Grid Connect EtherNet/IP Adapter CP1W-EIP61

Application and Setup Guide

1

Introduction

This section describes the features of the CP1W-EIP61 EtherNet/IP Adapter.

1-1 Introduction 1-2

1-1-1 Features 1-2

1-1-2 Compatible PLCs 1-3

1-1 Introduction

1-1-1 Features

Data Exchange

The CP1W-EIP61 is an EtherNet/IP adapter that allows intelligent devices, such as Omron CJ / CS series PLCs or NSJ hybrid controller with EtherNet/IP modules to very quickly and easily share data with CP1L and CP1H PLCs.

CP1L/H PLC as a Programmable I/O Module

The CP1L/CP1H PLC can function as a programmable I/O module capable of running a local program or act as a node in an EtherNet/IP network to exchange data such as positioning or I/O status with a CS/CJ-series controller.

Implicit Messaging (Datalink)

The CP1W-EIP61 supports the Implicit Messaging (Datalink) function of EtherNet/IP and Explicit Messaging to data areas of the PLC, or to the program area of the PLC. Data area manipulation and program loading can be accomplished via FINS UDP.

PLC Support

The adapter mounts in an Option Board Slot on the front of a CP1L/H PLC, and can be used in all CP1L/H PLCs with an available Option Board Slot. The CP1W-EIP61 is not supported by the CP1E PLC.

Normal Mode

The CP1W-EIP61 adapter allows other PLCs to connect to an Omron CP1L/H PLC and share up to 100 words of data in each direction with the originator PLC.

I/O Block Mode

Special assemblies have been provided to allow the originator PLC to directly read the inputs and directly control the outputs of the CP1L/H.

1-1-2 Compatible PLCs

The following table provides compatibility and configuration details about PLC models that support the CP1W-EIP61 Unit.

PLC Model	Compatible	Details
CP1E-E	NO	Option port does not support the required protocol
CP1E-N		
CP1L-L	YES	Compatible on models with available option port, configure with DIP switches/CX-Programmer
CP1L-EL		Configure with CX-Programmer
CP1L-EM		
CP1L-M		Configure with DIP switches/CX-Programmer
CP1H-Y		
CP1H-X		

2

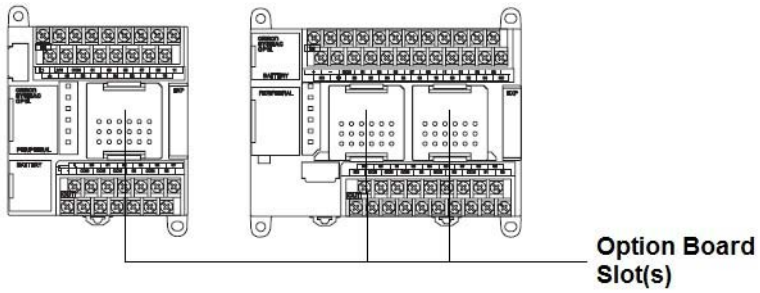
Operation

This section describes the configuration details of the CP1W-EIP61 Unit.

2-1 Installation 2-2
2-1-1 PLC Setup 2-2
2-2 Adapter Setup 2-5
2-2-1 Configuring the Adapter 2-5
2-2-2 Recovering a lost IP address setting 2-5
2-3 Operation Modes 2-6
2-3-1 Normal Mode 2-6
2-3-2 I/O Block Mode 2-6
2-4 Applications 2-8
2-5 Configuration Example 2-10
2-6 Connecting with CX-Programmer 2-17
2-7 Using an NS-series HMI with a CP1W-EIP61 Unit 2-18
2-8 Performance 2-19
2-8-1 Response Time 2-19
2-9 Requested Packet Interval and Connection Size Settings 2-20
2-10 Additional Support 2-21

2-1 Installation

The CP1W-EIP61 EtherNet/IP adapter mounts in one of the available Option Board Slots on the front of the CPU.



- **Mounting an Option Board**

  When mounting an Option Board, first remove the slot cover. Grasp the lock levers at the top and bottom of the cover at the same time to unlock the cover, and then pull the cover out. Then to mount the Option Board, check the alignment and firmly press it in until it snaps into place.

Precautions for Correct Use

Always turn OFF the power supply to the PLC before mounting or removing an Option Board.

