



BusWorks® 900MB Series Modbus-RTU I/O

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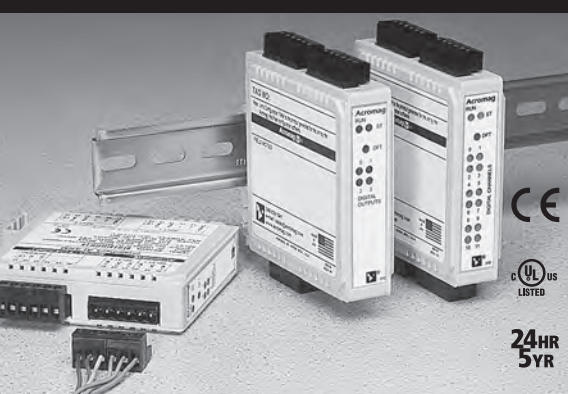
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	901/2/3	904/5/6	913/914	917/918	924	932/934	942
DISCRETE INPUTS							
Active low input	X						
Active high input		X					
ANALOG INPUTS							
DC voltage/current input			X				
DC millivolt input					X		
Thermocouple input					X		
RTD/resistance input						X	
Frequency input							X
AC current input (requires external sensor)			X				
DISCRETE OUTPUTS							
Sinking output (low-side switch)	X						
Sourcing output (high-side switch)		X					
Limit alarm (open-drain MOSFETs or relays)			X	X	X	X	X
ANALOG OUTPUTS							
DC voltage/current				X			
POWER CONFIGURATION							
DC-powered	X	X	X	X	X	X	X
AC-powered	X	X	X	X	X	X	X



Modbus I/O Network



900MB Series Modbus-RTU I/O Modules

The 900MB series is a high-performance line of multi-function I/O modules. These units feature universal input/output ranges and an intelligent microcontroller to provide extreme flexibility and powerful monitoring and control capabilities. Select from a variety of analog and discrete I/O models to meet your application requirements.

To ensure unsurpassed performance, these I/O modules employ the latest digital technology. State-of-the-art flash microcontrollers plus optically isolated input, output, power, and network circuits increase noise/transient immunity and prevent ground loops. Status LEDs provide diagnostic feedback and visually indicate which channels are outside their calibrated range.

Sophisticated watchdog timer functions allow the application to define the module's failsafe output state. The watchdog timer invokes the failsafe condition when communication between the host and module exceed a duration specified by the application. For further security, a second hardware watchdog timer monitors the microcontroller for failed operations or a "lock-up" condition and automatically resets the unit.

Special Features

- High-speed RS-485 communication allows data transfers up to 115K baud
- Modbus RTU protocol interfaces to popular HMI and SCADA software packages
- Wide-range, polarity-insensitive power supply supports 10-36V DC and 24V AC sources
- Powerful watchdog timers allow user-defined failsafe state when host communication is lost
- Isolation eliminates potential ground loops between I/O, power, and network circuitry
- Default switch allows user to set module to known communication parameters
- Menu-based Windows® configuration software simplifies setup and trouble-shooting

Discrete I/O

These modules monitor discrete levels of various devices and/or provide on/off control capabilities depending on the model selected. Each module offers high channel density to save space and keep costs low. Models are available with twelve inputs, twelve outputs, or twelve bidirectional I/O channels.

Inputs

- Active-high inputs, 0 to 35V DC
- Active-low inputs, 0 to 35V DC

Outputs

- Sourcing outputs, 5.5 to 35V DC, 250mA
- Sinking outputs, 0 to 35V DC, up to 1A

Functions

- Monitor discrete state or level
- On/off control
- Activate audible or visual alarms
- Transmit discrete data to other control systems

Analog Input

These units monitor DC or thermocouple sensor inputs and provide alarm outputs if conditions exceed user-defined limits. Each module has four analog input channels and four discrete outputs for independent local alarms or host-controlled on/off switching.

Inputs

- DC current
- DC voltage
- DC millivolts
- Thermocouple
- RTD/resistance
- Frequency
- AC current

Outputs

- Open drain MOSFETs (1A solid-state switches)

Functions

- Temperature monitoring
- Process variable measurement
- Limit alarms with high and/or low setpoints
- On/off control

Analog Output

Analog output modules are ideal for controlling a wide variety of industrial machinery. The host defines the output of voltage or current signals to control speed, flow, temperature, frequency, level, force, torque, intensity, and many other properties. Each module has four analog output channels plus four discrete outputs for on/off switching applications.

Outputs

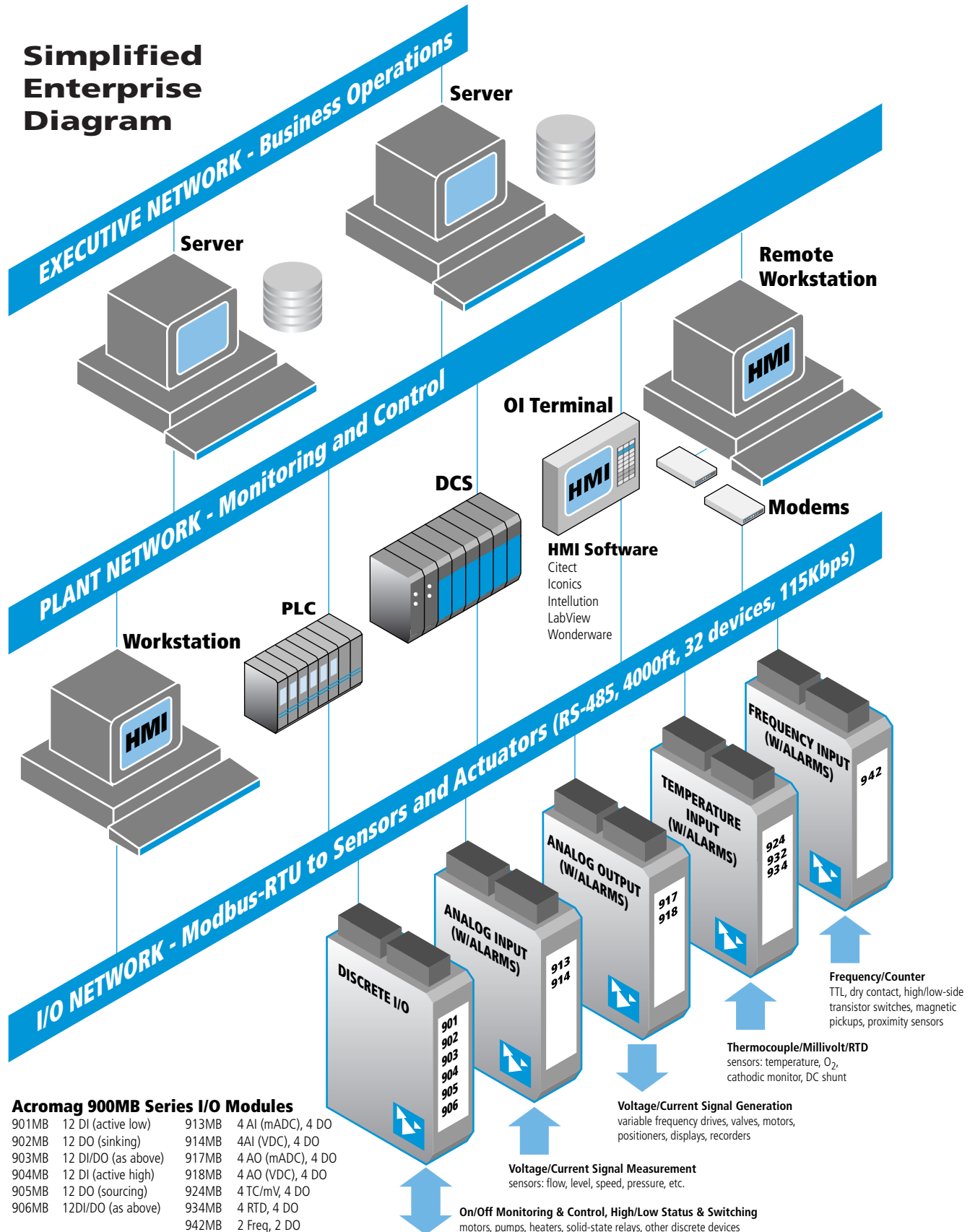
- DC voltage
- DC current
- Open drain MOSFETs (1A solid-state switches)

Functions

- Write data to local displays or recorders
- Control drives, valves, and other equipment
- Transmit discrete data to other control systems
- On/off control (alarms)



Simplified Enterprise Diagram



BusWorks® Modbus I/O

Acromag 900MB Series I/O Modules

901MB	12 DI (active low)	913MB	4 AI (mADC), 4 DO
902MB	12 DO (sinking)	914MB	4AI (VDC), 4 DO
903MB	12 DI/DO (as above)	917MB	4 AO (mADC), 4 DO
904MB	12 DI (active high)	918MB	4 AO (VDC), 4 DO
905MB	12 DO (sourcing)	924MB	4 TC/mV, 4 DO
906MB	12DI/DO (as above)	934MB	4 RTD, 4 DO
		942MB	2 Freq, 2 DO



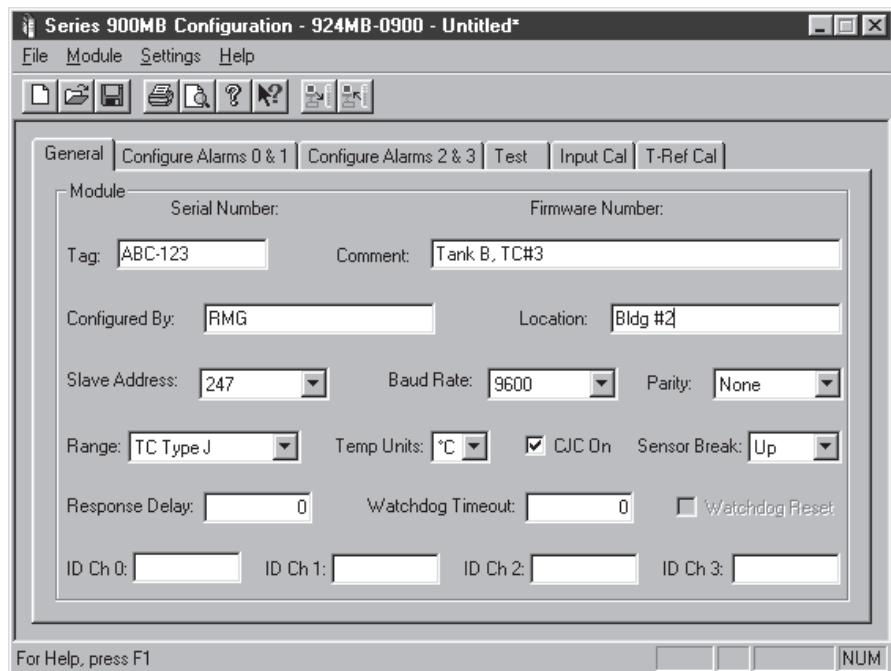
Software Support

Series 900 I/O modules are compatible with popular Human-Machine Interface (HMI) software packages that support Modbus communication. The I/O modules may be configured using generic drivers provided with the HMI software to access the Modbus register maps.

