GE VERNOVA

UR Family

Communications Guide



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Chapter 1: Introduction

This document outlines the communications protocols for the Universal Relay (UR) series 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

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							
Automatic Voltage Regulator	# of elements if voltage banks present; 0 if Enhanced Capacitor Bank Control software option not ordered	3					3													

1

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Autoreclose	# of current banks; 0 for L30 when Three-Pole Auto-Reclose not ordered	6						6		6	6			6						
Autoreclose 1P 3P		1				1			1						1	1				
Auxiliary Overvoltage	# of elements; 1 per voltage bank and 3 if C70 has voltage banks	3	3			2	3	1	2	3	2	2	2	1	1	2	2			3
Auxiliary Undervoltage	#of voltage banks	3				2		1	2	3	2	2	2	1	1	2	2			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																
B90 TOC	# of current terminals	24		24																
B90 Undervoltage	# of voltage terminals	12		12																

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Basic UR Features	Clock	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		6	6	6	6			6	6	6			6	6
Breaker Control	# of elements	6	6		2	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Breaker Switch	# of elements	24	24		8	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Breaker Failure	# of elements; if B30, # of sources	6	6			2	1		2		2		4	2	2	2	2			6
Breaker Flashover		2	2			2	1		2		2		2		2	2	2			2
Breaker Restrike	# of elements	3				3	3		3	3	1					3				3
Broken Conductor Detection	# of sources	6						6	6	6	6			6		6				
Broken Rotor Bar		1															1			

1

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Bus Differential		2	2																	
	Bus configuration	2																		
	Saturation detector	2																		
Bus Replica Isolator		48		48																
Capacitor Bank Overvoltage	# of elements	3					3													
Capacitor Control		4					4													
Change Phase Rotation		1										1	1							
Charging Current Compensation		1													1					
Cold Load Pickup		2									2									
Compensated Bank Neutral Unbalance	# of current banks	3					3													
Compensated Overvoltage		1							1											
Cont. Monitor		1														1				
Contact Inputs	# of inputs	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Contact Outputs	Latching can be only 14	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64
CT Fail	# of current banks	6										6	6	6	2	6	6		6	6
CT Trouble	# of zones from software option; 2 on B30	6	2	6																
Current CT settings	# of sources	6	6			6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
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
Demand	# of sources	6				6				6	6					6		6		6
Digital Counters		8	8		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Digital Elements		48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48		48
Digitizer		5																5		

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Direct Inputs/ Outputs	16 inputs and 8 outputs	1												1		1				
Disturbance Detection	# of elements	6						6	6		6			6	6	6		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		24																
Energy Metering	# of elements; 1 per source	6	6			6			6	6	6	6	6			6	6	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	1			1	1	1				
Field Ground Protection		1											1							
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																		

1

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
	Field unit RTDs	8																		
	Field unit shared inputs	16																		
	Field unit shared outputs	16																		
	Field unit transducers	8																		
	Field units	8																		
FlexElements		16	8		8	8	16	8	8	16	8	16	16	8	8	8	16	16	16	16
FlexLogic Equations	512 lines		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	FlexLogic timers	32																		
FlexMath																		1		
	Direct Analogs	32																32		
	Direct integers	16																16		
	Summator	6																6		
Frequency Rate of Change		4							4		4	4	4			4		4		4
Generator Unbalance		1										1	1							
Generic Comparator	8-bit comparator	6																6		
Ground Distance	Fast distance is not available on L60	5						5	5						3	5				5
Ground Instantaneous Overcurrent	# of elements	12	6			12	12	12	12	12	12	1	1	12	12	12	12			12
Ground Time Overcurrent	# of elements	6	6			6	6	6	6	6	6	1	1	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
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																		
IEC 61850 Remote I/O (Fixed GOOSE/ GSSE/GOOSE)			1	1		1	1	1	1	1	1	1	1	1	1	1	1		1	1
	Rx GOOSE	32	16	16	32	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Rx GOOSE Boolean	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128
	Rx GOOSE DPS	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	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	32	16	16	32	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
IEC103 Communications		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								6	2									
L60 Channel Tests		1													1					
Line Differential (87L) In-Zone Transformer		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
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 Encroachment		1						1	1		1				1	1				1
Loss of Excitation		1										1	1							
Modbus Communications		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			
Motor Start Supervision		1															1			
Negative Sequence Directional OC		2					2	2	2		2	2	2		2	2				
Negative Sequence Instantaneous Overcurrent		2					2	2	2	2	2			2	2	2				
Negative Sequence OV	# of voltage banks if at least one	3					3													
Negative Sequence Overvoltage								3	3		3	3	3	3	3		3			
Negative Sequence Time Overcurrent		2					2	2	2	2	2			2	2	2				
Neutral Current Unbalance	# of current banks	3					3													
Neutral Directional OC		2					1	2	2		2	2	2	2	2	2	2			1

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Neutral Instantaneous Overcurrent	# of CT banks	6	6									1	1							
Neutral Instantaneous Overcurrent	# of elements	12				12	12	12	12	12	12			12	12	12	12			12
Neutral Overvoltage	# of voltage banks; if C70 has at least one	3	3			3	3	3	3	3	3	3	3		3	3	3			3
Neutral Time Overcurrent	# of elements	6	6			6	6	6	6	6	6	1	1	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		1				1												1		
Oscillography		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Over Under Frequency Accumulation		1										1	1							
Overfrequency		4							4		4	4	4			4	4	4		4
Phase Comparison		1													1					
Phase Current Unbalance	# of current banks	3					3													
Phase Directional		2					2	2	2		2	1	1	2	2	2	2			1
Phase Distance	L60 does not support fast distance	5						5	5				3		3	5				5
Phase Instantaneous Overcurrent	# of elements	12	6			8	12	4	8	12	8	2	2	4	4	8	8	12		12
Phase Overvoltage	# of elements; 0 if no VT banks	3				3	3	3	3		3	3	3	3	3	3	3	3		3
Phase Time Overcurrent	# of elements	6	6			6	6	6	6	6	6	1	1	6	6	6			6	6
Phase Undervoltage	# of voltage banks; if C70 has at least one	3	3			3	3	3	3	3	3	3	3	3	3	3	3	3		3
PID Regulator		4			4					4										

1

Feature	Rule	Max	B30	B90	C30	C60	C70	D30	D60	F35	F60	G30	G60	L30	L60	L90	M60	N60	T35	T60
Pilot Schemes		1							1							1				
	Pilot blocking (1P)																			
	Pilot blocking 1 (1P)																			
	Pilot DCUB																			
	Pilot DUTT (1P)																			
	Pilot Hybrid POTT (1P)																			
	Pilot POTT (1P)																			
	Pilot POTT1 (1P)																			
	Pilot PUTT (1P)																			
	Pilot POTT														1					
Platform Direct I/O		96	32	96	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 CT banks; 0 if L90 has no inzone transformer	6									6	6	6			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		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
Simple Network Time Protocol		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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
Single Pole Tripping		1							1						1	1				
	Open pole detect (1P)																			
	Phase selection																			
	Trip output																			
Sources (1 per CT/VT bank)	# of sources	6	6			6	6	6	6	6	6	6	6	6	6	6	6	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		4				4		4	4		4	4	4	4	4	4		4		4
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
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																		

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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
Transformer Instantaneous Differential		1																	1	1
	Transformer general	1																		
Transformer Percent Differential		1										1							1	1
Transfer windings		6										2							6	6
Transformer Thermal Model		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		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; 16 for J, L, N, T, V, Y software options; 6 for vertical front panel; 12 for others		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	control Push-buttons	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		64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64
Virtual Outputs		96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Voltage Differential	# of VT banks	3					3													
Volts Per Hertz		2										2	2							2
VT Fuse Failure	# of sources; 0 if no CT or VT banks	6				6	6	6	6		6	6	6	6	6	6	6	6		6
Wattmetric Ground Fault		4							2	4	2				2	2				

1.3 Communication ports

URs are equipped with an RS232 port on the faceplate, and at the rear an 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.

1.4 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.

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

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

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

NOTICE 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

1

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 series 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 and RS485 serial links, 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 and RS485. The relay includes a faceplate (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 faceplate 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. 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 faceplate 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 2-6 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) can also 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 (1100000000000000101b). 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 holding registers	Read actual values or settings
04	4	Read holding registers	Read actual values or settings
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)

This function code allows 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. See the Memory map section on page 2-9 for the data registers.

Since some PLC implementations of Modbus only support one of function codes 03h and 04h. The UR interpretation allows either function code to be used for reading one or more consecutive data registers. The data starting address determines the type of data being read. Function codes 03h and 04h are therefore identical.

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 three register values starting at address 4050h from slave device 11h (17 decimal); the slave device responds with the values 40, 300, and 0 from registers 4050h, 4051h, and 4052h, respectively.

Table 2-5: Master and slave device packet transmission example

Master transmission	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
FUNCTION CODE	04
DATA STARTING ADDRESS - high	40
DATA STARTING ADDRESS - low	50

Slave response	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
FUNCTION CODE	04
BYTE COUNT	06
DATA #1 - high	00

Master transmission	
Packet format	**Example (Hex)**
NUMBER OF REGISTERS - high	00
NUMBER OF REGISTERS - low	03
CRC - low	A7
CRC - high	4A

Slave response	
Packet format	**Example (Hex)**
DATA #1 - low	28
DATA #2 - high	01
DATA #2 - low	2C
DATA #3 - high	00
DATA #3 - low	00
CRC - low	0D
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 2-6: Master and slave device packet transmission example

Master transmission	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
FUNCTION CODE	05
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)**
SLAVE ADDRESS	11
FUNCTION CODE	05
OPERATION CODE - high	00
OPERATION CODE - low	01
CODE VALUE - high	FF
CODE VALUE - low	00
CRC - low	DF
CRC - high	6A

Table 2-7: 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 faceplate **RESET** key
0005	CLEAR EVENT RECORDS	Performs the same function as the faceplate **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 2-8: 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 2-9: Master and slave device packet transmission example

Master transmission	
Packet format	**Example (Hex)**
SLAVE ADDRESS	11
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)**
SLAVE ADDRESS	11
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 2-10: 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 may 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, and data logger files

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

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.

To read binary COMTRADE oscillography files, read the following filenames:

`OSCnnnn.CFG` and `OSCnnn.DAT`

For all products except C70, G30, and L30, replace "nnn" with the desired oscillography trigger number. And for ASCII format, use the following file names:

`OSCAnnnn.CFG` and `OSCAnnn.DAT`

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.

To read the entire data logger in binary COMTRADE format, read the following files.

`datalog.cfg` and `datalog.dat`

To read the entire data logger in ASCII COMTRADE format, read the following files.

`dataloga.cfg` and `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.

2.4 Memory map

2.4.1 Modbus memory map

The table provides the Modbus memory map. The addresses in the table are expressed in hexadecimal. The particular registers actually present depend on the UR product and on the order codes software and module options.

The map is also viewable in a web browser. In the 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 map provide more information for some entries.

Table 2-11: Modbus memory map

Products	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
	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)
	Product Information (Read Only)						
G60	0100	GPM-F Version	0 to 655.35	---	0.01	F001	0
"	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
	Product Information (Read Only -- Written by Factory)						
All	0110	FPGA Version	---	---	---	F206	(none)
"	0113	FPGA Date	0 to 4294967295	--	1	F050	0
	Product Information (Read/Write)						
All	0120	Undefined	0 to 1	---	1	F102	0 (Disabled)
	Self Test Targets (Read Only)						
All	0200	Self Test States (4 items)	0 to 4294967295	0	1	F143	0
	Front Panel (Read Only)						
All	0208	LED Column n State, 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)

Products	Address	Register name	Range	Units	Step	Format	Default
	Keypress Emulation (Read/Write)						
All	0280	Simulated keypress -- write zero before each keystroke	0 to 46	---	1	F190	0 (No key -- use between real keys)
	Virtual Input Commands (Read/Write Command) (64 Modules)						
All	0400	Virtual Input 1 State	0 to 1	---	1	F108	0 (Off)
"	0401	Virtual Input 2 State	0 to 1	---	1	F108	0 (Off)
"	0402	Virtual Input 3 State	0 to 1	---	1	F108	0 (Off)
"	0403	Virtual Input 4 State	0 to 1	---	1	F108	0 (Off)
"	0404	Virtual Input 5 State	0 to 1	---	1	F108	0 (Off)
"	0405	Virtual Input 6 State	0 to 1	---	1	F108	0 (Off)
"	0406	Virtual Input 7 State	0 to 1	---	1	F108	0 (Off)
"	0407	Virtual Input 8 State	0 to 1	---	1	F108	0 (Off)
"	0408	Virtual Input 9 State	0 to 1	---	1	F108	0 (Off)
"	0409	Virtual Input 10 State	0 to 1	---	1	F108	0 (Off)
"	040A	Virtual Input 11 State	0 to 1	---	1	F108	0 (Off)
"	040B	Virtual Input 12 State	0 to 1	---	1	F108	0 (Off)
"	040C	Virtual Input 13 State	0 to 1	---	1	F108	0 (Off)
"	040D	Virtual Input 14 State	0 to 1	---	1	F108	0 (Off)
"	040E	Virtual Input 15 State	0 to 1	---	1	F108	0 (Off)
"	040F	Virtual Input 16 State	0 to 1	---	1	F108	0 (Off)
"	0410	Virtual Input 17 State	0 to 1	---	1	F108	0 (Off)
"	0411	Virtual Input 18 State	0 to 1	---	1	F108	0 (Off)
"	0412	Virtual Input 19 State	0 to 1	---	1	F108	0 (Off)
"	0413	Virtual Input 20 State	0 to 1	---	1	F108	0 (Off)
"	0414	Virtual Input 21 State	0 to 1	---	1	F108	0 (Off)
"	0415	Virtual Input 22 State	0 to 1	---	1	F108	0 (Off)
"	0416	Virtual Input 23 State	0 to 1	---	1	F108	0 (Off)
"	0417	Virtual Input 24 State	0 to 1	---	1	F108	0 (Off)
"	0418	Virtual Input 25 State	0 to 1	---	1	F108	0 (Off)
"	0419	Virtual Input 26 State	0 to 1	---	1	F108	0 (Off)
"	041A	Virtual Input 27 State	0 to 1	---	1	F108	0 (Off)
"	041B	Virtual Input 28 State	0 to 1	---	1	F108	0 (Off)
"	041C	Virtual Input 29 State	0 to 1	---	1	F108	0 (Off)
"	041D	Virtual Input 30 State	0 to 1	---	1	F108	0 (Off)
"	041E	Virtual Input 31 State	0 to 1	---	1	F108	0 (Off)
"	041F	Virtual Input 32 State	0 to 1	---	1	F108	0 (Off)
"	0420	Virtual Input 33 State	0 to 1	---	1	F108	0 (Off)
"	0421	Virtual Input 34 State	0 to 1	---	1	F108	0 (Off)
"	0422	Virtual Input 35 State	0 to 1	---	1	F108	0 (Off)
"	0423	Virtual Input 36 State	0 to 1	---	1	F108	0 (Off)
"	0424	Virtual Input 37 State	0 to 1	---	1	F108	0 (Off)
"	0425	Virtual Input 38 State	0 to 1	---	1	F108	0 (Off)
"	0426	Virtual Input 39 State	0 to 1	---	1	F108	0 (Off)
"	0427	Virtual Input 40 State	0 to 1	---	1	F108	0 (Off)
"	0428	Virtual Input 41 State	0 to 1	---	1	F108	0 (Off)
"	0429	Virtual Input 42 State	0 to 1	---	1	F108	0 (Off)

Products	Address	Register name	Range	Units	Step	Format	Default
"	042A	Virtual Input 43 State	0 to 1	---	1	F108	0 (Off)
"	042B	Virtual Input 44 State	0 to 1	---	1	F108	0 (Off)
"	042C	Virtual Input 45 State	0 to 1	---	1	F108	0 (Off)
"	042D	Virtual Input 46 State	0 to 1	---	1	F108	0 (Off)
"	042E	Virtual Input 47 State	0 to 1	---	1	F108	0 (Off)
"	042F	Virtual Input 48 State	0 to 1	---	1	F108	0 (Off)
"	0430	Virtual Input 49 State	0 to 1	---	1	F108	0 (Off)
"	0431	Virtual Input 50 State	0 to 1	---	1	F108	0 (Off)
"	0432	Virtual Input 51 State	0 to 1	---	1	F108	0 (Off)
"	0433	Virtual Input 52 State	0 to 1	---	1	F108	0 (Off)
"	0434	Virtual Input 53 State	0 to 1	---	1	F108	0 (Off)
"	0435	Virtual Input 54 State	0 to 1	---	1	F108	0 (Off)
"	0436	Virtual Input 55 State	0 to 1	---	1	F108	0 (Off)
"	0437	Virtual Input 56 State	0 to 1	---	1	F108	0 (Off)
"	0438	Virtual Input 57 State	0 to 1	---	1	F108	0 (Off)
"	0439	Virtual Input 58 State	0 to 1	---	1	F108	0 (Off)
"	043A	Virtual Input 59 State	0 to 1	---	1	F108	0 (Off)
"	043B	Virtual Input 60 State	0 to 1	---	1	F108	0 (Off)
"	043C	Virtual Input 61 State	0 to 1	---	1	F108	0 (Off)
"	043D	Virtual Input 62 State	0 to 1	---	1	F108	0 (Off)
"	043E	Virtual Input 63 State	0 to 1	---	1	F108	0 (Off)
"	043F	Virtual Input 64 State	0 to 1	---	1	F108	0 (Off)
	IEC103 Protocol Settings (Read/Write Setting)						
All	0582	IEC103 Common ASDU Address	0 to 254	---	1	F001	0
"	0583	IEC103 Sync Timeout	1 to 1440	min	1	F001	1
	IEC103 Binary Inputs (Read/Write Setting) (96 Modules)						
All	0584	IEC103 Binary Input 1 FUN	0 to 255	---	1	F001	0
"	0585	IEC103 Binary Input 1 INF	0 to 255	---	1	F001	0
"	0586	IEC103 Binary Input 1 Operand	0 to 4294967295	---	1	F300	0
"	0588	...Repeated for Binary Input 2					
"	058C	...Repeated for Binary Input 3					
"	0590	...Repeated for Binary Input 4					
"	0594	...Repeated for Binary Input 5					
"	0598	...Repeated for Binary Input 6					
"	059C	...Repeated for Binary Input 7					
"	05A0	...Repeated for Binary Input 8					
"	05A4	...Repeated for Binary Input 9					
"	05A8	...Repeated for Binary Input 10					
"	05AC	...Repeated for Binary Input 11					
"	05B0	...Repeated for Binary Input 12					
"	05B4	...Repeated for Binary Input 13					
"	05B8	...Repeated for Binary Input 14					
"	05BC	...Repeated for Binary Input 15					
"	05C0	...Repeated for Binary Input 16					
"	05C4	...Repeated for Binary Input 17					
"	05C8	...Repeated for Binary Input 18					
"	05CC	...Repeated for Binary Input 19					

Products	Address	Register name	Range	Units	Step	Format	Default
"	05D0	...Repeated for Binary Input 20					
"	05D4	...Repeated for Binary Input 21					
"	05D8	...Repeated for Binary Input 22					
"	05DC	...Repeated for Binary Input 23					
"	05E0	...Repeated for Binary Input 24					
"	05E4	...Repeated for Binary Input 25					
"	05E8	...Repeated for Binary Input 26					
"	05EC	...Repeated for Binary Input 27					
"	05F0	...Repeated for Binary Input 28					
"	05F4	...Repeated for Binary Input 29					
"	05F8	...Repeated for Binary Input 30					
"	05FC	...Repeated for Binary Input 31					
"	0600	...Repeated for Binary Input 32					
"	0604	...Repeated for Binary Input 33					
"	0608	...Repeated for Binary Input 34					
"	060C	...Repeated for Binary Input 35					
"	0610	...Repeated for Binary Input 36					
"	0614	...Repeated for Binary Input 37					
"	0618	...Repeated for Binary Input 38					
"	061C	...Repeated for Binary Input 39					
"	0620	...Repeated for Binary Input 40					
"	0624	...Repeated for Binary Input 41					
"	0628	...Repeated for Binary Input 42					
"	062C	...Repeated for Binary Input 43					
"	0630	...Repeated for Binary Input 44					
"	0634	...Repeated for Binary Input 45					
"	0638	...Repeated for Binary Input 46					
"	063C	...Repeated for Binary Input 47					
"	0640	...Repeated for Binary Input 48					
"	0644	...Repeated for Binary Input 49					
"	0648	...Repeated for Binary Input 50					
"	064C	...Repeated for Binary Input 51					
"	0650	...Repeated for Binary Input 52					
"	0654	...Repeated for Binary Input 53					
"	0658	...Repeated for Binary Input 54					
"	065C	...Repeated for Binary Input 55					
"	0660	...Repeated for Binary Input 56					
"	0664	...Repeated for Binary Input 57					
"	0668	...Repeated for Binary Input 58					
"	066C	...Repeated for Binary Input 59					
"	0670	...Repeated for Binary Input 60					
"	0674	...Repeated for Binary Input 61					
"	0678	...Repeated for Binary Input 62					
"	067C	...Repeated for Binary Input 63					
"	0680	...Repeated for Binary Input 64					
"	0684	...Repeated for Binary Input 65					
"	0688	...Repeated for Binary Input 66					

Products	Address	Register name	Range	Units	Step	Format	Default
"	068C	...Repeated for Binary Input 67					
"	0690	...Repeated for Binary Input 68					
"	0694	...Repeated for Binary Input 69					
"	0698	...Repeated for Binary Input 70					
"	069C	...Repeated for Binary Input 71					
"	06A0	...Repeated for Binary Input 72					
"	06A4	...Repeated for Binary Input 73					
"	06A8	...Repeated for Binary Input 74					
"	06AC	...Repeated for Binary Input 75					
"	06B0	...Repeated for Binary Input 76					
"	06B4	...Repeated for Binary Input 77					
"	06B8	...Repeated for Binary Input 78					
"	06BC	...Repeated for Binary Input 79					
"	06C0	...Repeated for Binary Input 80					
"	06C4	...Repeated for Binary Input 81					
"	06C8	...Repeated for Binary Input 82					
"	06CC	...Repeated for Binary Input 83					
"	06D0	...Repeated for Binary Input 84					
"	06D4	...Repeated for Binary Input 85					
"	06D8	...Repeated for Binary Input 86					
"	06DC	...Repeated for Binary Input 87					
"	06E0	...Repeated for Binary Input 88					
"	06E4	...Repeated for Binary Input 89					
"	06E8	...Repeated for Binary Input 90					
"	06EC	...Repeated for Binary Input 91					
"	06F0	...Repeated for Binary Input 92					
"	06F4	...Repeated for Binary Input 93					
"	06F8	...Repeated for Binary Input 94					
"	06FC	...Repeated for Binary Input 95					
"	0700	...Repeated for Binary Input 96					
	IEC103 ASDU Settings (Read/Write Setting) (4 Modules)						
All	0704	IEC103 ASDU1 TYP	0 to 1	---	1	F630	1(9)
"	0705	IEC103 ASDU 1 FUN	0 to 255	---	1	F001	0
"	0706	IEC103 ASDU 1 INF	0 to 255	---	1	F001	0
"	0707	IEC103 ASDU 1 Scan Timeout	0 to 1000	---	1	F001	0
"	0708	IEC103 ASDU 1 Analog Parameter 1	0 to 65535	---	1	F600	0
"	0709	IEC103 ASDU 1 Analog Factor 1	0 to 65.535	---	0.001	F001	1000
"	070A	IEC103 ASDU 1 Analog Offset 1	-32768 to 32767	---	1	F002	0
"	070B	IEC103 ASDU 1 Analog Parameter 2	0 to 65535	---	1	F600	0
"	070C	IEC103 ASDU 1 Analog Factor 2	0 to 65.535	---	0.001	F001	1000
"	070D	IEC103 ASDU 1 Analog Offset 2	-32768 to 32767	---	1	F002	0
"	070E	IEC103 ASDU 1 Analog Parameter 3	0 to 65535	---	1	F600	0
"	070F	IEC103 ASDU 1 Analog Factor 3	0 to 65.535	---	0.001	F001	1000
"	0710	IEC103 ASDU 1 Analog Offset 3	-32768 to 32767	---	1	F002	0
"	0711	IEC103 ASDU 1 Analog Parameter 4	0 to 65535	---	1	F600	0
"	0712	IEC103 ASDU 1 Analog Factor 4	0 to 65.535	---	0.001	F001	1000
"	0713	IEC103 ASDU 1 Analog Offset 4	-32768 to 32767	---	1	F002	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	0714	IEC103 ASDU 1 Analog Parameter 5	0 to 65535	---	1	F600	0
"	0715	IEC103 ASDU 1 Analog Factor 5	0 to 65.535	---	0.001	F001	1000
"	0716	IEC103 ASDU 1 Analog Offset 5	-32768 to 32767	---	1	F002	0
"	0717	IEC103 ASDU 1 Analog Parameter 6	0 to 65535	---	1	F600	0
"	0718	IEC103 ASDU 1 Analog Factor 6	0 to 65.535	---	0.001	F001	1000
"	0719	IEC103 ASDU 1 Analog Offset 6	-32768 to 32767	---	1	F002	0
"	071A	IEC103 ASDU 1 Analog Parameter 7	0 to 65535	---	1	F600	0
"	071B	IEC103 ASDU 1 Analog Factor 7	0 to 65.535	---	0.001	F001	1000
"	071C	IEC103 ASDU 1 Analog Offset 7	-32768 to 32767	---	1	F002	0
"	071D	IEC103 ASDU 1 Analog Parameter 8	0 to 65535	---	1	F600	0
"	071E	IEC103 ASDU 1 Analog Factor 8	0 to 65.535	---	0.001	F001	1000
"	071F	IEC103 ASDU 1 Analog Offset 8	-32768 to 32767	---	1	F002	0
"	0720	IEC103 ASDU 1 Analog Parameter 9	0 to 65535	---	1	F600	0
"	0721	IEC103 ASDU 1 Analog Factor 9	0 to 65.535	---	0.001	F001	1000
"	0722	IEC103 ASDU 1 Analog Offset 9	-32768 to 32767	---	1	F002	0
"	0723	...Repeated for IEC103 ASDU 2					
"	0742	...Repeated for IEC103 ASDU 3					
"	0761	...Repeated for IEC103 ASDU 4					
	IEC103 Commands (Read/Write Setting) (32 Modules)						
All	0780	IEC103 Command 1 FUN	0 to 255	---	1	F001	0
"	0781	IEC103 Command 1 INF	0 to 255	---	1	F001	0
"	0782	IEC103 Command 1 Param ON	0 to 64	---	1	F631	0 (OFF)
"	0783	IEC103 Command 1 Param OFF	0 to 64	---	1	F631	0 (OFF)
"	0784	...Repeated for IEC103 Command 2					
"	0788	...Repeated for IEC103 Command 3					
"	078C	...Repeated for IEC103 Command 4					
"	0790	...Repeated for IEC103 Command 5					
"	0794	...Repeated for IEC103 Command 6					
"	0798	...Repeated for IEC103 Command 7					
"	079C	...Repeated for IEC103 Command 8					
"	07A0	...Repeated for IEC103 Command 9					
"	07A4	...Repeated for IEC103 Command 10					
"	07A8	...Repeated for IEC103 Command 11					
"	07AC	...Repeated for IEC103 Command 12					
"	07B0	...Repeated for IEC103 Command 13					
"	07B4	...Repeated for IEC103 Command 14					
"	07B8	...Repeated for IEC103 Command 15					
"	07BC	...Repeated for IEC103 Command 16					
"	07C0	...Repeated for IEC103 Command 17					
"	07C4	...Repeated for IEC103 Command 18					
"	07C8	...Repeated for IEC103 Command 19					
"	07CC	...Repeated for IEC103 Command 20					
"	07D0	...Repeated for IEC103 Command 21					
"	07D4	...Repeated for IEC103 Command 22					
"	07D8	...Repeated for IEC103 Command 23					
"	07DC	...Repeated for IEC103 Command 24					
"	07E0	...Repeated for IEC103 Command 25					

Products	Address	Register name	Range	Units	Step	Format	Default
"	07E4	...Repeated for IEC103 Command 26					
"	07E8	...Repeated for IEC103 Command 27					
"	07EC	...Repeated for IEC103 Command 28					
"	07F0	...Repeated for IEC103 Command 29					
"	07F4	...Repeated for IEC103 Command 30					
"	07F8	...Repeated for IEC103 Command 31					
"	07FC	...Repeated for IEC103 Command 32					
	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
	RxGOOSE Boolean (Read/Write Setting) (128 Modules)						
All	0912	RxGOOSE Boolean 1 Default State	0 to 3	---	1	F086	0 (Off)
"	0913	RxGOOSE Boolean 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	0914	...Repeated for RxGOOSE Boolean 2					
"	0916	...Repeated for RxGOOSE Boolean 3					
"	0918	...Repeated for RxGOOSE Boolean 4					
"	091A	...Repeated for RxGOOSE Boolean 5					
"	091C	...Repeated for RxGOOSE Boolean 6					
"	091E	...Repeated for RxGOOSE Boolean 7					
"	0920	...Repeated for RxGOOSE Boolean 8					
"	0922	...Repeated for RxGOOSE Boolean 9					
"	0924	...Repeated for RxGOOSE Boolean 10					
"	0926	...Repeated for RxGOOSE Boolean 11					
"	0928	...Repeated for RxGOOSE Boolean 12					
"	092A	...Repeated for RxGOOSE Boolean 13					
"	092C	...Repeated for RxGOOSE Boolean 14					
"	092E	...Repeated for RxGOOSE Boolean 15					
"	0930	...Repeated for RxGOOSE Boolean 16					
"	0932	...Repeated for RxGOOSE Boolean 17					
"	0934	...Repeated for RxGOOSE Boolean 18					
"	0936	...Repeated for RxGOOSE Boolean 19					
"	0938	...Repeated for RxGOOSE Boolean 20					
"	093A	...Repeated for RxGOOSE Boolean 21					
"	093C	...Repeated for RxGOOSE Boolean 22					

Products	Address	Register name	Range	Units	Step	Format	Default
"	093E	...Repeated for RxGOOSE Boolean 23					
"	0940	...Repeated for RxGOOSE Boolean 24					
"	0942	...Repeated for RxGOOSE Boolean 25					
"	0944	...Repeated for RxGOOSE Boolean 26					
"	0946	...Repeated for RxGOOSE Boolean 27					
"	0948	...Repeated for RxGOOSE Boolean 28					
"	094A	...Repeated for RxGOOSE Boolean 29					
"	094C	...Repeated for RxGOOSE Boolean 30					
"	094E	...Repeated for RxGOOSE Boolean 31					
"	0950	...Repeated for RxGOOSE Boolean 32					
"	0952	...Repeated for RxGOOSE Boolean 33					
"	0954	...Repeated for RxGOOSE Boolean 34					
"	0956	...Repeated for RxGOOSE Boolean 35					
"	0958	...Repeated for RxGOOSE Boolean 36					
"	095A	...Repeated for RxGOOSE Boolean 37					
"	095C	...Repeated for RxGOOSE Boolean 38					
"	095E	...Repeated for RxGOOSE Boolean 39					
"	0960	...Repeated for RxGOOSE Boolean 40					
"	0962	...Repeated for RxGOOSE Boolean 41					
"	0964	...Repeated for RxGOOSE Boolean 42					
"	0966	...Repeated for RxGOOSE Boolean 43					
"	0968	...Repeated for RxGOOSE Boolean 44					
"	096A	...Repeated for RxGOOSE Boolean 45					
"	096C	...Repeated for RxGOOSE Boolean 46					
"	096E	...Repeated for RxGOOSE Boolean 47					
"	0970	...Repeated for RxGOOSE Boolean 48					
"	0972	...Repeated for RxGOOSE Boolean 49					
"	0974	...Repeated for RxGOOSE Boolean 50					
"	0976	...Repeated for RxGOOSE Boolean 51					
"	0978	...Repeated for RxGOOSE Boolean 52					
"	097A	...Repeated for RxGOOSE Boolean 53					
"	097C	...Repeated for RxGOOSE Boolean 54					
"	097E	...Repeated for RxGOOSE Boolean 55					
"	0980	...Repeated for RxGOOSE Boolean 56					
"	0982	...Repeated for RxGOOSE Boolean 57					
"	0984	...Repeated for RxGOOSE Boolean 58					
"	0986	...Repeated for RxGOOSE Boolean 59					
"	0988	...Repeated for RxGOOSE Boolean 60					
"	098A	...Repeated for RxGOOSE Boolean 61					
"	098C	...Repeated for RxGOOSE Boolean 62					
"	098E	...Repeated for RxGOOSE Boolean 63					
"	0990	...Repeated for RxGOOSE Boolean 64					
"	0992	...Repeated for RxGOOSE Boolean 65					
"	0994	...Repeated for RxGOOSE Boolean 66					
"	0996	...Repeated for RxGOOSE Boolean 67					
"	0998	...Repeated for RxGOOSE Boolean 68					
"	099A	...Repeated for RxGOOSE Boolean 69					

Products	Address	Register name	Range	Units	Step	Format	Default
"	099C	...Repeated for RxGOOSE Boolean 70					
"	099E	...Repeated for RxGOOSE Boolean 71					
"	09A0	...Repeated for RxGOOSE Boolean 72					
"	09A2	...Repeated for RxGOOSE Boolean 73					
"	09A4	...Repeated for RxGOOSE Boolean 74					
"	09A6	...Repeated for RxGOOSE Boolean 75					
"	09A8	...Repeated for RxGOOSE Boolean 76					
"	09AA	...Repeated for RxGOOSE Boolean 77					
"	09AC	...Repeated for RxGOOSE Boolean 78					
"	09AE	...Repeated for RxGOOSE Boolean 79					
"	09B0	...Repeated for RxGOOSE Boolean 80					
"	09B2	...Repeated for RxGOOSE Boolean 81					
"	09B4	...Repeated for RxGOOSE Boolean 82					
"	09B6	...Repeated for RxGOOSE Boolean 83					
"	09B8	...Repeated for RxGOOSE Boolean 84					
"	09BA	...Repeated for RxGOOSE Boolean 85					
"	09BC	...Repeated for RxGOOSE Boolean 86					
"	09BE	...Repeated for RxGOOSE Boolean 87					
"	09C0	...Repeated for RxGOOSE Boolean 88					
"	09C2	...Repeated for RxGOOSE Boolean 89					
"	09C4	...Repeated for RxGOOSE Boolean 90					
"	09C6	...Repeated for RxGOOSE Boolean 91					
"	09C8	...Repeated for RxGOOSE Boolean 92					
"	09CA	...Repeated for RxGOOSE Boolean 93					
"	09CC	...Repeated for RxGOOSE Boolean 94					
"	09CE	...Repeated for RxGOOSE Boolean 95					
"	09D0	...Repeated for RxGOOSE Boolean 96					
"	09D2	...Repeated for RxGOOSE Boolean 97					
"	09D4	...Repeated for RxGOOSE Boolean 98					
"	09D6	...Repeated for RxGOOSE Boolean 99					
"	09D8	...Repeated for RxGOOSE Boolean 100					
"	09DA	...Repeated for RxGOOSE Boolean 101					
"	09DC	...Repeated for RxGOOSE Boolean 102					
"	09DE	...Repeated for RxGOOSE Boolean 103					
"	09E0	...Repeated for RxGOOSE Boolean 104					
"	09E2	...Repeated for RxGOOSE Boolean 105					
"	09E4	...Repeated for RxGOOSE Boolean 106					
"	09E6	...Repeated for RxGOOSE Boolean 107					
"	09E8	...Repeated for RxGOOSE Boolean 108					
"	09EA	...Repeated for RxGOOSE Boolean 109					
"	09EC	...Repeated for RxGOOSE Boolean 110					
"	09EE	...Repeated for RxGOOSE Boolean 111					
"	09F0	...Repeated for RxGOOSE Boolean 112					
"	09F2	...Repeated for RxGOOSE Boolean 113					
"	09F4	...Repeated for RxGOOSE Boolean 114					
"	09F6	...Repeated for RxGOOSE Boolean 115					
"	09F8	...Repeated for RxGOOSE Boolean 116					

Products	Address	Register name	Range	Units	Step	Format	Default
"	09FA	...Repeated for RxGOOSE Boolean 117					
"	09FC	...Repeated for RxGOOSE Boolean 118					
"	09FE	...Repeated for RxGOOSE Boolean 119					
"	0A00	...Repeated for RxGOOSE Boolean 120					
"	0A02	...Repeated for RxGOOSE Boolean 121					
"	0A04	...Repeated for RxGOOSE Boolean 122					
"	0A06	...Repeated for RxGOOSE Boolean 123					
"	0A08	...Repeated for RxGOOSE Boolean 124					
"	0A0A	...Repeated for RxGOOSE Boolean 125					
"	0A0C	...Repeated for RxGOOSE Boolean 126					
"	0A0E	...Repeated for RxGOOSE Boolean 127					
"	0A10	...Repeated for RxGOOSE Boolean 128					
	Element States (Read Only)						
All	1000	Element Operate States (64 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
	Direct Analog Input and Output Settings (Read/Write Setting) (32 Modules)						
N60	1320	Direct Analog Output 1 Value	0 to 65535	---	1	F600	0
"	1321	Direct Analog Output 1 Deadband	0 to 1000000000	---	0.001	F060	1000000
"	1323	Direct Analog Output 1 Trigger	0 to 4294967295	---	1	F300	0
"	1325	Direct Analog Input 1 Device	0 to 16	---	1	F001	0
"	1326	Direct Analog Input 1 Number	0 to 32	---	1	F001	0
"	1327	Direct Analog Input 1 Units	---	---	---	F207	(none)
"	1329	Direct Analog Input 1 Default Value	–1000000000 to 1000000000	---	0.001	F060	1000
"	132B	Direct Analog Input 1 Mode	0 to 1	---	1	F491	0 (Default Value)
"	132C	Direct Analog Input 1 PU Base	1 to 2000000	---	1	F003	1
"	132E	...Repeated for Direct Analog Input and Output 2					
"	133C	...Repeated for Direct Analog Input and Output 3					
"	134A	...Repeated for Direct Analog Input and Output 4					
"	1358	...Repeated for Direct Analog Input and Output 5					
"	1366	...Repeated for Direct Analog Input and Output 6					
"	1374	...Repeated for Direct Analog Input and Output 7					
"	1382	...Repeated for Direct Analog Input and Output 8					
"	1390	...Repeated for Direct Analog Input and Output 9					
"	139E	...Repeated for Direct Analog Input and Output 10					
"	13AC	...Repeated for Direct Analog Input and Output 11					

Products	Address	Register name	Range	Units	Step	Format	Default
"	13BA	...Repeated for Direct Analog Input and Output 12					
"	13C8	...Repeated for Direct Analog Input and Output 13					
"	13D6	...Repeated for Direct Analog Input and Output 14					
"	13E4	...Repeated for Direct Analog Input and Output 15					
"	13F2	...Repeated for Direct Analog Input and Output 16					
"	1400	...Repeated for Direct Analog Input and Output 17					
"	140E	...Repeated for Direct Analog Input and Output 18					
"	141C	...Repeated for Direct Analog Input and Output 19					
"	142A	...Repeated for Direct Analog Input and Output 20					
"	1438	...Repeated for Direct Analog Input and Output 21					
"	1446	...Repeated for Direct Analog Input and Output 22					
"	1454	...Repeated for Direct Analog Input and Output 23					
"	1462	...Repeated for Direct Analog Input and Output 24					
"	1470	...Repeated for Direct Analog Input and Output 25					
"	147E	...Repeated for Direct Analog Input and Output 26					
"	148C	...Repeated for Direct Analog Input and Output 27					
"	149A	...Repeated for Direct Analog Input and Output 28					
"	14A8	...Repeated for Direct Analog Input and Output 29					
"	14B6	...Repeated for Direct Analog Input and Output 30					
"	14C4	...Repeated for Direct Analog Input and Output 31					
"	14D2	...Repeated for Direct Analog Input and Output 32					
	Element Targets (Read Only)						
All	14E0	Target Sequence	0 to 65535	---	1	F001	0
"	14E1	Number of Targets	0 to 65535	---	1	F001	0
	Element Targets (Read/Write)						
All	14E2	Target to Read	0 to 65535	---	1	F001	0
	Element Targets (Read Only)						
All	14E3	Target Message	---	---	---	F200	"."
	Contact Input/Output States (Read Only)						
All	1500	Contact Input States (6 items)	0 to 65535	---	1	F500	0
"	1508	Virtual Input States (8 items)	0 to 65535	---	1	F500	0
"	1510	Contact Output States (4 items)	0 to 65535	---	1	F500	0
"	1518	Contact Output Current States (4 items)	0 to 65535	---	1	F500	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	1520	Contact Output Voltage States (4 items)	0 to 65535	---	1	F500	0
"	1528	Virtual Output States (6 items)	0 to 65535	---	1	F500	0
"	1530	Contact Output Detectors (4 items)	0 to 65535	---	1	F500	0
	RxGOOSE Input/Output States (Read Only)						
All	1540	Remote Device x States (2 items)	0 to 65535	---	1	F500	0
"	1542	RxGOOSE Boolean x States (8 items)	0 to 65535	---	1	F500	0
"	1550	Remote Devices Online	0 to 1	---	1	F126	0 (No)
"	1551	RxGOOSE Double-Point Status Input 1 State	0 to 4	---	1	F605	3 (bad-state)
"	1552	RxGOOSE Double-Point Status Input 2 State	0 to 4	---	1	F605	3 (bad-state)
"	1553	RxGOOSE Double-Point Status Input 3 State	0 to 4	---	1	F605	3 (bad-state)
"	1554	RxGOOSE Double-Point Status Input 4 State	0 to 4	---	1	F605	3 (bad-state)
"	1555	RxGOOSE Double-Point Status Input 5 State	0 to 4	---	1	F605	3 (bad-state)
	Direct Input/Output States (Read Only)						
L30, L90	15A0	Direct Input 1-1 State (8 items)	0 to 1	---	1	F108	0 (Off)
"	15A8	Direct Input 1-2 State (8 items)	0 to 1	---	1	F108	0 (Off)
"	15B0	Direct Input 1 State	0 to 65535	---	1	F500	0
"	15B1	Direct Input 2 State	0 to 65535	---	1	F500	0
	Platform Direct Input/Output States (Read Only)						
All except L30, L90	15C0	Direct Input States (6 items)	0 to 65535	---	1	F500	0
"	15C8	Direct Outputs Average Message Return Time 1	0 to 65535	ms	1	F001	0
"	15C9	Direct Outputs Average Message Return Time 2	0 to 65535	ms	1	F001	0
"	15CA	Direct Inputs/Outputs Unreturned Message Count - Ch. 1	0 to 65535	---	1	F001	0
"	15CB	Direct Inputs/Outputs Unreturned Message Count - Ch. 2	0 to 65535	---	1	F001	0
"	15D0	Direct Device States	0 to 65535	---	1	F500	0
"	15D1	Reserved	0 to 65535	---	1	F001	0
"	15D2	Direct Inputs/Outputs CRC Fail Count 1	0 to 65535	---	1	F001	0
"	15D3	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
"	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

Products	Address	Register name	Range	Units	Step	Format	Default
"	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 B30, B90, D30	1618	Data Logger Channel Count	0 to 16	channel	1	F001	0
"	1619	Time of Oldest Available Samples	0 to 4294967295	seconds	1	F050	0
"	161B	Time of Newest Available Samples	0 to 4294967295	seconds	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)
	Channel Status Commands (Read/Write Command)						
L90	1630	L90 Channel Status Clear	0 to 1	---	1	F126	0 (No)
	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/Write Setting)						
L60	1640	L60 Test Mode	0 to 1	---	1	F102	0 (Disabled)
	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)
	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

Products	Address	Register name	Range	Units	Step	Format	Default
	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	---	0.1	F002	0
	Sensitive Directional Power Actual Values (Read Only) (2 Modules)						
C60, D60, F60, G30, G60, L90, M60, N60	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, 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					
F60, G60, L90, 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 Actuals (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					
"	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) (4 Modules)						
D60, F60, G30, G60 L90, N60, T60	16E0	Frequency Rate of Change 1	-327.67 to 327.67	Hz/s	0.01	F002	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	16E1	Reserved (3 items)	0 to 65535	---	1	F001	0
"	16E4	...Repeated for Frequency Rate of Change 2					
"	16E8	...Repeated for Frequency Rate of Change 3					
"	16EC	...Repeated for Frequency Rate of Change 4					
	Source Current (Read Only) (2, 4, or 6 Modules)						
All except B90, C30	1800	Source 1 Phase A Current RMS	0 to 999999.999	A	0.001	F060	0
"	1802	Source 1 Phase B Current RMS	0 to 999999.999	A	0.001	F060	0
"	1804	Source 1 Phase C Current RMS	0 to 999999.999	A	0.001	F060	0
"	1806	Source 1 Neutral Current RMS	0 to 999999.999	A	0.001	F060	0
"	1808	Source 1 Phase A Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	180A	Source 1 Phase A Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	180B	Source 1 Phase B Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	180D	Source 1 Phase B Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	180E	Source 1 Phase C Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	1810	Source 1 Phase C Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	1811	Source 1 Neutral Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	1813	Source 1 Neutral Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	1814	Source 1 Ground Current RMS	0 to 999999.999	A	0.001	F060	0
"	1816	Source 1 Ground Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	1818	Source 1 Ground Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	1819	Source 1 Zero Sequence Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	181B	Source 1 Zero Sequence Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	181C	Source 1 Positive Sequence Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	181E	Source 1 Positive Sequence Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	181F	Source 1 Negative Sequence Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	1821	Source 1 Negative Sequence Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	1822	Source 1 Differential Ground Current Magnitude	0 to 999999.999	A	0.001	F060	0
"	1824	Source 1 Differential Ground Current Angle	-359.9 to 0	degrees	0.1	F002	0
"	1825	Reserved (27 items)	---	---	---	F001	0
"	1840	...Repeated for Source 2					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	1880	...Repeated for Source 3					
"	18C0	...Repeated for Source 4					
B30, C70, F35, N60, T35, T60	1900	...Repeated for Source 5					
"	1940	...Repeated for Source 6					
	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

Products	Address	Register name	Range	Units	Step	Format	Default
"	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		V		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
"	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

Products	Address	Register name	Range	Units	Step	Format	Default
"	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					
	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					
	Energy Commands (Read/Write Command)						
B30, C60, D60, F35, F60, G30, G60, L90, M60, N60, T60	1D60	Energy Clear Command	0 to 1	---	1	F126	0 (No)

Products	Address	Register name	Range	Units	Step	Format	Default
	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)						
C60, F35, F60, 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					
F35, N60, T60	1E40	...Repeated for Source 5					
"	1E50	...Repeated for Source 6					
	Source Demand Peaks (Read Only Non-Volatile) (4 or 6 Modules)						
C60, F35, F60, L90, N60, T60	1E80	Source 1 Demand Ia Maximum	0 to 999999.999	A	0.001	F060	0
"	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					
F35, N60, T60	1F00	...Repeated for Source 5					
"	1F20	...Repeated for Source 6					

Products	Address	Register name	Range	Units	Step	Format	Default
	Source Voltage THD and Harmonics (Read Only) (4 or 6 Modules) (For F60, if order code has HIZ DSP, then 0 modules)						
C70, F35, F60, G30, G60	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					
"	2016	...Repeated for Source 3					
"	2061	...Repeated for Source 4					
C70, F35	20AC	...Repeated for Source 5					
"	20F7	...Repeated for Source 6					
	Breaker Flashover (Read/Write Setting) (1 or 2 Modules)						
B30, C60, C70, D60, F60, G60, L60, L90, M60, T60	2196	Breaker Flashover 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	2197	Breaker Flashover 1 Side 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	2198	Breaker Flashover 1 Side 2 Source	0 to 6	---	1	F211	0 (None)
"	2199	Breaker Flashover 1 Status Closed A	0 to 4294967295	---	1	F300	0
"	219B	Breaker Flashover 1 Status Closed B	0 to 4294967295	---	1	F300	0
"	219D	Breaker Flashover 1 Status Closed C	0 to 4294967295	---	1	F300	0
"	219F	Breaker Flashover 1 Voltage Pickup Level	0 to 1.5	pu	0.001	F001	850
"	21A0	Breaker Flashover 1 Voltage Difference Pickup Level	0 to 100000	V	1	F060	1000
"	21A2	Breaker Flashover 1 Current Pickup Level	0 to 1.5	pu	0.001	F001	600
"	21A3	Breaker Flashover 1 Pickup Delay	0 to 65.535	s	0.001	F001	100
"	21A4	Breaker Flashover 1 Supervision Phase A	0 to 4294967295	---	1	F300	0
"	21A6	Breaker Flashover 1 Supervision Phase B	0 to 4294967295	---	1	F300	0
"	21A8	Breaker Flashover 1 Supervision Phase C	0 to 4294967295	---	1	F300	0
"	21AA	Breaker Flashover 1 Block	0 to 4294967295	---	1	F300	0
"	21AC	Breaker Flashover 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	21AD	Breaker Flashover 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	21AE	Reserved (4 items)	---	---	---	F001	0
B30, C60, D60, F60, G60, L60, L90, M60, T60	21B2	...Repeated for Breaker Flashover 2					
	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					

Products	Address	Register name	Range	Units	Step	Format	Default
	Breaker Arcing Current Actual Values (Read Only Non-Volatile) (2, 4, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	21E0	Breaker 1 Arcing Current Phase A	0 to 99999999	kA^2-cyc	1	F060	0
"	21E2	Breaker 1 Arcing Current Phase B	0 to 99999999	kA^2-cyc	1	F060	0
	Bus Actuals (Read Only) (6 Modules)						
B90	21E2	...Repeated for Bus Zone 2 - continued	0 to 99999999	kA^2-cyc	1	F060	0
	Breaker Arcing Current Actual Values (Read Only Non-Volatile) (2, 4, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	21E4	Breaker 1 Arcing Current Phase C	0 to 99999999	kA^2-cyc	1	F060	0
	Bus Actuals (Read Only) (6 Modules)						
B90	21E5	...Repeated for Bus Zone 2 - continued					
	Breaker Arcing Current Actual Values (Read Only Non-Volatile) (2, 4, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	21E6	Breaker 1 Operating Time Phase A	0 to 65535	ms	1	F001	0
"	21E7	Breaker 1 Operating Time Phase B	0 to 65535	ms	1	F001	0
	Bus Actuals (Read Only) (6 Modules)						
B90	21E8	...Repeated for Bus Zone 2 - continued					
	Breaker Arcing Current Actual Values (Read Only Non-Volatile) (2, 4, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	21E8	Breaker 1 Operating Time Phase C	0 to 65535	ms	1	F001	0
"	21E9	Breaker 1 Operating Time	0 to 65535	ms	1	F001	0
"	21EA	...Repeated for Breaker 2					
	Bus Actuals (Read Only) (6 Modules)						
B90	21EC	...Repeated for Bus Zone 3					
	Breaker Arcing Current Actual Values (Read Only Non-Volatile) (2, 4, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	21EE	...Repeated for Breaker 2					
	Bus Actuals (Read Only) (6 Modules)						
B90	21F0	...Repeated for Bus Zone 3 - continued					
	Breaker Arcing Current Actual Values (Read Only Non-Volatile) (2, 4, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	21F0	...Repeated for Breaker 2					
	Bus Actuals (Read Only) (6 Modules)						
B90	21F1	...Repeated for Bus Zone 3 - continued					
	Breaker Arcing Current Actual Values (Read Only Non-Volatile) (2, 4, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	21F2	...Repeated for Breaker 2					
	Bus Actuals (Read Only) (6 Modules)						
B90	21F3	...Repeated for Bus Zone 3 - continued					
"	21FA	...Repeated for Bus Zone 4					

Products	Address	Register name	Range	Units	Step	Format	Default
	Breaker Arcing Current Actual Values (Read Only Non-Volatile) (2, 4, or 6 Modules)						
C60, D60, F35, L90, T35, T60	21FA	...Repeated for Breaker 3					
"	21FE	...Repeated for Breaker 4					
F35, T35	2208	...Repeated for Breaker 5					
"	2212	...Repeated for Breaker 6					
	Bus Actuals (Read Only) (6 Modules)						
B90	2208	...Repeated for Bus Zone 5					
"	2212	...Repeated for Bus Zone 6					
	Breaker Arcing Current Commands (Read/Write Command) (2, 4, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	2224	Breaker 1 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
"	2225	Breaker 2 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
C60, D60, F35, L90, T35, T60	2226	Breaker 3 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
"	2227	Breaker 4 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
F35, T35	2228	Breaker 5 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
"	2229	Breaker 6 Arcing Current Clear Command	0 to 1	---	1	F126	0 (No)
	Passwords Unauthorized Access (Read/Write Command)						
All	2230	Reset Unauthorized Access	0 to 1	---	1	F126	0 (No)
	Hi-Z (High Impedance Fault Detection) Commands (Read/Write Command)						
F60	2240	Hi-Z Clear Oscillography	0 to 1	---	1	F126	0 (No)
"	2241	Hi-Z Oscillography Force Trigger	0 to 1	---	1	F126	0 (No)
"	2242	Hi-Z Oscillography Force Algorithm Capture	0 to 1	---	1	F126	0 (No)
"	2243	Hi-Z Reset Sigma Values	0 to 1	---	1	F126	0 (No)
	Hi-Z (High Impedance Fault Detection) 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 (High Impedance Fault Detection) 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 (High Impedance Fault Detection) 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

Products	Address	Register name	Range	Units	Step	Format	Default
"	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
"	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)						
T60	2330	Transformer Top Oil Temperature	0 to 300	°C	1	F002	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	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)						
T60	2335	Transformer Loss of Life	0 to 500000	Hours	1	F060	0
	Fault Location (Read Only) (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
"	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
"	2366	...Repeated for Fault 2					
"	238C	...Repeated for Fault 3					
"	23B2	...Repeated for Fault 4					
"	23D8	...Repeated for Fault 5					
	Synchrocheck Actual Values (Read Only) (4 Modules)						
C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60	2400	Synchrocheck 1 Delta Voltage	-1000000000000 to 1000000000000	V	1	F060	0
"	2402	Synchrocheck 1 Delta Frequency	0 to 655.35	Hz	0.01	F001	0
"	2403	Synchrocheck 1 Delta Phase	0 to 180 (not 0 to 359.9)	degrees	0.1	F001	0
"	2404	...Repeated for Synchrocheck 2					
"	2408	...Repeated for Synchrocheck 3					

Products	Address	Register name	Range	Units	Step	Format	Default
"	240C	...Repeated for Synchrocheck 4					
	Autoreclose Status (Read Only) (1, 2, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90	2410	Autoreclose 1 Count	0 to 65535	---	1	F001	0
F35, F60, L30	2411	Autoreclose 2 Count	0 to 65535	---	1	F001	0
F35	2412	Autoreclose 3 Count	0 to 65535	---	1	F001	0
"	2413	Autoreclose 4 Count	0 to 65535	---	1	F001	0
"	2414	Autoreclose 5 Count	0 to 65535	---	1	F001	0
"	2415	Autoreclose 6 Count	0 to 65535	---	1	F001	0
	Field Unit Raw Data Settings (Read/Write Setting)						
All except B90, L60	2460	Field Raw Data Port	0 to 7	---	1	F244	6 (H1a)
"	2461	Field Raw Data Freeze	0 to 1	---	1	F102	0 (Disabled)
	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
"	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

Products	Address	Register name	Range	Units	Step	Format	Default
"	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
	Bus Actuals (Read Only) (2 Modules)						
B30	2500	Bus Differential IA Magnitude	0 to 999999.999	A	0.001	F060	0
"	2502	Bus Differential IA Angle	-359.9 to 0	degrees	0.1	F002	0
"	2503	Bus Differential IB Magnitude	0 to 999999.999	A	0.001	F060	0
"	2505	Bus Differential IB Angle	-359.9 to 0	degrees	0.1	F002	0
"	2506	Bus Differential IC Magnitude	0 to 999999.999	A	0.001	F060	0
"	2508	Bus Differential IC Angle	-359.9 to 0	degrees	0.1	F002	0
"	2509	Bus Differential Rest IA Magnitude	0 to 999999.999	A	0.001	F060	0
"	250B	Bus Differential Rest IA Angle	-359.9 to 0	degrees	0.1	F002	0
"	250C	Bus Differential Rest IB Magnitude	0 to 999999.999	A	0.001	F060	0
"	250E	Bus Differential Rest IB Angle	-359.9 to 0	degrees	0.1	F002	0
"	250F	Bus Differential Rest IC Magnitude	0 to 999999.999	A	0.001	F060	0
"	2511	Bus Differential Rest IC Angle	-359.9 to 0	degrees	0.1	F002	0
"	2515	Bus Maximum CT Primary	0 to 50000	---	1	F060	1
"	2517	Reserved (9 items)	---	---	---	F001	0
"	2520	...Repeated for Bus 2					
	RxGOOSE DPS (Read/Write Setting) (5 Modules)						
All	2548	RxGOOSE DPS 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	2549	RxGOOSE DPS 1 Default State	0 to 4	---	1	F605	4 (Latest)
"	254A	... Repeated for DPS 2					
"	254C	... Repeated for DPS 3					

Products	Address	Register name	Range	Units	Step	Format	Default
"	254E	... Repeated for DPS 4					
"	2550	... Repeated for DPS 5					
	Phasor Measurement Unit Actual Values (Read Only) (1, 2, 4, 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
"	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					

Products	Address	Register name	Range	Units	Step	Format	Default
	Phasor Measurement Unit Integer (Read Only) (1, 2, 4, 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) (4 or 6 Modules)						
C70, F60, G30, G60, 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
"	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					

Products	Address	Register name	Range	Units	Step	Format	Default
"	28C6	...Repeated for Source 3					
"	2929	...Repeated for Source 4					
C70, T60	298C	...Repeated for Source 5					
"	29EF	...Repeated for Source 6					
	Expanded FlexStates (Read Only)						
All	2B00	FlexStates, one per register (256 items)	0 to 1	---	1	F108	0 (Off)
	Expanded Contact Input/Output States (Read Only)						
All	2D00	Contact Input States, one per register (96 items)	0 to 1	---	1	F108	0 (Off)
"	2D80	Contact Output States, one per register (64 items)	0 to 1	---	1	F108	0 (Off)
"	2E00	Virtual Output States, one per register (96 items)	0 to 1	---	1	F108	0 (Off)
	Expanded Remote Input/Output Status (Read Only)						
All	2F00	Remote Device States, one per register (32 items)	0 to 1	---	1	F155	0 (Offline)
"	2F80	RxGOOSE Boolean x 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 Commands (Read/Write Command)						
All	3005	Oscillography Force Trigger	0 to 1	---	1	F126	0 (No)
"	3011	Oscillography Clear Data	0 to 1	---	1	F126	0 (No)
	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
"	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

Products	Address	Register name	Range	Units	Step	Format	Default
"	304C	Fault Report 15 Time	0 to 4294967295	---	1	F050	0
	User Programmable Fault Report Commands (Read/Write Command)						
B30, B90, C70, G30, G60, M60, N60, T35, T60	3060	User Fault Report Clear	0 to 1	---	1	F126	0 (No)
	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
	User Programmable Fault Report (Read/Write Setting) (2 Modules)						
B30, B90, C70, G30, G60, M60, N60, T35, T60	3090	Fault Report 1 Fault Trigger	0 to 4294967295	---	1	F300	0
"	3092	Fault Report 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3093	Fault Report 1 Prefault Trigger	0 to 4294967295	---	1	F300	0
"	3095	Fault Report Analog Channel 1 (32 items)	0 to 65536	---	1	F600	0
"	30B5	Reserved (5 items)	---	---	---	F001	0
"	30BA	...Repeated for Fault Report 2					
	Modbus File Transfer (Read/Write)						
All	3100	Name of File to Read	---	---	---	F204	(none)
	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 (Read/Write Setting)						
All	3280	Administrator Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read Only)						
All	328A	Administrator Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
	Security (Read/Write)						
All	328B	Administrator Alphanumeric Password Entry	---	---	---	F202	(none)
	Security (Read/Write Setting)						
All	3295	Supervisor Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read Only)						
All	329F	Supervisor Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
	Security (Read/Write)						
All	32A0	Supervisor Alphanumeric Password Entry	---	---	---	F202	(none)
	Security (Read/Write Setting)						
All	32AA	Engineer Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read Only)						
All	32B4	Engineer Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
	Security (Read/Write)						
All	32B5	Engineer Alphanumeric Password Entry	---	---	---	F202	(none)

Products	Address	Register name	Range	Units	Step	Format	Default
	Security (Read/Write Setting)						
All	32BF	Operator Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read Only)						
All	32C9	Operator Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
	Security (Read/Write)						
All	32CA	Operator Alphanumeric Password Entry	---	---	---	F202	(none)
	Security (Read/Write Setting)						
All	32D4	Observer Alphanumeric Password Setting	---	---	---	F202	(none)
	Security (Read Only)						
All	32DE	Observer Alphanumeric Password Status	0 to 1	---	1	F102	0 (Disabled)
	Security (Read/Write)						
All	32DF	Observer Alphanumeric Password Entry	---	---	1	F202	(none)
	Security (Read Only)						
All	32E9	Reserved for password settings of future roles (63 items)	0 to 65535	---	1	F001	0
"	3328	Security Status Indicator	0 to 65535	---	1	F618	0
	Security (Read/Write Setting)						
All	3329	Session Lockout	0 to 99	---	1	F001	3
"	332A	Session Lockout Period	0 to 9999	min	1	F001	3
"	332B	Load Factory Defaults	0 to 1	---	1	F126	0 (No)
"	332C	Syslog Server IP Address	0 to 4294967295	---	1	F003	0
"	332E	Syslog Server Port Number	1 to 65535	---	1	F001	514
	Security Supervisory (Read/Write Setting)						
All	3331	Device Authentication Enable	0 to 1	---	1	F126	1 (Yes)
"	3332	Supervisor Role Enable	0 to 1	---	1	F102	0 (Disabled)
"	3333	Lock Relay	0 to 1	---	1	F102	0 (Disabled)
"	3334	Factory Service Mode Enable	0 to 1	---	1	F102	0 (Disabled)
"	3335	Failed Authentication Alarm Enable	0 to 1	---	1	F102	1 (Enabled)
"	3336	Firmware Lock Alarm	0 to 1	---	1	F102	1 (Enabled)
"	3337	Settings Lock Alarm	0 to 1	---	1	F102	1 (Enabled)
"	3338	Bypass Access	0 to 3	---	1	F628	0 (Disabled)
"	333A	Serial Inactivity Timeout	1 to 9999	min	1	F001	1
	Security Command (Read/Write Command)						
All	3350	Operator Logoff	0 to 1	---	1	F126	0 (No)
"	3351	Engineer Logoff	0 to 1	---	1	F126	0 (No)
"	3352	Administrator Logoff	0 to 1	---	1	F126	0 (No)
"	3353	Clear Security Data	0 to 1	---	1	F126	0 (No)
	Security Reserved Modbus Registers (Read/Write)						
All	3360	Address 0x3360 reserved for serial login (20 items)	0 to 9999	---	1	F001	3
"	3374	Address 0x3374 reserved for serial logout	0 to 9999	---	1	F001	3
	Security Reserved Modbus Registers (Read Only)						
All	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

Products	Address	Register name	Range	Units	Step	Format	Default
	Event Recorder Commands (Read/Write Command)						
All	3406	Event Recorder Clear Command	0 to 1	---	1	F126	0 (No)
	Neutral Current Unbalance Commands and Actual Values (Read/Write Unless Noted) (3 Modules)						
C70	3410	Neutral Current Unbalance Automatic Setting Function	0 to 2	---	1	F092	0 (Disabled)
"	3411	Neutral Current Unbalance Apply Magnitude	0 to 1	---	1	F126	0 (No)
"	3412	Neutral Current Unbalance Apply Angle	0 to 1	---	1	F126	0 (No)
"	3413	Neutral Current Unbalance Apply Magnitude Actual Value (Read Only)	0 to 0.15	---	0.0001	F003	0
"	3415	Neutral Current Unbalance Apply Angle Actual Value (Read Only)	0 to 359	degrees	1	F003	0
"	3417	...Repeated for Neutral Current Unbalance 2					
"	341E	...Repeated for Neutral Current Unbalance 3					
	Neutral Voltage Unbalance Commands and Actual Values (Read/Write Unless Noted) (3 Modules)						
C70	3430	Neutral Voltage Unbalance Automatic Setting Function	0 to 2	---	1	F092	0 (Disabled)
"	3431	59NU XA/XB Ratio Actual Value (Read Only)	0 to 9.9999	---	0.0001	F003	0
"	3433	Neutral Voltage Unbalance Auto-set XA/XB Ratio	0 to 1	---	1	F126	0 (No)
"	3434	59NU XA/XC Ratio Actual Value (Read Only)	0 to 9.9999	---	0.0001	F003	0
"	3436	Neutral Voltage Unbalance Auto-set XA/XC Ratio	0 to 1	---	1	F126	0 (No)
"	3437	...Repeated for Neutral Voltage Unbalance 2					
"	343E	...Repeated for Neutral Voltage Unbalance 3					
	Phase Current Unbalance Commands and Actual Values (Read/Write Unless Noted) (3 Modules)						
C70	3450	Phase Current Unbalance Automatic Setting Function	0 to 2	---	1	F092	0 (Disabled)
"	3451	Phase Current Unbalance Ka Actual Value (Read Only)	–0.1 to 0.1	---	0.0001	F004	0
"	3453	Phase Current Unbalance Auto-set Ka	0 to 1	---	1	F126	0 (No)
"	3454	Phase Current Unbalance Kb Actual Value (Read Only)	–0.1 to 0.1	---	0.0001	F004	0
"	3456	Phase Current Unbalance Auto-set Kb	0 to 1	---	1	F126	0 (No)
"	3457	Phase Current Unbalance Kc Actual Value (Read Only)	–0.1 to 0.1	---	0.0001	F004	0
"	3459	Phase Current Unbalance Auto-set Kc	0 to 1	---	1	F126	0 (No)
"	345A	...Repeated for Phase Current Unbalance 2					
"	3464	...Repeated for Phase Current Unbalance 3					
	Voltage Differential Commands and Actual Values (Read/Write Unless Noted) (3 Modules)						
C70	3470	Voltage Differential Automatic Setting Function	0 to 2	---	1	F092	0 (Disabled)
"	3471	Voltage Differential Ka Actual Value (Read Only)	0 to 99.9999	---	0.0001	F003	0
"	3473	Voltage Differential Auto-set Ka	0 to 1	---	1	F126	0 (No)
"	3474	Voltage Differential Kb Actual value (Read Only)	0 to 99.9999	---	0.0001	F003	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	3476	Voltage Differential Auto-set Kb	0 to 1	---	1	F126	0 (No)
"	3477	Voltage Differential Kc Actual Value (Read Only)	0 to 99.9999	---	0.0001	F003	0
"	3479	Voltage Differential Auto-set Kc	0 to 1	---	1	F126	0 (No)
"	347A	...Repeated for Voltage Differential 2					
"	3484	...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
"	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

Products	Address	Register name	Range	Units	Step	Format	Default
	RTD Input Values (Read Only) (48 Modules)						
All except B90	34F0	RTD Input 1 Value	-32768 to 32767	°C	1	F002	0
"	34F1	RTD Input 2 Value	-32768 to 32767	°C	1	F002	0
"	34F2	RTD Input 3 Value	-32768 to 32767	°C	1	F002	0
"	34F3	RTD Input 4 Value	-32768 to 32767	°C	1	F002	0
"	34F4	RTD Input 5 Value	-32768 to 32767	°C	1	F002	0
"	34F5	RTD Input 6 Value	-32768 to 32767	°C	1	F002	0
"	34F6	RTD Input 7 Value	-32768 to 32767	°C	1	F002	0
"	34F7	RTD Input 8 Value	-32768 to 32767	°C	1	F002	0
"	34F8	RTD Input 9 Value	-32768 to 32767	°C	1	F002	0
"	34F9	RTD Input 10 Value	-32768 to 32767	°C	1	F002	0
"	34FA	RTD Input 11 Value	-32768 to 32767	°C	1	F002	0
"	34FB	RTD Input 12 Value	-32768 to 32767	°C	1	F002	0
"	34FC	RTD Input 13 Value	-32768 to 32767	°C	1	F002	0
"	34FD	RTD Input 14 Value	-32768 to 32767	°C	1	F002	0
"	34FE	RTD Input 15 Value	-32768 to 32767	°C	1	F002	0
"	34FF	RTD Input 16 Value	-32768 to 32767	°C	1	F002	0
"	3500	RTD Input 17 Value	-32768 to 32767	°C	1	F002	0
"	3501	RTD Input 18 Value	-32768 to 32767	°C	1	F002	0
"	3502	RTD Input 19 Value	-32768 to 32767	°C	1	F002	0
"	3503	RTD Input 20 Value	-32768 to 32767	°C	1	F002	0
"	3504	RTD Input 21 Value	-32768 to 32767	°C	1	F002	0
"	3505	RTD Input 22 Value	-32768 to 32767	°C	1	F002	0
"	3506	RTD Input 23 Value	-32768 to 32767	°C	1	F002	0
"	3507	RTD Input 24 Value	-32768 to 32767	°C	1	F002	0
"	3508	RTD Input 25 Value	-32768 to 32767	°C	1	F002	0
"	3509	RTD Input 26 Value	-32768 to 32767	°C	1	F002	0
"	350A	RTD Input 27 Value	-32768 to 32767	°C	1	F002	0
"	350B	RTD Input 28 Value	-32768 to 32767	°C	1	F002	0
"	350C	RTD Input 29 Value	-32768 to 32767	°C	1	F002	0
"	350D	RTD Input 30 Value	-32768 to 32767	°C	1	F002	0
"	350E	RTD Input 31 Value	-32768 to 32767	°C	1	F002	0
"	350F	RTD Input 32 Value	-32768 to 32767	°C	1	F002	0
"	3510	RTD Input 33 Value	-32768 to 32767	°C	1	F002	0
"	3511	RTD Input 34 Value	-32768 to 32767	°C	1	F002	0
"	3512	RTD Input 35 Value	-32768 to 32767	°C	1	F002	0
"	3513	RTD Input 36 Value	-32768 to 32767	°C	1	F002	0
"	3514	RTD Input 37 Value	-32768 to 32767	°C	1	F002	0
"	3515	RTD Input 38 Value	-32768 to 32767	°C	1	F002	0
"	3516	RTD Input 39 Value	-32768 to 32767	°C	1	F002	0
"	3517	RTD Input 40 Value	-32768 to 32767	°C	1	F002	0
"	3518	RTD Input 41 Value	-32768 to 32767	°C	1	F002	0
"	3519	RTD Input 42 Value	-32768 to 32767	°C	1	F002	0
"	351A	RTD Input 43 Value	-32768 to 32767	°C	1	F002	0
"	351B	RTD Input 44 Value	-32768 to 32767	°C	1	F002	0
"	351C	RTD Input 45 Value	-32768 to 32767	°C	1	F002	0
"	351D	RTD Input 46 Value	-32768 to 32767	°C	1	F002	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	351E	RTD Input 47 Value	-32768 to 32767	°C	1	F002	0
"	351F	RTD Input 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 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 (96 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
"	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

Products	Address	Register name	Range	Units	Step	Format	Default
"	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)
	RADIUS Configuration (Read/Write Setting)						
All	3735	Primary RADIUS IP Address	0 to 4294967295	---	1	F003	0
"	3737	Primary Authentication Port	1 to 65535	---	1	F001	1812
"	3738	Primary Accounting Port	1 to 65535	---	1	F001	1813
"	3739	Secondary RADIUS IP Address	0 to 4294967295	---	1	F003	0
"	373B	Secondary Authentication Port	0 to 65535	---	1	F001	1812
"	373D	Secondary Accounting Port	0 to 65535	---	1	F001	1813
"	373F	RADIUS Authentication Method	---	---	1	F619	0 (EAP-TTLS)
"	3740	RADIUS Vendor ID	1 to 65535	---	1	F001	2910
"	3741	Authentication Timeout	0 to 9999	sec	1	F001	10
"	3742	Authentication Retries	0 to 9999	---	1	F001	3
"	3743	RADIUS Authentication Shared Secret	---	---	---	F202	(none)
	PTP Basic Configuration (Read/Write Setting)						
All	3750	PTP Strict Power Profile	0 to 1	---	1	F102	0 (Disabled)
"	3751	PTP Domain Number	0 to 255	---	1	F001	0
"	3752	PTP VLAN Priority	0 to 7	---	1	F001	4
"	3753	PTP VLAN ID	0 to 4095	---	1	F001	0
"	3754	PTP Basic Configuration Reserved (2 items)	0 to 1	---	1	F001	0
	PTP Port Configuration (Read/Write Setting) (3 Modules)						
All	3756	PTP Port 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3757	PTP Port 1 Path Delay Adder	0 to 60000	ns	1	F001	0
"	3758	PTP Port 1 Path Delay Asymmetry	-1000 to 1000	ns	1	F002	0
"	3759	...Repeated for PTP Port 2					
"	375C	...Repeated for PTP Port 3					
	Real Time Clock Synchronizing Actuals (Read Only)						
All	375F	RTC Sync Source	0 to 5	---	1	F624	0 (None)

Products	Address	Register name	Range	Units	Step	Format	Default
"	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
	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) (4 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
"	3783	Capacitor Control 4 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
	Frequency Out-of-Band Accumulation Commands (Read/Write)						
G30, G60	37A7	Reset Frequency Out-Of-Band Accumulators	0 to 1	---	1	F126	0 (No)
"	37A8	Preset Frequency Out-Of-Band Accumulators	0 to 1	---	1	F126	0 (No)
	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
	Field Units (Read/Write Setting) (8 Modules)						
All except B90, L60	3800	Field Unit 1 ID	0 to 1	---	1	F205	"U1"
"	3806	Field Unit 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	3807	Field Unit 1 Type	0 to 3	---	1	F243	0 (CC-05)
"	3808	Field Unit 1 Serial Number	1 to 1	---	1	F205	"0000000000"
"	380E	Field Unit 1 Port	1 to 4	---	1	F001	1
"	380F	...Repeated for Field Unit 2					
"	381E	...Repeated for Field Unit 3					
"	382D	...Repeated for Field Unit 4					
"	383C	...Repeated for Field Unit 5					
"	384B	...Repeated for Field Unit 6					

Products	Address	Register name	Range	Units	Step	Format	Default
"	385A	...Repeated for Field Unit 7					
"	3869	...Repeated for Field Unit 8					
	Field Unit Process Card Ports (Read/Write Setting)						
All except B90, L60	3878	Field Unit 1 Process Card Port	0 to 7	---	1	F244	6 (H1a)
"	3879	Field Unit 2 Process Card Port	0 to 7	---	1	F244	4 (H2a)
"	387A	Field Unit3 Process Card Port	0 to 7	---	1	F244	2 (H3a)
"	387B	Field Unit 4 Process Card Port	0 to 7	---	1	F244	0 (H4a)
"	387C	Field Unit 5 Process Card Port	0 to 7	---	1	F244	7 (H1b)
"	387D	Field Unit 6 Process Card Port	0 to 7	---	1	F244	5 (H2b)
"	387E	Field Unit 7 Process Card Port	0 to 7	---	1	F244	3 (H3b)
"	387F	Field Unit 8 Process Card Port	0 to 7	---	1	F244	1 (H4b)
	Field Unit CT VT Settings (Read/Write Setting) (6 Modules)						
All except B90, L60	3890	Remote Phase CT x Origin 1	0 to 16	---	1	F247	0 (None)
"	3891	Remote Phase CT x Origin 2	0 to 16	---	1	F247	0 (None)
"	3892	Remote Ground CT x Origin 1	0 to 16	---	1	F248	0 (None))
"	3893	Remote Ground CT x Origin 2	0 to 16	---	1	F248	0 (None)
"	3894	AC Bank Redundancy Type	0 to 2	---	1	F261	1 (Dependability Biased)
"	3895	Remote Phase CT 1 Primary	1 to 65000	---	1	F001	1
"	3896	Remote Phase CT 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	3897	Remote Ground CT 1 Primary	1 to 65000	---	1	F001	1
"	3898	Remote Ground CT 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	3899	Remote Phase VT 1 Connection	0 to 1	---	1	F100	0 (Wye)
"	389A	Remote Phase VT 1 Secondary	25 to 240	---	0.1	F001	664
"	389B	Remote Phase VT 1 Ratio	1 to 24000	---	1	F060	1
"	389D	Remote Auxiliary VT 1 Connection	0 to 6	---	1	F166	1 (Vag)
"	389E	Remote Auxiliary VT 1 Secondary	25 to 240	---	0.1	F001	664
"	389F	Remote Auxiliary VT 1 Ratio	1 to 24000	---	1	F060	1
"	38A1	...Repeated for Field Unit 2					
"	38B2	...Repeated for Field Unit 3					
"	38C3	...Repeated for Field Unit 4					
"	38D4	...Repeated for Field Unit 5					
"	38E5	...Repeated for Field Unit 6					
	Field Unit Contact Inputs (Read/Write Setting) (40 Modules)						
All except B90, L60	3900	Field Contact Input 1 ID	---	---	---	F205	"FCI 1"
"	3906	Field Contact Input 1 Origin	0 to 8	---	1	F256	0 (None)
"	3907	Field Contact Input 1 Input	1 to 18	---	1	F001	1
"	3908	Field Contact Input 1 Failsafe Value	0 to 1	---	1	F108	0 (Off)
"	3909	Field Contact Input 1 Debounce Time	0 to 16	ms	0.5	F001	60
"	390A	Field Contact Input 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	390B	...Repeated for Field Contact Input 2					
"	3916	...Repeated for Field Contact Input 3					
"	3921	...Repeated for Field Contact Input 4					
"	392C	...Repeated for Field Contact Input 5					

Products	Address	Register name	Range	Units	Step	Format	Default
"	3937	...Repeated for Field Contact Input 6					
"	3942	...Repeated for Field Contact Input 7					
"	394D	...Repeated for Field Contact Input 8					
"	3958	...Repeated for Field Contact Input 9					
"	3963	...Repeated for Field Contact Input 10					
"	396E	...Repeated for Field Contact Input 11					
"	3979	...Repeated for Field Contact Input 12					
"	3984	...Repeated for Field Contact Input 13					
"	398F	...Repeated for Field Contact Input 14					
"	399A	...Repeated for Field Contact Input 15					
"	39A5	...Repeated for Field Contact Input 16					
"	39B0	...Repeated for Field Contact Input 17					
"	39BB	...Repeated for Field Contact Input 18					
"	39C6	...Repeated for Field Contact Input 19					
"	39D1	...Repeated for Field Contact Input 20					
"	39DC	...Repeated for Field Contact Input 21					
"	39E7	...Repeated for Field Contact Input 22					
"	39F2	...Repeated for Field Contact Input 23					
"	39FD	...Repeated for Field Contact Input 24					
"	3A08	...Repeated for Field Contact Input 25					
"	3A13	...Repeated for Field Contact Input 26					
"	3A1E	...Repeated for Field Contact Input 27					
"	3A29	...Repeated for Field Contact Input 28					
"	3A34	...Repeated for Field Contact Input 29					
"	3A3F	...Repeated for Field Contact Input 30					
"	3A4A	...Repeated for Field Contact Input 31					
"	3A55	...Repeated for Field Contact Input 32					
"	3A60	...Repeated for Field Contact Input 33					
"	3A6B	...Repeated for Field Contact Input 34					
"	3A76	...Repeated for Field Contact Input 35					
"	3A81	...Repeated for Field Contact Input 36					
"	3A8C	...Repeated for Field Contact Input 37					
"	3A97	...Repeated for Field Contact Input 38					
"	3AA2	...Repeated for Field Contact Input 39					
"	3AAD	...Repeated for Field Contact Input 40					
	Field Unit Shared Inputs (Read/Write Setting) (16 Modules)						
All except B90, L60	3B00	Field Shared Input 1 ID	0 to 65535	---	1	F205	"SI 1"
"	3B06	Field Shared Input 1 Unit Origin 1	0 to 8	---	1	F256	0 (None)
"	3B07	Field Shared Input 1 Channel Origin 1	1 to 15	---	1	F001	1
"	3B08	Field Shared Input 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	3B09	...Repeated for Field Shared Input 2					
"	3B12	...Repeated for Field Shared Input 3					
"	3B1B	...Repeated for Field Shared Input 4					
"	3B24	...Repeated for Field Shared Input 5					
"	3B2D	...Repeated for Field Shared Input 6					
"	3B36	...Repeated for Field Shared Input 7					

Products	Address	Register name	Range	Units	Step	Format	Default
"	3B3F	...Repeated for Field Shared Input 8					
"	3B48	...Repeated for Field Shared Input 9					
"	3B51	...Repeated for Field Shared Input 10					
"	3B5A	...Repeated for Field Shared Input 11					
"	3B63	...Repeated for Field Shared Input 12					
"	3B6C	...Repeated for Field Shared Input 13					
"	3B75	...Repeated for Field Shared Input 14					
"	3B7E	...Repeated for Field Shared Input 15					
"	3B87	...Repeated for Field Shared Input 16					
	Field Unit Contact Outputs (Read/Write Setting) (8 Modules)						
All except B90, L60	3B90	Field Contact Output 1 ID (6 items)	---	---	---	F205	"FCO U / OUT"
"	3BB4	Field Output 1 Operate (6 items)	0 to 4294967295	---	1	F300	0
"	3BC0	Field Output 1 Seal In (6 items)	0 to 4294967295	---	1	F300	0
"	3BCC	Field Output 1 Events (6 items)	0 to 1	---	1	F102	1 (Enabled)
"	3BD2	...Repeated for Field Contact Output 2					
"	3C14	...Repeated for Field Contact Output 3					
"	3C56	...Repeated for Field Contact Output 4					
"	3C98	...Repeated for Field Contact Output 5					
"	3CDA	...Repeated for Field Contact Output 6					
"	3D1C	...Repeated for Field Contact Output 7					
"	3D5E	...Repeated for Field Contact Output 8					
	Field Unit Latching Outputs (Read/Write Setting) (8 Modules)						
All except B90, L60	3DC7	Field Latching Output 1 ID	0 to 1	---	1	F205	"FLO Ux /LO"
"	3DCD	Field Latching Output 1 Open	0 to 4294967295	---	1	F300	0
"	3DCF	Field Latching Output 1 Close	0 to 4294967295	---	1	F300	0
"	3DD1	Field Latching Output 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	3DD2	Reserved (2 items)	0 to 1	---	1	F001	0
"	3DD4	...Repeated for Field Latching Output 2					
"	3DE1	...Repeated for Field Latching Output 3					
"	3DEE	...Repeated for Field Latching Output 4					
"	3DFB	...Repeated for Field Latching Output 5					
"	3E08	...Repeated for Field Latching Output 6					
"	3E15	...Repeated for Field Latching Output 7					
"	3E22	...Repeated for Field Latching Output 8					
	Field Unit Shared Outputs (Read/Write Setting) (16 Modules)						
All except B90, L60	3E30	Field Shared Output 1 ID	0 to 65535	---	1	F205	"SO 1"
"	3E36	Field Shared Output 1 Operate	0 to 4294967295	---	1	F300	0
"	3E38	Field Shared Output 1 Unit Dest 1	0 to 8	---	1	F256	0 (None)
"	3E39	Field Shared Output 1 Channel Dest 1	1 to 15	---	1	F001	1
"	3E3A	Field Shared Output 1 Unit Dest 2	0 to 8	---	1	F256	0 (None)
"	3E3B	Field Shared Output 1 Channel Dest 2	1 to 15	---	1	F001	1
"	3E3C	Field Shared Output 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	3E3D	...Repeated for Field Shared Output 2					
"	3E4A	...Repeated for Field Shared Output 3					
"	3E57	...Repeated for Field Shared Output 4					

