



## 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

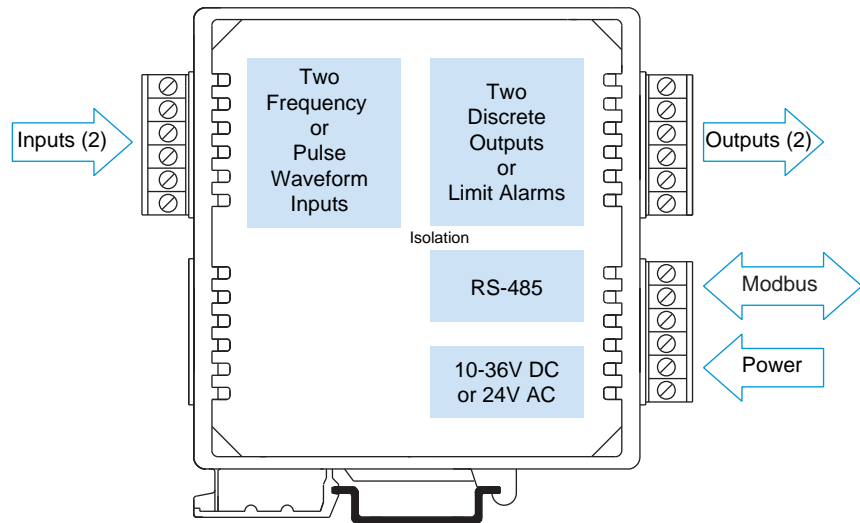
#### Power Requirement

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)

#### 4001-095

USB-to-RS232 adapter

#### TBK-B02

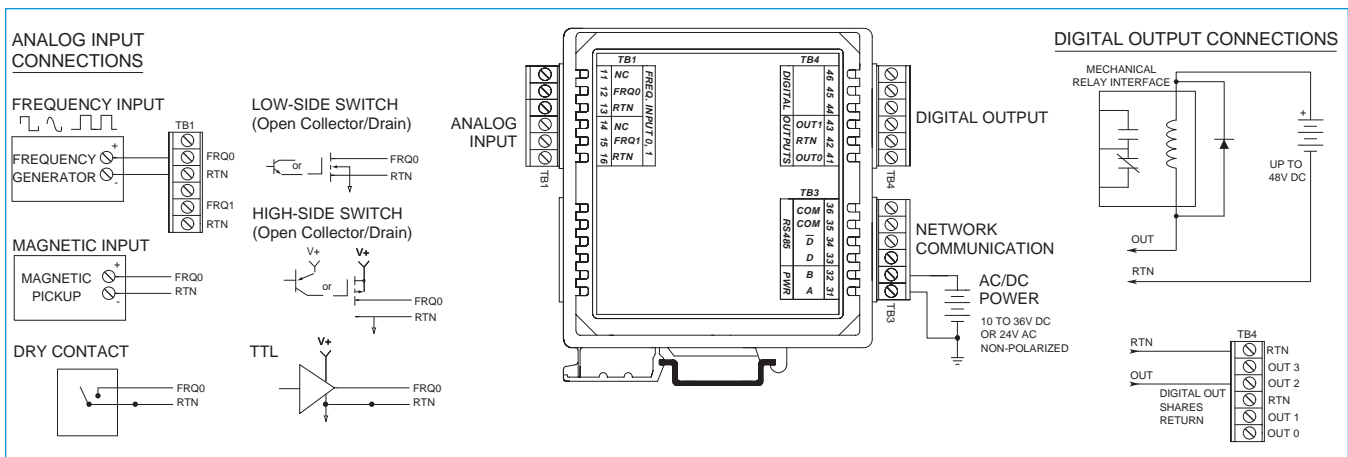
Optional terminal block kit, barrier strip style, 4 pcs.

