174 CEV 300 20
Modbus to Ethernet Bridge
User Guide

890USE19500 Version 1.0

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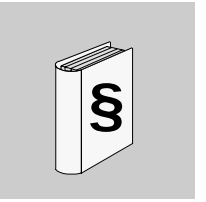
Safety Information



Important Information

NOTICE

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, serious injury, or equipment damage.

WARNING

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

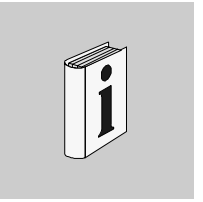
CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE

Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

About the Book



At a Glance

Document Scope

This user guide introduces the Modbus to Ethernet Bridge.

Validity Note

The data and illustrations found in this book are not binding. We reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be construed as a commitment by Schneider Electric.

Revision History

Rev. No.	Changes
1	Initial version.

Related Documents

Title of Documentation	Reference Number
174 CEV 300 20 Modbus to Ethernet Bridge Installation Instructions	31005102

Product Related Warnings

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When controllers are used for applications with technical safety requirements, please follow the relevant instructions.

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User Comments

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

Getting Started

1

At a Glance

Overview

This chapter provides an overview of the Modbus to Ethernet Bridge.

What's in this Chapter?

This chapter contains the following topics:

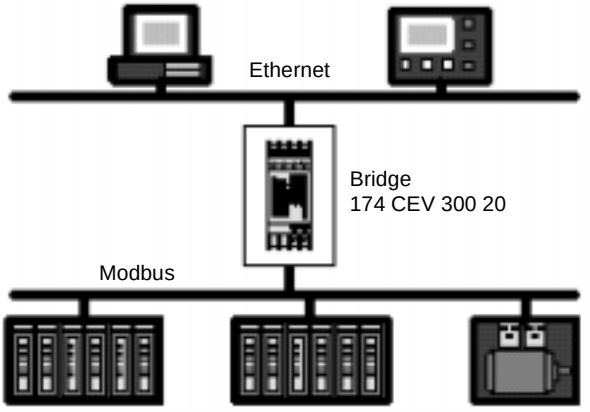
Introducing the Modbus to Ethernet Bridge

Overview

The Modicon Modbus to Ethernet Bridge provides a means for transacting messages between Ethernet TCP/IP devices and Modbus serial devices. It supports up to eight concurrent transactions between Modbus Master and Slave devices, handling the conversion of TCP/IP and Modbus RTU/ASCII protocols transparently to the user application.

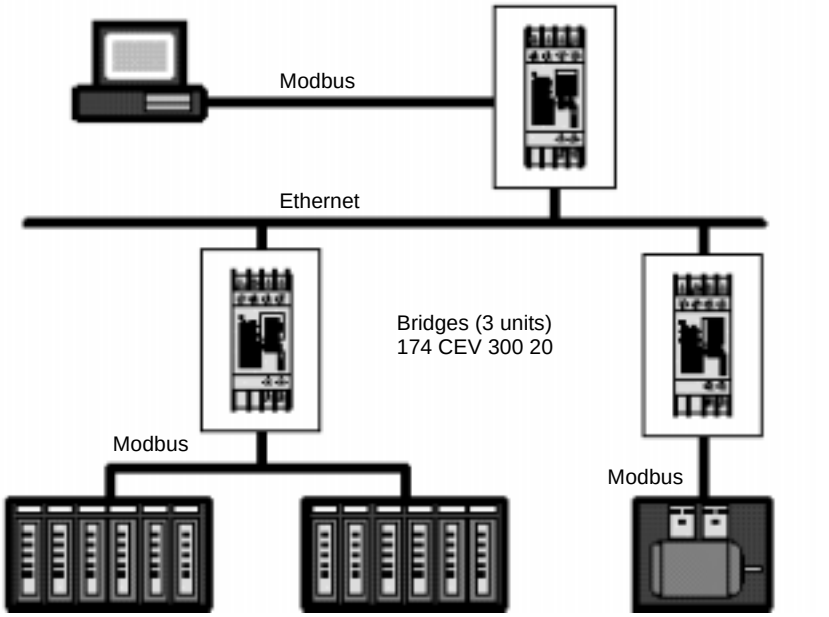
Bridge Applications

Ethernet nodes using TCP/IP can function as Modbus Masters, originating messages to the Bridge for delivery to Modbus Slave devices connected to the Bridge's Modbus port. The Bridge forwards the messages to the Slave devices using Modbus RTU or ASCII protocol and returns their responses to the Master.
The following figure shows a typical application in which a Bridge connects two Modbus Masters on Ethernet to several Modbus Slave serial devices.



The bridge also allows multiple Modbus networks to be linked together across an Ethernet connection. Multiple Bridges can furnish an Ethernet link between widely separated Modbus networks. This extends the message path beyond the cable lengths allowed for serial connections, and allows a Master on any Modbus network to access Slave devices on another network.

The following figure shows a typical application in which three Bridges join Modbus networks through a common Ethernet link.



Installation and Configuration

The Bridge is designed for easy ‘snap’ mounting on a standard DIN rail.Its front panel has connectors for power, ground, Ethernet and Modbus cables. It has a switch for selecting either an RS–232 or RS–422/485 interface for the Modbus port. Indicators show the status of communication at the Ethernet and Modbus ports. The Bridge contains a configuration utility program stored in its non–volatile memory. With this utility you can assign the Bridge’s Ethernet and Modbus parameters, using an ASCII terminal at the serial port or a Telnet connection over Ethernet.

The Bridge contains a factory-assigned MAC address that is derived from the serial number printed on the Bridge’s label. This allows you to establish an Ethernet connection to the Bridge to assign its IP address and the other parameters for reapplication.

Mapping Modbus and IP Addresses

Overview

The Bridge maps messages between Modbus and IP addresses according to the type of device you have configured at its Modbus port.

Mapping for a Modbus Master

When you configure a Modbus Master device at the Bridge's serial port, you can assign up to eight entries into an internal mapping table that is maintained in the Bridge's memory. You enter your intended mapping into the table during your configuration of the Bridge.

Each entry into the Mapping table for a Modbus Master can include the mapping of a range of Modbus serial addresses to a range of IP addresses. The Modbus serial address can be used to form the last byte of the IP address. This allows a Modbus Master to address 8 different subnets of IP devices.

When the Bridge receives a message from the Master, it searches the mapping table for an entry matching the Modbus address in the message. If one is found, the Bridge sends the message to the IP address for that entry. If a matching entry is not found, the Bridge returns an exception response to the Master application.

Note that the original Modbus address is retained in the message transmitted to the IP destination. If the remote IP node is another Bridge, the message's Modbus address can be used to identify a Slave device at that Bridge's serial port.

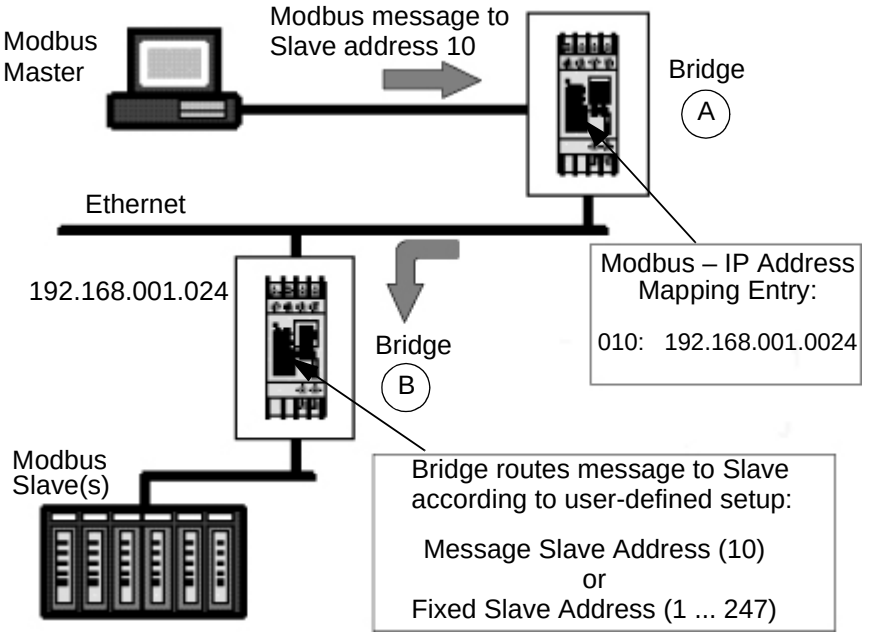
Mapping for a Modbus Slave

When you configure a Modbus Slave device or network with multiple Slaves at the Bridge's serial port, you have two options for routing messages to a Slave destination. You assign your choice during your configuration of the Bridge. Your options are: Message address routing; or, Fixed address routing.

You can specify that the Bridge must route each message to the Slave device that is identified in the Modbus address field of the message. This allows any Slave device with an assigned address from 1-247 at the Bridge's Modbus port.

You can specify that the Bridge must route all messages to one fixed Slave address that you define in the Bridge's configuration. With this option the Modbus address field is ignored, and each message is routed to that fixed Slave address only. This limits addressing to a single device at the port.

The following figure shows an example of message address mapping between a Modbus Master and a Modbus Slave using two Bridges with an Ethernet link.



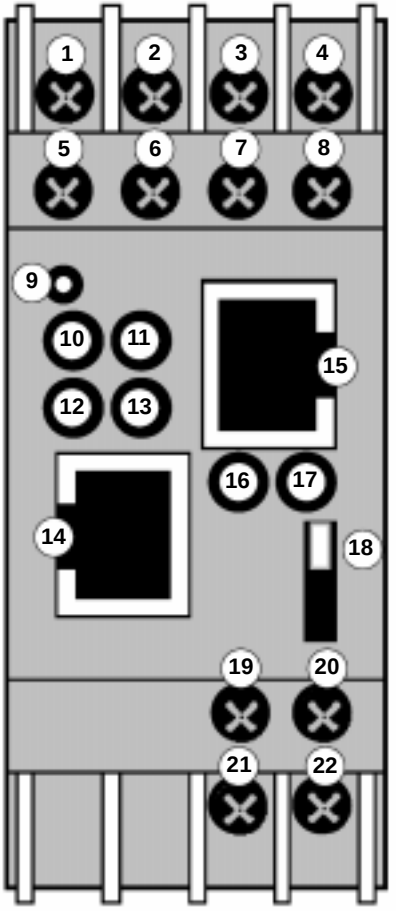
These are the events in the messaging routing:

- The Modbus Master sends its message containing address 10 decimal to Bridge A.
- You have set an entry in the mapping table in Bridge A. Your entry specifies that messages with address 10 are to be mapped to IP address 192.168.001.024
- Bridge B has that IP address and receives the message.
- Depending on the option you set in Bridge B, the message is routed either to the Modbus Slave device at address 10 as specified in the message, or to a fixed Slave address in the range 1....247.

Front Panel Layout

Overview

See the figure below for a layout of the front panel.



The table below shows the Front Panel components.

