Crestron **CEN-IO**
Ethernet Input/Output Module
Operations Guide

CRESTRON
REMOTE CONTROL SYSTEMS

Contents

Ethernet Input/Output Module: CEN-IO

Description

Functional Description

The CEN-IO is an Ethernet interface device for VersiPort input/outputs and relay closure outputs. It detects contact closure, digital and/or analog input/outputs and provides dry contact closure outputs. All signals are monitored/controlled via 10BASE-T Ethernet using standard Internet protocols. The CEN-IO includes a power pack (either a 500 mA pack for 120V AC or a 1000 mA pack for 220V AC supply which is provided with the international configuration, CENI-IO).

The CEN-IO contains eight VersiPorts. These eight input/output connections are referenced to a common ground. Each connection can act as either a digital output (<o1> through <o8>), a digital input (<i1> through <i8>), or an analog input (<ain1> through <ain8>). Pullup resistors may be turned on or off for each input/output connection (<pullup1-dis> through <pullup8-dis>). The following subsections make use of the reference diagram, shown below.

CEN-IO Reference Diagram
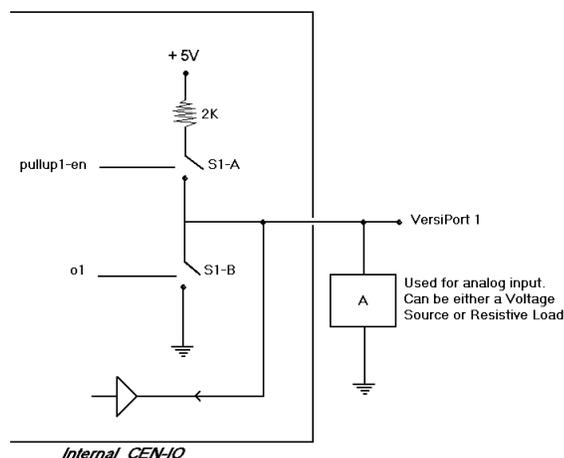
Digital Outputs: <01> through <08>

When a logic high signal is placed on <o1> through <o8>, the output pin is shorted to ground (switch S1-B in the reference diagram is closed). When a logic low signal is placed on <o1> through <o8>, the output pin is driven to +5V (switch S1-B in the reference diagram is open). This default behavior may be modified by placing a logic high signal on <pullup1-dis> through <pullup8-dis>. When the pullup resistor is disabled (switch S1-A in the reference diagram is open) and the corresponding <o> signal is driven low, the output pin floats. When the pullup resistor is enabled and the corresponding <o> signal is driven high, the output pin is shorted to ground.

Each signal <o1> through <o8> has a corresponding feedback <o1-f> through <o8-f> that is driven by the CEN-IO. Feedback is provided from the CEN-IO for these values since another non-Cresnet device on the network may talk directly to the CEN-IO and modify its values.

Example: <pullup1-dis> is driven high. When <o1> is logic low, versiport 1 is floating. When <o1> is driven high, versiport 1 is shorted to ground.

Example: <pullup1-dis> is driven low. When <o1> is logic low, verisport 1 is at +5V. When <o1> is driven high, versiport 1 is shorted to ground.

Digital Inputs: <i1> through <i8>

The CEN-IO can detect when one of its versiports is shorted to ground or driven by a 0 to 5 volt digital signal. When a pin is shorted to ground, the corresponding <i1> through <i8> signal is driven to logic high in the program. The threshold for detection is < +2.5V drives the signal in the program high. Note that for a contact closure input, the pullup resistor should be enabled for that particular input (this is the default behavior), else the input is floating.

Example: If versiport pin 5 is shorted to ground, <i5> is driven to a logic high level. When pin 5 is not tied to ground, <i5> is driven to a logic high level (as long as the pullup is left enabled, which is the default behavior).

Analog Inputs: <ain1> through <ain8> and Minimum Change <MinChange1> through <MinChange8>

A resistive sensor (for example, a sensor that measures humidity) or a voltage source may be tied to a vesiport. This sensor or source is represented by box "A" in the reference diagram.

When a resistive load is tied to a versiport, the corresponding pullup resistor must be enabled (default behavior). This creates a voltage divider and provides a varying voltage level (based on the current resistance of the sensor) for the CEN-IO to read. For example, if a resistive humidity sensor is tied to versiport 1, then <pullup1-dis> should be driven low. The corresponding level is read as an analog value on <ain1> and ranges from 0 to 65535.

When a voltage source is tied to a versiport, the corresponding pullup resistor should be disabled. This allows the A/D convertor in the CEN-IO to directly read the voltage source's value. For example, if a voltage source is tied to vesiport 1 then <pullup1-dis> should be driven high. The corresponding level is read as an analog value on <ain1> and ranges from 0 to 65535 (0 to +10V on the input pin).

The CEN-IO reports any change back to the program when an analog value changes. Depending on the input source, this can result in excessive traffic over the network. A minimum change value may be specified on a per-input basis. This tells the CEN-IO to wait until the corresponding analog input changes by the minimum value before reporting into the program. This is useful if an input source is not clean and has jitter.

Example: A voltage source is placed on versiport 1. <MinChange1> is set to 10 via an Analog Initialize symbol. The <ain1> input does not exhibit any change until it actually changes by 10. If the currently reported value is 500, for example, a new value is not reported until it changes to 510 or 490.

Each signal <MinChange1> through <MinChange8> has a corresponding feedback <MinChange1-f> through <MinChange8-f> that is driven by the CEN-IO. Feedback is provided from the CEN-IO for these values since another non-Cresnet device on the network may talk directly to the CEN-IO and modify its values.

Relay Inputs: <relay1> through <relay8> and Relay Outputs: <relay1-f> through <relay8-f>

The CEN-IO symbol definiton can control the eight relays on the CEN-IO and obtain true feedback as to the state of the relays in the CEN-IO.

The inputs to the symbol <relay1> through <relay8> allow the SIMPL program to turn the relays on and off. A high signal on any of these lines turns on the respective relay. A low signal turns the relay off. For example, if <relay1> has a high signal, then the relay turns on.

Since the relay states may be changed by a source outside of the Cresnet system, the symbol outputs <relay1-f> through <relay8-f> allow the Cresnet system to monitor the state of the relays in the CEN-IO. If an external source changes the state of the relay to closed, then the respective line is driven high. If an external source changes the state of the relay to open, then the respective line is driven low. For example, if an outside source closes relay 2, <relay2-f> goes high.

Physical Description

The CEN-IO is housed in a black enclosure with silk-screened labels on the front and rear panels. On the front of the unit there are 21 LEDs for indicating the unit's current status. All connections, except for one Ethernet port, are made on t he back of the unit. Refer to the physical views shown on the next page. There are four rubber feet on the base of the unit for stability and to prevent slippage when the unit is stored on a surface or stacked. Up to two units can be rack mounted with an optional 19.00 inch (48.26 cm) rack mount kit (sold separately).

CEN-IO Physical Views
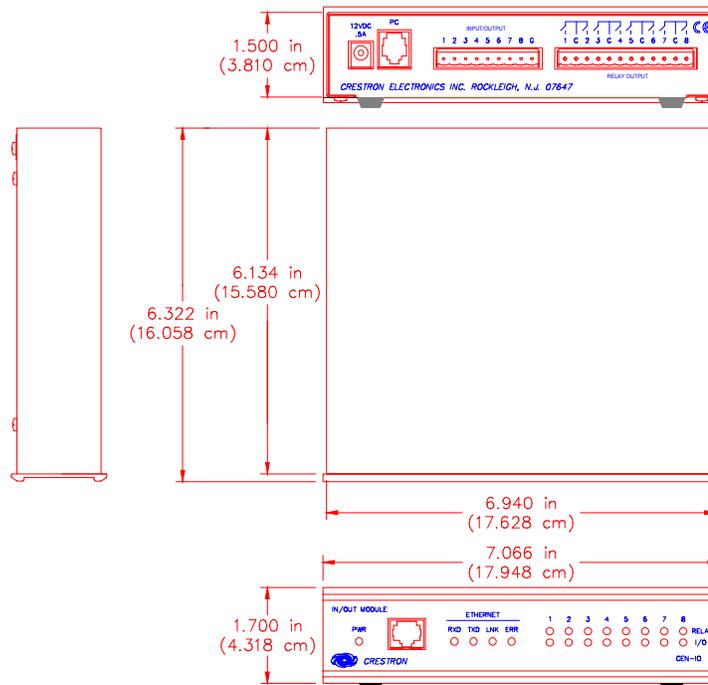
CEN-IO Ports

Most ports are provided on the back of the CEN-IO. Each has a silk-screened label. Refer to the illustration and descriptions below. There is only one port on the front panel of the CEN-IO.

