for RxGOOSE Boolean 131					
"	0B18	...Repeated for RxGOOSE Boolean 132					
"	0B1A	...Repeated for RxGOOSE Boolean 133					
"	0B1C	...Repeated for RxGOOSE Boolean 134					
"	0B1E	...Repeated for RxGOOSE Boolean 135					
"	0B20	...Repeated for RxGOOSE Boolean 136					
"	0B22	...Repeated for RxGOOSE Boolean 137					
"	0B24	...Repeated for RxGOOSE Boolean 138					
"	0B26	...Repeated for RxGOOSE Boolean 139					
"	0B28	...Repeated for RxGOOSE Boolean 140					
"	0B2A	...Repeated for RxGOOSE Boolean 141					
"	0B2C	...Repeated for RxGOOSE Boolean 142					
"	0B2E	...Repeated for RxGOOSE Boolean 143					
"	0B30	...Repeated for RxGOOSE Boolean 144					
"	0B32	...Repeated for RxGOOSE Boolean 145					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0B34	...Repeated for RxGOOSE Boolean 146					
"	0B36	...Repeated for RxGOOSE Boolean 147					
"	0B38	...Repeated for RxGOOSE Boolean 148					
"	0B3A	...Repeated for RxGOOSE Boolean 149					
"	0B3C	...Repeated for RxGOOSE Boolean 150					
"	0B3E	...Repeated for RxGOOSE Boolean 151					
"	0B40	...Repeated for RxGOOSE Boolean 152					
"	0B42	...Repeated for RxGOOSE Boolean 153					
"	0B44	...Repeated for RxGOOSE Boolean 154					
"	0B46	...Repeated for RxGOOSE Boolean 155					
"	0B48	...Repeated for RxGOOSE Boolean 156					
"	0B4A	...Repeated for RxGOOSE Boolean 157					
"	0B4C	...Repeated for RxGOOSE Boolean 158					
"	0B4E	...Repeated for RxGOOSE Boolean 159					
"	0B50	...Repeated for RxGOOSE Boolean 160					
"	0B52	...Repeated for RxGOOSE Boolean 161					
"	0B54	...Repeated for RxGOOSE Boolean 162					
"	0B56	...Repeated for RxGOOSE Boolean 163					
"	0B58	...Repeated for RxGOOSE Boolean 164					
"	0B5A	...Repeated for RxGOOSE Boolean 165					
"	0B5C	...Repeated for RxGOOSE Boolean 166					
"	0B5E	...Repeated for RxGOOSE Boolean 167					
"	0B60	...Repeated for RxGOOSE Boolean 168					
"	0B62	...Repeated for RxGOOSE Boolean 169					
"	0B64	...Repeated for RxGOOSE Boolean 170					
"	0B66	...Repeated for RxGOOSE Boolean 171					
"	0B68	...Repeated for RxGOOSE Boolean 172					
"	0B6A	...Repeated for RxGOOSE Boolean 173					
"	0B6C	...Repeated for RxGOOSE Boolean 174					
"	0B6E	...Repeated for RxGOOSE Boolean 175					
"	0B70	...Repeated for RxGOOSE Boolean 176					
"	0B72	...Repeated for RxGOOSE Boolean 177					
"	0B74	...Repeated for RxGOOSE Boolean 178					
"	0B76	...Repeated for RxGOOSE Boolean 179					
"	0B78	...Repeated for RxGOOSE Boolean 180					
"	0B7A	...Repeated for RxGOOSE Boolean 181					
"	0B7C	...Repeated for RxGOOSE Boolean 182					
"	0B7E	...Repeated for RxGOOSE Boolean 183					
"	0B80	...Repeated for RxGOOSE Boolean 184					
"	0B82	...Repeated for RxGOOSE Boolean 185					
"	0B84	...Repeated for RxGOOSE Boolean 186					
"	0B86	...Repeated for RxGOOSE Boolean 187					
"	0B88	...Repeated for RxGOOSE Boolean 188					
"	0B8A	...Repeated for RxGOOSE Boolean 189					
"	0B8C	...Repeated for RxGOOSE Boolean 190					
"	0B8E	...Repeated for RxGOOSE Boolean 191					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0B90	...Repeated for RxGOOSE Boolean 192					
"	0B92	...Repeated for RxGOOSE Boolean 193					
"	0B94	...Repeated for RxGOOSE Boolean 194					
"	0B96	...Repeated for RxGOOSE Boolean 195					
"	0B98	...Repeated for RxGOOSE Boolean 196					
"	0B9A	...Repeated for RxGOOSE Boolean 197					
"	0B9C	...Repeated for RxGOOSE Boolean 198					
"	0B9E	...Repeated for RxGOOSE Boolean 199					
"	0BA0	...Repeated for RxGOOSE Boolean 200					
"	0BA2	...Repeated for RxGOOSE Boolean 201					
"	0BA4	...Repeated for RxGOOSE Boolean 202					
"	0BA6	...Repeated for RxGOOSE Boolean 203					
"	0BA8	...Repeated for RxGOOSE Boolean 204					
"	0BAA	...Repeated for RxGOOSE Boolean 205					
"	0BAC	...Repeated for RxGOOSE Boolean 206					
"	0BAE	...Repeated for RxGOOSE Boolean 207					
"	0BB0	...Repeated for RxGOOSE Boolean 208					
"	0BB2	...Repeated for RxGOOSE Boolean 209					
"	0BB4	...Repeated for RxGOOSE Boolean 210					
"	0BB6	...Repeated for RxGOOSE Boolean 211					
"	0BB8	...Repeated for RxGOOSE Boolean 212					
"	0BBA	...Repeated for RxGOOSE Boolean 213					
"	0BBC	...Repeated for RxGOOSE Boolean 214					
"	0BBE	...Repeated for RxGOOSE Boolean 215					
"	0BC0	...Repeated for RxGOOSE Boolean 216					
"	0BC2	...Repeated for RxGOOSE Boolean 217					
"	0BC4	...Repeated for RxGOOSE Boolean 218					
"	0BC6	...Repeated for RxGOOSE Boolean 219					
"	0BC8	...Repeated for RxGOOSE Boolean 220					
"	0BCA	...Repeated for RxGOOSE Boolean 221					
"	0BCC	...Repeated for RxGOOSE Boolean 222					
"	0BCE	...Repeated for RxGOOSE Boolean 223					
"	0BD0	...Repeated for RxGOOSE Boolean 224					
"	0BD2	...Repeated for RxGOOSE Boolean 225					
"	0BD4	...Repeated for RxGOOSE Boolean 226					
"	0BD6	...Repeated for RxGOOSE Boolean 227					
"	0BD8	...Repeated for RxGOOSE Boolean 228					
"	0BDA	...Repeated for RxGOOSE Boolean 229					
"	0BDC	...Repeated for RxGOOSE Boolean 230					
"	0BDE	...Repeated for RxGOOSE Boolean 231					
"	0BE0	...Repeated for RxGOOSE Boolean 232					
"	0BE2	...Repeated for RxGOOSE Boolean 233					
"	0BE4	...Repeated for RxGOOSE Boolean 234					
"	0BE6	...Repeated for RxGOOSE Boolean 235					
"	0BE8	...Repeated for RxGOOSE Boolean 236					
"	0BEA	...Repeated for RxGOOSE Boolean 237					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0BEC	...Repeated for RxGOOSE Boolean 238					
"	0BEE	...Repeated for RxGOOSE Boolean 239					
"	0BF0	...Repeated for RxGOOSE Boolean 240					
"	0BF2	...Repeated for RxGOOSE Boolean 241					
"	0BF4	...Repeated for RxGOOSE Boolean 242					
"	0BF6	...Repeated for RxGOOSE Boolean 243					
"	0BF8	...Repeated for RxGOOSE Boolean 244					
"	0BFA	...Repeated for RxGOOSE Boolean 245					
"	0BFC	...Repeated for RxGOOSE Boolean 246					
"	0BFE	...Repeated for RxGOOSE Boolean 247					
"	0C00	...Repeated for RxGOOSE Boolean 248					
"	0C02	...Repeated for RxGOOSE Boolean 249					
"	0C04	...Repeated for RxGOOSE Boolean 250					
"	0C06	...Repeated for RxGOOSE Boolean 251					
"	0C08	...Repeated for RxGOOSE Boolean 252					
"	0C0A	...Repeated for RxGOOSE Boolean 253					
"	0C0C	...Repeated for RxGOOSE Boolean 254					
"	0C0E	...Repeated for RxGOOSE Boolean 255					
"	0C10	...Repeated for RxGOOSE Boolean 256					
	Direct Analog Input and Output Settings (Read/Write Setting) (32 Modules)						
N60	0DF5	Direct Analog Output 1 Value	0 to 4294967295	---	1	F600	0
"	0DF7	Direct Analog Output 1 Deadband	0 to 1000000000	---	0.001	F060	1000000
"	0DF9	Direct Analog Output 1 Trigger	0 to 4294967295	---	1	F300	0
"	0DFB	Direct Analog Input 1 Device	0 to 16	---	1	F001	0
"	0DFC	Direct Analog Input 1 Number	0 to 32	---	1	F001	0
"	0DFD	Direct Analog Input 1 Units	---	---	---	F207	(none)
"	0E00	Direct Analog Input 1 Default Value	–1000000000 to 1000000000	---	0.001	F060	1000
"	0E02	Direct Analog Input 1 Mode	0 to 1	---	1	F491	0 (Default Value)
"	0E03	Direct Analog Input 1 PU Base	1 to 2000000	---	1	F003	1
"	0E05	...Repeated for Direct Analog Input and Output 2					
"	0E15	...Repeated for Direct Analog Input and Output 3					
"	0E25	...Repeated for Direct Analog Input and Output 4					
"	0E35	...Repeated for Direct Analog Input and Output 5					
"	0E45	...Repeated for Direct Analog Input and Output 6					
"	0E55	...Repeated for Direct Analog Input and Output 7					
"	0E65	...Repeated for Direct Analog Input and Output 8					
"	0E75	...Repeated for Direct Analog Input and Output 9					
"	0E85	...Repeated for Direct Analog Input and Output 10					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	0E95	...Repeated for Direct Analog Input and Output 11					
"	0EA5	...Repeated for Direct Analog Input and Output 12					
"	0EB5	...Repeated for Direct Analog Input and Output 13					
"	0EC5	...Repeated for Direct Analog Input and Output 14					
"	0ED5	...Repeated for Direct Analog Input and Output 15					
"	0EE5	...Repeated for Direct Analog Input and Output 16					
"	0EF5	...Repeated for Direct Analog Input and Output 17					
"	0F05	...Repeated for Direct Analog Input and Output 18					
"	0F15	...Repeated for Direct Analog Input and Output 19					
"	0F25	...Repeated for Direct Analog Input and Output 20					
"	0F35	...Repeated for Direct Analog Input and Output 21					
"	0F45	...Repeated for Direct Analog Input and Output 22					
"	0F55	...Repeated for Direct Analog Input and Output 23					
"	0F65	...Repeated for Direct Analog Input and Output 24					
"	0F75	...Repeated for Direct Analog Input and Output 25					
"	0F85	...Repeated for Direct Analog Input and Output 26					
"	0F95	...Repeated for Direct Analog Input and Output 27					
"	0FA5	...Repeated for Direct Analog Input and Output 28					
"	0FB5	...Repeated for Direct Analog Input and Output 29					
"	0FC5	...Repeated for Direct Analog Input and Output 30					
"	0FD5	...Repeated for Direct Analog Input and Output 31					
"	0FE5	...Repeated for Direct Analog Input and Output 32					
	Field Unit Shared Inputs (Read/Write Setting) (16 Modules)						
All except B90, L60	0FF5	Field Shared Input 1 ID	0 to 65535	---	1	F636	"SI 1"
"	1000	Field Shared Input 1 Unit Origin 1	0 to 8	---	1	F256	0 (None)
"	1001	Field Shared Input 1 Channel Origin 1	1 to 15	---	1	F001	1
"	1002	Field Shared Input 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	1003	...Repeated for Field Shared Input 2					
"	1011	...Repeated for Field Shared Input 3					
"	101F	...Repeated for Field Shared Input 4					
"	102D	...Repeated for Field Shared Input 5					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	103B	...Repeated for Field Shared Input 6					
"	1049	...Repeated for Field Shared Input 7					
"	1057	...Repeated for Field Shared Input 8					
"	1065	...Repeated for Field Shared Input 9					
"	1073	...Repeated for Field Shared Input 10					
"	1081	...Repeated for Field Shared Input 11					
"	108F	...Repeated for Field Shared Input 12					
"	109D	...Repeated for Field Shared Input 13					
"	10AB	...Repeated for Field Shared Input 14					
"	10B9	...Repeated for Field Shared Input 15					
"	10C7	...Repeated for Field Shared Input 16					
	Field Unit Shared Outputs (Read/Write Setting) (16 Modules)						
All except B90, L60	10D5	Field Shared Output 1 ID	0 to 65535	---	1	F636	"SO 1"
"	10E0	Field Shared Output 1 Operate	0 to 4294967295	---	1	F300	0
"	10E2	Field Shared Output 1 Unit Dest 1	0 to 8	---	1	F256	0 (None)
"	10E3	Field Shared Output 1 Channel Dest 1	1 to 15	---	1	F001	1
"	10E4	Field Shared Output 1 Unit Dest 2	0 to 8	---	1	F256	0 (None)
"	10E5	Field Shared Output 1 Channel Dest 2	1 to 15	---	1	F001	1
"	10E6	Field Shared Output 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	10E7	...Repeated for Field Shared Output 2					
"	10F9	...Repeated for Field Shared Output 3					
"	110B	...Repeated for Field Shared Output 4					
"	111D	...Repeated for Field Shared Output 5					
"	112F	...Repeated for Field Shared Output 6					
"	1141	...Repeated for Field Shared Output 7					
"	1153	...Repeated for Field Shared Output 8					
"	1165	...Repeated for Field Shared Output 9					
"	1177	...Repeated for Field Shared Output 10					
"	1189	...Repeated for Field Shared Output 11					
"	119B	...Repeated for Field Shared Output 12					
"	11AD	...Repeated for Field Shared Output 13					
"	11BF	...Repeated for Field Shared Output 14					
"	11D1	...Repeated for Field Shared Output 15					
"	11E3	...Repeated for Field Shared Output 16					
	Element Targets (Read/Write)						
All	11F5	Target to Read	0 to 65535	---	1	F001	0
"	11F6	Target to Read for graphical front panel (GFP)	0 to 65535	---	1	F001	0
	Channel Status Commands (Read/Write Command)						
L90	11F7	L90 Channel Status Clear	0 to 1	---	1	F126	0 (No)
	L60 Test Mode (Read/Write Setting)						
L60	11F8	L60 Channel Test Mode	0 to 1	---	1	F102	0 (Disabled)
	Breaker Flashover (Read/Write Setting) (1 or 2 Modules)						
B30, C60, C70, D60, F35, F60, G60, L60, L90, M60, T60	11F9	Breaker Flashover 1 Function	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	11FA	Breaker Flashover 1 Side 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	11FB	Breaker Flashover 1 Side 2 Source	0 to 6	---	1	F211	0 (None)
"	11FC	Breaker Flashover 1 Status Closed A	0 to 4294967295	---	1	F300	0
"	11FE	Breaker Flashover 1 Status Closed B	0 to 4294967295	---	1	F300	0
"	1200	Breaker Flashover 1 Status Closed C	0 to 4294967295	---	1	F300	0
"	1202	Breaker Flashover 1 Voltage Pickup Level	0.004 to 1.5	pu	0.001	F001	850
"	1203	Breaker Flashover 1 Voltage Difference Pickup Level	0 to 100000	V	1	F060	1000
"	1205	Breaker Flashover 1 Current Pickup Level	0.02 to 1.5	pu	0.001	F001	600
"	1206	Breaker Flashover 1 Pickup Delay	0 to 65.535	s	0.001	F001	100
"	1207	Breaker Flashover 1 Supervision Phase A	0 to 4294967295	---	1	F300	0
"	1209	Breaker Flashover 1 Supervision Phase B	0 to 4294967295	---	1	F300	0
"	120B	Breaker Flashover 1 Supervision Phase C	0 to 4294967295	---	1	F300	0
"	120D	Breaker Flashover 1 Block	0 to 4294967295	---	1	F300	0
"	120F	Breaker Flashover 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	1210	Breaker Flashover 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	1211	Reserved (4 items)	---	---	---	F001	0
B30, C60, D60, F35, F60, G60, L60, L90, M60, T60	1215	...Repeated for Breaker Flashover 2					
	Energy Commands (Read/Write Command)						
B30, C60, D60, F35, F60, G30, G60, L90, M60, N60, T60	12A1	Energy Clear Command	0 to 1	---	1	F126	0 (No)
	Control Pushbuttons (Read/Write Setting) (7 Modules)						
All	12A2	Control Pushbutton 1 ID	0 to 1	---	1	F636	"CTRL PB 1"
"	12AD	Control Pushbutton 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	12AE	Control Pushbutton 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	12AF	...Repeated for Control Pushbutton 2					
"	12BC	...Repeated for Control Pushbutton 3					
"	12C9	...Repeated for Control Pushbutton 4					
"	12D6	...Repeated for Control Pushbutton 5					
"	12E3	...Repeated for Control Pushbutton 6					
"	12F0	...Repeated for Control Pushbutton 7					
	Breaker Arcing Current Commands (Read/Write Command) (2, 3, 4, or 6 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60	12FD	Breaker 1 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
"	12FE	Breaker 2 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
B30, C60, C70, F35, F60, L90, T35, T60	12FF	Breaker 3 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
B30, C60, F35, F60, L90, T35, T60	1300	Breaker 4 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
B30, F35, T35, T60	1301	Breaker 5 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1302	Breaker 6 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
	Passwords Unauthorized Access (Read/Write Command)						
All	1303	Reset Unauthorized Access	0 to 1	---	1	F126	0 (No)
	High Impedance Fault Detection (Hi-Z) Commands (Read/Write Command)						
F60	1304	Hi-Z Clear Oscillography	0 to 1	---	1	F126	0 (No)
"	1305	Hi-Z Oscillography Force Trigger	0 to 1	---	1	F126	0 (No)
"	1306	Hi-Z Oscillography Force Algorithm Capture	0 to 1	---	1	F126	0 (No)
"	1307	Hi-Z Reset Sigma Values	0 to 1	---	1	F126	0 (No)
	Field Unit Raw Data Settings (Read/Write Setting)						
All except B90, L60	1308	Field Raw Data Port	0 to 7	---	1	F244	6 (H1a)
"	1309	Field Raw Data Freeze	0 to 1	---	1	F102	0 (Disabled)
	RxGOOSE DPS (Read/Write Setting) (16 Modules)						
All	1321	RxGOOSE DPS 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	1322	RxGOOSE DPS 1 Default State	0 to 4	---	1	F605	4 (Latest)
"	1323	... Repeated for DPS 2					
"	1325	... Repeated for DPS 3					
"	1327	... Repeated for DPS 4					
"	1329	... Repeated for DPS 5					
"	132B	... Repeated for DPS 6					
"	132D	... Repeated for DPS 7					
"	132F	... Repeated for DPS 8					
"	1331	... Repeated for DPS 9					
"	1333	... Repeated for DPS 10					
"	1335	... Repeated for DPS 11					
"	1337	... Repeated for DPS 12					
"	1339	... Repeated for DPS 13					
"	133B	... Repeated for DPS 14					
"	133D	... Repeated for DPS 15					
"	133F	... Repeated for DPS 16					
	Breaker Status (Read/Write Setting) (20 Modules)						
B30	1341	Bay 1 Breaker ID	0 to 2	---	1	F202	(none)
"	134B	Bay 1 Breaker Input 52a	0 to 4294967295	---	1	F300	0
"	134D	Bay 1 Breaker Input 52b	0 to 4294967295	---	1	F300	0
"	134F	Bay 1 Breaker Racked-In	0 to 4294967295	---	1	F300	0
"	1351	...Repeated for Bay 2					
"	1361	...Repeated for Bay 3					
"	1371	...Repeated for Bay 4					
"	1381	...Repeated for Bay 5					
"	1391	...Repeated for Bay 6					
"	13A1	...Repeated for Bay 7					
"	13B1	...Repeated for Bay 8					
"	13C1	...Repeated for Bay 9					
"	13D1	...Repeated for Bay 10					
"	13E1	...Repeated for Bay 11					
"	13F1	...Repeated for Bay 12					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1401	...Repeated for Bay 13					
"	1411	...Repeated for Bay 14					
"	1421	...Repeated for Bay 15					
"	1431	...Repeated for Bay 16					
"	1441	...Repeated for Bay 17					
"	1451	...Repeated for Bay 18					
"	1461	...Repeated for Bay 19					
"	1471	...Repeated for Bay 20					
	Oscillography Commands (Read/Write Command)						
All	1501	Oscillography Force Trigger	0 to 1	---	1	F126	0 (No)
"	1502	Oscillography Clear Data	0 to 1	---	1	F126	0 (No)
	User Programmable Fault Report Commands (Read/Write Command)						
B30, B90, C70, G30, G60, M60, N60, T35, T60	1503	User Fault Report Clear	0 to 1	---	1	F126	0 (No)
	User Programmable Fault Report (Read/Write Setting) (2 Modules)						
B30, B90, C70, G30, G60, M60, N60, T35, T60	1504	Fault Report 1 Fault Trigger	0 to 4294967295	---	1	F300	0
"	1506	Fault Report 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	1507	Fault Report 1 Prefault Trigger	0 to 4294967295	---	1	F300	0
"	1509	Fault Report Analog Channel 1 (32 items)	0 to 4294967295	---	1	F600	0
"	1549	Reserved (5 items)	---	---	---	F001	0
"	154E	...Repeated for Fault Report 2					
	Process Card / Process Bus Module Time Sync (Read/Write Setting)						
All except B90, C30, L60	1598	PTP Function	0 to 2	---	1	F667	0 (Disabled)
"	1599	PTP Profile	0 to 1	---	1	F668	0 (Power Utility Profile)
"	159A	PTP Domain Number	0 to 255	---	1	F001	93
"	159B	PTP VLAN Priority (Reserve Address is 30E7)	0 to 7	---	1	F001	4
"	159C	PTP VLAN ID (Reserve Address is 30E8)	0 to 4094	---	1	F001	0
"	159D	PTP Master Priority 1	0 to 255	---	1	F001	128
"	159E	PTP Master Priority 2	0 to 255	---	1	F001	128
	Process Card / Process Bus Module PTP Port Settings (Read/Write Setting) (8 Modules)						
All except B90, C30, L60	159F	PTP Port 1a Path Delay Adder	0 to 60000	ns	1	F001	0
"	15A0	PTP Port 1a Path Delay Asymmetry	-1000 to 1000	ns	1	F002	0
"	15A1	...Repeated for Port 1b					
"	15A2	...Repeated for Port 1b					
"	15A3	...Repeated for Port 2a					
"	15A4	...Repeated for Port 2a					
"	15A5	...Repeated for Port 2b					
"	15A6	...Repeated for Port 2b					
"	15A7	...Repeated for Port 3a					
"	15A8	...Repeated for Port 3a					
"	15A9	...Repeated for Port 3b					
"	15AA	...Repeated for Port 3b					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	15AB	...Repeated for Port 4a					
"	15AC	...Repeated for Port 4a					
"	15AD	...Repeated for Port 4b					
"	15AE	...Repeated for Port 4b					
	Process Card / Process Bus Module Command (Read/Write Command)						
All except B90, C30, L60	15AF	Clear SV Diagnostics Command	0 to 1	---	1	F126	0 (No)
	Modbus File Transfer (Read/Write)						
All	15B0	Name of File to Read	---	---	---	F204	(none)
	Event Recorder Commands (Read/Write Command)						
All	15D9	Event Recorder Clear Command	0 to 1	---	1	F126	0 (No)
	Neutral Current Unbalance Settings and Commands (Read/Write) (3 Modules)						
C70	15DA	Neutral Current Unbalance Automatic Setting Function	0 to 2	---	1	F092	0 (Disabled)
"	15DB	Neutral Current Unbalance Apply Magnitude	0 to 1	---	1	F126	0 (No)
"	15DC	Neutral Current Unbalance Apply Angle	0 to 1	---	1	F126	0 (No)
"	15DD	...Repeated for Neutral Current Unbalance 2					
"	15E0	...Repeated for Neutral Current Unbalance 3					
	Neutral Voltage Unbalance Settings and Commands (Read/Write) (3 Modules)						
C70	15E3	Neutral Voltage Unbalance Automatic Setting Function	0 to 2	---	1	F092	0 (Disabled)
"	15E4	Neutral Voltage Unbalance Auto-set XA/XB Ratio	0 to 1	---	1	F126	0 (No)
"	15E5	Neutral Voltage Unbalance Auto-set XA/XC Ratio	0 to 1	---	1	F126	0 (No)
"	15E6	...Repeated for Neutral Voltage Unbalance 2					
"	15E9	...Repeated for Neutral Voltage Unbalance 3					
	Phase Current Unbalance Settings and Commands (Read/Write) (3 Modules)						
C70	15EC	Phase Current Unbalance Automatic Setting Function	0 to 2	---	1	F092	0 (Disabled)
"	15ED	Phase Current Unbalance Auto-set Ka	0 to 1	---	1	F126	0 (No)
"	15EE	Phase Current Unbalance Auto-set Kb	0 to 1	---	1	F126	0 (No)
"	15EF	Phase Current Unbalance Auto-set Kc	0 to 1	---	1	F126	0 (No)
"	15F0	...Repeated for Phase Current Unbalance 2					
"	15F4	...Repeated for Phase Current Unbalance 3					
	Voltage Differential Settings and Commands (Read/Write) (3 Modules)						
C70	15F8	Voltage Differential Automatic Setting Function	0 to 2	---	1	F092	0 (Disabled)
"	15F9	Voltage Differential Auto-set Ka	0 to 1	---	1	F126	0 (No)
"	15FA	Voltage Differential Auto-set Kb	0 to 1	---	1	F126	0 (No)
"	15FB	Voltage Differential Auto-set Kc	0 to 1	---	1	F126	0 (No)
"	15FC	...Repeated for Voltage Differential 2					
"	1600	...Repeated for Voltage Differential 3					
	GOOSE to R-GOOSE (Read/Write Setting) (16 Modules)						
C30	1604	GOOSE Destination MAC Address	---	---	---	F072	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1607	GOOSE 1 Destination IP Address	0 to 4294967295	---	1	F003	3758096384
"	1609	...Repeated for GOOSE 2					
"	160E	...Repeated for GOOSE 3					
"	1613	...Repeated for GOOSE 4					
"	1618	...Repeated for GOOSE 5					
"	161D	...Repeated for GOOSE 6					
"	1622	...Repeated for GOOSE 7					
"	1627	...Repeated for GOOSE 8					
"	162C	...Repeated for GOOSE 9					
"	1631	...Repeated for GOOSE 10					
"	1636	...Repeated for GOOSE 11					
"	163B	...Repeated for GOOSE 12					
"	1640	...Repeated for GOOSE 13					
"	1645	...Repeated for GOOSE 14					
"	164A	...Repeated for GOOSE 15					
"	164F	...Repeated for GOOSE 16					
	RADIUS Configuration (Read/Write Setting)						
All	1654	Primary RADIUS IP Address	0 to 4294967295	---	1	F003	0
"	1656	Primary Authentication Port	1 to 65535	---	1	F001	1812
"	1657	Primary Accounting Port	1 to 65535	---	1	F001	1813
"	1658	Secondary RADIUS IP Address	0 to 4294967295	---	1	F003	0
"	165A	Secondary Authentication Port	0 to 65535	---	1	F001	1812
"	165B	Secondary Accounting Port	0 to 65535	---	1	F001	1813
"	165C	RADIUS Authentication Method	0 to 2	---	1	F619	0 (EAP-TTLS)
"	165D	RADIUS Vendor ID	1 to 65535	---	1	F001	2910
"	165E	Authentication Timeout	0 to 9999	sec	1	F001	10
"	165F	Authentication Retries	0 to 9999	---	1	F001	3
"	1660	RADIUS Authentication Shared Secret	---	---	---	F202	(none)
	PTP Basic Configuration (Read/Write Setting)						
All	166A	PTP Strict Power Profile	0 to 1	---	1	F102	0 (Disabled)
"	166B	PTP Domain Number	0 to 255	---	1	F001	0
"	166C	PTP VLAN Priority	0 to 7	---	1	F001	4
"	166D	PTP VLAN ID	0 to 4095	---	1	F001	0
"	166E	PTP Basic Configuration Reserved (2 items)	0 to 1	---	1	F001	0
	PTP Port Configuration (Read/Write Setting) (3 Modules)						
All	1670	PTP Port 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	1671	PTP Port 1 Path Delay Adder	0 to 60000	ns	1	F001	0
"	1672	PTP Port 1 Path Delay Asymmetry	-1000 to 1000	ns	1	F002	0
"	1673	...Repeated for PTP Port 2					
"	1676	...Repeated for PTP Port 3					
	Frequency Out-of-Band Accumulation Commands (Read/Write)						
G30, G60	1679	Reset Frequency Out-Of-Band Accumulators	0 to 1	---	1	F126	0 (No)
"	167A	Preset Frequency Out-Of-Band Accumulators	0 to 1	---	1	F126	0 (No)

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Field Units (Read/Write Setting) (8 Modules)						
All except B90, L60	167B	Field Unit 1 ID	0 to 1	---	1	F205	"U1"
"	1682	Field Unit 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	1683	Field Unit 1 Type	0 to 3	---	1	F243	0 (CC-05)
"	1684	Field Unit 1 Serial Number	1 to 1	---	1	F205	"000000000000"
"	168B	Field Unit 1 Port	1 to 4	---	1	F001	1
"	168C	...Repeated for Field Unit 2					
"	168D	...Repeated for Field Unit 3					
"	16AE	...Repeated for Field Unit 4					
"	16BF	...Repeated for Field Unit 5					
"	16D0	...Repeated for Field Unit 6					
"	16E1	...Repeated for Field Unit 7					
"	16F2	...Repeated for Field Unit 8					
	Field Unit Process Card Ports (Read/Write Setting)						
All except B90, L60	1703	Field Unit 1 Process Card Port	0 to 7	---	1	F244	6 (H1a)
"	1704	Field Unit 2 Process Card Port	0 to 7	---	1	F244	4 (H2a)
"	1705	Field Unit 3 Process Card Port	0 to 7	---	1	F244	2 (H3a)
"	1706	Field Unit 4 Process Card Port	0 to 7	---	1	F244	0 (H4a)
"	1707	Field Unit 5 Process Card Port	0 to 7	---	1	F244	7 (H1b)
"	1708	Field Unit 6 Process Card Port	0 to 7	---	1	F244	5 (H2b)
"	1709	Field Unit 7 Process Card Port	0 to 7	---	1	F244	3 (H3b)
"	170A	Field Unit 8 Process Card Port	0 to 7	---	1	F244	1 (H4b)
	Field Unit Contact Inputs (Read/Write Setting) (40 Modules)						
All except B90, L60	170B	Field Contact Input 1 ID	---	---	---	F636	"FCI 1"
"	1716	Field Contact Input 1 Origin	0 to 8	---	1	F256	0 (None)
"	1717	Field Contact Input 1 Input	1 to 18	---	1	F001	1
"	1718	Field Contact Input 1 Failsafe Value	0 to 1	---	1	F108	0 (Off)
"	1719	Field Contact Input 1 Debounce Time	0 to 16	ms	0.5	F001	60
"	171A	Field Contact Input 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	171B	...Repeated for Field Contact Input 2					
"	172B	...Repeated for Field Contact Input 3					
"	173B	...Repeated for Field Contact Input 4					
"	174B	...Repeated for Field Contact Input 5					
"	175B	...Repeated for Field Contact Input 6					
"	176B	...Repeated for Field Contact Input 7					
"	177B	...Repeated for Field Contact Input 8					
"	178B	...Repeated for Field Contact Input 9					
"	179B	...Repeated for Field Contact Input 10					
"	17AB	...Repeated for Field Contact Input 11					
"	17BB	...Repeated for Field Contact Input 12					
"	17CB	...Repeated for Field Contact Input 13					
"	17DB	...Repeated for Field Contact Input 14					
"	17EB	...Repeated for Field Contact Input 15					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	17FB	...Repeated for Field Contact Input 16					
"	180B	...Repeated for Field Contact Input 17					
"	181B	...Repeated for Field Contact Input 18					
"	182B	...Repeated for Field Contact Input 19					
"	183B	...Repeated for Field Contact Input 20					
"	184B	...Repeated for Field Contact Input 21					
"	185B	...Repeated for Field Contact Input 22					
"	186B	...Repeated for Field Contact Input 23					
"	187B	...Repeated for Field Contact Input 24					
"	188B	...Repeated for Field Contact Input 25					
"	189B	...Repeated for Field Contact Input 26					
"	18AB	...Repeated for Field Contact Input 27					
"	18BB	...Repeated for Field Contact Input 28					
"	18CB	...Repeated for Field Contact Input 29					
"	18DB	...Repeated for Field Contact Input 30					
"	18EB	...Repeated for Field Contact Input 31					
"	18FB	...Repeated for Field Contact Input 32					
"	190B	...Repeated for Field Contact Input 33					
"	191B	...Repeated for Field Contact Input 34					
"	192B	...Repeated for Field Contact Input 35					
"	193B	...Repeated for Field Contact Input 36					
"	194B	...Repeated for Field Contact Input 37					
"	195B	...Repeated for Field Contact Input 38					
"	196B	...Repeated for Field Contact Input 39					
"	197B	...Repeated for Field Contact Input 40					
	Field Unit Contact Outputs (Read/Write Setting) (8 Modules)						
All except B90, L60	198B	Field Contact Output 1 ID (6 items)	---	---	---	F636	"FCO U / OUT"
"	19CD	Field Output 1 Operate (6 items)	0 to 4294967295	---	1	F300	0
"	19D9	Field Output 1 Seal In (6 items)	0 to 4294967295	---	1	F300	0
"	19E5	Field Output 1 Events (6 items)	0 to 1	---	1	F102	1 (Enabled)
"	19EB	...Repeated for Field Contact Output 2					
"	1A4B	...Repeated for Field Contact Output 3					
"	1AAB	...Repeated for Field Contact Output 4					
"	1B0B	...Repeated for Field Contact Output 5					
"	1B6B	...Repeated for Field Contact Output 6					
"	1BCB	...Repeated for Field Contact Output 7					
"	1C2B	...Repeated for Field Contact Output 8					
	B90 Direct Outputs (Read/Write Setting) (256 Modules)						
B90	1A00	Direct Output 1 Operand	0 to 4294967295	---	1	F300	0
"	1A02	Direct Output 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	1A03	...Repeated for Direct Output 2					
"	1A06	...Repeated for Direct Output 3					
"	1A09	...Repeated for Direct Output 4					
"	1A0C	...Repeated for Direct Output 5					
"	1A0F	...Repeated for Direct Output 6					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1A12	...Repeated for Direct Output 7					
"	1A15	...Repeated for Direct Output 8					
"	1A18	...Repeated for Direct Output 9					
"	1A1B	...Repeated for Direct Output 10					
	...	...					
"	1A93	...Repeated for Direct Output 50					
"	1B29	...Repeated for Direct Output 100					
	...	...					
"	1BBF	...Repeated for Direct Output 150					
	...	...					
"	1C55	...Repeated for Direct Output 200					
	...	...					
"	1CFD	...Repeated for Direct Output 256					
	Field Unit Latching Outputs (Read/Write Setting) (8 Modules)						
All except B90, L60	1C8B	Field Latching Output 1 ID	0 to 1	---	1	F636	"FLO Ux /LO"
"	1C96	Field Latching Output 1 Open	0 to 4294967295	---	1	F300	0
"	1C98	Field Latching Output 1 Close	0 to 4294967295	---	1	F300	0
"	1C9A	Field Latching Output 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	1C9B	Reserved (2 items)	0 to 1	---	1	F001	0
"	1C9D	...Repeated for Field Latching Output 2					
"	1CAF	...Repeated for Field Latching Output 3					
"	1CC1	...Repeated for Field Latching Output 4					
"	1CD3	...Repeated for Field Latching Output 5					
"	1CE5	...Repeated for Field Latching Output 6					
"	1CF7	...Repeated for Field Latching Output 7					
"	1D09	...Repeated for Field Latching Output 8					
	Field Unit RTDs (Read/Write Setting) (8 Modules)						
All except B90, L60	1D1B	Field Unit RTD 1 Name	0 to 1	---	1	F205	"RTD 1"
"	1D22	Field Unit RTD 1 Origin	0 to 24	---	1	F253	0 (None)
"	1D23	Field Unit RTD 1 Type	0 to 2	---	1	F259	0 (100 Ohm Nickel)
"	1D24	...Repeated for Field Unit RTD 2					
"	1D2D	...Repeated for Field Unit RTD 3					
"	1D36	...Repeated for Field Unit RTD 4					
"	1D3F	...Repeated for Field Unit RTD 5					
"	1D48	...Repeated for Field Unit RTD 6					
"	1D51	...Repeated for Field Unit RTD 7					
"	1D5A	...Repeated for Field Unit RTD 8					
	Field Unit Transducers (Read/Write Setting) (8 Modules)						
All except B90, L60	1D63	Field Unit Transducer 1 Name	0 to 1	---	1	F205	"TRD 1"
"	1D6A	Field Unit Transducer 1 Origin	0 to 24	---	1	F253	0 (None)
"	1D6B	Field Unit Transducer 1 Range	0 to 9	---	1	F246	6 (0...20mA)
"	1D6C	Field Unit Transducer 1 Min Value	-9999.999 to 9999.999	---	0.001	F004	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1D6E	Field Unit Transducer 1 Max Value	-9999.999 to 9999.999	---	0.001	F004	100000
"	1D70	Field Unit Transducer 1 Units	---	---	---	F206	(none)
"	1D73	...Repeated for Field Unit Transducer 2					
"	1D83	...Repeated for Field Unit Transducer 3					
"	1D93	...Repeated for Field Unit Transducer 4					
"	1DA3	...Repeated for Field Unit Transducer 5					
"	1DB3	...Repeated for Field Unit Transducer 6					
"	1DC3	...Repeated for Field Unit Transducer 7					
"	1DD3	...Repeated for Field Unit Transducer 8					
	User Display Invoke (Read/Write Setting)						
All	1E1D	Invoke and Scroll Through User Display Menu Operand	0 to 4294967295	---	1	F300	0
	LED Test (Read/Write Setting)						
All	1E1F	LED Test Function	0 to 1	---	1	F102	0 (Disabled)
"	1E20	LED Test Control	0 to 4294967295	---	1	F300	0
	Preferences (Read/Write Setting)						
All	1E22	Language	0 to 7	---	1	F531	0 (English)
"	1E23	Flash Message Time	0.5 to 10	s	0.1	F001	10
"	1E24	Default Message Timeout	10 to 900	s	1	F001	300
"	1E25	Default Message Intensity	0 to 3	---	1	F101	0 (25%)
"	1E26	Screen Saver Feature	0 to 1	---	1	F102	0 (Disabled)
"	1E27	Screen Saver Wait Time	1 to 65535	min	1	F001	30
"	1E28	Current Cutoff Level	0.002 to 0.02	pu	0.001	F001	20
"	1E29	Voltage Cutoff Level	0.1 to 1	V	0.1	F001	10
	87L Channel Status (Read/Write Command)						
L30	1E2A	Channel Status Clear	0 to 1	---	1	F126	0 (No)
	87L Power System (Read/Write Setting)						
L30	1E2B	Block GPS Time Reference	0 to 4294967295	---	1	F300	0
"	1E2D	Channel Asymmetry Compensation	0 to 4294967295	---	1	F300	0
"	1E2F	Charging Current Compensation	0 to 1	---	1	F102	0 (Disabled)
"	1E30	Local Relay ID	0 to 255	---	1	F001	0
"	1E31	Maximum Channel Asymmetry	0 to 10	ms	0.1	F001	15
"	1E32	Number of Channels	1 to 2	---	1	F001	1
"	1E33	Number of Terminals	2 to 3	---	1	F001	2
"	1E34	Positive Sequence Reactance	0.1 to 65.535	kohms	0.001	F001	100
"	1E35	Round Trip Time	0 to 10	ms	0.1	F001	15
"	1E36	Terminal 1 ID	0 to 255	---	1	F001	0
"	1E37	Terminal 2 ID	0 to 255	---	1	F001	0
"	1E38	Zero-Sequence Current Removal	0 to 1	---	1	F102	0 (Disabled)
"	1E39	Zero Sequence Reactance	0.1 to 65.535	kohms	0.001	F001	100
	Remote RTD Communications (Read/Write Setting)						
G60, M60, T60	1E3A	RRTD Slave Address	1 to 254	---	1	F001	254
"	1E3B	RRTD Baud Rate	0 to 4	---	1	F602	4 (19200)
	Communications (Read/Write Setting)						
All	1E3C	COM2 Selection	0 to 3	---	1	F601	0 (RS485)
"	1E3D	COM1 Minimum Response Time	0 to 1000	ms	10	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1E3E	COM2 Minimum Response Time	0 to 1000	ms	10	F001	0
"	1E3F	Modbus Slave Address	1 to 254	---	1	F001	254
"	1E40	RS485 Com1 Baud Rate	0 to 11	---	1	F112	8 (115200)
"	1E41	RS485 Com1 Parity	0 to 2	---	1	F113	0 (None)
"	1E42	RS485 Com2 Baud Rate	0 to 11	---	1	F112	5 (19200)
"	1E43	RS485 Com2 Parity	0 to 2	---	1	F113	2 (Even)
"	1E44	Port 1 IP Address	0 to 4294967295	---	1	F003	2130706433
"	1E46	Port 1 IP Subnet Mask	0 to 4294967295	---	1	F003	4278190080
"	1E48	Port 1 Gateway IP Address	0 to 4294967295	---	1	F003	56554497
"	1E4A	Network Address NSAP	---	---	---	F074	0
"	1E54	Port 1 Link Loss Alert	0 to 1	---	1	F102	0 (Disabled)
"	1E55	Port 2 Link Loss Alert	0 to 1	---	1	F102	0 (Disabled)
"	1E56	Port 3 Link Loss Alert	0 to 1	---	1	F102	0 (Disabled)
"	1E57	DNP Channel 1 Port	0 to 5	---	1	F177	0 (NONE)
"	1E58	DNP Channel 2 Port	0 to 5	---	1	F177	0 (NONE)
"	1E59	DNP Address	0 to 65519	---	1	F001	1
"	1E5A	DNP Client Addresses (2 items)	0 to 4294967295	---	1	F003	0
"	1E5E	TCP Port Number for the Modbus protocol	0 to 65535	---	1	F001	502
"	1E5F	TCP/UDP Port Number for the DNP Protocol	0 to 65535	---	1	F001	20000
"	1E60	TCP Port Number for the HTTP (Web Server) Protocol	0 to 65535	---	1	F001	80
"	1E61	Main UDP Port Number for the TFTP Protocol	0 to 65535	---	1	F001	69
"	1E62	Data Transfer UDP Port Numbers for the TFTP Protocol (zero means “automatic”) (2 items)	0 to 65535	---	1	F001	0
"	1E64	DNP Unsolicited Responses Function	0 to 1	---	1	F102	0 (Disabled)
"	1E65	DNP Unsolicited Responses Timeout	0 to 60	s	1	F001	5
"	1E66	DNP Unsolicited Responses Maximum Retries	1 to 255	---	1	F001	10
"	1E67	DNP Unsolicited Responses Destination Address	0 to 65519	---	1	F001	1
"	1E68	Ethernet Operation Mode	0 to 1	---	1	F192	1 (Full-Duplex)
"	1E69	DNP Current Scale Factor	0 to 11	---	1	F660	2 (1)
"	1E6A	DNP Voltage Scale Factor	0 to 11	---	1	F660	2 (1)
"	1E6B	DNP Power Scale Factor	0 to 11	---	1	F660	2 (1)
"	1E6C	DNP Energy Scale Factor	0 to 11	---	1	F660	2 (1)
"	1E6D	DNP Power Factor Scale Factor	0 to 11	---	1	F660	2 (1)
"	1E6E	DNP Other Scale Factor	0 to 11	---	1	F660	2 (1)
"	1E6F	DNP Current Default Deadband	0 to 100000000	---	1	F003	30000
"	1E71	DNP Voltage Default Deadband	0 to 100000000	---	1	F003	30000
"	1E73	DNP Power Default Deadband	0 to 100000000	---	1	F003	30000
"	1E75	DNP Energy Default Deadband	0 to 100000000	---	1	F003	30000
"	1E77	DNP Power Factor Default Deadband	0 to 100000000	--	1	F003	30000
"	1E79	DNP Other Default Deadband	0 to 100000000	---	1	F003	30000
"	1E7B	DNP IIN Time Synchronization Bit Period	1 to 10080	min	1	F001	1440
"	1E7C	DNP Message Fragment Size	30 to 2048	---	1	F001	240

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1E7D	DNP Client Address 3	0 to 4294967295	---	1	F003	0
"	1E7F	DNP Client Address 4	0 to 4294967295	---	1	F003	0
"	1E81	DNP Client Address 5	0 to 4294967295	---	1	F003	0
"	1E83	DNP Number of Paired Binary Output Control Points	0 to 64	---	1	F001	0
"	1E84	DNP TCP Connection Timeout	10 to 7200	s	1	F001	120
"	1E85	DNP Communications Reserved (22 items)	0 to 1	---	1	F001	0
"	1E9B	TCP Port Number for the IEC 60870-5-104 Protocol	0 to 65535	---	1	F001	2404
"	1E9C	IEC 60870-5-104 Protocol Common Address of ASDU	0 to 65535	---	1	F001	0
"	1E9D	IEC 60870-5-104 Protocol Cyclic Data Transmission Period	1 to 65535	s	1	F001	60
"	1E9E	IEC 60870-5-104 Current Default Threshold	0 to 100000000	---	1	F003	30000
"	1EA0	IEC 60870-5-104 Voltage Default Threshold	0 to 100000000	---	1	F003	30000
"	1EA2	IEC 60870-5-104 Power Default Threshold	0 to 100000000	---	1	F003	30000
"	1EA4	IEC 60870-5-104 Energy Default Threshold	0 to 100000000	---	1	F003	30000
"	1EA6	IEC 60870-5-104 Power Factor Default Threshold	0 to1	---	0.01	F001	100
"	1EA7	IEC 60870-5-104 Other Default Threshold	0 to 100000000	---	1	F003	30000
"	1EA9	IEC 60870-5-104 Client Address (5 items)	0 to 4294967295	---	1	F003	0
"	1EB3	IEC 60870-5-104 Redundancy Port Enabled/Disabled	0 to 1	---	1	F126	0 (No)
"	1EB4	Port 2 IP Address	0 to 4294967295	---	1	F003	2130706433
"	1EB6	Port 2 IP Subnet Mask	0 to 4294967295	---	1	F003	4278190080
"	1EB8	Port 2 Ethernet Operation Mode	0 to 1	---	1	F192	1 (Full-Duplex)
"	1EB9	Port 2 Redundancy Enabled	0 to 2	---	1	F627	0 (None)
"	1EBA	Port 3 IP Address	0 to 4294967295	---	1	F003	2130706433
"	1EBC	Port 3 IP Subnet Mask	0 to 4294967295	---	1	F003	4278190080
"	1EBE	Port 3 Ethernet Operation Mode	0 to 1	---	1	F192	1 (Full-Duplex)
"	1EBF	Default IPv4 Route	0 to 4294967295	---	1	F003	2130706433
"	1EC1	Port 2 PRP Mcst Addr	---	---	---	F072	0
"	1EC4	Port 1 Function	0 to 1	---	1	F102	1 (Enabled)
"	1EC5	Port 2 Function	0 to 1	---	1	F102	1 (Enabled)
"	1EC6	Port 3 Function	0 to 1	---	1	F102	1 (Enabled)
"	1EC7	IEC Communications Reserved (33 items)	0 to 1	---	1	F001	0
"	1EE8	DNP Object 1 Default Variation	1 to 2	---	1	F001	2
"	1EE9	DNP Object 2 Default Variation	1 to 3	---	1	F001	2
"	1EEA	DNP Object 20 Default Variation	0 to 3	---	1	F523	0 (1)
"	1EEB	DNP Object 21 Default Variation	0 to 3	---	1	F524	0 (1)
"	1EEC	DNP Object 22 Default Variation	0 to 3	---	1	F523	0 (1)
"	1EED	DNP Object 23 Default Variation	0 to 3	---	1	F523	0 (1)
"	1EEE	DNP Object 30 Default Variation	1 to 5	---	1	F001	1
"	1EEF	DNP Object 32 Default Variation	0 to 5	---	1	F525	0 (1)
"	1EF0	SCADA Protocol	0 to 2	---	1	F629	0 (DNP 3.0)
"	1EF1	RS232 Baud Rate	0 to 1	---	1	F635	1 (115200)
"	1EF2	DNP Event Time Base	0 to 1	---	1	F639	1 (LOCAL)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1EF3	IEC 104 Event Time Base	0 to 1	---	1	F639	1 (LOCAL)
"	1EF4	IEC 103 Event Time Base	0 to 1	---	1	F639	1 (LOCAL)
	Simple Network Time Protocol (Read/Write Setting)						
All	1EF5	Simple Network Time Protocol (SNTP) Function	0 to 1	---	1	F102	0 (Disabled)
"	1EF6	Simple Network Time Protocol (SNTP) Server IP Address (2 items)	0 to 4294967295	---	1	F003	2130706433
"	1EFA	Simple Network Time Protocol (SNTP) UDP Port Number (2 items)	0 to 65535	---	1	F001	123
	Data Logger Commands (Read/Write Command)						
All except B90	1EFC	Data Logger Clear	0 to 1	---	1	F126	0 (No)
	Data Logger (Read/Write Setting)						
All except B90	1EFD	Data Logger Channel Settings (16 items)	0 to 4294967295	---	---	F600	0
"	1F1D	Data Logger Mode	0 to 1	---	1	F260	0 (Continuous)
"	1F1E	Data Logger Trigger	0 to 4294967295	---	1	F300	0
"	1F20	Data Logger Rate	15 to 3600000	ms	1	F003	60000
	Clock (Read/Write Setting)						
All	1F22	Synchronizing Source	0 to 4	---	1	F623	0 (None)
	Clock (Read/Write Command)						
All	1F23	Real Time Clock Set Time	0 to 235959	---	1	F050	0
	Clock (Read/Write Setting)						
All	1F25	SR Date Format	0 to 4294967295	---	1	F051	0
"	1F27	SR Time Format	0 to 4294967295	---	1	F052	0
"	1F29	IRIG-B Signal Type	0 to 2	---	1	F114	0 (None)
"	1F2A	Clock Events Enable / Disable	0 to 1	---	1	F102	0 (Disabled)
"	1F2B	Time Zone Offset from UTC	–24 to 24	hours	0.5	F002	0
"	1F2C	Daylight Savings Time (DST) Function	0 to 1	---	1	F102	0 (Disabled)
"	1F2D	DST Start Month	0 to 11	---	1	F237	0 (January)
"	1F2E	DST Start Day	0 to 6	---	1	F238	0 (Sunday)
"	1F2F	DST Start Day Instance	0 to 4	---	1	F239	0 (First)
"	1F30	DST Start Hour	0 to 23	---	1	F001	2
"	1F31	DST Stop Month	0 to 11	---	1	F237	0 (January)
"	1F32	DST Stop Day	0 to 6	---	1	F238	0 (Sunday)
"	1F33	DST Stop Day Instance	0 to 4	---	1	F239	0 (First)
"	1F34	DST Stop Hour	0 to 23	---	1	F001	2
	Fault Report Commands (Read/Write Command)						
C60, D30, D60, F35, F60, L30, L60, L90	1F35	Fault Reports Clear Data Command	0 to 1	---	1	F126	0 (No)
	Oscillography (Read/Write Setting)						
C60, D30, D60, F35, F60, G30, G60, M60, T35, T60	1F36	Oscillography Number of Records	3 to 64	---	1	F001	5
B30, B90, C30, C70, L30, L60, L90, N90	1F36	Oscillography Number of Records	3 to 64	---	1	F001	15
All	1F37	Oscillography Trigger Mode	0 to 1	---	1	F118	0 (Auto. Overwrite)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	1F38	Oscillography Trigger Position	0 to 100	%	1	F001	50
"	1F39	Oscillography Trigger Source	0 to 4294967295	---	1	F300	0
"	1F3B	Oscillography AC Input Waveforms	0 to 4	---	1	F183	4 (64 samples/ cycle)
"	1F3C	Oscillography Analog Channel x (32 items)	0 to 4294967295	---	1	F600	0
"	1F7C	Oscillography Digital Channel x (127 items)	0 to 4294967295	---	1	F300	0
	Trip and Alarm LEDs (Read/Write Setting)						
All	207A	Trip LED Input FlexLogic Operand	0 to 4294967295	---	1	F300	0
"	207C	Alarm LED Input FlexLogic Operand	0 to 4294967295	---	1	F300	0
	User Programmable LEDs (Read/Write Setting) (48 Modules)						
All	207E	FlexLogic Operand to Activate LED	0 to 4294967295	---	1	F300	0
"	2080	User LED type (latched or self-resetting)	0 to 1	---	1	F127	1 (Self-Reset)
"	2081	...Repeated for User-Programmable LED 2					
"	2084	...Repeated for User-Programmable LED 3					
"	2087	...Repeated for User-Programmable LED 4					
"	208A	...Repeated for User-Programmable LED 5					
"	208D	...Repeated for User-Programmable LED 6					
"	2090	...Repeated for User-Programmable LED 7					
"	2093	...Repeated for User-Programmable LED 8					
"	2096	...Repeated for User-Programmable LED 9					
"	2099	...Repeated for User-Programmable LED 10					
"	209C	...Repeated for User-Programmable LED 11					
"	209F	...Repeated for User-Programmable LED 12					
"	20A2	...Repeated for User-Programmable LED 13					
"	20A5	...Repeated for User-Programmable LED 14					
"	20A8	...Repeated for User-Programmable LED 15					
"	20AB	...Repeated for User-Programmable LED 16					
"	20AE	...Repeated for User-Programmable LED 17					
"	20B1	...Repeated for User-Programmable LED 18					
"	20B4	...Repeated for User-Programmable LED 19					
"	20B7	...Repeated for User-Programmable LED 20					
"	20BA	...Repeated for User-Programmable LED 21					
"	20BD	...Repeated for User-Programmable LED 22					
"	20C0	...Repeated for User-Programmable LED 23					
"	20C3	...Repeated for User-Programmable LED 24					
"	20C6	...Repeated for User-Programmable LED 25					
"	20C9	...Repeated for User-Programmable LED 26					
"	20CC	...Repeated for User-Programmable LED 27					
"	20CF	...Repeated for User-Programmable LED 28					
"	20D2	...Repeated for User-Programmable LED 29					
"	20D5	...Repeated for User-Programmable LED 30					
"	20D8	...Repeated for User-Programmable LED 31					
"	20DB	...Repeated for User-Programmable LED 32					
"	20DE	...Repeated for User-Programmable LED 33					
"	20E1	...Repeated for User-Programmable LED 34					
"	20E4	...Repeated for User-Programmable LED 35					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	20E7	...Repeated for User-Programmable LED 36					
"	20EA	...Repeated for User-Programmable LED 37					
"	20ED	...Repeated for User-Programmable LED 38					
"	20F0	...Repeated for User-Programmable LED 39					
"	20F3	...Repeated for User-Programmable LED 40					
"	20F6	...Repeated for User-Programmable LED 41					
"	20F9	...Repeated for User-Programmable LED 42					
"	20FC	...Repeated for User-Programmable LED 43					
"	20FF	...Repeated for User-Programmable LED 44					
"	2102	...Repeated for User-Programmable LED 45					
"	2105	...Repeated for User-Programmable LED 46					
"	2108	...Repeated for User-Programmable LED 47					
"	210B	...Repeated for User-Programmable LED 48					
	IPv4 Route Table (Read/Write Setting) (6 Modules)						
All	210E	IPv4 Network Route 1 Destination	0 to 4294967295	---	1	F003	2130706433
"	2110	IPv4 Network Route 1 Netmask	0 to 4294967295	---	1	F003	4278190080
"	2112	IPv4 Network Route 1 Gateway	0 to 4294967295	---	1	F003	2130706433
"	2114	...Repeated for Route 2					
"	211A	...Repeated for Route 3					
"	2120	...Repeated for Route 4					
"	2126	...Repeated for Route 5					
"	212C	...Repeated for Route 6					
	Installation (Read/Write Setting)						
All	2132	Relay Programmed State	0 to 1	---	1	F133	0 (Not Programmed)
"	2133	Relay Name	---	---	---	F202	"Relay-1"
	User Programmable Self Tests (Read/Write Setting)						
All	213D	User Programmable Detect Ring Break Function	0 to 1	---	1	F102	1 (Enabled)
"	213E	User Programmable Direct Device Off Function	0 to 1	---	1	F102	1 (Enabled)
"	213F	User Programmable RxGOOSE Off Function	0 to 1	---	1	F102	1 (Enabled)
"	2140	User Programmable First Ethernet Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2141	User Programmable Second Ethernet Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2142	User Programmable Battery Fail Function	0 to 1	---	1	F102	1 (Enabled)
"	2143	User Programmable SNTP Fail Function	0 to 1	---	1	F102	1 (Enabled)
"	2144	User Programmable IRIG-B Fail Function	0 to 1	---	1	F102	1 (Enabled)
"	2145	Process Bus Failure Operand	0 to 4294967295	---	1	F300	0
"	2147	PTP Fail Function	0 to 1	---	1	F102	1 (Enabled)
"	2148	User Programmable Third Ethernet Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2149	User Programmable SFP Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	214A	User Programmable Process Bus Module Ethernet Port 1a Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	214B	User Programmable Process Bus Module Ethernet Port 1b Fail Function	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	214C	User Programmable Process Bus Module Ethernet Port 2a Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	214D	User Programmable Process Bus Module Ethernet Port 2b Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	214E	User Programmable Process Bus Module Ethernet Port 3a Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	214F	User Programmable Process Bus Module Ethernet Port 3b Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2150	User Programmable Process Bus Module Ethernet Port 4a Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2151	User Programmable Process Bus Module Ethernet Port 4b Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2152	User Programmable Process Bus Module SFP Module 1a Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2153	User Programmable Process Bus Module SFP Module 1b Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2154	User Programmable Process Bus Module SFP Module 2a Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2155	User Programmable Process Bus Module Ethernet Port 2b Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2156	User Programmable Process Bus Module SFP Module 3a Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2157	User Programmable Process Bus Module SFP Module 3b Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2158	User Programmable Process Bus Module SFP Module 4a Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	2159	User Programmable Process Bus Module SFP Module 4b Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	215A	User Programmable Process Bus Module SV Stream Trouble Function	0 to 1	---	1	F102	1 (Enabled)
	(Current) CT Settings (Read/Write Setting) (2, 4, 6, or 30 Modules)						
All except B90, C30	215B	Phase CT 1 Primary	1 to 65000	A	1	F001	1
"	215C	Phase CT 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	215D	Ground CT 1 Primary	1 to 65000	A	1	F001	1
"	215E	Ground CT 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	215F	...Repeated for CT Bank 2					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	2163	...Repeated for CT Bank 3					
"	2167	...Repeated for CT Bank 4					
B30, C60, C70, F35, N60, T35, T60	216B	...Repeated for CT Bank 5					
"	216F	...Repeated for CT Bank 6					
B30	2173	...Repeated for CT Bank 7					
"	2177	...Repeated for CT Bank 8					
"	217B	...Repeated for CT Bank 9					
"	217F	...Repeated for CT Bank 10					
"	2183	...Repeated for CT Bank 11					
"	2187	...Repeated for CT Bank 12					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	218B	...Repeated for CT Bank 13					
"	218F	...Repeated for CT Bank 14					
"	2193	...Repeated for CT Bank 15					
"	2197	...Repeated for CT Bank 16					
"	219B	...Repeated for CT Bank 17					
"	219F	...Repeated for CT Bank 18					
"	21A3	...Repeated for CT Bank 19					
"	21A7	...Repeated for CT Bank 20					
"	21AB	...Repeated for CT Bank 21					
"	21AF	...Repeated for CT Bank 22					
"	21B3	...Repeated for CT Bank 23					
"	21B7	...Repeated for CT Bank 24					
"	21BB	...Repeated for CT Bank 25					
"	21BF	...Repeated for CT Bank 26					
"	21C3	...Repeated for CT Bank 27					
"	21C7	...Repeated for CT Bank 28					
"	21CB	...Repeated for CT Bank 29					
"	21CF	...Repeated for CT Bank 30					
	Breaker Control (Read/Write Settings) (2, 3, 4, or 6 Modules)						
All except B90	21D3	Breaker 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	21D4	Breaker 1 Name	---	---	---	F206	"Bkr 1"
"	21D8	Breaker 1 Mode	0 to 1	---	1	F157	0 (3-Pole)
"	21D9	Breaker 1 Open	0 to 4294967295	---	1	F300	0
"	21DB	Breaker 1 Close	0 to 4294967295	---	1	F300	0
"	21DD	Breaker 1 Phase A / Three-pole Closed	0 to 4294967295	---	1	F300	0
"	21DF	Breaker 1 Phase B Closed	0 to 4294967295	---	1	F300	0
"	21E1	Breaker 1 Phase C Closed	0 to 4294967295	---	1	F300	0
"	21E3	Breaker 1 External Alarm	0 to 4294967295	---	1	F300	0
"	21E5	Breaker 1 Alarm Delay	0 to 65.535	s	0.001	F003	0
"	21E7	Breaker 1 Pushbutton Control	0 to 1	---	1	F102	0 (Disabled)
"	21E9	Breaker 1 Manual Close Recall Time	0 to 65.535	s	0.001	F003	0
"	21EB	Breaker 1 Out of Service	0 to 4294967295	---	1	F300	0
"	21ED	Breaker 1 Block Open	0 to 4294967295	---	1	F300	0
"	21EF	Breaker 1 Block Close	0 to 4294967295	---	1	F300	0
"	21F1	Breaker 1 Phase A / Three-pole Opened	0 to 4294967295	---	1	F300	0
"	21F3	Breaker 1 Phase B Opened	0 to 4294967295	---	1	F300	0
"	21F5	Breaker 1 Phase C Opened	0 to 4294967295	---	1	F300	0
"	21F7	Breaker 1 Operate Time	0 to 65535	ms	1	F003	70
"	21F9	Breaker 1 Open Seal In	0 to 65.535	s	0.001	F003	0
"	21FB	Breaker 1 Tagging	0 to 1	---	1	F102	0 (Disabled)
"	21FC	Breaker 1 Substitution	0 to 1	---	1	F102	0 (Disabled)
"	21FD	Breaker 1 Bypass	0 to 1	---	1	F102	0 (Disabled)
"	21FE	Breaker 1 AR Block	0 to 1	---	1	F102	0 (Disabled)
"	21FF	Breaker 1 Racked In	0 to 4294967295	---	1	F300	0
"	2201	Breaker 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	2202	Reserved	0 to 65535	s	1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	2203	...Repeated for Breaker 2					
B30, C30, C60, C70, D60, F60, F35, L90, N60, T35, T60	2233	...Repeated for Breaker 3					
B30, C30, C60, D60, F60, F35, L90, N60, T35, T60	2263	...Repeated for Breaker 4					
B30, C30, F35, N60, T35, T60	2293	...Repeated for Breaker 5					
"	22C3	...Repeated for Breaker 6					
	VT Settings (Read/Write Setting) (6 Modules)						
All except B90, C30	22F3	Phase VT 1 Connection	0 to 1	---	1	F100	0 (Wye)
"	22F4	Phase VT 1 Secondary	25 to 240	V	0.1	F001	664
"	22F5	Phase VT 1 Ratio	1 to 24000	:1	1	F060	1
"	22F7	Auxiliary VT 1 Connection	0 to 6	---	1	F166	1 (Vag)
"	22F8	Auxiliary VT 1 Secondary	25 to 240	V	0.1	F001	664
"	22F9	Auxiliary VT 1 Ratio	1 to 24000	:1	1	F060	1
"	22FB	...Repeated for VT Bank 2					
"	2303	...Repeated for VT Bank 3					
"	230B	...Repeated for VT Bank 4					
"	2313	...Repeated for VT Bank 5					
"	231B	...Repeated for VT Bank 6					
	Power System (Read/Write Setting)						
All except B90, C30	2323	Nominal Frequency	25 to 60	Hz	1	F001	60
"	2324	Phase Rotation	0 to 1	---	1	F106	0 (ABC)
"	2325	Frequency and Phase Reference	0 to 5	---	1	F167	0 (SRC 1)
"	2326	Frequency Tracking Function	0 to 1	---	1	F102	1 (Enabled)
	Change Phase Rotation (Read/Write Setting)						
G30, G60	2327	Reverse / Change Phase Rotation	0 to 4294967295	---	1	F300	0
	87L Power System In-Zone Transformer (Read/Write Setting)						
L30, L90	2329	In-Zone Transformer Connection	0 to 12	---	1	F560	0 (None)
"	232A	87L In-Zone Transformer Location	0 to 2	---	1	F562	0 (Local-Tap)
	Power System (Read/Write Setting)						
L90	232B	Number of Terminals	2 to 3	---	1	F001	2
"	232C	Number of Channels	1 to 2	---	1	F001	1
"	232D	Charging Current Compensation	0 to 1	---	1	F102	0 (Disabled)
"	232E	Positive Sequence Reactance	0.1 to 65.535	kohms	0.001	F001	100
"	232F	Zero Sequence Reactance	0.1 to 65.535	kohms	0.001	F001	100
"	2330	Zero Sequence Current Removal	0 to 1	---	1	F102	0 (Disabled)
"	2331	Local Relay ID	0 to 255	---	1	F001	0
"	2332	Terminal 1 ID	0 to 255	---	1	F001	0
"	2333	Terminal 2 ID	0 to 255	---	1	F001	0
"	2334	Channel Asymmetry Compensation	0 to 4294967295	---	1	F300	0
"	2336	Block GPS Time Reference	0 to 4294967295	---	1	F300	0
"	2338	Maximum Channel Asymmetry	0 to 10	ms	0.1	F001	15

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	2339	Round Trip Time	0 to 10	ms	0.1	F001	15
	Transformer General (Read/Write Setting)						
G30, T35, T60	233A	Transformer Number of Windings	2 to 6	---	1	F001	2
"	233B	Transformer Phase Compensation	0 to 1	---	1	F160	0 (Internal (software))
"	233C	Transformer Load Loss at Rated Load	1 to 20000	kW	1	F001	100
"	233D	Transformer Rated Winding Temperature Rise	0 to 4	---	1	F161	1 (65°C (oil))
"	233E	Transformer No Load Loss	1 to 20000	kW	1	F001	10
"	233F	Transformer Type of Cooling	0 to 6	---	1	F162	0 (OA)
"	2340	Transformer Top-oil Rise Over Ambient	1 to 200	°C	1	F001	35
"	2341	Transformer Thermal Capacity	0 to 200	kWh/°C	0.01	F001	10000
"	2342	Transformer Winding Thermal Time Constant	0.25 to 15	min	0.01	F001	200
"	2343	Transformer Reference Winding Manual Selection	0 to 7	---	1	F470	1
	Transformer Windings (Read/Write Settings) (2 or 6 Modules)						
G30, T35, T60	2344	Transformer Winding 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	2345	Transformer Winding 1 Rated MVA	0.001 to 2000	MVA	0.001	F003	100000
"	2347	Transformer Winding 1 Nominal Phase-Phase Voltage	0.001 to 2000	kV	0.001	F003	220000
"	2349	Transformer Winding 1 Connection	0 to 2	---	1	F163	0 (Wye)
"	234A	Transformer Winding 1 Grounding	0 to 1	---	1	F164	0 (Not within zone)
"	234B	Transformer Winding 1 Angle w.r.t. Winding 1	-359.9 to 0	degrees	0.1	F002	0
"	234C	Transformer Winding 1 Resistance	0.0001 to 100	ohms	0.0001	F003	100000
"	234E	Transformer Winding 1 Status	0 to 4294967295	---	1	F300	1
"	2350	...Repeated for Transformer Winding 2					
T35, T60	235C	...Repeated for Transformer Winding 3					
"	2368	...Repeated for Transformer Winding 4					
"	2374	...Repeated for Transformer Winding 5					
"	2380	...Repeated for Transformer Winding 6					
	Incipient Cable Fault Detector (Read/Write Settings) (1, 2, or 6 Modules)						
D30, F35, F60, L30	238C	Incipient Cable Fault Detector 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	238D	Incipient Cable Fault Detector 1 Block	0 to 4294967295	---	1	F300	0
"	238F	Incipient Cable Fault Detector 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	2390	Incipient Cable Fault Detector 1 Pickup	0.1 to 10	pu	0.01	F001	50
"	2391	Incipient Cable Fault Detector 1 Mode	0 to 1	---	1	F254	0 (Number of Counts)
"	2392	Incipient Cable Fault Detector 1 Counts	1 to 10	---	1	F001	2
"	2393	Incipient Cable Fault Detector 1 Time Window	0 to 1000	s	0.01	F003	1000
"	2395	Incipient Cable Fault Detector 1 Reset Delay	0 to 65.535	s	0.001	F001	100
"	2396	Incipient Cable Fault Detector 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	2397	Incipient Cable Fault Detector 1 Events	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
F35, F60	2398	...Repeated for Incipient Cable Fault Detector 2					
F35	23A4	...Repeated for Incipient Cable Fault Detector 3					
"	23B0	...Repeated for Incipient Cable Fault Detector 4					
"	23BC	...Repeated for Incipient Cable Fault Detector 5					
"	23C8	...Repeated for Incipient Cable Fault Detector 6					
	Breaker Control Commands (Read/Write Command) (2, 3, 4, or 6 Modules)						
All except B90	23D4	Breaker 1 Command	0 to 11	---	1	F282	0 (CANCEL)
"	23D5	...Repeated for Breaker 2					
B30, C30, C60, C70, D60, F60, F35, L90, N60, T35, T60	23D6	...Repeated for Breaker 3					
B30, C30, C60, D60, F60, F35, L90, N60, T35, T60	23D7	...Repeated for Breaker 4					
B30, C30, F35, N60, T35, T60	23D8	...Repeated for Breaker 5					
"	23D9	...Repeated for Breaker 6					
	Programmable Event Cause LEDs (Read/Write Setting) (9 Modules)						
All	23DA	Programmable Event Cause LED 1 Operand	0 to 4294967295	---	1	F300	0
"	23DC	Programmable Event Cause LED 2 Type	0 to 1	---	1	F127	1 (Self-Reset)
"	23DD	Programmable Event Cause LED 3 Color	0 to 2	---	1	F651	0 (ORANGE)
"	23DE	...Repeated for LED 2					
"	23E2	...Repeated for LED 3					
"	23E6	...Repeated for LED 4					
"	23EA	...Repeated for LED 5					
"	23EE	...Repeated for LED 6					
"	23F2	...Repeated for LED 7					
"	23F6	...Repeated for LED 8					
"	23FA	...Repeated for LED 9					
	Compensated Overvoltage (Read/Write Grouped Setting)						
D60, L60, L90	23FE	Compensated OV Function	0 to 1	---	1	F102	0 (Disabled)
"	23FF	Compensated OV Source	0 to 5	---	1	F167	0 (SRC 1)
"	2400	Compensated OV Zc Mag	0 to 500	ohm	0.01	F001	200
"	2401	Compensated OV Zc Ang	30 to 90	degrees	1	F001	90
"	2402	Compensated OV I_1max	0.01 to 1	pu	0.01	F001	20
"	2403	Compensated OV STG1 PKP	0.25 to 3	pu	0.001	F001	1300
"	2404	Compensated OV STG1 Delay	0 to 600	sec	0.01	F001	100
"	2405	Compensated OV STG2 PKP	0.25 to 3	pu	0.001	F001	1300
"	2406	Compensated OV STG2 Delay	0 to 600	sec	0.01	F001	100
"	2407	Compensated OV SGT3 PKP	0.25 to 3	pu	0.001	F001	1300
"	2408	Compensated OV STG3 Delay	0 to 600	sec	0.01	F001	100
"	2409	Compensated OV Block	0 to 4294967295	---	1	F300	0
"	240B	Compensated OV Target	0 to 2	---	1	F109	0 (Self-reset)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	240C	Compensated OV Events	0 to 1	---	1	F102	0 (Disabled)
	Demand (Read/Write Setting)						
B30, C60, D60, F35, F60, G60, L60, L90, N60, T60	240D	Demand Current Method	0 to 2	---	1	F139	0 (Thermal Exponential)
"	240E	Demand Power Method	0 to 2	---	1	F139	0 (Thermal Exponential)
"	240F	Demand Interval	0 to 5	---	1	F132	2 (15 MIN)
"	2410	Demand Input	0 to 4294967295	---	1	F300	0
	Demand (Read/Write Command)						
B30, C60, D60, F35, F60, G60, L60, L90, N60, T60	2412	Demand Clear Record	0 to 1	---	1	F126	0 (No)
	FlexCurves A and B (Read/Write Settings)						
All except C30	2413	FlexCurve A (120 items)	0 to 65535	ms	1	F011	0
"	248B	FlexCurve B (120 items)	0 to 65535	ms	1	F011	0
	Modbus User Map (Read/Write Setting)						
All	2503	Modbus Address Settings for User Map (256 items)	0 to 4294967295	---	1	F003	0
	User Displays Settings (Read/Write Setting) (16 Modules)						
All	2703	User-Definable Display 1 Top Line Text	---	---	---	F202	" "
"	270D	User-Definable Display 1 Bottom Line Text	---	---	---	F202	" "
"	2717	Modbus Addresses of Display 1 Items (5 items)	0 to 4294967295	---	1	F003	0
"	2721	Reserved (2 items)	---	---	---	F001	0
"	2723	...Repeated for User-Definable Display 2					
"	2743	...Repeated for User-Definable Display 3					
"	2763	...Repeated for User-Definable Display 4					
"	2783	...Repeated for User-Definable Display 5					
"	27A3	...Repeated for User-Definable Display 6					
"	27C3	...Repeated for User-Definable Display 7					
"	27E3	...Repeated for User-Definable Display 8					
"	2803	...Repeated for User-Definable Display 9					
"	2823	...Repeated for User-Definable Display 10					
"	2843	...Repeated for User-Definable Display 11					
"	2863	...Repeated for User-Definable Display 12					
"	2883	...Repeated for User-Definable Display 13					
"	28A3	...Repeated for User-Definable Display 14					
"	28C3	...Repeated for User-Definable Display 15					
"	28E3	...Repeated for User-Definable Display 16					
	FlexLogic (Read/Write Setting)						
All	2903	FlexLogic Entry (1024 items)	0 to 4294967295	---	1	F300	2097152
	Non Volatile Latches (Read/Write Setting) (16 Modules)						
All	3103	Non-Volatile Latch 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3104	Non-Volatile Latch 1 ID	---	---	---	F636	"NV Latch 1"
"	310F	Non-Volatile Latch 1 Type	0 to 1	---	1	F519	0 (Reset Dominant)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3110	Non-Volatile Latch 1 Set	0 to 4294967295	---	1	F300	0
"	3112	Non-Volatile Latch 1 Reset	0 to 4294967295	---	1	F300	0
"	3114	Non-Volatile Latch 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	3115	Non-Volatile Latch 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	3116	Reserved (4 items)	---	---	---	F001	0
"	311A	...Repeated for Non-Volatile Latch 2					
"	3131	...Repeated for Non-Volatile Latch 3					
"	3148	...Repeated for Non-Volatile Latch 4					
"	315F	...Repeated for Non-Volatile Latch 5					
"	3176	...Repeated for Non-Volatile Latch 6					
"	318D	...Repeated for Non-Volatile Latch 7					
"	31A4	...Repeated for Non-Volatile Latch 8					
"	31BB	...Repeated for Non-Volatile Latch 9					
"	31D2	...Repeated for Non-Volatile Latch 10					
"	31E9	...Repeated for Non-Volatile Latch 11					
"	3200	...Repeated for Non-Volatile Latch 12					
"	3217	...Repeated for Non-Volatile Latch 13					
"	322E	...Repeated for Non-Volatile Latch 14					
"	3245	...Repeated for Non-Volatile Latch 15					
"	325C	...Repeated for Non-Volatile Latch 16					
	Security (Read/Write Setting)						
All	3280	Administrator Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read/Write)						
All	328A	Administrator Alphanumeric Password Entry	---	---	---	F202	(none)
	Security (Read/Write Setting)						
All	3294	Supervisor Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read/Write)						
All	329E	Supervisor Alphanumeric Password Entry	---	---	---	F202	(none)
	Security (Read/Write Setting)						
All	32A8	Engineer Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read/Write)						
All	32B2	Engineer Alphanumeric Password Entry	---	---	---	F202	(none)
	Security (Read/Write Setting)						
All	32BC	Operator Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read/Write)						
All	32C6	Operator Alphanumeric Password Entry	---	---	---	F202	(none)
	Security (Read/Write Setting)						
All	32D0	Observer Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read/Write)						
All	32DA	Observer Alphanumeric Password Entry	---	---	1	F202	(none)
	Security (Read/Write Setting)						
All	32E4	Reserved for password settings of future roles (63 items)	0 to 65535	---	1	F001	0
"	3323	Session Lockout	0 to 99	---	1	F001	3
"	3324	Session Lockout Period	0 to 9999	min	1	F001	3

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3325	Load Factory Defaults	0 to 1	---	1	F126	0 (No)
"	3326	Syslog Server IP Address	0 to 4294967295	---	1	F003	0
"	3328	Syslog Server Port Number	1 to 65535	---	1	F001	514
	Security Supervisory (Read/Write Setting)						
All	3329	Device Authentication Enable	0 to 1	---	1	F126	1 (Yes)
"	332A	Supervisor Role Enable	0 to 1	---	1	F102	0 (Disabled)
"	332B	Lock Relay	0 to 1	---	1	F102	0 (Disabled)
"	332C	Factory Service Mode Enable	0 to 1	---	1	F102	0 (Disabled)
"	332D	Failed Authentication Alarm Enable	0 to 1	---	1	F102	1 (Enabled)
"	332E	Firmware Lock Alarm	0 to 1	---	1	F102	1 (Enabled)
"	332F	Settings Lock Alarm	0 to 1	---	1	F102	1 (Enabled)
"	3330	Bypass Access	0 to 4	---	1	F628	0 (Disabled)
"	3331	Serial Inactivity Timeout	1 to 9999	min	1	F001	1
	Security Command (Read/Write Command)						
All	3332	Operator Logoff	0 to 1	---	1	F126	0 (No)
"	3333	Engineer Logoff	0 to 1	---	1	F126	0 (No)
"	3334	Administrator Logoff	0 to 1	---	1	F126	0 (No)
"	3335	Clear Security Data	0 to 1	---	1	F126	0 (No)
	Security Reserved Modbus Registers (Read/Write)						
All	3336	Address 0x3360 reserved for serial login (20 items)	0 to 9999	---	1	F001	3
"	334A	Address 0x3374 reserved for serial logout	0 to 9999	---	1	F001	3
	Phase Time Overcurrent (Read/Write Grouped Setting) (2, 4, 6, or 20 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	334B	Phase Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	334C	Phase Time Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	334D	Phase Time Overcurrent 1 Input	0 to 1	---	1	F122	0 (Phasor)
"	334E	Phase Time Overcurrent 1 Pickup	0.02 to 30	pu	0.001	F001	1000
"	334F	Phase Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	3350	Phase Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	3351	Phase Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	3352	Phase Time Overcurrent 1 Voltage Restraint	0 to 1	---	1	F102	0 (Disabled)
"	3353	Phase TOC 1 Block For Each Phase (3 items)	0 to 4294967295	---	1	F300	0
"	3359	Phase Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	335A	Phase Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	335B	Reserved (3 items)	0 to 1	---	1	F001	0
"	335E	...Repeated for Phase Time Overcurrent 2					
"	3371	...Repeated for Phase Time Overcurrent 3					
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T35, T60	3384	...Repeated for Phase Time Overcurrent 4					

Products	Hex address	Register name	Range	Units	Step	Format	Default
B30, C60, C70, F35, F60, L90, M60, N60, T35, T60	3397	...Repeated for Phase Time Overcurrent 5					
"	33AA	...Repeated for Phase Time Overcurrent 6					
B30	33BD	...Repeated for Phase Time Overcurrent 7					
"	33D0	...Repeated for Phase Time Overcurrent 8					
"	33E3	...Repeated for Phase Time Overcurrent 9					
"	33F6	...Repeated for Phase Time Overcurrent 10					
"	3409	...Repeated for Phase Time Overcurrent 11					
"	341C	...Repeated for Phase Time Overcurrent 12					
"	342F	...Repeated for Phase Time Overcurrent 13					
"	3442	...Repeated for Phase Time Overcurrent 14					
"	3455	...Repeated for Phase Time Overcurrent 15					
"	3468	...Repeated for Phase Time Overcurrent 16					
"	347B	...Repeated for Phase Time Overcurrent 17					
"	348E	...Repeated for Phase Time Overcurrent 18					
"	34A1	...Repeated for Phase Time Overcurrent 19					
"	34B4	...Repeated for Phase Time Overcurrent 20					
	Neutral Time Overcurrent (Read/Write Grouped Setting) (2, 4, 6, or 20 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60	355F	Neutral Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3560	Neutral Time Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	3561	Neutral Time Overcurrent 1 Input	0 to 1	---	1	F122	0 (Phasor)
"	3562	Neutral Time Overcurrent 1 Pickup	0.02 to 30	pu	0.001	F001	1000
"	3563	Neutral Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	3564	Neutral Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	3565	Neutral Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	3566	Neutral Time Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	3568	Neutral Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	3569	Neutral Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	356A	Reserved (6 items)	0 to 1	---	1	F001	0
"	3570	...Repeated for Neutral Time Overcurrent 2					
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T60	3581	...Repeated for Neutral Time Overcurrent 3					
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T60	3592	...Repeated for Neutral Time Overcurrent 4					
B30, C60, C70, F35, F60, L90, M60, N60, T60	35A3	...Repeated for Neutral Time Overcurrent 5					
"	35B4	...Repeated for Neutral Time Overcurrent 6					
B30	35C5	...Repeated for Neutral Time Overcurrent 7					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	35D6	...Repeated for Neutral Time Overcurrent 8					
"	35E7	...Repeated for Neutral Time Overcurrent 9					
"	35F8	...Repeated for Neutral Time Overcurrent 10					
"	3609	...Repeated for Neutral Time Overcurrent 11					
"	361A	...Repeated for Neutral Time Overcurrent 12					
"	362B	...Repeated for Neutral Time Overcurrent 13					
"	363C	...Repeated for Neutral Time Overcurrent 14					
"	364D	...Repeated for Neutral Time Overcurrent 15					
"	365E	...Repeated for Neutral Time Overcurrent 16					
"	366F	...Repeated for Neutral Time Overcurrent 17					
"	3680	...Repeated for Neutral Time Overcurrent 18					
"	3691	...Repeated for Neutral Time Overcurrent 19					
"	36A2	...Repeated for Neutral Time Overcurrent 20					
	Neutral Instantaneous Overcurrent (Read/Write Grouped Setting) (1, 2, 4, 6, 8, 12, or 20 Modules)						
All except B90, C30, T35	373B	Neutral Instantaneous Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	373C	Neutral Instantaneous Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	373D	Neutral Instantaneous Overcurrent 1 Pickup	0.02 to 30	pu	0.001	F001	1000
"	373E	Neutral Instantaneous Overcurrent 1 Delay	0 to 600	s	0.01	F001	0
"	373F	Neutral Instantaneous Overcurrent 1 Reset Delay	0 to 600	s	0.01	F001	0
"	3740	Neutral Instantaneous Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	3742	Neutral Instantaneous Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	3743	Neutral Instantaneous Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	3744	Reserved (8 items)	0 to 1	---	1	F001	0
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, N60, T60	374C	...Repeated for Neutral Instantaneous Overcurrent 2					
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T60	375D	...Repeated for Neutral Instantaneous Overcurrent 3					
"	376E	...Repeated for Neutral Instantaneous Overcurrent 4					
B30, C60, C70, D60, F35, F60, L90, M60, N60, T60	377F	...Repeated for Neutral Instantaneous Overcurrent 5					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3790	...Repeated for Neutral Instantaneous Overcurrent 6					
C60, F35, F60, L90, M60, N60, T60	37A1	...Repeated for Neutral Instantaneous Overcurrent 7					
"	37B2	...Repeated for Neutral Instantaneous Overcurrent 8					
F35, N60, T60	37C3	...Repeated for Neutral Instantaneous Overcurrent 9					
"	37D4	...Repeated for Neutral Instantaneous Overcurrent 10					
"	37E5	...Repeated for Neutral Instantaneous Overcurrent 11					
"	37F6	...Repeated for Neutral Instantaneous Overcurrent 12					
B30	3807	...Repeated for Neutral Instantaneous Overcurrent 13					
"	3818	...Repeated for Neutral Instantaneous Overcurrent 14					
"	3829	...Repeated for Neutral Instantaneous Overcurrent 15					
"	383A	...Repeated for Neutral Instantaneous Overcurrent 16					
"	384B	...Repeated for Neutral Instantaneous Overcurrent 17					
"	385C	...Repeated for Neutral Instantaneous Overcurrent 18					
"	386D	...Repeated for Neutral Instantaneous Overcurrent 19					
"	387E	...Repeated for Neutral Instantaneous Overcurrent 20					
	Ground Time Overcurrent (Read/Write Grouped Setting) (1, 2, 4, 6, or 20 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	3917	Ground Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3918	Ground Time Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	3919	Ground Time Overcurrent 1 Input	0 to 1	---	1	F122	0 (Phasor)
"	391A	Ground Time Overcurrent 1 Pickup	0.02 to 30	pu	0.001	F001	1000
"	391B	Ground Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	391C	Ground Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	391D	Ground Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	391E	Ground Time Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	3920	Ground Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	3921	Ground Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	3922	Reserved (6 items)	0 to 1	---	1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, N60, T35, T60	3928	...Repeated for Ground Time Overcurrent 2					
B30, C60, C70, D60, F35, F60, L90, M60, N60, T35, T60	3939	...Repeated for Ground Time Overcurrent 3					
"	394A	...Repeated for Ground Time Overcurrent 4					
B30, C70, F35, N60, T35, T60	395B	...Repeated for Ground Time Overcurrent 5					
"	396C	...Repeated for Ground Time Overcurrent 6					
B30	397D	...Repeated for Ground Time Overcurrent 7					
"	398E	...Repeated for Ground Time Overcurrent 8					
"	399F	...Repeated for Ground Time Overcurrent 9					
"	39B0	...Repeated for Ground Time Overcurrent 10					
"	39C1	...Repeated for Ground Time Overcurrent 11					
"	39D2	...Repeated for Ground Time Overcurrent 12					
"	39E3	...Repeated for Ground Time Overcurrent 13					
"	39F4	...Repeated for Ground Time Overcurrent 14					
"	3A05	...Repeated for Ground Time Overcurrent 15					
"	3A16	...Repeated for Ground Time Overcurrent 16					
"	3A27	...Repeated for Ground Time Overcurrent 17					
"	3A38	...Repeated for Ground Time Overcurrent 18					
"	3A49	...Repeated for Ground Time Overcurrent 19					
"	3A5A	...Repeated for Ground Time Overcurrent 20					
	Ground Instantaneous Overcurrent (Read/Write Grouped Setting) (1, 2, 4, 6, 8, 12, or 20 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	3AF3	Ground Instantaneous Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3AF4	Ground Instantaneous Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	3AF5	Ground Instantaneous Overcurrent 1 Pickup	0.02 to 30	pu	0.001	F001	1000
"	3AF6	Ground Instantaneous Overcurrent 1 Delay	0 to 600	s	0.01	F001	0
"	3AF7	Ground Instantaneous Overcurrent 1 Reset Delay	0 to 600	s	0.01	F001	0
"	3AF8	Ground Instantaneous Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	3AFA	Ground Instantaneous Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3AFB	Ground Instantaneous Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	3AFC	Reserved (8 items)	0 to 1	---	1	F001	0
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, N60, T35, T60	3B04	...Repeated for Ground Instantaneous Overcurrent 2					
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T35, T60	3B15	...Repeated for Ground Instantaneous Overcurrent 3					
"	3B26	...Repeated for Ground Instantaneous Overcurrent 4					
B30, C60, C70, D60, F35, F60, L90, M60, N60, T35, T60	3B37	...Repeated for Ground Instantaneous Overcurrent 5					
"	3B48	...Repeated for Ground Instantaneous Overcurrent 6					
C60, C70, F35, L90, N60, T35, T60	3B59	...Repeated for Ground Instantaneous Overcurrent 7					
"	3B6A	...Repeated for Ground Instantaneous Overcurrent 8					
C70, F35, N60, T35, T60	3B7B	...Repeated for Ground Instantaneous Overcurrent 9					
"	3B8C	...Repeated for Ground Instantaneous Overcurrent 10					
"	3B9D	...Repeated for Ground Instantaneous Overcurrent 11					
"	3BAE	...Repeated for Ground Instantaneous Overcurrent 12					
B30	3BBF	...Repeated for Ground Instantaneous Overcurrent 13					
"	3BD0	...Repeated for Ground Instantaneous Overcurrent 14					
"	3BE1	...Repeated for Ground Instantaneous Overcurrent 15					
"	3BF2	...Repeated for Ground Instantaneous Overcurrent 16					
"	3C03	...Repeated for Ground Instantaneous Overcurrent 17					
"	3C14	...Repeated for Ground Instantaneous Overcurrent 18					
"	3C25	...Repeated for Ground Instantaneous Overcurrent 19					
"	3C36	...Repeated for Ground Instantaneous Overcurrent 20					
	CT Fail (Read/Write Setting) (2, 4, or 6 Modules)						
D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	3CCF	CT Fail 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3CD0	CT Fail 1 Block	0 to 4294967295	---	1	F300	0
"	3CD2	CT Fail 1 Current Source 1	0 to 5	---	1	F167	0 (SRC 1)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3CD3	CT Fail 1 Current Pickup 1	0.1 to 2	pu	0.1	F001	2
"	3CD4	CT Fail 1 Current Source 2	0 to 5	---	1	F167	1 (SRC 2)
"	3CD5	CT Fail 1 Current Pickup 2	0.1 to 2	pu	0.1	F001	2
"	3CD6	CT Fail 1 Voltage Source	0 to 5	---	1	F167	0 (SRC 1)
"	3CD7	CT Fail 1 Voltage Pickup	0.04 to 2	pu	0.01	F001	20
"	3CD8	CT Fail 1 Pickup Delay	0 to 65.535	s	0.001	F001	1000
"	3CD9	CT Fail 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	3CDA	CT Fail 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	3CDB	...Repeated for CT Fail 2					
D60, F60, G30, G60, L60, L90, M60, N60, T35, T60	3CE7	...Repeated for CT Fail 3					
"	3CF3	...Repeated for CT Fail 4					
N60, T35, T60	3CFF	...Repeated for CT Fail 5					
"	3D0B	...Repeated for CT Fail 6					
	Incipient Cable Fault Detector Command (Read/Write Setting)						
D30, F35, F60, L30	3D17	Incipient Cable Fault Detector Clear Counters	0 to 1	---	1	F126	0 (No)
	87L Trip Logic (Read/Write Grouped Setting)						
L90	3D18	87L Trip Function	0 to 1	---	1	F102	0 (Disabled)
"	3D19	87L Trip Source	0 to 5	---	1	F167	0 (SRC 1)
"	3D1A	87L Trip Mode	0 to 1	---	1	F157	0 (3-Pole)
"	3D1B	87L Trip Supervision	0 to 4294967295	---	1	F300	0
"	3D1D	87L Trip Force 3 Phase	0 to 4294967295	---	1	F300	0
"	3D1F	87L Trip Seal In	0 to 1	---	1	F102	0 (Disabled)
"	3D20	87L Trip Seal In Pickup	0.2 to 0.8	pu	0.01	F001	20
"	3D21	87L Trip Target	0 to 2	---	1	F109	0 (Self-reset)
"	3D22	87L Trip Events	0 to 1	---	1	F102	0 (Disabled)
"	3D23	87LG Trip Mode	0 to 1	---	1	F157	0 (3-Pole)
"	3D24	87LG Trip Supervision	0 to 4294967295	---	1	F300	0
	Stub Bus (Read/Write Grouped Setting)						
L30, L90	3D26	Stub Bus Function	0 to 1	---	1	F102	0 (Disabled)
"	3D27	Stub Bus Disconnect	0 to 4294967295	---	1	F300	0
"	3D29	Stub Bus Trigger	0 to 4294967295	---	1	F300	0
"	3D2B	Stub Bus Target	0 to 2	---	1	F109	0 (Self-reset)
"	3D2C	Stub Bus Events	0 to 1	---	1	F102	0 (Disabled)
	50DD Disturbance Detection (Read/Write Grouped Setting)						
L30, L90	3D2D	50DD Function	0 to 1	---	1	F102	0 (Disabled)
"	3D2E	50DD Non Current Supervision	0 to 4294967295	---	1	F300	0
"	3D30	50DD Control Logic	0 to 4294967295	---	1	F300	0
"	3D32	50DD Logic Seal In	0 to 4294967295	---	1	F300	0
"	3D34	50DD Events	0 to 1	---	1	F102	0 (Disabled)
"	3D35	50DD Seal-In by 87LG	0 to 1	---	1	F102	0 (Disabled)
"	3D36	50DD Voltage Supv	0 to 1	---	1	F102	0 (Disabled)
	Frequency Out-Of-Band Accumulation (Read/Write Setting)						
G30, G60	3D37	Frequency Out-Of-Band Accumulation Block	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3D39	Frequency Out-Of-Band Accumulation Events Enable	0 to 1	---	1	F102	0 (Disabled)
"	3D3A	Frequency Out-Of-Band Accumulator Function Enable Array (7 items)	0 to 1	---	1	F102	0 (Disabled)
"	3D41	Frequency Out-Of-Band Accumulator Lower Frequency Array (7 items)	20 to 70	Hz	0.01	F001	6000
"	3D48	Frequency Out-Of-Band Accumulator Min Value V A	0.1 to 1.25	pu	0.01	F001	10
"	3D49	Frequency Out-Of-Band Accumulator Source	0 to 5	---	1	F167	0 (SRC 1)
"	3D4A	Frequency Out-Of-Band Accumulator Target Messages Enable	0 to 2	---	1	F109	0 (Self-reset)
"	3D4B	Frequency Out-Of-Band Accumulator Time Limit Array (7 items)	1 to 65535	sec	1	F001	200
"	3D52	Frequency Out-Of-Band Accumulator Time Preset Array (7 items)	0 to 65535	sec	1	F001	0
"	3D59	Frequency Out-Of-Band Accumulator Upper Frequency Array (7 items)	20 to 70	Hz	0.01	F001	6000
	Setting Groups (Read/Write Setting)						
All except C30	3D60	Setting Group for Modbus Comms (0 means group 1)	0 to 5	---	1	F001	0
"	3D61	Setting Groups Block	0 to 4294967295	---	1	F300	0
"	3D63	FlexLogic Operands to Activate Groups 2 through 6 (5 items)	0 to 4294967295	---	1	F300	0
"	3D6D	Setting Group Function	0 to 1	---	1	F102	0 (Disabled)
"	3D6E	Setting Group Events	0 to 1	---	1	F102	0 (Disabled)
"	3D6F	Setting Groups Control Mode	0 to 1	---	1	F283	0 (Local)
	Setting Group Names (Read/Write Setting)						
All except C30	3D70	Setting Group 1 Name	---	---	---	F203	(none)
"	3D78	Setting Group 2 Name	---	---	---	F203	(none)
"	3D80	Setting Group 3 Name	---	---	---	F203	(none)
"	3D88	Setting Group 4 Name	---	---	---	F203	(none)
"	3D90	Setting Group 5 Name	---	---	---	F203	(none)
"	3D98	Setting Group 6 Name	---	---	---	F203	(none)
	Current Differential 87L (Read/Write Grouped Setting)						
L30, L90	3DA6	87L Current Differential Function	0 to 1	---	1	F102	0 (Disabled)
"	3DA7	87L Current Differential Block	0 to 4294967295	---	1	F300	0
"	3DA9	87L Current Differential Signal Source 1	0 to 5	---	1	F167	0 (SRC 1)
"	3DAA	87L Minimum Phase Current Sensitivity	0.1 to 4	pu	0.01	F001	20
L30	3DAB	87L Current Differential Tap Setting	0.2 to 5	---	0.01	F001	100
L90	3DAB	87L Current Differential Tap Setting	0.05 to 20	---	0.01	F001	100
L30, L90	3DAC	87L Current Differential Phase Percent Restraint 1	1 to 50	%	1	F001	30
"	3DAD	87L Current Differential Phase Percent Restraint 2	1 to 70	%	1	F001	50
"	3DAE	87L Current Differential Phase Dual Slope Breakpoint	0 to 20	pu	0.1	F001	10
"	3DAF	87L Current Differential Ground Function	0 to 1	---	1	F102	0 (Disabled)
"	3DB0	87L Current Differential Ground Pickup	0.05 to 1	pu	0.01	F001	10
"	3DB1	87L Current Differential Ground Restraint	1 to 50	%	1	F001	25
"	3DB2	87L Current Differential Ground Delay	0 to 5	seconds	0.01	F001	10

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3DB3	87L Current Differential Key DTT	0 to 1	---	1	F102	1 (Enabled)
"	3DB4	87L Current Differential External Key DTT	0 to 4294967295	---	1	F300	0
"	3DB6	87L Current Differential Target	0 to 2	---	1	F109	0 (Self-reset)
"	3DB7	87L Current Differential Event	0 to 1	---	1	F102	0 (Disabled)
L30	3DB8	87L Current Differential Tap 2 Setting	0.2 to 5	---	0.01	F001	100
L90	3DB8	87L Current Differential Tap 2 Setting	0.05 to 20	---	0.01	F001	100
L90	3DB9	87L Current Differential Signal Source 2	0 to 6	---	1	F211	0 (None)
"	3DBA	87L Current Differential Signal Source 3	0 to 6	---	1	F211	0 (None)
"	3DBB	87L Current Differential Signal Source 4	0 to 6	---	1	F211	0 (None)
	Current Differential 87L In-Zone Transformer (Read/Write Grouped Setting)						
L30, L90	3DBC	87L Inrush Inhibit Mode	0 to 3	---	1	F561	0 (Disabled)
"	3DBD	87L Inrush Inhibit Level	1 to 40	%fo	0.1	F001	200
	Open Pole Detect (Read/Write Grouped Setting)						
N60	3DBE	Open Pole Detect Function	0 to 1	---	1	F102	0 (Disabled)
"	3DBF	Open Pole Detect Block	0 to 4294967295	---	1	F300	0
"	3DC1	Open Pole Detect A Aux Co	0 to 4294967295	---	1	F300	0
"	3DC3	Open Pole Detect B Aux Co	0 to 4294967295	---	1	F300	0
"	3DC5	Open Pole Detect C Aux Co	0 to 4294967295	---	1	F300	0
"	3DC7	Open Pole Detect Current Source	0 to 5	---	1	F167	0 (SRC 1)
"	3DC8	Open Pole Detect Current Pickup	0.05 to 20	pu	0.01	F001	20
"	3DC9	Open Pole Detect Voltage Source	0 to 5	---	1	F167	0 (SRC 1)
"	3DCA	Open Pole Detect Voltage Input	0 to 1	---	1	F102	0 (Disabled)
"	3DCB	Open Pole Detect Pickup Delay	0 to 65.535	s	0.001	F001	60
"	3DCC	Open Pole Detect Reset Delay	0 to 65.535	s	0.001	F001	100
"	3DCD	Open Pole Detect Target	0 to 2	---	1	F109	0 (Self-reset)
"	3DCE	Open Pole Detect Events	0 to 1	---	1	F102	0 (Disabled)
"	3DCF	Open Pole Detect Broken Co	0 to 1	---	1	F102	0 (Disabled)
	Phase Comparison Negative Sequence Voltage (Read/Write Grouped Setting)						
L60	3DD0	Negative Sequence Voltage FD Function	0 to 1	---	1	F102	0 (Disabled)
"	3DD1	Negative Sequence Voltage FD Impedance	0 to 100	%	0.1	F001	100
"	3DD2	Negative Sequence Voltage FDL Pickup	0.005 to 3	pu	0.001	F001	10
"	3DD3	Negative Sequence Voltage FDH Pickup	0.005 to 3	pu	0.001	F001	50
"	3DD4	Negative Sequence Voltage FD Block	0 to 4294967295	---	1	F300	0
"	3DD6	Negative Sequence Voltage FD Target	0 to 2	---	1	F109	0 (Self-reset)
"	3DD7	Negative Sequence Voltage FD Events	0 to 1	---	1	F102	0 (Disabled)
	Phase Comparison Negative Sequence Current Rate of Change (ROC) (Read/Write Grouped Setting)						
L60	3DD8	Negative Sequence di/dt FD Function	0 to 1	---	1	F102	0 (Disabled)
"	3DD9	Negative Sequence di/dt FDL Pickup	0.01 to 5	pu	0.01	F001	10
"	3DDA	Negative Sequence di/dt FDL Seal-In	0 to 10	s	0.001	F001	600
"	3DDB	Negative Sequence di/dt FDH Pickup	0.01 to 5	pu	0.01	F001	50
"	3DDC	Negative Sequence di/dt FDH Seal-In	0 to 10	s	0.001	F001	200
"	3DDD	Negative Sequence di/dt FDH Supv	0 to 4294967295	---	1	F300	0
"	3DDF	Negative Sequence di/dt FD Block	0 to 4294967295	---	1	F300	0
"	3DE1	Negative Sequence di/dt FD Target	0 to 2	---	1	F109	0 (Self-reset)
"	3DE2	Negative Sequence di/dt FD Events	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Phase Comparison Rate of Change of Positive-Sequence Current Settings (Read/Write Grouped Setting)						
L60	3DE3	Positive-sequence Current Rate of Change (di/dt FD) Function	0 to 1	---	1	F102	0 (Disabled)
"	3DE4	Positive-sequence Current Rate of Change (di/dt FDL) Low Pickup	0.01 to 5	pu	0.01	F001	10
"	3DE5	Positive-sequence Current Rate of Change (di/dt FDL) Low Seal-in	0 to 10	s	0.001	F001	600
"	3DE6	Positive-sequence Current Rate of Change (di/dt FDH) High Pickup	0.01 to 5	pu	0.01	F001	50
"	3DE7	Positive-sequence Current Rate of Change (di/dt FDH) High Seal-in	0 to 10	s	0.001	F001	200
"	3DE8	Positive-sequence Current Rate of Change (di/dt FDH) Supervision	0 to 4294967295	---	1	F300	0
"	3DEA	Positive-sequence Current Rate of Change (di/dt FD) Block	0 to 4294967295	---	1	F300	0
"	3DEC	Positive-sequence Current Rate of Change (di/dt FD) Events	0 to 1	---	1	F102	0 (Disabled)
"	3DED	Positive-sequence Current Rate of Change (di/dt FD) Target	0 to 2	---	1	F109	0 (Self-reset)
	Phase Comparison Negative-Sequence Current Fault Detector (Read/Write Grouped Settings)						
L60	3DEE	Negative-sequence Current Fault Detector Function	0 to 1	---	1	F102	0 (Disabled)
"	3DEF	Negative-sequence Current Fault Detector Low Pickup	0.02 to 5	pu	0.01	F001	10
"	3DF0	Negative-sequence Current Fault Detector High Pickup	0.05 to 15	pu	0.01	F001	50
"	3DF1	Negative-sequence Current Fault Detector Block	0 to 4294967295	---	1	F300	0
"	3DF3	Negative-sequence Current Fault Detector Target	0 to 2	---	1	F109	0 (Self-reset)
"	3DF4	Negative-sequence Current Fault Detector Events	0 to 1	---	1	F102	0 (Disabled)
	Phase Comparison Positive-Sequence Current Fault Detector (Read/Write Grouped Settings)						
L60	3DF5	Positive-sequence Current Fault Detector Function	0 to 1	---	1	F102	0 (Disabled)
"	3DF6	Positive-sequence Current Fault Detector Low Pickup	0.2 to 5	pu	0.01	F001	50
"	3DF7	Positive-sequence Current Fault Detector High Pickup	0.5 to 15	pu	0.01	F001	75
"	3DF8	Positive-sequence Current Fault Detector Block	0 to 4294967295	---	1	F300	0
"	3DFA	Positive-sequence Current Fault Detector Target	0 to 2	---	1	F109	0 (Self-reset)
"	3DFB	Positive-sequence Current Fault Detector Events	0 to 1	---	1	F102	0 (Disabled)
	Phase Comparison Open Breaker Keying (Read/Write Grouped Setting)						
L60	3DFC	Open Breaker Keying	0 to 1	---	1	F102	0 (Disabled)
"	3DFD	Breaker 1 Auxiliary Contact	0 to 4294967295	---	1	F300	0
"	3DFF	Breaker 1 Supervision Element	0 to 4294967295	---	1	F300	0
"	3E01	Breaker 2 Auxiliary Contact	0 to 4294967295	---	1	F300	0
"	3E03	Breaker 2 Supervision Element	0 to 4294967295	---	1	F300	0
"	3E05	Weak-Infeed Keying	0 to 4294967295	---	1	F300	0
"	3E07	Supervision Element	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3E09	Infeed Pickup Delay	0 to 50	s	0.001	F001	0
"	3E0A	Infeed Reset Delay	0 to 50	s	0.001	F001	35
"	3E0B	Open Breaker Keying Pickup Delay	0 to 50	s	0.001	F001	0
"	3E0C	Open Breaker Keying Reset Delay	0 to 50	s	0.001	F001	0
	Phase Comparison Trip Scheme (Read/Write Grouped Setting)						
L60	3E0D	87PC Function	0 to 1	---	1	F102	0 (Disabled)
"	3E0E	87PC Channel Loss	0 to 500	ms	1	F001	0
"	3E0F	87PC Block	0 to 4294967295	---	1	F300	0
"	3E11	87PC Target	0 to 2	---	1	F109	0 (Self-reset)
"	3E12	87PC Events	0 to 1	---	1	F102	0 (Disabled)
"	3E13	87PC Scheme Select	0 to 8	---	1	F088	0 (2TL-TR-SPC-2FC)
"	3E14	87PC Scheme Signal	0 to 2	---	1	F150	0 (MIXED I_2 - K*I_1)
"	3E15	87PC Signal Source	0 to 1	---	1	F089	0 (One Source Current)
"	3E16	87PC FDL Pickup	0.02 to 15	pu	0.01	F001	50
"	3E17	87PC FDH Pickup	0.05 to 15	pu	0.01	F001	75
"	3E18	87PC Mixed Signal K	0 to 0.25	---	0.01	F001	20
"	3E19	87PC Phase Delay Ch1	0 to 30	ms	0.1	F001	0
"	3E1A	87PC Phase Delay Ch2	0 to 30	ms	0.1	F001	0
"	3E1B	87PC Transient Pickup	0 to 65.535	s	0.001	F001	30
"	3E1C	87PC Asymmetry Channel 1	-5 to 5	ms	0.1	F002	0
"	3E1D	87PC Asymmetry Channel 2	-5 to 5	ms	0.1	F002	0
"	3E1E	87PC Stability Angle	40 to 140	degrees	5	F001	75
"	3E1F	87PC Transient Reset	0 to 65.535	s	0.001	F001	30
"	3E20	87PC Received Volts Channel 1	0 to 125	V	0.1	F001	120
"	3E21	87PC Received Volts Channel 2	0 to 125	V	0.1	F001	120
"	3E22	87PC High-Speed Contact 1	0 to 64	---	1	F490	0
"	3E23	87PC High-Speed Contact 2	0 to 64	---	1	F490	0
"	3E24	87PC FDL AUX	0 to 4294967295	---	1	F300	0
"	3E26	87PC FDH AUX	0 to 4294967295	---	1	F300	0
"	3E28	87PC Reset Delay	0 to 200	ms	1	F001	30
"	3E29	87PC Mixed Signal Reference Angle	0 to 359	°	1	F001	0
"	3E2A	87PC Trip Security	0 to 1	---	1	F534	0 (First Coincidence)
"	3E2B	87PC Second Coincidence Timer	10 to 200	ms	1	F001	40
"	3E2C	87PC Enhanced Stability Angle	40 to 180	°	5	F001	110
"	3E2D	87PC FDH Supervision	0 to 4294967295	---	1	F300	0
"	3E2F	87PC Pickup Delay	0 to 50	ms	1	F001	0
"	3E30	87PC Stop Tx	0 to 4294967295	---	1	F300	0
"	3E32	87PC Tx Reset Delay	0 to 1000	ms	1	F001	0
	Continuous Monitor (Read/Write Setting)						
L90	3E33	Continuous Monitor Function	0 to 1	---	1	F102	0 (Disabled)
"	3E34	Continuous Monitor I (current) OP	0 to 4294967295	---	1	F300	0
"	3E36	Continuous Monitor I (current) Supervision	0 to 4294967295	---	1	F300	0
"	3E38	Continuous Monitor V (voltage) OP	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3E3A	Continuous Monitor V (voltage) Supervision	0 to 4294967295	---	1	F300	0
"	3E3C	Continuous Monitor Target	0 to 2	---	1	F109	0 (Self-reset)
"	3E3D	Continuous Monitor Events	0 to 1	---	1	F102	0 (Disabled)
	Transformer Hottest Spot (Read/Write Grouped Setting)						
G30, T35, T60	3E3E	Transformer Hottest Spot Function	0 to 1	---	1	F102	0 (Disabled)
"	3E3F	Transformer Hottest Spot Pickup	50 to 300	°C	1	F001	140
"	3E40	Transformer Hottest Spot Delay	0 to 30000	min	1	F001	1
"	3E41	Transformer Hottest Spot Block	0 to 4294967295	---	1	F300	0
"	3E43	Transformer Hottest Spot Target	0 to 2	---	1	F109	0 (Self-reset)
"	3E44	Transformer Hottest Spot Events	0 to 1	---	1	F102	0 (Disabled)
	Transformer Aging Factor (Read/Write Grouped Setting)						
G30, T35, T60	3E45	Transformer Aging Factor Function	0 to 1	---	1	F102	0 (Disabled)
"	3E46	Transformer Aging Factor Pickup	1 to 10	PU	0.1	F001	20
"	3E47	Transformer Aging Factor Delay	0 to 30000	min	1	F001	10
"	3E48	Transformer Aging Factor Block	0 to 4294967295	---	1	F300	0
"	3E4A	Transformer Aging Factor Target	0 to 2	---	1	F109	0 (Self-reset)
"	3E4B	Transformer Aging Factor Events	0 to 1	---	1	F102	0 (Disabled)
	Transformer Loss of Life (Read/Write Grouped Setting)						
G30, T35, T60	3E4C	Transformer Loss of Life Function	0 to 1	---	1	F102	0 (Disabled)
"	3E4D	XFMR LOL Initial Value	0 to 500000	hrs	1	F003	0
"	3E4F	Transformer Loss of Life Pickup	0 to 500000	hrs	1	F003	180000
"	3E51	Transformer Loss Of Life Block	0 to 4294967295	---	1	F300	0
"	3E53	Transformer Loss of Life Target	0 to 2	---	1	F109	0 (Self-reset)
"	3E54	Transformer Loss of Life Events	0 to 1	---	1	F102	0 (Disabled)
	Transformer Thermal Inputs (Read/Write Setting)						
G30, T35, T60	3E55	Transformer Thermal Model Source Input	0 to 5	---	1	F167	0 (SRC 1)
"	3E56	Ambient Temperature Input Sensor	0 to 32	---	1	F450	0
"	3E57	Top Oil Temperature Input Sensor	0 to 32	---	1	F460	0
"	3E58	January Average Ambient Temperature	-60 to 60	°C	1	F002	-20
"	3E59	February Average Ambient Temperature	-60 to 60	°C	1	F002	-30
"	3E5A	March Average Ambient Temperature	-60 to 60	°C	1	F002	-10
"	3E5B	April Average Ambient Temperature	-60 to 60	°C	1	F002	10
"	3E5C	May Average Ambient Temperature	-60 to 60	°C	1	F002	20
"	3E5D	June Average Ambient Temperature	-60 to 60	°C	1	F002	30
"	3E5E	July Average Ambient Temperature	-60 to 60	°C	1	F002	30
"	3E5F	August Average Ambient Temperature	-60 to 60	°C	1	F002	30
"	3E60	September Average Ambient Temperature	-60 to 60	°C	1	F002	20
"	3E61	October Average Ambient Temperature	-60 to 60	°C	1	F002	10
"	3E62	November Average Ambient Temperature	-60 to 60	°C	1	F002	10
"	3E63	December Average Ambient Temperature	-60 to 60	°C	1	F002	-10
	Transformer Thermal Inputs (Read/Write Command)						
G30, T35, T60	3E64	Transformer Loss of Life Clear Command	0 to 1	---	1	F126	0 (No)
	Transformer Percent Differential (Read/Write Grouped Setting)						
G30, T35, T60	3E65	Percent Differential Function	0 to 1	---	1	F102	0 (Disabled)
"	3E66	Percent Differential Pickup	0.05 to 1	pu	0.001	F001	100
"	3E67	Percent Differential Slope 1	15 to 100	%	1	F001	25

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3E68	Percent Differential Break 1	1 to 2	pu	0.001	F001	2000
"	3E69	Percent Differential Break 2	2 to 30	pu	0.001	F001	8000
"	3E6A	Percent Differential Slope 2	50 to 100	%	1	F001	90
"	3E6B	Inrush Inhibit Function	0 to 2	---	1	F168	1 (Adapt. 2nd)
"	3E6C	Inrush Inhibit Level	1 to 40	$\%f_o$	0.1	F001	200
"	3E6D	Overexcitation Inhibit Function	0 to 1	---	1	F169	0 (Disabled)
"	3E6E	Overexcitation Inhibit Level	1 to 40	$\%f_o$	0.1	F001	100
"	3E6F	Percent Differential Block	0 to 4294967295	---	1	F300	0
"	3E71	Percent Differential Target	0 to 2	---	1	F109	0 (Self-reset)
"	3E72	Percent Differential Events	0 to 1	---	1	F102	0 (Disabled)
"	3E73	Transformer Inrush Inhibit Mode	0 to 3	---	1	F189	0 (Per phase)
	Transformer Instantaneous Differential (Read/Write Grouped Setting)						
T35, T60	3E74	Inst Differential Function	0 to 1	---	1	F102	0 (Disabled)
"	3E75	Inst Differential Pickup	2 to 30	pu	0.001	F001	8000
"	3E76	Inst Differential Block	0 to 4294967295	---	1	F300	0
"	3E78	Inst Differential Target	0 to 2	---	1	F109	0 (Self-reset)
"	3E79	Inst Differential Events	0 to 1	---	1	F102	0 (Disabled)
	Autoreclose (Read/Write Setting) (1, 3, 4, or 6 Modules)						
B30, D30, F35, F60, L30	3E7A	Autoreclose 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3E7B	Autoreclose 1 Initiate	0 to 4294967295	---	1	F300	0
"	3E7D	Autoreclose 1 Block	0 to 4294967295	---	1	F300	0
"	3E7F	Autoreclose 1 Max Number of Shots	1 to 4	---	1	F001	1
"	3E80	Autoreclose 1 Manual Close	0 to 4294967295	---	1	F300	0
"	3E82	Autoreclose 1 Manual Reset from LO	0 to 4294967295	---	1	F300	0
"	3E84	Autoreclose 1 Reset Lockout if Breaker Closed	0 to 1	---	1	F108	0 (Off)
"	3E85	Autoreclose 1 Reset Lockout On Manual Close	0 to 1	---	1	F108	0 (Off)
"	3E86	Autoreclose 1 Breaker Closed	0 to 4294967295	---	1	F300	0
"	3E88	Autoreclose 1 Breaker Open	0 to 4294967295	---	1	F300	0
"	3E8A	Autoreclose 1 Block Time Upon Manual Close	0 to 655.35	s	0.01	F001	1000
"	3E8B	Autoreclose 1 Dead Time Shot 1	0 to 655.35	s	0.01	F001	100
"	3E8C	Autoreclose 1 Dead Time Shot 2	0 to 655.35	s	0.01	F001	200
"	3E8D	Autoreclose 1 Dead Time Shot 3	0 to 655.35	s	0.01	F001	300
"	3E8E	Autoreclose 1 Dead Time Shot 4	0 to 655.35	s	0.01	F001	400
"	3E8F	Autoreclose 1 Reset Lockout Delay	0 to 655.35	s	0.01	F001	6000
"	3E90	Autoreclose 1 Reset Time	0 to 655.35	s	0.01	F001	6000
"	3E91	Autoreclose 1 Incomplete Sequence Time	0 to 655.35	s	0.01	F001	500
"	3E92	Autoreclose 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	3E93	Autoreclose 1 Reduce Max 1	0 to 4294967295	---	1	F300	0
"	3E95	Autoreclose 1 Reduce Max 2	0 to 4294967295	---	1	F300	0
"	3E97	Autoreclose 1 Reduce Max 3	0 to 4294967295	---	1	F300	0
"	3E99	Autoreclose 1 Add Delay 1	0 to 4294967295	---	1	F300	0
"	3E9B	Autoreclose 1 Delay 1	0 to 655.35	s	0.01	F001	0
"	3E9C	Autoreclose 1 Add Delay 2	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3E9E	Autoreclose 1 Delay 2	0 to 655.35	s	0.01	F001	0
"	3E9F	Reserved (4 items)	0 to 0.001	---	0.001	F001	0
B30, F35, F60, L30	3EA3	...Repeated for Autoreclose 2					
"	3ECC	...Repeated for Autoreclose 3					
B30, F35, F60	3EF5	...Repeated for Autoreclose 4					
B30, F35	3F1E	...Repeated for Autoreclose 5					
"	3F47	...Repeated for Autoreclose 6					
	Negative Sequence Time Overcurrent (Read/Write Grouped Setting) (2 or 3 Modules)						
C70, D30, D60, F35, F60, L30, L60, L90, T60	3F70	Negative Sequence Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3F71	Negative Sequence Time Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	3F72	Negative Sequence Time Overcurrent 1 Pickup	0.02 to 30	pu	0.001	F001	1000
"	3F73	Negative Sequence Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	3F74	Negative Sequence Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	3F75	Negative Sequence Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	3F76	Negative Sequence Time Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	3F78	Negative Sequence Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	3F79	Negative Sequence Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	3F7A	...Repeated for Negative Sequence Time Overcurrent 2					
T60	3F84	...Repeated for Negative Sequence Time Overcurrent 3					
	Capacitor Bank Overvoltage Settings (Read/Write Grouped Setting) (3 Modules)						
C70	3FBE	Bank Phase Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3FBF	Bank Phase Overvoltage 1 Bus Source	0 to 5	---	1	F167	0 (SRC 1)
"	3F90	Bank Phase Overvoltage 1 Neutral Source	0 to 5	---	1	F167	0 (SRC 1)
"	3F91	Bank Phase Overvoltage 1 Bank Ground	0 to 2	---	1	F093	0 (Grounded)
"	3F92	Bank Phase Overvoltage 1 Curve	0 to 3	---	1	F094	0 (FlexCurve A)
"	3F93	Bank Phase Overvoltage 1 Curve Time Multiplier	1 to 10	---	0.01	F001	100
"	3F94	Bank Phase Overvoltage 1 Stage 1A Pickup	0.8 to 2	pu	0.001	F001	1050
"	3F95	Bank Phase Overvoltage 1 Stage 2A Pickup	0.8 to 2	pu	0.001	F001	1100
"	3F96	Bank Phase Overvoltage 1 Stage 3A Pickup	0.8 to 2	pu	0.001	F001	1200
"	3F97	Bank Phase Overvoltage 1 Stage 4A Pickup	0.8 to 2	pu	0.001	F001	1050
"	3F98	Bank Phase Overvoltage 1 Stage 1B Pickup	0.8 to 2	pu	0.001	F001	1050
"	3F99	Bank Phase Overvoltage 1 Stage 2B Pickup	0.8 to 2	pu	0.001	F001	1100
"	3F9A	Bank Phase Overvoltage 1 Stage 3B Pickup	0.8 to 2	pu	0.001	F001	1200
"	3F9B	Bank Phase Overvoltage 1 Stage 4B Pickup	0.8 to 2	pu	0.001	F001	1050
"	3F9C	Bank Phase Overvoltage 1 Stage 1C Pickup	0.8 to 2	pu	0.001	F001	1050

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	3F9D	Bank Phase Overvoltage 1 Stage 2C Pickup	0.8 to 2	pu	0.001	F001	1100
"	3F9E	Bank Phase Overvoltage 1 Stage 3C Pickup	0.8 to 2	pu	0.001	F001	1200
"	3F9F	Bank Phase Overvoltage 1 Stage 4C Pickup	0.8 to 2	pu	0.001	F001	1050
"	3FA0	Bank Phase Overvoltage 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	6000
"	3FA1	Bank Phase Overvoltage 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	3FA2	Bank Phase Overvoltage 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	200
"	3FA3	Bank Phase Overvoltage 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	3FA4	Bank Phase Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	3FA6	Bank Phase Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	3FA7	Bank Phase Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	3FA8	...Repeated for Bank Phase Overvoltage 2					
"	3FC2	...Repeated for Bank Phase Overvoltage 3					
	Passwords (Read/Write Command)						
All	4000	Command Password Setting	0 to 4294967295	---	1	F202	(none)
	Passwords (Read/Write Setting)						
All	400A	Setting Password Setting	0 to 4294967295	---	1	F202	(none)
	Passwords (Read/Write)						
All	4014	Command Password Entry	0 to 4294967295	---	1	F202	(none)
"	401E	Setting Password Entry	0 to 4294967295	---	1	F202	(none)
	Passwords (Read/Write Setting)						
All	402A	Command Password Access Timeout	5 to 480	min	1	F001	5
"	402B	Setting Password Access Timeout	5 to 480	min	1	F001	30
"	402C	Invalid Password Attempts (before lockout)	2 to 5	---	1	F001	3
"	402D	Password Lockout Duration	5 to 60	min	1	F001	5
	Passwords (Read/Write)						
All	402E	Password Access Events	0 to 1	---	1	F102	0 (Disabled)
	Passwords (Read/Write Setting)						
All	402F	Local Setting Auth	1 to 4294967295	---	1	F300	1
"	4031	Remote Setting Auth	0 to 4294967295	---	1	F300	1
"	4033	Access Auth Timeout	5 to 480	min	1	F001	30
	Negative Sequence Overvoltage (Read/Write Grouped Setting) (3 Modules)						
C70, D30, D60, F60, G30, G60, L30, L60, M60, T60	4035	Negative Sequence Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	4036	Negative Sequence Overvoltage 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	4037	Negative Sequence Overvoltage 1 Pickup	0.004 to 1.25	pu	0.001	F001	300
"	4038	Negative Sequence Overvoltage 1 Pickup Delay	0 to 600	s	0.01	F001	50
"	4039	Negative Sequence Overvoltage 1 Reset Delay	0 to 600	s	0.01	F001	50
"	403A	Negative Sequence Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	403C	Negative Sequence Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	403D	Negative Sequence Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	403E	...Repeated for Negative Sequence Overvoltage 2					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	4047	...Repeated for Negative Sequence Overvoltage 3					
	Overfrequency (Read/Write Setting) (4 Modules)						
C60, D60, F60, G30, G60, L90, M60, N60, T60	4050	Overfrequency 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	4051	Overfrequency 1 Block	0 to 4294967295	---	1	F300	0
"	4053	Overfrequency 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	4054	Overfrequency 1 Pickup	20 to 65	Hz	0.01	F001	6050
"	4055	Overfrequency 1 Pickup Delay	0 to 65.535	s	0.001	F001	500
"	4056	Overfrequency 1 Reset Delay	0 to 65.535	s	0.001	F001	500
"	4057	Overfrequency 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	4058	Overfrequency 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	4059	Reserved (4 items)	0 to 1	---	1	F001	0
"	405D	...Repeated for Overfrequency 2					
"	406A	...Repeated for Overfrequency 3					
"	4077	...Repeated for Overfrequency 4					
	Bus Configuration (Read/Write Setting) (2 Modules)						
B30	4084	Bus Zone 1A Source (6 items 1A to 1F)	0 to 5	---	1	F167	0 (SRC 1)
"	408A	Bus Zone 1A Status (6 items 1A to 1F)	0 to 4294967295	---	1	F300	0
"	4096	Bus Zone 1A Direction (6 items 1A to 1F)	0 to 1	---	1	F210	0 (IN)
"	409C	...Repeated for Bus Zone 2					
	Time of Day Timer (Read/Write Setting) (5 Modules)						
C70	40B4	Time of Day Timer 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	40B5	Time of Day Timer 1 Start Time	0 to 2359	---	1	F050	0
"	40B7	Time of Day Timer 1 Stop Time	0 to 2359	---	1	F050	2359
"	40B9	Time of Day Timer 1 Targets	0 to 2	---	1	F109	0 (Self-reset)
"	40BA	Time of Day Timer 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	40BB	...Repeated for Time of Day Timer 2					
"	40C2	...Repeated for Time of Day Timer 3					
"	40C9	...Repeated for Time of Day Timer 4					
"	40D0	...Repeated for Time of Day Timer 5					
	CT Trouble (Read/Write Setting) (2 or 6 Modules)						
B30, B90	40D7	CT Trouble 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	40D8	CT Trouble 1 Pickup	0.02 to 2	pu	0.001	F001	100
"	40D9	CT Trouble 1 Delay	1 to 60	s	0.1	F001	100
"	40DA	CT Trouble 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	40DB	CT Trouble 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	40DC	...Repeated for CT Trouble 2					
B90	40E1	...Repeated for CT Trouble 3					
"	40E6	...Repeated for CT Trouble 4					
"	40EB	...Repeated for CT Trouble 5					
"	40F0	...Repeated for CT Trouble 6					
	Power Swing Detect (Read/Write Grouped Setting)						
D30, D60, G60, L60, L90, N60, T60	40F5	Power Swing Detect Function	0 to 1	---	1	F102	0 (Disabled)
"	40F6	Power Swing Detect Source	0 to 5	---	1	F167	0 (SRC 1)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	40F7	Power Swing Detect Mode	0 to 1	---	1	F513	0 (Two Step)
"	40F8	Power Swing Detect Supervision	0.05 to 30	pu	0.001	F001	600
"	40F9	Power Swing Detect Forward Reach	0.1 to 500	ohms	0.01	F001	5000
"	40FA	Power Swing Detect Forward RCA	40 to 90	degrees	1	F001	75
"	40FB	Power Swing Detect Reverse Reach	0.1 to 500	ohms	0.01	F001	5000
"	40FC	Power Swing Detect Reverse RCA	40 to 90	degrees	1	F001	75
"	40FD	Power Swing Detect Outer Limit Angle	40 to 140	degrees	1	F001	120
"	40FE	Power Swing Detect Middle Limit Angle	40 to 140	degrees	1	F001	90
"	40FF	Power Swing Detect Inner Limit Angle	40 to 140	degrees	1	F001	60
"	4100	Power Swing Detect Delay 1 Pickup	0 to 65.535	s	0.001	F001	30
"	4101	Power Swing Detect Delay 1 Reset	0 to 65.535	s	0.001	F001	50
"	4102	Power Swing Detect Delay 2 Pickup	0 to 65.535	s	0.001	F001	17
"	4103	Power Swing Detect Delay 3 Pickup	0 to 65.535	s	0.001	F001	9
"	4104	Power Swing Detect Delay 4 Pickup	0 to 65.535	s	0.001	F001	17
"	4105	Power Swing Detect Seal In Delay	0 to 65.535	s	0.001	F001	400
"	4106	Power Swing Detect Trip Mode	0 to 1	---	1	F514	0 (Delayed)
"	4107	Power Swing Detect Block	0 to 4294967295	---	1	F300	0
"	4109	Power Swing Detect Target	0 to 2	---	1	F109	0 (Self-reset)
"	410A	Power Swing Detect Event	0 to 1	---	1	F102	0 (Disabled)
"	410B	Power Swing Detect Shape	0 to 1	---	1	F085	0 (Mho Shape)
"	410C	Power Swing Detect Quad Forward Middle	0.1 to 500	ohms	0.01	F001	6000
"	410D	Power Swing Detect Quad Forward Outer	0.1 to 500	ohms	0.01	F001	7000
"	410E	Power Swing Detect Quad Reverse Middle	0.1 to 500	ohms	0.01	F001	6000
"	410F	Power Swing Detect Quad Reverse Outer	0.1 to 500	ohms	0.01	F001	7000
"	4110	Power Swing Detect Outer Right Blinder	0.1 to 500	ohms	0.01	F001	10000
"	4111	Power Swing Detect Outer Left Blinder	0.1 to 500	ohms	0.01	F001	10000
"	4112	Power Swing Detect Middle Right Blinder	0.1 to 500	ohms	0.01	F001	10000
"	4113	Power Swing Detect Middle Left Blinder	0.1 to 500	ohms	0.01	F001	10000
"	4114	Power Swing Detect Inner Right Blinder	0.1 to 500	ohms	0.01	F001	10000
"	4115	Power Swing Detect Inner Left Blinder	0.1 to 500	ohms	0.01	F001	10000
"	4116	Power Swing I2 Supervision Enable	0 to 4294967295	---	1	F300	0
"	4118	Power Swing I2 Supervision	0.05 to 30	pu	0.001	F001	200
	Motor Setup (Read/Write Setting)						
M60	4119	Thermal Model Motor FLA	0.05 to 1	pu	0.001	F001	1000
"	411A	Thermal Model Motor Service (Overload) Factor	1 to 1.5	---	0.01	F001	100
"	411B	Thermal Model Line Source	0 to 5	---	1	F167	0 (SRC 1)
"	411C	Thermal Model Motor Offline	0 to 4294967295	---	1	F300	0
"	411E	Thermal Model RTD 1	0 to 48	---	1	F151	0 (NONE)
"	411F	Thermal Model RTD 2	0 to 48	---	1	F151	0 (NONE)
"	4120	Thermal Model RTD 3	0 to 48	---	1	F151	0 (NONE)
"	4121	Thermal Model RTD 4	0 to 48	---	1	F151	0 (NONE)
"	4122	Thermal Model RTD 5	0 to 48	---	1	F151	0 (NONE)
"	4123	Thermal Model RTD 6	0 to 48	---	1	F151	0 (NONE)
"	4124	Motor Emergency Restart	0 to 4294967295	---	1	F300	0
"	4126	Motor Nameplate Voltage	100 to 50000	V	1	F001	600

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	4127	Speed 2 Motor Protection	0 to 1	---	1	F102	0 (Disabled)
"	4128	Speed 2 Motor Switch	0 to 4294967295	---	1	F300	0
"	412A	Speed 2 Switch 2-1 Delay	0 to 600	s	0.01	F001	500
"	412B	Speed 2 Motor Source	0 to 5	---	1	F167	0 (SRC 1)
"	412C	Speed 2 Motor FLA	0.05 to 1	pu	0.001	F001	1000
	Accidental Energization (Read/Write Grouped Setting)						
G30, G60	412D	Accidental Energization Function	0 to 1	---	1	F102	0 (Disabled)
"	412E	Accidental Energization Source	0 to 5	---	1	F167	0 (SRC 1)
"	412F	Accidental Energization Arming Mode	0 to 1	---	1	F193	0 (UV AND OFFLINE)
"	4130	Accidental Energization OC Pickup	0.02 to 3	pu	0.001	F003	300
"	4132	Accidental Energization UV Pickup	0.004 to 3	pu	0.001	F003	500
"	4134	Accidental Energization Offline	0 to 4294967295	---	1	F300	0
"	4136	Accidental Energization Block	0 to 4294967295	---	1	F300	0
"	4138	Accidental Energization Target	0 to 2	---	1	F109	0 (Self-reset)
"	4139	Accidental Energization Events	0 to 1	---	1	F102	0 (Disabled)
"	413A	Reserved (5 items)	0 to 65535	---	1	F001	0
	Loss of Excitation (Read/Write Grouped Setting)						
G30, G60	413F	Loss Of Excitation Function	0 to 1	---	1	F102	0 (Disabled)
"	4140	Loss Of Excitation Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	4141	Loss Of Excitation Center 1	0.1 to 300	ohm	0.01	F001	1000
"	4142	Loss Of Excitation Radius 1	0.1 to 300	ohm	0.01	F001	800
"	4143	Loss Of Excitation UV Supervision Enable 1	0 to 1	---	1	F102	1 (Enabled)
"	4144	Loss Of Excitation Pickup Delay 1	0 to 65.535	s	0.001	F001	50
"	4145	Loss Of Excitation Center 2	0.1 to 300	ohm	0.01	F001	1200
"	4146	Loss Of Excitation Radius 2	0.1 to 300	ohm	0.01	F001	1000
"	4147	Loss Of Excitation UV Supervision Enable 2	0 to 1	---	1	F102	1 (Enabled)
"	4148	Loss Of Excitation Pickup Delay 2	0 to 65.535	s	0.001	F001	500
"	4149	Loss Of Excitation UV Supervision	0 to 1.25	pu	0.001	F001	700
"	414A	Loss Of Excitation Block	0 to 4294967295	---	1	F300	0
"	414C	Loss Of Excitation Target	0 to 2	---	1	F109	0 (Self-reset)
"	414D	Loss Of Excitation Events	0 to 1	---	1	F102	0 (Disabled)
"	414E	Reserved (5 items)	0 to 65535	---	1	F001	0
	Sensitive Directional Power (Read/Write Grouped Setting) (2 Modules)						
C60, D60, F60, G30, G60, L90, M60, N60, T60	4153	Sensitive Directional Power 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	4154	Sensitive Directional Power 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	4155	Sensitive Directional Power 1 RCA	0 to 359	degrees	1	F001	0
"	4156	Sensitive Directional Power 1 Calibration	0 to 0.95	degrees	0.05	F001	0
"	4157	Sensitive Directional Power 1 STG1 SMIN	-1.2 to 1.2	pu	0.001	F002	100
"	4158	Sensitive Directional Power 1 STG1 Delay	0 to 600	s	0.01	F001	50
"	4159	Sensitive Directional Power 1 STG2 SMIN	-1.2 to 1.2	pu	0.001	F002	100
"	415A	Sensitive Directional Power 1 STG2 Delay	0 to 600	s	0.01	F001	2000
"	415B	Sensitive Directional Power 1 Block	0 to 4294967295	---	1	F300	0
"	415D	Sensitive Directional Power 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	415E	Sensitive Directional Power 1 Events	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	415F	Reserved (5 items)	0 to 65535	---	1	F001	0
"	4164	...Repeated for Sensitive Directional Power 2					
	Underpower (Read/Write Grouped Setting) (2 Modules)						
M60	4175	Underpower 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	4176	Underpower 1 Start Block Delay	0 to 600	s	0.01	F001	50
"	4177	Underpower 1 Alarm Power Pickup	0.05 to 2	pu	0.01	F001	50
"	4178	Underpower 1 Alarm Pickup Delay	0 to 600	s	0.01	F001	200
"	4179	Underpower 1 Trip Power Pickup	0.05 to 2	pu	0.01	F001	40
"	417A	Underpower 1 Trip Pickup Delay	0 to 600	s	0.01	F001	100
"	417B	Underpower 1 Trip Reset Delay	0 to 600	s	0.01	F001	100
"	417C	Underpower 1 Block	0 to 4294967295	---	1	F300	0
"	417E	Underpower 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	417F	Underpower 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	4180	...Repeated for Underpower 2					
	Load Encroachment (Read/Write Grouped Setting)						
D30, D60, F60, L60, L90, T60	418B	Load Encroachment Function	0 to 1	---	1	F102	0 (Disabled)
"	418C	Load Encroachment Source	0 to 5	---	1	F167	0 (SRC 1)
"	418D	Load Encroachment Minimum Voltage	0.004 to 3	pu	0.001	F001	250
"	418E	Load Encroachment Reach	0.02 to 250	ohms	0.01	F001	100
"	418F	Load Encroachment Angle	5 to 50	degrees	1	F001	30
"	4190	Load Encroachment Pickup Delay	0 to 65.535	s	0.001	F001	0
"	4191	Load Encroachment Reset Delay	0 to 65.535	s	0.001	F001	0
"	4192	Load Encroachment Block	0 to 4294967295	---	1	F300	0
"	4194	Load Encroachment Target	0 to 2	---	1	F109	0 (Self-reset)
"	4195	Load Encroachment Events	0 to 1	---	1	F102	0 (Disabled)
"	4196	Reserved (6 items)	0 to 65535	---	1	F001	0
	Third Harmonic Neutral Undervoltage (Read/Write Grouped Setting)						
G30, G60	419C	Third Harmonic Neutral Undervoltage Function	0 to 1	---	1	F102	0 (Disabled)
"	419D	Third Harmonic Neutral Undervoltage Pickup	0.001 to 3	pu	0.0001	F003	3000
"	419F	Third Harmonic Neutral Undervoltage Delay	0 to 600	s	0.01	F001	0
"	41A0	Third Harmonic Neutral Undervoltage Max Power	0 to 1.25	pu	0.001	F003	200
"	41A2	Third Harmonic Neutral Undervoltage Min Power	0 to 1.25	pu	0.001	F003	200
"	41A4	Third Harmonic Neutral Undervoltage Volt Supervision	0 to 1.25	pu	0.001	F001	500
"	41A5	Third Harmonic Neutral Undervoltage Block	0 to 4294967295	---	1	F300	0
"	41A7	Third Harmonic Neutral Undervoltage Target	0 to 2	---	1	F109	0 (Self-reset)
"	41A8	Third Harmonic Neutral Undervoltage Events	0 to 1	---	1	F102	0 (Disabled)
"	41A9	Reserved (4 items)	0 to 65535	---	1	F001	0
	Generator Unbalance (Read/Write Grouped Setting)						
G30, G60	41AD	Generator Unbalance Function	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	41AE	Generator Unbalance Source	0 to 5	---	1	F167	0 (SRC 1)
"	41AF	Generator Unbalance Inom (rated full load current of the machine)	0 to 1.25	pu	0.001	F001	800
"	41B0	Generator Unbalance Stage 1 Pickup	0 to 100	%	0.01	F001	800
"	41B1	Generator Unbalance Stage 1 K value	0 to 100	---	0.01	F001	100
"	41B2	Generator Unbalance Stage 1 Tmin	0 to 50	s	0.001	F001	250
"	41B3	Generator Unbalance Stage 1 Tmax	0 to 1000	s	0.1	F001	6000
"	41B4	Generator Unbalance Stage 1 K Reset	0 to 1000	s	0.1	F001	2400
"	41B5	Generator Unbalance Stage 2 Pickup	0 to 100	%	0.01	F001	300
"	41B6	Generator Unbalance Stage 2 Pickup Delay	0 to 1000	s	0.1	F001	50
"	41B7	Generator Unbalance Block	0 to 4294967295	---	1	F300	0
"	41B9	Generator Unbalance Target	0 to 2	---	1	F109	0 (Self-reset)
"	41BA	Generator Unbalance Events	0 to 1	---	1	F102	0 (Disabled)
"	41BB	Reserved (3 items)	0 to 65535	---	1	F001	0
	Stator Ground Source (Read/Write Grouped Setting)						
G30, G60	41BE	Stator Ground Source	0 to 5	---	1	F167	0 (SRC 1)
	Subharmonic Stator Ground (Read/Write Grouped Setting)						
G60	41BF	Subharmonic Stator Ground Function	0 to 1	---	1	F102	0 (Disabled)
"	41C0	Subharmonic Stator Ground Stage 1 Pickup	1 to 20	kOhm	1	F001	10
"	41C1	Subharmonic Stator Ground Stage 1 Pickup Delay	0.1 to 600	s	0.1	F001	100
"	41C2	Subharmonic Stator Ground Stage 2 Pickup	1 to 20	kOhm	1	F001	3
"	41C3	Subharmonic Stator Ground Stage 2 Pickup Delay	0.1 to 600	s	0.1	F001	10
"	41C4	Subharmonic CT Angle Compensation	-30 to 30	degrees	0.1	F002	0
"	41C5	Subharmonic Stator Ground OC Pickup	0.001 to 1	pu	0.001	F001	10
"	41C6	Subharmonic Stator Ground OC Delay	0.1 to 600	s	0.01	F001	100
"	41C7	Subharmonic Stator Ground Volt Supv	0 to 0.1	pu	0.001	F001	0
"	41C8	Subharmonic Stator Ground Curr Supv	0 to 0.1	pu	0.001	F001	0
"	41C9	Subharmonic Stator Ground Block	0 to 4294967295	---	---	F300	0
"	41CB	Subharmonic Stator Ground Events	0 to 1	---	1	F102	0 (Disabled)
"	41CC	Subharmonic Stator Ground Target	0 to 2	---	1	F109	0 (Self-reset)
	Stator Ground (Read/Write Grouped Setting)						
G30, G60	41CD	Stator Ground Function	0 to 1	---	1	F102	0 (Disabled)
"	41CE	Stator Ground Stage 1 Pickup	0 to 0.9	pu	0.001	F001	150
"	41CF	Stator Ground Stage 1 Pickup Delay	0 to 600	s	0.01	F001	100
"	41D0	Stator Ground Stage 1 Supv	0.001 to 0.1	pu	0.0001	F001	57
"	41D1	Stator Ground Stage 2 Pickup	0 to 0.9	pu	0.001	F001	150
"	41D2	Stator Ground Stage 2 Pickup Delay	0 to 600	s	0.01	F001	0
"	41D3	Stator Ground Stage 2 Supv	0.001 to 0.1	pu	0.0001	F001	45
"	41D4	Stator Ground Block	0 to 4294967295	---	1	F300	0
"	41D6	Stator Ground Target	0 to 2	---	1	F109	0 (Self-reset)
"	41D7	Stator Ground Event	0 to 1	---	1	F102	0 (Disabled)
"	41D8	Reserved (5 items)	0 to 65535	---	1	F001	0
	Split Phase Protection (Read/Write Grouped Setting)						
G30, G60	41DD	Split Phase Protection Function	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	41DE	Split Phase Protection Source	0 to 5	---	1	F167	0 (SRC1)
"	41DF	Split Phase Protection Load Source	0 to 5	---	1	F167	0 (SRC1)
"	41E0	Split Phase Protection Phase A Pickup	0.02 to 1.5	pu	0.001	F001	200
"	41E1	Split Phase Protection Phase A Offset	0 to 1	pu	0.001	F001	0
"	41E2	Split Phase Protection Phase A Slope	0 to 100	%	0.1	F001	0
"	41E3	Split Phase Protection Phase B Pickup	0.02 to 1.5	pu	0.001	F001	200
"	41E4	Split Phase Protection Phase B Offset	0 to 1	pu	0.001	F001	0
"	41E5	Split Phase Protection Phase B Slope	0 to 100	%	0.1	F001	0
"	41E6	Split Phase Protection Phase C Pickup	0.02 to 1.5	pu	0.001	F001	200
"	41E7	Split Phase Protection Phase C Offset	0 to 1	pu	0.001	F001	0
"	41E8	Split Phase Protection Phase C Slope	0 to 100	%	0.1	F001	0
"	41E9	Split Phase Protection Minimum Load	0 to 1	pu	0.01	F001	0
"	41EA	Split Phase Protection Mode	0 to 1	---	1	F225	0 (Over)
"	41EB	Split Phase Protection Delay	0 to 65.535	s	0.001	F001	0
"	41EC	Split Phase Protection Block	0 to 4294967295	---	1	F300	0
"	41EE	Split Phase Protection Target	0 to 2	---	1	F109	0 (Self-Reset)
"	41EF	Split Phase Protection Events	0 to 1	---	1	F102	0 (Disabled)
"	41F0	Reserved (6 items)	0 to 65535	---	1	F001	0
	Reduced Voltage Starting (Read/Write Setting)						
M60	41F6	Reduced Voltage Start Function	0 to 1	---	1	F102	0 (Disabled)
"	41F7	Reduced Voltage Start Transition Mode	0 to 2	---	1	F095	0 (Current Only)
"	41F8	Reduced Voltage Start FLA (full load current)	25 to 300	%	1	F001	125
"	41F9	Reduced Voltage Start Timer	1 to 600	s	0.1	F001	100
"	41FA	Reduced Voltage Start Block	0 to 4294967295	---	1	F300	0
"	41FC	Reduced Voltage Target	0 to 2	---	1	F109	0 (Self-reset)
"	41FD	Reduced Voltage Start Event	0 to 1	---	1	F102	0 (Disabled)
"	41FE	Reserved (5 items)	0 to 1	---	1	F001	0
	Trip Output (Read/Write Setting)						
C60, D60, L60, L90	4203	Trip Mode	0 to 2	---	1	F195	0 (Disabled)
"	4204	Trip 3-Pole Input1	0 to 4294967295	---	1	F300	0
"	4206	Trip 3-Pole Input2	0 to 4294967295	---	1	F300	0
"	4208	Trip 3-Pole Input3	0 to 4294967295	---	1	F300	0
"	420A	Trip 3-Pole Input4	0 to 4294967295	---	1	F300	0
"	420C	Trip 3-Pole Input5	0 to 4294967295	---	1	F300	0
"	420E	Trip 3-Pole Input6	0 to 4294967295	---	1	F300	0
"	4210	Trip 1-Pole Input1	0 to 4294967295	---	1	F300	0
"	4212	Trip 1-Pole Input2	0 to 4294967295	---	1	F300	0
"	4214	Trip 1-Pole Input3	0 to 4294967295	---	1	F300	0
"	4216	Trip 1-Pole Input4	0 to 4294967295	---	1	F300	0
"	4218	Trip 1-Pole Input5	0 to 4294967295	---	1	F300	0
"	421A	Trip 1-Pole Input6	0 to 4294967295	---	1	F300	0
"	421C	Trip Reclose Input1	0 to 4294967295	---	1	F300	0
"	421E	Trip Reclose Input2	0 to 4294967295	---	1	F300	0
"	4220	Trip Reclose Input3	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	4222	Trip Reclose Input4	0 to 4294967295	---	1	F300	0
"	4224	Trip Reclose Input5	0 to 4294967295	---	1	F300	0
"	4226	Trip Reclose Input6	0 to 4294967295	---	1	F300	0
"	4228	Trip Force 3-Pole	0 to 4294967295	---	1	F300	0
"	422A	Trip Pilot Priority	0 to 65.535	s	0.001	F001	0
"	422B	Breaker Phase A Open	0 to 4294967295	---	1	F300	0
"	422D	Breaker Phase B Open	0 to 4294967295	---	1	F300	0
"	422F	Breaker Phase C Open	0 to 4294967295	---	1	F300	0
"	4231	Trip Events	0 to 1	---	1	F102	0 (Disabled)
"	4232	Reverse Fault Operand	0 to 4294967295	---	1	F300	0
"	4234	Trip Delay On Evolving Faults	0 to 65.535	s	0.001	F001	0
"	4235	Trip Seal-In Delay	0 to 65.535	s	0.001	F001	0
"	4236	Trip Reset	0 to 2	---	1	F609	0 (Pole Curr OR Custom)
"	4237	Start Timer Zone 2 Phase Input 1	0 to 4294967295	---	1	F300	0
"	4239	Start Timer Zone 2 Phase Input 2	0 to 4294967295	---	1	F300	0
"	423B	Start Timer Zone 2 Ground Input 1	0 to 4294967295	---	1	F300	0
"	423D	Start Timer Zone 2 Ground Input 2	0 to 4294967295	---	1	F300	0
"	423F	Phase Selector Reset Delay	0.5 to 3	s	0.001	F001	500
"	4240	Phase Selector Reset	0 to 4294967295	---	1	F300	0
"	4242	Reserved (4 items)	0 to 1	---	1	F001	0
	Time Overcurrent (Read/Write Grouped Setting) (24 Modules)						
B90	423B	Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	423C	Time Overcurrent 1 CT Setting	0 to 23	---	1	F400	0
"	423D	Time Overcurrent 1 Pickup	0.02 to 30	pu	0.001	F001	1200
"	423E	Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	423F	Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	4240	Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	4241	Time Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	4243	Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	4244	Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	4245	Reserved (2 items)	0 to 65535	---	1	F001	0
"	4247	...Repeated for Time Overcurrent 2					
"	4253	...Repeated for Time Overcurrent 3					
"	425F	...Repeated for Time Overcurrent 4					
"	426B	...Repeated for Time Overcurrent 5					
"	4277	...Repeated for Time Overcurrent 6					
"	4283	...Repeated for Time Overcurrent 7					
"	428F	...Repeated for Time Overcurrent 8					
"	429B	...Repeated for Time Overcurrent 9					
"	42A7	...Repeated for Time Overcurrent 10					
"	42B3	...Repeated for Time Overcurrent 11					
"	42BF	...Repeated for Time Overcurrent 12					
"	42CB	...Repeated for Time Overcurrent 13					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	42D7	...Repeated for Time Overcurrent 14					
"	42E3	...Repeated for Time Overcurrent 15					
"	42EF	...Repeated for Time Overcurrent 16					
"	42FB	...Repeated for Time Overcurrent 17					
"	4307	...Repeated for Time Overcurrent 18					
"	4313	...Repeated for Time Overcurrent 19					
"	431F	...Repeated for Time Overcurrent 20					
"	432B	...Repeated for Time Overcurrent 21					
"	4337	...Repeated for Time Overcurrent 22					
"	4343	...Repeated for Time Overcurrent 23					
"	434F	...Repeated for Time Overcurrent 24					
	Open Pole Detect (1P) (Read/Write Setting)						
C60, D60, L60, L90	4246	Open Pole Function	0 to 1	---	1	F102	0 (Disabled)
"	4247	Open Pole Block	0 to 4294967295	---	1	F300	0
"	4249	Open Pole Voltage Supervision	0 to 1	---	1	F102	0 (Disabled)
"	424A	Open Pole Current Pickup	0.02 to 30	pu	0.001	F001	50
"	424B	Open Pole Target	0 to 2	---	1	F109	0 (Self-reset)
"	424C	Open Pole Events	0 to 1	---	1	F102	0 (Disabled)
"	424D	Open Pole Line XC0	300 to 9999.9	ohms	0.1	F003	99999
"	424F	Open Pole Line XC1	300 to 9999.9	ohms	0.1	F003	99999
"	4251	Open Pole Remote Current Pickup	0.02 to 30	pu	0.001	F001	50
"	4252	Open Pole Detection	0 to 1	---	1	F608	0 (I AND V AND CBaux)
"	4253	Open Pole Mode	0 to 1	---	1	F607	0 (Accelerated)
"	4254	Reserved (3 items)	0 to 1	---	1	F001	0
	Pilot DUTT (1P) (Read/Write Setting)						
D60, L90	4257	DUTT Function	0 to 1	---	1	F102	0 (Disabled)
"	4258	DUTT Seal In Delay	0 to 65.535	s	0.001	F001	0
"	4259	DUTT 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	425A	DUTT RX1	0 to 4294967295	---	1	F300	0
"	425C	DUTT RX2	0 to 4294967295	---	1	F300	0
"	425E	DUTT RX3	0 to 4294967295	---	1	F300	0
"	4260	DUTT RX4	0 to 4294967295	---	1	F300	0
"	4262	DUTT 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	4263	DUTT 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	4264	DUTT 1P Scheme Block	0 to 4294967295	---	1	F300	0
"	4266	Reserved (6 items)	0 to 1	---	1	F001	0
	Pilot PUTT (1P) (Read/Write Setting)						
D60, L90	426C	PUTT 1P Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	426D	PUTT 1P Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	426E	PUTT 1P Seal In Delay	0 to 65.535	s	0.001	F001	0
"	426F	PUTT 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	4270	PUTT 1P Rx1	0 to 4294967295	---	1	F300	0
"	4272	PUTT 1P Rx2	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	4274	PUTT 1P Rx3	0 to 4294967295	---	1	F300	0
"	4276	PUTT 1P Rx4	0 to 4294967295	---	1	F300	0
"	4278	PUTT 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	4279	PUTT 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	427A	PUTT 1P Scheme Block	0 to 4294967295	---	1	F300	0
"	427C	Reserved (5 items)	0 to 1	---	1	F001	0
	Pilot Hybrid POTT (1P) (Read/Write Setting)						
D60, L90	4281	Hybrid POTT 1P Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	4282	Hybrid POTT 1P Permissive Echo	0 to 2	---	1	F199	0 (Disabled)
"	4283	Hybrid POTT 1P Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	4284	Hybrid POTT 1P Trans Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	4285	Hybrid POTT 1P Trans Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	4286	Hybrid POTT 1P Echo Duration	0 to 65.535	s	0.001	F001	100
"	4287	Hybrid POTT 1P Echo Lockout	0 to 65.535	s	0.001	F001	250
"	4288	Hybrid POTT 1P Seal In Delay	0 to 65.535	s	0.001	F001	0
"	4289	Hybrid POTT 1P Ground Directional Overcurrent Forward	0 to 4294967295	---	1	F300	0
"	428B	Hybrid POTT 1P Gnd Directional Overcurrent Reverse	0 to 4294967295	---	1	F300	0
"	428D	Hybrid POTT 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	428E	Hybrid POTT 1P Rx1	0 to 4294967295	---	1	F300	0
"	4290	Hybrid POTT 1P Rx2	0 to 4294967295	---	1	F300	0
"	4292	Hybrid POTT 1P Rx3	0 to 4294967295	---	1	F300	0
"	4294	Hybrid POTT 1P Rx4	0 to 4294967295	---	1	F300	0
"	4296	Hybrid POTT 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	4297	Hybrid POTT 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	4298	Hybrid POTT 1P Echo Condition	0 to 4294967295	---	1	F300	0
"	429A	Hybrid POTT 1P Weak Infeed	0 to 2	---	1	F199	1 (Enabled)
"	429B	Hybrid POTT 1P Weak Infeed Condition	0 to 4294967295	---	1	F300	0
"	429D	Hybrid POTT 1P Block	0 to 4294967295	---	1	F300	0
"	429F	Reserved (3 items)	0 to 1	---	1	F001	0
	Pilot Blocking (1P) (Read/Write Setting)						
D60, L90	42A2	Blocking Scheme 1P Function	0 to 1	---	1	F102	0 (Disabled)
"	42A3	Block 1P Rx Coord Pickup Delay	0 to 65.535	s	0.001	F001	10
"	42A4	Block 1P Transient Block Pickup Delay	0 to 65.535	s	0.001	F001	30
"	42A5	Block 1P Transient Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	42A6	Blocking Scheme 1P Seal In Delay	0 to 65.535	s	0.001	F001	0
"	42A7	Blocking Scheme 1P Gnd Directional Overcurrent Fwd	0 to 4294967295	---	1	F300	0
"	42A9	Blocking Scheme 1P Gnd Directional Overcurrent Rev	0 to 4294967295	---	1	F300	0
"	42AB	Blocking Scheme 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	42AC	Blocking Scheme 1P Rx1	0 to 4294967295	---	1	F300	0
"	42AE	Blocking Scheme 1P Rx2	0 to 4294967295	---	1	F300	0
"	42B0	Blocking Scheme 1P Rx3	0 to 4294967295	---	1	F300	0
"	42B2	Blocking Scheme 1P Rx4	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	42B4	Blocking 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	42B5	Blocking 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	42B6	Blocking Scheme 1P Block	0 to 4294967295	---	1	F300	0
"	42B8	Reserved (5 items)	0 to 1	---	1	F001	0
	Pilot Directional Comparison Unblocking (DCUB) Scheme (Read/Write Setting)						
D60, L90	42FA	Directional Comparison Unblocking Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	42FB	Directional Comparison Unblocking Block	0 to 4294967295	---	1	F300	0
"	42FD	Directional Comparison Unblocking Permissive Echo	0 to 2	---	1	F199	0 (Disabled)
"	42FE	Directional Comparison Unblocking Echo Condition	0 to 4294967295	---	1	F300	0
"	4300	DCUB Ground Directional Overcurrent Forward	0 to 4294967295	---	1	F300	0
"	4302	DCUB Ground Directional Overcurrent Reverse	0 to 4294967295	---	1	F300	0
"	4304	DCUB Transmit Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	4305	DCUB Transmit Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	4306	Directional Comparison Unblocking Echo Duration	0 to 65.535	s	0.001	F001	100
"	4307	Directional Comparison Unblocking Echo Lockout	0 to 65.535	s	0.001	F001	250
"	4308	DCUB Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	50
"	4309	DCUB Loss-of-Guard (Log) Pickup Delay	0 to 65.535	s	0.001	F001	8
"	430A	DCUB Guard Healthy Reset Delay	0 to 65.535	s	0.001	F001	15
"	430B	DCUB Loss-of-Guard Trip Window	0 to 65.535	s	0.001	F001	150
"	430C	Directional Comparison Unblocking Seal-In Delay	0 to 65.535	s	0.001	F001	10
"	430D	Directional Comparison Unblocking Communication Bits	0 to 2	---	1	F198	0 (1 bit)
"	430E	Directional Comparison Unblocking Rx1	0 to 4294967295	---	1	F300	0
"	4310	Directional Comparison Unblocking Log1	0 to 4294967295	---	1	F300	0
"	4312	Directional Comparison Unblocking Rx2	0 to 4294967295	---	1	F300	0
"	4314	Directional Comparison Unblocking Log2	0 to 4294967295	---	1	F300	0
"	4316	Directional Comparison Unblocking Rx3	0 to 4294967295	---	1	F300	0
"	4318	Directional Comparison Unblocking Log3	0 to 4294967295	---	1	F300	0
"	431A	Directional Comparison Unblocking Rx4	0 to 4294967295	---	1	F300	0
"	431C	Directional Comparison Unblocking Log4	0 to 4294967295	---	1	F300	0
"	431E	Directional Comparison Unblocking Target	0 to 2	---	1	F109	0 (Self-Reset)
"	431F	Directional Comparison Unblocking Event	0 to 1	--	1	F102	0 (Disabled)
"	4320	Reserved (6 items)	0 to 1	--	1	F001	0
	Motor Acceleration Commands (Read/Write Command)						
M60	4326	Motor Acceleration Clear Data Command	0 to 1	---	1	F126	0 (No)
	Motor Maximum Starting Rate (Read/Write Setting)						
M60	4327	Starts Per Hour Function	0 to 1	---	1	F102	0 (Disabled)
"	4328	Starts Per Hour Time Interval	1 to 300	min	1	F001	60
"	4329	Starts Per Hour Maximum Number of Starts	1 to 16	---	1	F001	3
"	432A	Starts Per Hour Block	0 to 4294967295	---	1	F300	0
"	432C	Starts Per Hour Target	0 to 2	---	1	F109	0 (Self-reset)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	432D	Starts Per Hour Events	0 to 1	---	1	F102	0 (Disabled)
"	432E	Reserved (9 items)	---	---	---	F001	0
	Motor Time Between Starts (Read/Write Setting)						
M60	4337	Time Between Starts Function	0 to 1	---	1	F102	0 (Disabled)
"	4338	Time Between Starts Minimum Time	0 to 300	min	1	F001	20
"	4339	Time Between Starts Block	0 to 4294967295	---	1	F300	0
"	433B	Time Between Starts Target	0 to 2	---	1	F109	0 (Self-reset)
"	433C	Time Between Starts Events	0 to 1	---	1	F102	0 (Disabled)
"	433D	Reserved (10 items)	0 to 1	---	1	F001	0
	Motor Restart Delay (Read/Write Setting)						
M60	4347	Restart Delay Function	0 to 1	---	1	F102	0 (Disabled)
"	4348	Restart Delay Minimum Time	0 to 50000	s	1	F001	0
"	4349	Restart Delay Block	0 to 4294967295	---	1	F300	0
"	434B	Restart Delay Target	0 to 2	---	1	F109	0 (Self-reset)
"	434C	Restart Delay Events	0 to 1	---	1	F102	0 (Disabled)
"	434D	Reserved (10 items)	---	---	---	F001	0
	Motor Mechanical Jam (Read/Write Grouped Setting)						
M60	4357	Mechanical Jam Function	0 to 1	---	1	F102	0 (Disabled)
"	4358	Mechanical Jam Pickup	1 to 10	x FLA	0.01	F001	200
"	4359	Mechanical Jam Pickup Delay	0.1 to 600	s	0.01	F001	10
"	435A	Mechanical Jam Reset Delay	0 to 600	s	0.01	F001	0
"	435B	Mechanical Jam Block	0 to 4294967295	---	1	F300	0
"	435D	Mechanical Jam Target	0 to 2	---	1	F109	0 (Self-reset)
"	435E	Mechanical Jam Events	0 to 1	---	1	F102	0 (Disabled)
"	435F	Reserved (8 items)	---	---	---	F001	0
	Motor Learned Data (Read/Write Setting)						
M60	4367	Motor Learned Data Starts to Learn	1 to 5	---	1	F001	1
"	4368	Motor Learned Data Calculation Period	1 to 90	minutes	1	F001	15
	RTD Inputs (Read/Write Setting) (48 Modules)						
All except B90	4369	RTD Input 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	436A	RTD Input 1 ID	---	---	---	F205	"RTD Ip 1"
"	4371	RTD Input 1 Type	0 to 3	---	1	F174	0 (100 ohm Platinum)
"	4372	RTD Input 1 Application	0 to 5	---	1	F550	0 (None)
"	4373	RTD Input 1 Alarm Temperature	1 to 249	°C	1	F001	130
"	4374	RTD Input 1 Alarm Pickup Delay	0 to 600	s	0.01	F001	0
"	4375	RTD Input 1 Trip Temperature	1 to 249	°C	1	F001	130
"	4376	RTD Input 1 Trip Pickup Delay	0 to 600	s	0.01	F001	0
"	4377	RTD Input 1 Trip Reset Delay	0 to 600	s	0.01	F001	0
"	4378	RTD Input 1 Trip Voting	0 to 48	---	1	F551	0
"	4379	RTD Input 1 Open	0 to 2	---	1	F552	0 (None)
"	437A	RTD Input 1 Block	0 to 4294967295	---	1	F300	0
"	437C	RTD Input 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	437D	RTD Input 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	437E	...Repeated for RTD Input 2					
"	4393	...Repeated for RTD Input 3					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	43A8	...Repeated for RTD Input 4					
"	43BD	...Repeated for RTD Input 5					
"	43D2	...Repeated for RTD Input 6					
"	43E7	...Repeated for RTD Input 7					
"	43FC	...Repeated for RTD Input 8					
"	4411	...Repeated for RTD Input 9					
"	4426	...Repeated for RTD Input 10					
"	443B	...Repeated for RTD Input 11					
"	4450	...Repeated for RTD Input 12					
"	4465	...Repeated for RTD Input 13					
"	447A	...Repeated for RTD Input 14					
"	448F	...Repeated for RTD Input 15					
"	44A4	...Repeated for RTD Input 16					
"	44B9	...Repeated for RTD Input 17					
"	44CE	...Repeated for RTD Input 18					
"	44E3	...Repeated for RTD Input 19					
"	44F8	...Repeated for RTD Input 20					
"	450D	...Repeated for RTD Input 21					
"	4522	...Repeated for RTD Input 22					
"	4537	...Repeated for RTD Input 23					
"	454C	...Repeated for RTD Input 24					
"	4561	...Repeated for RTD Input 25					
"	4576	...Repeated for RTD Input 26					
"	458B	...Repeated for RTD Input 27					
"	45A0	...Repeated for RTD Input 28					
"	45B5	...Repeated for RTD Input 29					
"	45CA	...Repeated for RTD Input 30					
"	45DF	...Repeated for RTD Input 31					
"	45F4	...Repeated for RTD Input 32					
"	4609	...Repeated for RTD Input 33					
"	461E	...Repeated for RTD Input 34					
"	4633	...Repeated for RTD Input 35					
"	4648	...Repeated for RTD Input 36					
"	465D	...Repeated for RTD Input 37					
"	4672	...Repeated for RTD Input 38					
"	4687	...Repeated for RTD Input 39					
"	469C	...Repeated for RTD Input 40					
"	46B1	...Repeated for RTD Input 41					
"	46C6	...Repeated for RTD Input 42					
"	46DB	...Repeated for RTD Input 43					
"	46F0	...Repeated for RTD Input 44					
"	4705	...Repeated for RTD Input 45					
"	471A	...Repeated for RTD Input 46					
"	472F	...Repeated for RTD Input 47					
"	4744	...Repeated for RTD Input 48					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Undervoltage (Read/Write Grouped Setting) (12 Modules)						
B90	44F3	Undervoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	44F4	Undervoltage 1 VT	0 to 11	---	1	F400	0
"	44F5	Undervoltage 1 Pickup	0.004 to 3	pu	0.001	F001	800
"	44F6	Undervoltage 1 Minimum Voltage	0 to 1	pu	0.001	F001	0
"	44F7	Undervoltage 1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	44F8	Undervoltage 1 Reset Delay	0 to 65.535	s	0.001	F001	0
"	44F9	Undervoltage 1 Block	0 to 4294967295	---	1	F300	0
"	44FB	Undervoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	44FC	Undervoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	44FD	Reserved (6 items)	---	---	---	F001	0
"	44FF	...Repeated for Undervoltage 2					
"	450B	...Repeated for Undervoltage 3					
"	4517	...Repeated for Undervoltage 4					
"	4523	...Repeated for Undervoltage 5					
"	452F	...Repeated for Undervoltage 6					
"	453B	...Repeated for Undervoltage 7					
"	4547	...Repeated for Undervoltage 8					
"	4553	...Repeated for Undervoltage 9					
"	455F	...Repeated for Undervoltage 10					
"	456B	...Repeated for Undervoltage 11					
"	4577	...Repeated for Undervoltage 12					
	B90 Function (Read/Write Setting)						
B90	4583	B90 Function	0 to 1	---	1	F250	1 (Protection)
	B90 Power System (Read/Write Setting)						
B90	4627	Terminal Nominal Frequency	25 to 60	Hz	1	F001	60
"	4628	Terminal Reference	0 to 23	---	1	F400	0
"	462F	Terminal Frequency Tracking Function	0 to 1	---	1	F102	1 (Enabled)
	Phase Undervoltage (Read/Write Grouped Setting) (3 or 6 Modules)						
All except B90, C30, T35	4759	Phase Undervoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	475A	Phase Undervoltage 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	475B	Phase Undervoltage 1 Pickup	0.004 to 3	pu	0.001	F001	1000
"	475C	Phase Undervoltage 1 Curve	0 to 1	---	1	F111	0 (Definite Time)
"	475D	Phase Undervoltage 1 Delay	0 to 600	s	0.01	F001	100
"	475E	Phase Undervoltage 1 Minimum Voltage	0 to 3	pu	0.001	F001	100
"	475F	Phase Undervoltage 1 Block	0 to 4294967295	---	1	F300	0
"	4761	Phase Undervoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	4762	Phase Undervoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	4763	Phase Undervoltage 1 Measurement Mode	0 to 1	---	1	F186	0 (Phase to Ground)
"	4764	Reserved (6 items)	0 to 1	---	1	F001	0
"	476A	...Repeated for Phase Undervoltage 2					
"	477B	...Repeated for Phase Undervoltage 3					
B30	478C	...Repeated for Phase Undervoltage 4					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	479D	...Repeated for Phase Undervoltage 5					
"	47AE	...Repeated for Phase Undervoltage 6					
	Phase Overvoltage (Read/Write Grouped Setting) (3 or 6 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60	47BF	Phase Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	47C0	Phase Overvoltage 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	47C1	Phase Overvoltage 1 Pickup	0.004 to 3	pu	0.001	F001	1000
"	47C2	Phase Overvoltage 1 Delay	0 to 600	s	0.01	F001	100
"	47C3	Phase Overvoltage 1 Reset Delay	0 to 600	s	0.01	F001	100
"	47C4	Phase Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	47C6	Phase Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	47C7	Phase Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	47C8	...Repeated for Phase Overvoltage 2					
"	47D1	...Repeated for Phase Overvoltage 3					
B30	47DA	...Repeated for Phase Overvoltage 4					
"	47E3	...Repeated for Phase Overvoltage 5					
"	47EC	...Repeated for Phase Overvoltage 6					
	Phase Distance (Read/Write Grouped Setting) (3 or 5 Modules)						
D30, D60, G60, L60, L90, T60	47F5	Phase Distance Zone 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	47F6	Phase Distance Zone 1 Current Supervision	0.05 to 30	pu	0.001	F001	200
"	47F7	Phase Distance Zone 1 Reach	0.02 to 500	ohms	0.01	F001	200
"	47F8	Phase Distance Zone 1 Direction	0 to 2	---	1	F154	0 (Forward)
"	47F9	Phase Distance Zone 1 Comparator Limit	30 to 90	degrees	1	F001	90
"	47FA	Phase Distance Zone 1 Delay	0 to 65.535	s	0.001	F001	0
"	47FB	Phase Distance Zone 1 Block	0 to 4294967295	---	1	F300	0
"	47FD	Phase Distance Zone 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	47FE	Phase Distance Zone 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	47FF	Phase Distance Zone 1 Shape	0 to 1	---	1	F120	0 (Mho) Fixed in G60
"	4800	Phase Distance Zone 1 RCA	30 to 90	degrees	1	F001	85
"	4801	Phase Distance Zone 1 DIR RCA	30 to 90	degrees	1	F001	85
"	4802	Phase Distance Zone 1 DIR Comp Limit	30 to 90	degrees	1	F001	90
"	4803	Phase Distance Zone 1 Quad Right Blinder	0.02 to 500	ohms	0.01	F001	1000
"	4804	Phase Distance Zone 1 Quad Right Blinder RCA	60 to 90	degrees	1	F001	85
"	4805	Phase Distance Zone 1 Quad Left Blinder	0.02 to 500	ohms	0.01	F001	1000
"	4806	Phase Distance Zone 1 Quad Left Blinder RCA	60 to 90	degrees	1	F001	85
"	4807	Phase Distance Zone 1 Volt Limit	0 to 5	pu	0.001	F001	0
"	4808	Phase Distance Zone 1 Transformer Voltage Connection	0 to 12	---	1	F153	0 (None)
"	4809	Phase Distance Zone 1 Transformer Current Connection	0 to 12	---	1	F153	0 (None)
"	480A	Phase Distance Zone 1 Rev Reach	0.02 to 500	ohms	0.01	F001	200
"	480B	Phase Distance Zone 1 Rev Reach RCA	30 to 90	degrees	1	F001	85