Item	Component	Name	Purpose
1	Wire terminal	RxD or Rx-	Modbus signal: RS–232: RxD (Receive Data) RS–422.485: RxD– (Receive Data –)
2	Wire Terminal	CTS or Rx+	Modbus signal: RS–232: CTS (Clear to Send) RS–422/485: RxD+ (Receive Data +)
3	Wire Terminal	RTS or Tx+	Modbus signal: RS–232: RTS (Request to Send) RS–422/485: TxD– (Transmit Data +)
4	Wire Terminal	TxD or Tx-	Modbus signal: RS–232: TxD (Transmit Data) RS–422/485: TxD– (Transmit Data –)
5,6,7	Wire Terminal	NC	No Connection
8	Wire Terminal	GND	Modbus signal ground
9	Reset Switch	RST	Push to reset and initialize bridge
10	LED (Red)	Fault or Configuration	ON: Fault in Bridge communication (or) Bridge is in Configuration Menu
11	LED (red)	Ready	ON: Bridge is ready for communication on both ports
12	LED (green)	Active Ethernet	Flashing: Indicates activity at Bridge's Ethernet port
13	LED (yellow)	Link Good	ON: Bridge has good connection at Ethernet port
14	Connector (RJ45)	Ethernet Port	RJ45 connector for Ethernet 10BaseT cable
15	Connector (RJ45)	Modbus Port	RJ45 connector for Modbus RS–232 or RS–485 cable
16	LED (yellow)	Modbus Tx	Flashing: Indicates transmission or upload at Modbus port
17	LED (yellow)	Modbus Rx	Flashing: Indicates reception at Modbus port
18	Switch	Modbus Interface selection	UP: Modbus port is RS–232 DOWN: Modbus port is RS–422/485
19	Wire Terminal	DC+ (or AC)	Operating power, positive
20	Wire Terminal	Ground	Earth ground
21	Wire Terminal	DC- (or AC)	Operating power, negative
22	Wire Terminal	Ground	Earth ground

Specifications

Overview

The Bridge specifications are listed in the following tables:

Power

The following table shows the power specifications.

Parameter	Specification
Operating Power, Nominal	12 or 24 Vdc or Vac
Operating Power Range	9 ... 30 Vdc; 9-24 Vac
Maximum Power Drain	3 W
Connection	Screw Terminals
Fuse	External, supplied by customer. Fuse value according to supply voltage (see Maximum Power Drain).
Grounding	Screw terminals provided for power ground and safety (Earth) ground

Environmental

The following table shows the environmental specifications.

Parameter	Reference	Limits
Operating Temperature	IEC 68-2-14	0...60° C (32 to 140° F) ambient
Operating Humidity	IEC 68–2–3	Humidity, Operating IEC 68–2–3 20 ... 90% RH, non–condensing

Ethernet Interface

The following table provides the Ethernet interface specifications.

Parameter	Specification
Protocol	Ethernet v2 encapsulation TCP/IP Version 4
Connector	RJ45 connector for 10BaseT/100Base-TX cable

Serial Interface

The following table provides the Serial interface specifications.

Parameter	Specification
Modbus Protocol	RTU or ASCII
Serial Protocol	Switch selectable, RS–232 or RS–485 Supports RS–232 RTS/CTS handshaking RS–485 setting supports RS–422 devices Supports 2–wire and 4–wire RS–485 Supports up to 16 RS–485 devices
Baud Rate	Selectable from 300 to 115200
Connector	1 RJ45 connector, 2 screw terminals RJ45 port connects to Modicon M1, Compact, 984 Slot. Mount controllers by direct cable. Cable adapters and adapter kits are available for other products.
Modem Control	CTS, RTS
Management	SNMP (read only) Serial login Telnet login

Packaging

The following table shows the Packaging specifications.

Parameter	Description
Dimensions (w/h/d)	35 x 95 x 60 mm (1.4 x 3.7 x 2.4 in)
Enclosure Material	High–impact plastic
Weight, Product	0.5 kg (1.0 lb)
Weight, Shipping	0.9 kg (2.0 lb)
Mounting Method	DIN rail: DIN EN S0 022 (35 mm)

Agency Approvals

The following table shows the Agency approvals.

Parameter	Specification
UL,CSA,CE, FM Cl1 Div 2	Approved

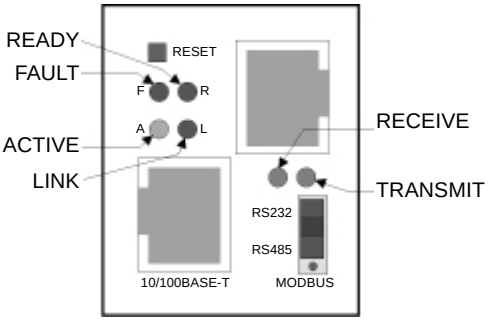
LEDs

Overview

The device contains the following LEDs:

- Two Green (R for ready, L for link)
- Three yellow (A for active, serial transmit, and serial receive)
- One Red (F for fault)

The following is a diagram of the LEDs.



The following table shows a description of the LEDs.

LED	Description
R (Green)	Ready (Solid-ready, blinking = error message, port busy)
L (Green)	Link (socket connection made) = Solid
A (Yellow)	Activity (network) = Random flashing
TXD (Yellow)	Transmitting serially (Modbus) = Flashes during transmit
RXD (Yellow)	Receiving serially (Modbus) = Flashes during receive
F (Red)	Fault in CEV 300 20 communications (read error) or CEV 300 20 is in Configuration Mode

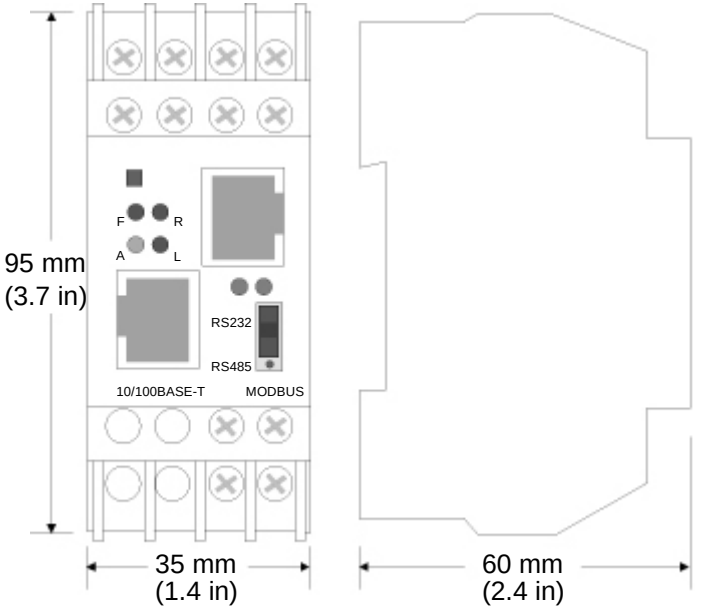
Simultaneously lit F (Red) and R (Green) LEDs means something is wrong. If the F (Red) LED is lit or blinking, count the number of times the R (Green) LED blinks between its pauses. Several possible blink patterns, detailed in the following table, indicate which fault condition exists.

LED	Error
Steady F (Red) and Blinking R (Green)	1 blink = EPROM checksum error 2 blinks = RAM error 3 blinks = Token Ring error 4 blinks = EEPROM checksum error
Blinking F (Red) and blinking R (Green)	1 blink = Faulty network connection 2 blinks = No DHCP response 4 blinks = Setup Mode

Dimensions

Overview

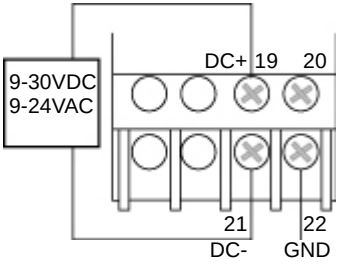
The figure below shows the dimensions of the Bridge.



Power Requirements

Overview

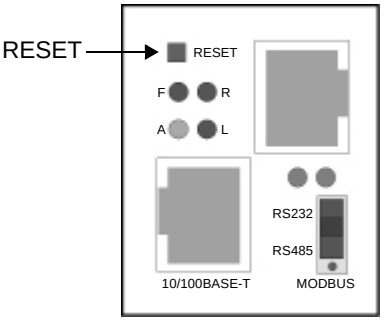
The Bridge is normally powered by the same 12Vor 24VDC supply that powers other devices in your panel. Many AC-powered industrial controllers also supply 24VDC for use by field devices. The Bridge is not shipped with a separate power supply, but any power supply between 9-30VDC or 9-24VAC can be used. The unit requires a maximum of 3 Watts. The diagram below shows the power supply.



Reset Switch

Overview

The unit has a reset switch located on the front panel, above the red LED, as shown in the following diagram.



Installing the Bridge Hardware

2

At a Glance

Overview

This chapter describes how to install the Bridge hardware.

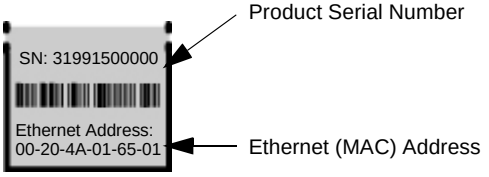
What's in this Chapter?

This chapter contains the following topics:

Mounting the Bridge on the DIN Rail

Before You Begin

The Bridge has an Ethernet address printed on the label on its side panel. The address is required for your Ethernet network administrator to configure the Bridge. Before you install the Bridge on the DIN rail, write down the Ethernet address and give it to your network administrator. The label may not be visible after you install the Bridge.The following diagram shows the bridge's Ethernet address and product serial number.



	**WARNING** **Communication Disruption Hazard** Connecting any device to an active Ethernet network can disrupt communication on the network. Before you connect the Bridge to your network, and before you apply power, contact your network administrator and ensure that your network application will not be affected. **Failure to follow this precaution can result in death, serious injury, or equipment damage.**

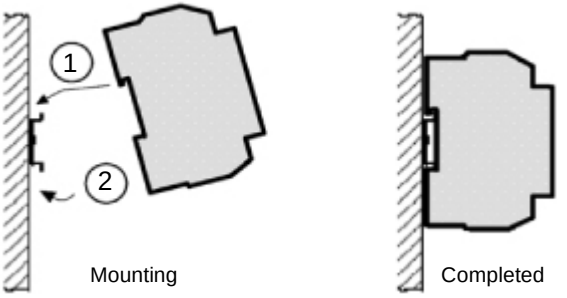
	**WARNING** **Duplicate Address Hazard** Having two or more devices with the same IP address can cause unpredictable operation of your network. Ensure that you are assigning a unique IP address to the Bridge. **Failure to follow this precaution can result in death, serious injury, or equipment damage.**

Mounting the Bridge

The Bridge is designed for mounting on a standard 35 mm DIN rail (DIN EN SO 022).

- Note the slot on the Bridge's rear panel. Position the top edge of the slot over the top edge of the DIN rail.
- Snap the Bridge into place on the lower edge of the rail.