2-1-1 PLC Setup

The CP1W-EIP61 adapter uses the Toolbus protocol. Configuration settings must be made before using the adapter as shown below.

Precautions for Correct Use

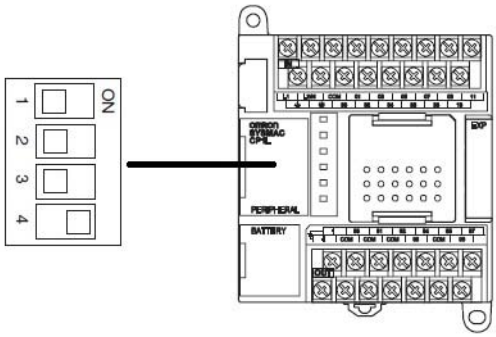
Always turn OFF the power supply to the PLC before mounting or removing the CP1W-EIP61 unit.

Precautions for Safe Use

Always turn OFF the power supply to the PLC before attempting to set the DIP switches. Not turning OFF the power supply may result in malfunction or electric shock.

CP1L-L PLCs with one option board slot

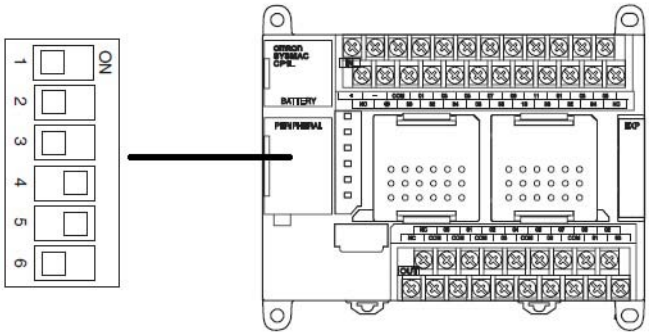
Use DIP Switch 4 in the ON position to configure the Option Board Slot for Peripheral Bus usage.



Switch No.	Setting	Description	Application	Default
4	ON	Used for peripheral bus (Toolbus).	Used to enable a Serial Communications Option Board mounted in Option Board Slot 1 to be used by the peripheral bus.	OFF
	OFF	According to PLC Setup.		

CP1L-M, CP1H PLCs with two option board slots

Use DIP Switch 4 and 5 in the ON position to configure the Option Board Slot for Peripheral Bus usage.

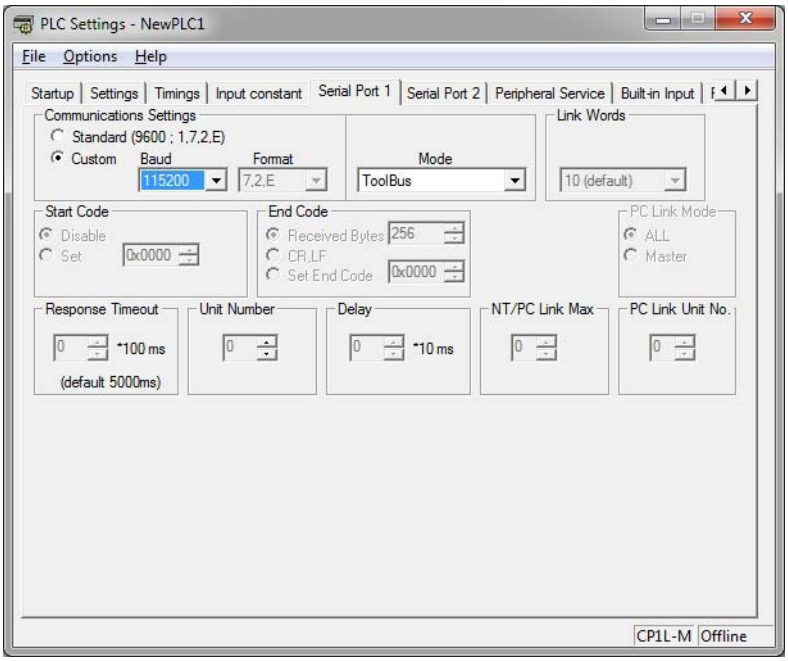


Switch No.	Setting	Description	Application	Default
4	ON	Used for peripheral bus (Toolbus).	Used to enable a Serial Communications Option Board mounted in Option Board Slot 1 to be used by the peripheral bus.	OFF
	OFF	According to PLC Setup.		
5	ON	Used for peripheral bus (Toolbus).	Used to enable a Serial Communications Option Board mounted in Option Board Slot 1 to be used by the peripheral bus.	OFF
	OFF	According to PLC Setup.		