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	480C	Reserved (10 items)	---	---	---	F001	0
"	4816	...Repeated for Phase Distance Zone 2					
"	4837	...Repeated for Phase Distance Zone 3					
D30, D60, L90 T60	4858	...Repeated for Phase Distance Zone 4					
"	4879	...Repeated for Phase Distance Zone 5					
	Ground Distance (Read/Write Grouped Setting) (3 or 5 Modules)						
D30, D60, L60, L90, T60	489A	Ground Distance Zone 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	489B	Ground Distance Zone 1 Current Supervision	0.05 to 30	pu	0.001	F001	200
"	489C	Ground Distance Zone 1 Reach	0.02 to 500	ohms	0.01	F001	200
"	489D	Ground Distance Zone 1 Direction	0 to 2	---	1	F154	0 (Forward)
"	489E	Ground Distance Zone 1 Comparator Limit	30 to 90	degrees	1	F001	90
"	489F	Ground Distance Zone 1 Delay	0 to 65.535	s	0.001	F001	0
"	48A0	Ground Distance Zone 1 Block	0 to 4294967295	---	1	F300	0
"	48A2	Ground Distance Zone 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	48A3	Ground Distance Zone 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	48A4	Ground Distance Zone 1 Shape	0 to 1	---	1	F120	0 (Mho)
"	48A5	Ground Distance Zone 1 Z0 Z1 Magnitude	0 to 10	---	0.01	F001	270
"	48A6	Ground Distance Zone 1 Z0 Z1 Angle	-90 to 90	degrees	1	F002	0
"	48A7	Ground Distance Zone 1 RCA	30 to 90	degrees	1	F001	85
"	48A8	Ground Distance Zone 1 DIR RCA	30 to 90	degrees	1	F001	85
"	48A9	Ground Distance Zone 1 DIR Comp Limit	30 to 90	degrees	1	F001	90
"	48AA	Ground Distance Zone 1 Quad Right Blinder	0.02 to 500	ohms	0.01	F001	1000
"	48AB	Ground Distance Zone 1 Quad Right Blinder RCA	60 to 90	degrees	1	F001	85
"	48AC	Ground Distance Zone 1 Quad Left Blinder	0.02 to 500	ohms	0.01	F001	1000
"	48AD	Ground Distance Zone 1 Quad Left Blinder RCA	60 to 90	degrees	1	F001	85
"	48AE	Ground Distance Zone 1 Z0M Z1 Magnitude	0 to 7	---	0.01	F001	0
"	48AF	Ground Distance Zone 1 Z0M Z1 Angle	-90 to 90	degrees	1	F002	0
"	48B0	Ground Distance Zone 1 Voltage Level	0 to 5	pu	0.001	F001	0
"	48B1	Ground Distance Zone 1 Non-Homogeneous Angle	-40 to 40	degrees	0.1	F002	0
"	48B2	Ground Distance Zone 1 POL Current	0 to 1	---	1	F521	0 (Zero-seq)
"	48B3	Ground Distance Zone 1 Reverse Reach	0.02 to 500	ohms	0.01	F001	200
"	48B4	Ground Distance Zone 1 Reverse Reach RCA	30 to 90	degrees	1	F001	85
"	48B5	Reserved (7 items)	0 to 65535	---	1	F001	0
"	48BC	...Repeated for Ground Distance Zone 2					
"	48DE	...Repeated for Ground Distance Zone 3					
D30, D60, L90, T60	4900	...Repeated for Ground Distance Zone 4					
"	4922	...Repeated for Ground Distance Zone 5					
	Line Pickup (Read/Write Grouped Setting)						
D30, D60, L60, L90	4944	Line Pickup Function	0 to 1	---	1	F102	0 (Disabled)
"	4945	Line Pickup Signal Source	0 to 5	---	1	F167	0 (SRC 1)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	4946	Line Pickup Phase IOC Pickup	0.02 to 30	pu	0.001	F001	1000
"	4947	Line Pickup UV Pickup	0.004 to 3	pu	0.001	F001	700
"	4948	Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	150
"	4949	Line End Open Reset Delay	0 to 65.535	s	0.001	F001	90
"	494A	Line Pickup OV Pickup Delay	0 to 65.535	s	0.001	F001	40
"	494B	Autoreclose Coordination Pickup Delay	0 to 65.535	s	0.001	F001	45
"	494C	Autoreclose Coordination Reset Delay	0 to 65.535	s	0.001	F001	5
"	494D	Autoreclose Coordination Bypass	0 to 1	---	1	F102	1 (Enabled)
"	494E	Line Pickup Block	0 to 4294967295	---	1	F300	0
"	4950	Line Pickup Target	0 to 2	---	1	F109	0 (Self-reset)
"	4951	Line Pickup Events	0 to 1	---	1	F102	0 (Disabled)
"	4952	Terminal Open	0 to 4294967295	---	1	F300	0
"	4954	Autoreclose Accelerate	0 to 4294967295	---	1	F300	0
"	4956	Distance Trip	0 to 1	---	1	F102	1 (Enabled)
	Phase Directional Overcurrent (Read/Write Grouped Setting) (1, 2, 3, or 6 Modules)						
B30, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60	4957	Phase Directional Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	4958	Phase Directional Overcurrent 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	4959	Phase Directional Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	495B	Phase Directional Overcurrent 1 ECA	0 to 359	---	1	F001	30
"	495C	Phase Directional Overcurrent 1 Pol V Threshold	0.004 to 3	pu	0.001	F001	700
"	495D	Phase Directional Overcurrent 1 Block Overcurrent	0 to 1	---	1	F126	0 (No)
"	495E	Phase Directional Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	495F	Phase Directional Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	4960	Phase Directional Overcurrent 1 CT Source	0 to 5	---	1	F677	0 (None)
"	4961	Phase Directional Overcurrent 1 VT Source	0 to 1	---	1	F167	0 (SRC 1)
"	4962	Reserved (6 items)	0 to 1	---	1	F001	0
B30, C70, D30, D60, F60, L30, L60, L90, M60, N60, T60	4968	...Repeated for Phase Directional Overcurrent 2					
N60, T60	4979	...Repeated for Phase Directional Overcurrent 3					
B30	498A	...Repeated for Phase Directional Overcurrent 4					
"	499B	...Repeated for Phase Directional Overcurrent 5					
"	49AC	...Repeated for Phase Directional Overcurrent 6					
	Current Unbalance (Read/Write Grouped Setting) (2 Modules)						
M60	49BD	Current Unbalance 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	49BE	Current Unbalance 1 Pickup	0.1 to 100	%	0.1	F001	400
"	49BF	Current Unbalance 1 Pickup Delay	0 to 600	s	0.01	F001	0
"	49C0	Current Unbalance 1 Reset Delay	0 to 600	s	0.01	F001	0
"	49C1	Current Unbalance 1 Block	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	49C3	Current Unbalance 1 Targets	0 to 2	---	1	F109	0 (Self-reset)
"	49C4	Current Unbalance 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	49C5	Reserved (5 items)	0 to 1	---	1	F001	0
"	49CA	...Repeated for Current Unbalance 2					
	Stator Differential (Read/Write Grouped Setting)						
G60, M60	49D7	Stator Differential Function	0 to 1	---	1	F102	0 (Disabled)
"	49D8	Stator Differential Pickup	0.05 to 1	pu	0.001	F001	100
"	49D9	Stator Differential Slope 1	1 to 100	%	1	F001	10
"	49DA	Stator Differential Slope 2	1 to 100	%	1	F001	80
"	49DB	Stator Differential Break 1	1 to 1.5	pu	0.01	F001	115
"	49DC	Stator Differential Break 2	1.5 to 30	pu	0.01	F001	800
"	49DD	Stator Differential Block	0 to 4294967295	---	1	F300	0
"	49DF	Stator Differential Targets	0 to 2	---	1	F109	0 (Self-reset)
"	49E0	Stator Differential Events	0 to 1	---	1	F102	0 (Disabled)
"	49E1	Stator Differential Line End Source	0 to 5	---	1	F167	0 (SRC 1)
"	49E2	Stator Differential Neutral End Source	0 to 5	---	1	F167	0 (SRC 1)
	Negative-Sequence Directional Overcurrent (Read/Write Grouped Settings) (2 or 3 Modules)						
C70, D30, D60, F60, G30, G60, L60, L90, T60	49F0	Negative Sequence Directional Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	49F1	Negative Sequence Directional Overcurrent 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	49F2	Negative Sequence Directional Overcurrent 1 Type	0 to 1	---	1	F179	0 (Neg Sequence)
"	49F3	Neg Sequence Directional Overcurrent 1 Forward ECA	0 to 90	° Lag	1	F002	75
"	49F4	Neg Seq Directional Overcurrent 1 Forward Limit Angle	40 to 90	degrees	1	F001	90
"	49F5	Neg Sequence Directional Overcurrent 1 Forward Pickup	0.015 to 30	pu	0.005	F001	50
"	49F6	Neg Seq Directional Overcurrent 1 Reverse Limit Angle	40 to 90	degrees	1	F001	90
"	49F7	Neg Sequence Directional Overcurrent 1 Reverse Pickup	0.015 to 30	pu	0.005	F001	50
"	49F8	Negative Sequence Directional Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	49F9	Negative Sequence Directional Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	49FB	Negative Sequence Directional Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	49FC	Negative Sequence Directional Overcurrent 1 Offset	0 to 250	ohms	0.01	F001	0
"	49FD	Negative Sequence Directional Overcurrent 1 Pos Seq Restraint	0 to 0.5	---	0.001	F001	63
"	49FE	Reserved (3 items)	0 to 1	---	1	F001	0
"	4A01	...Repeated for Neg Seq Directional Overcurrent 2					
T60	4A12	...Repeated for Neg Seq Directional Overcurrent 3					
	Breaker Arcing Current Settings (Read/Write Setting) (2, 3, 4, or 6 Modules)						

Products	Hex address	Register name	Range	Units	Step	Format	Default
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60	4A23	Breaker 1 Arcing Amp Function	0 to 1	---	1	F102	0 (Disabled)
"	4A24	Breaker 1 Arcing Amp Source	0 to 5	---	1	F167	0 (SRC 1)
"	4A25	Breaker 1 Arcing Amp Init	0 to 4294967295	---	1	F300	0
"	4A27	Breaker 1 Arcing Amp Init B	0 to 4294967295	---	1	F300	0
"	4A29	Breaker 1 Arcing Amp Init C	0 to 4294967295	---	1	F300	0
"	4A2B	Breaker 1 Arcing Amp Delay	0 to 65.535	s	0.001	F001	0
"	4A2C	Breaker 1 Arcing Amp Limit	0 to 50000	kA2-cyc	1	F001	1000
"	4A2D	Breaker 1 Arcing Interruption Rating	0 to 100	kA	0.1	F001	315
"	4A2E	Breaker 1 Arcing Clear Arcing Amps	0 to 4294967295	---	1	F300	0
"	4A30	Breaker 1 Arcing Amp Block	0 to 4294967295	---	1	F300	0
"	4A32	Breaker 1 Arcing Amp Target	0 to 2	---	1	F109	0 (Self-reset)
"	4A33	Breaker 1 Arcing Amp Events	0 to 1	---	1	F102	0 (Disabled)
"	4A34	...Repeated for Breaker 2 Arcing Amp					
B30, C60, C70, F35, F60, L90, T35, T60	4A45	...Repeated for Breaker 3 Arcing Amp					
B30, C60, F35, F60, L90, T35, T60	4A56	...Repeated for Breaker 4 Arcing Amp					
B30, F35, T35, T60	4A67	...Repeated for Breaker 5 Arcing Amp					
"	4A78	...Repeated for Breaker 6 Arcing Amp					
	Disconnect (Breaker) Switch (Read/Write Setting) (8, 12, 16, or 24 Modules)						
All except B90	4A89	Disconnect Switch 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	4A8A	Disconnect Switch 1 Name	---	---	---	F206	"SW-1"
"	4A8E	Disconnect Switch 1 Mode	0 to 1	---	1	F157	0 (3-Pole)
"	4A8F	Disconnect Switch 1 Open	0 to 4294967295	---	1	F300	0
"	4A91	Disconnect Switch 1 Block Open	0 to 4294967295	---	1	F300	0
"	4A93	Disconnect Switch 1 Close	0 to 4294967295	---	1	F300	0
"	4A95	Disconnect Switch 1 Block Close	0 to 4294967295	---	1	F300	0
"	4A97	Disconnect Switch 1 Phase A / Three-pole Closed	0 to 4294967295	---	1	F300	0
"	4A99	Disconnect Switch 1 Phase A / Three-pole Opened	0 to 4294967295	---	1	F300	0
"	4A9B	Disconnect Switch 1 Phase B Closed	0 to 4294967295	---	1	F300	0
"	4A9D	Disconnect Switch 1 Phase B Opened	0 to 4294967295	---	1	F300	0
"	4A9F	Disconnect Switch 1 Phase C Closed	0 to 4294967295	---	1	F300	0
"	4AA1	Disconnect Switch 1 Phase C Opened	0 to 4294967295	---	1	F300	0
"	4AA3	Disconnect Switch 1 Operate Time	0 to 65535	ms	1	F003	70
"	4AA5	Disconnect Switch 1 Open Seal In	0 to 65.535	s	0.001	F001	0
"	4AA6	Disconnect Switch 1 Close Seal In	0 to 65.535	s	0.001	F001	0
"	4AA7	Disconnect Switch 1 Alarm Delay	0 to 65.535	s	0.001	F003	0
"	4AA9	Disconnect Switch 1 Push Button Control	0 to 1	---	1	F102	0 (Disabled)
"	4AAB	Disconnect Switch 1 Tagging	0 to 1	---	1	F102	0 (Disabled)
"	4AAC	Disconnect Switch 1 Substitution	0 to 1	---	1	F102	0 (Disabled)
"	4AAD	Disconnect Switch 1 Bypass	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	4AAE	Disconnect Switch 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	4AAF	Reserved	---	---	---	F001	0
"	4AB0	...Repeated for Disconnect Switch 2					
"	4AD7	...Repeated for Disconnect Switch 3					
"	4AFE	...Repeated for Disconnect Switch 4					
"	4B25	...Repeated for Disconnect Switch 5					
"	4B4C	...Repeated for Disconnect Switch 6					
"	4B73	...Repeated for Disconnect Switch 7					
"	4B9A	...Repeated for Disconnect Switch 8					
B30, C60, C70, D60, F35, F60, L90, N60, T35, T60	4BC1	...Repeated for Disconnect Switch 9					
"	4BE8	...Repeated for Disconnect Switch 10					
"	4C0F	...Repeated for Disconnect Switch 11					
"	4C36	...Repeated for Disconnect Switch 12					
B30, C60, D60, F35, F60, L90, N60, T35, T60	4C5D	...Repeated for Disconnect Switch 13					
"	4C84	...Repeated for Disconnect Switch 14					
"	4CAB	...Repeated for Disconnect Switch 15					
"	4CD2	...Repeated for Disconnect Switch 16					
B30, C60, F35, L90, N60, T35, T60	4CF9	...Repeated for Disconnect Switch 17					
"	4D20	...Repeated for Disconnect Switch 18					
"	4D47	...Repeated for Disconnect Switch 19					
"	4D6E	...Repeated for Disconnect Switch 20					
"	4D95	...Repeated for Disconnect Switch 21					
"	4DBC	...Repeated for Disconnect Switch 22					
"	4DE3	...Repeated for Disconnect Switch 23					
"	4E0A	...Repeated for Disconnect Switch 24					
	Disconnect (Breaker) Switch Commands (Read/Write Command) (8, 12, 16, or 24 Modules)						
All except B90	4E31	Disconnect Switch 1 Command	0 to 11	---	1	F282	0 (CANCEL)
"	4E32	...Repeated for Disconnect Switch 2					
"	4E33	...Repeated for Disconnect Switch 3					
"	4E34	...Repeated for Disconnect Switch 4					
"	4E35	...Repeated for Disconnect Switch 5					
"	4E36	...Repeated for Disconnect Switch 6					
"	4E37	...Repeated for Disconnect Switch 7					
"	4E38	...Repeated for Disconnect Switch 8					
B30, C30, C60, C70, D60, F35, F60, L90, N60, T35, T60	4E39	...Repeated for Disconnect Switch 9					
"	4E3A	...Repeated for Disconnect Switch 10					
"	4E3B	...Repeated for Disconnect Switch 11					
"	4E3C	...Repeated for Disconnect Switch 12					

Products	Hex address	Register name	Range	Units	Step	Format	Default
B30, C30, C60, D60, F35, F60, L90, N60, T35, T60	4E3D	...Repeated for Disconnect Switch 13					
"	4E3E	...Repeated for Disconnect Switch 14					
"	4E3F	...Repeated for Disconnect Switch 15					
"	4E40	...Repeated for Disconnect Switch 16					
B30, C30, C60, F35, L90, N60, T35, T60	4E41	...Repeated for Disconnect Switch 17					
"	4E42	...Repeated for Disconnect Switch 18					
"	4E43	...Repeated for Disconnect Switch 19					
"	4E44	...Repeated for Disconnect Switch 20					
"	4E45	...Repeated for Disconnect Switch 21					
"	4E46	...Repeated for Disconnect Switch 22					
"	4E47	...Repeated for Disconnect Switch 23					
"	4E48	...Repeated for Disconnect Switch 24					
	Thermal Overload Protection (Read/Write Settings) (2 Modules)						
All except B90, C30, M60	4E49	Thermal Protection 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	4E4A	Thermal Protection 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	4E4B	Thermal Protection 1 Base Current	0.2 to 3	pu	0.01	F001	80
"	4E4C	Thermal Protection 1 K Factor	1 to 1.2	---	0.05	F001	110
"	4E4D	Thermal Protection 1 Trip Time Constant	0 to 1000	min.	1	F001	45
"	4E4E	Thermal Protection 1 Reset Time Constant	0 to 1000	min.	1	F001	45
"	4EF4	Thermal Protection 1 Minimum Reset Time	0 to 1000	min.	1	F001	20
"	4E50	Thermal Protection 1 Reset	0 to 4294967295	---	1	F300	0
"	4E52	Thermal Protection 1 Block	0 to 4294967295	---	1	F300	0
"	4E54	Thermal Protection 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	4E55	Thermal Protection 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	4E56	Reserved (2 items)	---	---	---	F001	0
"	4E58	Repeated for Thermal Protection 2					
	Broken Conductor Detection (Read/Write Settings) (2 or 6 Modules)						
D30, D60, F35, F60, L30, L60, L90	4E67	Broken Conductor 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	4E68	Broken Conductor 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	4E69	Broken Conductor 1 I2/I1 Ratio	20 to 100	%	0.1	F001	200
"	4E6A	Broken Conductor 1 I1 Minimum	0.05 to 1	pu	0.01	F001	10
"	4E6B	Broken Conductor 1 I1 Maximum	0.05 to 5	pu	0.01	F001	150
"	4E6C	Broken Conductor 1 Pickup Delay	0 to 65.535	s	0.001	F001	20000
"	4E6D	Broken Conductor 1 Block	0 to 4294967295	---	1	F300	0
"	4E6F	Broken Conductor 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	4E70	Broken Conductor 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	4E71	Reserved (2 items)	---	---	---	F001	0
"	4E73	...Repeated for Broken Conductor 2					
F35	4E7F	...Repeated for Broken Conductor 3					
"	4E8B	...Repeated for Broken Conductor 4					
"	4E97	...Repeated for Broken Conductor 5					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	4EA3	...Repeated for Broken Conductor 6					
	Ohm Inputs (Read/Write Setting) (2 Modules)						
All except B90	4EAF	Ohm Inputs 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	4EB0	Ohm Inputs 1 ID	---	---	---	F205	"Ohm Ip 1 "
"	4EB7	Reserved (9 items)	0 to 65535	---	1	F001	0
"	4EC0	...Repeated for Ohm Inputs 2					
	Phasor Measurement Unit Recorder Config Counter Command (Read/Write Command) (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	4ED1	PMU 1 Recorder Clear Config Counter	0 to 1	---	1	F126	0 (No)
C60, N60	4ED2	...Repeated for PMU 2					
N60	4ED3	...Repeated for PMU 3					
"	4ED4	...Repeated for PMU 4					
"	4ED5	...Repeated for PMU 5					
"	4ED6	...Repeated for PMU 6					
	Phasor Measurement Unit One-shot Command (Read/Write Setting)						
C60, D60, F60, G60, L30, L90, N60, T60	4ED7	PMU One-shot Function	0 to 1	---	1	F102	0 (Disabled)
"	4ED8	PMU One-shot Sequence Number	0 to 99	---	1	F001	1
"	4ED9	PMU One-shot Time	0 to 4294967295	---	1	F050	0
	Phasor Measurement Unit Test Values (Read/Write Setting) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	4EDB	PMU 1 Test Function	0 to 1	---	1	F102	0 (Disabled)
"	4EDC	PMU 1 Phase A Voltage Test Magnitude	0 to 700	kV	0.01	F003	50000
"	4EDE	PMU 1 Page A Voltage Test Angle	-180 to 180	degrees	0.05	F002	0
"	4EDF	PMU 1 Phase B Voltage Test Magnitude	0 to 700	kV	0.01	F003	50000
"	4EE1	PMU 1 Phase B Voltage Test Angle	-180 to 180	degrees	0.05	F002	-12000
"	4EE2	PMU 1 Phase C Voltage Test Magnitude	0 to 700	kV	0.01	F003	50000
"	4EE4	PMU 1 Phase C Voltage Test Angle	-180 to 180	degrees	0.05	F002	12000
"	4EE5	PMU 1 Auxiliary Voltage Test Magnitude	0 to 700	kV	0.01	F003	50000
"	4EE7	PMU 1 Auxiliary Voltage Test Angle	-180 to 180	degrees	0.05	F002	0
"	4EE8	PMU 1 Phase A Current Test Magnitude	0 to 9.999	kA	0.001	F004	1000
"	4EEA	PMU 1 Phase A Current Test Angle	-180 to 180	degrees	0.05	F002	-1000
"	4EEB	PMU 1 Phase B Current Test Magnitude	0 to 9.999	kA	0.001	F004	1000
"	4EED	PMU 1 Phase B Current Test Angle	-180 to 180	degrees	0.05	F002	-13000
"	4EEE	PMU 1 Phase C Current Test Magnitude	0 to 9.999	kA	0.001	F003	1000
"	4EF0	PMU 1 Phase C Current Test Angle	-180 to 180	degrees	0.05	F002	11000
"	4EF1	PMU 1 Ground Current Test Magnitude	0 to 9.999	kA	0.001	F004	0
"	4EF3	PMU 1 Ground Current Test Angle	-180 to 180	degrees	0.05	F002	0
"	4EF4	PMU 1 Test Frequency	20 to 70	Hz	0.001	F003	60000
"	4EF6	PMU 1 Test df/dt	-10 to 10	Hz/s	0.01	F002	0
C60, N60	4EF7	...Repeated for PMU 2					
N60	4F13	...Repeated for PMU 3					
"	4F2F	...Repeated for PMU 4					
"	4F4B	...Repeated for PMU 5					
"	4F67	...Repeated for PMU 6					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Validation Automation (Read/Write Setting)						
All	4F83	Validation Automation Setting (16 items)	0 to 4294967295	---	1	F003	0
	Thermal Model (Read/Write Grouped Setting)						
M60	4FFD	Thermal Model Function	0 to 1	---	1	F102	0 (Disabled)
"	4FFE	Thermal Model Curve	0 to 5	---	1	F099	0 (Motor)
"	4FFF	Thermal Model TD Multiplier	0 to 600	---	0.01	F001	100
"	5000	Thermal Model Bias K Factor	0 to 19	---	1	F001	0
"	5001	Thermal Model Time Constant Running	1 to 65000	min	1	F001	15
"	5002	Thermal Model Time Constant Stopped	1 to 65000	min	1	F001	30
"	5003	Thermal Model Hot Cold Ratio	0.01 to 1	---	0.01	F001	100
"	5004	Thermal Model RTD Bias	0 to 1	---	1	F102	0 (Disabled)
"	5005	Thermal Model RTD Bias Minimum	0 to 250	°C	1	F001	40
"	5006	Thermal Model RTD Bias Center	0 to 250	°C	1	F001	130
"	5007	Thermal Model RTD Bias Maximum	0 to 250	°C	1	F001	155
"	5008	Thermal Model Start Inhibit Margin	0 to 25	%	1	F001	0
"	5009	Thermal Model Block	0 to 4294967295	---	1	F300	0
"	500B	Thermal Model Events	0 to 1	---	1	F102	0 (Disabled)
"	500C	Thermal Model Target	0 to 2	---	1	F109	0 (Self-reset)
"	500D	Thermal Model Curve Effect	0 to 1	---	1	F096	0 (Cutoff)
"	500E	Speed 2 Thermal Model Curve	0 to 5	---	1	F099	0 (Motor)
"	500F	Speed 2 Thermal Model TD Multiplier	0 to 600	---	0.01	F001	100
"	5010	Reserved	0 to 600	---	0.01	F001	100
"	5011	Thermal Model IEC Curve K Factor	1 to 1.5	---	0.05	F001	110
"	5012	Thermal Model IEC Curve Time Constant	0 to 1000	min.	1	F001	45
	Voltage Dependent Overload (Read/Write Grouped Setting)						
M60	5013	Voltage Dependent Overload Function	0 to 1	---	1	F102	0 (Disabled)
"	5014	Voltage Dependent Overload Minimum Motor Volts	60 to 99	%	1	F001	80
"	5015	Voltage Dependent Overload Voltage Loss	0 to 4294967295	---	1	F300	0
"	5017	VD Overload Stall Current at Minimum Volts	1.5 to 20	× FLA	0.01	F001	450
"	5018	VD Overload Safe Stall Time at Minimum Volts	0.1 to 1000	s	0.1	F001	200
"	5019	VD Overload Acceleration Intersect at Minimum Volts	1.5 to 20	× FLA	0.01	F001	400
"	501A	VD Overload Stall Current at 100% Voltage	1.5 to 20	× FLA	0.01	F001	600
"	501B	VD Overload Safe Stall Time at 100% Voltage	0.1 to 1000	s	0.1	F001	100
"	501C	VD Overload Acceleration Intersect at 100% Voltage	1.5 to 20	× FLA	0.01	F001	500
"	501D	Speed 2 Voltage Dependent Overload Function	0 to 1	---	1	F102	0 (Disabled)
"	501E	Speed 2 VD Overload Minimum Motor Volts	60 to 99	%	1	F001	80
"	501F	Speed 2 Voltage Dependent Overload Voltage Loss	0 to 4294967295	---	1	F300	0
"	5021	Speed 2 VD Overload Stall Current at Minimum Volts	1.5 to 20	× FLA	0.01	F001	450
"	5022	Speed 2 VD Overload Safe Stall Time at Minimum Volts	0.1 to 1000	s	0.1	F001	200

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	5023	Speed 2 VD Acceleration Intersect at Minimum Volts	1.5 to 20	× FLA	0.01	F001	400
"	5024	Speed 2 VD Overload Stall Current at 100% Voltage	1.5 to 20	× FLA	0.01	F001	600
"	5025	Speed 2 VD Overload Safe Stall Time at 100% Voltage	0.1 to 1000	s	0.1	F001	200
"	5026	Speed 2 VD Acceleration Intersect at 100% Voltage	1.5 to 20	× FLA	0.01	F001	500
	Motor Acceleration Time (Read/Write Grouped Setting)						
M60	5027	Motor Acceleration Function	0 to 1	---	1	F102	0 (Disabled)
"	5028	Motor Acceleration Current	1 to 10	× FLA	0.01	F001	600
"	5029	Motor Acceleration Time	0.05 to 180	s	0.01	F001	1000
"	502A	Motor Acceleration Mode	0 to 1	---	1	F097	0 (Definite Time)
"	502B	Motor Acceleration Block	0 to 4294967295	---	1	F300	0
"	502D	Motor Acceleration Target	0 to 2	---	1	F109	0 (Self-reset)
"	502E	Motor Acceleration Events	0 to 1	---	1	F102	0 (Disabled)
"	502F	Speed 2 Motor Acceleration Current	1 to 10	× FLA	0.01	F001	600
"	5030	Speed 2 Motor Acceleration Time	0.05 to 180	s	0.01	F001	1000
"	5031	Speed 2 Motor Acceleration Mode	0 to 1	---	1	F097	0 (Definite Time)
"	5032	Speed 2 Motor Acceleration Speed 1-2	0.05 to 180	s	0.01	F001	1000
"	5033	Speed 2 Motor Acceleration Block	0 to 4294967295	---	1	F300	0
"	5035	Reserved (9 items)	---	---	---	F001	0
	Negative Sequence Instantaneous Overcurrent (Read/Write Grouped Setting) (2 or 3 Modules)						
C70, D30, D60, F35, F60, L30, L60, L90, T60	503E	Negative Sequence Instantaneous OC 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	503F	Negative Sequence Instantaneous OC 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5040	Negative Sequence Instantaneous Overcurrent 1 Pickup	0.02 to 30	pu	0.001	F001	1000
"	5041	Negative Sequence Instantaneous Overcurrent 1 Delay	0 to 600	s	0.01	F001	0
"	5042	Negative Sequence Instantaneous OC 1 Reset Delay	0 to 600	s	0.01	F001	0
"	5043	Negative Sequence Instantaneous Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	5045	Negative Sequence Instantaneous Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5046	Negative Sequence Instantaneous Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5047	Reserved (8 items)	0 to 1	---	1	F001	0
"	504F	...Repeated for Negative Sequence Instantaneous OC 2					
T60	5060	...Repeated for Negative Sequence Instantaneous OC 3					
	High Impedance Fault Detection (Hi-Z) Settings (Read/Write Setting)						
F60	533E	Hi-Z Function	0 to 1	---	1	F102	0 (Disabled)
"	533F	Hi-Z Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5340	Hi-Z Arcing Sensitivity	1 to 10	---	1	F001	5
"	5341	Hi-Z Phase Event Count	10 to 250	---	1	F001	30

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	5342	Hi-Z Ground Event Count	10 to 500	---	1	F001	30
"	5343	Hi-Z Event Count Time	5 to 180	min	1	F001	15
"	5344	Hi-Z OC Protection Coord Timeout	10 to 200	seconds	1	F001	15
"	5345	Hi-Z Phase OC Min Pickup	0.01 to 10	pu	0.01	F001	150
"	5346	Hi-Z Neutral OC Min Pickup	0.01 to 10	pu	0.01	F001	100
"	5347	Hi-Z Phase Rate of Change	1 to 999	A/ 2cycle	1	F001	150
"	5348	Hi-Z Neutral Rate of Change	1 to 999	A/ 2cycle	1	F001	150
"	5349	Hi-Z Loss of Load Threshold	5 to 100	%	1	F001	15
"	534A	Hi-Z Three-Phase Event Threshold	1 to 1000	A	1	F001	25
"	534B	Hi-Z Voltage Supv Threshold	0 to 100	%	1	F001	5
"	534C	Hi-Z Voltage Supv Delay	0 to 3000	cycles	2	F001	60
"	534D	Hi-Z Even Harmonic Restraint	0 to 100	%	1	F001	20
"	534E	Hi-Z Target	0 to 2	---	1	F109	0 (Self-reset)
"	534F	Hi-Z Events	0 to 1	---	1	F102	0 (Disabled)
"	5350	Hi-Z Arcing Reset Time	0 to 6000	seconds	0.1	F001	0
	Field Current (Read/Write Grouped Setting)						
G60	5351	Field Current Function	0 to 1	---	1	F102	0 (Disabled)
"	5352	Field Current Origin	0 to 48	---	1	F151	0 (NONE)
"	5353	Field Current Over Current (OC) Pickup	0.05 to 1	pu	0.01	F001	80
"	5354	Field Current Over Current (OC) Delay	0 to 600	seconds	0.01	F001	100
"	5355	Field Current Under Current (UC) Pickup	0.05 to 1	pu	0.01	F001	20
"	5356	Field Current Under Current (UC) Delay	0 to 600	seconds	0.01	F001	100
"	5357	Field Current Block	0 to 4294967295	---	1	F300	0
"	5359	Field Current Target	0 to 2	---	1	F109	0 (Self-reset)
"	535A	Field Current Events	0 to 1	---	1	F102	0 (Disabled)
	Field Ground (Read/Write Grouped Setting)						
G60	535B	Field Ground Function	0 to 1	---	1	F102	0 (Disabled)
"	535C	Field Ground Injection Frequency	0.1 to 3	Hz	0.01	F001	100
"	535D	Field Ground Injection Connection Type	0 to 1	---	1	F613	0 (Single Point)
"	535E	Field Ground STG1 Pickup	1 to 500	kOhm	1	F001	20
"	535F	Field Ground STG1 Delay	0.1 to 600	seconds	0.1	F001	100
"	5360	Field Ground STG2 Pickup	1 to 500	kOhm	1	F001	5
"	5361	Field Ground STG2 Delay	0.1 to 600	seconds	0.1	F001	30
"	5362	Field Ground UC Pickup	0.05 to 100	mA	0.01	F001	100
"	5363	Field Ground UC Delay	0.1 to 600	seconds	0.01	F001	100
"	5364	Field Ground Block	0 to 4294967295	---	1	F300	0
"	5366	Field Ground Target	0 to 2	---	1	F109	0 (Self-reset)
"	5367	Field Ground Events	0 to 1	---	1	F102	0 (Disabled)
	Distance (Read/Write Grouped Setting)						
D30, D60, G60, L60, L90, T60	5368	Distance Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5369	Memory Duration	5 to 25	cycles	1	F001	10
"	536A	Force Self-Polarization	0 to 4294967295	---	1	F300	0
"	536C	Force Memory Polarization	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
D30, D60, G60, L90, T60	536E	Fast Distance	0 to 1	---	1	F102	1 (Enabled)
D30, D60, G60, L60, L90, T60	536F	Ph Dist Ph Select Supv	0 to 1	---	1	F102	1 (Enabled)
	Neutral Overvoltage (Read/Write Grouped Setting) (3 or 6 Modules)						
All except B90, C30, N60, T35	5370	Neutral Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5371	Neutral Overvoltage 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5372	Neutral Overvoltage 1 Pickup	0.004 to 3	pu	0.001	F001	300
"	5373	Neutral Overvoltage 1 Pickup Delay	0 to 600	s	0.01	F001	100
"	5374	Neutral Overvoltage 1 Reset Delay	0 to 600	s	0.01	F001	100
"	5375	Neutral Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	5377	Neutral Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5378	Neutral Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5379	Neutral Overvoltage 1 Curves	0 to 3	---	1	F116	0 (Definite Time)
"	537A	Reserved (7 items)	0 to 65535	---	1	F001	0
"	5381	...Repeated for Neutral Overvoltage 2					
"	5392	...Repeated for Neutral Overvoltage 3					
B30	53A3	...Repeated for Neutral Overvoltage 4					
"	53B4	...Repeated for Neutral Overvoltage 5					
"	53C5	...Repeated for Neutral Overvoltage 6					
	Process Card / Process Bus Module General (Read/Write Setting)						
All except B90, C30, L60	53D6	Network Config Setting	0 to 3	---	1	F664	0 (INDEPENDENT)
"	53D7	SV Delay Alarm	1 to 10	ms	0.1	F001	60
"	53D8	SmpSynch Check	0 to 2	---	1	F665	0 (Global)
"	53D9	Quality Check for SV	0 to 1	---	1	F666	0 (Reject Questionable)
"	53DA	Anti-Aliasing Filter for SV	0 to 1	---	1	F102	1 (Enabled)
"	53DB	PRP Supervision Multicast Address (PC PRP Supv Mcst Addr)	---	---	---	F072	0
"	53DE	HSR Supervision Multicast Address (PC HSR-1 Supv Mcst Addr) (ports 1 and 2)	---	---	---	F072	0
"	53E1	HSR Supervision Multicast Address (PC HSR-2 Supv Mcst Addr) (ports 5 and 6)	---	---	---	F072	0
"	53E4	Port 1a Function	0 to 1	---	1	F102	1 (Enabled)
"	53E5	Port 1b Function	0 to 1	---	1	F102	1 (Enabled)
"	53E6	Port 2a Function	0 to 1	---	1	F102	1 (Enabled)
"	53E7	Port 2b Function	0 to 1	---	1	F102	1 (Enabled)
"	53E8	Port 3a Function	0 to 1	---	1	F102	1 (Enabled)
"	53E9	Port 3b Function	0 to 1	---	1	F102	1 (Enabled)
"	53EA	Port 4a Function	0 to 1	---	1	F102	1 (Enabled)
"	53EB	Port 4b Function	0 to 1	---	1	F102	1 (Enabled)
"	53EC	SV Sync Stream / Time Sync Stream	0 to 2	---	1	F284	0 (Disabled)
"	53ED	SV Trouble Protection Block	0 to 1	---	1	F680	0 (Global)
"	53EE	SV Trouble Contact Outputs Block	0 to 4294967295	---	1	F300	0
"	53F0	Reserved	0 to 1	---	1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Auxiliary Overvoltage (Read/Write Grouped Setting) (1, 2, 3, or 6 Modules)						
All except B90, C30, N60, T35	5409	Auxiliary Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	540A	Auxiliary Overvoltage 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	540B	Auxiliary Overvoltage 1 Pickup	0.004 to 3	pu	0.001	F001	300
"	540C	Auxiliary Overvoltage 1 Pickup Delay	0 to 600	s	0.01	F001	100
"	540D	Auxiliary Overvoltage 1 Reset Delay	0 to 600	s	0.01	F001	100
"	540E	Auxiliary Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	5410	Auxiliary Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5411	Auxiliary Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5412	Reserved (8 items)	0 to 65535	---	1	F001	0
B30, C70, C60, D60, F35, F60, G30 G60, L90, M60, T60	541A	...Repeated for Auxiliary Overvoltage 2					
B30, C70, F35, T60	542B	...Repeated for Auxiliary Overvoltage 3					
B30	543C	...Repeated for Auxiliary Overvoltage 4					
"	544D	...Repeated for Auxiliary Overvoltage 5					
"	545E	...Repeated for Auxiliary Overvoltage 6					
	Bus Configuration (Read/Write Setting) (6 Modules)						
B90	5468	Bus Zone 1 CT (24 items)	0 to 23	---	1	F400	0
"	5480	Bus Zone 1 Dir (24 items)	0 to 1	---	1	F210	0 (IN)
"	5498	Bus Zone 1 Status (24 items)	0 to 4294967295	---	1	F300	0
"	54C8	...Repeated for Bus Zone 2					
"	5528	...Repeated for Bus Zone 3					
"	5588	...Repeated for Bus Zone 4					
"	55E8	...Repeated for Bus Zone 5					
"	5659	...Repeated for Bus Zone 6					
	Generic Comparator Settings (Read/Write Setting) (6 Modules)						
N60	546F	Comparator 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5470	Comparator 1 Addition/Subtraction Mode Operand	0 to 4294967295	---	1	F300	0
"	5472	Comparator 1 Scale Factor	0.01 to 100	---	0.01	F001	100
"	5473	Comparator 1 Block	0 to 4294967295	---	1	F300	0
"	5475	Comparator 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5476	Comparator 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5477	Comparator 1 Argument A Bits (8 items)	0 to 4294967295	---	1	F300	0
"	5487	Comparator 1 Input Mode	0 to 1	---	1	F515	0 (SIGNED)
"	5488	Comparator 1 Direction Mode	0 to 1	---	1	F517	0 (OVER)
"	5489	Comparator 1 Pickup	-25400 to 25400	---	0.01	F004	1000000
"	548B	Comparator 1 Hysteresis	0 to 5000	---	0.01	F003	50000
"	548D	Comparator 1 Pickup Delay	0 to 65.353	s	0.001	F001	0
"	548E	Comparator 1 Reset Delay	0 to 65.353	s	0.001	F001	0
"	548F	Comparator 1 Argument B Bits (8 items)	0 to 4294967295	---	1	F300	0
"	549F	Reserved (4 items)	0 to 65535	---	1	F001	0
"	54A3	...Repeated for Comparator 2					
"	54D7	...Repeated for Comparator 3					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	550B	...Repeated for Comparator 4					
"	553F	...Repeated for Comparator 5					
"	5573	...Repeated for Comparator 6					
	Digitizer Settings (Read/Write) (5 Modules)						
N60	55A7	Digitizer 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	55A8	Digitizer 1 Source Input	0 to 4294967295	---	1	F600	0
"	55AA	Digitizer 1 Limit Setting	0.05 to 90	pu	0.001	F003	1000
"	55AC	Reserved (4 items)	0 to 65535	---	1	F001	0
"	55B0	...Repeated for Digitizer 2					
"	55B9	...Repeated for Digitizer 3					
"	55C2	...Repeated for Digitizer 4					
"	55CB	...Repeated for Digitizer 5					
	(8-bit) Switch (Read/Write Setting) (6 Modules)						
C30, F35, N60	55D4	Switch 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	55D5	Switch 1 Argument A Bits (8 items)	0 to 4294967295	---	1	F300	0
"	55E5	Switch 1 Argument B Bits (8 items)	0 to 4294967295	---	1	F300	0
"	55F5	Switch 1 Control	0 to 4294967295	---	1	F300	0
"	55F7	Reserved (6 items)	0 to 65535	---	1	F001	0
"	55FD	...Repeated for Switch 2					
"	5626	...Repeated for Switch 3					
"	564F	...Repeated for Switch 4					
"	5678	...Repeated for Switch 5					
"	56A1	...Repeated for Switch 6					
	B90 Direct Inputs (Read/Write Setting) (256 Modules)						
B90	56C1	Direct Input 1 Device	0 to 16	---	1	F001	0
"	56C2	Direct Input 1 Number	0 to 256	---	1	F001	0
"	56C3	Direct Input 1 Default State	0 to 3	---	1	F086	0 (Off)
"	56C4	Direct Input 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	56C5	...Repeated for Direct Input 2					
"	56C9	...Repeated for Direct Input 3					
"	56CD	...Repeated for Direct Input 4					
"	56D1	...Repeated for Direct Input 5					
"	56D5	...Repeated for Direct Input 6					
...	...	...					
"	5785	...Repeated for Direct Input 50					
...	...	...					
"	584D	...Repeated for Direct Input 100					
...	...	...					
"	5915	...Repeated for Direct Input 150					
...	...	...					
"	59DD	...Repeated for Direct Input 200					
...	...	...					
"	5ABD	...Repeated for Direct Input 256					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	EGD Fast Production (Read/Write Setting)						
B30, C30, C60, F35, F60, G30, G60, M60, T35, T60	56CA	EGD Fast Producer Exchange 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	56CB	EGD Fast Producer Exchange 1 Destination	0 to 4294967295	---	1	F003	0
"	56CD	EGD Fast Producer Exchange 1 Data Rate	50 to 1000	ms	50	F001	1000
"	56CE	EGD Fast Producer Exchange 1 Data Item 1 (20 items)	0 to 4294967295	---	1	F003	0
"	56F6	Reserved (60 items)	---	---	---	F001	0
	Direct Integers (Read/Write Setting) (16 Modules)						
N60	5802	Direct Integer Output 1 Value	0 to 65535	---	1	F612	0
"	5804	Direct Integer Output 1 Trigger	0 to 4294967295	---	1	F300	0
"	5806	Direct Integer Input 1 Device	0 to 16	---	1	F001	0
"	5807	Direct Integer Input 1 Number	0 to 16	---	1	F001	0
"	5808	Direct Integer Input 1 Default Value	0 to 4294967295	---	1	F003	1000
"	580A	Direct Integer Input 1 Mode	0 to 1	---	1	F491	0 (Default Value)
"	580B	Direct Integer Reserved	0 to 65535	---	1	F003	0
"	580D	...Repeated for Direct Integer Output 2					
"	5818	...Repeated for Direct Integer Output 3					
"	5823	...Repeated for Direct Integer Output 4					
"	582E	...Repeated for Direct Integer Output 5					
"	5839	...Repeated for Direct Integer Output 6					
"	5844	...Repeated for Direct Integer Output 7					
"	584F	...Repeated for Direct Integer Output 8					
"	585A	...Repeated for Direct Integer Output 9					
"	5865	...Repeated for Direct Integer Output 10					
"	5870	...Repeated for Direct Integer Output 11					
"	587B	...Repeated for Direct Integer Output 12					
"	5886	...Repeated for Direct Integer Output 13					
"	5891	...Repeated for Direct Integer Output 14					
"	589C	...Repeated for Direct Integer Output 15					
"	58A7	...Repeated for Direct Integer Output 16					
	Breaker Failure (Read/Write Grouped Setting) (2, 3, 4, 6, or 20 Modules)						
B30, C60, C70, D60, F60, G60, L30, L60, L90, M60, T60	58B2	Breaker Failure 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	58B3	Breaker Failure 1 Mode	0 to 1	---	1	F157	0 (3-Pole)
"	58B4	Breaker Failure 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	58B5	Breaker Failure 1 Amp Supervision	0 to 1	---	1	F126	1 (Yes)
"	58B6	Breaker Failure 1 Use Seal-In	0 to 1	---	1	F126	1 (Yes)
"	58B7	Breaker Failure 1 Three Pole Initiate	0 to 4294967295	---	1	F300	0
"	58B9	Breaker Failure 1 Block	0 to 4294967295	---	1	F300	0
"	58BB	Breaker Failure 1 Phase Amp Supv Pickup	0.02 to 30	pu	0.001	F001	1050
"	58BC	Breaker Failure 1 Neutral Amp Supv Pickup	0.02 to 30	pu	0.001	F001	1050
"	58BD	Breaker Failure 1 Use Timer 1	0 to 1	---	1	F126	1 (Yes)
"	58BE	Breaker Failure 1 Timer 1 Pickup	0 to 65.535	s	0.001	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	58BF	Breaker Failure 1 Use Timer 2	0 to 1	---	1	F126	1 (Yes)
"	58C0	Breaker Failure 1 Timer 2 Pickup	0 to 65.535	s	0.001	F001	0
"	58C1	Breaker Failure 1 Use Timer 3	0 to 1	---	1	F126	1 (Yes)
"	58C2	Breaker Failure 1 Timer 3 Pickup	0 to 65.535	s	0.001	F001	0
"	58C3	Breaker Failure 1 Breaker Status 1 Phase A/ 3P	0 to 4294967295	---	1	F300	0
"	58C5	Breaker Failure 1 Breaker Status 2 Phase A/ 3P	0 to 4294967295	---	1	F300	0
"	58C7	Breaker Failure 1 Breaker Test On	0 to 4294967295	---	1	F300	0
"	58C9	Breaker Failure 1 Phase Amp Hiset Pickup	0.02 to 30	pu	0.001	F001	1050
"	58CA	Breaker Failure 1 Neutral Amp Hiset Pickup	0.02 to 30	pu	0.001	F001	1050
"	58CB	Breaker Failure 1 Phase Amp Loset Pickup	0.02 to 30	pu	0.001	F001	1050
"	58CC	Breaker Failure 1 Neutral Amp Loset Pickup	0.02 to 30	pu	0.001	F001	1050
"	58CD	Breaker Failure 1 Loset Time	0 to 65.535	s	0.001	F001	0
"	58CE	Breaker Failure 1 Trip Dropout Delay	0 to 65.535	s	0.001	F001	0
"	58CF	Breaker Failure 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	58D0	Breaker Failure 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	58D1	Breaker Failure 1 Phase A Initiate	0 to 4294967295	---	1	F300	0
"	58D3	Breaker Failure 1 Phase B Initiate	0 to 4294967295	---	1	F300	0
"	58D5	Breaker Failure 1 Phase C Initiate	0 to 4294967295	---	1	F300	0
"	58D7	Breaker Failure 1 Breaker Status 1 Phase B	0 to 4294967295	---	1	F300	0
"	58D9	Breaker Failure 1 Breaker Status 1 Phase C	0 to 4294967295	---	1	F300	0
"	58DB	Breaker Failure 1 Breaker Status 2 Phase B	0 to 4294967295	---	1	F300	0
"	58DD	Breaker Failure 1 Breaker Status 2 Phase C	0 to 4294967295	---	1	F300	0
"	58DF	Breaker Failure 1 Retrip Pickup Delay	0 to 65.535	seconds	0.001	F001	33
"	58E0	...Repeated for Breaker Failure 2					
B30, C60, C70, D60, F60, L90, T60	590E	...Repeated for Breaker Failure 3					
B30, C60, D60, F60, L90, T60	593C	...Repeated for Breaker Failure 4					
B30, T60	596A	...Repeated for Breaker Failure 5					
"	5998	...Repeated for Breaker Failure 6					
B30	59C6	...Repeated for Breaker Failure 7					
"	59F4	...Repeated for Breaker Failure 8					
"	5A22	...Repeated for Breaker Failure 9					
"	5A50	...Repeated for Breaker Failure 10					
"	5A7E	...Repeated for Breaker Failure 11					
"	5AAC	...Repeated for Breaker Failure 12					
"	5ADA	...Repeated for Breaker Failure 13					
"	5B08	...Repeated for Breaker Failure 14					
"	5B37	...Repeated for Breaker Failure 15					
"	5B64	...Repeated for Breaker Failure 16					
"	5B92	...Repeated for Breaker Failure 17					
"	5BC0	...Repeated for Breaker Failure 18					
"	5BEE	...Repeated for Breaker Failure 19					
"	5C1C	...Repeated for Breaker Failure 20					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	B90 Instantaneous Overcurrent (Read/Write Grouped Setting) (24 Modules)						
B90	5AD0	IOC 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5AD1	IOC 1 CT	0 to 23	---	1	F400	0
"	5AD2	IOC 1 Pickup	0.005 to 30	pu	0.001	F001	1200
"	5AD3	IOC 1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	5AD4	IOC 1 Reset Delay	0 to 65.535	s	0.001	F001	0
"	5AD5	IOC 1 Block	0 to 4294967295	---	1	F300	0
"	5AD7	IOC 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5AD8	IOC 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5AD9	IOC 1 Reserved	0 to 65535	---	1	F001	0
"	5ADA	...Repeated for IOC 2					
"	5AE4	...Repeated for IOC 3					
"	5AEE	...Repeated for IOC 4					
"	5AF8	...Repeated for IOC 5					
"	5B02	...Repeated for IOC 6					
"	5B0C	...Repeated for IOC 7					
"	5B16	...Repeated for IOC 8					
"	5B20	...Repeated for IOC 9					
"	5B2A	...Repeated for IOC 10					
"	5B34	...Repeated for IOC 11					
"	5B3E	...Repeated for IOC 12					
"	5B48	...Repeated for IOC 13					
"	5B52	...Repeated for IOC 14					
"	5B65	...Repeated for IOC 15					
"	5B6F	...Repeated for IOC 16					
"	5B70	...Repeated for IOC 17					
"	5B7A	...Repeated for IOC 18					
"	5B84	...Repeated for IOC 19					
"	5B8E	...Repeated for IOC 20					
"	5B98	...Repeated for IOC 21					
"	5BA2	...Repeated for IOC 22					
"	5BAC	...Repeated for IOC 23					
"	5BB6	...Repeated for IOC 24					
	FlexState Settings (Read/Write Setting)						
All	5DBA	FlexState Parameters (256 items)	0 to 4294967295	---	1	F300	0
	Trip Bus (Read/Write Setting) (6 Modules)						
All	5FBA	Trip Bus 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5FBB	Trip Bus 1 Block	0 to 4294967295	---	1	F300	0
"	5FBD	Trip Bus 1 Pickup Delay	0 to 600	s	0.01	F001	0
"	5FBE	Trip Bus 1 Reset Delay	0 to 600	s	0.01	F001	0
"	5FBF	Trip Bus 1 Input (16 items)	0 to 4294967295	---	1	F300	0
"	5FDF	Trip Bus 1 Latching	0 to 1	---	1	F102	0 (Disabled)
"	5FE0	Trip Bus 1 Reset	0 to 4294967295	---	1	F300	0
"	5FE2	Trip Bus 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5FE3	Trip Bus 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5FE4	Reserved (8 items)	0 to 1	---	1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	5FEC	...Repeated for Trip Bus 2					
"	601E	...Repeated for Trip Bus 3					
"	6050	...Repeated for Trip Bus 4					
"	6082	...Repeated for Trip Bus 5					
"	60B4	...Repeated for Trip Bus 6					
	FlexElement (Read/Write Setting) (8 or 16 Modules)						
All except B90	60E6	FlexElement 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	60E7	FlexElement 1 Name	---	---	---	F206	"FxE 1"
"	60EB	FlexElement 1 InputP	0 to 4294967295	---	1	F600	0
"	60ED	FlexElement 1 InputM	0 to 4294967295	---	1	F600	0
"	60EF	FlexElement 1 Compare	0 to 1	---	1	F516	0 (LEVEL)
"	60F0	FlexElement 1 Input	0 to 1	---	1	F515	0 (SIGNED)
"	60F1	FlexElement 1 Direction	0 to 1	---	1	F517	0 (OVER)
"	60F2	FlexElement 1 Hysteresis	0.1 to 50	%	0.1	F001	30
"	60F3	FlexElement 1 Pickup	-90 to 90	pu	0.001	F004	1000
"	60F5	FlexElement 1 DeltaT Units	0 to 2	---	1	F518	0 (Milliseconds)
"	60F6	FlexElement 1 DeltaT	20 to 86400	---	1	F003	20
"	60F8	FlexElement 1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	60F9	FlexElement 1 Reset Delay	0 to 65.535	s	0.001	F001	0
"	60FA	FlexElement 1 Block	0 to 4294967295	---	1	F300	0
"	60FC	FlexElement 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	60FD	FlexElement 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	60FE	...Repeated for FlexElement 2					
"	6116	...Repeated for FlexElement 3					
"	612E	...Repeated for FlexElement 4					
"	6146	...Repeated for FlexElement 5					
"	615E	...Repeated for FlexElement 6					
"	6176	...Repeated for FlexElement 7					
"	618E	...Repeated for FlexElement 8					
C70, F35, G30, G60, M60, N60, T35, T60	61A6	...Repeated for FlexElement 9					
"	61BE	...Repeated for FlexElement 10					
"	61D6	...Repeated for FlexElement 11					
"	61EE	...Repeated for FlexElement 12					
"	6206	...Repeated for FlexElement 13					
"	621E	...Repeated for FlexElement 14					
"	6236	...Repeated for FlexElement 15					
"	624E	...Repeated for FlexElement 16					
	Fault Report Settings (Read/Write Setting) (1, 2, 3, 4, or 5 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90	6266	Fault Report 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	6267	Fault Report 1 Trigger	0 to 4294967295	---	1	F300	0
"	6269	Fault Report 1 Z1 Magnitude	0.01 to 250	ohms	0.01	F001	300
"	626A	Fault Report 1 Z1 Angle	25 to 90	degrees	1	F001	75

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	626B	Fault Report 1 Z0 Magnitude	0.01 to 650	ohms	0.01	F001	900
"	626C	Fault Report 1 Z0 Angle	25 to 90	degrees	1	F001	75
"	626D	Fault Report 1 Line Length Units	0 to 1	---	1	F147	0 (km)
"	626E	Fault Report 1 Line Length	0 to 2000	---	0.1	F001	1000
"	626F	Fault Report 1 VT Substitution	0 to 2	---	1	F270	0 (None)
"	6270	Fault Report 1 System Z0 Magnitude	0.01 to 650	ohms	0.01	F001	200
"	6271	Fault Report 1 System Z0 Angle	25 to 90	degrees	1	F001	75
"	6272	Fault REM1-TAP Z1 Magnitude	0.01 to 250	ohms	0.01	F001	300
"	6273	Fault REM1-TAP Z1 Angle	25 to 90	degrees	1	F001	75
"	6274	Fault REM1-TAP Length	0 to 2000	---	0.1	F001	1000
"	6275	Fault REM2-TAP Z1 Magnitude	0.01 to 250	ohms	0.01	F001	300
"	6276	Fault REM2-TAP Z1 Angle	25 to 90	degrees	1	F001	75
"	6277	Fault REM2-TAP Length	0 to 2000	---	0.1	F001	1000
C60, D60, F35, F60, L30, L60, L90	6278	...Repeated for Fault Report 2					
C60, D60, F35, F60, L90	628A	...Repeated for Fault Report 3					
C60, F35, L90	629C	...Repeated for Fault Report 4					
F35	62AE	...Repeated for Fault Report 5					
	Fault Report Parallel Line Settings (Read/Write Setting) (1, 2, 3, 4 or 5 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90	62C0	Fault Z0M Magnitude	0 to 650	ohm	0.01	F001	0
"	62C1	Fault Z0M Angle	25 to 90	degrees	1	F001	75
C60, D60, F35, F60, L30, L60, L90	62C2	...Repeated for Fault Report 2					
C60, D60, F35, F60, L90	62C4	...Repeated for Fault Report 3					
C60, F35, L90	62C6	...Repeated for Fault Report 4					
F35	62C8	...Repeated for Fault Report 5					
	RRTD Inputs (Read/Write Setting) (12 Modules)						
G60, M60, T60	62CA	RRTD RTD 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	62CB	RRTD RTD 1 ID	---	---	---	F205	"RRTD 1 "
"	62D2	RRTD RTD 1 Type	0 to 3	---	1	F174	0 (100 Ohm Platinum)
"	62D3	RRTD RTD 1 Application	0 to 5	---	1	F550	0 (None)
"	62D4	RRTD RTD 1 Alarm Temp	1 to 200	°C	1	F001	130
"	62D5	RRTD RTD 1 Alarm Pickup Delay	5 to 600	s	5	F001	5
"	62D6	RRTD RTD 1 Trip Temp	1 to 200	°C	1	F001	130
"	62D7	RRTD RTD 1 Trip Pickup Delay	5 to 600	s	5	F001	5
"	62D8	RRTD RTD 1 Trip Reset Delay	5 to 600	s	5	F001	5
"	62D9	RRTD RTD 1 Trip Voting	0 to 13	---	1	F603	0 (None)
"	62DA	RRTD RTD 1 Block	0 to 4294967295	---	1	F300	0
"	62DC	RRTD RTD 1 Open	0 to 2	---	1	F552	0 (None)
"	62DD	RRTD RTD 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	62DE	RRTD RTD 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	62DF	...Repeated for RRTD RTD 2		---			

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	62F4	...Repeated for RRTD RTD 3		---			
"	6309	...Repeated for RRTD RTD 4		---			
"	631E	...Repeated for RRTD RTD 5		---			
"	6333	...Repeated for RRTD RTD 6		---			
"	6348	...Repeated for RRTD RTD 7		---			
"	635D	...Repeated for RRTD RTD 8		---			
"	6372	...Repeated for RRTD RTD 9		---			
"	6387	...Repeated for RRTD RTD 10		---			
"	639C	...Repeated for RRTD RTD 11		---			
"	63B1	...Repeated for RRTD RTD 12		---			
	DCmA Outputs (Read/Write Setting) (24 Modules)						
All except B90	63C6	DCmA Output 1 Source	0 to 4294967295	---	1	F600	0
"	63C8	DCmA Output 1 Range	0 to 2	---	1	F522	0 (–1 to 1 mA)
"	63C9	DCmA Output 1 Minimum	–90 to 90	pu	0.001	F004	0
"	63CB	DCmA Output 1 Maximum	–90 to 90	pu	0.001	F004	1000
"	63CD	...Repeated for DCmA Output 2					
"	63D4	...Repeated for DCmA Output 3					
"	63DB	...Repeated for DCmA Output 4					
"	63E2	...Repeated for DCmA Output 5					
"	63E9	...Repeated for DCmA Output 6					
"	63F0	...Repeated for DCmA Output 7					
"	63F7	...Repeated for DCmA Output 8					
"	63FE	...Repeated for DCmA Output 9					
"	6405	...Repeated for DCmA Output 10					
"	640C	...Repeated for DCmA Output 11					
"	6413	...Repeated for DCmA Output 12					
"	641A	...Repeated for DCmA Output 13					
"	6421	...Repeated for DCmA Output 14					
"	6428	...Repeated for DCmA Output 15					
"	642F	...Repeated for DCmA Output 16					
"	6436	...Repeated for DCmA Output 17					
"	643D	...Repeated for DCmA Output 18					
"	6444	...Repeated for DCmA Output 19					
"	644B	...Repeated for DCmA Output 20					
"	6452	...Repeated for DCmA Output 21					
"	6459	...Repeated for DCmA Output 22					
"	6460	...Repeated for DCmA Output 23					
"	6467	...Repeated for DCmA Output 24					
	Direct Input/Output Names (Read/Write Setting) (32 or 64 Modules)						
All except B90, L30, L90	646E	Direct Input 1 Name	0 to 64	---	1	F205	"Dir Ip 1"
"	6475	Direct Output 1 Name	1 to 64	---	1	F205	"Dir Out 1"
"	647B	...Repeated for Direct Input/Output 2					
"	6488	...Repeated for Direct Input/Output 3					
"	6495	...Repeated for Direct Input/Output 4					
"	64A2	...Repeated for Direct Input/Output 5					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	64AF	...Repeated for Direct Input/Output 6					
"	64BC	...Repeated for Direct Input/Output 7					
"	64C9	...Repeated for Direct Input/Output 8					
"	64D6	...Repeated for Direct Input/Output 9					
"	64E3	...Repeated for Direct Input/Output 10					
"	64F0	...Repeated for Direct Input/Output 11					
"	64FD	...Repeated for Direct Input/Output 12					
"	650A	...Repeated for Direct Input/Output 13					
"	6517	...Repeated for Direct Input/Output 14					
"	6524	...Repeated for Direct Input/Output 15					
"	6531	...Repeated for Direct Input/Output 16					
"	653E	...Repeated for Direct Input/Output 17					
"	654B	...Repeated for Direct Input/Output 18					
"	6558	...Repeated for Direct Input/Output 19					
"	6565	...Repeated for Direct Input/Output 20					
"	6572	...Repeated for Direct Input/Output 21					
"	657F	...Repeated for Direct Input/Output 22					
"	658C	...Repeated for Direct Input/Output 23					
"	6599	...Repeated for Direct Input/Output 24					
"	65A6	...Repeated for Direct Input/Output 25					
"	65B3	...Repeated for Direct Input/Output 26					
"	65C0	...Repeated for Direct Input/Output 27					
"	65CD	...Repeated for Direct Input/Output 28					
"	65DA	...Repeated for Direct Input/Output 29					
"	65E7	...Repeated for Direct Input/Output 30					
"	65F4	...Repeated for Direct Input/Output 31					
"	6601	...Repeated for Direct Input/Output 32					
C30, N60	660E	...Repeated for Direct Input/Output 33					
"	661B	...Repeated for Direct Input/Output 34					
"	6628	...Repeated for Direct Input/Output 35					
"	6635	...Repeated for Direct Input/Output 36					
"	6642	...Repeated for Direct Input/Output 37					
"	664F	...Repeated for Direct Input/Output 38					
"	665C	...Repeated for Direct Input/Output 39					
"	6669	...Repeated for Direct Input/Output 40					
"	6676	...Repeated for Direct Input/Output 41					
"	6683	...Repeated for Direct Input/Output 42					
"	6690	...Repeated for Direct Input/Output 43					
"	669D	...Repeated for Direct Input/Output 44					
"	66AA	...Repeated for Direct Input/Output 45					
"	66B7	...Repeated for Direct Input/Output 46					
"	66C4	...Repeated for Direct Input/Output 47					
"	66D1	...Repeated for Direct Input/Output 48					
"	66DE	...Repeated for Direct Input/Output 49					
"	66EB	...Repeated for Direct Input/Output 50					
"	66F8	...Repeated for Direct Input/Output 51					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	6705	...Repeated for Direct Input/Output 52					
"	6712	...Repeated for Direct Input/Output 53					
"	671F	...Repeated for Direct Input/Output 54					
"	672C	...Repeated for Direct Input/Output 55					
"	6739	...Repeated for Direct Input/Output 56					
"	6746	...Repeated for Direct Input/Output 57					
"	6753	...Repeated for Direct Input/Output 58					
"	6760	...Repeated for Direct Input/Output 59					
"	676D	...Repeated for Direct Input/Output 60					
"	677A	...Repeated for Direct Input/Output 61					
"	6787	...Repeated for Direct Input/Output 62					
"	6794	...Repeated for Direct Input/Output 63					
"	67A1	...Repeated for Direct Input/Output 64					
	Breaker Failure (Read/Write Grouped Setting) (24Modules)						
B90	6500	Breaker Failure 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6501	Breaker Failure 1 Initiate	0 to 4294967295	---	1	F300	0
"	6503	Breaker Failure 1 Use Amp Supervision	0 to 1	---	1	F126	1 (Yes)
"	6504	Breaker Failure 1 Use Seal In	0 to 1	---	1	F126	1 (Yes)
"	6505	Breaker Failure 1 Amp Supervision OpA	0 to 4294967295	---	1	F300	0
"	6507	Breaker Failure 1 Amp Supervision OpB	0 to 4294967295	---	1	F300	0
"	6509	Breaker Failure 1 Amp Supervision OpC	0 to 4294967295	---	1	F300	0
"	650B	Breaker Failure 1 Use Timer1	0 to 1	---	1	F126	1 (Yes)
"	650C	Breaker Failure 1 Timer1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	650D	Breaker Failure 1 Use Timer2	0 to 1	---	1	F126	1 (Yes)
"	650E	Breaker Failure 1 Timer2 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	650F	Breaker Failure 1 Use Timer3	0 to 1	---	1	F126	1 (Yes)
"	6510	Breaker Failure 1 Timer3 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	6511	Breaker Failure 1 Breaker Pos1	0 to 4294967295	---	1	F300	0
"	6513	Breaker Failure 1 Breaker Pos2	0 to 4294967295	---	1	F300	0
"	6515	Breaker Failure 1 Breaker Test On	0 to 4294967295	---	1	F300	0
"	6517	Breaker Failure 1 Amp Hiset OpA	0 to 4294967295	---	1	F300	0
"	6519	Breaker Failure 1 Amp Hiset OpB	0 to 4294967295	---	1	F300	0
"	651B	Breaker Failure 1 Amp Hiset OpC	0 to 4294967295	---	1	F300	0
"	651D	Breaker Failure 1 Amp Loset OpA	0 to 4294967295	---	1	F300	0
"	651F	Breaker Failure 1 Amp Loset OpB	0 to 4294967295	---	1	F300	0
"	6521	Breaker Failure 1 Amp Loset OpC	0 to 4294967295	---	1	F300	0
"	6523	Breaker Failure 1 Loset Time Delay	0 to 65.535	s	0.001	F001	0
"	6524	Breaker Failure 1 Trip Dropout Time Delay	0 to 65.535	s	0.001	F001	0
"	6525	Breaker Failure 1 Retrip Time Delay	0 to 65.535	s	0.001	F001	0
"	6526	Breaker Failure 1 Block	0 to 4294967295	---	1	F300	0
"	6528	Breaker Failure 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6529	Breaker Failure 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	652A	Reserved (6 items)	0 to 65535	---	1	F001	0
"	6530	...Repeated for Breaker Failure 2					
"	6560	...Repeated for Breaker Failure 3					
"	6590	...Repeated for Breaker Failure 4					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	65C0	...Repeated for Breaker Failure 5					
"	65F0	...Repeated for Breaker Failure 6					
"	6620	...Repeated for Breaker Failure 7					
"	6650	...Repeated for Breaker Failure 8					
"	6680	...Repeated for Breaker Failure 9					
"	66B0	...Repeated for Breaker Failure 10					
"	66E0	...Repeated for Breaker Failure 11					
"	6710	...Repeated for Breaker Failure 12					
"	6740	...Repeated for Breaker Failure 13					
"	6770	...Repeated for Breaker Failure 14					
"	67A0	...Repeated for Breaker Failure 15					
"	67D0	...Repeated for Breaker Failure 16					
"	6800	...Repeated for Breaker Failure 17					
"	6830	...Repeated for Breaker Failure 18					
"	6860	...Repeated for Breaker Failure 19					
"	6890	...Repeated for Breaker Failure 20					
"	68C0	...Repeated for Breaker Failure 21					
"	68F0	...Repeated for Breaker Failure 22					
"	6920	...Repeated for Breaker Failure 23					
"	6950	...Repeated for Breaker Failure 24					
	Breaker Restrike (Read/Write Setting) (2 or 3 Modules)						
B30, C60, C70, D60, F35, F60, G60, L60, L90, M60, T60	67EE	Breaker Restrike 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	67EF	Breaker Restrike 1 Block	0 to 4294967295	---	1	F300	0
"	67F1	Breaker Restrike 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	67F2	Breaker Restrike 1 Pickup	0.1 to 2	pu	0.01	F001	50
"	67F3	Breaker Restrike 1 Reset Delay	0 to 65.535	s	0.001	F001	100
"	67F4	Breaker Restrike 1 HF Detect	0 to 1	---	1	F102	1 (Enabled)
"	67F5	Breaker Restrike 1 Breaker Open	0 to 4294967295	---	1	F300	0
"	67F7	Breaker Restrike 1 Open Command	0 to 4294967295	---	1	F300	0
"	67F9	Breaker Restrike 1 Close Command	0 to 4294967295	---	1	F300	0
"	67FB	Breaker Restrike 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	67FC	Breaker Restrike 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	67FD	Reserved (2 items)	---	---	---	F002	0
"	67FF	...Repeated for Breaker Restrike 2					
B30, C60, C70, F35, F60, T60	6810	...Repeated for Breaker Restrike 3					
	Teleprotection Inputs/Outputs Commands (Read/Write Command)						
All except B90, L30, L90	6821	Teleprotection Clear Lost Packets	0 to 1	---	1	F126	0 (No)
	Teleprotection Inputs/Outputs (Read/Write Settings)						
All except B90, L30, L90	6822	Teleprotection Function	0 to 1	---	1	F102	0 (Disabled)
"	6823	Teleprotection Number of Terminals	2 to 3	---	1	F001	2
"	6824	Teleprotection Number of Channels	1 to 2	---	1	F001	1
"	6825	Teleprotection Local Relay ID	0 to 63	---	1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	6826	Teleprotection Terminal 1 ID	0 to 63	---	1	F001	0
"	6827	Teleprotection Terminal 2 ID	0 to 63	---	1	F001	0
"	6828	Reserved (10 items)	0 to 1	---	1	F001	0
"	6832	Teleprotection Input 1-n Default States (16 items)	0 to 3	---	1	F086	0 (Off)
"	6842	Teleprotection Input 2-n Default States (16 items)	0 to 3	---	1	F086	0 (Off)
"	6852	Teleprotection Output 1-n Operand (16 items)	0 to 4294967295	---	1	F300	0
"	6872	Teleprotection Output 2-n Operand (16 items)	0 to 4294967295	---	1	F300	0
	Capacitor Control Settings (Read/Write Setting) (3 Modules)						
C70	6892	Capacitor Control 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6893	Capacitor Control 1 Set Remote 1	0 to 4294967295	---	1	F300	0
"	6895	Capacitor Control 1 Set Remote 2	0 to 4294967295	---	1	F300	0
"	6897	Capacitor Control 1 Set Local 1	0 to 4294967295	---	1	F300	0
"	6899	Capacitor Control 1 Set Local 2	0 to 4294967295	---	1	F300	0
"	689B	Capacitor Control 1 Remote Control Enable	0 to 4294967295	---	1	F300	0
"	689D	Capacitor Control 1 Local Control Enable	0 to 4294967295	---	1	F300	0
"	689F	Capacitor Control 1 Remote Set Automatic	0 to 4294967295	---	1	F300	0
"	68A1	Capacitor Control 1 Local Set Automatic	0 to 4294967295	---	1	F300	0
"	68A3	Capacitor Control 1 Remote Set Manual	0 to 4294967295	---	1	F300	0
"	68A5	Capacitor Control 1 Local Set Manual	0 to 4294967295	---	1	F300	0
"	68A7	Capacitor Control 1 Trip 1	0 to 4294967295	---	1	F300	0
"	68A9	Capacitor Control 1 Trip 2	0 to 4294967295	---	1	F300	0
"	68AB	Capacitor Control 1 Trip 3	0 to 4294967295	---	1	F300	0
"	68AD	Capacitor Control 1 Trip 4	0 to 4294967295	---	1	F300	0
"	68AF	Capacitor Control 1 Trip 5	0 to 4294967295	---	1	F300	0
"	68B1	Capacitor Control 1 Trip 6	0 to 4294967295	---	1	F300	0
"	68B3	Capacitor Control Switch to Manual on Trip	0 to 1	---	1	F126	1 (Yes)
"	68B4	Capacitor Control 1 Automatic Control Enable	0 to 4294967295	---	1	F300	0
"	68B6	Capacitor Control 1 Manual Control Enable	0 to 4294967295	---	1	F300	0
"	68B8	Capacitor Control 1 Remote Open	0 to 4294967295	---	1	F300	0
"	68BA	Capacitor Control 1 Local Open	0 to 4294967295	---	1	F300	0
"	68BC	Capacitor Control 1 Automatic Open	0 to 4294967295	---	1	F300	0
"	68BE	Capacitor Control 1 Breaker Open 52b	0 to 4294967295	---	1	F300	0
"	68C0	Capacitor Control 1 Trip Seal-in Delay	0 to 60	s	0.001	F001	400
"	68C1	Capacitor Control 1 Remote Close	0 to 4294967295	---	1	F300	0
"	68C3	Capacitor Control 1 Local Close	0 to 4294967295	---	1	F300	0
"	68C5	Capacitor Control 1 Automatic Close	0 to 4294967295	---	1	F300	0
"	68C7	Capacitor Control 1 Breaker Closed 52a	0 to 4294967295	---	1	F300	0
"	68C9	Capacitor Control 1 Close Discharge Time	0 to 3600	s	1	F001	300
"	68CA	Capacitor Control 1 Close Seal-in Delay	0 to 60	s	0.001	F001	400
"	68CB	Capacitor Control 1 Breaker Close Block	0 to 4294967295	---	1	F300	0
"	68CD	Capacitor Control 1 Close Override	0 to 4294967295	---	1	F300	0
"	68CF	Capacitor Control 1 Targets	0 to 2	---	1	F109	0 (Self-Reset)
"	68D0	Capacitor Control 1 Events	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	68D1	...Repeated for Capacitor Control Element 2					
"	6910	...Repeated for Capacitor Control Element 3					
	Automatic Voltage Regulator Settings (Read/Write) (3 Modules)						
C70	694F	Automatic Voltage Regulator 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6950	Automatic Voltage Regulator 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	6951	Automatic Voltage Regulator 1 Minimum Voltage	0.5 to 1.5	pu	0.001	F001	500
"	6952	Automatic Voltage Regulator 1 Control Mode	0 to 1	---	1	F536	0 (Voltage)
"	6953	Automatic Voltage Regulator 1 Voltage Operating Signal	0 to 8	---	1	F535	4 (V1)
"	6954	Automatic Voltage Regulator 1 Voltage Level to Close	0.75 to 1.5	pu	0.001	F001	950
"	6955	Automatic Voltage Regulator 1 Voltage Level to Open	0.75 to 1.5	pu	0.001	F001	1050
"	6956	AVR 1 Voltage Drop Compensation Impedance	0 to 250	ohms	0.01	F001	0
"	6957	AVR 1 Voltage Drop Compensation RCA	30 to 90	°	1	F001	75
"	6958	Automatic Voltage Regulator 1 VAR Level to Close	–1.5 to 1.5	pu	0.001	F002	950
"	6959	Automatic Voltage Regulator 1 VAR Level to Open	–1.5 to 1.5	pu	0.001	F002	1050
"	695A	Automatic Voltage Regulator 1 Power Factor Limit	0.5 to 1	---	0.01	F001	100
"	695B	Automatic Voltage Regulator 1 VAR Open Mode	0 to 1	---	1	F537	1 (Minimize No. of Ops.)
"	695C	Automatic Voltage Regulator 1 Delay Before Close	0 to 65.535	s	0.001	F001	1000
"	695D	Automatic Voltage Regulator 1 Delay Before Open	0 to 65.535	s	0.001	F001	1000
"	695E	Automatic Voltage Regulator 1 Block	0 to 4294967295	---	1	F300	0
"	6960	Automatic Voltage Regulator 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6961	Automatic Voltage Regulator 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	6962	Reserved	0 to 0.001	---	0.001	F001	0
"	6963	...Repeated for Automatic Voltage Regulator 2					
"	6977	...Repeated for Automatic Voltage Regulator 3					
	Neutral Current Unbalance Settings (Read/Write Grouped Setting) (3 Modules)						
C70	698B	Neutral Current Unbalance 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	698C	Neutral Current Unbalance 1 Bank Source	0 to 5	---	1	F167	0 (SRC 1)
"	698D	Neutral Current Unbalance 1 *k* Magnitude	0 to 0.15	---	0.0001	F001	0
"	698E	Neutral Current Unbalance 1 *k* Angle	0 to 359	°	1	F001	0
"	698F	Neutral Current Unbalance 1 Stage 1 Pickup	0 to 5	pu	0.001	F001	20
"	6990	Neutral Current Unbalance 1 Stage 1 Slope	0 to 10	%	0.1	F001	20
"	6991	Neutral Current Unbalance 1 Stage 2 Pickup	0 to 5	pu	0.001	F001	30
"	6992	Neutral Current Unbalance 1 Stage 2 Slope	0 to 10	%	0.1	F001	20
"	6993	Neutral Current Unbalance 1 Stage 3 Pickup	0 to 5	pu	0.001	F001	40

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	6994	Neutral Current Unbalance 1 Stage 3 Slope	0 to 10	%	0.1	F001	20
"	6995	Neutral Current Unbalance 1 Stage 4 Pickup	0 to 5	pu	0.001	F001	50
"	6996	Neutral Current Unbalance 1 Stage 4 Slope	0 to 10	%	0.1	F001	50
"	6997	Neutral Current Unbalance 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	3000
"	6998	Neutral Current Unbalance 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	6999	Neutral Current Unbalance 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	100
"	699A	Neutral Current Unbalance 1 Stage 4 Pickup Delay	0 to 600	s	0.01	F001	20
"	699B	Neutral Current Unbalance 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	699C	Neutral Current Unbalance 1 Stage 1 Block	0 to 4294967295	---	1	F300	0
"	699E	Neutral Current Unbalance 1 Stage 2 Block	0 to 4294967295	---	1	F300	0
"	69A0	Neutral Current Unbalance 1 Stage 3 Block	0 to 4294967295	---	1	F300	0
"	69A2	Neutral Current Unbalance 1 Stage 4 Block	0 to 4294967295	---	1	F300	0
"	69A4	Neutral Current Unbalance 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	69A5	Neutral Current Unbalance 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	69A6	...Repeated for Neutral Current Unbalance 2					
"	69C1	...Repeated for Neutral Current Unbalance 3					
	Neutral Voltage Unbalance Settings (Read/Write Grouped Setting) (3 Modules)						
C70	69DC	Neutral Voltage Unbalance 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	69DD	Neutral Voltage Unbalance 1 Neutral-Point Source	0 to 5	---	1	F167	0 (SRC 1)
"	69DE	Neutral Voltage Unbalance 1 Bus Source	0 to 5	---	1	F167	0 (SRC 1)
"	69DF	Neutral Voltage Unbalance 1 Bus 3V0	0 to 1	---	1	F241	0 (Calculated)
"	69E0	Neutral Voltage Unbalance 1 Ground	0 to 1	---	1	F255	0 (VT (ungrnd))
"	69E1	Neutral Voltage Unbalance 1 AB Ratio	0.75 to 1.25	---	0.0001	F001	10000
"	69E2	Neutral Voltage Unbalance 1 AC Ratio	0.75 to 1.25	---	0.0001	F001	10000
"	69E3	Neutral Voltage Unbalance 1 Stage 1 Pickup	0.001 to 1	pu	0.001	F001	10
"	69E4	Neutral Voltage Unbalance 1 Stage 1 Slope	0 to 10	%	0.1	F001	0
"	69E5	Neutral Voltage Unbalance 1 Stage 2 Pickup	0.001 to 1	pu	0.001	F001	20
"	69E6	Neutral Voltage Unbalance 1 Stage 2 Slope	0 to 10	%	0.1	F001	0
"	69E7	Neutral Voltage Unbalance 1 Stage 3 Pickup	0.001 to 1	pu	0.001	F001	20
"	69E8	Neutral Voltage Unbalance 1 Stage 3 Slope	0 to 10	%	0.1	F001	50
"	69E9	Neutral Voltage Unbalance 1 Stage 4 Pickup	0.001 to 1	pu	0.001	F001	30
"	69EA	Neutral Voltage Unbalance 1 Stage 4 Slope	0 to 10	%	0.1	F001	50
"	69EB	Neutral Voltage Unbalance 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	3000

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	69EC	Neutral Voltage Unbalance 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	69ED	Neutral Voltage Unbalance 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	100
"	69EE	Neutral Voltage Unbalance 1 Stage 4 Pickup Delay	0 to 600	s	0.01	F001	20
"	69EF	Neutral Voltage Unbalance 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	69F0	Neutral Voltage Unbalance 1 Stage 1 Block	0 to 4294967295	---	1	F300	0
"	69F2	Neutral Voltage Unbalance 1 Stage 2 Block	0 to 4294967295	---	1	F300	0
"	69F4	Neutral Voltage Unbalance 1 Stage 3 Block	0 to 4294967295	---	1	F300	0
"	69F6	Neutral Voltage Unbalance 1 Stage 4 Block	0 to 4294967295	---	1	F300	0
"	69F8	Neutral Voltage Unbalance 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	69F9	Neutral Voltage Unbalance 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	69FA	...Repeated for Neutral Voltage Unbalance 2					
"	6A18	...Repeated for Neutral Voltage Unbalance 3					
	Phase Current Unbalance Settings (Read/Write Grouped Setting) (3 Modules)						
C70	6A36	Phase Current Unbalance 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6A37	Phase Current Unbalance 1 Differential Source	0 to 5	---	1	F167	0 (SRC 1)
"	6A38	Phase Current Unbalance 1 Bank Source	0 to 5	---	1	F167	0 (SRC 1)
"	6A39	Phase Current Unbalance 1 Inherent Factor A	–0.1 to 0.1	---	0.0001	F002	0
"	6A3A	Phase Current Unbalance 1 Inherent Factor B	–0.1 to 0.1	---	0.0001	F002	0
"	6A3B	Phase Current Unbalance 1 Inherent Factor C	–0.1 to 0.1	---	0.0001	F002	0
"	6A3C	Phase Current Unbalance 1 Stage 1A Pickup	0.001 to 5	pu	0.001	F001	20
"	6A3D	Phase Current Unbalance 1 Stage 2A Pickup	0.001 to 5	pu	0.001	F001	30
"	6A3E	Phase Current Unbalance 1 Stage 3A Pickup	0.001 to 5	pu	0.001	F001	40
"	6A3F	Phase Current Unbalance 1 Stage 4A Pickup	0.001 to 5	pu	0.001	F001	50
"	6A40	Phase Current Unbalance 1 Stage 1B Pickup	0.001 to 5	pu	0.001	F001	20
"	6A41	Phase Current Unbalance 1 Stage 2B Pickup	0.001 to 5	pu	0.001	F001	30
"	6A42	Phase Current Unbalance 1 Stage 3B Pickup	0.001 to 5	pu	0.001	F001	40
"	6A43	Phase Current Unbalance 1 Stage 4B Pickup	0.001 to 5	pu	0.001	F001	50
"	6A44	Phase Current Unbalance 1 Stage 1C Pickup	0.001 to 5	pu	0.001	F001	20
"	6A45	Phase Current Unbalance 1 Stage 2C Pickup	0.001 to 5	pu	0.001	F001	30
"	6A46	Phase Current Unbalance 1 Stage 3C Pickup	0.001 to 5	pu	0.001	F001	40
"	6A47	Phase Current Unbalance 1 Stage 4C Pickup	0.001 to 5	pu	0.001	F001	50

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	6A48	Phase Current Unbalance 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	3000
"	6A49	Phase Current Unbalance 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	6A4A	Phase Current Unbalance 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	100
"	6A4B	Phase Current Unbalance 1 Stage 4 Pickup Delay	0 to 600	s	0.01	F001	20
"	6A4C	Phase Current Unbalance 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	6A4D	Phase Current Unbalance 1 Stage 1 Block	0 to 4294967295	---	1	F300	0
"	6A4F	Phase Current Unbalance 1 Stage 2 Block	0 to 4294967295	---	1	F300	0
"	6A51	Phase Current Unbalance 1 Stage 3 Block	0 to 4294967295	---	1	F300	0
"	6A53	Phase Current Unbalance 1 Stage 4 Block	0 to 4294967295	---	1	F300	0
"	6A55	Phase Current Unbalance 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	6A56	Phase Current Unbalance 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6A57	...Repeated for Phase Current Unbalance 2					
"	6A78	...Repeated for Phase Current Unbalance 3					
	Voltage Differential Settings (Read/Write Grouped Setting) (3 Modules)						
C70	6A99	Voltage Differential 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6A9A	Voltage Differential 1 Bus Source	0 to 5	---	1	F167	0 (SRC 1)
"	6A9B	Voltage Differential 1 Tap Source	0 to 5	---	1	F167	0 (SRC 1)
"	6A9C	Voltage Differential 1 Bank Ground	0 to 1	---	1	F091	0 (Grounded)
"	6A9D	Voltage Differential 1 Match Factor A	0.5 to 2000	---	0.0001	F003	20000
"	6A9F	Voltage Differential 1 Match Factor B	0.5 to 2000	---	0.0001	F003	20000
"	6AA1	Voltage Differential 1 Match Factor C	0.5 to 2000	---	0.0001	F003	20000
"	6AA3	Voltage Differential 1 Stage 1A Pickup	0.001 to 1	pu	0.001	F001	10
"	6AA4	Voltage Differential 1 Stage 2A Pickup	0.001 to 1	pu	0.001	F001	20
"	6AA5	Voltage Differential 1 Stage 3A Pickup	0.001 to 1	pu	0.001	F001	30
"	6AA6	Voltage Differential 1 Stage 4A Pickup	0.001 to 1	pu	0.001	F001	40
"	6AA7	Voltage Differential 1 Stage 1B Pickup	0.001 to 1	pu	0.001	F001	10
"	6AA8	Voltage Differential 1 Stage 2B Pickup	0.001 to 1	pu	0.001	F001	20
"	6AA9	Voltage Differential 1 Stage 3B Pickup	0.001 to 1	pu	0.001	F001	30
"	6AAA	Voltage Differential 1 Stage 4B Pickup	0.001 to 1	pu	0.001	F001	40
"	6AAB	Voltage Differential 1 Stage 1C Pickup	0.001 to 1	pu	0.001	F001	10
"	6AAC	Voltage Differential 1 Stage 2C Pickup	0.001 to 1	pu	0.001	F001	20
"	6AAD	Voltage Differential 1 Stage 3C Pickup	0.001 to 1	pu	0.001	F001	30
"	6AAE	Voltage Differential 1 Stage 4C Pickup	0.001 to 1	pu	0.001	F001	40
"	6AAF	Voltage Differential 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	3000
"	6AB0	Voltage Differential 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	6AB1	Voltage Differential 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	100
"	6AB2	Voltage Differential 1 Stage 4 Pickup Delay	0 to 600	s	0.01	F001	20
"	6AB3	Voltage Differential 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	6AB4	Voltage Differential 1 Stage 1 Block	0 to 4294967295	---	1	F300	0
"	6AB6	Voltage Differential 1 Stage 2 Block	0 to 4294967295	---	1	F300	0
"	6AB8	Voltage Differential 1 Stage 3 Block	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	6ABA	Voltage Differential 1 Stage 4 Block	0 to 4294967295	---	1	F300	0
"	6ABC	Voltage Differential 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	6ABD	Voltage Differential 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6ABE	...Repeated for Voltage Differential 2					
"	6AE3	...Repeated for Voltage Differential 3					
	Charge Current Compensation Settings (Read/Write Grouped Setting)						
L60	6B08	Charging Current Compensation Function	0 to 1	---	1	F102	0 (Disabled)
"	6B09	Charging Current Compensation Block	0 to 4294967295	---	1	F300	0
"	6B0B	Charging Current Compensation Positive-Sequence Capacitive Reactance (Xc)	0.1 to 65.535	kOhm	0.001	F001	100
"	6B0C	Charging Current Compensation Zero-Sequence Capacitive Reactance (Xc)	0.1 to 65.535	kOhm	0.001	F001	100
	Undercurrent (Read/Write Grouped Setting)						
M60	6B0D	Undercurrent Function	0 to 1	---	1	F102	0 (Disabled)
"	6B0E	Undercurrent Speed 1 Start Block Delay	0 to 600	s	0.01	F001	50
"	6B0F	Undercurrent Speed 1 Alarm Pickup	0.1 to 0.95	× FLA	0.01	F001	70
"	6B10	Undercurrent Speed 1 Alarm Pickup Delay	0 to 600	s	0.01	F001	200
"	6B11	Undercurrent Speed 1 Trip Pickup	0.1 to 0.95	× FLA	0.01	F001	70
"	6B12	Undercurrent Speed 1 Trip Pickup Delay	0 to 600	s	0.01	F001	100
"	6B13	Undercurrent Speed 1 Trip Reset Delay	0 to 600	s	0.01	F001	100
"	6B14	Undercurrent Speed 1 Block	0 to 4294967295	---	1	F300	0
"	6B16	Undercurrent Target	0 to 2	---	1	F109	0 (Self-reset)
"	6B17	Undercurrent Events	0 to 1	---	1	F102	0 (Disabled)
"	6B18	Undercurrent Speed 2 Start Block Delay	0 to 600	s	0.01	F001	50
"	6B19	Undercurrent Speed 2 Alarm Pickup	0.1 to 0.95	× FLA	0.01	F001	70
"	6B1A	Undercurrent Speed 2 Alarm Pickup Delay	0 to 600	s	0.01	F001	200
"	6B1B	Undercurrent Speed 2 Trip Pickup	0.1 to 0.95	× FLA	0.01	F001	70
"	6B1C	Undercurrent Speed 2 Trip Pickup Delay	0 to 600	s	0.01	F001	100
"	6B1D	Undercurrent Speed 2 Trip Reset Delay	0 to 600	s	0.01	F001	100
"	6B1E	Undercurrent Speed 2 Block	0 to 4294967295	---	1	F300	0
"	6B20	Reserved (2 items)	0 to 1	---	1	F001	0
	Cold Load Pickup (Read/Write Setting) (2 or 6 Modules)						
F35, F60	6B22	Cold Load Pickup 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6B23	Cold Load Pickup 1 Initiate	0 to 4294967295	---	1	F300	0
"	6B25	Cold Load Pickup 1 Block	0 to 4294967295	---	1	F300	0
"	6B27	Outage Time Before Cold Load Pickup 1	0 to 1000	s	1	F001	1000
"	6B28	On Load Time Before Reset 1	0 to 1000000	s	0.001	F003	100000
"	6B2A	Cold Load Pickup 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	6B2B	Reserved	0 to 65535	---	1	F001	0
"	6B2C	...Repeated for Cold Load Pickup 2					
F35	6B36	...Repeated for Cold Load Pickup 3					
"	6B40	...Repeated for Cold Load Pickup 4					
"	6B4A	...Repeated for Cold Load Pickup 5					
"	6B54	...Repeated for Cold Load Pickup 6					
	Broken Rotor Bar Commands (Read/Write Commands)						
M60	6B5E	Broken Rotor Bar Clear Data Command	0 to 1	---	1	F126	0 (No)

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Broken Rotor Bar Detection (Read/Write Settings)						
M60	6B5F	Broken Rotor Bar Function	0 to 1	---	1	F102	0 (Disabled)
"	6B60	Start of Broken Rotor Bar Offset	–12 to 11.99	Hz	0.01	F002	40
"	6B61	End of Broken Rotor Bar Offset	–11.99 to 12	Hz	0.01	F002	200
"	6B62	Broken Rotor Bar Start Block Delay	0 to 600	s	0.01	F001	6000
"	6B63	Minimum Motor Load	0.5 to 1	× FLA	0.01	F001	70
"	6B64	Maximum Load Deviation	0 to 1	× FLA	0.01	F001	10
"	6B65	Maximum Current Unbalance	0 to 100	%	0.1	F001	150
"	6B66	Broken Rotor Bar Pickup	–60 to –12	dB	1	F002	-40
"	6B67	Broken Rotor Bar Reset Delay	0 to 600	s	0.01	F001	0
"	6B68	Broken Rotor Bar Block	0 to 4294967295	---	1	F300	0
"	6B6A	Broken Rotor Bar Target	0 to 2	---	1	F109	0 (Self-reset)
"	6B6B	Broken Rotor Bar Events	0 to 1	---	1	F102	0 (Disabled)
	Pilot Permissive Overreach Transfer Trip (POTT) Settings (Read/Write)						
L60	6B6C	POTT Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	6B6D	POTT Permissive Echo	0 to 1	---	1	F102	0 (Disabled)
"	6B6E	POTT Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	6B6F	POTT Transient Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	6B70	POTT Transient Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	6B71	POTT Echo Duration	0 to 65.535	s	0.001	F001	100
"	6B72	POTT Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	50
"	6B73	POTT Seal In Delay	0 to 65.535	s	0.001	F001	400
"	6B74	POTT Ground Direction OC Forward	0 to 4294967295	---	1	F300	0
"	6B76	POTT Rx	0 to 4294967295	---	1	F300	0
"	6B78	POTT Echo Lockout	0 to 65.535	s	0.001	F001	250
"	6B79	POTT Target	0 to 2	---	1	F109	0 (Self-reset)
"	6B7A	POTT Events	0 to 1	---	1	F102	0 (Disabled)
	Summator Settings (Read/Write Setting) (6 Modules)						
N60	6B93	Summator 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6B94	Summator 1 Input Mode	0 to 1	---	1	F515	0 (SIGNED)
"	6B95	Summator 1 Hold	0 to 4294967295	---	1	F300	0
"	6B97	Summator 1 Pickup	–2000000 to 2000000	---	0.001	F004	1000000
"	6B99	Summator 1 Hysteresis	0.1 to 50	%	0.1	F001	30
"	6B9A	Summator 1 Input (6 items)	0 to 4294967295	---	1	F600	0
"	6BA6	Summator 1 Scale Factor (6 items)	–2000 to 2000	---	0.000 001	F004	1000000
"	6BB2	Summator 1 Position Selector (6 items)	0 to 4294967295	---	1	F300	0
"	6BBE	Summator 1 Units	---	---	---	F207	(none)
"	6BC1	Summator 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6BC2	Summator 1 Per-Unit Base	1 to 2000000	---	1	F004	1
"	6BC4	...Repeated for Summator 2					
"	6BF5	...Repeated for Summator 3					
"	6C26	...Repeated for Summator 4					
"	6C57	...Repeated for Summator 5					
"	6C88	...Repeated for Summator 6					
	Selector Switch Settings (Read/Write) (2 Modules)						

Products	Hex address	Register name	Range	Units	Step	Format	Default
All except B90	6CDD	Selector 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6CDE	Selector 1 Range	1 to 7	---	1	F001	7
"	6CDF	Selector 1 Timeout	3 to 60	s	0.1	F001	50
"	6CE0	Selector 1 Step Up	0 to 4294967295	---	1	F300	0
"	6CE2	Selector 1 Step Mode	0 to 1	---	1	F083	0 (Time-out)
"	6CE3	Selector 1 Acknowledge	0 to 4294967295	---	1	F300	0
"	6CE5	Selector 1 Bit0	0 to 4294967295	---	1	F300	0
"	6CE7	Selector 1 Bit1	0 to 4294967295	---	1	F300	0
"	6CE9	Selector 1 Bit2	0 to 4294967295	---	1	F300	0
"	6CEB	Selector 1 Bit Mode	0 to 1	---	1	F083	0 (Time-out)
"	6CEC	Selector 1 Bit Acknowledge	0 to 4294967295	---	1	F300	0
"	6CEE	Selector 1 Power Up Mode	0 to 2	---	1	F084	0 (Restore)
"	6CEF	Selector 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6CF0	Selector 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6CF1	Reserved (10 items)	---	---	1	F001	0
"	6CFB	...Repeated for Selector 2					
	Digital Counter (Read/Write Setting) (8 Modules)						
All except B90	6D19	Digital Counter 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6D1A	Digital Counter 1 Name	---	---	---	F205	"Counter 1"
"	6D21	Digital Counter 1 Units	---	---	---	F206	(none)
"	6D25	Digital Counter 1 Block	0 to 4294967295	---	1	F300	0
"	6D27	Digital Counter 1 Up	0 to 4294967295	---	1	F300	0
"	6D29	Digital Counter 1 Down	0 to 4294967295	---	1	F300	0
"	6D2B	Digital Counter 1 Preset	–2147483647 to 2147483647	---	1	F004	0
"	6D2D	Digital Counter 1 Compare	–2147483647 to 2147483647	---	1	F004	0
"	6D2F	Digital Counter 1 Reset	0 to 4294967295	---	1	F300	0
"	6D31	Digital Counter 1 Freeze/Reset	0 to 4294967295	---	1	F300	0
"	6D33	Digital Counter 1 Freeze/Count	0 to 4294967295	---	1	F300	0
"	6D35	Digital Counter 1 Set To Preset	0 to 4294967295	---	1	F300	0
"	6D37	Reserved (11 items)	---	---	---	F001	0
"	6D42	...Repeated for Digital Counter 2					
"	6D6B	...Repeated for Digital Counter 3					
"	6D94	...Repeated for Digital Counter 4					
"	6DBD	...Repeated for Digital Counter 5					
"	6DE6	...Repeated for Digital Counter 6					
"	6E0F	...Repeated for Digital Counter 7					
"	6E38	...Repeated for Digital Counter 8					
	CT Terminal Settings (Read/Write Setting) (24 Modules)						
B90	6D51	Terminal Current 1 Primary	1 to 65000	A	1	F001	1
"	6D52	Terminal Current 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	6D54	...Repeated for Terminal Current 2					
"	6D55	...Repeated for Terminal Current 3					
"	6D57	...Repeated for Terminal Current 4					
"	6D59	...Repeated for Terminal Current 5					
"	6D5B	...Repeated for Terminal Current 6					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	6D5D	...Repeated for Terminal Current 7					
"	6D5F	...Repeated for Terminal Current 8					
"	6D61	...Repeated for Terminal Current 9					
"	6D63	...Repeated for Terminal Current 10					
"	6D65	...Repeated for Terminal Current 11					
"	6D67	...Repeated for Terminal Current 12					
"	6D69	...Repeated for Terminal Current 13					
"	6D6B	...Repeated for Terminal Current 14					
"	6D6D	...Repeated for Terminal Current 15					
"	6D6F	...Repeated for Terminal Current 16					
"	6D71	...Repeated for Terminal Current 17					
"	6D73	...Repeated for Terminal Current 18					
"	6D75	...Repeated for Terminal Current 19					
"	6D77	...Repeated for Terminal Current 20					
"	6D79	...Repeated for Terminal Current 21					
"	6D7B	...Repeated for Terminal Current 22					
"	6D7D	...Repeated for Terminal Current 23					
"	6D7F	...Repeated for Terminal Current 24					
	PID Regulator (Read/Write Setting) (4 Modules)						
C30, F35	6E61	PID 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6E62	PID 1 Sample Time	0.05 to 30	sec	0.01	F001	5
"	6E63	PID 1 Process Signal	0 to 4294967295	---	1	F600	0
"	6E65	PID 1 Setpoint Signal	-99999.99 to 99999.99	---	0.01	F004	0
"	6E67	PID 1 Tracking Signal	0 to 4294967295	---	1	F600	0
"	6E69	PID 1 Proportional Gain	0.01 to 100	---	0.01	F001	100
"	6E6A	PID 1 Setpoint Weighting	0.01 to 1	---	0.01	F001	100
"	6E6B	PID 1 Integ Time Const	0 to 600	sec	0.01	F001	100
"	6E6C	PID 1 Antiwindup	0 to 1	---	1	F102	0 (Disabled)
"	6E6D	PID 1 AW Time Const	0 to 600	sec	0.01	F001	100
"	6E6E	PID 1 Deriv Time Const	0 to 600	sec	0.01	F001	100
"	6E6F	PID 1 Derivative Limit	1 to 20	---	1	F001	10
"	6E70	PID 1 Max	-10000 to 10000	---	1	F002	10
"	6E71	PID 1 Min	-10000 to 10000	---	1	F002	10
"	6E72	PID 1 T Min	100 to 9999	ms	1	F001	500
"	6E73	PID 1 Dead Time	1 to 20	sec	1	F001	1
"	6374	PID 1 Block	0 to 4294967295	---	1	F300	0
"	6E76	PID 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6E77	PID 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6E78	...Repeated for PID 2					
"	6E8F	...Repeated for PID 3					
"	6EA6	...Repeated for PID 4					
	Volts Per Hertz (Read/Write Grouped Setting) (2 Modules)						
G30, G60, L90, T60	6EBD	Volts Per Hertz 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6EBE	Volts Per Hertz 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	6EBF	Volts Per Hertz 1 Pickup	0.8 to 4	pu	0.01	F001	80

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	6EC0	Volts Per Hertz 1 Curves	0 to 7	---	1	F240	0 (Definite Time)
"	6EC1	Volts Per Hertz 1 TD Multiplier	0.05 to 600	---	0.01	F001	100
"	6EC2	Volts Per Hertz 1 Block	0 to 4294967295	---	1	F300	0
"	6EC4	Volts Per Hertz 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6EC5	Volts Per Hertz 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6EC6	Volts Per Hertz 1 T Reset	0 to 1000	s	0.1	F001	10
"	6EC7	Volts Per Hertz 1 Voltage Mode	0 to 1	---	1	F186	0 (Phase-to-Ground)
"	6EC8	...Repeated for Volts Per Hertz 2					
	FlexCurves C and D (Read/Write Setting)						
All except C30	6ED3	FlexCurve C (120 items)	0 to 65535	ms	1	F011	0
"	6F4B	FlexCurve D (120 items)	0 to 65535	ms	1	F011	0
	Annunciator (Read/Write Setting)						
All	6FC3	Annunciator Alarm Input (96 items)	0 to 4294967295	---	1	F300	0
"	7083	Clear Latched Alarms	0 to 4294967295	---	1	F300	0
	Annunciator (Read/Write Command)						
All	7085	Annunciator Acknowledge or Reset Alarm (3 items)	0 to 4294967295	---	1	F003	0
	Breaker Failure Current Supervision (Read/Write Grouped Setting) (24 Modules)						
B90	708B	Breaker Failure 1 Current Supervision Function	0 to 1	---	1	F102	0 (Disabled)
"	708C	Breaker Failure 1 Current Supervision CT	0 to 23	---	1	F400	0
"	708D	Breaker Failure 1 Current Supervision Amp Supv Pickup	0.02 to 30	pu	0.001	F001	1050
"	708E	Breaker Failure 1 Current Supervision Amp Hiset Pickup	0.02 to 30	pu	0.001	F001	1050
"	708F	Breaker Failure 1 Current Supervision Amp Loset Pickup	0.02 to 30	pu	0.001	F001	1050
"	7090	Reserved (4 items)	0 to 65535	---	1	F001	0
"	7094	...Repeated for Breaker Failure 2					
"	709D	...Repeated for Breaker Failure 3					
"	70A6	...Repeated for Breaker Failure 4					
"	70AF	...Repeated for Breaker Failure 5					
"	70B8	...Repeated for Breaker Failure 6					
"	70C1	...Repeated for Breaker Failure 7					
"	70CA	...Repeated for Breaker Failure 8					
"	70D3	...Repeated for Breaker Failure 9					
"	70DC	...Repeated for Breaker Failure 10					
"	70E5	...Repeated for Breaker Failure 11					
"	70EE	...Repeated for Breaker Failure 12					
"	70F7	...Repeated for Breaker Failure 13					
"	7100	...Repeated for Breaker Failure 14					
"	7109	...Repeated for Breaker Failure 15					
"	7112	...Repeated for Breaker Failure 16					
"	711B	...Repeated for Breaker Failure 17					
"	7124	...Repeated for Breaker Failure 18					
"	712D	...Repeated for Breaker Failure 19					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7136	...Repeated for Breaker Failure 20					
"	713F	...Repeated for Breaker Failure 21					
"	7148	...Repeated for Breaker Failure 22					
"	7151	...Repeated for Breaker Failure 23					
"	715A	...Repeated for Breaker Failure 24					
	Pilot POTT (1P) (Read/Write Setting)						
D60, L90	708B	POTT 1P Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	708C	POTT 1P Permissive Echo	0 to 2	---	1	F199	0 (Disabled)
"	708D	POTT 1P Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	708E	POTT 1P Trans Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	708F	POTT 1P Trans Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	7090	POTT 1P Echo Duration	0 to 65.535	s	0.001	F001	100
"	7091	POTT 1P Echo Lockout	0 to 65.535	s	0.001	F001	250
"	7092	POTT 1P Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	50
"	7093	POTT 1P Seal In Delay	0 to 65.535	s	0.001	F001	0
"	7094	POTT 1P Ground Directional Overcurrent Forward	0 to 4294967295	---	1	F300	0
"	7096	POTT 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	7097	POTT 1P Rx1	0 to 4294967295	---	1	F300	0
"	7099	POTT 1P Rx2	0 to 4294967295	---	1	F300	0
"	709B	POTT 1P Rx3	0 to 4294967295	---	1	F300	0
"	709D	POTT 1P Rx4	0 to 4294967295	---	1	F300	0
"	709F	POTT 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	70A0	POTT 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	70A1	POTT 1P Echo Condition	0 to 4294967295	---	1	F300	0
"	70A3	POTT 1P Scheme Block	0 to 4294967295	---	1	F300	0
"	70A5	Reserved (22 items)	0 to 1	---	1	F001	0
	Pilot POTT1 (1P) (Read/Write Setting)						
D60, L90	70BB	POTT1 1P Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	70BC	POTT1 1P Permissive Echo	0 to 2	---	1	F199	0 (Disabled)
"	70BD	POTT1 1P Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	70BE	POTT1 1P Trans Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	70BF	POTT1 1P Trans Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	70C0	POTT1 1P Echo Duration	0 to 65.535	s	0.001	F001	100
"	70C1	POTT1 1P Echo Lockout	0 to 65.535	s	0.001	F001	250
"	70C2	POTT1 1P Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	50
"	70C3	POTT1 1P Seal In Delay	0 to 65.535	s	0.001	F001	0
"	70C4	POTT1 1P Ground Directional Overcurrent Forward	0 to 4294967295	---	1	F300	0
"	70C6	POTT1 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	70C7	POTT1 1P Rx1	0 to 4294967295	---	1	F300	0
"	70C9	POTT1 1P Rx2	0 to 4294967295	---	1	F300	0
"	70CB	POTT1 1P Rx3	0 to 4294967295	---	1	F300	0
"	70CD	POTT1 1P Rx4	0 to 4294967295	---	1	F300	0
"	70CF	POTT1 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	70D0	POTT1 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	70D1	POTT1 1P Echo Condition	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	70D3	POTT1 1P Scheme Block	0 to 4294967295	---	1	F300	0
"	70D5	POTT1 1P OC Fwd2	0 to 4294967295	---	1	F300	0
"	70D7	POTT1 1P OC Fwd2	0 to 4294967295	---	1	F300	0
"	70D9	Reserved (22 items)	0 to 1	---	1	F001	0
	Pilot Blocking 1 (1P) (Read/Write Setting)						
D60, L90	70EF	Blocking 1 Scheme 1P Function	0 to 1	---	1	F102	0 (Disabled)
"	70F0	Blocking 1 Scheme 1P Block	0 to 4294967295	---	1	F300	0
"	70F2	Block 1 1P Rx Coord Pickup Delay	0 to 65.535	s	0.001	F001	10
"	70F3	Block 1 1P Transient Block Pickup Delay	0 to 65.535	s	0.001	F001	30
"	70F4	Block 1 1P Transient Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	70F5	Blocking 1 Scheme 1P Seal in Delay	0 to 65.535	s	0.001	F001	0
"	70F6	Blocking 1 Scheme 1P Dir Fwd 1	0 to 4294967295	---	1	F300	0
"	70F8	Blocking 1 Scheme 1P Dir Fwd 2	0 to 4294967295	---	1	F300	0
"	70FA	Blocking 1 Scheme 1P Dir Fwd 3	0 to 4294967295	---	1	F300	0
"	70FC	Blocking 1 Scheme 1P Dir Rev 1	0 to 4294967295	---	1	F300	0
"	70FE	Blocking 1 Scheme 1P Dir Rev 2	0 to 4294967295	---	1	F300	0
"	7100	Blocking 1 Scheme 1P Dir Rev 3	0 to 4294967295	---	1	F300	0
"	7102	Blocking 1 Scheme 1P Force Tx Stop 1	0 to 4294967295	---	1	F300	0
"	7104	Blocking 1 Scheme 1P Force Tx Stop 2	0 to 4294967295	---	1	F300	0
"	7106	Blocking 1 Scheme 1P Comm Bits	0 to 2	---	1	F198	0 (1)
"	7107	Blocking 1 Scheme 1P Rx1	0 to 4294967295	---	1	F300	0
"	7109	Blocking 1 Scheme 1P Rx2	0 to 4294967295	---	1	F300	0
"	710B	Blocking 1 Scheme 1P Rx3	0 to 4294967295	---	1	F300	0
"	710D	Blocking 1 Scheme 1P Rx4	0 to 4294967295	---	1	F300	0
"	710F	Blocking 1 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	7110	Blocking 1 1P Event	0 to 1	---	1	F102	0 (Disabled)
	Pilot POTT3 (Read/Write Setting)						
F60	7111	POTT3 Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	7112	POTT3 Scheme Block	0 to 4294967295	---	1	F300	0
"	7114	POTT3 Dir Fwd1	0 to 4294967295	---	1	F300	0
"	7116	POTT3 Dir Fwd2	0 to 4294967295	---	1	F300	0
"	7118	POTT3 Dir Fwd3	0 to 4294967295	---	1	F300	0
"	711A	POTT3 Rx	0 to 4294967295	---	1	F300	0
"	711C	POTT3 Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	711D	POTT3 Transient Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	711E	POTT3 Transient Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	711F	POTT3 Seal In Delay	0 to 65.535	s	0.001	F001	400
"	7120	POTT3 Line End Open	0 to 4294967295	---	1	F300	0
"	7122	POTT3 Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	50
"	7123	POTT3 Permissive Echo	0 to 1	---	1	F102	0 (Disabled)
"	7124	POTT3 Echo Duration	0 to 65.535	s	0.001	F001	100
"	7125	POTT3 Echo Lockout	0 to 65.535	s	0.001	F001	250
"	7126	POTT3 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7127	POTT3 Events	0 to 1	---	1	F102	0 (Disabled)
	Pilot DCB3 (Read/Write Setting)						
F60	7128	DCB3 Scheme Function	0 to 1	---	1	F102	0 (Disabled)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7129	DCB3 Scheme Block	0 to 4294967295	---	1	F300	0
"	712B	DCB3 Rx Coord Pickup Delay	0 to 65.535	s	0.001	F001	10
"	712C	DCB3 Trans Block Pickup Delay	0 to 65.535	s	0.001	F001	30
"	712D	DCB3 Trans Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	712E	DCB3 Scheme Seal In Delay	0 to 65.535	s	0.001	F001	10
"	713F	DCB3 Dir Fwd1	0 to 4294967295	---	1	F300	0
"	7131	DCB3 Dir Fwd2	0 to 4294967295	---	1	F300	0
"	7133	DCB3 Dir Fwd3	0 to 4294967295	---	1	F300	0
"	7135	DCB3 Dir Rev1	0 to 4294967295	---	1	F300	0
"	7137	DCB3 Dir Rev2	0 to 4294967295	---	1	F300	0
"	7139	DCB3 Dir Rev3	0 to 4294967295	---	1	F300	0
"	713B	DCB3 Force Tx Stop1	0 to 4294967295	---	1	F300	0
"	713D	DCB3 Force Tx Stop2	0 to 4294967295	---	1	F300	0
"	713F	DCB3 Rx	0 to 4294967295	---	1	F300	0
"	7141	DCB3 Scheme Target	0 to 2	---	1	F109	0 (Self-reset)
"	7142	DCB3 Scheme Events	0 to 1	---	1	F102	0 (Disabled)
	Frequency Rate of Change (Read/Write Setting) (2 or 4 Modules)						
D30, D60, F60, G30, G60, L30, L90, N60, T60	7143	Frequency Rate of Change 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7144	Frequency Rate of Change 1 OC Supervision	0.02 to 30	pu	0.001	F001	200
"	7145	Frequency Rate of Change 1 Min	20 to 80	Hz	0.01	F001	4500
"	7146	Frequency Rate of Change 1 Max	20 to 80	Hz	0.01	F001	6500
"	7147	Frequency Rate of Change 1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	7148	Frequency Rate of Change 1 Reset Delay	0 to 65.535	s	0.001	F001	0
"	7149	Frequency Rate of Change 1 Block	0 to 4294967295	---	1	F300	0
"	714B	Frequency Rate of Change 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	714C	Frequency Rate of Change 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	714D	Frequency Rate of Change 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	714E	Frequency Rate of Change 1 Trend	0 to 2	---	1	F224	0 (Increasing)
"	714F	Frequency Rate of Change 1 Pickup	0.1 to 15	Hz/s	0.01	F001	50
"	7150	Frequency Rate of Change 1 OV Supervision	0.1 to 3	pu	0.001	F001	700
"	7151	Reserved (3 items)	0 to 1	---	1	F001	0
"	7154	...Repeated for Frequency Rate of Change 2					
D60, F60, G30, G60, L90, N60, T60	7165	...Repeated for Frequency Rate of Change 3					
"	7176	...Repeated for Frequency Rate of Change 4					
	VT Terminal Settings (Read/Write Setting) (12 Modules)						
B90	7163	Terminal Voltage 1 Ratio	1 to 24000	:1	0.01	F060	1
"	7165	Terminal Voltage 1 Secondary	50 to 240	V	0.1	F001	664
"	7166	...Repeated for Terminal Voltage 2					
"	7169	...Repeated for Terminal Voltage 3					
"	716C	...Repeated for Terminal Voltage 4					
"	716F	...Repeated for Terminal Voltage 5					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7172	...Repeated for Terminal Voltage 6					
"	7175	...Repeated for Terminal Voltage 7					
"	7178	...Repeated for Terminal Voltage 8					
"	717B	...Repeated for Terminal Voltage 9					
"	717E	...Repeated for Terminal Voltage 10					
"	7181	...Repeated for Terminal Voltage 11					
"	7184	...Repeated for Terminal Voltage 12					
	Restricted Ground Fault (Read/Write Grouped Setting) (4 or 6 Modules)						
F60, G30, G60, L90, T35, T60	7187	Restricted Ground Fault 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7188	Restricted Ground Fault 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	7189	Restricted Ground Fault 1 Pickup	0.005 to 30	pu	0.001	F001	80
"	718A	Restricted Ground Fault 1 Slope	0 to 100	%	1	F001	40
"	718B	Restricted Ground Fault 1 Delay	0 to 600	s	0.01	F001	0
"	718C	Restricted Ground Fault 1 Reset Delay	0 to 600	s	0.01	F001	0
"	718D	Restricted Ground Fault 1 Block	0 to 4294967295	---	1	F300	0
"	718F	Restricted Ground Fault 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7190	Restricted Ground Fault 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7191	...Repeated for Restricted Ground Fault 2					
"	719B	...Repeated for Restricted Ground Fault 3					
"	71A5	...Repeated for Restricted Ground Fault 4					
T35, T60	71AF	...Repeated for Restricted Ground Fault 5					
"	71B9	...Repeated for Restricted Ground Fault 6					
	IEC 61850 Received Analog Settings (Read/Write) (32 Modules)						
All	71C3	IEC 61850 GOOSE Analog 1 Default Value	–1000000 to 1000000	---	0.001	F060	1000
"	71C5	IEC 61850 GOOSE Analog Input 1 Mode	0 to 1	---	1	F491	0 (Default Value)
"	71C6	IEC 61850 GOOSE Analog Input 1 Units	---	---	---	F207	(none)
"	71C9	IEC 61850 GOOSE Analog Input 1 Per-Unit Base	0 to 999999999.999	---	0.001	F060	1
"	71CB	...Repeated for IEC 61850 GOOSE Analog Input 2					
"	71D3	...Repeated for IEC 61850 GOOSE Analog Input 3					
"	71DB	...Repeated for IEC 61850 GOOSE Analog Input 4					
"	71E3	...Repeated for IEC 61850 GOOSE Analog Input 5					
"	71EB	...Repeated for IEC 61850 GOOSE Analog Input 6					
"	71F3	...Repeated for IEC 61850 GOOSE Analog Input 7					
"	71FB	...Repeated for IEC 61850 GOOSE Analog Input 8					
"	7203	...Repeated for IEC 61850 GOOSE Analog Input 9					
"	720B	...Repeated for IEC 61850 GOOSE Analog Input 10					
"	7213	...Repeated for IEC 61850 GOOSE Analog Input 11					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	721B	...Repeated for IEC 61850 GOOSE Analog Input 12					
"	7223	...Repeated for IEC 61850 GOOSE Analog Input 13					
"	722B	...Repeated for IEC 61850 GOOSE Analog Input 14					
"	7233	...Repeated for IEC 61850 GOOSE Analog Input 15					
"	723B	...Repeated for IEC 61850 GOOSE Analog Input 16					
"	7243	...Repeated for IEC 61850 GOOSE Analog Input 17					
"	724B	...Repeated for IEC 61850 GOOSE Analog Input 18					
"	7253	...Repeated for IEC 61850 GOOSE Analog Input 19					
"	725B	...Repeated for IEC 61850 GOOSE Analog Input 20					
"	7263	...Repeated for IEC 61850 GOOSE Analog Input 21					
"	726B	...Repeated for IEC 61850 GOOSE Analog Input 22					
"	7273	...Repeated for IEC 61850 GOOSE Analog Input 23					
"	727B	...Repeated for IEC 61850 GOOSE Analog Input 24					
"	7283	...Repeated for IEC 61850 GOOSE Analog Input 25					
"	728B	...Repeated for IEC 61850 GOOSE Analog Input 26					
"	7293	...Repeated for IEC 61850 GOOSE Analog Input 27					
"	729B	...Repeated for IEC 61850 GOOSE Analog Input 28					
"	72A3	...Repeated for IEC 61850 GOOSE Analog Input 29					
"	72AB	...Repeated for IEC 61850 GOOSE Analog Input 30					
"	72B3	...Repeated for IEC 61850 GOOSE Analog Input 31					
"	72BB	...Repeated for IEC 61850 GOOSE Analog Input 32					
	IEC 61850 XCBR Configuration (Read/Write Settings) (6 Modules)						
All except B90	72C3	FlexLogic Operand for IEC 61850 XCBR.ST.Loc status	0 to 4294967295	---	1	F300	0
"	72C5	FlexLogic Operand for IEC 61850 XCBR Check Sync Release	0 to 4294967295	---	1	F300	1
"	72C7	FlexLogic Operand for IEC 61850 XCBR Open Interlock	0 to 4294967295	---	1	F300	1
"	72C9	FlexLogic Operand for IEC 61850 XCBR Close Interlock	0 to 4294967295	---	1	F300	1
"	72CC	...Repeated for module number 2					
"	72D5	...Repeated for module number 3					
"	72DE	...Repeated for module number 4					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	72E7	...Repeated for module number 5					
"	72F0	...Repeated for module number 6					
	IEC 61850 XCBR Configuration (Read/Write Command) (6 Modules)						
All except B90	72CB	Command to Clear XCBR OpCnt (Operation Counter)	0 to 1	---	1	F126	0 (No)
	IEC 61850 GGIO4 Analog Input Points Configuration Settings (Read/Write) (32 Modules)						
All	72F9	IEC 61850 GGIO4 Analog Input 1 Value	0 to 4294967295	---	1	F600	0
"	72FB	IEC 61850 GGIO4 Analog Input 1 db (deadband)	0 to 100000	---	1	F003	0
"	72FD	IEC 61850 GGIO4 Analog Input 1 Minimum	-1000000000000 to 1000000000000	---	0.001	F060	0
"	72FF	IEC 61850 GGIO4 Analog Input 1 Maximum	-1000000000000 to 1000000000000	---	0.001	F060	1000000
"	7301	...Repeated for IEC 61850 GGIO4 Analog Input 2					
"	7309	...Repeated for IEC 61850 GGIO4 Analog Input 3					
"	7311	...Repeated for IEC 61850 GGIO4 Analog Input 4					
"	7319	...Repeated for IEC 61850 GGIO4 Analog Input 5					
"	7321	...Repeated for IEC 61850 GGIO4 Analog Input 6					
"	7329	...Repeated for IEC 61850 GGIO4 Analog Input 7					
"	7331	...Repeated for IEC 61850 GGIO4 Analog Input 8					
"	7339	...Repeated for IEC 61850 GGIO4 Analog Input 9					
"	7341	...Repeated for IEC 61850 GGIO4 Analog Input 10					
"	7349	...Repeated for IEC 61850 GGIO4 Analog Input 11					
"	7351	...Repeated for IEC 61850 GGIO4 Analog Input 12					
"	7359	...Repeated for IEC 61850 GGIO4 Analog Input 13					
"	7361	...Repeated for IEC 61850 GGIO4 Analog Input 14					
"	7369	...Repeated for IEC 61850 GGIO4 Analog Input 15					
"	7371	...Repeated for IEC 61850 GGIO4 Analog Input 16					
"	7379	...Repeated for IEC 61850 GGIO4 Analog Input 17					
"	7381	...Repeated for IEC 61850 GGIO4 Analog Input 18					
"	7389	...Repeated for IEC 61850 GGIO4 Analog Input 19					
"	7391	...Repeated for IEC 61850 GGIO4 Analog Input 20					
"	7399	...Repeated for IEC 61850 GGIO4 Analog Input 21					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	73A1	...Repeated for IEC 61850 GGIO4 Analog Input 22					
"	73A9	...Repeated for IEC 61850 GGIO4 Analog Input 23					
"	73B1	...Repeated for IEC 61850 GGIO4 Analog Input 24					
"	73B9	...Repeated for IEC 61850 GGIO4 Analog Input 25					
"	73C1	...Repeated for IEC 61850 GGIO4 Analog Input 26					
"	73C9	...Repeated for IEC 61850 GGIO4 Analog Input 27					
"	73D1	...Repeated for IEC 61850 GGIO4 Analog Input 28					
"	73D9	...Repeated for IEC 61850 GGIO4 Analog Input 29					
"	73E1	...Repeated for IEC 61850 GGIO4 Analog Input 30					
"	73E9	...Repeated for IEC 61850 GGIO4 Analog Input 31					
"	73F1	...Repeated for IEC 61850 GGIO4 Analog Input 32					
	IEC 61850 Server Configuration (Read/Write Settings)						
All	73F9	IEC 61850 Server Data Scanning Function	0 to 1	---	1	F102	0 (Disabled)
"	73FA	MMS TCP Connection Timeout	10 to 7200	s	10	F001	120
"	73FB	IEC 61850 SCL Edition	0 to 1	---	1	F663	1 (Edition2)
	Contact Inputs (Read/Write Setting) (120 Modules)						
All	73FC	Contact Input 1 Name	---	---	---	F636	"Cont Ip 1"
"	7407	Contact Input 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7408	Contact Input 1 Debounce Time	0 to 16	ms	0.5	F001	60
"	7409	...Repeated for Contact Input 2					
"	7416	...Repeated for Contact Input 3					
"	7423	...Repeated for Contact Input 4					
"	7430	...Repeated for Contact Input 5					
"	743D	...Repeated for Contact Input 6					
"	744A	...Repeated for Contact Input 7					
"	7457	...Repeated for Contact Input 8					
"	7464	...Repeated for Contact Input 9					
"	7471	...Repeated for Contact Input 10					
"	747E	...Repeated for Contact Input 11					
"	748B	...Repeated for Contact Input 12					
"	7498	...Repeated for Contact Input 13					
"	74A5	...Repeated for Contact Input 14					
"	74B2	...Repeated for Contact Input 15					
"	74BF	...Repeated for Contact Input 16					
"	74CC	...Repeated for Contact Input 17					
"	74D9	...Repeated for Contact Input 18					
"	74E6	...Repeated for Contact Input 19					
"	74F3	...Repeated for Contact Input 20					
"	7500	...Repeated for Contact Input 21					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	750D	...Repeated for Contact Input 22					
"	751A	...Repeated for Contact Input 23					
"	7527	...Repeated for Contact Input 24					
"	7534	...Repeated for Contact Input 25					
"	7541	...Repeated for Contact Input 26					
"	754E	...Repeated for Contact Input 27					
"	755B	...Repeated for Contact Input 28					
"	7568	...Repeated for Contact Input 29					
"	7575	...Repeated for Contact Input 30					
"	7582	...Repeated for Contact Input 31					
"	758F	...Repeated for Contact Input 32					
"	759C	...Repeated for Contact Input 33					
"	75A9	...Repeated for Contact Input 34					
"	75B6	...Repeated for Contact Input 35					
"	75C3	...Repeated for Contact Input 36					
"	75D0	...Repeated for Contact Input 37					
"	75DD	...Repeated for Contact Input 38					
"	75EA	...Repeated for Contact Input 39					
"	75F7	...Repeated for Contact Input 40					
"	7604	...Repeated for Contact Input 41					
"	7611	...Repeated for Contact Input 42					
"	761E	...Repeated for Contact Input 43					
"	762B	...Repeated for Contact Input 44					
"	7638	...Repeated for Contact Input 45					
"	7645	...Repeated for Contact Input 46					
"	7652	...Repeated for Contact Input 47					
"	765F	...Repeated for Contact Input 48					
"	766C	...Repeated for Contact Input 49					
"	7679	...Repeated for Contact Input 50					
"	7686	...Repeated for Contact Input 51					
"	7693	...Repeated for Contact Input 52					
"	76A0	...Repeated for Contact Input 53					
"	76AD	...Repeated for Contact Input 54					
"	76BA	...Repeated for Contact Input 55					
"	76C7	...Repeated for Contact Input 56					
"	76D4	...Repeated for Contact Input 57					
"	76E1	...Repeated for Contact Input 58					
"	76EE	...Repeated for Contact Input 59					
"	76FB	...Repeated for Contact Input 60					
"	7708	...Repeated for Contact Input 61					
"	7715	...Repeated for Contact Input 62					
"	7722	...Repeated for Contact Input 63					
"	772F	...Repeated for Contact Input 64					
"	773C	...Repeated for Contact Input 65					
"	7749	...Repeated for Contact Input 66					
"	7756	...Repeated for Contact Input 67					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7763	...Repeated for Contact Input 68					
"	7770	...Repeated for Contact Input 69					
"	777D	...Repeated for Contact Input 70					
"	778A	...Repeated for Contact Input 71					
"	7797	...Repeated for Contact Input 72					
"	77A4	...Repeated for Contact Input 73					
"	77B1	...Repeated for Contact Input 74					
"	77BE	...Repeated for Contact Input 75					
"	77CB	...Repeated for Contact Input 76					
"	77D8	...Repeated for Contact Input 77					
"	77E5	...Repeated for Contact Input 78					
"	77F2	...Repeated for Contact Input 79					
"	77FF	...Repeated for Contact Input 80					
"	780C	...Repeated for Contact Input 81					
"	7819	...Repeated for Contact Input 82					
"	7826	...Repeated for Contact Input 83					
"	7833	...Repeated for Contact Input 84					
"	7840	...Repeated for Contact Input 85					
"	784D	...Repeated for Contact Input 86					
"	785A	...Repeated for Contact Input 87					
"	7867	...Repeated for Contact Input 88					
"	7874	...Repeated for Contact Input 89					
"	7881	...Repeated for Contact Input 90					
"	788E	...Repeated for Contact Input 91					
"	789B	...Repeated for Contact Input 92					
"	78A8	...Repeated for Contact Input 93					
"	78B5	...Repeated for Contact Input 94					
"	78C2	...Repeated for Contact Input 95					
"	78CF	...Repeated for Contact Input 96					
"	78DC	...Repeated for Contact Input 97					
"	78E9	...Repeated for Contact Input 98					
"	78F6	...Repeated for Contact Input 99					
"	7903	...Repeated for Contact Input 100					
"	7910	...Repeated for Contact Input 101					
"	791D	...Repeated for Contact Input 102					
"	792A	...Repeated for Contact Input 103					
"	7937	...Repeated for Contact Input 104					
"	7944	...Repeated for Contact Input 105					
"	7951	...Repeated for Contact Input 106					
"	795E	...Repeated for Contact Input 107					
"	796B	...Repeated for Contact Input 108					
"	7978	...Repeated for Contact Input 109					
"	7985	...Repeated for Contact Input 110					
"	7992	...Repeated for Contact Input 111					
"	799F	...Repeated for Contact Input 112					
"	79AC	...Repeated for Contact Input 113					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	79B9	...Repeated for Contact Input 114					
"	79C6	...Repeated for Contact Input 115					
"	79D3	...Repeated for Contact Input 116					
"	79E0	...Repeated for Contact Input 117					
"	79ED	...Repeated for Contact Input 118					
"	79FA	...Repeated for Contact Input 119					
"	7A07	...Repeated for Contact Input 120					
	IEC 61850 XSWI Configuration (Read/Write Setting) (24 Modules)						
All except B90	7A14	FlexLogic Operand for IEC 61850 XSWI.ST.Loc Status	0 to 4294967295	---	1	F300	0
"	7A16	FlexLogic Operand for IEC 61850 XSWI Open Interlock	0 to 4294967295	---	1	F300	1
"	7A18	FlexLogic Operand for IEC 61850 XSW Close Interlock	0 to 4294967295	---	1	F300	1
"	7A1B	...Repeated for Switch 2					
"	7A22	...Repeated for Switch 3					
"	7A29	...Repeated for Switch 4					
"	7A30	...Repeated for Switch 5					
"	7A37	...Repeated for Switch 6					
"	7A3E	...Repeated for Switch 7					
"	7A45	...Repeated for Switch 8					
"	7A4C	...Repeated for Switch 9					
"	7A53	...Repeated for Switch 10					
"	7A5A	...Repeated for Switch 11					
"	7A61	...Repeated for Switch 12					
"	7A68	...Repeated for Switch 13					
"	7A6F	...Repeated for Switch 14					
"	7A76	...Repeated for Switch 15					
"	7A7D	...Repeated for Switch 16					
"	7A84	...Repeated for Switch 17					
"	7A8B	...Repeated for Switch 18					
"	7A92	...Repeated for Switch 19					
"	7A99	...Repeated for Switch 20					
"	7AA0	...Repeated for Switch 21					
"	7AA7	...Repeated for Switch 22					
"	7AAE	...Repeated for Switch 23					
"	7AB5	...Repeated for Switch 24					
	IEC 61850 XSWI Configuration (Read/Write Command) (24 Modules)						
All except B90	7A1A	Command to Clear XSWI OpCnt (Operation Counter)	0 to 1	---	1	F126	0 (No)
"	7A1B	...Repeated for module 2					
	...						
"	7AB5	...Repeated for module 24					
	IEC 61850 GOOSE Simulation (Read/Write Setting)						
All	7ABC	Tx GOOSE Sim Mode	0 to 1	---	1	F102	0 (Disabled)
"	7ABD	Sim q Validity	0 to 3	---	1	F661	0 (NONE)
"	7ABE	Sim q Test	0 to 2	---	1	F662	0 (NONE)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7ABF	Accept Sim GOOSE	0 to 1	---	1	F102	0 (Disabled)
"	7AC0	Sim Mode Input	0 to 4294967295	---	1	F300	0
"	7AC2	Sim Mode Ctrl Via IEC 61850	0 to 4294967295	---	1	F300	1
"	7AC4	Initiate Test Mode On Sim	0 to 2	---	1	F679	2 (Test-Blocked)
	Wattmetric Ground Fault Settings (Read/Write Grouped) (2 or 5 Modules)						
D30, D60, F35, F60, L60, L90	7AC5	Wattmetric Ground Fault 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7AC6	Wattmetric Ground Fault 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	7AC7	Wattmetric Ground Fault 1 Voltage	0 to 1	---	1	F234	0 (Calculated VN)
"	7AC8	Wattmetric Ground Fault 1 Overvoltage Pickup	0.02 to 3	pu	0.01	F001	20
"	7AC9	Wattmetric Ground Fault 1 Current	0 to 1	---	1	F235	0 (Calculated IN)
"	7ACA	Wattmetric Ground Fault 1 Overcurrent Pickup	0.002 to 30	pu	0.001	F001	60
"	7ACB	Wattmetric Ground Fault 1 Overcurrent Pickup Delay	0 to 600	s	0.01	F001	20
"	7ACC	Wattmetric Ground Fault 1 Power Pickup	0.001 to 1.2	pu	0.001	F001	100
"	7ACD	Wattmetric Ground Fault 1 ECA	0 to 360	° Lag	1	F001	0
"	7ACE	Wattmetric Ground Fault 1 Power Pickup Delay	0 to 600	s	0.01	F001	20
"	7ACF	Wattmetric Ground Fault 1 Curve	0 to 5	---	1	F236	0 (Definite Time)
"	7AD0	Wattmetric Ground Fault 1 Multiplier	0.01 to 2	s	0.01	F001	100
"	7AD1	Wattmetric Ground Fault 1 Block	0 to 4294967295	---	1	F300	0
"	7AD3	Wattmetric Ground Fault 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7AD4	Wattmetric Ground Fault 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7AD5	Wattmetric Ground Fault 1 Reference Power	0.001 to 1.2	pu	0.001	F001	500
"	7AD6	Reserved	0 to 1	---	1	F001	0
"	7AD7	...Repeated for Wattmetric Ground Fault 2					
F35	7AE9	...Repeated for Wattmetric Ground Fault 3					
"	7AFB	...Repeated for Wattmetric Ground Fault 4					
"	7B0D	...Repeated for Wattmetric Ground Fault 5					
	IEC 61850 GGIO1 Configuration Settings (Read/Write Setting)						
All	7B1F	Number of Status Indications in GGIO1	8 to 128	---	8	F001	8
"	7B20	IEC 61850 GGIO1 Indication FlexLogic operands (128 items)	0 to 4294967295	---	1	F300	0
	Contact Input Thresholds (Read/Write Setting)						
All	7C20	Contact Input x Threshold (48 items)	0 to 3	---	1	F128	2 (84 Vdc)
	Mandatory (Read/Write Setting)						
All	7C51	Contact I/O Forcing	0 to 4294967295	---	1	F300	1
	Mandatory (Read/Write Command)						
All	7C50	Force VFD and LED	0 to 1	---	1	F126	0 (No)
"	7C53	Clear All Relay Records Command	0 to 1	---	1	F126	0 (No)
All	7C54	Relay Reboot Command	0 to 1	---	1	F126	0 (No)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7C55	Save Volatile Data	0 to 1	---	1	F126	0 (No)
	Mandatory (Read/Write)						
All	7C56	CID Validation Reboot Handshake	0 to 1	---	1	F126	0 (No)
	Mandatory (Read/Write Setting)						
All	7C57	Spare Setting 1	0 to 1	---	1	F102	0 (Disabled)
"	7C58	Spare Setting 2	0 to 1	---	1	F102	0 (Disabled)
"	7C59	Spare Setting 3	0 to 65535	---	1	F001	0
"	7C5A	Spare Setting 4	0 to 65535	---	1	F001	0
"	7C5B	Spare Setting 5	0 to 1	---	1	F102	0 (Disabled)
"	7C5C	Spare Setting 6	0 to 1	---	1	F102	0 (Disabled)
"	7C5D	Spare Setting 7	0 to 1	---	1	F102	0 (Disabled)
"	7C5E	Spare Setting 8	0 to 1	---	1	F102	0 (Disabled)
"	7C5F	Spare Setting 9	0 to 65535	---	1	F001	0
"	7C60	Spare Setting 10	0 to 65535	---	1	F001	0
"	7C61	Spare Setting 11	0 to 65535	---	1	F001	0
"	7C62	Spare Setting 12	0 to 65535	---	1	F001	0
"	7C63	FLE Last Saved Timestamp	0 to 4294967295	---	1	F050	0
"	7C65	FLE Last Compiled Timestamp	0 to 4294967295	---	1	F050	0
"	7C67	RPN Last Saved Timestamp	0 to 4294967295	---	1	F050	0
"	7C69	Graphical Front Panel USB Device Port Function	0 to 1	---	1	F102	1 (Enabled)
"	7C6A	Graphical Front Panel USB Host Port Function	0 to 1	---	1	F102	1 (Enabled)
"	7C6B	IED Mode Via IEC 61850	0 to 4294967295	---	1	F300	0
"	7C6D	IED Test Mode	0 to 4294967295	---	1	F300	0
"	7C6F	IED Test-Blocked Mode	0 to 4294967295	---	1	F300	0
"	7C71	IED Mode	0 to 2	---	1	F678	0 (On)
	Clear Records (Read/Write Setting)						
B30, C60, D60, F35, F60, G60, L60, L90, N60, T60	7C72	Clear Demand Operand	0 to 4294967295	---	1	F300	0
C60, D30, D60, F35, F60, L30, L60, L90	7C74	Clear Fault Reports Operand	0 to 4294967295	---	1	F300	0
B30, B90, C70, G30, G60, M60, N60, T35, T60	7C76	Clear User Fault Reports Operand	0 to 4294967295	---	1	F300	0
All	7C78	Clear Event Records Operand	0 to 4294967295	---	1	F300	0
All	7C7A	Clear Oscillography Operand	0 to 4294967295	---	1	F300	0
All except B90	7C7C	Clear Data Logger Operand	0 to 4294967295	---	1	F300	0
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60	7C7E	Clear Breaker 1 Arcing Current Operand	0 to 4294967295	---	1	F300	0
"	7C80	Clear Breaker 2 Arcing Current Operand	0 to 4294967295	---	1	F300	0
B30, C60, C70, F35, F60, L90, T35, T60	7C82	Clear Breaker 3 Arcing Current Operand	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
B30, C60, F35, F60, L90, T35, T60	7C84	Clear Breaker 4 Arcing Current Operand	0 to 4294967295	---	1	F300	0
B30, F35, T35, T60	7C86	Clear Breaker 5 Arcing Current Operand	0 to 4294967295	---	1	F300	0
"	7C88	Clear Breaker 6 Arcing Current Operand	0 to 4294967295	---	1	F300	0
B30, C60, D60, F35, F60, G30, G60, L90, M60, N60, T60	7C8A	Clear Energy Operand	0 to 4294967295	---	1	F300	0
F60	7C8C	Clear Hi-Z Records Operand	0 to 4294967295	---	1	F300	0
All	7C8E	Clear Unauthorized Access Operand	0 to 4294967295	---	1	F300	0
M60	7C90	Clear Start Data Operand	0 to 4294967295	---	1	F300	0
All except L30, L90	7C92	Clear Platform Direct Input/Output Statistics Operand	0 to 4294967295	---	1	F300	0
All	7C94	Reserved (13 items)	---	---	---	F001	0
	Direct Input/Output Settings (Read/Write Setting)						
L30, L90	7CA1	Direct Input Default States (8 or 32 items)	0 to 1	---	1	F108	0 (Off)
"	7CC1	Direct Input Default States (8 or 32 items)	0 to 1	---	1	F108	0 (Off)
"	7CE1	Direct Output x 1 Operand (8 or 32 items)	0 to 4294967295	---	1	F300	0
"	7D21	Direct Output x 2 Operand (8 or 32 items)	0 to 4294967295	---	1	F300	0
	Platform Direct Outputs (Read/Write Setting)(32 or 64 Modules)						
All except B90, L30, L90	7D61	Direct Output 1 Operand	0 to 4294967295	---	1	F300	0
"	7D63	Direct Output 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7D64	...Repeated for Direct Output 2					
"	7D67	...Repeated for Direct Output 3					
"	7D6A	...Repeated for Direct Output 4					
"	7D6D	...Repeated for Direct Output 5					
"	7D70	...Repeated for Direct Output 6					
"	7D73	...Repeated for Direct Output 7					
"	7D76	...Repeated for Direct Output 8					
"	7D79	...Repeated for Direct Output 9					
"	7D7C	...Repeated for Direct Output 10					
"	7D7F	...Repeated for Direct Output 11					
"	7D82	...Repeated for Direct Output 12					
"	7D85	...Repeated for Direct Output 13					
"	7D88	...Repeated for Direct Output 14					
"	7D8B	...Repeated for Direct Output 15					
"	7D8E	...Repeated for Direct Output 16					
"	7D91	...Repeated for Direct Output 17					
"	7D94	...Repeated for Direct Output 18					
"	7D97	...Repeated for Direct Output 19					
"	7D9A	...Repeated for Direct Output 20					
"	7D9D	...Repeated for Direct Output 21					
"	7DA0	...Repeated for Direct Output 22					
"	7DA3	...Repeated for Direct Output 23					
"	7DA6	...Repeated for Direct Output 24					
"	7DA9	...Repeated for Direct Output 25					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7DAC	...Repeated for Direct Output 26					
"	7DAF	...Repeated for Direct Output 27					
"	7DB2	...Repeated for Direct Output 28					
"	7DB5	...Repeated for Direct Output 29					
"	7DB8	...Repeated for Direct Output 30					
"	7DBB	...Repeated for Direct Output 31					
"	7DBE	...Repeated for Direct Output 32					
C30, N60	7DC1	...Repeated for Direct Output 33					
"	7DC4	...Repeated for Direct Output 34					
"	7DC7	...Repeated for Direct Output 35					
"	7DCA	...Repeated for Direct Output 36					
"	7DCD	...Repeated for Direct Output 37					
"	7DD0	...Repeated for Direct Output 38					
"	7DD3	...Repeated for Direct Output 39					
"	7DD6	...Repeated for Direct Output 40					
"	7DD9	...Repeated for Direct Output 41					
"	7DDC	...Repeated for Direct Output 42					
"	7DDF	...Repeated for Direct Output 43					
"	7DE2	...Repeated for Direct Output 44					
"	7DE5	...Repeated for Direct Output 45					
"	7DE8	...Repeated for Direct Output 46					
"	7DEB	...Repeated for Direct Output 47					
"	7DEE	...Repeated for Direct Output 48					
"	7DF1	...Repeated for Direct Output 49					
"	7DF4	...Repeated for Direct Output 50					
"	7DF7	...Repeated for Direct Output 51					
"	7DFA	...Repeated for Direct Output 52					
"	7DFD	...Repeated for Direct Output 53					
"	7E00	...Repeated for Direct Output 54					
"	7E03	...Repeated for Direct Output 55					
"	7E06	...Repeated for Direct Output 56					
"	7E09	...Repeated for Direct Output 57					
"	7E0C	...Repeated for Direct Output 58					
"	7E0F	...Repeated for Direct Output 59					
"	7E12	...Repeated for Direct Output 60					
"	7E15	...Repeated for Direct Output 61					
"	7E18	...Repeated for Direct Output 62					
"	7E1B	...Repeated for Direct Output 63					
"	7E1E	...Repeated for Direct Output 64					
	Reset (Read/Write Setting)						
All	7E21	FlexLogic operand which initiates a reset	0 to 4294967295	---	1	F300	0
	87L Channel Tests (Read/Write)						
L30, L90	7E23	Local Loopback Function	0 to 1	---	1	F126	0 (No)
"	7E24	Local Loopback Channel	1 to 2	---	1	F001	1
"	7E25	Remote Loopback Function	0 to 1	---	1	F126	0 (No)
"	7E26	Remote Loopback Channel	1 to 2	---	1	F001	1

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7E27	Remote Diagnostics Transmit	0 to 2	---	1	F223	0 (NO TEST)
	Direct Inputs/Outputs (Read/Write Setting)						
All except L30, L90	7E28	Direct Device ID	1 to 16	---	1	F001	1
"	7E29	Direct I/O Channel 1 Ring Configuration Function	0 to 1	---	1	F126	0 (No)
"	7E2A	Platform Direct I/O Data Rate	0 to 2	---	1	F492	0 (64 kbps)
"	7E2B	Direct I/O Channel 2 Ring Configuration Function	0 to 1	---	1	F126	0 (No)
"	7E2C	Platform Direct I/O Crossover Function	0 to 1	---	1	F102	0 (Disabled)
	Direct Input/Output Commands (Read/Write Command)						
All except L30, L90	7E2D	Direct Input/Output Clear Counters Command	0 to 1	---	1	F126	0 (No)
	Direct Inputs (Read/Write Setting) (32 or 64 Modules)						
All except B90, L30, L90	7E2E	Direct Input 1 Device Number	0 to 16	---	1	F001	0
"	7E2F	Direct Input 1 Number	0 to 256	---	1	F001	0
"	7E30	Direct Input 1 Default State	0 to 3	---	1	F086	0 (Off)
"	7E31	Direct Input 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7E32	...Repeated for Direct Input 2					
"	7E36	...Repeated for Direct Input 3					
"	7E3A	...Repeated for Direct Input 4					
"	7E3E	...Repeated for Direct Input 5					
"	7E42	...Repeated for Direct Input 6					
"	7E46	...Repeated for Direct Input 7					
"	7E4A	...Repeated for Direct Input 8					
"	7E4E	...Repeated for Direct Input 9					
"	7E52	...Repeated for Direct Input 10					
"	7E56	...Repeated for Direct Input 11					
"	7E5A	...Repeated for Direct Input 12					
"	7E5E	...Repeated for Direct Input 13					
"	7E62	...Repeated for Direct Input 14					
"	7E66	...Repeated for Direct Input 15					
"	7E6A	...Repeated for Direct Input 16					
"	7E6E	...Repeated for Direct Input 17					
"	7E72	...Repeated for Direct Input 18					
"	7E76	...Repeated for Direct Input 19					
"	7E7A	...Repeated for Direct Input 20					
"	7E7E	...Repeated for Direct Input 21					
"	7E82	...Repeated for Direct Input 22					
"	7E86	...Repeated for Direct Input 23					
"	7E8A	...Repeated for Direct Input 24					
"	7E8E	...Repeated for Direct Input 25					
"	7E92	...Repeated for Direct Input 26					
"	7E96	...Repeated for Direct Input 27					
"	7E9A	...Repeated for Direct Input 28					
"	7E9E	...Repeated for Direct Input 29					
"	7EA2	...Repeated for Direct Input 30					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7EA6	...Repeated for Direct Input 31					
"	7EAA	...Repeated for Direct Input 32					
C30, N60	7EAE	...Repeated for Direct Input 33					
"	7EB2	...Repeated for Direct Input 34					
"	7EB6	...Repeated for Direct Input 35					
"	7EBA	...Repeated for Direct Input 36					
"	7EBE	...Repeated for Direct Input 37					
"	7EC2	...Repeated for Direct Input 38					
"	7EC6	...Repeated for Direct Input 39					
"	7ECA	...Repeated for Direct Input 40					
"	7ECE	...Repeated for Direct Input 41					
"	7ED2	...Repeated for Direct Input 42					
"	7ED6	...Repeated for Direct Input 43					
"	7EDA	...Repeated for Direct Input 44					
"	7EDE	...Repeated for Direct Input 45					
"	7EE2	...Repeated for Direct Input 46					
"	7EE6	...Repeated for Direct Input 47					
"	7EEA	...Repeated for Direct Input 48					
"	7EEE	...Repeated for Direct Input 49					
"	7EF2	...Repeated for Direct Input 50					
"	7EF6	...Repeated for Direct Input 51					
"	7EFA	...Repeated for Direct Input 52					
"	7EFE	...Repeated for Direct Input 53					
"	7F02	...Repeated for Direct Input 54					
"	7F06	...Repeated for Direct Input 55					
"	7F0A	...Repeated for Direct Input 56					
"	7F0E	...Repeated for Direct Input 57					
"	7F12	...Repeated for Direct Input 58					
"	7F16	...Repeated for Direct Input 59					
"	7F1A	...Repeated for Direct Input 60					
"	7F1E	...Repeated for Direct Input 61					
"	7F22	...Repeated for Direct Input 62					
"	7F26	...Repeated for Direct Input 63					
"	7F2A	...Repeated for Direct Input 64					
	Direct Input/Output Alarms (Read/Write Setting)						
All except L30, L90	7F2E	Direct Input/Output Channel 1 CRC Alarm Function	0 to 1	---	1	F102	0 (Disabled)
"	7F2F	Direct Input/Output Channel 1 CRC Alarm Message Count	100 to 10000	---	1	F001	600
"	7F30	Direct Input/Output Channel 1 CRC Alarm Threshold	1 to 1000	---	1	F001	10
"	7F31	Direct Input/Output Channel 1 CRC Alarm Events	0 to 1	---	1	F102	0 (Disabled)
"	7F32	Reserved (4 items)	1 to 1000	---	1	F001	10
"	7F36	Direct Input/Output Channel 2 CRC Alarm Function	0 to 1	---	1	F102	0 (Disabled)
"	7F37	Direct Input/Output Channel 2 CRC Alarm Message Count	100 to 10000	---	1	F001	600

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	7F38	Direct Input/Output Channel 2 CRC Alarm Threshold	1 to 1000	---	1	F001	10
"	7F39	Direct Input/Output Channel 2 CRC Alarm Events	0 to 1	---	1	F102	0 (Disabled)
"	7F3A	Reserved (4 items)	1 to 1000	---	1	F001	10
"	7F3E	Direct Input/Output Channel 1 Unreturned Messages Alarm Function	0 to 1	---	1	F102	0 (Disabled)
"	7F3F	Direct Input/Output Channel 1 Unreturned Messages Alarm Msg Count	100 to 10000	---	1	F001	600
"	7F40	Direct Input/Output Channel 1 Unreturned Messages Alarm Threshold	1 to 1000	---	1	F001	10
"	7F41	Direct Input/Output Channel 1 Unreturned Messages Alarm Events	0 to 1	---	1	F102	0 (Disabled)
"	7F42	Reserved (4 items)	1 to 1000	---	1	F001	10
"	7F46	Direct Input/Output Channel 2 Unreturned Messages Alarm Function	0 to 1	---	1	F102	0 (Disabled)
"	7F47	Direct Input/Output Channel 2 Unreturned Messages Alarm Msg Count	100 to 10000	---	1	F001	600
"	7F48	Direct Input/Output Channel 2 Unreturned Messages Alarm Threshold	1 to 1000	---	1	F001	10
"	7F49	Direct Input/Output Channel 2 Unreturned Messages Alarm Events	0 to 1	---	1	F102	0 (Disabled)
"	7F4A	Reserved (4 items)	1 to 1000	---	1	F001	10
	Contact Outputs (Read/Write Setting) (72 Modules)						
All	7F4E	Contact Output 1 Name	---	---	---	F636	"Cont Op 1"
"	7F59	Contact Output 1 Operation	0 to 4294967295	---	1	F300	0
"	7F5B	Contact Output 1 Seal In	0 to 4294967295	---	1	F300	0
"	7F5D	Latching Output 1 Reset	0 to 4294967295	---	1	F300	0
"	7F5F	Contact Output 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	7F60	Latching Output 1 Type	0 to 1	---	1	F090	0 (Operate-dominant)
"	7F61	Reserved	---	---	---	F001	0
"	7F62	...Repeated for Contact Output 2					
"	7F76	...Repeated for Contact Output 3					
"	7F8A	...Repeated for Contact Output 4					
"	7F9E	...Repeated for Contact Output 5					
"	7FB2	...Repeated for Contact Output 6					
"	7FC6	...Repeated for Contact Output 7					
"	7FDA	...Repeated for Contact Output 8					
"	7FEE	...Repeated for Contact Output 9					
"	8002	...Repeated for Contact Output 10					
"	8016	...Repeated for Contact Output 11					
"	802A	...Repeated for Contact Output 12					
"	803E	...Repeated for Contact Output 13					
"	8052	...Repeated for Contact Output 14					
"	8066	...Repeated for Contact Output 15					
"	807A	...Repeated for Contact Output 16					
"	808E	...Repeated for Contact Output 17					
"	80A2	...Repeated for Contact Output 18					
"	80B6	...Repeated for Contact Output 19					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	80CA	...Repeated for Contact Output 20					
"	80DE	...Repeated for Contact Output 21					
"	80F2	...Repeated for Contact Output 22					
"	8106	...Repeated for Contact Output 23					
"	811A	...Repeated for Contact Output 24					
"	812E	...Repeated for Contact Output 25					
"	8142	...Repeated for Contact Output 26					
"	8156	...Repeated for Contact Output 27					
"	816A	...Repeated for Contact Output 28					
"	817E	...Repeated for Contact Output 29					
"	8192	...Repeated for Contact Output 30					
"	81A6	...Repeated for Contact Output 31					
"	81BA	...Repeated for Contact Output 32					
"	81CE	...Repeated for Contact Output 33					
"	81E2	...Repeated for Contact Output 34					
"	81F6	...Repeated for Contact Output 35					
"	820A	...Repeated for Contact Output 36					
"	821E	...Repeated for Contact Output 37					
"	8232	...Repeated for Contact Output 38					
"	8246	...Repeated for Contact Output 39					
"	825A	...Repeated for Contact Output 40					
"	826E	...Repeated for Contact Output 41					
"	8282	...Repeated for Contact Output 42					
"	8296	...Repeated for Contact Output 43					
"	82AA	...Repeated for Contact Output 44					
"	82BE	...Repeated for Contact Output 45					
"	82D2	...Repeated for Contact Output 46					
"	82E6	...Repeated for Contact Output 47					
"	82FA	...Repeated for Contact Output 48					
"	830E	...Repeated for Contact Output 49					
"	8322	...Repeated for Contact Output 50					
"	8336	...Repeated for Contact Output 51					
"	834A	...Repeated for Contact Output 52					
"	835E	...Repeated for Contact Output 53					
"	8372	...Repeated for Contact Output 54					
"	8386	...Repeated for Contact Output 55					
"	839A	...Repeated for Contact Output 56					
"	83AE	...Repeated for Contact Output 57					
"	83C2	...Repeated for Contact Output 58					
"	83D6	...Repeated for Contact Output 59					
"	83EA	...Repeated for Contact Output 60					
"	83FE	...Repeated for Contact Output 61					
"	8412	...Repeated for Contact Output 62					
"	8426	...Repeated for Contact Output 63					
"	843A	...Repeated for Contact Output 64					
"	844E	...Repeated for Contact Output 65					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	8462	...Repeated for Contact Output 66					
"	8476	...Repeated for Contact Output 67					
"	848A	...Repeated for Contact Output 68					
"	849E	...Repeated for Contact Output 69					
"	84B2	...Repeated for Contact Output 70					
"	84C6	...Repeated for Contact Output 71					
"	84DA	...Repeated for Contact Output 72					
	Force Contact Inputs/Outputs (Read/Write Settings)						
All	84EE	Force Contact Input x State (120 items)	0 to 2	---	1	F144	0 (Normal)
"	8566	Force Contact Output x State (72 items)	0 to 3	---	1	F131	0 (Normal)
	R-GOOSE to GOOSE (Read/Write Setting) (16 Modules)						
C30	85AE	RGOOSE 1 Destination IP Address	0 to 4294967295	---	1	F003	3758096384
"	85B0	RGOOSE 1 Source IP Address	0 to 4294967295	---	1	F003	2130706433
"	85B2	RGOOSE 1 Destination MAC Address	---	---	---	F072	0
"	85B5	...Repeated for GOOSE 2					
"	85BC	...Repeated for GOOSE 3					
"	85C3	...Repeated for GOOSE 4					
"	85CA	...Repeated for GOOSE 5					
"	85D1	...Repeated for GOOSE 6					
"	85D8	...Repeated for GOOSE 7					
"	85DF	...Repeated for GOOSE 8					
"	85E6	...Repeated for GOOSE 9					
"	85ED	...Repeated for GOOSE 10					
"	85F4	...Repeated for GOOSE 11					
"	85FB	...Repeated for GOOSE 12					
"	8602	...Repeated for GOOSE 13					
"	8609	...Repeated for GOOSE 14					
"	8610	...Repeated for GOOSE 15					
"	8617	...Repeated for GOOSE 16					
	Synchrocheck (Read/Write Setting) (4, 6, or 10 Modules)						
B30, C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60	861E	Synchrocheck 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	861F	Synchrocheck 1 V1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	8620	Synchrocheck 1 V2 Source	0 to 5	---	1	F167	1 (SRC 2)
"	8621	Synchrocheck 1 Maximum Voltage Difference	0 to 400000	V	1	F060	10000
"	8623	Synchrocheck 1 Maximum Angle Difference	0 to 100	degrees	1	F001	30
"	8624	Synchrocheck 1 Maximum Frequency Difference	0 to 2	Hz	0.01	F001	100
"	8625	Synchrocheck 1 Maximum Frequency Hysteresis	0 to 0.1	Hz	0.01	F001	6
"	8626	Synchrocheck 1 Sync Close	0 to 4294967295	---	1	F300	0
"	8628	Synchrocheck 1 S-CLS Maximum dF	0.1 to 2	Hz	0.01	F001	50
"	8629	Synchrocheck 1 S-CLS Minimum dF	0.01 to 1	Hz	0.01	F001	10
"	862A	Synchrocheck 1 S-CLS Brk Time	0.01 to 0.5	s	0.001	F001	35

