



Industrial Ethernet Extender, 10/100, 1-Port

# User Manual



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This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

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## Instrucciones de Seguridad (Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico debe ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
  - A: El cable de poder o el contacto ha sido dañado; u
  - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
  - C: El aparato ha sido expuesto a la lluvia; o
  - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
  - E: El aparato ha sido tirado o su cubierta ha sido dañada.

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# Quick Start Guide

## Quick Start Guide

### Unpacking

Unpack the items. Your package should include:

- One LB320A Industrial Ethernet Extender
- This printed quick start guide

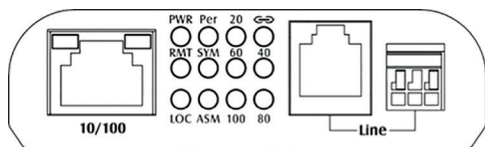
If items are missing or damaged, contact Black Box Technical Support at 724-746-5500 or [info@blackbox.com](mailto:info@blackbox.com). Keep the carton and packing material.

### Select a Location

- Installation: Desktop, Wallmount, DIN-Rail mount.
- Identify a power source within 6 feet (1.8 meters).
- Choose a dry area with ambient temperature between +14 and +140° F (-10 and +60° C).
- Keep away from heat sources, sunlight, warm air exhausts, hot-air vents, and heaters.
- Be sure there is adequate airflow.
- Keep the device at least 6-ft. (1.8-m) away from the nearest source of electromagnetic noise, such as a photocopier machine.

### Connect to the Data Ports

1. Insert one end of the Ethernet cable into a switch port.
2. Connect the other end into the Ethernet port of the device.
3. Insert the voice grade copper wire between one pair of Ethernet Extenders via the Ethernet Extender port (RJ-11 connector or terminal block). One device must be set to LOC mode and the other to Auto mode when two devices are connected.



Front panel of the extender.

#### LEDs on the extender.

LED	Color	Status
PWR	Green	ON = Receiving power OFF = Power off
Ethernet Extender Port		
Link Activity	Green	ON = Connection is established OFF = No connection is established Flashing = Port is sending or receiving data
Per	Green	ON = Performance mode OFF = Standard mode
RMT	Green	ON = Remote mode
LOC	Green	ON = Local mode
SYM	Green	ON = Symmetric mode

LEDs on the extender (continued).

LED	Color	Status
Ethernet Extender Port (continued)		
ASM	Green	ON = Asymmetric mode
Line Speed	Green	ON = Displays the link speed in Mbps
10/100TX port		
Link/Activity	Green	ON = Valid network connection OFF = No data transmission on port Flashing = Port is sending or receiving data
Speed	Yellow	ON = Link speed at 100 Mbps OFF = Link speed at 10 Mbps

Distance and data rate for the Ethernet Extender port:

Distance and Data Rate.

Distance (m)	Data Rate (Mbps)
300	100
400	80
600	60
800	40
1200	20
2600	1

This distance/data rate information is measured according to a testing standard in the laboratory. The actual installation will be affected by the quality of the copper wire and the impact of noise disturbance. The connection speed will be affected.**4. Apply DC Power**

Connect the supplied AC to DC power adapter to the receptacle on the rear panel of the Ethernet Extender, and then attach the plug into a standard AC outlet.

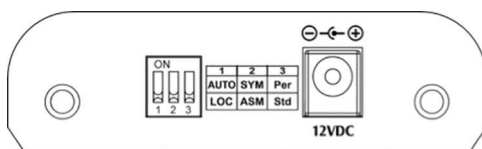


Figure 2. Back panel of the extender.

DIP Switches

Pin	Up	Down
DIP Switch 1	Auto mode	Local mode
DIP Switch 2	Symmetric	Asymmetric
DIP Switch 3	Performance	Standard

## 1. Specifications

Table 1-1. Specifications

Technology	
Standards	IEEE 802.3, 10BASE-T; IEEE 802.3u, 100BASE-TX; IEEE 802.3x, full-duplex and flow control
Forward and Filtering Rate	10 Mbps: 14,880 pps; 100 Mbps: 148,810 pps
Processing Type	Store-and-Forward, Half-duplex back pressure, and IEEE 802.3x full-duplex flow control
Auto-negotiation	Auto MDI/MDI-X
Power	
Input	12 VDC (DC jack)
Consumption	4.2 W max.
Mechanical	
Casing	Aluminum case, IP30
Dimensions	0.94"H x 3.16"W x 4.3"D (2.38 x 8.03 x 10.9 cm)
Weight	0.33 lb. (0.15 kg)
Mounting	DIN-rail (top hat type 35 mm) or wallmounting
Interface	
Connectors	Ethernet Port: (1) 10/100BASE-TX port, Ethernet Extender Port: (1) RJ-11 and terminal block port;
DIP Switch	DIP Switch 1: Auto/Local mode, DIP Switch 2: Symmetric/Asymmetric mode, DIP Switch 3: Performance/Standard mode
LED Indicators	Per unit: Power, Status; Ethernet Extender port: Link/Activity, Per, RMT, LOC, SYM, ASM, Line Speed



Table 1-1. Specifications (continued).

