



## 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

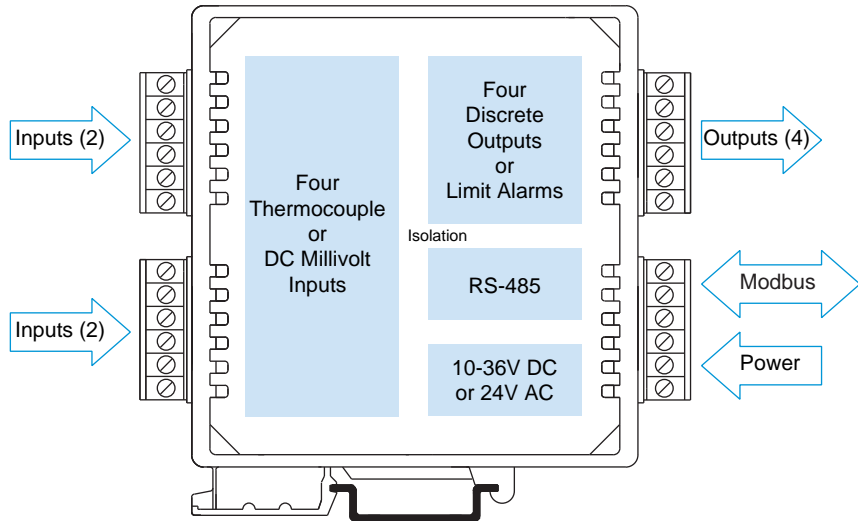
#### Power Requirement

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. See page 70 for more info.