CP1L-EL/EM PLCs with no DIP switches

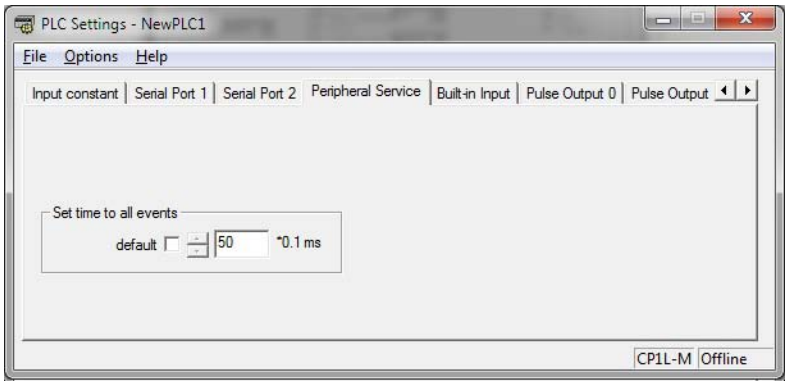
Use the following CX-Programmer settings to configure the Option Board slot for Peripheral Bus (Toolbus) usage. Make the settings below to the appropriate Serial Port 1 or 2 based on the mounting location. Transfer these settings to the PLC and cycle power to apply the changes.

- Custom Port Settings
- Baud 115200
- Mode Toolbus



Peripheral Service

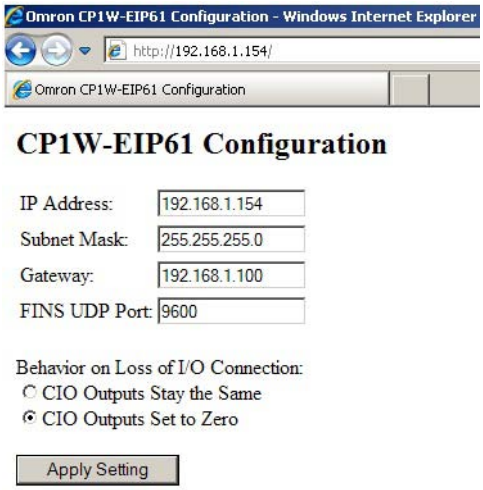
To maximize the throughput of the CP1W-EIP61, the amount of time per PLC scan that is allowed for servicing communications ports should be increased. This is accessed through the PLC Settings in CX-Programmer. On the Peripheral Service tab, uncheck the **default** option and enter 50 (5.0 ms). Transfer these settings to the PLC and cycle the power to apply the changes.



2-2 Adapter Setup

2-2-1 Configuring the Adapter

The CP1W-EIP61 is assigned a default IP address of 192.168.250.11. The IP address can be changed using a web browser and the default IP address of the adapter. A static IP address must be assigned to the PC's Ethernet card for this purpose. Enter the IP address of the adapter (192.168.250.11) in the web browsers address field to access the configuration page. Enter the desired new IP address (192.168.1.154 shown as an example), subnet mask, and default gateway (if applicable).



- **Behavior on Loss of I/O Connection (I/O Block Mode Only)**

  When a loss of I/O connection occurs while in I/O Block Mode, there are two selectable options for the behavior of the CP1W-EIP61.

  - CIO Outputs Stay the Same
  - CIO Outputs Set to Zero

  When *CIO Outputs Stay the Same* is selected, the data in CIO 0100 to 0119 will remain the same upon loss of connection until the connection is re-established and new data is present.

  When *CIO Outputs Set to Zero* is selected, the data in CIO 0100 to 0119 will be set to a value of zero upon loss of connection until the connection is re-established and new data is present.

Clicking **Apply Setting** will save the changes and configure the adapter with the new settings.

2-2-2 Recovering a lost IP address setting

If the IP address is lost or unknown, inspecting PLC memory areas can reveal the CP1W-EIP61's current IP address setting. Data memory areas D1200 ad 1201 store the IP address in the following format.

