



*Directional power and loss of field protection for generators.*

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### Features and Benefits

- Advanced 16-bit microprocessor
- Loss of field unit to detect loss of excitation
- Configurable logic, curves, digital I/Os and LEDs
- Flash memory for field upgrades
- Two settings groups
- Drawout case for serviceability

### Applications

- Controlling power flow in alternating current generator applications of any size
- enerVista.com compatible (see page 275)

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### Protection and Control

- Reverse, forward overpower, low forward power
- Loss of field/excitation, fuse failure

### Monitoring and Metering

- Power metering

### User Interfaces

- M+PC software for setting and monitoring
- RS232 and RS485 ports for local and remote access



## Protection

The MIW, part of the M Family, is a digital relay that provides directional power and loss of field protection for generators of any size. Advanced protection functions include:

### Directional Reverse Power

If three-phase total power exceeds the pickup level in the reverse direction (negative MW) for a period of time, a trip will occur. The pickup level is set by per unit of generator MW calculated from rated MVA and power factor.

If the generator accelerates via the power system rather than the prime mover, the reverse power element may be blocked for a chosen time period.

### Directional Low Forward Power

If the three-phase total power in the forward direction (positive MW) falls below the pickup level for a chosen period of time, an alarm will occur. The pickup level is programmed as above in directional reverse power.

The low forward power element is active only when the generator is online. The pickup level should be set lower than expected generator loading during normal operations.

### Loss of Excitation

Loss of excitation is detected via an impedance element. If the impedance falls within the impedance circle for the delay time specified, a trip will occur. The user can enable circle #1 and/or circle #2 to tune the protection feature to their system. The larger circle diameter can be set to the synchronous reactance of the generator  $x_d$ , and the circle offset should be set to the generator transient reactance  $x'_d/2$ . This element will be blocked if there is a fuse failure condition or if the generator is offline.

### Fuse Failure

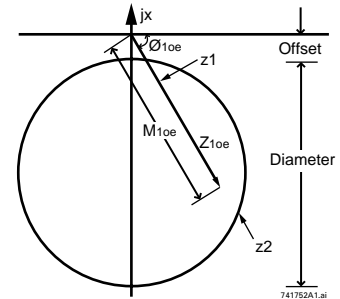
The MIW includes a VT fuse failure unit which measures the value of negative sequence voltage against positive sequence voltage and the current value.

### Inputs and Outputs

The factory configuration of MIW inputs and outputs can be easily modified using M+PC software. Two digital inputs and six relay outputs are provided, four of them programmable. These configurable outputs can be assigned either to a set of pre-configured values, or to an OR/NOT combination of the same values.

### Configurable Logic

Four configurable logic schemes can be implemented via four preconfigured logic gates and timer cells through a graphical user interface. The MIW configurable logic outputs can be used to configure digital outputs and LEDs.



The formula:  $Z_{1oe} = \frac{V_{AB}}{I_A \cdot I_B} = M_{1oe} \angle \phi_{1oe}$

where:  $Z_{1oe}$  = Secondary phase-to-phase loss of excitation impedance  
 $M_{1oe} \angle \phi_{1oe}$  = Secondary impedance phasor (magnitude and angle)

All relay quantities are in terms of secondary impedances. The formula to convert primary impedance quantities to secondary impedance quantities is provided below.

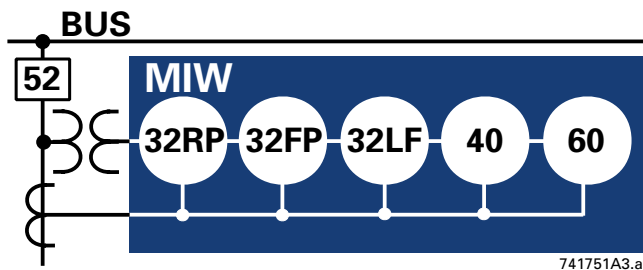
where:  $Z_{sec} = \frac{Z_{pri} \times CT_{ratio}}{VT_{ratio}}$

$Z_{pri}$  = primary ohms impedance  
 $CT_{ratio}$  = programmed CT ratio, if CT ratio is 1200:5 use a value of 1200/5 = 240  
 $VT_{ratio}$  = programmed VT ratio, if VT ratio is 100:1 use a value of 100

