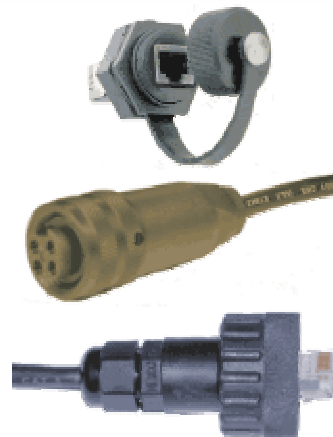


User Manual

8-port IP67 Ethernet Real-time Switch & Accessories



Contents at a Glance:

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Applicable standards and certifications:



This manual applies to the following products:

- EB-GT-8ES-#** (IP67 Industrial Ethernet Switch)
- EB-CP-RJ45-F#** (IP67 RJ45 to RJ45 Passthru Bulkhead Connector)
- EB-CC-CAT5-M#** (IP67 Field Installable RJ45 Connector)
- EB-CC-PS-F#** (IP67 Field Installable Power Connector)
- EB-CC-CAP-L#** (IP67 Protective Cap with Tether)

SIXNET Protected Technology Policy:

SIXNET protects your investment in SIXNET systems with long-term planned technology and our unique Protected Technology Policy. We will continue to support the specified capabilities of standard SIXNET products for at least five years. We plan each product improvement and new feature to be upward compatible with existing designs and installations. Our goals are to make each new software release bring new power to your SIXNET systems and have every existing feature, applications program and data file continue to work. We protect your investment even further with a liberal five-year trade-in policy. Exchange standard products for upgraded versions of the same product to take advantage of new features and performance improvements at any time for five years. A prorated trade-in allowance will be given for your existing equipment. SIXNET protects your long-term productivity with state-of-the-art planned technology and continued support.

SIXNET Statement of Limited Warranty:

SIXNET LLC, manufacturer of SIXNET products, warrants to Buyer that products, except software, manufactured by SIXNET will be free from defects in material and workmanship. SIXNET' obligation under this warranty will be limited to repairing or replacing, at SIXNET' option, the defective parts within one year of the date of installation, or within 18 months of the date of shipment from the point of manufacture, whichever is sooner. Products may be returned by Buyer only after permission has been obtained from SIXNET. Buyer will prepay all freight charges to return any products to the repair facility designated by SIXNET. This limited warranty does not cover losses or damages which occur in shipment to or from Buyer or due to improper installation, maintenance, misuse, neglect or any cause other than ordinary commercial or industrial applications. In particular, SIXNET makes no warranties whatsoever with respect to implied warranties of merchantability or fitness for any particular purpose. All such warranties are hereby expressly disclaimed. No oral or written information or advice given by SIXNET or SIXNET's representative shall create a warranty or in any way increase the scope of this warranty. This limited warranty is in lieu of all other warranties whether oral or written, expressed or implied. SIXNET's liability shall not exceed the price of the individual units, which are the basis of the claim. In no event shall SIXNET be liable for any loss of profits, loss of use of facilities or equipment, or other indirect, incidental or consequential damages.

INSTALLATION AND HAZARDOUS AREA WARNINGS:

These products should not be used to replace proper safety interlocking. No software-based device (or any other solid-state device) should ever be designed to be responsible for the maintenance of consequential equipment or personnel safety. In particular, SIXNET disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in any application.

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.

- WARNING (EXPLOSION HAZARD) -** SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.
- WARNING (EXPLOSION HAZARD) -** WHEN IN HAZARDOUS LOCATIONS, DISCONNECT POWER BEFORE REPLACING OR WIRING UNITS.
- WARNING (EXPLOSION HAZARD) -** DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

FCC Statement:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and receiver; Connect the equipment into an outlet on a circuit different from that to which the receiver is connected; Consult the dealer or an experienced radio/TV technician for help.

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Note: All information in this document is subject to change without notice.

Section 1

Overview

General Information

This manual will help you install and maintain the IP67 Industrial Ethernet Switch and accessories. 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 IP67 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 IP67 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 Specs

These general specifications apply to the IP67 Industrial Ethernet Switch. Refer to Section 7 for complete technical specifications.