CEN-IO Ports (Rear Panel)
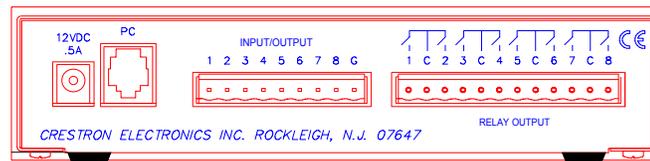
12 VDC .5A

This DC power socket connector is used to supply external power via the supplied 500 mA power pack (1000 mA power pack for CENI-IO configuration).

PC

This 6-pin, 6-position RJ11 modular jack is used to load the IP address and run diagnostics. Refer to the pinout table below.

PC Port (RJ11) Pinouts

PIN	DESCRIPTION
1	CTS
2	GND
3	RXD
4	TXD
5	RTS
6	No Connect

I/O (1 - 8, G)

This 9-pin connector (eight input/outputs and one common) is used to detect digital and analog input/output levels. The contact closures to ground current is 2.5mA. Port recognizes input/outputs compatible with TTL and CMOS digital signals and can tolerate up to 24V DC. Threshold is 2.5V. Input/outputs can also measure analog voltages from 0 to 10V DC.

RELAY OUTPUT (1 - 8)

This 12-pin connector provides eight normally open relays. Two relays share a common ground. Each relay closure is rated at 24V DC/AC, 1A.

UNMARKED (Ethernet - on front panel)

This RJ45 connector provides Ethernet connection, thereby making the unit IP addressable and compatible with 10BASE-T Ethernet systems. The Ethernet port is the standard 10BASE-T pinout. Refer to the pinout table after this paragraph.

Ethernet Port (RJ45) Pinouts

PIN	DESCRIPTION
1	TD+
2	TD-
3	RD+
4	No Connect
5	No Connect
6	RD-
7	No Connect
8	No Connect

CEN-IO Indicators

There are 21 LED indicators located on the front panel of the CEN-IO. Refer to the illustration and descriptions below.

CEN-IO Indicators (Front Panel)
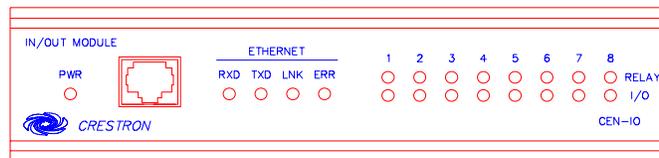
PWR (Power)

This LED illuminates when power is supplied to the CEN-IO.

RXD (Ethernet)

This LED illuminates during reception of Ethernet data by the unmarked Ethernet port on the front panel.

TXD (Ethernet)

This LED illuminates during transmission of Ethernet data from the unmarked Ethernet port on the front panel.

LNK (Ethernet)

This LED illuminates when there are attachments to the Ethernet port.

ERR (Ethernet)

This LED illuminates when an Ethernet protocol error is detected.

RELAY (1 - 8)

These LEDs illuminate when respective relay is closed.

I/O (1 - 8)

These LEDs illuminate when the input or output voltage threshold for respective INPUT ports are exceeded.

Leading Specifications

The table below provides a summary of leading specifications for the CEN-IO. Dimensions and weight are rounded to the nearest hundredth unit.

Leading Specifications of the CEN-IO

SPECIFICATION	DETAILS
Power Requirements	12V DC
Relay Closure Rating	24V AC/DC, 1A
Input Threshold (per channel)	2.5V DC
Input Analog Voltage Range (per channel)	0 to +10V DC
Input Digital Voltage Range (per channel)	0 to +24V DC (compatible with TTL & CMOS digital signals)
Switch Current (per channel)	2.5mA (contact closure to ground)
SIMPL™ Windows®	Version 1.30.01 or later *
CNX Operating System	Version 5.04.11 or later
Dimensions & Weight	Height: 1.70 in (4.32 cm) Width: 7.07 in (17.95 cm) Depth: 6.32 in (16.06 cm) TBS lbs. (TBS kg)

*   The latest software versions can be obtained from the Software Downloads page (Simplwin Library) of the Crestron website (www.crestron.com). New users are required to register in order to obtain access to the FTP site.

As of the date of manufacture, the unit has been tested and found to comply with specifications for CE marking.

C E

NOTE: This unit complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) these devices may not cause harmful interference, and (2) these devices must accept any interference received, including interference that may cause undesired operation.

Preparation for Use

Refer to the hookup diagram on the next page. Other than making the power connection last, complete the connections in any order. The only connection not shown in the diagram is the Ethernet/LAN connection made to the front panel of the unit. Use a CAT 5 cable; not supplied.

Hookup Connections for CEN-IO

NOTE:
CABLES ARE NOT SUPPLIED.
ETHERNET CONNECTION NOT SHOWN.

PC

TO
CONTROLLABLE DEVICES

FROM DEVICE OUTPUTS
- CONTACT CLOSURES
- SOLID STATE CLOSURES
- LIGHTING SYSTEMS

12VDC
.5A

PC

INPUT/OUTPUT
1 2 3 4 5 6 7 8 G

1 C 2 3 C 4 5 C 6 7 C 8

RELAY OUTPUT

CRESTRON ELECTRONICS INC. ROCKLEIGH, N.J. 07647

POWER PACK
(500 mA)
(1000 mA
for CENI-IO)

TO
CONTROLLABLE
DEVICES
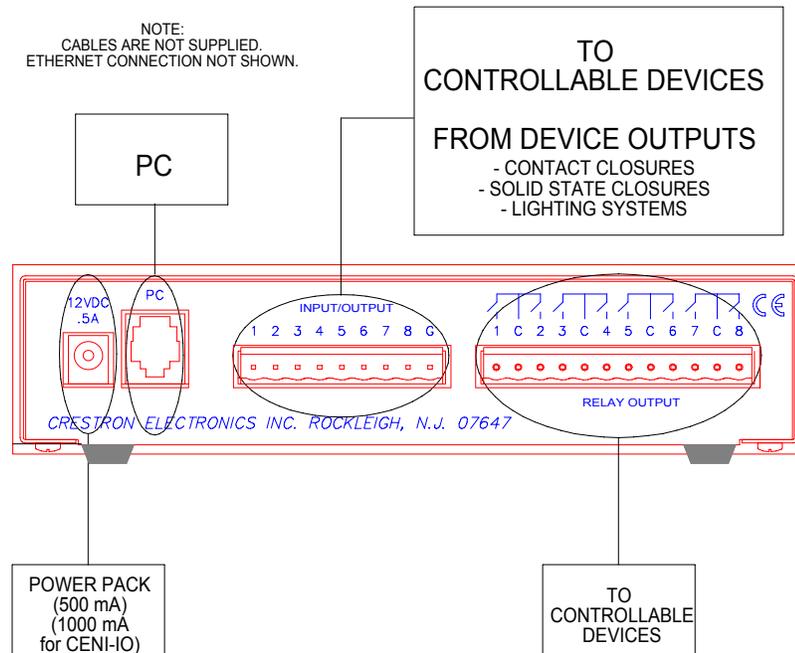
Setup Menus

The CEN-IO setup menus can be accessed only after connecting the communications port of the PC to the PC port on the CEN-IO. Communication cables are not provided. Refer to "Preparation for Use" on page 6 for CEN-IO hookup details. After connecting the CEN-IO and before applying power, open the communications package that resides on the PC. Viewport from either SIMPL Windows or VisionTools Pro is used in the illustrations that follow. Be sure to set the PC communication parameters as shown below.

