EISC Series

Ethernet Configurable Switch Hubs

CTRLink®

User Manual

TD021000-0MB

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EQUIPMENT
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Disclaimer

Contemporary Control Systems, Inc. reserves the right to make changes in the specifications of the product described within this manual at any time without notice and without obligation of Contemporary Control Systems, Inc. to notify any person of such revision or change.

WARNING — This is a Class A product as defined in EN55022.
In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

1 Table of Contents

2 Introduction

The EISC configurable switch in the CTRLink® family provides capabilities beyond those found in standard Plug and Play (PnP) switches. Besides conventional features (auto-negotiation, 10/100 Mbps data rate, half- or full-duplex operation, flow control), the EISC has advanced features such as VLAN, trunking, Quality of Service (QoS) and a programmable fault relay that can be connected to a supervisory system. Individual port parameters can be configured by a Windows-based workstation. Ports can also be monitored using the Modbus protocol, making it easy to interface the EISC with supervisory control equipment. These features and more, make the EISC one of the most versatile of Industrial Ethernet switches available.

The EISC boasts advanced features typically available only in high-end switches.

VLAN allows the physical network to be configured as multiple virtual local area networks — limiting broadcast/multicast domains and improving performance.

Trunking allows ports to be associated in groups of four — each group functioning as a high-speed backbone to another EISC configurable switch.

QoS provides message priority with any of three schemes: port-based priority, IP packet or Diff/Serv priority (RFC 2474) or IEEE 802.1p priority.

Programmable Fault Relay provides a dry contact to a supervisory system if the switch senses a condition such as the loss or addition of a link.

Configuration is typically done through a console port connected to a Windows-based configuration program included with the product. Modbus protocol and register information are also provided so the switch can be configured or monitored by a Modbus master device. Port parameters (data rate, duplex, flow control) can be pre-set via the console port or auto-negotiated. And a unique feature displays a dynamic signal strength bar graph for each port.

Each port supports the PAUSE function for full-duplex links, and uses the backpressure scheme for half-duplex segments.

The EISC is powered from wide-range, low-voltage AC or DC sources — and redundant power connections are available for backup considerations. It comes with the ability for either DIN-rail or panel mounting. The switch front panel features a power LED, a Fault Relay LED and bi-color LEDs for the link status, activity, and data rate of each port.

3 Versions of the EISC

Figure 1 — The EISC Family

4 Specifications

4.1 Electrical

	DC	AC
Input Voltage	10-36 VDC	8-24 VAC
Input Power (max)	10 W	10 VA
Input Frequency	N/A	47-63 Hz
Fault Relay Contacts	24 V, 500 mA (max)	

4.2 Environmental

Operating Temperature	0°C	to	+60°C	
Storage Temperature	–40°C	to	+85°C	
Humidity	10%	to	95%	Non-Condensing

4.3 Functional

Operating Systems for
EISC Configurator : Windows 98/ME/2K/XP

Aging (typical) 300 seconds

Connectors :	Type	Function	Attached Wiring
	RJ-45, shielded	Fieldbus	Category 5
	DB-9	Console	Null-Modem Cable
	Screw, 2-terminal	Fault Relay	16-22 AWG, solid
	Screw, 4-terminal	Power	16-22 AWG, solid

LED Indicators :	Function	Color
	Power	Green
	Link/Activity	Green/Yellow
	Status	Green/Yellow

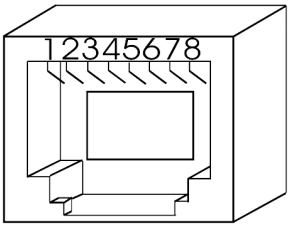
Flow Control :	Half-Duplex	Full-Duplex
	Backpressure	PAUSE (IEEE 802.3x)

Transceiver Parameters :	Twisted-Pair	Fiber
Signaling	10BASE-T/100BASE-TX	100BASE-FX, 1300 nm
Data Rates	10/100 Mbps	100 Mbps
Port Count	16 or 10	0 or 2
Connectors	RJ-45, shielded	SC or ST
Segment length (max)	100 m	2 km, multimode 15 km, single mode

4.4 RJ-45 Connector Pin Assignments

PIN	MDI-X	Port 16X
1	TD+	RD+
2	TD–	RD–
3	RD+	TD+
6	RD–	TD–

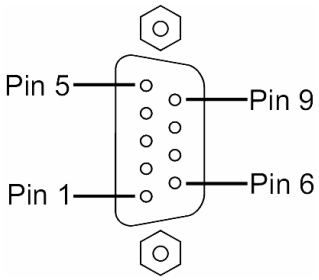
(All other pins are unused.)



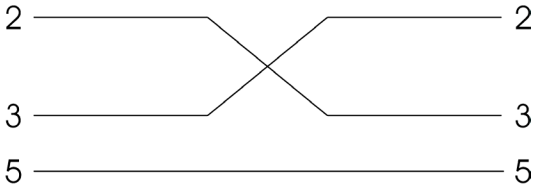
4.5 Console Port (EIA-232) Pin Assignments

PIN	Signal	Function
2	RXD	Receive Data
3	TXD	Transmit Data
5	GND	Ground

(All other pins are unused.)



Null Modem Cable



4.6 Console Port (EIA-232) Communication Parameters

Baud Rate	9600 bps
Data Bits	8
Parity	No Parity
Stop Bit	1

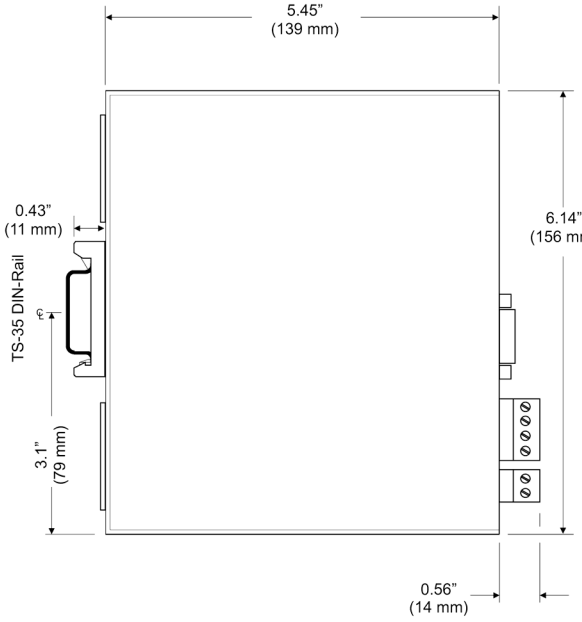
4.7 Compliance

Compatibility	Compliant with ANSI/IEEE 802.3
Regulatory Compliance	CE Mark FCC Part 15 Class A UL 508 Listed, Industrial Control Equipment

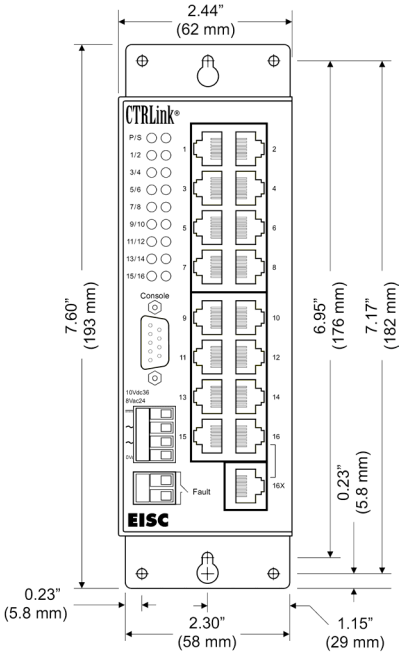
Regulatory Compliance Standards			
Standard	Test Method	Description	Test Levels
EN 55024	EN 61000-4-2	Electrostatic Discharge	6 kV Contact
EN 55024	EN 61000-4-3	Radiated Immunity	10 V/m 80 MHz to 1 Ghz
EN 55024	EN 61000-4-4	Fast Transient Burst	1 kV Clamp & 2 kV Direct
EN 55024	EN 61000-4-5	Voltage Surge	1 kV L to L & 2 kV L to Earth
EN 55024	EN 61000-4-6	Conducted Immunity	10 Volts (rms)
EN 55024	EN 61000-4-11	Voltage Dips & Interruptions	1 to 5 Seconds @ 100% Dip 1 Line Cycle @ 100% Dip
EN 55022	CISPR 22	Radiated Emissions	Class A
EN 55022	CISPR 22	Conducted Emissions	Class B