#### TBK-B01

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

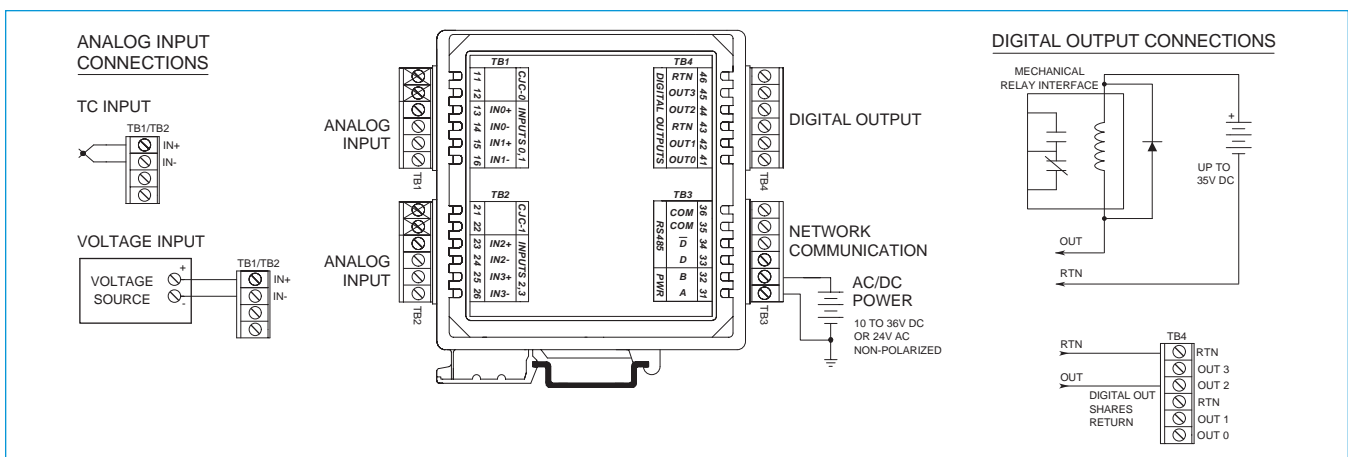
#### TBK-S02

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

#### PS5R-D24

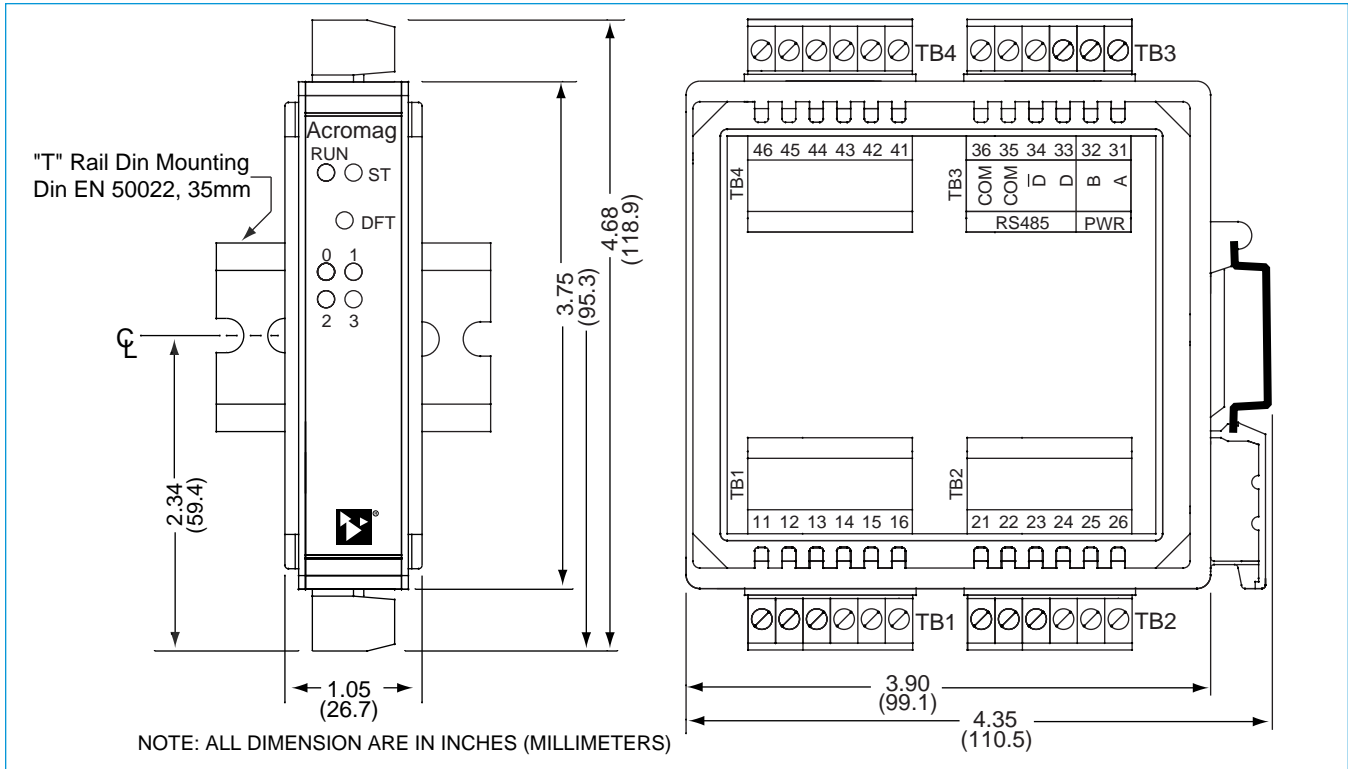
Power supply (24V DC, 2.1A).  
See Power Supplies on Page 199.

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





## 900MB Series Technical Diagrams

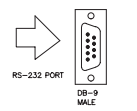


PERSONAL COMPUTER  
W/ WINDOWS 95/98 OR NT



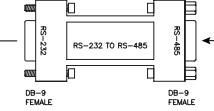
INSTALL MODBUS CONFIGURATION SOFTWARE

RS-232 SERIAL PORT CONNECTOR AT BACK OF PC



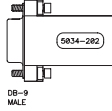
CONNECT THE RS-232 SIDE OF CONVERTER TO THE PC

