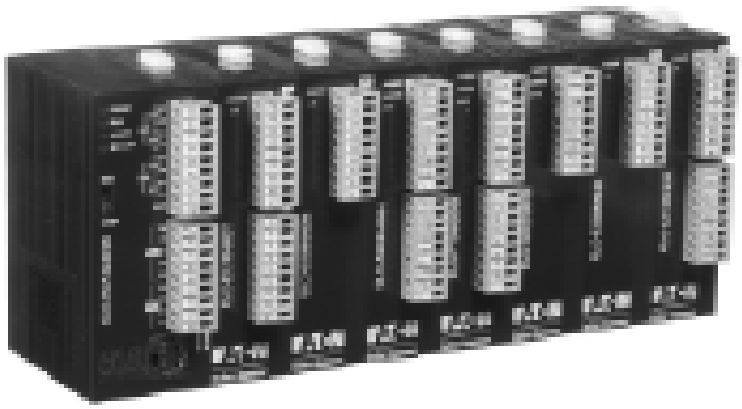
ELC Distributed I/O Adapters

Effective December 2010

Users Manual

ELC-CADNET
ELC-CAPBDP
ELC-CAENET
ELC-CARS485



Powering Business Worldwide

Introduction

✓ The ELC communications adapters are OPEN-TYPE devices 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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1 Introduction

The modules described in this manual attach to ELC I/O modules to allow them to be used as distributed I/O. The distributed I/O can be used with ELC processors or with controllers from many different vendors.

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2 ELC-CADNET

The ELC-CADNET is a distributed I/O adapter that connects ELC I/O modules to DeviceNet. The adapter provides I/O and module diagnostic information.

2.1 Features

- Supports Group 2 I/O polling
- Supports explicit connection via predefined Master/Slave connection set
- Supports EDS files configuration in DeviceNet network configuration tools.
- Supports up to 256 digital I/O points
- Supports up to 8 analog/specialty modules

Feature	Description
Graphic configuration interface	ELC-CADNET supports graphic configuration interface in DeviceNet network configuration tools.
Data retention	The user can choose either to retain or clear the data in the register when ELC-CADNET is offline.
Auto I/O module identification	The user can automatically identify the specialty I/O modules and the number of points on the ELC digital I/O modules connected to the ELC-CADNET through the DeviceNet network configuration tool.
Diagnostics	The ELC-CADNET is able to diagnose the status of the special I/O modules connected to it. When an error occurs, The ALARM LED on ELC-CADNET will flash red.
Status information	ELC-CADNET monitors the connection status between itself and the extension modules in the DeviceNet network configuration tool.
Error detection	The user can monitor errors through the DeviceNet network configuration tool.
Error correction	The user can correct common errors through the DeviceNet network configuration tool.
Flexible configuration	The user can configure the control registers (CR) in the speciatyl I/O modules via the I/O mapping data for DeviceNet.

2.2 Specifications

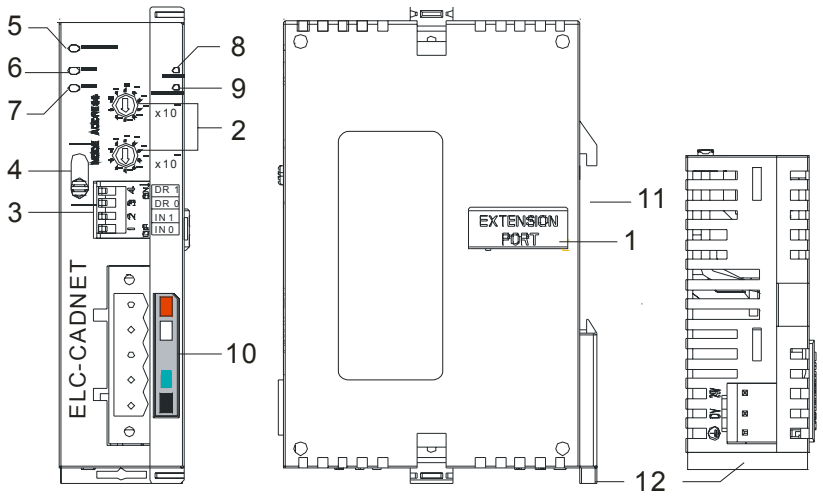
■ Functions Specification

DeviceNet Connection	
Transmission method	CAN
Electrical isolation	500VDC
Type	Removable connector (5.08mm)
Transmission cable	2-wire twister shielded cable with 2-wire bus power and drain
Communication	
Message type	I/O polling, explicit
Baud rate	125kbps; 250kbps; 500kbps

■ Electrical Specification

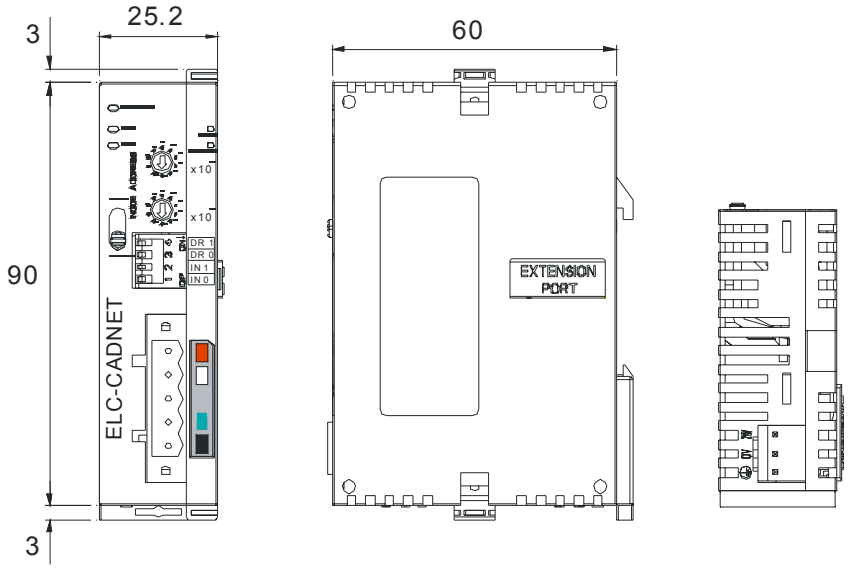
Power supply voltage	11 ~ 25VDC (DeviceNet Power)
Power supply current	28mA (typical), 125mA impulse current (24VDC)
Noise Immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8KV Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2KV, Digital I/O: 1KV Analog & Communication I/O: 1KV Damped-Oscillatory Wave: Power Line: 1KV, Digital I/O: 1KV RS (IEC 61131-2, IEC 61000-4-3): 26MHz ~ 1GHz, 10V/m
Operation/storage temperature	Operation: 0°C ~ 55°C (temperature), 50 ~ 95% (humidity), pollution degree 2; Storage: -25°C ~ 70°C (temperature), 5 ~ 95% (humidity)
Vibration/Shock Immunity	Standard: IEC61131-2, IEC 68-2-6 (TEST Fc)/IEC61131-2 & IEC 68-2-27 (TEST Ea)
Certification	CE cULus , Operating temperature code: T5

2.3 Product Profile and Outline



1.	Extension I/O interface	2.	Address setup switch
3.	Function setup switch	4.	RUN/STOP switch
5.	POWER indicator	6.	MS (Module Status) indicator
7.	NS (Network Status) indicator	8.	RUN indicator
9.	ALARM indicator	10.	DeviceNet connector
11.	DIN rail mounting slot	12.	DIN rail clip

■ **Dimension**

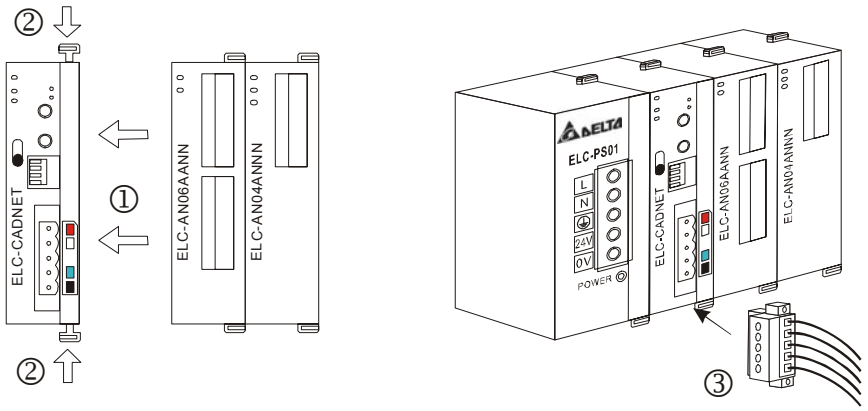


Unit: mm

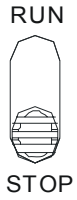
2.4 Installation and Wiring

■ **How to Connect the extension modules to the ELC-CADNET**

1. Open the extension clip on the right side of the ELC-CADNET.
2. Connect the extension port of the ELC-CADNET with the extension module and close the extension clips.
3. The colors on the pins on the DeviceNet connection port match the colors of the connection cables. Make sure you connect the cable to the right pins.



- **Switch Definition : RUN/STOP**

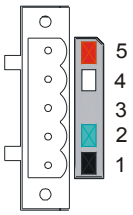


Status	Explanation
RUN	1. RUN indicator on ELC-CAENET is ON.
	2. Analog input/output modules are in RUN status.
RUN → STOP	1. Analog input/output module switches from RUN to STOP status.
	2. Y points on digital input/output module are all OFF.
STOP	1. RUN indicator on ELC-CAENET is OFF.
	2. Analog input/output modules are in STOP status.
STOP → RUN	1. ELC-CADNET re-detects the modules on the I/O bus.
	2. Analog input/output modules switch from STOP to RUN status.

- **DeviceNet Port:**

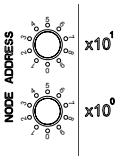
The DeviceNet removable terminal block is included with the ELC-CADNET

PIN	Signal	Color	Definition
1	V-	Black	0VDC
2	CAN_L	Blue	Signal-
3	SHIELD	-	Shielded cable
4	CAN_H	White	Signal+
5	V+	Red	24VDC



- **Address Setup Switch:**

Settings	Description
00 ~ 63	Valid DeviceNet node address
64 ~ 99	Invalid DeviceNet node address



The address setup switches $x10^0$ and $x10^1$ set up the node address on the DeviceNet network in decimal form. Setup range: 00 ~ 63 (64 ~ 99 are invalid)

Example: If you need to set the node address of ELC-CADNET to 26, simply switch the corresponding switch of $x10^1$ to 2 and the corresponding switch of $x10^0$ to 6.

Note:

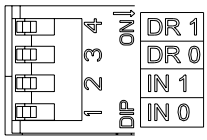
1. Set up the node address when the power is off. After the setup is completed, re-power ELC-CADNET.
2. When ELC-CADNET is operating, changing the setting of the node address will be invalid.

- **Function Setup Switch:**

The function setup switches are for

1. Setting I/O data hold function (IN0)
2. Setting the baud rate of DeviceNet network (DR0 ~ DR1)

DR1	DR0	Baud rates
OFF	OFF	125kbps
OFF	ON	250kbps
ON	OFF	500kbps
ON	ON	Incorrect setting
IN0	OFF	When the DeviceNet connection is interrupted, the content in the buffer area will be cleared.
	ON	When the DeviceNet connection is interrupted, the content in the buffer area will hold last state.
IN1	Reserved	



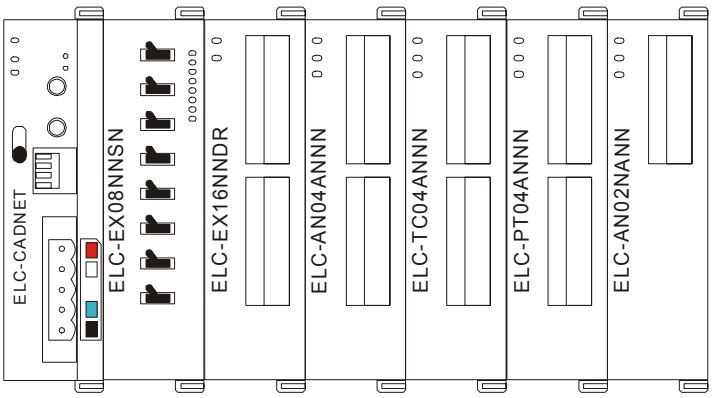
Note:

1. Set up the dip switches when the power is off. Then, re-power the ELC-CADNET.
2. When ELC-CADNET is operating, changing the setting of the dip switches will be invalid.

- **I/O Module Connection Port**

  The I/O module connection port is used to connect the ELC-CADNET to ELC digital I/O modules and special I/O modules.

- **Supported Extension Module**



- ELC digital I/O extension units supported by the ELC-CADNET

Digital I/O modules (model name)	I/O mapping data (DeviceNet → ELC-CADNET)	I/O mapping data (ELC-CADNET → DeviceNet)
ELC-EX08NNDN	N/A	8 bits
ELC-EX08NNNR/T	8 bits	N/A
ELC-EX08NNDR/T	8 bits	8 bits
ELC-EX16NNDR/T	8 bits	8 bits
ELC-EX08NNSN	N/A	8 bits

- Specialty I/O modules supported by the ELC-CADNET

Special I/O module (model name)	Default I/O mapping data (DeviceNet → ELC-CADNET)		I/O mapping data (ELC-CADNET → DeviceNet)	
	Start CR	Length (words)	Start CR	Length (words)
ELC-AN02NANN	CR#10	2	N/A	N/A

Special I/O module (model name)	Default I/O mapping data (DeviceNet → ELC-CADNET)		I/O mapping data (ELC-CADNET → DeviceNet)	
	Start CR	Length (words)	Start CR	Length (words)
ELC-AN04NANN	CR#6	4	N/A	N/A
ELC-AN04ANNN	N/A	N/A	CR#12	4
ELC-TC04ANNN	N/A	N/A	CR#14	4
ELC-PT04ANNN	N/A	N/A	CR#18	4
ELC-AN06AANN	CR#10	2	CR#12	4
ELC-MC01	CR#42	4	CR#33	4

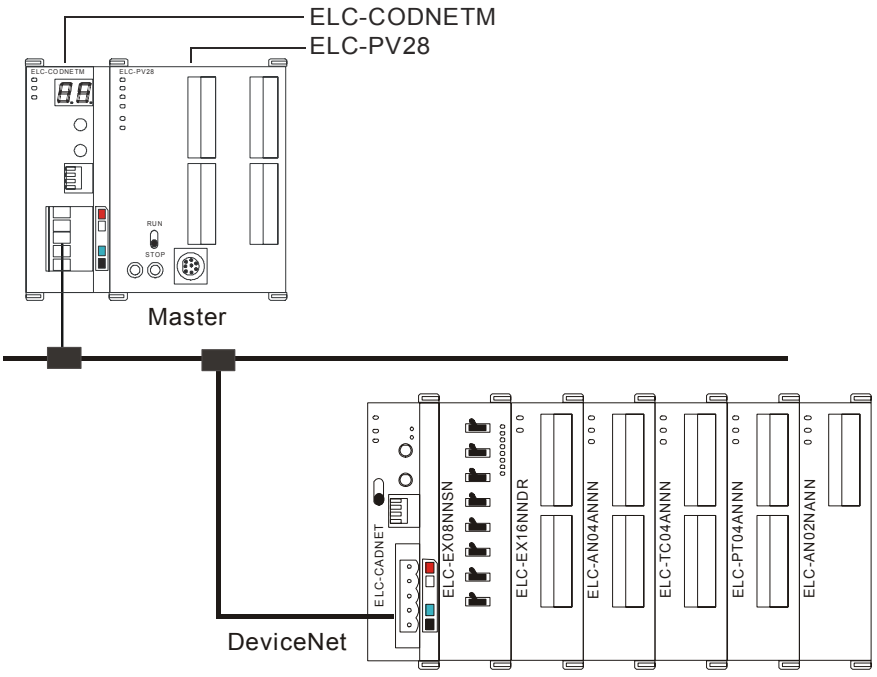
Note:

While connected to a special I/O module, the starting CR number and length of the upload/download data for the ELC-CADNET can be set up in the DeviceNet network configuration tool.

- **Example DeviceNet connection**

1. The DeviceNet master (such as the ELC-CODNETM) sends the output data to the ELC output modules connected to the ELC-CADNET).
2. ELC-CADNET sends the input data from ELC input modules to the DeviceNet master.

Connection Example:



2.5 DeviceNet Data access

2.5.1 I/O Mapped Data

The I/O data is accessed via the polled I/O connection from the DeviceNet master.

(1) Control word and status word in ELC-CADNET

- Control word

bit	Status value	Explanation
0	0	Setting ELC-CADNET to STOP mode
	1	Setting ELC-CADNET to RUN mode
1 ~ 14	0/1	Reserved
15	0	Disable control word
	1	Enable control word

- Status word

bit	Status value	Explanation
0	0	ELC-CADNET detects I/O modules.
	1	ELC-CADNET does not detect I/O modules.
1	0	The configurations of ELC-CADNET and the I/O module connected to it are consistent.
	1	The configurations of ELC-CADNET and the I/O module connected to it are inconsistent.
2	0	No error occurs in the special I/O module.
	1	There is an error in a special I/O module.
3	0	The special I/O module is operating normally.
	1	The special I/O module is offline.
4	0	The configuration data is valid.
	1	The configuration data is invalid.
5	0	ELC-CADNET is operating normally.
	1	The power of ELC-CADNET is in low voltage.
6	0	ELC-CADNET is operating normally.
	1	ELC-CADNET detects unidentifiable special I/O module.
7	0	ELC-CADNET is operating normally.
	1	More than 8 special I/O modules connected to ELC-CADNET, or the number of digital I/O points exceeds 128.
8 ~ 15	0/1	Reserved

(2) I/O data mapping

- If the I/O data does not include the control word and status word of ELC-CADNET, the I/O data mapping between the DeviceNet master and the ELC-CADNET will be:

DeviceNet master → ELC-CADNET

Master (byte)	ELC-CADNET	
0	Special I/O module	Low byte of the 1st special I/O module output channel 1
1		High byte of the 1st special I/O module output channel 1
2		Low byte of the 1st special I/O module output channel 2
3	Special I/O module	High byte of the 1st special I/O module output channel 2
…		…
N	ELC digital I/O module	Y0 ~ Y7 on the 1st ELC digital O I/O module
N+1		Y0 ~ Y7 of the 2nd ELC digital I/O module
…		…

ELC-CADNET → DeviceNet master

Master (byte)	ELC-CADNET	
0	Special I/O module	Low byte of the 1st special I/O module input channel 1
1		High byte of the 1st special I/O module input channel 1
2		Low byte of the 1st special I/O module input channel 2
3		High byte of the 1st special I/O module input channel 2
…		…
N	ELC digital I/O module	X0 ~ X7 on the 1st ELC digital I/O module
N+1		X0 ~ X7 on the 2nd ELC digital I/O module
…		…

- If the I/O data includes the control word and the status word of ELC-CADNET, the I/O data mapping between the DeviceNet master and the ELC-CADNET will be:

DeviceNet master → ELC-CADNET

Master (byte)	ELC-CADNET	
0	ELC-CADNET	Low byte of control word of ELC-CADNET
1		High byte of control word of ELC-CADNET
2	Special I/O module	Low byte of the 1st special I/O module output channel 1
3		High byte of the 1st special I/O module output channel 1
4		Low byte of the 1st special I/O module output channel 2

Master (byte)	ELC-CADNET	
5	Special I/O module	High byte of the 1st special I/O module output channel 2
…		…
N	ELC digital I/O module	Y0 ~ Y7 of the 1st ELC digital I/O module
N+1		Y0 ~ Y7 of the 2nd ELC digital I/O module
…		…

ELC-CADNET → DeviceNet master

Master (byte)	ELC-CADNET	
0	ELC-CADNET	Low byte of status word of ELC-CADNET
1		High byte of status word of ELC-CADNET
2	Special I/O module	Low byte of the 1st special I/O module output channel 1
3		High byte of the 1st special I/O module output channel 1
4		Low byte of the 1st special I/O module output channel 2
5		High byte of the 1st special I/O module output channel 2
…		…
N	ELC digital I/O module	X0 ~ X7 of the 1st ELC digital I/O module
N+1		X0 ~ X7 of the 2nd ELC digital I/O module
…		…

Note:

- If you choose to include the control word and status word of ELC-CADNET in the I/O data, the first word in the I/O data area will automatically be assigned to control word and status word.

2.5.2 Explicit Message access

In addition to polled I/O connection, additional information can be accessed using explicit messaging. The following vendor specific classes are implemented in the ELC-CADNET, and they can be accessed using explicit messages.

- Class 0x9A – ELC-CADNET setup parameter object

  Class attribute

Attribute ID	Access rule	Name	Data type
1	Get	Revision	UINT

Instance 1

Attrib. ID	Access rule	Name	Range	Data Type	Default	Explanation
1	Get	Length of input I/O data	N/A	UINT	N/A	The sum of the length of the status word of ELC-CADNET and the input data of the module connected to it. (Units: byte)
2	Get	Length of output I/O data	N/A	UINT	N/A	The sum of the length of the control word of ELC-CADNET and the output data of the module connected to it. (Units: byte)
3	Get	Number of digital input points (X)	0 ~ 128	UINT	N/A	The number of digital input points. This will be a multiple of 8. If fewer then 8 digital input points are present, the value will be set to 8. If more then 8, but less then 16 points are present, it will be set to 16. (Units: byte)
4	Get	Number of digital output points (Y)	0 ~ 128	UINT	N/A	The number of digital output points. This will be a multiple of 8, If fewer then 8 digital output points are present, the value will be set to 8. If more then 8, but less then 16 points are present, it will be set to 16. (Units: byte)
5	Get	Number of special I/O modules	0 ~ 8	UINT	N/A	The number of special I/O modules connected to ELC-CADNET. (Units: byte)
6	Get	Length of analog input	N/A	UINT	N/A	The length of input data of the special I/O module connected to ELC-CADNET. (Units: word)
7	Get	Length of analog output	N/A	UINT	N/A	The length of output data of the special I/O module connected to ELC-CADNET. (Units: word)
8	Get	Status word	0 ~ 255	UINT	N/A	Displaying the status of ELC-CADNET.
9	Get/ Set	Control word	N/A	UINT	N/A	For setting up the mode of ELC-CADNET, e.g. “H8000” for STOP mode and “H8001” for RUN mode.
10	Get/ Set	Diagnostic interval time	1 ~ 65 sec.	UINT	5 sec.	The interval when ELC-CADNET executes diagnosis.
11	Get/ Set	Special I/O module offline treatment	0 ~ 2	UINT	1	How ELC-CADNET will react when the special I/O module connected to it is offline. 0: Ignored. 1: Alarm. 2: Stop DeviceNet IO

Attrib. ID	Access rule	Name	Range	Data Type	Default	Explanation
12	Get/ Set	Special I/O module error treatment	0 ~ 2	UINT	1	How ELC-CADNET will react when it detects errors. 0: Ignored. 1: Alarm. 2: Stop DeviceNet IO
13	Get/ Set	ELC-CAD NET configurati on validation	N/A	UINT	0	Validating the configuration of ELC-CADNET when set to “11”
14	Get/ Set	Reset ELC-CAD NET	N/A	UINT	0	Resetting ELC-CADNET when set to”10”. After it, the parameter will change to “0” automatically.

- Class 0x9B – Special I/O module setup parameter object

  Class attribute

Attribute ID	Access rule	Name	Data type
1	Get	Revision	UINT

  Instance 1 ~ 8 (parameters for the 1st ~ 8th special I/O modules)

Attrib. ID	Access rule	Name	Range	Data Type	Default	Explanation		
1	Get	Model name	N/A	UINT	N/A	Model code for the special I/O module		
2	Get	Length of input data	N/A	UINT	N/A	The sum of the input data length of special I/O modules connected. (Unit: word)		
3	Get	Length of output data	N/A	UINT	N/A	The sum of the output data length of special I/O modules connected. (Unit: word)		
4	Get	Status	0 ~ 63	UINT	N/A	b0	0	Special I/O module online
							1	Special I/O module offline
						b1	0	Special I/O module normal
							1	Special I/O module in error
						b2	0	Special I/O module and configuration consistent
							1	Special I/O module and configuration inconsistent
						b3	0	Configuration data valid
						b3	1	Configuration data invalid
						b4	0	Special I/O module identified
							1	Special I/O module unidentified
						b5~ b15	Reserved	

Attrib. ID	Access rule	Name	Range	Data Type	Default	Explanation
5	Get/Set	Mapping mode	0 ~ 1	UINT	0	Mapping mode of special I/O module 0: auto 1: custom
6	Get/Set	Number of input data	0 ~ 8	UINT	N/A	Number of bytes of input data for the special I/O modules connected
7	Get/Set	Number of output data	0 ~ 8	UINT	N/A	Number of bytes of output data for the special I/O modules connected
8		Reserved				
9	Get	Error code		UINT	N/A	Error code in special I/O module
10 ~ 19		Reserved				
20	Get/Set	Starting CR for module 1 input data	N/A	UINT	N/A	Starting CR for the input data of special I/O module 1
21	Get/Set	Input data length for module 1	N/A	UINT	N/A	Length of input data of special I/O module 1
22	Get/Set	Starting CR for module 2 input data	N/A	UINT	N/A	Starting CR for the input data of special I/O module 2
23	Get/Set	Input data length for module 2	N/A	UINT	N/A	Length of input data of special I/O module 2
24	Get/Set	Starting CR for module 3 input data	N/A	UINT	N/A	Starting CR for the input data of special I/O module 3
25	Get/Set	Input data length for module 3	N/A	UINT	N/A	Length of input data of special I/O module 3
26	Get/Set	Starting CR for module 4 input data	N/A	UINT	N/A	Starting CR for the input data of special I/O module 4
27	Get/Set	Input data length for module 4	N/A	UINT	N/A	Length of input data of special I/O module 4
28	Get/Set	Starting CR for module 5 input data	N/A	UINT	N/A	Starting CR for the input data of special I/O module 5
29	Get/Set	Input data length for module 5	N/A	UINT	N/A	Length of input data of special I/O module 5
30	Get/Set	Starting CR for module 6 input data	N/A	UINT	N/A	Starting CR for the input data of special I/O module 6
31	Get/Set	Input data length for module 6	N/A	UINT	N/A	Length of input data of special I/O module 6
32	Get/Set	Starting CR for module 7 input data	N/A	UINT	N/A	Starting CR for the input data of special I/O module 7

Attrib. ID	Access rule	Name	Range	Data Type	Default	Explanation
33	Get/Set	Input data length for module 7	N/A	UINT	N/A	Length of input data of special I/O module 7
34	Get/Set	Starting CR for module 8 input data	N/A	UINT	N/A	Starting CR for the input data of special I/O module 8
35	Get/Set	Input data length for module 8	N/A	UINT	N/A	Length of input data of special I/O module 8
36 ~ 49		Reserved				
50	Get/Set	Starting CR for module 1 output data	N/A	UINT	N/A	Starting CR for the output data of special I/O module 1
51	Get/Set	Output data length for module 1	N/A	UINT	N/A	Length of output data of special I/O module 1
52	Get/Set	Starting CR for module 2 output data	N/A	UINT	N/A	Starting CR for the output data of special I/O module 2
53	Get/Set	Output data length for module 2	N/A	UINT	N/A	Length of output data of special I/O module 2
54	Get/Set	Starting CR for module 3 output data	N/A	UINT	N/A	Starting CR for the output data of special I/O module 3
55	Get/Set	Output data length for module 3	N/A	UINT	N/A	Length of output data of special I/O module 3
56	Get/Set	Starting CR for module 4 output data	N/A	UINT	N/A	Starting CR for the output data of special I/O module 4
57	Get/Set	Output data length for module 4	N/A	UINT	N/A	Length of output data of special I/O module 4
58	Get/Set	Starting CR for module 5 output data	N/A	UINT	N/A	Starting CR for the output data of special I/O module 5
59	Get/Set	Output data length for module 5	N/A	UINT	N/A	Length of output data of special I/O module 5
60	Get/Set	Starting CR for module 6 output data	N/A	UINT	N/A	Starting CR for the output data of special I/O module 6

Attrib. ID	Access rule	Name	Range	Data Type	Default	Explanation
61	Get/Set	Output data length for module 6	N/A	UINT	N/A	Length of output data of special I/O module 6
62	Get/Set	Starting CR for module 7 output data	N/A	UINT	N/A	Starting CR for the output data of special I/O module 7
63	Get/Set	Output data length for module 7	N/A	UINT	N/A	Length of output data of special I/O module 7
64	Get/Set	Starting CR for module 8 output data	N/A	UINT	N/A	Starting CR for the output data of special I/O module 8
65	Get/Set	Output data length for module 8	N/A	UINT	N/A	Length of output data of special I/O module 8

- Class 0x9C – Special I/O module parameter object

  Class attribute

Attribute ID	Access rule	Name	Data type
1	Get	Revision	UINT
2	Get	Max Instance	UINT

  Instance 1 ~ 8 (CR for the 1st ~ 8th special I/O module)

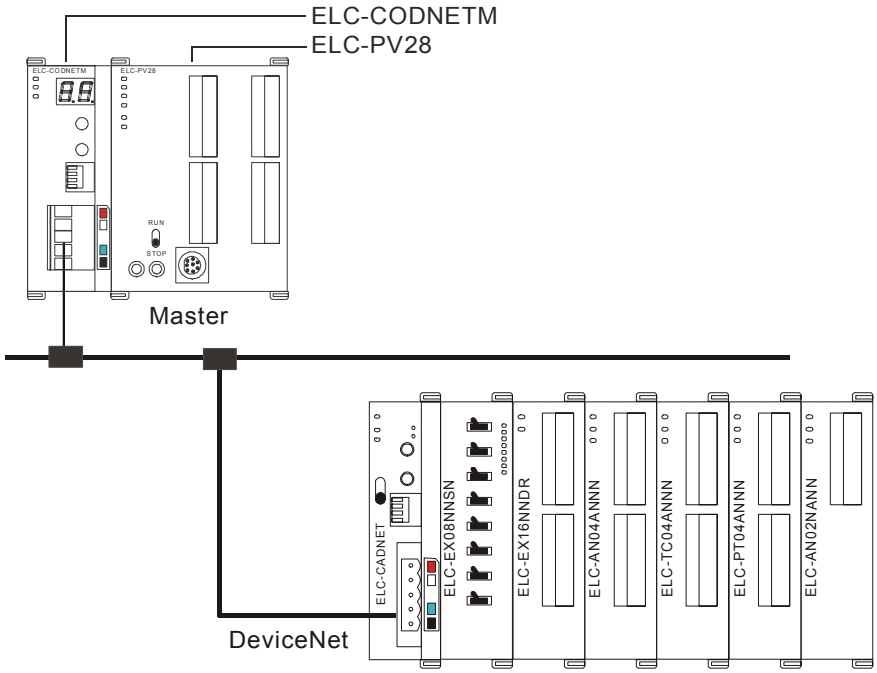
Attribute ID	Access rule	Name	Data type
1	Get	Contents of CR#0	UINT
2	Get/Set	Contents of CR#1	UINT
3	Get/Set	Contents of CR#2	UINT
…	…	…	UINT
9	Get/Set	Contents of CR#8	UINT
10	Get/Set	Contents of CR#9	UINT
…	…	…	UINT

Note:

- When you modify the contents of a CR for a special I/O module through DeviceNet, read back the contents (Get_Attribute_Single) after the write message to confirm that it has been modified successfully.
- The content in some CRs of the special I/O module cannot be modified. Consult the user documentation for the target specialty modules.

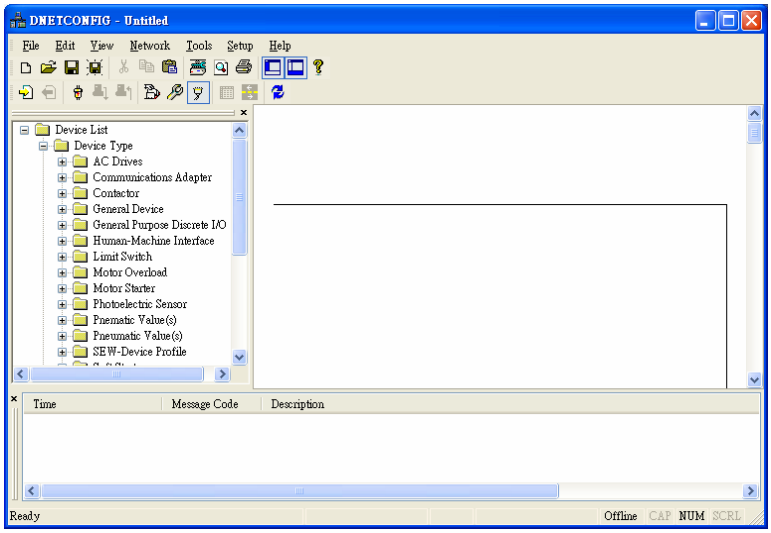
2.6 Application example: ELC-PV with ELC-CODNETM master

For this application example an ELC-PV processor with a CODNETM DeviceNet scanner module is the DeviceNet Master. Distributed ELC I/O is connected through the ELC-CADNET module.

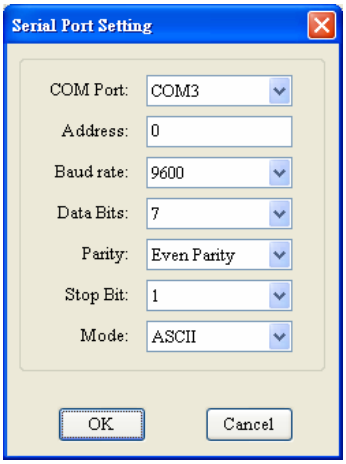


- **Configuration using ELCSoft / DeviceNetConfigurator software**

  - Open DeviceNetConfigurator software from ECISoft by clicking the DNETCONFIG button and the following screen will open.



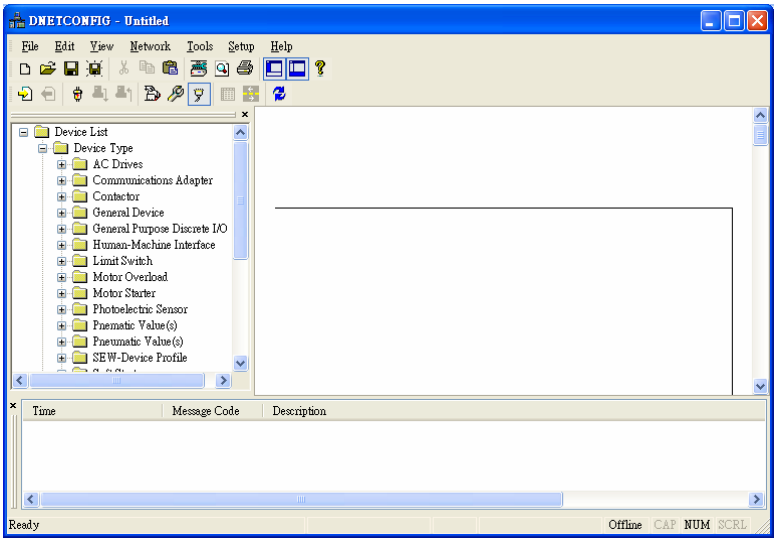
- Select “Setup” => “Communication Setting” => “System Channel”, and the “Serial Port Setting” dialog box will appear.



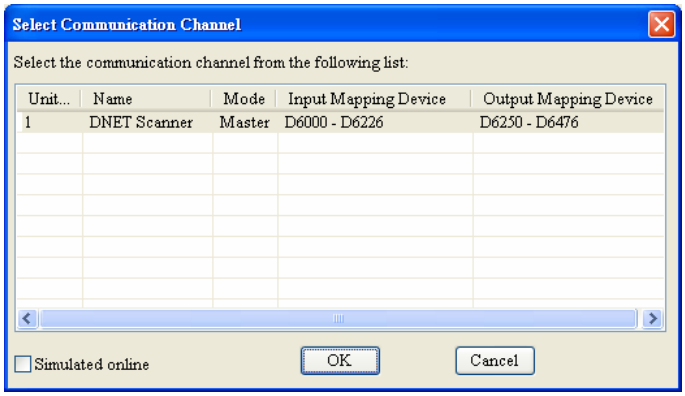
- Set up the communication parameters in the PC and ELC-PV28, e.g. the communication port, address, baud rate and communication format. The DeviceNetConfigurator software will access the DeviceNet network via the programming port on the ELC-PV controller.

Item	Function	Default
COM Port	COM port on the PC to be used to communicate with ELC-PV28	COM1
Address	Communication address of ELC-PV28	01
Baud rate	Communication speed between the PC and ELC-PV28	9,600 (bps)
Data Bits	Communication protocol between the PC and ELC-PV28	7
Parity		Even Parity
Stop Bit		1
Mode	Communication mode between the PC and ELC-PV28	ASCII

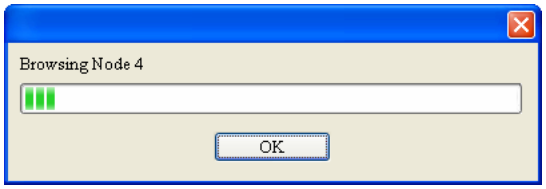
- Click on “OK” and return to the main page.



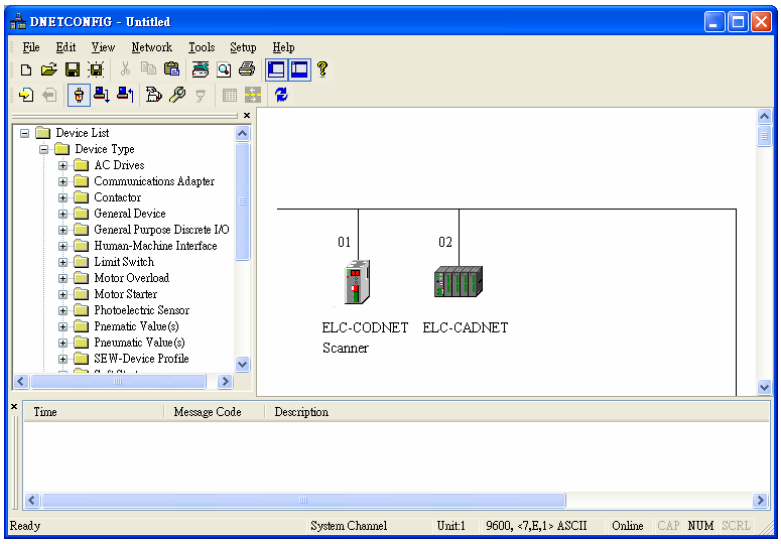
- Select “Network” => “Online” and the “Select Communication Channel” dialog box will appear.



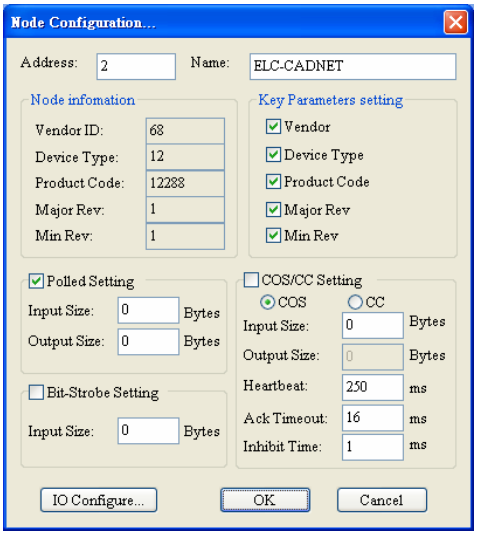
- Click on “OK”, and DeviceNetConfigurator will start to scan the entire network.



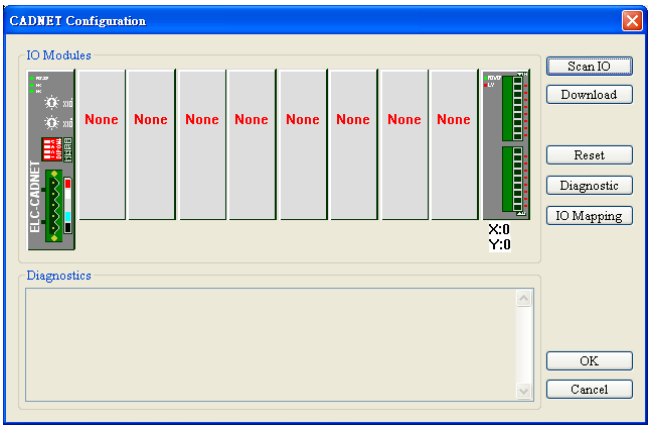
- If the bar on the dialog box does not progress, it means the connection between the PC and ELC-PV28 is not correctly configured, or there are other programs also using the COM port on the PC. After the scan is completed, the dialog box will tell you that the scan is completed, and the icons and device names of all the nodes scanned on the network will be shown on the screen. See the figure below, in which the node address of ELC-CODNETM is 01 and the node address of the ELC-CADNET is 2.



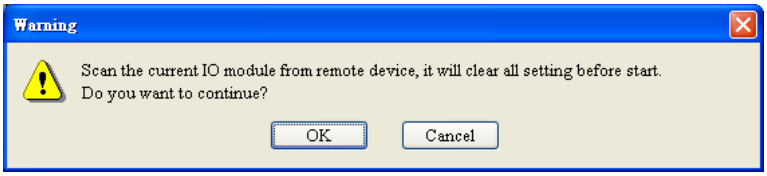
- Double click on ELC-CADNET (node 02), and the “Node Configuration…dialog box will appear.



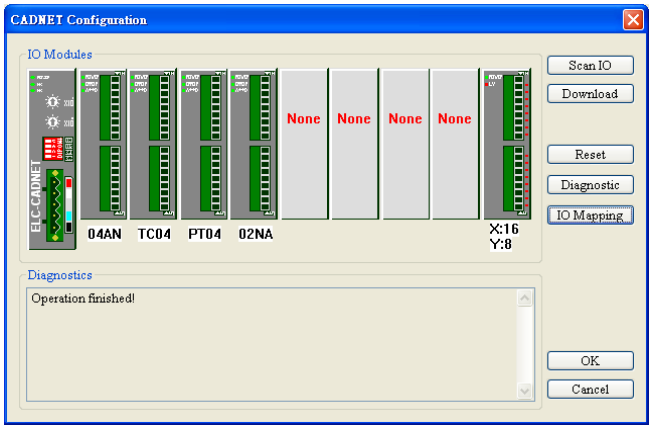
- Click on “IO Configure…” button in “Node Configuration" dialog box, and you will then see “RTU Configuration” page.



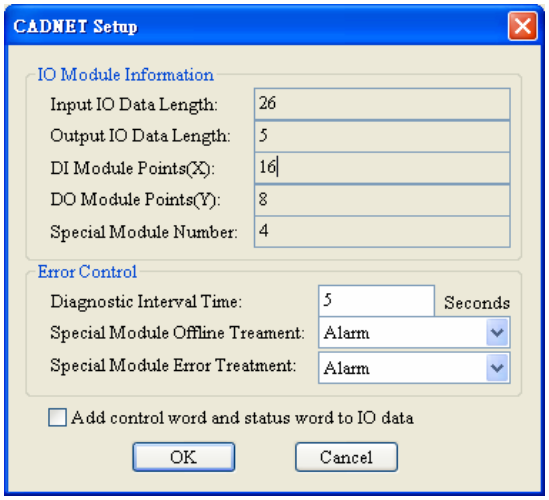
- Click on “Scan IO”, and the “Warning” dialog box will appear.



- Click on “OK”. DeviceNetConfigurator will then detect the special I/O module connected to ELC-CADNET and the number of points in the ELC digital I/O module and display the information on “RTU Configuration” page.



- Double click on ELC-CADNET icon, and you will then see “RTU Setup” dialog box.



- Set up the parameters in ELC-CADNET and confirm its I/O information.

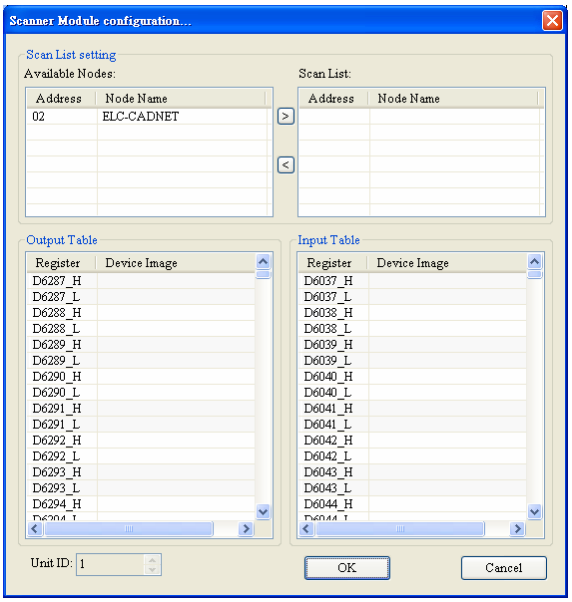
Item	Function	Default
Input IO Data Length	The sum of the length of the status word of ELC-CADNET and the input data of the I/O module connected to it. The status word of ELC-CADNET occupies 2 bytes. One input channel of the special I/O module occupies 2 bytes. 8 points of the digital input are counted as 1 byte.	N/A
Output IO Data Length	The sum of the length of the control word of ELC-CADNET and the output data of the I/O module connected to it. The control word of ELC-CADNET occupies 2 bytes. One output channel of the special I/O module occupies 2 bytes. 8 points of the digital output are counted as 1 byte.	N/A
DIDO Input Points (X)	The digital input points shall be multiples of 8. The number will be regarded as 8 when it is less than 8 and regarded as 16 when it is larger than 8 but less than 16.	N/A
DIDO Output Points (Y)	The digital output points shall be multiples of 8. The number will be regarded as 8 when it is less than 8 and regarded as 16 when it is bigger than 8 but less than 16.	N/A
Number of Analog Modules	The number of special I/O modules connected to ELC-CADNET. Range: 0 ~ 8	N/A

Item	Function	Default
Diagnostic Interval Time	The interval when ELC-CADNET executes diagnosis. Range: 1~ 65 sec.	5 (sec)
IO Module Offline Treatment	How ELC-CADNET will react when the special I/O module connected to it is offline. You can choose “Ignored”, "Alarm” or “stop DeviceNet IO".	Alarm
IO Module Error Treatment	How ELC-CADNET will react when it detects errors. You can choose “Ignored”, “Alarm” or “Stop DeviceNet IO”.	Alarm
Add control word and status word to IO data	For you to decide whether to add control word and status word to I/O data. When you choose not to do it, the I/O data in ELC-CADNET and DeviceNet master will not include control word and status word. If you choose to add them in, the I/O data in ELC-CADNET and DeviceNet master will include control word and status word.	Not to add

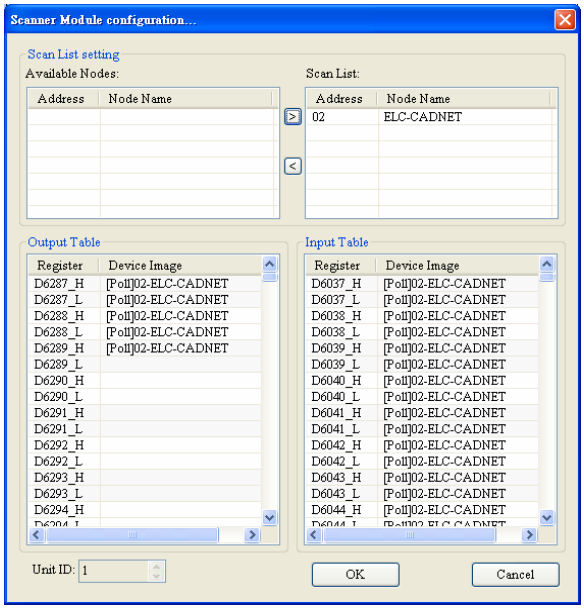
- Confirm all the configurations are correct and click on “Download” to download the configuration to ELC-CADNET. After the download is completed, click on “OK".

■ Configuration of the ELC-CODNETM

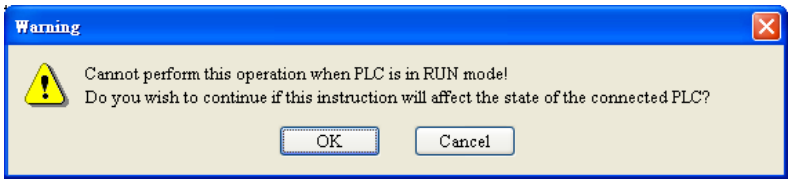
- Double click on DNET Scanner (node 01), and the “Scan Module Configuration…” dialog box will appear. You can find the currently available node, ELC-CADNET, in the list on the left side. On the right side, there is an empty “Scan List”.



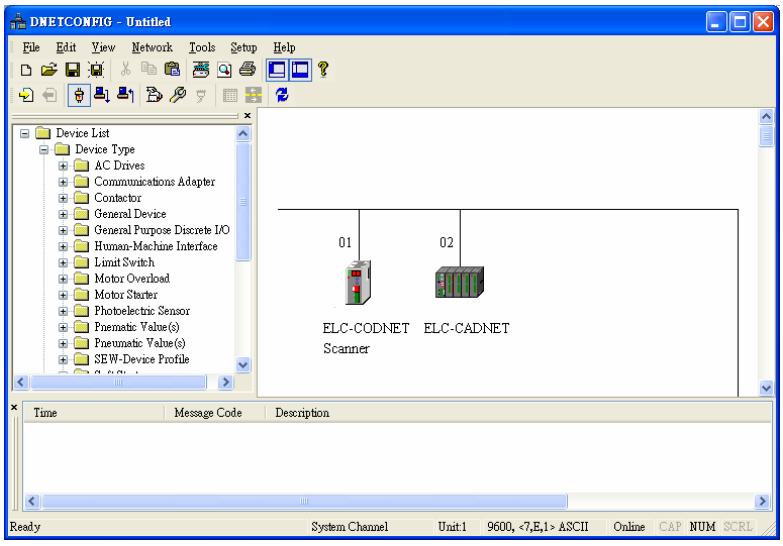
- Move the slave devices on DeviceNet in the “Available Nodes” list on the left side to the “Scan List” on the right side. Select a node and click on [>]. Follow the steps to move all the nodes to the scan list.



- Confirm all the settings and note the D-register addresses the I/O data is mapped to and click on “OK”. Next, download the configuration to ELC-CODNETM. If ELC-PV28 is in RUN mode while you are downloading the configuration, a "Warning” dialog box will appear.



- Click on “OK” to continue the download. Make sure ELC-PV28 is in RUN mode. The MS LED and NS LED on ELC-CADNET turn green.



(1) Follow the steps given above to configure other devices on the DeviceNet network. If the I/O data does not include the control word and status word of ELC-CADNET, the I/O data mapping of ELC-CODNETM and ELC-CADNET will be:

- ELC-CODNETM Master → ELC-CADNET Slave

ELC-CODNETM		Digital/Analog Extension Module	
D6282H		Analog Extension Module	High byte of the content of CH1 in ELC-AN02NANN
D6282L			Low byte of the content of CH1 in ELC-AN02NANN
D6283H	⇨		High byte of the content of CH2 in ELC-AN02NANN
D6283L			Low byte of the content of CH2 in ELC-AN02NANN
D6284H		Digital Extension Module	Y0 ~ Y7 of ELC-EX16NNDR

- ELC-CADNET Slave → ELC-CODNETM Master

ELC-CODNETM		Digital/Analog Extension Module	
D6032H		Analog Extension Module	High byte of the content of CH1 in ELC-AN04ANNN
D6032L			Low byte of the content of CH1 in ELC-AN04ANNN
D6033H			High byte of the content of CH2 in ELC-AN04ANNN
D6033L			Low byte of the content of CH2 in ELC-AN04ANNN
D6034H			High byte of the content of CH3 in ELC-AN04ANNN
D6034L			Low byte of the content of CH3 in ELC-AN04ANNN
D6035H			High byte of the content of CH4 in ELC-AN04ANNN
D6035L	⇦		Low byte of the content of CH4 in ELC-AN04ANNN
D6036H			High byte of the content of CH1 in ELC-TC04ANNN
D6036L			Low byte of the content of CH1 in ELC-TC04ANNN
D6037H			High byte of the content of CH2 in ELC-TC04ANNN
D6037L			Low byte of the content of CH2 in ELC-TC04ANNN
D6038H			High byte of the content of CH3 in ELC-TC04ANNN
D6038L			Low byte of the content of CH3 in ELC-TC04ANNN
D6039H			High byte of the content of CH4 in ELC-TC04ANNN

ELC-CODNETM		Digital/Analog Extension Module	
D6039L		Analog Extension Module	Low byte of the content of CH4 in ELC-TC04ANNN
D6040H			High byte of the content of CH1 in ELC-PT04ANNN
D6040L			Low byte of the content of CH1 in ELC-PT04ANNN
D6041H			High byte of the content of CH2 in ELC-PT04ANNN
D6041L			Low byte of the content of CH2 in ELC-PT04ANNN
D6042H			High byte of the content of CH3 in ELC-PT04ANNN
D6042L			Low byte of the content of CH3 in ELC-PT04ANNN
D6043H			High byte of the content of CH4 in ELC-PT04ANNN
D6043L			Low byte of the content of CH4 in ELC-PT04ANNN
D6044H		Digital Extension Module	X0 ~ X7 of ELC-EX08NNSN
D6044L			X0 ~ X7 of ELC-EX16NNDR

(2) When the I/O data contains the control word and status word of ELC-CADNET, the I/O data of ELC-CODNETM (master) and ELC-CADNET (slave) are mapped as the tables listed in the next column.

- ELC-CODNETM Master → ELC-CADNET Slave

ELC-CODNETM		Digital/Analog Extension Module	
D6282H		ELC-CADNET control word	High byte of the control word in ELC-CADNET
D6282L			Low byte of the control word in ELC-CADNET
D6283H		Analog Extension Module	High byte of the content of CH1 in ELC-AN02NANN
D6283L			Low byte of the content of CH1 in ELC-AN02NANN
D6284H			High byte of the content of CH2 in ELC-AN02NANN
D6284L			Low byte of the content of CH2 in ELC-AN02NANN
D6285H		Digital Extension Module	Y0 ~ Y7 of ELC-EX16NNDR

- ELC-CADNET Slave → ELC-CODNETM Master

ELC-CODNETM		Digital/Analog Extension Module	
D6032H		ELC-CADNET status word	High byte of the status word in ELC-CADNET
D6032L			Low byte of the status word in ELC-CADNET
D6033H		Analog Extension Module	High byte of the content of CH1 in ELC-AN04ANNN
D6033L			Low byte of the content of CH1 in ELC-AN04ANNN
D6034H			High byte of the content of CH2 in ELC-AN04ANNN
D6034L			Low byte of the content of CH2 in ELC-AN04ANNN 的 CH2
D6035H			High byte of the content of CH3 in ELC-AN04ANNN
D6035L			Low byte of the content of CH3 in ELC-AN04ANNN
D6036H			High byte of the content of CH4 in ELC-AN04ANNN
D6036L			Low byte of the content of CH4 in ELC-AN04ANNN
D6037H			High byte of the content of CH1 in ELC-TC04ANNN
D6037L	⇦		Low byte of the content of CH1 in ELC-TC04ANNN
D6038H			High byte of the content of CH2 in ELC-TC04ANNN
D6038L			Low byte of the content of CH2 in ELC-TC04ANNN
D6039H			High byte of the content of CH3 in ELC-TC04ANNN
D6039L			Low byte of the content of CH3 in ELC-TC04ANNN
D6040H			High byte of the content of CH4 in ELC-TC04ANNN
D6040L			Low byte of the content of CH4 in ELC-TC04ANNN
D6041H			High byte of the content of CH1 in ELC-PT04ANNN
D6041L			Low byte of the content of CH1 in ELC-PT04ANNN
D6042H			High byte of the content of CH2 in ELC-PT04ANNN
D6042L			Low byte of the content of CH2 in ELC-PT04ANNN
D6043H			High byte of the content of CH3 in ELC-PT04ANNN

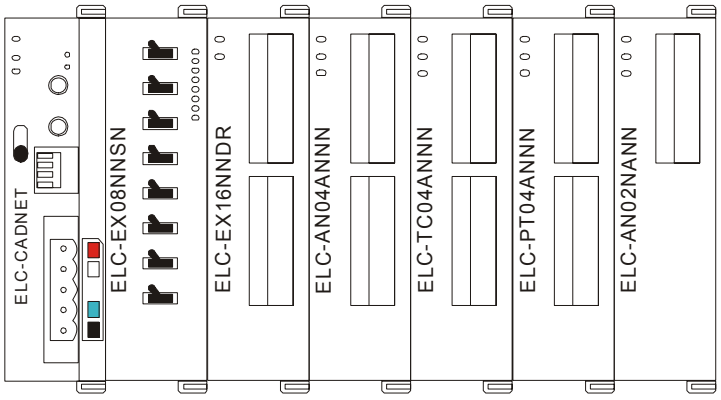
ELC-CODNETM
D6043L
D6044H
D6044L
D6045H
D6046L

⇦

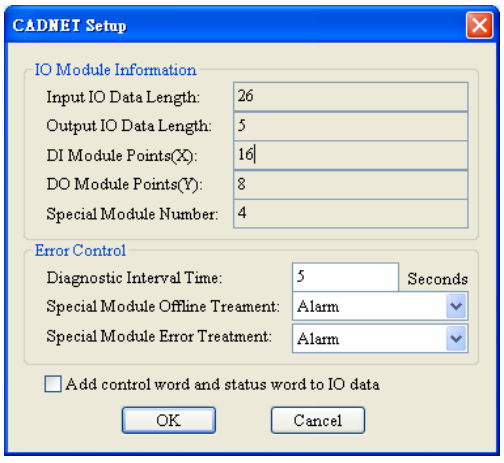
Digital/Analog Extension Module	
Analog Extension Module	Low byte of the content of CH3 in ELC-PT04ANNN
	High byte of the content of CH4 in ELC-PT04ANNN
	Low byte of the content of CH4 in ELC-PT04ANNN
Digital Extension Module	X0 ~ X7 of ELC-EX08NNSN
	X0 ~ X7 of ELC-EX16NNDR

2.7 Application Example: Custom Specialty I/O Data Mapping

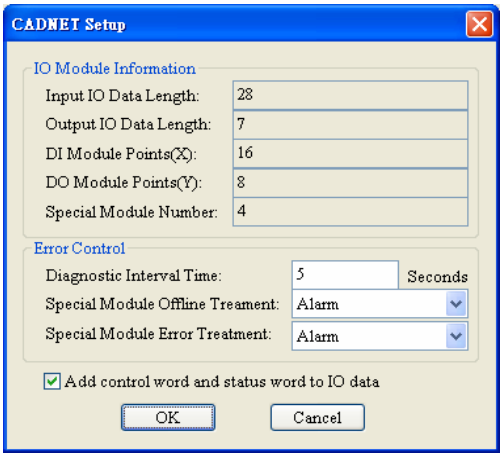
(1) Assume the I/O modules connected to the ELC-CADNET are:



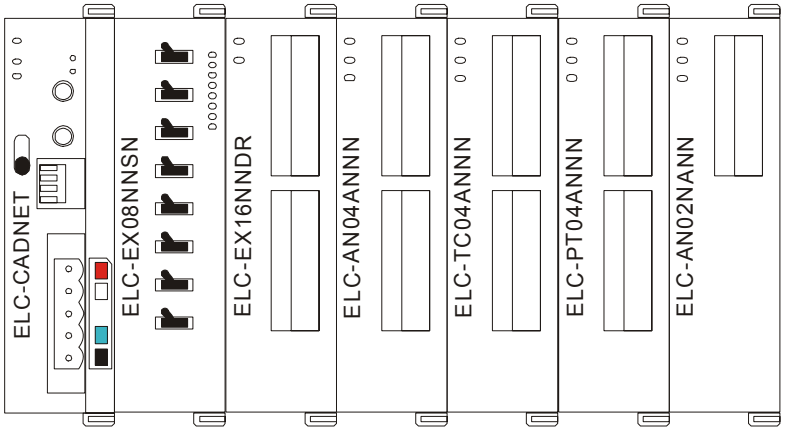
If the I/O data does not include control word and status word of ELC-CADNET, the information of the I/O module connected to ELC-CADNET are as follows:

Item	Content	Software screen
DIDO Input Points (X)	16 bits	
DIDO Output Points (Y)	8 bits	
Number of Analog Modules	4	
Input IO Data Length	26 bytes	
Output IO Data Length	5 bytes	

If the I/O data does include the control word and status word of ELC-CADNET, the information of the I/O module connected to ELC-CADNET are as follows:

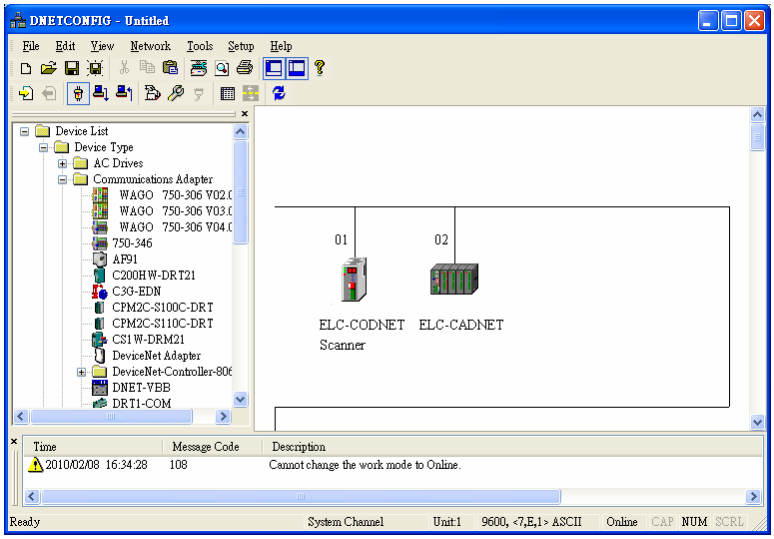
Item	Content	Software screen
DIDO Input Points (X)	16 bits	
DIDO Output Points (Y)	8 bits	
Number of Analog Modules	4	
Input IO Data Length	28 bytes	
Output IO Data Length	7 bytes	

(2) How to change the I/O mapping relation between ELC-CADNET and special I/O module.

