

**Three phase and ground overcurrent protection with communication capability.**



## DESCRIPTION

The MDP is a digital non-directional overcurrent relay that protects against three phase and ground faults. Time overcurrent relays are used for the protection of feeders, transmission lines, alternating current machines, and for many other applications where accurate measurement of current and timing are necessary. The MDP relays have control inputs and outputs that can be used for a zone interlocking scheme. Remote control and monitoring of the breaker enables control room breaker operation.

The MDP includes four measuring units, one for each of the three phase currents and one for ground or residual current. The phase and ground units contain settings for time overcurrent (TOC) and instantaneous overcurrent (IOC). The instantaneous unit can be disabled or blocked.

The MDP has four output relay contacts, including two which can be configured to distinguish between phase and ground or between time and instantaneous trips. Three external inputs are provided to block tripping by the ground unit, block tripping by the instantaneous functions, and indicate the breaker status.

Local user interface is provided via a scrolling display and 8 LEDs. Modular communication interface provides an easy field upgrade of communications protocols and physical interface. The available protocols are GE-modem, Commnet, and ModBus® RTU. Physical interface via an RS232 or an RS485 port is an upgradeable option.

The MDP comes in a space saving S2 drawout case construction. The case is suitable for semi-flush mounting on panels.

# MDP

## Overcurrent Protection

### Applications

- Protection of feeders, transmission lines, alternating current machines
- Control room breaker operation

### Protection and Control

- Phase and ground time overcurrent
- Instantaneous overcurrent
- Four user selectable TOC curves
- Four values of definite time protection
- Four output relay contacts
- Three external inputs
- Remote breaker control

### Monitoring and Metering

- Current measured every millisecond
- Built in self test with alarm
- Event data
- Time of trip to 0.01 second

### User Interfaces

- Eight LEDs on the front of the relay
- Seven segment display with scrolling
- Modular communications card
- RS232 and RS485 available
- Three available protocols

### Features

- Compact S2 drawout case
- Wide range AC/DC power supply
- Meets ANSI C37.9, IEC255, BS.142 standards

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## PROTECTION AND CONTROL

### Three Phase Time Overcurrent and Instantaneous Overcurrent

The MDP relay includes four measuring units, one for each of the three phase currents and one for ground (residual) current. Each one of the units includes a time and instantaneous overcurrent setting. All phase units share the same setting.

The inverse time overcurrent (TOC) unit contains four characteristic curves (inverse, very inverse, extremely inverse, and long time inverse) and four values of definite time protection. A time dial setting provides a selection of operating times.

The instantaneous overcurrent (IOC) unit can be adjusted between 1 and 31 times the TOC unit's setting. It can be delayed by 0.05 to 1.55 seconds to enable coordination flexibility. The unit can also be set to 0 times the TOC to disable the instantaneous unit.

The MDP may be ordered with one of seven different current ranges.

### Ground Time Overcurrent and Instantaneous Overcurrent

The ground measuring unit includes a time and instantaneous overcurrent unit similar to the phase overcurrent unit. The use of a separate ground overcurrent function is advantageous because it can be adjusted to provide faster and more sensitive protection for single-phase-to-ground faults than the phase-overcurrent functions. The ground TOC unit has a number of available setting ranges including a sensitive setting for detecting residual ground currents. Typical connections for ground residual sensing and for a well grounded system are shown in the Typical Wiring diagrams.

### Zone Selective Interlocking

Zone selective interlocking allows instantaneous operation of upstream and downstream devices, while blocking instantaneous operation of upstream devices for faults below the downstream device.

### Outputs

The MDP relay has four outputs. Two overcurrent outputs can be configured to allow the user to distinguish either between phase and ground or between time delay and instantaneous. The choice can be made via the output selection switch (A or B) located on the face plate. The other outputs are a control/power self test failure alarm, and an output contact to close the breaker.

### Inputs

Three external inputs are provided. When the first is energized it blocks tripping by the ground units. The second blocks tripping by the phase and ground instantaneous units. The third indicates that the breaker status is closed.

Diode bridges are provided on all inputs. These inputs can be energized by either AC or DC.

## MONITORING AND METERING

### Metering

Phase and ground line current measurements are made every millisecond. Each phase and ground measurement is recorded separately in groups of ten, and the average of the maximum value of these groups is taken. The MDP displays these phase and ground measurements on a 2 digit display. The currents are displayed in multiples of setpoint and the operation time of last trip is displayed in seconds.

