ELC-COENETM

Effective December 2010

Users Manual

Powering Business Worldwide

Introduction

✓ This is an OPEN-TYPE device and therefore should be installed in an enclosure free of airborne dust, excessive humidity, shock and vibration. The enclosure should prevent non-maintenance staff from operating the device (e.g. key or specific tools are required to open the enclosure) to avoid potential equipment damage or personal injury. DO NOT touch any terminal when the power is switched on.

✓ Please read this manual carefully and follow the instructions to avoid damage to the product or personal injury.

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The companies and products mentioned in this operation manual can be the trade mark possessed by the owner of that trade mark right.

1 Introduction

The ELC-COENETM is an Ethernet communication module for remote configuration, monitoring and control. It` supports the `Modbus TCP communication protocol as both a client and server device. Acting as a server device, the ELC-COENETM provides remote monitoring from SCADA (Supervisor Control and Data Acquisition) software or HMI (Human Machine Interfaces) panels. Acting as a client device, the ELC-COENETM can poll server devices such as VFDs and remote I/O products for use in the ELC control program.

In addition to Modbus TCP support, the ELC-COENETM module allows the ELC control program to be remotely monitored and updated from ELCSoft or EIPSoft over Ethernet. It also provides email support for event notification and provides for ELC clock synchronization from an NTP server.

- **Features**
  - Supports MODBUS TCP
  - Supports Master and Slave Data Exchange
  - ELC-PV28NNDR/T Automatic Time Correction
  - Supports E-Mail
  - RS-232/Ethernet Configuration
  - Transmission Speed: 10/100 Mbps

2 Specification

- **Functions Specification**

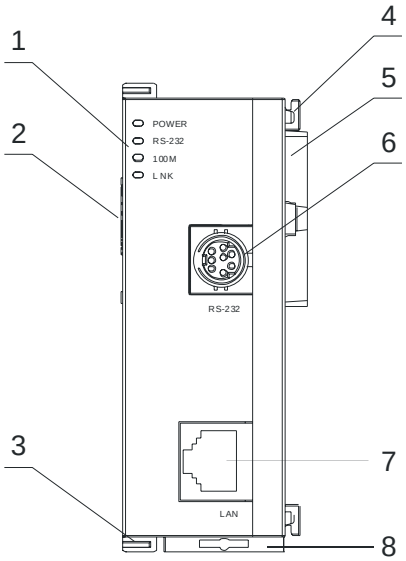
Network Interface	
Interface	RJ-45 with Auto MDI/MDIX
Number of ports	1 Port
Transmission method	IEEE 802.3, IEEE 802.3u
Transmission cable	Category 5e (TIA/EIA-568-A,TIA/EIA-568-B)
Transmission Rate	10/100 Mbps Auto-Detect
Protocol	ICMP, IP, TCP, UDP, DHCP, SMTP, NTP, MODBUS TCP
Serial Interface	
Interface	RS-232
Number of Ports	1 Port
Transmission Cable	ELC-CBPCELC3

- **Electrical Specification**

Power supply voltage	24VDC (-15% ~ 20%) (Power is supplied by the internal bus of MPU)
Power Consumption	1.5W

Noise Immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8KV Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2KV, Communication I/O: 1KV Damped-Oscillatory Wave: Power Line: 1KV, Digital I/O: 1KV RS (IEC 61131-2, IEC 61000-4-3): 26MHz ~ 1GHz, 10V/m
Insulation voltage	500V
Vibration/Shock Immunity	Standard: IEC61131-2, IEC 68-2-6 (TEST Fc)/IEC61131-2 & IEC 68-2-27 (TEST Ea)
Operation/storage temperature	Operation: 0°C ~ 55°C (temperature), 50 ~ 95% (humidity), pollution degree 2; Storage: -25°C ~ 70°C (temperature), 5 ~ 95% (humidity)
Certificates	CE cULus , Operating temperature code: T5
Weight (g)	92 (g)

3 Product Profile and Outline

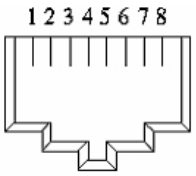


1. POWER, LINK, RS-232, 100M LED	2. Extension Port to connect Extension modules
3. Extension clip	4. Extension hole for mounting unit or module
5. Extension Port to connect I/O Modules	6. RS-232 port
7. Ethernet RJ-45 port	8. DIN rail clip

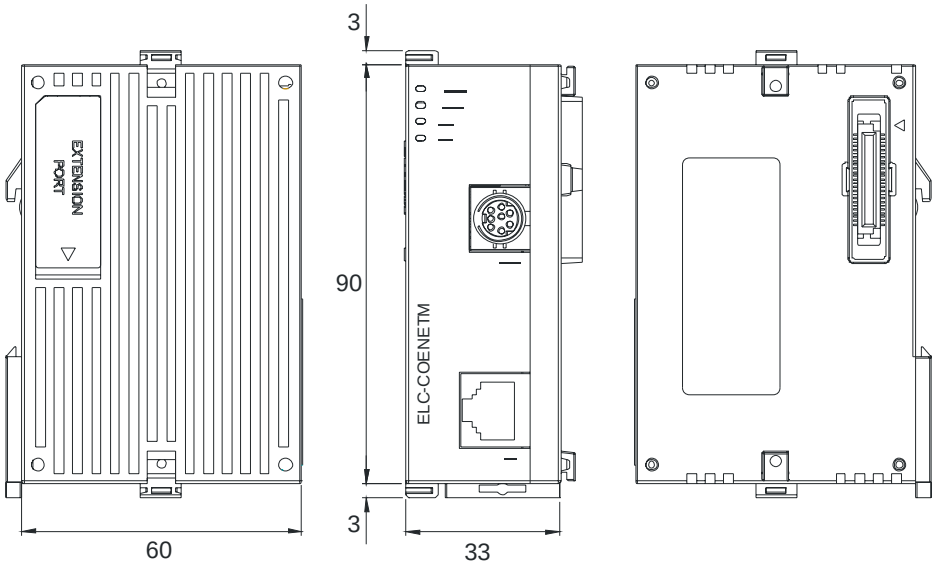
- **LED indicators**

Indicator	Color	Indication
POWER	Green	Power indication
RS-232	Red	Communication status for the serial port
100M	Orange	Network connection status
LINK	Green	Network communication speed

- **RJ-45 PIN definition**

RJ-45 sketch	Terminal No.	Definition	Explanation
	1	Tx+	Positive pole for data transmission
	2	Tx-	Negative pole for data transmission
	3	Rx+	Positive pole for data receiving
	6	Rx-	Negative pole for data receiving
	4, 5, 7, 8	-	N/C

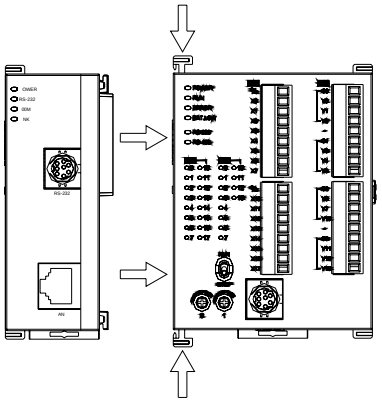
- **Dimension**



Unit: mm

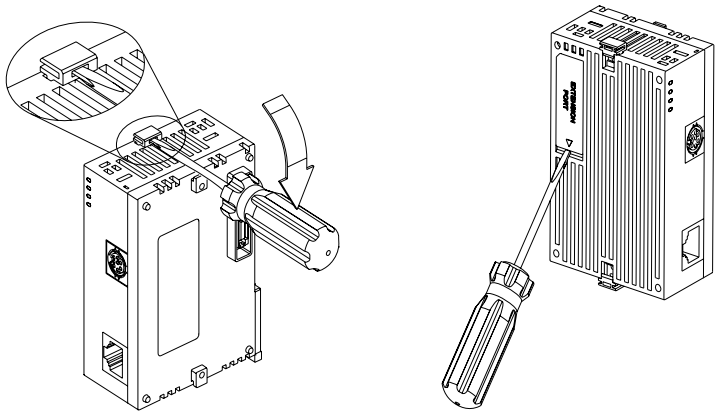
4 Installation and Wiring

- **How to Connect the ELC-COENETM with the ELC processor**
  - Open the extension clips on the left side of the MPU.
  - Connect the extension port of the ELC controller to the ELC-COENETM as shown below.
  - Close the extension clips.

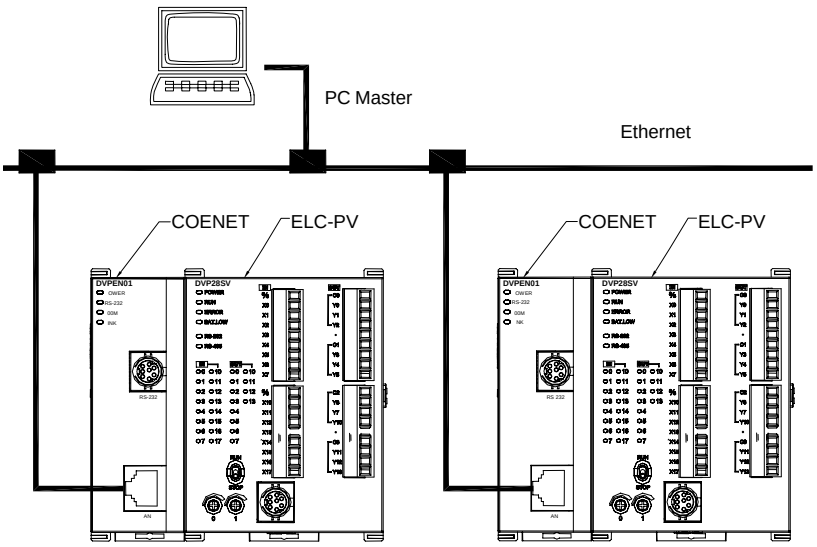


- **Installing the ELC-COENETM With Other Extension Modules**

  To connect ELC-COENETM with other extension modules, lift the extension clips of the extension module with a screwdriver and remove the side cover. Connect the second ELC-COENETM as described above. A maximum of 8 left side communication modules are supported.



- **Connecting the ELC-COENETM to the network**
  - Connect ELC-COENETM to the Ethernet switch using a standard CAT-5e cable. ELC-COENETM provides Auto MDI/MDIX function; therefore, ELC-COENETM does not need to use a cross over cable for direct connection to a PC.
  - A typical Network connection between the PC and ELC-COENETM is shown below:



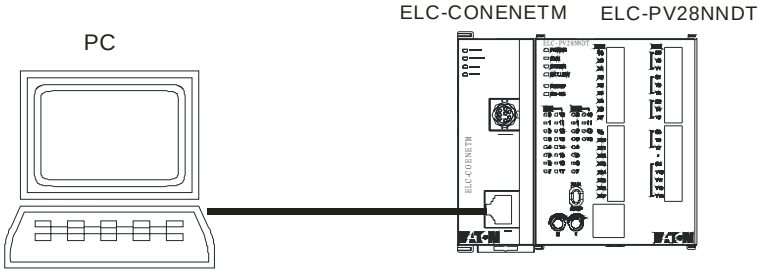
5 Configuring and applying the ELC-COENETM using ELCSoft (V2.0 or later)

ELCSoft integrates the capabilities to configure the ELC-COENETM module in the same programming environment used to generate your ELC control program. The following settings are described in this section:

- Establishing communications between ELCSoft and the ELC-COENETM module
- Assigning a new module name and network settings for the module
- Setting up and clearing password protection
- Recovering from a lost password
- Setting IP Filter Protection to restrict access
- Setting up email notification
- Setting up data exchange between ELC processors (continuous exchange)
- Setting up data exchange with any Modbus TCP server
- Setting up data exchange with any Modbus TCP client
- Setting up data exchange to an ELC remote I/O communications adapter (ELC-CAENET)

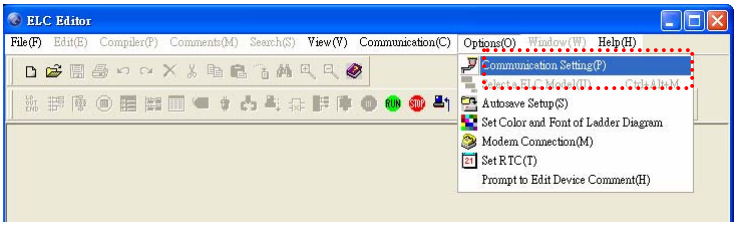
5.1 Connecting the PC to the ELC-COENETM through a LAN

(1) Connect the PC running ELCSoft and the ELC-COENETM to a common LAN. A direct RJ cable connection can also be used

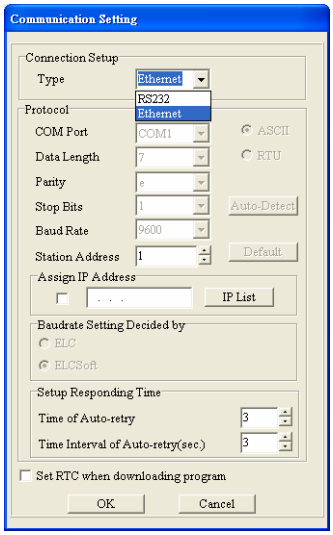


(Note: the default IP address setting for the ELC-COENETM module is IP address = 192.168.1.5. The PC IP address and network mask need to be set up to reside on the same network as the ELC-COENETM)

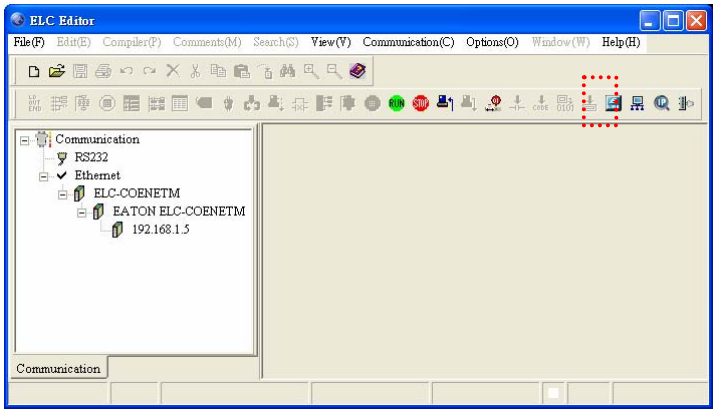
(2) Open “Communication Setting” in ELCSoft.