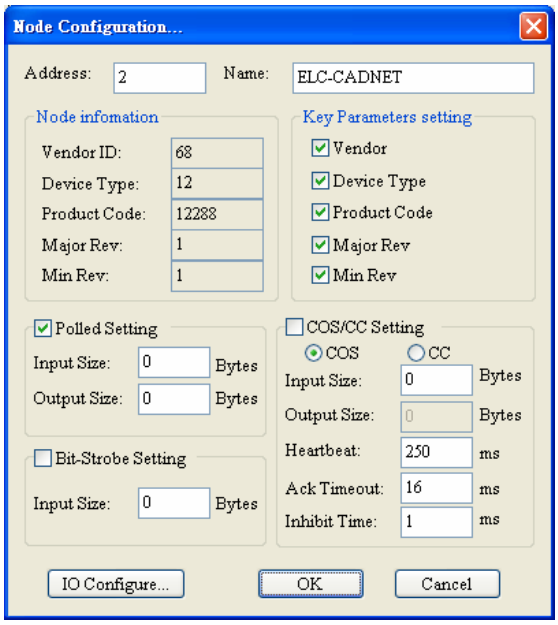


For the configuration above, if you need to read the average Celsius degree temperature at CH1 ~ CH4 on ELC-PT04ANNN, follow the steps below:

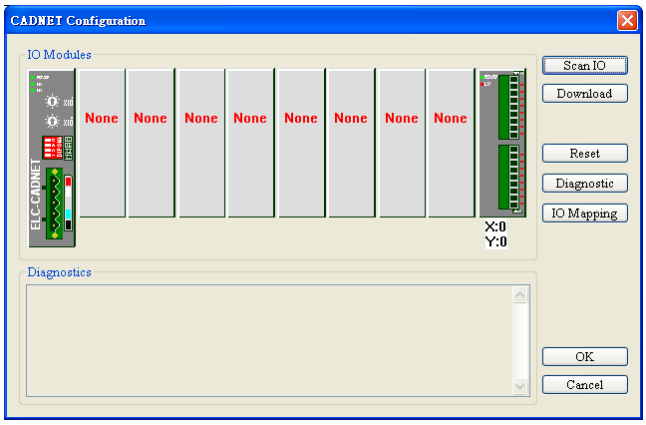
a. Scan DeviceNet by using DeviceNetBuilder software. After the scan is completed, the nodes on DeviceNet will be displayed on the screen.



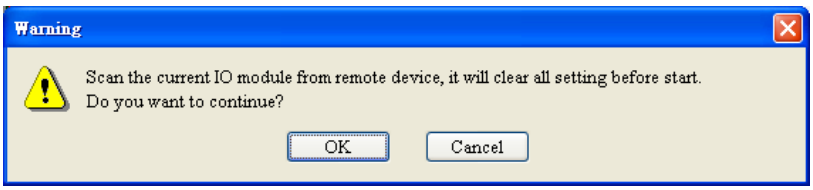
b. Double click on ELC-CADNET icon, and the “Node Configuration…” dialog box will appear.



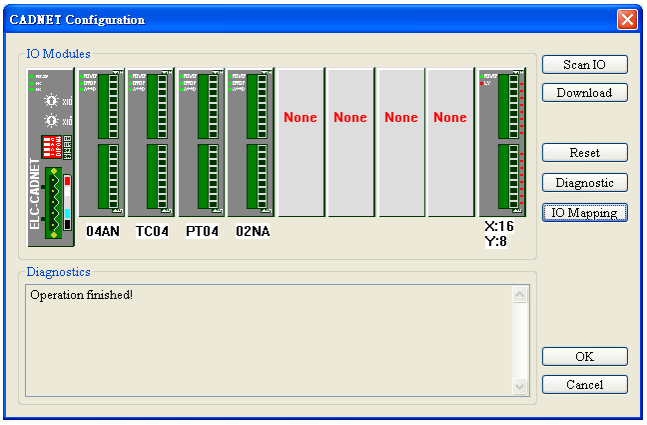
c. Click on “IO Configure…” button in “Node Configuration…” dialog box, and you will then see “RTU Configuration” page.



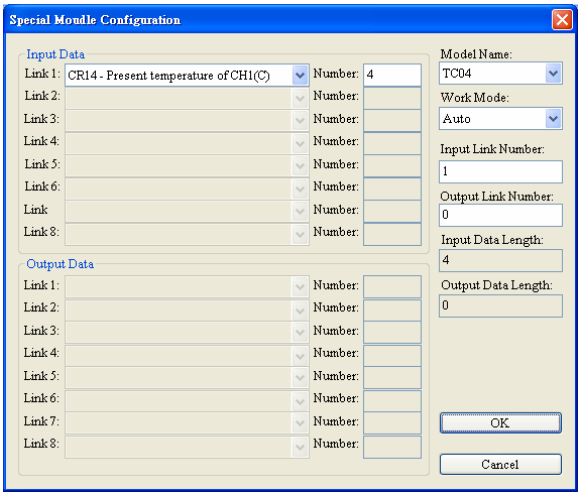
d. Click on “Scan IO”, and the “Warning” dialog box will appear.



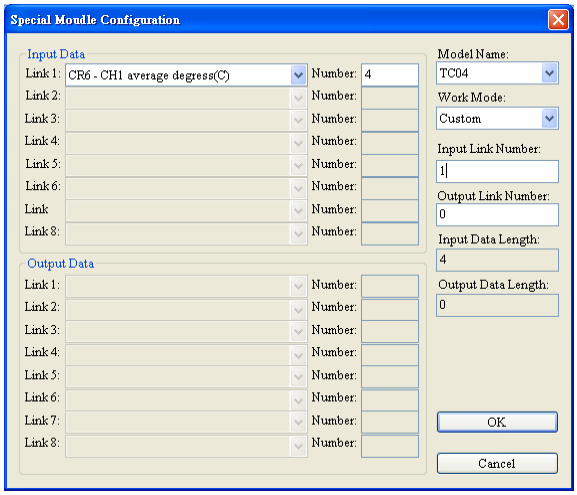
e. Click on “OK”. DeviceNetConfigurator will then display the special I/O modules connected and the number of digital I/O points on the “RTU Configuration” page.



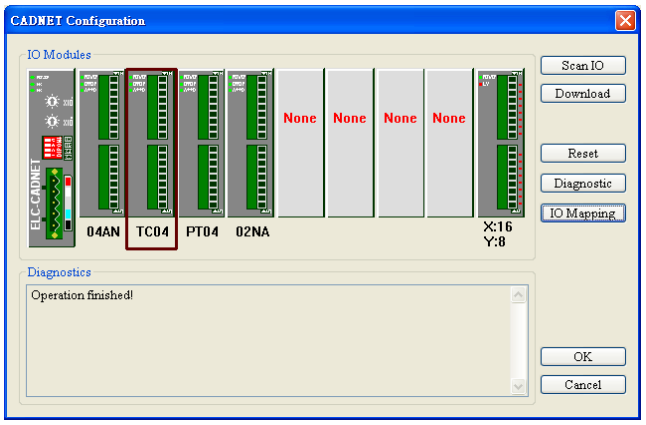
f. Double click on “04TC” icon, and you will then see the “AIAO Module Configuration” dialog box, as below. The content in Input Data >> Link 1 column is “CR14-Present temperature of CH1(C)”.



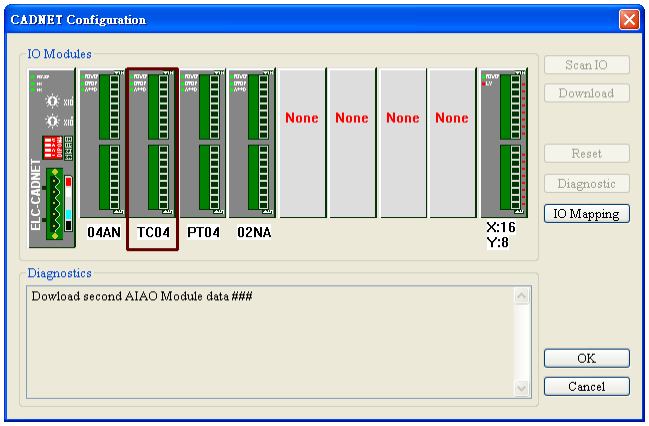
g. Set the Work Mode to “Custom” and Input Data >> Link 1 to “CR6-CH1 average degree(C)”.



h. Click on “OK” in “AIAO Module Configuration” page and return to “RTU Configuration” page.



i. Click on “Download” to download the configuration to ELC-CADNET.



j. After the download is completed, click on “OK”.

3 ELC-CAPBDP

The ELC-CAPBDP is a PROFIBUS DP Slave Communication Module. To ensure correct installation and operation of the product, please read this operation information below carefully before using it. ELC-CAPBDP is a PROFIBUS DP slave communication module for connecting ELC series special I/O modules, digital I/O modules and standard Modbus devices to PROFIBUS DP network.

3.1 Features

- Supports PROFIBUS DP cyclic data transmission.
- Auto-detects baud rates; supports max. 12Mbps.
- Self-diagnosis
- Able to connect to max. 8 special I/O modules (i.e. analog I/O, temperature measurement, counter and positioning modules) and 16 digital I/O modules (max. 256 digital I/O points).
- The RS-485 COM port is able to connect to max. 16 standard Modbus slave stations.

3.2 Specifications

PROFIBUS DP Port

Interface	DB9 connector
Transmission method	High-speed RS-485
Transmission cable	Shielded twisted pair cable
Electrical isolation	500VDC

Communication

Message type	Cyclic data exchange
Module name	ELC-CAPBDP
GSD file	EATN09B9.GSD
Product ID	09B9 (HEX)
Serial transmission speed supported (auto-detection)	9.6kbps; 19.2kbps; 93.75kbps; 187.5kbps; 500kbps; 1.5Mbps; 3Mbps; 6Mbps; 12Mbps (bits per second)

Environment

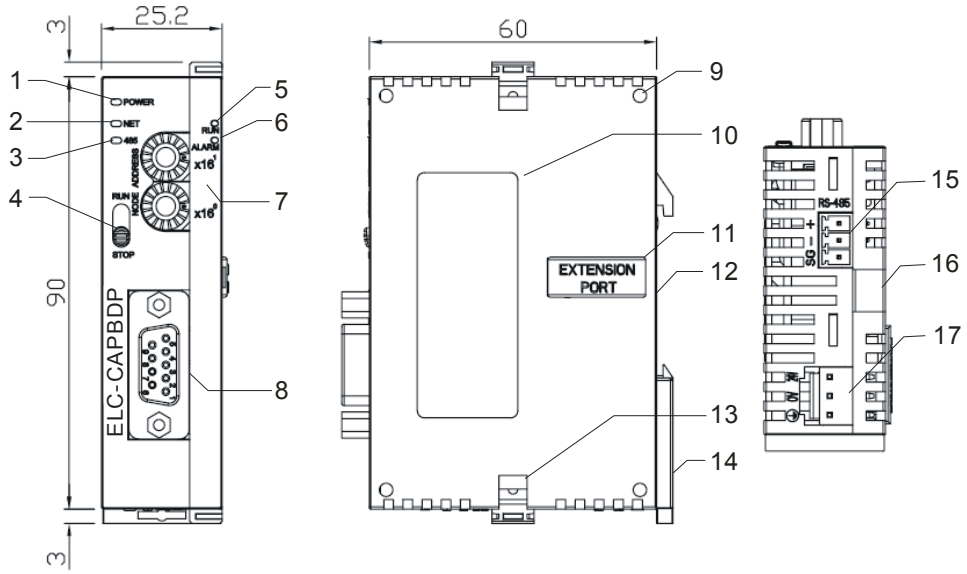
Noise immunity	ESD (IEC 61131-2,IEC 61000-4-2): 8kV Air Discharge EFT (IEC 61131-2,IEC 61000-4-4): Power Line:±2kV,Digital Input:±2kV Communication I/O: ±2kV Conducted Susceptibility Test (EN61000-4-6, IEC 61131-2 9.10): 150kHz ~ 80MHz,10V/m RS (IEC 61131-2, IEC 61000-4-3): 26MHz ~ 1GHz, 10V/m
Storage/operation	Operation: 0°C ~ 50°C (temperature), 50 ~ 90% (humidity), pollution degree 2 Storage: -25°C ~ 70°C (temperature), 5 ~ 95% (humidity)

Shock/vibration immunity	International standards: IEC 61131-2,IEC 68-2-6 (TEST Fc)/IEC 61131-2& IEC 68-2-27 (TEST Ea)

- **Electrical specification**

Power supply voltage	24VDC
Insulation voltage	500VDC
Power consumption	2.5W
Weight	90g

3.3 Product Profile and Outline



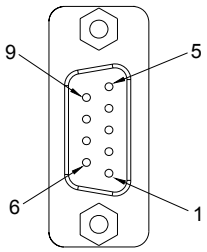
Unit: mm

1. POWER indicator	10. Nameplate
2. NET indicator	11. I/O module connection port
3. RS-485 indicator	12. DIN rail (35mm)
4. RUN/STOP switch	13. I/O module fixing clip
5. RUN indicator	14. DIN rail fixing clip
6. ALARM indicator	15. RS-485 COM port
7. Address setup switch	16. I/O module fixing notch
8. PROFIBUS DP COM port	17. DC24V power supply interface
9. I/O module positioning hole	

3.4 Installation and wiring

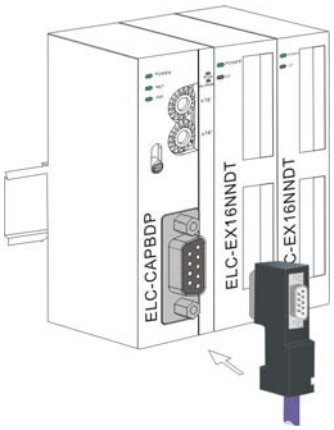
- **Definition of PROFIBUS DP Port**

PIN	PIN name	Definition
1	--	N/C
2	--	N/C
3	RxD/TxD-P	Sending/receiving data P(B)
4	--	N/C
5	DGND	Data reference potential (C)
6	VP	Power voltage – positive
7	--	N/C
8	RxD/TxD-N	Sending/receiving data N(A)
9	--	N/C

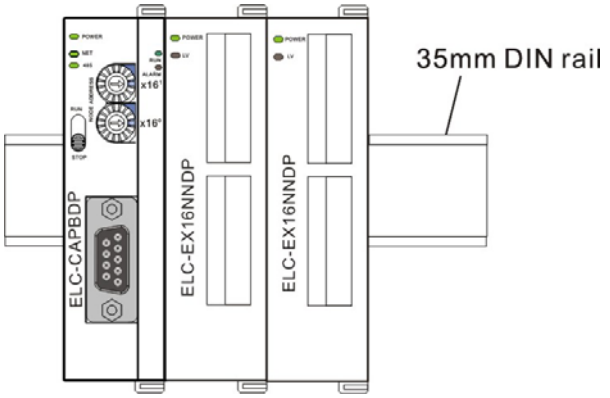


- **Connecting to PROFIBUS DP Port**

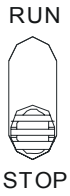
  Connect the PROFIBUS DP bus connector to the PROFIBUS DP port on the ELC-CAPBDP (see the figure below) Screw it tight to ensure ELC-CAPBDP and PROFIBUS DP bus are properly connected.



- **Installing ELC-CAPBDP and I/O Module on DIN Rail**
  - Use 35mm DIN rail.
  - Open the DIN rail clips on ELC-CAPBDP and I/O module. Insert ELC-CAPBDP and I/O module on the DIN rail.
  - Clip up the DIN rail clips on ELC-CAPBDP and I/O module to fix them on the DIN rail (see the figure below).



- **RUN/STOP Switch**

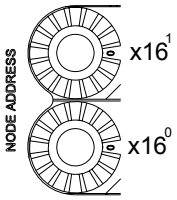


Status	Description
RUN => STOP	1. Special I/O module switches from RUN to STOP.
	2. All Y points on digital output module turn OFF.
	3. Modbus function disabled
	4. RUN LED turns off.
STOP => RUN	1. ELC-CAPBDP re-detects the number of digital I/O points and special I/O modules.
	2. Special I/O module switches from STOP to RUN.
	3. Enable digital I/O modules.
	4. Enable Modbus function.
	5. RUN LED turns on.

- **Address Setup Switch**

The two rotary address setup switches, $x16^0$ and $x16^1$, set up the node address of ELC-CAPBDP on PROFIBUS DP network in hex form. The range for rotation is 0 ~ F.

Address	Definition
H'1~ H'7D	Valid PROFIBUS address
H'0 or H'7E ~ H'FF	Invalid PROFIBUS address. NET LED will flash in red color if the node address falls within this range.



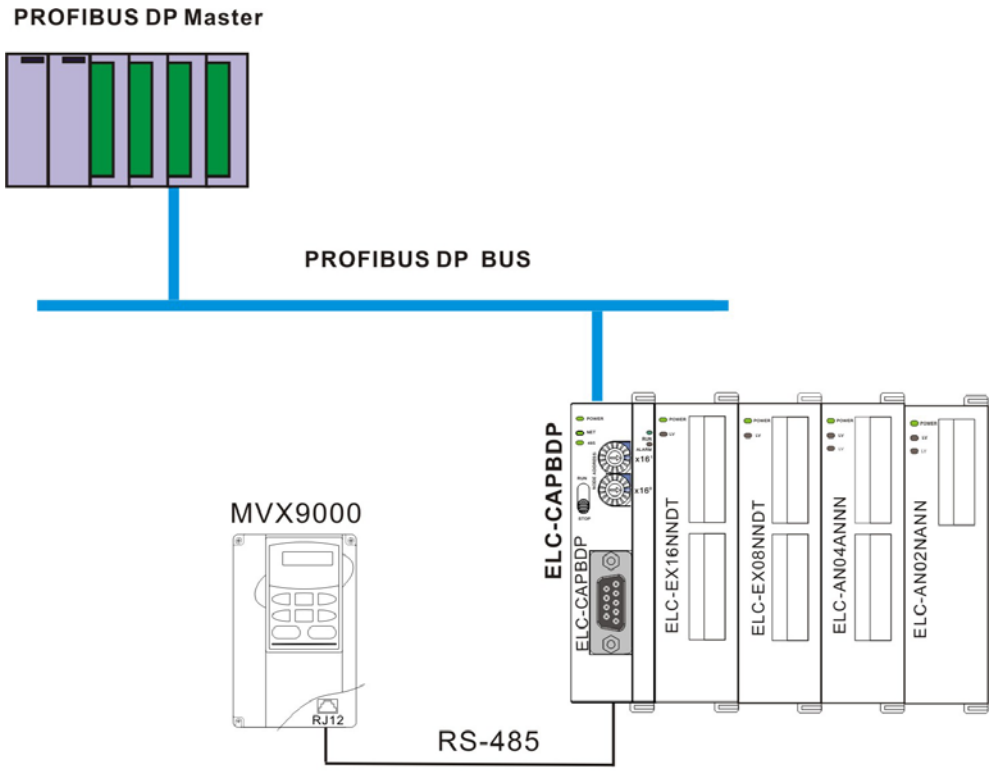
Example: If you need to set the node address of ELC-CAPBDP to 26 (decimal), simply switch $x16^1$ switch to "1" and $x16^0$ to "A". 26 (decimal) = 1A (hex) = $1x16^1 + Ax16^0$.

Note:

- Switch off the power supply before setting up the node address of ELC-CAPBDP. Re-power the module after the setup is completed.
- Changing the value on the switch during the operation of ELC-CAPBDP is invalid.
- Use slot type screwdriver to set up the switch.

- **Connecting to a PROFIBUS DP Network**

  See the figure below for the connection of ELC series I/O modules and Modbus devices into a PROFIBUS DP network.



- **Transmission Distance and Baud Rate**

  The baud rate range for PROFIBUS DP is 9.6kbps ~ 12Mbps, and the length of transmission cable varies with the transmission speed. The cable length ranges from 100m to 1,200m. See the table below for the baud rates ELC-CAPBDP supports and their corresponding cable lengths.

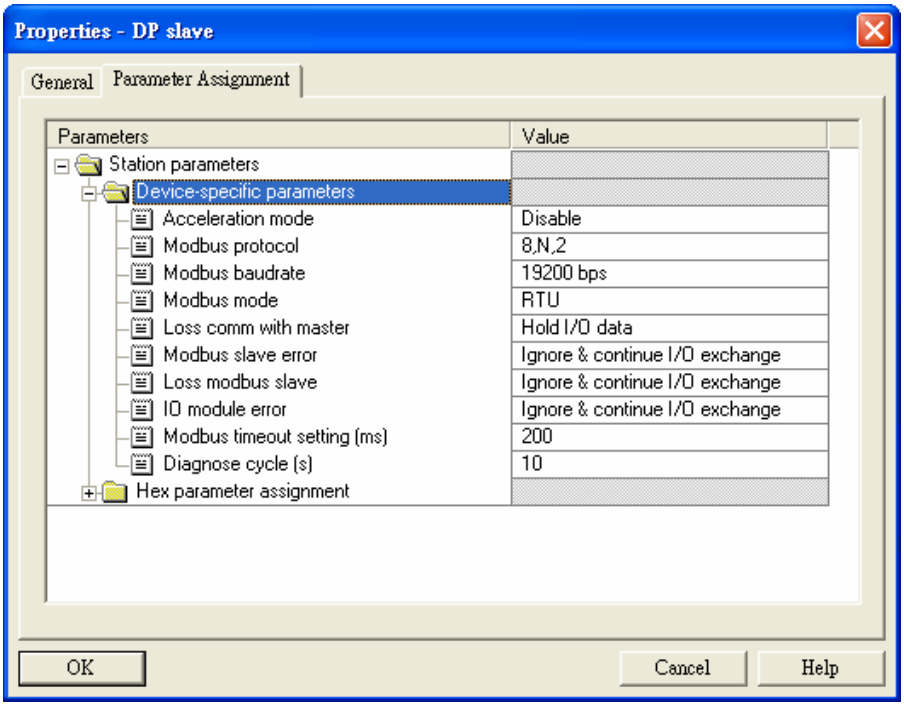
Baud rate (bps)	9.6k	19.2k	93.75k	187.5k	500k	1.5M	3M	6M	12M
Cable Length (m)	1,200	1,200	1,200	1,000	400	200	100	100	100

3.5 ELC-CAPBDP Settings and Configurations

The GSD file is a text file used to describe a PROFIBUS DP device (master or slave). A GSD file usually contains the supplier's information, baud rates supported and applicable I/O messages. When using the ELC-CAPBDP, import the ELC-CAPBDP GSD file into the configuration software for the PROFIBUS DP master you are using. After the file is imported, the configuration software for the master will display the ELC-CAPBDP and its configuration settings.

■ **ELC-CAPBDP Settings**

When you set up the ELC-CAPBDP in the configuration software for PROFIBUS DP master, you will be presented with multiple configuration settings, which adds flexibility to the use of the ELC-CAPBDP. See the figure below for ELC-CAPBDP settings.



Definitions of settings:

Setup item	Setting	Definition
Acceleration mode	Enable	When the Modbus device is configured with many addresses and the addresses are consecutive, all contents in the consecutive addresses can be read or written at a time.
	Disable	When the Modbus device is configured with many addresses, only contents in a single address can be read or written.
Modbus protocol	7, E, 1 7, O, 2 8, N, 1 7, O, 1 8, E, 1 8, N, 2 7, E, 2 8, O, 1	Modbus communication format (including data bit, stop bit and parity bit)
Modbus Baudrate	1,200bps 19,200bps 2,400bps 38,400bps 4,800bps 57,600bps 9,600bps 115,200bps	Modbus serial transmission speed
Modbus mode	RTU/ASCII	Modbus communication mode
Loss communication with master	Hold I/O data	ELC-CAPBDP retains the I/O data last received from the master.
	Clear I/O data	ELC-CAPBDP reset all the I/O data to 0 after communication from the master is lost.

Setup item	Setting	Definition
Modbus slave error	Ignore & continue I/O exchange	ELC-CAPBDP continues exchanging data with the master even when Modbus read/write error occurs.
	Stop I/O exchange &report fault	ELC-CAPBDP stops exchanging data with the master when Modbus read/write error occurs.
Loss Modbus slave	Ignore & continue I/O exchange	ELC-CAPBDP continues exchanging data with the master even when the Modbus slave is disconnected.
	Continue & report alarm	ELC-CAPBDP continues exchanging data with the master and alarms it when there is Modbus slave getting disconnected.
	Stop I/O exchange & report fault	ELC-CAPBDP stops exchanging data with the master and reports error to it when there is Modbus slave getting disconnected.
IO module error	Ignore & continue I/O exchange	ELC-CAPBDP continues exchanging data with the master even when error occurs in the right-side special I/O module.
	Continue & report alarm	ELC-CAPBDP continues exchanging data with the master and alarms it when error occurs in the right-side special I/O module.
IO module error	Stop I/O exchange & report fault	ELC-CAPBDP stops exchanging data with the master and reports error to it when error occurs in the right-side special I/O module.
Modbus timeout setting (ms)	0 ~ 65535	Modbus communication timeout. Unit: ms
Diagnose cycle (s)	1 ~ 20	Cycle for ELC-CAPBDP to diagnose the right-side special I/O module. Unit: s

- **Configuration Items**

ELC-CAPBDP offers flexible configuration when being configured in PROFIBUS DP master configuration tool, for example, you can configure digital I/O modules or special I/O modules by the actual name of the module, or self-define the configuration.

Configuration item	Configurable device	Configuration method
Modbus 1 read address	Modbus devices connected to ELC-CAPBDP	Modbus
Modbus 2 read address		
Modbus 4 read address		
Modbus 8 read address		
Modbus 1 write address		
Modbus 2 write address	Modbus devices connected to ELC-CAPBDP	Modbus

Configuration item	Configurable device	Configuration method
Modbus 4 write address	Modbus devices connected to ELC-CAPBDP	Modbus
Modbus 8 write address		
Modbus 1 read & write address		
Modbus 2 read & write address		
Modbus 4 read & write address		
Modbus 8 read & write address		
ELC-EX08NNDN	ELC-EX08NNDN connected to ELC-CAPBDP	Standard configuration method for digital I/O module
ELC-EX08NNNT	ELC-EX08NNNR or ELC-EX08NNNT connected to ELC-CAPBDP	
ELC-EX08NNDR/T	ELC-EX08NNDR or ELC-EX08NNDT connected to ELC-CAPBDP	
ELC-EX16NNDR/T	ELC-EX16NNDR or ELC-EX16NNDT connected to ELC-CAPBDP	
ELC-EX08NNSN	ELC-EX08NNSN module connected to ELC-CAPBDP	
8 DI	Digital I/O modules connected to ELC-CAPBDP	Self-defined configuration method for digital I/O module
8 DO		
8 DIDO		
16 DI		
16 DO		
16 DIDO		
32 DI		
32 DO		
32 DIDO		
64 DI		
64 DO		
64 DIDO		
ELC-AN04ANNN	ELC-AN04ANNN connected to ELC-CAPBDP	Standard configuration method for special I/O module
ELC-AN06ANNN	ELC-AN06ANNN connected to ELC-CAPBDP	
ELC-AN02NANN	ELC-AN02NANN connected to ELC-CAPBDP	
ELC-AN04NANN	ELC-AN04NANN connected to ELC-CAPBDP	Standard configuration method for special I/O

Configuration item	Configurable device	Configuration method
ELC-AN06AANN	ELC-AN06AANN connected to ELC-CAPBDP	module
ELC-PT04ANNN	ELC-PT04ANNN connected to ELC-CAPBDP	
ELC-TC04ANNN	ELC-TC04ANNN connected to ELC-CAPBDP	
1 AI	Special I/O modules connected to ELC-CAPBDP	Self-defined configuration method for special I/O module
2 AI		
4 AI		
8 AI		
1 AO		
2 AO		
4 AO		
8 AO		
1 AIAO		
2 AIAO		
4 AIAO		
8 AIAO		

- **Settings of Configuration Items**

  - Settings of Configuration Items for Digital I/O Modules

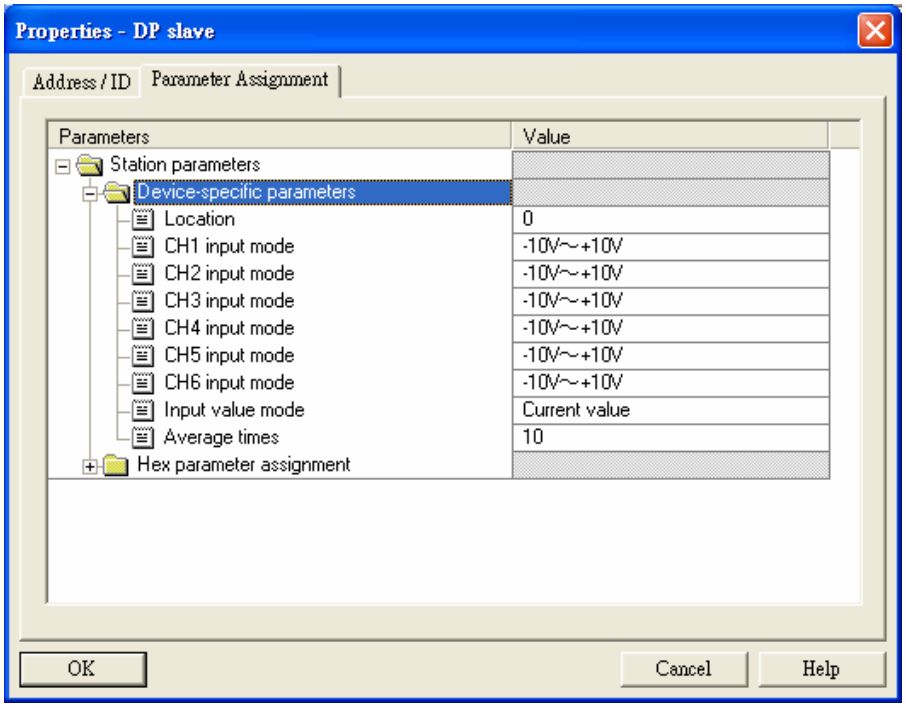
    There are 2 types of configuration items for digital I/O modules, standard configuration and self-defined configuration. By standard configuration, the digital I/O module is named after its actual name, whereas it is named after the number of points by self-defined configuration. You do not have to set up parameters in the configuration. The digital I/O can correspond to the master directly after the configuration

  - Settings of Configuration Items for Special I/O Modules

    The special I/O module is named after its actual name in the configuration. You can configure special I/O module by standard configuration items. Detailed configuration methods will be explained in the following paragraphs.

    (1) Configuration method for ELC-AN06ANNN and ELC-AN04ANNN

    Refer to the figure below for the relevant parameters to configure ELC-AN06ANNN. ELC-AN04ANNN and ELC-AN06ANNN have the same parameters to set, except that ELC-AN06ANNN has two more parameters for output channels to set than does ELC-AN04ANNN (Therefore, only the parameter settings for ELC-AN06ANNN are introduced in this section).



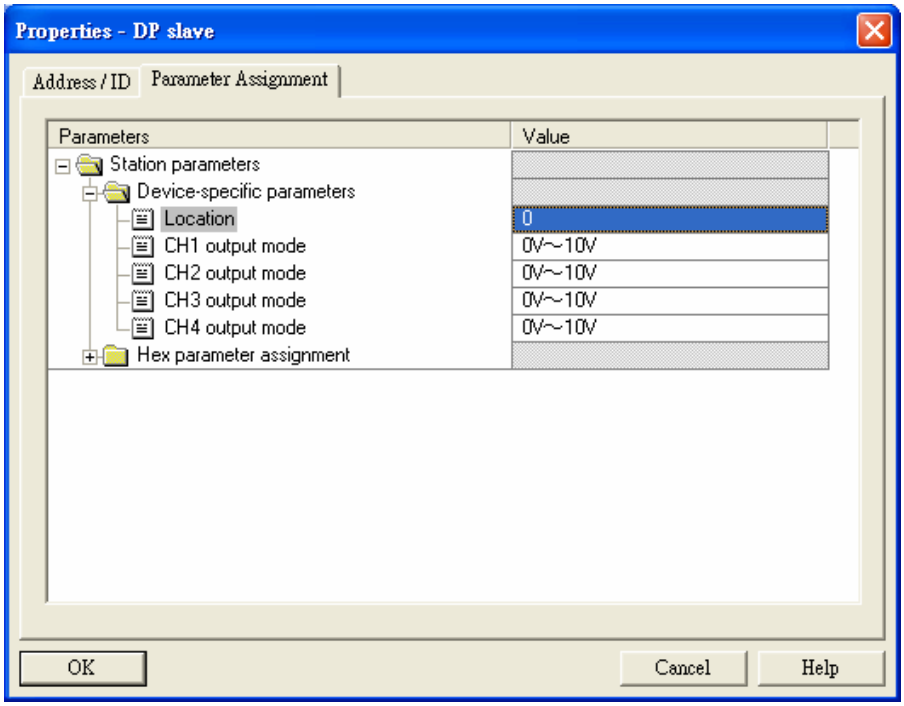
Definitions of configuration items:

Parameter	Value	Definition
Location	0 ~ 7	The location of ELC-AN06ANNN at the right side of ELC-CAPBDP. The location of the first special I/O module at the right side of ELC-CAPBDP is 0, the second is 1 and so forth. This rule is only applicable on special I/O modules.
CH1 input mode CH2 input mode CH3 input mode CH4 input mode CH5 input mode CH6 input mode	-10V ~ +10V	The input channel on ELC-AN06ANNN is set to mode 0: Voltage input mode. Input range: -10V ~ +10V
	-6V ~ +10V	The input channel on ELC-AN06ANNN is set to mode 1: Voltage input mode. Input range: -6V ~ +10V.
	-12mA ~ +20mA	The input channel on ELC-AN06ANNN is set to mode 2: Current input mode. Input range: -12mA ~ +20mA
	-20mA ~ +20mA	The input channel on ELC-AN06ANNN is set to mode 3: Current input mode. Input range: -20mA ~ +20mA
Input value mode	Current value	Current value of the input signal in all channels on ELC-AN06ANNN
	Average value	Average value of the input signals in all channels on ELC-AN06ANNN
Average times	1 ~ 4,096	The average times

(2) Configuration method for ELC-AN04NANN and ELC-AN02NANN

Refer to the figure below for the relevant parameters to configure ELC-AN04NANN. ELC-AN04NANN and ELC-AN02NANN have the same parameters to set, except that ELC-AN04NANN has two more parameters for input channels to set than does

ELC-AN02NANN (Therefore, only the parameter settings for ELC-AN04NANN are introduced in this section).

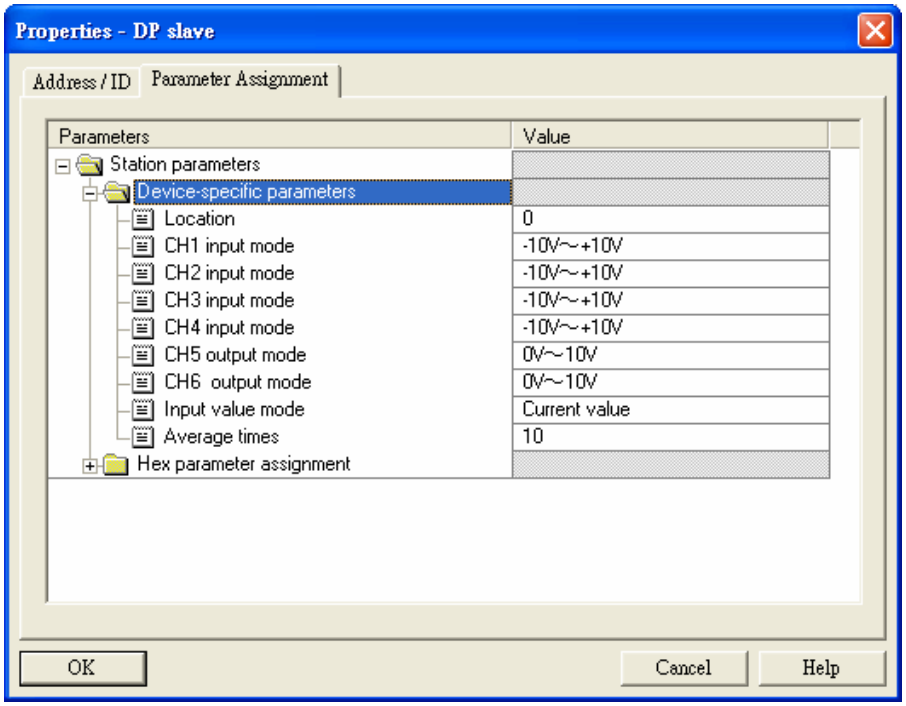


Definitions of configuration items:

Parameter	Value	Definition
Location	0 ~ 7	The location of ELC-AN04NANN at the right side of ELC-CAPBDP. The location of the first special I/O module at the right side of ELC-CAPBDP is 0, the second is 1 and so forth. This rule is only applicable on special I/O modules.
CH1 output mode CH2 output mode CH3 output mode CH4 output mode	0V ~ 10V	The output channel on ELC-AN04NANN is set to mode 0: Voltage output mode. Output range: 0V ~ +10V
	2V ~ 10V	The output channel on ELC-AN04NANN is set to mode 1: Voltage output mode. Output range: 2V ~ 10V
	4mA ~ 20mA	The output channel on ELC-AN04NANN is set to mode 2: Current output mode. Output range: 4mA ~ 20mA
	0mA ~ 20mA	The output channel on ELC-AN04NANN is set to mode 3: Current output mode. Output range: 0mA ~ 20mA

(3) Configuration method for ELC-AN06AANN

Refer to the figure below for the relevant parameters to configure ELC-AN06AANN.



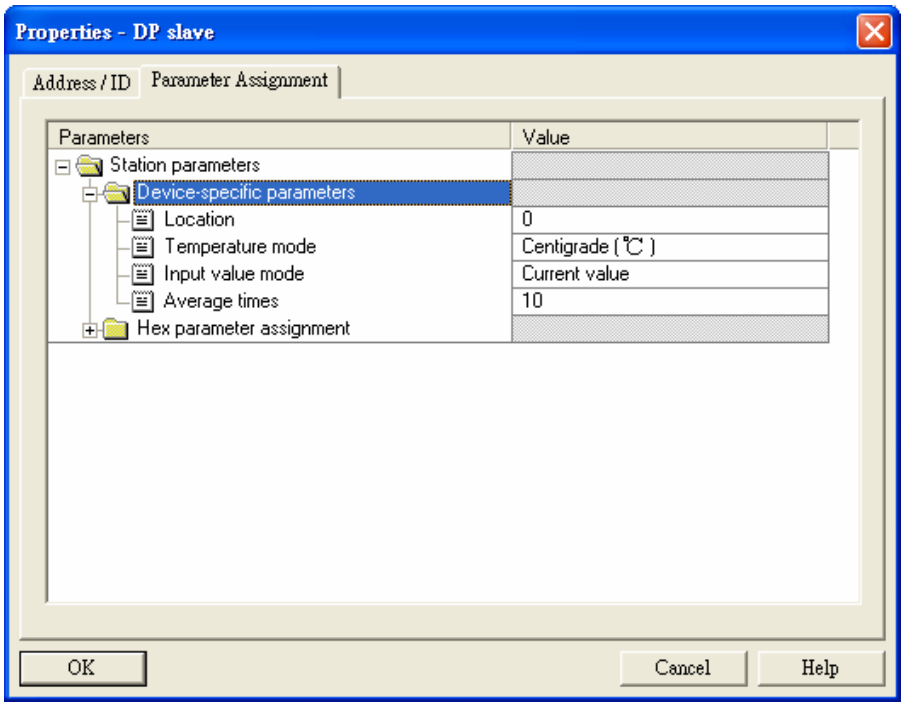
Definitions of configuration items:

Parameter	Value	Definition
Location	0 ~ 7	The location of ELC-AN06AANN at the right side of ELC-CAPBDP. The location of the first special I/O module at the right side of ELC-CAPBDP is 0, the second is 1 and so forth. This rule is only applicable on special I/O modules.
CH1 input mode CH2 input mode CH3 input mode CH4 input mode	-10V ~ +10V	The input channel on ELC-AN06AANN is set to mode 0: Voltage input mode. Input range: -10V ~ +10V
	-6V ~ +10V	The input channel on ELC-AN06AANN is set to mode 1: Voltage input mode. Input range: -6V ~ +10V
	-12mA ~ +20mA	The input channel on ELC-AN06AANN is set to mode 2: Current input mode. Input range: -12mA ~ +20mA
	-20mA ~ +20mA	The input channel on ELC-AN06AANN is set to mode 3: Current input mode. Input range: -20mA ~ +20mA
CH5 output mode CH6 output mode	0V ~ 10V	The output channel on ELC-AN06AANN is set to mode 0: Voltage output mode. Output range: 0V ~ +10V
	2V ~ 10V	The output channel on ELC-AN06AANN is set to mode 1: Voltage output mode. Output range: 2V ~ 10V
	4mA ~ 20mA	The output channel on ELC-AN06AANN is set to mode 2: Current output mode. Output range: 4mA ~ 20mA
	0mA ~ 20mA	The output channel on ELC-AN06AANN is set to mode 3: Current output mode. Output range: 0mA ~ 20mA

Parameter	Value	Definition
Input value mode	Current value	Current value of the input signal in CH1 ~ CH4 on ELC-AN06AANN
	Average value	Average value of the input signals in CH1 ~ CH4 on ELC-AN06AANN
Set average times	1 ~ 4,096	The average times

(4) Configuration method for ELC-PT04ANNN

Refer to the figure below for the relevant parameters to configure ELC-PT04ANNN.

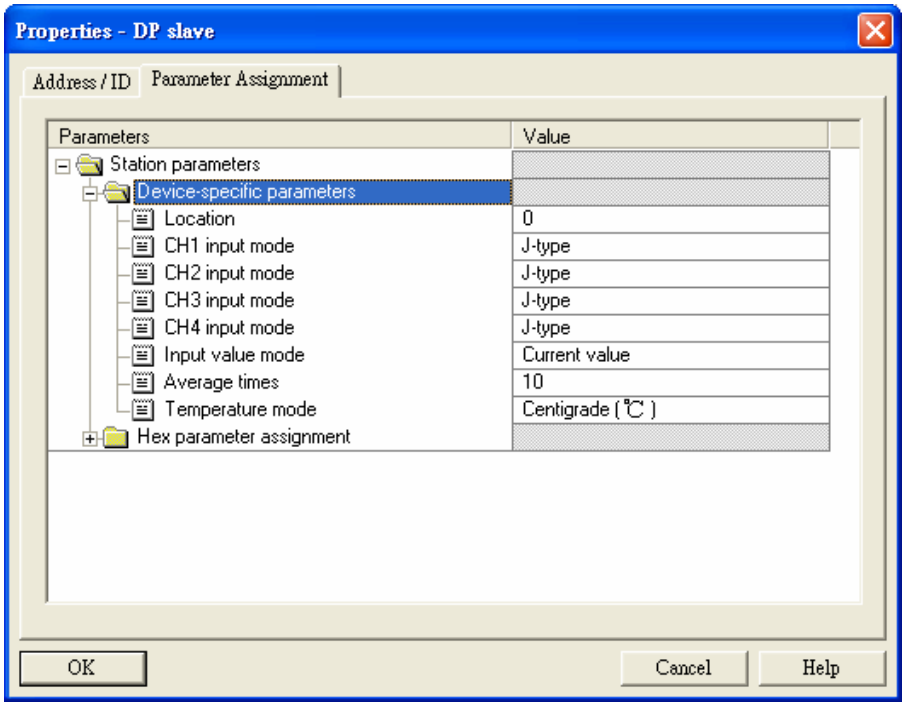


Definitions of configuration items:

Parameter	Value	Definition
Location	0 ~ 7	The location of ELC-PT04ANNN at the right side of ELC-CAPBDP. The location of the first special I/O module at the right side of ELC-CAPBDP is 0, the second is 1 and so forth. This rule is only applicable on special I/O modules.
Temperature mode	Centigrade (°C)	Collecting temperature in Centigrade by CH1 ~ CH4 on ELC-PT04ANNN
	Fahrenheit (°F)	Collecting temperature in Fahrenheit by CH1 ~ CH4 on ELC-PT04ANNN
Input value mode	Current value	Current value of the collected temperature at CH1 ~ CH4 on ELC-PT04ANNN
	Average value	Average value of the collected temperatures at CH1 ~ CH4 on ELC-PT04ANNN
Average times	1 ~ 4,096	The average times.

(5) Configuration method for ELC-TC04ANNN

Refer to the figure below for the relevant parameters to configure ELC-TC04ANNN.



Definitions of configuration items:

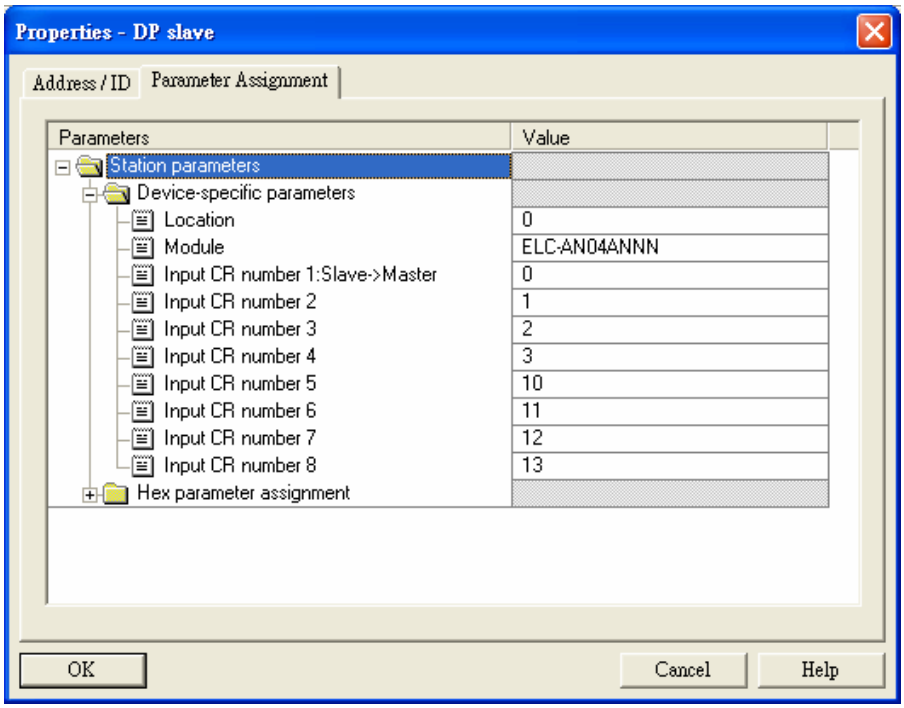
Parameter	Value	Definition
Location	0 ~ 7	The location of ELC-TC04ANNN at the right side of ELC-CAPBDP. The location of the first special I/O module at the right side of ELC-CAPBDP is 0, the second is 1 and so forth. This rule is only applicable on special I/O modules.
CH1 input mode	J, K, R, S, T	Thermocouple type for CH1 on ELC-TC04ANNN
CH2 input mode	J, K, R, S, T	Thermocouple type for CH2 on ELC-TC04ANNN
CH3 input mode	J, K, R, S, T	Thermocouple type for CH3 on ELC-TC04ANNN
CH4 input mode	J, K, R, S, T	Thermocouple type for CH4 on ELC-TC04ANNN
Input value mode	Current value	Current value of the collected temperature at CH1 ~ CH4 on ELC-TC04ANNN
	Average value	Average value of the collected temperatures at CH1 ~ CH4 on ELC-TC04ANNN
average times	1 ~ 4,096	The average times
Temperature mode	Centigrade (°C)	Collecting temperature in Centigrade by CH1 ~ CH4 on ELC-TC04ANNN
	Fahrenheit (°F)	Collecting temperature in Fahrenheit by CH1 ~ CH4 on ELC-TC04ANNN

- Self-Defined Configuration Settings for Special I/O Modules

  In self-defined configuration, special I/O modules are named after their configurable number of control registers (CR). You can choose the CR in the special I/O module to be read or written when configuring. See the following paragraphs for the meanings of each configuration item.

  (1) Configuration method for 8AI, 4AI, 2AI and 1AI modules

  Refer to the figure below for the relevant parameters to configure an 8AI module. 8AI, 4AI, 2AI and 1AI modules have the same parameters to set, except that the number of configurable CRs in 1AI, 2AI and 4AI modules is different from that of 8AI module (Therefore, only the parameter settings for 8AI are introduced in this section).



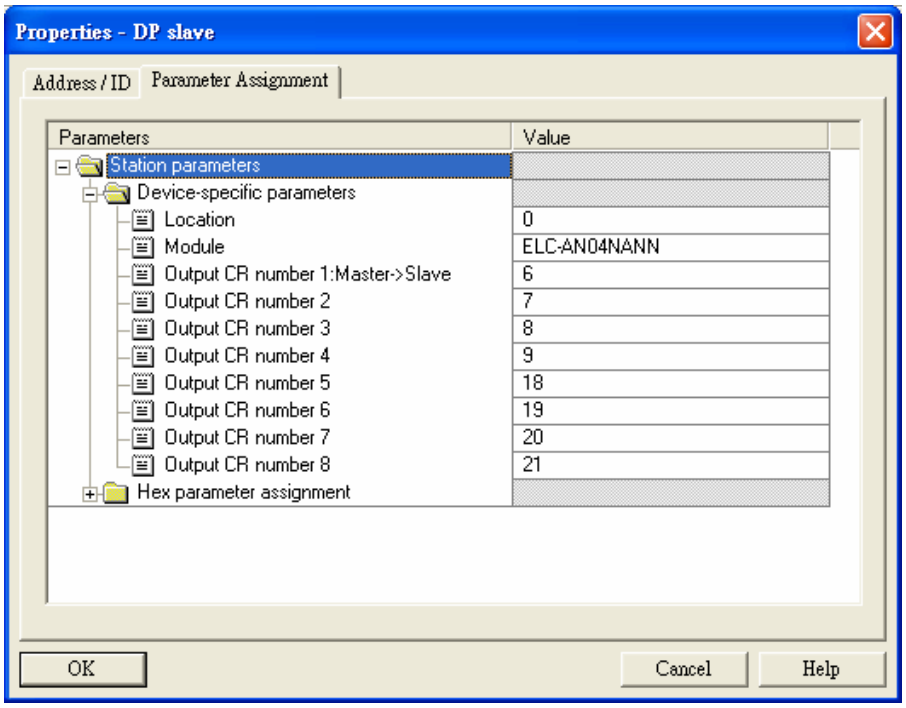
Definitions of configuration items:

Parameter	Value	Definition
Location	0 ~ 7	The location of the special I/O module at the right side of ELC-CAPBDP. The location of the first special I/O module at the right side of ELC-CAPBDP is 0, the second is 1 and so forth. This rule is only applicable on special I/O modules.
Module	ELC-AN04ANNN ELC-AN06ANNN ELC-AN02NANN ELC-AN04NANN ELC-AN06AANN ELC-PT04ANNN ELC-TC04ANNN ELC-MC01	Special I/O module in use

Parameter	Value	Definition
Input CR number 1: Slave → Master	0 ~ 48	No. of the CR in special I/O module to be read by PROFIBUS DP master
Input CR number 2	0 ~ 48	
Input CR number 3	0 ~ 48	
Input CR number 4	0 ~ 48	
Input CR number 5	0 ~ 48	
Input CR number 6	0 ~ 48	
Input CR number 7	0 ~ 48	
Input CR number 8	0 ~ 48	

(2) Configuration method for 8AO, 4 AO, 2AO and 1AO modules

Refer to the figure below for the relevant parameters to configure an 8AI module. 8AO, 4AO, 2AO and 1AO modules have the same parameters to set, except that the number of configurable CRs in 1AO, 2AO and 4AO modules is different from that of 8AO module (Therefore, only the parameter settings for 8AO are introduced in this section).



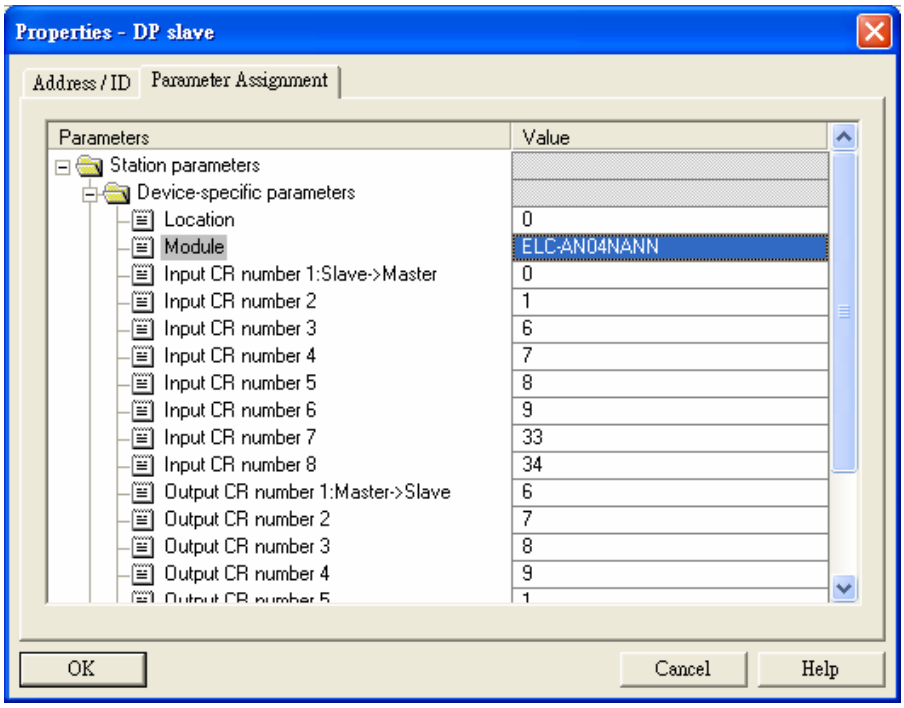
Definitions of configuration items:

Parameter	Value	Definition
Location	0 ~ 7	The location of the special I/O module at the right side of ELC-CAPBDP. The location of the first special I/O module at the right side of ELC-CAPBDP is 0, the second is 1 and so forth. This rule is only applicable on special I/O modules.

Parameter	Value	Definition
Module	ELC-AN04ANNN ELC-AN06ANNN ELC-AN02NANN ELC-AN04NANN ELC-AN06AANN ELC-PT04ANNN ELC-TC04ANNN ELC-MC01	Special I/O module in use
Output CR number 1: Master → Slave	0 ~ 48	No. of the CR in special I/O module to be written by PROFIBUS DP master
Output CR number 2	0 ~ 48	
Output CR number 3	0 ~ 48	
Output CR number 4	0 ~ 48	
Output CR number 5	0 ~ 48	
Output CR number 6	0 ~ 48	
Output CR number 7	0 ~ 48	
Output CR number 8	0 ~ 48	

(3) Configuration method for 8AIAO, 4AIAO, 2AIAO and 1AIAO modules

Refer to the figure below for the relevant parameters to configure an 8AIAO module. 8AIAO, 4AIAO, 2AIAO and 1AIAO modules have the same parameters to set, except that the number of configurable CRs in 1AIAO, 2AIAO and 4AIAO modules is different from that of 8AIAO module (Therefore, only the parameter settings for 8AIAO are introduced in this section).