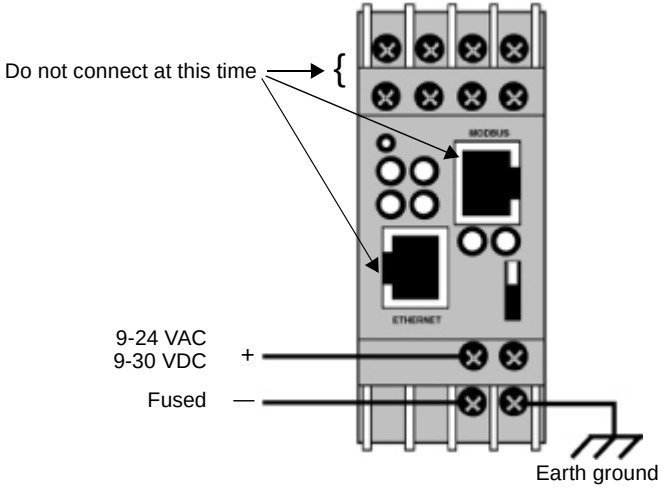
The figure below shows how to mount the Bridge



Connecting the Power Wiring

Overview

Operating power must be fused externally to the Bridge. The Bridge operates from a nominal 9-30 VDC or 9-24 VAC power source at 3 watts. The power must be fused externally to the Bridge. Select a fuse value according to the supply voltage. The Bridge requires an approved earth ground. Connect the Bridge to power and ground as shown in the figure below.



Setting the Serial Port Switch

Overview

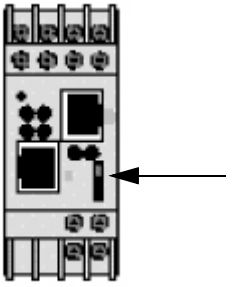
Before you place the Bridge into service, set the switch for the type of interface used in your application.

- UP for RS-232 interface
- DOWN for RS-422 or RS-485 interface

	**WARNING** **Communication Disruption Hazard** The serial port switch is a hardware function. It is not sensed by the Bridge's firmware. Changing the switch setting while the Bridge is operating can disrupt communication on the network. Do not change the switch setting unless you have first verified that it will be safe for your application. **Failure to follow this precaution can result in death, serious injury, or equipment damage.**

Serial Port Switch

Refer to the figure below for the Serial Port Switch settings.



RJ-45 Serial Connector

Overview

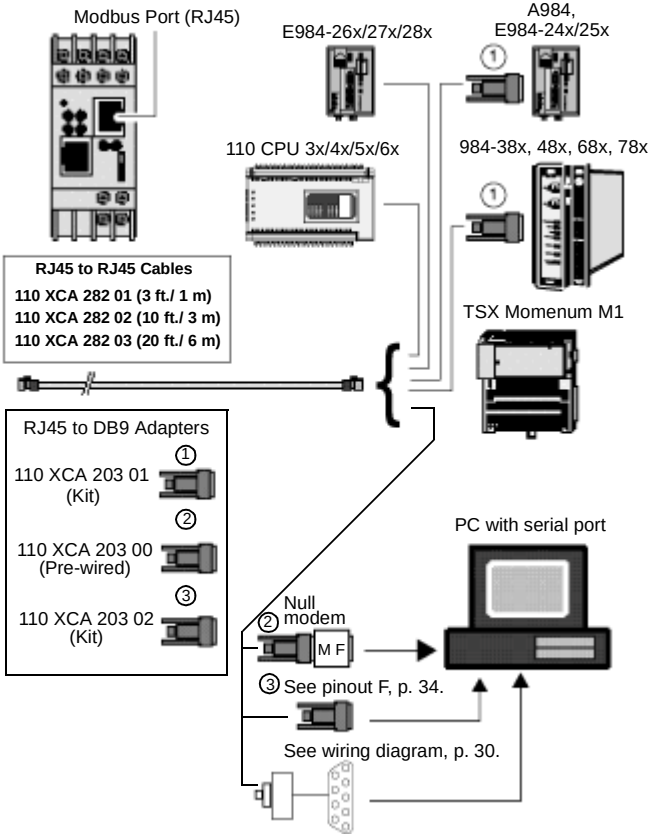
The serial RJ-45 connector supports up to 1152000 Bps. It has the following signals:

Pin	Direction	Name	Function
1	Not Connected		None
2	Hard-wired output	DTR	DTR Data Terminal Ready
3	To CEV 300 20	RXD or RXA	RS-232: RXD (Received Data) RS-422/485: RXA (Received Data -)
4	From CEV 300 20	TXD or TXA	RS-232: TXD (Transmit Data) RS-422/485: TXA (Transmit Data -)
5		GND	Ground
6	To CEV 300 20	CTS or RXB	RS-232: CTS (Clear to Send) RS-422/485: RXB (Received Data +)
7	From CEV 300 20	RTS or TXB	RS-232: RTS (Request to Send) RS-422/485: TXB (Transmit Data +)
8	Not Connected		None

Connect the Serial Cable (RJ45 Port)

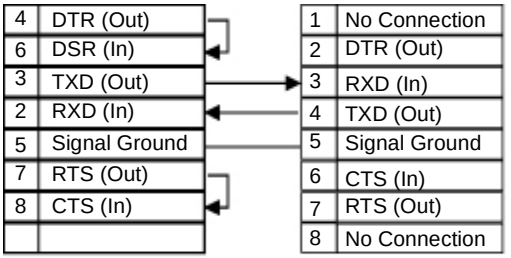
Connecting the Serial Cable

The following figure shows serial cable connections for several Modicon CPUs for operation as Modbus Master or Slave devices. The figure also shows a typical connection to a standard PC 9–pin serial port for setting up the Bridge configuration.

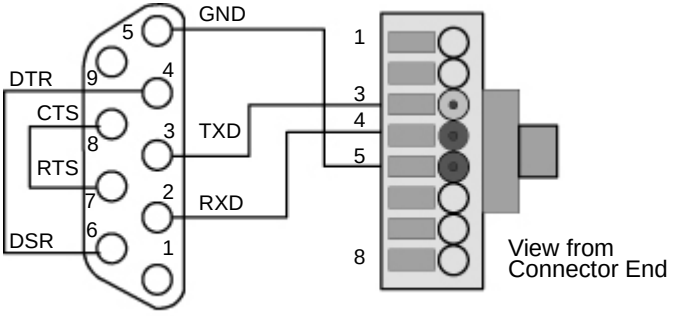


9-Pin RS-232 to Serial RJ-45

This connection assumes you are connecting a typical PC (COM1) to the 174 CEV 300 20 through the serial RJ-45 connector. See the pinout and cable diagrams below.



DTE, 9-Pin, Female SERIAL RJ-45



DTE, 9-Pin, FEMALE SERIAL RJ-45

Compatible Modbus Devices and Cables

Modbus Devices and Cables

The Bridge connects directly by RJ45 cable to various products, as shown in the figure in *Connect the Serial Cable (RJ45 Port), p. 29*.

Note: See the figure in *Modbus Cable Pinouts, p. 34* for pinout locations.

The table below lists other Modbus devices. Their cable connections to the Bridge.Connections are RS–232 unless indicated otherwise.

Device Part Number	Device Description	Cable Pinout*
MM–PM10–2xx	PanelMate Plus 1000 (RS232)	A
MM–PM10–2xx	PanelMate Plus 1000 (RS422)	B
AS–J478–000	Modbus Modem, Fixed Modem Control	C
AS–J478–000	Modbus Modem, Variable Modem Control	D
AS–J347–001	184/384 Controller Modbus Interface	E
AS–J375–000	Micro 84 Controller Modbus Interface	E
AS–P190–xxx	P190 Programming Panel	E
AS–984x–xxx	984A, B, X Controller	E
AS–A584–xxx	584A, L, M Controller	E (cable AS-W192-XXX with adapter 110 XCA204 02)
--	PC Serial Port, 9–Pin	F (see *Connecting the Serial Cable, p. 29* for other wiring alternatives.)
AS–P892–000	ASCII/RIO Interface	G
140 CPU 424 xx	Quantum Controller, 486	G
140 CPU 534 xx	Quantum Controller, 586	G
PC–0984–xxx	984 Controller, 38x/48x/68x/78x Slot Mount	G
PC–A984–xxx	984 Controller, Compact	G
PC–E984–24x/25x	984 Controller, Compact	G
PC–E984–455	984 Controller, 484 Replacement	G
PC–M984–xxx	Micro–984 Controller	G
NW–BM85xxxx	BM85 Bridge Multiplexer	G
---	Generic Modbus Serial Device, 9–Pin	G
110 VPU 192 00	Programmer, Handheld	H

Device Part Number	Device Description	Cable Pinout*
Twido	Twido PLC	I
AS–884A–xxx	884 Controller	J
TSX SCx	TSX Controllers, Modbus Interface	refer to product guide

Note: Use cable AS–W192–XXX with Adapter 110 XCA 204 02, pinouts in Cable E in the figure in *Modbus Cable Pinouts, p. 34* .

Note: TSX Controller products offer multiple options for cable connection to the Bridge.

Modbus Cable Pinouts

Overview

References to the following figure are to the devices listed in table in *Modbus Devices and Cables, p. 31*.

Modbus Cable Pinouts

The figure below identifies the Modbus cable pinouts.

A **Adapter Kit: 110 XCA 203 01**

DB9M	Wire	RJ45
2	Red	4
3	Black	3
5	Green	5
Shield	White	8

B **Adapter Kit: 110 XCA 203 01**

DB9M	Wire	RJ45
1	Red	3
4	Black	4
5	Green	5
6	Yellow	6
9	Brown	7
Shield	White	8

C **Adapter Kit: 110 XCA 204 01**

DB25M	Wire	RJ45
1	White	8
2	Red	4
3	Black	3
7	Green	5
4		
6		
20		

D **Adapter Kit: 110 XCA 204 01**

DB25M	Wire	RJ45
2		4
3		3
6		1
7		5
20		2
5		6
4		7
1		8

E **Adapter Kit: 110 XCA 204 01**

DB25M	Wire	RJ45
3	Red	4
2	Black	3
20	Blue	1
7	Green	5
6	Orange	2
4	Yellow	6
5	Brown	7
1	White	8

F **Adapter Kit: 110 XCA 203 02**

DB9F	Wire	RJ45
2	Red	4
3	Black	3
4		
6	Orange	2
5	Green	5
7		6
8		7
Shield	White	8

G **Adapter Kit: 110 XCA 203 01**

DB9M	Wire	RJ45
2	Red	4
3	Black	3
5	Green	5
6	Orange	2
7	Yellow	6
8	Brown	7
Shield	White	8