4.8 Mechanical

4.8.1 16-Port Version



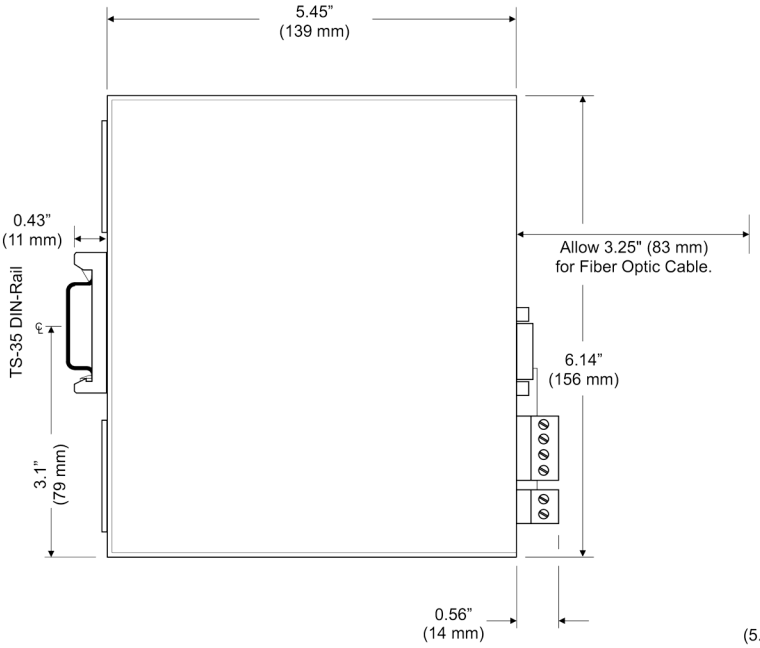
Side View showing DIN-rail Clip
(Mounting Brackets Retracted)



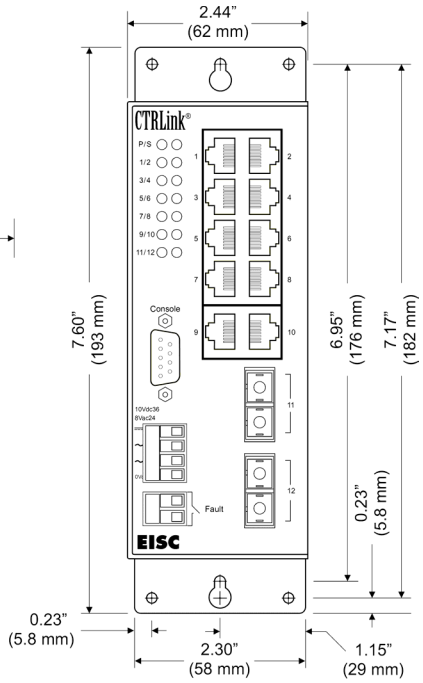
Front View with
Mounting Brackets Extended

4.8.2 12-Port Version

Dimensions of EISC12-100T/FC (below) match those of EISC12-100T/FT.



Side View showing DIN-rail Clip
(Mounting Brackets Retracted)



Front View with
Mounting Brackets Extended

5 Installation

5.1 Hardware

5.1.1 Mounting

The EISC is designed for mounting in an industrial enclosure or wiring closet using either set of the provided mounting hardware listed below:

TS-35 DIN-rail Mounting
DIN-rail clip
DIN-rail clip support bracket
4-40 screws, pan-head (2)

Panel Mounting
Panel mounting bracket
4-40 screws, flat-head (4)

For quick snap-mounting to 35 mm DIN-rail, a reinforced DIN-rail clip is pre-attached to the back of the EISC enclosure with two #4-40 pan-head screws. If the clip is removed, the EISC can be panel-mounted by extending the top and bottom brackets which are shipped in retracted position. The extended brackets can then anchor the EISC to a wall or other flat vertical surface with two #8 pan-head screws (not provided). The left illustration of Figure 2 shows a rear view of the EISC with brackets in retracted position. The right illustration of Figure 2 shows the brackets extended and secured to the EISC enclosure with the same screws used in retracted position.

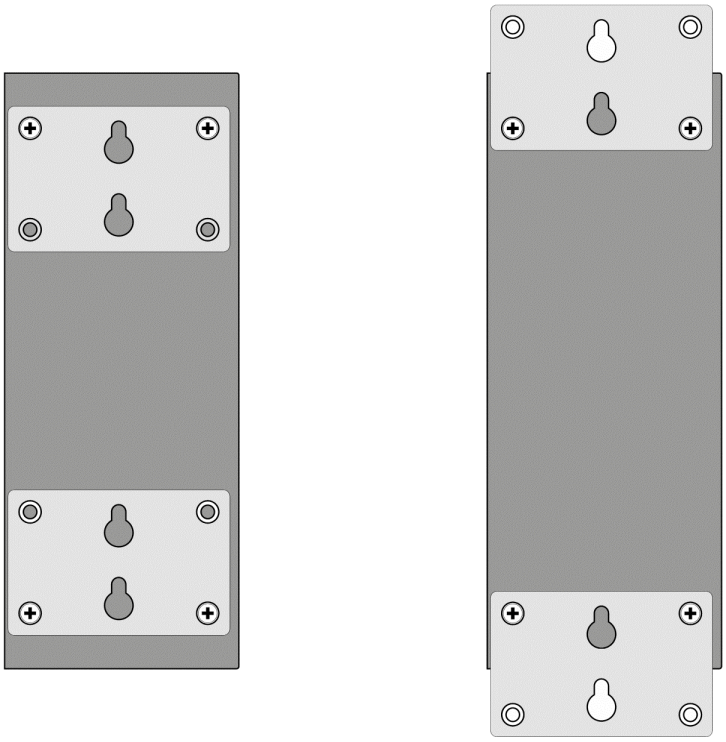


Figure 2 — Using the Panel-Mounting Brackets

5.1.2 Connecting to Power

The EISC requires power via its four-pin connector. The keyed plug is removable and is included with the switch. The applied voltage may be either AC or DC. For power requirements, consult the specifications. Conductors in the range of 12–24 AWG are secured in the plug by screw terminals. The various power options are explained below.

NOTE: **This device is intended for use with Class 2 circuits.**

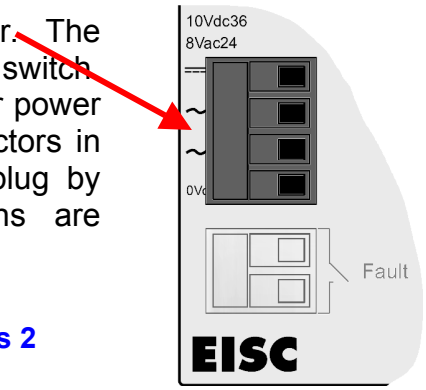


Figure 3 — The Power Connector

5.1.2.1 DC Powered

The EISC accepts a voltage range of 10-36 VDC and draws a value of current commensurate with 12-watt power consumption. Power conductors should be sized accordingly. Ground is directly connected to zero volts and the equipment chassis is isolated from zero volts. The input connections are reverse-polarity protected.

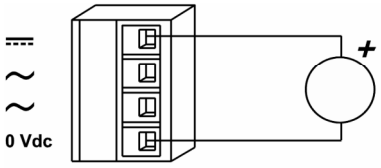


Figure 4 — DC Powered

5.1.2.2 Redundant DC Powered

Redundant diode-isolated DC power inputs are provided so the EISC can operate despite the loss of primary power. Both sources must provide 12 watts of power.

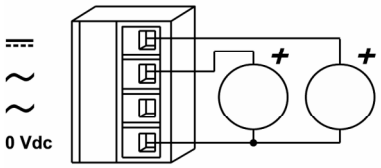


Figure 5 — Redundant DC Powered

5.1.2.3 AC Powered

The EISC can be powered by an AC voltage in the range of 8-24 V capable of delivering 12 VA of apparent power. Two auxiliary power supplies are available: The AI-XFMR is for use with 120 VAC. The AI-XFMR-E is for use with 230 VAC.

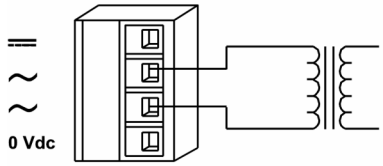


Figure 6 — AC Powered

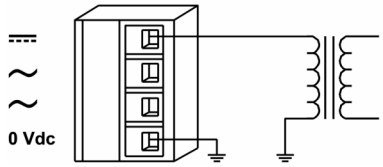


Figure 7 — AC Powered with Grounded Secondary

5.1.2.4 AC Powered with Battery Backup

The EISC can also operate in the AC mode with a backup battery providing power, if the AC source fails. The EISC does NOT charge the battery, so separate provisions are required for charging.

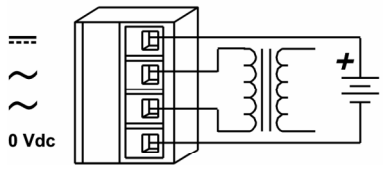


Figure 8 — AC Powered with Battery Backup

5.1.3 Connecting to the Network

When attaching network cables to the EISC, Table 1 should be considered.