Definitions of configuration items:

Parameter	Value	Definition
Location	0 ~ 7	The location of the special I/O module on the right side of ELC-CAPBDP. The location of the first special I/O module on the right side of ELC-CAPBDP is 0, the second is 1 and so forth. This rule is only applicable on special I/O modules.
Module	ELC-AN04ANNN ELC-AN06ANNN ELC-AN02NANN ELC-AN04NANN ELC-AN06AANN ELC-PT04ANNN ELC-TC04ANNN ELC-MC01	Special I/O module in use
Input CR number 1: Slave → Master	0 ~ 48	No. of the CR in special I/O module to be read by PROFIBUS DP master
Input CR number 2	0 ~ 48	
Input CR number 3	0 ~ 48	
Input CR number 4	0 ~ 48	
Input CR number 5	0 ~ 48	
Input CR number 6	0 ~ 48	
Input CR number 7	0 ~ 48	
Input CR number 8	0 ~ 48	
Output CR number 1: Master → Slave	0 ~ 48	No. of the CR in special I/O module to be written by PROFIBUS DP master
Output CR number 2	0 ~ 48	
Output CR number 3	0 ~ 48	
Output CR number 4	0 ~ 48	
Output CR number 5	0 ~ 48	
Output CR number 6	0 ~ 48	
Output CR number 7	0 ~ 48	
Output CR number 8	0 ~ 48	

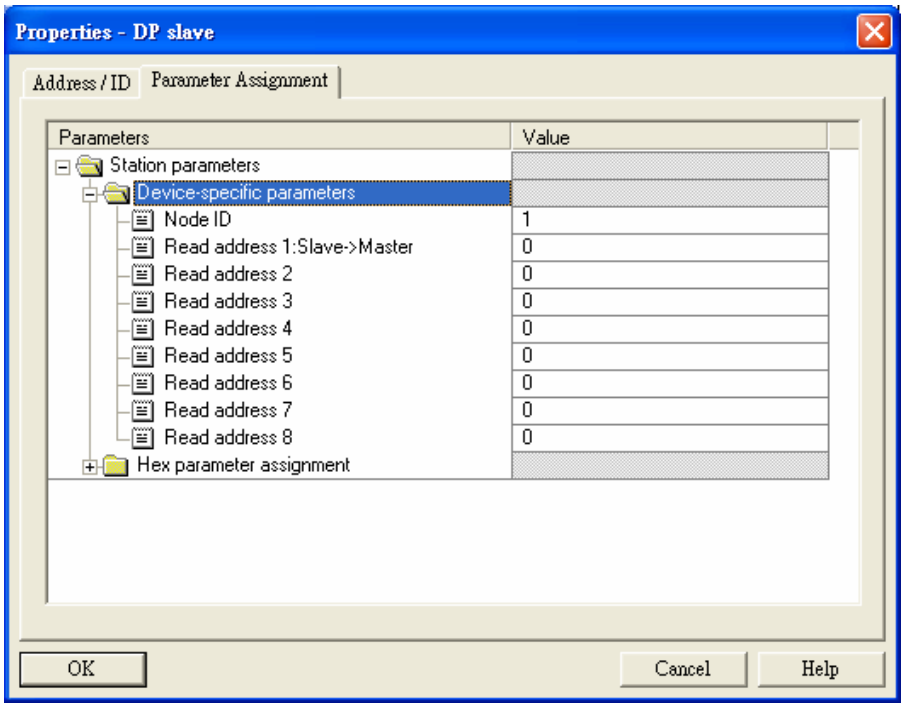
- Modbus Configuration Settings

  In Modbus configuration, parameters are named after the address of configurable Modbus device. See the following paragraphs for the meanings of each configuration item.

  (1) Configuration method for Modbus 8 read address, Modbus 4 read address, Modbus 2 read address and Modbus 1 read address

  Refer to the figure below for the relevant parameters to configure Modbus 8 read address. Modbus 8 read address, Modbus 4 read address, Modbus 2 read address

and Modbus 1 read address have the same parameters to set, except that the addresses of configurable Modbus device for Modbus 4 read address, Modbus 2 read address and Modbus 1 read address are different from that of Modbus 8 read address (Therefore, only the parameter settings for Modbus 8 read address are introduced in this section).



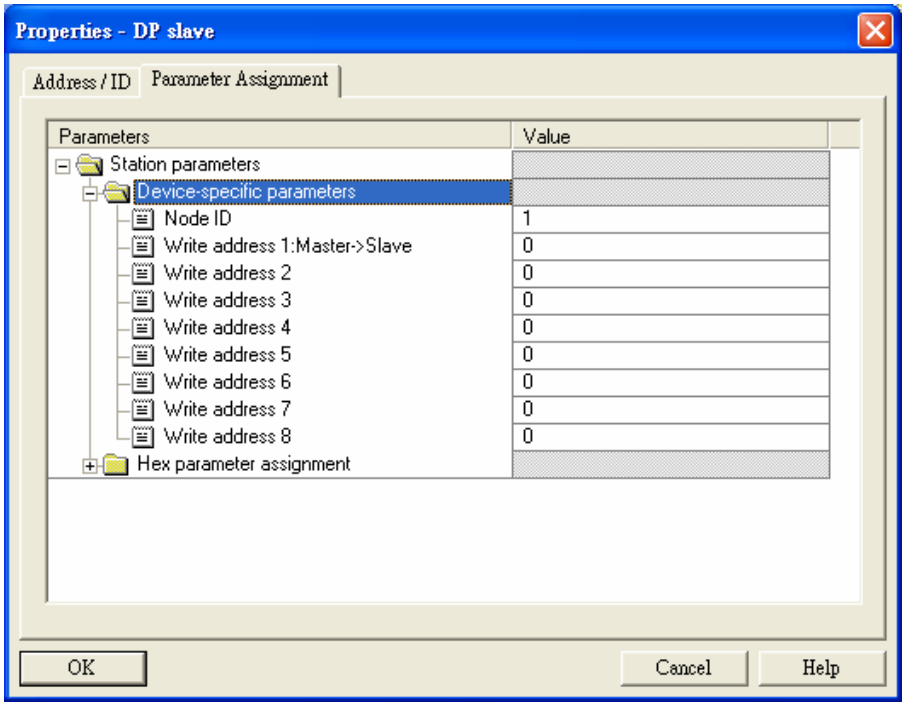
Definitions of configuration items:

Parameter	Value	Definition
Node ID	1 ~ 254	Address of Modbus device connected to ELC-CAPBDP
Read address 1: Slave → Master	0 ~ 65535	Parameter address of Modbus device to be read by PROFIBUS DP master
Read address 2	0 ~ 65535	
Read address 3	0 ~ 65535	
Read address 4	0 ~ 65535	
Read address 5	0 ~ 65535	
Read address 6	0 ~ 65535	
Read address 7	0 ~ 65535	
Read address 8	0 ~ 65535	

(2) Configuration method for Modbus8 write address, Modbus 4 write address, Modbus 2 write address, and Modbus 1 write address

Refer to the figure below for the relevant parameters to configure Modbus 8 write address. Modbus 8 write address, Modbus 4 write address, Modbus 2 write address and Modbus 1 write address have the same parameters to set, except that the addresses of configurable Modbus device for Modbus 4 write address, Modbus 2 write address and Modbus 1 write address are different from that of Modbus 8

write address (Therefore, only the parameter settings for Modbus 8 write address are introduced in this section).



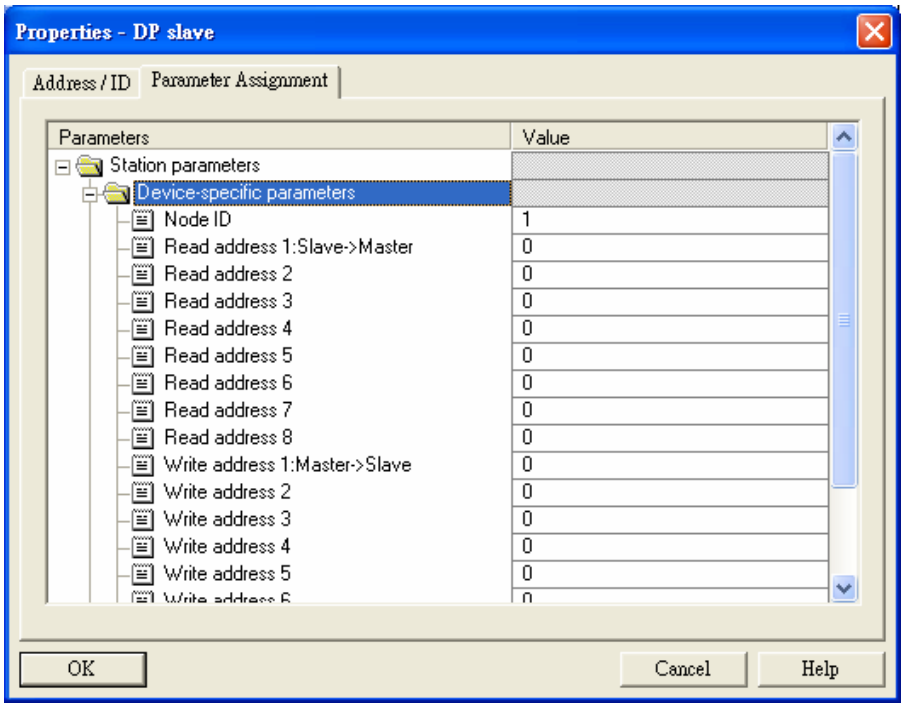
Definitions of configuration items:

Parameter	Value	Definition
Node ID	1 ~ 254	Address of Modbus device connected to ELC-CAPBDP
Write address 1 : Master → Slave	0 ~ 65535	Parameter address of Modbus device to be written by PROFIBUS DP master
Write address 2	0 ~ 65535	
Write address 3	0 ~ 65535	
Write address 4	0 ~ 65535	
Write address 5	0 ~ 65535	
Write address 6	0 ~ 65535	
Write address 7	0 ~ 65535	
Write address 8	0 ~ 65535	

(3) Configuration method for Modbus 8 read & write address, Modbus 4 read & write address, Modbus 2 read & write address and Modbus 1 read & write address

Refer to the figure below for the relevant parameters to configure Modbus 8 read & write address. Modbus 8 read & write address, Modbus 4 read & write address, Modbus 2 read & write address and Modbus 1 read & write address have the same parameters to set, except that the addresses of configurable Modbus device for Modbus 4 read & write address, Modbus 2 read & write address and Modbus 1 read & write address are different from that of Modbus 8 read & write address (Therefore, only the parameter settings for Modbus 8 read & write address are introduced in

this section).

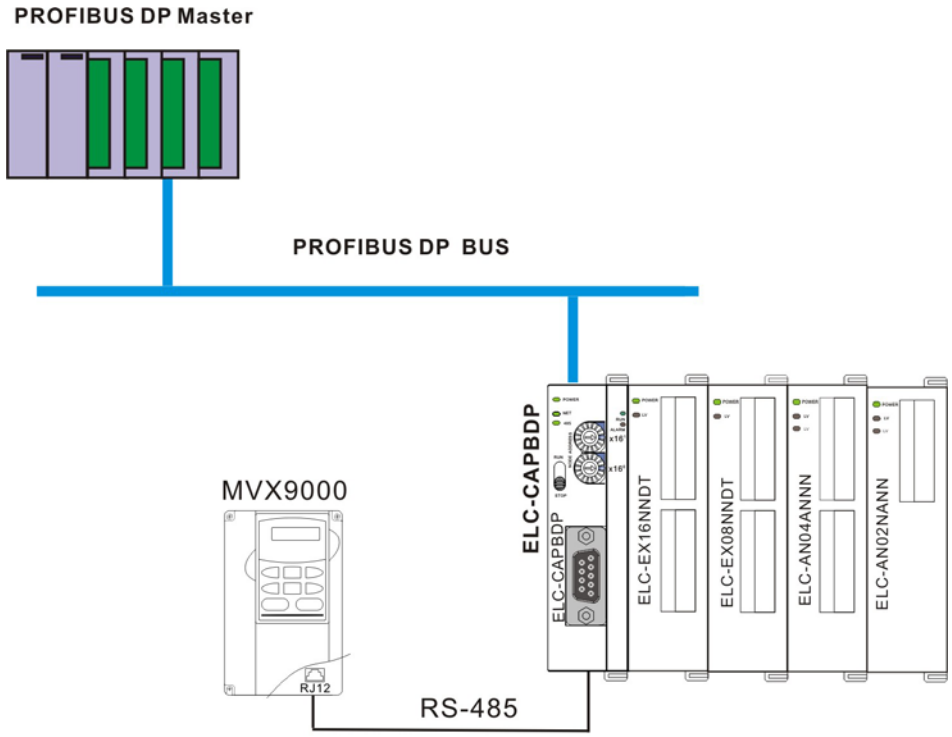


Definitions of configuration items:

Parameter	Value	Definition
Node ID	1 ~ 254	Address of Modbus device connected to ELC-CAPBDP
Read address 1: Slave → Master	0 ~ 65535	Parameter address of Modbus device to be read by PROFIBUS DP master
Read address 2	0 ~ 65535	
Read address 3	0 ~ 65535	
Read address 4	0 ~ 65535	
Read address 5	0 ~ 65535	Parameter address of Modbus device to be read by PROFIBUS DP master
Read address 6	0 ~ 65535	
Read address 7	0 ~ 65535	
Read address 8	0 ~ 65535	
Write address 1: Master → Slave	0 ~ 65535	Parameter address of Modbus device to be written by PROFIBUS DP master
Write address 2	0 ~ 65535	
Write address 3	0 ~ 65535	
Write address 4	0 ~ 65535	
Write address 5	0 ~ 65535	
Write address 6	0 ~ 65535	
Write address 7	0 ~ 65535	
Write address 8	0 ~ 65535	

3.6 Application example: Exchange data with Siemens S7-300 PLC

S7-300 as the PROFIBUS DP master; ELC-CAPBDP as the slave. See the PROFIBUS DP network in the figure below.

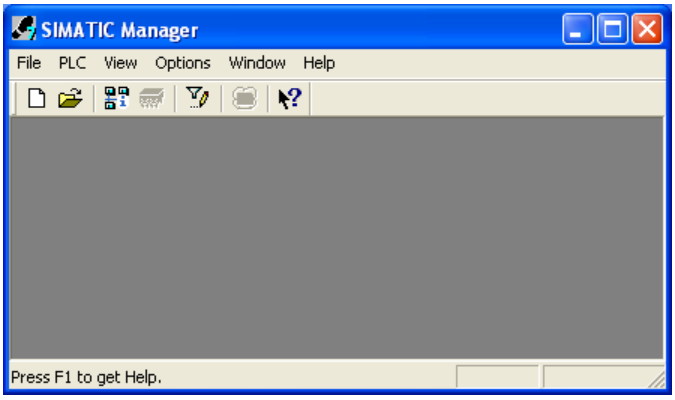


1. Set the PROFIBUS address of ELC-CAPBDP to “1”.
2. Connect ELC-CAPBDP to ELC-EX16NNDT, ELC-EX08NNDT, ELC-AN04ANNN and ELC-AN02NANN in order at its right hand side. Make sure the connection and wiring between ELC-CAPBDP and the special I/O modules and to the entire network is correct.

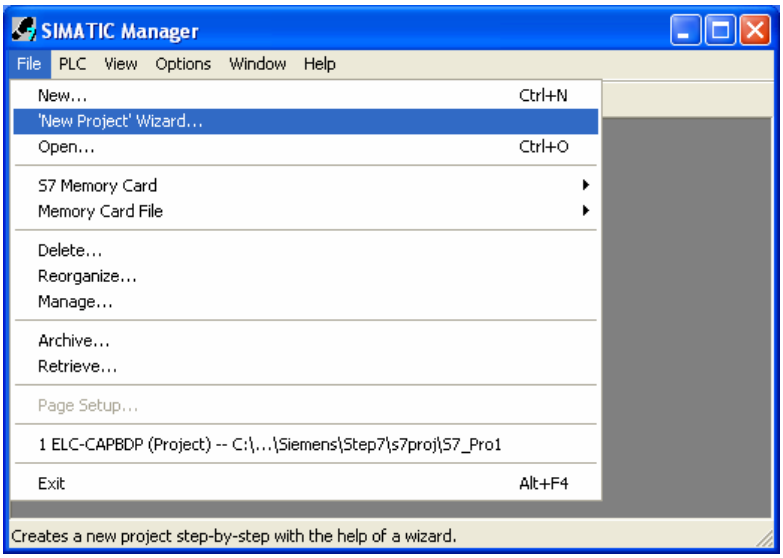
3.6.1 Configuring the ELC-CAPBDP (software configuration):

- **Create a new project**

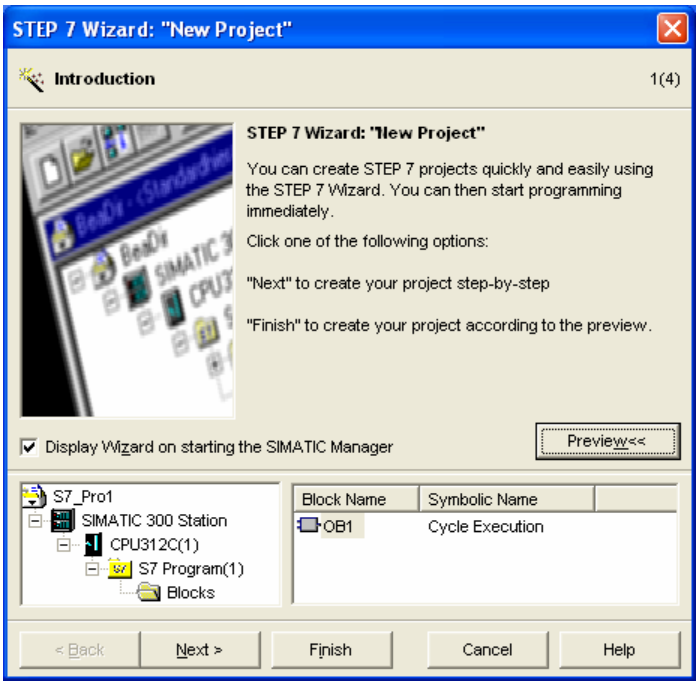
  Open SIMATIC Manager.



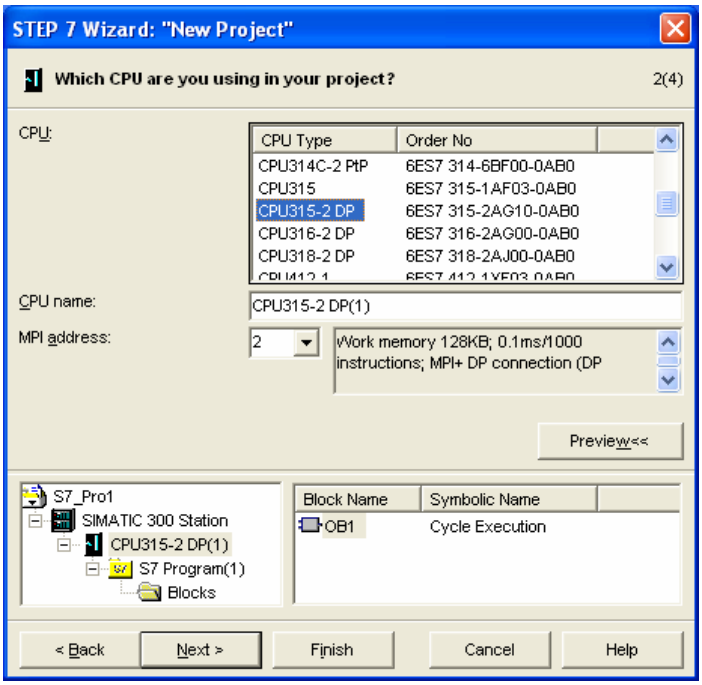
1. Select “File” => “New Project Wizard”.



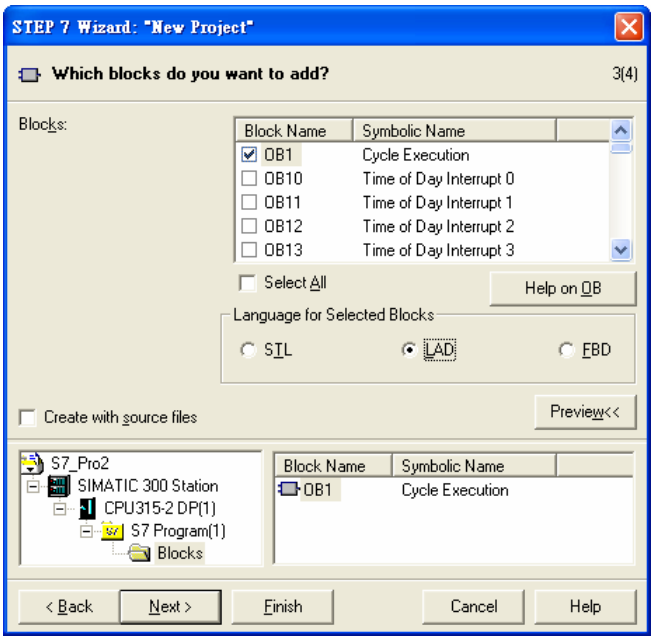
2. Click “Next” in the wizard.



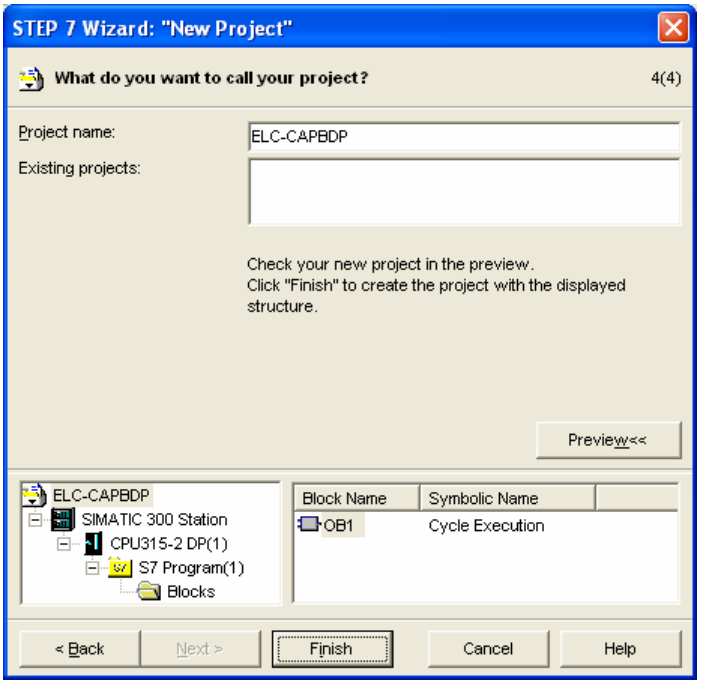
3. Select “CPU315-2 DP” for CPU as we are using the S7-300 model. Click “Next”.



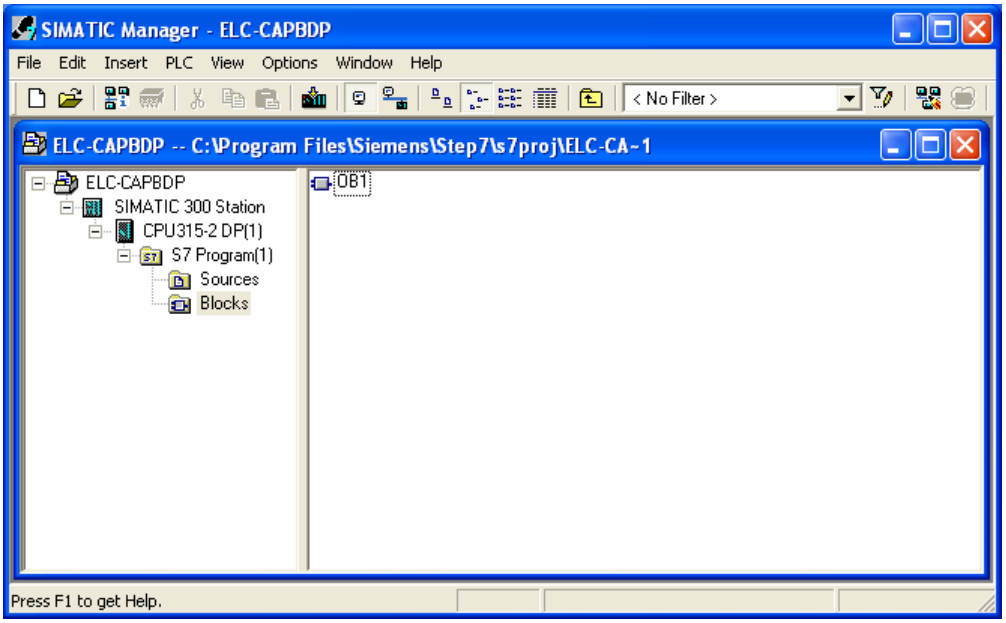
4. Select the block we need and click “Next”.



5. Enter the project name and click “Finish”.

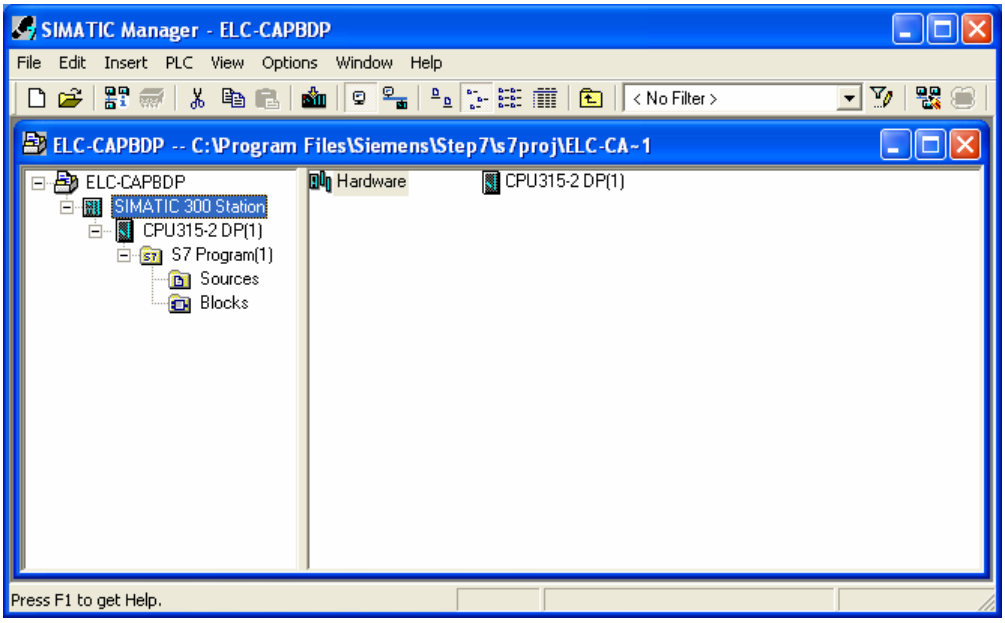


6. A new window will appear after the project is created.

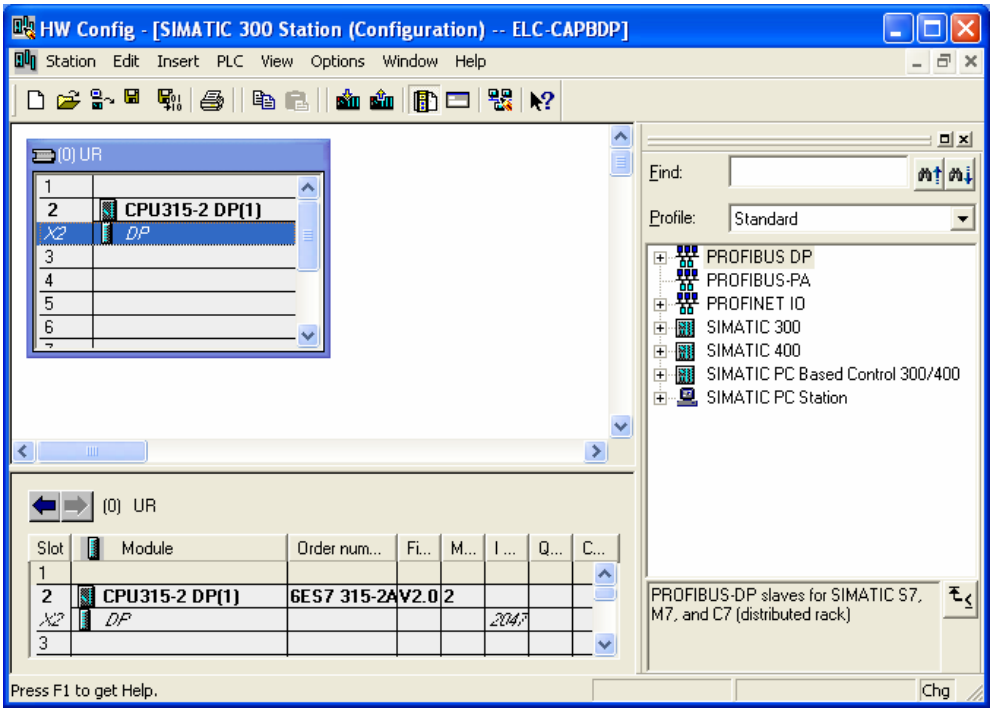


- **Add PROFIBUS DP bus**

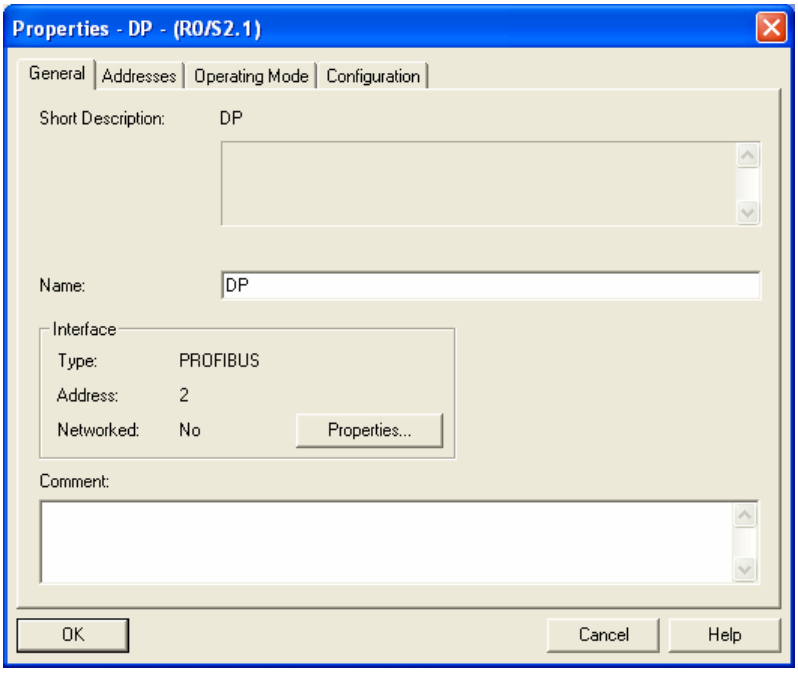
1. Select “SIMATIC 300 Station” in the project created. Double click “Hardware” and a new window (HW-Config) will appear.



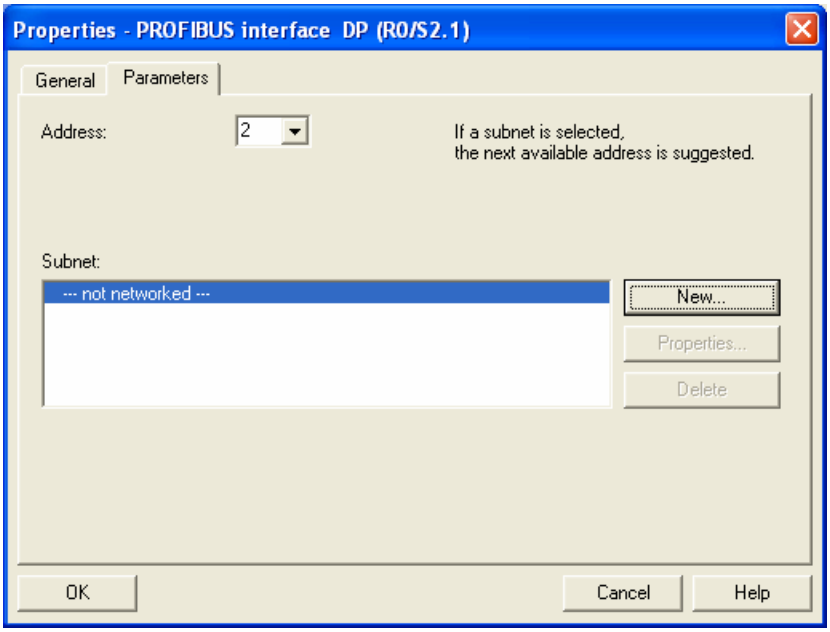
2. In the “HW Config” window, double click “DP” in the left-hand side column and a dialog box will appear.



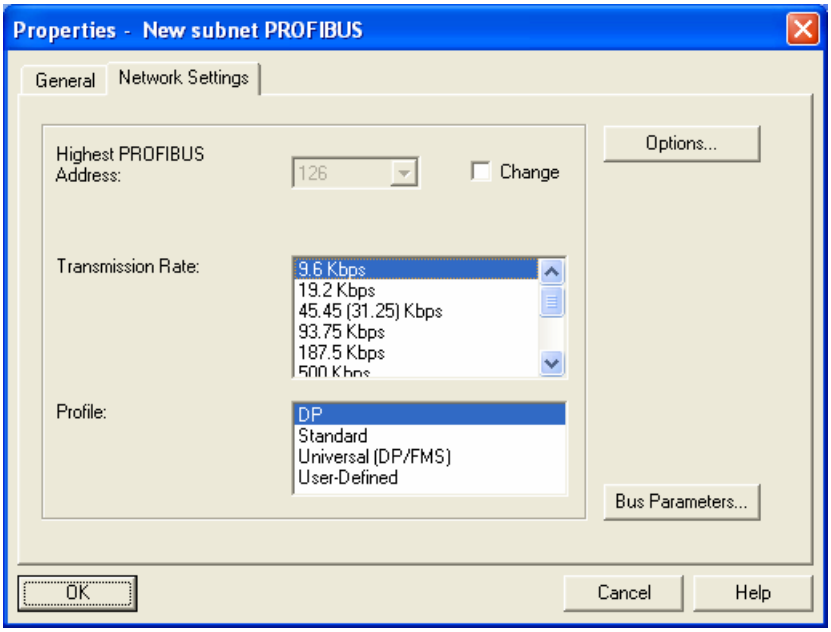
3. Click “Properties” in the dialog box, leading to another dialog box.



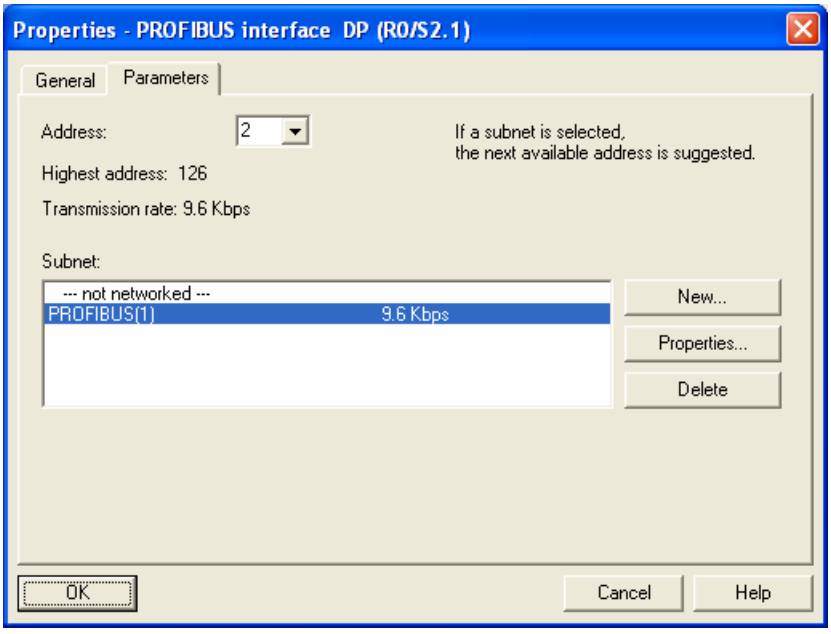
4. Select “Address” in the dialog box to be the address of the master. Then Click “New” to go to the next dialog box.



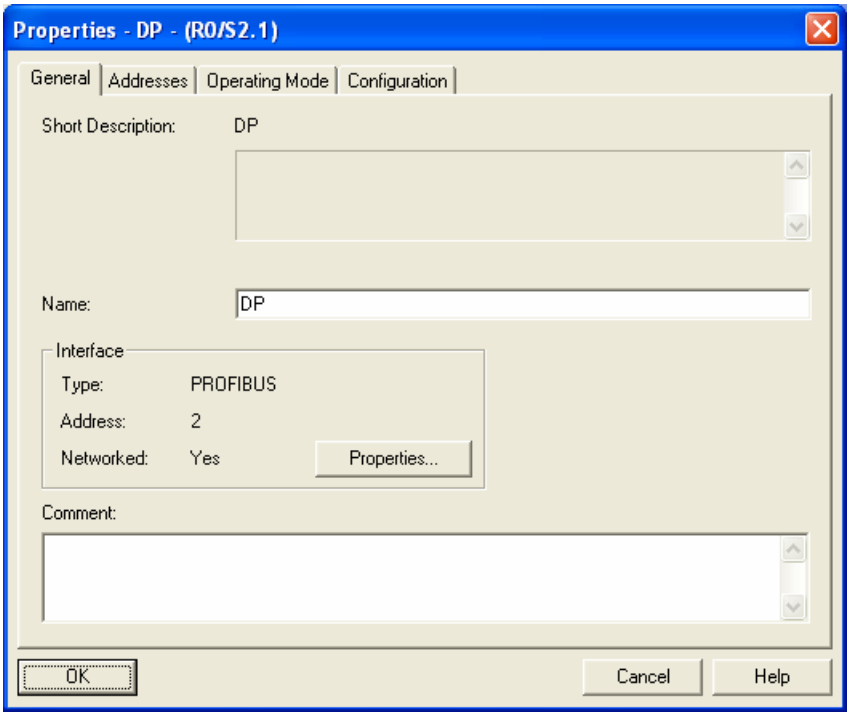
5. Select communication speed and bus type, and then click “OK”.



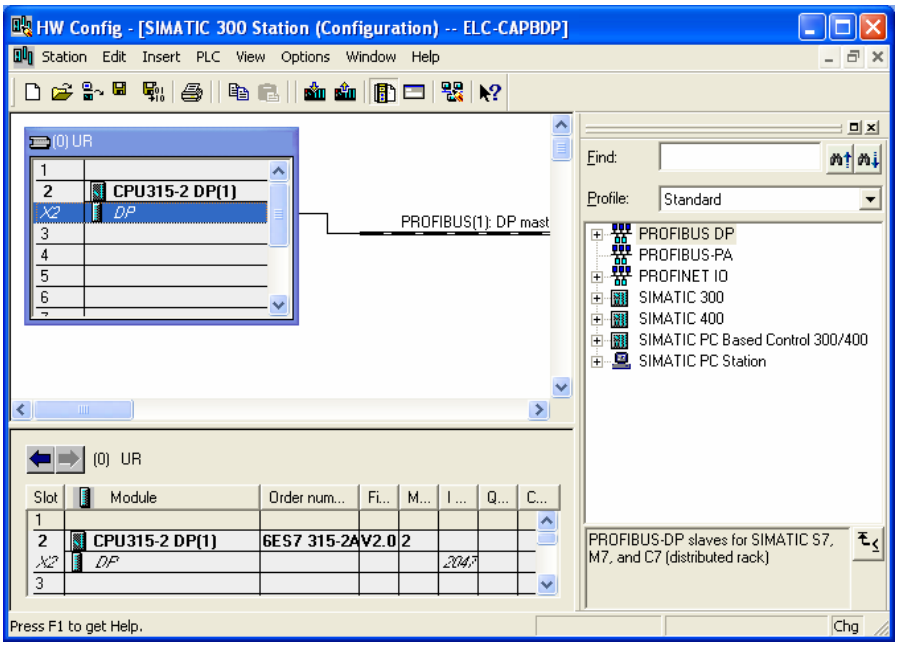
6. Confirm the communication speed and master address for PROFIBUS DP bus, then click “OK”.



7. Confirm the information on the PROFIBUS DP bus in the dialog box and click “OK”.

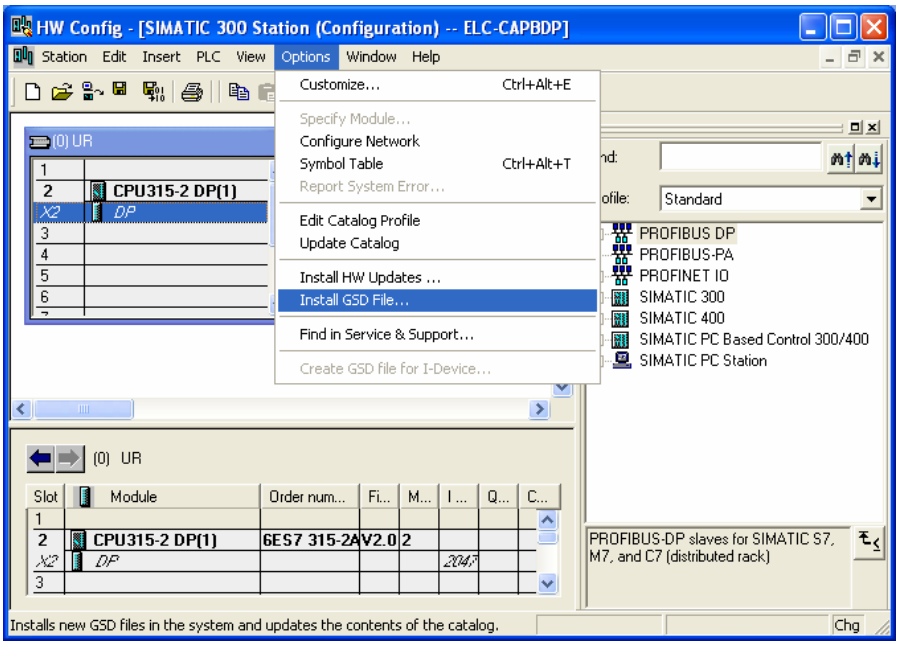


8. Once all the parameters are set, a PROFIBUS DP bus will appear after the UR window.

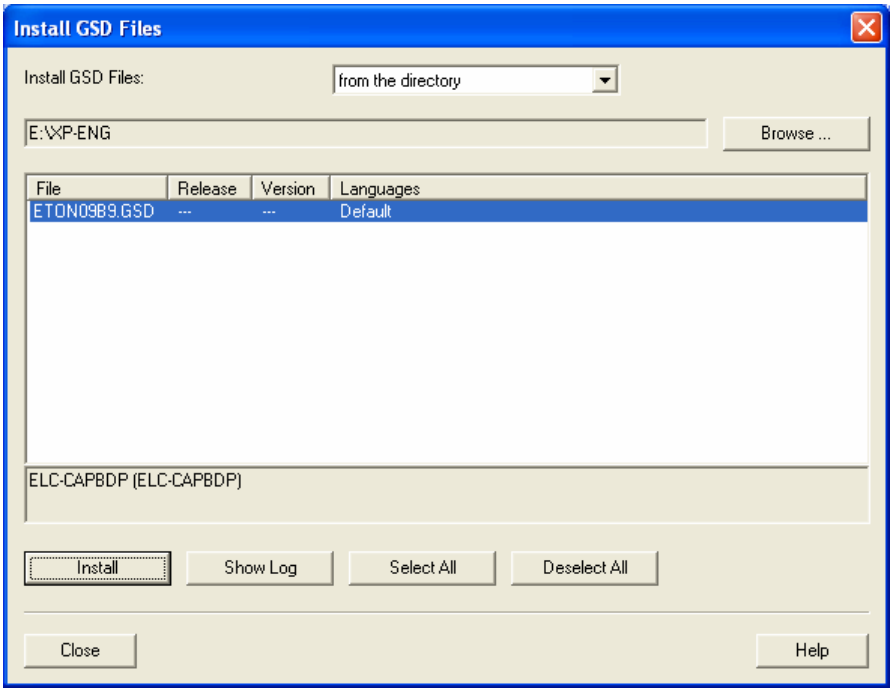


- **Add GSD file**

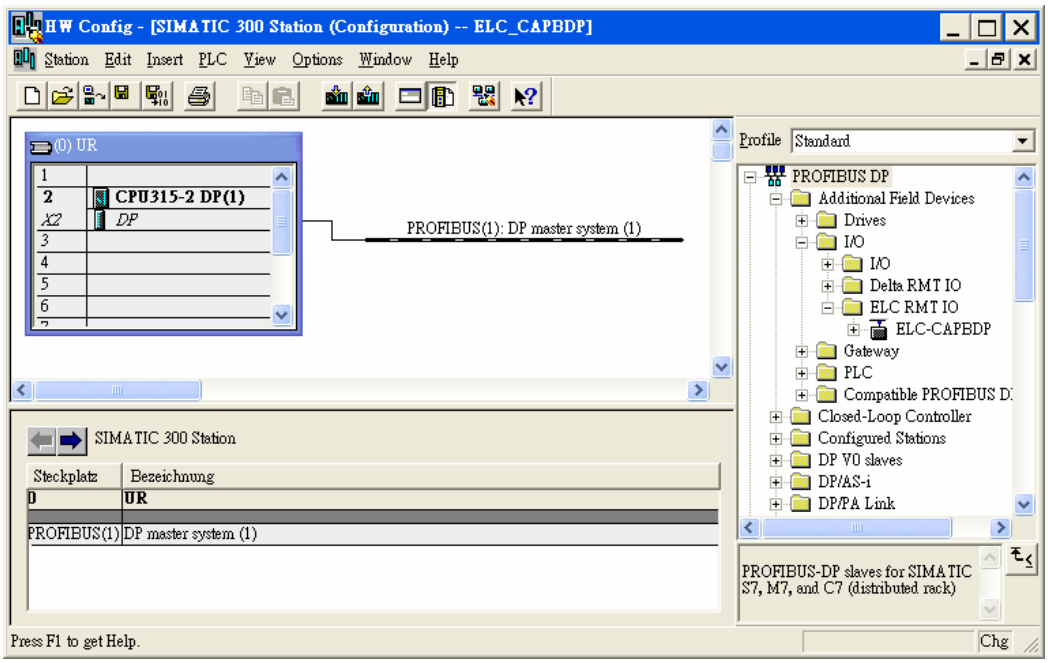
1. Select “Options” => “Install GSD File” in the HW Config window.



2. Find the path of the GSD file, select it and click “Install” to add the GSD file needed.

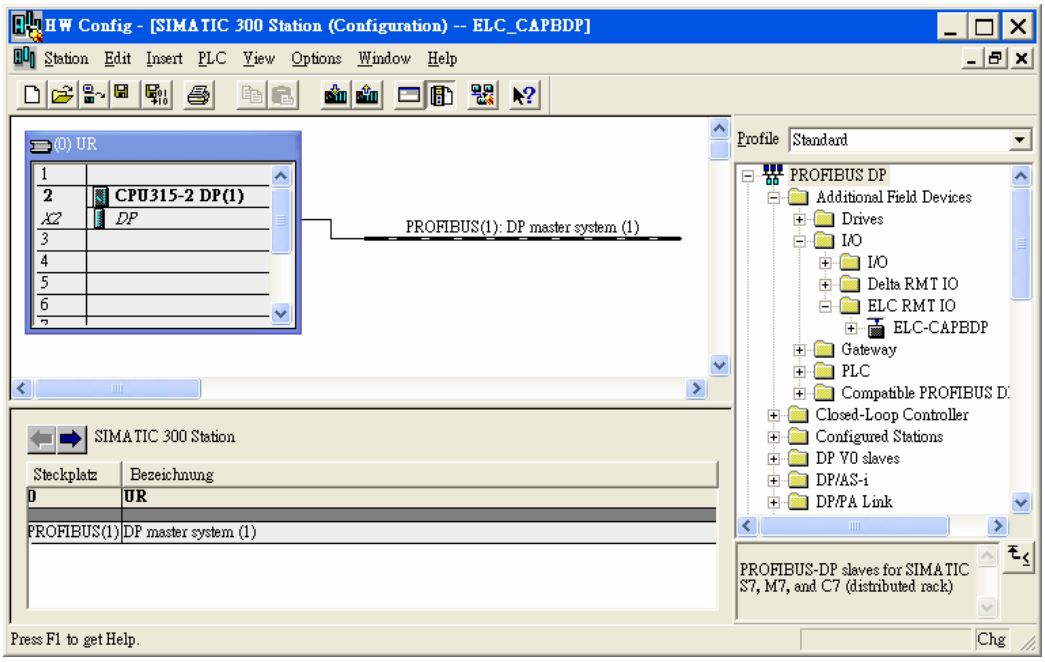


3. We can then see ELC-CAPBDP in the right-hand side column. ELC-CAPBDP is the module added.

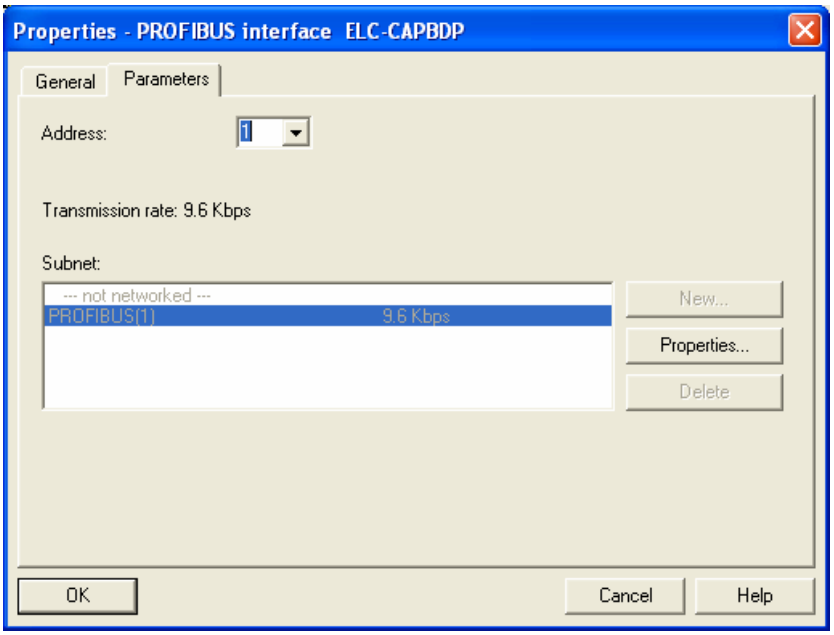


■ **Add ELC-CAPBDP slave and set up parameters**

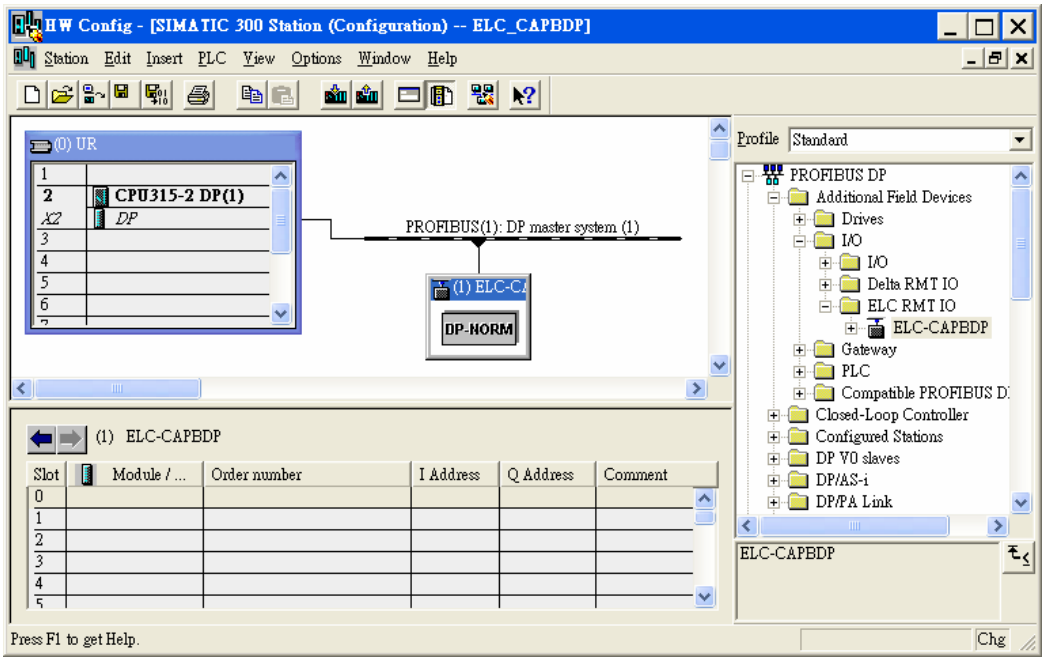
1. Select PROFIBUS DP on the right-hand side column and double click “ELC-CAPBDP” to open a dialog box.



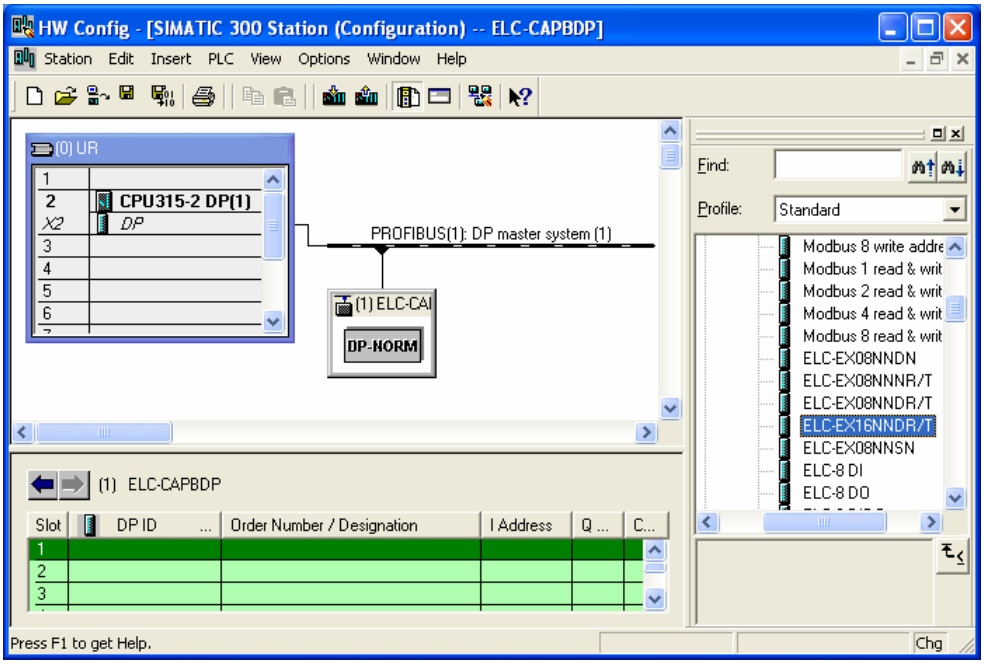
2. In the dialog box, select the address of ELC-CAPBDP slave. The address has to be the same as the setting of address setup switch on ELC-CAPBDP. Click “OK”.



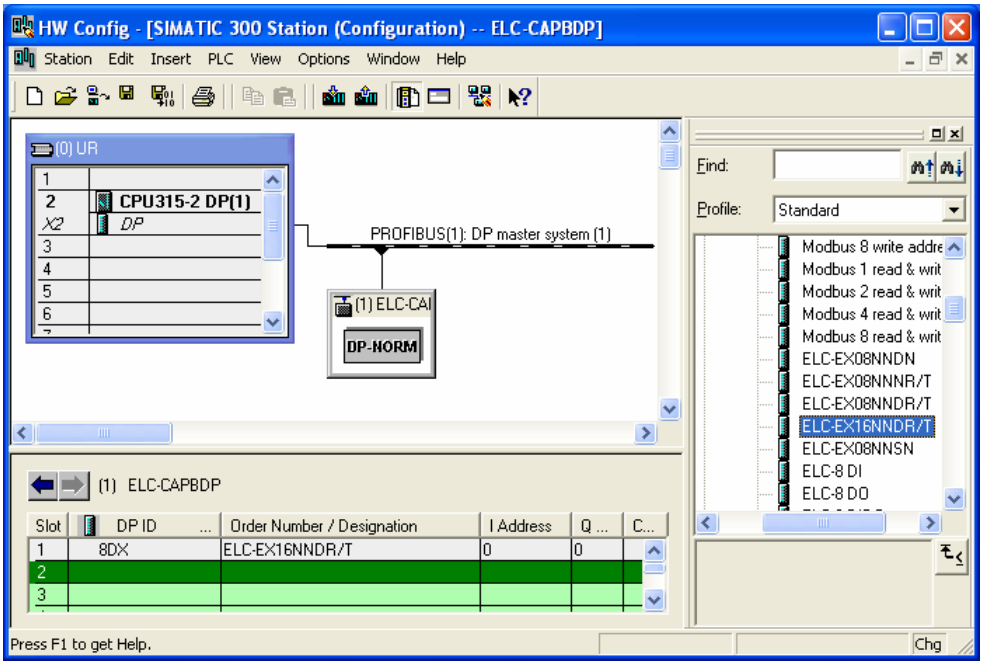
3. Add PROFIBUS DP bus to ELC-CAPBDP.