H **Adapter: None**

RJ45 (Prog)	RJ45 (Bridge)
1	2
2	1
3	4
4	3
5	5
6	6
7	7
8	8

I **Adapter: None**

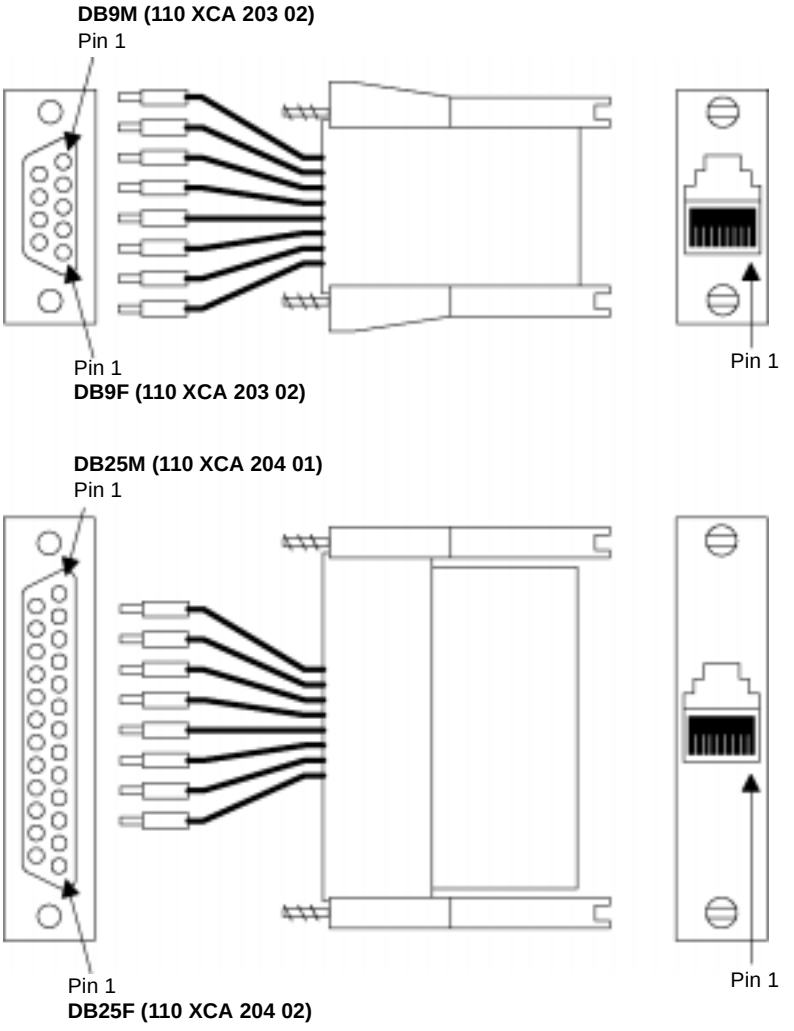
RS-232 (TWIDO)	Screws (Bridge)
3	1
4	4
1	8

J **Adapter Kit: 110 XCA 204 01**

DB25M	RJ45
2	3
3	4
1	5
6	6
8	7
20	
4	
5	
1	8

DB to RJ45 Adapter Kits

The following figure shows the layout of DB9–RJ45 and DB25–RJ45 Adapter Kits available from Schneider Automation. Each kit contains three jumper wires and a pin insertion tool. Follow the pinout diagrams in the figure in *Modbus Cable Pinouts, p. 34* for assembling the adapter for your product



Connecting the Serial Cable (Screw Terminals)

Overview

The following are the serial screw-terminal pinouts:

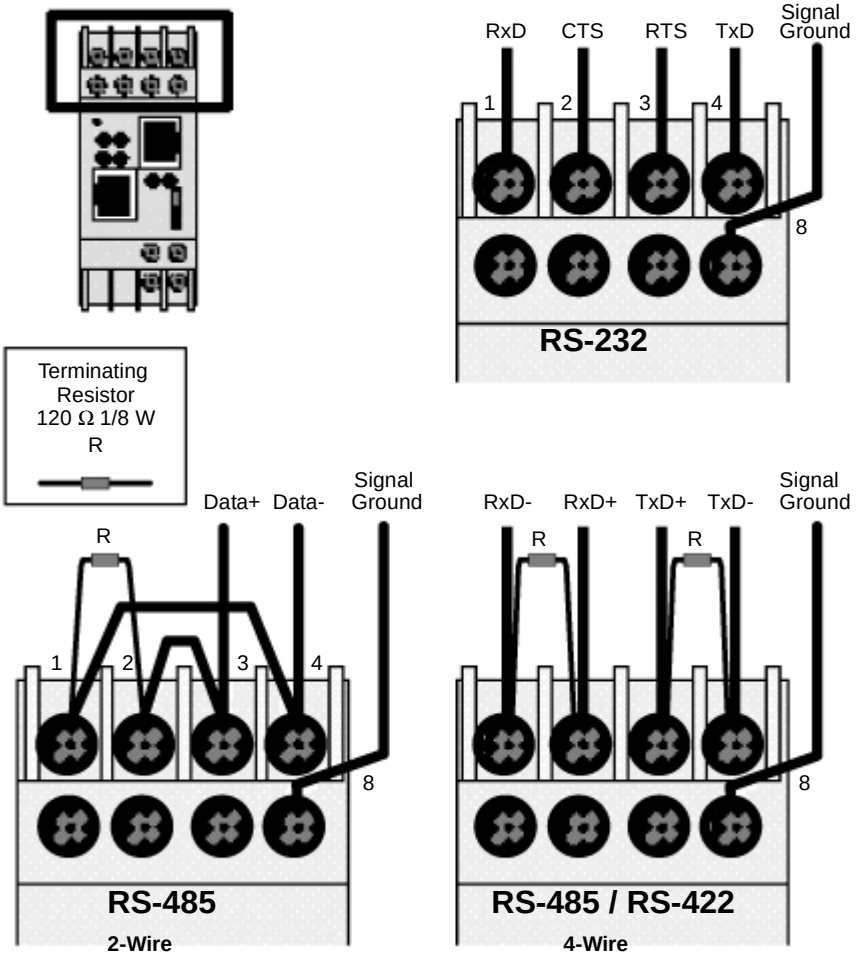
Pin	Direction	Name	Function
1	To CEV 300 20	RXD or RXA	RS-232: RXD (Received Data) RS-422/485: RXA (Received Data -)
4	From CEV 300 20	TXD or TXA	RS-232: TXD (Transmit Data) RS-422/485: TXA (Transmit Data -)
2	To CEV 300 20	CTS or RXB	RS-232: CTS (Clear to Send) RS-422/485: RXB (Received Data +)
3	From CEV 300 20	RTS or TXB	RS-232: RTS (Request to Send) RS-422/485: TXB (Transmit Data +)
8	Ground	GND	Ground

Note: For RS-485 2-wire functionality, pins 1 & 4 and 2 & 3 of the screw terminals must be connected together.

Note: Termination resistors (R = 120 Ω) are used to match impedance of a node to the impedance of the transmission (TX) line. Termination resistors should be placed only at the extreme ends of the data line, and no more than two terminations should be placed in any single segment of a RS-485 network. The terminator resistors may not be needed for your application.

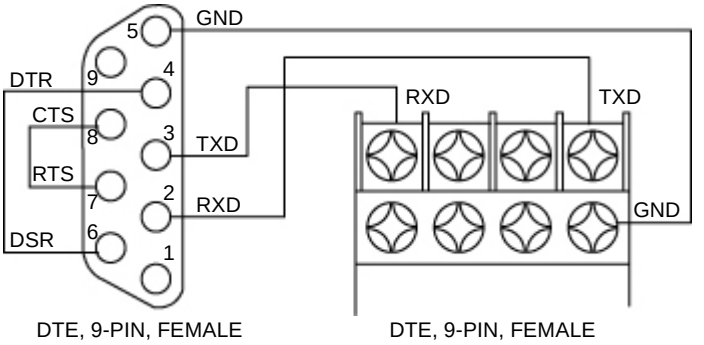
Serial Cable Wiring

Refer to the following figure for connection of serial cables at the Bridge's wiring terminals.



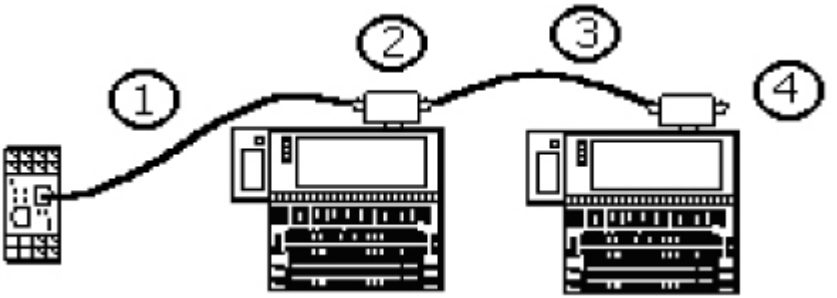
9-Pin RS-232 to Serial Screw Terminals

This connection assumes that you are connecting a typical PC (COM1) to the 174 CEV 300 20 bridge through the serial screw terminals.



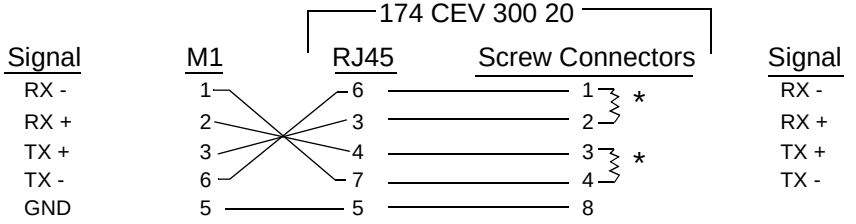
RS-485 4-Wire Momentum Cabling

The following diagram and pinout shows RS-485 (4-wire) Momentum cabling.



Note:
1. Special cable. See cable pinouts.
2. 170 XTS 041 00 (RJ45) or 170 XTS 040 00 (DB9) - RJ45 T connector
3. 170 MCI 020 10 – straight through interconnect cable
4. 170 XTS 021 00 – RS485 terminator resistor pack

RS-485 – Momentum to Modbus/Ethernet Bridge Cable



*120 Ohm terminating resistors

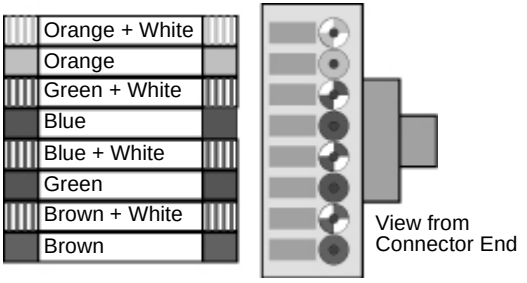
Ethernet Interface

Overview

The 124 CEV 300 20 supports 10/100Mbit Ethernet through its RJ-45 (10BaseT/ 100BaseTX) connector. The following table shows the Ethernet interface signals.

Signal Name	DIR	PIN	Primary Function
TX+	Out	1	Transmit Data +
TX-	Out	2	Transmit Data -
RX+	In	3	Differential Ethernet Receive Data +
RX-	In	6	Differential Ethernet Receive Data -

The following drawing shows a typical RJ-45 connector. The color is not standard but is very typical of an Ethernet Patch cable. Pin 1 is located at the top of the connector (Orange + White). The view is from the end of the connector.



Connecting the Ethernet Cable

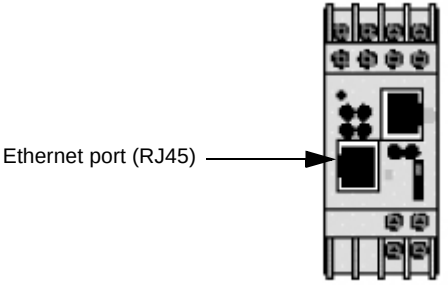
Overview

The Ethernet cable connects to the RJ45 port connection for a 10/100base T Ethernet connection.