Medium	Signaling and Data Rate	Minimum Required Cable	Maximum Segment Distance
Copper	10BASE-T 10 Mbps	Category 3 UTP	100 m (328 ft)
Copper	100BASE-TX 100 Mbps	Category 5 UTP	100 m (328 ft)
Fiber	100BASE-FX 100 Mbps	1300 nm, multimode 50/125 or 62.5/125 m	2 km (6562 ft) **(Full-Duplex only)**
Fiber	100BASE-FX 100 Mbps	1300 nm, single-mode	15 km (49213 ft) **(Full-Duplex only)**

Table 1 — Cabling Considerations

Observe in Table 1 that segment distance is very limited when using copper media — regardless of the data rate. Although 10BASE-T segments can successfully use Category 3, 4 or 5 cable, 100BASE-TX segments *must* use Category 5 or higher cable.

A popular choice for improved distance is fiber—which also gives good electromagnetic noise immunity and optimum protection from lightning strikes. Considerable distance can be achieved in multimode—and the greatest distance can be realized with single-mode fiber.

Note: The EISC allows fiber operation in full-duplex mode only.

The EISC switch supports RJ-45 field connectors. All are wired MDI-X — allowing DTE equipment to connect via straight-through cables — except Port 16X, which is wired MDI to permit the cascading of switches without the need of a crossover cable.

Note: Port 16 and Port 16X may NOT be used at the same time.

5.1.4 Connecting to the Configuring Device

If advanced operation is to be implemented, the **Console** port must be connected via a null-modem cable to a machine that is capable of configuring or monitoring the EISC.

5.1.5 Connecting to the Fault Relay

In advanced operation, the Fault Relay is available for use. To monitor the Fault Relay, connect a supervisory machine to the EISC via its two Fault Relay terminals.

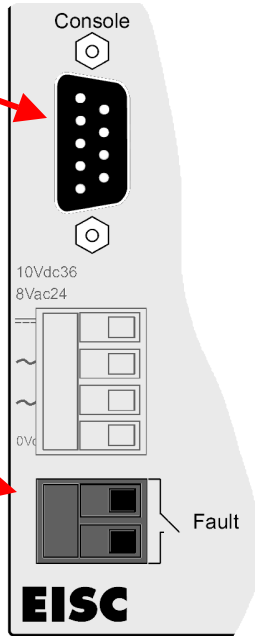


Figure 9 — The Console Port & Fault Relay Connector

5.2 Software

The provided CD-ROM contains **:**

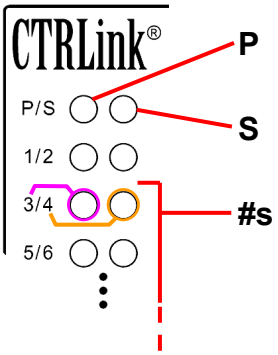
- The EISC Configurator Windows application and set up utility
- This User Manual
- An Ethernet Glossary
- Additional information of interest

The software installation procedure is discussed in the **readme.txt** file.

6 Plug-and-Play Operation

6.1 LED Indicators

(All LEDs are tested each time the EISC is powered up.)



P	**Power**	This LED glows green when power is supplied to the EISC.
S	**Fault Relay Status**	This LED glows green by default, but has no function in Plug-and-Play mode.
#s	**Link/Activity**	Each port has one of these LEDs. If a link is established, it glows green for 100 Mbps operation or yellow for 10 Mbps operation. It flashes as data transfer occurs. Even LEDs are on the right; odd LEDs are on the left.

Figure 10 — LEDs

Figure 6 shows how Ports 3 and 4 (for example) are numbered.

6.2 Switching

The EISC uses an 8K-address look-up table augmented with 128 entries of Content Addressable Memory to eliminate hash-collision problems. An address-hashing algorithm is used to update the table. Addresses are aged in about 300 seconds. Illegal frames that are always discarded include bad CRC packets, runt packets (less than 64 bytes) and oversized packets (greater than 1536 bytes).

6.3 Data Storage

Data storage buffer for Ethernet packets consists of 512 kB.

6.4 Data Forwarding

An entire Ethernet packet must be received before forwarding occurs. The EISC wire speed forwarding rate (non-blocking) is 148,800 packets per second at 100 Mbps and includes a special design to resolve head-of-line-blocking problems.

6.5 Flow Control

Each twisted-pair port automatically negotiates flow control and half- or full-duplex operation. In full-duplex mode, the IEEE 802.3x PAUSE function is supported. In half-duplex mode, the backpressure method is used. To prevent the connected repeater from being partitioned due to excessive collisions, backpressure allows the forwarding of one packet after 48 collisions.

6.6 Broadcast Storm Control

Using a storm-control counter, each port will pass 64 continuous broadcast packets before dropping extra ones. The counter will reset every 800 ms or after receiving a non-broadcast packet.

7 Advanced Operation

7.1 General Considerations

Configuration is accomplished while the EISC is connected to a suitable device — either a computer running the provided EISC Configurator Windows application or a Modbus-capable user device. For monitoring and configuring the EISC with Modbus, refer to Section 9.2.

7.2 EISC Configurator

When first launched, the EISC Configurator appears as in Figure 11 with no parameters configured and **Setup** and **Signal Strength** menus not available (dimmed). Configuring the switch is discussed on the following pages. The portions of Figure 11 outlined in red will be unavailable (dimmed) for models EISC12-100T/FC and EISC12-100T/FT.

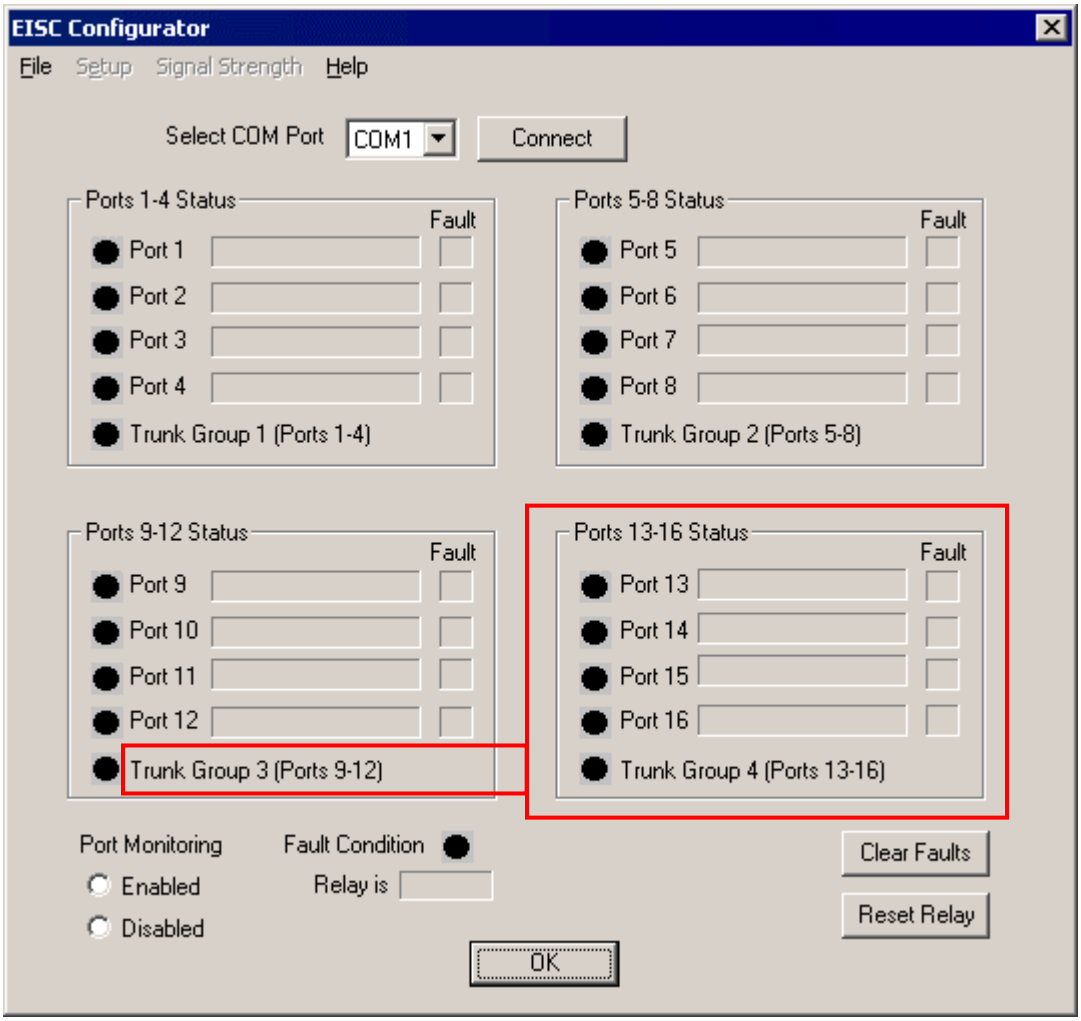


Figure 11 — The EISC Configurator

7.2.1 Initial Configuration

With a null-modem cable connecting the EISC to a suitable computer, launch the EISC Configurator, select a COM port and then click the “Connect” button. If the EISC Configurator cannot connect to the EISC, the error message of Figure 12 may appear. If this should happen, check that a proper null-modem cable is used for the connection and that suitable power is applied to the EISC. If the error in Figure 13 appears, a new COM port must be chosen.

