

5906 Ethernet Gateway Module

Installation, Operation and Maintenance
Setup Manual

5/19/2011



The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed. Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate.

CAUTION

CAUTION used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage..

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

BEFORE YOU BEGIN

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

 **CAUTION****EQUIPMENT OPERATION HAZARD**

Verify that all installation and set up procedures have been completed.

Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.

Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in injury or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and grounds, except those grounds installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove ground from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About The Book

At a Glance

Document Scope

This manual describes operation and maintenance of the 5906 Ethernet Gateway module.

Validity Notes

This document is valid for all versions of the 5906 Ethernet Gateway module .

Product Related Information

WARNING

UNINTENDED EQUIPMENT OPERATION

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter and apply this product.

Follow all local and national safety codes and standards.

Failure to follow these instructions can result in death, serious injury or equipment damage.

User Comments

We welcome your comments about this document. You can reach us by e-mail at technicalsupport@controlmicrosystems.com.

Overview

The 5906 Ethernet Gateway provides an interface between serial RS-232 or RS-485 Modbus communication devices and Ethernet networks. Modbus RTU or ASCII protocols on the serial port are converted to Modbus TCP, Modbus RTU in TCP, Modbus UDP, or Modbus RTU in UDP protocols on the Ethernet port.

Applications include in-plant I/O and connectivity between SCADAPack and operator workstations, other PLC devices, and SCADA systems communication, using standard Modbus. The 5906 Ethernet gateway may also be used to connect with other devices, which use Modbus protocol, such as PID controllers, Variable Frequency Drives (VFD), and UPS power systems.

Support for RS-232 using RTS/CTS handshaking, allows the 5906 Ethernet Gateway to be used as a gateway between Ethernet LAN and commonly used half-duplex SCADA communications media. Examples of devices which often require half-duplex support include the 5902 Bell 202 modem, radio modems, and various other half-duplex modems.

Multi-drop communication over RS-485, or half-duplex modems and radios, allows up to 65534 Modbus slave devices to be connected to a 5906 Ethernet gateway. The Ethernet Gateway supports a maximum of two IP connections. Each IP connection can be either TCP or UDP protocol.

Installation

Hardware Installation

The 5906 Ethernet Gateway is available in three versions. Each version uses the same 5906 Ethernet Gateway module mounted in different packages.

The 5906 Ethernet Gateway is available as an integrated part of SCADAPack 100, SCADAPack LP, SCADAPack 32 or SCADAPack 32P controllers.

The 5906 Ethernet Gateway is available in a DIN rail mountable enclosure. This version is used with SCADAPack controllers as a standard I/O module.

The 5906SA (Stand Alone) Ethernet Gateway is a stand-alone version of the 5906 and is used with other devices such as personal computers. This version is provided with an external power source and rubber feet for desktop mounting.

This manual covers the installation and hardware configuration of the 5906 Ethernet Gateway. Once the 5906 Ethernet Gateway is installed a Configuration Interface is used to configure the Ethernet and serial ports, protocols used, friendly IP table and the routing table. Refer to section **5906 Configurator GUI** for additional details on the 5906 Configurator GUI.

5906 Configurator GUI

The 5906 Ethernet gateway is configured using the 5906 Configurator Graphic User Interface (GUI). The GUI is an easy to use application that enables users to completely configure the 5906 Ethernet Gateway. The Configuration Interface runs on Microsoft Windows 98, Windows ME, Windows NT, Windows 2000 and Windows XP operating systems.

The 5906 Configurator GUI communicates with the 5906 Ethernet Gateway via the gateway's Ethernet port. Before using the GUI the 5906 Ethernet Gateway is powered and connected to the Ethernet or to the PC.

- Power the 5906 Ethernet Gateway using one of the methods described in the **Power Connections** section.
- Connect the Ethernet port to the same LAN as the PC you are using for configuration. You may connect the 5906 Ethernet Gateway directly to the Ethernet port on your PC if you are using a cross networking cable.

The 5906 Configurator GUI is provided with the hardware installation CD that accompanies your shipment. Locate the 5906 Configurator Interface on your hardware CD and follow through the installation instructions to install the application.

To run the Configuration Interface program:

- Click on Start | Programs | Control Microsystems | 5906 Configuration | Configuration Interface.
- Launch the user manual by clicking on Help | User Manual.

