



## **ED3541 Hardened Ethernet Extender**

### **User's Guide**

#### **FastFind Links**

**Introduction**

**Unpacking and Installation**

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<https://kb.etherwan.com/index.php?View=entry&EntryID=27>

### **Products Supported by this Manual:**

ED3541



# Preface

## Audience

This guide is designed for the person who installs, configures, deploys, and maintains the Ethernet network. This document assumes the reader has moderate hardware, computer, and Internet skills.

## Document Revision Level

This section provides a history of the revision changes to this document.

Drawing Number	Revision	Document Version	Date	Description
W70G-ED3541XM2	B	Version 2	04/24/2017	

## Changes in this Revision

This is second version of this document.

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## Document Conventions

This guide uses the following conventions to draw your attention to certain information.

### Safety and Warnings

This guide uses the following symbols to draw your attention to certain information.

Symbol	Meaning	Description
	Note	Notes emphasize or supplement important points of the main text.
	Tip	Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively.
	Warning	Warnings indicate that failure to take a specified action could result in damage to the device, or could result in serious bodily injury.
	Electric Shock Hazard	This symbol warns users of electric shock hazard. Failure to take appropriate precautions such as not opening or touching hazardous areas of the equipment could result in injury or death.

### Typographic Conventions

This guide also uses the following typographic conventions.

Convention	Description
<b>Bold</b>	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels.
<i>Italic</i>	Indicates a variable, which is a placeholder for actual text provided by the user or system. Angled brackets (< >) are also used to indicate variables.
screen/code	Indicates text that is displayed on screen or entered by the user.
< > angled brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Italic font is also used to indicate variables.
[ ] square brackets	Indicates optional values.
{ } braces	Indicates required or expected values.
vertical bar	Indicates that you have a choice between two or more options or arguments.

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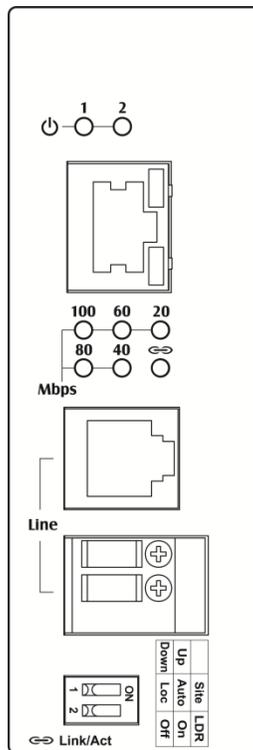
# 1 Introduction

**Topics:**

- ^ *Key Features (page 8)*
- ^ *Quick Start Guide (page 9)*

Congratulations on your purchase of the ED3541 Hardened Ethernet Extender from EtherWAN Systems, Inc. Your EtherWAN Hardened 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 Hardened Ethernet Extender is shipped ready for use.



**Figure 1-1. ED3541 Hardened Ethernet Extender**

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## Key Features

This section summarizes the key features of the ED3541 Hardened Ethernet Extender.

- One 10/100Base-TX Ethernet port with RJ-45 connector
- Auto negotiation of speed and duplex mode on Ethernet port
- Auto MDIX on Ethernet port
- Complies with IEEE 802.3 10Base-T and IEEE 802.3u 100Base-TX standards
- One Ethernet Extender port with RJ-11 connector or Terminal Block
- Ethernet Extender port auto senses the speed
- DIP switch for configuring Ethernet Extender Auto or Local mode, to turn on or off link down relay
- Status LEDs

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## Quick Start Guide

The following procedure enables advanced users to get their Hardened Ethernet Extender up and running in the shortest possible time. For detailed installation instructions, refer to the sections in the right column below.