A list of popular third-party HMI software manufacturers:

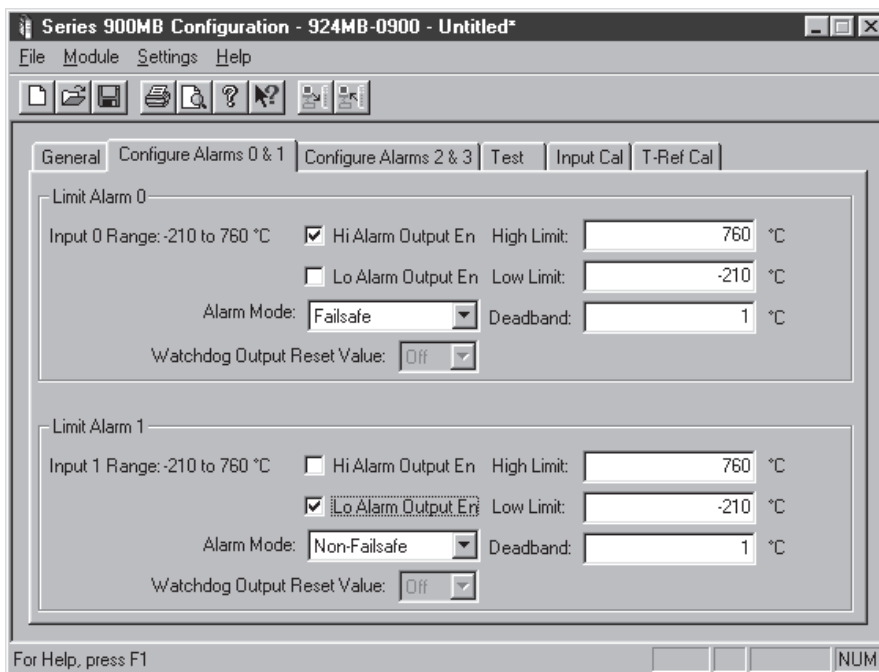
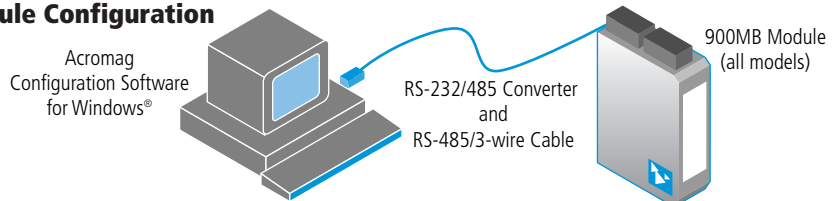
- AB/Rockwell
- Citect
- Iconics
- Intellution
- National Instruments
- Steeplechase
- Think and Do
- Wonderware

Acromag also offers a configuration utility for faster and easier setup. This software provides an intuitive approach to select configuration options for your application. Familiar Windows pull-down selection menus and fill-in-the-blank fields speed you through a few brief configuration screens. No programming is required. The utility also helps you monitor and verify proper operation of the module outside the main control software. This diagnostic tool provides a simple alternative to using Modbus register maps.



Acromag's configuration software can be used offline to set up a module and save the configuration to a file.

Module Configuration



Limit alarms are easy to configure with fill-in-the-blank fields in engineering units for high/low alarm setpoints.

Easy Configuration

Acromag's configuration software is designed for offline setup at a bench or in the field with a laptop computer. Configuration settings can be saved to a file or printed for archival purposes. Setup is quick and easy using the steps below.

- 1) Connect the module to a PC with the cable and RS-232/485 converter (typical system). Apply power.
- 2) In the software, open a saved configuration or select the Module Upload option.
- 3) Configure the operating parameters as desired and download the configuration into the module.
- 4) Use the software's Test function to verify module operation and communication.
- 5) Install the module on the network.



■ Accessories

■ Configuration Tools

Acromag provides a full set of tools to help you get your modules set up and ready to install.

Software Interface Package

See Page 69 for more information.

Includes the following:

- Configuration Software Utility
- Instruction manuals
- Serial port converter
- Interface cable

■ Network Devices

Everything you need to drive your network is available from Acromag: isolators, converters, signal boosters, and power sources.

Universal 50W Power Supply (Page 69)

Isolated RS-232/485 Converter (Page 70)

Isolated RS-485 Network Repeater (Page 70)

■ Mounting Hardware

Installation is a snap with Acromag accessories.

DIN RAIL Bars (Page 69)

19" Rack-Mount Kit (Page 69)

■ General Module Specifications

■ Communication Interface

Network Communication

Modbus-RTU protocol, RS485 (3-Wire). Standard Protocol implementation as defined under "Modicon Modbus Reference Guide" PI-MBUS-300 Rev. J. Reference: <http://public.modicon.com>. Search on: PI-MBUS-300 for technical publication.

Baud Rate

2400, 4800, 9600, 14.4k, 19.2k, 28.8k, 38.4k, 57.6k, 76.8k, or 115.2k baud. Default 9600 baud.

Module Addressing

0 to 247, selectable. Default address 247.

Network Distance

4000 feet without network repeater.

Nodes

Supports up to 32 modules without the use of a network repeater.

Parity

Odd, even, or none. Default setting none.

Stop Bits

One with parity, one or two with no parity. Default setting is two stop bits with no parity.

Watchdog Timer (Hardware)

A hardware watchdog timer is built into each module to perform a reset if the microcontroller fails to return from an operation in a timely manner or "locks up".

Watchdog Timer (Network Communication)

All modules have a communication watchdog timer function. The watchdog timer is configurable for timeout periods of up to 18 hours. This timer function monitors I/O communications with the host controller. In the event of lost communications, output ports optionally reset to a user-defined state or level. The watchdog timer restarts with a read/write to an I/O channel.

■ Environmental

Ambient Temperature

Operation: -25°C to +70°C (-13°F to +158°F). Storage: -40°C to +85°C (-40°F to +185°F).

Relative Humidity

5 to 95% non-condensing.

Radiated Field Interference Immunity (RFI)

Complies with EN61000-4-3 Level 2 and EN50082-1 (3V/M, 80 to 1000MHz AM and 900MHz keyed).

Electrical Fast Transient Immunity (EFT)

EN61000-4-4 Level 1 and EN50082-1 (0.5KV power, signal lines).

Electrostatic Discharge (ESD) Immunity

EN61000-4-2 Level 3 and EN50082-1 (8KV/4KV air/direct discharge).

Surge Immunity

EN61000-4-5 (0.5KV) and EN50082-1.

Radiated Emissions

Meets EN50081-1 for Class B equipment.

Approvals

CE marked. UL listed for US and Canada. Class I; Division 2; Groups A, B, C, D.

■ Enclosure/Physical

Enclosure

Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2, color beige; general purpose NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #12-24, stranded or solid copper.

Dimensions

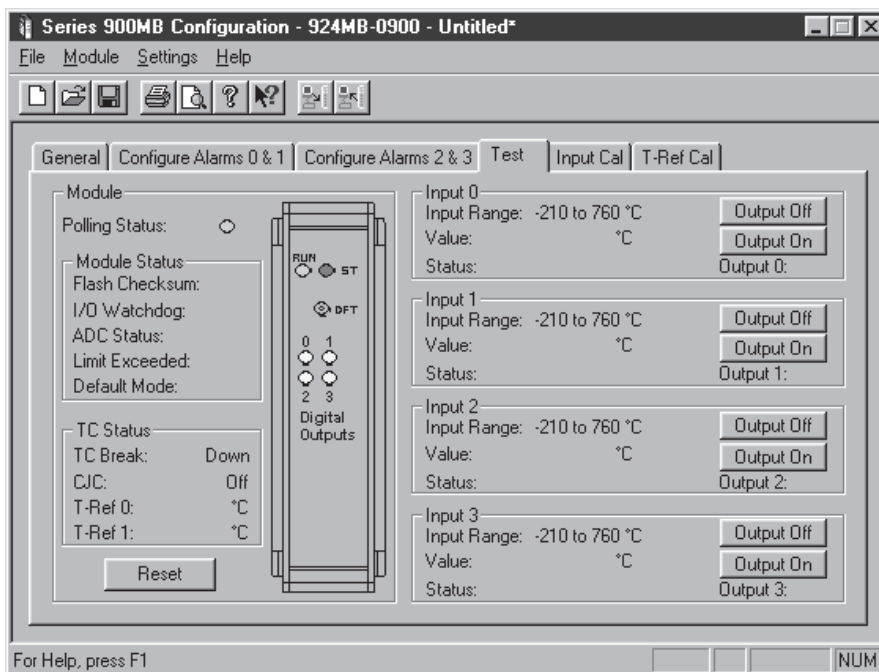
1.05W x 4.68H x 4.35D inches
26.7W x 118.9H x 110.5D mm.

DIN Rail Mounting

DIN rail mount, Type EN50022; "T" rail (35mm).

Shipping Weight

1 pound (0.45 Kg) packed.

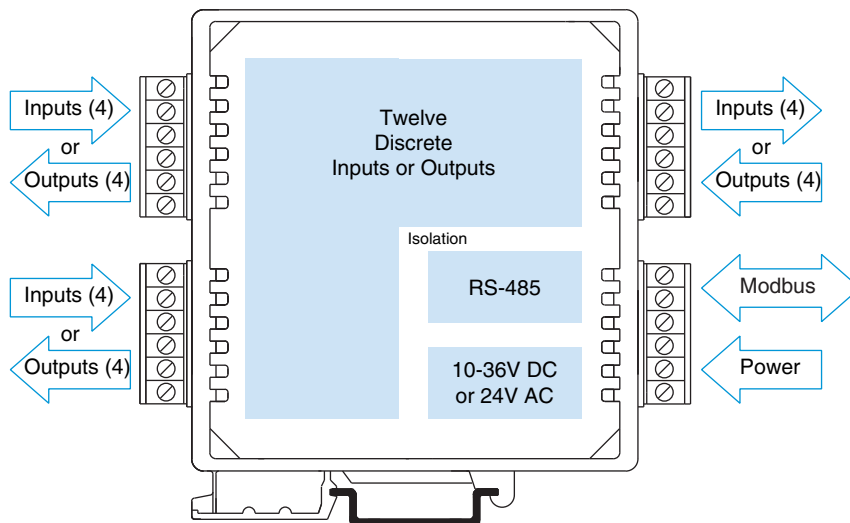




Modbus/RS-485



High-Density Discrete I/O Module



901/902/903MB Multi-Channel Discrete I/O Modules

Active-Low Inputs Sinking Outputs (Low-Side Switching)

Models

- 901MB: 12 input channels
- 902MB: 12 output channels
- 903MB: 12 input/output channels

Input

Twelve input channels (901, 903 models only)
0 to 35V DC

Output

Twelve output channels (902, 903 models only)
0 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

Description

These modules provide twelve discrete input and/or output channels. Isolation separates the I/O, power, and network circuits. Network communication adheres to the industry-standard RS-485 Modbus RTU protocol. Both AC and DC power sources are supported with wide range, nonpolarized, diode-coupled terminals.

The open-drain outputs are intended for current-sinking or low-side switching applications. The buffered inputs are active-low. These models are the complement of the 904, 905, and 906 units which have open-source, high-side output switches and active-high inputs. Socketed pull-up resistors are easily removed or exchanged to satisfy your application requirements.

The 903MB model has twelve input/output points that may be used as inputs or outputs on a bit-by-bit basis. Outputs may be read back to verify output settings.

Combining flexible I/O types, wide I/O ranges, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- Twelve I/O channels in a single inch-wide unit reduces system costs and saves panel space
- High-voltage, high-current, open-drain outputs enable direct (low-side) control of external devices
- High-voltage buffered inputs monitor discrete levels from a variety of industrial devices
- Tandem input/output circuitry (903 models only) connects input buffers with open-drain outputs for convenient loopback monitoring of the output state
- Outputs have built-in over-temperature and over-current shut-down protection, plus active clamping circuits for switching inductive loads
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Three-way isolation eliminates potential ground loops between power, I/O, and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Performance

Discrete Inputs (901 & 903 models only)

Input Type

12 active-low, buffered inputs, with a common connection. Inputs include transient suppression devices and series connected 100K ohm resistors, plus diode over-voltage clamps to the internal +5V supply.

Input Signal Voltage Range

0 to 35V DC, maximum.

Input Current

293µA, typical at 35V DC.

Input Signal Threshold

TTL compatible with 100mV of hysteresis, typical. Low-to-High threshold is 1.7VDC, High-to-Low is 1.6VDC, typical. Limited to TTL levels of 0.8VDC (max. LOW level) and 2.0VDC (min. HIGH level).

Input Resistance

100K ohms, typical.

Input Hysteresis

100mV DC, typical.