Figure 12 — Error Connecting to EISC

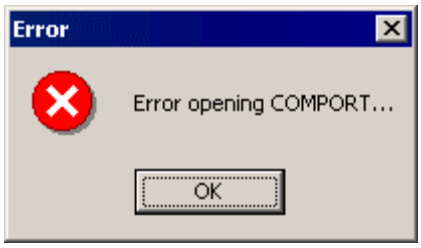


Figure 13 — COMPORT Error

Once the Configurator has connected to the EISC, the display of Figure 14 should appear — with the **Setup** and **Signal Strength** menus now available. The **File** menu will remain dimmed so long as the EISC is in communication with the EISC Configurator. The portions of Figure 14 shown outlined in red will be unavailable (dimmed) for models EISC12-100T/FC and EISC12-100T/FT.

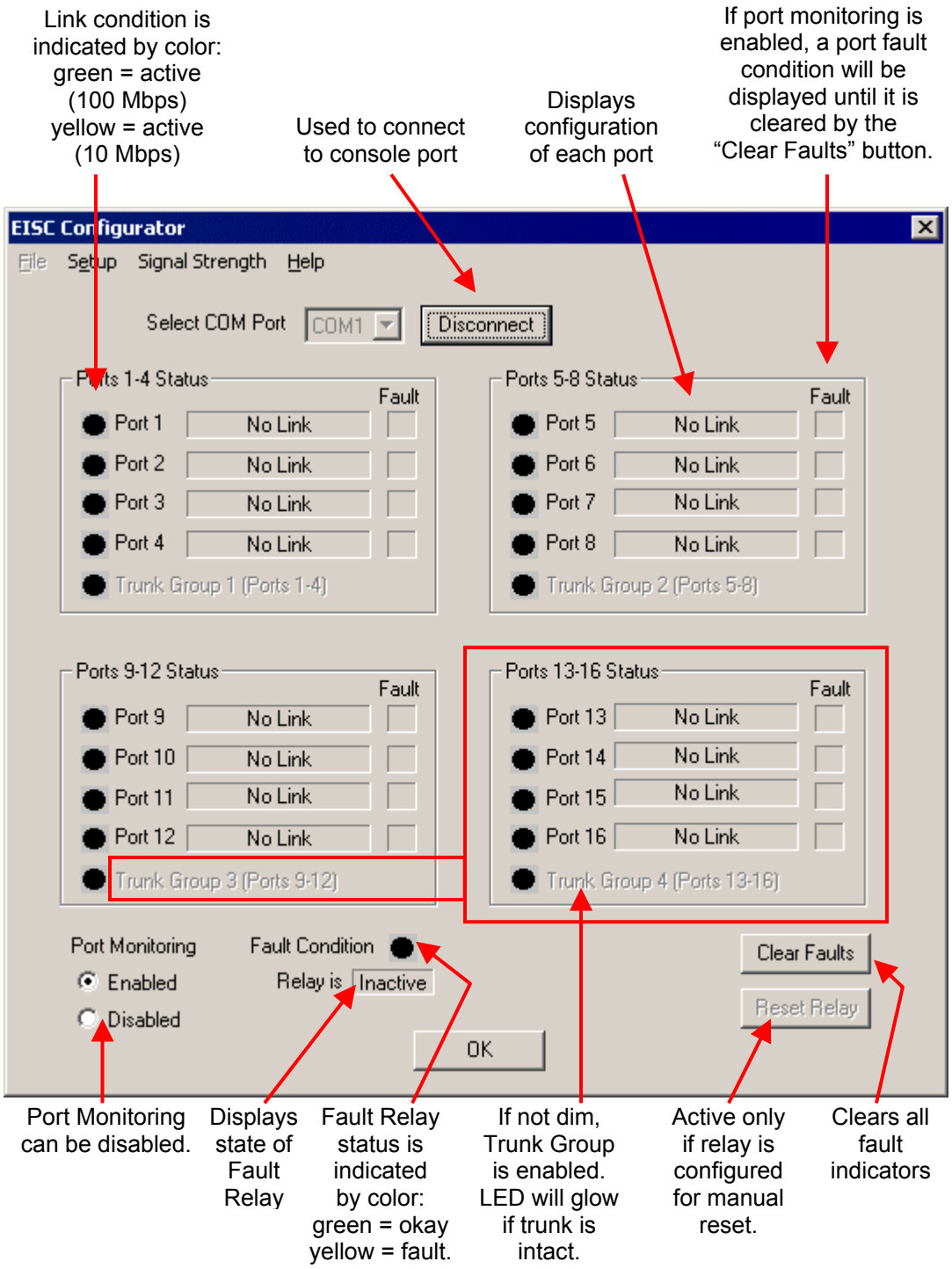


Figure 14 — EISC Ready for Configuration

7.2.2 Setup Options

The **Setup** pull-down menu offers the options shown in Figure 15:

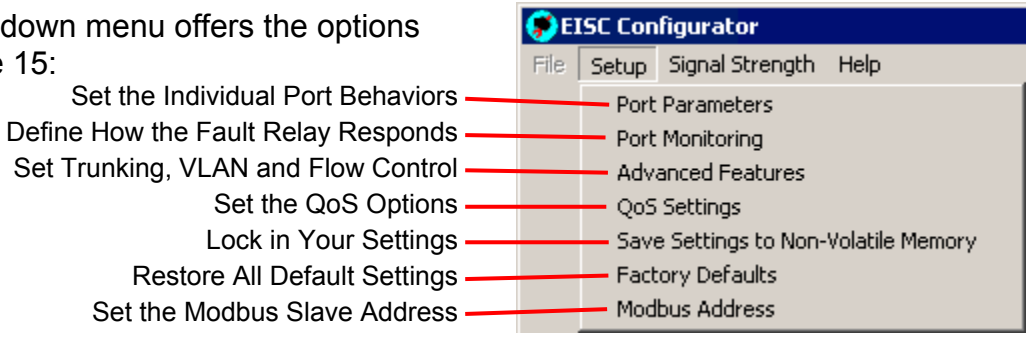


Figure 15 — Setup Options

The first order of business is to configure the port parameters.

7.2.3 Setting Parameters for Twisted-Pair (RJ-45) Ports

When the "Port Parameters" option is chosen, the display shown in Figure 16 appears. By default, each ***RJ45*** port is set to auto-negotiate with full-duplex flow control. The portion of Figure 16 outlined in red will be dimmed for models EISC12-100T/FC and EISC12-100T/FT. Fiber ports are ***permanently*** set to 100 Mbps and full-duplex.