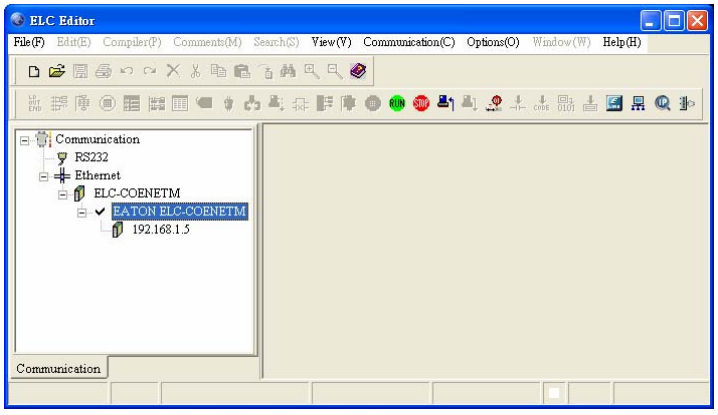
(3) Select “Ethernet” and press “OK”.



(4) Click the “Auto-Search” icon to search for all ELC-COENETM modules on the network. Follow “View → Workspace → Communication” or “View → Workspace → Project” to find the detected ELC-COENETM modules (default module name: EATON ELC-COENETM, IP: 192.168.1.5) in the window.

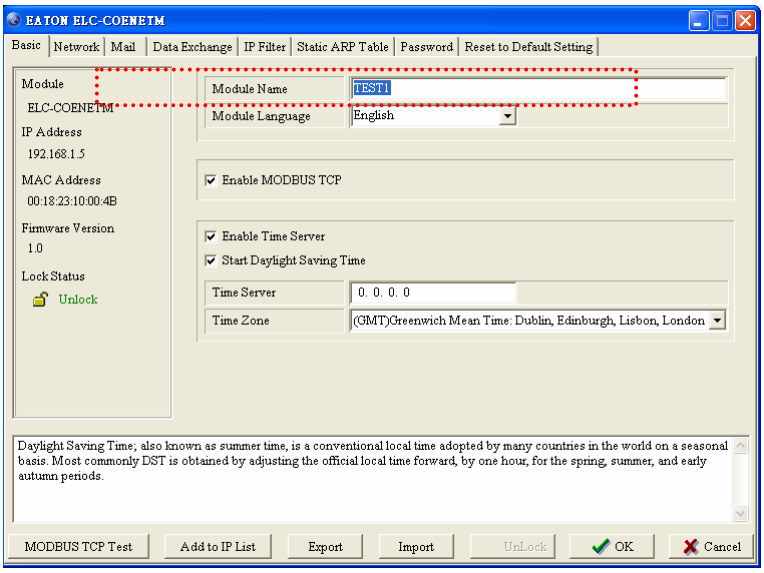


(5) Select the ELC-COENETM and double click it to open the setup page. All further ELC-COENETM configuration is done through the setup page

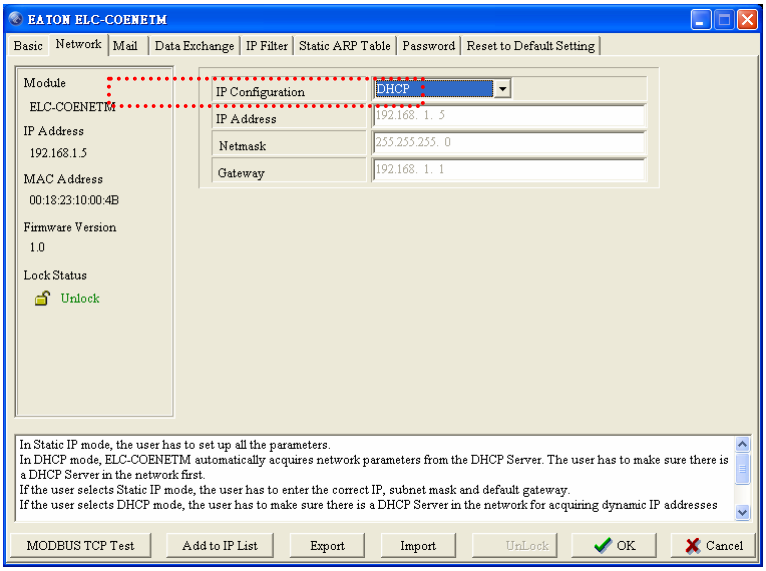


5.2 Changing the ELC-COENETM module name and IP address settings

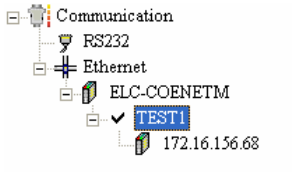
(1) After you open the setup dialog you will be on the Basic tab. You can modify the module name for easier identification.



(2) Next, set up the new IP address for the ELC-COENETM. First switch to “Network” setup page. If there is a DHCP server on the LAN, you may select DHCP in “IP Configuration”. If there is no DHCP server on the LAN, you must set a static IP. Please note that the settings for subnet mask and gateway have to be the same as the settings in the same LAN. Press “OK” to complete the setting, and ELCSoft will automatically search for the ELC-COENETM again.



(3) The module name and IP of ELC-COENETM have been modified into new settings (TEST1: 172.16.156.68).

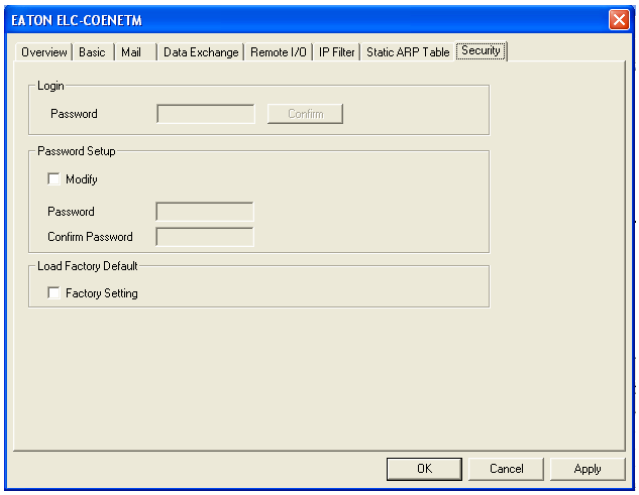


(4) Click on EATON ELC-COENETM, and ELCSoft will be able to communicate with the ELC controller (e.g. uploading/downloading program or monitoring devices) via Ethernet.

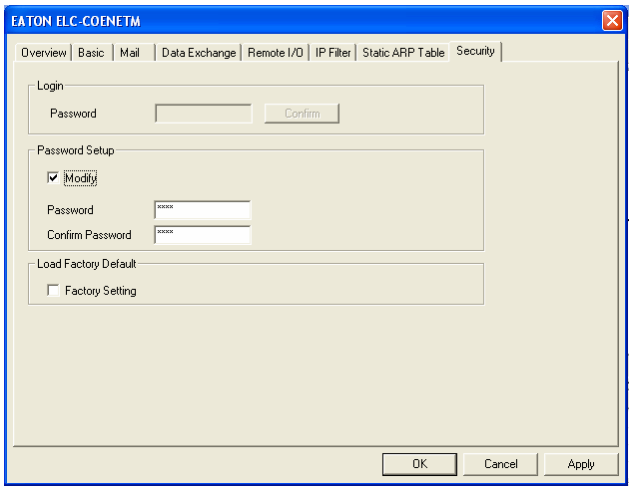
5.3 Setting up and Clearing a Password

(1) Follow the steps in: **Connecting the PC to the ELC-COENETM through a LAN**

(2) Open the setup page and switch to the “Security” page.

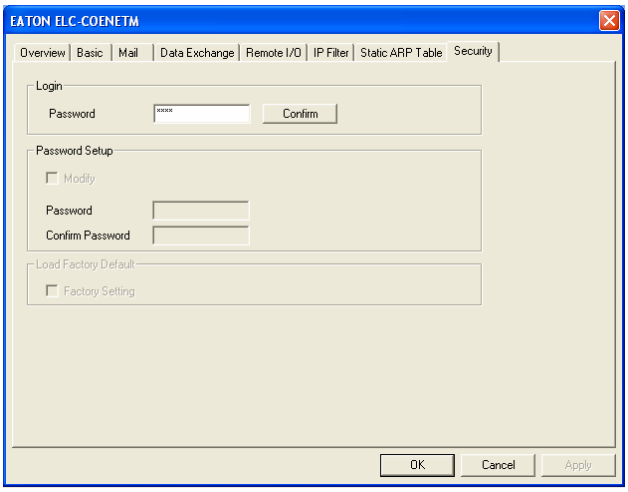


(3) Check “Modify” box and enter “aabb” in “Password” and “Confirm Password" columns. Click on “OK” to save the password.

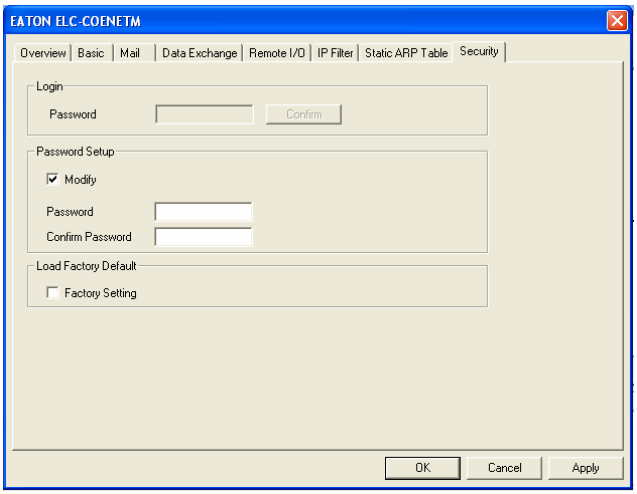


(4) Open the setup page again. The ELC-COENETM is now locked by the password. You

cannot open any of the settings without entering the module password.

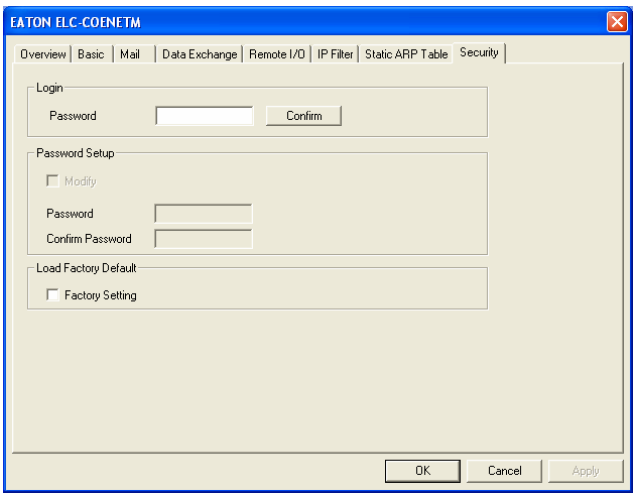


(5) To clear the password, simply leave the password columns blank. Click on “OK” to clear the password.

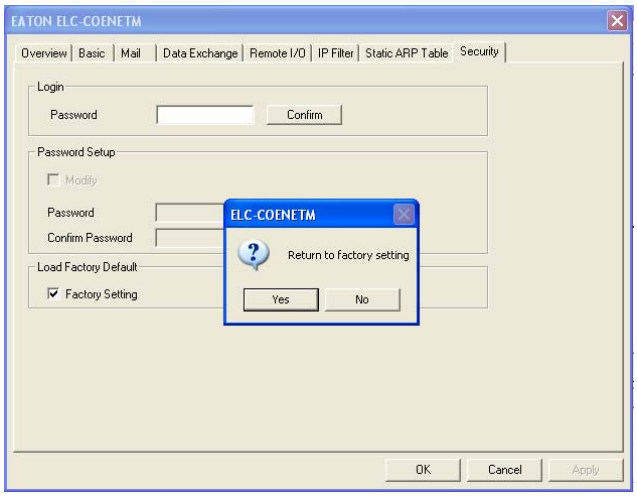


5.4 Recovering from a lost password

(1) Use ELC-CBPCELC3 cable to connect the PC and ELC-COENETM and open the setup page. Open the “Security” page.



(2) Check the “Factory Setting” box and the “Warning” dialog box will appear. Click on “Yes” to return to default setting (in approx. 5 ~ 10 seconds), and the password will be cleared as well.

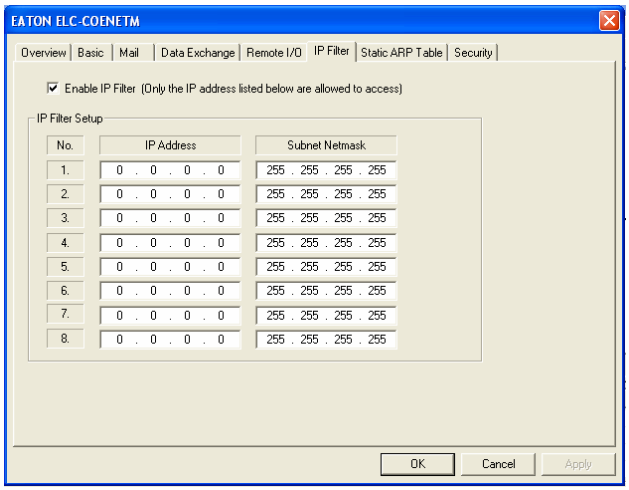


Note: this action returns all parameters are to their default settings.