PC Communication Parameters

COM1 Properties

Port Settings

Bits per second: 57600

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

Advanced...   Restore Defaults

OK   Cancel   Apply
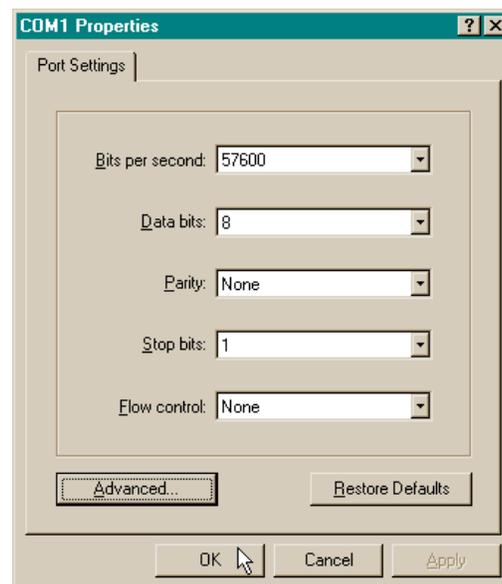
Apply power to the CEN-IO and notice that the MAIN MENU is displayed in the Viewport window, shown below.

MAIN MENU in Viewport Window

```
Crestron Viewport                               _ □ ✕

File  Edit  Setup  Diagnostics  Functions  File Transfer  Remote

TELNET_PROTOCOL defined
FNS device smc91c94 installed at 0x20
ll_route: failed 22
MAIN MENU

  1. Network Functions.
  2. Relay Control.
  3. VersiPort Control.
  4. Change Password.
  5. Perform Test.
  6. Restart Box.
  7. Upload Firmware.

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Port Settings:
Connected to "132.149.2.122" on Port 41795 (Crestron Terminal Pr
```
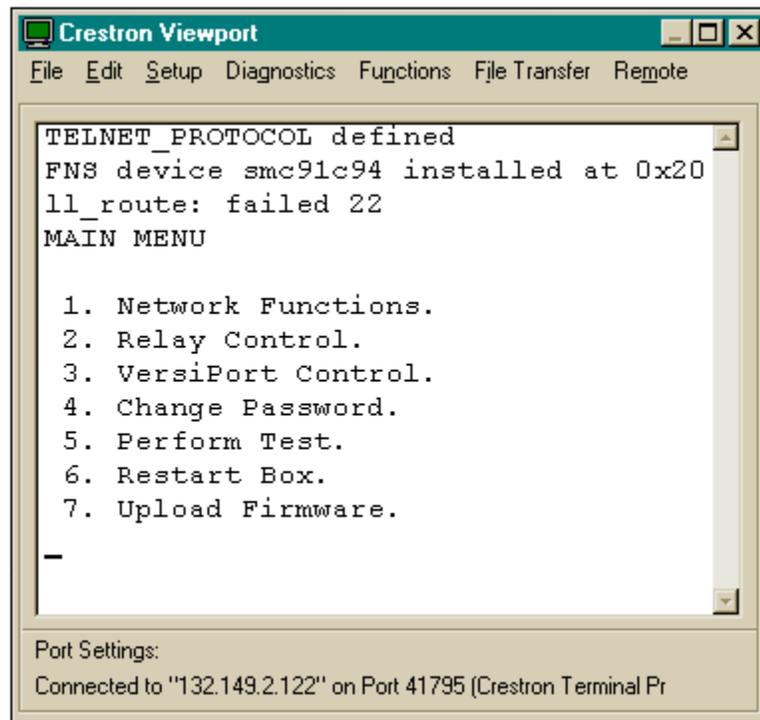
The menu consists of 7 options. Selection is made by depressing the appropriate number for each menu option.

Network Functions

Depressing "1" from the MAIN MENU opens the NETWORK FUNCTIONS MENU which appears on the screen as five options.

NETWORK FUNCTIONS MENU in Viewport Window

```
NETWORK FUNCTIONS

  1. TCP/IP Configuration.
  2. SNMP Configuration.
  3. Manipulate Master List.
  4. PING (ICMP Echo) Test.
  5. Go up one menu level.

  _
```
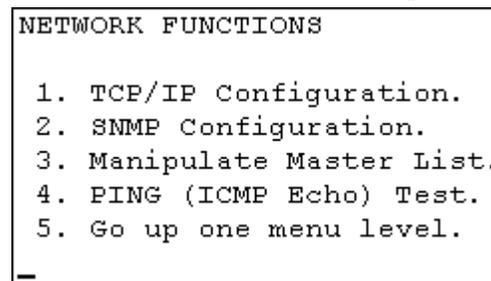
TCP/IP Configuration

Depressing "1" from the NETWORK FUNCTIONS MENU opens the TCP/IP
CONFIGURATION MENU which appears on the screen as six options.

TCP/IP CONFIGURATION MENU in Viewport Window

```
TCP/IP CONFIGURATION

 1. MAC Address:
 2. IP Address:
 3. IP Mask:
 4. IP MTU:
 5. Default router:
 6. Go up one menu level.

_
```

MAC Address - Depressing "1" from the TCP/IP CONFIGURATION MENU
displays the MAC address (## ## ## ## ## ##, where # represents an alphanumeric)
and prompts the user to 'Press any key to continue'. Doing so displays the TCP/IP
CONFIGURATION MENU again. The MAC address can not be changed.

*None of the changes to the
items marked with an asterisk
(*) takes effect until the unit
is restarted.*

IP Address (*) - Depressing "2" from the TCP/IP CONFIGURATION MENU
allows the user to change the IP address for the connected CEN-IO. The program
displays the current IP address and prompts the user to enter an new IP address.
Enter the new address and depress ENTER. The program responds with the new IP
address and prompts the user to 'Press any key to continue'. Doing so displays the
TCP/IP CONFIGURATION MENU again.

IP MASK (*) - Depressing "3" from the TCP/IP CONFIGURATION MENU
allows the user to change the IP mask for the connected CEN-IO. The program
displays the current IP mask and prompts the user to enter an new IP mask. Enter the
new mask and depress ENTER. The program responds with the new IP mask and
prompts the user to 'Press any key to continue'. Doing so displays the TCP/IP
CONFIGURATION MENU again.

IP MTU (*) - Depressing "4" from the TCP/IP CONFIGURATION MENU allows
the user to change the IP MTU for the connected CEN-IO. The program displays the
current IP MTU and prompts the user to enter an new IP MTU. Enter the new IP
MTU and depress ENTER. The program responds with the new IP MTU and
prompts the user to 'Press any key to continue'. Doing so displays the TCP/IP
CONFIGURATION MENU again.

Default router (*) - Depressing "5" from the TCP/IP CONFIGURATION MENU
allows the user to change the default router for the connected CEN-IO. The program
displays the current default router and prompts the user to enter an new default
router. Enter the new router and depress ENTER. The program responds with the
new default router and prompts the user to 'Press any key to continue'. Doing so
displays the TCP/IP CONFIGURATION MENU again.

SNMP Configuration

Depressing "2" from the NETWORK FUNCTIONS MENU opens the SNMP CONFIGURATION MENU which appears on the screen as four options.

SNMP CONFIGURATION MENU in Viewport Window

```
SNMP CONFIGURATION

  1. Configure NMS Trap catchers.
  2. Configure Community Strings.
  3. Miscellaneous Information.
  4. Go up one menu level.

_
```

Configure NMS (Network Management Station) Trap catchers

Depressing "1" from the SNMP CONFIGURATION MENU opens the CONFIGURE NMS TRAP CATCHERS MENU which appears on the screen as four options. A NMS trap catcher is an NMS configured to receive the traps originating from the CEN-IO.