Ports	10/100BaseT(x) (Shielded RJ45)
Required Voltage	10 - 30 VDC (-1) ; +/-16-40 VDC (-1EP)
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 Mbps (half duplex) or 200 Mbps (full duplex)
Ethernet Isolation	1500 Volts RMS (for 1 minute)
Operating Temp.	-40 to 70 °C (-1) ; -40 TO 60°C (-1EP)
Humidity	5 to 100% RH
Vibration	IEC 68-2-6 or better (completely potted design for max. resistance)

Standards and Safety

The IP67 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 IP67 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 IP67 Industrial Ethernet Switch has communication LEDs for each port and a power LED.

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 IP67 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. (The fiber optic port does not have one of these LEDs because its speed is fixed at 100 Mbps.)

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

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

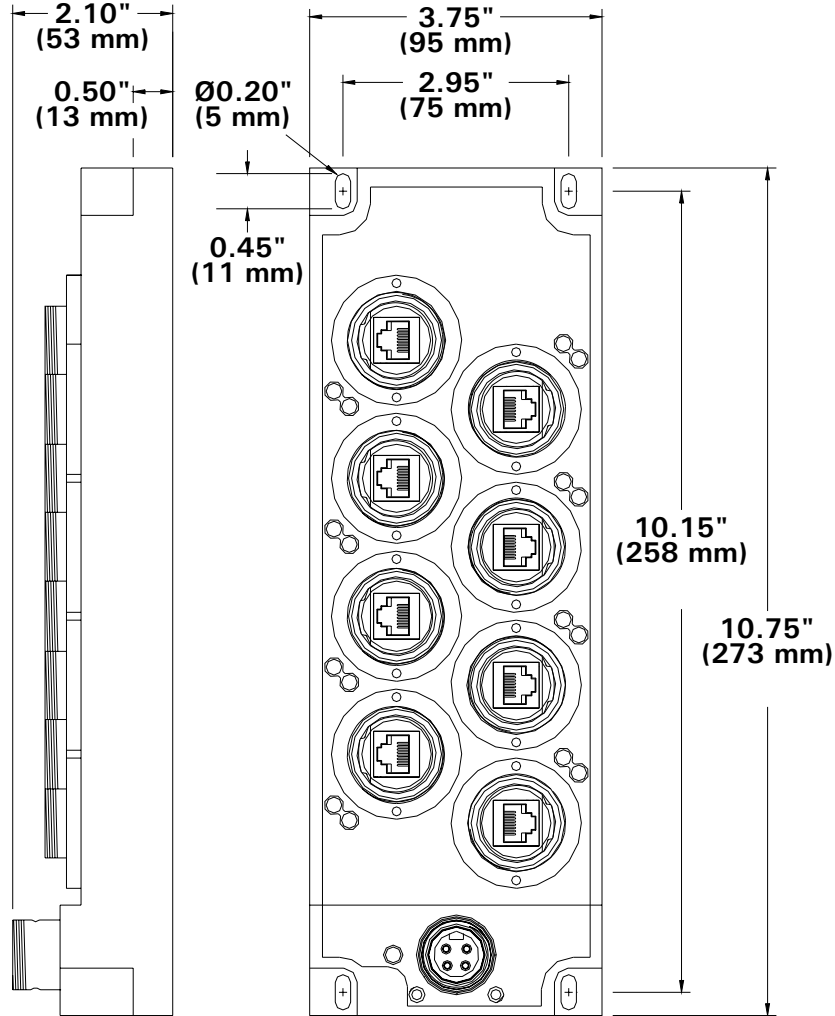
(Mbps = Megabits per Second)