### Event Record

The MDP stores the phase and ground currents and the last trip operating time. They can be displayed on the 2 digit display by toggling through the functions F5 through F9. Access via a computer or computer network gives additional event log details such as the date, time to the nearest 1/100 of a second, and type of trip.

### Testing

Test and connection plugs are provided for current injection testing.

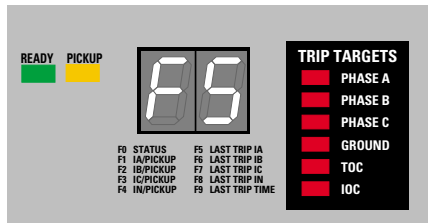
The MDP performs a complete self test check when powered up. Once in operation partial checks are made. If the system detects a critical failure of one of its components it gives a fatal error order and disables the trip outputs.

## USER INTERFACES

### LED Targets

The MDP has eight LEDs on the front of the relay. A green Ready LED indicates that the relay is in service. An amber Pickup LED indicates that one of the protection units has picked up. Six red LEDs indicate the trip was produced by phase A, B, C or ground units and TOC or IOC units. The trip LEDs can be reset with the reset lever.

LEDs provide a quick visual check of relay status



### Display

The 2 digit seven-segment display can be scrolled through by pushing the reset lever. The display indicates the status of the relay, the phase A, B, C, and ground current in multiples of pickup, the phase A, B, C, and ground current for the last trip in multiples of pickup, and the operating time for the last trip to a maximum of 199 seconds.

### Communications Port

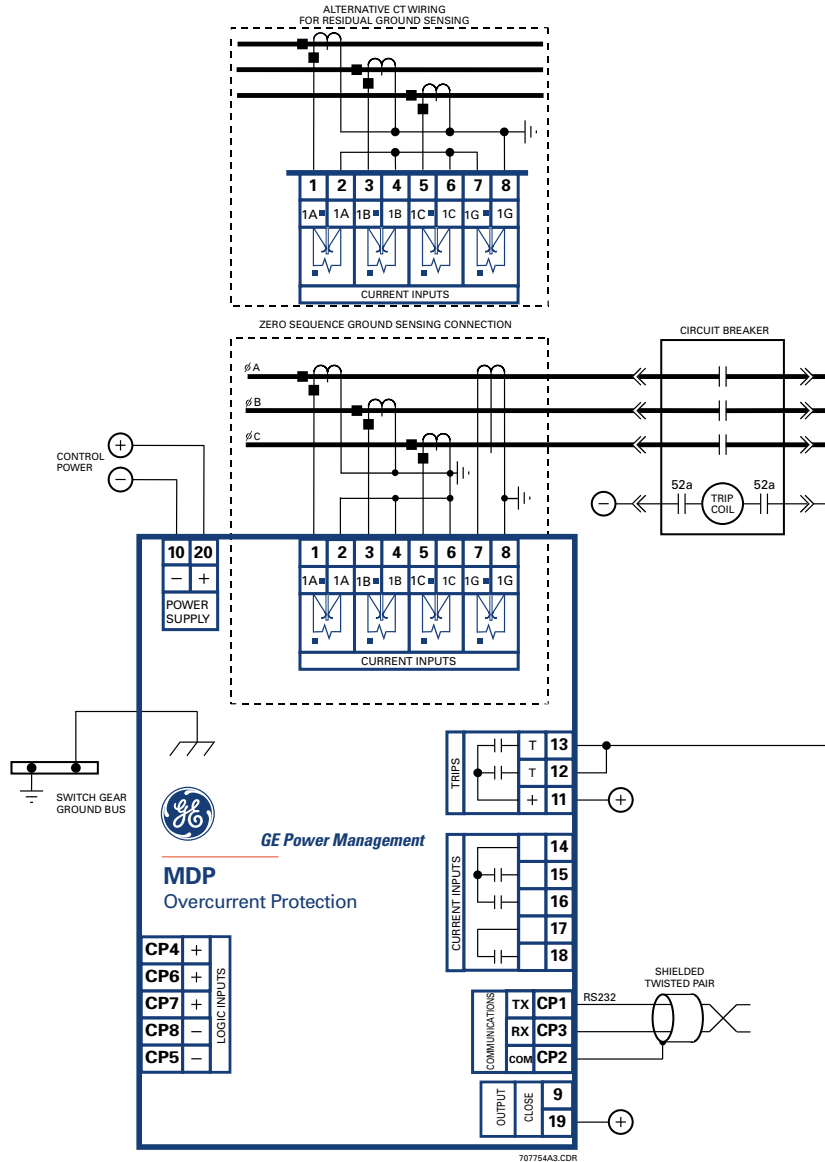
The MDP can be supplied with various communications interface modules. The communication interface card is modular and can be installed in the field. This enables the user to add or change communications protocols. There are currently two physical interfaces available, RS232 and RS485. The data communication rate is 2400 baud. MDP-LINK software is provided for PC communication.

