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All power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction.

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* E-SW05U is not intended for residential use.

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Section 1 General Information

Overview

This manual will help you install and maintain the Industrial Ethernet Switch. This unmanaged switch is extremely easy to install and operate because little or no user configuration is required. Once the Ethernet connections are made and the unit is powered up it will immediately begin to operate.

Operation

Unlike an Ethernet hub that broadcasts all messages out all ports, the Industrial Ethernet Switch will intelligently route Ethernet messages only out the appropriate port. The major benefits of this are increased bandwidth and speed, reduction or elimination of message collisions, and deterministic performance when tied with real-time systems.

The Industrial Ethernet Switch supports both 10BaseT (10 Mbps) and 100BaseTx (100 Mbps) on its RJ45 ports. Each of these ports will independently auto-sense the speed, allowing you to interface to regular or fast Ethernet devices.

Refer to Section 6 for more information on Industrial Ethernet Switch operation and features.

Performance Specifications

These general specifications apply to the Industrial Ethernet Switch. Refer to Section 7 for complete technical specifications.

Ports	10/100BaseT(x) (Shielded RJ45)
Required Voltage	10 - 30 VDC (see Section 7 for current draw)
Ethernet Standards	IEEE 802.3 (10BaseT), 802.3u (100BaseTX), 802.3x (Full Duplex)
Ethernet Protocols	All standard IEEE 802.3 protocols supported
Speed Per Port	RJ45: 10 or 100 Mbps (half duplex), 20 or 200 Mbps (full duplex)
Ethernet Isolation	1200 Volts RMS (for 1 minute)
Operating Temp.	-40 to 85 °C
Humidity	5 to 95% (non-condensing)
Screw Terminals	5 port switch: 14 AWG max. (tighten to 3.48 in-lbs. max.)

Standards and Safety

The Industrial Ethernet Switch meets the following standards:

Electrical safety - UL 508, CSA C22/14; EN61010-1 (IEC1010)
EMI emissions - FCC part 15, ICES 003, EN55022; Class B
EMC immunity – EN61326-1(EN61000-4--2, 3, 4, and 6)

Hazardous locations – UL 1604, CSA C22.2/213 (Class 1, Div. 2), Groups A, B, C, D; Cenelec EN50021 (Zone 2)

Install the Industrial Ethernet Switch in accordance with local and national electrical codes.

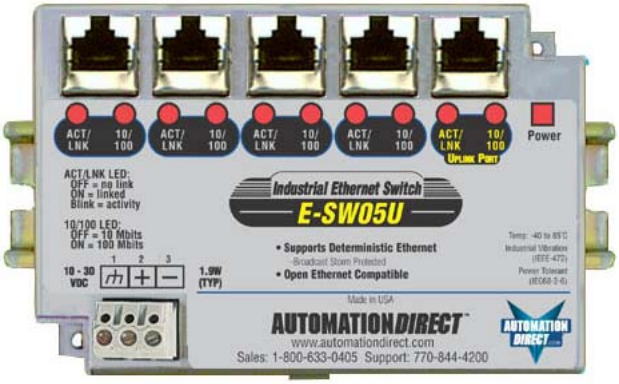
Lightning Danger: Do not work on equipment during periods of lightning activity.

Do not connect a telephone line into one of the Ethernet RJ45 connectors.

Section 2 LED Indicators

Overview

The Industrial Ethernet Switch has communication LEDs for each port and a power LED.



FIVE PORT SWITCH

Power LED

This LED will be on solid when proper power has been applied to the unit.

ACT / LNK LEDs

The activity (ACT) and link (LNK) indication is combined into one LED on the Industrial Ethernet Switch. There is one of these LEDs per port.

OFF – This would indicate that there is not a proper Ethernet connection (Link) between the port and another Ethernet device. Make sure the proper cable type is in use and that it has been plugged securely into the ports at both ends. See section 5 for proper Ethernet cabling.

ON Solid (not flashing) – This would indicate that there is a proper Ethernet connection (Link) between the port and another Ethernet device, but no communications activity is detected.

Flashing - This would indicate that there is a proper Ethernet connection (Link) between the port and another Ethernet device, and that there is communications activity.

10 / 100 LEDs

This LED indicates what speed of communications is detected on the port. There is one of these LEDs per RJ45 port

OFF – A 10 Mbps (10BaseT) connection is detected.