Section 3

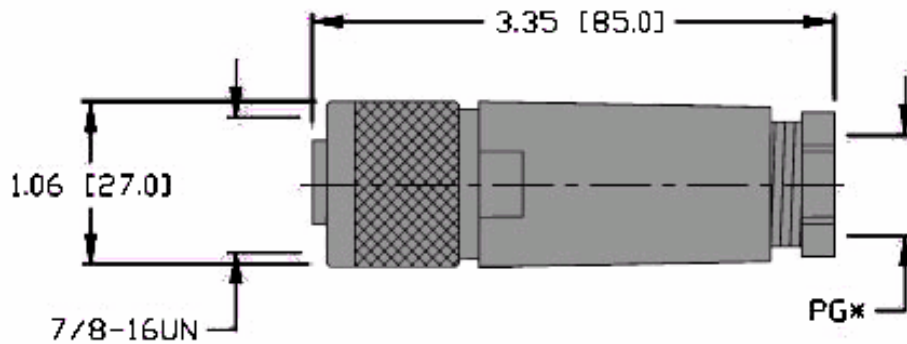
Dimensions and Installation

Overview

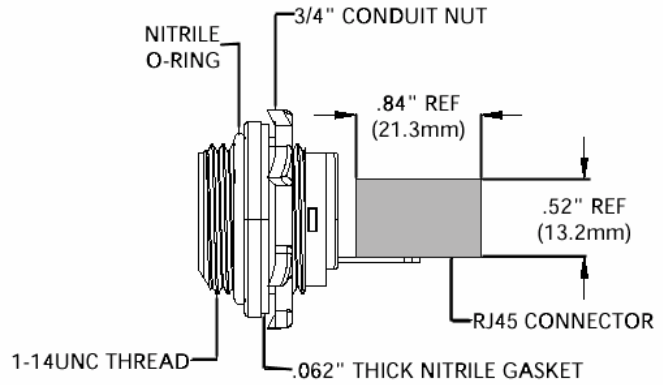
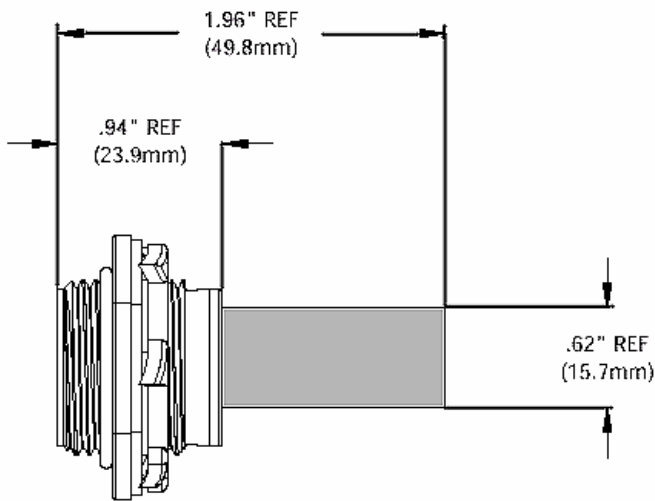
The IP67 Industrial Ethernet Switch is waterproof and therefore can be mounted directly to any flat surface. Refer to the mechanical drawings below.



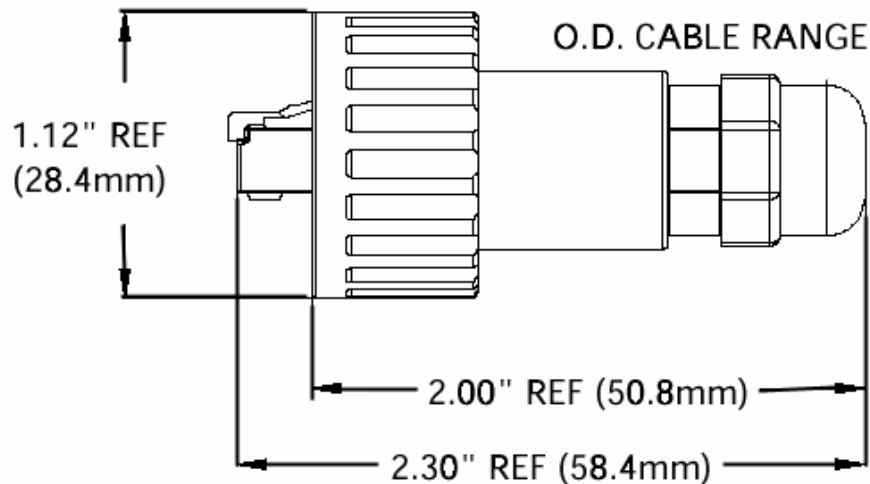
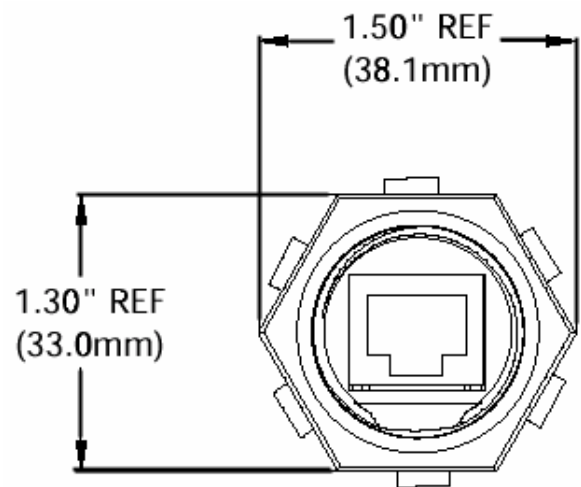
EB-GT-8ES-# (IP67 Industrial Ethernet Switch)



