# 24 VDC Mixed Discrete Input / Output Module

IC670MDD441

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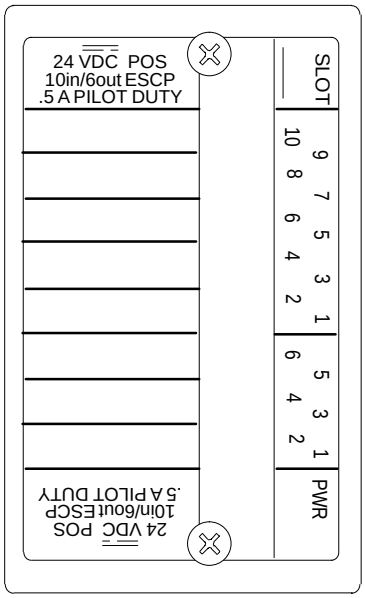
*August 1997*

The 24 VDC Mixed Input/Output Module with Electronic Short-Circuit Protection (IC670MDD441) provides 10 discrete input circuits and 6 discrete output circuits sharing the same common line. Each output point has electronic overcurrent and short circuit protection, and generates a fault if either condition exists.




An overcurrent or short–circuit fault on an output point causes the point to turn off. A module fault is reported to the BIU.

## Power Sources

Power for the module itself comes from the power supply in the Bus Interface Unit. An external source of DC power must be provided for the switches that power the loads. The common line on DC power is also the return for the input circuits.

## LEDs

Individual logic side LEDs indicate the presence of input voltage for each input point (green = ON).

A logic side bi–color LED for each output indicates that an output circuit is ON (green) or that a fault condition has occured (orange). The green LEDs will continue to operate when user power is not present. If a point fault occurs, the point is automatically turned OFF. The fault is cleared by sending a clear command from the HHM or by cycling power on either the backplane or the user side.

The PWR LED indicates logic and user power is available to operate the module (green = OK, OFF = loss of power).

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# Host Interface

Intelligent processing for this module is performed by the Bus Interface Unit or elsewhere in the system. The module uses 16 discrete input data bits (two bytes) and 8 discrete output data bits (one byte). The remaining 6 unused input data bits and 2 unused output data bits are not used A Bus Interface Unit is required to exchange this I/O data in a byte format with the host and/or a local processor.

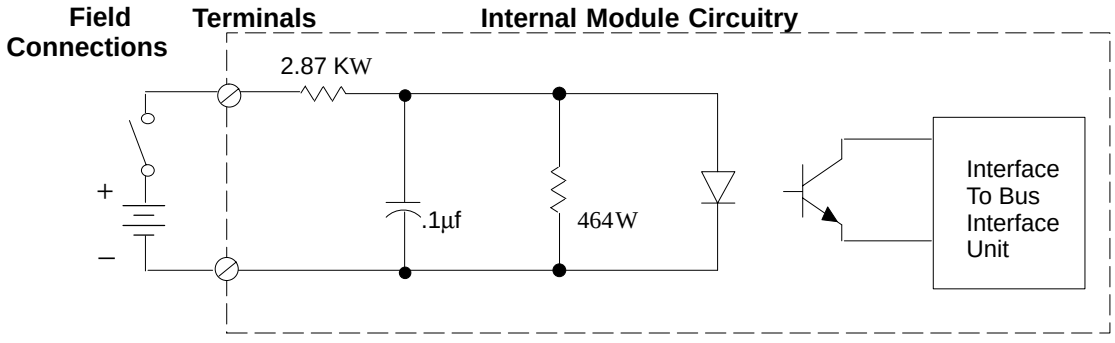
## Compatibility

This module must be used with a Genius Bus Interface Unit IC670GBI002 (revision 2.20) or later. This module can be used with a Profibus Bus Interface Unit or Interbus-S Bus Interface Unit version 2.20 or later.

# Module Operation

After checking the Board ID, the Bus Interface Unit sends output data to the module and receives input data from the module. Input, output, and Board ID data are in serial format. During transmission, the module automatically loops output data back to the Bus Interface Unit for verification. A serial to parallel conversion converts output data into the parallel format needed by the module. Conversely, a parallel to serial conversion converts input data into the serial format needed by the BIU. Opto-isolators isolate the module's inputs and outputs from the field. Power from the external power supply is used to drive the FET switches that source current to the loads.