CONFIGURE NMS TRAP CATCHERS MENU in Viewport Window

```
CONFIGURE NMS TRAP CATCHERS

  1. Display NMS Trap catchers.
  2. Add NMS Trap catcher.
  3. Remove NMS Trap catcher.
  4. Go up one menu level.

_
```

- Display NMS Trap Catchers - Depressing "1" from the CONFIGURE NMS TRAP CATCHERS MENU instructs the program to reveal its three trap catchers. Once displayed, the program prompts the user to 'Press any key to continue'. Doing so displays the CONFIGURE NMS TRAP CATCHERS MENU again.

- Add NMS Trap catcher - Depressing "2" from the CONFIGURE NMS TRAP CATCHERS MENU permits the user to add a new trap catcher. The program prompts the user to enter the trap catcher address. Enter the address (#.#.#.#) and depress ENTER. The program responds by repeating the new address and prompting the user to 'Press any key to continue'. Doing so displays the CONFIGURE NMS TRAP CATCHERS MENU again. The newly added address overwrites the first available address (0.0.0.0). If there are no addresses available, the program responds with the message: 'All three addresses are filled, remove one before adding'.

- Remove NMS Trap catcher - Depressing "3" from the CONFIGURE NMS TRAP CATCHERS MENU permits the user to delete an existing trap catcher. The program lists addresses for each trap catcher and prompts the user to 'Enter the entry number to remove'. Enter the entry number (1, 2, or 3). The program responds by prompting the user to 'Press any key to continue'. Doing so displays the CONFIGURE NMS TRAP CATCHERS MENU again.

Configure Community Strings

Depressing "2" from the SNMP CONFIGURATION MENU opens the
CONFIGURE COMMUNITY STRINGS MENU which appears on the screen as
three options. These strings serve as passwords to read and write SNMP MIB
elements. The read community string (public default) is used to authenticate SNMP
'Get Requests'. This parameter is also passed as the community string in SNMP trap
messages. The write community string (private default) is used to authenticate
SNMP 'Set Requests'.

CONFIGURE COMMUNITY STRINGS MENU in Viewport Window

```
CONFIGURE COMMUNITY STRINGS

 1. Change Read Community String.
 2. Change Write Community String.
 3. Go up one menu level.

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```

- Change Read Community String - Depressing "1" from the
  CONFIGURE COMMUNITY STRINGS MENU instructs the program
  to reveal the current read community string and prompts the user to
  'Enter the new "Read Community String"'. Enter the new string (254
  character maximum) and depress ENTER. The program responds with
  a 'SAVED' message and prompts the user to 'Press any key to
  continue'. Doing so displays the CONFIGURE COMMUNITY
  STRINGS MENU again.

- Change Write Community String - Depressing "2" from the
  CONFIGURE COMMUNITY STRINGS MENU instructs the program
  to reveal the current write community string and prompts the user to
  'Enter the new "Write Community String"'. Enter the new string (254
  character maximum) and depress ENTER. The program responds with
  a 'SAVED' message and prompts the user to 'Press any key to
  continue'. Doing so displays the CONFIGURE COMMUNITY
  STRINGS MENU again.

Miscellaneous Information

Depressing "3" from the SNMP CONFIGURATION MENU opens the
MISCELLANEOUS SNMP INFORMATION MENU which appears on the screen
as four options. Contact information is the textual identification for the managed
node. Assigned name is an administratively assigned name for this managed node.
Location information is the physical location of this node.

MISCELLANEOUS SNMP INFORMATION MENU in Viewport Window

```
MISCELLANEOUS SNMP INFORMATION

 1. Change the Contact Information.
 2. Change the Assigned Name.
 3. Change the Location Information.
 4. Go up one menu level.

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```

- Change the Contact Information - Depressing "1" from the
  MISCELLANEOUS SNMP INFORMATION MENU instructs the
  program to reveal the current contact information value and prompts
  the user to 'Enter the new "Contact Information"'. Enter the new string

(254 character maximum) and depress ENTER. The program responds with a 'SAVED' message and prompts the user to 'Press any key to continue'. Doing so displays the MISCELLANEOUS SNMP INFORMATION MENU again.

- Change the Assigned Name - Depressing "2" from the MISCELLANEOUS SNMP INFORMATION MENU instructs the program to reveal the current assigned name value and prompts the user to 'Enter the new "Assigned Name"'. Enter the new name (254 character maximum) and depress ENTER. The program responds with a 'SAVED' message and prompts the user to 'Press any key to continue'. Doing so displays the MISCELLANEOUS SNMP INFORMATION MENU again.

- Change the Location Information - Depressing "3" from the MISCELLANEOUS SNMP INFORMATION MENU instructs the program to reveal the current location information value and prompts the user to 'Enter the new "Location Information"'. Enter the new name (254 character maximum) and depress ENTER. The program responds with a 'SAVED' message and prompts the user to 'Press any key to continue'. Doing so displays the MISCELLANEOUS SNMP INFORMATION MENU again.

Manipulate Master List

Depressing "3" from the NETWORK FUNCTIONS MENU opens the MANIPULATE MASTER LIST MENU which appears on the screen as five options.

MANIPULATE MASTER LIST MENU in Viewport Window

```
MANIPULATE MASTER LIST

 1. Display Master Lists.
 2. Add Static Master.
 3. Remove Static Master.
 4. Clear Dynamic Master List.
 5. Go up one menu level.

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```

Display Master Lists - Depressing "1" from the MANIPULATE MASTER LIST MENU reveals the STATIC and DYNAMIC MASTERS lists. The program responds by prompting the user to 'Press any key to continue'. Doing so displays the MANIPULATE MASTER LIST MENU again.

Add Static Master - Depressing "2" from the MANIPULATE MASTER LIST MENU permits the user to add a new master IP address and new master CRESNET ID. The program prompts the user to enter the new master IP address. Enter the address (#.#.#.#) and depress ENTER. The program prompts the user to enter the new master CRESNET ID. Enter the address (####) and depress ENTER. The program responds by prompting the user to 'Press any key to continue'. Doing so displays the MANIPULATE MASTER LIST MENU again. The newly added address and ID overwrites the first available address (0.0.0.0) and ID (0000). If there are no open addresses or IDs available, the program responds with the message: 'The static master list is full. Try removing an entry and trying again'.

Remove Static Master - Depressing "3" from the MANIPULATE MASTER LIST MENU permits the user to delete an existing master IP address and new master CRESNET ID. The program lists addresses for each master IP address and new

master CRESNET ID and prompts the user to 'Enter the entry number to remove'. Enter the entry number (1, 2, 3, 4, or 5). The program responds by prompting the user to 'Press any key to continue'. Doing so displays the MANIPULATE MASTER LIST MENU again.

Clear Dynamic Master List - Depressing "4" from the MANIPULATE MASTER LIST MENU removes all current entries from the dynamic master list. Press any key to return to the MANIPULATE MASTER LIST MENU.

PING (ICMP Echo) Test

Depressing "4" from the NETWORK FUNCTIONS MENU allows the user to perform a PING from the CEN-IO to test the Ethernet connection and the TCP/IP configuration. The program responds by revealing the source IP address and prompts the user to enter the destination IP address. Doing so displays the packet size in bytes and the program prompts the user to resize. Depress ENTER. The program displays the number of packets to transmit and prompts the user change the number. Depress ENTER. The program prompts the user if it is OK to run the test. Depress 'Y' to run the test or 'N' to abort. If 'Y' is depressed, the program runs the test, reports its findings, and prompts the user to 'Press any key to continue'. Doing so displays the NETWORK FUNCTIONS MENU again.

Relay Control

Depressing "2" from the MAIN MENU opens the RELAY SELECTION MENU which appears on the screen as four options.

RELAY SELECTION MENU in Viewport Window