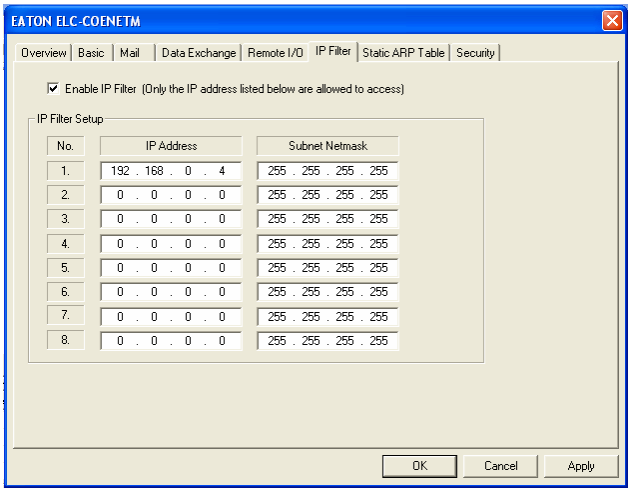
5.5 Setting IP Filter Protection to restrict access

(1) Follow the steps in: **Connecting the PC to the ELC-COENETM through a LAN**

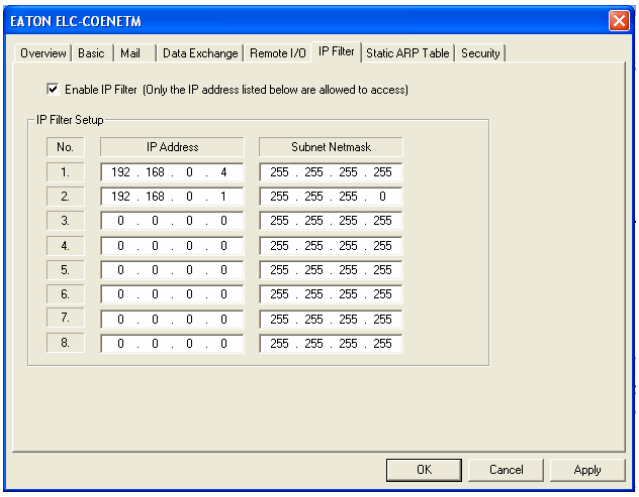
(2) Open the setup page and switch to the “IP Filter” page.



(3) Check the “Enable IP Filter” box. Enter “192.168.0.4” in the No. 1 “IP Address” and “255.255.255.255” in all “Subnet Netmask” columns.



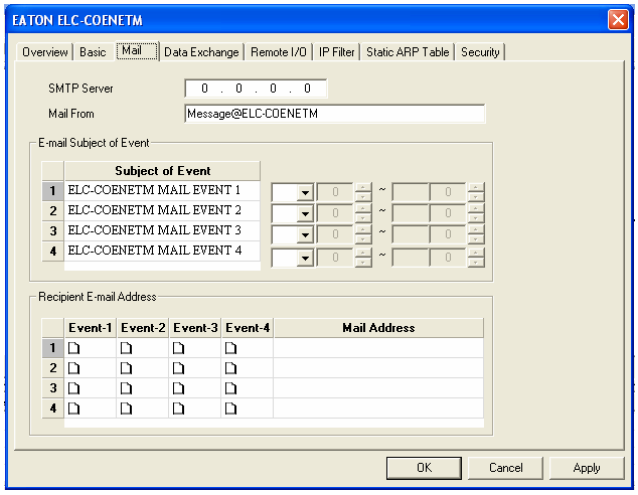
(4) Enter “192.168.0.1” in No. 2 “IP Address” and “255.255.255.0” in the No.2 “Subnet Netmask” column. Click on "OK” to complete the setting. Only the equipment within the IP range can be connected to the ELC-COENETM module.



5.6 Setting up E-Mail notification

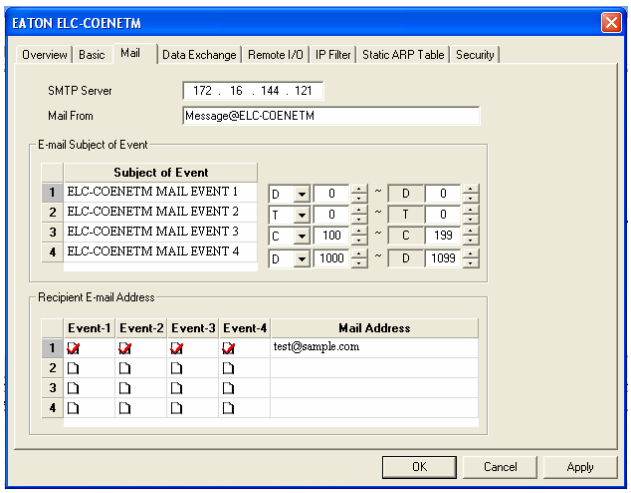
(1) Follow the steps in: **Connecting the PC to the ELC-COENETM through a LAN**.

(2) Open the setup page and switch to "Mail" page.

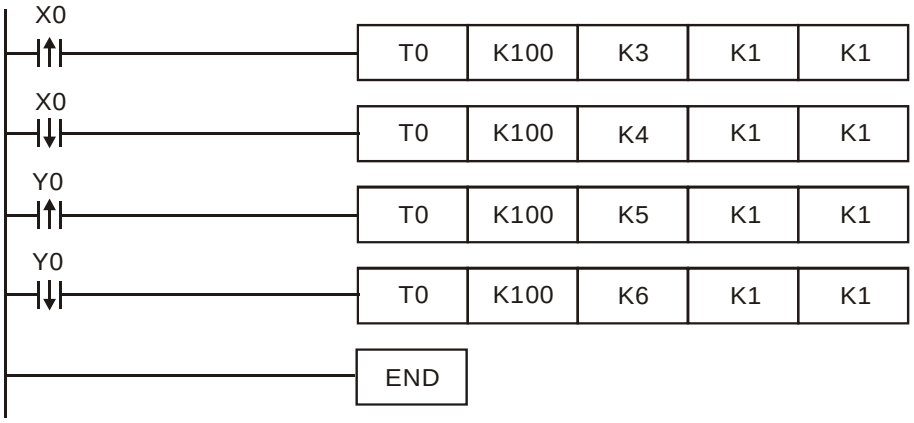


(3) In the “Mail” page, enter the address of the SMTP server, subject of event (up to 4), and mail address of the recipient. Next to the subject of event define the data you want to include in the email for that event.

(4) Check all the events that you want to trigger emails to “Recipient 1”. Click on “OK” to complete the setting.



(5) The emails are triggered by writes to the appropriate CRs of the ELC-COENETM module (CR#3-CR#6). After all the settings in ELC-COENETM are completed, enter a program that loads the CR registers based on desired trigger event, compile the ladder diagram and download it to the MPU. An example program is shown below



Description:

- If X0 transitions from Off to On, Write “1” into CR#3 of ELC-COENETM, and the first E-Mail will be sent out.
- If X0 transitions from On to Off. Write “1” into CR#4 of ELC-COENETM, and the second E-Mail will be sent out.
- If Y0 transitions from Off to On. Write “1” into CR#5 of ELC-COENETM, and the third E-Mail will be sent out.
- If Y0 transitions from On to Off. Write “1” into CR#6 of ELC-COENETM, and the fourth E-Mail will be sent out.

5.7 Setting up Data Exchange between ELC processors

This application example will demonstrate how to configure an ELC-COENETM Ethernet module to read and write data to another ELC-COENETM/ELC-PV controller. These messages may be set up to be sent continuously without ELC-PV control or triggered by the controller. The software used to configure the messages is called ECISoft and is included in ELCSoft.

The system used for this application example consists of the following:

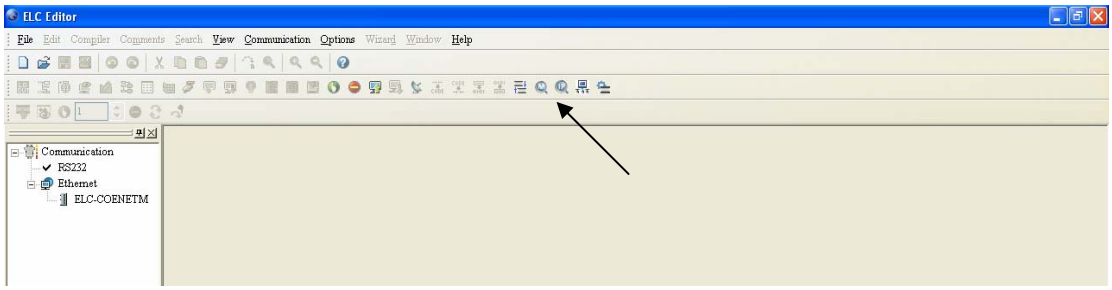
(2) ELC-PV28 controllers
(2) ELC-COENETM Ethernet modules (Modbus TCP protocol)
(1) ELC-PS01 24vdc power supply
(1) Ethernet switch 10/100mbps
(3) Ethernet patch cables

Both Ethernet modules are connected to the switch along with the computer running ELCSoft. The Subnet mask used for all devices is: 255.255.255.0. The IP addresses used for each device are:

1. ELC-COENETM (message initiator) 120.151.1.2
2. ELC-COENETM (message receiver) 120.151.1.4
3. Computer running ELCSoft 120.151.1.1

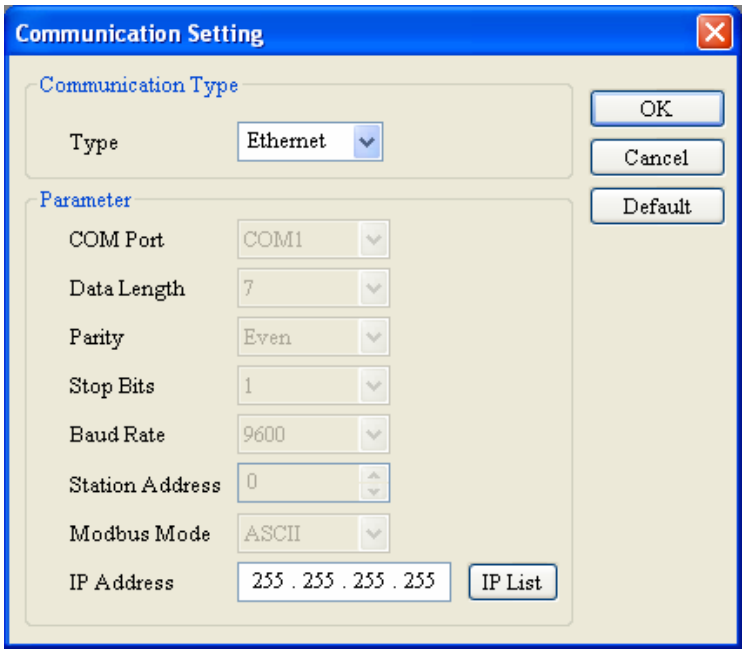
Setting up messages in an ELC-COENETM module using ECISoft

Start ELCSoft, then click the button shown below to start ECISoft. When holding the curser over the button, it will display ECISoft. Use this to verify that you're clicking the correct button. ECISoft will look like the following:

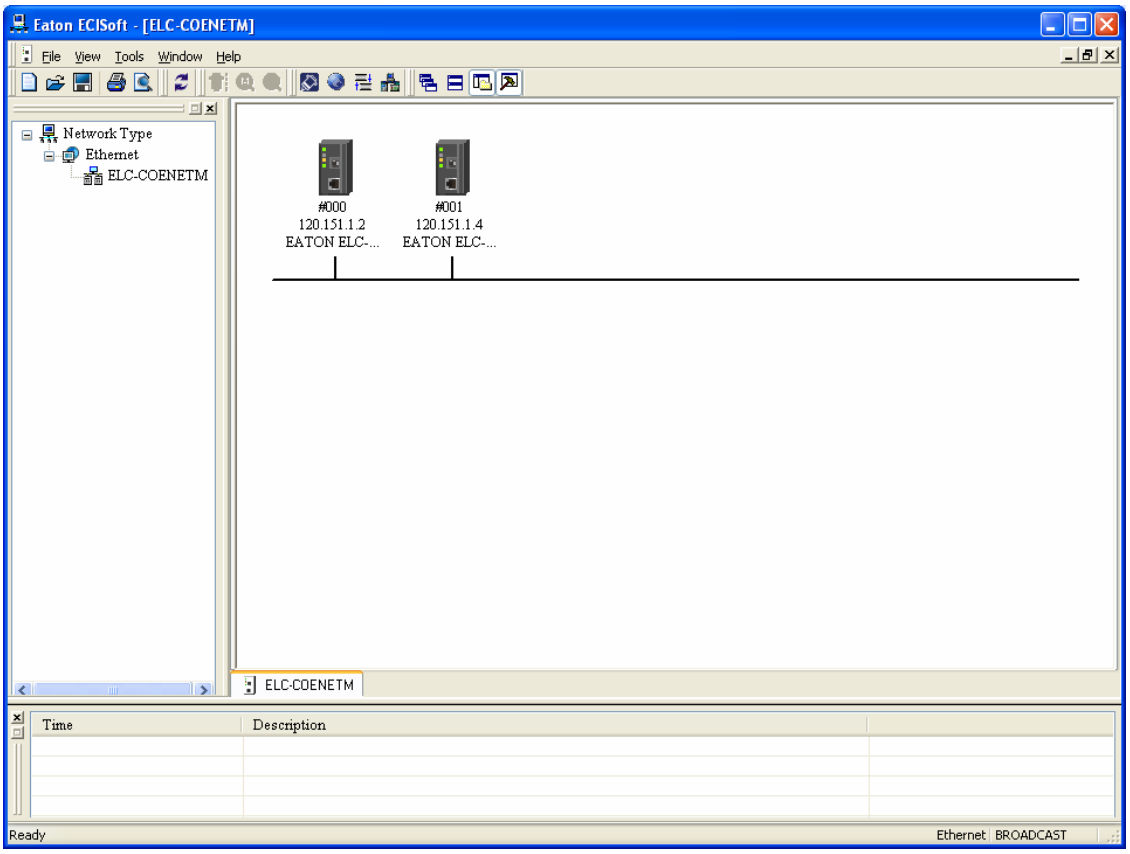


The ELC programming cable (ELC-CBPCELC3) may be used to connect to and configure each Ethernet module or Ethernet may be used to connect to both modules. For this example, RS232 was used to initially configure the IP address and Subnet Mask for each Ethernet module. The Ethernet modules do support DHCP. Note: the default IP address setting for the ELC-COENETM module is IP address 192.168.1.5. The PC IP address and network mask need to be set up to reside on the same network as the ELC-COENETM. This will allow you to connect to each module using ECISoft on Ethernet. If you choose to use RS232 to configure the Ethernet modules, use the ELC programming cable to connect to each Ethernet module to set the IP address and Subnet Mask. The computer and both Ethernet modules must then be connected to an Ethernet switch. Be sure the subnet mask is the same for all devices.