- D1200 stores the first and second octets in hexadecimal
- D1201 stores the third and fourth octets in hexadecimal

Example for an IP address of 192.168.1.154: D1200 = C0A8, D1201= 019A

2-3 Operation Modes

The operating mode of the CP1W-EIP61 adapter operation can be determined with the configuration of the Originator PLC using Network Configurator. See *2-5 Configuration Example* for more information.

2-3-1 Normal Mode

In normal operation, the CP1W-EIP61 adapter allows other PLCs to connect to an Omron CP1L/H PLC and share up to 100 words of data in each direction with the Originator PLC. Assemblies are provided to produce and consume 20 bytes (10 words), 40 bytes (20 words) 100 bytes (50 words) or 200 bytes (100 words) of PLC data.

The Produced Data (output from the CP1L/H) starts at D1000. The Consumed Data (input to the CP1L/H) starts at D1100. The size of the Produced and Consumed data will change as a function of the selected assembly, but the starting memory areas will remain the same. The current IP address of the CP1W-EIP61 adapter is stored in D1200 and D1201, as shown in *2-2-2 Recovering a lost IP address setting*.

Fixed Addresses	Usage
D1000 to D1099	Produced Data
D1100 to D1199	Consumed Data
D1200 to D1201	IP Address Configuration

2-3-2 I/O Block Mode

In I/O Block Mode, special assemblies have been provided to allow the Originator PLC to directly read the inputs and directly control the outputs of the CP1L/H. The maximum I/O configuration of a CP1L/H can be used, and the I/O is mapped directly over EtherNet/IP without the need of programming or additional configuration of the CP1L/H PLC. In this case, the CP1L/H PLC functions as an I/O block.

While this configuration is flexible and easy to configure, it should be used in applications that do not require high speed I/O. The typical response time of an input or output on a CP1L/H using the CP1W-EIP61 in I/O Block Mode when viewed from the Originator PLC is approximately 175 ms, using a 10 ms RPI for EtherNet/IP.

In I/O Block Mode, the user can choose if the CP1L/H PLC outputs should be turned off upon loss of communications to the Originator PLC, or if the output state should be maintained. This is done through the CP1W-CIF61 configuration Web Page (see *2-2-1 Configuring the Adapter*).

The I/O Assemblies for I/O Block Mode are 120 and 121.

The Input and Output connection size for I/O Block Mode is fixed at 40 bytes in and 40 bytes out, regardless of the actual amount of I/O connected to the CP1L/H. The I/O mapping of the CP1L/H I/O into the Originator PLC follows the channel I/O layout of the CP1L/H PLC, as shown below.

● I/O Mapping for I/O Block Mode

Fixed Addresses	Type	Input Bytes	Output Bytes
0000	Physical PLC Inputs	00 + 01	--
0001		02 + 03	--
0002		04 + 05	--
...		...	--
0019		38 + 39	---
100	Physical PLC Outputs	---	00 + 01
101		---	02 + 03
102		---	04 + 05
...		---	...
119		---	38 + 39