Products	Address	Register name	Range	Units	Step	Format	Default
"	3E64	...Repeated for Field Shared Output 5					
"	3E71	...Repeated for Field Shared Output 6					
"	3E7E	...Repeated for Field Shared Output 7					
"	3E8B	...Repeated for Field Shared Output 8					
"	3E98	...Repeated for Field Shared Output 9					
"	3EA5	...Repeated for Field Shared Output 10					
"	3EB2	...Repeated for Field Shared Output 11					
"	3EBF	...Repeated for Field Shared Output 12					
"	3ECC	...Repeated for Field Shared Output 13					
"	3ED9	...Repeated for Field Shared Output 14					
"	3EE6	...Repeated for Field Shared Output 15					
"	3EF3	...Repeated for Field Shared Output 16					
	Field Unit RTDs (Read/Write Setting) (8 Modules)						
All except B90, L60	3F00	Field Unit RTD 1Name	0 to 1	---	1	F205	"RTD 1"
"	3F06	Field Unit RTD 1 Origin	0 to 24	---	1	F253	0 (None)
"	3F07	Field Unit RTD 1 Type	0 to 2	---	1	F259	0 (100 Ohm Nickel)
"	3F08	...Repeated for Field Unit RTD 2					
"	3F10	...Repeated for Field Unit RTD 3					
"	3F18	...Repeated for Field Unit RTD 4					
"	3F20	...Repeated for Field Unit RTD 5					
"	3F28	...Repeated for Field Unit RTD 6					
"	3F30	...Repeated for Field Unit RTD 7					
"	3F38	...Repeated for Field Unit RTD 8					
	Field Unit Transducers (Read/Write Setting) (8 Modules)						
All except B90, L60	3F40	Field Unit Transducer 1 Name	0 to 1	---	1	F205	"TRD 1"
"	3F46	Field Unit Transducer 1 Origin	0 to 24	---	1	F253	0 (None)
"	3F47	Field Unit Transducer 1 Range	0 to 9	---	1	F246	6 (0...20mA)
"	3F48	Field Unit Transducer 1 Min Value	-9999.999 to 9999.999	---	0.001	F004	0
"	3F4A	Field Unit Transducer 1 Max Value	-9999.999 to 9999.999	---	0.001	F004	100000
"	3F4C	Field Unit Transducer 1 Units	---	---	---	F206	(none)
"	3F4F	...Repeated for Field Unit Transducer 2					
"	3F5E	...Repeated for Field Unit Transducer 3					
"	3F6D	...Repeated for Field Unit Transducer 4					
"	3F7C	...Repeated for Field Unit Transducer 5					
"	3F8B	...Repeated for Field Unit Transducer 6					
"	3F9A	...Repeated for Field Unit Transducer 7					
"	3FA9	...Repeated for Field Unit Transducer 8					
	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					

Products	Address	Register name	Range	Units	Step	Format	Default
"	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					
	Passwords (Read/Write Command)						
All	4000	Command Password Setting	0 to 4294967295	---	1	F202	0
	Passwords (Read/Write Setting)						
All	400A	Setting Password Setting	0 to 4294967295	---	1	F202	0
	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 Only)						
All	4028	Command Password Status	0 to 1	---	1	F102	0 (Disabled)
"	4029	Setting Password Status	0 to 1	---	1	F102	0 (Disabled)
	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
	User Display Invoke (Read/Write Setting)						
All	4040	Invoke and Scroll Through User Display Menu Operand	0 to 4294967295	---	1	F300	0
	LED Test (Read/Write Setting)						
All	4048	LED Test Function	0 to 1	---	1	F102	0 (Disabled)
"	4049	LED Test Control	0 to 4294967295	---	1	F300	0
	Preferences (Read/Write Setting)						
All	404F	Language	0 to 5	---	1	F531	0 (English)
"	4050	Flash Message Time	0.5 to 10	s	0.1	F001	10
"	4051	Default Message Timeout	10 to 900	s	1	F001	300
"	4052	Default Message Intensity	0 to 3	---	1	F101	0 (25%)
"	4053	Screen Saver Feature	0 to 1	---	1	F102	0 (Disabled)
"	4054	Screen Saver Wait Time	1 to 65535	min	1	F001	30
"	4055	Current Cutoff Level	0.002 to 0.02	pu	0.001	F001	20
"	4056	Voltage Cutoff Level	0.1 to 1	V	0.1	F001	10
	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)

Products	Address	Register name	Range	Units	Step	Format	Default
"	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)
	87L Channel Status (Read/Write Command)						
L30	4065	Channel Status Clear	0 to 1	---	1	F126	0 (No)
	87L Power System (Read/Write Setting)						
L30	4068	Block GPS Time Reference	0 to 4294967295	---	1	F300	0
"	406A	Channel Asymmetry Compensation	0 to 4294967295	---	1	F300	0
"	406C	Charging Current Compensation	0 to 1	---	1	F102	0 (Disabled)
"	406D	Local Relay ID	0 to 255	---	1	F001	0
"	406E	Maximum Channel Asymmetry	0 to 10	ms	0.1	F001	15
"	406F	Number of Channels	1 to 2	---	1	F001	1
"	4070	Number of Terminals	2 to 3	---	1	F001	2
"	4071	Positive Sequence Reactance	0.1 to 65.535	kohms	0.001	F001	100
"	4072	Round Trip Time	0 to 10	ms	0.1	F001	15
"	4073	Terminal 1 ID	0 to 255	---	1	F001	0
"	4074	Terminal 2 ID	0 to 255	---	1	F001	0
"	4075	Zero-Sequence Current Removal	0 to 1	---	1	F102	0 (Disabled)
"	4076	Zero Sequence Reactance	0.1 to 65.535	kohms	0.001	F001	100
	Remote RTD Communications (Read/Write Setting)						
G60, M60, T60	407A	RRTD Slave Address	1 to 254	---	1	F001	254
"	407B	RRTD Baud Rate	0 to 4	---	1	F602	4 (19200)
	Communications (Read/Write Setting)						
All	407D	COM2 Selection	0 to 3	---	1	F601	0 (RS485)
"	407E	COM1 Minimum Response Time	0 to 1000	ms	10	F001	0
"	407F	COM2 Minimum Response Time	0 to 1000	ms	10	F001	0
"	4080	Modbus Slave Address	1 to 254	---	1	F001	254
"	4083	RS485 Com1 Baud Rate	0 to 11	---	1	F112	8 (115200)
"	4084	RS485 Com1 Parity	0 to 2	---	1	F113	0 (None)
"	4085	RS485 Com2 Baud Rate	0 to 11	---	1	F112	5 (19200)
"	4086	RS485 Com2 Parity	0 to 2	---	1	F113	2 (Even)
"	4087	Port 1 IP Address	0 to 4294967295	---	1	F003	2130706433
"	4089	Port 1 IP Subnet Mask	0 to 4294967295	---	1	F003	4278190080
"	408B	Port 1 Gateway IP Address	0 to 4294967295	---	1	F003	56554497
"	408D	Network Address NSAP	---	---	---	F074	0
"	4097	Port 1 Link Loss Alert	0 to 1	---	1	F102	0 (Disabled)
"	4098	Port 2 Link Loss Alert	0 to 1	---	1	F102	0 (Disabled)
"	4099	Port 3 Link Loss Alert	0 to 1	---	1	F102	0 (Disabled)
"	409A	DNP Channel 1 Port	0 to 5	---	1	F177	0 (None)
"	409B	DNP Channel 2 Port	0 to 5	---	1	F177	0 (None)
"	409C	DNP Address	0 to 65519	---	1	F001	1
"	409E	DNP Client Addresses (2 items)	0 to 4294967295	---	1	F003	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	40A3	TCP Port Number for the Modbus protocol	0 to 65535	---	1	F001	502
"	40A4	TCP/UDP Port Number for the DNP Protocol	0 to 65535	---	1	F001	20000
"	40A5	TCP Port Number for the HTTP (Web Server) Protocol	0 to 65535	---	1	F001	80
"	40A6	Main UDP Port Number for the TFTP Protocol	0 to 65535	---	1	F001	69
"	40A7	Data Transfer UDP Port Numbers for the TFTP Protocol (zero means "automatic") (2 items)	0 to 65535	---	1	F001	0
"	40A9	DNP Unsolicited Responses Function	0 to 1	---	1	F102	0 (Disabled)
"	40AA	DNP Unsolicited Responses Timeout	0 to 60	s	1	F001	5
"	40AB	DNP Unsolicited Responses Maximum Retries	1 to 255	---	1	F001	10
"	40AC	DNP Unsolicited Responses Destination Address	0 to 65519	---	1	F001	1
"	40AD	Ethernet Operation Mode	0 to 1	---	1	F192	1 (Full-Duplex)
"	40AE	DNP Current Scale Factor	0 to 8	---	1	F194	2 (1)
"	40AF	DNP Voltage Scale Factor	0 to 8	---	1	F194	2 (1)
"	40B0	DNP Power Scale Factor	0 to 8	---	1	F194	2 (1)
"	40B1	DNP Energy Scale Factor	0 to 8	---	1	F194	2 (1)
"	40B2	DNP Power Scale Factor	0 to 8	---	1	F194	2 (1)
"	40B3	DNP Other Scale Factor	0 to 8	---	1	F194	2 (1)
"	40B4	DNP Current Default Deadband	0 to 100000000	---	1	F003	30000
"	40B6	DNP Voltage Default Deadband	0 to 100000000	---	1	F003	30000
"	40B8	DNP Power Default Deadband	0 to 100000000	---	1	F003	30000
"	40BA	DNP Energy Default Deadband	0 to 100000000	---	1	F003	30000
"	40BC	DNP Power Factor Default Deadband	0 to 100000000	--	1	F003	30000
"	40BE	DNP Other Default Deadband	0 to 100000000	---	1	F003	30000
"	40C0	DNP IIN Time Synchronization Bit Period	1 to 10080	min	1	F001	1440
"	40C1	DNP Message Fragment Size	30 to 2048	---	1	F001	240
"	40C2	DNP Client Address 3	0 to 4294967295	---	1	F003	0
"	40C4	DNP Client Address 4	0 to 4294967295	---	1	F003	0
"	40C6	DNP Client Address 5	0 to 4294967295	---	1	F003	0
"	40C8	DNP Number of Paired Binary Output Control Points	0 to 32	---	1	F001	0
"	40C9	DNP TCP Connection Timeout	10 to 7200	s	1	F001	120
"	40CA	DNP Communications Reserved (22 items)	0 to 1	---	1	F001	0
"	40E0	TCP Port Number for the IEC 60870-5-104 Protocol	0 to 65535	---	1	F001	2404
"	40E2	IEC 60870-5-104 Protocol Common Address of ASDU	0 to 65535	---	1	F001	0
"	40E3	IEC 60870-5-104 Protocol Cyclic Data Transmission Period	1 to 65535	s	1	F001	60
"	40E4	IEC 60870-5-104 Current Default Threshold	0 to 100000000	---	1	F003	30000
"	40E6	IEC 60870-5-104 Voltage Default Threshold	0 to 100000000	---	1	F003	30000
"	40E8	IEC 60870-5-104 Power Default Threshold	0 to 100000000	---	1	F003	30000
"	40EA	IEC 60870-5-104 Energy Default Threshold	0 to 100000000	---	1	F003	30000
"	40EC	IEC 60870-5-104 Power Factor Default Threshold	0 to1	---	0.01	F001	100
"	40EE	IEC 60870-5-104 Other Default Threshold	0 to 100000000	---	1	F003	30000

Products	Address	Register name	Range	Units	Step	Format	Default
"	40F0	IEC 60870-5-104 Client Address (5 items)	0 to 4294967295	---	1	F003	0
"	4104	IEC 60870-5-104 Redundancy Port Enabled/Disabled	0 to 1	---	1	F126	0 (No)
"	4105	Port 2 IP Address	0 to 4294967295	---	1	F003	2130706433
"	4107	Port 2 IP Subnet Mask	0 to 4294967295	---	1	F003	4278190080
"	410B	Port 2 Ethernet Operation Mode	0 to 1	---	1	F192	1 (Full-Duplex)
"	410C	Port 2 Redundancy Enabled	0 to 2	---	1	F627	0 (None)
"	410D	Port 3 IP Address	0 to 4294967295	---	1	F003	2130706433
"	410F	Port 3 IP Subnet Mask	0 to 4294967295	---	1	F003	4278190080
"	4113	Port 3 Ethernet Operation Mode	0 to 1	---	1	F192	1 (Full-Duplex)
"	4114	Port 1 GOOSE Enabled	0 to 1	---	1	F102	1 (Enabled)
"	4115	Port 2 GOOSE Enabled	0 to 1	---	1	F102	1 (Enabled)
"	4116	Port 3 GOOSE Enabled	0 to 1	---	1	F102	1 (Enabled)
"	4117	Default IPv4 Route	0 to 4294967295	---	1	F003	2130706433
"	4119	Port 2 PRP Mcst Addr	---	---	---	F072	0
"	411C	IEC Communications Reserved (33 items)	0 to 1	---	1	F001	0
"	4140	DNP Object 1 Default Variation	1 to 2	---	1	F001	2
"	4141	DNP Object 2 Default Variation	1 to 3	---	1	F001	2
"	4142	DNP Object 20 Default Variation	0 to 3	---	1	F523	0 (1)
"	4143	DNP Object 21 Default Variation	0 to 3	---	1	F524	0 (1)
"	4144	DNP Object 22 Default Variation	0 to 3	---	1	F523	0 (1)
"	4145	DNP Object 23 Default Variation	0 to 3	---	1	F523	0 (1)
"	4146	DNP Object 30 Default Variation	1 to 5	---	1	F001	1
"	4147	DNP Object 32 Default Variation	0 to 5	---	1	F525	0 (1)
"	4148	SCADA Protocol	0 to 2	---	1	F629	0 (DNP 3.0)
"	4149	RS232 Baud Rate	0 to 1	---	1	F635	1 (115200)
	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
	Simple Network Time Protocol (Read/Write Setting)						
All	4168	Simple Network Time Protocol (SNTP) Function	0 to 1	---	1	F102	0 (Disabled)
"	4169	Simple Network Time Protocol (SNTP) Server IP Address	0 to 4294967295	---	1	F003	0
"	416B	Simple Network Time Protocol (SNTP) UDP Port Number	1 to 65535	---	1	F001	123
	Data Logger Commands (Read/Write Command)						
All except B30, B90, D30	4170	Data Logger Clear	0 to 1	---	1	F126	0 (No)
	Data Logger (Read/Write Setting)						
All except B30, B90, D30	4181	Data Logger Channel Settings (16 items)	---	---	---	F600	0
"	4191	Data Logger Mode	0 to 1	---	1	F260	0 (Continuous)

Products	Address	Register name	Range	Units	Step	Format	Default
"	4192	Data Logger Trigger	0 to 4294967295	---	1	F300	0
"	4194	Data Logger Rate	15 to 3600000	ms	1	F003	60000
	Clock (Read/Write Setting)						
All	419F	Synchronizing Source	0 to 3	---	1	F623	0 (None)
	Clock (Read/Write Command)						
All	41A0	Real Time Clock Set Time	0 to 235959	---	1	F050	0
	Clock (Read/Write Setting)						
All	41A2	SR Date Format	0 to 4294967295	---	1	F051	0
"	41A4	SR Time Format	0 to 4294967295	---	1	F052	0
"	41A6	IRIG-B Signal Type	0 to 2	---	1	F114	0 (None)
"	41A7	Clock Events Enable / Disable	0 to 1	---	1	F102	0 (Disabled)
"	41A8	Time Zone Offset from UTC	–24 to 24	hours	0.5	F002	0
"	41A9	Daylight Savings Time (DST) Function	0 to 1	---	1	F102	0 (Disabled)
"	41AA	Daylight Savings Time (DST) Start Month	0 to 11	---	1	F237	0 (January)
"	41AB	Daylight Savings Time (DST) Start Day	0 to 6	---	1	F238	0 (Sunday)
"	41AC	Daylight Savings Time (DST) Start Day Instance	0 to 4	---	1	F239	0 (First)
"	41AD	Daylight Savings Time (DST) Start Hour	0 to 23	---	1	F001	2
"	41AE	Daylight Savings Time (DST) Stop Month	0 to 11	---	1	F237	0 (January)
"	41AF	Daylight Savings Time (DST) Stop Day	0 to 6	---	1	F238	0 (Sunday)
"	41B0	Daylight Savings Time (DST) Stop Day Instance	0 to 4	---	1	F239	0 (First)
"	41B1	Daylight Savings Time (DST) Stop Hour	0 to 23	---	1	F001	2
	Fault Report Commands (Read/Write Command)						
C60, D30, D60, F35, F60, L30, L60, L90	41B2	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	41C0	Oscillography Number of Records	3 to 64	---	1	F001	5
B30, B90, C30, C70, L30, L60, L90, N90	41C0	Oscillography Number of Records	3 to 64	---	1	F001	15
All	41C1	Oscillography Trigger Mode	0 to 1	---	1	F118	0 (Auto. Overwrite)
"	41C2	Oscillography Trigger Position	0 to 100	%	1	F001	50
"	41C3	Oscillography Trigger Source	0 to 4294967295	---	1	F300	0
"	41C5	Oscillography AC Input Waveforms	0 to 4	---	1	F183	2 (16 samples/ cycle)
"	41D0	Oscillography Analog Channel x (16 items)	0 to 65535	---	1	F600	0
"	4200	Oscillography Digital Channel x (63 items)	0 to 4294967295	---	1	F300	0
	Trip and Alarm LEDs (Read/Write Setting)						
All	42B0	Trip LED Input FlexLogic Operand	0 to 4294967295	---	1	F300	0
"	42B2	Alarm LED Input FlexLogic Operand	0 to 4294967295	---	1	F300	0
	User Programmable LEDs (Read/Write Setting) (48 Modules)						
All	42C0	FlexLogic Operand to Activate LED	0 to 4294967295	---	1	F300	0
"	42C2	User LED type (latched or self-resetting)	0 to 1	---	1	F127	1 (Self-Reset)
"	42C3	...Repeated for User-Programmable LED 2					

Products	Address	Register name	Range	Units	Step	Format	Default
"	42C6	...Repeated for User-Programmable LED 3					
"	42C9	...Repeated for User-Programmable LED 4					
"	42CC	...Repeated for User-Programmable LED 5					
"	42CF	...Repeated for User-Programmable LED 6					
"	42D2	...Repeated for User-Programmable LED 7					
"	42D5	...Repeated for User-Programmable LED 8					
"	42D8	...Repeated for User-Programmable LED 9					
"	42DB	...Repeated for User-Programmable LED 10					
"	42DE	...Repeated for User-Programmable LED 11					
"	42E1	...Repeated for User-Programmable LED 12					
"	42E4	...Repeated for User-Programmable LED 13					
"	42E7	...Repeated for User-Programmable LED 14					
"	42EA	...Repeated for User-Programmable LED 15					
"	42ED	...Repeated for User-Programmable LED 16					
"	42F0	...Repeated for User-Programmable LED 17					
"	42F3	...Repeated for User-Programmable LED 18					
"	42F6	...Repeated for User-Programmable LED 19					
"	42F9	...Repeated for User-Programmable LED 20					
"	42FC	...Repeated for User-Programmable LED 21					
"	42FF	...Repeated for User-Programmable LED 22					
"	4302	...Repeated for User-Programmable LED 23					
"	4305	...Repeated for User-Programmable LED 24					
"	4308	...Repeated for User-Programmable LED 25					
"	430B	...Repeated for User-Programmable LED 26					
"	430E	...Repeated for User-Programmable LED 27					
"	4311	...Repeated for User-Programmable LED 28					
"	4314	...Repeated for User-Programmable LED 29					
"	4317	...Repeated for User-Programmable LED 30					
"	431A	...Repeated for User-Programmable LED 31					
"	431D	...Repeated for User-Programmable LED 32					
"	4320	...Repeated for User-Programmable LED 33					
"	4323	...Repeated for User-Programmable LED 34					
"	4326	...Repeated for User-Programmable LED 35					
"	4329	...Repeated for User-Programmable LED 36					
"	432C	...Repeated for User-Programmable LED 37					
"	432F	...Repeated for User-Programmable LED 38					
"	4332	...Repeated for User-Programmable LED 39					
"	4335	...Repeated for User-Programmable LED 40					
"	4338	...Repeated for User-Programmable LED 41					
"	433B	...Repeated for User-Programmable LED 42					
"	433E	...Repeated for User-Programmable LED 43					
"	4341	...Repeated for User-Programmable LED 44					
"	4344	...Repeated for User-Programmable LED 45					
"	4347	...Repeated for User-Programmable LED 46					
"	434A	...Repeated for User-Programmable LED 47					
"	434D	...Repeated for User-Programmable LED 48					

Products	Address	Register name	Range	Units	Step	Format	Default
	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
	IPv4 Route Table (Read/Write Setting) (6 Modules)						
All	4370	IPv4 Network Route 1 Destination	0 to 4294967295	---	1	F003	2130706433
"	4372	IPv4 Network Route 1 Netmask	0 to 4294967295	---	1	F003	4278190080
"	4374	IPv4 Network Route 1 Gateway	0 to 4294967295	---	1	F003	2130706433
"	4376	...Repeated for Route 2					
"	437C	...Repeated for Route 3					
"	4382	...Repeated for Route 4					
"	4388	...Repeated for Route 5					
"	438E	...Repeated for Route 6					
	Installation (Read/Write Setting)						
All	43E0	Relay Programmed State	0 to 1	---	1	F133	0 (Not Programmed)
"	43E1	Relay Name	---	---	---	F202	"Relay-1"
	User Programmable Self Tests (Read/Write Setting)						
All	4441	User Programmable Detect Ring Break Function	0 to 1	---	1	F102	1 (Enabled)
"	4442	User Programmable Direct Device Off Function	0 to 1	---	1	F102	1 (Enabled)
"	4443	User Programmable RxGOOSE Off Function	0 to 1	---	1	F102	1 (Enabled)
"	4444	User Programmable First Ethernet Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	4445	User Programmable Secondary Ethernet Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	4446	User Programmable Battery Fail Function	0 to 1	---	1	F102	1 (Enabled)
"	4447	User Programmable SNTP Fail Function	0 to 1	---	1	F102	1 (Enabled)
"	4448	User Programmable IRIG-B Fail Function	0 to 1	---	1	F102	1 (Enabled)
"	444A	Process Bus Failure Operand	0 to 4294967295	---	1	F300	0
"	444C	PTP Fail Function	0 to 1	---	1	F102	1 (Enabled)
"	444D	User Programmable Third Ethernet Fail Function	0 to 1	---	1	F102	0 (Disabled)
"	444E	User Programmable SFP Fail Function	0 to 1	---	1	F102	0 (Disabled)
	CT Settings (Read/Write Setting) (6 Modules)						
All except B90, C30	4480	Phase CT 1 Primary	1 to 65000	A	1	F001	1
"	4481	Phase CT 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	4482	Ground CT 1 Primary	1 to 65000	A	1	F001	1
"	4483	Ground CT 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	4484	...Repeated for CT Bank 2					
"	4488	...Repeated for CT Bank 3					
"	448C	...Repeated for CT Bank 4					
"	4490	...Repeated for CT Bank 5					
"	4494	...Repeated for CT Bank 6					

Products	Address	Register name	Range	Units	Step	Format	Default
	VT Settings (Read/Write Setting) (6 Modules)						
All except B90, C30	4500	Phase VT 1 Connection	0 to 1	---	1	F100	0 (Wye)
"	4501	Phase VT 1 Secondary	25 to 240	V	0.1	F001	664
"	4502	Phase VT 1 Ratio	1 to 24000	:1	1	F060	1
"	4504	Auxiliary VT 1 Connection	0 to 6	---	1	F166	1 (Vag)
"	4505	Auxiliary VT 1 Secondary	25 to 240	V	0.1	F001	664
"	4506	Auxiliary VT 1 Ratio	1 to 24000	:1	1	F060	1
"	4508	...Repeated for VT Bank 2					
"	4510	...Repeated for VT Bank 3					
"	4518	...Repeated for VT Bank 4					
"	4520	...Repeated for VT Bank 5					
"	4528	...Repeated for VT Bank 6					
	Source Settings (Read/Write Setting) (2, 4, or 6 Modules)						
All except B90, C30	4580	Source 1 Name	0 to 1	---	1	F206	"SRC 1"
"	4583	Source 1 Phase CT	0 to 63	---	1	F400	0
"	4584	Source 1 Ground CT	0 to 63	---	1	F400	0
"	4585	Source 1 Phase VT	0 to 63	---	1	F400	0
"	4586	Source 1 Auxiliary VT	0 to 63	---	1	F400	0
"	4587	...Repeated for Source 2					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	458E	...Repeated for Source 3					
"	4595	...Repeated for Source 4					
B30, C70, F35, N60, T35, T60	459C	...Repeated for Source 5					
"	45A3	...Repeated for Source 6					
	Power System (Read/Write Setting)						
All except B90, C30	4600	Nominal Frequency	25 to 60	Hz	1	F001	60
"	4601	Phase Rotation	0 to 1	---	1	F106	0 (ABC)
"	4602	Frequency and Phase Reference	0 to 5	---	1	F167	0 (SRC 1)
"	4603	Frequency Tracking Function	0 to 1	---	1	F102	1 (Enabled)
	Change Phase Rotation (Read/Write Setting)						
G30, G60	4604	Reverse Phase Rotation	0 to 4294967295	---	1	F300	0
	87L Power System In-Zone Transformer (Read/Write Setting)						
L30, L90	4606	In-Zone Transformer Connection	0 to 12	---	1	F560	0 (None)
"	4607	87L In-Zone Transformer Location	0 to 2	---	1	F562	0 (Local-Tap)
	Power System (Read/Write Setting)						
L90	4610	Number of Terminals	2 to 3	---	1	F001	2
"	4611	Number of Channels	1 to 2	---	1	F001	1
"	4612	Charging Current Compensation	0 to 1	---	1	F102	0 (Disabled)
"	4613	Positive Sequence Reactance	0.1 to 65.535	kohms	0.001	F001	100
"	4614	Zero Sequence Reactance	0.1 to 65.535	kohms	0.001	F001	100
"	4615	Zero Sequence Current Removal	0 to 1	---	1	F102	0 (Disabled)
"	4616	Local Relay ID	0 to 255	---	1	F001	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	4617	Terminal 1 ID	0 to 255	---	1	F001	0
"	4618	Terminal 2 ID	0 to 255	---	1	F001	0
"	4619	Channel Asymmetry Compensation	0 to 4294967295	---	1	F300	0
"	461B	Block GPS Time Reference	0 to 4294967295	---	1	F300	0
"	461D	Maximum Channel Asymmetry	0 to 10	ms	0.1	F001	15
"	461F	Round Trip Time	0 to 10	ms	0.1	F001	15
	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)
	Transformer General (Read/Write Setting)						
G30, T35, T60	4630	Transformer Number of Windings	2 to 6	---	1	F001	2
"	4631	Transformer Phase Compensation	0 to 1	---	1	F160	0 (Internal (software))
"	4632	Transformer Load Loss at Rated Load	1 to 20000	kW	1	F001	100
"	4633	Transformer Rated Winding Temperature Rise	0 to 4	---	1	F161	1 (65°C (oil))
"	4634	Transformer No Load Loss	1 to 20000	kW	1	F001	10
"	4635	Transformer Type of Cooling	0 to 6	---	1	F162	0 (OA)
"	4636	Transformer Top-oil Rise Over Ambient	1 to 200	°C	1	F001	35
"	4637	Transformer Thermal Capacity	0 to 200	kWh/°C	0.01	F001	10000
"	4638	Transformer Winding Thermal Time Constant	0.25 to 15	min	0.01	F001	200
"	4639	Transformer Reference Winding Manual Selection	0 to 7	---	1	F470	0 (Auto. Selecti on)
	Transformer Windings (Read/Write Settings) (6 Modules)						
G30, T35, T60	4640	Transformer Winding 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	4641	Transformer Winding 1 Rated MVA	0.001 to 2000	MVA	0.001	F003	100000
"	4643	Transformer Winding 1 Nominal Phase-Phase Voltage	0.001 to 2000	kV	0.001	F003	220000
"	4645	Transformer Winding 1 Connection	0 to 2	---	1	F163	0 (Wye)
"	4646	Transformer Winding 1 Grounding	0 to 1	---	1	F164	0 (Not within zone)
"	4647	Transformer Winding 1 Angle w.r.t. Winding 1	-359.9 to 0	degrees	0.1	F002	0
"	4651	Transformer Winding 1 Resistance	0.0001 to 100	ohms	0.000 1	F003	100000
"	4653	...Repeated for Transformer Winding 2					
"	4666	...Repeated for Transformer Winding 3					
"	4679	...Repeated for Transformer Winding 4					
"	468C	...Repeated for Transformer Winding 5					
"	469F	...Repeated for Transformer Winding 6					
	Incipient Cable Fault Detector (Read/Write Settings) (2 or 6 Modules)						
F35, F60	46B2	Incipient Cable Fault Detector 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	46B3	Incipient Cable Fault Detector 1 Block	0 to 4294967295	---	1	F300	0
"	46B5	Incipient Cable Fault Detector 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	46B6	Incipient Cable Fault Detector 1 Pickup	0.1 to 10	pu	0.01	F001	50
"	46B7	Incipient Cable Fault Detector 1 Mode	0 to 1	---	1	F254	0 (Number of Counts)

Products	Address	Register name	Range	Units	Step	Format	Default
"	46B8	Incipient Cable Fault Detector 1 Counts	1 to 10	---	1	F001	2
"	46B9	Incipient Cable Fault Detector 1 Time Window	0 to 1000	s	0.01	F003	1000
"	46BB	Incipient Cable Fault Detector 1 Reset Delay	0 to 65.535	s	0.001	F001	100
"	46BC	Incipient Cable Fault Detector 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	46BD	Incipient Cable Fault Detector 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	46BE	...Repeated for Incipient Cable Fault Detector 2					
F35	46CA	...Repeated for Incipient Cable Fault Detector 3					
"	46D6	...Repeated for Incipient Cable Fault Detector 4					
"	46E2	...Repeated for Incipient Cable Fault Detector 5					
"	46EE	...Repeated for Incipient Cable Fault Detector 6					
	Breaker Control (Read/Write Settings) (2, 4, or 6 Modules)						
All except B90	47D0	Breaker 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	47D1	Breaker 1 Name	---	---	---	F206	"Bkr 1"
"	47D4	Breaker 1 Mode	0 to 1	---	1	F157	0 (3-Pole)
"	47D5	Breaker 1 Open	0 to 4294967295	---	1	F300	0
"	47D7	Breaker 1 Close	0 to 4294967295	---	1	F300	0
"	47D9	Breaker 1 Phase A / Three-pole Closed	0 to 4294967295	---	1	F300	0
"	47DB	Breaker 1 Phase B Closed	0 to 4294967295	---	1	F300	0
"	47DD	Breaker 1 Phase C Closed	0 to 4294967295	---	1	F300	0
"	47DF	Breaker 1 External Alarm	0 to 4294967295	---	1	F300	0
"	47E1	Breaker 1 Alarm Delay	0 to 65.535	s	0.001	F003	0
"	47E3	Breaker 1 Pushbutton Control	0 to 1	---	1	F102	0 (Disabled)
"	47E4	Breaker 1 Manual Close Recall Time	0 to 65.535	s	0.001	F003	0
"	47E6	Breaker 1 Out of Service	0 to 4294967295	---	1	F300	0
"	47E8	Breaker 1 Block Open	0 to 4294967295	---	1	F300	0
"	47EA	Breaker 1 Block Close	0 to 4294967295	---	1	F300	0
"	47EC	Breaker 1 Phase A / Three-pole Opened	0 to 4294967295	---	1	F300	0
"	47EE	Breaker 1 Phase B Opened	0 to 4294967295	---	1	F300	0
"	47F0	Breaker 1 Phase C Opened	0 to 4294967295	---	1	F300	0
"	47F2	Breaker 1 Operate Time	0 to 65535	ms	1	F003	70
"	47F4	Breaker 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	47F5	Reserved	0 to 65535	s	1	F001	0
"	47F6	...Repeated for Breaker 2					
B30, C60, C70, D60, F60, F35, G30, G60, L60, L90, M60, N60, T35, T60	481C	...Repeated for Breaker 3					
"	4842	...Repeated for Breaker 4					
B30, C70, F35, N60, T35, T60	4868	...Repeated for Breaker 5					
"	488E	...Repeated for Breaker 6					
	Compensated Overvoltage (Read/Write Grouped Setting)						
D60	48F0	Compensated OV Function	0 to 1	---	1	F102	0 (Disabled)

Products	Address	Register name	Range	Units	Step	Format	Default
"	48F1	Compensated OV Source	0 to 5	---	1	F167	0 (SRC 1)
"	48F2	Compensated OV Zc Mag	0 to 500	ohm	0.01	F001	200
"	48F3	Compensated OV Zc Ang	30 to 90	degrees	1	F001	90
"	48F4	Compensated OV I_1max	0.01 to 1	pu	0.01	F001	20
"	48F5	Compensated OV STG1 PKP	0.25 to 3	pu	0.001	F001	1300
"	48F6	Compensated OV STG1 Delay	0 to 600	sec	0.01	F001	100
"	48F7	Compensated OV STG2 PKP	0.25 to 3	pu	0.001	F001	1300
"	48F8	Compensated OV STG2 Delay	0 to 600	sec	0.01	F001	100
"	48F9	Compensated OV SGT3 PKP	0.25 to 3	pu	0.001	F001	1300
"	48FA	Compensated OV STG3 Delay	0 to 600	sec	0.01	F001	100
"	48FB	Compensated OV Block	0 to 4294967295	---	1	F300	0
"	48FD	Compensated OV Target	0 to 2	---	1	F109	0 (Self-reset)
"	48FE	Compensated OV Events	0 to 1	---	1	F102	0 (Disabled)
	Demand (Read/Write Setting)						
C60, F35, F60, L90, N60, T60	490A	Demand Current Method	0 to 2	---	1	F139	0 (Thermal Exponential)
"	490B	Demand Power Method	0 to 2	---	1	F139	0 (Thermal Exponential)
"	490C	Demand Interval	0 to 5	---	1	F132	2 (15 MIN)
"	490D	Demand Input	0 to 4294967295	---	1	F300	0
	Demand (Read/Write Command)						
C60, F35, F60, L90, N60, T60	490F	Demand Clear Record	0 to 1	---	1	F126	0 (No)
	FlexCurves A and B (Read/Write Settings)						
All except C30, N60	4910	FlexCurve A (120 items)	0 to 65535	ms	1	F011	0
"	4988	FlexCurve B (120 items)	0 to 65535	ms	1	F011	0
	Modbus User Map (Read/Write Setting)						
All	4A00	Modbus Address Settings for User Map (256 items)	0 to 65535	---	1	F001	0
	User Displays Settings (Read/Write Setting) (16 Modules)						
All	4C00	User-Definable Display 1 Top Line Text	---	---	---	F202	" "
"	4C0A	User-Definable Display 1 Bottom Line Text	---	---	---	F202	" "
"	4C14	Modbus Addresses of Display 1 Items (5 items)	0 to 65535	---	1	F001	0
"	4C19	Reserved (7 items)	---	---	---	F001	0
"	4C20	...Repeated for User-Definable Display 2					
"	4C40	...Repeated for User-Definable Display 3					
"	4C60	...Repeated for User-Definable Display 4					
"	4C80	...Repeated for User-Definable Display 5					
"	4CA0	...Repeated for User-Definable Display 6					
"	4CC0	...Repeated for User-Definable Display 7					
"	4CE0	...Repeated for User-Definable Display 8					
"	4D00	...Repeated for User-Definable Display 9					
"	4D20	...Repeated for User-Definable Display 10					
"	4D40	...Repeated for User-Definable Display 11					
"	4D60	...Repeated for User-Definable Display 12					
"	4D80	...Repeated for User-Definable Display 13					
"	4DA0	...Repeated for User-Definable Display 14					

Products	Address	Register name	Range	Units	Step	Format	Default
"	4DC0	...Repeated for User-Definable Display 15					
"	4DE0	...Repeated for User-Definable Display 16					
	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
"	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					

Products	Address	Register name	Range	Units	Step	Format	Default
	FlexLogic (Read/Write Setting)						
All	5000	FlexLogic Entry (512 items)	0 to 4294967295	---	1	F300	2097152
	RTD Inputs (Read/Write Setting) (48 Modules)						
All except B90	5400	RTD Input 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5401	RTD Input 1 ID	---	---	---	F205	"RTD Ip 1"
"	5407	RTD Input 1 Type	0 to 3	---	1	F174	0 (100 ohm Platinum)
"	5408	RTD Input 1 Application	0 to 5	---	1	F550	0 (None)
"	5409	RTD Input 1 Alarm Temperature	1 to 249	°C	1	F001	130
"	540A	RTD Input 1 Alarm Pickup Delay	0 to 600	s	0.01	F001	0
"	540B	RTD Input 1 Trip Temperature	1 to 249	°C	1	F001	130
"	540C	RTD Input 1 Trip Pickup Delay	0 to 600	s	0.01	F001	0
"	540D	RTD Input 1 Trip Reset Delay	0 to 600	s	0.01	F001	0
"	540E	RTD Input 1 Trip Voting	0 to 48	---	1	F551	0
"	540F	RTD Input 1 Open	0 to 2	---	1	F552	0 (None)
"	5410	RTD Input 1 Block	0 to 4294967295	---	1	F300	0
"	5412	RTD Input 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5413	RTD Input 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5414	...Repeated for RTD Input 2					
"	5428	...Repeated for RTD Input 3					
"	543C	...Repeated for RTD Input 4					
"	5450	...Repeated for RTD Input 5					
"	5464	...Repeated for RTD Input 6					
"	5478	...Repeated for RTD Input 7					
"	548C	...Repeated for RTD Input 8					
"	54A0	...Repeated for RTD Input 9					
"	54B4	...Repeated for RTD Input 10					
"	54C8	...Repeated for RTD Input 11					
"	54DC	...Repeated for RTD Input 12					
"	54F0	...Repeated for RTD Input 13					
"	5504	...Repeated for RTD Input 14					
"	5518	...Repeated for RTD Input 15					
"	552C	...Repeated for RTD Input 16					
"	5540	...Repeated for RTD Input 17					
"	5554	...Repeated for RTD Input 18					
"	5568	...Repeated for RTD Input 19					
"	557C	...Repeated for RTD Input 20					
"	5590	...Repeated for RTD Input 21					
"	55A4	...Repeated for RTD Input 22					
"	55B8	...Repeated for RTD Input 23					
"	55CC	...Repeated for RTD Input 24					
"	55E0	...Repeated for RTD Input 25					
"	55F4	...Repeated for RTD Input 26					
"	5608	...Repeated for RTD Input 27					
"	561C	...Repeated for RTD Input 28					
"	5630	...Repeated for RTD Input 29					
"	5644	...Repeated for RTD Input 30					

Products	Address	Register name	Range	Units	Step	Format	Default
"	5658	...Repeated for RTD Input 31					
"	566C	...Repeated for RTD Input 32					
"	5680	...Repeated for RTD Input 33					
"	5694	...Repeated for RTD Input 34					
"	56A8	...Repeated for RTD Input 35					
"	56BC	...Repeated for RTD Input 36					
"	56D0	...Repeated for RTD Input 37					
"	56E4	...Repeated for RTD Input 38					
"	56F8	...Repeated for RTD Input 39					
"	570C	...Repeated for RTD Input 40					
"	5720	...Repeated for RTD Input 41					
"	5734	...Repeated for RTD Input 42					
"	5748	...Repeated for RTD Input 43					
"	575C	...Repeated for RTD Input 44					
"	5770	...Repeated for RTD Input 45					
"	5784	...Repeated for RTD Input 46					
"	5798	...Repeated for RTD Input 47					
"	57AC	...Repeated for RTD Input 48					
	FlexLogic Timers (Read/Write Setting) (32 Modules)						
All	5800	FlexLogic Timer 1 Type	0 to 2	---	1	F129	0 (millisecond)
"	5801	FlexLogic Timer 1 Pickup Delay	0 to 60000	---	1	F001	0
"	5802	FlexLogic Timer 1 Dropout Delay	0 to 60000	---	1	F001	0
"	5803	Reserved (5 items)	0 to 65535	---	1	F001	0
"	5808	...Repeated for FlexLogic Timer 2					
"	5810	...Repeated for FlexLogic Timer 3					
"	5818	...Repeated for FlexLogic Timer 4					
"	5820	...Repeated for FlexLogic Timer 5					
"	5828	...Repeated for FlexLogic Timer 6					
"	5830	...Repeated for FlexLogic Timer 7					
"	5838	...Repeated for FlexLogic Timer 8					
"	5840	...Repeated for FlexLogic Timer 9					
"	5848	...Repeated for FlexLogic Timer 10					
"	5850	...Repeated for FlexLogic Timer 11					
"	5858	...Repeated for FlexLogic Timer 12					
"	5860	...Repeated for FlexLogic Timer 13					
"	5868	...Repeated for FlexLogic Timer 14					
"	5870	...Repeated for FlexLogic Timer 15					
"	5878	...Repeated for FlexLogic Timer 16					
"	5880	...Repeated for FlexLogic Timer 17					
"	5888	...Repeated for FlexLogic Timer 18					
"	5890	...Repeated for FlexLogic Timer 19					
"	5898	...Repeated for FlexLogic Timer 20					
"	58A0	...Repeated for FlexLogic Timer 21					
"	58A8	...Repeated for FlexLogic Timer 22					
"	58B0	...Repeated for FlexLogic Timer 23					
"	58B8	...Repeated for FlexLogic Timer 24					

Products	Address	Register name	Range	Units	Step	Format	Default
"	58C0	...Repeated for FlexLogic Timer 25					
"	58C8	...Repeated for FlexLogic Timer 26					
"	58D0	...Repeated for FlexLogic Timer 27					
"	58D8	...Repeated for FlexLogic Timer 28					
"	58E0	...Repeated for FlexLogic Timer 29					
"	58E8	...Repeated for FlexLogic Timer 30					
"	58F0	...Repeated for FlexLogic Timer 31					
"	58F8	...Repeated for FlexLogic Timer 32					
	Phase Time Overcurrent (Read/Write Grouped Setting (1, 2, 4, or 6 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, T35, T60	5900	Phase Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5901	Phase Time Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5902	Phase Time Overcurrent 1 Input	0 to 1	---	1	F122	0 (Phasor)
"	5903	Phase Time Overcurrent 1 Pickup	0 to 30	pu	0.001	F001	1000
"	5904	Phase Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	5905	Phase Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	5906	Phase Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	5907	Phase Time Overcurrent 1 Voltage Restraint	0 to 1	---	1	F102	0 (Disabled)
"	5908	Phase TOC 1 Block For Each Phase (3 items)	0 to 4294967295	---	1	F300	0
"	590F	Phase Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5910	Phase Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5911	Reserved (3 items)	0 to 1	---	1	F001	0
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, T35, T60	5914	...Repeated for Phase Time Overcurrent 2					
B30, C60, C70, D60, F35, F60, L60, L90, T35, T60	5928	...Repeated for Phase Time Overcurrent 3					
"	593C	...Repeated for Phase Time Overcurrent 4					
B30, C60, C70, F35, L90, T35, T60	5950	...Repeated for Phase Time Overcurrent 5					
"	5964	...Repeated for Phase Time Overcurrent 6					
	Phase Instantaneous Overcurrent (Read/Write Grouped Setting) (2, 4, 6, 8, or 12 Modules)						
All except B90, C30, T35	5A00	Phase Instantaneous Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5A01	Phase Instantaneous Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5A02	Phase Instantaneous Overcurrent 1 Pickup	0 to 30	pu	0.001	F001	1000
"	5A03	Phase Instantaneous Overcurrent 1 Delay	0 to 600	s	0.01	F001	0
"	5A04	Phase Instantaneous Overcurrent 1 Reset Delay	0 to 600	s	0.01	F001	0
"	5A05	Phase IOC1 Block For Each Phase (3 items)	0 to 4294967295	---	1	F300	0
"	5A0B	Phase Instantaneous Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)

Products	Address	Register name	Range	Units	Step	Format	Default
"	5A0C	Phase Instantaneous Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5A0D	Reserved (6 items)	0 to 1	---	1	F001	0
"	5A13	...Repeated for Phase Instantaneous Overcurrent 2					
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, N60, T60	5A26	...Repeated for Phase Instantaneous Overcurrent 3					
"	5A39	...Repeated for Phase Instantaneous Overcurrent 4					
B30, C60, C70, D60, F35, F60, L90, M60, N60, T60	5A4C	...Repeated for Phase Instantaneous Overcurrent 5					
"	5A5F	...Repeated for Phase Instantaneous Overcurrent 6					
C60, C70, D60, F35, F60, L90, M60, N60, T60	5A72	...Repeated for Phase Instantaneous Overcurrent 7					
"	5A85	...Repeated for Phase Instantaneous Overcurrent 8					
C70, F35, N60, T60	5A98	...Repeated for Phase Instantaneous Overcurrent 9					
"	5AAB	...Repeated for Phase Instantaneous Overcurrent 10					
"	5ABE	...Repeated for Phase Instantaneous Overcurrent 11					
"	5AD1	...Repeated for Phase Instantaneous Overcurrent 12					
	Neutral Time Overcurrent (Read/Write Grouped Setting) (1, 2, 4, or 6 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, T60	5B00	Neutral Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5B01	Neutral Time Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5B02	Neutral Time Overcurrent 1 Input	0 to 1	---	1	F122	0 (Phasor)
"	5B03	Neutral Time Overcurrent 1 Pickup	0 to 30	pu	0.001	F001	1000
"	5B04	Neutral Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	5B05	Neutral Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	5B06	Neutral Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	5B07	Neutral Time Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	5B09	Neutral Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5B0A	Neutral Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5B0B	Reserved (6 items)	0 to 1	---	1	F001	0
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, T60	5B11	...Repeated for Neutral Time Overcurrent 2					
B30, C60, C70, D60, F35, F60, L60, L90, T60	5B22	...Repeated for Neutral Time Overcurrent 3					

Products	Address	Register name	Range	Units	Step	Format	Default
"	5B33	...Repeated for Neutral Time Overcurrent 4					
B30, C60, C70, F35, L90, T60	5B44	...Repeated for Neutral Time Overcurrent 5					
"	5B55	...Repeated for Neutral Time Overcurrent 6					
	Neutral Instantaneous Overcurrent (Read/Write Grouped Setting) (1, 4, 6, 8, or 12 Modules)						
All except B90, C30, N60, T35	5C00	Neutral Instantaneous Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5C01	Neutral Instantaneous Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5C02	Neutral Instantaneous Overcurrent 1 Pickup	0 to 30	pu	0.001	F001	1000
"	5C03	Neutral Instantaneous Overcurrent 1 Delay	0 to 600	s	0.01	F001	0
"	5C04	Neutral Instantaneous Overcurrent 1 Reset Delay	0 to 600	s	0.01	F001	0
"	5C05	Neutral Instantaneous Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	5C07	Neutral Instantaneous Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5C08	Neutral Instantaneous Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5C09	Reserved (8 items)	0 to 1	---	1	F001	0
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, T60	5C11	...Repeated for Neutral Instantaneous Overcurrent 2					
"	5C22	...Repeated for Neutral Instantaneous Overcurrent 3					
"	5C33	...Repeated for Neutral Instantaneous Overcurrent 4					
B30, C60, C70, D60, F35, F60, L90, M60, T60	5C44	...Repeated for Neutral Instantaneous Overcurrent 5					
"	5C55	...Repeated for Neutral Instantaneous Overcurrent 6					
C60, C70, D60, F35, F60, L90, M60, T60	5C66	...Repeated for Neutral Instantaneous Overcurrent 7					
"	5C77	...Repeated for Neutral Instantaneous Overcurrent 8					
C70, F35, T60	5C88	...Repeated for Neutral Instantaneous Overcurrent 9					
"	5C99	...Repeated for Neutral Instantaneous Overcurrent 10					
"	5CAA	...Repeated for Neutral Instantaneous Overcurrent 11					
"	5CBB	...Repeated for Neutral Instantaneous Overcurrent 12					
	Ground Time Overcurrent (Read/Write Grouped Setting) (1, 2, 4, or 6 Modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60	5D00	Ground Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5D01	Ground Time Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5D02	Ground Time Overcurrent 1 Input	0 to 1	---	1	F122	0 (Phasor)
"	5D03	Ground Time Overcurrent 1 Pickup	0 to 30	pu	0.001	F001	1000

Products	Address	Register name	Range	Units	Step	Format	Default
"	5D04	Ground Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	5D05	Ground Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	5D06	Ground Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	5D07	Ground Time Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	5D09	Ground Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5D0A	Ground Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5D0B	Reserved (6 items)	0 to 1	---	1	F001	0
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, T35, T60	5D11	...Repeated for Ground Time Overcurrent 2					
B30, C60, C70, D60, F35, F60, L90, M60, T35, T60	5D22	...Repeated for Ground Time Overcurrent 3					
"	5D33	...Repeated for Ground Time Overcurrent 4					
B30, C70, F35, T35, T60	5D44	...Repeated for Ground Time Overcurrent 5					
"	5D55	...Repeated for Ground Time Overcurrent 6					
	Ground Instantaneous Overcurrent (Read/Write Grouped Setting) (1, 2, 4, 6, 8, or 12 Modules) (B30 has 1 per CT bank for 6 modules, while others have 2 per CT bank for 12 modules)						
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60	5DA0	Ground Instantaneous Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5DA1	Ground Instantaneous Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	5DA2	Ground Instantaneous Overcurrent 1 Pickup	0 to 30	pu	0.001	F001	1000
"	5DA3	Ground Instantaneous Overcurrent 1 Delay	0 to 600	s	0.01	F001	0
"	5DA4	Ground Instantaneous Overcurrent 1 Reset Delay	0 to 600	s	0.01	F001	0
"	5DA5	Ground Instantaneous Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	5DA7	Ground Instantaneous Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5DA8	Ground Instantaneous Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5DA9	Reserved (8 items)	0 to 1	---	1	F001	0
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, T60	5DB1	...Repeated for Ground Instantaneous Overcurrent 2					
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, T60	5DC2	...Repeated for Ground Instantaneous Overcurrent 3					
"	5DD3	...Repeated for Ground Instantaneous Overcurrent 4					
B30, C60, C70, D60, F35, F60, L90, M60, T60	5DE4	...Repeated for Ground Instantaneous Overcurrent 5					

Products	Address	Register name	Range	Units	Step	Format	Default
"	5DF5	...Repeated for Ground Instantaneous Overcurrent 6					
C60, C70, F35, F60, L90, M60, T60	5E06	...Repeated for Ground Instantaneous Overcurrent 7					
"	5E17	...Repeated for Ground Instantaneous Overcurrent 8					
C70, F35, T60	5E28	...Repeated for Ground Instantaneous Overcurrent 9					
"	5E39	...Repeated for Ground Instantaneous Overcurrent 10					
"	5E4A	...Repeated for Ground Instantaneous Overcurrent 11					
"	5E5B	...Repeated for Ground Instantaneous Overcurrent 12					
	CT Fail (Read/Write Setting) (2 or 6 Modules)						
G30, G60, L30, L60, L90, M60, T35, T60	5E6C	CT Fail 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	5E6D	CT Fail 1 Block	0 to 4294967295	---	1	F300	0
"	5E6F	CT Fail 1 Current Source 1	0 to 5	---	1	F167	0 (SRC 1)
"	5E70	CT Fail 1 Current Pickup 1	0 to 2	pu	0.1	F001	2
"	5E71	CT Fail 1 Current Source 2	0 to 5	---	1	F167	1 (SRC 2)
"	5E72	CT Fail 1 Current Pickup 2	0 to 2	pu	0.1	F001	2
"	5E73	CT Fail 1 Voltage Source	0 to 5	---	1	F167	0 (SRC 1)
"	5E74	CT Fail 1 Voltage Pickup	0 to 2	pu	0.01	F001	20
"	5E75	CT Fail 1 Pickup Delay	0 to 65.535	s	0.001	F001	1000
"	5E76	CT Fail 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	5E77	CT Fail 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	5E78	...Repeated for CT Fail 2					
G30, G60, L30, L90, M60, T35, T60	5E84	...Repeated for CT Fail 3					
"	5E90	...Repeated for CT Fail 4					
"	5E9C	...Repeated for CT Fail 5					
"	5EA8	...Repeated for CT Fail 6					
	Incipient Cable Fault Detector Actual Values (Read Only) (2 or 6 Modules)						
F35, F60	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
"	5EC3	...Repeated for Incipient Cable Fault Detector 2					
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					

Products	Address	Register name	Range	Units	Step	Format	Default
	Incipient Cable Fault Detector Command (Read/Write Setting)						
F35, F60	5ED8	Incipient Cable Fault Detector Clear Counters	0 to 1	---	1	F126	0 (No)
	87L Trip Logic (Read/Write Grouped Setting)						
L90	5EE0	87L Trip Function	0 to 1	---	1	F102	0 (Disabled)
"	5EE1	87L Trip Source	0 to 5	---	1	F167	0 (SRC 1)
"	5EE2	87L Trip Mode	0 to 1	---	1	F157	0 (3-Pole)
"	5EE3	87L Trip Supervision	0 to 4294967295	---	1	F300	0
"	5EE5	87L Trip Force 3 Phase	0 to 4294967295	---	1	F300	0
"	5EE7	87L Trip Seal In	0 to 1	---	1	F102	0 (Disabled)
"	5EE8	87L Trip Seal In Pickup	0.2 to 0.8	pu	0.01	F001	20
"	5EE9	87L Trip Target	0 to 2	---	1	F109	0 (Self-reset)
"	5EEA	87L Trip Events	0 to 1	---	1	F102	0 (Disabled)
	Stub Bus (Read/Write Grouped Setting)						
L30, L90	5F10	Stub Bus Function	0 to 1	---	1	F102	0 (Disabled)
"	5F11	Stub Bus Disconnect	0 to 4294967295	---	1	F300	0
"	5F13	Stub Bus Trigger	0 to 4294967295	---	1	F300	0
"	5F15	Stub Bus Target	0 to 2	---	1	F109	0 (Self-reset)
"	5F17	Stub Bus Events	0 to 1	---	1	F102	0 (Disabled)
	50DD Disturbance Detection (Read/Write Grouped Setting)						
L30, L90	5F20	50DD Function	0 to 1	---	1	F102	0 (Disabled)
"	5F21	50DD Non Current Supervision	0 to 4294967295	---	1	F300	0
"	5F23	50DD Control Logic	0 to 4294967295	---	1	F300	0
"	5F25	50DD Logic Seal In	0 to 4294967295	---	1	F300	0
"	5F27	50DD Events	0 to 1	---	1	F102	0 (Disabled)
	Frequency Out-Of-Band Accumulation (Read/Write Setting)						
G30, G60	5F40	Frequency Out-Of-Band Accumulation Block	0 to 4294967295	---	1	F300	0
"	5F42	Frequency Out-Of-Band Accumulation Events Enable	0 to 1	---	1	F102	0 (Disabled)
"	5F43	Frequency Out-Of-Band Accumulator Function Enable Array (7 items)	0 to 1	---	1	F102	0 (Disabled)
"	5F4A	Frequency Out-Of-Band Accumulator Lower Frequency Array (7 items)	20 to 70	Hz	0.01	F001	6000
"	5F51	Frequency Out-Of-Band Accumulator Min Value V A	0.1 to 1.25	pu	0.01	F001	10
"	5F52	Frequency Out-Of-Band Accumulator Source	0 to 5	---	1	F167	0 (SRC 1)
"	5F53	Frequency Out-Of-Band Accumulator Target Messages Enable	0 to 2	---	1	F109	0 (Self-reset)
"	5F54	Frequency Out-Of-Band Accumulator Time Limit Array (7 items)	1 to 65535	sec	1	F001	200
"	5F5B	Frequency Out-Of-Band Accumulator Time Preset Array (7 items)	0 to 65535	sec	1	F001	0
"	5F62	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	5F70	Setting Group for Modbus Comms (0 means group 1)	0 to 5	---	1	F001	0
"	5F71	Setting Groups Block	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	5F73	FlexLogic Operands to Activate Groups 2 through 6 (5 items)	0 to 4294967295	---	1	F300	0
"	5F7D	Setting Group Function	0 to 1	---	1	F102	0 (Disabled)
"	5F7E	Setting Group Events	0 to 1	---	1	F102	0 (Disabled)
	Setting Groups (Read Only)						
All except C30	5F7F	Current Setting Group	0 to 5	---	1	F001	0
	Setting Group Names (Read/Write Setting)						
All except C30	5F8C	Setting Group 1 Name	---	---	---	F203	(none)
"	5F94	Setting Group 2 Name	---	---	---	F203	(none)
"	5F9C	Setting Group 3 Name	---	---	---	F203	(none)
"	5FA4	Setting Group 4 Name	---	---	---	F203	(none)
"	5FAC	Setting Group 5 Name	---	---	---	F203	(none)
"	5FB4	Setting Group 6 Name	---	---	---	F203	(none)
	Current Differential 87L (Read/Write Grouped Setting)						
L30, L90	6000	87L Current Differential Function	0 to 1	---	1	F102	0 (Disabled)
"	6001	87L Current Differential Block	0 to 4294967295	---	1	F300	0
"	6003	87L Current Differential Signal Source 1	0 to 5	---	1	F167	0 (SRC 1)
"	6004	87L Minimum Phase Current Sensitivity	0.1 to 4	pu	0.01	F001	20
L30	6005	87L Current Differential Tap Setting	0.2 to 5	---	0.01	F001	100
L90	6005	87L Current Differential Tap Setting	0.05 to 20	---	0.01	F001	100
L30, L90	6006	87L Current Differential Phase Percent Restraint 1	1 to 50	%	1	F001	30
"	6007	87L Current Differential Phase Percent Restraint 2	1 to 70	%	1	F001	50
"	6008	87L Current Differential Phase Dual Slope Breakpoint	0 to 20	pu	0.1	F001	10
"	6009	87L Current Differential Ground Function	0 to 1	---	1	F102	0 (Disabled)
"	600A	87L Current Differential Ground Pickup	0.05 to 1	pu	0.01	F001	10
"	600B	87L Current Differential Ground Restraint	1 to 50	%	1	F001	25
"	600C	87L Current Differential Ground Delay	0 to 5	seconds	0.01	F001	10
"	600D	87L Current Differential Key DTT	0 to 1	---	1	F102	1 (Enabled)
"	600E	87L Current Differential External Key DTT	0 to 4294967295	---	1	F300	0
"	6010	87L Current Differential Target	0 to 2	---	1	F109	0 (Self-reset)
"	6011	87L Current Differential Event	0 to 1	---	1	F102	0 (Disabled)
L30	6012	87L Current Differential Tap 2 Setting	0.2 to 5	---	0.01	F001	100
L90	6012	87L Current Differential Tap 2 Setting	0.05 to 20	---	0.01	F001	100
L90	6013	87L Current Differential Signal Source 2	0 to 6	---	1	F211	0 (None)
"	6014	87L Current Differential Signal Source 3	0 to 6	---	1	F211	0 (None)
"	6015	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	601E	87L Inrush Inhibit Mode	0 to 3	---	1	F561	0 (Disabled)
"	601F	87L Inrush Inhibit Level	1 to 40	%fo	0.1	F001	200
	Open Pole Detect (Read/Write Grouped Setting)						
C60, N60	6040	Open Pole Detect Function	0 to 1	---	1	F102	0 (Disabled)
"	6041	Open Pole Detect Block	0 to 4294967295	---	1	F300	0
"	6043	Open Pole Detect A Aux Co	0 to 4294967295	---	1	F300	0
"	6045	Open Pole Detect B Aux Co	0 to 4294967295	---	1	F300	0
"	6047	Open Pole Detect C Aux Co	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	6049	Open Pole Detect Current Source	0 to 5	---	1	F167	0 (SRC 1)
"	604A	Open Pole Detect Current Pickup	0.05 to 20	pu	0.01	F001	20
"	604B	Open Pole Detect Voltage Source	0 to 5	---	1	F167	0 (SRC 1)
"	604C	Open Pole Detect Voltage Input	0 to 1	---	1	F102	0 (Disabled)
"	604D	Open Pole Detect Pickup Delay	0 to 65.535	s	0.001	F001	60
"	604E	Open Pole Detect Reset Delay	0 to 65.535	s	0.001	F001	100
"	604F	Open Pole Detect Target	0 to 2	---	1	F109	0 (Self-reset)
"	6050	Open Pole Detect Events	0 to 1	---	1	F102	0 (Disabled)
"	6051	Open Pole Detect Broken Co	0 to 1	---	1	F102	0 (Disabled)
	Phase Comparison Negative Sequence Voltage (Read/Write Grouped Setting)						
L60	6070	Negative Sequence Voltage FD Function	0 to 1	---	1	F102	0 (Disabled)
"	6071	Negative Sequence Voltage FD Impedance	0 to 100	%	0.1	F001	100
"	6072	Negative Sequence Voltage FDL Pickup	0.005 to 3	pu	0.001	F001	10
"	6073	Negative Sequence Voltage FDH Pickup	0.005 to 3	pu	0.001	F001	50
"	6074	Negative Sequence Voltage FD Block	0 to 4294967295	---	1	F300	0
"	6076	Negative Sequence Voltage FD Target	0 to 2	---	1	F109	0 (Self-reset)
"	6077	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	6080	Negative Sequence di/dt FD Function	0 to 1	---	1	F102	0 (Disabled)
"	6081	Negative Sequence di/dt FDL Pickup	0.01 to 5	pu	0.01	F001	10
"	6082	Negative Sequence di/dt FDL Seal-In	0 to 10	s	0.001	F001	600
"	6083	Negative Sequence di/dt FDH Pickup	0.01 to 5	pu	0.01	F001	50
"	6084	Negative Sequence di/dt FDH Seal-In	0 to 10	s	0.001	F001	200
"	6085	Negative Sequence di/dt FDH Supv	0 to 4294967295	---	1	F300	0
"	6087	Negative Sequence di/dt FD Block	0 to 4294967295	---	1	F300	0
"	6089	Negative Sequence di/dt FD Target	0 to 2	---	1	F109	0 (Self-reset)
"	608A	Negative Sequence di/dt FD Events	0 to 1	---	1	F102	0 (Disabled)
	Phase Comparison Rate of Change of Positive-Sequence Current Settings (Read/Write Grouped Setting)						
L60	6092	Positive-sequence Current Rate of Change (di/dt FD) Function	0 to 1	---	1	F102	0 (Disabled)
"	6093	Positive-sequence Current Rate of Change (di/dt FDL) Low Pickup	0.01 to 5	pu	0.01	F001	10
"	6094	Positive-sequence Current Rate of Change (di/dt FDL) Low Seal-in	0 to 10	s	0.001	F001	600
"	6095	Positive-sequence Current Rate of Change (di/dt FDH) High Pickup	0.01 to 5	pu	0.01	F001	50
"	6096	Positive-sequence Current Rate of Change (di/dt FDH) High Seal-in	0 to 10	s	0.001	F001	200
"	6097	Positive-sequence Current Rate of Change (di/dt FDH) Supervision	0 to 4294967295	---	1	F300	0
"	6099	Positive-sequence Current Rate of Change (di/dt FD) Block	0 to 4294967295	---	1	F300	0
"	609B	Positive-sequence Current Rate of Change (di/dt FD) Events	0 to 1	---	1	F102	0 (Disabled)
"	609C	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	60A0	Negative-sequence Current Fault Detector Function	0 to 1	---	1	F102	0 (Disabled)

Products	Address	Register name	Range	Units	Step	Format	Default
"	60A1	Negative-sequence Current Fault Detector Low Pickup	0.02 to 5	pu	0.01	F001	10
"	60A2	Negative-sequence Current Fault Detector High Pickup	0.05 to 15	pu	0.01	F001	50
"	60A3	Negative-sequence Current Fault Detector Block	0 to 4294967295	---	1	F300	0
"	60A5	Negative-sequence Current Fault Detector Target	0 to 2	---	1	F109	0 (Self-reset)
"	60A6	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	60A8	Positive-sequence Current Fault Detector Function	0 to 1	---	1	F102	0 (Disabled)
"	60A9	Positive-sequence Current Fault Detector Low Pickup	0.2 to 5	pu	0.01	F001	50
"	60AA	Positive-sequence Current Fault Detector High Pickup	0.5 to 15	pu	0.01	F001	75
"	60AB	Positive-sequence Current Fault Detector Block	0 to 4294967295	---	1	F300	0
"	60AD	Positive-sequence Current Fault Detector Target	0 to 2	---	1	F109	0 (Self-reset)
"	60AE	Positive-sequence Current Fault Detector Events	0 to 1	---	1	F102	0 (Disabled)
	Phase Comparison Open Breaker Keying (Read/Write Grouped Setting)						
L60	60C0	Open Breaker Keying	0 to 1	---	1	F102	0 (Disabled)
"	60C1	Breaker 1 Auxiliary Contact	0 to 4294967295	---	1	F300	0
"	60C3	Breaker 1 Supervision Element	0 to 4294967295	---	1	F300	0
"	60C5	Breaker 2 Auxiliary Contact	0 to 4294967295	---	1	F300	0
"	60C7	Breaker 2 Supervision Element	0 to 4294967295	---	1	F300	0
"	60C9	Weak-Infeed Keying	0 to 4294967295	---	1	F300	0
"	60CB	Supervision Element	0 to 4294967295	---	1	F300	0
"	60CD	Infeed Pickup Delay	0 to 50	s	0.001	F001	0
"	60CE	Infeed Reset Delay	0 to 50	s	0.001	F001	35
"	60CF	Open Breaker Keying Pickup Delay	0 to 50	s	0.001	F001	0
"	60D0	Open Breaker Keying Reset Delay	0 to 50	s	0.001	F001	0
	Phase Comparison Trip Scheme (Read/Write Grouped Setting)						
L60	60E0	87PC Function	0 to 1	---	1	F102	0 (Disabled)
"	60E1	87PC Channel Loss	0 to 500	ms	1	F001	0
"	60E2	87PC Block	0 to 4294967295	---	1	F300	0
"	60E4	87PC Target	0 to 2	---	1	F109	0 (Self-reset)
"	60E5	87PC Events	0 to 1	---	1	F102	0 (Disabled)
"	60E6	87PC Scheme Select	0 to 8	---	1	F088	0 (2TL-TR-SPC-2FC)
"	60E7	87PC Scheme Signal	0 to 2	---	1	F150	0 (MIXED I_2 - K*I_1)
"	60E8	87PC Signal Source	0 to 1	---	1	F089	0 (One Source Current)
"	60E9	87PC FDL Pickup	0.02 to 15	pu	0.01	F001	50
"	60EB	87PC FDH Pickup	0.05 to 15	pu	0.01	F001	75
"	60EC	87PC Mixed Signal K	0 to 0.25	---	0.01	F001	20
"	60F0	87PC Phase Delay Ch1	0 to 30	ms	0.1	F001	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	60F2	87PC Phase Delay Ch2	0 to 30	ms	0.1	F001	0
"	60F8	87PC Transient Pickup	0 to 65.535	s	0.001	F001	30
"	60FD	87PC Asymmetry Channel 1	-5 to 5	ms	0.1	F002	0
"	6104	87PC Asymmetry Channel 2	-5 to 5	ms	0.1	F002	0
"	6106	87PC Stability Angle	40 to 140	degrees	5	F001	75
"	6107	87PC Transient Reset	0 to 65.535	s	0.001	F001	30
"	6108	87PC Received Volts Channel 1	0 to 125	V	0.1	F001	120
"	6109	87PC Received Volts Channel 2	0 to 125	V	0.1	F001	120
"	610A	87PC High-Speed Contact 1	0 to 64	---	1	F490	0
"	610B	87PC High-Speed Contact 2	0 to 64	---	1	F490	0
"	610C	87PC FDL AUX	0 to 4294967295	---	1	F300	0
"	610E	87PC FDH AUX	0 to 4294967295	---	1	F300	0
"	6110	87PC Reset Delay	0 to 200	ms	1	F001	30
"	6111	87PC Mixed Signal Reference Angle	0 to 359	°	1	F001	0
"	6112	87PC Trip Security	0 to 1	---	1	F534	0 (First Coincidence)
"	6113	87PC Second Coincidence Timer	10 to 200	ms	1	F001	40
"	6114	87PC Enhanced Stability Angle	40 to 180	°	5	F001	110
"	6115	87PC FDH Supervision	0 to 4294967295	---	1	F300	0
"	6117	87PC Pickup Delay	0 to 50	ms	1	F001	0
"	6118	87PC Stop Tx	0 to 4294967295	---	1	F300	0
"	611A	87PC Tx Reset Delay	0 to 1000	ms	1	F001	0
	Continuous Monitor (Read/Write Setting)						
L90	6130	Continuous Monitor Function	0 to 1	---	1	F102	0 (Disabled)
"	6131	Continuous Monitor I (current) OP	0 to 4294967295	---	1	F300	0
"	6133	Continuous Monitor I (current) Supervision	0 to 4294967295	---	1	F300	0
"	6135	Continuous Monitor V (voltage) OP	0 to 4294967295	---	1	F300	0
"	6137	Continuous Monitor V (voltage) Supervision	0 to 4294967295	---	1	F300	0
"	6139	Continuous Monitor Target	0 to 2	---	1	F109	0 (Self-reset)
"	613A	Continuous Monitor Events	0 to 1	---	1	F102	0 (Disabled)
	Transformer Hottest Spot (Read/Write Grouped Setting)						
T60	6140	Transformer Hottest Spot Function	0 to 1	---	1	F102	0 (Disabled)
"	6141	Transformer Hottest Spot Pickup	50 to 300	°C	1	F001	140
"	6142	Transformer Hottest Spot Delay	0 to 30000	min	1	F001	1
"	6143	Transformer Hottest Spot Block	0 to 4294967295	---	1	F300	0
"	6145	Transformer Hottest Spot Target	0 to 2	---	1	F109	0 (Self-reset)
"	6146	Transformer Hottest Spot Events	0 to 1	---	1	F102	0 (Disabled)
	Transformer Aging Factor (Read/Write Grouped Setting)						
T60	6150	Transformer Aging Factor Function	0 to 1	---	1	F102	0 (Disabled)
"	6151	Transformer Aging Factor Pickup	1 to 10	PU	0.1	F001	20
"	6152	Transformer Aging Factor Delay	0 to 30000	min	1	F001	10
"	6153	Transformer Aging Factor Block	0 to 4294967295	---	1	F300	0
"	6155	Transformer Aging Factor Target	0 to 2	---	1	F109	0 (Self-reset)
"	6156	Transformer Aging Factor Events	0 to 1	---	1	F102	0 (Disabled)
	Transformer Loss of Life (Read/Write Grouped Setting)						
T60	6160	Transformer Loss of Life Function	0 to 1	---	1	F102	0 (Disabled)
"	6161	XFMR LOL Initial Value	0 to 500000	hrs	1	F003	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	6163	Transformer Loss of Life Pickup	0 to 500000	hrs	1	F003	180000
"	6165	Transformer Loss Of Life Block	0 to 4294967295	---	1	F300	0
"	6167	Transformer Loss of Life Target	0 to 2	---	1	F109	0 (Self-reset)
"	6168	Transformer Loss of Life Events	0 to 1	---	1	F102	0 (Disabled)
	Transformer Thermal Inputs (Read/Write Setting)						
T60	6170	Transformer Thermal Model Source Input	0 to 5	---	1	F167	0 (SRC 1)
"	6171	Ambient Temperature Input Sensor	0 to 32	---	1	F450	0
"	6172	Top Oil Temperature Input Sensor	0 to 32	---	1	F460	0
"	6173	January Average Ambient Temperature	-60 to 60	°C	1	F002	-20
"	6174	February Average Ambient Temperature	-60 to 60	°C	1	F002	-30
"	6175	March Average Ambient Temperature	-60 to 60	°C	1	F002	-10
"	6176	April Average Ambient Temperature	-60 to 60	°C	1	F002	10
"	6177	May Average Ambient Temperature	-60 to 60	°C	1	F002	20
"	6178	June Average Ambient Temperature	-60 to 60	°C	1	F002	30
"	6179	July Average Ambient Temperature	-60 to 60	°C	1	F002	30
"	617A	August Average Ambient Temperature	-60 to 60	°C	1	F002	30
"	617B	September Average Ambient Temperature	-60 to 60	°C	1	F002	20
"	617C	October Average Ambient Temperature	-60 to 60	°C	1	F002	10
"	617D	November Average Ambient Temperature	-60 to 60	°C	1	F002	10
"	617E	December Average Ambient Temperature	-60 to 60	°C	1	F002	-10
	Transformer Thermal Inputs (Read/Write Command)						
T60	6180	Transformer Loss of Life Clear Command	0 to 1	---	1	F126	0 (No)
	Transformer Percent Differential (Read/Write Grouped Setting)						
G30, T35, T60	61C0	Percent Differential Function	0 to 1	---	1	F102	0 (Disabled)
"	61C1	Percent Differential Pickup	0.05 to 1	pu	0.001	F001	100
"	61C2	Percent Differential Slope 1	15 to 100	%	1	F001	25
"	61C3	Percent Differential Break 1	1 to 2	pu	0.001	F001	2000
"	61C4	Percent Differential Break 2	2 to 30	pu	0.001	F001	8000
"	61C5	Percent Differential Slope 2	50 to 100	%	1	F001	100
"	61C6	Inrush Inhibit Function	0 to 2	---	1	F168	1 (Adapt. 2nd)
"	61C7	Inrush Inhibit Level	1 to 40	$\%f_o$	0.1	F001	200
"	61C8	Overexcitation Inhibit Function	0 to 1	---	1	F169	0 (Disabled)
"	61C9	Overexcitation Inhibit Level	1 to 40	$\%f_o$	0.1	F001	100
"	61CA	Percent Differential Block	0 to 4294967295	---	1	F300	0
"	61CC	Percent Differential Target	0 to 2	---	1	F109	0 (Self-reset)
"	61CD	Percent Differential Events	0 to 1	---	1	F102	0 (Disabled)
"	61CE	Transformer Inrush Inhibit Mode	0 to 2	---	1	F189	0 (Per phase)
	Transformer Inst Differential (Read/Write Grouped Setting)						
T35, T60	61DA	Inst Differential Function	0 to 1	---	1	F102	0 (Disabled)
"	61DB	Inst Differential Pickup	2 to 30	pu	0.001	F001	8000
"	61DC	Inst Differential Block	0 to 4294967295	---	1	F300	0
"	61DE	Inst Differential Target	0 to 2	---	1	F109	0 (Self-reset)
"	61DF	Inst Differential Events	0 to 1	---	1	F102	0 (Disabled)
	Autoreclose (Read/Write Setting) (1, 2, or 6 Modules)						
D30, F35, F60, L30	6200	Autoreclose 1 Function	0 to 1	---	1	F102	0 (Disabled)

Products	Address	Register name	Range	Units	Step	Format	Default
"	6201	Autoreclose 1 Initiate	0 to 4294967295	---	1	F300	0
"	6203	Autoreclose 1 Block	0 to 4294967295	---	1	F300	0
"	6205	Autoreclose 1 Max Number of Shots	1 to 4	---	1	F001	1
"	6206	Autoreclose 1 Manual Close	0 to 4294967295	---	1	F300	0
"	6208	Autoreclose 1 Manual Reset from LO	0 to 4294967295	---	1	F300	0
"	620A	Autoreclose 1 Reset Lockout if Breaker Closed	0 to 1	---	1	F108	0 (Off)
"	620B	Autoreclose 1 Reset Lockout On Manual Close	0 to 1	---	1	F108	0 (Off)
"	620C	Autoreclose 1 Breaker Closed	0 to 4294967295	---	1	F300	0
"	620E	Autoreclose 1 Breaker Open	0 to 4294967295	---	1	F300	0
"	6210	Autoreclose 1 Block Time Upon Manual Close	0 to 655.35	s	0.01	F001	1000
"	6211	Autoreclose 1 Dead Time Shot 1	0 to 655.35	s	0.01	F001	100
"	6212	Autoreclose 1 Dead Time Shot 2	0 to 655.35	s	0.01	F001	200
"	6213	Autoreclose 1 Dead Time Shot 3	0 to 655.35	s	0.01	F001	300
"	6214	Autoreclose 1 Dead Time Shot 4	0 to 655.35	s	0.01	F001	400
"	6215	Autoreclose 1 Reset Lockout Delay	0 to 655.35	s	0.01	F001	6000
"	6216	Autoreclose 1 Reset Time	0 to 655.35	s	0.01	F001	6000
"	6217	Autoreclose 1 Incomplete Sequence Time	0 to 655.35	s	0.01	F001	500
"	6218	Autoreclose 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6219	Autoreclose 1 Reduce Max 1	0 to 4294967295	---	1	F300	0
"	621B	Autoreclose 1 Reduce Max 2	0 to 4294967295	---	1	F300	0
"	621D	Autoreclose 1 Reduce Max 3	0 to 4294967295	---	1	F300	0
"	621F	Autoreclose 1 Add Delay 1	0 to 4294967295	---	1	F300	0
"	6221	Autoreclose 1 Delay 1	0 to 655.35	s	0.01	F001	0
"	6222	Autoreclose 1 Add Delay 2	0 to 4294967295	---	1	F300	0
"	6224	Autoreclose 1 Delay 2	0 to 655.35	s	0.01	F001	0
"	6225	Reserved (4 items)	0 to 0.001	---	0.001	F001	0
F35, F60, L30	6229	...Repeated for Autoreclose 2					
F35	6252	...Repeated for Autoreclose 3					
"	627B	...Repeated for Autoreclose 4					
"	62A4	...Repeated for Autoreclose 5					
"	62CD	...Repeated for Autoreclose 6					
	Negative Sequence Time Overcurrent (Read/Write Grouped Setting) (2 Modules)						
C70, D30, D60, F35, F60, L30, L60, L90	6300	Negative Sequence Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6301	Negative Sequence Time Overcurrent 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	6302	Negative Sequence Time Overcurrent 1 Pickup	0 to 30	pu	0.001	F001	1000
"	6303	Negative Sequence Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	6304	Negative Sequence Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	6305	Negative Sequence Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	6306	Negative Sequence Time Overcurrent 1 Block	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	6308	Negative Sequence Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6309	Negative Sequence Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	630A	Reserved (7 items)	0 to 1	---	1	F001	0
"	6311	...Repeated for Negative Sequence Time Overcurrent 2					
	Capacitor Bank Overvoltage Settings (Read/Write, Grouped Setting) (3 Modules)						
C70	6330	Bank Phase Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6331	Bank Phase Overvoltage 1 Bus Source	0 to 5	---	1	F167	0 (SRC 1)
"	6332	Bank Phase Overvoltage 1 Neutral Source	0 to 5	---	1	F167	0 (SRC 1)
"	6333	Bank Phase Overvoltage 1 Bank Ground	0 to 2	---	1	F093	0 (Grounded)
"	6334	Bank Phase Overvoltage 1 Curve	0 to 3	---	1	F094	0 (FlexCurve A)
"	6335	Bank Phase Overvoltage 1 Curve Time Multiplier	1 to 10	---	0.01	F001	100
"	6336	Bank Phase Overvoltage 1 Stage 1A Pickup	0.8 to 2	pu	0.001	F001	1050
"	6337	Bank Phase Overvoltage 1 Stage 2A Pickup	0.8 to 2	pu	0.001	F001	1100
"	6338	Bank Phase Overvoltage 1 Stage 3A Pickup	0.8 to 2	pu	0.001	F001	1200
"	6339	Bank Phase Overvoltage 1 Stage 4A Pickup	0.8 to 2	pu	0.001	F001	1050
"	633A	Bank Phase Overvoltage 1 Stage 1B Pickup	0.8 to 2	pu	0.001	F001	1050
"	633B	Bank Phase Overvoltage 1 Stage 2B Pickup	0.8 to 2	pu	0.001	F001	1100
"	633C	Bank Phase Overvoltage 1 Stage 3B Pickup	0.8 to 2	pu	0.001	F001	1200
"	633D	Bank Phase Overvoltage 1 Stage 4B Pickup	0.8 to 2	pu	0.001	F001	1050
"	633E	Bank Phase Overvoltage 1 Stage 1C Pickup	0.8 to 2	pu	0.001	F001	1050
"	633F	Bank Phase Overvoltage 1 Stage 2C Pickup	0.8 to 2	pu	0.001	F001	1100
"	6340	Bank Phase Overvoltage 1 Stage 3C Pickup	0.8 to 2	pu	0.001	F001	1200
"	6341	Bank Phase Overvoltage 1 Stage 4C Pickup	0.8 to 2	pu	0.001	F001	1050
"	6342	Bank Phase Overvoltage 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	6000
"	6343	Bank Phase Overvoltage 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	6344	Bank Phase Overvoltage 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	200
"	6345	Bank Phase Overvoltage 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	6346	Bank Phase Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	6348	Bank Phase Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6349	Bank Phase Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	634A	...Repeated for Bank Phase Overvoltage 2					
"	6364	...Repeated for Bank Phase Overvoltage 3					
	Capacitor Bank Overvoltage Actuals (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					

Products	Address	Register name	Range	Units	Step	Format	Default
	Negative Sequence Instantaneous Overcurrent (Read/Write Grouped Setting) (2 Modules)						
C70, D30, D60, F35, F60, L30, L60, L90	63C0	Negative Sequence Instantaneous OC 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	63C1	Negative Sequence Instantaneous OC 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	63C2	Negative Sequence Instantaneous Overcurrent 1 Pickup	0 to 30	pu	0.001	F001	1000
"	63C3	Negative Sequence Instantaneous Overcurrent 1 Delay	0 to 600	s	0.01	F001	0
"	63C4	Negative Sequence Instantaneous OC 1 Reset Delay	0 to 600	s	0.01	F001	0
"	63C5	Negative Sequence Instantaneous Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	63C7	Negative Sequence Instantaneous Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	63C8	Negative Sequence Instantaneous Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	63C9	Reserved (8 items)	0 to 1	---	1	F001	0
"	63D1	...Repeated for Negative Sequence Instantaneous OC 2					
	Current Unbalance (Read/Write Grouped Setting) (2 Modules)						
M60	63F0	Current Unbalance 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	63F1	Current Unbalance 1 Pickup	0.1 to 100	%	0.1	F001	400
"	63F2	Current Unbalance 1 Pickup Delay	0 to 600	s	0.01	F001	0
"	63F3	Current Unbalance 1 Reset Delay	0 to 600	s	0.01	F001	0
"	63F4	Current Unbalance 1 Block	0 to 4294967295	---	1	F300	0
"	63F6	Current Unbalance 1 Targets	0 to 2	---	1	F109	0 (Self-reset)
"	63F7	Current Unbalance 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	63F8	Reserved (5 items)	0 to 1	---	1	F001	0
"	63FD	...Repeated for Current Unbalance 2					
	Stator Differential (Read/Write Grouped Setting)						
G60, M60	6420	Stator Differential Function	0 to 1	---	1	F102	0 (Disabled)
"	6421	Stator Differential Pickup	0.05 to 1	pu	0.001	F001	100
"	6422	Stator Differential Slope 1	1 to 100	%	1	F001	10
"	6423	Stator Differential Slope 2	1 to 100	%	1	F001	80
"	6424	Stator Differential Break 1	1 to 1.5	pu	0.01	F001	115
"	6425	Stator Differential Break 2	1.5 to 30	pu	0.01	F001	800
"	6426	Stator Differential Block	0 to 4294967295	---	1	F300	0
"	6428	Stator Differential Targets	0 to 2	---	1	F109	0 (Self-reset)
"	6429	Stator Differential Events	0 to 1	---	1	F102	0 (Disabled)
"	642A	Stator Differential Line End Source	0 to 5	---	1	F167	0 (SRC 1)
"	642B	Stator Differential Neutral End Source	0 to 5	---	1	F167	0 (SRC 1)
	Negative Sequence Overvoltage (Read/Write Grouped Setting) (3 Modules)						
C70, D30, D60, F60, G30, G60, L30, L60, M60	6440	Negative Sequence Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6441	Negative Sequence Overvoltage 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	6442	Negative Sequence Overvoltage 1 Pickup	0 to 1.25	pu	0.001	F001	300
"	6443	Negative Sequence Overvoltage 1 Pickup Delay	0 to 600	s	0.01	F001	50