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	862B	Synchrocheck 1 V2 Magnitude Correction Factor	0.1 to 10	---	0.01	F001	100
"	862C	Synchrocheck 1 V2 Angle Shift	-180 to 180	---	1	F002	0
"	862D	Synchrocheck 1 Dead Source Select	0 to 5	---	1	F176	1 (LV1 and DV2)
"	862E	Synchrocheck 1 Dead V1 Maximum Voltage	0.04 to 1.25	pu	0.01	F001	30
"	862F	Synchrocheck 1 Dead V2 Maximum Voltage	0.04 to 1.25	pu	0.01	F001	30
"	8630	Synchrocheck 1 Live V1 Minimum Voltage	0.04 to 1.25	pu	0.01	F001	70
"	8631	Synchrocheck 1 Live V2 Minimum Voltage	0.04 to 1.25	pu	0.01	F001	70
"	8632	Synchrocheck 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	8633	Synchrocheck 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	8634	Synchrocheck 1 Block	0 to 4294967295	---	1	F300	0
"	8636	...Repeated for Synchrocheck 2					
"	864E	...Repeated for Synchrocheck 3					
"	8666	...Repeated for Synchrocheck 4					
B30, C60, D60, L90, N60, T60	867E	...Repeated for Synchrocheck 5					
"	8696	...Repeated for Synchrocheck 6					
C60, D60, L90	86AE	...Repeated for Synchrocheck 7					
"	86C6	...Repeated for Synchrocheck 8					
"	86DE	...Repeated for Synchrocheck 9					
"	86F6	...Repeated for Synchrocheck 10					
	DCmA Inputs (Read/Write Setting) (24 Modules)						
All except B90	870E	DCmA Inputs 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	870F	DCmA Inputs 1 ID	---	---	---	F205	"DCmA Ip 1"
"	8716	Reserved 1 (4 items)	0 to 65535	---	1	F001	0
"	871A	DCmA Inputs 1 Units	---	---	---	F206	"mA"
"	871E	DCmA Inputs 1 Range	0 to 6	---	1	F173	6 (4 to 20 mA)
"	871F	DCmA Inputs 1 Minimum Value	-9999.999 to 9999.999	---	0.001	F004	4000
"	8721	DCmA Inputs 1 Maximum Value	-9999.999 to 9999.999	---	0.001	F004	20000
"	8723	...Repeated for DCmA Inputs 2					
"	8738	...Repeated for DCmA Inputs 3					
"	874D	...Repeated for DCmA Inputs 4					
"	8762	...Repeated for DCmA Inputs 5					
"	8777	...Repeated for DCmA Inputs 6					
"	878C	...Repeated for DCmA Inputs 7					
"	87A1	...Repeated for DCmA Inputs 8					
"	87B6	...Repeated for DCmA Inputs 9					
"	87CB	...Repeated for DCmA Inputs 10					
"	87E0	...Repeated for DCmA Inputs 11					
"	87F5	...Repeated for DCmA Inputs 12					
"	880A	...Repeated for DCmA Inputs 13					
"	881F	...Repeated for DCmA Inputs 14					
"	8834	...Repeated for DCmA Inputs 15					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	8849	...Repeated for DCmA Inputs 16					
"	885E	...Repeated for DCmA Inputs 17					
"	8873	...Repeated for DCmA Inputs 18					
"	8888	...Repeated for DCmA Inputs 19					
"	889D	...Repeated for DCmA Inputs 20					
"	88B2	...Repeated for DCmA Inputs 21					
"	88C7	...Repeated for DCmA Inputs 22					
"	88DC	...Repeated for DCmA Inputs 23					
"	88F1	...Repeated for DCmA Inputs 24					
	DNP/IEC Points (Read/Write Setting)						
All	8906	DNP/IEC 60870-5-104 Binary Input Points (256 items)	0 to 4294967295	---	1	F300	0
"	8B06	DNP/IEC 60870-5-104 Analog Input Points (256 items)	0 to 4294967295	---	1	F600	0
	Phasor Measurement Unit Basic Configuration (Read/Write Setting) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	8D06	PMU 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	8D07	PMU 1 LDInst	---	---	---	F214	"PMUx"
"	8D28	PMU 1 IDcode	1 to 65534	---	1	F001	1
"	8D29	PMU 1 STN	---	---	---	F203	"GE-UR-PMU"
"	8D32	PMU 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	8D33	PMU 1 Class	0 to 2	---	1	F549	1 (M-CLASS)
"	8D34	PMU 1 Format	0 to 1	---	1	F547	0 (Integer)
"	8D35	PMU 1 Style	0 to 1	---	1	F546	0 (Polar)
"	8D36	PMU 1 Rate	0 to 13	---	1	F544	4 (10/sec)
"	8D37	PMU 1 PHS-x (14 items)	0 to 14	---	1	F543	1 (Va)
"	8D45	PMU 1 PHS-x Name (14 items)	---	---	---	F203	"GE-UR-PMU-PHS 1 "
"	8DC3	PMU 1 A-CH-x (16 items)	0 to 4294967295	---	1	F600	0
"	8DE3	PMU 1 A-CH-x Name (16 items)	---	---	---	F203	"AnalogChannel 1 "
"	8E73	PMU 1 D-CH-x (16 items)	0 to 4294967295	---	1	F300	0
"	8E93	PMU 1 D-CH-x Name (16 items)	---	---	---	F203	"Dig Channel 1 "
"	8F23	PMU 1 D-CH-x Normal State (16 items)	0 to 1	---	1	F108	0 (Off)
"	8F33	PMU 1 Post Filter	0 to 4	---	1	F540	0 (None)
"	8F34	Reserved (15 items)	0 to 1	---	1	F001	0
C60, N60	8F43	...Repeated for PMU 2					
N60	9180	...Repeated for PMU 3					
"	93DF	...Repeated for PMU 4					
"	95FA	...Repeated for PMU 5					
"	9837	...Repeated for PMU 6					
	Direct Input/Output Names (Read/Write Setting) (256 Modules)						
B90	8D06	Direct Input 1 Name	0 to 256	---	1	F205	"Dir Ip 1"
"	8D0C	Direct Output 1 Name	1 to 256	---	1	F205	"Dir Out 1"
"	8D12	...Repeated for Direct Input/Output 2					
"	8D1E	...Repeated for Direct Input/Output 3					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	8D2A	...Repeated for Direct Input/Output 4					
"	8D36	...Repeated for Direct Input/Output 5					
"	8D42	...Repeated for Direct Input/Output 6					
"	8D4E	...Repeated for Direct Input/Output 7					
"	8D5A	...Repeated for Direct Input/Output 8					
"	8D66	...Repeated for Direct Input/Output 9					
"	8D72	...Repeated for Direct Input/Output 10					
"	8D7E	...Repeated for Direct Input/Output 11					
"	8D8A	...Repeated for Direct Input/Output 12					
"	8D96	...Repeated for Direct Input/Output 13					
"	8DA2	...Repeated for Direct Input/Output 14					
"	8DAE	...Repeated for Direct Input/Output 15					
"	8DBA	...Repeated for Direct Input/Output 16					
"	8DC6	...Repeated for Direct Input/Output 17					
"	8DD2	...Repeated for Direct Input/Output 18					
"	8DDE	...Repeated for Direct Input/Output 19					
"	8DEA	...Repeated for Direct Input/Output 20					
"	8DF6	...Repeated for Direct Input/Output 21					
"	8E02	...Repeated for Direct Input/Output 22					
"	8E0E	...Repeated for Direct Input/Output 23					
"	8E1A	...Repeated for Direct Input/Output 24					
"	8E26	...Repeated for Direct Input/Output 25					
"	8E32	...Repeated for Direct Input/Output 26					
"	8E3E	...Repeated for Direct Input/Output 27					
"	8E4A	...Repeated for Direct Input/Output 28					
"	8E56	...Repeated for Direct Input/Output 29					
"	8E62	...Repeated for Direct Input/Output 30					
"	8E6E	...Repeated for Direct Input/Output 31					
"	8E7A	...Repeated for Direct Input/Output 32					
"	8E86	...Repeated for Direct Input/Output 33					
"	8E92	...Repeated for Direct Input/Output 34					
"	9E9E	...Repeated for Direct Input/Output 35					
"	9EAA	...Repeated for Direct Input/Output 36					
"	9EB6	...Repeated for Direct Input/Output 37					
"	9EC2	...Repeated for Direct Input/Output 38					
"	9ECE	...Repeated for Direct Input/Output 39					
"	9EDA	...Repeated for Direct Input/Output 40					
"	9EE6	...Repeated for Direct Input/Output 41					
"	9EF2	...Repeated for Direct Input/Output 42					
"	9EFE	...Repeated for Direct Input/Output 43					
"	9F0A	...Repeated for Direct Input/Output 44					
"	9F16	...Repeated for Direct Input/Output 45					
"	9F22	...Repeated for Direct Input/Output 46					
"	8F2E	...Repeated for Direct Input/Output 47					
"	8F3A	...Repeated for Direct Input/Output 48					
"	8F46	...Repeated for Direct Input/Output 49					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	8F52	...Repeated for Direct Input/Output 50					
"	8F5E	...Repeated for Direct Input/Output 51					
"	8F6A	...Repeated for Direct Input/Output 52					
"	8F76	...Repeated for Direct Input/Output 53					
"	8F82	...Repeated for Direct Input/Output 54					
"	8F8E	...Repeated for Direct Input/Output 55					
"	8F9A	...Repeated for Direct Input/Output 56					
"	8FA6	...Repeated for Direct Input/Output 57					
"	8FB2	...Repeated for Direct Input/Output 58					
"	8FBE	...Repeated for Direct Input/Output 59					
"	8FCA	...Repeated for Direct Input/Output 60					
"	8FD6	...Repeated for Direct Input/Output 61					
"	8FE2	...Repeated for Direct Input/Output 62					
"	8FEE	...Repeated for Direct Input/Output 63					
"	8FFA	...Repeated for Direct Input/Output 64					
"	9006	...Repeated for Direct Input/Output 65					
"	9012	...Repeated for Direct Input/Output 66					
"	901E	...Repeated for Direct Input/Output 67					
"	902A	...Repeated for Direct Input/Output 68					
"	9036	...Repeated for Direct Input/Output 69					
"	9042	...Repeated for Direct Input/Output 70					
"	904E	...Repeated for Direct Input/Output 71					
"	905A	...Repeated for Direct Input/Output 72					
"	9066	...Repeated for Direct Input/Output 73					
"	9072	...Repeated for Direct Input/Output 74					
"	907E	...Repeated for Direct Input/Output 75					
"	908A	...Repeated for Direct Input/Output 76					
"	9096	...Repeated for Direct Input/Output 77					
"	90A2	...Repeated for Direct Input/Output 78					
"	90AE	...Repeated for Direct Input/Output 79					
"	90BA	...Repeated for Direct Input/Output 80					
"	90C6	...Repeated for Direct Input/Output 81					
"	90D2	...Repeated for Direct Input/Output 82					
"	90DE	...Repeated for Direct Input/Output 83					
"	90EA	...Repeated for Direct Input/Output 84					
"	90F6	...Repeated for Direct Input/Output 85					
"	9102	...Repeated for Direct Input/Output 86					
"	910E	...Repeated for Direct Input/Output 87					
"	911A	...Repeated for Direct Input/Output 88					
"	9126	...Repeated for Direct Input/Output 89					
"	9132	...Repeated for Direct Input/Output 90					
"	913E	...Repeated for Direct Input/Output 91					
"	914A	...Repeated for Direct Input/Output 92					
"	9156	...Repeated for Direct Input/Output 93					
"	9162	...Repeated for Direct Input/Output 94					
"	916E	...Repeated for Direct Input/Output 95					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	917A	...Repeated for Direct Input/Output 96					
"	9186	...Repeated for Direct Input/Output 97					
"	9192	...Repeated for Direct Input/Output 98					
"	919E	...Repeated for Direct Input/Output 99					
"	91AA	...Repeated for Direct Input/Output 100					
"	91B6	...Repeated for Direct Input/Output 101					
"	91C2	...Repeated for Direct Input/Output 102					
"	91CE	...Repeated for Direct Input/Output 103					
"	91DA	...Repeated for Direct Input/Output 104					
"	91E6	...Repeated for Direct Input/Output 105					
"	91F2	...Repeated for Direct Input/Output 106					
"	91FE	...Repeated for Direct Input/Output 107					
"	920A	...Repeated for Direct Input/Output 108					
"	9216	...Repeated for Direct Input/Output 109					
"	9222	...Repeated for Direct Input/Output 110					
"	922E	...Repeated for Direct Input/Output 111					
"	923A	...Repeated for Direct Input/Output 112					
"	9246	...Repeated for Direct Input/Output 113					
"	9252	...Repeated for Direct Input/Output 114					
"	925E	...Repeated for Direct Input/Output 115					
"	926A	...Repeated for Direct Input/Output 116					
"	9276	...Repeated for Direct Input/Output 117					
"	9282	...Repeated for Direct Input/Output 118					
"	928E	...Repeated for Direct Input/Output 119					
"	929A	...Repeated for Direct Input/Output 120					
"	92A6	...Repeated for Direct Input/Output 121					
"	92B2	...Repeated for Direct Input/Output 122					
"	92BE	...Repeated for Direct Input/Output 123					
"	92CA	...Repeated for Direct Input/Output 124					
"	92D6	...Repeated for Direct Input/Output 125					
"	92E2	...Repeated for Direct Input/Output 126					
"	92EE	...Repeated for Direct Input/Output 127					
"	92FA	...Repeated for Direct Input/Output 128					
"	9306	...Repeated for Direct Input/Output 129					
"	9312	...Repeated for Direct Input/Output 130					
"	931E	...Repeated for Direct Input/Output 131					
"	932A	...Repeated for Direct Input/Output 132					
"	9336	...Repeated for Direct Input/Output 133					
"	9342	...Repeated for Direct Input/Output 134					
"	934E	...Repeated for Direct Input/Output 135					
"	935A	...Repeated for Direct Input/Output 136					
"	9366	...Repeated for Direct Input/Output 137					
"	9372	...Repeated for Direct Input/Output 138					
"	937E	...Repeated for Direct Input/Output 139					
"	938A	...Repeated for Direct Input/Output 140					
"	9396	...Repeated for Direct Input/Output 141					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	93A2	...Repeated for Direct Input/Output 142					
"	93AE	...Repeated for Direct Input/Output 143					
"	93BA	...Repeated for Direct Input/Output 144					
"	93C6	...Repeated for Direct Input/Output 145					
"	93D2	...Repeated for Direct Input/Output 146					
"	93DE	...Repeated for Direct Input/Output 147					
"	93EA	...Repeated for Direct Input/Output 148					
"	93F6	...Repeated for Direct Input/Output 149					
"	9402	...Repeated for Direct Input/Output 150					
"	940E	...Repeated for Direct Input/Output 151					
"	941A	...Repeated for Direct Input/Output 152					
"	9426	...Repeated for Direct Input/Output 153					
"	9432	...Repeated for Direct Input/Output 154					
"	943E	...Repeated for Direct Input/Output 155					
"	944A	...Repeated for Direct Input/Output 156					
"	9456	...Repeated for Direct Input/Output 157					
"	9462	...Repeated for Direct Input/Output 158					
"	946E	...Repeated for Direct Input/Output 159					
"	947A	...Repeated for Direct Input/Output 160					
"	9486	...Repeated for Direct Input/Output 161					
"	9492	...Repeated for Direct Input/Output 162					
"	949E	...Repeated for Direct Input/Output 163					
"	94AA	...Repeated for Direct Input/Output 164					
"	94B6	...Repeated for Direct Input/Output 165					
"	94C2	...Repeated for Direct Input/Output 166					
"	94CE	...Repeated for Direct Input/Output 167					
"	94DA	...Repeated for Direct Input/Output 168					
"	94E6	...Repeated for Direct Input/Output 169					
"	94F2	...Repeated for Direct Input/Output 170					
"	94FE	...Repeated for Direct Input/Output 171					
"	950A	...Repeated for Direct Input/Output 172					
"	9516	...Repeated for Direct Input/Output 173					
"	9522	...Repeated for Direct Input/Output 174					
"	952E	...Repeated for Direct Input/Output 175					
"	953A	...Repeated for Direct Input/Output 176					
"	9546	...Repeated for Direct Input/Output 177					
"	9552	...Repeated for Direct Input/Output 178					
"	955E	...Repeated for Direct Input/Output 179					
"	956A	...Repeated for Direct Input/Output 180					
"	9576	...Repeated for Direct Input/Output 181					
"	9582	...Repeated for Direct Input/Output 182					
"	958E	...Repeated for Direct Input/Output 183					
"	959A	...Repeated for Direct Input/Output 184					
"	95A6	...Repeated for Direct Input/Output 185					
"	95B2	...Repeated for Direct Input/Output 186					
"	95BE	...Repeated for Direct Input/Output 187					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	95CA	...Repeated for Direct Input/Output 188					
"	95D6	...Repeated for Direct Input/Output 189					
"	95E2	...Repeated for Direct Input/Output 190					
"	95EE	...Repeated for Direct Input/Output 191					
"	95FA	...Repeated for Direct Input/Output 192					
"	9606	...Repeated for Direct Input/Output 193					
"	9612	...Repeated for Direct Input/Output 194					
"	961E	...Repeated for Direct Input/Output 195					
"	962A	...Repeated for Direct Input/Output 196					
"	9636	...Repeated for Direct Input/Output 197					
"	9642	...Repeated for Direct Input/Output 198					
"	964E	...Repeated for Direct Input/Output 199					
"	965A	...Repeated for Direct Input/Output 200					
"	9666	...Repeated for Direct Input/Output 201					
"	9672	...Repeated for Direct Input/Output 202					
"	967E	...Repeated for Direct Input/Output 203					
"	968A	...Repeated for Direct Input/Output 204					
"	9696	...Repeated for Direct Input/Output 205					
"	96A2	...Repeated for Direct Input/Output 206					
"	96AE	...Repeated for Direct Input/Output 207					
"	96BA	...Repeated for Direct Input/Output 208					
"	96C6	...Repeated for Direct Input/Output 209					
"	96D2	...Repeated for Direct Input/Output 210					
"	96DE	...Repeated for Direct Input/Output 211					
"	96EA	...Repeated for Direct Input/Output 212					
"	96F6	...Repeated for Direct Input/Output 213					
"	9702	...Repeated for Direct Input/Output 214					
"	970E	...Repeated for Direct Input/Output 215					
"	971A	...Repeated for Direct Input/Output 216					
"	9726	...Repeated for Direct Input/Output 217					
"	9732	...Repeated for Direct Input/Output 218					
"	973E	...Repeated for Direct Input/Output 219					
"	974A	...Repeated for Direct Input/Output 220					
"	9756	...Repeated for Direct Input/Output 221					
"	9762	...Repeated for Direct Input/Output 222					
"	976E	...Repeated for Direct Input/Output 223					
"	977A	...Repeated for Direct Input/Output 224					
"	9786	...Repeated for Direct Input/Output 225					
"	9792	...Repeated for Direct Input/Output 226					
"	979E	...Repeated for Direct Input/Output 227					
"	97AA	...Repeated for Direct Input/Output 228					
"	97B6	...Repeated for Direct Input/Output 229					
"	97C2	...Repeated for Direct Input/Output 230					
"	97CE	...Repeated for Direct Input/Output 231					
"	97DA	...Repeated for Direct Input/Output 232					
"	97E6	...Repeated for Direct Input/Output 233					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	97F2	...Repeated for Direct Input/Output 234					
"	97FE	...Repeated for Direct Input/Output 235					
"	980A	...Repeated for Direct Input/Output 236					
"	9816	...Repeated for Direct Input/Output 237					
"	9822	...Repeated for Direct Input/Output 238					
"	982E	...Repeated for Direct Input/Output 239					
"	983A	...Repeated for Direct Input/Output 240					
"	9846	...Repeated for Direct Input/Output 241					
"	9852	...Repeated for Direct Input/Output 242					
"	985E	...Repeated for Direct Input/Output 243					
"	986A	...Repeated for Direct Input/Output 244					
"	987C	...Repeated for Direct Input/Output 245					
"	9882	...Repeated for Direct Input/Output 246					
"	988E	...Repeated for Direct Input/Output 247					
"	989A	...Repeated for Direct Input/Output 248					
"	98A6	...Repeated for Direct Input/Output 249					
"	98B2	...Repeated for Direct Input/Output 250					
"	98BE	...Repeated for Direct Input/Output 251					
"	98CA	...Repeated for Direct Input/Output 252					
"	98D6	...Repeated for Direct Input/Output 253					
"	98E2	...Repeated for Direct Input/Output 254					
"	98EE	...Repeated for Direct Input/Output 255					
"	98FA	...Repeated for Direct Input/Output 256					
	Phasor Measurement Unit Aggregator (Read/Write Setting) (1, 2, or 4 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9A74	PMU Aggregator 1 Name	---	---	---	F209	"MSVID 1 "
"	9A95	Aggregator 1 IDcode	1 to 65534	---	1	F001	1
"	9A96	Aggregator 1 Protocol	0 to 2	---	1	F548	0 (NONE)
"	9A97	Aggregator 1 TCP Port	0 to 65534	---	1	F001	4712
"	9A98	Aggregator 1 UDP Port	0 to 65534	---	1	F001	4713
"	9A99	PMU Aggregator 1 90-5 UDP Port	0 to 65534	---	1	F001	102
"	9A9A	PMU Aggregator 1 PDC Network Control	0 to 1	---	1	F102	0 (Disabled)
"	9A9B	Aggregator 1 Include PMU1	0 to 1	---	1	F126	0 (No)
"	9A9C	Aggregator 1 Include PMU2	0 to 1	---	1	F126	0 (No)
"	9A9D	Aggregator 1 Include PMU3	0 to 1	---	1	F126	0 (No)
"	9A9E	Aggregator 1 Include PMU4	0 to 1	---	1	F126	0 (No)
"	9A9F	Aggregator 1 Include PMU5	0 to 1	---	1	F126	0 (No)
"	9AA0	Aggregator 1 Include PMU6	0 to 1	---	1	F126	0 (No)
"	9AA1	PMU Aggregator 1 ASDUS	1 to 4	---	1	F001	1
"	9AA2	PMU Aggregator 1 Port	1 to 3	---	1	F001	1
"	9AA3	Reserved (3 items)	0 to 1	---	1	F001	0
C60, N60	9AA4	...Repeated for PMU Aggregator 2					
N60	9AD4	...Repeated for PMU Aggregator 3					
"	9B04	...Repeated for PMU Aggregator 4					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	Phasor Measurement Unit Aggregator Control Block (Read/Write Setting) (1, 2, or 4 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9B34	PMU Aggregator 1 Control Block SvEna	0 to 4294967295	---	1	F300	0
"	9B36	PMU Aggregator 1 Control Block Client Control	0 to 4294967295	---	1	F300	0
"	9B38	PMU Aggregator 1 CB SvEna Default	0 to 4294967295	---	1	F300	0
"	9B3A	PMU Aggregator 1 Control Block ConfRev	1 to 4294967295	---	1	F003	1
"	9B3C	PMU Aggregator 1 Control Block Priority	0 to 7	---	1	F001	4
"	9B3D	PMU Aggregator 1 Control Block IPClass	0 to 1	---	1	F563	1 (Expedited Forwarding)
"	9B3E	PMU Aggregator 1 Control Block VID	0 to 4095	---	1	F001	0
"	9B3F	PMU Aggregator 1 Control Block APPID	0 to 16383	---	1	F001	0
"	9B40	PMU Aggregator 1 Control Block IP Address	0 to 4294967295	---	1	F003	0
"	9B42	PMU Aggregator 1 Control Block Security	0 to 2	---	1	F001	0
C60, N60	9B43	...Repeated for PMU Aggregator 2					
N60	9B52	...Repeated for PMU Aggregator 3					
"	9B61	...Repeated for PMU Aggregator 4					
	Phasor Measurement Unit Recording Command (Read/Write Command) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9B70	PMU 1 Recording Clear Command	0 to 1	---	1	F126	0 (No)
"	9B71	PMU 1 Recording Force Trigger	0 to 1	---	1	F126	0 (No)
C60, N60	9B72	...Repeated for PMU 2					
N60	9B74	...Repeated for PMU 3					
"	9B76	...Repeated for PMU 4					
"	9B78	...Repeated for PMU 5					
"	9B7A	...Repeated for PMU 6					
	Phasor Measurement Unit Recording (Read/Write Setting)						
D60, F60, G60, L30, L90, T60	9B7C	PMU 1 Record Function	0 to 1	---	1	F102	0 (Disabled)
"	9B7D	PMU 1 No of Timed Records	2 to 128	---	1	F001	10
"	9B7E	PMU 1 Trigger Mode	0 to 1	---	1	F542	0 (Auto Overwrite)
"	9B7F	PMU 1 Timed Trigger Position	1 to 50	%	1	F001	10
	Phasor Measurement Unit Recording Ex (Read/Write Setting) (2 or 6 Modules)						
C60, N60	9B80	PMU 1 Record Function	0 to 1	---	1	F102	0 (Disabled)
"	9B81	PMU 1 No of Timed Records	2 to 128	---	1	F001	10
"	9B82	PMU 1 Trigger Mode Ex	0 to 1	---	1	F542	0 (Auto Overwrite)
"	9B83	PMU 1 Timed Trigger Position	1 to 50	%	1	F001	10
"	9B84	...Repeated for PMU 2					
N60	9B88	...Repeated for PMU 3					
"	9B8C	...Repeated for PMU 4					
"	9B90	...Repeated for PMU 5					
"	9B94	...Repeated for PMU 6					
	Phasor Measurement Unit Triggering (Read/Write Setting) (1,2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9B98	PMU 1 User Trigger	0 to 4294967295	---	1	F300	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
C60, N60	9B9A	...Repeated for PMU 2					
N60	9B9C	...Repeated for PMU 3					
"	9B9E	...Repeated for PMU 4					
"	9BA0	...Repeated for PMU 5					
"	9BA2	...Repeated for PMU 6					
	Phasor Measurement Unit Voltage Trigger (Read/Write Setting) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9BA4	PMU 1 Volt Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	9BA5	PMU 1 Voltage Trigger Low Volt	0.25 to 1.25	pu	0.001	F001	800
"	9BA6	PMU 1 Voltage Trigger High Volt	0.75 to 1.75	pu	0.001	F001	1200
"	9BA7	PMU 1 Voltage Trigger Pkp Time	0 to 600	s	0.01	F001	10
"	9BA8	PMU 1 Voltage Trigger Dpo Time	0 to 600	s	0.01	F001	100
"	9BA9	PMU 1 Voltage Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	9BAB	PMU 1 Voltage Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	9BAC	PMU 1 Voltage Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	9BAD	...Repeated for PMU 2					
N60	9BB6	...Repeated for PMU 3					
"	9BBF	...Repeated for PMU 4					
"	9BC8	...Repeated for PMU 5					
"	9BD1	...Repeated for PMU 6					
	Phasor Measurement Unit Current Trigger (Read/Write Setting (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9BDA	PMU 1 Current Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	9BDB	PMU 1 Current Trigger Pickup	0.1 to 30	pu	0.001	F001	1800
"	9BDC	PMU 1 Current Trigger Pkp Time	0 to 600	s	0.01	F001	10
"	9BDD	PMU 1 Current Trigger Dpo Time	0 to 600	s	0.01	F001	100
"	9BDE	PMU 1 Current Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	9BE0	PMU 1 Current Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	9BE1	PMU 1 Current Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	9BE2	...Repeated for PMU 2					
N60	9BEA	...Repeated for PMU 3					
"	9BF2	...Repeated for PMU 4					
"	9BFA	...Repeated for PMU 5					
"	9C02	...Repeated for PMU 6					
	Phasor Measurement Unit Frequency Trigger (Read/Write Setting) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9C0A	PMU 1 Frequency Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	9C0B	PMU 1 Frequency Trigger Low Frequency	20 to 70	Hz	0.01	F001	4900
"	9C0C	PMU 1 Frequency Trigger High Frequency	20 to 70	Hz	0.01	F001	6100
"	9C0D	PMU 1 Frequency Trigger Pickup Time	0 to 600	s	0.01	F001	10
"	9C0E	PMU 1 Frequency Trigger Dropout Time	0 to 600	s	0.01	F001	100
"	9C0F	PMU 1 Frequency Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	9C11	PMU 1 Frequency Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	9C12	PMU 1 Frequency Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	9C13	...Repeated for PMU 2					

Products	Hex address	Register name	Range	Units	Step	Format	Default
N60	9C1C	...Repeated for PMU 3					
"	9C25	...Repeated for PMU 4					
"	9C2E	...Repeated for PMU 5					
"	9C37	...Repeated for PMU 6					
	Phasor Measurement Unit df/dt Trigger (Read/Write Setting) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9C40	PMU 1 df/dt Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	9C41	PMU 1 df/dt Trigger Raise	0.1 to 15	Hz/s	0.01	F001	25
"	9C42	PMU 1 df/dt Trigger Fall	0.1 to 15	Hz/s	0.01	F001	25
"	9C43	PMU 1 df/dt Trigger Pkp Time	0 to 600	seconds	0.01	F001	10
"	9C44	PMU 1 df/dt Trigger Dpo Time	0 to 600	seconds	0.01	F001	100
"	9C45	PMU 1 df/dt Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	9C47	PMU 1 df/dt Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	9C48	PMU 1 df/dt Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	9C49	...Repeated for PMU 2					
N60	9C52	...Repeated for PMU 3					
"	9C5B	...Repeated for PMU 4					
"	9C64	...Repeated for PMU 5					
"	9C6D	...Repeated for PMU 6					
	Phasor Measurement Unit Power Trigger (Read/Write Setting) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9C76	PMU 1 Power Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	9C77	PMU 1 Power Trigger Active	0.25 to 3	pu	0.001	F001	1250
"	9C78	PMU 1 Power Trigger Reactive	0.25 to 3	pu	0.001	F001	1250
"	9C79	PMU 1 Power Trigger Apparent	0.25 to 3	pu	0.001	F001	1250
"	9C7A	PMU 1 Power Trigger Pkp Time	0 to 600	s	0.01	F001	10
"	9C7B	PMU 1 Power Trigger Dpo Time	0 to 600	s	0.01	F001	100
"	9C7C	PMU 1 Power Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	9C7E	PMU 1 Power Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	9C7F	PMU 1 Power Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	9C80	...Repeated for PMU 2					
N60	9C8A	...Repeated for PMU 3					
"	9C94	...Repeated for PMU 4					
"	9C9E	...Repeated for PMU 5					
"	9CA8	...Repeated for PMU 6					
	Phasor Measurement Unit Calibration (Read/Write Setting) (1, 2, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	9CB2	PMU 1 Va Calibration Angle	-5 to 5	°	0.05	F002	0
"	9CB3	PMU 1 Va Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	9CB4	PMU 1 Vb Calibration Angle	-5 to 5	°	0.05	F002	0
"	9CB5	PMU 1 Vb Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	9CB6	PMU 1 Vc Calibration Angle	-5 to 5	°	0.05	F002	0
"	9CB7	PMU 1 Vc Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	9CB8	PMU 1 Vx Calibration Angle	-5 to 5	°	0.05	F002	0
"	9CB9	PMU 1 Vx Calibration Magnitude	95 to 105	%	0.1	F002	1000

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	9CBA	PMU 1 Ia Calibration Angle	-5 to 5	°	0.05	F002	0
"	9CBB	PMU 1 Ia Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	9CBC	PMU 1 Ib Calibration Angle	-5 to 5	°	0.05	F002	0
"	9CBD	PMU 1 Ib Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	9CBE	PMU 1 Ic Calibration Angle	-5 to 5	°	0.05	F002	0
"	9CBF	PMU 1 Ic Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	9CC0	PMU 1 Ig Calibration Angle	-5 to 5	°	0.05	F002	0
"	9CC1	PMU 1 Ig Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	9CC2	PMU 1 Sequence Voltage Shift Angle	-180 to 180	°	30	F002	0
"	9CC3	PMU 1 Sequence Current Shift Angle	-180 to 180	°	30	F002	0
C60, N60	9CC4	...Repeated for PMU 2					
N60	9CD6	...Repeated for PMU 3					
"	9CE8	...Repeated for PMU 4					
"	9CFA	...Repeated for PMU 5					
"	9D0C	...Repeated for PMU 6					
	Phasor Measurement Unit Network Reporting Configuration (Read/Write Setting)						
C60, D60, F60, G60, L30, L90, N60, T60	9D1E	PMU Network Reporting Function	0 to 1	---	1	F102	0 (Disabled)
"	9D1F	PMU Network Reporting ID Code	1 to 65534	---	1	F001	1
"	9D20	PMU TCP Port Number	1 to 65535	---	1	F001	4712
"	9D21	PMU UDP Port Number 1	1 to 65535	---	1	F001	4713
"	9D22	PMU UDP Port Number 2	1 to 65535	---	1	F001	4714
	Settings File Template (Read/Write Setting)						
All	9D23	FlexLogic Displays Active	0 to 1	---	1	F102	1 (Enabled)
"	9D24	Template Access	---	---	---	F205	(none)
"	9D2B	Template Bitmask (750 items)	0 to 65535	---	1	F001	0
	Clear Channel Status (Read/Write Setting)						
L30, L90	A019	Clear Channel Status Operand	0 to 4294967295	---	1	F300	0
	End of Fault Protection / End Fault Protection (Read/Write Grouped Setting) (20 or 24 Modules)						
B30, B90	A01B	End of Fault Protection 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A01C	End of Fault Protection 1 CT	0 to 23	---	1	F400	0
"	A01D	End of Fault Protection 1 Pickup	0.02 to 30	pu	0.001	F001	1200
"	A01E	End of Fault Protection 1 Breaker Open	0 to 4294967295	---	1	F300	0
"	A020	End of Fault Protection 1 Breaker Delay	0 to 65.535	s	0.001	F001	400
"	A021	End of Fault Protection 1 Manual Close	0 to 4294967295	---	1	F300	0
"	A023	End of Fault Protection 1 Pickup Delay	0 to 65.535	s	0.001	F001	40
"	A024	End of Fault Protection 1 Block	0 to 4294967295	---	1	F300	0
"	A026	End of Fault Protection 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	A027	End of Fault Protection 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A028	...Repeated for End of Fault Protection 2					
"	A035	...Repeated for End of Fault Protection 3					
"	A042	...Repeated for End of Fault Protection 4					
"	A04F	...Repeated for End of Fault Protection 5					
"	A05C	...Repeated for End of Fault Protection 6					
"	A069	...Repeated for End of Fault Protection 7					
"	A076	...Repeated for End of Fault Protection 8					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	A083	...Repeated for End of Fault Protection 9					
"	A090	...Repeated for End of Fault Protection 10					
"	A09D	...Repeated for End of Fault Protection 11					
"	A0AA	...Repeated for End of Fault Protection 12					
"	A0B7	...Repeated for End of Fault Protection 13					
"	A0C4	...Repeated for End of Fault Protection 14					
"	A0D1	...Repeated for End of Fault Protection 15					
"	A0DE	...Repeated for End of Fault Protection 16					
"	A0EB	...Repeated for End of Fault Protection 17					
"	A0F8	...Repeated for End of Fault Protection 18					
"	A105	...Repeated for End of Fault Protection 19					
"	A112	...Repeated for End of Fault Protection 20					
B90	A11F	...Repeated for End of Fault Protection 21					
"	A12C	...Repeated for End of Fault Protection 22					
"	A139	...Repeated for End of Fault Protection 23					
"	A146	...Repeated for End of Fault Protection 24					
	Bus Replica Isolator (Read/Write Setting) (48 Modules)						
B30, B90	A187	Isolator 1 ID	0 to 2	---	1	F202	"ISO 1"
"	A191	Isolator 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A192	Isolator 1 Open	0 to 4294967295	---	1	F300	0
"	A194	Isolator 1 Closed	0 to 4294967295	---	1	F300	0
"	A196	Isolator 1 Alarm Delay	0 to 120	s	0.05	F001	5
"	A197	Isolator 1 Reset	0 to 4294967295	---	1	F300	0
"	A199	Isolator 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	A19A	Isolator 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A19B	Reserved (2 items)	---	---	---	F001	0
"	A19D	...Repeated for Isolator 2					
"	A1B3	...Repeated for Isolator 3					
"	A1C9	...Repeated for Isolator 4					
"	A1DF	...Repeated for Isolator 5					
"	A1F5	...Repeated for Isolator 6					
"	A20B	...Repeated for Isolator 7					
"	A221	...Repeated for Isolator 8					
"	A237	...Repeated for Isolator 9					
"	A24D	...Repeated for Isolator 10					
"	A263	...Repeated for Isolator 11					
"	A279	...Repeated for Isolator 12					
"	A28F	...Repeated for Isolator 13					
"	A2A5	...Repeated for Isolator 14					
"	A2BB	...Repeated for Isolator 15					
"	A2D1	...Repeated for Isolator 16					
"	A2E7	...Repeated for Isolator 17					
"	A2FD	...Repeated for Isolator 18					
"	A313	...Repeated for Isolator 19					
"	A329	...Repeated for Isolator 20					
"	A33F	...Repeated for Isolator 21					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	A355	...Repeated for Isolator 22					
"	A36B	...Repeated for Isolator 23					
"	A381	...Repeated for Isolator 24					
"	A397	...Repeated for Isolator 25					
"	A3AD	...Repeated for Isolator 26					
"	A3C3	...Repeated for Isolator 27					
"	A3D9	...Repeated for Isolator 28					
"	A3EF	...Repeated for Isolator 29					
"	A405	...Repeated for Isolator 30					
"	A41B	...Repeated for Isolator 31					
"	A431	...Repeated for Isolator 32					
"	A447	...Repeated for Isolator 33					
"	A45D	...Repeated for Isolator 34					
"	A473	...Repeated for Isolator 35					
"	A489	...Repeated for Isolator 36					
"	A49F	...Repeated for Isolator 37					
"	A4B5	...Repeated for Isolator 38					
"	A4CB	...Repeated for Isolator 39					
"	A4E1	...Repeated for Isolator 40					
"	A4F7	...Repeated for Isolator 41					
"	A50D	...Repeated for Isolator 42					
"	A523	...Repeated for Isolator 43					
"	A539	...Repeated for Isolator 44					
"	A54F	...Repeated for Isolator 45					
"	A565	...Repeated for Isolator 46					
"	A57B	...Repeated for Isolator 47					
"	A591	...Repeated for Isolator 48					
	Digital Elements (Read/Write Setting) (96 Modules)						
All	A7B7	Digital Element 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A7B8	Digital Element 1 Name	---	---	---	F203	"Dig Element 1"
"	A7C1	Digital Element 1 Input	0 to 4294967295	---	1	F300	0
"	A7C3	Digital Element 1 Pickup Delay	0 to 999999.999	s	0.001	F003	0
"	A7C5	Digital Element 1 Reset Delay	0 to 999999.999	s	0.001	F003	0
"	A7C7	Digital Element 1 Block	0 to 4294967295	---	1	F300	0
"	A7C9	Digital Element 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	A7CA	Digital Element 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A7CB	Digital Element 1 Pickup LED	0 to 1	---	1	F102	1 (Enabled)
"	A7CC	Reserved (2 items)	---	---	---	F001	0
"	A7CE	...Repeated for Digital Element 2					
"	A7E5	...Repeated for Digital Element 3					
"	A7FC	...Repeated for Digital Element 4					
"	A813	...Repeated for Digital Element 5					
"	A82A	...Repeated for Digital Element 6					
"	A841	...Repeated for Digital Element 7					
"	A858	...Repeated for Digital Element 8					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	A86F	...Repeated for Digital Element 9					
"	A886	...Repeated for Digital Element 10					
"	A89D	...Repeated for Digital Element 11					
"	A8B4	...Repeated for Digital Element 12					
"	A8CB	...Repeated for Digital Element 13					
"	A8E2	...Repeated for Digital Element 14					
"	A8F9	...Repeated for Digital Element 15					
"	A910	...Repeated for Digital Element 16					
"	A927	...Repeated for Digital Element 17					
"	A93E	...Repeated for Digital Element 18					
"	A955	...Repeated for Digital Element 19					
"	A96C	...Repeated for Digital Element 20					
"	A983	...Repeated for Digital Element 21					
"	A99A	...Repeated for Digital Element 22					
"	A9B1	...Repeated for Digital Element 23					
"	A9C8	...Repeated for Digital Element 24					
"	A9DF	...Repeated for Digital Element 25					
"	A9F6	...Repeated for Digital Element 26					
"	AA0D	...Repeated for Digital Element 27					
"	AA24	...Repeated for Digital Element 28					
"	AA3B	...Repeated for Digital Element 29					
"	AA52	...Repeated for Digital Element 30					
"	AA69	...Repeated for Digital Element 31					
"	AA80	...Repeated for Digital Element 32					
"	AA97	...Repeated for Digital Element 33					
"	AAAE	...Repeated for Digital Element 34					
"	AAC5	...Repeated for Digital Element 35					
"	AADC	...Repeated for Digital Element 36					
"	AAF3	...Repeated for Digital Element 37					
"	AB0A	...Repeated for Digital Element 38					
"	AB21	...Repeated for Digital Element 39					
"	AB38	...Repeated for Digital Element 40					
"	AB4F	...Repeated for Digital Element 41					
"	AB66	...Repeated for Digital Element 42					
"	AB7D	...Repeated for Digital Element 43					
"	AB94	...Repeated for Digital Element 44					
"	ABAB	...Repeated for Digital Element 45					
"	ABC2	...Repeated for Digital Element 46					
"	ABD9	...Repeated for Digital Element 47					
"	ABF0	...Repeated for Digital Element 48					
"	AC07	...Repeated for Digital Element 49					
"	AC1E	...Repeated for Digital Element 50					
"	AC35	...Repeated for Digital Element 51					
"	AC4C	...Repeated for Digital Element 52					
"	AC63	...Repeated for Digital Element 53					
"	AC7A	...Repeated for Digital Element 54					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	AC91	...Repeated for Digital Element 55					
"	ACA8	...Repeated for Digital Element 56					
"	ACBF	...Repeated for Digital Element 57					
"	ACD6	...Repeated for Digital Element 58					
"	ACED	...Repeated for Digital Element 59					
"	AD04	...Repeated for Digital Element 60					
"	AD1B	...Repeated for Digital Element 61					
"	AD32	...Repeated for Digital Element 62					
"	AD49	...Repeated for Digital Element 63					
"	AD60	...Repeated for Digital Element 64					
"	AD77	...Repeated for Digital Element 65					
"	AD8E	...Repeated for Digital Element 66					
"	ADA5	...Repeated for Digital Element 67					
"	ADBC	...Repeated for Digital Element 68					
"	ADD3	...Repeated for Digital Element 69					
"	ADEA	...Repeated for Digital Element 70					
"	AE01	...Repeated for Digital Element 71					
"	AE18	...Repeated for Digital Element 72					
"	AE2F	...Repeated for Digital Element 73					
"	AE46	...Repeated for Digital Element 74					
"	AE5D	...Repeated for Digital Element 75					
"	AE74	...Repeated for Digital Element 76					
"	AE8B	...Repeated for Digital Element 77					
"	AEA2	...Repeated for Digital Element 78					
"	AEB9	...Repeated for Digital Element 79					
"	AED0	...Repeated for Digital Element 80					
"	AEE7	...Repeated for Digital Element 81					
"	AEFE	...Repeated for Digital Element 82					
"	AF15	...Repeated for Digital Element 83					
"	AF2C	...Repeated for Digital Element 84					
"	AF43	...Repeated for Digital Element 85					
"	AF5A	...Repeated for Digital Element 86					
"	AF71	...Repeated for Digital Element 87					
"	AF88	...Repeated for Digital Element 88					
"	AF9F	...Repeated for Digital Element 89					
"	AFB6	...Repeated for Digital Element 90					
"	AFCD	...Repeated for Digital Element 91					
"	AFE4	...Repeated for Digital Element 92					
"	AFFB	...Repeated for Digital Element 93					
"	B012	...Repeated for Digital Element 94					
"	B029	...Repeated for Digital Element 95					
"	B040	...Repeated for Digital Element 96					
	FlexLogic Timers (Read/Write Setting) (64 Modules)						
All	B057	FlexLogic Timer 1 Type	0 to 2	---	1	F129	0 (millisecond)
"	B058	FlexLogic Timer 1 Pickup Delay	0 to 60000	---	1	F001	0

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	B059	FlexLogic Timer 1 Dropout Delay	0 to 60000	---	1	F001	0
"	B05A	Reserved (5 items)	0 to 65535	---	1	F001	0
"	B05F	...Repeated for FlexLogic Timer 2					
"	B067	...Repeated for FlexLogic Timer 3					
"	B06F	...Repeated for FlexLogic Timer 4					
"	B077	...Repeated for FlexLogic Timer 5					
"	B07F	...Repeated for FlexLogic Timer 6					
"	B087	...Repeated for FlexLogic Timer 7					
"	B08F	...Repeated for FlexLogic Timer 8					
"	B097	...Repeated for FlexLogic Timer 9					
"	B09F	...Repeated for FlexLogic Timer 10					
"	B0A7	...Repeated for FlexLogic Timer 11					
"	B0AF	...Repeated for FlexLogic Timer 12					
"	B0B7	...Repeated for FlexLogic Timer 13					
"	B0BF	...Repeated for FlexLogic Timer 14					
"	B0C7	...Repeated for FlexLogic Timer 15					
"	B0CF	...Repeated for FlexLogic Timer 16					
"	B0D7	...Repeated for FlexLogic Timer 17					
"	B0DF	...Repeated for FlexLogic Timer 18					
"	B0E7	...Repeated for FlexLogic Timer 19					
"	B0EF	...Repeated for FlexLogic Timer 20					
"	B0F7	...Repeated for FlexLogic Timer 21					
"	B0FF	...Repeated for FlexLogic Timer 22					
"	B107	...Repeated for FlexLogic Timer 23					
"	B10F	...Repeated for FlexLogic Timer 24					
"	B117	...Repeated for FlexLogic Timer 25					
"	B11F	...Repeated for FlexLogic Timer 26					
"	B127	...Repeated for FlexLogic Timer 27					
"	B12F	...Repeated for FlexLogic Timer 28					
"	B137	...Repeated for FlexLogic Timer 29					
"	B13F	...Repeated for FlexLogic Timer 30					
"	B147	...Repeated for FlexLogic Timer 31					
"	B14F	...Repeated for FlexLogic Timer 32					
"	B157	...Repeated for FlexLogic Timer 33					
"	B15F	...Repeated for FlexLogic Timer 34					
"	B167	...Repeated for FlexLogic Timer 35					
"	B16F	...Repeated for FlexLogic Timer 36					
"	B177	...Repeated for FlexLogic Timer 37					
"	B17F	...Repeated for FlexLogic Timer 38					
"	B187	...Repeated for FlexLogic Timer 39					
"	B18F	...Repeated for FlexLogic Timer 40					
"	B197	...Repeated for FlexLogic Timer 41					
"	B19F	...Repeated for FlexLogic Timer 42					
"	B1A7	...Repeated for FlexLogic Timer 43					
"	B1AF	...Repeated for FlexLogic Timer 44					
"	B1B7	...Repeated for FlexLogic Timer 45					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	B1BF	...Repeated for FlexLogic Timer 46					
"	B1C7	...Repeated for FlexLogic Timer 47					
"	B1CF	...Repeated for FlexLogic Timer 48					
"	B1D7	...Repeated for FlexLogic Timer 49					
"	B1DF	...Repeated for FlexLogic Timer 50					
"	B1E7	...Repeated for FlexLogic Timer 51					
"	B1EF	...Repeated for FlexLogic Timer 52					
"	B1F7	...Repeated for FlexLogic Timer 53					
"	B1FF	...Repeated for FlexLogic Timer 54					
"	B207	...Repeated for FlexLogic Timer 55					
"	B20F	...Repeated for FlexLogic Timer 56					
"	B217	...Repeated for FlexLogic Timer 57					
"	B21F	...Repeated for FlexLogic Timer 58					
"	B227	...Repeated for FlexLogic Timer 59					
"	B22F	...Repeated for FlexLogic Timer 60					
"	B237	...Repeated for FlexLogic Timer 61					
"	B23F	...Repeated for FlexLogic Timer 62					
"	B247	...Repeated for FlexLogic Timer 63					
"	B24F	...Repeated for FlexLogic Timer 64					
	Virtual Inputs (Read/Write Setting) (128 Modules)						
All	B257	Virtual Input 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	B258	Virtual Input 1 Name	---	---	---	F636	"Virt Ip 1"
"	B263	Virtual Input 1 Programmed Type	0 to 1	---	1	F127	0 (Latched)
"	B264	Virtual Input 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	B265	Reserved (3 items)	---	---	---	F001	0
"	B268	...Repeated for Virtual Input 2					
"	B279	...Repeated for Virtual Input 3					
"	B28A	...Repeated for Virtual Input 4					
"	B29B	...Repeated for Virtual Input 5					
"	B2AC	...Repeated for Virtual Input 6					
"	B2BD	...Repeated for Virtual Input 7					
"	B2CE	...Repeated for Virtual Input 8					
"	B2DF	...Repeated for Virtual Input 9					
"	B2F0	...Repeated for Virtual Input 10					
"	B301	...Repeated for Virtual Input 11					
"	B312	...Repeated for Virtual Input 12					
"	B323	...Repeated for Virtual Input 13					
"	B334	...Repeated for Virtual Input 14					
"	B345	...Repeated for Virtual Input 15					
"	B356	...Repeated for Virtual Input 16					
"	B367	...Repeated for Virtual Input 17					
"	B378	...Repeated for Virtual Input 18					
"	B389	...Repeated for Virtual Input 19					
"	B39A	...Repeated for Virtual Input 20					
"	B3AB	...Repeated for Virtual Input 21					
"	B3BC	...Repeated for Virtual Input 22					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	B3CD	...Repeated for Virtual Input 23					
"	B3DE	...Repeated for Virtual Input 24					
"	B3EF	...Repeated for Virtual Input 25					
"	B400	...Repeated for Virtual Input 26					
"	B411	...Repeated for Virtual Input 27					
"	B422	...Repeated for Virtual Input 28					
"	B433	...Repeated for Virtual Input 29					
"	B444	...Repeated for Virtual Input 30					
"	B455	...Repeated for Virtual Input 31					
"	B466	...Repeated for Virtual Input 32					
"	B477	...Repeated for Virtual Input 33					
"	B488	...Repeated for Virtual Input 34					
"	B499	...Repeated for Virtual Input 35					
"	B4AA	...Repeated for Virtual Input 36					
"	B4BB	...Repeated for Virtual Input 37					
"	B4CC	...Repeated for Virtual Input 38					
"	B4DD	...Repeated for Virtual Input 39					
"	B4EE	...Repeated for Virtual Input 40					
"	B4FF	...Repeated for Virtual Input 41					
"	B510	...Repeated for Virtual Input 42					
"	B521	...Repeated for Virtual Input 43					
"	B532	...Repeated for Virtual Input 44					
"	B543	...Repeated for Virtual Input 45					
"	B554	...Repeated for Virtual Input 46					
"	B565	...Repeated for Virtual Input 47					
"	B576	...Repeated for Virtual Input 48					
"	B587	...Repeated for Virtual Input 49					
"	B598	...Repeated for Virtual Input 50					
"	B5A9	...Repeated for Virtual Input 51					
"	B5BA	...Repeated for Virtual Input 52					
"	B5CB	...Repeated for Virtual Input 53					
"	B5DC	...Repeated for Virtual Input 54					
"	B5ED	...Repeated for Virtual Input 55					
"	B5FE	...Repeated for Virtual Input 56					
"	B60F	...Repeated for Virtual Input 57					
"	B620	...Repeated for Virtual Input 58					
"	B631	...Repeated for Virtual Input 59					
"	B642	...Repeated for Virtual Input 60					
"	B653	...Repeated for Virtual Input 61					
"	B664	...Repeated for Virtual Input 62					
"	B675	...Repeated for Virtual Input 63					
"	B686	...Repeated for Virtual Input 64					
"	B697	...Repeated for Virtual Input 65					
"	B6A8	...Repeated for Virtual Input 66					
"	B6B9	...Repeated for Virtual Input 67					
"	B6CA	...Repeated for Virtual Input 68					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	B6DB	...Repeated for Virtual Input 69					
"	B6EC	...Repeated for Virtual Input 70					
"	B6FD	...Repeated for Virtual Input 71					
"	B70E	...Repeated for Virtual Input 72					
"	B71F	...Repeated for Virtual Input 73					
"	B730	...Repeated for Virtual Input 74					
"	B741	...Repeated for Virtual Input 75					
"	B752	...Repeated for Virtual Input 76					
"	B763	...Repeated for Virtual Input 77					
"	B774	...Repeated for Virtual Input 78					
"	B785	...Repeated for Virtual Input 79					
"	B796	...Repeated for Virtual Input 80					
"	B7A7	...Repeated for Virtual Input 81					
"	B7B8	...Repeated for Virtual Input 82					
"	B7C9	...Repeated for Virtual Input 83					
"	B7DA	...Repeated for Virtual Input 84					
"	B7EB	...Repeated for Virtual Input 85					
"	B7FC	...Repeated for Virtual Input 86					
"	B80D	...Repeated for Virtual Input 87					
"	B81E	...Repeated for Virtual Input 88					
"	B82F	...Repeated for Virtual Input 89					
"	B840	...Repeated for Virtual Input 90					
"	B851	...Repeated for Virtual Input 91					
"	B862	...Repeated for Virtual Input 92					
"	B873	...Repeated for Virtual Input 93					
"	B884	...Repeated for Virtual Input 94					
"	B895	...Repeated for Virtual Input 95					
"	B8A6	...Repeated for Virtual Input 96					
"	B8B7	...Repeated for Virtual Input 97					
"	B8C8	...Repeated for Virtual Input 98					
"	B8D9	...Repeated for Virtual Input 99					
"	B8EA	...Repeated for Virtual Input 100					
"	B8FB	...Repeated for Virtual Input 101					
"	B90C	...Repeated for Virtual Input 102					
"	B91D	...Repeated for Virtual Input 103					
"	B92E	...Repeated for Virtual Input 104					
"	B93F	...Repeated for Virtual Input 105					
"	B950	...Repeated for Virtual Input 106					
"	B961	...Repeated for Virtual Input 107					
"	B972	...Repeated for Virtual Input 108					
"	B983	...Repeated for Virtual Input 109					
"	B994	...Repeated for Virtual Input 110					
"	B9A5	...Repeated for Virtual Input 111					
"	B9B6	...Repeated for Virtual Input 112					
"	B9C7	...Repeated for Virtual Input 113					
"	B9D8	...Repeated for Virtual Input 114					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	B9E9	...Repeated for Virtual Input 115					
"	B9FA	...Repeated for Virtual Input 116					
"	BA0B	...Repeated for Virtual Input 117					
"	BA1C	...Repeated for Virtual Input 118					
"	BA2D	...Repeated for Virtual Input 119					
"	BA3E	...Repeated for Virtual Input 120					
"	BA4F	...Repeated for Virtual Input 121					
"	BA60	...Repeated for Virtual Input 122					
"	BA71	...Repeated for Virtual Input 123					
"	BA82	...Repeated for Virtual Input 124					
"	BA93	...Repeated for Virtual Input 125					
"	BAA4	...Repeated for Virtual Input 126					
"	BAB5	...Repeated for Virtual Input 127					
"	BAC6	...Repeated for Virtual Input 128					
	Virtual Outputs (Read/Write Setting) (128 Modules)						
All	BAD7	Virtual Output 1 Name	---	---	---	F636	"Virt Op 1 "
"	BAE2	Virtual Output 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	BAE3	Reserved	---	---	---	F001	0
"	BAE4	...Repeated for Virtual Output 2					
"	BAF1	...Repeated for Virtual Output 3					
"	BAFE	...Repeated for Virtual Output 4					
"	BB0B	...Repeated for Virtual Output 5					
"	BB18	...Repeated for Virtual Output 6					
"	BB25	...Repeated for Virtual Output 7					
"	BB32	...Repeated for Virtual Output 8					
"	BB3F	...Repeated for Virtual Output 9					
"	BB4C	...Repeated for Virtual Output 10					
"	BB59	...Repeated for Virtual Output 11					
"	BB66	...Repeated for Virtual Output 12					
"	BB73	...Repeated for Virtual Output 13					
"	BB80	...Repeated for Virtual Output 14					
"	BB8D	...Repeated for Virtual Output 15					
"	BB9A	...Repeated for Virtual Output 16					
"	BBA7	...Repeated for Virtual Output 17					
"	BBB4	...Repeated for Virtual Output 18					
"	BBC1	...Repeated for Virtual Output 19					
"	BBCE	...Repeated for Virtual Output 20					
"	BBDB	...Repeated for Virtual Output 21					
"	BBE8	...Repeated for Virtual Output 22					
"	BBF5	...Repeated for Virtual Output 23					
"	BC02	...Repeated for Virtual Output 24					
"	BC0F	...Repeated for Virtual Output 25					
"	BC1C	...Repeated for Virtual Output 26					
"	BC29	...Repeated for Virtual Output 27					
"	BC36	...Repeated for Virtual Output 28					
"	BC43	...Repeated for Virtual Output 29					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	BC50	...Repeated for Virtual Output 30					
"	BC5D	...Repeated for Virtual Output 31					
"	BC6A	...Repeated for Virtual Output 32					
"	BC77	...Repeated for Virtual Output 33					
"	BC84	...Repeated for Virtual Output 34					
"	BC91	...Repeated for Virtual Output 35					
"	BC9E	...Repeated for Virtual Output 36					
"	BCAB	...Repeated for Virtual Output 37					
"	BCB8	...Repeated for Virtual Output 38					
"	BCC5	...Repeated for Virtual Output 39					
"	BCD2	...Repeated for Virtual Output 40					
"	BCDF	...Repeated for Virtual Output 41					
"	BCEC	...Repeated for Virtual Output 42					
"	BCF9	...Repeated for Virtual Output 43					
"	BD06	...Repeated for Virtual Output 44					
"	BD13	...Repeated for Virtual Output 45					
"	BD20	...Repeated for Virtual Output 46					
"	BD2D	...Repeated for Virtual Output 47					
"	BD3A	...Repeated for Virtual Output 48					
"	BD47	...Repeated for Virtual Output 49					
"	BD54	...Repeated for Virtual Output 50					
"	BD61	...Repeated for Virtual Output 51					
"	BD6E	...Repeated for Virtual Output 52					
"	BD7B	...Repeated for Virtual Output 53					
"	BD88	...Repeated for Virtual Output 54					
"	BD95	...Repeated for Virtual Output 55					
"	BDA2	...Repeated for Virtual Output 56					
"	BDAF	...Repeated for Virtual Output 57					
"	BDBC	...Repeated for Virtual Output 58					
"	BDC9	...Repeated for Virtual Output 59					
"	BDD6	...Repeated for Virtual Output 60					
"	BDE3	...Repeated for Virtual Output 61					
"	BDF0	...Repeated for Virtual Output 62					
"	BDFD	...Repeated for Virtual Output 63					
"	BE0A	...Repeated for Virtual Output 64					
"	BE17	...Repeated for Virtual Output 65					
"	BE24	...Repeated for Virtual Output 66					
"	BE31	...Repeated for Virtual Output 67					
"	BE3E	...Repeated for Virtual Output 68					
"	BE4B	...Repeated for Virtual Output 69					
"	BE58	...Repeated for Virtual Output 70					
"	BE65	...Repeated for Virtual Output 71					
"	BE72	...Repeated for Virtual Output 72					
"	BE7F	...Repeated for Virtual Output 73					
"	BE8C	...Repeated for Virtual Output 74					
"	BE99	...Repeated for Virtual Output 75					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	BEA6	...Repeated for Virtual Output 76					
"	BEB3	...Repeated for Virtual Output 77					
"	BEC0	...Repeated for Virtual Output 78					
"	BECD	...Repeated for Virtual Output 79					
"	BEDA	...Repeated for Virtual Output 80					
"	BEE7	...Repeated for Virtual Output 81					
"	BEF4	...Repeated for Virtual Output 82					
"	BF01	...Repeated for Virtual Output 83					
"	BF0E	...Repeated for Virtual Output 84					
"	BF1B	...Repeated for Virtual Output 85					
"	BF28	...Repeated for Virtual Output 86					
"	BF35	...Repeated for Virtual Output 87					
"	BF42	...Repeated for Virtual Output 88					
"	BF4F	...Repeated for Virtual Output 89					
"	BF5C	...Repeated for Virtual Output 90					
"	BF69	...Repeated for Virtual Output 91					
"	BF76	...Repeated for Virtual Output 92					
"	BF83	...Repeated for Virtual Output 93					
"	BF90	...Repeated for Virtual Output 94					
"	BF9D	...Repeated for Virtual Output 95					
"	BFAA	...Repeated for Virtual Output 96					
"	BFB7	...Repeated for Virtual Output 97					
"	BFC4	...Repeated for Virtual Output 98					
"	BFD1	...Repeated for Virtual Output 99					
"	BFDE	...Repeated for Virtual Output 100					
"	BFEB	...Repeated for Virtual Output 101					
"	BFF8	...Repeated for Virtual Output 102					
"	C005	...Repeated for Virtual Output 103					
"	C012	...Repeated for Virtual Output 104					
"	C01F	...Repeated for Virtual Output 105					
"	C02C	...Repeated for Virtual Output 106					
"	C039	...Repeated for Virtual Output 107					
"	C046	...Repeated for Virtual Output 108					
"	C053	...Repeated for Virtual Output 109					
"	C060	...Repeated for Virtual Output 110					
"	C06D	...Repeated for Virtual Output 111					
"	C07A	...Repeated for Virtual Output 112					
"	C087	...Repeated for Virtual Output 113					
"	C094	...Repeated for Virtual Output 114					
"	C0A1	...Repeated for Virtual Output 115					
"	C0AE	...Repeated for Virtual Output 116					
"	C0BB	...Repeated for Virtual Output 117					
"	C0C8	...Repeated for Virtual Output 118					
"	C0D5	...Repeated for Virtual Output 119					
"	C0E2	...Repeated for Virtual Output 120					
"	C0EF	...Repeated for Virtual Output 121					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	C0FC	...Repeated for Virtual Output 122					
"	C109	...Repeated for Virtual Output 123					
"	C116	...Repeated for Virtual Output 124					
"	C123	...Repeated for Virtual Output 125					
"	C130	...Repeated for Virtual Output 126					
"	C13D	...Repeated for Virtual Output 127					
"	C14A	...Repeated for Virtual Output 128					
	Virtual Input Commands (Read/Write Command) (128 Modules)						
All	C157	Virtual Input 1 State	0 to 1	---	1	F108	0 (Off)
"	C158	...Repeated for Virtual Input 2					
"	C159	...Repeated for Virtual Input 3					
"	C15A	...Repeated for Virtual Input 4					
"	C15B	...Repeated for Virtual Input 5					
"	C15C	...Repeated for Virtual Input 6					
"	C15D	...Repeated for Virtual Input 7					
"	C15E	...Repeated for Virtual Input 8					
"	C15F	...Repeated for Virtual Input 9					
"	C160	...Repeated for Virtual Input 10					
"	C161	...Repeated for Virtual Input 11					
"	C162	...Repeated for Virtual Input 12					
"	C163	...Repeated for Virtual Input 13					
"	C164	...Repeated for Virtual Input 14					
"	C165	...Repeated for Virtual Input 15					
"	C166	...Repeated for Virtual Input 16					
"	C167	...Repeated for Virtual Input 17					
"	C168	...Repeated for Virtual Input 18					
"	C169	...Repeated for Virtual Input 19					
"	C16A	...Repeated for Virtual Input 20					
"	C16B	...Repeated for Virtual Input 21					
"	C16C	...Repeated for Virtual Input 22					
"	C16D	...Repeated for Virtual Input 23					
"	C16E	...Repeated for Virtual Input 24					
"	C16F	...Repeated for Virtual Input 25					
"	C170	...Repeated for Virtual Input 26					
"	C171	...Repeated for Virtual Input 27					
"	C172	...Repeated for Virtual Input 28					
"	C173	...Repeated for Virtual Input 29					
"	C174	...Repeated for Virtual Input 30					
"	C175	...Repeated for Virtual Input 31					
"	C176	...Repeated for Virtual Input 32					
"	C177	...Repeated for Virtual Input 33					
"	C178	...Repeated for Virtual Input 34					
"	C179	...Repeated for Virtual Input 35					
"	C17A	...Repeated for Virtual Input 36					
"	C17B	...Repeated for Virtual Input 37					
"	C17C	...Repeated for Virtual Input 38					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	C17D	...Repeated for Virtual Input 39					
"	C17E	...Repeated for Virtual Input 40					
"	C17F	...Repeated for Virtual Input 41					
"	C180	...Repeated for Virtual Input 42					
"	C181	...Repeated for Virtual Input 43					
"	C182	...Repeated for Virtual Input 44					
"	C183	...Repeated for Virtual Input 45					
"	C184	...Repeated for Virtual Input 46					
"	C185	...Repeated for Virtual Input 47					
"	C186	...Repeated for Virtual Input 48					
"	C187	...Repeated for Virtual Input 49					
"	C188	...Repeated for Virtual Input 50					
"	C189	...Repeated for Virtual Input 51					
"	C18A	...Repeated for Virtual Input 52					
"	C18B	...Repeated for Virtual Input 53					
"	C18C	...Repeated for Virtual Input 54					
"	C18D	...Repeated for Virtual Input 55					
"	C18E	...Repeated for Virtual Input 56					
"	C18F	...Repeated for Virtual Input 57					
"	C190	...Repeated for Virtual Input 58					
"	C191	...Repeated for Virtual Input 59					
"	C192	...Repeated for Virtual Input 60					
"	C193	...Repeated for Virtual Input 61					
"	C194	...Repeated for Virtual Input 62					
"	C195	...Repeated for Virtual Input 63					
"	C196	...Repeated for Virtual Input 64					
"	C197	...Repeated for Virtual Input 65					
"	C198	...Repeated for Virtual Input 66					
"	C199	...Repeated for Virtual Input 67					
"	C19A	...Repeated for Virtual Input 68					
"	C19B	...Repeated for Virtual Input 69					
"	C19C	...Repeated for Virtual Input 70					
"	C19D	...Repeated for Virtual Input 71					
"	C19E	...Repeated for Virtual Input 72					
"	C19F	...Repeated for Virtual Input 73					
"	C1A0	...Repeated for Virtual Input 74					
"	C1A1	...Repeated for Virtual Input 75					
"	C1A2	...Repeated for Virtual Input 76					
"	C1A3	...Repeated for Virtual Input 77					
"	C1A4	...Repeated for Virtual Input 78					
"	C1A5	...Repeated for Virtual Input 79					
"	C1A6	...Repeated for Virtual Input 80					
"	C1A7	...Repeated for Virtual Input 81					
"	C1A8	...Repeated for Virtual Input 82					
"	C1A9	...Repeated for Virtual Input 83					
"	C1AA	...Repeated for Virtual Input 84					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	C1AB	...Repeated for Virtual Input 85					
"	C1AC	...Repeated for Virtual Input 86					
"	C1AD	...Repeated for Virtual Input 87					
"	C1AE	...Repeated for Virtual Input 88					
"	C1AF	...Repeated for Virtual Input 89					
"	C1B0	...Repeated for Virtual Input 90					
"	C1B1	...Repeated for Virtual Input 91					
"	C1B2	...Repeated for Virtual Input 92					
"	C1B3	...Repeated for Virtual Input 93					
"	C1B4	...Repeated for Virtual Input 94					
"	C1B5	...Repeated for Virtual Input 95					
"	C1B6	...Repeated for Virtual Input 96					
"	C1B7	...Repeated for Virtual Input 97					
"	C1B8	...Repeated for Virtual Input 98					
"	C1B9	...Repeated for Virtual Input 99					
"	C1BA	...Repeated for Virtual Input 100					
"	C1BB	...Repeated for Virtual Input 101					
"	C1BC	...Repeated for Virtual Input 102					
"	C1BD	...Repeated for Virtual Input 103					
"	C1BE	...Repeated for Virtual Input 104					
"	C1BF	...Repeated for Virtual Input 105					
"	C1C0	...Repeated for Virtual Input 106					
"	C1C1	...Repeated for Virtual Input 107					
"	C1C2	...Repeated for Virtual Input 108					
"	C1C3	...Repeated for Virtual Input 109					
"	C1C4	...Repeated for Virtual Input 110					
"	C1C5	...Repeated for Virtual Input 111					
"	C1C6	...Repeated for Virtual Input 112					
"	C1C7	...Repeated for Virtual Input 113					
"	C1C8	...Repeated for Virtual Input 114					
"	C1C9	...Repeated for Virtual Input 115					
"	C1CA	...Repeated for Virtual Input 116					
"	C1CB	...Repeated for Virtual Input 117					
"	C1CC	...Repeated for Virtual Input 118					
"	C1CD	...Repeated for Virtual Input 119					
"	C1CE	...Repeated for Virtual Input 120					
"	C1CF	...Repeated for Virtual Input 121					
"	C1D0	...Repeated for Virtual Input 122					
"	C1D1	...Repeated for Virtual Input 123					
"	C1D2	...Repeated for Virtual Input 124					
"	C1D3	...Repeated for Virtual Input 125					
"	C1D4	...Repeated for Virtual Input 126					
"	C1D5	...Repeated for Virtual Input 127					
"	C1D6	...Repeated for Virtual Input 128					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	IEC 61850 GGIO2 Control Configuration (Read/Write Setting) (128 Modules)						
All	C1D7	IEC 61850 GGIO2.CF.SPCSO1.ctlModel Value	0 to 2	---	1	F001	1
"	C1D8	...Repeated for SPCSO2.ctlModel Value					
"	C1D9	...Repeated for SPCSO3.ctlModel Value					
"	C1DA	...Repeated for SPCSO4.ctlModel Value					
"	C1DB	...Repeated for SPCSO5.ctlModel Value					
"	C1DC	...Repeated for SPCSO6.ctlModel Value					
"	C1DD	...Repeated for SPCSO7.ctlModel Value					
"	C1DE	...Repeated for SPCSO8.ctlModel Value					
"	C1DF	...Repeated for SPCSO9.ctlModel Value					
"	C1E0	...Repeated for SPCSO10.ctlModel Value					
"	C1E1	...Repeated for SPCSO11.ctlModel Value					
"	C1E2	...Repeated for SPCSO12.ctlModel Value					
"	C1E3	...Repeated for SPCSO13.ctlModel Value					
"	C1E4	...Repeated for SPCSO14.ctlModel Value					
"	C1E5	...Repeated for SPCSO15.ctlModel Value					
"	C1E6	...Repeated for SPCSO16.ctlModel Value					
"	C1E7	...Repeated for SPCSO17.ctlModel Value					
"	C1E8	...Repeated for SPCSO18.ctlModel Value					
"	C1E9	...Repeated for SPCSO19.ctlModel Value					
"	C1EA	...Repeated for SPCSO20.ctlModel Value					
"	C1EB	...Repeated for SPCSO21.ctlModel Value					
"	C1EC	...Repeated for SPCSO22.ctlModel Value					
"	C1ED	...Repeated for SPCSO23.ctlModel Value					
"	C1EE	...Repeated for SPCSO24.ctlModel Value					
"	C1EF	...Repeated for SPCSO25.ctlModel Value					
"	C1F0	...Repeated for SPCSO26.ctlModel Value					
"	C1F1	...Repeated for SPCSO27.ctlModel Value					
"	C1F2	...Repeated for SPCSO28.ctlModel Value					
"	C1F3	...Repeated for SPCSO29.ctlModel Value					
"	C1F4	...Repeated for SPCSO30.ctlModel Value					
"	C1F5	...Repeated for SPCSO31.ctlModel Value					
"	C1F6	...Repeated for SPCSO32.ctlModel Value					
"	C1F7	...Repeated for SPCSO33.ctlModel Value					
"	C1F8	...Repeated for SPCSO34.ctlModel Value					
"	C1F9	...Repeated for SPCSO35.ctlModel Value					
"	C1FA	...Repeated for SPCSO36.ctlModel Value					
"	C1FB	...Repeated for SPCSO37.ctlModel Value					
"	C1FC	...Repeated for SPCSO38.ctlModel Value					
"	C1FD	...Repeated for SPCSO39.ctlModel Value					
"	C1FE	...Repeated for SPCSO40.ctlModel Value					
"	C1FF	...Repeated for SPCSO41.ctlModel Value					
"	C200	...Repeated for SPCSO42.ctlModel Value					
"	C201	...Repeated for SPCSO43.ctlModel Value					
"	C202	...Repeated for SPCSO44.ctlModel Value					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	C203	...Repeated for SPCSO45.ctlModel Value					
"	C204	...Repeated for SPCSO46.ctlModel Value					
"	C205	...Repeated for SPCSO47.ctlModel Value					
"	C206	...Repeated for SPCSO48.ctlModel Value					
"	C207	...Repeated for SPCSO49.ctlModel Value					
"	C208	...Repeated for SPCSO50.ctlModel Value					
"	C209	...Repeated for SPCSO51.ctlModel Value					
"	C20A	...Repeated for SPCSO52.ctlModel Value					
"	C20B	...Repeated for SPCSO53.ctlModel Value					
"	C20C	...Repeated for SPCSO54.ctlModel Value					
"	C20D	...Repeated for SPCSO55.ctlModel Value					
"	C20E	...Repeated for SPCSO56.ctlModel Value					
"	C20F	...Repeated for SPCSO57.ctlModel Value					
"	C210	...Repeated for SPCSO58.ctlModel Value					
"	C211	...Repeated for SPCSO59.ctlModel Value					
"	C212	...Repeated for SPCSO60.ctlModel Value					
"	C213	...Repeated for SPCSO61.ctlModel Value					
"	C214	...Repeated for SPCSO62.ctlModel Value					
"	C215	...Repeated for SPCSO63.ctlModel Value					
"	C216	...Repeated for SPCSO64.ctlModel Value					
"	C217	...Repeated for SPCSO65.ctlModel Value					
"	C218	...Repeated for SPCSO66.ctlModel Value					
"	C219	...Repeated for SPCSO67.ctlModel Value					
"	C21A	...Repeated for SPCSO68.ctlModel Value					
"	C21B	...Repeated for SPCSO69.ctlModel Value					
"	C21C	...Repeated for SPCSO70.ctlModel Value					
"	C21D	...Repeated for SPCSO71.ctlModel Value					
"	C21E	...Repeated for SPCSO72.ctlModel Value					
"	C21F	...Repeated for SPCSO73.ctlModel Value					
"	C220	...Repeated for SPCSO74.ctlModel Value					
"	C221	...Repeated for SPCSO75.ctlModel Value					
"	C222	...Repeated for SPCSO76.ctlModel Value					
"	C223	...Repeated for SPCSO77.ctlModel Value					
"	C224	...Repeated for SPCSO78.ctlModel Value					
"	C225	...Repeated for SPCSO79.ctlModel Value					
"	C226	...Repeated for SPCSO80.ctlModel Value					
"	C227	...Repeated for SPCSO81.ctlModel Value					
"	C228	...Repeated for SPCSO82.ctlModel Value					
"	C229	...Repeated for SPCSO83.ctlModel Value					
"	C22A	...Repeated for SPCSO84.ctlModel Value					
"	C22B	...Repeated for SPCSO85.ctlModel Value					
"	C22C	...Repeated for SPCSO86.ctlModel Value					
"	C22D	...Repeated for SPCSO87.ctlModel Value					
"	C22E	...Repeated for SPCSO88.ctlModel Value					
"	C22F	...Repeated for SPCSO89.ctlModel Value					
"	C230	...Repeated for SPCSO90.ctlModel Value					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	C231	...Repeated for SPCSO91.ctlModel Value					
"	C232	...Repeated for SPCSO92.ctlModel Value					
"	C233	...Repeated for SPCSO93.ctlModel Value					
"	C234	...Repeated for SPCSO94.ctlModel Value					
"	C235	...Repeated for SPCSO95.ctlModel Value					
"	C236	...Repeated for SPCSO96.ctlModel Value					
"	C237	...Repeated for SPCSO97.ctlModel Value					
"	C238	...Repeated for SPCSO98.ctlModel Value					
"	C239	...Repeated for SPCSO99.ctlModel Value					
"	C23A	...Repeated for SPCSO100.ctlModel Value					
"	C23B	...Repeated for SPCSO101.ctlModel Value					
"	C23C	...Repeated for SPCSO102.ctlModel Value					
"	C23D	...Repeated for SPCSO103.ctlModel Value					
"	C23E	...Repeated for SPCSO104.ctlModel Value					
"	C23F	...Repeated for SPCSO105.ctlModel Value					
"	C240	...Repeated for SPCSO106.ctlModel Value					
"	C241	...Repeated for SPCSO107.ctlModel Value					
"	C242	...Repeated for SPCSO108.ctlModel Value					
"	C243	...Repeated for SPCSO109.ctlModel Value					
"	C244	...Repeated for SPCSO110.ctlModel Value					
"	C245	...Repeated for SPCSO111.ctlModel Value					
"	C246	...Repeated for SPCSO112.ctlModel Value					
"	C247	...Repeated for SPCSO113.ctlModel Value					
"	C248	...Repeated for SPCSO114.ctlModel Value					
"	C249	...Repeated for SPCSO115.ctlModel Value					
"	C24A	...Repeated for SPCSO116.ctlModel Value					
"	C24B	...Repeated for SPCSO117.ctlModel Value					
"	C24C	...Repeated for SPCSO118.ctlModel Value					
"	C24D	...Repeated for SPCSO119.ctlModel Value					
"	C24E	...Repeated for SPCSO120.ctlModel Value					
"	C24F	...Repeated for SPCSO121.ctlModel Value					
"	C250	...Repeated for SPCSO122.ctlModel Value					
"	C251	...Repeated for SPCSO123.ctlModel Value					
"	C252	...Repeated for SPCSO124.ctlModel Value					
"	C253	...Repeated for SPCSO125.ctlModel Value					
"	C254	...Repeated for SPCSO126.ctlModel Value					
"	C255	...Repeated for SPCSO127.ctlModel Value					
"	C256	...Repeated for SPCSO128.ctlModel Value					
	Bay Configuration (Read/Write Setting) (20 Modules)						
B30	C257	Bay 1 Aux Breaker Trip 1	0 to 4294967295	---	1	F300	0
"	C259	Bay 1 Aux Breaker Trip 2	0 to 4294967295	---	1	F300	0
"	C25B	Bay 1 Aux Breaker Trip 3	0 to 4294967295	---	1	F300	0
"	C25D	Bay 1 Connected Zone Trip 1	0 to 4294967295	---	1	F300	0
"	C25F	Bay 1 Connected Zone Trip 2	0 to 4294967295	---	1	F300	0
"	C261	Bay 1 Connected Zone Trip 3	0 to 4294967295	---	1	F300	0
"	C263	Bay 1 CT Source	0 to 30	---	1	F677	0 (None)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	C264	Bay 1 Direction	0 to 1	---	1	F210	0 (IN)
"	C265	Bay 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	C266	Bay 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	C267	Bay 1 Zone 1 Connection	0 to 4294967295	---	1	F300	0
"	C269	Bay 1 Zone 2 Connection	0 to 4294967295	---	1	F300	0
"	C26B	Bay 1 Zone 3 Connection	0 to 4294967295	---	1	F300	0
"	C26D	Bay 1 Zone 4 Connection	0 to 4294967295	---	1	F300	0
"	C26F	Bay 1 Zone 5 Connection	0 to 4294967295	---	1	F300	0
"	C271	Bay 1 Zone 6 Connection	0 to 4294967295	---	1	F300	0
"	C273	Bay 1 ID	0 to 2	---	1	F202	(none)
"	C27D	...Repeated for Bay 2					
"	C2A3	...Repeated for Bay 3					
"	C2C9	...Repeated for Bay 4					
"	C2EF	...Repeated for Bay 5					
"	C315	...Repeated for Bay 6					
"	C33B	...Repeated for Bay 7					
"	C361	...Repeated for Bay 8					
"	C387	...Repeated for Bay 9					
"	C3AD	...Repeated for Bay 10					
"	C3D3	...Repeated for Bay 11					
"	C3F9	...Repeated for Bay 12					
"	C41F	...Repeated for Bay 13					
"	C445	...Repeated for Bay 14					
"	C46B	...Repeated for Bay 15					
"	C491	...Repeated for Bay 16					
"	C4B7	...Repeated for Bay 17					
"	C4DD	...Repeated for Bay 18					
"	C503	...Repeated for Bay 19					
"	C529	...Repeated for Bay 20					
	B30 Current General (Read/Write Grouped Setting) (28 Modules)						
B30	C67F	B30 Current General 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	C680	B30 Current General 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	C681	B30 Current General 1 ID	0 to 2	---	1	F202	(none)
"	C68B	...Repeated for module 2					
"	C697	...Repeated for module 3					
"	C6A3	...Repeated for module 4					
"	C6AF	...Repeated for module 5					
"	C6BB	...Repeated for module 6					
"	C6C7	...Repeated for module 7					
"	C6D3	...Repeated for module 8					
"	C6DF	...Repeated for module 9					
"	C6EB	...Repeated for module 10					
"	C6F7	...Repeated for module 11					
"	C703	...Repeated for module 12					
"	C70F	...Repeated for module 13					
"	C71B	...Repeated for module 14					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	C727	...Repeated for module 15					
"	C733	...Repeated for module 16					
"	C73F	...Repeated for module 17					
"	C74B	...Repeated for module 18					
"	C757	...Repeated for module 19					
"	C763	...Repeated for module 20					
"	C76F	...Repeated for module 21					
"	C77B	...Repeated for module 22					
"	C787	...Repeated for module 23					
"	C793	...Repeated for module 24					
"	C79F	...Repeated for module 25					
"	C7AB	...Repeated for module 26					
"	C7B7	...Repeated for module 27					
"	C7C3	...Repeated for module 28					
	B30 Voltage General (Read/Write Grouped Setting) (6 Modules)						
B30	C7CF	Voltage General 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	C7D0	Voltage General 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	C7D1	Voltage General 1 VT Source	0 to 30	---	1	F677	0 (None)
"	C7D2	Voltage General 1 ID	0 to 2	---	1	F202	(none)
"	C7DC	...Repeated for module 2					
"	C7E9	...Repeated for module 3					
"	C7F6	...Repeated for module 4					
"	C803	...Repeated for module 5					
"	C810	...Repeated for module 6					
	Field Unit CT VT Settings (Read/Write Setting) (6 or 30 Modules)						
All except B90, L60	C81D	Remote Phase CT x Origin 1	0 to 16	---	1	F247	0 (None)
"	C81E	Remote Phase CT x Origin 2	0 to 16	---	1	F247	0 (None)
"	C81F	Remote Ground CT x Origin 1	0 to 16	---	1	F248	0 (None)
"	C820	Remote Ground CT x Origin 2	0 to 16	---	1	F248	0 (None)
"	C821	AC Bank Redundancy Type	0 to 2	---	1	F261	1 (Dependability Biased)
"	C822	Remote Phase CT 1 Primary	1 to 65000	---	1	F001	1
"	C823	Remote Phase CT 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	C824	Remote Ground CT 1 Primary	1 to 65000	---	1	F001	1
"	C825	Remote Ground CT 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	C826	Remote Phase VT 1 Connection	0 to 1	---	1	F100	0 (Wye)
"	C827	Remote Phase VT 1 Secondary	25 to 240	---	0.1	F001	664
"	C828	Remote Phase VT 1 Ratio	1 to 24000	---	1	F060	1
"	C82A	Remote Auxiliary VT 1 Connection	0 to 6	---	1	F166	1 (Vag)
"	C82B	Remote Auxiliary VT 1 Secondary	25 to 240	---	0.1	F001	664
"	C82C	Remote Auxiliary VT 1 Ratio	1 to 24000	---	1	F060	1
"	C82E	...Repeated for Field Unit 2					
"	C83F	...Repeated for Field Unit 3					
"	C850	...Repeated for Field Unit 4					
"	C861	...Repeated for Field Unit 5					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	C872	...Repeated for Field Unit 6					
B30	C883	...Repeated for Field Unit 7					
"	C894	...Repeated for Field Unit 8					
"	C8A5	...Repeated for Field Unit 9					
"	C8B6	...Repeated for Field Unit 10					
"	C8C7	...Repeated for Field Unit 11					
"	C8D8	...Repeated for Field Unit 12					
"	C8E9	...Repeated for Field Unit 13					
"	C8FA	...Repeated for Field Unit 14					
"	C90B	...Repeated for Field Unit 15					
"	C91C	...Repeated for Field Unit 16					
"	C92D	...Repeated for Field Unit 17					
"	C93E	...Repeated for Field Unit 18					
"	C94F	...Repeated for Field Unit 19					
"	C960	...Repeated for Field Unit 20					
"	C971	...Repeated for Field Unit 21					
"	C982	...Repeated for Field Unit 22					
"	C993	...Repeated for Field Unit 23					
"	C9A4	...Repeated for Field Unit 24					
"	C9B5	...Repeated for Field Unit 25					
"	C9C6	...Repeated for Field Unit 26					
"	C9D7	...Repeated for Field Unit 27					
"	C9E8	...Repeated for Field Unit 28					
"	C9F9	...Repeated for Field Unit 29					
"	CA0A	...Repeated for Field Unit 30					
	IEC 61869 Origin Settings (Read/Write Setting) (6 or 30 Modules)						
All except B90, C30, L60	CBBF	Phase 1 Origin 1	0 to 65535	---	1	F203	"None"
"	CBC8	Phase 1 Origin 2	0 to 65535	---	1	F203	"None"
"	CBD1	Aux 1 Origin 1	0 to 65535	---	1	F203	"None"
"	CBDA	Aux 2 Origin 2	0 to 65535	---	1	F203	"None"
"	CBE3	Process Bus Module AC Bank SV Stream Crosschecking	0 to 2	---	1	F675	0 (None)
"	CBE4	...Repeated for module 2					
"	CC09	...Repeated for module 3					
"	CC2E	...Repeated for module 4					
"	CC53	...Repeated for module 5					
"	CC78	...Repeated for module 6					
B30	CC9D	...Repeated for module 7					
"	CCC2	...Repeated for module 8					
"	CCE7	...Repeated for module 9					
"	CD0C	...Repeated for module 10					
"	CD31	...Repeated for module 11					
"	CD56	...Repeated for module 12					
"	CD7B	...Repeated for module 13					
"	CDA0	...Repeated for module 14					
"	CDC5	...Repeated for module 15					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	CDEA	...Repeated for module 16					
"	CE0F	...Repeated for module 17					
"	CE34	...Repeated for module 18					
"	CE59	...Repeated for module 19					
"	CE7E	...Repeated for module 20					
"	CEA3	...Repeated for module 21					
"	CEC8	...Repeated for module 22					
"	CEED	...Repeated for module 23					
"	CF12	...Repeated for module 24					
"	CF37	...Repeated for module 25					
"	CF5C	...Repeated for module 26					
"	CF81	...Repeated for module 27					
"	CFA6	...Repeated for module 28					
"	CFCB	...Repeated for module 29					
"	CFF0	...Repeated for module 30					
	Autoreclose 1P 3P (Read/Write Setting)						
C60, D60, L60, L90	D015	Autoreclose Mode	0 to 3	---	1	F622	0 (Mode 1 (1 & 3 Pole))
"	D016	Autoreclose Maximum Number of Shots	1 to 4	---	1	F001	2
"	D017	Autoreclose Block Breaker 1	0 to 4294967295	---	1	F300	0
"	D019	Autoreclose Close Time Breaker 1	0.1 to 655.35	s	0.01	F001	10
"	D01A	Autoreclose Breaker Manual Close	0 to 4294967295	---	1	F300	0
"	D01C	Autoreclose Function	0 to 1	---	1	F102	0 (Disabled)
"	D01D	Autoreclose Block Time Manual Close	0 to 655.35	s	0.01	F001	1000
"	D01E	Autoreclose 1P Initiate	0 to 4294967295	---	1	F300	0
"	D020	Autoreclose 3P Initiate	0 to 4294967295	---	1	F300	0
"	D022	Autoreclose 3P TD Initiate	0 to 4294967295	---	1	F300	0
"	D024	Autoreclose Multi-Phase Fault	0 to 4294967295	---	1	F300	0
"	D026	Autoreclose Breaker 1 Pole Open	0 to 4294967295	---	1	F300	0
"	D028	Autoreclose Breaker 3 Pole Open	0 to 4294967295	---	1	F300	0
"	D02A	Autoreclose 3-Pole Dead Time 1	0 to 655.35	s	0.01	F001	50
"	D02B	Autoreclose 3-Pole Dead Time 2	0 to 655.35	s	0.01	F001	120
"	D02C	Autoreclose Extend Dead T1	0 to 4294967295	---	1	F300	0
"	D02E	Autoreclose Dead T1 Extension	0 to 655.35	s	0.01	F001	50
"	D02F	Autoreclose Reset	0 to 4294967295	---	1	F300	0
"	D031	Autoreclose Reset Time	0 to 655.35	s	0.01	F001	6000
"	D032	Autoreclose Breaker Closed	0 to 4294967295	---	1	F300	0
"	D034	Autoreclose Block	0 to 4294967295	---	1	F300	0
"	D036	Autoreclose Pause	0 to 4294967295	---	1	F300	0
"	D038	Autoreclose Incomplete Sequence Time	0 to 655.35	s	0.01	F001	500
"	D039	Autoreclose Block Breaker 2	0 to 4294967295	---	1	F300	0
"	D03B	Autoreclose Close Time Breaker 2	0.1 to 655.35	s	0.01	F001	10
"	D03C	Autoreclose Transfer 1 to 2	0 to 1	---	1	F126	0 (No)
"	D03D	Autoreclose Transfer 2 to 1	0 to 1	---	1	F126	0 (No)
"	D03E	Autoreclose Breaker 1 Fail Option	0 to 1	---	1	F081	0 (Continue)
"	D03F	Autoreclose Breaker 2 Fail Option	0 to 1	---	1	F081	0 (Continue)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	D040	Autoreclose 1P Dead Time	0 to 655.35	s	0.01	F001	100
"	D041	Autoreclose Breaker Sequence	0 to 4	---	1	F082	3 (1 - 2)
"	D042	Autoreclose Transfer Time	0 to 655.35	s	0.01	F001	400
"	D043	Autoreclose Event	0 to 1	---	1	F102	0 (Disabled)
"	D044	Autoreclose 3P Dead Time 3	0 to 655.35	s	0.01	F001	200
"	D045	Autoreclose 3P Dead Time 4	0 to 655.35	s	0.01	F001	400
"	D046	Autoreclose Bus Fault Initiate	0 to 4294967295	---	1	F300	0
"	D048	Autoreclose Initiate Mode	0 to 1	---	1	F610	0 (Protection AND CB)
"	D049	Autoreclose Mode Aut	0 to 3	---	1	F622	0 (Mode 1 (1 & 3 Pole))
"	D04A	Autoreclose Mode 1 Activation	0 to 4294967295	---	1	F300	0
"	D04C	Autoreclose Mode 2 Activation	0 to 4294967295	---	1	F300	0
"	D04E	Autoreclose Mode 3 Activation	0 to 4294967295	---	1	F300	0
"	D050	Autoreclose Mode 4 Activation	0 to 4294967295	---	1	F300	0
	Auxiliary Undervoltage (Read/Write Grouped Setting) (3 or 6 Modules)						
B30, C60, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60	D052	Auxiliary Undervoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	D053	Auxiliary Undervoltage 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	D054	Auxiliary Undervoltage 1 Pickup	0.004 to 3	pu	0.001	F001	700
"	D055	Auxiliary Undervoltage 1 Delay	0 to 600	s	0.01	F001	100
"	D056	Auxiliary Undervoltage 1 Curve	0 to 1	---	1	F111	0 (Definite Time)
"	D057	Auxiliary Undervoltage 1 Minimum Voltage	0 to 3	pu	0.001	F001	100
"	D058	Auxiliary Undervoltage 1 Block	0 to 4294967295	---	1	F300	0
"	D05A	Auxiliary Undervoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	D05B	Auxiliary Undervoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	D05C	Reserved (7 items)	0 to 65535	---	1	F001	0
"	D063	...Repeated for Auxiliary Undervoltage 2					
"	D074	...Repeated for Auxiliary Undervoltage 3					
B30	D085	...Repeated for Auxiliary Undervoltage 4					
"	D096	...Repeated for Auxiliary Undervoltage 5					
"	D0A7	...Repeated for Auxiliary Undervoltage 6					
	Underfrequency (Read/Write Setting) (6 or 12 Modules)						
B30, D30, D60, F35, F60, G30, G60, L30, L90, M60, N60, T35, T60	D183	Underfrequency 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	D184	Underfrequency 1 Block	0 to 4294967295	---	1	F300	0
"	D186	Underfrequency 1 Min Current	0.1 to 1.25	pu	0.01	F001	10
"	D187	Underfrequency 1 Pickup	20 to 65	Hz	0.01	F001	5950
"	D188	Underfrequency 1 Pickup Delay	0 to 65.535	s	0.001	F001	2000
"	D189	Underfrequency 1 Reset Delay	0 to 65.535	s	0.001	F001	2000
"	D18A	Underfrequency 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	D18B	Underfrequency 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	D18C	Underfrequency 1 Target	0 to 2	---	1	F109	0 (Self-reset)

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	D18D	Reserved (5 items)	0 to 1	---	1	F001	0
"	D192	...Repeated for Underfrequency 2					
"	D1A1	...Repeated for Underfrequency 3					
"	D1B0	...Repeated for Underfrequency 4					
"	D1BF	...Repeated for Underfrequency 5					
"	D1CE	...Repeated for Underfrequency 6					
B30	D1DD	...Repeated for Underfrequency 7					
"	D1EC	...Repeated for Underfrequency 8					
"	D1FB	...Repeated for Underfrequency 9					
"	D20A	...Repeated for Underfrequency 10					
"	D219	...Repeated for Underfrequency 11					
"	D228	...Repeated for Underfrequency 12					
	Neutral Directional Overcurrent (Read/Write Grouped Setting) (1, 2, 3, or 6 Modules)						
B30, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60	D237	Neutral Directional Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	D238	Neutral Directional Overcurrent 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	D239	Neutral Directional Overcurrent 1 Polarizing	0 to 4	---	1	F230	0 (Voltage)
"	D23A	Neutral Directional Overcurrent 1 Forward ECA	-90 to 90	° Lag	1	F002	75
"	D23B	Neutral Directional Overcurrent 1 Forward Limit Angle	40 to 90	degrees	1	F001	90
"	D23C	Neutral Directional Overcurrent 1 Forward Pickup	0.006 to 30	pu	0.001	F001	50
"	D23D	Neutral Directional Overcurrent 1 Reverse Limit Angle	40 to 90	degrees	1	F001	90
"	D23E	Neutral Directional Overcurrent 1 Reverse Pickup	0.006 to 30	pu	0.001	F001	50
"	D23F	Neutral Directional Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	D240	Neutral Directional Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	D242	Neutral Directional Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	D243	Neutral Directional Overcurrent 1 Polarizing Voltage	0 to 1	---	1	F231	0 (Calculated V0)
"	D244	Neutral Directional Overcurrent 1 Op Current	0 to 1	---	1	F196	0 (Calculated 3I0)
"	D245	Neutral Directional Overcurrent 1 Offset	0 to 250	ohms	0.01	F001	0
"	D246	Neutral Directional Overcurrent 1 Pos Seq Restraint	0 to 0.5	---	0.001	F001	63
"	D247	Neutral Directional Overcurrent 1 CT Source	0 to 30	---	1	F677	0 (None)
D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60	D248	...Repeated for Neutral Directional Overcurrent 2					
B30, N60, T60	D259	...Repeated for Neutral Directional Overcurrent 3					
B30	D26A	...Repeated for Neutral Directional Overcurrent 4					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	D27B	...Repeated for Neutral Directional Overcurrent 5					
"	D28C	...Repeated for Neutral Directional Overcurrent 6					
	Source Settings (Read/Write Setting) (2, 4, 6, or 30 Modules)						
All except B90, C30	D300	Source 1 Name	0 to 1	---	1	F637	"SRC 1"
"	D30A	Source 1 Phase CT	0 to 63	---	1	F400	0
"	D30B	Source 1 Ground CT	0 to 63	---	1	F400	0
"	D30C	Source 1 Phase VT	0 to 63	---	1	F400	0
"	D30D	Source 1 Auxiliary VT	0 to 63	---	1	F400	0
"	D30E	...Repeated for Source 2					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	D31C	...Repeated for Source 3					
"	D32A	...Repeated for Source 4					
B30, C70, F35, N60, T35, T60	D338	...Repeated for Source 5					
"	D346	...Repeated for Source 6					
B30	D354	...Repeated for Source 7					
"	D362	...Repeated for Source 8					
"	D370	...Repeated for Source 9					
"	D37E	...Repeated for Source 10					
"	D38C	...Repeated for Source 11					
"	D39A	...Repeated for Source 12					
"	D3A8	...Repeated for Source 13					
"	D3B6	...Repeated for Source 14					
"	D3C4	...Repeated for Source 15					
"	D3D2	...Repeated for Source 16					
"	D3E0	...Repeated for Source 17					
"	D3EE	...Repeated for Source 18					
"	D3FC	...Repeated for Source 19					
"	D40A	...Repeated for Source 20					
"	D418	...Repeated for Source 21					
"	D426	...Repeated for Source 22					
"	D434	...Repeated for Source 23					
"	D442	...Repeated for Source 24					
"	D450	...Repeated for Source 25					
"	D45E	...Repeated for Source 26					
"	D46C	...Repeated for Source 27					
"	D47A	...Repeated for Source 28					
"	D488	...Repeated for Source 29					
"	D496	...Repeated for Source 30					

Products	Hex address	Register name	Range	Units	Step	Format	Default
	VT Fuse Failure Settings (Read/Write) (2, 4, or 6 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60	D5A0	VT Fuse Failure Function	0 to 1	---	1	F102	0 (Disabled)
"	D5A1	VT Fuse Failure Neutral Wire Open Function	0 to 1	---	1	F102	0 (Disabled)
"	D5A2	VT Fuse Failure Neutral Wire Open 3rd Harmonic Pickup	0.004 to 3	pu	0.001	F001	100
"	D5A3	VT Fuse Failure 1 Alarm Delay	0 to 65.535	s	0.001	F001	1000
B30	D5A4	VT Fuse Failure 1 CT Source B30	0 to 30	---	1	F677	0 (None)
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60	D5A5	...Repeated for Source 2					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T60	D5AA	...Repeated for Source 3					
"	D5AF	...Repeated for Source 4					
B30, C70, F35, N60, T60	D5B4	...Repeated for Source 5					
"	D5B9	...Repeated for Source 6					
	User Programmable Pushbuttons Commands (Read/Write Command) (48Modules)						
All	D5C0	User Programmable Pushbutton 1 On Command	0 to 1	---	1	F108	0 (Off)
"	D5C1	...Repeated for Pushbutton 2					
"	D5C2	...Repeated for Pushbutton 3					
"	D5C3	...Repeated for Pushbutton 4					
"	D5C4	...Repeated for Pushbutton 5					
"	D5C5	...Repeated for Pushbutton 6					
"	D5C6	...Repeated for Pushbutton 7					
"	D5C7	...Repeated for Pushbutton 8					
"	D5C8	...Repeated for Pushbutton 9					
"	D5C9	...Repeated for Pushbutton 10					
"	D5CA	...Repeated for Pushbutton 11					
"	D5CB	...Repeated for Pushbutton 12					
"	D5CC	...Repeated for Pushbutton 13					
"	D5CD	...Repeated for Pushbutton 14					
"	D5CE	...Repeated for Pushbutton 15					
"	D5CF	...Repeated for Pushbutton 16					
"	D5D0	...Repeated for Pushbutton 17					
"	D5D1	...Repeated for Pushbutton 18					
"	D5D2	...Repeated for Pushbutton 19					
"	D5D3	...Repeated for Pushbutton 20					
"	D5D4	...Repeated for Pushbutton 21					
"	D5D5	...Repeated for Pushbutton 22					
"	D5D6	...Repeated for Pushbutton 23					
"	D5D7	...Repeated for Pushbutton 24					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	D5D8	...Repeated for Pushbutton 25					
"	D5D9	...Repeated for Pushbutton 26					
"	D5DA	...Repeated for Pushbutton 27					
"	D5DB	...Repeated for Pushbutton 28					
"	D5DC	...Repeated for Pushbutton 29					
"	D5DD	...Repeated for Pushbutton 30					
"	D5DE	...Repeated for Pushbutton 31					
"	D5DF	...Repeated for Pushbutton 32					
"	D5E0	...Repeated for Pushbutton 33					
"	D5E1	...Repeated for Pushbutton 34					
"	D5E2	...Repeated for Pushbutton 35					
"	D5E3	...Repeated for Pushbutton 36					
"	D5E4	...Repeated for Pushbutton 37					
"	D5E5	...Repeated for Pushbutton 38					
"	D5E6	...Repeated for Pushbutton 39					
"	D5E7	...Repeated for Pushbutton 40					
"	D5E8	...Repeated for Pushbutton 41					
"	D5E9	...Repeated for Pushbutton 42					
"	D5EA	...Repeated for Pushbutton 43					
"	D5EB	...Repeated for Pushbutton 44					
"	D5EC	...Repeated for Pushbutton 45					
"	D5ED	...Repeated for Pushbutton 46					
"	D5EE	...Repeated for Pushbutton 47					
"	D5EF	...Repeated for Pushbutton 48					
	User Programmable Pushbuttons (Read/Write Setting) (48 Modules)						
All	D5F0	User Programmable Pushbutton 1 Function	0 to 2	---	1	F137	0 (Disabled)
"	D5F1	User Programmable Pushbutton 1 Top Line	---	---	---	F202	"USER PB 1 "
"	D5FB	User Programmable Pushbutton 1 On Text	---	---	---	F202	(none)
"	D605	User Programmable Pushbutton 1 Off Text	---	---	---	F202	(none)
"	D60F	User Programmable Pushbutton 1 Drop-Out Time	0 to 60	s	0.05	F001	0
"	D610	User Programmable Pushbutton 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	D611	User Programmable Pushbutton 1 LED Operand	0 to 4294967295	---	1	F300	0
"	D613	User Programmable Pushbutton 1 Autoreset Delay	0.2 to 600	s	0.1	F001	10
"	D614	User Programmable Pushbutton 1 Autoreset Function	0 to 1	---	1	F102	0 (Disabled)
"	D615	User Programmable Pushbutton 1 Local Lock Operand	0 to 4294967295	---	1	F300	0
"	D617	User Programmable Pushbutton 1 Message Priority	0 to 2	---	1	F220	0 (Disabled)
"	D618	User Programmable Pushbutton 1 Remote Lock Operand	0 to 4294967295	---	1	F300	0
"	D61A	User Programmable Pushbutton 1 Reset Operand	0 to 4294967295	---	1	F300	0
"	D61C	User Programmable Pushbutton 1 Set Operand	0 to 4294967295	---	1	F300	0
"	D61E	User Programmable Pushbutton 1 Hold	0 to 10	s	0.1	F001	1

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	D61F	...Repeated for User Programmable Pushbutton 2					
"	D64E	...Repeated for User Programmable Pushbutton 3					
"	D67D	...Repeated for User Programmable Pushbutton 4					
"	D6AC	...Repeated for User Programmable Pushbutton 5					
"	D6DB	...Repeated for User Programmable Pushbutton 6					
"	D70A	...Repeated for User Programmable Pushbutton 7					
"	D739	...Repeated for User Programmable Pushbutton 8					
"	D768	...Repeated for User Programmable Pushbutton 9					
"	D797	...Repeated for User Programmable Pushbutton 10					
"	D7C6	...Repeated for User Programmable Pushbutton 11					
"	D7F5	...Repeated for User Programmable Pushbutton 12					
"	D824	...Repeated for User Programmable Pushbutton 13					
"	D853	...Repeated for User Programmable Pushbutton 14					
"	D882	...Repeated for User Programmable Pushbutton 15					
"	D8B1	...Repeated for User Programmable Pushbutton 16					
"	D8E0	...Repeated for User Programmable Pushbutton 17					
"	D90F	...Repeated for User Programmable Pushbutton 18					
"	D93E	...Repeated for User Programmable Pushbutton 19					
"	D96D	...Repeated for User Programmable Pushbutton 20					
"	D99C	...Repeated for User Programmable Pushbutton 21					
"	D9CB	...Repeated for User Programmable Pushbutton 22					
"	D9FA	...Repeated for User Programmable Pushbutton 23					
"	DA29	...Repeated for User Programmable Pushbutton 24					
"	DA58	...Repeated for User Programmable Pushbutton 25					
"	DA87	...Repeated for User Programmable Pushbutton 26					
"	DAB6	...Repeated for User Programmable Pushbutton 27					
"	DAE5	...Repeated for User Programmable Pushbutton 28					

Products	Hex address	Register name	Range	Units	Step	Format	Default
"	DB14	...Repeated for User Programmable Pushbutton 29					
"	DB43	...Repeated for User Programmable Pushbutton 30					
"	DB72	...Repeated for User Programmable Pushbutton 31					
"	DBA1	...Repeated for User Programmable Pushbutton 32					
"	DBD0	...Repeated for User Programmable Pushbutton 33					
"	DBFF	...Repeated for User Programmable Pushbutton 34					
"	DC2E	...Repeated for User Programmable Pushbutton 35					
"	DC5D	...Repeated for User Programmable Pushbutton 36					
"	DC8C	...Repeated for User Programmable Pushbutton 37					
"	DCBB	...Repeated for User Programmable Pushbutton 38					
"	DCEA	...Repeated for User Programmable Pushbutton 39					
"	DD19	...Repeated for User Programmable Pushbutton 40					
"	DD48	...Repeated for User Programmable Pushbutton 41					
"	DD77	...Repeated for User Programmable Pushbutton 42					
"	DDA6	...Repeated for User Programmable Pushbutton 43					
"	DDD5	...Repeated for User Programmable Pushbutton 44					
"	DE04	...Repeated for User Programmable Pushbutton 45					
"	DE33	...Repeated for User Programmable Pushbutton 46					
"	DE62	...Repeated for User Programmable Pushbutton 47					
"	DE91	...Repeated for User Programmable Pushbutton 48					
	Source Setting Alternate (Read/Write Setting) (22 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L90, M60, N60, T35, T60	DEC0	Source 1 Alt Phase CT	0 to 87	---	1	F400	0
"	DEC1	Source 1 Alt Ground CT	0 to 87	---	1	F400	0
"	DEC2	Source 1 Switch Alt CT	0 to 4294967295	---	1	F300	0
"	DEC4	Source 1 Alt Phase VT	0 to 63	---	1	F400	0
"	DEC5	Source 1 Alt Auxiliary VT	0 to 63	---	1	F400	0
"	DEC6	Source 1 Switch Alt VT	0 to 4294967295	---	1	F300	0
"	DEC8	...Repeated for Source 2					

Products	Hex address	Register name	Range	Units	Step	Format	Default
B30, C60, C70, D60, F35, F60, G30, G60, L90, M60, N60, T35, T60	DED0	...Repeated for Source 3					
"	DED8	...Repeated for Source 4					
B30, C70, F35, N60, T35, T60	DEE0	...Repeated for Source 5					
"	DEE8	...Repeated for Source 6					
B30	DEF0	...Repeated for Source 7					
"	DEF8	...Repeated for Source 8					
"	DF00	...Repeated for Source 9					
"	DF08	...Repeated for Source 10					
"	DF10	...Repeated for Source 11					
"	DF18	...Repeated for Source 12					
"	DF20	...Repeated for Source 13					
"	DF28	...Repeated for Source 14					
"	DF30	...Repeated for Source 15					
"	DF38	...Repeated for Source 16					
"	DF40	...Repeated for Source 17					
"	DF48	...Repeated for Source 18					
"	DF50	...Repeated for Source 19					
"	DF58	...Repeated for Source 20					
"	DF60	...Repeated for Source 21					
"	DF68	...Repeated for Source 22					
	EGD Slow Production (Read/Write Setting) (2 Modules)						
B30, C30, C60, F35, F60, G30, G60, M60, T35, T60	DFB0	EGD Slow Producer Exchange 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	DFB1	EGD Fast Producer Exchange 1 Destination	0 to 4294967295	---	1	F003	0
"	DFB3	EGD Slow Producer Exchange 1 Data Rate	500 to 1000	ms	50	F001	1000
"	DFB4	EGD Slow Producer Exchange 1 Data Item 1 (50 items)	0 to 4294967295	---	1	F001	0
"	E018	Reserved (50 items)	---	---	---	F003	0
"	E04A	...Repeated for EGD Slow Producer Exchange 2					
	Settings Space Software Revisions (Read/Write)						
All	F0F9	Graphical Front Panel Version	0 to 655.35	---	0.01	F001	0

2.4.3 Data formats

Enumeration refers to a list where we read a numeric value but want to display it as more user-friendly text. An example is that F081 can be entered as F081 or something more convenient, such as Continue and Lockout. The F codes in this section are for reference.

F001
UR_UINT16 UNSIGNED 16 BIT INTEGER

F002
UR_SINT16 SIGNED 16 BIT INTEGER

F003
UR_UINT32 UNSIGNED 32 BIT INTEGER (2 registers)

High order word is stored in the first register.
Low order word is stored in the second register.

F004
UR_SINT32 SIGNED 32 BIT INTEGER (2 registers)

High order word is stored in the first register.
Low order word is stored in the second register.

F011
UR_UINT16 FLEXCURVE DATA (120 points)

A FlexCurve is an array of 120 consecutive data points (x, y) that are interpolated to generate a smooth curve. The y-axis is the user-defined trip or operation time setting; the x-axis is the pickup ratio and is pre-defined. See format F119 for a listing of the pickup ratios; the enumeration value for the pickup ratio indicates the offset into the FlexCurve base address where the corresponding time value is stored.

F013
POWER_FACTOR (SIGNED 16 BIT INTEGER)

Positive values indicate lagging power factor; negative values indicate leading.

F050
UR_UINT32 TIME and DATE (UNSIGNED 32 BIT INTEGER)

Gives the current time in seconds elapsed since 00:00:00 January 1, 1970.

F051
UR_UINT32 DATE in SR format (alternate format for F050)

First 16 bits are Month/Day (MM/DD/xxxx).
Month: 1=January, 2=February,...,12=December.
Day: 1 to 31 in steps of 1.

Last 16 bits are Year (xx/xx/YYYY): 1970 to 2106 in steps of 1.

F052
UR_UINT32 TIME in SR format (alternate format for F050)

First 16 bits are Hours/Minutes (HH:MM:xx.xxx).
Hours: 0=12am, 1=1am,...,12=12pm,...23=11pm.
Minutes: 0 to 59 in steps of 1.

Last 16 bits are Seconds (xx:xx:.SS.SSS): (0=00.000s, 1=00.001,...,59999=59.999s).

F060
FLOATING_POINT IEEE 32-BIT FLOATING POINT NUMBER

F072
HEX6 6 BYTES - 12 ASCII DIGITS

F073
HEX8 8 BYTES - 16 ASCII DIGITS

F074
HEX20 20 BYTES - 40 ASCII DIGITS

F076
TEXT128 128 CHARACTER ASCII TEXT

F081
ENUMERATION: AUTORECLOSE 1P/3P BKR FAIL OPTION

0 = Continue, 1 = Lockout

F082
ENUMERATION: AUTORECLOSE SINGLE-PHASE / THREE-PHASE (1P 3P) BREAKER SEQUENCE

0 = 1, 1 = 2, 2 = 1 & 2, 3 = 1 – 2, 4 = 2 – 1

F083
ENUMERATION: SELECTOR MODES

0 = Time-out, 1 = Acknowledge

F084
ENUMERATION: SELECTOR POWER UP

0 = Restore, 1 = Synchronize, 2 = Sync/Restore

F085
ENUMERATION: POWER SWING SHAPE

0 = Mho Shape, 1 = Quad Shape

2

F086
ENUMERATION: CONTACT INPUT DEFAULT STATE

0 = Off, 1 = On, 2= Latest/Off, 3 = Latest/On

F088
ENUMERATION: 87PC PHASE COMPARISON SCHEME SELECTION

Value	Scheme
0	2TL-TR-SPC-2FC
1	2TL-BL-SPC-2FC
2	2TL-UB-DPC-2FC
3	2TL-TR-DPC-3FC
4	2TL-BL-DPC-3FC
5	3TL-TR-SPC-2FC
6	3TL-BL-SPC-2FC
7	3TL-TR-DPC-3FC
8	3TL-BL-DPC-3FC

F089
ENUMERATION: 87PC SIGNAL SOURCE

1 = One Source Current, 2 = Two Sources Current

F090
ENUMERATION: LATCHING OUTPUT TYPE

0 = Operate-dominant, 1 = Reset-dominant

F091
ENUMERATION: VOLTAGE DIFFERENTIAL BANK GROUND TYPE

0 = Grounded, 1 = Ungrounded

F092
ENUMERATION: AUTOMATIC SETTING FUNCTION

0 = Disabled, 1 = Manual, 2 = Auto

F093
ENUMERATION: BANK OVERVOLTAGE GROUND TYPE

0 = Grounded, 1 = Ungrounded, 2 = Ungrounded without Vn

F094
ENUMERATION: BANK OVERVOLTAGE CURVE TYPE

0 = FlexCurve A, 1 = FlexCurve B, 2 = FlexCurve C,
3 = FlexCurve D

F095
ENUMERATION: REDUCED VOLTAGE START TRANSITION MODE

0 = Current Only, 1 = Current or Timer, 2 = Current and Timer

F096
ENUMERATION: THERMAL MODEL CURVE EFFECT

0 = Cutoff, 1 = Shift

F097
ENUMERATION: MOTOR ACCELERATION MODE

0 = Definite Time, 1 = Adaptive

F098
ENUMERATION: MOTOR STATUS

0 = Offline, 1 = Starting, 2 = Running, 3 = Overload

F099
ENUMERATION: MOTOR CURVES

0 = Motor, 1 = FlexCurve A, 2 = FlexCurve B,
3 = FlexCurve C, 4 = FlexCurve D, 5 = IEC

F100
ENUMERATION: VT CONNECTION TYPE

0 = Wye, 1 = Delta

F101
ENUMERATION: MESSAGE DISPLAY INTENSITY

0 = 25%, 1 = 50%, 2 = 75%, 3 = 100%

F102
ENUMERATION: DISABLED/ENABLED

0 = Disabled, 1 = Enabled

F103
ENUMERATION: CURVE SHAPES

Bitmask	Curve shape
0	IEEE Mod Inv
1	IEEE Very Inv
2	IEEE Ext Inv
3	IEC Curve A
4	IEC Curve B
5	IEC Curve C
6	IEC Short Inv
7	IAC Ext Inv

Bitmask	Curve shape
9	IAC Inverse
10	IAC Short Inv
11	I2t
12	Definite Time
13	FlexCurve A
14	FlexCurve B
15	FlexCurve C
16	FlexCurve D

Bitmask	Curve shape
8	IAC Very Inv

Bitmask	Curve shape

F104
ENUMERATION: RESET TYPE

0 = Instantaneous, 1 = Timed

F106
ENUMERATION: PHASE ROTATION

0 = ABC, 1 = ACB

F108
ENUMERATION: OFF/ON

0 = Off, 1 = On

F109
ENUMERATION: CONTACT OUTPUT OPERATION

0 = Self-reset, 1 = Latched, 2 = Disabled

F111
ENUMERATION: UNDERVOLTAGE CURVE SHAPES

0 = Definite Time, 1 = Inverse Time

F112
ENUMERATION: RS485 BAUD RATES

Bitmask	Value
0	300
1	1200
2	2400
3	4800

Bitmask	Value
4	9600
5	19200
6	38400
7	57600

Bitmask	Value
8	115200
9	14400
10	28800
11	33600

F113
ENUMERATION: PARITY

0 = None, 1 = Odd, 2 = Even

F114
ENUMERATION: IRIG-B SIGNAL TYPE

0 = None, 1 = DC Shift, 2 = Amplitude Modulated

F116
ENUMERATION: NEUTRAL OVERVOLTAGE CURVES

0 = Definite Time, 1 = FlexCurve A, 2 = FlexCurve B,
3 = FlexCurve C

F118
ENUMERATION: OSCILLOGRAPHY MODE

0 = Automatic Overwrite, 1 = Protected

F119
ENUMERATION: FLEXCURVE PICKUP RATIOS

Bitmask	Ratio
0	0.00
1	0.05
2	0.10
3	0.15
4	0.20
5	0.25
6	0.30
7	0.35
8	0.40

Bitmask	Ratio
9	0.45
10	0.48
...	...
25	0.78
...	...
100	10.50
...	...
118	19.50
119	20.00

F120
ENUMERATION: DISTANCE SHAPE

0 = Mho, 1 = Quad

Fixed at Mho in G60.

F122
ENUMERATION: ELEMENT INPUT SIGNAL TYPE

0 = Phasor, 1 = RMS

F123
ENUMERATION: CT SECONDARY

0 = 1 A, 1 = 5 A

F124
ENUMERATION: LIST OF ELEMENTS

Products	Bitmask	Element
All except B90, C30	0	Phase Instantaneous Overcurrent 1
"	1	Phase Instantaneous Overcurrent 2
B30, C60, C70, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	2	Phase Instantaneous Overcurrent 3
"	3	Phase Instantaneous Overcurrent 4
B30, C60, C70, D60, F35, F60, L90, M60, N60, T35, T60	4	Phase Instantaneous Overcurrent 5
"	5	Phase Instantaneous Overcurrent 6
B30, C60, C70, F35, F60, L90, M60, N60, T35, T60	6	Phase Instantaneous Overcurrent 7

Products	Bitmask	Element
"	7	Phase Instantaneous Overcurrent 8
B30, C70, F35, N60, T35, T60	8	Phase Instantaneous Overcurrent 9
"	9	Phase Instantaneous Overcurrent 10
"	10	Phase Instantaneous Overcurrent 11
"	11	Phase Instantaneous Overcurrent 12
B30	12	Phase Instantaneous Overcurrent 13
"	13	Phase Instantaneous Overcurrent 14
"	14	Phase Instantaneous Overcurrent 15
"	15	Phase Instantaneous Overcurrent 16
"	16	Phase Instantaneous Overcurrent 17
"	17	Phase Instantaneous Overcurrent 18
"	18	Phase Instantaneous Overcurrent 19
"	19	Phase Instantaneous Overcurrent 20
"	20	Phase Instantaneous Overcurrent 21
"	21	Phase Instantaneous Overcurrent 22
"	22	Phase Instantaneous Overcurrent 23
"	23	Phase Instantaneous Overcurrent 24
"	24	Phase Instantaneous Overcurrent 25
"	25	Phase Instantaneous Overcurrent 26
"	26	Phase Instantaneous Overcurrent 27
"	27	Phase Instantaneous Overcurrent 28
"	28	Phase Instantaneous Overcurrent 29
"	29	Phase Instantaneous Overcurrent 30
"	30	Phase Instantaneous Overcurrent 31
"	31	Phase Instantaneous Overcurrent 32
"	32	Phase Instantaneous Overcurrent 33
"	33	Phase Instantaneous Overcurrent 34
"	34	Phase Instantaneous Overcurrent 35
"	35	Phase Instantaneous Overcurrent 36
"	36	Phase Instantaneous Overcurrent 37
"	37	Phase Instantaneous Overcurrent 38
"	38	Phase Instantaneous Overcurrent 39
"	39	Phase Instantaneous Overcurrent 40
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	56	Phase Time Overcurrent 1
"	57	Phase Time Overcurrent 2
"	58	Phase Time Overcurrent 3
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T35, T60	59	Phase Time Overcurrent 4
B30, C60, C70, F35, F60, L90, M60, N60, T35, T60	60	Phase Time Overcurrent 5
"	61	Phase Time Overcurrent 6
B30	62	Phase Time Overcurrent 7

Products	Bitmask	Element
"	63	Phase Time Overcurrent 8
"	64	Phase Time Overcurrent 9
"	65	Phase Time Overcurrent 10
"	66	Phase Time Overcurrent 11
"	67	Phase Time Overcurrent 12
"	68	Phase Time Overcurrent 13
"	69	Phase Time Overcurrent 14
"	70	Phase Time Overcurrent 15
"	71	Phase Time Overcurrent 16
"	72	Phase Time Overcurrent 17
"	73	Phase Time Overcurrent 18
"	74	Phase Time Overcurrent 19
"	75	Phase Time Overcurrent 20
B30, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60	84	Phase Directional Overcurrent 1
B30, C70, D30, D60, F60, L30, L60, L90, M60, N60, T60	85	Phase Directional Overcurrent 2
N60, T60	86	Phase Directional Overcurrent 3
B30	87	Phase Directional Overcurrent 4
"	88	Phase Directional Overcurrent 5
"	89	Phase Directional Overcurrent 6
All except B90, C30, T35	112	Neutral Instantaneous Overcurrent 1
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, N60, T60	113	Neutral Instantaneous Overcurrent 2
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T60	114	Neutral Instantaneous Overcurrent 3
"	115	Neutral Instantaneous Overcurrent 4
B30, C60, C70, D60, F35, F60, L90, M60, N60, T60	116	Neutral Instantaneous Overcurrent 5
"	117	Neutral Instantaneous Overcurrent 6
C60, F35, F60, L90, M60, N60, T60	118	Neutral Instantaneous Overcurrent 7
"	119	Neutral Instantaneous Overcurrent 8
F35, N60, T60	120	Neutral Instantaneous Overcurrent 9
"	121	Neutral Instantaneous Overcurrent 10
"	122	Neutral Instantaneous Overcurrent 11
"	123	Neutral Instantaneous Overcurrent 12
B30	124	Neutral Instantaneous Overcurrent 13
"	125	Neutral Instantaneous Overcurrent 14

Products	Bitmask	Element
"	126	Neutral Instantaneous Overcurrent 15
"	127	Neutral Instantaneous Overcurrent 16
"	128	Neutral Instantaneous Overcurrent 17
"	129	Neutral Instantaneous Overcurrent 18
"	130	Neutral Instantaneous Overcurrent 19
"	131	Neutral Instantaneous Overcurrent 20
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60	140	Neutral Time Overcurrent 1
"	141	Neutral Time Overcurrent 2
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T60	142	Neutral Time Overcurrent 3
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T60	143	Neutral Time Overcurrent 4
B30, C60, C70, F35, F60, L90, M60, N60, T60	144	Neutral Time Overcurrent 5
"	145	Neutral Time Overcurrent 6
B30	146	Neutral Time Overcurrent 7
"	147	Neutral Time Overcurrent 8
"	148	Neutral Time Overcurrent 9
"	149	Neutral Time Overcurrent 10
"	150	Neutral Time Overcurrent 11
"	151	Neutral Time Overcurrent 12
"	152	Neutral Time Overcurrent 13
"	153	Neutral Time Overcurrent 14
"	154	Neutral Time Overcurrent 15
"	155	Neutral Time Overcurrent 16
"	156	Neutral Time Overcurrent 17
"	157	Neutral Time Overcurrent 18
"	158	Neutral Time Overcurrent 19
"	159	Neutral Time Overcurrent 20
C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60	168	Neutral Directional Overcurrent 1
D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60	169	Neutral Directional Overcurrent 2
N60, T60	170	Neutral Directional Overcurrent 3
B30		Neutral Directional Overcurrent 4
"		Neutral Directional Overcurrent 5
"		Neutral Directional Overcurrent 6

Products	Bitmask	Element
C70, D30, D60, F60, G30, G60, L60, L90, T60	172	Negative Sequence Directional Overcurrent 1
"	173	Negative Sequence Directional Overcurrent 2
T60	174	Negative Sequence Directional Overcurrent 3
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	176	Ground Instantaneous Overcurrent 1
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, N60, T35, T60	177	Ground Instantaneous Overcurrent 2
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, N60, T35, T60	178	Ground Instantaneous Overcurrent 3
"	179	Ground Instantaneous Overcurrent 4
B30, C60, C70, D60, F35, F60, L90, M60, N60, T35, T60	180	Ground Instantaneous Overcurrent 5
"	181	Ground Instantaneous Overcurrent 6
C60, C70, F35, L90, N60, T35, T60	182	Ground Instantaneous Overcurrent 7
"	183	Ground Instantaneous Overcurrent 8
C70, F35, N60, T35, T60	184	Ground Instantaneous Overcurrent 9
"	185	Ground Instantaneous Overcurrent 10
"	186	Ground Instantaneous Overcurrent 11
"	187	Ground Instantaneous Overcurrent 12
B30	188	Ground Instantaneous Overcurrent 13
"	189	Ground Instantaneous Overcurrent 14
"	190	Ground Instantaneous Overcurrent 15
"	191	Ground Instantaneous Overcurrent 16
"	192	Ground Instantaneous Overcurrent 17
"	193	Ground Instantaneous Overcurrent 18
"	194	Ground Instantaneous Overcurrent 19
"	195	Ground Instantaneous Overcurrent 20
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	204	Ground Time Overcurrent 1

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Products	Bitmask	Element
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, N60, T35, T60	205	Ground Time Overcurrent 2
B30, C60, C70, D60, F35, F60, L90, M60, N60, T35, T60	206	Ground Time Overcurrent 3
"	207	Ground Time Overcurrent 4
B30, C70, F35, N60, T35, T60	208	Ground Time Overcurrent 5
"	209	Ground Time Overcurrent 6
B30	210	Ground Time Overcurrent 7
"	211	Ground Time Overcurrent 8
"	212	Ground Time Overcurrent 9
"	213	Ground Time Overcurrent 10
"	214	Ground Time Overcurrent 11
"	215	Ground Time Overcurrent 12
"	216	Ground Time Overcurrent 13
"	217	Ground Time Overcurrent 14
"	218	Ground Time Overcurrent 15
"	219	Ground Time Overcurrent 16
"	220	Ground Time Overcurrent 17
"	221	Ground Time Overcurrent 18
"	222	Ground Time Overcurrent 19
"	223	Ground Time Overcurrent 20
F60, G30, G60, L90, T35, T60	232	Restricted Ground Fault 1
"	233	Restricted Ground Fault 2
"	234	Restricted Ground Fault 3
"	235	Restricted Ground Fault 4
T35, T60	236	Restricted Ground Fault 5
"	237	Restricted Ground Fault 6
C70, D30, D60, F35, F60, L30, L60, L90, T60	242	Negative Sequence Instantaneous Overcurrent 1
"	243	Negative Sequence Instantaneous Overcurrent 2
T60	244	Negative Sequence Instantaneous Overcurrent 3
D30, D60, G60, L90, T60	245	Fast Distance
G30, G60	247	Change Phase Rotation
N60	248	8-bit Comparator 1
"	249	8-bit Comparator 2
"	250	8-bit Comparator 3
"	251	8-bit Comparator 4
"	252	8-bit Comparator 5
"	253	8-bit Comparator 6
C70, D30, D60, F35, F60, L30, L60, L90, T60	258	Negative Sequence Time Overcurrent 1
"	259	Negative Sequence Time Overcurrent 2
T60	260	Negative Sequence Time Overcurrent 3
C70, D30, D60, F60, G30, G60, L30, L60, M60, T60	266	Negative Sequence Overvoltage 1
"	267	Negative Sequence Overvoltage 2
"	268	Negative Sequence Overvoltage 3
G30, G60	271	Generator Unbalance
F60	274	High Impedance Fault Detection (Hi-Z)
B30	279	Bus Zone 1
"	280	Bus Zone 2
"	281	Bus Zone 3
"	282	Bus Zone 4
"	283	Bus Zone 5
"	284	Bus Zone 6
D30, D60, F35, F60, L60, L90	285	Wattmetric 1
"	286	Wattmetric 2
F35	287	Wattmetric 3
"	288	Wattmetric 4
"	289	Wattmetric 5
All except B90, C30, T35	293	Phase Undervoltage 1
"	294	Phase Undervoltage 2
"	295	Phase Undervoltage 3
B30	296	Phase Undervoltage 4
"	297	Phase Undervoltage 5
"	298	Phase Undervoltage 6
All except B90, C30, N60, T35	299	Auxiliary Overvoltage 1
B30, C60, C70, D60, F35, F60, G30, G60, L90, M60, T60	300	Auxiliary Overvoltage 2
B30, C70, F35, T60	301	Auxiliary Overvoltage 3
B30	302	Auxiliary Overvoltage 4
"	303	Auxiliary Overvoltage 5
"	304	Auxiliary Overvoltage 6
All except B90, C30, T35	305	Phase Overvoltage 1
"	306	Phase Overvoltage 2
"	307	Phase Overvoltage 3
B30	308	Phase Overvoltage 4
"	309	Phase Overvoltage 5
"	310	Phase Overvoltage 6
D60, L60, L90	311	Compensated Overvoltage
All except B90, C30, N60, T35	312	Neutral Overvoltage 1

Products	Bitmask	Element
"	313	Neutral Overvoltage 2
"	314	Neutral Overvoltage 3
B30	315	Neutral Overvoltage 4
"	316	Neutral Overvoltage 5
"	317	Neutral Overvoltage 6
D30, D60, G60, L60, L90, T60	318	Phase Distance Zone 1
"	319	Phase Distance Zone 2
"	320	Phase Distance Zone 3
D30, D60, L90 T60	321	Phase Distance Zone 4
"	322	Phase Distance Zone 5
D30, D60, L60, L90	326	Line Pickup
D30, D60, L60, L90, T60	330	Ground Distance Zone 1
"	331	Ground Distance Zone 2
"	332	Ground Distance Zone 3
D30, D60, L90, T60	333	Ground Distance Zone 4
"	334	Ground Distance Zone 5
D30, D60, F60, L60, L90, T60	338	Load Encroachment
F60	340	POTT3
F60	341	DCB3
D60, L90	342	DUTT
D60, L90	343	PUTT
D60, L60, L90	344	POTT
D60, L90	345	Hybrid POTT
"	346	Block Scheme
D30, D60, G60, L60, L90, N60, T60	348	Power Swing Detect
G30, T35, T60	360	Transformer Hottest Spot
"	361	Transformer Aging Factor
"	362	Transformer Loss of Life
T35, T60	366	Transformer Instantaneous Differential
G30, T35, T60	367	Transformer Percent Differential
G30, G60, L90, T60	368	Volt per Hertz 1
"	369	Volt per Hertz 2
C60, D60, F60, G30, G60, L90, M60, N60, T60	372	Sensitive Directional Power 1
"	373	Sensitive Directional Power 2
G60	379	100% Stator Ground
G30, G60	380	Split Phase Protection
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60	382	SRC1 VT Fuse Failure
"	383	SRC2 VT Fuse Failure
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T60	384	SRC3 VT Fuse Failure
"	385	SRC4 VT Fuse Failure
B30, C70, F35, N60, T60	386	SRC5 VT Fuse Failure
"	387	SRC6 VT Fuse Failure
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	390	SRC1 50DD (Disturbance Detection)
"	391	SRC2 50DD (Disturbance Detection)
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	392	SRC3 50DD (Disturbance Detection)
"	393	SRC4 50DD (Disturbance Detection)
B30, C70, F35, N60, T35, T60	394	SRC5 50DD (Disturbance Detection)
"	395	SRC6 50DD (Disturbance Detection)
B30	396	SRC7 50DD (Disturbance Detection)
"	397	SRC8 50DD (Disturbance Detection)
"	398	SRC9 50DD (Disturbance Detection)
"	399	SRC10 50DD (Disturbance Detection)
"	400	SRC11 50DD (Disturbance Detection)
"	401	SRC12 50DD (Disturbance Detection)
"	402	SRC13 50DD (Disturbance Detection)
"	403	SRC14 50DD (Disturbance Detection)
"	404	SRC15 50DD (Disturbance Detection)
"	405	SRC16 50DD (Disturbance Detection)
"	406	SRC17 50DD (Disturbance Detection)
"	407	SRC18 50DD (Disturbance Detection)
"	408	SRC19 50DD (Disturbance Detection)
"	409	SRC20 50DD (Disturbance Detection)
"	410	SRC21 50DD (Disturbance Detection)
"	411	SRC22 50DD (Disturbance Detection)
"	412	SRC23 50DD (Disturbance Detection)
"	413	SRC24 50DD (Disturbance Detection)
"	414	SRC25 50DD (Disturbance Detection)
"	415	SRC26 50DD (Disturbance Detection)
"	416	SRC27 50DD (Disturbance Detection)
"	417	SRC28 50DD (Disturbance Detection)
"	418	SRC29 50DD (Disturbance Detection)
"	419	SRC30 50DD (Disturbance Detection)
L30, L90	420	87L Current Differential
"	421	87L Current Differential
C60, D60, L60, L90, N60	422	Open Pole Detector
L30, L90	424	50DD Disturbance Detector

Products	Bitmask	Element
L90	425	Continuous Monitor
B30	431	CT Trouble 1
"	432	CT Trouble 2
"	433	CT Trouble 3
"	434	CT Trouble 4
"	435	CT Trouble 5
"	436	CT Trouble 6
L30, L90	437	87L Trip (Current Differential Trip)
"	438	Stub Bus
M60	442	Reduced Voltage Start
"	443	Motor Thermal Model
"	444	Acceleration Time
G60, M60	448	Stator Differential
N60	449	Digitizer 1
"	450	Digitizer 2
"	451	Digitizer 3
"	452	Digitizer 4
"	453	Digitizer 5
D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	455	CT Fail 1
"	456	CT Fail 2
D60, F60, G30, G60, L60, L90, M60, N60, T35, T60	457	CT Fail 3
"	458	CT Fail 4
N60, T35, T60	459	CT Fail 5
"	460	CT Fail 6
B30, C60, C70, D60, F60, G60, L30, L60, L90, M60, T60	463	Breaker Failure 1
"	464	Breaker Failure 2
B30, C60, C70, D60, F60, L90, T60	465	Breaker Failure 3
B30, C60, D60, F60, L90, T60	466	Breaker Failure 4
B30, T60	467	Breaker Failure 5
"	468	Breaker Failure 6
B30	469	Breaker Failure 7
"	470	Breaker Failure 8
"	471	Breaker Failure 9
"	472	Breaker Failure 10
"	473	Breaker Failure 11
"	474	Breaker Failure 12
"	475	Breaker Failure 13
"	476	Breaker Failure 14
"	477	Breaker Failure 15
"	478	Breaker Failure 16
"	479	Breaker Failure 17
"	480	Breaker Failure 18
"	481	Breaker Failure 19
"	482	Breaker Failure 20
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60	493	Breaker Arcing Current 1
"	494	Breaker Arcing Current 2
B30, C60, C70, F35, F60, L90, T35, T60	495	Breaker Arcing Current 3
B30, C60, F35, F60, L90, T35, T60	496	Breaker Arcing Current 4
B30, F35, T35, T60	497	Breaker Arcing Current 5
"	498	Breaker Arcing Current 6
G30, G60	499	Accidental Energization
G30, G60	503	Loss Of Excitation
B30, D30, F35, F60, L30	507	Autoreclose 1
B30, F35, F60, L30	508	Autoreclose 2
"	509	Autoreclose 3
B30, F35, F60	510	Autoreclose 4
B30, F35	511	Autoreclose 5
"	512	Autoreclose 6
C60, D60, F60, G60, L30, L90, N60, T60	514	Phasor measurement unit one-shot
B30, C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60	515	Synchrocheck 1
"	516	Synchrocheck 2
"	517	Synchrocheck 3
"	518	Synchrocheck 4
B30, C60, D60, L90, N60, T60	519	Synchrocheck 5
"	520	Synchrocheck 6
C60, D60, L90	521	Synchrocheck 7
"	522	Synchrocheck 8
"	523	Synchrocheck 9
"	524	Synchrocheck 10
M60	527	Current unbalance 1
"	528	Current unbalance 2
G30, G60	533	Third harmonic neutral undervoltage
All	539	Setting Group
"	540	Reset
C70	543	Neutral voltage unbalance 1
"	544	Neutral voltage unbalance 2
"	545	Neutral voltage unbalance 3
C60, D60, F60, G30, G60, L90, M60, N60, T60	547	Overfrequency 1
"	548	Overfrequency 2

Products	Bitmask	Element
"	549	Overfrequency 3
"	550	Overfrequency 4
B30, D30, D60, F35, F60, G30, G60, L30, L90, M60, N60, T35, T60	551	Underfrequency 1
"	552	Underfrequency 2
"	553	Underfrequency 3
"	554	Underfrequency 4
"	555	Underfrequency 5
"	556	Underfrequency 6
B30	557	Underfrequency 7
"	558	Underfrequency 8
"	559	Underfrequency 9
"	560	Underfrequency 10
"	561	Underfrequency 11
"	562	Underfrequency 12
C60, D60, L60, L90	563	Trip Output
"	565	Phase Selector
C60, D60, L60, L90	566	Open Pole Detector
N60	567	Open Pole Detector (supervisory)
D60, L90	568	Directional Comparison Unblocking Scheme
D60, L90	569	DUTT Pilot Scheme
D60, L90	571	PUTT Pilot Scheme
L60	573	POTT Pilot Scheme
D60, L90	574	POTT1 Pilot Scheme
D60, L90	575	Hybrid POTT Pilot Scheme
D60, L90	576	Directional Comparison Blocking 1 Pilot Scheme
D60, L90	577	Directional Comparison Blocking Pilot Scheme
C60, D60, L60, L90	578	Autoreclose (single-pole / three-pole)
M60	580	Starts-per-hour
"	581	Time between starts
"	582	Restart delay
"	583	Mechanical jam
L60	585	87PC channel test
"	586	87PC phase comparison trip
"	587	87PC negative-sequence voltage fault detector
"	588	87PC negative-sequence current rate of change
"	589	87PC positive-sequence current rate of change
All except B90	591	Selector switch 1
"	592	Selector switch 2
All	593	Control pushbutton 1
"	594	Control pushbutton 2

Products	Bitmask	Element
"	595	Control pushbutton 3
"	596	Control pushbutton 4
"	597	Control pushbutton 5
"	598	Control pushbutton 6
"	599	Control pushbutton 7
All except B90	603	FlexElement 1
"	604	FlexElement 2
"	605	FlexElement 3
"	606	FlexElement 4
"	607	FlexElement 5
"	608	FlexElement 6
"	609	FlexElement 7
"	610	FlexElement 8
C70, F35, G30, G60, M60, N60, T35, T60	611	FlexElement 9
"	612	FlexElement 10
"	613	FlexElement 11
"	614	FlexElement 12
"	615	FlexElement 13
"	616	FlexElement 14
"	617	FlexElement 15
"	618	FlexElement 16
All	623	Non-volatile Latch 1
"	624	Non-volatile Latch 2
"	625	Non-volatile Latch 3
"	626	Non-volatile Latch 4
"	627	Non-volatile Latch 5
"	628	Non-volatile Latch 6
"	629	Non-volatile Latch 7
"	630	Non-volatile Latch 8
"	631	Non-volatile Latch 9
"	632	Non-volatile Latch 10
"	633	Non-volatile Latch 11
"	634	Non-volatile Latch 12
"	635	Non-volatile Latch 13
"	636	Non-volatile Latch 14
"	637	Non-volatile Latch 15
"	638	Non-volatile Latch 16
B90	643	Breaker Supervision 1
"	644	Breaker Supervision 2
"	645	Breaker Supervision 3
"	646	Breaker Supervision 4
"	647	Breaker Supervision 5
"	648	Breaker Supervision 6
"	649	Breaker Supervision 7
"	650	Breaker Supervision 8

Products	Bitmask	Element
"	651	Breaker Supervision 9
"	652	Breaker Supervision 10
"	653	Breaker Supervision 11
"	654	Breaker Supervision 12
"	655	Breaker Supervision 13
"	656	Breaker Supervision 14
"	657	Breaker Supervision 15
"	658	Breaker Supervision 16
"	659	Breaker Supervision 17
"	660	Breaker Supervision 18
"	661	Breaker Supervision 19
"	662	Breaker Supervision 20
"	663	Breaker Supervision 21
"	664	Breaker Supervision 22
"	665	Breaker Supervision 23
"	666	Breaker Supervision 24
B30, B90	675	End of Fault Protection 1
"	676	End of Fault Protection 2
"	677	End of Fault Protection 3
"	678	End of Fault Protection 4
"	679	End of Fault Protection 5
"	680	End of Fault Protection 6
"	681	End of Fault Protection 7
"	682	End of Fault Protection 8
"	683	End of Fault Protection 9
"	684	End of Fault Protection 10
"	685	End of Fault Protection 11
"	686	End of Fault Protection 12
"	687	End of Fault Protection 13
"	688	End of Fault Protection 14
"	689	End of Fault Protection 15
"	690	End of Fault Protection 16
"	691	End of Fault Protection 17
"	692	End of Fault Protection 18
"	693	End of Fault Protection 19
"	694	End of Fault Protection 20
B90	695	End of Fault Protection 21
"	696	End of Fault Protection 22
"	697	End of Fault Protection 23
"	698	End of Fault Protection 24
B90	703	Undervoltage 1
"	704	Undervoltage 2
"	705	Undervoltage 3
"	706	Undervoltage 4
"	707	Undervoltage 5
"	708	Undervoltage 6

Products	Bitmask	Element
"	709	Undervoltage 7
"	710	Undervoltage 8
"	711	Undervoltage 9
"	712	Undervoltage 10
"	713	Undervoltage 11
"	714	Undervoltage 12
B30, C60, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60	715	Auxiliary Undervoltage 1
"	716	Auxiliary Undervoltage 2
"	717	Auxiliary Undervoltage 3
B30	718	Auxiliary Undervoltage 4
"	719	Auxiliary Undervoltage 5
"	720	Auxiliary Undervoltage 6
"	721	Bus 1
"	722	Bus 2
"	723	Bus 3
"	724	Bus 4
"	725	Bus 5
"	726	Bus 6
"	727	CT Trouble1
"	728	CT Trouble2
"	729	CT Trouble3
"	730	CT Trouble4
"	731	CT Trouble5
"	732	CT Trouble6
D30, D60, F60, G30, G60, L30, L90, N60, T60	733	Frequency Rate of Change 1
"	734	Frequency Rate of Change 2
D60, F60, G30, G60, L90, N60, T60	735	Frequency Rate of Change 3
"	736	Frequency Rate of Change 4
C30, F35, N60	739	8-bit Switch 1
"	740	8-bit Switch 2
"	741	8-bit Switch 3
"	742	8-bit Switch 4
"	743	8-bit Switch 5
"	744	8-bit Switch 6
All except B90	747	Digital Counter 1
"	748	Digital Counter 2
"	749	Digital Counter 3
"	750	Digital Counter 4
"	751	Digital Counter 5
"	752	Digital Counter 6
"	753	Digital Counter 7
"	754	Digital Counter 8

Products	Bitmask	Element
B30, B90	763	Isolator 1
"	764	Isolator 2
"	765	Isolator 3
"	766	Isolator 4
"	767	Isolator 5
"	768	Isolator 6
"	769	Isolator 7
"	770	Isolator 8
"	771	Isolator 9
"	772	Isolator 10
"	773	Isolator 11
"	774	Isolator 12
"	775	Isolator 13
"	776	Isolator 14
"	777	Isolator 15
"	778	Isolator 16
"	779	Isolator 17
"	780	Isolator 18
"	781	Isolator 19
"	782	Isolator 20
"	783	Isolator 21
"	784	Isolator 22
"	785	Isolator 23
"	786	Isolator 24
"	787	Isolator 25
"	788	Isolator 26
"	789	Isolator 27
"	790	Isolator 28
"	791	Isolator 29
"	792	Isolator 30
"	793	Isolator 31
"	794	Isolator 32
"	795	Isolator 33
"	796	Isolator 34
"	797	Isolator 35
"	798	Isolator 36
"	799	Isolator 37
"	800	Isolator 38
"	801	Isolator 39
"	802	Isolator 40
"	803	Isolator 41
"	804	Isolator 42
"	805	Isolator 43
"	806	Isolator 44
"	807	Isolator 45
"	808	Isolator 46
"	809	Isolator 47
"	810	Isolator 48
B30	811	Isolator 49
"	812	Isolator 50
"	813	Isolator 51
"	814	Isolator 52
"	815	Isolator 53
"	816	Isolator 54
"	817	Isolator 55
"	818	Isolator 56
"	819	Isolator 57
"	820	Isolator 58
"	821	Isolator 59
"	822	Isolator 60
"	823	Isolator 61
"	824	Isolator 62
"	825	Isolator 63
"	826	Isolator 64
"	827	Isolator 65
"	828	Isolator 66
"	829	Isolator 67
"	830	Isolator 68
"	831	Isolator 69
"	832	Isolator 70
"	833	Isolator 71
"	834	Isolator 72
B90	835	Breaker Fail 1
"	836	Breaker Fail 2
"	837	Breaker Fail 3
"	838	Breaker Fail 4
"	839	Breaker Fail 5
"	840	Breaker Fail 6
"	841	Breaker Fail 7
"	842	Breaker Fail 8
"	843	Breaker Fail 9
"	844	Breaker Fail 10
"	845	Breaker Fail 11
"	846	Breaker Fail 12
"	847	Breaker Fail 13
"	848	Breaker Fail 14
"	849	Breaker Fail 15
"	850	Breaker Fail 16
"	851	Breaker Fail 17
"	852	Breaker Fail 18
"	853	Breaker Fail 19
"	854	Breaker Fail 20

Products	Bitmask	Element
"	855	Breaker Fail 21
"	856	Breaker Fail 22
"	857	Breaker Fail 23
"	858	Breaker Fail 24
"	859	IOC 1
"	860	IOC 2
"	861	IOC 3
"	862	IOC 4
"	863	IOC 5
"	864	IOC 6
"	865	IOC 7
"	866	IOC 8
"	867	IOC 9
"	868	IOC 10
"	869	IOC 11
"	870	IOC 12
"	871	IOC 13
"	872	IOC 14
"	873	IOC 15
"	874	IOC 16
"	875	IOC 17
"	876	IOC 18
"	877	IOC 19
"	878	IOC 20
"	879	IOC 21
"	880	IOC 22
"	881	IOC 23
"	882	IOC 24
"	883	TOC 1
"	884	TOC 2
"	885	TOC 3
"	886	TOC 4
"	887	TOC 5
"	888	TOC 6
"	889	TOC 7
"	890	TOC 8
"	891	TOC 9
"	892	TOC 10
"	893	TOC 11
"	894	TOC 12
"	895	TOC 13
"	896	TOC 14
"	897	TOC 15
"	898	TOC 16
"	899	TOC 17
"	900	TOC 18

Products	Bitmask	Element
"	901	TOC 19
"	902	TOC 20
"	903	TOC 21
"	904	TOC 22
"	905	TOC 23
"	906	TOC 24
All	907	Digital Element 1
"	908	Digital Element 2
"	909	Digital Element 3
"	910	Digital Element 4
"	911	Digital Element 5
"	912	Digital Element 6
"	913	Digital Element 7
"	914	Digital Element 8
"	915	Digital Element 9
"	916	Digital Element 10
"	917	Digital Element 11
"	918	Digital Element 12
"	919	Digital Element 13
"	920	Digital Element 14
"	921	Digital Element 15
"	922	Digital Element 16
"	923	Digital Element 17
"	924	Digital Element 18
"	925	Digital Element 19
"	926	Digital Element 20
"	927	Digital Element 21
"	928	Digital Element 22
"	929	Digital Element 23
"	930	Digital Element 24
"	931	Digital Element 25
"	932	Digital Element 26
"	933	Digital Element 27
"	934	Digital Element 28
"	935	Digital Element 29
"	936	Digital Element 30
"	937	Digital Element 31
"	938	Digital Element 32
"	939	Digital Element 33
"	940	Digital Element 34
"	941	Digital Element 35
"	942	Digital Element 36
"	943	Digital Element 37
"	944	Digital Element 38
"	945	Digital Element 39
"	946	Digital Element 40

Products	Bitmask	Element
"	947	Digital Element 41
"	948	Digital Element 42
"	949	Digital Element 43
"	950	Digital Element 44
"	951	Digital Element 45
"	952	Digital Element 46
"	953	Digital Element 47
"	954	Digital Element 48
"	955	Digital Element 49
"	956	Digital Element 50
"	957	Digital Element 51
"	958	Digital Element 52
"	959	Digital Element 53
"	960	Digital Element 54
"	961	Digital Element 55
"	962	Digital Element 56
"	963	Digital Element 57
"	964	Digital Element 58
"	965	Digital Element 59
"	966	Digital Element 60
"	967	Digital Element 61
"	968	Digital Element 62
"	969	Digital Element 63
"	970	Digital Element 64
"	971	Digital Element 65
"	972	Digital Element 66
"	973	Digital Element 67
"	974	Digital Element 68
"	975	Digital Element 69
"	976	Digital Element 70
"	977	Digital Element 71
"	978	Digital Element 72
"	979	Digital Element 73
"	980	Digital Element 74
"	981	Digital Element 75
"	982	Digital Element 76
"	983	Digital Element 77
"	984	Digital Element 78
"	985	Digital Element 79
"	986	Digital Element 80
"	987	Digital Element 81
"	988	Digital Element 82
"	989	Digital Element 83
"	990	Digital Element 84
"	991	Digital Element 85
"	992	Digital Element 86
"	993	Digital Element 87
"	994	Digital Element 88
"	995	Digital Element 89
"	996	Digital Element 90
"	997	Digital Element 91
"	998	Digital Element 92
"	999	Digital Element 93
"	1000	Digital Element 94
"	1001	Digital Element 95
"	1002	Digital Element 96
C60, D60, F60, G60, L30, L90, N60, T60	1003	Phasor Measurement Unit 1 Frequency
C60, N60	1004	Phasor Measurement Unit 2 Frequency
N60	1005	Phasor Measurement Unit 3 Frequency
"	1006	Phasor Measurement Unit 4 Frequency
"	1007	Phasor Measurement Unit 5 Frequency
"	1008	Phasor Measurement Unit 6 Frequency
C60, D60, F60, G60, L30, L90, N60, T60	1009	Phasor Measurement Unit 1 Voltage
C60, N60	1010	Phasor Measurement Unit 2 Voltage
N60	1011	Phasor Measurement Unit 3 Voltage
"	1012	Phasor Measurement Unit 4 Voltage
"	1013	Phasor Measurement Unit 5 Voltage
"	1014	Phasor Measurement Unit 6 Voltage
C60, D60, F60, G60, L30, L90, N60, T60	1015	Phasor Measurement Unit 1 Current
C60, N60	1016	Phasor Measurement Unit 2 Current
N60	1017	Phasor Measurement Unit 3 Current
"	1018	Phasor Measurement Unit 4 Current
"	1019	Phasor Measurement Unit 5 Current
"	1020	Phasor Measurement Unit 6 Current
C60, D60, F60, G60, L30, L90, N60, T60	1021	Phasor Measurement Unit 1 Power
C60, N60	1022	Phasor Measurement Unit 2 Power
N60	1023	Phasor Measurement Unit 3 Power
"	1024	Phasor Measurement Unit 4 Power
"	1025	Phasor Measurement Unit 5 Power
"	1026	Phasor Measurement Unit 6 Power
C60, D60, F60, G60, L30, L90, N60, T60	1027	PMU 1 Rate of Change of Frequency
C60, N60	1028	PMU 2 Rate of Change of Frequency
N60	1029	PMU 3 Rate of Change of Frequency
"	1030	PMU 4 Rate of Change of Frequency
"	1031	PMU 5 Rate of Change of Frequency

Products	Bitmask	Element
"	1032	PMU 6 Rate of Change of Frequency
"	1037	Summator 1
"	1038	Summator 2
"	1039	Summator 3
"	1040	Summator 4
"	1041	Summator 5
"	1042	Summator 6
C70	1044	Time of day timer 1
"	1045	Time of day timer 2
"	1046	Time of day timer 3
"	1047	Time of day timer 4
"	1048	Time of day timer 5
"	1050	Automatic voltage regulator 1
"	1051	Automatic voltage regulator 2
"	1052	Automatic voltage regulator 3
"	1053	Phase current unbalance 1
"	1054	Phase current unbalance 2
"	1055	Phase current unbalance 3
"	1056	Phase current unbalance 1 continued
"	1057	Phase current unbalance 2 continued
"	1058	Phase current unbalance 3 continued
"	1066	Voltage differential 1
"	1067	Voltage differential 2
"	1068	Voltage differential 3
"	1069	Voltage differential 1 continued
"	1070	Voltage differential 2 continued
"	1071	Voltage differential 3 continued
"	1076	Capacitor control 1
"	1077	Capacitor control 2
"	1078	Capacitor control 3
"	1083	Neutral current unbalance 1
"	1084	Neutral current unbalance 2
"	1085	Neutral current unbalance 3
C60, D60, F60, G60, L30, L90, N60, T60	1086	Phasor Measurement Unit 1
C60, N60	1087	Phasor Measurement Unit 2
N60	1088	Phasor Measurement Unit 3
"	1089	Phasor Measurement Unit 4
"	1090	Phasor Measurement Unit 5
"	1091	Phasor Measurement Unit 6
C70	1093	Bank phase overvoltage 1 phase A
"	1094	Bank phase overvoltage 1 phase B
"	1095	Bank phase overvoltage 1 phase C
"	1096	Bank phase overvoltage 2 phase A

Products	Bitmask	Element
"	1097	Bank phase overvoltage 2 phase B
"	1098	Bank phase overvoltage 2 phase C
M60	1103	Underpower 1
"	1104	Underpower 2
All	1105	Trip Bus 1
"	1106	Trip Bus 2
"	1107	Trip Bus 3
"	1108	Trip Bus 4
"	1109	Trip Bus 5
"	1110	Trip Bus 6
M60	1111	Undercurrent
All except B90	1112	RTD Input 1
"	1113	RTD Input 2
"	1114	RTD Input 3
"	1115	RTD Input 4
"	1116	RTD Input 5
"	1117	RTD Input 6
"	1118	RTD Input 7
"	1119	RTD Input 8
"	1120	RTD Input 9
"	1121	RTD Input 10
"	1122	RTD Input 11
"	1123	RTD Input 12
"	1124	RTD Input 13
"	1125	RTD Input 14
"	1126	RTD Input 15
"	1127	RTD Input 16
"	1128	RTD Input 17
"	1129	RTD Input 18
"	1130	RTD Input 19
"	1131	RTD Input 20
"	1132	RTD Input 21
"	1133	RTD Input 22
"	1134	RTD Input 23
"	1135	RTD Input 24
"	1136	RTD Input 25
"	1137	RTD Input 26
"	1138	RTD Input 27
"	1139	RTD Input 28
"	1140	RTD Input 29
"	1141	RTD Input 30
"	1142	RTD Input 31
"	1143	RTD Input 32
"	1144	RTD Input 33
"	1145	RTD Input 34
"	1146	RTD Input 35

Products	Bitmask	Element
"	1147	RTD Input 36
"	1148	RTD Input 37
"	1149	RTD Input 38
"	1150	RTD Input 39
"	1151	RTD Input 40
"	1152	RTD Input 41
"	1153	RTD Input 42
"	1154	RTD Input 43
"	1155	RTD Input 44
"	1156	RTD Input 45
"	1157	RTD Input 46
"	1158	RTD Input 47
"	1159	RTD Input 48
G30, G60	1179	Frequency out-of-band accumulation 1
"	1180	Frequency out-of-band accumulation 2
All except B90	1183	Disconnect switch 1
"	1184	Disconnect switch 2
"	1185	Disconnect switch 3
"	1186	Disconnect switch 4
"	1187	Disconnect switch 5
"	1188	Disconnect switch 6
"	1189	Disconnect switch 7
"	1190	Disconnect switch 8
B30, C60, C70, D60, F35, F60, L90, N60, T35, T60	1191	Disconnect switch 9
"	1192	Disconnect switch 10
"	1193	Disconnect switch 11
"	1194	Disconnect switch 12
B30, C60, D60, F35, F60, L90, N60, T35, T60	1195	Disconnect switch 13
"	1196	Disconnect switch 14
"	1197	Disconnect switch 15
"	1198	Disconnect switch 16
B30, C60, F35, L90, N60, T35, T60	1199	Disconnect switch 17
"	1200	Disconnect switch 18
"	1201	Disconnect switch 19
"	1202	Disconnect switch 20
"	1203	Disconnect switch 21
"	1204	Disconnect switch 22
"	1205	Disconnect switch 23
"	1206	Disconnect switch 24
All except B90	1231	Breaker 1
"	1232	Breaker 2
B30, C30, C60, C70, D60, F35, F60, L90, N60, T35, T60	1233	Breaker 3
B30, C30, C60, D60, F35, F60, L90, N60, T35, T60	1234	Breaker 4
B30, C30, C60, F35, N60, T35, T60	1235	Breaker 5
"	1236	Breaker 6
N60	1237	Breaker 1
"	1238	Breaker 2
"	1239	Breaker 3
"	1240	Breaker 4
"	1241	Breaker 5
"	1242	Breaker 6
	1243	Breaker 1
	1244	Breaker 2
	1245	Breaker 3
	1246	Breaker 4
	1247	Breaker 5
	1248	Breaker 6
L60	1252	87PC I_2
"	1253	87PC I_1
G60, M60, T60	1254	Remote RTD Input 1
"	1255	Remote RTD Input 2
"	1256	Remote RTD Input 3
"	1257	Remote RTD Input 4
"	1258	Remote RTD Input 5
"	1259	Remote RTD Input 6
"	1260	Remote RTD Input 7
"	1261	Remote RTD Input 8
"	1262	Remote RTD Input 9
"	1263	Remote RTD Input 10
"	1264	Remote RTD Input 11
"	1265	Remote RTD Input 12
L30, L90	1266	87L Diff
M60	1267	Broken Rotor Bar
C30, F35	1268	PID 1
"	1269	PID 2
"	1270	PID 3
"	1271	PID 4
G60	1272	Sh Stat Ground
"	1273	Field Ground
"	1274	Field Current
All except B90, C30, M60	1275	Thermal overload protection 1
"	1276	Thermal overload protection 2

Products	Bitmask	Element
D30, D60, F35, F60, L30, L60, L90	1277	Broken conductor detection 1
"	1278	Broken conductor detection 2
F35	1279	Broken conductor detection 3
"	1280	Broken conductor detection 4
"	1281	Broken conductor detection 5
"	1282	Broken conductor detection 6
G30, T35, T60	1283	Transformer percent differential
F35, F60	1284	Cold load pickup 1
"	1285	Cold load pickup 2
F35	1286	Cold load pickup 3
"	1287	Cold load pickup 4
"	1288	Cold load pickup 5
"	1289	Cold load pickup 6
B30, C60, C70, D60, F35, F60, G60, L60, L90, M60, T60	1290	Breaker restrike 1
"	1291	Breaker restrike 2
B30, C60, C70, F35, F60, T60	1292	Breaker restrike 3
B30 C60 C70 D60 F35 F60 G60 L60 L90 M60 T60	1296	Breaker flashover 1
B30 C60 D60 F35 F60 G60 L60 L90 M60 T60	1297	Breaker flashover 2
D30, F35, F60, L30	1302	Incipient cable fault detector 1
F35, F60	1303	Incipient cable fault detector 2
F35	1304	Incipient cable fault detector 3
"	1305	Incipient cable fault detector 4
"	1306	Incipient cable fault detector 5
"	1307	Incipient cable fault detector 6
B30	1308	Breaker 1
"	1309	Breaker 2
"	1310	Breaker 3
"	1311	Breaker 4
"	1312	Breaker 5
"	1313	Breaker 6
"	1314	Breaker 7
"	1315	Breaker 8
"	1316	Breaker 9
"	1317	Breaker 10
"	1318	Breaker 11
"	1319	Breaker 12
"	1320	Breaker 13
"	1321	Breaker 14
"	1322	Breaker 15
"	1323	Breaker 16
"	1324	Breaker 17
"	1325	Breaker 18
"	1326	Breaker 19
"	1327	Breaker 20
"	1328	Breaker 21
"	1329	Breaker 22
"	1330	Breaker 23
"	1331	Breaker 24
"	1332	Breaker 25
"	1333	Breaker 26
"	1334	Breaker 27
"	1335	Breaker 28
"	1336	Bay 1
"	1337	Bay 2
"	1338	Bay 3
"	1339	Bay 4
"	1340	Bay 5
"	1341	Bay 6
"	1342	Bay 7
"	1343	Bay 8
"	1344	Bay 9
"	1345	Bay 10
"	1346	Bay 11
"	1347	Bay 12
"	1348	Bay 13
"	1349	Bay 14
"	1350	Bay 15
"	1351	Bay 16
"	1352	Bay 17
"	1353	Bay 18
"	1354	Bay 19
"	1355	Bay 20
All	1364	User-Programmable Pushbutton 1
"	1365	User-Programmable Pushbutton 2
"	1366	User-Programmable Pushbutton 3
"	1367	User-Programmable Pushbutton 4
"	1368	User-Programmable Pushbutton 5
"	1369	User-Programmable Pushbutton 6
"	1370	User-Programmable Pushbutton 7
"	1371	User-Programmable Pushbutton 8
"	1372	User-Programmable Pushbutton 9
"	1373	User-Programmable Pushbutton 10
"	1374	User-Programmable Pushbutton 11
"	1375	User-Programmable Pushbutton 12
"	1376	User-Programmable Pushbutton 13
"	1377	User-Programmable Pushbutton 14
"	1378	User-Programmable Pushbutton 15

Products	Bitmask	Element
"	1379	User-Programmable Pushbutton 16
B30	1380	User-Programmable Pushbutton 17
"	1381	User-Programmable Pushbutton 18
"	1382	User-Programmable Pushbutton 19
"	1383	User-Programmable Pushbutton 20
"	1384	User-Programmable Pushbutton 21
"	1385	User-Programmable Pushbutton 22
"	1386	User-Programmable Pushbutton 23
"	1387	User-Programmable Pushbutton 24
"	1388	User-Programmable Pushbutton 25
"	1389	User-Programmable Pushbutton 26
"	1390	User-Programmable Pushbutton 27
"	1391	User-Programmable Pushbutton 28
"	1392	User-Programmable Pushbutton 29
"	1393	User-Programmable Pushbutton 30
"	1394	User-Programmable Pushbutton 31
"	1395	User-Programmable Pushbutton 32
"	1396	User-Programmable Pushbutton 33
"	1397	User-Programmable Pushbutton 34
"	1398	User-Programmable Pushbutton 35
"	1399	User-Programmable Pushbutton 36
"	1400	User-Programmable Pushbutton 37
"	1401	User-Programmable Pushbutton 38
"	1402	User-Programmable Pushbutton 39
"	1403	User-Programmable Pushbutton 40
"	1404	User-Programmable Pushbutton 41
"	1405	User-Programmable Pushbutton 42
"	1406	User-Programmable Pushbutton 43
"	1407	User-Programmable Pushbutton 44
"	1408	User-Programmable Pushbutton 45
"	1409	User-Programmable Pushbutton 46
"	1410	User-Programmable Pushbutton 47
"	1411	User-Programmable Pushbutton 48

F126
ENUMERATION: NO/YES CHOICE

0 = No, 1 = Yes

F127
ENUMERATION: LATCHED OR SELF-RESETTING

0 = Latched, 1 = Self-Reset

F128
ENUMERATION: CONTACT INPUT THRESHOLD

0 = 17 V DC, 1 = 33 V DC, 2 = 84 V DC, 3 = 166 V DC

F129
ENUMERATION: FLEXLOGIC TIMER TYPE

0 = millisecond, 1 = second, 2 = minute

F131
ENUMERATION: FORCED CONTACT OUTPUT STATE

0 = Normal, 1 = Energized, 2 = De-energized, 3 = Freeze

F132
ENUMERATION: DEMAND INTERVAL

0 = 5 MIN, 1 = 10 MIN, 2 = 15 MIN, 3 = 20 MIN, 4 = 30 MIN, 5 = 60 MIN

F133
ENUMERATION: PROGRAM STATE

0 = Not Programmed, 1 = Programmed

F134
ENUMERATION: PASS/FAIL

0 = Fail, 1 = OK, 2 = n/a

F137
ENUMERATION: USER-PROGRAMMABLE PUSHBUTTON FUNCTION

0 = Disabled, 1 = Self-Reset, 2 = Latched

F139
ENUMERATION: DEMAND CALCULATIONS

0 = Thermal Exponential, 1 = Block Interval, 2 = Rolling Demand

F141
ENUMERATION: SELF TEST ERRORS

Products	Bitmask	Error
All	0	Any Self Tests
"	1	IRIG-B Failure
"	2	Port 1 Offline
"	3	Port 2 Offline
"	4	Port 3 Offline
"	5	Port 4 Offline
"	6	Port 5 Offline
"	7	Port 6 Offline
"	8	RRTD Communications Failure
"	9	Voltage Monitor
"	10	FlexLogic Error Token
"	11	Equipment Mismatch

Products	Bitmask	Error
"	12	Process Bus Failure
"	13	Unit Not Programmed
"	14	System Exception
"	15	Latching Output Discrepancy
"	17	Maintenance Alert 01
"	18	SNTP Failure
"	19	Maintenance Alert
"	20	Maintenance Alert
"	21	Maintenance Alert
"	22	Temperature Monitor
All except B90, L60	23	Process Bus Trouble
All except B90, L60	24	Brick Trouble
All	25	Field RTD Trouble
"	26	Field TDR Trouble
"	27	RxGOOSE Offline
"	28	Direct Device Offline
"	29	Maintenance Alert
"	30	Any Minor Error
"	31	Any Major Error
"	33	Maintenance Alert
All except B90, C30, L60	49	Maintenance Alert
"	50	Maintenance Alert
"	51	Maintenance Alert
"	52	Maintenance Alert
"	53	Maintenance Alert
"	54	Maintenance Alert
"	55	Maintenance Alert
"	56	Maintenance Alert
All	64	Maintenance Alert
"	65	IEC 61850 Data Set
"	66	Aggregator Error
"	67	Unit Not Calibrated
"	68	Settings Save Error
"	69	SRAM Data Error
"	70	Program Memory
"	71	Watchdog Error
"	72	Low on Memory
"	73	Prototype Firmware
"	74	Module Failure 01
"	75	Module Failure 02
"	76	Module Failure 03
"	77	Module Failure 04
"	78	Module Failure 05
"	79	Module Failure 06
"	80	Module Failure 07
"	81	Module Failure 08

Products	Bitmask	Error
"	82	Module Failure 09
"	83	Incompatible H/W
"	84	Module Failure 10
"	85	Module Failure 11
"	86	Module Failure 12
"	87	High ENET Traffic
"	89	Relay Restart
"	90	FGM Failure
"	91	FGM Failure
"	92	FGM Failure
"	93	FGM Failure
"	94	FGM Failure
"	95	FGM Error
"	96	Maintenance Alert
"	97	PHY Monitor
"	98	Storage Media Alarm
"	99	Wrong Transceiver
"	100	Power Supply Warning
"	101	RAM Filesystem Fail
"	102	Backup CID Imported
"	103	Defaulted to ICD
"	104	TO Install Settings
"	107	Maintenance Alert
"	108	Diagnostics Alarm
"	109	System Failure
"	110	Diagnostic Alarm Cop
"	111	Diagnostic Alarm
"	112	System Failure
"	113	Diagnostics Failure
"	114	Maintenance Alert
"	123	Maintenance Alert
"	124	Maintenance Alert
"	125	Maintenance Alert
"	126	Maintenance Alert
"	127	Maintenance Alert
"	128	Maintenance Alert
"	129	Maintenance Alert
"	130	Maintenance Alert
"	131	Maintenance Alert
"	132	Process Bus Module Setting Error
"	133	Maintenance Alert
"	134	Maintenance Alert
"	135	Maintenance Alert
All except B90, C30, L60	136	SV 1 Stream Trouble
"	137	SV 2 Stream Trouble

Products	Bitmask	Error
"	138	SV 3 Stream Trouble
"	139	SV 4 Stream Trouble
"	140	SV 5 Stream Trouble
"	141	SV 6 Stream Trouble
"	142	SV 7 Stream Trouble
"	143	SV 8 Stream Trouble
B30	144	SV 9 Stream Trouble
"	145	SV 10 Stream Trouble
"	146	SV 11 Stream Trouble
"	147	SV 12 Stream Trouble
"	148	SV 13 Stream Trouble
"	149	SV 14 Stream Trouble
"	150	SV 15 Stream Trouble
"	151	SV 16 Stream Trouble

F143
UR_UINT32: 32 BIT ERROR CODE (F141 specifies bit number)

A bit value of 0 = no error, 1 = error

F144
ENUMERATION: FORCED CONTACT INPUT STATE

0 = Normal, 1 = Open, 2 = Closed

F146
ENUMERATION: MISCELLANEOUS EVENT CAUSES

Products	Bitmask	Definition
All	0	Events Cleared
"	1	Oscillography Triggered
"	2	Date/time Changed
"	3	Default Settings Loaded
"	4	Test Mode Forcing On
"	5	Test Mode Forcing Off
"	6	Power On
"	7	Power Off
"	8	Relay In Service
"	9	Relay Out of Service
"	10	Watchdog Reset
"	11	Oscillography Clear
"	12	Reboot Command
"	13	LED Test Initiated
"	14	Flash Programming
"	15	Fault Report Trigger
"	16	User-Programmable Fault Report Trigger
"	17	---
"	18	Reload CT/VT module (DSP) Settings
"	19	---
"	20	Ethernet Port 1 Offline
"	21	Ethernet Port 2 Offline
"	22	Ethernet Port 3 Offline
"	23	Ethernet Port 4 Offline
"	24	Ethernet Port 5 Offline
"	25	Ethernet Port 6 Offline
"	26	Test-Blocked Mode
"	27	Test Mode
"	28	Test Mode Disabled
"	29	Temperature Warning On
"	30	Temperature Warning Off
"	31	Unauthorized Access
"	32	System Integrity Recovery
"	33	System Integrity Recovery 06
"	34	System Integrity Recovery 07
N60	35	Slot B Module
"	36	Slot D Module
"	37	Slot F Module
"	38	Slot G Module
"	39	Slot H Module
"	40	Slot J Module
"	41	Slot K Module
"	42	Slot L Module
"	43	Slot M Module
"	44	Slot N Module
"	45	Slot P Module
"	46	Slot R Module
"	47	Slot S Module
"	48	Slot T Module
"	49	Slot U Module
"	50	Slot V Module
"	51	Slot W Module
"	52	Slot X Module
All	53	CID Imported
"	54	Backup CID Imported
"	55	ICD Applied
"	56	SYS INTEGR RECOV 08
C60 D60 F60 G60 L30 L90 N60 T60	57	PMU 1 Record Triggered
C60 N60	58	PMU 2 Record Triggered
N60	59	PMU 3 Record Triggered
"	60	PMU 4 Record Triggered
"	61	PMU 5 Record Triggered
"	62	PMU 6 Record Triggered

2

F147
ENUMERATION: LINE LENGTH UNITS

0 = km, 1 = miles

F148
ENUMERATION: FAULT TYPE

Bitmask	Fault type
0	NA
1	AG
2	BG
3	CG
4	AB
5	BC

Bitmask	Fault type
6	AC
7	ABG
8	BCG
9	ACG
10	ABC
11	ABCG

F150
ENUMERATION: 87PC PHASE COMPARISON SCHEME SIGNAL SELECTION

0 = MIXED I_2 - K*I_1
1 = 3I_0
2 = MIXED I_1 + I_2/K

F151
ENUMERATION: RTD SELECTION

Bitmask	RTD#
0	NONE
1	RTD 1
2	RTD 2
3	RTD 3
4	RTD 4
5	RTD 5
6	RTD 6
7	RTD 7
8	RTD 8
9	RTD 9
10	RTD 10
11	RTD 11
12	RTD 12
13	RTD 13
14	RTD 14
15	RTD 15
16	RTD 16

Bitmask	RTD#
17	RTD 17
18	RTD 18
19	RTD 19
20	RTD 20
21	RTD 21
22	RTD 22
23	RTD 23
24	RTD 24
25	RTD 25
26	RTD 26
27	RTD 27
28	RTD 28
29	RTD 29
30	RTD 30
31	RTD 31
32	RTD 32

Bitmask	RTD#
33	RTD 33
34	RTD 34
35	RTD 35
36	RTD 36
37	RTD 37
38	RTD 38
39	RTD 39
40	RTD 40
41	RTD 41
42	RTD 42
43	RTD 43
44	RTD 44
45	RTD 45
46	RTD 46
47	RTD 47
48	RTD 48

F152
ENUMERATION: SETTING GROUP

0 = Active Group, 1 = Group 1, 2 = Group 2, 3 = Group 3
4 = Group 4, 5 = Group 5, 6 = Group 6

F153
ENUMERATION: DISTANCE TRANSFORMER CONNECTION

Bitmask	Type
0	None
1	Dy1
2	Dy3
3	Dy5
4	Dy7

Bitmask	Type
5	Dy9
6	Dy11
7	Yd1
8	Yd3
9	Yd5

Bitmask	Type
10	Yd7
11	Yd9
12	Yd11

F154
ENUMERATION: DISTANCE DIRECTION

0 = Forward, 1 = Reverse, 2 = Non-Directional

F155
ENUMERATION: REMOTE DEVICE STATE

0 = Offline, 1 = Online

F157
ENUMERATION: BREAKER MODE

0 = 3-Pole, 1 = 1-Pole

F160
ENUMERATION: TRANSFORMER PHASE COMPENSATION

0 = Internal (software), 1 = External (with CTs)

F161
ENUMERATION: TRANSFORMER RATED WINDING TEMPERATURE RISE

0 = 55°C (oil), 1 = 65°C (oil), 2 = 80°C (dry), 3 = 115°C (dry),
4 = 150°C (dry)

F162
ENUMERATION: TRANSFORMER TYPE OF COOLING

0 = OA, 1 = FA, 2 = Non-directed FOA/FOW,
3 = Directed FOA/FOW, 4 = Sealed Self Cooled,
5 = Vented Self Cooled, 6 = Forced Cooled

F163
ENUMERATION: TRANSFORMER WINDING CONNECTION

0 = Wye, 1 = Delta, 2 = Zig-zag

F164
ENUMERATION: TRANSFORMER WINDING GROUNDING

0 = Not within zone, 1 = Within zone

F166
ENUMERATION: AUXILIARY VT CONNECTION TYPE

0 = Vn, 1 = Vag, 2 = Vbg, 3 = Vcg, 4 = Vab, 5 = Vbc, 6 = Vca

F167
ENUMERATION: SIGNAL SOURCE

0 = SRC 1, 1 = SRC 2, 2 = SRC 3, 3 = SRC 4, 4 = SRC 5, 5 = SRC 6

F168
ENUMERATION: INRUSH INHIBIT FUNCTION

0 = Disabled, 1 = Adapt. 2nd, 2 = Trad. 2nd

F169
ENUMERATION: OVEREXCITATION INHIBIT FUNCTION

0 = Disabled, 1 = 5th

F172
ENUMERATION: SLOT LETTERS

Bitmask	Slot	Bitmask	Slot	Bitmask	Slot	Bitmask	Slot
0	F	4	K	8	P	12	U
1	G	5	L	9	R	13	V
2	H	6	M	10	S	14	W
3	J	7	N	11	T	15	X

F173
ENUMERATION: DCmA INPUT/OUTPUT RANGE

Bitmask	DCmA input/output range
0	0 to –1 mA
1	0 to 1 mA
2	–1 to 1 mA
3	0 to 5 mA
4	0 to 10 mA
5	0 to 20 mA
6	4 to 20 mA

F174
ENUMERATION: TRANSDUCER RTD INPUT TYPE

0 = 100 Ohm Platinum, 1 = 120 Ohm Nickel,
2 = 100 Ohm Nickel, 3 = 10 Ohm Copper

F176
ENUMERATION: SYNCHROCHECK DEAD SOURCE SELECT

Bitmask	Synchrocheck dead source
0	None
1	LV1 and DV2
2	DV1 and LV2
3	DV1 or DV2
4	DV1 Xor DV2
5	DV1 and DV2

F177
ENUMERATION: COMMUNICATION PORT

0 = None, 1 = COM1 - RS485 (not applicable to UR firmware 7.00),
2 = COM2 - RS485, 3 = Front Panel - RS232, 4 = Network - TCP,
5 = Network - UDP

F179
ENUMERATION: NEGATIVE SEQUENCE DIRECTIONAL OVERCURRENT TYPE

0 = Neg Sequence, 1 = Zero Sequence

F183
ENUMERATION: AC INPUT WAVEFORMS

Bitmask	Definition
0	Off
1	8 samples/cycle
2	16 samples/cycle
3	32 samples/cycle
4	64 samples/cycle

F186
ENUMERATION: MEASUREMENT MODE

0 = Phase to Ground, 1 = Phase to Phase

F187
ENUMERATION: HI-Z STATES

Bitmask	Hi-Z state
0	Normal
1	Coordination Timeout
2	Armed
5	Arcing
9	Downed Conductor

F188
ENUMERATION: HI-Z CAPTURE TRIGGER TYPES

Bitmask	Trigger type
0	None
1	Loss Of Load
2	Arc Suspected
3	Arcing
4	Overcurrent
5	Down Conductor
6	External

F189
ENUMERATION: INRUSH INHIBIT MODE

0 = Per Phase, 1 = 2-out-of-3, 2 = Average, 3 = 1-out-of-3

F190
ENUMERATION: SIMULATED KEYPRESS

Bitmask	Keypress
0	No key — use between real keys
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	0
11	Decimal Point
12	Plus/Minus
13	Value Up
14	Value Down
15	Message Up
16	Message Down
17	Message Left
18	Message Right
19	Menu
20	Help
21	Escape
22	Enter
23	Reset
24	User 1
25	User 2
26	User 3
27	User-programmable key 1
28	User-programmable key 2
29	User-programmable key 3
30	User-programmable key 4
31	User-programmable key 5
32	User-programmable key 6
33	User-programmable key 7
34	User-programmable key 8
35	User-programmable key 9
36	User-programmable key 10
37	User-programmable key 11
38	User-programmable key 12
39	User 4
40	User 5
41	User 6
42	User 7
43	User-programmable key 13
44	User-programmable key 14
45	User-programmable key 15
46	User-programmable key 16

F192
ENUMERATION: ETHERNET OPERATION MODE

0 = Half-Duplex, 1 = Full-Duplex

F193
ENUMERATION: ACCIDENTAL ENERGIZATION ARMING MODE

0 = UV AND OFFLINE, 1 = UV OR OFFLINE

F195
ENUMERATION: SINGLE POLE TRIP MODE

0 = Disabled, 1 = 3 Pole Only, 2 = 3 Pole & 1 Pole

F196
ENUMERATION: NEUTRAL DIRECTIONAL OVERCURRENT OPERATING CURRENT

0 = Calculated 3I0, 1 = Measured IG

F198
ENUMERATION: PILOT SCHEME COMMUNICATION BITS

0 = 1, 1 = 2, 2 = 4

F199
ENUMERATION: DISABLED/ENABLED/CUSTOM

0 = Disabled, 1 = Enabled, 2 = Custom

F200
TEXT40: 40-CHARACTER ASCII TEXT

20 registers, 16 Bits: 1st Char MSB, 2nd Char LSB

F202
TEXT20: 20-CHARACTER ASCII TEXT

10 registers, 16 Bits: 1st Char MSB, 2nd Char LSB

F203
TEXT16: 16-CHARACTER ASCII TEXT

F204
TEXT80: 80-CHARACTER ASCII TEXT

F205
TEXT12: 12-CHARACTER ASCII TEXT

F206
TEXT6: 6-CHARACTER ASCII TEXT

Unsigned 48-bit integer (three registers) numerical data. For every 16-bit register (two characters), the most-significant byte represents the first character, and the least-significant byte represents the second character.