Discrete Outputs (902 & 903 models only)

Output Type

12 independent, open-drain, DMOS MOSFET switches with a common source connection that operate as low-side switches.

Output Voltage Range

0 to 35V DC max. (0 to 500mA/channel continuous). External voltage source required.

Output ON Resistance

0.28 ohms maximum.

Output Response Time

Force Single Coil: Output updates within 250µs of receipt of a command.

Force Multiple Coils: First coil updates in 250µs, followed successively by additional coils every 180µs.

General

I/O Pull-ups and Socket

5.6K ohm pull-up resistor SIPs are installed in sockets at each port (four-channels per port).

Excitation (per port)

External excitation voltage for each four-channel port is limited to 35V or less.

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

- Read Coil (Output) Status
- Read Input Status
- Read Holding Registers
- Force Single Coil (Output)
- Preset Single Register
- Reset Slave
- Force Multiple Coils (Outputs)
- Preset Multiple Registers
- Report Slave ID

LED Indicators

LEDs indicate power, status, and discrete level.

Power Requirements

10 to 36V DC,
22 to 26V AC.

Supply Current

Supply	Current Draw
10V DC	80mA maximum
24V DC	40mA maximum
24V AC	70mA rms maximum

Isolation

1500V AC for 60 seconds or 250V AC continuous. 3-way isolation between I/O, network, and power circuits.

Ordering Information

Models

901MB-0900
Discrete input module

902MB-0900
Discrete output module

903MB-0900
Discrete input/output module

Accessories

900C-SIP
Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

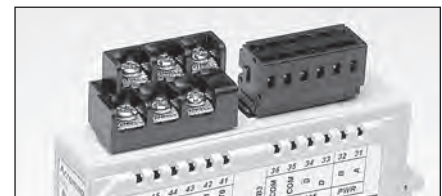
5034-225
USB-to-RS232 adapter. See page 68 for more info.

TBK-B02
Optional terminal block kit, barrier strip style, 4 pcs.

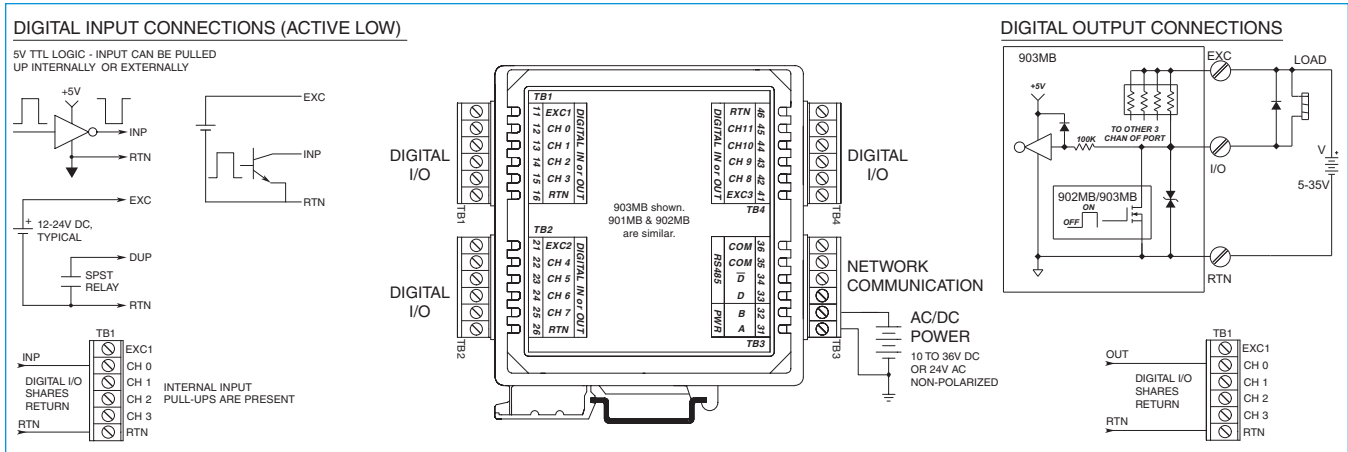
TBK-S02
Optional terminal block kit, spring clamp style, 4 pcs.

P55R-D24
Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.

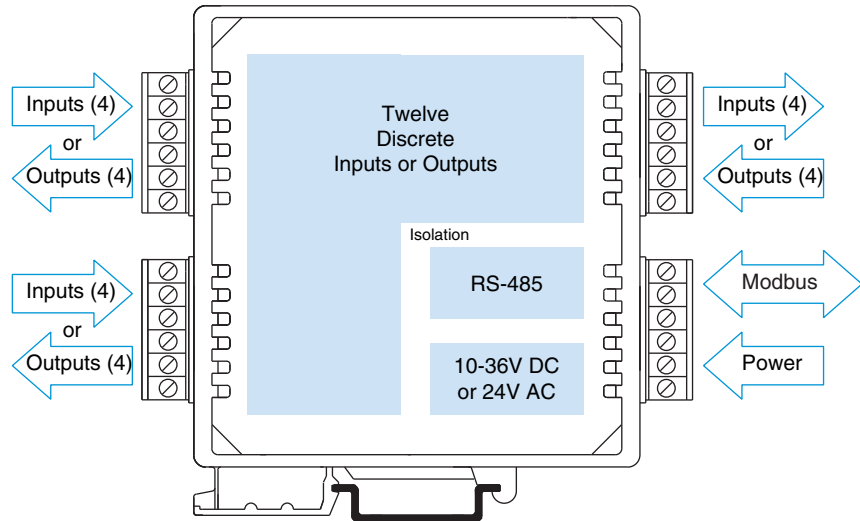




Modbus/RS-485



High-Density Discrete I/O Module



904/905/906MB Multi-Channel Discrete I/O Modules

Active-High Inputs Sourcing Outputs (High-Side Switching)

Models

- 904MB: 12 input channels
- 905MB: 12 output channels
- 906MB: 12 input/output channels

Input

Twelve input channels (904, 906 models only)
0 to 35V DC

Output

Twelve output channels (905, 906 models only)
5.5 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

Description

These modules provide twelve discrete input and/or output channels. Isolation separates the I/O, power, and network circuits. Network communication adheres to the industry-standard RS-485 Modbus RTU protocol. Both AC and DC power sources are supported with wide range, nonpolarized, diode-coupled terminals.

The outputs are intended for current-sourcing or high-side switching applications. The buffered inputs are active-high. These models are the complement of the 901, 902, and 903 units which have low-side output switches and active-low inputs. Socketed pull-down resistors are easily removed or exchanged to satisfy your application requirements.

The 906MB model has twelve input/output points that may be used as inputs or outputs on a bit-by-bit basis. Outputs may be read back to verify output settings.

Combining flexible I/O types, wide I/O ranges, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- Twelve I/O channels in a single inch-wide unit reduces system costs and saves panel space
- High-voltage, high-current, open-source outputs enable direct (high-side) control of external devices
- High-voltage buffered inputs monitor discrete levels from a variety of industrial devices
- Tandem input/output circuitry (906 models only) connects input buffers with open-source outputs for convenient loopback monitoring of the output state
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Three-way isolation eliminates potential ground loops between power, I/O, and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Performance

Discrete Inputs (904 & 906 models only)

Input Type

12 active-high, buffered inputs, with a common connection. Inputs include transient suppression devices and series connected 100K ohm resistors, plus diode over-voltage clamps to the internal +5V supply.

Input Signal Voltage Range

0 to 35V DC, maximum.

Input Current

293µA, typical at 35V DC.

Input Signal Threshold

TTL compatible with 100mV of hysteresis, typical. Thus, Low-to-High threshold is 1.5VDC, High-to-Low is 1.4VDC, typical. Limited to TTL levels of 0.8VDC (max. LOW level) and 2.0VDC (min. HIGH level).

Input Resistance

5.6K ohms with standard factory pull-down resistors installed. 100K ohms without pull-downs.

Input Hysteresis

100mV DC, typical.

Input Response Time

500ns for low-to-high, 2µs for high-to-low, typical. Microcontroller samples inputs as a group every 10mS.

Discrete Outputs (905 & 906 models only)

Output Type

12 independent, open-source, MOSFET switches that operate as high-side switches.

Output Voltage Range

5.5 to 35V DC (0 to 250mA/channel continuous). External excitation voltage required.

Output ON Resistance

0.15 ohms maximum.

Output Response Time

Outputs update within 50ms of a write command and switch within 5mS of receipt of command. Loopback response (906MB) is 1µs low-to high, 5µs high-to-low.

General

I/O Pull-downs and Socket

5.6K ohm pull-down resistor SIPs are installed in sockets at each port (four-channels per port).

Excitation (per port)

External excitation voltage for each four-channel port is limited to 35V or less.

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

- Read Coil (Output) Status
- Read Input Status
- Read Holding Registers
- Read Input Registers
- Force Single Coil (Output)
- Preset Single Register
- Reset Slave
- Force Multiple Coils (Outputs)
- Preset Multiple Registers
- Report Slave ID

LED Indicators

LEDs indicate power, status, and discrete level.

Power Requirements

10 to 36V DC,
22 to 26V AC.

Supply Current

Supply	Current Draw
10V DC	90mA maximum
24V DC	40mA maximum
24V AC	75mA rms maximum

Isolation

1500V AC for 60 seconds or 250V AC continuous. 3-way isolation between I/O, network, and power circuits.

Ordering Information

Models

904MB-0900
Discrete input module

905MB-0900
Discrete output module

906MB-0900
Discrete input/output module

Accessories

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

5034-225

USB-to-RS232 adapter. See page 68 for more info.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.

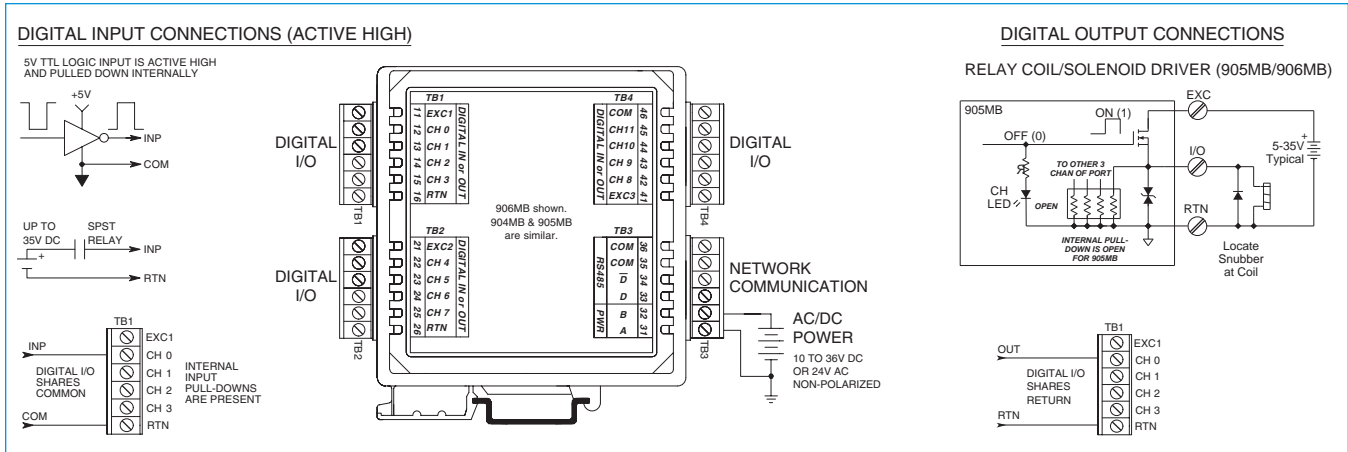
P55R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.