```
RELAY SELECTION


 1. Display Relay Status.
 2. Open Relay.
 3. Close Relay.
 4. Go up one menu level.

 _
```

Display Relay Status

Depressing "1" from the RELAY SELECTION MENU reveals the current relay states (#1 through #8). The program further responds by prompting the user to 'Press space bar to continue'. Doing so displays the RELAY SELECTION MENU again.

Open Relay

Depressing "2" from the RELAY SELECTION MENU permits the user to open a given relay (#1 through #8). The program responds with the message 'SELECT RELAY' and prompts the user to 'Press the number of the relay you wish to open'. Enter a number (1 through 8). More than one relay can be opened in a session; enter the numbers consecutively. When all the numbers are entered, depress '9' to return to the RELAY SELECTION MENU.

Close Relay

Depressing "3" from the RELAY SELECTION MENU permits the user to close a given relay (#1 through #8). The program responds with the message 'SELECT RELAY' and prompts the user to 'Press the number of the relay you wish to close'. Enter a number (1 through 8). More than one relay can be closed in a session, enter

the numbers consecutively. When all the numbers are entered, depress '9' to return to the RELAY SELECTION MENU.

VersiPort Control

Depressing "3" from the MAIN MENU opens the VERSIPORT SELECTION MENU which appears on the screen as four options.

VERSIPORT SELECTION MENU in Viewport Window

```
VERSIPORT SELECTION

 1. Display All Inputs as Digital.
 2. Display All Inputs as Analog.
 3. Access Settings.
 4. Go up one menu level.

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```

Display All Inputs as Digital

Depressing "1" from the VERSIPORT SELECTION MENU reveals the current digital state of the eight inputs (#1 through #8). The program further responds by prompting the user to 'Press space bar to continue'. Doing so displays the VERSIPORT SELECTION MENU again.

Display All Inputs as Analog

Depressing "2" from the VERSIPORT SELECTION MENU reveals the current analog value of the eight inputs (#1 through #8). The program further responds by prompting the user to 'Press space bar to continue'. Doing so displays the VERSIPORT SELECTION MENU again.

Access Settings

Depressing "3" from the VERSIPORT SELECTION MENU permits the user to review all the access settings for a given input (#1 through #8). The program provides the given inputs digital state, analog value, analog threshold value, and VersiPort connections. The program prompts the user to do one of the following.

- Depress "1" to toggle the voltage state.

- Depress "2" to toggle the grounding state.

- Depress "3" to set the analog threshold.

- Depress "4" and the space bar to access the setting of another VersiPort. The program prompts the user with the 'SELECT VERSIPORT' message. Either enter the number (1 through 8) or depress '9' to display the VERSIPORT SELECTION MENU.

Change Password

Passwords allow the user to access these menus via a TELNET session. Depressing "4" from the MAIN MENU permits the user to alter the current password. The program prompts the user to enter a new password. Enter the password and depress ENTER. The program prompts the user to enter the new password again. Enter the password and depress ENTER. If done correctly, the program responds that the password was accepted. The program further responds by prompting the user to 'Press space bar to continue'. Doing so displays the MAIN MENU again.

Restart Box

Depressing "6" from the MAIN MENU allows the user to restart the device. The program responds with the 'DO YOU REALLY WANT TO RESTART THE DEVICE?' message. Depress 'Y' to restart or 'N' to abort the restart. Depress any key to return to the MAIN MENU.

Upload Firmware

Depressing "7" from the MAIN MENU allows the user to upload the latest firmware via the Serial connection. The program responds with the 'READY FOR XMODEM TRANSFER' message and then proceeds to upload the firmware. When the upload is complete, the program returns to the MAIN MENU.

SIMPL™ Windows® Programming

SIMPL (Symbol Intensive Master Programming Language) is an easy-to-use programming language that is completely integrated and compatible with all Crestron system hardware. The objects that are used in SIMPL are called symbols. SIMPL Windows offers drag and drop functionality in a familiar Windows® environment.

SIMPL Windows is Crestron Electronics' software for programming Crestron control systems. It provides a well-designed graphical environment with a number of workspaces (i.e., windows) in which a programmer can select, configure, program, test, and monitor a Crestron control system.

The next two subsections describe a sample SIMPL Windows program that utilizes a CEN-IO module. The first subsection details how the sample program works with a textual description and block diagram. The second subsection provides a broad description of how to actually create the SIMPL Windows program.

NOTE: The following description assumes that the reader has knowledge of SIMPL Windows. If not, please refer to the extensive help information provided with the software.

NOTE: There is no need to recreate the sample SIMPL Windows program. A similar copy of this program is available from Crestron's ControlCD (version 5.2 and later). Search for the CEN-IO.SMW project in the SIMPL Windows Example Base.

How the Program Works

A basic CEN-IO SIMPL program is shown below in block diagram form. This example demonstrates a two zone lighting system (ZONE 1 and ZONE 2) that utilizes a CT-3500 touchpanel as the user interface and a CEN-IO to control the lights.

Block Diagram of System Incorporating a CEN-IO
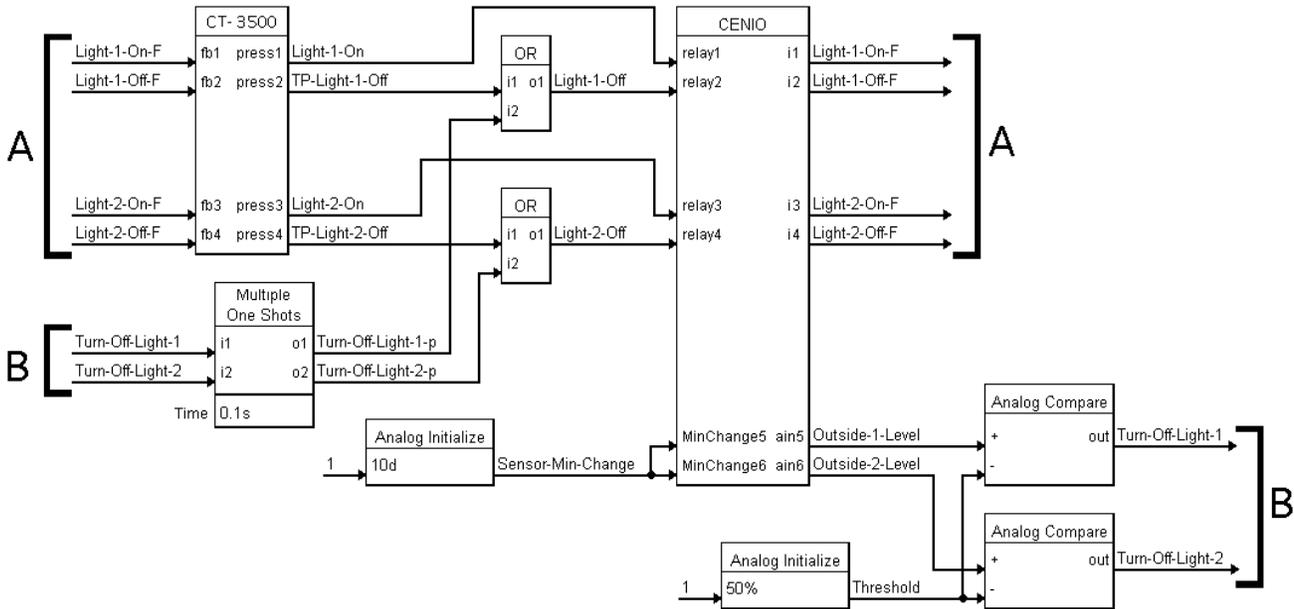
The touchpanel has an ON and OFF button for each zone (join number 1 and 2 for ZONE 1 and join numbers 3 and 4 for ZONE 2). Each zone has a light sensor that is connected to an analog input of the CEN-IO. The lights can be turned off either via a button press from the touchpanel or when the sensor detects a light level greater than 50% of its maximum value. The lights can be turned on via the button presses (join numbers 1 and 3). The relays are used to control the lights. True feedback from the lighting system is used from the digital inputs.

The **MinChange** is set to 10 to compensate for jitter on the values being reported from the light sensors. The lights sensors in this example are resistive, therefore, the pullup resistors in the CEN-IO are left enabled.