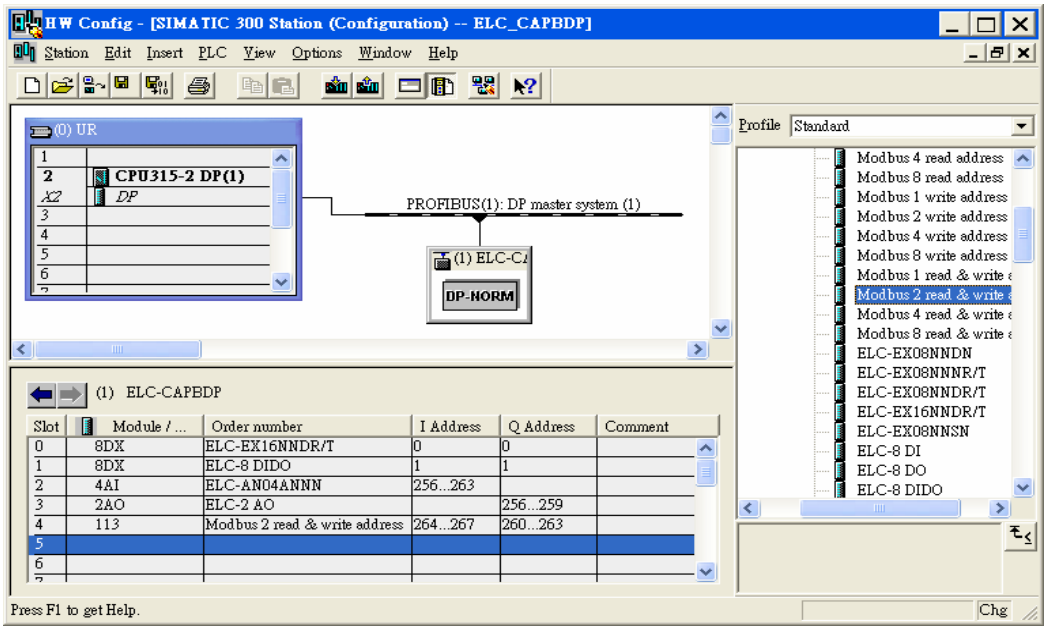
4. Select Slot 0 and double click “ELC-EX16NNDR/T” in the right-hand side column.



5. Configure ELC-EX16NNDR/T to Slot 0.

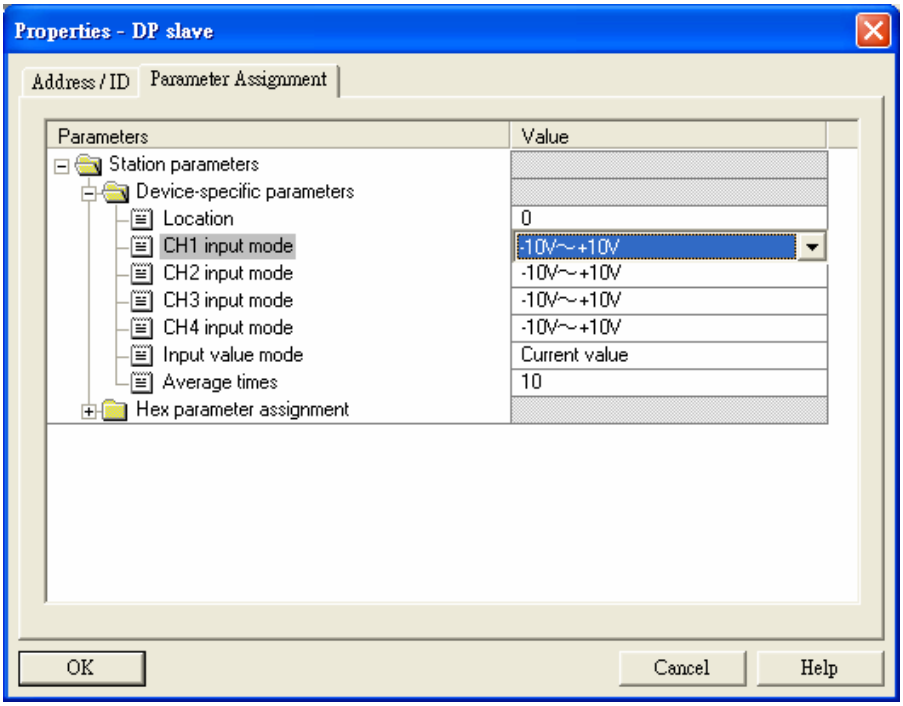


6. Configure other slots as Slot 0 was configured. To configure, select one of the slots and double click on the items to be configured in the right-hand side column. Apply it to configure Slot 0 ~ Slot 4.

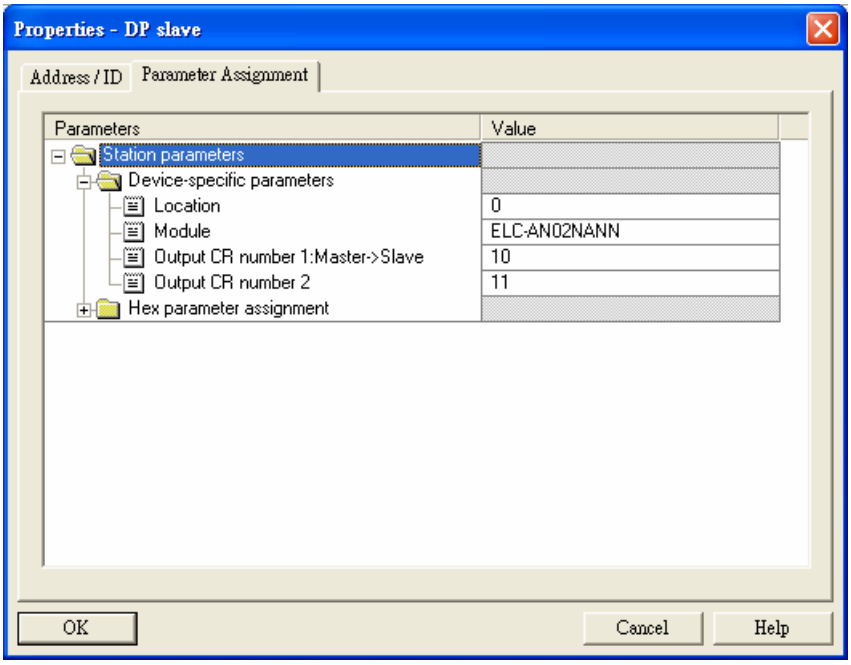


7. Slot 0 and Slot 1 are for the configuration of digital I/O modules. The configuration of digital I/O modules does not require other parameter settings. When you configure digital I/O modules by self-defined method, and if the number of I/O points is less than 8, the calculation will be based on the number 8. For example, Slot 1 is configured 8DIDO, and its corresponding digital I/O module is DVP08SP (4 input points and 4 output points). See the following paragraph for detailed corresponding relations between slots and I/O modules.

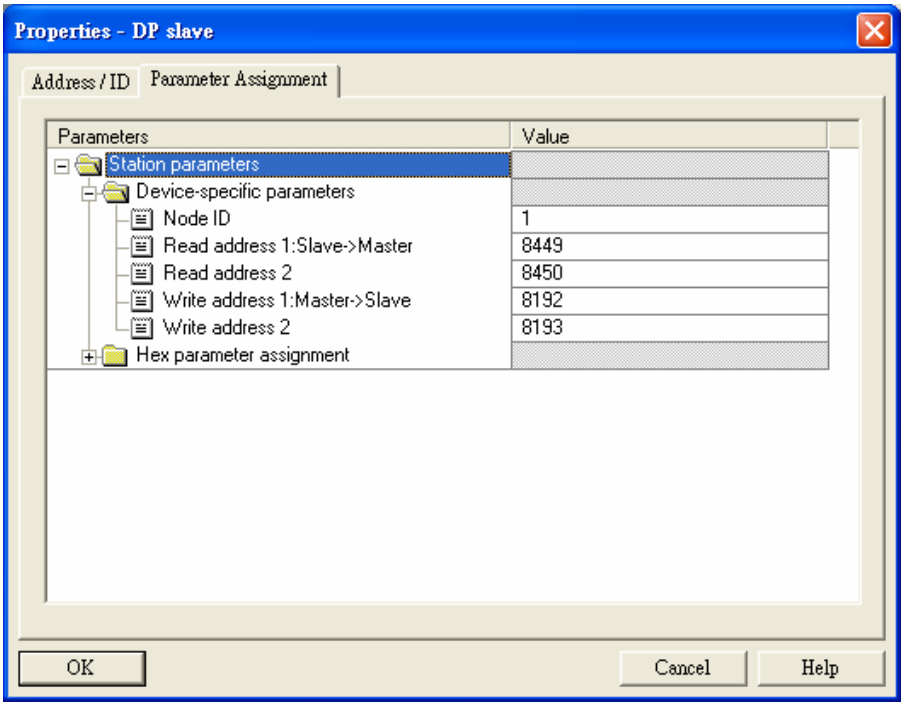
8. Double click the configured Slot 2 in “HW Config” window to open the dialog box in the figure below. Refer to the configuration chapter for the definition of every parameter in this dialog box.



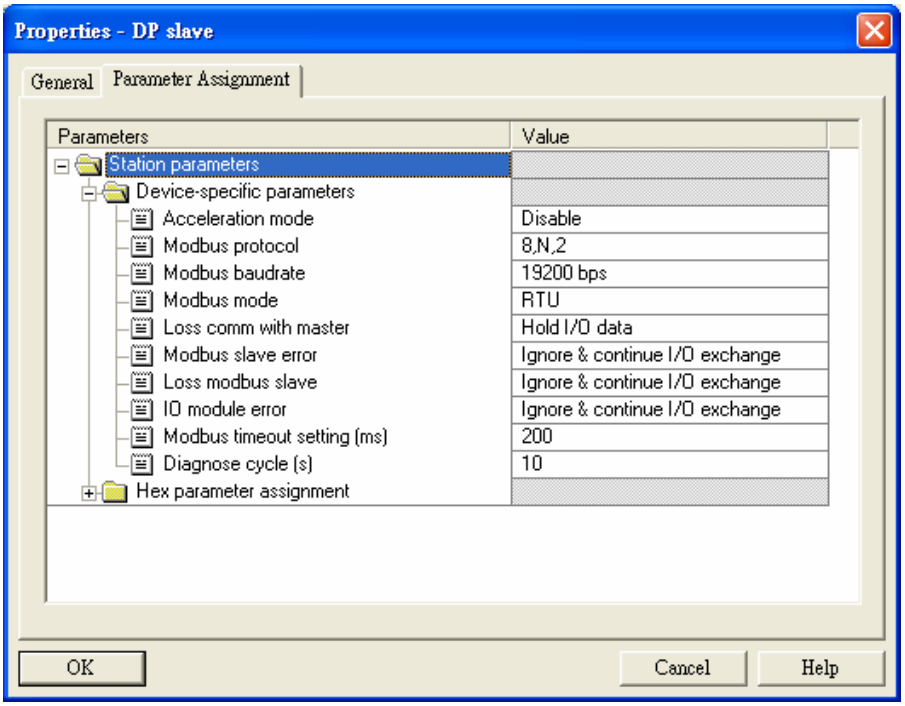
9. Double click the configured Slot 3 in “HW Config” window to open the dialog box in the figure below. Refer to the configuration chapter for the definition of every parameter in this dialog box.



10. Double click the configured Slot 4 in “HW Config” window to open the dialog box in the figure below. Refer to the configuration chapter for the definition of every parameter in this dialog box.

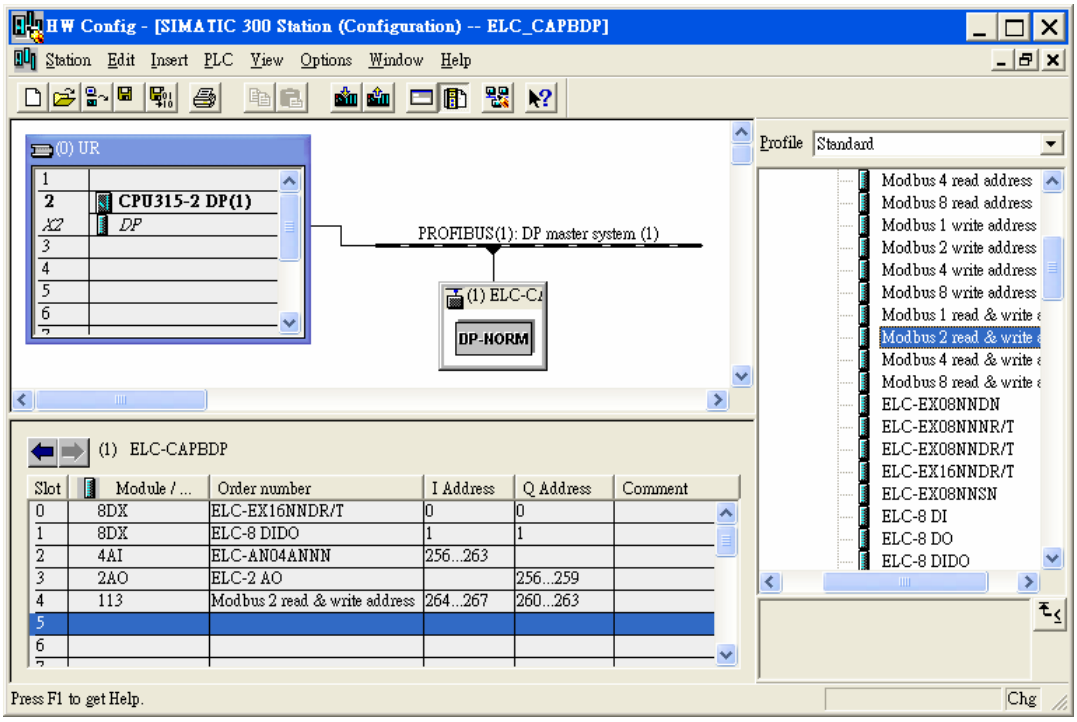


11. After all the configuration items for ELC-CAPBDP are set, double click the ELC-CAPBDP slave on the PROFIBUS DP bus in “HW Config” window to open the dialog box in the figure below. Refer to 8.1 for the definition of every parameter in this dialog box.



12. After all the parameters are set, download the parameters, and once the master is connected to ELC-CAPBDP, the NET indicator on ELC-CAPBDP will constantly be On in green color.

■ **Data Mapping**

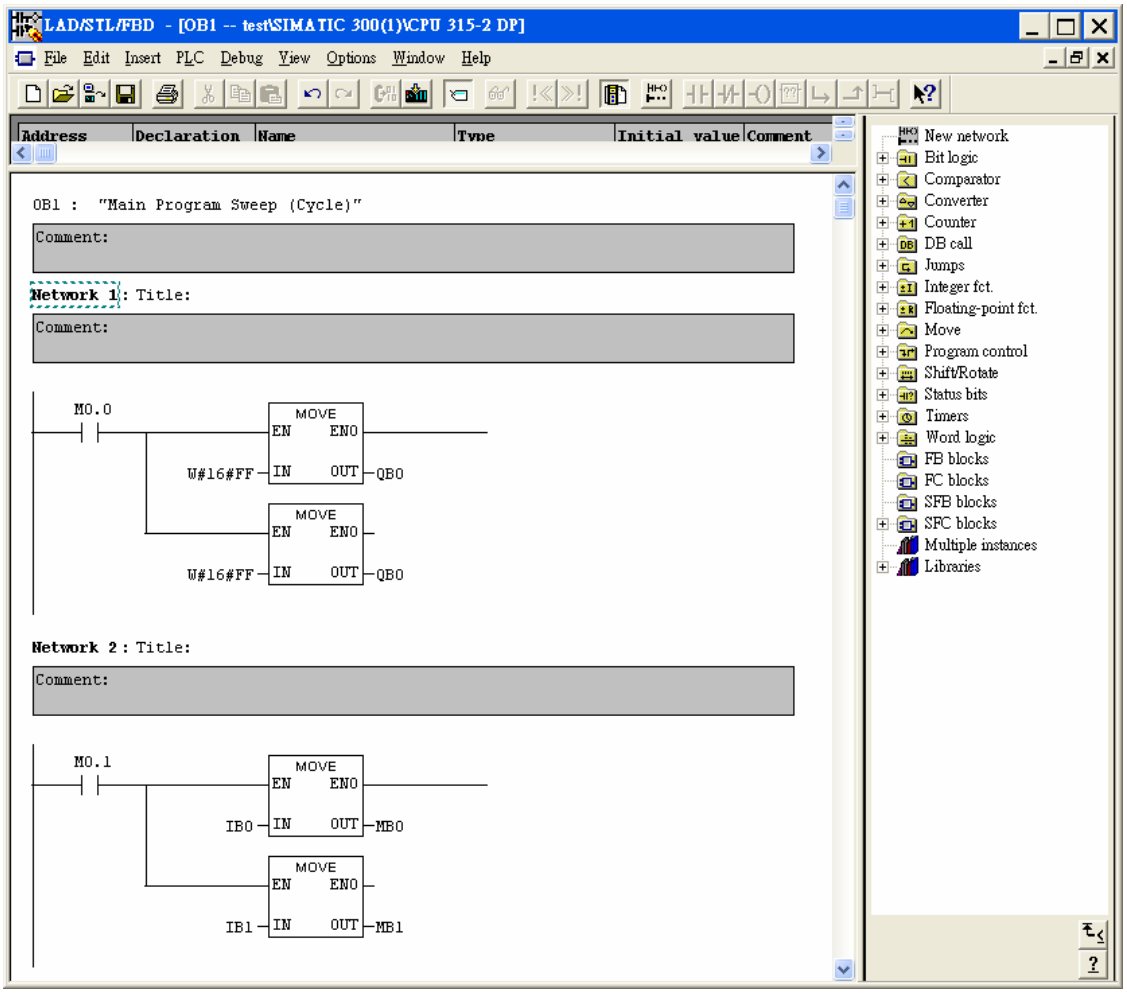


See the table below for the data mapping relations under the parameter settings.

Register in S7-300 master	Data transmission direction in PROFIBUS DP network	Slave devices and addresses connected to ELC-CAPBDP
QB0 bit 0 ~ bit 7		Y0 ~ Y7 on ELC-EX16NNDT
QB1 bit 0 ~ bit 3		Y0 ~ Y3 on ELC-EX08NNDT
PQW256	⇨	Output value in CH1 on ELC-AN02NANN
PQW258		Output value in CH2 on ELC-AN02NANN
PQW260		Modbus address 8192
PQW262		Modbus address 8193
IB0 bit 0 ~ bit 7		X0 ~ X7 on ELC-EX16NNDT
IB1 bit 0 ~ bit 3		X0 ~ X3 on ELC-EX08NNDT
PIW256		Input value in CH1 on ELC-AN04ANNN
PIW258	⇦	Input value in CH2 on ELC-AN04ANNN
PIW260		Input value in CH3 on ELC-AN04ANNN
PIW262		Input value in CH4 on ELC-AN04ANNN
PIW264		Modbus address 8449
PIW266		Modbus address 8450

■ Program Example

- When M0.0 = ON, write 1 to Y0 ~ Y7 on ELC-EX16NNDT and Y0 ~ Y3 on ELC-EX08NNDT connected to ELC-CAPBDP.
- When M0.1 = ON, read the status on X0 ~ X7 on ELC-EX16NNDT connected to ELC-CAPBDP to MB0, and the status on X0 ~ X3 on ELC-EX08NNDT to MB1.
- You can also read or write other devices connected to ELC-CAPBDP by using MOVE instruction.



4 ELC-CAENET

To ensure correct installation and operation of ELC-CAENET, please read this chapter carefully before using your ELC-CAENET. The ELC-CAENET is an Ethernet remote I/O adapter product that connects ELC I/O modules to Ethernet networks using either EtherNet/IP or Modbus TCP protocols. To configure the ELC-CAENET module use EATON's ELCSoft and ECISoft or an embedded web page on the device.

The ELC-CAENET supports Modbus TCP server protocol and can be used as remote I/O from a PLC or other Modbus TCP client devices. The ELC-CAENET can also be used as a Modbus TCP gateway, supporting the conversion from Modbus TCP commands to Modbus ASCII/RTU. The ELC-ENET also supports EtherNet/IP adapter functionality to provide remote I/O for a PLC capable of being an EtherNet/IP scanner.

4.1 Features

- Supports EtherNet/IP Adapter communication with up to 8 connections.
- Supports Modbus TCP server communications with up to 16 connections.
- 10/100 Mbps transmission speed; MDI/MDI-X auto-detect.
- Supports up to 16 expansion modules, including up to 8 analog modules
- Supports a maximum of 256 digital Input and Output points.
- Integrated Modbus TCP to Modbus serial gateway (Allows a Modbus TCP client to connect to 32 devices on a local modbus serial link).
- Supports embedded "local logic functions": IF-THEN, counter, timer and real-time clock. Able to operate independently without control from a main PLC.
- Real time clock synchronized via NTP
- Configurable using embedded web page or Eaton ELCSoft/ECISoft.

4.2 Specifications

- **Ethernet interface**

Interface	RJ-45 with Auto MDI/MDIX
Transmission method	802.3, 802.3u
Transmission cable	Category 5e, 100m (Max)
Transmission speed	10/100 Mbps Auto-Detection
Communication protocol	ICMP, IP, TCP, UDP, DHCP, SMTP, NTP, MODBUS TCP, ETHERNET/IP

- **Serial communication interface (COM1)**

Interface	Mini Din
Transmission method	RS-232
Communication speed	19,200 bps
Communication format	Stop bit: 1; Parity bit: None; Data bit: 8

Transmission cable	ELC-CBPCELC3

- **Serial communication interface (COM2)**

Interface	3 PIN feed-through terminal
Transmission method	RS-485
Transmission distance	4,000 ft (@19.2K)
Communication speed	110, 150, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, 38,400, 57,600, 115,200 bps
Communication format	Stop bit: 1, 2; Parity bit: None, Odd, Even; Data bit: 7, 8
Communication protocol	Modbus ASCII、Modbus RTU

- **Environment**

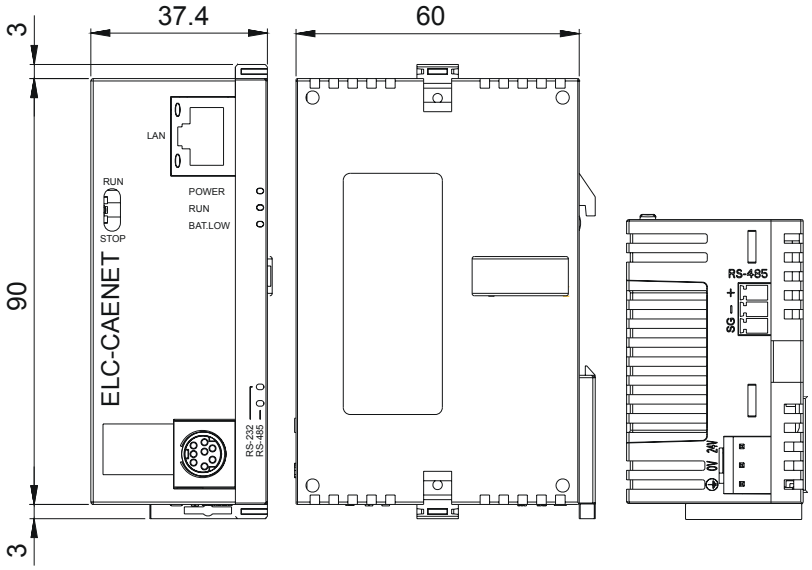
Noise immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8KV Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line:±2KV, Digital Input: ±2KV, Communication I/O: ±2KV RS (IEC 61131-2, IEC 61000-4-3): 80MHz ~ 100MHz, 10V/m. 1.4GHz ~ 2.0GHz, 10V/m Conducted Susceptibility Test (EN61000-4-6, IEC61131-2 9.10): 150kHz ~ 80MHz, 3V/m Surge Test (Biwave IEC61132-2, IEC61000-4-5): Power line 0.5KV DM, Ethernet 0.5KV CM, RS-485 0.5KV CM
Operation	0ºC ~ 55ºC (temperature), 50 ~ 95% (humidity), pollution degree 2
Storage	-25ºC ~ 70ºC (temperature), 5 ~ 95% (humidity)
Shock/vibration immunity	International standards: IEC61131-2, IEC 68-2-6 (TEST Fc)/IEC61131-2 & IEC 68-2-27 (TEST Ea)
Certificates	CE cULus

- **Electrical specification**

Power supply voltage	24VDC (-15% ~ 20%) (with DC input polarity reverse protection)
Power fuse capacity	1.85A/30VDC, Polyswitch
Power consumption	2W
Insulation voltage	500VDC
Weight	116g

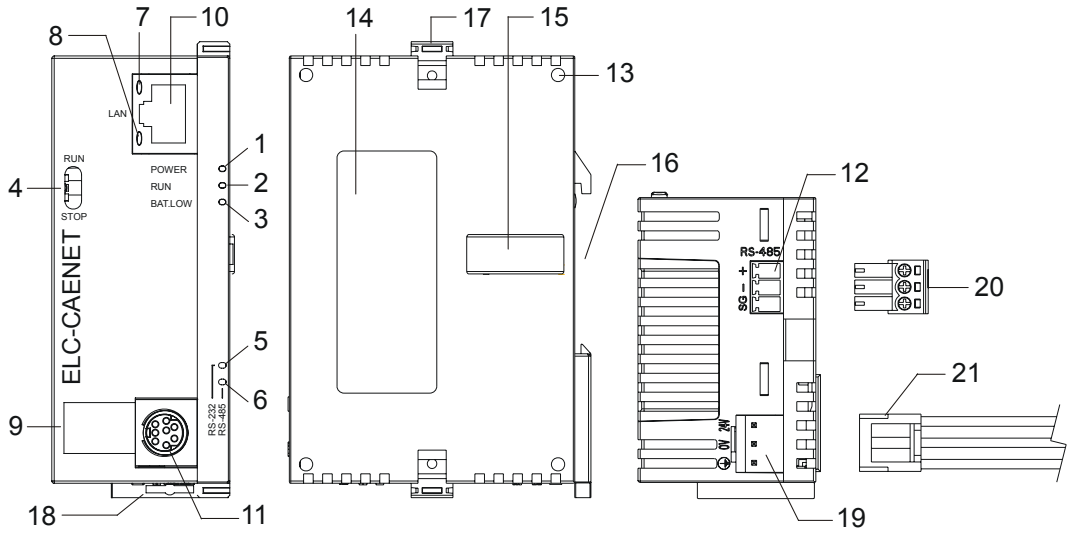
4.3 Product Profile & Outline

4.3.1 Dimension



Unit: mm

4.3.2 Product Profile



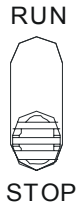
1. POWER indicator	12. RS-485 communication port
2. RUN indicator	13. Extension module positioning hole
3. BAT.LOW indicator	14. Nameplate
4. RUN/STOP switch	15. Extension port
5. RS-232 indicator	16. DIN rail (35mm)
6. RS-485 indicator	17. Extension module fixing clip
7. LINK/ACK indicator	18. DIN rail clip
8. SPEED indicator	19. Power supply port
9. Digital display	20. 3P terminal block (standard accessory)

10. Ethernet communication port	21. Power supply connection cable (standard accessory)
11. RS-232 communication port	

4.3.3 LED Indicators

LED	Color	Function
POWER	Green	Power supply indication
RUN	Green	RUN/STOP indication
BAT.LOW	Red	Battery in low power indication
RS-232	Yellow	Displays communication status of RS-232 port
RS-485	Yellow	Displays communication status of RS-485 port
LINK/ACT	Green	Displays the status of network
SPEED	Yellow	Displays the speed of network connection

4.3.4 RUN/STOP Switch

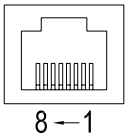


Status	Explanation
RUN	1. RUN indicator on ELC-CAENET is ON.
	2. Analog input/output modules are in RUN status.
	3. Local logic functions are running.
RUN → STOP	1. Analog input/output module switches from RUN to STOP status.
	2. Y points on digital input/output module are all OFF.
STOP	1. RUN indicator on ELC-CAENET is OFF.
	2. Analog input/output modules are in STOP status.
	3. Local logic function halted.
STOP → RUN	1. ELC-CAENET re-detects the modules on the I/O bus.
	2. Analog input/output modules switch from STOP to RUN status.

4.3.5 Ethernet RJ-45 PIN Definition

PIN	Signal	Definition
1	Tx+	Positive pole for data transmission
2	Tx-	Negative pole for data transmission
3	Rx+	Positive pole for data receiving
4	--	N/C

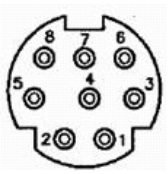
PIN	Signal	Definition
5	--	N/C
6	Rx-	Negative pole for data receiving
7	--	N/C
8	--	N/C



4.3.6 RS-232 PIN Definition

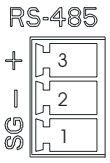
PIN	Signal	Definition
1	--	N/C
2	--	N/C
3	--	N/C
4	Rx	Reception data

PIN	Signal	Definition
5	Tx	Transmission data
6	--	N/C
7	--	N/C
8	GND	Ground



4.3.7 RS-485 PIN Definition

PIN	Signal	Definition
1	SG	Signal Ground
2	D-	Negative pole for data
3	D+	Positive pole for data

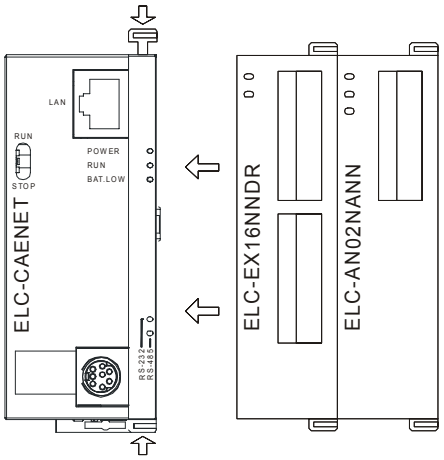


4.4 Installation & Wiring

In this section, we will describe how to connect the ELC-CAENET module to other devices and the network.

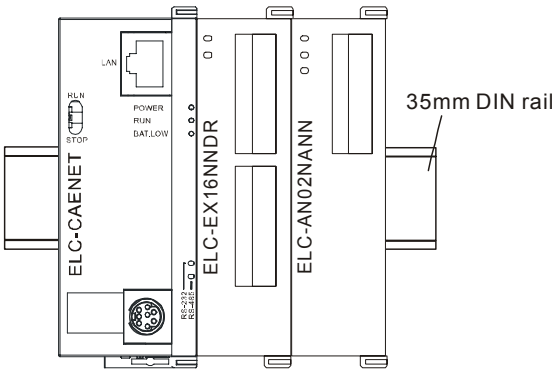
4.4.1 Connecting the ELC-CAENET to ELC I/O Modules

- Open the extension clips on the top and bottom of the ELC-CAENET. Connect the extension port of the ELC-CAENET and the I/O module.
- Fasten the extension clips on the I/O module. Make sure the contact between the modules is secure.



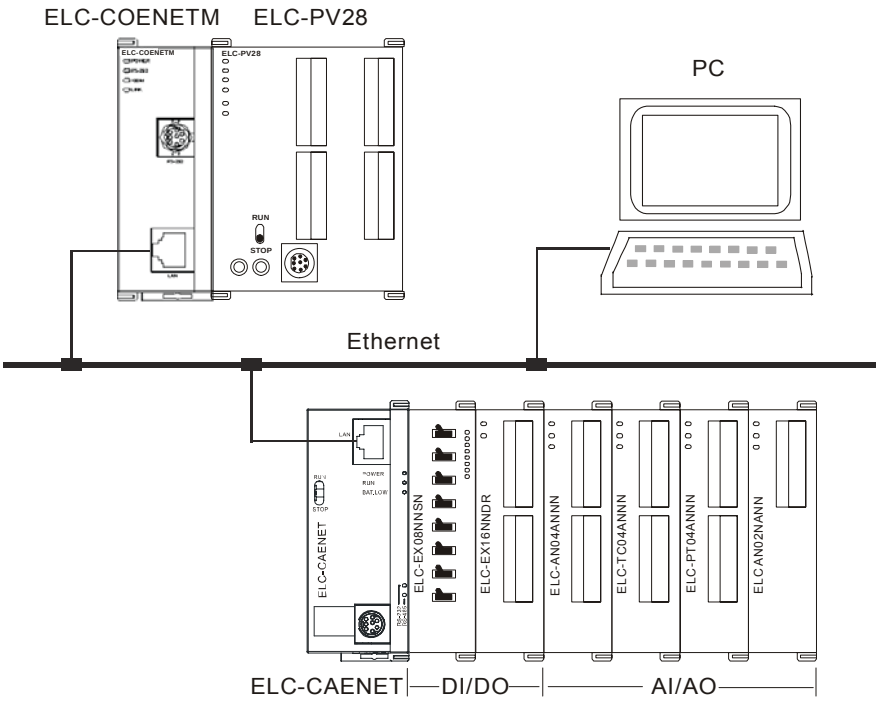
4.4.2 Installing the ELC-CAENET and ELC I/O Modules onto a DIN Rail

- Use standard 35mm DIN rail.
- Open the DIN rail clips on ELC-CAENET and the I/O modules and insert the modules onto the rail.
- Press the clips to secure the modules onto the rail.



4.4.3 How to Connect the ELC-CAENET to the Local Area Network

Connect ELC-CAENET to the Ethernet switch using CAT-5e twisted pair cable. Since the ELC-CAENET has Auto MDI/MDIX functionality, a cross over cable is not requried to connect directly to a PC. See below for the connection between the PC and ELC-CAENET modules:



4.5 Internal data structure for the ELC-CAENET

This section describes the internal data structure for the ELC-CAENET module. These data elements can be accessed from Modbus TCP, EtherNet/IP and the local logic features described in later sections of this manual

4.5.1 Basic Registers (BR)

BR#	Attribute	Content	Explanation	Default	Latched
0	R	Model name	Set up by the system; read only. The model code of ELC-CAENET= H'0600.	H'0600	YES

BR#	Attribute	Content	Explanation	Default	Latched
1	R	Firmware version	the current firmware verision in hex, e.g. V1.2 is indicated as high byte = 0x01 and low byte = 0x20.		YES
2	R	Release date of the version	the data in decimal form. 10,000s digit and 1,000s digit are for “month”; 100s digit and 10s digit are for “day”. For 1s digit: 0 = morning; 1 = afternoon. Example: 12191 indicates the version released in the afternoon of December 19.		YES
3	R/W	Start/Stop PLC function			NO
4		Reserved			NO
5	R/W	COM2 communication settings	RS-485 communication settings. Please refer to the table of baud rate setting and communication format setting.	H’0368	YES
6	R/W	Address	For setting up the station address	K’1	YES
7	R	Number of DI points	Range: 0 ~ 256		NO
8	R	Number of DO points	Range: 0 ~ 256		NO
9	R	Error code	Displaying the errors. Please refer to the table of error codes.		NO
10		Reserved			NO
11	R/W	Communication time-out	For setting up the communication time-out (ms) in Modbus TCP mode.	K’5000	YES
12	R/W	Communication delay time	For setting up the minimum interval time between every communication datum.	K’0	YES
13	R/W	TCP connection idle time	For setting up idle time for TCP communication. Unit: second	K’30	YES
14 ~ 22		Reserved			NO
23	R	Number of analog I/O modules	Max. 8		NO
24	R	ID of the 1st analog I/O module	ID of the 1st analog I/O module		NO
25	R	ID of the 2nd analog I/O module	ID of the 2nd analog I/O module		NO
26	R	ID of the 3rd analog I/O module	ID of the 3rd analog I/O module		NO
27	R	ID of the 4th analog I/O module	ID of the 4th analog I/O module		NO
28	R	ID of the 5th analog I/O module	ID of the 5th analog I/O module		NO
29	R	ID of the 6th analog I/O module	ID of the 6th analog I/O module		NO
30	R	ID of the 7th analog I/O module	ID of the 7th analog I/O module		NO

BR#	Attribute	Content	Explanation	Default	Latched
31	R	ID of the 8th analog I/O module	ID of the 8th analog I/O module		NO
32 ~ 49		Reserved			NO
50	R/W	RTC settings	Settings of the real-time clock		NO
51	R/W	Year	Range: 1970 ~ 2099		YES
52	R/W	Week	Range: 1 ~ 7		YES
53	R/W	Month	Range: 1 ~ 12		YES
54	R/W	Day	Range: 1 ~ 31		YES
55	R/W	Hour	Range: 0 ~ 23		YES
56	R/W	Minute	Range: 0 ~ 59		YES
57	R/W	Second	Range: 0 ~ 59		YES
58 ~ 59		Reserved			NO
60		Reserved			NO
61 ~ 63		Reserved		0	NO
Symbol “R” refers to ready only; “R/W” refers to read and write.					

4.5.2 Basic Registers (BR) descriptions

BR#0: Model Name

Model code of ELC-CAENET = H’0600.

BR#1: Firmware Version

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

BR#2: Release Date of the Version

The date in decimal form 10,000s digit and 1,000s digit are for “month”; 100s digit and 10s digit are for “day”. For 1s digit: 0 = morning; 1 = afternoon.

Example: 12191 indicate the version released in the afternoon of December 19.

BR#5: COM2 Communication Settings

Description:

b0 ~ b3							
Content	Interface	Explanation					
	COM2 RS-485	Data	Baud rate (bps)	Data	Baud rate (bps)	Data	Baud rate (bps)
		0x1	110	0x6	2,400	0xB	57,600
		0x2	150	0x7	4,800	0xC	115,200
		0x3	300	0x8	9,600		
		0x4	600	0x9	19,200		
		0x5	1,200	0xA	38,400		
b4 ~ b7							

	b7		b6 ~ b5		b4			
Explanation	Stop bit 0: 1 Stop bit 1: 2 Stop bits		Parity bit 00 : None parity bit 01 : Odd parity bit 11 : Even parity bit		Data bit 0 : 7 Data bits 1 : 8 Data bits			
Content	0000 (0)	7-N-1	0011 (3)	8-O-1	1000 (8)	7-N-2	1011 (B)	8-O-2
	0001 (1)	8-N-1	0110 (6)	7-E-1	1001 (9)	8-N-2	1110 (E)	7-E-2
	0010 (2)	7-O-1	0111 (7)	8-E-1	1010 (A)	7-O-2	1111 (F)	8-E-2

b8 ~ b15	
Content	Explanation
0x02	Modbus RTU Master
0x03	Modbus ASCII Master

BR#6: Address

For assigning or reading the Modbus serial address of the ELC-CAENET. The address will be displayed in the message display after being set up. Range: 1 ~ 247.

BR#7: Number of Digital Input Points

Read the number of digital input points from BR#7. Range: 0 ~ 256. Max. I/O points: 256. The number of input points is autiomatically detected by the ELC-CAENET based on the connected I/O cards.

BR#8: Number of Digital Output Points

Read the number of digital output points from BR#8. Range: 0 ~ 256. Max. I/O points: 256. The number of output points is autiomatically detected by the ELC-CAENET based on the connected I/O cards.

BR#9: Error Code

Description:

Error code = 0 refers to no error occurring.

Code	Indication	How to correct
F0	Returning to default setting	--
F1	ELC-CAENET being powered	--
F2	Power supply in low voltage	Check if the power supply of the module is functioning normally.
F3	Internal error. Manufacturing error.	1. Check if the settings of local logic are incorrect. 2. Re-power ELC-CAENET. If the error still exists, try step 3. 3. Reset ELC-CAENET. If the error still exists, send the module back to the manufacturer for repair.
F5	Network connection error	Check if ELC-CAENET is properly connected to the

Code	Indication	How to correct
		network.
F6	TCP connection limit exceeded	Check if the number of client connections exceeds the maximum. (8 EtherNet/IP or 16 Modbus TCP connections)
F7	RS-485 setting error	Check if the RS-485 communication format is correct.
F8	IP addressing error	1. DHCP request failure. 2. IP address invalid. 3. Subnet mask invalid. 4. Gateway does not exist in the same subnet. 5. Returning to default setting.
F9	Extension module error	Check if the configuration of the extension module has been modified. If the error still exists, check if the number of I/O points exceeds the maximum and whether the there are more than 8 analog/specialty I/O modules connected.
04	Slave error	1. Check if ELC-CAENET and RS-485 are properly connected. 2. Check if the RS-485 transmission speed is consistent with that of other nodes on the serial network.
0b	No response from station	

BR#11: Communication Time-out (ms)

Communication time-out. Default = 5,000ms. For example, if you wish to set up the communication time-out to 7 seconds manually, write 7000 to BR#11. Range: 5 ~ 65,535.

BR#12: Communication Delay Time (ms)

Minimum interval time between every Modbus command. Default = 0ms. For example, if you wish to set up the communication delay time to 100ms manually, write 100 into BR#12. Range: 0 ~ 65,535.

BR#13: TCP Connection Idle Time (s)

TCP connection idle time. Default = 30 seconds. For example, if you wish to set up the idle time to 7 seconds manually, write 7 into BR#13. Range: 5 ~ 65,535.

BR#23: Number of Analog/Specialty I/O Modules

The number of Analog/Specialty modules detected at “go to run”. Max. 8.

BR#24 ~ #31: ID of the 1st ~ 8th Analog I/O Module

The ID of the 1st ~ 8th analog I/O modules are read from BR#24 ~ BR#31.

BR#50 ~ BR#57: RTC Settings

Real-time clock (RTC) set-up. When BR#9 = 1, ELC-CAENET will stop to update the RTC values to BR#10 ~ #16. Once the setup is completed, ELC-CAENET will set BR#9 to 0.

Allowed range for RTC: 1970/01/01 00:00:00 ~ 2037/12/31 23:59:59

BR#9	
0	No action
1	RTC stops
2	RTC being set

4.5.3 External Input Contacts (RX)

RX#	Attribute	Content	Explanation	Default	Latched
0 ~ 255	R/W	External input contact	Input points on digital I/O module	OFF	NO
Symbol “R” refers to ready only; “R/W” refers to read and write.					

RX#0 ~ #255: External Input Contact

The current state of the input points. The right-side extension interface on ELC-CAENET is able to connect to ELC digital I/O modules. ELC-CAENET supports maximum 256 I/O points.

4.5.4 External Output Contacts (RY)

RY#	Attribute	Content	Explanation	Default	Latched
0 ~ 255	R/W	External output contact	Output points on digital I/O module	OFF	NO
Symbol “R” refers to ready only; “R/W” refers to read and write.					

RY#0 ~ #255: External Output Contact

The desired output point states. The right-side extension interface on ELC-CAENET is able to connect to ELC digital I/O modules. ELC-CAENET supports maximum 256 I/O points.

4.5.5 Control Register for Extension Modules (RCR)

RCR#	Attribute	Content	Explanation	Default	Latched
0 ~ 49	R/W	The 1st analog I/O module	Control register for the 1st analog I/O module	--	NO
50 ~ 99	R/W	The 2nd analog I/O module	Control register for the 2nd analog I/O module	--	NO
100 ~ 149	R/W	The 3rd analog I/O module	Control register for the 3rd analog I/O module	--	NO
150 ~ 199	R/W	The 4th analog I/O module	Control register for the 4th analog I/O module	--	NO
200 ~ 249	R/W	The 5th analog I/O module	Control register for the 5th analog I/O module	--	NO
250 ~ 299	R/W	The 6th analog I/O module	Control register for the 6th analog I/O module	--	NO

RCR#	Attribute	Content	Explanation	Default	Latched
300 ~ 349	R/W	The 7th analog I/O module	Control register for the 7th analog I/O module	--	NO
350 ~ 399	R/W	The 8th analog I/O module	Control register for the 8th analog I/O module	--	NO
Symbol “R” refers to ready only; “R/W” refers to read and write.					

RCR#0 ~ #399: Control Register for Right-Side Analog I/O Modules

By reading/writing RCR in ELC-CAENET, you are able to store or retrieve the data in the control register (CR) inside the analog input/output module.

Example: RCR#0 corresponds to CR#0 in the 1st analog I/O module. RCR#260 corresponds to CR#10 in the 6th analog I/O module. Extension module closest to ELC-CAENET is regarded as the 1st module.

4.5.6 Word Devices & Bit Devices for Timers (T)

T#	Attribute	Register/coil name	Explanation	Default	Latched
0	R/W	Timer 0	Timer	0/OFF	NO
1	R/W	Timer 1	Timer	0/OFF	NO
2	R/W	Timer 2	Timer	0/OFF	NO
3	R/W	Timer 3	Timer	0/OFF	NO
4	R/W	Timer 4	Timer	0/OFF	NO
5	R/W	Timer 5	Timer	0/OFF	NO
6	R/W	Timer 6	Timer	0/OFF	NO
7	R/W	Timer 7	Timer	0/OFF	NO
8	R/W	Timer 8	Timer	0/OFF	NO
9	R/W	Timer 9	Timer	0/OFF	NO
10	R/W	Timer 10	Timer	0/OFF	NO
11	R/W	Timer 11	Timer	0/OFF	NO
12	R/W	Timer 12	Timer	0/OFF	NO
13	R/W	Timer 13	Timer	0/OFF	NO
14	R/W	Timer 14	Timer	0/OFF	NO
15	R/W	Timer 15	Timer	0/OFF	NO
Symbol “R” refers to ready only; “R/W” refers to read and write.					

T#0: Timer 0

When the timer is enabled, it will start to time according to the settings. When the timing reaches the target, the timer done bit, T0, will be ON. When the bit is reset, the timer value will be reset to 0 as well.

T#1 ~ #15: Timer 1 ~ 15

Same as T#0.

4.5.7 Word Devices & Bit Devices for Counters (C)

C#	Attribute	Register/coil name	Explanation	Default	Latched
0	R/W	Counter 0	Counting up/down counter	0/OFF	NO
1	R/W	Counter 1	Counting up/down counter	0/OFF	NO
2	R/W	Counter 2	Counting up/down counter	0/OFF	NO
3	R/W	Counter 3	Counting up/down counter	0/OFF	NO
4	R/W	Counter 4	Counting up/down counter	0/OFF	NO
5	R/W	Counter 5	Counting up/down counter	0/OFF	NO
6	R/W	Counter 6	Counting up/down counter	0/OFF	NO
7	R/W	Counter 7	Counting up/down counter	0/OFF	NO
8	R/W	Counter 8	Counting up/down counter	0/OFF	NO
9	R/W	Counter 9	Counting up/down counter	0/OFF	NO
10	R/W	Counter 10	Counting up/down counter	0/OFF	NO
11	R/W	Counter 11	Counting up/down counter	0/OFF	NO
12	R/W	Counter 12	Counting up/down counter	0/OFF	NO
13	R/W	Counter 13	Counting up/down counter	0/OFF	NO
14	R/W	Counter 14	Counting up/down counter	0/OFF	NO
15	R/W	Counter 15	Counting up/down counter	0/OFF	NO
Symbol “R” refers to ready only; “R/W” refers to read and write.					

C#0: Counter 0

When the counter is enabled, the counter wil count up or down.. When the count reaches the target, the counter will stop, and the done bit ,C0, will be set to ON. If the user resets the done bit, the count value will be reset to 0 as well.

C#1 ~ #15: Counter 1 ~ 15

Same as C#0.

4.5.8 Bit Devices for Real-Time Clock (R)

The ELC-CAENET provides a set of 16 flags to be defined based on the internal Real Time Clock.

R#	Attribute	Content	Explanation	Default	Latched
0	R/W	RTC 0	Real-time clock flag 0	OFF	NO
1	R/W	RTC 1	Real-time clock flag 1	OFF	NO
2	R/W	RTC 2	Real-time clock flag 2	OFF	NO
3	R/W	RTC 3	Real-time clock flag 3	OFF	NO

R#	Attribute	Content	Explanation	Default	Latched
4	R/W	RTC 4	Real-time clock flag 4	OFF	NO
5	R/W	RTC 5	Real-time clock flag 5	OFF	NO
6	R/W	RTC 6	Real-time clock flag 6	OFF	NO
7	R/W	RTC 7	Real-time clock flag 7	OFF	NO
8	R/W	RTC 8	Real-time clock flag 8	OFF	NO
9	R/W	RTC 9	Real-time clock flag 9	OFF	NO
10	R/W	RTC 10	Real-time clock flag 10	OFF	NO
11	R/W	RTC 11	Real-time clock flag 11	OFF	NO
12	R/W	RTC 12	Real-time clock flag 12	OFF	NO
13	R/W	RTC 13	Real-time clock flag 13	OFF	NO
14	R/W	RTC 14	Real-time clock flag 14	OFF	NO
15	R/W	RTC 15	Real-time clock flag 15	OFF	NO
Symbol “R” refers to ready only; “R/W” refers to read and write.					

R#0: RTC 0

When the RTC function is enabled, and the assigned trigger RTC condition is true, ELC-CAENET will set the corresponding bit flag, R0, to ON.

R#1 ~ #15: RTC 1 ~ 15

Same as R#0.

4.6 Modbus TCP Communications

The ELC-CAENET module supports the MODBUS TCP protocol. It acts as a MODBUS TCP server, providing access to the internal data elements described earlier in this document.

4.6.1 Function Codes Supported

Function code	Explanation	Devices supported
0x02	Read discrete inputs	RX, RY, T, R, C
0x03	Read holding registers	BR, T, C, RCR
0x05	Write single coil	RY, T, R, C
0x06	Write single register	BR, T, C, RCR
0x0F	Write multiple coils	RY, T, R, C
0x10	Write multiple registers	BR, T, C, RCR
0x17	Read/write multiple registers	BR, T, C, RCR

4.6.2 Exception Codes Supported

Exception code	Explanation
0x01	Illegal function
0x02	Illegal data address

Exception code	Explanation
0x03	Illegal data value
0x04	Slave device failure
0x0b	Gateway target device failed to respond.

4.6.3 Device Type & Device Address

Discrete input			
Device type	Modbus address (Hex)	6-digit Modbus address (Dec)	Number
RX	0x0400 ~ 0x04FF	101025 ~ 101280	256
Coil			
RY	0x0500 ~ 0x05FF	001281 ~ 001537	256
T	0x1600 ~ 0x160F	005633 ~ 005649	16
R	0x1900 ~ 0x190F	006401 ~ 006416	16
C	0x1E00 ~ 0x1E0F	007681 ~ 007696	16
Holding register			
Device	Modbus address (Hex)	6-digit Modbus address (Dec)	Number
BR	0x0000~0x0040	400001~400064	64
T	0x1600~0x160F	405633~405649	16
C	0x1E00~0x1E0F	407681~407696	16
RCR	0x3000~0x3190	412289~412689	400

4.7 EtherNet/IP Communications

The ELC-CAENET module supports the EtherNet/IP protocol. It acts as an adapter device. It provides access to internal data elements through both implicit I/O connections to the I/O assemblies, and explicit messages to data objects.

4.7.1 Instance Level Service Codes Supported

Service code	Explanation	Object supported
0x05	Reset	Identity Object
0x0E	Get Attribute Single	Identity Object Message Router Object Assembly Object Connection Manager Object Discrete Input Object Discrete Ouput Object BR Object RCR Object TCP/IP Interface Object Ethernet Link Object
0x10	Set Attribute Single	Assembly Object Discrete Ouput Object BR Object RCR Object

Service code	Explanation	Object supported
0x4E	Forward Close	Connection Manager Object
0x54	Forward Open	Connection Manager Object

4.7.2 Object and Instances Supported

Object	Class Code	Instance Code	Explanation
Identity Object	0x01	#1	CIP Identity*
Message Router Object	0x02	#1	Application message router*
Assembly Object	0x04	#100	Input point assembly
		#101	Output point assembly
		#102	CR read mapping assembly
		#103	CR write mapping assembly
		#104	Input point and RCR read mapping assembly
		#105	Output point and RCR write mapping assembly
Connection Manager Object	0x06	#1	Application connection mamager*
Discrete Input Object	0x08	#1 ~ #256	256 Input points*
Discrete Ouput Object	0x09	#1 ~ #256	256 Output points*
BR Object	0x64	#1 ~ #64	64 BR registers
RCR Object	0x65	#1 ~ #400	400 RCR registers
TCP/IP Interface Object	0xF5	#1	TCP/IP Parameters*
Ethernet Link Object	0xF6	#1	Ethernet Link Parameters*

4.7.3 Identity Object (0x01)

Instance #	Attribute ID	Name	Data Type	Description of Attribute	Default	Access Rule
#1	#1	Vendor ID	UINT	Identification of each vendor by number	K'799	Get
	#2	Device Type	UINT	Indication of general type of product	H'000C	Get
	#3	Product Code	UINT	Identification of a particular product of an individual vendor	H'0600	Get
	#4	Revision	STRUCT of:	Revision of the item the Identity Object represents		Get
		Major Revision	USINT			
		Minor Revision	USINT			
	#5	Status	WORD	Summary status of device		Get
	#6	Serial Number	UDINT	Serial number of device		Get
	#7	Product Name	SHORT_ STRING	Human readable identification	"ELC-CAENET"	Get

4.7.4 Assembly Object (0x04)

Instance #	Attribute ID	Name	Data Type	Description of Attribute	Default	Access Rule
#100	#3	Data	ARRAY of BYTEs	Discrete Input points on digital Input module		Get
	#4	Size	UINT	Number of bytes in Attribute#3	32	Get
#101	#3	Data	ARRAY of BYTEs	Discrete Output points on digital Input module		Get/Set
	#4	Size	UINT	Number of bytes in Attribute#3	32	Get
#102	#3	Data	ARRAY of BYTEs	CR read mapping on externsion analog module		Get
	#4	Size	UINT	Number of bytes in Attribute#3	128	Get
#103	#3	Data	ARRAY of BYTEs	CR write mapping on externsion analog module		Get/Set
	#4	Size	UINT	Number of bytes in Attribute#3	128	Get
#104	#3	Data	ARRAY of BYTEs	Discrete Input points on digital Input module and CR write mapping on externsion analog module		Get
	#4	Size	UINT	Number of bytes in Attribute#3	160	Get
#105	#3	Data	ARRAY of BYTE	Discrete Output points on digital Input module and CR write mapping on externsion analog module		Get/Set
	#4	Size	UINT	Number of bytes in Attribute#3	160	Get

Instance Data Format

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
#100	0	Discrete Input#8	Discrete Input#7	Discrete Input#6	Discrete Input#5	Discrete Input#4	Discrete Input#3	Discrete Input#2	Discrete Input#1
	1	Discrete Input#16	Discrete Input#15	Discrete Input#14	Discrete Input#13	Discrete Input#12	Discrete Input#11	Discrete Input#10	Discrete Input#9
	2	Discrete Input#24	Discrete Input#23	Discrete Input#22	Discrete Input#21	Discrete Input#20	Discrete Input#19	Discrete Input#18	Discrete Input#17
	…								
	31	Discrete Input#256	Discrete Input#255	Discrete Input#254	Discrete Input#253	Discrete Input#252	Discrete Input#251	Discrete Input#250	Discrete Input#249

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
#101	0	Discrete Output#8	Discrete Output#7	Discrete Output#6	Discrete Output#5	Discrete Output#4	Discrete Output#3	Discrete Output#2	Discrete Output#1
	1	Discrete Output#16	Discrete Output#15	Discrete Output#14	Discrete Output#13	Discrete Output#12	Discrete Output#11	Discrete Output#10	Discrete Output#9
	2	Discrete Output#24	Discrete Output#23	Discrete Output#22	Discrete Output#21	Discrete Output#20	Discrete Output#19	Discrete Output#18	Discrete Output#17
	…								
	31	Discrete Output#256	Discrete Output#255	Discrete Output#254	Discrete Output#253	Discrete Output#252	Discrete Output#251	Discrete Output#250	Discrete Output#249

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
#102	0	Low Byte of CR Read Mapping#1							
	1	High Byte of CR Read Mapping#1							
	2	Low Byte of CR Read Mapping#2							
	3	High Byte of CR Read Mapping#2							
	4	Low Byte of CR Read Mapping#3							
	5	High Byte of CR Read Mapping#3							
	…								
	126	Low Byte of CR Read Mapping#64							
	127	High Byte of CR Read Mapping#64							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
#103	0	Low Byte of CR Write Mapping#1							
	1	High Byte of CR Write Mapping#1							
	2	Low Byte of CR Write Mapping#2							
	3	High Byte of CR Write Mapping#2							
	4	Low Byte of CR Write Mapping#3							
	5	High Byte of CR Write Mapping#3							
	…								
	126	Low Byte of CR Write Mapping#64							
	127	High Byte of CR Write Mapping#64							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
#104	0	Discrete Input#8	Discrete Input#7	Discrete Input#6	Discrete Input#5	Discrete Input#4	Discrete Input#3	Discrete Input#2	Discrete Input#1
	1	Discrete Input#16	Discrete Input#15	Discrete Input#14	Discrete Input#13	Discrete Input#12	Discrete Input#11	Discrete Input#10	Discrete Input#9
	2	Discrete Input#24	Discrete Input#23	Discrete Input#22	Discrete Input#21	Discrete Input#20	Discrete Input#19	Discrete Input#18	Discrete Input#17
	…								
	31	Discrete Input#256	Discrete Input#255	Discrete Input#254	Discrete Input#253	Discrete Input#252	Discrete Input#251	Discrete Input#250	Discrete Input#249
	32	Low Byte of CR Read Mapping#1							
	33	High Byte of CR Read Mapping#1							
	34	Low Byte of CR Read Mapping#2							
	35	High Byte of CR Read Mapping#2							
	36	Low Byte of CR Read Mapping#3							
	37	High Byte of CR Read Mapping#3							
	…								
	158	Low Byte of CR Read Mapping#64							
	159	High Byte of CR Read Mapping#64							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
#105	0	Discrete Output#8	Discrete Output#7	Discrete Output#6	Discrete Output#5	Discrete Output#4	Discrete Output#3	Discrete Output#2	Discrete Output#1
	1	Discrete Output#16	Discrete Output#15	Discrete Output#14	Discrete Output#13	Discrete Output#12	Discrete Output#11	Discrete Output#10	Discrete Output#9
	2	Discrete Output#24	Discrete Output#23	Discrete Output#22	Discrete Output#21	Discrete Output#20	Discrete Output#19	Discrete Output#18	Discrete Output#17
	…								
	31	Discrete Output#256	Discrete Output#255	Discrete Output#254	Discrete Output#253	Discrete Output#252	Discrete Output#251	Discrete Output#250	Discrete Output#249
	32	Low Byte of CR Write Mapping#1							
	33	High Byte of CR Write Mapping#1							
	34	Low Byte of CR Write Mapping#2							
	35	High Byte of CR Write Mapping#2							
	36	Low Byte of CR Write Mapping#3							
	37	High Byte of CR Write Mapping#3							
	…								
	158	Low Byte of CR Write Mapping#64							
	159	High Byte of CR Write Mapping#64							

Note: See the section on Analog I/O mapping in the configuration section of this manual

4.7.5 Discrete Input Object (0x08)

Instance #	Attribute ID	Name	Data Type	Description of Attribute	Default	Access Rule
#1 ~ #256	#3	Value	BOOL	Discrete Input point value. 0 = OFF; 1 = ON.		Get

4.7.6 Discrete Output Object (0x09)

Instance #	Attribute ID	Name	Data Type	Description of Attribute	Default	Access Rule
#1 ~ #256	#3	Value	BOOL	Discrete Output point value. 0 = OFF; 1 = ON.		Get/Set

4.7.7 BR Object (0x64)

Instance #	Attribute ID	Name	Data Type	Description of Attribute	Default	Access Rule
#1 ~ #64	#3	Value	WORD	BR register		Get/Set

4.7.8 RCR Object (0x65)

Instance #	Attribute ID	Name	Data Type	Description of Attribute	Default	Access Rule
#1 ~ #400	#3	Value	WORD	RCR register		Get/Set

4.7.9 CIP General Status Code

General Status Code	Status Name	Description of Status
0x 00	Success	Service was successfully performed by the object specified.
0x 01	Connection failure	A connection related service failed along the connection path.
0x 02	Resource unavailable	Resources needed for the object to perform the requested service were unavailable.
0x 04	Path segment error	The path segment identifier or the segment syntax was not understood by the processing node. Path processing shall stop when a path segment error is encountered.
0x 05	Path destination unknown	The path is referencing an object class, instance or structure element that is not known or is not contained in the processing node. Path processing shall stop when a path destination unknown error is encountered.
0x 08	Service not supported	The requested service was not implemented or was not defined for this Object Class/Instance.
0x 09	Invalid attribute value	Invalid attribute data detected
0x 0E	Attribute not settable	A request to modify a non-modifiable attribute was received.
0x 13	Not enough data	The service did not supply enough data to perform the specified operation.
0x 14	Attribute not supported	The attribute specified in the request is not supported
0x 15	Too much data	The service supplied more data than was expected
0x 16	Object does not exist	The object specified does not exist in the device.
0x 20	Invalid parameter	A parameter associated with the request was invalid. This code is used when a parameter does not meet the requirements of this specification and/or the requirements defined in an Application Object Specification.
0x 26	Path Size Invalid	The size of the path which was sent with the Service Request is either not large enough to allow the Request to be routed to an object or too much routing data was included.