Step	Description	For Reference, See...
1.	<b>Find a Location for the Hardened Ethernet Extender</b> Set the Hardened Ethernet Extender on a flat surface, Wall-mount, or DIN-Rail mount.	"Preparing the Site" (page 15)
2.	<b>Connect to the 10/100 Mbps Ethernet Port</b> <ul style="list-style-type: none"><li>• Connect one end of a Category 5 or better Ethernet cable to the Ethernet port of a computer, printer, network storage, or other network device.</li><li>• Connect the other end to a 10/100 Mbps RJ-45 port on the Hardened Ethernet Extender.</li></ul>	"10/100 Mbps RJ-45 Port" (page 12) and "Connecting to the 10/100 Mbps RJ-45 Port" (page 16)
3.	<b>Connect to the Ethernet Extender Port</b> Insert the voice grade copper wire between one pair of Ethernet Extenders via Ethernet Extender port (RJ-11 connector or Terminal Block).	
4.	<b>Power On</b> <ul style="list-style-type: none"><li>• Connect the DC power cord to the plug-able terminal block on the Ethernet Extender, and then plug it into a standard DC outlet.</li><li>• Connect the ground connection from the terminal block to the grounding surface.</li><li>• Wait for the Hardened Ethernet Extender to complete its Power On Self Test.</li><li>• Confirm that the LEDs for ports connected to a device are green. If not, replace the Ethernet cable, and then check the port LED again.</li></ul>	"Applying DC Power" (page 17)

## 2 Unpacking and Installation

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**Topics:**

- ^ *Unpacking the Hardware (page 11)*
- ^ *Hardware Features (page 11)*
- ^ *Installing the Hardened Ethernet Extender (page 14)*

This chapter describes how to unpack and install the ED3541 Hardened Ethernet Extender.

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## Unpacking the Hardware

Unpack the items and confirm that no items are missing or damaged. Your package should include:

- One ED3541 Hardened Ethernet Extender
- One CD containing this user's guide

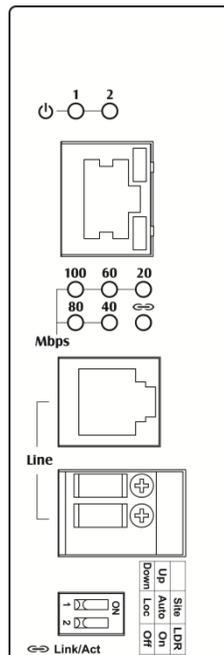
If any item is damaged or missing, notify your authorized EtherWAN representative. Keep the carton, including the original packing material, in case you need to store the product or return it.

## Hardware Features

The following sections describe the hardware features of the ED3541 Hardened Ethernet Extender.

### Front Panel

Figure 2-1 shows the front panels of the ED3541 Hardened Ethernet Extender.



**Figure 2-1. Front Panel of the ED3541 Hardened Ethernet Extender**

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

The ED3541 Hardened Ethernet Extender has one 10/100 Mbps RJ-45 port (see Figure 2-1). This port is auto-sensing, auto-MDIX 10/100 Mbps port.

When you insert a cable into an RJ-45 port, the Hardened 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.

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

### ***Ethernet Extender Port***

The ED3541 Hardened 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 Ethernet Extender port (RJ-11 connector or Terminal Block).

### ***LEDs***

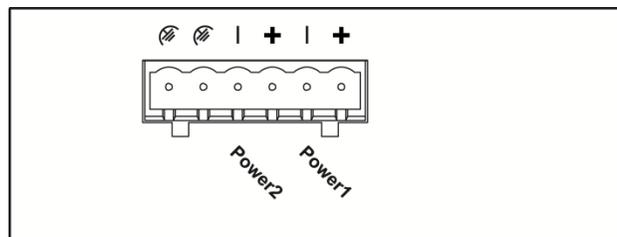
The ED3541 front panel LEDs show power and link/activity status. Table 2-1 summarizes the LEDs on the Hardened Ethernet Extender.

**Table 2-1. Front Panel LEDs**

LED	Color	Status	Description
⏻ PWR 1, 2	Green	ON	Receiving power.
		OFF	Power off.
<b>Ethernet Extender Port</b>			
↔ Link/Activity	Green	ON	Connection is established.
		OFF	No connection is established.
		Flashing	Port is sending or receiving data.
Line Speed	Green	ON	Displays the link speed in Mbps.
<b>10/100TX Port</b>			
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 100Mbps.
		OFF	Link speed at 10Mbps.