Products	Address	Register name	Range	Units	Step	Format	Default
"	6444	Negative Sequence Overvoltage 1 Reset Delay	0 to 600	s	0.01	F001	50
"	6445	Negative Sequence Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	6447	Negative Sequence Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6448	Negative Sequence Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6449	...Repeated for Negative Sequence Overvoltage 2					
"	6452	...Repeated for Negative Sequence Overvoltage 3					
	Overfrequency (Read/Write Setting) (4 Modules)						
D60, F60, G30, G60, L90, M60, N60, T60	6470	Overfrequency 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6471	Overfrequency 1 Block	0 to 4294967295	---	1	F300	0
"	6473	Overfrequency 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	6474	Overfrequency 1 Pickup	20 to 65	Hz	0.01	F001	6050
"	6475	Overfrequency 1 Pickup Delay	0 to 65.535	s	0.001	F001	500
"	6476	Overfrequency 1 Reset Delay	0 to 65.535	s	0.001	F001	500
"	6477	Overfrequency 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6478	Overfrequency 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6479	Reserved (4 items)	0 to 1	---	1	F001	0
"	647D	...Repeated for Overfrequency 2					
"	648A	...Repeated for Overfrequency 3					
"	6497	...Repeated for Overfrequency 4					
	Bus Configuration (Read/Write Setting) (2 Modules)						
B30	64B0	Bus Zone xA Source (6 items)	0 to 5	---	1	F167	0 (SRC 1)
"	64B6	Bus Zone xA Status (6 items)	0 to 4294967295	---	1	F300	0
"	64C2	...Repeated for Bus Zone 2					
	Bus Differential (Read/Write Grouped Setting) (4 or 6 Modules)						
B30, B90	64E0	Bus Zone 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	64E1	Bus Zone 1 Pickup	0.05 to 6	pu	0.001	F001	100
"	64E2	Bus Zone 1 Low Slope	15 to 100	%	1	F001	25
"	64E3	Bus Zone 1 Low Breakpoint	1 to 30	pu	0.01	F001	200
"	64E4	Bus Zone 1 High Slope	50 to 100	%	1	F001	60
"	64E5	Bus Zone 1 High Breakpoint	1 to 30	pu	0.01	F001	800
"	64E6	Bus Zone 1 High Set	0.1 to 99.99	pu	0.01	F001	1500
"	64E7	Bus Zone 1 Seal In	0 to 65.535	s	0.001	F001	400
"	64E8	Bus Zone 1 Block	0 to 4294967295	---	1	F300	0
"	64EA	Bus Zone 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	64EB	Bus Zone 1 Target	0 to 2	---	1	F109	0 (Self-reset)
B90	64EC	Bus Zone 1 Supervision	0 to 4294967295	---	1	F300	1
B90	64F6	Bus Zone 1 Trip	0 to 4294967295	---	1	F300	0
B30, B90	64F8	...Repeated for Bus Zone 2					
"	6510	...Repeated for Bus Zone 3					
"	6528	...Repeated for Bus Zone 4					
B90	6540	...Repeated for Bus Zone 5					
"	6558	...Repeated for Bus Zone 6					

Products	Address	Register name	Range	Units	Step	Format	Default
	Time of Day Timer (Read/Write Setting) (5 Modules)						
C70	6570	Time of Day Timer 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6571	Time of Day Timer 1 Start Time	0 to 2359	---	1	F050	0
"	6573	Time of Day Timer 1 Stop Time	0 to 2359	---	1	F050	2359
"	6575	Time of Day Timer 1 Targets	0 to 2	---	1	F109	0 (Self-reset)
"	6576	Time of Day Timer 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6577	...Repeated for Time of Day Timer 2					
"	657E	...Repeated for Time of Day Timer 3					
"	6585	...Repeated for Time of Day Timer 4					
"	658C	...Repeated for Time of Day Timer 5					
	CT Trouble (Read/Write Setting) (2 or 6 Modules)						
B30, B90	65A0	CT Trouble 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	65A1	CT Trouble 1 Pickup	0.02 to 2	pu	0.001	F001	100
"	65A2	CT Trouble 1 Delay	1 to 60	s	0.1	F001	100
"	65A3	CT Trouble 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	65A4	CT Trouble 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	65A5	...Repeated for CT Trouble 2					
B90	65AA	...Repeated for CT Trouble 3					
"	65AF	...Repeated for CT Trouble 4					
"	65B4	...Repeated for CT Trouble 5					
"	65B9	...Repeated for CT Trouble 6					
	Bus Configuration (Read/Write Setting) (6 Modules)						
B90	65BE	Bus Zone x CT (24 items)	0 to 23	---	1	F400	0
	Power Swing Detect (Read/Write Grouped Setting)						
D30, D60, G60, L60, L90, N60, T60	65C0	Power Swing Detect Function	0 to 1	---	1	F102	0 (Disabled)
"	65C1	Power Swing Detect Source	0 to 5	---	1	F167	0 (SRC 1)
"	65C2	Power Swing Detect Mode	0 to 1	---	1	F513	0 (Two Step)
"	65C3	Power Swing Detect Supervision	0.05 to 30	pu	0.001	F001	600
"	65C4	Power Swing Detect Forward Reach	0.1 to 500	ohms	0.01	F001	5000
"	65C5	Power Swing Detect Forward RCA	40 to 90	degrees	1	F001	75
"	65C6	Power Swing Detect Reverse Reach	0.1 to 500	ohms	0.01	F001	5000
"	65C7	Power Swing Detect Reverse RCA	40 to 90	degrees	1	F001	75
"	65C8	Power Swing Detect Outer Limit Angle	40 to 140	degrees	1	F001	120
"	65C9	Power Swing Detect Middle Limit Angle	40 to 140	degrees	1	F001	90
"	65CA	Power Swing Detect Inner Limit Angle	40 to 140	degrees	1	F001	60
"	65CB	Power Swing Detect Delay 1 Pickup	0 to 65.535	s	0.001	F001	30
"	65CC	Power Swing Detect Delay 1 Reset	0 to 65.535	s	0.001	F001	50
"	65CD	Power Swing Detect Delay 2 Pickup	0 to 65.535	s	0.001	F001	17
"	65CE	Power Swing Detect Delay 3 Pickup	0 to 65.535	s	0.001	F001	9
"	65CF	Power Swing Detect Delay 4 Pickup	0 to 65.535	s	0.001	F001	17
"	65D0	Power Swing Detect Seal In Delay	0 to 65.535	s	0.001	F001	400
"	65D1	Power Swing Detect Trip Mode	0 to 1	---	1	F514	0 (Delayed)
"	65D2	Power Swing Detect Block	0 to 4294967295	---	1	F300	0
"	65D4	Power Swing Detect Target	0 to 2	---	1	F109	0 (Self-reset)
"	65D5	Power Swing Detect Event	0 to 1	---	1	F102	0 (Disabled)

Products	Address	Register name	Range	Units	Step	Format	Default
"	65D6	Power Swing Detect Shape	0 to 1	---	1	F085	0 (Mho Shape)
	Bus Configuration (Read/Write Setting) (6 Modules)						
B90	65D6	Bus Zone x Dir (24 items)	0 to 1	---	1	F210	0 (IN)
	Power Swing Detect (Read/Write Grouped Setting)						
D30, D60, G60, L60, L90, N60, T60	65D7	Power Swing Detect Quad Forward Middle	0.1 to 500	ohms	0.01	F001	6000
"	65D8	Power Swing Detect Quad Forward Outer	0.1 to 500	ohms	0.01	F001	7000
"	65D9	Power Swing Detect Quad Reverse Middle	0.1 to 500	ohms	0.01	F001	6000
"	65DA	Power Swing Detect Quad Reverse Outer	0.1 to 500	ohms	0.01	F001	7000
"	65DB	Power Swing Detect Outer Right Blinder	0.1 to 500	ohms	0.01	F001	10000
"	65DC	Power Swing Detect Outer Left Blinder	0.1 to 500	ohms	0.01	F001	10000
"	65DD	Power Swing Detect Middle Right Blinder	0.1 to 500	ohms	0.01	F001	10000
"	65DE	Power Swing Detect Middle Left Blinder	0.1 to 500	ohms	0.01	F001	10000
"	65DF	Power Swing Detect Inner Right Blinder	0.1 to 500	ohms	0.01	F001	10000
"	65E0	Power Swing Detect Inner Left Blinder	0.1 to 500	ohms	0.01	F001	10000
"	65E1	Power Swing I2 Supervision Enable	0 to 4294967295	---	1	F300	0
"	65E3	Power Swing I2 Supervision	0.05 to 30	pu	0.001	F001	200
	Bus Configuration (Read/Write Setting) (6 Modules)						
B90	65EE	Bus Zone x Status (24 items)	0 to 4294967295	---	1	F300	0
	Motor Setup (Read/Write Setting)						
M60	6600	Thermal Model Motor FLA	0.05 to 1	pu	0.001	F001	1000
"	6601	Thermal Model Motor Service (Overload) Factor	1 to 1.5	---	0.01	F001	100
"	6602	Thermal Model Line Source	0 to 5	---	1	F167	0 (SRC 1)
"	6603	Thermal Model Motor Offline	0 to 4294967295	---	1	F300	0
"	6605	Thermal Model RTD 1	0 to 48	---	1	F151	0 (NONE)
"	6606	Thermal Model RTD 2	0 to 48	---	1	F151	0 (NONE)
"	6607	Thermal Model RTD 3	0 to 48	---	1	F151	0 (NONE)
"	6608	Thermal Model RTD 4	0 to 48	---	1	F151	0 (NONE)
"	6609	Thermal Model RTD 5	0 to 48	---	1	F151	0 (NONE)
"	660A	Thermal Model RTD 6	0 to 48	---	1	F151	0 (NONE)
"	660B	Motor Emergency Restart	0 to 4294967295	---	1	F300	0
"	660D	Motor Nameplate Voltage	100 to 50000	V	1	F001	600
"	660E	Speed 2 Motor Protection	0 to 1	---	1	F102	0 (Disabled)
"	660F	Speed 2 Motor Switch	0 to 4294967295	---	1	F300	0
"	6611	Speed 2 Switch 2-1 Delay	0 to 600	s	0.01	F001	500
"	6612	Speed 2 Motor Source	0 to 5	---	1	F167	0 (SRC 1)
"	6613	Speed 2 Motor FLA	0.05 to 1	pu	0.001	F001	1000
	Bus Configuration (Read/Write Setting) (6 Modules)						
B90	661E	...Repeated for Bus Zone 2					
	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

Products	Address	Register name	Range	Units	Step	Format	Default
	Thermal Model Actuals (Read Only)						
M60	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 50000	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"
	Accidental Energization (Read/Write Grouped Setting)						
G30, G60	6650	Accidental Energization Function	0 to 1	---	1	F102	0 (Disabled)
"	6651	Accidental Energization Source	0 to 5	---	1	F167	0 (SRC 1)
"	6652	Accidental Energization Arming Mode	0 to 1	---	1	F193	0 (UV AND OFFLINE)
"	6653	Accidental Energization OC Pickup	0 to 3	pu	0.001	F003	300
"	6655	Accidental Energization UV Pickup	0 to 3	pu	0.001	F003	500
"	6657	Accidental Energization Offline	0 to 4294967295	---	1	F300	0
"	6659	Accidental Energization Block	0 to 4294967295	---	1	F300	0
"	665B	Accidental Energization Target	0 to 2	---	1	F109	0 (Self-reset)
"	665C	Accidental Energization Events	0 to 1	---	1	F102	0 (Disabled)
"	665D	Reserved (5 items)	0 to 65535	---	1	F001	0
	Loss of Excitation (Read/Write Grouped Setting)						
G30, G60	666A	Loss Of Excitation Function	0 to 1	---	1	F102	0 (Disabled)
"	666B	Loss Of Excitation Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	666C	Loss Of Excitation Center 1	0.1 to 300	ohm	0.01	F001	1000
"	666D	Loss Of Excitation Radius 1	0.1 to 300	ohm	0.01	F001	800
"	666E	Loss Of Excitation UV Supervision Enable 1	0 to 1	---	1	F102	1 (Enabled)
"	666F	Loss Of Excitation Pickup Delay 1	0 to 65.535	s	0.001	F001	50
"	6670	Loss Of Excitation Center 2	0.1 to 300	ohm	0.01	F001	1200
"	6671	Loss Of Excitation Radius 2	0.1 to 300	ohm	0.01	F001	1000
"	6672	Loss Of Excitation UV Supervision Enable 2	0 to 1	---	1	F102	1 (Enabled)
"	6673	Loss Of Excitation Pickup Delay 2	0 to 65.535	s	0.001	F001	500
"	6674	Loss Of Excitation UV Supervision	0 to 1.25	pu	0.001	F001	700
"	6675	Loss Of Excitation Block	0 to 4294967295	---	1	F300	0
"	6677	Loss Of Excitation Target	0 to 2	---	1	F109	0 (Self-reset)
"	6678	Loss Of Excitation Events	0 to 1	---	1	F102	0 (Disabled)
"	6679	Reserved (5 items)	0 to 65535	---	1	F001	0
	Bus Configuration (Read/Write Setting) (6 Modules)						
B90	667E	...Repeated for Bus Zone 3					

Products	Address	Register name	Range	Units	Step	Format	Default
	Sensitive Directional Power (Read/Write Grouped Setting) (2 Modules)						
C60, D60, F60, G30, G60, L90, M60, N60	6680	Sensitive Directional Power 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6681	Sensitive Directional Power 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	6682	Sensitive Directional Power 1 RCA	0 to 359	degrees	1	F001	0
"	6683	Sensitive Directional Power 1 Calibration	0 to 0.95	degrees	0.05	F001	0
"	6684	Sensitive Directional Power 1 STG1 SMIN	-1.2 to 1.2	pu	0.001	F002	100
"	6685	Sensitive Directional Power 1 STG1 Delay	0 to 600	s	0.01	F001	50
"	6686	Sensitive Directional Power 1 STG2 SMIN	-1.2 to 1.2	pu	0.001	F002	100
"	6687	Sensitive Directional Power 1 STG2 Delay	0 to 600	s	0.01	F001	2000
"	6688	Sensitive Directional Power 1 Block	0 to 4294967295	---	1	F300	0
"	668A	Sensitive Directional Power 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	668B	Sensitive Directional Power 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	668C	Reserved (5 items)	0 to 65535	---	1	F001	0
"	6691	...Repeated for Sensitive Directional Power 2					
	Underpower (Read/Write Grouped Setting) (2 Modules)						
M60	66AA	Underpower 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	66AB	Underpower 1 Start Block Delay	0 to 600	s	0.01	F001	50
"	66AC	Underpower 1 Alarm Power Pickup	0.05 to 2	pu	0.01	F001	50
"	66AD	Underpower 1 Alarm Pickup Delay	0 to 600	s	0.01	F001	200
"	66AE	Underpower 1 Trip Power Pickup	0.05 to 2	pu	0.01	F001	40
	Underpower (Read/Write Grouped Setting) (2 Modules)						
M60	66AF	Underpower 1 Trip Pickup Delay	0 to 600	s	0.01	F001	100
"	66B0	Underpower 1 Trip Reset Delay	0 to 600	s	0.01	F001	100
"	66B1	Underpower 1 Block	0 to 4294967295	---	1	F300	0
"	66B3	Underpower 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	66B4	Underpower 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	66B5	...Repeated for Underpower 2					
	Load Encroachment (Read/Write Grouped Setting)						
D30, D60, F60, L60, L90, T60	66C0	Load Encroachment Function	0 to 1	---	1	F102	0 (Disabled)
"	66C1	Load Encroachment Source	0 to 5	---	1	F167	0 (SRC 1)
"	66C2	Load Encroachment Minimum Voltage	0 to 3	pu	0.001	F001	250
"	66C3	Load Encroachment Reach	0.02 to 250	ohms	0.01	F001	100
"	66C4	Load Encroachment Angle	5 to 50	degrees	1	F001	30
"	66C5	Load Encroachment Pickup Delay	0 to 65.535	s	0.001	F001	0
"	66C6	Load Encroachment Reset Delay	0 to 65.535	s	0.001	F001	0
"	66C7	Load Encroachment Block	0 to 4294967295	---	1	F300	0
"	66C9	Load Encroachment Target	0 to 2	---	1	F109	0 (Self-reset)
"	66CA	Load Encroachment Events	0 to 1	---	1	F102	0 (Disabled)
"	66CB	Reserved (6 items)	0 to 65535	---	1	F001	0
	Third Harmonic Neutral Undervoltage (Read/Write Grouped Setting)						
G30, G60	66DA	Third Harmonic Neutral Undervoltage Function	0 to 1	---	1	F102	0 (Disabled)
"	66DB	Third Harmonic Neutral Undervoltage Pickup	0 to 3	pu	0.0001	F003	3000

Products	Address	Register name	Range	Units	Step	Format	Default
"	66DD	Third Harmonic Neutral Undervoltage Delay	0 to 600	s	0.01	F001	0
"	66DE	Third Harmonic Neutral Undervoltage Max Power	0 to 1.25	pu	0.001	F003	200
	Bus Configuration (Read/Write Setting) (6 Modules)						
B90	66DE	...Repeated for Bus Zone 4					
	Third Harmonic Neutral Undervoltage (Read/Write Grouped Setting)						
G30, G60	66E0	Third Harmonic Neutral Undervoltage Min Power	0 to 1.25	pu	0.001	F003	200
"	66E2	Third Harmonic Neutral Undervoltage Volt Supervision	0 to 1.25	pu	0.001	F001	500
"	66E3	Third Harmonic Neutral Undervoltage Block	0 to 4294967295	---	1	F300	0
"	66E5	Third Harmonic Neutral Undervoltage Target	0 to 2	---	1	F109	0 (Self-reset)
"	66E6	Third Harmonic Neutral Undervoltage Events	0 to 1	---	1	F102	0 (Disabled)
"	66E7	Reserved (4 items)	0 to 65535	---	1	F001	0
	Generator Unbalance (Read/Write Grouped Setting)						
G30, G60	66F0	Generator Unbalance Function	0 to 1	---	1	F102	0 (Disabled)
"	66F1	Generator Unbalance Source	0 to 5	---	1	F167	0 (SRC 1)
"	66F2	Generator Unbalance Inom (rated full load current of the machine)	0 to 1.25	pu	0.001	F001	800
"	66F3	Generator Unbalance Stage 1 Pickup	0 to 100	%	0.01	F001	800
"	66F4	Generator Unbalance Stage 1 K value	0 to 100	---	0.01	F001	100
"	66F5	Generator Unbalance Stage 1 Tmin	0 to 50	s	0.001	F001	250
"	66F6	Generator Unbalance Stage 1 Tmax	0 to 1000	s	0.1	F001	6000
"	66F7	Generator Unbalance Stage 1 K Reset	0 to 1000	s	0.1	F001	2400
"	66F8	Generator Unbalance Stage 2 Pickup	0 to 100	%	0.01	F001	300
"	66F9	Generator Unbalance Stage 2 Pickup Delay	0 to 1000	s	0.1	F001	50
"	66FA	Generator Unbalance Block	0 to 4294967295	---	1	F300	0
"	66FC	Generator Unbalance Target	0 to 2	---	1	F109	0 (Self-reset)
"	66FD	Generator Unbalance Events	0 to 1	---	1	F102	0 (Disabled)
"	66FE	Reserved (3 items)	0 to 65535	---	1	F001	0
	Stator Ground Source (Read/Write Grouped Setting)						
G30, G60	670A	Stator Ground Source	0 to 5	---	1	F167	0 (SRC 1)
	Subharmonic Stator Ground (Read/Write Grouped Setting)						
G60	6710	Subharmonic Stator Ground Function	0 to 1	---	1	F102	0 (Disabled)
"	6711	Subharmonic Stator Ground Stage 1 Pickup	1 to 20	kOhm	1	F001	10
"	6712	Subharmonic Stator Ground Stage 1 Pickup Delay	0.1 to 600	s	0.1	F001	100
"	6713	Subharmonic Stator Ground Stage 2 Pickup	1 to 20	kOhm	1	F001	3
"	6714	Subharmonic Stator Ground Stage 2 Pickup Delay	0.1 to 600	s	0.1	F001	10
"	6715	Subharmonic CT Angle Compensation	-30 to 30	degrees	0.1	F002	0
"	6718	Subharmonic Stator Ground OC Pickup	0.001 to 1	pu	0.001	F001	10
"	6719	Subharmonic Stator Ground OC Delay	0.01 to 600	s	0.01	F001	100
"	671A	Subharmonic Stator Ground Volt Supv	0 to 0.1	pu	0.001	F001	0
"	671B	Subharmonic Stator Ground Curr Supv	0 to 0.1	pu	0.001	F001	0
"	671C	Subharmonic Stator Ground Block	0 to 4294967295	---	---	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	671E	Subharmonic Stator Ground Events	0 to 1	---	1	F102	0 (Disabled)
"	671F	Subharmonic Stator Ground Target	0 to 2	---	1	F109	0 (Self-reset)
	Stator Ground (Read/Write Grouped Setting)						
G30, G60	6720	Stator Ground Function	0 to 1	---	1	F102	0 (Disabled)
"	6721	Stator Ground Stage 1 Pickup	0 to 0.9	pu	0.001	F001	150
"	6722	Stator Ground Stage 1 Pickup Delay	0 to 600	s	0.01	F001	100
"	6723	Stator Ground Stage 1 Supv	0.001 to 0.1	pu	0.0001	F001	57
"	6724	Stator Ground Stage 2 Pickup	0 to 0.9	pu	0.001	F001	150
"	6725	Stator Ground Stage 2 Pickup Delay	0 to 600	s	0.01	F001	0
"	6726	Stator Ground Stage 2 Supv	0.001 to 0.1	pu	0.0001	F001	45
"	6727	Stator Ground Block	0 to 4294967295	---	1	F300	0
"	6729	Stator Ground Target	0 to 2	---	1	F109	0 (Self-reset)
"	672A	Stator Ground Event	0 to 1	---	1	F102	0 (Disabled)
"	672B	Reserved (5 items)	0 to 65535	---	1	F001	0
	Split Phase Protection (Read/Write Grouped Setting)						
G30, G60	6730	Split Phase Protection Function	0 to 1	---	1	F102	0 (Disabled)
"	6731	Split Phase Protection Source	0 to 5	---	1	F167	0 (SRC1)
"	6732	Split Phase Protection Load Source	0 to 5	---	1	F167	0 (SRC1)
"	6733	Split Phase Protection Phase A Pickup	0.02 to 1.5	pu	0.001	F001	200
"	6734	Split Phase Protection Phase A Offset	0 to 1	pu	0.001	F001	0
"	6735	Split Phase Protection Phase A Slope	0 to 100	%	0.1	F001	0
"	6736	Split Phase Protection Phase B Pickup	0.02 to 1.5	pu	0.001	F001	200
"	6737	Split Phase Protection Phase B Offset	0 to 1	pu	0.001	F001	0
"	6738	Split Phase Protection Phase B Slope	0 to 100	%	0.1	F001	0
"	6739	Split Phase Protection Phase C Pickup	0.02 to 1.5	pu	0.001	F001	200
"	673A	Split Phase Protection Phase C Offset	0 to 1	pu	0.001	F001	0
"	673B	Split Phase Protection Phase C Slope	0 to 100	%	0.1	F001	0
"	673C	Split Phase Protection Minimum Load	0 to 1	pu	0.01	F001	0
"	673D	Split Phase Protection Mode	0 to 1	---	1	F225	0 (Over)
"	673E	Split Phase Protection Delay	0 to 65.535	s	0.001	F001	0
	Bus Configuration (Read/Write Setting) (6 Modules)						
B90	673E	...Repeated for Bus Zone 5					
	Split Phase Protection (Read/Write Grouped Setting)						
G30, G60	673F	Split Phase Protection Block	0 to 4294967295	---	1	F300	0
"	6741	Split Phase Protection Target	0 to 2	---	1	F109	0 (Self-Reset)
"	6742	Split Phase Protection Events	0 to 1	---	1	F102	0 (Disabled)
"	6743	Reserved (6 items)	0 to 65535	---	1	F001	0
	Reduced Voltage Starting (Read/Write Setting)						
M60	6750	Reduced Voltage Start Function	0 to 1	---	1	F102	0 (Disabled)
"	6751	Reduced Voltage Start Transition Mode	0 to 2	---	1	F095	0 (Current Only)
"	6752	Reduced Voltage Start FLA (full load current)	25 to 300	%	1	F001	125
"	6753	Reduced Voltage Start Timer	1 to 600	s	0.1	F001	100
"	6754	Reduced Voltage Start Block	0 to 4294967295	---	1	F300	0
"	6756	Reduced Voltage Target	0 to 2	---	1	F109	0 (Self-reset)

Products	Address	Register name	Range	Units	Step	Format	Default
"	6757	Reduced Voltage Start Event	0 to 1	---	1	F102	0 (Disabled)
"	6758	Reserved (5 items)	0 to 1	---	1	F001	0
	Trip Output (Read/Write Setting)						
D60, L60, L90	6760	Trip Mode	0 to 2	---	1	F195	0 (Disabled)
"	6761	Trip 3-Pole Input1	0 to 4294967295	---	1	F300	0
"	6763	Trip 3-Pole Input2	0 to 4294967295	---	1	F300	0
"	6765	Trip 3-Pole Input3	0 to 4294967295	---	1	F300	0
"	6767	Trip 3-Pole Input4	0 to 4294967295	---	1	F300	0
"	6769	Trip 3-Pole Input5	0 to 4294967295	---	1	F300	0
"	676B	Trip 3-Pole Input6	0 to 4294967295	---	1	F300	0
"	676D	Trip 1-Pole Input1	0 to 4294967295	---	1	F300	0
"	676F	Trip 1-Pole Input2	0 to 4294967295	---	1	F300	0
"	6771	Trip 1-Pole Input3	0 to 4294967295	---	1	F300	0
"	6773	Trip 1-Pole Input4	0 to 4294967295	---	1	F300	0
"	6775	Trip 1-Pole Input5	0 to 4294967295	---	1	F300	0
"	6777	Trip 1-Pole Input6	0 to 4294967295	---	1	F300	0
"	6779	Trip Reclose Input1	0 to 4294967295	---	1	F300	0
"	677B	Trip Reclose Input2	0 to 4294967295	---	1	F300	0
"	677D	Trip Reclose Input3	0 to 4294967295	---	1	F300	0
"	677F	Trip Reclose Input4	0 to 4294967295	---	1	F300	0
"	6781	Trip Reclose Input5	0 to 4294967295	---	1	F300	0
"	6783	Trip Reclose Input6	0 to 4294967295	---	1	F300	0
"	6785	Trip Force 3-Pole	0 to 4294967295	---	1	F300	0
"	6787	Trip Pilot Priority	0 to 65.535	s	0.001	F001	0
"	6788	Breaker Phase A Open	0 to 4294967295	---	1	F300	0
"	678A	Breaker Phase B Open	0 to 4294967295	---	1	F300	0
"	678C	Breaker Phase C Open	0 to 4294967295	---	1	F300	0
"	678E	Trip Events	0 to 1	---	1	F102	0 (Disabled)
"	678F	Reverse Fault Operand	0 to 4294967295	---	1	F300	0
"	6791	Trip Delay On Evolving Faults	0 to 65.535	s	0.001	F001	0
"	6792	Trip Seal-In Delay	0 to 65.535	s	0.001	F001	0
"	6793	Trip Reset	0 to 2	---	1	F609	0 (Pole Curr OR Custom)
"	6794	Start Timer Zone 2 Phase Input 1	0 to 4294967295	---	1	F300	0
"	6796	Start Timer Zone 2 Phase Input 2	0 to 4294967295	---	1	F300	0
"	6798	Start Timer Zone 2 Ground Input 1	0 to 4294967295	---	1	F300	0
"	679A	Start Timer Zone 2 Ground Input 2	0 to 4294967295	---	1	F300	0
"	679C	Phase Selector Reset Delay	0.5 to 3	s	0.001	F001	500
"	679D	Reserved (4 items)	0 to 1	---	1	F001	0
	Bus Configuration (Read/Write Setting) (6 Modules)						
B90	679E	...Repeated for Bus Zone 6					
	Open Pole Detect (1P) (Read/Write Setting)						
D60, L60, L90	67B0	Open Pole Function	0 to 1	---	1	F102	0 (Disabled)
"	67B1	Open Pole Block	0 to 4294967295	---	1	F300	0
"	67B3	Open Pole Voltage Supervision	0 to 1	---	1	F102	0 (Disabled)
"	67B4	Open Pole Current Pickup	0 to 30	pu	0.001	F001	50
"	67B5	Open Pole Target	0 to 2	---	1	F109	0 (Self-reset)

Products	Address	Register name	Range	Units	Step	Format	Default
"	67B6	Open Pole Events	0 to 1	---	1	F102	0 (Disabled)
"	67B7	Open Pole Line XC0	300 to 9999.9	ohms	0.1	F003	99999
"	67B9	Open Pole Line XC1	300 to 9999.9	ohms	0.1	F003	99999
"	67BB	Open Pole Remote Current Pickup	0 to 30	pu	0.001	F001	50
"	67BC	Open Pole Detection	0 to 1	---	1	F608	0 (I AND V AND CBaux)
"	67BD	Open Pole Mode	0 to 1	---	1	F607	0 (Accelerated)
"	67BE	Reserved (3 items)	0 to 1	---	1	F001	0
	Pilot DUTT (1P) (Read/Write Setting)						
D60, L90	67D0	DUTT Function	0 to 1	---	1	F102	0 (Disabled)
"	67D1	DUTT Seal In Delay	0 to 65.535	s	0.001	F001	0
"	67D2	DUTT 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	67D3	DUTT RX1	0 to 4294967295	---	1	F300	0
"	67D5	DUTT RX2	0 to 4294967295	---	1	F300	0
"	67D7	DUTT RX3	0 to 4294967295	---	1	F300	0
"	67D9	DUTT RX4	0 to 4294967295	---	1	F300	0
"	67DB	DUTT 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	67DC	DUTT 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	67DD	DUTT 1P Scheme Block	0 to 4294967295	---	1	F300	0
"	67DF	Reserved (6 items)	0 to 1	---	1	F001	0
	Pilot PUTT (1P) (Read/Write Setting)						
D60, L90	67EA	PUTT 1P Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	67EB	PUTT 1P Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	67EC	PUTT 1P Seal In Delay	0 to 65.535	s	0.001	F001	0
"	67ED	PUTT 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	67EE	PUTT 1P Rx1	0 to 4294967295	---	1	F300	0
"	67F0	PUTT 1P Rx2	0 to 4294967295	---	1	F300	0
"	67F2	PUTT 1P Rx3	0 to 4294967295	---	1	F300	0
"	67F4	PUTT 1P Rx4	0 to 4294967295	---	1	F300	0
"	67F6	PUTT 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	67F7	PUTT 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	67F8	PUTT 1P Scheme Block	0 to 4294967295	---	1	F300	0
"	67FA	Reserved (5 items)	0 to 1	---	1	F001	0
	Pilot Hybrid POTT (1P) (Read/Write Setting)						
D60, L90	6820	Hybrid POTT 1P Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	6821	Hybrid POTT 1P Permissive Echo	0 to 2	---	1	F199	0 (Disabled)
"	6822	Hybrid POTT 1P Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	6823	Hybrid POTT 1P Trans Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	6824	Hybrid POTT 1P Trans Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	6825	Hybrid POTT 1P Echo Duration	0 to 65.535	s	0.001	F001	100
"	6826	Hybrid POTT 1P Echo Lockout	0 to 65.535	s	0.001	F001	250
"	6827	Hybrid POTT 1P Seal In Delay	0 to 65.535	---	0.001	F001	0
"	6828	Hybrid POTT 1P Ground Directional Overcurrent Forward	0 to 4294967295	---	1	F300	0
"	682A	Hybrid POTT 1P Gnd Directional Overcurrent Reverse	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	682C	Hybrid POTT 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	682D	Hybrid POTT 1P Rx1	0 to 4294967295	---	1	F300	0
"	682F	Hybrid POTT 1P Rx2	0 to 4294967295	---	1	F300	0
"	6831	Hybrid POTT 1P Rx3	0 to 4294967295	---	1	F300	0
"	6833	Hybrid POTT 1P Rx4	0 to 4294967295	---	1	F300	0
"	6835	Hybrid POTT 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	6836	Hybrid POTT 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	6837	Hybrid POTT 1P Echo Condition	0 to 4294967295	---	1	F300	0
"	6839	Hybrid POTT 1P Weak Infeed	0 to 2	---	1	F199	1 (Enabled)
"	683A	Hybrid POTT 1P Weak Infeed Condition	0 to 4294967295	---	1	F300	0
"	683C	Hybrid POTT 1P Block	0 to 4294967295	---	1	F300	0
"	683E	Reserved (3 items)	0 to 1	---	1	F001	0
	Pilot Blocking (1P) (Read/Write Setting)						
D60, L90	6845	Blocking Scheme 1P Function	0 to 1	---	1	F102	0 (Disabled)
"	6846	Block 1P Rx Coord Pickup Delay	0 to 65.535	s	0.001	F001	10
"	6847	Block 1P Transient Block Pickup Delay	0 to 65.535	s	0.001	F001	30
"	6848	Block 1P Transient Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	6849	Blocking Scheme 1P Seal In Delay	0 to 65.535	s	0.001	F001	0
"	684A	Blocking Scheme 1P Gnd Directional Overcurrent Fwd	0 to 4294967295	---	1	F300	0
"	684C	Blocking Scheme 1P Gnd Directional Overcurrent Rev	0 to 4294967295	---	1	F300	0
"	684E	Blocking Scheme 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	684F	Blocking Scheme 1P Rx1	0 to 4294967295	---	1	F300	0
"	6851	Blocking Scheme 1P Rx2	0 to 4294967295	---	1	F300	0
"	6853	Blocking Scheme 1P Rx3	0 to 4294967295	---	1	F300	0
"	6855	Blocking Scheme 1P Rx4	0 to 4294967295	---	1	F300	0
"	6857	Blocking 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	6858	Blocking 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	6859	Blocking Scheme 1P Block	0 to 4294967295	---	1	F300	0
"	685B	Reserved (5 items)	0 to 1	---	1	F001	0
	Autoreclose 1P 3P (Read/Write Setting)						
C60, D60, L60, L90	6860	Autoreclose Mode	0 to 3	---	1	F622	0 (Mode 1 (1 & 3 Pole))
"	6861	Autoreclose Maximum Number of Shots	1 to 4	---	1	F001	2
"	6862	Autoreclose Block Breaker 1	0 to 4294967295	---	1	F300	0
"	6864	Autoreclose Close Time Breaker 1	0 to 655.35	s	0.01	F001	10
"	6865	Autoreclose Breaker Manual Close	0 to 4294967295	---	1	F300	0
"	6867	Autoreclose Function	0 to 1	---	1	F102	0 (Disabled)
"	6868	Autoreclose Block Time Manual Close	0 to 655.35	s	0.01	F001	1000
"	6869	Autoreclose 1P Initiate	0 to 4294967295	---	1	F300	0
"	686B	Autoreclose 3P Initiate	0 to 4294967295	---	1	F300	0
"	686D	Autoreclose 3P TD Initiate	0 to 4294967295	---	1	F300	0
"	686F	Autoreclose Multi-Phase Fault	0 to 4294967295	---	1	F300	0
"	6871	Autoreclose Breaker 1 Pole Open	0 to 4294967295	---	1	F300	0
"	6873	Autoreclose Breaker 3 Pole Open	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	6875	Autoreclose 3-Pole Dead Time 1	0 to 655.35	s	0.01	F001	50
"	6876	Autoreclose 3-Pole Dead Time 2	0 to 655.35	s	0.01	F001	120
"	6877	Autoreclose Extend Dead T1	0 to 4294967295	---	1	F300	0
"	6879	Autoreclose Dead T1 Extension	0 to 655.35	s	0.01	F001	50
"	687A	Autoreclose Reset	0 to 4294967295	---	1	F300	0
"	687C	Autoreclose Reset Time	0 to 655.35	s	0.01	F001	6000
"	687D	Autoreclose Breaker Closed	0 to 4294967295	---	1	F300	0
"	687F	Autoreclose Block	0 to 4294967295	---	1	F300	0
"	6881	Autoreclose Pause	0 to 4294967295	---	1	F300	0
"	6883	Autoreclose Incomplete Sequence Time	0 to 655.35	s	0.01	F001	500
"	6884	Autoreclose Block Breaker 2	0 to 4294967295	---	1	F300	0
"	6886	Autoreclose Close Time Breaker 2	0 to 655.35	s	0.01	F001	10
"	6887	Autoreclose Transfer 1 to 2	0 to 1	---	1	F126	0 (No)
"	6888	Autoreclose Transfer 2 to 1	0 to 1	---	1	F126	0 (No)
"	6889	Autoreclose Breaker 1 Fail Option	0 to 1	---	1	F081	0 (Continue)
"	688A	Autoreclose Breaker 2 Fail Option	0 to 1	---	1	F081	0 (Continue)
"	688B	Autoreclose 1P Dead Time	0 to 655.35	s	0.01	F001	100
"	688C	Autoreclose Breaker Sequence	0 to 4	---	1	F082	3 (1 - 2)
"	688D	Autoreclose Transfer Time	0 to 655.35	s	0.01	F001	400
"	688E	Autoreclose Event	0 to 1	---	1	F102	0 (Disabled)
"	688F	Autoreclose 3P Dead Time 3	0 to 655.35	s	0.01	F001	200
"	6890	Autoreclose 3P Dead Time 4	0 to 655.35	s	0.01	F001	400
"	6891	Autoreclose Bus Fault Initiate	0 to 4294967295	---	1	F300	0
"	6893	Autoreclose Initiate Mode	0 to 1	---	1	F610	0 (Protection AND CB)
"	6894	Autoreclose Mode Aut	0 to 3	---	1	F622	0 (Mode 1 (1 & 3 Pole))
"	6895	Autoreclose Mode 1 Activation	0 to 4294967295	---	1	F300	0
"	6897	Autoreclose Mode 2 Activation	0 to 4294967295	---	1	F300	0
"	6899	Autoreclose Mode 3 Activation	0 to 4294967295	---	1	F300	0
"	689B	Autoreclose Mode 4 Activation	0 to 4294967295	---	1	F300	0
	Pilot Directional Comparison Unblocking (DCUB) Scheme (Read/Write Setting)						
D60, L90	68A0	Directional Comparison Unblocking Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	68A1	Directional Comparison Unblocking Block	0 to 4294967295	---	1	F300	0
"	68A3	Directional Comparison Unblocking Permissive Echo	0 to 2	---	1	F199	0 (Disabled)
"	68A4	Directional Comparison Unblocking Echo Condition	0 to 4294967295	---	1	F300	0
"	68A6	DCUB Ground Directional Overcurrent Forward	0 to 4294967295	---	1	F300	0
"	68A8	DCUB Ground Directional Overcurrent Reverse	0 to 4294967295	---	1	F300	0
"	68AA	DCUB Transmit Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	68AB	DCUB Transmit Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	68AC	Directional Comparison Unblocking Echo Duration	0 to 65.535	s	0.001	F001	100
"	68AD	Directional Comparison Unblocking Echo Lockout	0 to 65.535	s	0.001	F001	250
"	68AE	DCUB Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	50

Products	Address	Register name	Range	Units	Step	Format	Default
"	68AF	DCUB Loss-of-Guard (Log) Pickup Delay	0 to 65.535	s	0.001	F001	8
"	68B0	DCUB Guard Healthy Reset Delay	0 to 65.535	s	0.001	F001	15
"	68B1	DCUB Loss-of-Guard Trip Window	0 to 65.535	s	0.001	F001	150
"	68B2	Directional Comparison Unblocking Seal-In Delay	0 to 65.535	s	0.001	F001	10
"	68B3	Directional Comparison Unblocking Communication Bits	0 to 2	---	1	F198	0 (1 bit)
"	68B4	Directional Comparison Unblocking Rx1	0 to 4294967295	---	1	F300	0
"	68B6	Directional Comparison Unblocking Log1	0 to 4294967295	---	1	F300	0
"	68B8	Directional Comparison Unblocking Rx2	0 to 4294967295	---	1	F300	0
"	68BA	Directional Comparison Unblocking Log2	0 to 4294967295	---	1	F300	0
"	68BC	Directional Comparison Unblocking Rx3	0 to 4294967295	---	1	F300	0
"	68BE	Directional Comparison Unblocking Log3	0 to 4294967295	---	1	F300	0
"	68C0	Directional Comparison Unblocking Rx4	0 to 4294967295	---	1	F300	0
"	68C2	Directional Comparison Unblocking Log4	0 to 4294967295	---	1	F300	0
"	68C4	Directional Comparison Unblocking Target	0 to 2	---	1	F109	0 (Self-Reset)
"	68C5	Directional Comparison Unblocking Event	0 to 1	--	1	F102	0 (Disabled)
"	68C6	Reserved (6 items)	0 to 1	--	1	F001	0
	Motor Acceleration Actuals (Read Only Non-Volatile) (5 Modules)						
M60	68D0	Motor Acceleration 1 Time/Date	0 to 4294967295	---	1	F050	0
"	68D2	Motor Acceleration 1 Starting Time	0 to 655.35	s	0.01	F001	0
"	68D3	Motor Acceleration 1 Effective Current	0 to 999999.999	A	0.001	F060	0
"	68D5	Motor Acceleration 1 Peak Current	0 to 999999.999	A	0.001	F060	0
"	68D7	Reserved (8 items)	---	---	---	F001	0
"	68DF	...Repeated for Motor Acceleration 2					
"	68EE	...Repeated for Motor Acceleration 3					
"	68FD	...Repeated for Motor Acceleration 4					
"	690C	...Repeated for Motor Acceleration 5					
	Motor Acceleration Commands (Read/Write Command)						
M60	691F	Motor Acceleration Clear Data Command	0 to 1	---	1	F126	0 (No)
	Motor Maximum Starting Rate (Read/Write Setting)						
M60	6920	Starts Per Hour Function	0 to 1	---	1	F102	0 (Disabled)
"	6921	Starts Per Hour Time Interval	1 to 300	min	1	F001	60
"	6922	Starts Per Hour Maximum Number of Starts	1 to 16	---	1	F001	3
"	6923	Starts Per Hour Block	0 to 4294967295	---	1	F300	0
"	6925	Starts Per Hour Target	0 to 2	---	1	F109	0 (Self-reset)
"	6926	Starts Per Hour Events	0 to 1	---	1	F102	0 (Disabled)
"	6927	Reserved (9 items)	---	---	---	F001	0
	Motor Time Between Starts (Read/Write Setting)						
M60	6930	Time Between Starts Function	0 to 1	---	1	F102	0 (Disabled)
"	6931	Time Between Starts Minimum Time	0 to 300	min	1	F001	20
"	6932	Time Between Starts Block	0 to 4294967295	---	1	F300	0
"	6934	Time Between Starts Target	0 to 2	---	1	F109	0 (Self-reset)
"	6935	Time Between Starts Events	0 to 1	---	1	F102	0 (Disabled)
"	6936	Reserved (10 items)	0 to 1	---	1	F001	0
	Motor Restart Delay (Read/Write Setting)						
M60	6940	Restart Delay Function	0 to 1	---	1	F102	0 (Disabled)

Products	Address	Register name	Range	Units	Step	Format	Default
"	6941	Restart Delay Minimum Time	0 to 50000	s	1	F001	0
"	6942	Restart Delay Block	0 to 4294967295	---	1	F300	0
"	6944	Restart Delay Target	0 to 2	---	1	F109	0 (Self-reset)
"	6945	Restart Delay Events	0 to 1	---	1	F102	0 (Disabled)
"	6946	Reserved (10 items)	---	---	---	F001	0
	Motor Mechanical Jam (Read/Write Grouped Setting)						
M60	6950	Mechanical Jam Function	0 to 1	---	1	F102	0 (Disabled)
"	6951	Mechanical Jam Pickup	1 to 10	x FLA	0.01	F001	200
"	6952	Mechanical Jam Pickup Delay	0.1 to 600	s	0.01	F001	10
"	6953	Mechanical Jam Reset Delay	0 to 600	s	0.01	F001	0
"	6954	Mechanical Jam Block	0 to 4294967295	---	1	F300	0
"	6956	Mechanical Jam Target	0 to 2	---	1	F109	0 (Self-reset)
"	6957	Mechanical Jam Events	0 to 1	---	1	F102	0 (Disabled)
"	6958	Reserved (8 items)	---	---	---	F001	0
	Motor Learned Data (Read/Write Setting)						
M60	6960	Motor Learned Data Starts to Learn	1 to 5	---	1	F001	1
"	6961	Motor Learned Data Calculation Period	1 to 90	minutes	1	F001	15
"	6962	Reserved	---	---	---	F001	0
	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 Acceleration Time	0 to 655.35	s	0.01	F001	0
"	6967	Motor Learned Data Starting Current	0 to 40	x FLA	0.01	F001	0
"	6968	Motor Learned Data Thermal Capacity Used	0 to 65535	%	1	F001	0
"	6969	Motor Learned Data Motor Load	0 to 40	x FLA	0.01	F001	0
"	696A	Motor Learned Data Run Time After Start	0 to 4294967295	hr	1	F050	0
"	696C	Reserved	---	---	---	F001	0
	Undervoltage (Read/Write Grouped Setting) (12 Modules)						
B90	6AF0	Undervoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6AF1	Undervoltage 1 VT	0 to 11	---	1	F400	0
"	6AF2	Undervoltage 1 Pickup	0 to 3	pu	0.001	F001	800
"	6AF3	Undervoltage 1 Minimum Voltage	0 to 1	pu	0.001	F001	0
"	6AF4	Undervoltage 1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	6AF5	Undervoltage 1 Reset Delay	0 to 65.535	s	0.001	F001	0
"	6AF6	Undervoltage 1 Block	0 to 4294967295	---	1	F300	0
"	6AF8	Undervoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6AF9	Undervoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6AFA	Reserved (2 items)	---	---	---	F001	0
"	6AFC	...Repeated for Undervoltage 2					
"	6B08	...Repeated for Undervoltage 3					
"	6B14	...Repeated for Undervoltage 4					
"	6B20	...Repeated for Undervoltage 5					
"	6B2C	...Repeated for Undervoltage 6					
"	6B38	...Repeated for Undervoltage 7					
"	6B44	...Repeated for Undervoltage 8					
"	6B50	...Repeated for Undervoltage 9					

Products	Address	Register name	Range	Units	Step	Format	Default
"	6B5C	...Repeated for Undervoltage 10					
"	6B68	...Repeated for Undervoltage 11					
"	6B74	...Repeated for Undervoltage 12					
	End of Fault Protection (Read/Write Grouped Setting) (24 Modules)						
B90	6B80	End of Fault Protection 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6B81	End of Fault Protection 1 CT	0 to 23	---	1	F400	0
"	6B82	End of Fault Protection 1 Pickup	0 to 30	pu	0.001	F001	1200
"	6B83	End of Fault Protection 1 Breaker Open	0 to 4294967295	---	1	F300	0
"	6B85	End of Fault Protection 1 Breaker Delay	0 to 65.535	s	0.001	F001	400
"	6B86	End of Fault Protection 1 Manual Close	0 to 4294967295	---	1	F300	0
"	6B88	End of Fault Protection 1 Pickup Delay	0 to 65.535	s	0.001	F001	40
"	6B89	End of Fault Protection 1 Block	0 to 4294967295	---	1	F300	0
"	6B8B	End of Fault Protection 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6B8C	End of Fault Protection 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6B8D	...Repeated for End of Fault Protection 2					
"	6B9A	...Repeated for End of Fault Protection 3					
"	6BA7	...Repeated for End of Fault Protection 4					
"	6BB4	...Repeated for End of Fault Protection 5					
"	6BC1	...Repeated for End of Fault Protection 6					
"	6BCE	...Repeated for End of Fault Protection 7					
"	6BDB	...Repeated for End of Fault Protection 8					
"	6BE8	...Repeated for End of Fault Protection 9					
"	6BF5	...Repeated for End of Fault Protection 10					
"	6C02	...Repeated for End of Fault Protection 11					
"	6C0F	...Repeated for End of Fault Protection 12					
"	6C1C	...Repeated for End of Fault Protection 13					
"	6C29	...Repeated for End of Fault Protection 14					
"	6C36	...Repeated for End of Fault Protection 15					
"	6C43	...Repeated for End of Fault Protection 16					
"	6C50	...Repeated for End of Fault Protection 17					
"	6C5D	...Repeated for End of Fault Protection 18					
"	6C6A	...Repeated for End of Fault Protection 19					
"	6C77	...Repeated for End of Fault Protection 20					
"	6C84	...Repeated for End of Fault Protection 21					
"	6C91	...Repeated for End of Fault Protection 22					
"	6C9E	...Repeated for End of Fault Protection 23					
"	6CAB	...Repeated for End of Fault Protection 24					
	Bus Replica Isolator (Read/Write Setting) (48 Modules)						
B90	6CBC	Isolator 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	6CBD	Isolator 1 Open	0 to 4294967295	---	1	F300	0
"	6CBF	Isolator 1 Closed	0 to 4294967295	---	1	F300	0
"	6CC1	Isolator 1 Alarm Delay	0 to 120	s	0.05	F001	5
"	6CC2	Isolator 1 Reset	0 to 4294967295	---	1	F300	0
"	6CC4	Isolator 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	6CC5	Isolator 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	6CC6	Reserved (2 items)	---	---	---	F001	0
"	6CC8	...Repeated for Isolator 2					

Products	Address	Register name	Range	Units	Step	Format	Default
"	6CD4	...Repeated for Isolator 3					
"	6CE0	...Repeated for Isolator 4					
"	6CEC	...Repeated for Isolator 5					
"	6CF8	...Repeated for Isolator 6					
"	6D04	...Repeated for Isolator 7					
"	6D10	...Repeated for Isolator 8					
"	6D1C	...Repeated for Isolator 9					
"	6D28	...Repeated for Isolator 10					
"	6D34	...Repeated for Isolator 11					
"	6D40	...Repeated for Isolator 12					
"	6D4C	...Repeated for Isolator 13					
"	6D58	...Repeated for Isolator 14					
"	6D64	...Repeated for Isolator 15					
"	6D70	...Repeated for Isolator 16					
"	6D7C	...Repeated for Isolator 17					
"	6D88	...Repeated for Isolator 18					
"	6D94	...Repeated for Isolator 19					
"	6DA0	...Repeated for Isolator 20					
"	6DAC	...Repeated for Isolator 21					
"	6DB8	...Repeated for Isolator 22					
"	6DC4	...Repeated for Isolator 23					
"	6DD0	...Repeated for Isolator 24					
"	6DDC	...Repeated for Isolator 25					
"	6DE8	...Repeated for Isolator 26					
"	6DF4	...Repeated for Isolator 27					
"	6E00	...Repeated for Isolator 28					
"	6E0C	...Repeated for Isolator 29					
"	6E18	...Repeated for Isolator 30					
"	6E24	...Repeated for Isolator 31					
"	6E30	...Repeated for Isolator 32					
"	6E3C	...Repeated for Isolator 33					
"	6E48	...Repeated for Isolator 34					
"	6E54	...Repeated for Isolator 35					
"	6E60	...Repeated for Isolator 36					
"	6E6C	...Repeated for Isolator 37					
"	6E78	...Repeated for Isolator 38					
"	6E84	...Repeated for Isolator 39					
"	6E90	...Repeated for Isolator 40					
"	6E9C	...Repeated for Isolator 41					
"	6EA8	...Repeated for Isolator 42					
"	6EB4	...Repeated for Isolator 43					
"	6EC0	...Repeated for Isolator 44					
"	6ECC	...Repeated for Isolator 45					
"	6ED8	...Repeated for Isolator 46					
"	6EE4	...Repeated for Isolator 47					
	6EF0	...Repeated for Isolator 48					

Products	Address	Register name	Range	Units	Step	Format	Default
	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					
	CT Terminal Settings (Read/Write Setting) (24 Modules)						
B90	6F6C	Terminal Current 1 Primary	1 to 65000	A	1	F001	1
"	6F6D	Terminal Current 1 Secondary	0 to 1	---	1	F123	0 (1 A)
"	6F6E	...Repeated for Terminal Current 2					
"	6F70	...Repeated for Terminal Current 3					
"	6F72	...Repeated for Terminal Current 4					
"	6F74	...Repeated for Terminal Current 5					

Products	Address	Register name	Range	Units	Step	Format	Default
"	6F76	...Repeated for Terminal Current 6					
"	6F78	...Repeated for Terminal Current 7					
"	6F7A	...Repeated for Terminal Current 8					
"	6F7C	...Repeated for Terminal Current 9					
"	6F7E	...Repeated for Terminal Current 10					
"	6F80	...Repeated for Terminal Current 11					
"	6F82	...Repeated for Terminal Current 12					
"	6F84	...Repeated for Terminal Current 13					
"	6F86	...Repeated for Terminal Current 14					
"	6F88	...Repeated for Terminal Current 15					
"	6F8A	...Repeated for Terminal Current 16					
"	6F8C	...Repeated for Terminal Current 17					
"	6F8E	...Repeated for Terminal Current 18					
"	6F90	...Repeated for Terminal Current 19					
"	6F92	...Repeated for Terminal Current 20					
"	6F94	...Repeated for Terminal Current 21					
"	6F96	...Repeated for Terminal Current 22					
"	6F98	...Repeated for Terminal Current 23					
"	6F9A	...Repeated for Terminal Current 24					
	VT Terminal Settings (Read/Write Setting) (12 Modules)						
B90	6F9C	Terminal Voltage 1 Ratio	1 to 24000	:1	0.01	F060	1
"	6F9E	Terminal Voltage 1 Secondary	50 to 240	V	0.1	F001	664
"	6F9F	...Repeated for Terminal Voltage 2					
"	6FA2	...Repeated for Terminal Voltage 3					
"	6FA5	...Repeated for Terminal Voltage 4					
"	6FA8	...Repeated for Terminal Voltage 5					
"	6FAB	...Repeated for Terminal Voltage 6					
"	6FAE	...Repeated for Terminal Voltage 7					
"	6FB1	...Repeated for Terminal Voltage 8					
"	6FB4	...Repeated for Terminal Voltage 9					
"	6FB7	...Repeated for Terminal Voltage 10					
"	6FBA	...Repeated for Terminal Voltage 11					
"	6FBD	...Repeated for Terminal Voltage 12					
	B90 Function (Read/Write Setting)						
B90	6FC0	B90 Function	0 to 1	---	1	F250	0 (Logic)
	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
	Breaker Failure Current Supervision (Read/Write Grouped Setting) (24 Modules)						
B90	7000	Breaker Failure 1 Current Supervision Function	0 to 1	---	1	F102	0 (Disabled)
"	7001	Breaker Failure 1 Current Supervision CT	0 to 23	---	1	F400	0
"	7002	Breaker Failure 1 Current Supervision Amp Supv Pickup	0.001 to 30	pu	0.001	F001	1050
"	7003	Breaker Failure 1 Current Supervision Amp Hiset Pickup	0.001 to 30	pu	0.001	F001	1050
"	7004	Breaker Failure 1 Current Supervision Amp Loset Pickup	0.001 to 30	pu	0.001	F001	1050

Products	Address	Register name	Range	Units	Step	Format	Default
"	7005	Reserved (4 items)	0 to 65535	---	1	F001	0
"	7009	...Repeated for Breaker Failure 2					
"	7012	...Repeated for Breaker Failure 3					
"	701B	...Repeated for Breaker Failure 4					
"	7024	...Repeated for Breaker Failure 5					
"	702D	...Repeated for Breaker Failure 6					
"	7036	...Repeated for Breaker Failure 7					
"	703F	...Repeated for Breaker Failure 8					
"	7048	...Repeated for Breaker Failure 9					
"	7051	...Repeated for Breaker Failure 10					
"	705A	...Repeated for Breaker Failure 11					
"	7063	...Repeated for Breaker Failure 12					
"	706C	...Repeated for Breaker Failure 13					
"	7075	...Repeated for Breaker Failure 14					
"	707E	...Repeated for Breaker Failure 15					
"	7087	...Repeated for Breaker Failure 16					
"	7090	...Repeated for Breaker Failure 17					
"	7099	...Repeated for Breaker Failure 18					
"	70A2	...Repeated for Breaker Failure 19					
"	70AB	...Repeated for Breaker Failure 20					
"	70B4	...Repeated for Breaker Failure 21					
"	70BD	...Repeated for Breaker Failure 22					
"	70C6	...Repeated for Breaker Failure 23					
"	70CF	...Repeated for Breaker Failure 24					
	Phase Undervoltage (Read/Write Grouped Setting) (3 Modules)						
All except B90, C30, T35	7000	Phase Undervoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7001	Phase Undervoltage 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	7002	Phase Undervoltage 1 Pickup	0 to 3	pu	0.001	F001	1000
"	7003	Phase Undervoltage 1 Curve	0 to 1	---	1	F111	0 (Definite Time)
"	7004	Phase Undervoltage 1 Delay	0 to 600	s	0.01	F001	100
"	7005	Phase Undervoltage 1 Minimum Voltage	0 to 3	pu	0.001	F001	100
"	7006	Phase Undervoltage 1 Block	0 to 4294967295	---	1	F300	0
"	7008	Phase Undervoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7009	Phase Undervoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	700A	Phase Undervoltage 1 Measurement Mode	0 to 1	---	1	F186	0 (Phase to Ground)
"	700B	Reserved (6 items)	0 to 1	---	1	F001	0
"	7013	...Repeated for Phase Undervoltage 2					
"	7022	...Repeated for Phase Undervoltage 3					
	Phase Overvoltage (Read/Write Grouped Setting) (3 Modules)						
C60, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60	7040	Phase Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7041	Phase Overvoltage 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	7042	Phase Overvoltage 1 Pickup	0 to 3	pu	0.001	F001	1000

Products	Address	Register name	Range	Units	Step	Format	Default
"	7043	Phase Overvoltage 1 Delay	0 to 600	s	0.01	F001	100
"	7044	Phase Overvoltage 1 Reset Delay	0 to 600	s	0.01	F001	100
"	7045	Phase Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	7047	Phase Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7048	Phase Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7049	...Repeated for Phase Overvoltage 2					
"	7052	...Repeated for Phase Overvoltage 3					
	Phase Distance (Read/Write Grouped Setting) (3 or 5 Modules)						
D30, D60, G60, L60, L90, T60	7070	Phase Distance Zone 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7071	Phase Distance Zone 1 Current Supervision	0.05 to 30	pu	0.001	F001	200
"	7072	Phase Distance Zone 1 Reach	0.02 to 500	ohms	0.01	F001	200
"	7073	Phase Distance Zone 1 Direction	0 to 2	---	1	F154	0 (Forward)
"	7074	Phase Distance Zone 1 Comparator Limit	30 to 90	degrees	1	F001	90
"	7075	Phase Distance Zone 1 Delay	0 to 65.535	s	0.001	F001	0
"	7076	Phase Distance Zone 1 Block	0 to 4294967295	---	1	F300	0
"	7078	Phase Distance Zone 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7079	Phase Distance Zone 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	707A	Phase Distance Zone 1 Shape	0 to 1	---	1	F120	0 (Mho) Fixed in G60
"	707B	Phase Distance Zone 1 RCA	30 to 90	degrees	1	F001	85
"	707C	Phase Distance Zone 1 DIR RCA	30 to 90	degrees	1	F001	85
"	707D	Phase Distance Zone 1 DIR Comp Limit	30 to 90	degrees	1	F001	90
"	707E	Phase Distance Zone 1 Quad Right Blinder	0.02 to 500	ohms	0.01	F001	1000
"	707F	Phase Distance Zone 1 Quad Right Blinder RCA	60 to 90	degrees	1	F001	85
"	7080	Phase Distance Zone 1 Quad Left Blinder	0.02 to 500	ohms	0.01	F001	1000
"	7081	Phase Distance Zone 1 Quad Left Blinder RCA	60 to 90	degrees	1	F001	85
"	7082	Phase Distance Zone 1 Volt Limit	0 to 5	pu	0.001	F001	0
"	7083	Phase Distance Zone 1 Transformer Voltage Connection	0 to 12	---	1	F153	0 (None)
"	7084	Phase Distance Zone 1 Transformer Current Connection	0 to 12	---	1	F153	0 (None)
"	7085	Phase Distance Zone 1 Rev Reach	0.02 to 500	ohms	0.01	F001	200
"	7086	Phase Distance Zone 1 Rev Reach RCA	30 to 90	degrees	1	F001	85
"	7087	Reserved (10 items)	---	---	---	F001	0
"	7091	...Repeated for Phase Distance Zone 2					
"	70B2	...Repeated for Phase Distance Zone 3					
D30, D60, L90 T60	70D3	...Repeated for Phase Distance Zone 4					
"	70F4	...Repeated for Phase Distance Zone 5					
	Breaker Failure (Read/Write Grouped Setting) (24 Modules)						
B90	7100	Breaker Failure 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7101	Breaker Failure 1 Initiate	0 to 4294967295	---	1	F300	0
"	7103	Breaker Failure 1 Use Amp Supervision	0 to 1	---	1	F126	1 (Yes)
"	7104	Breaker Failure 1 Use Seal In	0 to 1	---	1	F126	1 (Yes)
"	7105	Breaker Failure 1 Amp Supervision OpA	0 to 4294967295	---	1	F300	0
"	7107	Breaker Failure 1 Amp Supervision OpB	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	7109	Breaker Failure 1 Amp Supervision OpC	0 to 4294967295	---	1	F300	0
"	710B	Breaker Failure 1 Use Timer1	0 to 1	---	1	F126	1 (Yes)
"	710C	Breaker Failure 1 Timer1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	710D	Breaker Failure 1 Use Timer2	0 to 1	---	1	F126	1 (Yes)
"	710E	Breaker Failure 1 Timer2 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	710F	Breaker Failure 1 Use Timer3	0 to 1	---	1	F126	1 (Yes)
"	7110	Breaker Failure 1 Timer3 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	7111	Breaker Failure 1 Breaker Pos1	0 to 4294967295	---	1	F300	0
"	7113	Breaker Failure 1 Breaker Pos2	0 to 4294967295	---	1	F300	0
"	7115	Breaker Failure 1 Breaker Test On	0 to 4294967295	---	1	F300	0
"	7117	Breaker Failure 1 Amp Hiset OpA	0 to 4294967295	---	1	F300	0
"	7119	Breaker Failure 1 Amp Hiset OpB	0 to 4294967295	---	1	F300	0
"	711B	Breaker Failure 1 Amp Hiset OpC	0 to 4294967295	---	1	F300	0
"	711D	Breaker Failure 1 Amp Loset OpA	0 to 4294967295	---	1	F300	0
"	711F	Breaker Failure 1 Amp Loset OpB	0 to 4294967295	---	1	F300	0
"	7121	Breaker Failure 1 Amp Loset OpC	0 to 4294967295	---	1	F300	0
"	7123	Breaker Failure 1 Loset Time Delay	0 to 65.535	s	0.001	F001	0
"	7124	Breaker Failure 1 Trip Dropout Time Delay	0 to 65.535	s	0.001	F001	0
"	7125	Breaker Failure 1 Retrip Time Delay	0 to 65.535	s	0.001	F001	0
"	7126	Breaker Failure 1 Block	0 to 4294967295	---	1	F300	0
"	7128	Breaker Failure 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7129	Breaker Failure 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	712A	Reserved (6 items)	0 to 65535	---	1	F001	0
"	7130	...Repeated for Breaker Failure 2					
"	7160	...Repeated for Breaker Failure 3					
"	7190	...Repeated for Breaker Failure 4					
"	71C0	...Repeated for Breaker Failure 5					
"	71F0	...Repeated for Breaker Failure 6					
"	7220	...Repeated for Breaker Failure 7					
"	7250	...Repeated for Breaker Failure 8					
"	7280	...Repeated for Breaker Failure 9					
"	72B0	...Repeated for Breaker Failure 10					
"	72E0	...Repeated for Breaker Failure 11					
"	7310	...Repeated for Breaker Failure 12					
"	7340	...Repeated for Breaker Failure 13					
"	7370	...Repeated for Breaker Failure 14					
"	73A0	...Repeated for Breaker Failure 15					
"	73D0	...Repeated for Breaker Failure 16					
"	7400	...Repeated for Breaker Failure 17					
"	7430	...Repeated for Breaker Failure 18					
"	7460	...Repeated for Breaker Failure 19					
"	7490	...Repeated for Breaker Failure 20					
"	74C0	...Repeated for Breaker Failure 21					
"	74F0	...Repeated for Breaker Failure 22					
"	7520	...Repeated for Breaker Failure 23					
"	7550	...Repeated for Breaker Failure 24					

Products	Address	Register name	Range	Units	Step	Format	Default
	Ground Distance (Read/Write Grouped Setting) (3 or 5 Modules)						
D30, D60, L60, L90, T60	7130	Ground Distance Zone 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7131	Ground Distance Zone 1 Current Supervision	0.05 to 30	pu	0.001	F001	200
"	7132	Ground Distance Zone 1 Reach	0.02 to 500	ohms	0.01	F001	200
"	7133	Ground Distance Zone 1 Direction	0 to 2	---	1	F154	0 (Forward)
"	7134	Ground Distance Zone 1 Comparator Limit	30 to 90	degrees	1	F001	90
"	7135	Ground Distance Zone 1 Delay	0 to 65.535	s	0.001	F001	0
"	7136	Ground Distance Zone 1 Block	0 to 4294967295	---	1	F300	0
"	7138	Ground Distance Zone 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7139	Ground Distance Zone 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	713A	Ground Distance Zone 1 Shape	0 to 1	---	1	F120	0 (Mho)
"	713B	Ground Distance Zone 1 Z0 Z1 Magnitude	0 to 10	---	0.01	F001	270
"	713C	Ground Distance Zone 1 Z0 Z1 Angle	-90 to 90	degrees	1	F002	0
"	713D	Ground Distance Zone 1 RCA	30 to 90	degrees	1	F001	85
"	713E	Ground Distance Zone 1 DIR RCA	30 to 90	degrees	1	F001	85
"	713F	Ground Distance Zone 1 DIR Comp Limit	30 to 90	degrees	1	F001	90
"	7140	Ground Distance Zone 1 Quad Right Blinder	0.02 to 500	ohms	0.01	F001	1000
"	7141	Ground Distance Zone 1 Quad Right Blinder RCA	60 to 90	degrees	1	F001	85
"	7142	Ground Distance Zone 1 Quad Left Blinder	0.02 to 500	ohms	0.01	F001	1000
"	7143	Ground Distance Zone 1 Quad Left Blinder RCA	60 to 90	degrees	1	F001	85
"	7144	Ground Distance Zone 1 Z0M Z1 Magnitude	0 to 7	---	0.01	F001	0
"	7145	Ground Distance Zone 1 Z0M Z1 Angle	-90 to 90	degrees	1	F002	0
"	7146	Ground Distance Zone 1 Voltage Level	0 to 5	pu	0.001	F001	0
"	7147	Ground Distance Zone 1 Non-Homogeneous Angle	-40 to 40	degrees	0.1	F002	0
"	7148	Ground Distance Zone 1 POL Current	0 to 1	---	1	F521	0 (Zero-seq)
"	7149	Ground Distance Zone 1 Reverse Reach	0.02 to 500	ohms	0.01	F001	200
"	714A	Ground Distance Zone 1 Reverse Reach RCA	30 to 90	degrees	1	F001	85
"	714B	Reserved (7 items)	0 to 65535	---	1	F001	0
"	7152	...Repeated for Ground Distance Zone 2					
"	7174	...Repeated for Ground Distance Zone 3					
D30, D60, L90, T60	7196	...Repeated for Ground Distance Zone 4					
"	71B8	...Repeated for Ground Distance Zone 5					
	Line Pickup (Read/Write Grouped Setting)						
D30, D60, L60, L90	71E0	Line Pickup Function	0 to 1	---	1	F102	0 (Disabled)
"	71E1	Line Pickup Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	71E2	Line Pickup Phase IOC Pickup	0 to 30	pu	0.001	F001	1000
"	71E3	Line Pickup UV Pickup	0 to 3	pu	0.001	F001	700
"	71E4	Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	150
"	71E5	Line End Open Reset Delay	0 to 65.535	s	0.001	F001	90
"	71E6	Line Pickup OV Pickup Delay	0 to 65.535	s	0.001	F001	40
"	71E7	Autoreclose Coordination Pickup Delay	0 to 65.535	s	0.001	F001	45

Products	Address	Register name	Range	Units	Step	Format	Default
"	71E8	Autoreclose Coordination Reset Delay	0 to 65.535	s	0.001	F001	5
"	71E9	Autoreclose Coordination Bypass	0 to 1	---	1	F102	1 (Enabled)
"	71EA	Line Pickup Block	0 to 4294967295	---	1	F300	0
"	71EC	Line Pickup Target	0 to 2	---	1	F109	0 (Self-reset)
"	71ED	Line Pickup Events	0 to 1	---	1	F102	0 (Disabled)
"	71EE	Terminal Open	0 to 4294967295	---	1	F300	0
"	71F0	Autoreclose Accelerate	0 to 4294967295	---	1	F300	0
"	71F2	Distance Trip	0 to 1	---	1	F102	1 (Enabled)
	Phase Directional Overcurrent (Read/Write Grouped Setting) (1 or 2 Modules)						
C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, T60	7200	Phase Directional Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7201	Phase Directional Overcurrent 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	7202	Phase Directional Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	7204	Phase Directional Overcurrent 1 ECA	0 to 359	---	1	F001	30
"	7205	Phase Directional Overcurrent 1 Pol V Threshold	0 to 3	pu	0.001	F001	700
"	7206	Phase Directional Overcurrent 1 Block Overcurrent	0 to 1	---	1	F126	0 (No)
"	7207	Phase Directional Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7208	Phase Directional Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7209	Reserved (8 items)	0 to 1	---	1	F001	0
C70, D30, D60, F60, L30, L60, L90, M60	7211	...Repeated for Phase Directional Overcurrent 2					
	Neutral Directional Overcurrent (Read/Write Grouped Setting) (1 or 2 Modules)						
C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, T60	7230	Neutral Directional Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7231	Neutral Directional Overcurrent 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	7232	Neutral Directional Overcurrent 1 Polarizing	0 to 4	---	1	F230	0 (Voltage)
"	7233	Neutral Directional Overcurrent 1 Forward ECA	-90 to 90	° Lag	1	F002	75
"	7234	Neutral Directional Overcurrent 1 Forward Limit Angle	40 to 90	degrees	1	F001	90
"	7235	Neutral Directional Overcurrent 1 Forward Pickup	0.006 to 30	pu	0.001	F001	50
"	7236	Neutral Directional Overcurrent 1 Reverse Limit Angle	40 to 90	degrees	1	F001	90
"	7237	Neutral Directional Overcurrent 1 Reverse Pickup	0.006 to 30	pu	0.001	F001	50
"	7238	Neutral Directional Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7239	Neutral Directional Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	723B	Neutral Directional Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	723C	Neutral Directional Overcurrent 1 Polarizing Voltage	0 to 1	---	1	F231	0 (Calculated V0)
"	723D	Neutral Directional Overcurrent 1 Op Current	0 to 1	---	1	F196	0 (Calculated 3I0)
"	723E	Neutral Directional Overcurrent 1 Offset	0 to 250	ohms	0.01	F001	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	723F	Neutral Directional Overcurrent 1 Pos Seq Restraint	0 to 0.5	---	0.001	F001	63
"	7240	Reserved	0 to 1	---	1	F001	0
D30, D60, F60, G30, G60, L30, L60, L90, M60	7241	...Repeated for Neutral Directional Overcurrent 2					
	Negative-Sequence Directional Overcurrent (Read/Write Grouped Settings) (2 Modules)						
C70, D30, D60, F60, G30, G60, L60, L90	7260	Negative Sequence Directional Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7261	Negative Sequence Directional Overcurrent 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	7262	Negative Sequence Directional Overcurrent 1 Type	0 to 1	---	1	F179	0 (Neg Sequence)
"	7263	Neg Sequence Directional Overcurrent 1 Forward ECA	0 to 90	° Lag	1	F002	75
"	7264	Neg Seq Directional Overcurrent 1 Forward Limit Angle	40 to 90	degrees	1	F001	90
"	7265	Neg Sequence Directional Overcurrent 1 Forward Pickup	0.015 to 30	pu	0.005	F001	50
"	7266	Neg Seq Directional Overcurrent 1 Reverse Limit Angle	40 to 90	degrees	1	F001	90
"	7267	Neg Sequence Directional Overcurrent 1 Reverse Pickup	0.015 to 30	pu	0.005	F001	50
"	7268	Negative Sequence Directional Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7269	Negative Sequence Directional Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	726B	Negative Sequence Directional Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	726C	Negative Sequence Directional Overcurrent 1 Offset	0 to 250	ohms	0.01	F001	0
"	726D	Negative Sequence Directional Overcurrent 1 Pos Seq Restraint	0 to 0.5	---	0.001	F001	63
"	726E	Reserved (3 items)	0 to 1	---	1	F001	0
"	7271	...Repeated for Neg Seq Directional Overcurrent 2					
	Breaker Arcing Current Settings (Read/Write Setting) (2, 4, or 6 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	7290	Breaker 1 Arcing Amp Function	0 to 1	---	1	F102	0 (Disabled)
"	7291	Breaker 1 Arcing Amp Source	0 to 5	---	1	F167	0 (SRC 1)
"	7292	Breaker 1 Arcing Amp Init	0 to 4294967295	---	1	F300	0
"	7294	Breaker 1 Arcing Amp Init B	0 to 4294967295	---	1	F300	0
"	7296	Breaker 1 Arcing Amp Init C	0 to 4294967295	---	1	F300	0
"	7298	Breaker 1 Arcing Amp Delay	0 to 65.535	s	0.001	F001	0
"	7299	Breaker 1 Arcing Amp Limit	0 to 50000	kA2-cyc	1	F001	1000
"	729A	Breaker 1 Arcing Amp Block	0 to 4294967295	---	1	F300	0
"	729C	Breaker 1 Arcing Amp Target	0 to 2	---	1	F109	0 (Self-reset)
"	729D	Breaker 1 Arcing Amp Events	0 to 1	---	1	F102	0 (Disabled)
"	729E	...Repeated for Breaker 2 Arcing Amp					
C60, D60, F35, L90, T35, T60	72AC	...Repeated for Breaker 3 Arcing Amp					

Products	Address	Register name	Range	Units	Step	Format	Default
"	72BA	...Repeated for Breaker 4 Arcing Amp					
F35, T35	72C8	...Repeated for Breaker 5 Arcing Amp					
"	72D6	...Repeated for Breaker 6 Arcing Amp					
	Disconnect (Breaker) Switch (Read/Write Setting) (8, 16, or 24 Modules)						
All except B90	74A0	Disconnect Switch 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	74A1	Disconnect Switch 1 Name	---	---	---	F206	"SW 1"
"	74A4	Disconnect Switch 1 Mode	0 to 1	---	1	F157	0 (3-Pole)
"	74A5	Disconnect Switch 1 Open	0 to 4294967295	---	1	F300	0
"	74A7	Disconnect Switch 1 Block Open	0 to 4294967295	---	1	F300	0
"	74A9	Disconnect Switch 1 Close	0 to 4294967295	---	1	F300	0
"	74AB	Disconnect Switch 1 Block Close	0 to 4294967295	---	1	F300	0
"	74AD	Disconnect Switch 1 Phase A / Three-pole Closed	0 to 4294967295	---	1	F300	0
"	74AF	Disconnect Switch 1 Phase A / Three-pole Opened	0 to 4294967295	---	1	F300	0
"	74B1	Disconnect Switch 1 Phase B Closed	0 to 4294967295	---	1	F300	0
"	74B3	Disconnect Switch 1 Phase B Opened	0 to 4294967295	---	1	F300	0
"	74B5	Disconnect Switch 1 Phase C Closed	0 to 4294967295	---	1	F300	0
"	74B7	Disconnect Switch 1 Phase C Opened	0 to 4294967295	---	1	F300	0
"	74B9	Disconnect Switch 1 Operate Time	0 to 65535	ms	1	F003	70
"	74BB	Disconnect Switch 1 Alarm Delay	0 to 65.535	s	0.001	F003	0
"	74BD	Disconnect Switch 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	74BE	Reserved (2 items)	---	---	---	F001	0
"	74BF	...Repeated for Disconnect Switch 2					
"	74DE	...Repeated for Disconnect Switch 3					
"	74FD	...Repeated for Disconnect Switch 4					
"	751C	...Repeated for Disconnect Switch 5					
"	753B	...Repeated for Disconnect Switch 6					
"	755A	...Repeated for Disconnect Switch 7					
"	7579	...Repeated for Disconnect Switch 8					
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	7598	...Repeated for Disconnect Switch 9					
"	75B7	...Repeated for Disconnect Switch 10					
"	75D6	...Repeated for Disconnect Switch 11					
"	75F5	...Repeated for Disconnect Switch 12					
"	7614	...Repeated for Disconnect Switch 13					
"	7633	...Repeated for Disconnect Switch 14					
"	7652	...Repeated for Disconnect Switch 15					
"	7671	...Repeated for Disconnect Switch 16					
B30, C70, F35, N60, T35, T60	7690	...Repeated for Disconnect Switch 17					
"	76AF	...Repeated for Disconnect Switch 18					
"	76CE	...Repeated for Disconnect Switch 19					
"	76ED	...Repeated for Disconnect Switch 20					
"	770C	...Repeated for Disconnect Switch 21					
"	772B	...Repeated for Disconnect Switch 22					

Products	Address	Register name	Range	Units	Step	Format	Default
"	774A	...Repeated for Disconnect Switch 23					
"	7769	...Repeated for Disconnect Switch 24					
	Instantaneous Overcurrent (Read/Write Grouped Setting) (24 Modules)						
B90	7600	Instantaneous Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7601	Instantaneous Overcurrent 1 CT	0 to 23	---	1	F400	0
"	7602	Instantaneous Overcurrent 1 Pickup	0.001 to 30	pu	0.001	F001	1200
"	7603	Instantaneous Overcurrent 1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	7604	Instantaneous Overcurrent 1 Reset Delay	0 to 65.535	s	0.001	F001	0
"	7605	Instantaneous Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	7607	Instantaneous Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7608	Instantaneous Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7609	Reserved (2 items)	0 to 65535	---	1	F001	0
"	760A	...Repeated for Instantaneous Overcurrent 2					
"	7614	...Repeated for Instantaneous Overcurrent 3					
"	761E	...Repeated for Instantaneous Overcurrent 4					
"	7628	...Repeated for Instantaneous Overcurrent 5					
"	7632	...Repeated for Instantaneous Overcurrent 6					
"	763C	...Repeated for Instantaneous Overcurrent 7					
"	7646	...Repeated for Instantaneous Overcurrent 8					
"	7650	...Repeated for Instantaneous Overcurrent 9					
"	765A	...Repeated for Instantaneous Overcurrent 10					
"	7664	...Repeated for Instantaneous Overcurrent 11					
"	766E	...Repeated for Instantaneous Overcurrent 12					
"	7678	...Repeated for Instantaneous Overcurrent 13					
"	7682	...Repeated for Instantaneous Overcurrent 14					
"	768C	...Repeated for Instantaneous Overcurrent 15					
"	7696	...Repeated for Instantaneous Overcurrent 16					
"	76A0	...Repeated for Instantaneous Overcurrent 17					
"	76AA	...Repeated for Instantaneous Overcurrent 18					
"	76B4	...Repeated for Instantaneous Overcurrent 19					
"	76BE	...Repeated for Instantaneous Overcurrent 20					
"	76C8	...Repeated for Instantaneous Overcurrent 21					
"	76D2	...Repeated for Instantaneous Overcurrent 22					

Products	Address	Register name	Range	Units	Step	Format	Default
"	76DC	...Repeated for Instantaneous Overcurrent 23					
"	76E6	...Repeated for Instantaneous Overcurrent 24					
	Time Overcurrent (Read/Write Grouped Setting) (24 Modules)						
B90	7700	Time Overcurrent 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7701	Time Overcurrent 1 CT Setting	0 to 23	---	1	F400	0
"	7702	Time Overcurrent 1 Pickup	0.001 to 30	pu	0.001	F001	1200
"	7703	Time Overcurrent 1 Curve	0 to 16	---	1	F103	0 (IEEE Mod Inv)
"	7704	Time Overcurrent 1 Multiplier	0 to 600	---	0.01	F001	100
"	7705	Time Overcurrent 1 Reset	0 to 1	---	1	F104	0 (Instantaneous)
"	7706	Time Overcurrent 1 Block	0 to 4294967295	---	1	F300	0
"	7708	Time Overcurrent 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7709	Time Overcurrent 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	770A	Reserved (2 items)	0 to 65535	---	1	F001	0
"	770C	...Repeated for Time Overcurrent 2					
"	7718	...Repeated for Time Overcurrent 3					
"	7724	...Repeated for Time Overcurrent 4					
"	7730	...Repeated for Time Overcurrent 5					
"	773C	...Repeated for Time Overcurrent 6					
"	7748	...Repeated for Time Overcurrent 7					
"	7754	...Repeated for Time Overcurrent 8					
"	7760	...Repeated for Time Overcurrent 9					
"	776C	...Repeated for Time Overcurrent 10					
"	7778	...Repeated for Time Overcurrent 11					
"	7784	...Repeated for Time Overcurrent 12					
"	7790	...Repeated for Time Overcurrent 13					
"	779C	...Repeated for Time Overcurrent 14					
"	77AB	...Repeated for Time Overcurrent 15					
"	77B4	...Repeated for Time Overcurrent 16					
"	77C0	...Repeated for Time Overcurrent 17					
"	77CC	...Repeated for Time Overcurrent 18					
"	77D8	...Repeated for Time Overcurrent 19					
"	77E4	...Repeated for Time Overcurrent 20					
"	77F0	...Repeated for Time Overcurrent 21					
"	77FC	...Repeated for Time Overcurrent 22					
"	7808	...Repeated for Time Overcurrent 23					
"	7814	...Repeated for Time Overcurrent 24					
	Thermal Overload Protection (Read/Write Settings) (2 Modules)						
All except B90, C30, M60	7788	Thermal Protection 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7789	Thermal Protection 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	778A	Thermal Protection 1 Base Current	0.2 to 3	pu	0.01	F001	80
"	778B	Thermal Protection 1 K Factor	1 to 1.2	---	0.05	F001	110
"	778C	Thermal Protection 1 Trip Time Constant	0 to 1000	min.	1	F001	45
"	778D	Thermal Protection 1 Reset Time Constant	0 to 1000	min.	1	F001	45

Products	Address	Register name	Range	Units	Step	Format	Default
"	778E	Thermal Protection 1 Minimum Reset Time	0 to 1000	min.	1	F001	20
"	778F	Thermal Protection 1 Reset	0 to 4294967295	---	1	F300	0
"	7791	Thermal Protection 1 Block	0 to 4294967295	---	1	F300	0
"	7793	Thermal Protection 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7794	Thermal Protection 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7795	Reserved (2 items)	---	---	---	F001	0
"	7797	Repeated for Thermal Protection 2					
	Broken Conductor Detection (Read/Write Settings) (2, 4, or 6 Modules)						
D30, D60, F35, F60, L30, L90	77AA	Broken Conductor 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	77AB	Broken Conductor 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	77AC	Broken Conductor 1 I2/I1 Ratio	20 to 100	%	0.1	F001	200
"	77AD	Broken Conductor 1 I1 Minimum	0.05 to 1	pu	0.01	F001	10
"	77AE	Broken Conductor 1 I1 Maximum	0.05 to 5	pu	0.01	F001	150
"	77AF	Broken Conductor 1 Pickup Delay	0 to 65.535	s	0.001	F001	20000
"	77B0	Broken Conductor 1 Block	0 to 4294967295	---	1	F300	0
"	77B2	Broken Conductor 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	77B3	Broken Conductor 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	77B4	Reserved (2 items)	---	---	---	F001	0
"	77B6	...Repeated for Broken Conductor 2					
D60, F35. F60, L90	77C2	...Repeated for Broken Conductor 3					
"	77CE	...Repeated for Broken Conductor 4					
F35	77DA	...Repeated for Broken Conductor 5					
"	77E6	...Repeated for Broken Conductor 6					
	Ohm Inputs (Read/Write Setting) (2 Modules)						
All except B90	77F8	Ohm Inputs 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	77F9	Ohm Inputs 1 ID	---	---	---	F205	"Ohm Ip 1 "
"	77FF	Reserved (9 items)	0 to 65535	---	1	F001	0
"	7808	...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	781A	PMU 1 Recorder Clear Config Counter	0 to 1	---	1	F126	0 (No)
C60, N60	781B	...Repeated for PMU 2					
N60	781C	...Repeated for PMU 3					
"	781D	...Repeated for PMU 4					
"	781E	...Repeated for PMU 5					
"	781F	...Repeated for PMU 6					
	Phasor Measurement Unit One-shot Command (Read/Write Setting)						
C60, D60, F60, G60, L30, L90, N60, T60	788C	PMU One-shot Function	0 to 1	---	1	F102	0 (Disabled)
"	788D	PMU One-shot Sequence Number	0 to 99	---	1	F001	1
"	788E	PMU One-shot Time	0 to 4294967295	---	1	F050	0
	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