	**DANGER**
	Communication Disruption Hazard Connecting any device to an active Ethernet network can disrupt communication on your network. Before you connect the Bridge to your network and before you apply power to the Bridge, follow the instructions in *Configuring the Bridge, p. 43*. **Failure to follow this precaution will result in death, serious injury, or equipment damage.**

Connect the Ethernet Cable

Refer to the diagram below when connecting the Ethernet cable:



Methods of Assigning the IP Address

Overview

The unit's IP address must be configured before a network connection is available. You have the following options for assigning an IP to your unit:

Method	Description
DHCP	A DHCP server automatically assigns the IP address and network settings.
ARP and Telnet	You manually assign the IP address and other network settings at a command prompt using a UNIX or Windows-based system. Only one person at a time can be logged into the configuration port (port 9999). This eliminates the possibility of several people simultaneously attempting to configure the unit. See *Connecting by Telnet (IP Address Not Assigned), p. 46* for more information.
AutoIP	This automatic method is appropriate when you have a small group of hosts rather than a large network. This method allows the hosts to negotiate with each other and assign addresses, in effect creating a small network.
Serial Port Login	You initially configure the unit through a serial connection. See *Connecting by the RS-232 Port, p. 45* for more information.
BootP	A BootP server automatically assigns the IP address.

DHCP

The unit ships with a default IP address of 0.0.0.0, which automatically enables DHCP.

Provided a DHCP server exists on the network, it will assign the unit an IP address, gateway address, and subnet mask when the unit boots up. The Bridge has acquired an IP address if the red LED stops flashing and the green Status LED is on continuously. (If no DHCP server exists, the unit responds with a diagnostic error: the red Diagnostic LED blinks continuously, and the green Status LED blinks five times. This blinking only continues for about 15 seconds.)

Note: This DHCP address will not appear in the unit's standard configuration screens. You can determine your unit's DHCP-assigned IP address from the DHCP server.

DHCP Naming

There are three methods for assigning DHCP names to these products.

1. Default DHCP name. If you do not change the DHCP name, and you are using an IP of 0.0.0.0, then the DHCP name will default to CXXXXXX (XXXXXX is the last 6 digits of the MAC address shown on the label on the bottom/side of the unit). For example, if the MAC address is 00-20-4A-12-34-56, then the default DHCP name is C123456.

2. Numeric DHCP name. You are able to change the DHCP name by specifying the last octet of the IP address. When you use this method, the DHCP name will be BRIDGEYY where YY is what you chose for the last octet of the IP address. If the IP address you specify is 0.0.0.12, then the DHCP name will be BRIDGE12. This method will only work with 2 digit numbers (0-99).

AutoIP

The unit ships with a default IP address of 0.0.0.0, which automatically enables Auto IP within the unit. AutoIP is an alternative to DHCP that allows hosts to automatically obtain an IP address in smaller networks that may not have a DHCP server. A range of IP addresses (from 169.254.0.1 to 169.254.255.254) has been explicitly reserved for AutoIP-enabled devices. The range of Auto IP addresses is not to be used over the Internet.

If your unit cannot find a DHCP server, and you have not manually assigned an IP address to it, the unit automatically selects an address from the AutoIP reserved range. Then, your unit sends out a (ARP) request to other nodes on the same network to see whether the selected address is being used.

- If the selected address is not in use, then the unit uses it for local subnet communication.

- If another device is using the selected IP address, the unit selects another address from the AutoIP range and reboots itself. After reboot, the unit sends out another ARP request to see if the selected address is in use, and so on.

AutoIP is not intended to replace DHCP. The unit will continue to look for a DHCP server on the network. If a DHCP server is found, the unit will switch to the DHCP server-provided address and reboot.

Note: If a DHCP server is found, but it denies the request for an IP address, the unit does not attach to the network, but waits and retries.

AutoIP can be disabled by setting the unit's IP address to 0.0.1.0. This setting enables DHCP but disables AutoIP.

Configuring the Bridge

3

At a Glance

Overview

This chapter describes how to configure the Bridge.

What's in this Chapter?

This chapter contains the following topics:

Before You Start

Overview

Your Bridge must be configured to match your system application. Before you start to configure the Bridge, get the Bridge's Ethernet and serial port parameters from your network administrator.

	**WARNING**
	Communication Disruption Hazard When you view, change the configuration, or reset a running Bridge, you will disrupt communication with the Bridge. Ensure that this action will not cause any undesirable effect on your application. **Failure to follow this precaution can result in death, serious injury, or equipment damage.**

	**WARNING**
	Duplicate Address Hazard Having two or more devices with the same IP address can cause unpredictable operation of your network. Ensure that you will be assigning a unique IP address to the Bridge. **Failure to follow this precaution can result in death, serious injury, or equipment damage.**

Configuration Check List

Here is your check list for obtaining the configuration information:

- Ethernet IP address
- Ethernet Gateway address if applicable to your Bridge's network.
- Serial port interface: RS–232, RS–422, RS–485.
- Serial port communication: Baud rate, Data bits, Parity mode, Stop bits.
- Serial port modem controls: RTS/CTS timing values.
- Serial port device: Modbus Master or Modbus Slave.
- Modbus Protocol: RTU or ASCII.
- Modbus Timeout values: Character timeout, Message timeout.
- Modbus Slave only: Address source from Unit_ID header, or Fixed address.
- Modbus Slave only: Allowing broadcasts to serial port: Enable or Disable.
- Modbus Master only: Mapping of Modbus Slave addresses to IP addresses.

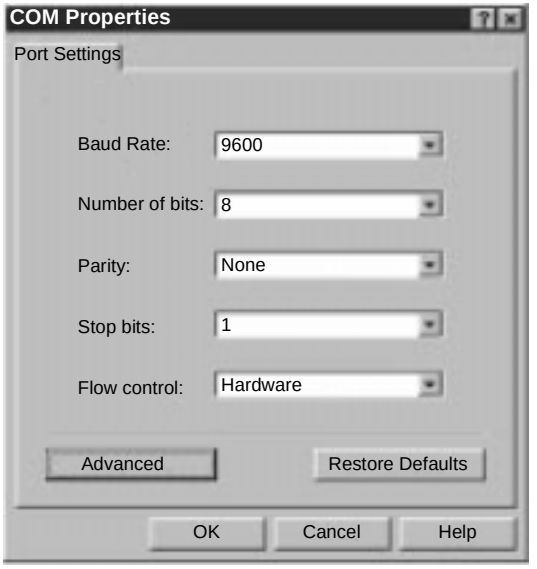
Connecting by the RS-232 Port

Overview

To configure the Bridge at its local RS–232 port, use a serial terminal emulation program and a modem cable.

Connect by RS-232 Port

Regardless of any serial parameters currently set into the Bridge for a user application, it will always use the following parameters for setup: 9600 baud, 8 data bits, No parity, 1 Stop bit (9600,8,N,1). Set your emulator to these parameters. Refer to the figure below:



Force the Bridge into its Configuration mode as follows:

- Ensure the emulator is connected to the Bridge's serial port and ready.
- Hold down the 'X' key on your emulator keyboard. While holding the key down,initialize the Bridge by cycling its power or by pressing its Reset button. The Bridge will enter its configuration mode, and you will see this opening screen:

  Schneider Automation, Inc. – Modbus Bridge (174 CEV 300 20)
  Serial Number 101–161 Software Version V01.00 (990402)
  Press Enter to go into Setup Mode, wait to close

  At this screen, press <Enter> to go to the Configuration Menu. See *Using the Configuration Menu, p. 48* for more information.

Connecting by Telnet (IP Address Not Assigned)

Overview

If the Bridge does not yet have an IP address stored in its memory, you can establish an initial connection using its MAC address. This will allow you to access the Bridge's Configuration Menu, assign an IP address, and make it persistent in the Bridge. If you are not sure about whether your Bridge has a stored IP address, you must connect at its serial port and access its Configuration Menu. See *Connecting by the RS-232 Port, p. 45* for information on how to connect the serial port.

Telnet Host Requirement

To use Telnet to set an initial IP address for the Bridge, your Telnet host must be on the same Ethernet subnetwork as the Bridge, both physically and in its IP range. Otherwise, the configuration will not work. Take the following steps to connect by telnet:

1	Get the Bridge's MAC Address. The Bridge's MAC address is printed on the label on its side panel. Example: MAC address: 00 20 4A 01 65 A1.
2	Issue an "arp" Command to the Bridge. Open a Console or DOS window. Issue an arp command to the Bridge with this syntax: Syntax: `arp –s <IP_address> <MAC_address>` Example (UNIX): `arp –s 192.168.1.23 00:20:4A:01:65:A1` Example (DOS): `arp –s 192.168.1.23 00–20–4A–01–65–A1` To confirm IP assignment, issue another arp command: `arp -a`
3	Connect by Telnet to Port 1. Open a Telnet connection to the IP address you assigned in Step 2, using port 1. This connection will fail, but the Bridge will change its IP address to the one in this Telnet connection. This will allow you to make your final connection for configuring the Bridge.
4	Connect by Telnet to Port 9999. Open a new a Telnet connection to the IP address using port 9999. This connection will succeed. You should now see the Bridge's opening screen: Schneider Automation, Inc. – Modbus Bridge (174 CEV 300 20) Serial Number 101–161 Software Version V01.00 (990402) Press Enter to go into Setup Mode, wait to close At this screen press **Enter** to go to the Configuration Menu (see *Using the Configuration Menu, p. 48*).

Connecting by Telnet (IP Address Assigned)

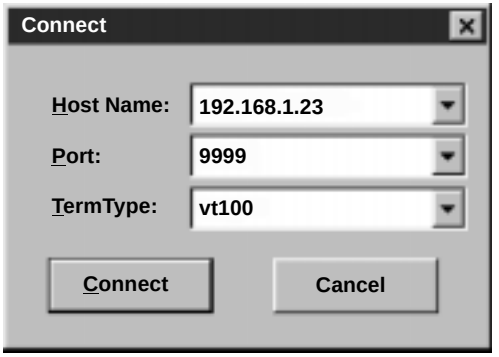
Overview

If the Bridge already has an IP address stored in its memory, and you know that address, you can establish a Telnet connection to the Bridge using port 9999.If you do not know the IP address currently stored in the Bridge, you can find that address by connecting to the Bridge's serial port and accessing its Configuration Menu. See *Connecting by the RS-232 Port, p. 45* for information on how to connect to the serial port.

If you want to verify the existence of an Ethernet device at a known IP address, you can use the PING utility.

Telnet Host Requirement

To use Telnet to set an initial IP address for the Bridge, your Telnet host must be on the same Ethernet subnetwork as the Bridge, both physically and in its IP range. Otherwise the configuration will not work. See the figure below:



When the connection is established, you should see the Bridge's opening screen:

Schneider Automation, Inc. – Modbus Bridge (174 CEV 300 20)
Serial Number 101–161 Software Version V01.00 (990402)
Press Enter to go into Setup Mode, wait to close

At this screen, press **Enter** to go to the Configuration Menu (see *Using the Configuration Menu, p. 48*).