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



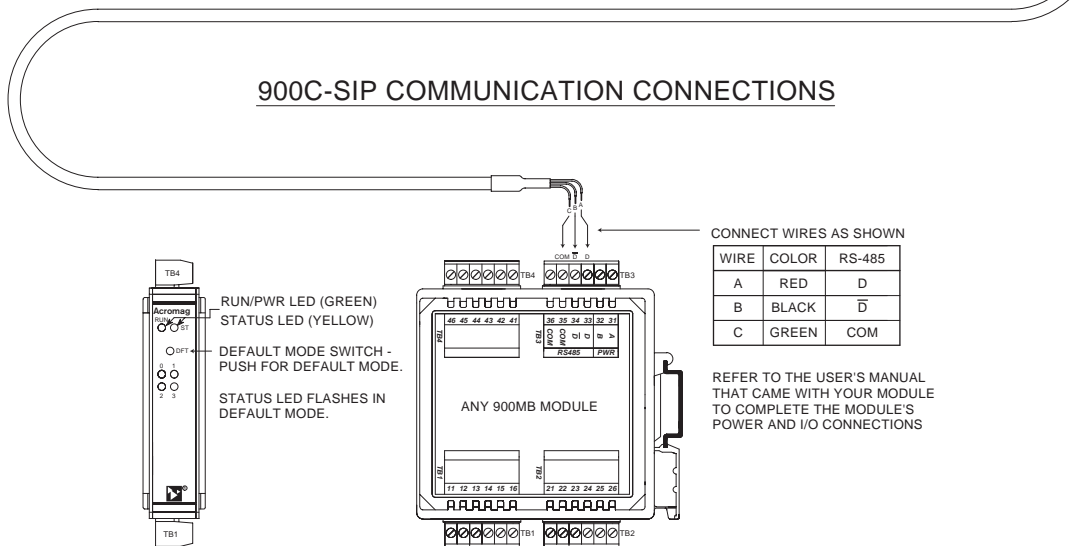
CONNECT THE RS-485 SIDE OF CONVERTER TO THE CABLE

CABLE 5034-202



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

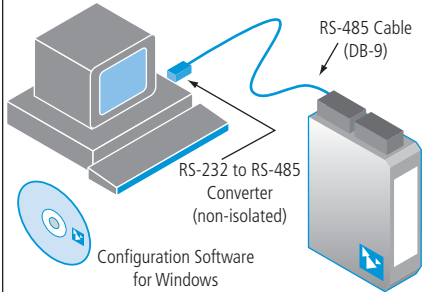
### 900C-SIP COMMUNICATION CONNECTIONS





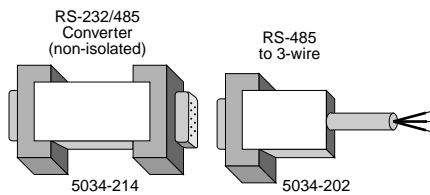
## Configuration Kit

Software Interface Package  
Model No. 900C-SIP



## Software Interface Package

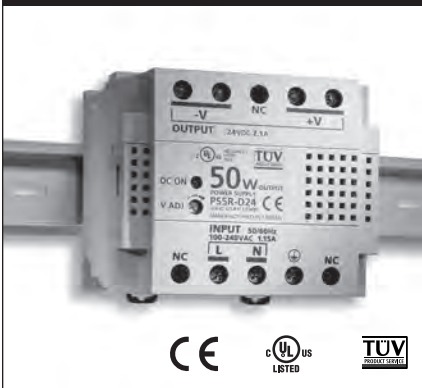
This package includes Windows® Configuration Software, an RS-232-to-485 Serial Port Converter, and an RS-485 Signal Cable. These components provide everything you need to set up a Series 900 I/O module from your desktop PC before installing it on the network.



## 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



## Universal 50W Power Supply

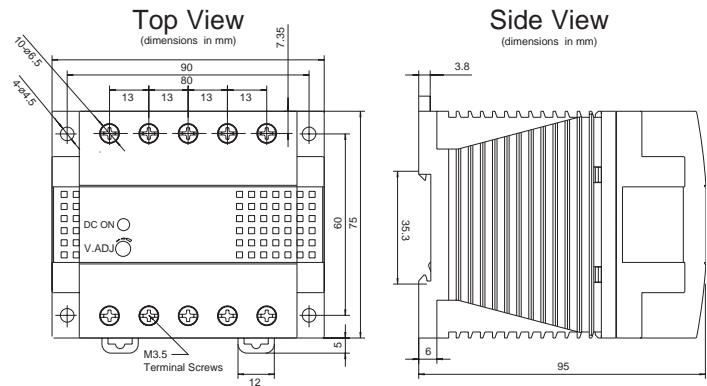
The PS5R-D24 is the ideal power source to drive your network.