Products	Address	Register name	Range	Units	Step	Format	Default
"	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					
	Phasor Measurement Unit Test Values (Read/Write Setting) (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	78AE	PMU 1 Test Function	0 to 1	---	1	F102	0 (Disabled)
"	78AF	PMU 1 Phase A Voltage Test Magnitude	0 to 700	kV	0.01	F003	50000
"	78B1	PMU 1 Page A Voltage Test Angle	-180 to 180	°	0.05	F002	0
"	78B2	PMU 1 Phase B Voltage Test Magnitude	0 to 700	kV	0.01	F003	50000
"	78B4	PMU 1 Phase B Voltage Test Angle	-180 to 180	°	0.05	F002	-12000
"	78B5	PMU 1 Phase C Voltage Test Magnitude	0 to 700	kV	0.01	F003	50000
"	78B7	PMU 1 Phase C Voltage Test Angle	-180 to 180	°	0.05	F002	12000
"	78B8	PMU 1 Auxiliary Voltage Test Magnitude	0 to 700	kV	0.01	F003	50000
"	78BA	PMU 1 Auxiliary Voltage Test Angle	-180 to 180	°	0.05	F002	0
"	78BB	PMU 1 Phase A Current Test Magnitude	0 to 9.999	kA	0.001	F004	1000
"	78BD	PMU 1 Phase A Current Test Angle	-180 to 180	°	0.05	F002	-1000
"	78BE	PMU 1 Phase B Current Test Magnitude	0 to 9.999	kA	0.001	F004	1000
"	78C0	PMU 1 Phase B Current Test Angle	-180 to 180	°	0.05	F002	-13000
"	78C1	PMU 1 Phase C Current Test Magnitude	0 to 9.999	kA	0.001	F003	1000
"	78C3	PMU 1 Phase C Current Test Angle	-180 to 180	°	0.05	F002	11000
"	78C4	PMU 1 Ground Current Test Magnitude	0 to 9.999	kA	0.001	F004	0
"	78C6	PMU 1 Ground Current Test Angle	-180 to 180	°	0.05	F002	0
"	78C7	PMU 1 Test Frequency	20 to 70	Hz	0.001	F003	60000
"	78C9	PMU 1 Test df/dt	-10 to 10	Hz/s	0.01	F002	0
C60, N60	78CA	...Repeated for PMU 2					
N60	78E6	...Repeated for PMU 3					
"	7902	...Repeated for PMU 4					
"	791E	...Repeated for PMU 5					
"	793A	...Repeated for PMU 6					
	Validation Automation (Read/Write Setting)						
All	7A00	Validation Automation Setting (16 items)	0 to 4294967295	---	1	F003	0
	Underfrequency (Read/Write Setting) (6 Modules)						
D60, F35, F60, G30, G60, L30, L90, M60, N60, T60	7A80	Underfrequency 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7A81	Underfrequency 1 Block	0 to 4294967295	---	1	F300	0
"	7A83	Underfrequency 1 Min Current	0.1 to 1.25	pu	0.01	F001	10
"	7A84	Underfrequency 1 Pickup	20 to 65	Hz	0.01	F001	5950
"	7A85	Underfrequency 1 Pickup Delay	0 to 65.535	s	0.001	F001	2000
"	7A86	Underfrequency 1 Reset Delay	0 to 65.535	s	0.001	F001	2000
"	7A87	Underfrequency 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	7A88	Underfrequency 1 Events	0 to 1	---	1	F102	0 (Disabled)

Products	Address	Register name	Range	Units	Step	Format	Default
"	7A89	Underfrequency 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7A8A	Reserved (5 items)	0 to 1	---	1	F001	0
"	7A8F	...Repeated for Underfrequency 2					
"	7A9E	...Repeated for Underfrequency 3					
"	7AAD	...Repeated for Underfrequency 4					
"	7ABC	...Repeated for Underfrequency 5					
"	7ACB	...Repeated for Underfrequency 6					
	Thermal Model (Read/Write Grouped Setting)						
M60	7B00	Thermal Model Function	0 to 1	---	1	F102	0 (Disabled)
"	7B01	Thermal Model Curve	0 to 5	---	1	F099	0 (Motor)
"	7B02	Thermal Model TD Multiplier	0 to 600	---	0.01	F001	100
"	7B03	Thermal Model Bias K Factor	0 to 19	---	1	F001	0
"	7B04	Thermal Model Time Constant Running	1 to 65000	min	1	F001	15
"	7B05	Thermal Model Time Constant Stopped	1 to 65000	min	1	F001	30
"	7B06	Thermal Model Hot Cold Ratio	0.01 to 1	---	0.01	F001	100
"	7B07	Thermal Model RTD Bias	0 to 1	---	1	F102	0 (Disabled)
"	7B08	Thermal Model RTD Bias Minimum	0 to 250	°C	1	F001	40
"	7B09	Thermal Model RTD Bias Center	0 to 250	°C	1	F001	130
"	7B0A	Thermal Model RTD Bias Maximum	0 to 250	°C	1	F001	155
"	7B0B	Thermal Model Start Inhibit Margin	0 to 25	%	1	F001	0
"	7B0C	Thermal Model Block	0 to 4294967295	---	1	F300	0
"	7B0E	Thermal Model Events	0 to 1	---	1	F102	0 (Disabled)
"	7B0F	Thermal Model Target	0 to 2	---	1	F109	0 (Self-reset)
"	7B10	Thermal Model Curve Effect	0 to 1	---	1	F096	0 (Cutoff)
"	7B11	Speed 2 Thermal Model Curve	0 to 5	---	1	F099	0 (Motor)
"	7B12	Speed 2 Thermal Model TD Multiplier	0 to 600	---	0.01	F001	100
"	7B13	Reserved	0 to 600	---	0.01	F001	100
"	7B14	Thermal Model IEC Curve K Factor	1 to 1.5	---	0.05	F001	110
"	7B15	Thermal Model IEC Curve Time Constant	0 to 1000	min.	1	F001	45
	Voltage Dependent Overload (Read/Write Grouped Setting)						
M60	7B20	Voltage Dependent Overload Function	0 to 1	---	1	F102	0 (Disabled)
"	7B21	Voltage Dependent Overload Minimum Motor Volts	60 to 99	%	1	F001	80
"	7B22	Voltage Dependent Overload Voltage Loss	0 to 4294967295	---	1	F300	0
"	7B24	VD Overload Stall Current at Minimum Volts	1.5 to 20	× FLA	0.01	F001	450
"	7B25	VD Overload Safe Stall Time at Minimum Volts	0.1 to 1000	s	0.1	F001	200
"	7B26	VD Overload Acceleration Intersect at Minimum Volts	1.5 to 20	× FLA	0.01	F001	400
"	7B27	VD Overload Stall Current at 100% Voltage	1.5 to 20	× FLA	0.01	F001	600
"	7B28	VD Overload Safe Stall Time at 100% Voltage	0.1 to 1000	s	0.1	F001	100
"	7B29	VD Overload Acceleration Intersect at 100% Voltage	1.5 to 20	× FLA	0.01	F001	500
"	7B2A	Speed 2 Voltage Dependent Overload Function	0 to 1	---	1	F102	0 (Disabled)
"	7B2B	Speed 2 VD Overload Minimum Motor Volts	60 to 99	%	1	F001	80
"	7B2C	Speed 2 Voltage Dependent Overload Voltage Loss	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	7B2E	Speed 2 VD Overload Stall Current at Minimum Volts	1.5 to 20	× FLA	0.01	F001	450
"	7B2F	Speed 2 VD Overload Safe Stall Time at Minimum Volts	0.1 to 1000	s	0.1	F001	200
"	7B30	Speed 2 VD Acceleration Intersect at Minimum Volts	1.5 to 20	× FLA	0.01	F001	400
"	7B31	Speed 2 VD Overload Stall Current at 100% Voltage	1.5 to 20	× FLA	0.01	F001	600
"	7B32	Speed 2 VD Overload Safe Stall Time at 100% Voltage	0.1 to 1000	s	0.1	F001	200
"	7B33	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	7B40	Motor Acceleration Function	0 to 1	---	1	F102	0 (Disabled)
"	7B41	Motor Acceleration Current	1 to 10	× FLA	0.01	F001	600
"	7B42	Motor Acceleration Time	0.05 to 180	s	0.01	F001	1000
"	7B43	Motor Acceleration Mode	0 to 1	---	1	F097	0 (Definite Time)
"	7B44	Motor Acceleration Block	0 to 4294967295	---	1	F300	0
"	7B46	Motor Acceleration Target	0 to 2	---	1	F109	0 (Self-reset)
"	7B47	Motor Acceleration Events	0 to 1	---	1	F102	0 (Disabled)
"	7B48	Speed 2 Motor Acceleration Current	1 to 10	× FLA	0.01	F001	600
"	7B49	Speed 2 Motor Acceleration Time	0.05 to 180	s	0.01	F001	1000
"	7B4A	Speed 2 Motor Acceleration Mode	0 to 1	---	1	F097	0 (Definite Time)
"	7B4B	Speed 2 Motor Acceleration Speed 1-2	0.05 to 180	s	0.01	F001	1000
"	7B4C	Speed 2 Motor Acceleration Block	0 to 4294967295	---	1	F300	0
"	7B4E	Reserved (9 items)	---	---	---	F001	0
	User Programmable Pushbuttons (Read/Write Setting) (16 Modules)						
All	7B60	User Programmable Pushbutton 1 Function	0 to 2	---	1	F137	0 (Disabled)
"	7B61	User Programmable Pushbutton 1 Top Line	---	---	---	F202	(none)
"	7B6B	User Programmable Pushbutton 1 On Text	---	---	---	F202	(none)
"	7B75	User Programmable Pushbutton 1 Off Text	---	---	---	F202	(none)
"	7B7F	User Programmable Pushbutton 1 Drop-Out Time	0 to 60	s	0.05	F001	0
"	7B81	User Programmable Pushbutton 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7B82	User Programmable Pushbutton 1 LED Operand	0 to 4294967295	---	1	F300	0
"	7B84	User Programmable Pushbutton 1 Autoreset Delay	0.2 to 600	s	0.1	F001	10
"	7B85	User Programmable Pushbutton 1 Autoreset Function	0 to 1	---	1	F102	0 (Disabled)
"	7B86	User Programmable Pushbutton 1 Local Lock Operand	0 to 4294967295	---	1	F300	0
"	7B88	User Programmable Pushbutton 1 Message Priority	0 to 2	---	1	F220	0 (Disabled)
"	7B89	User Programmable Pushbutton 1 Remote Lock Operand	0 to 4294967295	---	1	F300	0
"	7B8B	User Programmable Pushbutton 1 Reset Operand	0 to 4294967295	---	1	F300	0
"	7B8D	User Programmable Pushbutton 1 Set Operand	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	7B8F	User Programmable Pushbutton 1 Hold	0 to 10	s	0.1	F001	1
"	7B90	...Repeated for User Programmable Pushbutton 2					
"	7BC0	...Repeated for User Programmable Pushbutton 3					
"	7BF0	...Repeated for User Programmable Pushbutton 4					
"	7C20	...Repeated for User Programmable Pushbutton 5					
"	7C50	...Repeated for User Programmable Pushbutton 6					
"	7C80	...Repeated for User Programmable Pushbutton 7					
"	7CB0	...Repeated for User Programmable Pushbutton 8					
"	7CE0	...Repeated for User Programmable Pushbutton 9					
"	7D10	...Repeated for User Programmable Pushbutton 10					
"	7D40	...Repeated for User Programmable Pushbutton 11					
"	7D70	...Repeated for User Programmable Pushbutton 12					
"	7DA0	...Repeated for User Programmable Pushbutton 13					
"	7DD0	...Repeated for User Programmable Pushbutton 14					
"	7E00	...Repeated for User Programmable Pushbutton 15					
"	7E30	...Repeated for User Programmable Pushbutton 16					
	High Impedance Fault Detection (Hi-Z) Settings (Read/Write Setting)						
F60	7E60	Hi-Z Function	0 to 1	---	1	F102	0 (Disabled)
"	7E61	Hi-Z Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	7E62	Hi-Z Arcing Sensitivity	1 to 10	---	1	F001	5
"	7E63	Hi-Z Phase Event Count	10 to250	---	1	F001	30
"	7E64	Hi-Z Ground Event Count	10 to 500	---	1	F001	30
"	7E65	Hi-Z Event Count Time	5 to 180	min	1	F001	15
"	7E66	Hi-Z OC Protection Coord Timeout	10 to 200	seconds	1	F001	15
"	7E67	Hi-Z Phase OC Min Pickup	0.01 to 10	pu	0.01	F001	150
"	7E68	Hi-Z Neutral OC Min Pickup	0.01 to 10	pu	0.01	F001	100
"	7E69	Hi-Z Phase Rate of Change	1 to 999	A/2cycle	1	F001	150
"	7E6A	Hi-Z Neutral Rate of Change	1 to 999	A/2cycle	1	F001	150
"	7E6B	Hi-Z Loss of Load Threshold	5 to 100	%	1	F001	15
"	7E6C	Hi-Z Three-Phase Event Threshold	1 to 1000	A	1	F001	25
"	7E6D	Hi-Z Voltage Supv Threshold	0 to 100	%	1	F001	5
"	7E6E	Hi-Z Voltage Supv Delay	0 to 3000	cycles	2	F001	60
"	7E6F	Hi-Z Even Harmonic Restraint	0 to 100	%	1	F001	20
"	7E70	Hi-Z Target	0 to 2	---	1	F109	0 (Self-reset)
"	7E71	Hi-Z Events	0 to 1	---	1	F102	0 (Disabled)
"	7E72	Hi-Z Arcing Reset Time	0 to 6000	seconds	0.1	F001	0

Products	Address	Register name	Range	Units	Step	Format	Default
	Field Current (Read/Write Grouped Setting)						
G60	7E74	Field Current Function	0 to 1	---	1	F102	0 (Disabled)
"	7E75	Field Current Origin	0 to 48	---	1	F151	0 (NONE)
"	7E76	Field Current OC Pickup	0.05 to 1	pu	0.01	F001	80
"	7E77	Field Current OC Delay	0 to 600	seconds	0.01	F001	100
"	7E78	Field Current UC Pickup	0.05 to 1	pu	0.01	F001	20
"	7E79	Field Current UC Delay	0 to 600	seconds	0.01	F001	100
"	7E7A	Field Current Block	0 to 4294967295	---	1	F300	0
"	7E7C	Field Current Target	0 to 2	---	1	F109	0 (Self-reset)
"	7E7D	Field Current Events	0 to 1	---	1	F102	0 (Disabled)
	Field Ground (Read/Write Grouped Setting)						
G60	7E7E	Field Ground Function	0 to 1	---	1	F102	0 (Disabled)
"	7E7F	Field Ground Injection Frequency	0.1 to 3	Hz	0.01	F001	100
"	7E80	Field Ground Injection Connection Type	0 to 1	---	1	F613	0 (Single Point)
"	7E81	Field Ground STG1 Pickup	1 to 500	kOhm	1	F001	20
"	7E82	Field Ground STG1 Delay	0.1 to 600	seconds	0.1	F001	100
"	7E83	Field Ground STG2 Pickup	1 to 500	kOhm	1	F001	5
"	7E84	Field Ground STG2 Delay	0.1 to 600	seconds	0.1	F001	30
"	7E85	Field Ground UC Pickup	0.05 to 100	mA	0.01	F001	100
"	7E86	Field Ground UC Delay	0.1 to 600	seconds	0.01	F001	100
"	7E87	Field Ground Block	0 to 4294967295	---	1	F300	0
"	7E89	Field Ground Target	0 to 2	---	1	F109	0 (Self-reset)
"	7E8A	Field Ground Events	0 to 1	---	1	F102	0 (Disabled)
	Distance (Read/Write Grouped Setting)						
D30, D60, G60, L60, L90, T60	7E8C	Distance Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	7E8D	Memory Duration	5 to 25	cycles	1	F001	10
"	7E8E	Force Self-Polarization	0 to 4294967295	---	1	F300	0
"	7E90	Force Memory Polarization	0 to 4294967295	---	1	F300	0
	Distance 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

Products	Address	Register name	Range	Units	Step	Format	Default
"	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
"	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
	Neutral Overvoltage (Read/Write Grouped Setting) (3 Modules)						
All except B90, C30, L30, N60, T35	7F00	Neutral Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7F01	Neutral Overvoltage 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	7F02	Neutral Overvoltage 1 Pickup	0 to 3	pu	0.001	F001	300
"	7F03	Neutral Overvoltage 1 Pickup Delay	0 to 600	s	0.01	F001	100
"	7F04	Neutral Overvoltage 1 Reset Delay	0 to 600	s	0.01	F001	100
"	7F05	Neutral Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	7F07	Neutral Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7F08	Neutral Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7F09	Neutral Overvoltage 1 Curves	0 to 3	---	1	F116	0 (Definite Time)

Products	Address	Register name	Range	Units	Step	Format	Default
"	7F0A	Reserved (7 items)	0 to 65535	---	1	F001	0
"	7F11	...Repeated for Neutral Overvoltage 2					
"	7F22	...Repeated for Neutral Overvoltage 3					
	Auxiliary Undervoltage (Read/Write Grouped Setting) (1, 2, or 3 Modules)						
C60, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60	7F60	Auxiliary Undervoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7F61	Auxiliary Undervoltage 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	7F62	Auxiliary Undervoltage 1 Pickup	0 to 3	pu	0.001	F001	700
"	7F63	Auxiliary Undervoltage 1 Delay	0 to 600	s	0.01	F001	100
"	7F64	Auxiliary Undervoltage 1 Curve	0 to 1	---	1	F111	0 (Definite Time)
"	7F65	Auxiliary Undervoltage 1 Minimum Voltage	0 to 3	pu	0.001	F001	100
"	7F66	Auxiliary Undervoltage 1 Block	0 to 4294967295	---	1	F300	0
"	7F68	Auxiliary Undervoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7F69	Auxiliary Undervoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7F6A	Reserved (7 items)	0 to 65535	---	1	F001	0
C60, D60, F35, F60, G30, G60, L90, M60, T60	7F71	...Repeated for Auxiliary Undervoltage 2					
F35, T60	7F82	...Repeated for Auxiliary Undervoltage 3					
	Auxiliary Overvoltage (Read/Write Grouped Setting) (1, 2, or 3 Modules)						
All except B90, C30, N60, T35	7FA0	Auxiliary Overvoltage 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	7FA1	Auxiliary Overvoltage 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	7FA2	Auxiliary Overvoltage 1 Pickup	0 to 3	pu	0.001	F001	300
"	7FA3	Auxiliary Overvoltage 1 Pickup Delay	0 to 600	s	0.01	F001	100
"	7FA4	Auxiliary Overvoltage 1 Reset Delay	0 to 600	s	0.01	F001	100
"	7FA5	Auxiliary Overvoltage 1 Block	0 to 4294967295	---	1	F300	0
"	7FA7	Auxiliary Overvoltage 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	7FA8	Auxiliary Overvoltage 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	7FA9	Reserved (8 items)	0 to 65535	---	1	F001	0
B30, C70, C60, D60, F35, F60, G30 G60, L90, M60, T60	7FB1	...Repeated for Auxiliary Overvoltage 2					
B30, C70, F35, T60	7FC2	...Repeated for Auxiliary Overvoltage 3					
	Frequency (Read Only)						
All except B90, C30	8000	Tracking Frequency	2 to 90	Hz	0.01	F001	0
	Generic Comparator Settings (Read/Write Setting) (6 Modules)						
N60	8010	Comparator 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	8011	Comparator 1 Addition/Subtraction Mode Operand	0 to 4294967295	---	1	F300	0
"	8013	Comparator 1 Scale Factor	0.01 to 100	---	0.01	F001	100
"	8014	Comparator 1 Block	0 to 4294967295	---	1	F300	0
"	8016	Comparator 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	8017	Comparator 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	8018	Comparator 1 Argument A Bits (8 items)	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	8028	Comparator 1 Input Mode	0 to 1	---	1	F515	0 (SIGNED)
"	8029	Comparator 1 Direction Mode	0 to 1	---	1	F517	0 (OVER)
"	802A	Comparator 1 Pickup	-25400 to 25400	---	0.01	F004	1000000
"	802C	Comparator 1 Hysteresis	0 to 5000	---	0.01	F003	50000
"	802E	Comparator 1 Pickup Delay	0 to 65.353	s	0.001	F001	0
"	802F	Comparator 1 Reset Delay	0 to 65.353	s	0.001	F001	0
"	8030	Comparator 1 Argument B Bits (8 items)	0 to 4294967295	---	1	F300	0
"	8040	Reserved (4 items)	0 to 65535	---	1	F001	0
"	8044	...Repeated for Comparator 2					
"	8078	...Repeated for Comparator 3					
"	80AC	...Repeated for Comparator 4					
"	80E0	...Repeated for Comparator 5					
"	8114	...Repeated for Comparator 6					
	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	...Repeated for Direct Analog Input 2					
"	8184	...Repeated for Direct Analog Input 3					
"	8186	...Repeated for Direct Analog Input 4					
"	8188	...Repeated for Direct Analog Input 5					
"	818A	...Repeated for Direct Analog Input 6					
"	818C	...Repeated for Direct Analog Input 7					
"	818E	...Repeated for Direct Analog Input 8					
"	8190	...Repeated for Direct Analog Input 9					
"	8192	...Repeated for Direct Analog Input 10					
"	8194	...Repeated for Direct Analog Input 11					
"	8196	...Repeated for Direct Analog Input 12					
"	8198	...Repeated for Direct Analog Input 13					
"	819A	...Repeated for Direct Analog Input 14					
"	819C	...Repeated for Direct Analog Input 15					
"	819E	...Repeated for Direct Analog Input 16					
"	81A0	...Repeated for Direct Analog Input 17					
"	81A2	...Repeated for Direct Analog Input 18					
"	81A4	...Repeated for Direct Analog Input 19					
"	81A6	...Repeated for Direct Analog Input 20					
"	81A8	...Repeated for Direct Analog Input 21					
"	81AA	...Repeated for Direct Analog Input 22					
"	81AC	...Repeated for Direct Analog Input 23					
"	81AE	...Repeated for Direct Analog Input 24					

Products	Address	Register name	Range	Units	Step	Format	Default
"	81B0	...Repeated for Direct Analog Input 25					
"	81B2	...Repeated for Direct Analog Input 26					
"	81B4	...Repeated for Direct Analog Input 27					
"	81B6	...Repeated for Direct Analog Input 28					
"	81B8	...Repeated for Direct Analog Input 29					
"	81BA	...Repeated for Direct Analog Input 30					
"	81BC	...Repeated for Direct Analog Input 31					
"	81BE	...Repeated for Direct Analog Input 32					
	Temp Monitor Actual Values (Read Only Non-Volatile)						
All	81C0	Reserved Register T1	-55 to 125	C	1	F002	-55
"	81C1	Reserved Register T2	-55 to 125	C	1	F002	125
"	81C2	Reserved Register T3	-2147483647 to 2147483647	---	1	F004	0
"	81C4	Reserved Register T4	0 to 4294967295	---	1	F003	0
"	81C6	Reserved Register T5	0 to 4294967295	---	1	F003	0
"	81C8	Reserved Register T6	0 to 4294967295	---	1	F003	0
"	81CA	Reserved Register T7	0 to 4294967295	---	1	F003	0
"	81CC	Reserved Register T8	0 to 4294967295	---	1	F003	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 Settings (Read/Write) (5 Modules)						
N60	8260	Digitizer 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	8261	Digitizer 1 Source Input	0 to 65535	---	1	F600	0
"	8262	Digitizer 1 Limit Setting	0.05 to 90	pu	0.001	F003	1000
"	8264	Reserved (4 items)	0 to 65535	---	1	F001	0
"	8268	...Repeated for Digitizer 2					
"	8270	...Repeated for Digitizer 3					
"	8278	...Repeated for Digitizer 4					
"	8280	...Repeated for Digitizer 5					
	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
	(8-bit) Switch (Read/Write Setting) (6 Modules)						
C30, F35, N60	82C0	Switch 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	82C1	Switch 1 Argument A Bits (8 items)	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	82D1	Switch 1 Argument B Bits (8 items)	0 to 4294967295	---	1	F300	0
"	82E1	Switch 1 Control	0 to 4294967295	---	1	F300	0
"	82E3	Reserved (6 items)	0 to 65535	---	1	F001	0
"	82E9	...Repeated for Switch 2					
"	8312	...Repeated for Switch 3					
"	833B	...Repeated for Switch 4					
"	8364	...Repeated for Switch 5					
"	838D	...Repeated for Switch 6					
	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					
	EGD Fast Production (Read/Write Setting)						
B30, C30, C60, F35, F60, G30, G60, M60, T35, T60	8400	EGD Fast Producer Exchange 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	8401	EGD Fast Producer Exchange 1 Destination	0 to 4294967295	---	1	F003	0
"	8403	EGD Fast Producer Exchange 1 Data Rate	50 to 1000	ms	50	F001	1000
"	8404	EGD Fast Producer Exchange 1 Data Item 1 (20 items)	0 to 65535	---	1	F001	0
"	8418	Reserved (80 items)	---	---	---	F001	0
	EGD Slow Production (Read/Write Setting) (2 Modules)						
B30, C30, C60, F35, F60, G30, G60, M60, T35, T60	8468	EGD Slow Producer Exchange 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	8469	EGD Fast Producer Exchange 1 Destination	0 to 4294967295	---	1	F003	0
"	846B	EGD Slow Producer Exchange 1 Data Rate	500 to 1000	ms	50	F001	1000
"	846C	EGD Slow Producer Exchange 1 Data Item 1 (50 items)	0 to 65535	---	1	F001	0
"	849E	Reserved (50 items)	---	---	---	F001	0
"	84D0	...Repeated for EGD Slow Producer Exchange 2					
	Direct Integers (Read/Write Setting) (16 Modules)						
N60	8540	Direct Integer Output 1 Value	0 to 65535	---	1	F612	0
"	8541	Direct Integer Output 1 Trigger	0 to 4294967295	---	1	F300	0
"	8543	Direct Integer Input 1 Device	0 to 16	---	1	F001	0
"	8544	Direct Integer Input 1 Number	0 to 16	---	1	F001	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	8545	Direct Integer Input 1 Default Value	0 to 4294967295	---	1	F003	1000
"	8547	Direct Integer Input 1 Mode	0 to 1	---	1	F491	0 (Default Value)
"	8548	Direct Integer Reserved	0 to 65535	---	1	F003	0
"	854A	...Repeated for Direct Integer Output 2					
"	8554	...Repeated for Direct Integer Output 3					
"	855E	...Repeated for Direct Integer Output 4					
"	8568	...Repeated for Direct Integer Output 5					
"	8572	...Repeated for Direct Integer Output 6					
"	857C	...Repeated for Direct Integer Output 7					
"	8586	...Repeated for Direct Integer Output 8					
"	8590	...Repeated for Direct Integer Output 9					
"	859A	...Repeated for Direct Integer Output 10					
"	85A4	...Repeated for Direct Integer Output 11					
"	85AE	...Repeated for Direct Integer Output 12					
"	85B8	...Repeated for Direct Integer Output 13					
"	85C2	...Repeated for Direct Integer Output 14					
"	85CC	...Repeated for Direct Integer Output 15					
"	85D6	...Repeated for Direct Integer Output 16					
	Breaker Failure (Read/Write Grouped Setting) (1, 2, 4, or 6 Modules)						
B30, C60, C70, D60, F60, G60, L30, L60, L90, M60, T60	8600	Breaker Failure 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	8601	Breaker Failure 1 Mode	0 to 1	---	1	F157	0 (3-Pole)
"	8602	Breaker Failure 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	8603	Breaker Failure 1 Amp Supervision	0 to 1	---	1	F126	1 (Yes)
"	8604	Breaker Failure 1 Use Seal-In	0 to 1	---	1	F126	1 (Yes)
"	8605	Breaker Failure 1 Three Pole Initiate	0 to 4294967295	---	1	F300	0
"	8607	Breaker Failure 1 Block	0 to 4294967295	---	1	F300	0
"	8609	Breaker Failure 1 Phase Amp Supv Pickup	0.001 to 30	pu	0.001	F001	1050
"	860A	Breaker Failure 1 Neutral Amp Supv Pickup	0.001 to 30	pu	0.001	F001	1050
"	860B	Breaker Failure 1 Use Timer 1	0 to 1	---	1	F126	1 (Yes)
"	860C	Breaker Failure 1 Timer 1 Pickup	0 to 65.535	s	0.001	F001	0
"	860D	Breaker Failure 1 Use Timer 2	0 to 1	---	1	F126	1 (Yes)
"	860E	Breaker Failure 1 Timer 2 Pickup	0 to 65.535	s	0.001	F001	0
"	860F	Breaker Failure 1 Use Timer 3	0 to 1	---	1	F126	1 (Yes)
"	8610	Breaker Failure 1 Timer 3 Pickup	0 to 65.535	s	0.001	F001	0
"	8611	Breaker Failure 1 Breaker Status 1 Phase A/ 3P	0 to 4294967295	---	1	F300	0
"	8613	Breaker Failure 1 Breaker Status 2 Phase A/ 3P	0 to 4294967295	---	1	F300	0
"	8615	Breaker Failure 1 Breaker Test On	0 to 4294967295	---	1	F300	0
"	8617	Breaker Failure 1 Phase Amp Hiset Pickup	0.001 to 30	pu	0.001	F001	1050
"	8618	Breaker Failure 1 Neutral Amp Hiset Pickup	0.001 to 30	pu	0.001	F001	1050
"	8619	Breaker Failure 1 Phase Amp Loset Pickup	0.001 to 30	pu	0.001	F001	1050
"	861A	Breaker Failure 1 Neutral Amp Loset Pickup	0.001 to 30	pu	0.001	F001	1050
"	861B	Breaker Failure 1 Loset Time	0 to 65.535	s	0.001	F001	0
"	861C	Breaker Failure 1 Trip Dropout Delay	0 to 65.535	s	0.001	F001	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	861D	Breaker Failure 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	861E	Breaker Failure 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	861F	Breaker Failure 1 Phase A Initiate	0 to 4294967295	---	1	F300	0
"	8621	Breaker Failure 1 Phase B Initiate	0 to 4294967295	---	1	F300	0
"	8623	Breaker Failure 1 Phase C Initiate	0 to 4294967295	---	1	F300	0
"	8625	Breaker Failure 1 Breaker Status 1 Phase B	0 to 4294967295	---	1	F300	0
"	8627	Breaker Failure 1 Breaker Status 1 Phase C	0 to 4294967295	---	1	F300	0
"	8629	Breaker Failure 1 Breaker Status 2 Phase B	0 to 4294967295	---	1	F300	0
"	862B	Breaker Failure 1 Breaker Status 2 Phase C	0 to 4294967295	---	1	F300	0
B30, C60, D60, F60, G60, L30, L60, L90, M60, T60	862D	...Repeated for Breaker Failure 2					
B30, G60, T60	865A	...Repeated for Breaker Failure 3					
"	8687	...Repeated for Breaker Failure 4					
B30, T60	86B4	...Repeated for Breaker Failure 5					
"	86E1	...Repeated for Breaker Failure 6					
	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
	FlexState Settings (Read/Write Setting)						
All	8800	FlexState Parameters (256 items)	0 to 4294967295	---	1	F300	0
	Digital Elements (Read/Write Setting) (48 Modules)						
All except T35	8A00	Digital Element 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	8A01	Digital Element 1 Name	---	---	---	F203	"Dig Element 1"
"	8A09	Digital Element 1 Input	0 to 4294967295	---	1	F300	0
"	8A0B	Digital Element 1 Pickup Delay	0 to 999999.999	s	0.001	F003	0
"	8A0D	Digital Element 1 Reset Delay	0 to 999999.999	s	0.001	F003	0
"	8A0F	Digital Element 1 Block	0 to 4294967295	---	1	F300	0
"	8A11	Digital Element 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	8A12	Digital Element 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	8A13	Digital Element 1 Pickup LED	0 to 1	---	1	F102	1 (Enabled)
"	8A14	Reserved (2 items)	---	---	---	F001	0
"	8A16	...Repeated for Digital Element 2					
"	8A2C	...Repeated for Digital Element 3					
"	8A42	...Repeated for Digital Element 4					
"	8A58	...Repeated for Digital Element 5					

Products	Address	Register name	Range	Units	Step	Format	Default
"	8A6E	...Repeated for Digital Element 6					
"	8A84	...Repeated for Digital Element 7					
"	8A9A	...Repeated for Digital Element 8					
"	8AB0	...Repeated for Digital Element 9					
"	8AC6	...Repeated for Digital Element 10					
"	8ADC	...Repeated for Digital Element 11					
"	8AF2	...Repeated for Digital Element 12					
"	8B08	...Repeated for Digital Element 13					
"	8B1E	...Repeated for Digital Element 14					
"	8B34	...Repeated for Digital Element 15					
"	8B4A	...Repeated for Digital Element 16					
"	8B60	...Repeated for Digital Element 17					
"	8B76	...Repeated for Digital Element 18					
"	8B8C	...Repeated for Digital Element 19					
"	8BA2	...Repeated for Digital Element 20					
"	8BB8	...Repeated for Digital Element 21					
"	8BCE	...Repeated for Digital Element 22					
"	8BE4	...Repeated for Digital Element 23					
"	8BFA	...Repeated for Digital Element 24					
"	8C10	...Repeated for Digital Element 25					
"	8C26	...Repeated for Digital Element 26					
"	8C3C	...Repeated for Digital Element 27					
"	8C52	...Repeated for Digital Element 28					
"	8C68	...Repeated for Digital Element 29					
"	8C7E	...Repeated for Digital Element 30					
"	8C94	...Repeated for Digital Element 31					
"	8CAA	...Repeated for Digital Element 32					
"	8CC0	...Repeated for Digital Element 33					
"	8CD6	...Repeated for Digital Element 34					
"	8CEC	...Repeated for Digital Element 35					
"	8D02	...Repeated for Digital Element 36					
"	8D18	...Repeated for Digital Element 37					
"	8D2E	...Repeated for Digital Element 38					
"	8D44	...Repeated for Digital Element 39					
"	8D5A	...Repeated for Digital Element 40					
"	8D70	...Repeated for Digital Element 41					
"	8D86	...Repeated for Digital Element 42					
"	8D9C	...Repeated for Digital Element 43					
"	8DB2	...Repeated for Digital Element 44					
"	8DC8	...Repeated for Digital Element 45					
"	8DDE	...Repeated for Digital Element 46					
"	8DF4	...Repeated for Digital Element 47					
"	8E0A	...Repeated for Digital Element 48					
	Trip Bus (Read/Write Setting) (6 Modules)						
All	8ED0	Trip Bus 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	8ED1	Trip Bus 1 Block	0 to 4294967295	---	1	F300	0
"	8ED3	Trip Bus 1 Pickup Delay	0 to 600	s	0.01	F001	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	8ED4	Trip Bus 1 Reset Delay	0 to 600	s	0.01	F001	0
"	8ED5	Trip Bus 1 Input (16 items)	0 to 4294967295	---	1	F300	0
"	8EF5	Trip Bus 1 Latching	0 to 1	---	1	F102	0 (Disabled)
"	8EF6	Trip Bus 1 Reset	0 to 4294967295	---	1	F300	0
"	8EF8	Trip Bus 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	8EF9	Trip Bus 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	8EFA	Reserved (8 items)	0 to 1	---	1	F001	0
"	8F02	...Repeated for Trip Bus 2					
"	8F34	...Repeated for Trip Bus 3					
"	8F66	...Repeated for Trip Bus 4					
"	8F98	...Repeated for Trip Bus 5					
"	8FCA	...Repeated for Trip Bus 6					
	FlexElement (Read/Write Setting) (8 or 16 Modules)						
All except B90	9000	FlexElement 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	9001	FlexElement 1 Name	---	---	---	F206	"FxE 1"
"	9004	FlexElement 1 InputP	0 to 65535	---	1	F600	0
"	9005	FlexElement 1 InputM	0 to 65535	---	1	F600	0
"	9006	FlexElement 1 Compare	0 to 1	---	1	F516	0 (LEVEL)
"	9007	FlexElement 1 Input	0 to 1	---	1	F515	0 (SIGNED)
"	9008	FlexElement 1 Direction	0 to 1	---	1	F517	0 (OVER)
"	9009	FlexElement 1 Hysteresis	0.1 to 50	%	0.1	F001	30
"	900A	FlexElement 1 Pickup	-90 to 90	pu	0.001	F004	1000
"	900C	FlexElement 1 DeltaT Units	0 to 2	---	1	F518	0 (Milliseconds)
"	900D	FlexElement 1 DeltaT	20 to 86400	---	1	F003	20
"	900F	FlexElement 1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	9010	FlexElement 1 Reset Delay	0 to 65.535	s	0.001	F001	0
"	9011	FlexElement 1 Block	0 to 4294967295	---	1	F300	0
"	9013	FlexElement 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	9014	FlexElement 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	9015	...Repeated for FlexElement 2					
"	902A	...Repeated for FlexElement 3					
"	903F	...Repeated for FlexElement 4					
"	9054	...Repeated for FlexElement 5					
"	9069	...Repeated for FlexElement 6					
"	907E	...Repeated for FlexElement 7					
"	9093	...Repeated for FlexElement 8					
C70, F35, G30, G60, M60, N60, T35, T60	90A8	...Repeated for FlexElement 9					
"	90BD	...Repeated for FlexElement 10					
"	90D2	...Repeated for FlexElement 11					
"	90E7	...Repeated for FlexElement 12					
"	90FC	...Repeated for FlexElement 13					
"	9111	...Repeated for FlexElement 14					
"	9126	...Repeated for FlexElement 15					
"	913B	...Repeated for FlexElement 16					

Products	Address	Register name	Range	Units	Step	Format	Default
	Fault Report Settings (Read/Write Setting) (1 or 5 Modules)						
C60, D30, D60, F35, F60, L30, L60, L90	9200	Fault Report 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	9201	Fault Report 1 Trigger	0 to 4294967295	---	1	F300	0
"	9203	Fault Report 1 Z1 Magnitude	0.01 to 250	ohms	0.01	F001	300
"	9204	Fault Report 1 Z1 Angle	25 to 90	degrees	1	F001	75
"	9205	Fault Report 1 Z0 Magnitude	0.01 to 650	ohms	0.01	F001	900
"	9206	Fault Report 1 Z0 Angle	25 to 90	degrees	1	F001	75
"	9207	Fault Report 1 Line Length Units	0 to 1	---	1	F147	0 (km)
"	9208	Fault Report 1 Line Length	0 to 2000	---	0.1	F001	1000
"	9209	Fault Report 1 VT Substitution	0 to 2	---	1	F270	0 (None)
"	920A	Fault Report 1 System Z0 Magnitude	0.01 to 650	ohms	0.01	F001	200
"	920B	Fault Report 1 System Z0 Angle	25 to 90	degrees	1	F001	75
"	920C	Fault REM1-TAP Z1 Magnitude	0.01 to 250	ohms	0.01	F001	300
"	920D	Fault REM1-TAP Z1 Angle	25 to 90	degrees	1	F001	75
"	920E	Fault REM1-TAP Length	0 to 2000	---	0.1	F001	1000
"	920F	Fault REM2-TAP Z1 Magnitude	0.01 to 250	ohms	0.01	F001	300
"	9210	Fault REM2-TAP Z1 Angle	25 to 90	degrees	1	F001	75
"	9211	Fault REM2-TAP Length	0 to 2000	---	0.1	F001	1000
F35	9212	...Repeated for Fault Report 2					
"	9224	...Repeated for Fault Report 3					
"	9236	...Repeated for Fault Report 4					
"	9248	...Repeated for Fault Report 5					
	RRTD Inputs (Read/Write Setting) (12 Modules)						
G60, M60, T60	9260	RRTD RTD 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	9261	RRTD RTD 1 ID	---	---	---	F205	"RRTD 1 "
"	9267	RRTD RTD 1 Type	0 to 3	---	1	F174	0 (100 Ohm Platinum)
"	9268	RRTD RTD 1 Application	0 to 5	---	1	F550	0 (None)
"	9269	RRTD RTD 1 Alarm Temp	1 to 200	°C	1	F001	130
"	926A	RRTD RTD 1 Alarm Pickup Delay	5 to 600	s	5	F001	5
"	926B	RRTD RTD 1 Trip Temp	1 to 200	°C	1	F001	130
"	926C	RRTD RTD 1 Trip Pickup Delay	5 to 600	s	5	F001	5
"	926D	RRTD RTD 1 Trip Reset Delay	5 to 600	s	5	F001	5
"	926E	RRTD RTD 1 Trip Voting	0 to 13	---	1	F603	0 (None)
"	926F	RRTD RTD 1 Block	0 to 4294967295	---	1	F300	0
"	9271	RRTD RTD 1 Open	0 to 2	---	1	F552	0 (None)
"	9272	RRTD RTD 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	9273	RRTD RTD 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	9274	...Repeated for RRTD RTD 2		---			
"	9288	...Repeated for RRTD RTD 3		---			
"	929C	...Repeated for RRTD RTD 4		---			
"	92B0	...Repeated for RRTD RTD 5		---			
"	92C4	...Repeated for RRTD RTD 6		---			
"	92D8	...Repeated for RRTD RTD 7		---			
"	92EC	...Repeated for RRTD RTD 8		---			
"	9300	...Repeated for RRTD RTD 9		---			

Products	Address	Register name	Range	Units	Step	Format	Default
"	9314	...Repeated for RRTD RTD 10		---			
"	9328	...Repeated for RRTD RTD 11		---			
"	933C	...Repeated for RRTD RTD 12		---			
	DCmA Outputs (Read/Write Setting) (24 Modules)						
All except B90	9360	DCmA Output 1 Source	0 to 65535	---	1	F600	0
"	9361	DCmA Output 1 Range	0 to 2	---	1	F522	0 (–1 to 1 mA)
"	9362	DCmA Output 1 Minimum	–90 to 90	pu	0.001	F004	0
"	9364	DCmA Output 1 Maximum	–90 to 90	pu	0.001	F004	1000
"	9366	...Repeated for DCmA Output 2					
"	936C	...Repeated for DCmA Output 3					
"	9372	...Repeated for DCmA Output 4					
"	9378	...Repeated for DCmA Output 5					
"	937E	...Repeated for DCmA Output 6					
"	9384	...Repeated for DCmA Output 7					
"	938A	...Repeated for DCmA Output 8					
"	9390	...Repeated for DCmA Output 9					
"	9396	...Repeated for DCmA Output 10					
"	939C	...Repeated for DCmA Output 11					
"	93A2	...Repeated for DCmA Output 12					
"	93A8	...Repeated for DCmA Output 13					
"	93AE	...Repeated for DCmA Output 14					
"	93B4	...Repeated for DCmA Output 15					
"	93BA	...Repeated for DCmA Output 16					
"	93C0	...Repeated for DCmA Output 17					
"	93C6	...Repeated for DCmA Output 18					
"	93CC	...Repeated for DCmA Output 19					
"	93D2	...Repeated for DCmA Output 20					
"	93D8	...Repeated for DCmA Output 21					
"	93DE	...Repeated for DCmA Output 22					
"	93E4	...Repeated for DCmA Output 23					
"	93EA	...Repeated for DCmA Output 24					
	Direct Input/Output Names (Read/Write Setting) (32, 64, or 96 Modules)						
All except L30, L90	9400	Direct Input 1 Name	0 to 96	---	1	F205	"Dir Ip 1"
"	9406	Direct Output 1 Name	1 to 96	---	1	F205	"Dir Out 1"
"	940C	...Repeated for Direct Input/Output 2					
"	9418	...Repeated for Direct Input/Output 3					
"	9424	...Repeated for Direct Input/Output 4					
"	9430	...Repeated for Direct Input/Output 5					
"	943C	...Repeated for Direct Input/Output 6					
"	9448	...Repeated for Direct Input/Output 7					
"	9454	...Repeated for Direct Input/Output 8					
"	9460	...Repeated for Direct Input/Output 9					
"	946C	...Repeated for Direct Input/Output 10					
"	9478	...Repeated for Direct Input/Output 11					
"	9484	...Repeated for Direct Input/Output 12					

Products	Address	Register name	Range	Units	Step	Format	Default
"	9490	...Repeated for Direct Input/Output 13					
"	949C	...Repeated for Direct Input/Output 14					
"	94A8	...Repeated for Direct Input/Output 15					
"	94B4	...Repeated for Direct Input/Output 16					
"	94C0	...Repeated for Direct Input/Output 17					
"	94CC	...Repeated for Direct Input/Output 18					
"	94D8	...Repeated for Direct Input/Output 19					
"	94E4	...Repeated for Direct Input/Output 20					
"	94F0	...Repeated for Direct Input/Output 21					
"	94FC	...Repeated for Direct Input/Output 22					
"	9508	...Repeated for Direct Input/Output 23					
"	9514	...Repeated for Direct Input/Output 24					
"	9520	...Repeated for Direct Input/Output 25					
"	952C	...Repeated for Direct Input/Output 26					
"	9538	...Repeated for Direct Input/Output 27					
"	9544	...Repeated for Direct Input/Output 28					
"	9550	...Repeated for Direct Input/Output 29					
"	955C	...Repeated for Direct Input/Output 30					
"	9568	...Repeated for Direct Input/Output 31					
"	9574	...Repeated for Direct Input/Output 32					
B90, N60	9580	...Repeated for Direct Input/Output 33					
"	958C	...Repeated for Direct Input/Output 34					
"	9598	...Repeated for Direct Input/Output 35					
"	95A4	...Repeated for Direct Input/Output 36					
"	95B0	...Repeated for Direct Input/Output 37					
"	95BC	...Repeated for Direct Input/Output 38					
"	95C8	...Repeated for Direct Input/Output 39					
"	95D4	...Repeated for Direct Input/Output 40					
"	95E0	...Repeated for Direct Input/Output 41					
"	95EC	...Repeated for Direct Input/Output 42					
"	95F8	...Repeated for Direct Input/Output 43					
"	9604	...Repeated for Direct Input/Output 44					
"	9610	...Repeated for Direct Input/Output 45					
"	961C	...Repeated for Direct Input/Output 46					
"	9628	...Repeated for Direct Input/Output 47					
"	9634	...Repeated for Direct Input/Output 48					
"	9640	...Repeated for Direct Input/Output 49					
"	964C	...Repeated for Direct Input/Output 50					
"	9658	...Repeated for Direct Input/Output 51					
"	9664	...Repeated for Direct Input/Output 52					
"	9670	...Repeated for Direct Input/Output 53					
"	967C	...Repeated for Direct Input/Output 54					
"	9688	...Repeated for Direct Input/Output 55					
"	9694	...Repeated for Direct Input/Output 56					
"	96A0	...Repeated for Direct Input/Output 57					
"	96AC	...Repeated for Direct Input/Output 58					
"	96B8	...Repeated for Direct Input/Output 59					

Products	Address	Register name	Range	Units	Step	Format	Default
"	96C4	...Repeated for Direct Input/Output 60					
"	96D0	...Repeated for Direct Input/Output 61					
"	96DC	...Repeated for Direct Input/Output 62					
"	96E8	...Repeated for Direct Input/Output 63					
"	96F4	...Repeated for Direct Input/Output 64					
B90	9700	...Repeated for Direct Input/Output 65					
"	970C	...Repeated for Direct Input/Output 66					
"	9718	...Repeated for Direct Input/Output 67					
"	9724	...Repeated for Direct Input/Output 68					
"	9730	...Repeated for Direct Input/Output 69					
"	973C	...Repeated for Direct Input/Output 70					
"	9748	...Repeated for Direct Input/Output 71					
"	9754	...Repeated for Direct Input/Output 72					
"	9760	...Repeated for Direct Input/Output 73					
"	976C	...Repeated for Direct Input/Output 74					
"	9778	...Repeated for Direct Input/Output 75					
"	9784	...Repeated for Direct Input/Output 76					
"	9790	...Repeated for Direct Input/Output 77					
"	979C	...Repeated for Direct Input/Output 78					
"	97A8	...Repeated for Direct Input/Output 79					
"	97B4	...Repeated for Direct Input/Output 80					
"	97C0	...Repeated for Direct Input/Output 81					
"	97CC	...Repeated for Direct Input/Output 82					
"	97D8	...Repeated for Direct Input/Output 83					
"	97E4	...Repeated for Direct Input/Output 84					
"	97F0	...Repeated for Direct Input/Output 85					
"	97FC	...Repeated for Direct Input/Output 86					
"	9808	...Repeated for Direct Input/Output 87					
"	9814	...Repeated for Direct Input/Output 88					
"	9820	...Repeated for Direct Input/Output 89					
"	982C	...Repeated for Direct Input/Output 90					
"	9838	...Repeated for Direct Input/Output 91					
"	9844	...Repeated for Direct Input/Output 92					
"	9850	...Repeated for Direct Input/Output 93					
"	985C	...Repeated for Direct Input/Output 94					
"	9868	...Repeated for Direct Input/Output 95					
"	9874	...Repeated for Direct Input/Output 96					
	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

Products	Address	Register name	Range	Units	Step	Format	Default
"	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
	Breaker Restrike (Read/Write Setting) (1, 2, or 3 Modules)						
C60, C70, D60, F35, F60, L90, T60	9930	Breaker Restrike 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	9931	Breaker Restrike 1 Block	0 to 4294967295	---	1	F300	0
"	9933	Breaker Restrike 1 Signal Source	0 to 5	---	1	F167	0 (SRC 1)
"	9934	Breaker Restrike 1 Pickup	0.1 to 2	pu	0.01	F001	50
"	9935	Breaker Restrike 1 Reset Delay	0 to 65.535	s	0.001	F001	100
"	9936	Breaker Restrike 1 HF Detect	0 to 1	---	1	F102	1 (Enabled)
"	9937	Breaker Restrike 1 Breaker Open	0 to 4294967295	---	1	F300	0
"	9939	Breaker Restrike 1 Open Command	0 to 4294967295	---	1	F300	0
"	993B	Breaker Restrike 1 Close Command	0 to 4294967295	---	1	F300	0
"	993D	Breaker Restrike 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	993E	Breaker Restrike 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	993F	Reserved (2 items)	---	---	---	F002	0
C60, C70, D60, F35, L90, T60	9941	...Repeated for Breaker Restrike 2					
C70, F35, T60	9952	...Repeated for Breaker Restrike 3					
	Teleprotection Inputs/Outputs Commands (Read/Write Command)						
All except B90, C70, L30, L90	9980	Teleprotection Clear Lost Packets	0 to 1	---	1	F126	0 (No)
	Teleprotection Inputs/Outputs (Read/Write Settings)						
All except B90, C70, L30, L90	9990	Teleprotection Function	0 to 1	---	1	F102	0 (Disabled)
"	9991	Teleprotection Number of Terminals	2 to 3	---	1	F001	2
"	9992	Teleprotection Number of Channels	1 to 2	---	1	F001	1
"	9993	Teleprotection Local Relay ID	0 to 255	---	1	F001	0
"	9994	Teleprotection Terminal 1 ID	0 to 255	---	1	F001	0
"	9995	Teleprotection Terminal 2 ID	0 to 255	---	1	F001	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	9996	Reserved (10 items)	0 to 1	---	1	F001	0
"	9A00	Teleprotection Input 1-n Default States (16 items)	0 to 3	---	1	F086	0 (Off)
"	9A10	Teleprotection Input 2-n Default States (16 items)	0 to 3	---	1	F086	0 (Off)
"	9A20	Teleprotection Output 1-n Operand (16 items)	0 to 4294967295	---	1	F300	0
"	9A40	Teleprotection Output 2-n Operand (16 items)	0 to 4294967295	---	1	F300	0
	Teleprotection Channel Tests (Read Only)						
All except B90, C70, 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
"	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)
"	9AAF	Teleprotection Channel 1 Input States	0 to 1	---	1	F500	0
"	9AB0	Teleprotection Channel 2 Input States	0 to 1	---	1	F500	0
"	9AC0	Teleprotection Input 1 States, 1 per register (16 items)	0 to 1	---	1	F108	0 (Off)
"	9AD0	Teleprotection Input 2 States, 1 per register (16 items)	0 to 1	---	1	F108	0 (Off)
	Capacitor Control Settings Read/Write Setting) (4 Modules)						
C70	9B00	Capacitor Control 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	9B01	Capacitor Control 1 Set Remote 1	0 to 4294967295	---	1	F300	0
"	9B03	Capacitor Control 1 Set Remote 2	0 to 4294967295	---	1	F300	0
"	9B05	Capacitor Control 1 Set Local 1	0 to 4294967295	---	1	F300	0
"	9B07	Capacitor Control 1 Set Local 2	0 to 4294967295	---	1	F300	0
"	9B09	Capacitor Control 1 Remote Control Enable	0 to 4294967295	---	1	F300	0
"	9B0B	Capacitor Control 1 Local Control Enable	0 to 4294967295	---	1	F300	0
"	9B0D	Capacitor Control 1 Remote Set Automatic	0 to 4294967295	---	1	F300	0
"	9B0F	Capacitor Control 1 Local Set Automatic	0 to 4294967295	---	1	F300	0
"	9B11	Capacitor Control 1 Remote Set Manual	0 to 4294967295	---	1	F300	0
"	9B13	Capacitor Control 1 Local Set Manual	0 to 4294967295	---	1	F300	0
"	9B15	Capacitor Control 1 Trip 1	0 to 4294967295	---	1	F300	0
"	9B17	Capacitor Control 1 Trip 2	0 to 4294967295	---	1	F300	0
"	9B19	Capacitor Control 1 Trip 3	0 to 4294967295	---	1	F300	0
"	9B1B	Capacitor Control 1 Trip 4	0 to 4294967295	---	1	F300	0
"	9B1D	Capacitor Control 1 Trip 5	0 to 4294967295	---	1	F300	0
"	9B1F	Capacitor Control 1 Trip 6	0 to 4294967295	---	1	F300	0
"	9B21	Capacitor Control Switch to Manual on Trip	0 to 1	---	1	F126	1 (Yes)
"	9B22	Capacitor Control 1 Automatic Control Enable	0 to 4294967295	---	1	F300	0
"	9B24	Capacitor Control 1 Manual Control Enable	0 to 4294967295	---	1	F300	0
"	9B26	Capacitor Control 1 Remote Open	0 to 4294967295	---	1	F300	0
"	9B28	Capacitor Control 1 Local Open	0 to 4294967295	---	1	F300	0
"	9B2A	Capacitor Control 1 Automatic Open	0 to 4294967295	---	1	F300	0
"	9B2C	Capacitor Control 1 Breaker Open 52b	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	9B2E	Capacitor Control 1 Trip Seal-in Delay	0 to 60	s	0.001	F001	400
"	9B2F	Capacitor Control 1 Remote Close	0 to 4294967295	---	1	F300	0
"	9B31	Capacitor Control 1 Local Close	0 to 4294967295	---	1	F300	0
"	9B33	Capacitor Control 1 Automatic Close	0 to 4294967295	---	1	F300	0
"	9B35	Capacitor Control 1 Breaker Closed 52a	0 to 4294967295	---	1	F300	0
"	9B37	Capacitor Control 1 Close Discharge Time	0 to 3600	s	1	F001	300
"	9B39	Capacitor Control 1 Close Seal-in Delay	0 to 60	s	0.001	F001	400
"	9B3A	Capacitor Control 1 Breaker Close Block	0 to 4294967295	---	1	F300	0
"	9B3C	Capacitor Control 1 Close Override	0 to 4294967295	---	1	F300	0
"	9B3E	Capacitor Control 1 Targets	0 to 2	---	1	F109	0 (Self-Reset)
"	9B3F	Capacitor Control 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	9B40	...Repeated for Capacitor Control Element 2					
"	9B80	...Repeated for Capacitor Control Element 3					
"	9BC0	...Repeated for Capacitor Control Element 4					
	Automatic Voltage Regulator Settings (Read/Write) (3 Modules)						
C70	9C90	Automatic Voltage Regulator 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	9C91	Automatic Voltage Regulator 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	9C92	Automatic Voltage Regulator 1 Minimum Voltage	0.5 to 1.5	pu	0.001	F001	500
"	9C93	Automatic Voltage Regulator 1 Control Mode	0 to 1	---	1	F536	0 (Voltage)
"	9C94	Automatic Voltage Regulator 1 Voltage Operating Signal	0 to 8	---	1	F535	4 (V1)
"	9C95	Automatic Voltage Regulator 1 Voltage Level to Close	0.75 to 1.5	pu	0.001	F001	950
"	9C96	Automatic Voltage Regulator 1 Voltage Level to Open	0.75 to 1.5	pu	0.001	F001	1050
"	9C97	AVR 1 Voltage Drop Compensation Impedance	0 to 250	ohms	0.01	F001	0
"	9C98	AVR 1 Voltage Drop Compensation RCA	30 to 90	°	1	F001	75
"	9C99	Automatic Voltage Regulator 1 VAR Level to Close	–1.5 to 1.5	pu	0.001	F002	950
"	9C9A	Automatic Voltage Regulator 1 VAR Level to Open	–1.5 to 1.5	pu	0.001	F002	1050
"	9C9B	Automatic Voltage Regulator 1 Power Factor Limit	0.5 to 1	---	0.01	F001	100
"	9C9C	Automatic Voltage Regulator 1 VAR Open Mode	0 to 1	---	1	F537	1 (Minimize no. of ops.)
"	9C9D	Automatic Voltage Regulator 1 Delay Before Close	0 to 65.535	s	0.001	F001	1000
"	9C9E	Automatic Voltage Regulator 1 Delay Before Open	0 to 65.535	s	0.001	F001	1000
"	9C9F	Automatic Voltage Regulator 1 Block	0 to 4294967295	---	1	F300	0
"	9CA1	Automatic Voltage Regulator 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	9CA2	Automatic Voltage Regulator 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	9CA3	Reserved	0 to 0.001	---	0.001	F001	0
"	9CA4	...Repeated for Automatic Voltage Regulator 2					
"	9CB8	...Repeated for Automatic Voltage Regulator 3					

Products	Address	Register name	Range	Units	Step	Format	Default
	Neutral Current Unbalance Settings (Read/Write Grouped Setting) (3 Modules)						
C70	9CE0	Neutral Current Unbalance 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	9CE1	Neutral Current Unbalance 1 Bank Source	0 to 5	---	1	F167	0 (SRC 1)
"	9CE2	Neutral Current Unbalance 1 *k* Magnitude	0 to 0.15	---	0.0001	F001	0
"	9CE3	Neutral Current Unbalance 1 *k* Angle	0 to 359	°	1	F001	0
"	9CE4	Neutral Current Unbalance 1 Stage 1 Pickup	0 to 5	pu	0.001	F001	20
"	9CE5	Neutral Current Unbalance 1 Stage 1 Slope	0 to 10	%	0.1	F001	20
"	9CE6	Neutral Current Unbalance 1 Stage 2 Pickup	0 to 5	pu	0.001	F001	30
"	9CE7	Neutral Current Unbalance 1 Stage 2 Slope	0 to 10	%	0.1	F001	20
"	9CE8	Neutral Current Unbalance 1 Stage 3 Pickup	0 to 5	pu	0.001	F001	40
"	9CE9	Neutral Current Unbalance 1 Stage 3 Slope	0 to 10	%	0.1	F001	20
"	9CEA	Neutral Current Unbalance 1 Stage 4 Pickup	0 to 5	pu	0.001	F001	50
"	9CEB	Neutral Current Unbalance 1 Stage 4 Slope	0 to 10	%	0.1	F001	50
"	9CEC	Neutral Current Unbalance 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	3000
"	9CED	Neutral Current Unbalance 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	9CEE	Neutral Current Unbalance 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	100
"	9CEF	Neutral Current Unbalance 1 Stage 4 Pickup Delay	0 to 600	s	0.01	F001	20
"	9CF0	Neutral Current Unbalance 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	9CF1	Neutral Current Unbalance 1 Stage 1 Block	0 to 4294967295	---	1	F300	0
"	9CF3	Neutral Current Unbalance 1 Stage 2 Block	0 to 4294967295	---	1	F300	0
"	9CF5	Neutral Current Unbalance 1 Stage 3 Block	0 to 4294967295	---	1	F300	0
"	9CF7	Neutral Current Unbalance 1 Stage 4 Block	0 to 4294967295	---	1	F300	0
"	9CF9	Neutral Current Unbalance 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	9CFA	Neutral Current Unbalance 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	9CFB	...Repeated for Neutral Current Unbalance 2					
"	9D16	...Repeated for Neutral Current Unbalance 3					
	Neutral Voltage Unbalance Settings (Read/Write Grouped Setting) (3 Modules)						
C70	9D50	Neutral Voltage Unbalance 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	9D51	Neutral Voltage Unbalance 1 Neutral-Point Source	0 to 5	---	1	F167	0 (SRC 1)
"	9D52	Neutral Voltage Unbalance 1 Bus Source	0 to 5	---	1	F167	0 (SRC 1)
"	9D53	Neutral Voltage Unbalance 1 Bus 3V0	0 to 1	---	1	F241	0 (Calculated)
"	9D54	Neutral Voltage Unbalance 1 Ground	0 to 1	---	1	F255	0 (VT (ungrnd))
"	9D55	Neutral Voltage Unbalance 1 AB Ratio	0.75 to 1.25	---	0.0001	F001	10000
"	9D56	Neutral Voltage Unbalance 1 AC Ratio	0.75 to 1.25	---	0.0001	F001	10000
"	9D57	Neutral Voltage Unbalance 1 Stage 1 Pickup	0.001 to 1	pu	0.001	F001	10

Products	Address	Register name	Range	Units	Step	Format	Default
"	9D58	Neutral Voltage Unbalance 1 Stage 1 Slope	0 to 10	%	0.1	F001	0
"	9D59	Neutral Voltage Unbalance 1 Stage 2 Pickup	0.001 to 1	pu	0.001	F001	20
"	9D5A	Neutral Voltage Unbalance 1 Stage 2 Slope	0 to 10	%	0.1	F001	0
"	9D5B	Neutral Voltage Unbalance 1 Stage 3 Pickup	0.001 to 1	pu	0.001	F001	20
"	9D5C	Neutral Voltage Unbalance 1 Stage 3 Slope	0 to 10	%	0.1	F001	50
"	9D5D	Neutral Voltage Unbalance 1 Stage 4 Pickup	0.001 to 1	pu	0.001	F001	30
"	9D5E	Neutral Voltage Unbalance 1 Stage 4 Slope	0 to 10	%	0.1	F001	50
"	9D5F	Neutral Voltage Unbalance 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	3000
"	9D60	Neutral Voltage Unbalance 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	9D61	Neutral Voltage Unbalance 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	100
"	9D62	Neutral Voltage Unbalance 1 Stage 4 Pickup Delay	0 to 600	s	0.01	F001	20
"	9D63	Neutral Voltage Unbalance 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	9D64	Neutral Voltage Unbalance 1 Stage 1 Block	0 to 4294967295	---	1	F300	0
"	9D66	Neutral Voltage Unbalance 1 Stage 2 Block	0 to 4294967295	---	1	F300	0
"	9D68	Neutral Voltage Unbalance 1 Stage 3 Block	0 to 4294967295	---	1	F300	0
"	9D6A	Neutral Voltage Unbalance 1 Stage 4 Block	0 to 4294967295	---	1	F300	0
"	9D6C	Neutral Voltage Unbalance 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	9D6D	Neutral Voltage Unbalance 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	9D6E	...Repeated for Neutral Voltage Unbalance 2					
"	9D8C	...Repeated for Neutral Voltage Unbalance 3					
	Phase Current Unbalance Settings (Read/Write Grouped Setting) (3 Modules)						
C70	9DC0	Phase Current Unbalance 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	9DC1	Phase Current Unbalance 1 Differential Source	0 to 5	---	1	F167	0 (SRC 1)
"	9DC2	Phase Current Unbalance 1 Bank Source	0 to 5	---	1	F167	0 (SRC 1)
"	9DC3	Phase Current Unbalance 1 Inherent Factor A	–0.1 to 0.1	---	0.0001	F002	0
"	9DC4	Phase Current Unbalance 1 Inherent Factor B	–0.1 to 0.1	---	0.0001	F002	0
"	9DC5	Phase Current Unbalance 1 Inherent Factor C	–0.1 to 0.1	---	0.0001	F002	0
"	9DC6	Phase Current Unbalance 1 Stage 1A Pickup	0.001 to 5	pu	0.001	F001	20
"	9DC7	Phase Current Unbalance 1 Stage 2A Pickup	0.001 to 5	pu	0.001	F001	30
"	9DC8	Phase Current Unbalance 1 Stage 3A Pickup	0.001 to 5	pu	0.001	F001	40
"	9DC9	Phase Current Unbalance 1 Stage 4A Pickup	0.001 to 5	pu	0.001	F001	50
"	9DCA	Phase Current Unbalance 1 Stage 1B Pickup	0.001 to 5	pu	0.001	F001	20
"	9DCB	Phase Current Unbalance 1 Stage 2B Pickup	0.001 to 5	pu	0.001	F001	30

Products	Address	Register name	Range	Units	Step	Format	Default
"	9DCC	Phase Current Unbalance 1 Stage 3B Pickup	0.001 to 5	pu	0.001	F001	40
"	9DCD	Phase Current Unbalance 1 Stage 4B Pickup	0.001 to 5	pu	0.001	F001	50
"	9DCE	Phase Current Unbalance 1 Stage 1C Pickup	0.001 to 5	pu	0.001	F001	20
"	9DCF	Phase Current Unbalance 1 Stage 2C Pickup	0.001 to 5	pu	0.001	F001	30
"	9DD0	Phase Current Unbalance 1 Stage 3C Pickup	0.001 to 5	pu	0.001	F001	40
"	9DD1	Phase Current Unbalance 1 Stage 4C Pickup	0.001 to 5	pu	0.001	F001	50
"	9DD2	Phase Current Unbalance 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	3000
"	9DD3	Phase Current Unbalance 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	9DD4	Phase Current Unbalance 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	100
"	9DD5	Phase Current Unbalance 1 Stage 4 Pickup Delay	0 to 600	s	0.01	F001	20
"	9DD6	Phase Current Unbalance 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	9DD7	Phase Current Unbalance 1 Stage 1 Block	0 to 4294967295	---	1	F300	0
"	9DD9	Phase Current Unbalance 1 Stage 2 Block	0 to 4294967295	---	1	F300	0
"	9DDB	Phase Current Unbalance 1 Stage 3 Block	0 to 4294967295	---	1	F300	0
"	9DDD	Phase Current Unbalance 1 Stage 4 Block	0 to 4294967295	---	1	F300	0
"	9DDF	Phase Current Unbalance 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	9DE0	Phase Current Unbalance 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	9DE1	...Repeated for Phase Current Unbalance 2					
"	9E02	...Repeated for Phase Current Unbalance 3					
	Voltage Differential Settings (Read/Write Grouped Setting) (3 Modules)						
C70	9E40	Voltage Differential 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	9E41	Voltage Differential 1 Bus Source	0 to 5	---	1	F167	0 (SRC 1)
"	9E42	Voltage Differential 1 Tap Source	0 to 5	---	1	F167	0 (SRC 1)
"	9E43	Voltage Differential 1 Bank Ground	0 to 1	---	1	F091	0 (Grounded)
"	9E44	Voltage Differential 1 Match Factor A	0.5 to 2000	---	0.0001	F003	20000
"	9E46	Voltage Differential 1 Match Factor B	0.5 to 2000	---	0.0001	F003	20000
"	9E48	Voltage Differential 1 Match Factor C	0.5 to 2000	---	0.0001	F003	20000
"	9E4A	Voltage Differential 1 Stage 1A Pickup	0.001 to 1	pu	0.001	F001	10
"	9E4B	Voltage Differential 1 Stage 2A Pickup	0.001 to 1	pu	0.001	F001	20
"	9E4C	Voltage Differential 1 Stage 3A Pickup	0.001 to 1	pu	0.001	F001	30
"	9E4D	Voltage Differential 1 Stage 4A Pickup	0.001 to 1	pu	0.001	F001	40
"	9E4E	Voltage Differential 1 Stage 1B Pickup	0.001 to 1	pu	0.001	F001	10
"	9E4F	Voltage Differential 1 Stage 2B Pickup	0.001 to 1	pu	0.001	F001	20
"	9E50	Voltage Differential 1 Stage 3B Pickup	0.001 to 1	pu	0.001	F001	30
"	9E51	Voltage Differential 1 Stage 4B Pickup	0.001 to 1	pu	0.001	F001	40
"	9E52	Voltage Differential 1 Stage 1C Pickup	0.001 to 1	pu	0.001	F001	10
"	9E53	Voltage Differential 1 Stage 2C Pickup	0.001 to 1	pu	0.001	F001	20
"	9E54	Voltage Differential 1 Stage 3C Pickup	0.001 to 1	pu	0.001	F001	30

Products	Address	Register name	Range	Units	Step	Format	Default
"	9E55	Voltage Differential 1 Stage 4C Pickup	0.001 to 1	pu	0.001	F001	40
"	9E56	Voltage Differential 1 Stage 1 Pickup Delay	0 to 600	s	0.01	F001	3000
"	9E57	Voltage Differential 1 Stage 2 Pickup Delay	0 to 600	s	0.01	F001	1000
"	9E58	Voltage Differential 1 Stage 3 Pickup Delay	0 to 600	s	0.01	F001	100
"	9E59	Voltage Differential 1 Stage 4 Pickup Delay	0 to 600	s	0.01	F001	20
"	9E5A	Voltage Differential 1 Dropout Delay	0 to 600	s	0.01	F001	25
"	9E5B	Voltage Differential 1 Stage 1 Block	0 to 4294967295	---	1	F300	0
"	9E5D	Voltage Differential 1 Stage 2 Block	0 to 4294967295	---	1	F300	0
"	9E5F	Voltage Differential 1 Stage 3 Block	0 to 4294967295	---	1	F300	0
"	9E61	Voltage Differential 1 Stage 4 Block	0 to 4294967295	---	1	F300	0
"	9E63	Voltage Differential 1 Target	0 to 2	---	1	F109	0 (Self-Reset)
"	9E64	Voltage Differential 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	9E65	...Repeated for Voltage Differential 2					
"	9E8A	...Repeated for Voltage Differential 3					
	Charge Current Compensation Settings (Read/Write Grouped Setting)						
L60	9EF0	Charging Current Compensation Function	0 to 1	---	1	F102	0 (Disabled)
"	9EF1	Charging Current Compensation Block	0 to 4294967295	---	1	F300	0
"	9EF3	Charging Current Compensation Positive-Sequence Capacitive Reactance (Xc)	0.1 to 65.535	kOhm	0.001	F001	100
"	9EF4	Charging Current Compensation Zero-Sequence Capacitive Reactance (Xc)	0.1 to 65.535	kOhm	0.001	F001	100
	Undercurrent (Read/Write Grouped Setting)						
M60	9F00	Undercurrent Function	0 to 1	---	1	F102	0 (Disabled)
"	9F01	Undercurrent Speed 1 Start Block Delay	0 to 600	s	0.01	F001	50
"	9F02	Undercurrent Speed 1 Alarm Pickup	0.1 to 0.95	× FLA	0.01	F001	70
"	9F03	Undercurrent Speed 1 Alarm Pickup Delay	0 to 600	s	0.01	F001	200
"	9F04	Undercurrent Speed 1 Trip Pickup	0.1 to 0.95	× FLA	0.01	F001	70
"	9F05	Undercurrent Speed 1 Trip Pickup Delay	0 to 600	s	0.01	F001	100
"	9F06	Undercurrent Speed 1 Trip Reset Delay	0 to 600	s	0.01	F001	100
"	9F07	Undercurrent Speed 1 Block	0 to 4294967295	---	1	F300	0
"	9F09	Undercurrent Target	0 to 2	---	1	F109	0 (Self-reset)
"	9F0A	Undercurrent Events	0 to 1	---	1	F102	0 (Disabled)
"	9F0B	Undercurrent Speed 2 Start Block Delay	0 to 600	s	0.01	F001	50
"	9F0C	Undercurrent Speed 2 Alarm Pickup	0.10 to 0.95	× FLA	0.01	F001	70
"	9F0D	Undercurrent Speed 2 Alarm Pickup Delay	0 to 600	s	0.01	F001	200
"	9F0E	Undercurrent Speed 2 Trip Pickup	0.10 to 0.95	× FLA	0.01	F001	70
"	9F0F	Undercurrent Speed 2 Trip Pickup Delay	0 to 600	s	0.01	F001	100
"	9F10	Undercurrent Speed 2 Trip Reset Delay	0 to 600	s	0.01	F001	100
"	9F11	Undercurrent Speed 2 Block	0 to 4294967295	---	1	F300	0
"	9F13	Reserved (2 items)	0 to 1	---	1	F001	0
	Cold Load Pickup (Read/Write Setting) (2 Modules)						
F60	A000	Cold Load Pickup 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A001	Cold Load Pickup 1 Initiate	0 to 4294967295	---	1	F300	0
"	A003	Cold Load Pickup 1 Block	0 to 4294967295	---	1	F300	0
"	A005	Outage Time Before Cold Load Pickup 1	0 to 1000	s	1	F001	1000
"	A006	On Load Time Before Reset 1	0 to 1000000	s	0.001	F003	100000
"	A008	Cold Load Pickup 1 Source	0 to 5	---	1	F167	0 (SRC 1)

Products	Address	Register name	Range	Units	Step	Format	Default
"	A009	Reserved	0 to 65535	---	1	F001	0
"	A00A	...Repeated for Cold Load Pickup 2					
	Broken Rotor Bar Detection (Read Only Actual Values)						
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
	Broken Rotor Bar Commands (Read/Write Commands)						
M60	A02D	Broken Rotor Bar Clear Data Command	0 to 1	---	1	F126	0 (No)
	Broken Rotor Bar Detection (Read/Write Settings)						
M60	A030	Broken Rotor Bar Function	0 to 1	---	1	F102	0 (Disabled)
"	A031	Start of Broken Rotor Bar Offset	–12 to 11.99	Hz	0.01	F002	40
"	A032	End of Broken Rotor Bar Offset	–11.99 to 12	Hz	0.01	F002	200
"	A033	Broken Rotor Bar Start Block Delay	0 to 600	s	0.01	F001	6000
"	A034	Minimum Motor Load	0.5 to 1	× FLA	0.01	F001	70
"	A035	Maximum Load Deviation	0 to 1	× FLA	0.01	F001	10
"	A036	Maximum Current Unbalance	0 to 100	%	0.1	F001	150
"	A037	Broken Rotor Bar Pickup	–60 to –12	dB	1	F002	-40
"	A038	Broken Rotor Bar Reset Delay	0 to 600	s	0.01	F001	0
"	A039	Broken Rotor Bar Block	0 to 4294967295	---	1	F300	0
"	A03B	Broken Rotor Bar Target	0 to 2	---	1	F109	0 (Self-reset)
"	A03C	Broken Rotor Bar Events	0 to 1	---	1	F102	0 (Disabled)
	Pilot Permissive Overreach Transfer Trip (POTT) Settings (Read/Write)						
L60	A070	POTT Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	A071	POTT Permissive Echo	0 to 1	---	1	F102	0 (Disabled)
"	A072	POTT Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	A073	POTT Transient Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	A074	POTT Transient Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	A075	POTT Echo Duration	0 to 65.535	s	0.001	F001	100
"	A076	POTT Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	50
"	A077	POTT Seal In Delay	0 to 65.535	s	0.001	F001	400
"	A078	POTT Ground Direction OC Forward	0 to 4294967295	---	1	F300	0
"	A07A	POTT Rx	0 to 4294967295	---	1	F300	0
"	A07C	POTT Echo Lockout	0 to 65.535	s	0.001	F001	250
"	A07D	POTT Target	0 to 2	---	1	F109	0 (Self-reset)
"	A07E	POTT Events	0 to 1	---	1	F102	0 (Disabled)

Products	Address	Register name	Range	Units	Step	Format	Default
	VT Fuse Failure Settings (Read/Write) (2, 4, or 6 Modules)						
C60, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60	A09A	VT Fuse Failure Function	0 to 1	---	1	F102	0 (Disabled)
"	A09B	VT Fuse Failure Neutral Wire Open Function	0 to 1	---	1	F102	0 (Disabled)
"	A09C	VT Fuse Failure Neutral Wire Open 3rd Harmonic Pickup	0 to 3	pu	0.001	F001	100
"	A09D	VT Fuse Failure 1 Alarm Delay	0 to 65.535	s	0.001	F001	1000
"	A09E	...Repeated for Source 2					
C60, C70, D60, F60, G30, G60, L60, L90, M60, N60, T60	A0A2	...Repeated for Source 3					
"	A0A6	...Repeated for Source 4					
C70, N60, T60	A0AA	...Repeated for Source 5					
"	A0AE	...Repeated for Source 6					
	VT Fuse Failure Actuals (Read Only) (2, 4, or 6 Modules)						
C60, C70, D30, D60, 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					
C60, C70, D60, F60, G30, G60, L60, L90, M60, N60, T60	A0B6	...Repeated for Source 3					
"	A0B8	...Repeated for Source 4					
C70, N60, T60	A0BA	...Repeated for Source 5					
"	A0BC	...Repeated for Source 6					
	Summator Settings (Read/Write Setting) (6 Modules)						
N60	A0C0	Summator 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A0C1	Summator 1 Input Mode	0 to 1	---	1	F515	0 (SIGNED)
"	A0C2	Summator 1 Hold	0 to 4294967295	---	1	F300	0
"	A0C4	Summator 1 Pickup	–2000000 to 2000000	---	0.001	F004	1000000
"	A0C6	Summator 1 Hysteresis	0.1 to 50	%	0.1	F001	30
"	A0C7	Summator 1 Input (6 items)	0 to 65535	---	1	F600	0
"	A0CD	Summator 1 Scale Factor (6 items)	–2000 to 2000	---	0.000 001	F004	1000000
"	A0D9	Summator 1 Position Selector (6 items)	0 to 4294967295	---	1	F300	0
"	A0E5	Summator 1 Units	---	---	---	F207	(none)
"	A0E7	Summator 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A0E8	Summator 1 Per-Unit Base	1 to 2000000	---	1	F004	1
"	A0EA	...Repeated for Summator 2					
"	A114	...Repeated for Summator 3					
"	A13E	...Repeated for Summator 4					
"	A168	...Repeated for Summator 5					
"	A192	...Repeated for Summator 6					

Products	Address	Register name	Range	Units	Step	Format	Default
	Current Unbalance Actual Values (Read Only)						
M60	A200	Current Amp Unbalance	0 to 100	%	0.1	F001	0
	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
	Selector Switch Settings (Read/Write) (2 Modules)						
All except B90	A280	Selector 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A281	Selector 1 Range	1 to 7	---	1	F001	7
"	A282	Selector 1 Timeout	3 to 60	s	0.1	F001	50
"	A283	Selector 1 Step Up	0 to 4294967295	---	1	F300	0
"	A285	Selector 1 Step Mode	0 to 1	---	1	F083	0 (Time-out)
"	A286	Selector 1 Acknowledge	0 to 4294967295	---	1	F300	0
"	A288	Selector 1 Bit0	0 to 4294967295	---	1	F300	0
"	A28A	Selector 1 Bit1	0 to 4294967295	---	1	F300	0
"	A28C	Selector 1 Bit2	0 to 4294967295	---	1	F300	0
"	A28E	Selector 1 Bit Mode	0 to 1	---	1	F083	0 (Time-out)
"	A28F	Selector 1 Bit Acknowledge	0 to 4294967295	---	1	F300	0
"	A291	Selector 1 Power Up Mode	0 to 2	---	1	F084	0 (Restore)
"	A292	Selector 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	A293	Selector 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A294	Reserved (10 items)	---	---	1	F001	0
"	A29E	...Repeated for Selector 2					
	Digital Counter (Read/Write Setting) (8 Modules)						
All except B90	A300	Digital Counter 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A301	Digital Counter 1 Name	---	---	---	F205	"Counter 1"
"	A307	Digital Counter 1 Units	---	---	---	F206	(none)
"	A30A	Digital Counter 1 Block	0 to 4294967295	---	1	F300	0
"	A30C	Digital Counter 1 Up	0 to 4294967295	---	1	F300	0
"	A30E	Digital Counter 1 Down	0 to 4294967295	---	1	F300	0
"	A311	Digital Counter 1 Preset	–2147483647 to 2147483647	---	1	F004	0
"	A313	Digital Counter 1 Compare	–2147483647 to 2147483647	---	1	F004	0
"	A315	Digital Counter 1 Reset	0 to 4294967295	---	1	F300	0
"	A317	Digital Counter 1 Freeze/Reset	0 to 4294967295	---	1	F300	0
"	A319	Digital Counter 1 Freeze/Count	0 to 4294967295	---	1	F300	0
"	A31B	Digital Counter 1 Set To Preset	0 to 4294967295	---	1	F300	0
"	A31D	Reserved (11 items)	---	---	---	F001	0
"	A328	...Repeated for Digital Counter 2					
"	A350	...Repeated for Digital Counter 3					
"	A378	...Repeated for Digital Counter 4					
"	A3A0	...Repeated for Digital Counter 5					
"	A3C8	...Repeated for Digital Counter 6					
"	A3F0	...Repeated for Digital Counter 7					
"	A418	...Repeated for Digital Counter 8					
	PID Regulator (Read/Write Setting) (4 Modules)						
C30, F35	A500	PID 1 Function	0 to 1	---	1	F102	0 (Disabled)

Products	Address	Register name	Range	Units	Step	Format	Default
"	A501	PID 1 Sample Time	0.05 to 30	sec	0.01	F001	5
"	A502	PID 1 Process Signal	0 to 65535	---	1	F600	0
"	A503	PID 1 Setpoint Signal	-99999.99 to 99999.99	---	0.01	F004	0
"	A505	PID 1 Tracking Signal	0 to 65535	---	1	F600	0
"	A506	PID 1 Proportional Gain	0.01 to 100	---	0.01	F001	100
"	A507	PID 1 Setpoint Weighting	0.01 to 1	---	0.01	F001	100
"	A508	PID 1 Integ Time Const	0 to 600	sec	0.01	F001	100
"	A509	PID 1 Antiwindup	0 to 1	---	1	F102	0 (Disabled)
"	A50A	PID 1 AW Time Const	0 to 600	sec	0.01	F001	100
"	A50B	PID 1 Deriv Time Const	0 to 600	sec	0.01	F001	100
"	A50C	PID 1 Derivative Limit	1 to 20	---	1	F001	10
"	A50D	PID 1 Max	-10000 to 10000	---	1	F002	10
"	A50E	PID 1 Min	-10000 to 10000	---	1	F002	10
"	A50F	PID 1 T Min	100 to 9999	ms	1	F001	500
"	A510	PID 1 Dead Time	1 to 20	sec	1	F001	1
"	A511	PID 1 Block	0 to 4294967295	---	1	F300	0
"	A513	PID 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	A514	PID 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A515	...Repeated for PID 2					
"	A52A	...Repeated for PID 3					
"	A53F	...Repeated for PID 4					
	PID Regulator Actuals (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 (Read/Write Grouped Setting) (2 Modules)						
G30, G60, T60	A580	Volts Per Hertz 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A581	Volts Per Hertz 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	A582	Volts Per Hertz 1 Pickup	0.8 to 4	pu	0.01	F001	80
"	A583	Volts Per Hertz 1 Curves	0 to 7	---	1	F240	0 (Definite Time)
"	A584	Volts Per Hertz 1 TD Multiplier	0.05 to 600	---	0.01	F001	100
"	A585	Volts Per Hertz 1 Block	0 to 4294967295	---	1	F300	0
"	A587	Volts Per Hertz 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A588	Volts Per Hertz 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	A589	Volts Per Hertz 1 T Reset	0 to 1000	s	0.1	F001	10
"	A58A	Volts Per Hertz 1 Voltage Mode	0 to 1	---	1	F186	0 (Phase-to-Ground)
"	A58B	...Repeated for Volts Per Hertz 2					
	Volts Per Hertz Actuals (Read Only) (2 Modules)						
G30, G60, 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