4.8 ELC-CAENET Configuration

Eaton provides software that simplifies the configuration of the ELC-CAENET including the local logic functions.

This section gives instructions on how to set up ELC-CAENET using this software and explanation on each setup page. The software uses UDP port 20006 in the set up of the ELC-CAENET. Appropriate firewall settings will need to be in place for remote access.

ECISoft is a stand alone application that manages the ELC Ethernet components on a network. This application is integrated into the ELC programming software, ELCSoft.

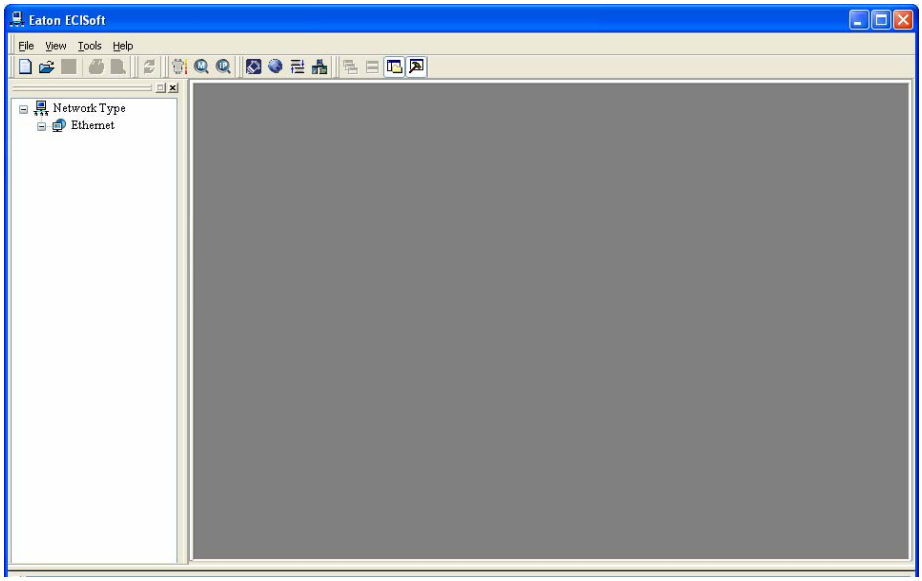
An embedded web page on the ELC-CAENET also presents the set-up screens described in

this section. This provides a convenient alternative when the Eaton software is not available. The Web page can be accessed by entering the IP address of the ELC-CAENET into your browser.

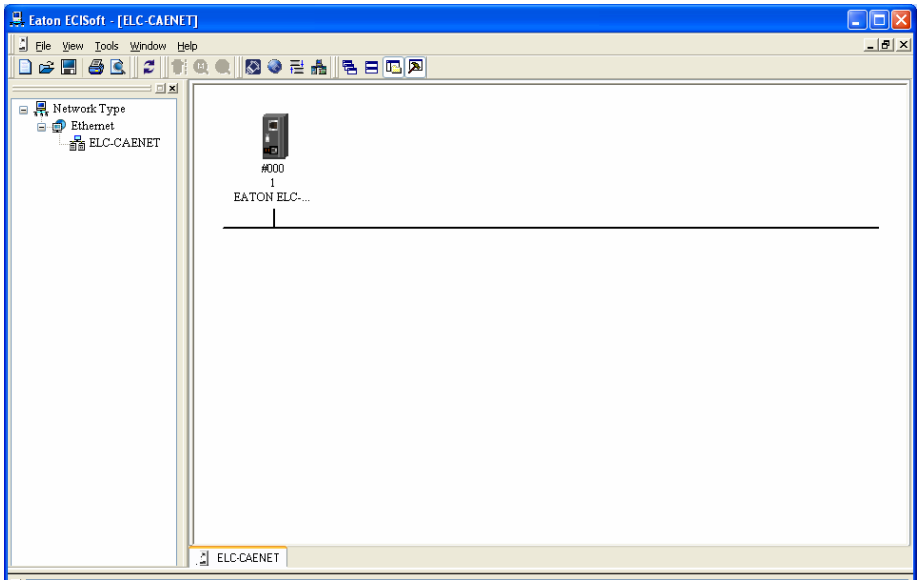
4.8.1 Setting up Communications & Searching for Communication Modules with EICSoft

- **Broadcast search**

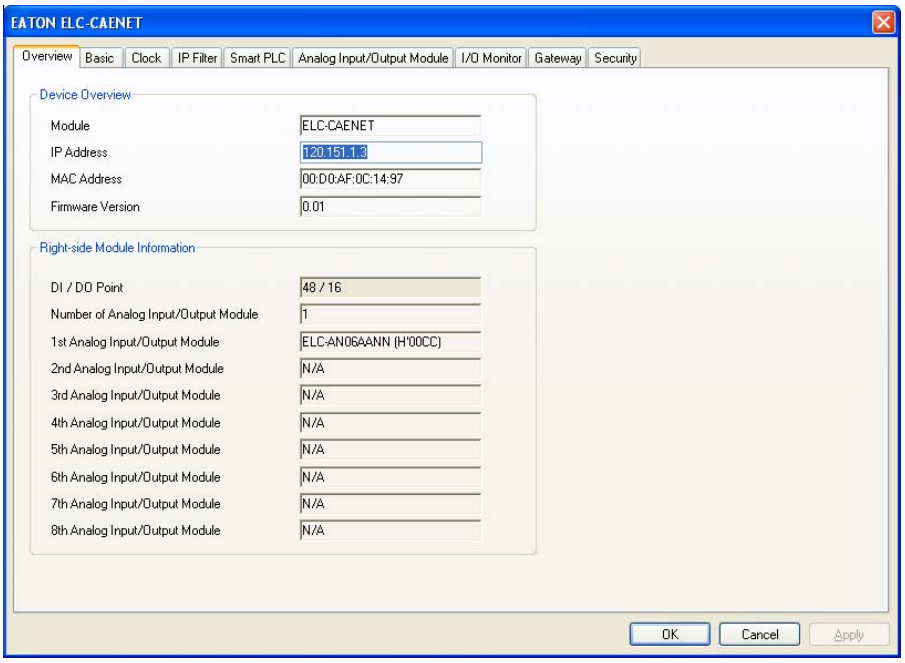
1. Open ECISoft on the PC and click on the “IP Search” icon (ECISoft can be accessed via a button in ELCSoft).



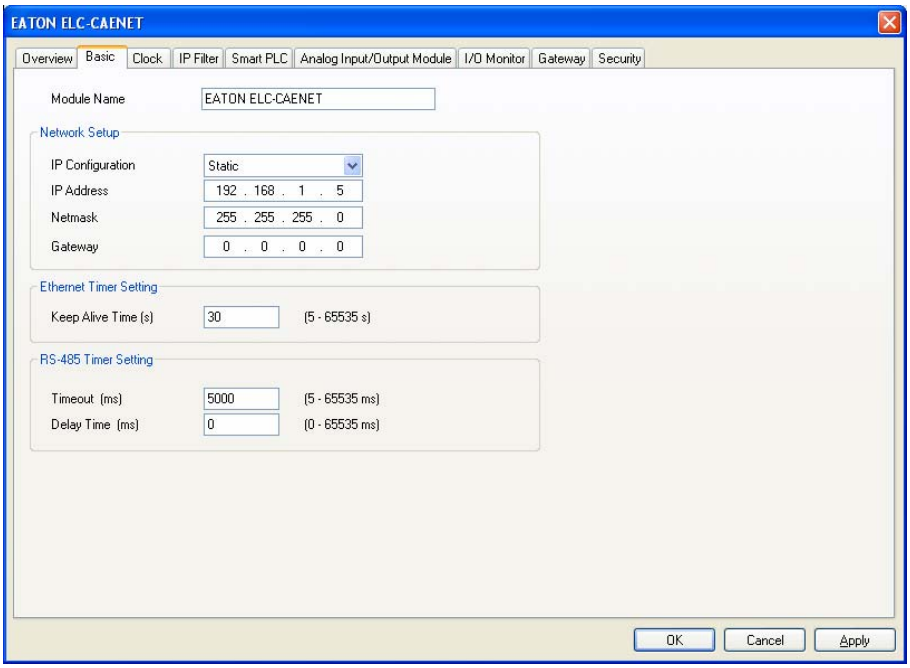
2. Thecommunication module will be displayed when found.



3. Double-click on the module to be configured to enter the setup page. The Overview tab contains the basic status of the module and information on the connected I/O modules. This will also be the first view you would see from a web browser.



4. The next page is for basic network setup. For other settings, see BR#11 ~ BR#13.



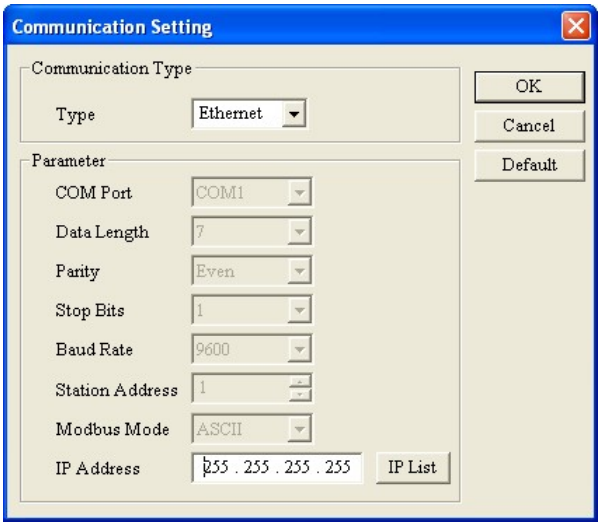
4.8.2 Recording IP Address

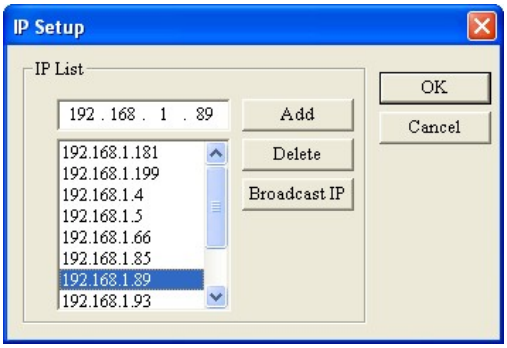
The IP list allows the user to select modules directly and designate a module for search. Recording IP address means to add this ELC-CAENET to the list, allowing the user to see ELC-CAENET in the search.

- **Recording IP address**

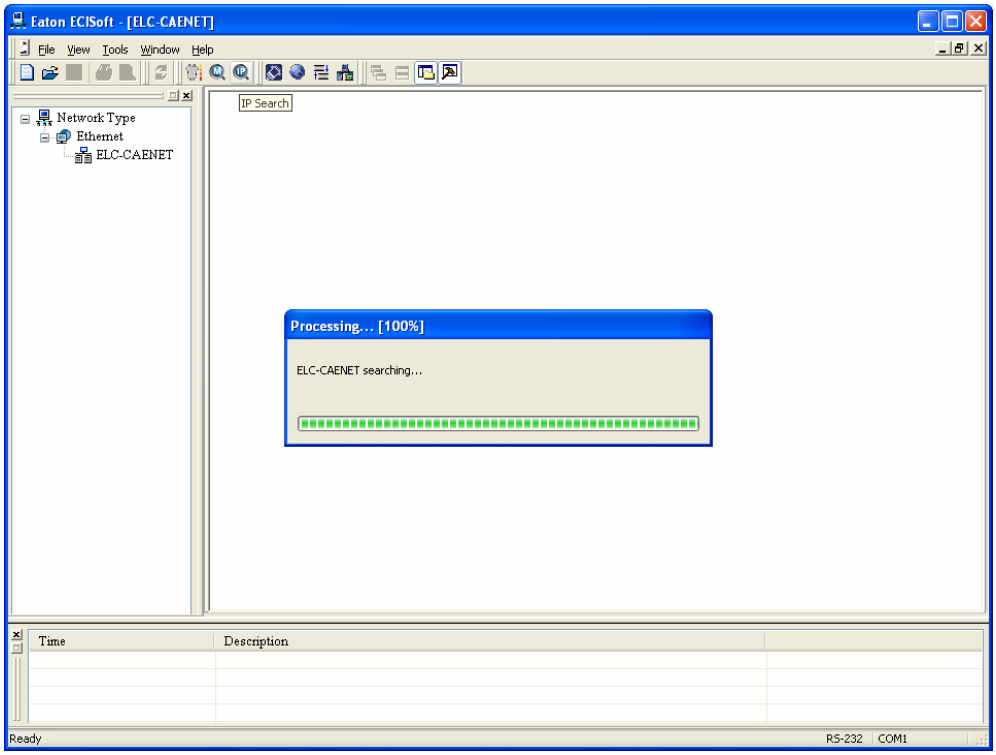
IP list:

In the list, you will see the network IPs already used. Click “Add” to record the known IP address into the list and next search for the module on the network by designated IP.





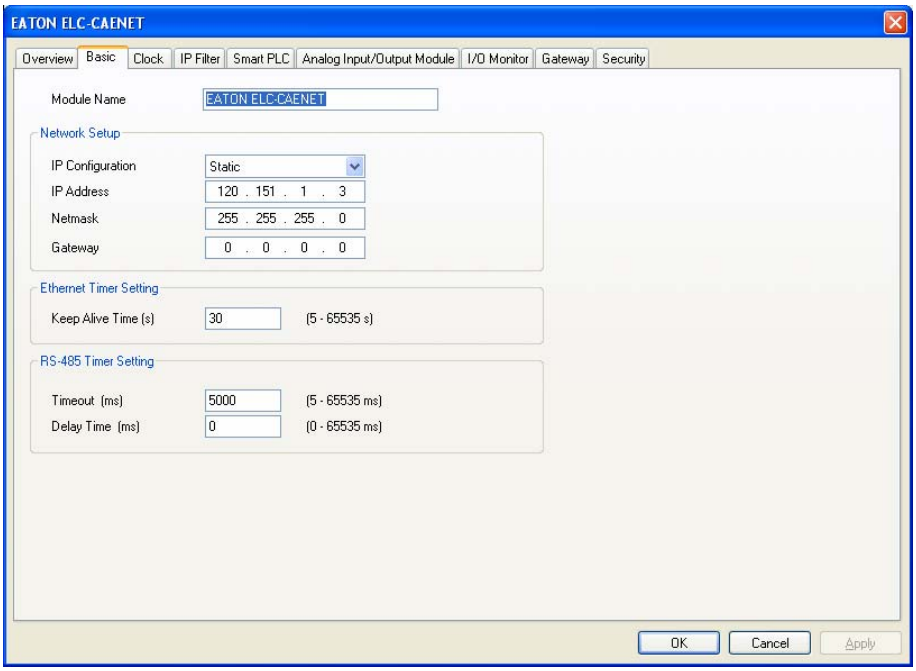
Click the icon to search for the module.



4.8.3 Basic Settings

The basic settings include parameters such module name, network settings and communication time.

- **The basic tab**



1. Module name:

   There can be many ELC-CAENET modules on the network. You can set up a module name for each module to identify the module when you need to use them.

2. Network setup:

   Enable dynamic IP (DHCP) or static IP..

   A. IP configuration:

   There are 2 types of IP, static IP and DHCP.

   Static IP: Preset or manually modified by the user.

   DHCP: Automatically updated by a DHCP server. There must be a DHCP server in the LAN.

IP	Explanation
Static	The user enters the IP address, subnet mask and gateway.
DHCP	DHCP server offers the IP address, subnet mask and gateway.

   B. IP address:

   IP address is the location of the equipment on the network. Every device connected to the network has to have a unique IP address. Incorrect IP address will result in connection failure. The default IP for ELC-CAENET is 192.168.1.5.

   C. Netmask:

   Subnet mask is an important parameter for setting up the subnet, used for seeing if the destination IP and the local equipment are in the same subnet. If not, the equipment will send the packet to the gateway, and the gateway will send the packet to another subnet. Incorrect setting may cause the destination equipment unable to communicate to ELC-CAENET. To see if your setting is correct, conduct bitwise AND operations between your IP and subnet mask and destination IP and subnet mask. If the two values obtained are the same, the two IPs are in the same subnet. The default subnet mask of ELC-CAENET is 255.255.255.0.

   D. Gateway:

   Gateway is the window for two different subnets, allowing the two ends in different subnets to communicate. For example, if the LAN has to be connected to a WAN, it will need a gateway to bridge the communication. The IP of the gateway has to be in the same subnet as ELC-CAENET. The default gateway of ELC-CAENET is 192.168.1.1.

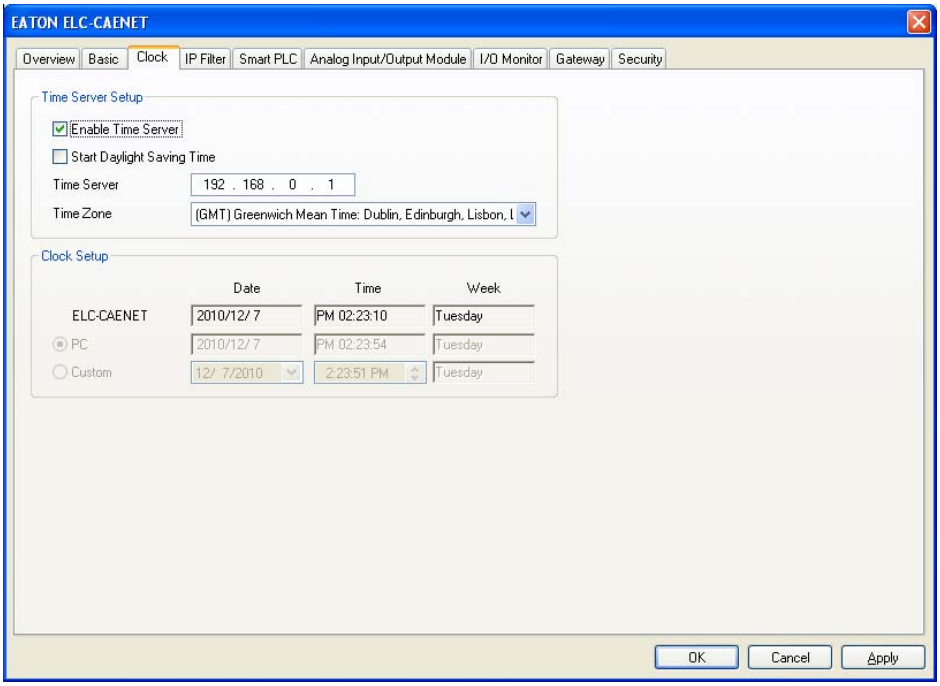
3. Timer setting:

   For setting up TCP connection idle time, Modbus time-out and minimum delay time for every communication data. Please refer to the explanations on BR#11, BR#12, and BR#13.

4.8.4 Setting up Time Server

ELC-CAENET offers real-time clock (RTC) functions. You can set up your own time for ELC-CAENET or update the time through NTP server.

■ **Setup page**



1. Enable time server
   ELC-CAENET executes automatic time correction from the NTP server on the network every 6 hours to ensure the time is correct in the RTC. To enable this function, you first have to set up the IP address of the NTP server and the time zone and daylight saving time.

2. Start daylight saving time
   Daylight Saving Time.

3. Time server
   IP address of the time server. You can acquire the correct time from the time server to correct the time in the MPU.

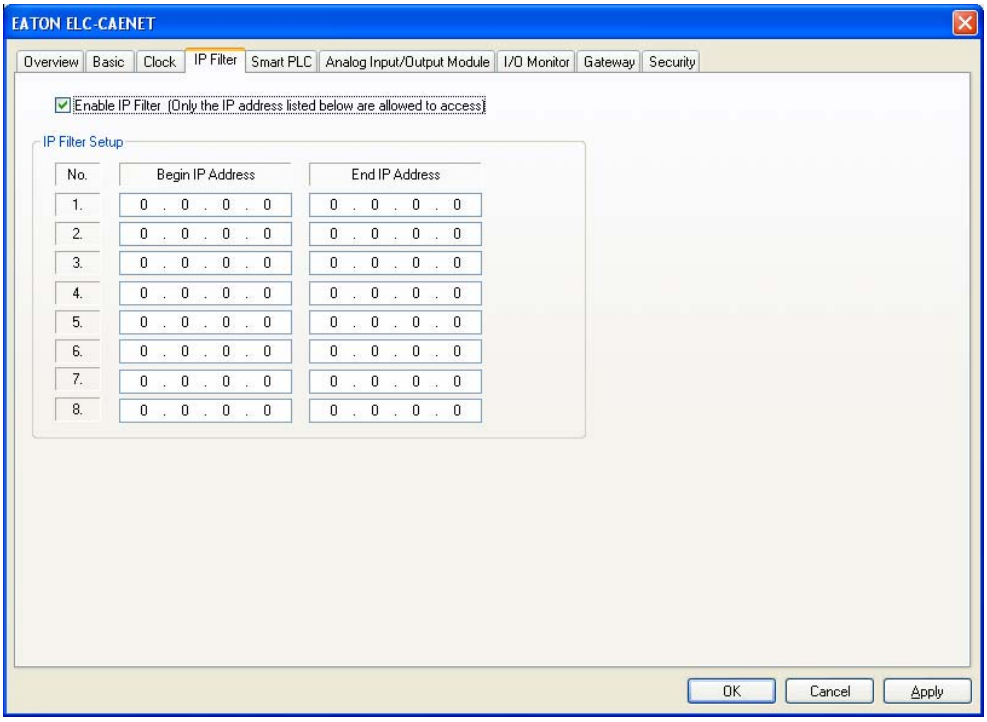
4. Time zone
   There are 24 time zones on earth and follow Greenwich Mean Time (GMT) as the standard time. Select the time zone you are in and adjust the offset between the time of your city and Coordinated Universal Time (UTC).

5. Clock setup
   Set up the time in ELC-CAENET. You can set the time to the same as the PC in operation, or you can set up the time manually.

4.8.5 IP Filter

The IP filter is used for restricting the computers or devices that can establish connection to the ELC-CAENET. Only the IP set within a certain range can establish a connection. Other IPs will be rejected.

- **Setting up IP filter**

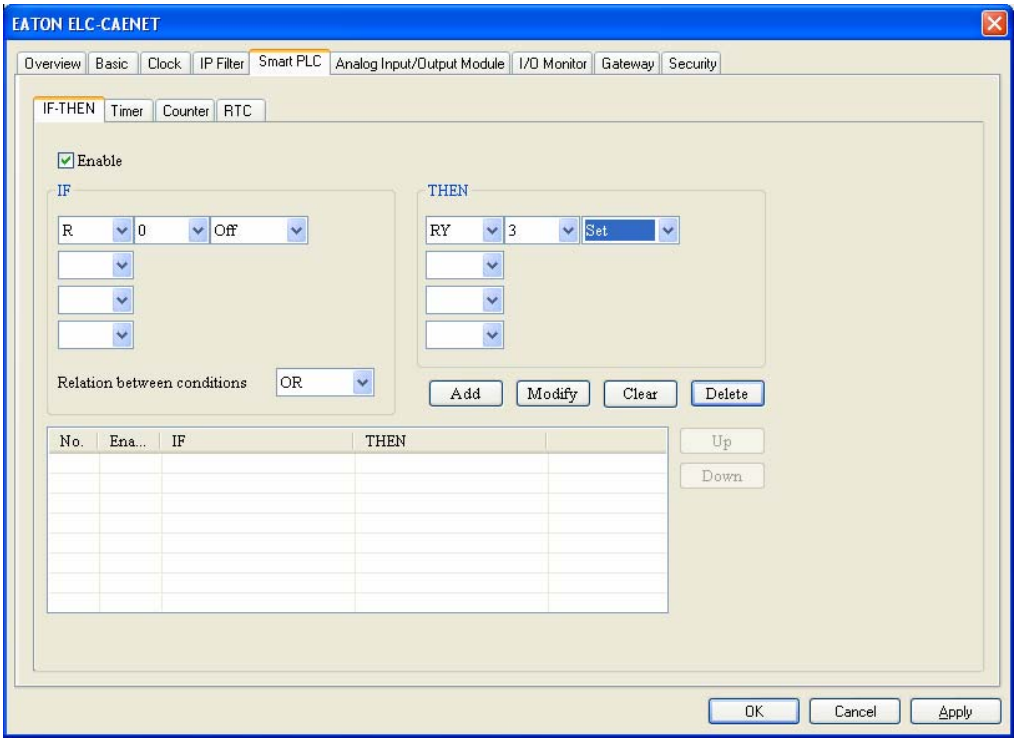


1. Enable IP filter:
   Check the box to enable IP filter.
2. Begin IP address:
   Start IP addresses allowed to establish connection. Max. 8 IPs are allowed.
3. End IP address:
   End IP addresses allowed to establish connection. Max. 8 IPs are allowed.

4.8.6 Local Logic Setting: IF-THEN

ELC-CAENET supports independent local logic functions. The IF-THEN function is able to excute user specified actions based on trigger conditions of counter, timer, RTC, digital I/O points and analog I/O modules. You can use AND or OR as the trigger condition. There are 16IF-THEN functions in ELC-CAENET).

■ **IF-THEN**



1. Enable

   Check the box to enable IF-THEN.

2. IF

   For the trigger condition, you can select bit devices RX, RY, C, T, RT or word device RCR and set them to ON, OFF, Rising, Falling, >, <, =, <>, >= or <=. The trigger condition can be AND or OR. When the device is a register, the allowed trigger range will be K-32,768 ~ K32,767.

3. THEN

   For the execution, you can select bit devices RY, C, T, RT or word device RCR and Set, Reset, Toggle or set up a value for them. Please refer to the explanations on IF#13 ~ IF#24. When the device is a register, the allowed trigger range will be K-32,768 ~ K32,767.

4. Add, Modify, Clear, Delete

   All the settings above can be added to the IF-THEN table below, or you can modify, clear or delete the settings.

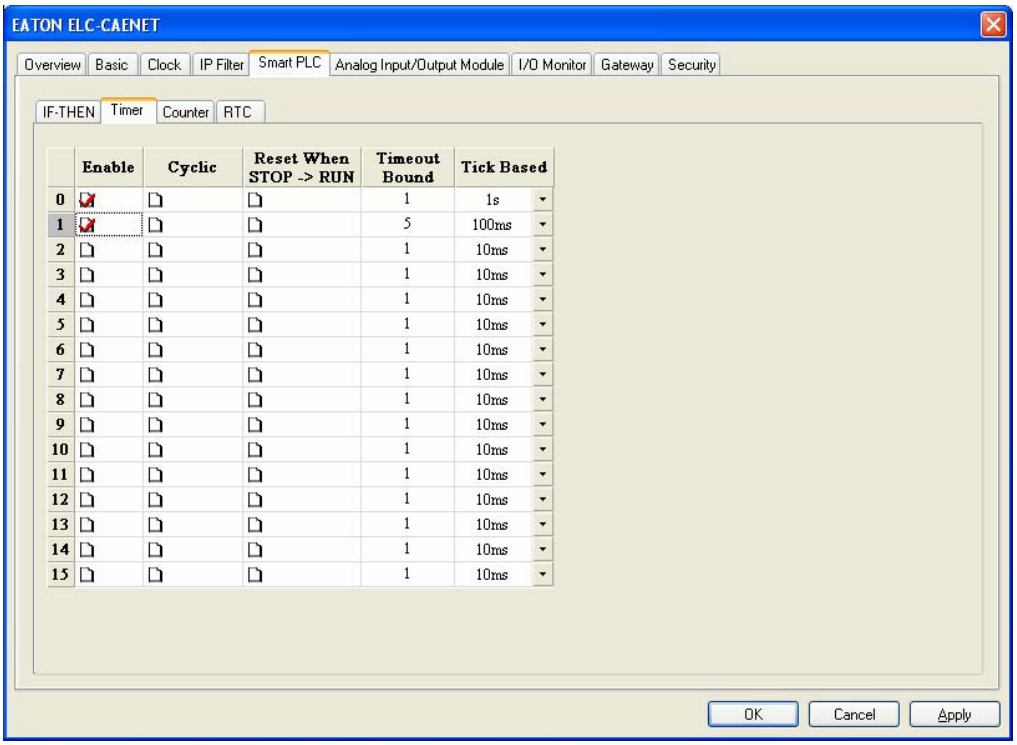
5. Up, Down

   You can move the IF-THEN setting up or down to change the execution order.

4.8.7 Local Logic Setting: Timer

The timer function is able to time following the system time. There are 16 timers in ELC-CAENET. The timing range is 10ms ~ 65,535s.

- **Timer**



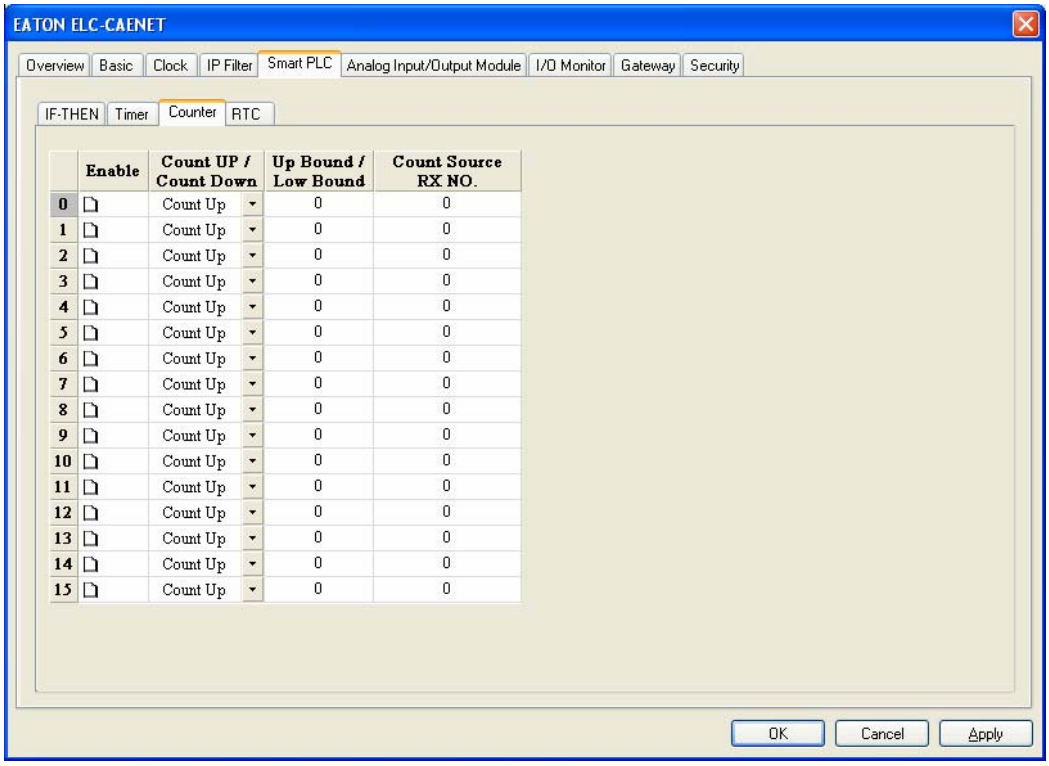
	Enable	Cyclic	Reset When STOP -> RUN	Timeout Bound	Tick Based
0	☑	☐	☐	1	1s
1	☑	☐	☐	5	100ms
2	☐	☐	☐	1	10ms
3	☐	☐	☐	1	10ms
4	☐	☐	☐	1	10ms
5	☐	☐	☐	1	10ms
6	☐	☐	☐	1	10ms
7	☐	☐	☐	1	10ms
8	☐	☐	☐	1	10ms
9	☐	☐	☐	1	10ms
10	☐	☐	☐	1	10ms
11	☐	☐	☐	1	10ms
12	☐	☐	☐	1	10ms
13	☐	☐	☐	1	10ms
14	☐	☐	☐	1	10ms
15	☐	☐	☐	1	10ms

1. Enable
   Decide whether to enable the timer in this column.
2. Cyclic
   Decide whether to reset the timer and re-start the timing when the timer reaches the target in this column.
3. Reset when STOP->RUN
   Decide whether to reset the timer when the system goes from STOP to RUN.
4. Timeout bound
   The time for the timer to reach the target. Range: 10ms ~ 65,535s.

4.8.8 Local Logic Setting – Counter

The counter can be triggered by the external input points RX. When RX turns from OFF to ON, the counter will start to count. There are 16 counters in the ELC-CAENET, selectable for counting up and counting down. The counting range is -32,768 ~ 32,767.

■ **Counter**



1. Enable

   Decide whether to enable the counter in this column.

2. Count up/count down

   Decide whether the counter will be counting up or counting down.

3. Up bound/low bound

   The upper limit and lower limit for the counter. Range: -32,768 ~ 32,767.

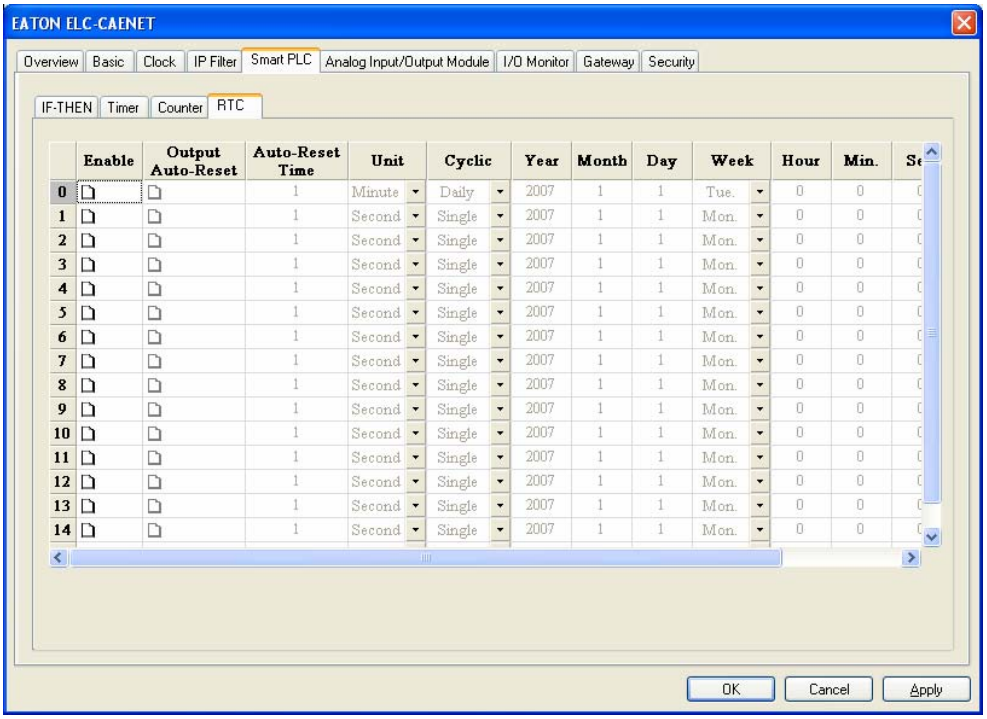
4. Count source RX NO.

   No. of the external input point RX driving the counter. Range: RX#0 ~ RX#255.

4.8.9 Local Logic Setting – RTC

The real-time clock (RTC) can be triggered by the system at a specific time. There are 16 RTC triggers in ELC-CAENET. You can designate the trigger time or trigger the RTC on a monthly, weekly or daily basis. Please refer to the descriptions for RS#0 ~ RS#159.

- **RTC**



1. Enable

   Decide whether to trigger the RTC in this column.

2. Cyclic

   Decide to trigger the RTC only once, or trigger it on a daily, weekly or monthly basis.

3. Output auto-reset

   After the RTC is triggered, decide whether to retain the output for a period of time and reset the RTC automatically. R (Coil) will be OFF when the time for reset is reached.

4. Auto-reset time, Units

   If you select to auto-reset the RTC, the bit device for each RTC trigger will remain set for a period of time. Range: 1s ~ 24hr.

   Range for seconds: 1 ~ 32,767

   Range for minutes: 1 ~ 3,600

   Range for hours: 1 ~ 24

5. Year, Month, Day, Hour, Minute, Second, Week

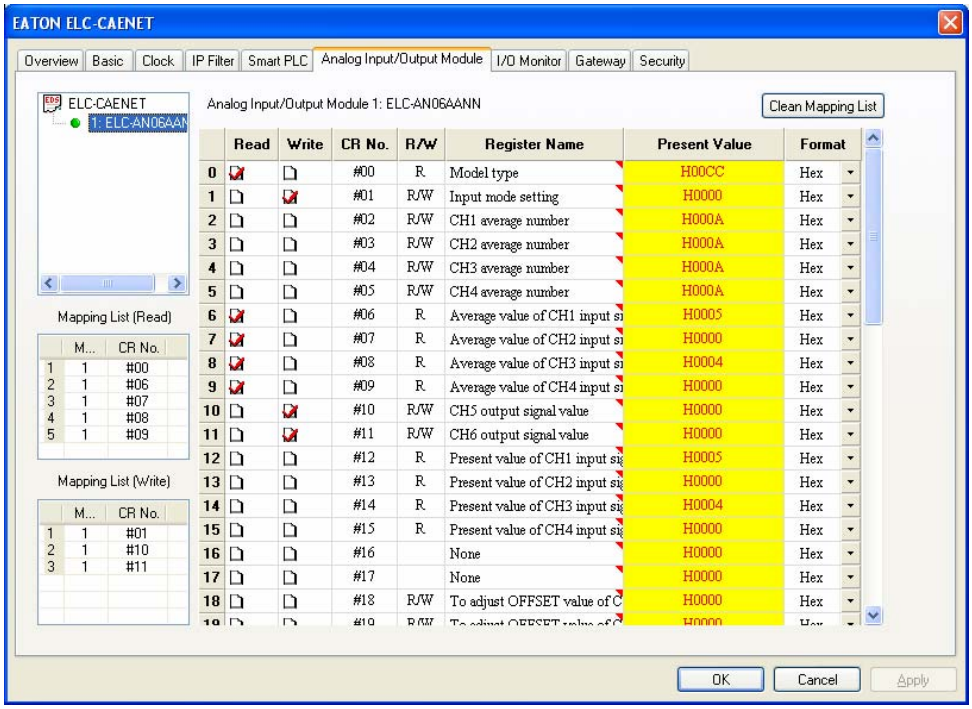
   The time to trigger the RTC. If you would like to trigger it only once, the Year, Month, Day, Hour, Minute and Second need to be set. If you would like to trigger on a daily basis, only the Hour, Minute and Second need to be set. If you would like the RTC to be triggered on a weekly basis, you only need to set up Week, Hour, Minute and Second. If the RTC is triggered monthly, set up only Day, Hour, Minute and Second.

4.8.10 Analog Input/Output Module data mapping

ELC-CAENET offers control registers (CR) for analog I/O modules. And has built-in mapping tables for the CR numbers. The user can select the CRs to be read/written and use EATON's communication module ELC-COENETM to map the CR directly to D registers in ELC-PV controller and utilize these D registers in the program, controlling and monitoring the analog I/O modules connected to ELC-CAENET. ELC-CAENET supports a maximum of reading 64 CR values and writing 64 CR values.

► This function works with the ELC-COENETM, firmware V2.0 or later.

■ **Analog I/O modules**



1. Corresponding table:
   Open ECISoft and it will automatically load in the control register information on the analog I/O modules. (When using the Web page for configuration, you must load the EDS file for analog I/O seperately.) Check the CR you are to read or write to establish a mapping table. ELC-COENETM will map the CR established in the table to D registers in ELC-PV PLC.

2. Read
   Check the CR (read) to be added to the mapping table. Click "Apply" and the checked CR will be added.

3. Write
   Check the CR (write) to be added to the mapping table. Click "Apply" and the checked CR will be added.

4. Clear mapping list

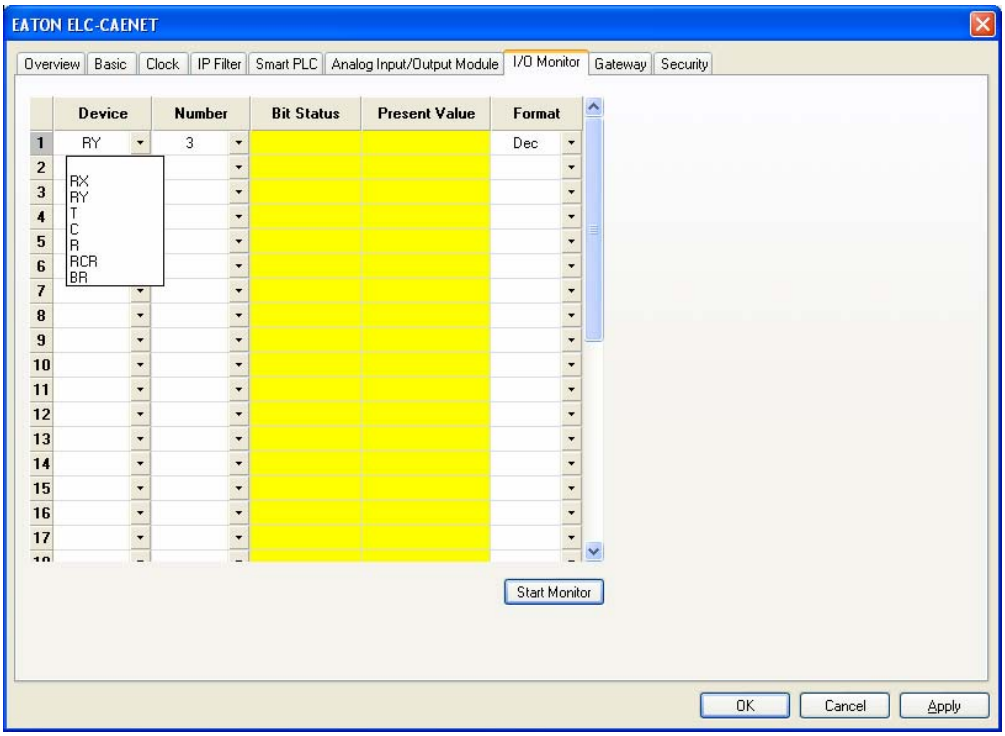
This clears all the information in the mapping table.

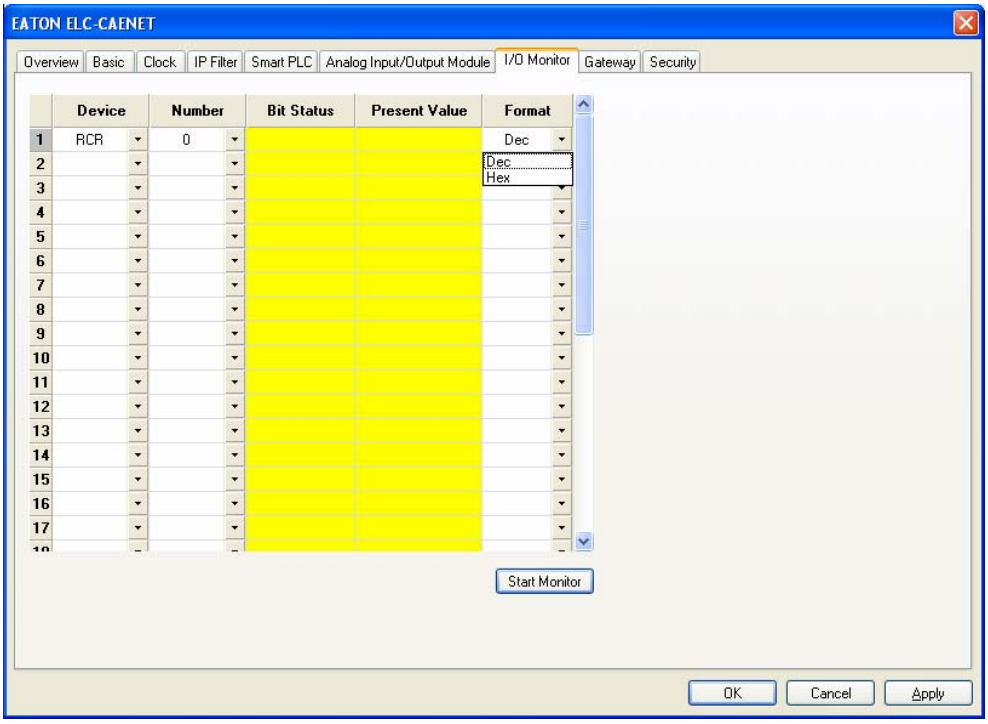
5. CR No.
   The number of the control registers for all analog I/O modules connected to ELC-CAENET.
6. R/W
   Indicating whether the CR can be read or written.
7. Register name
   The name of the CR for the analog I/O modules.
8. Present value
   The present value in the CR for the analog I/O modules.
9. Format
   The display format for each CR value. Available formats: hex, signed decimal integer and binary integer.

4.8.11 I/O Monitoring Table

ELC-CAENET is able to monitor internal registers on-line. Scroll the table to monitor bit devices RX, RY, T, C, R, RCR and BR and the bit status and present value in the register. You can choose to monitor decimal or hex values.

- **I/O monitoring table**





1. Device

   Select an internal register in the ELC-CAENET.

   Bit devices: RX, RY, T, C, R

   Registers: T, C, R, RCR, BR.

2. Number

   Select the bit devices and registers to be monitored by their numbers.

   RX#0 ~ RX#255, total 256 bits.

   RY#0 ~ RY#255, total 256 bits.

   T#0 ~ T#15, total 16 bits and 16 registers.

   C#0 ~ C#15, total 16 bits and 16 registers.

   R#0 ~ R#15, total 16 bits and 16 registers.

   RCR#0 ~ RCR#399, total 400 registers.

   BR#0 ~ BR#63, total 64 registers.

3. Format

   Select the format of the register to be monitored, decimal (Dec) or hexadecimal (Hex).

   ► Once the number and format are set, click “Apply” to save the setting and start the monitoring.

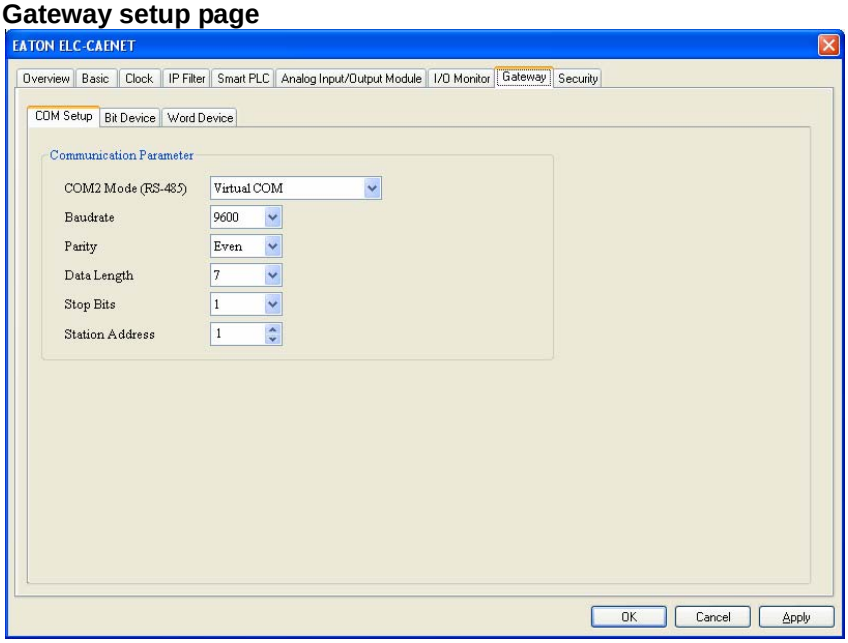
4. Start/Stop monitor

Start or stop the saved and applied device number to be monitored. Settings not applied will be deleted.

4.8.12 Setting up the Modbus TCP to Modbus serial gateway

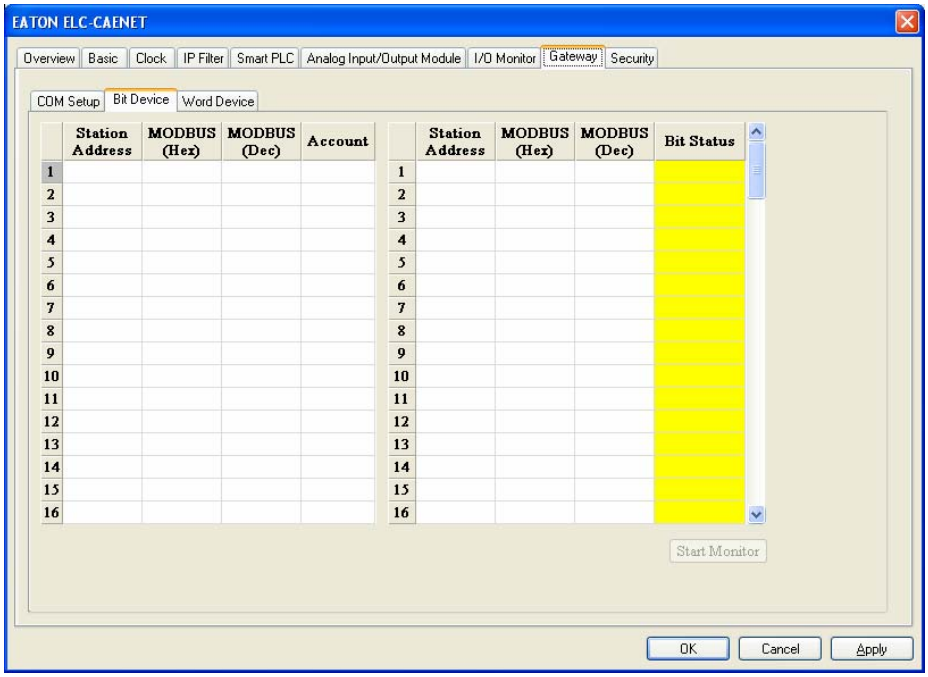
ELC-CAENET offers Modbus TCP to RS-485 gateway functions. By setting up ELC-CAENET, you can read the data in specific devices on the network. Gateway functions help you quikly store and retrieve data and offers on-line monitoring for maximum of 100 bits of data and words of data. The data can be temporarily stored in the ELC-CAENET, speeding up the write/read and response time.

- **Gateway setup page**



1. COM Setup

- COM2 Mode (RS-485):
  You can choose Modbus ASCII Master, Modbus RTU Master or Virtual COM.
- Baudrate:
  The baud rate for communication.
- Parity
- Data length
- Stop bits
- Station address:
  The Modbus address.



2. Bit device

For setting up the addresses for the bit type serial slave device and reading the contents from the designated slave.

- Station address:
  Enter the address of the slave to be monitored. (Max. 16 slaves)
- MODBUS (Hex):
  Enter the 4-digit hex Modbus address of the slave data to be monitored.
- MODBUS (Dec):
  Enter the 6-digit decimal Modbus address of the slave data to be monitored.
- Account:
  Enter the number of consecutive bits to be monitored (Max. 100).

3. Word device

For setting up the addresses for the word type serial slave device and reading the contents from the designated slave.

- Station address:
  Enter the address of slave to be monitored. (Max. 16 slaves)
- MODBUS (Hex):
  Enter the 4-digit hex Modbus address of the slave data to be monitored.
- MODBUS (Dec):
  Enter the 6-digit decimal Modbus address of the slave data to be monitored.
- Account:
  Enter the number of consecutive words to be monitored (Max. 100).

▶ Once the information of slave monitoring is set, click "Apply" to save the setting and start the monitoring. Incomplete device information will be deleted.

- Format:

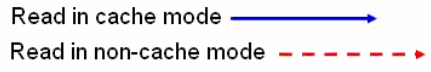
  Select the format of the register to be monitored, decimal (Dec), hexadecimal (Hex) or binary.

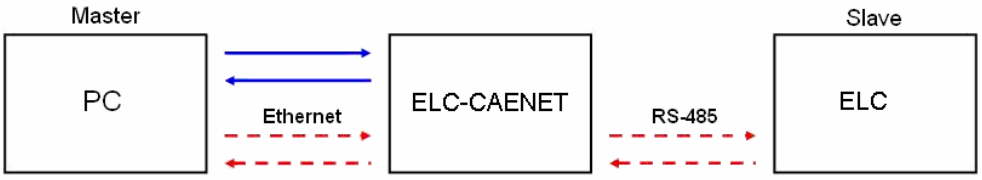
- Start/Stop monitor

  Start or stop the saved and applied device number to be monitored. Unapplied saved settings will be deleted.

Note:

The default is in cache enabled mode. You can set up maximum 16 sets of slave information for the monitored bits and words (Max. 100 data). Under the cache mode, you are able to send the read data back to the registers in ELC-CAENET.

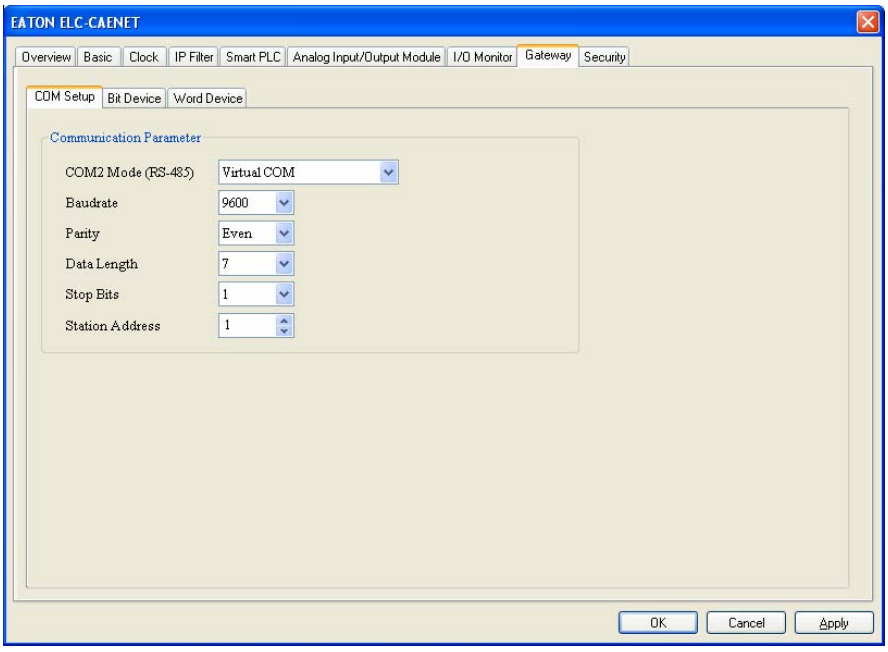




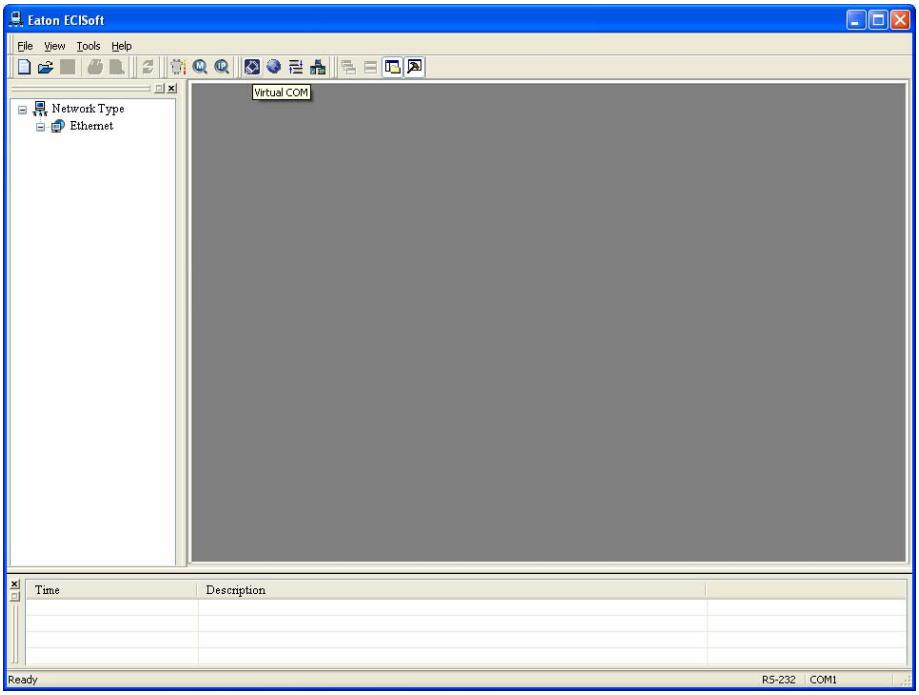
4.8.13 Setting up virtual Com

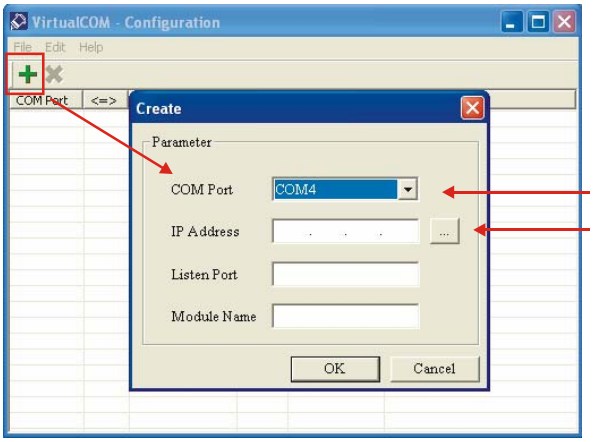
The virtual COM converts the data sent to the RS-232 port into Ethernet.

