



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

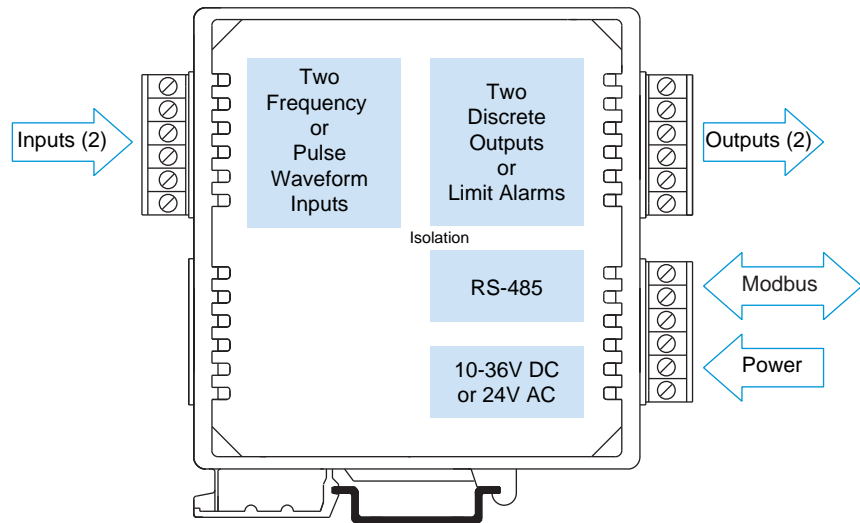
Power Requirement

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.

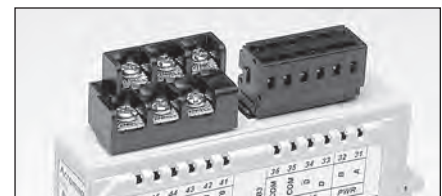
Versatile inputs accommodate many applications using TTL, magnetic pickups, proximity sensors, or a variety of switches (high/low-side transistor, dry contact, open drain, open collector). Bipolar and unipolar waveforms are supported with a selectable input bias that accepts both zero and non-zero crossing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

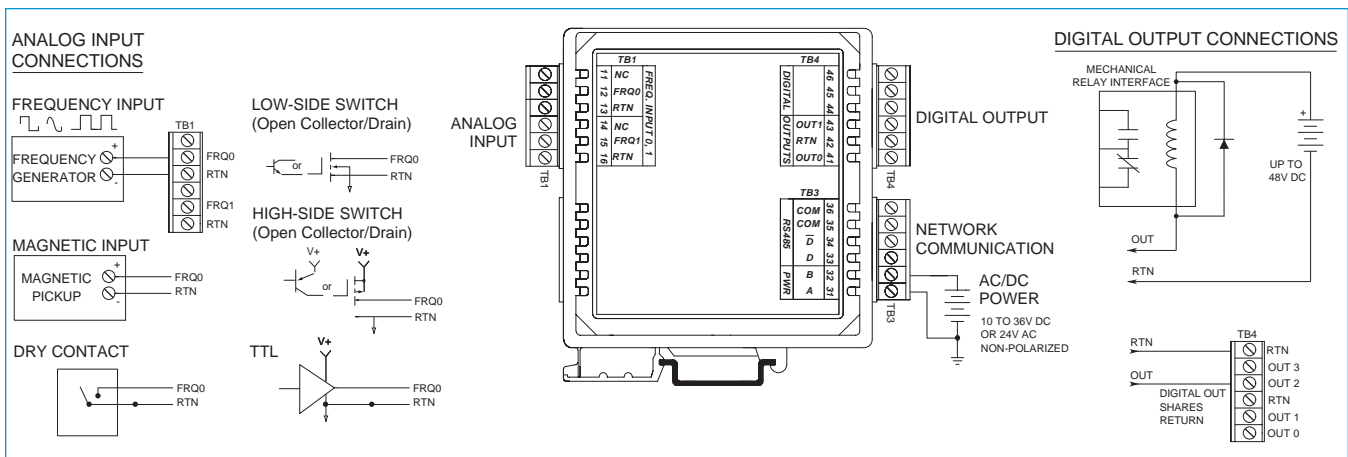
Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