Products	Address	Register name	Range	Units	Step	Format	Default
	FlexCurves C and D (Read/Write Setting)						
All except C30, N60	A600	FlexCurve C (120 items)	0 to 65535	ms	1	F011	0
"	A680	FlexCurve D (120 items)	0 to 65535	ms	1	F011	0
	Non Volatile Latches (Read/Write Setting) (16 Modules)						
All	A700	Non-Volatile Latch 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A701	Non-Volatile Latch 1 Type	0 to 1	---	1	F519	0 (Reset Dominant)
"	A702	Non-Volatile Latch 1 Set	0 to 4294967295	---	1	F300	0
"	A704	Non-Volatile Latch 1 Reset	0 to 4294967295	---	1	F300	0
"	A706	Non-Volatile Latch 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	A707	Non-Volatile Latch 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A708	Reserved (4 items)	---	---	---	F001	0
"	A70C	...Repeated for Non-Volatile Latch 2					
"	A718	...Repeated for Non-Volatile Latch 3					
"	A724	...Repeated for Non-Volatile Latch 4					
"	A730	...Repeated for Non-Volatile Latch 5					
"	A73C	...Repeated for Non-Volatile Latch 6					
"	A748	...Repeated for Non-Volatile Latch 7					
"	A754	...Repeated for Non-Volatile Latch 8					
"	A760	...Repeated for Non-Volatile Latch 9					
"	A76C	...Repeated for Non-Volatile Latch 10					
"	A778	...Repeated for Non-Volatile Latch 11					
"	A784	...Repeated for Non-Volatile Latch 12					
"	A790	...Repeated for Non-Volatile Latch 13					
"	A79C	...Repeated for Non-Volatile Latch 14					
"	A7A8	...Repeated for Non-Volatile Latch 15					
"	A7B4	...Repeated for Non-Volatile Latch 16					
	Pilot POTT (1P) (Read/Write Setting)						
D60, L90	A800	POTT 1P Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	A801	POTT 1P Permissive Echo	0 to 2	---	1	F199	0 (Disabled)
"	A802	POTT 1P Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	A803	POTT 1P Trans Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	A804	POTT 1P Trans Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	A805	POTT 1P Echo Duration	0 to 65.535	s	0.001	F001	100
"	A806	POTT 1P Echo Lockout	0 to 65.535	s	0.001	F001	250
"	A807	POTT 1P Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	50
"	A808	POTT 1P Seal In Delay	0 to 65.535	s	0.001	F001	0
"	A809	POTT 1P Ground Directional Overcurrent Forward	0 to 4294967295	---	1	F300	0
"	A80B	POTT 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	A80C	POTT 1P Rx1	0 to 4294967295	---	1	F300	0
"	A80E	POTT 1P Rx2	0 to 4294967295	---	1	F300	0
"	A810	POTT 1P Rx3	0 to 4294967295	---	1	F300	0
"	A812	POTT 1P Rx4	0 to 4294967295	---	1	F300	0
"	A814	POTT 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	A815	POTT 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	A816	POTT 1P Echo Condition	0 to 4294967295	---	1	F300	0

Products	Address	Register name	Range	Units	Step	Format	Default
"	A818	POTT 1P Scheme Block	0 to 4294967295	---	1	F300	0
"	A81A	Reserved (22 items)	0 to 1	---	1	F001	0
	Pilot POTT1 (1P) (Read/Write Setting)						
D60, L90	A830	POTT1 1P Scheme Function	0 to 1	---	1	F102	0 (Disabled)
"	A831	POTT1 1P Permissive Echo	0 to 2	---	1	F199	0 (Disabled)
"	A832	POTT1 1P Rx Pickup Delay	0 to 65.535	s	0.001	F001	0
"	A833	POTT1 1P Trans Block Pickup Delay	0 to 65.535	s	0.001	F001	20
"	A834	POTT1 1P Trans Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	A835	POTT1 1P Echo Duration	0 to 65.535	s	0.001	F001	100
"	A836	POTT1 1P Echo Lockout	0 to 65.535	s	0.001	F001	250
"	A837	POTT1 1P Line End Open Pickup Delay	0 to 65.535	s	0.001	F001	50
"	A838	POTT1 1P Seal In Delay	0 to 65.535	s	0.001	F001	0
"	A839	POTT1 1P Ground Directional Overcurrent Forward	0 to 4294967295	---	1	F300	0
"	A83B	POTT1 1P Number of Communication Bits	0 to 2	---	1	F198	0 (1)
"	A83C	POTT1 1P Rx1	0 to 4294967295	---	1	F300	0
"	A83E	POTT1 1P Rx2	0 to 4294967295	---	1	F300	0
"	A840	POTT1 1P Rx3	0 to 4294967295	---	1	F300	0
"	A842	POTT1 1P Rx4	0 to 4294967295	---	1	F300	0
"	A844	POTT1 1P Target	0 to 2	---	1	F109	0 (Self-reset)
"	A845	POTT1 1P Event	0 to 1	---	1	F102	0 (Disabled)
"	A846	POTT1 1P Echo Condition	0 to 4294967295	---	1	F300	0
"	A848	POTT1 1P Scheme Block	0 to 4294967295	---	1	F300	0
"	A84A	POTT1 1P OC Fwd2	0 to 4294967295	---	1	F300	0
"	A84C	POTT1 1P OC Fwd2	0 to 4294967295	---	1	F300	0
"	A84E	Reserved (22 items)	0 to 1	---	1	F001	0
	Pilot Blocking 1 (1P) (Read/Write Setting)						
D60, L90	A864	Blocking 1 Scheme 1P Function	0 to 1	---	1	F102	0 (Disabled)
"	A865	Blocking 1 Scheme 1P Block	0 to 4294967295	---	1	F300	0
"	A867	Block 1 1P Rx Coord Pickup Delay	0 to 65.535	s	0.001	F001	10
"	A868	Block 1 1P Transient Block Pickup Delay	0 to 65.535	s	0.001	F001	30
"	A869	Block 1 1P Transient Block Reset Delay	0 to 65.535	s	0.001	F001	90
"	A86A	Blocking 1 Scheme 1P Seal in Delay	0 to 65.535	s	0.001	F001	0
"	A86B	Blocking 1 Scheme 1P Dir Fwd 1	0 to 4294967295	---	1	F300	0
"	A86D	Blocking 1 Scheme 1P Dir Fwd 2	0 to 4294967295	---	1	F300	0
"	A86F	Blocking 1 Scheme 1P Dir Fwd 3	0 to 4294967295	---	1	F300	0
"	A871	Blocking 1 Scheme 1P Dir Rev 1	0 to 4294967295	---	1	F300	0
"	A873	Blocking 1 Scheme 1P Dir Rev 2	0 to 4294967295	---	1	F300	0
"	A875	Blocking 1 Scheme 1P Dir Rev 3	0 to 4294967295	---	1	F300	0
"	A877	Blocking 1 Scheme 1P Force Tx Stop 1	0 to 4294967295	---	1	F300	0
"	A879	Blocking 1 Scheme 1P Force Tx Stop 2	0 to 4294967295	---	1	F300	0
"	A87B	Blocking 1 Scheme 1P Comm Bits	0 to 2	---	1	F198	0 (1)
"	A87C	Blocking 1 Scheme 1P Rx1	0 to 4294967295	---	1	F300	0
"	A87E	Blocking 1 Scheme 1P Rx2	0 to 4294967295	---	1	F300	0
"	A880	Blocking 1 Scheme 1P Rx3	0 to 4294967295	---	1	F300	0
"	A882	Blocking 1 Scheme 1P Rx4	0 to 4294967295	---	1	F300	0
"	A884	Blocking 1 1P Target	0 to 2	---	1	F109	0 (Self-reset)

Products	Address	Register name	Range	Units	Step	Format	Default
"	A885	Blocking 1 1P Event	0 to 1	---	1	F102	0 (Disabled)
	Frequency Rate of Change (Read/Write Setting) (4 Modules)						
D60, F60, G30, G60, L90, N60, T60	A900	Frequency Rate of Change 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A901	Frequency Rate of Change 1 OC Supervision	0 to 30	pu	0.001	F001	200
"	A902	Frequency Rate of Change 1 Min	20 to 80	Hz	0.01	F001	4500
"	A903	Frequency Rate of Change 1 Max	20 to 80	Hz	0.01	F001	6500
"	A904	Frequency Rate of Change 1 Pickup Delay	0 to 65.535	s	0.001	F001	0
"	A905	Frequency Rate of Change 1 Reset Delay	0 to 65.535	s	0.001	F001	0
"	A906	Frequency Rate of Change 1 Block	0 to 4294967295	---	1	F300	0
"	A908	Frequency Rate of Change 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	A909	Frequency Rate of Change 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A90A	Frequency Rate of Change 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	A90B	Frequency Rate of Change 1 Trend	0 to 2	---	1	F224	0 (Increasing)
"	A90C	Frequency Rate of Change 1 Pickup	0.1 to 15	Hz/s	0.01	F001	50
"	A90D	Frequency Rate of Change 1 OV Supervision	0.1 to 3	pu	0.001	F001	700
"	A90E	Reserved (3 items)	0 to 1	---	1	F001	0
"	A911	...Repeated for Frequency Rate of Change 2					
"	A922	...Repeated for Frequency Rate of Change 3					
"	A933	...Repeated for Frequency Rate of Change 4					
	Restricted Ground Fault (Read/Write Grouped Setting) (4 or 6 Modules)						
F60, G30, G60, L90, T60	A960	Restricted Ground Fault 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	A961	Restricted Ground Fault 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	A962	Restricted Ground Fault 1 Pickup	0.005 to 30	pu	0.001	F001	80
"	A963	Restricted Ground Fault 1 Slope	0 to 100	%	1	F001	40
"	A964	Restricted Ground Fault 1 Delay	0 to 600	s	0.01	F001	0
"	A965	Restricted Ground Fault 1 Reset Delay	0 to 600	s	0.01	F001	0
"	A966	Restricted Ground Fault 1 Block	0 to 4294967295	---	1	F300	0
"	A968	Restricted Ground Fault 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	A969	Restricted Ground Fault 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	A96A	...Repeated for Restricted Ground Fault 2					
"	A974	...Repeated for Restricted Ground Fault 3					
"	A97E	...Repeated for Restricted Ground Fault 4					
F60, G60, L90, T60	A988	...Repeated for Restricted Ground Fault 5					
"	A992	...Repeated for Restricted Ground Fault 6					
	IEC 61850 Received Analog Settings (Read/Write) (32 Modules)						
All	AA00	IEC 61850 GOOSE Analog 1 Default Value	–1000000 to 1000000	---	0.001	F060	1000
"	AA02	IEC 61850 GOOSE Analog Input 1 Mode	0 to 1	---	1	F491	0 (Default Value)
"	AA03	IEC 61850 GOOSE Analog Input 1 Units	---	---	---	F207	(none)
"	AA05	IEC 61850 GOOSE Analog Input 1 Per-Unit Base	0 to 999999999.999	---	0.001	F060	1

Products	Address	Register name	Range	Units	Step	Format	Default
"	AA07	...Repeated for IEC 61850 GOOSE Analog Input 2					
"	AA0E	...Repeated for IEC 61850 GOOSE Analog Input 3					
"	AA15	...Repeated for IEC 61850 GOOSE Analog Input 4					
"	AA1C	...Repeated for IEC 61850 GOOSE Analog Input 5					
"	AA23	...Repeated for IEC 61850 GOOSE Analog Input 6					
"	AA2A	...Repeated for IEC 61850 GOOSE Analog Input 7					
"	AA31	...Repeated for IEC 61850 GOOSE Analog Input 8					
"	AA38	...Repeated for IEC 61850 GOOSE Analog Input 9					
"	AA3F	...Repeated for IEC 61850 GOOSE Analog Input 10					
"	AA46	...Repeated for IEC 61850 GOOSE Analog Input 11					
"	AA4D	...Repeated for IEC 61850 GOOSE Analog Input 12					
"	AA54	...Repeated for IEC 61850 GOOSE Analog Input 13					
"	AA5B	...Repeated for IEC 61850 GOOSE Analog Input 14					
"	AA62	...Repeated for IEC 61850 GOOSE Analog Input 15					
"	AA69	...Repeated for IEC 61850 GOOSE Analog Input 16					
"	AA70	...Repeated for IEC 61850 GOOSE Analog Input 17					
"	AA77	...Repeated for IEC 61850 GOOSE Analog Input 18					
"	AA7E	...Repeated for IEC 61850 GOOSE Analog Input 19					
"	AA85	...Repeated for IEC 61850 GOOSE Analog Input 20					
"	AA8C	...Repeated for IEC 61850 GOOSE Analog Input 21					
"	AA93	...Repeated for IEC 61850 GOOSE Analog Input 22					
"	AA9A	...Repeated for IEC 61850 GOOSE Analog Input 23					
"	AAA1	...Repeated for IEC 61850 GOOSE Analog Input 24					
"	AAA8	...Repeated for IEC 61850 GOOSE Analog Input 25					
"	AAAF	...Repeated for IEC 61850 GOOSE Analog Input 26					
"	AAB6	...Repeated for IEC 61850 GOOSE Analog Input 27					
"	AABD	...Repeated for IEC 61850 GOOSE Analog Input 28					
"	AAC4	...Repeated for IEC 61850 GOOSE Analog Input 29					

Products	Address	Register name	Range	Units	Step	Format	Default
"	AACB	...Repeated for IEC 61850 GOOSE Analog Input 30					
"	AAD2	...Repeated for IEC 61850 GOOSE Analog Input 31					
"	AAD9	...Repeated for IEC 61850 GOOSE Analog Input 32					
	IEC 61850 XCBR Configuration (Read/Write Settings) (6 Modules)						
All except B90	AB00	FlexLogic Operand for IEC 61850 XCBR.ST.Loc status	0 to 4294967295	---	1	F300	0
"	AB02	FlexLogic Operand for IEC 61850 XCBR Check Sync Release	0 to 4294967295	---	1	F300	1
"	AB04	FlexLogic Operand for IEC 61850 XCBR Open Interlock	0 to 4294967295	---	1	F300	1
"	AB06	FlexLogic Operand for IEC 61850 XCBR Close Interlock	0 to 4294967295	---	1	F300	1
"	AB08	...Repeated for module number 2					
"	AB10	...Repeated for module number 3					
"	AB18	...Repeated for module number 4					
"	AB20	...Repeated for module number 5					
"	AB28	...Repeated for module number 6					
	IEC 61850 Files (Read Only)						
All	AB40	IEC 61850 CID Filename	---	---	---	F209	(none)
	IEC 61850 GGIO4 Analog Input Points Configuration Settings (Read/Write) (32 Modules)						
All	AF10	IEC 61850 GGIO4 Analog Input 1 Value	---	---	---	F600	0
"	AF11	IEC 61850 GGIO4 Analog Input 1 Deadband	0 to 100000	---	1	F003	10000
"	AF13	IEC 61850 GGIO4 Analog Input 1 Minimum	-1000000000000 to 1000000000000	---	0.001	F060	0
"	AF15	IEC 61850 GGIO4 Analog Input 1 Maximum	-1000000000000 to 1000000000000	---	0.001	F060	1000000
"	AF17	...Repeated for IEC 61850 GGIO4 Analog Input 2					
"	AF1E	...Repeated for IEC 61850 GGIO4 Analog Input 3					
"	AF25	...Repeated for IEC 61850 GGIO4 Analog Input 4					
"	AF2C	...Repeated for IEC 61850 GGIO4 Analog Input 5					
"	AF33	...Repeated for IEC 61850 GGIO4 Analog Input 6					
"	AF3A	...Repeated for IEC 61850 GGIO4 Analog Input 7					
"	AF41	...Repeated for IEC 61850 GGIO4 Analog Input 8					
"	AF48	...Repeated for IEC 61850 GGIO4 Analog Input 9					
"	AF4F	...Repeated for IEC 61850 GGIO4 Analog Input 10					
"	AF56	...Repeated for IEC 61850 GGIO4 Analog Input 11					
"	AF5D	...Repeated for IEC 61850 GGIO4 Analog Input 12					
"	AF64	...Repeated for IEC 61850 GGIO4 Analog Input 13					

Products	Address	Register name	Range	Units	Step	Format	Default
"	AF6B	...Repeated for IEC 61850 GGIO4 Analog Input 14					
"	AF72	...Repeated for IEC 61850 GGIO4 Analog Input 15					
"	AF79	...Repeated for IEC 61850 GGIO4 Analog Input 16					
"	AF80	...Repeated for IEC 61850 GGIO4 Analog Input 17					
"	AF87	...Repeated for IEC 61850 GGIO4 Analog Input 18					
"	AF8E	...Repeated for IEC 61850 GGIO4 Analog Input 19					
"	AF95	...Repeated for IEC 61850 GGIO4 Analog Input 20					
"	AF9C	...Repeated for IEC 61850 GGIO4 Analog Input 21					
"	AFA3	...Repeated for IEC 61850 GGIO4 Analog Input 22					
"	AFAA	...Repeated for IEC 61850 GGIO4 Analog Input 23					
"	AFB1	...Repeated for IEC 61850 GGIO4 Analog Input 24					
"	AFB8	...Repeated for IEC 61850 GGIO4 Analog Input 25					
"	AFBF	...Repeated for IEC 61850 GGIO4 Analog Input 26					
"	AFC6	...Repeated for IEC 61850 GGIO4 Analog Input 27					
"	AFCD	...Repeated for IEC 61850 GGIO4 Analog Input 28					
"	AFD4	...Repeated for IEC 61850 GGIO4 Analog Input 29					
"	AFDB	...Repeated for IEC 61850 GGIO4 Analog Input 30					
"	AFE2	...Repeated for IEC 61850 GGIO4 Analog Input 31					
"	AFE9	...Repeated for IEC 61850 GGIO4 Analog Input 32					
	IEC 61850 Server Configuration (Read/Write Settings)						
All	B06C	TCP Port Number for the IEC 61850 / MMS Protocol	0 to 65535	---	1	F001	102
"	B06D	IEC 61850 Server Data Scanning Function	0 to 1	---	1	F102	0 (Disabled)
	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					

Products	Address	Register name	Range	Units	Step	Format	Default
"	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					
"	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 Settings (Read/Write Grouped) (2 or 4 Modules)						
D60, F35, F60, L60, L90	B300	Wattmetric Ground Fault 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	B301	Wattmetric Ground Fault 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	B302	Wattmetric Ground Fault 1 Voltage	0 to 1	---	1	F234	0 (Calculated VN)
"	B303	Wattmetric Ground Fault 1 Overvoltage Pickup	0.02 to 3	pu	0.01	F001	20
"	B304	Wattmetric Ground Fault 1 Current	0 to 1	---	1	F235	0 (Calculated IN)
"	B305	Wattmetric Ground Fault 1 Overcurrent Pickup	0.002 to 30	pu	0.001	F001	60
"	B306	Wattmetric Ground Fault 1 Overcurrent Pickup Delay	0 to 600	s	0.01	F001	20
"	B307	Wattmetric Ground Fault 1 Power Pickup	0.001 to 1.2	pu	0.001	F001	100
"	B308	Wattmetric Ground Fault 1 ECA	0 to 360	° Lag	1	F001	0
"	B309	Wattmetric Ground Fault 1 Power Pickup Delay	0 to 600	s	0.01	F001	20
"	B30A	Wattmetric Ground Fault 1 Curve	0 to 5	---	1	F236	0 (Definite Time)
"	B30B	Wattmetric Ground Fault 1 Multiplier	0.01 to 2	s	0.01	F001	100
"	B30C	Wattmetric Ground Fault 1 Block	0 to 4294967295	---	1	F300	0
"	B30E	Wattmetric Ground Fault 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	B30F	Wattmetric Ground Fault 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	B310	Wattmetric Ground Fault 1 Reference Power	0.001 to 1.2	pu	0.001	F001	500

Products	Address	Register name	Range	Units	Step	Format	Default
"	B311	Reserved	0 to 1	---	1	F001	0
"	B312	...Repeated for Wattmetric Ground Fault 2					
F35	B324	...Repeated for Wattmetric Ground Fault 3					
"	B336	...Repeated for Wattmetric Ground Fault 4					
	Wattmetric Ground Fault Actual Values (Read Only) (2 or 4 Modules)						
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					
	IEC 61850 XSWI Configuration (Read/Write Setting) (24 Modules)						
All except B90	B370	FlexLogic Operand for IEC 61850 XSWI.ST.Loc Status	0 to 4294967295	---	1	F300	0
"	B372	FlexLogic Operand for IEC 61850 XSWI Open Interlock	0 to 4294967295	---	1	F300	1
"	B374	FlexLogic Operand for IEC 61850 XSW Close Interlock	0 to 4294967295	---	1	F300	1
"	B376	...Repeated for Switch 2					
"	B37C	...Repeated for Switch 3					
"	B382	...Repeated for Switch 4					
"	B388	...Repeated for Switch 5					
"	B38E	...Repeated for Switch 6					
"	B394	...Repeated for Switch 7					
"	B39A	...Repeated for Switch 8					
"	B3A0	...Repeated for Switch 9					
"	B3A6	...Repeated for Switch 10					
"	B3AC	...Repeated for Switch 11					
"	B3B2	...Repeated for Switch 12					
"	B3B8	...Repeated for Switch 13					
"	B3BE	...Repeated for Switch 14					
"	B3C4	...Repeated for Switch 15					
"	B3CA	...Repeated for Switch 16					
"	B3D0	...Repeated for Switch 17					
"	B3D6	...Repeated for Switch 18					
"	B3DC	...Repeated for Switch 19					
"	B3E2	...Repeated for Switch 20					
"	B3E8	...Repeated for Switch 21					
"	B3EE	...Repeated for Switch 22					
"	B3F4	...Repeated for Switch 23					
"	B3FA	...Repeated for Switch 24					
	IEC 61850 GGIO1 Configuration Settings (Read/Write Setting)						
All	B400	Number of Status Indications in GGIO1	8 to 128	---	8	F001	8
"	B402	IEC 61850 GGIO1 Indication FlexLogic operands (128 items)	0 to 4294967295	---	1	F300	0
	Contact Inputs (Read/Write Setting) (96 Modules)						
All	BB00	Contact Input 1 Name	---	---	---	F205	"Cont Ip 1"
"	BB06	Contact Input 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	BB07	Contact Input 1 Debounce Time	0 to 16	ms	0.5	F001	60

Products	Address	Register name	Range	Units	Step	Format	Default
"	BB08	...Repeated for Contact Input 2					
"	BB10	...Repeated for Contact Input 3					
"	BB18	...Repeated for Contact Input 4					
"	BB20	...Repeated for Contact Input 5					
"	BB28	...Repeated for Contact Input 6					
"	BB30	...Repeated for Contact Input 7					
"	BB38	...Repeated for Contact Input 8					
"	BB40	...Repeated for Contact Input 9					
"	BB48	...Repeated for Contact Input 10					
"	BB50	...Repeated for Contact Input 11					
"	BB58	...Repeated for Contact Input 12					
"	BB60	...Repeated for Contact Input 13					
"	BB68	...Repeated for Contact Input 14					
"	BB70	...Repeated for Contact Input 15					
"	BB78	...Repeated for Contact Input 16					
"	BB80	...Repeated for Contact Input 17					
"	BB88	...Repeated for Contact Input 18					
"	BB90	...Repeated for Contact Input 19					
"	BB98	...Repeated for Contact Input 20					
"	BBA0	...Repeated for Contact Input 21					
"	BBA8	...Repeated for Contact Input 22					
"	BBB0	...Repeated for Contact Input 23					
"	BBB8	...Repeated for Contact Input 24					
"	BBC0	...Repeated for Contact Input 25					
"	BBC8	...Repeated for Contact Input 26					
"	BBD0	...Repeated for Contact Input 27					
"	BBD8	...Repeated for Contact Input 28					
"	BBE0	...Repeated for Contact Input 29					
"	BBE8	...Repeated for Contact Input 30					
"	BBF0	...Repeated for Contact Input 31					
"	BBF8	...Repeated for Contact Input 32					
"	BC00	...Repeated for Contact Input 33					
"	BC08	...Repeated for Contact Input 34					
"	BC10	...Repeated for Contact Input 35					
"	BC18	...Repeated for Contact Input 36					
"	BC20	...Repeated for Contact Input 37					
"	BC28	...Repeated for Contact Input 38					
"	BC30	...Repeated for Contact Input 39					
"	BC38	...Repeated for Contact Input 40					
"	BC40	...Repeated for Contact Input 41					
"	BC48	...Repeated for Contact Input 42					
"	BC50	...Repeated for Contact Input 43					
"	BC58	...Repeated for Contact Input 44					
"	BC60	...Repeated for Contact Input 45					
"	BC68	...Repeated for Contact Input 46					
"	BC70	...Repeated for Contact Input 47					
"	BC78	...Repeated for Contact Input 48					

Products	Address	Register name	Range	Units	Step	Format	Default
"	BC80	...Repeated for Contact Input 49					
"	BC88	...Repeated for Contact Input 50					
"	BC90	...Repeated for Contact Input 51					
"	BC98	...Repeated for Contact Input 52					
"	BCA0	...Repeated for Contact Input 53					
"	BCA8	...Repeated for Contact Input 54					
"	BCB0	...Repeated for Contact Input 55					
"	BCB8	...Repeated for Contact Input 56					
"	BCC0	...Repeated for Contact Input 57					
"	BCC8	...Repeated for Contact Input 58					
"	BCD0	...Repeated for Contact Input 59					
"	BCD8	...Repeated for Contact Input 60					
"	BCE0	...Repeated for Contact Input 61					
"	BCE8	...Repeated for Contact Input 62					
"	BCF0	...Repeated for Contact Input 63					
"	BCF8	...Repeated for Contact Input 64					
"	BD00	...Repeated for Contact Input 65					
"	BD08	...Repeated for Contact Input 66					
"	BD10	...Repeated for Contact Input 67					
"	BD18	...Repeated for Contact Input 68					
"	BD20	...Repeated for Contact Input 69					
"	BD28	...Repeated for Contact Input 70					
"	BD30	...Repeated for Contact Input 71					
"	BD38	...Repeated for Contact Input 72					
"	BD40	...Repeated for Contact Input 73					
"	BD48	...Repeated for Contact Input 74					
"	BD50	...Repeated for Contact Input 75					
"	BD58	...Repeated for Contact Input 76					
"	BD60	...Repeated for Contact Input 77					
"	BD68	...Repeated for Contact Input 78					
"	BD70	...Repeated for Contact Input 79					
"	BD78	...Repeated for Contact Input 80					
"	BD80	...Repeated for Contact Input 81					
"	BD88	...Repeated for Contact Input 82					
"	BD90	...Repeated for Contact Input 83					
"	BD98	...Repeated for Contact Input 84					
"	BDA0	...Repeated for Contact Input 85					
"	BDA8	...Repeated for Contact Input 86					
"	BDB0	...Repeated for Contact Input 87					
"	BDB8	...Repeated for Contact Input 88					
"	BDC0	...Repeated for Contact Input 89					
"	BDC8	...Repeated for Contact Input 90					
"	BDD0	...Repeated for Contact Input 91					
"	BDD8	...Repeated for Contact Input 92					
"	BDE0	...Repeated for Contact Input 93					
"	BDE8	...Repeated for Contact Input 94					
"	BDF0	...Repeated for Contact Input 95					

Products	Address	Register name	Range	Units	Step	Format	Default
"	BDF8	...Repeated for Contact Input 96					
	Contact Input Thresholds (Read/Write Setting)						
All	BE00	Contact Input x Threshold (48 items)	0 to 3	---	1	F128	1 (33 Vdc)
	Virtual Inputs (Read/Write Setting) (64 Modules)						
All	BE30	Virtual Input 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	BE31	Virtual Input 1 Name	---	---	---	F205	"Virt Ip 1"
"	BE37	Virtual Input 1 Programmed Type	0 to 1	---	1	F127	0 (Latched)
"	BE38	Virtual Input 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	BE39	Reserved (3 items)	---	---	---	F001	0
"	BE3C	...Repeated for Virtual Input 2					
"	BE48	...Repeated for Virtual Input 3					
"	BE54	...Repeated for Virtual Input 4					
"	BE60	...Repeated for Virtual Input 5					
"	BE6C	...Repeated for Virtual Input 6					
"	BE78	...Repeated for Virtual Input 7					
"	BE84	...Repeated for Virtual Input 8					
"	BE90	...Repeated for Virtual Input 9					
"	BE9C	...Repeated for Virtual Input 10					
"	BEA8	...Repeated for Virtual Input 11					
"	BEB4	...Repeated for Virtual Input 12					
"	BEC0	...Repeated for Virtual Input 13					
"	BECC	...Repeated for Virtual Input 14					
"	BED8	...Repeated for Virtual Input 15					
"	BEE4	...Repeated for Virtual Input 16					
"	BEF0	...Repeated for Virtual Input 17					
"	BEFC	...Repeated for Virtual Input 18					
"	BF08	...Repeated for Virtual Input 19					
"	BF14	...Repeated for Virtual Input 20					
"	BF20	...Repeated for Virtual Input 21					
"	BF2C	...Repeated for Virtual Input 22					
"	BF38	...Repeated for Virtual Input 23					
"	BF44	...Repeated for Virtual Input 24					
"	BF50	...Repeated for Virtual Input 25					
"	BF5C	...Repeated for Virtual Input 26					
"	BF68	...Repeated for Virtual Input 27					
"	BF74	...Repeated for Virtual Input 28					
"	BF80	...Repeated for Virtual Input 29					
"	BF8C	...Repeated for Virtual Input 30					
"	BF98	...Repeated for Virtual Input 31					
"	BFA4	...Repeated for Virtual Input 32					
"	BFB0	...Repeated for Virtual Input 33					
"	BFBC	...Repeated for Virtual Input 34					
"	BFC8	...Repeated for Virtual Input 35					
"	BFD4	...Repeated for Virtual Input 36					
"	BFE0	...Repeated for Virtual Input 37					
"	BFEC	...Repeated for Virtual Input 38					
"	BFF8	...Repeated for Virtual Input 39					

Products	Address	Register name	Range	Units	Step	Format	Default
"	C004	...Repeated for Virtual Input 40					
"	C010	...Repeated for Virtual Input 41					
"	C01C	...Repeated for Virtual Input 42					
"	C028	...Repeated for Virtual Input 43					
"	C034	...Repeated for Virtual Input 44					
"	C040	...Repeated for Virtual Input 45					
"	C04C	...Repeated for Virtual Input 46					
"	C058	...Repeated for Virtual Input 47					
"	C064	...Repeated for Virtual Input 48					
"	C070	...Repeated for Virtual Input 49					
"	C07C	...Repeated for Virtual Input 50					
"	C088	...Repeated for Virtual Input 51					
"	C094	...Repeated for Virtual Input 52					
"	C0A0	...Repeated for Virtual Input 53					
"	C0AC	...Repeated for Virtual Input 54					
"	C0B8	...Repeated for Virtual Input 55					
"	C0C4	...Repeated for Virtual Input 56					
"	C0D0	...Repeated for Virtual Input 57					
"	C0DC	...Repeated for Virtual Input 58					
"	C0E8	...Repeated for Virtual Input 59					
"	C0F4	...Repeated for Virtual Input 60					
"	C100	...Repeated for Virtual Input 61					
"	C10C	...Repeated for Virtual Input 62					
"	C118	...Repeated for Virtual Input 63					
"	C124	...Repeated for Virtual Input 64					
	Virtual Outputs (Read/Write Setting) (96 Modules)						
All	C130	Virtual Output 1 Name	---	---	---	F205	"Virt Op 1 "
"	C136	Virtual Output 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	C137	Reserved	---	---	---	F001	0
"	C138	...Repeated for Virtual Output 2					
"	C140	...Repeated for Virtual Output 3					
"	C148	...Repeated for Virtual Output 4					
"	C150	...Repeated for Virtual Output 5					
"	C158	...Repeated for Virtual Output 6					
"	C160	...Repeated for Virtual Output 7					
"	C168	...Repeated for Virtual Output 8					
"	C170	...Repeated for Virtual Output 9					
"	C178	...Repeated for Virtual Output 10					
"	C180	...Repeated for Virtual Output 11					
"	C188	...Repeated for Virtual Output 12					
"	C190	...Repeated for Virtual Output 13					
"	C198	...Repeated for Virtual Output 14					
"	C1A0	...Repeated for Virtual Output 15					
"	C1A8	...Repeated for Virtual Output 16					
"	C1B0	...Repeated for Virtual Output 17					
"	C1B8	...Repeated for Virtual Output 18					
"	C1C0	...Repeated for Virtual Output 19					

Products	Address	Register name	Range	Units	Step	Format	Default
"	C1C8	...Repeated for Virtual Output 20					
"	C1D0	...Repeated for Virtual Output 21					
"	C1D8	...Repeated for Virtual Output 22					
"	C1E0	...Repeated for Virtual Output 23					
"	C1E8	...Repeated for Virtual Output 24					
"	C1F0	...Repeated for Virtual Output 25					
"	C1F8	...Repeated for Virtual Output 26					
"	C200	...Repeated for Virtual Output 27					
"	C208	...Repeated for Virtual Output 28					
"	C210	...Repeated for Virtual Output 29					
"	C218	...Repeated for Virtual Output 30					
"	C220	...Repeated for Virtual Output 31					
"	C228	...Repeated for Virtual Output 32					
"	C230	...Repeated for Virtual Output 33					
"	C238	...Repeated for Virtual Output 34					
"	C240	...Repeated for Virtual Output 35					
"	C248	...Repeated for Virtual Output 36					
"	C250	...Repeated for Virtual Output 37					
"	C258	...Repeated for Virtual Output 38					
"	C260	...Repeated for Virtual Output 39					
"	C268	...Repeated for Virtual Output 40					
"	C270	...Repeated for Virtual Output 41					
"	C278	...Repeated for Virtual Output 42					
"	C280	...Repeated for Virtual Output 43					
"	C288	...Repeated for Virtual Output 44					
"	C290	...Repeated for Virtual Output 45					
"	C298	...Repeated for Virtual Output 46					
"	C2A0	...Repeated for Virtual Output 47					
"	C2A8	...Repeated for Virtual Output 48					
"	C2B0	...Repeated for Virtual Output 49					
"	C2B8	...Repeated for Virtual Output 50					
"	C2C0	...Repeated for Virtual Output 51					
"	C2C8	...Repeated for Virtual Output 52					
"	C2D0	...Repeated for Virtual Output 53					
"	C2D8	...Repeated for Virtual Output 54					
"	C2E0	...Repeated for Virtual Output 55					
"	C2E8	...Repeated for Virtual Output 56					
"	C2F0	...Repeated for Virtual Output 57					
"	C2F8	...Repeated for Virtual Output 58					
"	C300	...Repeated for Virtual Output 59					
"	C308	...Repeated for Virtual Output 60					
"	C310	...Repeated for Virtual Output 61					
"	C318	...Repeated for Virtual Output 62					
"	C320	...Repeated for Virtual Output 63					
"	C328	...Repeated for Virtual Output 64					
"	C330	...Repeated for Virtual Output 65					
"	C338	...Repeated for Virtual Output 66					

Products	Address	Register name	Range	Units	Step	Format	Default
"	C340	...Repeated for Virtual Output 67					
"	C348	...Repeated for Virtual Output 68					
"	C350	...Repeated for Virtual Output 69					
"	C358	...Repeated for Virtual Output 70					
"	C360	...Repeated for Virtual Output 71					
"	C368	...Repeated for Virtual Output 72					
"	C370	...Repeated for Virtual Output 73					
"	C378	...Repeated for Virtual Output 74					
"	C380	...Repeated for Virtual Output 75					
"	C388	...Repeated for Virtual Output 76					
"	C390	...Repeated for Virtual Output 77					
"	C398	...Repeated for Virtual Output 78					
"	C3A0	...Repeated for Virtual Output 79					
"	C3A8	...Repeated for Virtual Output 80					
"	C3B0	...Repeated for Virtual Output 81					
"	C3B8	...Repeated for Virtual Output 82					
"	C3C0	...Repeated for Virtual Output 83					
"	C3C8	...Repeated for Virtual Output 84					
"	C3D0	...Repeated for Virtual Output 85					
"	C3D8	...Repeated for Virtual Output 86					
"	C3E0	...Repeated for Virtual Output 87					
"	C3E8	...Repeated for Virtual Output 88					
"	C3F0	...Repeated for Virtual Output 89					
"	C3F8	...Repeated for Virtual Output 90					
"	C400	...Repeated for Virtual Output 91					
"	C408	...Repeated for Virtual Output 92					
"	C410	...Repeated for Virtual Output 93					
"	C418	...Repeated for Virtual Output 94					
"	C420	...Repeated for Virtual Output 95					
"	C428	...Repeated for Virtual Output 96					
	Mandatory (Read/Write Setting)						
All	C430	Test Mode Function	0 to 2	---	1	F245	0 (Disabled)
	Mandatory (Read/Write Command)						
All	C431	Force VFD and LED	0 to 1	---	1	F126	0 (No)
	Mandatory (Read/Write Setting)						
All	C432	Test Mode Initiate (Forcing)	0 to 4294967295	---	1	F300	1
	Mandatory (Read/Write Command)						
All	C434	Clear All Relay Records Command	0 to 1	---	1	F126	0 (No)
	Mandatory (Read Only)						
All	C435	DSP Advanced Diagnostics Active	0 to 1	--	1	F126	0 (No)
"	C436	Synchrophasor Feature Active	0 to 1	--	1	F126	0 (No)
	Mandatory (Read/Write Command)						
All	C437	Relay Reboot Command	0 to 1	---	1	F126	0 (No)
"	C438	Save Volatile Data	0 to 1	---	1	F126	0 (No)
	Mandatory (Read Only)						
All	C439	CID File Status	0 to 4	---	1	F632	0 (None)

Products	Address	Register name	Range	Units	Step	Format	Default
	Mandatory (Read/Write Setting)						
All	C43A	Spare Setting 1	0 to 1	---	1	F102	0 (Disabled)
"	C43B	Spare Setting 2	0 to 1	---	1	F102	0 (Disabled)
"	C43C	Spare Setting 3	0 to 65535	---	1	F001	0
"	C43D	Spare Setting 4	0 to 65535	---	1	F001	0
	Mandatory (Read/Write)						
All	C43E	Undefined	0 to 1	---	1	F126	0 (No)
	Clear Records (Read/Write Setting)						
C60, F35, F60, L90, N60, T60	C446	Clear Demand Operand	0 to 4294967295	---	1	F300	0
C60, D30, D60, F35, F60, L30, L60, L90	C450	Clear Fault Reports Operand	0 to 4294967295	---	1	F300	0
B30, B90, C70, G30, G60, M60, N60, T35, T60	C452	Clear User Fault Reports Operand	0 to 4294967295	---	1	F300	0
All	C454	Clear Event Records Operand	0 to 4294967295	---	1	F300	0
All	C456	Clear Oscillography Operand	0 to 4294967295	---	1	F300	0
All except B30, B90, D30	C458	Clear Data Logger Operand	0 to 4294967295	---	1	F300	0
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	C45A	Clear Breaker 1 Arcing Current Operand	0 to 4294967295	---	1	F300	0
"	C45C	Clear Breaker 2 Arcing Current Operand	0 to 4294967295	---	1	F300	0
C60, D60, F35, L90, T35, T60	C45E	Clear Breaker 3 Arcing Current Operand	0 to 4294967295	---	1	F300	0
"	C460	Clear Breaker 4 Arcing Current Operand	0 to 4294967295	---	1	F300	0
F35, T35	C462	Clear Breaker 5 Arcing Current Operand	0 to 4294967295	---	1	F300	0
"	C464	Clear Breaker 6 Arcing Current Operand	0 to 4294967295	---	1	F300	0
L30, L90	C466	Clear Channel Tests Status Operand	0 to 4294967295	---	1	F300	0
B30, C60, D60, F35, F60, G30, G60, L90, M60, N60, T60	C468	Clear Energy Operand	0 to 4294967295	---	1	F300	0
F60	C46A	Clear Hi-Z Records Operand	0 to 4294967295	---	1	F300	0
All	C46C	Clear Unauthorized Access Operand	0 to 4294967295	---	1	F300	0
M60	C46E	Clear Start Data Operand	0 to 4294967295	---	1	F300	0
All except L30, L90	C470	Clear Platform Direct Input/Output Statistics Operand	0 to 4294967295	---	1	F300	0
All	C472	Reserved (13 items)	---	---	---	F001	0
	Direct Input/Output Settings (Read/Write Setting)						
L30, L90	C500	Direct Input Default States (8 items)	0 to 1	---	1	F108	0 (Off)
"	C508	Direct Input Default States (8 items)	0 to 1	---	1	F108	0 (Off)
"	C510	Direct Output x 1 Operand (8 items)	0 to 4294967295	---	1	F300	0
"	C520	Direct Output x 2 Operand (8 items)	0 to 4294967295	---	1	F300	0
	Platform Direct Outputs (Read/Write Setting) (32, 64, or 96 Modules)						
All except L30, L90	C600	Direct Output 1 Operand	0 to 4294967295	---	1	F300	0
"	C602	Direct Output 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	C603	...Repeated for Direct Output 2					
"	C606	...Repeated for Direct Output 3					

Products	Address	Register name	Range	Units	Step	Format	Default
"	C609	...Repeated for Direct Output 4					
"	C60C	...Repeated for Direct Output 5					
"	C60F	...Repeated for Direct Output 6					
"	C612	...Repeated for Direct Output 7					
"	C615	...Repeated for Direct Output 8					
"	C618	...Repeated for Direct Output 9					
"	C61B	...Repeated for Direct Output 10					
"	C61E	...Repeated for Direct Output 11					
"	C621	...Repeated for Direct Output 12					
"	C624	...Repeated for Direct Output 13					
"	C627	...Repeated for Direct Output 14					
"	C62A	...Repeated for Direct Output 15					
"	C62D	...Repeated for Direct Output 16					
"	C630	...Repeated for Direct Output 17					
"	C633	...Repeated for Direct Output 18					
"	C636	...Repeated for Direct Output 19					
"	C639	...Repeated for Direct Output 20					
"	C63C	...Repeated for Direct Output 21					
"	C63F	...Repeated for Direct Output 22					
"	C642	...Repeated for Direct Output 23					
"	C645	...Repeated for Direct Output 24					
"	C648	...Repeated for Direct Output 25					
"	C64B	...Repeated for Direct Output 26					
"	C64E	...Repeated for Direct Output 27					
"	C651	...Repeated for Direct Output 28					
"	C654	...Repeated for Direct Output 29					
"	C657	...Repeated for Direct Output 30					
"	C65A	...Repeated for Direct Output 31					
"	C65D	...Repeated for Direct Output 32					
B90, N60	C660	...Repeated for Direct Output 33					
"	C663	...Repeated for Direct Output 34					
"	C666	...Repeated for Direct Output 35					
"	C669	...Repeated for Direct Output 36					
"	C66C	...Repeated for Direct Output 37					
"	C66F	...Repeated for Direct Output 38					
"	C672	...Repeated for Direct Output 39					
"	C675	...Repeated for Direct Output 40					
"	C678	...Repeated for Direct Output 41					
"	C67B	...Repeated for Direct Output 42					
"	C67E	...Repeated for Direct Output 43					
"	C681	...Repeated for Direct Output 44					
"	C684	...Repeated for Direct Output 45					
"	C687	...Repeated for Direct Output 46					
"	C68A	...Repeated for Direct Output 47					
"	C68D	...Repeated for Direct Output 48					
"	C690	...Repeated for Direct Output 49					
"	C693	...Repeated for Direct Output 50					

Products	Address	Register name	Range	Units	Step	Format	Default
"	C696	...Repeated for Direct Output 51					
"	C699	...Repeated for Direct Output 52					
"	C69C	...Repeated for Direct Output 53					
"	C69F	...Repeated for Direct Output 54					
"	C6A2	...Repeated for Direct Output 55					
"	C6A5	...Repeated for Direct Output 56					
"	C6A8	...Repeated for Direct Output 57					
"	C6AB	...Repeated for Direct Output 58					
"	C6AE	...Repeated for Direct Output 59					
"	C6B1	...Repeated for Direct Output 60					
"	C6B4	...Repeated for Direct Output 61					
"	C6B7	...Repeated for Direct Output 62					
"	C6BA	...Repeated for Direct Output 63					
"	C6BD	...Repeated for Direct Output 64					
B90	C6C0	...Repeated for Direct Output 65					
"	C6C3	...Repeated for Direct Output 66					
"	C6C6	...Repeated for Direct Output 67					
"	C6C9	...Repeated for Direct Output 68					
"	C6CC	...Repeated for Direct Output 69					
"	C6CF	...Repeated for Direct Output 70					
"	C6D2	...Repeated for Direct Output 71					
"	C6D5	...Repeated for Direct Output 72					
"	C6D8	...Repeated for Direct Output 73					
"	C6DB	...Repeated for Direct Output 74					
"	C6DE	...Repeated for Direct Output 75					
"	C6E1	...Repeated for Direct Output 76					
"	C6E4	...Repeated for Direct Output 77					
"	C6E7	...Repeated for Direct Output 78					
"	C6EA	...Repeated for Direct Output 79					
"	C6ED	...Repeated for Direct Output 80					
"	C6F0	...Repeated for Direct Output 81					
"	C6F3	...Repeated for Direct Output 82					
"	C6F6	...Repeated for Direct Output 83					
"	C6F9	...Repeated for Direct Output 84					
"	C6FC	...Repeated for Direct Output 85					
"	C6FF	...Repeated for Direct Output 86					
"	C702	...Repeated for Direct Output 87					
"	C705	...Repeated for Direct Output 88					
"	C708	...Repeated for Direct Output 89					
"	C70B	...Repeated for Direct Output 90					
"	C70E	...Repeated for Direct Output 91					
"	C711	...Repeated for Direct Output 92					
"	C714	...Repeated for Direct Output 93					
"	C717	...Repeated for Direct Output 94					
"	C71A	...Repeated for Direct Output 95					
"	C71D	...Repeated for Direct Output 96					

Products	Address	Register name	Range	Units	Step	Format	Default
	Reset (Read/Write Setting)						
All	C750	FlexLogic operand which initiates a reset	0 to 4294967295	---	1	F300	0
	Control Pushbuttons (Read/Write Setting) (7 Modules)						
All	C760	Control Pushbutton 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	C761	Control Pushbutton 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	C762	...Repeated for Control Pushbutton 2					
"	C764	...Repeated for Control Pushbutton 3					
"	C766	...Repeated for Control Pushbutton 4					
"	C768	...Repeated for Control Pushbutton 5					
"	C76A	...Repeated for Control Pushbutton 6					
"	C76C	...Repeated for Control Pushbutton 7					
	Force Contact Inputs/Outputs (Read/Write Settings)						
All	C7A0	Force Contact Input x State (96 items)	0 to 2	---	1	F144	0 (Disabled)
"	C800	Force Contact Output x State (64 items)	0 to 3	---	1	F131	0 (Disabled)
	87L Channel Tests (Read/Write)						
L30, L90	C840	Local Loopback Function	0 to 1	---	1	F126	0 (No)
"	C841	Local Loopback Channel	1 to 2	---	1	F001	1
"	C842	Remote Loopback Function	0 to 1	---	1	F126	0 (No)
"	C843	Remote Loopback Channel	1 to 2	---	1	F001	1
"	C844	Remote Diagnostics Transmit	0 to 2	---	1	F223	0 (NO TEST)
	Direct Inputs/Outputs (Read/Write Setting)						
All except L30, L90	C880	Direct Device ID	1 to 16	---	1	F001	1
"	C881	Direct I/O Channel 1 Ring Configuration Function	0 to 1	---	1	F126	0 (No)
"	C882	Platform Direct I/O Data Rate	64 to 128	kbps	64	F001	64
"	C883	Direct I/O Channel 2 Ring Configuration Function	0 to 1	---	1	F126	0 (No)
"	C884	Platform Direct I/O Crossover Function	0 to 1	---	1	F102	0 (Disabled)
	Direct Input/Output Commands (Read/Write Command)						
All except L30, L90	C888	Direct Input/Output Clear Counters Command	0 to 1	---	1	F126	0 (No)
	Direct Inputs (Read/Write Setting) (32, 64, or 96 Modules)						
All except L30, L90	C890	Direct Input 1 Device Number	0 to 16	---	1	F001	0
"	C891	Direct Input 1 Number	0 to 96	---	1	F001	0
"	C892	Direct Input 1 Default State	0 to 3	---	1	F086	0 (Off)
"	C893	Direct Input 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	C894	...Repeated for Direct Input 2					
"	C898	...Repeated for Direct Input 3					
"	C89C	...Repeated for Direct Input 4					
"	C8A0	...Repeated for Direct Input 5					
"	C8A4	...Repeated for Direct Input 6					
"	C8A8	...Repeated for Direct Input 7					
"	C8AC	...Repeated for Direct Input 8					
"	C8B0	...Repeated for Direct Input 9					
"	C8B4	...Repeated for Direct Input 10					
"	C8B8	...Repeated for Direct Input 11					

Products	Address	Register name	Range	Units	Step	Format	Default
"	C8BC	...Repeated for Direct Input 12					
"	C8C0	...Repeated for Direct Input 13					
"	C8C4	...Repeated for Direct Input 14					
"	C8C8	...Repeated for Direct Input 15					
"	C8CC	...Repeated for Direct Input 16					
"	C8D0	...Repeated for Direct Input 17					
"	C8D4	...Repeated for Direct Input 18					
"	C8D8	...Repeated for Direct Input 19					
"	C8DC	...Repeated for Direct Input 20					
"	C8E0	...Repeated for Direct Input 21					
"	C8E4	...Repeated for Direct Input 22					
"	C8E8	...Repeated for Direct Input 23					
"	C8EC	...Repeated for Direct Input 24					
"	C8F0	...Repeated for Direct Input 25					
"	C8F4	...Repeated for Direct Input 26					
"	C8F8	...Repeated for Direct Input 27					
"	C8FC	...Repeated for Direct Input 28					
"	C900	...Repeated for Direct Input 29					
"	C904	...Repeated for Direct Input 30					
"	C908	...Repeated for Direct Input 31					
"	C90C	...Repeated for Direct Input 32					
B90, N60	C910	...Repeated for Direct Input 33					
"	C914	...Repeated for Direct Input 34					
"	C918	...Repeated for Direct Input 35					
"	C91C	...Repeated for Direct Input 36					
"	C920	...Repeated for Direct Input 37					
"	C924	...Repeated for Direct Input 38					
"	C928	...Repeated for Direct Input 39					
"	C92C	...Repeated for Direct Input 40					
"	C930	...Repeated for Direct Input 41					
"	C934	...Repeated for Direct Input 42					
"	C938	...Repeated for Direct Input 43					
"	C93C	...Repeated for Direct Input 44					
"	C940	...Repeated for Direct Input 45					
"	C944	...Repeated for Direct Input 46					
"	C948	...Repeated for Direct Input 47					
"	C94C	...Repeated for Direct Input 48					
"	C950	...Repeated for Direct Input 49					
"	C954	...Repeated for Direct Input 50					
"	C958	...Repeated for Direct Input 51					
"	C95C	...Repeated for Direct Input 52					
"	C960	...Repeated for Direct Input 53					
"	C964	...Repeated for Direct Input 54					
"	C968	...Repeated for Direct Input 55					
"	C96C	...Repeated for Direct Input 56					
"	C970	...Repeated for Direct Input 57					
"	C974	...Repeated for Direct Input 58					

Products	Address	Register name	Range	Units	Step	Format	Default
"	C978	...Repeated for Direct Input 59					
"	C97C	...Repeated for Direct Input 60					
"	C980	...Repeated for Direct Input 61					
"	C984	...Repeated for Direct Input 62					
"	C988	...Repeated for Direct Input 63					
"	C98C	...Repeated for Direct Input 64					
B90	C990	...Repeated for Direct Input 65					
"	C994	...Repeated for Direct Input 66					
"	C998	...Repeated for Direct Input 67					
"	C99C	...Repeated for Direct Input 68					
"	C9A0	...Repeated for Direct Input 69					
"	C9A4	...Repeated for Direct Input 70					
"	C9A8	...Repeated for Direct Input 71					
"	C9AC	...Repeated for Direct Input 72					
"	C9B0	...Repeated for Direct Input 73					
"	C9B4	...Repeated for Direct Input 74					
"	C9B8	...Repeated for Direct Input 75					
"	C9BC	...Repeated for Direct Input 76					
"	C9C0	...Repeated for Direct Input 77					
"	C9C4	...Repeated for Direct Input 78					
"	C9C8	...Repeated for Direct Input 79					
"	C9CC	...Repeated for Direct Input 80					
"	C9D0	...Repeated for Direct Input 81					
"	C9D4	...Repeated for Direct Input 82					
"	C9D8	...Repeated for Direct Input 83					
"	C9DC	...Repeated for Direct Input 84					
"	C9E0	...Repeated for Direct Input 85					
"	C9E4	...Repeated for Direct Input 86					
"	C9E8	...Repeated for Direct Input 87					
"	C9EC	...Repeated for Direct Input 88					
"	C9F0	...Repeated for Direct Input 89					
"	C9F4	...Repeated for Direct Input 90					
"	C9F8	...Repeated for Direct Input 91					
"	C9FC	...Repeated for Direct Input 92					
"	CA00	...Repeated for Direct Input 93					
"	CA04	...Repeated for Direct Input 94					
"	CA08	...Repeated for Direct Input 95					
"	CA0C	...Repeated for Direct Input 96					
	Direct Input/Output Alarms (Read/Write Setting)						
All except L30, L90	CAD0	Direct Input/Output Channel 1 CRC Alarm Function	0 to 1	---	1	F102	0 (Disabled)
"	CAD1	Direct Input/Output Channel 1 CRC Alarm Message Count	100 to 10000	---	1	F001	600
"	CAD2	Direct Input/Output Channel 1 CRC Alarm Threshold	1 to 1000	---	1	F001	10
"	CAD3	Direct Input/Output Channel 1 CRC Alarm Events	0 to 1	---	1	F102	0 (Disabled)
"	CAD4	Reserved (4 items)	1 to 1000	---	1	F001	10

Products	Address	Register name	Range	Units	Step	Format	Default
"	CAD8	Direct Input/Output Channel 2 CRC Alarm Function	0 to 1	---	1	F102	0 (Disabled)
"	CAD9	Direct Input/Output Channel 2 CRC Alarm Message Count	100 to 10000	---	1	F001	600
"	CADA	Direct Input/Output Channel 2 CRC Alarm Threshold	1 to 1000	---	1	F001	10
"	CADB	Direct Input/Output Channel 2 CRC Alarm Events	0 to 1	---	1	F102	0 (Disabled)
"	CADC	Reserved (4 items)	1 to 1000	---	1	F001	10
"	CAE0	Direct Input/Output Channel 1 Unreturned Messages Alarm Function	0 to 1	---	1	F102	0 (Disabled)
"	CAE1	Direct Input/Output Channel 1 Unreturned Messages Alarm Msg Count	100 to 10000	---	1	F001	600
"	CAE2	Direct Input/Output Channel 1 Unreturned Messages Alarm Threshold	1 to 1000	---	1	F001	10
"	CAE3	Direct Input/Output Channel 1 Unreturned Messages Alarm Events	0 to 1	---	1	F102	0 (Disabled)
"	CAE4	Reserved (4 items)	1 to 1000	---	1	F001	10
"	CAE8	Direct Input/Output Channel 2 Unreturned Messages Alarm Function	0 to 1	---	1	F102	0 (Disabled)
"	CAE9	Direct Input/Output Channel 2 Unreturned Messages Alarm Msg Count	100 to 10000	---	1	F001	600
"	CAEA	Direct Input/Output Channel 2 Unreturned Messages Alarm Threshold	1 to 1000	---	1	F001	10
"	CAEB	Direct Input/Output Channel 2 Unreturned Messages Alarm Events	0 to 1	---	1	F102	0 (Disabled)
"	CAEC	Reserved (4 items)	1 to 1000	---	1	F001	10
	IEC 61850 GGIO2 Control Configuration (Read/Write Setting) (64 Modules)						
All	D320	IEC 61850 GGIO2.CF.SPCSO1.ctlModel Value	0 to 2	---	1	F001	1
"	D321	IEC 61850 GGIO2.CF.SPCSO2.ctlModel Value	0 to 2	---	1	F001	1
"	D322	IEC 61850 GGIO2.CF.SPCSO3.ctlModel Value	0 to 2	---	1	F001	1
"	D323	IEC 61850 GGIO2.CF.SPCSO4.ctlModel Value	0 to 2	---	1	F001	1
"	D324	IEC 61850 GGIO2.CF.SPCSO5.ctlModel Value	0 to 2	---	1	F001	1
"	D325	IEC 61850 GGIO2.CF.SPCSO6.ctlModel Value	0 to 2	---	1	F001	1
"	D326	IEC 61850 GGIO2.CF.SPCSO7.ctlModel Value	0 to 2	---	1	F001	1
"	D327	IEC 61850 GGIO2.CF.SPCSO8.ctlModel Value	0 to 2	---	1	F001	1
"	D328	IEC 61850 GGIO2.CF.SPCSO9.ctlModel Value	0 to 2	---	1	F001	1
"	D329	IEC 61850 GGIO2.CF.SPCSO10.ctlModel Value	0 to 2	---	1	F001	1
"	D32A	IEC 61850 GGIO2.CF.SPCSO11.ctlModel Value	0 to 2	---	1	F001	1
"	D32B	IEC 61850 GGIO2.CF.SPCSO12.ctlModel Value	0 to 2	---	1	F001	1
"	D32C	IEC 61850 GGIO2.CF.SPCSO13.ctlModel Value	0 to 2	---	1	F001	1

Products	Address	Register name	Range	Units	Step	Format	Default
"	D32D	IEC 61850 GGIO2.CF.SPCSO14.ctlModel Value	0 to 2	---	1	F001	1
"	D32E	IEC 61850 GGIO2.CF.SPCSO15.ctlModel Value	0 to 2	---	1	F001	1
"	D32F	IEC 61850 GGIO2.CF.SPCSO16.ctlModel Value	0 to 2	---	1	F001	1
"	D330	IEC 61850 GGIO2.CF.SPCSO17.ctlModel Value	0 to 2	---	1	F001	1
"	D331	IEC 61850 GGIO2.CF.SPCSO18.ctlModel Value	0 to 2	---	1	F001	1
"	D332	IEC 61850 GGIO2.CF.SPCSO19.ctlModel Value	0 to 2	---	1	F001	1
"	D333	IEC 61850 GGIO2.CF.SPCSO20.ctlModel Value	0 to 2	---	1	F001	1
"	D334	IEC 61850 GGIO2.CF.SPCSO21.ctlModel Value	0 to 2	---	1	F001	1
"	D335	IEC 61850 GGIO2.CF.SPCSO22.ctlModel Value	0 to 2	---	1	F001	1
"	D336	IEC 61850 GGIO2.CF.SPCSO23.ctlModel Value	0 to 2	---	1	F001	1
"	D337	IEC 61850 GGIO2.CF.SPCSO24.ctlModel Value	0 to 2	---	1	F001	1
"	D338	IEC 61850 GGIO2.CF.SPCSO25.ctlModel Value	0 to 2	---	1	F001	1
"	D339	IEC 61850 GGIO2.CF.SPCSO26.ctlModel Value	0 to 2	---	1	F001	1
"	D33A	IEC 61850 GGIO2.CF.SPCSO27.ctlModel Value	0 to 2	---	1	F001	1
"	D33B	IEC 61850 GGIO2.CF.SPCSO28.ctlModel Value	0 to 2	---	1	F001	1
"	D33C	IEC 61850 GGIO2.CF.SPCSO29.ctlModel Value	0 to 2	---	1	F001	1
"	D33D	IEC 61850 GGIO2.CF.SPCSO30.ctlModel Value	0 to 2	---	1	F001	1
"	D33E	IEC 61850 GGIO2.CF.SPCSO31.ctlModel Value	0 to 2	---	1	F001	1
"	D33F	IEC 61850 GGIO2.CF.SPCSO32.ctlModel Value	0 to 2	---	1	F001	1
"	D340	IEC 61850 GGIO2.CF.SPCSO33.ctlModel Value	0 to 2	---	1	F001	1
"	D341	IEC 61850 GGIO2.CF.SPCSO34.ctlModel Value	0 to 2	---	1	F001	1
"	D342	IEC 61850 GGIO2.CF.SPCSO35.ctlModel Value	0 to 2	---	1	F001	1
"	D343	IEC 61850 GGIO2.CF.SPCSO36.ctlModel Value	0 to 2	---	1	F001	1
"	D344	IEC 61850 GGIO2.CF.SPCSO37.ctlModel Value	0 to 2	---	1	F001	1
"	D345	IEC 61850 GGIO2.CF.SPCSO38.ctlModel Value	0 to 2	---	1	F001	1
"	D346	IEC 61850 GGIO2.CF.SPCSO39.ctlModel Value	0 to 2	---	1	F001	1
"	D347	IEC 61850 GGIO2.CF.SPCSO40.ctlModel Value	0 to 2	---	1	F001	1
"	D348	IEC 61850 GGIO2.CF.SPCSO41.ctlModel Value	0 to 2	---	1	F001	1

Products	Address	Register name	Range	Units	Step	Format	Default
"	D349	IEC 61850 GGIO2.CF.SPCSO42.ctlModel Value	0 to 2	---	1	F001	1
"	D34A	IEC 61850 GGIO2.CF.SPCSO43.ctlModel Value	0 to 2	---	1	F001	1
"	D34B	IEC 61850 GGIO2.CF.SPCSO44.ctlModel Value	0 to 2	---	1	F001	1
"	D34C	IEC 61850 GGIO2.CF.SPCSO45.ctlModel Value	0 to 2	---	1	F001	1
"	D34D	IEC 61850 GGIO2.CF.SPCSO46.ctlModel Value	0 to 2	---	1	F001	1
"	D34E	IEC 61850 GGIO2.CF.SPCSO47.ctlModel Value	0 to 2	---	1	F001	1
"	D34F	IEC 61850 GGIO2.CF.SPCSO48.ctlModel Value	0 to 2	---	1	F001	1
"	D350	IEC 61850 GGIO2.CF.SPCSO49.ctlModel Value	0 to 2	---	1	F001	1
"	D351	IEC 61850 GGIO2.CF.SPCSO50.ctlModel Value	0 to 2	---	1	F001	1
"	D352	IEC 61850 GGIO2.CF.SPCSO51.ctlModel Value	0 to 2	---	1	F001	1
"	D353	IEC 61850 GGIO2.CF.SPCSO52.ctlModel Value	0 to 2	---	1	F001	1
"	D354	IEC 61850 GGIO2.CF.SPCSO53.ctlModel Value	0 to 2	---	1	F001	1
"	D355	IEC 61850 GGIO2.CF.SPCSO54.ctlModel Value	0 to 2	---	1	F001	1
"	D356	IEC 61850 GGIO2.CF.SPCSO55.ctlModel Value	0 to 2	---	1	F001	1
"	D357	IEC 61850 GGIO2.CF.SPCSO56.ctlModel Value	0 to 2	---	1	F001	1
"	D358	IEC 61850 GGIO2.CF.SPCSO57.ctlModel Value	0 to 2	---	1	F001	1
"	D359	IEC 61850 GGIO2.CF.SPCSO58.ctlModel Value	0 to 2	---	1	F001	1
"	D35A	IEC 61850 GGIO2.CF.SPCSO59.ctlModel Value	0 to 2	---	1	F001	1
"	D35B	IEC 61850 GGIO2.CF.SPCSO60.ctlModel Value	0 to 2	---	1	F001	1
"	D35C	IEC 61850 GGIO2.CF.SPCSO61.ctlModel Value	0 to 2	---	1	F001	1
"	D35D	IEC 61850 GGIO2.CF.SPCSO62.ctlModel Value	0 to 2	---	1	F001	1
"	D35E	IEC 61850 GGIO2.CF.SPCSO63.ctlModel Value	0 to 2	---	1	F001	1
"	D35F	IEC 61850 GGIO2.CF.SPCSO64.ctlModel Value	0 to 2	---	1	F001	1
	RxGOOSE Status (Read Only) (16 or 32 Modules)						
All	D360	Remote Device 1 StNum	0 to 4294967295	---	1	F003	0
"	D362	Remote Device 1 SqNum	0 to 4294967295	---	1	F003	0
"	D364	...Repeated for Remote Device 2					
"	D368	...Repeated for Remote Device 3					
"	D36C	...Repeated for Remote Device 4					
"	D370	...Repeated for Remote Device 5					
"	D374	...Repeated for Remote Device 6					

Products	Address	Register name	Range	Units	Step	Format	Default
"	D378	...Repeated for Remote Device 7					
"	D37C	...Repeated for Remote Device 8					
"	D380	...Repeated for Remote Device 9					
"	D384	...Repeated for Remote Device 10					
"	D388	...Repeated for Remote Device 11					
"	D38C	...Repeated for Remote Device 12					
"	D390	...Repeated for Remote Device 13					
"	D394	...Repeated for Remote Device 14					
"	D398	...Repeated for Remote Device 15					
"	D39C	...Repeated for Remote Device 16					
C30	D3A0	...Repeated for Remote Device 17					
"	D3A4	...Repeated for Remote Device 18					
"	D3A8	...Repeated for Remote Device 19					
"	D3AC	...Repeated for Remote Device 20					
"	D3B0	...Repeated for Remote Device 21					
"	D3B4	...Repeated for Remote Device 22					
"	D3B8	...Repeated for Remote Device 23					
"	D3BC	...Repeated for Remote Device 24					
"	D3C0	...Repeated for Remote Device 25					
"	D3C4	...Repeated for Remote Device 26					
"	D3C8	...Repeated for Remote Device 27					
"	D3CC	...Repeated for Remote Device 28					
"	D3D0	...Repeated for Remote Device 29					
"	D3D4	...Repeated for Remote Device 30					
"	D3D8	...Repeated for Remote Device 31					
"	D3DC	...Repeated for Remote Device 32					
	Contact Outputs (Read/Write Setting) (64 Modules)						
All	D3E0	Contact Output 1 Name	---	---	---	F205	"Cont Op 1"
"	D3E6	Contact Output 1 Operation	0 to 4294967295	---	1	F300	0
"	D3E8	Contact Output 1 Seal In	0 to 4294967295	---	1	F300	0
"	D3EA	Latching Output 1 Reset	0 to 4294967295	---	1	F300	0
"	D3EC	Contact Output 1 Events	0 to 1	---	1	F102	1 (Enabled)
"	D3ED	Latching Output 1 Type	0 to 1	---	1	F090	0 (Operate-dominant)
"	D3EE	Reserved	---	---	---	F001	0
"	D3EF	...Repeated for Contact Output 2					
"	D3FE	...Repeated for Contact Output 3					
"	D40D	...Repeated for Contact Output 4					
"	D41C	...Repeated for Contact Output 5					
"	D42B	...Repeated for Contact Output 6					
"	D43A	...Repeated for Contact Output 7					
"	D449	...Repeated for Contact Output 8					
"	D458	...Repeated for Contact Output 9					
"	D467	...Repeated for Contact Output 10					
"	D476	...Repeated for Contact Output 11					
"	D485	...Repeated for Contact Output 12					
"	D494	...Repeated for Contact Output 13					

Products	Address	Register name	Range	Units	Step	Format	Default
"	D4A3	...Repeated for Contact Output 14					
"	D4B2	...Repeated for Contact Output 15					
"	D4C1	...Repeated for Contact Output 16					
"	D4D0	...Repeated for Contact Output 17					
"	D4DF	...Repeated for Contact Output 18					
"	D4EE	...Repeated for Contact Output 19					
"	D4FD	...Repeated for Contact Output 20					
"	D50C	...Repeated for Contact Output 21					
"	D51B	...Repeated for Contact Output 22					
"	D52A	...Repeated for Contact Output 23					
"	D539	...Repeated for Contact Output 24					
"	D548	...Repeated for Contact Output 25					
"	D557	...Repeated for Contact Output 26					
"	D566	...Repeated for Contact Output 27					
"	D575	...Repeated for Contact Output 28					
"	D584	...Repeated for Contact Output 29					
"	D593	...Repeated for Contact Output 30					
"	D5A2	...Repeated for Contact Output 31					
"	D5B1	...Repeated for Contact Output 32					
"	D5C0	...Repeated for Contact Output 33					
"	D5CF	...Repeated for Contact Output 34					
"	D5DE	...Repeated for Contact Output 35					
"	D5ED	...Repeated for Contact Output 36					
"	D5FC	...Repeated for Contact Output 37					
"	D60B	...Repeated for Contact Output 38					
"	D61A	...Repeated for Contact Output 39					
"	D629	...Repeated for Contact Output 40					
"	D638	...Repeated for Contact Output 41					
"	D647	...Repeated for Contact Output 42					
"	D656	...Repeated for Contact Output 43					
"	D665	...Repeated for Contact Output 44					
"	D674	...Repeated for Contact Output 45					
"	D683	...Repeated for Contact Output 46					
"	D692	...Repeated for Contact Output 47					
"	D6A1	...Repeated for Contact Output 48					
"	D6B0	...Repeated for Contact Output 49					
"	D6BF	...Repeated for Contact Output 50					
"	D6CE	...Repeated for Contact Output 51					
"	D6DD	...Repeated for Contact Output 52					
"	D6EC	...Repeated for Contact Output 53					
"	D6FB	...Repeated for Contact Output 54					
"	D70A	...Repeated for Contact Output 55					
"	D719	...Repeated for Contact Output 56					
"	D728	...Repeated for Contact Output 57					
"	D737	...Repeated for Contact Output 58					
"	D746	...Repeated for Contact Output 59					
"	D755	...Repeated for Contact Output 60					

Products	Address	Register name	Range	Units	Step	Format	Default
"	D764	...Repeated for Contact Output 61					
"	D773	...Repeated for Contact Output 62					
"	D782	...Repeated for Contact Output 63					
"	D791	...Repeated for Contact Output 64					
	DCmA Inputs (Read/Write Setting) (24 Modules)						
All except B90	D7A0	DCmA Inputs 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	D7A1	DCmA Inputs 1 ID	---	---	---	F205	"DCmA Ip 1"
"	D7A7	Reserved 1 (4 items)	0 to 65535	---	1	F001	0
"	D7AB	DCmA Inputs 1 Units	---	---	---	F206	"mA"
"	D7AE	DCmA Inputs 1 Range	0 to 6	---	1	F173	6 (4 to 20 mA)
"	D7AF	DCmA Inputs 1 Minimum Value	-9999.999 to 9999.999	---	0.001	F004	4000
"	D7B1	DCmA Inputs 1 Maximum Value	-9999.999 to 9999.999	---	0.001	F004	20000
"	D7B3	...Repeated for DCmA Inputs 2					
"	D7C6	...Repeated for DCmA Inputs 3					
"	D7D9	...Repeated for DCmA Inputs 4					
"	D7EC	...Repeated for DCmA Inputs 5					
"	D7FF	...Repeated for DCmA Inputs 6					
"	D812	...Repeated for DCmA Inputs 7					
"	D825	...Repeated for DCmA Inputs 8					
"	D838	...Repeated for DCmA Inputs 9					
"	D84B	...Repeated for DCmA Inputs 10					
"	D85E	...Repeated for DCmA Inputs 11					
"	D871	...Repeated for DCmA Inputs 12					
"	D884	...Repeated for DCmA Inputs 13					
"	D897	...Repeated for DCmA Inputs 14					
"	D8AA	...Repeated for DCmA Inputs 15					
"	D8BD	...Repeated for DCmA Inputs 16					
"	D8D0	...Repeated for DCmA Inputs 17					
"	D8E3	...Repeated for DCmA Inputs 18					
"	D8F6	...Repeated for DCmA Inputs 19					
"	D909	...Repeated for DCmA Inputs 20					
"	D91C	...Repeated for DCmA Inputs 21					
"	D92F	...Repeated for DCmA Inputs 22					
"	D942	...Repeated for DCmA Inputs 23					
"	D955	...Repeated for DCmA Inputs 24					
	DNP/IEC Points (Read/Write Setting)						
All	D968	DNP/IEC 60870-5-104 Binary Input Points (256 items)	0 to 4294967295	---	1	F300	0
"	DB68	DNP/IEC 60870-5-104 Analog Input Points (256 items)	0 to 65535	---	1	F600	0
	Synchrocheck (Read/Write Setting) (4 Modules)						
C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60	DC70	Synchrocheck 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	DC71	Synchrocheck 1 V1 Source	0 to 5	---	1	F167	0 (SRC 1)

Products	Address	Register name	Range	Units	Step	Format	Default
"	DC72	Synchrocheck 1 V2 Source	0 to 5	---	1	F167	1 (SRC 2)
"	DC73	Synchrocheck 1 Maximum Voltage Difference	0 to 400000	V	1	F060	10000
"	DC75	Synchrocheck 1 Maximum Angle Difference	0 to 100	degrees	1	F001	30
"	DC76	Synchrocheck 1 Maximum Frequency Difference	0 to 2	Hz	0.01	F001	100
"	DC77	Synchrocheck 1 Dead Source Select	0 to 5	---	1	F176	1 (LV1 and DV2)
"	DC78	Synchrocheck 1 Dead V1 Maximum Voltage	0 to 1.25	pu	0.01	F001	30
"	DC79	Synchrocheck 1 Dead V2 Maximum Voltage	0 to 1.25	pu	0.01	F001	30
"	DC7A	Synchrocheck 1 Live V1 Minimum Voltage	0 to 1.25	pu	0.01	F001	70
"	DC7B	Synchrocheck 1 Live V2 Minimum Voltage	0 to 1.25	pu	0.01	F001	70
"	DC7C	Synchrocheck 1 Target	0 to 2	---	1	F109	0 (Self-reset)
"	DC7D	Synchrocheck 1 Events	0 to 1	---	1	F102	0 (Disabled)
"	DC7E	Synchrocheck 1 Block	0 to 4294967295	---	1	F300	0
"	DC80	Synchrocheck 1 Frequency Hysteresis	0 to 0.1	Hz	0.01	F001	6
"	DC81	...Repeated for Synchrocheck 2					
"	DC92	...Repeated for Synchrocheck 3					
"	DCA3	...Repeated for Synchrocheck 4					
	Phasor Measurement Unit Basic Configuration (Read/Write Setting) (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	DCB4	PMU 1 Function	0 to 1	---	1	F102	0 (Disabled)
"	DCB5	PMU 1 LDInst	---	---	---	F214	"PMUx"
"	DCD6	PMU 1 IDcode	1 to 65534	---	1	F001	1
"	DCD7	PMU 1 STN	---	---	---	F203	"GE-UR-PMU"
"	DCDF	PMU 1 Source	0 to 5	---	1	F167	0 (SRC 1)
"	DCE0	PMU 1 Class	0 to 2	---	1	F549	1 (M-CLASS)
"	DCE1	PMU 1 Format	0 to 1	---	1	F547	0 (Integer)
"	DCE2	PMU 1 Style	0 to 1	---	1	F546	0 (Polar)
"	DCE3	PMU 1 Rate	0 to 13	---	1	F544	4 (10/sec)
"	DCE4	PMU 1 PHS-x (14 items)	0 to 14	---	1	F543	1 (Va)
"	DCF2	PMU 1 PHS-x Name (14 items)	---	---	---	F203	"GE-UR-PMU-PHS 1 "
"	DD62	PMU 1 A-CH-x (16 items)	0 to 65535	---	1	F600	0
"	DD72	PMU 1 A-CH-x (16 items)	---	---	---	F203	"AnalogChannel 1 "
"	DDF2	PMU 1 D-CH-x (16 items)	0 to 4294967295	---	1	F300	0
"	DE12	PMU 1 D-CH-x Name (16 items)	---	---	---	F203	"Dig Channel 1 "
"	DE92	PMU 1 D-CH-x Normal State (16 items)	0 to 1	---	1	F108	0 (Off)
"	DEA2	PMU 1 Post Filter	0 to 5	---	1	F540	0 (None)
"	DEA3	Reserved (15 items)	0 to 1	---	1	F001	0
C60, N60	DEB2	...Repeated for PMU 2					
N60	E0B0	...Repeated for PMU 3					
"	E2AE	...Repeated for PMU 4					
"	E4AC	...Repeated for PMU 5					

Products	Address	Register name	Range	Units	Step	Format	Default
"	E6AA	...Repeated for PMU 6					
	Phasor Measurement Unit Aggregator (Read/Write Setting) (1, 2, or 4 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	E8A8	PMU Aggregator 1 Name	---	---	1	F209	"MSVID 1 "
"	E8C9	Aggregator 1 IDcode	1 to 65534	---	1	F001	1
"	E8CA	Aggregator 1 Protocol	0 to 2	---	1	F548	0 (NONE)
"	E8CB	Aggregator 1 TCP Port	0 to 65534	---	1	F001	4712
"	E8CC	Aggregator 1 UDP Port	0 to 65534	---	1	F001	4713
"	E8CD	PMU Aggregator 1 90-5 UDP Port	0 to 65534	---	1	F001	102
"	E8CE	PMU Aggregator 1 PDC Network Control	0 to 1	---	1	F102	0 (Disabled)
"	E8CF	Aggregator 1 Include PMU1	0 to 1	---	1	F126	0 (No)
"	E8D0	Aggregator 1 Include PMU2	0 to 1	---	1	F126	0 (No)
"	E8D1	Aggregator 1 Include PMU3	0 to 1	---	1	F126	0 (No)
"	E8D2	Aggregator 1 Include PMU4	0 to 1	---	1	F126	0 (No)
"	E8D3	Aggregator 1 Include PMU5	0 to 1	---	1	F126	0 (No)
"	E8D4	Aggregator 1 Include PMU6	0 to 1	---	1	F126	0 (No)
"	E8D5	PMU Aggregator 1 ASDUS	1 to 4	---	1	F001	1
"	E8D6	PMU Aggregator 1 Port	1 to 3	---	1	F001	1
"	E8D7	Reserved (3 items)	0 to 1	---	1	F001	0
C60, N60	E8D8	...Repeated for PMU Aggregator 2					
N60	E908	...Repeated for PMU Aggregator 3					
"	E938	...Repeated for PMU Aggregator 4					
	Phasor Measurement Unit Aggregator Control Block (Read/Write Setting) (1, 2, or 4 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	E9C8	PMU Aggregator 1 Control Block SvEna	0 to 4294967295	---	1	F300	0
"	E9CA	PMU Aggregator 1 Control Block Client Control	0 to 4294967295	---	1	F300	0
"	E9CC	PMU Aggregator 1 CB SvEna Default	0 to 4294967295	---	1	F300	0
"	E9CE	PMU Aggregator 1 Control Block ConfRev	1 to 4294967295	---	1	F003	1
"	E9D0	PMU Aggregator 1 Control Block Priority	0 to 7	---	1	F001	4
"	E9D1	PMU Aggregator 1 Control Block IPClass	0 to 1	---	1	F563	1 (Expedited Forwarding)
"	E9D2	PMU Aggregator 1 Control Block VID	0 to 4095	---	1	F001	0
"	E9D3	PMU Aggregator 1 Control Block APPID	0 to 16383	---	1	F001	0
"	E9D4	PMU Aggregator 1 Control Block IP Address	0 to 4294967295	---	1	F003	0
"	E9D6	PMU Aggregator 1 Control Block Security	0 to 2	---	1	F001	0
C60, N60	E9D7	...Repeated for PMU Aggregator 2					
N60	E9E6	...Repeated for PMU Aggregator 3					
"	E9F5	...Repeated for PMU Aggregator 4					
	Phasor Measurement Unit Recording Command (Read/Write Command) (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	EA22	PMU 1 Recording Clear Command	0 to 1	---	1	F126	0 (No)
"	EA23	PMU 1 Recording Force Trigger	0 to 1	---	1	F126	0 (No)
C60, N60	EA24	...Repeated for PMU 2					
N60	EA26	...Repeated for PMU 3					
"	EA28	...Repeated for PMU 4					

Products	Address	Register name	Range	Units	Step	Format	Default
"	EA2A	...Repeated for PMU 5					
"	EA2C	...Repeated for PMU 6					
	Phasor Measurement Unit Recording (Read/Write Setting)						
D60, F60, G60, L30, L90, T60	EA2E	PMU 1 Record Function	0 to 1	---	1	F102	0 (Disabled)
"	EA2F	PMU 1 No of Timed Records	2 to 128	---	1	F001	10
"	EA30	PMU 1 Trigger Mode	0 to 1	---	1	F542	0 (Auto Overwrite)
"	EA31	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	EA32	PMU 1 Record Function	0 to 1	---	1	F102	0 (Disabled)
"	EA33	PMU 1 No of Timed Records	2 to 128	---	1	F001	10
"	EA34	PMU 1 Trigger Mode Ex	0 to 1	---	1	F542	0 (Auto Overwrite)
"	EA35	PMU 1 Timed Trigger Position	1 to 50	%	1	F001	10
"	EA36	...Repeated for PMU 2					
N60	EA3A	...Repeated for PMU 3					
"	EA3E	...Repeated for PMU 4					
"	EA42	...Repeated for PMU 5					
"	EA46	...Repeated for PMU 6					
	Phasor Measurement Unit Triggering (Read/Write Setting) (1,2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	EA4A	PMU 1 User Trigger	0 to 4294967295	---	1	F300	0
C60, N60	EA4C	...Repeated for PMU 2					
N60	EA4E	...Repeated for PMU 3					
"	EA50	...Repeated for PMU 4					
"	EA52	...Repeated for PMU 5					
"	EA54	...Repeated for PMU 6					
	Phasor Measurement Unit Voltage Trigger (Read/Write Setting) (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	EA56	PMU 1 Volt Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	EA57	PMU 1 Voltage Trigger Low Volt	0.25 to 1.25	pu	0.001	F001	800
"	EA58	PMU 1 Voltage Trigger High Volt	0.75 to 1.75	pu	0.001	F001	1200
"	EA59	PMU 1 Voltage Trigger Pkp Time	0 to 600	s	0.01	F001	10
"	EA5A	PMU 1 Voltage Trigger Dpo Time	0 to 600	s	0.01	F001	100
"	EA5B	PMU 1 Voltage Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	EA61	PMU 1 Voltage Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	EA62	PMU 1 Voltage Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	EA63	...Repeated for PMU 2					
N60	EA70	...Repeated for PMU 3					
"	EA7D	...Repeated for PMU 4					
"	EA8A	...Repeated for PMU 5					
"	EA97	...Repeated for PMU 6					
	Phasor Measurement Unit Current Trigger (Read/Write Setting (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	EAA4	PMU 1 Current Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	EAA5	PMU 1 Current Trigger Pickup	0.1 to 30	pu	0.001	F001	1800