Environment	
Operating Temperature	14 to 140° F (-10 to +60° C)
Storage Temperature	-40 to +185° F (-40 to +85° C)
Ambient Relative Humidity	5 to 95%, noncondensing
Approvals	
ISO	Manufactured in an ISO facility
Safety	UL60950-1, EN60950-1
EMI	FCC Part 15B, Class A; EN61000-6-4: EN55022, EN61000-3-2, EN61000-3-3
EMS	EN61000-6-2: ESD Standard: EN61000-4-2; Radiated RFI Standards: EN61000-4-3; Burst Standards: EN61000-4-4; Surge Standards: EN61000-4-5; Induced RFI Standards: EN61000-4-6-8; Magnetic Field Standards: EN61000-4-8
Environmental Test Compliance	Vibration Resistance: IEC60068-2-6 Fc; Shock: IEC60068-2-27; Free fall with package: FED STD 101C Method 5007.1

Table 1-2. Data Rate Specifications.

Distance (feet [meters])	Data Rate (Mbps)
960 ft. (300 m)	100 Mbps
1280 ft. (400 m)	80 Mbps
1920 ft. (600 m)	60 Mbps
2560 ft. (800 m)	40 Mbps
3840 ft. (1200 m)	20 Mbps
8320 ft. (2600 m)	1 Mbps

### 2. Overview

#### 2.1 Introduction

Your Industrial Ethernet Extender is a state-of-the-art IEEE-compliant network solution designed for users who require high-performance to eliminate bottlenecks and increase productivity.

To simplify installation, the Industrial Ethernet Extender is shipped ready for use.

#### 2.2. Features

- Has (1) 10/100BASE-TX Ethernet port with an RJ-45 connector.
- Auto negotiates speed and duplex mode on the Ethernet port.
- Auto MDIX on Ethernet port.
- Complies with IEEE 802.3 10BASE-T and IEEE 802.3u 100BASE-TX standards.
- Has (1) Ethernet Extender port with an RJ-11 connector or terminal block.
- Ethernet Extender port auto-senses the speed.
- DIP switch configures Ethernet Extender Auto or Local mode, Symmetric or Asymmetric mode, and Performance or Standard mode.
- Status LEDs.
- Uses an external AC to DC power adapter (included).

#### 2.3 What's Included

Your package should contain the following items. If anything is missing or damaged, contact Black Box Technical Support at 724-746-5500 or [info@blackbox.com](mailto:info@blackbox.com).

- Industrial Ethernet Extender
- (1) external power adapter
- A printed Quick Start Guide

*NOTE: You will need two extenders to complete the application.*

The full user manual/installation guide (the document you are reading) can be downloaded from the Black Box Web site.

To download from the Web site:

1. Go to [www.blackbox.com](http://www.blackbox.com)
2. Enter the part number in the search box:
3. Click on the "Resources" tab on the product page, and select the document you wish to download.

## 2.4 Hardware Description

Figures 2-1 through 2-4 show the front and back panels of the extender units. Tables 2-1 and 2-2 describe the extender's components. Use the extenders in pairs: one unit is configured as the local unit and the other unit is configured as the remote unit.



Figure 2-1. Front panel of the extender.

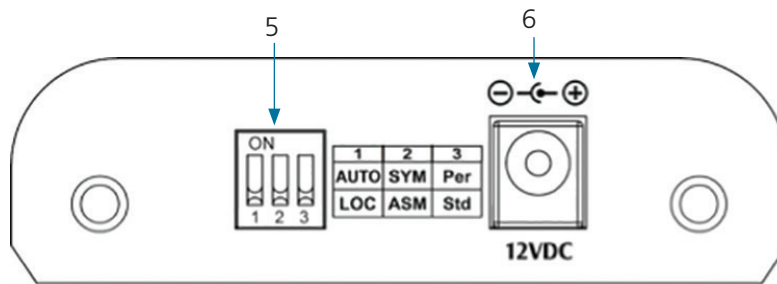


Figure 2-2. Back panel of the extender.

Table 2-1. Extender components.