### Communications Protocols

The three communications protocols available are GE modem, Commnet, and ModBus® RTU.

- GE modem enables the user to save fault files, read actual parameters, and close and trip the breaker.
- Commnet enables the MDP to interface to Power Leader's Distribution Software. This system interface allows control and monitoring of the distribution system.
- ModBus® RTU is a widely accepted protocol that provides active control and monitoring of the components on a distribution system. The MDP relay accepts commands to monitor actual values and force outputs.

# TYPICAL WIRING



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## MDP TECHNICAL SPECIFICATIONS

METERING	
Frequency:	20/50/60 Hz
Current:	1 or 5 A
<b>Max Permissible Current:</b>	
Continuous:	2 x I <sub>n</sub>
Three Sec:	50 x I <sub>n</sub>
One Sec:	100 x I <sub>n</sub>

INPUTS	
Contact Converter Inputs:	38.5 - 300 VDC
<b>BURDENS</b>	
<b>Current Circuits AC:</b>	
(0.1 - 0.875)/(0.3 - 2.65) =	0.009 Ω, 2.8° @ 60 Hz (2.25 VA @ 5 A)
(0.1 - 0.875)/(0.3 - 2.65) =	0.009 Ω, 2.4° @ 50 Hz (2.25 VA @ 5 A)
(0.5 - 4.375)/(1.5 - 13.25) =	0.01 Ω, 11.5° @ 60 Hz (0.25 VA @ 5 A)
(0.5 - 4.375)/(1.5 - 13.25) =	0.01 Ω, 9.7° @ 50 Hz (0.25 VA @ 5 A)
<b>Power Supply:</b>	< 3 W @ quiescent < 4.5 W @ V <sub>DCmax</sub>

POWER SUPPLY	
Control Voltage:	24 - 48 VDC 48 - 125 VDC 110 - 250 VDC

COMMUNICATIONS	
<b>Protocol:</b>	ModBus® RTU, Commet, and GE Modem
<b>Ports:</b>	RS485 or RS232 rear connector
<b>Display:</b>	Two digit LED display
<b>Reset Switch:</b>	Used to toggle through the display values and reset trips

OUTPUTS	
<b>Output and Trip Contacts:</b>	
<b>Closing:</b>	30 A, 300 VDC for tripping duty Rated for capacitor trip
<b>Interrupting:</b>	50 W resistive @ 2 A, 300 VDC
<b>Continuous:</b>	5 A @ 300 VDC

ENVIRONMENTAL	
<b>Ambient Temperature Range:</b>	
<b>Storage:</b>	-20°C to +70°C (-40°C also available)
<b>Operation:</b>	-40°C to +65°C
<b>Humidity:</b>	up to 95% without condensation

TYPE TESTS	
<b>Insulation Withstand Tests:</b>	
<b>Impulse Voltage:</b>	5 kV peak, 1.2/50 μs, 0.5 Joules per: ANSI C37.90.1, IEC 255-5, Class III 2.5 kVDC
<b>DC Hipot</b>	
<b>Surge Withstand Capability:</b>	5 kV Crest, < 10 ns rise time, > 50 pulses per sec, 2 sec duration each polarity per: ANSI C37.90.1 per: IEC 255.22.4, Class III
<b>Fast Transient:</b>	3 kV Crest, >50 test per sec, 2 sec duration each polarity decay < 6 μs per: ANSI C37.90.1 per: IEC 255.22.1, Class III
<b>Oscillator:</b>	
<b>Radio Frequency Interference:</b>	20 MHz to 1 GHz keyed every 1 MHz for 2 sec per: ANSI C37.90.2, IEC 801.3
<b>Electrostatic Discharge:</b>	per: IEC 801.2

APPROVALS	
UL - UL listed for USA and Canada	

Specifications subject to change without notice.

## GUIDEFORM SPECIFICATIONS

The relay shall be an integrated digital protection system including overcurrent protection, current monitoring, diagnostic, and communication capabilities.