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

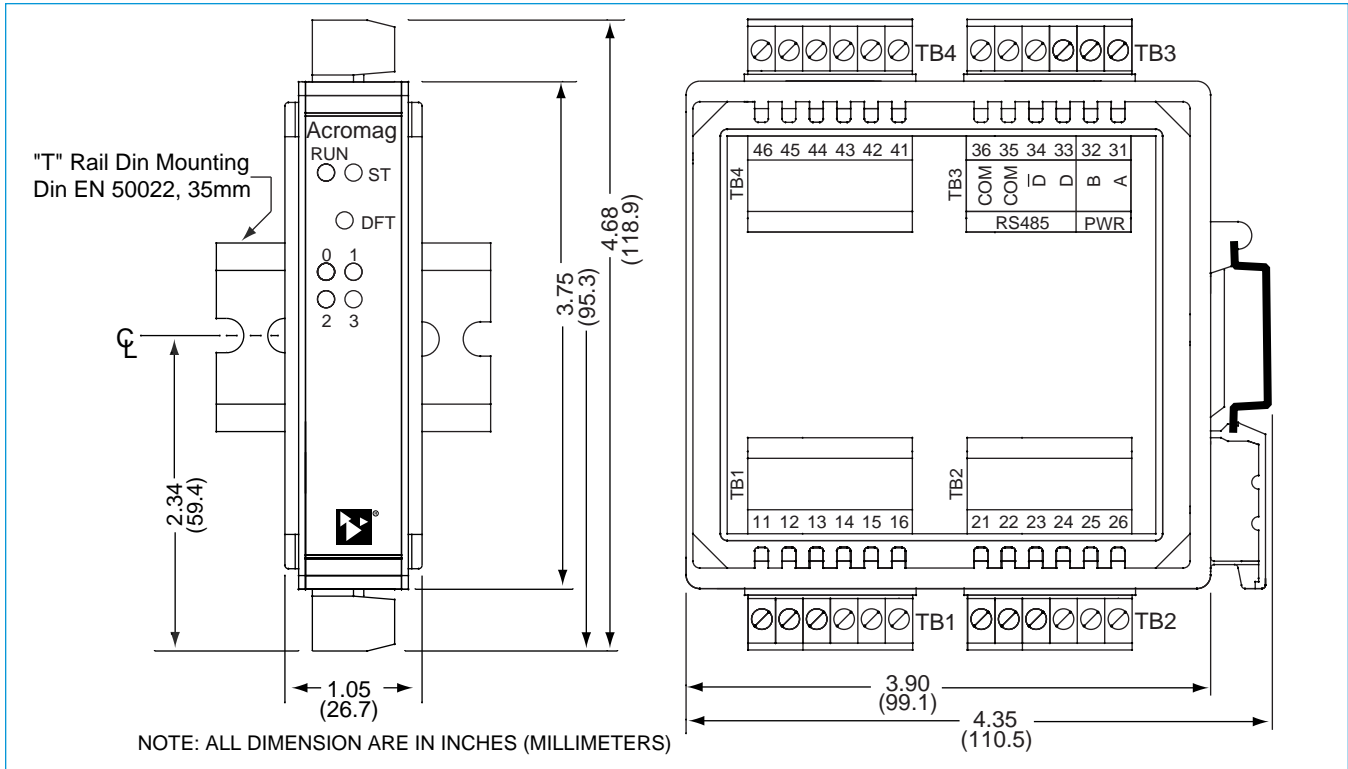
PSSR-VB24

Power supply (24V DC, 2.1A)