## Top Panel

The ED3541 top panel has a Terminal Block for connecting the external power supply.



**Figure 2-2. Top Panel of the ED3541 Hardened Ethernet Extender**

## Side Panels

The ED3541 side panel has a product label that shows regulatory compliance, product serial number, and other information.

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## Installing the Hardened Ethernet Extender

Hardened Ethernet Extender installation involves the following steps:

1. [Preparing the site](#). See page 15
2. [Installing the Hardened Ethernet Extender](#). See page 15.
3. [Connecting to the 10/100 Mbps RJ-45 Port](#). See page 16.
4. [Connecting to Ethernet Extender Port](#). See page 16.
5. [Checking the installation](#). See page 16.
6. [Applying DC Power](#). See page 17.

## Preparing the Site

Before you install your Hardened Ethernet Extender, be sure your operating environment meets the operating environment requirements in Table 2-2.

**Table 2-2. Site Requirements**

Characteristics	Requirements
Mounting Desktop installations: DIN-Rail installations:	Provide a flat table or shelf surface. Top hat type 35mm.
Access	Locate the Hardened Ethernet Extender in a position that lets you access the front panel RJ-45 port and Ethernet Extender port, view the front panel LEDs, and access the top-panel power connector.
Power source	Provide a power source within 6 feet (1.8 meters) of the installation location. Power specifications for the Hardened Ethernet Extender are shown in Appendix A.
Environmental Temperature: Operating humidity: Ventilation: Operating conditions:	Install the Hardened Ethernet Extender in a dry area, with ambient temperature between -40 and 75°C (-40 and 167°F). Keep the Hardened Ethernet Extender away from heat sources such as direct sunlight, warm air exhausts, hot-air vents, and heaters. The installation location should have a maximum relative humidity of 95%, non-condensing. Do not restrict airflow by covering or obstructing the top and side panels of the Hardened Ethernet Extender. Keep at least 2 inches (5.08 centimeters) free on all sides for cooling. Be sure there is adequate airflow in the room where you intend to install the Hardened Ethernet Extender. Keep the Hardened 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 Hardened 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>

## Installing the Hardened Ethernet Extender

- This equipment is open-type device that is to be installed in an enclosure only accessible with a tool and for the environment.
- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.
- **WARNING - EXPLOSION HAZARD** - Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

### Installation Instruction:

- The Input Terminal Block is suitable for 12~24 AWG (3.31~0.2047mm<sup>2</sup>) wire size, torque value 7 lb-in (0.791 N-m).

- 
- The Ethernet Extender Terminal Block is suitable for 12~24 AWG (3.31~0.2047mm<sup>2</sup>) wire size, torque value 4.5 lb-in (0.508 N-m).
  - The minimum cross-sectional area of Earthing conductor shall equal to Input wiring cable.
  - Conductors suitable for use in an ambient temperature of 83.2°C must be used for all Terminal Block.

Condition of safe use:

- Subject devices are for use in an area of not more than pollution degree 2 in accordance with EN/IEC 60664-1.
- The equipment shall be installed in an enclosure that provides a degree of protection not less than IP 54 and accessible only by use of a tool in accordance with EN/IEC 60079-15.
- Provision shall be made to prevent the rated voltage being exceeded by the transient disturbances of more than 140% of peak rated voltage.

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

- If installing the Hardened Ethernet Extender on a desktop, shelf, or DIN-Rail, allow sufficient ventilation space between the device and the objects around it.
- ED3541 Hardened Ethernet Extender Dimensions: 42mm (W) x 90mm (D) x 100mm (H) (1.65" (W) x 3.54" (D) x 3.94" (H))

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

The front panel of the Hardened Ethernet Extender provides one 10/100 Mbps RJ-45 port (see "10/100 Mbps RJ-45 Port" on page 12). To prevent ESD damage, follow normal board and component handling procedures.

To connect devices to the Hardened 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.