Products	Address	Register name	Range	Units	Step	Format	Default
"	EAA6	PMU 1 Current Trigger Pkp Time	0 to 600	s	0.01	F001	10
"	EAA7	PMU 1 Current Trigger Dpo Time	0 to 600	s	0.01	F001	100
"	EAA8	PMU 1 Current Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	EAAE	PMU 1 Current Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	EAAF	PMU 1 Current Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	EAB0	...Repeated for PMU 2					
N60	EABC	...Repeated for PMU 3					
"	EAC8	...Repeated for PMU 4					
"	EAD4	...Repeated for PMU 5					
"	EAE0	...Repeated for PMU 6					
	Phasor Measurement Unit Frequency Trigger (Read/Write Setting) (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	EAEC	PMU 1 Frequency Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	EAED	PMU 1 Frequency Trigger Low Frequency	20 to 70	Hz	0.01	F001	4900
"	EAEE	PMU 1 Frequency Trigger High Frequency	20 to 70	Hz	0.01	F001	6100
"	EAEF	PMU 1 Frequency Trigger Pickup Time	0 to 600	s	0.01	F001	10
"	EAF0	PMU 1 Frequency Trigger Dropout Time	0 to 600	s	0.01	F001	100
"	EAF1	PMU 1 Frequency Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	EAF7	PMU 1 Frequency Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	EAF8	PMU 1 Frequency Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	EAF9	...Repeated for PMU 2					
N60	EB06	...Repeated for PMU 3					
"	EB13	...Repeated for PMU 4					
"	EB20	...Repeated for PMU 5					
"	EB2D	...Repeated for PMU 6					
	Phasor Measurement Unit df/dt Trigger (Read/Write Setting) (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	EB3A	PMU 1 df/dt Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	EB3B	PMU 1 df/dt Trigger Raise	0.1 to 15	Hz/s	0.01	F001	25
"	EB3C	PMU 1 df/dt Trigger Fall	0.1 to 15	Hz/s	0.01	F001	25
"	EB3D	PMU 1 df/dt Trigger Pkp Time	0 to 600	seconds	0.01	F001	10
"	EB3E	PMU 1 df/dt Trigger Dpo Time	0 to 600	seconds	0.01	F001	100
"	EB3F	PMU 1 df/dt Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	EB45	PMU 1 df/dt Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	EB46	PMU 1 df/dt Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	EB47	...Repeated for PMU 2					
N60	EB54	...Repeated for PMU 3					
"	EB61	...Repeated for PMU 4					
"	EB6E	...Repeated for PMU 5					
"	EB7B	...Repeated for PMU 6					
	Phasor Measurement Unit Power Trigger (Read/Write Setting) (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	EB88	PMU 1 Power Trigger Function	0 to 1	---	1	F102	0 (Disabled)
"	EB89	PMU 1 Power Trigger Active	0.25 to 3	pu	0.001	F001	1250
"	EB8A	PMU 1 Power Trigger Reactive	0.25 to 3	pu	0.001	F001	1250
"	EB8B	PMU 1 Power Trigger Apparent	0.25 to 3	pu	0.001	F001	1250

Products	Address	Register name	Range	Units	Step	Format	Default
"	EB8C	PMU 1 Power Trigger Pkp Time	0 to 600	s	0.01	F001	10
"	EB8D	PMU 1 Power Trigger Dpo Time	0 to 600	s	0.01	F001	100
"	EB8E	PMU 1 Power Trigger Block (3 items)	0 to 4294967295	---	1	F300	0
"	EB94	PMU 1 Power Trigger Target	0 to 2	---	1	F109	0 (Self-reset)
"	EB95	PMU 1 Power Trigger Events	0 to 1	---	1	F102	0 (Disabled)
C60, N60	EB96	...Repeated for PMU 2					
N60	EBA4	...Repeated for PMU 3					
"	EBB2	...Repeated for PMU 4					
"	EBC0	...Repeated for PMU 5					
"	EBCE	...Repeated for PMU 6					
	Phasor Measurement Unit Calibration (Read/Write Setting) (1, 2, 4, or 6 Modules)						
C60, D60, F60, G60, L30, L90, N60, T60	EBDC	PMU 1 Va Calibration Angle	-5 to 5	°	0.05	F002	0
"	EBDD	PMU 1 Va Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	EBDE	PMU 1 Vb Calibration Angle	-5 to 5	°	0.05	F002	0
"	EBDF	PMU 1 Vb Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	EBE0	PMU 1 Vc Calibration Angle	-5 to 5	°	0.05	F002	0
"	EBE1	PMU 1 Vc Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	EBE2	PMU 1 Vx Calibration Angle	-5 to 5	°	0.05	F002	0
"	EBE3	PMU 1 Vx Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	EBE4	PMU 1 Ia Calibration Angle	-5 to 5	°	0.05	F002	0
"	EBE5	PMU 1 Ia Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	EBE6	PMU 1 Ib Calibration Angle	-5 to 5	°	0.05	F002	0
"	EBE7	PMU 1 Ib Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	EBE8	PMU 1 Ic Calibration Angle	-5 to 5	°	0.05	F002	0
"	EBE9	PMU 1 Ic Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	EBEA	PMU 1 Ig Calibration Angle	-5 to 5	°	0.05	F002	0
"	EBEB	PMU 1 Ig Calibration Magnitude	95 to 105	%	0.1	F002	1000
"	EBEC	PMU 1 Sequence Voltage Shift Angle	-180 to 180	°	30	F002	0
"	EBED	PMU 1 Sequence Current Shift Angle	-180 to 180	°	30	F002	0
C60, N60	EBEE	...Repeated for PMU 2					
N60	EC00	...Repeated for PMU 3					
"	EC12	...Repeated for PMU 4					
"	EC24	...Repeated for PMU 5					
"	EC36	...Repeated for PMU 6					
	Phasor Measurement Unit Network Reporting Configuration (Read/Write Setting)						
C60, D60, F60, G60, L30, L90, N60, T60	EC48	PMU Network Reporting Function	0 to 1	---	1	F102	0 (Disabled)
"	EC49	PMU Network Reporting ID Code	1 to 65534	---	1	F001	1
"	EC4A	PMU TCP Port Number	1 to 65535	---	1	F001	4712
"	EC4B	PMU UDP Port Number 1	1 to 65535	---	1	F001	4713
"	EC4C	PMU UDP Port Number 2	1 to 65535	---	1	F001	4714
	Settings File Template (Read/Write Setting)						
All	ED00	FlexLogic Displays Active	0 to 1	---	1	F102	1 (Enabled)
"	ED01	Template Access	---	---	---	F205	(none)

Products	Address	Register name	Range	Units	Step	Format	Default
	Setting File Template (Read Only Non-Volatile)						
All	ED07	Last Settings Change Date	0 to 4294967295	---	1	F050	0
	Settings File Template (Read/Write Setting)						
All	ED09	Template Bitmask (750 items)	0 to 65535	---	1	F001	0
	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 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 FLOATING POINT (32 bits)

F072
HEX6 6 BYTES - 12 ASCII DIGITS

F073
HEX8 8 BYTES - 16 ASCII DIGITS

F074
HEX20 20 BYTES - 40 ASCII DIGITS

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

F086
ENUMERATION: CONTACT INPUT DEFAULT STATE

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

2

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
8	IAC Very 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

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	Bit mask	Element
All except B90, C30, T35	0	Phase Instantaneous Overcurrent 1
"	1	Phase Instantaneous Overcurrent 2
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, N60, T60	2	Phase Instantaneous Overcurrent 3
"	3	Phase Instantaneous Overcurrent 4
B30, C60, C70, D60, F35, F60, L90, M60, N60, T60	4	Phase Instantaneous Overcurrent 5
"	5	Phase Instantaneous Overcurrent 6
C60, C70, D60, F35, F60, L90, M60, N60, T60	6	Phase Instantaneous Overcurrent 7
"	7	Phase Instantaneous Overcurrent 8
C70, F35, N60, T60	8	Phase Instantaneous Overcurrent 9
"	9	Phase Instantaneous Overcurrent 10

Products	Bit mask	Element
"	10	Phase Instantaneous Overcurrent 11
"	11	Phase Instantaneous Overcurrent 12
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, T35, T60	16	Phase Time Overcurrent 1
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, T35, T60	17	Phase Time Overcurrent 2
B30, C60, C70, D60, F35, F60, L60, L90, T35, T60	18	Phase Time Overcurrent 3
"	19	Phase Time Overcurrent 4
B30, C60, C70, F35, L90, T35, T60	20	Phase Time Overcurrent 5
"	21	Phase Time Overcurrent 6
C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, T60	24	Phase Directional Overcurrent 1
C70, D30, D60, F60, L30, L60, L90, M60	25	Phase Directional Overcurrent 2
All except B90, C30, N60, T35	32	Neutral Instantaneous Overcurrent 1
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, T60	33	Neutral Instantaneous Overcurrent 2
"	34	Neutral Instantaneous Overcurrent 3
"	35	Neutral Instantaneous Overcurrent 4
B30, C60, C70, D60, F35, F60, L90, M60, T60	36	Neutral Instantaneous Overcurrent 5
"	37	Neutral Instantaneous Overcurrent 6
C60, C70, D60, F35, F60, L90, M60, T60	38	Neutral Instantaneous Overcurrent 7
"	39	Neutral Instantaneous Overcurrent 8
C70, F35, T60	40	Neutral Instantaneous Overcurrent 9
"	41	Neutral Instantaneous Overcurrent 10
"	42	Neutral Instantaneous Overcurrent 11
"	43	Neutral Instantaneous Overcurrent 12
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, T60	48	Neutral Time Overcurrent 1
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, T60	49	Neutral Time Overcurrent 2
B30, C60, C70, D60, F35, F60, L60, L90, T60	50	Neutral Time Overcurrent 3
"	51	Neutral Time Overcurrent 4
B30, C60, C70, F35, L90, T60	52	Neutral Time Overcurrent 5
"	53	Neutral Time Overcurrent 6
C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, T60	56	Neutral Directional Overcurrent 1
D30, D60, F60, G30, G60, L30, L60, L90, M60	57	Neutral Directional Overcurrent 2
C70, D30, D60, F60, G30, G60, L60, L90	60	Negative Sequence Directional Overcurrent 1
"	61	Negative Sequence Directional Overcurrent 2
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60	64	Ground Instantaneous Overcurrent 1
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, T60	65	Ground Instantaneous Overcurrent 2
B30, C60, C70, D60, F35, F60, L30, L60, L90, M60, T60	66	Ground Instantaneous Overcurrent 3
"	67	Ground Instantaneous Overcurrent 4
B30, C60, C70, D60, F35, F60, L90, M60, T60	68	Ground Instantaneous Overcurrent 5
"	69	Ground Instantaneous Overcurrent 6
C60, C70, F35, F60, L90, M60, T60	70	Ground Instantaneous Overcurrent 7
"	71	Ground Instantaneous Overcurrent 8
C70, F35, T60	72	Ground Instantaneous Overcurrent 9
"	73	Ground Instantaneous Overcurrent 10
"	74	Ground Instantaneous Overcurrent 11
"	75	Ground Instantaneous Overcurrent 12
B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60	80	Ground Time Overcurrent 1
B30, C60, C70, D30, D60, F35, F60, L30, L60, L90, M60, T35, T60	81	Ground Time Overcurrent 2
B30, C60, C70, D60, F35, F60, L90, M60, T35, T60	82	Ground Time Overcurrent 3
"	83	Ground Time Overcurrent 4
B30, C70, F35, T35, T60	84	Ground Time Overcurrent 5
"	85	Ground Time Overcurrent 6
F60, G30, G60, L90, T60	86	Restricted Ground Fault 1
"	87	Restricted Ground Fault 2
"	88	Restricted Ground Fault 3
"	89	Restricted Ground Fault 4
F60, G60, L90, T60	90	Restricted Ground Fault 5
"	91	Restricted Ground Fault 6

Products	Bit mask	Element
C70, D30, D60, F35, F60, L30, L60, L90	96	Negative Sequence Instantaneous Overcurrent 1
"	97	Negative Sequence Instantaneous Overcurrent 2
N60	98	Fast Dist
G30, G60	101	Change Phase Rotation
N60	102	8-bit Comparator 1
"	103	8-bit Comparator 2
"	104	8-bit Comparator 3
"	105	8-bit Comparator 4
"	106	8-bit Comparator 5
"	107	8-bit Comparator 6
C70, D30, D60, F35, F60, L30, L60, L90	112	Negative Sequence Time Overcurrent 1
"	113	Negative Sequence Time Overcurrent 2
C70, D30, D60, F60, G30, G60, L30, L60, M60	120	Negative Sequence Overvoltage 1
"	121	Negative Sequence Overvoltage 2
"	122	Negative Sequence Overvoltage 3
G30, G60	125	Generator Unbalance
F60	128	High Impedance Fault Detection (Hi-Z)
B30	133	Bus Zone 1
"	134	Bus Zone 2
C60, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T60	140	Auxiliary Undervoltage 1
C60, D60, F35, F60, G30, G60, L90, M60, T60	141	Auxiliary Undervoltage 2
F35, T60	142	Auxiliary Undervoltage 3
All except B90, C30, T35	144	Phase Undervoltage 1
"	145	Phase Undervoltage 2
"	146	Phase Undervoltage 3
All except B90, C30, N60, T35	148	Auxiliary Overvoltage 1
B30, C60, C70, D60, F35, F60, G30, G60, L90, M60, T60	149	Auxiliary Overvoltage 2
B30, C70, F35, T60	150	Auxiliary Overvoltage 3
All except B30, B90, C30, F35, T35	151	Phase Overvoltage 1
"	152	Phase Overvoltage 2
"	153	Phase Overvoltage 3
D60	154	Compensated Overvoltage
All except B90, C30, L30, N60, T35	156	Neutral Overvoltage 1
"	157	Neutral Overvoltage 2
"	158	Neutral Overvoltage 3

Products	Bit mask	Element
D30, D60, G60, L60, L90, T60	160	Phase Distance Zone 1
"	161	Phase Distance Zone 2
"	162	Phase Distance Zone 3
D30, D60, L90 T60	163	Phase Distance Zone 4
"	164	Phase Distance Zone 5
D30, D60, L60, L90	168	Line Pickup
D30, D60, L60, L90, T60	172	Ground Distance Zone 1
"	173	Ground Distance Zone 2
"	174	Ground Distance Zone 3
D30, D60, L90, T60	175	Ground Distance Zone 4
"	176	Ground Distance Zone 5
D30, D60, F60, L60, L90, T60	180	Load Encroachment
D60, L90	184	DUTT
D60, L90	185	PUTT
L60	186	POTT
D60, L90	187	Hybrid POTT
"	188	Block Scheme
D30, D60, F60, G60, L60, L90, N60, T60	190	Power Swing Detect
T60	202	Transformer Hottest Spot
"	203	Transformer Aging Factor
"	204	Transformer Loss of Life
T35, T60	208	Transformer Instantaneous Differential
G30, T35, T60	209	Transformer Percent Differential
G30, G60, T60	210	Volt per Hertz 1
"	211	Volt per Hertz 2
C60, D60, F60, G30, G60, L90, M60, N60	214	Sensitive Directional Power 1
"	215	Sensitive Directional Power 2
G60	221	100% Stator Ground
G30, G60	222	Split Phase Protection
C60, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60	224	SRC1 VT Fuse Failure
"	225	SRC2 VT Fuse Failure
C60, C70, D60, F60, G30, G60, L60, L90, M60, N60, T60	226	SRC3 VT Fuse Failure
"	227	SRC4 VT Fuse Failure
C70, N60, T60	228	SRC5 VT Fuse Failure
"	229	SRC6 VT Fuse Failure
C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60	232	SRC1 50DD (Disturbance Detection)

Products	Bit mask	Element
"	233	SRC2 50DD (Disturbance Detection)
C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	234	SRC3 50DD (Disturbance Detection)
"	235	SRC4 50DD (Disturbance Detection)
C70, F35, N60, T35, T60	236	SRC5 50DD (Disturbance Detection)
"	237	SRC6 50DD (Disturbance Detection)
L30, L90	240	87L Current Differential
"	241	87L Current Differential
C60, D60, L60, L90, N60	242	Open Pole Detector
L30, L90	244	50DD Disturbance Detector
L90	245	Continuous Monitor
B30	251	CT Trouble 1
"	252	CT Trouble 2
L30, L90	254	87L Trip (Current Differential Trip)
"	255	Stub Bus
M60	259	Reduced Voltage Start
"	260	Motor Thermal Model
"	261	Acceleration Time
G60, M60	265	Stator Differential
N60	266	Digitizer 1
"	267	Digitizer 2
"	268	Digitizer 3
"	269	Digitizer 4
"	270	Digitizer 5
G30, G60, L30, L60, L90, M60, T35, T60	272	CT Fail 1
"	273	CT Fail 2
G30, G60, L30, L90, M60, T35, T60	274	CT Fail 3
"	275	CT Fail 4
"	276	CT Fail 5
"	277	CT Fail 6
B30, C60, C70, D60, F60, G60, L30, L60, L90, M60, T60	280	Breaker Failure 1
B30, C60, D60, F60, G60, L30, L60, L90, M60, T60	281	Breaker Failure 2
B30, G60, T60	282	Breaker Failure 3
"	283	Breaker Failure 4
B30, T60	284	Breaker Failure 5
"	285	Breaker Failure 6
C60, D30, D60, F35, F60, L30, L60, L90, T35, T60	288	Breaker Arcing Current 1
"	289	Breaker Arcing Current 2

Products	Bit mask	Element
C60, D60, F35, L90, T35, T60	290	Breaker Arcing Current 3
"	291	Breaker Arcing Current 4
F35, T35	292	Breaker Arcing Current 5
"	293	Breaker Arcing Current 6
B30, C60, C70, D60, F60, G60, L60, L90, M60, T60	294	Breaker 1 Flashover
B30, C60, D60, F60, G60, L60, L90, M60, T60	295	Breaker 2 Flashover
G30, G60	296	Accidental Energization
G30, G60	300	Loss Of Excitation
D30, F35, F60, L30	304	Autoreclose 1
F35, F60, L30	305	Autoreclose 2
F35	306	Autoreclose 3
"	307	Autoreclose 4
"	308	Autoreclose 5
"	309	Autoreclose 6
C60, D60, F60, G60, L30, L90, N60, T60	311	Phasor measurement unit one-shot
C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60	312	Synchrocheck 1
"	313	Synchrocheck 2
"	314	Synchrocheck 3
"	315	Synchrocheck 4
F60	320	Cold load pickup 1
"	321	Cold load pickup 2
M60	324	Current unbalance 1
"	325	Current unbalance 2
G30, G60	330	Third harmonic neutral undervoltage
All	336	Setting Group
"	337	Reset
C70	340	Neutral voltage unbalance 1
"	341	Neutral voltage unbalance 2
"	342	Neutral voltage unbalance 3
D60, F60, G30, G60, L90, M60, N60, T60	344	Overfrequency 1
"	345	Overfrequency 2
"	346	Overfrequency 3
"	347	Overfrequency 4
D60, F35, F60, G30, G60, L30, L90, M60, N60, T60	352	Underfrequency 1
"	353	Underfrequency 2
"	354	Underfrequency 3
"	355	Underfrequency 4
"	356	Underfrequency 5

Products	Bit mask	Element
"	357	Underfrequency 6
D60, L60, L90	360	Trip Output
"	362	Phase Selector
C60, D60, L60, L90	363	Open Pole Detector
N60	364	Open Pole Detector (N60)
D60, L90	365	Directional Comparison Unblocking Scheme
D60, L90	366	DUTT Pilot Scheme
D60, L90	368	PUTT Pilot Scheme
L60	370	POTT Pilot Scheme
D60, L90	371	POTT1 Pilot Scheme
"	372	Hybrid POTT Pilot Scheme
"	373	Directional Comparison Blocking 1 Pilot Scheme
"	374	Directional Comparison Blocking Pilot Scheme
C60, D60, L60, L90	375	Autoreclose (single-pole / three-pole)
M60	377	Starts-per-hour
"	378	Time between starts
"	379	Restart delay
"	380	Mechanical jam
L60	382	87PC channel test
"	383	87PC phase comparison trip
"	384	87PC negative-sequence voltage fault detector
"	385	87PC negative-sequence current rate of change
"	386	87PC positive-sequence current rate of change
All except B90	388	Selector switch 1
"	389	Selector switch 2
All	390	Control pushbutton 1
"	391	Control pushbutton 2
"	392	Control pushbutton 3
"	393	Control pushbutton 4
"	394	Control pushbutton 5
"	395	Control pushbutton 6
"	396	Control pushbutton 7
All except B90	400	FlexElement 1
"	401	FlexElement 2
"	402	FlexElement 3
"	403	FlexElement 4
"	404	FlexElement 5
"	405	FlexElement 6
"	406	FlexElement 7
"	407	FlexElement 8
C70, F35, G30, G60, M60, N60, T35, T60	408	FlexElement 9
"	409	FlexElement 10
"	410	FlexElement 11
"	411	FlexElement 12
"	412	FlexElement 13
"	413	FlexElement 14
"	414	FlexElement 15
"	415	FlexElement 16
All	420	Non-volatile Latch 1
"	421	Non-volatile Latch 2
"	422	Non-volatile Latch 3
"	423	Non-volatile Latch 4
"	424	Non-volatile Latch 5
"	425	Non-volatile Latch 6
"	426	Non-volatile Latch 7
"	427	Non-volatile Latch 8
"	428	Non-volatile Latch 9
"	429	Non-volatile Latch 10
"	430	Non-volatile Latch 11
"	431	Non-volatile Latch 12
"	432	Non-volatile Latch 13
"	433	Non-volatile Latch 14
"	434	Non-volatile Latch 15
"	435	Non-volatile Latch 16
B90	440	Breaker Supervision 1
"	441	Breaker Supervision 2
"	442	Breaker Supervision 3
"	443	Breaker Supervision 4
"	444	Breaker Supervision 5
"	445	Breaker Supervision 6
"	446	Breaker Supervision 7
"	447	Breaker Supervision 8
"	448	Breaker Supervision 9
"	449	Breaker Supervision 10
"	450	Breaker Supervision 11
"	451	Breaker Supervision 12
"	452	Breaker Supervision 13
"	453	Breaker Supervision 14
"	454	Breaker Supervision 15
"	455	Breaker Supervision 16
"	456	Breaker Supervision 17
"	457	Breaker Supervision 18
"	458	Breaker Supervision 19
"	459	Breaker Supervision 20
"	460	Breaker Supervision 21
"	461	Breaker Supervision 22

Products	Bit mask	Element
"	462	Breaker Supervision 23
"	463	Breaker Supervision 24
"	472	End of Fault Protection 1
"	473	End of Fault Protection 2
"	474	End of Fault Protection 3
"	475	End of Fault Protection 4
"	476	End of Fault Protection 5
"	477	End of Fault Protection 6
"	478	End of Fault Protection 7
"	479	End of Fault Protection 8
"	480	End of Fault Protection 9
"	481	End of Fault Protection 10
"	482	End of Fault Protection 11
"	483	End of Fault Protection 12
"	484	End of Fault Protection 13
"	485	End of Fault Protection 14
"	486	End of Fault Protection 15
"	487	End of Fault Protection 16
"	488	End of Fault Protection 17
"	489	End of Fault Protection 18
"	490	End of Fault Protection 19
"	491	End of Fault Protection 20
"	492	End of Fault Protection 21
"	493	End of Fault Protection 22
"	494	End of Fault Protection 23
"	495	End of Fault Protection 24
"	500	Undervoltage 1
"	501	Undervoltage 2
"	502	Undervoltage 3
"	503	Undervoltage 4
"	504	Undervoltage 5
"	505	Undervoltage 6
"	506	Undervoltage 7
"	507	Undervoltage 8
"	508	Undervoltage 9
"	509	Undervoltage 10
"	510	Undervoltage 11
"	511	Undervoltage 12
"	518	Bus 1
"	519	Bus 2
"	520	Bus 3
"	521	Bus 4
"	522	Bus 5
"	523	Bus 6
"	524	CT Trouble1

Products	Bit mask	Element
"	525	CT Trouble2
"	526	CT Trouble3
"	527	CT Trouble4
"	528	CT Trouble5
"	529	CT Trouble6
D60, F60, G30, G60, L90, N60, T60	530	Frequency Rate of Change 1
"	531	Frequency Rate of Change 2
"	532	Frequency Rate of Change 3
"	533	Frequency Rate of Change 4
C30, F35, N60	536	8-bit Switch 1
"	537	8-bit Switch 2
"	538	8-bit Switch 3
"	539	8-bit Switch 4
"	540	8-bit Switch 5
"	541	8-bit Switch 6
All except B90	544	Digital Counter 1
"	545	Digital Counter 2
"	546	Digital Counter 3
"	547	Digital Counter 4
"	548	Digital Counter 5
"	549	Digital Counter 6
"	550	Digital Counter 7
"	551	Digital Counter 8
B90	560	Isolator 1
"	561	Isolator 2
"	562	Isolator 3
"	563	Isolator 4
"	564	Isolator 5
"	565	Isolator 6
"	566	Isolator 7
"	567	Isolator 8
"	568	Isolator 9
"	569	Isolator 10
"	570	Isolator 11
"	571	Isolator 12
"	572	Isolator 13
"	573	Isolator 14
"	574	Isolator 15
"	575	Isolator 16
"	576	Isolator 17
"	577	Isolator 18
"	578	Isolator 19
"	579	Isolator 20
"	580	Isolator 21
"	581	Isolator 22

Products	Bit mask	Element
"	582	Isolator 23
"	583	Isolator 24
"	584	Isolator 25
"	585	Isolator 26
"	586	Isolator 27
"	587	Isolator 28
"	588	Isolator 29
"	589	Isolator 30
"	590	Isolator 31
"	591	Isolator 32
"	592	Isolator 33
"	593	Isolator 34
"	594	Isolator 35
"	595	Isolator 36
"	596	Isolator 37
"	597	Isolator 38
"	598	Isolator 39
"	599	Isolator 40
"	600	Isolator 41
"	601	Isolator 42
"	602	Isolator 43
"	603	Isolator 44
"	604	Isolator 45
"	605	Isolator 46
"	606	Isolator 47
"	607	Isolator 48
"	608	Breaker Fail 1
"	609	Breaker Fail 2
"	610	Breaker Fail 3
"	611	Breaker Fail 4
"	612	Breaker Fail 5
"	613	Breaker Fail 6
"	614	Breaker Fail 7
"	615	Breaker Fail 8
"	616	Breaker Fail 9
"	617	Breaker Fail 10
"	618	Breaker Fail 11
"	619	Breaker Fail 12
"	620	Breaker Fail 13
"	621	Breaker Fail 14
"	622	Breaker Fail 15
"	623	Breaker Fail 16
"	624	Breaker Fail 17
"	625	Breaker Fail 18
"	626	Breaker Fail 19

Products	Bit mask	Element
"	627	Breaker Fail 20
"	628	Breaker Fail 21
"	629	Breaker Fail 22
"	630	Breaker Fail 23
"	631	Breaker Fail 24
"	632	IOC 1
"	633	IOC 2
"	634	IOC 3
"	635	IOC 4
"	636	IOC 5
"	637	IOC 6
"	638	IOC 7
"	639	IOC 8
"	640	IOC 9
"	641	IOC 10
"	642	IOC 11
"	643	IOC 12
"	644	IOC 13
"	645	IOC 14
"	646	IOC 15
"	647	IOC 16
"	648	IOC 17
"	649	IOC 18
"	650	IOC 19
"	651	IOC 20
"	652	IOC 21
"	653	IOC 22
"	654	IOC 23
"	655	IOC 24
"	656	TOC 1
"	657	TOC 2
"	658	TOC 3
"	659	TOC 4
"	660	TOC 5
"	661	TOC 6
"	662	TOC 7
"	663	TOC 8
"	664	TOC 9
"	665	TOC 10
"	666	TOC 11
"	667	TOC 12
"	668	TOC 13
"	669	TOC 14
"	670	TOC 15
"	671	TOC 16

Products	Bit mask	Element
"	672	TOC 17
"	673	TOC 18
"	674	TOC 19
"	675	TOC 20
"	676	TOC 21
"	677	TOC 22
"	678	TOC 23
"	679	TOC 24
All except T35	692	Digital Element 1
"	693	Digital Element 2
"	694	Digital Element 3
"	695	Digital Element 4
"	696	Digital Element 5
"	697	Digital Element 6
"	698	Digital Element 7
"	699	Digital Element 8
"	700	Digital Element 9
"	701	Digital Element 10
"	702	Digital Element 11
"	703	Digital Element 12
"	704	Digital Element 13
"	705	Digital Element 14
"	706	Digital Element 15
"	707	Digital Element 16
"	708	Digital Element 17
"	709	Digital Element 18
"	710	Digital Element 19
"	711	Digital Element 20
"	712	Digital Element 21
"	713	Digital Element 22
"	714	Digital Element 23
"	715	Digital Element 24
"	716	Digital Element 25
"	717	Digital Element 26
"	718	Digital Element 27
"	719	Digital Element 28
"	720	Digital Element 29
"	721	Digital Element 30
"	722	Digital Element 31
"	723	Digital Element 32
"	724	Digital Element 33
"	725	Digital Element 34
"	726	Digital Element 35
"	727	Digital Element 36
"	728	Digital Element 37

Products	Bit mask	Element
"	729	Digital Element 38
"	730	Digital Element 39
"	731	Digital Element 40
"	732	Digital Element 41
"	733	Digital Element 42
"	734	Digital Element 43
"	735	Digital Element 44
"	736	Digital Element 45
"	737	Digital Element 46
"	738	Digital Element 47
"	739	Digital Element 48
C60, D60, F60, G60, L30, L90, N60, T60	740	Phasor Measurement Unit 1 Frequency
C60, N60	741	Phasor Measurement Unit 2 Frequency
N60	742	Phasor Measurement Unit 3 Frequency
"	743	Phasor Measurement Unit 4 Frequency
"	744	Phasor Measurement Unit 5 Frequency
"	745	Phasor Measurement Unit 6 Frequency
C60, D60, F60, G60, L30, L90, N60, T60	746	Phasor Measurement Unit 1 Voltage
C60, N60	747	Phasor Measurement Unit 2 Voltage
N60	748	Phasor Measurement Unit 3 Voltage
"	749	Phasor Measurement Unit 4 Voltage
"	750	Phasor Measurement Unit 5 Voltage
"	751	Phasor Measurement Unit 6 Voltage
C60, D60, F60, G60, L30, L90, N60, T60	752	Phasor Measurement Unit 1 Current
C60, N60	753	Phasor Measurement Unit 2 Current
N60	754	Phasor Measurement Unit 3 Current
"	755	Phasor Measurement Unit 4 Current
"	756	Phasor Measurement Unit 5 Current
"	757	Phasor Measurement Unit 6 Current
C60, D60, F60, G60, L30, L90, N60, T60	758	Phasor Measurement Unit 1 Power
C60, N60	759	Phasor Measurement Unit 2 Power
N60	760	Phasor Measurement Unit 3 Power
"	761	Phasor Measurement Unit 4 Power
"	762	Phasor Measurement Unit 5 Power
"	763	Phasor Measurement Unit 6 Power
C60, D60, F60, G60, L30, L90, N60, T60	764	PMU 1 Rate of Change of Frequency
C60, N60	765	PMU 2 Rate of Change of Frequency
N60	766	PMU 3 Rate of Change of Frequency
"	767	PMU 4 Rate of Change of Frequency

Products	Bit mask	Element
"	768	PMU 5 Rate of Change of Frequency
"	769	PMU 6 Rate of Change of Frequency
"	774	Summator 1
"	775	Summator 2
"	776	Summator 3
"	777	Summator 4
"	778	Summator 5
"	779	Summator 6
C70	781	Time of day timer 1
"	782	Time of day timer 2
"	783	Time of day timer 3
"	784	Time of day timer 4
"	785	Time of day timer 5
"	787	Automatic voltage regulator 1
"	788	Automatic voltage regulator 2
"	789	Automatic voltage regulator 3
"	790	Phase current unbalance 1
"	791	Phase current unbalance 2
"	792	Phase current unbalance 3
"	793	Phase current unbalance 1 continued
"	794	Phase current unbalance 2 continued
"	795	Phase current unbalance 3 continued
"	803	Voltage differential 1
"	804	Voltage differential 2
"	805	Voltage differential 3
"	806	Voltage differential 1 continued
"	807	Voltage differential 2 continued
"	808	Voltage differential 3 continued
"	813	Capacitor control 1
"	814	Capacitor control 2
"	815	Capacitor control 3
"	816	Capacitor control 4
"	820	Neutral current unbalance 1
"	821	Neutral current unbalance 2
"	822	Neutral current unbalance 3
C60, D60, F60, G60, L30, L90, N60, T60	823	Phasor Measurement Unit 1
C60, N60	824	Phasor Measurement Unit 2
N60	825	Phasor Measurement Unit 3
"	826	Phasor Measurement Unit 4
"	827	Phasor Measurement Unit 5
"	828	Phasor Measurement Unit 6
C70	830	Bank phase overvoltage 1 phase A
"	831	Bank phase overvoltage 1 phase B
"	832	Bank phase overvoltage 1 phase C
"	833	Bank phase overvoltage 2 phase A
"	834	Bank phase overvoltage 2 phase B
"	835	Bank phase overvoltage 2 phase C
M60	840	Underpower 1
"	841	Underpower 2
All	842	Trip Bus 1
"	843	Trip Bus 2
"	844	Trip Bus 3
"	845	Trip Bus 4
"	846	Trip Bus 5
"	847	Trip Bus 6
M60	848	Undercurrent
All except B90	849	RTD Input 1
"	850	RTD Input 2
"	851	RTD Input 3
"	852	RTD Input 4
"	853	RTD Input 5
"	854	RTD Input 6
"	855	RTD Input 7
"	856	RTD Input 8
"	857	RTD Input 9
"	858	RTD Input 10
"	859	RTD Input 11
"	860	RTD Input 12
"	861	RTD Input 13
"	862	RTD Input 14
"	863	RTD Input 15
"	864	RTD Input 16
"	865	RTD Input 17
"	866	RTD Input 18
"	867	RTD Input 19
"	868	RTD Input 20
"	869	RTD Input 21
"	870	RTD Input 22
"	871	RTD Input 23
"	872	RTD Input 24
"	873	RTD Input 25
"	874	RTD Input 26
"	875	RTD Input 27
"	876	RTD Input 28
"	877	RTD Input 29
"	878	RTD Input 30
"	879	RTD Input 31
"	880	RTD Input 32
"	881	RTD Input 33
"	882	RTD Input 34

Products	Bit mask	Element
"	883	RTD Input 35
"	884	RTD Input 36
"	885	RTD Input 37
"	886	RTD Input 38
"	887	RTD Input 39
"	888	RTD Input 40
"	889	RTD Input 41
"	890	RTD Input 42
"	891	RTD Input 43
"	892	RTD Input 44
"	893	RTD Input 45
"	894	RTD Input 46
"	895	RTD Input 47
"	896	RTD Input 48
All	900	User-Programmable Pushbutton 1
"	901	User-Programmable Pushbutton 2
"	902	User-Programmable Pushbutton 3
"	903	User-Programmable Pushbutton 4
"	904	User-Programmable Pushbutton 5
"	905	User-Programmable Pushbutton 6
"	906	User-Programmable Pushbutton 7
"	907	User-Programmable Pushbutton 8
"	908	User-Programmable Pushbutton 9
"	909	User-Programmable Pushbutton 10
"	910	User-Programmable Pushbutton 11
"	911	User-Programmable Pushbutton 12
"	912	User-Programmable Pushbutton 13
"	913	User-Programmable Pushbutton 14
"	914	User-Programmable Pushbutton 15
"	915	User-Programmable Pushbutton 16
G30, G60	916	Frequency out-of-band accumulation 1
"	917	Frequency out-of-band accumulation 2
All except B90	920	Disconnect switch 1
"	921	Disconnect switch 2
"	922	Disconnect switch 3
"	923	Disconnect switch 4
"	924	Disconnect switch 5
"	925	Disconnect switch 6
"	926	Disconnect switch 7
"	927	Disconnect switch 8
B30, C60, C70, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60	928	Disconnect switch 9
"	929	Disconnect switch 10

Products	Bit mask	Element
"	930	Disconnect switch 11
"	931	Disconnect switch 12
"	932	Disconnect switch 13
"	933	Disconnect switch 14
"	934	Disconnect switch 15
"	935	Disconnect switch 16
B30, C70, F35, N60, T35, T60	936	Disconnect switch 17
"	937	Disconnect switch 18
"	938	Disconnect switch 19
"	939	Disconnect switch 20
"	940	Disconnect switch 21
"	941	Disconnect switch 22
"	942	Disconnect switch 23
"	943	Disconnect switch 24
All except B90	968	Breaker 1
"	969	Breaker 2
All except B90, C30, D30, F60	970	Breaker 3
"	971	Breaker 4
B30, C70, F35, N60, T35	972	Breaker 5
"	973	Breaker 6
All except B90	974	Breaker 1
"	975	Breaker 2
All except B90, C30, D30, F60	976	Breaker 3
"	977	Breaker 4
B30, C70, F35, N60, T35	978	Breaker 5
"	979	Breaker 6
C60, C70, D60, F35, F60, L90, T60	980	Breaker restrike 1
C60, C70, D60, F35, L90, T60	981	Breaker restrike 2
C70, F35, T60	982	Breaker restrike 3
F35, F60	983	Incipient cable fault detector 1
"	984	Incipient cable fault detector 2
F35	985	Incipient cable fault detector 3
"	986	Incipient cable fault detector 4
"	987	Incipient cable fault detector 5
"	988	Incipient cable fault detector 6
L60	989	87PC I_2
"	990	87PC I_1
G60, M60, T60	991	Remote RTD Input 1
"	992	Remote RTD Input 2
"	993	Remote RTD Input 3
"	994	Remote RTD Input 4

Products	Bit mask	Element
"	995	Remote RTD Input 5
"	996	Remote RTD Input 6
"	997	Remote RTD Input 7
"	998	Remote RTD Input 8
"	999	Remote RTD Input 9
"	1000	Remote RTD Input 10
"	1001	Remote RTD Input 11
"	1002	Remote RTD Input 12
L30, L90	1003	87L Diff
M60	1004	Broken Rotor Bar
C30, F35	1005	PID 1
"	1006	PID 2
"	1007	PID 3
"	1008	PID 4
G60	1009	Sh Stat Ground
"	1010	Field Ground
"	1011	Field Current
All except B90, C30, M60	1012	Thermal overload protection 1
"	1013	Thermal overload protection 2
D30, D60, F35, F60, L30, L90	1014	Broken conductor detection 1
"	1015	Broken conductor detection 2
D60, F35, F60, L90	1016	Broken conductor detection 3
"	1017	Broken conductor detection 4
F35	1018	Broken conductor detection 5
"	1019	Broken conductor detection 6
D60, F35, F60, L60, L90	1020	Wattmetric 1
"	1021	Wattmetric 2
F35	1022	Wattmetric 3
"	1023	Wattmetric 4

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 = Disabled, 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

2

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
	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
	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
	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

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 = Disabled, 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 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

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

Bitmask	RTD#
17	RTD 17
18	RTD 18
19	RTD 19
20	RTD 20
21	RTD 21
22	RTD 22
23	RTD 23

Bitmask	RTD#
33	RTD 33
34	RTD 34
35	RTD 35
36	RTD 36
37	RTD 37
38	RTD 38
39	RTD 39

Bitmask	RTD#
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#
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#
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
0	F
1	G
2	H
3	J

Bitmask	Slot
4	K
5	L
6	M
7	N

Bitmask	Slot
8	P
9	R
10	S
11	T

Bitmask	Slot
12	U
13	V
14	W
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

2

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

F194
ENUMERATION: DNP SCALE

0 = 0.01, 1 = 0.1, 2 = 1, 3 = 10, 4 = 100, 5 = 1000, 6 = 10000, 7 = 100000, 8 = 0.001

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

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

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
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

Value	IEC 61850 GOOSE Tx dataset item
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
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
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

Value	IEC 61850 GOOSE Tx dataset item
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
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

Value	IEC 61850 GOOSE Tx dataset item
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
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

Value	IEC 61850 GOOSE Tx dataset item
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
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
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

Value	IEC 61850 GOOSE Rx dataset item
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

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

Value	Month
6	July
7	August
8	September
9	October
10	November
11	December

F238
ENUMERATION: REAL TIME CLOCK DAY (FOR EXAMPLE, DAY-LIGHT 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

Value	Description
12	U6/AC5..7
13	U7/AC1..3
14	U7/AC5..7
15	U8/AC1..3
16	U8/AC5..7

F248
ENUMERATION: BRICK AUX 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/AC5
14	U7/AC8
15	U8/AC5
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
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

2

F270
ENUMERATION: FAULT REPORT VT SUBSTITUTION

Value	Description
0	None
1	I0
2	V0

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 96)

[3] CONTACT INPUTS OFF (1 to 96)

[4] VIRTUAL INPUTS (1 to 32)

[6] VIRTUAL OUTPUTS (1 to 64)

[8] CONTACT OUTPUTS

[10] CONTACT OUTPUTS VOLTAGE DETECTED (1 to 64)

[11] CONTACT OUTPUTS VOLTAGE OFF DETECTED (1 to 64)

[12] CONTACT OUTPUTS CURRENT DETECTED (1 to 64)

[13] CONTACT OUTPUTS CURRENT OFF DETECTED (1 to 64)

[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 32)

[50] ASSIGN VIRTUAL OUTPUT (1 to 64)

[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

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].

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

2

F530
ENUMERATION: FRONT PANEL INTERFACE KEYPRESS

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

F531
ENUMERATION: LANGUAGE

0 = English, 1 = French, 2 = Chinese, 3 = Russian, 4 = Turkish, 5 = German

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
5	None

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
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
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 used when this parameter is selected. Only certain values can be used as FlexAnalogs (basically all metering quantities used in protection).

2

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, whether 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).

F619
ENUMERATION: RADIUS AUTHENTICATION METHOD

0 = EAP-TTLS

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/SNTP
2	IRIG-B/PP/PTP/SNTP
3	PP/PTP/IRIG-B/SNTP

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	SNTP

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

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

UR Family

Chapter 3: IEC 61850 communication

This chapter outlines the IEC 61850 communications protocol.



The IEC 61850 protocol applies when ordered with the product. Check your order code.

3.1 Overview

3.1.1 Introduction

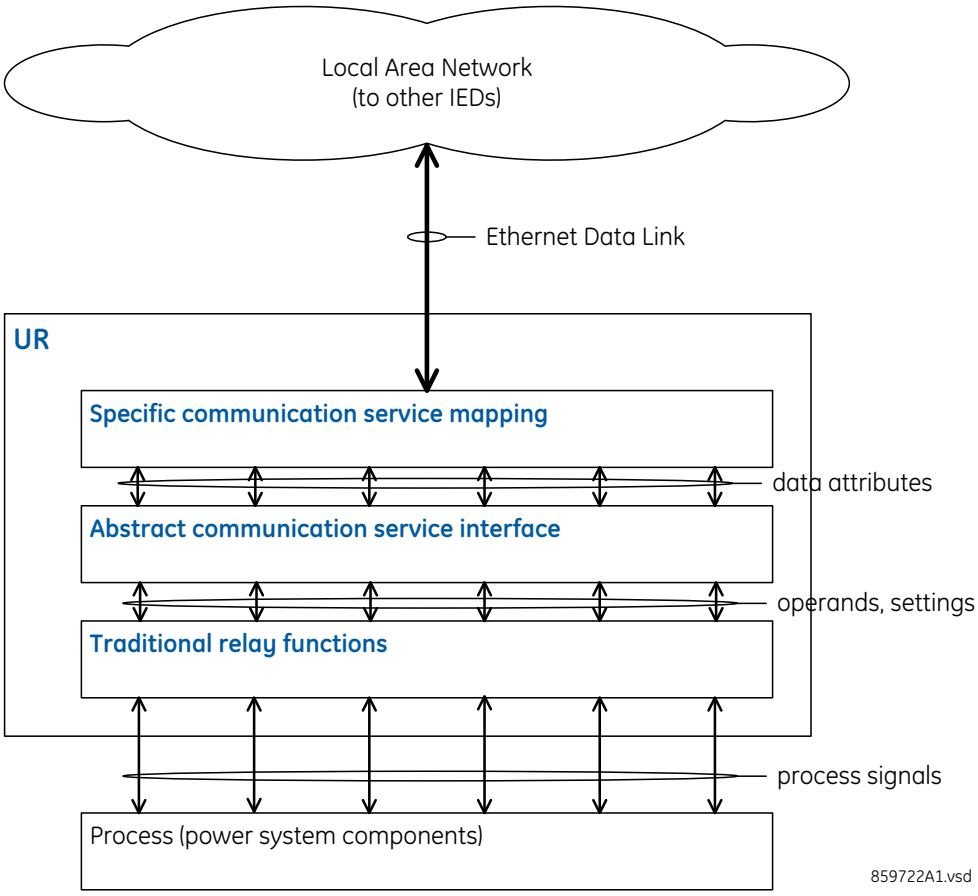
This section contains a description of IEC 61850, an International Electrotechnical Commission (IEC) series of documents entitled Communication Networks and Systems for Power Utility Automation. The focus is on those features implemented since UR 7.3x.

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. 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. Whereas prior UR releases used edition 1.0 of IEC 61850, this release uses edition 2.0. 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 such as the UR 7.3x release. GSSE, fixed GOOSE, and fixed report services of previous releases are no longer supported, and thus UR devices of previous releases using these features have to be converted to configurable GOOSE to communicate with a 7.3x 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 series devices, are as follows:

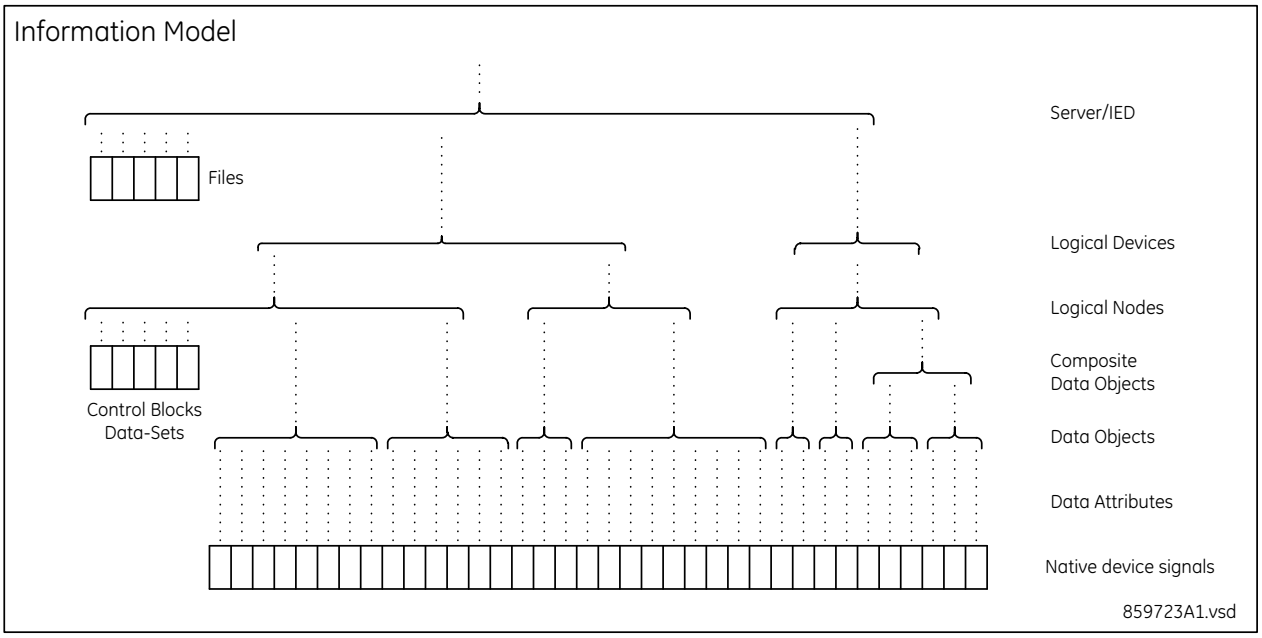
- Read/write services — These services allow a client IED to obtain a directory of a server's signals and to read and write the server's signal values one at a time, or a few related values at a time. These services are implemented on a stack consisting of MMS, TCP, IP, and Ethernet protocols. UR series 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 series 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 series 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 series 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 series 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. The UR series 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 have six logical devices, with logical node instance names and contained logical nodes as generally described in the following table. The logical device each logical node is assigned to is as specified in clause 3.4 MICS.

Table 3-1: Logical nodes

Logical device instance name	Generally contains logical nodes modelling...
Master	communications, including GOOSE, reports, Remote I/O, Direct 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

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. The function-related name is 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 series 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
```

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 series devices do not implement that service. Datasets in UR devices must be pre-configured.

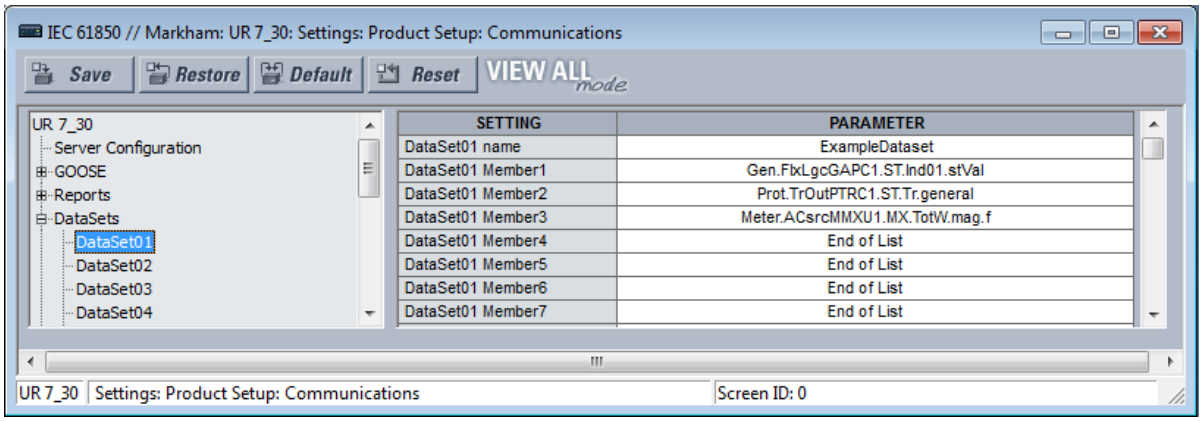
The following figure shows an EnerVista UR Setup dataset configuration page. Members are selected from a drop-down list. Note that in EnerVista UR Setup the format of references to dataset members is:

<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.

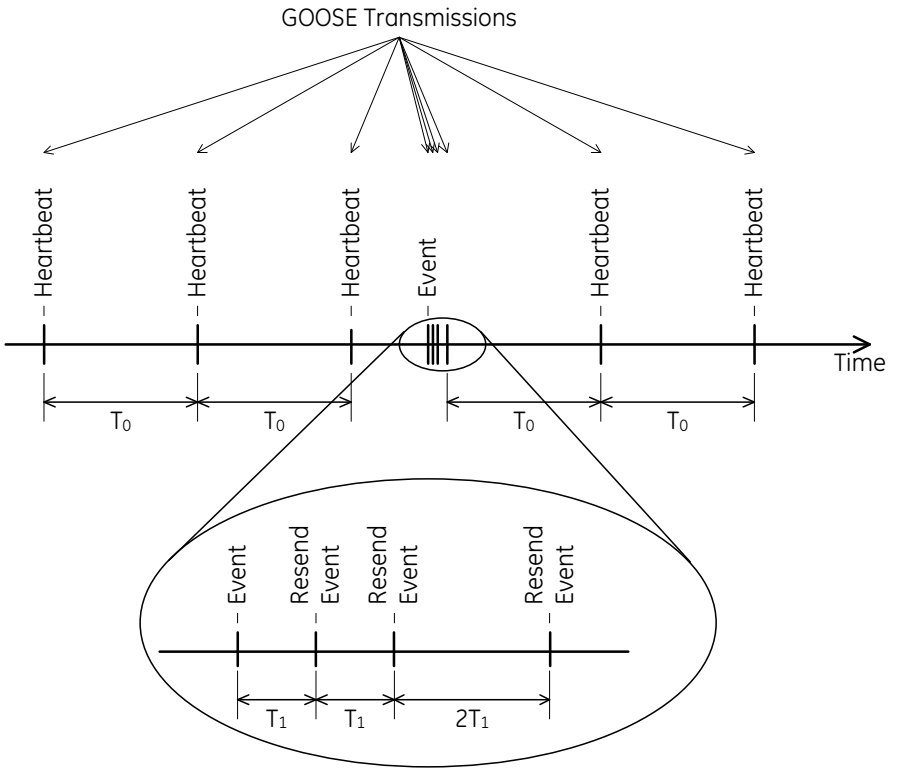
Each GOOSE message includes the values of all of the members of the dataset to which it is configured, and a number of fields that can be used by the subscriber to identify the particular GOOSE message it subscribes to. The identification fields are as follows:

- 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 UPDATE TIME setting value

T_1 - TxGOOSE1 RETRANS TIME setting value

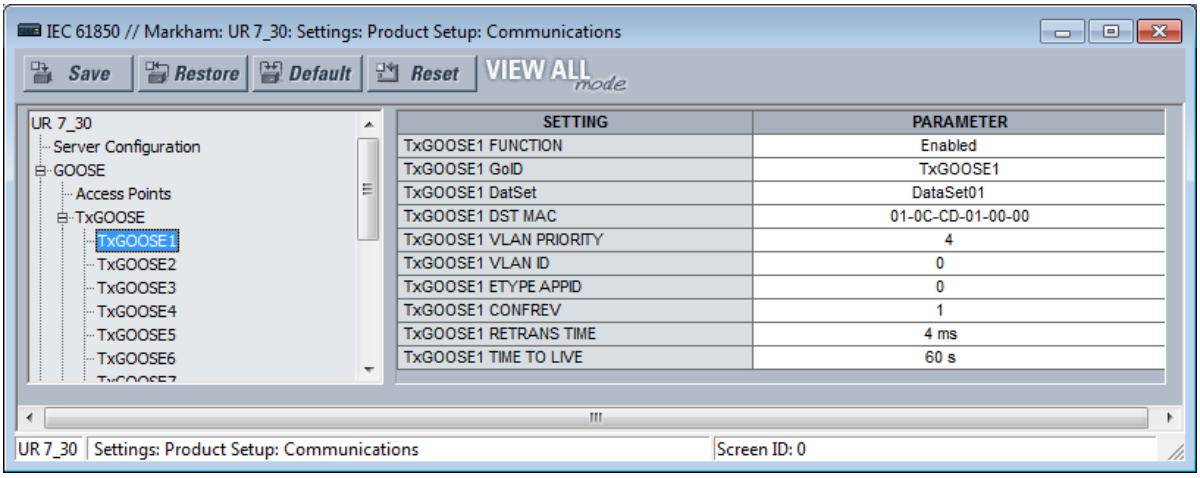
859728A1.vsd

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 UPDATE TIME setting, and the timeAllowedtoLive value is controlled by the TIME 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 RETRANS TIME settings. However, if the TxGOOSE RETRANS 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

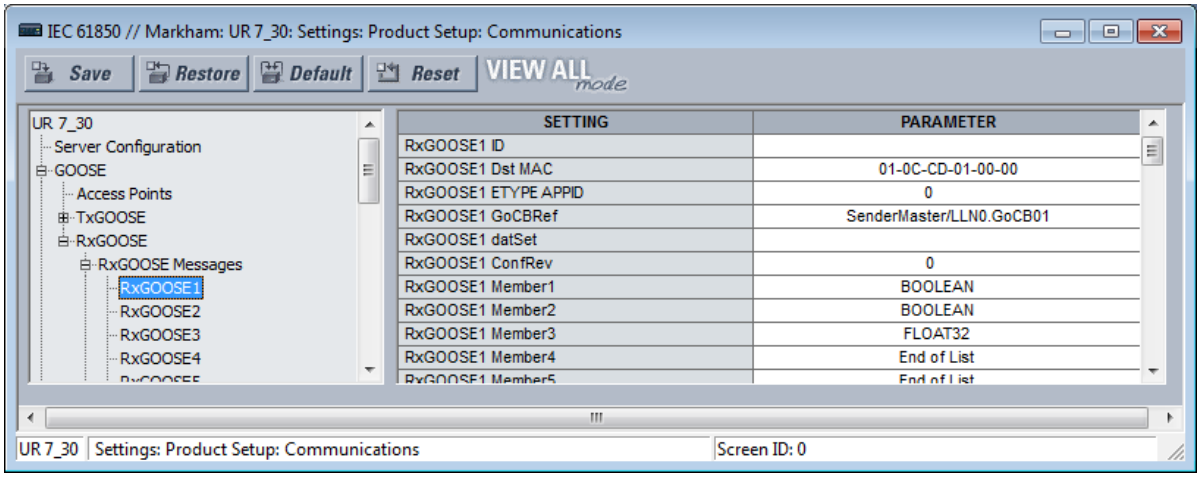


3.1.5 RxGOOSE

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.

Figure 3-6: IEC 61850 RxGOOSE Messages panel



The RxGOOSE Dst MAC, RxGOOSE GoCBRef, and RxGOOSE Member settings must be correctly entered for GOOSE messages to be accepted. 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. 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 configure structured GOOSE messages that are used to communicate FCDs.

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.

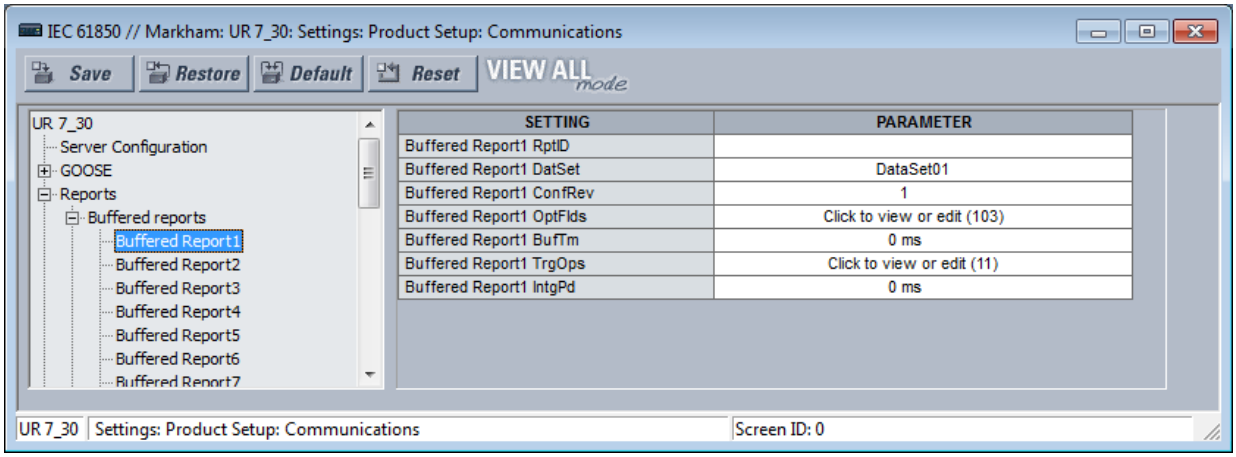
3.1.6 Reports

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 XLM 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 data objects and data attributes of the logical node templates used in the IED section(s). 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 publically 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.

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 be actual 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, where a "put" command cannot be used for FTP for security reasons and 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 7.31.

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 7.31 on Thu Oct 1 8:56:15 2014-->
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">
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-PSEL">00000001</P>
13                                      <P type="OSI-SSEL">0001</P>
14                                      <P type="OSI-TSEL">0001</P>
15                                      <P type="OSI-AP-Title">1,3,9999,1</P>
16                                      <P type="OSI-AE-Qualifier">12</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                                      </Address>
27                                      <MinTime unit="s" multiplier="m">4</MinTime>
28                                       <MaxTime unit="s" multiplier="m">300000</MaxTime>
29                              </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 name="TEMPLATE" manufacturer="GE Multilin" type="D60" desc="UR" configVersion="7.31">
296           <Private type="GE_Digital_Energy_UR D60-UB9-HPH-F8L-H6R-M8L-P6S-U4L-W2H_7.31"><![CDATA[
297                  45826,1,1,1,0
298                  45826,2,1,1,0
299                  45826,3,1,1,0
299                  45826,4,1,1,0
```


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.

```
13102         <Private type="GE_Digital_Energy_UR GE_Authentication_Code">3628718054</Private>
13103         <Services nameLength="64">
13104                <ClientServices goose="true"/>
13105                <SettingGroups><SGEdit/></SettingGroups>
13106                <GetDirectory/>
13107                <GetDataObjectDefinition/>
13108                <DataObjectDirectory/>
13109                <GetDataSetValue/>
13110                <DataSetDirectory/>
13111                <ConfDataSet max="12" maxAttributes="64"/>
13112                <ReadWrite/>
13113                <ConfReportControl max="34"/>
13114                <GetCBValues/>
13115                <ReportSettings datSet="Conf" rptID="Conf" optFields="Conf" bufTime="Conf"
trgOps="Conf" intgPd="Conf"/>
13116                <GSESettings datSet="Conf" appID="Conf"/>
13117                <ConfLNs fixPrefix="true" fixLnInst="true"/>
13118                <ConfLdName/>
13119                <GOOSE max="8"/>
13120                <FileHandling/>
13121                <SupSubscription maxGo="8" maxSv="0"/>
13122         </Services>
```

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 control block.

```
13123         <AccessPoint name ="S1">
13124                <Server>
13125                      <Authentication none = "true"/>
13126                      <LDevice inst="Master" >
13127                             <LN0 lnType="LLN0_0" lnClass="LLN0" inst="">
13128                                    <ReportControl name="BRCB01"  intgPd="0" confRev="1"
buffered="true" bufTime="0" indexed="false">
13129                                           <TrgOps dchg="true" qchg="true" dupd="false"
period="true" gi="true"/>
```

```
13130                                        <OptFields seqNum="true" timeStamp="true" dataSet="true"
reasonCode="true" dataRef="true" bufOvfl="false" entryID="false" configRef="true"/>
13131                                              <RptEnabled max="1"/>
13132                                        </ReportControl>
```

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.

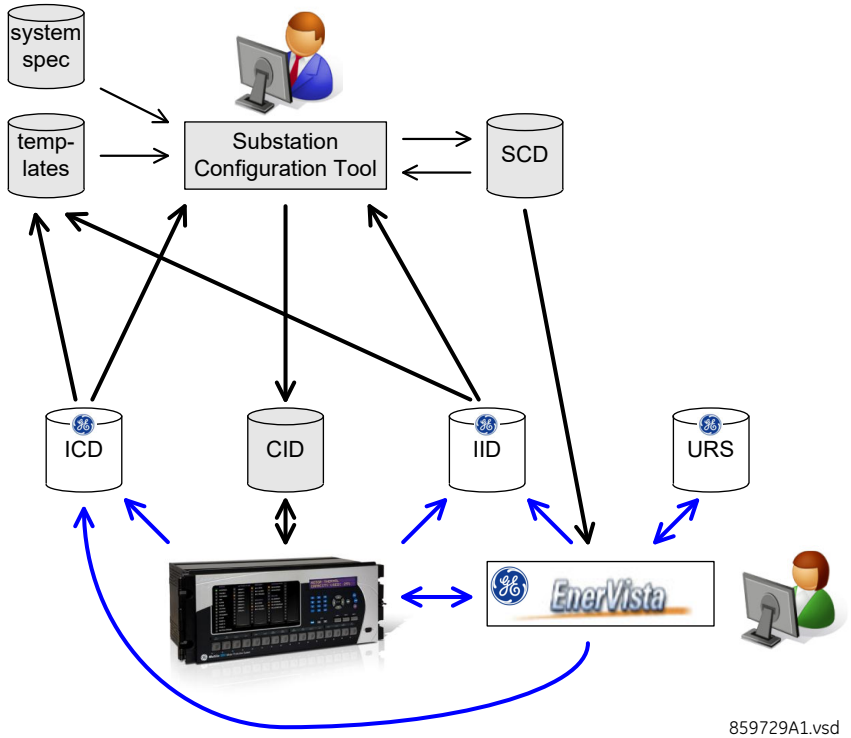
3.2 Configuring the UR using SCL

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 3-185). 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 3-202). 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

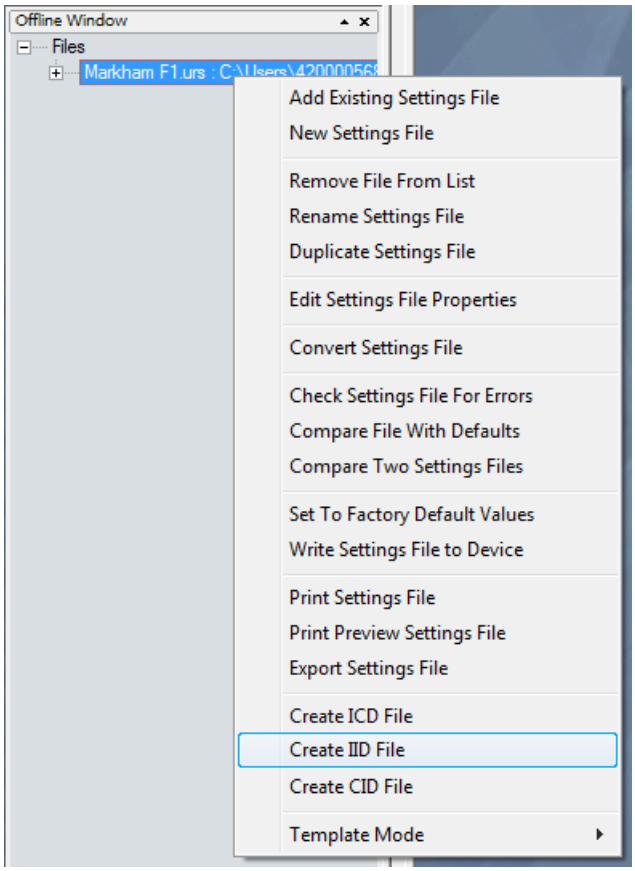


The SCT begins by importing a collection of SCL files, including a System Specification Description (SSD) that describes the single line diagram and functions of the substation, and for each IED in the system an IED Capabilities Description (ICD) that describes the functional and engineering capabilities 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 series 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 series 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:

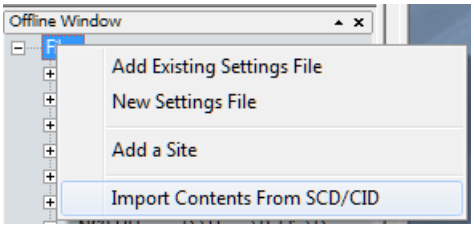
- No elements in the IED element can be removed, added or reordered, except that DataSet, Private, and IEDName elements can be added where allowed by the standard. IED element attributes can also be added. DataSet elements must be added only in @Master/LLN0, and must not exceed the number supported. Private elements must only be added to the IED element. The IED element attributes type and manufacturer must not be modified. The value of data attributes that are not shown with a "C" in the R/W/C columns in the Model implementation conformance statement (MICS) section on page 3-25 cannot have their value changed by the SCT.
- 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 **Files** label in the Offline Window, select **Import Contents From SCD/CID**, 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.

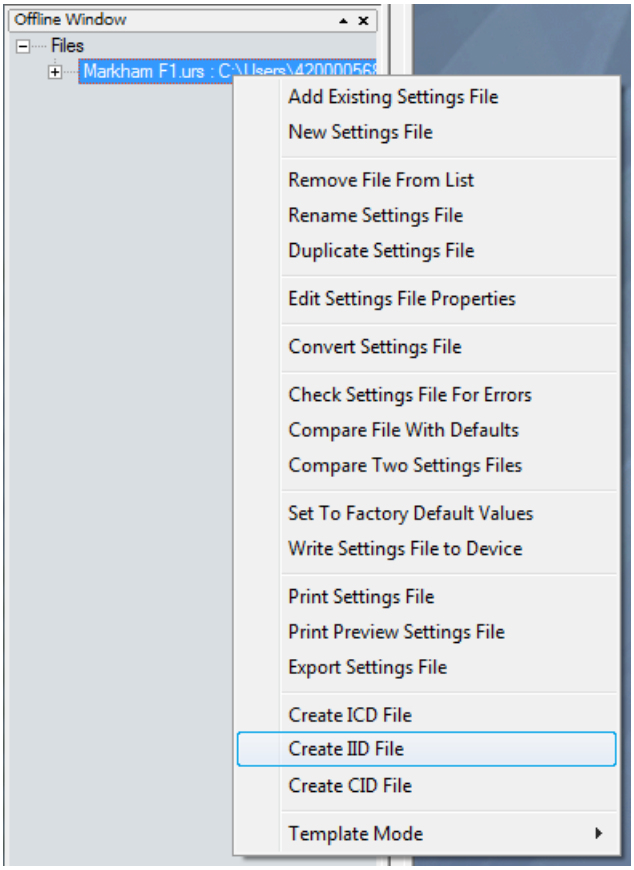
If the configuration generated by the SCT is not complete, which is typically the case, proceed as in the previous paragraph to import the SCD/CID, complete the configuration in the URS files using EnerVista UR Setup, and then drag the URS files to the UR devices.

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 **Read Device Settings** 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.

3.3 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		

Profile description		Client / subscriber	Server / publisher	Value / comments
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			

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
T2	SV T-Profile per IEC 61850 9 2 clause 5.3.3			
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			

3.4.2 ACSI models conformance statement

The table contains the conformance statement.

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	

		Client / subscriber	Server / publisher	Value / comments
Reporting				
M7	**Buffered report control**		Yes	
M7-1	sequence-number		Yes	
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			
M15	Unicast SVC			
Miscellaneous				
M16	Time	Yes		
M17	File transfer		Yes	

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	ServerDirectory		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	
Setting group control (IEC 61850-7-2 clause 16)				
S18	SelectActiveSG		Yes	
S19	SelectEditSG		Yes	
S20	SetEditSGValue		Yes	automatic confirm
S21	ConfirmEditSGValues		Yes	
S22	SetEditSGValue		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	
Logging (IEC 61850-7-2 clause 17)				
Log control block				
S30	GetLCBValues			
S31	SetLCBValues			

		Client / subscriber	Server / publisher	Comments
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			
S41	GetGsReference			
S42	GetGSSEElementNumber			
S43	GetGsCBValues			
S44	SetGsCBValues			
Transmission of sampled value model (SVC) (IEC 61850-7-2 clause 19)				
Multicast SVC				
S45	SendMSVMessage			
S46	GetMSVCBValues			
S47	SetMSVCBValues			
Unicast SVC				
S48	SendUSVMessage			
S49	GetUSVCBValues			
S50	SetUSVCBValues			
Control (IEC 61850-7-2 clause 20)				
S51	Select		Yes	
S52	SelectWithValue			
S53	Cancel		Yes	
S54	Operate		Yes	
S55	Command-Terminate			
S56	TimeActivated-Operate			
File transfer (IEC 61850-7-2 clause 23)				
S57	GetFile		Yes	
S58	SetFile			
S59	DeleteFile			
S60	GetFileAttributeValues		Yes	
Time (clause 5.5)				
T1	Time resolution of internal clock			1 µs ≈ 2**-20 s
T2	Time accuracy of internal clock			SNTP, IRIG-B, PTP
T3	Supported TimeStamp resolution			1 µs ≈ 2**-20 s

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 series 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 device, 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 61850-7-4:2007B". Otherwise, it has the value "GE Multilin Namespace:2013A" 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	Any minor error (FlexLogic operand)	q. validity	q. test	q. detailQual	q. source	q. operatorblocked
on	Off	good	false	0	process	false
on	On	questionable	false	0	process	false
test	Off	good	true	0	process	false
test	On	questionable	true	0	process	false
test/blocked	any	invalid	true	0	process	false
off	any	invalid	false	0	process	false

Many of the UR series 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.

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. This is the root logical device.
Protection	protection functions
Control	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	metering and measurement (other than PMU), including Signal Sources
General	FlexLogic, virtual outputs, non-volatile latches, FlexElements, recording (for example oscillography), security, front panel, clock

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 series 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 a setting change occurs 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)

LLN0 is instantiated in all UR series 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				
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
NamPlt		LPL			UR device and configuration information	R
	vendor	VISIBLE STRING255	DC		Mapped to LPHD1/PhyNam.vendor	R
	swRev	VISIBLE STRING255	DC		Mapped to LPHD1/PhyNam.swRev	R
	configRev	VISIBLE STRING255	DC	Master configRev	The factory default value is the empty string	R
	paramRev	INT32	ST	paramRev	The factory default value is 0	R
	ldNs	VISIBLE STRING255	EX		"IEC 61850-7-4:2007B"	R
Health		ENS				R
	stVal	ENUMERATED	ST		Mapped to LPHD1/PhyHealth.stVal	R
On		SPS				R
	stVal	BOOLEAN	ST	On	Logic 1 fixed operand	R
Off		SPS				R
	stVal	BOOLEAN	ST	Off	Logic 0 fixed operand	R
Zero		SPS				R
	mag	AnalogueValue	MX			R
	Mag.f	FLOAT32		0.0	Analog 0 fixed operand	R
Mod		ENC			Control to "on" changes TEST MODE FUNCTION to Disabled. Control to "on-blocked" results in negative acknowledge. Control to "test" changes TEST MODE FUNCTION to Test. Control to "test/blocked" changes TEST MODE FUNCTION to Test-Blocked Control to "off" results in negative acknowledge.	R/Ctrl
	stVal	ENUMERATED	ST	TEST MODE FUNCTION	Test/blocked if TEST MODE FUNCTION is Test-Blocked, otherwise test if TEST MODE FUNCTION is Test, otherwise on	R
	ctlModel	CtlModels	CF	LLN0.Mod.ctlModel	Factory default is SBO control with normal security	R/C
	sboTimeout	INT32U	CF		30000 ms	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
MltLev		SPG				R
	setVal	BOOLEAN	SP		True	R
GoEna Port1		ENG			PORT1 TxGOOSE ENABLE setting	R
	setVal	ENUMERATED	SP	PORT1 TxGOOSE ENABLE		R/C
GoEna Port2		ENG			PORT2 TxGOOSE ENABLE setting	R
	setVal	ENUMERATED	SP	PORT2 TxGOOSE ENABLE		R/C
GoEna Port3		ENG			PORT3 TxGOOSE ENABLE setting	R
	setVal	ENUMERATED	SP	PORT3 TxGOOSE ENABLE		R/C

LNName: LLN0		LDevice inst: Master				
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Function##		ENG			TxGOOSE# FUNCTION setting, duplicates GoEna in GoCB##	R
	setVal	ENUMERATED	SP	TxGOOSE# FUNCTION.		R/W/C
UpdateTms		ING			TxGOOSE UPDATE TIME setting (heartbeat interval)	R
	setVal	INT32	SP	TxGOOSE UPDATE TIME		R/C
	minVal	INT32	CF		1	R
	maxVal	INT32	CF		60	R
	stepSize	INT32	CF		1	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			4, the code for time in seconds	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
GoCB##		GoCB		TxGOOSE#	GOOSE control block associated with TxGOOSE#	R
	GoCBRef	ObjectReference	GO		<LDName>/LLN0.GoCB##	R
	GoEna	BOOLEAN	GO	TxGOOSE # FUNCTION		R/W
	GoID	VISIBLE STRING129	GO	TxGOOSE # ID		R/C
	DatSet	Object-Reference	GO	DataSetδδ	DataSetδδ name where δδ is the dataset number selected by UR setting TxGOOSE## DatSet	R/C
	ConfRev	INT32U	GO	TxGOOSE # CONFREV		R/C
	NdsCom	BOOLEAN	GO		false	R
	DstAddress	PHYCOMADDR	GO			R
	DstAddress .Addr	OCTET-STRING	GO	TxGOOSE # DST MAC		R/C
	DstAddress .PRIORITY	Unsigned8	GO	TxGOOSE # VLAN PRIORITY		R/C
	DstAddress. VID	Unsigned16	GO	TxGOOSE # VLAN ID		R/C
	DstAddress. APPID	Unsigned16	GO	TxGOOSE # ETYPE APPID		R/C

LNName: LLN0		LDevice inst: Master				
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
URCBYY		URCB			Unbuffered report control block	R
	URCBRef	ObjectReference	RP		"<LDName>/LLN0.URCBYY"	R
	RptID	VISIBLE STRING129	RP	Unbuffered ReportYY RptID	Factory default is NULL	R/W/C
	RptEna	BOOLEAN	RP		Factory default is false	R/W
	Resv	BOOLEAN	RP		Factory default is false	R/W
	DatSet	ObjectReference	RP	Unbuffered ReportYY DatSet	Factory default is NULL	R/C
	ConfRev	INT32U	RP	Unbuffered ReportYY ConfRev	Factory default is 1	R/C
	OpFlds	PACKED LIST	RP	Unbuffered ReportYY OptFlds		R/W/C
	OpFlds. sequence-number	BOOLEAN			Factory default is true	C
	OpFlds. report-time-stamp	BOOLEAN			Factory default is true	C
	OpFlds.reason-for-inclusion	BOOLEAN			Factory default is true	C
	OpFlds. data-set-name	BOOLEAN			Factory default is true	C
	OpFlds. data-reference	BOOLEAN			Factory default is true	C
	OpFlds. buffer-overflow	BOOLEAN			Factory default is true	C
	OpFlds. entryID	BOOLEAN			Factory default is true	C
	OpFlds. conf-revision	BOOLEAN			Factory default is true	C
	BufTm	INT32U	RP	Unbuffered ReportYY BufTm	Factory default is 0	R/W/C
	SqNum	INT8U	RP			R
	TrgOps	Trigger Conditions	RP	Unbuffered ReportYY TrgOps		R/W/C
	TrgOps. data-change				Factory default is true	C
	TrgOps. quality-change				Factory default is true	C
	TrgOps. data-update				Factory default is false	C
	TrgOps. integrity				Factory default is true	C
	TrgOps.general-interrogation				Factory default is true	C
	IntgPd	INT32U			Factory default is 0	R/W/C
	GI	BOOLEAN			Factor default is false. When written true, the value immediately returns to false.	R/W

LNName: LLN0		LDevice inst: Master				
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BRCBYY		BRCB			Buffered report control block	R/W
	BRCBRef	ObjectReference	BR		"<LDName>/LLN0.BRCBYY"	R
	RptID	VISIBLE STRING129	BR	Buffered ReportYY RptID	Factory default is NULL	R/W/C
	RptEna	BOOLEAN	BR		Factory default is false	R/W
	DatSet	ObjectReference	BR	Buffered ReportYY DatSet	Factory default is NULL	R/C
	ConfRev	INT32U	BR	Buffered ReportYY ConfRev	Factory default is false	R/C
	OpFlds	PACKEDLIST	BR	Buffered ReportYY OptFlds	Factory default is 1	R/W/C
	OpFlds. sequence-number	BOOLEAN			Factory default is true	C
	OpFlds. report-time-stamp	BOOLEAN			Factory default is true	C
	OpFlds.reason-for-inclusion	BOOLEAN			Factory default is true	C
	OpFlds. data-set-name	BOOLEAN			Factory default is true	C
	OpFlds. data-reference	BOOLEAN			Factory default is true	C
	OpFlds. buffer-overflow	BOOLEAN			Factory default is true	C
	OpFlds. entryID	BOOLEAN			Factory default is true	C
	OpFlds. conf-revision	BOOLEAN			Factory default is true	C
	BufTm	INT32U	BR	Buffered ReportYY BufTm	Factory default is 0	R/W/C
	SqNum	INT16U	BR			R
	TrgOps	Trigger Conditions	BR	Buffered ReportYY TrgOps		R/W/C
	TrgOps. data-change				Factory default is true	C
	TrgOps. quality-change				Factory default is true	C
	TrgOps. data-update				Factory default is false	C
	TrgOps. integrity				Factory default is true	C
	TrgOps.general-interrogation				Factory default is true	C
	IntgPd	INT32U	BR		Factory default is 0	R/C
	GI	BOOLEAN	BR		Factory default is false. When written true, the value immediately returns to false.	R/W
	PurgeBuf	BOOLEAN	BR		Factory default is false. When written true, the value immediately returns to false.	R/W
	EntryID	EntryID	BR			R/W
	TimeOfEntry	EntryTime	BR			R
InRef1		ORG			CLEAR EVENT RECORDS setting	R
	setSrcRef	ObjectReference	SP	CLEAR EVENT RECORDS	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C

LNName: LLN0		LDevice inst: Master				
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
EvtRcdClr		SPC		CLEAR EVENT RECORDS	CLEAR EVENT RECORDS command	R/Ctrl
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	LLN0.EvtRcdClr.ctlModel		R/W/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
GrActγ		SPS			Not instantiated in C30	R
	stVal	BOOLEAN	ST	SETTING GROUP ACT γ		R
BlkRef1		ORG			Not instantiated in C30	R
	setSrcRef	ObjectReference	SP	SETTING GROUPS BLK	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R
InRefϕ		ORG			ϕ is a syntactic variable representing the setting group number, 2...6. Not instantiated in C30.	R
	setSrcRef	ObjectReference	SP	GROUP ϕ ACTIVATE ON	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R
SGCB		SGCB			Setting Group Control Block. Not instantiated in C30.	R
	NumOfSG	INT8U	SG		6	R
	ActSG	INT8U	SG	Current Setting Group		R/W/C
	EditSG	INT8U	SG	Setting Group for Modbus Comms		R/W
	CnfEdit	BOOLEAN	SG		False	R/W
	LActTm	TimeStamp	SG		Relay UTC time when the last service SelectActiveSG has been processed successfully	R
DataSet#		DATA-SET			Data set #	R
	DSMemberRef[η]	ObjectReference		DataSet Member η		R/C

3.5.1.3 Physical device information (LPHD1)

LPHD1 is instantiated in all UR series 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

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/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		ENS			This physical device's health	R
	stVal	ENUMERATED	ST		3 when ANY MAJOR ERROR==On; 2 when ANY MINOR ERROR==On, otherwise 1	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	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32			0	R
	pulseConfig .numPls	INT32			1	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		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
Sim		SPC			Will accept simulated GOOSE messages	R
	stVal	BOOLEAN	ST			R
	ctlModel	CtlModels	CF		0	R/C
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

LNName: LPHD1		LDevice inst: Master		UR element:		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
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
	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
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
InRef1		ORG			PROCESS BUS FAILURE setting.	R
	setSrcRef	ObjectReference	SP	PROCESS BUS FAILURE setting	reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

3.5.1.4 GOOSE subscription monitor (LGOS)

LGOS is instantiated in all UR series devices.

See the G2 implementation model for GOOSE configuration via SCL section on page 3-185 for descriptions of data objects MAC, APPID, GoDatSetRef, GoID, ConfRev and InRefδδ.

Table 3-13: GOOSE subscription monitor data objects

LNName: LGOS#		LDevice inst: Prot		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	Unit	CF			R
	units.SIUnit	ENUMERATED			1	R
	units.multiplier	ENUMERATED			0	R
LastSqNum		INS			Actual value RxGOOSE# sqNum	R
	stVal	INT32	ST	Actual value RxGOOSE# sqNum		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1	R
	units.multiplier	ENUMERATED			0	R
ConfRevNum		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	Unit	CF			R
	units.SIUnit	ENUMERATED			1	R
	units.multiplier	ENUMERATED			0	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		R/C
APPID		ING			Setting RxGOOSE# ETYPE APPID	R
	setVal	INT32	SP	RxGOOSE# ETYPE APPID		R/C
	minVal	INT32	CF		0	R
	maxVal	INT32	CF		65535	R
	stepSize	INT32	CF		1	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1	R
	units.multiplier	ENUMERATED			0	R

LNName: LGOS#		LDevice inst: Prot		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**
GoDatSet Ref		ORG			Setting RxGOOSE# datSet	R
	setSrcRef	ObjectReference	SP	Mapped to RxGOOSE# datSet prefixed with the <LDName>/ LLN0$ portion of RxGOOSE# GoCBRef	reference to the data attribute to input	R/C
GoID		VSG			Setting RxGOOSE# ID	R
	setVal	VISIBLE STRING255	SP	RxGOOSE# ID		R/C
ConfRev		ING			Setting RxGOOSE# ConfRev	R
	setVal	INT32	SP	RxGOOSE# ConfRev		R/C
	minVal	INT32	CF	-2147483648		R
	maxVal	INT32	CF		2147483647	R
	stepSize	INT32	CF		1	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
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)

GGIO1 is instantiated in all UR series 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		ENS			Relay health, value is 2 (yellow) when ANY MINOR ERROR, 3 (red) when ANY MAJOR ERROR	R
		INS				R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
						R
Indψψψ		SPS			The name of the operand selected by setting GGIO1 INDICATION ψ	R
	stVal	BOOLEAN	ST		Value of operand selected by setting GGIO1 INDICATION ψ	R

3.5.1.6 Virtual inputs (GGIO2)

GGIO2 is instantiated in all UR series 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**
Mod		INC			This logical node's mode	R/Ctrl

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**
	stVal	ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
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	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			0	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	GGIO2 CF SPCSO ψ CTLMODEL		R/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R

3.5.1.7 Intermediate GOOSE subscription objects (GGIO3)

GGIO3 is instantiated in all UR series devices.