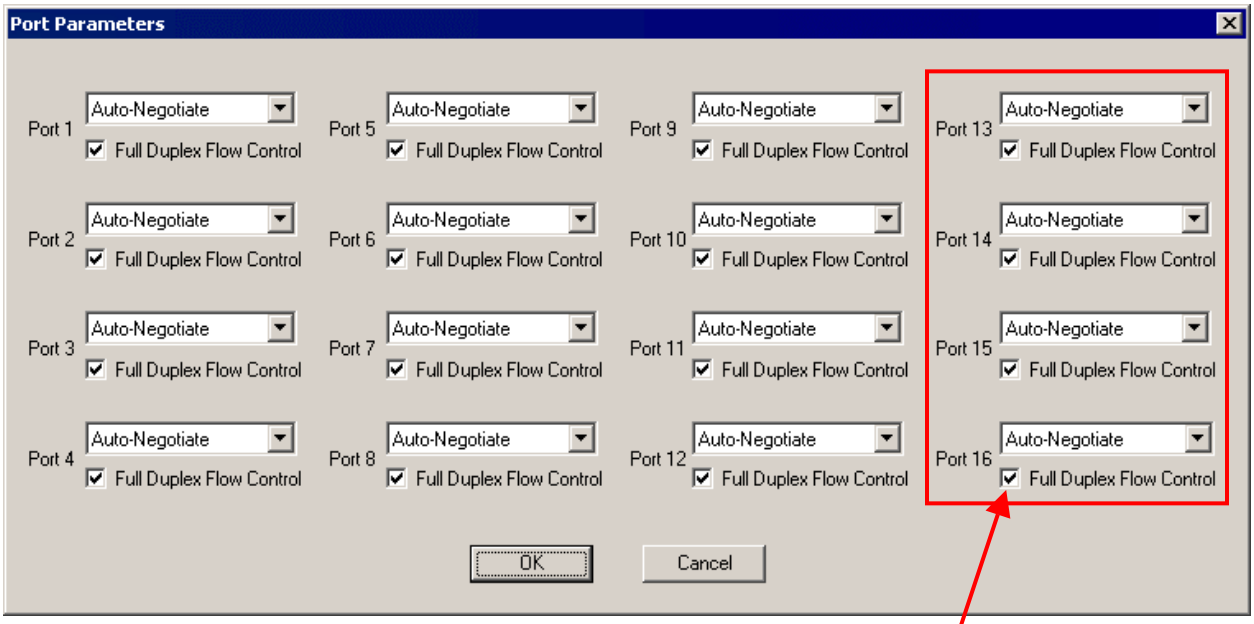


Figure 16 — Port Parameters

Each ***RJ-45*** port has a pull-down menu so the port can be set with any of the parameters shown in Figure 17. If either Half Duplex option is chosen, the Full Duplex Flow Control check box will be dimmed. In this case, half-duplex flow control will be set by the Backpressure Flow Control option under Advanced Features. Otherwise, full-duplex flow control may be engaged or disengaged for each ***RJ-45*** port on an individual basis.

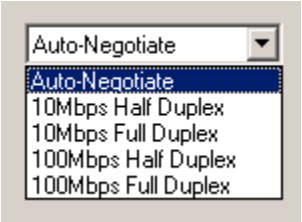


Figure 17 — RJ45 Port Options

7.2.4 Configuring the Port Monitor

Figure 18 displays the features of the Port Monitor which can watch each port for a fault condition specific to that port. The portion of Figure 18 shown outlined in red will be unavailable (dimmed) for models EISC12-100T/FC and EISC12-100T/FT.

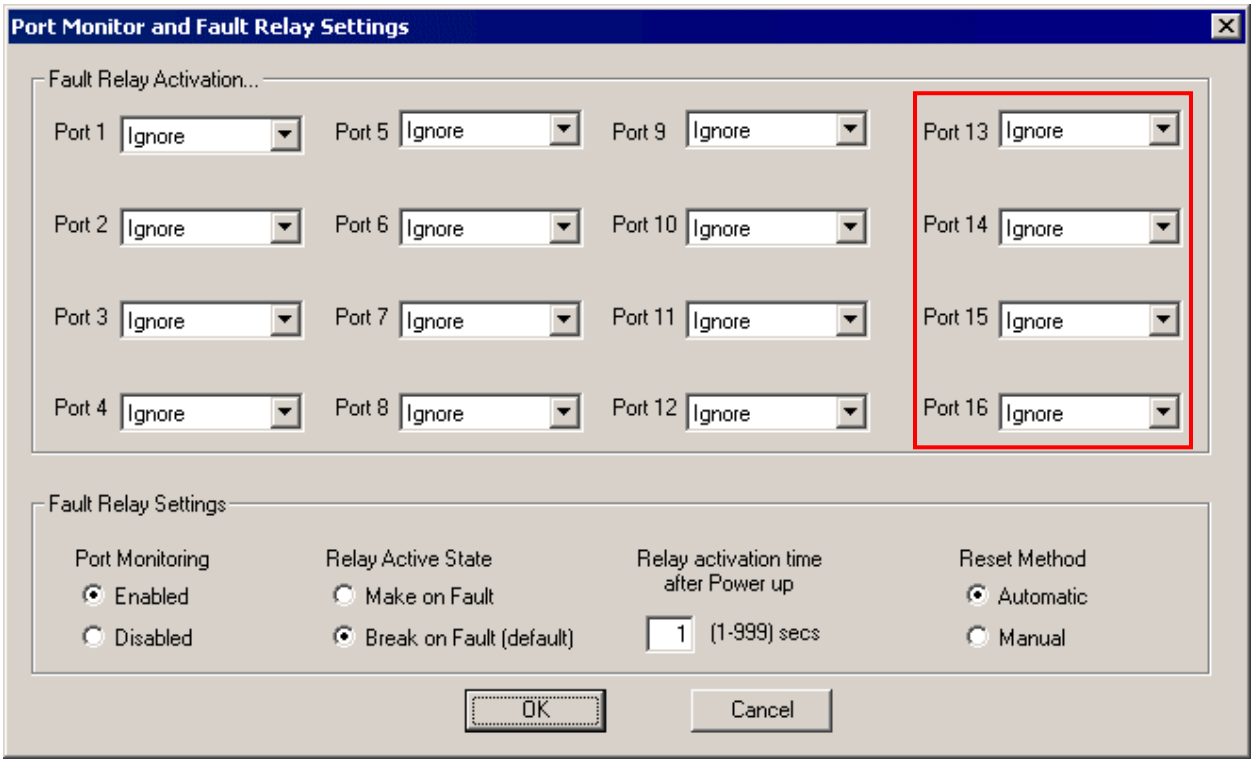


Figure 18 — The Port Monitor

Each port can be monitored for one of three options shown in Figure 19. The default setting is for the Port Monitor to "Ignore" the situation of a given port. If the user chooses the "No Link" option, the monitor will report a fault if proper link pulses are not received by the given port. Selecting the "Link Present" option provides a means for alerting the network administrator if an unauthorized link has been established.

Figure 19 — Port Monitor Options

7.2.5 Setting the Fault Relay

At the bottom of the Port Monitor window shown in Figure 18 there are four Fault Relay settings: "Port Monitoring" must be enabled for the relay to function. The user may choose for the relay to either "make" or "break" on fault. Following power up, the relay action can be delayed for up to 999 seconds. Finally, the user can elect to reset the relay manually or have it reset automatically once the fault clears.

For convenience, Port Monitoring can also be controlled from the bottom of the main Configurator panel where the relay state is reported and where faults can be cleared and the relay manually reset (if enabled).

7.2.6 Advanced Features

7.2.6.1 Port Trunking

Port Trunking allows four ports to be grouped together with the resulting group behaving as a *single* logical link. Each trunk is constructed of *four* fixed physical ports — with one status "LED" for each Trunk Group shown in the main screen of the configuration program. This "LED" will glow solid green when the trunk is enabled and operating properly. If the link for any physical port of a trunk fails, then all of the physical ports of the trunk are treated as defective and the trunk "LED" will no longer glow — thus indicating a fault condition.

Model EISC16-100T supports ***four*** trunks and the trunk selection in its Advanced Settings display will appear as shown in Figure 20.

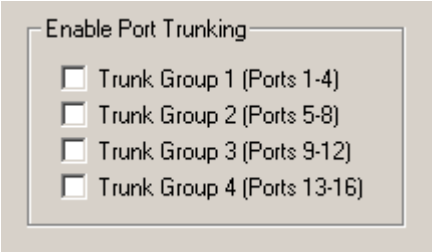


Figure 20 — Trunk Options :

EISC16-100T

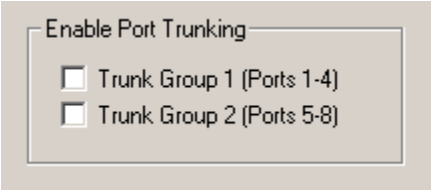


Figure 21 — Trunk Options :

EISC12-100T/FC & EISC12-100T/FT

Models EISC12-100T/FC and EISC12-100T/FT support ***two*** trunks and the trunk options in their Advanced Settings display will appear as shown in Figure 21.

To keep frames in order, packets with identical source/destination MAC addresses are sent over the same trunk path — but the reverse path may follow a different link. A hash algorithm is used to balance the load between links in a trunk.

7.2.6.2 Port-Based VLAN Function

In the Advanced Settings window, port-based (also called Layer 1) VLAN functionality can be selected. The number of VLANs available varies with the EISC model.

Model ESIC16-100T supports 14 or 15 VLANs as shown in Figure 22. If 14 VLANs are chosen, each of Ports 1–14 becomes an independent VLAN. All 14 VLANs can communicate with Ports 15 and 16 which are termed *common ports*. If 15 VLANs are defined, Port 15 ceases to act as a common port and acts, instead, as one of the independent VLAN ports — and then Ports 1–15 can communicate with the only remaining *common port*, Port 16.