EB-CC-PS-F# (Field Installable IP67 Power Connector)



EB-CP-RJ45-F#
(RJ45 to RJ45
IP67 Bulkhead
Passthru Connector)
(Required hole size = 1.063" (27mm))



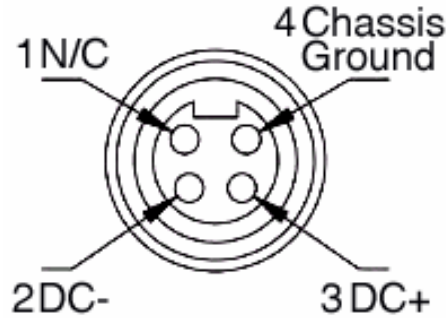
EB-CC-CAT5-M#
(Field Installable IP67 RJ45 Connector)

Section 4

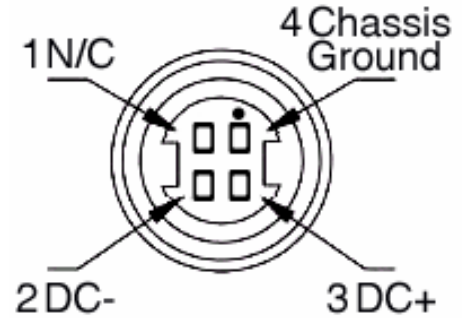
Power Wiring

Overview

The IP67 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 the mating DC power connector (supplied with the switch). The integrated screw terminals can accept up to 16 AWG wire. Refer to the wiring diagrams below.



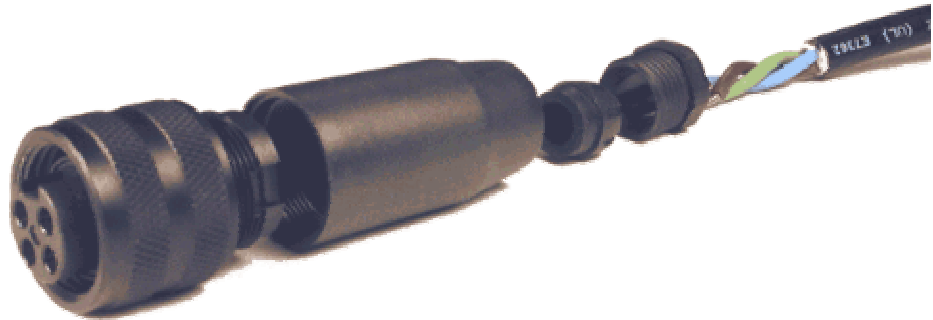
**Male Power Connector
on Switch**



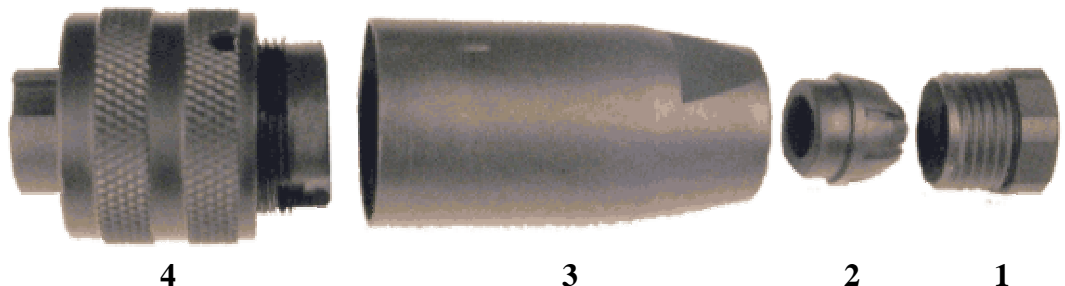
**Screw Terminal Side of Field
Installable Power Connector**

Connector Assembly

The assembly of the field installable power connector (EB-CC-PS-F1) requires no special tools, just a standard small slotted screwdriver. The power cable should be between 6 and 8 mm in diameter.