Using the Configuration Menu

Overview

When the Bridge enters its configuration mode it displays its opening screen:

```
Schneider Automation, Inc. – Modbus Bridge (174 CEV 300 20)
Serial Number 6144236 MAC address 00204A61ACCC
Software Version V01.00 (030609) DLX
Press Enter to go into Setup Mode, wait to close
```

At this screen, press **Enter** to see the Configuration Menu.

Configuration Menu

The Configuration Menu shows the Bridge's current settings. See below for an example:

```
Modbus Bridge Firmware Setup, Schneider Automation, Inc.

1. Network/IP Settings:
   IP Address ................... 0.0.0.0/DHCP/BOOTP/AutoIP
   Default Gateway .............. not set
   Netmask ...................... not set

2. Serial & Mode Settings:
   Protocol ..................... Modbus/RTU, Slave(s)
   attached
   Serial Interface ............. 9600,8,E,1,RS232

3. Modem Control Settings:
   RTS Output ................... Fixed High/Active

4. Advanced Modbus Protocol Settings:
   Slave Addr/Unit ID Source .... Modbus/TCP header
   Modbus Serial Broadcasts ..... Disabled (Id=0 auto-mapped to
   1)
   MB/TCP Exception Codes .... Yes (return 0x0A and 0x0B)
   Char, Message Timeout ... 00050 ms, 05000 ms

Commands: D)efault settings, S)ave, Q)uit without save
Select Command or Parameter Set (1...4) to change: __
```

Modbus Master Device: Additional Menu Items

If the serial port has already been configured for a Modbus Master device, menu item 4 will omit references to a Slave device, showing only the following:

```
4) Advanced Modbus Protocol Settings:
MB/TCP Exception Codes ..... Yes (return 0x0A and 0x0B)
Character, Message Timeout ... 00050 ms, 01000 ms
```

Menu item 5 will show current mapping between Modbus addresses and IP addresses.

`5) Unit ID –> IP Address Table`: (followed by the current mapping table).

```
Close Idle Sockets ........ 10sec
001-001: 192.168.000.022
```

Configuration Options:1-5

These are your configuration options:

- Network IP Settings (see *Option 1: Network IP Settings, p. 51*).
- Serial and Mode Settings (see *Option 2: Serial and Mode Settings, p. 54*).
- Modem Control Settings (see *Option 3: Modem Control Settings, p. 55*).
- Advanced Modbus Protocol Settings (see *Option 4: Advanced Modbus Protocol Settings, p. 56*).
- Unit ID/IP Address Table (see *Option 5: Unit ID to IP Address Mapping Table, p. 59*).

Viewing and Changing Configuration Parameters

When you view the Bridge's configuration parameters, you can retain their current values or change them.

Retaining the Current Value

In all cases, if you press **Enter** when the current value is displayed, you will retain the current value. For example, if the Bridge's current values are as shown below, pressing **Enter** at each field will retain that current value:

```
IP Address : (192) .(168) .(001) .(023)
```

Changing a Value

To change a value, type the new value into the field at the point shown on your screen. For example, to change the Bridge's IP address to: 192.168.1.24:

```
IP Address : (192) .(168) .(001) .(023) 24
```

In this example, you would type the 24 immediately following the (023). Then press **Enter** for the Bridge to accept your entry.

Commands: Default Settings, Save, Quit Without Save

These are your commands:

- `D D)efault settings:` Restores the Bridge factory-installed default settings for all parameters except the Ethernet IP settings.
- `S S)ave:` Stores the current settings into the Bridge's memory, and exits the configuration. The Bridge will restart immediately using the current settings.
- `Q Q)uit:` Exits the configuration. The Bridge will restart immediately using the settings it had prior to the last Save.

Option 1: Network IP Settings

Overview

When you first connect to the product, the menu for option 1 will appear as:

```
IP Address .......... -0.0.0.0/DHCP/BOOTP/AutoIP
Default Gateway ..... 192.168.001.001
Netmask ..... 255.255.255.000
```

The IP address of the unit can be determined through four different ways:

- through the menu by entering an address
- by setting a DHCP server (see *DHCP, p. 41*)
- by setting a BootP server
- by using the AutoIP method (see *AutoIP, p. 42*)

When you select option 1 on the configuration menu, the Bridge gives you the ability to configure all Ethernet parameters. An example is shown below:

```
IP Address (192).(168).(001).(008)
Set Gateway IP Address (Y)Y
Gateway IP Address: (192).(168).(001).(001)
Set Netmask (N for default)(Y)Y
(255).(255).(255).(000)
Change telnet config password (N)Y
Enter new Password: mart
```

IP Address

The four entry fields for the IP address are shown as parenthesis ( ).

To retain the Bridge's current IP address, just press **Enter** at each field. To assign a new IP address, enter it into each field.

IP 0.0.0.0:

Note that setting the IP address to all zero (0.0.0.0) causes the Bridge to be in an "Address Not Assigned" status. It reports its address as: 0.0.0.0/DHCP/BOOTP/AutoIP.

Set Gateway IP Address

The Gateway IP Address is used only if your Ethernet network is larger than one continuous network (it contains subnetworks).

Each node within the subnetwork can directly reach all the other nodes within the same subnetwork. If the Bridge's subnetwork has a gateway to another subnetwork, the Gateway IP Address parameter identifies the gateway's address.

Set Netmask

If the Bridge's subnetwork has a gateway node, the Bridge needs to know how to recognize which IP addresses it can communicate with directly on its own subnetwork and which addresses it must refer to the gateway node.

The Netmask (subnetwork mask) specifies which portion of the an IP address defines devices on the local subnetwork, and which portion defines the entire subnetwork the devices are on. By comparing IP addresses with the subnetwork mask, the Bridge can determine which addresses are on its subnetwork and which are not.

Users can define different subnetwork masks to support their requirements. For example, common "Class C" IP addresses assume a default subnetwork mask of0xFFFFFF00 or 255.255.255.0, using the lower 8 bits for the host part of the IP address. This allows up to 255 devices on the local subnetwork.

If you want to have multiple subnetworks with up to 32 devices on each, the subnetwork mask could define 5 "host" bits or 255.255.255.224. With this setting, the decimal value 224 configures the lower 8 bits of the address, with the upper 3 of these bits addressing up to 8 subnetworks, and the lowest 5 bits forming the part of the address for the 32 local devices.

If you wish to specify a subnetwork mask, enter `Y` at the menu prompt and then enter your values for the mask.

Enter `N` to use the default subnetwork mask of 255.255.255.0.

Change Telnet Configuration Password

Setting the Telnet configuration password prevents unauthorized access of the setup menu via a Telnet connection to port 9999 or via Web pages. The password is limited to four characters. An enhanced password setting of 16 characters is available under Security Settings for Telnet access only. Passwords are alphanumeric and case sensitive.

Note: No password is required to access the Setup Mode window via a serial connection.

Option 2: Serial and Mode Settings

Overview

When you select option 2 on the Configuration Menu, the Bridge displays its current serial port settings. Below is an example:

```
Attached Device (1=Slave, 2=Master) (2)
Serial Protocol (1=Modbus/RTU, 2=Modbus/ASCII) (1)
Interface Type (1=RS232, 2=RS422/RS485+4-wire, 3=RS485+2-
wire) (1)
!! Remember to set the external switch also !!
Enter Serial Parameters (9600,8,E,1)
```

Attached Device

Identify the type of Modbus device (Slave or Master) attached to the Bridge's serial port. The default is Slave.

Serial Protocol

Identify the type of Modbus protocol (RTU or ASCII) to be used at the serial port. The default is RTU.

Interface Type

Identify the specific communication interface type (RS232, RS422 or RS485), including 2 or 4 wire connection, used at the serial port. The default is RS232.

Enter Serial Parameters

Enter the serial communication parameters used at the port, delimited by commas:

`<baudrate>,<databits>,<parity>,<stopbits>`

The defaults are: 9600,8,E,1.
The allowed values are:

- Baud rate: 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
- Data bits: 7, 8
- Parity: E, O, N
- Stop bits: 1, 2

Option 3: Modem Control Settings

Overview

When you select option 3 on the Configuration Menu, the Bridge displays:

```
RTS/CTS Mode (1=Fixed, 2=Variable) (001):
```

RTS/CTS Mode

RTS (Request to Send) and CTS (Clear to Send) are serial port signals that coordinate the starting and stopping of data requests between the Bridge and its port device. You can customize the RTS/CTS mode.

The options are: Fixed or Variable. The default is Fixed. This causes the Bridge to apply RTS/CTS with no time delays. If you enter 2 to select the Variable option, you can specify timing values to allow a slower device to respond in the RTS/CTS dialog. When you choose this option the Bridge displays:

```
Delay after output RTS (0–1275 msec, 5 ms resolution) (00000):
Wait for CTS to go active (N):
Delay after CTS going active (0–1275 msec, 5 ms res) (00000):
Delay dropping RTS after TX (0–1275 msec, 5 ms res) (00000):
```

Example

If you select the RTS/CTS Variable mode and enter the following values:

```
RTS/CTS Mode (1=Fixed, 2=Variable) (001): 2
Delay after output RTS (0–1275 msec, 5 ms resolution) (00000):
200
Wait for CTS to go active (N): Y
Delay after CTS going active (0–1275 msec, 5 ms res) (00000):
250
Delay dropping RTS after TX (0–1275 msec, 5 ms res) (00000):
300
```

... you are specifying that after the Bridge asserts RTS it should wait up to 200 ms for the serial port device to respond with CTS. It will then wait 250 ms before sending data to the device. It will wait 300 ms before dropping RTS at the end of transmission.

Your new values will be now be shown in the Bridge's Configuration Menu:

```
3) Modem Control Settings:
RTS Output ................... Variable, Delay 0200 ms, Hold
0250 ms
CTS Input to TX Delay ........ 0300 ms
```

Option 4: Advanced Modbus Protocol Settings

Overview

When you select option 4 on the Configuration Menu, the Bridge displays parameters for the type of Modbus device (Slave or Master) at its serial port.

Slave Device

Slave device parameters are (when Slave is selected in menu option 2):

```
Slave Address (0 for auto, or 1...255 fixed otherwise) (0)
Allow Modbus Broadcasts (1–Yes, 2=No) (2)
Use MB/TCP 0x0B/0x0A Exception Responses (1=No 2=Yes) (2)
Disable Modbus/TCP pipeline (1=No 2=Yes) (1)
Character Timeout (10–7050 msec) (50)
Message Timeout (200–65000 msec) (5000)
Serial TX delay after RX (0-1275 msec) (0)
Swap 4x/0x to get 3x/1x (N) N
```

Master Device

Master device parameters are:

```
Use MB/TCP 0x0B/0x0A Exception Responses (1=No 2=Yes) (2)
Disable Modbus/TCP pipeline (1=No 2=Yes) (1)
Character Timeout (10–7050 msec) (00050)
Message Timeout (200–65000 msec) (01000)
Serial TX delay after RX (0-1275 msec) (0)
Swap 4x/0x to get 3x/1x (N) N
```

Slave Address

The Bridge's Slave Address parameter specifies how the Bridge will direct messages received from Ethernet to a Slave device at the serial port.