- **Select Virtual COM for COM2 mode (RS-485)**



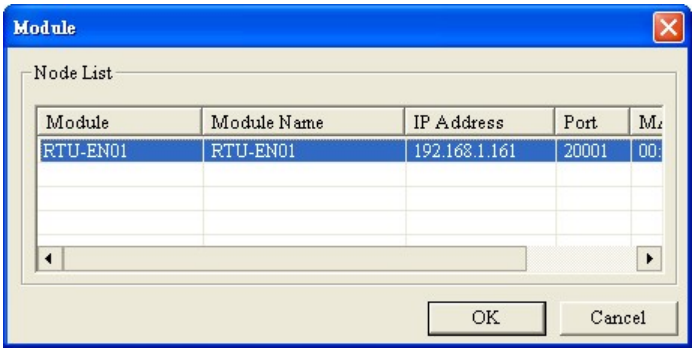
- The default setting for listen port is 20001.
- Open the setup page for Virtual COM.





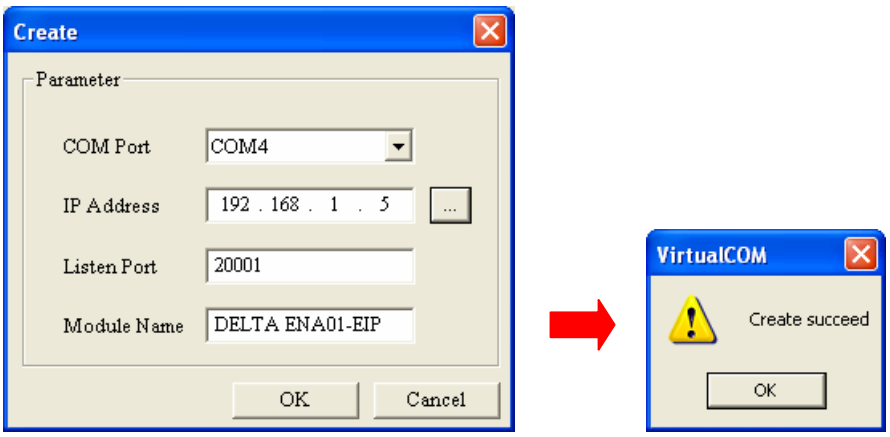
Select COM port
Search device on network or enter IP address

- Press “Search”, and you will see all the connected devices on the network

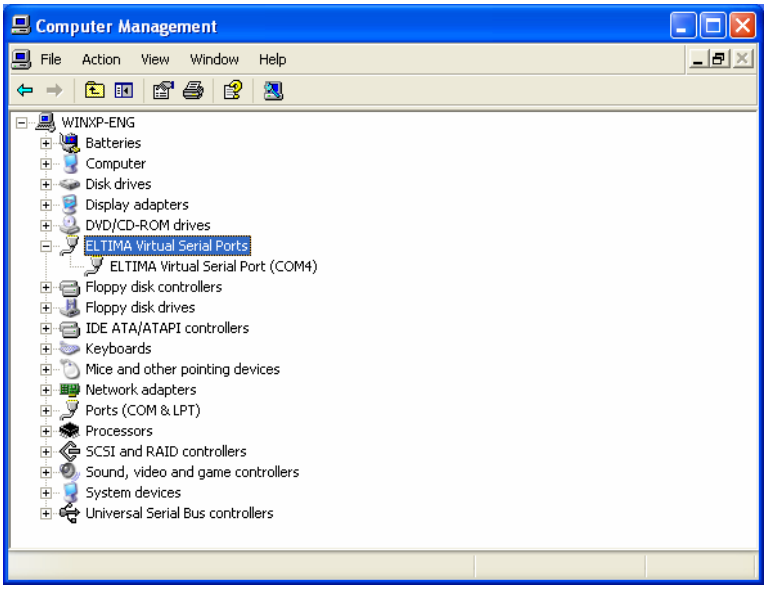


- Select the device and click “OK”. Information on the device will be loaded in automatically.

Press “OK” to complete the setup.



- Once the setup is completed, you will then be able to see the virtual COM just set in “Computer Management”.

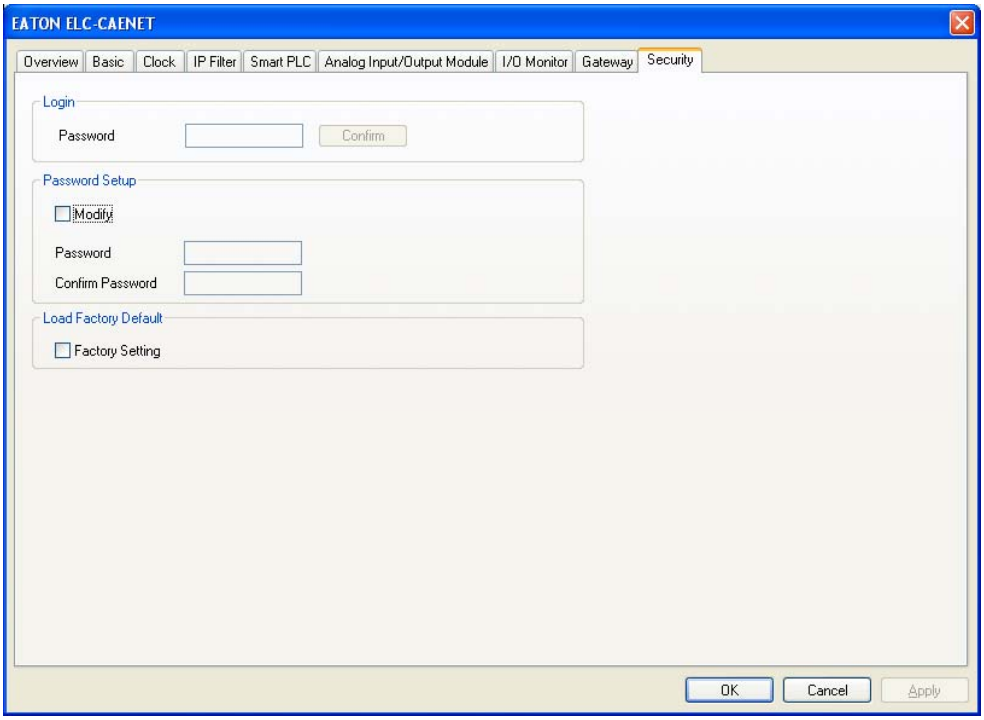


4.8.14 Security Setting

To prevent the values set in the ELC-CAENET from being modified, you can set up passwords

to lock the settings in the ELC-CAENET.

- Setting up a password



1. Login

   Log in to check and modify parameters.

2. Password setup

   Check the “Modify” box to set up the password.

3. Password

   Enter maximum 4 characters. Leave it blank to clear the password.

4. Confirm password

   Enter the new password again.

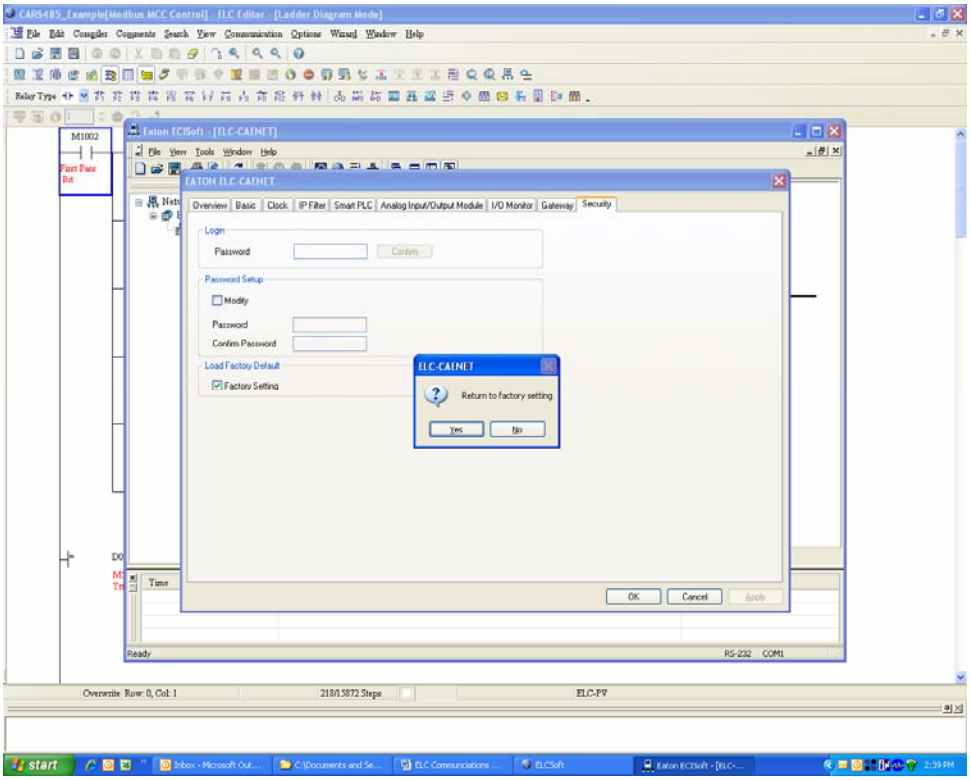
Note:

Once the password is set, none of the configuration pages can be accessed unless you enter the password. However, if you access the ELC-CAENET via RS-232, you can return the module to defaults whether the password isset or not. For example, if you have locked ELC-CAENET but forget the password, you must return the ELC-CAENET to default settings viay RS-232, and all the settings will return to default.

4.8.15 Returning to Default Settings

If you need to clear all the settings and return them to defaults, check the “Factory Setting” box.

- **Returning to default settings**



Check “Factory Setting” box and click on “Yes”.

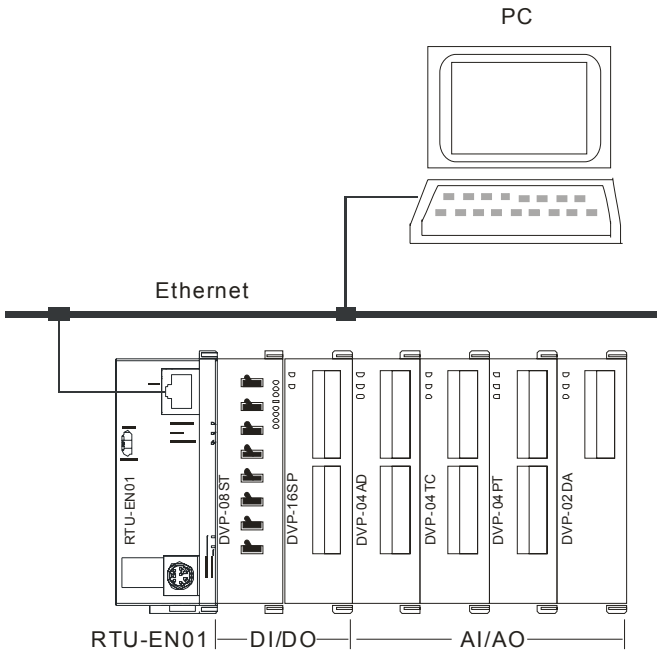
Note:

If you set up the ELC-CAENET via RS-232, you can return the settings to defaults whether the password is locked or not. It will take approximately 10 seconds to return to default settings, so DO NOT switch off the power within the until it’s complete.

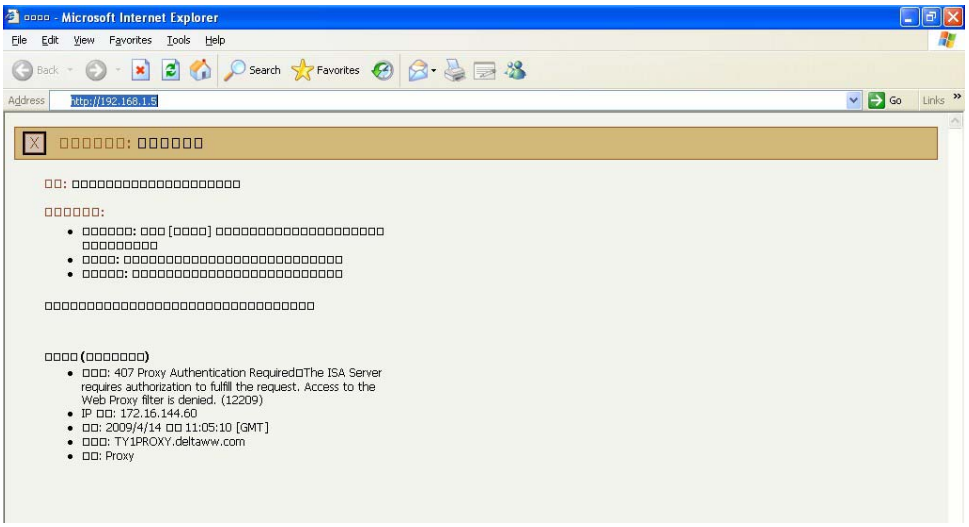
4.8.16 Web Function

ELC-CAENET offers a Web function for the user to connect through an Internet browser (e.g. Internet Explorer). You can configure and monitor the ELC-CAENET using this embedded web page.

1. Set up serial communications.



2. Open Internet Explorer and enter IP address “192.168.1.5” (default) of ELC-CAENET. You can also copy the IP address of ELC-CAENET in ECISoft and paste it to the address column in IE. Press “Enter” on keyboard to open the webpage.



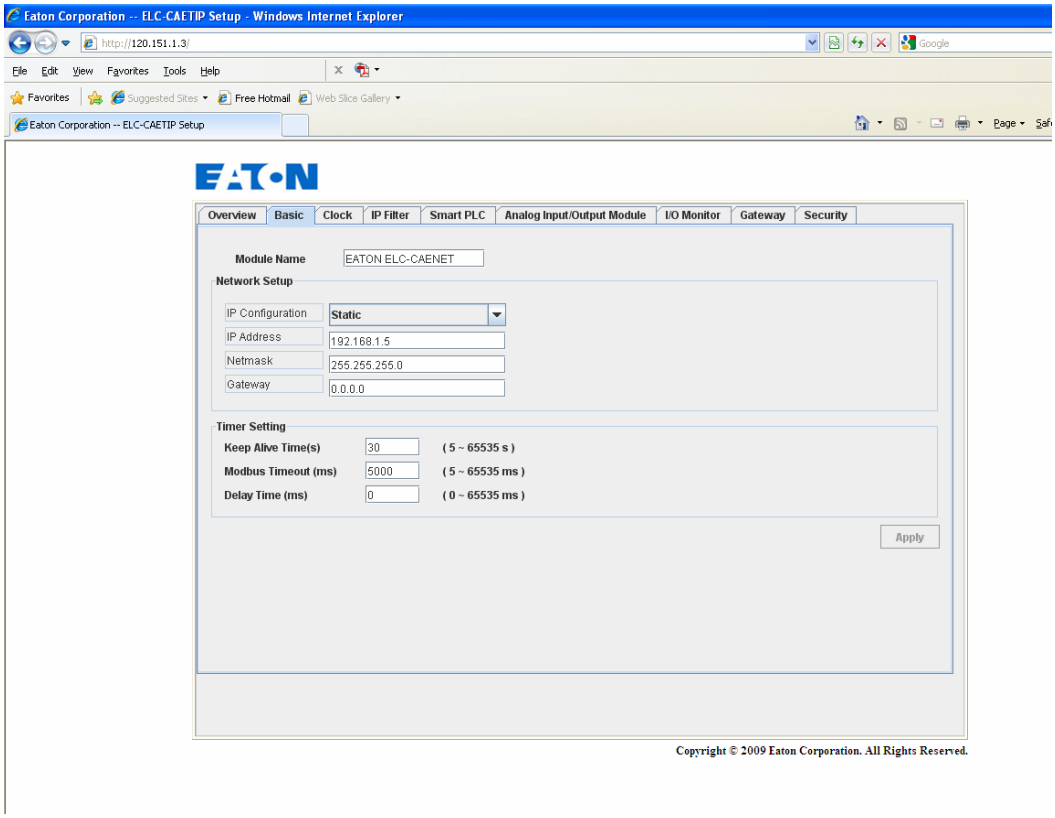
3. To use the analog input/output modules tab via the web, download “EatonR-Side-S_ENU.eds” file from Delta’s website first and import the file to the page. in the web pages will look just like the tabs in ECISoft. The webpage supports Java Runtime Environment (JRE) v1.4.2_xx and above.
4. Webpage troubleshooting

   Unable to connect:

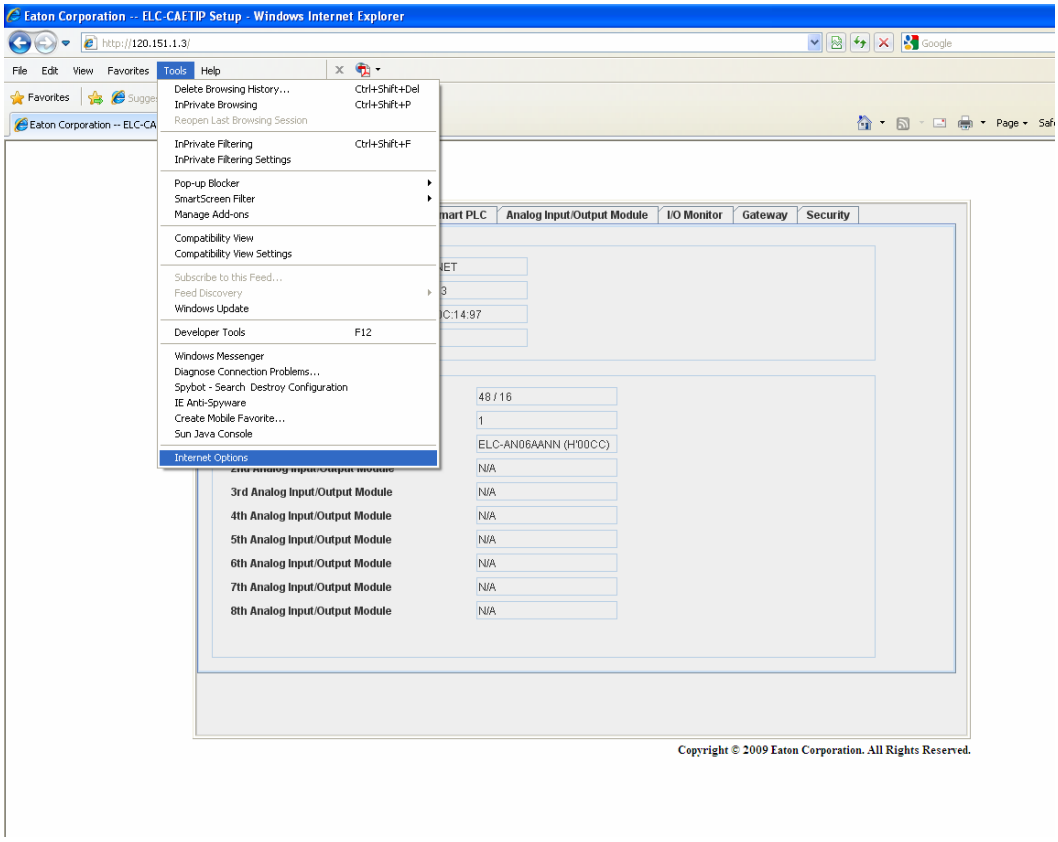
   (1) Check if Java is correctly installed. Connect to the Java page to confirm.

   (2) Check Proxy settings. Close Proxy or set up exceptions.

   Close Proxy:

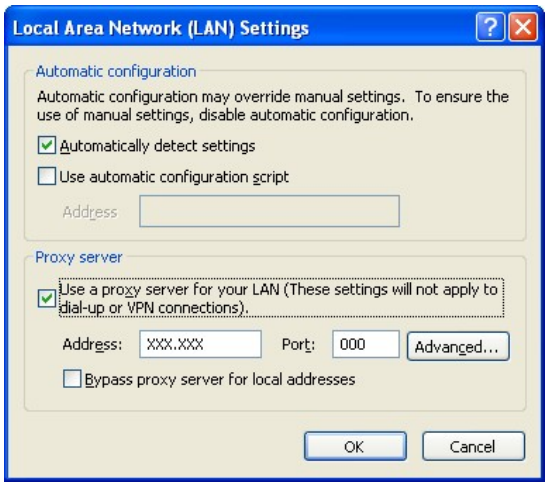


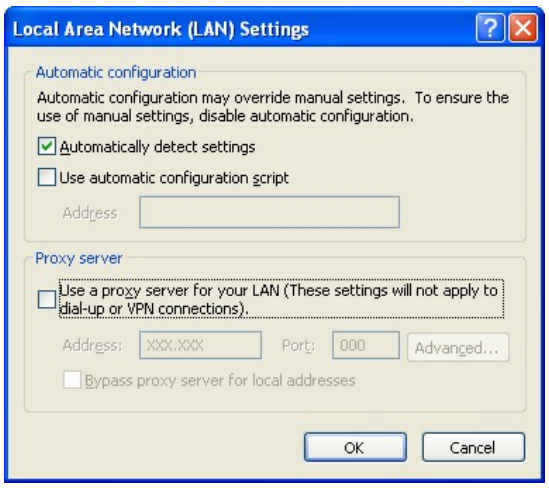
1. In IE, select “Tool” => “Internet Options…”.



2. Select “Connections” and Click “LAN Settings…".

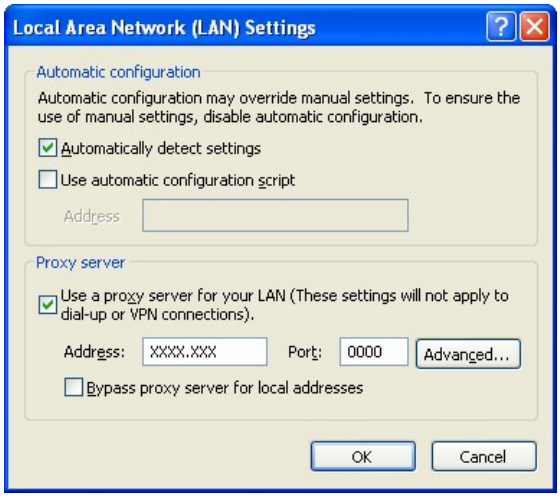
3. Uncheck “Proxy server” options and click "OK”.



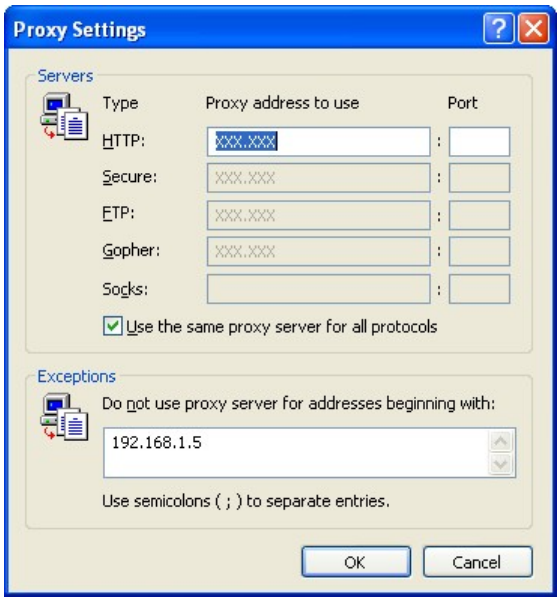


Set up exceptions:

1. Click “Advanced…” on Local Area Network (LAN) Settings page.



2. Enter the IP address “192.168.1.5” of ELC-CAENET in Exceptions.

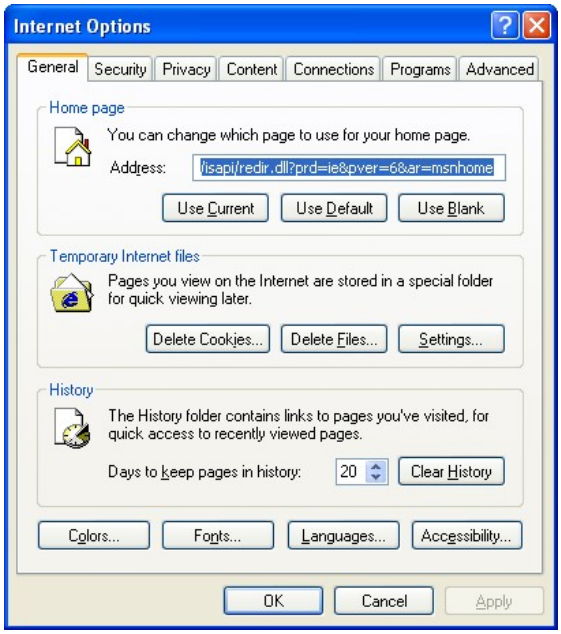


3. Click “OK”.

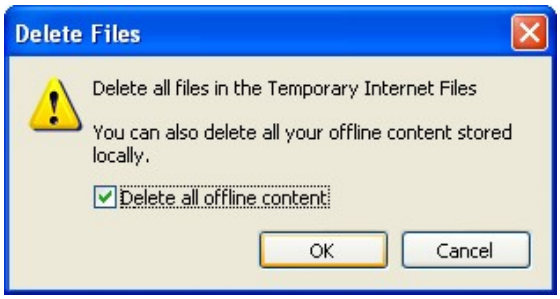
Abnormal webpage action: In this case, please clear your temporary Internet files.

Clear temporary Internet files:

1. In IE, select “Tools” => “Internet Options…”.
   In the “General” page, click “Delete Files…” in Temporary Internet files column.



2. Check “Delete all offline content” and click "OK” to start the deletion.



3. Click “OK” to leave the “General” page.

4.8.17 Reading the ELC-CAENET EDS file to view/edit analog data

When using the web pages to configure and view the data on the Analog I/O Module tab, click the “Read EDS File” button and browse the following path on your computer for the EDS file:

C:\Program Files\EATON\Communication\ECISoft\EDS

The filename is: EatonR-Side-S_ENU.eds

Select the file and click Open and all the analog information available will be filled in on this page. It will also allow you to configure this page and download it to the module.

4.9 Using the ELC-PV Controller and the ELC-COENETM Ethernet Module to Control and Monitor I/O Data from Distributed I/O Adapter ELC-CAENET via Modbus TCP Ethernet

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:

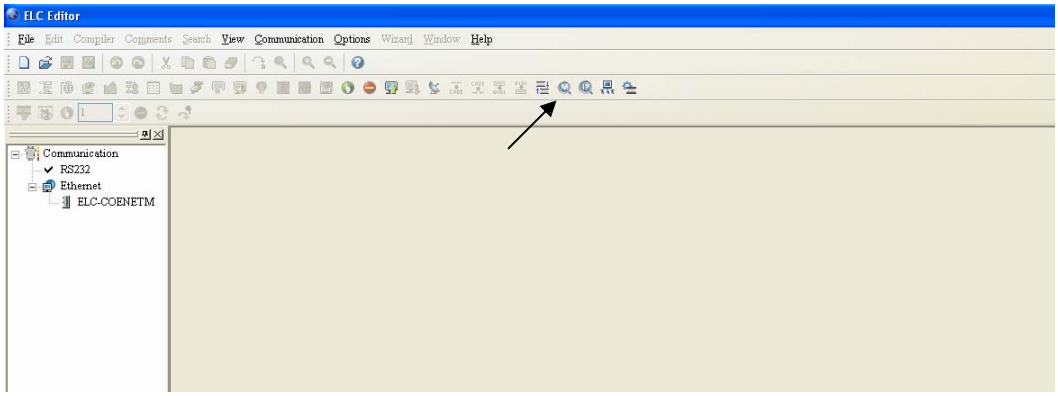
(1) ELC-PV28 controller
(1) ELC-COENETM Ethernet module (Modbus TCP protocol)
(1) ELC-CAENET Ethernet distributed I/O adapter
(1) ELC-PS02 24vdc power supply
(1) Ethernet switch 10/100mbps
(3) Ethernet patch cables

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:

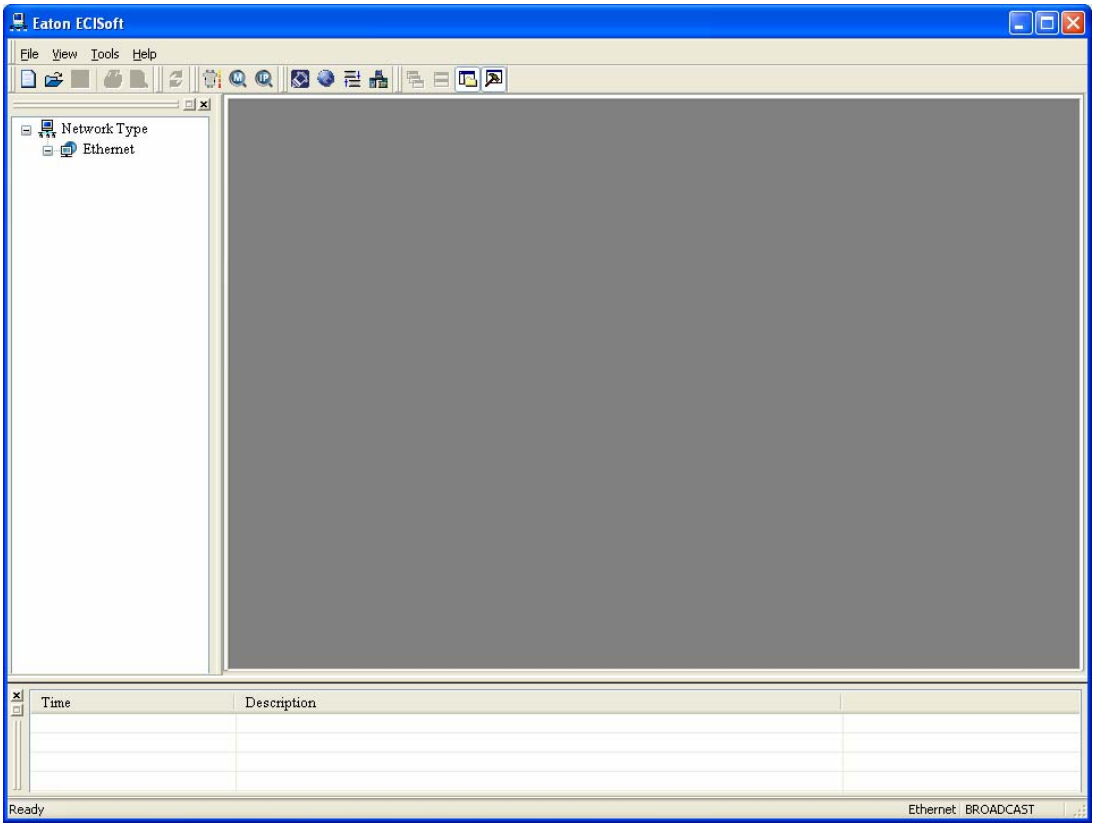
1. ELC-COENETM	120.151.1.2
2. ELC-CAENET	120.151.1.3
3. Computer running ELCSoft/ECISoft	120.151.1.1

Configuring the ELC-CAENET Distributed I/O Adapter

ECISoft is used to configure the ELC-CAENET adapter. Start ELCSoft 2.0 or later, and 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.

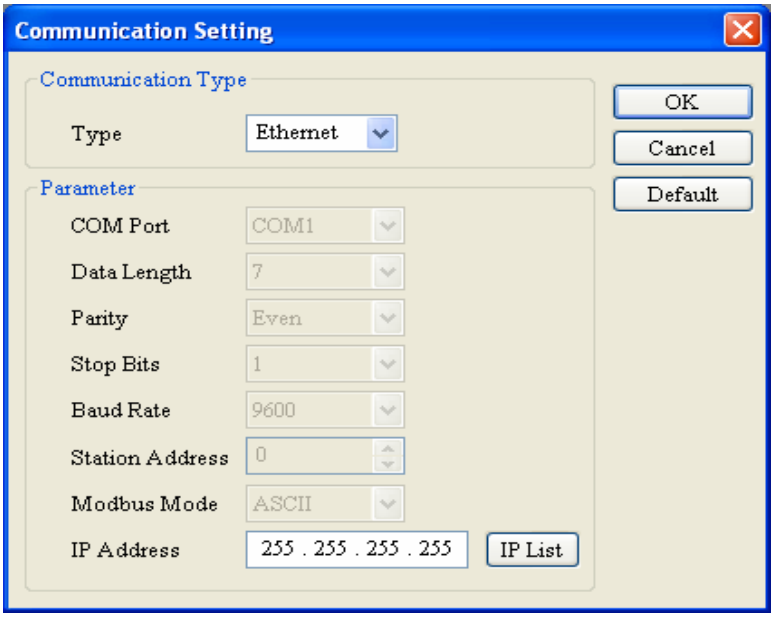


The following window will open after the ECISoft button is clicked:

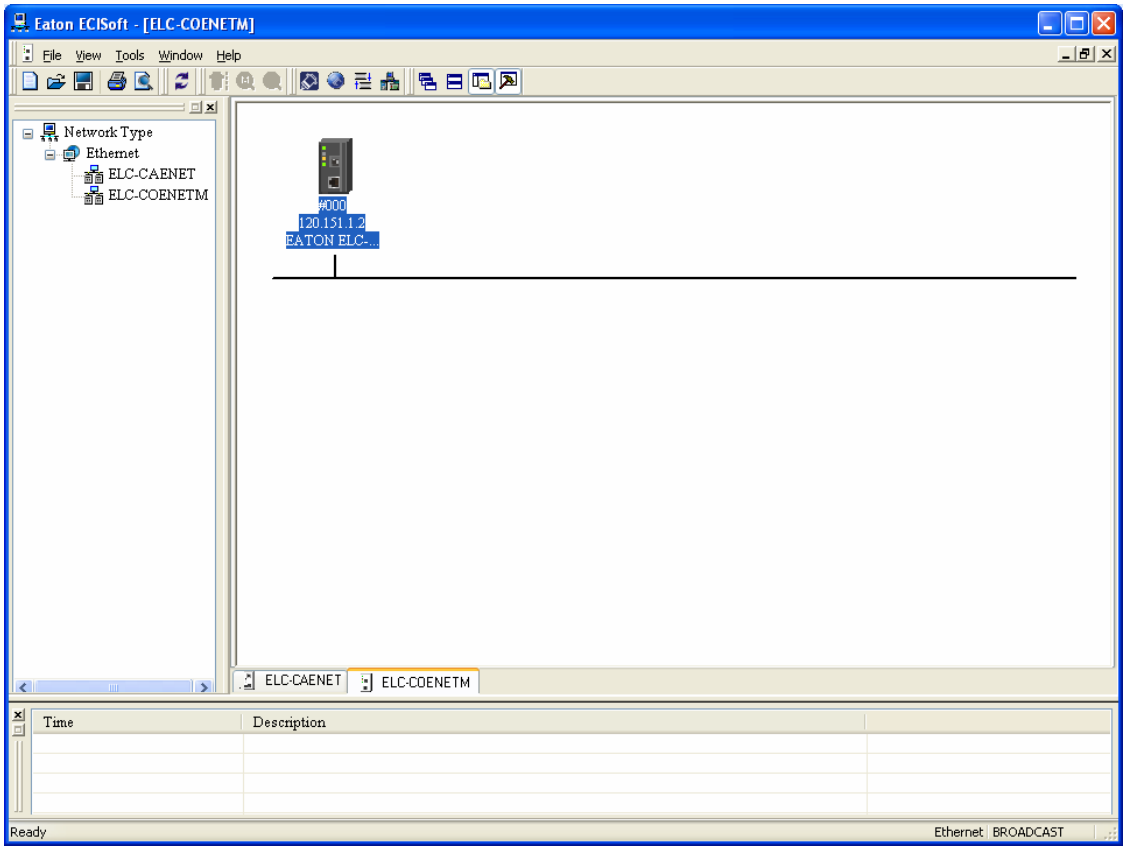


The ELC programming cable (ELC-CBPCELC3) may be used to connect to and configure each Ethernet module or Ethernet may be used to connect to both modules. For this example, RS232 was used to initially configure the IP address and Subnet Mask for each Ethernet module. The Ethernet modules do support DHCP. 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.

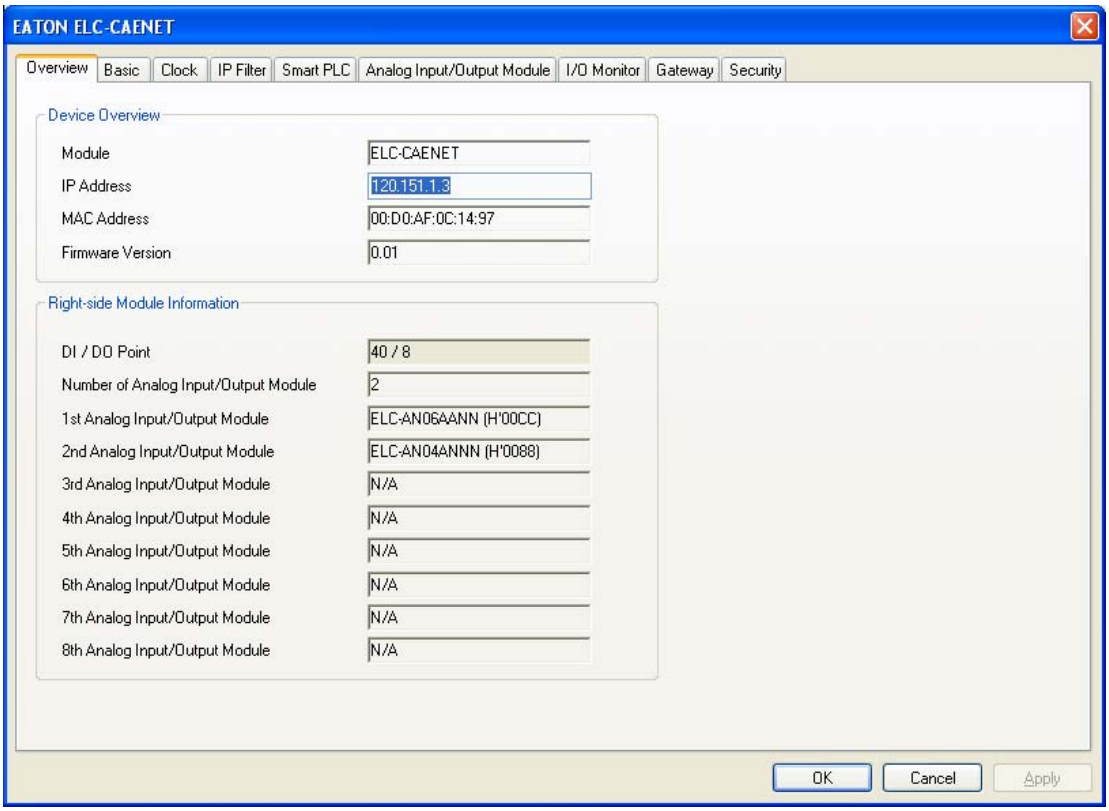
In ECISoft select the Tools drop down menu then choose Communication Setting. For this example the IP addresses are set up for each device as shown earlier in this document. The Communication Setting page looks like the following:



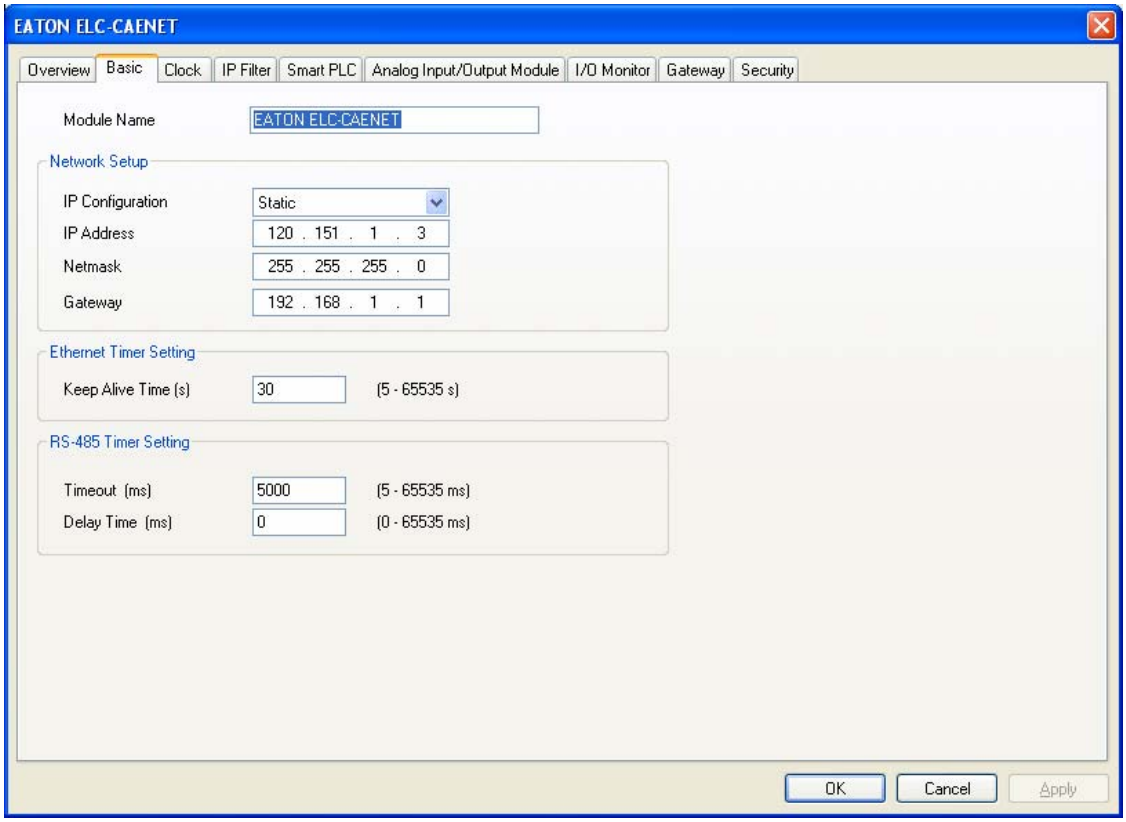
Click OK after selecting Ethernet for the Type. Then in ECISoft, click the IP "magnifying glass" and the software will search for all ELC Ethernet devices connected to the same Ethernet switch. When complete, the following screen will be displayed:



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

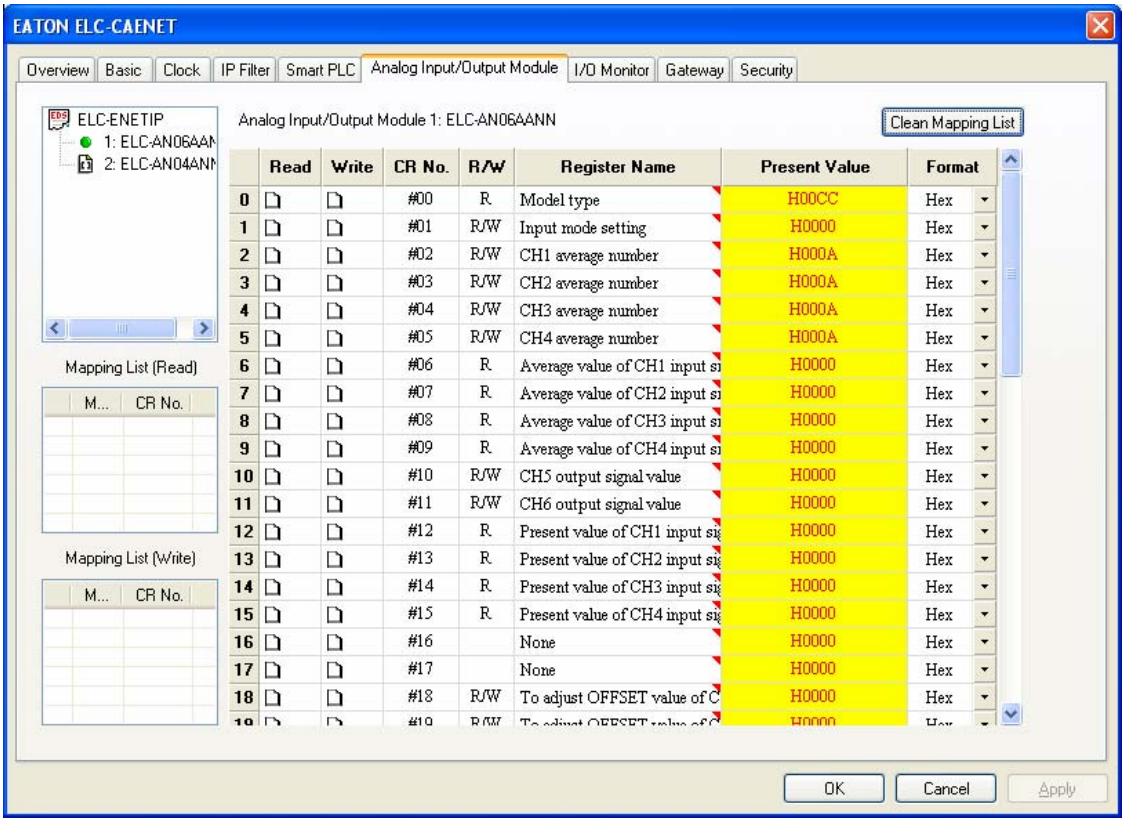
ELC-AN06AANN 4 input, 2 output analog module

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.

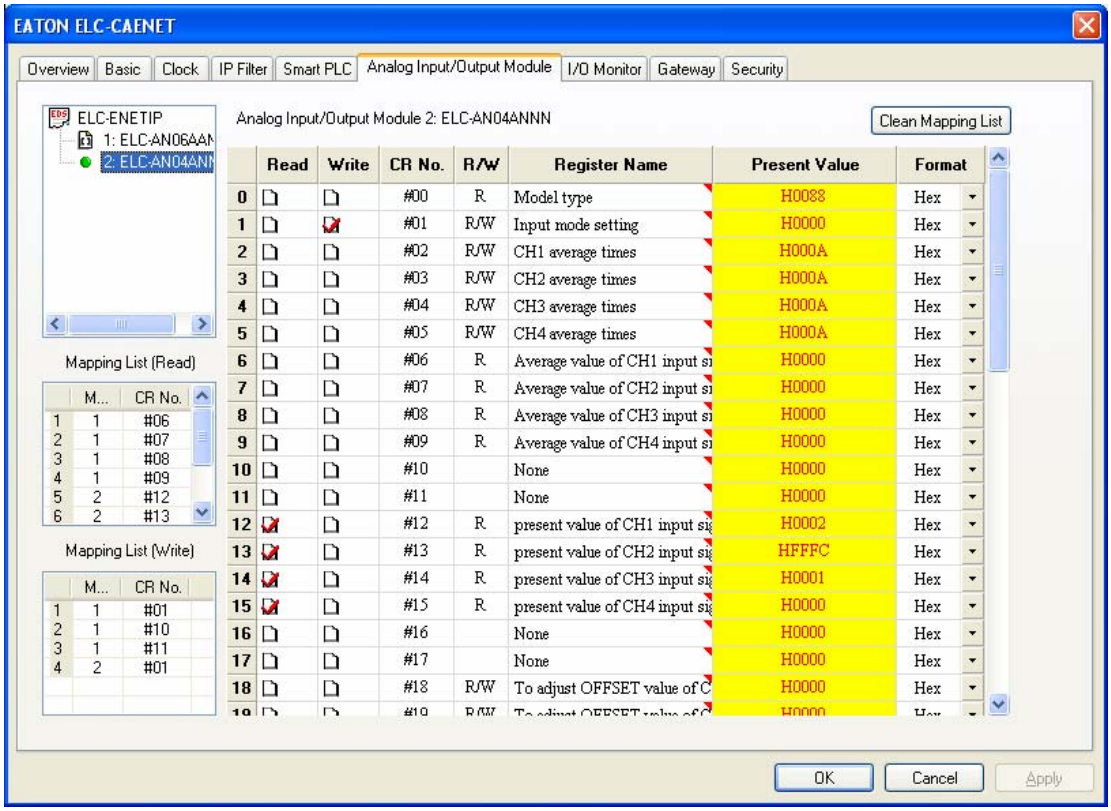
Click the ELC-AN04ANNN in the upper left box to select it. The mapping list is cleared so parameters for this module can now be selected as follows:

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.



	Read	Write	CR No.	R/W	Register Name	Present Value	Format
0	☐	☐	#00	R	Model type	H0088	Hex
1	☐	☑	#01	R/W	Input mode setting	H0000	Hex
2	☐	☐	#02	R/W	CH1 average times	H000A	Hex
3	☐	☐	#03	R/W	CH2 average times	H000A	Hex
4	☐	☐	#04	R/W	CH3 average times	H000A	Hex
5	☐	☐	#05	R/W	CH4 average times	H000A	Hex
6	☐	☐	#06	R	Average value of CH1 input si	H0000	Hex
7	☐	☐	#07	R	Average value of CH2 input si	H0000	Hex
8	☐	☐	#08	R	Average value of CH3 input si	H0000	Hex
9	☐	☐	#09	R	Average value of CH4 input si	H0000	Hex
10	☐	☐	#10		None	H0000	Hex
11	☐	☐	#11		None	H0000	Hex
12	☑	☐	#12	R	present value of CH1 input sig	H0002	Hex
13	☑	☐	#13	R	present value of CH2 input sig	HFFFC	Hex
14	☑	☐	#14	R	present value of CH3 input sig	H0001	Hex
15	☑	☐	#15	R	present value of CH4 input sig	H0000	Hex
16	☐	☐	#16		None	H0000	Hex
17	☐	☐	#17		None	H0000	Hex
18	☐	☐	#18	R/W	To adjust OFFSET value of C	H0000	Hex

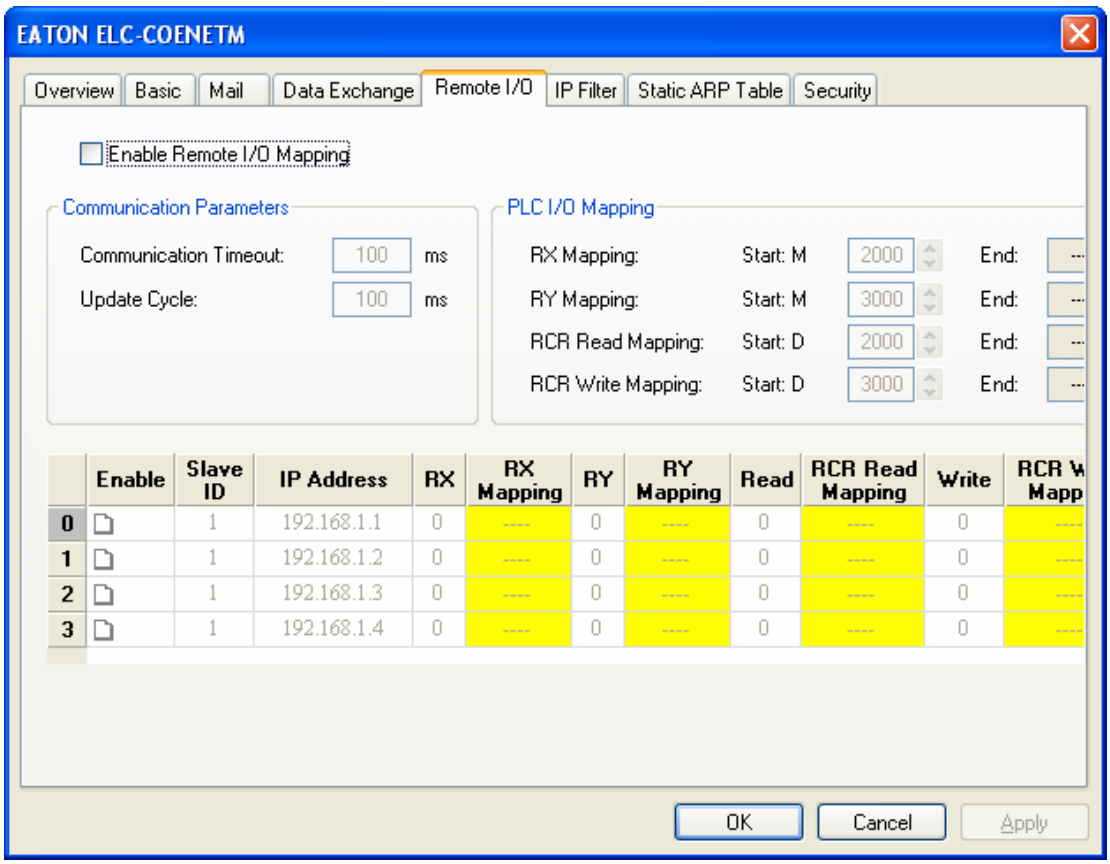
	M...	CR No.
1	1	#06
2	1	#07
3	1	#08
4	1	#09
5	2	#12
6	2	#13

	M...	CR No.
1	1	#01
2	1	#10
3	1	#11
4	2	#01

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:

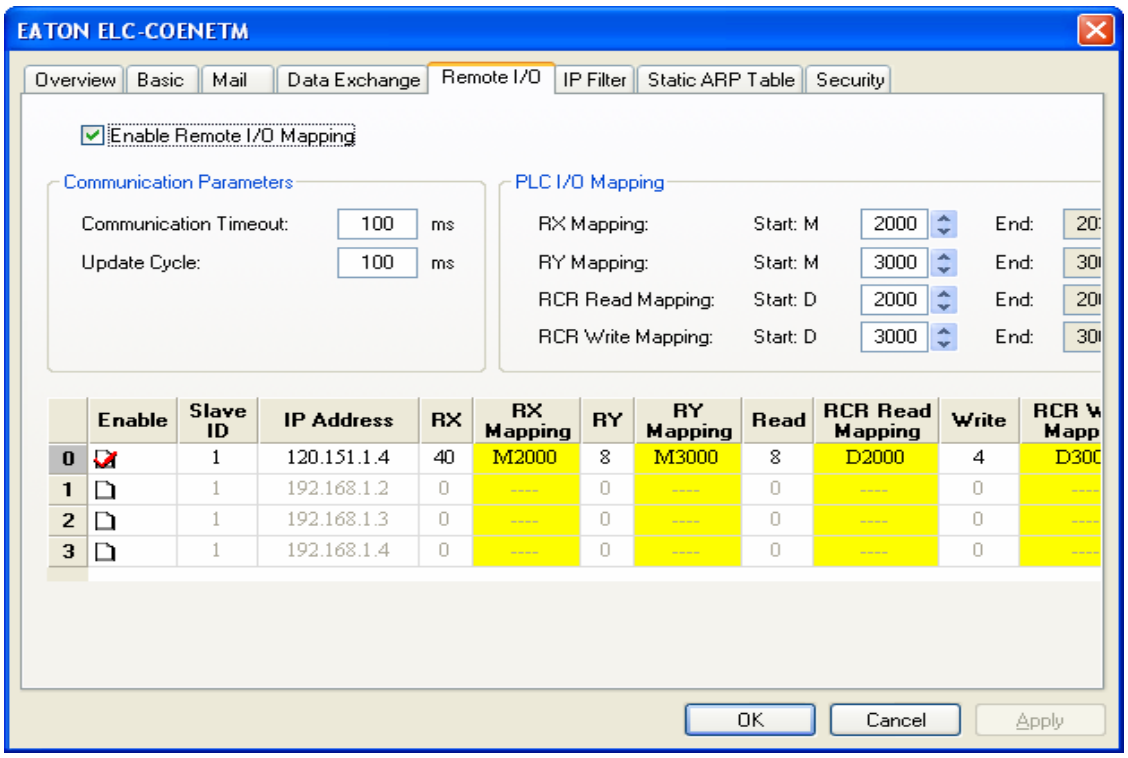
RX (digital inputs) = 40 bits

RY (digital outputs) = 8 bits

Read (analog input data) = 8 words

Write (analog outout 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.

4.10 Using a Rockwell CompactLogix PLC and RSLOGIX5000 to Control and Monitor I/O Data from Distributed I/O Adapter ELC-CAENET via Ethernet IP

This application example will demonstrate how to set up a Rockwell CompactLogix PLC with an imbedded Ethernet IP scanner port to read and write I/O data from an ELC-CAENET Ethernet distributed I/O adapter. The software used to configure the adapter is called ECISoft and is included in ELCSoft. The software used to configure the CompactLogix PLC and its Ethernet IP port is RSLOGIX5000.