### **Connecting to Ethernet Extender Port**

The front panel of the Hardened Ethernet Extender provides one RJ-11 connector or Terminal Block (see "Ethernet Extender Port" on page 12). To prevent ESD damage, follow normal board and component handling procedures.

To connect the Hardened Ethernet Extender's Ethernet Extender port:

Insert the voice grade copper wire between one pair of Ethernet Extenders via Ethernet Extender port (RJ-11 connector or Terminal Block).

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## Checking the Installation

Before you apply power:

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

## Applying DC Power

1. Connect the DC power cord to the plug-able terminal block on the Ethernet Extender, and then plug it into a standard DC outlet.
2. Connect the ground connection from the terminal block to the grounding surface.

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 Hardened Ethernet Extender conducts a brief Power On Self-Test (POST).

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

If the **Power** LED is not ON, check that the power source is plugged in correctly and that the power source is good. If this does not resolve the problem, see Chapter 3, Troubleshooting

## 3 Troubleshooting

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### Topics:

- ^ *Troubleshooting Chart (page 19)*
- ^ *Additional Troubleshooting Suggestions (page 20)*

This chapter provides information about troubleshooting the Hardened Ethernet Extender.



## Troubleshooting Chart

Symptoms, causes, and solutions of possible problems.

**Table 3-1. Troubleshooting Chart**

Symptom	Cause	Solution
Power LED is OFF.	The Hardened Ethernet Extender is not receiving power.	Check the power connections for the Hardened Ethernet Extender at the Hardened Ethernet Extender and the connected device. Be sure all cables used are correct and comply with Ethernet specifications.
Link/Activity LED is OFF or intermittent.	Port connection is not working.	Check the crimp on the connectors and be sure the plug is inserted properly and locked into the port at both the Hardened 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.
File transfer is slow or performance degradation is a problem.	Half- or full-duplex setting on the Hardened Ethernet Extender and the connected device are not the same.	Configure the Hardened Ethernet Extender and the attached device to auto-negotiate.
A segment or device is not recognized as part of the network.	One or more devices are not connected properly or cabling does not meet Ethernet guidelines.	Verify that the cabling is correct. Be sure all connectors are securely positioned in the required ports. Equipment may have been disconnected accidentally.
Collisions are occurring on the connected segment.	Some collisions are normal when the connection is operating in half-duplex mode.	Recheck the settings of the device attached to the Hardened Ethernet Extender port. Be sure the Hardened Ethernet Extender and the attached device are using the same duplex setting. Be sure the Hardened Ethernet Extender and the attached device are set to auto-negotiate.
Link/Activity LED is flashing continuously on all connected ports and the network is disabled.	A network loop (redundant path) has been created.	Break the loop by ensuring that there is only one path from any networked device to any other networked device.

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## Additional Troubleshooting Suggestions

If the suggestions in Table 3-1 do not resolve your problem, refer to the troubleshooting suggestions in this section.

### Configuration

If problems occur after altering the Hardened 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.

### Hardened Ethernet Extender Integrity

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

### Auto-Negotiation

The 10/100 Mbps ports negotiate the correct duplex mode and speed since the Hardened Ethernet Extender is configured for auto-negotiation (this is the Hardened 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 Hardened Ethernet Extender determines only the speed correctly and the duplex mode defaults to half-duplex.

## Appendix A - Specifications

### Technology

Specification	Description
Standards:	<ul style="list-style-type: none"> <li>• IEEE802.3, 10BASE-T</li> <li>• IEEE802.3u, 100BASE-TX</li> <li>• IEEE802.3x, full-duplex and flow control</li> </ul>
Forward and Filtering Rate:	<ul style="list-style-type: none"> <li>• 10 Mbps: 14,880 pps</li> <li>• 100 Mbps: 148,810 pps</li> </ul>
Processing Type:	<ul style="list-style-type: none"> <li>• Store-and-Forward</li> <li>• Half-duplex back-pressure and IEEE802.3x full-duplex flow control</li> <li>• Auto Negotiation</li> <li>• Auto MDI/MDIX</li> </ul>

### Power

Specification	Description
Power Input:	12 to 48 VDC (Terminal Block), 0.1 to 0.5A
Power Consumption:	4.2 W Max.