900MB Series Technical Diagrams

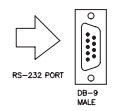


PERSONAL COMPUTER
W/ WINDOWS 95/98 OR NT

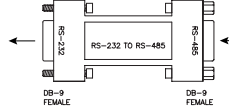


INSTALL MODBUS CONFIGURATION SOFTWARE

RS-232 SERIAL PORT CONNECTOR AT BACK OF PC



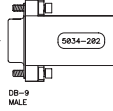
RS-232 TO RS-485 CONVERTER MODEL 5034-214



CONNECT THE RS-232 SIDE OF CONVERTER TO THE PC

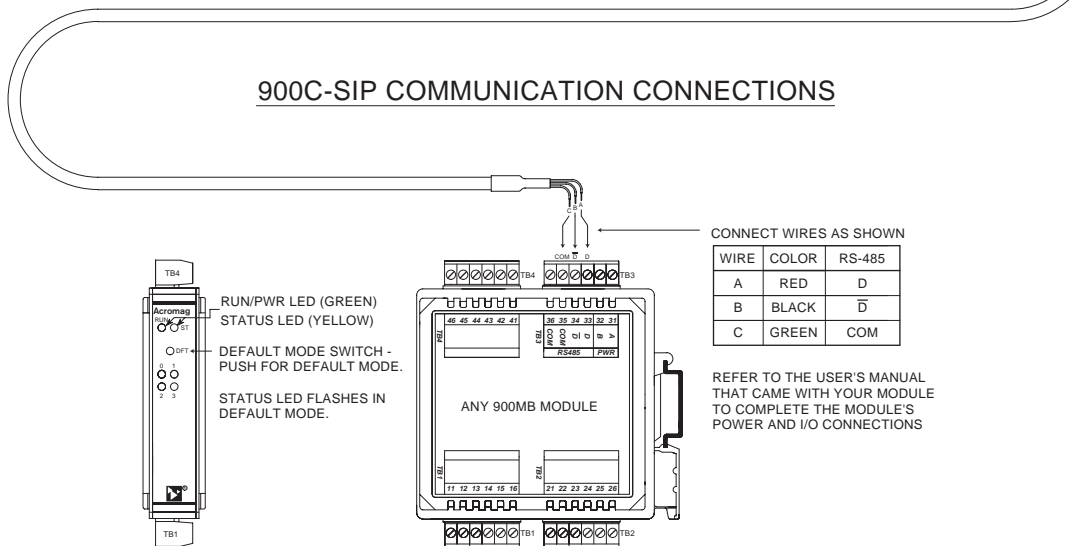
CONNECT THE RS-485 SIDE OF CONVERTER TO THE CABLE

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





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	130mA maximum
24V DC	54mA maximum
24V AC	95mA 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)

4001-095

USB-to-RS232 adapter

TBK-B02

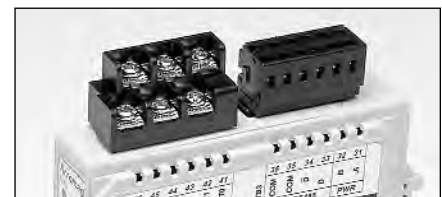
Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