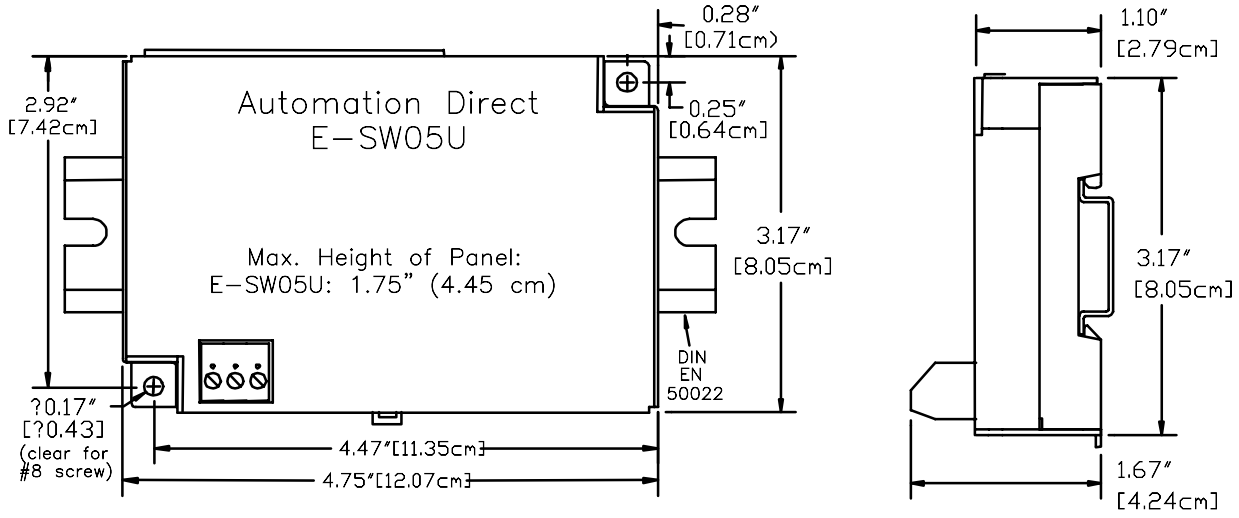
ON – A 100 Mbps (100BaseTx) connection is detected.

(Mbps = Megabits per Second)

Section 3 Installation

Overview

The Industrial Ethernet Switch can be snapped onto a standard DIN rail (EN50022) or screwed directly to a flat panel. Refer to the mechanical drawings below.

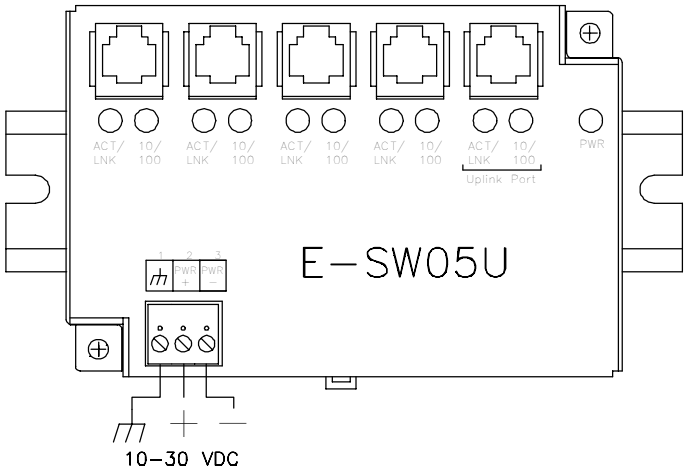


E-SW05U

Section 4 Power Wiring

Overview

The Industrial Ethernet Switch can be powered from the same DC source that is used to power your I/O devices. 10 to 30 VDC needs to be applied to terminals 2 and 3. Refer to the wiring diagram below.



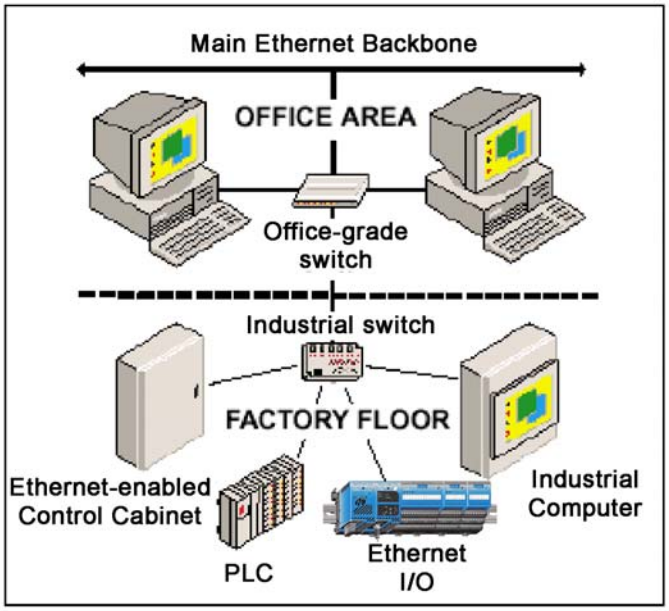
Screw Torque

The screw terminals should be tightened to a maximum 3.48 in-lbs (0.4 Nm).