How to Create the Program

Configuration Manager

Use the Configuration Manager workspace (**Project | Configure System**) in SIMPL Windows to select and configure all the devices that need to be included into the system. For this example, from the Control Systems folder in the *Device Library* select CNMSX-PRO. Drag and drop the CT-3500 (Touchpanels (Wired) folder in the *Device Library*) and CEN-IO (Ethernet Control Modules folder) into *System View*. For this example, the NET ID of the touchpanel must be set to 03 and the CEN-IO IP Net Address must be set to 03, shown on the next page.

NOTE: SIMPL Windows v1.30.01 or later is required to program the control system containing a CEN-IO. If using an earlier version of SIMPL Windows, Crestron recommends a SIMPL Windows and operating system upgrade. The latest version can be obtained from the Software Downloads page (Simplwin Library) of Crestron's website (www.crestron.com). New users are required to register in order to obtain access to the FTP site.

System View of the CT-3500 in SIMPL Windows' Configuration Manager
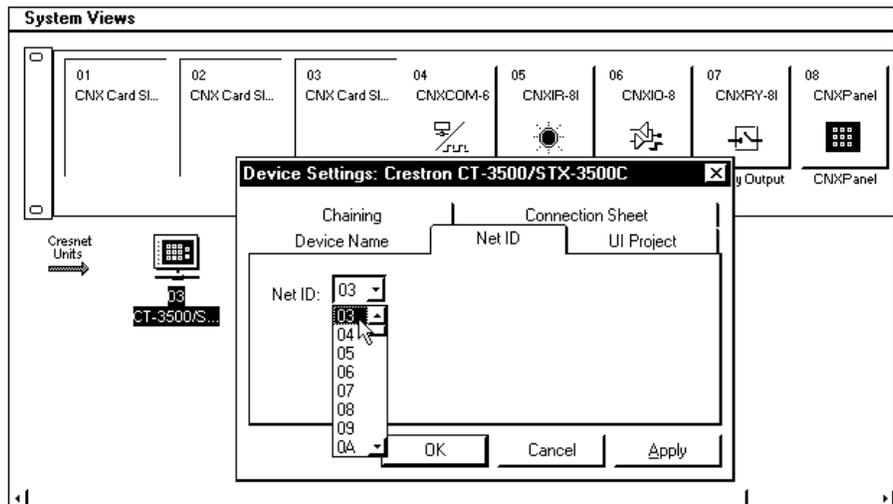
System View of the CEN-IO in SIMPL Windows' Configuration Manager
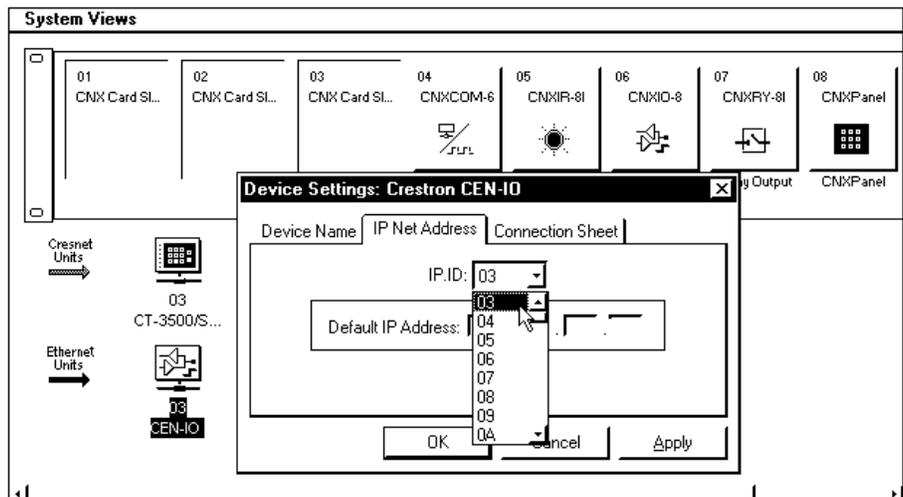
Programming Manager

Use the Programming Manager workspace (**Project | Program System**) in SIMPL Windows to select symbols and assign their respective signals. For this example, a touchpanel and CEN-IO symbol were added automatically when the devices were added to the system in the Configuration Manager workspace. Expand the Network Modules folder and double click on the CT-3500 for a detail view (alternatively CTRL+D or drag and drop into *Detail View*). Assign the signal as shown after this paragraph.

Detail View of the CT-3500 in SIMPL Windows' Programming Manager
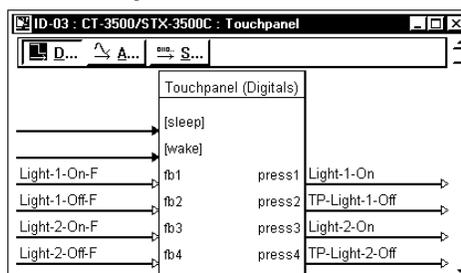
Expand the Ethernet folder and double click on the CEN-IO for a detail view (alternatively CTRL+D or drag and drop into *Detail View*). Assign the signal as shown after this paragraph.

Detail View of the CEN-IO in SIMPL Windows' Programming Manager
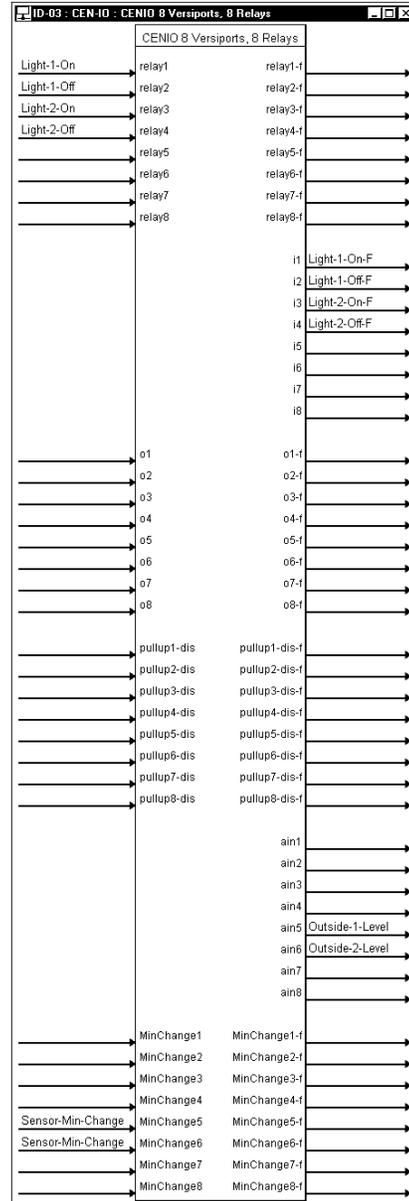
All logic symbols necessary for the SIMPL Windows program must be added from the *Symbol Library* in the Programming Manager workspace. In this example, drag and drop two Analog Initialize symbols from the Analog Operations folder, a Multiple One Shot symbol from the Timers folder, and two Analog Compare and two OR symbols from the Conditional folder into the Logic folder in *Program View*. Expand the Logic folder and double click on symbol icons for a detail view (alternatively CTRL+D or drag and drop into *Detail View*). Assign signals as shown below and on the next page.

Detail View of the ANALOG INITIALIZE (S-1 and S2) in SIMPL Windows' Programming Manager

```
┌─ S-1 : Threshold for Light Activation : Analog Initialize ─ □ ✕ ┐
│                  ┌─────────────────────┐                        │
│                  │  Analog Initialize  │                        │
│    1             │  50%                │  Threshold             │
│    ───────────────>                    │  ─────────────────────>│
│                  └─────────────────────┘                        │
└─────────────────────────────────────────────────────────────────┘

┌─ S-2 : Minimum Change Value : Analog Initialize ─────── □ ✕ ┐
│                  ┌─────────────────────┐                    │
│                  │  Analog Initialize  │                    │
│    1             │  10d                │  Sensor-Min-Change  │
│    ───────────────>                    │  ──────────────────>│
│                  └─────────────────────┘                    │
└─────────────────────────────────────────────────────────────┘
```
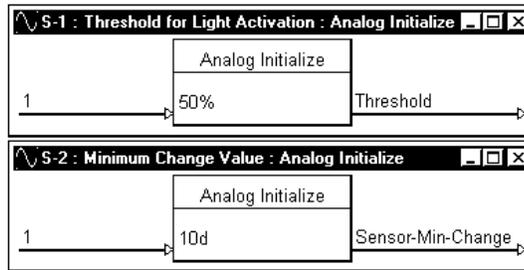
NOTE: For a more descriptive symbol name, as shown in the illustration above, right mouse click on the symbol icon in the Logic folder in *Program View* and select **Edit Symbol Comment** (alternatively, highlight the icon and depress Ctrl+R or Tab). Enter a new descriptive name in the "Enter Symbol Comment" dialog box and click OK.