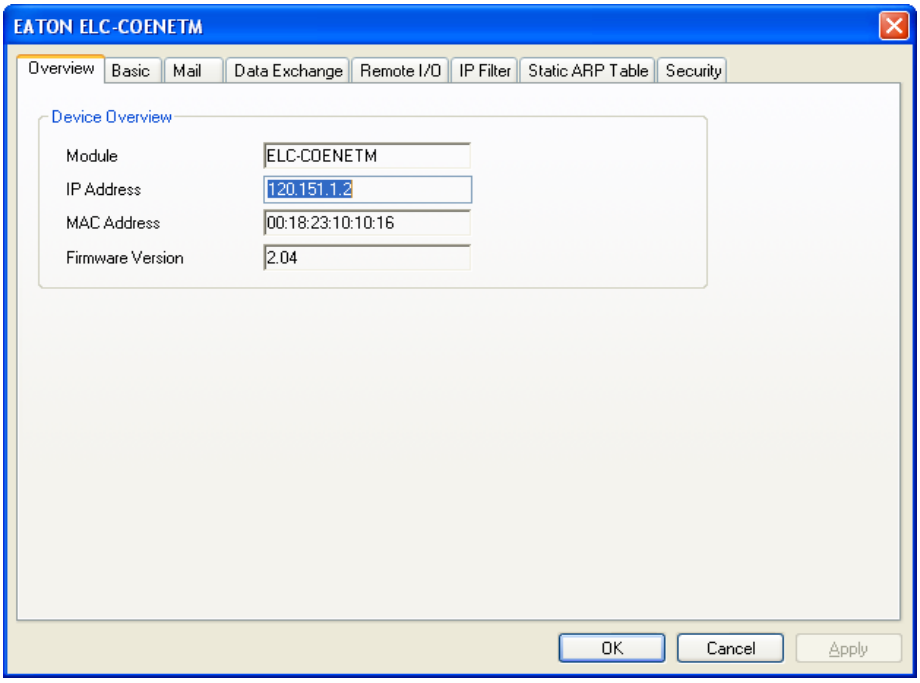
Select the Tools drop down menu then choose Communication Setting. For this example the IP addresses are set up for each device as shown earlier in this document. The Communication Setting page looks like the following:



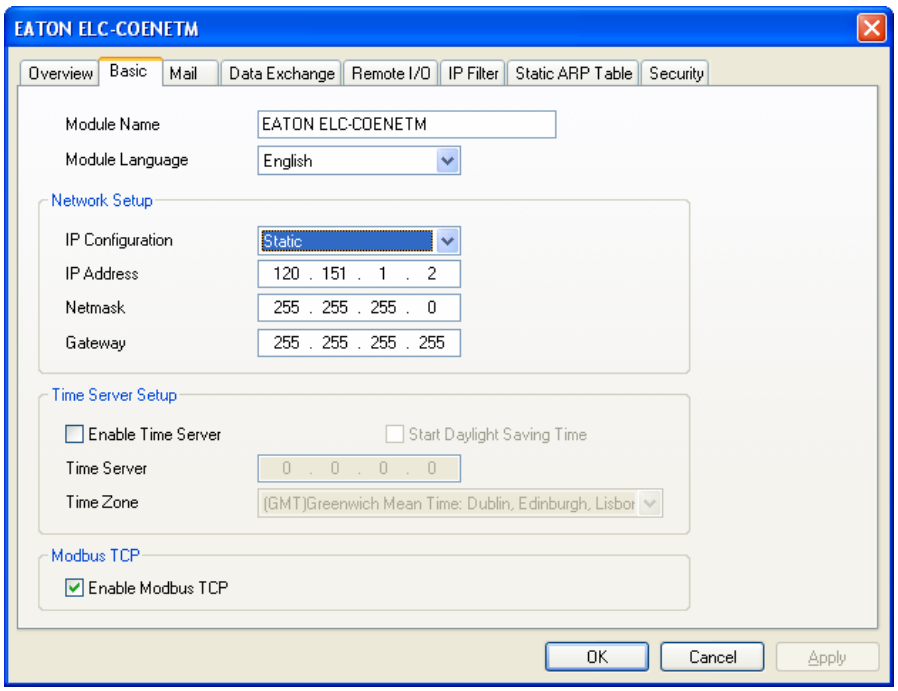
Click OK after selecting Ethernet for the Type. Then in ECISoft, click the IP "magnifying glass" and the software will search for all ELC Ethernet devices connected to the same Ethernet network. When complete, the following screen will be displayed:



To access the configuration pages for each module, double click its icon. When the icon for the first ELC-COENETM module is double clicked, the following window will open:



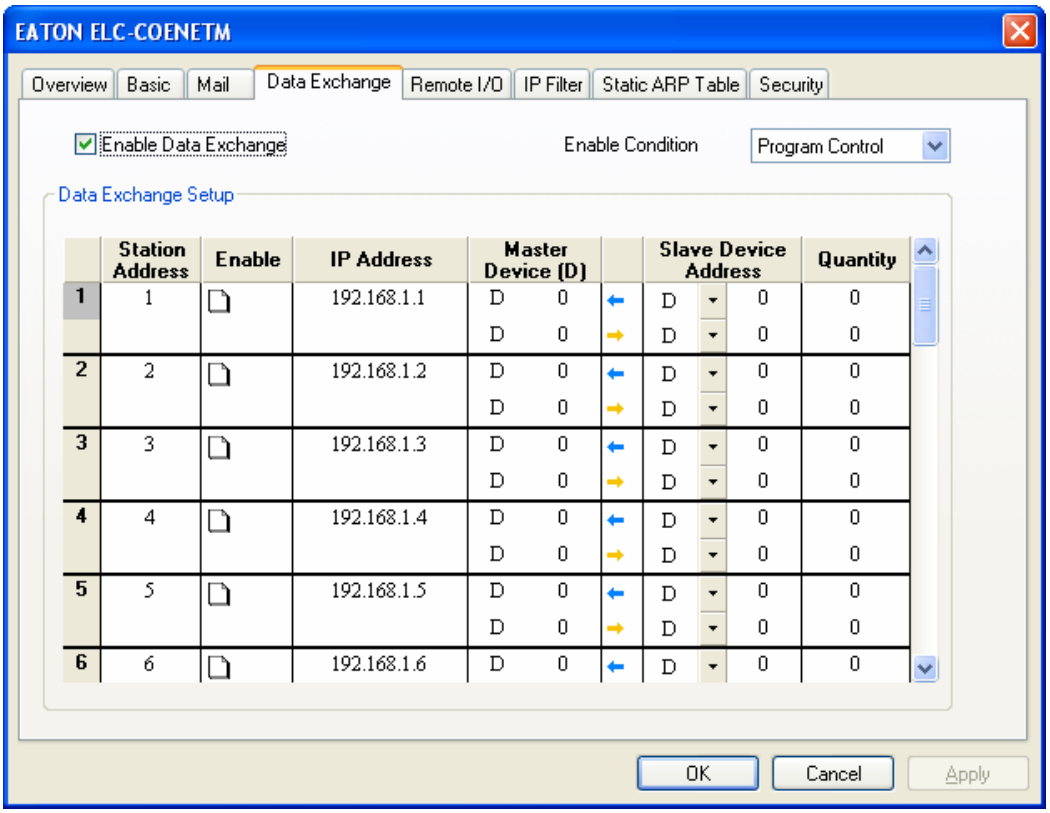
The Overview window displays specifics about each module. The Basic tab allows the IP address to be changed as well as the subnet mask and gateway address. This is also where the IP address can be made Static or DHCP. Be sure Modbus TCP is enabled in the bottom left portion of the screen. When finished, the Basic tab looks like the following for this example:



Configure the other Ethernet module in the same manner. The Ethernet module at IP address 120.151.1.4 will only require setting up the IP address, subnet mask and optional gateway address. It will only be receiving messages from the other Ethernet module.

Setting up peer-to-peer Ethernet messages in an ELC-COENETM module.

From ECISoft, open the Data Exchange tab for the Ethernet module at IP address 120.151.1.2. It looks like the following:



In the top right portion of the screen, select “Always Enable” or “Program Control” to determine how the messages will be triggered. Always Enable means the Ethernet module will continuously send the messages. It will get the data for write messages from the attached ELC-PV controller and send it to the D-registers selected for the Slave controller. For read messages it will read the data from the Slave controller and store the data in the selected D-registers in the local, attached controller.

If Program Control is selected, all messages are triggered from the attached PV controller. This is accomplished by sending data to CR#13 in the Ethernet module via a TO instruction as follows;

CR#13 = 2 Execute the messages
CR#13 = 0 Stop the messages

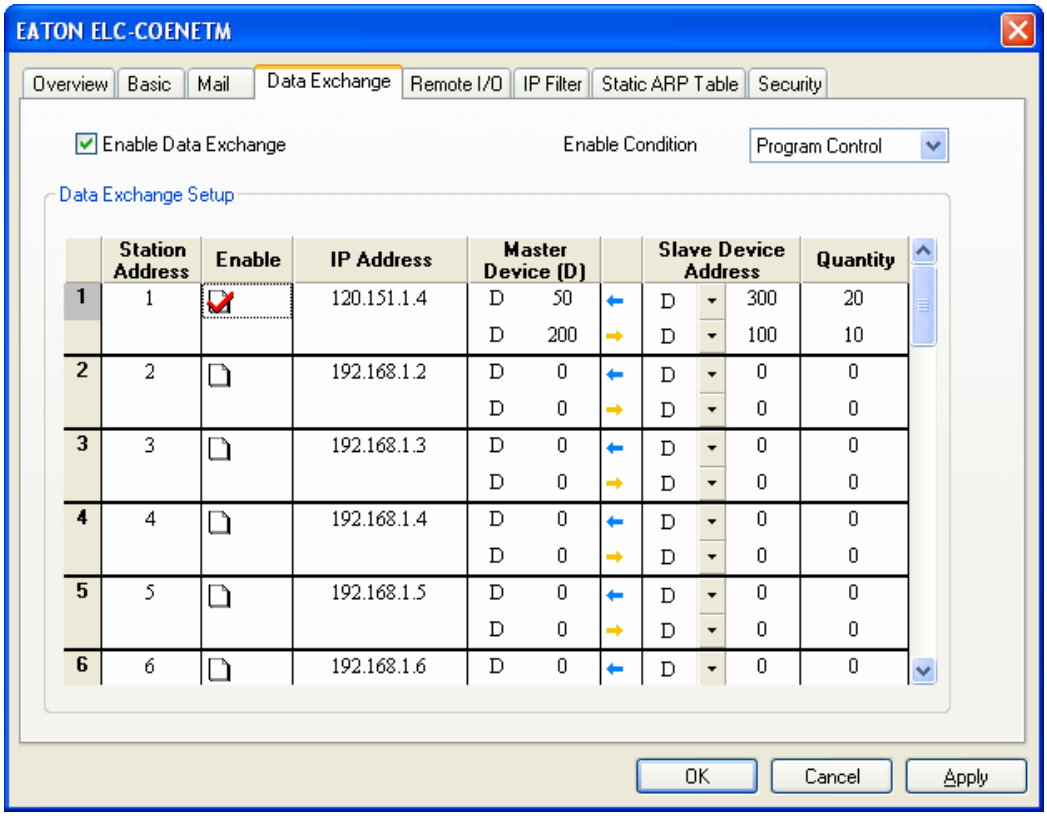
Instruction list for the TO Instruction:
TO K100 K2 K1 This will instruct the COENETM module to begin sending the messages.
TO K100 K0 K1 This will instruct the COENETM module to stop sending the messages.

Set up read and write messages in the Ethernet module with IP address 120.151.1.2 to be sent to the Ethernet module with IP address 120.151.1.4. This Ethernet module will then route data received to the attached PV controller’s selected D-registers. It will also access the data in the attached PV controller requested by the other Ethernet module and sent in a response message back to the Ethernet module initiating the messages. This Ethernet module will move the data received to the selected D-registers in the PV controller attached to it. The following

messages will be configured in the master Ethernet module:

1. Read 20 registers of data beginning with D300 in the remote controller and store that data beginning with D50 in the local controller.
2. Write 10 registers of data starting at D200 in the local controller to D100 in the remote controller.

The Data Exchange tab in the Ethernet module with IP address 120.151.1.2 should look like the following:



Enable Data Exchange must be selected before any messages can be configured.

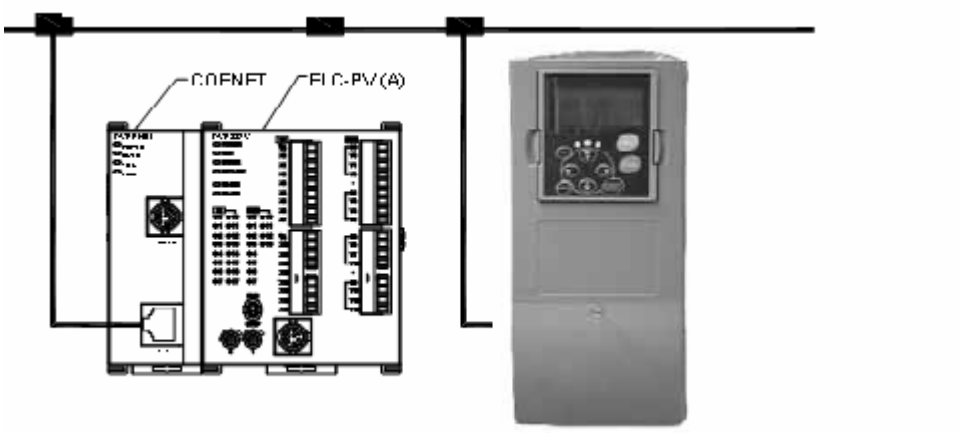
Also, the Enable column must be selected to be allowed to configure the read/write messages for that row.