Number in Figure 2-1	Component	Description
1	RJ-45 connector	Links to 10/100 Mbps Ethernet.
2	LEDs	Indicate status at a glance. See Table 2-3 for details.
3	RJ-11 connector	Links to Ethernet line.
4	Terminal block	Links to Ethernet line.
5	DIP switches	Select Mode, Symmetry, and Performance
6	Barrel connector	Links to 12-VDC power

### Front Panel Features

#### 10/100 Mbps RJ-45 Port

The LB320A Industrial Ethernet Extender has one 10/100 Mbps RJ-45 port (see Figure 2-1). This port is an auto-sensing, auto-MDIX 10/100 Mbps port.

When you insert a cable into an RJ-45 port, the Industrial Ethernet Extender:

- Determines whether the cable is a straight-through or crossover cable.
- Automatically ascertains the maximum speed (10 or 100 Mbps) and duplex mode (half- or full-duplex) of the attached device.

## Chapter 2: Overview

After determining this information, the Industrial Ethernet Extender configures the RJ-45 port automatically to enable communications with the attached device, without requiring user intervention.

### Ethernet Extender Port

The LB320A Industrial Ethernet Extender has one Ethernet Extender port (RJ-11 connector or terminal block, see Figure 2-1).

Insert the voice-grade copper wire between one pair of Ethernet Extenders via the Ethernet Extender port (RJ-11 connector or terminal block). One device must be set to LOC mode and the other to Auto mode when two devices are connected.

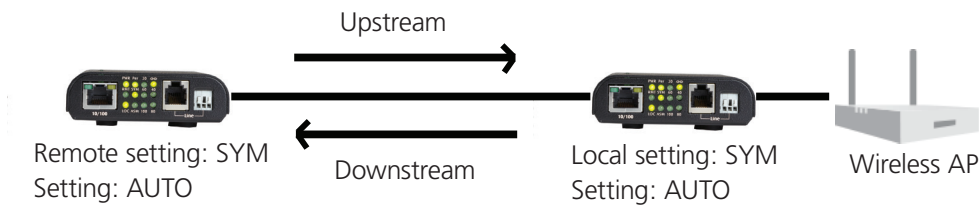


Figure 2-5. Symmetric mode: The data rate for upstream and downstream is the same and is suitable for network extension.

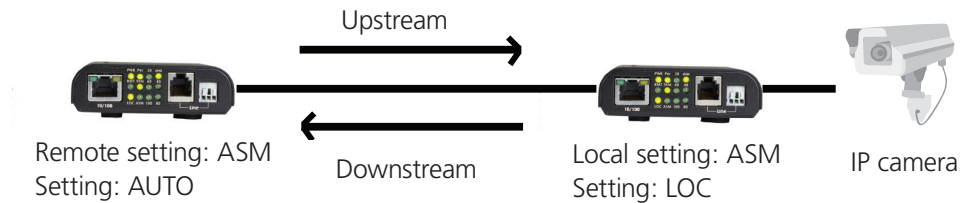


Figure 2-6. Asymmetric mode: The data rate for downstream is more than the data rate of upstream and is usable for IP camera applications.

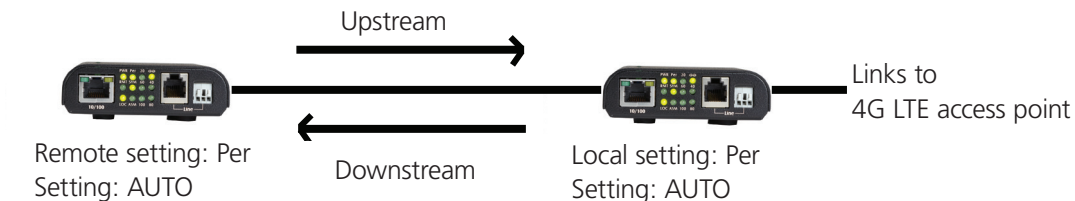


Figure 2-7. Performance mode: Use this mode for high-speed data transmission when the line quality is good.

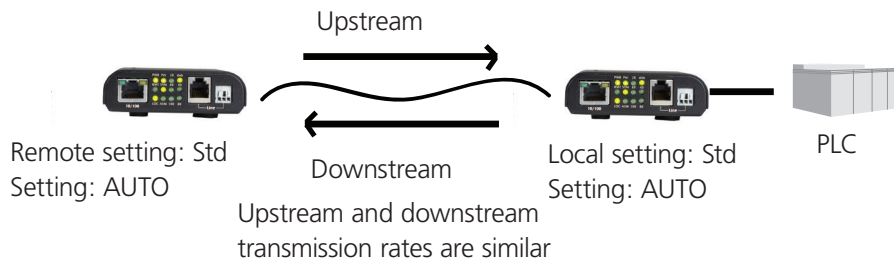


Figure 2-8. Standard mode: Use this mode for long-distance with more noise immunity when the line quality is poor or the noise interferes with the cable.