Detail View of a MULTIPLE ONE SHOT (S-3) in SIMPL Windows' Programming Manager

```
┌─ S-3 : Pulses to turn off lights from sensors : Multiple One Shots ─ □ ✕ ┐
│                      ┌────────────────────┐                               │
│                      │  Multiple One Shots │                              │
│                      │  [reset]            │                              │
│  Turn-Off-Light-1    │  i1             o1  │  Turn-Off-Light-1-p          │
│  ─────────────────────>                    >  ─────────────────────────>  │
│  Turn-Off-Light-2    │  i2             o2  │  Turn-Off-Light-2-p          │
│  ─────────────────────>                    >  ─────────────────────────>  │
│                 Time │  0.1s               │                              │
│                      └────────────────────┘                               │
└───────────────────────────────────────────────────────────────────────────┘
```
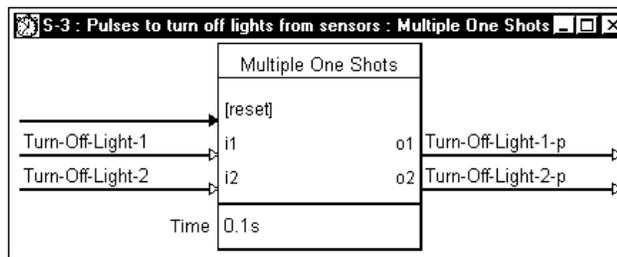
Detail View of the ANALOG COMPARE (S-4.1 and S-5.1) in SIMPL Windows' Programming Manager

```
┌─ S-4.1 : If outside >= Threshold, turn off light : Analog Compare ─ □ ✕ ┐
│                      ┌────────────────────┐                              │
│                      │  Analog Compare    │                              │
│  Outside-1-Level     │  +            out  │  Turn-Off-Light-1            │
│  ─────────────────────>                    ─────────────────────────────>│
│  Threshold           │  -          [out*] │                              │
│  ─────────────────────>                    ─────────────────────────────>│
│                      │  [-]               │                              │
│                      └────────────────────┘                              │
└──────────────────────────────────────────────────────────────────────────┘

┌─ S-5.1 : If outside >= Threshold, turn off light : Analog Compare ─ □ ✕ ┐
│                      ┌────────────────────┐                              │
│                      │  Analog Compare    │                              │
│  Outside-2-Level     │  +            out  │  Turn-Off-Light-2            │
│  ─────────────────────>                    ─────────────────────────────>│
│  Threshold           │  -          [out*] │                              │
│  ─────────────────────>                    ─────────────────────────────>│
│                      │  [-]               │                              │
│                      └────────────────────┘                              │
└──────────────────────────────────────────────────────────────────────────┘
```
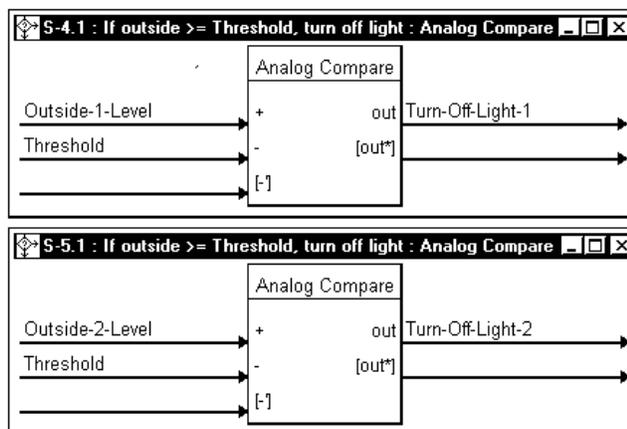
Detail View of the OR (S-4.2 and S-5.2) in SIMPL Windows' Programming Manager
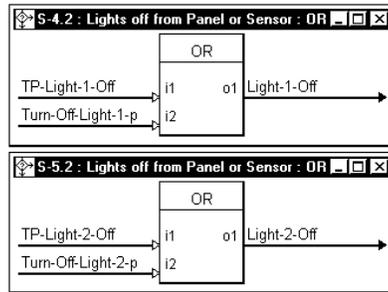
Problem Solving

Troubleshooting

The table following this paragraph provides corrective action for possible trouble situations. If further assistance is required, please contact a Crestron customer service representative.

CEN-IO Troubleshooting

TROUBLE	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Green PWR LED does not illuminate.	CEN-IO is not receiving power.	Confirm that power pack securely plugged into outlet and that the connector is properly attached to the CEN-IO.
CEN-IO does not communicate with PC.	Improper CEN-IO/PC cable connections.	Verify cable connections with PC: proper connector is used, cable in intact, and connections are secure.
	Improper terminal emulator used.	Use Viewport (F4) from either SIMPL Windows or VT Pro.
CEN-IO does not communicate with LAN.	Improper addresses used.	Verify addresses via the Setup Menus described in this Operations Guide.
	Improper CEN-IO/LAN cable connections.	Verify cable connections with LAN: proper connector is used, cable in intact, and connections are secure.

Further Inquiries

If after reviewing this Operations Guide for the CEN-IO, you cannot locate specific information or have questions, please take advantage of Crestron's award winning customer service team by calling:

- In the US and Canada, call Crestron's corporate headquarters at 1-888-CRESTRON [1-888-273-7876] or 1-201-767-3400.

- In Europe, call Crestron International at +32-15-50-99-50.

- In Asia, call Crestron Asia at +852-2341-2016.

- In Latin America, call Crestron Latin America at +5255-5093-2160.

- In Australia, call Crestron Pacific at +613-9480-2999.

For local support from exclusive Crestron factory-trained personnel in New Zealand call Amber Technologies at +649-410-8382.

Return and Warranty Policies

Merchandise Returns / Repair Service

1. No merchandise may be returned for credit, exchange, or service without prior authorization from CRESTRON. To obtain warranty service for CRESTRON products, contact the factory and request an RMA (Return Merchandise Authorization) number. Enclose a note specifying the nature of the problem, name and phone number of contact person, RMA number, and return address.

2. Products may be returned for credit, exchange, or service with a CRESTRON Return Merchandise Authorization (RMA) number. Authorized returns must be shipped freight prepaid to CRESTRON, Cresskill, N.J., or its authorized subsidiaries, with RMA number clearly marked on the outside of all cartons. Shipments arriving freight collect or without an RMA number shall be subject to refusal. CRESTRON reserves the right in its sole and absolute discretion to charge a 15% restocking fee, plus shipping costs, on any products returned with an RMA.

3. Return freight charges following repair of items under warranty shall be paid by CRESTRON, shipping by standard ground carrier. In the event repairs are found to be non-warranty, return freight costs shall be paid by the purchaser.

CRESTRON Limited Warranty

CRESTRON ELECTRONICS, Inc. warrants its products to be free from manufacturing defects in materials and workmanship under normal use for a period of three (3) years from the date of purchase from CRESTRON, with the following exceptions: disk drives and any other moving or rotating mechanical parts, pan/tilt heads and power supplies are covered for a period of one (1) year; touchscreen display and overlay components are covered for 90 days; batteries and incandescent lamps are not covered.