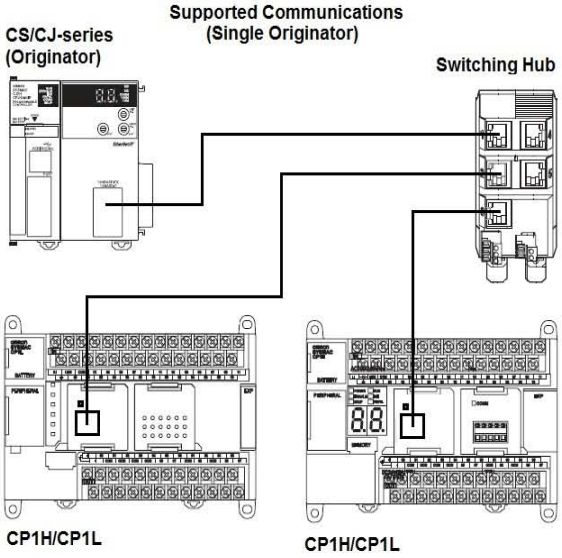
Additional Information

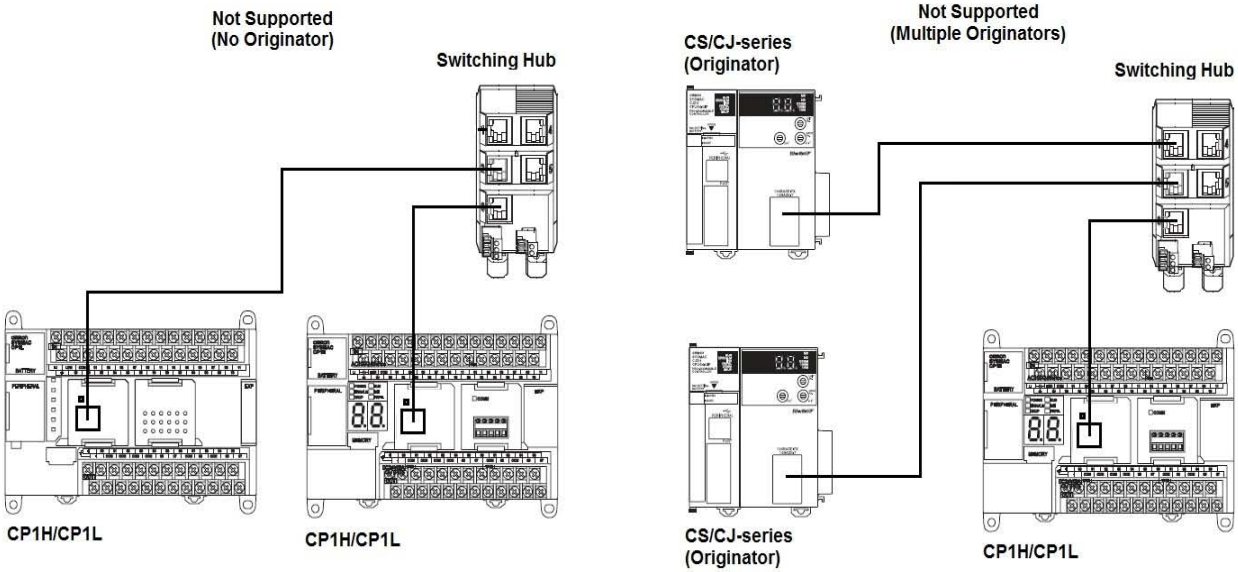
Refer to the following manuals for additional information on CP1L/H I/O allocation.

- *CP1L CPU Unit Operation Manual* (Cat. No. W462)
- *CP1H CPU Unit Operation Manual* (Cat. No. W450)
- *CP1L-EL/EM CPU Unit Operation Manual* (Cat. No. W516)