Click Apply, then OK. When the controllers are placed into the run mode, the messages will begin. When data is placed into D200-D209 in the master controller, it will be sent to D100-D109 in the remote controller. Data in D300-319 in the remote controller will be sent to D50-D69 in the master controller.

5.8 Setting up Data Exchange from ELC processor to any Modbus TCP servers

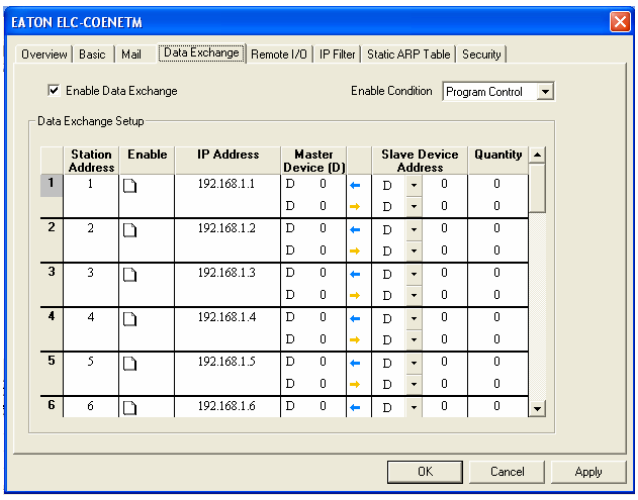
The ELC-COENETM modules can be used for high performance data exchange between an ELC and any Modbus TCP server device. The figure below shows an ELC processor with an ELC-COENETM acting as a Modbus TCP client to an Eaton SVX drive that has an Ethernet OPTCi board installed. The drive is at IP= 196.168.0.197.

This example will demonstrate reading the FB Process data In (modbus registers 2001-2011) into ELC registers D1 to D11, and writing the FB Process data out (registers 2101 -2111) from ELC registers D101 to D111.

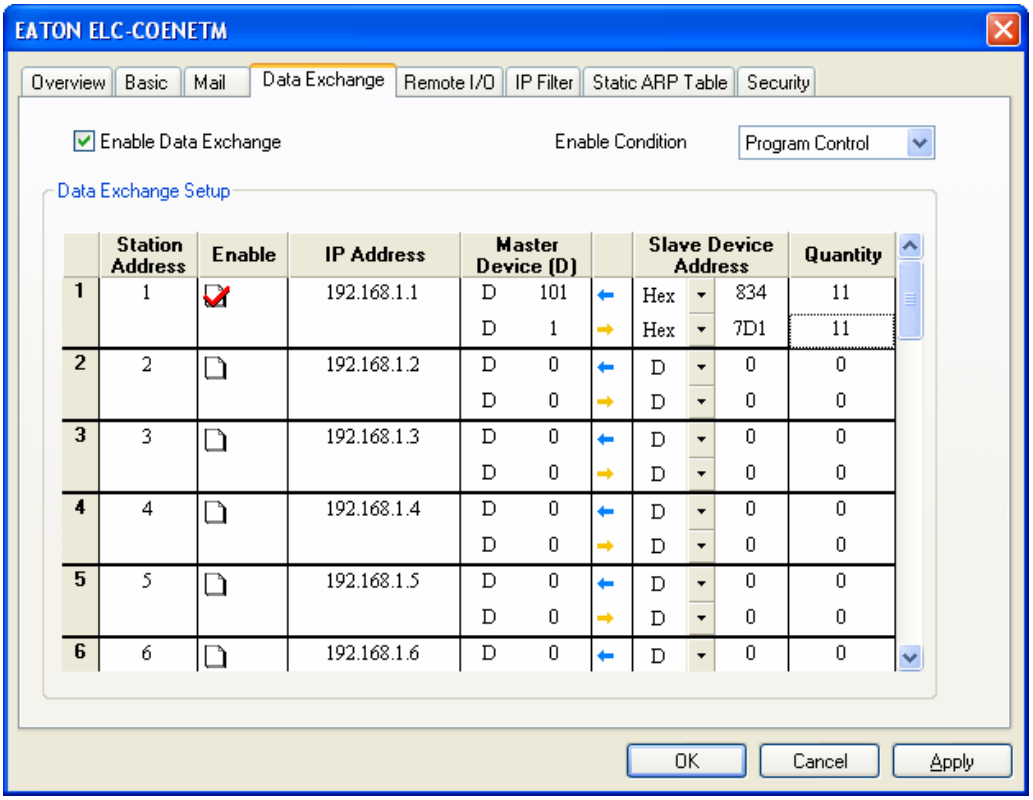


(1) Follow the steps in: **Connecting the PC with ELC-COENETM through a LAN**.

(2) Open the setup page of ELC-COENETM and switch to “Data Exchange” page.



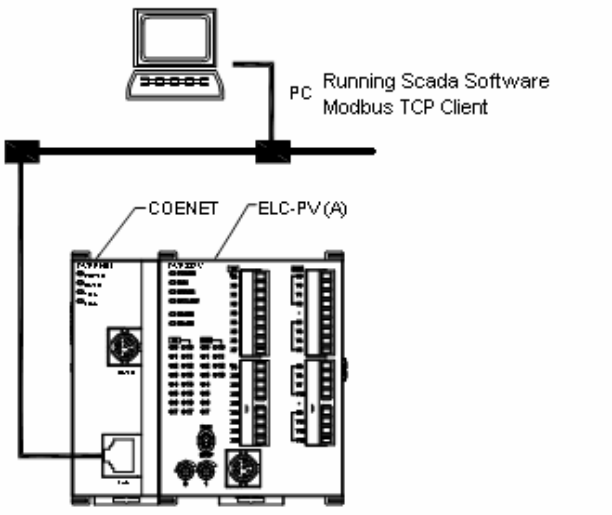
(3) Check “Enable Data Exchange” box. Select “Always Enable” for Enable Condition. Enter IP address of the drive “192.168.1.97”, D101←834 Hex (decimal 2101) Quantity:11 and D1→7D1 Hex (2001 Hex) Quantity:11 in No. 1 Data Exchange IP Address column. Click “OK” to complete the setting.



After the ELC enters run mode, it will begin exchanging data from its D registers with the modbus registers in the Drive.

5.9 Setting up Data Exchange between ELC processor to other Modbus TCP clients

The ELC-COENETM modules can be used for high performance data exchange between any Modbus TCP master and the ELC processors acting as a Modbus TCP server. In the figure below, SCADA software running on the PC acts as a Modbus TCP client to initiate data exchange with the ELC processor.



The mapping of ELC registers to Modbus TCP registers is the same as the modbus serial port of the ELC and is shown in the table below. This mapping is done automatically and no mapping logic is required in the ELC program.

Device	Range	MODBUS Address	Hex Address
S	000~255	000001~000256	0000~00FF
S	246~511	000257~000512	0100~01FF
S	512~767	000513~000768	0200~02FF
S	768~1023	000769~001024	0300~03FF
X	000~377 (Octal)	101025~101280	0400~04FF
Y	000~377 (Octal)	001281~001536	0500~05FF
T	000~255 bit	001537~001792	0600~06FF
	000~255 word	401537~401792	0600~06FF
M	000~255	002049~003584	0800~08FF
M	256~511		0900~09FF
M	512~767		0A00~0AFF
M	768~1023		0B00~0BFF
M	1024~1279		0C00~0CFF
M	1280~1535		0D00~0DFF
M	1536~1791	045057~047616	B000~B0FF
M	1792~2047		B100~B1FF
M	2048~2303		B200~B2FF
M	2304~2559		B300~B3FF
M	2560~2815		B400~B4FF
M	2816~3071		B500~B5FF
M	3072~3327		B600~B6FF
M	3328~3583		B700~B7FF
M	3584~3839		B800~B8FF
M	3840~4095		B900~B9FF
C	000~199 (16-bit)	003585~003784	0E00~0EC7
		403585~403784	0E00~0EC7
	200~255 (32-bit)	003785~003840	0EC8~0EFF
		401793~401903 (Odd address valid)	0700~076F

Device	Range	MODBUS Address	Hex Address
D	000~255	404097~405376	1000~10FF
D	256~511		1100~11FF

Device	Range	MODBUS Address	Hex Address
D	512~767	404097~405376	1200~12FF
D	768~1023		1300~13FF
D	1024~1279		1400~14FF
D	1280~1535	405377~408192	1500~15FF
D	1536~1791		1600~16FF
D	1792~2047		1700~17FF
D	2048~2303		1800~18FF
D	2304~2559		1900~19FF
D	2560~2815		1A00~1AFF
D	2816~3071		1B00~1BFF
D	3072~3327		1C00~1CFF
D	3328~3583		1D00~1DFF
D	3584~3839		1E00~1EFF
D	3840~4095		1F00~1FFF
D	4096~4351	436865~440960	9000~90FF
D	4352~4999		9100~91FF
D	4608~4863		9200~92FF
D	4864~5119		9300~93FF
D	5120~5375		9400~94FF
D	5376~5631		9500~95FF
D	5632~5887		9600~96FF
D	5888~6143		9700~97FF
D	6144~6399		9800~98FF
D	6400~6655		9900~99FF
D	6656~6911		9A00~9AFF
D	6912~7167		9B00~9BFF
D	7168~7423		9C00~9CFF
D	7424~7679		9D00~9DFF
D	7680~7935		9E00~9EFF
D	7936~8191		9F00~9FFF
D	8192~8447	440961~443008	A000~A0FF
D	8448~8703		A100~A1FF
D	8704~8959		A200~A2FF
D	8960~9215		A300~A3FF
D	9216~9471		A400~A4FF
D	9472~9727		A500~A5FF
D	9728~9983		A600~A6FF
D	9984~9999		A700~A70F

5.10 Setting up Data Exchange with an ELC Remote I/O Adapter (ELC-CAENET)

This application example will demonstrate how to set up an ELC-COENETM Ethernet module to read and write I/O data from an ELC-CAENET Ethernet distributed I/O adapter. The software used to configure the adapter and the COENETM module is called ECISoft and is included in ELCSoft.

The system used for this application example consists of the following:

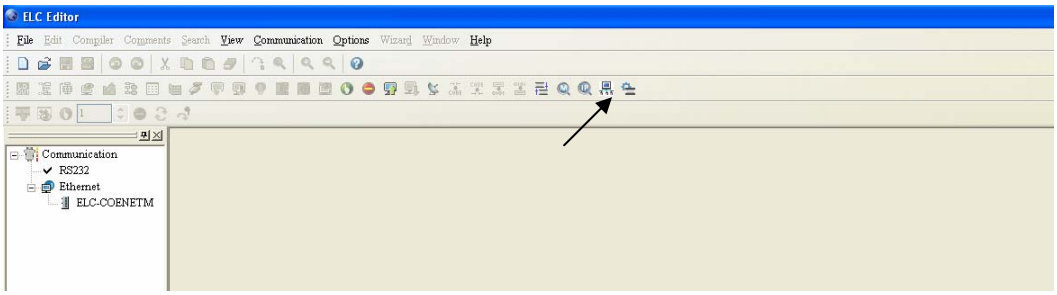
(1) ELC-PV28 controller
(1) ELC-COENETM Ethernet module (Modbus TCP protocol)
(1) ELC-CAENET Ethernet distributed I/O adapter
(1) ELC-PS02 24vdc power supply
(1) Ethernet switch 10/100mbps
(3) Ethernet patch cables

Both Ethernet modules are connected to the switch along with the computer running ECISoft. The Subnet mask used for all devices is: 255.255.255.0. The IP addresses used for each device are:

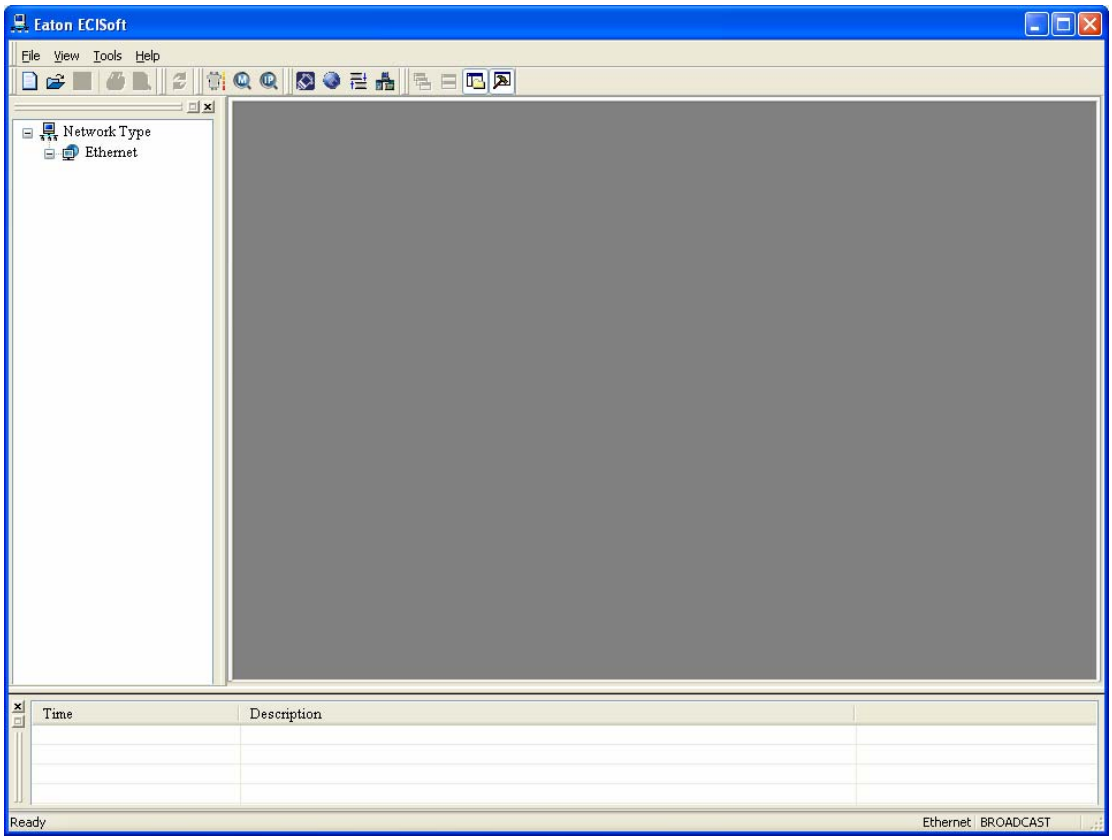
1. ELC-COENETM 120.151.1.2
2. ELC-CAENET 120.151.1.3
3. Computer running ELCSoft/ECISoft 120.151.1.1

Configuring the ELC-CAENET Distributed I/O Adapter

ECISoft is used to configure the ELC-CAENET adapter. Start ELCSoft 2.0 or later, then click the ECISoft button shown below. Note that when the curser is over the ECISoft button, it displays ECISoft. Use this to verify that you're clicking the correct button.