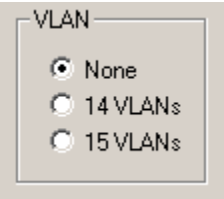


Figure 22 — VLAN Options :

EISC16-100T

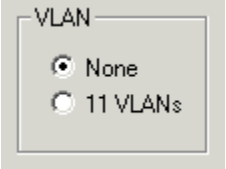


Figure 23 — VLAN Options

EISC12-100T/FC & EISC12-100T/FT

Figure 23 depicts the VLAN options for models EISC12-100T/FC and EISC12-100T/FT. As shown, each 12-port model can support 11 VLANS, with Port 12 (one of the fiber optic ports) performing the function of the common port.

When VLANs are enabled, a frame received from a VLAN port will only be forwarded to the common port[s]. If the destination port belongs to another VLAN, the frame will be discarded. If the source of the frame is a common port, then the frame can be forwarded to any destination. This topology allows networks to share a server or router via the common port[s], but use different VLANs for security or performance reasons.

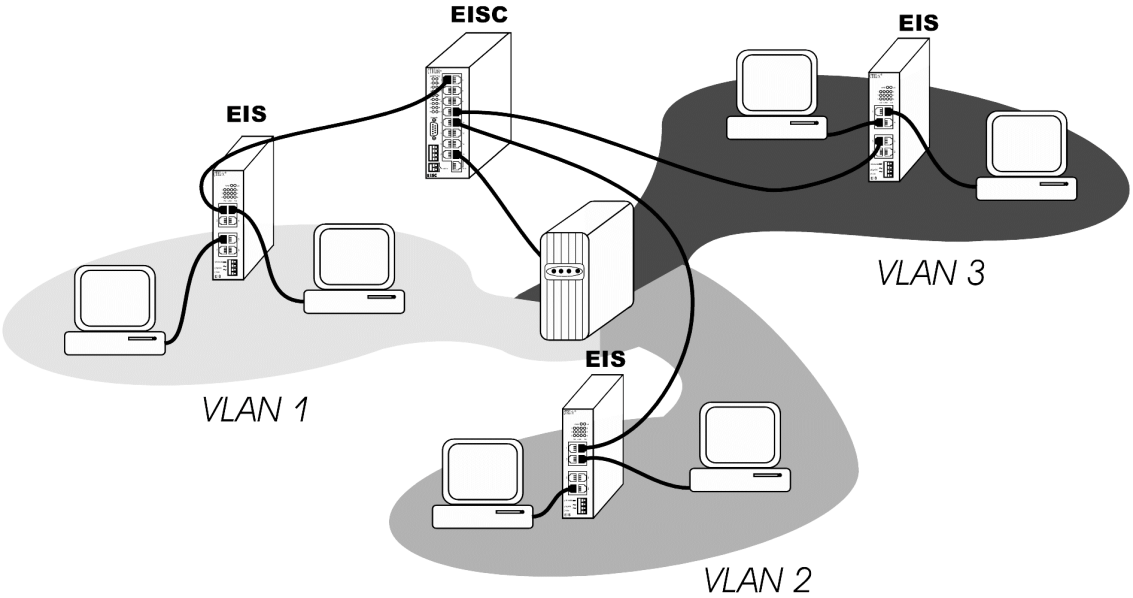


Figure 24 — VLANs with a Common Server

7.2.6.3 Global Features (applying to ALL ports)

7.2.3.6.1 Broadcast Storm Control

The EISC can enable or disable broadcast storm filtering. When enabled, each port will drop broadcast packets — those with a Destination MAC ID of FF FF FF FF FF FF — after receiving 64 continuous broadcast packets. The counter will be reset to 0 every 800 ms or on receiving a packet with a Destination MAC ID other than FF FF FF FF FF FF.

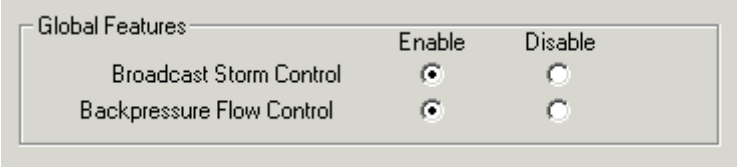


Figure 25 — Global Features

7.2.3.6.2 Backpressure Flow Control

Backpressure flow control is applied globally — affecting all half-duplex ports or none. If this feature is disabled, the destination of the incoming packet is checked and, if found to be congested, the packet is discarded to avoid blocking the packet stream.

7.2.7 QoS Function

The EISC can recognize QoS priority information for incoming frames. With this information, each affected frame is assigned an appropriate level of priority.

7.2.7.1 Priority Queues. The EISC has two queues, one for High-priority frames and one for Low-priority frames. The queue service rate uses the Weighted Round Robin algorithm where the weight ratio of high-to-low priority queuing can be 2:1, 4:1, 8:1 or "Always high priority first". For example, if the “4:1” option is selected, the High-priority queue is serviced 4 times as often as the Low-priority queue.

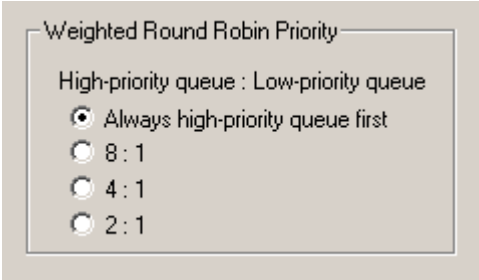


Figure 26 — Round Robin Priority

7.2.7.2 Auto-off Flow Control. If a port receives a high-priority frame, flow control can be disabled for 1–2 seconds and automatically re-enabled after no priority frames have been received for a period of 1–2 seconds — when this option is enabled.

The EISC offers three kinds of QoS priority:

- DiffServ Priority (IP Packet);
- 802.1p/Q Tagging;
- Port-Based Priority.

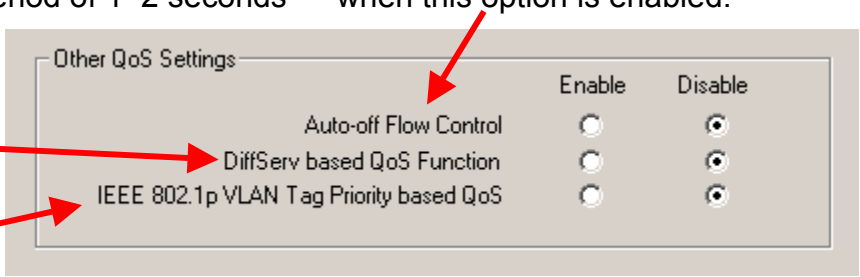


Figure 27 — Other QoS Settings

7.2.7.3 Port-Based Priority. When this is applied, any frame received via a high priority port is given high priority. In the EISC, Ports 1 and 2 can be designated high priority ports — or Ports 1–4 can be assigned — or all of Ports 1–8 can be given high-priority. Whatever port group is defined, frames received via this group are buffered into the High-priority queue while frames from all other ports are relegated to the Low-priority queue.

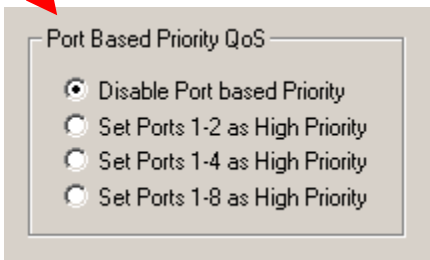


Figure 28 — Port Based Prority

7.2.7.4 ***ToS/DiffServ Priority.***

IP protocol frames include in their network headers an 8-bit Type of Service (ToS) field for packet prioritization. The first three of these bits specify 8 levels of priority. The next three bits provide the QoS refinement known as Differentiated Services (DiffServ or DS) which efficiently manages traffic by categorizing packets into classes to apply rules for packet delay and discarding. The two remaining bits of the ToS octet are not yet defined.

Differentiated Services can offer:

- **Expedited Forwarding** (EF) for low loss, low latency, low jitter and assured bandwidth;
- **Assured Forwarding** (AF) specifies drop precedence to apply when traffic becomes congested;
- **Best Effort**, which uses any bandwidth not allocated to EF and AF.

DiffServ allows nodes that are either ignorant of or incapable of DS coding to use the network with best-effort forwarding by using the default value in the DS field.

If ToS/DiffServ priority is applied, the EISC can read this information (defined in RFC2474) from the DS field byte. Recommended codepoints are defined in RFC2597 to distinguish traffic by different service classes. The EISC can read this 6-bit value — in either IPv4 or IPv6 frames — and can then identify the incoming packet priority as shown in Table 2:

DS Field Value	Priority	Per Hop Behavior
101110	High	EF (Expected Forwarding)
001010, 010010, 011010, 100010		AF (Assured Forwarding)
110000, 111000		Network Control
All others values	Low	Uncharacterized

Table 2 — DiffServ Packet Priority

7.2.7.5 ***802.1p/Q Priority Tagging.***

When this EISC option is enabled, VLAN "tagged" frame priority is recognized. In the data link header, the 802.1p supplement provides priority coding which was never specified in the 802.1Q VLAN-tagging standard. Within the VLAN tag space, a 3-bit code is applied so that "tagged" frames can specify priority. Values 4–7 are assigned to the EISC High-priority queue and values 0–3 to the Low-priority queue. Switches and other network equipment, can set these priority bits.