Simply install the components in the order shown below. First, strip off 1/4" of the plastic sheathing on each conductor of your power cable. Tightly twist stranded cable so there are no loose strands. Second, slide component 1, then 2, then 3 over your power cable in the orientation shown below. Keep these first 3 components loose. Do not tighten them yet. Third, using the integrated screw terminals, attach component 4 to the appropriate conductors of your power cable. Refer to the wiring diagram above. Fourth, screw component 3 to component 4. Finally, slide component 2 into component 3 and then screw component 1 to component 3. You now have a watertight IP67 power connector.

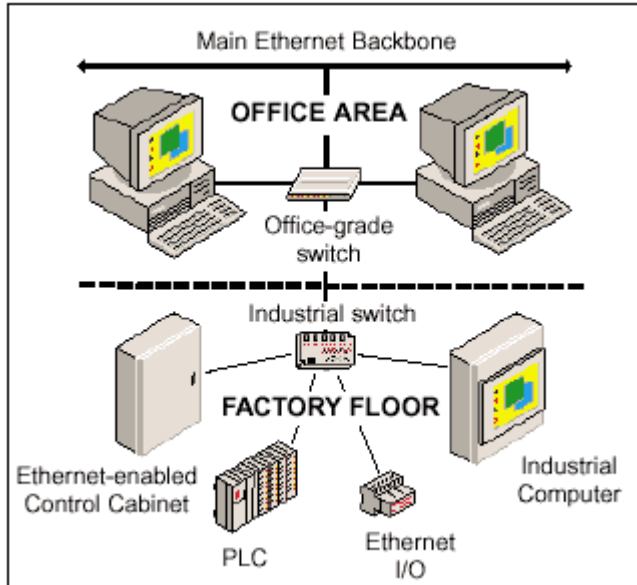


Section 5

Ethernet Wiring

Overview

The IP67 Industrial Ethernet Switch provides connections to Ethernet devices on the factory floor. Any uplink port can be used to connect to another Ethernet switch or hub that is connected to the main Ethernet backbone. The other 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) & 100BaseFX wiring practices when installing the IP67 Industrial Ethernet Switch.**



Typical Industrial Ethernet Switch Installation

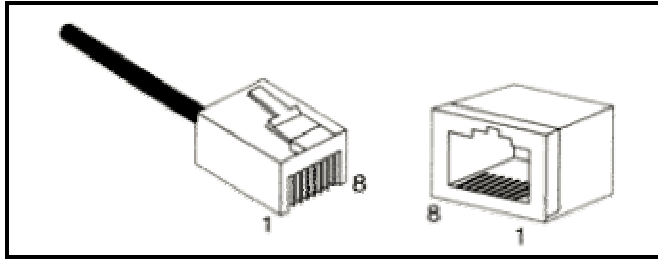
Ethernet RJ45 Wiring Guidelines

Ethernet RJ45 Cable Type

Use data-quality (not voice-quality) twisted pair cable rated category 5. For best performance use shielded cable. Please note that these cables are available or can be wired as straight-thru or cross-over configurations.

For connections to the IP67 switch, either cable type will work because the IP67 switch supports auto-cross-over (auto-mdi/mdix) and will auto-detect the cable and adjust accordingly.

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

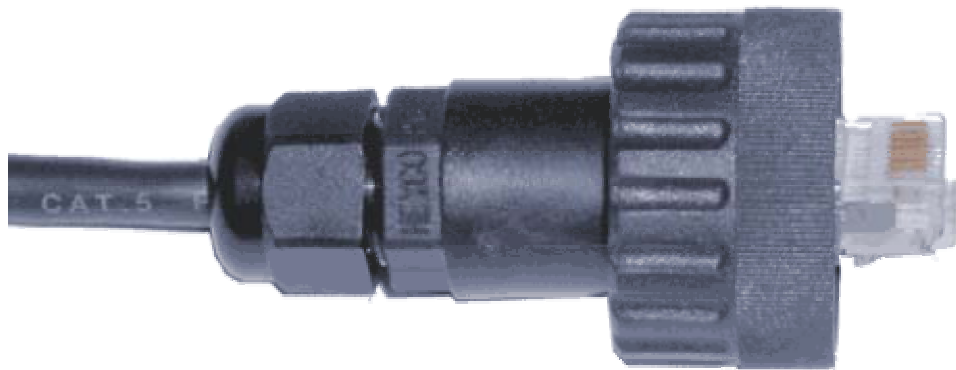
The maximum cable length for 10/100BaseT(x) is typically 100 meters (328 ft.). Refer to the following chart for some general guidelines.