Modbus/RS-485



913/914MB Multi-Channel Analog Input Modules

DC Current, DC Voltage or AC Current Input

Limit Alarms or Discrete Outputs

Models

913MB: 4 current input channels
914MB: 4 voltage input channels

Input Ranges

0 to 20mA DC,
±10V DC,
0 to 20A AC (with 5020-350 sensor)

Output

Four output channels:
Open-drain MOSFETs (1A DC loads)
0 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

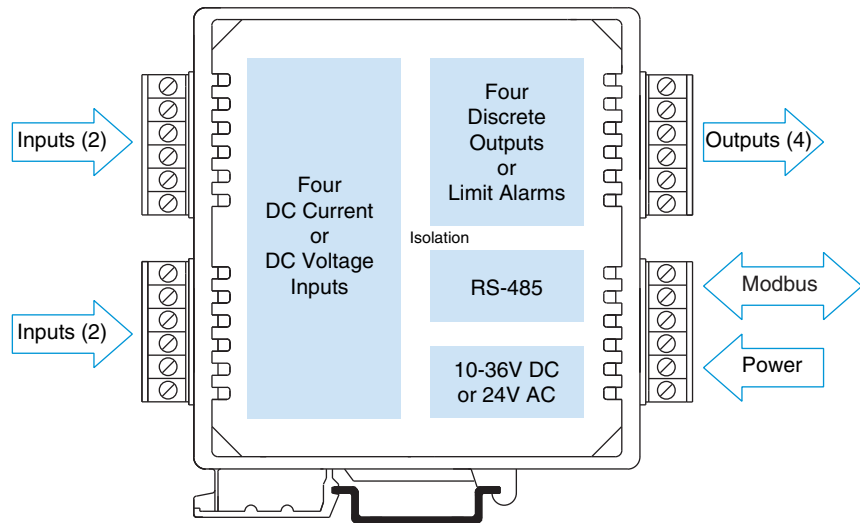
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

DC Current/Voltage Input Module



Description

This signal conditioner is a four-channel analog input module with four discrete outputs. It provides isolation between input, output, power, and network circuits. Network communication adheres to the industry-standard RS-485 Modbus RTU protocol. AC and DC power sources are supported with nonpolarized, diode-coupled terminals.

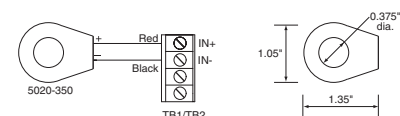
The inputs accommodate wide DC voltage or current ranges. Flexible discrete outputs operate as alarms or on/off controllers. As limit alarms, each discrete output can be configured with high and/or low setpoints exclusively tied to an analog input channel. Alarm trips function without host communication enabling low-cost stand-alone alarms, as well as local backup for the primary control system. Otherwise, on/off control is based on commands issued by the host system.

Combining flexible transmitter functions, mixed signal I/O, alarm support, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- 16-bit sigma-delta A/D yields 0.1% of range resolution and accuracy
- Four inputs in a single inch-wide module reduces system costs and saves panel space
- Four discrete outputs enable local limit alarms or host-controlled on/off switching
- Heavy-duty 1A solid-state relays provide dependable on/off control of industrial devices
- Self-calibration lowers maintenance costs by reducing periodic manual calibration checks
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Four-way isolation eliminates potential ground loops between power, input, output, and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication

AC Current Sensor Model 5020-350



For 913MB. Order separately (one per channel).



Performance

General Input

Resolution
0.005% or 1 part in 20,000.

Noise Rejection
Normal mode: 40dB @ 60Hz, typical.
Common mode: 140dB @ 60Hz, typical.

Input Filter Bandwidth
-3dB at 3Hz, typical.

Input Conversion Rate
180ms per channel.

Current Input (913MB)

DC Current Input Ranges
Range user-configured. Range selected applies to all channels.

0 to 1mA, 0 to 20mA, 4 to 20mA,
0 to 11.17mA (for use with 5020-350 AC sensor).

DC Current Input Resistance
49.9 ohms.

DC Current Input Accuracy
±0.1% of input range.

Voltage Input (914MB)

DC Voltage Input Ranges
Range user-configured. Range selected applies to all channels.

±10V, ±5V, ±2.5V, ±1.25V,
±625mV, ±313mV, ±156mV, ±78mV

Input Impedance
110.5K ohms.

DC Voltage Input Accuracy
±0.1% of input range.

Discrete Output

Output Type
Four independent open drain MOSFET switches with a common return that operate as low-side switches.

Output Voltage Range
0 to 35V DC.
External voltage source required.

Output Current Range
0 to 1A DC continuous for each output.

Output OFF Leakage Current
50µA maximum.

Output ON Resistance
0.15 ohms maximum.

Output Response Time
4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Operation
Digital outputs are set to their OFF state following a software or power-on reset. Outputs can optionally be set to user-defined states following a watchdog timeout. Watchdog timeout output control takes precedence over limit alarm control. Alarm control takes precedence over host control.

Communication

Supported Modbus Commands
The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

- Read Coil (Output) Status
- Read Holding Registers
- Read Input Registers
- Force Single Coil (Output)
- Preset Single Register
- Force Multiple Coils (Output)
- Preset Multiple Registers
- Report Slave ID
- Reset Slave

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements
10 to 36V DC or 22 to 26V AC.

Supply Current

Supply	Current Draw
10V DC	125mA maximum
24V DC	50mA maximum
24V AC	100mA rms maximum

Isolation

1500V AC for 60 seconds or 250V AC continuous. 4-way isolation between input, network, power, and discrete I/O circuits. Inputs are isolated channel-to-channel for common mode voltage to ±4V DC.

Ordering Information

Models

913MB-0900
914MB-0900
DC current (913MB) or voltage (914MB) input module

Accessories

900C-SIP
Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

5034-225
USB-to-RS232 adapter. See page 68 for more info.

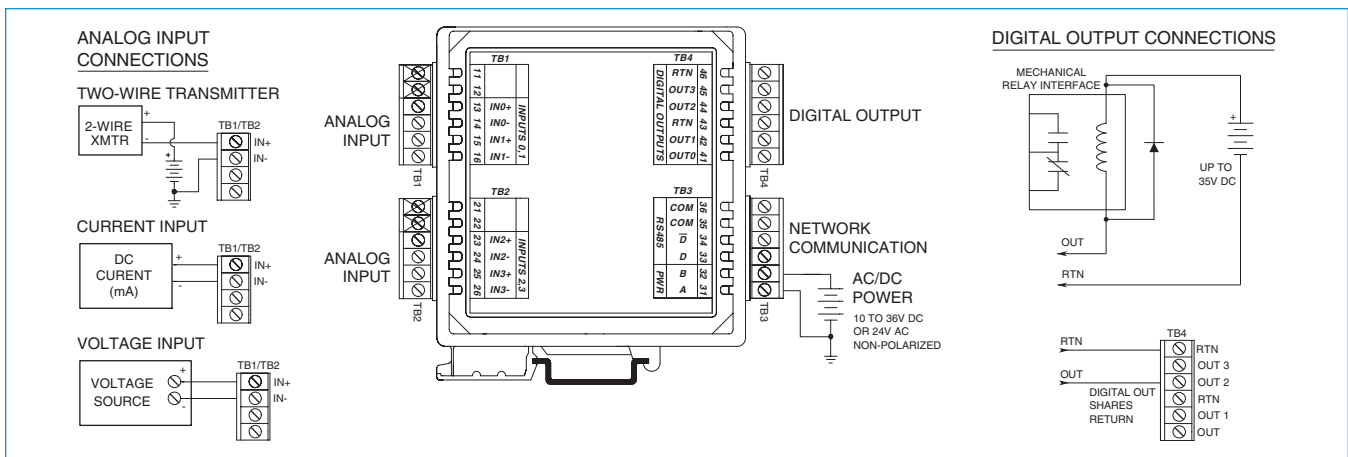
5020-350
AC current sensor for 913MB. One for each channel. (See page 205)

TBK-B02
Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02
Optional terminal block kit, spring clamp style, 4 pcs.

PS5R-D24
Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.

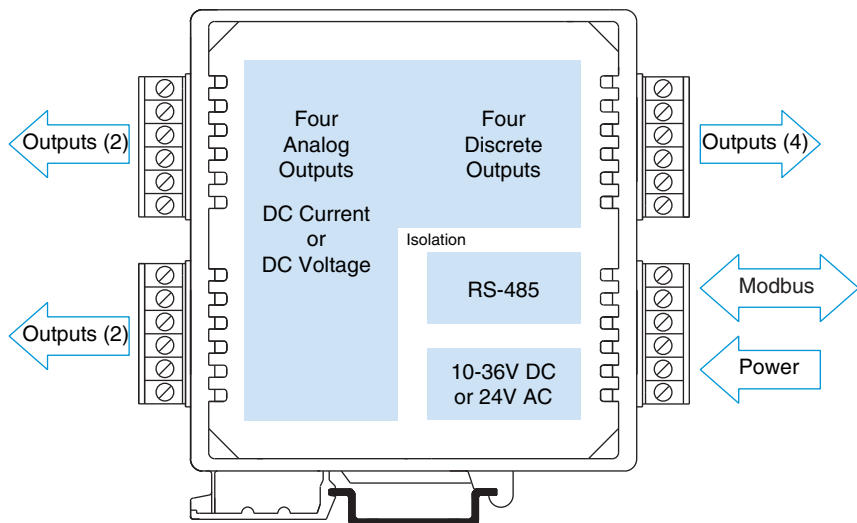




Modbus/RS-485



Analog Output Module



917/918MB Multi-Channel Analog Output Modules

DC Current or DC Voltage Outputs

Discrete Outputs

Models

917MB: 4 current output channels

918MB: 4 voltage output channels

Analog Output

917MB: 0 to 20mA, 4 to 20mA, 0 to 1mA DC

918MB: 0 to 10V, 0 to 5V, 0 to 1V DC

Discrete Output

Four output channels:

Open-drain MOSFETs (1A DC loads)

0 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

Power Requirement

12 to 36V DC (917MB), 10 to 36V DC (918MB),

24V AC

Approvals

CE marked. UL, cUL listed

Class I; Division 2; Groups A, B, C, D.

Description

These modules drive four analog output channels and also feature four discrete outputs for on/off control. Isolation separates the output, power, and network circuits. Network communication adheres to the industry-standard RS-485 Modbus RTU protocol. AC and DC power sources are supported with nonpolarized, diode-coupled terminals.

The analog outputs generate a signal based on communication from the host. They accommodate wide DC voltage or current ranges.

Discrete outputs provide simple on/off switching capability (open-drain) for external devices.

Combining analog outputs, on/off controllers, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction make it reliable for both control room and distributed field I/O use in a broad range of temperature control applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- 12-bit D/A yields 0.1% of span resolution and accuracy
- Four analog outputs in an inch-wide module reduces system costs and saves panel space
- Four discrete outputs enable host-controlled on/off switching
- Heavy-duty 1A solid-state relays provide dependable on/off control of industrial devices
- Self-calibration lowers maintenance costs by reducing periodic manual calibration checks
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Three-way isolation eliminates potential ground loops between power, output, and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Performance

General Analog Output

Resolution

See current/voltage output specifications for more information.

Ambient Temperature Effect

Better than $\pm 0.001\%$ of output span per $^{\circ}\text{C}$, or $\pm 1.0\mu\text{V}/^{\circ}\text{C}$, whichever is greater.

Ambient Temperature

Operation (917MB): -25°C to 60°C (-13°F to 140°F).
 Operation (918MB): -25°C to 70°C (-13°F to 158°F).
 Storage: -40°C to $+85^{\circ}\text{C}$ (-40°F to $+185^{\circ}\text{F}$).

* Limit 917MB maximum ambient to 50°C (122°F) when using supply voltages less than 15V DC.

Current Output (917MB)

DC Current Output Ranges

Range user-configured. Range selected applies to all channels.

Output Range	Resolution	Accuracy (% span)
0 to 1mA	0.554%	$\pm 2.0\%$ ($\pm 0.002\text{mA}$)
0 to 20mA	0.028%	$\pm 0.1\%$ ($\pm 0.02\text{mA}$)
4 to 20mA	0.035%	$\pm 0.1\%$ ($\pm 0.02\text{mA}$)

Maximum Output Current

22.5mA DC typical.