Each message originated from a Modbus Master contains a Unit_ID field that addresses a Modbus Slave destination device. The Bridge can be configured to use that Unit_ID address as received, or to substitute a fixed address instead.

Setting the Slave Address parameter to 0 (zero) configures the Bridge to use the Unit_ID field as received in the message. It will pass the message out its Modbus port to the Slave device addressed in the Unit_ID field.

Setting the Slave Address parameter to any non–zero value causes the Bridge to always use that fixed value as the Slave address for all messages sent out its Modbus port, regardless of the Unit_ID contained in the message. This routes all messages to a single device.

The allowable non–zero range for entering this value is 1 ... 255 decimal. Note that Modbus Slave addresses are valid in the range 1 ... 247 only. The default is 0 (zero), specifying the Bridge to use the received Unit_ID field.

Allow Modbus Broadcasts

This parameter specifies whether the Bridge may allow a Modbus Broadcast message to be sent to Slave devices at its serial port, or not allow those messages. Broadcast messages are those received by the Bridge containing a Unit_ID of 0 (zero).

If Modbus Broadcasts are allowed, broadcast messages are passed to the serial port as received with the Unit_ID contents of 0 (zero).

If Modbus Broadcasts are not allowed, the Unit_ID in the message is disregarded and the message is sent to Slave address 1 at the serial port.

The default is to not allow Broadcast messages to the serial port.

MB/TCP 0x0B/ 0x0A Exception Responses

This parameter defines if the bridge will send 0A and 0B modbus exception response codes if a connection cannot be established.

If a Modbus Serial Master is attached, then disabling this option will prevent the Bridge from reporting a failed attempt to contact a TCP/IP device, the Bridge will also suppress any 0A and 0B responses received from the ethernet interface.
The serial Master will instead see just silence and will experience a normal message timeout.

This setting is useful for serial masters that cannot handle the 0A and 0B codes.If a Modbus Serial Slave is attached then these codes will be reported back to the Modbus TCP/IP device initiating a request to the Serial device.

Disable Modbus TCP Pipeline

This parameter will set the Bridge to disable Modbus TCP pipelining. Pipelining occurs when a Modbus TCP device sends more than one outstanding request to another device using a single socket connection. The MODBUS TCP/IP specification does not define this as valid operation, however some devices will attempt this.

As the Modbus TCP device can send requests faster than the Bridge can retrieve answers from the attached serial devices, the message que will become clogged with old requests and retries. Disabling the pipeline forces the Bridge to only act on the most recent message in the queue. Other messages are discarded.

This option must be used with caution, an alternate solution that should be attempted is to set the timeout of the modbus TCP/IP request to less than the message timeout set for the serial connection.

Character Timeout

This parameter sets the timeout value between successive characters in messages. If this timeout is exceeded, the Bridge returns an error response to the originating Master. Typically RTU protocol already contains a 3.5 character timeout, but some serial devices might have internal interrupts or other delays which can cause pauses of 5 to 10 characters during transmission. This parameter can be set to accommodate those devices.

The allowable range is 10 ... 1275 msec in 5 msec increments.

The default is 50 msec.

Message Timeout

This parameter sets the timeout value for the expected response from a Slave device. If a response is not received within this time, the Bridge continues with other tasks if any are pending from other Master devices. The Master application must provide its own method of handling the message timeout.

The allowable range is 500 ... 60000 msec (0.5 ... 60 sec) in 250 msec increments.

The default is 5000 msec (5 sec).

Serial TX Delay after RX

This parameter sets a delay value that is used to activate TX after an RX signal is received.

Swap 4x/0x to Get 3x/1x

The setup option Swap 4x/0x to get 3x/1x allows you to have the Bridge translate Modbus command Read Holding Reg (03) into Read Input Reg (04) or command Read Coil (01) into Read Input (02). You must set the corresponding Swap Offset to a non-zero value in setup. The Swap Offset entered is 0-based like the protocol. Setting an offset of 1 maps a Read Holding Reg of 400002-409999 to a Read Input Reg of 300001-309998. Setting an offset of 1000 maps a Read Holding Reg of 401001-409999 to a Read Input Reg of 300001-308999.

Option 5: Unit ID to IP Address Mapping Table

Overview

If you have specified the Bridge's serial port Attached Device parameter as a Modbus Master you will need to map the Slave addresses received in messages from that Master to their intended IP address destinations. The Bridge maps the one–byte Modbus Slave address to an IP address or an IP address range for delivery on Ethernet.

How the Address Mapping Works

The Bridge contains an address mapping table with eight entries. Each entry maps a Modbus Slave address (range 1 ... 247 decimal) to a standard IP address (XXX.XXX.XXX.XXX) or to a range of IP addresses.

When the Bridge receives a message from the Master at its serial port, the Bridge searches the table for a match between the message's Slave address and a Slave address entry in the mapping table. If a match is found, the Bridge forwards the message to the IP address specified in that location in the table. If a match is not found, a message timeout will occur. If a match is found, but there is not an active TCP connection at the IP address, a message timeout will occur. The Master application must provide its own method of handling the message timeout.

The Bridge begins its search at table location 1, and continues in the sequence 1, 2 ... 8. It stops at the first location which matches the Slave address, and sends the message to the corresponding IP address. Thus any duplicate entry, if one exists in the table, will be ignored.

If you have configured the serial port for a Modbus Master, you must use the mapping table to associate the ranges of Slave addresses in your Master application to the IP destination addresses for those Slaves.

As noted above, in addition to direct mapping of a Modbus serial address to a IP address, the bridge can map a range of Serial addresses to a range of IP addresses. To configure the bridge in this way the user selects a range of Serial addresses but selects the last entry in the IP address as '000'. The bridge will now use the modbus serial address as the last byte of the IP address. See the example in *Examples: Address Mapping* below.

Examples: Address Mapping

If you have configured the serial port for a Modbus Master, and have entered your mapping, it will appear on the Bridge's initial Configuration Menu. Here is an example.

Example: Mapping Serial Address to IP Address

```
5) Unit ID –> IP Address Table:
Close Idle Sockets ......... 10 sec
001–010: 192.168.001.000+SLV 011–011: 192.168.001.111
012–012: 192.168.001.142
Close Idle TCP sockets after (3-60 sec, 0=leave open) (10)
(Set 4th octet to 0 to use Slave Address as part of IP)
```

This configuration will map Modbus serial address 001-010 to IP address 10.143.128.001 - 10.143.128.010.

Modbus Serial address 5 will be mapped to IP address 10.143.128.5. It maps Slave address 11 to IP address 192.168.1.111. It maps Slave address 12 to IP address 192.168.1.142.

Close Idle TCP Sockets After

This parameter defines how long the bridge should hold open an Idle Modbus TCP/IP socket that has been initiated by a Modbus Serial Master.

Entering New Address Mapping

When you select option 5 on the Configuration Menu, the Bridge displays it current mapping. Then it prompts:

```
A)dd, D)elete, E)xit –– select function:
```

Adding a New Map Entry

Press A to add a new entry into the mapping table. The Bridge will prompt you to enter the new mapping values. The values will go into the first available (empty) table location. Here is an example:

```
Modbus addr from (000): 1
Modbus addr to (000): 1
Slave IP address (192) .(168) . (001) .(020)
```

Deleting a Map Entry

Press D to delete an entry from the mapping table. The Bridge will prompt you to enter the number of the table location you want to delete. Here is an example:

```
Delete entry number: 1
```

Changing an Existing Map Entry

If you want to change an existing entry in the mapping table, you must first delete that entry and then add your changes as a new entry.

- Press D to delete the current entry from the table.
- Press A to add a new entry into the table, supplying the values for the new entry.

Exit the Mapping Menu

Press E to exit Mapping Table menu and return to the initial Configuration Menu. The Configuration Menu will display the new mapping.

Note that when you return to the Configuration Menu, you must select Save on that menu to save the address mapping in the Bridge's memory. Selecting Save will also restart the Bridge. See *Using the Configuration Menu, p. 48* for a description of the Configuration Menu.

Using Panel Software

4

At a Glance

Overview

This chapter describes how to use panel software.

What's in this Chapter?

This chapter contains the following topics:

Using Concept or ProWORX

Overview

To support Modbus/TCP to the Bridge, you need Concept version 2.1 or higher, ProWORX NxT, version 2.2 or higher, or ProWORX 32, version 1.0 or higher. In Concept, set the communications paramaters as follows:

- Protocol: TCP/IP
- Dest_Port: 502
- Dest_Index: Modbus Slave Address
- TCP/IP Address: as required

In ProWORX NxT, go to the **Communication Setup** screen. In the **Interface** section of the window, select **Ethernet Gateway**. Under Ethernet Gateway type, choose CEV 300 10, IP Addresss: xxxx, Timeout = 00x.

In ProWORX 32, go to **Communications Setup** and select the **Gateway** tab. Under **Resource Type**, select **Gateway Type** and **NR&D MEB** under **Setting**.

Note: The Bridge contains an internal Slave Address configuration option which might affect the delivery of messages to a Slave device at its serial port. With this option, the Bridge may be configured internally to use the Dest_Index address exactly as received in the message, or it may be configured to steer all messages to a fixed Slave address, ignoring the Dest_Index address.

Modbus Slave Address

This is an additional explanation of how the Bridge uses the Modbus Slave address. In a Modbus TCP message sent to the Bridge, the Slave address (defined in Concept as the Dest_Index address, or in ProWORX NxT as Device # in **Select Modbus Device** window, or in ProWORX 32 under **Index** in the **Communications Setup** window) is stored in the Unit_ID field of the message. This field is used to address a unique Slave device on a Modbus network which may contain multiple Slave devices.

The Bridge's internal configuration contains a Slave Address parameter which can be set to override the Unit_ID address received in the message.

If the parameter is set to 0 (zero), the message will be delivered to the Slave device whose address is defined in the Unit_ID field. If the parameter is set to a non–zero value (range 1 ... 255), the message will be delivered to the Slave device at that numerical address, regardless of the contents of the Unit_ID field.

For example: If you are accessing the device at Modbus Slave address 34, you must

- set the Dest_Index field to 34
- ensure the Bridge's internal Slave Address parameter is configured to 0 (zero)

Using Other Software

Intellution FIX MMI

The Bridge allows Windows workstations with Intellution FIX software to access Modbus devices by TCP/IP over Ethernet.

The current version of this software does not support the Modbus/TCP Unit_ID field.Therefore if you have configured the Bridge for a Slave device at its serial port, you must configure the Bridge's internal Slave Address parameter for that device. This restricts the Bridge to a single Slave device at its port.

Refer to the software product's documentation for further information.

WinTech Modscan

WinTech supplies ModScan32 software, which can select and poll coils and registers from various Modbus RTU/ASCII and Modbus TCP devices.

This software supports the Modbus/TCP Unit_ID field, so RS–485 multiple–drop configurations are supported through the Bridge.