The IEEE suggests a priority scheme, but does not mandate a definition. This method represents a simple, best-effort Layer 2 prioritization for network adapters and switches — requiring no bandwidth reservation.

Note: Since the data link header is only read at the switch level, networks which have routers cannot use this method unless special mapping is implemented.

7.2.8 Saving Settings to EEPROM

After configuring the EISC, the new parameters will apply, but only so long as the switch has power. If it is desired to retain settings in EEPROM for use after a power interruption, choose the "Save Settings to Non-Volatile Memory" option in the **Setup** pull-down menu. The message shown in Figure 29 confirms the action.

Figure 29 — Save Settings to Switch

7.2.9 Saving and Retrieving Configuration Files

To save the EISC configuration to a file for later use, it is first necessary to disconnect the EISC from the EISC Configurator. Once this has been done, choose the "Save As …" option in the **File** pull-down menu. A standard "Save As" pop-up window will then allow the user to create a file name for the saved file. The file type will be **.eic*.

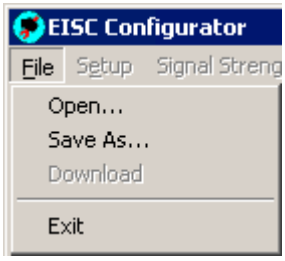


Figure 30 — Saving or Opening a File

A saved configuration file can be retrieved and downloaded to the EISC. Once this is done, the retrieved parameters are implemented automatically. Retrieve the file by choosing the "Open…" option under the **File** pull-down menu. Once the file is opened, the title bar of the EISC Configurator window will report the file name and the **Setup** pull-down menu will become active. At this point, the retrieved file can be modified before it is downloaded to the EISC. Modifiable options are indicated as active in the **Setup** pull-down menu.

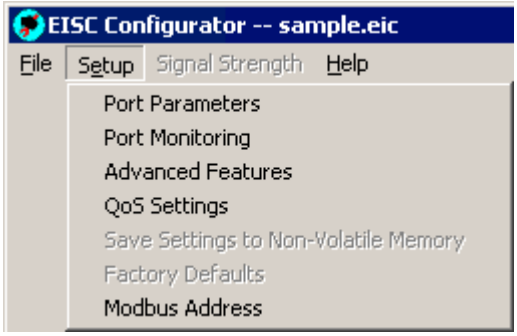


Figure 31 — Retrieved File

Note: A retrieved file will NOT be retained in the switch EEPROM unless the user chooses the "Save Settings to Non-Volatile Memory" option in the **Setup** pull-down menu.

7.2.10 Port Signal Strength (Only for 100 Mbps RJ-45 ports)

The EISC can display the signal strength received at its RJ-45 ports in four graduated steps. Each port display can thereby indicate the robustness of its communication channel. Although an attached device could cause problems, the usual concern with signal strength is the nature of attached twisted-pair cable.

A port label will only display as active if it is receiving proper Link Pulses. If a port is not attached to a working partner, its label will be dim and its bar graph completely gray.

To read the display properly, the user must have knowledge of the cabling attached to the EISC. As more cable length is used to connect an EISC port to a remote device, weaker signal strength will be seen. As the 100-m cable length limit is approached, the smallest signal strength step will be displayed in red (as with Port 11 in Figure 32). A disparity between two ports does not necessarily imply a problem with the weaker one; the two ports may simply be attached to different lengths of cable.

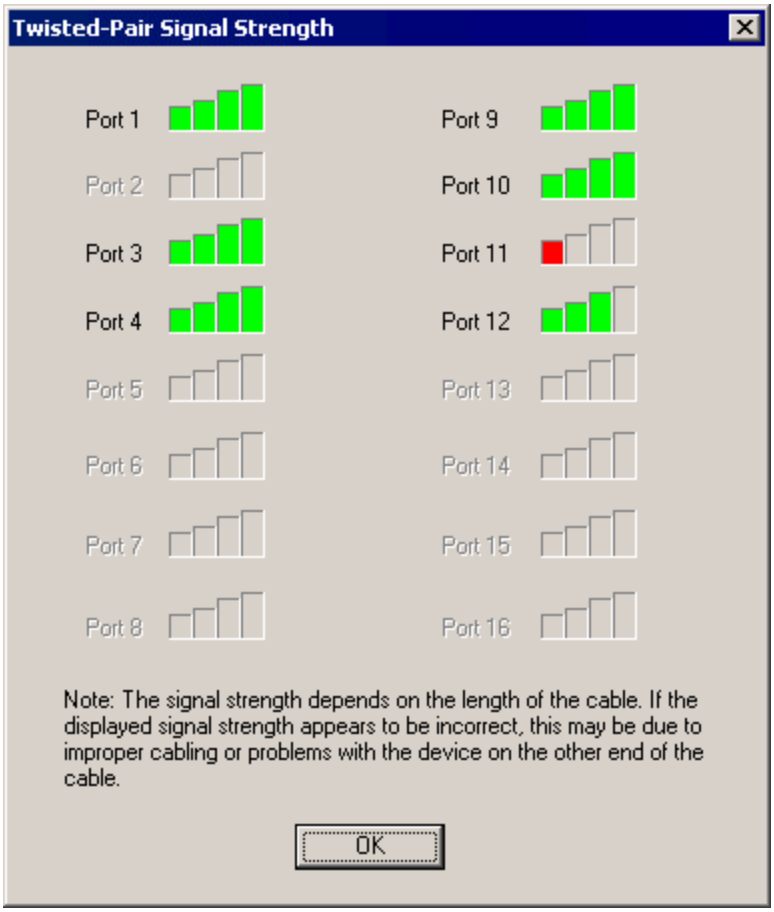


Figure 32 — Twisted-Pair Signal Strength

Example: In Figure 32, a comparison of Port 10 and Port 11 should only be interpreted as problematic if the segment lengths for Ports 10 and 11 are approximately equal. On the other hand, if Port 10 has only 15 m of attached cable while Port 11 has 85 m of attached cable, the example display would be normal.

Note: There is no requirement for all segments of a trunk to be equal in length. Thus, Ports 9–12 in Figure 32, could be displaying a properly functioning trunk.

Note for 12-port models: The signal strength display applies only to Ports 1–8. For Ports 9–12 the bar graph will be completely blank — even if the port is working. Although there is no signal strength indication for Ports 9–12, the *status* of these ports can be determined by simply observing the port ***label*** . If the label is not dimmed, the port is active. But if the label is dimmed, the port is not in use.

8 Service

8.1 Warranty

Contemporary Controls (CC) warrants its product to the original purchaser for one year from the product's shipping date. If a CC product fails to operate in compliance with its specification during this period, CC will, at its option, repair or replace the product at no charge. The customer is, however, responsible for shipping the product; CC assumes no responsibility for the product until it is received. This warranty does not cover repair of products that have been damaged by abuse, accident, disaster, misuse, or incorrect installation.

CC's limited warranty covers products only as delivered. User modification may void the warranty if the product is damaged during installation of the modifications, in which case this warranty does not cover repair or replacement.

This warranty in no way warrants suitability of the product for any specific application.

IN NO EVENT WILL CC BE LIABLE FOR ANY DAMAGES INCLUDING LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT EVEN IF CC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY PARTY OTHER THAN THE PURCHASER.

THE ABOVE WARRANTY IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED OR STATUTORY, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR USE, TITLE AND NONINFRINGEMENT.

Repair or replacement as provided above shall be the purchaser's sole and exclusive remedy and CC's exclusive liability for any breach of warranty.

8.2 Technical Support

Technical support is available each weekday (except holidays) during the office hours listed below. Outside these hours, voice-mail messages can be left in our mailbox after contacting the main phone number. Requests can also be submitted by fax or by e-mail to the numbers listed below, but please leave a detailed description of the problem. We will contact you the next business day by the method requested by the customer. If the problem cannot be resolved by technical support, the customer will be given an RMA number in order that the product may be returned to CC for repair.

