M II Family Digital Differential Protection Relay

Features and Benefits
- Configurable Logic
- Flash memory for field upgrades
- Two setting tables
- Drawout case
- DC power supply

Applications
- High impedance differential protection
- Restricted Ground Fault protection with one/two elements
- Lockout logic

Monitoring and Metering
- 24 Event record per M Family Unit
- Analog/digital oscillography
- Per phase current metering

User Interfaces
- EnerVista software for setting & monitoring
- RS232 port, faceplate accessible (0.3-19.2kbps, ModBus® RTU)
- RS485 rear port (0.3-19.2 kbps, ModBus® RTU)
- LED dot matrix display and keypad
- Target LED indicators

High Impedance Bus Differential Protection

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Description

The MIB, a member of the M family of protection relays, is a microprocessor based relay that provides three phase high impedance differential protection for Substation busbars of any voltage level. Additionally, it can also be used to protect electrical machines like transformers, generators or motors against restricted earth faults.

Basic protection functions features include a high impedance differential protection unit. Stability against external faults is guaranteed thanks to the use of an stabilizing resistor. Additionally, the unit includes a set of MOVs (Metal Oxide Varistors) in order to clamp the secondary peak voltage below 2kV during fault conditions.

For applications as restricted earth fault protection (RGF) of electrical machines, the differential principle of operation is similar. The unit is intended to provide sensitive ground fault detection for low magnitude fault currents.

Each MIB relay unit has two configurable digital inputs and six contact outputs (four of them are configurable). Six LEDs are also provided, being four of them user configurable. The front panel also features a three key keypad and a 3.5 digit LED dot matrix display that provides an easy to use user interface.

The front keypad allows the user to set the baud rate and relay address for communication. A front RS232 and a rear RS485 communication port are provided for computer access using ModBus® RTU protocol. The rear RS485 can be converted to an RS232 or fiber optic port (plastic or glass fiber optics) by means of using an external converter (SAC 300, F485). Windows® based ENERVISTA software is provided free of charge with the relay to allow setup and configuration of MIB units.

Computer access allows setting and configuration (inputs, outputs, LEDs and configurable logic) of the units, display of metering information, and real-time status of the unit. The display of event records and oscillography report for the last fault is also included.

The MIB has a drawout construction in a 19” rack case and can be flush or 19” rack mounted.

PROTECTION

Differential Unit (87H)

This unit detects internal faults within the busbars. It is based on a very sensitive overcurrent differential unit that can be adjusted between 10mA and 400mA. The MIB includes a 2000 Ohm set of stabilizing resistors to make sure that the unit remains stable for pass-through faults.

In order to protect the unit, a set of MOVs clamps the secondary voltage under faults to less than 2 kV. Please note that all the CTs must have the same ratio.

Alarm Unit (87L)

The alarm unit detects any current unbalance condition, like the ones produced when one of the CTs has a phase open. Once the condition is detected a timer starts that finally blocks the operation of the MIB.

Settings go between 10mA and 400mA. Timer is up to 600 sec in steps of 10 ms.

Restricted Ground Fault

Restricted Ground Fault (RGF) protection is intended to provide sensitive ground fault detection for low magnitude fault currents. This protection is often applied to machines and transformers having impedance grounded Wye windings. It is intended to provide sensitive ground fault detection for low magnitude fault currents which would not be detected by other protection functions.

Configurable Logic

Up to a maximum of 4 configurable logic schemes can be implemented into each MIB relay by means of using a set of 4 pre-configured logic gates and timer cells. A graphical user interface is provided for configuration of the logic. The outputs of the configurable logic can be used to configure digital outputs and LEDs.

Multiple Setting Groups

Two separate settings groups are stored in non-volatile memory, with only one group active at a given time. Switching between setting groups 1 and 2 can be done by means of a setting, a communication command or digital input activation.

Settings are divided in 2 categories, main and advanced settings. This allows users to have access to main relay functionalities in an extremely simple, user friendly way by entering only main settings, while having access to complete functionality for more complex use through advanced settings.

Inputs and Outputs

Two configurable inputs and six contact outputs (four of them configurable) are provided for each MIB relay.

Metering

MIB provides metering values for phase differential current.
FEATURES

Event Recording
Events consist of a broad range of change of state occurrences, including pickups, trips, contact operations, alarms and self test status. Each MIB relay stores up to 24 events time tagged to the nearest millisecond. This provides the information needed to determine sequence of events which facilitates diagnosis of relay operation. Each event can be individually maskable in order to avoid the generation of undesired events.