This warranty extends to products purchased directly from CRESTRON or an authorized CRESTRON dealer. Purchasers should inquire of the dealer regarding the nature and extent of the dealer's warranty, if any.

CRESTRON shall not be liable to honor the terms of this warranty if the product has been used in any application other than that for which it was intended, or if it has been subjected to misuse, accidental damage, modification, or improper installation procedures. Furthermore, this warranty does not cover any product that has had the serial number altered, defaced, or removed.

This warranty shall be the sole and exclusive remedy to the original purchaser. In no event shall CRESTRON be liable for incidental or consequential damages of any kind (property or economic damages inclusive) arising from the sale or use of this equipment. CRESTRON is not liable for any claim made by a third party or made by the purchaser for a third party.

CRESTRON shall, at its option, repair or replace any product found defective, without charge for parts or labor. Repaired or replaced equipment and parts supplied under this warranty shall be covered only by the unexpired portion of the warranty.

Except as expressly set forth in this warranty, CRESTRON makes no other warranties, expressed or implied, nor authorizes any other party to offer any other party to offer any warranty, including any implied warranties of merchantability or fitness for a particular purpose. Any implied warranties that may be imposed by law are limited to the terms of this limited warranty. This warranty statement supercedes all previous warranties.

Trademark Information
All brand names, product names, and trademarks are the sole property of their respective owners. Windows is a registered trademark of Microsoft Corporation. Windows95/98/Me/XP and WindowsNT/2000 are trademarks of Microsoft Corporation

Appendix

CEN-IO Management Information Block (MIB)

The Management Information Block file, **cenio.mib**, defines the information that is available to other computers via SNMP protocol.

```
-- Crestron Electronics, Inc. Private Enterprise MIB: CENIO
-- Version 1.0 July 1998
-- Copyright (C) 1998 Crestron Electronics, Inc.
--
-- Revision History:
-- 7/98 Litt      created
--

CENIO-MIB DEFINITIONS ::= BEGIN

IMPORTS
      enterprises
            FROM RFC1155-SMI
      OBJECT-TYPE
            FROM RFC-1212;

-- CENIO is the first subtree within Crestron's enterprise MIB tree

crestron OBJECT IDENTIFIER ::= { enterprises 3212 }
crestron-CENIO OBJECT IDENTIFIER ::= { crestron 1 }

-- textual conventions

      DisplayString ::=
            OCTET STRING
      -- This data type is used to model textual information taken
      -- from the NVT ASCII character set.  By convention, objects
      -- with this syntax are declared as having
      --       SIZE (0..255)

-- CENIO Groups
```

```
relay OBJECT IDENTIFIER ::= { crestron-CENIO 1 }
versiport OBJECT IDENTIFIER ::= { crestron-CENIO 2 }


-- the relay group

relayNumber OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
            "The number of relays in this system."
    ::= { relay 1 }

-- the relay table

relayTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF RelayEntry
    ACCESS  not-accessible
      STATUS  mandatory
      DESCRIPTION
            "A list of relay entries. The number of entries is given by the
            value of relayNumber."
      ::= { relay 2 }

relayEntry OBJECT-TYPE
    SYNTAX  RelayEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION
            "A relay entry containing objects the describe a relay instance."
    INDEX   { relayIndex }
    ::= { relayTable 1 }

RelayEntry ::=
    SEQUENCE {
        relayIndex
            INTEGER,
        relayDescr
            DisplayString,
        relayState
            INTEGER
    }

relayIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
            "A unique value for each relay. Its value ranges between 1 and
            the value of relayNumber. The value for each relay must remain
            constant at least from one reinitialization of the entity's
            network management system to the next reinitialization."
    ::= { relayEntry 1 }
```

```
relayDescr OBJECT-TYPE
    SYNTAX  DisplayString (SIZE (0..255))
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION
            "A textual string containing information about the relay."
    ::= { relayEntry 2 }


relayState OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION
            "The current operational state of the relay (0=Open,1=Closed)."
    ::= { relayEntry 3 }



-- the versiport group

versiportNumber OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
            "The number of versiports in this system."
    ::= { versiport 1 }

-- the versiport table

versiportTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF VersiportEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION
            "A list of versiport entries.  The number of entries is given by
            the value of versiportNumber."
    ::= { versiport 2 }

versiportEntry OBJECT-TYPE
    SYNTAX  VersiportEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION
            "A versiport entry containing objects the describe a versiport
instance."
    INDEX   { versiportIndex }
    ::= { versiportTable 1 }

VersiportEntry ::=
    SEQUENCE {
        versiportIndex
            INTEGER,
        versiportDescr
```

```
        DisplayString,
    versiportDigitalInput
        INTEGER,
    versiportAnalogInput
        INTEGER,
    versiportAnalogThreshold
        INTEGER,
    versiportGroundingState
        INTEGER,
    versiportVoltageState
        INTEGER
}

versiportIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "A unique value for each versiport. Its value ranges between 1
        and the value of versiportNumber. The value for each versiport
        must remain constant at least from one reinitialization of the
        entity's network management system to the next reinitialization."
    ::= { versiportEntry 1 }

versiportDescr OBJECT-TYPE
    SYNTAX  DisplayString (SIZE (0..255))
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION
        "A textual string containing information about the versiport."
    ::= { versiportEntry 2 }

versiportDigitalInput OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The current digital input state of the versiport (0=Low,1=High)."
    ::= { versiportEntry 3 }

versiportAnalogInput OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The current analog input level of the versiport."
    ::= { versiportEntry 4 }

versiportAnalogThreshold OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION
        "The current analog threshold value of the versiport."
```

```
    ::= { versiportEntry 5 }

versiportGroundingState OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
          "The current grouding state of the versiport
(0=Grounded,1=Floating)."
     ::= { versiportEntry 6 }

versiportVoltageState OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
          "The current voltage state of the versiport
(0=No volatge supplied,1=Voltage supplied)."
     ::= { versiportEntry 7 }

END


_
```

Glossary of Terms

Community String

Community strings are passwords that let an SNMP controlled device know the priviledge level of the controller with which it is communicating. There are seperate community strings for read only permission and read writer permission.

Default Router

Default router is the address of the router the device uses to communicate with devices that are not connected directly to the local network.

IP Address

Internet protocol address is a unique number that is used to represent every single computer in a network. All the computers on the internet have a unique IP address. The format of the IP address is four numbers separated by dots (e.g., 198.123.456.7).

IP Mask

Internet protocol mask is a number that is used in conjunction with the IP address to determine whether or not a particular IP address is on the local network. If it is on the local network, communicate directly. Otherwise, use a router attached to the IP network. The IP mask for any device should be assigned by whoever manages the local network. The format of the IP mask is four numbers separated by dots (e.g., 255.255.255.0).

IP MTU

IP MTU is the maximum packet size that the device can transmit. It is not necessary to change this value from 1500 for an all ethernet network.

MAC Address

MAC address is a unique hardware address assigned to every network device in use. The MAC address is assigned by Crestron at the factory and is never changed.

Master List

Master list is a list of Crestron Internet Protocol (CIP) enabled devices that will be informed of any changes in the state of the controlled device. The device accepts commands from the addresses of these masters.

NMS Trap Catcher

NMS trap catcher is the address of a SNMP monitoring station that sends any alarm messages that the monitored device wishes to send.

Router

Router is a communications device which routes data between networks.

SNMP

SNMP stands for Simple Network Management Protocol. It is part of TCP/IP that deals with managing the devices in a network.

TCP/IP

TCP/IP stands for Transmission Control Protocol/Internet Protocol. It is quite simply a standard set of protocols that govern the basic workings of the Internet that was implemented in 1982.

The TCP part is all about ensuring that data is transmitted correctly between two computers. If any errors occur these are detected and the data is retransmitted. The data transmitted is split up into small portions called data packets. The IP part of TCP/IP is how these data packets are moved from one point to another. Each computer on the internet has a unique IP address and the data packets are moved from the source to the destination through many different computers which is controlled via TCP/IP. This protocol is used on the Internet and also by computers that are part of a LAN.

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