Integral Non-Linearity

$\pm 0.1\%$ of span or ± 2 LSB typical, whichever is larger, for spans equal to or greater than 16mA.

Output Compliance

12V minimum, 12.7V typical.

Output Load Resistance Range

0 to 630 ohms typical.

Response Time

11ms typical into 500 ohms, for measurement to reach 98% of the final value in response to a step command. Actual response time will vary with load.

Voltage Output (918MB)

DC Voltage Output Ranges

Range user-configured. Selection applies to all channels.

Output Range	Resolution	Accuracy (% span)
0 to 1V	0.274%	$\pm 0.6\%$ ($\pm 6\text{mV}$)
0 to 5V	0.055%	$\pm 0.1\%$ ($\pm 5\text{mV}$)
0 to 10V	0.027%	$\pm 0.1\%$ ($\pm 10\text{mV}$)

Maximum Output Voltage

11.255V DC typical.

Integral Non-Linearity

$\pm 0.1\%$ of span or ± 2 LSB typical, whichever is larger, for spans equal to or greater than 5V.

Output Current

0 to 10mA DC maximum.

Output Impedance

1 ohm.

Output Short Circuit Protection

Included.

Response Time

110 μs rise time typical, 150 μs fall time typical, unloaded, for output to reach 98% of the final value in response to a step command. Time varies with load.

Discrete Output

Output Type

Four independent open drain MOSFET switches with a common return that operate as low-side switches.

Output Voltage Range

0 to 35V DC (up to 1A/channel continuous).
 External voltage source required.

Output ON Resistance

0.15 ohms maximum.

Operation

Digital outputs are set to their OFF state following a software or power-on reset. Outputs may be set to user-defined states following a watchdog timeout. Watchdog timeout output control takes precedence over limit alarm control. Alarm control takes precedence over host control.

Output Response Time

4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Communication

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

Read Coil (Output) Status	Report Slave ID
Read Holding Registers	Reset Slave
Read Input Registers	
Force Single Coil (Output)	
Preset Single Register	
Force Multiple Coils (Output)	
Preset Multiple Registers	

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements

10 to 36V DC (918MB), 12 to 36V DC (917MB)
 22 to 26V AC.

Supply Current

Supply	Current Draw (917)	Current Draw (918)
10V DC	Not Recommended	100mA maximum
12V DC	275mA maximum	85mA maximum
24V DC	120mA maximum	45mA maximum
24V AC	210mA rms max.	85mA rms max.

Isolation

1500V AC for 60 seconds or 250V AC continuous.
 3-way isolation between outputs, network, and power circuits.

Ordering Information

Models

917MB-0900

918MB-0900

DC current (917MB) or voltage (918MB) output module

Accessories

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

5034-225

USB-to-RS232 adapter. See page 68 for more info.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

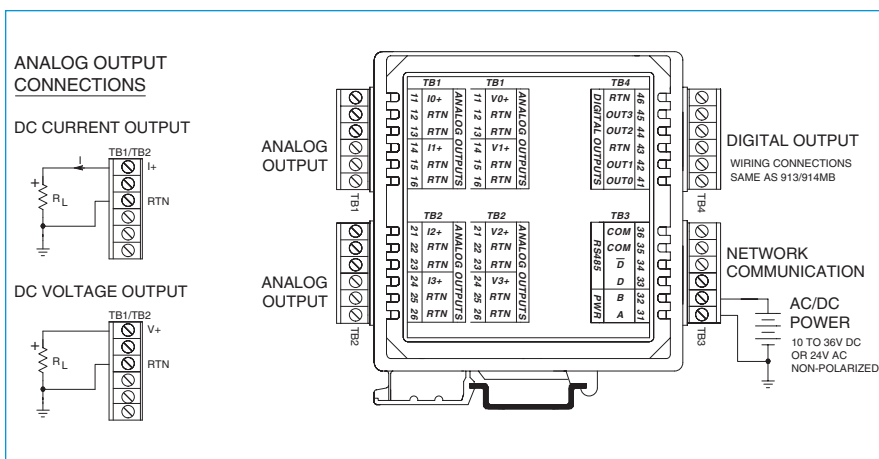
Optional terminal block kit, spring clamp style, 4 pcs.

PS5R-D24

Power supply (24V DC, 2.1A).

See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.





Modbus/RS-485



924MB Multi-Channel Temperature Control Modules

Thermocouple or Millivolt Input

Limit Alarms or Discrete Outputs

Model

924MB: 4 input channels

Input

Four input channels:
Thermocouple (types J, K, T, R, S, E, B, N),
±100mV DC

Output

Four output channels:
Open-drain MOSFETs (1A DC loads)
0 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

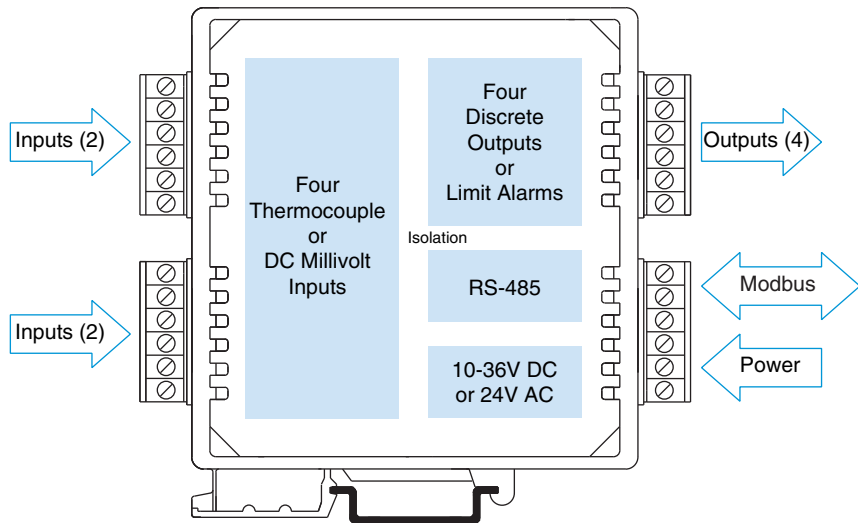
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

Thermocouple/Millivolt Input Module



Description

This signal conditioner is a four-channel analog input module with four discrete outputs. It filters and linearizes thermocouple inputs while providing isolation between input, output, power, and network circuits. Cold junction compensation and upscale/downscale sensor break detection are standard. AC and DC power sources are supported with nonpolarized, diode-coupled terminals.

The programmable inputs accommodate eight thermocouple types plus wide-range millivolt signals. Flexible discrete outputs operate as alarms or on/off controllers. As limit alarms, each discrete output can be configured with high and/or low setpoints exclusively tied to an analog input channel. Alarm trips function without host communication enabling low-cost stand-alone alarms as well as local backup for the primary control system. Otherwise, on/off control is based on commands issued by the host system.

Combining flexible transmitter functions, mixed signal I/O, alarm support, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- 16-bit sigma-delta A/D yields 0.1°C resolution and 0.5°C measurement accuracy
- Thermocouple linearization and sensor break detection ensure reliable measurements
- Four discrete outputs enable local temperature limit alarms or host-controlled on/off switching
- Heavy-duty 1A solid-state relays provide dependable on/off control of industrial devices
- Self-calibration lowers maintenance costs by reducing periodic manual calibration checks
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Four-way isolation eliminates potential ground loops between power, input, output and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Performance

General Input

Resolution

±100mV DC input: 0.1%.
Thermocouple input: 0.1°C (0.18°F).

Ambient Temperature Effect

Better than ±0.005% of input span per °C, or ±1.0uV/°C, whichever is greater.

Noise Rejection

Normal mode: 40dB @ 60Hz, typical.
Common mode: 140dB @ 60Hz, typical.

Input Filter Bandwidth

-3dB at 3Hz, typical.

Input Conversion Rate

90ms per channel.

Thermocouple Input

Thermocouple Input Ranges

Thermocouple type user-configured. Type selected applies to all channels. Signal linearization, cold-junction compensation, and open circuit or lead break detection are included.

TC	°C Range (°F Range)	Accuracy
J	-210 to 760°C (-346 to 1400°F)	±0.5°C
K	-200 to 1372°C (-328 to 2502°F)	±0.5°C
T	-260 to 400°C (-436 to 752°F)	±0.5°C
R	-50 to 1768°C (-58 to 3214°F)	±1.0°C
S	-50 to 1768°C (-58 to 3214°F)	±1.0°C
E	-200 to 1000°C (-328 to 1832°F)	±0.5°C
B	260 to 1820°C (500 to 3308°F)	±1.0°C
N	-230 to 1300°C (-382 to 2372°F)	±1.0°C

Note 1: Accuracy is given with CJC switched off.

Relative inaccuracy with CJC enabled may increase by ±0.5°C.

Thermocouple Break Detection

TC sensor failure can be configured for either upscale or downscale. Selection applies to all channels.

DC Millivolt Input

Millivolt Input Ranges

±100mV DC.

Millivolt Input Accuracy

±0.1% of input range.

Discrete Output

Output Type

Four independent open drain MOSFET switches with a common return that operate as low-side switches.

Output Voltage Range

0 to 35V DC, 1A DC maximum for each output.
External voltage source required.

Output ON Resistance

0.15 ohms maximum.

Operation

Digital outputs are set to their OFF state following a software or power-on reset. Outputs can optionally be set to user-defined states following a watchdog timeout. Watchdog timeout output control takes precedence over limit alarm control. Alarm control takes precedence over host control.

Output Response Time

4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Communication

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

- Read Coil
- Read Holding Registers
- Read Input Registers
- Force Single Coil
- Preset Single Register
- Force Multiple Coils
- Preset Multiple Registers
- Report Slave ID
- Reset Slave

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements

10 to 36V DC,
22 to 26V AC.

Supply Current

Supply	Current Draw
10V DC	100mA maximum
24V DC	45mA maximum
24V AC	85mA rms maximum

Isolation

1500V AC for 60 seconds or 250V AC continuous.
4-way isolation between input, network, power and discrete I/O circuits. Inputs are isolated channel-to-channel for common mode voltage to ±5V DC.

Ordering Information

924MB-0900

Thermocouple/millivolt input module

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

503A-225

USB-to-RS232 adapter. See page 68 for more info.

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs. (Does not include terminal block for input wiring.)

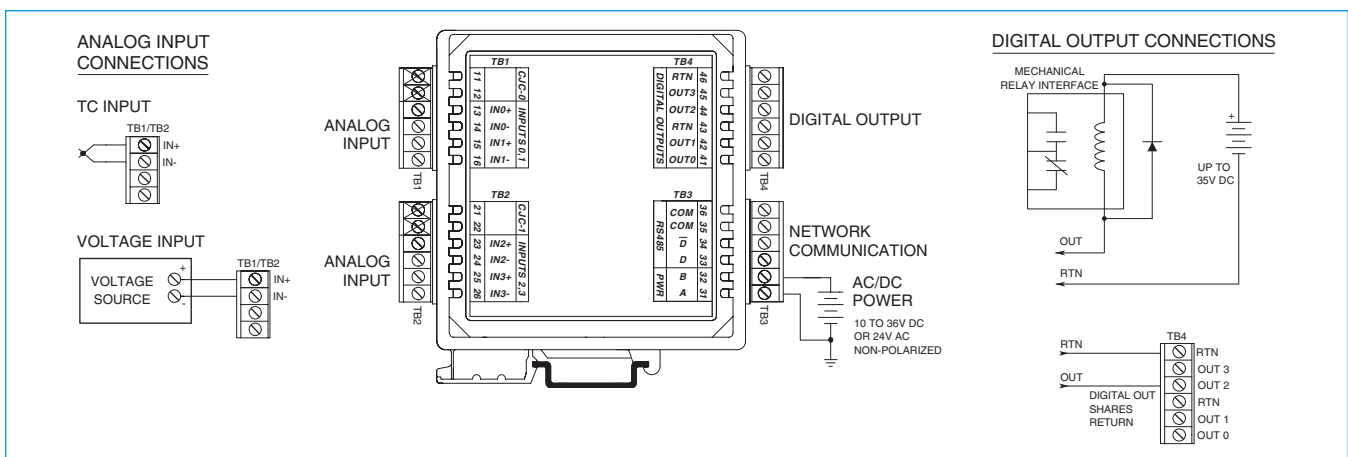
TBK-S02

Optional terminal block kit, spring clamp style, 2 pcs. (Does not include terminal block for input wiring.)