From	To	Maximum Distance
Switch	Switch or Hub	100 meters (328 feet)
10Mbps Hub	10Mbps Hub	100 meters (328 feet)
Switch or Hub	PLC, Ethernet I/O, PC, etc.	100 meters (328 feet)

Note: Hubs and Switch are different devices. Hubs simply broadcast all messages out all ports. Switch intelligently route messages only out the appropriate port. **The device described in this manual is a Switch.**

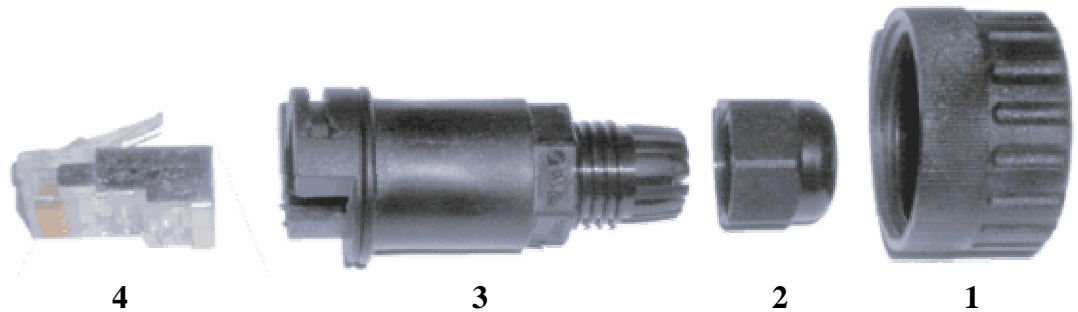
Field Installable RJ45 Connector

The field installable RJ45 connector (EB-CC-CAT5-M#) is easy to install. A standard RJ45 crimping tool is required. Follow the instructions that come with the tool on how to attach the supplied RJ45 connector to your Ethernet cable. Category 5E cable is highly recommended. See the upcoming instructions for exact details on how to assemble this connector.



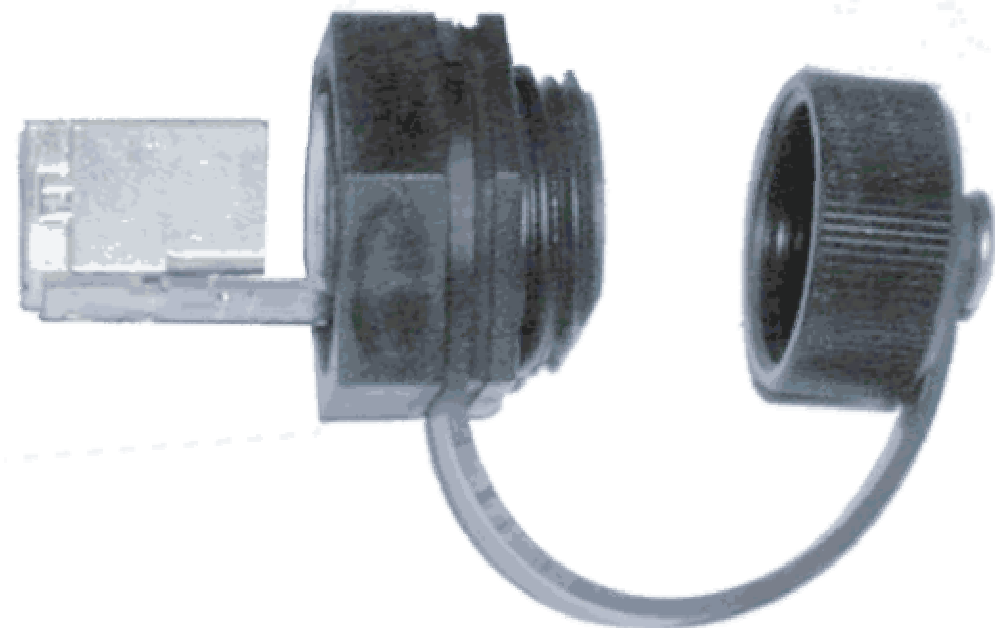
Simply install the components in the order shown below. First, slide the o-ring over component 3 if it isn't already. Second, slide component 1, then 2, then 3 over your un-terminated Ethernet cable in the orientation show below. Keep these first 3 components loose. Do not tighten them yet. Third, using your crimping tool, attach the supplied RJ45 connector to your Ethernet cable. Follow the instructions that come with your crimping tool. Fourth, push the attached RJ45 connector firmly into component 3. Fifth, firmly screw component 2 to component 3. Finally, slide component 1 up over component 3. You now have a watertight IP67 RJ45 Ethernet connector.