Table 3-16: Intermediate GOOSE subscription data objects

LNName: GGIO3		LDevice inst: Prot		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	AnalogueValue	MX			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)

GGIO4 is instantiated in all UR series 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
AnInψψ		MV			The name of the operand selected by setting ANALOG IN ψ VALUE	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		the operand selected by setting ANALOG IN ψ VALUE		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			the operand selected by setting ANALOG IN ψ VALUE, deadbanded	R
	db	INT32U	CF	ANALOG IN ψ DB		R/W/C
	zeroDb	INT32U	CF		0	R
DbMaxψψ		ASG			Value of max. in deadband calculations	R
	setMag	AnalogueValue	SP			R
	setMag.f	FLOAT32		ANALOG IN ψ MAX		R/C
	minVal	AnalogueValue	CF			R
	minVal.f	FLOAT32		-1 000 000 000		R
	maxVal	AnalogueValue	CF			R
	maxVal.f	FLOAT32			1 000 000 000	R
	stepSize	AnalogueValue	CF			R
	stepSize.f	FLOAT32			0.001	R
DbMinψψ		ASG			Value of min. in deadband calculations	R
	setMag	AnalogueValue	SP			R
	setMag.f	FLOAT32		ANALOG IN ψ MIN		R/C
	minVal	AnalogueValue	CF			R
	minVal.f	FLOAT32		-1 000 000 000		R
	maxVal	AnalogueValue	CF			R
	maxVal.f	FLOAT32			1 000 000 000	R
	stepSize	AnalogueValue	CF			R
	stepSize.f	FLOAT32			0.001	R

3.5.2 Protection (Prot) logical device

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

3.5.2.1 Logical node zero (LLN0)

LLN0 is instantiated in all UR series 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 behaviour	R

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**
		INS				R
	stVal	ENUMERATED	ST			R
						R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
						R
Health		ENS			Only instantiated in the Master logical device	R
		INS				R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
						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			0.0	R
Mod		ENC			Only instantiated in the Master logical device	R/Ctrl
		INC				R
	ctlVal	ENUMERATED	CO			R
		ENUMERATED	CO			R
	stVal	ENUMERATED	ST			R
		ENUMERATED	ST			R
		ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF		0 (status only)	R
	sboTimeout	INT32U	CF		30000	R
		INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
		SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
GrRef		ORG			Reference to root logical device	R
		GEORG				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
		VISIBLE STRING255	SP			R
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

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**
MltLev		SPG			Instantiated only in the Master logical device	R
	setVal	BOOLEAN	SP			R
<TTΣDataSet##>		DATA-SET				R
	DSMemberRef[η]	ObjectReference		DataSet Member η		R/C

3.5.2.2 Auxiliary overvoltage element (AuxOv)

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

Table 3-19: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
Str		ACD			AUX OV# PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	AUX OV# PKP		R
	dirGeneral	ENUMERATED	ST		0	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
		GEORG				R
	setSrcRef	ObjectReference	SP	AUX OV# BLK for group γ.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AUX OV# BLK for setting group γ.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.3 Auxiliary undervoltage (AuxUv) element

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

Table 3-20: 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

LNName: AuxUvPTUV#		LDevice inst: Prot		UR element: Auxiliary Undervoltage element# functions		
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			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		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

3.5.2.4 B90 breaker failure (B_BFai)

This element is instantiated in the following products: B90.

Table 3-21: 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 3-22: 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

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**
InRefγ05		ORG			BF# BKR POS1 setting for setting group γ	R
	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

3.5.2.5 B90 bus differential (B_Dif)

This element is instantiated in the following products: B90.

Table 3-23: 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

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**
	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	Vector	MX			R
	instCVal.mag.f	FLOAT32		BUS ZONE # DIFF current magnitude		R
	instCVal.ang.f	FLOAT32		BUS # DIFF current angle	UR range -180...+180 converted to 0...360	R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.i deadbanded	R
	units	Unit	CF			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	Vector	MX			R
	instCVal.mag.f	FLOAT32		BUS ZONE # REST current magnitude		R
	instCVal.ang.f	FLOAT32		BUS # REST current angle	UR range -180...+180 converted to 0...360	R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.i deadbanded	R
	units	Unit	CF			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		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

3.5.2.6 B90 end fault protection (B_Efp)

This element is instantiated in the following products: B90.

Table 3-24: 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

3.5.2.7 B90 instantaneous overcurrent (B_Ioc)

This element is instantiated in the following products: B90.

Table 3-25: 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 that Op operates 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

LNName: B_IocPIOC#		LDevice inst: Prot		UR element: B90 Instantaneous Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
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

3.5.2.8 B90 time overcurrent (B_Toc)

This element is instantiated in the following products: B90.

Table 3-26: 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 that Op operates 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
DpoPhs1		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

3.5.2.9 B90 undervoltage (B_Uv)

This element is instantiated in the following products: B90.

Table 3-27: 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

3.5.2.10 Breaker failure (BkrFa)

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

Table 3-28: 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
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

LNName: BkrFaRBRF#		LDevice inst: Prot		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/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

3.5.2.11 Bus differential (BusDif)

This element is instantiated in the following products: B30.

Table 3-29: 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		1 (forward)	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		1 (forward)	R
	dirPhsB	ENUMERATED	ST		1 (forward)	R
	dirPhsC	ENUMERATED	ST		1 (forward)	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	UR range -180...+180 converted to 0...360	R
	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	UR range -180...+180 converted to 0...360	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.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.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	UR range -180...+180 converted to 0...360	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	UR range -180...+180 converted to 0...360	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.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
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

3.5.2.12 Compensated overvoltage (CompOv)

This element is instantiated in the following products: D60.

Table 3-30: D60 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

LNName: CmpOv0PTOV1		LDevice inst: Prot		UR element: Compensated Overvoltage functions.		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
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 3-31: D60 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

3.5.2.13 Direct under-reaching transfer trip (DUTT_)

This element is instantiated in the following products: D60, L90.

Table 3-32: 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

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**
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

3.5.2.14 Directional comparison blocking (DCB_)

This element is instantiated in the following products: D60.

Table 3-33: D60 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

LNName: DCB_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Blocking element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	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

3.5.2.15 Directional comparison blocking (DCB1_)

This element is instantiated in the following products: D60.

Table 3-34: D60 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
	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			DIR BLOCK1 TRIP 3P operand	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

LNName: DCB1_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Blocking1 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
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
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

3.5.2.16 Directional comparison unblocking (DCUB_)

This element is instantiated in the following products: D60.

Table 3-35: D60 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

LNName: DCUB_PSCH1		LDevice inst: Prot		UR element: Directional Comparison Unblocking 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
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
	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 LOGX3 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

3.5.2.17 Frequency rate of change (RteHz)

This element is instantiated in the following products: D60, F60, G30, G60, L90, N60, T60.

Table 3-36: 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 indicates that Op operates 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	AnalogueValue	MX			R
	instMag.f	FLOAT32		FREQUENCY RATE OF CHANGE #		R
	Mag	AnalogueValue	MX			R
	mag.f	FLOAT32		FREQUENCY RATE OF CHANGE # on deadband exception		R
	units	Unit	CF			R
	units.SIUint	ENUMERATED			75, the code for Rate of change of frequency (Hz/s)	R

LNName: RteHzPFRC#		LDevice inst: Prot		UR element: Frequency Rate of Change 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	INT32U	CF	RteHzPFRC#.HzChgRte.db		R/W/C
	zeroDb	INT32U	CF		0	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

3.5.2.18 Ground distance (GndDis)

This element is instantiated in the following products: D30, D60, L60, L90, T60.

Table 3-37: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
Str		ACD			GND DIST Z# PKP operand in Phase –To –Ground	R
	general	BOOLEAN	ST	GND DIST Z# PKP		R
	dirGeneral	ENUMERATED	ST		1(Forward) if GND DIST Z DIR value is Forward, 2 (backward) if GND DIST Z1 DIR value is Reverse, and otherwise 0 (unknown).	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
		GEORG				R
	setSrcRef	ObjectReference	SP	GND DIST Z# BLK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting GND DIST Z# BLK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C

LNName: GndDisPDIS#		LDevice inst: Prot		UR element: Ground Distance Z# Settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.19 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, T60.

Table 3-38: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
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	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		ORG			GROUND IOC# BLOCK setting in setting group γ.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	GROUND IOC# BLOCK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting GROUND IOC# BLOCK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.20 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, T60.

Table 3-39: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R

LNName: GndTocPTOC#		LDevice inst: Prot		UR element: Ground Time Overcurrent element#		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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	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
		GEORG				R
	setSrcRef	ObjectReference	SP	GROUND TOC# BLOCK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting GROUND TOC# BLOCK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.21 Hybrid permissive over-reaching transfer trip (HPOTT_)

This element is instantiated in the following products: D60, L90.

Table 3-40: 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
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

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**
	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

3.5.2.22 Line current differential (LinDif)

This element is instantiated in the following products: L30, L90.

Table 3-41: Line current differential general 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
	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

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**
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
IdFailζ		SPS			87L DIFF CHζ ID FAIL operand, which becomes on when the differential element's ID check for a peer L90 on channel ζ has failed	R
	stVal	BOOLEAN	ST	87L DIFF CHζ ID FAIL		R
AnyGpsFail		SPS			87L DIFF GPS FAIL operand, which becomes on when the GPS signal failed or is not configured properly at any terminal	R
	stVal	BOOLEAN	ST	87L DIFF GPS FAIL		R
MaxAsymOpζ		SPS			87L DIFF CHζ MAX ASYM operand, which becomes on when the Asymmetry on channel ζ exceeded preset value	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**
	stVal	BOOLEAN	ST	87L DIFF CHζ MAX ASYM		R
TmChgOpζ		SPS			87L DIFF CHζ TIME CHNG operand, which becomes on when the Change in round trip delay on channel ζ exceeded preset value	R
	stVal	BOOLEAN	ST	87L DIFF CHζ TIME CHNG		R
GpsFailζ		SPS			87L DIFF GPS ζ FAIL operand	R
	stVal	BOOLEAN	ST	87L DIFF GPS ζ FAIL		R
Blk		SPS			87L DIFF BLOCKED operand, which becomes On when the 87L function is blocked due to communication problems	R
	stVal	BOOLEAN	ST	87L DIFF BLOCKED		R
BlkHϕ		SPS			Only instantiated in L90	R
	stVal	BOOLEAN	ST	87L HARM2 θ OP		R
DistDet		SPS			50DD SV operand, which becomes On when the 87L disturbance detector has operated	R
	stVal	BOOLEAN	ST	50DD SV		R
StubBusOp		SPS			STUB BUS OP operand, which becomes On when the Stub Bus function is active	R
	stVal	BOOLEAN	ST	STUB BUS OP		R
DifAClc		WYE			Differential currents	R
	phsθ	CMV				R
	phsθ.instCVal	Vector	MX			R
	phsθ.instCVal.mag.f	FLOAT32		Iθ DIFF. CURRENT magnitude, in primary amps		R
	phsθ.instCVal.ang.f	FLOAT32		Iθ DIFF. CU	UR range -180...+180 converted to 0...360	R
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		Iθ DIFF. CURRENT magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		Iθ DIFF. CU	UR range -180...+180 converted to 0...360	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	LinDfPDIF1.DifAClc.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF	CURRENT CUT-OFF LEVEL setting multiplied by 100000/46		R
	neut	CMV				R
	neut.instCVal	Vector	MX			R
	neut.instCVal.mag.f	FLOAT32		IG DIFF. CURRENT magnitude, in primary amps		R
	neut.instCVal.ang.f	FLOAT32		IG DIFF. CU	UR range -180...+180 converted to 0...360	R
	neut.cVal	Vector	MX			R
	neut.cVal.mag.f	FLOAT32		IG DIFF. CURRENT magnitude, in primary amps, with deadband		R
	neut.cVal.ang.f	FLOAT32		IG DIFF. CU	UR range -180...+180 converted to 0...360	R
	neut.units	Unit	CF			R
	neut.units.SIUnit	ENUMERATED			5, the code for amps	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**
	neut.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	neut.db	INT32U	CF	LinDfPDIF1.DifAClc.neut.db		R/W/C
	neut.zeroDb	INT32U	CF	CURRENT CUT-OFF LEVEL setting multiplied by 100000/46		R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
RstA		WYE			Restraint currents	R
	phsθ	CMV				R
	phsθ.instCVal	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		Iθ RESTR. CURRENT magnitude, in primary amps		R
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		Iθ RESTR. CURRENT magnitude, in primary amps, with deadband		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	LinDfPDIF1.DifAClc.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF	CURRENT CUT-OFF LEVEL setting multiplied by 100000/46		R
	neut	CMV				R
	neut.instCVal	Vector	MX			R
	neut.instCVal.mag .f	FLOAT32		IG RESTR. CURRENT magnitude, in primary amps		R
	neut.cVal	Vector	MX			R
	neut.cVal.mag.f	FLOAT32		IG RESTR. CURRENT magnitude, in primary amps, with deadband		R
	neut.units	Unit	CF			R
	neut.units.SIUnit	ENUMERATED			5, the code for amps	R
	neut.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	neut.db	INT32U	CF	LinDfPDIF1.DifAClc.neut.db		R/W/C
	neut.zeroDb	INT32U	CF	CURRENT CUT-OFF LEVEL setting multiplied by 100000/46		R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R
InRef001		ORG			CHNL ASYM COMP setting	R
	setSrcRef	ObjectReference	SP	CHNL ASYM COMP setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
BlkRef9		ORG			BLOCK GPS TIME REF setting	R
	setSrcRef	ObjectReference	SP	BLOCK GPS TIME REF setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
BlkRefγ		ORG			CURRENT DIFF BLOCK setting of setting group γ	R
	setSrcRef	ObjectReference	SP	CURRENT DIFF BLOCK setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
InRefγ05		ORG			CURRENT DIFF KEY DTT setting of setting group γ	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**
	setSrcRef	ObjectReference	SP	CURRENT DIFF KEY DTT setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
InRefγ06		ORG			STUB BUS DISCONNECT setting of setting group γ	R
	setSrcRef	ObjectReference	SP	STUB BUS DISCONNECT setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
InRefγ07		ORG			STUB BUS TRIGGER setting of setting group γ	R
	setSrcRef	ObjectReference	SP	STUB BUS TRIGGER setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
InRefγ08		ORG			DD NON-CURRENT SUPV setting	R
	setSrcRef	ObjectReference	SP	DD NON-CURRENT SUPV setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
InRefγ09		ORG			DD CONTROL LOGIC setting of setting group γ	R
	setSrcRef	ObjectReference	SP	DD CONTROL LOGIC setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
InRefγ10		ORG			DD LOGIC SEAL-IN setting of setting group γ	R
	setSrcRef	ObjectReference	SP	DD LOGIC SEAL-IN setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
InRefγ12		ORG			Only instantiated in L90	R
	setSrcRef	ObjectReference	SP	87L TRIP SUPV setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C
InRefγ13		ORG			Only instantiated in L90	R
	setSrcRef	ObjectReference	SP	87L TRIP FORCE 3-ϕ setting	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C

Table 3-42: Line current differential local terminal current data objects

LNName: LinDf0MMXU1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) – local terminal current function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
A		WYE			Local terminal currents	R
	phsθ	CMV				R
	phsθ.instCVal	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		LOCAL Iθ magnitude, in primary amps		R
	phsθ.instCVal.ang .f	FLOAT32		LOCAL Iθ an	UR range -180...+180 converted to 0...360	R
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		LOCAL Iθ magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		LOCAL Iθ an	UR range -180...+180 converted to 0...360	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	LinDf0MMXU1.A.phsθ.db		R/W/C

LNName: LinDf0MMXU1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) – local terminal current function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsθ.zeroDb	INT32U	CF	CURRENT CUT-OFF LEVEL setting multiplied by 100000/46		R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R

Table 3-43: Line current differential terminal 1 current data objects

LNName: LinDf1MMXU1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) – terminal 1 current function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
A		WYE			Terminal 1 currents	R
	phsθ	CMV				R
	phsθ.instCVal	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		TERMINAL 1 Iθ magnitude, in primary amps		R
	phsθ.instCVal.ang .f	FLOAT32		TERMINAL 1	UR range -180...+180 converted to 0...360	R
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		TERMINAL 1 Iθ magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		TERMINAL 1	UR range -180...+180 converted to 0...360	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	LinDf1MMXU1.A.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF	CURRENT CUT-OFF LEVEL setting multiplied by 100000/46		R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R

Table 3-44: Line current differential terminal 2 current data objects

LNName: LinDf2MMXU1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) – terminal 2 current function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
A		WYE			Terminal 2 currents	R
	phsθ	CMV				R
	phsθ.instCVal	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		TERMINAL 2 Iθ magnitude, in primary amps		R
	phsθ.instCVal.ang .f	FLOAT32		TERMINAL 2	UR range -180...+180 converted to 0...360	R
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		TERMINAL 2 Iθ magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		TERMINAL 2	UR range -180...+180 converted to 0...360	R
	phsθ.units	Unit	CF			R
	phsθ.units.SIUnit	ENUMERATED			5, the code for amps	R

LNName: LinDf2MMXU1		LDevice inst: Prot		UR element: Line Differential element (ANSI 87L) – terminal 2 current function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsθ.units .multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	phsθ.db	INT32U	CF	LinDf2MMXU1.A.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF	CURRENT CUT-OFF LEVEL setting multiplied by 100000/46		R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R

3.5.2.23 Line pickup (LinPkp)

This element is instantiated in the following products: D30, D60, L60, L90.

Table 3-45: 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

3.5.2.24 Negative sequence directional overcurrent (NegDoc)

This element is instantiated in the following products: C70, D30, D60, F60, G30, G60, L60, L90.

Table 3-46: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R

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		1 for forward 2 for backward 0 for none 3 for both	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
		GEORG				R
	setSrcRef	ObjectReference	SP	NEG SEQ DIR OC# BLOCK for group γ.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP			R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.25 Negative sequence instantaneous overcurrent (NegIoc)

This element is instantiated in the following products: C70, D30, D60, F35, F60, L30, L60, L90.

Table 3-47: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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	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
		GEORG				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**
	setSrcRef	ObjectReference	SP	NEG SEQ IOC# BLOCK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting NEG SEQ IOC# BLOCK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.26 Negative sequence overvoltage (NegOv)

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

Table 3-48: 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

3.5.2.27 Negative sequence time overcurrent (NegToc)

This element is instantiated in the following products: C70, D30, D60, F35, F60, L30, L60, L90.

Table 3-49: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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	R
Op		ACT			NEG SEQ TOC# OP operand	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**
	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		ORG			NEG SEQ TOC# BLOCK setting for setting group γ.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	NEG SEQ TOC# BLOCK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting NEG SEQ TOC# BLOCK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.28 Neutral directional overcurrent (NeuDoc)

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

Table 3-50: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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		1 for forward 2 for backward 0 for none 3 for both	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
		GEORG				R
	setSrcRef	ObjectReference	SP	NEUTRAL DIR OC# BLOCK for group γ.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP			R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

LNName: NeuDocRDIR#		LDevice inst: Prot		UR element: Neutral Directional Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.29 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, T60.

Table 3-51: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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	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
		GEORG				R
	setSrcRef	ObjectReference	SP	NEUTRAL IOC# BLOCK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting NEUTRAL IOC# BLOCK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.30 Neutral overvoltage (NeuOv)

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

Table 3-52: 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

3.5.2.31 Neutral time overcurrent (NeuToc)

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

Table 3-53: 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 that Op operates 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

3.5.2.32 Overfrequency (OvHz)

This element is instantiated in the following products: D60, F60, G30, G60, L90, M60, N60, T60.

Table 3-54: 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 that Op operates 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

LNName: OvHzPTOF#		LDevice inst: Prot		UR element: Overfrequency element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	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

3.5.2.33 Permissive overreaching transfer trip (POTT_)

This element is instantiated in the following products: D60, L60, L90.

Table 3-55: 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
	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

3.5.2.34 Permissive overreaching transfer trip 1 (POTT1_)

This element is instantiated in the following products: D60, L90.

Table 3-56: 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			POTT1 TRIP 3P operand	R
	general	BOOLEAN	ST	POTT1 TRIP 3P		R
Tx1		SPS			POTT1 TX1 operand	R
	stVal	BOOLEAN	ST	POTT1 TX1		R
Tx2		SPS			POTT1 TX2 operand	R
	stVal	BOOLEAN	ST	POTT1 TX2		R
Tx3		SPS			POTT1 TX3 operand	R
	stVal	BOOLEAN	ST	POTT1 TX3		R
Tx4		SPS			POTT1 TX4 operand	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
	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			POTT1 RX2 setting	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			POTT1 RX3 setting	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			POTT1 RX4 setting	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

3.5.2.35 Permissive under-reaching transfer trip (PUTT_)

This element is instantiated in the following products: D60, L90.

Table 3-57: 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

3.5.2.36 Phase comparison (PhCmp)

This element is instantiated in the following products: L60.

Table 3-58: 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
	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

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**
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	AnalogueValue	MX			R
	instMag.f	FLOAT32		CT# COMP I1 Mag		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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		0	R
CmpCt#I2		MV			CT# COMP I2 Mag in amperes	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		CT# COMP I2 Mag		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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		0	R

Table 3-59: 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

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**
	setSrcRef	ObjectReference	SP	87PC FDH SUPV 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 FDH OP operand	R
	general	BOOLEAN	ST	87PC FDH OP		R

Table 3-60: 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 3-61: 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 3-62: 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	AnalogueValue	SG			R
	setMag.f	FLOAT32		POS SEQ di/dt FDL PICKUP		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1 is code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	minVal	AnalogueValue	CF			R
	minVal.f	FLOAT32			0.01	R
	maxVal	AnalogueValue	CF			R
	maxVal.f	FLOAT32			5.00	R
	stepSize	AnalogueValue	CF			R
	stepSize.f	FLOAT32			0.01	R
Op		ACT			87PC di1/dt FDL OP operand	R

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**
	general	BOOLEAN	ST	87PC di1/dt FDL OP		R

Table 3-63: 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	AnalogueValue	SG			R
	setMag.f	FLOAT32		POS SEQ di/dt FDH PICKUP		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1 is code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	minVal	AnalogueValue	CF			R
	minVal.f	FLOAT32			0.01	R
	maxVal	AnalogueValue	CF			R
	maxVal.f	FLOAT32			5.00	R
	stepSize	AnalogueValue	CF			R
	stepSize.f	FLOAT32			0.01	R
Op		ACT			87PC di1/dt FDH OP operand	R
	general	BOOLEAN	ST	87PC di1/dt FDH OP		R

Table 3-64: 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	AnalogueValue	SG			R
	setMag.f	FLOAT32		NEG SEQ di/dt FDL PICKUP		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1 is code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	minVal	AnalogueValue	CF			R
	minVal.f	FLOAT32			0.01	R
	maxVal	AnalogueValue	CF			R
	maxVal.f	FLOAT32			5.00	R
	stepSize	AnalogueValue	CF			R
	stepSize.f	FLOAT32			0.01	R
Op		ACT			87PC di2/dt FDL OP operand	R

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**
	general	BOOLEAN	ST	87PC di2/dt FDL OP		R

Table 3-65: 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	AnalogueValue	SG			R
	setMag.f	FLOAT32		NEG SEQ di/dt FDH PICKUP		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1 is code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R
	minVal	AnalogueValue	CF			R
	minVal.f	FLOAT32			0.01	R
	maxVal	AnalogueValue	CF			R
	maxVal.f	FLOAT32			5.00	R
	stepSize	AnalogueValue	CF			R
	stepSize.f	FLOAT32			0.01	R
Op		ACT			87PC di2/dt FDH OP operand	R
	general	BOOLEAN	ST	87PC di2/dt FDH OP		R

Table 3-66: 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 3-67: 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 3-68: 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 3-69: 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 3-70: 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	AnalogueValue	SG			R
	setMag.f	FLOAT32			0	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R

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**
	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

3.5.2.37 Phase directional (PhsDir)

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

Table 3-71: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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	R
	phsA	BOOLEAN	ST	PH DIR # BLK A		R
	dirPhsA	ENUMERATED	ST		0	R
	phsB	BOOLEAN	ST	PH DIR # BLK B		R
	dirPhsB	ENUMERATED	ST		0	R
	phsC	BOOLEAN	ST	PH DIR # BLK C		R
	dirPhsC	ENUMERATED	ST		0	R
BlkRefγ		ORG			PHASE DIR # BLOCK setting for setting group γ.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	PHASE DIR # BLOCK for group γ.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting PHASE DIR # BLOCK for setting group γ.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.38 Phase distance (PhsDis)

This element is instantiated in the following products: D30, D60, G60, L60, L90, T60.

Table 3-72: 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**
Mod		INC			This logical node's mode	R/Ctrl

LNName: PhsDisPDIS#		LDevice inst: Prot		UR element: Phase Distance Z# settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
Str		ACD			PHS DIST Z# PKP operand in Phase-To-Phase	R
	general	BOOLEAN	ST	PH DIST Z# PKP		R
	dirGeneral	ENUMERATED	ST		1(Forward) if PHS DIST Z DIR value is Forward, 2 (backward) if PHS DIST Z1 DIR value is Reverse, and otherwise 0 (unknown).	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
		GEORG				R
	setSrcRef	ObjectReference	SP	PHS DIST Z# BLK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting PHS DIST Z# BLK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRefγ2		ORG			instantiated only in logical node instance 1	R
		GEORG				R
	setSrcRef	ObjectReference	SP	FORCE SELF-POLAR.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting FORCE SELF-POLAR.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C

LNName: PhsDisPDIS#		LDevice inst: Prot		UR element: Phase Distance Z# settings		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRefγ3		ORG			instantiated only in logical node instance 1	R
		GEORG				R
	setSrcRef	ObjectReference	SP	FORCE MEM-POLAR.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting FORCE MEM-POLAR.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.39 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, T60.

Table 3-73: 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 that Op operates 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		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

3.5.2.40 Phase overvoltage (PhsOv)

This element is instantiated in the following products: C60, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 3-74: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
Str		ACD			PHASE OV # PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE OV # PKP		R
	dirGeneral	ENUMERATED	ST		0	R
	phsA	BOOLEAN	ST	PHASE OV # PKP A		R
	dirPhsA	ENUMERATED	ST		0	R
	phsB	BOOLEAN	ST	PHASE OV # PKP B		R
	dirPhsB	ENUMERATED	ST		0	R
	phsC	BOOLEAN	ST	PHASE OV # PKP C		R
	dirPhsC	ENUMERATED	ST		0	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
		GEORG				R
	setSrcRef	ObjectReference	SP	PHASE OV # BLK for group γ.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting PHASE OV # BLK for setting group γ.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

LNName: PhsOvPTOV#		LDevice inst: Prot		UR element: Phase Overvoltage element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.41 Phase time overcurrent (PhsToc)

This element is instantiated in the following products: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, T35, T60.

Table 3-75: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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	R
	phsA	BOOLEAN	ST	PHASE TOC# PKP A		R
	dirPhsA	ENUMERATED	ST		0	R
	phsB	BOOLEAN	ST	PHASE TOC# PKP B		R
	dirPhsB	ENUMERATED	ST		0	R
	phsC	BOOLEAN	ST	PHASE TOC# PKP C		R
	dirPhsC	ENUMERATED	ST		0	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
		GEORG				R
	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
		VISIBLE STRING255	SP			R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C

LNName: PhsTocPTOC#		LDevice inst: Prot		UR element: Phase Time Overcurrent element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.42 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 3-76: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
Str		ACD			PHASE UV# PKP operands (including individual three phases)	R
	general	BOOLEAN	ST	PHASE UV# PKP		R
	dirGeneral	ENUMERATED	ST		0	R
	phsA	BOOLEAN	ST	PHASE UV# PKP A		R
	dirPhsA	ENUMERATED	ST		0	R
	phsB	BOOLEAN	ST	PHASE UV# PKP B		R
	dirPhsB	ENUMERATED	ST		0	R
	phsC	BOOLEAN	ST	PHASE UV# PKP C		R
	dirPhsC	ENUMERATED	ST		0	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
		GEORG				R
	setSrcRef	ObjectReference	SP	PHASE UV# BLOCK for group γ.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting PHASE UV# BLOCK for setting group γ.		R/C

LNName: PhsUvPTUV#		LDevice inst: Prot		UR element: Phase Undervoltage 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
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.43 Power swing detection (RPSB_)

This element is instantiated in the following products: D30, D60, G60, L60, L90, N60, T60.

Table 3-77: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
Str		ACD			POWER SWING INCOMING operand	R
	general	BOOLEAN	ST	POWER SWING INCOMING		R
	dirGeneral	ENUMERATED	ST		0	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
		GEORG				R

LNName: PwrSwgRPSB1		LDevice inst: Prot		UR element: Power Swing Detect element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	POWER SW I2 SUPV ENAB	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting POWER SW I2 SUPV ENAB		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
BlkRefγ		ORG			POWER SWING BLK setting for setting group γ.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	POWER SWING BLK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting POWER SWING BLK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.44 Restricted ground fault (RgDif)

This element is instantiated in the following products: F60, G30, G60, L90, T60.

Table 3-78: 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	Vector	MX			R
	net.instCVal.mag .f	FLOAT32		RGF# DIFF Igd magnitude, in primary amps		R
	net.cVal	Vector	MX			R
	net.cVal.mag.f	FLOAT32		RGF# DIFF Igd magnitude, in primary amps, with deadband		R
	net.units	Unit	CF			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.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	Vector	MX			R
	net.instCVal.mag .f	FLOAT32		RGF# RESTR Igr magnitude, in primary amps		R
	net.cVal	Vector	MX			R
	net.cVal.mag.f	FLOAT32		RGF# RESTR Igr magnitude, in primary amps, with deadband		R
	net.units	Unit	CF			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

3.5.2.45 Sensitive directional power (Sen)

This element is instantiated in the following products: C60, D60, F60, G30, G60, L90, M60, N60.

Table 3-79: 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 can 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	AnalogueValue	MX			R
	instMag.f	FLOAT32		DIRECTIONAL POWER # 3ϕ		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			DIRECTIONAL POWER # 3ϕ, deadbanded	R
	units	Unit	CF			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

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**
	zeroDb	INT32U	CF		3-phase power cut-off level in percent multiplied by 1000	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 3-80: 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 can 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 3-81: 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 can 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

3.5.2.46 Stator differential (SttDif)

This element is instantiated in the following products: G60, M60.

Table 3-82: 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

LNName: SttDifPDIF#		LDevice inst: Prot		UR element: Stator Differential Function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
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		0	R
	phsA	BOOLEAN	ST	STATOR DIFF# PKP A		R
	dirPhsA	ENUMERATED	ST		0	R
	phsB	BOOLEAN	ST	STATOR DIFF# PKP B		R
	dirPhsB	ENUMERATED	ST		0	R
	phsC	BOOLEAN	ST	STATOR DIFF# PKP C		R
	dirPhsC	ENUMERATED	ST		0	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

3.5.2.47 Transformer instantaneous differential (PiDif)

This element is instantiated in the following products: T35, T60.

Table 3-83: 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		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

3.5.2.48 Transformer percent differential (PctDif)

This element is instantiated in the following products: G30, T35, T60.

Table 3-84: 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

LNName: PctDifPDIF1		LDevice inst: Prot		UR element: Transformer Percent Differential function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
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		0	R
	phsA	BOOLEAN	ST	XFMR PCNT DIFF PKP A		R
	dirPhsA	ENUMERATED	ST		0	R
	phsB	BOOLEAN	ST	XFMR PCNT DIFF PKP B		R
	dirPhsB	ENUMERATED	ST		0	R
	phsC	BOOLEAN	ST	XFMR PCNT DIFF PKP C		R
	dirPhsC	ENUMERATED	ST		0	R
RefWinding		INS			Number of winding used as the reference winding for ratio compensation	R
	stVal	INT32	ST	REFERENCE WINDING		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
DifAClc		WYE			Phase differential currents	R
	phsθ	CMV				R
	phsθ.instCVal	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		DIFF PHASOR Iθd magnitude, in primary amps		R
	phsθ.instCVal.ang .f	FLOAT32		DIFF PHASOR	UR range -180...+180 converted to 0...360	R
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		DIFF PHASOR Iθd magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		DIFF PHASOR	UR range -180...+180 converted to 0...360	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	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	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		DIFF 2ND HARM Iθd magnitude, in primary amps		R
	phsθ.instCVal.ang .f	FLOAT32		DIFF 2ND HA	UR range -180...+180 converted to 0...360	R
	phsθ.cVal	Vector	MX			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 2ND HARM Iθd magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		DIFF 2ND HA	UR range -180...+180 converted to 0...360	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	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	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		DIFF 5TH HARM Iθd magnitude, in primary amps		R
	phsθ.instCVal.ang .f	FLOAT32		DIFF 5TH HA	UR range -180...+180 converted to 0...360	R
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		DIFF 5TH HARM Iθd magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		DIFF 5TH HA	UR range -180...+180 converted to 0...360	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	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	Vector	MX			R
	phsθ.instCVal.mag .f	FLOAT32		REST PHASOR Iθr magnitude, in primary amps		R
	phsθ.instCVal.ang .f	FLOAT32		REST PHASOR	UR range -180...+180 converted to 0...360	R
	phsθ.cVal	Vector	MX			R
	phsθ.cVal.mag.f	FLOAT32		REST PHASOR Iθr magnitude, in primary amps, with deadband		R
	phsθ.cVal.ang.f	FLOAT32		REST PHASOR	UR range -180...+180 converted to 0...360	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	PctDifPDIF#.RstA.phsθ.db		R/W/C
	phsθ.zeroDb	INT32U	CF			R

LNName: PctDifPDIF1		LDevice inst: Prot		UR element: Transformer Percent Differential function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	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

3.5.2.49 Trip bus (TrBus)

This element is instantiated in all UR products (B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60).

Table 3-85: 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 that Op operates 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

3.5.2.50 Trip output (TrOut)

This element is instantiated in the following products: D60, L60, L90.

Table 3-86: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by TRIP 3-POLE INPUT-α	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting TRIP 3-POLE INPUT-α		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef1α		ORG			TRIP 1-POLE INPUT-α setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by TRIP 1-POLE INPUT-α	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting TRIP 1-POLE INPUT-α		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef2α		ORG			TRIP RECLOSE INPUT-α setting.	R
		GEORG				R

LNName: TrOutPTRC1		LDevice inst: Prot		UR element: Trip Output element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	setSrcRef	ObjectReference	SP	Reference to the data object selected by TRIP RECLOSE INPUT-α	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting TRIP RECLOSE INPUT-α		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef01		ORG			START TMR Z2PH Inp1 setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by START TMR Z2PH Inp1	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting START TMR Z2PH Inp1		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef02		ORG			START TMR Z2PH Inp2 setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by START TMR Z2PH Inp2	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting START TMR Z2PH Inp2		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef03		ORG			START TMR Z2GR Inp1 setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by START TMR Z2GR Inp1	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**
		VISIBLE STRING255	SP	Reference to the data object selected by setting START TMR Z2GR Inp1		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef04		ORG			START TMR Z2GR Inp2 setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by START TMR Z2GR Inp2	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting START TMR Z2GR Inp2		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef05		ORG			BKR ϕA OPEN setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by BKR ϕA OPEN	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting BKR ϕA OPEN		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef06		ORG			BKR ϕB OPEN setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by BKR ϕB OPEN	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting BKR ϕB OPEN		R/C
	setSrcCB	ObjectReference	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**
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef07		ORG			BKR ϕC OPEN setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by BKR ϕC OPEN	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting BKR ϕC OPEN		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef08		ORG			TRIP FORCE 3-POLE setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by TRIP FORCE 3-POLE	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting TRIP FORCE 3-POLE		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef09		ORG			REVERSE FAULT setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	Reference to the data object selected by REVERSE FAULT	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the data object selected by setting REVERSE FAULT		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R

LNName: TrOutPTRC1		LDevice inst: Prot		UR element: Trip Output element		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.2.51 Underfrequency (UnHz)

This element is instantiated in the following products: D60, F35, F60, G30, G60, L30, L90, M60, N60, T60.

Table 3-87: 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 indicates that Op operates 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

3.5.2.52 Volts per Hertz (VpHz)

This element is instantiated in the following products: G30, G60, T60.

Table 3-88: 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		0	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

3.5.2.53 VT fuse failure (Vtff)

This element is instantiated in the following products: C60, C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, N60, T60.

Table 3-89: 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

LNName: VtffGAPC#		LDevice inst: Prot		UR element: VT FUSE FAILURE # function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
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

3.5.2.54 Wattmetric ground fault (Watt)

This element is instantiated in the following products: D60, F35, F60, L60, L90.

Table 3-90: 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		0 (unknown)	R
Op		ACT			WATTMETRIC GND FLT # OP operand	R
	general	BOOLEAN	ST	WATTMETRIC GND FLT # OP		R
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	AnalogueValue	MX			R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units	Unit	CF			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		3-phase power cut-off level in percent multiplied by 1000	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)

LLN0 is instantiated in all UR series devices implementing the Ctrl logical device.

Table 3-91: 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 behaviour	R
		INS				R
	stVal	ENUMERATED	ST			R
						R

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**
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
						R
Health		ENS			Only instantiated in the Master logical device	R
		INS				R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
						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			0.0	R
Mod		ENC			Only instantiated in the Master logical device	R/Ctrl
		INC				R
	ctlVal	ENUMERATED	CO			R
		ENUMERATED	CO			R
	stVal	ENUMERATED	ST			R
		ENUMERATED	ST			R
		ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF		0 (status only)	R
	sboTimeout	INT32U	CF		30000	R
		INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
		SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
GrRef		ORG			Reference to root logical device	R
		GEORG				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
		VISIBLE STRING255	SP			R
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
MltLev		SPG			Instantiated only in the Master logical device	R
	setVal	BOOLEAN	SP			R

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**
<TTΣDataSet##>		DATA-SET				R
	DSMemberRef[η]	ObjectReference		DataSet Member η		R/C

3.5.3.2 B90 CT trouble (B_CtTb)

This element is instantiated in the following products: B90.

Table 3-92: 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

3.5.3.3 Fault location (FltRpt)

This element is instantiated in the following products: C60, D30, D60, F35, F60, L30, L60, L90.

Table 3-93: Fault report settings data objects

LNName: FltRptRFLO#		LDevice inst: Gen		UR element: 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	Vector	MX			R
	cVal.mag.f	FLOAT32			0	R
	cVal.ang.f	FLOAT32			0	R
RsStat		SPC			Instantiated only in FltRptRFLO1	R/Ctrl
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	FltRptRFLO1.RsStat.ctlModel		R/W/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	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 3-94: Fault report settings data objects

LNName: FltRFLOψψ		LDevice inst: Gen		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

LNName: FltRFLOψψ		LDevice inst: Gen		UR element: Selected values from Fault Report Data file ψψ		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	cVal	Vector	MX			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
FltNum		INS			FAULT NUMBER	R
	stVal	INT32	ST	FAULT NUMBER in Fault Report Data file ψψ		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
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
FltDiskm		MV			FAULT LOCATION	R
	mag	Analogue Value	MX			R
	mag.f	FLOAT32		FAULT LOCATION in Fault Report Data file ψψ, converted to kilometers where required		R
	units	Unit	CF			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	UNIT	CF			R
	units.SIUnit	ENUMERATED			1, the code for dimensionless	R
	units.multiplier	ENUMERATED			0, the code for a multiplier of 1	R

3.5.3.4 Single pole autoreclose (Rec13p)

This element is instantiated in the following products: to C60, D60, L60, L90.

Table 3-95: 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		3 if operand AR FORCE 3-P TRIP is On, 2 otherwise	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

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 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
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

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 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
	setSrcRef	ObjectReference	SP	AR Mode 4 Activation setting	Reference to the data attribute to input	R
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R
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

LNName: Rec13pRREC1		LDevice inst: Ctrl		UR element: Autoreclose 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
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

3.5.3.5 Synchrocheck (SynChk)

This element is instantiated in the following products: C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60.

Table 3-96: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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

LNName: SynChkRSYN#		LDevice inst: Ctrl		UR element: Synchrocheck element # (ANSI 25)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
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
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SYNCHROCHECK 1 DELTA VOLT		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			SYNCHROCHECK # DELTA VOLT, deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	SynChkRSYN#.DifVClc.db		R/W/C
	zeroDb	INT32U	CF		0	R
DifHzClc		MV			SYNCHROCHECK # DELTA FREQ, in Hz	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SYNCHROCHECK # DELTA FREQ		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32		SYNCHROCHECK # DELTA FREQ on deadband exception		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			33	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	SynChkRSYN#.DifHzClc.db		R/W/C
	zeroDb	INT32U	CF		0	R
DifAngClc		MV			SYNCHROCHECK # DELTA PHASE, in degrees	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SYNCHROCHECK # DELTA PHASE		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32		SYNCHROCHECK # DELTA PHASE on deadband exception		R

LNName: SynChkRSYN#		LDevice inst: Ctrl		UR element: Synchrocheck element # (ANSI 25)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			9	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	SynChkRSYN#.DifAngClc.db		R/W/C
	zeroDb	INT32U	CF		0	R
V1Src		CMV			SYNCHROCHECK # V1 voltage phasor, in primary volts	R
	instCVal	Vector	MX			R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V1 MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V1 ANG		R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	SynChkRSYN#.V1Src.db		R/W/C
	dbAng	INT32U	CF	SynChkRSYN#.V1Src.dbAng		R/W/C
	zeroDb	INT32U	CF		0	R
V2Src		CMV			SYNCHROCHECK # V2 voltage phasor, in primary volts	R
	instCVal	Vector	MX			R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V2 MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V2 ANG		R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	SynChkRSYN#.V2Src.db		R/W/C
	dbAng	INT32U	CF	SynChkRSYN#.V2Src.dbAng		R/W/C
	zeroDb	INT32U	CF		0	R
ProjectedV2		CMV			SYNCHROCHECK # V2' voltage phasor, in primary volts	R
	instCVal	Vector	MX			R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V2' MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V2' ANG		R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	SynChkRSYN#.ProjectedV2.db		R/W/C
	dbAng	INT32U	CF	SynChkRSYN#.ProjectedV2.dbAng		R/W/C
	zeroDb	INT32U	CF		0	R
ProjV2		CMV			SYNCHROCHECK # V2' voltage phasor, 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**
	instCVal	Vector	MX			R
	instCVal.mag.f	FLOAT32		SYNCHROCHECK # V2' MAG		R
	instCVal.ang.f	FLOAT32		SYNCHROCHECK # V2' ANG		R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	SynChkRSYN#.ProjectedV2.db		R/W/C
	zeroDb	INT32U	CF		0	R
Projected Dif		MV			SYNCHROCHECK # DELTA PHASE', in degrees which is the phase angle difference between V1 and projected V2	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SYNCHROCHECK # '		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			9	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	SynChkRSYN#.ProjectedDif.db		R/W/C
	zeroDb	INT32U	CF		0	R
ProjDif		MV			SYNCHROCHECK # DELTA PHASE', in degrees which is the phase angle difference between V1 and projected V2	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SYNCHROCHECK # '		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			9	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	SynChkRSYN#.ProjectedDif.db		R/W/C
	zeroDb	INT32U	CF		0	R
BlkRef1		ORG			SYNCHK# BLOCK setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	SYNCHK# BLOCK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting SYNCHK# BLOCK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef3		ORG			SYNCHK# SYNC CLOSE setting.	R

LNName: SynChkRSYN#		LDevice inst: Ctrl		UR element: Synchrocheck element # (ANSI 25)		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
		GEORG				R
	setSrcRef	ObjectReference	SP	SYNCHK# SYNC CLOSE.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting SYNCHK# SYNC CLOSE.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.3.6 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 3-97: 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
InRef2		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

3.5.3.7 Three pole autoreclose (Rec3p)

This element is instantiated in the following products: D30, F35, F60, L30.

Table 3-98: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
ShotCnt		INS			AUTORECLOSE# SHOT COUNT actual value	R
	stVal	INT32	ST	AUTORECLOSE# SHOT COUNT		R
AutoRecSt		ENS			Autoreclosing status	R
		INS				R
	stVal	ENUMERATED	ST			R

LNName: Rec3pRREC#		LDevice inst: Ctrl		UR element: Autoreclose element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
		INT32	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
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		ORG			AR# INITIATE setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# INITIATE.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# INITIATE.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
BlkRef1		ORG			AR# BLOCK setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# BLOCK.	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# BLOCK.		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C

LNName: Rec3pRREC#		LDevice inst: Ctrl		UR element: Autoreclose element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef02		ORG			AR# REDUCE MAX TO 1 setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# REDUCE MAX TO 1	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# REDUCE MAX TO 1		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef03		ORG			AR# REDUCE MAX TO 2 setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# REDUCE MAX TO 2	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# REDUCE MAX TO 2		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef04		ORG			AR# REDUCE MAX TO 3 setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# REDUCE MAX TO 3	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# REDUCE MAX TO 3		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef05		ORG			AR# MANUAL CLOSE setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# MANUAL CLOSE	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**
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# MANUAL CLOSE		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef06		ORG			AR# MNL RST FRM LO setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# MNL RST FRM LO	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# MNL RST FRM LO		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef07		ORG			AR# BKR CLOSED setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# BKR CLOSED	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# BKR CLOSED		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef08		ORG			AR# BKR OPEN setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# BKR OPEN	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# BKR OPEN		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C

LNName: Rec3pRREC#		LDevice inst: Ctrl		UR element: Autoreclose element # functions		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef09		ORG			AR# ADD DELAY 1 setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# ADD DELAY 1	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# ADD DELAY 1		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
InRef10		ORG			AR# ADD DELAY 2 setting.	R
		GEORG				R
	setSrcRef	ObjectReference	SP	AR# ADD DELAY 2	reference to the data attribute to input	R/C
		VISIBLE STRING255	SP	Reference to the ultimate source of value selected by setting AR# ADD DELAY 2		R/C
	setSrcCB	ObjectReference	SP		source GoCB of input if via GOOSE	R/C
		VISIBLE STRING255	SP	If reference is external to this IED, mapped to the source's GOOSE control block, else empty string		R/C
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R

3.5.3.8 Transformer aging factor (Age)

This element is instantiated in the following products: T60.

Table 3-99: 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		0	R
AgeRte		MV			AGING FACTOR actual Values	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		AGING FACTOR		R
	mag	Analogue Value	MX			R

LNName: AgeSPTR1	LDevice inst: Ctrl			UR element: Aging Factor Function		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	mag.f	FLOAT32		instMag.i on deadband exception		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1	R
	units.multiplier	ENUMERATED			0 is multiplier for 1	R
	db	INT32U	CF	AgeSPTR1.AgeRte.db		R/W/C
	zeroDb	INT32U	CF		0	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

3.5.3.9 Transformer hottest spot temperature (HPTmp)

This element is instantiated in the following products: T60.

Table 3-100: 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
	dirGeneral	ENUMERATED	ST		0	R
ToOilTmp		MV			TOP OIL °C actual Value	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		TOP OIL °C		R
	mag	Analogue Value	MX			R
	mag.f	FLOAT32		instMag.i on deadband exception		R
	units	Unit	CF			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		0	R
HPTmpClc		MV			HOTTEST-SPOT ° C actual values	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		HOTTEST-SPOT ° C		R
	mag	Analogue Value	MX			R
	mag.f	FLOAT32		instMag.i on deadband exception		R
	units	Unit	CF			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		0	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

3.5.3.10 Transformer loss of life (LosLif)

This element is instantiated in the following products: T60.

Table 3-101: 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		0	R
LosLifeRte		MV			DAILY RATE LOL actual Values	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		DAILY RATE LOL		R
	mag	Analogue Value	MX			R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units	Unit	CF			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
	sVC	Scaled Value Config	CF			R
	sVC.scaleFactor	FLOAT32			1/3600	R
	sVC.offset	FLOAT32			0	R
LosLife		MV			XFMR LIFE LOST actual Values	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		XFMR LIFE LOST		R
	mag	Analogue Value	MX			R
	mag.f	FLOAT32		instMag.f on deadband exception		R
	units	Unit	CF			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
	sVC	Scaled Value Config	CF			R
	sVC.scaleFactor	FLOAT32			1/3600	R
	sVC.offset	FLOAT32			0	R
BlkRefγ		ORG			LOSS OF LIFE BLOCK for setting group γ	R
	setSrcRef	ObjectReference	SP	LOSS OF LIFE 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

3.5.4 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)

LLN0 is instantiated in all UR series devices implementing the System logical device.

Table 3-102: 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 behaviour	R
		INS				R
	stVal	ENUMERATED	ST			R
						R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
						R
Health		ENS			Only instantiated in the Master logical device	R
		INS				R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
						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			0.0	R
Mod		ENC			Only instantiated in the Master logical device	R/Ctrl
		INC				R
	ctlVal	ENUMERATED	CO			R
		ENUMERATED	CO			R
	stVal	ENUMERATED	ST			R
		ENUMERATED	ST			R
		ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF		0 (status only)	R
	sboTimeout	INT32U	CF		30000	R
		INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
		SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
GrRef		ORG			Reference to root logical device	R
		GEORG				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
		VISIBLE STRING255	SP			R
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R

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**
	cdcName	VISIBLE STRING255	EX	GEORG		R
MltLev		SPG			Instantiated only in the Master logical device	R
	setVal	BOOLEAN	SP			R
<TTΣDataSet##>		DATA-SET				R
	DSMemberRef[η]	ObjectReference		DataSet Member η		R/C

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 3-25.

3.5.4.3 B90 isolator monitoring (B_Iso)

This element is instantiated in the following products: B90.

Table 3-103: 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

3.5.4.4 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.

The logical nodes are mapped to the breaker as follows. They are populated based on the **Settings > System Setup > Breakers > Breaker x > Breaker x Mode** setting, where x is the breaker instance.

Breaker 1: XCBR1
Bkr0XCBR1 - 3 phase together
Bkr1XCBR1 - A phase
Bkr2XCBR1 - B phase
Bkr3XCBR1 - C phase

Breaker 2: XCBR2
Bkr0XCBR2 - 3 phase together
Bkr1XCBR2 - A phase
Bkr2XCBR2 - B phase
Bkr3XCBR2 - C phase

Table 3-104: 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**
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	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	BkrCSWI# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	BkrCSWI# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF	BkrCSWI# Pos operTimeout		R/C

Table 3-105: 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		The state of the operand selected by setting XCBR# INTERLOCK OPN	R
EnaCls		SPS			Enable Close status	R
	stVal	BOOLEAN	ST		Logical OR of the state of the operand selected by setting XCBR# SYNCCHECK CLS and the state of the operand selected by setting XCBR# INTERLOCK CLS	R
InRef2		ORG			XCBR# INTERLOCK OPN setting.	R
	setSrcRef	ObjectReference	SP	XCBR# 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			XCBR# INTERLOCK CLS setting.	R
	setSrcRef	ObjectReference	SP	XCBR# INTERLOCK CLS	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C

Table 3-106: 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	BOOLEAN	ST		2 when BREAKER # OOS is On, otherwise 3 when operand BREAKER # TROUBLE is On, otherwise 1	R
Loc		SPS			Value of operand selected by setting XCBR# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST		Value of operand selected by setting XCBR# ST.LOC OPERAND	R
OpCnt		INS			Breaker operations counter	R

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	stVal	INT32	ST			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
OpOpn		ACT			BREAKER # OFF CMD (3-phase trip), BREAKER # TRIP A, BREAKER # TRIP B and BREAKER # 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
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
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	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	XCBR# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	XCBR# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF	BREAKER # Toperate		R/C

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
BlkOpn		SPC			Blocks breaker open commands from all sources including protection	R/Ctrl
	stVal	BOOLEAN	ST			R
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			1 (persistent)	R
	pulseConfig.onDur	INT32U			0	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			0	R
	ctlModel	CtlModels	CF	XCBR# BlkOpn ctlModel		R/W/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
BlkCls		SPC			Blocks breaker close commands from all sources	R/Ctrl
	stVal	BOOLEAN	ST			R
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			1 (persistent)	R
	pulseConfig.onDur	INT32U			0	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			0	R
	ctlModel	CtlModels	CF	XCBR# BlkCls ctlModel		R/W/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	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
	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			XCBR# SYNCCHECK CLS setting	R
	setSrcRef	ObjectReference	SP	XCBR# 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

LNName: Bkr0XCBR#		LDevice inst: System		UR element: Breaker Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	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			XCBR# ST.LOC OPERAND (local control) setting.	R
	setSrcRef	ObjectReference	SP	XCBR# ST.LOC OPERAND	Reference to the data attribute to input	R/C
	setSrcCB	ObjectReference	SP		Source GoCB of input if via GOOSE	R/C

Table 3-107: 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**
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	Unit	CF			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
	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

3.5.4.5 Contact input interface (ConIn)

This element is instantiated in all UR products (B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60).

Table 3-108: 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			Concatenation of value of CONTACT INPUT ϕ ID + " On (ϕ) operand value	R
	stVal	BOOLEAN	ST	Cont Ip ϕ On		R
Ind2Θ		SPS			Concatenation of value of CONTACT INPUT ϕ ID + " Off (ϕ) operand value	R
	stVal	BOOLEAN	ST	Cont Ip ϕ Off		R

3.5.4.6 Contact output interface (ConOut)

This element is instantiated in all UR products (B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60).

Table 3-109: 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
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			CONTACT OUTPUT ϕ SEAL-IN setting.	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.

The logical nodes are mapped to the disconnect switches as follows. They are populated based on the **Settings > System Setup > Switches > Switch x > Switch x Mode** setting, where x is the switch instance.

Disc 1: XSWI1
Disc0XSWI1 - 3 phase together
Disc1XSWI1 - A phase
Disc2XSWI1 - B Phase
Disc3XSWI1 - C Phase

Disc 2: XSWI2
Disc0XSWI2 - 3 phase together
Disc1XSWI2 - A phase
Disc2XSWI2 - B Phase
Disc3XSWI2 - C Phase

Table 3-110: Disconnect switch data objects

LNName: DiscCSWI#		LDevice inst: System		UR element: Disconnect Control element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
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	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	DiscCSWI# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	DiscCSWI# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF	DiscCSWI# Pos operTimeout		R/C

Table 3-111: Disconnect switch 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		The state of the operand selected by setting XSWI# INTERLOCK OPN	R
EnaCls		SPS			Enable Close status	R
	stVal	BOOLEAN	ST		The state of the operand selected by setting XSWI# INTERLOCK CLS	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 3-112: Disconnect switch 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	BOOLEAN	ST		3 when operand SWITCH # TROUBLE is On, otherwise 1	R
Loc		SPS			Value of operand selected by XSWI# ST.LOC OPERAND	R
	stVal	BOOLEAN	ST		Value of operand selected by setting XSWI# ST.LOC OPERAND	R
OpCnt		INS			Disconnect switch operations counter	R
	stVal	INT32	ST			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
SwTyp		ENS			Disconnect switch type, fixed at 2 (Disconnector)	R
	stVal	BOOLEAN	ST		2	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
Pos		DPC			Disconnect switch position control	R/Ctrl
	stVal	CODED ENUM	ST			R
	stSeld	BOOLEAN	ST		The controllable data status is “selected”	R
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	XSWI# Pos ctlModel		R/W/C
	sboTimeout	INT32U	CF	XSWI# Pos sboTimeout		R/W/C
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF	SWITCH # Toperate		R/C

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	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			1 (persistent)	R
	pulseConfig.onDur	INT32U			0	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			0	R
	ctlModel	CtlModels	CF	Disc0XSWI# BlkOpn ctlModel		R/W/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
BlkCls		SPC			Blocks disconnect switch close commands from all sources	R/Ctrl
	stVal	BOOLEAN	ST			R
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			1 (persistent)	R
	pulseConfig.onDur	INT32U			0	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			0	R
	ctlModel	CtlModels	CF	Disc0XSWI# BlkCls ctlModel		R/W/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	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

Table 3-113: Disconnect switch 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	Unit	CF			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		2	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

3.5.5 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)

LLN0 is instantiated in all UR series devices implementing the Meter logical device.

Table 3-114: 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 behaviour	R
		INS				R
	stVal	ENUMERATED	ST			R
						R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
						R
Health		ENS			Only instantiated in the Master logical device	R
		INS				R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
						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			0.0	R
Mod		ENC			Only instantiated in the Master logical device	R/Ctrl
		INC				R
	ctlVal	ENUMERATED	CO			R
		ENUMERATED	CO			R
	stVal	ENUMERATED	ST			R
		ENUMERATED	ST			R
		ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF		0 (status only)	R
	sboTimeout	INT32U	CF		30000	R
		INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
		SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
GrRef		ORG			Reference to root logical device	R
		GEORG				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
		VISIBLE STRING255	SP			R

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**
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
MltLev		SPG			Instantiated only in the Master logical device	R
	setVal	BOOLEAN	SP			R
<TTΣDataSet##>		DATA-SET				R
	DSMemberRef[η]	ObjectReference		DataSet Member η		R/C

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 3-115: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
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	R
TotW		MV			SRC # Three Phase Real Power, in primary watts	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Three Phase Real Power		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			38	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# TotW DEADBAND		R/W/C
	zeroDb	INT32U	CF		power cut-off level.	R
TotVAr		MV			SRC # Three Phase Reactive Power, in primary VAr	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Three Phase Reactive Power		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			63	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# TotVAr 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		power cut-off level.	R
TotVA		MV			SRC # Three Phase Apparent Power, in primary VA	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Three Phase Apparent Power		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			61	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# TotVA DEADBAND		R/W/C
	zeroDb	INT32U	CF		power cut-off level.	R
ClcTotVA		ENG			Calculation method used for total apparent power (TotVA) is Vector	R
	setVal	ENUMERATED	SG		1	R
TotPF		MV			SRC # Three Phase Power Factor, dimensionless	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Three Phase Power Factor		R
	Mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			65	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# TotPF DEADBAND		R/W/C
	zeroDb	INT32U	CF		0	R
PFSign		ENG			Sign convention for power factor (PF) is fixed at Lead/Lag (usually named IEEE)	R
		ING				R
	setVal	ENUMERATED	SP		2	R
		INT32	SP		2	R
Hz		MV			SRC # Frequency, in Hz	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Frequency		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			33	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# Hz DEADBAND		R/W/C
	zeroDb	INT32U	CF		0	R
PPV		DEL			SRC # Phase-to-phase Voltage phasors, in primary volts	R
	phsAB	CMV				R
	phsAB.instCVal	Vector	MX			R
	phsAB.instCVal .mag.f	FLOAT32		SRC # Phase AB Voltage Magnitude		R
	phsAB.instCVal .ang.f	FLOAT32		SRC # Phase AB Voltage Angle	UR range -180...+180 converted to 0...360	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsAB.cVal	Vector	MX			R
	phsAB.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsAB.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	phsAB.units	Unit	CF			R
	phsAB.units .SIUnit	ENUMERATED			29	R
	phsAB.units .multiplier	ENUMERATED			0	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		voltage cut-off level.	R
	phsBC	CMV				R
	phsBC.instCVal	Vector	MX			R
	phsBC.instCVal .mag.f	FLOAT32		SRC # Phase BC Voltage Magnitude		R
	phsBC.instCVal .ang.f	FLOAT32		SRC # Phase BC Voltage Angle	UR range -180...+180 converted to 0...360	R
	phsBC.cVal	Vector	MX			R
	phsBC.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsBC.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	phsBC.units	Unit	CF			R
	phsBC.units .SIUnit	ENUMERATED			29	R
	phsBC.units .multiplier	ENUMERATED			0	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		voltage cut-off level.	R
	phsCA	CMV				R
	phsCA.instCVal	Vector	MX			R
	phsCA.instCVal .mag.f	FLOAT32		SRC # Phase CA Voltage Magnitude		R
	phsCA.instCVal .ang.f	FLOAT32		SRC # Phase CA Voltage Angle	UR range -180...+180 converted to 0...360	R
	phsCA.cVal	Vector	MX			R
	phsCA.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsCA.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	phsCA.units	Unit	CF			R
	phsCA.units .SIUnit	ENUMERATED			29	R
	phsCA.units .multiplier	ENUMERATED			0	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		voltage cut-off level.	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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Phase AB Voltage RMS		R
	mag	AnalogueValue	MX			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			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS PPV.phsAB DEADBAND		R/W/C
	zeroDb	INT32U	CF		voltage cut-off level.	R
VbcRMS		MV			SRC # Phase BC Voltage RMS, in primary volts	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Phase BC Voltage RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS PPV.phsBC DEADBAND		R/W/C
	zeroDb	INT32U	CF		voltage cut-off level.	R
VcaRMS		MV			SRC # Phase CA Voltage RMS, in primary volts	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Phase CA Voltage RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS PPV.phsCA DEADBAND		R/W/C
	zeroDb	INT32U	CF		voltage cut-off level.	R
PhV		WYE			SRC # Phase Voltage phasors, in primary volts	R
	phsA	CMV				R
	phsA.instCVal	Vector	MX			R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase AG Voltage Magnitude		R
	phsA.instCVal.ang .f	FLOAT32		SRC # Phase AG Voltage Angle	UR range -180...+180 converted to 0...360	R
	phsA.cVal	Vector	MX			R
	phsA.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsA.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	phsA.units	Unit	CF			R
	phsA.units.SIUnit	ENUMERATED			29	R
	phsA.units .multiplier	ENUMERATED			0	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		voltage cut-off level.	R
	phsB	CMV				R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsB.instCVal	Vector	MX			R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase BG Voltage Magnitude		R
	phsB.instCVal.ang .f	FLOAT32		SRC # Phase BG Voltage Angle	UR range -180...+180 converted to 0...360	R
	phsB.cVal	Vector	MX			R
	phsB.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsB.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	phsB.units	Unit	CF			R
	phsB.units.SIUnit	ENUMERATED			29	R
	phsB.units .multiplier	ENUMERATED			0	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		voltage cut-off level.	R
	phsC	CMV				R
	phsC.instCVal	Vector	MX			R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase CG Voltage Magnitude		R
	phsC.instCVal.ang .f	FLOAT32		SRC # Phase CG Voltage Angle	UR range -180...+180 converted to 0...360	R
	phsC.cVal	Vector	MX			R
	phsC.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsC.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	phsC.units	Unit	CF			R
	phsC.units.SIUnit	ENUMERATED			29	R
	phsC.units .multiplier	ENUMERATED			0	R
	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		voltage cut-off level.	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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Phase AG Voltage RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS PhV.phsA DEADBAND		R/W/C
	zeroDb	INT32U	CF		voltage cut-off level.	R
VbRMS		MV			SRC # Phase BG Voltage RMS, in primary volts	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Phase BG 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	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS PhV.phsB DEADBAND		R/W/C
	zeroDb	INT32U	CF		voltage cut-off level.	R
VcRMS		MV			SRC # Phase CG Voltage RMS, in primary volts	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Phase CG Voltage RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS PhV.phsC DEADBAND		R/W/C
	zeroDb	INT32U	CF		voltage cut-off level.	R
A		WYE			SRC # Current phasors, in primary amperes	R
	phsA	CMV				R
	phsA.instCVal	Vector	MX			R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Current Magnitude		R
	phsA.instCVal.ang .f	FLOAT32		SRC # Phase A Current Angle	UR range -180...+180 converted to 0...360	R
	phsA.cVal	Vector	MX			R
	phsA.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsA.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	phsA.units	Unit	CF			R
	phsA.units.SIUnit	ENUMERATED			5	R
	phsA.units .multiplier	ENUMERATED			0	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		current cut-off level.	R
	phsB	CMV				R
	phsB.instCVal	Vector	MX			R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Current Magnitude		R
	phsB.instCVal.ang .f	FLOAT32		SRC # Phase B Current Angle	UR range -180...+180 converted to 0...360	R
	phsB.cVal	Vector	MX			R
	phsB.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsB.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	phsB.units	Unit	CF			R
	phsB.units.SIUnit	ENUMERATED			5	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	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		current cut-off level.	R
	phsC	CMV				R
	phsC.instCVal	Vector	MX			R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase C Current Magnitude		R
	phsC.instCVal.ang .f	FLOAT32		SRC # Phase C Current Angle	UR range -180...+180 converted to 0...360	R
	phsC.cVal	Vector	MX			R
	phsC.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsC.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	phsC.units	Unit	CF			R
	phsC.units.SIUnit	ENUMERATED			5	R
	phsC.units .multiplier	ENUMERATED			0	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		current cut-off level.	R
	res	CMV				R
	res.instCVal	Vector	MX			R
	res.instCVal.mag .f	FLOAT32		SRC # Neutral Current Magnitude		R
	res.instCVal.ang .f	FLOAT32		SRC # Neutral Current Angle	UR range -180...+180 converted to 0...360	R
	res.cVal	Vector	MX			R
	res.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	res.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	res.units	Unit	CF			R
	res.units.SIUnit	ENUMERATED			5	R
	res.units .multiplier	ENUMERATED			0	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		current cut-off level.	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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Phase A Current RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			5	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS A.phsA DEADBAND		R/W/C
	zeroDb	INT32U	CF		current cut-off level.	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
AbRMS		MV			SRC # Phase B Current RMS, in primary amperes	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Phase B Current RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			5	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS A.phsB DEADBAND		R/W/C
	zeroDb	INT32U	CF		current cut-off level.	R
AcRMS		MV			SRC # Phase C Current RMS, in primary amperes	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Phase C Current RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			5	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS A.phsC DEADBAND		R/W/C
	zeroDb	INT32U	CF		current cut-off level.	R
AresRMS		MV			SRC # Neutral Current RMS, in primary amperes	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Neutral Current RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			5	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXU# RMS A.neut DEADBAND		R/W/C
	zeroDb	INT32U	CF		current cut-off level.	R
Adif		CMV			SRC # Differential Ground Current phasor, in primary amperes	R
	instCVal	Vector	MX			R
	instCVal.mag.f	FLOAT32		SRC # Differential Ground Current Magnitude		R
	instCVal.ang.f	FLOAT32		SRC # Differential Ground Current Angle	UR range -180...+180 converted to 0...360	R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			5	R
	units.multiplier	ENUMERATED			0	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		current cut-off level.	R
	angRef	ENUMERATED	CF		See UR product manual regarding FREQUENCY AND PHASE REFERENCE	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
W		WYE			SRC # Phase Real Power, in primary watts	R
	phsA	CMV				R
	phsA.instCVal	Vector	MX			R
	phsA.instCVal.mag.f	FLOAT32		SRC # Phase A Real Power		R
	phsA.cVal	Vector	MX			R
	phsA.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsA.units	Unit	CF			R
	phsA.units.SIUnit	ENUMERATED			38	R
	phsA.units.multiplier	ENUMERATED			0	R
	phsA.db	INT32U	CF	MMXU# W.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF		power cut-off level.	R
	phsB	CMV				R
	phsB.instCVal	Vector	MX			R
	phsB.instCVal.mag.f	FLOAT32		SRC # Phase B Real Power		R
	phsB.cVal	Vector	MX			R
	phsB.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsB.units	Unit	CF			R
	phsB.units.SIUnit	ENUMERATED			38	R
	phsB.units.multiplier	ENUMERATED			0	R
	phsB.db	INT32U	CF	MMXU# W.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF		power cut-off level.	R
	phsC	CMV				R
	phsC.instCVal	Vector	MX			R
	phsC.instCVal.mag.f	FLOAT32		SRC # Phase C Real Power		R
	phsC.cVal	Vector	MX			R
	phsC.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsC.units	Unit	CF			R
	phsC.units.SIUnit	ENUMERATED			38	R
	phsC.units.multiplier	ENUMERATED			0	R
	phsC.db	INT32U	CF	MMXU# W.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF		power cut-off level.	R
VAr		WYE			SRC # Phase Reactive Power, in primary VAr	R
	phsA	CMV				R
	phsA.instCVal	Vector	MX			R
	phsA.instCVal.mag.f	FLOAT32		SRC # Phase A Reactive Power		R
	phsA.cVal	Vector	MX			R
	phsA.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsA.units	Unit	CF			R
	phsA.units.SIUnit	ENUMERATED			63	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsA.units .multiplier	ENUMERATED			0	R
	phsA.db	INT32U	CF	MMXU# VAr.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF		power cut-off level.	R
	phsB	CMV				R
	phsB.instCVal	Vector	MX			R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Reactive Power		R
	phsB.cVal	Vector	MX			R
	phsB.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsB.units	Unit	CF			R
	phsB.units.SIUnit	ENUMERATED			63	R
	phsB.units .multiplier	ENUMERATED			0	R
	phsB.db	INT32U	CF	MMXU# VAr.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF		power cut-off level.	R
	phsC	CMV				R
	phsC.instCVal	Vector	MX			R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase C Reactive Power		R
	phsC.cVal	Vector	MX			R
	phsC.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsC.units	Unit	CF			R
	phsC.units.SIUnit	ENUMERATED			63	R
	phsC.units .multiplier	ENUMERATED			0	R
	phsC.db	INT32U	CF	MMXU# VAr.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF		power cut-off level.	R
VA		WYE			SRC # Phase Apparent Power, in primary VA	R
	phsA	CMV				R
	phsA.instCVal	Vector	MX			R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Apparent Power		R
	phsA.cVal	Vector	MX			R
	phsA.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsA.units	Unit	CF			R
	phsA.units.SIUnit	ENUMERATED			61	R
	phsA.units .multiplier	ENUMERATED			0	R
	phsA.db	INT32U	CF	MMXU# VA.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF		power cut-off level.	R
	phsB	CMV				R
	phsB.instCVal	Vector	MX			R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Apparent Power		R
	phsB.cVal	Vector	MX			R
	phsB.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsB.units	Unit	CF			R
	phsB.units.SIUnit	ENUMERATED			61	R
	phsB.units .multiplier	ENUMERATED			0	R
	phsB.db	INT32U	CF	MMXU# VA.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF		power cut-off level.	R
	phsC	CMV				R
	phsC.instCVal	Vector	MX			R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase C Apparent Power		R
	phsC.cVal	Vector	MX			R
	phsC.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsC.units	Unit	CF			R
	phsC.units.SIUnit	ENUMERATED			61	R
	phsC.units .multiplier	ENUMERATED			0	R
	phsC.db	INT32U	CF	MMXU# VA.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF		power cut-off level.	R
PF		WYE			SRC # Phase Power Factor, dimensionless	R
	phsA	CMV				R
	phsA.instCVal	Vector	MX			R
	phsA.instCVal.mag .f	FLOAT32		SRC # Phase A Power Factor		R
	phsA.cVal	Vector	MX			R
	phsA.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsA.units	Unit	CF			R
	phsA.units.SIUnit	ENUMERATED			65	R
	phsA.units .multiplier	ENUMERATED			0	R
	phsA.db	INT32U	CF	MMXU# PF.phsA DEADBAND		R/W/C
	phsA.zeroDb	INT32U	CF		0	R
	phsB	CMV				R
	phsB.instCVal	Vector	MX			R
	phsB.instCVal.mag .f	FLOAT32		SRC # Phase B Power Factor		R
	phsB.cVal	Vector	MX			R
	phsB.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsB.units	Unit	CF			R
	phsB.units.SIUnit	ENUMERATED			65	R
	phsB.units .multiplier	ENUMERATED			0	R
	phsB.db	INT32U	CF	MMXU# PF.phsB DEADBAND		R/W/C
	phsB.zeroDb	INT32U	CF		0	R
	phsC	CMV				R
	phsC.instCVal	Vector	MX			R
	phsC.instCVal.mag .f	FLOAT32		SRC # Phase C Power Factor		R

LNName: ACsrcMMXU#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	phsC.cVal	Vector	MX			R
	phsC.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	phsC.units	Unit	CF			R
	phsC.units.SIUnit	ENUMERATED			65	R
	phsC.units .multiplier	ENUMERATED			0	R
	phsC.db	INT32U	CF	MMXU# PF.phsC DEADBAND		R/W/C
	phsC.zeroDb	INT32U	CF		0	R

Table 3-116: AC signal sources data objects

LNName: ACsrcMMXN#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
Vaux		CMV			SRC # Auxiliary Voltage phasor, in primary volts	R
	instCVal	Vector	MX			R
	instCVal.mag.f	FLOAT32		SRC # Auxiliary Voltage Magnitude		R
	instCVal.ang.f	FLOAT32		SRC # Auxiliary Voltage Angle	UR range -180...+180 converted to 0...360	R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXN# AuxV.db		R/W/C
	dbAng	INT32U	CF	MMXN# AuxV.dbAng		R/W/C
	zeroDb	INT32U	CF		voltage cut-off level.	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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Auxiliary Voltage RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			29	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXN# RMS AuxV DEADBAND		R/W/C
	zeroDb	INT32U	CF		voltage cut-off level.	R
Agnd		CMV			SRC # Ground Current phasor, in primary amperes	R
	instCVal	Vector	MX			R

LNName: ACsrcMMXN#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	instCVal.mag.f	FLOAT32		SRC # Ground Current Magnitude		R
	instCVal.ang.f	FLOAT32		SRC # Ground Current Angle	UR range -180...+180 converted to 0...360	R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			5	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXN# GndCur.db		R/W/C
	dbAng	INT32U	CF	MMXN# GndCur.dbAng		R/W/C
	zeroDb	INT32U	CF		current cut-off level	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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # Ground Current RMS		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			5	R
	units.multiplier	ENUMERATED			0	R
	db	INT32U	CF	MMXN# RMS GndCur DEADBAND		R/W/C
	zeroDb	INT32U	CF		current cut-off level.	R

Table 3-117: 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
SeqA		SEQ			SRC # Sequence Current phasors, in primary amperes	R
	c1	CMV				R
	c1.instCVal	Vector	MX			R
	c1.instCVal.mag.f	FLOAT32		SRC # Positive Sequence Current Magnitude		R
	c1.instCVal.ang.f	FLOAT32		SRC # Positive Sequence Current Angle	UR range -180...+180 converted to 0...360	R
	c1.cVal	Vector	MX			R
	c1.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	c1.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	c1.units	Unit	CF			R
	c1.units.SIUnit	ENUMERATED			5	R
	c1.units .multiplier	ENUMERATED			0	R

LNName: ACsrcMSQI#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	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		current cut-off level.	R
	c2	CMV				R
	c2.instCVal	Vector	MX			R
	c2.instCVal.mag.f	FLOAT32		SRC # Negative Sequence Current Magnitude		R
	c2.instCVal.ang.f	FLOAT32		SRC # Negative Sequence Current Angle	UR range -180...+180 converted to 0...360	R
	c2.cVal	Vector	MX			R
	c2.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	c2.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	c2.units	Unit	CF			R
	c2.units.SIUnit	ENUMERATED			5	R
	c2.units .multiplier	ENUMERATED			0	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		current cut-off level.	R
	c3	CMV				R
	c3.instCVal	Vector	MX			R
	c3.instCVal.mag.f	FLOAT32		SRC # Zero Sequence Current Magnitude		R
	c3.instCVal.ang.f	FLOAT32		SRC # Zero Sequence Current Angle	UR range -180...+180 converted to 0...360	R
	c3.cVal	Vector	MX			R
	c3.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	c3.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	c3.units	Unit	CF			R
	c3.units.SIUnit	ENUMERATED			5	R
	c3.units .multiplier	ENUMERATED			0	R
	c3.db	INT32U	CF	MSQI# Seq0 Cur.db		R/W/C
	c3.dbAng	INT32U	CF	MSQI# Seq0 Cur.dbAng		R/W/C
	c3.zeroDb	INT32U	CF		current cut-off level.	R
	seqT	ENUMERATED	MX		0	R
	phsRef	ENUMERATED	CF		0	R
SeqV		SEQ			SRC # Sequence Voltage phasors, in primary volts	R
	c1	CMV				R
	c1.instCVal	Vector	MX			R
	c1.instCVal.mag.f	FLOAT32		SRC # Positive Sequence Voltage Magnitude		R
	c1.instCVal.ang.f	FLOAT32		SRC # Positive Sequence Voltage Angle	UR range -180...+180 converted to 0...360	R
	c1.cVal	Vector	MX			R
	c1.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	c1.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	c1.units	Unit	CF			R
	c1.units.SIUnit	ENUMERATED			29	R
	c1.units .multiplier	ENUMERATED			0	R

LNName: ACsrcMSQI#		LDevice inst: Meter		UR element: AC Source #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
	c1.db	INT32U	CF	MSQI# Seq1 V.db		R/W/C
	c1.dbAng	INT32U	CF	MSQI# Seq1 V.dbAng		R/W/C
	c1.zeroDb	INT32U	CF		voltage cut-off level.	R
	c2	CMV				R
	c2.instCVal	Vector	MX			R
	c2.instCVal.mag.f	FLOAT32		SRC # Negative Sequence Voltage Magnitude		R
	c2.instCVal.ang.f	FLOAT32		SRC # Negative Sequence Voltage Angle	UR range -180...+180 converted to 0...360	R
	c2.cVal	Vector	MX			R
	c2.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	c2.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	c2.units	Unit	CF			R
	c2.units.SIUnit	ENUMERATED			29	R
	c2.units .multiplier	ENUMERATED			0	R
	c2.db	INT32U	CF	MSQI# Seq2 V.db		R/W/C
	c2.dbAng	INT32U	CF	MSQI# Seq2 V.dbAng		R/W/C
	c2.zeroDb	INT32U	CF		voltage cut-off level.	R
	c3	CMV				R
	c3.instCVal	Vector	MX			R
	c3.instCVal.mag.f	FLOAT32		SRC # Zero Sequence Voltage Magnitude		R
	c3.instCVal.ang.f	FLOAT32		SRC # Zero Sequence Voltage Angle	UR range -180...+180 converted to 0...360	R
	c3.cVal	Vector	MX			R
	c3.cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	c3.cVal.ang.f	FLOAT32			instCVal.ang.f deadbanded	R
	c3.units	Unit	CF			R
	c3.units.SIUnit	ENUMERATED			29	R
	c3.units .multiplier	ENUMERATED			0	R
	c3.db	INT32U	CF	MSQI# Seq0 V.db		R/W/C
	c3.dbAng	INT32U	CF	MSQI# Seq0 V.dbAng		R/W/C
	c3.zeroDb	INT32U	CF		voltage cut-off level.	R
	seqT	ENUMERATED	MX		0	R
	phsRef	ENUMERATED	CF		0	R

3.5.5.3 B90 AC channel metering (B_Mtr)

This element is instantiated in the following products: B90.

Table 3-118: B90 AC channel metering 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	Vector	MX			R
	instCVal.mag.f	FLOAT32		ϕ CURRENT magnitude		R
	instCVal.ang.f	FLOAT32		ϕ CURRENT a	UR range -180...+180 converted to 0...360	R
	cVal	Vector	MX			R

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**
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.i deadbanded	R
	units	Unit	CF			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 3-119: B90 AC channel metering 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	Vector	MX			R
	instCVal.mag.f	FLOAT32		ϕ VOLTAGE magnitude		R
	instCVal.ang.f	FLOAT32		ϕ VOLTAGE a	UR range -180...+180 converted to 0...360	R
	cVal	Vector	MX			R
	cVal.mag.f	FLOAT32			instCVal.mag.f deadbanded	R
	cVal.ang.f	FLOAT32			instCVal.ang.i deadbanded	R
	units	Unit	CF			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
	zeroDb	INT32U	CF	(VOLTAGE CUT-OFF LEVEL) / 275 * 100 000		R

Table 3-120: B90 AC channel metering 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	AnalogueValue	MX			R
	instMag.f	FLOAT32		FREQUENCY		R
	Mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.i deadbanded	R
	Q	Quality	MX	See document IMD - Quality		R
	units	Unit	CF			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		0	R
TrcHz		MV			Tracking Frequency in Hz	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		TRACKING FREQUENCY		R
	Mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.i deadbanded	R
	Q	Quality	MX	See document IMD - Quality		R
	T	TimeStamp	MX	Relay UTC time at last value change of mag.i or q		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**
	Units	Unit	CF			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		0	R

3.5.5.4 Demand metering (DmdMtr)

This element is instantiated in the following products: C60, F35, F60, L90, N60, T60.

Table 3-121: 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	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	DmdMtrMMTR1.RsStat.ctlModel		R/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
AaDmd		MV			SRC # DMD IA, in primary amperes	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD IA		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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/C
	zeroDb	INT32U	CF		Current cut-off level	R
AaMaxDmdDt		MV			SRC # DMD IA MAX, in primary amperes with associated date, SRC # DMD IA DATE	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD IA MAX		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**
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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#.AaMaxDmdDt.db		R/C
	zeroDb	INT32U	CF		Current cut-off level	R
AbDmd		MV			SRC # DMD IB, in primary amperes	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD IB		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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/C
	zeroDb	INT32U	CF		Current cut-off level	R
AbMaxDmdDt		MV			SRC # DMD IB MAX, in primary amperes with associated date, SRC # DMD IB DATE	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD IB MAX		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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#.AbMaxDmdDt.db		R/C
	zeroDb	INT32U	CF		Current cut-off level	R
AcDmd		MV			SRC # DMD IC, in primary amperes	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD IC		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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/C
	zeroDb	INT32U	CF		Current cut-off level	R
AcMaxDmdDt		MV			SRC # DMD IC MAX, in primary amperes with associated date, SRC # DMD IC DATE	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD IC MAX		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			5, the code for primary amperes	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**
	db	INT32U	CF	DmdMtrMMTR#.AcMaxDmdDt.db		R/C
	zeroDb	INT32U	CF		Current cut-off level	R
WDmd		MV			SRC # DMD W, in primary watt	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD W		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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/C
	zeroDb	INT32U	CF		Power cut-off level	R
WMaxDmdDt		MV			SRC # DMD W, in primary watt, with associated date, SRC # DMD W DATE	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD W MAX		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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#.WMaxDmdDt.db		R/C
	zeroDb	INT32U	CF		Power cut-off level	R
VArDmd		MV			SRC # DMD VAR, in primary volt ampere reactive	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD VAR		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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/C
	zeroDb	INT32U	CF		Power cut-off level	R
VArMaxDmdDt		MV			SRC # DMD VAR, in primary volt ampere reactive, with associated date, SRC # DMD VAR DATE	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD VAR MAX		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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#.VArMaxDmdDt.db		R/C
	zeroDb	INT32U	CF		Power cut-off level	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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD VA		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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/C
	zeroDb	INT32U	CF		Power cut-off level	R
VAMaxDmdDt		MV			SRC # DMD VA, in primary volt ampere, with associated date, SRC # DMD VA DATE	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # DMD VA MAX		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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#.VAMaxDmdDt.db		R/C
	zeroDb	INT32U	CF		Power cut-off level	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 3-122: 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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # POS WATTHOUR		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # NEG WATTHOUR		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			72, the code for real energy in watt hours (Wh)	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.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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # T POS VARHOUR		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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	AnalogueValue	MX			R
	instMag.f	FLOAT32		SRC # NEG VARHOUR		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32			instMag.f deadbanded	R
	units	Unit	CF			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#.NegTotVArh.db		R/W/C
RsStat		SPC			Only instantiated in EnrMtrMMTR1	R/Ctrl
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			0 indicates the duration is locally defined	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	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		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	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

3.5.6 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)

LLN0 is instantiated in all UR series devices implementing the Gen logical device.

