



## 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

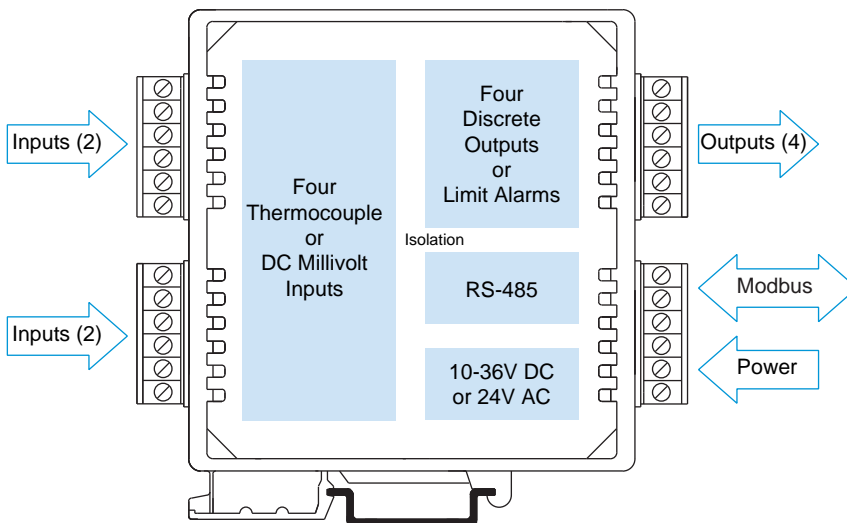
#### Power Requirement

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)

#### 4001-095

USB-to-RS232 adapter

#### TBK-B01

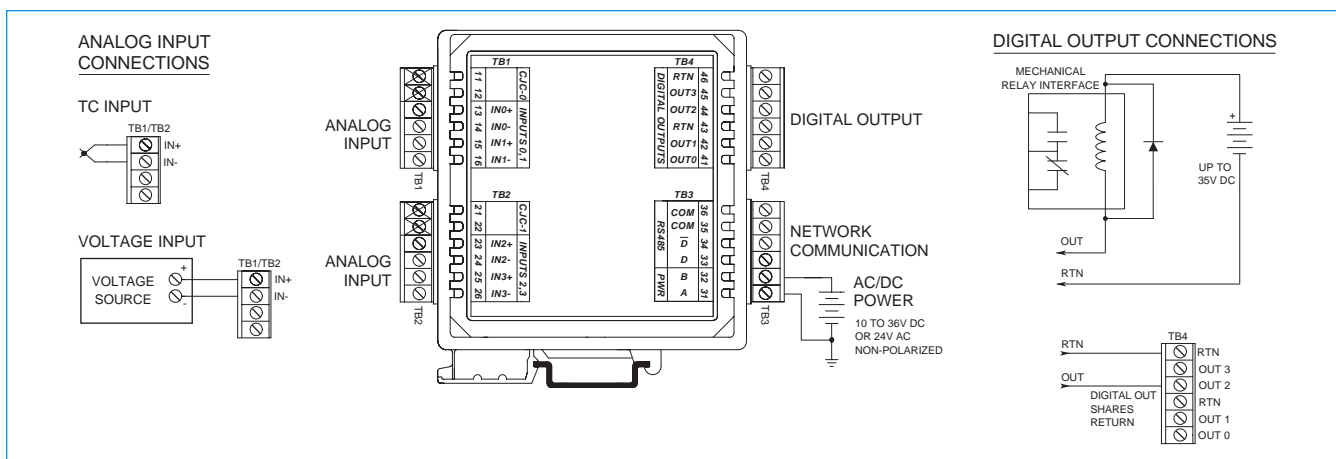
Optional terminal block kit, barrier strip style, 2 pcs.  
(Does not include terminal block for input wiring.)

#### TBK-S02

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

#### PS5R-VB24

Power supply (24V DC, 2.1A)





## 900MB Series Technical Diagrams