Oscillography
Each MIB relay captures current waveforms and digital channels at 8 samples per cycle. One oscillography record with a maximum length of 24 cycles is stored in memory. Oscillography is triggered either by internal signals or an external contact.

Configurable I/O and LEDs
There are two configurable digital inputs in each MIB relay. Out of the six digital outputs, two have a fixed function (trip and service required), while the other four are user configurable. Those configurable outputs can be assigned either to a set of preconfigured values, or an OR/NOT combination of the same values. Each configurable output can be independently latched. The first LED has a fixed assignment (relay in service), the second is fixed for trip, and the remaining four LEDs are user configurable in function, memory and/or blinking/fixed indication.

USER INTERFACES

Status LEDs
The status of the relay is indicated through six LEDs located on the front panel. The first one is green and has a fixed assignment showing that the relay is in service. The other five are user configurable.

Keypad and Display
A three button keypad allows user access for easy relay interrogation and change of settings. Metering data, last trip information and settings are displayed through the LED dot matrix display. Note that full access to the event and oscillography records, and unit configuration is possible only through PC communication.

Self Test Diagnostics
Comprehensive self test diagnostics occur at power up and continuously during relay operation. Any problem found by self tests causes an alarm and an event is logged.

Communication Ports
A front mounted RS232 and a rear RS485 port allow easy user interface via a PC. ModBus® RTU protocol is used for all ports. The relay supports baud rates from 300 to 19,200 bps. Up to 32 relays can be addressed on a single communications channel. A unique address must be assigned to each relay via a setting when multiple relays are connected.
EnerVista Software

A single PC software package is required to access, configure, and monitor all relays in the M family regardless of their model, application, or available options. EnerVista extracts the model number, version, and configuration parameters from the connected relay to display only the relevant data and options for the relay it is communicating with. This eliminates having to manually configure the relay within the software and provides an simple and easy to use operator user interface.

All M Family products are supplied with Windows® based EnerVista software. EnerVista allows communication among M Family relays for monitoring, setting changes, information and configuration.

Keep track of and react to all relay status data with ease.

EnerVista may be run on a PC with the Windows® systems. The program may be used locally on the RS232 front port or remotely on the RS485 port.

It provides full access to the relay data with the following features:
- View actual values
- View relay status
- View/edit settings on-line/off-line
- View event recorder for troubleshooting
- Configure inputs, outputs and LEDs through configurable logic
- Utilize a configurable protection curve
- Relay firmware programming for upgrades
- Allow multi language selection of the menus (English, Spanish, French, German, Italian, Turkish, etc.)

All status information such as target messages and digital input/output states may be viewed with EnerVista software.

Busbar Application

High impedance differential busbar protection, monitoring and metering shall be provided in one integrated digital package for application on any voltage substation. The device shall be suitable for incorporation in an integrated substation control system.

Protection and control functions shall include:
- Differential protection (87H)
- CT opening alarm (87L)
- Lockout logic
- 6 outputs, four of them configurable
- Two setting tables

Transformer Application

High impedance restricted earth fault protection, control and metering shall be provided in one integrated digital package. The device shall be suitable for incorporation in an integrated substation control system.

Protection and control functions shall include:
- Restricted earth fault differential protection
- 2 lockout contacts with pushbutton
- Two setting tables

Monitoring

Monitoring features shall include:
- 24 event record
- Oscillography
- Differential current metering per phase

Guideform Specifications

Available on the Product CD, Online or from your Sales Representative.