**LEDs**

The LB320A front-panel LEDs show power and link/activity status. Table 2-3 summarizes the LEDs on the Industrial Ethernet Extender.

Table 2-3. Front-panel LEDs on the extender.

LED	Color	Status
PWR	Green	ON = Receiving power OFF = Power off
Ethernet Extender Port		
Link Activity	Green	ON = Connection is established OFF = No connection is established Flashing = Port is sending or receiving data
Per	Green	ON = Performance mode OFF = Standard mode
RMT	Green	ON = Remote mode
LOC	Green	ON = Local mode
SYM	Green	ON = Symmetric mode
ASM	Green	ON = Asymmetric mode
Line Speed	Green	ON = Displays the link speed in Mbps
10/100TX port		
Link/Activity	Green	ON = Valid network connection OFF = No data transmission on port Flashing = Port is sending or receiving data
Speed	Yellow	ON = Link speed at 100 Mbps OFF = Link speed at 10 Mbps

**Rear Panel**

The LB320A rear panel has a receptacle for connecting the supplied external power adapter. Use only the external power adapter supplied with the Industrial Ethernet Extender.

**Bottom Panel**

The LB320A bottom panel has a product label that shows regulatory compliance, product serial number, and other information.

### 3. Installation

#### 3.1 Preparing the Site

Before you install your Industrial Ethernet Extender, be sure your operating environment meets the operating environment requirements in Table 3-1.

Table 3-1. Site requirements.

Characteristics	Requirements
Mounting	Desktop installations: Provide a flat table or shelf surface. DIN-Rail installations: Top hat type 35 mm. Wallmounting installations: Mounting on the wall.
Access	Locate the Industrial Ethernet Extender in a position that lets you access the front-panel RJ-45 and Ethernet Extender port, view the front-panel LEDs, and access the rear-panel power connector.
Power source	Provide a power source within 6 feet (1.8 meters) of the installation location. Power specifications for the Industrial Ethernet Extender are shown in Chapter 1. Be sure that the AC outlet is not controlled by a wall switch, which can accidentally turn off power to the outlet and the Industrial Ethernet Extender.
Environmental	Temperature: Install the Industrial Ethernet Extender in a dry area, with ambient temperature between +14 and +140° F (-10 and +60° C). Keep the Industrial Ethernet Extender away from heat sources such as direct sunlight, warm air exhausts, hot-air vents, and heaters.  Operating Humidity: The installation location should have a maximum relative humidity of 95%, non-condensing.  Ventilation: Do not restrict airflow by covering or obstructing the rear and side panels of the Industrial Ethernet Extender. Keep at least 2 inches (5.08 centimeters) free on all sides for cooling.  Operating Conditions: Keep the Industrial Ethernet Extender at least 6 ft (1.83 m) away from nearest source of electromagnetic noise, such as a photocopy machine.
Stacking	If you intend to stack two or more Industrial Ethernet Extenders, be sure: <ul style="list-style-type: none"><li>• The mounting surface can safely support the stack.</li><li>• There is adequate space around the stack for ventilation and cooling.</li></ul>

#### 3.2 Installing the Industrial Ethernet Extender

You can install your Industrial Ethernet Extender on a flat surface, DIN-Rail, or wall with other equipment.

If installing the Industrial Ethernet Extender on a desktop, shelf, DIN-Rail, or wall, allow sufficient ventilation space between the device and the objects around it.

The LB320A Industrial Ethernet Extender's dimensions are: 0.94"H x 3.16"W x 4.3"D (2.38 x 8.03 x 10.92 cm).

#### 3.3 Connecting to the 10/100 Mbps RJ-45 Port

The front panel of the Industrial Ethernet Extender provides one 10/100 Mbps RJ-45 port (see "10/100 Mbps RJ-45 Port" on page X). To prevent ESD damage, follow normal board and component handling procedures.

To connect devices to the Industrial Ethernet Extender's 10/100 Mbps RJ-45 port:

1. Insert one end of a Category 5 or better Ethernet cable into a Ethernet port.
2. Insert the other cable end into the Ethernet port of a computer, printer, network storage, or other network device.

### 3.4 Connecting to the Ethernet Extender Port

The front panel of the Industrial Ethernet Extender provides one RJ-11 connector or Terminal Block (see “Ethernet Extender Port” on page X). To prevent ESD damage, follow normal board and component handling procedures.