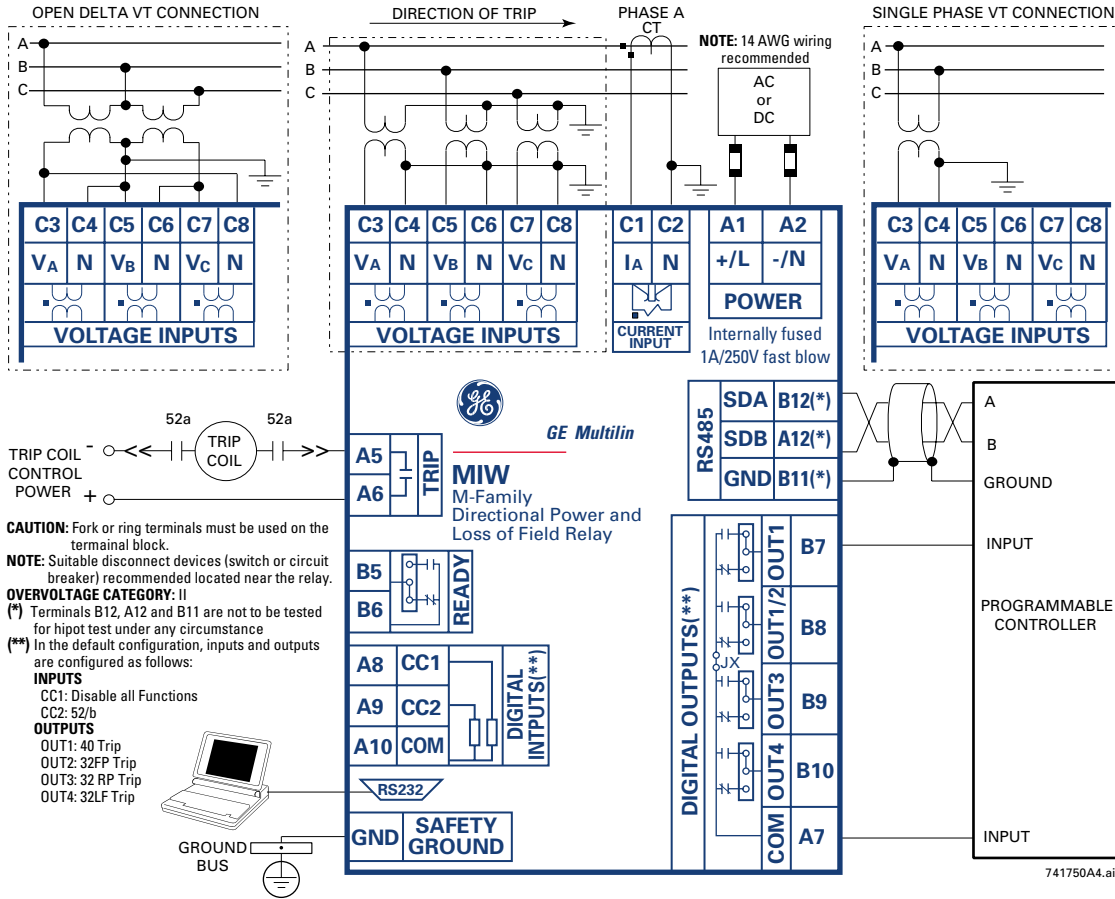
## Monitoring and Metering

The MIW provides metering values for  $I_a$ , voltage values, P, Q, S,  $V_1$ ,  $V_2$  and angle. A 24 event record and oscillography data help with troubleshooting and performance analysis.

## Functional Block Diagram



## Typical Wiring



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## MIW Guideform Specifications

For an electronic version of the MIW guideform specifications, please visit: [www.GEindustrial.com/Multilin/specs](http://www.GEindustrial.com/Multilin/specs), fax your request to 905-201-2098 or email to [literature.multilin@indsys.ge.com](mailto:literature.multilin@indsys.ge.com).



## Ordering

MIW 1 0 0 0E000 \* 00 \*

MIW		Directional power/loss of field relay
F		24 – 48 VDC (Range: 19 – 58 VDC) power supply
H		110 – 250 VDC (Range: 88 – 300 VDC) power supply and 120 – 230 VAC (Range: 88 – 264 VAC) power supply
C		Individual relay
S		Mounted in an M+ system †

† If relays are to be mounted in an M+ system either an M050 half 19" rack or M100 full 19" rack case must be ordered. The M050 and M100 racks are provided at no additional cost.

## Accessories

Depth Reducing Collar: Reduces the mounting depth in 63 mm

enerVista enabled See page 275.  
[www.enerVista.com](http://www.enerVista.com)