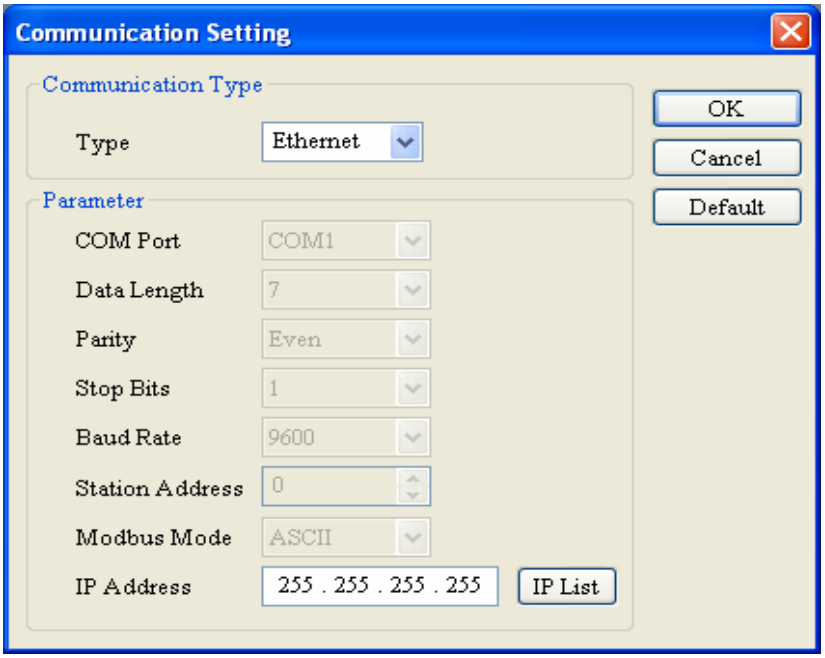


The following window will open after the ECISoft button is clicked:

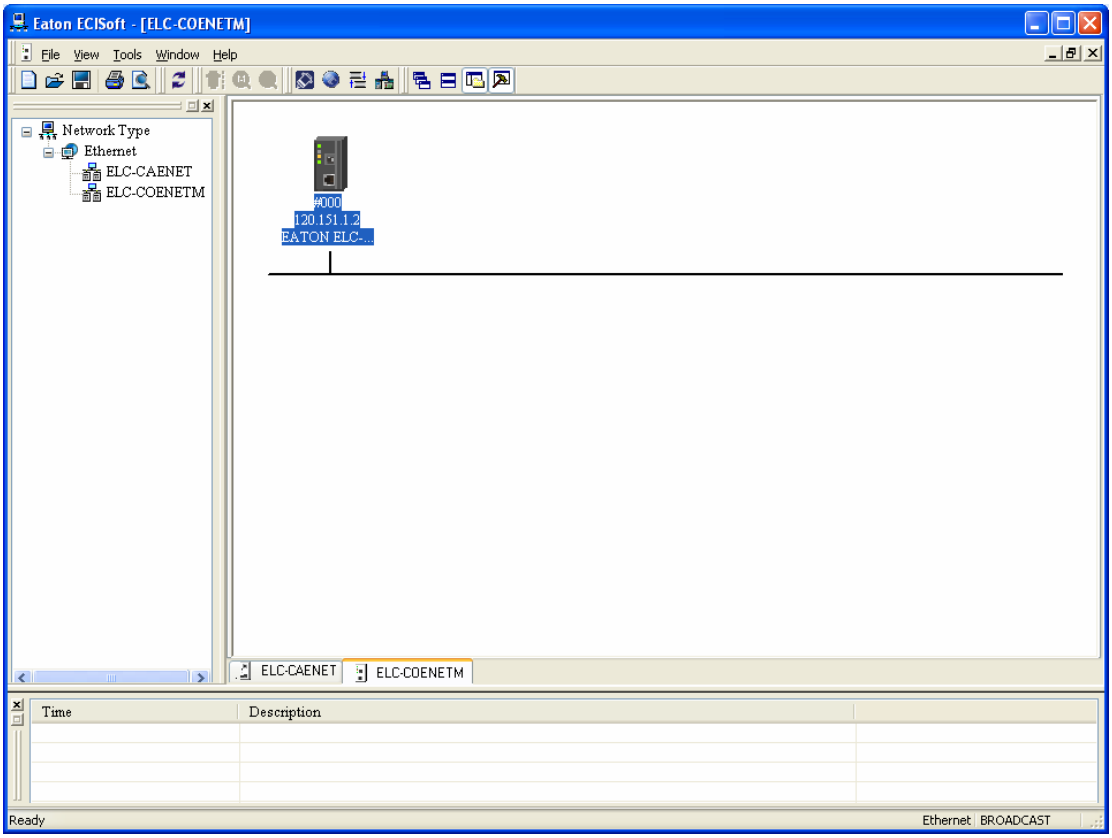


The ELC programming cable (ELC-CBPCELC3) may be used to connect to and configure each Ethernet module or Ethernet may be used to connect to both modules. For this example, RS232 was used to initially configure the IP address and Subnet Mask for each Ethernet module. The Ethernet modules do support DHCP. Note: the default IP address setting for the ELC-COENETM module is IP address 192.168.1.5. The PC IP address and network mask need to be set up to reside on the same network as the ELC-COENETM. This will allow you to immediately connect to each module using ECISoft on Ethernet. If you choose to use RS232 to configure the Ethernet modules, use the ELC programming cable to connect to each Ethernet module to set the IP address and Subnet Mask. The computer and both Ethernet modules must then be connected to an Ethernet switch. Be sure the subnet mask is the same for all devices.

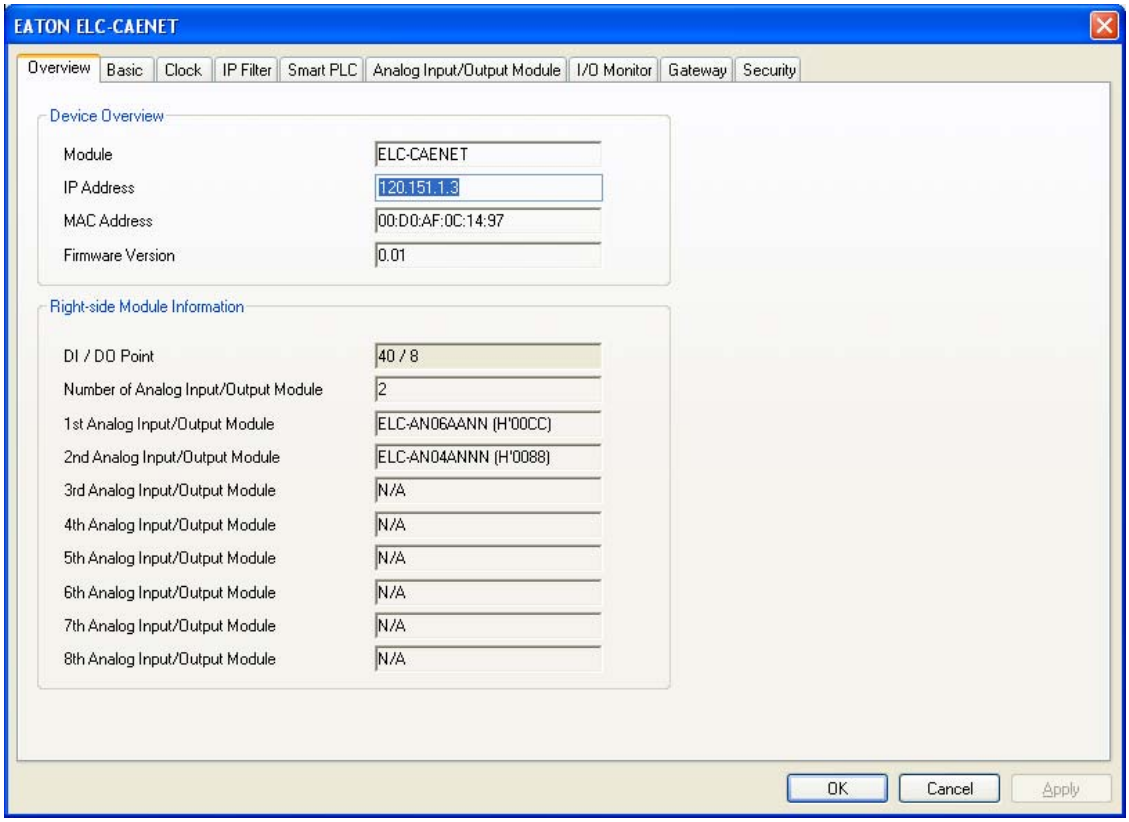
In ECISoft select the Tools drop down menu then choose Communication Setting. For this example the IP addresses are set up for each device as shown earlier in this document. The Communication Setting page looks like the following:



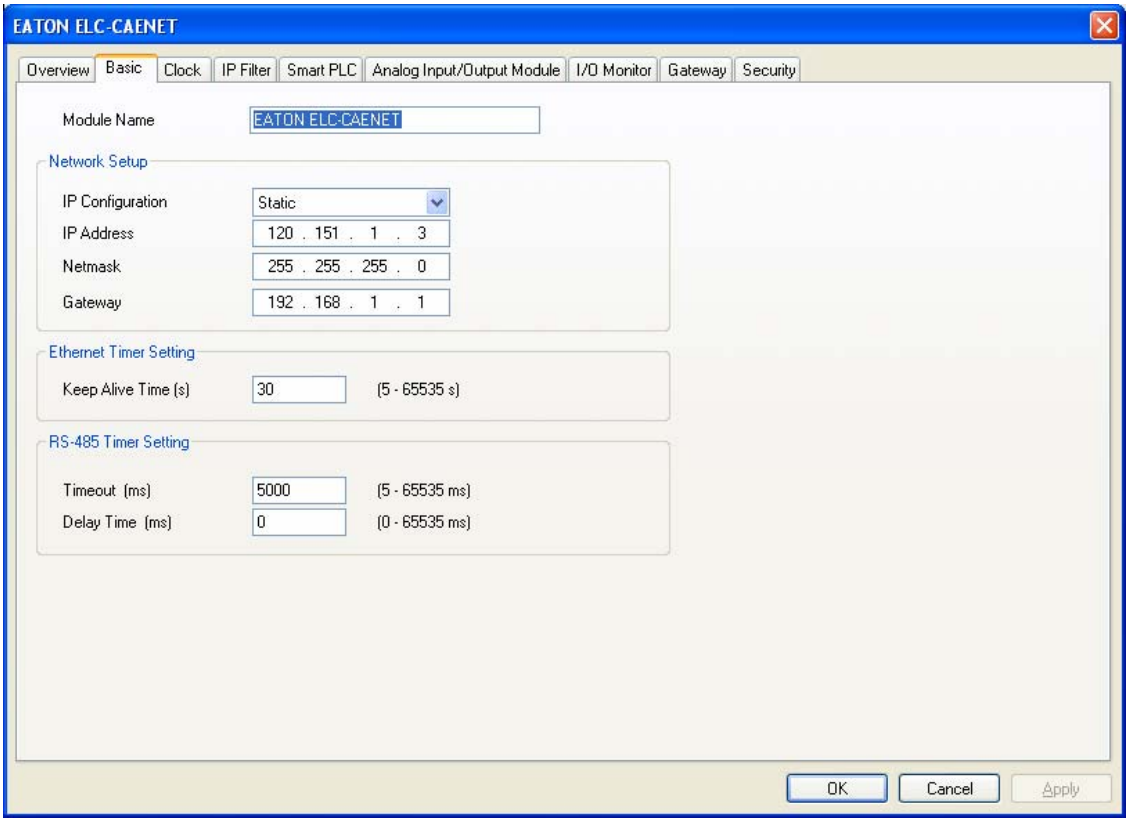
Click OK after selecting Ethernet for the Type. Then in ECISoft, click the IP "magnifying glass" and the software will search for all ELC Ethernet devices connected to the same Ethernet switch. When complete, the following screen will be displayed:



Note the two tabs at the bottom left of the main window. Both modules have been found and each type of module is located in a separate tab. Click the tab for the ELC-CAENET module, then double click its icon to open its configuration pages as follows:



The Overview window displays specifics about each module. The Basic tab allows the IP address to be changed as well as the subnet mask and gateway address. This is also where the IP address can be made static or DHCP. When finished, the Basic tab looks like the following for this example:

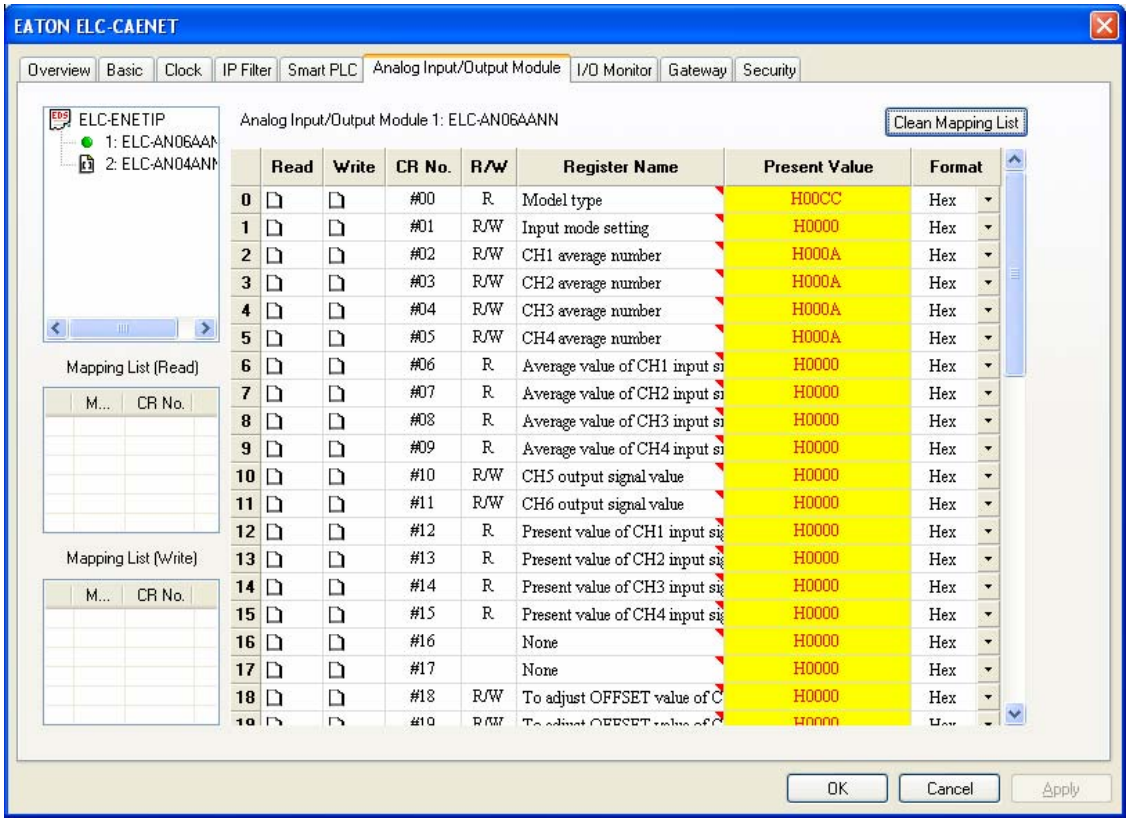


Select the Overview tab. Note that there are 40 digital inputs, 8 digital outputs and 2 analog modules connected to the ELC-CAENET adapter. For this application, the following modules are connected to the adapter from left to right:

ELC-EX08NNSN	8 input switch module
ELC-EX08NNSN	8 input switch module
ELC-EX08NNSN	8 input switch module
ELC-EX08NNSN	8 input switch module
ELC-AN06AANN	4 input, 2 output analog module
ELC-AN04ANNN	4 input analog module
ELC-EX16NNDR	8 input, 8 output digital combo I/O module

There are a total of 40 digital inputs, 8 digital outputs and 2 analog modules, matching the totals shown on the adapter module's configuration pages (Overview tab) above.

Next we need to map the analog I/O data for each of the analog modules connected to the adapter. Each analog module contains many data words. Only those that are absolutely necessary should be mapped. Click the Analog Input/Output Module tab and the following page will be displayed:



The upper box on the left displays the two analog modules. Click the module to be mapped so the green dot appears to its left. The AN06AANN is selected, so we can begin mapping its data. For this example, the following data will be mapped for this module:

CR#1 This is the configuration word for the analog I/O on this module (write).

CR#6-9 These are the Average values for the 4 analog inputs. The default is to average the values over 10ms. This average value can be changed with CR#2-5 if needed (read).

CR#10-11 These are the two analog outputs (write).

Click Apply and the chosen values are displayed in the Read and Write Mapping Lists shown on the left side of the screen.

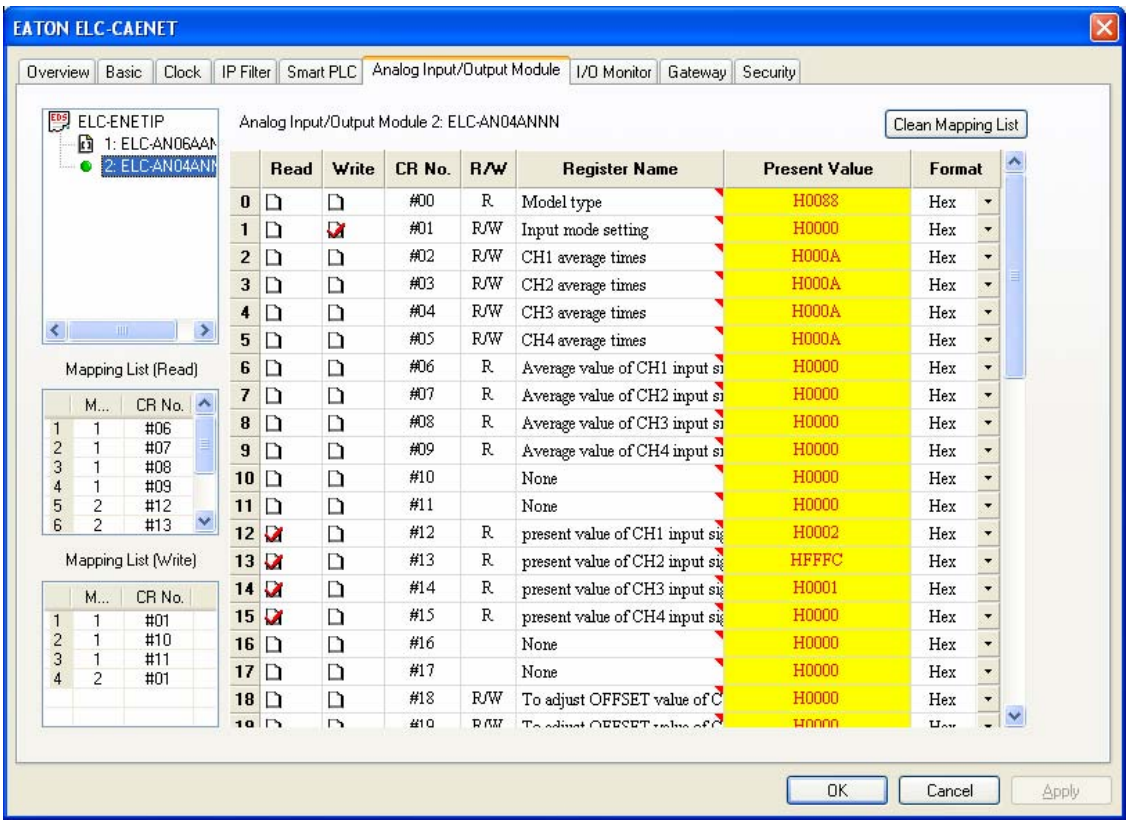
Click the ELC-AN04ANNN in the upper left box to select it. The mapping list is cleared so parameters for this module can now be selected as follows:

CR#1 This is the configuration word for the analog inputs on this module (write).

CR#12-15 These are the Present Values for the four analog inputs. These were chosen for this module because the analog inputs connected to this module do not change quickly, so average values are not required.

Click Apply and the chosen values will be added to the Read and Write Mapping tables on the left side of the screen. Note that 8 input words are mapped along with 4 output words, per the screen below. Note exactly how this data is mapped, it will be needed later when writing the

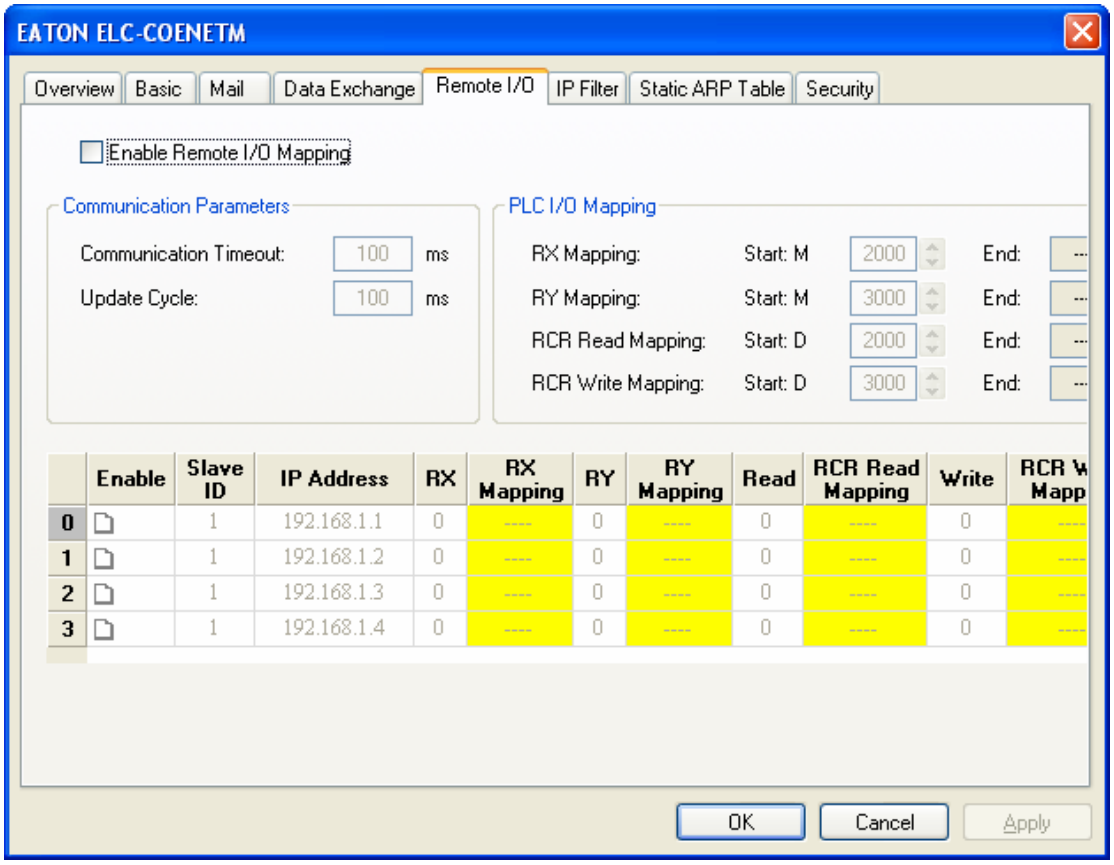
program.



Click OK to save the configuration and exit this screen.

From the main ECISoft screen, click the tab for the ELC-COENETM module, then double click the module's icon to open its configuration pages. The Overview tab displays specifics about each module. The Basic tab allows the IP address to be changed as well as the subnet mask and gateway address. This is also where the IP address can be made static or DHCP. Be sure Modbus TCP is enabled at the bottom left portion of the Basic screen.

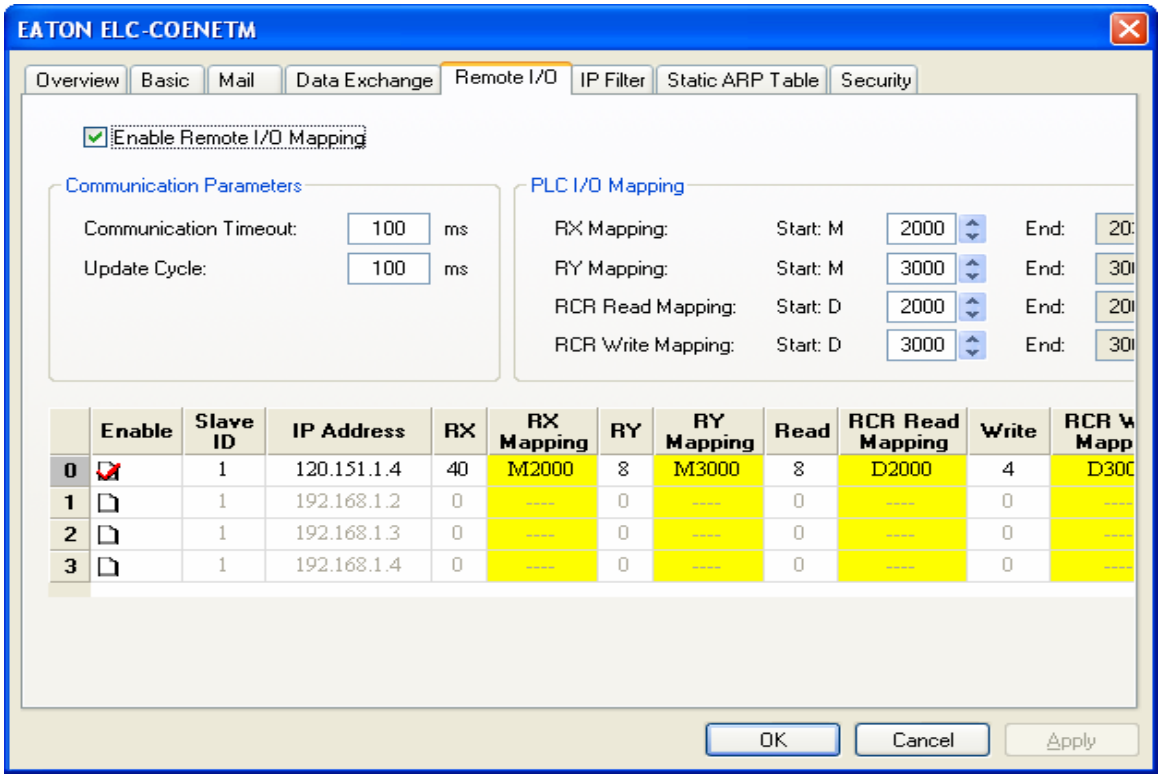
Click the Remote I/O tab to open the following screen:



Click to select Enable Remote I/O Mapping, then click the Enable column for row 0. Enter the IP address of the ELC-CAENET module (120.151.1.4 for this example). Then configure row 0 as follows:

RX (digital inputs)	= 40 bits
RY (digital outputs)	= 8 bits
Read (analog input data)	= 8 words
Write (analog output data)	= 4 words

The Remote I/O tab should look like the following:



Note that the data is mapped to addresses in the ELC-PV controller connected the

ELC-COENETM module. These addresses may be changed under PLC I/O Mapping in the upper right portion of this page. Enter different starting addresses and the end address will change based on the amount of data for each. The valid ranges for the M bits and D registers are as follows:

RX Mapping: M2000 – M4095
RY Mapping: M2000 – M4095
RCR Read mapping: D2000 – D9999
RCR Write mapping: D2000 – D9999

These are actual data addresses in the ELC-PV controller. The data will be mapped based on the position of the I/O modules with respect to the ELC-CAENET module as follows:

M2000 – M2007	ELC-EX08NNSN	8 input switch module #1
M2008 – M2015	ELC-EX08NNSN	8 input switch module #2
M2016 – M2023	ELC-EX08NNSN	8 input switch module #3
M2024 – M2031	ELC-EX08NNSN	8 input switch module #4
M2032 – M2039	ELC-EX16NNDR	8 inputs digital combo module
M3000 – M3007	ELC-EX16NNDR	8 outputs digital combo module
D2000 – D2003	ELC-AN06AANN	4 analog inputs
D3000	ELC-AN06AANN	Configuration word
D3001 – D3002	ELC-AN06AANN	2 analog outputs

D2004 – D2007	ELC-AN04ANNN	4 analog inputs
D3003	ELC-AN04ANNN	Configuration word

When finished, click Apply, then OK to save all changes. Place the ELC-CAENET module into Run mode using the switch on the module. The ELC-PV controller must contain an instruction that moves a 1 to CR#15 in the COENETM module. Below is the instruction List rung of code that is required in the ELC program to instruct the Ethernet module to begin polling the ELC-CAENET module.