PS5R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.





Modbus/RS-485



932/934MB Multi-Channel Temperature Control Modules

RTD or Resistance Input

Limit Alarms or Discrete Outputs

Models

932MB: 2 input channels, 2 relay outputs

934MB: 4 input channels, 4 relay outputs

Input

RTD (100 ohm Pt, 120 ohm Ni, 10 ohm Cu), Resistance (0 to 500 ohms)

Output

Solid-state relays, Form A, SPST-NO

Network Communication

Modbus-RTU high-speed RS-485

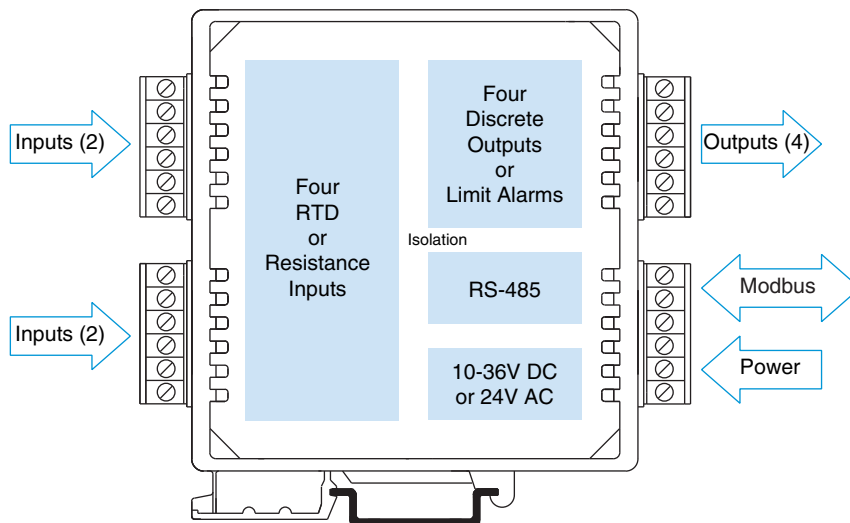
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

RTD/Resistance Input Module



Description

This signal conditioner is a dual or quad-channel analog input module with one discrete/relay output per input channel and a Modbus interface. It filters and linearizes RTD or resistance inputs while providing isolation between input, output, power, and network circuits. Lead wire compensation and upscale/downscale sensor break detection are standard. Low voltage AC and DC power sources are supported with nonpolarized, diode-coupled terminals.

The programmable inputs accommodate four RTD types plus wide-range resistance signals. Flexible discrete outputs operate as alarms or on/off controllers. As limit alarms, each discrete output can be configured with high and/or low setpoints exclusively tied to an analog input channel. Alarm trips function without host communication enabling low-cost stand-alone alarms as well as local backup for the primary control system. Otherwise, on/off control is based on commands issued by the host system.

Combining flexible transmitter functions, mixed signal I/O, alarm support, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- 16-bit sigma-delta A/D yields 0.1°C resolution and 0.25°C accuracy (Pt, Ni RTDs)
- RTD linearization and sensor break detection ensure reliable measurements
- Discrete relay outputs enable local temperature limit alarms or host-controlled on/off switching
- Heavy-duty 1A solid-state relays provide dependable on/off control of industrial devices
- Self-calibration lowers maintenance costs by reducing periodic manual calibration checks
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Four-way isolation eliminates potential ground loops between power, input, output and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Performance

RTD/Resistance Input

Input Ranges

Input type user-configured. Type selected applies to all channels. RTD linearization, lead wire compensation, and open circuit or lead break detection are included.

Input Type	Alpha	Input Range	Accuracy
Pt 100 ohm	1.3850	-200 to 850°C	±0.25°C
Pt 100 ohm	1.3911	-200 to 850°C	±0.25°C
Ni 120 ohm	1.6720	-80 to 320°C	±0.25°C
Cu 10 ohm	1.4272	-200 to 260°C	±1.00°C
Resistance	linear	0 to 500 ohms	±0.05 ohm

Resolution

Input Type	Alpha	Resolution
Pt 100 ohm	1.3850	0.1°C
Pt 100 ohm	1.3911	0.1°C
Ni 120 ohm	1.6720	0.1°C
Cu 10 ohm	1.4272	0.2°C
Resistance	linear	7.8125 milliohms

Ambient Temperature Effect

Better than ±0.005% of input span per °C, or ±1.0uV/°C, whichever is greater.

Noise Rejection

Normal mode: 40dB @ 60Hz, typical.
Common mode: 130dB @ 60Hz, typical.

Input Filter Bandwidth

-3dB at 3Hz, typical.

Input Conversion Rate

300ms per channel typical.

RTD Break Detection

Sensor failure can be configured for either upscale or downscale. Selection applies to all channels.

Excitation Current

1mA DC typical, all types.

Lead-Wire Compensation

Inherent for 3-wire RTD. The maximum lead resistance is 25 ohms per lead (Pt), 20 ohms per lead (Ni), 10 ohms per lead (Cu). All lead wires must be of equal size and length.

Discrete Output

Output Type

Solid-State Relay (SSR), one Form A (SPST-NO) switch per input channel. Outputs share a common return connection at the RTN terminals for low side switching

Output Voltage Range

0 to 48V DC, 1A DC.

Output ON Resistance

0.4 ohms maximum.

Output Response Time

4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Operation

Digital outputs are set to their OFF state following a software or power-on reset. Outputs can be set to user-defined states following a watchdog timeout.

Communication

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

Read Holding Registers	Read Coil
Read Input Registers	Reset Slave
Preset Single Register	Report Slave ID
Force Multiple Coils	Force Single Coil
Preset Multiple Register	

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements

10 to 36V DC (56mA max. at 24V DC).
22 to 26V AC (94mA rms max. at 24V AC).

Isolation

1500V AC for 60 seconds or 250V AC continuous. 4-way isolation between input, network, power and discrete I/O circuits. Inputs are isolated channel-to-channel for common mode voltage to ±5V DC.

Ordering Information

932MB-0900

Two channel RTD/Resistance input module

934MB-0900

Four channel RTD/Resistance input module

Accessories

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

5034-225

USB-to-RS232 adapter. See page 68 for more info.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

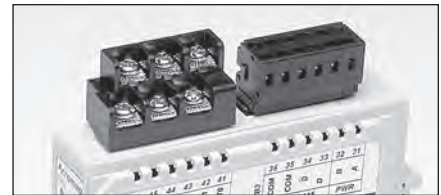
TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.

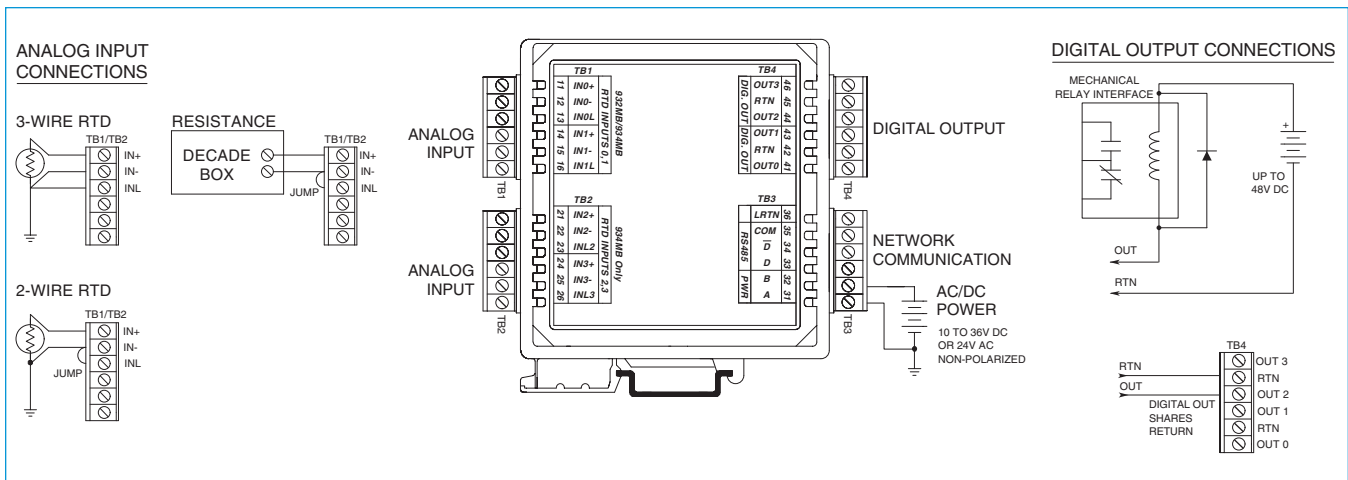
PS5R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.





Modbus/RS-485



942MB Frequency/ Pulse Counter Modules

Periodic or Pulse Waveform Input

Limit Alarms or Discrete Outputs

Model

942MB: 2 input channels

Input

Two input channels:
0 to 50KHz in three selectable ranges
Amplitudes up to 140V AC or 200V peak
Pulse counter range of 0 to 65535

Output

Two output channels:
Solid-state relays (1A DC loads)
0 to 48V DC

Network Communication

Modbus-RTU high-speed RS-485

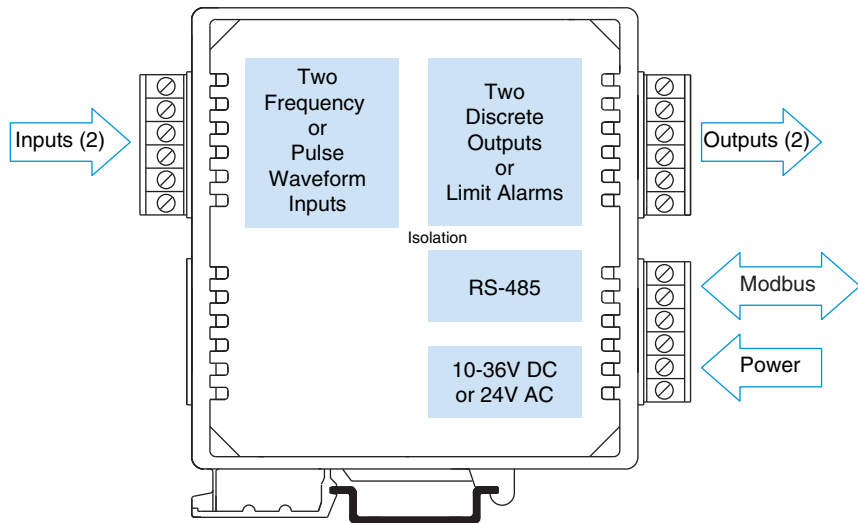
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

Frequency/Counter Module



Description

This signal conditioner is a two-channel analog input module with discrete outputs and Modbus communication. It conditions periodic or pulse waveform inputs and provides solid-state relays for limit alarms or ON/OFF control.

Versatile inputs accommodate many applications using TTL, magnetic pickups, proximity sensors, or a variety of switches (high/low-side transistor, dry contact, open drain, open collector). Bipolar and unipolar waveforms are supported with a selectable input bias that accepts both zero and non-zero crossing signals. Voltage threshold and relative hysteresis are also user selectable.

Inputs may also function as event counters with separate microcontrollers for each channel. The module counts pulses on the positive or negative edge. It can wrap around to zero for continuous counting, latch at a programmed count value (setpoint), or automatically reset itself to zero after reaching a setpoint value. Software controls enable remote resets. A variety of filters help remove noise, jitter, and other mechanical effects to prevent false counts.