Protection functions shall include:

- phase and ground time overcurrent (TOC 51/51N)
- four characteristic curves (inverse, very inverse, extremely inverse, and long time inverse) and four values of definite time protection
- ground TOC unit includes a sensitive setting for detecting residual ground currents
- phase and ground instantaneous overcurrent (IOC 50/50N)
- IOC functions include an adjustable timer
- the IOC functions can be disabled with a 0 time setting

The relay shall have three external inputs which shall block IOC trips, block ground trips, and indicate breaker status. Four output relay contacts shall be provided. Two can be configured by an output selection switch to distinguish either between phase and ground trips, or between time delay and instantaneous trips. The other two outputs are a control power/self test failure alarm, and a contact to close the breaker.

The monitoring functions shall include:

- phase and ground current metering with a sampling rate of 20 samples per cycle, displayed in 5 second intervals
- fault currents for the last trip
- operating time for the last trip to within 1/100 of a second

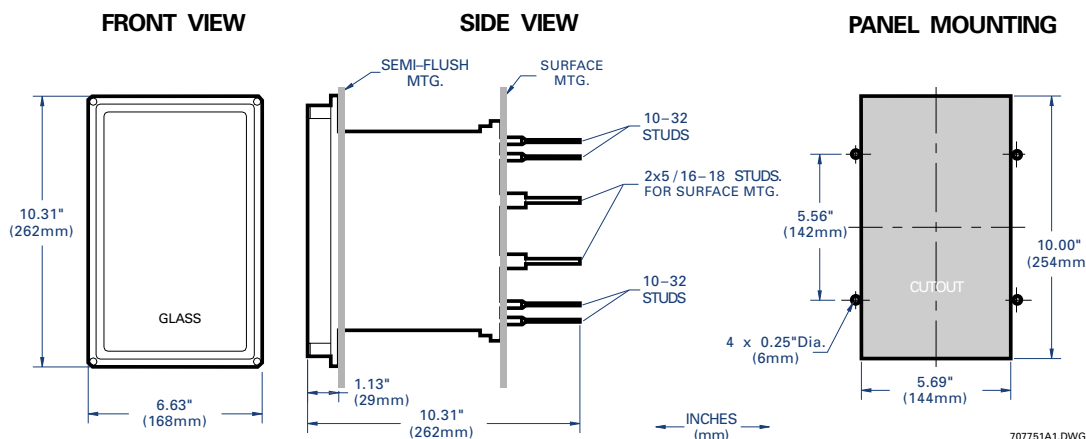
- self test

User interfaces shall include:

- LEDs to indicate the relay is in service and if a protection device has picked up
- six individual target LEDs to indicate each protection function
- relay settings controlled by front panel dip switches
- 2 digit scrolling display
- test and connection plugs for current injection testing
- rear serial data interface for communication and data retrieval, including choice of RS232 or RS485, and choice of GE-modem, Commnet, or ModBus® RTU protocols
- software for PC communication

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## DIMENSIONS



## ORDERING

To order select the basic model and the desired features from the Selection Guide below.

MDP \* \* \* 0 000 \* A

MDP				
MDP				Base unit with 50/51 overcurrent protection
0				No Communications or control inputs (Block Ground, Block Instantaneous, Breaker Status)
1				Control inputs and communications upgrade socket
2				Commnet
3				ModBus® RTU
4				RS232
5				RS485
1				5 A Nominal, 1.5 to 13.125 A Phase, 0.5 to 4.375 A Ground
2				5 A Nominal, 1.5 to 13.125 A Phase, 1.5 to 13.125 A Ground
3				5 A Nominal, 1.5 to 13.125 A Phase, 0.1 to 0.875 A Ground
4				1 A Nominal, 0.3 to 2.625 A Phase, 0.1 to 0.875 A Ground
5				1 A Nominal, 0.3 to 2.625 A Phase, 0.3 to 2.625 A Ground
6				1 A Nominal, 0.3 to 2.625 A Phase, 0.05 to 0.4375 A Ground
7				5 A Nominal, 0.5 to 4.375 A Phase, 0.5 to 4.375 A Ground
1				24-48 VDC (19 to 60 VDC)
2				48-125 VDC/AC (38.5 to 150 VDC/AC) 35 to 120 AC
3				110-250 VDC (88 to 285 VDC) 85 to 240 AC
			D	Revision Levels

**Online ordering is available for this product.**

See pages 15 - 18.

[www.GEindustrial.com/pm](http://www.GEindustrial.com/pm)