LD M1000	Always True bit
TO K100 K15 K1 K1	Send a 1 to CR#15 in the COENETM to begin polling

Note: The K100 in the TO instruction above is the designation for the first Communication module to the left of the ELC-PV controller. The ELC-PV controller supports up to 8 communication modules. Send a K0 to stop polling (LD K100 K15 K0 K1).

Click Apply, then OK. When the controllers are placed into the run mode, the messages will begin. When data is placed into D200-D209 in the master controller, it will be sent to D100-D109 in the remote controller. Data in D300-319 in the remote controller will be sent to D50-D69 in the master controller.

6 CR Definitions for ELC-COENETM

This section contains a description of all CR registers in the ELC-COENETM module.

CR No.		Type	Register	Description			
HW	LW						
	#0	R	Model NO	Read only; ELC-COENETM model NO.=H'4050			
	#1	R	Firmware version	System firmware version; The type is hex. For example, H'0100 means the firmware version is v1.00.			
	#2	R	Communication Mode	b0	Modbus TCP Mode		
				b1	Data Exchange Mode		
	#3	W	E-Mail Event 1 Trigger	Set to 1 to send the E-mail 1.			
	#4	W	E-Mail Event 2 Trigger	Set to 1 to send the E-mail 2.			
	#5	W	E-Mail Event 3 Trigger	Set to 1 to send the E-mail 3.			
	#6	W	E-Mail Event 4 Trigger	Set to 1 to send the E-mail 4.			
	#7	R	E-Mail 1, 2 Status Register	b0~b7	Status of E-Mail 2	b8~b15	Status of E-Mail 1
	#8	R	E-Mail 3, 4 Status Register	b0~b7	Status of E-Mail 4	b8~b15	Status of E-Mail 3
	#9	R/W	E-Mail 1 Additional Message	User defined message to be sent by email.			
	#10	R/W	E-Mail 2 Additional Message	User defined message to be sent by email.			

CR No.		Type	Register	Description
HW	LW			
	#11	R/W	E-Mail 3 Additional Message	User defined message to be sent by email.
	#12	R/W	E-Mail 4 Additional Message	User defined message to be sent by email.
	#13	R/W	Data Exchange trigger	Set to 1 to start the Data Exchange transaction.
	#14	R	Data Exchange Status Register	Status of Data Exchange transaction
	#15	R	Remote I/O mapping Trigger	Set to 1 to start the Remote I/O polling.
	#16	R/W	Status of Remote I/O slaves	CR#16 b0 ~ b3: Connection status of Remote I/O mapping slave 1 ~ 4
	#17	R/W	Data Exchange cycle time	Minimum cycle time (ms) of Data Exchange command
#19	#18	R	Error status of Data Exchange slaves	CR#19 b0 ~ b15: Status of Data Exchange slave 1~ 16 CR#18 b0 ~ b8: Status of Data Exchange slave 17~ 24 Status = 1 when an error occurs.
#26	#25	R/W	Destination IP	Destination IP address for Data Exchange
	#27	-	Reserved	Reserved
	#28	R/W	Destination Slave ID	Destination Slave ID for Data Exchange
#48 ~ #29		R/W	Default Transmission Buffer	Transmit data buffer for Data Exchange Mode
#68 ~ #49		R	Default Received Buffer	Receive data buffer for Data Exchange Mode
#80 ~ #69		-	Reserved	Reserved
	#81	R/W	Slave Transmission Buffer Address	Slave Transmission buffer Address for Data Exchange
	#82	R/W	Number of Received Registers	Number of Received Registers
	#83	R/W	Master Received Buffer Address	Master Receive Buffer Address for Data Exchange
	#84	R/W	Slave Received Buffer Address	Slave Receive Buffer Address for Data Exchange
	#85	R/W	Number of Registers to Send	Number of Registers to Send
	#86	R/W	Master Transmission Buffer Address	Master Transmission Buffer Address for Data Exchange
	#111	R/W	Modbus TCP Operating Mode	Set to 1 to configure Modbus TCP for 8-bit mode.
	#112	R/W	Modbus TCP Keep-Alive Time-out	Modbus TCP Keep-Alive Time-out (s)
	#113	-	Reserved	Reserved
	#114	R/W	Modbus TCP Time-Out	Modbus TCP transaction time-out (ms)
	#115	R/W	Modbus TCP Trigger	Set to 1 to send Modbus command.
	#116	R/W	Modbus TCP Status Register	Status of Modbus TCP transaction

CR No.		Type	Register	Description
HW	LW			
#118 ~ #117		R/W	Modbus TCP Destination IP	The Destination IP Address of Modbus TCP transaction
	#119	R/W	Modbus TCP Data Length	Data length of Modbus TCP in CR#120 ~ CR#219
#219 ~ #120		R/W	Modbus TCP Data Buffer	Data buffer of Modbus TCP Mode for storing sending/receiving data
#250 ~ #220		-	Reserved	Reserved
	#251	R	Error Code	The ELC-COENETM error code
#255 ~ #252		-	Reserved	Reserved
Symbol definition: R: Read, W: Write				

- **Read and write CR register**

1. ELC uses the FROM/DFROM instruction to read CR data of left-side expansion modules.
2. ELC uses the TO/DTO instruction to write CR data of left-side expansion modules.
3. The number of left-side expansion modules is from 100 to 107 (maximum of 8 left-side expansion modules).

Description of CRs

CR#0: Model Name

1. Model code of ELC-COENETM = H'4050.
2. You can read the model code in the program to see if the I/O module exists.

CR#1: Firmware Version

The firmware version of ELC-COENETM is displayed in hex, e.g. H'0100 indicates version V1.00.

CR#2: Communication Mode

Communication mode setting: Set to 0 to Disable; Set to 1 to Enable.

bit	Mode	0	1
b0	Modbus TCP Mode	Modbus TCP Mode Disable	Modbus TCP Mode Enable
b1	Data Exchange Mode	Data Exchange Mode Disable	Data Exchange Mode Enable

- **Sending E-mail Functions**

CR#3 ~ 6: E-Mail Event 1 ~ 4 Trigger

When the CR is set as “1”, E-mail will be sent. After the E-mail is sent, the CR will automatically be reset as “0”. Note: Your logic program will determine the trigger conditions for the E-mail.

CR#7 ~ 8: Status of E-Mail 1 ~ 4

1. CR#7_b0 ~ b7: current status of E-Mail 2; CR#7_b8 ~ b15: current status of E-Mail 1.
2. CR#8_b0 ~ b7: current status of E-Mail 4; CR#8_b8 ~ b15: current status of E-Mail 3.
3. Table of E-Mail status

CR Value	E-Mail Status
0	No status
1	Processing
2	Success
3 ~ 9	Reserve
10	Cannot connect to SMTP-Server
11	E-mail Address error
12	Error response SMTP-Server transmission error
13	No available TCP connection
14 ~ 255	Reserve

CR#9 ~ 12: E-Mail 1 ~ 4 Additional Message

The user fills in the code, and the code will be stored in the title of the E-Mail and sent out with the E-Mail.

- **Data Exchange Function**

CR#13: Data Exchange Trigger

When the CR is set as “0”, the data in the data exchange area will not be transmitted. When the CR is set as “1”, the data in the data exchange area will be transmitted. (The continual execution is only supported by firmware V2.0 or later).

CR#14: Data Exchange Status

When the CR is set as “0”, the data have not yet been received. When the CR is set as “1”, the data exchange is in progress. When the CR is set as “2”, the data exchange is successful. When the CR is set as “3”, the data exchange fails.

CR value	Status
0	Data have not yet been received.
1	Data exchange is in progress.
2	Data exchange is successful.
3	Data exchange fails.

CR#17: Data Exchange cycle time

CR#17 is the execution cycle time (ms) of the Data Exchange function.

CR#18,19: Error status of the Data Exchange slaves

CR#18 ~ CR#19 are the error status of the Data Exchange slaves. The error bit will be set to 1 when connection fails or an error occurs. CR19# b0 ~ b15: Status of Data Exchange slave 1 ~ 16, CR18# b0 ~ b8: Status of Data Exchange Slave 17 ~ 24.

CR#25, 26: Destination IP

Before setting up the destination IP address of Data Exchange Mode, set CR#28 to 0. For example, if the user wants to set the destination IP address to 192.168.0.2, write H'0002 to CR#25 and H'C0A8 to CR#26. (K192 = H'C0, K168 = H'A8, K0 = H'00, K2 = H'02). See Description on CR#70 and CR#71 for how to set.

CR#28: Destination Slave ID

When you set up the Slave ID (i.e. K1 ~ K255) for data exchange, ELC-COENETM will automatically search for the corresponding IP address from the Slave IP list. For example, if the ID is set as "0", the value in CR#25 and CR#26 will be regarded as the destination IP.

CR#29 ~ 48: Data Transmission Buffer

The default Data Exchange registers for storing the data to be sent to the remote ELC controller.

CR#49 ~ 68: Data Receiving Buffer

The default Data Exchange registers for storing the received data from the remote ELC controller.

CR#81: Read Address for Data Exchange

Setting the Modbus Address for the data in the Slave being read for Data Exchange

Mode. It's only permitted to use D Registers. Ex. D0 = H1000.

CR#82: Read Length for Data Exchange

The number of registers to read for Data Exchange Mode. Range: K1 ~ K100.

CR#83: Read Length for Data Exchange

Setting the Read Length in the Master for Data Exchange Mode. Only D Registers are supported.

CR#84: Write Address for Data Exchange

Setting the Modbus Address to be written to in Slave for Data Exchange Mode. Only D Registers are supported.

CR#85: Number of registers being sent for Data Exchange

The number of registers being sent for Data Exchange Mode. Range: K1 ~ K100.

CR#86: Transmission Address for Data Exchange

Setting the Modbus Address for data to be sent from the Master for Data Exchange Mode. Only D Registers are supported.. For example, set CR#81 to H1000 (D0), set CR#82 to K1, and set CR#83 to H1064 (D100). When the Data Exchange is executed, it will read the Slave's D0 and write into the D100 in Master. Set CR#84 to H1002 (D2), set CR#85 to K4, and set CR#86 to H1008 (D8). When the Data Exchange is executed, It will read the Master's D8~D11 and write it to the Slave's D2~D5. The sending and receiving functions can be executed at one time. If both values of CR#82 and CR#85 are 0, default send and receive buffers (CR#29~CR#68) and default register number (K20) will be used.

- **Remote I/O Function**

CR#15: Remote I/O mapping Trigger

The data for the Remote I/O device will be continually mapped to D registers and M bits when CR#15 is set to 1. Set CR#15 to 0 to stop the polling.
Firmware V2.0 and later versions support RTU mapping.

CR#16: Status of Remote I/O slaves

Connection status of Remote I/O polling. CR#16 b0 ~ b3 = 1 when the connection to Remote I/O slave is established. CR#16 b0 ~ b3 = 0 when the connection is closed.

Firmware V2.0 and later versions support RTU mapping.

- **Modbus TCP Function**

CR#111: 8-bit Processing Mode

The Modbus TCP communication Mode. Set CR#111 to 1 for 8-bit mode or set to 0 for 16-bit mode.

CR#112: Modbus TCP Keep-Alive Time-out

CR#112 is the TCP Keep-Alive Time-out for Modbus TCP connection (s).

CR#114: Modbus TCP Time-Out

Setting up the communication time-out (in ms) for Modbus TCP mode.

CR#115: Modbus TCP Trigger

When the CR value is set as “1”, Modbus TCP will be triggered. After the data transmission is completed in Modbus TCP mode, the CR value will automatically be reset to “0”. Trigger with a one-shot rising (LDP or use TOP)

CR#116: Modbus TCP Status

The status registers of Modbus TCP transaction.

CR#116 = 1 when the Data Exchange transaction is being processed.

CR#116 = 2 when the Data Exchange transaction is completed.

CR#116 = 3 when an error occurs.

CR value	Data exchange status
0	The data have not been received.
1	The data exchange is in progress.
2	The data exchange is successful.
3	The data exchange fails.

CR#117, 118: Modbus TCP Destination IP

Setting up the destination IP address in Modbus TCP mode. See Description on CR#70 and CR#71 for how to set it.

CR#119: Modbus TCP Data Length

The data length of Modbus TCP in CR#120 ~ CR#247. In 8-bit mode the range is K1 to K100. In 16-bit mode the range is K1 to K200.

CR#120 ~ 219: Modbus TCP Data Buffer

Modbus TCP registers for storing the data to be sent and received.

CR#251: Error Codes

Table of error codes:

CR#251	Error status
b0	Not connected
b3	CR#13 is set as 1 but Data Exchange function has not been enabled
b7	Connecting to SMTP Server fails
b8	DHCP did not acquire correct network parameters

MEMO