### Mechanical

Specification	Description
Casing:	<ul style="list-style-type: none"> <li>• Aluminum case</li> <li>• IP30</li> </ul>
Dimensions:	42 mm (W) x 90 mm (D) x 100 mm (H) (1.65" (W) x 3.54" (D) x 3.94" (H))
Weight:	410 g (0.9 lb)
Installation:	DIN-Rail (Top hat type 35 mm) Mounting

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## Interface

Specification	Description
Ethernet Port:	One 10/100BASE-TX port
Ethernet Extender Port:	One RJ-11 and Terminal Block port
DIP Switch	<ul style="list-style-type: none"><li>DIP Switch 1: Auto/Local mode</li><li>DIP Switch 2: Link down relay</li></ul>
LED Indicators:	<ul style="list-style-type: none"><li>Per unit: Power Status</li><li>Ethernet port: Link/Activity, Speed</li><li>Ethernet Extender port: Link/Activity, Line Speed</li></ul>

Auto mode: This is the factory default setting. The Extender will automatically select the Extender port to operate in Local or Remote mode.

Local mode: Operation mode of the Extender is fixed as Local mode.

A pair of Extenders can only have one Extender set to Local mode.

Connection establishment time for Extender port:

- One Extender is set as Local mode, the other is set as Auto mode: Around 40 seconds.
- A pair of Extenders are set to Auto mode: Connection establishment time may be longer, sometimes the connection establishment time may be up to a few minutes.

The data rates will vary according to the quality of the connected cable. The information below is only for reference of applications.

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

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

**NOTE:** After making changes to the position of any DIP switch, the Ethernet Extender must be rebooted for the new settings to take effect.

## Environment

Specification	Description
Operating Temperature:	$-40^{\circ}\text{C} \leq T_a \leq +75^{\circ}\text{C}$ ( $-40^{\circ}\text{F} \leq T_a \leq +167^{\circ}\text{F}$ )
Storage Temperature:	$-40^{\circ}\text{C}$ to $85^{\circ}\text{C}$ ( $-40^{\circ}\text{F}$ to $185^{\circ}\text{F}$ )
Ambient Relative Humidity:	5% to 95% (non-condensing)

## Ethernet Extender Connection

Specification	Description
The RJ-11 and Terminal Block port pinouts	
Pin 3: Tip, Pin 4: Ring.	
Use a telephone line to connect two RJ-11 or Terminal Block ports between two Hardened Ethernet Extenders.	

## Regulatory Approvals

Specification	Description
Address of manufacturer:	4F.-7, No.79, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City, 221, Taiwan R.O.C.
ISO:	Manufactured in an ISO9001 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: <ul style="list-style-type: none"> <li>• EN61000-4-2 (ESD Standard)</li> <li>• EN61000-4-3 (Radiated RFI Standards)</li> <li>• EN61000-4-4 (Burst Standards)</li> <li>• EN61000-4-5 (Surge Standards)</li> <li>• EN61000-4-6 (Induced RFI Standards)</li> <li>• EN61000-4-8 (Magnetic Field Standards)</li> </ul>
CE:	 DEMKO 15 ATEX 1625X
IECEX	IECEX UL 17.0039X
ATEX:	 II 3 G Ex nA IIC T4 Gc
Environmental Test Compliance	<ul style="list-style-type: none"> <li>• IEC60068-2-6 Fc (Vibration Resistance)</li> <li>• IEC60068-2-27 Ea (Shock)</li> <li>• FED STD 101C Method 5007.1 (Free fall w/ package)</li> </ul>
Standard and Certification	<ul style="list-style-type: none"> <li>• IEC60079-0:2011, 6th Edition</li> <li>• IEC60079-15:2010, 4th Edition</li> <li>• EN60079-0:2012+A11:2013</li> <li>• EN60079-15:2010</li> </ul>



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ED3541 Hardened Ethernet Extender User Guide

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