NOTES:

- The 5906 Configurator Software will find a 5906 device if the software is running behind a firewall.
- The 5906 devices operates at 10Mbps. If connected directly to the 5906 device using a cross over cable, check that the Ethernet port on your PC or laptop is not set to operate at speeds higher than 10Mbps.

Field Wiring

The 5906 Ethernet Gateway module has three connectors for field wiring. Refer to **Figure 1: 5906 Module Layout** for the location of these connectors.

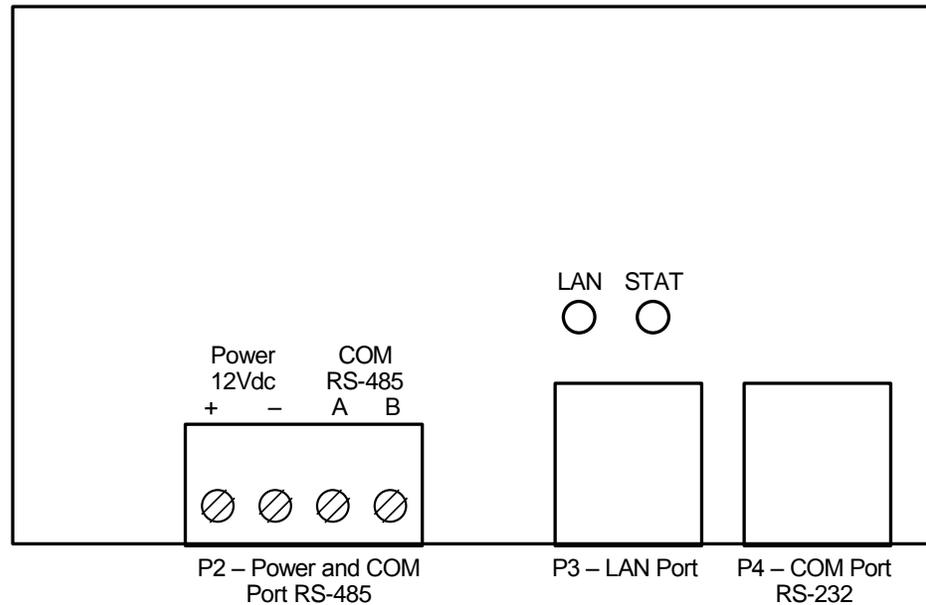


Figure 1: 5906 Module Layout

Connector P2 is a 4 position removable terminal block that provides 2 terminal connections for the COM 1 RS-485 port and 2 terminal connections for the PWR 12Vdc + and -. Refer to the section **RS-485 Serial Communication Port** for more information on the RS-485 connection. The PWR 12Vdc + and – terminals are used with the 5906SA version to provide power for the 5906 Ethernet Gateway. Refer to section **5906SA Ethernet Gateway Power Connection** for more information.

Connector P3 is a RJ-45 modular jack that provides the Ethernet connection for the 5906 Ethernet Gateway. The RJ-45 modular jack pin-out is compatible with standard Ethernet cables. Refer to section **Ethernet Port** for more information.

Connector P4 is a RJ-45 modular jack that provides the RS-232 connection for the 5906 Ethernet Gateway. This connection is configured as a DTE (Data Terminal Equipment). Connector P4 is also used to power the 5906 Ethernet Gateway when it is integrated into a SCADAPack controller. Input power is supplied through pin 1, Refer to section **RS-232 Serial Communication Port** for more information.

RS-232 Serial Communication Port

The RS-232 port is an 8-position RJ-45 modular jack, configured as Data Terminal Equipment (DTE). **Figure 2: RS-232 Port Connector (DTE)** and **Table 1: RS-232 Connections** describe the RS-232 connector.

P4: RJ-45 Modular Jack

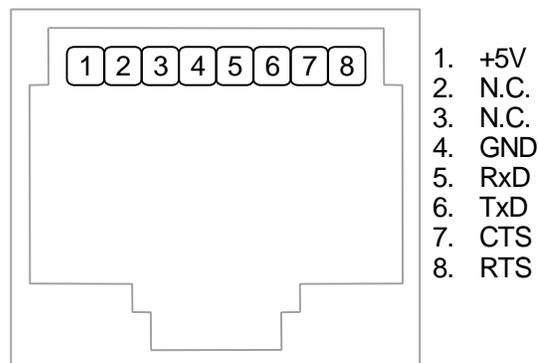


Figure 2: RS-232 Port Connector (DTE)

A description of each pin signal is shown in **Table 1: RS-232 Connections**. In this table a MARK is a voltage of +3 volts or greater and a SPACE is a voltage of 0 volts or less.