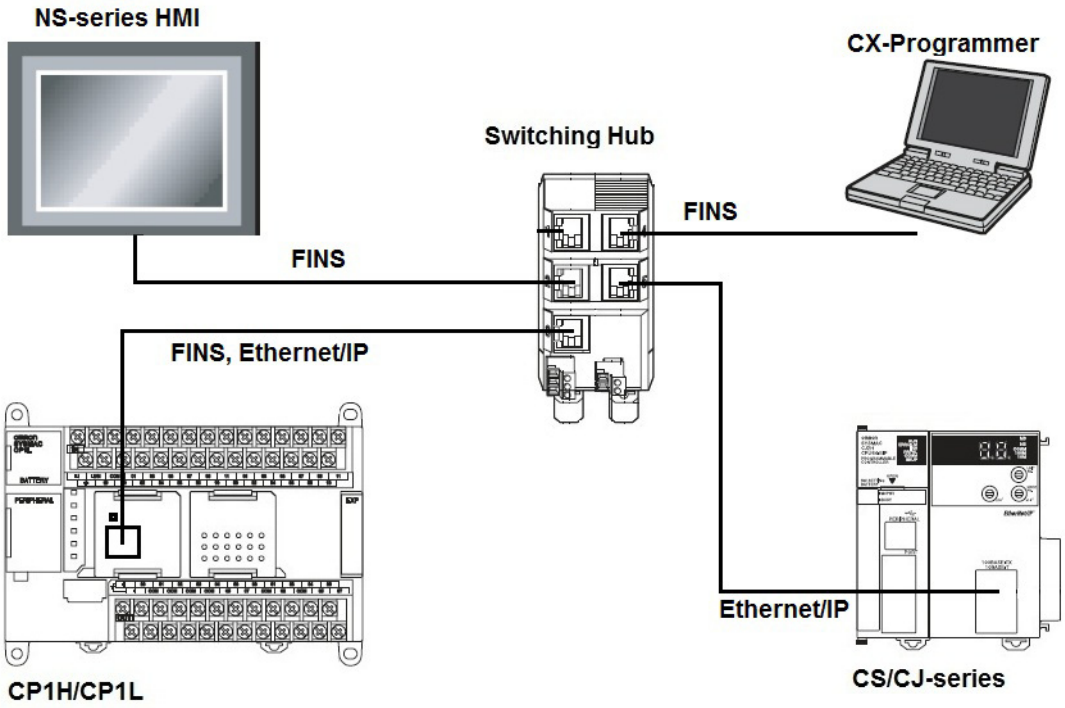
2-4 Applications

The CP1W-EIP61 has been developed to allow Omron CP1L and CP1H PLCs to function as programmable I/O modules. The adapter is an EtherNet/IP Connection Target, meaning the adapter cannot establish a connection to another device. A device, such as a CJ or CS series PLC or NSJ hybrid controller with an EtherNet/IP module, functioning as a Connection Originator, must be the device used to establish the Datalink (implicit messaging) connection to the CP1W-EIP61. Only 1 Originator can establish a connection to the CP1L/H PLC. The CP1W-EIP61 does not support communications to multiple Originator PLCs.





The CP1W-EIP61 also supports FINS UDP communications, allowing NS series HMIs, PLCs or CX-Programmer programming software to connect via FINS UDP while maintaining EtherNet/IP connections.

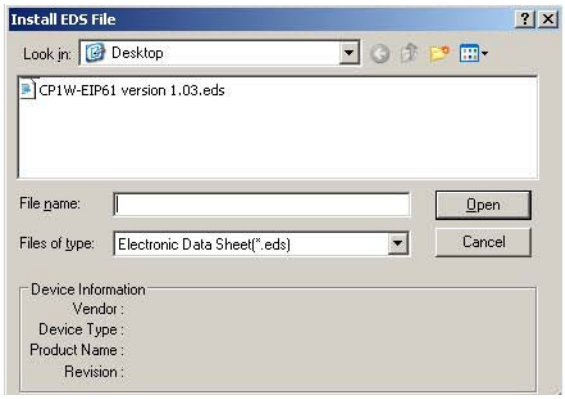


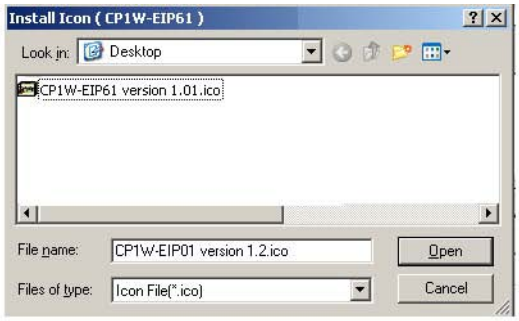
2-5 Configuration Example

The following example is shown to assist in establishing an initial connection with the CP1W-EIP61 Unit. For this example, a CJ2M PLC and CP1L PLC will establish a connection where 100 bytes (50 words) will be produced and consumed.

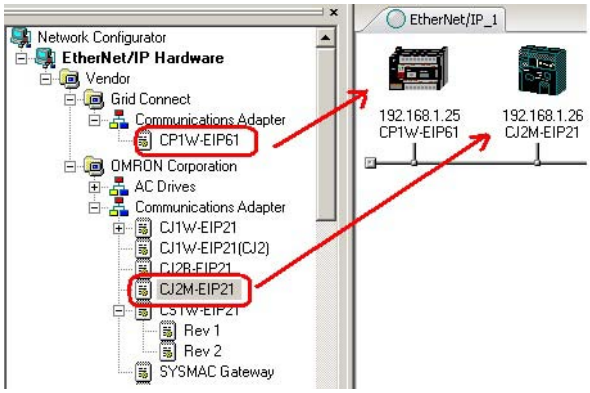
CJ2M PLC	CP1L PLC
D5000 to D5049 Consumed	D1000 to D1049 Produced
D5100 to D5149 Produced	D1100 to D1149 Consumed