The discrete outputs can operate as independent alarms or provide on/off control regulated by the host system. As limit alarms, each output can be set for high and/or low setpoints exclusively tied to an analog input. These low cost modules are ideal for standalone alarms as well as for local backup of the primary control system.

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- Separate microcontrollers on each channel for pulse counting and period measurement
- Solid-state relay outputs enable local limit alarms or host-controlled on/off switching
- Bipolar and unipolar input signal support
- Programmable pulse counter functions
- Input filtering functions include hysteresis, averaging, debounce, relay time delay, and alarm deadband controls
- 4-way isolation (input, output, power, network)
- Watchdog timers provide a failsafe output
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



Performance

Frequency/Counter Input

Input Ranges

Input type user-configured. Applies to both channels.

Input Range	Accuracy	Accuracy over Temp.
0 to 100Hz	±0.04Hz	±0.06Hz
0 to 1000Hz	±0.4Hz	±0.6Hz
0 to 50,000Hz	±10Hz	±15Hz
0 to 65,535 pulses	±1 pulse	±1 pulse

Unipolar Input Configuration

Amplitude: 0 to 3V minimum range,
0 to 200V peak maximum range.

Threshold: Configurable for 1.5V or 5V, typical.

Hysteresis: Configurable for ±25mV (at 1.5V threshold), or ±83mV (at 5.0V threshold), typical.

Bipolar (Zero-Crossing) Input Configuration

Amplitude (0-20KHz): ±50mV minimum (with ±25mV hysteresis), or ±150mV minimum (with ±83mV hysteresis), to ±200V peak maximum.

Amplitude (Above 20KHz): ±100mV minimum (with ±25mV hysteresis), or ±200mV minimum (with ±83mV hysteresis), to ±200V peak maximum.

Threshold: 0mV nominal, 0.01V typical with ±25mV hysteresis; 0.03V typical with ±83mV hysteresis.

Hysteresis: Configurable for ±25mV or ±83mV, typical.

Resolution

0 to 100Hz input range: 0.01Hz

0 to 1000Hz input range: 0.1Hz

0 to 50,000Hz input range: 1Hz

Pulse counter: 1 pulse

Minimum Input Pulse Width

10µs (frequency input); 5ms (pulse input).

Counting Rate

100Hz maximum counting rate

(5ms ON and 5ms OFF for 10ms period or 100Hz).

Input Impedance

35K ohms, typical.

Input Filter Bandwidth

-3dB at 35kHz, typical.

Input Pullup/Pulldown

Software selectable 2.7K ohm input pullup to +5V and a 1K ohm input pulldown to return. The resistors may also be left floating (none).

Input Debounce

0 to 1.375 seconds, configurable in 5mS increments.

Noise Rejection

Common mode: 80dB @ 60Hz, typical with 100 ohm input unbalance.

Discrete Output

Output Type

Solid-State Relay (SSR), one Form A (SPST-NO) switch per input channel. Outputs share a common return connection at the RTN terminals for low-side switching

Output Voltage Range

0 to 48V DC, 1A DC.

Output ON Resistance

0.4 ohms maximum.

Output Response Time

4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Operation

Digital outputs are set to their OFF state following a software or power-on reset. Outputs can be set to user-defined states following a watchdog timeout.

Communication

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

Read Holding Registers	Read Coil
Read Input Registers	Reset Slave
Preset Single Register	Report Slave ID
Force Multiple Coils	Force Single Coil
Preset Multiple Registers	

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements

10 to 36V DC.

22 to 26V AC.

Isolation

1500V AC for 60 seconds or 250V AC continuous.

4-way isolation between input, network, power and discrete I/O circuits. Inputs are isolated channel-to-channel for common mode voltage to ±5V DC.

Ordering Information

942MB-0900

Frequency/counter input module

Accessories

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

5034-225

USB-to-RS232 adapter. See page 68 for more info.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

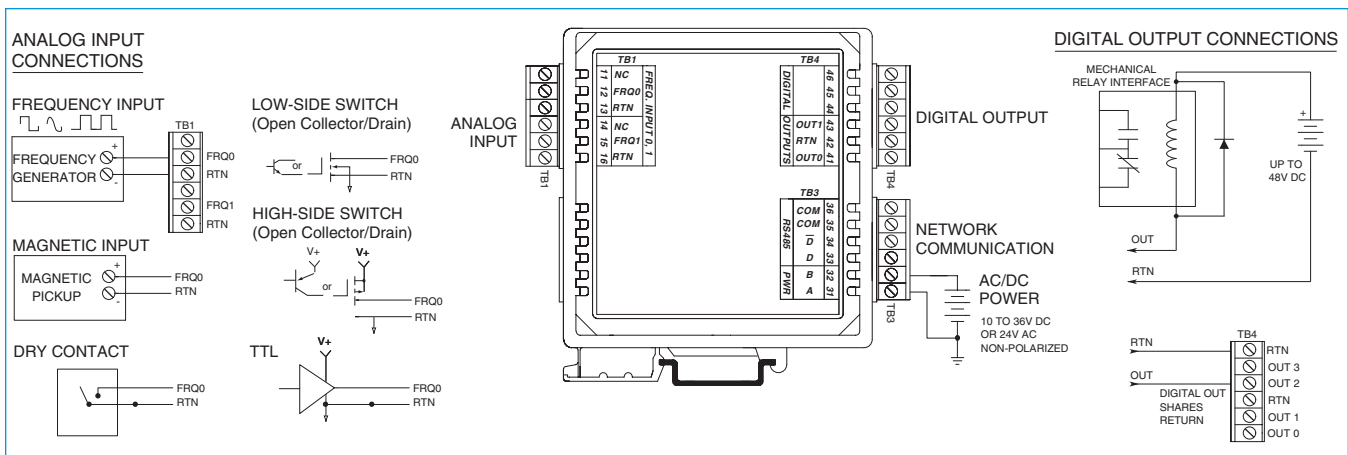
Optional terminal block kit, spring clamp style, 4 pcs.

P55R-D24

Power supply (24V DC, 2.1A).

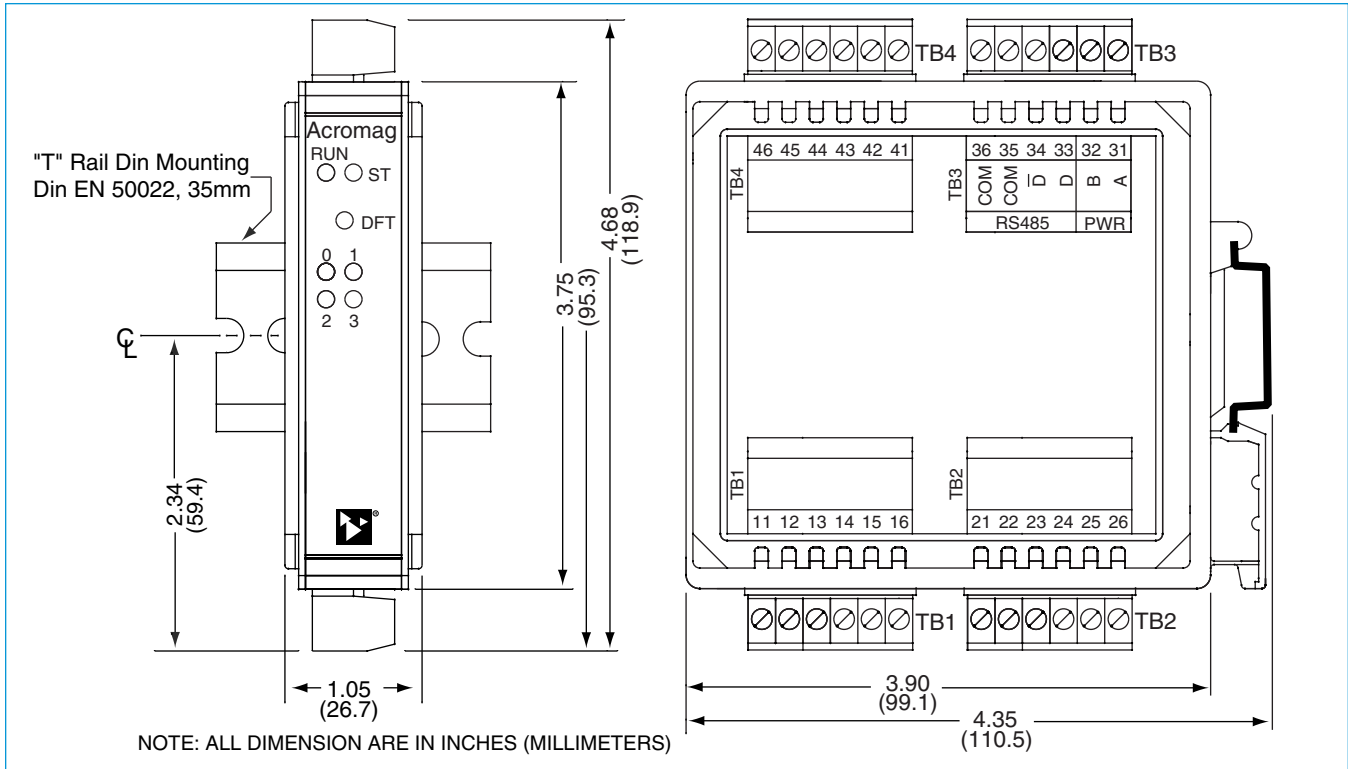
See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.





900MB Series Technical Diagrams

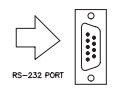


PERSONAL COMPUTER
W/ WINDOWS 95/98 OR NT



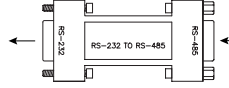
INSTALL MODBUS
CONFIGURATION
SOFTWARE

RS-232 SERIAL
PORT CONNECTOR
AT BACK OF PC



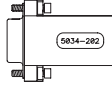
CONNECT THE RS-232
SIDE OF CONVERTER
TO THE PC

RS-232 TO RS-485 CONVERTER
MODEL 5034-214



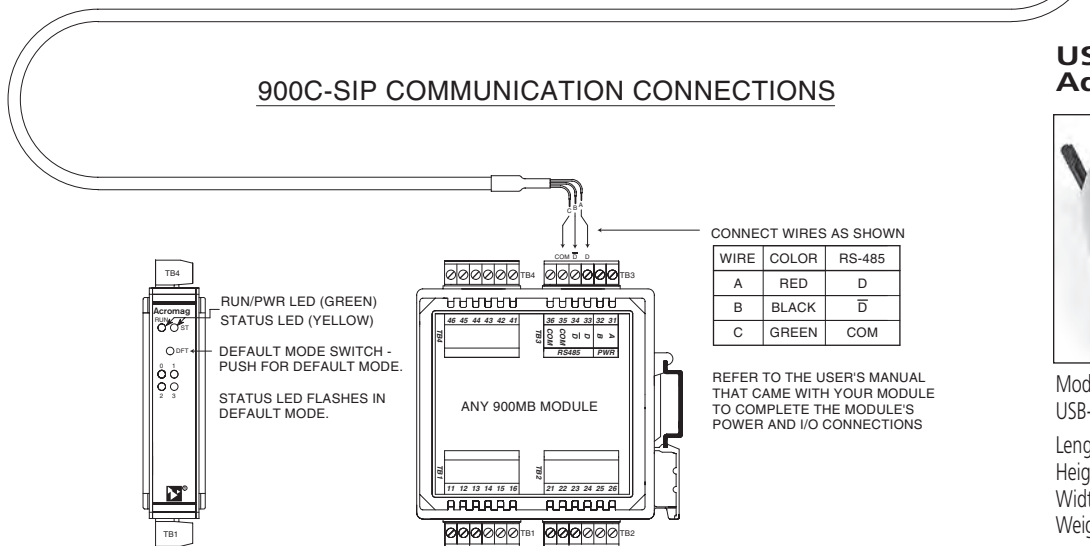
CONNECT THE RS-485
SIDE OF CONVERTER
TO THE CABLE

CABLE 5034-202



CAUTION: DO NOT CONNECT THE
CABLE DIRECTLY TO THE PC WITHOUT
THE CONVERTER, OR DAMAGE TO
THE MODULE MAY RESULT.