To connect the Extender’s Ethernet port:

Insert the voice grade copper wire between one pair of Ethernet Extenders via Ethernet Extender port (RJ-11 connector or Terminal Block). Set one device to LOC mode and the other to Auto mode when two devices are connected.

### 3.5 Checking the Installation

Before you apply power:

- Inspect the equipment thoroughly.
- Verify that all cables are installed correctly.
- Check cable routing to make sure the cables are not damaged or do not create a safety hazard.
- Be sure all equipment is mounted properly and securely.

### 3.6 Applying AC Power

Before you connect the power adapter, select an AC outlet that is not controlled by a wall switch, which can turn off power to the Industrial Ethernet Extender. After you select an appropriate outlet, use the following procedure to apply AC power.

1. Connect the female end of the supplied AC power adapter cable to the power receptacle on the back of the Industrial Ethernet Extender.
2. Connect the 3-pronged end of the AC power adapter cable to a grounded 3-pronged AC outlet.

When you apply power:

- All green Link/Activity LEDs blink momentarily.
- The green Power LED goes ON.
- The Link/Activity LEDs for every port connected to a device flash, as the Industrial Ethernet Extender conducts a brief Power On Self-Test (POST).

After the Industrial Ethernet Extender passes the POST, the Link/Activity LEDs for every port connected to a device go ON. The Industrial Ethernet Extender is now functional and ready to pass data.

If the Power LED is not ON, check that the power adapter is plugged in correctly, and that the power source is good and not controlled by a wall switch. If this does not resolve the problem, see Chapter 4, Troubleshooting.

### 4. Troubleshooting

#### 4.1 Troubleshooting Tips

Symptoms, causes, and solutions of possible problems are described below.

**Symptom:** The Power LED is off.

**Cause:** The Industrial Ethernet Extender is not receiving power.

**Solution:** Check the power adapter connections for the Industrial Ethernet Extender and the connected device.

Be sure all cables used are correct and comply with Ethernet specifications.

**Symptom:** Link/Activity LED is OFF or intermittent.

**Cause:** The port connection is not working.

**Solution:** Check the crimp on the connectors and be sure the plug is inserted properly and locked into the port at both the Industrial Ethernet Extender and the connecting device.

Be sure all cables used are correct and comply with Ethernet specifications.

Check for a defective adapter card, cable, or port by testing them in an alternate environment where all products are functioning.

**Symptom:** File transfer is slow or performance degradation is a problem.

**Cause:** Half- or full-duplex setting on the Industrial Ethernet Extender and the connected device are not the same.

**Solution:**

Configure the Industrial Ethernet Extender and the attached device to auto-negotiate.

**Symptom:** A segment or device is not recognized as part of the network.

**Cause:** One or more devices are not connected properly or cabling does not meet Ethernet guidelines.

**Solution:** Verify that the cabling is correct.

Be sure all connectors are securely positioned in the required ports. Equipment may have been disconnected accidentally.

**Symptom:** Collisions are occurring on the connected segment.

**Cause:** Some collisions are normal when the connection is operating in half-duplex mode.

**Solution:** Recheck the settings of the device attached to the Industrial Ethernet Extender port.

Be sure the Industrial Ethernet Extender and the attached device are using the same duplex setting.

Be sure the Industrial Ethernet Extender and the attached device are set to auto-negotiate.

**Symptom:** Link/Activity LED is flashing continuously on all connected ports and the network is disabled.

**Cause:** A network loop (redundant path) has been created.

**Solution:** Break the loop by ensuring that there is only one path from any networked device to any other networked device.



### 4.2 Additional Troubleshooting Suggestions

If the suggestions in Section 4-1 do not resolve your problem, refer to the troubleshooting suggestions in this section.

#### 4.2.1 Configuration

If problems occur after altering the Industrial Ethernet Extender's network configuration, restore the original connections and determine the problem by implementing the new changes one step at a time. Be sure cable distances, repeater limits, and other physical aspects of the installation do not exceed the Ethernet limitations.

#### 4.2.2 Industrial Ethernet Extender Integrity

If required, verify the integrity of the Industrial Ethernet Extender by resetting it.

#### 4.2.3 Auto-Negotiation

The 10/100 Mbps ports negotiate the correct duplex mode and speed since the Industrial Ethernet Extender is configured for auto-negotiation (this is the Industrial Ethernet Extender's default setting) and the device at the other end of the link supports auto-negotiation. If the device does not support auto-negotiation, the Industrial Ethernet Extender determines only the speed correctly and the duplex mode defaults to half-duplex.





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