Table 3-123: 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 behaviour	R
		INS				R
	stVal	ENUMERATED	ST			R
						R
	stVal	ENUMERATED	ST	LLN0.Beh.stVal of the Master logical device		R
						R
Health		ENS			Only instantiated in the Master logical device	R
		INS				R
	stVal	ENUMERATED	ST	LPHD1.PhyHealth.stVal		R
						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			0.0	R
Mod		ENC			Only instantiated in the Master logical device	R/Ctrl
		INC				R
	ctlVal	ENUMERATED	CO			R
		ENUMERATED	CO			R
	stVal	ENUMERATED	ST			R
		ENUMERATED	ST			R
		ENUMERATED	ST		1 (on)	R
	ctlModel	CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF	LLN0.Mod.ctlModel		R/C
		CtlModels	CF		0 (status only)	R
	sboTimeout	INT32U	CF		30000	R
		INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
		SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
GrRef		ORG			Reference to root logical device	R
		GEORG				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
		VISIBLE STRING255	SP			R

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**
	cdcNs	VISIBLE STRING255	EX	Name of the GE Multilin namespace at the time of this firmware release		R
	cdcName	VISIBLE STRING255	EX	GEORG		R
MltLev		SPG			Instantiated only in the Master logical device	R
	setVal	BOOLEAN	SP			R
<TTΣDataSet##>		DATA-SET				R
	DSMemberRef[η]	ObjectReference		DataSet Member η		R/C

3.5.6.2 Data logger (DatLog)

This element is instantiated in the following products: C30, C60, C70, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Table 3-124: 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		0 if data logger is cleared, 1 once a sample has been recorded.	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			0 (pulse)	R
	pulseConfig.onDur	INT32U			2 ms (actually one pass)	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	DatLogRDRE1.MemClr.ctlModel		R/W/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	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

3.5.6.3 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 3-125: 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
EqLim		SPS			Counter #(CNT#) EQL operand, which indicates the number of pulses counted is equal to the set numbe	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
CntRs		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		1	R
	frEna	BOOLEAN	CF			R
	strTm	TimeStamp	CF		0	R
	frPd	INT32	CF		0	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

3.5.6.4 Digital elements (DigEl)

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 3-126: 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 that Op operates 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 that the element drops 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

3.5.6.5 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 3-127: 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 OP	R
	stVal	BOOLEAN	ST	FxE # DPO		R
OpSig		MV			FLEXELEMENT # OpSig, in per unit	R
	instMag	AnalogueValue	MX			R
	instMag.f	FLOAT32		FLEXELEMENT # OpSig		R
	mag	AnalogueValue	MX			R
	mag.f	FLOAT32		FLEXELEMENT # OpSig on deadband exception		R
	units	Unit	CF			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		0	R

LNName: FlxElGAPC#		LDevice inst: Gen		UR element: FlexElement element #		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
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
	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

3.5.6.6 FlexLogic, FlexLogic timers, and virtual outputs (FlxLgc)

This element is instantiated all UR products (B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60).

Table 3-128: FlexLogic data objects

LNName: FlxLgcGAPC1		LDevice inst: Gen		UR element: FlexLogic		
data obj.	**data attribute**	**Type**	**FC**	**UR Name**	**Description**	**R/W/C**
Health		ENS			FLEXLOGIC ERR TOKEN self-test	R
	stVal	ENUMERATED	ST	FLEXLOGIC ERR TOKEN, 1 (Ok) when operand is Off, 3 (Alarm) when operand is On		R
Indξ		SPS			Concatenation of value of VIRTUAL OUTPUT ξ ID + " On (VOξ) operand value	R
	stVal	BOOLEAN	ST	VOξ On		R
Idξ		VSG			This setting is used to describe virtual output ξ	R
	setVal	VISIBLE STRING255	SP	The first twelve characters are mapped to setting VIRTUAL OUTPUT ξ ID		R

3.5.6.7 Non-volatile latches (NVLat)

This element is instantiated in all UR products (B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60).

Table 3-129: 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

3.5.6.8 Oscillography (Osc)

This element is instantiated in all UR products (B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60).

Table 3-130: Oscillograph 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**
Mod		INC			This logical node's mode	R/Ctrl
	stVal	INT32	ST		1 (on)	R
	ctlModel	CtlModels	CF		0 (status only)	R
Health		INS			This logical node's health	R
	stVal	INT32	ST	LPHD1.PhyHealth.stVal		R
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	Unit	CF			R
	units.SIUnit	ENUMERATED			1	R
	units.multiplier	ENUMERATED			0	R
NumCycPer		INS			CYCLES PER RECORD actual value	R
	stVal	INT32	ST	actual value CYCLES PER RECORD		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			1	R
	units.multiplier	ENUMERATED			0	R
RsTms		INS			LAST CLEARED DATE actual value	R
	stVal	INT32	ST	actual value LAST CLEARED DATE		R
	units	Unit	CF			R
	units.SIUnit	ENUMERATED			4	R
	units.multiplier	ENUMERATED			0	R
RcdTrg		SPC			External command to trigger recorder	R/Ctrl
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			2	R
	pulseConfig .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	OscRDRE1.RcdTrg.ctlModel		R/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R
MemClr		SPC			Clear all oscillography records command	R/Ctrl
	pulseConfig	PulseConfig	CF			R
	pulseConfig .cmdQual	ENUMERATED			0 (pulse)	R
	pulseConfig.onDur	INT32U			2	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 .offDur	INT32U			0	R
	pulseConfig .numPls	INT32U			1	R
	ctlModel	CtlModels	CF	OscRDRE1.MemClr.ctlModel		R/W/C
	sboTimeout	INT32U	CF		30000	R
	sboClass	SboClasses	CF		0 (operate-once)	R
	operTimeout	INT32U	CF		0	R

3.5.6.9 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 3-131: 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

3.5.7 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:2013A"

Table 3-132: GE namespace

Data object name	CDC	Semantics	Used in logical nodes...
AaDmd	MV	Phase A demand	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.	DmdMtrMMTR
AaRMS	MV	Phase A current RMS	ACsrcMMXU
AbDmd	MV	Phase B demand	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.	DmdMtrMMTR
AbRMS	MV	Phase B current RMS	ACsrcMMXU
AcDmd	MV	Phase C demand	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.	DmdMtrMMTR
AcRMS	MV	Phase C current RMS	ACsrcMMXU
AddDlTmcs1	ING	This setting establishes the extent of the additional dead time	Rec3pRREC
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.	ACsrcMMXU
Agnd	CMV	Ground current (fourth input in a current AC bank)	ACsrcMMXN
AgndRMS	MV	Ground current RMS (fourth input in a current AC bank)	ACsrcMMXN
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
AnyErr	SPS	Any of the self-test errors generated	LPHD
AnyGpsFail	SPS	The GPS signal failed or is not configured properly at any terminal	LinDfPDIF
AnyPoleOpn	SPS	At least one pole is open	Bkr?XCBR
AnyShotCnt	SPS	The first breaker close signal has been issued	Rec13pRREC
APPID	ING	Expected value of APPID field in messages subscribed to by RxGOOSE#	LGOS
ArBlk1	SPS	Autoreclose Breaker number indicated by the data instance number is temporarily disabled	Rec3pRREC, Rec13pRREC
AresRMS	MV	Residual Current RMS	ACsrcMMXU
ArLO	SPS	Autoreclose is locked out	Rec3pRREC, Rec13pRREC
ArMod1	SPS	Autoreclosec mode equals to the number indicated by the data instance number, in this case 1 and 3 pole mode	Rec13pRREC
ArRip	SPS	Autoreclose is in progress	Rec3pRREC, Rec13pRREC
ASupn	SPS	Indicates the state of current supervision	PhsDisPDIS
Asymmetry	SPS	Communications channel asymmetry detected	LinDfPDIF
BadSt1	SPS	Bad-status detected	Bkr?XCBR, Disc0XSWI, Disc?XSWI, GGIO3
BatFail	SPS	The battery is not functioning	LPHD
BDifAClc	CMV	B90 differential current	B_DifPDIF

Data object name	CDC	Semantics	Used in logical nodes...
BkrBlkdMod1	ENG	Action to take when process is blocked: 0 = stop, 1 = use-alternate	Rec13pRREC
BkrOp1	SPS	Breaker failure status information operands	BkrFaRBRF, B_BFaiRBRF
BkrSeq	ENG	Breaker sequence setting: 0 = reclose-breaker-1-only, 1 = reclose-breaker-2-only, 2 = reclose-both breakers-simultaneously, 3 = reclose-breaker-1-then-2 – 2, 4 = reclose-breaker-2–then-1	Rec13pRREC
BkrSeqTmcs	ING	Time between closing the lead breaker and the second breaker	Rec13pRREC
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)	PctDifPDIF1
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)	PctDifPDIF1
BlkH1	SPS	The second harmonic of the transformer magnetizing inrush current has inhibited the current differential element from operating	LinDfPDIF (L90)
BlkMod1	ENG	Action to take when breaker is blocked: 0 = stop, 1 = use-alternate	Rec13pRREC
BlkTmcs	ING	Duration reclose is blocked after an associated circuit breaker is manually commanded to close	Rec13pRREC
BrckTrbl	SPS	Brick trouble	LPHD
BRstA	CMV	B90 restraint current	B_DifPDIF
ChA	CMV	B90's AC channel current	B_AmpMMXN
ChFail1	SPS	Communications channel failed	LinDfPDIF
ChV	CMV	B90's AC channel voltage	B_VolMMXN
ClkUnsynch	SPS	Relay is not synchronized to the international time standard	LPHD
Cls2ndBkr	SPS	Close second Breaker signal	Rec13pRREC
ClsBkrTmcs1	ING	Closing time of breaker in centiseconds	Rec13pRREC
ClsFailMod1	ENG	Action to take when process fails to respond to a close signal: 0 = use-alternate, 1 = stop	Rec13pRREC
ClsPlsTmms	ING	Close pulse duration in milliseconds	Bkr?XCBR
ClsSt1	SPS	Close status detected	Bkr?XCBR, Disc0XSWI, Disc?XSWI, GGIO3
ConfRev	ING	Expected value of confRev field in messages subscribed to by RxGOOSE#	LGOS
Connection	ENG	Auxiliary AC input connection: 0 = Vn, 1 = Vag, 2 = Vbg, 3 = Vcg, 4 = Vab, 5 = Vbc, 6 = Vca	ACinTVTR
CrcFail1	SPS	The CRC error threshold has been exceeded	LinDfPDIF
DbMax1	ASG	Value of "max." in deadband calculations	GGIO4
DbMin1	ASG	Value of "min." in deadband calculations	GGIO4
DeadEx1Tmcs	ING	This timer is used to set the length of the dead time 1 extension for possible non-simultaneous tripping of the two ends of the line	Rec13pRREC
DeaV1	SPS	This data object indicates that V1 is below the DeaVal1 setting.	SynChkRSYN
DifA2ndH	WYE	Differential current	PctDifPDIF1
DifA5thH	WYE	Differential current	PctDifPDIF1
DirSupn	SPS	Directional overcurrent supervision status	GndDisPDIS
Disabled	SPS	Function is disabled	Rec3pRREC, Rec13pRREC
DistDet	SPS	Sensitive current disturbance detector. For PwrSwgRPSB1, power swing element detected disturbance other than power swing.	LinDfPDIF, PwrSwgRPSB1

Data object name	CDC	Semantics	Used in logical nodes...
Dpo	SPS	Inverse of Str	AgeSPTR1, AuxOvPTOV, AuxUvPTUV, B_IocPIOC, B_EfpPIOC, B_TocPTOC, B_UvPTUV, BusDifPDIF, CmpOvPTOV, DigElGAPC, FlxElGAPC, GndIocPIOC, GndTocPTOC, HPTmpSPTR1, LinPkpPIOC, NegIocPIOC, NegOvPTOV, NegTocPTOC, NeuIocPIOC, NeuTocPTOC, NeuOvPTOV, OvHzPTOF, PhsIocPIOC, PhsOvPTOV, PhsTocPTOC, PhsUvPTUV, RgDifPDIF, RteHzPFRC, SenPDOP,Sen1PDOP, Sen2PDOP, UnHzPTUF, VpHzPVPH, VtffGAPC
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)	PhsTocPTOC, PhsIocPIOC, PhsOvPTOV, B_TocPTOC, BusDifPDIF, GndDisPDIS, PhsDisPDIS, PhsIocPIOC, PhsTocPTOC, PhsUvPTUV, SttDifPDIF
DrcDevOff	SPS	A direct device is configured but not connected	LPHD
DrcRingBrk	SPS	The Direct I/O settings is for a ring but the connection is not in a ring	LPHD
DscDlTmms	ING	Time delay in milliseconds allowed with discrepant pole position till discrepancy is declared	Bkr?XCBR
Ena1	SPS	Function is Enabled	Rec3pRREC, Rec13pRREC
EqLim	SPS	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	LPHD
EvtEna1	ENG	Setting to enable generation of events in event record, 0 = Disabled, 1 = Enabled	Rec3pRREC, Rec13pRREC, AuxOvPTOV, AuxUvPTUV, B_IocPIOC, B_TocPTOC, Bkr?XCBR, BkrFaRBRF, GGIO3, NegDocRDIR
EvtRcdClr	SPC	Clear Event Records (erase all Events). The CLEAR EVENT RECORDS command.	Master/LLN0

Data object name	CDC	Semantics	Used in logical nodes...
FlexErrTkn	SPS	A FlexLogic equation is incorrect	LPHD
FltLinID	VSS	Faulted line ID	FltRFLO
FrstEthFail	SPS	First Ethernet failure	LPHD
Function1	ENG	Function Enable/Disable setting: 0 = Disabled, 1 = Enabled (note that TISSUE 670 suggests something like this named SetMod)	Rec3pRREC, Rec13pRREC, AuxOvPTOV, AuxUvPTUV, B_IocPIOC, B_TocPTOC, Bkr?XCBR, Master/ LLN0, GGIO2, TrBusPTRC
FwdOp	SPS	Fault direction is forward	NegDocRDIR, NeuDocRDIR
GoDatSetRef	ORG	Expected value of datSet field in messages subscribed to by RxGOOSE#	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#	LGOS
GpsFail1	SPS	GPS failed at terminal corresponding to instance number	LinDfPDIF
GrAct1	SPS	Setting group corresponding to index is active	Master/LLN0 (not in C30)
HzChgRte	MV	Frequency rate of change measured value	RteHzPFRC
Id1	VSG	Name setting	ACsrcMMXU, Bkr?XCBR, FlxLgcGAPC, GGIO2
IdFail1	SPS	ID check for a peer L30/L90 on the channel 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
IndPos	DPS	Generic remote DPS input status values: 0 for intermediate-state, 1 for off, 2 for on, 3 for bad-state	GGIO3
InitMod	ENG	Initiate mode setting: 0 = Protection and CB, 1 = Protection Only	Rec13pRREC
IntermSt1	SPS	Intermediate-status detected	Bkr?XCBR, Disc?XSWI, GGIO3
IrigbFail	SPS	A bad IRIG-B input signal has been detected	LPHD
IsoBlk	ACT	B90 - Indicates that the isolator position is invalid	B_IsoSSWI
IsoPos	ACT	B90 - Indicates position of isolator. When "On", the related current is included in differential zone; when "Off", the current is excluded from differential calculations.	B_IsoSSWI
LastSqNum	INS	Last sequence number received	LGOS
LatchErr	SPS	A difference is detected between the desired and actual latch contact state	LPHD
LeoSt	SPS	Line end open status	LinPkpPIOC
LivDea	SPS	This data object indicates that live/dead conditions have been met	SynChkRSYN
LivDeaDpo	SPS	This data object 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	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	SynChkRSYN
LivV1	SPS	This data object indicates that V1 is above the LivVal1 setting	SynChkRSYN
LosLife	MV		LosLifSPTR1
LosLifeRte	MV		LosLifSPTR1
LosPkt1	SPS	The lost packet threshold has been exceeded	LinDfPDIF
MAC	VSG	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)	LPHD

Data object name	CDC	Semantics	Used in logical nodes...
MaxAsymOp1	SPS	Asymmetry on the channel exceeded pre-set value	LinDfPDIF
MinorErr	SPS	Any of the minor self-test errors generated (minor error)	LPHD
MnlCls	SPS	Manual close initiated	Bkr?XCBR
NegTotVArh	MV	Total VAr-hour in negative direction	EnrMtrMMTR
NegTotWh	MV	Total Watt-hour in negative direction	EnrMtrMMTR
NeutOpn	SPS	Indicates source has lost voltage signal	VtffGAPC
NeutSupn	SPS	Neutral overcurrent supervision status	GndDisPDIS
NumCycPer	INS	Number of cycles of the nominal frequency	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	Bkr?XCBR
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
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
OpnSt1	SPS	Open status detected	Bkr?XCBR, Disc0XSWI, Disc?XSWI, GGIO3
OpPhs1	SPS	Indicates a trip decision for a particular cause per phase	BusDifPDIF, PhsDisPDIS
OpSig	MV	Operating signal, the analogue value used by the comparator	FlxElGAPC
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	LPHD
OutOfSrv	SPS	Out-of-service	Bkr?XCBR
P1Rip	SPS	Autoreclose A single pole is in progress	Rec13pRREC
P3Rip1	SPS	Autoreclose 3-pole is in progress via dead time number indicated by the data instance number	Rec13pRREC
P3Tr	SPS	Force any trip to 3-phase trip	Rec13pRREC
PbCtl	ENG	Front panel pushbutton control Enable/Disable setting: 0 = Disabled, 1 = Enabled	Bkr?XCBR
PFLLfail	SPS	Phase and/or 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	B_DifPDIF, BusDifPDIF, SttDifPDIF
PosTotVArh	MV	Total VAr-hour in positive direction	EnrMtrMMTR
PosTotWh	MV	Total Watt-hour in positive direction	EnrMtrMMTR
ProcBusFail	SPS	Process bus system status	LPHD
ProcBusTrbl	SPS	Process Bus Trouble	LPHD
PtpFail	SPS	Bad PTP Signal	LPHD
RecMod	ENG	AR Mode setting: 1 = 1 and 3 Pole, 2 = 1 Pole, 3 = 3 Pole-A, 4 = 3 Pole-B	Rec13pRREC
RefWinding	INS	Reference winding	PctDifPDIF1
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.	SynChkRSYN
RrtdComFail	SPS	RRTD communication failure	LPHD
Rs	SPS	Autoreclose has been reset either manually or by the rest timer	Rec13pRREC
RsLO1	ENG	Reset lockout on condition setting: 0 = Off, 1 = On, in this case on Breaker Closed condition	Rec3pRREC

Data object name	CDC	Semantics	Used in logical nodes...
RsLOTmcs	ING	This setting establishes how long the breaker stays closed after a manual close command, in order for the autorecloser to reset from lockout	Rec3pRREC
RsTms	INS	The UTC time of the last clear in seconds elapsed since 00:00:00 January 1, 1970	OscRDRE
RtdTrbl	SPS	RTD Trouble	LPHD
RvOp	SPS	Fault direction is reverse	NegDocRDIR, NeuDocRDIR
RxGooseOff	SPS	One or more RxGOOSE is not responding	LPHD
Sat1	SPS	Indicates CT saturation is detected. For SttDifPDIF, indicates phase saturation of differential is detected per phase.	B_DifPDIF, SttDifPDIF
Sat1	SPS	Indicates CT saturation is detected per phase (where the last digit of instance number 1, 2, or 3 refers to phase A, B, and C respectively)	BusDifPDIF
SecEthFail	SPS	Second Ethernet failure	LPHD
SeqDlTmcs	ING	Time interval allowed for a single reclose shot. Timing is started whenever reclose shot is initiated and is active until a breaker closed signal is sent.	Rec3pRREC, Rec13pRREC
SeqTO	SPS	The incomplete sequence timer timed out	Rec13pRREC
ShotCnt1	SPS	Autoreclosec # shot count is equal to the number indicated by the data instance number	Rec3pRREC
ShotCnt1	SPS	Autoreclosec shot count is equal to the number indicated by the data instance number	Rec13pRREC
SntpFail	SPS	SNTP server is not responding	LPHD
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	PwrSwgRPSB1
StrPhs	SPS	Indicates the detection of a fault or an unacceptable condition on a particular phase-to-phase loop	PhsDisPDIS
StrRec3p	SPS	Initiate a three-pole reclose	TrOutPTRC
StrZ2GndDl	SPS	Start zone 2 ground timer	TrOutPTRC
StrZ2PhDl	SPS	Start zone 2 phase timer	TrOutPTRC
StTyp	ENG	Switch input status type: 0 = 3-Pole (i.e. not independent pole status), 1 = 1-Pole (i.e. three independent pole status)	Bkr?XCBR,
StubBusOp	SPS	The stub bus function is operated	LinDfPDIF
SwFail	SPS	Autoreclose mode switching failed	Rec13pRREC
SysExcp	SPS	System exception	LPHD
TdrTrbl	SPS	TDR Trouble	LPHD
TempMnt	SPS	The ambient temperature is greater than the maximum operating temperature	LPHD
TgtEna1	ENG	Enable generation of targets (front panel display messages) setting: 0 = Self-reset, 1 = Latched, and 2 = Disabled	AuxOvPTOV, AuxUvPTUV, B_IocPIOC, B_TocPTOC, BkrFaRBRF
ThrdEthFail	SPS	Third Ethernet failure	LPHD
TmChgOp1	SPS	Change in round trip delay on the channel exceeded pre-set value	LinDfPDIF
TmStr1	SPS	Power swing timer picked up	PwrSwgRPSB1
ToOilTmp	MV	Indicates top oil temperature	HPTmpSPTR1
Tr1p	ACT	Single pole trip operation initiated	LinDfPDIF (L90), TrOutPTRC

Data object name	CDC	Semantics	Used in logical nodes...
Tr3p	ACT	Three pole trip operation initiated	DCB_PSCH, DCB1_PSCH, DCUB_PSCH, DUTT_PSCH, HPOTT_PSCH, LinDfPDIF (L90), POTT_PSCH, POTT1_PSCH, PUTT_PSCH, TrOutPTRC
Tr3pFrcd	SPS	Three pole trip mode is being forced	TrOutPTRC
TrcHz	MV	B90 frequency	B_MtrMMXN
Tx1	SPS	Transmit signal	DCUB_PSCH, DUTT_PSCH, HPOTT_PSCH, POTT_PSCH, POTT1_PSCH, PUTT_PSCH
TxStop1	SPS	Transmit signal stop	DCB_PSCH, DCB1_PSCH
UnA	SPS	Undercurrent pickup	LinPkpPIOC
UNotPrgm	SPS	The Product Setup > Installation > Relay Settings setting is not programmed	LPHD
UnV	SPS	Undervoltage pickup	LinPkpPIOC
UpdateTms	ING	Periodic update time	Master/LLN0
VabRMS	MV	Phase AB Voltage RMS	ACsrcMMXU
VADmd	MV	Apparent power demand in VA	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.	DmdMtrMMTR
VArDmd	MV	Reactive power demand in VAR	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.	DmdMtrMMTR
VaRMS	MV	Phase A Voltage RMS	ACsrcMMXU
Vaux	CMV	Auxiliary voltage (fourth input in a voltage AC bank)	ACsrcMMXN
VauxRMS	MV	Auxiliary voltage RMS (fourth input in a voltage AC bank)	ACsrcMMXN
VbcRMS	MV	Phase BC Voltage RMS	ACsrcMMXU
VbRMS	MV	Phase B Voltage RMS	ACsrcMMXU
VcaRMS	MV	Phase CA Voltage RMS	ACsrcMMXU
VcRMS	MV	Phase A Voltage RMS	ACsrcMMXU
VoltMntr	SPS	Voltage Monitor	LPHD
VSigLos	SPS	Indicates source has lost voltage signal	VtffGAPC
Watt	MV	Real power in a non-three-phase circuit. In this case it is the average of 3I0 times (phase shifted 3Vo), which is not exactly real power.	WattPSDE
WDmd	MV	Power demand in Watts	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.	DmdMtrMMTR
WyeDelta	ENG	Connection arrangement of voltage transformers: 0 = wye, 1 = delta	ACinTVTR
Z1Chr1	SPS	Positive-sequence impedance is within the configured characteristic. This Data Object is used by power swing detection element for outer characteristic.	PwrSwgRPSB1
Zero	MV	Analog 0 fixed operand	Master/LLN0
Zn1Extend	SPS	The zone 1 distance function must be set to the extended overreach value	Rec13pRREC
Zn2Tr	SPS	Operated from overreaching zone 2 when reclosing the line	LinPkpPIOC

3.6 SCL implementation conformance statement (SICS)

The table outlines conformance to the Substation Configuration Language (SCL).

Table 3-133: SCL conformance statement

		UR	UR Setup	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**	
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			
I26	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	

		UR	UR Setup	Value/comments
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 with firmware version 7.3 and later.

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 3-134: PIXIT for Association model

ID	Ed	Description	Value / Clarification
As2	1,2	TCP_KEEPALIVE value. The recommended range is 1..20s.	7200 seconds
As3	1,2	Lost connection detection time	120 seconds (if there is no MMS traffic for this time, the connection is dropped)
As5	1,2	What association parameters are necessary for successful association?	Transport selector Y Session selector Y Presentation selector Y AP Title N AE Qualifier N
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 64000 Min MMS PDU size 13000
As8	1,2	What is the maximum start up time after a power supply interrupt?	120 seconds

Table 3-135: PIXIT for Server model

ID	Ed	Description	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 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

Table 3-136: PIXIT for Setting group control model

ID	Ed	Description	Value / Clarification
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
Sg6	2	When ResvTms is not present how long is an edit setting group locked?	60 seconds

Table 3-137: PIXIT for Reporting model

ID	Ed	Description	Value / Clarification
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
Rp7	1,2	What is the buffer size for each BRCB or how many reports can be buffered?	Buffer size = 36864 bytes
Rp10	1,2	What is the scan cycle for binary events? Is this fixed, configurable?	1/8 cycle (2.0 ms @60 Hz, 2.5 ms @50 Hz) Fixed
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

Table 3-138: PIXIT for GOOSE publish model

ID	Ed	Description	Value / Clarification
Gp1	1,2	Can the test (Ed1) / simulation (Ed2) flag in the published GOOSE be set?	Y The "S" bit in the GOOSE "Reserved 1" word is not set.
Gp3	1,2	Published FCD supported common data classes are	All instantiated FCDs Arrays are not supported
Gp4	1,2	What is the slow retransmission time? Is it fixed or configurable?	1000 to 60000 ms Configured by SCL
Gp5	1,2	What is the fastest retransmission time? Is it fixed or configurable?	2 to 100 ms Configured by SCL
Gp7	1,2	What is the initial GOOSE sqNum after restart?	sqNum = 1

Table 3-139: PIXIT for GOOSE subscribe model

ID	Ed	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 may be removed by a Ethernet switch and shall not be checked • The simulation flag shall always be checked (Ed2) • The ndsCom shall always be checked (Ed2)	Y destination MAC address Configurable APPID Y gocbRef Y timeAllowedtoLive Configurable datSet Configurable goID N t Y stNum N sqNum Y simulation / test Configurable 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)	a) Message does not arrive prior to TAL
Gs3	1,2	What is the behavior when one or more subscribed GOOSE messages isn't 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 assigned to default values
Gs4	1,2	What is the behavior when a subscribed GOOSE message is out-of-order?	Sequence number is ignored. State number is checked for proper order.
Gs5	1,2	What is the behavior when a subscribed GOOSE message is duplicated?	Sequence number is ignored
Gs8	1,2	Subscribed FCD supported common data classes are...	None. Arrays are not supported.
Gs9	1,2	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode?	Y

Table 3-140: PIXIT for GOOSE performance

ID	Ed	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.	

Table 3-141: PIXIT for Control model

ID	Ed	Description	Value / Clarification
Ct2	1,2	Is the control model fixed, configurable and/or dynamic?	Fixed, Configurable, or Dynamic depending on the particular control point

ID	Ed	Description	Value / Clarification
Ct9	1,2	Which additional cause diagnosis are supported?	N Unknown Y Not-supported Y Blocked-by-switching-hierarchy Y Select-failed Y Invalid-position Y Position-reached N Parameter-change-in-execution 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 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
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" shall be 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?	DOns: N SBOns: N DOes: N SBOes: N Configurable N
Ct18	1,2	Is for SBOes the internal validation performed during the SelectWithValue and/ or Operate step?	SelectWithValue and Operate
Ct20	1,2	Does the IED support local / remote operation?	Y

ID	Ed	Description	Value / Clarification
Ct21	1,2	Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security?	SBOns: N DOns: N
Ct22	2	How to force a "parameter-change-in-execution"	SBOns: Not possible SBOes: Not possible

Table 3-142: PIXIT for Time synchronization model

ID	Ed	Description	Value / Clarification
Tm1	1,2	What time quality bits are supported (may be set by the IED)?	N LeapSecondsKnown N ClockFailure Y ClockNotSynchronized
Tm2	1,2	Describe the behavior when the time server(s) ceases to respond. What is the time server lost detection time?	On one time server: Internal clock is used. On all time servers: Internal clock is used. 50 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
Tm5	1,2	When is the time quality bit "Clock not Synchronized" set?	When connection to all time servers is lost (see PIXIT-Tm2)
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 (meaning not configurable)

Table 3-143: PIXIT for File transfer model

ID	Ed	Description	Value / Clarification
Ft2	1,2	Directory names are separated from the file name by	"/"
Ft4	1,2	Are directory/file name case sensitive?	Not case sensitive
Ft5	1,2	Maximum file size for SetFile	16 megabytes
Ft8	1,2	Is it allowed that two clients get a file at the same time?	N same file Y different files

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 section applies to URs with firmware versions 7.30 and later.

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)

Tissues 675, 735, 772, 775, 776, and 878 are not relevant for conformance testing.

Notes follow the tables.

Table 3-144: Part 6 Tissues

Part 6 Tissue	Description	Implemented by server?
658	Tracking related features	na
663	FCDA element cannot be a "functionally constrained logical node"	Y
668	Autotransformer modeling	Y
719	ConfDataSet - maxAttributes definition is confusing	Y
721	Log element name	na
768	bType VisString65 is missing	na
779	object references	Y
788	SICS S56 from optional to mandatory	na
789	ConfLdName as services applies to both server and client (supportsLdname)	Y
804	valKind and IED versus System configuration (valimport)	na
806	Max length of log name inconsistent between -6 and -7-2	na
807	Need a way to indicate if "Owner" present in RCB	Y
822	Extension of IED capabilities	Y
823	ValKind for structured data attributes	na
824	Short addresses on structured data attributes	na
825	Floating point value	Y
845	SGCB ResvTms	Y
853	SBO and ProtNs	Y
855	Recursive SubFunction	na
856	VoltageLevel frequency and phases	ni
857	Function/SubFunction for ConductingEquipment	na
886	Missing 8-1 P-types	na
901	tServices as AP or as IED element	Y
936	SupSubscription parameter usage is difficult	Y
1175	IPv6 address lowercase only	na

Table 3-145: Part 7 Tissues

Part 7 Tissue	Description	Implemented by server?
Part 7-1		
828	Data model namespace revision IEC 61850-7-4:2007[A]	Y
1151	Simulated GOOSE disappears after 1st appearance when LPHD.Sim = TRUE	Y
1196	Extensions to standardized LN classes made by third parties Note: this tissue is not final yet	Y
Part 7-2		
778	AddCause values – add value notsupported	Y
780	What are unsupported trigger option at a control block?	Y
783	TimOper Resp- ; add Authorization check	na
786	AddCause values 26 and 27 are switched	Y
820	Mandatory ACSI services (use for PICS template)	Y
858	Typo in enumeration ServiceType	ni
861	dchg of ConfRev attribute	na

Part 7 Tissue	Description	Implemented by server?
876	GenLogiclNodeClass and SGCB, GoCB, MsvCB, UsvCB	Y
1038	Loss of Info Detection After Resynch	Y
1062	Entrytime not used in CDC	Y
1071	Length of DO name	Y
1091	The sentence "The initial value of EditSG shall be 0", has to be stated in part 7.2 not in 8.1	Y
1127	Missing owner attribute in BTS and UTS	na
1163	Old report in URCB	Y
1202	GI not optional	Y
Part 7-3		
697	Persistent command / PulseConfig	Y
698	Wrong case is BAC.dB attribute	na
722	Units for 'h' and 'min' not in UnitKind enumeration.	Y
919	Presence Condition for sVC	Y
925	Presence of i or f attribute - Problem with writing	na
926	Presence Conditions within RangeConfig	na
Part 7-4		
671	Mistake in definition of Mod & Beh	Y
674	CDC of ZRRC.LocSta is wrong	na
675	SIML LN	na
676	Same data object name used with different CDC	na
677	MotStr is used with different CDC in PMMS and SOPM LN classes	na
679	Remove CycTrMod Enum	na
680	SI unit for MHYD.Cndct	ni
681	Enum PIDAlg	ni
682	ANCR.ParColMod	na
683	Enum QVVR.IntrDetMth	na
685	Enum ParTraMod	na
686	New annex H - enums types in XML	Y
694	Data object CmdBlk	na
696	LSVS.St (Status of subscription)	na
712	Interpretation of quality operatorBlocked	na
713	DO Naming of time constants in FFIL	na
724	ANCR.Auto	na
725	Loc in LN A-group	na
734	LLN0.OpTmh vs. LPHD.OpTmh	na
735	ISAF.Alm and ISAF.AlmReset	na
736	PFSign	na
742	GAPC.Str, GAPC.Op and GAPC.StrVal	Y
743	CCGR.PmpCtl and CCGR.FanCtl	na
744	LN STMP, EEHealth and EEName	na
772	LPHD.PwrUp/PwrDn shall be transient	na
773	Loc, LocKey and LocSta YPSH and YLTC	na
774	ITCI.LocKey	na
775	KVLV.ClsLim and OpnLim	na
776	LPHD.OutOv/InOv and LCCH.OutOv/InOv	na

Part 7 Tissue	Description	Implemented by server?
800	Misspelling in CSYN	na
802	CCGR and Harmonized control authority	na
808	Presence condition of ZMOT.DExt and new Dos	na
831	Setting of ConfRevNum in LGOS	Y
838	Testing in Beh=Blocked	na
844	MFLK.PhPiMax, MFLK.PhPiLoFil, MFLK.PhPiRoot DEL->WYE	na
849	Presence conditions re-assessing in case of derived statistical calculation	na
877	QVUB -settings should be optional	na
909	Remove ANCR.ColOpR and ColOpL	na
920	Resetable Counter is NOT resettable	na
932	Rename AVCO.SptVol to AVCO.VolSpt	na
939	Change CDC for ANCR.FixCol	na
991	LGOS: GoCBRef (as well as LSVS.SvCBRef) should be mandatory	Y
1007	PTRC as fault indicator - Update of description required	na
1044	TapChg in AVCO	na
1077	Rename DOnames within LTIM	na

Table 3-146: Part 8 Tissues

Part 8-1 Tissue	Description	Implemented by server?
784	Tracking of control (CTS)	na
817	Fixed-length GOOSE float encoding	na
834	File dir name length 64	na
951	Encoding of Owner attribute	na
1040	More associate error codes	Y
1178	Select Response+ is non-null value	Y

Notes

668 — For the UR, the value should be "na," but the TICS template gives "Y" as the only choice for this Tissue.

825 — Engineering notation is not supported in CID files sent to the UR.

853 — In UR ICD/IID files, ProtNs is not applied to SBO.

780 — The TrgOps "dupd" value is not accepted by the UR.

1038 — To be conformance tested.

1091 — The initial value of EditSG is 1.

1163 — To be conformance tested.

722 — In UR ICD/IID files, "h" and "min" have not been added to SIUnitKind.

926 — In UR ICD/IID files "RangeConfig_0" is not used and should be removed.

831 — The ConfRevNum "q" component is not set as per the Tissue resolution.

1178 — The objectReference of the "Oper" component is returned, which is allowed, but is not the recommended value.

3.9 SCL log messages

Logs are kept by UR devices for Substation Configuration Language (SCL) files received. These messages are associated with errors/incompatibilities in received SCL.

UR firmware 7.3 and up with the IEC 61850 software option accepts a CID file. This file is parsed and validated when received and on each start-up. All errors and warnings encountered in this process are logged in a file on the RAM file system. As the RAM file system is volatile, the file content is lost whenever the UR device is powered down. The name of the file is URscl.log. It can be accessed by any of the supported file transfer protocols.

This section outlines all errors and warnings that are logged in the file, meaning the SCL log messages.

Any text that follows a heading gives additional explanation of the log entry.

SCL Parsing Started <Timestamp>

This is the first message logged after a reboot and just before the start of parsing of CID/ICD file. This is logged from mmsServer task.

Error parsing SCL file

SCL file parsing error.

apply_private_settings: <Modbus address in hex>(<Modbus address in decimal> - <format code>) <Modbus Setting name>- error value not set = <value>

Provides the address of the Private setting value that has an issue when writing the value to the NOR flash.

apply_private_settings: <Modbus address in hex>(<Modbus address in decimal> - <format code>) <Modbus Setting name>- invalid value = <value>

Provides the address of the Private setting that has an issue when performing an ASCII conversion and reading from the NOR flash.

apply_private_settings: invalid addr <Modbus address in hex>

Provides the address of the Private setting that has an issue finding the MODBUS address in the memory map.

CID FLASH file copy: CRC Error

Each CID file is compressed and stored on the FLASH. Before compression a small header is added to the CID file. A CRC is added to this header. On decompression, if the CRC in this header does not match the one calculated on the decompressed file, then the message is logged.

CID FLASH file copy: Error order code or FW version

This message is logged when the uncompressed CID header fails for any of the following:

- Order code length
- The order code in the header must start with GE_Digital_Energy_UR
- If the order code in the header does not match the order code of the relay in SYS_Permanent data

CID FLASH file uncompress error

This message is logged when the decompression of the CID file fails.

NO CID File found in FLASH

This message is logged when the FLASH does not have a working copy of the CID file.

Error parsing SCL file

This message is logged when the parsing of the SCL file fails.

SCL Parsing Failed

This message is logged along with any of the other failures listed in this section.

SCL Parsing OK

This message is logged when the SCL parsing completes successfully.

g2_find_duplicate_sub_gcb: duplicate GCB=<name of the gcb> found in <logical device>/<variable name in logical node>

This message is logged when duplicate GSEControl elements are detected. The GOOSE subscription parsing is in progress at this stage.

g2_process_goose_extref: extref.iedName=<IED name> shall not be local IED

This message is logged when the iedName defined with extRefs is the target iedName. The GOOSE subscription parsing is in progress at this stage.

g2_process_goose_extref: scl_server_find() fail, iedName=<IED name>

This message is logged when the iedName defined with extRefs is not found in the CID file. The GOOSE subscription parsing is in progress at this stage.

g2_process_goose_extref: scl_gcb_find() fail, IED=<IED name of publisher>, srcLDInst=<LDInst>, lnName=<lnName>, srcCBName=<srcCBName of extRef>

This message is logged when unable to find the associated gcb. The GOOSE subscription parsing is in progress at this stage.

g2_process_goose_extref: scl_gse_find() fail, srcLDInst=<LDInst>, srcCBName=<srcCBName of extRef>

This message is logged when unable to find the associated gse. The GOOSE subscription parsing is in progress at this stage.

g2_process_goose_extref: scl_dataset_find() fail, datSet=<datset from publisher gcb>

This message is logged when unable to find the associated dataset. The GOOSE subscription parsing is in progress at this stage.

scl_dataset_check: too many FCDA in dataset=<datset name>

This message is logged when the FCDAs are more than the supported count. The GOOSE subscription parsing is in progress at this stage.

FCDA: empty doName in =\<lnType><instance>

This message is logged when empty doName is detected. The GOOSE subscription parsing is in progress at this stage.

FCDA: NO LNodeType=\<lnType><instance>\ found

This message is logged when no lnType associated with the logical node instance is found. The GOOSE subscription parsing is in progress at this stage.

No LN=<fcda prefix><lnClass>,lnInst> found in LD=<LD>

This message is logged when the associated logical node is not found in the device. The GOOSE subscription parsing is in progress at this stage.

No LD=<ldInst> found in IED=<IED name>

This message is logged when the associated logical device is not found. The GOOSE subscription parsing is in progress at this stage.

g2_process_goose_extref: error mapping data=<btype from publisher fcda> to ExtRef=<internal address>

This message is logged when the datatype of the publisher FCDA does not match the one defined in the associated extRef. The GOOSE subscription parsing is in progress at this stage.

add_missing_extref: error to add ExtRef intAddr=<internal address> desc=<desc>

This message is logged when the number of extRefs are less than the number supported. The GOOSE subscription parsing is in progress at this stage.

extref_intaddr_check: too many GGIO3.extref

This message is logged when the number of extRefs defined in GGIO3 are greater than the number supported. The GOOSE subscription parsing is in progress at this stage.

g2_map_goose_inref: GGIO3 missing

This message is logged when the GGIO3 logical node is missing. The GOOSE subscription parsing is in progress at this stage.

ERROR Inref to ExtRef conversion: setSrcRef=<value>

This message is logged when there are no more extRefs left to map an inRef. The GOOSE subscription parsing is in progress at this stage.

Error of RxGOOSE InRef.setSrcRef=<value> InRef.setSrcCB=<value>

This message is logged when inRef conversion to extRef fails. The GOOSE subscription parsing is in progress at this stage.

g2_process_goose_inref: no matching setSrcRef found in LN=<logical node> for setSrcCB=<value>

This message is logged when the source reference in setSrcRef is not found. The GOOSE subscription parsing is in progress at this stage.

g2_find_duplicate_extref: GGIO3 missing

This message is logged when the logical node GGIO3 is not found. The GOOSE subscription parsing is in progress at this stage.

g2_find_duplicate_extref: duplicate external source found in <first extref internal address> and <internal address>

This message is logged when a duplicate extRef is found. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: target iedName or apName missing

This message is logged when iedName or apName of the target IED is missing. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: missing IED=<IED name>

This message is logged when the IED cannot be located. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: missing GGIO3 in IED=<IED name>

This message is logged when the GGIO3 logical node is missing. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: illegal setSrcCB=<value> in ln=<logical mode>, must be empty

This message is logged when an empty setSrcCB is detected. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: cannot add DAI=<DAI flatname>

This message is logged when the DAI is not supported. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: GoCBRef=<LGOS GoCBRef>

This message is logged when GoCBRef does not have '/' or the first character in the reference string is '/' or '@'. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: GoDatSetRef=<GoDatSetRef in LGOS>

This message is logged when GoDatSetRef does not have '/' or the first character in the reference string is '/' or '@'. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: wrong LN in GoCBRef=<GoCBRef in LGOS>, must be LLN0

This message is logged when a logical node other than LLN0 is found in GoCBRef in LGOS. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: GSEControl name <GSEControl name attribute> is too long

This message is logged when the GSEControl name is longer than supported. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: no GoCB in GoCBRef=<GoCBRef in LGOS>

This message is logged when no GoCB is found in GoCBRef in the LGOS logical node. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: GoDatSetRef=<GoDatSetRef> has different LDName

This message is logged when GoDatsetRef has a different LDName. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: wrong LN in GoDatSetRef=< GoDatSetRef>, must be LLN0

This message is logged when GoDatSetRef does not belong to LLN0. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: dataset name <dataset name> is too long

This message is logged when dataset name is too long than supported. The GOOSE subscription parsing is in progress at this stage.

Illegal character in DataSet name=<DataSet name>

This message is logged when DataSet name has an illegal character. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: no DatSet in GoDatSetRef=<GoDatSetRef in LGOS>

This message is logged when GoDatsetRef has missing DatSet. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: illegal MAC Address <MAC address in LGOS>

This message is logged when LGOS has an illegal MAC address. The GOOSE subscription parsing is in progress at this stage.

GOOSE destination MAC address not multicast (XX-XX-XX-XX-XX-XX). Changing to multicast.

This message is logged when the GOOSE destination MAC address is not multicast. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: illegal APPID <APPID value> (must be 0-FFFF)

This message is logged when the APPID is out of range. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: appID name <GoID> is too long

This message is logged when the appID is too long in GOCBdata object belonging to GoID GOOSE. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: can't convert string <ConfRev in LGOS> to ConfRev

This message is logged when the ConfRev string conversion fails. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: illegal InRef=<internal address of InRef in LGOS>

This message is logged when the internal address is not in range. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: missing doName in InRef=<internal address of InRef in LGOS>

This message is logged when the doName is missing from InRef. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: illegal doName=<doName>

This message is logged when the doName cannot be found in GGIO3 lntype. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: missing daName in InRef=<internal address of InRef>

This message is logged when daName is missing from InRef. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: illegal daName=<daName>

This message is logged when daName is neither of stVal, q, t or mag.f. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: illegal InRef=<internal address of InRef in LGOS>

This message is logged when the daName does not contain stVal or AnIn. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add SubNetwork

This message is logged when a subNetwork cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add LNodeType=<lnType>

This message is logged when the IED cannot add dummy LNodeType/DOType/DAType/BDAType for the logical node. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add dummy DOType

This message is logged when a data object type cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add dummy DAType

This message is logged when a data attribute cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add ConnectedAP to the dummy ied

This message is logged when a ConnectedAP cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add GSE to the dummy ied

This message is logged when GSE section cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add IED to the dummy ied

This message is logged when an IED section cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add LD to the dummy ied

This message is logged when a logical device cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add LLN0 to the dummy ied

This message is logged when LLN0 logical node cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add GSEControl=<cbName in LGOS> to the dummy ied

This message is logged when GSEControl section cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: datSet=<dataset name> and datSet=<dataset name> map to same GSEControl=<cbName in LGOS>

This message is logged when two different dataset mapped to a same GSEControl. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add dataset=<dataset name> to the dummy ied

This message is logged when dataset cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add FCDA to the dummy ied

This message is logged when FCDAs cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add GGIO1 to the dummy ied

This message is logged when GGIO1 logical node cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't add GGIO2 to the dummy ied

This message is logged when GGIO2 logical node cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: create dummy IED for <logical node>

This message is logged when logical node cannot be added to dummy IED. A dummy IED is created for each remote IED. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: Couldn't find GGIO3.ExtRef.intAddr=<internal address of InRef>

This message is logged when the internal address is out of range. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: re-used GGIO3.ExtRef.intAddr=<internal address of ExtRef>

This message is logged when the internal address is reused. The GOOSE subscription parsing is in progress at this stage.

E3-2.0 ERROR: map InRef for <ExtRef>

This message is logged when unable to map the LGOS Inref to GGIO3 extref. The GOOSE subscription parsing is in progress at this stage.

check_goose_subscription failed

This message is logged when unable to GOOSE subscription validation fails. The GOOSE subscription parsing is in progress at this stage.

check_lgos_gocbref: iedName or apName missing

This message is logged when iedName or apName is missing in the LGOS logical node. The GOOSE subscription parsing is in progress at this stage.

check_lgos_gocbref: invalid GoCBRef.setSrcRef=<DAI value>

This message is logged when invalid DAI is detected in LGOS gocbref. The GOOSE subscription parsing is in progress at this stage.

check_lgos_gocbref: cannot reference target IED in GoCBRef.setSrcRef=<DAI value>

This message is logged when unable to find the reference target IED specified in the setSrcRef. The GOOSE subscription parsing is in progress at this stage.

check_lgos_gocbref: invalid LN in GoCBRef.setSrcRef=<DAI value>

This message is logged when invalid logical node is detected in the setSrcRef of LGOS gocbref. The GOOSE subscription parsing is in progress at this stage.

check_lgos_gocbref: invalid GSEControl in GoCBRef.setSrcRef=<DAI value>

This message is logged when invalid GSEControl is detected in the setSrcRef of LGOS gocbref. The GOOSE subscription parsing is in progress at this stage.

check_lgos_gocbref failed

This message is logged when gocbref of LGOS validation fails. The GOOSE subscription parsing is in progress at this stage.

Could not find doTYPE=<data object type> for SDO=<data object>

This message is logged when unable to find the doType for the data object.

ERROR: InRef=<DAI value> in DO$DA <DAI flattened name> for LN <data attribute>

This message is logged when the inRef is referring to anything other than BOOLEAN, FLOAT, or INT32.

check_local_inref_all failed

This message is logged when inrefs validation fails for the local IED.

Data types already created for this SCL file. Cannot create again.

This message is logged when data in the CID file is such that it invokes duplicate creation of datatypes.

Error generating type name for LNodeType id=<lnType id>

This message is logged when unable to create LNType.

SCL ERROR: DAType id=<type id> not found

This message is logged when unable to locate the data attribute type in the CID file.

SCL ERROR: Can't add type definition for BDA Struct type=<type>

This message is logged when unable to add the type definition of base data attribute.

EnumType <type> could not be found

This message is logged when unable to find the enumeration type in the CID file.

INT64 not supported on this platform

This message is logged when a 64-bit basic type is detected in the CID file.

INT64U not supported on this platform

This message is logged when an unsigned 64-bit basic type is detected in the CID file.

bType=<btype> is not recognized

This message is logged when an unrecognized basic type is found.

SDO type <type> cannot be found

This message is logged when unable to find the SDO type in the CID file.

ERROR adding type definitions for DO=<data object>

This message is logged when unable to add the data object definition due to errors in the configuration of CID file.

Cannot find DOType=<data object type> for DO=<data object name>

This message is logged when the DOtype cannot be found in the CID file.

ERROR adding SGCB

This message is logged when an error is found in setting group control block.

scl2_datatype_create FAILED for LNodeType id=<logical node id>

This message is logged when lnType cannot be created.

Number of RUNTIME_TYPE elements (<number of runtime type>) exceeds maximum (<maximum number of runtime types). Cannot create type for LNodeType id=<logical node>

RUNTIME type elements are data attributes.

This message is logged when a new runtime type could not be created since the maximum allowed limit is reached.

Number of RUNTIME_TYPE elements = 0. Cannot create type for LNodeType id=<logical node>

RUNTIME type elements are data attributes.

This message is logged when a new runtime type cannot be created for a logical node.

Type creation error: name <type name> already in use

RUNTIME type elements are data attributes.

This message is logged when a new runtime type was detected but was found to be already in use.

mvl_type_id_create error: type array full

RUNTIME type elements are data attributes.

This message is logged when the number of data attributes exceeds the limit.

Error setting leaf functions for LNodeType id=<logical node>

This message is logged when unable to create read and write functions for each attribute in logical node.

Could not create type for LNodeType id = <logical node>

This message is logged when lnType cannot be created due to type id being < 0.

Logical Devices already created for this SCL file. Cannot create again.

This message is logged when duplicate logical device creation is requested due to configuration errors in the CID file.

Cannot find type=<lnType> for logical node=<logical node>

This message is logged when lnType is not found for a logical node in the CID file.

Error creating VAR <logical node>: domain <logical domain> not found

This message is logged when there is an error constructing object name from LD and LN information.

Cannot create LN=<logical node> in LD=<logical device>

This message is logged when logical node cannot be created in logical device.

Cannot find GSE element for GOOSE Control <gcb name>

This message is logged when unable to find the GSE element specified in the GOOSE control block in the CID file.

Constructed ObjectReference would be too long for <object name>

This message is logged when the specified object reference string is longer than supported.

Attribute Datset not found so not initialized.

This message is logged when GOOSE datset was not found.

Attribute GoID not found so not initialized.

This message is logged when GOOSE ID was not found.

Attribute ConfRev not found so not initialized.

This message is logged when GOOSE ConfRev was not found.

Attribute FixedOffs not found so not initialized.

This message is logged when GOOSE FixedOffs was not found.

Attribute MinTime not found so not initialized.

This message is logged when GOOSE MinTime was not found.

Attribute MaxTime not found so not initialized.

This message is logged when GOOSE MaxTime was not found.

Attribute DstAddress not found so not initialized.

This message is logged when GOOSE DstAddress was not found.

Attribute SP$SGCB$NumOfSG not found so not initialized.

This message is logged when GOOSE SP$SGCB$NumOfSG was not found.

Attribute SP$SGCB$ActSG not found so not initialized.

This message is logged when GOOSE SP$SGCB$ActSG was not found.

scl2_ln_create FAILED for <logical node>

This message is logged upon failure to create logical node for MMS.

scl2_ld_create_part1 for <logical device> FAILED

This message is logged upon failure to create logical device for MMS.

convert_initial_value: index out of range

This message is logged when an indexing error is detected when performing special conversion for Boolean or enumeration types.

Cannot convert DA or BDA Val=<data attribute value> to data for <data attribute> attribute

This message is logged when performing string conversion of the data attribute.

scl2_dai_set_value FAILED for <DAI flattened name> (LD=<logical device> LN=<logical node>)

This message is logged upon failure to set the DAI value.

scl2_ld_create_part2 for <logical device> FAILED

This message is logged upon failure to create a logical device.

ERROR creating all LD for Server

This message is logged when unable to create all six supported logical devices.

ERROR creating all LD for Client

This message is logged when failed to create all logical devices for the MMS client.

scl2_vmd_create_all: OK

This message is logged when successfully created logical devices and all its nodes.

ERROR: cannot find GCB <secCBName of extRef>

This message is logged when unable to locate the GCB from the srcCBName.

ERROR: unable to find addressing information for GSEControl <gcb of publisher> in ldInst <logical device instance> in IED <IED name>

This message is logged when unable to locate the GOOSE publisher.

Error creating GOOSE control: GoCBRef too long.

This message is logged when the GOOSE control block reference string is longer than supported.

Error creating GOOSE control: DatSet too long.

This message is logged when the string of dataset reference is longer than supported.

Error creating GOOSE control: GoID too long.

This message is logged when GoID is longer than supported.

Error creating GOOSE control: numDataEntry=<number of data items> not allowed.

This message is logged when the number of dataitems in a dataset is zero.

Cannot find runtime type for type id=<type id of dataitem>

This message is logged when unable to find the dataitem with data type in the GCB.

gse_iec_data_init failed for type id=<type is of dataitem>

This message is logged when a dataitem with data type cannot be initialized.

Number of ExtRef elements = <ExtRefs count>. Number of successful GOOSE Subscriptions = <subscriptions count>

This message is informational.

ERROR: GGIO3 missing

This message is logged when the logical node GGIO3 is missing from the local IED, implying errors with the CID file. Compare with the IID file and look for differences.

ERROR: add extref=<internal address of extRef> input info

This message is logged when the input is not one of the types — a float, boolean, double point status, quality, timestamp — or if input assignment fails due to configuration error in the CID file.

update_goose_subscription failed

This message is logged on goose subscription configuration failure.

ldHead is missing for AccessPoint=<apName> in IED=<IED name>

This message is logged when logical device cannot be linked to an access point.

iecGoosePubCreateAll: iedName or apName missing

This message is logged when iedName or apName is missing for the publisher IED.

ERROR: VLAN-PRIORITY=<VLAN priority> out of range.

This message is logged when VLAN-PRIORITY > 13.

ERROR: VLAN-ID=<VLAN ID> out of range.

This message is logged when VLANID > 4095.

ERROR: iecGoosePubCreate failed for finding GCB <gcb name> in <logical device instance>/LLN0 in IED <ied name>

This message is logged when failed to get update time and address of GoEna from @Master/LLN0.

ERROR: iecGoosePubCreate failed for GSEControl <gcb name> in ldInst <logical device instance> in IED <ied name>

This message is logged upon failure to create GSEControl for publisher GOOSE.

ERROR: GSSE not supported by this application

This message is logged when the type attribute of GSEControl is GSSE.

iecGoosePubCreateAll: OK

Informational. The publisher GOOSE configuration is complete without issues.

Backup CID data in FLASH is invalid, erasing it. Inspect the log and manually reboot the relay. Default to ICD.

To increase the reliability of the CID files stored in the relay, two copies are maintained in the non-volatile storage. 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. This message is logged when both the working copy and the backup copy are corrupted and unusable. In this scenario, the device configuration is defaulted. The urscl.log provides more information, and a manual reboot is required to recover the device from this state.

Erasing CID data in flash, inspect log and manually reboot to ICD

To increase the reliability of the CID files stored in the relay, two copies are maintained in the non-volatile storage. 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. This message is logged when the working copy is corrupted and the configuration from the backup copy is ready to be applied. The urscl.log provides more information, and a manual reboot is required to apply the backup CID file configuration.

scl2_vmd_create_all: FAILURE

This message is logged when the IED creation fails. This implies that configuration in the CID file is incorrect.

SCL Parsing Done

This message is logged when the incoming CID file parsing is complete.

IED <IED name>: multiple instances

This message is logged when multiple instances of IED are detected. The CID file requires correction.

Private section: Error GE_Authentication_Code

This message is logged when CRC check of Private section fails. Read the IID file either from the IED or EnerVista software, and update the Private section of the CID file from the read IID file.

security_check_private_settings: <MODBUS address in hex>(<MODBUS address in decimal>-<format code>) <MODBUS name> = <value>, No permission for <user role>

This message is logged when the role used to write the CID file does not have the write permission.

security_check_private_settings: invalid addr <MODBUS address in hex>

This message is logged when an invalid MODBUS address is detected.

Private section: Error order code or firmware version

This message is logged when a matching IP address is not detected in the ConnectedAPs for the target. Or, it is also logged when the order code and firmware revision used to generate the CID file differ from that currently running in the relay. A minor revision mismatch is tolerated.

Subnet section: NO ConnectedAP with matching IP address

This message is logged when a matching IP address is not detected in the ConnectedAPs for the target.

Subnet section: Unable to find a Server in AccessPoint=<IED name>/<apName>

This message is logged when a server is not detected in the specified IED.

Subnet section: Unable to find a AccessPoint for apName=<apName> in IED=<target IED name>

This message is logged when an AccessPoint is not detected in the specified IED.

Subnet section: Conflict found for VLAN-ID in <gse cbName>

This message is logged when the VLAN-ID conflicts are detected between various gse sections of IED.

Subnet section: Conflict found for VLAN-PRIORITY in <gse cbName>

This message is logged when VLAN-PRIORITY conflicts are detected between various gse sections of IED.

Subnet section: Conflict found for MAC-Address in <gse cbName>

This message is logged when MAC-Address conflicts are detected between various gse sections of IED.

Subnet section: Conflict found for APPID in <gse cbName>

This message is logged when APPID conflicts are detected between the various gse sections of the specified IED.

Subnet section: Conflict found for MinTime in <gse cbName>

This message is logged when MinTime value conflicts are detected between the various gse sections of the specified IED.

Subnet section: Conflict found for MaxTime in <gse cbName>

This message is logged when MaxTime value conflicts are detected between the various gse sections of the specified IED.

Server section: different IED configuration

This message is logged when the server configuration in the CID file differs from the one supported.

Server section: could not find the <NEW/EXISTING> IED

This message is logged when the specified IED is not found in the CID file.

Illegal array index in <flattened name>

This message is logged when the array index is illegal in DAI flattened name, implying invalid flattened name.

Array index specified for non-array component in flat name <flat name>

This message is logged when DAI flattened name has indexing issues, implying invalid flattened name.

Array index <array index> out of bounds in flat name <flattened name>. Array size = <number of DAI elements>

This message is logged when the array index of flattened name of DAI is out of bounds, implying invalid flattened name.

Specified array index on non-array component <component name>

This message is logged when the flattened name of DAI is not an array, implying invalid flattened name.

Array index <array index of DAI> out of bounds for array size <number of DAIs> on component <component name>

This message is logged when the flattened name of DAI is not an array, implying invalid DAI.

Alternate access type <sel type> not supported

This message is logged when an unsupported alternate access type is detected.

dai_val_validate: Attribute <DAI flattened name> in <logical node> not found.

This message is logged when all possible functional constraint are searched and no match is found.

dai_val_validate: Attribute <flattened name> in <logical node> not a primitive type.

This message is logged when the attribute is not a basic (primitive) type.

\<logical node type> \<DAI flattened name>\ Val=<value> does not match any EnumVal. Trying numeric conversion.

This message is logged when DAI does not have a matching enumeration.

\<logical node type>\<DAI flattened type> Val=<DAI value> Illegal character (0x%02x) in visible string.

This message is logged when DAI value has illegal characters.

String <DAI value> exceeds max len <maximum length>

This message is logged when the attribute value exceeds the maximum length.

String <DAI value> does not match fixed len <length>

This message is logged when DAI string is longer than the supported length.

dai_val_validate: Val <DAI value> conversion for <logical node>$<DAI fixed name> FAILED"

This message is logged when conversion of DAI value failed.

Attempt to change value of DAI <DAI flattened name> in node <lnClass> instance <ln inst> from value <reference DAI value> to value <new DAI value>

This message is logged when an attempt is made to change the DAI value to an invalid value.

<logical node> Invalid DAI value: <DAI flattened name> = <DAI value>

This message is logged when an invalid value is detected for a DAI.

Invalid FC for DAI <DAI flattened name> in LN <logical node>

This message is logged when an invalid functional constraint is detected for a DAI.

Total invalid DAI->val <invalid DAI count>

This message is logged to show the total number of invalid DAIs.

check_iec61850_advanced_option: iedName or apName missing

This message is logged when the iedName or apName is missing.

check_iec61850_advanced_option: too many LD, should be <maximum number of supported logical devices>

This message is logged when the number of logical devices in an IED is detected to be more than six.

check_iec61850_advanced_option: too many RxGOOSE(<number of gcb>), should be <maximum number of supported RxGOOSE>

This message is logged when the number of RxGOOSE are more than supported (16 for most products and 32 for C30).

check_goose_publishing: iedName or apName missing

This message is logged when the iedName or apName is missing from the GOOSE publisher IED.

check_goose_publishing: gcb <gcb name> must be configured in Master/LLN0

This message is logged when the GOOSE control block is not configured in Master/LLN0.

check_goose_publishing: too many GSEControl

This message is logged when the number of GSEControl are more than the eight supported.

check_goose_publishing: wrong name gcbName=<gcb name>

This message is logged when the index of GoCB is beyond 07.

check_goose_publishing: NO GSE=<gcb name> found

This message is logged when the mentioned GSE element is not found.

check_goose_publishing: NO DataSet=<gcb datSet> found

This message is logged when the publisher dataset cannot be found.

check_iec_report: iedName or apName missing

This message is logged when validating the report control or dataset and the iedName or apName cannot be found.

check_iec_report: rcb <report control block name> must be configured in Master/LLN0

This message is logged when a report control is detected in a node other than Master/LLN0.

check_iec_report: too many buffered ReportControl

This message is logged when the number of buffered report controls is more than 20.

check_iec_report: too many unbuffered ReportControl

This message is logged when the number of unbuffered report controls is more than 14.

check_iec_report: RptEnabled max=<maximum number of supported clients>, too many clients

This message is logged when more than one client is requesting the report to be enabled.

check_iec_report: too many DataSet(<number of datasets>) used by report

This message is logged when more than four datasets are used by report controls.

UR7.30 and above only supports SCL edition 2

This message is logged when the edition information in the CID file says edition 1 of IEC 61850.

CID validation FAILED

This message is logged when the CID file validation fails.

Parsing Failed <Timestamp>

This message is logged when parsing fails.

Missing configurable DAIs in LN <logical node prefix><lnClass> in LD <ldinst>

This message is logged if a configurable instantiated data attribute (DAI), that is not a "d" attribute, is missing from the new CID file.

Did not find reference LN <logical node prefix><lnClass> in LD <ldinst>

Reference logic node was not found in the specific logic device of the incoming SCL info, when checking if the node has all configurable DAIs.

Did not find reference LD <ldinst>

Reference logic device was not found in the incoming SCL information, when checking if the node has all configurable DAIs.

Missing configurable DAIs in CID file

Generated if any configurable DAIs are missing in the incoming CID file.

All DAIs are missing for node <logical node prefix> <lnClass> inst=<lninst> in LD <logical device instance>

A given node is missing all DAIs.

DAI <DAI flattened name> missing in LN <logical node prefix><lnClass> inst=<lninst> in LD <logical device

instance>

Specifies the DAI that is missing in the respective logic node of the respective logic device.

insert_dai: failed to insert <reference DAI flattened name> after <new DAI flattened name>

After a reboot after sending a CID file, we failed to add a missing DAI.

SCL_Node: failed to add DAI <DAI flattened name> to end of list

After a reboot after sending a CID file, we failed to add a missing DAI.

Error: CID file <filename> open

Upon receiving a CID file, failed attempt to open the file.

Error: CID file <filename> status

Upon receiving a CID file, failed attempt to retrieve the file status.

Error: CID file <filename> size is too big

Received a CID file exceeding 16 MB.

Error: CID file <filename> read

Upon receiving a CID file, failed attempt to read from the file.

Private section: couldn't find a target Server

Failed to identify a target server in a newly received CID file.

New LNodeType=<logical node type> has different number of DO

The logical node type has different number of data objects than supported.

New LNodeType=<logical node type> has different lnClass=<lnClass>

The logical node type has a different lnClass than supported.

No DO=<data object> found in LNodeType=<logical node type>

The given logical node type does not have any data objects in it.

No DOType=<data object type> for DO=<data object> in new IED

In the new CID IED section, the data object type cannot be found for the specified data object.

No DOType=<data object type> for DO=<data object> in existing IED

In the existing CID IED section, the data object type cannot be found for the specified data object.

DO=<data object> in LNodeType=<logical node type> is different in new IED

The logical node type in the new CID file differs from the supported type.

Number of LDevice mismatch: NEW(<number of logical devices>) ApName=<ApName> (IED=<IED name>) - REF(<number of logical devices>) ApName=<ApName> (IED=<IED name>)

The model does not match due to number of logical devices mismatch. The number of logical devices in the new CID file is different from that in the reference file in the device.

Number of LN mismatch: NEW(<number of logical nodes>) ApName=<ApName> (IED=<IED name>) -

REF(<number of logical nodes>) ApName=<ApName> (IED=<IED name>)

The model does not match due to number of logical nodes mismatch. The number of logical nodes in the new CID file is different from that in the reference file in the device.

NO LDevice=<logical device> in IED=<IED name>

No logical devices were found in the IED section of the CID file.

NO LN=<prefix of logical node><lnClass><logical node> not found

The specified logical node is not found.

No LNodeType=<logical node type> found for LN=<logical node> in new IED

The specified logical node type is missing in the new CID file.

No LNodeType=<logical node type> found for LN=<logical node> in existing IED

The specified logical node type is missing in the existing CID file.

New DOType=<data object type> has different number of DA

The number of data attributes in the specified data object type is not supported.

New DOType=<data object type> has different cdc

The CDC of the specified data object type is not supported.

No DA=<data attribute> found in DOType=<data object type>

The specified data object type has no data attributes.

No DOType=<data object type> found for SDO=<data object> in new IED

The specified data object type is missing in the new CID file.

No DOType=<data object type> found for SDO=<data object> in existing IED

The specified data object type is missing in the existing CID file.

DOType=<new data object type> mismatch vs <reference data object type>

The DOType of the specified data object in the new CID file does not match the reference file.

No DAType=<new data attribute type> found for DA=<data attribute> in new IED

The DAType of the specified data attribute in the new CID file is missing.

No DAType=<new data attribute type> found for DA=<data attribute> in existing IED

The DAType of the specified data attribute in the existing CID file is missing.

DAType=<new data attribute type> is different in new IED

The DAType is different in the new CID file from the reference in the device.

No EnumType=<enumeration type> found in new IED

The EnumType is missing in the new CID file.

No EnumType=<enumeration type> found in existing IED

The EnumType is missing in the existing CID file.

EnumType=<enumeration type> is different in existing IED

The EnumType is different in the new CID from the reference in the device.

DA=<data attribute> is DOType=<data object type> mismatch

The data attribute in the DOType differs from the reference in the device.

New DAType=<data attribute type> has different number of BDA

The DAType in the new CID file has a different number of BDA when compared to the reference in the device.

No BDA=<base data attribute> found in DAType=<data attribute type> in the new IED

The base data attributes are missing the specified DAType in the new CID file.

No DAType=<data attribute type> for BDA=<base data attribute> in new IED

The data attribute type is missing for the base data attribute in the new CID file.

No DAType=<data attribute type> for BDA=<base data attribute> in existing IED

The data attribute type is missing for the base data attribute in the existing CID file.

DAType=<data attribute type> is different in new IED

The data attribute type is different in the new CID file from the reference in the device.

No EnumType=<enumeration type> is found in new IED

The enumeration type is missing in the new CID file.

No EnumType=<enumeration type> is found in existing IED

The enumeration type is missing in the existing CID file.

EnumType=<enumeration type> is different in new IED

The enumeration type in the new CID file differs from the reference in the device.

CID is invalid, restored backup CID copy. Manually reboot the relay to initialize with backup CID.

The working copy of the CID file is invalid, hence the backup copy is ready to be used. To activate the configuration from the backup copy, a reboot is required.

Settings that require a reboot have been changed. Please restart the relay.

A few settings from the Private section require a reboot to take effect. Private settings are validated and applied after the IEC 61850 data model is validated and the relay is rebooted. This message is logged when configuration changes to such Private settings are detected.

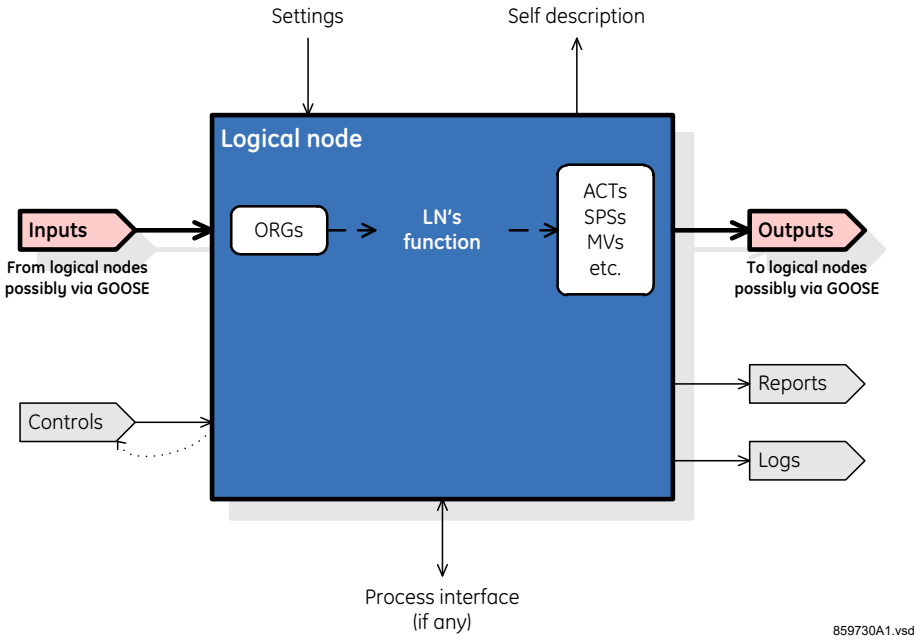
3.10 G2 implementation model for GOOSE configuration via SCL

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 3-12: 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).

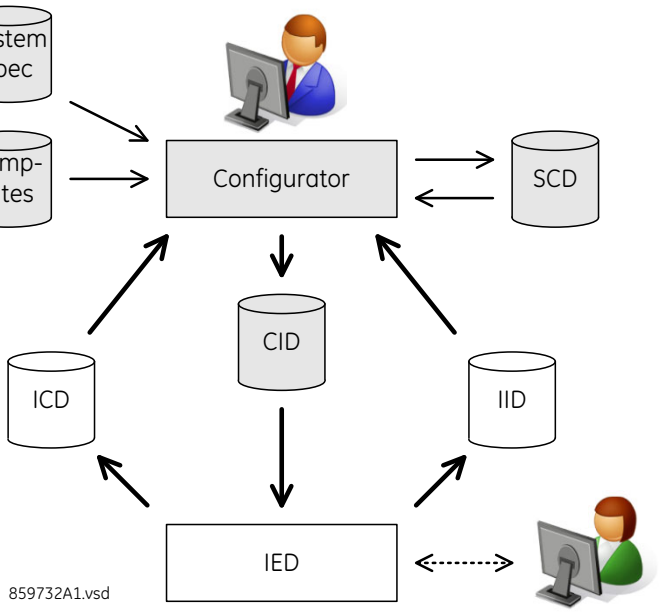
In practice, a problem with this approach is that it requires the configuration engineers to use as many IED configurators as there are IED manufactures. As the configurators are from different manufacturers, the engineer needs to learn how to use each. Another problem is that many IEDs do not handle 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 3-13: 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.

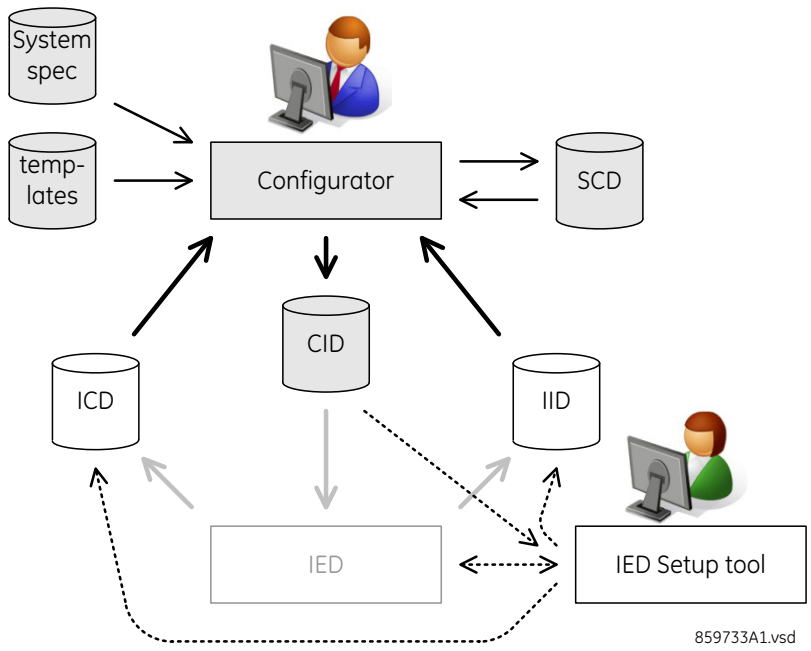
IID files can also be used long after the project is over to verify that the project settings are still present in the IED. The IID file contains the values of configRev, paramRev, and confRev, which are identical to those in the CID file if no setting changes have been made since the CID file was loaded.

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 3-14: 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

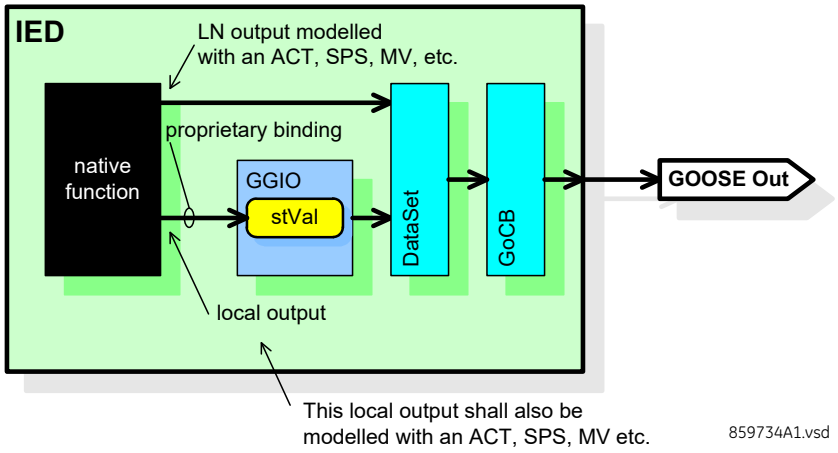
The Header element contains an id element attribute that has the make and model of the applicable IED.

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 3-15: 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.

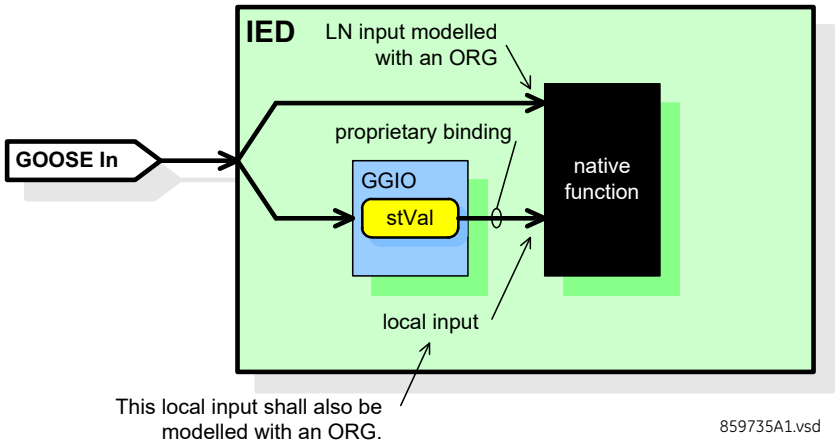
As a result of compliance with this clause, a generic configurator on importing this ICD file has at least the IED designation of all publishable outputs. A generic configurator that can import the manufacturer's namespace also has access to semantic information on all publishable outputs.

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 3-16: 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".

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.

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>
…
```

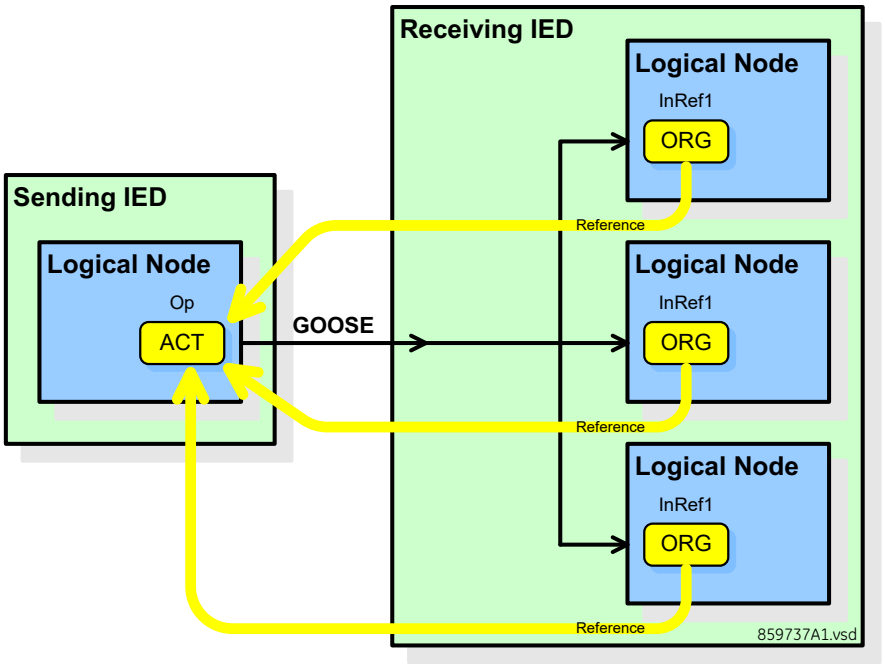
In this simple case, the rest of this file is the same as the ICD file.

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 3-17: Logical nodes communicate with logical nodes



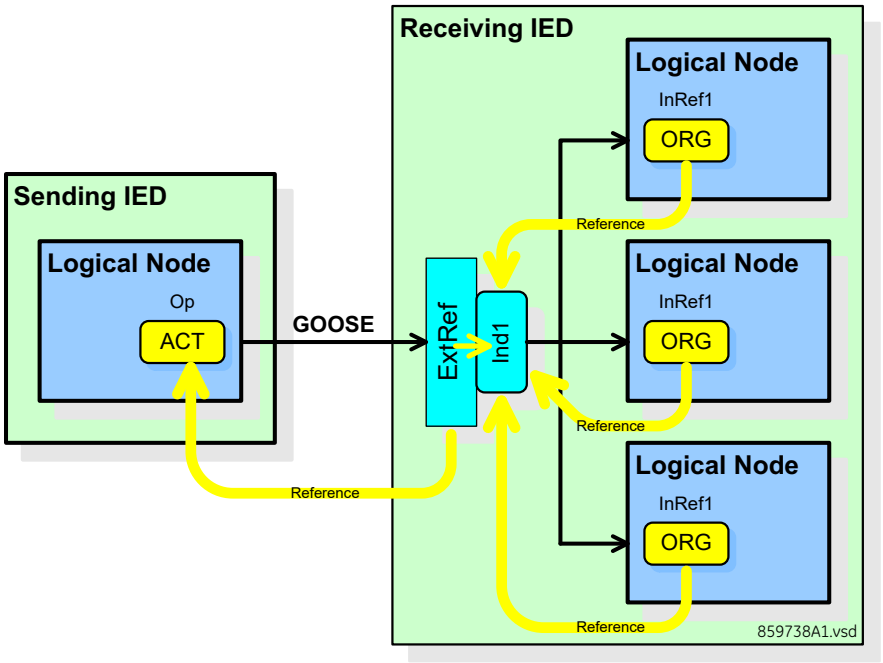
However, this requires that each logical node in the receiving IED that receives a signal via GOOSE needs to be individually configured with the final application-specific reference. This can be a disadvantage for example when a user wants to pre-configure a setting template SCL file for the receiving 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 following figure.

Figure 3-18: 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.

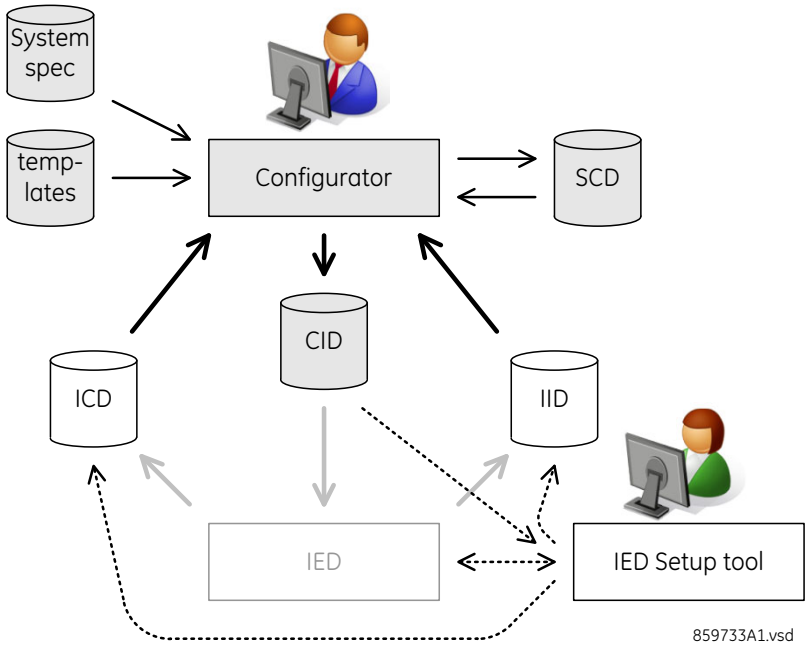
To satisfy customer preference, UR 7.30 and later releases allow SCL files to use either the G2 implementation model or the E3-2.0 implementation model. E3-2.0 is essentially E3 Option A, but with changes required to make it compliant with edition 2.0 of the standard.

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 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 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 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 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 3-19: 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 3-147: 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	

LGOS class for E3-2.0			
Data object name	**Common data class**	**Explanation**	**T**
GoDatSetRef	ORG	Reference to the subscribed GOOSE DataSet	
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 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.

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.

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: DNP communication

This chapter outlines the Distributed Network Protocol (DNP).

4.1 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 4-1: 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) Transmitted: **292** Received: **292**	**Maximum application fragment size (octets)** Transmitted: **configurable up to 2048** Received: **2048**
Maximum data link re-tries ☒ None ☐ Fixed at 3 ☐ Configurable	**Maximum application layer re-tries** ☒ None ☐ 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

4.1.1 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 4-2: 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 (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
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)

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 cont'd	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)
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)

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	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)
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)
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)

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)**
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)		
34 cont'd	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)
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				

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)**
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.

4.2 DNP point lists

4.2.1 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**

4.2.2 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 4-3: 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

4.2.3 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 4-4: 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. Care should be taken when interpreting negative counter values.

4.2.4 Analog inputs

he DNP analog input data points are configured through the **PRODUCT SETUP ⇨⇩ COMMUNICATIONS ⇨⇩ DNP / IEC104 POINT LISTS ð ANALOG INPUT / MME POINTS** menu. See the Communications section of chapter 5 in the Instruction Manual for details.

It is important to 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**

UR Family

Chapter 5: 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.

5.1 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.

5.2 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

5.3 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 6: 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.

6.1 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> are 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> are 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																			
<30>	M_SP_TB_1			X								X	X							
<31>	M_DP_TB_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
<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																			
<105>	C_RP_NA_1						X	X												
<106>	C_CD_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
<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)

6.2 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)

Manual 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-AB3	7.3x	1 March 2021	21-6255

Table A-2: Major changes for version AB3 (English)

Page	Description
1-7	Updated features per product table for IEC 61850 remote inputs/outputs
2-	Updated Modbus memory map and F codes
3-	Updated the following IMD tables: GOOSE Subscription Monitor (LGOS), Intermediate GOOSE subscription objects (GGIO3)

Table A-3: Major changes for version AB2 (English)

Page	Description
2-	Updated Modbus memory map and F codes
3-	Updated IEC 61850 Communication chapter

Table A-4: Major changes for version AB1 (English)

Page	Description
---	Initial release, moving Appendices B through F from UR instruction manuals
1-1	Added features per product table
2-	Updated Modbus memory map and F codes
3-	Added IEC 61850 Communication chapter
A-1	Updated product warranty from 24 months to 10 years

A

UR Family

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GE VERNOVA

GE Vernova
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: GA.support@gevernova.com
Website: https://www.gevernova.com/grid-solutions/multilin/