F207
TEXT4: 4-CHARACTER ASCII TEXT

F208
TEXT2: 2-CHARACTER ASCII TEXT

F209
TEXT65: 65-CHARACTER ASCII TEXT

F210
ENUMERATION: DIRECTION ENUMERATION

0 = IN, 1 = OUT

F211
ENUMERATION: SOURCE SELECTION

0 = None, 1 = SRC 1, 2 = SRC 2, 3 = SRC 3, 4 = SRC 4, 5 = SRC 5, 6 = SRC 6

F214
TEXT64: 64-CHARACTER ASCII TEXT

F220
ENUMERATION: PUSHBUTTON MESSAGE PRIORITY

Value	Priority
0	Disabled
1	Normal
2	High Priority

F223
ENUMERATION: DIAGNOSTIC TEST

0 = NO TEST, 1 = RUN TEST, 2 = END TEST

F224
ENUMERATION: RATE TREND FOR FREQ RATE OF CHANGE

0 = Increasing, 1 = Decreasing, 2 = Bidirectional

F225
ENUMERATION: SPLIT PHASE PROTECTION MODE

0 = Over, 1 = Over-Under

F229
ENUMERATION: SETTINGS CONTROL CHANGE METHOD

Value	Method
0	None
1	Keypad
2	Front port
3	COM1 (not used)
4	COM2 (RS485)
5	Ethernet

F230
ENUMERATION: DIRECTIONAL POLARIZING

0 = Voltage, 1 = Current, 2 = Dual, 3 = Dual-V, 4 = Dual-I

F231
ENUMERATION: POLARIZING VOLTAGE

0 = Calculated V0, 1 = Measured VX

F232
ENUMERATION: CONFIGURABLE GOOSE Tx DATASET ITEMS

Value	IEC 61850 GOOSE Tx dataset item
0	None
1	GGIO1.ST.Ind1.q
2	GGIO1.ST.Ind1.stVal
3	GGIO1.ST.Ind2.q
4	GGIO1.ST.Ind2.stVal
↓	↓
255	GGIO1.ST.Ind128.q
256	GGIO1.ST.Ind128.stVal
257	MMXU1.MX.TotW.mag.f
258	MMXU1.MX.TotVAr.mag.f
259	MMXU1.MX.TotVA.mag.f
260	MMXU1.MX.TotPF.mag.f
261	MMXU1.MX.Hz.mag.f
262	MMXU1.MX.PPV.phsAB.cVal.mag.f
263	MMXU1.MX.PPV.phsAB.cVal.ang.f

Value	IEC 61850 GOOSE Tx dataset item
264	MMXU1.MX.PPV.phsBC.cVal.mag.f
265	MMXU1.MX.PPV.phsBC.cVal.ang.f
266	MMXU1.MX.PPV.phsCA.cVal.mag.f
267	MMXU1.MX.PPV.phsCA.cVal.ang.f
268	MMXU1.MX.PhV.phsA.cVal.mag.f
269	MMXU1.MX.PhV.phsA.cVal.ang.f
270	MMXU1.MX.PhV.phsB.cVal.mag.f
271	MMXU1.MX.PhV.phsB.cVal.ang.f
272	MMXU1.MX.PhV.phsC.cVal.mag.f
273	MMXU1.MX.PhV.phsC.cVal.ang.f
274	MMXU1.MX.A.phsA.cVal.mag.f
275	MMXU1.MX.A.phsA.cVal.ang.f
276	MMXU1.MX.A.phsB.cVal.mag.f
277	MMXU1.MX.A.phsB.cVal.ang.f
278	MMXU1.MX.A.phsC.cVal.mag.f
279	MMXU1.MX.A.phsC.cVal.ang.f
280	MMXU1.MX.A.neut.cVal.mag.f
281	MMXU1.MX.A.neut.cVal.ang.f
282	MMXU1.MX.W.phsA.cVal.mag.f
283	MMXU1.MX.W.phsB.cVal.mag.f
284	MMXU1.MX.W.phsC.cVal.mag.f
285	MMXU1.MX.VAr.phsA.cVal.mag.f
286	MMXU1.MX.VAr.phsB.cVal.mag.f
287	MMXU1.MX.VAr.phsC.cVal.mag.f
288	MMXU1.MX.VA.phsA.cVal.mag.f
289	MMXU1.MX.VA.phsB.cVal.mag.f
290	MMXU1.MX.VA.phsC.cVal.mag.f
291	MMXU1.MX.PF.phsA.cVal.mag.f
292	MMXU1.MX.PF.phsB.cVal.mag.f
293	MMXU1.MX.PF.phsC.cVal.mag.f
294	MMXU2.MX.TotW.mag.f
295	MMXU2.MX.TotVAr.mag.f
296	MMXU2.MX.TotVA.mag.f
297	MMXU2.MX.TotPF.mag.f
298	MMXU2.MX.Hz.mag.f
299	MMXU2.MX.PPV.phsAB.cVal.mag.f
300	MMXU2.MX.PPV.phsAB.cVal.ang.f
301	MMXU2.MX.PPV.phsBC.cVal.mag.f
302	MMXU2.MX.PPV.phsBC.cVal.ang.f
303	MMXU2.MX.PPV.phsCA.cVal.mag.f
304	MMXU2.MX.PPV.phsCA.cVal.ang.f
305	MMXU2.MX.PhV.phsA.cVal.mag.f
306	MMXU2.MX.PhV.phsA.cVal.ang.f
307	MMXU2.MX.PhV.phsB.cVal.mag.f
308	MMXU2.MX.PhV.phsB.cVal.ang.f
309	MMXU2.MX.PhV.phsC.cVal.mag.f

Value	IEC 61850 GOOSE Tx dataset item
310	MMXU2.MX.PhV.phsC.cVal.ang.f
311	MMXU2.MX.A.phsA.cVal.mag.f
312	MMXU2.MX.A.phsA.cVal.ang.f
313	MMXU2.MX.A.phsB.cVal.mag.f
314	MMXU2.MX.A.phsB.cVal.ang.f
315	MMXU2.MX.A.phsC.cVal.mag.f
316	MMXU2.MX.A.phsC.cVal.ang.f
317	MMXU2.MX.A.neut.cVal.mag.f
318	MMXU2.MX.A.neut.cVal.ang.f
319	MMXU2.MX.W.phsA.cVal.mag.f
320	MMXU2.MX.W.phsB.cVal.mag.f
321	MMXU2.MX.W.phsC.cVal.mag.f
322	MMXU2.MX.VAr.phsA.cVal.mag.f
323	MMXU2.MX.VAr.phsB.cVal.mag.f
324	MMXU2.MX.VAr.phsC.cVal.mag.f
325	MMXU2.MX.VA.phsA.cVal.mag.f
326	MMXU2.MX.VA.phsB.cVal.mag.f
327	MMXU2.MX.VA.phsC.cVal.mag.f
328	MMXU2.MX.PF.phsA.cVal.mag.f
329	MMXU2.MX.PF.phsB.cVal.mag.f
330	MMXU2.MX.PF.phsC.cVal.mag.f
331	MMXU3.MX.TotW.mag.f
332	MMXU3.MX.TotVAr.mag.f
333	MMXU3.MX.TotVA.mag.f
334	MMXU3.MX.TotPF.mag.f
335	MMXU3.MX.Hz.mag.f
336	MMXU3.MX.PPV.phsAB.cVal.mag.f
337	MMXU3.MX.PPV.phsAB.cVal.ang.f
338	MMXU3.MX.PPV.phsBC.cVal.mag.f
339	MMXU3.MX.PPV.phsBC.cVal.ang.f
340	MMXU3.MX.PPV.phsCA.cVal.mag.f
341	MMXU3.MX.PPV.phsCA.cVal.ang.f
342	MMXU3.MX.PhV.phsA.cVal.mag.f
343	MMXU3.MX.PhV.phsA.cVal.ang.f
344	MMXU3.MX.PhV.phsB.cVal.mag.f
345	MMXU3.MX.PhV.phsB.cVal.ang.f
346	MMXU3.MX.PhV.phsC.cVal.mag.f
347	MMXU3.MX.PhV.phsC.cVal.ang.f
348	MMXU3.MX.A.phsA.cVal.mag.f
349	MMXU3.MX.A.phsA.cVal.ang.f
350	MMXU3.MX.A.phsB.cVal.mag.f
351	MMXU3.MX.A.phsB.cVal.ang.f
352	MMXU3.MX.A.phsC.cVal.mag.f
353	MMXU3.MX.A.phsC.cVal.ang.f
354	MMXU3.MX.A.neut.cVal.mag.f
355	MMXU3.MX.A.neut.cVal.ang.f

Value	IEC 61850 GOOSE Tx dataset item
356	MMXU3.MX.W.phsA.cVal.mag.f
357	MMXU3.MX.W.phsB.cVal.mag.f
358	MMXU3.MX.W.phsC.cVal.mag.f
359	MMXU3.MX.VAr.phsA.cVal.mag.f
360	MMXU3.MX.VAr.phsB.cVal.mag.f
361	MMXU3.MX.VAr.phsC.cVal.mag.f
362	MMXU3.MX.VA.phsA.cVal.mag.f
363	MMXU3.MX.VA.phsB.cVal.mag.f
364	MMXU3.MX.VA.phsC.cVal.mag.f
365	MMXU3.MX.PF.phsA.cVal.mag.f
366	MMXU3.MX.PF.phsB.cVal.mag.f
367	MMXU3.MX.PF.phsC.cVal.mag.f
368	MMXU4.MX.TotW.mag.f
369	MMXU4.MX.TotVAr.mag.f
370	MMXU4.MX.TotVA.mag.f
371	MMXU4.MX.TotPF.mag.f
372	MMXU4.MX.Hz.mag.f
373	MMXU4.MX.PPV.phsAB.cVal.mag.f
374	MMXU4.MX.PPV.phsAB.cVal.ang.f
375	MMXU4.MX.PPV.phsBC.cVal.mag.f
376	MMXU4.MX.PPV.phsBC.cVal.ang.f
377	MMXU4.MX.PPV.phsCA.cVal.mag.f
378	MMXU4.MX.PPV.phsCA.cVal.ang.f
379	MMXU4.MX.PhV.phsA.cVal.mag.f
380	MMXU4.MX.PhV.phsA.cVal.ang.f
381	MMXU4.MX.PhV.phsB.cVal.mag.f
382	MMXU4.MX.PhV.phsB.cVal.ang.f
383	MMXU4.MX.PhV.phsC.cVal.mag.f
384	MMXU4.MX.PhV.phsC.cVal.ang.f
385	MMXU4.MX.A.phsA.cVal.mag.f
386	MMXU4.MX.A.phsA.cVal.ang.f
387	MMXU4.MX.A.phsB.cVal.mag.f
388	MMXU4.MX.A.phsB.cVal.ang.f
389	MMXU4.MX.A.phsC.cVal.mag.f
390	MMXU4.MX.A.phsC.cVal.ang.f
391	MMXU4.MX.A.neut.cVal.mag.f
392	MMXU4.MX.A.neut.cVal.ang.f
393	MMXU4.MX.W.phsA.cVal.mag.f
394	MMXU4.MX.W.phsB.cVal.mag.f
395	MMXU4.MX.W.phsC.cVal.mag.f
396	MMXU4.MX.VAr.phsA.cVal.mag.f
397	MMXU4.MX.VAr.phsB.cVal.mag.f
398	MMXU4.MX.VAr.phsC.cVal.mag.f
399	MMXU4.MX.VA.phsA.cVal.mag.f
400	MMXU4.MX.VA.phsB.cVal.mag.f
401	MMXU4.MX.VA.phsC.cVal.mag.f

Value	IEC 61850 GOOSE Tx dataset item
402	MMXU4.MX.PF.phsA.cVal.mag.f
403	MMXU4.MX.PF.phsB.cVal.mag.f
404	MMXU4.MX.PF.phsC.cVal.mag.f
405	MMXU5.MX.TotW.mag.f
406	MMXU5.MX.TotVAr.mag.f
407	MMXU5.MX.TotVA.mag.f
408	MMXU5.MX.TotPF.mag.f
409	MMXU5.MX.Hz.mag.f
410	MMXU5.MX.PPV.phsAB.cVal.mag.f
411	MMXU5.MX.PPV.phsAB.cVal.ang.f
412	MMXU5.MX.PPV.phsBC.cVal.mag.f
413	MMXU5.MX.PPV.phsBC.cVal.ang.f
414	MMXU5.MX.PPV.phsCA.cVal.mag.f
415	MMXU5.MX.PPV.phsCA.cVal.ang.f
416	MMXU5.MX.PhV.phsA.cVal.mag.f
417	MMXU5.MX.PhV.phsA.cVal.ang.f
418	MMXU5.MX.PhV.phsB.cVal.mag.f
419	MMXU5.MX.PhV.phsB.cVal.ang.f
420	MMXU5.MX.PhV.phsC.cVal.mag.f
421	MMXU5.MX.PhV.phsC.cVal.ang.f
422	MMXU5.MX.A.phsA.cVal.mag.f
423	MMXU5.MX.A.phsA.cVal.ang.f
424	MMXU5.MX.A.phsB.cVal.mag.f
425	MMXU5.MX.A.phsB.cVal.ang.f
426	MMXU5.MX.A.phsC.cVal.mag.f
427	MMXU5.MX.A.phsC.cVal.ang.f
428	MMXU5.MX.A.neut.cVal.mag.f
429	MMXU5.MX.A.neut.cVal.ang.f
430	MMXU5.MX.W.phsA.cVal.mag.f
431	MMXU5.MX.W.phsB.cVal.mag.f
432	MMXU5.MX.W.phsC.cVal.mag.f
433	MMXU5.MX.VAr.phsA.cVal.mag.f
434	MMXU5.MX.VAr.phsB.cVal.mag.f
435	MMXU5.MX.VAr.phsC.cVal.mag.f
436	MMXU5.MX.VA.phsA.cVal.mag.f
437	MMXU5.MX.VA.phsB.cVal.mag.f
438	MMXU5.MX.VA.phsC.cVal.mag.f
439	MMXU5.MX.PF.phsA.cVal.mag.f
440	MMXU5.MX.PF.phsB.cVal.mag.f
441	MMXU5.MX.PF.phsC.cVal.mag.f
442	MMXU6.MX.TotW.mag.f
443	MMXU6.MX.TotVAr.mag.f
444	MMXU6.MX.TotVA.mag.f
445	MMXU6.MX.TotPF.mag.f
446	MMXU6.MX.Hz.mag.f
447	MMXU6.MX.PPV.phsAB.cVal.mag.f

Value	IEC 61850 GOOSE Tx dataset item
448	MMXU6.MX.PPV.phsAB.cVal.ang.f
449	MMXU6.MX.PPV.phsBC.cVal.mag.f
450	MMXU6.MX.PPV.phsBC.cVal.ang.f
451	MMXU6.MX.PPV.phsCA.cVal.mag.f
452	MMXU6.MX.PPV.phsCA.cVal.ang.f
453	MMXU6.MX.PhV.phsA.cVal.mag.f
454	MMXU6.MX.PhV.phsA.cVal.ang.f
455	MMXU6.MX.PhV.phsB.cVal.mag.f
456	MMXU6.MX.PhV.phsB.cVal.ang.f
457	MMXU6.MX.PhV.phsC.cVal.mag.f
458	MMXU6.MX.PhV.phsC.cVal.ang.f
459	MMXU6.MX.A.phsA.cVal.mag.f
460	MMXU6.MX.A.phsA.cVal.ang.f
461	MMXU6.MX.A.phsB.cVal.mag.f
462	MMXU6.MX.A.phsB.cVal.ang.f
463	MMXU6.MX.A.phsC.cVal.mag.f
464	MMXU6.MX.A.phsC.cVal.ang.f
465	MMXU6.MX.A.neut.cVal.mag.f
466	MMXU6.MX.A.neut.cVal.ang.f
467	MMXU6.MX.W.phsA.cVal.mag.f
468	MMXU6.MX.W.phsB.cVal.mag.f
469	MMXU6.MX.W.phsC.cVal.mag.f
470	MMXU6.MX.VAr.phsA.cVal.mag.f
471	MMXU6.MX.VAr.phsB.cVal.mag.f
472	MMXU6.MX.VAr.phsC.cVal.mag.f
473	MMXU6.MX.VA.phsA.cVal.mag.f
474	MMXU6.MX.VA.phsB.cVal.mag.f
475	MMXU6.MX.VA.phsC.cVal.mag.f
476	MMXU6.MX.PF.phsA.cVal.mag.f
477	MMXU6.MX.PF.phsB.cVal.mag.f
478	MMXU6.MX.PF.phsC.cVal.mag.f
479	GGIO4.MX.AnIn1.mag.f
480	GGIO4.MX.AnIn2.mag.f
481	GGIO4.MX.AnIn3.mag.f
482	GGIO4.MX.AnIn4.mag.f
483	GGIO4.MX.AnIn5.mag.f
484	GGIO4.MX.AnIn6.mag.f
485	GGIO4.MX.AnIn7.mag.f
486	GGIO4.MX.AnIn8.mag.f
487	GGIO4.MX.AnIn9.mag.f
488	GGIO4.MX.AnIn10.mag.f
489	GGIO4.MX.AnIn11.mag.f
490	GGIO4.MX.AnIn12.mag.f
491	GGIO4.MX.AnIn13.mag.f
492	GGIO4.MX.AnIn14.mag.f
493	GGIO4.MX.AnIn15.mag.f

Value	IEC 61850 GOOSE Tx dataset item
494	GGIO4.MX.AnIn16.mag.f
495	GGIO4.MX.AnIn17.mag.f
496	GGIO4.MX.AnIn18.mag.f
497	GGIO4.MX.AnIn19.mag.f
498	GGIO4.MX.AnIn20.mag.f
499	GGIO4.MX.AnIn21.mag.f
500	GGIO4.MX.AnIn22.mag.f
501	GGIO4.MX.AnIn23.mag.f
502	GGIO4.MX.AnIn24.mag.f
503	GGIO4.MX.AnIn25.mag.f
504	GGIO4.MX.AnIn26.mag.f
505	GGIO4.MX.AnIn27.mag.f
506	GGIO4.MX.AnIn28.mag.f
507	GGIO4.MX.AnIn29.mag.f
508	GGIO4.MX.AnIn30.mag.f
509	GGIO4.MX.AnIn31.mag.f
510	GGIO4.MX.AnIn32.mag.f
511	GGIO5.ST.UIntIn1.q
512	GGIO5.ST.UIntIn1.stVal
513	GGIO5.ST.UIntIn2.q
514	GGIO5.ST.UIntIn2.stVal
515	GGIO5.ST.UIntIn3.q
516	GGIO5.ST.UIntIn3.stVal
517	GGIO5.ST.UIntIn4.q
518	GGIO5.ST.UIntIn4.stVal
519	GGIO5.ST.UIntIn5.q
520	GGIO5.ST.UIntIn5.stVal
521	GGIO5.ST.UIntIn6.q
522	GGIO5.ST.UIntIn6.stVal
523	GGIO5.ST.UIntIn7.q
524	GGIO5.ST.UIntIn7.stVal
525	GGIO5.ST.UIntIn8.q
526	GGIO5.ST.UIntIn8.stVal
527	GGIO5.ST.UIntIn9.q
528	GGIO5.ST.UIntIn9.stVal
529	GGIO5.ST.UIntIn10.q
530	GGIO5.ST.UIntIn10.stVal
531	GGIO5.ST.UIntIn11.q
532	GGIO5.ST.UIntIn11.stVal
533	GGIO5.ST.UIntIn12.q
534	GGIO5.ST.UIntIn12.stVal
535	GGIO5.ST.UIntIn13.q
536	GGIO5.ST.UIntIn13.stVal
537	GGIO5.ST.UIntIn14.q
538	GGIO5.ST.UIntIn14.stVal
539	GGIO5.ST.UIntIn15.q

Value	IEC 61850 GOOSE Tx dataset item
540	GGIO5.ST.UIntIn15.stVal
541	GGIO5.ST.UIntIn16.q
542	GGIO5.ST.UIntIn16.stVal

F233
ENUMERATION: CONFIGURABLE GOOSE Rx DATASET ITEMS

Value	IEC 61850 GOOSE Rx dataset item
0	None
1	GGIO3.ST.Ind1.q
2	GGIO3.ST.Ind1.stVal
3	GGIO3.ST.Ind2.q
4	GGIO3.ST.Ind2.stVal
↓	↓
127	GGIO3.ST.Ind64q
128	GGIO3.ST.Ind64.stVal
129	GGIO3.MX.AnIn1.mag.f
130	GGIO3.MX.AnIn2.mag.f
131	GGIO3.MX.AnIn3.mag.f
132	GGIO3.MX.AnIn4.mag.f
133	GGIO3.MX.AnIn5.mag.f
134	GGIO3.MX.AnIn6.mag.f
135	GGIO3.MX.AnIn7.mag.f
136	GGIO3.MX.AnIn8.mag.f
137	GGIO3.MX.AnIn9.mag.f
138	GGIO3.MX.AnIn10.mag.f
139	GGIO3.MX.AnIn11.mag.f
140	GGIO3.MX.AnIn12.mag.f
141	GGIO3.MX.AnIn13.mag.f
142	GGIO3.MX.AnIn14.mag.f
143	GGIO3.MX.AnIn15.mag.f
144	GGIO3.MX.AnIn16.mag.f
145	GGIO3.MX.AnIn17.mag.f
146	GGIO3.MX.AnIn18.mag.f
147	GGIO3.MX.AnIn19.mag.f
148	GGIO3.MX.AnIn20.mag.f
149	GGIO3.MX.AnIn21.mag.f
150	GGIO3.MX.AnIn22.mag.f
151	GGIO3.MX.AnIn23.mag.f
152	GGIO3.MX.AnIn24.mag.f
153	GGIO3.MX.AnIn25.mag.f
154	GGIO3.MX.AnIn26.mag.f
155	GGIO3.MX.AnIn27.mag.f
156	GGIO3.MX.AnIn28.mag.f
157	GGIO3.MX.AnIn29.mag.f
158	GGIO3.MX.AnIn30.mag.f
159	GGIO3.MX.AnIn31.mag.f
160	GGIO3.MX.AnIn32.mag.f
161	GGIO3.ST.IndPos1.stVal
162	GGIO3.ST.IndPos2.stVal
163	GGIO3.ST.IndPos3.stVal
164	GGIO3.ST.IndPos4.stVal
165	GGIO3.ST.IndPos5.stVal
166	GGIO3.ST.UIntIn1.q
167	GGIO3.ST.UIntIn1.stVal
168	GGIO3.ST.UIntIn2.q
169	GGIO3.ST.UIntIn2.stVal
170	GGIO3.ST.UIntIn3.q
171	GGIO3.ST.UIntIn3.stVal
172	GGIO3.ST.UIntIn4.q
173	GGIO3.ST.UIntIn4.stVal
174	GGIO3.ST.UIntIn5.q
175	GGIO3.ST.UIntIn5.stVal
176	GGIO3.ST.UIntIn6.q
177	GGIO3.ST.UIntIn6.stVal
178	GGIO3.ST.UIntIn7.q
179	GGIO3.ST.UIntIn7.stVal
180	GGIO3.ST.UIntIn8.q
181	GGIO3.ST.UIntIn8.stVal
182	GGIO3.ST.UIntIn9.q
183	GGIO3.ST.UIntIn9.stVal
184	GGIO3.ST.UIntIn10.q
185	GGIO3.ST.UIntIn10.stVal
186	GGIO3.ST.UIntIn11.q
187	GGIO3.ST.UIntIn11.stVal
188	GGIO3.ST.UIntIn12.q
189	GGIO3.ST.UIntIn12.stVal
190	GGIO3.ST.UIntIn13.q
191	GGIO3.ST.UIntIn13.stVal
192	GGIO3.ST.UIntIn14.q
193	GGIO3.ST.UIntIn14.stVal
194	GGIO3.ST.UIntIn15.q
195	GGIO3.ST.UIntIn15.stVal
196	GGIO3.ST.UIntIn16.q
197	GGIO3.ST.UIntIn16.stVal

F234
ENUMERATION: WATTMETRIC GROUND FAULT VOLTAGE

Value	Voltage
0	Calculated VN
1	Measured VX

2

F235
ENUMERATION: WATTMETRIC GROUND FAULT CURRENT

Value	Current
0	Calculated IN
1	Measured IG

F236
ENUMERATION: WATTMETRIC GROUND FAULT CURVE

Value	Description
0	Definite Time
1	Inverse
2	FlexCurve A
3	FlexCurve B
4	FlexCurve C
5	FlexCurve D

F237
ENUMERATION: REAL TIME CLOCK MONTH (FOR EXAMPLE, DAYLIGHT SAVINGS TIME)

Value	Month
0	January
1	February
2	March
3	April
4	May
5	June
6	July
7	August
8	September
9	October
10	November
11	December

F238
ENUMERATION: REAL TIME CLOCK DAY (FOR EXAMPLE, DAYLIGHT SAVINGS TIME)

Value	Day
0	Sunday
1	Monday
2	Tuesday
3	Wednesday
4	Thursday
5	Friday
6	Saturday

F239
ENUMERATION: REAL TIME CLOCK DAYLIGHT SAVINGS TIME START DAY INSTANCE

Value	Instance
0	First
1	Second
2	Third
3	Fourth
4	Last

F240
ENUMERATION: V/HZ CURVES

Value	Description
0	Definite Time
1	Inverse A
2	Inverse B
3	Inverse C
4	FlexCurve A
5	FlexCurve B
6	FlexCurve C
7	FlexCurve D

F241
ENUMERATION: NEUTRAL VOLTAGE UNBALANCE BUS 3V0

0 = Calculated, 1 = Measured

F243
ENUMERATION: FIELD UNIT TYPE

0 = CC-05, 1 = CV-05, 2 = CC-01, 3 = CV-01

F244
ENUMERATION: FIELD UNIT PROCESS CARD PORT

0 = H4a, 1 = H4b 2 = H3a, 3 = H3b, 4 = H2a, 5 = H2b, 6 = H1a, 7 = H1b

F245
ENUMERATION: TEST MODE FUNCTION

Value	Instance
0	Disabled
1	Test-Blocked
2	Test

F246
ENUMERATION: BRICK TRANSDUCER RANGE

Value	Description
0	-5...5V
1	-1...1mA
2	0...1mA
3	0...-1mA
4	0...5mA
5	0...10mA
6	0...20mA
7	4...20mA
8	potentiometer
9	tap position

F247
ENUMERATION: BRICK AC BANK ORIGIN

Value	Description
0	None
1	U1/AC1..3
2	U1/AC5..7
3	U2/AC1..3
4	U2/AC5..7
5	U3/AC1..3
6	U3/AC5..7
7	U4/AC1..3
8	U4/AC5..7
9	U5/AC1..3
10	U5/AC5..7
11	U6/AC1..3
12	U6/AC5..7
13	U7/AC1..3
14	U7/AC5..7
15	U8/AC1..3
16	U8/AC5..7

F248
ENUMERATION: BRICK AUX AC BANK ORIGIN

Value	Description
0	None
1	U1/AC4
2	U1/AC8
3	U2/AC4
4	U2/AC8
5	U3/AC4
6	U3/AC8
7	U4/AC4
8	U4/AC8
9	U5/AC4
10	U5/AC8
11	U6/AC4
12	U6/AC8
13	U7/AC4
14	U7/AC8
15	U8/AC4
16	U8/AC8

F250
ENUMERATION: B90 PRODUCT FUNCTION

0 = Logic, 1 = Protection

F253
ENUMERATION: BRICK TRANSDUCER ORIGIN

Value	Description
0	None
1	U1/DC1
2	U1/DC2
3	U1/DC3
4	U2/DC1
5	U2/DC2
6	U2/DC3
↓	↓
24	U8/DC3

F254
ENUMERATION: INCIPIENT CABLE FAULT MODE

Value	Function
0	Number of Counts
1	Counts per Window

F255
ENUMERATION: CAPACITOR BANK GROUNDING

Value	Description
0	VT (ungrnd) = ungrounded
1	CTxR (grnd) = grounded

F256
ENUMERATION: BRICK ORIGIN/DESTINATION

Value	Description
0	None
1	U1

Value	Description
2	U2
3	U3
4	U4
5	U5
6	U6
7	U7
8	U8

F259
ENUMERATION: BRICK RTD TYPE

0 = 100 Ohm Nickel, 1 = 120 Ohm Nickel, 2 = 100 Ohm Platinum

F260
ENUMERATION: DATA LOGGER MODE

0 = Continuous, 1 = Trigger

F261
ENUMERATION: BANK REDUNDANCY TYPE

0 = None, 1 = Dependability Biased, 2 = Security Biased

F262
ENUMERATION: BRICK STATUS

0 = Disabled, 1 = OK, 2 = Communications Trouble, 3 = Equipment Mismatch, 4 = Brick Trouble

F264
ENUMERATION: LOGIC TYPE

0 = OFF, 1 = OR, 2 = AND

F270
ENUMERATION: FAULT REPORT VT SUBSTITUTION

Value	Description
0	None
1	I0
2	V0

F282
ENUMERATION: BREAKER/SWITCH COMMAND

Value	Description
0	Cancel
1	Open
2	Close
3	Tag
4	Untag
5	Substitute Closed
6	Substitute Open
7	Remove Substitution
8	Bypass
9	Remove Bypass
10	Block Autoreclose
11	Unblock Autoreclose

F283
ENUMERATION: SETTING GROUP CONTROL MODE

Value	Description
0	Local
1	IEC61850 Client

F284
ENUMERATION: SV SYNC STREAM / TIME SYNC STREAM

Value	Description
0	Disabled
1	AC Bank 1 Phase
2	AC Bank 1 Phase Only

F300
UR_UINT32: FLEXLOGIC BASE TYPE (15-bit type)

The FlexLogic BASE type is 14 bits and is combined with a 17-bit descriptor and 1 bit for the protection element to form a 32-bit value. The combined bits are of the form: PTTTTTTTTTTTTTTDDDDDDDDDDDDDDDDD, where P bit if set indicates that the FlexLogic type is associated with a protection element state and D represents bits for the type in F124 format. If P bit is not set, then the T represents bits for the type and D represents range.

The values in square brackets indicate the base type with P prefix [PTTTTTTTTTTTTTT] and the values in round brackets indicate the descriptor range. The left-most D bit indicates whether the type is an ON or OFF type. There can be a total 65535 BASE type elements, 131071 protection element IDs, and 16383 element states. There can be a total of 65535 descriptors of each type.

[0] Off (0) – This is boolean FALSE value

[1] On (1) – This is boolean TRUE value

[2] CONTACT INPUTS (1 to 120)

[3] CONTACT INPUTS OFF (1 to 120)

[4] VIRTUAL INPUTS (1 to 128)

[6] VIRTUAL OUTPUTS (1 to 128)

[8] CONTACT OUTPUTS (1 to 72)

[10] CONTACT OUTPUTS VOLTAGE DETECTED (1 to 72)

[11] CONTACT OUTPUTS VOLTAGE OFF DETECTED (1 to 72)

[12] CONTACT OUTPUTS CURRENT DETECTED (1 to 72)

[13] CONTACT OUTPUTS CURRENT OFF DETECTED (1 to 72)

[14] REMOTE INPUTS (1 to 32)
[16] DIRECT INPUTS (1 to 96)
[18] REMOTE OUTPUT DNA BIT PAIRS (1 to 32)
[20] REMOTE OUTPUT UserSt BIT PAIRS (1 to 32)
[22] REMOTE DEVICE ONLINE (1 to 16)
[24] MISCELLANEOUS EQUATION
[26] TELEPROTECTION INPUTS
[28] INSERT (via keypad only)
[30] DELETE (via keypad only)
[32] END
[34] NOT (1 INPUT)
[36] 2 INPUT XOR (0)
[38] LATCH SET/RESET (2 inputs)
[40] OR (2 to 16 inputs)
[42] AND (2 to 16 inputs)
[44] NOR (2 to 16 inputs)
[46] NAND (2 to 16 inputs)
[48] TIMER (1 to 64)
[50] ASSIGN VIRTUAL OUTPUT (1 to 128)
[52] ONE SHOT
[54] SELF-TEST ERROR (see F141 for range)
[56] PLATFORM DIRECT INPUT (1 to 96)
[58] PLATFORM DIRECT OUTPUT (1 to 96)
[60] PLATFORM DIRECT DEVICE (1 to 8)
[62] MISCELLANEOUS EVENTS (see F146 for range)
[64] PDC NETWORK CONTROL
[66] PMU RECORDER OUT OF MEMORY
[68] PMU RECORDER STOPPED
[128 to 255] ELEMENT STATES (see the Element States section in the Modbus memory map)

F400
UR_UINT16: CT/VT BANK SELECTION

Bitmask	Bank selection
0	Card 1 Contact 1 to 4
1	Card 1 Contact 5 to 8
2	Card 2 Contact 1 to 4
3	Card 2 Contact 5 to 8
4	Card 3 Contact 1 to 4
5	Card 3 Contact 5 to 8

F450
UR_UINT16: AMBIENT SENSOR TYPES

This is a dynamic format code that is populated at initialization with transducer types as specified in the order code.

F460
UR_UINT16: TOP-OIL SENSOR TYPES

This is a dynamic format code that is populated at initialization with transducer types as specified in the order code.

F470
UR_UINT16: TRANSFORMER REFERENCE WINDING SELECTION

F490
UR_UINT16: HI-SPEED CONTACTS

Off, available contact outputs

F491
ENUMERATION: ANALOG INPUT MODE

0 = Default Value, 1 = Last Known

F492
ENUMERATION: DIRECT INPUT/OUTPUT DATA RATE

0 = 64 kbps, 1 = 128 kbps, 2 = 256 kbps

F500
UR_UINT16: PACKED BITFIELD

First register indicates input/output state with bits 0 (MSB) to 15 (LSB) corresponding to input/output state 1 to 16. The second register indicates input/output state with bits 0 to 15 corresponding to input/output state 17 to 32 (if required). The third register indicates input/output state with bits 0 to 15 corresponding to input/output state 33 to 48 (if required). The fourth register indicates input/output state with bits 0 to 15 corresponding to input/output state 49 to 64 (if required).

The number of registers required is determined by the specific data item. A bit value of 0 = Off and 1 = On.

0 = Off, 1 = On

F501
UR_UINT16: LED STATUS

Low byte of register indicates LED status with bit 0 representing the top LED and bit 7 the bottom LED. A bit value of 1 indicates the LED is on, 0 indicates the LED is off.

0 = Off, 1 = On

F502
BITFIELD: ELEMENT OPERATE STATES

Each bit contains the operate state for an element. See the F124 format code for a list of element IDs. The operate bit for element ID X is bit [X mod 16] in register [X/16].

2

F513
ENUMERATION: POWER SWING MODE

0 = Two Step, 1 = Three Step

F514
ENUMERATION: POWER SWING TRIP MODE

0 = Delayed, 1 = Early

F515
ENUMERATION ELEMENT INPUT MODE

0 = SIGNED, 1 = ABSOLUTE

F516
ENUMERATION ELEMENT COMPARE MODE

0 = LEVEL, 1 = DELTA

F517
ENUMERATION: ELEMENT DIRECTION OPERATION

0 = OVER, 1 = UNDER

F518
ENUMERATION: FLEXELEMENT UNITS

0 = Milliseconds, 1 = Seconds, 2 = Minutes

F519
ENUMERATION: NON-VOLATILE LATCH

0 = Reset-Dominant, 1 = Set-Dominant

F521
ENUMERATION: GROUND DISTANCE POLARIZING CURRENT

0 = Zero-Sequence, 1 = Negative-Sequence

F522
ENUMERATION: TRANSDUCER DCmA OUTPUT RANGE

0 = –1 to 1 mA, 1 = 0 to 1 mA, 2 = 4 to 20 mA

F523
ENUMERATION: DNP OBJECTS 20, 22, AND 23 DEFAULT VARIATION

Bitmask	Default variation
0	1
1	2
2	5
3	6

F524
ENUMERATION: DNP OBJECT 21 DEFAULT VARIATION

Bitmask	Default variation
0	1
1	2
2	9
3	10

F525
ENUMERATION: DNP OBJECT 32 DEFAULT VARIATION

Bitmask	Default variation
0	1
1	2
2	3
3	4
4	5
5	7

F530
ENUMERATION: FRONT PANEL INTERFACE KEYPRESS

Value	Keypress	Value	Keypress	Value	Keypress
0	None	15	3	33	User PB 3
1	Menu	16	Enter	34	User PB 4
2	Message Up	17	Message Down	35	User PB 5
3	7	18	0	36	User PB 6
4	8	19	Decimal	37	User PB 7
5	9	20	+/–	38	User PB 8
6	Help	21	Value Up	39	User PB 9
7	Message Left	22	Value Down	40	User PB 10
8	4	23	Reset	41	User PB 11
9	5	24	User 1	42	User PB 12
10	6	25	User 2	44	User 4
11	Escape	26	User 3	45	User 5
12	Message Right	31	User PB 1	46	User 6
13	1	32	User PB 2	47	User 7
14	2				

F531
ENUMERATION: LANGUAGE

0 = English, 1 = French, 2 = Chinese, 3 = Russian, 4 = Turkish, 5 = German, 6 = Polish, 7 = Japanese

F534
ENUMERATION: 87PC TRIP SECURITY

0 = First Coincidence, 1 = Enhanced

F535
ENUMERATION: AUTOMATIC VOLTAGE REGULATOR OPERATING SIGNAL

0 = Vab, 1 = Vbc, 2 = Vca, 3 = Vaver, 4 = V1, 5 = Vaux, 6 = Vag, 7 = Vbg, 8 = Vcg

F536
ENUMERATION: AUTOMATIC VOLTAGE REGULATOR CONTROL MODE

0 = Voltage, 1 = VAR

F537
ENUMERATION: AUTOMATIC VOLTAGE REGULATOR VAR OPEN MODE

0 = Minimize uptime, 1 = Minimize number of operations

F540
ENUMERATION: PMU POST-FILTER

Enumeration	Filter
0	None
1	10Hz/s<10Hz
2	10Hz/s<20Hz
3	20Hz/s<10Hz
4	20Hz/s<20Hz

F542
ENUMERATION: PMU TRIGGERING MODE

0 = Automatic Overwrite, 1 = Protected

F543
ENUMERATION: PMU PHASORS

Value	Phasor
0	Off
1	Va
2	Vb
3	Vc
4	Vx
5	Ia
6	Ib
7	Ic

Value	Phasor
8	Ig
9	V1
10	V2
11	V0
12	I1
13	I2
14	I0

F544
ENUMERATION: PMU RECORDING/REPORTING RATE

Value	Rate
0	1/second
1	2/second
2	4/second
3	5/second
4	10/second
5	12/second
6	15/second

Value	Rate
7	20second
8	25/second
9	30/second
10	50/second
11	60/second
12	100/second
13	120/second

F546
ENUMERATION: PMU REPORTING STYLE

0 = Polar, 1 = Rectangular

F547
ENUMERATION: PMU REPORTING FORMAT

0 = Integer, 1 = Floating

F548
ENUMERATION: PMU COMMUNICATION PROTOCOL

0 = NONE, 1 = 37.118, 2 = 90-5

F549
ENUMERATION: PMU PERFORMANCE CLASS

0 = None, 1 = M-CLASS, 2 = P-CLASS

F550
ENUMERATION: RTD INPUT APPLICATION

Enumeration	RTD input application
0	None
1	Stator
2	Bearing
3	Ambient
4	Group 1
5	Group 2

F551
ENUMERATION: RTD TRIP VOTING

Enumeration	RTD trip voting
0	None
1	Group
2	RTD Input 1
3	RTD Input 2
4	RTD Input 3
5	RTD Input 4
6	RTD Input 5
7	RTD Input 6
8	RTD Input 7
9	RTD Input 8
10	RTD Input 9
11	RTD Input 10
12	RTD Input 11
13	RTD Input 12

F552
ENUMERATION: RTD INPUT OPEN

Enumeration	RTD open
0	None
1	Alarm
2	Block

F560
ENUMERATION: IN-ZONE TRANSFORMER CONNECTION

Enumeration	In-zone transformer connection
0	None
1	0° lag
2	30° lag
3	60° lag
4	90° lag
5	120° lag
6	150° lag
7	180° lag
8	210° lag
9	240° lag
10	270° lag
11	300° lag
12	330° lag

F561
ENUMERATION: 87L INRUSH INHIBIT MODE

Enumeration	Inrush inhibit mode
0	Disabled
1	Per phase
2	Two out of three
3	Average

F562
ENUMERATION: 87L IN-ZONE TRANSFORMER LOCATION

Enumeration	In-zone transformer location
0	Local-Tap
1	Remote 1-Tap
2	Remote 2-Tap

F563
ENUMERATION: DSCP TYPE

Enumeration	DSCP type
0	None
1	Expedited Forwarding

F600
UR_UINT16: FLEXANALOG PARAMETER

Corresponds to the Modbus address of the value to be used when this parameter is selected. Only certain values can be used as FlexAnalogs (basically all metering quantities used in protection).

F601
ENUMERATION: COM2 PORT USAGE

Enumeration	COM2 port usage
0	RS485
1	RRTD
2	GPM-F
3	RRTD & GPM-F

F602
ENUMERATION: RRTD BAUD RATE

Enumeration	RRTD baud rate
0	1200 bps
1	2400 bps
2	4800 bps
3	9600 bps
4	19200 bps

F603
ENUMERATION: RRTD TRIP VOTING

Enumeration	RRTD trip voting
0	None
1	Group
2	Remote RTD 1
3	Remote RTD 2
4	Remote RTD 3
5	Remote RTD 4
6	Remote RTD 5
7	Remote RTD 6
8	Remote RTD 7
9	Remote RTD 8
10	Remote RTD 9
11	Remote RTD 10
12	Remote RTD 11
13	Remote RTD 12

F605
ENUMERATION: REMOTE DOUBLE-POINT STATUS INPUT STATUS

Enumeration	Remote DPS input status
0	intermediate-state
1	off
2	on
3	bad-stqte
4	Latest

F607
ENUMERATION: OPEN POLE DETECTOR MODE

Enumeration	Open Pole Mode
0	Accelerated
1	Traditional

F608
ENUMERATION: OPEN POLE DETECTION FUNCTION

Enumeration	Open Pole Detection
0	I AND V AND CBaux
1	I AND V only

F609
ENUMERATION: TRIP OUTPUT TRIP RESET FUNCTION

Enumeration	Trip Reset
0	Pole Curr OR Custom
1	CBaux OR Custom
2	Custom

F610
ENUMERATION: SINGLE-POLE AUTORECLOSE INITIATION MODE

Enumeration	Initiation mode
0	Protection AND CB
1	Protection only

F612
UR_UINT16: FLEXINTEGER PARAMETER

This 16-bit value corresponds to the Modbus address of the selected FlexInteger parameter. Only certain values can be used as FlexIntegers. There is no operation executed even though they are called FlexIntegers.

F613
ENUMERATION: FIELD GROUND MODULE (FGM) INJECTION CONNECTION TYPE

Enumeration	Connection type
0	Single point
1	Double point

F617
ENUMERATION: LOGIN ROLES

Enumeration	Role
0	None
1	Administrator
2	Supervisor
3	Engineer
4	Operator
5	Factory

F618
BITFIED: SECURITY STATUS INDICATOR

Has been activated, if the password has been set.

1 = Bit#0, Administrator password was set. The list is continued for all other roles (Engineer = bit#2, Operator = bit#3, Observer = bit#3).

2

F619
ENUMERATION: RADIUS AUTHENTICATION METHOD

Enumeration	Authentication protocol
0	EAP-TTLS
1	PEAP-GTC
2	PAP

F621
ENUMERATION: MODBUS LOGIN ROLES

Enumeration	Role
0	None
1	Administrator
2	Supervisor
3	Engineer
4	Operator
5	Observer

F622
ENUMERATION: AUTORECLOSE 1P 3P MODE AUTOMATED

Enumeration	Mode
0	Mode 1 (1 & 3 Pole)
1	Mode 2 (1 Pole)
2	Mode 3 (3 Pole - A)
3	Mode 4 (3 Pole - B)

F623
ENUMERATION: REAL-TIME CLOCK SYNCHRONIZING SOURCE CONFIGURATION

Enumeration	Item
0	None
1	PP/IRIG-B/PTP/Other
2	IRIG-B/PP/PTP/Other
3	PP/PTP/IRIG-B/Other
4	Process Bus Module Clock

F624
ENUMERATION: REAL-TIME CLOCK SYNCHRONZING SOURCE ACTUALS

Enumeration	Item
0	None
1	Port 1 PTP Clock
2	Port 2 PTP Clock
3	Port 3 PTP Clock
4	IRIG-B
5	Other
6	Process Bus Module Clock
7	SNTP1
8	SNTP2

F625
ENUMERATION: PTP STATE

Enumeration	Item
0	Disabled
1	No Signal
2	Calibrating
3	Synchronized
4	Synchronized (No PDelay)

F627
ENUMERATION: REDUNDANCY MODE

Enumeration	Item
0	None
1	Failover
2	PRP

F628
ENUMERATION: SECURITY BYPASS ACCESS

Disables security on local access, remote access, or both.

Enumeration	Item
0	Disabled
1	Local and Remote
2	Local
3	Remote
4	Pushbuttons

F629
ENUMERATION: SCADA PROTOCOL

0 = DNP 3.0, 1 = IEC 60870-5-104, 2 = IEC 60870-5-103

F630
ENUMERATION: IEC 103 ASDU TYPE

0 = 3, 1 = 9

F631
ENUMERATION: VIRTUAL INPUTS FOR IEC 103

Enumeration	Item
0	OFF
1	Virtual Input 1
2	Virtual Input 2
3	Virtual Input 3
↓	↓
64	Virtual Input 64

F632
ENUMERATION: CID FILE STATUS

0 = None, 1 = Received, 2 = Rejected, 3 = Accepted, 4 = Private Section Error

F633
ENUMERATION: IEC 61850 CONTROL MODEL

Enumeration	Item
0	Status-only
1	Direct-with-normal-security
2	SBO-with-normal-security
3	Direct-with-enhanced-security
4	SBO-with-enhanced-security

F634
ENUMERATION: IEC 61850 CONTROL MODEL - NORMAL SECURITY ONLY

0 = Status-only, 1 = Direct-with-normal-security, 2 = SBO-with-normal-security

F635
ENUMERATION: RS232 BAUD RATE

0 = 19200, 1 = 115200

F636
TEXT20: 20 CHARACTER ASCII TEXT DISPLAYED TRUNCATED TO 12 CHARACTERS

F637
TEXT20: 20 CHARACTER ASCII TEXT DISPLAYED TRUNCATED TO 6 CHARACTERS

F639
ENUMERATION: SCADA EVENT TIME BASE (DNP/104/103)

0 = UTC, 1 = LOCAL

F647
ENUMERATION: GRAPHICAL FRONT PANEL PAGE

Enumeration	Item
0	Product Information
1	Single-line Diagram (SLD) 1
2	SLD2
3	SLD3
4	SLD4
5	SLD5
6	Annunciator
7	Annunciator 1
8	Annunciator 2
9	Annunciator 3
10	Annunciator 4
11	Annunciator 5
12	Annunciator 6
13	Annunciator 7
14	Annunciator 8
15	Phasors 1
16	Phasors 2
17	Phasors 3
18	Phasors 4
19	Phasors 5
20	Phasors 6
21	Tabular 1
22	Tabular 2
23	Tabular 3
24	Tabular 4
25	Tabular 5
26	Event Records
27	Targets

F648
ENUMERATION: GRAPHICAL FRONT PANEL DATE FORMAT

Enumeration	Item
0	yyyy-mm-dd
1	dd-mmm-yy
2	yyyy/mm/dd
3	m/d/yyyy
4	m/d/yy
5	mm/dd/yy
6	mm/dd/yyyy
7	yy/mm/dd

2

F649
ENUMERATION: GRAPHICAL FRONT PANEL TIME FORMAT

Enumeration	Item
0	hh:mm:ss
1	h:mm:ss tt

F650
ENUMERATION: GRAPHICAL FRONT PANEL SCREEN SAVER INTENSITY

Enumeration	Item
0	0 %
1	10 %
2	20 %
3	30 %

F651
ENUMERATION: GRAPHICAL FRONT PANEL LED COLOR

0 = ORANGE, 1 = RED, 2 = GREEN

F652
ENUMERATION: GRAPHICAL FRONT PANEL MISC STATES BIT POSITIONS

Enumeration	Item
0	Clock Sync
1	Any Minor Self Test
2	Any Major Self Test
4	Operator Active Bit
5	Engineer Active Bit
6	Supervisor Active Bit
7	Administrator Active Bit
12	Modbus Security Count Bit 0
13	Modbus Security Count Bit 1
14	Modbus Security Count Bit 2
15	Modbus Security Count Bit 3

F660
ENUMERATION: DNP SCALE

0 = 0.01, 1 = 0.1, 2 = 1, 3 = 10, 4 = 100, 5 = 1000, 6 = 10000, 7 = 100000, 8 = 0.001, 9 = 1000000, 10 = 10000000, 11 = 100000000

F661
ENUMERATION: Tx GOOSE SIM Q VALIDITY

Enumeration	Item
0	NONE
1	GOOD
2	INVALID
3	QUESTIONABLE

F662
ENUMERATION: Tx GOOSE SIM Q TEST

0 = NONE, 1 = TRUE, 2 = FALSE

F663
ENUMERATION: IEC 61850 SCL EDITION

0 = Edition1, 1 = Edition2

F664
ENUMERATION: PROCESS CARD / PROCESS BUS MODULE NETWORK CONFIG

Enumeration	Item
0	INDEPENDENT
1	PRP
2	HSR
3	Dual HSR

F665
ENUMERATION: PROCESS CARD / PROCESS BUS MODULE SMPSYNCH CHECK SV TIME SYNCH

Enumeration	Item
0	Global
1	Local
2	Any

F666
ENUMERATION: PROCESS CARD / PROCESS BUS MODULE QUALITY CHECK FOR SV

Enumeration	Item
0	Reject Questionable
1	Accept Questionable

F667
ENUMERATION: PROCESS CARD / PROCESS BUS MODULE PTP FUNCTION

Enumeration	Item
0	Disabled
1	Slave-only
2	Master-Slave

F668
ENUMERATION: PROCESS CARD / PROCESS BUS MODULE PTP PROFILE

Enumeration	Item
0	Power Utility Profile

F670
ENUMERATION: PROCESS CARD / PROCESS BUS MODULE PORT STATUS

Enumeration	Item
0	Disabled
1	Enabled
2	Active

F671
ENUMERATION: PROCESS CARD / PROCESS BUS MODULE SYNCHRONIZING SOURCE ACTUAL VALUES

Enumeration	Item
0	None
1	CPU Clock
2	Process Bus Module Clock
3	SV Sync Stream / Time Sync Stream

F673
ENUMERATION: PROCESS CARD / PROCESS BUS MODULE SV STREAM STATUS ACTUAL VALUES

Enumeration	Item
0	Disabled
1	On
2	Off
3	Lost

F675
ENUMERATION: PROCESS CARD / PROCESS BUS MODULE RxSV AC BANK CROSSCHECKING

Enumeration	Item
0	None
1	Depend Origin-1 Pref
2	Depend Origin-2 Pref

F676
ENUMERATION: BREAKER STATUS

Enumeration	Item
0	Not Configured
1	Opened
2	Closed
3	Unknown State

F677
ENUMERATION: OFFSET SIGNAL SOURCE

Enumeration	Item
0	None
1	SRC 1
2	SRC 2
3	SRC 3
4	SRC 4
5	SRC 5
6	SRC 6
7	SRC 7
8	SRC 8
9	SRC 9
10	SRC 10
11	SRC 11
12	SRC 12
13	SRC 13
14	SRC 14
15	SRC 15
16	SRC 16
17	SRC 17
18	SRC 18
19	SRC 19
20	SRC 20
21	SRC 21
22	SRC 22
23	SRC 23
24	SRC 24
25	SRC 25
26	SRC 26

Enumeration	Item
27	SRC 27
28	SRC 28
29	SRC 29
30	SRC 30

F678
ENUMERATION: IED MODE AND BEHAVIOR

Enumeration	Item
0	On
1	Test
2	Test-Blocked

F679
ENUMERATION: IED INITIATE TEST MODE ON SIM

Enumeration	Item
0	Disabled
1	Test
2	Test-Blocked

F680
ENUMERATION: PROCESS BUS MODULE PROTECTION BLOCKING MODE

Enumeration	Item
0	Global
1	Partial

F685
ENUMERATION: PROCESS BUS MODULE RxSV SYNC STATUS

Enumeration	Item
0	Local
1	Global
2	No Sync

F686
ENUMERATION: PROCESS BUS MODULE SV STREAM STATUS

Enumeration	Item
0	Off
1	On
2	Not Configured

UR Family

Chapter 3: IEC 61850 Ed. 2 communication

This chapter outlines the IEC 61850 Edition 2 communications protocol.



The protocol applies when ordered with the product. Check your order code.

3.1 Overview

3.1.1 Introduction

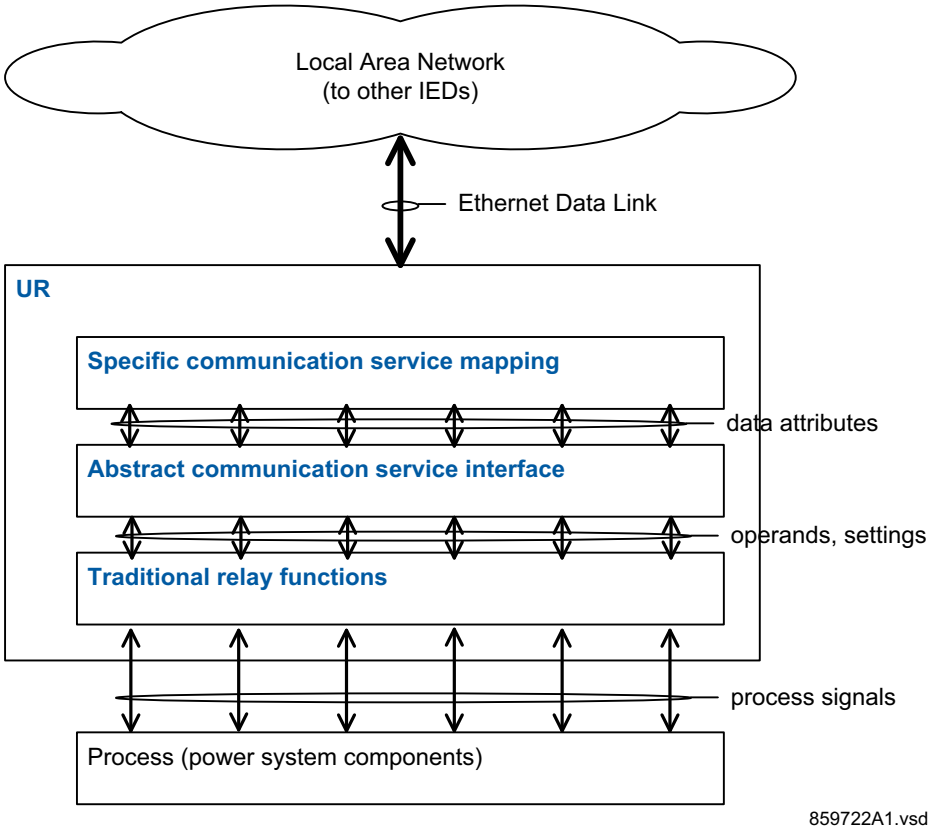
This section contains a description of IEC 61850, an International Electrotechnical Commission (IEC) series of documents entitled Communication Networks and Systems for Power Utility Automation. The focus is on those features implemented since UR 7.3x.

IEC 61850 is a series of international standards and technical reports applicable to power utility automation systems (PUAS). It includes semantics, abstract communication services, specific communication services, performance specifications, network engineering guidelines, configuration description methodologies, and engineering processes. The objective of the standard is to provide a framework to achieve interoperability among the intelligent electronic devices (IEDs) from different suppliers, and interoperability among software configuration tools from different suppliers. Interoperability in this case is the ability for IEDs to operate on the same network or communication path sharing information and commands, and for configuration tools to understand each other's configuration files. The standards can be obtained from the IEC (http://www.iec.ch).

The UR supports a large subset of the IEC 61850 features and virtual local area network (VLAN) IEEE 802.1Q. These are described at a high level in this chapter and include the information model, GOOSE publish, GOOSE subscribe, buffered report server, unbuffered report server, and Manufacturing Message Specification (MMS) query, read, write, and control services. In addition, the UR and the EnerVista UR Setup software support IEC 61850 Substation Configuration Language (SCL) file import/export and merging. UR releases before 7.3x use edition 1.0 of IEC 61850. Release 7.3 and later use edition 2.0. Release 7.7 and later use both Editions 1 and 2. The edition 2.0 differs from edition 1.0, particularly in SCL. Edition 2.0 GOOSE, Sampled Value, and Report messages GSSE, can be understood by edition 1.0 devices, that is to say these are backward compatible. However, only edition 2.0 61850 configuration tools can interoperate with edition 2.0 devices. Fixed GOOSE, GSSE, and Edition 1 report services are not supported beyond version 7.2x. UR devices using these features must be set to use configurable GOOSE to communicate with a 7.3x or later device.

The figure shows IEC 61850 as it pertains to an IED, such as a UR device.

Figure 3-1: IEC 61850 and device overview



The Process block at the bottom of the figure represents power system components monitored and controlled by the IED, such as circuit breakers, disconnect switches, and current and voltage instrument transformers. These are connected typically through conventional copper wiring to IEDs, although the possibility exists with some IEDs for connection via Ethernet communications, such as IEC 61850 process bus. The copper wiring typically connects the IED to status monitoring mechanical contacts, secondary windings of current and voltage transformers, and trip and close circuits. These process signals are represented in the figure by the lines connecting the Process block to the Traditional relay functions block inside the IED.

The Traditional Relay Functions block consist of protection, control, and monitoring functions, such as phasor and root mean square (RMS) estimators, distance protection elements, overcurrent elements, reclosing, and predictive maintenance monitors. The input and output signals of these functions (other than the process signals) are represented in the figure by the lines connecting the Traditional Relay Functions block to the Abstract Communications Service Interface. These signals are typically Boolean and numeric signals, including FlexLogic operands, FlexAnalog operands, actual values, and UR settings, and can be communicated between IEDs using IEC 61850 communications.

The Abstract Communication Service Interface (ACSI) block translates the native names of the signals, names that vary in different manufacturers' products, to names using a standard naming convention that are to be understood by all IEC 61850 compliant devices. This is also called the information model. The signals with their standard names are called data attributes, and are represented in the figure by the lines connecting the ACSI block to the Specific Communication Service Mapping block. The next section details the ASCI block.

The Specific Communication Service Mapping (SCSM) block converts the ACSI signals to/from Ethernet messages, which are carried by a local area network to/from other IEDs. The standard specifies several "services" for doing the translation, each of which is designed for different performance/capability needs. The main services, the ones implemented by UR family devices, are as follows:

- Read/write services — These services allow a client IED to obtain a directory of a server's signals and to read and write the server's signal values one at a time, or a few related values at a time. These services are implemented on a stack

consisting of MMS, TCP, IP, and Ethernet protocols. UR devices participate in these services as server IEDs, not as clients.

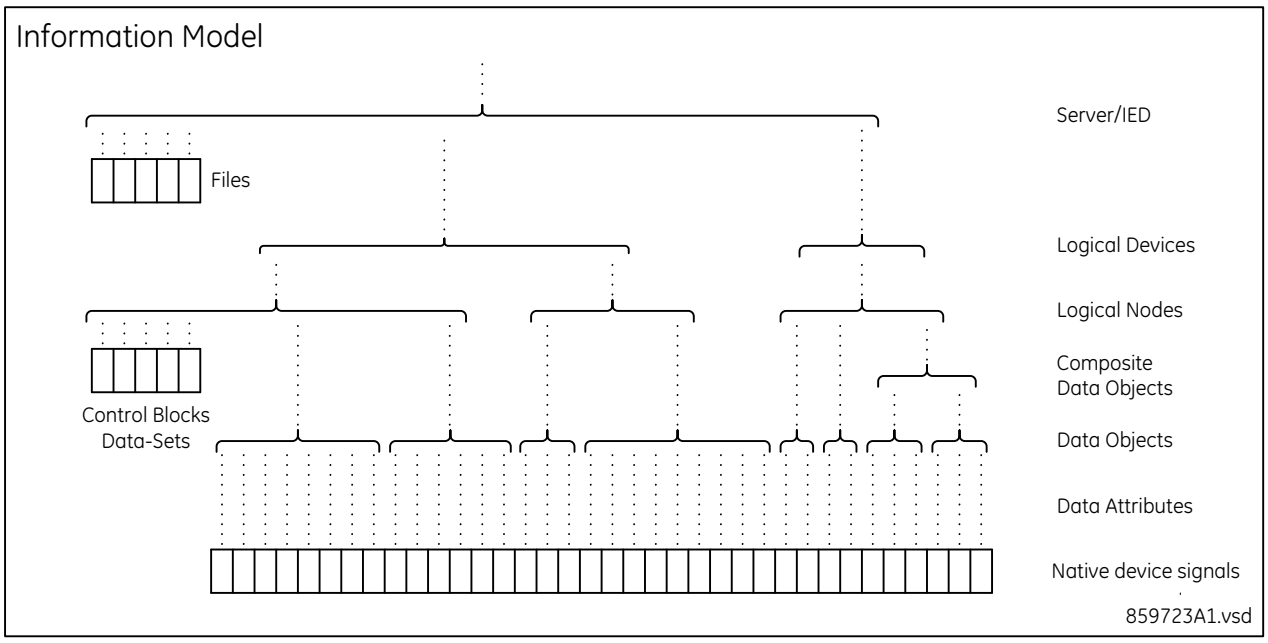
- Command services — These services allow a client IED to send commands to a server IED, to for instance open and close circuit breakers through a server IED, and to confirm that the command was successfully executed. These services are expected to be completed in the order of half a second. Again these services are implemented on a MMS, TCP, IP, and Ethernet stack, and UR devices participate as servers, not as clients.
- Report services — These services allow a client IED to set up a server IED to send the client messages containing the values of a set of predefined signals periodically, on request, and/or whenever one of the signals undergoes a change of state or value. The reports are expected to be completed in the order of one second after a signal change of state. Again these services are implemented on a MMS, TCP, IP, and Ethernet stack, and UR devices participate as servers, not as clients.
- GOOSE — This service allows a publisher IED to transfer a predefined set of signal values to one or more subscriber IEDs periodically and/or whenever one of the signals undergoes a change of state or value. This service is intended for trip and blocking signals, and is expected to be completed in the order of three milliseconds for some message types. This service is implemented directly on the Ethernet protocol. UR devices implement the publisher side of this service under the name TxGOOSE and the subscriber side of this service under the name RxGOOSE.
- Sampled values (SV) — This service allows a publisher IED to transfer a predefined set of values of its signals to one or more subscriber IEDs periodically. This service is intended for analog signals whose waveform needs to be reconstructed by the subscriber, such as power system voltage and current signals, and synchrophasor signals. Sample rates for different applications can range from thousands to once per power system cycle. This service is implemented directly on the Ethernet protocol. UR devices implement the publisher side of this service for synchrophasors.

3.1.2 Abstract Communication Service Interface (ASCI)

The Abstract Communications Service Interface (ACSI) is defined in IEC 61850 7-2, 61850 7-3, and 61850 7-4. A fundamental component of ACSI is its information model, which defines the ACSI names of signals, and attaches a "semantic" to name parts. A semantic is a usually brief description of what the named item represents. For instance, the name part "stVal" has the defined semantic "Status value of the data".

The figure shows the information model that organizes the native device signals.

Figure 3-2: ASCI block



The native IED signals (UR settings, FlexLogic operands FlexAnalog operands, and actual values) are assigned to entities known as Data Attributes (DAs). Data Attributes typically contain the value of a single signal, most often with a Boolean, Float or Enumerated value. Alternatively a data attribute can have meta-data related to another data attribute, such as the quality, timestamp, and range of the other attributes. Data attributes have defined names and semantic as defined in IEC 61850 7-3:2010 clause 8. There are 15 pages of these in the standard, so they are not listed here. A few representative data attributes are as follows:

- stVal — Status value of the data
- setVal — The value of a setting
- instMag — Magnitude of the instantaneous value of a measured value
- t — Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute
- q — Quality of the attribute(s) representing the value of the data

A collection of related data attributes are combined into an entity at the next level up in the hierarchy known as a Data Object (DO). Data objects are required to be formed in accordance with one of the Common Data Class (CDC) definitions in IEC 61850 7-3:2010 clause 7. A CDC defines what data attributes an implementing data object is required to contain and which data objects an implementing data object can optionally contain. CDCs also define the functional constraint (FC) of each data attribute. An FC is a two-letter code with additional information, such as ST (status information) or SP (setting). For instance, the Single point status CDC, which is named SPS, requires data attributes stVal, q, and t, and it allows certain data attributes concerned with the substitution model, value update blocking, and description. The data attribute stVal is required by the CDC to be a Boolean value, q is required to be a code for the quality of stVal, and t is required to be the time at which stVal last changed state. Thus an SPS data object contains an amalgamation of information about a Boolean condition, for instance the thermal alarm status of a thermal overload protection.

In some cases, data objects are constructed from data objects and data attributes. These are known as constructed data objects. An example is the Phase to ground/neutral related measured values of a three-phase system (WYE) CDC that is constructed of data objects implementing the Complex measured value (CMV) CDC. The complex measured values here are the individual phase and neutral phasor value measurements.

A collection of related data objects are combined into an entity at the next level up in the hierarchy known as a Logical Node. Logical nodes are required to be formed in accordance with one of the individual logical node class specifications in IEC 61850 7-4:2010 clause 5, as well as conforming to the common logical node class specifications in clause 5.3.3. A logical node class defines what kind of function an implementing logical node models (its "semantic"), what data objects an implementing logical node is required to contain, and which data objects an implementing logical node can optionally contain. A logical node class also defines the name and CDC of each of its data objects. IEC 61850 7-4:2010 clause 6 defines the semantic of standard data object names. For instance, the Instantaneous overcurrent logical node class, which has class name PIOC, requires an Op data object with the following CDC Protection activation information (ACT) and semantic:

> "Operate (common data classes ACT) indicates the trip decision of a protection function (LN). The trip itself is issued by PTRC."

Logical node class PIOC also requires the mandatory data object Beh (Behaviour, meaning on, off, test, and so on) and permits the optional data objects Str (Start), OpCntRs (Resettable operation counter), StrVal (Start value setting) and several others from the common logical node class. It is possible for a device manufacturer to add data objects in addition to those specified by a logical node class, but the expansion rules in IEC 61850 7-1:2011 clause 14 must be followed. UR devices in fact do extend the standard logical nodes in many cases; the data objects implemented are as tabulated in clause 3.4 MICS.

Logical node names are required to be formed from the four-character logical node class name that it implements, a prefix text, and a suffix instance number. An example is PhsIocPIOC1, in which "PIOC" is the implemented logical node class name, "PhsIoc" is the prefix, and "1" is the instance number. UR devices adopt the convention that the prefix identifies the UR element that the logical node is used to model, and the instance number is the UR element number. For instance, all logical nodes used to model the AC sources use the prefix ACsrc. The logical nodes used to model AC source 1 have logical node instance 1, the logical nodes used to model AC source 2 have logical node instance 2, and so on. Thus the names for logical nodes modelling AC source 1 are ACsrcMMXU1, ACsrcMMXN1, and ACsrcMSQI1. Prefixes and instance numbers are fixed in UR devices, except that three special logical nodes can have user configurable prefixes (GGIO1, GGIO2, and GGIO4).

A collection of related logical nodes are combined into an entity at the next level up in the hierarchy known as a Logical Device. Logical devices are required to have one logical node implementing logical node LLN0, which addresses common issues for the containing logical device. Logical devices can also contain as many logical nodes as desired. UR devices of this release initially have six logical devices, with logical node instance names and contained logical nodes as generally described in the following table, but can be reconfigured to have from 1 to 16 logical devices. The logical device to which each logical node is assigned initially is as specified in clause 3.4 MICS, but except for the logical nodes shown there in logical device Master, logical nodes can be moved to any logical device. The assignment of logical nodes to logical devices is configurable, as is the number of logical devices from 1 to 16.

Table 3-1: Factory default logical nodes

Logical device instance name	Generally contains logical nodes modelling...
Master	communications, including GOOSE, reports, Remote I/O, Virtual Inputs, Modbus, DNP, and setting group control
Prot	protection and protection-related functions
Ctrl	control and monitoring functions
System	power system devices: breakers, switches, CTs, VTs, and so on, including interfaces to these, such as AC inputs, contact I/O, transducer I/O, HardFiber I/O
Meter	metering and measurement (other than PMU), including AC sources
Gen	FlexLogic, Virtual Outputs, non-volatile latches, FlexElements, recording (for example oscillography), security, front panel, clock
PBus	Process Bus Module

Logical devices have a product-related name and optionally a function-related name. The product-related name consists of the logical device instance name (see table) prefixed by the configured IED name. Other than the product-related name of the logical device "Master," both the product-related name and the function-related name are freely configurable, although the standard strongly recommends use of the IEC 81346 series for the derivation of function related name. The function-related names are used only when configured by the user, and then only in communications, not in Substation Configuration Language (SCL). The product-related name is used in SCL, and when no function-related name is configured, in communications. Note that the symbol "LDName" is used in standard documents to represent either the function-related or product-related name as appropriate to the context, while "ldName" is used to define the function-related name. Upper/lower case is critically significant in many 61850 names.

The complete set of logical devices in an IED are combined into an entity at the next level up in the hierarchy known as a Server. Only one server exists in most IEDs, including UR devices, so a server can usually be considered synonymous with the IED. The logical devices in an IED can be arranged in a hierarchical structure. Certain entities like revision counters have a scope that extends to lower levels that do not contain an instance of that entity. UR devices arrange their logical devices such that the Master logical device is the root of the hierarchy, and all other logical devices are direct descendants of Master.

When a particular data attribute or data object needs to be referenced by an SCL configuration file, in many cases the name of each level in the information hierarchy are independently specified. For instance, to specify the reception of the power of AC source 1 from an external IED, SCL can contain the following:

```
<ExtRef iedName="Fdr1" ldInst="Meter" prefix="ACsrc" lnClass="MMXU" lnInst="1" doName="TotW"
daName="mag.f" fc="MX" />
```

In other cases, an ObjectReference is used to identify the data attribute. An ObjectReference concatenates the names of each hierarchical level with defined delimiting characters. For instance, the ObjectReference for the previous example looks like the following:

```
Fdr1Meter/ACsrcMMXU1.TotW.mag.f
```

This format is known as the ACSI ObjectReference format, which is used exclusively in SCL, and in communication messages where the value of a data attribute containing an ObjectReference is being transmitted. However, in communications messages where an ObjectReference is a reference to the entity whose value is being communicated, it is reformatted according to the MMS addressing scheme specified in IEC 61850 8-1. Thus on the wire, one can see a message requesting the present value of source 1 power identifying the requested data attribute as

```
Fdr1Meter/ACsrcMMXU1$MX$TotW$mag$f
```

Since version 7.70, UR devices implement file transfer directories for Data Logger and User Fault Report files are fixed as follows. For IEC 61850 Edition 1, the files are located in the LD folder in which the logical nodes exist. For Edition 2, the files are located in the LD folder associated with the Master logical device.

3.1.3 Datasets

A dataset is an ordered list of member data objects and/or data attributes. Datasets

- Allow for a client to get the values of all members of a dataset with a single request rather than having to individually request each member
- Are used to define which data attributes to include in a GOOSE message or a sampled value message or a report

A dataset member can be either a functional constrained data attribute (FCDA) or a functional constrained data object (FCD). An FCD is a structure containing all the data attributes of a data object or composite data object as explained in the previous section, except that only those data attributes with function constraint code matching the code configured for that member are included. An FCDA is to all intents and purposes a single data attribute or constructed data attribute; the words "functional constrained" are superfluous. Note that a Substation Configuration Language (SCL) element with tag "FCDA" is used to specify both FCDAs and FCDs. If the FCDA element attribute daName is omitted, an FCD is specified. If the FCDA element attribute daName is included, an FCDA is specified.

UR devices accept both FCD and FCDA as dataset members.

The standards allow dataset names to be configured in SCL files as required, as do UR devices. The standards define a service that creates a dataset online through MMS services, but UR devices do not implement that service. Datasets in UR devices must be pre-configured.

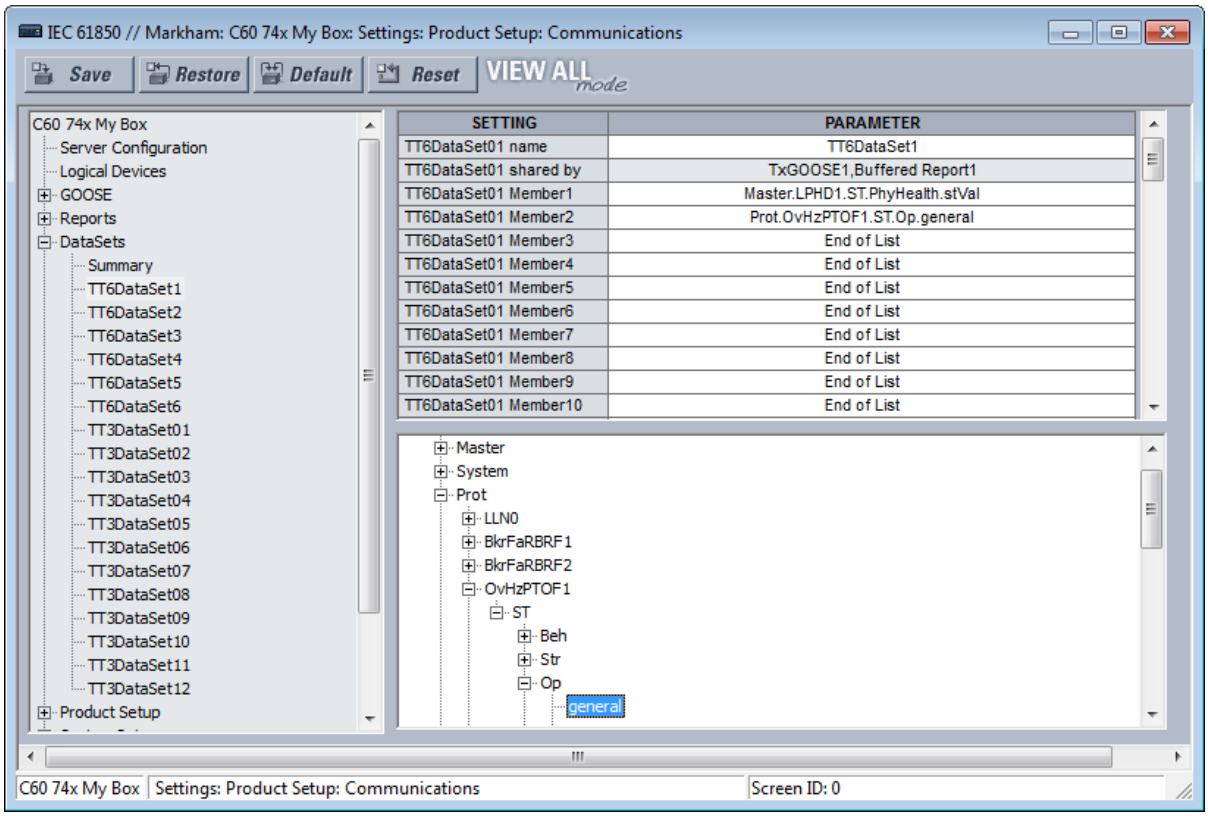
The following figure shows an EnerVista UR Setup dataset configuration page. Members are selected from a drop-down list or by dragging and dropping. Datasets also can be configured from a GOOSE or Report configuration page. Note that in EnerVista UR Setup the format of references to dataset members is:

<ldInst>.<LNName>.<fc>.<doName>.<daName>

where

ldInst is the logical device instance name (Master, Prot, Ctrl, System, Meter or Gen)
LNName is the logical node name, including prefix, class name, and instance number
fc is the functional constraint (EnerVista UR Setup uses only ST and MX)
doName is the data object name, including sub-data objects if any
daName is the data attribute name, including sub-data attributes if any

Figure 3-3: IEC 61850 DataSets



3.1.4 TxGOOSE

GOOSE is a service for communicating trip and blocking signals between IEDs. It is expected to be executed in the order of three milliseconds for Type 1A "Trip" messages within a substation. Publishing of each GOOSE message is controlled by a control block in the information model of the publishing device, which since UR 7.30 is represented by a TxGOOSE element.

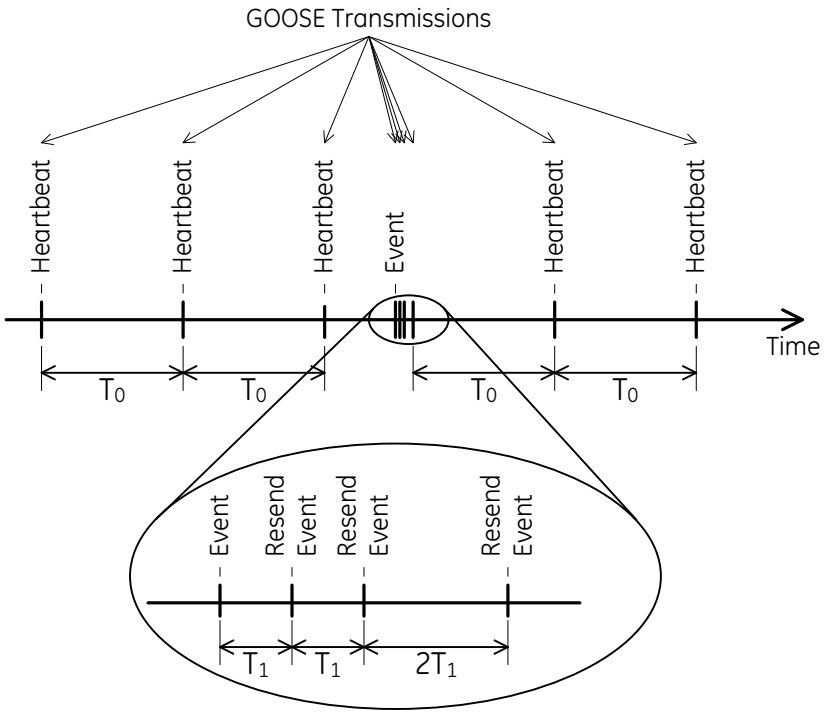
Each GOOSE message includes the values of all of the members of the dataset to which it is configured, and a number of fields that can be used by the subscriber to identify the particular GOOSE message it subscribes to. The identification fields are as follows:

- Destination MAC address — A multicast address that selects the set of destination IEDs
- Source MAC address — A globally unique identification of the publisher
- APPID — A number that is recommended by the standard to be unique within the system
- gocbRef — A reference to the control block object that controls message publishing
- datSet — A reference to the dataset whose members are published
- goID — A string that allows a user to assign an identification to the GOOSE message
- confRev — Configuration revision number to identify changes affecting message content
- ndsCom — A Boolean flag that indicates the publisher needs to be commissioned
- numDatSetEntries — The number of members in the dataset

To facilitate rapid processing in both the publisher and subscriber, the MMS/TCP/IP stacks are bypassed; GOOSE messages interface directly to the Ethernet layer. To avoid the publisher having to compose and send sequentially individual messages to each subscriber, multicast addressing is used whereby the network copies each transmitted GOOSE messages to all subscribers on the same VLAN. Finally, to avoid the long delays that handshaking type protocols can introduce when a packet is lost, GOOSE instead employs a scheme whereby messages encoding a change of state are repeated several times; if the first event message is lost, the closely following repetition gets through.

The figure shows the timing of GOOSE transmissions.

Figure 3-4: TxGOOSE timing



T_0 - TxGOOSE MAX TIME setting value
T_1 - TxGOOSE1 MIN TIME setting value

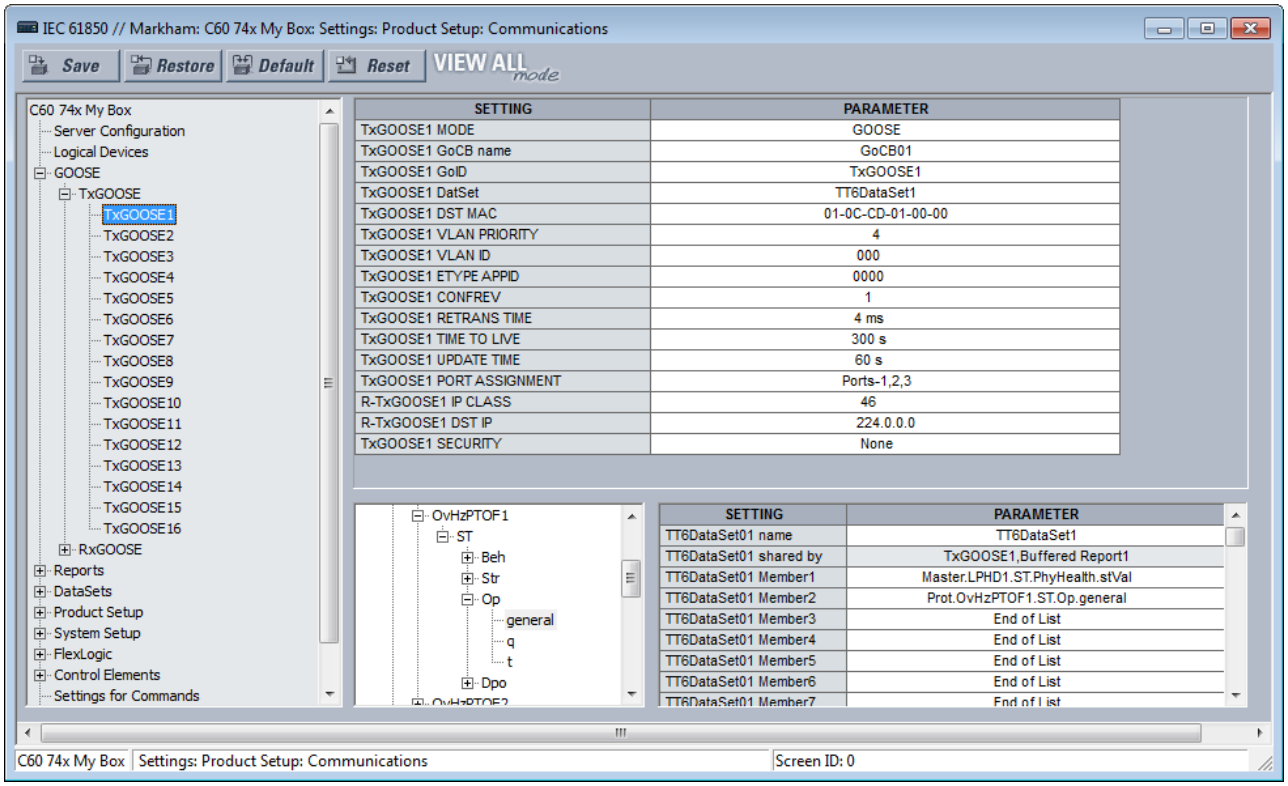
859786A1.vsd

When none of the published member values are changing, the GOOSE message is sent periodically to allow subscribers to monitor the connection. These messages, called heartbeat messages, also allow a subscriber recovering from an interruption or outage to obtain the values of the members in the absence of event messages. A timeAllowedtoLive field including in each GOOSE message informs the subscriber of the maximum amount of time to wait for another message before declaring the connection lost. In UR devices, the heartbeat period is controlled by the **TxGOOSE MAX TIME** setting, and the timeAllowedtoLive value is controlled by the **TIME ALLOWED TO LIVE** setting.

When any published member value changes state, the GOOSE message is immediately sent with the new values. Such a message is called an event message. A short time after the initial event message is sent, it is resent several times. In UR devices there are normally three retransmissions, with intervals controlled by the **TxGOOSE MIN TIME** settings. However, if the **TxGOOSE MIN TIME** setting is set to zero, there are no retransmissions.

UR devices implement the publisher side of each GOOSE service under the name TxGOOSE. See the applicable UR instruction manual for the number of TxGOOSE elements available, and the performance of each.

Figure 3-5: IEC 61850 TxGOOSE panel

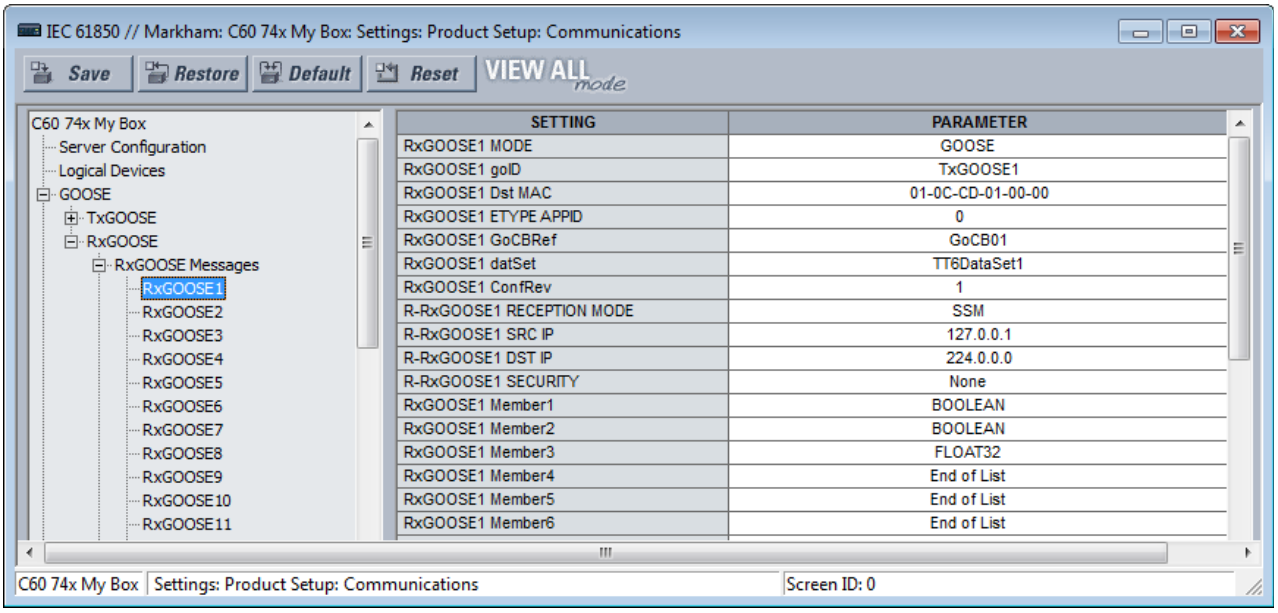


3.1.5 RxGOOSE

The IEC 61850 standard does not contain a control block or equivalent for subscribing to GOOSE messages. The standard assumes that the subscriber has access to a description of the information model of the publisher, and from that can extract the information that it needs to subscribe.

Since UR 7.30, an RxGOOSE is a UR element that contains in a single entity all the information necessary to subscribe to a specific GOOSE message. Both the UR and EnerVista UR Setup software automatically extract this information on receiving an appropriate SCL file. However, EnerVista UR Setup also allows manual entry of this information via RxGOOSE configuration pages. The figure shows an example of an RxGOOSE configuration page, which subscribes to the message generated by the TxGOOSE and dataset examples of the preceding sections of this manual. If an SCL file with the publisher's configuration is available, all of the settings on this page are completed automatically when a subscription is configured on an RxGOOSE Inputs page, except for a few settings necessary for R-GOOSE. When a subscription is configured using RxGOOSE Inputs page, the EnerVista software uses the first available RxGOOSE message to populate the publisher settings.

Figure 3-6: IEC 61850 RxGOOSE Messages panel



The RxGOOSE MODE, RxGOOSE Dst MAC, RxGOOSE GoCBRef, ConfRev, and RxGOOSE Member settings must be correctly entered for GOOSE messages to be accepted. The RxGOOSE MODE setting enables the UR to receive GOOSE rather than R-GOOSE messages. Dst MAC is used by the UR hardware to pass only subscribed messages, so the CPU does not parse messages of no interest to that device. GoCBRef is used to determine which if any of the RxGOOSE an incoming message is for. ConfRev is used to verify that the publisher has the expected configuration revision. And the Member settings define the structure of the data in the message, so that appropriate buffers can be pre-allocated. In EnerVista UR Setup, the structure must consist of the basic data types BOOLEAN, FLOAT32, INT32, Dbpos, Quality, and TimeStamp; that is to say, EnerVista UR Setup cannot manually configure reception of structured GOOSE messages that are used to communicate FCDs. However, messages with structure can be used by importing into UR Setup SCL files wherein the message structure is already defined.

When RxGOOOSE MODE is set to R-GOOSE, the R-RxGOOSE DST IP needs to be a valid multicast or unicast IP address. R-RxGOOSE RECEPTION MODE specifies the R-RxGOOSE DST IP range. When RxGOOSE RECEPTION MODE is set to SSM, R-RxGOOSE DST IP must be in the range of 232.0.0.1 to 232.255.255.255. When RxGOOSE RECEPTION MODE is set to ASM, R-RxGOOSE DST IP must be in the range of 224.0.0.1 to 239.255.255.255, excluding the SSM range. Note that the SSM range is inside the ASM range and therefore the ASM use excludes the SSM range. The default destination IP address 224.0.0.0 is reserved, and hence not a valid multicast IP address.

With R-GOOSE subscription, a UR can subscribe to a maximum of 25 unique destination IP addresses.

Each of the remaining settings on this page can be left at its default value, in which case the value in the corresponding field of incoming messages is not validated, the message is accepted no matter the received field value.

For a value received in a subscribed GOOSE to be used by the UR, it must be mapped to a FlexLogic or FlexAnalog operand. This is done by RxGOOSE Input elements, of which there are three types: an RxGOOSE Boolean Input maps a BOOLEAN Member to a FlexLogic "On" operand; an RxGOOSE DPS Input maps a Dbpos (double point position) Member to "Bad," "Interm," "On," and "Off" FlexLogic operands; and an RxGOOSE Analog Input maps a FLOAT32 Member to an Analog In FlexAnalog operand. These operands can be used as inputs wherever a FlexLogic or FlexAnalog operand can be used.

3.1.6 Reports

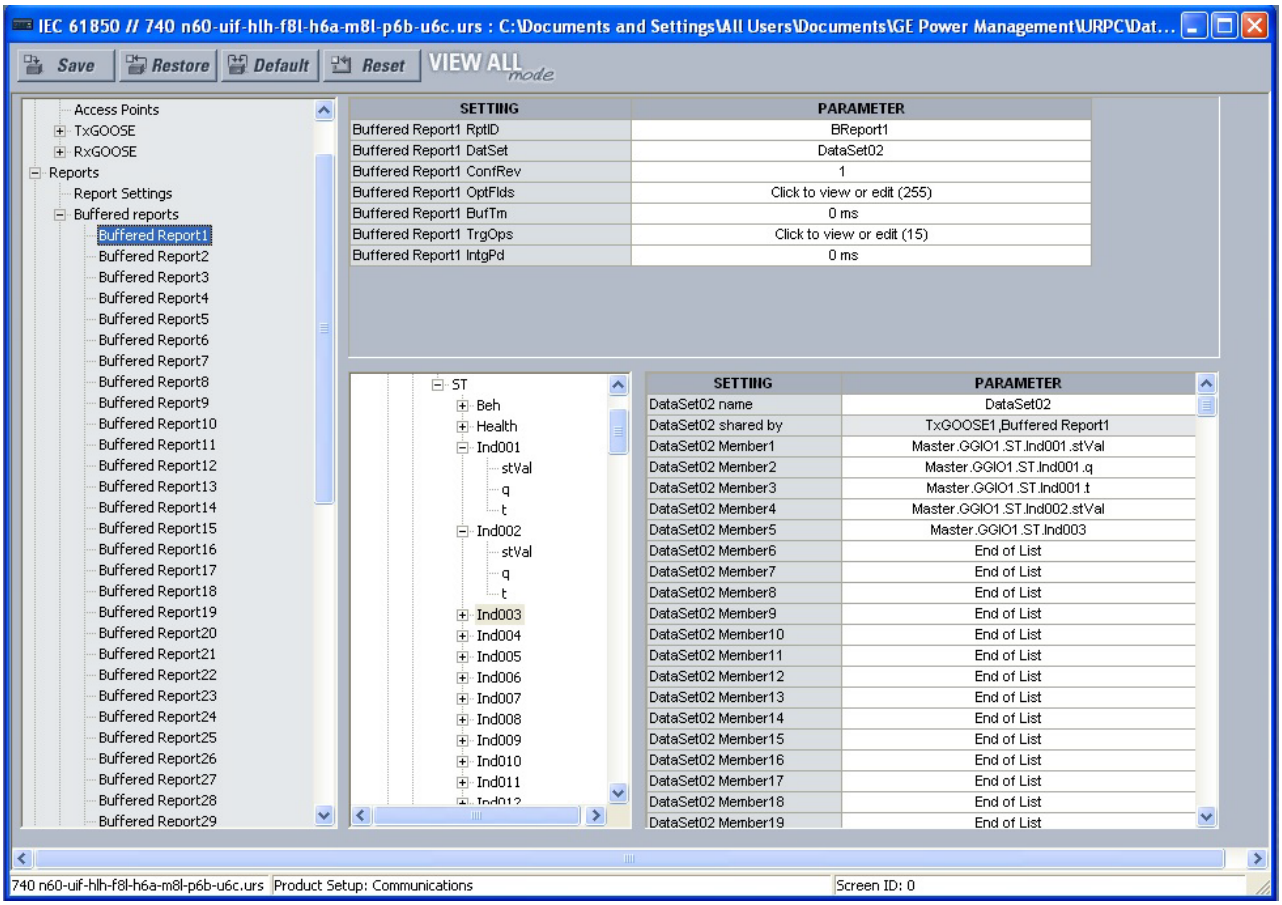
A report is an IEC 61850 service whereby a client IED can establish a one-to-one connection over a local area network to a server, and over this connection the server keeps the client updated on the values of a set of the server's signals. The set of signals reported on is defined by a dataset, with datasets being explained earlier in this chapter. Report messages can be configured to be issued periodically, on request, and/or on events, where an event is defined as one of the signals

undergoing a change of state or value. Event messages contain only the values that have suffered events, reducing the bandwidth requirements of report services. Report services are intended for supervisory control and data acquisition (SCADA)-type applications, wherein transfer time is not as critical as in protection applications.

IEC 61850 specifies two types of report: buffered reports and unbuffered reports. The difference between these two is that when the connection between server and client is lost, unbuffered reports flush events not yet reported to the client, while buffered reports retain (buffer) any events not yet reported and any subsequent events so that the interruption does not result in the loss of events. Unbuffered reports are thus more suitable where client is just displaying the reported values or using them to make real-time decisions, such as tap-changer voltage control. In these applications, events during the interruptions are not of interest, and preservation unnecessarily consumes server resources. Buffered reports are more suitable where the client is using the data for historical purposes, such as for instance creating a load profile. In these applications, the events during an interruption are necessary to prevent gaps in the history.

Each report service is controlled by a report control block in the information model of the publishing device, which since UR 7.30 is represented by either a buffered report element or an unbuffered report element. See the applicable UR instruction manual for the number of report elements available. Typically, report control blocks are configured by the client using MMS messages defined in the standard immediately on opening the client/server connection. However, EnerVista UR Setup also allows manual entry of this information via Buffered report and Unbuffered report configuration pages. The figure shows an example of a Buffered report configuration page.

Figure 3-7: IEC 61850 buffered report panel



The RptID setting allows each report service to be given a user-specified functional name, though if left blank a system unique name in the format "<LDName>/LLN0BR"BRCB01" is used, where the last two digits are the report element number. DatSet specifies the dataset that defines what values are to be included in report messages. TrgOps is a bitmapped value, wherein each bit specifies a kind of event that is to be reported on: data-change, quality-change, data-update, integrity (for example, periodic), and/or general-interrogation (for example, on request). BufTm specifies how long after an initial event to collect and append possible additional events before sending a report message. IntgPd specifies

the interval of periodic reports. OptFlds is a bitmapped value, wherein each bit specifies whether an optional particular field is to be included in the message: sequence-numer, report-time-stamp, reason-for-inclusion, data-set-name, data-reference, buffer-overflow, entryID, and/or conf-revision.

3.1.7 Commands

IEC 61850 controls are complex. The following is a brief description.

From a UR perspective, you can issue open or close controls to the UR Breaker Control element using IEC 61850 controllable points.

This is accomplished by standard IEC 61850 models and services. Bkr0XCBR1.Pos is a DPC (Dual Point Control) point that drives the Breaker Control 1 element. BkrCSWI1.Pos is also a DPC point that drives the Breaker Control 1 element. Of course, the Breaker Control element can be used entirely outside of IEC 61850 by using FlexLogic operands as the control inputs.

Similarly Disc0XSWI1.Pos and/or DiscCSWI1.Pos can be used to control the Disconnect Switch 1 element.

From an IEC 61850 standard perspective, controllable points can be SPC (Single Point Control, as used to control UR Virtual Inputs), DPC (Dual Point Control, as used to control UR Breaker Control and Disconnect Switch elements), or other less common control types.

Bkr0XCBR1.Pos is a DPC. It supports all IEC 61850 control models. The Pos.ctlModel attribute selects the control model, where

1 = Direct Control with Normal Security
2 = SBO Control with Normal Security
3 = Direct Control with Enhanced Security
4 = SBO Control with Enhanced Security

In order to execute the IEC 61850 control services, you need to know the value of ctlModel. For Direct Control with Normal Security, an IEC 61850 Client can write to the Pos.Oper structure. The entire Pos.Oper structure must be written in one MMS write transaction. Pos.Oper.ctlVal determines whether the control is "open" or "close".

For SBO Control with Normal Security, the Pos.SBO element is used. A read of this element is the "select" operation. The Pos.Oper structure can then be written as described above.

For Direct Control with Enhanced Security, only the Pos.Oper element is used. The client must write the entire Pos.Oper structure in one MMS write transaction.

For SBO Control with Enhanced Security, the Pos.SBOw element must be written first. This is the "select" operation. The Pos.Oper element can then be written.

Note that the SBOw element is always present if SBO with Enhanced Security is supported for a particular point, regardless of the current value of ctlModel. Similarly, the SBO element is always present if SBO with Normal Security is supported, regardless of the current value of ctlModel.

3.1.8 Substation Configuration Language (SCL)

The Substation Configuration Language (SCL) is a file format defined by IEC 61850-6 to describe/specify in a way understandable by configuration tools of different manufacturers the capabilities and configuration of IEDs and communication systems, as well as the relations between the utility automation system and the substation/switch yard, and describe the switch yard topology.

SCL is based on the Extensible Markup Language (XML) version 1.0, and specified in IEC 61850-6 using the XML Schema language. Both the SCL language and the XML Schema language are complex; only SCL features needed to obtain a high level understanding of SCL files are discussed here.

An SCL file, being an XML file, consists of a root element, which contains child elements, which in turn contain child elements, and so on. In SCL files, the root element is named SCL. Its standard child elements are as follows:

- Header, which can be used to identify the SCL file, its version, and history
- Substation, each of which describes the topology of a substation and either the assignment of logical nodes in the IEDs to power system elements or the required types of logical nodes for each of its power system elements

- Communications, which describes which IED access points (for example, IED Ethernet ports) are connected to which communications subnetworks, and describes the communications addresses used by the IED access points
- IED, each of which describes for a single IED its access points, logical devices, logical nodes, control blocks, and datasets. The logical nodes are described using templates. The IED element can also contain some or all of its settings and factory configured values.
- DataTypeTemplates, which describes the logical nodes used in the IED section(s) and their contained data objects and data attributes. The DataTypeTemplates element can also contain settings and factory configured values.

These elements are so-called "Public" elements, in that they are precisely defined in IEC 61850-6, a publicly available document. These elements are expected to be understood by all IEC 61850 configuration tools, and any tool is allowed modify the settings in them. UR 7.30 and later SCL files contain in these Public elements all settings that directly control implemented IEC 61850 services, including GOOSE publish and subscribe, and MMS services such as reports and commands. UR 7.30 and later SCL files also contain for each of the UR elements that have so far been mapped to IEC 61850 a description of the UR element's FlexLogic and FlexAnalog operands and of the UR element's settings that select an operand. Thus configuration tools of any manufacturer can be used to configure the IEC 61850 communication aspects of UR 7.30 and later devices.

In addition to Public elements, SCL allows elements named "Private," whose content is not defined by the standard and which is contained within a <Private></Private> tag. The content and format of Private elements is determined by the manufacturer of the tool that inserts them into an SCL file, and as such is in general understood only by that tool. Only the owner's tools are allowed to modify a Private element. Other tools are required to preserve Private elements unchanged.

Different manufacturers, indeed even different tools from the same manufacturer, use Private elements for different purposes. A UR SCL file has two Private elements. The first Private section contains all the settings not in a Public element. The second Private section contains an authentication code that allows the UR and UR Setup to determine if a non-GE tool has modified the first one. Thus between the Public and Private elements, a UR SCL file contains all of the device's settings in that single file. In IID files, there can be a third Private element that contains information regarding subscribed GOOSE messages, information that in CID and SCD files is in Public elements.

3.1.8.1 File types

SCL file names are given different extensions based on where they have been created in the substation configuration process and where they are intended to be used, as follows.

- **.icd — Default settings on UR** — An IED Capability Description (ICD) SCL file describes to a system configurator tool a single type of IED. For UR 7.30 and later, an ICD file describes a UR with a particular order code. It includes all the data attributes, control blocks, and settings with the factory default values for that order code. A copy of it can be obtained directly from a UR device, or from EnerVista UR Setup.
- **.ssd** — A System Specification Description (SSD) SCL file describes the single line diagram and functions of the substation and the required logical nodes. It is intended for exchange from a system specification tool to a system configurator and as such is not used by UR 7.30 and later.
- **.scd** — A System Configuration Description (SCD) SCL file describes the complete system configuration, including the single line diagram, all the IEDs and their information models, and the data flow between IEDs. It is intended for configuration exchange from the system configurator tool to each of the IED configurator tools. Typically a system configuration tool creates an SCD file by merging an ICD file for each IED in the substation with an SSD file, then configuring the GOOSE and report communications. EnerVista UR Setup is an IED configurator tool, and can accept an SCD file and save the settings for any UR devices it contains in URS files. EnerVista UR Setup can then send the settings in these URS files to the corresponding UR devices.
- **.cid — Settings sent to UR (may or may not contain the present settings)** — A Configured IED Description (CID) file describes the required settings of an IED and is intended for transmission of configuration from an IED configurator to the IED. It is an SCD file, possibly stripped down to what the concerned IED needs to know. EnerVista UR Setup creates and sends a CID file to the UR device when IEC 61850 settings are involved. A UR 7.30 and later CID file includes all data attributes of the target IED, control blocks and settings, and completely re-programs the receiving device. UR 7.30 and later devices also accept a CID file from a third-party configuration tool provided that the CID file is derived from a UR ICD file and contains the elements of the ICD file, possibly with modified settings. Supported file transfer formats are SFTP and 61850 MMS. TFTP can be used to get files, but a TFTP "put" command cannot be used for security reasons. The port number can be set as per the settings in the Instruction Manual.

- **.iid — Actual settings on UR** — An Instantiated IED Description (IID) SCL file describes a specific IED to a system configurator tool, typically more or less as configured for its role in the system. For UR 7.30 and later, an IID file includes all the data attributes of the UR device, control blocks and settings, with setting values all as they were at the moment that the IID file was generated. A copy of it can be obtained directly from a UR device or from EnerVista UR Setup. If obtained from the EnerVista UR Setup Offline Window, the settings are from the URS file selected. See the next section for more information.
- **.sed** — A System Exchange Description (SED) file is intended for configuration exchange between system configurators of different projects. This file describes the interfaces of one project to be used by the other project, and as such is not used by UR 7.30 and later.

3.1.8.2 SCL file example

To illustrate what an SCL file looks like, this section presents parts of an ICD file generated by a D60 UR with firmware 7.40.

The following appears at the beginning of UR SCL files. The first line identifies this file as an XML formatted file. The second line is a comment unique to UR devices. The third line indicates that it is an SCL file conforming to IEC 61850-6 edition 2.0 schema revision "B." The fourth line is a mandatory element that can be used by SCL tools to identify the specific configuration in this file and its version.

```
1       <?xml version="1.0" encoding="UTF-8"?>
2       <!--Created by GE Digital Energy UR 7.40 on Tue Dec 1 05:38:26 2015-->
3       <SCL xmlns="http://www.iec.ch/61850/2003/SCL" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.iec.ch/61850/2003/SCL SCL.xsd" version="2007" revision="B"
xmlns:eGE="http://www.gedigitalenergy.com/multilin">
4               <Header id="" nameStructure="IEDName"/>
```

Following the Header element is the Communication element. The Communications element contains a ConnectedAP element for each of the three UR Ethernet ports. Each ConnectedAP element is within its own SubNetwork element, as it is expected that each Ethernet port is connected to a separate network. Ethernet port 1 has ConnectedAP apName S1, while port 2 is S2 and port 3 is S3. The Address element at line 9 contains the IP address of the S1 port. The GSE element at line 20 contains address information of the first TxGOOSE, the interval to the first TxGOOSE message retransmission following an initial event message (MinTime), and the time allowed to live value. In the ICD file but not shown here, following this are the GSE elements for the remaining TxGOOSE, and then the SubNetwork elements for the other Ethernet ports, which are similar to the first.

```
5       <Communication>
6               <SubNetwork name="W1">
7                       <ConnectedAP iedName="TEMPLATE" apName="S1">
8                               <Address>
9                                       <P type="IP">127.0.0.1</P>
10                                      <P type="IP-SUBNET">255.0.0.0</P>
11                                      <P type="IP-GATEWAY">127.0.0.1</P>
12                                      <P type="OSI-AP-Title">1,3,9999,1</P>
13                                      <P type="OSI-AE-Qualifier">12</P>
14                                      <P type="OSI-PSEL">00000001</P>
15                                      <P type="OSI-SSEL">0001</P>
16                                      <P type="OSI-TSEL">0001</P>
17                                      <P type="OSI-AP-Invoke">102</P>
18                                      <P type="OSI-AE-Invoke">103</P>
19                              </Address>
20                              <GSE ldInst="Master" cbName="GoCB01">
21                                      <Address>
22                                              <P type="VLAN-ID">000</P>
23                                              <P type="VLAN-PRIORITY">4</P>
24                                              <P type="MAC-Address">01-0C-CD-01-00-00</P>
25                                              <P type="APPID">0000</P>
26                                              <P type="TransportInUse">0</P>
27                                              <P type="IPClassOfTraffic">46</P>
28                                              <P type="IPv6FlowLabel">0</P>
```

```
29                                      <P type="IpAddressLength">4</P>
30                                      <P type="IP">224.0.0.0</P>
31                                  </Address>
32                                  <MinTime unit="s" multiplier="m">4</MinTime>
33                                   <MaxTime unit="s" multiplier="m">300000</MaxTime>
34                          </GSE>
```

When TxGOOSE# MODE is set to GOOSE, the GSE element is as follows:

```
20                      <GSE ldInst="Master" cbName="GoCB01">
21                              <Address>
22                                      <P type="VLAN-ID">000</P>
23                                      <P type="VLAN-PRIORITY">4</P>
24                                      <P type="MAC-Address">01-0C-CD-01-00-00</P>
25                                      <P type="APPID">0000</P>
26                              </Address>
27                              <MinTime unit="s" multiplier="m">4</MinTime>
28                              <MaxTime unit="s" multiplier="m">300000</MaxTime>
29                      </GSE>
```

When TxGOOSE# MODE is set to R-GOOSE, the GSE element is as follows:

```
20                      <GSE ldInst="Master" cbName="GoCB01">
21                              <Address>
22                                      <P type="VLAN-ID">000</P>
23                                      <P type="VLAN-PRIORITY">4</P>
24                                      <P type="APPID">0000</P>
25                                      <P type="IPv6ClassOfTraffic">46</P>
26                                      <P type="IP">224.0.0.0</P>
27                              </Address>
28                              <MinTime unit="s" multiplier="m">4</MinTime>
29                              <MaxTime unit="s" multiplier="m">300000</MaxTime>
30                      </GSE>
```

Following the Communication element is the IED element, the beginning of which is as follows. As this example is an ICD file that has not been configured, the IED name has the filler "TEMPLATE." The first element in the IED element at line 296 is the Private element that contains the UR settings that are not contained in Public elements.

```
295     <IED type="L90" configVersion="7.80" desc="UR" name="Publisher" manufacturer="GE Multilin">
296             <Private type="GE_Digital_Energy_UR L90-UH7-HPH-F8L-H6R-M8L-P6S-U6L-W2H_7.80"><![CDATA[
297                     16435,1,1,1,30
298                     17074,1,1,1,0
299                     26763,1,1,1,1.00
```

After this main Private element, the IED element has a second Private element that contains a "signature" or hash of the first Private element, which allows the UR and EnerVista UR Setup software to detect if there has been any unauthorized change in the first element. Following that is the Services element that declares the IEC 61850 services that the UR device supports. For Edition 2:

```
13102           <Private type="GE_Digital_Energy_UR GE_Authentication_Code">331709458</Private>
13103           <Services nameLength="64">
13104                   <ClientServices goose="true"/>
13105                      <TimeSyncProt c37_238="true" sntp="true" />
13106                   </ClientServices>
13107                   <DynAssociation max="5"/>
13108                   <SettingGroups><SGEdit/></SettingGroups>
13109                   <GetDirectory/>
```

```
13110                <GetDataObjectDefinition/>
13111                <DataObjectDirectory/>
13112                <GetDataSetValue/>
13113                <DataSetDirectory/>
13114                <ConfDataSet max="18" maxAttributes="64"/>
13115                <ReadWrite/>
13116                <ConfReportControl max="48"/>
13117                <GetCBValues/>
13118               <ReportSettings cbName="Conf" datSet="Conf" rptID="Dyn/Conf" optFields="Dyn/Conf
" bufTime="Dyn/Conf " trgOps="Dyn/Conf " intgPd="Dyn/Conf "/>
13119                <GSESettings datSet="Conf" appID="Conf"/>
13120                <ConfLNs fixPrefix="true" fixLnInst="true"/>
13121                <ConfLdName/>
13122                <GOOSE max="16"/>
13123                <FileHandling/>
13124                <SupSubscription maxGo="64" maxSv="0"/>
13125         </Services>
```

For Edition 1, the Services content is as follows:

```
<Services>
  <DynAssociation />
  <SettingGroups>
       <SGEdit/>
  </SettingGroups>
  <GetDirectory/>
  <GetDataObjectDefinition/>
  <DataObjectDirectory/>
  <GetDataSetValue/>
  <DataSetDirectory/>
  <ConfDataSet max="18" maxAttributes="64"/>
  <ReadWrite/>
  <ConfReportControl max="48"/>
  <GetCBValues/>
  <ReportSettings cbName="Conf" datSet="Conf" rptID="{ReportSettings rptID setting value}"
optFields="{ReportSettings optFields setting value}" bufTime="{ReportSettings bufTime setting value}"
trgOps="{ReportSettings trgOps setting value}" intgPd="{ReportSettings intgPd setting value}"/>
  <GSESettings cbName="Conf" datSet=" Conf" appID="Conf"/>
  <ConfLNs fixPrefix="true" fixLnInst="true"/>
  <GOOSE max="16"/>
  <FileHandling/>
</Services>
```

For a unit with a non-HardFiber Process Bus Module, the Services content is as follows. For maxSV, X denotes 8, 16, or 24 based on the number of RxSV streams supported by the order code.

```
<Services nameLength="64">
   <ConfDataSet max="18" maxAttributes="64"/>
   <ConfReportControl max="48"/>
   <ReportSettings cbName="Conf" datSet="Conf" rptID="{ReportSettings rptID setting value}"
optFields="{ReportSettings optFields setting value}" bufTime="{ReportSettings bufTime setting value}"
trgOps="{ReportSettings trgOps setting value}" intgPd="{ReportSettings intgPd setting value}"/>
   <GSESettings cbName="Conf" datSet=" Conf" appID="Conf"/>
   <ConfLNs fixPrefix="true" fixLnInst="true"/>
   <ConfLdName/>
   <GOOSE max="16"/>
   <SupSubscription maxGo="64" maxSv="X"/>
</Services>
```

The "ReportSettings" element attributes "rptID," "optFields," "bufTime," "trgOps," and "intgPd" are configurable under **Settings > Product Setup > Communications > IEC 61850 > Reports > Report Settings** to either "Dyn" or "Conf."

Next in the IED element is the AccessPoint element, which describes the information model visible through Ethernet port 1. Following this AccessPoint element are AccessPoint elements for Ethernet ports 2 and 3, each of which declares that it has the same information model by referencing the first AccessPoint element. This first AccessPoint element contains an LDevice element for each logical device in the IED. Each LDevice element contains an LN0 or LN element for each logical node in that logical device. Each LN0 and LN element contains for each of its control blocks and data objects an element defining that control block or data object. In IID files for URs in which datasets have been configured, each dataset has an element defining that dataset also included here. The following code shows the first AccessPoint, its first logical device, first logical node, and first dataset.

```
13123    <AccessPoint name ="S1">
13124           <Server>
13125                 <Authentication none = "true"/>
13126                 <LDevice inst="Master" >
13127                        <LN0 lnType="LLN0_0" lnClass="LLN0" inst="">
13128                               <DataSet name="TT6DataSet1" eGE:Label="TT6DataSet1">
13129                                     <FCDA ldInst="Master" prefix="lnClass="LPHD" lnInst="1"
doName="PhyHealth" daName="stVal" fc="ST"/>
13130                                  <FCDA ldInst="Prot" prefix="PhsIoc" lnClass="PIOC" lnInst="1"
doName="Op" daName="general" fc="ST"/>
13131                                 </DataSet>
13132                             <ReportControl name="BRCB01"  intgPd="0" confRev="1" buffered="true"
bufTime="0" indexed="false">
13133                                    <TrgOps dchg="true" qchg="true" dupd="false" period="true"
gi="true"/>
13134                                     <OptFields seqNum="true" timeStamp="true" dataSet="true"
reasonCode="true" dataRef="true" bufOvfl="false" entryID="false" configRef="true"/>
13135                                     <RptEnabled max="1"/>
13136                              </ReportControl>
```

The Services element under the AccessPoint element is as follows.

For AccessPoints S1, S2 and S3:

```
<Services>
   <ClientServices goose="true"/>
        <TimeSyncProt c37_238="true" sntp="true" />
   </ClientServices>
   <DynAssociation max="5"/>
   <SettingGroups>
        <SGEdit/>
   </SettingGroups>
   <GetDirectory/>
   <GetDataObjectDefinition/>
   <DataObjectDirectory/>
   <GetDataSetValue/>
   <DataSetDirectory/>
   <ReadWrite/>
   <GetCBValues/>
   <FileHandling/>
</Services>
```

For AccessPoints P1 and P2, where X denotes 8, 16, or 24 based on the number of RxSV streams supported by the order code:

```
<Services>
   <ClientServices goose="true" sv="true" maxSMV="X"/>
```

```
      <TimeSyncProt sntp="true" />
   </ClientServices>
</Services>
```

Following is the element for a typical data object that is mapped to a FlexLogic operand. The Val element on line 47166 was within the TEMPLATE IED element, in the Prot LDevice element, and in the LN element with lnClass="PIOC" inst="1" prefix="PhsIoc", so the text in the Val element is the configured value of data attribute TEMPLATEProt/PhsIocPIOC1.Dpo.d.

```
47164                <DOI name="Dpo">
47165                       <DAI name="d">
47166                              <Val>PHASE IOC1 DPO operand</Val>
47167                       </DAI>
47168                </DOI>
```

Following is the element for a typical data object that is mapped to a setting that selects a FlexLogic operand. The Val element on line 47186 was within the same LN element shown previously, so the text of the Val element is the configured value of TEMPLATEProt/PhsIocPIOC1.BlkRef11.setSrcRef, which has here a 61850 ObjectReference to the FlexLogic operand "Off." The "@" represents the name of the containing IED element.

```
47184                <DOI name="BlkRef11">
47185                       <DAI name="setSrcRef">
47186                              <Val>@Master/LLN0.Off.stVal</Val>
47187                       </DAI>
47188                       <DAI name="setSrcCB">
47189                              <Val></Val>
47190                       </DAI>
47191                       <DAI name="d">
47192                              <Val>PHASE IOC1 BLOCK A setting for setting group 1.</Val>
47193                       </DAI>
47194                </DOI>
```

The IED element describes the structure of the information model by specifying for each logical node its lnType (for example, see line 13127 earlier). After the IED element, there is a DataTypeTemplates element that contains LNodeType elements that define for each lnType the data objects contained in logical nodes of that lnType. Similarly, the components of each data object type are defined in DOType elements, and the components of structured data attributes are defined in DAType elements.

3.1.8.3 Deadbands

Deadbands for measured values

The "db" data attributes are used by the relay to determine when to update the "mag" and "cVal" values from the associated "instmag" and "instcVal" values. Updates trigger reports and GOOSE messages.

Deadbands for complex measured values

A complex value, such as cVal, is a deadbanded value that contains magnitude and angle, with a specific timestamp. Although individual deadband data attributes for Magnitude (db) and Angle (dbAng) are instantiated, the cVal (mag & ang) need to be captured and frozen simultaneously with a corresponding timestamp (can be triggered by either mag or ang). This means that either a magnitude or an angle data attribute included in a GOOSE message or a report triggers a GOOSE message or report send.

"db" and "dbAng" CF parameters are configurable via SCL (CID) file and MMS clients can write the value.

Deadband parameters of measured values related to the signal sources are configurable under **Settings > Product Setup > Communications > IEC 61850 > System Setup > Signal Sources**.

Deadband parameters of measured values related to the Demand metering are configurable under **Settings > Product Setup > Communications > IEC 61850 > Product Setup > Demand**.

Deadband parameters of measured values related to the Energy metering are configurable under **Settings > Product Setup > Communications > IEC 61850 > Product Setup > Energy**.

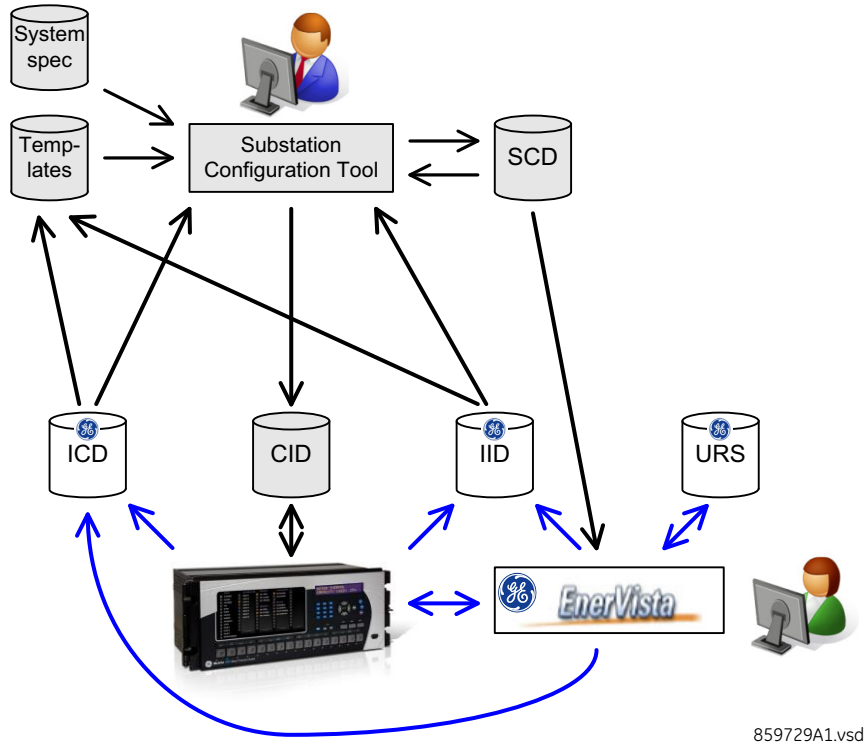
3.2 Configuring the UR using SCL

This section discusses use of an IEC 61850 Substation Configuration Tool (SCT) to configure a UR 7.30 or later device in a substation protection and control system consisting of many IEDs interconnected via an Ethernet local area network.

SCTs are available from a number of vendors. At present, GE does not market an SCT. In selecting an SCT, bear in mind that the SCT needs to understand how to use the particular SCL features used by each of the IEDs in the system; do not assume that any SCT claiming IEC 61850 can interoperate with any IED claiming 61850. A formal definition of SCL features used by UR 7.3 or later devices is contained near the end of this chapter (G2 implementation model for GOOSE configuration via SCL section on page 3-231). In addition, UR 7.3 and later devices implement an extension defined near the end of this chapter (E3-2.0 implementation model for GOOSE configuration via SCL section on page 3-247). These two sections are intended for SCT developers; an understanding of them is not required to follow this discussion.

IEC 61850 configuration consists of the exchange of SCL files, as illustrated in the figure.

Figure 3-8: Configuration for IEC 61850

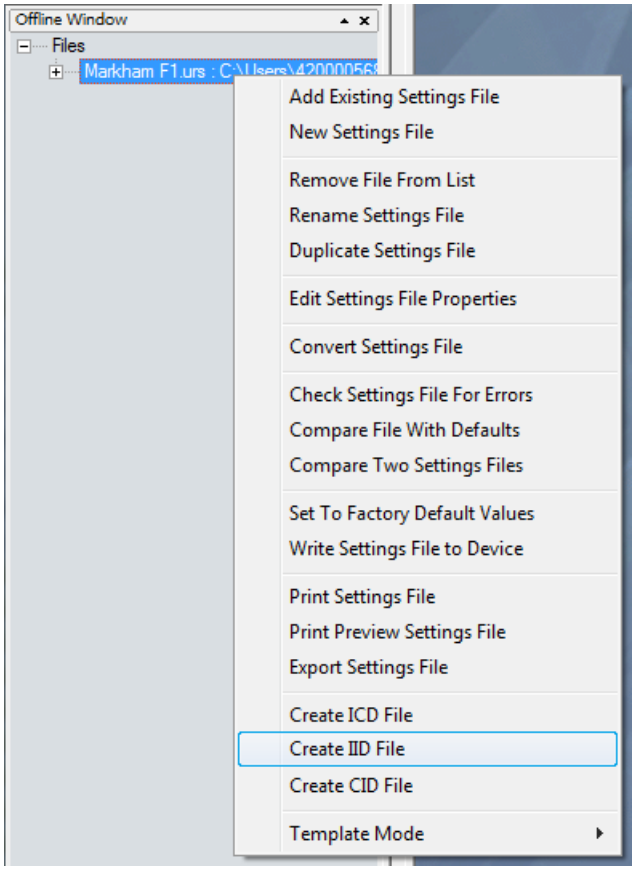


The SCT begins by importing a collection of SCL files, including a System Specification Description (SSD) that describes the single line diagram and functions of the substation, and for each IED in the system an IED Capabilities Description (ICD) that describes the functional and engineering capabilities of an IED type. In some cases System Exchange Description (SED) files are also used to exchange data between system configurators of different projects. Neither UR devices nor EnerVista UR Setup software deals with SSD or SED files, so they are not discussed further here; see instead the documentation of the SCT.

ICD files for UR devices can be obtained a number of ways, as follows:

- An ICD file can be obtained directly from the UR device using any of the supported file transfer protocols. The file name inside the UR device is "ur.icd".
- Another way that does not need a UR device is through EnerVista UR Setup software. Create a new URS settings file in the Offline Window with the exact order code of the target relay or use an existing offline settings file with the same order code, right-click on the file name, select **Create ICD File**, and enter a name for the file. A URS file is a file containing all the settings of a single UR family device in the native EnerVista UR Setup format.

Figure 3-9: Creating ICD file



An ICD file obtained from a UR 7.3 or later device or from EnerVista UR Setup software contains all of the settings in the device at their factory default values. Unlike some IEDs that use several files to contain a complete set of settings, UR-generated SCL files contain all of the device's settings. Settings related to IEC 61850 communications (such as GOOSE, reports, datasets, commands, MMS queries) are in Public elements that can be understood and configured by SCTs. The remainder of the settings are contained in a Private element that is not intended to be understood or modified by SCTs, only by EnerVista UR Setup. A second Private element contains a "signature" of the first that allows any modifications of UR Private setting data to be detected.

As these ICD files apply to all UR family devices with the same order code and firmware version, they can be given an appropriate file name, saved in a templates database, and reused for each similar UR device in the system and in future systems. However, starting the configuration from the factory default values for each of several similar UR devices applications unnecessarily duplicates setting efforts. In these cases it is more efficient to begin with a "template" ICD file in which the setting values that are the same of each application are preconfigured.

Pre-configured template ICD files can be obtained using EnerVista UR Setup software to create a settings file in its Offline Window as described, but to then to continue to use EnerVista software to configure its protection and control settings for a particular application type, for instance for a typical low voltage feeder. Some or all of its communications settings can be configured as well. Next, right-click on the file name, select **Create IID File**, enter a name for the file. Such IID files are the same as the ICD files previously described except that the settings are as modified by the EnerVista UR Setup user. Finally, rename the IID file with a .icd extension and save it in the templates database.

The SCT merges all the imported SCL files into a single System Configuration Description (SCD), and completes the communications configuration. For UR devices, this involves some or all of:

- Setting various configuration version parameters
- Giving the UR device a unique name
- Configuring the IP source address parameters
- Configuring addressing and timing parameters of GOOSE messages
- Adding datasets for publishing GOOSE messages
- Configuring GOOSE subscription
- Configuring addressing and timing parameters for reports
- Adding datasets for reports
- Configuring command models and timeouts

The following conditions apply to ensure that the resulting configuration is not rejected by the UR device or EnerVista UR Setup:

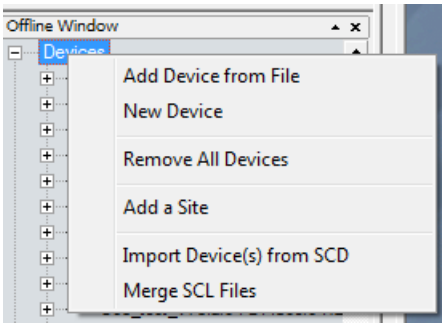
- In UR 7.40 and later, new LDevice elements can be added, LN elements other than those originally in the Master logical device can be moved between LDevice elements, and LDevice elements containing no LN elements can be removed
- The DataTypeTemplates element cannot be changed in a way that removes, adds, reorders, or changes properties of data objects or data attributes, although the template id attributes can be changed provided it is done consistently throughout the file so as to not affect the information model. EnumVal elements can be removed or reordered.
- Unused SubNetwork, GSE, and Address elements in the Communications element can be omitted as long as one SubNetwork and Communications element remains; the settings corresponding to omitted attributes are left at their factory default value. BitRate elements can be added to SubNetwork elements, but do not affect the fixed UR bit rate. Note that Access point S1 is physical Ethernet port 1, access point S2 is physical Ethernet port 2, and access point S3 is physical Ethernet port 3.
- Some other additions/changes can be tolerated on import, but are not preserved on export

If the configuration generated by the SCT in the SCD is complete, the next step is to use it to program each of the IEDs. For UR devices, there are several ways in which this can be done. A CID file can be sent directly to the UR device using any of the supported file transfer protocols. CID files, which can be directly generated by some SCTs, are just the SCD with configuration information not required by the target IED removed.

Alternatively, the SCD can be imported by EnerVista UR Setup, which generates URS files for each UR device that the SCD contains, and the configuration in those URS files sent to the URs.

To import a SCD or CID into EnerVista UR Setup, right-click on either the Offline Window label or the **Devices** label in the Offline Window, select **Import Devices from SCD**, and enter a name for a URS file for each of the IED configurations being imported. The default URS file name is the IED name in the SCD/CID. For writing settings from the imported files to the UR devices, connect to each UR device in the Online Window, and drag-and-drop the URS file in the Offline Window to the appropriate UR device in the Online Window. When the SCD file has more than one UR device in it, the system prompts for the name to use.

Figure 3-10: Importing a settings file



Note that there is no option to import IID files. This is because it is not called for in the standards and there is little need.

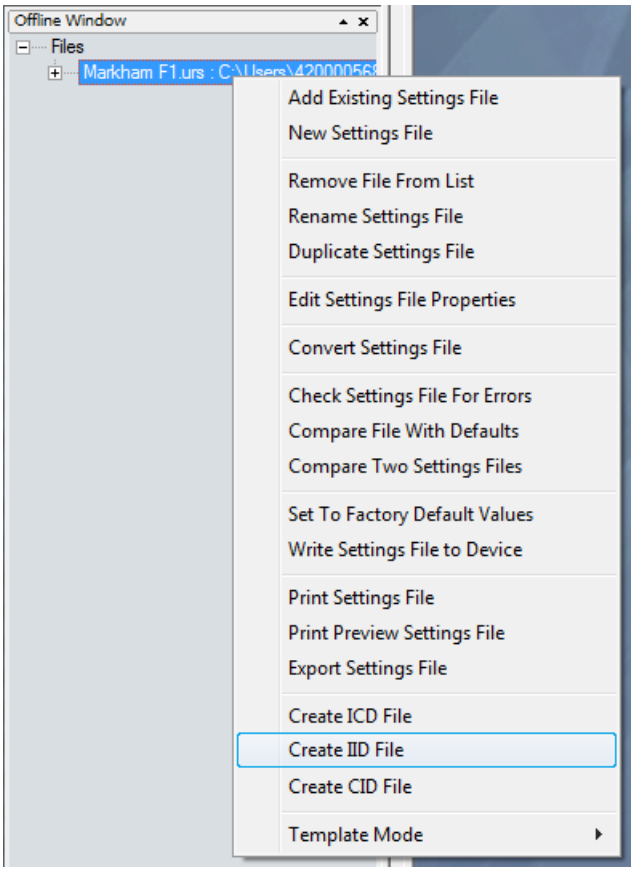
If the configuration generated by the SCT is not complete, which is typically the case, proceed as in the previous paragraph to import the SCD/CID, complete the configuration in the URS files using EnerVista UR Setup, and then drag the URS files to the UR devices.

For problems found during the commissioning stage that require a setting change, setting changes can be made using the front panel, EnerVista UR Setup, or the SCT. Changes made at any level in the SCT/UR Setup/UR device chain can be propagated down using the methods described in the preceding paragraphs. It is important that any changes made at a lower level in the UR device/UR Setup/SCT chain be propagated up to the other levels as well. Changes made through the front panel can be propagated to EnerVista UR Setup using the traditional **Add Device to Offline Window** selection in the Online Window. Changes made through the front panel can be propagated to the SCD by retrieving the IID file from the device using any of the supported file transfer protocols, and by using the SCT to merge that IID into the SCD. Changes made offline with the EnerVista UR Setup file can be propagated to the SCD by right-clicking on the file name in the Offline Window, selecting **Create IID File**, and using the SCT to merge that IID into the SCD.

As shown in the configuration figure earlier in this section, CID files can be retrieved for UR devices using any of the supported file transfer protocols. However, note that the CID that can be retrieved is the most recently received and accepted CID, renamed ur.cid. It does not contain any setting changes that have been made via the front panel. Neither does it contain any setting changes made by EnerVista UR Setup, unless the online IEC 61850 screen has been saved. Saving the online IEC 61850 screen sends a CID file to the UR.

EnerVista UR Setup can also generate a CID from a URS, using the **Create CID File** option in the Offline Window area. These CID files are the only ones sensitive to the Configuration Type setting on the **Settings > Product Setup > Communications > IEC 61850 > Server Configuration** panel. The UR 7.3 and later series devices implement two profiles of SCL, these being the G2 implementation model and the E3-2.0 implementation model, both of which are outlined near the end of this chapter. These vary in how GOOSE subscription configuration is represented. In the G2 model, either an ORG data object mapped to the final destination or a ExtRef in @Master/GGIO3 has an object reference to the quantity subscribed to and the GOOSE control block that transmits it, and the IED element of the publisher must be consulted to find information on the GOOSE message and where in the message is the subscribed quantity. In the E3-2.0 model, all the information necessary to subscribe to a published quantity is contained within the subscriber's IED element, using data objects that extend the standard logical node class LGOS. The G2 model is the way the standard intended GOOSE subscription to be configured. While the E3-2.0 model does not employ the standard's vision for subscription, it only requires CID files to contain one IED element, and the extensions do conform to the standard's rules for extensions.

Figure 3-11: Creating CID file



UR devices and EnerVista UR Setup automatically detect whether an imported CID file uses the G3 or the E3-2.0 model. UR devices do not generate CID files, they only make available a copy of the most recently received and accepted CID file. The model used when EnerVista UR Setup generates a CID file is determined by the Configuration Type setting.

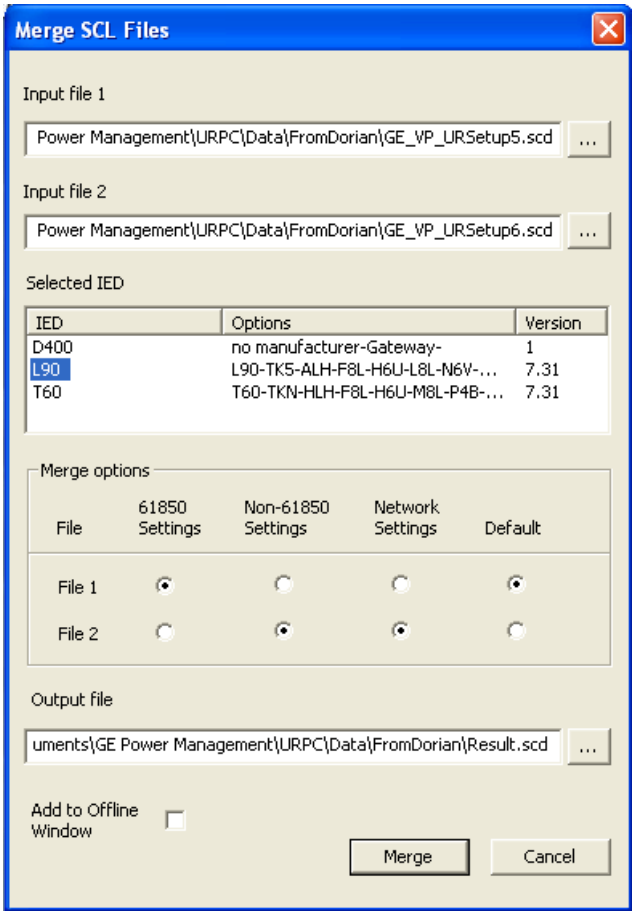
ICD files generated by UR devices and EnerVista UR Setup have factory default settings that do not have GOOSE subscription configured, and so implement both the G2 and the E3-2.0 model. IID files generated by UR devices and EnerVista UR Setup are constrained by the standard to have only one IED element, and so for IID files the G2 model and the E3-2.0 model are equivalent, provided the E3-2.0 extensions are populated, which they are. Thus only CID files generated by EnerVista UR Setup are sensitive to the Configuration Type setting.

3.2.1 Merge SCL file

The EnerVista UR Setup software includes a function to merge SCL files with UR settings. ICD, CID, IID, and SCD files are accepted as input and output.

1. In the software, select the device in the Offline Window area.
2. Select the **Offline > Merge SCL Files** menu item. The window opens.

Figure 3-12: Merge settings files



3. Complete the fields.

   Input file 1 — Select the source file to import. Valid file types are ICD, CID, IID, and SCD.

   Input file 2 — Select a second source file to import. An example is when IP addresses or Private settings are to be imported from another source file. Valid file types are ICD, CID, IID, and SCD.

   Selected IED — The order codes in the input files must match for a device to appear in the list here. The device name, order code, and firmware version of the device display.

   61850 Settings — The source file for the Public section of IEC 61850 settings.

   Non-61850 Settings — The source file for the Private section of the file.

   Network Settings — The source file for the three port IP and subnet addresses, default gateway and routing table settings. The relay applies the network settings (IP, subnet, gateway, routes) to its interfaces from the CID file when file is written to the relay via serial interface only. When the same file is written via Ethernet interface, these settings are not applied. The redundancy setting is applied by the relay from the CID file irrespective of the interface it is received from.

   Default — Merging common settings. This operation is necessary because of potential differences between the Public and Private values for the same setting.

   Output file — Name and location of the merged file.

   Add to Offline Window — Enable to copy the output file to the Offline Window area of the software, resulting in a .urs file visible in the Offline area. If the output file is not a CID file, it is renamed temporarily to .cid, imported, and renamed back to the original name.

4. Click the **Merge** button.
5. If a window opens, specify the location for the file to be added to the Offline Window area in the **Target Folder** field

and a name for this device/folder in the **Device Name** field. Click the **Finish** button.

6. The files are validated and the settings are imported from the files identified. When the option to Add to the Offline Window was selected, the output generates as merged files in the ICD, CID, IID, and SCD formats. Otherwise, a single file generates. Check the contents in a text editor. The _MergeReports.txt file indicates when the Default was used to merge common settings.
7. To use a merged file, drag-and-drop it into the Online Window area.

3.2.2 Configurable logical devices

The configurable logical devices feature available since UR 7.40 allows the assignment of logical nodes to logical devices to be customized to user requirements, and the number of logical devices to be changed to any number from 1 to 16.

The one logical device that must remain is Master. The following logical nodes have fixed assignment to the Master logical device:

- LPHD1 — models common issues for physical devices
- The LLN0 in the Master logical device, which includes group, GOOSE and report control blocks, and datasets
- LGOS logical nodes — for GOOSE subscription
- GGIO1 — for unmapped FlexLogic operands
- GGIO2 — for Virtual Input control
- GGIO3 — for RxGOOSE Inputs
- GGIO4 — for unmapped FlexAnalog operands

Other than these, and other than the LLN0 logical nodes in logical devices other than Master, all LN elements can be moved freely between LDevice elements. Note however that LN elements cannot be deleted, only moved.

An LDevice element that has no remaining LN elements (only LN0 remaining) can be deleted, effectively removing the logical device from the information model as if it never existed.

LDevice elements can be added up to 16 in total and LN elements moved into it from other LDevice elements, provided that it contains an LN0 element with lnType referencing a DOType equivalent to the LLN0_1 DOType contained in ICD files generated by the UR or the EnerVista UR Setup software.

3.3 Protocol implementation conformance statement (PICS)

3.3.1 Basic conformance statement

The tables contain the basic conformance statement.

Table 3-2: PICS for A-profile support

Profile description		Client / subscriber	Server / publisher	Value / comments
A1	Client/Server A-Profile per IEC 61850 8 1 clause 6.2.2		Yes	
A2	GOOSE/GSE management A-Profile per IEC 61850 8 1 clause 6.3.2		Yes	
A3	GOOSE A-Profile per IEC 61850 8 1 clause 6.3.2	Yes	Yes	
A4	TimeSync A-Profile	Yes		
A5	Security for Client/server A-Profile			
A6	Security for GOOSE/GSE management A-Profile			
A7	SV A-Profile per IEC 61850 9 2 clause 5.3.2	Yes		

Table 3-3: PICS for T-profile support

Profile description		Client / subscriber	Server / publisher	Value / comments
T1	TCP/IP T-Profile per IEC 61850 8 1 clause 6.2.2		Yes	RJ-45 and/or LC

Profile description		Client / subscriber	Server / publisher	Value / comments
T2	SV T-Profile per IEC 61850 9 2 clause 5.3.3	Yes		
T3	GOOSE T-Profile per IEC 61850 8 1 clause 6.3.3	Yes	Yes	RJ-45 and/or LC
T4	GSSE T-Profile			deprecated
T5	TimeSync T-Profile per IEC 61850 8 1 clause 6.4.3		Yes	RJ-45 and/or LC

3.4 ACSI conformance statement

3.4.1 ACSI basic conformance statement

The table contains the Abstract Communication Service Interface (ACSI) conformance statement.

Table 3-4: ACSI basic conformance statement

		Client / subscriber	Server / publisher	Value / comments
Client-server roles				
B11	Server side (of Two-party Application-Association)		Yes	
B12	Client side (of Two-party Application-Association)			
SCSMs supported				
B21	SCSM: IEC 61850-8-1 used		Yes	
B22	SCSM: IEC 61850-9-1 used			deprecated
B23	SCSM: IEC 61850-9-2 used			
B24	SCSM: other			
Generic substation event model (GSE)				
B31	Publisher side		Yes	
B32	Subscriber side	Yes		
Transmission of sampled value model (SVC)				
B41	Publisher side			
B42	Subscriber side	Yes		

3.4.2 ACSI models conformance statement

The table contains the conformance statement.

Notes:

- Yes = Service is supported
- No or empty = Service is not supported

Table 3-5: ACSI models conformance statement

		Client / subscriber	Server / publisher	Value / comments
M1	Logical device		Yes	
M2	Logical node		Yes	
M3	Data		Yes	
M4	Data set		Yes	
M5	Substitution			
M6	Setting group control		Yes	
Reporting				
M7	**Buffered report control**		Yes	
M7-1	sequence-number		Yes	

		Client / subscriber	Server / publisher	Value / comments
M7-2	report-time-stamp		Yes	
M7-3	reason-for-inclusion		Yes	
M7-4	data-set-name		Yes	
M7-5	data-reference		Yes	
M7-6	buffer-overflow		Yes	
M7-7	entryID		Yes	
M7-8	BufTm		Yes	
M7-9	IntgPd		Yes	
M7-10	GI		Yes	
M7-11	conf-revision		Yes	
M8	**Unbuffered report control**		Yes	
M8-1	sequence-number		Yes	
M8-2	report-time-stamp		Yes	
M8-3	reason-for-inclusion		Yes	
M8-4	data-set-name		Yes	
M8-5	data-reference		Yes	
M8-6	BufTm		Yes	
M8-7	IntgPd		Yes	
M8-8	GI		Yes	
M8-9	conf-revision		Yes	
Logging				
M9	Log control (LCB)			
M9-1	IntgPd			
M10	Log			
Control				
M11	Control		Yes	
GSE				
M12	GOOSE	Yes	Yes	
M13	GSSE			deprecated
SVC				
M14	Multicast SVC	Yes		
M15	Unicast SVC			
Miscellaneous				
M16	Time	Yes		
M17	File transfer		Yes	
M18	Application association		Yes	
M19	GOOSE Control Block		Yes	
M20	Sampled Value Control Block			

3.4.3 ACSI services conformance statement

The table contains the conformance statement.

Table 3-6: ACSI services conformance statement

		Client / subscriber	Server / publisher	Comments
Server (IEC 61850-7-2 clause 7)				
S1	GetServerDirectory (LOGICAL-DEVICE)		Yes	

		Client / subscriber	Server / publisher	Comments
Application association (IEC 61850-7-2 clause 8)				
S2	Associate		Yes	
S3	Abort		Yes	
S4	Release		Yes	
Logical device (IEC 61850-7-2 clause 9)				
S5	LogicalDeviceDirectory		Yes	
Logical node (IEC 61850-7-2 clause 10)				
S6	GetLogicalNodeDirectory		Yes	
S7	GetAllDataValues		Yes	
Data object (IEC 61850-7-2 clause 11)				
S8	GetDataValues		Yes	
S9	SetDataValues		Yes	
S10	GetDataDirectory		Yes	
S11	GetDataDefinition		Yes	
Data set (IEC 61850-7-2 clause 13)				
S12	GetDataSetValues		Yes	
S13	SetDataSetValues			
S14	CreateDataSet			
S15	DeleteDataSet			
S16	GetDataSetDirectory		Yes	
Substitution				
S17	SetDataValues			
Setting group control (IEC 61850-7-2 clause 16)				
S18	SelectActiveSG		Yes	
S19	SelectEditSG		Yes	
S20	SetEditSGValue			
S21	ConfirmEditSGValues			
S22	GetEditSGValue		Yes	
S23	GetSGCBValues		Yes	
Reporting (IEC 61850-7-2 clause 17)				
Buffered report control block (BRCB)				
S24	Report		Yes	
S24-1	data-change (dchg)		Yes	
S24-2	qchg-change (qchg)		Yes	
S24-3	data-update (dupd)			
S25	GetBRCBValues		Yes	
S26	SetBRCBValues		Yes	
Unbuffered report control block (URCB)				
S27	Report		Yes	
S27-1	data-change (dchg)		Yes	
S27-2	qchg-change (qchg)		Yes	
S27-3	data-update (dupd)			
S28	GetURCBValues		Yes	
S29	SetURCBValues		Yes	

		Client / subscriber	Server / publisher	Comments
Logging (IEC 61850-7-2 clause 17)				
Log control block				
S30	GetLCBValues			
S31	SetLCBValues			
Log				
S32	QueryLogByTime			
S33	QueryLogAfter			
S34	GetLogStatusValues			
Generic substation event model (GSE)				
GOOSE (Clause 18)				
S35	SendGOOSEMessage		Yes	
S36	GetGoReference			
S37	GetGOOSEElementNumber			
S38	GetGoCBValues		Yes	
S39	SetGoCBValues		Yes	
GSSE (IEC 61850-7-2 clause 18)				
S40	SendGSSEMessage			deprecated
S41	GetGsReference			deprecated
S42	GetGSSEElementNumber			deprecated
S43	GetGsCBValues			deprecated
S44	SetGsCBValues			deprecated
Transmission of sampled value model (SVC) (IEC 61850-7-2 clause 19)				
Multicast SVC				
S45	SendMSVMessage	Yes		
S46	GetMSVCBValues			
S47	SetMSVCBValues			
Unicast SVC				
S48	SendUSVMessage			
S49	GetUSVCBValues			
S50	SetUSVCBValues			
Control (IEC 61850-7-2 clause 20)				
S51	Select		Yes	
S52	SelectWithValue		Yes	
S53	Cancel		Yes	
S54	Operate		Yes	
S55	Command-Terminate		Yes	
S56	TimeActivatedOperate			
File transfer (IEC 61850-7-2 clause 23)				
S57	GetFile		Yes	
S58	SetFile		Yes	
S59	DeleteFile			
S60	GetFileAttributeValues		Yes	
S61	GetServerDirectory (FILE-SYSTEM)		Yes	
Time (clause 5.5)				
T1	Time resolution of internal clock	20		Nearest negative power of 2^{-n} in seconds (number 0 .. 24)

		Client / subscriber	Server / publisher	Comments
T2	Time accuracy of internal clock	T0 SNTP T1 IRIG-B PTP		TL (ms) (low accuracy), T3 < 7) (only Ed2) T0 (ms) (≤10 ms), 7 ≤ T3 < 10 T1 (µs) (≤1 ms), 10 ≤ T3 < 13 T2 (µs) (≤100 µS), 13 ≤ T3 < 15 T3 (µs) (≤25 µS), 15 ≤ T3 < 18 T4 (µs) (≤25 µS), 15 ≤ T3 < 18 T5 (µs) (≤1 µS), T3 ≥ 20
T3	Supported TimeStamp resolution	20		Nearest value of 2^{-n} in seconds (number 0 .. 24)

3.5 Model implementation conformance statement (MICS)

This model implementation conformance statement (MICS) details the information model supported by a particular UR device, including implemented logical devices, logical nodes, data objects, and data attributes. It is the top-level IEC 61850 data model. The information model also contains implemented control blocks and datasets.

The information model of a UR device depends in general on the device's order code, and it can vary widely from product to product and from option to option. The complete information model for a particular UR device with a particular order code, as it exists with factory default settings, is embodied in the device's IED capability description (ICD) file. A device's ICD file can be obtained from the device itself or from the EnerVista UR Setup software.

This section contains an outline of the information model of the UR family of devices; the information model of a particular UR device consists of the subset of what is shown here that is relevant to that UR device.

In order to contain the size of this chapter, the following repetitious data objects and data attributes are omitted from this outline. These are nonetheless implemented in the device.

Table 3-7: Common data objects and attributes

Name	Description
Beh	The data object Beh is mandatory in every logical node. The value of Beh.stVal in LLN0 of the Master logical device is test/blocked if the FlexLogic operand ANY MAJOR ERROR is On, otherwise test/blocked if the **TEST MODE FUNCTION** selection is Test-Blocked, otherwise test if the **TEST MODE FUNCTION** selection is Test, otherwise on. In all other logical nodes, the value of Beh.stVal is off if the function modeled by the logical node has a Function Disabled/Enabled setting and that setting is selected Disabled, otherwise is the same as the value of Beh.stVal in the Master LLN0.
NamPlt	Although optional, the data object NamPlt is instantiated in every logical node except LPHD1. This data object contains in its d data attribute a natural language description of the UR element the containing logical node is modelling. It is included below only in the Master logical device, as there it contains several important data attributes not found in the others.
t	The data attribute t (TimeStamp) is mandatory in every status, measurand and control data object, and reflects the UR device UTC time at last value change of the status, measurand, control, or q values of the containing data object.
q	The data attribute q (Quality) is mandatory in every status, measurand and control data object, and reflects the quality of the status, measurand and control values of the containing data object. q is fixed at zero in cases where the value is an internal UR device mode or status, and thus the value is known to be good, is unaffected by test mode, cannot be operator blocked and cannot be substituted. Otherwise, q is set according to the following table. Note that the value of Beh.stVal of the logical node containing the Quality data attribute is as described a few paragraphs earlier in this section.
d	This textual description is in every logical node. When in a NamPlt data object, the description refers to the logical node, otherwise it describes the data object it is in. These data attributes are readable via MMS services and reconfigurable via SCL file download.
dataNs	The data name space is included in data objects that extend those specified by the logical node class in the standard. Where the extended data object is defined in IEC 61850 7 4, its value is "IEC 61850-7-4:2007A". Otherwise, it has the value "GE Multilin UR Namespace:2015A" and is defined in the GE Namespace subsection of this section. These data attributes are readable via MMS services.

Table 3-8: Typical Quality data attribute values in UR devices

Containing logical node's Beh.stVal	q. validity	q. test	q. detailQual	q. source	q. operatorblocked
on	good	false	0	process	false
test	good	true	0	process	false
test/blocked	invalid if ANY MAJOR ERROR, else good	true	0	process	false
off	invalid	false	0	process	false

Many of the UR family device elements have multiple instances, and in many cases the number of instances depends on the product or the device's order code. Also, many UR elements have operands and/or settings that are repetitive, such as for every phase, or for every step. Again for brevity, in the following information model outline a template representing multiple logical nodes or multiple data objects is often used. These templates are identified with a Greek or punctuation character, such as γ or #, in the logical node/data object name. In a UR device, the template is instantiated multiple times with the punctuation or Greek character replaced with the appropriate instance number or instance identifier.

The R/W/C column in the following tables is coded as follows:

- R — Value of the data object or data attribute is readable via MMS services
- W — Value of the data object or data attribute is writable via MMS services
- C — Value of the data object or data attribute is configurable via SCL file download
- Ctrl — The data object can be controlled via MMS services

The logical nodes implemented in UR devices since version 7.30 are sorted into six logical devices. The table outlines the six logical devices and the general rules for the fixed assignment of logical nodes to them. Each logical device has a section in this chapter that defines the logical nodes implemented for that logical device. In UR 7.40 and later, new LDevice elements other than those originally in the Master logical device can be moved between LDevice elements, and LDevice elements containing no LN elements can be removed.

Table 3-9: Logical devices

Logical device	Contains logical nodes modeling...
Master	communications, including GOOSE, reports, Remote I/O, Direct I/O, Virtual Inputs, Modbus, DNP, and so on. Setting group control. This is the root logical device.
Protection (Prot)	protection functions
Control (Ctrl)	control and monitoring functions
System	power system devices: breakers, switches, CTs, VTs, and so on, including interface to these such as AC inputs, contact I/O, transducer I/O, HardFiber I/O
Metering (Meter)	metering and measurement (other than PMU), including Signal Sources
General (Gen)	FlexLogic, virtual outputs, non-volatile latches, FlexElements, FlexMath, recording (for example oscillography), security, front panel, clock
Process Bus Module (PBus)	UR Process Bus Module functions, such as SV subscription, AC Banks, and process bus Time Synchronization. Order code requires a Process Bus Module. Logical device is read-only.

3.5.1 Master (root) logical device

The Master logical device contains communications-related logical nodes, including GOOSE, reports, log, and virtual inputs.

The logical devices in UR family devices are arranged in a hierarchy, with the Master logical device as the root logical device and all other implemented logical devices direct descendants. The effect of this arrangement is that the scope of certain items in the Master logical device includes the entire hierarchy, as outlined in the following table.

Table 3-10: Master/root data objects and attributes

Name	Description
Mod	The controllable data object Mod controls the test mode selection of the UR device and thus affects the status of Beh data objects and of q data attributes
configRev	The configurable data attribute configRev has a scope that includes the entire UR device. Modify this attribute whenever any logical node gets a new semantic use, for example an instance of a CSWI is now serving a different physical switch or an instance of a logical node PDIS is now used for another zone. Also modify this attribute whenever any data object gets a new semantic use, for example the use of ConInGGIO.Ind1 changes from "Door open" to "Fire alarm". As it is not in general possible for the device to know that such a change has occurred, you need to revise the value of configRev.
paramRev	The configurable data attribute paramRev has a scope that includes the entire device, and thus is modified whenever any setting in the device changes. The UR increments the value of paramRev by one whenever one or multiple setting changes occurs in one Modbus write request by any means (front panel, Modbus, or MMS) other than by SCL file download. Incrementing occurs whether or not the setting is represented in the information model. When a UR device or EnerVista UR Setup accepts an SCL file, paramRev is set to the value in that SCL file. When EnerVista UR Setup changes one or more settings, and prepares an SCL file, it increments paramRev to the next higher multiple of 10 000.
SCGB	The setting group control block in the Master logical device has a scope that includes the entire device due to the UR logical device hierarchy. That is to say, all grouped settings are controlled form this one control block.

3.5.1.1 Event recorder (EvtRcd)

See LLN0.

3.5.1.2 Logical node zero (LLN0)

This element is instantiated in all UR devices.

The following is specific to the Master logical device. LLN0 in other logical devices have different content.

Table 3-11: Logical node zero data objects

LNName: LLN0		LDevice inst: Master		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		ENS			This logical device's behaviour	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
Health		ENS			Only instantiated in the Master logical device	R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
On		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST			R
Off		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST			R
Zero		MV			Only instantiated in the Master logical device	R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32				R
ZeroSV		SAV			Only instantiated in the Master logical device and when the order code includes process bus module. Not instantiated in C30.	R
	instMag	AnalogueValue	MX			R
	instMag.i	INT32				R
Mod		ENC			Only instantiated in the Master logical device	R/Ctrl
	ctlVal	ENUMERATED	CO			R

LNName: LLN0		LDevice inst: Master		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	ENUMERATED	ST			R
	ctlModel	CtlModels	CF	LLN0.Mod.ctlModel	2, the code for SBO control with normal security according to IEC 61850-7-2.	R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
TstMod		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST	IED Beh Test RLY IN TEST MODE		R
TstBlkMod		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST	IED Beh Test-Blocked RLY IN TESTBLK MODE		R
OnMod		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST	IED Beh On RLY IN ON MODE		R
GrRef		ORG			Reference to root logical device	R
	setSrcRef	ObjectReference	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R
MltLev		SPG			Instantiated only in the Master logical device	R
	setVal	BOOLEAN	SP			R
InRef11		ORG			TEST MODE INPUT setting	R
	setSrcRef	ObjectReference	SP	TEST MODE INPUT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef12		ORG			TEST-BLK MODE INPUT setting	R
	setSrcRef	ObjectReference	SP	TEST-BLK MODE INPUT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.1.3 Physical device information (LPHD1)

This element is instantiated in all UR devices.

Table 3-12: Physical device data objects

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
PhyNam		DPL			This physical device's name plate	R
	vendor	VISIBLE STRING255	DC	"GE Multilin"		R
	swRev	VISIBLE STRING255	DC	Firmware revision, e.g. "7.30"		R
	serNum	VISIBLE STRING255	DC	The serial number of this unit.		R
	model	VISIBLE STRING255	DC	The order code of this unit.		R
	location	VISIBLE STRING255	DC	Location		R/C
	name	VISIBLE STRING64	DC	RELAY NAME		R/C

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	latitude	FLOAT32	DC	Latitude		R/C
	longitude	FLOAT32	DC	Longitude		R/C
	altitude	FLOAT32	DC	Altitude		R/C
PhyHealth		ENS			This physical device's health	R
	stVal	ENUMERATED	ST			R
Proxy		SPS			Indicates if this LN is a proxy	R
	stVal	BOOLEAN	ST			R
RsStat		SPC			Mapped to command CLEAR ALL RELAY RECORDS	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	LPHD1.RsStat.ctlModel	1, the code for direct control with normal security; 2 is code for SBO with normal security; 0 is for status only according to IEC 61850-7-2. Enhanced security is not supported as there is no means of confirming successful execution of the control command.	R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
Sim		SPC			Will accept simulated GOOSE messages	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	LPHD1.Sim.ctlModel	1, the code for direct control with normal security; 2 is code for SBO with normal security; 0 is for status only according to IEC 61850-7-2. Enhanced security is not supported as there is no means of confirming successful execution of the control command.	R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
	stVal	BOOLEAN	ST			R
TxGoSim		SPC			Sim bit status in transmitted GOOSE messages	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U				R

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	LPHD1.TxGoSim.ctlModel	1, the code for direct control with normal security; 2 is code for SBO with normal security; 0 is for status only according to IEC 61850-7-2. Enhanced security is not supported as there is no means of confirming successful execution of the control command.	R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
	stVal	BOOLEAN	ST	True if "Tx GOOSE Sim Mode" is EnabledFalse if "Tx GOOSE Sim Mode" is Disabled.		R
MMSConnects		MV			Number of MMS client connections active	R
	mag.i	INT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	sVC.scaleFactor	FLOAT32				R
	sVC.offset	FLOAT32				R
AnyErr		SPS			ANY SELF TESTS operand	R
	stVal	BOOLEAN	ST	ANY SELF TESTS		R
MajorErr		SPS			ANY MAJOR ERROR operand	R
	stVal	BOOLEAN	ST	ANY MAJOR ERROR		R
MinorErr		SPS			ANY MINOR ERROR operand	R
	stVal	BOOLEAN	ST	ANY MINOR ERROR		R
BatFail		SPS			BATTERY FAIL operand	R
	stVal	BOOLEAN	ST	BATTERY FAIL		R
ClkUnsynch		SPS			CLOCK UNSYNCHRONIZED operand	R
	stVal	BOOLEAN	ST	CLOCK UNSYNCHRONIZED		R
DrcDevOff		SPS			DIRECT DEVICE OFF operand	R
	stVal	BOOLEAN	ST	DIRECT DEVICE OFF		R
DrcRingBrk		SPS			DIRECT RING BREAK operand	R
	stVal	BOOLEAN	ST	DIRECT RING BREAK		R
EqpMismat		SPS			EQUIPMENT MISMATCH operand	R
	stVal	BOOLEAN	ST	EQUIPMENT MISMATCH		R
FlexErrTkn		SPS			FLEXLOGIC ERR TOKEN operand	R
	stVal	BOOLEAN	ST	FLEXLOGIC ERR TOKEN		R
IrigbFail		SPS			IRIG-B FAILURE operand	R
	stVal	BOOLEAN	ST	IRIG-B FAILURE		R
LatchErr		SPS			LATCHING OUT ERROR operand	R
	stVal	BOOLEAN	ST	LATCHING OUT ERROR		R
OscilGOOSE		SPS			Oscillatory GOOSE operand	R
	stVal	BOOLEAN	ST	Oscillatory GOOSE		R
FrstEthFail		SPS			FIRST ETHERNET FAIL operand	R
	stVal	BOOLEAN	ST	FIRST ETHERNET FAIL		R
PtpFail		SPS			PTP FAILURE operand	R

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	PTP FAILURE		R
RxGooseOff		SPS			RxGOOSE OFF operand	R
	stVal	BOOLEAN	ST	RxGOOSE OFF		R
RrtdComFail		SPS			RRTD COMM FAIL operand	R
	stVal	BOOLEAN	ST	RRTD COMM FAIL		R
SecEthFail		SPS			SECOND ETHERNET FAIL operand	R
	stVal	BOOLEAN	ST	SECOND ETHERNET FAIL		R
ThrdEthFail		SPS			THIRD ETHERNET FAIL operand	R
	stVal	BOOLEAN	ST	THIRD ETHERNET FAIL		R
PBEth$Fail		SPS			Instantiated only if the order code includes Process Bus Module	R
	stVal	BOOLEAN	ST	PBEthPort$ Fail		R
SntpFail		SPS			SNTP FAILURE operand	R
	stVal	BOOLEAN	ST	SNTP FAILURE		R
SysExcp		SPS			SYSTEM EXCEPTION operand	R
	stVal	BOOLEAN	ST	SYSTEM EXCEPTION		R
TempMnt		SPS			TEMP MONITOR operand	R
	stVal	BOOLEAN	ST	TEMP MONITOR		R
UNotPrgm		SPS			UNIT NOT PROGRAMMED operand	R
	stVal	BOOLEAN	ST	UNIT NOT PROGRAMMED		R
ProcBusFail		SPS			PROCESS BUS FAILURE operand	R
	stVal	BOOLEAN	ST	PROCESS BUS FAILURE		R
ProcBusTrbl		SPS			PROCESS BUS TROUBLE operand	R
	stVal	BOOLEAN	ST	PROCESS BUS TROUBLE		R
VoltMntr		SPS			VOLTAGE MONITOR operand	R
	stVal	BOOLEAN	ST	VOLTAGE MONITOR		R
BrckTrbl		SPS			BRICK TROUBLE operand	R
	stVal	BOOLEAN	ST	BRICK TROUBLE		R
RtdTrbl		SPS			RTD TROUBLE operand	R
	stVal	BOOLEAN	ST	RTD TROUBLE		R
TdrTrbl		SPS			TDR TROUBLE operand	R
	stVal	BOOLEAN	ST	TDR TROUBLE		R
RlyUTCTms		INS			Relay UTC time	R
	stVal	INT32	ST	Modbus register 41A0h value, i.e., “Relay time clock set time” register value after converting to UTC (if time zone and DST is used)		R
	units.SIUnit	ENUMERATED			4, the code for time	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

3.5.1.4 GOOSE subscription monitor (LGOS)

This element is instantiated in all UR devices.

See the G2 implementation model for GOOSE configuration via SCL section on page 3-231 for descriptions of data objects MAC, APPID, GoDatSetRef, GoID, ConfRev and InRefδδ.

Table 3-13: GOOSE subscription monitor data objects

LNName: LGOS#		LDevice inst: Master		UR element: Mapped to setting RxGOOSE# ID if not empty string, otherwise "RxGOOSE#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
St		SPS			RxGOOSE# On operand	R
	stVal	BOOLEAN	ST	RxGOOSE# On		R
Alm		SPS			RxGOOSE# Off operand	R
	stVal	BOOLEAN	ST	RxGOOSE# Off		R
SimSt		SPS			Status showing that Sim messages are being received and accepted for RxGOOSE#	R
	stVal	BOOLEAN	ST	Status showing that really Sim messages are received and accepted		R
LastStNum		INS			Actual value RxGOOSE# stNum	R
	stVal	INT32	ST	Actual value RxGOOSE# stNum		R
	units.SIUnit	ENUMERATED				R
	units.multiplier	ENUMERATED				R
LastSqNum		INS			Actual value RxGOOSE# sqNum	R
	stVal	INT32	ST	Actual value RxGOOSE# sqNum		R
	units.SIUnit	ENUMERATED				R
	units.multiplier	ENUMERATED				R
RxConfRevNum		INS			Status of the confRev field in last accepted RxGOOSE# message	R
	stVal	INT32	ST	Status of the confRev field in last accepted RxGOOSE# message		R
	units.SIUnit	ENUMERATED				R
	units.multiplier	ENUMERATED				R
ConfRevNum		INS			Expected ConfRev number	R
	stVal	INT32	ST	value of RxGOOSE# ConfRev		R/C
	units.SIUnit	ENUMERATED				R
	units.multiplier	ENUMERATED				R
GoCBRef		ORG				R
	setSrcRef	ObjectReference	SP	Mapped to RxGOOSE# GoCBRef	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R
MAC		VSG			Destination MAC address of messages subscribed to by RxGOOSE#	R
	setVal	VISIBLE STRING255	SP	RxGOOSE# Dst MAC if in E32.0 mode, otherwise empty string.		R/C
RgRxMode		ENG			R-RxGOOSE# RECEPTION MODE setting	R
	setVal	ENUMERATED	SP	R-RxGOOSE# RECEPTION MODE		R/C
RgSrcIP		VSG			Source IP address of subscribed RGOOSE message	R
	setVal	VISIBLE STRING255	SP	R-RxGOOSE# SRC IP if in E32.0 mode, otherwise empty string.		R/C
RgDstIP		VSG			Destination IP address of subscribed R-GOOSE message	R
	setVal	VISIBLE STRING255	SP	R-RxGOOSE# DST IP if in E32.0 mode, otherwise empty string.		R/C

LNName: LGOS#		LDevice inst: Master		UR element: Mapped to setting RxGOOSE# ID if not empty string, otherwise "RxGOOSE#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
SecEna		ENG			R-RxGOOSE# SECURITY setting	R
	setVal	ENUMERATED	SP	RxGOOSE# SECURITY if in E32.0 mode, otherwise 0.		R/C
APPID		ING			Setting RxGOOSE# ETYPE APPID	R
	setVal	INT32	SP	RxGOOSE# ETYPE APPID if in E32.0 mode, otherwise 0.		R/C
	minVal	INT32	CF			R
	maxVal	INT32	CF			R
	stepSize	INT32U	CF			R
	units.SIUnit	ENUMERATED				R
	units.multiplier	ENUMERATED				R
GoDatSet Ref		ORG			Setting RxGOOSE# datSet	R
	setSrcRef	ObjectReference	SP	Mapped to RxGOOSE# datSet prefixed with the <LDName>/ LLN0$ portion of RxGOOSE# GoCBRef if in E32.0 mode, otherwise empty string.	reference to the data attribute to input	R/C
GoID		VSG			Setting RxGOOSE# goID	R
	setVal	VISIBLE STRING255	SP	RxGOOSE# goID if in E32.0 mode, otherwise empty string.		R/C
RxMode		ENG			RxGOOSE# MODE setting	R
	setVal	ENUMERATED	SP	RxGOOSE# MODE if in E3-2.0 mode, otherwise set to default " 0"		R/C
InRefδδ		ORG			RxGOOSE# Member δδ	R
	setSrcRef	ObjectReference	SP	specifying bType and intermediate data object for RxGOOSE# Member δδ	reference to the data attribute to input	R/C
	intAddr	VISIBLE STRING255	SP			R/C

3.5.1.5 FlexLogic operand interface (GGIO1)

This element is instantiated in all UR devices.

Table 3-14: FlexLogic data objects

LNName: <configured GGIO1 prefix>GGIO1		LDevice inst: Master		UR element: FlexLogic Operand Interface functionality		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Indψψψ		SPS			The name of the operand selected by setting GGIO1 INDICATION ψ	R
	stVal	BOOLEAN	ST			R

3.5.1.6 Virtual inputs (GGIO2)

This element is instantiated in all UR devices.

Table 3-15: Virtual input data objects

LNName: <configured GGIO2 prefix>GGIO2		LDevice inst: Master		UR element: Generic controllable single point		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
SPCSOψ		SPC			Status and control of FlexLogic operand Virt Ip ψ On	R/Ctrl
	stVal	BOOLEAN	ST	FlexLogic operand Virt Ip ψ On		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	GGIO2 CF SPCSO ψ CTLMODEL		R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R

3.5.1.7 Intermediate GOOSE subscription objects (GGIO3)

This element is instantiated in all UR devices.

Table 3-16: Intermediate GOOSE subscription data objects

LNName: GGIO3		LDevice inst: Master		UR element: RxGOOSE Inputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Indψψψ		SPS			RxGOOSE Booleanψ operand	R
	stVal	BOOLEAN	ST	RxGOOSE Booleanψ On		R
IndPosψψ		DPS			RxGOOSE DPSψ actual value	R
	stVal	CODED ENUM	ST			R
OpnStψψ		SPS			RxGOOSE DPSψ Off operand	R
	stVal	BOOLEAN	ST	FlexLogic operand RxGOOSE DPSψ Off		R
ClsStψψ		SPS			RxGOOSE DPSψ On operand	R
	stVal	BOOLEAN	ST	FlexLogic operand RxGOOSE DPSψ On		R
BadStψψ		SPS			RxGOOSE DPSψ Bad operand	R
	stVal	BOOLEAN	ST	FlexLogic operand RxGOOSE DPSψ Bad		R
IntermStψψ		SPS			RxGOOSE DPSψ INTERM operand	R
	stVal	BOOLEAN	ST	FlexLogic operand RxGOOSE DPSψ Interm		R
AnInψψ		MV			RxGOOSE Analogψ operand	R
	mag.f	FLOAT32		RxGOOSE Analog In ψ		R
	units.SIUnit	ENUMERATED		RxGOOSE Analog # UNITS		R
	units.multiplier	ENUMERATED		RxGOOSE Analog # UNITS		R

3.5.1.8 FlexAnalog operand interface (GGIO4)

This element is instantiated in all UR devices.