Pin	Function	Description
1	+5V (Input)	This pin is the 5V power input when the 5906 is integrated with a controller. J6 should be installed.
2	N.C.	No connection.
3	N.C.	No connection.
4	GND	This pin is connected to the system ground.
5	RxD (Input)	The level is SPACE on standby and MARK for received data.
6	TxD (Output)	The level is SPACE on standby and MARK for transmitted data.
7	CTS (Input)	This level must be a MARK for the communication port to transmit data. When the attached device does not provide this signal, the controller keeps the line at a MARK.

Pin	Function	Description
8	RTS (Output)	This pin is a MARK if full-duplex operation is selected for the port. This pin is set to a MARK just before and during transmission of data if half-duplex operation is selected. This pin is set to a SPACE when no data is being transmitted.

Table 1: RS-232 Connections

RS-232 Serial Port Connection to DTE Devices

The serial cable that is provided with the 5906 Ethernet Gateway is suitable for connecting the module to a DTE (Data Terminal Equipment) device such as a SCADAPack controller. This cable is Control Microsystems part number TBUM297303 and is wired as shown in **Figure 3: RS-232 Wiring - 5906 (DTE) to SCADAPack (DTE)**.

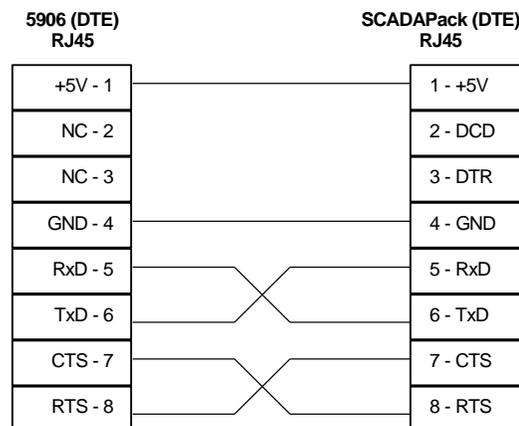


Figure 3: RS-232 Wiring - 5906 (DTE) to SCADAPack (DTE)

The 5906SA Ethernet Gateway generally connects to other DTE devices such as a personal computer and will require a longer serial cable. **Figure 4: RS-232 Wiring - 5906 (DTE) to DTE** shows a typical serial connection. This cable is available from Control Microsystems in a 10 foot length. Part number is TBUM297217.

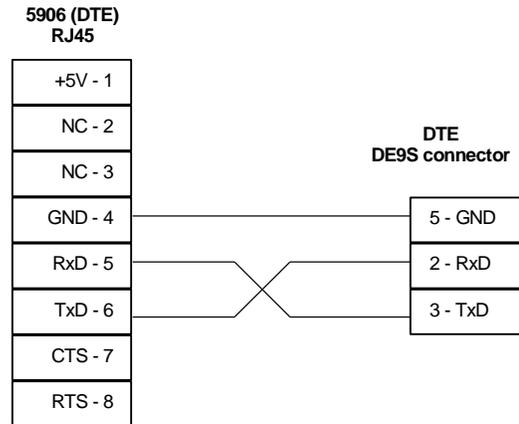


Figure 4: RS-232 Wiring - 5906 (DTE) to DTE

RS-232 wiring uses shielded cable. The shield should be connected to chassis ground at one end of the cable only. The DE-9 connector shell is a good ground point. A maximum cable length of 50ft (15.2m) is allowed. Improperly shielded cables may result in the installation not complying with FCC or IC radio interference regulations.

RS-485 Serial Communication Port

The 5906 Ethernet Gateway has a two-wire RS-485 serial communication port. The RS-485 port transmits and receives differential voltages to other RS-485 devices. The RS-485 specification allows a maximum of 32 devices. A maximum cable length of 4000 feet (1200 m) terminated at each end is recommended. Termination resistors are required when using long cable lengths and high baud rates. Refer to section **RS-485 Termination Resistors** section.