900C-SIP COMMUNICATION CONNECTIONS



USB-to-RS232 Adapter



Model 5034-225
USB-to-RS232 adapter
Length: 3.15 in (8.0 cm)
Height: 0.80 in (2.03 cm)
Width: 1.75 in (4.44 cm)
Weight: 1.6 oz (45.36 g)



Configuration Kit

Software Interface Package
Model No. 900C-SIP

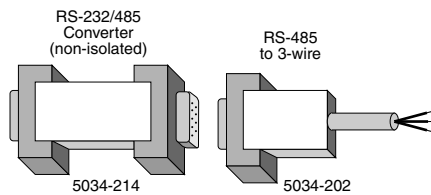
RS-485 Cable (DB-9)

RS-232 to RS-485 Converter (non-isolated)

Configuration Software for Windows

Software Interface Package

This package includes Windows® Configuration Software, an RS-232-to-485 Serial Port Converter, and an RS-485 Signal Cable. These components provide everything you need to set up a Series 900 I/O module from your desktop PC before installing it on the network.



Ordering Information

- 900C-SIP
Software Interface Package.
Includes Configuration Software (5034-186), Non-isolated RS-232 to RS-485 Serial Port Converter (5034-214), and RS-485 Cable (5034-202).
Items can also be ordered separately below.
- 5034-186
Configuration Software for Windows (95/98/2000/ME/NT4/XP) on CD-ROM.
- 5034-214
Non-isolated RS-232 to RS-485 Serial Port Converter, DB-9F to DB-9F.
- 5034-202
RS-485 to 3-wire Cable Converter, DB-9M to 3 x 12AWG RS-485 Cable, 8 ft.

Network Power

OUTPUT 24VDC 2.1A

50W

PS5R-D24

INPUT 85-300VAC 100-240VAC 1.5A

DC ON

V.ADJ.

CE, UL, TUV

Universal 50W Power Supply

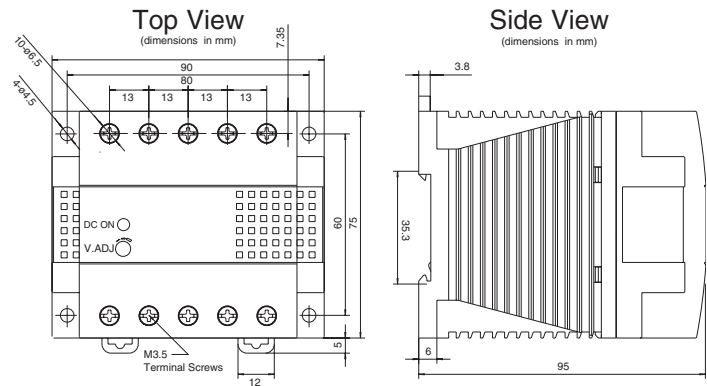
The PS5R-D24 is the ideal power source to drive your network.

Input Power Requirement
Universal power
85 to 264V AC,
105 to 370V DC

Output
24V DC, 2.1A (50W)

Ordering Information

- PS5R-D24
Universal Power Supply



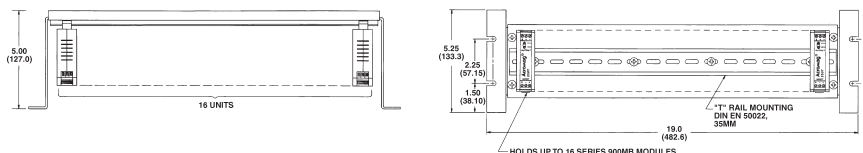
Mounting Hardware

DIN-Rail Mounting

For your convenience, Acromag offers several mounting accessories to simplify your system installation. Our 19" rack-mount kit provides a clean solution for mounting your I/O modules and a power supply. Or you can buy precut DIN rail strips for mounting on any flat surface.

Ordering Information

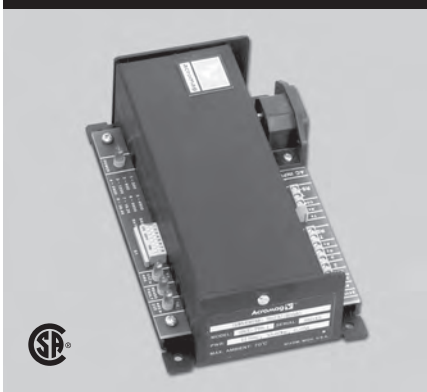
- 20RM-16-DIN
19" rack-mount kit with DIN rail.
- DIN RAIL 3.0
DIN RAIL 16.7
DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)



Dimensions in inches (mm).



RS-232 to RS-485



4SCC-TTM Isolated Signal Converter

This unit provides an isolated interface between the host PC's RS-232 port and RS-485 Modbus network devices. Signal conversion is bidirectional with operation that is transparent to all devices. The RS-485 network supports up to 32 devices (including the 4SCC-TTM Converter) across 4000 foot distances. Installation of additional network devices or extending the distance requires the 4SCR-TTM Network Repeater.

Specifications

Baud Rates
Switch-selectable from 300 to 38.4K baud.

Duplex
Half duplex only.

Network Termination Resistors
Two terminal blocks and 120 ohm resistors provided to terminate both ends of the RS-485 network.

Wiring Connectors
Terminal blocks with screw clamps for 14-26AWG.

Operating Temperature Range
-25 to 60°C (-13 to 140°F).

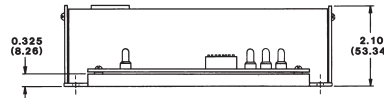
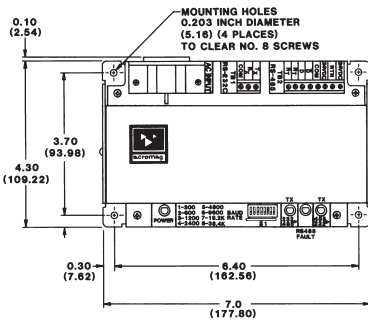
Isolation
Withstands 1500V AC surge for 60 seconds (250V AC or 354V DC continuous).

Ordering Information

4SCC-TTM-1
Signal Converter, 115V AC (power cord included)

4SCC-TTM-2
Signal Converter, 230V AC (power cord included)

5020-924
Signal Cable, 8ft. long, DB-9 to three wires. Connects PC's RS-232 port to 4SCC-TTM-x.



Dimensions in inches (mm).

Shipping Weight
3.0 lbs. (1.4 kg) packed.

BusWorks® Modbus I/O

RS-485 to RS-485



4SCR-TTM Isolated Network Repeater

This unit isolates and boosts RS-485 signals to extend communication distances or increase the number of devices on the network. Each Repeater permits the addition of a network branch with up to 32 devices (including the 4SCR-TTM) and will transmit RS-485 signals another 4000 feet. Operation is transparent to all devices and no handshaking is required. Two terminal blocks are provided for 120 ohm resistors to terminate both ends of the network branch.

Specifications

Baud Rates
Switch-selectable from 300 to 38.4K baud.

Duplex
Half duplex only.

Network Termination Resistors
Two terminal blocks and 120 ohm resistors provided to terminate both ends of the RS-485 network.

RS-485 Wiring Connectors
Terminal blocks with screw clamps for 14-26AWG.

Power Wiring Connections
Terminal block with screw clamps for 12-18AWG.

Operating Temperature Range
-25 to 60°C (-13 to 140°F).

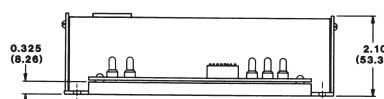
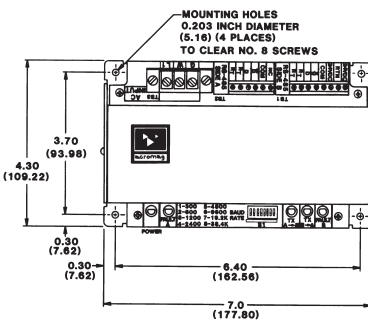
Isolation
Withstands 1500V AC surge for 60 seconds (250V AC or 354V DC continuous).

Ordering Information

4SCR-TTM-1
Signal Converter, 115V AC power

4SCR-TTM-2
Signal Converter, 230V AC power

40LC-GBW-1
115V AC power cord

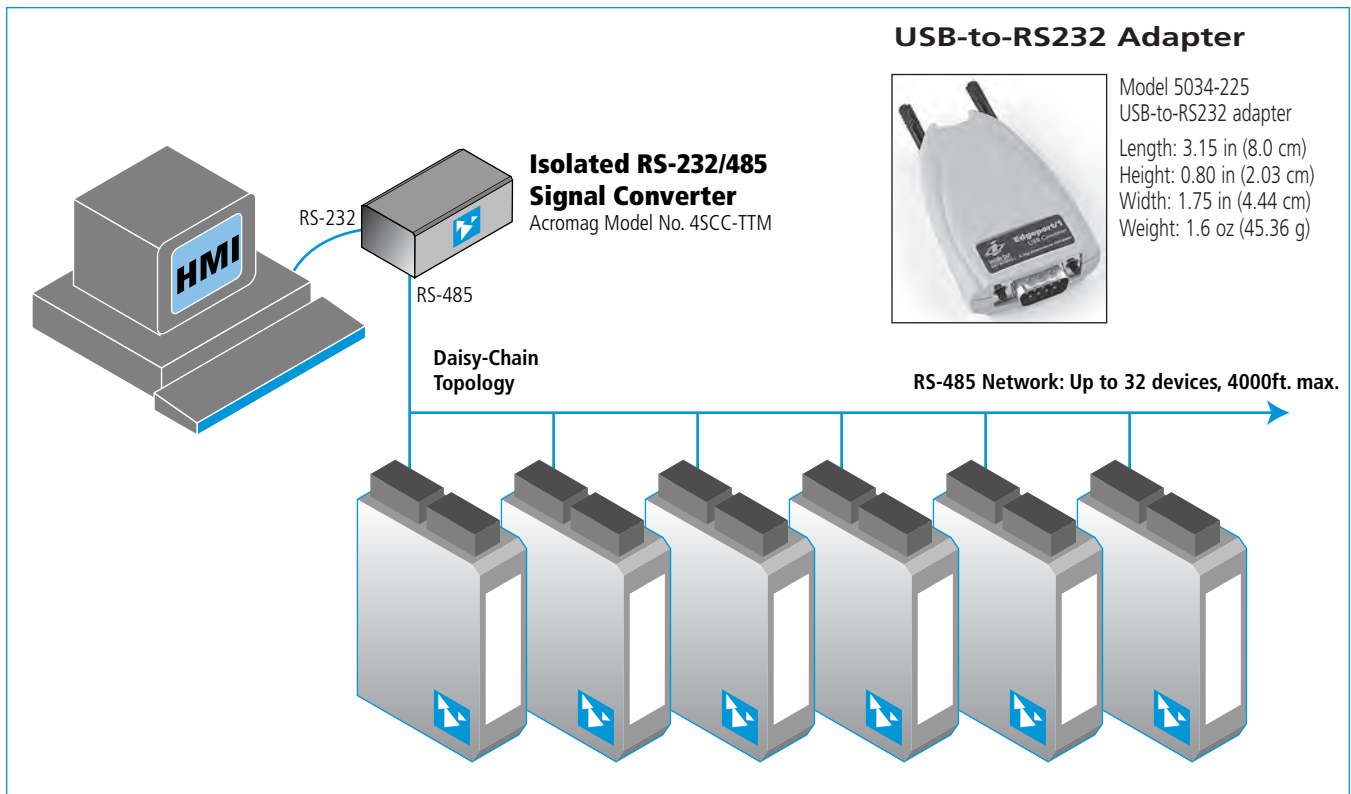


Dimensions in inches (mm).

Shipping Weight
3.0 lbs. (1.4 kg) packed.



System Connection



BusWorks® Modbus I/O

Extending the Network