www.GEindustrial.com/Multilin

Dimensions

Front View

Top View

Panel Mounting
Typical Wiring

CAUTION: FORK OR RING TERMINALS MUST BE USED ON THE TERMINAL BLOCK

NOTES: SUITABLE DISCONNECT DEVICES RECOMMENDED LOCATED NEAR THE RELAY

OVERVOLTAGE CATEGORY II

WARNING: GROUND PC TO RELAY GROUND. OTHERWISE USE UNGROUNDED PC

NOTE: 14 AWG WIRING RECOMMENDED

GE Multilin

MIB Module

CURRENT INPUTS

Returning Section

GROUND BUS

DC POWER SUPPLY

NOTE: 14 AWG WIRING RECOMMENDED

WARNING: GROUND PC TO RELAY GROUND. OTHERWISE USE UNGROUNDED PC

RETURN

DIFF PHASE C
E12

DIFF PHASE B
E11

DIFF PHASE A
E10

G5
G6

GND F1 F2 F3 F4 F5 F6 SDA SDB COM

RS485 G12 H12 G11

F1 F2 F3 F4 F5 F6

H1 H2 H3 H4 H5 H6 G7 G8 G9 G10 H7

A1 A4 B9 B12

B7 B8
MIB Technical Specifications

**High Impedance**

<table>
<thead>
<tr>
<th>Differential Unit (7)</th>
<th>Contact Level</th>
<th>CT Primary</th>
<th>10mA to 400mA</th>
<th>Define Time: Up to 900 sec (10msec steps)</th>
<th>Accuracy: ±3% in the complete range</th>
</tr>
</thead>
</table>

**Alarm Unit (8) | Contact Level | CT Primary | 10mA to 400mA | Define Time: Up to 900 sec (10msec steps) | Accuracy: ±3% in the complete range |
|----------------|--------------|------------|----------------|---------------------------------------------|---------------------------------|

**Application**

1. 1 winding Transf. REF App. 1 High Imp. Differential Element
2. 2 winding Transf. REF App. 2 High Imp. Differential Elements
3. Busbar App. 3 High Imp. Differential Elements

**Auxiliary Voltage**

- LO Power Supply: 24-28 Vdc (range: 19-58Vdc)
- HI Power Supply: 110-250Vdc (range: 88-300Vdc)

**METERING**

- Current Circuits: 4A
- During 2 Sec: 10A
- During 1 Sec: 100A

**Communications**

- Local Communication: Alphanumeric display; 3 button front panel keypad
- Remote Communication: ModBus® RTU

**Power Supply**

- Frequency: 50/60 Hz
- Auxiliary Voltage: 24-48 Vdc ±20%
- 110-250 Vdc ±20%

**Resistance**

- Value: 2000 ohm
- Max. Operating Cont. Voltage: 300 V
- MOV: V Peak: 1900 V
- Max. Withstand Energy: 5400 J

**Environmental**

- Temperature: -40ºC to +70ºC
- Operation: -25ºC to +70ºC
- Humidity: Up to 95% without condensing

**Packaging**

- Approximate Weight: 23.89 lb (10.7 kg)
- Net: 25 lb (11.3 kg)

**Type Test**

- Isolation Test Voltage: 2kV, 50/60 Hz, 1 min IEC 60255-5
- Surge Test Voltage: 5 kV peak, 0.5 J IEC 60255-6
- Interference:
  - Electromagnetic Discharge: Class III according to IEC60255-22-1
  - Radiointerference: Class IV according to IEC60255-22-2
  - Fast Transient: Class IV according to IEC60255-22-3
  - Radiointerference: Class III according to IEC60255-22-4
- Sinusoidal Vibration: Class 1 according to IEC60255-21-1
- Shock: Class I according to IEC60255-21-2
- Radiofrequency Emission:
  - According to IEC418 (Sec. 81)
  - EN55022 Class B
- Oscillatory / Fast Risetime Transient: ANSI/IEEE C 37.90.1
- Electromagnetic Interference Withstand Capability: ANSI/IEEE C 37.90.2

**Inputs**

- Current Circuits: <0.08 VA at In (1A)
- DC Burden: During Operation: 5 W standby
- Per Each Activated Input: 8 mA / 1 W, Vaux: 125

**Outputs**

- TRIPPING CONTACTS
  - Contact Capacity: 400 Vac
  - Continuous Current: 16 A
  - Breaking: 4000 VA
- OUTPUT RELAYS
  - Configuration: 6 Electro-Mechanical Form C
  - Contact Material: Alloy suited for inductive loads
  - Operate Time: 8 ms
  - Inductive load: 0.3 A at 125 Vdc

**Environment**

- Temperature: -40ºC to +80ºC
- Storage: -25ºC to +40ºC
- Humidity: Up to 95% without condensing

**Approvals**

- CSA: Approved under LR 41286
- C: Conforms to EN/IEC 60255
- ISO: Manufactured to an ISO9001 registered program

*Specifications subject to change without notice.

Ordering

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

**MIB High Impedance Differential Protection Relay**

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