The RS-485 port is part of a 4 position removable terminal block, P2, that is shared with the power input. **Figure 5: RS-485 Connections** and **Table 2: RS-485 Connections** describe this connector.

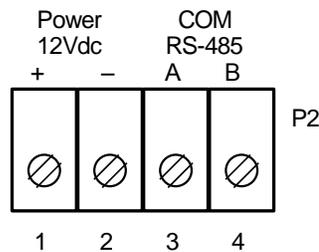


Figure 5: RS-485 Connections

A description of each terminal block signal for connector P5 is shown in **Table 2: RS-485 Connections**.

Pins	Type	Description
+12V Pin 1	Power Input	See section 5906SA Ethernet Gateway Power Connection for information about connecting to this pin.
Pin 2	Ground	See section 5906SA Ethernet Gateway Power Connection for information about connecting to this pin. Terminate one end of the shield of the RS-485 cable to this pin. This pin is connected to the enclosure.
+A Pin 3	Input/ Output	This is the +/A side of a differential output that meets the RS-485 specification.
-B Pin 4	Input/ Output	This is the -/B side of a differential output that meets the RS-485 specification.

Table 2: RS-485 Connections

The signal grounds of the RS-485 devices in the network are not connected together but instead are referenced to their respective incoming electrical grounds. The grounds of the RS-485 devices on the network are wired to be within several volts of each other. The 5906 ground is connected to the chassis of the integrated controller.

RS-485 Bias Resistors

The RS-485 receiver inputs on the 5906 Ethernet Gateway are biased so that received data is driven to a valid state (space) when there are no active drivers on the network. The value of these bias resistors is 5100 ohms from Ground to the B input and 5100 ohms from +5V to the A input.

RS-485 Termination Resistors

Termination resistors are required on the first and last station on the RS-485 wire pair. Other stations should not have termination resistors. Resistors for receiver and transmitter termination are pre-installed on the 5906 Ethernet Gateway.

The 5906 Ethernet Gateway uses a traditional termination scheme with one 120-ohm resistor across the line. Installing jumper link connects this termination resistor. Refer to chapter **Configuration Jumpers** for instructions on connecting the termination resistors.

This termination scheme may not be compatible with other RS-485 devices. RS-485 receivers that cannot tolerate a differential input voltage of 0 volts (line terminated but not driven) should be terminated with resistors that bias the line to a known state during these conditions. Termination resistors are required in long networks operating at the highest baud rates. Shorter networks in high noise environments may also benefit from terminations.

Ethernet Port

The Ethernet network connects to the RJ-45 modular jack labeled P3. The RJ-45 jack mates with a 8-pin connector and cable assemblies common to Ethernet 10Base-T applications. Pins 1,2,3 and 6 are used. Pins 4,5,7, and 8 are not

used. See **Figure 6: 5906 Ethernet Gateway RJ-45 Connector** for pin connections.

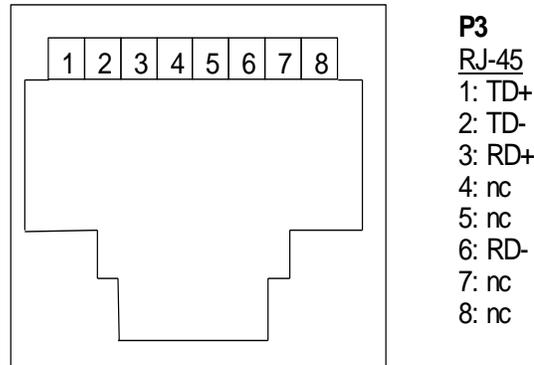


Figure 6: 5906 Ethernet Gateway RJ-45 Connector

10BaseT has a maximum run of 100m or 350 feet, but the actual limit is based on signal loss and the noise in the environment. This may limit the practical distance to less than 100m or 350 feet. The Ethernet cables should not be run in parallel with power or any cables that generate noise.

Power Connections

5906 Ethernet Gateway Power Connection

The 5906 Ethernet Gateway is powered with 5V from the integrated controller. This power is supplied through pin 1 of the RS-232 connector P4. Refer to section **Table 1: RS-232 Connections**

RS-232 Serial Port Connection to DTE Devices for more information on this connection.