1. Insert the CP1W-EIP61 Unit into the leftmost Option Board Slot, set DIP switch 4 to ON and apply power to the CP1L.
2. Connect the CJ2M, CP1W-EIP61, and PC to an Ethernet Switch.
3. Configure the IP address of the CJ2M as 192.168.1.26 using CX Programmer.
4. Configure the IP address of the CP1W-EIP61 as 192.168.1.25 as shown in Section 4.
5. Launch the Network Configurator for EtherNet/IP from Start / Programs / Omron / CX-One / Network Configurator for EthernetIP / Network Configurator (default installation directory).
6. Install the .eds file (available from Omron) and the associated icon by clicking the EDS File / Install menus, and browsing for the .eds file and the .ico file.



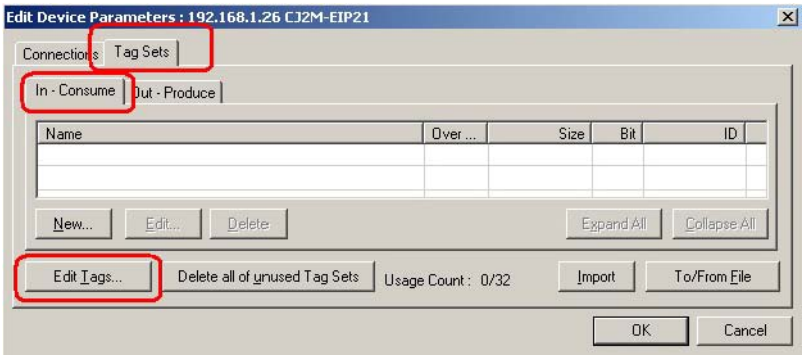


7. Drag a CP1W-EIP61 device and a CJ2M-EIP21 onto the network diagram as shown. Change the IP addresses of the devices to 192.168.1.25 and 192.168.1.26 as shown, by right clicking on each device, and selecting **Change Node Address**.



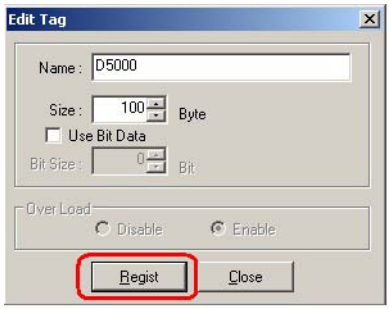
8 Double click on the CJ2M-EIP21 in the network diagram.

9 Click on the **Tag Sets** tab, In- Consume, and click **Edit Tags**.

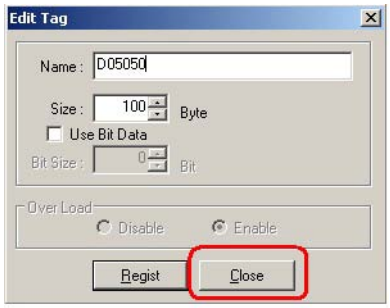


10 Click **New** to create a new tag.

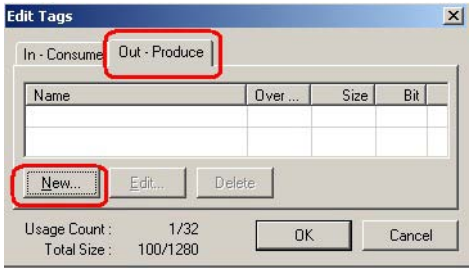
11 Enter D5000 as the tag name (this is also the PLC memory address), and a size of 100 bytes. Click **Regist** to create the tag.



12 Click **Close** after creating the D5000 tag, as the software assumes that another tag will be created.

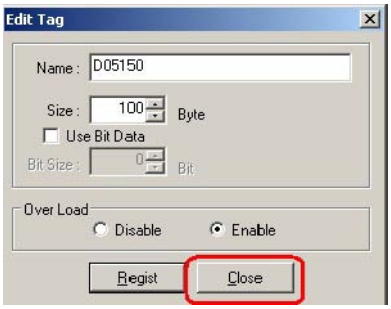


13 Click on the **Out – Produce** tab, and then click **New** to create a Produced Tag.

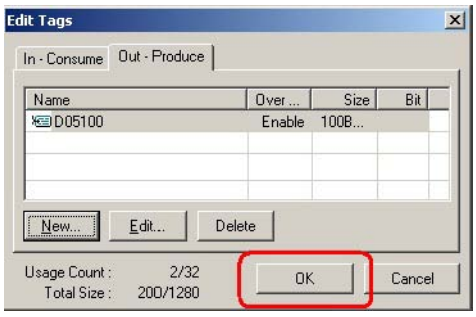


14 Enter D5100 as the tag name (this is also the PLC memory address), and a size of 100 bytes. Click **Regist** to create the tag.