Note: You may have also been supplied a "C" retaining clip. It's recommended that you test your cable before installing this retaining clip to component 3.



Bulkhead Connector

The RJ45 to RJ45 passthru bulkhead connector is also simple to install. First, punch a 1.063" (27 mm) diameter (3/4" conduit punch out) hole in your cabinet or panel. Remove the 3/4" conduit nut. If you are going to install the tethered cap (supplied) then also remove the rubber gasket. Slide the integrated-gasket end of the tether over where the original gasket was located. It's not recommended to use both gaskets at the same time. Insert the assembly into your hole (punch out) from the outside. Then firmly screw on the 3/4" conduit nut from the inside. Recommended tightening torque is 6 in-lbs (.07 kg-m). You now have a watertight IP67 RJ45 to RJ45 passthru connector.



Section 6

Switching Features

Switching Features

Here are brief explanations of the features found in the IP67 Industrial Ethernet Switch documented by this manual.

10BaseT and 100BaseTx Auto-detection

Standard Ethernet (10BaseT) has a maximum speed of 10 Mbps in half duplex mode. Fast Ethernet (100BaseTx) has a maximum speed of 200 Mbps in full duplex mode. The RJ45 ports on the IP67 Industrial Ethernet Switch will automatically select the appropriate speed.

2.0 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-crossover (auto-mdi/mdix)

The RJ45 ports will automatically detect the cable type (straight-thru vs. cross-wired) and re-configure themselves accordingly.

Auto-sensing or auto-negotiating speed

The RJ45 ports of the IP67 Industrial Ethernet Switch will auto-negotiate with the connected device to determine the optimal speed (10 Mbps vs. 100 Mbps) 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 IP67 Industrial Ethernet Switch will drop a packet after 16 collisions.

Back pressure for half-duplex

The IP67 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

Broadcast messages are limited to 5% of the available bandwidth. Unicast and multicast messages are not limited.

Buffering

SRAM is used for buffering the messages. There are 1024 (128 bytes each) buffers available. Each port is allocated 113 buffers.

Unmanaged operation

The IP67 Industrial Ethernet Switch requires no supervisory processor to operate properly.

Flow control

The IP67 Industrial Ethernet Switch automatically supports flow control frames on both the transmit and receive sides.

Forwarding

The IP67 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 IP67 Industrial Ethernet Switch will not forward error packets, 802.3x pause frames, or “local” packets.

Full/Half duplex operation

The RJ45 ports of the IP67 Industrial Ethernet Switch support 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 IP67 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.

Latency

The typical latency of a message is 5 microseconds or faster. The latency is the time it takes a message to be routed internal to a switch from one port to another.

Plug and play

This means that most functions or features of the IP67 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 IP67 Industrial Ethernet Switch will work with all popular Ethernet protocols and networks such as TCP/IP, the Internet (IP), UDP, NetBEUI, 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 IP67 Industrial Ethernet Switch covered by this manual.

Industrial Ethernet Switch: EB-GT-8ES-1	
10/100BaseT(x) Ports:	
10/100BaseT(x) ports	Shielded RJ45
Protocols supported	All standard IEEE 802.3
Ethernet compliancy	IEEE 802.3
Auto-mdi/mdix crossover	All 8 ports
Auto-negotiating speed	10BaseT or 100BaseTX
Flow control	Half or Full Duplex
Ethernet isolation	1500 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
Latency (typical)	5 usec (time to route a message from one port to another internal to switch)
Memory bandwidth	2.0 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
Broadcast storm protection	Limits to 5% of bandwidth
Buffering	113 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 (-1) ; +/- 16-40 VDC (-1EP)
Power consumption	4.0 W Typical
Power saving	Automatic
Operating temp. range	-40 to 70° C (-1) ; -40 TO 60°C (-1EP)
Storage temp. range	-40 to 85° C
Humidity	5 to 100 % RH
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
Vibration	IEC68-2-6
Hazardous locations	UL1604, CSA C22.2/213 (Class 1, Div. 2), Cenelec EN50021 (Zone 2)
Environmental Rating	IEC IP67 and NEMA 6
Weight	2.5 lbs.