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

(1) CompactLogix L23E controller
(1) ELC-CAENET Ethernet distributed I/O adapter
(1) ELC-PS02 24vdc power supply
(1) Ethernet switch 10/100mbps

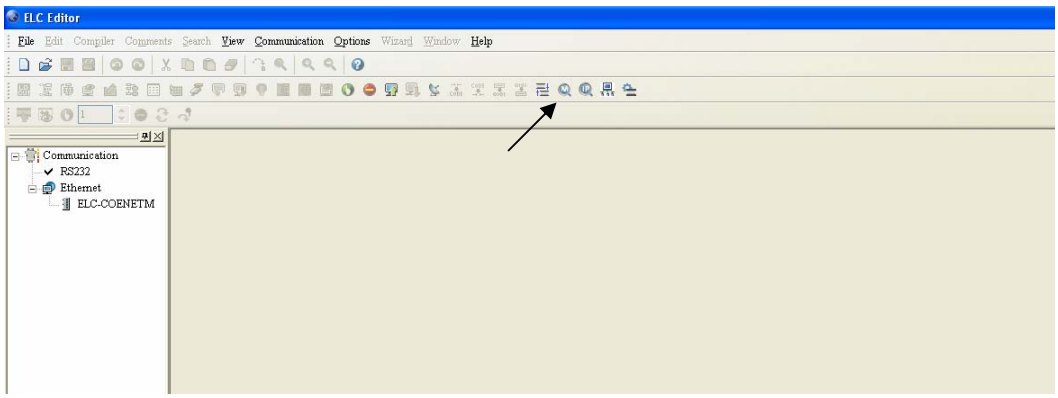
(3) Ethernet patch cables

Both Ethernet modules are connected to the switch along with the computer running ECISoft and RSLOGIX5000. The Subnet mask used for all devices is: 255.255.255.0. The IP addresses used for each device are:

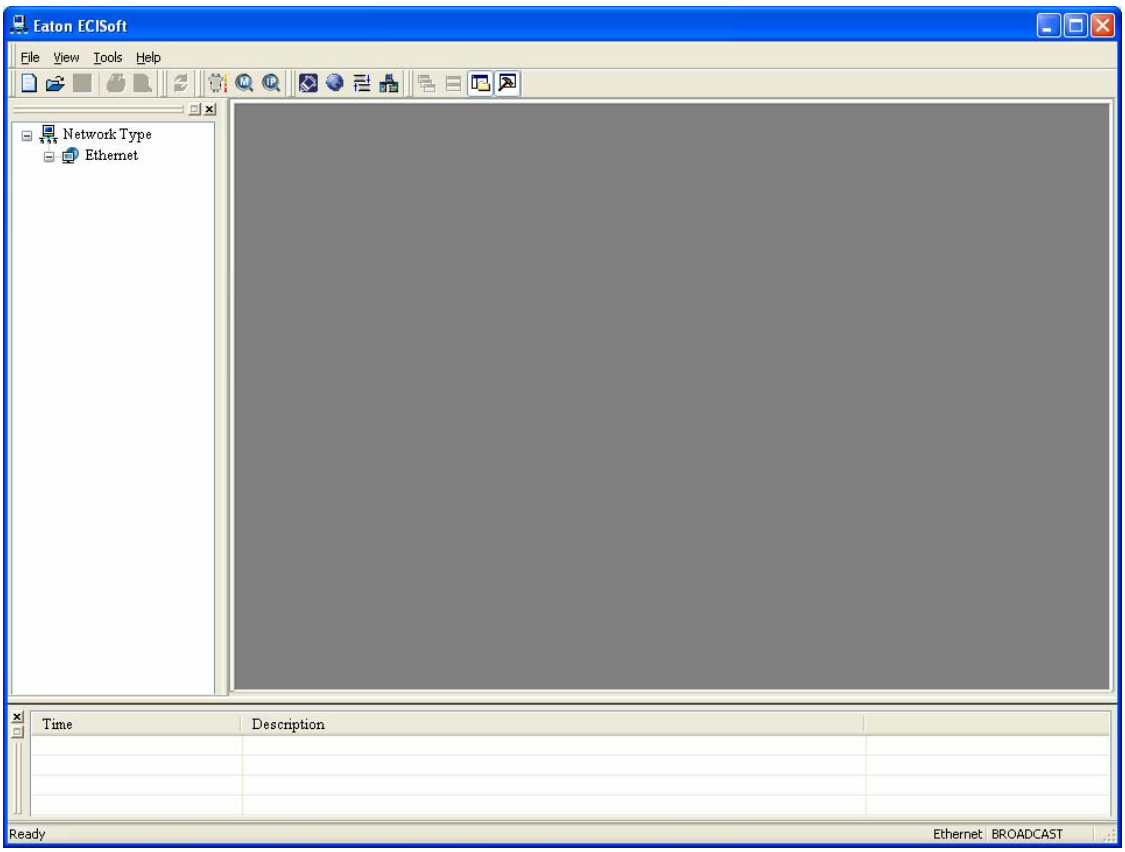
1. CompactLogix L23E 120.151.1.2
2. ELC-CAENET 120.151.1.3
3. Computer 120.151.1.1

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.

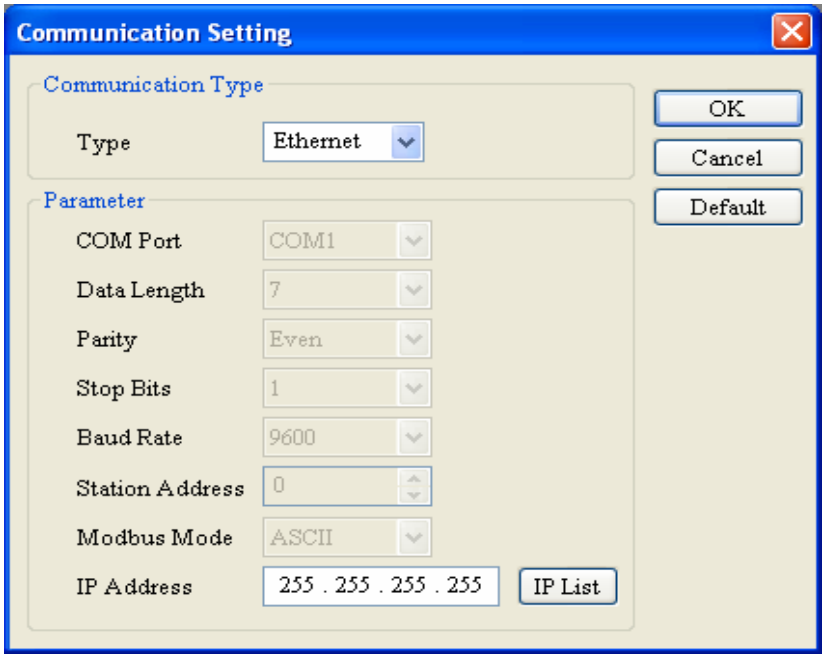


The following window will open after the ECISoft button is clicked:

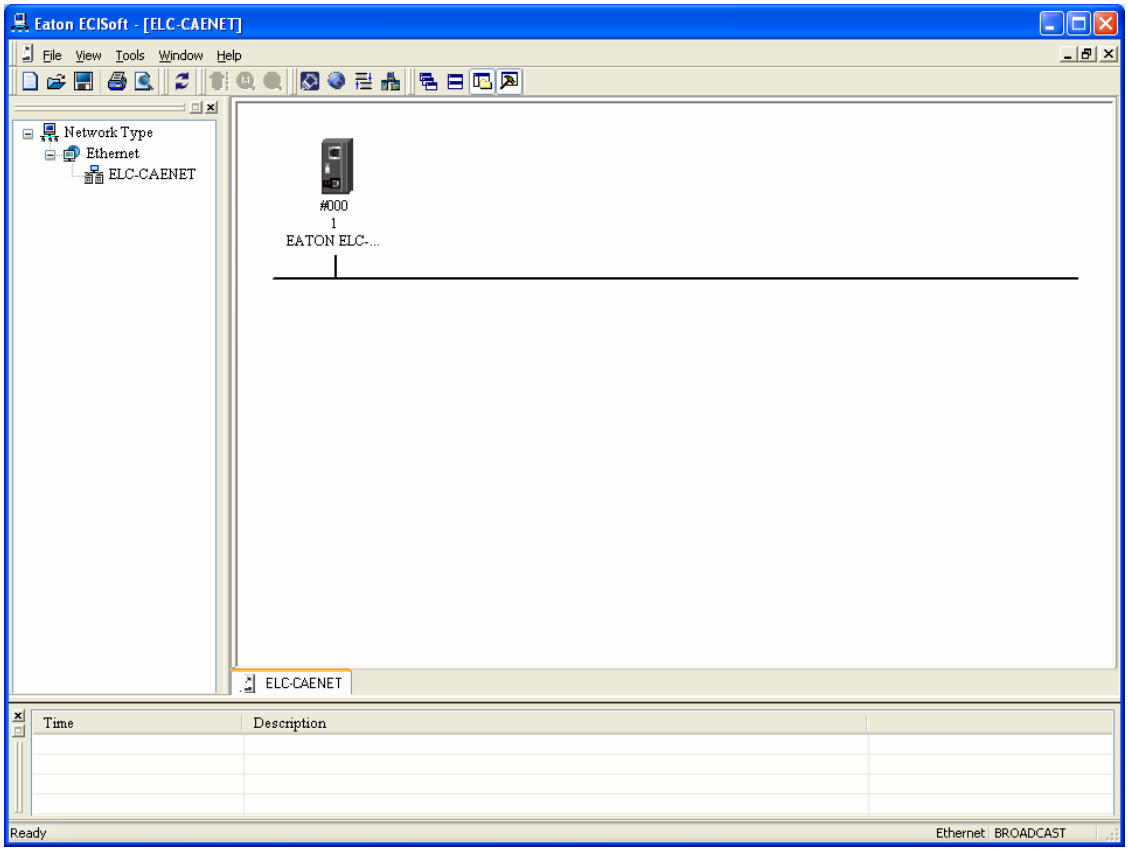


The ELC programming cable (ELC-CBPCELC3) may be used to connect to and configure the ELC-CAENET module or Ethernet may be used to connect to the module. For this example, RS232 was used to initially configure the IP address and Subnet Mask for the CAENET Ethernet module. The Ethernet module does support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

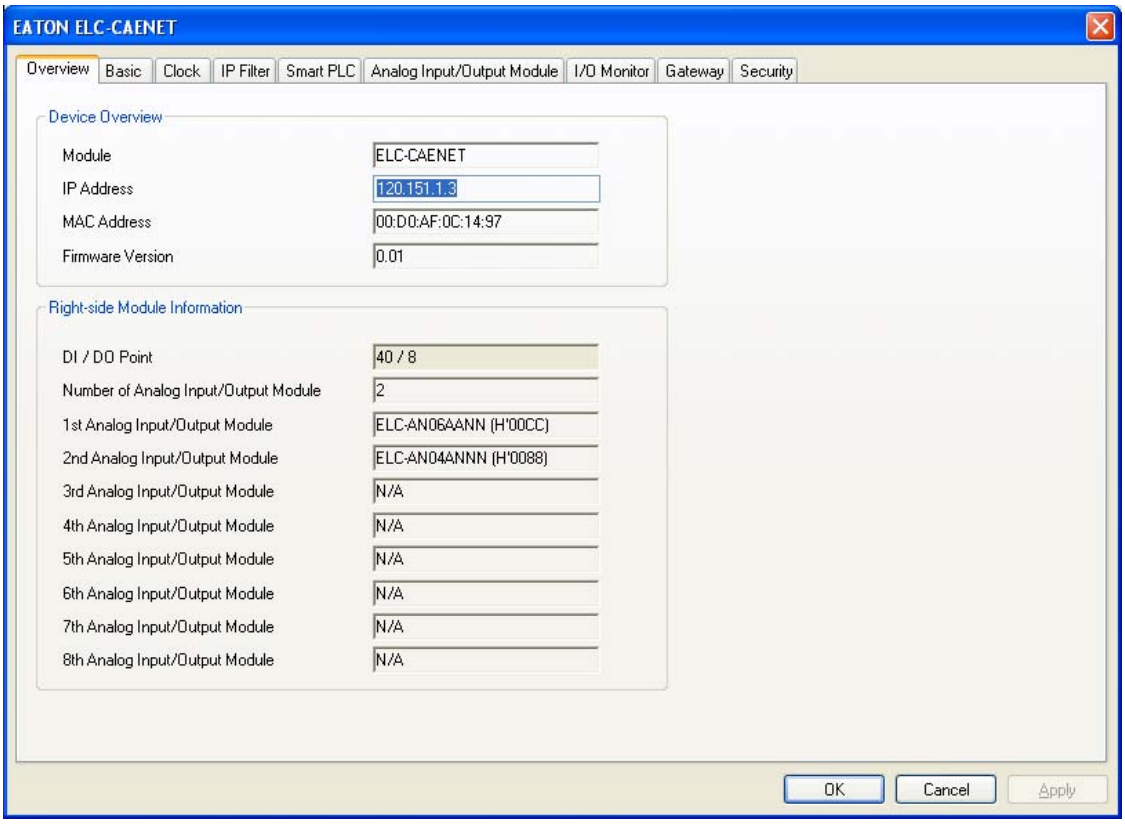
In ECISoft select the Tools drop down menu then choose Communication Setting. For this example the IP addresses are set up for each device as shown earlier in this document. The Communication Setting page looks like the following:



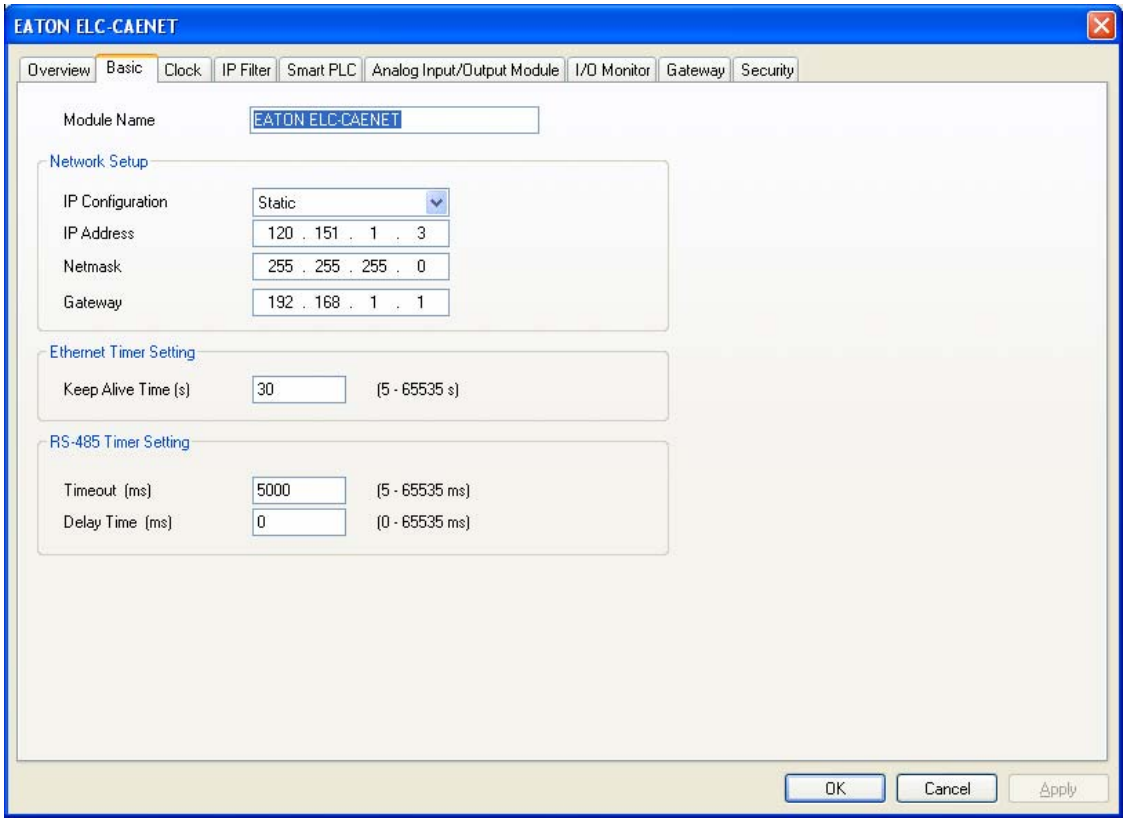
Click OK after selecting Ethernet for the Type. Then in ECISoft, click the IP "magnifying glass" and the software will search for all ELC Ethernet devices connected to the same Ethernet switch. When complete, the following screen will be displayed:



Note that the ELC-CAENET module has been found. Double click its icon to open its configuration pages as follows:



The Overview window displays specifics about the 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:

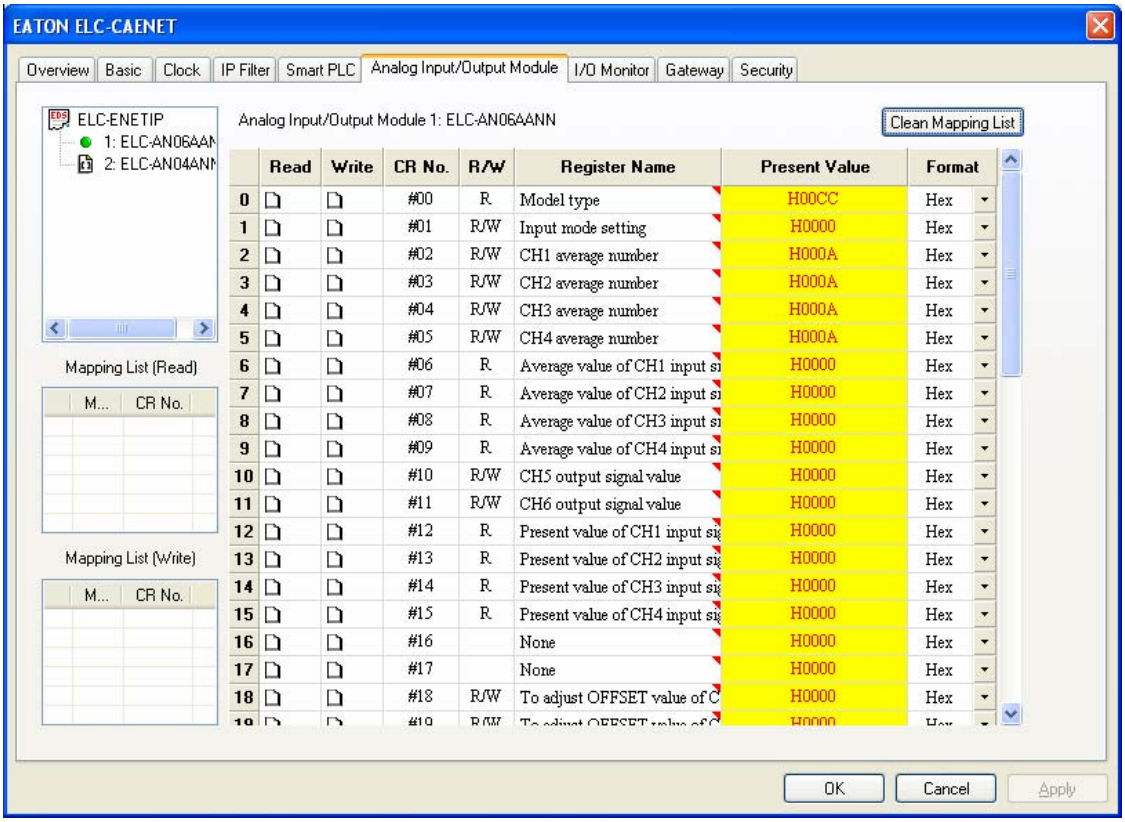


Select the Overview tab. Note that there are 40 digital inputs, 8 digital outputs and 2 analog modules connected to the ELC-CAENET adapter. For this application, the following modules are connected to the adapter from left to right:

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 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).

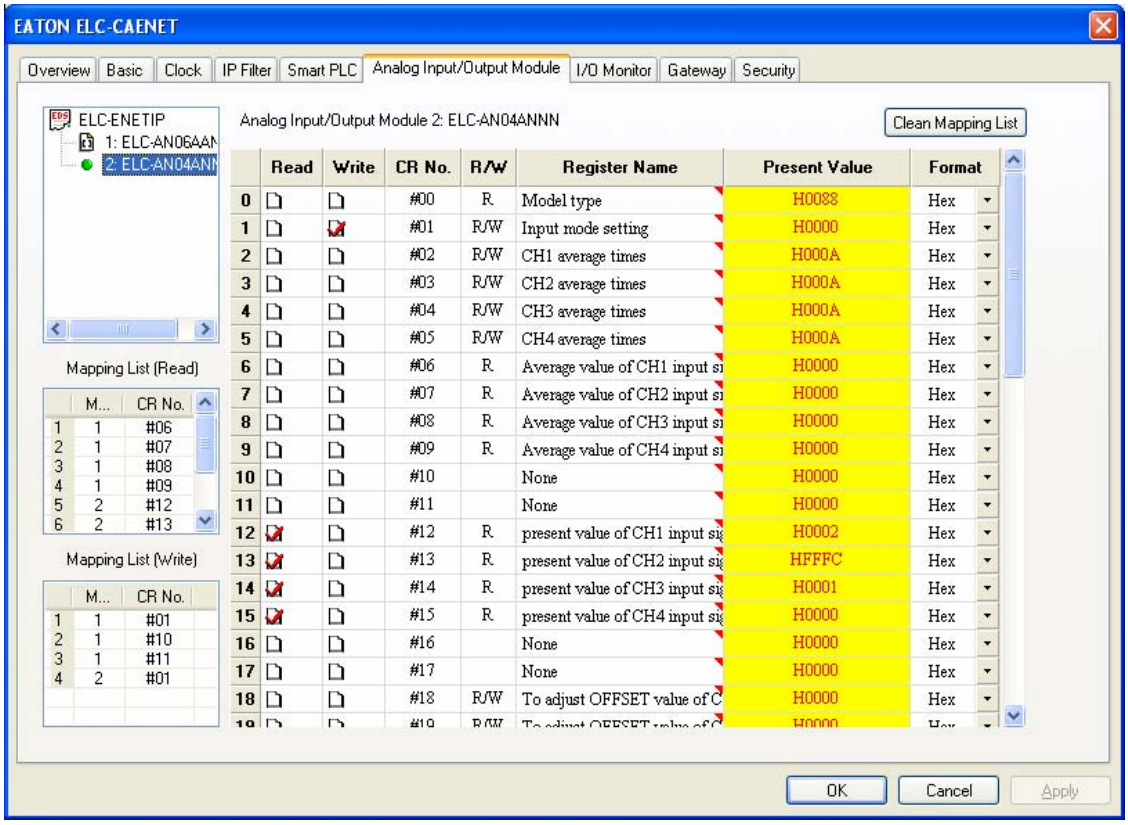
Click Apply and the chosen values are displayed in the Read and Write Mapping Lists shown on the left side of the screen.

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 PLC program.



Click OK to save the configuration and exit this screen.

The ELC-CAENET module creates an Input Image with all possible discrete inputs (256 bits or 16 words) followed by the analog input data. It also creates an Output Image with all possible discrete outputs (256 bits or 16 words) followed by the analog output data. The I/O data in the CAENET module will be as follows:

Input Image:

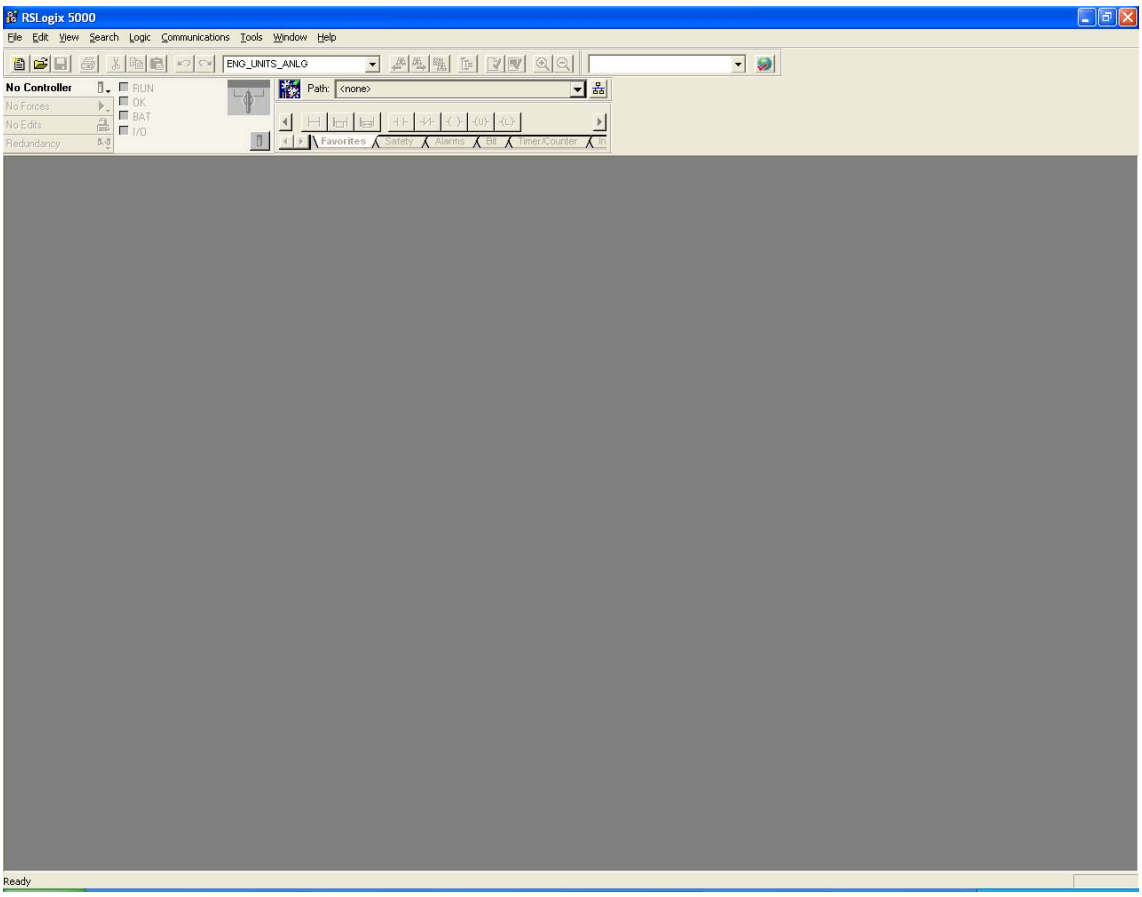
Discrete Input words 0-15: all possible discrete inputs
4 Analog Input Words for each analog module: total 8 input words
Total input words = 24 words.

Output Image:

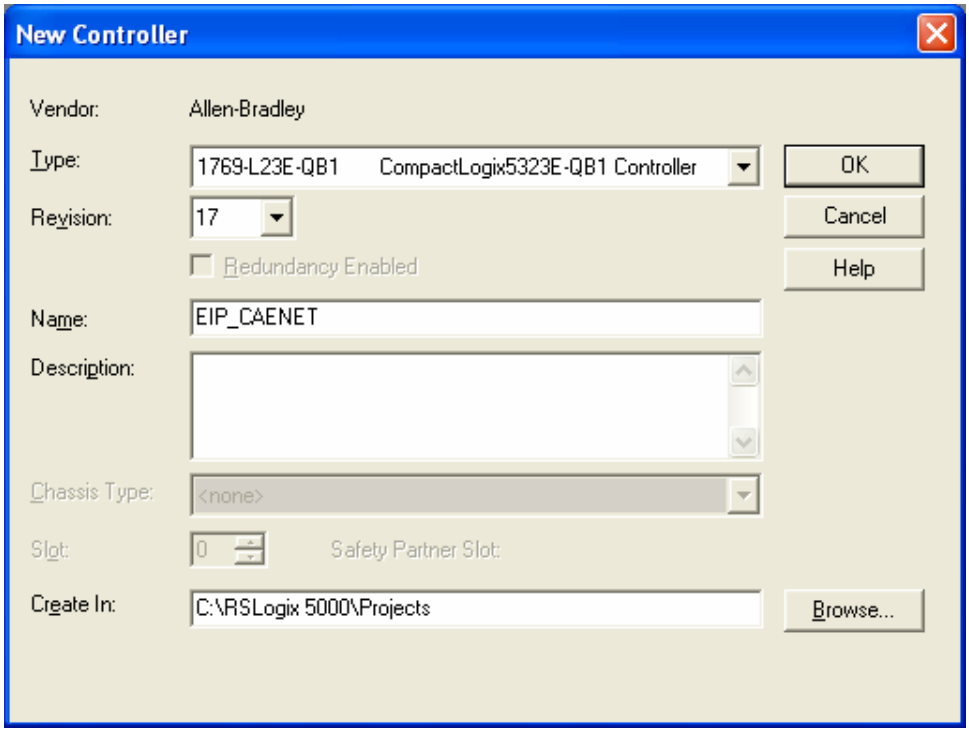
Discrete Output words 0-15: all possible discrete outputs
3 Analog output words for the AN06 module and 1 analog output word for the AN04 module
Total output words: 20 words.

Now that we know the amount of data to read and write from the ELC-CAENET adapter, we can now configure the Ethernet IP scanner port on the CompactLogix PLC to poll the CAENET module for that data.

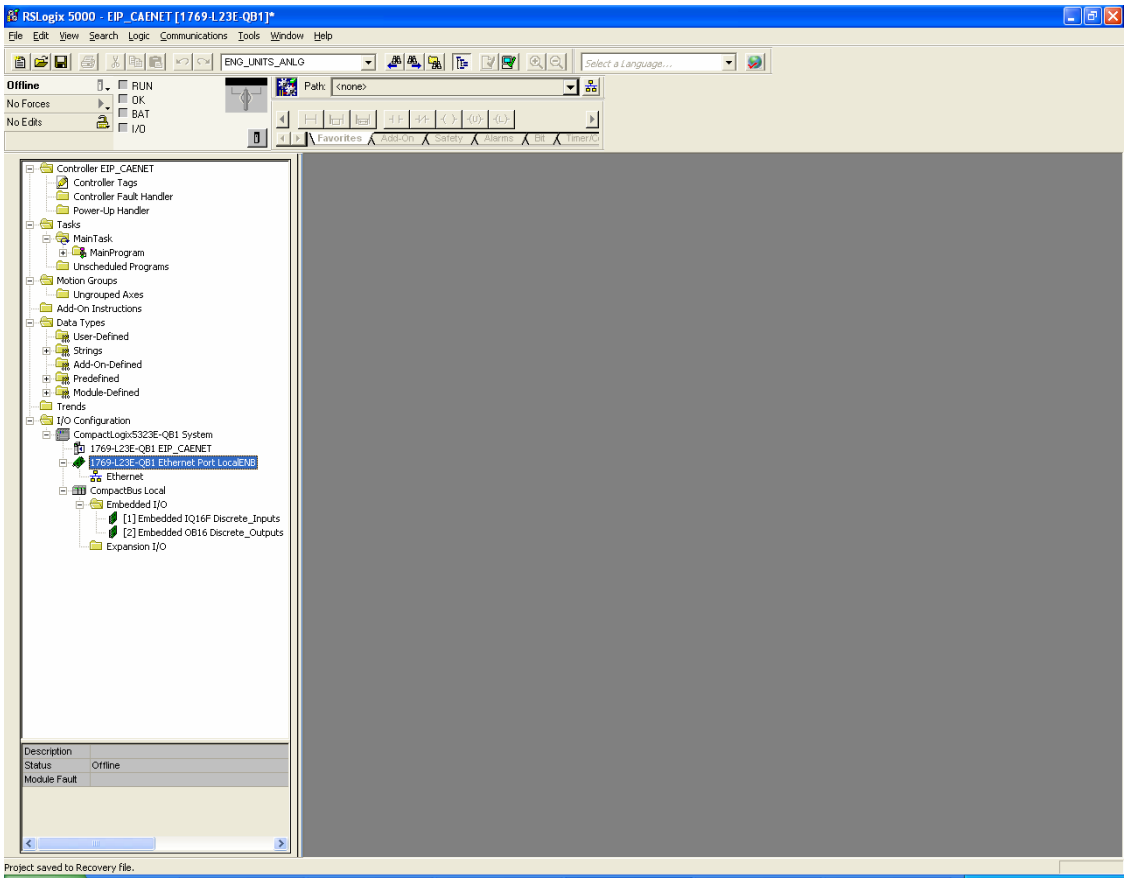
Be sure RSLinx is running. This is the communication software which will allow the computer running RSLOGIX5000 to download the program with the Ethernet IP configuration to the CompactLogix controller. Start RSLOGIX5000 by double-clicking its icon on the desktop. The following will be displayed:



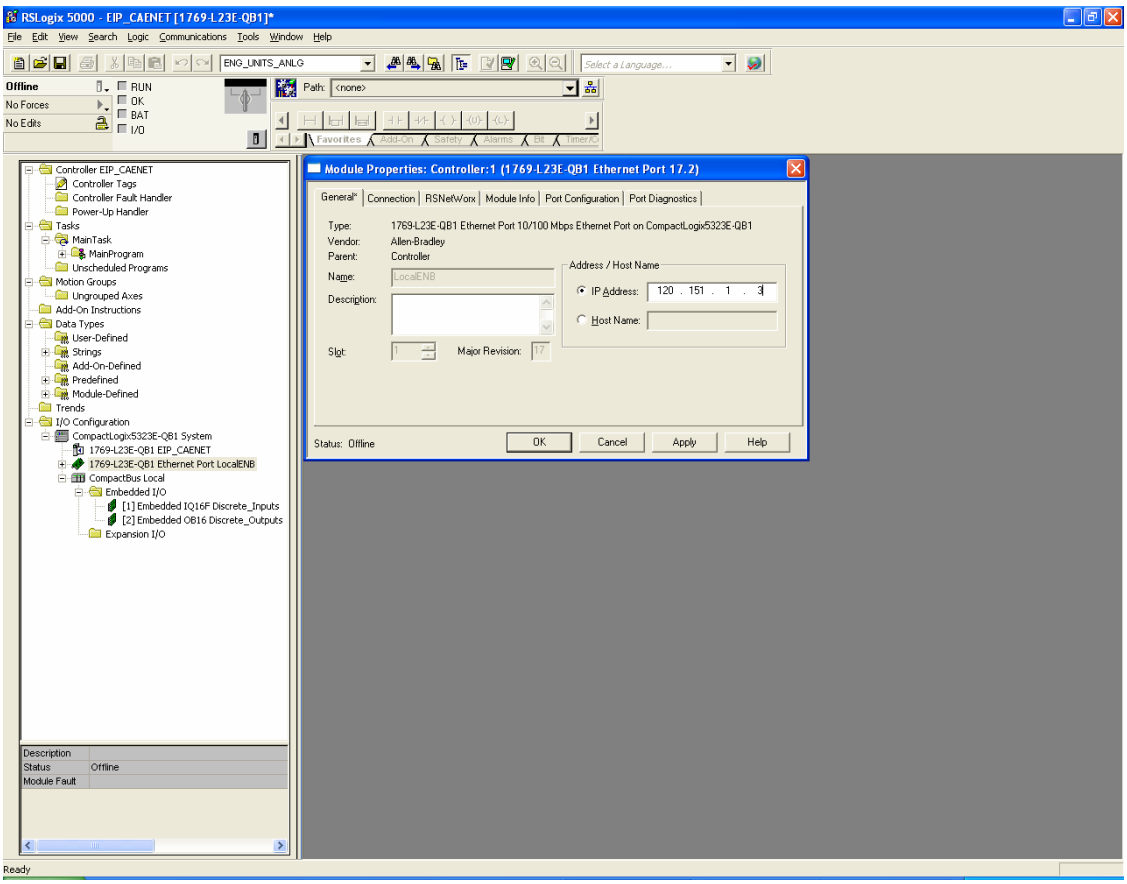
To create a project in RSLOGIX5000, click the “New” button at the top left corner of the screen and choose the controller type, the revision and give the project a name as follows:



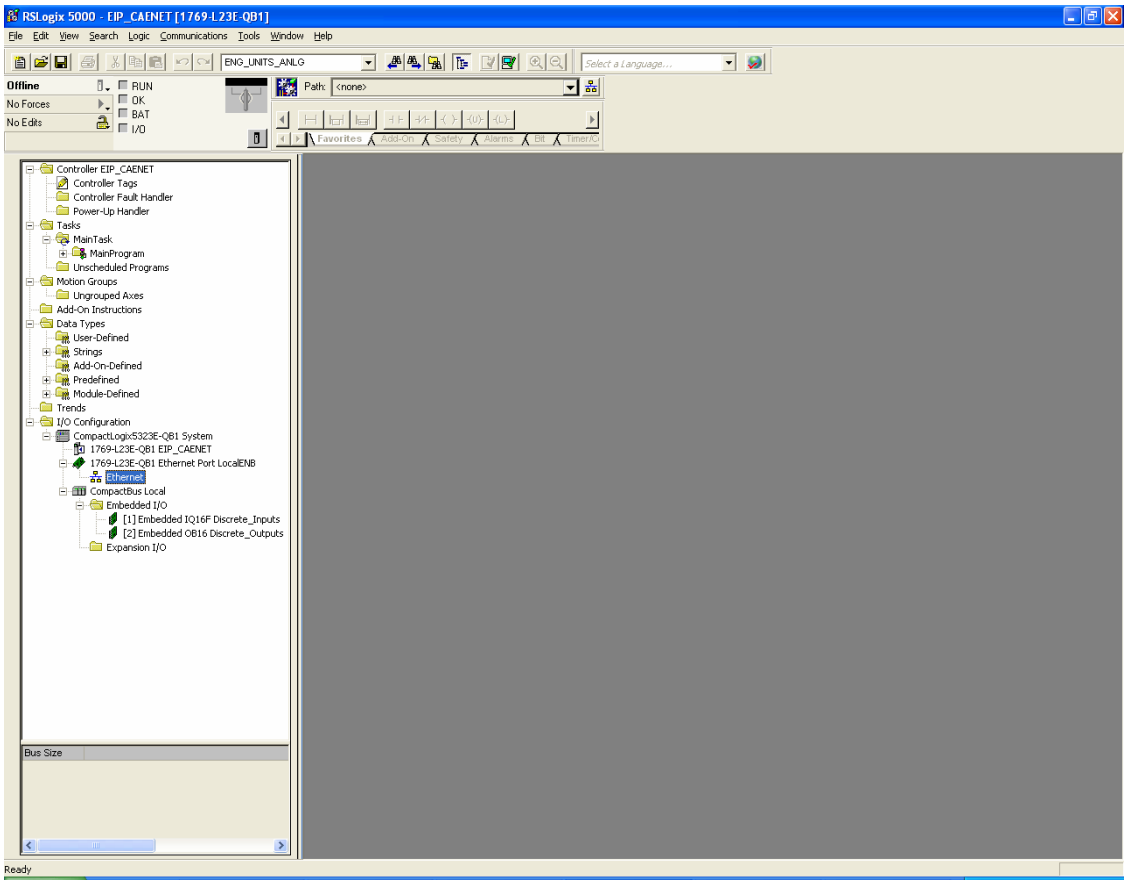
Click OK to create the project. On the left portion of the project screen, click to select the controllers Ethernet IP scanner port as shown below, then right click and choose Properties.



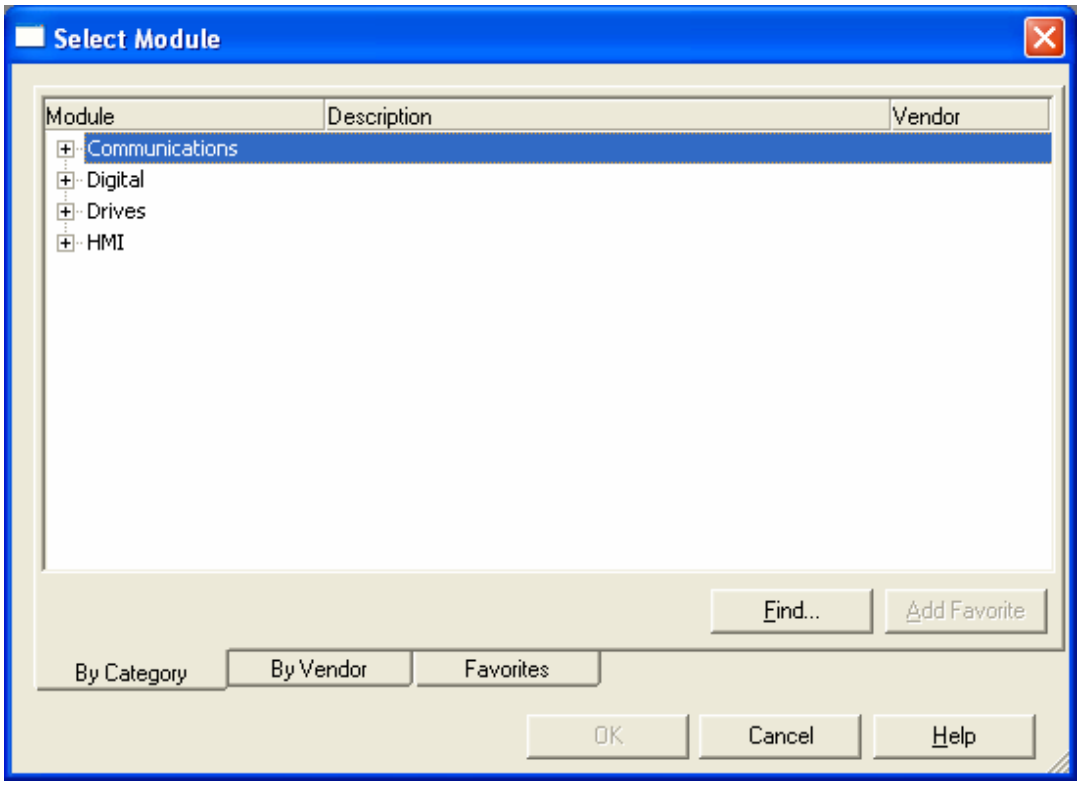
Fill in the IP Address for the CompactLogix Ethernet IP scanner port as shown below:



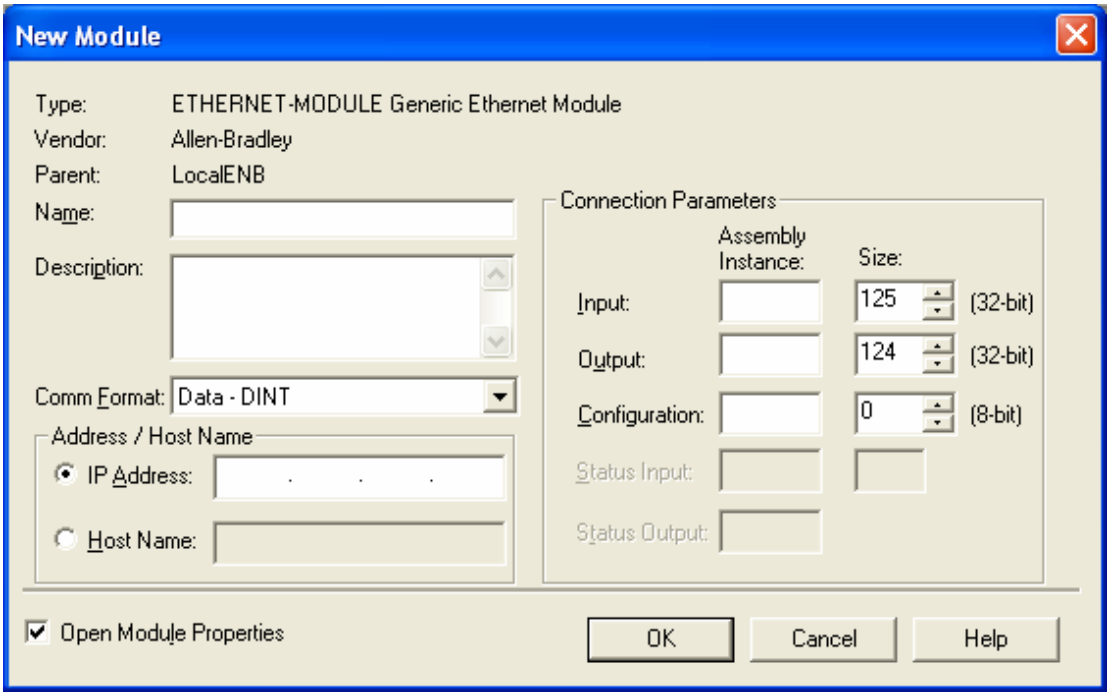
Click Apply, then OK to save the configuration. On the left portion of the project screen, right click on Ethernet as shown highlighted below and choose “New Module”.



The following window will be displayed:



Click the + sign to the left of Communications, then scroll down to “Ethernet-Module Generic Ethernet Module”, select it and click OK. The following window will open:



Provide the following information:

Name: ELC_CAENET

Comm Format: Data-INT

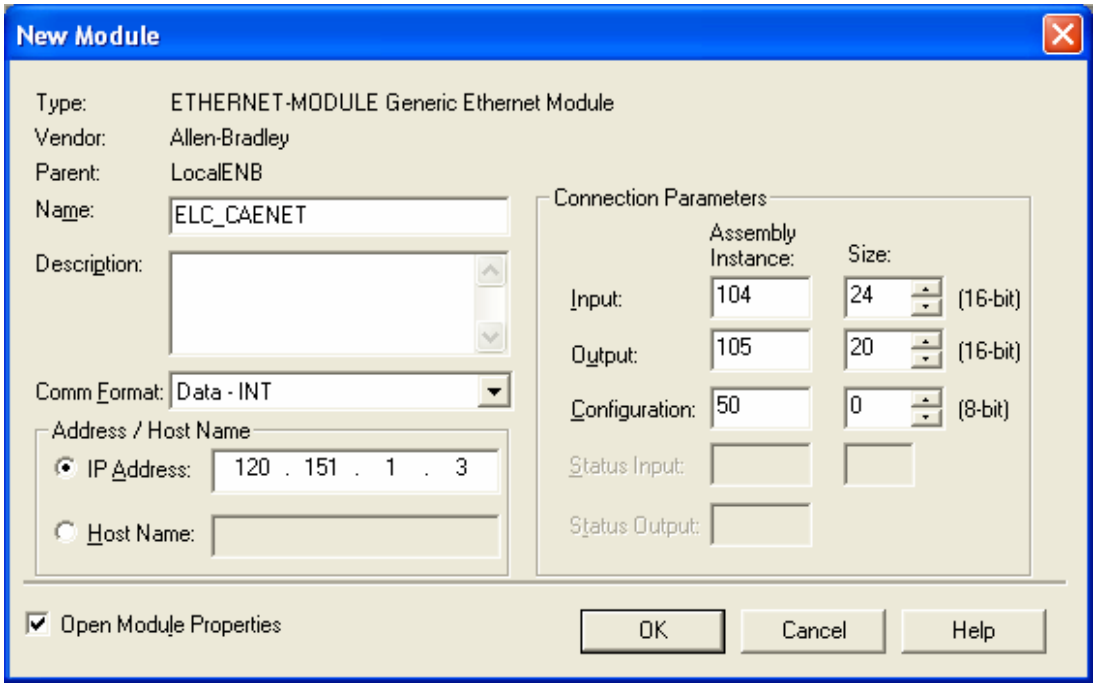
IP Address: 120.151.1.3

Input: Assembly Instance 104, Size: 24 16-bit words

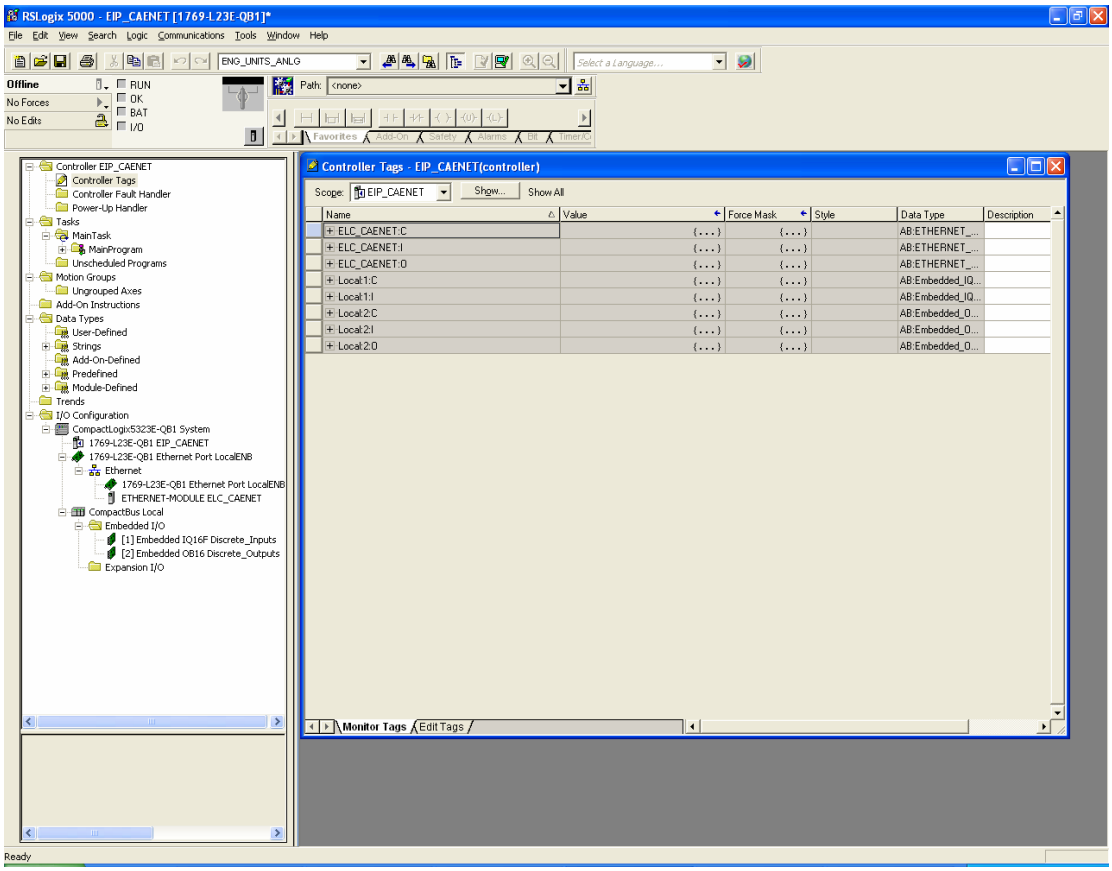
Output: Assembly Instance 105, Size: 20 16-bit words

Configuration: Assembly Instance 50, Size: 0 words (this parameter is not used, but values must be entered.)

When finished, the New Module screen should look like the following:



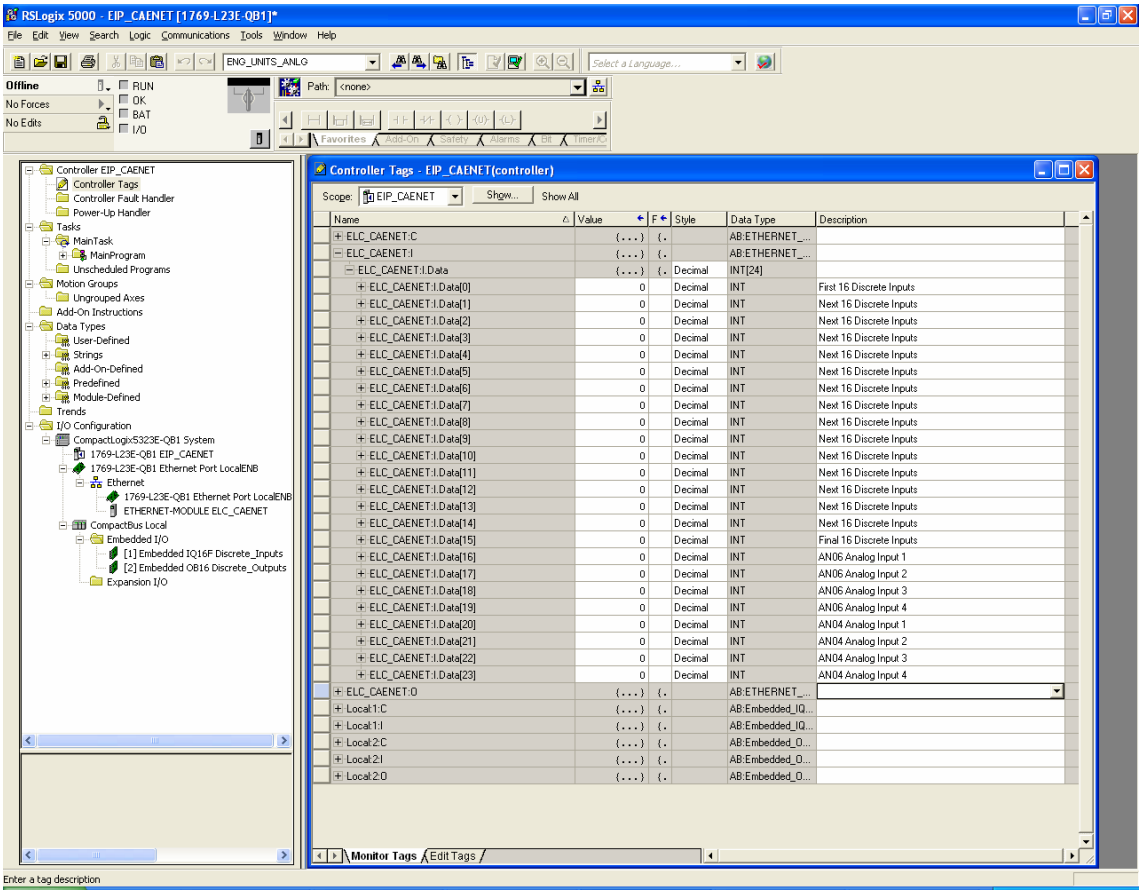
Click OK to close and save this window, then OK to the Module Info Screen. From the Project screen, double click Controller Tags and the following will be displayed:



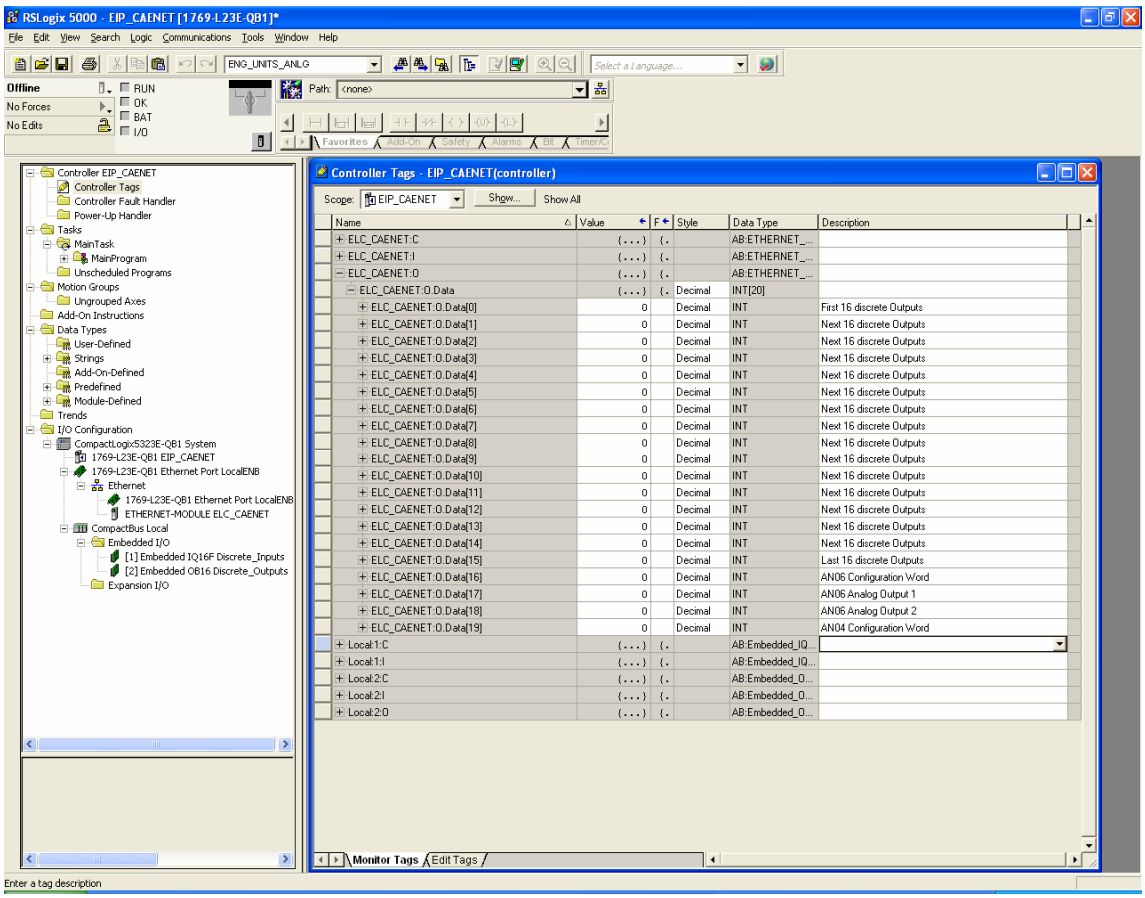
Note that three sets of tags have been created for the ELC_CAENET module. The Configuration tags are not used, but note that 24 16-bit integer tags have been created for Input

Data and 20 16-bit integer tags have been created for Output Data. This is where the CompactLogix program will access input data from the remote ELC input modules and write data for the ELC output modules. The first 16 words of the Input and the Output tags are for the discrete I/O, followed by the analog I/O as follows:

Tags for the Input Data from the ELC-CAENET module:



Tags for the Output Data for the ELC-CAENET module:



Download the project to the CompactLogix controller and place the controller into the Run mode and manipulate the discrete output bits and analog output words per the following, as a test:

ELC_CAENET:O.Data[0]	16 discrete outputs for this example (Total 16)
ELC_CAENET:O.Data[16]	Configuration word for the ELC-AN06 analog module
ELC_CAENET:O.Data[17]	An06 Analog Output 1
ELC_CAENET:O.Data[18]	An06 Analog Output 2
ELC_CAENET:O.Data[19]	Configuration word for the ELC-AN04 analog module

These are the only output tags that are needed for this example.

View the discrete input bits and analog input words per the following. Analog outputs may be wired to analog inputs for test purposes:

ELC_CAENET:I.Data[0]	First 16 discrete inputs
ELC_CAENET:I.Data[1]	Second 16 discrete inputs
ELC_CAENET:I.Data[2]	Final 16 discrete inputs for this example (total 48)
ELC_CAENET:I.Data[16]	AN06 Analog Input 1
ELC_CAENET:I.Data[17]	AN06 Analog Input 2
ELC_CAENET:I.Data[18]	AN06 Analog Input 3

ELC_CAENET:I.Data[19] AN06 Analog Input 4
ELC-CAENET:I.Data[20] ANO4 Analog Input 1
ELC-CAENET:I.Data[21] ANO4 Analog Input 2
ELC-CAENET:I.Data[22] ANO4 Analog Input 3
ELC-CAENET:I.Data[23] ANO4 Analog Input 4

These are the only input tags that are needed for this example.