Table 3-17: FlexAnalog data objects

LNName: <configured GGIO4 prefix>GGIO4		LDevice inst: Master		UR element: FlexAnalog Operand Interface functionality		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
AnInψψ		MV			OFF	R
	instMag.f	FLOAT32		the operand selected by setting ANALOG IN ψ VALUE		R
	mag.f	FLOAT32				R
	db	INT32U	CF	ANALOG IN ψ DB		R/W/C
	zeroDb	INT32U	CF			R
DbMaxψψ		ASG			Value of max. in deadband calculations	R
	setMag.f	FLOAT32		ANALOG IN ψ MAX		R/C
	minVal.f	FLOAT32		-1 000 000 000 000		R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R
DbMinψψ		ASG			Value of min. in deadband calculations	R
	setMag.f	FLOAT32		ANALOG IN ψ MIN		R/C
	minVal.f	FLOAT32		-1 000 000 000 000		R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R

3.5.2 Protection (Prot) logical device

The Prot logical device contains logical nodes that model protection and protection-related functions.

The Prot logical device is available when the IEC 61850 option is purchased with the UR device.

3.5.2.1 Logical node zero (LLN0)

This element is instantiated in all UR devices implementing the Prot logical device.

Table 3-18: Logical node zero data objects for protection

LNName: LLN0		LDevice inst: Prot		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		ENS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		ORG			Reference to root logical device	R
	setSrcRef	ObjectReference	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

3.5.2.2 Accidental energization (AcdEnr)

This element is instantiated in the following products: G30, G60.

Table 3-19: Accidental energization data objects

LNName: AcdEnrPIOC1		LDevice inst: Prot		UR element: Accidental Energization element – Over-current function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			ACCDNT ENRG OP operand	R
	general	BOOLEAN	ST	ACCDNT ENRG OP		R
Dpo		SPS			ACCDNT ENRG DPO operand	R
	stVal	BOOLEAN	ST	ACCDNT ENRG DPO		R
Armed		SPS			ACCDNT ENRG ARMED operand	R
	stVal	BOOLEAN	ST	ACCDNT ENRG ARMED		R
InRefγ		ORG			ACCDNT ENRG OFFLINE setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	ACCDNT ENRG OFFLINE	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRefγ		ORG			ACCDNT ENRG BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	ACCDNT ENRG BLOCK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.3 Auxiliary overvoltage (AuxOv)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60.

Table 3-20: Auxiliary overvoltage data objects

LNName: AuxOvPTOV#		LDevice inst: Prot		UR element: Auxiliary Overvoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			AUX OV# PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	AUX OV# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			AUX OV# OP operand	R
	general	BOOLEAN	ST	AUX OV# OP		R
Dpo		SPS			AUX OV# DPO operand, which is the inverse of AUX OV PKP	R
	stVal	BOOLEAN	ST	AUX OV# DPO		R
BlkRefγ		ORG			AUX OV# BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	AUX OV# BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.4 Auxiliary undervoltage (AuxUv)

This element is instantiated in the following products: B30, C60, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60.

Table 3-21: Auxiliary undervoltage data objects

LNName: AuxUvPTUV#		LDevice inst: Prot		UR element: Auxiliary Undervoltage element# functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			AUX UV# PKP operands	R
	general	BOOLEAN	ST	AUX UV# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			AUX UV# OP operand	R
	general	BOOLEAN	ST	AUX UV# OP		R

LNName: AuxUvPTUV#		LDevice inst: Prot		UR element: Auxiliary Undervoltage element# functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dpo		SPS			AUX UV# DPO operand, which is the inverse of AUX UV PKP	R
	stVal	BOOLEAN	ST	AUX UV# DPO		R
BlkRefγ		ORG			AUX UV# BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	AUX UV# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.5 B90 breaker failure (B_BFai)

This element is instantiated in the following products: B90.

Table 3-22: B90 breaker failure current data objects

LNName: B_BFaiPIOC#		LDevice inst: Prot		UR element: B90 BREAKER FAILURE CURRENT SUPV # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			BKRSUPV # SUPV OP operand	R
	general	BOOLEAN	ST	BKRSUPV # SUPV OP		R
OpHiSet		ACT			BKRSUPV # HISET OP operand	R
	general	BOOLEAN	ST	BKRSUPV # HISET OP		R
OpLoSet		ACT			BKRSUPV # LOSET OP operand	R
	general	BOOLEAN	ST	BKRSUPV # LOSET OP		R

Table 3-23: B90 breaker failure logic data objects

LNName: B_BFaiRBRF#		LDevice inst: Prot		UR element: B90 BREAKER FAILURE logic element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
OpEx		ACT			BKRFAIL # TRIP OP operand	R
	general	BOOLEAN	ST	BKRFAIL # TRIP OP		R
OpIn		ACT			BKRFAIL # RETRIP operand	R
	general	BOOLEAN	ST	re-trip operand BKRFAIL # RETRIP		R
BkrOp&		SPS			BKRFAIL # T& OP operand	R
	stVal	BOOLEAN	ST	BKRFAIL # T& OP		R
InRefγ01		ORG			BF# INITIATE setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# INITIATE for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ02		ORG			BF# AMP SUPV OP A setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# AMP SUPV OP A for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ03		ORG			BF# AMP SUPV OP B setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# AMP SUPV OP B for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ04		ORG			BF# AMP SUPV OP C setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# AMP SUPV OP C for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ05		ORG			BF# BKR POS1 setting for setting group γ.	R

LNName: B_BFaiRBRF#		LDevice inst: Prot		UR element: B90 BREAKER FAILURE logic element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	BF# BKR POS1 for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ06		ORG			BF# BKR POS2 setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# BKR POS2 for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ07		ORG			BF# BKR TEST ON setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# BKR TEST ON for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ08		ORG			BF# AMP HISET OP A setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# AMP HISET OP A for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ09		ORG			BF# AMP HISET OP B setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# AMP HISET OP B for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ10		ORG			BF# AMP HISET OP C setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# AMP HISET OP C for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ11		ORG			BF# AMP LOSET OP A setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# AMP LOSET OP A for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ12		ORG			BF# AMP LOSET OP B setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# AMP LOSET OP B for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ13		ORG			BF# AMP LOSET OP C setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# AMP LOSET OP C for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRefγ		ORG			BF# BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BF# BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.6 B90 bus differential (B_Dif)

This element is instantiated in the following products: B90.

Table 3-24: B90 bus differential data objects

LNName: B_DifPDIF#		LDevice inst: Prot		UR element: B90 Bus zone # differential element function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
StrBia		ACD			BUS # BIASED PKP operand	R
	general	BOOLEAN	ST	BUS # BIASED PKP		R

LNName: B_DifPDIF#		LDevice inst: Prot		UR element: B90 Bus zone # differential element function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	dirGeneral	ENUMERATED	ST		1 for Forward, and it is mapped to same operand BUS # BIASED PKP (since differential DIR logic condition is part of differential logic)	R
Op		ACT			BUS # OP operand	R
	general	BOOLEAN	ST	BUS # OP		R
OpBia		ACT			BUS # BIASED OP operand	R
	general	BOOLEAN	ST	BUS # BIASED OP		R
OpUnBia		ACT			BUS # UNBIASED OP operand	R
	general	BOOLEAN	ST	BUS # UNBIASED OP		R
DpoBia		SPS			BUS # BIASED DPO operand, which is the inverse of BUS BIASED PKP	R
	stVal	BOOLEAN	ST	BUS # BIASED DPO		R
PhDir1		SPS			BUS # DIR operand	R
	stVal	BOOLEAN	ST	BUS # DIR		R
Sat1		SPS			BUS # SAT operand	R
	stVal	BOOLEAN	ST	BUS # SAT		R
BDifAClc		CMV			BUS ZONE # differential current in primary amps	R
	instCVal.mag.f	FLOAT32		BUS ZONE # DIFF current magnitude		R
	instCVal.ang.f	FLOAT32		BUS # DIFF current angle		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_DifPDIF#.BDifAClc.db		R/W/C
	dbAng	INT32U	CF	B_DifPDIF#.BDifAClc.dbAng		R/W/C
	zeroDb	INT32U	CF			R
BRstA		CMV			BUS ZONE # restraint current in primary amps	R
	instCVal.mag.f	FLOAT32		BUS ZONE # REST current magnitude		R
	instCVal.ang.f	FLOAT32		BUS # REST current angle		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_DifPDIF#.BRstA.db		R/W/C
	dbAng	INT32U	CF	B_DifPDIF#.BRstA.dbAng		R/W/C
	zeroDb	INT32U	CF			R
InRefγ01		ORG			BUS ZONE # DIFF SUPV setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BUS ZONE # DIFF SUPV for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ02		ORG			BUS ZONE # DIFF TRIP setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BUS ZONE # DIFF TRIP for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

LNName: B_DifPDIF#	LDevice inst: Prot		UR element: B90 Bus zone # differential element function			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγ		ORG			BUS ZONE # DIFF BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BUS ZONE # DIFF BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef9ττ		ORG			BUS ZONE #τ STATUS setting.	R
	setSrcRef	ObjectReference	SP	BUS ZONE #τ STATUS setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.7 B90 end fault protection (B_Efp)

This element is instantiated in the following products: B90.

Table 3-25: B90 end fault protection data objects

LNName: B_EfpPIOC#	LDevice inst: Prot		UR element: B90 End fault protection element # function			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			EFP # PKP operand	R
	general	BOOLEAN	ST	EFP # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			EFP # OP operand	R
	general	BOOLEAN	ST	EFP # OP		R
Dpo		SPS			EFP # DPO operand, which is the inverse of EFP PKP	R
	stVal	BOOLEAN	ST	EFP # DPO		R
InRefγ1		ORG			EFP# BREAKER OPEN setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	EFP# BREAKER OPEN for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ2		ORG			EFP# MANUAL CLOSE setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	EFP# MANUAL CLOSE for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRefγ		ORG			EFP# BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	EFP# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.8 B90 instantaneous overcurrent (B_Ioc)

This element is instantiated in the following products: B90.

Table 3-26: B90 instantaneous overcurrent data objects

LNName: B_IocPIOC#	LDevice inst: Prot		UR element: B90 Instantaneous Overcurrent element #			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			IOC # PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	IOC # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			IOC # OP operand	R

LNName: B_IocPIOC#		LDevice inst: Prot		UR element: B90 Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	general	BOOLEAN	ST	IOC # OP		R
Dpo		SPS			IOC # DPO operand	R
	stVal	BOOLEAN	ST	IOC # DPO		R
BlkRefγ		ORG			IOC# BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	IOC# BLOCK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.9 B90 time overcurrent (B_Toc)

This element is instantiated in the following products: B90.

Table 3-27: B90 time overcurrent data objects

LNName: B_TocPTOC#		LDevice inst: Prot		UR element: Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			TOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			TOC# OP operands (including individual three phases)	R
	general	BOOLEAN	ST	TOC# OP		R
Dpo		SPS			TOC# DPO operand	R
	stVal	BOOLEAN	ST	TOC# DPO		R
BlkRefγ		ORG			TOC# BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	TOC# BLOCK for group γ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.10 B90 undervoltage (B_Uv)

This element is instantiated in the following products: B90.

Table 3-28: B90 undervoltage data objects

LNName: B_UvPTUV#		LDevice inst: Prot		UR element: B90 Undervoltage element # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			UNDERVOLTAGE # PKP operands	R
	general	BOOLEAN	ST	UNDERVOLTAGE # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			UNDERVOLTAGE # OP operand	R
	general	BOOLEAN	ST	UNDERVOLTAGE # OP		R
Dpo		SPS			UNDERVOLTAGE # DPO operand, which is the inverse of UNDERVOLTAGE PKP	R
	stVal	BOOLEAN	ST	UNDERVOLTAGE # DPO		R
BlkRefγ		ORG			UNDERVOLTAGE # BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	UNDERVOLTAGE # BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.11 Breaker failure (BkrFa)

This element is instantiated in the following products: B30, C60, C70, D60, F60, G60, L30, L60, L90, M60, T60.

Table 3-29: Breaker failure data objects

LNName: BkrFaRBRF#		LDevice inst: Prot		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRefγ02		ORG			BF# 3-POLE INITIATE setting for setting group γ	R
	setSrcRef	ObjectReference	SP	3-POLE INITIATE input	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRefγ		ORG			BF# BLOCK setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ03		ORG			BF# BKR POS1 ϕA/3P setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# BKR POS1 ϕA/3P.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ04		ORG			BF# BKR POS2 ϕA/3P setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# BKR POS2 ϕA/3P.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ05		ORG			BF# BKR POS1 ϕB setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# BKR POS1 ϕB.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ06		ORG			BF# BKR POS1 ϕC setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# BKR POS1 0C.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ07		ORG			BF# BKR POS2 ϕB setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# BKR POS2 ϕB.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ08		ORG			BF# BKR POS2 ϕC setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# BKR POS2 ϕC.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
OpIn		ACT			BKR FAIL # RETRIP operands	R
	general	BOOLEAN	ST	re-trip operand BKR FAIL # RETRIP		R
	phsA	BOOLEAN	ST	re-trip operand BKR FAIL # RETRIPA		R
	phsB	BOOLEAN	ST	re-trip operand BKR FAIL # RETRIPB		R
	phsC	BOOLEAN	ST	re-trip operand BKR FAIL # RETRIPC		R
BkrOp&		SPS			BKR FAIL # T& OP operand	R
	stVal	BOOLEAN	ST	BKR FAIL # T& OP		R
OpEx		ACT			BKR FAIL # TRIP OP operand	R
	general	BOOLEAN	ST	trip operand BKR FAIL # TRIP OP		R
InRefγ09		ORG			BF# PH A INITIATE setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# PH A INITIATE.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

LNName: BkrFaRBRF#	LDevice inst: Prot	UR element: Breaker Control element #				
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRefγ10		ORG			BF# PH B INITIATE setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# PH B INITIATE.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ11		ORG			BF# PH C INITIATE setting for setting group γ	R
	setSrcRef	ObjectReference	SP	BF# PH C INITIATE.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.12 Breaker flashover (FlshOv)

This element is instantiated in the following products: B30, C60, C70, D60, F35, F60, G60, L60, L90, M60, T60.

Table 3-30: Breaker flashover data objects

LNName: FlshOvPIOC#	LDevice inst: Prot	UR element: BREAKER FLASHOVER element #				
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			BKR # FLSHOVR OP operand (including individual three phases)	R
	general	BOOLEAN	ST	BKR # FLSHOVR OP		R
	phsA	BOOLEAN	ST	BKR # FLSHOVR OP A		R
	phsB	BOOLEAN	ST	BKR # FLSHOVR OP B		R
	phsC	BOOLEAN	ST	BKR # FLSHOVR OP C		R
Str		ACD			BKR # FLSHOVR PKP operand (including individual three phases)	R
	general	BOOLEAN	ST	BKR # FLSHOVR PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
	phsA	BOOLEAN	ST	BKR # FLSHOVR PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown	R
	phsB	BOOLEAN	ST	BKR # FLSHOVR PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown	R
	phsC	BOOLEAN	ST	BKR # FLSHOVR PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown	R
Dpo		SPS			BKR # FLSHOVR DPO operand	R
	stVal	BOOLEAN	ST	BKR # FLSHOVR DPO		R
DpoPhsϕ		SPS			BKR # FLSHOVR DPO θ operand	R
	stVal	BOOLEAN	ST	BKR # FLSHOVR DPO θ		R
BlkRef1		ORG			BKR # FLSHOVR BLOCK setting	R
	setSrcRef	ObjectReference	SP	BKR # FLSHOVR BLOCK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			BKR # STATUS CLSD A setting	R
	setSrcRef	ObjectReference	SP	BKR # STATUS CLSD A	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			BKR # STATUS CLSD B setting	R
	setSrcRef	ObjectReference	SP	BKR # STATUS CLSD B	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			BKR # STATUS CLSD C setting	R
	setSrcRef	ObjectReference	SP	BKR # STATUS CLSD C	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			BKR # FLSHOVR SPV A setting	R
	setSrcRef	ObjectReference	SP	BKR # FLSHOVR SPV A	reference to the data attribute to input	R/C

LNName: FlshOvPIOC#		LDevice inst: Prot		UR element: BREAKER FLASHOVER element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			BKR # FLSHOVR SPV B setting	R
	setSrcRef	ObjectReference	SP	BKR # FLSHOVR SPV B	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef6		ORG			BKR # FLSHOVR SPV C setting	R
	setSrcRef	ObjectReference	SP	BKR # FLSHOVR SPV C	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.13 Bus differential (BusDif)

This element is instantiated in the following products: B30.

Table 3-31: B30 bus differential data objects

LNName: BusDifPDIF#		LDevice inst: Prot		UR element: Bus Differential element # (ANSI 87B)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			BUS # BIASED PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	logical OR of phsA, phsB and phsC		R
	dirGeneral	ENUMERATED	ST			R
	phsA	BOOLEAN	ST	BUS # BIASED PKP A		R
	phsB	BOOLEAN	ST	BUS # BIASED PKP B		R
	phsC	BOOLEAN	ST	BUS # BIASED PKP C		R
	dirPhsA	ENUMERATED	ST			R
	dirPhsB	ENUMERATED	ST			R
	dirPhsC	ENUMERATED	ST			R
Op		ACT			BUS # OP operand	R
	general	BOOLEAN	ST	BUS # OP		R
Dpo		SPS			BUS # DPO operand	R
	stVal	BOOLEAN	ST	BUS # DPO		R
DpoPhs1ϕ		SPS			BUS # BIASED DPO θ operand	R
	stVal	BOOLEAN	ST	BUS # BIASED DPO θ		R
DpoPhs2ϕ		SPS			BUS # UNBIASED DPO θ operand	R
	stVal	BOOLEAN	ST	BUS # UNBIASED DPO θ		R
OpPhs1ϕ		SPS			BUS # BIASED OP θ operand	R
	stVal	BOOLEAN	ST	BUS # BIASED OP θ		R
OpPhs2ϕ		SPS			BUS # UNBIASED OP θ operand	R
	stVal	BOOLEAN	ST	BUS # UNBIASED OP θ		R
PhDirϕ		SPS			BUS # DIR θ operand	R
	stVal	BOOLEAN	ST	BUS # DIR θ		R
Satϕ		SPS			BUS # SAT θ operand	R
	stVal	BOOLEAN	ST	BUS # SAT θ		R
DifAClc		WYE			Phase differential currents	R
	phsθ	CMV				R
	phsθ.instCVal	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		BUS # DIFF Iθd magnitude, in primary amps		R
	phsθ.instCVal.ang .f	FLOAT32		BUS # DIFF		R

LNName: BusDifPDIF#		LDevice inst: Prot		UR element: Bus Differential element # (ANSI 87B)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		BUS # DIFF Iθd magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		BUS # DIFF		R
	phsθ.units	Unit	CF			R
	phsθ.units.SIUnit	ENUMERATED			5, the code for amps	R
	phsθ.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsθ.db	INT32U	CF	BusDifPDIF#.DifAClc.phsθ.db		R/W/C
	phsθ.dbAng	INT32U	CF	BusDifPDIF#.DifAClc.phsθ.dbAng		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
RstA		WYE			Phase restraint currents	R
	phsθ	CMV				R
	phsθ.instCVal	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		BUS # REST Iθr magnitude, in primary amps		R
	phsθ.instCVal.ang .f	FLOAT32		BUS # REXT		R
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		BUS # REST Iθr magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		BUS # REST		R
	phsθ.units	Unit	CF			R
	phsθ.units.SIUnit	ENUMERATED			5, the code for amps	R
	phsθ.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsθ.db	INT32U	CF	BusDifPDIF#.DifAClc.phsθ.db		R/W/C
	phsθ.dbAng	INT32U	CF	BusDifPDIF#.DifAClc.phsθ.dbAng		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
InRef2τ		ORG			BUS ZONE #τ STATUS setting.	R
	setSrcRef	ObjectReference	SP	BUS ZONE #τ STATUS setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef10γ		ORG			Instantiated only for B30X order code option	R
	setSrcRef	ObjectReference	SP	BUS ZONE # DIFF AUX ZONE TRIP setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef11γ		ORG			Instantiated only for B30X order code option	R
	setSrcRef	ObjectReference	SP	BUS ZONE # DIFF SUPERVISION 1 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef12γ		ORG			Instantiated only for B30X order code option	R
	setSrcRef	ObjectReference	SP	BUS ZONE # DIFF SUPERVISION 2 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

LNName: BusDifPDIF#		LDevice inst: Prot		UR element: Bus Differential element # (ANSI 87B)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγ		ORG			BUS ZONE # DIFF BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BUS ZONE # DIFF BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-32: B30 bus differential CT trouble data objects

LNName: BbCtTbPIOC#		LDevice inst: Prot		UR element: Bus Differential CT Trouble function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			BUS ZONE # DIFF CT TROUBLE OP operands (including individual three phases)	R
	general	BOOLEAN	ST	CT TROUBLE # OP		R
	phsA	BOOLEAN	ST	CT TROUBLE # OP A		R
	phsB	BOOLEAN	ST	CT TROUBLE # OP B		R
	phsC	BOOLEAN	ST	CT TROUBLE # OP C		R

3.5.2.14 Capacitor bank phase overvoltage (CPhOv)

This element is instantiated in the following products: C70.

Table 3-33: C70 capacitor bank phase overvoltage function data objects

LNName: CPhOvPTOV#		LDevice inst: Prot		UR element: BANK OVERVOLTAGE element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			BANK OV # PKP operands (including individual three phases), which indicates element will operate when delay expires.	R
	general	BOOLEAN	ST	BANK OV # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsA	BOOLEAN	ST	BANK OV # PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown.	R
	phsB	BOOLEAN	ST	BANK OV # PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown.	R
	phsC	BOOLEAN	ST	BANK OV # PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			BANK OV # OP operands (including individual three phases)	R
	general	BOOLEAN	ST	BANK OV # OP		R
	phsA	BOOLEAN	ST	BANK OV # OP A		R
	phsB	BOOLEAN	ST	BANK OV # OP B		R
	phsC	BOOLEAN	ST	BANK OV # OP C		R
Dpo		SPS			BANK OV # DPO operand	R
	stVal	BOOLEAN	ST	BANK OV # DPO		R
BlkRefγ		ORG			BANK OV # BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	BANK OV # BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
OpV		WYE			Bank Operating Voltage in per unit for Ph A, B, and C	R
	phsA	CMV				R
	phsA.instCVal	Vector	MX			R

LNName: CPhOvPTOV#		LDevice inst: Prot		UR element: BANK OVERVOLTAGE element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsA.instCVal.mag .f	FLOAT32		Bank overvoltage # phase A operate voltage		R
	phsA.cVal	Vector	MX			R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units	Unit	CF			R
	phsA.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	CPhOvPTOV#.OpV.phsAdb		R/W/C
	phsA.zeroDb	INT32U	CF	(VOLTAGE CUT-OFF LEVEL) / 275 * 100 000		R
	phsB	CMV				R
	phsB.instCVal	Vector	MX			R
	phsB.instCVal.mag .f	FLOAT32		Bank overvoltage # phase B operate voltage		R
	phsB.cVal	Vector	MX			R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units	Unit	CF			R
	phsB.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	CPhOvPTOV#.OpV.phsB.db		R/W/C
	phsB.zeroDb	INT32U	CF	(VOLTAGE CUT-OFF LEVEL) / 275 * 100 000		R
	phsC	CMV				R
	phsC.instCVal	Vector	MX			R
	phsC.instCVal.mag .f	FLOAT32		Bank overvoltage # phase B operate voltage		R
	phsC.cVal	Vector	MX			R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units	Unit	CF			R
	phsC.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	CPhOvPTOV#.OpV.phsC.db		R/W/C
	phsC.zeroDb	INT32U	CF	(VOLTAGE CUT-OFF LEVEL) / 275 * 100 000		R

Table 3-34: Capacitor bank phase overvoltage stage data objects

LNName: CPhOv$PTOV#		LDevice inst: Prot		UR element: BANK OVERVOLTAGE element # Stage $		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			BANK OV # STG $ PKP operands (including individual three phases), which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	Logical OR of data attributes phsA, phsB and phsC		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
	phsA	BOOLEAN	ST	BANK OV # STG $A PKP		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown.	R

LNName: CPhOv$PTOV#		LDevice inst: Prot		UR element: BANK OVERVOLTAGE element # Stage $		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsB	BOOLEAN	ST	BANK OV # STG $B PKP		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown.	R
	phsC	BOOLEAN	ST	BANK OV # STG $C PKP		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			BANK OV # STG $ OP per phase operands (including individual three phases of each stage)	R
	general	BOOLEAN	ST	Logical OR of data attributes phsA, phsB and phsC		R
	phsA	BOOLEAN	ST	BANK OV # STG $A OP		R
	phsB	BOOLEAN	ST	BANK OV # STG $B OP		R
	phsC	BOOLEAN	ST	BANK OV # STG $C OP		R

3.5.2.15 Compensated overvoltage (CompOv)

This element is instantiated in the following products: D60, L60, L90.

Table 3-35: Compensated overvoltage function data objects

LNName: CmpOv0PTOV1		LDevice inst: Prot		UR element: Compensated Overvoltage functions.		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			COMP OV PKP operand	R
	general	BOOLEAN	ST	COMP OV PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			COMP OV OP operand	R
	general	BOOLEAN	ST	COMP OV OP		R
Dpo		SPS			COMP OV DPO operand, which is the inverse of COMP OV PKP	R
	stVal	BOOLEAN	ST	COMP OV DPO		R
BlkRefγ		ORG			COMPENSATED OV BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	COMPENSATED OV BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-36: Compensated overvoltage stage data objects

LNName: CmpOvPTOV$		LDevice inst: Prot		UR element: Compensated Overvoltage stage $.		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			COMP OV STG$ PKP operand	R
	general	BOOLEAN	ST	COMP OV STG$ PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			COMP OV STG$ OP operand	R
	general	BOOLEAN	ST	COMP OV STG$ OP		R
Dpo		SPS			COMP OV STG$ DPO operand, which is the inverse of COMP OV STG$ PKP	R
	stVal	BOOLEAN	ST	COMP OV STG$ DPO		R

3.5.2.16 Continuous monitor (CnMntr)

This element is instantiated in the following products: L90.

Table 3-37: Continuous monitor data objects

LNName: CnMntrGAPC1		LDevice inst: Prot		UR element: Continuous Monitor element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			CONT MONITOR PKP operand	R
	general	BOOLEAN	ST	CONT MONITOR PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
Op		ACT			CONT MONITOR OP operand	R
	general	BOOLEAN	ST	CONT MONITOR OP		R
InRef1		ORG			CONT MONITOR I-OP setting.	R
	setSrcRef	ObjectReference	SP	CONT MONITOR I-OP setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			CONT MONITOR I-SUPV setting.	R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by CONT MONITOR I-SUPV	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			CONT MONITOR V-OP setting.	R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by CONT MONITOR V-OP	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			CONT MONITOR V-SUPV setting.	R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by CONT MONITOR V-SUPV	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.17 Current (amp) unbalance (AmpUnb)

This element is instantiated in the following products: M60.

Table 3-38: Current unbalance data objects

LNName: AmpUnbPTOC#		LDevice inst: Prot		UR element: Amp Unbalance element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			AMP UNBALANCE # PKP operand	R
	general	BOOLEAN	ST	AMP UNBALANCE # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			AMP UNBALANCE # OP operand	R
	general	BOOLEAN	ST	AMP UNBALANCE # OP		R
Dpo		SPS			AMP UNBALANCE # DPO operand	R
	stVal	BOOLEAN	ST	AMP UNBALANCE # DPO		R
BlkRefγ		ORG			AMP UNBAL # BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	AMP UNBAL # BLOCK for group γ."	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
CurUnb		MV			CURRENT UNBALANCE in percentage (%)	R
	instMag.f	FLOAT32		CURRENT UNBALANCE		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R

LNName: AmpUnbPTOC#		LDevice inst: Prot		UR element: Amp Unbalance element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			-2 is code for percent	R
	db	INT32	CF	AmpUnbPTOC#.CurUnb.db		R/W/C
	zeroDb	INT32	CF			R

3.5.2.18 Direct under-reaching transfer trip (DUTT_)

This element is instantiated in the following products: D60, L90.

Table 3-39: DUTT data objects

LNName: DUTT_PSCH1		LDevice inst: Prot		UR element: Direct Under-reaching Transfer Trip element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			DUTT OP operand	R
	general	BOOLEAN	ST	DUTT OP		R
	phsA	BOOLEAN	ST	DUTT TRIP A		R
	phsB	BOOLEAN	ST	DUTT TRIP B		R
	phsC	BOOLEAN	ST	DUTT TRIP C		R
Tr3p		ACT			DUTT TRIP 3P operand	R
	general	BOOLEAN	ST	DUTT TRIP 3P		R
Tx1		SPS			DUTT TX1 operand	R
	stVal	BOOLEAN	ST	DUTT TX1		R
Tx2		SPS			DUTT TX2 operand	R
	stVal	BOOLEAN	ST	DUTT TX2		R
Tx3		SPS			DUTT TX3 operand	R
	stVal	BOOLEAN	ST	DUTT TX3		R
Tx4		SPS			DUTT TX4 operand	R
	stVal	BOOLEAN	ST	DUTT TX4		R
BlkRef1		ORG			DUTT SCHEME BLOCK setting.	R
	setSrcRef	ObjectReference	SP	DUTT SCHEME BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			DUTT RX1 setting.	R
	setSrcRef	ObjectReference	SP	DUTT RX1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			DUTT RX2 setting.	R
	setSrcRef	ObjectReference	SP	DUTT RX2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			DUTT RX3 setting.	R
	setSrcRef	ObjectReference	SP	DUTT RX3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			DUTT RX4 setting.	R
	setSrcRef	ObjectReference	SP	DUTT RX4	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.19 Directional comparison blocking (DCB_)

This element is instantiated in the following products: D60, L90.

Table 3-40: DCB data objects

LNName: DCB_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Blocking element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			DIR BLOCK OP operand	R
	general	BOOLEAN	ST	DIR BLOCK OP		R
	phsA	BOOLEAN	ST	DIR BLOCK TRIP A		R
	phsB	BOOLEAN	ST	DIR BLOCK TRIP B		R
	phsC	BOOLEAN	ST	DIR BLOCK TRIP C		R
Tr3p		ACT			DIR BLOCK TRIP 3P operand	R
	general	BOOLEAN	ST	DIR BLOCK TRIP 3P		R
TxBlk		ACT			DIR BLOCK TX INIT operand	R
	general	BOOLEAN	ST	DIR BLOCK TX INIT		R
TxStop1		SPS			DIR BLOCK TX1 STOP operand	R
	stVal	BOOLEAN	ST	DIR BLOCK TX1 STOP		R
TxStop2		SPS			DIR BLOCK TX2 STOP operand	R
	stVal	BOOLEAN	ST	DIR BLOCK TX2 STOP		R
TxStop3		SPS			DIR BLOCK TX3 STOP operand	R
	stVal	BOOLEAN	ST	DIR BLOCK TX3 STOP		R
TxStop4		SPS			DIR BLOCK TX4 STOP operand	R
	stVal	BOOLEAN	ST	DIR BLOCK TX4 STOP		R
BlkRef1		ORG			BLOCKING SCHEME BLOCK setting.	R
	setSrcRef	ObjectReference	SP	BLOCKING SCHEME BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef6		ORG			GND DIR O/C FWD setting.	R
	setSrcRef	ObjectReference	SP	GND DIR O/C FWD	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef7		ORG			GND DIR O/C REV setting.	R
	setSrcRef	ObjectReference	SP	GND DIR O/C REV	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			BLOCK SCHEME RX1 setting.	R
	setSrcRef	ObjectReference	SP	BLOCK SCHEME RX1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			BLOCK SCHEME RX2 setting.	R
	setSrcRef	ObjectReference	SP	BLOCK SCHEME RX2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			BLOCK SCHEME RX3 setting.	R
	setSrcRef	ObjectReference	SP	BLOCK SCHEME RX3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			BLOCK SCHEME RX4 setting.	R
	setSrcRef	ObjectReference	SP	BLOCK SCHEME RX4	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.20 Directional comparison blocking (DCB1_)

This element is instantiated in the following products: D60, L90.

Table 3-41: DCB1 data objects

LNName: DCB1_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Blocking1 element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			DIR BLOCK1 OP operand	R
	general	BOOLEAN	ST	DIR BLOCK1 OP		R

LNName: DCB1_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Blocking1 element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsA	BOOLEAN	ST	DIR BLOCK1 TRIP A		R
	phsB	BOOLEAN	ST	DIR BLOCK1 TRIP B		R
	phsC	BOOLEAN	ST	DIR BLOCK1 TRIP C		R
Tr3p		ACT			Instantiated only on products with single pole tripping.	R
	general	BOOLEAN	ST	DIR BLOCK1 TRIP 3P		R
TxBlk		ACT			DIR BLOCK1 TX INIT operand	R
	general	BOOLEAN	ST	DIR BLOCK1 TX INIT		R
TxStop1		SPS			DIR BLOCK1 TX1 STOP operand	R
	stVal	BOOLEAN	ST	DIR BLOCK1 TX1 STOP		R
TxStop2		SPS			DIR BLOCK1 TX2 STOP operand	R
	stVal	BOOLEAN	ST	DIR BLOCK1 TX2 STOP		R
TxStop3		SPS			DIR BLOCK1 TX3 STOP operand	R
	stVal	BOOLEAN	ST	DIR BLOCK1 TX3 STOP		R
TxStop4		SPS			DIR BLOCK1 TX4 STOP operand	R
	stVal	BOOLEAN	ST	DIR BLOCK1 TX4 STOP		R
BlkRef1		ORG			BLOCK1 SCHEME BLOCK setting.	R
	setSrcRef	ObjectReference	SP	BLOCKI1 SCHEME BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef06		ORG			BLK1 SCHME DIR FWD1 setting.	R
	setSrcRef	ObjectReference	SP	BLK1 SCHME DIR FWD1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef07		ORG			BLK1 SCHME DIR FWD2 setting.	R
	setSrcRef	ObjectReference	SP	BLK1 SCHME DIR FWD2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef08		ORG			BLK1 SCHME DIR FWD3 setting.	R
	setSrcRef	ObjectReference	SP	BLK1 SCHME DIR FWD3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef09		ORG			BLK1 SCHME DIR REV1 setting.	R
	setSrcRef	ObjectReference	SP	BLK1 SCHME DIR REV1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef10		ORG			BLK1 SCHME DIR REV2 setting.	R
	setSrcRef	ObjectReference	SP	BLK1 SCHME DIR REV2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef11		ORG			BLK1 SCHME DIR REV3 setting.	R
	setSrcRef	ObjectReference	SP	BLK1 SCHME DIR REV3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef12		ORG			BLK1 FORCE TX STOP1 setting.	R
	setSrcRef	ObjectReference	SP	BLK1 FORCE TX STOP1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef13		ORG			BLK1 FORCE TX STOP2 setting.	R
	setSrcRef	ObjectReference	SP	BLK1 FORCE TX STOP2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef01		ORG			BLOCK1 SCHEME RX1 setting.	R
	setSrcRef	ObjectReference	SP	BLOCK1 SCHEME RX1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef02		ORG			BLOCK1 SCHEME RX2 setting.	R
	setSrcRef	ObjectReference	SP	BLOCK1 SCHEME RX2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

LNName: DCB1_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Blocking1 element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRef03		ORG			BLOCK1 SCHEME RX3 setting.	R
	setSrcRef	ObjectReference	SP	BLOCK1 SCHEME RX3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef04		ORG			BLOCK1 SCHEME RX4 setting.	R
	setSrcRef	ObjectReference	SP	BLOCK1 SCHEME RX4	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.21 Directional comparison blocking (DCB3_)

This element is instantiated in the following products: F60.

Table 3-42: DCB3 data objects

LNName: DCB3_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Blocking3 element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			DCB3 OP operand	R
	general	BOOLEAN	ST	DCB3 OP		R
TxBlk		ACT			DCB3 TX INIT operand	R
	general	BOOLEAN	ST	DCB3 TX INIT		R
TxStop		SPS			DCB3 TX STOP operand	R
	stVal	BOOLEAN	ST	DCB3 TX STOP		R
BlkRef1		ORG			DCB3 SCHEME BLOCK setting.	R
	setSrcRef	ObjectReference	SP	DCB3 SCHEME BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef01		ORG			DCB3 SCHME DIR FWD1 setting.	R
	setSrcRef	ObjectReference	SP	DCB3 SCHME DIR FWD1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef02		ORG			DCB3 SCHME DIR FWD2 setting.	R
	setSrcRef	ObjectReference	SP	DCB3 SCHME DIR FWD2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef03		ORG			DCB3 SCHME DIR FWD3 setting.	R
	setSrcRef	ObjectReference	SP	DCB3 SCHME DIR FWD3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef11		ORG			DCB3 SCHME DIR REV1 setting.	R
	setSrcRef	ObjectReference	SP	DCB3 SCHME DIR REV1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef12		ORG			DCB3 SCHME DIR REV2 setting.	R
	setSrcRef	ObjectReference	SP	DCB3 SCHME DIR REV2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef13		ORG			DCB3 SCHME DIR REV3 setting.	R
	setSrcRef	ObjectReference	SP	DCB3 SCHME DIR REV3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef21		ORG			DCB3 FORCE TX STOP1 setting.	R
	setSrcRef	ObjectReference	SP	DCB3 FORCE TX STOP1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef22		ORG			DCB3 FORCE TX STOP2 setting.	R
	setSrcRef	ObjectReference	SP	DCB3 FORCE TX STOP2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef31		ORG			DCB3 RX setting.	R
	setSrcRef	ObjectReference	SP	DCB3 RX	reference to the data attribute to input	R/C

LNName: DCB3_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Blocking3 element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.22 Directional comparison unblocking (DCUB_)

This element is instantiated in the following products: D60, L90.

Table 3-43: Directional comparison unblocking data objects

LNName: DCUB_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Unblocking element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			DCUB OP operand	R
	general	BOOLEAN	ST	DCUB OP		R
	phsA	BOOLEAN	ST	DCUB TRIP A		R
	phsB	BOOLEAN	ST	DCUB TRIP B		R
	phsC	BOOLEAN	ST	DCUB TRIP C		R
Tr3p		ACT			DCUB TRIP 3P operand	R
	general	BOOLEAN	ST	DCUB TRIP 3P		R
Tx1		SPS			DCUB TX1 operand	R
	stVal	BOOLEAN	ST	DCUB TX1		R
Tx2		SPS			DCUB TX2 operand	R
	stVal	BOOLEAN	ST	DCUB TX2		R
Tx3		SPS			DCUB TX3 operand	R
	stVal	BOOLEAN	ST	DCUB TX3		R
Tx4		SPS			DCUB TX4 operand	R
	stVal	BOOLEAN	ST	DCUB TX4		R
BlkRef1		ORG			DCUB BLOCK setting.	R
	setSrcRef	ObjectReference	SP	DCUB BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef05		ORG			DCUB ECHO COND setting.	R
	setSrcRef	ObjectReference	SP	DCUB ECHO COND	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef06		ORG			GND DIR O/C FWD setting.	R
	setSrcRef	ObjectReference	SP	GND DIR O/C FWD	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef07		ORG			GND DIR O/C REV setting.	R
	setSrcRef	ObjectReference	SP	GND DIR O/C REV	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef01		ORG			DCUB RX1 setting.	R
	setSrcRef	ObjectReference	SP	DCUB RX1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef11		ORG			DCUB LOG RX1 setting (Loss of Guard)	R
	setSrcRef	ObjectReference	SP	DCUB LOG1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef02		ORG			DCUB RX2 setting.	R
	setSrcRef	ObjectReference	SP	DCUB RX2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef12		ORG			DCUB LOG2 setting (Loss of Guard)	R
	setSrcRef	ObjectReference	SP	DCUB LOG2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef03		ORG			DCUB RX3 setting.	R

LNName: DCUB_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Unblocking element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	DCUB RX3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef13		ORG			DCUB LOG3 setting (Loss of Guard)	R
	setSrcRef	ObjectReference	SP	DCUB LOG3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef04		ORG			DCUB RX4 setting.	R
	setSrcRef	ObjectReference	SP	DCUB RX4	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef14		ORG			DCUB LOG4 setting (Loss of Guard)	R
	setSrcRef	ObjectReference	SP	DCUB LOG4	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.23 Field current protection (FldAmp)

This element is instantiated in the following products: G60.

Table 3-44: Field current overcurrent data objects

LNName: FldAmpPTOC1		LDevice inst: Prot		UR element: FIELD CURRENT element over current functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			FIELD OC PKP operand	R
	general	BOOLEAN	ST	FIELD OC PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			FIELD OC OP operand	R
	general	BOOLEAN	ST	FIELD OC OP		R
Dpo		SPS			FIELD OC DPO operand	R
	stVal	BOOLEAN	ST	FIELD OC DPO		R
BlkRefγ		ORG			FIELD CURRENT BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	FIELD CURRENT BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-45: Field current undercurrent data objects

LNName: FldAmpPTUC1		LDevice inst: Prot		UR element: FIELD GROUND element under current functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			FIELD UC PKP operand	R
	general	BOOLEAN	ST	FIELD UC PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			FIELD UC OP operand	R
	general	BOOLEAN	ST	FIELD UC OP		R
Dpo		SPS			FIELD UC DPO operand	R
	stVal	BOOLEAN	ST	FIELD UC DPO		R

3.5.2.24 Field ground protection (FldGnd)

This element is instantiated in the following products: G60.

Table 3-46: Field ground protection data objects

LNName: FldGnd0PHIZ1		LDevice inst: Prot		UR element: FIELD GROUND INJ UC element functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			FIELD GND INJ UC PKP operand	R
	general	BOOLEAN	ST	FIELD GND INJ UC PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			FIELD GND INJ UC OP operand	R
	general	BOOLEAN	ST	FIELD GND INJ UC OP		R
Dpo		SPS			FIELD GND INJ UC DPO operand	R
	stVal	BOOLEAN	ST	FIELD GND INJ UC DPO		R
Fail		SPS			GPM-F FAILURE operand	R
	stVal	BOOLEAN	ST	GPM-F FAILURE		R
GndRis		MV			FIELD GROUND RESIST in ohms	R
	instMag.f	FLOAT32		FIELD GROUND RESIST		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			30, the code for ohm	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	FldGnd0PHIZ1.GndRis.db		R/W/C
	zeroDb	INT32U	CF			R
GndAmp		MV			FIELD GROUND CURRENT in amperes	R
	instMag.f	FLOAT32		FIELD GROUND CURRENT		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	FldGnd0PHIZ1.GndAmp.db		R/W/C
	zeroDb	INT32U	CF			R
Vol		MV			FIELD VOLTAGE in volts	R
	instMag.f	FLOAT32		FIELD VOLTAGE		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	FldGnd0PHIZ1.Vol.db		R/W/C
	zeroDb	INT32U	CF			R
Amp		MV			FIELD CURRENT in amperes	R
	instMag.f	FLOAT32		FIELD CURRENT		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	FldGnd0PHIZ1.Amp.db		R/W/C
	zeroDb	INT32U	CF			R
InjVol		MV			INJECTED VOLTAGE in volts	R
	instMag.f	FLOAT32		INJECTED VOLTAGE		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	FldGnd0PHIZ1.InjVol.db		R/W/C

LNName: FldGnd0PHIZ1		LDevice inst: Prot		UR element: FIELD GROUND INJ UC element functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	zeroDb	INT32U	CF			R
FltLocation		MV			FAULT LOCATION in percentage of field winding from negative terminal in case of single point injection. If double point injection, displays Invalid value	R
	instMag.f	FLOAT32		FAULT LOCATION		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	FldGnd0PHIZ1.FltLocation.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRefγ		ORG			FIELD GROUND BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	FIELD GROUND BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-47: Field ground protection stage 1 objects

LNName: FldGnd1PHIZ1		LDevice inst: Prot		UR element: FIELD GROUND element stage 1 functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			FIELD GND STG1 PKP operand	R
	general	BOOLEAN	ST	FIELD GND STG1 PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			FIELD GND STG1 OP operand	R
	general	BOOLEAN	ST	FIELD GND STG1 OP		R
Dpo		SPS			FIELD GND STG1 DPO operand	R
	stVal	BOOLEAN	ST	FIELD GND STG1 DPO		R

Table 3-48: Field ground protection stage 2 objects

LNName: FldGnd2PHIZ1		LDevice inst: Prot		UR element: FIELD GROUND element stage 2 functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			FIELD GND STG2 PKP operand	R
	general	BOOLEAN	ST	FIELD GND STG2 PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			FIELD GND STG2 OP operand	R
	general	BOOLEAN	ST	FIELD GND STG2 OP		R
Dpo		SPS			FIELD GND STG2 DPO operand	R
	stVal	BOOLEAN	ST	FIELD GND STG2 DPO		R

3.5.2.25 Frequency rate of change (RteHz)

This element is instantiated in the following products: D30, D60, F60, G30, G60, L30, L90, N60, T60.

Table 3-49: Frequency rate of change data objects

LNName: RteHzPFRC#		LDevice inst: Prot		UR element: Frequency Rate of Change element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			FREQ RATE # PKP operand, which is indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	FREQ RATE # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			FREQ RATE # OP operand	R
	general	BOOLEAN	ST	FREQ RATE # OP		R
Dpo		SPS			FREQ RATE # DPO operand	R
	stVal	BOOLEAN	ST	FREQ RATE # DPO		R
HzChgRte		MV			FREQUENCY RATE OF CHANGE # in Hz/s	R
	instMag.f	FLOAT32		FREQUENCY RATE OF CHANGE #		R
	mag.f	FLOAT32		FREQUENCY RATE OF CHANGE # on deadband exception		R
	units.SIUint	ENUMERATED			75, the code for Rate of change of frequency (Hz/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	RteHzPFRC#.HzChgRte.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRef1		ORG			FREQ RATE # BLOCK setting.	R
	setSrcRef	ObjectReference	SP	FREQ RATE # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.26 Generator unbalance (GnUnb)

This element is instantiated in the following products: G30, G60.

Table 3-50: Generator unbalance data objects

LNName: GnUnbPTOC1		LDevice inst: Prot		UR element: Generator Unbalance element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			GEN UNBAL PKP operands (including individual three phases), which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	GEN UNBAL PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			GEN UNBAL OP operand	R
	general	BOOLEAN	ST	GEN UNBAL OP		R
Dpo		SPS			GEN UNBAL DPO operand	R
	stVal	BOOLEAN	ST	GEN UNBAL DPO		R
BlkRefy		ORG			GEN UNBAL BLK setting for setting group Y.	R
	setSrcRef	ObjectReference	SP	GEN UNBAL BLK for group	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-51: Generator unbalance stage objects

LNName: GnUnb$PTOC1		LDevice inst: Prot		UR element: Generator Unbalance element Stage $		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			GEN UNBAL STG$ PKP operand	R
	general	BOOLEAN	ST	GEN UNBAL STG$ PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R

LNName: GnUnb$PTOC1		LDevice inst: Prot		UR element: Generator Unbalance element Stage $		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			GEN UNBAL STG$ OP operand	R
	general	BOOLEAN	ST	GEN UNBAL STG$ OP		R
Dpo		SPS			GEN UNBAL STG$ DPO operand	R
	stVal	BOOLEAN	ST	GEN UNBAL STG$ DPO		R

3.5.2.27 Ground distance (GndDis)

This element is instantiated in the following products: D30, D60, L60, L90, T60.

Table 3-52: Ground distance data objects

LNName: GndDisPDIS#		LDevice inst: Prot		UR element: Ground Distance Z# Settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			GND DIST Z# PKP operand in Phase –To –Ground	R
	general	BOOLEAN	ST	GND DIST Z# PKP		R
	dirGeneral	ENUMERATED	ST			R
	phsA	BOOLEAN	ST	GND DIST Z# PKP A		R
	dirPhsA	ENUMERATED	ST	dirGeneral		R
	phsB	BOOLEAN	ST	GND DIST Z# PKP B		R
	dirPhsB	ENUMERATED	ST	dirGeneral		R
	phsC	BOOLEAN	ST	GND DIST Z# PKP C		R
	dirPhsC	ENUMERATED	ST	dirGeneral		R
Op		ACT			GND DIST Z# OP operand	R
	general	BOOLEAN	ST	GND DIST Z# OP		R
	phsA	BOOLEAN	ST	GND DIST Z# OP A		R
	phsB	BOOLEAN	ST	GND DIST Z# OP B		R
	phsC	BOOLEAN	ST	GND DIST Z# OP C		R
NeutSupn		SPS			GND DIST Z# SUPN IN operand	R
	stVal	BOOLEAN	ST	GND DIST Z# SUPN IN		R
DpoPhsϕ		SPS			GND DIST Z# DPO θ operand	R
	stVal	BOOLEAN	ST	GND DIST Z#DPO θ		R
BlkRefγ		ORG			GND DIST Z# BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	GND DIST Z# BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.28 Ground instantaneous overcurrent (GndIoc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-53: Ground instantaneous overcurrent data objects

LNName: GndIocPIOC#		LDevice inst: Prot		UR element: Ground Instantaneous Overcurrent element#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			GROUND IOC# PKP operand, which is indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	GROUND IOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			GROUND IOC# OP operand	R

LNName: GndIocPIOC#		LDevice inst: Prot		UR element: Ground Instantaneous Overcurrent element#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	general	BOOLEAN	ST	GROUND IOC# OP		R
Dpo		SPS			GROUND IOC# DPO operand	R
	stVal	BOOLEAN	ST	GROUND IOC# DPO		R
BlkRefγ1		ORG			GROUND IOC# BLOCK setting in setting group γ.	R
	setSrcRef	ObjectReference	SP	GROUND IOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.29 Ground time overcurrent (GndToc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-54: Ground time overcurrent data objects

LNName: GndTocPTOC#		LDevice inst: Prot		UR element: Ground Time Overcurrent element#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			GROUND TOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	GROUND TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			GROUND TOC# OP operand	R
	general	BOOLEAN	ST	GROUND TOC# OP		R
Dpo		SPS			GROUND TOC# DPO operand	R
	stVal	BOOLEAN	ST	GROUND TOC# DPO		R
BlkRefγ1		ORG			GROUND TOC# BLOCK setting in setting group γ.	R
	setSrcRef	ObjectReference	SP	GROUND TOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.30 Hybrid permissive over-reaching transfer trip (HPOTT_)

This element is instantiated in the following products: D60, L90.

Table 3-55: Hybrid POTT data objects

LNName: HPOTT_PSCH1		LDevice inst: Prot		UR element: Hybrid Permissive Over-reaching Transfer Trip element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			HYBRID POTT OP operand	R
	general	BOOLEAN	ST	HYBRID POTT OP		R
	phsA	BOOLEAN	ST	HYBRID POTT TRIP A		R
	phsB	BOOLEAN	ST	HYBRID POTT TRIP B		R
	phsC	BOOLEAN	ST	HYBRID POTT TRIP C		R
Tr3p		ACT			HYBRID POTT TRIP 3P operand	R
	general	BOOLEAN	ST	HYBRID POTT TRIP 3P		R
Tx1		SPS			HYBRID POTT TX1 operand	R
	stVal	BOOLEAN	ST	HYBRID POTT TX1		R
Tx2		SPS			HYBRID POTT TX2 operand	R
	stVal	BOOLEAN	ST	HYBRID POTT TX2		R
Tx3		SPS			HYBRID POTT TX3 operand	R
	stVal	BOOLEAN	ST	HYBRID POTT TX3		R

LNName: HPOTT_PSCH1		LDevice inst: Prot		UR element: Hybrid Permissive Over-reaching Transfer Trip element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Tx4		SPS			HYBRID POTT TX4 operand	R
	stVal	BOOLEAN	ST	HYBRID POTT TX4		R
BlkRef1		ORG			HYB POTT SCHEME BLOCK setting.	R
	setSrcRef	ObjectReference	SP	HYB POTT SCHEME BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			HYB POTT ECHO COND setting.	R
	setSrcRef	ObjectReference	SP	HYB POTT ECHO COND	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef8		ORG			HYB POTT W/I COND setting.	R
	setSrcRef	ObjectReference	SP	HYB POTT W/I COND	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef6		ORG			GND DIR O/C FWD setting.	R
	setSrcRef	ObjectReference	SP	GND DIR O/C FWD	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef7		ORG			GND DIR O/C REV setting.	R
	setSrcRef	ObjectReference	SP	GND DIR O/C REV	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			HYB POTT RX1 setting.	R
	setSrcRef	ObjectReference	SP	HYB POTT RX1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			HYB POTT RX2 setting.	R
	setSrcRef	ObjectReference	SP	HYB POTT RX2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			HYB POTT RX3 setting.	R
	setSrcRef	ObjectReference	SP	HYB POTT RX3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			HYB POTT RX4 setting.	R
	setSrcRef	ObjectReference	SP	HYB POTT RX4	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.31 Line current differential (LinDif)

This element is instantiated in the following products: L30, L90.

Table 3-56: Line current differential data objects

LNName: LinDfPDIF1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) phase and general functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			only instantiated in L90	R
	general	BOOLEAN	ST	87L DIFF OP		R
	dirGeneral	ENUMERATED	ST		1, the code for forward	R
	phsA	BOOLEAN	ST	87L DIFF OP A		R
	dirPhsA	ENUMERATED	ST		1, the code for forward	R
	phsB	BOOLEAN	ST	87L DIFF OP B		R
	dirPhsB	ENUMERATED	ST		1, the code for forward	R
	phsC	BOOLEAN	ST	87L DIFF OP C		R
	dirPhsC	ENUMERATED	ST		1, the code for forward	R
Op		ACT			only instantiated in L90	R
	general	BOOLEAN	ST	87L TRIP OP		R

LNName: LinDfPDIF1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) phase and general functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsA	BOOLEAN	ST	87L TRIP OP A		R
	phsB	BOOLEAN	ST	87L TRIP OP B		R
	phsC	BOOLEAN	ST	87L TRIP OP C		R
Op		ACT			only instantiated in L30	R
	general	BOOLEAN	ST	87L DIFF OP		R
StrGnd		ACD			87L DIFF PKP G operand	R
	general	BOOLEAN	ST	87L DIFF PKP G		R
	dirGeneral	ENUMERATED	ST		1, the code for forward	R
OpGnd		ACT			87L DIFF OP G operand	R
	general	BOOLEAN	ST	87L DIFF OP G		R
Tr3p		ACT			only instantiated in L90	R
	general	BOOLEAN	ST	87L TRIP 3P OP		R
Tr1p		ACT			only instantiated in L90	R
	general	BOOLEAN	ST	87L TRIP 1P OP		R
RxTr1		ACT			only instantiated in L90	R
	general	BOOLEAN	ST	logical OR of phsA, phsB, phsC		R
	phsA	BOOLEAN	ST	87L DIFF RECVD DTT A		R
	phsB	BOOLEAN	ST	87L DIFF RECVD DTT B		R
	phsC	BOOLEAN	ST	87L DIFF RECVD DTT C		R
RxTr1		ACT			only instantiated in L30	R
	general	BOOLEAN	ST	87L DIFF RECVD DTT		R
TxTr		ACT			87L DIFF KET DTT operand, which becomes on when the differential element is sending direct transfer trip to the remote terminals.	R
	general	BOOLEAN	ST	87L DIFF KET DTT		R
PFLLfail		SPS			87L DIFF PFLL FAIL operand, which becomes on when the differential element's phase and frequency lock loop (PFLL) has failed.	R
	stVal	BOOLEAN	ST	87L DIFF PFLL FAIL		R
Asymmetry		SPS			87L DIFF CH ASYM DET operand, which becomes on when the differential element's has detected substantial communications channel asymmetry.	R
	stVal	BOOLEAN	ST	87L DIFF CH ASYM DET		R
ChFailζ		SPS			87L DIFF CH ζ FAIL operand, which becomes on when the differential element's has detected communications channel ζ failed.	R
	stVal	BOOLEAN	ST	87L DIFF CH ζ FAIL		R
LosPktζ		SPS			87L DIFF CHζ LOSTPKT operand, which becomes on when the differential element's has detected the lost packet threshold has been exceeded on channel ζ.	R
	stVal	BOOLEAN	ST	87L DIFF CHζ LOSTPKT		R
CrcFailζ		SPS			87L DIFF CHζ CRCFAIL operand, which becomes on when the differential element's has detected the CRC error threshold has been exceeded on channel ζ.	R
	stVal	BOOLEAN	ST	87L DIFF CHζ CRCFAIL		R

3.5.2.32 Line pickup (LinPkp)

This element is instantiated in the following products: D30, D60, L60, L90.

Table 3-57: Line pickup data objects

LNName: LinPkpPIOC1	LDevice inst: Prot		UR element: Line Pickup functions.			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			LINE PICKUP PKP operand	R
	general	BOOLEAN	ST	LINE PICKUP PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			LINE PICKUP OP operand	R
	general	BOOLEAN	ST	LINE PICKUP OP		R
Dpo		SPS			LINE PICKUP DPO operand, which is the inverse of LINE PICKUP PKP	R
	stVal	BOOLEAN	ST	LINE PICKUP DPO		R
UnAϕ		SPS			LINE PICKUP operand that activates on phase θ current below 5% of nominal	R
	stVal	BOOLEAN	ST	LINE PICKUP I<θ		R
UnV		SPS			LINE PICKUP UV PKP operand	R
	stVal	BOOLEAN	ST	LINE PICKUP UV PKP		R
LeoSt		SPS			LINE PICKUP LEO PKP operand	R
	stVal	BOOLEAN	ST	LINE PICKUP LEO PKP		R
Zn2Tr		SPS			LINE PICKUP RCL TRIP operand	R
	stVal	BOOLEAN	ST	LINE PICKUP RCL TRIP		R
BlkRefγ		ORG			LINE PICKUP BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	LINE PICKUP BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.33 Load encroachment (LodEn)

This element is instantiated in the following products: D30, D60, F60, L60, L90, T60.

Table 3-58: Load encroachment data objects

LNName: LodEncPDIS1	LDevice inst: Prot		UR element: LOAD ENCROACHMENT functions			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			LOAD ENCHR PKP operand	R
	general	BOOLEAN	ST	LOAD ENCHR PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			LOAD ENCHR OP operand	R
	general	BOOLEAN	ST	LOAD ENCHR OP		R
Dpo		SPS			LOAD ENCHR DPO operand	R
	stVal	BOOLEAN	ST	LOAD ENCHR DPO		R
BlkRefγ		ORG			LOAD ENCRMNT BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	LOAD ENCRMNT BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.34 Loss of excitation (LosExt)

This element is instantiated in the following products: G30, G60.

Table 3-59: Loss of excitation data objects

LNName: LosExtPDIS1		LDevice inst: Prot		UR element: LOSS OF EXCITATION core functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			LOSS EXCIT PKP operand, which becomes On when either stage 1 or stage 2 of this element has picked up.	R
	general	BOOLEAN	ST	LOSS EXCIT PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			LOSS EXCIT OP operand	R
	general	BOOLEAN	ST	LOSS EXCIT OP		R
Dpo		SPS			LOSS EXCIT DPO operand	R
	stVal	BOOLEAN	ST	LOSS EXCIT DPO		R
BlkRefγ		ORG			LOSS OF EXCIT BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	LOSS OF EXCIT BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-60: Loss of excitation stage 1 objects

LNName: LosExt1PDIS1		LDevice inst: Prot		UR element: Loss of Excitation element stage 1 functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			LOSS EXCIT STG1 PKP operand	R
	general	BOOLEAN	ST	LOSS EXCIT STG1 PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			LOSS EXCIT STG1 OP operand	R
	general	BOOLEAN	ST	LOSS EXCIT STG1 OP		R
Dpo		SPS			LOSS EXCIT STG1 DPO operand	R
	stVal	BOOLEAN	ST	LOSS EXCIT STG1 DPO		R

Table 3-61: Loss of excitation stage 2 objects

LNName: LosExt2PDIS1		LDevice inst: Prot		UR element: Loss of Excitation stage 2 functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			LOSS EXCIT STG2 PKP operand	R
	general	BOOLEAN	ST	LOSS EXCIT STG2 PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			LOSS EXCIT STG2 OP operand	R
	general	BOOLEAN	ST	LOSS EXCIT STG2 OP		R
Dpo		SPS			LOSS EXCIT STG2 DPO operand	R
	stVal	BOOLEAN	ST	LOSS EXCIT STG2 DPO		R

3.5.2.35 Mechanical jam (MecJam)

This element is instantiated in the following products: M60.

Table 3-62: Mechanical jam data objects

LNName: MecJamPMSS1		LDevice inst: Prot		UR element: MECHANICAL JAM element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			MECHANICAL JAM PKP operand	R
	general	BOOLEAN	ST	MECHANICAL JAM PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			MECHANICAL JAM OP operand	R
	general	BOOLEAN	ST	MECHANICAL JAM OP		R
Dpo		SPS			MECHANICAL JAM DPO operand, which is the inverse of MECHANICAL JAM PKP	R
	stVal	BOOLEAN	ST	MECHANICAL JAM DPO		R
BlkRefγ		ORG			MECH JAM BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	MECH JAM BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.36 Motor acceleration time (MAccTm)

This element is instantiated in the following products: M60.

Table 3-63: Motor acceleration time data objects

LNName: MAccTmPMSS1		LDevice inst: Prot		UR element: Acceleration Time element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			MOTOR ACCEL TIME OP operand	R
	general	BOOLEAN	ST	MOTOR ACCEL TIME OP		R
Dpo		SPS			MOTOR ACCEL TIME DPO operand	R
	stVal	BOOLEAN	ST	MOTOR ACCEL TIME DPO		R
BlkRefγ		ORG			ACCELERATION BLOCK setting.	R
	setSrcRef	ObjectReference	SP	ACCELERATION BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
StrAccTmζ		MV			START ζ ACCELERATION TIME in Sec	R
	instMag.f	FLOAT32		START ζ ACCELERATION TIME		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for Time (Sec)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	MAccTmPMSS1.StrAccTmζ.db		R/W/C
	zeroDb	INT32	CF			R
StrEffAζ		MV			START ζ EFFECTIVE CURRENT in x FLA	R
	instMag.f	FLOAT32		START ζ EFFECTIVE CURRENT		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			1, the code for dimension less	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	MAccTmPMSS1.StrEffAζ.db		R/W/C
	zeroDb	INT32	CF			R
StrPeakAζ		MV			START ζ PEAK CURRENT in x FLA	R
	instMag.f	FLOAT32		START ζ PEAK CURRENT		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R

LNName: MAccTmPMSS1		LDevice inst: Prot		UR element: Acceleration Time element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	MAccTmPMSS1.StrPeakAζ.db		R/W/C
	zeroDb	INT32	CF			R
StrTDζ		INS			START ζ TIME/DATE actual value	R
	stVal	INT32	ST	START ζ TIME/DATE actual value		R
	units.SIUnit	ENUMERATED			4, the code for time	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

3.5.2.37 Motor thermal model (MotThm)

This element is instantiated in the following products: M60.

Table 3-64: Thermal model data objects

LNName: MotThmPTTR1		LDevice inst: Prot		UR element: THERMAL MODEL element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			MOTOR THERMAL OP operand	R
	general	BOOLEAN	ST	MOTOR THERMAL OP		R
Str		ACD			MOTOR THERMAL PKP operand	R
	general	BOOLEAN	ST	MOTOR THERMAL PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Dpo		SPS			MOTOR THERMAL DPO operands	R
	stVal	BOOLEAN	ST	MOTOR THERMAL DPO		R
InRef10		ORG			MOTOR OFFLINE setting	R
	setSrcRef	ObjectReference	SP	MOTOR OFFLINE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef20		ORG			EMERGENCY RESTART setting	R
	setSrcRef	ObjectReference	SP	EMERGENCY RESTART setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef30		ORG			SPEED2 MOTOR SWITCH setting	R
	setSrcRef	ObjectReference	SP	SPEED2 MOTOR SWITCH setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4γ		ORG			VD VOLTAGE LOSS setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	VD VOLTAGE LOSS	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5γ		ORG			SPEED2 VD VOLTAGE LOSS setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	SPEED2 VD VOLTAGE LOSS setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRefγ		ORG			THERMAL MODEL BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	THERMAL MODEL BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
Restart		SPS			MOTOR RESTART operand	R
	stVal	BOOLEAN	ST	MOTOR RESTART		R
Offline		SPS			MOTOR OFFLINE operand	R
	stVal	BOOLEAN	ST	MOTOR OFFLINE		R
Starting		SPS			MOTOR STARTING operand	R
	stVal	BOOLEAN	ST	MOTOR STARTING		R

LNName: MotThmPTTR1		LDevice inst: Prot		UR element: THERMAL MODEL element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Running		SPS			MOTOR RUNNING operand	R
	stVal	BOOLEAN	ST	MOTOR RUNNING		R
AlmThm		SPS			MOTOR OVERLOAD operand	R
	stVal	BOOLEAN	ST	MOTOR OVERLOAD		R
StrInh		SPS			MOTOR START INHIBIT operand	R
	stVal	BOOLEAN	ST	MOTOR START INHIBIT		R
MotStatus		ENS			Thermal Model MOTOR STATUS	R
	stVal	ENUMERATED	ST	actual value for Thermal Model MOTOR STATUS		R
Amp		MV			THERMAL MODEL LOAD in x FLA	R
	instMag.f	FLOAT32		THERMAL MODEL LOAD		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	MotThmPTTR1.Amp.db		R/W/C
	zeroDb	INT32	CF			R
OvlTripTm		MV			ESTIMATED TRIP TIME ON OVERLOAD in seconds	R
	instMag.f	FLOAT32		ESTIMATED TRIP TIME ON OVERLOAD		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for Time (Sec)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	MotThmPTTR1.OvlTripTm.db		R/W/C
	zeroDb	INT32	CF			R
ThmCap		MV			MOTOR THERMAL CAPACITY USED in percentage (%)	R
	instMag.f	FLOAT32		MOTOR THERMAL CAPACITY USED		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			-2 is code for percent	R
	db	INT32	CF	MotThmPTTR1.ThmCap.db		R/W/C
	zeroDb	INT32	CF			R
ThmLOTm		MV			THERMAL LOCKOUT TIME in seconds	R
	instMag.f	FLOAT32		THERMAL LOCKOUT TIME		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for Time (Sec)NOTE: Modbus measures this value in Minute	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	MotThmPTTR1.ThmLOTm.db		R/W/C
	zeroDb	INT32	CF			R
MotUnb		MV			THERMAL MODEL MOTOR UNBALANCE in percentage (%)	R
	instMag.f	FLOAT32		THERMAL MODEL MOTOR UNBALANCE		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R

LNName: MotThmPTTR1		LDevice inst: Prot		UR element: THERMAL MODEL element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			-2 is code for percent	R
	db	INT32	CF	MotThmPTTR1.MotUnb.db		R/W/C
	zeroDb	INT32	CF			R
BiasMotLod		MV			THERMAL MODEL BIASED MOTOR LOAD in x FLA	R
	instMag.f	FLOAT32		THERMAL MODEL BIASED MOTOR LOAD		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	MotThmPTTR1.BiasMotLod.db		R/W/C
	zeroDb	INT32	CF			R
TotLOTm		MV			TOTAL MOTOR LOCKOUT TIME in seconds	R
	instMag.f	FLOAT32		TOTAL MOTOR LOCKOUT TIME		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for Time (Sec)NOTE: Modbus measures this value in Minute	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	MotThmPTTR1.TotLOTm.db		R/W/C
	zeroDb	INT32	CF			R

3.5.2.38 Negative sequence directional overcurrent (NegDoc)

This element is instantiated in the following products: C70, D30, D60, F60, G30, G60, L60, L90, T60.

Table 3-65: Negative sequence directional overcurrent data objects

LNName: NegDocRDIR#		LDevice inst: Prot		UR element: Negative sequence Directional Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dir		ACD			NEG DIR OC# FWD or NEG DIR OC# REV operands, which becomes On when Negative sequence directional overcurrent is flowing in either forward or reverse direction respectively	R
	general	BOOLEAN	ST	logical OR of operands NEG DIR OC# FWD and NEG DIR OC# REV		R
	dirGeneral	ENUMERATED	ST			R
FwdOp		SPS			NEG SEQ DIR OC# FWD operand	R
	stVal	BOOLEAN	ST	NEG SEQ DIR OC# FWD		R
RvOp		SPS			NEG SEQ DIR OC# REV operand	R
	stVal	BOOLEAN	ST	NEG SEQ DIR OC# REV		R
BlkRefγ		ORG			NEG SEQ DIR OC# BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	NEG SEQ DIR OC# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.39 Negative sequence instantaneous overcurrent (NegIoc)

This element is instantiated in the following products: C70, D30, D60, F35, F60, L30, L60, L90, T60.

Table 3-66: Negative sequence instantaneous overcurrent data objects

LNName: NegIocPIOC#		LDevice inst: Prot		UR element: Negative sequence Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEG SEQ IOC# PKP operand, which is indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	NEG SEQ IOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NEG SEQ IOC# OP operand	R
	general	BOOLEAN	ST	NEG SEQ IOC# OP		R
Dpo		SPS			NEG SEQ IOC# DPO operand	R
	stVal	BOOLEAN	ST	NEG SEQ IOC# DPO		R
BlkRefγ1		ORG			NEG SEQ IOC# BLOCK setting in setting group γ.	R
	setSrcRef	ObjectReference	SP	NEG SEQ IOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.40 Negative sequence overvoltage (NegOv)

This element is instantiated in the following products: C70, D30, D60, F60, G30, G60, L30, L60, M60, T60.

Table 3-67: Negative sequence overvoltage data objects

LNName: NegOvPTOV#		LDevice inst: Prot		UR element: Negative Sequence Overvoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEG SEQ OV # PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	NEG SEQ # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			NEG SEQ OV # OP operand (including individual three phases)	R
	general	BOOLEAN	ST	NEG SEQ OV # OP		R
Dpo		SPS			NEG SEQ OV # DPO operand, which is the inverse of NEG SEQ OV PKP	R
	stVal	BOOLEAN	ST	NEG SEQ OV # DPO		R
BlkRefγ		ORG			NEG SEQ OV # BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	NEG SEQ OV # BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.41 Negative sequence time overcurrent (NegToc)

This element is instantiated in the following products: C70, D30, D60, F35, F60, L30, L60, L90, T60.

Table 3-68: Negative sequence time overcurrent data objects

LNName: NegTocPTOC#		LDevice inst: Prot		UR element: Negative sequence Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEG SEQ TOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	NEG SEQ TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NEG SEQ TOC# OP operand	R
	general	BOOLEAN	ST	NEG SEQ TOC# OP		R

LNName: NegTocPTOC#		LDevice inst: Prot		UR element: Negative sequence Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dpo		SPS			NEG SEQ TOC# DPO operand	R
	stVal	BOOLEAN	ST	NEG SEQ TOC# DPO		R
BlkRefγ1		ORG			NEG SEQ TOC# BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	NEG SEQ TOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.42 Neutral current unbalance (NeAun)

This element is instantiated in the following products: C70.

Table 3-69: Neutral current unbalance data objects

LNName: NeAUnPTOC#		LDevice inst: Prot		UR element: Neutral Current Unbalance element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NTRL CUR # PKP operands.	R
	general	BOOLEAN	ST	NTRL CUR # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NTRL CUR # OP operand	R
	general	BOOLEAN	ST	NTRL CUR # OP		R
Dpo		SPS			NTRL CUR # DPO operand	R
	stVal	BOOLEAN	ST	NTRL CUR # DPO		R
RawAnsp		MV			Raw INsp in per unit	R
	instMag.f	FLOAT32		Raw INsp		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	NeAUnPTOC#.RawAnsp.db		R/W/C
	zeroDb	INT32	CF			R
CompAop		MV			Comp Iop in per unit	R
	instMag.f	FLOAT32		Comp Iop		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	NeAUnPTOC#.CompAop.db		R/W/C
	zeroDb	INT32	CF			R

Table 3-70: Neutral current unbalance stage objects

LNName: NeAUn$PTOC#		LDevice inst: Prot		UR element: Neutral Current Unbalance element # Stage$		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NTRL CUR # STG$ PKP operands.	R
	general	BOOLEAN	ST	NTRL CUR # STG$ PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NTRL CUR # STG$ OP operands	R
	general	BOOLEAN	ST	NTRL CUR # STG$ OP		R
BlkRefγ		ORG			NTRL CUR # BLK STG$ setting for setting group γ.	R

LNName: NeAUn$PTOC#		LDevice inst: Prot		UR element: Neutral Current Unbalance element # Stage$		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	NTRL CUR # BLK STG$ for group γ (where $ refers to STAGE 1, 2, 3, 4)	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.43 Neutral directional overcurrent (NeuDoc)

This element is instantiated in the following products: B30, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 3-71: Neutral directional overcurrent data objects

LNName: NeuDocRDIR#		LDevice inst: Prot		UR element: Neutral Directional Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dir		ACD			NTRL DIR OC# FWD or NTRL DIR OC# REV operands, which becomes On when neutral directional overcurrent is flowing in either forward or reverse direction respectively	R
	general	BOOLEAN	ST	logical OR of operands NTRL DIR OC# FWD and NTRL DIR OC# REV		R
	dirGeneral	ENUMERATED	ST			R
FwdOp		SPS			NTRL DIR OC# FWD operand	R
	stVal	BOOLEAN	ST	NTRL DIR OC# FWD		R
RvOp		SPS			NTRL DIR OC# REV operand	R
	stVal	BOOLEAN	ST	NTRL DIR OC# REV		R
BlkRefγ		ORG			NEUTRAL DIR OC# BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	NEUTRAL DIR OC# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.44 Neutral instantaneous overcurrent (NeuIoc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 3-72: Neutral instantaneous overcurrent data objects

LNName: NeuIocPIOC#		LDevice inst: Prot		UR element: Neutral Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEUTRAL IOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	NEUTRAL IOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NEUTRAL IOC# OP operand	R
	general	BOOLEAN	ST	NEUTRAL IOC# OP		R
Dpo		SPS			NEUTRAL IOC# DPO operand	R
	stVal	BOOLEAN	ST	NEUTRAL IOC# DPO		R
BlkRefγ1		ORG			NEUTRAL IOC# BLOCK setting in setting group γ.	R
	setSrcRef	ObjectReference	SP	NEUTRAL IOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.45 Neutral overvoltage (NeuOv)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60.

Table 3-73: Neutral overvoltage data objects

LNName: NeuOvPTOV#		LDevice inst: Prot		UR element: Neutral Overvoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEUTRAL OV# PKP operands	R
	general	BOOLEAN	ST	NEUTRAL OV# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			NEUTRAL OV# OP operand	R
	general	BOOLEAN	ST	NEUTRAL OV# OP		R
Dpo		SPS			NEUTRAL OV# DPO operand, which is the inverse of NEUTRAL OV PKP	R
	stVal	BOOLEAN	ST	NETRAL OV# DPO		R
BlkRefγ		ORG			NEUTRAL OV# BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	NEUTRAL OV# BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.46 Neutral time overcurrent (NeuToc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 3-74: Neutral time overcurrent data objects

LNName: NeuTocPTOC#		LDevice inst: Prot		UR element: Neutral Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEUTRAL TOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	NEUTRAL TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NEUTRAL TOC# OP operand	R
	general	BOOLEAN	ST	NEUTRAL TOC# OP		R
Dpo		SPS			NEUTRAL TOC# DPO operand	R
	stVal	BOOLEAN	ST	NEUTRAL TOC# DPO		R
BlkRefγ1		ORG			NEUTRAL TOC# BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	NEUTRAL TOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.47 Neutral voltage unbalance (NuVUn)

This element is instantiated in the following products: C70.

Table 3-75: Neutral voltage unbalance data objects

LNName: NuVUnPTOV#		LDevice inst: Prot		UR element: Neutral Voltage Unbalance element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NTRL VOLT # PKP operands	R
	general	BOOLEAN	ST	NTRL VOLT # PKP		R

LNName: NuVUnPTOV#		LDevice inst: Prot		UR element: Neutral Voltage Unbalance element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			NTRL VOLT # OP operand	R
	general	BOOLEAN	ST	NTRL VOLT # OP		R
Dpo		SPS			NTRL VOLT# DPO operand, which is the inverse of NTRL VOLT # PKP	R
	stVal	BOOLEAN	ST	NTRL VOLT # DPO		R
NeutVx		CMV			Neutral point voltage in p.u.	R
	instCVal.mag.f	FLOAT32		NEUTRAL-POINT Vx magnitude		R
	instCVal.ang.f	FLOAT32		NEUTRAL-POI		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for the dimension less (in p.u)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	NuVUnPTOV#.NeutVx.db		R/W/C
	dbAng	INT32U	CF	NuVUnPTOV#.NeutVx.dbAng		R/W/C
	zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
BusV0		CMV			Zero Sequence Bus voltage in p.u.	R
	instCVal.mag.f	FLOAT32		BUS V0 magnitude		R
	instCVal.ang.f	FLOAT32		BUS V0, in		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for the dimension less (in p.u)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	NuVUnPTOV#.BusV0.db		R/W/C
	dbAng	INT32U	CF	NuVUnPTOV#.BusV0.dbAng		R/W/C
	zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
VOp		MV			NEUTRAL VOLTAGE UNBALANCE # Vop, in p.u.	R
	instMag.f	FLOAT32		NEUTRAL VOLTAGE UNBALANCE # Vop		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1 is code for dimensionless (per unit)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	NuVUnPTOV#.VOp.db		R/W/C
	zeroDb	INT32U	CF			R
VRst		MV			NEUTRAL VOLTAGE UNBALANCE # Vres, in p.u.	R
	instMag.f	FLOAT32		NEUTRAL VOLTAGE UNBALANCE # Vres		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1 is code for dimensionless (per unit)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	NuVUnPTOV#.VRst.db		R/W/C
	zeroDb	INT32U	CF			R

Table 3-76: Neutral voltage unbalance stage objects

LNName: NuVUn$PTOV#		LDevice inst: Prot		UR element: Neutral Voltage Unbalance element # stage $		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NTRL VOLT # STG$ PKP operand ".	R
	general	BOOLEAN	ST	NTRL VOLT # STG$ PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NTRL VOLT # STG$ OP operand	R
	general	BOOLEAN	ST	NTRL VOLT # STG$ OP		R
BlkRefγ		ORG			NTRL VOL # BLK STG$ setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	NTRL VOL # BLK STG$ for group γ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.48 Open pole detector (OpnPl)

This element is instantiated in the following products: C60, D60, L60, L90. It does not apply to open pole detector supervisor N60.

Table 3-77: Open pole detector data objects

LNName: OpnPl0SCBR1		LDevice inst: Prot		UR element: Open Pole Detector element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRef1		ORG			OPEN POLE BLOCK setting	R
	setSrcRef	ObjectReference	SP	OPEN POLE BLOCK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
ColOpn		SPS			Logical OR of status value of mapped FlexLogic operands in TRIP PHASE A, TRIP PHASE B, TRIP PHASE C".	R
	stVal	BOOLEAN	ST	Status of Logical OR condition to OpnPl1SCBR1.ColOpn, OpnPl2SCBR1.ColOpn, OpnPl3SCBR1.ColOpn		R
PlOpn		ACT			OPEN POLE OP operand	R
	general	BOOLEAN	ST	OPEN POLE OP		R
BlkPhDis		SPS			OPEN POLE BLK N operand	R
	stVal	BOOLEAN	ST	OPEN POLE BLK N		R

Table 3-78: Open pole detector data objects

LNName: OpnPlΘSCBR1		LDevice inst: Prot		UR element: Open Pole Detector element for ψ and ψτ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ColOpn		SPS			Status value of mapped settings TRIP ψ	R
	stVal	BOOLEAN	ST	Status value TRIP ψ setting		R
PlOpn		ACT			OPEN POLE OP ψ operand	R
	general	BOOLEAN	ST	OPEN POLE OP ψ		R
BkrOpnPl		ACT			OPEN POLE BKR ψ OP operand	R
	general	BOOLEAN	ST	OPEN POLE BKR ψ OP		R
BlkPhDis		SPS			OPEN POLE BLK ψτ operand	R
	stVal	BOOLEAN	ST	OPEN POLE BLK ψτ		R
RemUnA		SPS			OPEN POLE REM OP ψ operand	R
	stVal	BOOLEAN	ST	OPEN POLE REM OP ψ		R
UnA		SPS			OPEN POLE I < ψ operand	R
	stVal	BOOLEAN	ST	OPEN I < ψ		R

3.5.2.49 Overfrequency (OvHz)

This element is instantiated in the following products: C60, D60, F60, G30, G60, L90, M60, N60, T60.

Table 3-79: Overfrequency data objects

LNName: OvHzPTOF#		LDevice inst: Prot		UR element: Overfrequency element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			OVERFREQ # PKP operand which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	OVERFREQ # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			OVERFREQ # OP operand	R
	general	BOOLEAN	ST	OVERFREQ # OP		R
Dpo		SPS			OVERFREQ # DPO operand	R
	stVal	BOOLEAN	ST	OVERFREQ # DPO		R
BlkRef1		ORG			OVERFREQ # BLOCK setting.	R
	setSrcRef	ObjectReference	SP	OVERFREQ # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.50 Permissive overreaching transfer trip (POTT_)

This element is instantiated in the following products: D60, L60, L90.

Table 3-80: POTT data objects

LNName: POTT_PSCH1		LDevice inst: Prot		UR element: Permissive Over-reaching Transfer Trip element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			POTT OP operand	R
	general	BOOLEAN	ST	POTT OP		R
	phsA	BOOLEAN	ST	POTT TRIP A		R
	phsB	BOOLEAN	ST	POTT TRIP B		R
	phsC	BOOLEAN	ST	POTT TRIP C		R
Tr3p		ACT			POTT TRIP 3P operand	R
	general	BOOLEAN	ST	POTT TRIP 3P		R
Tx1		SPS			POTT TX1 operand	R
	stVal	BOOLEAN	ST	POTT TX1		R
Tx2		SPS			POTT TX2 operand	R
	stVal	BOOLEAN	ST	POTT TX2		R
Tx3		SPS			POTT TX3 operand	R
	stVal	BOOLEAN	ST	POTT TX3		R
Tx4		SPS			POTT TX4 operand	R
	stVal	BOOLEAN	ST	POTT TX4		R
BlkRef1		ORG			POTT SCHEME BLOCK setting.	R
	setSrcRef	ObjectReference	SP	POTT SCHEME BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			POTT ECHO COND setting.	R
	setSrcRef	ObjectReference	SP	POTT ECHO COND	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef6		ORG			GND DIR O/C FWD setting.	R
	setSrcRef	ObjectReference	SP	GND DIR O/C FWD	reference to the data attribute to input	R/C

LNName: POTT_PSCH1		LDevice inst: Prot		UR element: Permissive Over-reaching Transfer Trip element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			POTT RX1 setting.	R
	setSrcRef	ObjectReference	SP	POTT RX1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			POTT RX2 setting.	R
	setSrcRef	ObjectReference	SP	POTT RX2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			POTT RX3 setting.	R
	setSrcRef	ObjectReference	SP	POTT RX3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			POTT RX4 setting.	R
	setSrcRef	ObjectReference	SP	POTT RX4	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.51 Permissive overreaching transfer trip 1 (POTT1_)

This element is instantiated in the following products: D60, L90.

Table 3-81: POTT1 data objects

LNName: POTT1_PSCH1		LDevice inst: Prot		UR element: Permissive Over-reaching Transfer Trip 1 element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			POTT1 OP operand	R
	general	BOOLEAN	ST	POTT1 OP		R
	phsA	BOOLEAN	ST	POTT1 TRIP A		R
	phsB	BOOLEAN	ST	POTT1 TRIP B		R
	phsC	BOOLEAN	ST	POTT1 TRIP C		R
Tr3p		ACT			Instantiated only on products with single pole tripping.	R
	general	BOOLEAN	ST	POTT1 TRIP 3P		R
Tx1		SPS			POTT1 TX1 operand	R
	stVal	BOOLEAN	ST	POTT1 TX1		R
Tx2		SPS			Instantiated only on products with single pole tripping.	R
	stVal	BOOLEAN	ST	POTT1 TX2		R
Tx3		SPS			Instantiated only on products with single pole tripping.	R
	stVal	BOOLEAN	ST	POTT1 TX3		R
Tx4		SPS			Instantiated only on products with single pole tripping.	R
	stVal	BOOLEAN	ST	POTT1 TX4		R
BlkRef1		ORG			POTT1 SCHEME BLOCK setting.	R
	setSrcRef	ObjectReference	SP	POTT1 SCHEME BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			POTT1 ECHO COND setting.	R
	setSrcRef	ObjectReference	SP	POTT1 ECHO COND	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef6		ORG			DIR FWD1 setting.	R
	setSrcRef	ObjectReference	SP	DIR FWD1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef7		ORG			DIR FWD2 setting.	R

LNName: POTT1_PSCH1		LDevice inst: Prot		UR element: Permissive Over-reaching Transfer Trip 1 element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	DIR FWD 2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef8		ORG			DIR FWD3 setting.	R
	setSrcRef	ObjectReference	SP	DIR FWD3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			POTT1 RX1 setting.	R
	setSrcRef	ObjectReference	SP	POTT1 RX1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			Instantiated only on products with single pole tripping.	R
	setSrcRef	ObjectReference	SP	POTT1 RX2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			Instantiated only on products with single pole tripping.	R
	setSrcRef	ObjectReference	SP	POTT1 RX3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			Instantiated only on products with single pole tripping.	R
	setSrcRef	ObjectReference	SP	POTT1 RX4	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.52 Permissive over-reaching transfer trip (POTT3)

This element is instantiated in the following products: F60.

Table 3-82: POTT3 data objects

LNName: POTT3_PSCH1		LDevice inst: Prot		UR element: Permissive Over-reaching Transfer Trip 3 element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			POTT3 OP operand	R
	general	BOOLEAN	ST	POTT3 OP		R
TxPrm		ACT			POTT3 TX operand	R
	general	BOOLEAN	ST	POTT3 TX		R
BlkRef1		ORG			POTT3 SCHEME BLOCK setting.	R
	setSrcRef	ObjectReference	SP	POTT3 SCHEME BLOCK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef01		ORG			POTT3 DIR FWD1 setting.	R
	setSrcRef	ObjectReference	SP	POTT3 DIR FWD1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef02		ORG			POTT3 DIR FWD2 setting.	R
	setSrcRef	ObjectReference	SP	POTT3 DIR FWD 2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef03		ORG			POTT3 DIR FWD3 setting.	R
	setSrcRef	ObjectReference	SP	POTT3 DIR FWD3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef21		ORG			POTT3 RX setting.	R
	setSrcRef	ObjectReference	SP	POTT3 RX	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef22		ORG			LINE END OPEN setting.	R
	setSrcRef	ObjectReference	SP	LINE END OPEN	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.53 Permissive under-reaching transfer trip (PUTT_)

This element is instantiated in the following products: D60, L90.

Table 3-83: PUTT data objects

LNName: PUTT_PSCH1		LDevice inst: Prot		UR element: Permissive Under-reaching Transfer Trip element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			PUTT OP operand	R
	general	BOOLEAN	ST	PUTT OP		R
	phsA	BOOLEAN	ST	PUTT TRIP A		R
	phsB	BOOLEAN	ST	PUTT TRIP B		R
	phsC	BOOLEAN	ST	PUTT TRIP C		R
Tr3p		ACT			PUTT TRIP 3P operand	R
	general	BOOLEAN	ST	PUTT TRIP 3P		R
Tx1		SPS			PUTT TX1 operand	R
	stVal	BOOLEAN	ST	PUTT TX1		R
Tx2		SPS			PUTT TX2 operand	R
	stVal	BOOLEAN	ST	PUTT TX2		R
Tx3		SPS			PUTT TX3 operand	R
	stVal	BOOLEAN	ST	PUTT TX3		R
Tx4		SPS			PUTT TX4 operand	R
	stVal	BOOLEAN	ST	PUTT TX4		R
BlkRef1		ORG			PUTT SCHEME BLOCK setting.	R
	setSrcRef	ObjectReference	SP	PUTT SCHEME BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			PUTT RX1 setting.	R
	setSrcRef	ObjectReference	SP	PUTT RX1	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			PUTT RX2 setting.	R
	setSrcRef	ObjectReference	SP	PUTT RX2	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			PUTT RX3 setting.	R
	setSrcRef	ObjectReference	SP	PUTT RX3	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			PUTT RX4 setting.	R
	setSrcRef	ObjectReference	SP	PUTT RX4	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.54 Phase comparison (PhCmp)

This element is instantiated in the following products: L60.

Table 3-84: Phase comparison data objects

LNName: PhCmp1PDIF1		LDevice inst: Prot		UR element: 87PC SCHEME (except FDH element specifics) and Charging Current Compensation element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγ1		ORG			87PC BLOCK setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	87PC BLOCK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ1		ORG			87PC FDL AUX setting of setting group γ.	R

LNName: PhCmp1PDIF1		LDevice inst: Prot		UR element: 87PC SCHEME (except FDH element specifics) and Charging Current Compensation element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	87PC FDL AUX setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ2		ORG			87PC STOP TX setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	87PC STOP TX setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRefγ2		ORG			CHARGE COMPENST BLK setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	CHARGE COMPENST BLK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
Str		ACD			87PC PKP operand	R
	general	BOOLEAN	ST	87PC PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Dpo		SPS			87PC DPO operand, which is the inverse of 87PC PKP	R
	stVal	BOOLEAN	ST	87PC DPO		R
Op		ACT			87PC OP operand	R
	general	BOOLEAN	ST	87PC OP		R
FDLOp		SPS			87PC FDL OP operand	R
	stVal	BOOLEAN	ST	87PC FDL OP		R
TransBlk		SPS			87PC TRANS BLOCK OP operand	R
	stVal	BOOLEAN	ST	87PC TRANS BLOCK OP		R
RXζ		SPS			87PC RXζ operand.	R
	stVal	BOOLEAN	ST	87PC RXζ		R
CmpCtβI1		MV			CT# COMP I1 Mag in amperes	R
	instMag.f	FLOAT32		CT# COMP I1 Mag		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	PhCmp1PDIF1.CmpCt#I1.db		R/W/C
	zeroDb	INT32U	CF			R
CmpCt#I2		MV			CT# COMP I2 Mag in amperes	R
	instMag.f	FLOAT32		CT# COMP I2 Mag		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	PhCmp1PDIF1.CmpCt#I2.		R/W/C
	zeroDb	INT32U	CF			R

Table 3-85: Phase comparison fault detector high (FDH) data objects

LNName: PhCmp2PDIF1		LDevice inst: Prot		UR element: 87PC SCHEME specific to FDH element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRefγ1		ORG			87PC FDH AUX setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	87PC FDH AUX setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ2		ORG			87PC FDH SUPV setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	87PC FDH SUPV setting	reference to the data attribute to input	R/C

LNName: PhCmp2PDIF1		LDevice inst: Prot		UR element: 87PC SCHEME specific to FDH element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
Op		ACT			87PC FDH OP operand	R
	general	BOOLEAN	ST	87PC FDH OP		R

Table 3-86: Phase comparison negative sequence voltage (excluding FDH) data objects

LNName: PhCmp1PTOV1		LDevice inst: Prot		UR element: Negative Sequence Voltage element (except FDH element specifics) as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			87PC V2 FDL OP operand	R
	general	BOOLEAN	ST	87PC V2 FDL OP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
BlkRefγ		ORG			NEG SEQ VOL FD BLK setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	NEG SEQ VOL FD BLK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-87: Phase comparison negative sequence voltage (for FDH) data objects

LNName: PhCmp2PTOV1		LDevice inst: Prot		UR element: Negative Sequence Voltage element specific to FDH element as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			87PC V2 FDH OP operand	R
	general	BOOLEAN	ST	87PC V2 FDH OP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R

Table 3-88: Phase comparison advanced fault detector rate of change of positive sequence current (excluding FDH) data objects

LNName: PhCmp1FXOT1		LDevice inst: Prot		UR element: RATE OF CHANGE OF POS SEQ CURRENT element (except FDH element specifics) as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγ		ORG			POS SEQ di/dt BLK setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	POS SEQ di/dt BLK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
StrVal		ASG			POS SEQ di/dt FDL PICKUP setting	R
	setMag.f	FLOAT32		POS SEQ di/dt FDL PICKUP		R
	units.SIUnit	ENUMERATED			1 is code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	minVal.f	FLOAT32				R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R
Op		ACT			87PC di1/dt FDL OP operand	R
	general	BOOLEAN	ST	87PC di1/dt FDL OP		R

Table 3-89: Phase comparison advanced fault detector rate of change of positive sequence current (for FDH) data objects

LNName: PhCmp2FXOT1		LDevice inst: Prot		UR element: RATE OF CHANGE OF POS SEQ CURRENT element specific to FDH element as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRefγ		ORG			POS SEQ FDH SUPV setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	POS SEQ FDH SUPV setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
StrVal		ASG			POS SEQ di/dt FDH PICKUP setting	R
	setMag.f	FLOAT32		POS SEQ di/dt FDH PICKUP		R
	units.SIUnit	ENUMERATED			1 is code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	minVal.f	FLOAT32				R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R
Op		ACT			87PC di1/dt FDH OP operand	R
	general	BOOLEAN	ST	87PC di1/dt FDH OP		R

Table 3-90: Phase comparison advanced fault detector rate of change of negative sequence current (excluding FDH) data objects

LNName: PhCmp3FXOT1		LDevice inst: Prot		UR element: RATE OF CHANGE OF NEG SEQ CURRENT element (except FDH element specifics) as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγ		ORG			NEG SEQ di/dt BLK setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	NEG SEQ di/dt BLK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
StrVal		ASG			NEG SEQ di/dt FDL PICKUP setting	R
	setMag.f	FLOAT32		NEG SEQ di/dt FDL PICKUP		R
	units.SIUnit	ENUMERATED			1 is code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	minVal.f	FLOAT32				R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R
Op		ACT			87PC di2/dt FDL OP operand	R
	general	BOOLEAN	ST	87PC di2/dt FDL OP		R

Table 3-91: Phase comparison advanced fault detector rate of change of negative sequence current (for FDH) data objects

LNName: PhCmp4FXOT1		LDevice inst: Prot		UR element: RATE OF CHANGE OF NEG SEQ CURRENT element specific to FDH element as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRefγ		ORG			NEG SEQ FDH SUPV setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	NEG SEQ FDH SUPV setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
StrVal		ASG			NEG SEQ di/dt FDH PICKUP setting	R
	setMag.f	FLOAT32		NEG SEQ di/dt FDH PICKUP		R
	units.SIUnit	ENUMERATED			1 is code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

LNName: PhCmp4FXOT1		LDevice inst: Prot		UR element: RATE OF CHANGE OF NEG SEQ CURRENT element specific to FDH element as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	minVal.f	FLOAT32				R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R
Op		ACT			87PC di2/dt FDH OP operand	R
	general	BOOLEAN	ST	87PC di2/dt FDH OP		R

Table 3-92: Phase comparison advanced fault detector positive sequence current (excluding FDH) data objects

LNName: PhCmp1PIOC1		LDevice inst: Prot		UR element: Positive Sequence Current element (except FDH element specifics) as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγ		ORG			POS SEQ I_1 BLK setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	POS SEQ I_1 BLK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
Op		ACT			87PC I_1 FDL OP operand	R
	general	BOOLEAN	ST	87PC I_1 FDL OP		R

Table 3-93: Phase comparison advanced fault detector positive sequence current (for FDH) data objects

LNName: PhCmp2PIOC1		LDevice inst: Prot		UR element: Positive Sequence Current element specific to FDH element as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			87PC I_1 FDH OP operand	R
	general	BOOLEAN	ST	87PC I_1 FDH OP		R

Table 3-94: Phase comparison advanced fault detector negative sequence current (excluding FDH) data objects

LNName: PhCmp3PIOC1		LDevice inst: Prot		UR element: Negative Sequence Current element (except FDH element specifics) as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγ		ORG			NEG SEQ I_2 BLK setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	NEG SEQ I_2 BLK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
Op		ACT			87PC I_2 FDL OP operand	R
	general	BOOLEAN	ST	87PC I_2 FDL OP		R

Table 3-95: Phase comparison advanced fault detector negative sequence current (for FDH) data objects

LNName: PhCmp4PIOC1		LDevice inst: Prot		UR element: Negative Sequence Current element specific to FDH element as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		SPS			87PC I_2 FDH OP operand	R
	stVal	BOOLEAN	ST	87PC I_2 FDH OP		R

Table 3-96: Phase comparison open breaker echo data objects

LNName: PhCmp5FXOT1		LDevice inst: Prot		UR element: OPEN BREAKER ECHO element as a part of Phase comparison function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRefγ1		ORG			BRK 1 AUX CONTACT setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	BRK 1 AUX CONTACT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ2		ORG			BRK 1 CONT SUPV setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	BRK 1 CONT SUPV setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ3		ORG			BRK 2 AUX CONTACT setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	BRK 2 AUX CONTACT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ4		ORG			BRK 2 CONT SUPV setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	BRK 2 CONT SUPV setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ5		ORG			WEAK-INFEED KEYING setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	WEAK-INFEED KEYING setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ6		ORG			WEAK-INFEED SUPV setting of setting group γ.	R
	setSrcRef	ObjectReference	SP	WEAK-INFEED SUPV setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
StrVal		ASG			Non-mapped mandatory DO, Non-configurable read only value	R
	setMag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
Op		ACT			87PC BKR ECHO PKP operand	R
	general	BOOLEAN	ST	87PC BKR ECHO PKP		R

3.5.2.55 Phase current unbalance (PhAUn)

This element is instantiated in the following products: C70.

Table 3-97: Phase current unbalance data objects

LNName: PhAUnPTOC#		LDevice inst: Prot		UR element: Phase Current Unbalance element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			CUR BAL # PKP operands (including individual three phases), which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	CUR BAL # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
	phsA	BOOLEAN	ST	CUR BAL # PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown.	R
	phsB	BOOLEAN	ST	CUR BAL # PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown.	R
	phsC	BOOLEAN	ST	CUR BAL # PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown.	R

LNName: PhAUnPTOC#		LDevice inst: Prot		UR element: Phase Current Unbalance element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			CUR BAL # OP operands (including individual three phases)	R
	general	BOOLEAN	ST	CUR BAL # OP		R
	phsA	BOOLEAN	ST	CUR BAL # OP A		R
	phsB	BOOLEAN	ST	CUR BAL # OP B		R
	phsC	BOOLEAN	ST	CUR BAL # OP C		R
Dpo		SPS			CUR BAL # DPO operand	R
	stVal	BOOLEAN	ST	CUR BAL # DPO		R
RawAPh		WYE			Raw Id in per unit for Ph A, B, and C	R
	phsA	CMV				R
	phsA.instCVal.mag .f	FLOAT32		Raw Id A		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	PhAUnPTOC#.RawAPh.phsA.db		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag .f	FLOAT32		Raw Id B		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	PhAUnPTOC#.RawAPh.phsB.db		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag .f	FLOAT32		Raw Id C		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	PhAUnPTOC#.RawAPh.phsC.db		R/W/C
	phsC.zeroDb	INT32U	CF			R
CompAPh		WYE			Cm Iop in per unit for Ph A, B, and C	R
	phsA	CMV				R
	phsA.instCVal.mag .f	FLOAT32		Cm Iop A		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	PhAUnPTOC#.CompAPh.phsA.db		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R

LNName: PhAUnPTOC#		LDevice inst: Prot		UR element: Phase Current Unbalance element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsB.instCVal.mag.f	FLOAT32		Cm Iop B		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsB.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	PhAUnPTOC#.CompAPh.phsB.db		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag.f	FLOAT32		Cm Iop C		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsC.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	PhAUnPTOC#.CompAPh.phsC.db		R/W/C
	phsC.zeroDb	INT32U	CF			R

Table 3-98: Phase current unbalance stage objects

LNName: PhAUn$PTOC#		LDevice inst: Prot		UR element: Phase Current Unbalance element # Stage $		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			CUR BAL # STG$ PKP operands (including individual three phases of this stage), which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	Logical OR of data attributes phsA, phsB and phsC		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
	phsA	BOOLEAN	ST	CUR BAL # STG$A PKP		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown.	R
	phsB	BOOLEAN	ST	CUR BAL # STG$B PKP		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown.	R
	phsC	BOOLEAN	ST	CUR BAL # STG$C PKP		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			CUR BAL # OP operands (including individual three phases of this stage).	R
	general	BOOLEAN	ST	Logical OR of data attributes phsA, phsB, phsC		R
	phsA	BOOLEAN	ST	CUR BAL # STG$A OP		R
	phsB	BOOLEAN	ST	CUR BAL # STG$B OP		R
	phsC	BOOLEAN	ST	CUR BAL # STG$C OP		R
BlkRefγ		ORG			CUR UNBL # BLK STG$ setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	CUR UNBL # BLK STG$ for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.56 Phase directional (PhsDir)

This element is instantiated in the following products: B30, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 3-99: Phase directional data objects

LNName: PhsDirRDIR#		LDevice inst: Prot		UR element: Phase Directional element # (ANSI 67P)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dir		ACD			PH DIR # BLK operand, which becomes On when phase current is flowing in the set direction	R
	general	BOOLEAN	ST	PH DIR # BLK		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
	phsA	BOOLEAN	ST	PH DIR # BLK A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown	R
	phsB	BOOLEAN	ST	PH DIR # BLK B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown	R
	phsC	BOOLEAN	ST	PH DIR # BLK C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown	R
BlkRefγ		ORG			PHASE DIR # BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	PHASE DIR # BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.57 Phase distance (PhsDis)

This element is instantiated in the following products: D30, D60, G60, L60, L90, T60.

Table 3-100: Phase distance data objects

LNName: PhsDisPDIS#		LDevice inst: Prot		UR element: Phase Distance Z# settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHS DIST Z# PKP operand in Phase-To-Phase	R
	general	BOOLEAN	ST	PH DIST Z# PKP		R
	dirGeneral	ENUMERATED	ST			R
Op		ACT			PHS DIST Z# OP operand in Phase-To-Phase	R
	general	BOOLEAN	ST	PHS DIST Z# OP		R
StrPhsϕ		SPS			PHS DIST Z# PKP θ operand in Phase-To-Phase	R
	stVal	BOOLEAN	ST	PHS DIST Z# PKP θ		R
DpoPhsϕ		SPS			PHS DIST Z# DPO θ operand in Phase-To-Phase	R
	stVal	BOOLEAN	ST	PHS DIST Z# DPO θ		R
OpPhsϕ		SPS			PH DIST Z # OP θ operand	R
	stVal	BOOLEAN	ST	PH DIST Z# OP θ		R
ASupnϕ		SPS			PHS DIST Z# SUPN θ operand in Phase-To-Phase	R
	stVal	BOOLEAN	ST	PHS DIST Z# SUPN θ		R
BlkRefγ		ORG			PHS DIST Z# BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	PHS DIST Z# BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ2		ORG			instantiated only in logical node instance 1	R

LNName: PhsDisPDIS#		LDevice inst: Prot		UR element: Phase Distance Z# settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	setting FORCE SELF-POLAR	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefγ3		ORG			instantiated only in logical node instance 1	R
	setSrcRef	ObjectReference	SP	setting FORCE MEM-POLAR I	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.58 Phase instantaneous overcurrent (PhsIoc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-101: Phase instantaneous overcurrent data objects

LNName: PhsIocPIOC#		LDevice inst: Prot		UR element: Phase Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHASE IOC# PKP operands (including individual three phases), which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	PHASE IOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
	phsA	BOOLEAN	ST	PHASE IOC# PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown.	R
	phsB	BOOLEAN	ST	PHASE IOC# PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown.	R
	phsC	BOOLEAN	ST	PHASE IOC# PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			PHASE IOC# OP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE IOC# OP		R
	phsA	BOOLEAN	ST	PHASE IOC# OP A		R
	phsB	BOOLEAN	ST	PHASE IOC# OP B		R
	phsC	BOOLEAN	ST	PHASE IOC# OP C		R
Dpo		SPS			PHASE IOC# DPO operand	R
	stVal	BOOLEAN	ST	PHASE IOC# DPO		R
DpoPhsβ		SPS			PHASE IOC# DPO β operands" (where β refers to Phase-A, B or C)	R
	stVal	BOOLEAN	ST	PHASE IOC# DPO β (where β refers to Phase-A, B or C)		R
BlkRefγβ		ORG			PHASE IOC# BLOCK β setting for setting group γ." (where β refers to Phase-A, B or C)	R
	setSrcRef	ObjectReference	SP	PHASE IOC# BLOCK β (where β refers to Phase-A, B or C)	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.59 Phase overvoltage (PhsOv)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 3-102: Phase overvoltage data objects

LNName: PhsOvPTOV#		LDevice inst: Prot		UR element: Phase Overvoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHASE OV # PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE OV # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsA	BOOLEAN	ST	PHASE OV # PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsB	BOOLEAN	ST	PHASE OV # PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsC	BOOLEAN	ST	PHASE OV # PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			PHASE OV # OP operand (including individual three phases)	R
	general	BOOLEAN	ST	PHASE OV # OP		R
	phsA	BOOLEAN	ST	PHASE OV # OP A		R
	phsB	BOOLEAN	ST	PHASE OV # OP B		R
	phsC	BOOLEAN	ST	PHASE OV # OP C		R
Dpo		SPS			PHASE OV # DPO operand, which is the inverse of PHASE OV PKP	R
	stVal	BOOLEAN	ST	PHASE OV # DPO		R
DpoPhsβ		SPS			PHASE OV# DPO β operand" (where β refers to Phase-A, B or C)	R
	stVal	BOOLEAN	ST	PHASE OV# DPO β (where β refers to Phase-A, B or C)		R
BlkRefγ		ORG			PHASE OV # BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	PHASE OV # BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.60 Phase select (PhSel)

This element is instantiated in the following products: C60, D60, L60, L90.

Table 3-103: Phase select data objects

LNName: PhSelGAPC1		LDevice inst: Prot		UR element: Phase select element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
FltAG		SPS			PHASE SELECT AG operand	R
	stVal	BOOLEAN	ST	PHASE SELECT AG		R
FltBG		SPS			PHASE SELECT BG operand	R
	stVal	BOOLEAN	ST	PHASE SELECT BG		R
FltCG		SPS			PHASE SELECT CG operand	R
	stVal	BOOLEAN	ST	PHASE SELECT CG		R
FltSLG		SPS			PHASE SELECT SLG operand	R
	stVal	BOOLEAN	ST	PHASE SELECT SLG		R
FltAB		SPS			PHASE SELECT AB operand	R
	stVal	BOOLEAN	ST	PHASE SELECT AB		R
FltBC		SPS			PHASE SELECT BC operand	R
	stVal	BOOLEAN	ST	PHASE SELECT BC		R

LNName: PhSelGAPC1		LDevice inst: Prot		UR element: Phase select element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
FltCA		SPS			PHASE SELECT CA operand	R
	stVal	BOOLEAN	ST	PHASE SELECT CA		R
FltABG		SPS			PHASE SELECT ABG operand	R
	stVal	BOOLEAN	ST	PHASE SELECT ABG		R
FltBCG		SPS			PHASE SELECT BCG operand	R
	stVal	BOOLEAN	ST	PHASE SELECT BCG		R
FltCAG		SPS			PHASE SELECT CAG operand	R
	stVal	BOOLEAN	ST	PHASE SELECT CAG		R
Flt3Ph		SPS			PHASE SELECT 3P operand	R
	stVal	BOOLEAN	ST	PHASE SELECT 3P		R
FltMulti		SPS			PHASE SELECT MULTI-P operand	R
	stVal	BOOLEAN	ST	PHASE SELECT MULTI-P		R
FltVoid		SPS			PHASE SELECT VOID operand	R
	stVal	BOOLEAN	ST	PHASE SELECT VOID		R

3.5.2.61 Phase time overcurrent (PhsToc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-104: Phase time overcurrent data objects

LNName: PhsTocPTOC#		LDevice inst: Prot		UR element: Phase Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHASE TOC# PKP operands (including individual three phases), which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	PHASE TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
	phsA	BOOLEAN	ST	PHASE TOC# PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown.	R
	phsB	BOOLEAN	ST	PHASE TOC# PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown.	R
	phsC	BOOLEAN	ST	PHASE TOC# PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			PHASE TOC# OP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE TOC# OP		R
	phsA	BOOLEAN	ST	PHASE TOC# OP A		R
	phsB	BOOLEAN	ST	PHASE TOC# OP B		R
	phsC	BOOLEAN	ST	PHASE TOC# OP C		R
Dpo		SPS			PHASE TOC# DPO operand	R
	stVal	BOOLEAN	ST	PHASE TOC# DPO		R
DpoPhsβ		SPS			PHASE TOC# DPO β operands" (where β refers to Phase-A, B or C)	R
	stVal	BOOLEAN	ST	PHASE TOC# DPO β (where β refers to Phase-A, B or C)		R
BlkRefγβ		ORG			PHASE TOC# BLOCK β setting for setting group γ." (where β refers to Phase-A, B or C)	R

LNName: PhsTocPTOC#		LDevice inst: Prot		UR element: Phase Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	PHASE TOC# BLOCK β for group γ (where β refers to Phase-A, B or C)	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.62 Phase undervoltage (PhsUv)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 3-105: Phase undervoltage data objects

LNName: PhsUvPTUV#		LDevice inst: Prot		UR element: Phase Undervoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHASE UV# PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE UV# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsA	BOOLEAN	ST	PHASE UV# PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsB	BOOLEAN	ST	PHASE UV# PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsC	BOOLEAN	ST	PHASE UV# PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			PHASE UV# OP operand (including individual three phases)	R
	general	BOOLEAN	ST	PHASE UV# OP		R
	phsA	BOOLEAN	ST	PHASE UV# OP A		R
	phsB	BOOLEAN	ST	PHASE UV# OP B		R
	phsC	BOOLEAN	ST	PHASE UV# OP C		R
Dpo		SPS			PHASE UV# DPO operand, which is the inverse of PHASE UV PKP	R
	stVal	BOOLEAN	ST	PHASE UV# DPO		R
DpoPhsβ		SPS			PHASE UV# DPO β operands" (where β refers to Phase-A, B or C)	R
	stVal	BOOLEAN	ST	PHASE UV# DPO β (where β refers to Phase-A, B or C)		R
BlkRefγ		ORG			PHASE UV# BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	PHASE UV# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.63 Power swing detection (PwrSwg)

This element is instantiated in the following products: D30, D60, G60, L60, L90, N60, T60.

Table 3-106: Power swing detection data objects

LNName: PwrSwgRPSB1		LDevice inst: Prot		UR element: Power Swing Detect element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			POWER SWING INCOMING operand	R
	general	BOOLEAN	ST	POWER SWING INCOMING		R
	dirGeneral	ENUMERATED	ST			R
StrOutgoing		SPS			POWER SWING OUTGOING operand	R
	stVal	BOOLEAN	ST	POWER SWING OUTGOING		R
Op		ACT			POWER SWING TRIP	R
	general	BOOLEAN	ST	POWER SWING TRIP		R
BlkZn		SPS			POWER SWING BLOCK operand	R
	stVal	BOOLEAN	ST	POWER SWING BLOCK		R
Z1Chr1		SPS			POWER SWING OUTER operand	R
	stVal	BOOLEAN	ST	POWER SWING OUTER		R
Z1Chr2		SPS			POWER SWING MIDDLE operand	R
	stVal	BOOLEAN	ST	POWER SWING MIDDLE		R
Z1Chr3		SPS			POWER SWING INNER operand	R
	stVal	BOOLEAN	ST	POWER SWING INNER		R
TmStr2		SPS			POWER SWING TMR2 PKP operand	R
	stVal	BOOLEAN	ST	POWER SWING TMR2 PKP		R
TmStr3		SPS			POWER SWING TMR3 PKP operand	R
	stVal	BOOLEAN	ST	POWER SWING TMR3 PKP		R
TmStr4		SPS			POWER SWING TMR4 PKP operand	R
	stVal	BOOLEAN	ST	POWER SWING TMR4 PKP		R
Blk		SPS			POWER SWING UN/BLOCK operand	R
	stVal	BOOLEAN	ST	POWER SWING UN/BLOCK		R
DistDet		SPS			POWER SWING 50DD operand	R
	stVal	BOOLEAN	ST	POWER SWING 50DD		R
InRefγ2		ORG			POWER SW I2 SUPV ENAB setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	POWER SW I2 SUPV ENAB setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRefγ		ORG			POWER SWING BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	POWER SWING BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.64 Restricted ground fault (RgDif)

This element is instantiated in the following products: F60, G30, G60, L90, T35, T60.

Table 3-107: Restricted ground fault data objects

LNName: RgDifPDIF#		LDevice inst: Prot		UR element: Restricted Ground Fault # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			RESTD GND FT# OP operands	R
	general	BOOLEAN	ST	RESTD GND FT# OP		R
Dpo		SPS			RESTD GND FT# DPO operand,	R
	stVal	BOOLEAN	ST	RESTD GND FT# DPO		R
Str		ACD			RESTD GND FT# PKP operand	R
	general	BOOLEAN	ST	RESTD GND FT# PKP		R

LNName: RgDifPDIF#		LDevice inst: Prot		UR element: Restricted Ground Fault # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	dirGeneral	ENUMERATED	ST		1 is code for Forward	R
DifAClc		WYE			Differential currents	R
	net	CMV				R
	net.instCVal.mag .f	FLOAT32		RGF# DIFF Igd magnitude, in primary amps		R
	net.cVal.mag.f	FLOAT32		RGF# DIFF Igd magnitude, in primary amps, with deadband		R
	net.units.SIUnit	ENUMERATED			5, the code for amps	R
	net.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	net.db	INT32U	CF	RgDifPDIF#.DifAClc.net.db		R/W/C
	net.zeroDb	INT32U	CF			R
RstA		WYE			Restraint currents	R
	net	CMV				R
	net.instCVal.mag .f	FLOAT32		RGF# RESTR Igr magnitude, in primary amps		R
	net.cVal.mag.f	FLOAT32		RGF# RESTR Igr magnitude, in primary amps, with deadband		R
	net.units.SIUnit	ENUMERATED			5, the code for amps	R
	net.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	net.db	INT32U	CF	RgDifPDIF#.RstA.net.db		R/W/C
	net.zeroDb	INT32U	CF			R
BlkRefγ		ORG			RESTD GND FT# BLOCK for setting group γ.	R
	setSrcRef	ObjectReference	SP	RESTD GND FT# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.65 RTD (PRTDs)

This element is instantiated in the following products: G60, M60, T60.

Table 3-108: RTD data objects

LNName: PRTDsSTMP#		LDevice inst: Prot		UR element: RTD Input ϕ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			RTD Ip # TRIP PKP operand	R
	general	BOOLEAN	ST	RTD Ip # TRIP PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
StrAlm		ACD			RTD Ip # ALARM PKP operand	R
	general	BOOLEAN	ST	RTD Ip # ALARM PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
Trip		SPS			RTD Ip # TRIP OP operand	R
	stVal	BOOLEAN	ST	RTD Ip # TRIP OP		R
Alm		SPS			RTD Ip # ALARM OP operand	R
	stVal	BOOLEAN	ST	RTD Ip # ALARM OP		R
Dpo		SPS			RTD Ip # TRIP DPO operand	R
	stVal	BOOLEAN	ST	RTD Ip # TRIP DPO		R
DpoAlm		SPS			RTD Ip # ALARM DPO operand	R
	stVal	BOOLEAN	ST	RTD Ip # ALARM DPO		R
OpnCirc		SPS			RTD Ip # OPEN operand	R

LNName: PRTDsSTMP#		LDevice inst: Prot		UR element: RTD Input ϕ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	RTD Ip # OPEN		R
ShrtCirc		SPS			RTD Ip # SHORTED operand	R
	stVal	BOOLEAN	ST	RTD Ip # SHORTED		R
Tmp		MV			RTD INPUT ϕ Temperature in degree Celsius	R
	instMag.f	FLOAT32		RTD INPUT ϕ		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			23, the code for degree Celsius (°C)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	PRTDsSTMP#.Tmp.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRef1		ORG			RTD INPUT ϕ BLOCK setting.	R
	setSrcRef	ObjectReference	SP	RTD INPUT ϕ BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.66 RRTD (RRTDs)

This element is instantiated in the following products: G60, M60, T60.

Table 3-109: RRTD data objects

LNName: RRTDsSTMP#		LDevice inst: Prot		UR element: RRTD Input #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			RRTD RTD # TRIP PKP operand	R
	general	BOOLEAN	ST	RRTD RTD # TRIP PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
StrAlm		ACD			RRTD RTD # ALARM PKP operand	R
	general	BOOLEAN	ST	RRTD RTD # ALARM PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
Trip		SPS			RRTD RTD # TRIP OP operand	R
	stVal	BOOLEAN	ST	RRTD RTD # TRIP OP		R
Alm		SPS			RRTD RTD # ALARM OP operand	R
	stVal	BOOLEAN	ST	RRTD RTD # ALARM OP		R
Dpo		SPS			RRTD RTD # TRIP DPO operand	R
	stVal	BOOLEAN	ST	RRTD RTD # TRIP DPO		R
DpoAlm		SPS			RRTD RTD # ALARM DPO operand	R
	stVal	BOOLEAN	ST	RRTD RTD # ALARM DPO		R
OpnCirc		SPS			RRTD RTD # OPEN operand	R
	stVal	BOOLEAN	ST	RRTD RTD # OPEN		R
ShrtCirc		SPS			RRTD RTD # SHORTED operand	R
	stVal	BOOLEAN	ST	RRTD RTD # SHORTED		R
Tmp		MV			RRTD INPUT # Temperature in degree Celsius	R
	instMag.f	FLOAT32		RRTD INPUT #		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			23, the code for degree Celsius (°C)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	RRTDsSTMP#.Tmp.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRef1		ORG			RRTD # BLOCK setting.	R

LNName: RRTDsSTMP#		LDevice inst: Prot		UR element: RRTD Input #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	RRTD # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.67 Sensitive directional power (Sen)

This element is instantiated in the following products: C60, D60, F60, G30, G60, L90, M60, N60, T60.

Table 3-110: Sensitive directional power general data objects

LNName: SenPDOP#		LDevice inst: Prot		UR element: Sensitive Directional Power element # core functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			DIR POWER # PKP operand, which becomes On when either stage 1 or stage 2 of this element has picked up.	R
	general	BOOLEAN	ST	DIR POWER # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			DIR POWER # OP operand	R
	general	BOOLEAN	ST	DIR POWER # OP		R
Dpo		SPS			DIR POWER # DPO operand, which is the inverse of DIR POWER OP	R
	stVal	BOOLEAN	ST	DIR POWER # DPO		R
TotW		MV			DIRECTIONAL POWER # 3-PHASE, in primary watts	R
	instMag.f	FLOAT32		DIRECTIONAL POWER # 3ϕ		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SenPDOP#.TotW.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRefγ		ORG			DIR POWER # BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	DIR POWER # BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-111: Sensitive directional power stage 1 data objects

LNName: Sen1PDOP#		LDevice inst: Prot		UR element: Sensitive Directional Power element # stage 1 functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			DIR POWER # STG1 PKP operand, which becomes On when the directional power comparator has operated.	R
	general	BOOLEAN	ST	DIR POWER # STG1 PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			DIR POWER # STG1 OP operand	R
	general	BOOLEAN	ST	DIR POWER # STG1 OP		R
Dpo		SPS			DIR POWER # STG1 DPO operand, which is the inverse of DIR POWER STG1 OP	R
	stVal	BOOLEAN	ST	DIR POWER # STG1 DPO		R

Table 3-112: Sensitive directional power stage 2 data objects

LNName: Sen2PDOP#		LDevice inst: Prot		UR element: Sensitive Directional Power element # stage 2 functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			DIR POWER # STG2 PKP operand, which becomes On when the directional power comparator has operated.	R
	general	BOOLEAN	ST	DIR POWER # STG2 PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			DIR POWER # STG2 OP operand	R
	general	BOOLEAN	ST	DIR POWER # STG2 OP		R
Dpo		SPS			DIR POWER # STG2 DPO operand, which is the inverse of DIR POWER STG2 OP	R
	stVal	BOOLEAN	ST	DIR POWER # STG2 DPO		R

3.5.2.68 Speed 2 motor acceleration time (S2AcTm)

This element is instantiated in the following products: M60.

Table 3-113: Speed 2 acceleration time data objects

LNName: S2AcTmPMSS1		LDevice inst: Prot		UR element: SPEED2 Acceleration Time element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			MOTOR SPD2 ACL t OP operand	R
	general	BOOLEAN	ST	MOTOR SPD2 ACL t OP		R
Dpo		SPS			MOTOR SPD2 ACL t DPO operand	R
	stVal	BOOLEAN	ST	MOTOR SPD2 ACL t DPO		R
SPDTR		SPS			MOTOR SPD2 TR 2-1 OP operand	R
	stVal	BOOLEAN	ST	MOTOR SPD2 TR 2-1 OP		R
BlkRefγ		ORG			SPEED2 ACCEL BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	SPEED2 ACCEL BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.69 Split phase (SpltPh)

This element is instantiated in the following products: G30, G60.

Table 3-114: Split phase data objects

LNName: SpltPhPDIF1		LDevice inst: Prot		UR element: Split Phase Element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			SPLIT PHASE PKP, SPLIT PHASE A PKP, SPLIT PHASE B PKP & SPLIT PHASE C PKP operands	R
	general	BOOLEAN	ST	SPLIT PHASE PKP		R
	dirGeneral	ENUMERATED	ST			R
	phsA	BOOLEAN	ST	SPLIT PHASE A PKP		R
	dirPhsA	ENUMERATED	ST			R
	phsB	BOOLEAN	ST	SPLIT PHASE B PKP		R
	dirPhsB	ENUMERATED	ST			R
	phsC	BOOLEAN	ST	SPLIT PHASE C PKP		R
	dirPhsC	ENUMERATED	ST			R

LNName: SpltPhPDIF1		LDevice inst: Prot		UR element: Split Phase Element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			SPLIT PHASE OP, SPLIT PHASE A OP, SPLIT PHASE B OP & SPLIT PHASE C OP operands	R
	general	BOOLEAN	ST	SPLIT PHASE OP		R
	phsA	BOOLEAN	ST	SPLIT PHASE A OP		R
	phsB	BOOLEAN	ST	SPLIT PHASE B OP		R
	phsC	BOOLEAN	ST	SPLIT PHASE C OP		R
Dpo		SPS			SPLIT PHASE DPO operand	R
	stVal	BOOLEAN	ST	SPLIT PHASE DPO		R
DpoPhsϕ		SPS			SPLIT PHASE θ DPO operand	R
	stVal	BOOLEAN	ST	SPLIT PHASE θ DPO		R
BlkRefγ		ORG			SPLIT PHASE BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	SPLIT PHASE BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.70 Stator differential (SttDif)

This element is instantiated in the following products: G60, M60.

Table 3-115: Stator differential data objects

LNName: SttDifPDIF#		LDevice inst: Prot		UR element: Stator Differential Function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			STATOR DIFF OP ,STATOR DIFF OP A, STATOR DIFF OP B & STATOR DIFF OP C operands	R
	general	BOOLEAN	ST	STATOR DIFF OP		R
	phsA	BOOLEAN	ST	STATOR DIFF OP A		R
	phsB	BOOLEAN	ST	STATOR DIFF OP B		R
	phsC	BOOLEAN	ST	STATOR DIFF OP C		R
DpoPhsϕ		SPS			STATOR DIFF# DPO θ operand	R
	stVal	BOOLEAN	ST	STATOR DIFF #DPO θ		R
Str		ACD			STATOR DIFF# PKP A, STATOR DIFF# PKP B & STATOR DIFF# PKP C operand	R
	general	BOOLEAN	ST	logical OR of phsA, phsB, phsC		R
	dirGeneral	ENUMERATED	ST			R
	phsA	BOOLEAN	ST	STATOR DIFF# PKP A		R
	dirPhsA	ENUMERATED	ST			R
	phsB	BOOLEAN	ST	STATOR DIFF# PKP B		R
	dirPhsB	ENUMERATED	ST			R
	phsC	BOOLEAN	ST	STATOR DIFF# PKP C		R
	dirPhsC	ENUMERATED	ST			R
Satϕ		SPS			STATOR DIFF # SAT θ operand	R
	stVal	BOOLEAN	ST	STATOR DIFF # SAT θ		R
PhDirϕ		SPS			STATOR DIFF # DIR θ operand	R
	stVal	BOOLEAN	ST	STATOR DIFF # DIR θ		R
BlkRefγ		ORG			STATOR DIFF BLK for setting group γ.	R
	setSrcRef	ObjectReference	SP	STATOR DIFF BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.71 100% stator ground (Statr)

This element is instantiated in the following products: G60.

Table 3-116: Stator ground data objects

LNName: StatrPHIZ1	LDevice inst: Prot		UR element: 100% stator ground element core functions			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			100% STATOR PKP operand	R
	general	BOOLEAN	ST	100% STATOR PKP		R
	dirGeneral	ENUMERATED	ST			R
Op		ACT			100% STATOR OP operand	R
	general	BOOLEAN	ST	100% STATOR OP		R
Dpo		SPS			100% STATOR DPO operand	R
	stVal	BOOLEAN	ST	100% STATOR DPO		R
Ha3NV		MV			STATOR GND 3RD HARM VN in volts	R
	instMag.f	FLOAT32		STATOR GND 3RD HARM VN		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	StatrPHIZ1.Ha3NV.db		R/W/C
	zeroDb	INT32U	CF			R
Ha3ZroV		MV			STATOR GND 3RD HARM V0 in volts	R
	instMag.f	FLOAT32		STATOR GND 3RD HARM V0		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	StatrPHIZ1.Ha3ZroV.db		R/W/C
	zeroDb	INT32U	CF			R
SumHa3NVZroV		MV			STATOR GND 3RD HARM VN+V0 in volts	R
	instMag.f	FLOAT32		STATOR GND 3RD HARM VN+V0		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	StatrPHIZ1. SumHa3NVZroV.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRefγ		ORG			100% STATOR GND BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	100% STATOR GND BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-117: Stator ground stage data objects

LNName: Statr$PHIZ1	LDevice inst: Prot		UR element: 100% stator ground element stage $ functions			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			100% STATOR STG$ PKP operand	R
	general	BOOLEAN	ST	100% STATOR STG$ PKP		R
	dirGeneral	ENUMERATED	ST			R
Op		ACT			100% STATOR STG$ OP operand	R
	general	BOOLEAN	ST	100% STATOR STG$ OP		R
Dpo		SPS			100% STATOR STG$ DPO operand	R
	stVal	BOOLEAN	ST	100% STATOR STG$ DPO		R

3.5.2.72 Subharmonic stator ground (SubHa)

This element is instantiated in the following products: G60.

Table 3-118: Subharmonic stator ground data objects

LNName: SubHaPHIZ1		LDevice inst: Prot		UR element: Sub-harmonic stator ground overcurrent functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			SH STAT GND OC PKP operand	R
	general	BOOLEAN	ST	SH STAT GND OC PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			SH STAT GND OC OP operand	R
	general	BOOLEAN	ST	SH STAT GND OC OP		R
Dpo		SPS			SH STAT GND OC DPO operand	R
	stVal	BOOLEAN	ST	SH STAT GND OC DPO		R
Trouble		SPS			SH STAT GND TRB OP operand	R
	stVal	BOOLEAN	ST	SH STAT GND TRB OP		R
GndRis		MV			STATOR GND. RESIST in kilo ohms	R
	instMag.f	FLOAT32		STATOR GND. RESIST		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			30, the code for ohm	R
	units.multiplier	ENUMERATED			3, the code for a multiplier of kilo	R
	db	INT32U	CF	SubHaPHIZ1.GndRis.db		R/W/C
	zeroDb	INT32U	CF			R
InjVol		MV			SH INJECTION VOLTS in volts	R
	instMag.f	FLOAT32		SH INJECTION VOLTS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SubHaPHIZ1.InjVol.db		R/W/C
	zeroDb	INT32U	CF			R
InjAmp		MV			SH INJECTION AMPS in amperes	R
	instMag.f	FLOAT32		SH INJECTION AMPS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for ampere (A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SubHaPHIZ1.InjAmp.db		R/W/C
	zeroDb	INT32U	CF			R
SHAmpAng		MV			SH CURRENT ANGLE in degrees	R
	instMag.f	FLOAT32		SH CURRENT ANGLE		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			9, the code for degrees (deg)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SubHaPHIZ1.SHAmpAng.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRefγ		ORG			SH STATOR GND BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	SH STATOR GND BLK for group γ.	reference to the data attribute to input	R/C

LNName: SubHaPHIZ1		LDevice inst: Prot		UR element: Sub-harmonic stator ground overcurrent functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-119: Subharmonic stator ground stage data objects

LNName: SubHa$PHIZ1		LDevice inst: Prot		UR element: Sub-harmonic stator ground stage $ functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			SH STAT GND STG$ PKP operand	R
	general	BOOLEAN	ST	SH STAT GND STG$ PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
Op		ACT			SH STAT GND STG$ OP operand	R
	general	BOOLEAN	ST	SH STAT GND STG$ OP		R
Dpo		SPS			SH STAT GND STG$ DPO operand	R
	stVal	BOOLEAN	ST	SH STAT GND STG$ DPO		R

3.5.2.73 Third harmonic neutral undervoltage (Ha3NUv)

This element is instantiated in the following products: G30, G60.

Table 3-120: Third harmonic neutral undervoltage data objects

LNName: Ha3NUvPTUV1		LDevice inst: Prot		UR element: Third Harmonic Neutral Under Voltage element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			3RD HARM NTRL UV PKP operands	R
	general	BOOLEAN	ST	3RD HARM NTRL UV PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			3RD HARM NTRL UV OP operand	R
	general	BOOLEAN	ST	3RD HARM NTRL UV OP		R
Dpo		SPS			3RD HARM NTRL UV DPO operand, which is the inverse of 3RD HARM NTRL UV PKP	R
	stVal	BOOLEAN	ST	3RD HARM NTRL UV DPO		R
BlkRefγ		ORG			3RD HARM NTRL UV BLK setting for setting group γ	R
	setSrcRef	ObjectReference	SP	3RD HARM NTRL UV BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.74 Transformer instantaneous differential (PiDif)

This element is instantiated in the following products: T35, T60.

Table 3-121: Transformer instantaneous differential data objects

LNName: PiDifPDIF1		LDevice inst: Prot		UR element: Transformer Instantaneous Differential # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			XFMR INST DIFF OP , XFMR INST DIFF OP A, XFMR INST DIFF OP B & XFMR INST DIFF OP C operands	R
	general	BOOLEAN	ST	XFMR INST DIFF OP		R
	phsA	BOOLEAN	ST	XFMR INST DIFF OP A		R
	phsB	BOOLEAN	ST	XFMR INST DIFF OP B		R
	phsC	BOOLEAN	ST	XFMR INST DIFF OP C		R

LNName: PiDifPDIF1		LDevice inst: Prot		UR element: Transformer Instantaneous Differential # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγ		ORG			INST DIFF BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	INST DIFF BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.75 Transformer percent differential (PctDif)

This element is instantiated in the following products: G30, T35, T60.

Table 3-122: Transformer percent differential data objects

LNName: PctDifPDIF1		LDevice inst: Prot		UR element: Transformer Percent Differential function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			XFMR PCNT DIFF OP, XFMR PCNT DIFF OP A, XFMR PCNT DIFF OP B & XFMR PCNT DIFF OP C operands	R
	general	BOOLEAN	ST	XFMR PCNT DIFF OP		R
	phsA	BOOLEAN	ST	XFMR PCNT DIFF OP A		R
	phsB	BOOLEAN	ST	XFMR PCNT DIFF OP B		R
	phsC	BOOLEAN	ST	XFMR PCNT DIFF OP C		R
Blk2ndHϕ		SPS			XFMR PCNT DIFF 2ND θ operand	R
	stVal	BOOLEAN	ST	XFMR PCNT DIFF 2ND θ		R
Blk5thHϕ		SPS			XFMR PCNT DIFF 5TH θ operand	R
	stVal	BOOLEAN	ST	XFMR PCNT DIFF 5TH θ		R
Str		ACD			XFMR PCNT DIFF PKP A, XFMR PCNT DIFF PKP B & XFMR PCNT DIFF PKP C operand	R
	general	BOOLEAN	ST	logical OR of phsA, phsB & phsB		R
	dirGeneral	ENUMERATED	ST			R
	phsA	BOOLEAN	ST	XFMR PCNT DIFF PKP A		R
	dirPhsA	ENUMERATED	ST			R
	phsB	BOOLEAN	ST	XFMR PCNT DIFF PKP B		R
	dirPhsB	ENUMERATED	ST			R
	phsC	BOOLEAN	ST	XFMR PCNT DIFF PKP C		R
	dirPhsC	ENUMERATED	ST			R
RefWinding		INS			Number of winding used as the reference winding for ratio compensation	R
	stVal	INT32	ST	REFERENCE WINDING		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
DifAClc		WYE			Phase differential currents	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		DIFF PHASOR Iθd magnitude, in pu		R
	phsθ.instCVal.ang .f	FLOAT32		DIFF PHASOR		R
	phsθ.cVal.mag.f	FLOAT32		DIFF PHASOR Iθd magnitude, inpu, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		DIFF PHASOR		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	phsθ.units .multiplier	ENUMERATED			-2, the code for a multiplier of Centi	R

LNName: PctDifPDIF1		LDevice inst: Prot		UR element: Transformer Percent Differential function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsθ.db	INT32U	CF	PctDifPDIF1.DifAClc.phsθ.db		R/W/C
	phsθ.dbAng	INT32U	CF	PctDifPDIF1.DifAClc.phsθ.dbAng		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
DifA2ndH		WYE			Phase differential currents	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		DIFF 2ND HARM Iθd magnitude, in %		R
	phsθ.instCVal.ang .f	FLOAT32		DIFF 2ND HA		R
	phsθ.cVal.mag.f	FLOAT32		DIFF 2ND HARM Iθd magnitude, in%, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		DIFF 2ND HA		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	phsθ.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsθ.db	INT32U	CF	PctDifPDIF1.DifA2ndH.phsθ.db		R/W/C
	phsθ.dbAng	INT32U	CF	PctDifPDIF1.DifA2ndH.phsθ.dbAng		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
DifA5thH		WYE			Phase differential currents	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		DIFF 5TH HARM Iθd magnitude, in %		R
	phsθ.instCVal.ang .f	FLOAT32		DIFF 5TH HA		R
	phsθ.cVal.mag.f	FLOAT32		DIFF 5TH HARM Iθd magnitude, in%, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		DIFF 5TH HA		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	phsθ.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsθ.db	INT32U	CF	PctDifPDIF#.DifA5thH.phsθ.db		R/W/C
	phsθ.dbAng	INT32U	CF	PctDifPDIF#.DifA5thH.phsθ.dbAng		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
RstA		WYE			Phase restraint currents	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		REST PHASOR Iθr magnitude, in pu		R
	phsθ.instCVal.ang .f	FLOAT32		REST PHASOR		R
	phsθ.cVal.mag.f	FLOAT32		REST PHASOR Iθr magnitude, inpu, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		REST PHASOR		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless	R

LNName: PctDifPDIF1	LDevice inst: Prot			UR element: Transformer Percent Differential function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsθ.units .multiplier	ENUMERATED			-2, the code for a multiplier of Centi	R
	phsθ.db	INT32U	CF	PctDifPDIF#.RstA.phsθ.db		R/W/C
	phsθ.dbAng	INT32U	CF	PctDifPDIF#.RstA.phsθ.dbAng		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
BlkRefγ		ORG			PERCENT DIFF BLOCK for setting group γ.	R
	setSrcRef	ObjectReference	SP	PERCENT DIFF BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.76 Trip bus (TrBus)

This element is instantiated in all UR products.

Table 3-123: Trip bus data objects

LNName: TrBusPTRC#	LDevice inst: Prot			UR element: Trip Bus element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			TRIP BUS # OP operand, which becomes On when any input is On, and the element is not blocked	R
	general	BOOLEAN	ST	TRIP BUS # OP		R
Str		ACD			TRIP BUS # PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	TRIP BUS # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
InRefαα		ORG			TRIP BUS # INPUT α setting.	R
	setSrcRef	ObjectReference	SP	TRIP BUS # INPUT α setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef99		ORG			TRIP BUS # RESET setting, which when On resets the non-volatile set-dominant input conditions latch.	R
	setSrcRef	ObjectReference	SP	TRIP BUS # RESET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			TRIP BUS # BLOCK setting.	R
	setSrcRef	ObjectReference	SP	TRIP BUS # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.77 Trip output (TrOut)

This element is instantiated in the following products: C60, D60, L60, L90.

Table 3-124: Trip output data objects

LNName: TrOutPTRC1	LDevice inst: Prot			UR element: Trip Output element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Tr		ACT			TRIP OUTPUT OP (any trip) operand	R
	general	BOOLEAN	ST	TRIP OUTPUT OP		R
Tr3p		ACT			TRIP 3-POLE operand	R
	general	BOOLEAN	ST	TRIP 3-POLE		R

LNName: TrOutPTRC1		LDevice inst: Prot		UR element: Trip Output element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Tr1p		ACT			general is TRIP 1-POLE operand, phsA is TRIP PHASE A operand, phsB is TRIP PHASE B operand and phsC is TRIP PHASE C operand	R
	general	BOOLEAN	ST	TRIP 1-POLE		R
	phsA	BOOLEAN	ST	TRIP PHASE A		R
	phsB	BOOLEAN	ST	TRIP PHASE B		R
	phsC	BOOLEAN	ST	TRIP PHASE C		R
StrRec3p		SPS			TRIP AR INIT 3-POLE operand	R
	stVal	BOOLEAN	ST	TRIP AR INIT 3-POLE		R
Tr3pFrcd		SPS			TRIP FORCE 3-POLE operand (3-pole trip mode is being forced)	R
	stVal	BOOLEAN	ST	TRIP FORCE 3-POLE		R
StrZ2PhDl		SPS			TRIP Z2PH TMR INIT operand	R
	stVal	BOOLEAN	ST	TRIP Z2PH TMR INIT		R
StrZ2GndDl		SPS			TRIP Z2GR TMR INIT operand	R
	stVal	BOOLEAN	ST	TRIP Z2GR TMR INIT		R
InRef3α		ORG			TRIP 3-POLE INPUT-α setting.	R
	setSrcRef	ObjectReference	SP	TRIP 3-POLE INPUT-α setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1α		ORG			TRIP 1-POLE INPUT-α setting.	R
	setSrcRef	ObjectReference	SP	TRIP 1-POLE INPUT-α setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2α		ORG			TRIP RECLOSE INPUT-α setting.	R
	setSrcRef	ObjectReference	SP	TRIP RECLOSE INPUT-α setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef01		ORG			START TMR Z2PH Inp1 setting.	R
	setSrcRef	ObjectReference	SP	START TMR Z2PH Inp1 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef02		ORG			START TMR Z2PH Inp2 setting.	R
	setSrcRef	ObjectReference	SP	START TMR Z2PH Inp2 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef03		ORG			START TMR Z2GR Inp1 setting.	R
	setSrcRef	ObjectReference	SP	START TMR Z2GR Inp1 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef04		ORG			START TMR Z2GR Inp2 setting.	R
	setSrcRef	ObjectReference	SP	START TMR Z2GR Inp2 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef05		ORG			BKR ϕA OPEN setting.	R
	setSrcRef	ObjectReference	SP	BKR ϕA OPEN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef06		ORG			BKR ϕB OPEN setting.	R
	setSrcRef	ObjectReference	SP	BKR ϕB OPEN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef07		ORG			BKR ϕC OPEN setting.	R
	setSrcRef	ObjectReference	SP	BKR ϕC OPEN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef08		ORG			TRIP FORCE 3-POLE setting.	R
	setSrcRef	ObjectReference	SP	TRIP FORCE 3-POLE setting	reference to the data attribute to input	R/C

LNName: TrOutPTRC1		LDevice inst: Prot		UR element: Trip Output element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef09		ORG			REVERSE FAULT setting.	R
	setSrcRef	ObjectReference	SP	REVERSE FAULT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.78 Undercurrent (UnCur)

This element is instantiated in the following products: M60.

Table 3-125: Undercurrent data objects

LNName: UnCurPTUC1		LDevice inst: Prot		UR element: Undercurrent element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
StrAlm		ACD			U/CURR ALARM PKP operand	R
	general	BOOLEAN	ST	U/CURR ALARM PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Str		ACD			U/CURR TRIP PKP operand	R
	general	BOOLEAN	ST	U/CURR TRIP PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
OpAlm		ACT			U/CURR ALARM OP operand	R
	general	BOOLEAN	ST	U/CURR ALARM OP		R
Op		ACT			U/CURR TRIP OP operand	R
	general	BOOLEAN	ST	U/CURR TRIP OP		R
BlkRefγ		ORG			UNDERCURRENT BLOCK setting in setting group γ	R
	setSrcRef	ObjectReference	SP	UNDERCURRENT BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.79 Underfrequency (UnHz)

This element is instantiated in the following products: B30, D30, D60, F35, F60, G30, G60, L30, L90, M60, N60, T35, T60.

Table 3-126: Underfrequency data objects

LNName: UnHzPTUF#		LDevice inst: Prot		UR element: Underfrequency element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			UNDERFREQ # PKP operand, which is indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	UNDERFREQ # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			UNDERFREQ # OP operand	R
	general	BOOLEAN	ST	UNDERFREQ # OP		R
Dpo		SPS			UNDERFREQ # DPO operand	R
	stVal	BOOLEAN	ST	UNDERFREQ # DPO		R
BlkRef1		ORG			UNDERFREQ # BLOCK setting.	R
	setSrcRef	ObjectReference	SP	UNDERFREQ # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.80 Underpower (UnPwr)

This element is instantiated in the following products: M60.

Table 3-127: Underpower data objects

LNName: UnPwrPDUP#		LDevice inst: Prot		UR element: Under Power element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
StrAlm		ACD			UNDERPWR # ALARM PKP operand	R
	general	BOOLEAN	ST	UNDERPWR # ALARM PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Str		ACD			UNDERPWR # TRIP PKP operand	R
	general	BOOLEAN	ST	UNDERPWR # TRIP PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
OpAlm		ACT			UNDERPWR # ALARM OP operand	R
	general	BOOLEAN	ST	UNDERPWR # ALARM OP		R
Op		ACT			UNDERPWR # TRIP OP operand	R
	general	BOOLEAN	ST	UNDERPWR # TRIP OP		R
DpoAlm		SPS			UNDERPWR # ALARM DPO operand	R
	stVal	BOOLEAN	ST	UNDERPWR # ALARM DPO		R
Dpo		SPS			UNDERPWR # TRIP DPO operand	R
	stVal	BOOLEAN	ST	UNDERPWR # TRIP DPO		R
BlkRefγ		ORG			UNDERPOWER # BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	UNDERPOWER # BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.81 Voltage differential (VDif)

This element is instantiated in the following products: C70.

Table 3-128: Voltage differential data objects

LNName: VDifPDIF#		LDevice inst: Prot		UR element: Voltage Differential element # core functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			VOLT DIF # PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	VOLT DIF # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
	phsA	BOOLEAN	ST	VOLT DIF # PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown	R
	phsB	BOOLEAN	ST	VOLT DIF # PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown	R
	phsC	BOOLEAN	ST	VOLT DIF # PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown	R
Op		ACT			VOLT DIF # OP operand	R
	general	BOOLEAN	ST	VOLT DIF # OP		R
	phsA	BOOLEAN	ST	VOLT DIF # OP A		R
	phsB	BOOLEAN	ST	VOLT DIF # OP B		R
	phsC	BOOLEAN	ST	VOLT DIF # OP C		R
Dpo		SPS			VOLT DIF # DPO operand	R
	stVal	BOOLEAN	ST	VOLT DIF # DPO		R

LNName: VDifPDIF#		LDevice inst: Prot		UR element: Voltage Differential element # core functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
DifVPh		WYE			Differential voltage in per unit for phase A, B and C	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		Dif Vϕ magnitude		R
	phsθ.cVal.mag.f	FLOAT32		Dif Vϕ magnitude, with deadband		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsθ.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsθ.db	INT32U	CF	VDifPDIF#.DifVPh.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF			R
BusVPh		WYE			Bus voltage in per unit for phase A, B and C	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		Bus Vϕ magnitude		R
	phsθ.cVal.mag.f	FLOAT32		Bus Vϕ magnitude, with deadband		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	phsθ.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsθ.db	INT32U	CF	VDifPDIF#.BusVPh.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF			R

Table 3-129: Voltage differential stage objects

LNName: VDif$PDIF#		LDevice inst: Prot		UR element: Voltage Differential element # stage $		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			VOLT DIF # STG$ PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	Logical OR of data attributes phsA, phsB and phsC		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
	phsA	BOOLEAN	ST	VOLT DIF # STG$A PKP		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown	R
	phsB	BOOLEAN	ST	VOLT DIF # STG$B PKP		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown	R
	phsC	BOOLEAN	ST	VOLT DIF # STG$C PKP		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown	R
Op		ACT			VOLT DIF # STG$ OP operands	R
	general	BOOLEAN	ST	Logical OR of data attributes phsA, phsB, phsC		R
	phsA	BOOLEAN	ST	VOLT DIF # STG$A OP		R
	phsB	BOOLEAN	ST	VOLT DIF # STG$B OP		R
	phsC	BOOLEAN	ST	VOLT DIF # STG$C OP		R
BlkRefγ		ORG			VOLT DIF # BLK STG$ setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	VOLT DIF # BLK STG$ for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.82 Volts per hertz (VpHz)

This element is instantiated in the following products: G30, G60, L90, T60.

Table 3-130: Volts per hertz data objects

LNName: VpHzPVPH#		LDevice inst: Prot		UR element: Volts per Hertz element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			VOLTS PER HERTZ # OP operand	R
	general	BOOLEAN	ST	VOLTS PER HERTZ # OP		R
Dpo		SPS			VOLTS PER HERTZ # DPO operand,	R
	stVal	BOOLEAN	ST	VOLTS PER HERTZ # DPO		R
Str		ACD			VOLTS PER HERTZ # PKP operand	R
	general	BOOLEAN	ST	VOLTS PER HERTZ # PKP operand		R
	dirGeneral	ENUMERATED	ST			R
BlkRefγ		ORG			VOLTS /HZ # BLOCK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	VOLTS/HZ # BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.2.83 VT fuse failure (Vtff)

This element is instantiated in the following products: C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 3-131: VT fuse failure data objects

LNName: VtffGAPC#		LDevice inst: Prot		UR element: VT FUSE FAILURE # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
FuFail		SPS			SRC# VT FUSE FAIL OP operands	R
	stVal	BOOLEAN	ST	SRC# VT FUSE FAIL OP		R
Dpo		SPS			SRC# VT FUSE FAIL DPO operand,	R
	stVal	BOOLEAN	ST	SRC# VT FUSE FAIL DPO		R
Alm1		SPS			SRC# VT FF ALARM	R
	stVal	BOOLEAN	ST	SRC# VT FF ALARM		R
VSigLos		SPS			SRC# VT FUSE FAIL VOL LOSS operand	R
	stV al	BOOLEAN	ST	SRC# VT FUSE FAIL VOL LOSS		R
NeutOpn		SPS			SRC# VT NEU WIRE OPEN operand	R
	stV al	BOOLEAN	ST	SRC# VT NEU WIRE OPEN		R

3.5.2.84 Wattmetric ground fault (Watt)

This element is instantiated in the following products: D30, D60, F35, F60, L60, L90.

Table 3-132: Wattmetric ground fault data objects

LNName: WattPSDE#		LDevice inst: Prot		UR element: Wattmetric Ground Fault # settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			WATTMETRIC GND FLT # PKP operand	R
	general	BOOLEAN	ST	WATTMETRIC GND FLT # PKP		R
	dirGeneral	ENUMERATED	ST			R
Op		ACT			WATTMETRIC GND FLT # OP operand	R
	general	BOOLEAN	ST	WATTMETRIC GND FLT # OP		R

LNName: WattPSDE#		LDevice inst: Prot		UR element: Wattmetric Ground Fault # settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Watt		MV			SRC # Three Phase Real Power, in primary watts	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		WATT GND FLT # actual value		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	WattPSDE#.Watt.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRefγ		ORG			WATTMETRIC GND FLT # BLK setting for setting group γ.	R
	setSrcRef	ObjectReference	SP	WATTMETRIC GND FLT # BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3 Control (Ctrl) logical device

The Ctrl logical device contains logical nodes that model UR control and monitoring functions.

3.5.3.1 Logical node zero (LLN0)

This element is instantiated in UR devices implementing the Ctrl logical device.

Table 3-133: LLN0 data objects and attributes

LNName: LLN0		LDevice inst: Ctrl		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		ENS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		ORG			Reference to root logical device	R
	setSrcRef	ObjectReference	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

3.5.3.2 8-bit switch (Sw8bit)

This element is instantiated in the following products: C30, F35, N60.

Table 3-134: 8-bit switch data objects

LNName: Sw8BitGAPC#		LDevice inst: Ctrl		UR element: 8-Bit Switch #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
IndY		SPS			8BIT SWITCH # BIT Θ operand value	R
	stVal	BOOLEAN	ST	8BIT SWITCH # BIT Θ		R
InRef1Θ		ORG			8BIT SW # ARG AΘ setting.	R
	setSrcRef	ObjectReference	SP	8BIT SW # ARG AΘ setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2Θ		ORG			8BIT SW # ARG BΘ setting.	R

LNName: Sw8BitGAPC#		LDevice inst: Ctrl		UR element: 8-Bit Switch #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	8BIT SW # ARG BΘ setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef01		ORG			8BIT SW # CONTROL setting.	R
	setSrcRef	ObjectReference	SP	8BIT SW # CONTROL setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.3 Automatic voltage regulator (Avr)

This element is instantiated in the following products: C70.

Table 3-135: Automatic voltage regulator data objects

LNName: AvrGAPC#		LDevice inst: Ctrl		UR element: Automatic Voltage Regulator # element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
StrCls		SPS			AVR # CLOSE PKP operands.	R
	stVal	BOOLEAN	ST	AVR # CLOSE PKP		R
OpCls		ACT			AVR # CLOSE OP operand	R
	general	BOOLEAN	ST	AVR # CLOSE OP		R
DpoCls		SPS			AVR CLOSE # DPO operand	R
	stVal	BOOLEAN	ST	AVR # CLOSE DPO		R
StrOpn		SPS			AVR # OPEN PKP operands.	R
	stVal	BOOLEAN	ST	AVR # OPEN PKP		R
OpOpn		ACT			AVR # OPEN OP operand	R
	general	BOOLEAN	ST	AVR # OPEN OP		R
DpoOpn		SPS			AVR OPEN # DPO operand	R
	stVal	BOOLEAN	ST	AVR OPEN # DPO		R
BlkRef1		ORG			AVR # BLOCK setting	R
	setSrcRef	ObjectReference	SP	AVR # BLOCK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.4 B90 CT trouble (B_CtTb)

This element is instantiated in the following products: B90.

Table 3-136: B90 CT trouble data objects

LNName: B_CtTbPIOC#		LDevice inst: Ctrl		UR element: B90 CT Trouble Zone element # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			CT TROUBLE ZONE# OP operand	R
	general	BOOLEAN	ST	CT TROUBLE ZONE# OP		R

3.5.3.5 Breaker arcing current (CBArc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60.

Table 3-137: Breaker arcing current data objects

LNName: CBArc0SCBR#		LDevice inst: Ctrl		UR element: BREAKER # ARCING CURRENT element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
AbrAlm		SPS			BKR ARC # OP operand	R
	stVal	BOOLEAN	ST	BKR ARC # OP		R

LNName: CBArc0SCBR#	LDevice inst: Ctrl			UR element: BREAKER # ARCING CURRENT element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dpo		SPS			BKR ARC # DPO operand	R
	stVal	BOOLEAN	ST	BKR ARC # DPO		R
IntrAlm		SPS			BKR ARC # MAX OP operand	R
	stVal	BOOLEAN	ST	BKR ARC # MAX OP		R
IntrAlmDpo		SPS			BKR ARC # MAX DPO operand	R
	stVal	BOOLEAN	ST	BKR ARC # MAX DPO		R
InRef1		ORG			BKR # CLR ARC AMPS setting	R
	setSrcRef	ObjectReference	SP	BKR # CLR ARC AMPS	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			BKR # ARC AMP BLOCK setting	R
	setSrcRef	ObjectReference	SP	BKR # ARC AMP BLOCK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
ColOpn		SPS			Logical OR of status value of mapped FlexLogic operands in BKR # ARC AMP INT- A, BKR # ARC AMP INT- B, BKR # ARC AMP INT- C	R
	stVal	BOOLEAN	ST	Logical OR condition to CBArc1SCBR#.ColOpn, CBArc2SCBR#.ColOpn, CBArc3SCBR#.ColOpn		R
OpTmOpn		MV			BKR # OPERATING TIME in ms	R
	instMag.f	FLOAT32		Mapped BKR # OPERATING TIME		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for Time (Sec)	R
	units.multiplier	ENUMERATED			-3, the code for a multiplier of 1/1000	R
	db	INT32	CF	CBArc0SCBR#.OpTmOpn.db		R/W/C
	zeroDb	INT32	CF			R
MemClr		SPC			CLEAR BREAKER # ARCING AMPS command	R/Ctrl
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	CBArc0SCBR#.MemClr.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R

Table 3-138: Breaker arcing current phase data objects

LNName: CBArcΘSCBR#	LDevice inst: Ctrl			UR element: BREAKER # ARCING CURRENT element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ColOpn		SPS			Status value of mapped FlexLogic operand in BKR # ARC AMP INT- ψ	R
	stVal	BOOLEAN	ST	Status value of mapped FlexLogic operand in BKR # ARC AMP INT- ψ setting		R

LNName: CBArcΘSCBR#	LDevice inst: Ctrl			UR element: BREAKER # ARCING CURRENT element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRef1		ORG			BKR # ARC AMP INT-μ setting	R
	setSrcRef	ObjectReference	SP	BKR # ARC AMP INT- μ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
AccAbr		MV			BKR # ACC ARCING AMP ψ in A2s	R
	instMag.f	FLOAT32		BKR # ACC ARCING AMP ψ		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			70, the code for Amps Squared time (A2t)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	CBArcΘSCBR#.AccAbr.db		R/W/C
	zeroDb	INT32	CF			R
SwA		MV			BKR 1 ARCING AMP ψ in A2s	R
	instMag.f	FLOAT32		BKR 1 ARCING AMP ψ		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			70, the code for Amps Squared time (A2t)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	CBArcΘSCBR#.SwA.db		R/W/C
	zeroDb	INT32	CF			R
MaxIntrA		MV			BKR 1 AMP MAX ψ	R
	instMag.f	FLOAT32		BKR 1 AMP MAX ψ		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			5, the code for ampere	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	CBArcΘSCBR#.MaxIntrA.db		R/W/C
	zeroDb	INT32	CF			R
RctTmOpn		MV			BKR # OPERATING TIME ψ in ms	R
	instMag.f	FLOAT32		Mapped BKR # OPERATING TIME ψ		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for Time (Sec)	R
	units.multiplier	ENUMERATED			-3, the code for a multiplier of 1/1000	R
	db	INT32	CF	CBArcΘSCBR#.RctTmOpn.db		R/W/C
	zeroDb	INT32	CF			R

3.5.3.6 Breaker restrike (BkrRtk)

This element is instantiated in the following products: B30, C60, C70, D60, F35, F60, G60, L60, L90, M60, T60.

Table 3-139: Breaker restrike data objects

LNName: BkrRtkPIOC#	LDevice inst: Ctrl			UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			BRK RESTIRKE # OP operand (including individual three phases)	R
	general	BOOLEAN	ST	BRK RESTIRKE # OP		R
	phsA	BOOLEAN	ST	BRK RESTIRKE # OP A		R
	phsB	BOOLEAN	ST	BRK RESTIRKE # OP B		R
	phsC	BOOLEAN	ST	BRK RESTIRKE # OP C		R

LNName: BkrRtkPIOC#		LDevice inst: Ctrl		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRef1		ORG			BKR RSTR # BLOCK setting	R
	setSrcRef	ObjectReference	SP	BKR RSTR # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			BKR RSTR # BKR OPEN setting	R
	setSrcRef	ObjectReference	SP	BKR RSTR # BKR OPEN.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			BKR RSTR # OPEN CMD setting	R
	setSrcRef	ObjectReference	SP	BKR RSTR # OPEN CMD.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			BKR RSTR # CLS CMD setting	R
	setSrcRef	ObjectReference	SP	BKR RSTR # CLS CMD.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.7 Broken conductor detection (BknCnd)

This element is instantiated in the following products: D30, D60, F35, F60, L30, L60, L90.

Table 3-140: Broken conductor detection data objects

LNName: BknCndPIOC#		LDevice inst: Ctrl		UR element: Broken Conductor element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			BROKEN CONDUCT # PKP operand	R
	general	BOOLEAN	ST	BROKEN CONDUCT # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			BROKEN CONDUCT # OP operand	R
	general	BOOLEAN	ST	BROKEN CONDUCT # OP		R
BlkRef1		ORG			BROKEN CONDCT # BLOCK setting	R
	setSrcRef	ObjectReference	SP	BROKEN CONDCT # BLOCK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.8 Broken rotor bar (BkrRot)

This element is instantiated in the following products: M60.

Table 3-141: Broken rotor bar data objects

LNName: BknRotSVBR1		LDevice inst: Ctrl		UR element: Broken Rotor Bar element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Alm		SPS			ROTOR ALARM # PKP operand	R
	stVal	BOOLEAN	ST	ROTOR ALARM # PKP		R
Trip		SPS			ROTOR ALARM # OP operand	R
	stVal	BOOLEAN	ST	ROTOR ALARM # OP		R
BlkRef1		ORG			BRB BLOCK setting	R
	setSrcRef	ObjectReference	SP	BRB BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
CompLevel		MV			COMPONENT LEVEL in dB	R
	instMag.f	FLOAT32		COMPONENT LEVEL		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R
	units.SIUnit	ENUMERATED			79, the code for dB	R

LNName: BknRotSVBR1		LDevice inst: Ctrl		UR element: Broken Rotor Bar element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	BknRotSVBR1.CompLevel.db		R/W/C
	zeroDb	INT32	CF			R
CompHz		MV			COMPONENT FREQ. in Hz	R
	instMag.f	FLOAT32		COMPONENT FREQ.		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	BknRotSVBR1.CompHz.db		R/W/C
	zeroDb	INT32	CF			R
MotLoad		MV			MOTOR LOAD AT BRB CALC. in x FLA	R
	instMag.f	FLOAT32		MOTOR LOAD AT BRB CALC.		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	BknRotSVBR1.MotLoad.db		R/W/C
	zeroDb	INT32U	CF			R
LoadDev		MV			LOAD DEV. AT BRB CALC. in x FLA	R
	instMag.f	FLOAT32		LOAD DEV. AT BRB CALC.		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	BknRotSVBR1.LoadDev.db		R/W/C
	zeroDb	INT32U	CF			R
TmOfClc		INS			TIME OF BRB CALC. actual value	R
	stVal	INT32	ST	TIME OF BRB CALC. actual value		R
	units.SIUnit	ENUMERATED			4, the code for time	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
MaxComp Level		MV			MAXIMUM COMPONENT LEVEL in dB	R
	instMag.f	FLOAT32		MAXIMUM COMPONENT LEVEL		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R
	units.SIUnit	ENUMERATED			79, the code for dB	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	BknRotSVBR1.MaxCompLevel.db		R/W/C
	zeroDb	INT32	CF			R
MaxComp Hz		MV			MAXIMUM COMPONENT FREQ. in Hz	R
	instMag.f	FLOAT32		MAXIMUM COMPONENT FREQ.		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	BknRotSVBR1.MaxCompHz.db		R/W/C
	zeroDb	INT32	CF			R
MaxMotLoad		MV			MOTOR LOAD AT BRB MAX in x FLA	R
	instMag.f	FLOAT32		MOTOR LOAD AT BRB MAX		R

LNName: BknRotSVBR1		LDevice inst: Ctrl		UR element: Broken Rotor Bar element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	BknRotSVBR1.MaxMotLoad.db		R/W/C
	zeroDb	INT32U	CF			R
MaxLoadDev		MV			LOAD DEV. AT BRB MAX in x FLA	R
	instMag.f	FLOAT32		LOAD DEV. AT BRB MAX		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	BknRotSVBR1.MaxLoadDev.db		R/W/C
	zeroDb	INT32U	CF			R
TmOfMax		INS			TIME OF MAXIMUM BRB actual value	R
	stVal	INT32	ST	TIME OF MAXIMUM BRB actual value		R
	units.SIUnit	ENUMERATED			4, the code for time	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
BknRotClr		SPC			Mapped to command CLEAR BROKEN ROTOR BAR DATA	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicated the duration is locally defined	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	BknRotSVBR1.BknRotClr.ctlModel	1, the code for direct control with normal security; 2 is code for SBO with normal security.	R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R

3.5.3.9 Capacitor control (CapCtl)

This element is instantiated in the following products: C70.

Table 3-142: Capacitor control data objects

LNName: CapCtlGAPC#		LDevice inst: Ctrl		UR element: Capacitor control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
RemMod		SPS			CAP # IN REMOTE operand	R
	stVal	BOOLEAN	ST	CAP # IN REMOTE		R
LocMod		SPS			CAP # IN LOCAL operand	R
	stVal	BOOLEAN	ST	CAP # IN LOCAL		R
AutoMod		SPS			"CAP # IN AUTO operand	R
	stVal	BOOLEAN	ST	CAP # IN AUTO		R
ManMod		SPS			"CAP # IN MAN operand	R
	stVal	BOOLEAN	ST	CAP # IN MAN		R
Discharging		SPS			"CAP # DISCHARGING operand	R

LNName: CapCtlGAPC#		LDevice inst: Ctrl		UR element: Capacitor control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	CAP # DISCHARGING		R
OpOpn		ACT			CAP # BKR TRIP operand	R
	general	BOOLEAN	ST	CAP # BKR TRIP		R
OpCls		ACT			CAP # BKR CLOSE operand	R
	general	BOOLEAN	ST	CAP # BKR CLOSE		R
Discharge Tms		MV			CAP # DISCHARGE TIME in seconds	R
	instMag.f	FLOAT32		CAP # DISCHARGE TIME actual value		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			4, the code for time (s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	CapCtlGAPC#.DschTms.db		R/W/C
	zeroDb	INT32U	CF			R
InRef01		ORG			CAP # SET REMOTE 1 setting.	R
	setSrcRef	ObjectReference	SP	CAP # SET REMOTE 1 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef02		ORG			CAP # SET REMOTE 2 setting.	R
	setSrcRef	ObjectReference	SP	CAP # SET REMOTE 2 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef03		ORG			CAP # SET LOCAL 1 setting.	R
	setSrcRef	ObjectReference	SP	CAP # SET LOCAL 1 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef04		ORG			CAP # SET LOCAL 2 setting.	R
	setSrcRef	ObjectReference	SP	CAP # SET LOCAL 2 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef05		ORG			CAP # RMT CTRL EN setting.	R
	setSrcRef	ObjectReference	SP	CAP # RMT CTRL EN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef06		ORG			CAP # LCL CTRL EN setting.	R
	setSrcRef	ObjectReference	SP	CAP # LCL CTRL EN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef07		ORG			CAP # RMT SET AUTO setting.	R
	setSrcRef	ObjectReference	SP	CAP # RMT SET AUTO setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef08		ORG			CAP # LCL SET AUTO setting.	R
	setSrcRef	ObjectReference	SP	CAP # LCL SET AUTO setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef09		ORG			CAP # RMT SET MAN setting.	R
	setSrcRef	ObjectReference	SP	CAP # RMT SET MAN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef10		ORG			CAP # LCL SET MAN setting.	R
	setSrcRef	ObjectReference	SP	CAP # LCL SET MAN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1$		ORG			CAP # TRIP $ setting.	R
	setSrcRef	ObjectReference	SP	CAP # TRIP $ setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef22		ORG			CAP # MAN CTRL EN setting.	R
	setSrcRef	ObjectReference	SP	CAP # MAN CTRL EN setting	reference to the data attribute to input	R/C

LNName: CapCtlGAPC#		LDevice inst: Ctrl		UR element: Capacitor control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef23		ORG			CAP # REMOTE OPEN setting.	R
	setSrcRef	ObjectReference	SP	CAP # REMOTE OPEN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef24		ORG			CAP # LOCAL OPEN setting.	R
	setSrcRef	ObjectReference	SP	CAP # LOCAL OPEN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef25		ORG			CAP # AUTO OPEN setting.	R
	setSrcRef	ObjectReference	SP	CAP # AUTO OPEN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef26		ORG			CAP # BKR OPEN 52b setting.	R
	setSrcRef	ObjectReference	SP	CAP # BKR OPEN 52b setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef27		ORG			CAP # REMOTE CLOSE setting.	R
	setSrcRef	ObjectReference	SP	CAP # REMOTE CLOSE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef28		ORG			CAP # LOCAL CLOSE setting.	R
	setSrcRef	ObjectReference	SP	CAP # LOCAL CLOSE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef29		ORG			CAP # AUTO CLOSE setting.	R
	setSrcRef	ObjectReference	SP	CAP # AUTO CLOSE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef30		ORG			CAP # BKR CLSD 52a setting.	R
	setSrcRef	ObjectReference	SP	CAP # BKR CLSD 52a setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			CAP # BKR CLOSE BLK setting.	R
	setSrcRef	ObjectReference	SP	CAP # BKR CLOSE BLK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef31		ORG			CAP # CLS OVERRIDE setting.	R
	setSrcRef	ObjectReference	SP	CAP # CLS OVERRIDE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.10 Cold load pickup (Cold)

This element is instantiated in the following products: F35, F60.

Table 3-143: Cold load pickup data objects

LNName: ColdFXUT#		LDevice inst: Ctrl		UR element: Cold Load Pickup # element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			COLD LOAD # OP operand	R
	general	BOOLEAN	ST	COLD LOAD # OP		R
StrVal		ASG			Start level of the current, which is fixed at 2% of Nominal CT (0.02 pu), and it is non-configurable read only value	R
	setMag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
BlkRef1		ORG			COLD LOAD # BLK setting	R
	setSrcRef	ObjectReference	SP	COLD LOAD # BLK.	reference to the data attribute to input	R/C

LNName: ColdFXUT#		LDevice inst: Ctrl		UR element: Cold Load Pickup # element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			COLD LOAD # INIT setting	R
	setSrcRef	ObjectReference	SP	COLD LOAD # INIT.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.11 CT failure detector (CtFail)

This element is instantiated in the following products: D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-144: CT fail data objects

LNName: CtFailPIOC#		LDevice inst: Ctrl		UR element: CT failure detector # element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			CT FAIL # PKP operand, which indicated Op will operate when delay expires	R
	general	BOOLEAN	ST	CT FAIL # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
Op		ACT			CT FAIL # OP operand	R
	general	BOOLEAN	ST	CT FAIL # OP		R
BlkRef1		ORG			CT FAIL # BLOCK setting	R
	setSrcRef	ObjectReference	SP	CT FAIL # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.12 CT trouble (CtTb)

This element is instantiated in the following products: B30, B90.

Table 3-145: CT trouble data objects

LNName: CtTbPIOC#		LDevice inst: Ctrl		UR element: CT Trouble Zone # element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			CT TROUBLE ZONE # OP operands (including individual three phases)	R
	general	BOOLEAN	ST	CT TROUBLE #1 OP		R
	phsA	BOOLEAN	ST	CT TROUBLE # OP A		R
	phsB	BOOLEAN	ST	CT TROUBLE # OP B		R
	phsC	BOOLEAN	ST	CT TROUBLE # OP C		R

3.5.3.13 Digitizers (Dgtzr)

This element is instantiated in the following products: N60.

Table 3-146: Digitizer data objects

LNName: DgtzrGAPC#		LDevice inst: Ctrl		UR element: Digitizer #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
IndΘ		SPS			DIGITIZER # BIT Θ-1 operand value	R
	stVal	BOOLEAN	ST	DIGITIZER # BIT Θ-1		R
Out		MV			DIGITIZER # Out Value	R
	instMag.f	FLOAT32		DIGITIZER # Out Value		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R

LNName: DgtzrGAPC#	LDevice inst: Ctrl		UR element: Digitizer #			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			0, the code for multiplier 1	R
	db	INT32U	CF	DgtzrGAPC#.Out.db		R/W/C
	zeroDb	INT32U	CF			R
InRef1		ORG			DIGITIZER # SOURCE setting.	R
	setSrcRef	ObjectReference	SP	DIGITIZER # SOURCE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.14 Fault location (FltRpt)

This element is instantiated in the following products: C60, D30, D60, F35, F60, L30, L60, L90.