RJ45 to RJ45 Passthru Bulkhead Connector: EB-CP-RJ45-F# (includes cap with tether)	
Gasket Material	Nitrile Rubber
Insert Material	Acrylonitrile-Butadiene-Styrene (ABS)
Overmold Material	Polyurethane
Coupling Nut Material	Acrylonitrile-Butadiene-Styrene (ABS)
Shell Material	Acrylonitrile-Butadiene-Styrene (ABS)
Knockout Hole	1.063
Thread Size	UNC 1" - 14"
Operating Temperature	-40° to 85° C
Return Loss	5 Db @ 100 Mhz
Environmental Rating	IEC IP67 and NEMA 6
TIA/EIA Rating	Category 5e
Jacks	RJ-45
Plating	50 Microns of Gold over 100 Microns Of Nickel
Current Rating	1.5 A
Voltage Rating	125V DC
Recommended Tightening Torque	6 in-lbs (.07 kg-m)

Field Installable RJ45 Connector: EB-CC-CAT5-M#	
O-Ring Material	Nitrile Rubber
Insert Material	Acrylonitrile-Butadiene-Styrene (ABS)
Overmold Material	Polyurethane
Coupling Nut Material	Acrylonitrile-Butadiene-Styrene (ABS)
Shell Material	Acrylonitrile-Butadiene-Styrene (ABS)
Thread Size	UNC 1" - 14
Recommended cable diameter	Accepts 4 - 6 mm Cable
Operating Temperature	-40° to 85° C
Environmental Rating	IEC IP67 and NEMA 6

Field Installable Power Connector: EB-CC-PS-F#	
Housing	Glass Filled Nylon
Connector	Pur.
Contacts	Brass, Gold over Nickel Plating
Coupling Nuts	Anodized Aluminum
Conductors	Accepts Up To 16 AWG
Ratings	600V, 9A
PG 9 Cable Gland	Accepts 6 - 8 mm Cable
Operating Temperature	-40 to +85°C
Environmental Rating	IEC IP67 and NEMA 6

Protective Cap with Tether: EB-CC-CAP-L# (for use with IP67 switch; not for use with bulkhead)	
Tether/Gasket Material	Nitrile Rubber
Coupling Nut Material	Acrylonitrile-Butadiene-Styrene (ABS)
Thread Size	UNC 1" - 14
Operating Temperature	-40° to 85° C
Environmental Rating	IEC IP67 and NEMA 6

Section 8

Service Information

Service Information

We sincerely hope that you never experience a problem with any **SIXNET** product. If you do need service, call **SIXNET** at (518) 877-5173 and ask for Applications Engineering. A trained specialist will help you to quickly determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RMA (Return Material Authorization) number will be given to you.

SIXNET tracks the flow of returned material with our RMA system to ensure speedy service. You must include this RMA number on the outside of the box so that your return can be processed immediately.

The applications engineer you are speaking with will fill out an RMA request for you. If the unit has a serial number, we will not need detailed financial information. Otherwise, be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RMA form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Normally, repairs are completed in two days. Sometimes difficult problems take a little longer to solve.

If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery. Many repairs received by mid-morning (typical overnight delivery) can be finished the same day and returned immediately.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:

Please fill in the following and keep this manual with your **SIXNET** system for future reference:

P.O. #: _____ Date Purchased: _____

Purchased From: _____

Product Support

To obtain support for **SIXNET** products:

On-line support: www.get2support.com

Order on-line: www.industrialmodem.com

Latest product info: www.sixnetio.com

Phone: +1 (518) 877-5173

Fax: +1 (518) 877-8346

E-mail: support@sixnetio.com

Mailing address: **SIXNET**, 331 Ushers Road, P.O. Box 767, Clifton Park, NY 12065