Section 5 Ethernet Wiring

Overview

The Industrial Ethernet Switch provides connections to Ethernet devices on the factory floor. Typically the uplink port is used to connect to another Ethernet switch or hub that is connected to the main Ethernet backbone. The other four Ethernet ports are then connected to Ethernet devices such as PLCs, Ethernet I/O, or industrial computers. Electrical isolation is provided on the Ethernet ports for increased reliability. **Please follow normal 10/100BaseT(x) wiring practices when installing the Industrial Ethernet Switch.**



Typical Industrial Ethernet Switch Installation

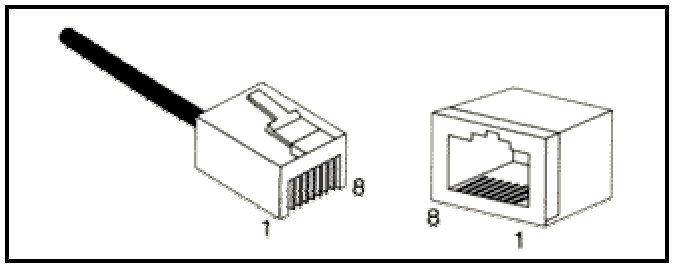
Ethernet RJ45 Wiring Guidelines

Ethernet RJ45 Cable Type

Use data-quality (not voice-quality) twisted pair cable rated category 5 with standard RJ45 connectors. For best performance use shielded cable. Please note that these cables are available as straight-thru or cross-over configurations. The following is a guide for when to use each type:

Ethernet Switch STANDARD Port to	Cable Type to Use		Ethernet Switch UPLINK Port to	Cable Type to Use
PC card	Straight-thru		PC card	Cross-over
Ethernet I/O	Straight-thru		Ethernet I/O	Cross-over
PLC	Straight-thru		PLC	Cross-over
Other Ethernet enabled devices	Straight-thru		Other Ethernet enabled devices	Cross-over
* Uplink port on another switch or hub	* Straight-thru (see note)		Standard port on another switch or hub	Straight-thru
*** Note:** Some Ethernet switches and hubs have a settable switch on their Uplink port that will change how the port is internally wired. Make sure this switch is set in the "To Hub/Switch (MDI)" position as opposed to the "To PC (MDI-X)" position.				

Straight-thru Cable Wiring			Cross-over Cable Wiring	
Pin 1	Pin 1		Pin 1	Pin 3
Pin 2	Pin 2		Pin 2	Pin 6
Pin 3	Pin 3		Pin 3	Pin 1
Pin 6	Pin 6		Pin 6	Pin 2



Ethernet Connector Pin Positions

Pin #	Assignment
1	TX+
2	TX-
3	RX+
6	RX-

Ethernet Connector Pin Assignments

Cable Distance

The maximum cable length for 10/100BaseT(x) is typically 100 meters (328 ft.). Refer to the following chart for some general guidelines.

From	To	Maximum Distance
Switch	**Switch** or Hub	100 meters (328 feet)
Switch or Hub	PLC, Ethernet I/O, PC, etc.	100 meters (328 feet)

Note: Hubs and Switches are different devices. Hubs simply broadcast all messages out all ports. Switches intelligently route messages only out the appropriate port. All the devices described in this manual are Switches.

Full or Half Duplex Operation

The RJ45 ports will auto-sense for Full or Half duplex operation. No user configuration is necessary.

Section 6 Switching Features

Switching Features

Here's a brief explanation of the features found in the Industrial Ethernet Switch documented by this manual.

10BaseT and 100BaseTx Autodetection

Standard Ethernet (10BaseT) has a maximum speed of 10 Mbps (megabits per second). Fast Ethernet (100BaseTx) has a maximum speed of 100 Mbps. The RJ45 ports on the Industrial Ethernet Switch automatically supports both types.

1.4 Gbps combined bandwidth

With full duplex and 100BaseTX communications, each port can provide a full 200 Mbps of data throughput.

1K MAC addresses with automatic learning, aging and migration

Each Ethernet device inserts its unique "MAC" address into each message it sends out. The port on the switch used for a given MAC address is automatically learned when a frame is received from that address. Once an address is learned, the switch will route messages to only the appropriate port, instead of broadcasting messages out all ports like a hub. A time stamp is also placed in memory when a new address is learned. This time stamp is used with the aging feature, which will remove unused MAC addresses from the table after 300 seconds. If a device moves, the associated port on the switch will be changed (migrated) as needed. Up to 1,024 MAC addresses can be stored and monitored at any time.