Table 3-147: Fault report settings data objects

LNName: FltRptRFLO#	LDevice inst: Ctrl		UR element: FAULT REPORT # settings			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
TapLocFlt		SPS			TAP-LOCAL FAULT operand	R
	stVal	BOOLEAN	ST	TAP-LOCAL FAULT		R
NumRcd		INS			instantiated only in FltRptRFLO1	R
	stVal	INT32	ST	Modbus register 3020h, I.e., "Number of Fault Reports"		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
FltZ		CMV			Mandatory data attribute which in this case is fixed at zero	R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
RsStat		SPC			instantiated only in FltRptRFLO1	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	FltRptRFLO1.RsStat.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
InRef1		ORG			FAULT REPORT# TRIG.	R
	setSrcRef	ObjectReference	SP	FAULT REPORT# TRIG.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			Only instantiated in FltRptRFLO1	R
	setSrcRef	ObjectReference	SP	CLEAR FAULT REPORTS.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-148: Fault report data file data objects

LNName: FltRFLOψψ		LDevice inst: Ctrl		UR element: Selected values from Fault Report Data file ψψ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
FltZ		CMV			Mandatory data attribute which in this case is fixed at zero	R
	cVal.mag.f	FLOAT32		Fault impedance magnitude in primary ohms calculated as shown below		R
	cVal.ang.f	FLOAT32		Fault impedance angle in degrees calculated as shown below		R
FltRis		MV			FAULTψψ FAULT RESIST converted to primary ohms	R
	mag.f	FLOAT32		Actual Value FAULTψψ FAULT RESIST converted to primary ohms		R
	units.SIUnit	ENUMERATED			30, the code for primary electric resistance in ohm (V/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
FltLoopRis		MV			FAULTψψ LOOP RESIST converted to primary ohms	R
	mag.f	FLOAT32		Actual Value FAULTψψ LOOP RESIST converted to primary ohms		R
	units.SIUnit	ENUMERATED			30, the code for primary electric resistance in ohm (V/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
FltLoopReact		MV			FAULTψψ LOOP REACT converted to primary ohms	R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			30, the code for primary electric resistance in ohm (V/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
FltNum		INS			FAULT NUMBER	R
	stVal	INT32	ST	FAULT NUMBER in Fault Report Data file ψψ		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
FltLinID		VSS			Faulted line ID	R
	stVal	VISIBLE STRING 255	ST	LINE ID in Fault Report Data file ψψ		R
FltLoop		ENS			FAULT TYPE	R
	stVal	ENUMERATED	ST	FAULT TYPE in Fault Report Data file ψψ		R
FltSegment		ENS			FAULT ψψ FAULTED SEGMENT	R
	stVal	ENUMERATED	ST	FAULT ψψ FAULTED SEGMENT		R
FltDiskm		MV			FAULT LOCATION	R
	mag.f	FLOAT32		FAULT LOCATION in Fault Report Data file ψψ, converted to kilometers where required		R
	units.SIUnit	ENUMERATED			2, the code for meter	R
	units.multiplier	ENUMERATED			3, the code for a multiplier of 1000	R
RecCyc		INS			FAULT RECLOSE SHOT	R
	stVal	INT32	ST	FAULT RECLOSE SHOT in Fault Report Data file ψψ		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R

LNName: FltRFLOψψ		LDevice inst: Ctrl		UR element: Selected values from Fault Report Data file ψψ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

The FltRFLO1 logical node always reads the latest fault data, when a new fault report is generated. FltRFLO2 always reads the previous fault data and FltRFLO3 reads the next previous data and so on.

3.5.3.15 Frequency out-of-band accumulation (HzBnd)

This element is instantiated in the following products: G30, G60.

Table 3-149: Frequency out-of-band accumulation data objects

LNName: HzBndPTUF1		LDevice inst: Ctrl		UR element: Frequency OOB Accumulation element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			FREQ OOB ACCUM PKP operand, which is indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	FREQ OOB ACCUM PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			FREQ OOB ACCUM OP operand	R
	general	BOOLEAN	ST	FREQ OOB ACCUM OP		R
BlkRef1		ORG			FREQ ACCUM BLOCK setting.	R
	setSrcRef	ObjectReference	SP	FREQ ACCUM BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-150: Frequency out-of-band accumulation prefix instance number $ data objects

LNName: HzBnd$PTUF1		LDevice inst: Ctrl		UR element: Frequency OOB Accumulator $		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			FREQ OOB BAND $ PKP operand, which is indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	FREQ OOB BAND $ PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			FREQ OOB BAND $ OP operand	R
	general	BOOLEAN	ST	FREQ OOB BAND $ OP		R
Dpo		SPS			FREQ OOB BAND $ DPO operand	R
	stVal	BOOLEAN	ST	FREQ OOB BAND $ DPO		R
HzObAccum		MV			FREQUENCY OOB BAND $ ACCUMULATION in percentage (%)	R
	instMag.f	FLOAT32		FREQUENCY OOB BAND $ ACCUMULATION		R
	mag.f	FLOAT32		instMag.f deadbanded exception		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			-2 is code for percent	R
	db	INT32	CF	HzBnd$PTUF1.HzObAccum.db		R/W/C
	zeroDb	INT32	CF			R

3.5.3.16 High-impedance fault detection (HiZ)

This element is instantiated in the following products: F60.

Table 3-151: Hi-Z data objects

LNName: HiZPHIZ1		LDevice inst: Ctrl		UR element: HI-Z function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			HI-Z ARMED operand	R
	general	BOOLEAN	ST	HI-Z ARMED		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown It is unknown as the element is non-directional.	R
Op		ACT			HI-Z ARC DETECTED operand including Phases-A, B, C and Neutral	R
	general	BOOLEAN	ST	HI-Z ARC DETECTED		R
	phsA	BOOLEAN	ST	HI-Z ARC DETECTED-A		R
	phsB	BOOLEAN	ST	HI-Z ARC DETECTED-B		R
	phsC	BOOLEAN	ST	HI-Z ARC DETECTED-C		R
	neut	BOOLEAN	ST	HI-Z ARC DETECTED-N		R
Dpo		SPS			HI-Z ARC DETECTED DPO operand	R
	stVal	BOOLEAN	ST	HI-Z ARC DETECTED DPO		R
DisArmed		SPS			HI-Z DISARMED operand	R
	stVal	BOOLEAN	ST	HI-Z DISARMED		R
DwnCond		ACT			HI-Z DOWNED COND operand including phsA, B, C and Neutral	R
	general	BOOLEAN	ST	HI-Z DOWNED COND		R
	phsA	BOOLEAN	ST	HI-Z DOWNED COND-A		R
	phsB	BOOLEAN	ST	HI-Z DOWNED COND-B		R
	phsC	BOOLEAN	ST	HI-Z DOWNED COND-C		R
	neut	BOOLEAN	ST	HI-Z DOWNED COND-N		R
ArcSuspect		ACT			HI-Z ARC SUSPECTED operand including Phases-A, B, C and Neutral	R
	general	BOOLEAN	ST	HI-Z ARC SUSPECTED		R
	phsA	BOOLEAN	ST	HI-Z ARC SUSPECTED-A		R
	phsB	BOOLEAN	ST	HI-Z ARC SUSPECTED-B		R
	phsC	BOOLEAN	ST	HI-Z ARC SUSPECTED-C		R
	neut	BOOLEAN	ST	HI-Z ARC SUSPECTED-N		R
HiZIOC		ACT			HI-Z IOC operand including Phases A, B, C.	R
	general	BOOLEAN	ST	OR logic of operands (HI-Z IOC A or HI-Z IOC B or HI-Z IOC C)		R
	phsA	BOOLEAN	ST	HI-Z IOC A		R
	phsB	BOOLEAN	ST	HI-Z IOC B		R
	phsC	BOOLEAN	ST	HI-Z IOC C		R
	neut	BOOLEAN	ST	HI-Z IOC N		R
LossLd		ACT			HI-Z LOSS OF LOAD operand including Phases A, B, C.	R
	general	BOOLEAN	ST	OR logic of operands HI-Z LOSS OF LOAD-A or HI-Z LOSS OF LOAD–B or HI-Z LOSS OF LOAD-C		R
	phsA	BOOLEAN	ST	HI-Z LOSS OF LOAD-A		R
	phsB	BOOLEAN	ST	HI-Z LOSS OF LOAD–B		R
	phsC	BOOLEAN	ST	HI-Z LOSS OF LOAD-C		R
HiZSt		ENS			HIZ STATUS actual value	R
	stVal	ENUMERATED	ST	HIZ STATUS, where 0 = Normal, 1 = Coordination Timeout, 2 = Armed, 5 = Arcing, 9 = Downed Conductor		R

LNName: HiZPHIZ1		LDevice inst: Ctrl		UR element: HI-Z function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ArcConfid Φ		INS			HIZ Phase Φ Arc Conf Actual Value	R
	stVal	INT32	ST	HIZ Phase Φ Arc Conf in percentage		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
Trigger1$		ENS			HIZ RECORDS, HIZ $ actual value	R
	stVal	ENUMERATED	ST	HI-Z Capture $ Trigger Type, where 0 = None, 1 = Loss of Load, 2 = Arc Suspected, 3 = Arcing, 4 = Overcurrent, 5 = Down Conductor, 6 = External		R
Trigger2$		ENS			HIZ RECORDS, RMS $ actual value	R
	stVal	ENUMERATED	ST	HI-Z RMS Capture $ Trigger Type, where 0 = None, 1 = Loss of Load, 2 = Arc Suspected, 3 = Arcing, 4 = Overcurrent, 5 = Down Conductor, 6 = External		R
ClrMem		SPC			Hi-Z Clear Oscillography command	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	HiZPHIZ1.ClrMem.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
FrcTrigger		SPC			Hi-Z Oscillography Force Trigger command	R/Ctrl
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	HiZPHIZ1.FrcTrigger.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
AlgCap		SPC			Hi-Z Oscillography Force Algorithm Capture command	R/Ctrl
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R

LNName: HiZPHIZ1		LDevice inst: Ctrl		UR element: HI-Z function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	ctlModel	CtlModels	CF	HiZPHIZ1.AlgCap.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
ReSigma		SPC			Hi-Z Reset Sigma Values command	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	HiZPHIZ1.ReSigma.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R

3.5.3.17 Incipient cable fault detection (ICFlt)

This element is instantiated in the following products: D30, F35, F60, L30.

Table 3-152: Incipient fault detector data objects

LNName: ICFltPTEF#		LDevice inst: Ctrl		UR element: Incipient Cable Fault Element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			INCIPNT FLT # PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	INCIPNT FLT # PKP		R
	dirGeneral	ENUMERATED	ST			R
	phsA	BOOLEAN	ST	INCIPNT FLT # PKP A		R
	dirPhsA	ENUMERATED	ST			R
	phsB	BOOLEAN	ST	INCIPNT FLT # PKP B		R
	dirPhsB	ENUMERATED	ST			R
	phsC	BOOLEAN	ST	INCIPNT FLT # PKP C		R
	dirPhsC	ENUMERATED	ST			R
Op		ACT			INCIPNT FLT # OP operands (including individual three phases)"	R
	general	BOOLEAN	ST	INCIPNT FLT # OP		R
	phsA	BOOLEAN	ST	INCIPNT FLT # OP A		R
	phsB	BOOLEAN	ST	INCIPNT FLT # OP B		R
	phsC	BOOLEAN	ST	INCIPNT FLT # OP C		R
FltCntPhϕ		INS			INCIPIENT FAULT # PH θ FAULTS.	R
	stVal	INT32	ST	INCIPIENT FAULT # PH θ FAULTS		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
FltCntClr		SPC			Only instantiated in ICFltPTEF1	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R

LNName: ICFltPTEF#	LDevice inst: Ctrl			UR element: Incipient Cable Fault Element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	ICFltPTEF#.FltCntClr.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
BlkRef1		ORG			INCIPNT FLT # BLOCK setting.	R
	setSrcRef	ObjectReference	SP	INCIPNT FLT # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.18 Maximum starting rate (StrRte)

This element is instantiated in the following products: M60.

Table 3-153: Maximum starting rate data objects

LNName: StrRtePMRI1	LDevice inst: Ctrl			UR element: Maximum starting rate element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			STARTS-PER-HOUR PKP operand	R
	general	BOOLEAN	ST	STARTS-PER-HOUR PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			STARTS-PER-HOUR OP operand	R
	general	BOOLEAN	ST	STARTS-PER-HOUR OP		R
Dpo		SPS			STARTS-PER-HOUR DPO operand, which is the inverse of STARTS-PER-HOUR PKP	R
	stVal	BOOLEAN	ST	STARTS-PER-HOUR DPO		R
BlkRef1		ORG			STARTS/HR BLK setting.	R
	setSrcRef	ObjectReference	SP	STARTS/HR BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
StrHrLOTm		MV			Start/Hour Lockout Time in min	R
	instMag.f	FLOAT32		Start/Hour Lockout Time		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for Time (Sec)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32	CF	StrRtePMRI1.StrHrLOTm.db		R/W/C
	zeroDb	INT32	CF			R

3.5.3.19 PID regulator (PIDReg)

This element is instantiated in the following products: C30, F35.

Table 3-154: PID regulator data objects

LNName: PIDRegFPID#	LDevice inst: Ctrl			UR element: PID Regulator element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Raise		SPS			PID # RAISE operand value	R
	stVal	BOOLEAN	ST	PID # RAISE		R

LNName: PIDRegFPID#		LDevice inst: Ctrl		UR element: PID Regulator element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Lower		SPS			PID # LOWER operand value	R
	stVal	BOOLEAN	ST	PID # LOWER		R
Out		MV			PID # Out value	R
	instMag.f	FLOAT32		PID # Out		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	PIDRegFPID#.Out.db		R/W/C
	zeroDb	INT32U	CF			R
DeltaOut		MV			PID # Delta Out value	R
	instMag.f	FLOAT32		PID # Delta Out		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	PIDRegFPID#.DeltaOut.db		R/W/C
	zeroDb	INT32U	CF			R
Spt		MV			PID # Setpoint value	R
	instMag.f	FLOAT32		PID # Setpoint		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	PIDRegFPID#.Spt.db		R/W/C
	zeroDb	INT32U	CF			R
PIDAlg		ENG			Algorithm, which is fixed at PID	R
	setVal	ENUMERATED	SP		7, the code for PID	R
KP		ASG			PID # PROPORTIONAL GAIN setting	R
	setMag	AnalogueValue	SP			R
	setMag.i	INT32		PID # PROPORTIONAL GAIN		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	sVC	ScaledValue Config	CF			R
	sVC.scaleFactor	FLOAT32				R
	sVC.offset	FLOAT32				R
KI		ASG			PID # Integral gain value	R
	setMag.i	INT32		PID # PROPORTIONAL GAIN		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	sVC.scaleFactor	FLOAT32				R
	sVC.offset	FLOAT32				R
ITmms		ING			PID # INTEG. TIME CONST. setting in milliseconds	R
	setVal	INT32	SP	PID # INTEG. TIME CONST. scaled to make the result in milliseconds		R
	minVal	INT32	CF			R
	maxVal	INT32	CF			R
	stepSize	INT32U	CF			R
	units.SIUnit	ENUMERATED			4, the code for time in seconds	R

LNName: PIDRegFPID#		LDevice inst: Ctrl		UR element: PID Regulator element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			-3, the code for a multiplier of 0.001 (i.e. Milli)	R
KD		ASG			PID # Derivative gain value	R
	setMag.i	INT32		PID # PROPORTIONAL GAIN		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	sVC.scaleFactor	FLOAT32				R
	sVC.offset	FLOAT32				R
DTmms		ING			PID # DERIV. TIME CONST. setting in milliseconds	R
	setVal	INT32	SP	PID # DERIV. TIME CONST. scaled to make the result in milliseconds		R
	minVal	INT32	CF			R
	maxVal	INT32	CF			R
	stepSize	INT32	CF			R
	units.SIUnit	ENUMERATED			4, the code for time in seconds	R
	units.multiplier	ENUMERATED			-3, the code for a multiplier of 0.001 (i.e. Milli)	R
DFilTmms		ING			PID # Derivative filter time setting in milliseconds, which is the ratio of derivative time constant to derivative limit	R
	setVal	INT32	SP	(PID # DERIV. TIME CONST. divided by PID # DERIVATIVE LIMIT) scaled to make the result in milliseconds		R
	units.SIUnit	ENUMERATED			4, the code for time in seconds	R
	units.multiplier	ENUMERATED			-3, the code for a multiplier of 0.001 (i.e. Milli)	R
InRef1		ORG			PID # PROCESS SIGNAL setting.	R
	setSrcRef	ObjectReference	SP	PID # PROCESS SIGNAL setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			PID # TRACKING SIGNAL setting.	R
	setSrcRef	ObjectReference	SP	PID # TRACKING SIGNAL setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			PID # BLK setting.	R
	setSrcRef	ObjectReference	SP	PID # BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.20 Reduced voltage starting (LoVStr)

This element is instantiated in the following products: M60.

Table 3-155: Reduced voltage starting data objects

LNName: LoVStrGAPC1		LDevice inst: Ctrl		UR element: REDUCED VOLTAGE STARTING element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			REDUCED VOLT OP operand	R
	general	BOOLEAN	ST	REDUCED VOLT OP		R
Ctrl		SPS			REDUCED VOLT CTRL operand	R
	stVal	BOOLEAN	ST	REDUCED VOLT CTRL operand		R
BlkRef1		ORG			REDUCED VOLT BLOCK setting.	R

LNName: LoVStrGAPC1	LDevice inst: Ctrl			UR element: REDUCED VOLTAGE STARTING element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	REDUCED VOL BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.21 Restart delay (StrDl)

This element is instantiated in the following products: M60.

Table 3-156: Restart delay data objects

LNName: StrDlPMRI1	LDevice inst: Ctrl			UR element: RESTART DELAY element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
StrInh		SPS			RESTART TIME OP operand	R
	stVal	BOOLEAN	ST	RESTART TIME OP		R
BlkRef1		ORG			RESTART DELAY BLK setting	R
	setSrcRef	ObjectReference	SP	RESTART DELAY BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
StrInhTmm		INS			RESTART DELAY LO TIME in Sec	R
	stVal	INT32	ST	RESTART DELAY LO TIME divided by 60 to convert seconds to minutes.		R

3.5.3.22 Single pole autoreclose (Rec13p)

This element is instantiated in the following products: C60, D60, L60, L90.

Table 3-157: Single pole autoreclose data objects

LNName: Rec13pRREC1	LDevice inst: Ctrl			UR element: Autoreclose element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
TrBeh		ENS			AR FORCE 3-P TRIP operand	R
	stVal	ENUMERATED	ST			R
RecCyc		INS			AUTORECLOSE SHOT COUNT actual value	R
	stVal	INT32	ST	AUTORECLOSE SHOT COUNT		R
AutoRecSt		ENS			Autoreclosing status	R
	stVal	ENUMERATED	ST			R
Ena1		SPS			AR ENABLED operand	R
	stVal	BOOLEAN	ST	AR ENABLED		R
Disabled		SPS			AR DISABLED operand	R
	stVal	BOOLEAN	ST	AR DISABLED		R
ArRip		SPS			AR RIP operand	R
	stVal	BOOLEAN	ST	AR RIP		R
P1Rip		SPS			AR 1-P RIP operand	R
	stVal	BOOLEAN	ST	AR 1-P RIP		R
P3Rip1		SPS			AR 3-P/1 RIP operand	R
	stVal	BOOLEAN	ST	AR 3-P/1 RIP		R
P3Rip2		SPS			AR 3-P/2 RIP operand	R
	stVal	BOOLEAN	ST	AR 3-P/2 RIP		R
P3Rip3		SPS			AR 3-P/3 RIP operand	R
	stVal	BOOLEAN	ST	AR 3-P/3 RIP		R
P3Rip4		SPS			AR 3-P/4 RIP operand	R
	stVal	BOOLEAN	ST	AR 3-P/4 RIP		R

LNName: Rec13pRREC1		LDevice inst: Ctrl		UR element: Autoreclose element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ArLO		SPS			AR LO operand	R
	stVal	BOOLEAN	ST	AR LO		R
ArBlk1		SPS			AR BKR1 BLK operand	R
	stVal	BOOLEAN	ST	AR BKR1 BLK		R
ArBlk1		SPS			AR BKR2 BLK operand	R
	stVal	BOOLEAN	ST	AR BKR2 BLK		R
OpCls		ACT			AR CLOSE BKR1 operand	R
	general	BOOLEAN	ST	AR CLOSE BKR1		R
Cls2ndBkr		SPS			AR CLOSE BKR2 operand	R
	stVal	BOOLEAN	ST	AR CLOSE BKR2		R
P3Tr		SPS			AR FORCE 3-P TRIP operand	R
	stVal	BOOLEAN	ST	AR FORCE 3-P TRIP		R
AnyShotCnt		SPS			AR SHOT CNT>0 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT>0		R
ShotCnt1		SPS			AR SHOT CNT=1 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT=1		R
ShotCnt2		SPS			AR SHOT CNT=2 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT=2		R
ShotCnt3		SPS			AR SHOT CNT=3 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT=3		R
ShotCnt4		SPS			AR SHOT CNT=4 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT=4		R
ArMod1		SPS			AR MODE = 1 operand	R
	stVal	BOOLEAN	ST	AR MODE = 1		R
ArMod2		SPS			AR MODE = 2 operand	R
	stVal	BOOLEAN	ST	AR MODE = 2		R
ArMod3		SPS			AR MODE = 3 operand	R
	stVal	BOOLEAN	ST	AR MODE = 3		R
ArMod4		SPS			AR MODE = 4 operand	R
	stVal	BOOLEAN	ST	AR MODE = 4		R
SwFail		SPS			AR MODE SWITCH FAIL operand	R
	stVal	BOOLEAN	ST	AR MODE SWITCH FAIL		R
Zn1Extend		SPS			AR ZONE 1 EXTENT operand	R
	stVal	BOOLEAN	ST	AR ZONE1 EXTENT		R
SeqTO		SPS			AR INCOMPLETE SEQ operand	R
	stVal	BOOLEAN	ST	AR INCOMPLETE SEQ		R
Rs		SPS			AR RESET operand	R
	stVal	BOOLEAN	ST	AR RESET		R
InRef01		ORG			Mode 1 Activation setting	R
	setSrcRef	ObjectReference	SP	AR Mode 1 Activation setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef02		ORG			Mode 2 Activation setting	R
	setSrcRef	ObjectReference	SP	AR Mode 2 Activation setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef03		ORG			Mode 3 Activation setting	R
	setSrcRef	ObjectReference	SP	AR Mode 3 Activation setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef04		ORG			Mode 4 Activation setting	R

LNName: Rec13pRREC1		LDevice inst: Ctrl		UR element: Autoreclose element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	AR Mode 4 Activation setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef2		ORG			AR BLOCK BKR1 setting	R
	setSrcRef	ObjectReference	SP	AR BLOCK BKR 1 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef06		ORG			AR BKR MAN CLOSE setting	R
	setSrcRef	ObjectReference	SP	AR BKR MAN CLOSE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef07		ORG			AR 1P INIT setting	R
	setSrcRef	ObjectReference	SP	AR 1P INIT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef08		ORG			AR 3P INIT setting	R
	setSrcRef	ObjectReference	SP	AR 3P INIT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef09		ORG			AR 3P TD INIT setting	R
	setSrcRef	ObjectReference	SP	AR 3P TD INIT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef10		ORG			AR MULTI-P FAULT setting	R
	setSrcRef	ObjectReference	SP	AR MULTI-P FAULT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef11		ORG			BKR ONE POLE OPEN setting	R
	setSrcRef	ObjectReference	SP	BKR ONE POLE OPEN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef12		ORG			BKR 3 POLE OPEN setting	R
	setSrcRef	ObjectReference	SP	BKR 3 POLE OPEN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef13		ORG			AR EXTEND DEAD T 1 setting	R
	setSrcRef	ObjectReference	SP	AR EXTEND DEAD T 1setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef14		ORG			AR RESET setting	R
	setSrcRef	ObjectReference	SP	AR RESET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef15		ORG			AR BKR CLOSED setting	R
	setSrcRef	ObjectReference	SP	AR BKR CLOSED setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			AR BLOCK setting	R
	setSrcRef	ObjectReference	SP	AR BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef17		ORG			AR PAUSE setting	R
	setSrcRef	ObjectReference	SP	AR PAUSE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef3		ORG			AR BLOCK BKR2 setting	R
	setSrcRef	ObjectReference	SP	AR BLOCK BKR2 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef19		ORG			AR BUS FLT INIT setting	R
	setSrcRef	ObjectReference	SP	AR BUS FLT INIT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.23 Synchrocheck (SynChk)

This element is instantiated in the following products: B30, C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60.

Table 3-158: Synchrocheck data objects

LNName: SynChkRSYN#		LDevice inst: Ctrl		UR element: Synchrocheck element # (ANSI 25)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Rel		SPS			SYNC # CLS OP operand, which becomes On all synchrocheck criteria are fulfilled.	R
	stVal	BOOLEAN	ST	SYNC # CLS OP		R
RelDpo		SPS			SYNC # CLS DPO operand, which becomes Off when all synchrocheck criteria are fulfilled.	R
	stVal	BOOLEAN	ST	SYNC # CLS DPO		R
LivV1		SPS			SYNC # V1 ABOVE MIN operand, which indicates that V1 is above the LivVal1 setting.	R
	stVal	BOOLEAN	ST	SYNC # V1 ABOVE MIN		R
DeaV1		SPS			SYNC # V1 BELOW MAX operand, which indicates that V1 is below the DeaVal1 setting.	R
	stVal	BOOLEAN	ST	SYNC # V1 BELOW MAX		R
LivV2		SPS			SYNC # V2 ABOVE MIN operand, which indicates that V1 is above the LivVal2 setting.	R
	stVal	BOOLEAN	ST	SYNC # V2 ABOVE MIN		R
DeaV2		SPS			SYNC # V2 BELOW MAX operand, which indicates that V2 is below the DeaVal1 setting.	R
	stVal	BOOLEAN	ST	SYNC # V2 BELOW MAX		R
LivDea		SPS			SYNC # DEAD S OP operand, which indicates that live/dead conditions have been met.	R
	stVal	BOOLEAN	ST	SYNC # DEAD S OP		R
LivDeaDpo		SPS			SYNC # DEAD S DPO operand, which indicates that live/dead conditions have not been met.	R
	stVal	BOOLEAN	ST	SYNC # DEAD S DPO		R
LivLiv		SPS			SYNC # SYNC OP operand, which indicates that both sources are live, and that angle, frequency and voltage difference and range conditions have been met.	R
	stVal	BOOLEAN	ST	SYNC # SYNC OP		R
LivLivDpo		SPS			SYNC # SYNC DPO operand, which indicates that that one or both sources are not live, or that angle, frequency and voltage difference and range conditions have been met.	R
	stVal	BOOLEAN	ST	SYNC # SYNC DPO		R
DynOp		SPS			SYNC# S-CLOSE OP operand, which becomes on when all criteria for dynamic mode are fulfilled	R
	stVal	BOOLEAN	ST	SYNC# S-CLOSE OP		R
DynDpo		SPS			SYNC# S-CLOSE DPO operand, which becomes off when all criteria for dynamic mode are fulfilled	R
	stVal	BOOLEAN	ST	SYNC# S-CLOSE DPO		R
DynArmd		SPS			SYNC# S-CLOSE ARMD operand, which becomes on when dynamic mode is armed	R

LNName: SynChkRSYN#		LDevice inst: Ctrl		UR element: Synchrocheck element # (ANSI 25)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	SYNC# S-CLOSE ARMD		R
DifVClc		MV			SYNCHROCHECK # DELTA VOLT, in primary volts	R
	instMag.f	FLOAT32		SYNCHROCHECK 1 DELTA VOLT		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.DifVClc.db		R/W/C
	zeroDb	INT32U	CF			R
DifHzClc		MV			SYNCHROCHECK # DELTA FREQ, in Hz	R
	instMag.f	FLOAT32		SYNCHROCHECK # DELTA FREQ		R
	mag.f	FLOAT32		SYNCHROCHECK # DELTA FREQ on deadband exception		R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.DifHzClc.db		R/W/C
	zeroDb	INT32U	CF			R
DifAngClc		MV			SYNCHROCHECK # DELTA PHASE, in degrees	R
	instMag.f	FLOAT32		SYNCHROCHECK # DELTA PHASE		R
	mag.f	FLOAT32		SYNCHROCHECK # DELTA PHASE on deadband exception		R
	units.SIUnit	ENUMERATED			9, the code for degrees	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.DifAngClc.db		R/W/C
	zeroDb	INT32U	CF			R
DifAngDis		MV			SYNCHROCHECK # SYNSCP D_PH, in degrees	R
	instMag.f	FLOAT32		SYNCHROCHECK # SYNSCP D_PH		R
	mag.f	FLOAT32		SYNCHROCHECK # SYNSCP D_PH on deadband exception		R
	units.SIUnit	ENUMERATED			9, the code for degrees	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.DifAngDis.db		R/W/C
	zeroDb	INT32U	CF			R
V1Src		CMV			SYNCHROCHECK # V1 voltage phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V1 MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V1 ANG		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.V1Src.db		R/W/C
	dbAng	INT32U	CF	SynChkRSYN#.V1Src.dbAng		R/W/C
	zeroDb	INT32U	CF			R
V2Src		CMV			SYNCHROCHECK # V2 voltage phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V2 MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V2 ANG		R

LNName: SynChkRSYN#		LDevice inst: Ctrl		UR element: Synchrocheck element # (ANSI 25)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.V2Src.db		R/W/C
	dbAng	INT32U	CF	SynChkRSYN#.V2Src.dbAng		R/W/C
	zeroDb	INT32U	CF			R
ProjectedV2		CMV			SYNCHROCHECK # V2' voltage phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V2' MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V2' ANG		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.ProjectedV2.db		R/W/C
	dbAng	INT32U	CF	SynChkRSYN#.ProjectedV2.dbAng		R/W/C
	zeroDb	INT32U	CF			R
Projected Dif		MV			SYNCHROCHECK # DELTA PHASE', in degrees which is the phase angle difference between V1 and projected V2	R
	instMag.f	FLOAT32		SYNCHROCHECK # '		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			9, the code for degrees	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.ProjectedDif.db		R/W/C
	zeroDb	INT32U	CF			R
ProjDifDis		MV			SYNCHROCHECK # PROJ SYNSCP D_PH, in degrees	R
	instMag.f	FLOAT32		SYNCHROCHECK # PROJ SYNSCP D_PH		R
	mag.f	FLOAT32		SYNCHROCHECK # PROJ SYNSCP D_PH on deadband exception		R
	units.SIUnit	ENUMERATED			9, the code for degrees	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.ProjDifDis.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRef1		ORG			SYNCHK# BLOCK setting.	R
	setSrcRef	ObjectReference	SP	SYNCHK# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			SYNCHK# SYNC CLOSE setting.	R
	setSrcRef	ObjectReference	SP	SYNCHK# SYNC CLOSE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.24 Thermal overload (ThmOvl)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, N60, T35, T60.

Table 3-159: Thermal overload data objects

LNName: ThmOvlPTTR#		LDevice inst: Ctrl		UR element: THERMAL OVERLOAD PROTECTION # element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			THERMAL PROT # OP operand	R
	general	BOOLEAN	ST	THERMAL PROT # OP		R
Str		ACD			THERMAL PROT # PKP operand	R
	general	BOOLEAN	ST	THERMAL PROT # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
InRef1		ORG			THERMAL PROT # RESET setting.	R
	setSrcRef	ObjectReference	SP	THERMAL PROT # RESET	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			THERMAL PROT # BLOCK setting.	R
	setSrcRef	ObjectReference	SP	THERMAL PROT # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.25 Three pole autoreclose (Rec3p)

This element is instantiated in the following products: B30, D30, F35, F60, L30.

Table 3-160: Three pole autoreclose data objects

LNName: Rec3pRREC#		LDevice inst: Ctrl		UR element: Autoreclose element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ShotCnt		INS			AUTORECLOSE# SHOT COUNT actual value	R
	stVal	INT32	ST	AUTORECLOSE# SHOT COUNT		R
AutoRecSt		ENS			Autoreclosing status	R
	stVal	ENUMERATED	ST			R
Ena1		SPS			AR# ENABLED operand	R
	stVal	BOOLEAN	ST	AR# ENABLED		R
ArRip		SPS			AR# RIP operand	R
	stVal	BOOLEAN	ST	AR# RIP		R
ArLO		SPS			AR# LO operand	R
	stVal	BOOLEAN	ST	AR# LO		R
ArBlk1		SPS			AR# BLK FROM MAN CLS operand	R
	stVal	BOOLEAN	ST	AR# BLK FROM MAN CLS		R
OpCls		ACT			AR# CLOSE operand	R
	general	BOOLEAN	ST	AR# CLOSE		R
ShotCnt0		SPS			AR# SHOT CNT=0 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=0		R
ShotCnt1		SPS			AR# SHOT CNT=1 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=1		R
ShotCnt2		SPS			AR# SHOT CNT=2 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=2		R
ShotCnt3		SPS			AR# SHOT CNT=3 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=3		R
ShotCnt4		SPS			AR# SHOT CNT=4 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=4		R
Disabled		SPS			AR# DISABLED operand	R
	stVal	BOOLEAN	ST	AR# DISABLED		R
InRef01		ORG			AR# INITIATE setting.	R
	setSrcRef	ObjectReference	SP	AR# INITIATE setting	reference to the data attribute to input	R/C

LNName: Rec3pRREC#		LDevice inst: Ctrl		UR element: Autoreclose element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			AR# BLOCK setting.	R
	setSrcRef	ObjectReference	SP	AR# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef02		ORG			AR# REDUCE MAX TO 1 setting.	R
	setSrcRef	ObjectReference	SP	AR# REDUCE MAX TO 1 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef03		ORG			AR# REDUCE MAX TO 2 setting.	R
	setSrcRef	ObjectReference	SP	AR# REDUCE MAX TO 2 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef04		ORG			AR# REDUCE MAX TO 3 setting.	R
	setSrcRef	ObjectReference	SP	AR# REDUCE MAX TO 3 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef05		ORG			AR# MANUAL CLOSE setting.	R
	setSrcRef	ObjectReference	SP	AR# MANUAL CLOSE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef06		ORG			AR# MNL RST FRM LO setting.	R
	setSrcRef	ObjectReference	SP	AR# MNL RST FRM LO setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef07		ORG			AR# BKR CLOSED setting.	R
	setSrcRef	ObjectReference	SP	AR# BKR CLOSED setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef08		ORG			AR# BKR OPEN setting.	R
	setSrcRef	ObjectReference	SP	AR# BKR OPEN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef09		ORG			AR# ADD DELAY 1 setting.	R
	setSrcRef	ObjectReference	SP	AR# ADD DELAY 1 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef10		ORG			AR# ADD DELAY 2 setting.	R
	setSrcRef	ObjectReference	SP	AR# ADD DELAY 2 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.26 Time between starts (TmBtwn)

This element is instantiated in the following products: M60.

Table 3-161: Time between starts data objects

LNName: TmBtwnPMRI1		LDevice inst: Ctrl		UR element: TIME BETWEEN STARTS element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			TIME–BTWN-STARTS PKP operand	R
	general	BOOLEAN	ST	TIME–BTWN-STARTS PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
StrInh		SPS			TIME-BTWN-STARTS OP operand	R
	stVal	BOOLEAN	ST	TIME-BTWN-STARTS OP		R
Dpo		SPS			TIME-BTWN-STARTS DPO operand, which is the inverse of TIME-BTWN-STARTS PKP	R
	stVal	BOOLEAN	ST	TIME-BTWN-STARTS DPO		R
BlkRef1		ORG			TIME-BTWN-STARTS BLK setting.	R

LNName: TmBtwnPMRI1		LDevice inst: Ctrl		UR element: TIME BETWEEN STARTS element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	TIME-BTWN-STARTS BLK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
StrInhTmm		INS			TIME-BTWN-STARTS LO TIME in min	R
	stVal	INT32	ST	TIME-BTWN-STARTS LO TIME		R

3.5.3.27 Transformer aging factor (Age)

This element is instantiated in the following products: G30, T35, T60.

Table 3-162: Transformer aging data objects

LNName: AgeSPTR1		LDevice inst: Ctrl		UR element: Aging Factor Function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			XFMR AGING FCTR OP	R
	general	BOOLEAN	ST	XFMR AGING FCTR OP		R
Dpo		SPS			XFMR AGING FCTR DPO operand	R
	stVal	BOOLEAN	ST	XFMR AGING FCTR DPO		R
Str		ACD			XFMR AGING FCTR PKP operand	R
	general	BOOLEAN	ST	XFMR AGING FCTR PKP		R
	dirGeneral	ENUMERATED	ST			R
AgeRte		MV			AGING FACTOR actual Values.	R
	instMag.f	FLOAT32		AGING FACTOR		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED				R
	units.multiplier	ENUMERATED			0 is multiplier for 1 (actually seconds per day, but there is no standard enumeration for that, probably should have divided by 86400 to make it seconds per second, or dimensionless)	R
	db	INT32U	CF	AgeSPTR1.AgeRte.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRefγ		ORG			AGING FACTOR BLOCK for setting group γ.	R
	setSrcRef	ObjectReference	SP	AGING FACTOR BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.28 Transformer hottest spot temperature (HPTmp)

This element is instantiated in the following products: G30, T35, T60.

Table 3-163: Hottest spot temperature data objects

LNName: HPTmpSPTR1		LDevice inst: Ctrl		UR element: Hottest-Spot Temperature Function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			XFMR HST-SPOT ˚C OP	R
	general	BOOLEAN	ST	XFMR HST-SPOT ˚C OP		R
Dpo		SPS			XFMR HST-SPOT °C DPO operand	R
	stVal	BOOLEAN	ST	XFMR HST-SPOT °C DPO		R
Str		ACD			XFMR HST-SPOT °C PKP operand	R
	general	BOOLEAN	ST	XFMR HST-SPOT °C PKP		R

LNName: HPTmpSPTR1		LDevice inst: Ctrl		UR element: Hottest-Spot Temperature Function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	dirGeneral	ENUMERATED	ST			R
ToOilTmp		MV			TOP OIL °C actual Value.	R
	instMag.f	FLOAT32		TOP OIL °C		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			23, the code for °C	R
	units.multiplier	ENUMERATED			0 is code for a multiplier 1	R
	db	INT32U	CF	HPTmpSPTR1.ToOilTmp.db		R/W/C
	zeroDb	INT32U	CF			R
HPTmpClc		MV			HOTTEST-SPOT ° C actual values.	R
	instMag.f	FLOAT32		HOTTEST-SPOT ° C		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			23, the code for °C	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	HPTmpSPTR1.HPTmpClc.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRefγ		ORG			XFMR HST BLOCK for setting group γ.	R
	setSrcRef	ObjectReference	SP	XFMR HST BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.29 Transformer loss of life (LosLif)

This element is instantiated in the following products: G30, T35, T60.

Table 3-164: Transformer loss of life data objects

LNName: LosLifSPTR1		LDevice inst: Ctrl		UR element: Loss of Life Function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			XFMR LIFE LOST OP operands	R
	general	BOOLEAN	ST	XFMR LIFE LOST OP		R
Str		ACD			XFMR LIFE LOST PKP operand	R
	general	BOOLEAN	ST	XFMR LIFE LOST PKP		R
	dirGeneral	ENUMERATED	ST			R
LosLifeRte		MV			DAILY RATE LOL actual Values.	R
	instMag.f	FLOAT32		DAILY RATE LOL		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for second	R
	units.multiplier	ENUMERATED			0 is multiplier for 1	R
	db	INT32	CF	LosLifSPTR1.LosLifeRte.db		R/W/C
	zeroDb	INT32	CF			R
LosLife		MV			XFMR LIFE LOST actual Values.	R
	instMag.f	FLOAT32		XFMR LIFE LOST		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for second	R
	units.multiplier	ENUMERATED			0 is multiplier for 1	R
	db	INT32	CF	LosLifSPTR1.LosLife.db		R/W/C
	zeroDb	INT32	CF			R
BlkRefγ		ORG			LOSS OF LIFE BLOCK for setting group γ.	R

LNName: LosLifSPTR1		LDevice inst: Ctrl		UR element: Loss of Life Function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	LOSS OF LIFE BLOCK for group Y.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.3.30 User-programmable fault report (UFlt)

This element is instantiated in the following products: B30, B90, C70, G30, G60, M60, N60, T35, T60.

Table 3-165: User-programmable fault report data objects

LNName: UFltRFLO#		LDevice inst: Ctrl		UR element: USER PROGRAMMABLE FAULT REPORT # settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
FltZ		CMV			Mandatory data attribute which in this case is fixed at zero	R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
InRef1		ORG			PRE-FAULT # TRIGGER.	R
	setSrcRef	ObjectReference	SP	PRE-FAULT # TRIGGER.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			FAULT # TRIGGER.	R
	setSrcRef	ObjectReference	SP	FAULT # TRIGGER.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-166: User-programmable fault report actual values and clear data objects

LNName: UFlt0RFLO1		LDevice inst: Ctrl		UR element: USER PROGRAMMABLE FAULT REPORT actual values and clear		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
FltZ		CMV			Mandatory data attribute which in this case is fixed at zero	R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
FltNum		INS			NEWEST RECORD NUMBER	R
	stVal	INT32	ST	NEWEST RECORD NUMBER		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
LastClrTm		INS			LAST CLEARED DATE actual value	R
	stVal	INT32	ST	LAST CLEARED DATE actual value		R
	units.SIUnit	ENUMERATED			4, the code for time	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
LastRptTm		INS			LAST REPORT DATE actual value	R
	stVal	INT32	ST	LAST REPORT DATE actual value		R
	units.SIUnit	ENUMERATED			4, the code for time	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

3.5.4 System logical device

The Ctrl logical device contains logical nodes that model UR power system devices: breakers, switches, CTs, and VTs, and including interface to these such as AC inputs and contact I/O.

3.5.4.1 Logical node zero (LLN0)

This element is instantiated in UR devices implementing the System logical device.

Table 3-167: LLN0 data objects and attributes

LNName: LLN0		LDevice inst: System		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		ENS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		ORG			Reference to root logical device	R
	setSrcRef	ObjectReference	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

3.5.4.2 AC inputs (CT inputs and VT inputs) (ACin)

Uses Beh and NamPlt elements outlined in the Common data objects and attributes table on page 3-30.

3.5.4.3 Breaker control (Bkr)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-168: Breaker control data objects

LNName: BkrCSWI#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
CmdBlk		SPC			Command block status of this LN	R/Ctrl
	stVal	BOOLEAN	ST			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	CSWI# CmdBlk ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
Blk		SPS			Breaker Block status	R
	stVal	BOOLEAN	ST	value "Bkr0XCBR#.BlkCls.stVal" AND "Bkr0XCBR#.BlkOpn.stVal"		R
Loc		SPS			Breaker Loc status	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.Loc.stVal		R
OpOpn		ACT			BREAKER # MNL OPEN operand	R

LNName: BkrCSWI#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	general	BOOLEAN	ST	Bkr0XCBR#.OpOpn.general operand BREAKER # MNL OPEN		R
	phsA	BOOLEAN	ST	Bkr0XCBR#.OpOpn.phsA		R
	phsB	BOOLEAN	ST	Bkr0XCBR#.OpOpn.phsB		R
	phsC	BOOLEAN	ST	Bkr0XCBR#.OpOpn.phsC		R
SelOpn		SPS			Breaker Select status for open operation	R
	stVal	BOOLEAN	ST			R
OpCls		ACT			BREAKER # MNL CLS operand	R
	general	BOOLEAN	ST	Bkr0XCBR#.OpCls.general operand BREAKER # MNL CLS		R
SelCls		SPS			Breaker Select status for close operation	R
	stVal	BOOLEAN	ST			R
Pos		DPC			Breaker position control and status	R/Ctrl
	stVal	CODED ENUM	ST	Bkr0XCBR#.Pos.stVal		R
	stSeld	BOOLEAN	ST		The controllable data status is “selected”	R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	BkrCSWI# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	BkrCSWI# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF	BkrCSWI# Pos operTimeout		R/C
BlkOpn		SPC			Blocks breaker open commands from all sources including protection	R/Ctrl
	stVal	BOOLEAN	ST	the output of the logic gates as shown on Sheet 1 of the Breaker Control Logic		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	CSWI# BlkOpn ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
BlkCls		SPC			Blocks breaker close commands from all sources	R/Ctrl
	stVal	BOOLEAN	ST	the output of the logic gates as shown on Sheet 1 of the Breaker Control Logic		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R

LNName: BkrCSWI#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	CSWI# BlkCls ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
TagOn		SPS			BREAKER # TAG ON operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.TagOn.stVal		R
TagOff		SPS			BREAKER # TAG OFF operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.TagOff.stVal		R
SbstCls		SPS			BREAKER # SUBD CLSD operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.SbstCls.stVal		R
SbstOpn		SPS			BREAKER # SUBD OPEN operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.SbstOpn.stVal		R
BypsOn		SPS			BREAKER # BYPASS ON operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.BypsOn.stVal		R
BypsOff		SPS			BREAKER # BYPASS OFF operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.BypsOff.stVal		R

Table 3-169: Breaker control data objects

LNName: BkrCILO#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EnaOpn		SPS			Enable Open status	R
	stVal	BOOLEAN	ST			R
EnaCls		SPS			Enable Close status	R
	stVal	BOOLEAN	ST			R
InRef2		ORG			BKR# INTERLOCK OPN setting.	R
	setSrcRef	ObjectReference	SP	BKR# INTERLOCK OPN	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			BKR# INTERLOCK CLS setting.	R
	setSrcRef	ObjectReference	SP	BKR# INTERLOCK CLS	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-170: Breaker control data objects

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EEHealth		ENS			Breaker health, value is 2 (yellow) when breaker is out of service, 3 (red) when breaker trouble is detected and breaker is not out of service	R
	stVal	ENUMERATED	ST			R
Loc		SPS			Value of operand selected by setting BKR# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST			R
OpCnt		INS			Breaker operations counter.	R
	stVal	INT32	ST			R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
OpOpn		ACT			BREAKER # OFF CMD (3-phase trip), TRIP A, TRIP B and TRIP C operands	R
	general	BOOLEAN	ST	BREAKER # OFF CMD		R
	phsA	BOOLEAN	ST	BREAKER # TRIP A		R
	phsB	BOOLEAN	ST	BREAKER # TRIP B		R
	phsC	BOOLEAN	ST	BREAKER # TRIP C		R
OpCls		ACT			BREAKER # ON CMD (close) operand	R
	general	BOOLEAN	ST	BREAKER # ON CMD		R
BadSt1		SPS			BREAKER # BAD STATUS operand	R
	stVal	BOOLEAN	ST	BREAKER # BAD STATUS		R
ClsSt1		SPS			BREAKER # CLOSED operand	R
	stVal	BOOLEAN	ST	BREAKER # CLOSED		R
OpnSt1		SPS			BREAKER # OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # OPEN		R
Dsc		SPS			BREAKER # DISCREP operand, which is breaker pole discrepancy status	R
	stVal	BOOLEAN	ST	BREAKER # DISCREP		R
Alm		SPS			BREAKER # TROUBLE operand, which is breaker pole discrepancy, bad-status, or BREAKER # EXT ALARM	R
	stVal	BOOLEAN	ST	BREAKER # TROUBLE		R
MnlOpn		SPS			BREAKER # MNL OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # MNL OPEN		R
MnlCls		SPS			BREAKER # MNL CLS operand	R
	stVal	BOOLEAN	ST	BREAKER # MNL CLS		R
AnyPoleOpn		SPS			BREAKER # ANY P OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # ANY P OPEN		R
OnePoleOpn		SPS			BREAKER # ONE P OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # ONE P OPEN		R
OutOfSrv		SPS			BREAKER # OOS operand	R
	stVal	BOOLEAN	ST	BREAKER # OOS		R
TagOn		SPS			BREAKER # TAG ON operand	R
	stVal	BOOLEAN	ST	BREAKER # TAG ON		R
TagOff		SPS			BREAKER # TAG OFF operand	R
	stVal	BOOLEAN	ST	BREAKER # TAG OFF		R
SbstCls		SPS			BREAKER # SUBD CLSD operand	R
	stVal	BOOLEAN	ST	BREAKER # SUBD CLSD		R
SbstOpn		SPS			BREAKER # SUBD OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # SUBD OPEN		R
BypsOn		SPS			BREAKER # BYPASS ON operand	R
	stVal	BOOLEAN	ST	BREAKER # BYPASS ON		R
BypsOff		SPS			BREAKER # BYPASS OFF operand	R
	stVal	BOOLEAN	ST	BREAKER # BYPASS OFF		R
RecBlk		SPS			BREAKER # BLK RCLS operand	R
	stVal	BOOLEAN	ST	BREAKER # BLK RCLS		R
RecEna		SPS			BREAKER # ENA RCLS operand	R
	stVal	BOOLEAN	ST	BREAKER # ENA RCLS		R

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Pos		DPC			Breaker position control and status	R/Ctrl
	stVal	CODED ENUM	ST			R
	stSeld	BOOLEAN	ST		The controllable data status is "selected"	R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	XCBR# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	XCBR# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF	BREAKER # Toperate		R/C
BlkOpn		SPC			Blocks breaker open commands from all sources including protection	R/Ctrl
	stVal	BOOLEAN	ST	the output of the logic gates as shown on Sheet 1 of the Breaker Control Logic		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	XCBR# BlkOpn ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
BlkCls		SPC			Blocks breaker close commands from all sources	R/Ctrl
	stVal	BOOLEAN	ST	the output of the logic gates as shown on Sheet 1 of the Breaker Control Logic		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	XCBR# BlkCls ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
InRef1		ORG			BREAKER # OPEN setting.	R
	setSrcRef	ObjectReference	SP	BREAKER # OPEN	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			BREAKER # BLK OPEN setting.	R
	setSrcRef	ObjectReference	SP	BREAKER # BLK OPEN	reference to the data attribute to input	R/C

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			BREAKER # CLOSE setting.	R
	setSrcRef	ObjectReference	SP	BREAKER # CLOSE	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			BREAKER # BLK CLOSE setting.	R
	setSrcRef	ObjectReference	SP	BREAKER # BLK CLOSE	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef8		ORG			BKR# SYNCCHECK CLS setting.	R
	setSrcRef	ObjectReference	SP	BKR# SYNCCHECK CLS	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			BREAKER # EXT ALARM setting.	R
	setSrcRef	ObjectReference	SP	BREAKER # EXT ALARM	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef6		ORG			BREAKER # OUT OF SV (out-of-service) setting.	R
	setSrcRef	ObjectReference	SP	BREAKER # OUT OF SV	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef7		ORG			BKR# ST.LOC OPERAND (local control) setting.	R
	setSrcRef	ObjectReference	SP	BKR# ST.LOC OPERAND	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef9		ORG			BREAKER # RACKED-IN setting.	R
	setSrcRef	ObjectReference	SP	BREAKER # RACKED-IN	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef10		ORG			BREAKER # PUSH BUTTON CONTROL setting	R
	setSrcRef	ObjectReference	SP	BREAKER # PUSH BUTTON CONTROL	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-171: Breaker control data objects

LNName: BkrΘXCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Loc		SPS			Value of operand selected by setting XCBR# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.Loc.stVal		R
OpCnt		INS			Phase ψ breaker operations counter.	R
	stVal	INT32	ST			R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
BadSt1		SPS			BREAKER # ψ BAD ST operand	R
	stVal	BOOLEAN	ST	BREAKER # ψ BAD ST		R
ClsSt1		SPS			BREAKER # ψ CLSD operand	R
	stVal	BOOLEAN	ST	BREAKER # ψ CLSD		R
OpnSt1		SPS			BREAKER # ψ OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # ψ OPEN		R
IntermSt1		SPS			BREAKER # ψ INTERM operand	R
	stVal	BOOLEAN	ST	BREAKER # ψ INTERM		R
Pos		DPC			Breaker ϕψ position status	R

LNName: BkrΘXCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	CODED ENUM	ST			R
	ctlModel	CtlModels	CF		0, the code for status-only	R
BlkOpn		SPC			Breaker open commands blocked from all sources including protection	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.BlkOpn.stVal		R
	ctlModel	CtlModels	CF		0, the code for status-only	R
BlkCls		SPC			Breaker close commands blocked from all sources including protection	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.BlkCls.stVal		R
	ctlModel	CtlModels	CF		0, the code for status-only	R
InRef1		ORG			BREAKER # ϕA/3P CLSD setting" if Θ="1", "BREAKER # ϕB CLSD setting" if Θ="2", or "BREAKER # ϕC CLSD setting" if Θ="3	R
	setSrcRef	ObjectReference	SP	BREAKER # ϕA/3P CLSD if Θ="1", BREAKER # ϕB CLSD if Θ="2", or BREAKER # ϕC CLSD if Θ="3"	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			BREAKER # ϕA/3P OPND setting" if Θ="1", "BREAKER # ϕB OPND setting" if Θ="2", or "BREAKER # ϕC OPND setting" if Θ="3	R
	setSrcRef	ObjectReference	SP	BREAKER # ϕA/3P OPND if Θ="1", BREAKER # ϕB OPND if Θ="2", or BREAKER # ϕC OPND if Θ="3"	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.4.4 B90 isolator monitoring (B_Iso)

This element is instantiated in the following products: B90.

Table 3-172: B90 isolator monitoring data objects

LNName: B_IsoSSWI#		LDevice inst: System		UR element: B90 ISOLATOR # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
OpTmAlm		SPS			ISOLATOR # ALARM operand.	R
	stVal	BOOLEAN	ST	ISOLATOR # ALARM		R
IsoPos		ACT			ISOLATOR # POSITION operand.	R
	general	BOOLEAN	ST	ISOLATOR # POSITION		R
IsoBlk		ACT			ISOLATOR # BLOCK OP operand.	R
	general	BOOLEAN	ST	ISOLATOR # BLOCK		R
InRef1		ORG			ISOLATOR # OPEN setting.	R
	setSrcRef	ObjectReference	SP	ISOLATOR # OPEN	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			ISOLATOR # CLOSED setting.	R
	setSrcRef	ObjectReference	SP	ISOLATOR # CLOSED	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			ISOLATOR # RESET setting	R
	setSrcRef	ObjectReference	SP	ISOLATOR # RESET.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.4.5 Contact input interface (ConIn)

This element is instantiated in all UR products.

Table 3-173: Contact input data objects

LNName: ConInGGIO1	LDevice inst: System		UR element: Contact Inputs			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Ind1Θ		SPS			Cont Ip Θ On (ϕ) operand value	R
	stVal	BOOLEAN	ST	Cont Ip ϕ On		R
Ind2Θ		SPS			Cont Ip Θ Off (ϕ) operand value	R
	stVal	BOOLEAN	ST	Cont Ip ϕ Off		R
Ind2Θ		SPS			Instantiated only if the order code has more than 99 contact inputs	R
	stVal	BOOLEAN	ST	Cont Ip ϕ Off		R
Ind1Θ		SPS			Instantiated only if the order code has more than 99 contact inputs	R
	stVal	BOOLEAN	ST	Cont Ip ϕ On		R

3.5.4.6 Contact output interface (ConOut)

This element is instantiated in all UR products.

Table 3-174: Contact output data objects

LNName: ConOutGGIO1	LDevice inst: System		UR element: Contact Outputs			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Ind1Θ		SPS			only instantiated where the order code indicates that contact output Θ is equipped with a current detector	R
	stVal	BOOLEAN	ST	Cont Op ϕ IOn		R
Ind2Θ		SPS			only instantiated where the order code indicates that contact output Θ is equipped with a voltage detector	R
	stVal	BOOLEAN	ST	Cont Op ϕ VOn		R
Ind3Θ		SPS			only instantiated where the order code indicates that contact output Θ is equipped with a voltage detector	R
	stVal	BOOLEAN	ST	Cont Op ϕ VOff		R
Ind4Θ		SPS			Cont Op Θ On (ϕ) operand value	R
	stVal	BOOLEAN	ST	Cont Op ϕ On		R
InRef1Θ		ORG			CONTACT OUTPUT ϕ OPERATE setting.	R
	setSrcRef	ObjectReference	SP	CONTACT OUTPUT ϕ OPERATE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2Θ		ORG			only instantiated where the order code indicates that contact output Θ is not a latching output.	R
	setSrcRef	ObjectReference	SP	CONTACT OUTPUT ϕ SEAL-IN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3Θ		ORG			only instantiated where the order code indicates that contact output Θ is a latching output.	R
	setSrcRef	ObjectReference	SP	OUTPUT ϕ RESET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.4.7 Disconnect switch (Disc)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-175: Disconnect switch DiscCSWI data objects

LNName: DiscCSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Loc		SPS			Disconnect switch Loc status	R
	stVal	BOOLEAN	ST	Disc0XSWI#.Loc.stVal		R
Pos		DPC			Disconnect position control and status	R/Ctrl
	stVal	CODED ENUM	ST	Disc0XSWI#.Pos.stVal		R
	stSeld	BOOLEAN	ST		The controllable data status is "selected"	R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	DiscCSWI# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	DiscCSWI# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF	DiscCSWI# Pos operTimeout		R/C

Table 3-176: Disconnect switch DiscCILO data objects

LNName: DiscCILO#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EnaOpn		SPS			Enable Open status	R
	stVal	BOOLEAN	ST			R
EnaCls		SPS			Enable Close status	R
	stVal	BOOLEAN	ST			R
InRef2		ORG			XSWI# INTERLOCK OPN setting.	R
	setSrcRef	ObjectReference	SP	XSWI# INTERLOCK OPN	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			XSWI# INTERLOCK CLS setting.	R
	setSrcRef	ObjectReference	SP	XSWI# INTERLOCK CLS	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-177: Disconnect switch Disc0XSWI data objects

LNName: Disc0XSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EEHealth		ENS			Disconnect switch health, value is 3 (red) when disconnect switch trouble is detected	R
	stVal	ENUMERATED	ST			R
Loc		SPS			Value of operand selected by XSWI# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST			R
OpCnt		INS			Disconnect switch operations counter.	R
	stVal	INT32	ST			R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R

LNName: Disc0XSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
SwTyp		ENS			Disconnect switch type, fixed at 2 (Disconnector)	R
	stVal	ENUMERATED	ST			R
OpOpn		ACT			SWITCH # OFF CMD (open) operand	R
	general	BOOLEAN	ST	SWITCH # OFF CMD		R
OpCls		ACT			SWITCH # ON CMD (close) operand	R
	general	BOOLEAN	ST	SWITCH # ON CMD		R
BadSt1		SPS			SWITCH # BAD STATUS operand	R
	stVal	BOOLEAN	ST	SWITCH # BAD STATUS		R
ClsSt1		SPS			SWITCH # CLOSED operand	R
	stVal	BOOLEAN	ST	SWITCH # CLOSED		R
OpnSt1		SPS			SWITCH # OPEN operand	R
	stVal	BOOLEAN	ST	SWITCH # OPEN		R
Dsc		SPS			SWITCH # DISCREP operand, which is disconnect pole discrepancy status	R
	stVal	BOOLEAN	ST	SWITCH # DISCREP		R
Alm		SPS			SWITCH # TROUBLE operand, which is disconnect pole discrepancy, bad-status, or SWITCH # EXT ALARM	R
	stVal	BOOLEAN	ST	SWITCH # TROUBLE		R
TagOn		SPS			SWITCH # TAG ON operand	R
	stVal	BOOLEAN	ST	SWITCH # TAG ON		R
TagOff		SPS			SWITCH # TAG OFF operand	R
	stVal	BOOLEAN	ST	SWITCH # TAG OFF		R
SbstCls		SPS			SWITCH # SUBD CLSD operand	R
	stVal	BOOLEAN	ST	SWITCH # SUBD CLSD		R
SbstOpn		SPS			SWITCH # SUBD OPEN operand	R
	stVal	BOOLEAN	ST	SWITCH # SUBD OPEN		R
BypsOn		SPS			SWITCH # BYPASS ON operand	R
	stVal	BOOLEAN	ST	SWITCH # BYPASS ON		R
BypsOff		SPS			SWITCH # BYPASS OFF operand	R
	stVal	BOOLEAN	ST	SWITCH # BYPASS OFF		R
Pos		DPC			Disconnect switch position control	R/Ctrl
	stVal	CODED ENUM	ST			R
	stSeld	BOOLEAN	ST		The controllable data status is “selected”	R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	XSWI# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	XSWI# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF	SWITCH # Toperate		R/C
BlkOpn		SPC			Blocks disconnect switch open commands from all sources including protection	R/Ctrl

LNName: Disc0XSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	Disc0XSWI# BlkOpn ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
BlkCls		SPC			Blocks disconnect switch close commands from all sources	R/Ctrl
	stVal	BOOLEAN	ST			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	Disc0XSWI# BlkCls ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
InRef1		ORG			SWITCH # OPEN setting.	R
	setSrcRef	ObjectReference	SP	SWITCH # OPEN	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			SWITCH # BLK OPEN setting.	R
	setSrcRef	ObjectReference	SP	SWITCH # BLK OPEN	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			SWITCH # CLOSE setting.	R
	setSrcRef	ObjectReference	SP	SWITCH # CLOSE	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			SWITCH # BLK CLOSE setting.	R
	setSrcRef	ObjectReference	SP	SWITCH # BLK CLOSE	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			XSWI# ST.LOC OPERAND (local control) setting.	R
	setSrcRef	ObjectReference	SP	XSWI# ST.LOC OPERAND	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			XSWI# PUSH BUTTON CONTROL setting	R
	setSrcRef	ObjectReference	SP	XSWI# PUSH BUTTON CONTROL	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

Table 3-178: Disconnect switch DiscΘXSWI data objects

LNName: DiscΘXSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Loc		SPS			Value of operand selected by XSWI# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST	Disc0XSWI#.Loc.stVal		R
OpCnt		INS			Phase ψ disconnect switch operation counter.	R
	stVal	INT32	ST			R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
SwTyp		ENS			Disconnect switch type, fixed at 2 (Disconnector)	R
	stVal	BOOLEAN	ST			R
BadSt1		SPS			SWITCH # ϕψ BAD STATUS operand	R
	stVal	BOOLEAN	ST	SWITCH # ϕψ BAD STATUS		R
ClsSt1		SPS			SWITCH # ϕψ CLOSED operand	R
	stVal	BOOLEAN	ST	SWITCH # ϕψ CLOSED		R
OpnSt1		SPS			SWITCH # ϕψ OPEN operand	R
	stVal	BOOLEAN	ST	SWITCH # ϕψ OPEN		R
IntermSt1		SPS			SWITCH # ϕψ INTERM operand, which is disconnect pole discrepancy status	R
	stVal	BOOLEAN	ST	SWITCH # ϕψ INTERM		R
Pos		DPC			Disconnect switch ϕψ position control	R
	stVal	CODED ENUM	ST			R
	ctlModel	CtlModels	CF		0, the code for status-only	R
BlkOpn		SPC			Disconnect switch open commands blocked from all sources including protection	R
	stVal	BOOLEAN	ST	Disc0XSWI#.BlkOpn.stVal		R
	ctlModel	CtlModels	CF		0, the code for status-only	R
BlkCls		SPC			Disconnect switch close commands blocked from all sources	R
	stVal	BOOLEAN	ST	Disc0XSWI#.BlkCls.stVal		R
	ctlModel	CtlModels	CF		0, the code for status-only	R
InRef1		ORG			SWITCH # ϕA/3P CLSD setting" if Θ="1", "SWITCH # ϕB CLSD setting" if Θ="2", or "SWITCH # ϕC CLSD setting" if Θ="3	R
	setSrcRef	ObjectReference	SP	SWITCH # ϕA/3P CLSD if Θ="1", SWITCH # ϕB CLSD if Θ="2", or SWITCH # ϕC CLSD if Θ="3"	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			SWITCH # ϕA/3P OPND setting" if Θ="1", "SWITCH # ϕB OPND setting" if Θ="2", or "SWITCH # ϕC OPND setting" if Θ="3	R
	setSrcRef	ObjectReference	SP	SWITCH # ϕA/3P OPND if Θ="1", SWITCH # ϕB OPND if Θ="2", or SWITCH # ϕC OPND if Θ="3"	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.4.8 Field contact inputs (FCIn)

This element is instantiated in all UR products.

Table 3-179: Field contact input data objects

LNName: FCInGGIO1		LDevice inst: System		UR element: Field Contact Inputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
IndΘ		SPS			FCI Θ On operand value	R
	stVal	BOOLEAN	ST	FCI Θ On		R

3.5.4.9 Field contact outputs (FCOut)

This element is instantiated in all UR products.

Table 3-180: Field contact output data objects

LNName: FCOutGGIO1		LDevice inst: System		UR element: Field Contact Outputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Ind1Θ		SPS			FCO ϕ DOn operand value	R
	stVal	BOOLEAN	ST	FCO ϕ DOn		R
Ind2Θ		SPS			Only instantiated for SSR contact outputs, i.e., OUT1 to OUT4	R
	stVal	BOOLEAN	ST	FCO ϕ IOn		R
Ind3Θ		SPS			Only instantiated for SSR contact outputs, i.e., OUT1 to OUT4	R
	stVal	BOOLEAN	ST	FCO ϕ VOn		R
InRef1Θ		ORG			FCO ϕ Operate setting.	R
	setSrcRef	ObjectReference	SP	Operate setting of FCO ϕ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2Θ		ORG			FCO ϕ Seal-In setting.	R
	setSrcRef	ObjectReference	SP	Seal-In setting of FCO ϕ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.4.10 Field latching outputs (FLOut)

This element is instantiated in all UR products.

Table 3-181: Field latching output data objects

LNName: FLOutGGIO1		LDevice inst: System		UR element: Field Latching Outputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Ind1Θ		SPS			FLO Θ Opened operand value	R
	stVal	BOOLEAN	ST	FLO Θ Opened		R
Ind2Θ		SPS			FLO Θ Closed operand value	R
	stVal	BOOLEAN	ST	FLO Θ Closed		R
Ind3Θ		SPS			FLO Θ OpnDOn operand value	R
	stVal	BOOLEAN	ST	FLO Θ OpnDOn		R
Ind4Θ		SPS			FLO Θ ClsDOn operand value	R
	stVal	BOOLEAN	ST	FLO Θ ClsDOn		R
InRef1Θ		ORG			FLO Θ Open setting.	R
	setSrcRef	ObjectReference	SP	Open setting of FLO Θ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2Θ		ORG			FLO Θ Close setting.	R
	setSrcRef	ObjectReference	SP	Close setting of FLO Θ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.4.11 Field RTDs (FRTDs)

This element is instantiated in all UR products.

Table 3-182: Field RTD data objects

LNName: FRTDsGGIO1		LDevice inst: System		UR element: Field RTDs (Resistance Temperature Detectors)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
IndΘ		SPS			RTDΘ Trouble On operand value	R
	stVal	BOOLEAN	ST	RTDΘ Trouble On		R
AnInΘ		MV			RTDΘ Temperature in degree Celsius	R
	instMag.f	FLOAT32		RTDΘ Temperature		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			23, the code for degree Celsius (°C)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	FRTDsGGIO1.AnInΘ.db		R/W/C
	zeroDb	INT32U	CF			R

3.5.4.12 Field units (FUnt)

This element is instantiated in all UR products.

Table 3-183: Field unit data objects

LNName: FUnitGGIO1		LDevice inst: System		UR element: Field units		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
IndΘ		SPS			UΘ On operand value	R
	stVal	BOOLEAN	ST	UΘ On		R

3.5.4.13 Field transducers (FTDRs)

This element is instantiated in all UR products.

Table 3-184: Field transducer data objects

LNName: FTDRsGGIO1		LDevice inst: System		UR element: Field Transducers		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
IndΘ		SPS			TDRΘ Trouble On operand value	R
	stVal	BOOLEAN	ST	TDRΘ Trouble On		R
AnInΘ		MV			TDR Θ Value	R
	instMag.f	FLOAT32		TDR Θ Value		R
	mag.f	FLOAT32				R
	db	INT32U	CF	FTDRsGGIO1.AnInΘ.db		R/W/C
	zeroDb	INT32U	CF			R
DbMaxΘ		ASG			Maximum Value in deadband calculations	R
	setMag.f	FLOAT32		"Maximum Value" of TDRΘ		R/C
	minVal.f	FLOAT32		–9999.999		R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R
DbMinΘ		ASG			Minimum Value in deadband calculations	R
	setMag.f	FLOAT32		"Minimum Value" of TDRΘ		R/C
	minVal.f	FLOAT32		–9999.999		R
	maxVal.f	FLOAT32				R

LNName: FTDRsGGIO1		LDevice inst: System		UR element: Field Transducers		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stepSize.f	FLOAT32				R

3.5.4.14 Latched outputs (FLOut)

This element is instantiated in all UR products.

Table 3-185: Latched output data objects

LNName: FLOutGGIO1		LDevice inst: System		UR element: Field Latching Outputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Ind1Θ		SPS			FLO Θ Opened operand value	R
	stVal	BOOLEAN	ST	FLO Θ Opened		R
Ind2Θ		SPS			FLO Θ Closed operand value	R
	stVal	BOOLEAN	ST	FLO Θ Closed		R
Ind3Θ		SPS			FLO Θ OpnDOn operand value	R
	stVal	BOOLEAN	ST	FLO Θ OpnDOn		R
Ind4Θ		SPS			FLO Θ ClsDOn operand value	R
	stVal	BOOLEAN	ST	FLO Θ ClsDOn		R
InRef1Θ		ORG			FLO Θ Open setting.	R
	setSrcRef	ObjectReference	SP	Open setting of FLO Θ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2Θ		ORG			FLO Θ Close setting.	R
	setSrcRef	ObjectReference	SP	Close setting of FLO Θ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.4.15 Shared inputs (FShIn)

This element is instantiated in all UR products.

Table 3-186: Shared input data objects

LNName: FShInGGIO1		LDevice inst: System		UR element: Field Shared Inputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
IndΘ		SPS			SI Θ On operand value	R
	stVal	BOOLEAN	ST	SI Θ On		R

3.5.4.16 Shared outputs (FShOut)

This element is instantiated in all UR products.

Table 3-187: Shared output data objects

LNName: FShOutGGIO1		LDevice inst: System		UR element: Field Shared Outputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRefΘ		ORG			SOΘ Operate setting.	R
	setSrcRef	ObjectReference	SP	Operate setting of SOΘ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.4.17 Transducer DCmA inputs (TDCIn)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-188: DCmA input data objects

LNName: TDCInGGIO1		LDevice inst: System		UR element: DCmA Inputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
AnInΘ		MV			DCMA INPUT ϕ Value	R
	instMag.f	FLOAT32		DCMA INPUT ϕ Value		R
	mag.f	FLOAT32				R
	db	INT32U	CF	TDCInGGIO1.AnInΘ.db		R/W/C
	zeroDb	INT32U	CF			R
MaxValΘ		ASG			Maximum Value in deadband calculations	R
	setMag.f	FLOAT32		"DCMA INPUT ϕ MAX VALUE"		R/C
	minVal.f	FLOAT32		–9999.999		R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R
MinValΘ		ASG			Minimum Value in deadband calculations	R
	setMag.f	FLOAT32		"DCMA INPUT ϕ MIN VALUE"		R/C
	minVal.f	FLOAT32		–9999.999		R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R

3.5.4.18 Transducer DCmA outputs (TDCOut)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-189: DCmA output data objects

LNName: TDCOutGGIO1		LDevice inst: System		UR element: DCmA outputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRefΘ		ORG			DCMA OUTPUT ϕ SOURCE setting.	R
	setSrcRef	ObjectReference	SP	DCMA OUTPUT ϕ SOURCE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
MaxValΘ		ASG			Maximum Value in deadband calculations	R
	setMag.f	FLOAT32		"DCMA OUTPUT ϕ MAX VALUE"		R/C
	minVal.f	FLOAT32		–90.000		R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R
MinValΘ		ASG			Minimum Value in deadband calculations	R
	setMag.f	FLOAT32		"DCMA OUTPUT ϕ MIN VALUE"		R/C
	minVal.f	FLOAT32		–90.000		R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R

3.5.4.19 Transducer resistance temperature detectors (TRTDs)

This element is instantiated in the following products: G60, M60.

Table 3-190: RTD input data objects

LNName: TRTDsGGIO1	LDevice inst: System			UR element: RTDs (Resistance Temperature Detectors)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
AnInΘ		MV			RTD INPUT ϕ Temperature in degree Celsius	R
	instMag.f	FLOAT32		RTD INPUT ϕ Value		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			23, the code for degree Celsius (°C)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	TRTDsGGIO1.AnInΘ.db		R/W/C
	zeroDb	INT32U	CF			R

3.5.5 Meter logical device

The Ctrl logical device contains logical nodes that model UR metering and measurement functions (other than PMU), including Signal Sources.

3.5.5.1 Logical node zero (LLN0)

This element is instantiated in all UR devices implementing the Meter logical device.

Table 3-191: LLN0 data objects

LNName: LLN0	LDevice inst: Meter			UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		ENS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		ORG			Reference to root logical device	R
	setSrcRef	ObjectReference	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

3.5.5.2 AC signal sources (ACsrc)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-192: AC signal sources data objects

LNName: ACsrcMMXU#	LDevice inst: Meter			UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			SRC# 50DD operand, which becomes On when a disturbance (change in magnitude of a sequence current greater than twice the current cutoff level) is detected on AC Source #.	R
	general	BOOLEAN	ST	SRC# 50DD		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
TotW		MV			SRC # Three Phase Real Power, in primary watts	R
	instMag.f	FLOAT32		SRC # Three Phase Real Power		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# TotW DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
TotVAr		MV			SRC # Three Phase Reactive Power, in primary VAr	R
	instMag.f	FLOAT32		SRC # Three Phase Reactive Power		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			63, the code for primary volt amperes reactive (VIsinΘ)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# TotVAr DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
TotVA		MV			SRC # Three Phase Apparent Power, in primary VA	R
	instMag.f	FLOAT32		SRC # Three Phase Apparent Power		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			61, the code for primary volt amperes (VA)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# TotVA DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
TotPF		MV			SRC # Three Phase Power Factor, dimensionless	R
	instMag.f	FLOAT32		SRC # Three Phase Power Factor		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			65, the code for power factor (dimensionless)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# TotPF DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
PFSign		ENG			Sign convention for power factor (PF) is fixed at Lead/Lag (usually named IEEE)	R
	setVal	ENUMERATED	SP		2, the code for Lead/Lag (usually named IEEE, Enumeration name is "EEI" per http://www.tissues.iec61850.com/tissue.mspx?issueid=686)	R
Hz		MV			SRC # Frequency, in Hz	R
	instMag.f	FLOAT32		SRC # Frequency		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# Hz DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
PPV		DEL			SRC # Phase-to-phase Voltage phasors, in primary volts	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsAB.instCVal .mag.f	FLOAT32		SRC # Phase AB Voltage Magnitude		R
	phsAB.instCVal .ang.f	FLOAT32		SRC # Phase AB Voltage Angle		R
	phsAB.cVal.mag.f	FLOAT32				R
	phsAB.cVal.ang.f	FLOAT32				R
	phsAB.units .SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsAB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsAB.db	INT32U	CF	MMXU# PPV.phsAB.db		R/W/C
	phsAB.dbAng	INT32U	CF	MMXU# PPV.phsAB.dbAng		R/W/C
	phsAB.zeroDb	INT32U	CF			R
	phsBC.instCVal .mag.f	FLOAT32		SRC # Phase BC Voltage Magnitude		R
	phsBC.instCVal .ang.f	FLOAT32		SRC # Phase BC Voltage Angle		R
	phsBC.cVal.mag.f	FLOAT32				R
	phsBC.cVal.ang.f	FLOAT32				R
	phsBC.units .SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsBC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsBC.db	INT32U	CF	MMXU# PPV.phsBC.db		R/W/C
	phsBC.dbAng	INT32U	CF	MMXU# PPV.phsBC.dbAng		R/W/C
	phsBC.zeroDb	INT32U	CF			R
	phsCA.instCVal .mag.f	FLOAT32		SRC # Phase CA Voltage Magnitude		R
	phsCA.instCVal .ang.f	FLOAT32		SRC # Phase CA Voltage Angle		R
	phsCA.cVal.mag.f	FLOAT32				R
	phsCA.cVal.ang.f	FLOAT32				R
	phsCA.units .SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsCA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsCA.db	INT32U	CF	MMXU# PPV.phsCA .db		R/W/C
	phsCA.dbAng	INT32U	CF	MMXU# PPV.phsCA.dbAng		R/W/C
	phsCA.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
VabRMS		MV			SRC # Phase AB Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase AB Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PPV.phsAB DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
VbcRMS		MV			SRC # Phase BC Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase BC Voltage RMS		R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PPV.phsBC DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
VcaRMS		MV			SRC # Phase CA Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase CA Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PPV.phsCA DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
PhV		WYE			SRC # Phase Voltage phasors, in primary volts	R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase AG Voltage Magnitude		R
	phsA.instCVal.ang .f	FLOAT32		SRC # Phase AG Voltage Angle		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.cVal.ang.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# PhV.phsA.db		R/W/C
	phsA.dbAng	INT32U	CF	MMXU# PhV.phsA .dbAng		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase BG Voltage Magnitude		R
	phsB.instCVal.ang .f	FLOAT32		SRC # Phase BG Voltage Angle		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.cVal.ang.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# PhV.phsB .db		R/W/C
	phsB.dbAng	INT32U	CF	MMXU# PhV.phsB.dbAng		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase CG Voltage Magnitude		R
	phsC.instCVal.ang .f	FLOAT32		SRC # Phase CG Voltage Angle		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.cVal.ang.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsC.db	INT32U	CF	MMXU# PhV.phsC.db		R/W/C
	phsC.dbAng	INT32U	CF	MMXU# PhV.phsC.dbAng		R/W/C
	phsC.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
	phsToNeut	BOOLEAN	CF			R
VaRMS		MV			SRC # Phase AG Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase AG Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PhV.phsA DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
VbRMS		MV			SRC # Phase BG Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase BG Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PhV.phsB DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
VcRMS		MV			SRC # Phase CG Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase CG Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PhV.phsC DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
A		WYE			SRC # Current phasors, in primary amperes	R
	phsA	CMV				R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Current Magnitude		R
	phsA.instCVal.ang .f	FLOAT32		SRC # Phase A Current Angle		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.cVal.ang.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# A.phsA .db		R/W/C
	phsA.dbAng	INT32U	CF	MMXU# A.phsA.dbAng		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Current Magnitude		R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsB.instCVal.ang.f	FLOAT32		SRC # Phase B Current Angle		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.cVal.ang.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	phsB.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# A.phsB.db		R/W/C
	phsB.dbAng	INT32U	CF	MMXU# A.phsB.dbAng		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag.f	FLOAT32		SRC # Phase C Current Magnitude		R
	phsC.instCVal.ang.f	FLOAT32		SRC # Phase C Current Angle		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.cVal.ang.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	phsC.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# A.phsC.db		R/W/C
	phsC.dbAng	INT32U	CF	MMXU# A.phsC.dbAng		R/W/C
	phsC.zeroDb	INT32U	CF			R
	res	CMV				R
	res.instCVal.mag.f	FLOAT32		SRC # Neutral Current Magnitude		R
	res.instCVal.ang.f	FLOAT32		SRC # Neutral Current Angle		R
	res.cVal.mag.f	FLOAT32				R
	res.cVal.ang.f	FLOAT32				R
	res.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	res.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	res.db	INT32U	CF	MMXU# A.neut.db		R/W/C
	res.dbAng	INT32U	CF	MMXU# A.neut.dbAng		R/W/C
	res.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
AaRMS		MV			SRC # Phase A Current RMS, in primary amperes	R
	instMag.f	FLOAT32		SRC # Phase A Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS A.phsA DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
AbRMS		MV			SRC # Phase B Current RMS, in primary amperes	R
	instMag.f	FLOAT32		SRC # Phase B Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS A.phsB DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
AcRMS		MV			SRC # Phase C Current RMS, in primary amperes	R
	instMag.f	FLOAT32		SRC # Phase C Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS A.phsC DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
AresRMS		MV			SRC # Neutral Current RMS, in primary amperes	R
	instMag.f	FLOAT32		SRC # Neutral Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS A.neut DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
Adif		CMV			SRC # Differential Ground Current phasor, in primary amperes	R
	instCVal.mag.f	FLOAT32		SRC # Differential Ground Current Magnitude		R
	instCVal.ang.f	FLOAT32		SRC # Differential Ground Current Angle		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# Dif Gnd Cur.db		R/W/C
	dbAng	INT32U	CF	MMXU# Dif Gnd Cur.dbAng		R/W/C
	zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
W		WYE			SRC # Phase Real Power, in primary watts	R
	phsA	CMV				R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Real Power		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# W.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Real Power		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# W.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase C Real Power		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R
	phsC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# W.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF			R
VAr		WYE			SRC # Phase Reactive Power, in primary VAr	R
	phsA	CMV				R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Reactive Power		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			63, the code for primary volt amperes reactive (VIsinΘ)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# VAr.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Reactive Power		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			63, the code for primary volt amperes reactive (VIsinΘ)	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# VAr.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase C Reactive Power		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			63, the code for primary volt amperes reactive (VIsinΘ)	R
	phsC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# VAr.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF			R
VA		WYE			SRC # Phase Apparent Power, in primary VA	R
	phsA	CMV				R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Apparent Power		R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			61, the code for primary volt amperes (VA)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# VA.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Apparent Power		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			61, the code for primary volt amperes (VA)	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# VA.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase C Apparent Power		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			61, the code for primary volt amperes (VA)	R
	phsC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# VA.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF			R
PF		WYE			SRC # Phase Power Factor, dimensionless	R
	phsA	CMV				R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Power Factor		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			65, the code for power factor (dimensionless)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# PF.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Power Factor		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			65, the code for power factor (dimensionless)	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# PF.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsC.instCVal.mag.f	FLOAT32		SRC # Phase C Power Factor		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			65, the code for power factor (dimensionless)	R
	phsC.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# PF.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF			R

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Table 3-193: AC signal sources data object

LNName: ACsrcMMXN#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Vaux		CMV			SRC # Auxiliary Voltage phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		SRC # Auxiliary Voltage Magnitude		R
	instCVal.ang.f	FLOAT32		SRC # Auxiliary Voltage Angle		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXN# AuxV.db		R/W/C
	dbAng	INT32U	CF	MMXN# AuxV.dbAng		R/W/C
	zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
VauxRMS		MV			SRC # Auxiliary Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Auxiliary Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXN# RMS AuxV DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
Agnd		CMV			SRC # Ground Current phasor, in primary amperes	R
	instCVal.mag.f	FLOAT32		SRC # Ground Current Magnitude		R
	instCVal.ang.f	FLOAT32		SRC # Ground Current Angle		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXN# GndCur.db		R/W/C
	dbAng	INT32U	CF	MMXN# GndCur.dbAng		R/W/C
	zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
AgndRMS		MV			SRC # Ground Current RMS, in primary amperes	R

LNName: ACsrcMMXN#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	instMag.f	FLOAT32		SRC # Ground Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXN# RMS GndCur DEADBAND		R/W/C
	zeroDb	INT32U	CF			R

Table 3-194: AC signal sources data objects

LNName: ACsrcMSQI#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
SeqA		SEQ			SRC # Sequence Current phasors, in primary amperes	R
	c1	CMV				R
	c1.instCVal.mag.f	FLOAT32		SRC # Positive Sequence Current Magnitude		R
	c1.instCVal.ang.f	FLOAT32		SRC # Positive Sequence Current Angle		R
	c1.cVal.mag.f	FLOAT32				R
	c1.cVal.ang.f	FLOAT32				R
	c1.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	c1.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	c1.db	INT32U	CF	MSQI# Seq1 Cur.db		R/W/C
	c1.dbAng	INT32U	CF	MSQI# Seq1 Cur.dbAng		R/W/C
	c1.zeroDb	INT32U	CF			R
	c2	CMV				R
	c2.instCVal.mag.f	FLOAT32		SRC # Negative Sequence Current Magnitude		R
	c2.instCVal.ang.f	FLOAT32		SRC # Negative Sequence Current Angle		R
	c2.cVal.mag.f	FLOAT32				R
	c2.cVal.ang.f	FLOAT32				R
	c2.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	c2.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	c2.db	INT32U	CF	MSQI# Seq2 Cur.db		R/W/C
	c2.dbAng	INT32U	CF	MSQI# Seq2 Cur.dbAng		R/W/C
	c2.zeroDb	INT32U	CF			R
	c3	CMV				R
	c3.instCVal.mag.f	FLOAT32		SRC # Zero Sequence Current Magnitude		R
	c3.instCVal.ang.f	FLOAT32		SRC # Zero Sequence Current Angle		R
	c3.cVal.mag.f	FLOAT32				R
	c3.cVal.ang.f	FLOAT32				R
	c3.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	c3.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	c3.db	INT32U	CF	MSQI# Seq0 Cur.db		R/W/C
	c3.dbAng	INT32U	CF	MSQI# Seq0 Cur.dbAng		R/W/C

LNName: ACsrcMSQI#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	c3.zeroDb	INT32U	CF			R
	seqT	ENUMERATED	MX		0, the code for pos-neg-zero	R
	phsRef	ENUMERATED	CF		0, the code for phase A	R

3.5.5.3 B90 AC channel metering (B_Mtr)

This element is instantiated in the following products: B90.

Table 3-195: B90 AC channel metering current input data objects

LNName: B_AmpMMXN#		LDevice inst: Meter		UR element: B90 Metering for current input ϕ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ChA		CMV			ϕ current in primary amps	R
	instCVal.mag.f	FLOAT32		ϕ CURRENT magnitude		R
	instCVal.ang.f	FLOAT32		ϕ CURRENT a		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_AmpMMXNϕ.ChA.db		R/W/C
	dbAng	INT32U	CF	B_AmpMMXNϕ.ChA.dbAng		R/W/C
	zeroDb	INT32U	CF			R

Table 3-196: B90 AC channel metering voltage input data objects

LNName: B_VolMMXN#		LDevice inst: Meter		UR element: B90 Metering for voltage input ϕ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ChV		CMV			ϕ voltage in primary volts	R
	instCVal.mag.f	FLOAT32		ϕ VOLTAGE magnitude		R
	instCVal.ang.f	FLOAT32		ϕ VOLTAGE a		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_VolMMXNϕ.ChV.db		R/W/C
	dbAng	INT32U	CF	B_VolMMXNϕ.ChV.dbAng		R/W/C
	zeroDb	INT32U	CF	(VOLTAGE CUT-OFF LEVEL) / 275 * 100 000		R

Table 3-197: B90 AC channel metering frequency data objects

LNName: B_FrqMMXN1		LDevice inst: Meter		UR element: B90 Metering for frequency		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Hz		MV			Frequency in Hz	R
	instMag.f	FLOAT32		FREQUENCY		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_FrqMMXN1.Hz.db		R/W/C
	zeroDb	INT32U	CF			R

LNName: B_FrqMMXN1		LDevice inst: Meter		UR element: B90 Metering for frequency		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
TrcHz		MV			Tracking Frequency in Hz	R
	instMag.f	FLOAT32		TRACKING FREQUENCY		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_FrqMMXN1.TrcHz.db		R/W/C
	zeroDb	INT32U	CF			R

3.5.5.4 Demand metering (DmdMtr)

This element is instantiated in the following products: B30, C60, D60, F35, F60, G60, L60, L90, N60, T60.

Table 3-198: Demand metering data objects

LNName: DmdMtrMMTR#		LDevice inst: Meter		UR element: Signal Source # NAME Demand Metering		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ClcExp		SPS			Status information to indicate the calculation period has expired	R
	stVal	BOOLEAN	ST	TRUE | FALSE		R
ClcMth		ENG			Calculation method of statistical data objects	R
	setVal	ENUMERATED	SP	UNSPECIFIED		R
InSyn		ORG			Only instantiated in DmdMtrMMTR1	R
	setSrcRef	ObjectReference	SP	DEMAND TRIGGER	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
RsStat		SPC			Only instantiated in DmdMtrMMTR1. Clears demand for all sources.	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	DmdMtrMMTR1.RsStat.ctlModel		R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
AaDmd		MV			SRC # DMD IA, in primary amperes	R
	instMag.f	FLOAT32		SRC # DMD IA		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	DmdMtrMMTR#.AaDmd.db		R/W/C
	zeroDb	INT32U	CF			R
AaMaxDmdDt		MV			SRC # DMD IA MAX, in primary amperes with associated date, SRC # DMD IA DATE	R
	mag.f	FLOAT32		SRC # DMD IA MAX		R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
AbDmd		MV			SRC # DMD IB, in primary amperes	R

LNName: DmdMtrMMTR#		LDevice inst: Meter		UR element: Signal Source # NAME Demand Metering		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	instMag.f	FLOAT32		SRC # DMD IB		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	DmdMtrMMTR#.AbDmd.db		R/W/C
	zeroDb	INT32U	CF			R
AbMaxDmdDt		MV			SRC # DMD IB MAX, in primary amperes with associated date, SRC # DMD IB DATE	R
	mag.f	FLOAT32		SRC # DMD IB MAX		R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
AcDmd		MV			SRC # DMD IC, in primary amperes	R
	instMag.f	FLOAT32		SRC # DMD IC		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	DmdMtrMMTR#.AcDmd.db		R/W/C
	zeroDb	INT32U	CF			R
AcMaxDmdDt		MV			SRC # DMD IC MAX, in primary amperes with associated date, SRC # DMD IC DATE	R
	mag.f	FLOAT32		SRC # DMD IC MAX		R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
WDmd		MV			SRC # DMD W, in primary watt	R
	instMag.f	FLOAT32		SRC # DMD W		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			38 is unit for power in watts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	DmdMtrMMTR#.WDmd.db		R/W/C
	zeroDb	INT32U	CF			R
WMaxDmdDt		MV			SRC # DMD W, in primary watt, with associated date, SRC # DMD W DATE	R
	mag.f	FLOAT32		SRC # DMD W MAX		R
	units.SIUnit	ENUMERATED			38 is unit for power in watts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
VArDmd		MV			SRC # DMD VAR, in primary volt ampere reactive	R
	instMag.f	FLOAT32		SRC # DMD VAR		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			63 is unit for apparent power in volt-ampere	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	DmdMtrMMTR#.VArDmd.db		R/W/C
	zeroDb	INT32U	CF			R
VArMaxDmdDt		MV			SRC # DMD VAR, in primary volt ampere reactive, with associated date, SRC # DMD VAR DATE	R
	mag.f	FLOAT32		SRC # DMD VAR MAX		R
	units.SIUnit	ENUMERATED			63 is unit for apparent power in volt-ampere	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

LNName: DmdMtrMMTR#		LDevice inst: Meter		UR element: Signal Source # NAME Demand Metering		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
VADmd		MV			SRC # DMD VA, in primary volt ampere	R
	instMag.f	FLOAT32		SRC # DMD VA		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			61 is unit for apparent power in volt-ampere	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	DmdMtrMMTR#.VADmd.db		R/W/C
	zeroDb	INT32U	CF			R
VAMaxDmdDt		MV			SRC # DMD VA, in primary volt ampere, with associated date, SRC # DMD VA DATE	R
	mag.f	FLOAT32		SRC # DMD VA MAX		R
	units.SIUnit	ENUMERATED			61 is unit for apparent power in volt-ampere	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

3.5.5.5 Energy metering (EnrMtr)

This element is instantiated in the following products: C60, D60, F35, F60, G30, G60, L90, M60, N60, T60.

Table 3-199: Energy metering data objects

LNName: EnrMtrMMTR#		LDevice inst: Meter		UR element: Signal Source # Energy Metering		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
PosTotWh		MV			SRC # Total Watt-hour in positive direction	R
	instMag.f	FLOAT32		SRC # POS WATTHOUR		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			72, the code for real energy in watt hours (Wh)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	EnrMtrMMTR#.PosTotWh.db		R/W/C
NegTotWh		MV			SRC # Total Watt-hour in negative direction	R
	instMag.f	FLOAT32		SRC # NEG WATTHOUR		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			72, the code for real energy in watt hours (Wh)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	EnrMtrMMTR#.NegTotWh.db		R/W/C
PosTotVArh		MV			SRC # Total VAr-hour in positive direction	R
	instMag.f	FLOAT32		SRC # T POS VARHOUR		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			73, the code for reactive energy in volt ampere hours (VArh)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	EnrMtrMMTR#.PosTotVArh.db		R/W/C
NegTotVArh		MV			SRC # Total VAr-hour in negative direction	R
	instMag.f	FLOAT32		SRC # NEG VARHOUR		R
	mag.f	FLOAT32				R

LNName: EnrMtrMMTR#		LDevice inst: Meter		UR element: Signal Source # Energy Metering		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.SIUnit	ENUMERATED			73, the code for reactive energy in volt ampere hours (VArh)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	EnrMtrMMTR#.NegTotVArh.db		R/W/C
RsStat		SPC			only instantiated in EnrMtrMMTR1	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	EnrMtrMMTR1.RsStat.ctlModel	1, the code for direct control with normal security; 2 is code for SBO with normal security.	R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
InRef1		ORG			CLEAR ENERGY setting.	R
	setSrcRef	ObjectReference	SP	setting reference to clear Energy, which shows the receiving of dynamically clearing signal for energy calculation	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.5.6 Harmonics and THD metering (HThd)

There is a single IMD for Source Current THD and Harmonics Metering, Source Voltage Harmonics and THD Metering, and Source Current THD.

This element is instantiated in the following products: C70, D60, F35, F60, G30, G60, L30, L60, L90, N60, T60.

Table 3-200: Harmonics and THD metering data objects

LNName: HThdMHAI#		LDevice inst: Meter		UR element: Harmonics and THD metering		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Hz		MV			SRC # Frequency, in Hz	R
	instMag.f	FLOAT32		SRC # Frequency		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	HThdMHAI#.Hz.db		R/W/C
	zeroDb	INT32U	CF			R
ThdA		WYE			Instantiated only in products that measure THD current	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		SRC # THD Iϕ magnitude		R
	phsθ.cVal.mag.f	FLOAT32		SRC # THD Iϕ magnitude, with dead band		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R

LNName: HThdMHAI#		LDevice inst: Meter		UR element: Harmonics and THD metering		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsϑ.units .multiplier	ENUMERATED		-2		R
	phsϑ.db	INT32U	CF	HThdMHAI#.ThdA.phsϑ.db		R/W/C
	phsϑ.zeroDb	INT32U	CF			R
	neut	CMV				R
	neut.instCVal.mag .f	FLOAT32		SRC # Neutral THD magnitude		R
	neut.cVal.mag.f	FLOAT32		SRC # Neutral THD magnitude, with dead band		R
	neut.units.SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R
	neut.units .multiplier	ENUMERATED		-2		R
	neut.db	INT32U	CF	HThdMHAI#.ThdA.neut.db		R/W/C
	neut.zeroDb	INT32U	CF			R
HA		HWYE			Instantiated only in products that measure current harmonics	R
	phsθHar(0)	CMV				R
	phsθHar(0) .instCVal.mag.f	FLOAT32				R
	phsθHar(0).cVal .mag.f	FLOAT32				R
	phsθHar(0).units .SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R
	phsθHar(0).units .multiplier	ENUMERATED		-2		R
	phsθHar(0).db	INT32U	CF			R
	phsθHar(0).zeroD b	INT32U	CF			R
	phsθHar(1)	CMV				R
	phsθHar(1) .instCVal.mag.f	FLOAT32				R
	phsθHar(1).cVal .mag.f	FLOAT32				R
	phsθHar(1).units .SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R
	phsθHar(1).units .multiplier	ENUMERATED		-2		R
	phsθHar(1).db	INT32U	CF			R
	phsθHar(1).zeroD b	INT32U	CF			R
	phsθHar(n)	CMV				R
	phsθHar(n) .instCVal.mag.f	FLOAT32		SRC # nτ Iϕ		R
	phsθHar(n).cVal .mag.f	FLOAT32		SRC # nτ Iϕ magnitude, with dead band		R
	phsθHar(n).units .SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R
	phsθHar(n).units .multiplier	ENUMERATED		-2		R
	phsθHar(n).db	INT32U	CF	HThdMHAI#.HA.phsθHar(n).db		R/W/C
	phsθHar(n).zeroD b	INT32U	CF			R
	numHar	INT16U	CF			R
	numCyc	INT16U	CF			R

LNName: HThdMHAI#		LDevice inst: Meter		UR element: Harmonics and THD metering		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	evalTm	INT16U	CF	(1/ NOMINAL FREQUENCY) * 1000		R
	frequency	FLOAT32	CF	NOMINAL FREQUENCY		R
	rmsCyc	INT16U	CF			R
ThdPhV		WYE			Instantiated only in products that measure THD voltage	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		SRC # THD Vϕ magnitude		R
	phsθ.cVal.mag.f	FLOAT32		SRC # THD Vϕ magnitude, with dead band		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R
	phsθ.units .multiplier	ENUMERATED		-2		R
	phsθ.db	INT32U	CF	HThdMHAI#.ThdPhV.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF			R
HPhV		HWYE			Instantiated only in products that measure voltage harmonics	R
	phsθHar(0)	CMV				R
	phsθHar(0) .instCVal.mag.f	FLOAT32				R
	phsθHar(0).cVal .mag.f	FLOAT32				R
	phsθHar(0).units .SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R
	phsθHar(0).units .multiplier	ENUMERATED		-2		R
	phsθHar(0).db	INT32U	CF			R
	phsθHar(0).zeroDb	INT32U	CF			R
	phsθHar(1)	CMV				R
	phsθHar(1) .instCVal.mag.f	FLOAT32				R
	phsθHar(1).cVal .mag.f	FLOAT32				R
	phsθHar(1).units .SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R
	phsθHar(1).units .multiplier	ENUMERATED		-2		R
	phsθHar(1).db	INT32U	CF			R
	phsθHar(1).zeroDb	INT32U	CF			R
	phsθHar(n)	CMV				R
	phsθHar(n) .instCVal.mag.f	FLOAT32		SRC # nτ Vϕ		R
	phsθHar(n).cVal .mag.f	FLOAT32		SRC # nτ Vϕ magnitude, with dead band		R
	phsθHar(n).units .SIUnit	ENUMERATED			1, the code for dimensionless (percentage)	R
	phsθHar(n).units .multiplier	ENUMERATED		-2		R
	phsθHar(n).db	INT32U	CF	HThdMHAI#.HPhV.phsθHar(n).db		R/W/C
	phsθHar(n).zeroDb	INT32U	CF			R

LNName: HThdMHAI#		LDevice inst: Meter		UR element: Harmonics and THD metering		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	numHar	INT16U	CF			R
	evalTm	INT16U	CF	(1/ NOMINAL FREQUENCY) * 1000		R
	frequency	FLOAT32	CF	NOMINAL FREQUENCY		R
	rmsCyc	INT16U	CF			R

3.5.6 General (Gen) logical device

The Gen logical device contains logical nodes that model UR FlexLogic, Virtual Outputs, non-volatile latches, FlexElements, and recording (for example, oscillography) functions.

3.5.6.1 Logical node zero (LLN0)

This element is instantiated in all UR devices implementing the Gen logical device.

Table 3-201: LLN0 data objects

LNName: LLN0		LDevice inst: Gen		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		ENS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		ORG			Reference to root logical device	R
	setSrcRef	ObjectReference	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

3.5.6.2 8-bit comparator (Cmp8Bt)

This element is instantiated in the following products: N60.

Table 3-202: 8-bit comparator data objects

LNName: Cmp8BtGAPC#		LDevice inst: Gen		UR element: 8-Bit Comparator #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			8BIT COMP # PKP operand	R
	general	BOOLEAN	ST	8BIT COMP # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			8BIT COMP # OP operand	R
	general	BOOLEAN	ST	8BIT COMP # OP		R
Dpo		SPS			8BIT COMP # DPO operand	R
	stVal	BOOLEAN	ST	8BIT COMP # DPO		R
IndΘ		SPS			8BIT COMP # BIT Θ-1 operand value	R
	stVal	BOOLEAN	ST	8BIT COMP # BIT Θ-1		R
AnOutput 1		MV			8BIT COMP # A value	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32				R
	mag	AnalogueValue	MX			R

LNName: Cmp8BtGAPC#		LDevice inst: Gen		UR element: 8-Bit Comparator #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	mag.f	FLOAT32				R
	db	INT32U	CF	Cmp8BtGAPC#.AnIn1.db		R/W/C
	zeroDb	INT32U	CF			R
AnOutput 2		MV			8BIT COMP # B value	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32				R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32				R
	db	INT32U	CF	Cmp8BtGAPC#.AnIn2.db		R/W/C
	zeroDb	INT32U	CF			R
AnOutput 3		MV			8BIT COMP # Out value	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32				R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32				R
	db	INT32U	CF	Cmp8BtGAPC#.AnIn3.db		R/W/C
	zeroDb	INT32U	CF			R
InRef1Θ		ORG			8BIT COMP # ARG AΘ setting.	R
	setSrcRef	ObjectReference	SP	8BIT 8BIT COMP # ARG AΘ setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2Θ		ORG			8BIT COMP # ARG BΘ setting.	R
	setSrcRef	ObjectReference	SP	8BIT 8BIT COMP # ARG BΘ setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef01		ORG			8BIT COMP # ADD/SUB setting.	R
	setSrcRef	ObjectReference	SP	8BIT COMP # ADD/SUB setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			8BIT COMP # BLOCK setting	R
	setSrcRef	ObjectReference	SP	8BIT COMP # BLOCK	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.3 Annunciator (Anctr)

This element is instantiated in the following products: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-203: Annunciator data objects

LNName: AnctrCALH1		LDevice inst: Gen		UR element: Annunciator		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
GrInd		SPS			ANY ANCTR ABNORMAL operand value	R
	stVal	BOOLEAN	ST	ANY ANCTR ABNORMAL		R
RsOpRem		SPS			ANY ANCTR ALARMED operand value	R
	stVal	BOOLEAN	ST	ANY ANCTR ALARMED		R
InRef1		ORG			RESET ANNUNCIATOR setting.	R
	setSrcRef	ObjectReference	SP	Operate setting of RESET ANNUNCIATOR	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

LNName: AnctrCALH1		LDevice inst: Gen		UR element: Annunciator		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRef1ψ		ORG			Alarm Input setting of Annunciator window ψ	R
	setSrcRef	ObjectReference	SP	Operate setting "Alarm Input" of Annunciator window ψ	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.4 Control pushbuttons (CtlPsh)

This element is instantiated in the following products: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-204: Control pushbutton data objects

LNName: CtlPshIHMI#		LDevice inst: Gen		UR element: CONTROL PUSH BUTTON # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Activated		SPS			CONTROL PUSH BUTTON # ON operand.	R
	stVal	BOOLEAN	ST	CONTROL PUSHBTN # ON		R

3.5.6.5 Current differential 87L composite voltage (VComp)

This element is instantiated in the following products: L90.

Table 3-205: Current differential composite voltage data objects

LNName: VCompMMXU1		LDevice inst: Gen		UR element: Current Differential Composite Voltage element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
VolLoc		CMV			Local Vcomp phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		Local Vcomp Mag		R
	instCVal.ang.f	FLOAT32		Local Vcomp Ang		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	VCompMMXU1.VolLoc.db		R/W/C
	dbAng	INT32U	CF	VCompMMXU1.VolLoc.dbAng		R/W/C
	zeroDb	INT32U	CF			R
VolRem1		CMV			Term 1 Vcomp phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		Term 1 Vcomp Mag		R
	instCVal.ang.f	FLOAT32		Term 1 Vcomp Ang		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	VCompMMXU1.VolRem1.db		R/W/C
	dbAng	INT32U	CF	VCompMMXU1.VolRem1.dbAng		R/W/C
	zeroDb	INT32U	CF			R
VolRem2		CMV			Term 2 Vcomp phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		Term 2 Vcomp Mag		R
	instCVal.ang.f	FLOAT32		Term 2 Vcomp Ang		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R

LNName: VCompMMXU1		LDevice inst: Gen		UR element: Current Differential Composite Voltage element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.SIUnit	ENUMERATED			29, the code for primary volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	VCompMMXU1.VolRem2.db		R/W/C
	dbAng	INT32U	CF	VCompMMXU1.VolRem2.dbAng		R/W/C
	zeroDb	INT32U	CF			R

3.5.6.6 Data logger (DatLog)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-206: Data logger data objects

LNName: DatLogRDRE1		LDevice inst: Gen		UR element: Data Logger		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
FltNum		INS			Fault number	R
	stVal	INT32	ST			R
RcdMade		SPS			Recording started, timestamp mapped to NEWEST SAMPLE TIME actual	R
	stVal	BOOLEAN	ST	Transitions to true whenever a new sample is recorded, cleared to false when recorder is cleared.		R
MemClr		SPC			Clear all data logger records command	R/Ctrl
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	DatLogRDRE1.MemClr.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
InRef1		ORG			DATA LOGGER TRIGGER setting.	R
	setSrcRef	ObjectReference	SP	DATA LOGGER TRIGGER setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.7 Digital counters (DigCnt)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-207: Digital counter data objects

LNName: DigCntFCNT#		LDevice inst: Gen		UR element: Digital Counters #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
HiLim		SPS			Counter #(CNT#) HI, which indicates the number of pulses counted is above the set number.	R
	stVal	BOOLEAN	ST	Counter #(CNT#) HI		R

LNName: DigCntFCNT#		LDevice inst: Gen		UR element: Digital Counters #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EqLim		SPS			Counter #(CNT#) EQL operand, which indicates the number of pulses counted is equal to the set number	R
	stVal	BOOLEAN	ST	Counter #(CNT#) EQL		R
LoLim		SPS			Counter #(CNT#) LO operand, which indicates the number of pulses counted is below the set number.	R
	stVal	BOOLEAN	ST	Counter #(CNT#) LO		R
CntVal		BCR			Counter # ACCUM, which indicates the accumulated number of pulses	R
	actVal	INT64	ST	actual value of Counter # ACCUM		R
	frVal	INT64	ST	actual value of Counter # FROZEN (count)		R
	frTm	TimeStamp	ST	actual value of Counter # FROZEN (date/time) combined with Counter # MICROS (fractional seconds)		R
	units.SIUnit	ENUMERATED		COUNTER # UNITS		R
	units.multiplier	ENUMERATED		COUNTER # UNITS		R
	pulsQty	FLOAT32	CF			R
	frEna	BOOLEAN	CF			R
	strTm	TimeStamp	CF			R
	frPd	INT32	CF			R
	frRs	BOOLEAN	CF			R
InRef1		ORG			COUNTER # UP setting.	R
	setSrcRef	ObjectReference	SP	COUNTER # UP setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			COUNTER # DOWN setting.	R
	setSrcRef	ObjectReference	SP	COUNTER # DOWN setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			CNT# SET TO PRESET setting.	R
	setSrcRef	ObjectReference	SP	CNT# SET TO PRESET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			COUNTER # RESET setting.	R
	setSrcRef	ObjectReference	SP	COUNTER # RESET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			COUNTER # FREEZE/RESET setting.	R
	setSrcRef	ObjectReference	SP	COUNTER # FREEZE/RESET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef6		ORG			COUNTER # FREEZE/COUNT setting.	R
	setSrcRef	ObjectReference	SP	COUNTER # FREEZE/COUNT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			COUNTER # BLOCK setting.	R
	setSrcRef	ObjectReference	SP	COUNTER # BLOCK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.8 Digital elements (DigEl)

This element is instantiated all UR products.

Table 3-208: Digital element data objects

LNName: DigElGAPC#		LDevice inst: Gen		UR element: Digital Element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			Dig Element # PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	Dig Element #(DE#) PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
Op		ACT			Dig Element # OP operand, which becomes On when the input is On, and the element is not blocked	R
	general	BOOLEAN	ST	Dig Element #(DE#) OP		R
Dpo		SPS			Dig Element # DPO operand, which indicates the element will drop out (Reset) when delay expires.	R
	stVal	BOOLEAN	ST	Dig Element #(DE#) DPO		R
InRef1		ORG			DIG ELEM #INPUT setting.	R
	setSrcRef	ObjectReference	SP	DIG ELEM #INPUT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		ORG			DIG ELEM # BLOCK setting.	R
	setSrcRef	ObjectReference	SP	DIG ELEM # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.9 FlexElement element (FlxEl)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-209: FlexElement data objects

LNName: FlxElGAPC#		LDevice inst: Gen		UR element: FlexElement element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			FxE # PKP operand, which becomes On when this element has picked up.	R
	general	BOOLEAN	ST	FxE # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
Op		ACT			FxE # OP operand	R
	general	BOOLEAN	ST	FxE # OP		R
Dpo		SPS			FxE # DPO operand, which is the inverse of FxE PKP	R
	stVal	BOOLEAN	ST	FxE # DPO		R
OpSig		MV			FLEXELEMENT # OpSig, in per unit	R
	instMag.f	FLOAT32		FLEXELEMENT # OpSig		R
	mag.f	FLAOT32		FLEXELEMENT # OpSig on deadband exception		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless (per unit)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	FlxElGAPC#.OpSig.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRef1		ORG			FLEXELEMENT # BLOCK setting.	R
	setSrcRef	ObjectReference	SP	FLEXELEMENT # BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef1		ORG			FLEXELEMENT # +IN setting.	R
	setSrcRef	ObjectReference	SP	FLEXELEMENT # +IN	reference to the data attribute to input	R/C

LNName: FlxElGAPC#		LDevice inst: Gen		UR element: FlexElement element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			FLEXELEMENT # IN setting.	R
	setSrcRef	ObjectReference	SP	FLEXELEMENT # IN	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.10 FlexLogic, FlexLogic timers, and virtual outputs (FlxLgc)

This element is instantiated all UR products.

Table 3-210: FlexLogic data objects

LNName: FlxLgcGAPC1		LDevice inst: Gen		UR element: FlexLogic		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Indξξξ		SPS			Virt Op ξ On (VOξξ) operand value	R
	stVal	BOOLEAN	ST	VOξξ On		R

3.5.6.11 Non-volatile latches (NVLat)

This element is instantiated in all UR products.

Table 3-211: Non-volatile latch data objects

LNName: NVLatGAPC#		LDevice inst: Gen		UR element: Non-Volatile Latches element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Ind1		SPS			LATCH # ON operand value	R
	stVal	BOOLEAN	ST	LATCH # ON		R
Ind2		SPS			”LATCH # OFF operand value	R
	stVal	BOOLEAN	ST	LATCH # OFF		R
InRef1		ORG			Non-Volatile Latch LATCH # SET setting.	R
	setSrcRef	ObjectReference	SP	Non-Volatile Latch SET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			Non-Volatile Latch LATCH # RESET setting.	R
	setSrcRef	ObjectReference	SP	Non-Volatile Latch RESET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.12 Oscillography (Osc)

This element is instantiated in all UR products.

Table 3-212: Oscillography data objects

LNName: OscRDRE1		LDevice inst: Gen		UR element: Oscillography, core logical node		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
RcdMade		SPS			Records are available	R
	stVal	BOOLEAN	ST			R
FltNum		INS			NUMBER OF TRIGGERS actual value	R
	stVal	INT32	ST	NUMBER OF TRIGGERS actual value		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
NumRcd		INS			AVAILABLE RECORDS actual value	R

LNName: OscRDRE1		LDevice inst: Gen		UR element: Oscillography, core logical node		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	INT32	ST	actual value AVAILABLE RECORDS		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
NumCycPer		INS			CYCLES PER RECORD actual value	R
	stVal	INT32	ST	actual value CYCLES PER RECORD		R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
RsTms		INS			LAST CLEARED DATE actual value	R
	stVal	INT32	ST	actual value LAST CLEARED DATE		R
	units.SIUnit	ENUMERATED			4, the code for time	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
RcdTrg		SPC			External command to trigger recorder	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	OscRDRE1.RcdTrg.ctlModel		R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
MemClr		SPC			Clear all oscillography records command	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	OscRDRE1.MemClr.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R

3.5.6.13 Real time clock (TmClk)

This element is instantiated in all UR products.

Table 3-213: Real-time clock data objects

LNName: TmClkLTMS1		LDevice inst: Gen		UR element: REAL TIME CLOCK feature except LOCAL TIME		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
TmAcc		INS			ACCURACY in number of significant bits in the Fraction Of Second	R
	stVal	INT32	ST			R
TmSrc		VSS			RTC Sync Source	R

LNName: TmClkLTMS1		LDevice inst: Gen		UR element: REAL TIME CLOCK feature except LOCAL TIME		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	VISIBLE STRING255	SP	Dotted decimal IP address of the time source		R
TmChSt1		SPS			Time channel status	R
	stVal	BOOLEAN	ST	logical OR of SNTP, PTP or IRIG-B time synchronization status.		R
TmSynSrc		ENS			RTC Sync Source actual value indicates time synchronizing source the device is using at present	R
	stVal	ENUMERATED	ST	Actual Value: RTC Sync Source.		R
PTPChSt$		SPS			PTP Port $ Status	R
	stVal	BOOLEAN	ST			R
GrdMaster ID		VSS			GrandMaster ID actual value	R
	stVal	VISIBLE STRING 255	ST	GrandMaster ID		R
TmnsDelta		MV			PTP-IRIG-B Delta in ns	R
	instMag.f	FLOAT32		PTP-IRIG-B Delta		R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units.SIUnit	ENUMERATED			4, the code for Time (Sec)	R
	units.multiplier	ENUMERATED			-9, the code for a multiplier of 10-9	R
	db	INT32	CF	TmClkLTMS1.TmnsDelta.db		R/W/C
	zeroDb	INT32	CF			R

3.5.6.14 Security (Sec)

This element is instantiated in all UR products.

Table 3-214: Security data objects

LNName: SecGSAL1		LDevice inst: Gen		UR element: UR Basic Security element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
AuthFail		SEC			Number of authorisation failures: an association to the client could not be established due to an authorisation failure (fixed at 0)	R
	cnt	INT32U	ST			R
	sev	ENUMERATED	ST		2=major	R
AcsCtlFail		SEC			Counter for Access control failures detection (fixed at 0)	R
	cnt	INT32U	ST			R
	sev	ENUMERATED	ST		0=Unknown	R
SvcViol		SEC			Counter for Service Violations	R
	cnt	INT32U	ST	a new counter which increments by 1, every time the data object that the client wanted to access exists, but the requested service is not allowed		R
	sev	ENUMERATED	ST		3 = Minor	R
Ina		SEC			Counter for number of associations terminated due to inactivity	R
	cnt	INT32U	ST	New counter that counts number of associations terminated due to inactivity		R
	sev	ENUMERATED	ST		0=Unknown	R

LNName: SecGSAL1		LDevice inst: Gen		UR element: UR Basic Security element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
SecDataClr		SPC			Mapped to command Clear Security Data	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicated the duration is locally defined	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	a new setting SecGSAL1.SecDataClr.ctlModel default value 1, range 1...2	1, the code for direct control with normal security; 2 is code for SBO with normal security.	R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
OpCntRs		INC			Data object to clear all 5 security violation counters	R/Ctrl
	stVal	INT32	ST	Sum of AuthFail + AcsCtlFail + SvcViol + Ina		R
	ctlModel	CtlModels	CF	a new setting SecGSAL1.OpCntRs ctlModel default value 1, range 1...2	1, the code for direct control with normal security; 2 is code for SBO with normal security.	R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
	operTimeout	INT32U	CF			R
LocSetAcsOff		SPS			ACCESS LOC STG OFF operand	R
	stVal	BOOLEAN	ST	ACCESS LOC STG OFF		R
LocSetAcsOn		SPS			ACCESS LOC STG ON operand	R
	stVal	BOOLEAN	ST	ACCESS LOC STG ON		R
LocCmdAcsOn		SPS			ACCESS LOC CMND ON operand	R
	stVal	BOOLEAN	ST	ACCESS LOC CMND ON		R
LocCmdAcsOff		SPS			ACCESS LOC CMND OFF operand	R
	stVal	BOOLEAN	ST	ACCESS LOC CMND OFF		R
RemSetAcsOn		SPS			ACCESS REM STG ON operand	R
	stVal	BOOLEAN	ST	ACCESS REM STG ON		R
RemSetAcsOff		SPS			ACCESS REM STG OFF operand	R
	stVal	BOOLEAN	ST	ACCESS REM STG OFF		R
RemCmdAcsOn		SPS			ACCESS REM CMND ON operand	R
	stVal	BOOLEAN	ST	ACCESS REM CMND ON		R
RemCmdAcsOff		SPS			ACCESS REM CMND OFF operand	R
	stVal	BOOLEAN	ST	ACCESS REM CMND OFF		R
InRef1		ORG			LOCAL SETTING AUTH setting.	R
	setSrcRef	ObjectReference	SP	LOCAL SETTING AUTH setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			REMOTE SETTING AUTH setting.	R

LNName: SecGSAL1		LDevice inst: Gen		UR element: UR Basic Security element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	REMOTE SETTING AUTH setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.15 Selector switch (SelSw)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-215: Selector switch data objects

LNName: SelSwGAPC#		LDevice inst: Gen		UR element: Selector Switch element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
IndY		SPS			SELECTOR # POS Y operand value	R
	stVal	BOOLEAN	ST	SELECTOR # POS Y		R
Indα		SPS			SELECTOR # BIT β operand value	R
	stVal	BOOLEAN	ST	SELECTOR # BIT β		R
Alm2		SPS			SELECTOR # STP ALARM operand value	R
	stVal	BOOLEAN	ST	SELECTOR # STP ALARM		R
Alm3		SPS			"SELECTOR # BIT ALARM operand value	R
	stVal	BOOLEAN	ST	SELECTOR # BIT ALARM		R
Alm1		SPS			"SELECTOR # ALARM operand value	R
	stVal	BOOLEAN	ST	SELECTOR # ALARM		R
Alm4		SPS			"SELECTOR # PWR ALARM operand value	R
	stVal	BOOLEAN	ST	SELECTOR # PWR ALARM		R
InRef1		ORG			SELECTOR # STEP-UP setting.	R
	setSrcRef	ObjectReference	SP	SELECTOR # STEP-UP setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			SELECTOR # ACK setting.	R
	setSrcRef	ObjectReference	SP	SELECTOR # ACK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			SELECTOR # 3BIT A0 setting.	R
	setSrcRef	ObjectReference	SP	SELECTOR # 3BIT A0 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			SELECTOR # 3BIT A1 setting.	R
	setSrcRef	ObjectReference	SP	SELECTOR # 3BIT A1 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			SELECTOR # 3BIT A2 setting.	R
	setSrcRef	ObjectReference	SP	SELECTOR # 3BIT A2 setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef6		ORG			SELECTOR # 3BIT ACK setting.	R
	setSrcRef	ObjectReference	SP	SELECTOR #3BIT ACK setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.16 Target resetting (TgtRs)

This element is instantiated in all UR products.

Table 3-216: Target resetting data objects

LNName: TgtRsIHMI1		LDevice inst: Gen		UR element: Target Resetting		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
RsOp		SPS			RESET OP operand value	R
	stVal	BOOLEAN	ST	RESET OP		R
RsOpRem		SPS			RESET OP (COMMS) operand value	R
	stVal	BOOLEAN	ST	RESET OP (COMMS)		R
RsOpLoc		SPS			RESET OP (OPERAND) operand value	R
	stVal	BOOLEAN	ST	RESET OP (OPERAND)		R
RsOpPB		SPS			RESET OP (PUSHBUTTON) operand value	R
	stVal	BOOLEAN	ST	RESET OP (PUSHBUTTON)		R
InRef1		ORG			RESET OPERAND setting.	R
	setSrcRef	ObjectReference	SP	Operate setting of RESET OPERAND	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.17 Time of day timer (TmDay)

This element is instantiated in the following products: C70.

Table 3-217: Time of day timer data objects

LNName: TmDayGAPC#		LDevice inst: Gen		UR element: TIME OF DAY TIMER #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
IsOn		SPS			TIME OF DAY # ON operand	R
	stVal	BOOLEAN	ST	TIME OF DAY # ON		R
Start		SPS			TIME OF DAY # START operand	R
	stVal	BOOLEAN	ST	TIME OF DAY # START		R
Stop		SPS			TIME OF DAY # STOP operand	R
	stVal	BOOLEAN	ST	TIME OF DAY # STOP		R
MonthΘ		SPS			Instantiated only in the first instance of TmDayGAPC#	R
	stVal	BOOLEAN	ST	MONTH Φ		R
MonthΘ		SPS			Instantiated only in the first instance of TmDayGAPC#	R
	stVal	BOOLEAN	ST	DAY Φ		R
SecondOfDay		INS			Instantiated only in the first instance of TmDayGAPC#	R
	stVal	INT32	ST	SecondOfDay Actual Value		R
	units.SIUnit	ENUMERATED			4, the code for time in seconds	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
DayofMonth		INS			Instantiated only in the first instance of TmDayGAPC#	R
	stVal	INT32	ST	DayOfMonth Actual Value		R
DayofYear		INS			Instantiated only in the first instance of TmDayGAPC#	R
	stVal	INT32	ST	DayOfYear Actual Value		R
Year		INS			Instantiated only in the first instance of TmDayGAPC#	R
	stVal	INT32	ST	Year Actual Value		R

3.5.6.18 User-definable displays (UsrDs)

This element is instantiated in all UR products with enhanced or standard front panel.

Table 3-218: User-definable displays data objects

LNName: UsrDsIHMI1		LDevice inst: Gen		UR element: User definable displays		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRef1		ORG			INVOKE AND SCROLL setting.	R
	setSrcRef	ObjectReference	SP	setting of INVOKE AND SCROLL	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.19 User-programmable pushbuttons (UsrPb)

This element is instantiated in all UR products.

Table 3-219: User-programmable pushbutton data objects

LNName: UsrPbIHMI#		LDevice inst: Gen		UR element: USER PUSHBUTTON # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
PBOn		SPS			PUSHBUTTON # ON operand.	R
	stVal	BOOLEAN	ST	PUSHBUTTON # ON		R
Deactivated		SPS			PUSHBUTTON # OFF operand.	R
	stVal	BOOLEAN	ST	PUSHBUTTON # OFF		R
AnyPBOn		SPS			Instantiated only in first Instance	R
	stVal	BOOLEAN	ST	ANY PB ON		R
InRef1		ORG			PUSHBTN # SET setting.	R
	setSrcRef	ObjectReference	SP	PUSHBTN # SET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2		ORG			PUSHBTN # RESET setting.	R
	setSrcRef	ObjectReference	SP	PUSHBTN # RESET setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef3		ORG			PUSHBTN # REMOTE setting.	R
	setSrcRef	ObjectReference	SP	PUSHBTN # REMOTE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef4		ORG			PUSHBTN # LOCAL setting.	R
	setSrcRef	ObjectReference	SP	PUSHBTN # LOCAL setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef5		ORG			PUSHBTN # LED CTL setting.	R
	setSrcRef	ObjectReference	SP	PUSHBTN # LED CTL setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.6.20 User-programmable LEDs (LEDs)

This element is instantiated in all UR products with enhanced or standard front panel.

Table 3-220: User-programmable LED data objects

LNName: LEDsIHMI1		LDevice inst: Gen		UR element: Front Panel LEDs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InService		SPS			LED IN SERVICE operand	R
	stVal	BOOLEAN	ST	LED IN SERVICE		R
Trouble		SPS			LED TROUBLE operand	R
	stVal	BOOLEAN	ST	LED TROUBLE		R

LNName: LEDsIHMI1		LDevice inst: Gen		UR element: Front Panel LEDs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
TestMod		SPS			LED TEST MODE operand	R
	stVal	BOOLEAN	ST	LED TEST MODE		R
TripInd		SPS			LED TRIP operand	R
	stVal	BOOLEAN	ST	LED TRIP		R
AlmInd		SPS			LED ALARM operand	R
	stVal	BOOLEAN	ST	LED ALARM		R
StrInd		SPS			LED PICKUP operand	R
	stVal	BOOLEAN	ST	LED PICKUP		R
VoltsInd		SPS			LED VOLTAGE operand	R
	stVal	BOOLEAN	ST	LED VOLTAGE		R
AmpInd		SPS			LED CURRENT operand	R
	stVal	BOOLEAN	ST	LED CURRENT		R
HzLedInd		SPS			LED FREQUENCY operand	R
	stVal	BOOLEAN	ST	LED FREQUENCY		R
OtherInd		SPS			LED OTHER operand	R
	stVal	BOOLEAN	ST	LED OTHER		R
PhsAInd		SPS			LED PHASE A operand	R
	stVal	BOOLEAN	ST	LED PHASE A		R
PhsBInd		SPS			LED PHASE B operand	R
	stVal	BOOLEAN	ST	LED PHASE B		R
PhsCInd		SPS			LED PHASE C operand	R
	stVal	BOOLEAN	ST	LED PHASE C		R
GndNeutInd		SPS			LED NEUTRAL/GROUND operand	R
	stVal	BOOLEAN	ST	LED NEUTRAL/GROUND		R
TestPrgInd		SPS			LED TEST IN PROGRESS operand	R
	stVal	BOOLEAN	ST	LED TEST IN PROGRESS		R
UsrPrgmLED$$		SPS			instantiated only if the order code includes optional standard/Enhanced front panel	R
	stVal	BOOLEAN	ST	LED USER $		R
EvtLED$		SPS			Instantiated only if the order code includes graphical front panel	R
	stVal	BOOLEAN	ST	“EVENT CAUSE LED $” operand		R
InRef1		ORG			LED TEST CONTROL setting.	R
	setSrcRef	ObjectReference	SP	LED TEST CONTROL setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRefψψ		ORG			instantiated only if the order code includes optional standard/Enhanced front panel	R
	setSrcRef	ObjectReference	SP	LED ψ OPERAND setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef51		ORG			TRIP LED INPUT setting.	R
	setSrcRef	ObjectReference	SP	TRIP LED INPUT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef52		ORG			ALARM LED INPUT setting.	R
	setSrcRef	ObjectReference	SP	ALARM LED INPUT setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef53		ORG			Instantiated only if the order code includes graphical front panel	R
	setSrcRef	ObjectReference	SP	LED 1 OPERAND setting	reference to the data attribute to input	R/C

LNName: LEDsIHMI1		LDevice inst: Gen		UR element: Front Panel LEDs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef54		ORG			Instantiated only if the order code includes graphical front panel	R
	setSrcRef	ObjectReference	SP	LED 2 OPERAND setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef55		ORG			Instantiated only if the order code includes graphical front panel	R
	setSrcRef	ObjectReference	SP	LED 3 OPERAND setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef56		ORG			Instantiated only if the order code includes graphical front panel	R
	setSrcRef	ObjectReference	SP	LED 4 OPERAND setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef57		ORG			Instantiated only if the order code includes graphical front panel	R
	setSrcRef	ObjectReference	SP	LED 5 OPERAND setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef58		ORG			Instantiated only if the order code includes graphical front panel	R
	setSrcRef	ObjectReference	SP	LED 6 OPERAND setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef59		ORG			Instantiated only if the order code includes graphical front panel	R
	setSrcRef	ObjectReference	SP	LED 7 OPERAND setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef60		ORG			Instantiated only if the order code includes graphical front panel	R
	setSrcRef	ObjectReference	SP	LED 8 OPERAND setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef61		ORG			Instantiated only if the order code includes graphical front panel	R
	setSrcRef	ObjectReference	SP	LED 9 OPERAND setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.7 Process Bus Module (PBus) logical device

The PBus logical device is available when the UR device includes a non-HardFiber Process Bus Module.

3.5.7.1 Sampled value subscription (RxSV)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L90, M60, N60, T35, T60.

Table 3-221: Sampled value subscription data objects

LNName: LSVS#		LDevice inst: PBus		UR element: RxSV#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
St		SPS			RxSV# On operand	R
	stVal	BOOLEAN	ST	RxSV# On		R
Alm		SPS			RxSV# Off operand	R
	stVal	BOOLEAN	ST	RxSV# Off		R
Lost		SPS			RxSV# Lost operand	R

LNName: LSVS#		LDevice inst: PBus		UR element: RxSV#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	RxSV# Lost		R
DlyAlm		SPS			RxSV# Delay Alarm operand	R
	stVal	BOOLEAN	ST	RxSV# Delay Alarm		R
QualChkF		SPS			RxSV# QualChk Fail operand	R
	stVal	BOOLEAN	ST	RxSV# QualChk Fail		R
SynChkF		SPS			RxSV# SynChk Fail operand	R
	stVal	BOOLEAN	ST	RxSV# SynChk Fail		R
SimSt		SPS			RxSV# SimBit On operand	R
	stVal	BOOLEAN	ST	RxSV# SimBit On		R
SvCBRef		ORG			Setting RxSV# SvCBRef	R
	setSrcRef	ObjectReference	SP	Mapped to RxSV# SvCBRef. If the value is empty string, URPC creates the dummy IED, LDevice and SampleValuecontrol element names and set to the value in exported SCL file:<Dummy LDName>/ LLN0.<Dummy SvCBName>	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R
MAC		VSG			Destination MAC address of messages subscribed to by RxSV#	R
	setVal	VISIBLE STRING255	SP	RxSV# Dst MAC if in E32.0 mode, otherwise empty string.		R/C
SvID		VSG			Setting RxSV# svID	R
	setVal	VISIBLE STRING255	SP	RxSV# MsvID if in E32.0 mode, otherwise empty string.		R/C
RxConfRev Num		INS			Status of the confRev field in last accepted RxSV# message	R
	stVal	INT32	ST	Status of the confRev field in last accepted RxSV# message		R
	units.SIUnit	ENUMERATED				R
	units.multiplier	ENUMERATED				R
ConfRevN um		INS			Expected ConfRev number	R
	stVal	INT32	ST	value of RxSV# ConfRev		R
	units.SIUnit	ENUMERATED				R
	units.multiplier	ENUMERATED				R
NoASDU		ENG			RxSV# ASDUs setting	R
	setVal	ENUMERATED	SP	RxSV# ASDIUs if in E3-2.0 mode, otherwise set to default 1		R/C
InRefδδ		ORG			RxSV# Member δδ	R
	setSrcRef	ObjectReference	SP	specifying bType and intermediate data object for RxSV# Analog channel δδ	reference to the data attribute to input	R/C
	intAddr	VISIBLE STRING255	SP			R/C

Table 3-222: AC bank data objects

LNName: ACBnkTBNK#		LDevice inst: PBus		UR element: AC Bank B#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
AnCh1βSv		SAV			Analog Channel 1β	R
	instMag.i	INT32				R
	units.SIUnit	ENUMERATED			1, the code for None	R

LNName: ACBnkTBNK#	LDevice inst: PBus			UR element: AC Bank B#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
AnCh2βSv		SAV			Analog Channel 2β	R
	instMag.i	INT32				R
	units.SIUnit	ENUMERATED			1, the code for None	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
CrsChkFail		SPS			ACBANK# CrsChk Fail operand	R
	stVal	BOOLEAN	ST	ACBANK# CrsChk Fail		R
InRef1Θ		ORG			AC Bank # Phase origin 1 Phs Θ Input	R
	setSrcRef	ObjectReference	SP	RxSV# CT1-Θ or RxSv# VT1- Θ, if AC Bank# Phase Origin 1 is RxSV#-CT1/PHS or RxSv#-VT1/ PHS respectively if any, otherwise empty string.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef14		ORG			AC Bank # Phase origin 1 Aux Input	R
	setSrcRef	ObjectReference	SP	RxSV# CT1-N or RxSV# VT1-N, if AC Bank# Aux Origin 1 is RxSV#-CT1/NTR or RxSV#-VT1/NTR respectively if any, otherwise empty string.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef2Θ		ORG			AC Bank # Phase origin 2 Phs Θ Input	R
	setSrcRef	ObjectReference	SP	RxSV# CT1-Θ or RxSV# VT1-Θ, if AC Bank# Phase Origin 2 is RxSV#-CT1/PHS or RxSV#-VT1/ PHS respectively if any, otherwise empty string.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
InRef24		ORG			AC Bank # Phase origin 2 Aux Input	R
	setSrcRef	ObjectReference	SP	RxSV# CT1-N or RxSV# VT1-N, if AC Bank# Aux Origin 2 is RxSV#-CT1/NTR or RxSV# VT1/NTR respectively if any, otherwise empty string.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.7.2 Real-time clock (PcClk)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L90, M60, N60, T35, T60.

Table 3-223: Real-time clock data objects

LNName: PcClkLTMS1	LDevice inst: PBus			UR element: PROCESS BUS MODULE REAL TIME CLOCK feature		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
PTPFail		SPS			PROCESS BUS PTP FAILURE operand	R
	stVal	BOOLEAN	ST	"PROCESS BUS PTP FAILURE"		R
ClkMis		SPS			Process bus module CLOCK MISMATCH operand	R
	stVal	BOOLEAN	ST	"CLOCK MISMATCH"		R
PBClkTrbl		SPS			Process bus module PB CLK UNSYNCHRONIZED operand	R
	stVal	BOOLEAN	ST	"PB CLK UNSYNCHRONIZED"		R
TmSynSrc		ENS			The Sync Source actual value indicates time synchronizing source the UR process bus module is using at present	R

LNName: PcClkLTMS1		LDevice inst: PBus		UR element: PROCESS BUS MODULE REAL TIME CLOCK feature		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	ENUMERATED	ST	Actual Value: Sync Source		R
GrdMaster ID		VSS			GrandMaster ID actual value	R
	stVal	VISIBLE STRING 255	ST	process bus module clock synchronizing GrandMaster ID		R
TmAcc		INS			Process bus module time ACCURACY in number of significant bits in the Fraction Of Second	R
	stVal	INT32	ST			R
TmSrc		VSS			RTC Sync Source	R
	stVal	VISIBLE STRING255	SP	Null		R

3.5.8 GE namespace

The GE namespace is an extension of the "IEC 61850-7-4:2007A" namespace, and as such includes by reference all data object names in IEC 61850-7-4 Edition 2.0 2010-03. As these names are defined in the standard, they are not described in this document. The GE namespace schema file "GEExtensionsV1_0.xsd" is located in the same folder as the UR EnerVista software installation, for example in C:\Program Files (x86)\GE Power Management\URPC\GESchema\

The name of the GE namespace specified in this document is "GE Multilin UR Namespace:2015A"

In the last column, the logical node number is not included. For example, LPHD refers to LPHD1.

Table 3-224: GE namespace

Data object name	CDC	Semantics	Used in logical nodes...
AaDmd	MV	Phase A demand. SRC 1 DMD IA, in primary amperes.	DmdMtrMMTR
AaMaxDmdDt	MV	Phase A Max Demand with Date (time stamp). The ClcMth cannot be used for MAX, as the time stamp definition of IEC 61850 is different from UR. SRC 1 DMD IA MAX, in primary amperes with associated date, SRC 1 DMD IA DATE.	DmdMtrMMTR
AaRMS	MV	Phase A current RMS. SRC 1 Phase A Current RMS, in primary amperes.	ACsrcMMXU
AbDmd	MV	Phase B demand. SRC 1 DMD IB, in primary amperes.	DmdMtrMMTR
AbMaxDmdDt	MV	Phase B Max Demand with Date (time stamp). The ClcMth cannot be used for MAX, as the time stamp definition of IEC 61850 is different from UR. SRC 1 DMD IB MAX, in primary amperes with associated date, SRC 1 DMD IB DATE.	DmdMtrMMTR
AbRMS	MV	Phase B current RMS. SRC 1 Phase B Current RMS, in primary amperes.	ACsrcMMXU
AcDmd	MV	Phase C demand. SRC 1 DMD IC, in primary amperes.	DmdMtrMMTR
AcMaxDmdDt	MV	Phase C Max Demand with Date (time stamp). The ClcMth cannot be used for MAX, as the time stamp definition of IEC 61850 is different from UR. SRC 1 DMD IC MAX, in primary amperes with associated date, SRC 1 DMD IC DATE.	DmdMtrMMTR
AcRMS	MV	Phase C current RMS. SRC 1 Phase C Current RMS, in primary amperes.	ACsrcMMXU
Activated	SPS	Activated. In this logical node, indicates position of a pushbutton. When "true", the pushbutton is asserted state; when "false", the pushbutton is in a released state. CONTROL PUSH BUTTON 1 ON operand. PUSHBUTTON 1 ON operand.	CtlPshIHMI, UsrPbIHMI

Data object name	CDC	Semantics	Used in logical nodes...
Adif	CMV	Differential current (sum of the three phase currents and the ground (fourth) current. Restricted ground differential if the fourth current measures the ground current in a grounded wye winding. Measures CT secondary circuit trouble if fourth current measures the CT secondary neutral current. SRC 1 Differential Ground Current phasor, in primary volts.	ACsrcMMXU
Agnd	CMV	Ground current (fourth input in a current AC bank). SRC 1 Ground Current phasor, in primary amperes.	ACsrcMMXN
AgndRMS	MV	Ground current RMS (fourth input in a current AC bank). SRC 1 Ground Current RMS, in primary amperes.	ACsrcMMXN
AlgCap	SPC	Command for the Hi-Z Oscillography Force Algorithm Capture	HiZPHIZ
AlmInd	SPS	An LED. The LED ALARM operand.	LEDsIHMI
AlmOvl	SPS	Indicates the motor overload condition has occurred	MotThmPTTR
AmpInd	SPS	An LED. The LED CURRENT operand.	LEDsIHMI
AnFailBeh	ENG	Setting to select the behavior of the RxGOOSE Analog when the sending device is offline: 0 = Default Value, 1 = Last Known	GGIO3
AnFailVal	ASG	The value of the RxGOOSE Analog when the sending device is offline and the FailBeh is set to "Default Value"	GGIO3
AnOutput1	MV	Analog output	Cmp8BtGAPC
AnyPBOn	SPS	Indicates ANY PB ON operand state. When any of the user pushbuttons is asserted, status is "true"; when none of the user pushbuttons are asserted, status is "false."	UsrPbIHMI
AnyErr	SPS	Any of the self-test errors generated. The ANY SELF TESTS operand.	LPHD
AnyGpsFail	SPS	The GPS signal failed or is not configured properly at any terminal. The 87L DIFF GPS FAIL operand, which becomes On when the GPS signal failed or is not configured properly at any terminal.	LinDfPDIF
AnyPoleOpn	SPS	At least one pole is open. The BREAKER 1 ANY P OPEN operand.	Bkr0XCBR
AnyShotCnt	SPS	The first breaker close signal has been issued. The AR SHOT CNT greater than zero operand.	Rec13pRREC
APPID	ING	Expected value of APPID field in messages subscribed to by RxGOOSE# The RxGOOSE1 ETYPE APPID setting.	LGOS
ArBlk1	SPS	Autoreclose Breaker number indicated by the data instance number is temporarily disabled. The AR BKR1 BLK operand and the AR1 BLK FROM MAN CLS operand.	Rec13pRREC, Rec3pRREC
ArcConfid1	INS	Represents the Arc Confidence in percentage for Phase A, B, C, or N	HiZPHIZ
ArcSuspect	ACT	Indicates suspected element has operated	HiZPHIZ
AresRMS	MV	Residual Current RMS. SRC 1 Neutral Current RMS, in primary amperes.	ACsrcMMXU
ArLO	SPS	Autoreclose is locked out. The AR LO operand.	Rec13pRREC, Rec3pRREC
Armed	SPS	Accidental energization. Occurs when the generator is offline with no fault involved. The ACCDNT ENRG ARMED operand.	AcdEnrPIOC
ArMod1	SPS	Autoreclosec mode equals to the number indicated by the data instance number, in this case 1 and 3 pole mode. The AR MODE = 1 operand.	Rec13pRREC
ArRip	SPS	Autoreclose is in progress. The AR RIP operand.	Rec13pRREC, Rec3pRREC
ASupn1	SPS	Indicates the state of current supervision. The PHS DIST Z1 SUPN AB/BC/CA operand in Phase-To-Phase.	PhsDisPDIS
Asymmetry	SPS	Communications channel asymmetry detected. The 87L DIFF CH ASYM DET operand, which becomes On when the differential element's has detected substantial communications channel asymmetry.	LinDfPDIF
AutoMod	SPS	Capacitor control in auto mode. The CAP 1 IN AUTO operand.	CapCtlGAPC
BadSt1	SPS	Bad-status detected. The BREAKER/SWITCH BAD STATUS operand.	BbBkrSCBR, BkrΘXCBR, Bkr0XCBR, Disc0XSWI, DiscΘXSWI, GGIO3
BatFail	SPS	The battery is not functioning. The BATTERY FAIL operand.	LPHD

Data object name	CDC	Semantics	Used in logical nodes...
BDifAClc	CMV	B90 differential current	B_DifPDIF
BiasMotLod	MV	Indicates thermal model biased motor load. THERMAL MODEL BIASED MOTOR LOAD in x FLA.	MotThmPTTR
BknRotClr	SPC	Command to Clear BROKEN ROTOR BAR DATA. TRUE= CLEAR BROKEN ROTOR BAR DATA	BknRotSVBR
BkrOp1	SPS	Breaker failure status information operands. The BKR FAIL 1 T1 OP operand.	BkrFaRBRF, B_BFaiRBRF
BkrOpnPl	ACT	Indicates open pole condition is detected in phase A, B, or C based on the breaker auxiliary contacts. The OPEN POLE BKR phase A/B/C OP operand.	OpnPlΘSCBR
BkrSt	ENS	BKR STATUS BAY actual value	BbBkrSCBR
Blk2ndH1	SPS	Indicates second harmonic blocking active (where the last digit of instance number 1, 2, or 3 refers to phase A, B, and C respectively). The XFMR PCNT DIFF 2ND A/B/C operand.	PctDifPDIF
Blk5thH1	SPS	Indicates fifth harmonic blocking active (where the last digit of instance number 1, 2, or 3 refers to phase A, B, and C respectively). The XFMR PCNT DIFF 5TH A/B/C operand.	PctDifPDIF
BlkH1	SPS	The second harmonic of the transformer magnetizing inrush current has inhibited the current differential element from operating. The 87L HARM2 A/B/C OP operand, which becomes asserted when phase A/B/C of second harmonic of the transformer magnetizing inrush current inhibits the current differential element from operating.	LinDfPDIF (L90)
BlkPhDis	SPS	Indicates blocking signal for neutral, ground, or negative sequence overcurrent elements. The OPEN POLE BLK Phase AB/BC/CA/N operand.	OpnPl0SCBR, OpnPlΘSCBR
BrckTrbl	SPS	HardFiber Brick trouble. The BRICK TROUBLE operand.	LPHD
BRstA	CMV	B90 restraint current	B_DifPDIF
BusV0	CMV	Zero Sequence Bus voltage in pu	NuVUnPTOV
BusVPh	WYE	Bus voltage in per unit for phase A, B, and C	VDifPDIF
BypsOff	SPS	Control interlocking is not manually bypassed. The BREAKER 1 BYPASS OFF operand.	Bkr0XCBR
BypsOn	SPS	Control interlocking is manually bypassed. The BREAKER 1 BYPASS ON operand.	Bkr0XCBR
ChA	CMV	B90's AC channel current	B_AmpMMXN
ChFail1	SPS	Communications channel failed. The 87L DIFF CH 1 FAIL operand, which becomes On when the differential element has detected communications channel 1 failed.	LinDfPDIF
ChV	CMV	B90's AC channel voltage	B_VolMMXN
ClkMis	SPS	This operand is set when process card and main CPU clocks are independently free running and the clocks are deviating more than 100 microseconds. Resets when the deviation is below 100 microseconds.	PcClkLTMS
ClkUnsynch	SPS	Relay is not synchronized to the international time standard. The CLOCK UNSYNCHRONIZED operand.	LPHD
ClrMem	SPC	Clear Hi-Z oscillography	HiZPHIZ
Cls2ndBkr	SPS	Close second Breaker signal. The AR CLOSE BKR2 operand.	Rec13pRREC
ClsSt1	SPS	Close status detected. The BREAKER/SWITCH CLOSED operand.	BbBkrSCBR, BkrΘXCBR, Bkr0XCBR, Disc0XSWI, DiscΘXSWI, GGIO3
CmpCt1I1	MV	Compensated I1 current magnitude for CT bank 1. CT1 COMP I1 Mag in amperes.	PhCmp1PDIF
CmpCt1I2	MV	Compensated I2 current magnitude for CT bank 1. CT2 COMP I1 Mag in amperes.	PhCmp1PDIF
CompAop	MV	Compensated operating current. Comp Iop in per unit.	NeAUnPTOC
CompAPh	WYE	Cm Iop in per unit for Phase A, B, and C	PhAUnPTOC
CompHz	MV	Indicates the frequency of the broken rotor bar spectral component. The COMPONENT FREQ. in Hz.	BknRotSVBR

Data object name	CDC	Semantics	Used in logical nodes...
CompLevel	MV	Indicates the level of the broken rotor bar spectral component relative to the spectral component of the system frequency. The COMPONENT LEVEL in dB.	BknRotSVBR
CrcFail1	SPS	The CRC error threshold has been exceeded. The 87L DIFF CH 1 CRCFAIL operand, which becomes On when the differential element has detected the CRC error threshold has been exceeded on channel 1.	LinDfPDIF
Ctrl	SPS	Asserted for one second upon any transition in any mode	LoVStrGAPC
CurUnb	MV	% UNBALANCE CURRENT	AmpUnbPTOC
DatSetRef	GEORG	Expected value of datSet field in messages subscribed to by RxGOOSE# . Edition 1. The setting RxGOOSE1 DatSet.	LGOS
Day1	SPS	Current day, where 1 = Sunday. The DAY operand.	TmDayGAPC
DayofMonth	INS	Represents the day of current month (range 1 to 31). The DayOfMonth Actual Value to represent in date of month in number form.	TmDayGAPC
DayofYear	INS	Represents the day of the year (range 1 to 366). The DayOfYear Actual Value to represent day of year in number form.	TmDayGAPC
DbMax1	ASG	Value of “max.” in deadband calculations	FTDRsGGIO1, GGIO4
DbMin1	ASG	Value of “min.” in deadband calculations	FTDRsGGIO1, GGIO4
Deactivated	SPS	Indicates PUSHBUTTON # OFF state. When user pushbutton is asserted, status is "false"; when user pushbutton is released, status is "true." The PUSHBUTTON 1 OFF operand.	UsrPbIHMI
DeaV1	SPS	This data object indicates that V1 is below the DeaVal1 setting. The SYNC 1 V1 BELOW MAX operand.	SynChkRSYN
DeltaOut	MV	PID Delta Output value	PIDRegFPID
DifA2ndH	WYE	Phase differential current	PctDifPDIF
DifA5thH	WYE	Phase differential current	PctDifPDIF
DifAngDis	MV	Synchroscope displayed value for the Phase angle difference between V1 and V2	SynChkRSYN
DifVPh	WYE	Differential voltage in per unit for phase A, B, and C	VDifPDIF
DirSupn	SPS	Directional overcurrent supervision status (not instantiated for zone 1 GndDisPDIS1). The GND DIST Z2 DIR SUPN operand.	GndDisPDIS
Disabled	SPS	Function is disabled	Rec13pRREC, Rec3pRREC
DisArmed	SPS	Indicates the high impedance fault detection element is in disarmed state	HiZPHIZ
DischargeTms	MV	Capacitor discharge time in seconds. Edition 2. CAP 1 DISCHARGE TIME in seconds.	CapCtlGAPC
Discharging	SPS	Capacitor bank is discharging. Edition 2. CAP 1 DISCHARGING operand.	CapCtlGAPC
DistDet	SPS	Sensitive current disturbance detector. For PwrSwgRPSB1, power swing element detected disturbance other than power swing. The 50DD SV operand, which becomes On when the 87L disturbance detector has operated. The POWER SWING 50DD operand.	LinDfPDIF, PwrSwgRPSB
DlyAlm	SPS	General single alarm for Sampled Value Subscription	LSVS

Data object name	CDC	Semantics	Used in logical nodes...
Dpo	SPS	The DPO (dropout) operand. Inverse of Str, Op, or Pkp.	AcdEnrPIOC, AgeSPTR, AmpUnbPTOC, AuxOvPTOV, AuxUvPTUV, B_IocPIOC, B_EfpPIOC, B_TocPTOC, B_UvPTUV, BbEfpPIOC, BusDifPDIF, CBArc0SCBR, Cmp8BtGAPC, CmpOvPTOV, CPhOvPTOV, DigElGAPC, FldAmpPTOC, FldAmpPTUC, FldGnd0PHIZ, FldGnd1PHIZ, FldGnd2PHIZ, FlshOvPIOC, FlxElGAPC, GndIocPIOC, GndTocPTOC, GnUnb$PTOC, GnUnbPTOC, Ha3NUvPTUV, HiZPHIZ, HPTmpSPTR, HzBnd$PTUF, LinPkpPIOC, LodEncPDIS, LosExtPDIS, LosExt1PDIS1, LosExt2PDIS, MAccTmPMSS, MecJamPMSS, MotThmPTTR, NeAUnPTOC, NegIocPIOC, NegOvPTOV, NegTocPTOC, NeuIocPIOC, NeuTocPTOC, NeuOvPTOV, NuVUnPTOV OvHzPTOF, PhAUnPTOC, PhCmp1PDIF, PhsIocPIOC, PhsOvPTOV, PhsTocPTOC, PhsUvPTUV, PRTDsSTMP, RgDifPDIF, RRTDsSTMP, RteHzPFRC, S2AcTmPMSS1, SenPDOP, Sen1PDOP, Sen2PDOP, SpltPhPDIF, Statr$PHIZ, StatrPHIZ, StrRtePMRI, SubHa$PHIZ, SubHaPHIZ, TmBtwnPMRI, UnHzPTUF, UnPwrPDUP, VDifPDIF, VpHzPVPH, VtffGAPC
DpoAlm	SPS	Inverse of alarm Pkp. RRTD RTD 1 ALARM DPO operand. RTD Ip 1 ALARM DPO operand. UNDERPWR 1 ALARM DPO operand.	PRTDsSTMP, RRTDsSTMP, UnPwrPDUP
DpoBia	SPS	B90 Drop-out of Biased indicates the dropping of pick-up condition for biased differential element	B_DifPDIF
DpoCls	SPS	Inverse of close pkp. The AVR CLOSE 1 DPO operand.	AvrGAPC
DpoOpn	SPS	Inverse of open pkp. The AVR OPEN 1 DPO operand.	AvrGAPC
DpoPhsϕ	SPS	Split phase	SpltPhPDIF
DpoPhs1	SPS	Inverse of per phase pickup (Pkp). Individual phase DPO (dropout) operand.	BbEfpPIOC, BusDifPDIF, PhsIocPIOC, B_TocPTOC, FlshOvPIOC, GndDisPDIS, PhsDisPDIS, PhsTocPTOC, SttDifPDIF
DpoPhs1	SPS	Inverse of Op	PhsIocPIOC, PhsOvPTOV, PhsUvPTUV
DrcDevOff	SPS	A direct device is configured but not connected. The DIRECT DEVICE OFF operand.	LPHD

Data object name	CDC	Semantics	Used in logical nodes...
DrcRingBrk	SPS	The Direct I/O settings is for a ring but the connection is not in a ring. The DIRECT RING BREAK operand.	LPHD
Dsching	SPS	Capacitor bank is discharging. Edition 1. CAP 1 DISCHARGING operand.	CapCtlGAPC
DschTms	MV	Capacitor discharge time in seconds. Edition 1. CAP 1 DISCHARGE TIME in seconds.	CapCtlGAPC
DwnCond	ACT	Indicates the high impedance fault downed conductor element has operated	HiZPHIZ
DynArmd	SPS	This data object indicates that dynamic mode is armed. The SYNC1 S-CLOSE ARMD operand, which becomes On when dynamic mode is armed.	SynChkRSYN
DynDpo	SPS	The SYNC1 S-CLOSE DPO operand, which becomes Off when all criteria for dynamic mode are fulfilled	SynChkRSYN
DynOp	SPS	This data object indicates that all criteria for dynamic mode are fulfilled if value is TRUE else false. The SYNC1 S-CLOSE OP operand, which becomes On when all criteria for dynamic mode are fulfilled.	SynChkRSYN
Ena1	SPS	Function is Enabled. The AR ENABLED operand.	Rec13pRREC, Rec3pRREC
EqLim	SPS	The number of pulses counted is equal to the set number. Counter 1(CNT1) EQL operand, which indicates the number of pulses counted is equal to the set number.	DigCntFCNT
EqpMismat	SPS	The configuration of modules does not match the stored order code. The EQUIPMENT MISMATCH operand.	LPHD
EvtEna1	ENG	Setting to enable generation of events in event record, 0 = Disabled, 1 = Enabled	GGIO3
EvtLED	SPS	An LED - Event Cause LED status. For graphical front panel. The EVENT CAUSE LED 1 operand.	LEDsIHMI
EvtRcdClr	SPC	Clear Event Records (erase all Events). The CLEAR EVENT RECORDS command.	Master/LLN0
Fail	SPS	Ground Protection Module Failure. GPM-F (Field Ground Protection Module) Fail status. The GPM-F FAILURE operand.	FldGnd0PHIZ
FDLOp	SPS	Overcurrent fault detector low has operated. The 87PC FDL OP operand.	PhCmp1PDIF
FlexErrTkn	SPS	A FlexLogic equation is incorrect. The FLEXLOGIC ERR TOKEN operand.	LPHD
Flt3Ph	SPS	Fault indication - Three phase fault. The PHASE SELECT 3P operand.	PhSelGAPC
FltAB	SPS	Fault indication - Phase A to B. The PHASE SELECT AB operand.	PhSelGAPC
FltABG	SPS	Fault indication - Phase A to B to ground. The PHASE SELECT ABG operand.	PhSelGAPC
FltAG	SPS	Fault indication - Phase A to ground. The PHASE SELECT AG operand.	PhSelGAPC
FltBC	SPS	Fault indication - Phase B to C. The PHASE SELECT BC operand.	PhSelGAPC
FltBCG	SPS	Fault indication - Phase B to C to ground. The PHASE SELECT BCG operand.	PhSelGAPC
FltBG	SPS	Fault indication - Phase B to ground. The PHASE SELECT BG operand.	PhSelGAPC
FltCA	SPS	Fault indication - Phase C to A. The PHASE SELECT CA operand.	PhSelGAPC
FltCAG	SPS	Fault indication - Phase C to A to ground. The PHASE SELECT CAG operand.	PhSelGAPC
FltCG	SPS	Fault indication - Phase C to ground. The PHASE SELECT CG operand.	PhSelGAPC
FltCntClr	SPC	TRUE = clear incipient fault count. The clear incipient fault counters command.	ICFltPTEF

Data object name	CDC	Semantics	Used in logical nodes...
FltCntPhϕ	INS	Number of detected incipient faults. INCIPIENT FAULT 1 PH A/B/C FAULTS.	ICFltPTEF
FltLocation	MV	Fault location in percentage. The FAULT LOCATION in percentage of field winding from negative terminal in case of single point injection. If double point injection, displays Invalid value.	FldGnd0PHIZ
FltLoopReact	MV	D30, D60, L60, L90 - The fault loop reactance - Edition 2	FltRFLO
FltLoopRis	MV	D30, D60, L60, L90 - The fault loop resistance - Edition 2	FltRFLO
FltLpReact	MV	D30, D60, L60, L90 - The fault loop reactance - Edition 1	FltRFLO
FltLpRis	MV	D30, D60, L60, L90 - The fault loop resistance - Edition 1	FltRFLO
FltMulti	SPS	Fault indication - Multi phase fault. The PHASE SELECT MULTI-P operand.	PhSelGAPC
FltRis	MV	L90 - The fault resistance at the fault point	FltRFLO
FltSegment	ENS	Edition 2. L90 - Indicates in which segment of the line the fault occurred: 0 = N/A, 1 = LOCAL, 2 = REMOTE 1, 3 = REMOTE 2	FltRFLO
FltSegment	INS	Edition 1. L90 - Indicates in which segment of the line the fault occurred: 0 = N/A, 1 = LOCAL, 2 = REMOTE 1, 3 = REMOTE 2	FltRFLO
FltSLG	SPS	Fault indication - single line to ground. The PHASE SELECT SLG operand.	PhSelGAPC
FltVoid	SPS	Fault indication - Fault type not detected. The PHASE SELECT VOID operand.	PhSelGAPC
FrcTrigger	SPC	Command for the Hi-Z Oscillography Force Trigger	HiZPHIZ
FrstEthFail	SPS	First Ethernet failure. The FIRST ETHERNET FAIL operand.	LPHD
Function1	ENG	Function Enable/Disable setting: 0 = Disabled, 1 = Enabled (note that TISSUE 670 suggests something like this named SetMod)	Master/LLN0
FwdOp	SPS	Fault direction is forward. The NEG SEQ DIR OC1 FWD operand. The NTRL DIR OC1 FWD operand.	NegDocRDIR, NeuDocRDIR
GoDatSetRef	ORG	Expected value of datSet field in messages subscribed to by RxGOOSE# . Edition 2. The setting RxGOOSE1 DatSet.	LGOS
GoEnaPort1	ENG	Enable all GOOSE on Ethernet port setting: 0 = Disabled, 1 = Enabled	Master/LLN0
GoID	VSG	Expected value of goID field in messages subscribed to by RxGOOSE# . Edition 2. The setting RxGOOSE1 ID.	LGOS
GoID	GEVSG	Expected value of goID field in messages subscribed to by RxGOOSE# . Edition 1. The setting RxGOOSE1 ID.	LGOS
GndAmp	MV	Ground current. The FIELD GROUND CURRENT in amperes.	FldGnd0PHIZ
GndNeutInd	SPS	An LED. The LED NEUTRAL/GROUND operand.	LEDsIHMI
GndRis	MV	Ground resistance. FIELD GROUND RESIST in ohms. STATOR GND. RESIST in kilo ohms.	FldGnd0PHIZ, SubHaPHIZ
GpsFail1	SPS	GPS failed at terminal corresponding to instance number. The 87L DIFF GPS 1 FAIL operand.	LinDfPDIF
GrAct1	SPS	Setting group corresponding to index is active (not instantiated in C30). The SETTING GROUP ACT 1 operand.	Master/LLN0
GrdMasterID	VSS	Grand master ID actual value	TmClkLTMS, PcClkLTMS
Ha3NV	MV	Third harmonic component of neutral voltage. STATOR GND 3RD HARM VN in volts.	StatrPHIZ
Ha3NVZroV	MV	Sum of third harmonic neutral voltage and zero sequence voltage	StatrPHIZ
Ha3ZroV	MV	Third harmonic component of zero sequence voltage. STATOR GND 3RD HARM V0 in volts.	StatrPHIZ
HiLimit	SPS	The number of pulses counted is above the set number	DigCntFCNT
HiZIOC	ACT	Indicates phase instantaneous overcurrent has operated	HiZPHIZ

Data object name	CDC	Semantics	Used in logical nodes...
HiZSt	ENS	Represents the status of Hi-Z fault detection function. Edition 2.	HiZPHIZ
HiZSt	INS	Represents the status of Hi-Z fault detection function. Edition 1.	HiZPHIZ
HzChgRte	MV	Frequency rate of change measured value. FREQUENCY RATE OF CHANGE 1 in Hz/s.	RteHzPFRC
HzLedInd	SPS	An LED. The LED FREQUENCY operand.	LEDsIHMI
HzObAccum	MV	FREQUENCY OOB BAND 1 ACCUMULATION in percentage (%)	HzBnd$PTUF
IdFail1	SPS	ID check for a peer L30/L90 on the channel has failed. 87L DIFF CH 1 ID FAIL operand, which becomes On when the differential element's ID check for a peer L30 on channel 1 has failed.	LinDfPDIF
IndFailBeh	ENG	Setting to select the behavior of the RxGOOSE Boolean when the sending device is offline: 0 = On, 1 = Off, 2 = Latest/On, 3 = Latest/Off	GGIO3
IndPos1	DPS	Generic remote DPS input status values: 0 for intermediate-state, 1 for off, 2 for on, 3 for bad-state. RxGOOSE DPS1 actual value.	GGIO3
InjAmp	MV	Injected current. SH INJECTION AMPS in amperes.	SubHaPHIZ
InjVol	MV	Injected voltage. INJECTED VOLTAGE in volts. SH INJECTION VOLTS in volts.	FldGnd0PHIZ, SubHaPHIZ
InService	SPS	LED indication - Relay In-service. The LED IN SERVICE operand.	LEDsIHMI
IntermSt1	SPS	Intermediate-status detected. The BREAKER/SWITCH INTERM operand.	BkrΘXCBR, DiscΘXSWI, GGIO3
IntrAlm	SPS	Indicates that the current exceeded the maximum interrupting current rating during the last interruption event. The BKR ARC 1 MAX OP operand.	CBArc0SCBR
IntrAlmDpo	SPS	Inverse of IntrAlm. The BKR ARC 1 MAX DPO operand.	CBArc0SCBR
IrigbFail	SPS	A bad IRIG-B input signal has been detected. The IRIG-B FAILURE operand.	LPHD
IsoBlk	ACT	Indicates that the isolator position is invalid	B_IsoSSWI, BbIsoSSWI
IsOn	SPS	Indicates the time of day timer is on. The TIME OF DAY 1 ON operand.	TmDayGAPC
IsoPos	ACT	Position of isolator, meaning On (current included in differential zone) or Off (current excluded from differential calculations)	B_IsoSSWI, BbIsoSSWI
LastClrTm	INS	Represents the UTC time of user fault reports last cleared time in seconds elapsed since 1970/01/01, 00.00.00. The LAST CLEARED DATE actual value.	UFlt0RFLO
LastRptTm	INS	Represents the UTC time of last user fault report generated time in seconds elapsed since 1970/01/01, 00.00.00. The LAST REPORT DATE actual value.	UFlt0RFLO
LastSqNum	INS	Last sequence number received. Actual value RxGOOSE1 SqNum.	LGOS
LatchErr	SPS	A difference is detected between the wanted and actual latch contact state. The LATCHING OUT ERROR operand.	LPHD
LeoSt	SPS	Line end open status. The LINE PICKUP LEO PKP operand.	LinPkpPIOC
LivDea	SPS	This data object indicates that live/dead conditions have been met. The SYNC 1 DEAD S OP operand, which indicates that live/dead conditions have been met.	SynChkRSYN
LivDeaDpo	SPS	This data object indicates that live/dead conditions have not been met. The SYNC 1 DEAD S DPO operand, which indicates that live/dead conditions have not been met.	SynChkRSYN

Data object name	CDC	Semantics	Used in logical nodes...
LivLiv	SPS	This data object indicates that both sources are live, and that angle, frequency, and voltage difference and range conditions have been met. The SYNC 1 SYNC OP operand, which indicates that both sources are live, and that angle, frequency, and voltage difference and range conditions have been met.	SynChkRSYN
LivLivDpo	SPS	This data object indicates that one or both sources are not live, or that angle, frequency, and voltage difference and range conditions have been met. The SYNC 1 SYNC DPO operand, which indicates that one or both sources are not live, or that angle, frequency, and voltage difference and range conditions have been met.	SynChkRSYN
LivV1	SPS	This data object indicates that V1 is above the LivVal1 setting. The SYNC 1 V1 ABOVE MIN operand, which indicates that V1 is above the LivVal1 setting.	SynChkRSYN
LoadDev	MV	Indicates the motor load standard deviation at the time of the broken rotor bar data acquisition stage. LOAD DEV. AT BRB CALC. in x FLA.	BknRotSVBR
LocCmdAcsOff	SPS	Indicates operations of FlexLogic operand ACCESS LOC CMND OFF	SecGSAL
LocCmdAcsOn	SPS	Indicates operations of FlexLogic operand ACCESS LOC CMND ON	SecGSAL
LocMod	SPS	Capacitor control in local mode. The CAP 1 IN LOCAL operand.	CapCtlGAPC
LocSetAcsOff	SPS	Indicates operations of FlexLogic operand ACCESS LOC SETG OFF	SecGSAL
LocSetAcsOn	SPS	Indicates operations of FlexLogic operand ACCESS LOC SETG ON	SecGSAL
LoLimit	SPS	The number of pulses counted is below the set number	DigCntFCNT
LosLife	MV	XFMR LIFE LOST actual values	LosLifSPTR
LosLifeRte	MV	DAILY RATE LOL actual values	LosLifSPTR
LosPkt1	SPS	The lost packet threshold has been exceeded. The 87L DIFF CH 1 LOSTPKT operand, which becomes On when the differential element has detected the lost packet threshold has been exceeded on channel 1.	LinDfPDIF
LossLd	ACT	The high impedance fault phase A, B, C loss of load element has operated	HiZPHIZ
Lost	SPS	RxSV# stream is lost for Sampled Value Subscription	LSVS
Lower	SPS	PID Lower operand. The PID 1 LOWER operand value.	PIDRegFPID
MAC	VSG	Expected value of Destination MAC address field in messages subscribed to by RxGOOSE#	LGOS, LSVS
MajorErr	SPS	Any of the major self-test errors generated (major error). The ANY MAJOR ERROR operand.	LPHD
ManMod	SPS	Capacitor control in manual mode. The CAP 1 IN MAN operand.	CapCtlGAPC
MaxAsymOp1	SPS	Asymmetry on the channel exceeded pre-set value. The 87L DIFF CH 1 MAX ASYM operand, which becomes On when the Asymmetry on channel 1 exceeded preset value.	LinDfPDIF
MaxCompHz	MV	The frequency of the learned maximum broken rotor bar spectral component. MAXIMUM COMPONENT FREQ. in Hz.	BknRotSVBR
MaxCompLevel	MV	Indicates the learned maximum level of the broken rotor bar spectral component since the last data clear. MAXIMUM COMPONENT LEVEL in dB.	BknRotSVBR
MaxIntrA	MV	Indicates Breaker Arcing Current per phase. BKR 1 AMP MAX phase A/B/C.	CBArcΘSCBR
MaxLoadDev	MV	Indicates the motor load standard deviation at the time when data for the maximum broken rotor bar was acquired. LOAD DEV. AT BRB MAX in x FLA.	BknRotSVBR
MaxMotLoad	MV	Indicates the average motor load at the time when data for the maximum broken rotor bar was acquired. MOTOR LOAD AT BRB MAX in x FLA.	BknRotSVBR
MaxVal1	ASG	Maximum value in deadband calculations	TDCInGGIO1, TDCOutGGIO1
MinorErr	SPS	Any of the minor self-test errors generated (minor error). The ANY MINOR ERROR operand.	LPHD

Data object name	CDC	Semantics	Used in logical nodes...
MinVal1	ASG	Minimum value in deadband calculations	TDCInGGIO1, TDCOutGGIO1
MltLev	SPG	Select mode of authority for local control true means control from level below a level where Loc is true are allowed where Loc at the lower level is false	Master/LLN0
MMSConnects	MV	Number of MMS client connections active	LPHD
MnlCls	SPS	Manual close initiated. The BREAKER 1 MNL CLS operand.	Bkr0XCBR
MnlOpn	SPS	Manual open initiated. The BREAKER 1 MNL OPEN operand.	Bkr0XCBR
Month1	SPS	Current month, where 1 = January. The MONTH operand.	TmDayGAPC
MotLoad	MV	The average motor load at the time of the broken rotor bar data acquisition stage. MOTOR LOAD AT BRB CALC. in x FLA	BknRotSVBR
MotStatus	ENS	Indicated the status of the motor (in Actual Values) where 0 = Offline, 1= Starting, 2 = Running and 3 = Overload. Thermal Model MOTOR STATUS.	MotThmPTTR
MotUnb	MV	% thermal model motor unbalance. THERMAL MODEL MOTOR UNBALANCE in percentage (%).	MotThmPTTR
NegTotVArh	MV	SRC 1 Total VAr-hour in negative direction	EnrMtrMMTR
NegTotWh	MV	SRC 1 Total Watt-hour in negative direction	EnrMtrMMTR
NeutOpn	SPS	Indicates source has lost voltage signal. The SRC1 VT NEU WIRE OPEN operand.	VtffGAPC
NeutSupn	SPS	Neutral overcurrent supervision status. The GND DIST Z1 SUPN IN operand.	GndDisPDIS
NeutVx	CMV	Neutral point voltage in pu	NuVUnPTOV
NoASDU	ENG	RxSV# ASDUs setting: 1 = 1; 2 = 2. For Sampled Value Subscription.	LSVS
NumCycPer	INS	Number of cycles of the nominal frequency. The CYCLES PER RECORD actual value.	OscRDRE
Off	SPS	Logic 0 fixed operand	Master/LLN0
Offline	SPS	Indicate the motor is offline. The MOTOR OFFLINE operand.	MotThmPTTR
On	SPS	Logic 1 fixed operand	Master/LLN0
OnePoleOpn	SPS	One pole is open, others closed. The BREAKER 1 ONE P OPEN operand.	Bkr0XCBR
OnePU	ASG	The per-unit base factor applied to the corresponding RxGOOSE analog input FlexAnalog quantity to normalize it to a per-unit quantity.	GGIO3
OnMod	SPS	Relay in On Mode	Master / LNN0
OpAlm	ACT	Operate indicates the alarm decision of a protection function. The U/CURR ALARM OP operand. The UNDERPWR 1 ALARM OP operand.	UnCurPTUC, UnPwrPDUP
OpBia	ACT	B90 Operate indicates the trip decision of a biased protection logic	B_DifPDIF
OpHiSet	ACT	B90 Operate indicates the trip decision of the HISET element of breaker failure current supervision function.	B_BFaiPIOC
OpLoSet	ACT	B90 Operate indicates the trip decision of the LOSET element of breaker failure current supervision function.	B_BFaiPIOC
OpnCirc	SPS	Open circuit detected. The RRTD RTD 1 OPEN operand. The RTD Ip 1 OPEN operand.	PRTDsSTMP, RRTDsSTMP
OpnSt1	SPS	Open status detected. The BREAKER/SWITCH OPEN operand. The RxGOOSE DPS1 Off operand.	BbBkrSCBR, BkrΘXCBR, Bkr0XCBR, Disc0XSWI, DiscΘXSWI, GGIO3
OpPhs1	SPS	Indicates a trip decision for a particular cause per phase. The BUS 1 BIASED OP A/B/C operand. The BUS 1 UNBIASED OP A/B/C operand. The PHS DIST Z1 OP AB/BC/CA operand.	BusDifPDIF, PhsDisPDIS