Support Option	Contemporary Controls (USA)	Contemporary Controls Ltd (UK)
Office Hours	8:00 a.m. — 5:00 p.m. Central time	8:00 a.m. — 5:00 p.m. United Kingdom time
Voice	+1-630-963-7070	+44 (0)24 7641 3786
Fax	+1-630-963-0109	+44 (0)24 7641 3923
Email	techsupport@ccontrols.com	support@ccontrols.co.uk
Web Site	www.ccontrols.com	www.ccontrols.co.uk

8.3 Warranty Repair

Products under warranty that were not subjected to misuse or abuse will be repaired at no charge to the customer. The customer, however, pays for shipping the product back to CC while CC pays for the return shipment to the customer. CC normally ships ground. International shipments may take longer. If the product has been determined to be misused or abused, CC will provide the customer with a quotation for repair. No work will be done without customer approval.

8.4 Non-Warranty Repair

CC provides a repair service for all its products. Repair charges are based upon a fixed fee basis depending upon the complexity of the product. Therefore, Customer Service can provide a quotation on the repair cost at the time a Returned Material Authorization (RMA) is requested. Customers pay the cost of shipping the defective product to CC and will be invoiced for the return shipment to their facility. No repair will be performed without customer approval. If a product is determined to be unrepairable, the customer will be asked if the product can be replaced with a refurbished product (assuming one is available). Under no circumstances will CC replace a defective product without customer approval. Allow ten working days for repairs.

8.5 Returning Products for Repair

To schedule service for a product, please call CC Customer Service support directly at +1-630-963-7070 (U.S.) or +44 (0)24 7641 3786 (U.K.). Have the product model and serial number available, along with a description of the problem. A Customer Service representative will record the appropriate information and issue, via fax, an RMA number—a code number by which we track the product while it is being processed. Once you have received the RMA number, follow the instructions of the Customer Service support representative and return the product to us, freight prepaid, with the RMA number clearly marked on the exterior of the package. If possible, reuse the original shipping containers and packaging. In any event, be sure you follow good ESD-control practices when handling the product, and ensure that antistatic bags and packing materials with adequate padding and shock-absorbing properties are used. CC is not responsible for any damage incurred from improper packaging. Shipments should be insured for your protection.

Ship the product, freight prepaid, to the location from which it was purchased:

Contemporary Control Systems, Inc.
2431 Curtiss Street
Downers Grove, IL 60515
U.S.A.

Contemporary Controls Ltd
Sovereign Court Two, UWSP
Sir William Lyons Rd.
Coventry CV4 7EZ
U.K.

9 Appendices

9.1 Declaration of Conformity

9.1.1 Applied Council Directives:

Electromagnetic Compatibility Directive, 89/336/EEC Council Directive as amended by Council Directive 92/31/EEC & Council Directive 93/68/EEC

General Product Safety Directive 92/59/EEC

9.1.2 Standards to which Conformity is Declared

EN 55022:1995 CISPR22: 1993, Class A, Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment

EN 55024:1998, Information Technology Equipment — Immunity Characteristics — Limits and Methods of Measurement

9.1.3 Manufacturer:

Contemporary Control Systems, Inc.
2431 Curtiss Street
Downers Grove, IL 60515 USA

9.1.4 Authorized Representative:

Contemporary Controls Ltd
Sovereign Court Two, UWSP
Sir William Lyons Road
Coventry CV4 7EZ
UNITED KINGDOM

9.1.5 Type of equipment — Ethernet configurable switching hub.

Models			
EISC16-100T	EISC12-100T/FC	EISC12-100T/FCS	EISC12-100T/FT

For regulatory compliance, refer to Section 4.7

Manufacturer's Declaration: I, the undersigned, hereby declare that the product specified above conform to the listed directives and standards.

George M. Thomas, President January 1, 2004

9.2 Modbus Operation

For Modbus operation, the EIA-232 parameters must be set as follows :

Baud Rate = 9600 bps, Data Bits = 8, Stop Bit = 1, No Parity

9.3 Modbus Registers

9.3.1 WRITE/READ

40001-40016: Port Settings: Auto-negotiation or set speed/duplex per port

Bit 0 – Auto-negotiation (enabled = 1, disabled = 0) – default = 1

Bit 1 – 10Mbps(0) or 100Mbps (1)

Bit 2 – Half duplex (0) or full duplex (1)

Bit 3 – Enable full duplex flow control (enabled = 1, disabled = 0) – default = 1

40001: Port Settings port 1

40002: Port Settings port 2

40003: Port Settings port 3

40004: Port Settings port 4

40005: Port Settings port 5

40006: Port Settings port 6

40007: Port Settings port 7

40008: Port Settings port 8

40009: Port Settings port 9

40010: Port Settings port 10

40011: Port Settings port 11

40012: Port Settings port 12

40013: Port Settings port 13

40014: Port Settings port 14

40015: Port Settings port 15

40016: Port Settings port 16

[40017-40128: Port Settings port 17 – port 128 reserved]

40129: Reserved for future use

40130: Reserved for future use

40131: Reserved for future use

40132: Relay Setting1

Bit 0: Relay Active State (0- Disengaged, 1-Engaged) default = 0

Bit 1: Relay Reset Method (0 – Self-recovering, 1- Reset by user) default = 0

Bit 2: Monitoring Status (0 – Disabled, 1 – Enabled) default = 1

Bit 3: Clear Faults (1 = Clear)

Bit 4: Reset Relay (1 = Reset)

40133: Relay Activation Time after power up (in secs)

40134: Port monitor setting1 (ports 1-8): Energize relay upon matching condition

00 – Don't care

01 – Link_Lost

10 – Link_Up

11 – Don't care

	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1
Bit	15,14	13,12	11,10	9,8	7,6	5,4	3,2	1,0

40135: Port monitor setting2 (ports 9-16): Energize relay upon matching condition

00 – Don't care

01 – Link_Lost

10 – Link_Up

11 – Don't care

	Port16	Port15	Port14	Port13	Port12	Port11	Port10	Port9
Bit	15,14	13,12	11,10	9,8	7,6	5,4	3,2	1,0

40136-40149: (reserved for 128 port switch)

40150: QOS Settings (all disabled by default)

Bit 6: Enable Flow Control Automatic disable

Bit 5: Enable DiffServ Priority QOS

Bit 4-3: Enable Port based Priority QOS

00 – disable(default)

01 – Ports 0&1 high priority

10 – Ports 0-3 high priority

11 – Ports 0-7 high priority

Bit 2-1: Enable Weighted Round Robin Priority

It is the service rate ratio of High-Priority queue to Low-Pri Queue

11 – always high priority queue first(default)

10 – 8:1

01 – 4:1

00 – 2:1

Bit 0: Enable 802.1p VLAN Tag Priority based QOS

40151: Misc. Feature Settings

(all disabled by default, except for backpressure and Broadcast Storm Control)

Bit 7: Enable Backpressure (0=disabled, 1=enabled) – default:enabled

Bit 6: VLAN Type (0 = 14 VLANS, 1 = 15 VLANS)

Bit 5: Enable VLAN

Bits 4-1: Enable Port Trunking and select trunks (0-3)

Bit 4: 1 – Enable Port Trunk 3

Bit 3: 1 – Enable Port Trunk 2

Bit 2: 1 – Enable Port Trunk 1

Bit 1: 1 – Enable Port Trunk 0

Bit 0: Enable Broadcast Storm control – default: enabled.

40152: Modbus Slave Address

Modbus Address of the switch

40153: Offline Mode (1 = Offline & MAC in Reset)

40154: Write EEPROM with current switch settings (1= write)

40155: Write Switch with default settings (1 = write)

9.3.2 READ Only

41001-41016: Port 1-16 status:

Bit 0: Duplex (0 = half, 1= full)

Bit 1: Speed (0 = 10Mbps, 1 = 100Mbps)

Bit 2: Link (0 = no link, 1=link active)

Bit 3-6: Reserved

Bit 7: 1 = Relay Activation due to fault on this port

41001: Port status port 1
41002: Port status port 2
41003: Port status port 3
41004: Port status port 4
41005: Port status port 5
41006: Port status port 6
41007: Port status port 7
41008: Port status port 8
41009: Port status port 9
41010: Port status port 10
41011: Port status port 11
41012: Port status port 12
41013: Port status port 13
41014: Port status port 14
41015: Port status port 15
41016: Port status port 16

[41017-41128: Port status port 17- port 128 reserved]

41129: Trunk Status:

Bit 0: Trunk 0 status (0 = Disabled, 1 = Enabled)

Bit 1: Trunk 1 status (0 = Disabled, 1 = Enabled)

Bit 2: Trunk 2 status (0 = Disabled, 1 = Enabled)

Bit 3: Trunk 3 status (0 = Disabled, 1 = Enabled)

41130: MISC Status:

Bit 0: Relay Status (0= Relay Active, 1= Relay Inactive)

Active state could be engaged/disengaged, depending on the value set in register 40132, bit 0.

41134: Firmware Version