Refer to the software product's documentation for further information.

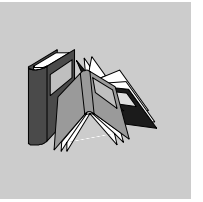
Wonderware MMI

The Bridge allows Windows workstations with Wonderware software to access Modbus devices by TCP/IP over Ethernet. You will need the Wonderware Modicon Ethernet I/O Server software, at version 7.0.0.15 or higher.

The current version of this software does not support the Modbus/TCP Unit_ID field. Therefore if you have configured the Bridge for a Slave device at its serial port, you must configure the Bridge's internal Slave Address parameter for that device. This restricts the Bridge to a single Slave device at its port.

Refer to the software product's documentation for further information.

Glossary



A

Address — On a network, the identification of a station. In a frame, a grouping of bits that identifies the frame's source or destination.

API — Application Program Interface. The specification of functions and data used by one program module to access another; the programming interface that corresponds to the boundary between protocol layers.

ARP — Address Resolution Protocol. A network layer protocol used to determine the physical address which corresponds to the IP address for a host on the network. ARP is a sub–protocol which operates under TCP/IP.

Auto-Negotiate — Protocol that allows devices at either end of a link segment to advertise and negotiate modes of operation such as speed of link, flow control, or half or full duplex operation.

Auto-sense — Ability of a 10/100 Ethernet device to interpret the speed or duplex mode of the attached device and to adjust to that rate.

Autobaud — Automatic determination and matching of transmission speed.

AutoIP — AutoIP is an alternative to DHCP that allows a computer to automatically obtain an IP DHCP server available to perform that function.

B

Backbone The main cable in a network.

Bandwidth on Demand Feature that allows a remote access device to initiate a second connection to a particular site to increase the amount of data transferred to that site to increase the desired threshold. The network manager configuring the remote access server will specify a number of bits or a percentage of connection bandwidth threshold which will trigger the secondary connection. Multilink PPP is an emerging standard to allow this feature to be interoperable, but right now the only way to ensure correct operation is to use devices on both end from the same vendor.

Baseband LAN A LAN that uses a single carrier frequency over a single channel. Ethernet, Token Ring and Arcnet LANs use baseband transmission.

Baud Unit of signal frequency in signals per second. Not synonymous with bits per second since signals can represent more than one bit. Baud equals bits per second only when the signal represents a single bit.

Binaries Binary, machine readable forms of programs that have been compiled or assembled. As opposed to Source language forms of programs.

Binary Characteristic of having only two states, such as current on and current off. The binary number system uses only ones and zeros.

Bit The smallest unit of data processing information. A bit (or binary digit) assumes the value of either 1 or 0.

Block A block is a variable-size piece of memory that a task can acquire. Blocks are allocated from heaps.]

BNC A standardized connector used with Thinnet and coaxial cable.

BOOTP Bootstrap Protocol. A TCP/IP–based protocol that allows a host to configure itselfdynamically. Provides a means to assign a host its IP address, typically without user intervention.

Bps Bits per second.

Bridge A device that connects two or more physical networks which use the same protocol. Bridges read frames and decide whether to transmit or block them based on their destination address.

Broadband A data transmission technique allowing multiple high-speed signals to share the bandwidth of a single cable via frequency division multiplexing.

Broadband Network A network that uses multiple carrier frequencies to transmit multiplexed signals on a single cable. Several networks may coexist on a single cable without interfering with one another.

Brouter A device that routes specific protocols, such as TCP/IP and IPX, and bridges other protocols, thereby combining the functions of both routers and bridges.

Bus A LAN topology in which all the nodes are connected to a single cable. All nodes are considered equal and receive all transmissions on the medium.

Byte A data unit of eight bits.

C

Channel The data path between two nodes.

Client A computer process requesting service from other computer processes.

Coaxial Cable An electrical cable with a solid wire conductor at its center surrounded by insulating materials and an outer metal screen conductor with an axis of curvature coinciding with the inner conductor - hence "coaxial." Examples are standard Ethernet cable and Thinwire Ethernet cable.

Collision The result of two network nodes transmitting on the same channel at the same time. The transmitted data is not usable.

Collision Detect A signal indicating that one or more stations are contending with the local station's transmission. The signal is sent by the Physical layer to the Data Link layer on an Ethernet/IEEE 802.3 node.

Communication Server A dedicated, standalone system that manages communications activities for other computers.

CSMA/CD Carrier Sense Multiple Access with Collision Detection is the Ethernet media access method. All network devices contend equally for access to transmit. If a device detects another device's signal while it is transmitting, it aborts transmission and retries after a brief pause.

Cut-through Technique for examining incoming packets whereby an Ethernet switch looks only at the first few bytes of a packet before forwarding or filtering it. This process is faster than looking at the whole packet, but it also allows some bad packets to be forwarded.

D

Data Link A logical connection between two nodes on the same circuit.

Data Link Layer Layer 2 of the seven-layer OSI reference model for communication between computers on networks. This layer defines protocols for data packets and how they are transmitted to and from each network device. It is a medium-independent, link-level communications facility on top of the Physical layer, and is divided into two sublayers: medium-access control (MAC) and logical-link control (LLC).

default gateway The IP address of the network or host to which all packets addressed to an unknown network or host are sent. The default gateway is typically a router or other device.

Dest_idx The destination field in a Modbus message. Corresponds to the Modbus deviceaddressed in the message.

DHCP Dynamic Host Configuration Protocol. A network protocol used to configure IP addresses dynamically. DHCP is an extension of BOOTP.

Dialback A security feature that ensures people do not log into modems that they shouldn't have access to. When a connection is requested, the system checks the user name for validity, then "dials back" the number associated with that user name.

DNS Domain Name System. A protocol within TCP/IP used to find IP addresses based on host names.

Download The transfer of a file or information from one network node to another.

E

End Node A node such as a PC that can only send and receive information for its own use. It cannot route and forward information to another node.

Ethernet The most popular LAN technology in use today. The IEEE standard 802.3 defines the rules for configuring an Ethernet network. It is a 10 Mbps, CSMA/CD baseband network that runs over thin coax, thick coax, twisted pair or fiber optic cable.

F

FDDI Fiberoptic Data Distribution Interface. A cable interface capable of transmitting data at 100 Mbps. Originally specified for fiber lines, FDDI can also operate over twisted-pair cable for short distances.

Fiber optic cable A transmission medium composed of a central glass optical fiber cable surrounded by cladding and an outer protective sheath. It transmits digital signals in the form of modulated light from a laser or LED (light-emitting diode).

field A logical grouping of contiguous bits that convey one kind of information, such as the start or end of a message, an address, data or an error check.

File Server A computer that stores data for network users and provides network access to that data.

Filtering Process whereby an Ethernet switch or bridge reads the contents of a packet and then finds that the packet does not need to be forwarded, drops it. a filtering rate is the rate at which a device can receive packets and drop them without any loss of incoming packets or delay in processing.

Firmware Alterable programs in semipermanent storage, e.g., some type of read-only or flash reprogrammable memory.

Forwarding Process whereby an Ethernet switch or bridge reads the contents of a packet and then passes that packet on to the appropriate attached segment. A forwarding rate is the time that it takes the device to execute all of the steps.

Frame A group of bits which form a discrete block of information. Frames contain networkcontrol information or data. The size and composition of a frame is determined by the network technology being used.

Framing types Two common framing types are Ethernet II and IEEE 802.3.

FTP File Transfer Protocol. A networking protocol used to exchange files between stations on a network or over the Internet.

Full-Duplex Independent, simultaneous two-way transmission in both directions, as opposed to half-duplextransmission.

G

Gateway A device which connects networks with dissimilar network architectures and which operates at the Application Layer. This term may refer to a router.

H

Header The initial part of a data packet or frame containing identifying information such as the source of the data, its destination, and length.

Heartbeat Ethernet defined SQE signal quality test function.

host A node on a network.

Host table A list of TCP/IP hosts on the network along with their IP addresses.

hostname A domain name given to a specific computer on a network and used to address that computer.

HTTP HyperText Transport Protocol. A protocol used to deliver hypertext documents.

hub A device which connects a series of flexible and centralized modules to create a network.

I

ICMP Internet Control Message Protocol. A protocol within TCP/IP used to report errors in datagram transmission.

IEEE 802.3 The IEEE (Institute of Electrical and Electronic Engineers) standard that defines the CSMA/CD media-access method and the physical and data link layer specifications of a local area network. Among others, it includes 10BASE2, 10BASE5, 10BASE-FL and 10BASE-T Ethernet implementations.

Internet The global interconnection of TCP/IP based computer communication networks.

Internetworking A term for all the concepts, technologies, and devices that allow people and their computers to communicate across different kinds of networks.

IP Internet Protocol. A common network layer protocol. IP is most often used with TCP.

IP Address Internet Protocol Address. A 32–bit address assigned to hosts using TCP/IP.

L

Layer In the OSI model, a portion of the structure of a device which provides defined services for the transfer of information.

M

MAC Address Media Access Control address. The hardware address of a device. A MAC address is assigned to an Ethernet TCP/IP module in the factory.

N

network Interconnected devices sharing a common data path and protocol for communication.

node An addressable device on a communications network.

O

OSI Model Open System Interconnection model. A reference standard describing the required performance of devices for data communication. Produced by the International Standards Organization.

P

packet The unit of data sent across a network.

PING Packet Internet Groper. A program used to test whether a destination on a network can be reached.

port An access point for data entry or exit within a host using TCP services.

protocol Describes message formats and a set of rules used by two or more devices to communicate using those formats.

R

repeater A device that connects two sections of a network and conveys signals between them without making routing decisions or filtering packets.

router A device that connects two or more sections of a network and allows information to flow between them. A router examines every packet it receives and decides whether to block the packet from the rest of the network or transmit it. The router will attempt to send the packet through the network by the most efficient path.

S

server Provides services to clients. This term may also refer to the computer on which the service is based.

socket The association of a port with an IP address, serving as an identification of sender or recipient.

stack The software code which implements the protocol being used. In the case of the NOE modules it is TCP/IP.

STP Shielded Twisted Pair. A type of cabling consisting of several strands of wire surrounded by foil shielding, twisted together.

subnet A physical or logical network within an IP network, which shares a network address with other portions of the network.

subnet mask Used to indicate which bits in an IP address identify a subnet.

switch A network device which connects two or more separate network segments and allows traffic to be passed between them. A switch determines whether a frame should be blocked or transmitted based on its destination address.

T

TCP Transmission Control Protocol.

TCP/IP A protocol suite consisting of the Transmission Control Protocol and the Internet Protocol; the suite of communications protocols on which the Internet is based.

U

UDP User Datagram Protocol. A protocol which transmits data over IP.

URL Uniform Resource Locator. The network address of a file.

UTP Unshielded Twisted Pair. A type of cabling consisting of insulated cable strands which are twisted together in pairs.

W

Winsock The Microsoft implementation of the Windows Sockets networking API based on the Berkeley UNIX Sockets interface for supporting TCP/IP.

WWW World Wide Web. A hypertext–based, distributed information system in which clients and servers are freely available.

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