5906SA Ethernet Gateway Power Connection

The 5906SA version of the Ethernet gateway is powered using an AC adapter (Control Microsystems part number: TBUM210240) connected to terminal P2. See **Figure 7: 5906SA Ethernet Gateway Power Connection** below for terminal connections. The AC adapter plugs into a 120Vac supply and provides 12Vdc to the 5906SA. This AC adapter is shipped with all 5906SA modules.

The AC adapter is used *only* with the 5906SA version of the Ethernet Gateway. Do not use the AC adapter when the Ethernet Gateway is powered through the RS-232 connector.

To power the 5906SA module using the AC adapter:

Check that the AC adapter is not connected to the 120VAC supply.

Locate connector P2 on the 5906 module. Refer to **Figure 1: 5906 Module Layout** section for the location of P2.

Connect the black wire to P2 Pin 1 (PWR 12Vdc +) and the black wire with the white stripe to P2 Pin 2 (PWR 12Vdc -).

Plug the AC adapter into a 120Vac supply.

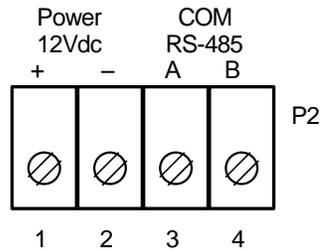


Figure 7: 5906SA Ethernet Gateway Power Connection

The 12Vdc AC adapter connection cannot be used in Hazardous Locations.

Configuration Jumpers

The 5906 module uses several configuration jumpers for setting the operating conditions and factory diagnostics. These jumpers are described in **Table 3: Jumper Settings** and **Figure 8: Jumper Layout** below.

Jumper	Description	Setting
J1	Normal / Cold Boot	This jumper is set at the factory. Leave in the "Normal" position.
J4	RS-485 Termination	When installed a 120Ω resistor terminates the RS-485 lines. This should be left off when operating in RS-232 mode.
J5	Future	No jumper is installed.
J6	5V P4 (COM1), pin 1	When installed in the upper position as shown, the 5906 is powered with 5V from P4, pin 1. This jumper is normally installed in this position as shown below. When installed in the lower the 5906 is powered from the external power provided on P2. This is the default position for the desktop version of the 5906.
P7	Factory	This jumper is factory set. Two jumpers installed 1-2 and 3-4 as shown below.
TP1	Test points.	Nothing installed.

Table 3: Jumper Settings

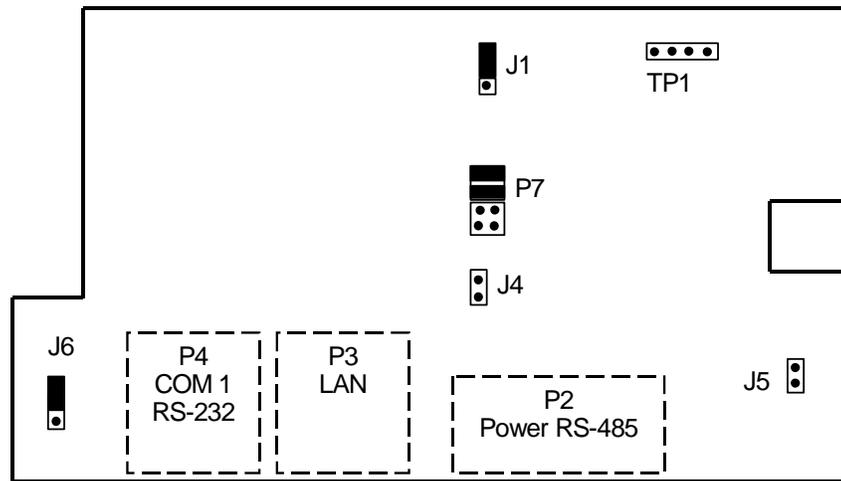


Figure 8: Jumper Layout

LED Indicators

The 5906 module has two LEDs to indicate module operation and status. The STAT and LAN LEDs provide an indication of the operating condition of the 5906 Ethernet Gateway. These LEDs are not disabled to conserve power.

STAT and LAN LEDs Operation

The LAN LED will flash whenever traffic is detected on the Ethernet.

The STAT LED operates as shown in the **Table 4: STAT LED Operation** table below.