## Input Circuit



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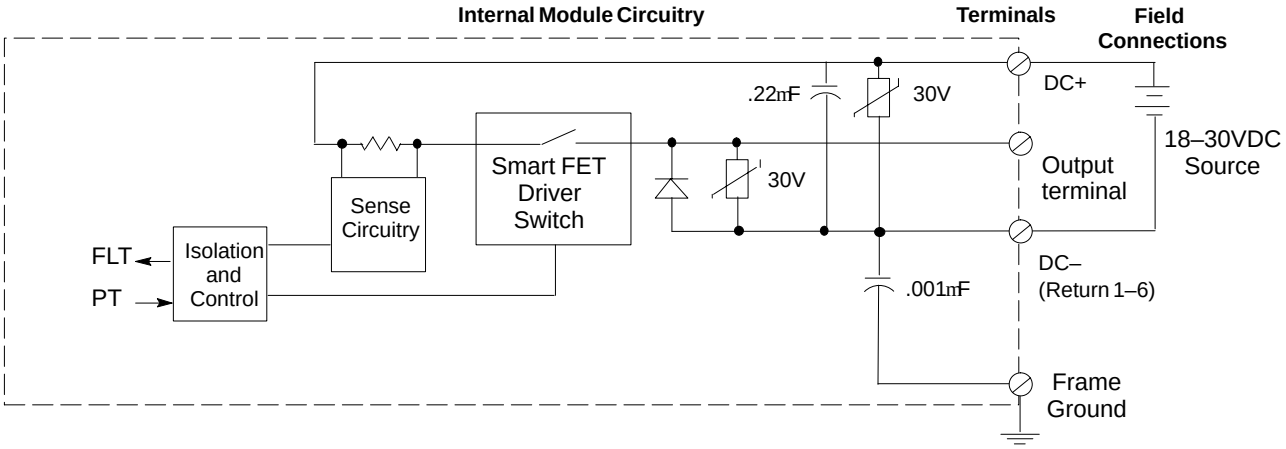
### Output Circuit




A MOV across the power supply lines protects the module from transient voltage surges. Capacitors across the supply lines and from each supply line to frame ground provide further noise protection.

### External Power Supply Requirements

The external power supply used with the module must provide sufficient field power for the module during short circuit events.

When a load is shorted, an inadequate external power supply may allow field power to drop below the specified operating range, causing misoperation of the module. The external power supply must be capable of providing short circuit energy without degradation of output voltage levels. The amount of energy required depends on the number of simultaneously-shorted points that might occur. Refer to power supply short circuit operation specifications prior to selecting the power supply to be used with the module.

Local energy storage (either batteries or capacitors) can be used to compensate for insufficient power supply characteristics.

**Important Note:** Additional best practices including minimizing wiring resistance from the external power supply to the module, preventing voltage drop during short circuit energy transfer.

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# Module Specifications

| | |
|---|---|
| **Input Circuits** | |
| Rated Input Voltage | 24 VDC |
| Inputs per module | 10 Pos / Neg Logic Inputs |
| Input Voltage Range | 0 to +30 VDC |
| User Input Current | 8.0mA per point @ 24 VDC |
| Isolation to case, ground, logic side | 250 VAC continuous, 1500 VAC for 1 minute. No isolation between individual points in a group. |
| Indicators | 1 LED per point shows individual point status |
| Input Impedance | 2.87k typical |
| On–state voltage | +15 VDC to +30 VDC |
| OFF–state voltage | 0 to +5 VDC |
| On–state current | 3.0 mA to 8.0 mA |
| OFF–state current | 0 to 1.5 mA |
| Response Time–On | 25µs typical, 60µs maximum |
| Response Time–Off | 100µs typical, 150µs maximum |
| **Output Circuits** | |
| Rated Output Voltage | 24 VDC |
| Output Voltage Range | 15 VDC to 30 VDC |
| Output Current | 0.5 A maximum per point |
| Outputs per module | 6 |
| Indicators | 1 Bi–color LED per point indicating on / off status of output circuits (green) and short / over current circuit fault (orange) |
| Isolation to case, ground, logic side | 250 VAC continuous, 1500 VAC for 1 minute. No isolation between individual points in a group. |
| Steady State Overcurrent Trip Point | 1.6 A typical, 0.7 A to 2.5 A max range |
| Maximum Load Current (resistive) | 0.5 A @ 30 VDC |
| Output Voltage Drop | 0.2 V maximum |
| Output Leakage Current | 0.5 mA @ 30 VDC maximum |
| Response Time–On | 100µs typical, 150µs maximum |
| Response Time–Off | 400µs typical, 500µs maximum |
| Protection (each output) | short circuit protection, over current protection, MOV and freewheeling diodes |
| **Input/Output Circuits** | |
| Total Current Drawn from BIU | 110mA |
| Indicators backplane | PWR LED indicates field and backplane power are present |