**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

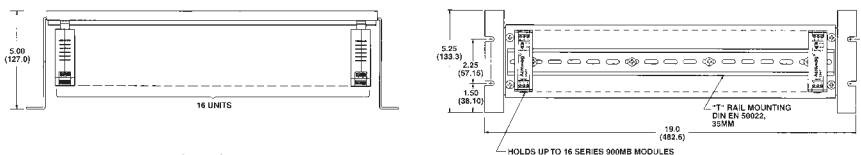


## DIN-Rail Mounting

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.

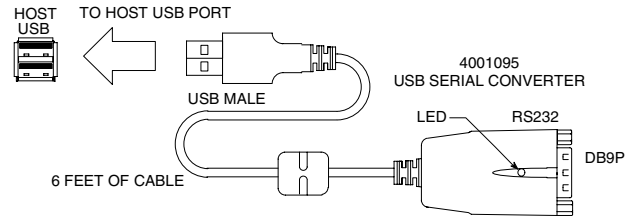
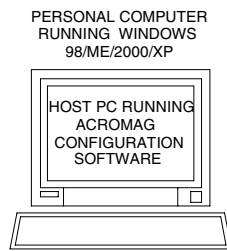
## Ordering Information

- 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).

## Model 4001-095 USB-to-Serial Adapter



Simplifies configuration of Acromag I/O Modules ♦ Enables configuration via USB port

### Description

This device is a USB-to-serial adapter that you can use to communicate with many Acromag I/O products for setup and re-configuration for your application.

### Key Features & Benefits

- Connects to I/O modules via USB (other adapters may be necessary)
- Complete RS232 control signals
- Conforms to USB Specification, Version 1.1
- USB-powered
- Cable length, 6 ft., UL approved

### Performance Specifications

**USB Specification**  
Version 1.1

**Data rate**  
Up to 115.2Kbps

**Environmental Standards**  
RoHS-compliant

**Basic Power Consumption**  
150mA

**PC Requirements**  
Windows® 7 (32-/64-bit) / Vista (32-/64-bit) / XP (32-/64-bit) / Server 2003 & 2008 (32-/64-bit) / 2000 / ME / 98SE / 98

### Ordering Information

NOTE: For more information visit [www.acromag.com](http://www.acromag.com).

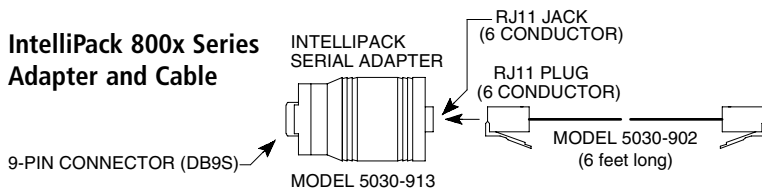
#### Adapters

- 4001-095**  
USB to serial adapter. Includes driver CD and manual.
- 5030-913**  
Serial port adapter. DB9S connector to RJ11 jack.
- 5034-202**  
RS-485 to 3-wire cable converter and cable, DB-9M to 3 x 12AWG RS-485 cable, 8 ft.
- 5032-287**  
RS-232 to 151T transmitter configuration device converter and cable, 6 ft.
- 5034-214**  
Non-isolated RS-232 to RS-485 Serial Port Converter, DB-9F to DB-9F.

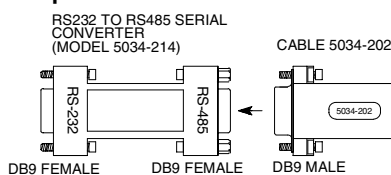
#### Cables

- 5030-902**  
Cable. 6 feet long with RJ11 plug at each end.

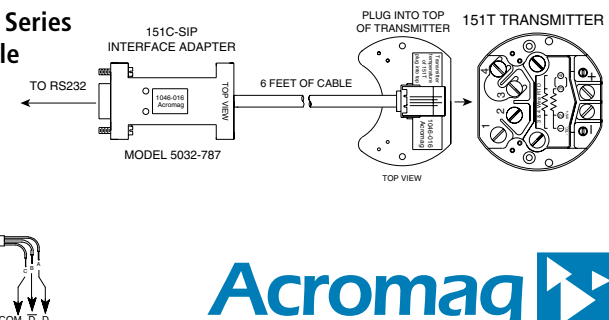
### IntelliPack 800x Series Adapter and Cable



### 900MB Modbus Series Adapter and Cable



### 151T Transmitter Series Adapter and Cable



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