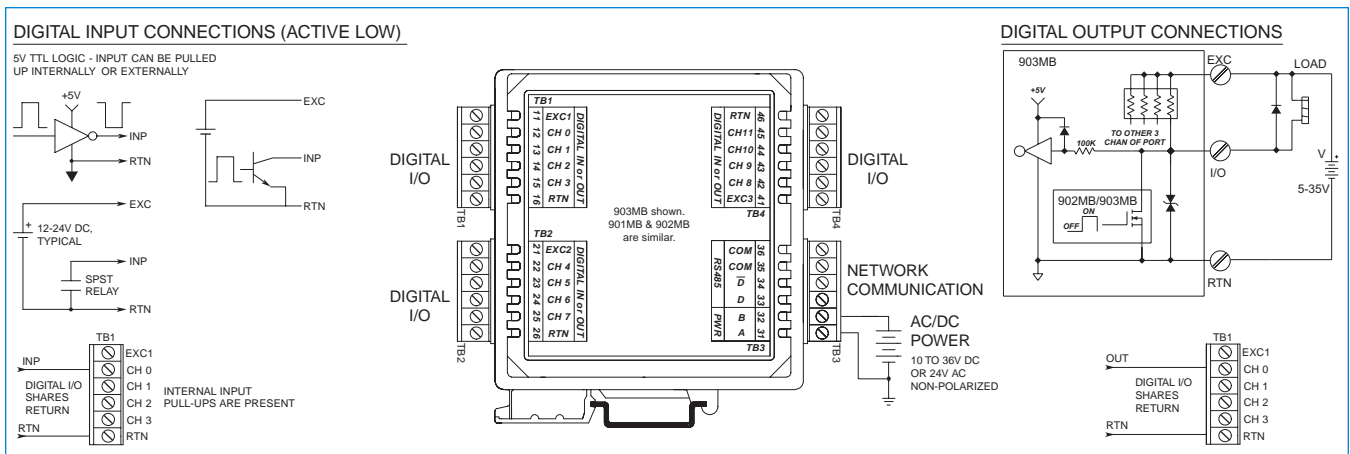
Optional terminal block kit, spring clamp style, 4 pcs.

PSSR-VB24

Power supply (24V DC, 2.1A)

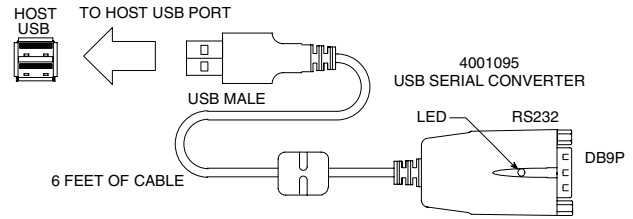
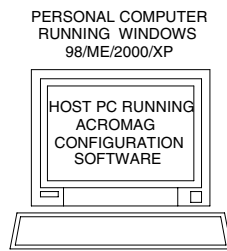
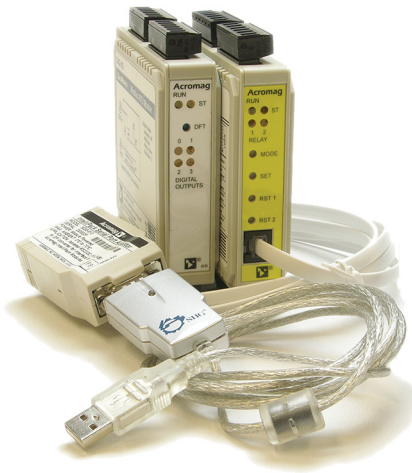


Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



BusWorks® Modbus I/O

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 and newer.

Ordering Information

NOTE: For more information visit www.acromag.com.

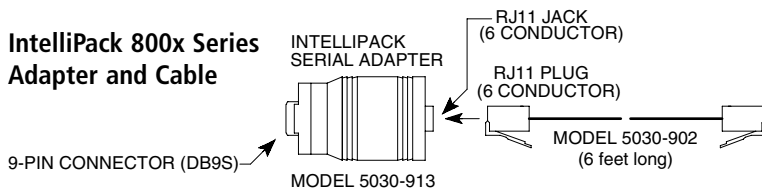
Adapters

- [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.
- [5032-787](#)
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.

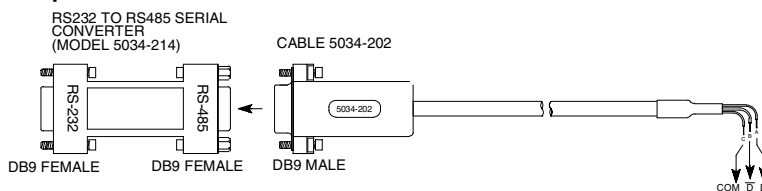
Cables

- [5030-902](#)
Cable. 6 feet long with RJ11 plug at each end.

IntelliPack 800x Series Adapter and Cable



900MB Modbus Series Adapter and Cable



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