Auto-sensing speed and flow control

The RJ45 ports of the Industrial Ethernet Switch will auto-negotiate with the connected device to determine the optimal speed (10 Mbps vs. 100 Mbps) and flow control for each port.

Automatic power saving

If there is no cable on a port, most of the circuitry for that port is disabled to save power.

Backoff operation

The Industrial Ethernet Switch will drop a packet after 16 collisions.

Back pressure for half-duplex

The Industrial Ethernet Switch will apply "back pressure" when necessary with half-duplex operation. This "back pressure" will reduce congestion on busy networks.

Broadcast storm protection

Broadcasts and multicasts are limited to 25% of the available bandwidth.

Buffering

SRAM is used for buffering the messages. There are 1024 (128 bytes each) buffers available. Each port is allocated 205 buffers.

Unmanaged operation
The Industrial Ethernet Switch requires no supervisory processor to operate properly.

Flow control
The Industrial Ethernet Switch automatically supports flow control frames on both the transmit and receive sides.

Forwarding
The Industrial Ethernet Switch supports store and forward mode. It will forward messages with known addresses out only the appropriate port. Messages with unknown addresses, broadcast messages, and multicast messages will get forwarded out all ports except the source port. The Industrial Ethernet Switch will not forward error packets, 802.3x pause frames, or "local" packets.

Full/Half duplex operation
The RJ45 ports of the Industrial Ethernet Switch automatically support (auto-sense) both full and half duplex flow control.

Illegal frames
Illegal frames as defined by IEEE 802.3 will be dropped. This includes short frames, long frames, and FCS error frames.

IEEE 802.3 compliant
The Industrial Ethernet Switch strictly abides to the IEEE 802.3 standard for 10BaseT and 100BaseTX Ethernet communications.

Late collision
If a packet experiences collisions after 512 bit times of transmission, the packet will be dropped.

Plug and play
This means that most functions or features of the Industrial Ethernet Switch are automatic and that there are minimal or no optional parameters that need to be set. Just plug in your Ethernet cables, apply power, and the unit will immediately begin to operate.

Protocol independent
The Industrial Ethernet Switch will work with all popular Ethernet protocols and networks such as TCP/IP, the Internet (IP), UDP, NetBEUI, IPX, and many more. It is compatible with all protocols that run over standard Ethernet (IEEE 802.3). In fact, it will support packets of different protocols simultaneously.

Section 7
Technical Specifications

Technical Specifications

Here are the technical specifications for the Industrial Ethernet Switch covered by this manual.

10/100BaseT(x) Ports:	
10/100BaseT(x) ports	Shielded RJ45
Protocols supported	All standard IEEE 802.3
Ethernet compliancy	IEEE 802.3
Auto-sensing operation	Full and half duplex
Auto-negotiating	10BaseT and 100BaseTX
Flow control	Automatic
Ethernet isolation	1200 VRMS 1 minute
Plug and play	Yes
Cable requirements	Twisted pair (Cat. 5) (shielded recommended)
Max. cable distance	100 meters
General:	
Forwarding mode	Store and forward
Memory bandwidth	1.4 Gbps
MAC addresses	1K
Address learning	Automatic
Address aging	Remove old address after 300s
Address migration	Automatic
Backoff operation	Drops after 16 collisions
Back pressure	Automatic for half-duplex
Buffering	205 buffers per port (128 bytes per buffer)
Illegal frames	Dropped per 802.3
Late collisions	Dropped after 512 bit times
Environmental:	
Required supply voltage	10 – 30 VDC
Power consumption	1.9 W
Power saving	Automatic
Max. screw terminal torque	5 port switch: 3.48 in-lbs (0.4 Nm).
Max. wire gauge	12 AWG
Operating temp. range	-40 to 85 C
Storage temp. range	-40 to 85 C
Humidity	5 to 95 % (non-condensing)
Flammability	UL 94V-0 materials
Electrical safety	UL508, CSA C22/14; EN61010-1 (IEC1010), CE
EMI emissions	FCC part 15, ICES 003, EN55022; Class B; CE
EMC immunity	EN61326-1 (EN61000-4-2, 3, 4, and 6), CE
Surge withstand	IEEE-472 (ANSI C37.90)
Vibration	IEC68-2-6
Hazardous locations	UL1604, CSA C22.2/213 (Class 1, Div. 2), Cenelec EN50021 (Zone 2)
Dimensions	3.25” x 4.75”
Mounting	DIN rail or panel direct