STATUS LED	Condition
On	The 5906 Ethernet Gateway is functioning properly.
Short blink followed by long blink	The 5906 Ethernet Gateway is not configured.
Long blink	The 5906 Ethernet Gateway can not presently serve any more messages.
Off	The 5906 Ethernet Gateway is not powered or is starting up.

Table 4: STAT LED Operation

Maintenance

This module requires no routine maintenance. If the module is not functioning correctly, contact Control Microsystems Technical Support for more information and instructions for returning the module for repair.

Troubleshooting

Condition	Solutions
STAT led is off	Check that power is connected to pin 1 of the RS-232 connector, P4, for 5906. Ensure AC adapter is connected for 5906SA.
STAT led is off and power is connected	Check that jumper J6 is installed.
No Ethernet to serial or serial to Ethernet communication	Check that the 5906 is configured using the Configuration Interface software application.
No LAN led flashing during configuration.	Check that the 5906 is connected to the same network as the configuration PC.

Specifications

Disclaimer: Control Microsystems reserves the right to change product specifications. For more information visit www.controlmicrosystems.com.

LAN Compatibility	IEEE 802.3
Ethernet Termination	RJ-45, 10Base-T (twisted pair), 10M bits/second
Network Protocols	IP:ARP, TCP, UDP, ICMP
SCADA Protocols	Modbus RTU, Modbus ASCII, Modbus TCP, Modbus RTU in TCP, Modbus UDP and Modbus RTU in UDP.
RS-232/485 Data Rate	1200 to 57600 baud
Duplex	Full or half. Half requires the DTE to implement hardware RTS/CTS handshake
RS-232	TxD, RxD, RTS, CTS implemented
RS-232 Termination	RJ-45 connector, DTE
RS-485	2 wire Bias and termination resistors included.
RS-485 Termination	4 pole terminal strip and removable terminal block shared with power input 12 to 22 AWG
Configuration	Remote over Ethernet
Visual Indicators	Ethernet Link (LAN) and Status (STAT)
Dimensions and mounting	Integrated inside the cover of the SCADAPack 100, SCADAPack LP, SCADAPack 32 and SCADAPack 32P.
Packaging	Corrosion resistant zinc plated steel with black enamel paint
Environment	5% RH to 95% RH, non-condensing -40°C/-40°F to 70°C /158°F
Power Requirements	5V/50mA required from the SCADAPack controller RS232 COM port. 60mA when RS-485 operation is enabled.

5906 desktop and DIN rail

Part Number	TBUM297275 Model 5906 Ethernet Gateway for DIN
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	Rail Mounting 297285 Model 5906SA Ethernet Gateway for desk top mounting
Mounting	desktop, rubber feet or 7.5 x 35 DIN rail
Dimensions	5.65 inch (144 mm) wide 4.625 inch (118 mm) high 2.00 inch (51 mm) deep
Power Requirements	9-18V/50mA supplied by an external power supply or 12Vdc AC adapter -or- 5V/50mA required from the SCADAPack controller RS232 COM port. 60mA when RS-485 operation is enabled.

Approvals and Certifications

Hazardous Locations - North America	<p>Suitable for use in Class I, Division 2, Groups A, B, C and D Hazardous Locations. Temperature Code T4</p> <p>CSA certified to the requirements of:</p> <ul style="list-style-type: none"> • CSA Std. C22.2 No. 213-M1987 - Hazardous Locations. • UL Std. No. 1604 - Hazardous (Classified) Locations.
Safety	<p>CSA (cCSAus) certified to the requirements of: CSA C22.2 No. 142-M1987 and UL508. (Process Control Equipment, Industrial Control Equipment)</p> <p>UL (cULus) listed: UL508 (Industrial Control Equipment)</p>
Digital Emissions	<p>FCC Part 15, Subpart B, Class A Verification</p> <p>EN61000-6-4: 2001 Electromagnetic Compatibility Generic Emission Standard Part2: Industrial Environment C-Tick compliance. Registration number N15744.</p>
Immunity	<p>EN61000-6-2: 2001 Electromagnetic Compatibility Generic Standards Immunity for Industrial Environments</p>
Declaration	<p>This product conforms to the above Emissions and Immunity Standards and therefore conforms with the requirements of Council Directive 2004/108/EC (as amended) relating to electromagnetic compatibility.</p> <p>The Low Voltage Directive is not applicable to this product.</p>