Data object name	CDC	Semantics	Used in logical nodes...
OpSig	MV	Operating signal, the analogue value used by the comparator. FLEXELEMENT 1 OpSig, in per unit.	FlxElGAPC
OpUnBia	ACT	B90 Operate indicates the trip decision of an unbiased protection logic	B_DifPDIF
OpV	WYE	Phase Operating Voltages. Bank Operating Voltage in per unit for Phase A, B, and C.	CPhOvPTOV
OscilGOOSE	SPS	One or more of GGIO1.Ind###.stVal has been frozen due to frequent status changes (chatter) in the mapped operand. The Oscillatory GOOSE operand.	LPHD
OtherInd	SPS	An LED. The LED OTHER operand.	LEDsIHMI
OvlTripTm	MV	Indicates estimation of trip time on overload. The ESTIMATED TRIP TIME ON OVERLOAD in seconds.	MotThmPTTR
OutOfSrv	SPS	Out-of-service. The BREAKER 1 OOS operand.	Bkr0XCBR
P1Rip	SPS	Autoreclose A single pole is in progress. The AR 1-P RIP operand.	Rec13pRREC
P3Rip1	SPS	Autoreclose 3-pole is in progress via dead time number indicated by the data instance number. The AR 3-P/1 RIP operand.	Rec13pRREC
P3Tr	SPS	Force any trip to 3-phase trip. The AR FORCE 3-P TRIP operand.	Rec13pRREC
PBEth$Fail	SPS	Process Bus Module Ethernet port failure indication. When order code includes UR Process Bus Module.	LPHD
PFLLfail	SPS	Phase and/or frequency lock loop (PFLL) has failed. The 87L DIFF PFLL FAIL operand, which becomes On when the differential element's phase and frequency lock loop (PFLL) has failed.	LinDfPDIF
PhDir1	SPS	Indicates Phase Comparison of differential is satisfied per phase, where the last digit of instance number 1, 2, or 3 refers to phase A, B, and C respectively. The BUS 1 DIR A/B/C operand. The STATOR DIFF1 DIR A/B/C operand.	B_DifPDIF, BusDifPDIF, SttDifPDIF
PhsAInd	SPS	An LED. The LED PHASE A operand.	LEDsIHMI
PhsBInd	SPS	An LED. The LED PHASE B operand.	LEDsIHMI
PhsCInd	SPS	An LED. The LED PHASE C operand.	LEDsIHMI
PlOpn	ACT	Open pole detector is operated. The OPEN POLE OP operand.	OpnPl0SCBR, OpnPlΘSCBR
PosTotVArh	MV	SRC 1 Total VAr-hour in positive direction	EnrMtrMMTR
PosTotWh	MV	SRC 1 Total Watt-hour in positive direction	EnrMtrMMTR
ProcBusFail	SPS	Process bus system status. The PROCESS BUS FAILURE operand.	LPHD
ProcBusTrbl	SPS	HardFiber process bus trouble. The PROCESS BUS TROUBLE operand.	LPHD
ProjDif	MV	Phase angle difference between V1 and projected V2 (V2'). Edition 1. SYNCHROCHECK 1 DELTA PHASE', in degrees which is the phase angle difference between V1 and projected V2.	SynChkRSYN
ProjDifDis	MV	Synchroscope displayed value for the Phase angle difference between V1 and projected V2 (V2')	SynChkRSYN
ProjectedDif	MV	Phase angle difference between V1 and projected V2 (V2'). Edition 2. SYNCHROCHECK 1 DELTA PHASE', in degrees which is the phase angle difference between V1 and projected V2.	SynChkRSYN
ProjectedV2	CMV	Projected V2 Voltage phasor. Edition 2. SYNCHROCHECK 1 V2' voltage phasor, in primary volts.	SynChkRSYN
ProjV2	CMV	Projected V2 Voltage phasor. Edition 1. SYNCHROCHECK 1 V2' voltage phasor, in primary volts.	SynChkRSYN

Data object name	CDC	Semantics	Used in logical nodes...
PTPChSt$	SPS	$ = 1, 2, 3 represent Port 1, Port 2, and Port 3. Indicates if PTP Time Port (channel) state is down (Disabled OR No Signal) OR up (Calibrating; OR Synch'd (No PDelay); OR Synchronized. $ = 1 to 8 represent Port 1 to 8. Indicates if PTP Time Port (channel) state is down (Disabled OR No Signal) OR up (Calibrating; OR Synch'd (No PDelay); OR Synchronized; OR Qualifying; OR Master.	TmClkLTMS PcClkLTMS
PtpFail	SPS	Bad PTP Signal. The PTP FAILURE operand. No grandmaster clocks available on any of the Process Bus Module ports.	LPHD, PcClkLTMS
QualChkF	SPS	General single alarm for Sampled Value Subscription	LSVS
RackdIn	SPS	Breaker is connected to power system	BbBkrSCBR
RackdOut	SPS	Breaker is not connected to power system	BbBkrSCBR
Raise	SPS	PID 1 RAISE operand value	PIDRegFPID
RawAnsp	MV	Raw neutral split phase current. Raw INsp in per unit.	NeAUnPTOC
RawAPh	WYE	Raw Id in per unit for Phase A, B, and C	PhAUnPTOC
RecBlk	SPS	Manually block autoreclose. The BREAKER 1 BLK RCLS operand.	Bkr0XCBR
RecEna	SPS	Manually enable autoreclose. The BREAKER 1 ENA RCLS operand.	Bkr0XCBR
RefLst	SPS	This operand is set when the process card is free-running, that is, when both PTP grandmaster on process card and 1 PPS from main CPU are not available. Resets when any of the reference is available.	PcClkLTMS
RefWinding	INS	Reference winding. Number of windings used as the reference winding for ratio compensation.	PctDifPDIF
RelDpo	SPS	This data object indicates that not all criteria are fulfilled, and the switching/ operation action is not released to proceed. Complement of Rel. The SYNC 1 CLS DPO operand, which becomes Off when all synchrocheck criteria are fulfilled.	SynChkRSYN
RemCmdAcsOff	SPS	Indicates operations of FlexLogic operand ACCESS REM CMND OFF	SecGSAL
RemCmdAcsOn	SPS	Indicates operations of FlexLogic operand ACCESS REM CMND ON	SecGSAL
RemMod	SPS	Capacitor control in remote mode. The CAP 1 IN REMOTE operand.	CapCtlGAPC
RemSetAcsOff	SPS	Indicates operations of FlexLogic operand ACCESS REM SETG OFF	SecGSAL
RemSetAcsOn	SPS	Indicates operations of FlexLogic operand ACCESS REM SETG ON	SecGSAL
RemUnA	SPS	Indicates remote open pole condition is detected in phase A, B, or C. The OPEN POLE REM OP phase A/B/C operand.	OpnPlΘSCBR
ReSigma	SPC	Command for the Hi-Z Sigma Value Reset	HiZPHIZ
Restart	SPS	Indicates the motor has restarted. The MOTOR RESTART operand.	MotThmPTTR
RgDstIP	VSG	Expected value of Destination IP address field in messages subscribed to by RxGOOSE#. The multicast IP address of subscribed R-GOOSE message.	LGOS
RgRxMode	ENG	R-RxGOOSE1 Reception Mode setting: 0 = Unicast, 1 = SSM; 2=ASM.	LGOS
RgSrcIP	VSG	Expected value of Source IP address field in messages subscribed to by RxGOOSE#. The source IP address of subscribed R-GOOSE message.	LGOS
RlyUTCTms	INS	Represents the relay UTC time in seconds elapsed since 00:00:00 January 1, 1970. Mapped to Modbus register 41A0h value, that is, "Relay time clock set time" register value after converting to UTC (if time zone and DST is used).	LPHD
RrtdComFail	SPS	RRTD communication failure. The RRTD COMM FAIL operand.	LPHD
Rs	SPS	Autoreclose has been reset either manually or by the rest timer. The AR RESET operand.	Rec13pRREC
RsOp	SPS	Target resetting - General indication (binary input). The RESET OP operand value.	TgtRsIHMI

Data object name	CDC	Semantics	Used in logical nodes...
RsOpLoc	SPS	Target resetting - General indication (binary input). The RESET OP (OPERAND) operand value.	TgtRsIHMI
RsOpPB	SPS	Target resetting - General indication (binary input). The RESET OP (PUSHBUTTON) operand value.	TgtRsIHMI
RsOpRem	SPS	Target resetting - General indication (binary input). The RESET OP (COMMS) operand value.	TgtRsIHMI
RsTms	INS	The UTC time of the last clear in seconds elapsed since 00:00:00 January 1, 1970. The LAST CLEARED DATE actual value.	OscRDRE
RtdTrbl	SPS	RTD trouble. The RTD TROUBLE operand.	LPHD
Running	SPS	Indicate the motor is running. The MOTOR RUNNING operand.	MotThmPTTR
RvOp	SPS	Fault direction is reverse. The NEG SEQ DIR OC1 REV operand. The NTRL DIR OC1 REV operand.	NegDocRDIR, NeuDocRDIR
RX1	SPS	Pulse received on channel 1 or 2. The 87PC RX1 operand.	PhCmp1PDIF
RxGooseOff	SPS	One or more RxGOOSE is not responding. The RxGOOSE OFF operand.	LPHD
RxMode	ENG	RxGOOSE# Mode setting	LGOS
Sat1	SPS	Indicates CT saturation is detected. The BUS 1 SAT A/B/C operand.	B_DifPDIF, BusDifPDIF
Sat1	SPS	Indicates phase saturation of differential is detected per phase The STATOR DIFF1 SAT A/B/C operand.	SttDifPDIF
SbstCls	SPS	Manually substituted to close. The BREAKER 1 SUBD CLSD operand.	Bkr0XCBR
SbstOpn	SPS	Manually substituted to open. The BREAKER 1 SUBD OPEN operand.	Bkr0XCBR
SecDataClr	SPC	Command CLEAR SECURITY DATA, TRUE = CLEAR SECURITY DATA	SecGSAL
SecEna	ENG	RxRGOOSE1 Security Ena setting: 0=None; 1=Signature; 2=Signature and Encryption. Otherwise ignored.	LGOS
SecEthFail	SPS	Second Ethernet failure. The SECOND ETHERNET FAIL operand.	LPHD
SecndOfDay	INS	Represents integer number of seconds past midnight (Range1-86400). Edition 1. The SecondOfDay actual value in seconds.	TmDayGAPC
SecondOfDay	INS	Represents integer number of seconds past midnight (Range1-86400). Edition 2. The SecondOfDay actual value in seconds.	TmDayGAPC
SeqTO	SPS	The incomplete sequence timer timed out. The AR INCOMPLETE SEQ operand.	Rec13pRREC
SHAmpAng	MV	Sub harmonic current angle. SH CURRENT ANGLE in degrees.	SubHaPHIZ
ShotCnt1	SPS	Autoreclosec shot count is equal to the number indicated by the data instance number. The AR SHOT CNT=1 operand.	Rec13pRREC, Rec3pRREC
ShrtCirc	SPS	Short circuit detected. The RRTD RTD 1 SHORTED operand. The RTD Ip 1 SHORTED operand.	PRTDsSTMP, RRTDsSTMP
Sim	SPC	Simulated GOOSE values or simulated sampled measurand values are used instead of original values since they are first received	LPHD
SntpFail	SPS	SNTP server is not responding. The SNTP FAILURE operand.	LPHD
SPDTR	SPS	Motor switches from speed 2 to speed 1. MOTOR SPD2 TR 2-1 OP operand.	S2AcTmPMSS
Spt	MV	Set point value. The PID 1 Setpoint value.	PIDRegFPID

Data object name	CDC	Semantics	Used in logical nodes...
Start	SPS	One-second pulse at set time of day timer # start time. The TIME OF DAY 1 START operand.	TmDayGAPC
Starting	SPS	Indicate the motor is starting. The MOTOR STARTING operand.	MotThmPTTR
Stop	SPS	One-second pulse at set time of day timer 1 stop time. The TIME OF DAY 1 STOP operand.	TmDayGAPC
StrAccTm1	MV	Indicates motor start acceleration time. START 1 ACCELERATION TIME in seconds.	MAccTmPMSS
StrAlm	ACD	Indicates the detection of a fault or an unacceptable condition. The RRTD RTD 1 ALARM PKP operand. The RTD Ip 1 ALARM PKP operand. The U/CURR ALARM PKP operand. The UNDERPWR 1 ALARM PKP operand.	PRTDsSTMP, RRTDsSTMP, UnCurPTUC, UnPwrPDUP
StrBia	ACD	B90 Start Biased indicates the detection of a fault or an unacceptable condition by Biased Differential element	B_DifPDIF
StrCls	SPS	Close start indicates the pickup of close command, and its operation is pending. The AVR 1 CLOSE PKP operands.	AvrGAPC
StrEffA1	MV	Indicates motor start effective current. START 1 EFFECTIVE CURRENT in x FLA.	MAccTmPMSS
StrHrLOTm	MV	Start/Hour Lockout Time in minutes	StrRtePMRI
StrInd	SPS	An LED. The LED PICKUP operand.	LEDsIHMI
StrOpn	SPS	Open start indicates the pickup of open command, and its operation is pending. AVR 1 OPEN PKP operands.	AvrGAPC
StrOutgoing	SPS	This Data Object indicates an unstable Power swing detection for outgoing Locus. The POWER SWING OUTGOING operand.	PwrSwgRPSB
StrPeak1	MV	Indicates motor start peak current. START 1 PEAK CURRENT in x FLA.	MAccTmPMSS
StrPhs1	SPS	Indicates the detection of a fault or an unacceptable condition on a particular phase-to-phase loop. The PHS DIST Z1 PKP AB/BC/CA operand in Phase-To-Phase.	PhsDisPDIS
StrRec3p	SPS	Initiate a three-pole reclose. The TRIP AR INIT 3-POLE operand.	TrOutPTRC
StrTD1	INS	Represents UTC timestamp for motor acceleration Time/DATE in seconds elapsed since 00:00:00, 1970/01/01. The START 1 TIME/DATE actual value.	MAccTmPMSS
StrZ2GndDl	SPS	Start zone 2 ground timer. The TRIP Z2GR TMR INIT operand.	TrOutPTRC
StrZ2PhDl	SPS	Start zone 2 phase timer. The TRIP Z2PH TMR INIT operand.	TrOutPTRC
StubBusOp	SPS	The stub bus function is operated. The STUB BUS OP operand, which becomes On when the Stub Bus function is active.	LinDfPDIF
SumHa3NVZroV	MV	Sum of third harmonic neutral voltage and zero sequence voltage. The STATOR GND 3RD HARM VN+V0 in volts.	StatrPHIZ
SvID	VSG	Expected value of MsvID field in messages subscribed to by RxSV#	LSVS
SwFail	SPS	Autoreclose mode switching failed. The AR MODE SWITCH FAIL operand.	Rec13pRREC
SynChkF	SPS	Unsynchronized to common time source, for Sample Value Subscription	LSVS
SysExcp	SPS	System exception. The SYSTEM EXCEPTION operand.	LPHD
TagOn	SPS	Breaker tagged. The BREAKER 1 TAG ON operand.	Bkr0XCBR
TagOff	SPS	Breaker not tagged. The BREAKER 1 TAG OFF operand.	Bkr0XCBR
TapLocFlt	SPS	L90 - The fault is identified between the local terminal and the tap point. The TAP-LOCAL FAULT operand.	FltRptRFLO

Data object name	CDC	Semantics	Used in logical nodes...
TdrTrbl	SPS	TDR trouble. The TDR TROUBLE operand.	LPHD
TempMnt	SPS	The ambient temperature is greater than the maximum operating temperature. The TEMP MONITOR operand.	LPHD
TestMod	SPS	LED indication - Relay in Test Mode. The LED TEST MODE operand.	LEDsIHMI
TestPrgInd	SPS	LED indication - Test In-Progress. The LED TEST IN PROGRESS operand.	LEDsIHMI
ThmCap	MV	% thermal model motor unbalance. MOTOR THERMAL CAPACITY USED in percentage (%).	MotThmPTTR
ThmLOTm	MV	Indicates Thermal Lockout for the motor. THERMAL LOCKOUT TIME in seconds.	MotThmPTTR
ThrdEthFail	SPS	Third Ethernet failure. The THIRD ETHERNET FAIL operand.	LPHD
TmChgOp1	SPS	Change in round trip delay on the channel exceeded pre-set value. 87L DIFF CH 1 TIME CHNG operand, which becomes On when the Change in round trip delay on channel 1 exceeded preset value.	LinDfPDIF
TmnsDelta	MV	PTP-IRIG-B Delta in ns	TmClkLTMS
TmOfClc	INS	Represents the UTC time of the broken rotor bar calculation in seconds elapsed since 1970/01/01, 00.00.00. The TIME OF BRB CALC. actual value.	BknRotSVBR
TmOfMax	INS	The TIME OF MAXIMUM BRB actual value	BknRotSVBR
TmStr1	SPS	Power swing timer picked up. The POWER SWING TMR2 PKP operand.	PwrSwgRPSB
TmSynSrc	ENS	Indicates RTC Sync Source, which is the time synchronizing source the device is using at present. Possible sources are: Port1 PTP Clock, Port2 PTP Clock, Port3 PTP Clock, IRIG-B, SNTP, and None. The Sync Source actual value is the time synchronizing source the UR Process Bus Module is using at present. Possible sources are: Port 1 PTP Clock, Port 2 PTP Clock, Port 3 PTP Clock, Port 4 PTP Clock, Port 5 PTP Clock, Port 6 PTP Clock, Port 7 PTP Clock, Port 8 PTP Clock, CPU clock, and None.	TmClkLTMS, PcClkLTMS
ToOilTmp	MV	Indicates top oil temperature. The TOP OIL degrees C actual value.	HPTmpSPTR
TotLOTm	MV	Indicates total lockout time for the motor. TOTAL MOTOR LOCKOUT TIME in seconds.	MotThmPTTR
Tr1p	ACT	Single pole trip operation initiated. The 87L TRIP 1P OP operand. General is TRIP 1-POLE operand, phsA is TRIP PHASE A operand, phsB is TRIP PHASE B operand, and phsC is TRIP PHASE C operand.	LinDfPDIF, TrOutPTRC
Tr3p	ACT	Three pole trip operation initiated. The DCUB TRIP 3P operand. The DIR BLOCK1 TRIP 3P operand. The DUTT TRIP 3P operand. The HYBRID POTT TRIP 3P operand. The 87L TRIP 3P OP operand. The POTT1 TRIP 3P operand. The PUTT TRIP 3P operand. The TRIP 3-POLE operand.	DCB_PSCH, DCB1_PSCH, DCUB_PSCH, DUTT_PSCH, HPOTT_PSCH, LinDfPDIF, POTT_PSCH, POTT1_PSCH, PUTT_PSCH, TrOutPTRC
Tr3pFrcd	SPS	Three pole trip mode is being forced. The TRIP FORCE 3-POLE operand (3-pole trip mode is being forced).	TrOutPTRC
TransBlk	SPS	Phase comparison transient blocking has operated. The 87PC TRANS BLOCK OP operand.	PhCmp1PDIF
TrcHz	MV	B90 frequency	B_FrqMMXN
Trigger11	ENS	Represents the Hi-Z Data Capture 1 trigger type. Edition 2.	HiZPHIZ
Trigger11	INS	Represents the Hi-Z Data Capture 1 trigger type. Edition 1.	HiZPHIZ
Trigger21	ENS	Represents the Hi-Z Data Capture 1 RMS type. Edition 2.	HiZPHIZ
Trigger21	INS	Represents the Hi-Z Data Capture 1 RMS type. Edition 1.	HiZPHIZ

Data object name	CDC	Semantics	Used in logical nodes...
TripInd	SPS	LED indication - Element Trip Indication. The LED TRIP operand.	LEDsIHMI
Trouble	SPS	Trouble operand or LED. The LED TROUBLE operand. The SH STAT GND TRB OP operand.	SubHaPHIZ, LEDsIHMI
TstBlkMod	SPS	Relay in Test/blocked Mode	Master/LLN0
TstMod	SPS	Relay in Test Mode	Master/LLN0
Tx1	SPS	Transmit signal. The DCUB TX1 operand. The DUTT TX1 operand. The HYBRID POTT TX1 operand. The POTT1 TX1 operand. The PUTT TX1 operand.	DCUB_PSCH, DUTT_PSCH, HPOTT_PSCH, POTT_PSCH, POTT1_PSCH, PUTT_PSCH
TxStop1	SPS	Transmit signal stop. The DIR BLOCK1 TX1 STOP operand.	DCB_PSCH, DCB1_PSCH
UnA1	SPS	Undercurrent pickup. This operand operates when an open pole condition is detected due to undercurrent in phase A, B, or C. The OPEN POLE I< phase A/B/C operand.	LinPkpPIOC, OpnPlΘSCBR
UNotPrgm	SPS	The Product Setup > Installation > Relay Settings setting is not programmed. The UNIT NOT PROGRAMMED operand.	LPHD
UnV	SPS	Undervoltage pickup. The LINE PICKUP UV PKP operand.	LinPkpPIOC
UpdateTms	ING	Periodic update time	Master/LLN0
UsrPrgmLED1	SPS	Edition 2. LED indication - User Programmable LED status. For enhanced and standard front panels. The LED USER 1 operand.	LEDsIHMI
UsrPrLED1	SPS	Edition 1. LED indication - User Programmable LED status. For enhanced and standard front panels. The LED USER 1 operand.	LEDsIHMI
V1Src	CMV	V1 Voltage phasor. SYNCHROCHECK 1 V1 voltage phasor, in primary volts.	SynChkRSYN
V2Src	CMV	V2 Voltage phasor. SYNCHROCHECK 1 V2 voltage phasor, in primary volts.	SynChkRSYN
VabRMS	MV	Phase AB Voltage RMS. SRC 1 Phase AB Voltage RMS, in primary Volts.	ACsrcMMXU
VADmd	MV	Apparent power demand in VA. SRC 1 DMD VA, in primary volt ampere.	DmdMtrMMTR
VAMaxDmdDt	MV	Max apparent power demand in VA with associated date/time stamp. The ClcMth cannot be used for MAX, as the time stamp definition of IEC 61850 is different from UR. SRC 1 DMD VA, in primary volt ampere, with associated date, SRC 1 DMD VA DATE.	DmdMtrMMTR
VArDmd	MV	Reactive power demand in VAR. SRC 1 DMD VAR, in primary volt ampere reactive.	DmdMtrMMTR
VArMaxDmdDt	MV	Max reactive power demand in VAR with associated date/time stamp. The ClcMth cannot be used for MAX, as the time stamp definition of IEC 61850 is different from UR. SRC 1 DMD VAR, in primary volt ampere reactive, with associated date, SRC 1 DMD VAR DATE.	DmdMtrMMTR
VaRMS	MV	Phase A Voltage RMS. SRC 1 Phase AG Voltage RMS, in primary volts.	ACsrcMMXU
Vaux	CMV	Auxiliary voltage (fourth input in a voltage AC bank). SRC 1 Auxiliary Voltage phasor, in primary volts.	ACsrcMMXN
VauxRMS	MV	Auxiliary voltage RMS (fourth input in a voltage AC bank). SRC 1 Auxiliary Voltage RMS, in primary volts.	ACsrcMMXN
VbcRMS	MV	Phase BC Voltage RMS. SRC 1 Phase BC Voltage RMS, in primary Volts.	ACsrcMMXU

Data object name	CDC	Semantics	Used in logical nodes...
VbRMS	MV	Phase B Voltage RMS. SRC 1 Phase BG Voltage RMS, in primary volts.	ACsrcMMXU
VcaRMS	MV	Phase CA Voltage RMS. SRC 1 Phase CA Voltage RMS, in primary Volts.	ACsrcMMXU
VcRMS	MV	Phase A Voltage RMS. SRC 1 Phase CG Voltage RMS, in primary volts.	ACsrcMMXU
VolLoc	CMV	Composite Voltage at the Local Terminal. Local Vcomp phasor, in primary volts.	VCompMMXU
VolRem1	CMV	Composite Voltage at the Remote Terminal 1, from Channel 1. Term 1 Vcomp phasor, in primary volts.	VCompMMXU
VolRem2	CMV	Composite Voltage at the Remote Terminal 2, from Channel 2	VCompMMXU
VoltMntr	SPS	Voltage Monitor. The VOLTAGE MONITOR operand.	LPHD
VoltsInd	SPS	An LED. The LED VOLTAGE operand.	LEDsIHMI
VOp	MV	NEUTRAL VOLTAGE UNBALANCE # Vop, in pu	NuVUnPTOV
VRst	MV	NEUTRAL VOLTAGE UNBALANCE # Vres, in pu	NuVUnPTOV
VSigLos	SPS	Indicates source has lost voltage signal. The SRC1 VT FUSE FAIL VOL LOSS operand.	VtffGAPC
Watt	MV	Real power in a non-three-phase circuit. In this case it is the average of 3Io times (phase shifted 3Vo), which is not exactly real power.	WattPSDE
WDmd	MV	Power demand in Watts. SRC 1 DMD W, in primary watt.	DmdMtrMMTR
WMaxDmdDt	MV	Max real power demand in Watt with associated date/time stamp. The ClcMth cannot be used for MAX, as the time stamp definition of IEC 61850 is different from UR. SRC 1 DMD W, in primary watt, with associated date, SRC 1 DMD W DATE.	DmdMtrMMTR
Year	INS	Represents the year (from 1970 onwards). The Year actual value.	TmDayGAPC
Z1Chr1	SPS	Positive-sequence impedance is within the configured characteristic. This Data Object is used by power swing detection element for outer characteristic. The POWER SWING INNER operand. The POWER SWING MIDDLE operand. The POWER SWING OUTER operand.	PwrSwgRPSB
Zero	MV	Analog 0 fixed operand. FlexAnalog fixed operand Off.	Master/LLN0
ZeroSV	SAV	In Master logical device when order code includes a Process Bus Module	Master/LLN0
Zn1Extend	SPS	The zone 1 distance function must be set to the extended overreach value. The AR ZONE 1 EXTENT operand.	Rec13pRREC
Zn2Tr	SPS	Operated from overreaching zone 2 when reclosing the line. The LINE PICKUP RCL TRIP operand.	LinPkpPIOC

3.5.9 Enumerations

3.5.9.1 Standard enumerations

EnumType id and the EnumType content of standard enumerations from IEC 61850 7-4 match those in the tissues standard.

EnumType id and EnumType content of standard enumerations from IEC 61850 7-3 match those in IEC 61850 7-3:Annex D.

3.5.9.2 GE extended enumerations

For extended enumerations, EnumType id begins with the string "GE_Digital_Energy_UR_", followed by descriptive text, followed by "Kind". The following is a sample excerpt of the extended Enumerations from a firmware-generated UR.ICD file.

```
<EnumType id="GE_Digital_Energy_UR_HiZStKind">
        <EnumVal ord="0">Normal</EnumVal>
        <EnumVal ord="1">Coordination Timeout</EnumVal>
        <EnumVal ord="2">Armed</EnumVal>
        <EnumVal ord="5">Arcing</EnumVal>
        <EnumVal ord="9">Downed Conductor</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_TriggerKind">
        <EnumVal ord="0">None</EnumVal>
        <EnumVal ord="1">Loss of Load</EnumVal>
        <EnumVal ord="2">Arc Suspected</EnumVal>
        <EnumVal ord="3">Arcing</EnumVal>
        <EnumVal ord="4">Overcurrent</EnumVal>
        <EnumVal ord="5">Down Conductor</EnumVal>
        <EnumVal ord="6">External</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_MotStatusKind">
        <EnumVal ord="0">Offline</EnumVal>
        <EnumVal ord="1">Starting</EnumVal>
        <EnumVal ord="2">Running</EnumVal>
        <EnumVal ord="3">Overload</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_RGooseRxModeKind">
        <EnumVal ord="0">Unicast</EnumVal>
        <EnumVal ord="1">SSM</EnumVal>
        <EnumVal ord="2">ASM</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_RGooseSecEnaKind">
        <EnumVal ord="0">None</EnumVal>
        <EnumVal ord="1">Signature</EnumVal>
        <EnumVal ord="2">SignatureAndEncryption</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_FltSegmentKind">
        <EnumVal ord="0">N/A</EnumVal>
        <EnumVal ord="1">LOCAL</EnumVal>
        <EnumVal ord="2">REMOTE 1</EnumVal>
        <EnumVal ord="3">REMOTE 2</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_TimeSourceKind">
        <EnumVal ord="0">None</EnumVal>
        <EnumVal ord="1">Port 1 PTP Clock</EnumVal>
        <EnumVal ord="2">Port 2 PTP Clock</EnumVal>
        <EnumVal ord="3">Port 3 PTP Clock</EnumVal>
        <EnumVal ord="4">IRIG-B</EnumVal>
        <EnumVal ord="5">SNTP</EnumVal>
</EnumType>
```

The table outlines the logical nodes and data objects that use the extended enumerations.

Table 3-225: GE extended enumerations usage

Enum ID	Used in logical node	Using data object	CDC	Semantic
GE_Digital_Energy_UR_HiZStKind	HiZPHIZ	HiZSt	ENS	Status of High Impedance fault detection function

Enum ID	Used in logical node	Using data object	CDC	Semantic
GE_Digital_Energy_UR_TriggerKind	HiZPHIZ	Trigger11	ENS	HIZ Capture1 Trigger Type
		Trigger12	ENS	HIZ Capture2 Trigger Type
		Trigger13	ENS	HIZ Capture3 Trigger Type
		Trigger14	ENS	HIZ Capture4 Trigger Type
		Trigger21	ENS	HIZ RMS Capture1 Trigger Type
		Trigger22	ENS	HIZ RMS Capture2 Trigger Type
		Trigger23	ENS	HIZ RMS Capture3 Trigger Type
		Trigger24	ENS	HIZ RMS Capture4 Trigger Type
GE_Digital_Energy_UR_MotStatusKind	MotThmPTTR	MotStatus	ENS	Motor status
GE_Digital_Energy_UR_RGooseRxModeKind	LGOS	RgRxMode	ENG	Routable GOOSE reception mode
GE_Digital_Energy_UR_RGooseSecEnaKind	LGOS	SecEna	ENG	Routable GOOSE security
GE_Digital_Energy_UR_FltSegmentKind	FltRFLO	FltSegment	ENS	Segment of the line fault occured
GE_Digital_Energy_UR_TimeSourceKind	TmClkLTMS	TmSrc	ENS	RTC Sync source

3.6 SCL implementation conformance statement (SICS)

The table outlines conformance to the Substation Configuration Language (SCL).

Table 3-226: SCL conformance statement

		UR firmware	UR Setup software	Value/comments
ICD Export		**Yes**	**Yes**	
I11	Fix ICD file (no adaptable export needed)	Yes	Yes	
I12	Export of ICD file or IID file according to IED preconfiguration performed by tool			
I13	State the data model name space (61850-7-3 subclause 7.2) within ICD file (LLN0.NamPlt.ldNs value)	Yes	Yes	
I14	State the data model version (61850-7-3 subclause 7.8.3) and any predefined / fixed configuration values within ICD file (9.5.4.4)	Yes	Yes	
I15	Version 2003 export			
I16	Version 2007 export	Yes	Yes	
I17	Predefined data sets			
I18	Predefined control blocks	Yes	Yes	
I19	Substation bay template with IED part			
I110	Communication section with default address	Yes	Yes	
I111	Export correct valKind value (Table 46)			
I112	Exports internal addresses as InRef or Input section (subclause 9.3.13)	Yes	Yes	
I113	Exports internal addresses in Input section with expected serviceType (subclause 9.3.13)			
I114	Exports in UTF-8 coding	Yes	Yes	
SCD import		**If renamed CID**	**Yes**	

		UR firmware	UR Setup software	Value/comments
I21	Identify IED to be configured in SCD file by IED name	Yes IP address is used to locate the IED name	Yes	
I22	Configure LD name (at least via ldInst, dependent on the IED capabilities) and IED addresses from SCD	Yes	Yes	
I23	Determine communication side addresses of IED inputs from SCD	Yes	Yes	
I24	Determine and use clock communication addresses from SCD			
I25	Configure values of (existing) control block from SCD (9.3)	Yes	Yes	
I26	Prepare (new) control block instances according to SCD file			
I27	Prepare / configure data sets according to SCD file	Yes	Yes	
I28	Modify predefined data sets according to SCD			
I29	Interpret client references in the control blocks of other IEDs to find the control block instances allocated to this IED, and data sent to this IED.	Yes	Yes	
I210	Set IED configuration values and parameter values as defined in SCD file	Yes	Yes	Where configurable
I211	Support changed (reduced capability) valKind (e.g. from Set to RO or to Conf) (able 46)			
I212	Support ldName on other IEDs (9.3.4)	Yes	Yes	
I213	Interpret input signal references to source control blocks (9.3.13)	Yes	Yes	
I214	Imports UTF-8 coding of XML	Yes	Yes	
IID export after IED engineering		**Yes**	**Yes**	
I31	IED version and instance information: LPHD.PhyNam: swRev, serNum, LLN0.NamPlt.configRev	Yes	Yes	
I32	Configuration values (fc=CF)	Yes	Yes	
I33	Setting Parameter values (fc=SP, SG)	Yes	Yes	
I34	SCL Header management (9.1)			
I35	Modify IED data model (add LN/Data object/LD, or remove unused LD/LN/Data object)			
Tool functionality				
I41	Support MustUnderstand concept (8.2)	Yes	Yes	
I42	Bind incoming 61850 signals to IED internal (input) signals	Yes	Yes	
I43	Use or create IED Input section for binding incoming (external) signals to internal signals, to document this binding	Yes	Yes	
I44	Create CID file for IED		Yes	
I45	Support ldName for LD name specification	Yes	Yes	
I46	Modify LN prefixes or ldInst			

3.7 PIXIT conformance statement

This section outlines protocol implementation extra information for testing (PIXIT), which relates to restrictions and limitations of a device. This section specifies the PIXIT of the IEC 61850 interface in UR devices.

Together with PICS and the MICS, the PIXIT forms the basis for a conformance test according to IEC 61850-10. The PIXIT entries contain information that is not available in the PICS, MICS, TICS documents or SCL file.

Each table specifies the PIXIT for applicable ACSI service model as structured in IEC 61850-10. The "Ed" column indicates if the entry is applicable for IEC 61850 Edition 1 and/or Edition 2.

Table 3-227: PIXIT for Documentation

ID	Edition	Description	Value / Clarification
Do1	2	How to expose required firmware versions not present in the datamodel	N/A

Table 3-228: PIXIT for Association model

ID	Edition	Description	Value / Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	5
As2	1, 2	TCP_KEEPALIVE value. The recommended range is 1..20s.	20 seconds
As3	1, 2	Lost connection detection time	Configurable 11 to 7200 seconds or 10 seconds (disabled). If there is no MMS traffic for this time, the connection is dropped.
As5	1, 2	What association parameters are necessary for successful association?	Y Transport selector Y Session selector Y Presentation selector N AP Title N AE Qualifier
As6	1, 2	If association parameters are necessary for association, describe the correct values	Transport selector 0001 Session selector 0001 Presentation selector 00000001
As7	1, 2	What are the maximum and minimum MMS PDU sizes?	Max MMS PDU size 128000 Min MMS PDU size 700
As8	1, 2	What is the maximum start up time after a power supply interrupt?	120 seconds
As9	1, 2	Does this device function only as test equipment? (test equipment need not have a non-volatile configuration; but it cannot be part of the substation automation system)	No

Table 3-229: PIXIT for Server model

ID	Edition	Edition	Value / Clarification
Sr1	1, 2	Which analogue value (MX) quality bits are supported (can be set by server)?	Validity: Y Good Y Invalid N Reserved Y Questionable N Overflow N OutofRange N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Source: Y Process N Substituted Y Test N OperatorBlocked
Sr2	1, 2	Which status value (ST) quality bits are supported (can be set by server)?	Validity: Y Good Y Invalid N Reserved Y Questionable N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Source: Y Process N Substituted Y Test N OperatorBlocked
Sr5	1	Which Mode values are supported	Y On N [On-]Blocked Y Test Y Test/Blocked Y Off

Table 3-230: PIXIT for Data set model

ID	Edition	Description	Value / Clarification
Ds1	1	What is the maximum number of data elements in one data set (compare ICD setting)?	64
Ds2	1	How many persistent data sets can be created by one or more clients? (this number includes predefined datasets)	0
Ds3	1	How many non-persistent data sets can be created by one or more clients?	0

Table 3-231: PIXIT for Setting group control model

ID	Edition	Description	Value / Clarification
Sg1	1	What is the number of supported setting groups for each logical device?	6, see SGCB value
Sg2	1, 2	What is the effect of when and how the non-volatile storage is updated? (compare IEC 61850-8-1 16.2.4)?	Not applicable

ID	Edition	Description	Value / Clarification
Sg3	1	Can multiple clients edit the same setting group?	N
Sg4	1	What happens if the association is lost while editing a setting group?	No editable grouped settings are instantiated
Sg5	1	Is EditSG value 0 allowed?	N
Sg6	2	When ResvTms is not present how long is an edit setting group locked?	60 seconds

Table 3-232: PIXIT for Reporting model

ID	Edition	Description	Value / Clarification
Rp1	1	The supported trigger conditions are (compare PICS)	Y integrity Y data change Y quality change N data update Y general interrogation
Rp2	1	The supported optional fields are	Y sequence-number Y report-time-stamp Y reason-for-inclusion Y data-set-name Y data-reference Y buffer-overflow Y entryID Y conf-rev Y segmentation
Rp3	1, 2	Can the server send segmented reports?	Y
Rp4	1, 2	Mechanism on second internal data change notification of the same analogue data value within buffer period (Compare IEC 61850-7-2 14.2.2.9)	Send report immediately
Rp5	1	Multi client URCB approach (compare IEC 61850-7-2:2003 §14.2.1)	Each URCB is visible to all clients
Rp7	1, 2	What is the buffer size for each BRCB or how many reports can be buffered?	36864 bytes
Rp9	1	May the reported data set contain: - structured data objects - data attributes	 Y Y
Rp10	1, 2	What is the scan cycle for binary events? Is this fixed, configurable?	All Boolean and Dbpos type values in "fast" datasets are scanned for 1/8 cycle (2.0 ms at 60 Hz, 2.5 ms at 50 Hz). All values in "slow" datasets are scanned for every 100 ms. Fixed
Rp11	1	Does the device support to pre-assign a RCB to a specific client in the SCL?	N
Rp12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart?	Retained prior to restart
Rp13	1, 2	Does the server accept any client to configure / enable a BRCB with ResvTms=-1? What fields are used to do the identification?	RsevTms not used
Rp14	1, 2	What is default value for BRCB.ResvTms if client does not write or ResvTms not exposed in the control block (must be ≥ 0)	0 milliseconds

Table 3-233: PIXIT for GOOSE publish model

ID	Edition	Description	Value / Clarification
Gp1	1, 2	Can the test (Ed1) / simulation (Ed2) flag in the published GOOSE be set?	Y
Gp2	1	What is the behavior when the GOOSE publish configuration is incorrect?	GoCB is not instantiated
Gp3	1, 2	Published FCD supported common data classes are	All instantiated FCDs Arrays are supported
Gp4	1, 2	What is the maximum value of TAL (maxTime)? Is it fixed or configurable?	1000 to 300000 ms Configured by SCL or GoCB MaxTime
Gp5	1, 2	What is the fastest retransmission time?	1 to 100 ms Configured by SCL or GoCB MinTime
Gp7	1, 2	What is the initial GOOSE sqNum after restart?	sqNum = 1
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD) - timestamp data attributes	 Y Y
Gp9	1, 2	Does Server or ICT refuse GOOSE payload dataset length greater than SCSM supports?	Y

Table 3-234: PIXIT for GOOSE subscribe model

ID	Edition	Description	Value / Clarification
Gs1	1, 2	What elements of a subscribed GOOSE header are checked to decide the message is valid and the allData values are accepted? If yes, describe the conditions. Notes: • The VLAN tag can be removed by an Ethernet switch and is not checked • The simulation flag is always checked (Ed2) • The ndsCom is always checked (Ed2)	Y destination MAC address Y APPID Y gocbRef Y timeAllowedtoLive Y datSet Y goID N t Y stNum N sqNum Y simulation (Ed2) / N test (Ed1) Y confRev Y ndsCom Y numDatSetEntries
Gs2	1, 2	When is a subscribed GOOSE marked as lost? (TAL = time allowed to live value from the last received GOOSE message)	Message does not arrive prior to TAL
Gs3	1, 2	What is the behavior when one or more subscribed GOOSE messages is not received or syntactically incorrect (missing GOOSE)?	When a subscribed GOOSE is marked as lost, a Self Test Alarm target is generated, and all internal data that is derived from GOOSE data is configured to default values
Gs4	1, 2	What is the behavior when a subscribed GOOSE message is out-of-order?	Sequence number order (with no state number change) is not checked. State number order is checked; the older message is ignored.
Gs5	1, 2	What is the behavior when a subscribed GOOSE message is duplicated?	Duplicate message is ignored
Gs6	1	Does the device subscribe to GOOSE messages with/ without the VLAN tag?	Y with the VLAN tag Y without the VLAN tag
Gs7	1	May the GOOSE data set contain: - structured data objects (FCD) - timestamp data attributes	 Y Y
Gs8	1, 2	Subscribed FCD supported common data classes are...	All FCDs that are defined by GOOSE publishers in the CID file. Arrays are supported.

ID	Edition	Description	Value / Clarification
Gs9	1, 2	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode?	Y
Gs10	1, 2	Max number of dataset members?	64
Gs11	1	Is Fixed-length encoded GOOSE supported?	N

Table 3-235: PIXIT for GOOSE performance

ID	Edition	Description	Value / Clarification	
Gf1	1, 2	Performance class	P1	
Gf2	1, 2	GOOSE ping-pong processing method	Scan cycle based	
Gf3	1, 2	Application logic scan cycle (ms)	Max.	1/8 cycle (2.0 ms @60 Hz, 2.5 ms @50 Hz) or 100 ms (configurable)
			Min.	
Gf4	1	Maximum number of data attributes in GOOSE dataset (value and quality have to be counted as separate attributes)	64	

Table 3-236: PIXIT for Control model

ID	Edition	Description	Value / Clarification
Ct1	1	What control models are supported?	Y Dons Y SBOns DOes Y (XCBR, XSWI, CSWI) SBOes Y (XCBR, XSWI, CSWI)
Ct2	1, 2	Is the control model fixed, configurable and/ or dynamic?	Fixed, Configurable, or Dynamic depending on the particular control point
Ct5	1	Will the DUT activate the control output when the test attribute is set in the SelectWithValue and/or Operate request (when N test procedure Ctl2 is applicable)?	N
Ct8	1	What is the behavior of the DUT when the check conditions are set? Is this behavior fixed, configurable, online changeable?	Y synchrocheck Y interlock-check DUT uses the check value to perform the check Configurable

ID	Edition	Description	Value / Clarification
Ct9	1, 2	Which additional cause diagnoses are supported?	N Unknown Y Not-supported Y Blocked-by-switching-hierarchy Y Select-failed Y Invalid-position Y Position-reached N Step-limit Y Blocked-by-Mode N Blocked-by-process Y Blocked-by-interlocking Y Blocked-by-synchrocheck Y Command-already-in-execution N Blocked-by-health N 1-of-n-control N Abortion-by-cancel N Time-limit-over N Abortion-by-trip Y Object-not-selected Edition 1 specific values: Y Parameter-change-in-execution (Ed 1 semantics) Edition 2 specific values: Y Object-already-selected N No-access-authority N Ended-with-overshoot N Abortion-due-to-deviation N Abortion-by-communication-loss Y Blocked-by-command N None Y Inconsistent-parameters Y Locked-by-other-client N Parameter-change-in-execution (Ed 2 semantics)
Ct10	1, 2	How to force a “test-not-ok” respond with SelectWithValue request	Not possible
Ct11	1, 2	How to force a “test-not-ok” respond with Select request	Not possible
Ct12	1, 2	How to force a “test-not-ok” respond with Operate request	DOns SBOns DOes SBOes As per IEC 61850-8-1, clause 20.11 (“Operator Test Not OK” is returned if an Operate control command is issued, with TEST=TRUE, and the operation fails.)
Ct13	1, 2	Which origin categories are supported / accepted?	Y bay-control Y station-control Y remote-control Y automatic-bay Y automatic-station Y automatic-remote Y maintenance Y process
Ct14	1, 2	What happens if the orCat value is not supported or invalid?	DOns: Operate fails SBOns: Operate fails DOes: Operate fails SBOes: Select fails
Ct15	1, 2	Does the IED accept a SelectWithValue / Operate with the same control value as the current status value? Is this behavior configurable?	N DOns N SBOns N DOes SBOes: Y SelectWithValue N Operate N Configurable

ID	Edition	Description	Value / Clarification
Ct16	1	Does the IED accept a select/operate on the same control object from two different clients at the same time?	Y DOns N SBOns N DOes N SBOes
Ct17	1	Does the IED accept a Select/ SelectWithValue from the same client when the control object is already selected (Tissue #334)?	N SBOns N SBOes
Ct20	1, 2	Does the IED support local / remote operation?	Y (XCBR, XSWI)
Ct21	1, 2	Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security?	N SBOns N DOns
Ct22	2	How to force a “parameter-change-in-execution”	SBOns: Not possible SBOes: Not possible
Ct23	1, 2	How many SBOns/SBOes control objects can be selected at the same time?	SBOns: n = "multiple" SBOes: n = "multiple"
Ct24	1, 2	Can a controllable object be forced to keep its old state, for example Internal Controllable Objects may not be accessible to force this, whereas a switch like a Circuit Breaker outside the DUT can?	Y (XCBR, XSWI, CSWI)
Ct25	1, 2	When CDC=DPC is supported, is it possible to have DPC (Controllable Double Point) go to the intermediate state? (00)	Y
Ct26	1, 2	Name an enhanced security point (if any) with a finite operate timeout specify the timeout (in milliseconds)	xxxSystem/Bkr0XCBR1.Pos.operTimeout DOes: 70 ms (configurable) SBOes: 70 ms (configurable)
Ct27	2	Does the IED support control objects with external signals?	Y DOns Y SBOns Y DOes Y SBOes

Table 3-237: PIXIT for Time synchronization model

ID	Edition	Description	Value / Clarification
Tm1	1	What time quality bits are supported (may be set by the IED)?	Y LeapSecondsKnown N ClockFailure Y ClockNotSynchronized
Tm2	1, 2	Describe the behavior when all time server(s) ceases to respond. What is the time server lost detection time?	Internal clock is used 120 seconds
Tm3	1, 2	How long does it take to take over the new time from time server?	200 seconds
Tm4	1, 2	When is the time quality bit “ClockFailure” set?	Never set
Tm5	1	When is the time quality bit “Clock not Synchronized” set?	When connection to all time servers is lost (see PIXIT-Tm2)
Tm7	1	Does the device support time zone and daylight savings?	Y

ID	Edition	Description	Value / Clarification
Tm8	1, 2	Which attributes of the SNTP response packet are validated?	N Leap indicator not equal to 3 N Mode is equal to SERVER N OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp Y RX/TX timestamp fields are checked for reasonableness N SNTP version 3 and/or 4 N other (describe)
Tm9	1, 2	Do the COMTRADE files have local time or UTC time and is this configurable?	Local N Configurable

Table 3-238: PIXIT for File transfer model

ID	Edition	Description	Value / Clarification
Ft1	1	What is the structure of files and directories? Where are the COMTRADE files stored? Are COMTRADE files zipped and what files are included in each zip file?	Flat file system with pseudo folders LD/<IED+LD>/COMTRADE Not zipped
Ft2	1, 2	Directory names are separated from the file name by	"/"
Ft3	1	The maximum file name size including path (recommended 64 chars)	64 chars
Ft4	1, 2	Are directory/file names case sensitive?	Not case sensitive
Ft5	1, 2	Maximum file size for SetFile	16 megabytes Only CID files can be received
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name?	Y
Ft7	1	Is the wild card supported in the MMS fileDirectory request?	Yes, wild card = *
Ft8	1, 2	Is it allowed that two clients get a file at the same time?	N one oscillography file at a time, one event record file at a time, one SCL file at a time, one of any other type of file at a time. Y different file types.
Ft9	1, 2	Which files can be deleted?	None

3.8 TICS conformance statement

A Technical Issue Implementation Conformance Statement (TICS) is required under IEC 61850.

This section provides a template for the TICS. According to the UCA International Users Group (UCAIug) Quality Assurance Program (QAP), the TICS is a required conformance test and is referenced on the certificate.

This document is applicable for URs with firmware version 7.90.

The tables are for Edition 2.

Below tables give an overview of the applicable mandatory Tissues.

Items in italic are brief interpretations provided by the UCA International Users Group to aid in interpretation and are not normative.

The original TISSUE should be consulted for details of changes.

Y — The server has implemented the Tissue

na — Not applicable if the server does not support the corresponding ACSI service(s)

Tissues 675, 735, 772, 775, 776, and 878 are not relevant for conformance testing..

Table 3-239: Part 6 Tissues

Part 6 Tissue	Description	Implemented by server?
658	Tracking related features *EntryID and CST missing, these are checked by schema*	na
663	FCDA element cannot be a "functionally constrained logical node" *doName now mandatory in FCDA element,* *SCT: refuse to make empty doName? ICT: Refuse SCD*	Y
668	Autotransformer modeling *Autotransformer model in substation section has changed*	na
687	SGCB ResvTms *SettingControl has added attribute resvTms* *see also TISSUE 845*	Y
719	ConfDataSet - maxAttributes definition is confusing maxAttributes now means max count of FCDA in dataset	Y
721	Log element name *LN0/Log now has optional attribute "name"*	na
768	bType VisString65 is missing *VisString65 added as SCL BasicType*	na
779	Object references *"@" as first character in object references now allowed*	Y
788	SICS S56 from optional to mandatory *SICS S56="Interpret IED capabilities and prohibit unsupported usage"*	na
789	ConfLdName as services applies to both server and client *Many changes made to Services section*	Y
804	valKind and IED versus System configuration *valImport missing/false DAI means ICT shall ignore value in SCD and SCT shall not change from ICD/IID value.* *Instance section inherits from DA/BDA element.*	Y
806	Max length of log name inconsistent between -6 and -7-2 *LogControl.logName and Log.name restricted to 32 chars*	na
807	Need a way to indicate if "Owner" present in RCB *Services/ReportSettings@owner added*	Y
823	ValKind for structured data attributes *valKind is prohibited on structured attributes*	Y
824	Short addresses on structured data attributes *sAddr is now allowed for structured attributes*	na
825	Floating point value *Server shall support <Val> with exponential notation*	na
845	SGCB ResvTms *Services/SettingGroups/SGEdit added attribute resvTms* *Services/SettingGroups/ConfSG added attribute resvTms* *See also TISSUE 687*	Y
853	SBO and ProtNs *DA[@name=SBO] element shall have ProtNS element*	Y
855	Recursive SubFunction *Substation section extension must be tolerated*	na
856	VoltageLevel frequency and phases *Substation section extension must be tolerated*	na
857	Function/SubFunction for ConductingEquipment *Substation section extension must be tolerated*	na
886	Missing 8-1 P-types *"tP_IP_UDP_PORT" and "tP_IP_TCP_PORT" added*	na
901	tServices as AP or as IED element *Rules for contents of AP/Server/Services are now defined*	Y

Part 6 Tissue	Description	Implemented by server?
936	SupSubscription parameter usage is difficult *SupSubscription "max" replaced by "maxGo" and "maxSv"*	Y
1147	tServices - FileHandling not consistent with -7-2 *Services/FileHandling now means only support for GetFile and GetFileAttributeValues and NOT SetFile/DeleteFile*	Y
1185	Valkind value Conf for EX FC data *valKind=Conf is allowed for dataNs*	Y
1284	SCSM mapping may require a communication section in an ICD file *Server IEDs supporting client/server associations to IEC 61850-8-1 shall include a <Communication> section*	Y
1328	Limitation on the size of data type templates identifiers *Identifier now limited to 255 characters*	Y
1395	Client LN attributes *ReportControl/RptEnabled/ClientLN@ldInst shall be "LD0" for pure clients (without any Logical Devices)*	na
1402	ExtRef during engineering *an ExtRef.intAddr attribute value unequal to empty string (prescribed or filled by the IED tool) is the flag indicating that the ExtRef shall not be deleted by the system tool. The system tool can however remove the link to the source IED.* *<<applicable for SCL tool test>>*	na
1415	SICS-S110 IID import mandatory for Edition2 *only the import of data model modifications and CF value changes is mandatory for system tool* *<<applicable for SCL tool test>>*	na
1419	Support of ldName on other IEDs *SICS I212 is now mandatory*	na
1444	Need to support fixed and SCT controlled Datasets *Services/xxxSetttings@datSet=fix now means "data set pointed by Control Block cannot be altered from ICD/IID value* *<<applicable for SCL tool test>>*	na
1445	ConfReportControl and a fixed ReportSettings *Control block capabilities must be consistent* *<<applicable for SCL tool test>>*	na
1450	originalSclXxx computation rules *Ed2 ICD/IID files specifying SCL@version=2007 SHALL include originalSCLVersion=2007 and originalSCLRevision as attributes of the <IED>element*	Y
1485	Need to supercede Tissue 1398 to clarify SCT behavior *Same as TISSUE 1450* *<<applicable for SCL tool test>>*	Y

Table 3-240: Part 7 Tissues

Part 7 Tissue	Description	Implemented by server?
Part 7-1		
828	Data model namespace revision IEC 61850-7-4:2007[A] *Both 2007 and 2007A are allowed for namespace name*	Y
948	Enumeration (string) values format *Enums are limited to 127 characters from Basic-Latin and Latin-1 character sets*	Y
1151	Simulated GOOSE disappears after 1st appearance when LPHD.Sim = TRUE *New LGOS state machine defined, but TISSUE is not IntOp2, therefore TISSUE is optional if LGOS is used*	Y

Part 7 Tissue	Description	Implemented by server?
1396	The use and configuration flow of LGOS and LSVS is unclear *If Services/SupSubscription@maxGo > 1 then at least 1 LGOS must exist. Same for maxSv/LSVS.* *If maxGo > count(LGOS) then SCT can create additional LGOS. Same for maxSv/LSVS.*	Y
1447	Restriction on ENUMtypes in SCL *If a ENUM DA limits write or configuration to a subset, then that subset must be declared*	Y
1457	Multiple DOI nodes with the same name *LN can have no more than one DOI with same name*	Y
1468	Re-use DO from other LN *allow standard or private dataNs*	Y
1491	CmdBlk blocks itself? *The data CmdBlk shall have no effect on the controllable data Mod or CmdBlk*	Y
1495	GetVariableAccessAttributes error code *Return MMS error access/object-non-existent if the object does not exist*	Y
Part 7-2		
728	BRCB: could PurgeBuf be set when RptEna=TRUE? *PurgeBuf while RptEna=true is prohibited*	Y
778	AddCause values – add value not-supported *Align 7-2 with 8-1 (nothing new to 8-1)*	Y
780	What are unsupported trigger option at a control block? *All control blocks must support all trigger options*	Y
783	TimOper Resp- ; add Authorization check *Clarifies Time-Operated Controls*	na
786	AddCause values 26 and 27 are switched *Annex B.2 has wrong AddCause values*	Y
820	Mandatory ACSI services (use for PICS template) *Model entries M18 (Application Association), M19 (GCB), M20 (SVCB) are new. Services S17 (Substitution) and S61 (GetServerDirectory) are new. Services S1, S3, S4, S5, S6, S8, S16, S18, S23, S36, S37, S41, S42 are changed.*	Y
858	typo in enumeration ServiceType *Tracking serviceType now has GetLogicalNodeDirectory*	na
861	dchg of ConfRev attribute *Clarifies (tracking) BTS.confRev is AFTER BRCB change*	na
1050	GTS Phycomaddr definition in SCL *(Tracking) GTS needs a special structure for SCL*	Y
1071	Length of DO name *Private DO name length shall be <=12 including instance*	Y
1127	Missing owner attribute in BTS and UTS *NSD files for 61850-7-3 show owner in (tracking) BTS/UTS*	na
1202	GI not optional *GI support is mandatory for both URCB and BRCB*	Y
1232	EntryID needs clarification *Segments of a report shall have same identifiers*	Y
1242	NTS definition *NTS.resv have been added*	na
1307	Segmented report with Buffer overflow *Segments of a report shall have identical buf-overflow value*	Y
1428	MTS and NTS should use svOptFlds *MTS.optFlds and NTS.optFlds now have bType=SvOptFlds*	na
1630	Attributes in CDC=LTS do not match 8-1 definition *Order of attributes in LTS changed to:* *logEna, logRef, datSet, oldEntrTm, newEntrTm, oldEnt, newEnt, trgOps, intgPd*	na
Part 7-3		

Part 7 Tissue	Description	Implemented by server?
697	Persistent command / PulseConfig *PulseConfig adds enum "persistent-feedback"* *DPC.cmdQual=="persistent" is conditionally allowed*	na
698	Wrong case is BAC.dB attribute *attribute renamed from "dB" to "db"*	na
711	blkEna freeze data update while setting its quality to operaterBlocked *Mode=Blocked shall not cause q.operatorBlocked*	Y
722	Units for 'h' and 'min' not in UnitKind enumeration *New unit enums 84=hours, 85=minutes*	Y
919	Presence Condition for sVC *svC may be valKind=Conf in ICD file*	Y
925	Presence of i or f attribute - Problem with writing *New constructed attribute class "AnalogueValueCtl"*	na
926	Presence Conditions within RangeConfig *All or none of hhLim+hLim+lLim+llLim shall be present*	na
954	Data attributes with FC=CF should have trgOp=dchg *Some INS and HST and CSG attributes missing dchg*	na
1078	CMV.t update if rangeAng changed *Add rangeAng to"reasons-to-update-timestamp-of-CMV"*	na
1565	db = 0 behaviour *db=0 not longer suppresses reporting*	Y
1578	dataAttribute NameSpace content *Attributes with FC=EX must be initialized in ICD/IID file*	Y
Part 7-4		
671	mistake in definition of Mod & Beh *Beh=on, q=test should be "Processed as valid"*	Y
674	CDC of ZRRC.LocSta is wrong *ZRRC LocSta should be CDC=SPC*	na
676	Same data object name used with different CDC *LCCH.Fer renamed to FerCh, LCCH.RedFer to RedFerCh*	na
677	MotStr is used with different CDC in PMMS and SOPM LN classes *Rename SOPM.MotStr to MotStrNum*	na
679	Remove CycTrMod Enum *Enum is no longer used, use TrMod instead*	na
680	SI unit for MHYD.Cndct *Change unit from S/cm^2 to S/m*	na
681	Enum PIDAlg *Typographical error, invalid XML syntax*	Y
682	ANCR.ParColMod *ParColMod enum values text have changed*	na
683	Enum QVVR.IntrDetMth *IntrDetMth enum values text have changed*	na
685	Enum ParTraMod *ParTraMod enum values text have changed*	na
686	New annex H - enums types in XML *Many changes have been made to enumeration names*	Y
694	Data object CmdBlk *CmdBlk semantics have changed*	na
696	LSVS.St (Status of subscription) *LSVS.St is now mandatory*	na
712	Interpretation of quality operatorBlocked *Mode and Behavior semantics have changed*	na
713	DO Naming of time constants in FFIL *Many DO names in FFIL have changed*	na
714	Enums for ShOpCap and SwOpCap *Type for YPSH.ShOpCap and XSWI.SwOpCap have changed*	Y

Part 7 Tissue	Description	Implemented by server?
715	RBDR.ChNum1 *RBDR.ChNum1 changes from optional to conditional*	na
716	TAXD text for condition *TAXD.SmRte condition for inclusion has changed*	na
724	ANCR.Auto *ANCR.Auto changes from mandatory to optional*	na
725	Loc in LN A-group *Loc changes to optional, LocKey/LocSta conditions change*	na
734	LLN0.OpTmh vs. LPHD.OpTmh *LLN0.OpTmh deleted, LPHD.OpTmH added as conditional*	na
736	PFSign *MMXU.PFSign enum is extended with 3=Excitation*	Y
742	GAPC.Str, GAPC.Op and GAPC.StrVal *Objects have instance indicator removed (ex, Str1 to Str)*	Y
743	CCGR.PmpCtl and CCGR.FanCtl *Object have instance indicator added (ex:PmpCtl to PmpCtl1)*	na
744	LN STMP, EEHealth and EEName *Removed STMP.EEHealth and STMP.EEName*	Y
772	LPHD.PwrUp/PwrDn should be transient *These objects are now transient*	na
773	Loc, LocKey and LocSta YPSH and YLTC *Add Loc, LocKey and LocSta in YLTC and YPSH (optional)*	na
774	ITCI.LocKey *Add ITCI.LocKey as optional*	na
776	LPHD.OutOv/InOv and LCCH.OutOv/InOv *Clarified: stays true until buffer space again available*	na
800	Misspelling in CSYN *CSYN.VInvTmms renamed to CSYN.VIntvTmms*	na
802	CCGR and Harmonized control authority *Add Loc, LocKSta to every controllable LN (e.g. FSPT)*	na
808	Presence condition of ZMOT.DExt and new Dos *Change ZMOT.DExt to optional; add TotThmSt and MotSt*	na
831	Setting of ConfRevNum in LGOS *Add RxConfRevNum to LGOS and LSVS*	Y
838	Testing in Beh=Blocked *Change semantic of Beh=Blocked to allow controls to be acknowledged even when LN is blocked*	Y
844	MFLK.PhPiMax, MFLK.PhPiLoFil, MFLK.PhPiRoot DEL->WYE *Change these NFLK objects from cdc=DEL to cdc=WYE*	na
877	QVUB -settings should be optional *Change QVUB.UnbDetMth and QVUB.StrVal to optional*	na
908	ARIS.StrSeq - transient *Change ARIS.StrSeq to transient*	na
909	Remove ANCR.ColOpR and ColOpL *Replace ANCR.ColOpR and ANCR.ColOpL with ANCR.ColChg. Add YEFN.ColChg*	na
912	Clarification of PwrRtg/VARtg *Change many DOs in YPTR, and ZGEN, see name space 2007A2.nsd for final result*	na
920	Resettable Counter is NOT resettable *Change GGIO.CntRs to CntVal; Same for FCNT*	Y
932	Rename AVCO.SptVol to AVCO.VolSpt	na
933	Presence of LCCH.RedFerCh and RedRxCnt *Change the presence condition of LCCH.RedChLiv*	na
939	Change CDC for ANCR.FixCol *Change ANCR.FixCol from APC to ASG*	na

Part 7 Tissue	Description	Implemented by server?
991	LGOS: GoCBRef (as well as LSVS.SvCBRef) should be mandatory *LGOS.GoCBRef and LSVS.SvCBRef are now both mandatory*	Y
1007	PTRC as fault indicator - Update of description required *PTRC.Tr and Op and Str conditional (at least 1 of group)*	Y
1044	TapChg in AVCO *AVCO.TapChg is now optional*	na
1077	Rename DOnames within LTIM *LTIM.TmChgDayTm, changed to TmChgDay;* *LTIM.TmChgStdTm changed to TmChgStd*	na
1256	New DO for LTIM to set time "manually" *Add LTIM.TmSet*	na
1331	Mod, Beh and Health with q=TEST, client can't receive their states *Mod while in Blocked will always be processed*	Y
1426	Add two DO for leap seconds in LTIM *LTIM.Leap added*	na
1456	Annex A and Mod/Beh/Health *Mod.stVal writes always ignore test bits in controls*	Y
1568	ISAF.AlmReset ->transient *Change ISAF.AmlReset to transient*	na

Note: TISSUES 675, 735, 772, 775, 776, 878 are not relevant for conformance testing.

Table 3-241: Part 8 Tissues

Part 8-1 Tissue	Description	Implemented by server?
770	GoID type mismatch 18.1.1 and 18.1.2.5.2 *GoID string length is now 129*	Y
784	Tracking of control (CTS) *Tracking CTS has been added*	na
817	Fixed-length GOOSE float encoding *GOOSE float is encoded Tag-0x87, length=5, first octet=8*	na
827	Mandatory ACSI services (Part of 7-2 TISSUE resolution) *Change Table 111 (ServicesSupported): Add initiate, abort, and release.* *Change conditions for defineNamedVariables.*	Y
834	File dir name length 64 *Filename length changed from 32 to 64*	Y
951	Encoding of Owner attribute *xRCB.owner is encoded as 4 octets(IPv4) or 16 octets(IPv6)*	na
1040	More associate error codes *3 additional associate error codes added*	Y
1178	Select Response+ is non-null value *Response to SBO read should be <CO_CtrlObjectRef>*	Y
1324	The response- for DeleteNamedVariableList is not defined *numDeleted=0; error=service/object-constraint-conflict*	na
1345	Fixed-length GOOSE ASN.1 length encoding *GOOSE publisher shall always encode minimum size length field*	na
1441	Optional fields in buffered reports *Writing BRCB.optFld shall not cause a purgeBuf operation*	Y
1442	Journal variableTag for ReasonCode *Example in the standard is incorrect*	na
1453	Purge buffer on write to BRCB *PurgeBuf only occurs if different value is written*	Y
1454	Reports can be transmitted before write(RptEna=true) is confirmed	na

Part 8-1 Tissue	Description	Implemented by server?
1500	the response for DeleteNamedVariableList with a non-existent LN is not specified *CreateDataSet/DefineNamedVariableList specifying a non-existing LD/LN shall fail with access/object-non-existent*	na

Compare the TISSUE database for more details: http://iec61850.tissue-db.com

3.9 SCL logging

3.9.1 Overview of process

The process of creating a CID file to import into a UR is described in the Configuring the UR using SCL section on page 3-19. As described, the file can be created using EnerVista software or other, third party IEC 61850 configuration software. The file transfer to the UR can be done by EnerVista or another client using one of the specified protocols. Upon receipt of the complete CID file, the UR attempts to parse the file, extract the configuration data and settings that it requires, verify the data, and then apply the data. During the data application process, the UR is taken out of service automatically if required. When complete, the UR goes back to its previous in-service or out-of-service state.

During this entire process, an internal log file in the UR is updated to provide information and possibly error logs that can be used to check the outcome of the process. Transfer this log file from the UR and examine it. This happens automatically if EnerVista is used to import the CID file to the UR.

The name of the SCL Log file is "urscl.log". This file is stored in the UR in a RAM file system, thus the file content is volatile and is lost when the UR is powered off. To view the file, open a command window and enter

```
tftp 10.10.20.34 get urscl.log
```

substituting the IP address of the device for that shown.

3.9.2 SCL file storage on UR

To provide high reliability storage of the CID file in the UR, two copies are maintained in non-volatile memory. One is the working copy and the other is the backup copy. The working copy is the configuration that is currently active in the device, and the backup copy is the last known good copy. Thus, if a CID file storage operation is not completed properly, due to a loss of control power for example, the last good CID file is still be available for use. If a CID file transfer is halted partway through, or if the UR rejects a transferred CID file, the working file settings are still in effect.

ICD and IID files obtained from a UR are created on demand when requested by a client, and thus are not stored in the UR file system. The IID file is always up to date at the time that it is requested.

3.9.3 Generation of CID files

CID files can be produced by EnerVista, a third party Subsystem Configuration Tool (SCT), or even by editing the XML file manually using a text editor. It is recommended that CID files not created by EnerVista that are intended for use in a UR, be imported into EnerVista to check for errors prior to being transferred to a UR.

3.9.4 Schema version used by UR/EnerVista

All IEC 61850 SCL files, including ICD, IID, and CID files are formatted as XML and follow some version of the IEC 61850 XML schema.

UR firmware 7.4 uses IEC 61850 Edition 2, SCL schema version "2007", revision "B", release 1, date 2014-07-18.

It is very important that all CID files sent to the UR are well-formed XML, and are valid according to this IEC schema version. Note that the UR itself does not contain a schema validator. Validate the CID file schema on a computer before the file is transferred to the UR. While the UR performs a number of parsing and data validation checks as described as follows, send only syntactically valid files to the UR.

3.9.5 CID file processing steps

When a file transfer protocol is initiated to send a CID file to a UR, the UR remains in its current operational state until the completion of the file transfer and file validation processes. That is, if the IN SERVICE indicator is on, the UR remains in service, if the IN SERVICE indicator is off, the UR remains out of service.

Upon completion of the file transfer, the UR parses the file and performs a number of validation checks. First, the file is parsed and the data is extracted and stored in internal data structures. To accomplish this, each element and attribute is parsed and the associated data is converted for local storage. Since the file can contain multiple IED elements, the UR locates the "target" IED element and then extracts the appropriate information. See the Configured IED description (CID) file section on page 3-237 for a description of the CID file contents.

If the file is found to be valid, the UR takes itself out of service (the IN SERVICE indicator turns off if it is currently on), and the new configuration is applied. This includes all IEC 61850 configurations in the standard part of the CID file, and the UR settings in the Private settings element of the CID file. If the file is valid, the UR returns to service (the IN SERVICE indicator turns on) if it was in service before the file validation. The CID file import is complete.

If the file is found to be invalid, the existing UR settings remains in place.

In either case, check the urscl.log file to determine if there were any issues found with the CID file.

3.9.6 SCL log file format and examples

The urscl.log file is a simple text file that contains a number of individual entries describing the CID file validation process. Each entry has a timestamp and a description. The entries are categorized as follows:

- INFORMATION — This entry is for information purposes and does not indicate a problem with the CID file
- ERROR — This entry indicates that the UR encountered some type of problem when parsing, validating, or applying the data in the CID file
- INTERNAL ERROR — This entry indicates that the UR encountered an internal error. This type of entry does not normally occur.

The text after the category describes in more detail what was encountered. ERROR entries commonly describe the process or element that was in progress when the error occurred. Examples include "Parsing", "GOOSE subscription", "GOOSE e3-2.0", "ReportControl", and "DAI." Additional contextual information is provided so that the location of the problem can be found in the file.

The following is an example of a log file for a successful CID file import. Note that there are no errors reported and the CID file loaded successfully.

```
2015-12-08 09:00:27.823752 : === INFORMATION: SCL file parsing started. ===
2015-12-08 09:01:09.138276 : INFORMATION: Number of ExtRef elements = 0. Number of successful GOOSE/
R-GOOSE subscriptions = 0/0.
2015-12-08 09:01:09.900773 : INFORMATION: Total number of different data in fast scan list: 0.
2015-12-08 09:01:09.900773 : INFORMATION: Total number of different data in slow scan list: 0.
2015-12-08 09:01:17.173752 : INFORMATION: File '/ram:1/ur.cid' imported.
```

In the following log file, the CID file load fails because the target IED IP address does not match the actual IP address of the UR.

```
2015-12-08 09:20:29.890419 : === INFORMATION: SCL file parsing started. ===
2015-12-08 09:20:30.311192 : ERROR: target IED not found in file.
2015-12-08 09:20:30.311192 : ERROR: Parsing SCL file failed.
```

In the following log file, the CID file load fails because the lnType (logical node type) for the PhsIocPIOCx logical nodes is missing.

```
2015-12-08 09:24:23.357086 : === INFORMATION: SCL file parsing started. ===
2015-12-08 09:24:42.152856 : ERROR: lnType for Logical Node 'TEMPLATEProt/PhsIocPIOC1' not found.
2015-12-08 09:24:42.152856 : ERROR: lnType for Logical Node 'TEMPLATEProt/PhsIocPIOC2' not found.
2015-12-08 09:24:42.152856 : ERROR: lnType for Logical Node 'TEMPLATEProt/PhsIocPIOC3' not found.
2015-12-08 09:24:42.152856 : ERROR: lnType for Logical Node 'TEMPLATEProt/PhsIocPIOC4' not found.
```

In the following log file, the CID file load fails because the IED name attribute is set to "&Test," which is not valid according to the standard as the "&" character is not allowed here.


```
2015-12-08 09:34:55.007086 : === INFORMATION: SCL file parsing started. ===
2015-12-08 09:34:55.423761 : ERROR: Parsing, IED name='&Test' is invalid.
2015-12-08 09:34:55.423761 : ERROR: Parsing SCL file failed.
```

In the following log file, the CID file load fails because the DAI value for 'SPCSO01.sboTimeout' differs from the non-configurable value given in the ICD file.

```
2015-12-08 09:47:29.540418 : === INFORMATION: SCL file parsing started. ===
2015-12-08 09:47:48.471606 : ERROR: Read only DAI 'SPCSO01$sboTimeout' (valKind="RO") in LN
'TestMaster/GGIO2' cannot be changed.
```

In the following log file, the CID file import is successful. Note also that the UR Private element contained some non IEC 61850 settings that have been stored in the UR but do not take effect until the UR is rebooted. Most UR settings take effect without a reboot, and all others generate log entries as shown.

```
2015-12-09 03:10:55.329941 : === INFORMATION: SCL file parsing started. ===
2015-12-09 03:11:36.592443 : INFORMATION: UR reboot is required for setting 'DNP Binary Input Point x'
to take effect.
2015-12-09 03:11:36.629941 : INFORMATION: UR reboot is required for setting 'DNP Channel 1 Port' to
take effect.
2015-12-09 03:11:36.659114 : INFORMATION: Number of ExtRef elements = 0. Number of successful GOOSE/
R-GOOSE subscriptions = 0/0.
2015-12-09 03:11:37.419523 : INFORMATION: Total number of different data in fast scan list: 0.
2015-12-09 03:11:37.419523 : INFORMATION: Total number of different data in slow scan list: 0.
2015-12-09 03:11:41.704931 : INFORMATION: File '/ram:1/ur.cid' imported.
```

3.9.7 Troubleshooting log file errors

When an SCL log file contains an ERROR entry, examine the CID file to find the source of the problem. The log contains sufficient information to find and correct most minor problems. Note that the UR terminates the validation process on the first occurrence of most errors. Thus fixing one error in a CID file can result in the UR detecting the next occurrence of the same type of error. So when an error is found, determine if it is a single error or just the first occurrence of a systemic error.

As described in the Schema version used by UR/EnerVista section on page 3-228, the CID file needs to be well-formed XML that is valid according to the version of the IEC 61850 XML schema currently used by the UR.

When an SCL log file contains an INTERNAL ERROR entry, save the CID file and urscl.log file. Contact the GE information and call center as outlined in the instruction manual.

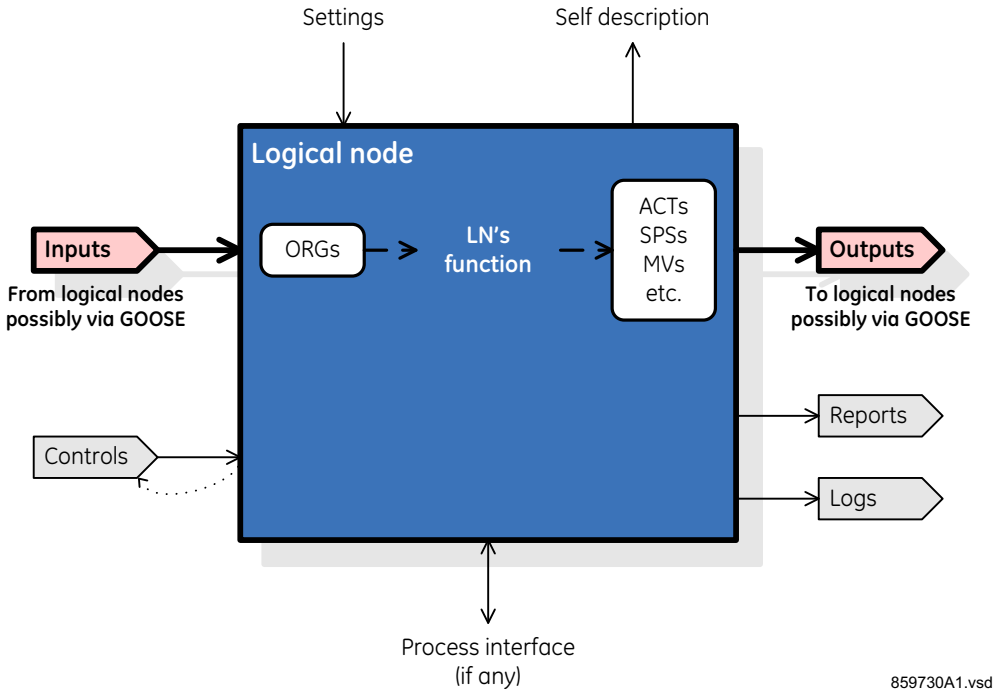
3.10 G2 implementation model for GOOSE configuration via SCL

3.10.1 Introduction

This section specifies the G2 implementation model for configuring the publishing and subscription of GOOSE messages using Substation Configuration Language (SCL) files compliant with IEC 61850 6:2009(E). For context, read the next section (E3-2.0 implementation model).

GOOSE is a communication service defined in the standards and is used to connect virtually an output signal of a logical node in one IED to an input of a logical node in another IED. In this section, the terms input and output are references to signal inputs to and outputs of logical nodes. In the standards, input and output often refer to signals from the process to an IED and from an IED to the process.

Figure 3-13: Generic logical node interfaces for the "logical nodes communicate with logical nodes" standard



The standards provide for the GOOSE configuration process to begin with each IED providing the names of the outputs it can publish in an SCL file. The SCL files at this stage have the file-name extension .icd (an acronym for IED Capability Description). The names and semantics of the outputs are strictly defined in the standards. As the names are standardized, and as SCL standardizes how they are presented in ICD files, all standards-compliant configuration tools are able to recognize the function of each output, even outputs of an IED of a manufacturer unknown to the tool.

However, definition and naming of logical node inputs are left almost exclusively to the IED manufacturer. There is no requirement in the standards for the ICD file to include descriptions of the logical node inputs or their function. Instead, the intent of the standards is that the IED manufacturer provides an "IED configurator" tool specific to the IED that this configurator knows what inputs each logical node has and their function, so that the IED configurator can determine which of the available outputs each can be connected to. The standards suggest but do not require that the IED configurator sends the input to output bindings and other settings to the IED through the use of an SCL file with the file extension .cid (an acronym for Configured IED Description).

In practice, a problem with this approach is that it requires the configuration engineers to use as many IED configurators as there are IED manufactures. As the configurators are from different manufacturers, the engineer needs to learn how to use each. Another problem is that many IEDs do not handle GOOSE publishing and subscribing in the "Logical nodes

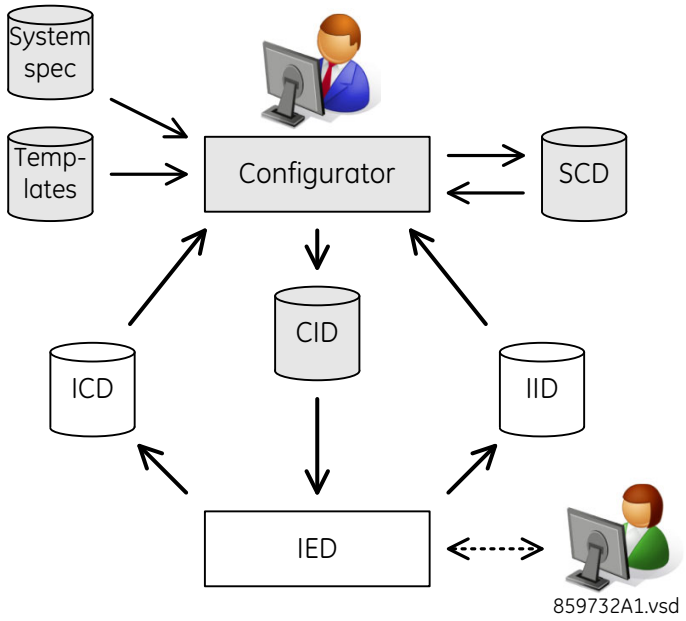
communicate with logical nodes" (that is, end-to-end) paradigm of the standards. Instead inputs and/or outputs are mapped to and from intermediate objects, such as GGIO using proprietary means, hiding their standardized names and thus their function from generic configurators.

The purpose of this section is to specify means to use the standards such that a single generic implementation model compliant Configurator can interoperate with all G2 implementation model-compliant IEDs sufficiently well that configuration of GOOSE publishing and subscription can be accomplished with moderate effort on the part of the engineer supervising the process. The means do not require proprietary IED configuration tools for GOOSE configuration. The method is strictly compliant with the standards, only requiring that some items optional in the standards be either mandatory or restricted.

3.10.2 Configuration process

The figure shows the SCL file flow in the configuration process under this implementation model.

Figure 3-14: SCL file flow for IED configuration



An ICD file is obtained from each IED. Each ICD file contains a full description of the capabilities of the IED and all of its factory configuration/settings. Included is a description of all logical node outputs that the IED is able to publish via GOOSE, and of all logical node inputs that it is able to drive from GOOSE subscriptions.

The Configurator imports system specifications, templates, and all ICD files. At this point, the Configurator has descriptions of all inputs and all outputs of all IEDs in the project. Various configuration activities occur, including binding of logical nodes to substation functions. Under the direction of the configuration engineer, the Configurator then determines which outputs are to connect to which inputs, and determines the GOOSE publish and subscription configuration required for these connections. The Configurator can for example use the semantics from the standards, logical node to power system device bindings, and power system device interconnectivity information to prepare for each input a list of likely output candidates for the engineer to select from. Typically, the complete configuration of the project including all configuration/settings of all IEDs is saved in an SCD (an acronym for System Configuration Description) file, although that is outside the scope of this document.

When project configuration is complete, the Configurator prepares a CID file for each IED. Each CID file contains at least all of the configuration/settings relevant to the target IED. In addition to the IED element of the target IED, the CID files have IED elements for each IED that the target IED subscribes to; these other IED elements contain descriptions of the GOOSE messages subscribed to.

When the project IEDs have been installed and connected, the CID files are transmitted to their target IED using an available file transfer protocol, such as SFTP or MMS. Before transfer is initiated, the target IED needs to have settings required by the file transfer protocol entered, such as the IP address. Also, the target IED needs to already have its project specific IED name setting made so that the target IED can determine which of the IED elements in the CID file applies to itself. The IED parses the received file and checks that the CID settings can be implemented; if so it adjusts its internal settings and re-starts using the new set of settings.

At this point, the GOOSE configuration process is complete. However, there can be other settings, such as for protection pickup, that the Configurator did not or cannot set. In this case, the manufacturer's IED setup tool (lower right in the figure) or perhaps the IED's front panel is used to complete these settings. To update the project records (that is, the SCD file) the Configurator obtains and imports an IID (an acronym for Instantiated IED Description) file from the IED. IID files contain a description of the capabilities of the IED and the values of its configuration/settings as of the moment the IID file was retrieved. The IED element for the concerned IED is the only IED element in the file. As a result, the values of the subscribed GOOSE message fields datSet, goID, and confRev, and the structure of the dataset are not contained in IID files unless non-standard means, such as Private elements or logical node extensions, are used. This information can be obtained from the CID or SCD files.

A variation of this sequence is to use the manufacturer's IED setup tool before the Configurator. In this case, the Configurator begins by importing the IID file rather than the ICD file.

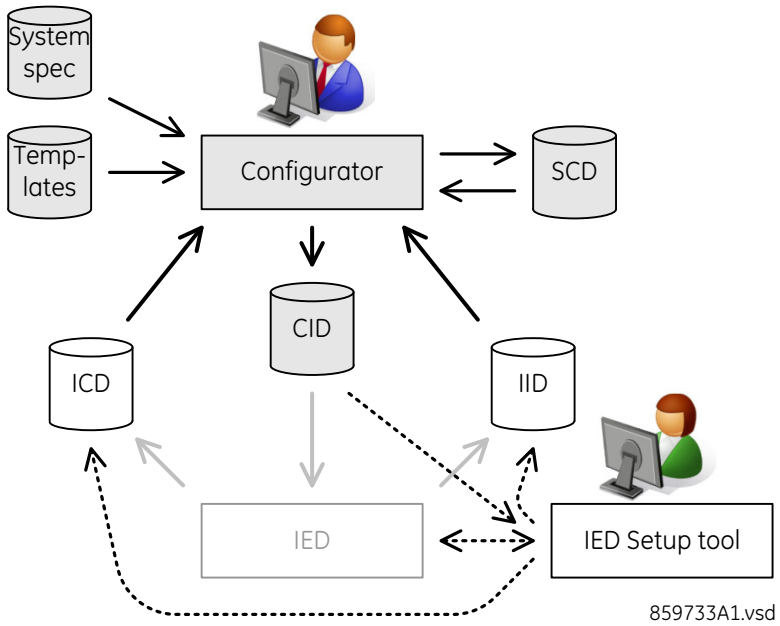
IID files can also be used long after the project is over to verify that the project settings are still present in the IED. The IID file contains the values of configRev, paramRev, and confRev, which are identical to those in the CID file if no setting changes have been made since the CID file was loaded.

3.10.3 Configuration process with IED setup tool

The GOOSE configuration process can also be completed up to the point where the configuration is sent to the IED without involving the IED. The IED setup tool provides the same ability as the IED to generate ICD and IID files and to consume CID files. See the following figure.

Use of the IED setup tool for configuring GOOSE is optional under normal conditions. However, if the hardware configuration of the IED is changed, for instance by changing the number or type of contact I/O modules, use of the IED setup tool can be required.

Figure 3-15: SCL file flow using IED setup tool



3.10.4 IED Capability Description (ICD) file

The ICD file contains one SCL element. The SCL element contains one Header element, one Communication element, and one IED element.

3.10.4.1 Header

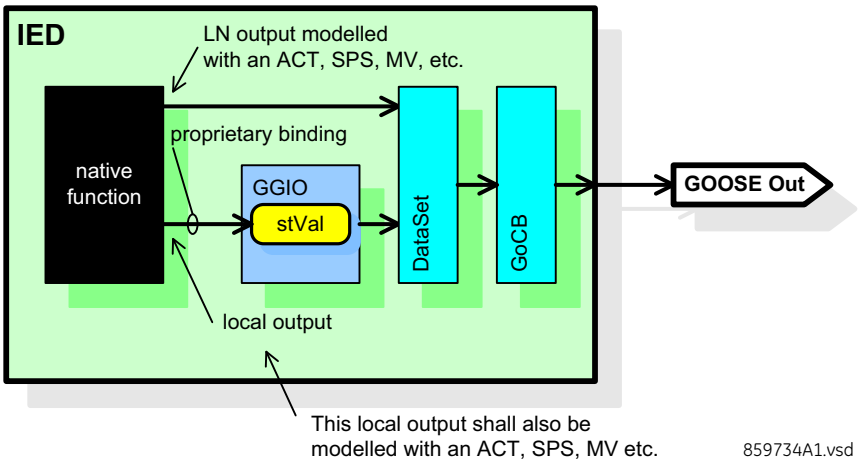
The Header element contains an id element attribute that has the make and model of the applicable IED.

3.10.4.2 Outputs

The ICD file describes an information model compliant with the standards that models all values that the IED is able to publish via GOOSE. These values are modeled within the so-called Public elements, that is, elements other than Private elements.

The values subject to these requirements include local (that is, non-standard or native) outputs that the IED is able to publish using means not defined in the standards. For example, if an IED can use non-standard means to map a local output to GGIO1.Ind1.stVal and then publish GGIO1.Ind1.stVal in a GOOSE message, then compliance to this implementation model requires that the local output be included as a named logical node output in the ICD file. This is required even though when the local output is published, the dataset member is GGIO1.Ind1.stVal rather than the local output. When a CID file is received that requires such a local output to be published, the IED allocates and configures the local resources as necessary to include the value of the local output in the GOOSE message.

Figure 3-16: Mapping local outputs



The extension rules of the standards are used to create data objects to model outputs where no suitable data objects are defined in the standards.

Each data object is to contain a d data attribute describing the IED quantity modeled. The description is to at least contain the manufacturer's designation of the quantity or some reference that can be used to find a detailed functional description of the output in the IED instruction manual.

As a result of compliance with this clause, a generic configurator on importing this ICD file has at least the IED designation of all publishable outputs. A generic configurator that can import the manufacturer's namespace also has access to semantic information on all publishable outputs.

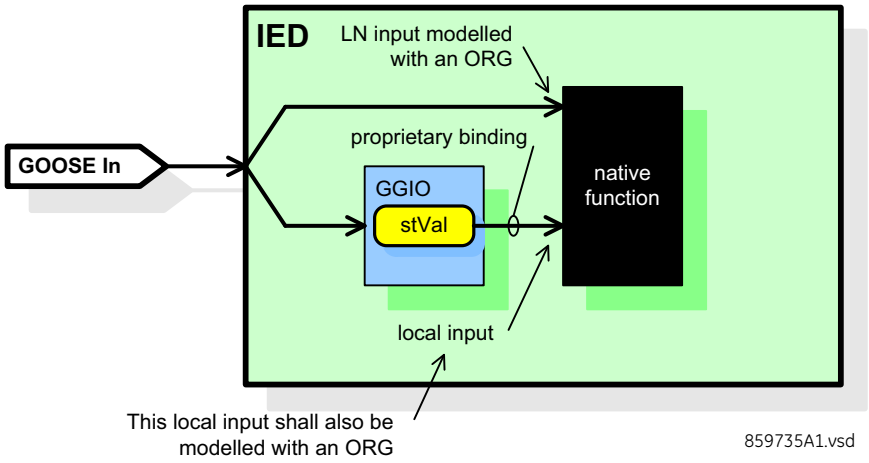
3.10.4.3 Inputs

The information model described by the ICD file also models all inputs that can be configured to receive values via GOOSE. These inputs are modeled within the so-called Public elements, that is. elements other than Private elements.

The inputs subject to these requirements include any which are able to receive values in GOOSE messages using means not defined in the standards. For example, if an IED can use standard means to receive values into GGIO1.Ind1.stVal and non-standard means to select GGIO1.Ind1.stVal to a local input of some function, then this implementation model requires

that this local input be included as an input in the ICD file. Similarly, a local input that can be selected to an internal signal that receives its value directly from GOOSE messages are also included in the model. When a CID file is received that requires such a local input to receive values from a GOOSE message, the IED is to allocate and configure the local resources as necessary to make this happen, which can include mapping the GOOSE value to a data attribute and using local means to connect this data attribute to the local input.

Figure 3-17: Mapping local inputs



Each input is to include in the ICD file a description of the input modeled. The description is to at least contain the manufacturer's designation of the input or some reference that can be used to find a detailed functional description of the input in the IED instruction manual.

As a result of compliance with this clause, a generic configurator on importing this ICD file has at least the IED designation of all inputs that can receive quantities via GOOSE.

One data object of common data class ORG is to be used to model each input that can be configured to receive values via GOOSE. This data object is to be described in the ICD file as follows.

- One LN element that is used to model the function that uses the input contains one DOI element with element attribute name with value equal to the name of the ORG data object representing the input. The ORG data object name needs to be unique among the data object names in the LN element and be one of the names defined for an ORG data object in the standards. One of the defined names (InRef1) is a general input reference, and thus can be used where no other defined name is suitable. Note that where the standards define a data object name that ends in a "1", they are implying that names with any number in place of the "1" are also defined. Thus the standards allow any number of inputs to be modeled in a logical node using ORG data objects. Where the input is a grouped setting, there is to be one ORG data object for each group. The first digit of the data object instance number is to be the group number.
- The DOI element contains one DAI element with element attribute name="setSrcRef". This DAI element is to contain a single Val element. The content of the Val elements is to be empty, or in cases where there is a factory-configured selection, a valid object reference to the output selected.
- The DOI element also contains one DAI element with element attribute name="setSrcCB". This DAI element is to contain a single Val element. The content of the Val element is to be empty.
- The DOI element also contains one DAI element with element attribute name="d". This DAI element is to contain a single Val element that contains a description of the input modeled.
- Other element attributes and element content defined as optional by the standards can be included, but if included are to be used strictly according to their semantic as defined by the standards.

3.10.4.4 Communication element

The Communication element contains one SubNetwork element for each Ethernet port of the IED that can with appropriate configuration support GOOSE publishing or subscription. Each of these SubNetwork elements is to contain one ConnectedAP element. Each of these ConnectedAP elements is to contain a GSE element for each factory-configured transmit GOOSE message on the corresponding Ethernet port.

Each GSE element is to contain one Address element, one MinTime element, and one MaxTime element. The Mintime element contains the factory-configured value of the sending delay on a data change between the first immediate sending of the change and the first repetition (the value of T1 in IEC 61850 8 1:2011 Figure 8). The Maxtime element contains the factory-configured value of the source supervision time in ms (within this time a failed message from the source is to be detected by the client, some multiple of the time T0 in IEC 61850 8 1:2011 Figure 8).

Each of the Address elements of the previous paragraph is to contain four P elements: one with type="MAC-Address" containing the factory configured destination address of the GOOSE message, one with type="APPID" containing the Application Identification number as four hexadecimal characters, one with type="VLAN-ID" containing the VLAN ID number as three hexadecimal characters, and one with type="VLAN-PRIORITY" containing the VLAN priority code.

Each GSE element in a given ConnectedAP element is to reference a different GOOSE control block using its cbName and ldInst element attributes. GSE elements in different ConnectedAP elements can reference the same GOOSE control block provided all GSE elements referencing a given GOOSE control block have the same address and time values.

3.10.4.5 IED element

The IED element is to have an element attribute name with a value equal to the factory-configured IED name, which is "TEMPLATE".

The IED element is to contain one Services element. This Services element is to contain a GSESettings element having element attributes cbName, datSet, and appID. The values of each of these element attributes are to be "Fix", "Conf", or "Dyn", depending on how the GOOSE control block attributes GoCBName, DatSet, and GoID can be modified. The value is to be "Conf" when the element attribute value can be modified via CID file transfer to the IED but not via MMS communication services, "Dyn" when the element attribute value can be modified via MMS communication services and via CID file transfer to the IED, and otherwise is to be "Fix".

The Services element also contains a GOOSE element having element attribute max. The value of this element attribute is set to the maximum number of GOOSE control blocks that the IED can support (max="0" means the IED is only a GOOSE subscriber).

The Services element is not to contain a ClientServices element with element attribute called goose.

The IED element also contains one AccessPoint element corresponding to each ConnectedAP element required for the Communication element. Each of these AccessPoint elements is to contain a Services element that in turn contains a ClientServices element having element attribute goose="true". Each of these AccessPoint elements also is to contain one GOOSE element. These GOOSE elements are to have element attribute max with value equal to the number of GOOSE messages that can be transmitted on the port. The IED element can contain other AccessPoint elements, but these are to have a ClientServices element having element attribute goose="false".

For Edition 2, one of the AccessPoint elements is to contain one Server element. All other AccessPoint elements are to contain one ServerAt element having element attribute apName with value equal to the name of the AccessPoint element containing the Server element.

For Edition 1, the AccessPoint element is to contain one Authentication element.

The Server element is to contain at least one LDevice element. Each LDevice element is to contain one LN0 element.

The LN0 elements are to contain amongst them a GSEControl element for each GOOSE control block that the IED is capable of implementing. In cases where the IED element contains multiple LN0 elements, the GSEControl elements can be distributed among the LN0 elements in any fashion.

Each GSEControl element is to have element attributes name, appID, and confRev. In cases where there is a factory-configured GOOSE dataset, the GSEControl element also is to have element attribute datSet. The datSet element attribute is to be omitted where the dataset is not factory-configured. The value of these element attributes are to be the factory configured values of the GOOSE control block attributes GoCBName, GoID, and ConfRev respectively. If element attribute datSet exists, its value is to be the factory-configured value of the GOOSE control block attribute DatSet.

Each GSEControl element having a datSet attribute is to have a corresponding DataSet element located in the same LN0 element as the GSEControl element. Each DataSet element is to contain an FCDA element for each factory-configured member of the dataset. The FCDA elements can reference any data attribute defined in the Server element that the IED is capable of publishing via GOOSE. FCDA elements are not to reference data objects (that is, omit the daName element attribute) except where the IED and all subscribing IEDs are capable of using such in GOOSE messages.

3.10.4.6 GOOSE subscription

For each GOOSE message that can be subscribed to, there is to be in the LDevice element an LN element with element attribute lnClass="LGOS". The LN element is to contain a DOI element with element attribute name="GoCBRef". The DOI element is to contain a DAI element with element attribute name="setSrcRef", and the corresponding DA element is to contain the element attribute valKind="Set". The DAI element is to contain a Val element. The content of the Val elements is to be empty.

Note that it is not practical under this implementation model to have factory-configured GOOSE subscription down to the individual input level. Configuration of inputs for GOOSE subscription consists of a reference to the external IED, and the factory is unaware of what external IEDs are to be connected or what their names are when the IED is deployed.

For this reason, external references are not included in ICD files.

3.10.5 Instantiated IED capability description (IID) file

IEDs conforming to this implementation model are to have the ability to export an IID file compliant with the standards. This IID file is to be as specified for the ICD file, except that rather than describing the IED with factory configuration and settings, it describes the configuration and settings in effect at the time of IID file export.

Note that it can happen that unbeknownst to the IED, a GOOSE message that it is subscribing to has been reconfigured, changing the outputs published. As the IED is unaware of this, it cannot be certain that the external object references given to it in a CID file continue to be correct.

Also, it can happen that means outside of the standards such as the IED setup tool or front panel can have been used to reconfigure which GOOSE message or which GOOSE dataset member is used by an input, changing the output used by the input without the IED having knowledge of the name of that output.

Nevertheless, the external references in the IID file are to be those in the last accepted CID file.

3.10.6 Configured IED description (CID) file

The CID file is to be equivalent to an ICD or IID file from the target IED for all elements and element attributes specified for the ICD file, except as provided in this clause, and except that rather than describing the IED with factory configuration and settings, it describes the required configuration and settings.

The value of the id element attribute in the Header element can be any string of length not greater than 64.

Modify the following reference names to their project-specific names. Where the name/id of an element is modified, change all references to it so as to maintain the integrity of the references.

- Sub-network name
- Access point name
- IED name
- Logical device ldName
- Data set name, provided the value of GSESettings element's element attribute datSet is other than "Fix"
- GOOSE control block name, provided the value of GSESettings element's element attribute cbName is other than "Fix"
- Logical node type id
- DO type id
- EnumType id

Change the following parameters to their project values:

- MAC address

- APPID
- VLAN ID
- VLAN priority
- MinTime
- MaxTime
- appID (GoID), provided the value of GSESettings element's element attribute appID is other than "Fix"
- confRev
- setSrcRef
- setSrcCB (including those for the LGOS logical nodes)

Where the ICD file contains a GSEControl element with no datSet element attribute, a datSet attribute can be added to the GSEControl element and a like-named DataSet element added to the LN0 element. The data set name can be any name that conforms to the standard and is unique within its containing logical node. The contents of the DataSet elements used for GOOSE can be replaced with any number of FCDA elements up to the number that the IED is capable of.

Where "true" is the value of the element attribute goose in a ClientServices element that is contained in a Services element that is contained in an AccessPoint element, the GSE elements in the ConnectedAP element corresponding to that AccessPoint element can be replaced with new GSE elements up to the limit imposed by the max element attributes in the GOOSE elements corresponding to that ConnectedAP. The replacement GSE elements are to conform to the same rules as given previously for GSE elements in ICD files.

In addition to the ConnectedAP elements derived from an ICD or IID file from the target IED, one ConnectedAP element for each IED the target IED subscribes GOOSE messages from is to be added to each Subnetwork element on which GOOSE messages from that IED are to be received. Each of these ConnectedAP elements is to contain a GSE element for each GOOSE message subscribed to that is identical to the GSE element for that GOOSE message in the publishing IED's CID file.

In addition to the IED element derived from an ICD or IID file from the target IED, the CID also contains one IED element for each IED that the target IED receives a GOOSE message from. These other IED elements are to be identical to the IED element in the publishing IED's CID file, except that the following elements and their content can be omitted:

- Services elements
- AccessPoint elements that do not contain a Server element
- SMVSecurity elements
- Association elements
- AccessControl elements
- Elements contained within LN0 elements other than GSEControl and DataSet elements
- GSEControl elements other than those for GOOSE messages subscribed to
- DataSet elements not referenced by any remaining GSEControl element
- LN elements not referenced by any remaining FCDA element
- LDevice elements that do not contain any remaining GSEControl or LN element
- Elements contained within LN elements
- Private elements

In addition to the DataTypeTemplates element content of an ICD or IID file from the target IED, the CID also is to contain the DataTypeTemplates element content of the CID files the target IED subscribes GOOSE messages from that is referenced by elements copied from those CID files.

A device receiving a CID file can determine which of the IED elements contains its configuration by finding an Address element that is an immediate child of a ConnectedAP element and that contains the MAC address of the receiving IED. The name element attribute of the target IED element has the same value as the iedName element attribute of this ConnectedAP element.

The CID file can contain additional elements unrelated to GOOSE subscription by the target IED. The CID file can even be the entire SCD file with only the id element attribute of the Header element changed, although this results in a larger file than necessary.

The relay makes available for upload the last CID file accepted exactly as received. Setting changes since the CID file was accepted are not reflected in the uploaded file in either the Private or Public sections.

3.10.7 Sample SCL files

The process is illustrated using a simple project involving two identical IEDs, each having a single overcurrent function and a single programmable contact output. The output of the overcurrent is TEMPLATELD1/PIOC1.Op.general, and the contact output is driven by the value selected by TEMPLATELD1/ConOutGGIO1.InRef1. Each also has the capability to publish one GOOSE message and to subscribe to one GOOSE message. The project requires an overcurrent condition detected by one IED to cause the closing of the contact output of the other IED.

3.10.7.1 ICD files

As the IEDs are identical, they have identical ICD files, as follows.


```
<?xml version="1.0" encoding="UTF-8"?>
<SCL xmlns="http://www.iec.ch/61850/2003/SCL" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.iec.ch/61850/2003/SCL SCL.xsd" version="2007" revision="A">
<Header id="ICD file for Acme Mini model 123" />

<Communication>
<SubNetwork name="W1" type="8-MMS">
<ConnectedAP iedName="TEMPLATE" apName="S1">
<GSE ldInst="LD1" cbName="GoCB1">
<Address>
<P type="MAC-Address">01-0C-CD-01-00-01</P>
<P type="APPID">3001</P>
<P type="VLAN-ID">000</P>
<P type="VLAN-PRIORITY">4</P>
</Address>
<MinTime>10</MinTime>
<MaxTime>1000</MaxTime>
</GSE>
</ConnectedAP>
</SubNetwork>
</Communication>

<IED name="TEMPLATE">

<Services>
<GSESettings appID="Conf" cbName="Conf" datSet="Conf"/>
<GOOSE max="1"/>
</Services>

<AccessPoint name="S1">
<Server>
<Authentication none="true"/>
<LDevice inst="LD1">

<LN0 inst="" lnClass="LLN0" lnType="LN0">
<GSEControl name="GoCB1" appID="GOOSE1"/>
</LN0>

<LN lnClass="LPHD" inst="1" lnType="LPHD" />

<LN lnClass="PIOC" inst="1" lnType="PIOC">
<DOI name="Op" desc="Instantaneous Overcurrent Operated" />
</LN>

<LN lnClass="GGIO" prefix="ConOut" lnType="GGIO"  inst="1">
<DOI name="InRef1" desc="Contact Output Control">
<DAI name="setSrcRef"><Val></Val></DAI>
```

```
<DAI name="setSrcCB"><Val></Val></DAI>
</DOI>
</LN>

<LN prefix="" lnClass="LGOS" inst="1" lnType="LGOS">
<DOI name="GoCBRef">
<DAI name="setSrcRef"><Val></Val></DAI>
</DOI>
</LN>

</LDevice>
</Server>

</AccessPoint>
</IED>

<DataTypeTemplates>

<LNodeType id="LN0" lnClass="LLN0">
<DO name="NamPlt" type="LN0NamPlt"></DO>
<DO name="Beh" type="Beh"></DO>
<DO name="Health" type="Health"></DO>
<DO name="Mod" type="Mod"></DO>
</LNodeType>

<LNodeType id="LPHD" lnClass="LPHD">
<DO name="PhyNam" type="PhyNam"></DO>
<DO name="PhyHealth" type="Health"></DO>
<DO name="Proxy" type="Proxy"></DO>
</LNodeType>

<LNodeType id="PIOC" lnClass="PIOC">
<DO name="Op" type="ACT" />
</LNodeType>

<LNodeType id="GGIO" lnClass="GGIO">
<DO name="InRef1" type="ORG" />
</LNodeType>

<LNodeType id="LGOS" lnClass="LGOS">
<DO name="St" type="SPS" />
<DO name="GoCBRef" type="ORG" />
</LNodeType>

<DOType id="ORG" cdc="ORG">
<DA name="setSrcRef" fc="SG" dchg="true" bType="ObjRef" />
<DA name="setSrcCB" fc="SG" qchg="true" bType="ObjRef" />
</DOType>

<DOType id="SPS" cdc="SPS">
<DA name="stVal" fc="ST" dchg="true" bType="BOOLEAN" />
<DA name="q" fc="ST" qchg="true" bType="Quality" />
<DA name="t" fc="ST" bType="Timestamp" />
</DOType>

<DOType id="ACT" cdc="ACT">
<DA name="general" fc="ST" dchg="true" bType="BOOLEAN" />
<DA name="q" fc="ST" qchg="true" bType="Quality" />
<DA name="t" fc="ST" bType="Timestamp" />
</DOType>

<DOType id="LN0NamPlt" cdc="LPL">
<DA name="vendor" fc="DC" bType="VisString255"  />
<DA name="swRev" fc="DC" bType="VisString255" ><Val>1v00</Val></DA>
<DA name="ldNs" fc="EX" bType="VisString255"  ><Val>IEC 61850-7-4:2007</Val></DA>
```

```
<DA name="configRev" fc="DC" bType="VisString255" ><Val>not configured</Val></DA>
</DOType>

<DOType id="Beh" cdc="ENS">
<DA name="stVal" fc="ST" dchg="true" dupd="true" bType="Enum" type="Beh" />
<DA name="q" fc="ST" qchg="true" bType="Quality" />
<DA name="t" fc="ST" bType="Timestamp" />
</DOType>

<DOType id="Health" cdc="ENS">
<DA name="stVal" fc="ST" dchg="true" dupd="true" bType="Enum" type="Health" />
<DA name="q" fc="ST" qchg="true" bType="Quality" />
<DA name="t" fc="ST" bType="Timestamp" />
</DOType>

<DOType id="Mod" cdc="ENC">
<DA name="stVal" fc="ST" dchg="true" bType="Enum" type="Mod" />
<DA name="q" fc="ST" qchg="true" bType="Quality" />
<DA name="t" fc="ST" bType="Timestamp" />
<DA name="ctlModel" fc="ST" dchg="true" bType="Enum" type="CtlModels" ><Val>status-only</Val></DA>
</DOType>

<DOType id="PhyNam" cdc="DPL">
<DA name="vendor" fc="DC" bType="VisString255" >
<Val>Acme Manufacturing Ltd., 1 North Rodeo Drive, Beverley Hills, CA, 90210</Val></DA>
</DOType>

<DOType id="Proxy" cdc="SPS">
<DA name="stVal" fc="ST" dchg="true" bType="BOOLEAN" ><Val>false</Val></DA>
<DA name="q" fc="ST" qchg="true" bType="Quality" />
<DA name="t" fc="ST" bType="Timestamp" />
</DOType>

<EnumType id="Beh">
<EnumVal ord="1">on</EnumVal>
<EnumVal ord="2">blocked</EnumVal>
<EnumVal ord="3">test</EnumVal>
<EnumVal ord="4">test/blocked</EnumVal>
<EnumVal ord="5">off</EnumVal>
</EnumType>

<EnumType id="Health">
<EnumVal ord="1">Ok</EnumVal>
<EnumVal ord="2">Warning</EnumVal>
<EnumVal ord="3">Alarm</EnumVal>
</EnumType>

<EnumType id="CtlModels">
<EnumVal ord="0">status-only</EnumVal>
</EnumType>
</DataTypeTemplates>

</SCL>
```

3.10.7.2 CID files

The configurator makes a CID file for each of the two IEDs. The changes from the ICD files are shown in **red**.

CID file for E1Q1BP1 (Publishing IED)

```
<?xml version="1.0" encoding="UTF-8"?>
<SCL xmlns="http://www.iec.ch/61850/2003/SCL" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.iec.ch/61850/2003/SCL SCL.xsd" version="2007" revision="A">
<Header id="CID file for E1Q1BP1" />
```

```
<Communication>
<SubNetwork name="W1" type="8-MMS">
<ConnectedAP iedName="E1Q1BP1" apName="S1">
<GSE ldInst="LD1" cbName="GoCB1">
<Address>
<P type="MAC-Address">01-0C-CD-01-00-01</P>
<P type="APPID">3001</P>
<P type="VLAN-ID">010</P>
<P type="VLAN-PRIORITY">7</P>
</Address>
<MinTime>5</MinTime>
<MaxTime>5000</MaxTime>
</GSE>
</ConnectedAP>
</SubNetwork>
</Communication>
<IED name="E1Q1BP1">

<Services>
<GSESettings appID="Conf" cbName="Conf" datSet="Conf"/>
<GOOSE max="1"/>
</Services>

<AccessPoint name="S1">
<Server>
<Authentication none="true"/>
<LDevice inst="LD1">

<LN0 inst="" lnClass="LLN0" lnType="LN0">
<DataSet name="GOOSE1DS">
<FCDA ldInst="LD1" prefix="" lnClass="PIOC" lnInst="1" doName="Op" fc="ST" daName="general"/>
</DataSet>
<GSEControl name="GoCB1" datSet="GOOSE1DS" appID="E1Q1BP1LD1_GOOSE1"/>
</LN0>

<LN lnClass="LPHD" inst="1" lnType="LPHD" />

<LN lnClass="PIOC" inst="1" lnType="PIOC">
<DOI name="Op" desc="Instantaneous Overcurrent Operated" />
</LN>

<LN lnClass="GGIO" prefix="ConOut" lnType="GGIO"  inst="1">
<DOI name="InRef1" desc="Contact Output Control">
<DAI name="setSrcRef"><Val></Val></DAI>
<DAI name="setSrcCB"><Val></Val></DAI>
</DOI>
</LN>

<LN prefix="" lnClass="LGOS" inst="1" lnType="LGOS">
<DOI name="GoCBRef">
<DAI name="setSrcRef"><Val></Val></DAI>
</DOI>
</LN>

</LDevice>
</Server>

</AccessPoint>
</IED>

<DataTypeTemplates>
…
```

In this simple case, the rest of this file is the same as the ICD file.

CID file for E1Q2BP1 (Subscribing IED)

```
<?xml version="1.0" encoding="UTF-8"?>
<SCL xmlns="http://www.iec.ch/61850/2003/SCL" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.iec.ch/61850/2003/SCL SCL.xsd" version="2007" revision="A">
<Header id="CID file for E1Q2BP1" />

<Communication>
<SubNetwork name="W1" type="8-MMS">
<ConnectedAP iedName="E1Q1BP1" apName="S1">
<GSE ldInst="LD1" cbName="GoCB1">
<Address>
<P type="MAC-Address">01-0C-CD-01-00-01</P>
<P type="APPID">3001</P>
<P type="VLAN-ID">010</P>
<P type="VLAN-PRIORITY">7</P>
</Address>
<MinTime>5</MinTime>
<MaxTime>5000</MaxTime>
</GSE>
</ConnectedAP>
</SubNetwork>
</Communication>

<IED name="E1Q2BP1">

<Services>
<GSESettings appID="Conf" cbName="Conf" datSet="Conf"/>
<GOOSE max="1"/>
</Services>

<AccessPoint name="S1">
<Server>
<Authentication none="true"/>
<LDevice inst="LD1">

<LN0 inst="" lnClass="LLN0" lnType="LN0">
<GSEControl name="GoCB1" appID="GOOSE1"/>
</LN0>

<LN lnClass="LPHD" inst="1" lnType="LPHD" />

<LN lnClass="PIOC" inst="1" lnType="PIOC">
<DOI name="Op" desc="Instantaneous Overcurrent Operated" />
</LN>

<LN lnClass="GGIO" prefix="ConOut" lnType="GGIO"  inst="1">
<DOI name="InRef1" desc="Contact Output Control">
<DAI name="setSrcRef"><Val>E1Q1BP1LD1/PIOC1.Op.general</Val></DAI>
<DAI name="setSrcCB"><Val>E1Q1BP1LD1/LLN0.GoCB1</Val></DAI>
</DOI>
</LN>

<LN prefix="" lnClass="LGOS" inst="1" lnType="LGOS">
<DOI name="GoCBRef">
<DAI name="setSrcRef"><Val>E1Q1BP1LD1/GoCB1</Val></DAI>
</DOI>
</LN>

</LDevice>
</Server>

</AccessPoint>
</IED>
<IED name="E1Q1BP1">
```

```
<AccessPoint name="S1">
<Server>
<Authentication none="true"/>
<LDevice inst="LD1">

<LN0 inst="" lnClass="LLN0" lnType="LN0">
<DataSet name="GOOSE1DS">
<FCDA ldInst="LD1" prefix="" lnClass="PIOC" lnInst="1" doName="Op" fc="ST" daName="general"/>
</DataSet>
<GSEControl name="GoCB1" datSet="GOOSE1DS" appID="E1Q1BP1LD1_GOOSE1"/>
</LN0>

<LN lnClass="PIOC" inst="1" lnType="PIOC">
<DOI name="Op" desc="Instantaneous Overcurrent Operated" />

</LDevice>
</Server>

</AccessPoint>
</IED>

<DataTypeTemplates>
…
```

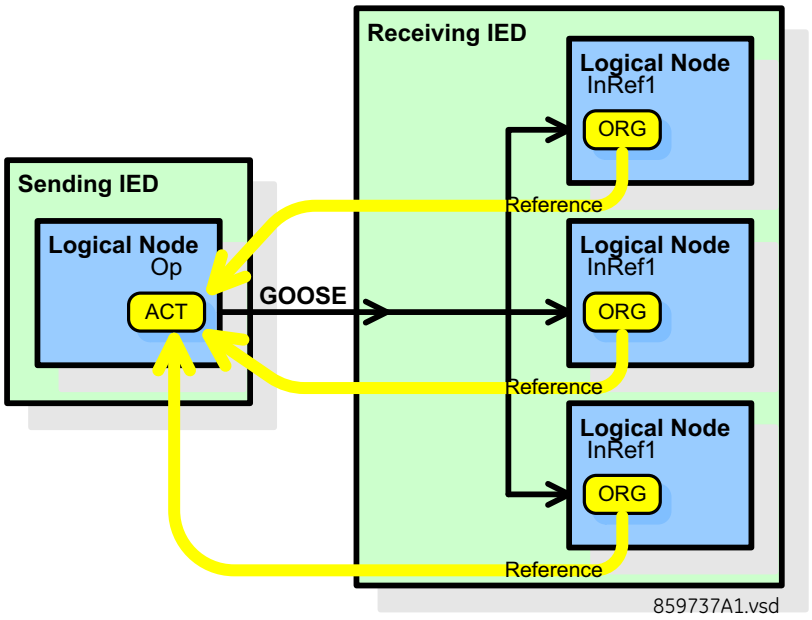
In this simple case, the rest of this file is the same as the ICD file.

3.10.8 Annex - Optional intermediate GOOSE reception objects

3.10.8.1 Introduction

IEC 61850 standards require that "logical nodes communicate with other logical nodes" (IEC 61850-7-1 Edition 2.0 2011-07 clause 9.6). That is to say, from an application viewpoint, the logical nodes (and only the logical nodes) can be understood as being in communication with one another. As illustrated in the following figure, the receiving logical nodes directly reference the sending logical node without an intermediate object in either the sending IED or the receiving IED. This is accomplished in the preceding implementation model through the use of an ORG object in the receiving logical nodes that contains a reference to the sending logical node.

Figure 3-18: Logical nodes communicate with logical nodes



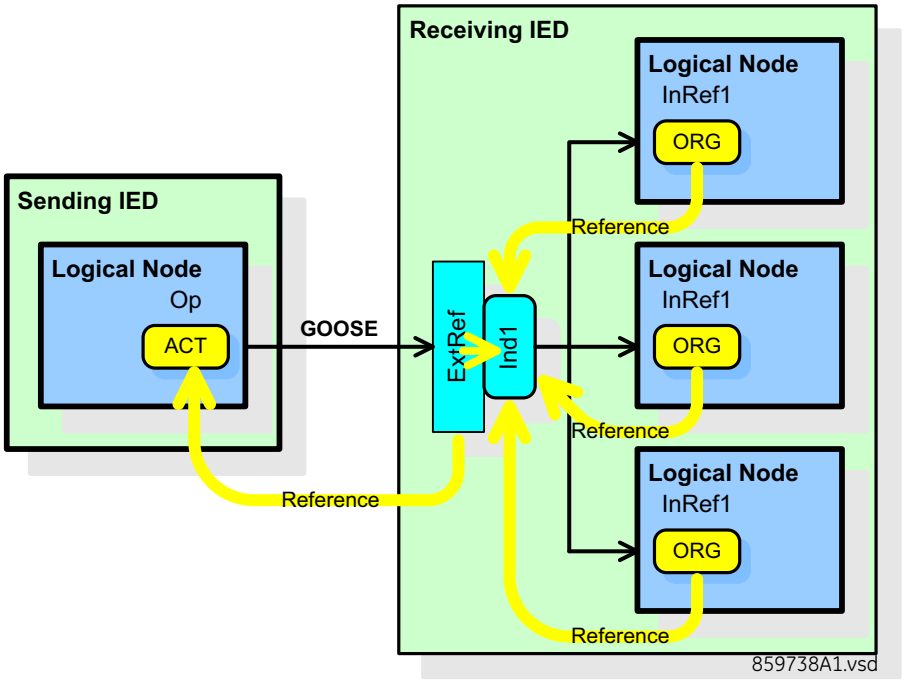
However, this requires that each logical node in the receiving IED that receives a signal via GOOSE needs to be individually configured with the final application-specific reference. This can be a disadvantage for example when a user wants to pre-configure a setting template SCL file for the receiving IED. In the template the user can want to define an application-specific signal, possibly used by multiple devices, that when in-service arrive via GOOSE. The ultimate source of the signal is not known at the template-building stage, so it is not possible to enter in the template an ObjectReference to it. Also, while at this stage, the generic semantic to the signal to be received is known; later at the system configuration stage the signals needed as inputs to the various logical nodes in the receiving IEDs may not be obvious, especially if the signal is input to user programmable logic.

A complementary example is where first a system configuration tool configures GOOSE connections only to the IED, then later an IED configurator completes the connection from where the system configurator left it to the destination logical node.

3.10.8.2 ExtRef

Therefore, the G2 implementation model also allows the IED to support in GOOSE connections intermediate objects at the receiving end, one of which is as shown in the figure.

Figure 3-19: Intermediate object at the receiving end



Each intermediate object is represented in the SCL as an ExtRef element and a data object (Ind1 in the figure) within the same logical node. In devices that implement this feature, the ICD file contains ExtRef elements each pre-configured with the name of the intermediate data object in its intAddr element attribute. The iedName, ldInst, prefix, lnClass, lnInst, doName, and daName element attributes of the ExtRef elements are user-configured to reference the source of the signal in the sending logical node, and the iedName, srcLDInst, srcPrefix, srcLNClass, srcLNInst, and srcCBName element attributes of the ExtRef elements are user-configured to specify the GOOSE control block and thus the GOOSE message the signal is sent in. The desc element attribute of the ExtRef element is available for the user to give the intermediate object an application-specific name or description.

In developing a template file, the configurator is used to assign an intermediate object of the appropriate basic data type for each signal that the IED needs to receive, by putting an application-specific name or description in the desc element attribute of its ExtRef element. The desc element attribute is used in later stages to make the intended use of this intermediate object apparent. In each logical node that uses the signal, the configurator is used to set the input ORG data

object to reference the stVal data attribute of the data object referenced by the corresponding intAddr element attribute. When template configuration is complete, the configurator exports either an IID or CID file depending on the tool used, which becomes the template file.

When applying such a template file at the system configuration stage, the configurator is used to put in the ExtRef element a reference to the signal source appropriate to the description in desc element attribute. The configurator is also used to configure a GOOSE control block and dataset in the sending IED to publish the signal, and to put in the ExtRef element a reference to this control block.

3.10.8.3 SCL file example

Were the example IED of clause 7 outlined earlier to support intermediate objects according to this annex, its ICD file then defines each of them with the lines similar to the following in one of its LN or LN0 elements, in this example, in GGIO3. Note that in this example only two such are defined; typically there are many more. The changes from the files are shown in **red**.


```
<LN lnClass="GGIO" prefix="ConOut" lnType="GGIO"  inst="1">
<DOI name="InRef1" desc="Contact Output Control">
<DAI name="setSrcRef"><Val></Val></DAI>
<DAI name="setSrcCB"><Val></Val></DAI>
</DOI>
</LN>
<LN lnClass="GGIO" prefix="" lnType="ExtRefs"  inst="3">
<Inputs>
<ExtRef desc="unassigned GOOSE Boolean input #1" intAddr="Ind1"/>
<ExtRef desc="unassigned GOOSE Analog input #1" intAddr="AnIn1"/>
</Inputs>
</LN>

<LNodeType id="ExtRefs" lnClass="GGIO">
<DO name="Ind1" type="SPS" />
<DO name="AnIn1" type="MV" />
</LNodeType>
```

To specify that the IED receives an unspecified "Overcurrent alarm" GOOSE signal and that this signal drives a contact output, the configurator copies the previous code to the template file for the subscribing IED modified as follows.

```
<LN lnClass="GGIO" prefix="ConOut" lnType="GGIO"  inst="1">
<DOI name="InRef1" desc="Contact Output Control">
<DAI name="setSrcRef"><Val>TEMPLATELD1/GGIO3.Ind1.stVal</Val></DAI>
<DAI name="setSrcCB"><Val></Val></DAI>
</DOI>
<LN lnClass="GGIO" prefix="" lnType="ExtRefs"  inst="3">
<Inputs>
<ExtRef desc="Overcurrent alarm" intAddr="Ind1"/>
<ExtRef desc="unassigned GOOSE Analog input #1" intAddr="AnIn1"/>
</Inputs>
</LN>
```

The CID for the example IED of clause 7 earlier then has these lines further modified as follows.

```
<LN lnClass="GGIO" prefix="ConOut" lnType="GGIO"  inst="1">
<DOI name="InRef1" desc="Contact Output Control">
<DAI name="setSrcRef"><Val>E1Q2BP1LD1/GGIO3.Ind1.stVal</Val></DAI>
<DAI name="setSrcCB"><Val></Val></DAI>
</DOI>
<LN lnClass="GGIO" prefix="" lnType="ExtRefs"  inst="3">
<Inputs>
<ExtRef desc="Overcurrent alarm" intAddr="Ind1"
iedName="E1Q1BP1" ldInst="LD1" prefix="" lnClass="PIOC" lnInst="1" doName="Op" daName="general"
srcLDInst="LD1" srcPrefix="" srcLNClass="LLN0" srcCBName="GoCB1"/>
```

```
<ExtRef desc="unassigned GOOSE Analog input #1" intAddr="AnIn1"/>
</Inputs>
</LN>
```

3.11 E3-2.0 implementation model for GOOSE configuration via SCL

3.11.1 Introduction

This section specifies the E3-2.0 GOOSE subscription implementation model in UR 7.30 and later releases.

The "E3 - Spanish Electricity Companies for Studies on IEC 61850" is a working group formed by the main Spanish electricity companies, which agreed on requirements to comply with for devices to be installed in their substations under the IEC 61850 Edition 1.0 standards. These requirements are contained in the document GROUP OF SPANISH ELECTRICITY COMPANIES FOR STUDIES ON IEC 61850 - MINIMUM COMMON SPECIFICATION FOR SUBSTATION PROTECTION AND CONTROL EQUIPMENT IN ACCORDANCE WITH THE IEC 61850 STANDARD, edition 3 (09.06.10). In that document, ANNEX D: GOOSE AND SV SUBSCRIPTION MODELING sets out requirements for two means of using the IEC 61850 6 Edition 1.0 Substation Configuration Language (SCL) to model GOOSE and Sampled Value configuration. Option A specifies a model wherein all subscription information is contained within the IED element modelling the subscribing IED. Option B specifies a model wherein a portion of the information required by the subscriber is contained in IED elements modelling the publishers.

While both options are technically compliant with edition 1.0 of the standard, Option B also is consistent with the standard envisioned for SCL. Except for being implemented under edition 1.0 of the standard, Option B is the same as the G2 Implementation Model, which is outlined later.

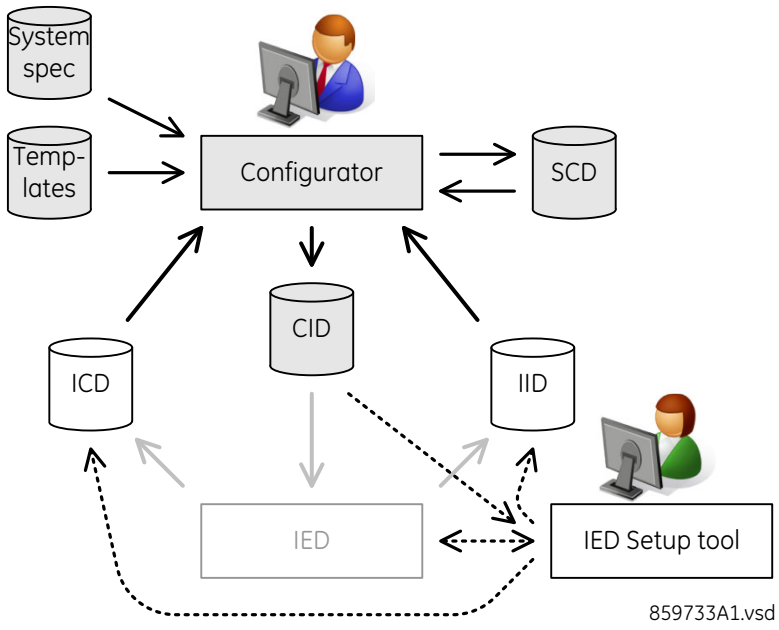
To satisfy customer preference, UR 7.30 and later releases allow SCL files to use either the G2 implementation model or the E3-2.0 implementation model. E3-2.0 is essentially E3 Option A, but with changes required to make it compliant with edition 2.0 of the standard.

3.11.2 Workflow

Workflow of SCL files under E3-2.0 is the same as described in the G2 implementation model. This is summarized in the figure that follows.

- Both the UR and EnerVista UR Setup software can generate ICD files, which contain all the factory default settings. Settings not modelled in Public elements are modelled in a Private element.
- Both the UR and EnerVista UR Setup software can generate IID files, which contain the settings as configured at the time the IID file was generated. IID files contain only a single IED element, the IED element modelling the target IED. In E3-2.0 IID files, all settings are included.
- Both UR and EnerVista UR Setup software can receive CID files. When the UR receives a CID file, it automatically verifies that it can implement the specified functionality, and if no problems are detected, reboots using the settings in the CID file. Although not shown in the figure, the most recently accepted CID file can be retrieved from the UR.
- The UR and EnerVista UR Setup software exchange 61850 configuration, including GOOSE configuration, using IID and/or CID file transfer exclusively. Modbus is retained as an alternative for non-61850 settings. Other than IP Address settings, SCL file transfer is the only means to configure 61850.

Figure 3-20: SCL file flow using IED setup tool



3.11.3 ICD files

Compared to the G2 model, E3-2.0 adds data objects to the LGOS logical nodes as specified in the following table. E3-2.0 configurations do not use the ExtRef elements used by the G2 model. Conversely, the G2 model does not use the LGOS data objects added by E3-2.0. Nevertheless, both the G2 model ExtRef elements and E3-2.0 LGOS data objects are included in ICD files.

Table 3-242: LGOS class for E3-2.0

LGOS class for E3-2.0			
Data object name	**Common data class**	**Explanation**	**T**
LNName		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22	
Data objects			
Descriptions			
NamPlt	LPL	Name plate of the logical node, with d data attribute	
Status information			
Beh	ENS	This logical node's behavior	
St	SPS	Status of the subscription (True = active, False = not active)	
Alm	SPS	Complement of St (True = not active, False = active)	
SimSt	SPS	Status showing that really Sim messages are received and accepted	
LastStNum	INS	Last state number received	
LastSqNum	INS	Last sequence number received	
ConfRevNum	INS	Last configuration revision number received	
Settings			
GoCBRef	ORG	Reference to the subscribed GOOSE control block	
MAC	VSG	Publisher IED MAC address	
APPID	ING	GOOSE message application identifier	
GoDatSetRef	ORG	Reference to the subscribed GOOSE DataSet	

LGOS class for E3-2.0			
Data object name	**Common data class**	**Explanation**	**T**
GoID	VSG	Identification for the GOOSE message	
ConfRev	ING	GOOSE configuration revision number	
InRefδδ	ORG	Data attribute intAddr specifies the intermediate data object receiving values in allData member δδ. Note that δδ is a number from 1 through to the maximum number of members the IED is capable of subscribing to using this LGOS.	

The number of GOOSE messages that can be subscribed to, and thus the number of LGOS logical nodes, is product-specific, and as such is specified elsewhere. Similarly, the maximum number of members that are allowed in a message is specified elsewhere.

3.11.4 CID files

A CID file is generated by modifying the configured values in an ICD or IID file, and otherwise keeping the ICD file/IID file as is. Both the G2 model ExtRef elements and the E3-2.0 LGOS data objects are retained in CID files.

E3-2.0 model configuration is assumed when only one IED element is present in the CID file.

The E3-2.0 GOOSE configuration consists of configuring the following LGOS settings for each GOOSE message that is to be subscribed to.

Unlike the G2 model wherein ORG data objects throughout the information model can reference an external data attribute, causing a GOOSE association to automatically form, under E3-2.0 external references are not allowed other than in LGOS#.GoCBRef and LGOS#.GoDatSetRef. Also, under E3-2.0 the GGIO3.Inputs.ExtRef are not allowed to be configured. Conversely, under G2, the LGOS#.InRef data objects used for E3-2.0 are not allowed to be configured. UR 7.30 and later do not accept CID files that violate these rules.

The GoCBRef setting is used by both G2 and E3-2.0 models. Otherwise, only when the UR or EnerVista UR Setup software detects that the E3-2.0 model was used for configuration are the other settings outlined here used.

GoCBRef

An empty string indicates that the LGOS is spare, and subscribes to no message. Otherwise, the setSrcRef data attribute is configured to an ACSI ObjectReference according to IEC 61850-7-2 clause 6.1.2.3 referencing the publishing GOOSE control block, except that if the publishing logical device uses function-related naming (that is, its LDevice element contains an ldName attribute), the LDName portion of the reference must use the value of ldName. Only GOOSE messages with the corresponding MMS Object Name in the gocbRef field are accepted.

MAC

The setVal data attribute is configured to a six-octet hyphen-separated string (for example, 01-0C-CD-01-00-00). Only GOOSE messages with this value of the Destination MAC address field are accepted.

APPID

The setVal data attribute is configured to an integer number from 0 through 65535. If the configured value is not zero, only GOOSE messages with the configured value in the APPID field are accepted. If the configured value is zero, any value in the APPID field is acceptable.

GoDatSetRef

The setSrcRef data attribute is configured to an ACSI ObjectReference according to IEC 61850-7-2 clause 6.1.2.3 referencing the publishing dataset, except that if the publishing logical device uses function-related naming (that is, its LDevice element contains an ldName attribute), the LDName portion of the reference must use the value of ldName. Alternatively, the setSrcRef data attribute can be configured to the empty string. If the configured value is not the empty string, only GOOSE messages with the corresponding MMS Object Name in the datSet field are accepted. If the configured value is the empty string, any value in the datSet field is acceptable.

GoID

The setVal data attribute is configured to a VisibleString with a maximum size of 129 octets. If the configured value is not the empty string, only GOOSE messages with the corresponding string in the goID field are accepted. If the configured value is the empty string, any value in the goID field is acceptable.

ConfRev

The setVal data attribute is configured to an integer number from 0 through 2147483647. If the configured value is not zero, only GOOSE messages with the configured value in the confRev field are accepted. If the configured value is zero, any value in the confRev field is acceptable.

InRefδδ

The intAddr data attribute is configured to either 1) a string that references the intermediate data attribute to which the values received in the δδth member of accepted GOOSE messages are saved, or 2) in case the δδth member is not subscribed to, "BOOLEAN", "FLOAT32", "INT32", "Dbpos", "Quality", or "Timestamp" according to the published type, or 3) "" (empty string) in the case where δδ is greater than the number of members in the subscribed GOOSE.

The first InRefδδ wherein intAddr is the empty string marks the end of the GOOSE message. Any following InRefδδ are ignored.

The format of LGOS#.InRefδδ.intAddr references is the referenced logical node name, a period, the data object name, a period, and the data attribute name. The LGOS#.InRefδδ.intAddr data attributes are in the same IED and same LDevice element as the referenced intermediate data attribute, so inclusion of the IED name and logical device instance name is unnecessary. In UR 7.30 and later, the referenced logical node name is always "GGIO3". The data object name is either Indψ for BOOLEAN members, AnInψ for FLOAT32 members, or PosIndψ for double-point status members, where ψ is the data object instance number. The data attribute name is either stVal for BOOLEAN or double point status members, mag.f for FLOAT32 members, q for Quality members, or t for Timestamp members.

An example of LGOS#.InRefδδ.intAddr reference is as follows: GGIO3.Ind001.stVal

Note that LGOS#.InRefδδ data attribute setSrcRef is mandatory under the standard and is present. UR 7.30 and later ignores any value in this data attribute on input, and may or may not preserve its value on output.

3.11.5 IID files

In UR-generated IID files, the LGOS configuration values outlined are identical to those in the most recently accepted CID file.

EnerVista UR Setup software offers the user a choice to generate an E3-2.0 model IID file or a G2 model IID file.

UR Family

Chapter 4: IEC 61850 Ed. 1 communication

This chapter outlines the IEC 61850 Edition 1 tables. See the previous chapter for information on the protocol.



The protocol applies when ordered with the product. Check your order code.

4.1 Model implementation conformance statement (MICS)

This model implementation conformance statement (MICS) details the information model supported by a particular UR device, including implemented logical devices, logical nodes, data objects, and data attributes. It is the top-level IEC 61850 data model. The information model also contains implemented control blocks and datasets.

The information model of a UR device depends in general on the device's order code, and it can vary widely from product to product and from option to option. The complete information model for a particular UR device with a particular order code, as it exists with factory default settings, is embodied in the device's IED capability description (ICD) file. A device's ICD file can be obtained from the device itself or from the EnerVista UR Setup software.

This section contains an outline of the information model of the UR family of devices; the information model of a particular UR device consists of the subset of what is shown here that is relevant to that UR device.

In order to contain the size of this chapter, the following repetitious data objects and data attributes are omitted from this outline. These are nonetheless implemented in the device.

Table 4-1: Common data objects and attributes

Name	Description
Beh	The data object Beh is mandatory in every logical node. The value of Beh.stVal in LLN0 of the Master logical device is test/blocked if the FlexLogic operand ANY MAJOR ERROR is On, otherwise test/blocked if the **TEST MODE FUNCTION** selection is Test-Blocked, otherwise test if the **TEST MODE FUNCTION** selection is Test, otherwise on. In all other logical nodes, the value of Beh.stVal is off if the function modeled by the logical node has a Function Disabled/Enabled setting and that setting is selected Disabled, otherwise is the same as the value of Beh.stVal in the Master LLN0.
NamPlt	Although optional, the data object NamPlt is instantiated in every logical node except LPHD1. This data object contains in its d data attribute a natural language description of the UR element the containing logical node is modelling. It is included below only in the Master logical device, as there it contains several important data attributes not found in the others.
t	The data attribute t (TimeStamp) is mandatory in every status, measurand and control data object, and reflects the UR device UTC time at last value change of the status, measurand, control, or q values of the containing data object.

Name	Description
q	The data attribute q (Quality) is mandatory in every status, measurand and control data object, and reflects the quality of the status, measurand and control values of the containing data object. q is fixed at zero in cases where the value is an internal UR device mode or status, and thus the value is known to be good, is unaffected by test mode, cannot be operator blocked and cannot be substituted. Otherwise, q is set according to the following table. Note that the value of Beh.stVal of the logical node containing the Quality data attribute is as described a few paragraphs earlier in this section.
d	This textual description is in every logical node. When in a NamPlt data object, the description refers to the logical node, otherwise it describes the data object it is in. These data attributes are readable via MMS services and reconfigurable via SCL file download.
dataNs	The data name space is included in data objects that extend those specified by the logical node class in the standard. Where the extended data object is defined in IEC 61850 7 4, its value is "IEC 61850-7-4:2007A". Otherwise, it has the value "GE Multilin UR Namespace:2015A" and is defined in the GE Namespace subsection of this section. These data attributes are readable via MMS services.

Table 4-2: Typical Quality data attribute values in UR devices

Containing logical node's Beh.stVal	q. validity	q. test	q. detailQual	q. source	q. operatorblocked
on	good	false	0	process	false
test	good	true	0	process	false
test/blocked	invalid if ANY MAJOR ERROR, else good	true	0	process	false
off	invalid	false	0	process	false

Many of the UR family device elements have multiple instances, and in many cases the number of instances depends on the product or the device's order code. Also, many UR elements have operands and/or settings that are repetitive, such as for every phase, or for every step. Again for brevity, in the following information model outline a template representing multiple logical nodes or multiple data objects is often used. These templates are identified with a Greek or punctuation character, such as γ or #, in the logical node/data object name. In a UR device, the template is instantiated multiple times with the punctuation or Greek character replaced with the appropriate instance number or instance identifier.

The R/W/C column in the following tables is coded as follows:

- R — Value of the data object or data attribute is readable via MMS services
- W — Value of the data object or data attribute is writable via MMS services
- C — Value of the data object or data attribute is configurable via SCL file download
- Ctrl — The data object can be controlled via MMS services

The logical nodes implemented in UR devices since version 7.30 are sorted into six logical devices. The table outlines the six logical devices and the general rules for the fixed assignment of logical nodes to them. Each logical device has a section in this chapter that defines the logical nodes implemented for that logical device. In UR 7.40 and later, new LDevice elements other than those originally in the Master logical device can be moved between LDevice elements, and LDevice elements containing no LN elements can be removed.

Table 4-3: Logical devices

Logical device	Contains logical nodes modeling...
Master	communications, including GOOSE, reports, Remote I/O, Direct I/O, Virtual Inputs, Modbus, DNP, and so on. Setting group control. This is the root logical device.
Protection (Prot)	protection functions
Control (Ctrl)	control and monitoring functions
System	power system devices: breakers, switches, CTs, VTs, and so on, including interface to these such as AC inputs, contact I/O, transducer I/O, HardFiber I/O
Metering (Meter)	metering and measurement (other than PMU), including Signal Sources
General (Gen)	FlexLogic, virtual outputs, non-volatile latches, FlexElements, FlexMath, recording (for example oscillography), security, front panel, clock

4.1.1 Master (root) logical device

The Master logical device contains communications-related logical nodes, including GOOSE, reports, log, and virtual inputs.

The logical devices in UR family devices are arranged in a hierarchy, with the Master logical device as the root logical device and all other implemented logical devices direct descendants. The effect of this arrangement is that the scope of certain items in the Master logical device includes the entire hierarchy, as outlined in the following table.

Table 4-4: Master/root data objects and attributes

Name	Description
Mod	The controllable data object Mod controls the test mode selection of the UR device and thus affects the status of Beh data objects and of q data attributes
configRev	The configurable data attribute configRev has a scope that includes the entire UR device. Modify this attribute whenever any logical node gets a new semantic use, for example an instance of a CSWI is now serving a different physical switch or an instance of a logical node PDIS is now used for another zone. Also modify this attribute whenever any data object gets a new semantic use, for example the use of ConInGGIO.Ind1 changes from "Door open" to "Fire alarm". As it is not in general possible for the device to know that such a change has occurred, you need to revise the value of configRev.
paramRev	The configurable data attribute paramRev has a scope that includes the entire device, and thus is modified whenever any setting in the device changes. The UR increments the value of paramRev by one whenever one or multiple setting changes occurs in one Modbus write request by any means (front panel, Modbus, or MMS) other than by SCL file download. Incrementing occurs whether or not the setting is represented in the information model. When a UR device or EnerVista UR Setup accepts an SCL file, paramRev is set to the value in that SCL file. When EnerVista UR Setup changes one or more settings, and prepares an SCL file, it increments paramRev to the next higher multiple of 10 000.
SCGB	The setting group control block in the Master logical device has a scope that includes the entire device due to the UR logical device hierarchy. That is to say, all grouped settings are controlled form this one control block.

4.1.1.1 Event recorder (EvtRcd)

See LLN0.

4.1.1.2 Logical node zero (LLN0)

This element is instantiated in all UR devices.

The following is specific to the Master logical device. LLN0 in other logical devices have different content.

Table 4-5: Logical node zero data objects

LNName: LLN0		LDevice inst: Master		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		INS			This logical device's behaviour	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
Health		INS			This physical device's health	R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
On		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST			R
Off		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST			R
Zero		MV			Only instantiated in the Master logical device	R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32				R
Mod		INC			This device's mode	R/Ctrl
	ctlVal	ENUMERATED	CO			R
	stVal	ENUMERATED	ST			R

LNName: LLN0		LDevice inst: Master		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
		ENUMERATED	ST			R
	ctlModel	CtlModels	CF	LLN0.Mod.ctlModel	2, the code for SBO control with normal security according to IEC 61850-7-2.	R/C
		CtlModels	CF			R
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
TstMod		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST	IED Beh Test RLY IN TEST MODE		R
TstBlkMod		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST	IED Beh Test-Blocked RLY IN TESTBLK MODE		R
OnMod		SPS			Only instantiated in the Master logical device	R
	stVal	BOOLEAN	ST	IED Beh On RLY IN ON MODE		R
GrRef		GEORG			Reference to root logical device	R
	setSrcRef	VISIBLE STRING255	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R
MltLev		SPG			Instantiated only in the Master logical device	R
	setVal	BOOLEAN	SP			R
InRef11		GEORG			TEST MODE INPUT setting	R
	setSrcRef	VISIBLE STRING255	SP	TEST MODE INPUT	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef12		GEORG			TEST-BLK MODE INPUT setting	R
	setSrcRef	VISIBLE STRING255	SP	TEST-BLK MODE INPUT	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.1.3 Physical device information (LPHD1)

This element is instantiated in all UR devices.

Table 4-6: Physical device data objects

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
PhyNam		DPL			This physical device's name plate	R
	vendor	VISIBLE STRING255	DC	"GE Multilin"		R
	swRev	VISIBLE STRING255	DC	Firmware revision, e.g. "7.30"		R
	serNum	VISIBLE STRING255	DC	The serial number of this unit.		R
	model	VISIBLE STRING255	DC	The order code of this unit.		R

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	location	VISIBLE STRING255	DC	Location		R/C
	name	VISIBLE STRING64	DC	RELAY NAME		R/C
	latitude	FLOAT32	DC	Latitude		R/C
	longitude	FLOAT32	DC	Longitude		R/C
	altitude	FLOAT32	DC	Altitude		R/C
PhyHealth		INS			This physical device's health	R
	stVal	ENUMERATED	ST			R
Proxy		SPS			Indicates if this LN is a proxy	R
	stVal	BOOLEAN	ST			R
RsStat		SPC			Mapped to command CLEAR ALL RELAY RECORDS	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	LPHD1.RsStat.ctlModel	1, the code for direct control with normal security; 2 is code for SBO with normal security; 0 is for status only according to IEC 61850-7-2. Enhanced security is not supported as there is no means of confirming successful execution of the control command.	R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
MMSClnts		MV			Number of MMS client connections active	R
	mag.i	INT32				R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	sVC.scaleFactor	FLOAT32				R
	sVC.offset	FLOAT32				R
AnyErr		SPS			ANY SELF TESTS operand	R
	stVal	BOOLEAN	ST	ANY SELF TESTS		R
MajorErr		SPS			ANY MAJOR ERROR operand	R
	stVal	BOOLEAN	ST	ANY MAJOR ERROR		R
MinorErr		SPS			ANY MINOR ERROR operand	R
	stVal	BOOLEAN	ST	ANY MINOR ERROR		R
BatFail		SPS			BATTERY FAIL operand	R
	stVal	BOOLEAN	ST	BATTERY FAIL		R
ClkUnsynch		SPS			CLOCK UNSYNCHRONIZED operand	R
	stVal	BOOLEAN	ST	CLOCK UNSYNCHRONIZED		R
DrcDevOff		SPS			DIRECT DEVICE OFF operand	R
	stVal	BOOLEAN	ST	DIRECT DEVICE OFF		R
DrcRingBrk		SPS			DIRECT RING BREAK operand	R
	stVal	BOOLEAN	ST	DIRECT RING BREAK		R

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EqpMismat		SPS			EQUIPMENT MISMATCH operand	R
	stVal	BOOLEAN	ST	EQUIPMENT MISMATCH		R
FlexErrTkn		SPS			FLEXLOGIC ERR TOKEN operand	R
	stVal	BOOLEAN	ST	FLEXLOGIC ERR TOKEN		R
IrigbFail		SPS			IRIG-B FAILURE operand	R
	stVal	BOOLEAN	ST	IRIG-B FAILURE		R
LatchErr		SPS			LATCHING OUT ERROR operand	R
	stVal	BOOLEAN	ST	LATCHING OUT ERROR		R
OscilGOOSE		SPS			Oscillatory GOOSE operand	R
	stVal	BOOLEAN	ST	Oscillatory GOOSE		R
Eth1Fail		SPS			FIRST ETHERNET FAIL operand	R
	stVal	BOOLEAN	ST	FIRST ETHERNET FAIL		R
PtpFail		SPS			PTP FAILURE operand	R
	stVal	BOOLEAN	ST	PTP FAILURE		R
RxGooseOff		SPS			RxGOOSE OFF operand	R
	stVal	BOOLEAN	ST	RxGOOSE OFF		R
RrtdFail		SPS			RRTD COMM FAIL operand	R
	stVal	BOOLEAN	ST	RRTD COMM FAIL		R
Eth2Fail		SPS			FIRST ETHERNET FAIL operand	R
	stVal	BOOLEAN	ST	FIRST ETHERNET FAIL		R
Eth3Fail		SPS			FIRST ETHERNET FAIL operand	R
	stVal	BOOLEAN	ST	FIRST ETHERNET FAIL		R
SntpFail		SPS			SNTP FAILURE operand	R
	stVal	BOOLEAN	ST	SNTP FAILURE		R
SysExcp		SPS			SYSTEM EXCEPTION operand	R
	stVal	BOOLEAN	ST	SYSTEM EXCEPTION		R
TempMnt		SPS			TEMP MONITOR operand	R
	stVal	BOOLEAN	ST	TEMP MONITOR		R
UNotPrgm		SPS			UNIT NOT PROGRAMMED operand	R
	stVal	BOOLEAN	ST	UNIT NOT PROGRAMMED		R
PBusFail		SPS			PROCESS BUS FAILURE operand	R
	stVal	BOOLEAN	ST	PROCESS BUS FAILURE		R
PBusTrbl		SPS			PROCESS BUS TROUBLE operand	R
	stVal	BOOLEAN	ST	PROCESS BUS TROUBLE		R
VoltMntr		SPS			VOLTAGE MONITOR operand	R
	stVal	BOOLEAN	ST	VOLTAGE MONITOR		R
BrckTrbl		SPS			BRICK TROUBLE operand	R
	stVal	BOOLEAN	ST	BRICK TROUBLE		R
RtdTrbl		SPS			RTD TROUBLE operand	R
	stVal	BOOLEAN	ST	RTD TROUBLE		R
TdrTrbl		SPS			TDR TROUBLE operand	R
	stVal	BOOLEAN	ST	TDR TROUBLE		R
RlyUTCTms		INS			Relay UTC time	R

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	INT32	ST	Modbus register 41A0h value, i.e., "Relay time clock set time" register value after converting to UTC (if time zone and DST is used)		R

4.1.1.4 FlexLogic operand interface (GGIO1)

This element is instantiated in all UR devices.

Table 4-7: FlexLogic data objects

LNName: <configured GGIO1 prefix>GGIO1		LDevice inst: Master		UR element: FlexLogic Operand Interface functionality		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Indψψψ		SPS			The name of the operand selected by setting GGIO1 INDICATION ψ	R
	stVal	BOOLEAN	ST			R

4.1.1.5 Virtual inputs (GGIO2)

This element is instantiated in all UR devices.

Table 4-8: Virtual input data objects

LNName: <configured GGIO2 prefix>GGIO2		LDevice inst: Master		UR element: Generic controllable single point		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
SPCSOψ		SPC			Status and control of FlexLogic operand Virt Ip ψ On	R/Ctrl
	stVal	BOOLEAN	ST	FlexLogic operand Virt Ip ψ On		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	GGIO2 CF SPCSO ψ CTLMODEL		R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R

4.1.1.6 FlexAnalog operand interface (GGIO4)

This element is instantiated in all UR devices.

Table 4-9: FlexAnalog data objects

LNName: <configured GGIO4 prefix>GGIO4		LDevice inst: Master		UR element: FlexAnalog Operand Interface functionality		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
AnInψψ		MV			OFF	R
	instMag.f	FLOAT32		the operand selected by setting ANALOG IN ψ VALUE		R
	mag.f	FLOAT32				R

LNName: <configured GGIO4 prefix>GGIO4		LDevice inst: Master		UR element: FlexAnalog Operand Interface functionality		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	db	INT32U	CF	ANALOG IN ψ DB		R/W/C
	zeroDb	INT32U	CF			R
DbMaxψψ		ASG			Value of max. in deadband calculations	R
	setMag.f	FLOAT32		ANALOG IN ψ MAX		R/C
	minVal.f	FLOAT32		-1 000 000 000 000		R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R
DbMinψψ		ASG			Value of min. in deadband calculations	R
	setMag.f	FLOAT32		ANALOG IN ψ MIN		R/C
	minVal.f	FLOAT32		-1 000 000 000 000		R
	maxVal.f	FLOAT32				R
	stepSize.f	FLOAT32				R

4.1.2 Protection (Prot) logical device

The Prot logical device contains logical nodes that model protection and protection-related functions.

The Prot logical device is available when the IEC 61850 option is purchased with the UR device.

4.1.2.1 Logical node zero (LLN0)

This element is instantiated in all UR devices implementing the Prot logical device.

Table 4-10: Logical node zero data objects for protection

LNName: LLN0		LDevice inst: Prot		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		INS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		GEORG			Reference to root logical device	R
	setSrcRef	VISIBLE STRING255	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

4.1.2.2 Auxiliary overvoltage (AuxOv)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60.

Table 4-11: Auxiliary overvoltage data objects

LNName: AuxOvPTOV#		LDevice inst: Prot		UR element: Auxiliary Overvoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			AUX OV# PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	AUX OV# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			AUX OV# OP operand	R

LNName: AuxOvPTOV#		LDevice inst: Prot		UR element: Auxiliary Overvoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	general	BOOLEAN	ST	AUX OV# OP		R
Dpo		SPS			AUX OV# DPO operand, which is the inverse of AUX OV PKP	R
	stVal	BOOLEAN	ST	AUX OV# DPO		R
BlkRefγ		GEORG			AUX OV# BLK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	AUX OV# BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.3 Auxiliary undervoltage (AuxUv)

This element is instantiated in the following products: C60, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60.

Table 4-12: Auxiliary undervoltage data objects

LNName: AuxUvPTUV#		LDevice inst: Prot		UR element: Auxiliary Undervoltage element# functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			AUX UV# PKP operands	R
	general	BOOLEAN	ST	AUX UV# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			AUX UV# OP operand	R
	general	BOOLEAN	ST	AUX UV# OP		R
Dpo		SPS			AUX UV# DPO operand, which is the inverse of AUX UV PKP	R
	stVal	BOOLEAN	ST	AUX UV# DPO		R
BlkRefγ		GEORG			AUX UV# BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	AUX UV# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.4 B90 bus differential (B_Dif)

This element is instantiated in the following products: B90.

Table 4-13: B90 bus differential data objects

LNName: B_DifPDIF#		LDevice inst: Prot		UR element: B90 Bus zone # differential element function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
StrBia		ACD			BUS # BIASED PKP operand	R
	general	BOOLEAN	ST	BUS # BIASED PKP		R
	dirGeneral	ENUMERATED	ST		1 for Forward, and it is mapped to same operand BUS # BIASED PKP (since differential DIR logic condition is part of differential logic)	R
Op		ACT			BUS # OP operand	R
	general	BOOLEAN	ST	BUS # OP		R
OpBia		ACT			BUS # BIASED OP operand	R
	general	BOOLEAN	ST	BUS # BIASED OP		R
OpUnBia		ACT			BUS # UNBIASED OP operand	R
	general	BOOLEAN	ST	BUS # UNBIASED OP		R

LNName: B_DifPDIF#		LDevice inst: Prot		UR element: B90 Bus zone # differential element function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
DpoBia		SPS			BUS # BIASED DPO operand, which is the inverse of BUS BIASED PKP	R
	stVal	BOOLEAN	ST	BUS # BIASED DPO		R
PhDir1		SPS			BUS # DIR operand	R
	stVal	BOOLEAN	ST	BUS # DIR		R
Sat1		SPS			BUS # SAT operand	R
	stVal	BOOLEAN	ST	BUS # SAT		R
BDifAClc		CMV			BUS ZONE # differential current in primary amps	R
	instCVal.mag.f	FLOAT32		BUS ZONE # DIFF current magnitude		R
	instCVal.ang.f	FLOAT32		BUS # DIFF current angle		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_DifPDIF#.BDifAClc.db		R/W/C
	zeroDb	INT32U	CF			R
BRstA		CMV			BUS ZONE # restraint current in primary amps	R
	instCVal.mag.f	FLOAT32		BUS ZONE # REST current magnitude		R
	instCVal.ang.f	FLOAT32		BUS # REST current angle		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_DifPDIF#.BRstA.db		R/W/C
	zeroDb	INT32U	CF			R
InRefγ01		GEORG			BUS ZONE # DIFF SUPV setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	BUS ZONE # DIFF SUPV for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRefγ02		GEORG			BUS ZONE # DIFF TRIP setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	BUS ZONE # DIFF TRIP for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
BlkRefγ		GEORG			BUS ZONE # DIFF BLK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	BUS ZONE # DIFF BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef9ττ		GEORG			BUS ZONE #τ STATUS setting.	R
	setSrcRef	VISIBLE STRING255	SP	BUS #τ STATUS.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.5 B90 instantaneous overcurrent (B_Ioc)

This element is instantiated in the following products: B90.

Table 4-14: B90 instantaneous overcurrent data objects

LNName: B_IocPIOC#		LDevice inst: Prot		UR element: B90 Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			IOC # PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	IOC # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			IOC # OP operand	R
	general	BOOLEAN	ST	IOC # OP		R
Dpo		SPS			IOC # DPO operand	R
	stVal	BOOLEAN	ST	IOC # DPO		R
BlkRefγ		GEORG			IOC# BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	IOC# BLOCK	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.6 B90 time overcurrent (B_Toc)

This element is instantiated in the following products: B90.

Table 4-15: B90 time overcurrent data objects

LNName: B_TocPTOC#		LDevice inst: Prot		UR element: Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			TOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			TOC# OP operands (including individual three phases)	R
	general	BOOLEAN	ST	TOC# OP		R
Dpo		SPS			TOC# DPO operand	R
	stVal	BOOLEAN	ST	TOC# DPO		R
BlkRefγ		GEORG			TOC# BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	TOC# BLOCK for group γ	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.7 B90 undervoltage (B_Uv)

This element is instantiated in the following products: B90.

Table 4-16: B90 undervoltage data objects

LNName: B_UvPTUV#		LDevice inst: Prot		UR element: B90 Undervoltage element # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			UNDERVOLTAGE # PKP operands	R
	general	BOOLEAN	ST	UNDERVOLTAGE # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R

LNName: B_UvPTUV#		LDevice inst: Prot		UR element: B90 Undervoltage element # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			UNDERVOLTAGE # OP operand	R
	general	BOOLEAN	ST	UNDERVOLTAGE # OP		R
Dpo		SPS			UNDERVOLTAGE # DPO operand, which is the inverse of UNDERVOLTAGE PKP	R
	stVal	BOOLEAN	ST	UNDERVOLTAGE # DPO		R
BlkRefγ		GEORG			UNDERVOLTAGE # BLK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	UNDERVOLTAGE # BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.8 Ground distance (GndDis)

This element is instantiated in the following products: D30, D60, L60, L90, T60.

Table 4-17: Ground distance data objects

LNName: GndDisPDIS#		LDevice inst: Prot		UR element: Ground Distance Z# Settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			GND DIST Z# PKP operand in Phase –To –Ground	R
	general	BOOLEAN	ST	GND DIST Z# PKP		R
	dirGeneral	ENUMERATED	ST			R
	phsA	BOOLEAN	ST	GND DIST Z# PKP A		R
	dirPhsA	ENUMERATED	ST	dirGeneral		R
	phsB	BOOLEAN	ST	GND DIST Z# PKP B		R
	dirPhsB	ENUMERATED	ST	dirGeneral		R
	phsC	BOOLEAN	ST	GND DIST Z# PKP C		R
	dirPhsC	ENUMERATED	ST	dirGeneral		R
Op		ACT			GND DIST Z# OP operand	R
	general	BOOLEAN	ST	GND DIST Z# OP		R
	phsA	BOOLEAN	ST	GND DIST Z# OP A		R
	phsB	BOOLEAN	ST	GND DIST Z# OP B		R
	phsC	BOOLEAN	ST	GND DIST Z# OP C		R
NeutSupn		SPS			GND DIST Z# SUPN IN operand	R
	stVal	BOOLEAN	ST	GND DIST Z# SUPN IN		R
DpoPhsϕ		SPS			GND DIST Z# DPO θ operand	R
	stVal	BOOLEAN	ST	GND DIST Z#DPO θ		R
BlkRefγ		GEORG			GND DIST Z# BLK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	GND DIST Z# BLK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.9 Ground instantaneous overcurrent (GndIoc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 4-18: Ground instantaneous overcurrent data objects

LNName: GndIocPIOC#		LDevice inst: Prot		UR element: Ground Instantaneous Overcurrent element#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			GROUND IOC# PKP operand, which is indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	GROUND IOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			GROUND IOC# OP operand	R
	general	BOOLEAN	ST	GROUND IOC# OP		R
Dpo		SPS			GROUND IOC# DPO operand	R
	stVal	BOOLEAN	ST	GROUND IOC# DPO		R
BlkRefγ1		GEORG			GROUND IOC# BLOCK setting in setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	GROUND IOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.10 Ground time overcurrent (GndToc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 4-19: Ground time overcurrent data objects

LNName: GndTocPTOC#		LDevice inst: Prot		UR element: Ground Time Overcurrent element#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			GROUND TOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	GROUND TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			GROUND TOC# OP operand	R
	general	BOOLEAN	ST	GROUND TOC# OP		R
Dpo		SPS			GROUND TOC# DPO operand	R
	stVal	BOOLEAN	ST	GROUND TOC# DPO		R
BlkRefγ1		ORG			GROUND TOC# BLOCK setting in setting group γ.	R
	setSrcRef	ObjectReference	SP	GROUND TOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

4.1.2.11 Line current differential (LinDif)

This element is instantiated in the following products: L30, L90.

Table 4-20: Line current differential data objects

LNName: LinDfPDIF1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) phase and general functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			only instantiated in L90	R
	general	BOOLEAN	ST	87L DIFF OP		R
	dirGeneral	ENUMERATED	ST		1, the code for forward	R
	phsA	BOOLEAN	ST	87L DIFF OP A		R

LNName: LinDfPDIF1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) phase and general functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	dirPhsA	ENUMERATED	ST		1, the code for forward	R
	phsB	BOOLEAN	ST	87L DIFF OP B		R
	dirPhsB	ENUMERATED	ST		1, the code for forward	R
	phsC	BOOLEAN	ST	87L DIFF OP C		R
	dirPhsC	ENUMERATED	ST		1, the code for forward	R
Op		ACT			only instantiated in L90	R
	general	BOOLEAN	ST	87L TRIP OP		R
	phsA	BOOLEAN	ST	87L TRIP OP A		R
	phsB	BOOLEAN	ST	87L TRIP OP B		R
	phsC	BOOLEAN	ST	87L TRIP OP C		R
Op		ACT			only instantiated in L30	R
	general	BOOLEAN	ST	87L DIFF OP		R
StrGnd		ACD			87L DIFF PKP G operand	R
	general	BOOLEAN	ST	87L DIFF PKP G		R
	dirGeneral	ENUMERATED	ST		1, the code for forward	R
OpGnd		ACT			87L DIFF OP G operand	R
	general	BOOLEAN	ST	87L DIFF OP G		R
Tr3p		ACT			only instantiated in L90	R
	general	BOOLEAN	ST	87L TRIP 3P OP		R
Tr1p		ACT			only instantiated in L90	R
	general	BOOLEAN	ST	87L TRIP 1P OP		R
RxTr1		ACT			only instantiated in L90	R
	general	BOOLEAN	ST	logical OR of phsA, phsB, phsC		R
	phsA	BOOLEAN	ST	87L DIFF RECVD DTT A		R
	phsB	BOOLEAN	ST	87L DIFF RECVD DTT B		R
	phsC	BOOLEAN	ST	87L DIFF RECVD DTT C		R
RxTr1		ACT			only instantiated in L30	R
	general	BOOLEAN	ST	87L DIFF RECVD DTT		R
TxTr		ACT			87L DIFF KET DTT operand, which becomes on when the differential element is sending direct transfer trip to the remote terminals.	R
	general	BOOLEAN	ST	87L DIFF KET DTT		R
PFLLfail		SPS			87L DIFF PFLL FAIL operand, which becomes on when the differential element's phase and frequency lock loop (PFLL) has failed.	R
	stVal	BOOLEAN	ST	87L DIFF PFLL FAIL		R
Asymmetry		SPS			87L DIFF CH ASYM DET operand, which becomes on when the differential element's has detected substantial communications channel asymmetry.	R
	stVal	BOOLEAN	ST	87L DIFF CH ASYM DET		R
ChFailζ		SPS			87L DIFF CH ζ FAIL operand, which becomes on when the differential element's has detected communications channel ζ failed.	R
	stVal	BOOLEAN	ST	87L DIFF CH ζ FAIL		R

LNName: LinDfPDIF1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) phase and general functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
LosPktζ		SPS			87L DIFF CHζ LOSTPKT operand, which becomes on when the differential element's has detected the lost packet threshold has been exceeded on channel ζ.	R
	stVal	BOOLEAN	ST	87L DIFF CHζ LOSTPKT		R
CrcFailζ		SPS			87L DIFF CHζ CRCFAIL operand, which becomes on when the differential element's has detected the CRC error threshold has been exceeded on channel ζ.	R
	stVal	BOOLEAN	ST	87L DIFF CHζ CRCFAIL		R

4.1.2.12 Negative sequence directional overcurrent (NegDoc)

This element is instantiated in the following products: C70, D30, D60, F60, G30, G60, L60, L90, T60.

Table 4-21: Negative sequence directional overcurrent data objects

LNName: NegDocRDIR#		LDevice inst: Prot		UR element: Negative sequence Directional Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dir		ACD			NEG DIR OC# FWD or NEG DIR OC# REV operands, which becomes On when Negative sequence directional overcurrent is flowing in either forward or reverse direction respectively	R
	general	BOOLEAN	ST	logical OR of operands NEG DIR OC# FWD and NEG DIR OC# REV		R
	dirGeneral	ENUMERATED	ST			R
FwdOp		SPS			NEG SEQ DIR OC# FWD operand	R
	stVal	BOOLEAN	ST	NEG SEQ DIR OC# FWD		R
RvOp		SPS			NEG SEQ DIR OC# REV operand	R
	stVal	BOOLEAN	ST	NEG SEQ DIR OC# REV		R
BlkRefγ		GEORG			NEG SEQ DIR OC# BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	NEG SEQ DIR OC# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.13 Negative sequence instantaneous overcurrent (NegIoc)

This element is instantiated in the following products: C70, D30, D60, F35, F60, L30, L60, L90, T60.

Table 4-22: Negative sequence instantaneous overcurrent data objects

LNName: NegIocPIOC#		LDevice inst: Prot		UR element: Negative sequence Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEG SEQ IOC# PKP operand, which is indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	NEG SEQ IOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NEG SEQ IOC# OP operand	R
	general	BOOLEAN	ST	NEG SEQ IOC# OP		R

LNName: NegIocPIOC#		LDevice inst: Prot		UR element: Negative sequence Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dpo		SPS			NEG SEQ IOC# DPO operand	R
	stVal	BOOLEAN	ST	NEG SEQ IOC# DPO		R
BlkRefγ1		GEORG			NEG SEQ IOC# BLOCK setting in setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	NEG SEQ IOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

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4.1.2.14 Negative sequence time overcurrent (NegToc)

This element is instantiated in the following products: C70, D30, D60, F35, F60, L30, L60, L90, T60.

Table 4-23: Negative sequence time overcurrent data objects

LNName: NegTocPTOC#		LDevice inst: Prot		UR element: Negative sequence Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEG SEQ TOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	NEG SEQ TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NEG SEQ TOC# OP operand	R
	general	BOOLEAN	ST	NEG SEQ TOC# OP		R
Dpo		SPS			NEG SEQ TOC# DPO operand	R
	stVal	BOOLEAN	ST	NEG SEQ TOC# DPO		R
BlkRefγ1		GEORG			NEG SEQ TOC# BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	NEG SEQ TOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.15 Neutral directional overcurrent (NeuDoc)

This element is instantiated in the following products: C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 4-24: Neutral directional overcurrent data objects

LNName: NeuDocRDIR#		LDevice inst: Prot		UR element: Neutral Directional Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dir		ACD			NTRL DIR OC# FWD or NTRL DIR OC# REV operands, which becomes On when neutral directional overcurrent is flowing in either forward or reverse direction respectively	R
	general	BOOLEAN	ST	logical OR of operands NTRL DIR OC# FWD and NTRL DIR OC# REV		R
	dirGeneral	ENUMERATED	ST			R
FwdOp		SPS			NTRL DIR OC# FWD operand	R
	stVal	BOOLEAN	ST	NTRL DIR OC# FWD		R
RvOp		SPS			NTRL DIR OC# REV operand	R
	stVal	BOOLEAN	ST	NTRL DIR OC# REV		R

LNName: NeuDocRDIR#		LDevice inst: Prot		UR element: Neutral Directional Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγ		GEORG			NEUTRAL DIR OC# BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	NEUTRAL DIR OC# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.16 Neutral instantaneous overcurrent (NeuIoc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 4-25: Neutral instantaneous overcurrent data objects

LNName: NeuIocPIOC#		LDevice inst: Prot		UR element: Neutral Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEUTRAL IOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	NEUTRAL IOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NEUTRAL IOC# OP operand	R
	general	BOOLEAN	ST	NEUTRAL IOC# OP		R
Dpo		SPS			NEUTRAL IOC# DPO operand	R
	stVal	BOOLEAN	ST	NEUTRAL IOC# DPO		R
BlkRefγ1		GEORG			NEUTRAL IOC# BLOCK setting in setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	NEUTRAL IOC# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.17 Neutral time overcurrent (NeuToc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 4-26: Neutral time overcurrent data objects

LNName: NeuTocPTOC#		LDevice inst: Prot		UR element: Neutral Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			NEUTRAL TOC# PKP operand, which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	NEUTRAL TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			NEUTRAL TOC# OP operand	R
	general	BOOLEAN	ST	NEUTRAL TOC# OP		R
Dpo		SPS			NEUTRAL TOC# DPO operand	R
	stVal	BOOLEAN	ST	NEUTRAL TOC# DPO		R
BlkRefγ1		GEORG			NEUTRAL TOC# BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	NEUTRAL TOC# BLOCK.	reference to the data attribute to input	R/C

LNName: NeuTocPTOC#		LDevice inst: Prot		UR element: Neutral Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.18 Phase directional (PhsDir)

This element is instantiated in the following products: B30, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 4-27: Phase directional data objects

LNName: PhsDirRDIR#		LDevice inst: Prot		UR element: Phase Directional element # (ANSI 67P)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Dir		ACD			PH DIR # BLK operand, which becomes On when phase current is flowing in the set direction	R
	general	BOOLEAN	ST	PH DIR # BLK		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element may be connected/ configured to look forward or backward	R
	phsA	BOOLEAN	ST	PH DIR # BLK A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown	R
	phsB	BOOLEAN	ST	PH DIR # BLK B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown	R
	phsC	BOOLEAN	ST	PH DIR # BLK C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown	R
BlkRefγ		GEORG			PHASE DIR # BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	PHASE DIR # BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.19 Phase distance (PhsDis)

This element is instantiated in the following products: D30, D60, G60, L60, L90, T60.