#### TBK-S02

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

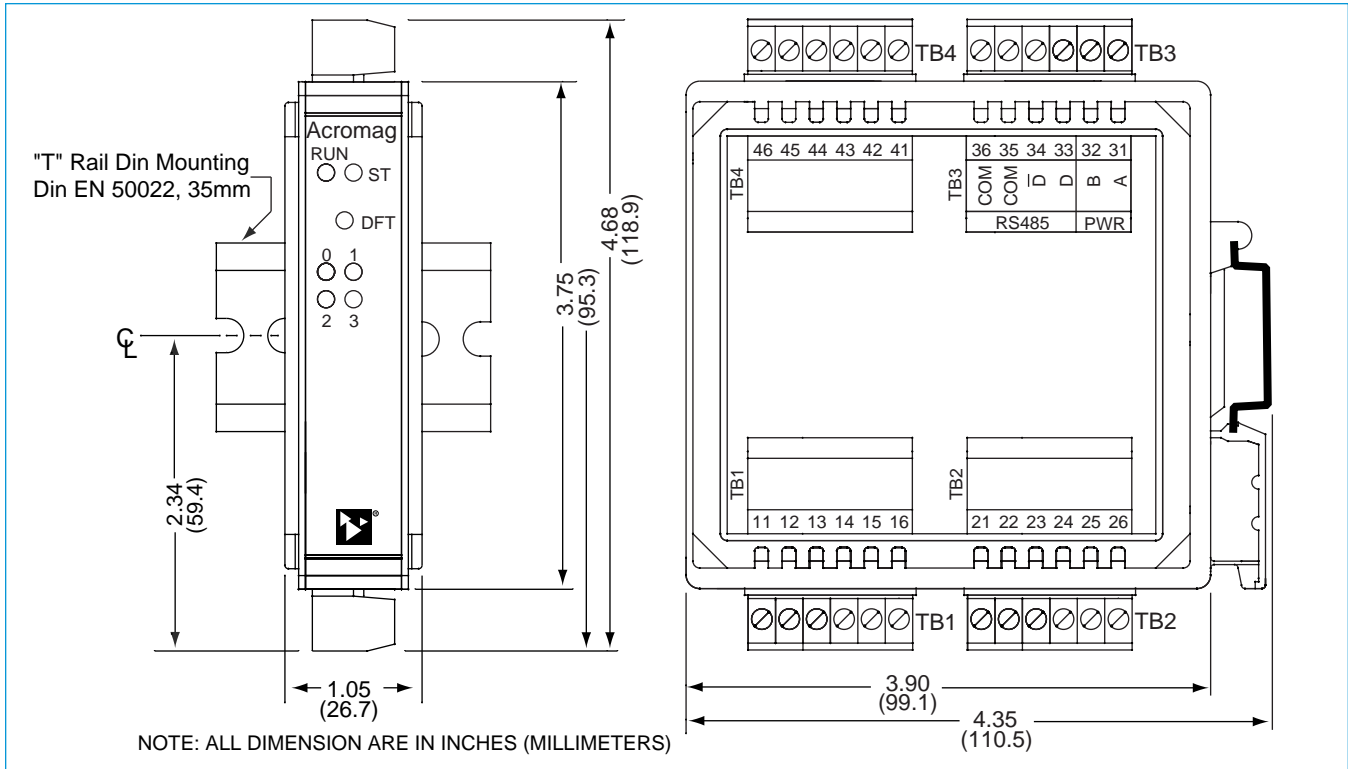
#### PSSR-VB24

Power supply (24V DC, 2.1A)

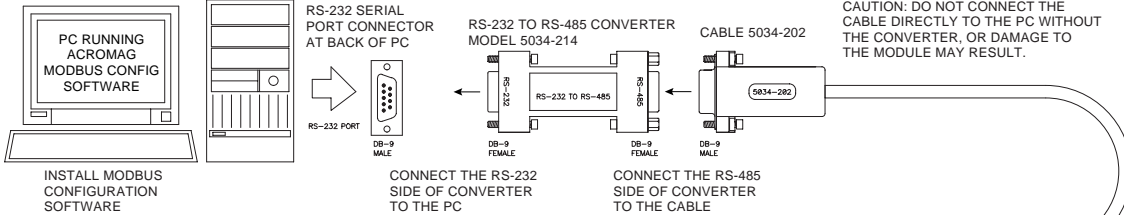




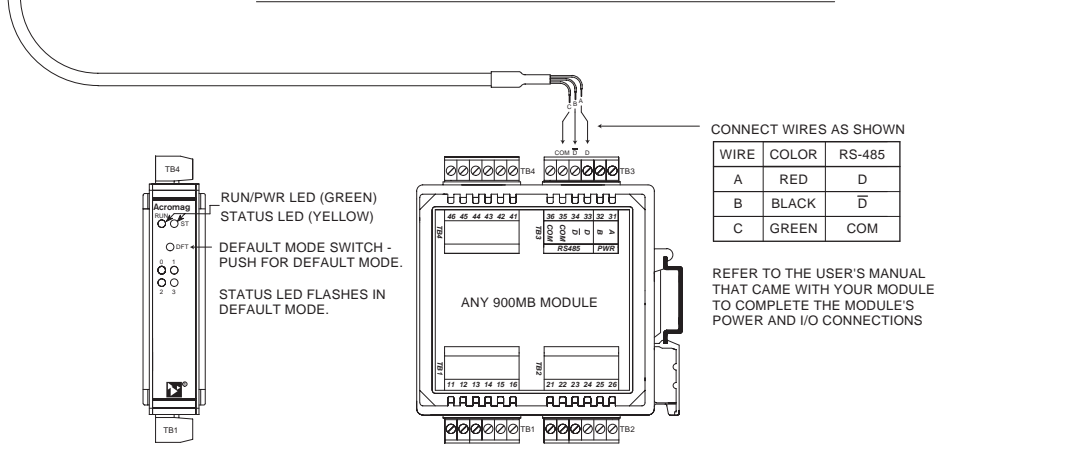
## 900MB Series Technical Diagrams



PERSONAL COMPUTER  
W/ WINDOWS 95/98 OR NT



## 900C-SIP COMMUNICATION CONNECTIONS





## ■ 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

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 Isolated  
RS-232/485 Converter Isolated RS-485  
Network Repeater

### ■ Mounting Hardware

Installation is a snap with Acromag accessories.

DIN RAIL Bars

19" Rack-Mount Kit

## ■ 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.