4.11 Application Example using the Smart PLC functions

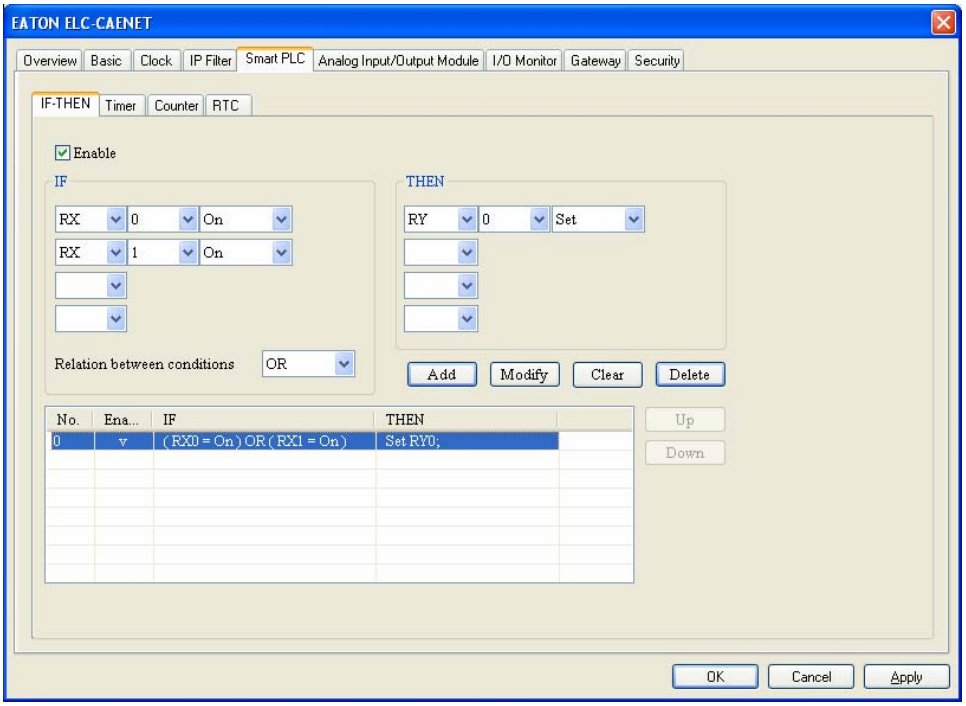
- Local Logic: IF-THEN

Application	Local Logic IF-THEN functions set up using ECISoft
Steps	1. When RX#0 and RX#1 are ON, turn output RY0 to ON. 2. When RX#2 turns from OFF to ON, change the state of RY1.

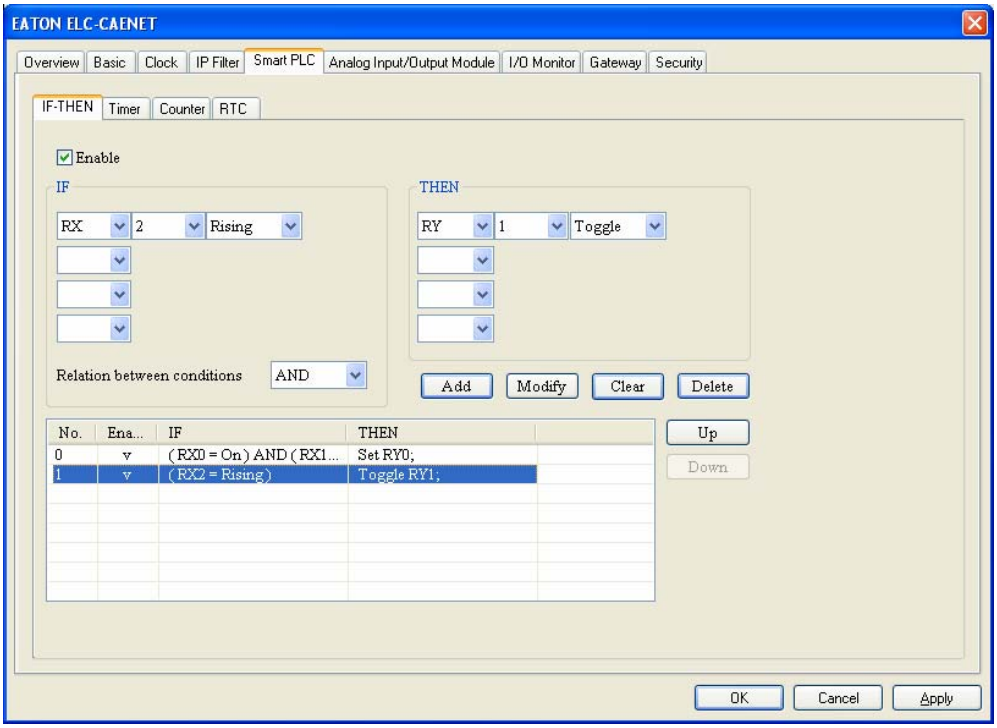
1. The system for this application example is a computer running ELCSoft and ECISoft connected to the Ethernet port on the ELC-CAENET module via an Ethernet switch and a couple of patch cables. Assume the following I/O modules are connected to the adapter:

   (1) ELC-EX08NNSN 8-point switch input module
   (1) ELC-EX08NNNR 8-point relay output module
   (1) ELC-AN04ANNN 4 point analog input module
   (1) ELC-04TCANNN 4 point thermocouple input module
   (1) ELC-PT04ANNN 4 point Platinum RTD (PT100) input module

2. Open ECISoft with the button in ELCSoft, go online via Ethernet and double click the ELC-CAENET icon to open its Property Pages. Then, click the “Smart PLC” tab.
3. Select “RX 0 On” and “RX 1 On” in the IF column and select “AND” for the relation between conditions. Next, select “RY 0 Set” in the THEN column and press “Add” to add the logic into the table below.



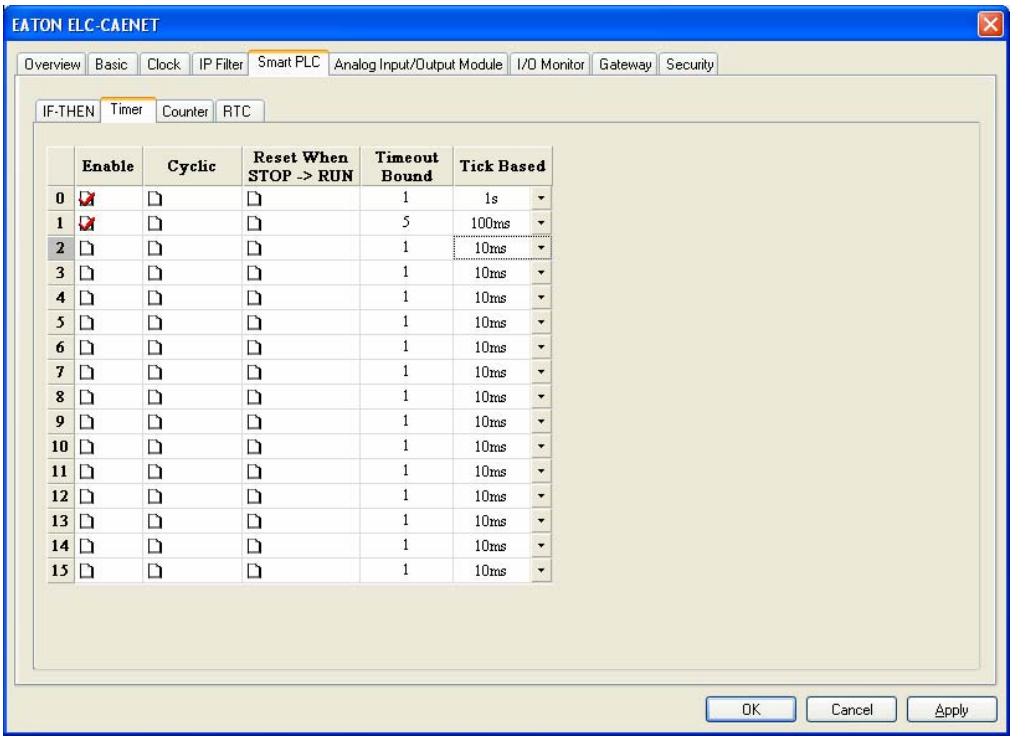
4. Select “RX 2 Rising” in the IF column and “RY 1 Toggle” in the THEN column. Press “Add” to add the settings into the table below. Press “Apply” to store these settings into the ELC-CAENET module.



- Local Logic: Timer

Application	Local Logic Timer function in ECISoft. After RY0 is On for 1 second, it will turn Off for 500 ms. This will repeat every cycle.
Steps	(1) Set up the timer: Timer 0 1s, Timer 1 500ms. (2) Set up IF-THEN: When the timing reaches the target, RY0 will be On or Off.

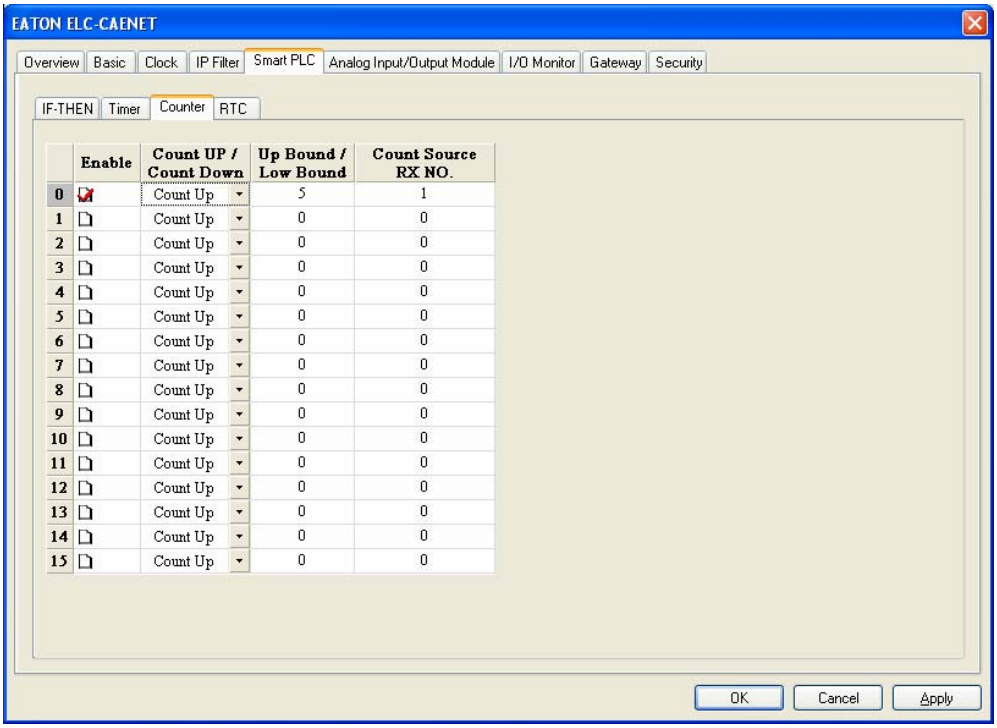
1. Open the setup page for the ELC-CAENET module and click the “Smart PLC” tab, then the “Timer” tab.
2. Check the “Enable” box for Timer 0 and Timer 1 and set Timer 0 to “1s” and Timer 1 to “500ms”. Click “Apply” to write the settings into the ELC-CAENET module.



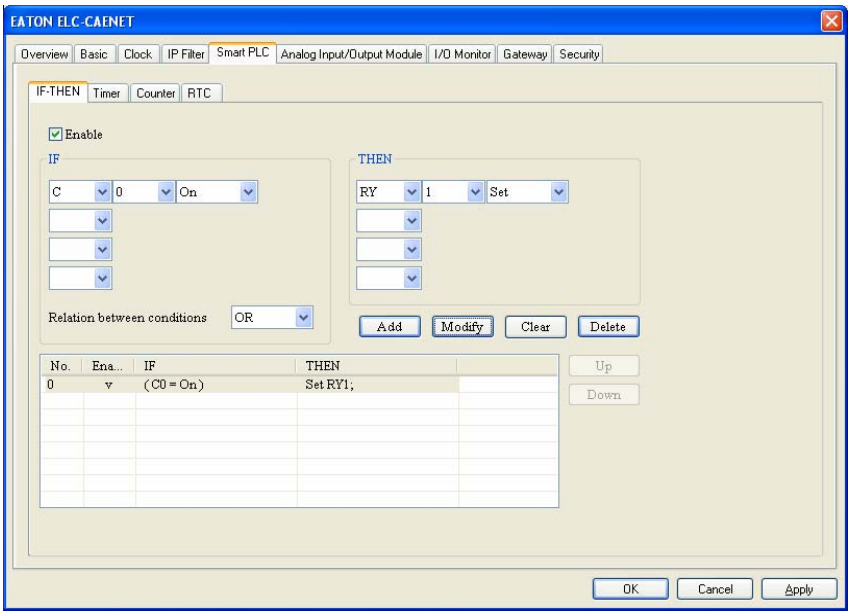
- Local Logic: Counter

Application	Local Logic counters function in ECISoft. Once RX#1 toggles 5 times, output RY0 will energize
Steps	(1) Set up counter C0: RX#1 toggles 5 times and reaches the target. (2) Set up IF-THEN: When the counting reaches the target, RY0 will output.

1. Open the setup page for the ELC-CAENET module and click the “Smart PLC” tab, then the “Counter” tab.
2. Check to “Enable” Counter 0, select “Count Up”, set the Up Bound limit to “5” and Count Source RX NO. to RX”1”. Click "Apply” to write these settings into the ELC-CAENET module.



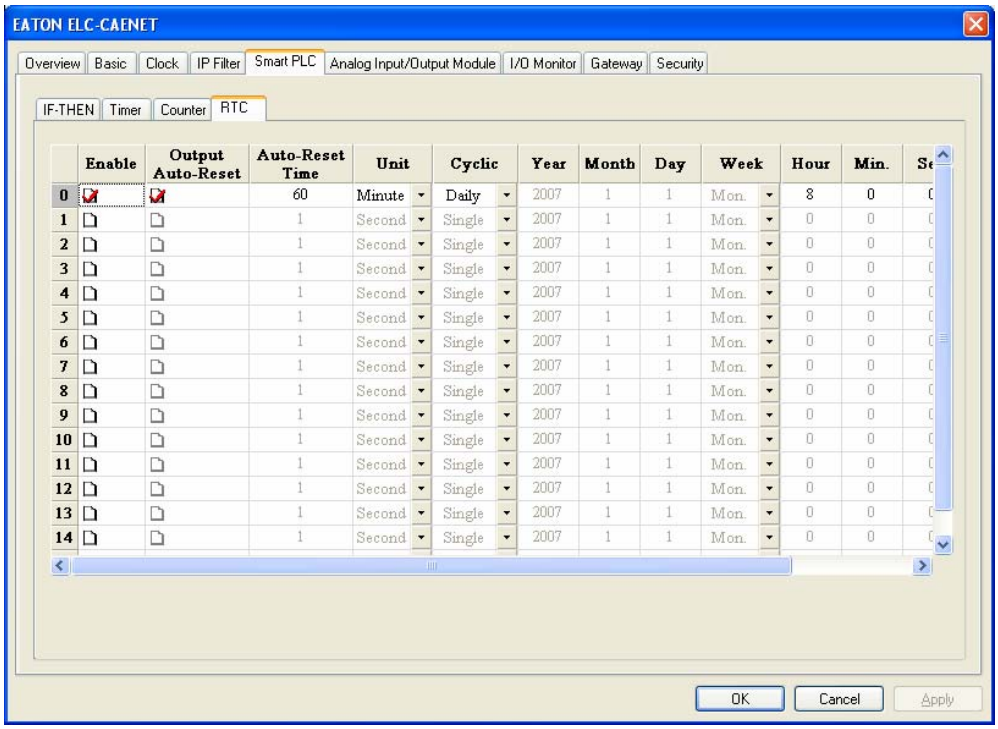
3. Switch to the “IF-THEN” page and check the “Enable” box. Select “C 0 On” in the IF column and “RY 0 Set” in the THEN column. Click on “Add” to add the settings to the table below and press “OK” to save the settings into ELC-CAENET.



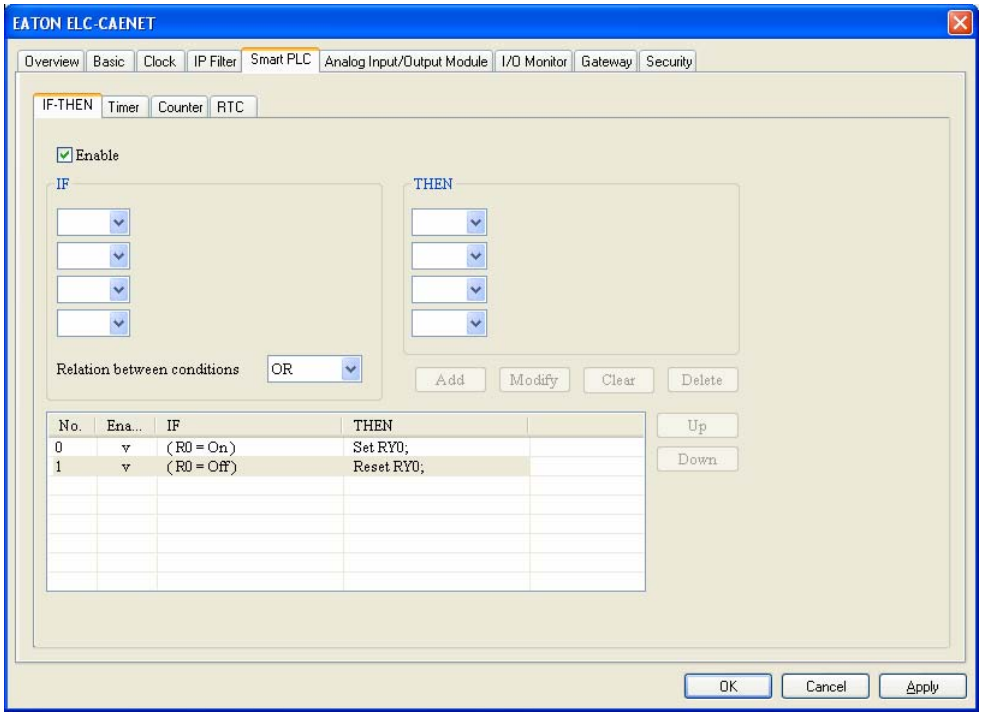
- Local Logic: RTC

Application	Local Logic RTC function in ECISoft. RY0 turns On at 08:00 and Off at 09:00 every day.
Steps	(1) Set up the RTC to be On at 08:00 every day and continue to be On for 1 hour. (2) Set up IF-THEN: RY0 will be switched On or Off based on RT0

1. Open the setup page and click the “Smart PLC” tab. Then the “RTC” tab.
2. Check to “Enable” RTC 0 and set Cyclic to “Daily”, Auto-Reset Time to “60 Minutes” and enabling time to 08:00:00. Press “Apply” to write the settings into ELC-CAENET.



3. Switch to the “IF-THEN” tab. Check the “Enable” box and select “R0 On” in the IF column and “RY0 Set” in the THEN column. Press “Add” to add the settings to the table below.
4. Select “R0 Off” in the IF column and “RY0 Reset” in the THEN column. Press “Add" to add the settings to the table below and click “APPLY” to save the settings into ELC-CAENET.



Every day when the time reaches 8:00am exactly, remote output RY0 will be set and stay set for 60 minutes, then it will be reset.

5 ELC-CARS485

ELC-CARS485 is a serial Modbus distributed I/O adapter module which uses the standard low cost ELC I/O. As a standard Modbus slave, ELC-CARS485 is compatible with any valid master.

5.1 Features

- Supports up to 256 digital I/O points
- Supports up to 8 analog / specialty modules
- Configurable interface parameters

5.2 Specification

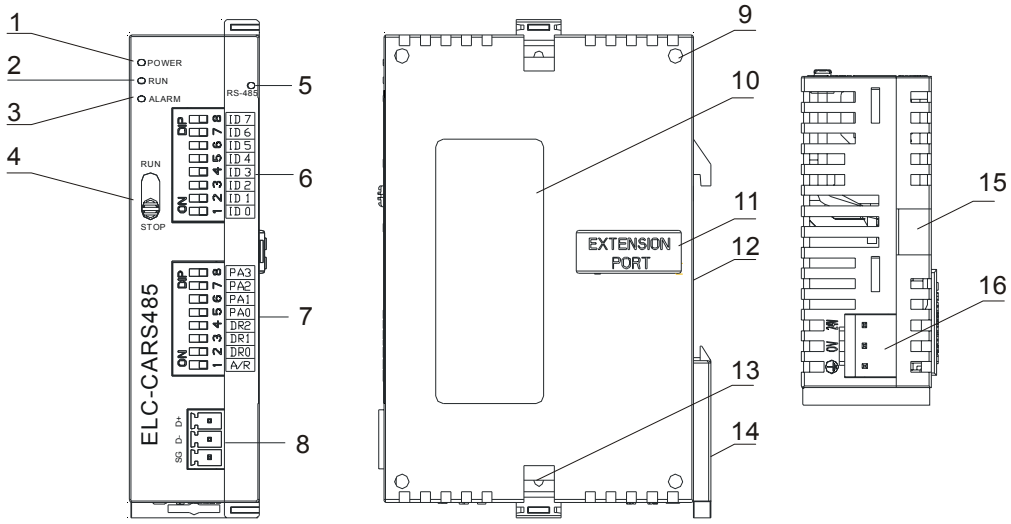
■ Functions Specification

Communication	
Transmission method	RS-485
Electrical isolation	500VDC
Type	Removable 3-pin connector
Transmission cable	2 twisted isolation cables
Valid communication address	1 ~ F0 (decimal: 1 ~ 240)
Series transmission speed	1,200/2,400/4,800/9,600/19,200/38,400/57,600/115,200 bps (bits per second)
Communication mode	7,E,1-ASCII / 7,O,1-ASCII / 7,E,2-ASCII / 7,O,2-ASCII / 7,N,2-ASCII / 8,E,1-ASCII / 8,O,1-ASCII / 8,N,1-ASCII / 8,N,2-ASCII / 8,E,1-RTU / 8,O,1-RTU / 8,N,1-RTU/ 8,N,2-RTU

■ Electrical Specification

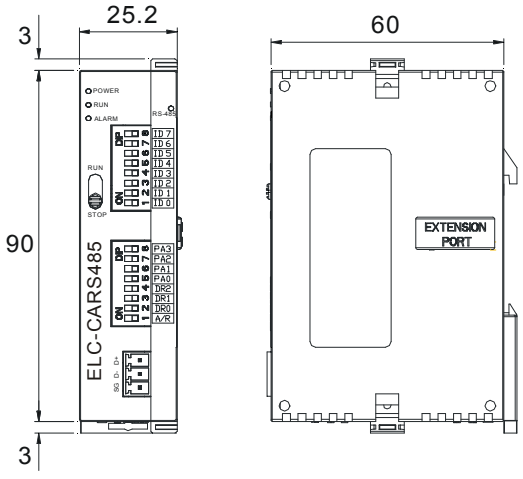
Power supply voltage	24VDC (-15% ~ 20%) (with DC input polarity reverse protection)
Noise Immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8KV Air Discharge, 4KV Contact Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Li4ne: 2KV, Digital I/O: 1KV Analog & Communication I/O: 1KV Damped-Oscillatory Wave: Power Line: 1KV, Digital I/O: 1KV RS (IEC 61131-2, IEC 61000-4-3): 80MHz ~ 1000MHz , 1.4GHz ~ 2.0GHz , 10V/m
Operation/storage temperature	Operation: 0°C ~ 55°C (temperature), 50 ~ 95% (humidity), pollution degree 2; Storage: -25°C ~ 70°C (temperature), 5 ~ 95% (humidity)
Vibration/Shock Immunity	Standard: IEC61131-2, IEC 68-2-6 (TEST Fc)/IEC61131-2 & IEC 68-2-27 (TEST Ea)
Certificates	CE cULus , Operating temperature code: T5

5.3 Product Profile and Outline



1. POWER indicator	9. Mounting hole for extension unit
2. RUN indicator	10. Nameplate
3. ALARM indicator	11. Extension port for extension unit
4. RUN/STOP switch	12. DIN rail mounting slot (35mm)
5. RS485 indicator	13. Fastening hole for extension unit
6. Address setup DIP switch	14. DIN rail clip
7. Communication mode setup DIP switch	15. Mounting rail for extension unit
8. RS-485 communication port	16. Power input

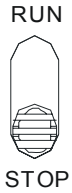
- **Dimension**



Unit: mm

5.4 Installation and Wiring

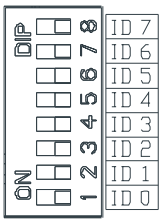
- **Switch Definition : RUN/STOP**



Status	Explanation
RUN	1. RUN indicator on ELC-CARS485 is On. 2. AI/AO extension unit in RUN status.
RUN → STOP	1. AI/AO extension unit switches from RUN to STOP status. 2. Y points on DI/DO extension unit are all Off.
STOP	1. RUN indicator on ELC-CARS485 is Off. 2. AI/AO extension unit in STOP status. 3. Communication control is not allowed in AI/AO extension unit. 4. Communication control is not allowed in DI/DO extension unit.
STOP → RUN	1. ELC-CARS485 re-detects the number of points in DI/DO unit and the number of AI/AO units. 2. AI/AO extension unit switches from STOP to RUN status.

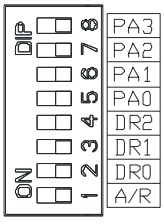
- **Modbus Address Setup DIP Switch:**

DIP Switch Setting	Explanation
H'01 ~ H'F0	Valid ELC-CARS485 addresses, the dip switches are weighted as follows: ID0 ~ ID7 are: 2^0, 2^1, 2^2, … 2^6 , 2^7 .
H'00, H'F1 ~ H'FF	In the Modbus protocol, H'00 is defined as broadcast mode. H'F1 ~ H'FF are incorrect ELC-CARS485 addresses.



- **Communication Mode Setup DIP Switch:**

PA3	PA2	PA1	PA0	A/R	Communication mode
OFF	OFF	OFF	OFF	ON	7,E,1-ASCII
OFF	OFF	OFF	ON	ON	7,O,1-ASCII
OFF	OFF	ON	OFF	ON	7,E,2-ASCII
OFF	OFF	ON	ON	ON	7,O,2-ASCII
OFF	ON	OFF	OFF	ON	7,N,2-ASCII
OFF	ON	OFF	ON	ON	8,E,1-ASCII
OFF	ON	ON	OFF	ON	8,O,1-ASCII
OFF	ON	ON	ON	ON	8,N,1-ASCII
ON	OFF	OFF	OFF	ON	8,N,2-ASCII
OFF	ON	OFF	ON	OFF	8,E,1-RTU
OFF	ON	ON	OFF	OFF	8,O,1-RTU
OFF	ON	ON	ON	OFF	8,N,1-RTU
ON	OFF	OFF	OFF	OFF	8,N,2-RTU
Other settings of PA3, PA2, PA1, PA0 and A/R are invalid					



DR2	DR1	DR0	Series Transmission speed
OFF	OFF	OFF	1,200 bit/s
OFF	OFF	ON	2,400 bit/s
OFF	ON	OFF	4,800 bit/s
OFF	ON	ON	9,600 bit/s
ON	OFF	OFF	19,200 bit/s
ON	OFF	ON	38,400 bit/s
ON	ON	OFF	57,600 bit/s
ON	ON	ON	115,200 bit/s

5.5 Modbus Register assignments

- **Discrete Input and Output register mapping**

Communication address	Devices	Attribute	Data type	Length
H'0400 ~ H'047F	X: X000 ~ X177 (Octal)	R	bit	128 points
H'0500 ~ H'057F	Y: Y000 ~ Y177 (Octal)	R/W	bit	128 points

- **Specialty Module register mapping**

Communication address	Devices	Attribute	Data type	Length
H'1600 ~ H'1630	1st specialty module: CR0 ~ CR48	Please refer to the CR attribute of each specialty module.	word	49
H'1640 ~ H'1670	2nd specialty module: CR0 ~ CR48		word	49
H'1680 ~ H'16B0	3rd specialty module: CR0 ~ CR48		word	49
H'16C0 ~ H'16F0	4th specialty module: CR0 ~ CR48		word	49
H'1700 ~ H'1730	5th specialty module: CR0 ~ CR48		word	49
H'1740 ~ H'1770	6th specialty module: CR0 ~ CR48		word	49
H'1780 ~ H'17B0	7th specialty module: CR0 ~ CR48		word	49
H'17C0 ~ H'17F0	8th specialty module: CR0 ~ CR48		word	49

Note:

A maximum of 8 specialty modules are allowed. The first specialty module is first unit installed on the right hand side of the ELC-CARS485 adapter.

- **Adapter configuration and status registers**

Communication address	Attribute	Content	Explanation
H'0000	R	Model name	Model code of the ELC-CARS485 = H'0200.
H'0001	R	Firmware version	The current firmware version is displayed in hex, e.g. V0.1 is indicated as H'0010.

Communication address	Attribute	Content	Explanation
H'0002	R	Issue date	The issue data of the firmware is displayed in hex, e.g. H'1FD0 = K8150 indicates that the firmware is issued on the morning of August 15.
H'0003	R/W	RUN/STOP ELC-CARS485	H'0003 = 1, the ELC-CARS485 RUN; H'0003 = 0, the ELC-CARS485 STOP.
H'0004	R	Communication format	The communication parameters for the ELC-CARS485.
H'0005	R	Baud rate	The baud rate of the ELC-CARS485.
H'0006	R	Communication address	The communication address of ELC-CARS485.
H'0007	R	Number of DI/DO points	High byte stores the number of input points. Low byte stores the number of output points.
H'0008	R	Error code	The current error. See 4.4 for the meaning of error codes.
H'0009	R	Historical error code	The number of errors that have occurred. Range: 0 ~ 32
H'0017	R	Number of specialty modules	The number of specialty modules detected.
H'0018	R	Model code of the 1st specialty module	The model code of the 1st specialty module connected to the ELC-CARS485.
H'0019	R	Model code of the 2nd specialty module	The model code of the 2nd specialty module connected to the ELC-CARS485.
H'001A	R	Model code of the 3rd specialty module	The model code of the 3rd specialty module connected to the ELC-CARS485.
H'001B	R	Model code of the 4th specialty module	The model code of the 4th specialty module connected to the ELC-CARS485.
H'001C	R	Model code of the 5th specialty module	The model code of the 5th specialty module connected to the ELC-CARS485.
H'001D	R	Model code of the 6th specialty module	The model code of the 6th specialty module connected to the ELC-CARS485.
H'001E	R	Model code of the 7th specialty module	The model code of the 7th specialty module connected to the ELC-CARS485.
H'001F	R	Model code of the 8th specialty module	The model code of the 8th specialty module connected to the ELC-CARS485.

5.6 Supported Function Codes

ELC-CARS485 complies with the standard Modbus protocol, supporting the 7 function codes, H'01, H'02, H'03, H'05, H'06, H'0F, and H'10. Please refer to the standard Modbus protocol for the specific data format of each function code.

Function code	Function	Data type	Applicable address
H'01	Read output bit status	bit	DO area: H'0500 ~ H'057F
H'02	Read input bit status.	bit	DI area: H'0400 ~ H'047F
H'03	Read register(s)	word	Special function area: H'0000 ~ H'001F
			CR of the 1st AI/AO unit: H'1600 ~ H'1630
			CR of the 2nd AI/AO unit: H'1640 ~ H'1670
			CR of the 3rd AI/AO unit: H'1680 ~ H'16B0
			CR of the 4th AI/AO unit: H'16C0 ~ H'16F0
			CR of the 5th AI/AO unit: H'1700 ~ H'1730
			CR of the 6th AI/AO unit: H'1740 ~ H'1770
			CR of the 7th AI/AO unit: H'1780 ~ H'17B0
H'03	Read register(s)	word	CR of the 8th AI/AO unit: H'17C0 ~ H'17F0
H'05	Write single bit	bit	DO area: H'0500 ~ H'057F
H'06	Write single register	word	RUN/STOP ELC-CARS485 module: H'0003
			Applicable to CR with write attribute in the 1st ~ 8th AI/AO extension unit.
H'0F	Write multiple bits	bit	DO area: H'0500 ~ H'057F
H'10	Write multiple registers	word	RUN/STOP ELC-CARS485 module: H'0003
			Applicable to CR with write attribute in the 1st ~ 8th AI/AO extension unit.

- **Example:**
  - Use function code 03 to read CR0 and CR1 in the 1st AI/AO extension unit: (ASCII mode)
  - The request message sent from master ELC to ELC-CARS485 is ": 01 03 16 00 00 02 E4 CR LF"
  - The responding message sent from ELC-CARS485 to the master ELC is ": 01 03 04 00 88 00 00 70 CR LF"

Note:

1. ELC-CARS485 can only read and write one AI/AO extension unit at a time.
2. ELC-CARS485 is able to read/write a maximum of 16 words at a time.

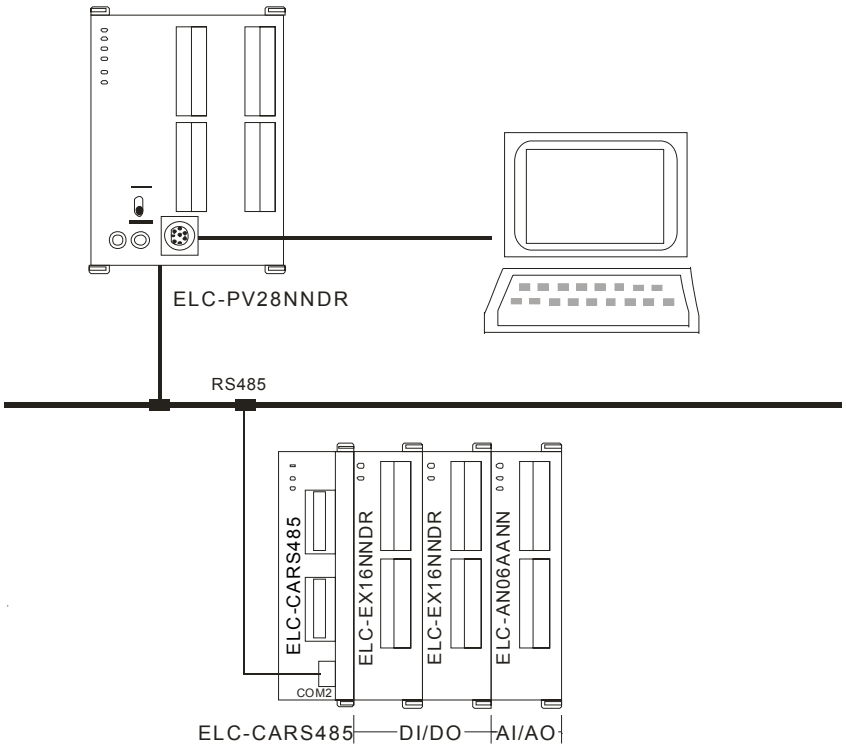
- Error Codes

Code	Indication	Explanation
0001	Incorrect function code	The ELC-CARS485 does not support this function code.

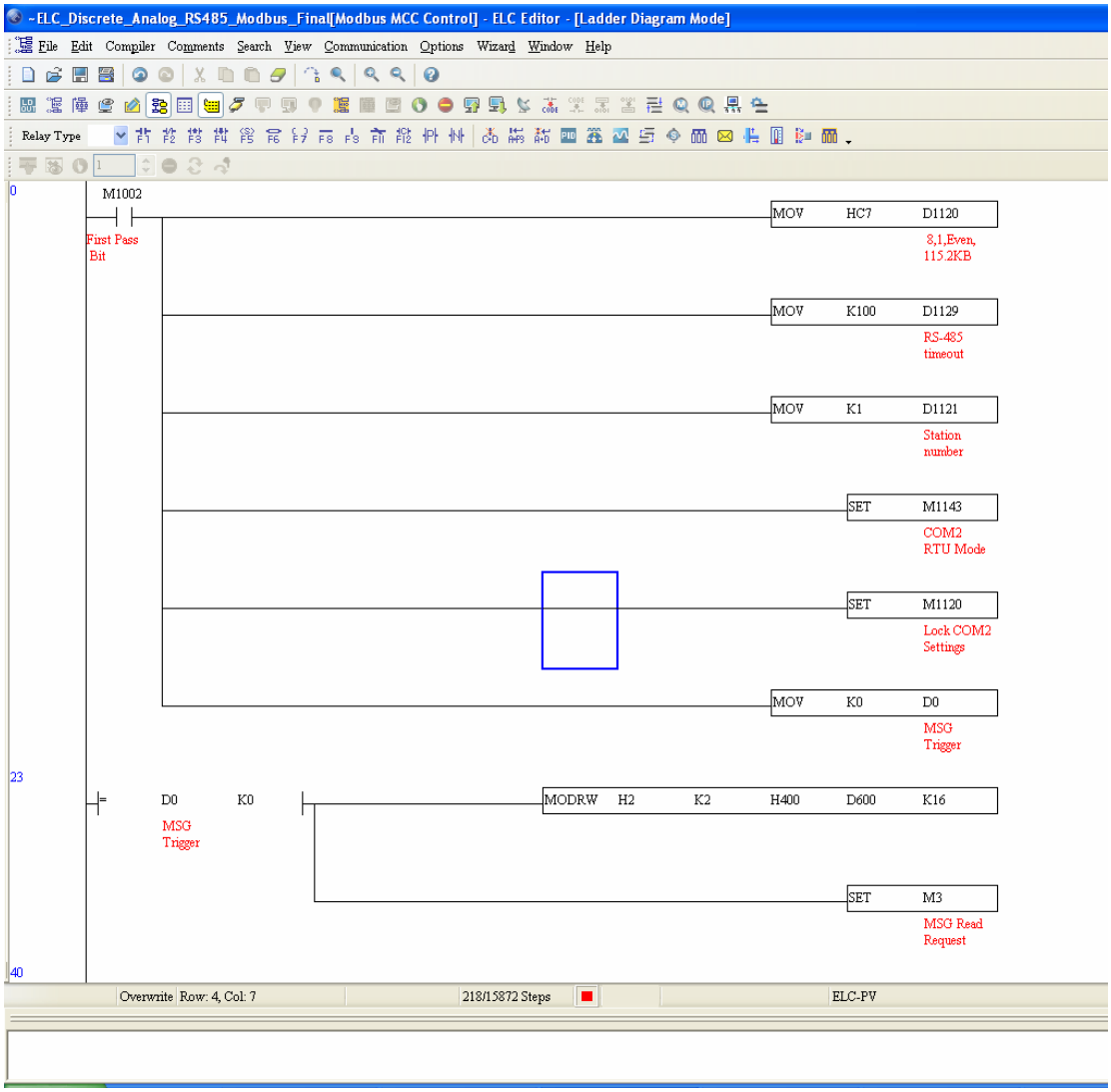
Code	Indication	Explanation
0002	Incorrect operand address	The function code is not valid for the operand address
0003	Incorrect data	The data read/written exceeds the maximum length.
0004	The ELC-CARS485 in STOP	The ELC-CARS485 is in STOP mode.
000B	Incorrect communication format	The length of data received by the ELC-CARS485 is too short.
000C	Incorrect communication format	The length of data received by the ELC-CARS485 is too long.

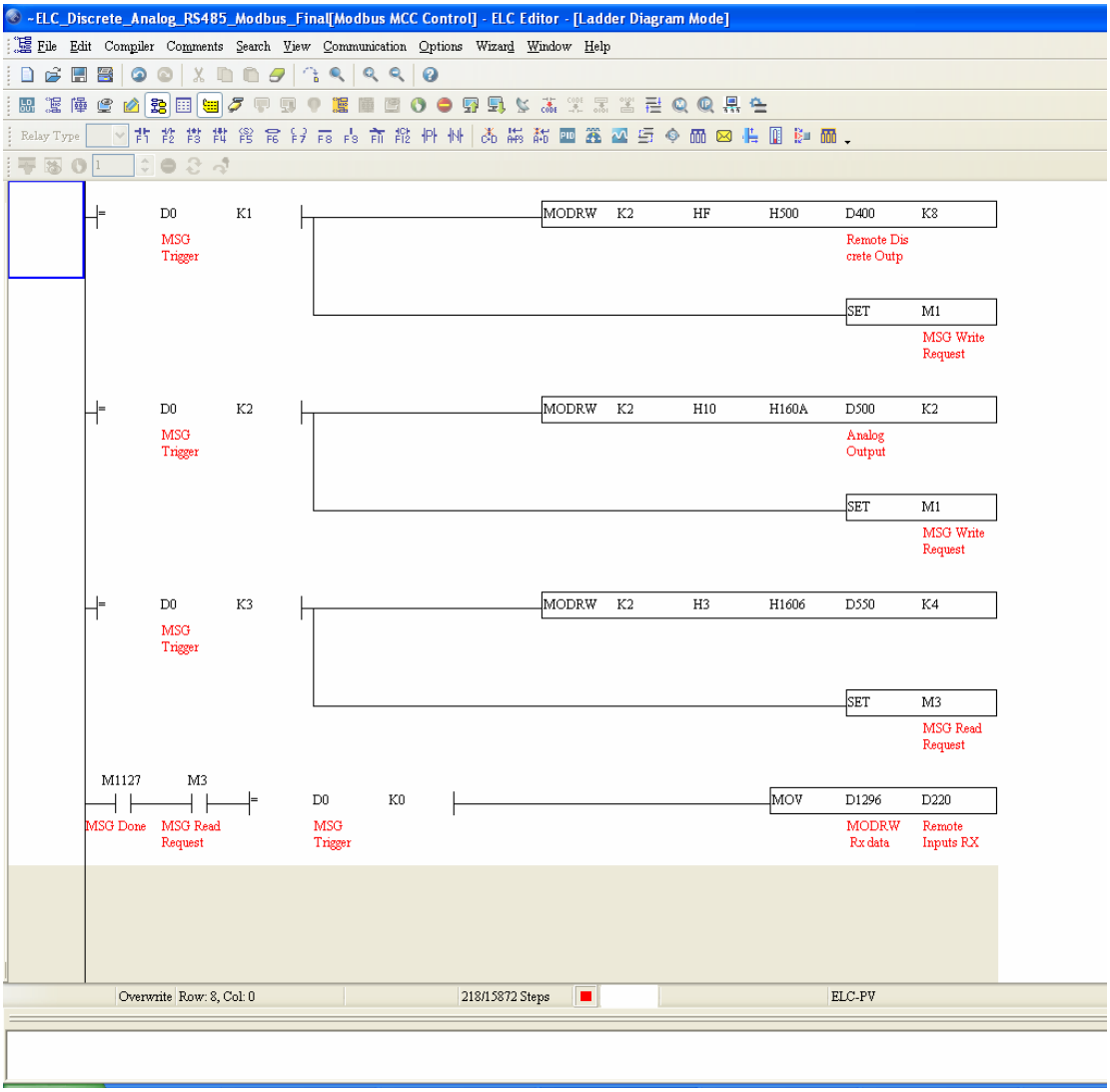
5.7 Application example: ELC processor as the Modbus master

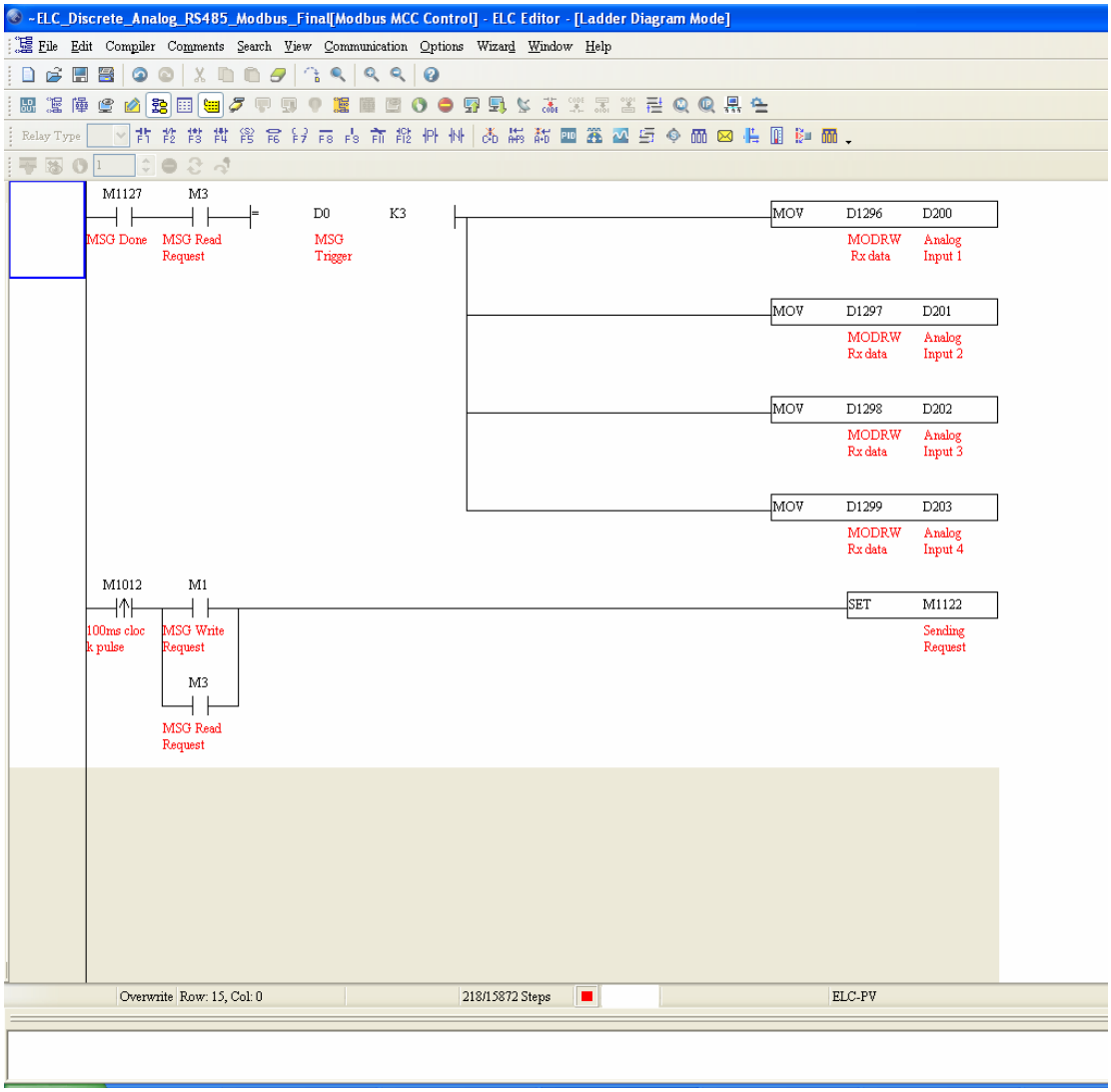
As a Modbus slave, the ELC-CARS485 is compatible with any valid Modbus master. This example uses an ELC controller as the Modbus master. The PC downloads the ladder program to the ELC controller via the RS-232 programming port (COM1). When controller executes the ladder program, it will issue Modbus commands through the RS-485 communication port (COM2), monitoring inputs and controlling outputs through the ELC-CARS485 adapter. See the figure below for the system overview:

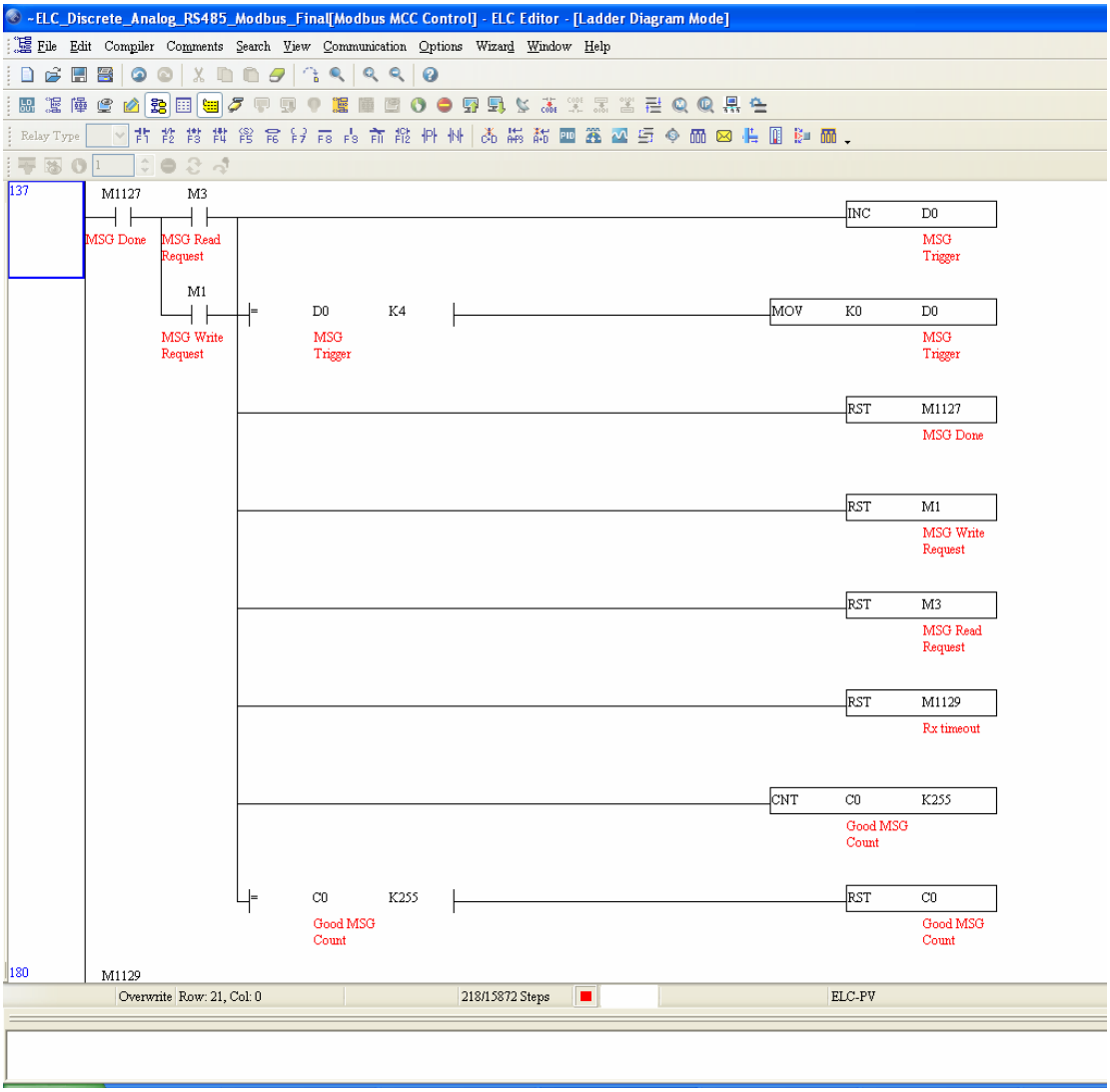


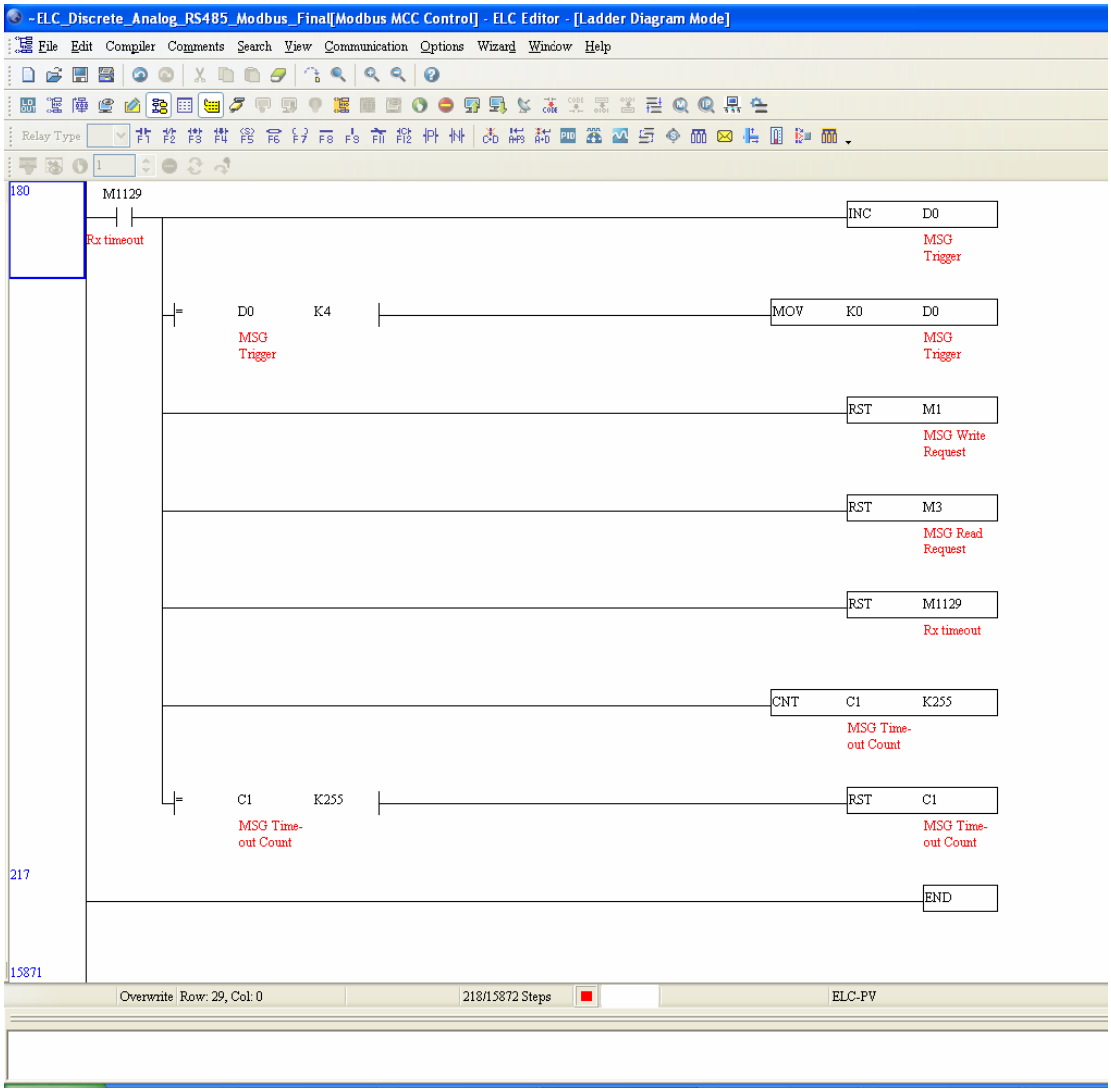
The station No. of the ELC-CARS485 is node “2”. The master ELC-PV controller is node 1. Read the state of “X0 ~ X15” with the ELC-PV controller from the ELC-CARS485. Also, write to control outputs “Y0 ~ Y7” in the first ELC-EX16NNDR. Then write the value from “D500 ~ D501” in the ELC-PV controller to “CR10 ~ CR11” in the ELC-AN06AANN module. Finally, read the values in “CR6 ~ CR9” in ELC-AN06AANN.


~ELC_Discrete_Analog_RS485_Modbus_Final[Modbus MCC Control] - ELC Editor - [Ladder Diagram Mode]
File Edit Compiler Comments Search View Communication Options Wizard Window Help
Relay Type
0
M1002
First Pass Bit
MOV HC7 D1120
8,1,Even, 115.2KB
MOV K100 D1129
RS-485 timeout
MOV K1 D1121
Station number
SET M1143
COM2 RTU Mode
SET M1120
Lock COM2 Settings
MOV K0 D0
MSG Trigger
23
D0 K0
MSG Trigger
MODRW H2 K2 H400 D600 K16
SET M3
MSG Read Request
40
Overwrite Row: 4, Col: 7
218/15872 Steps
ELC-PV


~ELC_Discrete_Analog_RS485_Modbus_Final[Modbus MCC Control] - ELC Editor - [Ladder Diagram Mode]
File Edit Compiler Comments Search View Communication Options Wizard Window Help
D0 K1
MSG Trigger
MODRW K2 HF H500 D400 K8
Remote Discrete Outp
SET M1
MSG Write Request
D0 K2
MSG Trigger
MODRW K2 H10 H160A D500 K2
Analog Output
SET M1
MSG Write Request
D0 K3
MSG Trigger
MODRW K2 H3 H1606 D550 K4
SET M3
MSG Read Request
M1127 M3
MSG Done
MSG Read Request
D0 K0
MSG Trigger
MOV D1296 D220
MODRW Rx data
Remote Inputs RX
Overwrite Row: 8, Col: 0
218/15872 Steps
ELC-PV


~ELC_Discrete_Analog_RS485_Modbus_Final[Modbus MCC Control] - ELC Editor - [Ladder Diagram Mode]
File Edit Compiler Comments Search View Communication Options Wizard Window Help
M1127
MSG Done
M3
MSG Read Request
D0
MSG Trigger
K3
MOV D1296 D200
MODRW Rx data
Analog Input 1
MOV D1297 D201
MODRW Rx data
Analog Input 2
MOV D1298 D202
MODRW Rx data
Analog Input 3
MOV D1299 D203
MODRW Rx data
Analog Input 4
M1012
100ms clock pulse
M1
MSG Write Request
M3
MSG Read Request
SET M1122
Sending Request
Overwrite Row: 15, Col: 0
218/15872 Steps
ELC-PV


~ELC_Discrete_Analog_RS485_Modbus_Final[Modbus MCC Control] - ELC Editor - [Ladder Diagram Mode]
File Edit Compiler Comments Search View Communication Options Wizard Window Help
137
M1127
MSG Done
M3
MSG Read Request
INC D0
MSG Trigger
M1
MSG Write Request
D0 K4
MSG Trigger
MOV K0 D0
MSG Trigger
RST M1127
MSG Done
RST M1
MSG Write Request
RST M3
MSG Read Request
RST M1129
Rx timeout
CNT C0 K255
Good MSG Count
C0 K255
Good MSG Count
RST C0
Good MSG Count
180
M1129
Overwrite Row: 21, Col: 0
218/15872 Steps
ELC-PV



Explanations:

(1) Set up the communication parameters at the beginning of the program, conditioned with the power-up bit. The communication parameters for the master and slave must be the same, e.g. both devices must be configured form the same baud rate, bits/byte, parity, stop bits and RTU/ASCII mode. Each device must also have a unique node address. For this example, each device is configured for: 115200 baud, 8 bits/byte, Even parity, 1 stop bit and RTU mode.

(2) When the ELC controller transitions to run mode, the value of “D0” will be initialized to “0”.

(3) When the value of “D0” is “0”, the ELC controller will read the state of “X0 ~ X15” (H400 – H40F) in the ELC extension modules and save it in “D220”.

(4) When the value of “D0” is “1”, the ELC controller will write to “Y0 ~ Y7” with the data in the low byte of “D400”.

(5) When the value of “D0” is “2”, the ELC controller will write the values in “D500~D501” to “CR10~CR11” in the 1st special module (ELC-AN06 for this example).

(6) When the value of “D0” is “3”, the ELC controller will read the values from “CR6 ~ CR9” in

the special module (ELC-AN06) and buffer it in “D200 ~ D203”. The Modbus reply header information will be written to D550-D553.

(7) When the value of “D0” is “4”, and the fourth message has been executed, the ELC controller will re-initialize the value of “D0” to K0, to begin the message cycle again.

MEMO