Table 4-28: Phase distance data objects

LNName: PhsDisPDIS#		LDevice inst: Prot		UR element: Phase Distance Z# settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHS DIST Z# PKP operand in Phase-To-Phase	R
	general	BOOLEAN	ST	PH DIST Z# PKP		R
	dirGeneral	ENUMERATED	ST			R
Op		ACT			PHS DIST Z# OP operand in Phase-To-Phase	R
	general	BOOLEAN	ST	PHS DIST Z# OP		R
StrPhsϕ		SPS			PHS DIST Z# PKP θ operand in Phase-To-Phase	R
	stVal	BOOLEAN	ST	PHS DIST Z# PKP θ		R
DpoPhsϕ		SPS			PHS DIST Z# DPO θ operand in Phase-To-Phase	R
	stVal	BOOLEAN	ST	PHS DIST Z# DPO θ		R
OpPhsϕ		SPS			PH DIST Z # OP θ operand	R
	stVal	BOOLEAN	ST	PH DIST Z# OP θ		R

LNName: PhsDisPDIS#		LDevice inst: Prot		UR element: Phase Distance Z# settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ASupnϕ		SPS			PHS DIST Z# SUPN θ operand in Phase-To-Phase	R
	stVal	BOOLEAN	ST	PHS DIST Z# SUPN θ		R
BlkRefγ		GEORG			PHS DIST Z# BLK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	PHS DIST Z# BLK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRefγ2		GEORG			instantiated only in logical node instance 1	R
	setSrcRef	VISIBLE STRING255	SP	setting FORCE SELF-POLAR	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRefγ3		GEORG			instantiated only in logical node instance 1	R
	setSrcRef	VISIBLE STRING255	SP	setting FORCE MEM-POLAR I	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.20 Phase instantaneous overcurrent (PhsIoc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 4-29: Phase instantaneous overcurrent data objects

LNName: PhsIocPIOC#		LDevice inst: Prot		UR element: Phase Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHASE IOC# PKP operands (including individual three phases), which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	PHASE IOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
	phsA	BOOLEAN	ST	PHASE IOC# PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown.	R
	phsB	BOOLEAN	ST	PHASE IOC# PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown.	R
	phsC	BOOLEAN	ST	PHASE IOC# PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			PHASE IOC# OP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE IOC# OP		R
	phsA	BOOLEAN	ST	PHASE IOC# OP A		R
	phsB	BOOLEAN	ST	PHASE IOC# OP B		R
	phsC	BOOLEAN	ST	PHASE IOC# OP C		R
Dpo		SPS			PHASE IOC# DPO operand	R
	stVal	BOOLEAN	ST	PHASE IOC# DPO		R
DpoPhsβ		SPS			PHASE IOC# DPO β operands" (where β refers to Phase-A, B or C)	R
	stVal	BOOLEAN	ST	PHASE IOC# DPO β (where β refers to Phase-A, B or C)		R

LNName: PhsIocPIOC#		LDevice inst: Prot		UR element: Phase Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkRefγβ		GEORG			PHASE IOC# BLOCK β setting for setting group γ." (where β refers to Phase-A, B or C)	R
	setSrcRef	VISIBLE STRING255	SP	PHASE IOC# BLOCK β (where β refers to Phase-A, B or C)	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.21 Phase overvoltage (PhsOv)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 4-30: Phase overvoltage data objects

LNName: PhsOvPTOV#		LDevice inst: Prot		UR element: Phase Overvoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHASE OV # PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE OV # PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsA	BOOLEAN	ST	PHASE OV # PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsB	BOOLEAN	ST	PHASE OV # PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsC	BOOLEAN	ST	PHASE OV # PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			PHASE OV # OP operand (including individual three phases)	R
	general	BOOLEAN	ST	PHASE OV # OP		R
	phsA	BOOLEAN	ST	PHASE OV # OP A		R
	phsB	BOOLEAN	ST	PHASE OV # OP B		R
	phsC	BOOLEAN	ST	PHASE OV # OP C		R
Dpo		SPS			PHASE OV # DPO operand, which is the inverse of PHASE OV PKP	R
	stVal	BOOLEAN	ST	PHASE OV # DPO		R
DpoPhsβ		SPS			PHASE OV# DPO β operand" (where β refers to Phase-A, B or C)	R
	stVal	BOOLEAN	ST	PHASE OV# DPO β (where β refers to Phase-A, B or C)		R
BlkRefγ		GEORG			PHASE OV # BLK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	PHASE OV # BLK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.22 Phase time overcurrent (PhsToc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 4-31: Phase time overcurrent data objects

LNName: PhsTocPTOC#		LDevice inst: Prot		UR element: Phase Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHASE TOC# PKP operands (including individual three phases), which indicates Op will operate when delay expires.	R
	general	BOOLEAN	ST	PHASE TOC# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
	phsA	BOOLEAN	ST	PHASE TOC# PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown.	R
	phsB	BOOLEAN	ST	PHASE TOC# PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown.	R
	phsC	BOOLEAN	ST	PHASE TOC# PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			PHASE TOC# OP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE TOC# OP		R
	phsA	BOOLEAN	ST	PHASE TOC# OP A		R
	phsB	BOOLEAN	ST	PHASE TOC# OP B		R
	phsC	BOOLEAN	ST	PHASE TOC# OP C		R
Dpo		SPS			PHASE TOC# DPO operand	R
	stVal	BOOLEAN	ST	PHASE TOC# DPO		R
DpoPhsβ		SPS			PHASE TOC# DPO β operands" (where β refers to Phase-A, B or C)	R
	stVal	BOOLEAN	ST	PHASE TOC# DPO β (where β refers to Phase-A, B or C)		R
BlkRefγβ		GEORG			PHASE TOC# BLOCK β setting for setting group γ." (where β refers to Phase-A, B or C)	R
	setSrcRef	VISIBLE STRING255	SP	PHASE TOC# BLOCK β for group γ (where β refers to Phase-A, B or C)	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.23 Phase undervoltage (PhsUv)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 4-32: Phase undervoltage data objects

LNName: PhsUvPTUV#		LDevice inst: Prot		UR element: Phase Undervoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			PHASE UV# PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE UV# PKP		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsA	BOOLEAN	ST	PHASE UV# PKP A		R
	dirPhsA	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R

LNName: PhsUvPTUV#		LDevice inst: Prot		UR element: Phase Undervoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsB	BOOLEAN	ST	PHASE UV# PKP B		R
	dirPhsB	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
	phsC	BOOLEAN	ST	PHASE UV# PKP C		R
	dirPhsC	ENUMERATED	ST		0, the code for unknown. It is unknown as the element is non-directional	R
Op		ACT			PHASE UV# OP operand (including individual three phases)	R
	general	BOOLEAN	ST	PHASE UV# OP		R
	phsA	BOOLEAN	ST	PHASE UV# OP A		R
	phsB	BOOLEAN	ST	PHASE UV# OP B		R
	phsC	BOOLEAN	ST	PHASE UV# OP C		R
Dpo		SPS			PHASE UV# DPO operand, which is the inverse of PHASE UV PKP	R
	stVal	BOOLEAN	ST	PHASE UV# DPO		R
DpoPhsβ		SPS			PHASE UV# DPO β operands" (where β refers to Phase-A, B or C)	R
	stVal	BOOLEAN	ST	PHASE UV# DPO β (where β refers to Phase-A, B or C)		R
BlkRefγ		GEORG			PHASE UV# BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	PHASE UV# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.24 Power swing detection (PwrSwg)

This element is instantiated in the following products: D30, D60, G60, L60, L90, N60, T60.

Table 4-33: Power swing detection data objects

LNName: PwrSwgRPSB1		LDevice inst: Prot		UR element: Power Swing Detect element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			POWER SWING INCOMING operand	R
	general	BOOLEAN	ST	POWER SWING INCOMING		R
	dirGeneral	ENUMERATED	ST			R
StrOut		SPS			POWER SWING OUTGOING operand	R
	stVal	BOOLEAN	ST	POWER SWING OUTGOING		R
Op		ACT			POWER SWING TRIP	R
	general	BOOLEAN	ST	POWER SWING TRIP		R
BlkZn		SPS			POWER SWING BLOCK operand	R
	stVal	BOOLEAN	ST	POWER SWING BLOCK		R
Z1Chr1		SPS			POWER SWING OUTER operand	R
	stVal	BOOLEAN	ST	POWER SWING OUTER		R
Z1Chr2		SPS			POWER SWING MIDDLE operand	R
	stVal	BOOLEAN	ST	POWER SWING MIDDLE		R
Z1Chr3		SPS			POWER SWING INNER operand	R
	stVal	BOOLEAN	ST	POWER SWING INNER		R
TmStr2		SPS			POWER SWING TMR2 PKP operand	R
	stVal	BOOLEAN	ST	POWER SWING TMR2 PKP		R
TmStr3		SPS			POWER SWING TMR3 PKP operand	R

LNName: PwrSwgRPSB1		LDevice inst: Prot		UR element: Power Swing Detect element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	POWER SWING TMR3 PKP		R
TmStr4		SPS			POWER SWING TMR4 PKP operand	R
	stVal	BOOLEAN	ST	POWER SWING TMR4 PKP		R
Blk		SPS			POWER SWING UN/BLOCK operand	R
	stVal	BOOLEAN	ST	POWER SWING UN/BLOCK		R
DistDet		SPS			POWER SWING 50DD operand	R
	stVal	BOOLEAN	ST	POWER SWING 50DD		R
InRefγ2		GEORG			POWER SW I2 SUPV ENAB setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	POWER SW I2 SUPV ENAB	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
BlkRefγ		GEORG			POWER SWING BLK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	POWER SWING BLK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.25 Restricted ground fault (RgDif)

This element is instantiated in the following products: F60, G30, G60, L90, T35, T60.

Table 4-34: Restricted ground fault data objects

LNName: RgDifPDIF#		LDevice inst: Prot		UR element: Restricted Ground Fault # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			RESTD GND FT# OP operands	R
	general	BOOLEAN	ST	RESTD GND FT# OP		R
Dpo		SPS			RESTD GND FT# DPO operand,	R
	stVal	BOOLEAN	ST	RESTD GND FT# DPO		R
Str		ACD			RESTD GND FT# PKP operand	R
	general	BOOLEAN	ST	RESTD GND FT# PKP		R
	dirGeneral	ENUMERATED	ST		1 is code for Forward	R
DifAClc		WYE			Differential currents	R
	net	CMV				R
	net.instCVal.mag .f	FLOAT32		RGF# DIFF Igd magnitude, in primary amps		R
	net.cVal.mag.f	FLOAT32		RGF# DIFF Igd magnitude, in primary amps, with deadband		R
	net.units.SIUnit	ENUMERATED			5, the code for amps	R
	net.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	net.db	INT32U	CF	RgDifPDIF#.DifAClc.net.db		R/W/C
	net.zeroDb	INT32U	CF			R
RstA		WYE			Restraint currents	R
	net	CMV				R
	net.instCVal.mag .f	FLOAT32		RGF# RESTR Igr magnitude, in primary amps		R
	net.cVal.mag.f	FLOAT32		RGF# RESTR Igr magnitude, in primary amps, with deadband		R
	net.units.SIUnit	ENUMERATED			5, the code for amps	R

LNName: RgDifPDIF#	LDevice inst: Prot			UR element: Restricted Ground Fault # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	net.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	net.db	INT32U	CF	RgDifPDIF#.RstA.net.db		R/W/C
	net.zeroDb	INT32U	CF			R
BlkRefγ		GEORG			RESTD GND FT# BLOCK for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	RESTD GND FT# BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.26 Transformer instantaneous differential (PiDif)

This element is instantiated in the following products: T35, T60.

Table 4-35: Transformer instantaneous differential data objects

LNName: PiDifPDIF1	LDevice inst: Prot			UR element: Transformer Instantaneous Differential # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			XFMR INST DIFF OP , XFMR INST DIFF OP A, XFMR INST DIFF OP B & XFMR INST DIFF OP C operands	R
	general	BOOLEAN	ST	XFMR INST DIFF OP		R
	phsA	BOOLEAN	ST	XFMR INST DIFF OP A		R
	phsB	BOOLEAN	ST	XFMR INST DIFF OP B		R
	phsC	BOOLEAN	ST	XFMR INST DIFF OP C		R
BlkRefγ		GEORG			INST DIFF BLOCK setting for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	INST DIFF BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.27 Transformer percent differential (PctDif)

This element is instantiated in the following products: G30, T35, T60.

Table 4-36: Transformer percent differential data objects

LNName: PctDifPDIF1	LDevice inst: Prot			UR element: Transformer Percent Differential function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Op		ACT			XFMR PCNT DIFF OP , XFMR PCNT DIFF OP A, XFMR PCNT DIFF OP B & XFMR PCNT DIFF OP C operands	R
	general	BOOLEAN	ST	XFMR PCNT DIFF OP		R
	phsA	BOOLEAN	ST	XFMR PCNT DIFF OP A		R
	phsB	BOOLEAN	ST	XFMR PCNT DIFF OP B		R
	phsC	BOOLEAN	ST	XFMR PCNT DIFF OP C		R
Blk2ndHϕ		SPS			XFMR PCNT DIFF 2ND θ operand	R
	stVal	BOOLEAN	ST	XFMR PCNT DIFF 2ND θ		R
Blk5thHϕ		SPS			XFMR PCNT DIFF 5TH θ operand	R
	stVal	BOOLEAN	ST	XFMR PCNT DIFF 5TH θ		R
Str		ACD			XFMR PCNT DIFF PKP A, XFMR PCNT DIFF PKP B & XFMR PCNT DIFF PKP C operand	R

LNName: PctDifPDIF1		LDevice inst: Prot		UR element: Transformer Percent Differential function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	general	BOOLEAN	ST	logical OR of phsA, phsB & phsB		R
	dirGeneral	ENUMERATED	ST			R
	phsA	BOOLEAN	ST	XFMR PCNT DIFF PKP A		R
	dirPhsA	ENUMERATED	ST			R
	phsB	BOOLEAN	ST	XFMR PCNT DIFF PKP B		R
	dirPhsB	ENUMERATED	ST			R
	phsC	BOOLEAN	ST	XFMR PCNT DIFF PKP C		R
	dirPhsC	ENUMERATED	ST			R
RefWinding		INS			Number of winding used as the reference winding for ratio compensation	R
	stVal	INT32	ST	REFERENCE WINDING		R
DifAClc		WYE			Phase differential currents	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		DIFF PHASOR Iθd magnitude, in pu		R
	phsθ.instCVal.ang .f	FLOAT32		DIFF PHASOR		R
	phsθ.cVal.mag.f	FLOAT32		DIFF PHASOR Iθd magnitude, inpu, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		DIFF PHASOR		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	phsθ.units .multiplier	ENUMERATED			-2, the code for a multiplier of Centi	R
	phsθ.db	INT32U	CF	PctDifPDIF1.DifAClc.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
DifA2ndH		WYE			Phase differential currents	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		DIFF 2ND HARM Iθd magnitude, in %		R
	phsθ.instCVal.ang .f	FLOAT32		DIFF 2ND HA		R
	phsθ.cVal.mag.f	FLOAT32		DIFF 2ND HARM Iθd magnitude, in%, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		DIFF 2ND HA		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	phsθ.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsθ.db	INT32U	CF	PctDifPDIF1.DifA2ndH.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
DifA5thH		WYE			Phase differential currents	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		DIFF 5TH HARM Iθd magnitude, in %		R
	phsθ.instCVal.ang .f	FLOAT32		DIFF 5TH HA		R

LNName: PctDifPDIF1	LDevice inst: Prot		UR element: Transformer Percent Differential function			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsθ.cVal.mag.f	FLOAT32		DIFF 5TH HARM Iθd magnitude, in%, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		DIFF 5TH HA		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	phsθ.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsθ.db	INT32U	CF	PctDifPDIF#.DifA5thH.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
RstA		WYE			Phase restraint currents	R
	phsθ	CMV				R
	phsθ.instCVal.mag .f	FLOAT32		REST PHASOR Iθr magnitude, in pu		R
	phsθ.instCVal.ang .f	FLOAT32		REST PHASOR		R
	phsθ.cVal.mag.f	FLOAT32		REST PHASOR Iθr magnitude, inpu, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		REST PHASOR		R
	phsθ.units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	phsθ.units .multiplier	ENUMERATED			-2, the code for a multiplier of Centi	R
	phsθ.db	INT32U	CF	PctDifPDIF#.RstA.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
BlkRefγ		GEORG			PERCENT DIFF BLOCK for setting group γ.	R
	setSrcRef	VISIBLE STRING255	SP	PERCENT DIFF BLOCK for group γ.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.2.28 Trip output (TrOut)

This element is instantiated in the following products: C60, D60, L60, L90.

Table 4-37: Trip output data objects

LNName: TrOutPTRC1	LDevice inst: Prot		UR element: Trip Output element			
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Tr		ACT			TRIP OUTPUT OP (any trip) operand	R
	general	BOOLEAN	ST	TRIP OUTPUT OP		R
Tr3p		ACT			TRIP 3-POLE operand	R
	general	BOOLEAN	ST	TRIP 3-POLE		R
Tr1p		ACT			general is TRIP 1-POLE operand, phsA is TRIP PHASE A operand, phsB is TRIP PHASE B operand and phsC is TRIP PHASE C operand	R
	general	BOOLEAN	ST	TRIP 1-POLE		R
	phsA	BOOLEAN	ST	TRIP PHASE A		R
	phsB	BOOLEAN	ST	TRIP PHASE B		R
	phsC	BOOLEAN	ST	TRIP PHASE C		R
StrRec3p		SPS			TRIP AR INIT 3-POLE operand	R

LNName: TrOutPTRC1		LDevice inst: Prot		UR element: Trip Output element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	TRIP AR INIT 3-POLE		R
Tr3pFrcd		SPS			TRIP FORCE 3-POLE operand (3-pole trip mode is being forced)	R
	stVal	BOOLEAN	ST	TRIP FORCE 3-POLE		R
StrZ2PhDl		SPS			TRIP Z2PH TMR INIT operand	R
	stVal	BOOLEAN	ST	TRIP Z2PH TMR INIT		R
StrZ2GndDl		SPS			TRIP Z2GR TMR INIT operand	R
	stVal	BOOLEAN	ST	TRIP Z2GR TMR INIT		R
InRef3α		GEORG			TRIP 3-POLE INPUT-α setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by TRIP 3-POLE INPUT-α	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef1α		GEORG			TRIP 1-POLE INPUT-α setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by TRIP 1-POLE INPUT-α	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef2α		GEORG			TRIP RECLOSE INPUT-α setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by TRIP RECLOSE INPUT-α	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef01		GEORG			START TMR Z2PH Inp1 setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by START TMR Z2PH Inp1	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef02		GEORG			START TMR Z2PH Inp2 setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by START TMR Z2PH Inp2	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef03		GEORG			START TMR Z2GR Inp1 setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by START TMR Z2GR Inp1	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef04		GEORG			START TMR Z2GR Inp2 setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by START TMR Z2GR Inp2	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef05		GEORG			BKR ϕA OPEN setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by BKR ϕA OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

LNName: TrOutPTRC1		LDevice inst: Prot		UR element: Trip Output element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRef06		GEORG			BKR ϕB OPEN setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by BKR ϕB OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef07		GEORG			BKR ϕC OPEN setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by BKR ϕC OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef08		GEORG			TRIP FORCE 3-POLE setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by TRIP FORCE 3-POLE	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef09		GEORG			REVERSE FAULT setting.	R
	setSrcRef	VISIBLE STRING255	SP	Reference to the data object selected by REVERSE FAULT	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.3 Control (Ctrl) logical device

The Ctrl logical device contains logical nodes that model UR control and monitoring functions.

4.1.3.1 Logical node zero (LLN0)

This element is instantiated in all UR devices implementing the Ctrl logical device.

Table 4-38: LLN0 data objects and attributes

LNName: LLN0		LDevice inst: Ctrl		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		INS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		GEORG			Reference to root logical device	R
	setSrcRef	VISIBLE STRING255	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

4.1.3.2 Fault location (FltRpt)

This element is instantiated in the following products: C60, D30, D60, F35, F60, L30, L60, L90.

Table 4-39: Fault report settings data objects

LNName: FltRptRFLO#		LDevice inst: Ctrl		UR element: FAULT REPORT # settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
TapLocFlt		SPS			TAP-LOCAL FAULT operand	R

LNName: FltRptRFLO#		LDevice inst: Ctrl		UR element: FAULT REPORT # settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	TAP-LOCAL FAULT		R
NumRcd		INS			instantiated only in FltRptRFLO1	R
	stVal	INT32	ST	Modbus register 3020h, I.e., "Number of Fault Reports"		R
FltDiskm		MV			Mandatory data object which in this case is fixed at zero	R
	mag.f	FLOAT32				R
FltZ		CMV			Mandatory data attribute which in this case is fixed at zero	R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
RsStat		SPC			instantiated only in FltRptRFLO1	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	FltRptRFLO1.RsStat.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
InRef1		GEORG			FAULT REPORT# TRIG.	R
	setSrcRef	VISIBLE STRING255	SP	FAULT REPORT# TRIG.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef2		GEORG			CLEAR FAULT REPORTS	R
	setSrcRef	VISIBLE STRING255	SP	CLEAR FAULT REPORTS.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

Table 4-40: Fault report data file data objects

LNName: FltRFLOψψ		LDevice inst: Ctrl		UR element: Selected values from Fault Report Data file ψψ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
FltZ		CMV			Mandatory data attribute which in this case is fixed at zero	R
	cVal.mag.f	FLOAT32		Fault impedance magnitude in primary ohms calculated as shown below		R
	cVal.ang.f	FLOAT32		Fault impedance angle in degrees calculated as shown below		R
FltRis		MV			FAULTψψ FAULT RESIST converted to primary ohms	R
	mag.f	FLOAT32		Actual Value FAULTψψ FAULT RESIST converted to primary ohms		R
	units.SIUnit	ENUMERATED			30, the code for primary electric resistance in ohm (V/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

LNName: FltRFLOψψ		LDevice inst: Ctrl		UR element: Selected values from Fault Report Data file ψψ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
FltLpRis		MV			FAULTψψ LOOP RESIST converted to primary ohms	R
	mag.f	FLOAT32		Actual Value FAULTψψ LOOP RESIST converted to primary ohms		R
	units.SIUnit	ENUMERATED			30, the code for primary electric resistance in ohm (V/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
FltLpReact		MV			FAULTψψ LOOP REACT converted to primary ohms	R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			30, the code for primary electric resistance in ohm (V/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
FltNum		INS			FAULT NUMBER	R
	stVal	INT32	ST	FAULT NUMBER in Fault Report Data file ψψ		R
FltLinID		GEVSS			Faulted line ID	R
	stVal	VISIBLE STRING 255	ST	LINE ID in Fault Report Data file ψψ		R
FltLoop		INS			FAULT TYPE	R
	stVal	ENUMERATED	ST	FAULT TYPE in Fault Report Data file ψψ		R
FltSegment		INS			FAULT ψψ FAULTED SEGMENT	R
	stVal	ENUMERATED	ST	FAULT ψψ FAULTED SEGMENT		R
FltDiskm		MV			FAULT LOCATION	R
	mag.f	FLOAT32		FAULT LOCATION in Fault Report Data file ψψ, converted to kilometers where required		R
	units.SIUnit	ENUMERATED			2, the code for meter	R
	units.multiplier	ENUMERATED			3, the code for a multiplier of 1000	R
RecCyc		INS			FAULT RECLOSE SHOT	R
	stVal	INT32	ST	FAULT RECLOSE SHOT in Fault Report Data file ψψ		R

The FltRFLO1 logical node always reads the latest fault data, when a new fault report is generated. FltRFLO2 always reads the previous fault data and FltRFLO3 reads the next previous data and so on.

4.1.3.3 Single pole autoreclose (Rec13p)

This element is instantiated in the following products: C60, D60, L60, L90.

Table 4-41: Single pole autoreclose data objects

LNName: Rec13pRREC1		LDevice inst: Ctrl		UR element: Autoreclose element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
TrBeh		INS			AR FORCE 3-P TRIP operand	R
	stVal	INT32	ST			R
RecCyc		INS			AUTORECLOSE SHOT COUNT actual value	R
	stVal	INT32	ST	AUTORECLOSE SHOT COUNT		R
AutoRecSt		INS			Autoreclosing status	R
	stVal	ENUMERATED	ST			R
Ena1		SPS			AR ENABLED operand	R

LNName: Rec13pRREC1		LDevice inst: Ctrl		UR element: Autoreclose element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	AR ENABLED		R
Disabled		SPS			AR DISABLED operand	R
	stVal	BOOLEAN	ST	AR DISABLED		R
ArRip		SPS			AR RIP operand	R
	stVal	BOOLEAN	ST	AR RIP		R
P1Rip		SPS			AR 1-P RIP operand	R
	stVal	BOOLEAN	ST	AR 1-P RIP		R
P3Rip1		SPS			AR 3-P/1 RIP operand	R
	stVal	BOOLEAN	ST	AR 3-P/1 RIP		R
P3Rip2		SPS			AR 3-P/2 RIP operand	R
	stVal	BOOLEAN	ST	AR 3-P/2 RIP		R
P3Rip3		SPS			AR 3-P/3 RIP operand	R
	stVal	BOOLEAN	ST	AR 3-P/3 RIP		R
P3Rip4		SPS			AR 3-P/4 RIP operand	R
	stVal	BOOLEAN	ST	AR 3-P/4 RIP		R
ArLO		SPS			AR LO operand	R
	stVal	BOOLEAN	ST	AR LO		R
ArBlk1		SPS			AR BKR1 BLK operand	R
	stVal	BOOLEAN	ST	AR BKR1 BLK		R
ArBlk1		SPS			AR BKR2 BLK operand	R
	stVal	BOOLEAN	ST	AR BKR2 BLK		R
Op		ACT			AR CLOSE BKR1 operand	R
	general	BOOLEAN	ST	AR CLOSE BKR1		R
Cls2ndBkr		SPS			AR CLOSE BKR2 operand	R
	stVal	BOOLEAN	ST	AR CLOSE BKR2		R
P3Tr		SPS			AR FORCE 3-P TRIP operand	R
	stVal	BOOLEAN	ST	AR FORCE 3-P TRIP		R
AnyShotCnt		SPS			AR SHOT CNT>0 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT>0		R
ShotCnt1		SPS			AR SHOT CNT=1 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT=1		R
ShotCnt2		SPS			AR SHOT CNT=2 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT=2		R
ShotCnt3		SPS			AR SHOT CNT=3 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT=3		R
ShotCnt4		SPS			AR SHOT CNT=4 operand	R
	stVal	BOOLEAN	ST	AR SHOT CNT=4		R
ArMod1		SPS			AR MODE = 1 operand	R
	stVal	BOOLEAN	ST	AR MODE = 1		R
ArMod2		SPS			AR MODE = 2 operand	R
	stVal	BOOLEAN	ST	AR MODE = 2		R
ArMod3		SPS			AR MODE = 3 operand	R
	stVal	BOOLEAN	ST	AR MODE = 3		R
ArMod4		SPS			AR MODE = 4 operand	R
	stVal	BOOLEAN	ST	AR MODE = 4		R
SwFail		SPS			AR MODE SWITCH FAIL operand	R
	stVal	BOOLEAN	ST	AR MODE SWITCH FAIL		R
Zn1Extend		SPS			AR ZONE 1 EXTENT operand	R

LNName: Rec13pRREC1		LDevice inst: Ctrl		UR element: Autoreclose element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	AR ZONE1 EXTENT		R
SeqTO		SPS			AR INCOMPLETE SEQ operand	R
	stVal	BOOLEAN	ST	AR INCOMPLETE SEQ		R
Rs		SPS			AR RESET operand	R
	stVal	BOOLEAN	ST	AR RESET		R
InRef01		GEORG			Mode 1 Activation setting	R
	setSrcRef	VISIBLE STRING255	SP	Mode 1 Activation.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef02		VISIBLE STRING255			Mode 2 Activation setting	R
	setSrcRef	VISIBLE STRING255	SP	Mode 2 Activation.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef03		GEORG			Mode 3 Activation setting	R
	setSrcRef	VISIBLE STRING255	SP	Mode 3 Activation.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef04		GEORG			Mode 4 Activation setting	R
	setSrcRef	VISIBLE STRING255	SP	Mode 4 Activation.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
BlkRef2		GEORG			AR BLOCK BKR1 setting	R
	setSrcRef	VISIBLE STRING255	SP	AR BLOCK BKR1	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef06		GEORG			AR BKR MAN CLOSE setting	R
	setSrcRef	VISIBLE STRING255	SP	AR BKR MAN CLOSE	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef07		GEORG			AR 1P INIT setting	R
	setSrcRef	VISIBLE STRING255	SP	AR 1P INIT	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef08		GEORG			AR 3P INIT setting	R
	setSrcRef	VISIBLE STRING255	SP	AR 3P INIT	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef09		GEORG			AR 3P TD INIT setting	R
	setSrcRef	VISIBLE STRING255	SP	AR 3P TD INIT	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef10		GEORG			AR MULTI-P FAULT setting	R
	setSrcRef	VISIBLE STRING255	SP	AR MULTI-P FAULT	reference to the data attribute to input	R/C

LNName: Rec13pRREC1		LDevice inst: Ctrl		UR element: Autoreclose element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef11		GEORG			BKR ONE POLE OPEN setting	R
	setSrcRef	VISIBLE STRING255	SP	BKR ONE POLE OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef12		GEORG			BKR 3 POLE OPEN setting	R
	setSrcRef	VISIBLE STRING255	SP	BKR 3 POLE OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef13		GEORG			AR EXTEND DEAD T 1 setting	R
	setSrcRef	VISIBLE STRING255	SP	AR EXTEND DEAD T 1	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef14		GEORG			AR RESET setting	R
	setSrcRef	VISIBLE STRING255	SP	AR RESET	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef15		GEORG			AR BKR CLOSED setting	R
	setSrcRef	VISIBLE STRING255	SP	AR BKR CLOSED	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		GEORG			AR BLOCK setting	R
	setSrcRef	VISIBLE STRING255	SP	AR BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef17		GEORG			AR PAUSE setting	R
	setSrcRef	VISIBLE STRING255	SP	AR PAUSE	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
BlkRef3		GEORG			AR BLOCK BKR2 setting	R
	setSrcRef	VISIBLE STRING255	SP	AR BLOCK BKR2	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef19		GEORG			AR BUS FLT INIT setting	R
	setSrcRef	VISIBLE STRING255	SP	AR BUS FLT INIT	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.3.4 Synchrocheck (SynChk)

This element is instantiated in the following products: C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60.

Table 4-42: Synchrocheck data objects

LNName: SynChkRSYN#		LDevice inst: Ctrl		UR element: Synchrocheck element # (ANSI 25)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Rel		SPS			SYNC # CLS OP operand, which becomes On all synchrocheck criteria are fulfilled.	R
	stVal	BOOLEAN	ST	SYNC # CLS OP		R
RelDpo		SPS			SYNC # CLS DPO operand, which becomes Off when all synchrocheck criteria are fulfilled.	R
	stVal	BOOLEAN	ST	SYNC # CLS DPO		R
LivV1		SPS			SYNC # V1 ABOVE MIN operand, which indicates that V1 is above the LivVal1 setting.	R
	stVal	BOOLEAN	ST	SYNC # V1 ABOVE MIN		R
DeaV1		SPS			SYNC # V1 BELOW MAX operand, which indicates that V1 is below the DeaVal1 setting.	R
	stVal	BOOLEAN	ST	SYNC # V1 BELOW MAX		R
LivV2		SPS			SYNC # V2 ABOVE MIN operand, which indicates that V1 is above the LivVal2 setting.	R
	stVal	BOOLEAN	ST	SYNC # V2 ABOVE MIN		R
DeaV2		SPS			SYNC # V2 BELOW MAX operand, which indicates that V2 is below the DeaVal1 setting.	R
	stVal	BOOLEAN	ST	SYNC # V2 BELOW MAX		R
LivDea		SPS			SYNC # DEAD S OP operand, which indicates that live/dead conditions have been met.	R
	stVal	BOOLEAN	ST	SYNC # DEAD S OP		R
LivDeaDpo		SPS			SYNC # DEAD S DPO operand, which indicates that live/dead conditions have not been met.	R
	stVal	BOOLEAN	ST	SYNC # DEAD S DPO		R
LivLiv		SPS			SYNC # SYNC OP operand, which indicates that both sources are live, and that angle, frequency and voltage difference and range conditions have been met.	R
	stVal	BOOLEAN	ST	SYNC # SYNC OP		R
LivLivDpo		SPS			SYNC # SYNC DPO operand, which indicates that that one or both sources are not live, or that angle, frequency and voltage difference and range conditions have been met.	R
	stVal	BOOLEAN	ST	SYNC # SYNC DPO		R
DynOp		SPS			SYNC# S-CLOSE OP operand, which becomes on when all criteria for dynamic mode are fulfilled	R
	stVal	BOOLEAN	ST	SYNC# S-CLOSE OP		R
DynDpo		SPS			SYNC# S-CLOSE DPO operand, which becomes off when all criteria for dynamic mode are fulfilled	R
	stVal	BOOLEAN	ST	SYNC# S-CLOSE DPO		R
DynArmd		SPS			SYNC# S-CLOSE ARMD operand, which becomes on when dynamic mode is armed	R
	stVal	BOOLEAN	ST	SYNC# S-CLOSE ARMD		R
DifVClc		MV			SYNCHROCHECK # DELTA VOLT, in primary volts	R

LNName: SynChkRSYN#		LDevice inst: Ctrl		UR element: Synchrocheck element # (ANSI 25)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	instMag.f	FLOAT32		SYNCHROCHECK 1 DELTA VOLT		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.DifVClc.db		R/W/C
	zeroDb	INT32U	CF			R
DifHzClc		MV			SYNCHROCHECK # DELTA FREQ, in Hz	R
	instMag.f	FLOAT32		SYNCHROCHECK # DELTA FREQ		R
	mag.f	FLOAT32		SYNCHROCHECK # DELTA FREQ on deadband exception		R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.DifHzClc.db		R/W/C
	zeroDb	INT32U	CF			R
DifAngClc		MV			SYNCHROCHECK # DELTA PHASE, in degrees	R
	instMag.f	FLOAT32		SYNCHROCHECK # DELTA PHASE		R
	mag.f	FLOAT32		SYNCHROCHECK # DELTA PHASE on deadband exception		R
	units.SIUnit	ENUMERATED			9, the code for degrees	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.DifAngClc.db		R/W/C
	zeroDb	INT32U	CF			R
DifAngDis		MV			SYNCHROCHECK # SYNSCP D_PH, in degrees	R
	instMag.f	FLOAT32		SYNCHROCHECK # SYNSCP D_PH		R
	mag.f	FLOAT32		SYNCHROCHECK # SYNSCP D_PH on deadband exception		R
	units.SIUnit	ENUMERATED			9, the code for degrees	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.DifAngDis.db		R/W/C
	zeroDb	INT32U	CF			R
V1Src		CMV			SYNCHROCHECK # V1 voltage phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V1 MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V1 ANG		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.V1Src.db		R/W/C
	zeroDb	INT32U	CF			R
V2Src		CMV			SYNCHROCHECK # V2 voltage phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V2 MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V2 ANG		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

LNName: SynChkRSYN#		LDevice inst: Ctrl		UR element: Synchrocheck element # (ANSI 25)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	db	INT32U	CF	SynChkRSYN#.V2Src.db		R/W/C
	zeroDb	INT32U	CF			R
ProjV2		CMV			SYNCHROCHECK # V2' voltage phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V2' MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V2' ANG		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for volts	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.ProjV2.db		R/W/C
	zeroDb	INT32U	CF			R
ProjDif		MV			SYNCHROCHECK # DELTA PHASE', in degrees which is the phase angle difference between V1 and projected V2	R
	instMag.f	FLOAT32		SYNCHROCHECK # '		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			9, the code for degrees	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.ProjDif.db		R/W/C
	zeroDb	INT32U	CF			R
ProjDifDis		MV			SYNCHROCHECK # PROJ SYNSCP D_PH, in degrees	R
	instMag.f	FLOAT32		SYNCHROCHECK # PROJ SYNSCP D_PH		R
	mag.f	FLOAT32		SYNCHROCHECK # PROJ SYNSCP D_PH on deadband exception		R
	units.SIUnit	ENUMERATED			9, the code for degrees	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	SynChkRSYN#.ProjDifDis.db		R/W/C
	zeroDb	INT32U	CF			R
BlkRef1		GEORG			SYNCHK# BLOCK setting.	R
	setSrcRef	VISIBLE STRING255	SP	SYNCHK# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef1		GEORG			SYNCHK# SYNC CLOSE setting.	R
	setSrcRef	VISIBLE STRING255	SP	SYNCHK# SYNC CLOSE.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.3.5 Three pole autoreclose (Rec3p)

This element is instantiated in the following products: D30, F35, F60, L30.

Table 4-43: Three pole autoreclose data objects

LNName: Rec3pRREC#		LDevice inst: Ctrl		UR element: Autoreclose element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ShotCnt		INS			AUTORECLOSE# SHOT COUNT actual value	R

LNName: Rec3pRREC#		LDevice inst: Ctrl		UR element: Autoreclose element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	INT32	ST	AUTORECLOSE# SHOT COUNT		R
AutoRecSt		INS			Autoreclosing status	R
	stVal	ENUMERATED	ST			R
Ena1		SPS			AR# ENABLED operand	R
	stVal	BOOLEAN	ST	AR# ENABLED		R
ArRip		SPS			AR# RIP operand	R
	stVal	BOOLEAN	ST	AR# RIP		R
ArLO		SPS			AR# LO operand	R
	stVal	BOOLEAN	ST	AR# LO		R
ArBlk1		SPS			AR# BLK FROM MAN CLS operand	R
	stVal	BOOLEAN	ST	AR# BLK FROM MAN CLS		R
Op		ACT			AR# CLOSE operand	R
	general	BOOLEAN	ST	AR# CLOSE		R
ShotCnt0		SPS			AR# SHOT CNT=0 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=0		R
ShotCnt1		SPS			AR# SHOT CNT=1 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=1		R
ShotCnt2		SPS			AR# SHOT CNT=2 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=2		R
ShotCnt3		SPS			AR# SHOT CNT=3 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=3		R
ShotCnt4		SPS			AR# SHOT CNT=4 operand	R
	stVal	BOOLEAN	ST	AR# SHOT CNT=4		R
Disabled		SPS			AR# DISABLED operand	R
	stVal	BOOLEAN	ST	AR# DISABLED		R
InRef01		GEORG			AR# INITIATE setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# INITIATE.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
BlkRef1		GEORG			AR# BLOCK setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# BLOCK.	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef02		GEORG			AR# REDUCE MAX TO 1 setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# REDUCE MAX TO 1	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef03		GEORG			AR# REDUCE MAX TO 2 setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# REDUCE MAX TO 2	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef04		GEORG			AR# REDUCE MAX TO 3 setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# REDUCE MAX TO 3	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef05		GEORG			AR# MANUAL CLOSE setting.	R

LNName: Rec3pRREC#		LDevice inst: Ctrl		UR element: Autoreclose element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	VISIBLE STRING255	SP	AR# MANUAL CLOSE	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef06		GEORG			AR# MNL RST FRM LO setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# MNL RST FRM LO	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef07		GEORG			AR# BKR CLOSED setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# BKR CLOSED	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef08		GEORG			AR# BKR OPEN setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# BKR OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef09		GEORG			AR# ADD DELAY 1 setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# ADD DELAY 1	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef10		GEORG			AR# ADD DELAY 2 setting.	R
	setSrcRef	VISIBLE STRING255	SP	AR# ADD DELAY 2	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.4 System logical device

The Ctrl logical device contains logical nodes that model UR power system devices: breakers, switches, CTs, and VTs, and including interface to these such as AC inputs and contact I/O.

4.1.4.1 Logical node zero (LLN0)

This element is instantiated in all UR devices implementing the System logical device.

Table 4-44: LLN0 data objects and attributes

LNName: LLN0		LDevice inst: System		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		INS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		GEORG			Reference to root logical device	R
	setSrcRef	VISIBLE STRING255	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

4.1.4.2 AC inputs (CT inputs and VT inputs) (ACin)

Uses Beh and NamPlt elements outlined in the Common data objects and attributes table on page 4-1.

4.1.4.3 Breaker control (Bkr)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 4-45: Breaker control data objects

LNName: BkrCSWI#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
CmdBlk		SPC			Command block status of this LN	R/Ctrl
	stVal	BOOLEAN	ST			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	CSWI# CmdBlk ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
Blk		SPS			Breaker Block status	R
	stVal	BOOLEAN	ST	value “Bkr0XCBR#.BlkCls.stVal” AND “Bkr0XCBR#.BlkOpn.stVal”		R
Loc		SPS			Breaker Loc status	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.Loc.stVal		R
OpOpn		ACT			BREAKER # MNL OPEN operand	R
	general	BOOLEAN	ST	Bkr0XCBR#.OpOpn.general operand BREAKER # MNL OPEN		R
	phsA	BOOLEAN	ST	Bkr0XCBR#.OpOpn.phsA		R
	phsB	BOOLEAN	ST	Bkr0XCBR#.OpOpn.phsB		R
	phsC	BOOLEAN	ST	Bkr0XCBR#.OpOpn.phsC		R
SelOpn		SPS			Breaker Select status for open operation	R
	stVal	BOOLEAN	ST			R
OpCls		ACT			BREAKER # MNL CLS operand	R
	general	BOOLEAN	ST	Bkr0XCBR#.OpCls.general operand BREAKER # MNL CLS		R
SelCls		SPS			Breaker Select status for close operation	R
	stVal	BOOLEAN	ST			R
Pos		DPC			Breaker position control and status	R/Ctrl
	stVal	CODED ENUM	ST	Bkr0XCBR#.Pos.stVal		R
	stSeld	BOOLEAN	ST		The controllable data status is “selected”	R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R

LNName: BkrCSWI#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	ctlModel	CtlModels	CF	BkrCSWI# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	BkrCSWI# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF			R
BlkOpn		SPC			Blocks breaker open commands from all sources including protection	R/Ctrl
	stVal	BOOLEAN	ST	the output of the logic gates as shown on Sheet 1 of the Breaker Control Logic		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	CSWI# BlkOpn ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
BlkCls		SPC			Blocks breaker close commands from all sources	R/Ctrl
	stVal	BOOLEAN	ST	the output of the logic gates as shown on Sheet 1 of the Breaker Control Logic		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	CSWI# BlkCls ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
TagOn		SPS			BREAKER # TAG ON operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.TagOn.stVal		R
TagOff		SPS			BREAKER # TAG OFF operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.TagOff.stVal		R
SbstCls		SPS			BREAKER # SUBD CLSD operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.SbstCls.stVal		R
SbstOpn		SPS			BREAKER # SUBD OPEN operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.SbstOpn.stVal		R
BypsOn		SPS			BREAKER # BYPASS ON operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.BypsOn.stVal		R
BypsOff		SPS			BREAKER # BYPASS OFF operand	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.BypsOff.stVal		R

Table 4-46: Breaker control data objects

LNName: BkrCILO#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EnaOpn		SPS			Enable Open status	R

LNName: BkrCILO#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST			R
EnaCls		SPS			Enable Close status	R
	stVal	BOOLEAN	ST			R
InRef2		GEORG			BKR# INTERLOCK OPN setting.	R
	setSrcRef	VISIBLE STRING255	SP	BKR# INTERLOCK OPN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef3		GEORG			BKR# INTERLOCK CLS setting.	R
	setSrcRef	VISIBLE STRING255	SP	BKR# INTERLOCK CLS	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

Table 4-47: Breaker control data objects

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EEHealth		INS			Breaker health, value is 2 (yellow) when breaker is out of service, 3 (red) when breaker trouble is detected and breaker is not out of service	R
	stVal	ENUMERATED	ST			R
Loc		SPS			Value of operand selected by setting BKR# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST			R
OpCnt		INS			Breaker operations counter.	R
	stVal	INT32	ST			R
CBOpCap		INS			Mandatory data object which in this case is fixed at 3	R
	stVal	ENUMERATED	ST			R
OpOpn		ACT			BREAKER # OFF CMD (3-phase trip), TRIP A, TRIP B and TRIP C operands	R
	general	BOOLEAN	ST	BREAKER # OFF CMD		R
	phsA	BOOLEAN	ST	BREAKER # TRIP A		R
	phsB	BOOLEAN	ST	BREAKER # TRIP B		R
	phsC	BOOLEAN	ST	BREAKER # TRIP C		R
OpCls		ACT			BREAKER # ON CMD (close) operand	R
	general	BOOLEAN	ST	BREAKER # ON CMD		R
BadSt1		SPS			BREAKER # BAD STATUS operand	R
	stVal	BOOLEAN	ST	BREAKER # BAD STATUS		R
ClsSt1		SPS			BREAKER # CLOSED operand	R
	stVal	BOOLEAN	ST	BREAKER # CLOSED		R
OpnSt1		SPS			BREAKER # OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # OPEN		R
Dsc		SPS			BREAKER # DISCREP operand, which is breaker pole discrepancy status	R
	stVal	BOOLEAN	ST	BREAKER # DISCREP		R
Alm		SPS			BREAKER # TROUBLE operand, which is breaker pole discrepancy, bad-status, or BREAKER # EXT ALARM	R
	stVal	BOOLEAN	ST	BREAKER # TROUBLE		R
MnlOpn		SPS			BREAKER # MNL OPEN operand	R

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	BOOLEAN	ST	BREAKER # MNL OPEN		R
MnlCls		SPS			BREAKER # MNL CLS operand	R
	stVal	BOOLEAN	ST	BREAKER # MNL CLS		R
AnyPoleOpn		SPS			BREAKER # ANY P OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # ANY P OPEN		R
OnePoleOpn		SPS			BREAKER # ONE P OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # ONE P OPEN		R
OutOfSrv		SPS			BREAKER # OOS operand	R
	stVal	BOOLEAN	ST	BREAKER # OOS		R
TagOn		SPS			BREAKER # TAG ON operand	R
	stVal	BOOLEAN	ST	BREAKER # TAG ON		R
TagOff		SPS			BREAKER # TAG OFF operand	R
	stVal	BOOLEAN	ST	BREAKER # TAG OFF		R
SbstCls		SPS			BREAKER # SUBD CLSD operand	R
	stVal	BOOLEAN	ST	BREAKER # SUBD CLSD		R
SbstOpn		SPS			BREAKER # SUBD OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # SUBD OPEN		R
BypsOn		SPS			BREAKER # BYPASS ON operand	R
	stVal	BOOLEAN	ST	BREAKER # BYPASS ON		R
BypsOff		SPS			BREAKER # BYPASS OFF operand	R
	stVal	BOOLEAN	ST	BREAKER # BYPASS OFF		R
RecBlk		SPS			BREAKER # BLK RCLS operand	R
	stVal	BOOLEAN	ST	BREAKER # BLK RCLS		R
RecEna		SPS			BREAKER # ENA RCLS operand	R
	stVal	BOOLEAN	ST	BREAKER # ENA RCLS		R
Pos		DPC			Breaker position control and status	R/Ctrl
	stVal	CODED ENUM	ST			R
	stSeld	BOOLEAN	ST		The controllable data status is “selected”	R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	XCBR# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	XCBR# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF			R
BlkOpn		SPC			Blocks breaker open commands from all sources including protection	R/Ctrl
	stVal	BOOLEAN	ST	the output of the logic gates as shown on Sheet 1 of the Breaker Control Logic		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	XCBR# BlkOpn ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
BlkCls		SPC			Blocks breaker close commands from all sources	R/Ctrl
	stVal	BOOLEAN	ST	the output of the logic gates as shown on Sheet 1 of the Breaker Control Logic		R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	XCBR# BlkCls ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
InRef1		GEORG			BREAKER # OPEN setting.	R
	setSrcRef	VISIBLE STRING255	SP	BREAKER # OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef2		GEORG			BREAKER # BLK OPEN setting.	R
	setSrcRef	VISIBLE STRING255	SP	BREAKER # BLK OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef3		GEORG			BREAKER # CLOSE setting.	R
	setSrcRef	VISIBLE STRING255	SP	BREAKER # CLOSE	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef4		GEORG			BREAKER # BLK CLOSE setting.	R
	setSrcRef	VISIBLE STRING255	SP	BREAKER # BLK CLOSE	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef8		GEORG			BKR# SYNCCHECK CLS setting.	R
	setSrcRef	VISIBLE STRING255	SP	BKR# SYNCCHECK CLS	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef5		GEORG			BREAKER # EXT ALARM setting.	R
	setSrcRef	VISIBLE STRING255	SP	BREAKER # EXT ALARM	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef6		GEORG			BREAKER # OUT OF SV (out-of-service) setting.	R
	setSrcRef	VISIBLE STRING255	SP	BREAKER # OUT OF SV	reference to the data attribute to input	R/C

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef7		GEORG			BKR# ST.LOC OPERAND (local control) setting.	R
	setSrcRef	VISIBLE STRING255	SP	BKR# ST.LOC OPERAND	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef9		GEORG			BREAKER # RACKED-IN setting.	R
	setSrcRef	VISIBLE STRING255	SP	BREAKER # RACKED-IN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef10		GEORG			BREAKER # PUSH BUTTON CONTROL setting	R
	setSrcRef	VISIBLE STRING255	SP	BREAKER # PUSH BUTTON CONTROL	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

Table 4-48: Breaker control data objects

LNName: BkrΘXCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Loc		SPS			Value of operand selected by setting XCBR# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.Loc.stVal		R
OpCnt		INS			Phase ψ breaker operations counter.	R
	stVal	INT32	ST			R
BadSt1		SPS			BREAKER # ψ BAD ST operand	R
	stVal	BOOLEAN	ST	BREAKER # ψ BAD ST		R
ClsSt1		SPS			BREAKER # ψ CLSD operand	R
	stVal	BOOLEAN	ST	BREAKER # ψ CLSD		R
OpnSt1		SPS			BREAKER # ψ OPEN operand	R
	stVal	BOOLEAN	ST	BREAKER # ψ OPEN		R
IntermSt1		SPS			BREAKER # ψ INTERM operand	R
	stVal	BOOLEAN	ST	BREAKER # ψ INTERM		R
Pos		DPC			Breaker ϕψ position status	R
	stVal	CODED ENUM	ST			R
	ctlModel	CtlModels	CF		0, the code for status-only	R
BlkOpn		SPC			Breaker open commands blocked from all sources including protection	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.BlkOpn.stVal		R
	ctlModel	CtlModels	CF		0, the code for status-only	R
BlkCls		SPC			Breaker close commands blocked from all sources including protection	R
	stVal	BOOLEAN	ST	Bkr0XCBR#.BlkCls.stVal		R
	ctlModel	CtlModels	CF		0, the code for status-only	R
CBOpCap		INS			Mandatory data object which in this case is fixed at 3	R
	stVal	ENUMERATED	ST			R
InRef1		GEORG			BREAKER # ϕA/3P CLSD setting" if Θ="1", "BREAKER # ϕB CLSD setting" if Θ="2", or "BREAKER # ϕC CLSD setting" if Θ="3	R

LNName: BkrΘXCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	VISIBLE STRING255	SP	BREAKER # ϕA/3P CLSD if Θ="1", BREAKER # ϕB CLSD if Θ="2", or BREAKER # ϕC CLSD if Θ="3"	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef2		GEORG			BREAKER # ϕA/3P OPND setting" if Θ="1", "BREAKER # ϕB OPND setting" if Θ="2", or "BREAKER # ϕC OPND setting" if Θ="3	R
	setSrcRef	VISIBLE STRING255	SP	BREAKER # ϕA/3P OPND if Θ="1", BREAKER # ϕB OPND if Θ="2", or BREAKER # ϕC OPND if Θ="3"	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.4.4 Contact output interface (ConOut)

This element is instantiated in all UR products.

Table 4-49: Contact output data objects

LNName: ConOutGGIO1		LDevice inst: System		UR element: Contact Outputs		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Ind1Θ		SPS			only instantiated where the order code indicates that contact output Θ is equipped with a current detector	R
	stVal	BOOLEAN	ST	Cont Op ϕ IOn		R
Ind2Θ		SPS			only instantiated where the order code indicates that contact output Θ is equipped with a voltage detector	R
	stVal	BOOLEAN	ST	Cont Op ϕ VOn		R
Ind3Θ		SPS			only instantiated where the order code indicates that contact output Θ is equipped with a voltage detector	R
	stVal	BOOLEAN	ST	Cont Op ϕ VOff		R
Ind4Θ		SPS			Cont Op Θ On (ϕ) operand value	R
	stVal	BOOLEAN	ST	Cont Op ϕ On		R
InRef1Θ		GEORG			CONTACT OUTPUT ϕ OPERATE setting.	R
	setSrcRef	VISIBLE STRING255	SP	CONTACT OUTPUT ϕ OPERATE	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef2Θ		GEORG			only instantiated where the order code indicates that contact output Θ is not a latching output.	R
	setSrcRef	VISIBLE STRING255	SP	CONTACT OUTPUT ϕ SEAL-IN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef3Θ		GEORG			only instantiated where the order code indicates that contact output Θ is a latching output.	R
	setSrcRef	VISIBLE STRING255	SP	OUTPUT ϕ RESET	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.4.5 Disconnect switch (Disc)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 4-50: Disconnect switch DiscCSWI data objects

LNName: DiscCSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Loc		SPS			Disconnect switch Loc status	R
	stVal	BOOLEAN	ST	Disc0XSWI#.Loc.stVal		R
Pos		DPC			Disconnect position control and status	R/Ctrl
	stVal	CODED ENUM	ST	Disc0XSWI#.Pos.stVal		R
	stSeld	BOOLEAN	ST		The controllable data status is "selected"	R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	DiscCSWI# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	DiscCSWI# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF			R

Table 4-51: Disconnect switch DiscCILO data objects

LNName: DiscCILO#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EnaOpn		SPS			Enable Open status	R
	stVal	BOOLEAN	ST			R
EnaCls		SPS			Enable Close status	R
	stVal	BOOLEAN	ST			R
InRef2		GEORG			XSWI# INTERLOCK OPN setting.	R
	setSrcRef	VISIBLE STRING255	SP	XSWI# INTERLOCK OPN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef3		GEORG			XSWI# INTERLOCK CLS setting.	R
	setSrcRef	VISIBLE STRING255	SP	XSWI# INTERLOCK CLS	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

Table 4-52: Disconnect switch Disc0XSWI data objects

LNName: Disc0XSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EEHealth		INS			Disconnect switch health, value is 3 (red) when disconnect switch trouble is detected	R
	stVal	ENUMERATED	ST			R
Loc		SPS			Value of operand selected by XSWI# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST			R
OpCnt		INS			Disconnect switch operations counter.	R

LNName: Disc0XSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	INT32	ST			R
SwTyp		INS			Disconnect switch type, fixed at 2 (Disconnector)	R
	stVal	ENUMERATED	ST			R
SwOpCap		INS			Mandatory data object which in this case is fixed at 4	R
	stVal	ENUMERATED	ST			R
OpOpn		ACT			SWITCH # OFF CMD (open) operand	R
	general	BOOLEAN	ST	SWITCH # OFF CMD		R
OpCls		ACT			SWITCH # ON CMD (close) operand	R
	general	BOOLEAN	ST	SWITCH # ON CMD		R
BadSt1		SPS			SWITCH # BAD STATUS operand	R
	stVal	BOOLEAN	ST	SWITCH # BAD STATUS		R
ClsSt1		SPS			SWITCH # CLOSED operand	R
	stVal	BOOLEAN	ST	SWITCH # CLOSED		R
OpnSt1		SPS			SWITCH # OPEN operand	R
	stVal	BOOLEAN	ST	SWITCH # OPEN		R
Dsc		SPS			SWITCH # DISCREP operand, which is disconnect pole discrepancy status	R
	stVal	BOOLEAN	ST	SWITCH # DISCREP		R
Alm		SPS			SWITCH # TROUBLE operand, which is disconnect pole discrepancy, bad-status, or SWITCH # EXT ALARM	R
	stVal	BOOLEAN	ST	SWITCH # TROUBLE		R
TagOn		SPS			SWITCH # TAG ON operand	R
	stVal	BOOLEAN	ST	SWITCH # TAG ON		R
TagOff		SPS			SWITCH # TAG OFF operand	R
	stVal	BOOLEAN	ST	SWITCH # TAG OFF		R
SbstCls		SPS			SWITCH # SUBD CLSD operand	R
	stVal	BOOLEAN	ST	SWITCH # SUBD CLSD		R
SbstOpn		SPS			SWITCH # SUBD OPEN operand	R
	stVal	BOOLEAN	ST	SWITCH # SUBD OPEN		R
BypsOn		SPS			SWITCH # BYPASS ON operand	R
	stVal	BOOLEAN	ST	SWITCH # BYPASS ON		R
BypsOff		SPS			SWITCH # BYPASS OFF operand	R
	stVal	BOOLEAN	ST	SWITCH # BYPASS OFF		R
Pos		DPC			Disconnect switch position control	R/Ctrl
	stVal	CODED ENUM	ST			R
	stSeld	BOOLEAN	ST		The controllable data status is “selected”	R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	XSWI# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	XSWI# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF			R

LNName: Disc0XSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkOpn		SPC			Blocks disconnect switch open commands from all sources including protection	R/Ctrl
	stVal	BOOLEAN	ST			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	Disc0XSWI# BlkOpn ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
BlkCls		SPC			Blocks disconnect switch close commands from all sources	R/Ctrl
	stVal	BOOLEAN	ST			R
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U				R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	Disc0XSWI# BlkCls ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
InRef1		GEORG			SWITCH # OPEN setting.	R
	setSrcRef	VISIBLE STRING255	SP	SWITCH # OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef2		GEORG			SWITCH # BLK OPEN setting.	R
	setSrcRef	VISIBLE STRING255	SP	SWITCH # BLK OPEN	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef3		GEORG			SWITCH # CLOSE setting.	R
	setSrcRef	ISIBLE STRING255	SP	SWITCH # CLOSE	reference to the data attribute to input	R/C
	setSrcCB	ISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef4		GEORG			SWITCH # BLK CLOSE setting.	R
	setSrcRef	VISIBLE STRING255	SP	SWITCH # BLK CLOSE	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef5		GEORG			XSWI# ST.LOC OPERAND (local control) setting.	R
	setSrcRef	VISIBLE STRING255	SP	XSWI# ST.LOC OPERAND	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

LNName: Disc0XSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
InRef5		GEORG			XSWI# PUSH BUTTON CONTROL setting	R
	setSrcRef	VISIBLE STRING255	SP	XSWI# PUSH BUTTON CONTROL	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

Table 4-53: Disconnect switch DiscΘXSWI data objects

LNName: DiscΘXSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Loc		SPS			Value of operand selected by XSWI# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST	Disc0XSWI#.Loc.stVal		R
OpCnt		INS			Phase ψ disconnect switch operation counter.	R
	stVal	INT32	ST			R
SwTyp		INS			Disconnect switch type, fixed at 2 (Disconnector)	R
	stVal	BOOLEAN	ST			R
SwOpCap		INS			Mandatory data object which in this case is fixed at 4	R
	stVal	ENUMERATED	ST			R
BadSt1		SPS			SWITCH # ϕψ BAD STATUS operand	R
	stVal	BOOLEAN	ST	SWITCH # ϕψ BAD STATUS		R
ClsSt1		SPS			SWITCH # ϕψ CLOSED operand	R
	stVal	BOOLEAN	ST	SWITCH # ϕψ CLOSED		R
OpnSt1		SPS			SWITCH # ϕψ OPEN operand	R
	stVal	BOOLEAN	ST	SWITCH # ϕψ OPEN		R
IntermSt1		SPS			SWITCH # ϕψ INTERM operand, which is disconnect pole discrepancy status	R
	stVal	BOOLEAN	ST	SWITCH # ϕψ INTERM		R
Pos		DPC			Disconnect switch ϕψ position control	R
	stVal	CODED ENUM	ST			R
	ctlModel	CtlModels	CF		0, the code for status-only	R
BlkOpn		SPC			Disconnect switch open commands blocked from all sources including protection	R
	stVal	BOOLEAN	ST	Disc0XSWI#.BlkOpn.stVal		R
	ctlModel	CtlModels	CF		0, the code for status-only	R
BlkCls		SPC			Disconnect switch close commands blocked from all sources	R
	stVal	BOOLEAN	ST	Disc0XSWI#.BlkCls.stVal		R
	ctlModel	CtlModels	CF		0, the code for status-only	R
InRef1		GEORG			SWITCH # ϕA/3P CLSD setting" if Θ="1", "SWITCH # ϕB CLSD setting" if Θ="2", or "SWITCH # ϕC CLSD setting" if Θ="3	R
	setSrcRef	VISIBLE STRING255	SP	SWITCH # ϕA/3P CLSD if Θ="1", SWITCH # ϕB CLSD if Θ="2", or SWITCH # ϕC CLSD if Θ="3"	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C
InRef2		GEORG			SWITCH # ϕA/3P OPND setting" if Θ="1", "SWITCH # ϕB OPND setting" if Θ="2", or "SWITCH # ϕC OPND setting" if Θ="3	R

LNName: DiscΘXSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	VISIBLE STRING255	SP	SWITCH # ϕA/3P OPND if Θ="1", SWITCH # ϕB OPND if Θ="2", or SWITCH # ϕC OPND if Θ="3"	reference to the data attribute to input	R/C
	setSrcCB	VISIBLE STRING255	SP		source GoCB of input if via GOOSE	R/C

4.1.5 Meter logical device

The Meter logical device contains logical nodes that model UR metering and measurement functions (other than PMU), including Signal Sources.

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4.1.5.1 Logical node zero (LLN0)

This element is instantiated in all UR devices implementing the Meter logical device.

Table 4-54: LLN0 data objects

LNName: LLN0		LDevice inst: Meter		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		INS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		GEORG			Reference to root logical device	R
	setSrcRef	VISIBLE STRING255	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

4.1.5.2 AC signal sources (ACsrc)

This element is instantiated in the following products: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 4-55: AC signal sources data objects

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			SRC# 50DD operand, which becomes On when a disturbance (change in magnitude of a sequence current greater than twice the current cutoff level) is detected on AC Source #.	R
	general	BOOLEAN	ST	SRC# 50DD		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown	R
TotW		MV			SRC # Three Phase Real Power, in primary watts	R
	instMag.f	FLOAT32		SRC # Three Phase Real Power		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# TotW DEADBAND		R/W/C

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	zeroDb	INT32U	CF			R
TotVAr		MV			SRC # Three Phase Reactive Power, in primary VAr	R
	instMag.f	FLOAT32		SRC # Three Phase Reactive Power		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			63, the code for primary volt amperes reactive (VIsinΘ)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# TotVAr DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
TotVA		MV			SRC # Three Phase Apparent Power, in primary VA	R
	instMag.f	FLOAT32		SRC # Three Phase Apparent Power		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			61, the code for primary volt amperes (VA)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# TotVA DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
TotPF		MV			SRC # Three Phase Power Factor, dimensionless	R
	instMag.f	FLOAT32		SRC # Three Phase Power Factor		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			65, the code for power factor (dimensionless)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# TotPF DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
PFSign		ING			Sign convention for power factor (PF) is fixed at Lead/Lag (usually named IEEE)	R
	setVal	ENUMERATED	SP		2, the code for Lead/Lag (usually named IEEE, Enumeration name is "EEI" per http://www.tissues.iec61850.com/tissue.mspx?issueid=686)	R
Hz		MV			SRC # Frequency, in Hz	R
	instMag.f	FLOAT32		SRC # Frequency		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# Hz DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
PPV		DEL			SRC # Phase-to-phase Voltage phasors, in primary volts	R
	phsAB.instCVal .mag.f	FLOAT32		SRC # Phase AB Voltage Magnitude		R
	phsAB.instCVal .ang.f	FLOAT32		SRC # Phase AB Voltage Angle		R
	phsAB.cVal.mag.f	FLOAT32				R
	phsAB.cVal.ang.f	FLOAT32				R
	phsAB.units .SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsAB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsAB.db	INT32U	CF	MMXU# PPV.phsAB.db		R/W/C
	phsAB.zeroDb	INT32U	CF			R
	phsBC.instCVal .mag.f	FLOAT32		SRC # Phase BC Voltage Magnitude		R
	phsBC.instCVal .ang.f	FLOAT32		SRC # Phase BC Voltage Angle		R
	phsBC.cVal.mag.f	FLOAT32				R
	phsBC.cVal.ang.f	FLOAT32				R
	phsBC.units .SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsBC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsBC.db	INT32U	CF	MMXU# PPV.phsBC.db		R/W/C
	phsBC.zeroDb	INT32U	CF			R
	phsCA.instCVal .mag.f	FLOAT32		SRC # Phase CA Voltage Magnitude		R
	phsCA.instCVal .ang.f	FLOAT32		SRC # Phase CA Voltage Angle		R
	phsCA.cVal.mag.f	FLOAT32				R
	phsCA.cVal.ang.f	FLOAT32				R
	phsCA.units .SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsCA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsCA.db	INT32U	CF	MMXU# PPV.phsCA .db		R/W/C
	phsCA.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
VabRMS		MV			SRC # Phase AB Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase AB Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PPV.phsAB DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
VbcRMS		MV			SRC # Phase BC Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase BC Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PPV.phsBC DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
VcaRMS		MV			SRC # Phase CA Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase CA Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PPV.phsCA DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
PhV		WYE			SRC # Phase Voltage phasors, in primary volts	R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase AG Voltage Magnitude		R
	phsA.instCVal.ang .f	FLOAT32		SRC # Phase AG Voltage Angle		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.cVal.ang.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# PhV.phsA.db		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase BG Voltage Magnitude		R
	phsB.instCVal.ang .f	FLOAT32		SRC # Phase BG Voltage Angle		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.cVal.ang.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# PhV.phsB .db		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase CG Voltage Magnitude		R
	phsC.instCVal.ang .f	FLOAT32		SRC # Phase CG Voltage Angle		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.cVal.ang.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	phsC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# PhV.phsC.db		R/W/C
	phsC.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
VaRMS		MV			SRC # Phase AG Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase AG Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PhV.phsA DEADBAND		R/W/C
	zeroDb	INT32U	CF			R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
VbRMS		MV			SRC # Phase BG Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase BG Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PhV.phsB DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
VcRMS		MV			SRC # Phase CG Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Phase CG Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS PhV.phsC DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
A		WYE			SRC # Current phasors, in primary amperes	R
	phsA	CMV				R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Current Magnitude		R
	phsA.instCVal.ang .f	FLOAT32		SRC # Phase A Current Angle		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.cVal.ang.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# A.phsA .db		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Current Magnitude		R
	phsB.instCVal.ang .f	FLOAT32		SRC # Phase B Current Angle		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.cVal.ang.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# A.phsB.db		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase C Current Magnitude		R
	phsC.instCVal.ang .f	FLOAT32		SRC # Phase C Current Angle		R
	phsC.cVal.mag.f	FLOAT32				R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsC.cVal.ang.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	phsC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# A.phsC.db		R/W/C
	phsC.zeroDb	INT32U	CF			R
	res	CMV				R
	res.instCVal.mag .f	FLOAT32		SRC # Neutral Current Magnitude		R
	res.instCVal.ang .f	FLOAT32		SRC # Neutral Current Angle		R
	res.cVal.mag.f	FLOAT32				R
	res.cVal.ang.f	FLOAT32				R
	res.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	res.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	res.db	INT32U	CF	MMXU# A.neut.db		R/W/C
	res.zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
AaRMS		MV			SRC # Phase A Current RMS, in primary amperes	R
	instMag.f	FLOAT32		SRC # Phase A Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS A.phsA DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
AbRMS		MV			SRC # Phase B Current RMS, in primary amperes	R
	instMag.f	FLOAT32		SRC # Phase B Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS A.phsB DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
AcRMS		MV			SRC # Phase C Current RMS, in primary amperes	R
	instMag.f	FLOAT32		SRC # Phase C Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS A.phsC DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
AresRMS		MV			SRC # Neutral Current RMS, in primary amperes	R
	instMag.f	FLOAT32		SRC # Neutral Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# RMS A.neut DEADBAND		R/W/C

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	zeroDb	INT32U	CF			R
Adif		CMV			SRC # Differential Ground Current phasor, in primary amperes	R
	instCVal.mag.f	FLOAT32		SRC # Differential Ground Current Magnitude		R
	instCVal.ang.f	FLOAT32		SRC # Differential Ground Current Angle		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXU# Dif Gnd Cur.db		R/W/C
	zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
W		WYE			SRC # Phase Real Power, in primary watts	R
	phsA	CMV				R
	phsA.instCVal.mag.f	FLOAT32		SRC # Phase A Real Power		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R
	phsA.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# W.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag.f	FLOAT32		SRC # Phase B Real Power		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R
	phsB.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# W.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag.f	FLOAT32		SRC # Phase C Real Power		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			38, the code for primary watts (J/s)	R
	phsC.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# W.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF			R
VAr		WYE			SRC # Phase Reactive Power, in primary VAr	R
	phsA	CMV				R
	phsA.instCVal.mag.f	FLOAT32		SRC # Phase A Reactive Power		R
	phsA.cVal.mag.f	FLOAT32				R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsA.units.SIUnit	ENUMERATED			63, the code for primary volt amperes reactive (VIsinΘ)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# VAr.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Reactive Power		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			63, the code for primary volt amperes reactive (VIsinΘ)	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# VAr.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase C Reactive Power		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			63, the code for primary volt amperes reactive (VIsinΘ)	R
	phsC.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# VAr.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF			R
VA		WYE			SRC # Phase Apparent Power, in primary VA	R
	phsA	CMV				R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Apparent Power		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			61, the code for primary volt amperes (VA)	R
	phsA.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# VA.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Apparent Power		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			61, the code for primary volt amperes (VA)	R
	phsB.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# VA.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsC.instCVal.mag.f	FLOAT32		SRC # Phase C Apparent Power		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			61, the code for primary volt amperes (VA)	R
	phsC.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# VA.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF			R
PF		WYE			SRC # Phase Power Factor, dimensionless	R
	phsA	CMV				R
	phsA.instCVal.mag.f	FLOAT32		SRC # Phase A Power Factor		R
	phsA.cVal.mag.f	FLOAT32				R
	phsA.units.SIUnit	ENUMERATED			65, the code for power factor (dimensionless)	R
	phsA.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsA.db	INT32U	CF	MMXU# PF.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF			R
	phsB	CMV				R
	phsB.instCVal.mag.f	FLOAT32		SRC # Phase B Power Factor		R
	phsB.cVal.mag.f	FLOAT32				R
	phsB.units.SIUnit	ENUMERATED			65, the code for power factor (dimensionless)	R
	phsB.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsB.db	INT32U	CF	MMXU# PF.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF			R
	phsC	CMV				R
	phsC.instCVal.mag.f	FLOAT32		SRC # Phase C Power Factor		R
	phsC.cVal.mag.f	FLOAT32				R
	phsC.units.SIUnit	ENUMERATED			65, the code for power factor (dimensionless)	R
	phsC.units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsC.db	INT32U	CF	MMXU# PF.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF			R

Table 4-56: AC signal sources data object

LNName: ACsrcMMXN#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Vaux		CMV			SRC # Auxiliary Voltage phasor, in primary volts	R
	instCVal.mag.f	FLOAT32		SRC # Auxiliary Voltage Magnitude		R
	instCVal.ang.f	FLOAT32		SRC # Auxiliary Voltage Angle		R

LNName: ACsrcMMXN#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXN# AuxV.db		R/W/C
	zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
VauxRMS		MV			SRC # Auxiliary Voltage RMS, in primary volts	R
	instMag.f	FLOAT32		SRC # Auxiliary Voltage RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXN# RMS AuxV DEADBAND		R/W/C
	zeroDb	INT32U	CF			R
Agnd		CMV			SRC # Ground Current phasor, in primary amperes	R
	instCVal.mag.f	FLOAT32		SRC # Ground Current Magnitude		R
	instCVal.ang.f	FLOAT32		SRC # Ground Current Angle		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXN# GndCur.db		R/W/C
	zeroDb	INT32U	CF			R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
AgndRMS		MV			SRC # Ground Current RMS, in primary amperes	R
	instMag.f	FLOAT32		SRC # Ground Current RMS		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	MMXN# RMS GndCur DEADBAND		R/W/C
	zeroDb	INT32U	CF			R

Table 4-57: AC signal sources data objects

LNName: ACsrcMSQI#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
SeqA		SEQ			SRC # Sequence Current phasors, in primary amperes	R
	c1	CMV				R
	c1.instCVal.mag.f	FLOAT32		SRC # Positive Sequence Current Magnitude		R
	c1.instCVal.ang.f	FLOAT32		SRC # Positive Sequence Current Angle		R
	c1.cVal.mag.f	FLOAT32				R
	c1.cVal.ang.f	FLOAT32				R

LNName: ACsrcMSQI#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	c1.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	c1.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	c1.db	INT32U	CF	MSQI# Seq1 Cur.db		R/W/C
	c1.zeroDb	INT32U	CF			R
	c2	CMV				R
	c2.instCVal.mag.f	FLOAT32		SRC # Negative Sequence Current Magnitude		R
	c2.instCVal.ang.f	FLOAT32		SRC # Negative Sequence Current Angle		R
	c2.cVal.mag.f	FLOAT32				R
	c2.cVal.ang.f	FLOAT32				R
	c2.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	c2.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	c2.db	INT32U	CF	MSQI# Seq2 Cur.db		R/W/C
	c2.zeroDb	INT32U	CF			R
	c3	CMV				R
	c3.instCVal.mag.f	FLOAT32		SRC # Zero Sequence Current Magnitude		R
	c3.instCVal.ang.f	FLOAT32		SRC # Zero Sequence Current Angle		R
	c3.cVal.mag.f	FLOAT32				R
	c3.cVal.ang.f	FLOAT32				R
	c3.units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	c3.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	c3.db	INT32U	CF	MSQI# Seq0 Cur.db		R/W/C
	c3.zeroDb	INT32U	CF			R
	seqT	ENUMERATED	MX		0, the code for pos-neg-zero	R
	phsRef	ENUMERATED	CF		0, the code for phase A	R
SeqV		SEQ			SRC # Sequence Voltage phasors, in primary volts	R
	c1	CMV				R
	c1.instCVal.mag.f	FLOAT32		SRC # Positive Sequence Voltage Magnitude		R
	c1.instCVal.ang.f	FLOAT32		SRC # Positive Sequence Voltage Angle		R
	c1.cVal.mag.f	FLOAT32				R
	c1.cVal.ang.f	FLOAT32				R
	c1.units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	c1.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	c1.db	INT32U	CF	MSQI# Seq1 V.db		R/W/C
	c1.zeroDb	INT32U	CF			R
	c2	CMV				R
	c2.instCVal.mag.f	FLOAT32		SRC # Negative Sequence Voltage Magnitude		R
	c2.instCVal.ang.f	FLOAT32		SRC # Negative Sequence Voltage Angle		R
	c2.cVal.mag.f	FLOAT32				R
	c2.cVal.ang.f	FLOAT32				R

LNName: ACsrcMSQI#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	c2.units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	c2.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	c2.db	INT32U	CF	MSQI# Seq2 V.db		R/W/C
	c2.zeroDb	INT32U	CF			R
	c3	CMV				R
	c3.instCVal.mag.f	FLOAT32		SRC # Zero Sequence Voltage Magnitude		R
	c3.instCVal.ang.f	FLOAT32		SRC # Zero Sequence Voltage Angle		R
	c3.cVal.mag.f	FLOAT32				R
	c3.cVal.ang.f	FLOAT32				R
	c3.units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	c3.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	c3.db	INT32U	CF	MSQI# Seq0 V.db		R/W/C
	c3.zeroDb	INT32U	CF			R
	seqT	ENUMERATED	MX		0, the code for pos-neg-zero	R
	phsRef	ENUMERATED	CF		0, the code for phase A	R

4.1.5.3 B90 AC channel metering (B_Mtr)

This element is instantiated in the following products: B90.

Table 4-58: B90 AC channel metering current input data objects

LNName: B_AmpMMXN#		LDevice inst: Meter		UR element: B90 Metering for current input ϕ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ChA		CMV			ϕ current in primary amps	R
	instCVal.mag.f	FLOAT32		ϕ CURRENT magnitude		R
	instCVal.ang.f	FLOAT32		ϕ CURRENT a		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_AmpMMXNϕ.ChA.db		R/W/C
	zeroDb	INT32U	CF			R

Table 4-59: B90 AC channel metering voltage input data objects

LNName: B_VolMMXN#		LDevice inst: Meter		UR element: B90 Metering for voltage input ϕ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
ChV		CMV			ϕ voltage in primary volts	R
	instCVal.mag.f	FLOAT32		ϕ VOLTAGE magnitude		R
	instCVal.ang.f	FLOAT32		ϕ VOLTAGE a		R
	cVal.mag.f	FLOAT32				R
	cVal.ang.f	FLOAT32				R
	units.SIUnit	ENUMERATED			29, the code for primary volts (W/A)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_VolMMXNϕ.ChV.db		R/W/C

LNName: B_VolMMXN#		LDevice inst: Meter		UR element: B90 Metering for voltage input ϕ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	zeroDb	INT32U	CF	(VOLTAGE CUT-OFF LEVEL) / 275 * 100 000		R

Table 4-60: B90 AC channel metering frequency data objects

LNName: B_FrqMMXN1		LDevice inst: Meter		UR element: B90 Metering for frequency		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Hz		MV			Frequency in Hz	R
	instMag.f	FLOAT32		FREQUENCY		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_FrqMMXN1.Hz.db		R/W/C
	zeroDb	INT32U	CF			R
TrcHz		MV			Tracking Frequency in Hz	R
	instMag.f	FLOAT32		TRACKING FREQUENCY		R
	mag.f	FLOAT32				R
	units.SIUnit	ENUMERATED			33, the code for hertz (1/s)	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	db	INT32U	CF	B_FrqMMXN1.TrcHz.db		R/W/C
	zeroDb	INT32U	CF			R

4.1.6 General (Gen) logical device

The Gen logical device contains logical nodes that model UR FlexLogic, Virtual Outputs, non-volatile latches, FlexElements, and recording (for example, oscillography) functions.

4.1.6.1 Logical node zero (LLN0)

This element is instantiated in all UR devices implementing the Gen logical device.

Table 4-61: LLN0 data objects

LNName: LLN0		LDevice inst: Gen		UR element: Nameplate information for the logical nodes		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Beh		INS			This logical device's behavior	R
	stVal	ENUMERATED	ST			R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
GrRef		GEORG			Reference to root logical device	R
	setSrcRef	VISIBLE STRING255	SP	For communications, mapped to Master ldName if not empty, otherwise to the concatenation of the IED name and "Master". For SCL, mapped to the concatenation of the IED name and "Master".	reference to the data attribute to input	R

4.1.6.2 FlexLogic, FlexLogic timers, and virtual outputs (FlxLgc)

This element is instantiated all UR devices.

Table 4-62: FlexLogic data objects

LNName: FlxLgcGAPC1		LDevice inst: Gen		UR element: FlexLogic		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Str		ACD			Mandatory data object which in this case is fixed at False	R
	general	BOOLEAN	ST	False		R
	dirGeneral	ENUMERATED	ST		0, the code for unknown.	R
Op		ACT			Mandatory data object which in this case is fixed at False	R
	general	BOOLEAN	ST	False		R
IndξξΞ		SPS			Virt Op ξ On (VOξΞ) operand value	R
	stVal	BOOLEAN	ST	VOΞξ On		R

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4.1.6.3 Oscillography (Osc)

This element is instantiated in all UR devices.

Table 4-63: Oscillography data objects

LNName: OscRDRE1		LDevice inst: Gen		UR element: Oscillography, core logical node		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
RcdMade		SPS			Records are available	R
	stVal	BOOLEAN	ST			R
FltNum		INS			NUMBER OF TRIGGERS actual value	R
	stVal	INT32	ST	NUMBER OF TRIGGERS actual value		R
NumRcd		INS			AVAILABLE RECORDS actual value	R
	stVal	INT32	ST	actual value AVAILABLE RECORDS		R
NumCycPer		INS			CYCLES PER RECORD actual value	R
	stVal	INT32	ST	actual value CYCLES PER RECORD		R
RsTms		INS			LAST CLEARED DATE actual value	R
	stVal	INT32	ST	actual value LAST CLEARED DATE		R
RcdTrg		SPC			External command to trigger recorder	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	OscRDRE1.RcdTrg.ctlModel		R/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R
MemClr		SPC			Clear all oscillography records command	R/Ctrl
	pulseConfig .cmdQual	ENUMERATED				R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U				R

LNName: OscRDRE1		LDevice inst: Gen		UR element: Oscillography, core logical node		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	pulseConfig .numPls	INT32U				R
	ctlModel	CtlModels	CF	OscRDRE1.MemClr.ctlModel		R/W/C
	sboTimeout	INT32U	CF			R
	sboClass	SboClasses	CF			R

4.1.7 GE namespace

The GE namespace is an extension of the "IEC 61850-7-4:2007A" namespace, and as such includes by reference all data object names in IEC 61850-7-4 Edition 2.0 2010-03. As these names are defined in the standard, they are not described in this document.

The name of the GE namespace specified in this document is "GE Multilin UR Namespace:2016A".

In the last column, the logical node number is not included. For example, LPHD refers to LPHD1.

Table 4-64: GE namespace

Data object name	CDC	Semantics	Used in logical nodes...
AaRMS	MV	Phase A current RMS. SRC 1 Phase A Current RMS, in primary amperes.	ACsrcMMXU
AbRMS	MV	Phase B current RMS. SRC 1 Phase B Current RMS, in primary amperes.	ACsrcMMXU
AcRMS	MV	Phase C current RMS. SRC 1 Phase C Current RMS, in primary amperes.	ACsrcMMXU
Adif	CMV	Differential current (sum of the three phase currents and the ground (fourth) current. Restricted ground differential if the fourth current measures the ground current in a grounded wye winding. Measures CT secondary circuit trouble if fourth current measures the CT secondary neutral current. SRC 1 Differential Ground Current phasor, in primary volts.	ACsrcMMXU
Agnd	CMV	Ground current (fourth input in a current AC bank). SRC 1 Ground Current phasor, in primary amperes.	ACsrcMMXN
AgndRMS	MV	Ground current RMS (fourth input in a current AC bank). SRC 1 Ground Current RMS, in primary amperes.	ACsrcMMXN
AnyErr	SPS	Any of the self-test errors generated. The ANY SELF TESTS operand.	LPHD
AnyGpsFail	SPS	The GPS signal failed or is not configured properly at any terminal. The 87L DIFF GPS FAIL operand, which becomes On when the GPS signal failed or is not configured properly at any terminal.	LinDfPDIF
AnyPoleOpn	SPS	At least one pole is open. The BREAKER 1 ANY P OPEN operand.	Bkr0XCBR
AnyShotCnt	SPS	The first breaker close signal has been issued. The AR SHOT CNT greater than zero operand.	Rec13pRREC
APPID	ING	Expected value of APPID field in messages subscribed to by RxGOOSE# The RxGOOSE1 ETYPE APPID setting.	LGOS
ArBlk1	SPS	Autoreclose Breaker number indicated by the data instance number is temporarily disabled. The AR BKR1 BLK operand and the AR1 BLK FROM MAN CLS operand.	Rec13pRREC, Rec3pRREC
AresRMS	MV	Residual Current RMS. SRC 1 Neutral Current RMS, in primary amperes.	ACsrcMMXU
ArLO	SPS	Autoreclose is locked out. The AR LO operand.	Rec13pRREC, Rec3pRREC
ArMod1	SPS	Autoreclosec mode equals to the number indicated by the data instance number, in this case 1 and 3 pole mode. The AR MODE = 1 operand.	Rec13pRREC
ArRip	SPS	Autoreclose is in progress. The AR RIP operand.	Rec13pRREC, Rec3pRREC

Data object name	CDC	Semantics	Used in logical nodes...
Asymmetry	SPS	Communications channel asymmetry detected. The 87L DIFF CH ASYM DET operand, which becomes On when the differential element's has detected substantial communications channel asymmetry.	LinDfPDIF
BadSt1	SPS	Bad-status detected. The BREAKER/SWITCH BAD STATUS operand.	BbBkrSCBR, BkrΘXCBR, Bkr0XCBR, Disc0XSWI, DiscΘXSWI, GGIO3
BatFail	SPS	The battery is not functioning. The BATTERY FAIL operand.	LPHD
BDifAClc	CMV	B90 differential current	B_DifPDIF
BkrSt	ENS	BKR STATUS BAY actual value	BbBkrSCBR
Blk2ndH1	SPS	Indicates second harmonic blocking active (where the last digit of instance number 1, 2, or 3 refers to phase A, B, and C respectively). The XFMR PCNT DIFF 2ND A/B/C operand.	PctDifPDIF
Blk5thH1	SPS	Indicates fifth harmonic blocking active (where the last digit of instance number 1, 2, or 3 refers to phase A, B, and C respectively). The XFMR PCNT DIFF 5TH A/B/C operand.	PctDifPDIF
BlkH1	SPS	The second harmonic of the transformer magnetizing inrush current has inhibited the current differential element from operating. The 87L HARM2 A/B/C OP operand, which becomes asserted when phase A/B/C of second harmonic of the transformer magnetizing inrush current inhibits the current differential element from operating.	LinDfPDIF (L90)
BrckTrbl	SPS	HardFiber Brick trouble. The BRICK TROUBLE operand.	LPHD
BRstA	CMV	B90 restraint current	B_DifPDIF
ChA	CMV	B90's AC channel current	B_AmpMMXN
ChFail1	SPS	Communications channel failed. The 87L DIFF CH 1 FAIL operand, which becomes On when the differential element has detected communications channel 1 failed.	LinDfPDIF
ChV	CMV	B90's AC channel voltage	B_VolMMXN
ClkUnsynch	SPS	Relay is not synchronized to the international time standard. The CLOCK UNSYNCHRONIZED operand.	LPHD
Cls2ndBkr	SPS	Close second Breaker signal. The AR CLOSE BKR2 operand.	Rec13pRREC
ClsSt1	SPS	Close status detected. The BREAKER/SWITCH CLOSED operand.	BbBkrSCBR, BkrΘXCBR, Bkr0XCBR, Disc0XSWI, DiscΘXSWI, GGIO3
ConfRev	ING	Expected value of confRev field in messages subscribed to by RxGOOSE#	LGOS
CrcFail1	SPS	The CRC error threshold has been exceeded. The 87L DIFF CH 1 CRCFAIL operand, which becomes On when the differential element has detected the CRC error threshold has been exceeded on channel 1.	LinDfPDIF
DatSetRef	GEORG	Expected value of datSet field in messages subscribed to by RxGOOSE# . Edition 1. The setting RxGOOSE1 DatSet.	LGOS
DbMax1	ASG	Value of "max." in deadband calculations	GGIO4
DbMin1	ASG	Value of "min." in deadband calculations	GGIO4
DeaV1	SPS	This data object indicates that V1 is below the DeaVal1 setting. The SYNC 1 V1 BELOW MAX operand.	SynChkRSYN
DifA2ndH	WYE	Phase differential current	PctDifPDIF
DifA5thH	WYE	Phase differential current	PctDifPDIF
DirSupn	SPS	Directional overcurrent supervision status (not instantiated for zone 1 GndDisPDIS1). The GND DIST Z2 DIR SUPN operand.	GndDisPDIS
Disabled	SPS	Function is disabled	Rec13pRREC, Rec3pRREC
DistDet	SPS	Sensitive current disturbance detector. For PwrSwgRPSB1, power swing element detected disturbance other than power swing. The 50DD SV operand, which becomes On when the 87L disturbance detector has operated. The POWER SWING 50DD operand.	LinDfPDIF, PwrSwgRPSB

Data object name	CDC	Semantics	Used in logical nodes...
Dpo	SPS	The DPO (dropout) operand. Inverse of Str, Op, or Pkp.	AuxOvPTOV, AuxUvPTUV, B_TocPTOC, B_UvPTUV, GndIocPIOC, GndTocPTOC, NegIocPIOC, NegTocPTOC, NeuIocPIOC, NeuTocPTOC, PhsIocPIOC, PhsOvPTOV, PhsTocPTOC, PhsUvPTUV, RgDifPDIF, SubHa$PHIZ
DpoBia	SPS	B90 Drop-out of Biased indicates the dropping of pick-up condition for biased differential element	B_DifPDIF
DpoPhs1	SPS	Inverse of per phase pickup (Pkp). Individual phase DPO (dropout) operand.	B_TocPTOC, PhsIocPIOC, GndDisPDIS, PhsDisPDIS, PhsTocPTOC
DpoPhs1	SPS	Inverse of Op	PhsIocPIOC, PhsOvPTOV, PhsUvPTUV
DrcDevOff	SPS	A direct device is configured but not connected. The DIRECT DEVICE OFF operand.	LPHD
DrcRingBrk	SPS	The Direct I/O settings is for a ring but the connection is not in a ring. The DIRECT RING BREAK operand.	LPHD
DynArmd	SPS	This data object indicates that dynamic mode is armed. The SYNC1 S-CLOSE ARMD operand, which becomes On when dynamic mode is armed.	SynChkRSYN
DynDpo	SPS	The SYNC1 S-CLOSE DPO operand, which becomes Off when all criteria for dynamic mode are fulfilled	SynChkRSYN
DynOp	SPS	This data object indicates that all criteria for dynamic mode are fulfilled if value is TRUE else false. The SYNC1 S-CLOSE OP operand, which becomes On when all criteria for dynamic mode are fulfilled.	SynChkRSYN
Ena1	SPS	Function is Enabled. The AR ENABLED operand.	Rec13pRREC, Rec3pRREC
EqpMismat	SPS	The configuration of modules does not match the stored order code. The EQUIPMENT MISMATCH operand.	LPHD
Eth1Fail	SPS	First Ethernet port failure	LPHD
Eth2Fail	SPS	Second Ethernet port failure	LPHD
Eth3Fail	SPS	Third Ethernet port failure	LPHD
EvtEna1	ENG	Setting to enable generation of events in event record, 0 = Disabled, 1 = Enabled	GGIO3
EvtRcdClr	SPC	Clear Event Records (erase all Events). The CLEAR EVENT RECORDS command.	Master/LLN0
FlexErrTkn	SPS	A FlexLogic equation is incorrect. The FLEXLOGIC ERR TOKEN operand.	LPHD
FltLinID	VSS	Faulted line ID	FltRFLO
Function1	ENG	Function Enable/Disable setting: 0 = Disabled, 1 = Enabled (note that TISSUE 670 suggests something like this named SetMod)	Master/LLN0
FwdOp	SPS	Fault direction is forward. The NEG SEQ DIR OC1 FWD operand. The NTRL DIR OC1 FWD operand.	NegDocRDIR, NeuDocRDIR
GoDatSetRef	ORG	Expected value of datSet field in messages subscribed to by RxGOOSE# The setting RxGOOSE1 DatSet.	LGOS
GoEnaPort1	ENG	Enable all GOOSE on Ethernet port setting: 0 = Disabled, 1 = Enabled	Master/LLN0
GoID	VSG	Expected value of goID field in messages subscribed to by RxGOOSE# The setting RxGOOSE1 ID.	LGOS
GpsFail1	SPS	GPS failed at terminal corresponding to instance number. The 87L DIFF GPS 1 FAIL operand.	LinDfPDIF
GrAct1	SPS	Setting group corresponding to index is active (not instantiated in C30). The SETTING GROUP ACT 1 operand.	Master/LLN0

Data object name	CDC	Semantics	Used in logical nodes...
IdFail1	SPS	ID check for a peer L30/L90 on the channel has failed. 87L DIFF CH 1 ID FAIL operand, which becomes On when the differential element's ID check for a peer L30 on channel 1 has failed.	LinDfPDIF
IndFailBeh	ENG	Setting to select the behavior of the RxGOOSE Boolean when the sending device is offline: 0 = On, 1 = Off, 2 = Latest/On, 3 = Latest/Off	GGIO3
IndPos1	DPS	Generic remote DPS input status values: 0 for intermediate-state, 1 for off, 2 for on, 3 for bad-state. RxGOOSE DPS1 actual value.	GGIO3
IntermSt1	SPS	Intermediate-status detected. The BREAKER/SWITCH INTERM operand.	BkrΘXCBR, DiscΘXSWI, GGIO3
IrigbFail	SPS	A bad IRIG-B input signal has been detected. The IRIG-B FAILURE operand.	LPHD
IsoBlk	ACT	Indicates that the isolator position is invalid	B_IsoSSWI, BbIsoSSWI
IsoPos	ACT	Position of isolator, meaning On (current included in differential zone) or Off (current excluded from differential calculations)	BbIsoSSWI
LastSqNum	INS	Last sequence number received. Actual value RxGOOSE1 SqNum.	LGOS
LatchErr	SPS	A difference is detected between the wanted and actual latch contact state. The LATCHING OUT ERROR operand.	LPHD
LivDea	SPS	This data object indicates that live/dead conditions have been met. The SYNC 1 DEAD S OP operand, which indicates that live/dead conditions have been met.	SynChkRSYN
LivDeaDpo	SPS	This data object indicates that live/dead conditions have not been met. The SYNC 1 DEAD S DPO operand, which indicates that live/dead conditions have not been met.	SynChkRSYN
LivLiv	SPS	This data object indicates that both sources are live, and that angle, frequency, and voltage difference and range conditions have been met. The SYNC 1 SYNC OP operand, which indicates that both sources are live, and that angle, frequency, and voltage difference and range conditions have been met.	SynChkRSYN
LivLivDpo	SPS	This data object indicates that one or both sources are not live, or that angle, frequency, and voltage difference and range conditions have been met. The SYNC 1 SYNC DPO operand, which indicates that one or both sources are not live, or that angle, frequency, and voltage difference and range conditions have been met.	SynChkRSYN
LivV1	SPS	This data object indicates that V1 is above the LivVal1 setting. The SYNC 1 V1 ABOVE MIN operand, which indicates that V1 is above the LivVal1 setting.	SynChkRSYN
LosPkt1	SPS	The lost packet threshold has been exceeded. The 87L DIFF CH 1 LOSTPKT operand, which becomes On when the differential element has detected the lost packet threshold has been exceeded on channel 1.	LinDfPDIF
MAC	GEVSG	Expected value of Destination MAC address field in messages subscribed to by RxGOOSE#	LGOS
MajorErr	SPS	Any of the major self-test errors generated (major error). The ANY MAJOR ERROR operand.	LPHD
MaxAsymOp1	SPS	Asymmetry on the channel exceeded pre-set value. The 87L DIFF CH 1 MAX ASYM operand, which becomes On when the Asymmetry on channel 1 exceeded preset value.	LinDfPDIF
MinorErr	SPS	Any of the minor self-test errors generated (minor error). The ANY MINOR ERROR operand.	LPHD
MltLev	SPG	Select mode of authority for local control true means control from level below a level where Loc is true are allowed where Loc at the lower level is false	Master/LLN0
MMSClnts	MV	Number of MMS client connections active	LPHD
MnlCls	SPS	Manual close initiated. The BREAKER 1 MNL CLS operand.	Bkr0XCBR
NeutSupn	SPS	Neutral overcurrent supervision status. The GND DIST Z1 SUPN IN operand.	GndDisPDIS

Data object name	CDC	Semantics	Used in logical nodes...
NumCycPer	INS	Number of cycles of the nominal frequency. The CYCLES PER RECORD actual value.	OscRDRE
Off	SPS	Logic 0 fixed operand	Master/LLN0
On	SPS	Logic 1 fixed operand	Master/LLN0
OnePoleOpn	SPS	One pole is open, others closed. The BREAKER 1 ONE P OPEN operand.	Bkr0XCBR
OnePU	ASG	The per-unit base factor applied to the corresponding RxGOOSE analog input FlexAnalog quantity to normalize it to a per-unit quantity.	GGIO3
OnMod	SPS	Relay in On Mode	Master / LNN0
OpBia	ACT	B90 Operate indicates the trip decision of a biased protection logic	B_DifPDIF
OpnSt1	SPS	Open status detected. The BREAKER/SWITCH OPEN operand. The RxGOOSE DPS1 Off operand.	BbBkrSCBR, BkrΘXCBR, Bkr0XCBR, Disc0XSWI, DiscΘXSWI, GGIO3
OpPhs1	SPS	Indicates a trip decision for a particular cause per phase. The BUS 1 BIASED OP A/B/C operand. The BUS 1 UNBIASED OP A/B/C operand. The PHS DIST Z1 OP AB/BC/CA operand.	PhsDisPDIS
OpUnBia	ACT	B90 Operate indicates the trip decision of an unbiased protection logic	B_DifPDIF
OscilGOOSE	SPS	One or more of GGIO1.Ind###.stVal has been frozen due to frequent status changes (chatter) in the mapped operand. The Oscillatory GOOSE operand.	LPHD
OutOfSrv	SPS	Out-of-service. The BREAKER 1 OOS operand.	Bkr0XCBR
P1Rip	SPS	Autoreclose A single pole is in progress. The AR 1-P RIP operand.	Rec13pRREC
P3Rip1	SPS	Autoreclose 3-pole is in progress via dead time number indicated by the data instance number. The AR 3-P/1 RIP operand.	Rec13pRREC
P3Tr	SPS	Force any trip to 3-phase trip. The AR FORCE 3-P TRIP operand.	Rec13pRREC
PBusFail	SPS	HardFiber process bus system status	LPHD
PBusTrbl	SPS	HardFiber process bus trouble	LPHD
PFLLfail	SPS	Phase and/or frequency lock loop (PFLL) has failed. The 87L DIFF PFLL FAIL operand, which becomes On when the differential element's phase and frequency lock loop (PFLL) has failed.	LinDfPDIF
PhDir1	SPS	Indicates Phase Comparison of differential is satisfied per phase, where the last digit of instance number 1, 2, or 3 refers to phase A, B, and C respectively. The BUS 1 DIR A/B/C operand. The STATOR DIFF1 DIR A/B/C operand.	B_DifPDIF
ProcBusTrbl	SPS	HardFiber Process bus trouble. The PROCESS BUS TROUBLE operand.	LPHD
ProjectedDif	MV	Phase angle difference between V1 and projected V2 (V2'). SYNCHROCHECK 1 DELTA PHASE', in degrees which is the phase angle difference between V1 and projected V2.	SynChkRSYN
ProjectedV1	CMV	Projected V2 Voltage phasor. SYNCHROCHECK 1 V2' voltage phasor, in primary volts.	SynChkRSYN
PtpFail	SPS	Bad PTP Signal. The PTP FAILURE operand.	LPHD
RackdIn	SPS	Breaker is connected to power system	BbBkrSCBR
RackdOut	SPS	Breaker is not connected to power system	BbBkrSCBR
RefWinding	INS	Reference winding. Number of windings used as the reference winding for ratio compensation.	PctDifPDIF
RelDpo	SPS	This data object indicates that not all criteria are fulfilled, and the switching/ operation action is not released to proceed. Complement of Rel. The SYNC 1 CLS DPO operand, which becomes Off when all synchrocheck criteria are fulfilled.	SynChkRSYN

Data object name	CDC	Semantics	Used in logical nodes...
RlyUTCTms	INS	Represents the relay UTC time in seconds elapsed since 00:00:00 January 1, 1970. Mapped to Modbus register 41A0h value, that is, "Relay time clock set time" register value after converting to UTC (if time zone and DST is used).	LPHD
RrtdComFail	SPS	RRTD communication failure. The RRTD COMM FAIL operand.	LPHD
RrtdFail	SPS	RRTD communication failure	LPHD
Rs	SPS	Autoreclose has been reset either manually or by the rest timer. The AR RESET operand.	Rec13pRREC
RsTms	INS	The UTC time of the last clear in seconds elapsed since 00:00:00 January 1, 1970. The LAST CLEARED DATE actual value.	OscRDRE
RtdTrbl	SPS	RTD trouble. The RTD TROUBLE operand.	LPHD
RvOp	SPS	Fault direction is reverse. The NEG SEQ DIR OC1 REV operand. The NTRL DIR OC1 REV operand.	NegDocRDIR, NeuDocRDIR
RxGooseOff	SPS	One or more RxGOOSE is not responding. The RxGOOSE OFF operand.	LPHD
Sat1	SPS	Indicates CT saturation is detected. The BUS 1 SAT A/B/C operand.	B_DifPDIF
SecDataClr	SPC	Command CLEAR SECURITY DATA, TRUE = CLEAR SECURITY DATA	SecGSAL
SeqTO	SPS	The incomplete sequence timer timed out. The AR INCOMPLETE SEQ operand.	Rec13pRREC
ShotCnt1	SPS	Autoreclosec shot count is equal to the number indicated by the data instance number. The AR SHOT CNT=1 operand.	Rec13pRREC, Rec3pRREC
SntpFail	SPS	SNTP server is not responding. The SNTP FAILURE operand.	LPHD
StlGMP	SPS	Indicates status of IGMP connection for R-GOOSE multicast reception. The R-RxGOOSE1 IGMP On operand.	LGOS
StrBia	ACD	B90 Start Biased indicates the detection of a fault or an unacceptable condition by Biased Differential element	B_DifPDIF
StrOutgoing	SPS	This Data Object indicates an unstable Power swing detection for outgoing Locus. The POWER SWING OUTGOING operand.	PwrSwgRPSB
StrPhs1	SPS	Indicates the detection of a fault or an unacceptable condition on a particular phase-to-phase loop. The PHS DIST Z1 PKP AB/BC/CA operand in Phase-To-Phase.	PhsDisPDIS
StubBusOp	SPS	The stub bus function is operated. The STUB BUS OP operand, which becomes On when the Stub Bus function is active.	LinDfPDIF
SwFail	SPS	Autoreclose mode switching failed. The AR MODE SWITCH FAIL operand.	Rec13pRREC
SysExcp	SPS	System exception. The SYSTEM EXCEPTION operand.	LPHD
TapLocFlt	SPS	L90 - The fault is identified between the local terminal and the tap point	FltRptRFLO
TdrTrbl	SPS	TDR trouble. The TDR TROUBLE operand.	LPHD
TempMnt	SPS	The ambient temperature is greater than the maximum operating temperature. The TEMP MONITOR operand.	LPHD
TmChgOp1	SPS	Change in round trip delay on the channel exceeded pre-set value. 87L DIFF CH 1 TIME CHNG operand, which becomes On when the Change in round trip delay on channel 1 exceeded preset value.	LinDfPDIF
TmStr1	SPS	Power swing timer picked up. The POWER SWING TMR2 PKP operand.	PwrSwgRPSB

Data object name	CDC	Semantics	Used in logical nodes...
Tr1p	ACT	Single pole trip operation initiated. The 87L TRIP 1P OP operand. General is TRIP 1-POLE operand, phsA is TRIP PHASE A operand, phsB is TRIP PHASE B operand, and phsC is TRIP PHASE C operand.	LinDfPDIF, TrOutPTRC
Tr3p	ACT	Three pole trip operation initiated. The DCUB TRIP 3P operand. The DIR BLOCK1 TRIP 3P operand. The DUTT TRIP 3P operand. The HYBRID POTT TRIP 3P operand. The 87L TRIP 3P OP operand. The POTT1 TRIP 3P operand. The PUTT TRIP 3P operand. The TRIP 3-POLE operand.	LinDfPDIF, TrOutPTRC
Tr3pFrcd	SPS	Three pole trip mode is being forced. The TRIP FORCE 3-POLE operand (3-pole trip mode is being forced).	TrOutPTRC
TrcHz	MV	B90 frequency	B_FrqMMXN
TstBlkMod	SPS	Relay in Test/blocked Mode	Master/LLN0
TstMod	SPS	Relay in Test Mode	Master/LLN0
UNotPrgm	SPS	The Product Setup > Installation > Relay Settings setting is not programmed. The UNIT NOT PROGRAMMED operand.	LPHD
UpdateTms	ING	Periodic update time	Master/LLN0
V1Src	CMV	V1 Voltage phasor. SYNCHROCHECK 1 V1 voltage phasor, in primary volts.	SynChkRSYN
V2Src	CMV	V2 Voltage phasor. SYNCHROCHECK 1 V2 voltage phasor, in primary volts.	SynChkRSYN
VabRMS	MV	Phase AB Voltage RMS. SRC 1 Phase AB Voltage RMS, in primary Volts.	ACsrcMMXU
VaRMS	MV	Phase A Voltage RMS. SRC 1 Phase AG Voltage RMS, in primary volts.	ACsrcMMXU
Vaux	CMV	Auxiliary voltage (fourth input in a voltage AC bank). SRC 1 Auxiliary Voltage phasor, in primary volts.	ACsrcMMXN
VauxRMS	MV	Auxiliary voltage RMS (fourth input in a voltage AC bank). SRC 1 Auxiliary Voltage RMS, in primary volts.	ACsrcMMXN
VbcRMS	MV	Phase BC Voltage RMS. SRC 1 Phase BC Voltage RMS, in primary Volts.	ACsrcMMXU
VbRMS	MV	Phase B Voltage RMS. SRC 1 Phase BG Voltage RMS, in primary volts.	ACsrcMMXU
VcaRMS	MV	Phase CA Voltage RMS. SRC 1 Phase CA Voltage RMS, in primary Volts.	ACsrcMMXU
VcRMS	MV	Phase A Voltage RMS. SRC 1 Phase CG Voltage RMS, in primary volts.	ACsrcMMXU
VoltMntr	SPS	Voltage Monitor. The VOLTAGE MONITOR operand.	LPHD
Z1Chr1	SPS	Positive-sequence impedance is within the configured characteristic. This Data Object is used by power swing detection element for outer characteristic. The POWER SWING INNER operand. The POWER SWING MIDDLE operand. The POWER SWING OUTER operand.	PwrSwgRPSB
Zero	MV	Analog 0 fixed operand. FlexAnalog fixed operand Off.	Master/LLN0
Zn1Extend	SPS	The zone 1 distance function must be set to the extended overreach value. The AR ZONE 1 EXTENT operand.	Rec13pRREC

4.1.8 Enumerations

4.1.8.1 Standard enumerations

EnumType id and the EnumType content of standard enumerations from IEC 61850 7-4 match those in the tissues standard.

EnumType id and EnumType content of standard enumerations from IEC 61850 7-3 match those in IEC 61850 7-3:Annex D.

4.1.8.2 GE extended enumerations

For extended enumerations, EnumType id begins with the string "GE_Digital_Energy_UR_", followed by descriptive text, followed by "Kind". The following is a sample excerpt of the extended Enumerations from a firmware-generated UR.ICD file.


```
<EnumType id="GE_Digital_Energy_UR_HiZStKind">
        <EnumVal ord="0">Normal</EnumVal>
        <EnumVal ord="1">Coordination Timeout</EnumVal>
        <EnumVal ord="2">Armed</EnumVal>
        <EnumVal ord="5">Arcing</EnumVal>
        <EnumVal ord="9">Downed Conductor</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_TriggerKind">
        <EnumVal ord="0">None</EnumVal>
        <EnumVal ord="1">Loss of Load</EnumVal>
        <EnumVal ord="2">Arc Suspected</EnumVal>
        <EnumVal ord="3">Arcing</EnumVal>
        <EnumVal ord="4">Overcurrent</EnumVal>
        <EnumVal ord="5">Down Conductor</EnumVal>
        <EnumVal ord="6">External</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_MotStatusKind">
        <EnumVal ord="0">Offline</EnumVal>
        <EnumVal ord="1">Starting</EnumVal>
        <EnumVal ord="2">Running</EnumVal>
        <EnumVal ord="3">Overload</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_FltSegmentKind">
        <EnumVal ord="0">N/A</EnumVal>
        <EnumVal ord="1">LOCAL</EnumVal>
        <EnumVal ord="2">REMOTE 1</EnumVal>
        <EnumVal ord="3">REMOTE 2</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_TimeSourceKind">
        <EnumVal ord="0">None</EnumVal>
        <EnumVal ord="1">Port 1 PTP Clock</EnumVal>
        <EnumVal ord="2">Port 2 PTP Clock</EnumVal>
        <EnumVal ord="3">Port 3 PTP Clock</EnumVal>
        <EnumVal ord="4">IRIG-B</EnumVal>
        <EnumVal ord="5">SNTP</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_ClcMthKind">
        <EnumVal ord="1">UNSPECIFIED</EnumVal>
        <EnumVal ord="2">TRUE_RMS</EnumVal>
        <EnumVal ord="3">PEAK_FUNDAMENTAL</EnumVal>
        <EnumVal ord="4">RMS_FUNDAMENTAL</EnumVal>
        <EnumVal ord="5">MIN</EnumVal>
        <EnumVal ord="6">MAX</EnumVal>
        <EnumVal ord="7">AVG</EnumVal>
        <EnumVal ord="8">SDV</EnumVal>
        <EnumVal ord="9">PREDICTION</EnumVal>
        <EnumVal ord="10">RATE</EnumVal>
</EnumType>
```

```
<EnumType id="GE_Digital_Energy_UR_PIDAlg">
        <EnumVal ord="1">P</EnumVal>
        <EnumVal ord="2">I</EnumVal>
        <EnumVal ord="3">>D</EnumVal>
        <EnumVal ord="4">PI</EnumVal>
        <EnumVal ord="5">PD</EnumVal>
        <EnumVal ord="6">ID</EnumVal>
        <EnumVal ord="7">PID</EnumVal>
</EnumType>
<EnumType id="GE_Digital_Energy_UR_PFSignKind">
        <EnumVal ord="1">IEC</EnumVal>
        <EnumVal ord="2">EEI</EnumVal>
</EnumType>
```


The table outlines the logical nodes and data objects that use the extended enumerations.

Table 4-65: GE extended enumerations usage

Enum ID	Used in logical node	Using data object	CDC	Semantic
GE_Digital_Energy_UR_HiZStKind	HiZPHIZ	HiZSt	INS	Status of High Impedance fault detection function
GE_Digital_Energy_UR_TriggerKind	HiZPHIZ	Trigger11	INS	HIZ Capture1 Trigger Type
		Trigger12	INS	HIZ Capture2 Trigger Type
		Trigger13	INS	HIZ Capture3 Trigger Type
		Trigger14	INS	HIZ Capture4 Trigger Type
		Trigger21	INS	HIZ RMS Capture1 Trigger Type
		Trigger22	INS	HIZ RMS Capture2 Trigger Type
		Trigger23	INS	HIZ RMS Capture3 Trigger Type
		Trigger24	INS	HIZ RMS Capture4 Trigger Type
GE_Digital_Energy_UR_MotStatusKind	MotThmPTTR	MotStatus	INS	Motor status
GE_Digital_Energy_UR_FltSegmentKind	FltRFLO	FltSegment	INS	Segment of the line fault occurred
GE_Digital_Energy_UR_TimeSourceKind	TmClkLTMS	TmSrc	INS	RTC Sync source
GE_Digital_Energy_UR_ClcMthKind	DmdMtrMMTR	ClcMth	ING	Calculation Method
GE_Digital_Energy_UR_PIDAlg	PIDRegFPID	PIDAlg	ING	PID Algorithm
GE_Digital_Energy_UR_PFSignKind	ACSrcMMXU	PFSign	ING	PF Sign

4.2 PIXIT conformance statement

See the previous chapter.

4.3 TICS conformance statement

A Technical Issue Implementation Conformance Statement (TICS) is required under IEC 61850.

This section provides a template for the TICS. According to the UCA International Users Group (UCAIug) Quality Assurance Program (QAP), the TICS is a required conformance test and is referenced on the certificate.

The tables outline applicable mandatory technical issues (Tissues).

Y — The server has implemented the Tissue

ni — No impact on testing

na — Not applicable if the server does not support the corresponding ACSI service(s)

Notes follow the tables, which are for Edition 1.

Table 4-66: Part 6 Tissues

Part 6 Tissue	Description	Implemented by server?
1	Syntax	Y
5	tExtensionAttributeNameEnum is restricted	Y
8	SIUnit enumeration for W	Y
10	Base type for bitstring usage	Y
17	DAI/SDI elements syntax	Y
169	Ordering of enum differs from 7-3	na
245	Attribute RptId in SCL	Y
529	Replace sev - Unknown by unknown	Y

Table 4-67: Part 7 Tissues

Part 7 Tissue	Description	Implemented by server?
Part 7-2		
30	control parameter T	Y
31	Typo	na
32	Typo in syntax	na
35	Typo Syntax Control time	na
36	Syntax parameter DSet-Ref missing	Y
37	Syntax GOOSE "T" type	Y
39	Add DstAddr to GoCB	Y
40	GOOSE Message "AppID" to "GoID"	Y
41	GsCB "AppID" to "GsID"	na
42	SV timestamp: "EntryTime" to "TimeStamp"	na
43	Control "T" semantic	Y
44	AddCause - Object not sel	Y
45	Missing AddCauses	na
46	Synchro check cancel	na
47	"." in LD Name?	Y
49	BRCB TimeOfEntry (part of #453)	-
50	LNName start with number?	Y
51	ARRAY [0..num] missing	na
52	Ambiguity GOOSE SqNum	Y
53	Add DstAddr to GsCB, SV	na
151	Name constraint for control blocks etc.	Y
166	DataRef attribute in Log	na
185	Logging - Integrity period	na
189	SV Format	na
190	BRCB: EntryId and TimeOfEntry (part of #453)	-
191	BRCB: Integrity and buffering reports (part of #453)	-
278	EntryId not valid for a server (part of #453)	-
333	Enabling of an incomplete GoCB	Y
453	Combination of all reporting and logging tissues	Y
1281	Trigger option GI is by default	Y

Part 7 Tissue	Description	Implemented by server?
Part 7-3		
28	Definition of APC	na
54	Point def xVal, not cVal	na
55	Ineut = Ires ?	Y
63	mag in CDC CMV	Y
65	Deadband calculation of a Vector and trigger option	Y
219	operTm in ACT	na
270	WYE and DEL rms values	Y
1199	BCR	Y

Table 4-68: Part 8 Tissues

Part 8-1 Tissue	Description	Implemented by server?
116	GetNameList with empty response?	Y
165	Improper Error Response for GetDataSetValues	Y
183	GetNameList error handling	Y
246	Control negative response (SBOns) with LastApplError	Y
545	Skip file directories with no files	Y

NOTES:

- Tissues 49, 190, 191, 275, and 278 are part of tissue 453, all other technical tissues in the table are mandatory if applicable
- Editorial tissues are marked as "na"
- Final proposal on tissue 45 is not defined yet

UR Family

Chapter 5: DNP communication

This chapter outlines the Distributed Network Protocol (DNP).

5.1 Device profile document

The following table provides a 'Device Profile Document' in the standard format defined in the DNP 3.0 Subset Definitions Document.

Table 5-1: DNP v3.00 device profile

(Also see the IMPLEMENTATION TABLE in the following section)	
Vendor Name: **General Electric Multilin**	
Device Name: **UR Series Relay**	
Highest DNP level supported For Requests: **Level 2** For Responses: **Level 2**	**Device function** ☐ Master ☒ Slave
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table): **Binary Inputs (Object 1)** **Binary Input Changes (Object 2)** **Binary Outputs (Object 10)** **Control Relay Output Block (Object 12)** **Binary Counters (Object 20)** **Frozen Counters (Object 21)** **Counter Change Event (Object 22)** **Frozen Counter Event (Object 23)** **Analog Inputs (Object 30)** **Analog Input Changes (Object 32)** **Analog Deadbands (Object 34)** **Time and Date (Object 50)** **File Transfer (Object 70)** **Internal Indications (Object 80)**	

Maximum data link frame size (octets)	**Maximum application fragment size (octets)**
Transmitted: **292**	Transmitted: **configurable up to 2048**
Received: **292**	Received: **2048**
Maximum data link re-tries	**Maximum application layer re-tries**
☒ None	☒ None
☐ Fixed at 3	☐ Configurable
☐ Configurable	

Requires data link layer confirmation

☒ Never
☐ Always
☐ Sometimes
☐ Configurable

Requires application layer confirmation

☐ Never
☐ Always
☒ When reporting Event Data
☒ When sending multi-fragment responses
☐ Sometimes
☐ Configurable

Timeouts while waiting for

Data Link Confirm:	☒ None	☐ Fixed at ____	☐ Variable	☐ Configurable
Complete Appl. Fragment:	☒ None	☐ Fixed at ____	☐ Variable	☐ Configurable
Application Confirm:	☐ None	☒ Fixed at 10 s	☐ Variable	☐ Configurable
Complete Appl. Response:	☒ None	☐ Fixed at ____	☐ Variable	☐ Configurable

Others

Transmission Delay:	**No intentional delay**
Need Time Interval:	**Configurable (default = 24 hrs.)**
Select/Operate Arm Timeout:	**10 s**
Binary input change scanning period:	**8 times per power system cycle**
Analog input change scanning period:	**500 ms**
Counter change scanning period:	**500 ms**
Frozen counter event scanning period:	**500 ms**
Unsolicited response notification delay:	**100 ms**
Unsolicited response retry delay:	**configurable 0 to 60 sec.**

Sends/executes control operations

WRITE Binary Outputs	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
SELECT/OPERATE	☐ Never	☒ Always	☐ Sometimes	☐ Configurable
DIRECT OPERATE	☐ Never	☒ Always	☐ Sometimes	☐ Configurable
DIRECT OPERATE – NO ACK	☐ Never	☒ Always	☐ Sometimes	☐ Configurable

Count > 1	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
Pulse On	☐ Never	☐ Always	☒ Sometimes	☐ Configurable
Pulse Off	☐ Never	☐ Always	☒ Sometimes	☐ Configurable
Latch On	☐ Never	☐ Always	☒ Sometimes	☐ Configurable
Latch Off	☐ Never	☐ Always	☒ Sometimes	☐ Configurable

Queue	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
Clear Queue	☒ Never	☐ Always	☐ Sometimes	☐ Configurable

Explanation of 'Sometimes': Object 12 points are mapped to UR Virtual Inputs. The persistence of Virtual Inputs is determined by the **VIRTUAL INPUT X TYPE** settings. Both "Pulse On" and "Latch On" operations perform the same function in the UR; that is, the appropriate Virtual Input is put into the "On" state. If the Virtual Input is set to "Self-Reset", it will reset after one pass of FlexLogic. The On/Off times and Count value are ignored. "Pulse Off" and "Latch Off" operations put the appropriate Virtual Input into the "Off" state. "Trip" and "Close" operations both put the appropriate Virtual Input into the "On" state.

Reports Binary Input Change Events when no specific variation requested

☐ Never
☒ Only time-tagged
☐ Only non-time-tagged
☐ Configurable

Reports time-tagged Binary Input Change Events when no specific variation requested

☐ Never
☒ Binary Input Change With Time
☐ Binary Input Change With Relative Time
☐ Configurable (attach explanation)

Sends unsolicited responses

☐ Never
☒ Configurable
☐ Only certain objects
☐ Sometimes (attach explanation)
☒ ENABLE/DISABLE unsolicited Function codes supported

Sends static data in unsolicited responses

☒ Never
☐ When Device Restarts
☐ When Status Flags Change
No other options are permitted.

Default counter object/variation

☐ No Counters Reported
☐ Configurable (attach explanation)
☒ Default Object: 20
Default Variation: 1
☒ Point-by-point list attached

Counters roll over at

☐ No Counters Reported
☐ Configurable (attach explanation)
☒ 16 Bits (Counter 8)
☒ 32 Bits (Counters 0 to 7, 9)
☐ Other Value: _____
☒ Point-by-point list attached

Sends multi-fragment responses

☒ Yes
☐ No

5.1.1 Implementation table

The following table identifies the variations, function codes, and qualifiers supported by the UR in both request messages and response messages. For static (non-change-event) objects, requests sent with qualifiers 00, 01, 06, 07, or 08, are responded to with qualifiers 00 or 01. Static object requests sent with qualifiers 17 or 28 are responded to with qualifiers 17 or 28. For change-event objects, qualifiers 17 or 28 are always responded.

Table 5-2: DNP implementation table

Object			Request		Response	
Object no.	**Variation no.**	**Description**	**Function codes (dec)**	**Qualifier codes (hex)**	**Function codes (dec)**	**Qualifier codes (hex)**
1	0	Binary Input Change (Variation 0 is used to request default variation)	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)		
	1	Binary Input	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	2	Binary Input with Status	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
2	0	Binary Input Change (Variation 0 is used to request default variation)	1 (read)	06 (no range, or all) 07, 08 (limited quantity)		
	1	Binary Input Change without Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	2	Binary Input Change with Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response 130 (unsol. resp.)	17, 28 (index)
	3	Binary Input Change with Relative Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)		
10	0	Binary Output Status (Variation 0 is used to request default variation)	1 (read)	00, 01(start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)		
	2	Binary Output Status	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
12	1	Control Relay Output Block	3 (select) 4 (operate) 5 (direct op) 6 (dir. op, noack)	00, 01 (start-stop) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	echo of request

Note 1: A default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans. The default variations for object types 1, 2, 20, 21, 22, 23, 30, and 32 are selected via relay settings. See the Communications section in Chapter 5 of the Instruction Manual for details. This optimizes the class 0 poll data size.

Note 2: For static (non-change-event) objects, qualifiers 17 or 28 are only responded when a request is sent with qualifiers 17 or 28, respectively. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01 (for change-event objects, qualifiers 17 or 28 are always responded).

Note 3: Cold restarts are implemented the same as warm restarts, meaning that the UR is not restarted, but the DNP process is restarted.

Object			Request		Response	
Object no.	**Variation no.**	**Description**	**Function codes (dec)**	**Qualifier codes (hex)**	**Function codes (dec)**	**Qualifier codes (hex)**
20	0	Binary Counter (Variation 0 is used to request default variation)	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. noack) 22 (assign class)	00, 01 (start-stop) 06(no range, or all) 07, 08 (limited quantity) 17, 28 (index)		
	1	32-Bit Binary Counter	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. noack) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	2	16-Bit Binary Counter	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. noack) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	5	32-Bit Binary Counter without Flag	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. noack) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	6	16-Bit Binary Counter without Flag	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. noack) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)

Note 1: A default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans. The default variations for object types 1, 2, 20, 21, 22, 23, 30, and 32 are selected via relay settings. See the Communications section in Chapter 5 of the Instruction Manual for details. This optimizes the class 0 poll data size.

Note 2: For static (non-change-event) objects, qualifiers 17 or 28 are only responded when a request is sent with qualifiers 17 or 28, respectively. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01 (for change-event objects, qualifiers 17 or 28 are always responded).

Note 3: Cold restarts are implemented the same as warm restarts, meaning that the UR is not restarted, but the DNP process is restarted.

Object			Request		Response	
Object no.	**Variation no.**	**Description**	**Function codes (dec)**	**Qualifier codes (hex)**	**Function codes (dec)**	**Qualifier codes (hex)**
21	0	Frozen Counter (Variation 0 is used to request default variation)	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)		
	1	32-Bit Frozen Counter	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	2	16-Bit Frozen Counter	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	9	32-Bit Frozen Counter without Flag	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	10	16-Bit Frozen Counter without Flag	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
22	0	Counter Change Event (Variation 0 is used to request default variation)	1 (read)	06 (no range, or all) 07, 08 (limited quantity)		
	1	32-Bit Counter Change Event	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	2	16-Bit Counter Change Event	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	5	32-Bit Counter Change Event with Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	6	16-Bit Counter Change Event with Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
23	0	Frozen Counter Event (Variation 0 is used to request default variation)	1 (read)	06 (no range, or all) 07, 08 (limited quantity)		
	1	32-Bit Frozen Counter Event	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	2	16-Bit Frozen Counter Event	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)

Note 1: A default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans. The default variations for object types 1, 2, 20, 21, 22, 23, 30, and 32 are selected via relay settings. See the Communications section in Chapter 5 of the Instruction Manual for details. This optimizes the class 0 poll data size.

Note 2: For static (non-change-event) objects, qualifiers 17 or 28 are only responded when a request is sent with qualifiers 17 or 28, respectively. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01 (for change-event objects, qualifiers 17 or 28 are always responded).

Note 3: Cold restarts are implemented the same as warm restarts, meaning that the UR is not restarted, but the DNP process is restarted.

Object			Request		Response	
Object no.	**Variation no.**	**Description**	**Function codes (dec)**	**Qualifier codes (hex)**	**Function codes (dec)**	**Qualifier codes (hex)**
23 cont'd	5	32-Bit Frozen Counter Event with Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	6	16-Bit Frozen Counter Event with Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
30	0	Analog Input (Variation 0 is used to request default variation)	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)		
	1	32-Bit Analog Input	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	2	16-Bit Analog Input	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	3	32-Bit Analog Input without Flag	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	4	16-Bit Analog Input without Flag	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
	5	short floating point	1 (read) 22 (assign class)	00, 01 (start-stop) 06(no range, or all) 07, 08(limited quantity) 17, 28(index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)

Note 1: A default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans. The default variations for object types 1, 2, 20, 21, 22, 23, 30, and 32 are selected via relay settings. See the Communications section in Chapter 5 of the Instruction Manual for details. This optimizes the class 0 poll data size.

Note 2: For static (non-change-event) objects, qualifiers 17 or 28 are only responded when a request is sent with qualifiers 17 or 28, respectively. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01 (for change-event objects, qualifiers 17 or 28 are always responded).

Note 3: Cold restarts are implemented the same as warm restarts, meaning that the UR is not restarted, but the DNP process is restarted.

Object			Request		Response	
Object no.	**Variation no.**	**Description**	**Function codes (dec)**	**Qualifier codes (hex)**	**Function codes (dec)**	**Qualifier codes (hex)**
32	0	Analog Change Event (Variation 0 is used to request default variation)	1 (read)	06 (no range, or all) 07, 08 (limited quantity)		
	1	32-Bit Analog Change Event without Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	2	16-Bit Analog Change Event without Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	3	32-Bit Analog Change Event with Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	4	16-Bit Analog Change Event with Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	5	short floating point Analog Change Event without Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
	7	short floating point Analog Change Event with Time	1 (read)	06 (no range, or all) 07, 08 (limited quantity)	129 (response) 130 (unsol. resp.)	17, 28 (index)
34	0	Analog Input Reporting Deadband (Variation 0 is used to request default variation)	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)		
	1	16-bit Analog Input Reporting Deadband (default – see Note 1)	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
			2 (write)	00, 01 (start-stop) 07, 08 (limited quantity) 17, 28 (index)		
	2	32-bit Analog Input Reporting Deadband	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
			2 (write)	00, 01 (start-stop) 07, 08 (limited quantity) 17, 28 (index)		
	3	Short floating point Analog Input Reporting Deadband	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)

Note 1: A default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans. The default variations for object types 1, 2, 20, 21, 22, 23, 30, and 32 are selected via relay settings. See the Communications section in Chapter 5 of the Instruction Manual for details. This optimizes the class 0 poll data size.

Note 2: For static (non-change-event) objects, qualifiers 17 or 28 are only responded when a request is sent with qualifiers 17 or 28, respectively. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01 (for change-event objects, qualifiers 17 or 28 are always responded).

Note 3: Cold restarts are implemented the same as warm restarts, meaning that the UR is not restarted, but the DNP process is restarted.

Object			Request		Response	
Object no.	**Variation no.**	**Description**	**Function codes (dec)**	**Qualifier codes (hex)**	**Function codes (dec)**	**Qualifier codes (hex)**
50	1	Time and Date (default – see Note 1)	1 (read) 2 (write)	00, 01 (start-stop) 06 (no range, or all) 07 (limited qty=1) 08 (limited quantity) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) (see Note 2)
52	2	Time Delay Fine			129 (response)	07 (limited quantity) (quantity = 1)
60	0	Class 0, 1, 2, and 3 Data	1 (read) 20 (enable unsol) 21 (disable unsol) 22 (assign class)	06 (no range, or all)		
	1	Class 0 Data	1 (read) 22 (assign class)	06 (no range, or all)		
	2	Class 1 Data	1 (read) 20 (enable unsol) 21 (disable unsol) 22 (assign class)	06 (no range, or all) 07, 08 (limited quantity)		
	3	Class 2 Data				
	4	Class 3 Data				
70	0	File event - any variation	1 (read)	06 (no range, or all) 07, 08 (limited quantity)		
			22 (assign class)	06 (no range, or all)		
	2	File authentication	29 (authenticate)	5b (free format)	129 (response)	5b (free format)
	3	File command	25 (open) 27 (delete)	5b (free format)		
	4	File command status	26 (close) 30 (abort)	5b (free format)	129 (response) 130 (unsol. resp.)	5b (free format)
	5	File transfer	1 (read) 2 (write)	5b (free format)	129 (response) 130 (unsol. resp.)	5b (free format)
	6	File transfer status			129 (response) 130 (unsol. resp.)	5b (free format)
	7	File descriptor	28 (get file info.)	5b (free format)	129 (response) 130 (unsol. resp.)	5b (free format)
80	1	Internal Indications	1 (read)	00, 01 (start-stop) (index =7)	129 (response)	00, 01 (start-stop)
			2 (write) (see Note 3)	00 (start-stop) (index =7)		
---		No Object (function code only) (see Note 3)	13 (cold restart)			
---		No Object (function code only)	14 (warm restart)			
---		No Object (function code only)	23 (delay meas.)			

Note 1: A default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans. The default variations for object types 1, 2, 20, 21, 22, 23, 30, and 32 are selected via relay settings. See the Communications section in Chapter 5 of the Instruction Manual for details. This optimizes the class 0 poll data size.

Note 2: For static (non-change-event) objects, qualifiers 17 or 28 are only responded when a request is sent with qualifiers 17 or 28, respectively. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01 (for change-event objects, qualifiers 17 or 28 are always responded).

Note 3: Cold restarts are implemented the same as warm restarts, meaning that the UR is not restarted, but the DNP process is restarted.

5.2 DNP point lists

5.2.1 Binary input points

The DNP binary input data points are configured through the **PRODUCT SETUP ⇨⇩ COMMUNICATIONS ⇨⇩ DNP / IEC104 POINT LISTS ⇨ BINARY INPUT / MSP POINTS** menu. See the Communications section of chapter 5 in the Instruction Manual for details. When a freeze function is performed on a binary counter point, the frozen value is available in the corresponding frozen counter point.

BINARY INPUT POINTS
Static (Steady-State) Object Number: **1**
Change Event Object Number: **2**
Request Function Codes supported: **1 (read), 22 (assign class)**
Static Variation reported when variation 0 requested: **2 (Binary Input with status), Configurable**
Change Event Variation reported when variation 0 requested: **2 (Binary Input Change with Time), Configurable**
Change Event Scan Rate: **8 times per power system cycle**
Change Event Buffer Size: **500**
Default Class for All Points: **1**

5.2.2 Binary and control relay output

Supported Control Relay Output Block fields: Pulse On, Pulse Off, Latch On, Latch Off, Paired Trip, Paired Close.

BINARY OUTPUT STATUS POINTS
Object Number: **10**
Request Function Codes supported: **1 (read)**
Default Variation reported when Variation 0 requested: **2 (Binary Output Status)**
CONTROL RELAY OUTPUT BLOCKS
Object Number: **12**
Request Function Codes supported: **3 (select), 4 (operate), 5 (direct operate), 6 (direct operate, noack)**

Table 5-3: Binary/control outputs

Point	Name/Description
0	Virtual Input 1
1	Virtual Input 2
2	Virtual Input 3
3	Virtual Input 4
4	Virtual Input 5
5	Virtual Input 6
6	Virtual Input 7
7	Virtual Input 8
8	Virtual Input 9
9	Virtual Input 10
10	Virtual Input 11
11	Virtual Input 12
12	Virtual Input 13
13	Virtual Input 14
14	Virtual Input 15
15	Virtual Input 16
16	Virtual Input 17
17	Virtual Input 18
18	Virtual Input 19
19	Virtual Input 20
20	Virtual Input 21
21	Virtual Input 22
22	Virtual Input 23
23	Virtual Input 24
24	Virtual Input 25
25	Virtual Input 26
26	Virtual Input 27
27	Virtual Input 28
28	Virtual Input 29
29	Virtual Input 30
30	Virtual Input 31
31	Virtual Input 32

Point	Name/Description
32	Virtual Input 33
33	Virtual Input 34
34	Virtual Input 35
35	Virtual Input 36
36	Virtual Input 37
37	Virtual Input 38
38	Virtual Input 39
39	Virtual Input 40
40	Virtual Input 41
41	Virtual Input 42
42	Virtual Input 43
43	Virtual Input 44
44	Virtual Input 45
45	Virtual Input 46
46	Virtual Input 47
47	Virtual Input 48
48	Virtual Input 49
49	Virtual Input 50
50	Virtual Input 51
51	Virtual Input 52
52	Virtual Input 53
53	Virtual Input 54
54	Virtual Input 55
55	Virtual Input 56
56	Virtual Input 57
57	Virtual Input 58
58	Virtual Input 59
59	Virtual Input 60
60	Virtual Input 61
61	Virtual Input 62
62	Virtual Input 63
63	Virtual Input 64

5.2.3 Counters

The following table lists both Binary Counters (Object 20) and Frozen Counters (Object 21). When a freeze function is performed on a Binary Counter point, the frozen value is available in the corresponding Frozen Counter point.

BINARY COUNTERS

Static (Steady-State) Object Number: **20**

Change Event Object Number: **22**

Request Function Codes supported: **1 (read), 7 (freeze), 8 (freeze noack), 9 (freeze and clear), 10 (freeze and clear, noack), 22 (assign class)**

Static Variation reported when variation 0 requested: **1 (32-Bit Binary Counter with Flag)**

Change Event Variation reported when variation 0 requested: **1 (32-Bit Counter Change Event without time)**

Change Event Buffer Size: **10**

Default Class for all points: **3**

FROZEN COUNTERS

Static (Steady-State) Object Number: **21**

Change Event Object Number: **23**

Request Function Codes supported: **1 (read)**

Static Variation reported when variation 0 requested: **1 (32-Bit Frozen Counter with Flag)**

Change Event Variation reported when variation 0 requested: **1 (32-Bit Frozen Counter Event without time)**

Change Event Buffer Size: **10**

Default Class for all points: **3**

Table 5-4: Binary and frozen counters

Point index	Name/Description
0	Digital Counter 1
1	Digital Counter 2
2	Digital Counter 3
3	Digital Counter 4
4	Digital Counter 5
5	Digital Counter 6
6	Digital Counter 7
7	Digital Counter 8
8	Oscillography Trigger Count
9	Events Since Last Clear

A counter freeze command has no meaning for counters 8 and 9. UR Digital Counter values are represented as 32-bit integers. The DNP 3.0 protocol defines counters to be unsigned integers. Take care when interpreting negative counter values.

5.2.4 Analog inputs

The DNP analog input data points are configured through the **PRODUCT SETUP ⇨⇩ COMMUNICATIONS ⇨⇩ DNP / IEC104 POINT LISTS ⇨ ANALOG INPUT / MME POINTS** menu. See the Communications section of chapter 5 in the Instruction Manual for details.

Note that 16-bit and 32-bit variations of analog inputs are transmitted through DNP as signed numbers. Even for analog input points that are not valid as negative values, the maximum positive representation is 32767 for 16-bit values and 2147483647 for 32-bit values. This is a DNP requirement.

The deadbands for all Analog Input points are in the same units as the Analog Input quantity. For example, an Analog Input quantity measured in volts has a corresponding deadband in units of volts. This is in conformance with DNP Technical Bulletin 9809-001: Analog Input Reporting Deadband. Relay settings are available to set default deadband values according to data type. Deadbands for individual Analog Input Points can be set using DNP Object 34.

Static (Steady-State) Object Number: **30**
Change Event Object Number: **32**
Request Function Codes supported: **1 (read), 2 (write, deadbands only), 22 (assign class)**
Static Variation reported when variation 0 requested: **1 (32-Bit Analog Input)**
Change Event Variation reported when variation 0 requested: **1 (Analog Change Event without Time)**
Change Event Scan Rate: defaults to **500 ms**
Change Event Buffer Size: **256**
Default Class for all Points: **2**

5

UR Family

Chapter 6: IEC 60870-5-103 communication

This chapter outlines the IEC 60870-5-103 communications protocol.



The protocol applies when ordered with the product. Check your order code.

6.1 Overview

IEC 60870-5-103 is defined as a companion standard for the informative element of the protection equipment. IEC 60870-5-103 defines communication for a serial, unbalanced link only. Communication speeds are defined as either 9600 or 19200 baud.

This manual assumes basic knowledge of the IEC 60870-5-103 protocol and the standard IEC 60870 documents relating to the protocol.

Standard IEC 60870 documents relating to IEC 60870-5-103:

- IEC 60870-5-1 Transmission frame formats
- IEC 60870-5-2 Link transmission procedures
- IEC 60870-5-3 General structure of application data
- IEC 60870-5-4 Definition and coding of application information elements
- IEC 60870-5-5 Basic application functions
- IEC 60870-5-6 Conformance testing guidelines

An IEC 60870-5-103 device is required to provide an interoperability table. Interoperability means that any required application data in the device, which can be coded into an IEC 60870-5-103 data type, can be mapped into the IEC 60870-5-103 address space. This data is recognized by any IEC 60870-5-103 master.

6.2 Factor and offset calculation to transmit measurand

The general formula for the transmitted value is Xt = a * X + b

where

X is the measurand
a is the multiplication factor
b is the offset
Xt is the value transmitted

The conditions for determining a and b, when the values exceed the range are:

4096 = a*Xmax + b (Xmax is the maximum value for the measurand)

-4095 =a*Xmin + b (Xmin is the minimum value for the measurand)

By solving the above system of equations for a and b, we find that:

a = 8191 / (Xmax - Xmin)

b = -4096 * (Xmax + Xmin) / (Xmax - Xmin)

So

Xt = 8191/(Xmax - Xmin)) * X - 4096 * (Xmax + Xmin) / (Xmax - Xmin)

We can further simplify the formula for situations where:

1)

Xmin = -Xmax (positive and negative values) :

Xt = (8191/2*Xmax) * X

a = 4096/Xmax

b = 0

2)

If Xmin = 0 (only positive values)

Xt = (8191/Xmax) * X - 4096

a = 2 * 4096/Xmax

b = -4096

To calculate Xmax, one needs to know the rated value for the specific type of measurand.

Xmax = 2.4 * Xrated

6.3 Interoperability document

The boxes indicate the following:

☒ – used in standard direction
☐ – not used

1. PHYSICAL LAYER

Electrical interface

☒ EIA RS-485

32 Number of loads for one protection equipment

Optical interface

☐ Glass fibre
☐ Plastic fibre
☐ F-SMA type connector
☐ BFOC/2.5 type connector

Transmission speed

☒ 9600 bits/s
☒ 19200 bits/s

2. LINK LAYER

There are no choices for the link layer.

3. APPLICATION LAYER

Transmission mode for application data

Mode 1 (least significant octet first), as defined in 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common address of ASDU

- ☒ One COMMON ADDRESS OF ASDU (identical with station address)
- ☐ More than one COMMON ADDRESS OF ASDU

Selection of standard information numbers in monitor direction

System functions in monitor direction

	INF	Semantics
☒	<0>	End of general interrogation
☒	<0>	Time synchronization
☒	<2>	Reset FCB
☒	<3>	Reset CU
☒	<4>	Start/restart
☒	<5>	Power on

Status indications in monitor direction

	INF	Semantics
☐	<16>	Auto-recloser active
☐	<17>	Teleprotection active
☐	<18>	Protection active
☐	<19>	LED reset
☐	<20>	Monitor direction blocked
☐	<21>	Test mode
☐	<22>	Local parameter setting
☐	<23>	Characteristic 1
☐	<24>	Characteristic 2
☐	<25>	Characteristic 3
☐	<26>	Characteristic 4
☐	<27>	Auxiliary input 1
☐	<28>	Auxiliary input 2
☐	<29>	Auxiliary input 3
☐	<30>	Auxiliary input 4

Supervision indications in monitor direction

	INF	Semantics
☐	<32>	Measurand supervision I
☐	<33>	Measurand supervision V
☐	<35>	Phase sequence supervision
☐	<36>	Trip circuit supervision
☐	<37>	I>> back-up operation
☐	<38>	VT fuse failure
☐	<39>	Teleprotection disturbed
☐	<46>	Group warning
☐	<47>	Group alarm

Earth fault indications in monitor direction

INF	Semantics

- ☐ <48> Earth fault L_1
- ☐ <49> Earth fault L_2
- ☐ <50> Earth fault L_3
- ☐ <51> Earth fault forward, meaning line
- ☐ <52> Earth fault reverse, meaning busbar

Fault indications in monitor direction

INF Semantics

- ☐ <64> Start/pick-up L_1
- ☐ <65> Start/pick-up L_2
- ☐ <66> Start/pick-up L_3
- ☐ <67> Start/pick-up N
- ☐ <68> General trip
- ☐ <69> Trip L_1
- ☐ <70> Trip L_2
- ☐ <71> Trip L_3
- ☐ <72> Trip I>> (back-up operation)
- ☐ <73> Fault location X in ohms
- ☐ <74> Fault forward/line
- ☐ <75> Fault reverse/busbar
- ☐ <76> Teleprotection signal transmitted
- ☐ <77> Teleprotection signal received
- ☐ <78> Zone 1
- ☐ <79> Zone 2
- ☐ <80> Zone 3
- ☐ <81> Zone 4
- ☐ <82> Zone 5
- ☐ <83> Zone 6
- ☐ <84> General start / pick-up
- ☐ <85> Breaker failure
- ☐ <86> Trip measuring system L_1
- ☐ <87> Trip measuring system L_2
- ☐ <88> Trip measuring system L_3
- ☐ <89> Trip measuring system E
- ☐ <90> Trip I>
- ☐ <91> Trip I>>
- ☐ <92> Trip IN>
- ☐ <93> Trip IN>>

Auto-reclosure indications in monitor direction

INF Semantics

- ☐ <128> CB 'on' by AR
- ☐ <129> CB 'on' by long-time AR
- ☐ <130> AR blocked

Measurands in monitor direction

INF Semantics

- ☐ <144> Measurand I
- ☐ <145> Measurands I, V
- ☐ <146> Measurands I, V, P, Q
- ☐ <147> Measurands I_N, V_{EN}

☐ <148> Measurands I_{L123}, V_{L123}, P, Q, f

Generic functions in monitor direction

INF Semantics

☐ <240> Read headings of all defined groups
☐ <241> Read values or attributes of all entries of one group
☐ <243> Read directory of a single entry
☐ <244> Read value or attribute of a single entry
☐ <245> End of general interrogation of generic data
☐ <249> Write entry with confirmation
☐ <250> Write entry with execution
☐ <251> Write entry aborted

Selection of standard information numbers in control direction

System functions in control direction

INF Semantics

☒ <0> Initiation of general interrogation
☒ <0> Time synchronization

General commands in control direction

INF Semantics

☐ <16> Auto-recloser on/off
☐ <17> Teleprotection on/off
☐ <18> Protection on/off
☐ <19> LED reset
☐ <23> Activate characteristic 1
☐ <24> Activate characteristic 2
☐ <25> Activate characteristic 3
☐ <26> Activate characteristic 4

Generic functions in control direction

INF Semantics

☐ <240> Read headings of all defined groups
☐ <241> Read values or attributes of all entries of one group
☐ <243> Read directory of a single entry
☐ <244> Read value or attribute of a single entry
☐ <245> General interrogation of generic data
☐ <248> Write entry
☐ <249> Write entry with confirmation
☐ <250> Write entry with execution
☐ <251> Write entry abort

Basic application functions

☐ Test mode
☐ Blocking of monitor direction
☐ Disturbance data
☐ Generic services
☐ Private data

Miscellaneous

Measurand	max Mval = times rated value		
	1,2	or	2,4
Current L_1	☐		☒

Measurand	max Mval = times rated value		
	1,2	or	2,4
Current L_2	☐		☒
Current L_3	☐		☒
Voltage L_{1-E}	☐		☒
Voltage L_{2-E}	☐		☒
Voltage L_{3-E}	☐		☒
Active power P	☐		☒
Reactive power Q	☐		☒
Frequency f	☐		☒
Voltage L_1-L_2	☐		☒

UR Family

Chapter 7: IEC 60870-5-104 communication

This chapter outlines the IEC 60870-5-104 communications protocol.



The protocol applies when ordered with the product. Check your order code.

7.1 Interoperability document

This document is adapted from the IEC 60870-5-104 standard. The boxes indicate the following:

☒ – used in standard direction
☐ – not used
■ – cannot be selected in IEC 60870-5-104 standard

1. SYSTEM OR DEVICE

- ☐ System Definition
- ☐ Controlling Station Definition (Master)
- ☒ Controlled Station Definition (Slave)

2. NETWORK CONFIGURATION

- ■ ~~Point-to-Point~~
- ■ ~~Multipoint~~
- ■ ~~Multiple Point-to-Point~~
- ■ ~~Multipoint Star~~

3. PHYSICAL LAYER

Transmission speed (control direction)

Unbalanced interchange circuit V.24/V.28 standard	Unbalanced interchange circuit V.24/V.28 recommended if >1200 bits/s	Balanced interchange circuit X.24/X.27
■ ~~100 bits/sec.~~ ■ ~~200 bits/sec.~~ ■ ~~300 bits/sec.~~ ■ ~~600 bits/sec.~~ ■ ~~1200 bits/sec.~~	■ ~~2400 bits/sec.~~ ■ ~~4800 bits/sec.~~ ■ ~~9600 bits/sec.~~	■ ~~2400 bits/sec.~~ ■ ~~4800 bits/sec.~~ ■ ~~9600 bits/sec.~~ ■ ~~19200 bits/sec.~~ ■ ~~38400 bits/sec.~~ ■ ~~56000 bits/sec.~~ ■ ~~64000 bits/sec.~~

Transmission speed (monitor direction)

Unbalanced interchange circuit V.24/V.28 standard	Unbalanced interchange circuit V.24/V.28 recommended if >1200 bits/s	Balanced interchange circuit X.24/X.27
■ ~~100 bits/sec.~~ ■ ~~200 bits/sec.~~ ■ ~~300 bits/sec.~~ ■ ~~600 bits/sec.~~ ■ ~~1200 bits/sec.~~	■ ~~2400 bits/sec.~~ ■ ~~4800 bits/sec.~~ ■ ~~9600 bits/sec.~~	■ ~~2400 bits/sec.~~ ■ ~~4800 bits/sec.~~ ■ ~~9600 bits/sec.~~ ■ ~~19200 bits/sec.~~ ■ ~~38400 bits/sec.~~ ■ ~~56000 bits/sec.~~ ■ ~~64000 bits/sec.~~

4. **LINK LAYER**

Link transmission procedure	Address field of the link
■ ~~Balanced Transmission~~ ■ ~~Unbalanced Transmission~~	■ ~~Not Present (Balanced Transmission Only)~~ ■ ~~One Octet~~ ■ ~~Two Octets~~ ■ ~~Structured~~ ■ ~~Unstructured~~
Frame Length (maximum length, number of octets): Not selectable in companion IEC 60870-5-104 standard	

When using an unbalanced link layer, the following Application Service Data Unit (ASDU) types are returned in class 2 messages (low priority) with the indicated causes of transmission:

■ ~~The standard assignment of ASDUs to class 2 messages is used as follows:~~

■ ~~A special assignment of ASDUs to class 2 messages is used as follows:~~

5. APPLICATION LAYER

Transmission mode for application data

Mode 1 (least significant octet first), as defined in Clause 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common address of ASDU

■ ~~One Octet~~

☒ Two Octets

Information object address

■ ~~One Octet~~

■ ~~Two Octets~~

☒ Three Octets

☒ Structured

☒ Unstructured

Cause of transmission

■ ~~One Octet~~

☒ Two Octets (with originator address). Originator address is set to zero if not used.

Maximum Length of APDU: 253 (the maximum length may be reduced by the system)

Selection of standard ASDUs

For the following lists, the boxes indicate the following:

☒ – used in standard direction

☐ – not used

■ – cannot be selected in IEC 60870-5-104 standard

Process information in monitor direction

☒ <1> := Single-point information	M_SP_NA_1
■ ~~<2> := Single-point information with time tag~~	~~M_SP_TA_1~~
☐ <3> := Double-point information	M_DP_NA_1
■ ~~<4> := Double-point information with time tag~~	~~M_DP_TA_1~~
☐ <5> := Step position information	M_ST_NA_1
■ ~~<6> := Step position information with time tag~~	~~M_ST_TA_1~~
☐ <7> := Bitstring of 32 bits	M_BO_NA_1
■ ~~<8> := Bitstring of 32 bits with time tag~~	~~M_BO_TA_1~~
☐ <9> := Measured value, normalized value	M_ME_NA_1
■ ~~<10> := Measured value, normalized value with time tag~~	~~M_NE_TA_1~~
☐ <11> := Measured value, scaled value	M_ME_NB_1
■ ~~<12> := Measured value, scaled value with time tag~~	~~M_NE_TB_1~~
☒ <13> := Measured value, short floating point value	M_ME_NC_1
■ ~~<14> := Measured value, short floating point value with time tag~~	~~M_NE_TC_1~~
☒ <15> := Integrated totals	M_IT_NA_1
■ ~~<16> := Integrated totals with time tag~~	~~M_IT_TA_1~~
■ ~~<17> := Event of protection equipment with time tag~~	~~M_EP_TA_1~~
■ ~~<18> := Packed start events of protection equipment with time tag~~	~~M_EP_TB_1~~
■ ~~<19> := Packed output circuit information of protection equipment with time tag~~	~~M_EP_TC_1~~
☐ <20> := Packed single-point information with status change detection	M_SP_NA_1
☐ <21> := Measured value, normalized value without quantity descriptor	M_ME_ND_1
☒ <30> := Single-point information with time tag CP56Time2a	M_SP_TB_1
☐ <31> := Double-point information with time tag CP56Time2a	M_DP_TB_1
☐ <32> := Step position information with time tag CP56Time2a	M_ST_TB_1
☐ <33> := Bitstring of 32 bits with time tag CP56Time2a	M_BO_TB_1
☐ <34> := Measured value, normalized value with time tag CP56Time2a	M_ME_TD_1
☐ <35> := Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1
☐ <36> := Measured value, short floating point value with time tag CP56Time2a	M_ME_TF_1
☒ <37> := Integrated totals with time tag CP56Time2a	M_IT_TB_1
☐ <38> := Event of protection equipment with time tag CP56Time2a	M_EP_TD_1
☐ <39> := Packed start events of protection equipment with time tag CP56Time2a	M_EP_TE_1
☐ <40> := Packed output circuit information of protection equipment with time tag CP56Time2a	M_EP_TF_1

Either the ASDUs of the set <2>, <4>, <6>, <8>, <10>, <12>, <14>, <16>, <17>, <18>, and <19> or of the set <30> to <40> is used.

Process information in control direction

☒ <45> := Single command	C_SC_NA_1
☐ <46> := Double command	C_DC_NA_1
☐ <47> := Regulating step command	C_RC_NA_1
☐ <48> := Set point command, normalized value	C_SE_NA_1
☐ <49> := Set point command, scaled value	C_SE_NB_1
☐ <50> := Set point command, short floating point value	C_SE_NC_1
☐ <51> := Bitstring of 32 bits	C_BO_NA_1
☒ <58> := Single command with time tag CP56Time2a	C_SC_TA_1
☐ <59> := Double command with time tag CP56Time2a	C_DC_TA_1
☐ <60> := Regulating step command with time tag CP56Time2a	C_RC_TA_1
☐ <61> := Set point command, normalized value with time tag CP56Time2a	C_SE_TA_1
☐ <62> := Set point command, scaled value with time tag CP56Time2a	C_SE_TB_1
☐ <63> := Set point command, short floating point value with time tag CP56Time2a	C_SE_TC_1
☐ <64> := Bitstring of 32 bits with time tag CP56Time2a	C_BO_TA_1

Either the ASDUs of the set <45> to <51> or of the set <58> to <64> is used.

System information in monitor direction

☒ <70> := End of initialization	M_EI_NA_1

System information in control direction

☒ <100> := Interrogation command	C_IC_NA_1
☒ <101> := Counter interrogation command	C_CI_NA_1
☒ <102> := Read command	C_RD_NA_1
☒ <103> := Clock synchronization command (see Clause 7.6 in standard)	C_CS_NA_1
■ ~~<104> := Test command~~	~~C_TS_NA_1~~
☒ <105> := Reset process command	C_RP_NA_1
■ <106> := Delay acquisition command	C_CD_NA_1
☒ <107> := Test command with time tag CP56Time2a	C_TS_TA_1

Parameter in control direction

☐ <110> := Parameter of measured value, normalized value	PE_ME_NA_1
☐ <111> := Parameter of measured value, scaled value	PE_ME_NB_1
☒ <112> := Parameter of measured value, short floating point value	PE_ME_NC_1
☐ <113> := Parameter activation	PE_AC_NA_1

File transfer

☐ <120> := File Ready	F_FR_NA_1
☐ <121> := Section Ready	F_SR_NA_1
☐ <122> := Call directory, select file, call file, call section	F_SC_NA_1
☐ <123> := Last section, last segment	F_LS_NA_1
☐ <124> := Ack file, ack section	F_AF_NA_1
☐ <125> := Segment	F_SG_NA_1

☐ <126> := Directory (blank or X, available only in monitor [standard] direction) C_CD_NA_1

Type identifier and cause of transmission assignments
(station-specific parameters)

In the following table:

- Shaded boxes are not required
- Black boxes are not permitted in this companion standard
- Blank boxes indicate functions or ASDU not used
- 'X' if only used in the standard direction

Type identification		Cause of transmission																	
		PERIODIC, CYCLIC	BACKGROUND SCAN	SPONTANEOUS	INITIALIZED	REQUEST OR REQUESTED	ACTIVATION	ACTIVATION CONFIRMATION	DEACTIVATION	DEACTIVATION CONFIRMATION	ACTIVATION TERMINATION	RETURN INFO CAUSED BY LOCAL CMD	FILE TRANSFER	INTERROGATED BY GROUP <NUMBER>	REQUEST BY GROUP <N> COUNTER REQ	UNKNOWN TYPE IDENTIFICATION	UNKNOWN CAUSE OF TRANSMISSION	UNKNOWN COMMON ADDRESS OF ASDU	UNKNOWN INFORMATION OBJECT ADDR	UNKNOWN INFORMATION OBJECT ADDR
No.	Mnemonic	1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<1>	M_SP_NA_1			X		X						X	X		X					
<2>	M_SP_TA_1																			
<3>	M_DP_NA_1																			
<4>	M_DP_TA_1																			
<5>	M_ST_NA_1																			
<6>	M_ST_TA_1																			
<7>	M_BO_NA_1																			
<8>	M_BO_TA_1																			
<9>	M_ME_NA_1																			
<10>	M_ME_TA_1																			
<11>	M_ME_NB_1																			
<12>	M_ME_TB_1																			
<13>	M_ME_NC_1	X		X		X									X					
<14>	M_ME_TC_1																			
<15>	M_IT_NA_1			X												X				
<16>	M_IT_TA_1																			
<17>	M_EP_TA_1																			
<18>	M_EP_TB_1																			
<19>	M_EP_TC_1																			
<20>	M_PS_NA_1																			
<21>	M_ME_ND_1																			

Type identification		Cause of transmission																		
		PERIODIC, CYCLIC	BACKGROUND SCAN	SPONTANEOUS	INITIALIZED	REQUEST OR REQUESTED	ACTIVATION	ACTIVATION CONFIRMATION	DEACTIVATION	DEACTIVATION CONFIRMATION	ACTIVATION TERMINATION	RETURN INFO CAUSED BY LOCAL CMD	FILE TRANSFER	INTERROGATED BY GROUP <NUMBER>	REQUEST BY GROUP <N> COUNTER REQ	UNKNOWN TYPE IDENTIFICATION	UNKNOWN CAUSE OF TRANSMISSION	UNKNOWN COMMON ADDRESS OF ASDU	UNKNOWN INFORMATION OBJECT ADDR	UNKNOWN INFORMATION OBJECT ADDR
No.	Mnemonic	1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<30>	M_SP_TB_1			X								X	X							
<31>	M_DP_TB_1																			
<32>	M_ST_TB_1																			
<33>	M_BO_TB_1																			
<34>	M_ME_TD_1																			
<35>	M_ME_TE_1																			
<36>	M_ME_TF_1																			
<37>	M_IT_TB_1			X												X				
<38>	M_EP_TD_1																			
<39>	M_EP_TE_1																			
<40>	M_EP_TF_1																			
<45>	C_SC_NA_1						X	X	X	X	X									
<46>	C_DC_NA_1																			
<47>	C_RC_NA_1																			
<48>	C_SE_NA_1																			
<49>	C_SE_NB_1																			
<50>	C_SE_NC_1																			
<51>	C_BO_NA_1																			
<58>	C_SC_TA_1						X	X	X	X	X									
<59>	C_DC_TA_1																			
<60>	C_RC_TA_1																			
<61>	C_SE_TA_1																			
<62>	C_SE_TB_1																			
<63>	C_SE_TC_1																			
<64>	C_BO_TA_1																			
<70>	M_EI_NA_1*)				X															
<100>	C_IC_NA_1						X	X	X	X	X									
<101>	C_CI_NA_1						X	X			X									
<102>	C_RD_NA_1					X														
<103>	C_CS_NA_1			X			X	X												
<104>	C_TS_NA_1																			

Type identification		Cause of transmission																		
		PERIODIC, CYCLIC	BACKGROUND SCAN	SPONTANEOUS	INITIALIZED	REQUEST OR REQUESTED	ACTIVATION	ACTIVATION CONFIRMATION	DEACTIVATION	DEACTIVATION CONFIRMATION	ACTIVATION TERMINATION	RETURN INFO CAUSED BY LOCAL CMD	FILE TRANSFER	INTERROGATED BY GROUP <NUMBER>	REQUEST BY GROUP <N> COUNTER REQ	UNKNOWN TYPE IDENTIFICATION	UNKNOWN CAUSE OF TRANSMISSION	UNKNOWN COMMON ADDRESS OF ASDU	UNKNOWN INFORMATION OBJECT ADDR	UNKNOWN INFORMATION OBJECT ADDR
No.	Mnemonic	1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<105>	C_RP_NA_1						X	X												
<106>	C_CD_NA_1																			
<107>	C_TS_TA_1																			
<110>	P_ME_NA_1																			
<111>	P_ME_NB_1																			
<112>	P_ME_NC_1						X	X							X					
<113>	P_AC_NA_1																			
<120>	F_FR_NA_1																			
<121>	F_SR_NA_1																			
<122>	F_SC_NA_1																			
<123>	F_LS_NA_1																			
<124>	F_AF_NA_1																			
<125>	F_SG_NA_1																			
<126>	F_DR_TA_1*)																			

6. BASIC APPLICATION FUNCTIONS

Station initialization

☒ Remote initialization

Cyclic data transmission

☒ Cyclic data transmission

Read procedure

☒ Read procedure

Spontaneous transmission

☒ Spontaneous transmission

Double transmission of information objects with cause of transmission spontaneous

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

☐ Single point information: M_SP_NA_1, M_SP_TA_1, M_SP_TB_1, and M_PS_NA_1
☐ Double point information: M_DP_NA_1, M_DP_TA_1, and M_DP_TB_1
☐ Step position information: M_ST_NA_1, M_ST_TA_1, and M_ST_TB_1
☐ Bitstring of 32 bits: M_BO_NA_1, M_BO_TA_1, and M_BO_TB_1 (if defined for a specific project)
☐ Measured value, normalized value: M_ME_NA_1, M_ME_TA_1, M_ME_ND_1, and M_ME_TD_1
☐ Measured value, scaled value: M_ME_NB_1, M_ME_TB_1, and M_ME_TE_1
☐ Measured value, short floating point number: M_ME_NC_1, M_ME_TC_1, and M_ME_TF_1

Station interrogation

☒ Global

☒ Group 1	☒ Group 5	☒ Group 9	☒ Group 13
☒ Group 2	☒ Group 6	☒ Group 10	☒ Group 14
☒ Group 3	☒ Group 7	☒ Group 11	☒ Group 15
☒ Group 4	☒ Group 8	☒ Group 12	☒ Group 16

Clock synchronization

☒ Clock synchronization (optional, see Clause 7.6)

Command transmission

☒ Direct command transmission
☐ Direct setpoint command transmission
☒ Select and execute command
☐ Select and execute setpoint command
☒ C_SE ACTTERM used
☒ No additional definition
☒ Short pulse duration (duration determined by a system parameter in the outstation)
☒ Long pulse duration (duration determined by a system parameter in the outstation)
☒ Persistent output

☒ Supervision of maximum delay in command direction of commands and setpoint commands
Maximum allowable delay of commands and setpoint commands: **10 s**

Transmission of integrated totals

☒ Mode A: Local freeze with spontaneous transmission
☒ Mode B: Local freeze with counter interrogation
☒ Mode C: Freeze and transmit by counter-interrogation commands
☒ Mode D: Freeze by counter-interrogation command, frozen values reported simultaneously

☒ Counter read
☒ Counter freeze without reset
☒ Counter freeze with reset
☒ Counter reset

☒ General request counter
☒ Request counter group 1
☒ Request counter group 2
☒ Request counter group 3
☒ Request counter group 4

Parameter loading

☒ Threshold value
☐ Smoothing factor
☐ Low limit for transmission of measured values
☐ High limit for transmission of measured values

Parameter activation

☐ Activation/deactivation of persistent cyclic or periodic transmission of the addressed object

Test procedure

☐ Test procedure

File transfer

File transfer in monitor direction:

☐ Transparent file
☐ Transmission of disturbance data of protection equipment
☐ Transmission of sequences of events
☐ Transmission of sequences of recorded analog values

File transfer in control direction:

☐ Transparent file

Background scan

☐ Background scan

Acquisition of transmission delay

■ ~~Acquisition of transmission delay~~

Definition of time outs

Parameter	Default value	Remarks	Selected value
t_0	30 s	Timeout of connection establishment	120 s
t_1	15 s	Timeout of send or test APDUs	15 s
t_2	10 s	Timeout for acknowledgements in case of no data messages $t_2 < t_1$	10 s
t_3	20 s	Timeout for sending test frames in case of a long idle state	20 s

Maximum range of values for all time outs: 1 to 255 s, accuracy 1 s.

Maximum number of outstanding I-format APDUs k and latest acknowledge APDUs (w)

Parameter	Default value	Remarks	Selected value
k	12 APDUs	Maximum difference receive sequence number to send state variable	12 APDUs
w	8 APDUs	Latest acknowledge after receiving w I-format APDUs	8 APDUs

Maximum range of values k:1 to 32767 ($2^{15} - 1$) APDUs, accuracy 1 APDU
Maximum range of values w:1 to 32767 APDUs, accuracy 1 APDU
Recommendation: w should not exceed two-thirds of k

Portnumber

Parameter	Value	Remarks
Portnumber	2404	In all cases

RFC 2200 suite

RFC 2200 is an official Internet Standard which describes the state of standardization of protocols used in the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used in the Internet. The suitable selection of documents from RFC 2200 defined in this standard for given projects has to be chosen by the user of this standard.

☒ Ethernet 802.3

☐ Serial X.21 interface

☐ Other selection(s) from RFC 2200 (list below if selected)

7.2 IEC 60870-5-104 points

The IEC 60870-5-104 data points are configured through the **SETTINGS ⇨ PRODUCT SETUP ⇨⇩ COMMUNICATIONS ⇨⇩ DNP / IEC104 POINT LISTS** menu. See the Communications section of chapter 5 in the Instruction Manual for details.

UR Family

Appendix A: Miscellaneous

This chapter provides the revision history.

A.1 Revision history

The tables outline the releases and revision history of this document.

Table A-1: Revision history (English)

Part number	Firmware	Release date	ECO
1601-0401-AB1	7.3x	7 November 2014	14-1408
1601-0401-AB2	7.3x	1 September 2015	15-2215
1601-0401-AC1	7.40x	8 December 2016	16-3319
1601-0401-AE1	7.41x	31 January 2017	17-3427
1601-0401-AE3	7.4x	28 April 2017	17-3561
1601-0401-AF1	7.6x	30 June 2017	17-3779
1601-0401-AF2	7.6x	31 October 2017	17-3935
1601-0401-AG1	7.7x	31 March 2018	18-4430
1601-0401-AG2	7.7x	4 May 2018	18-4517
1601-0401-AH1	7.8x	17 December 2018	18-4703
1601-0401-AI1	7.9x	14 November 2019	19-5181
1601-0401-AI2	7.9x	12 February 2020	20-5579
1601-0401-AI3	7.9x	9 October 2020	20-6008

Table A-2: Major changes for version AI3 (English)

Page	Change
2-	Updated Modbus memory map
3-129	Updated Maximum Starting Rate IMD table

Table A-3: Major changes for version AI2 (English)

Page	Change
---	Updated user-programmable pushbutton information because 48 applies to B30 with IY software option and graphical front panel and 16 applies to other products

Table A-4: Major changes for version AI1 (English)

Page	Change
---	Increased number of user-programmable pushbuttons to 48 in Features per Product table and Modbus memory map
1-1	Updated the following elements in Features per Product table for B30: Autoreclose, Auxiliary Overvoltage, Auxiliary Undervoltage, Breaker Failure, Bus Differential, Bus Replica Isolator, Current CT settings, Disturbance Detection, End of Fault Protection, Ground Instantaneous Overcurrent, Ground Time Overcurrent, Neutral Directional Overcurrent, Neutral Instantaneous Overcurrent, Neutral Overvoltage, Neutral Time Overcurrent, Phase Directional, Phase Instantaneous Overcurrent, Phase Overvoltage, Phase Time Overcurrent, Phase Undervoltage, Sources, Synchrocheck, Underfrequency, VT Fuse Failure. Updated number of Digital Elements, FlexElements, FlexLogic Equations timers, Virtual Inputs, Virtual Outputs, Analog Channels (oscillography), Digital Channels (oscillography) for all products.
2-	Updated Modbus memory map and F codes, including restructuring into Settings and Actual Values sections. Converted hexadecimal addresses to decimal.
3-	Updated tables for IEC 61850 Edition 2
3-8	Updated TxGOOSE Timing figure and text to rename the following settings: Retrans Time to Min Time, Update Time to Max Time, and Time to Live to Time Allowed to Live
4-	Updated tables for IEC 61850 Edition 1

Table A-5: Major changes for version AH1 (English)

Page	Change
1-8	Updated features per product table for IEC 61850 remote input/output
2-	Updated Modbus memory map and F codes, including adding content for new non-HardFiber Process Bus Modules (order codes 85, 86, 87)
3-	Updated tables for IEC 61850 Edition 2, including adding content for new non-HardFiber Process Bus Modules (order codes 85, 86, 87)
3-25	Updated PICS tables
4-	Updated tables for IEC 61850 Edition 1

Table A-6: Major changes for version AG2 (English)

Page	Change
---	Updated number of Wattmetric Ground Fault elements for F35 from 4 to 5 in Features per Product table and Modbus memory map tables
---	Updated number of Breaker Control elements for C30 and N60 to six, C60 to four, and removed dependency on number of CT banks, in Features per Product and Modbus memory map tables
3-	Updated tables for IEC 61850 Edition 2
4-	Updated tables for IEC 61850 Edition 1

Table A-7: Major changes for version AG1 (English)

Page	Change
2-	Updated Modbus memory map and F codes, including addition of IEC 61850 GOOSE Simulation settings, support for a redundant SNTP server, and increasing the number of L90 direct inputs/outputs from 8 to 32
3-	Updated IMD tables for IEC 61850 Edition 2
4-	Added a new chapter 4 for IEC 61850 Edition 1

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