# Keying Locations

Optional keying locations for the 24 VDC Mixed Input / Output Module are shown below.

| Keying Locations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **J** | **K** |
| ✓ | | ✓ | | | | ✓ | ✓ | | |

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# Field Wiring

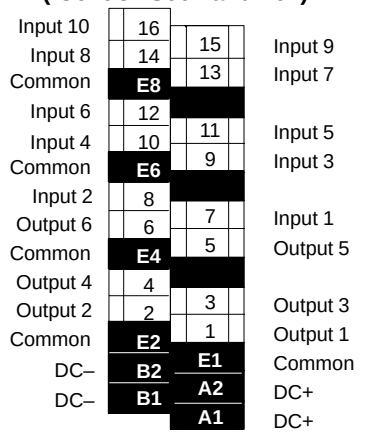
The Terminal Block with box terminals has 25 terminals per module, each of which accommodates one AWG #14 (avg 2.1mm$^2$ cross section) to AWG #22 (avg 0.36mm$^2$ cross section) wire, or two wires up to AWG #18 (avg. 0.86mm$^2$ cross section). Using an external jumper reduces wire capacity from AWG #14 (2.10mm$^2$) to AWG #16 (1.32mm$^2$).

The I/O Terminal Block with barrier terminals has 18 terminals per module. Each terminal can accommodate one or two wires up to AWG #14 (avg 2.10mm$^2$ cross section).

The I/O Terminal Block with Connectors has one 20-pin male connector per module.

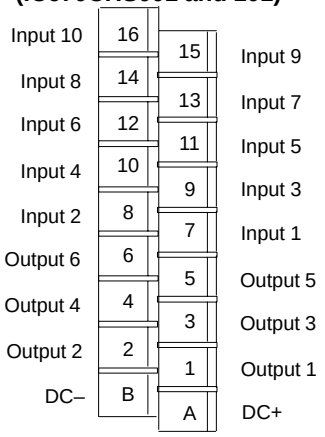
The following illustration shows terminal assignments for the 24 VDC Electronic Short Circuit Protection Output Module. The eight outputs form one group, with a common return.

**I/O Terminal Block with Box Terminals (IC670CHS002 and 102)**

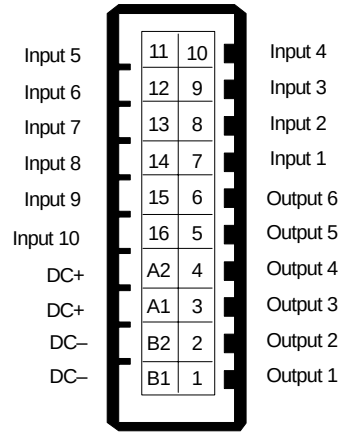



Terminals E1, E2, E4, E6, and E8 are electrically connected together, A1 and A2 are electrically connected together, B1 and B2 are electrically connected together.

**I/O Terminal Block with Barrier Terminals (IC670CHS001 and 101)**




**I/O Terminal Block with Wire to Board Connectors (IC670CHS003 and 103)**




## Wiring Example

The following illustration shows example wiring to the module.