15 Click **Close** after creating the D5100 tag, as the software assumes that another tag will be created.

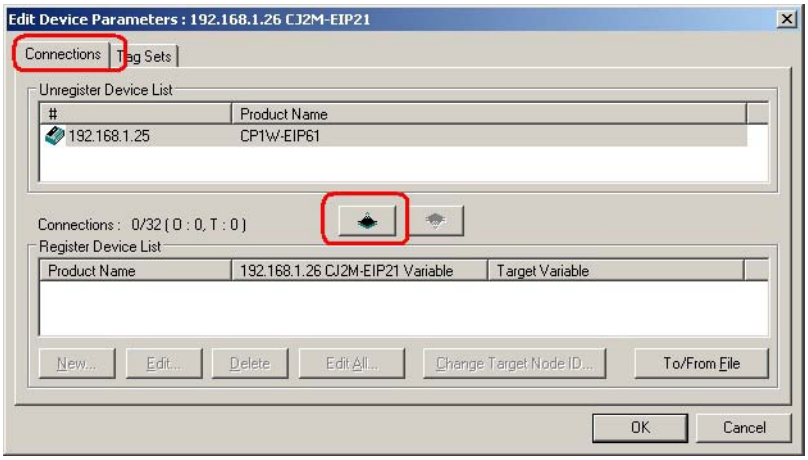


16 Click **OK** to complete the creation of the tags.

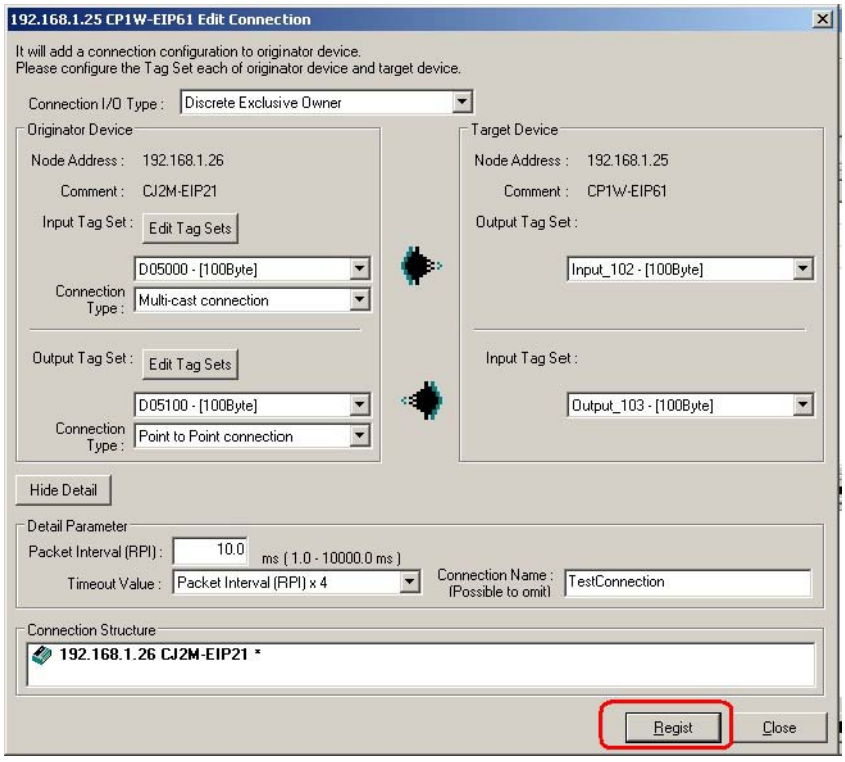


17 When prompted, click **Yes** to create Tag Sets with the same name as the Tags that they contain.

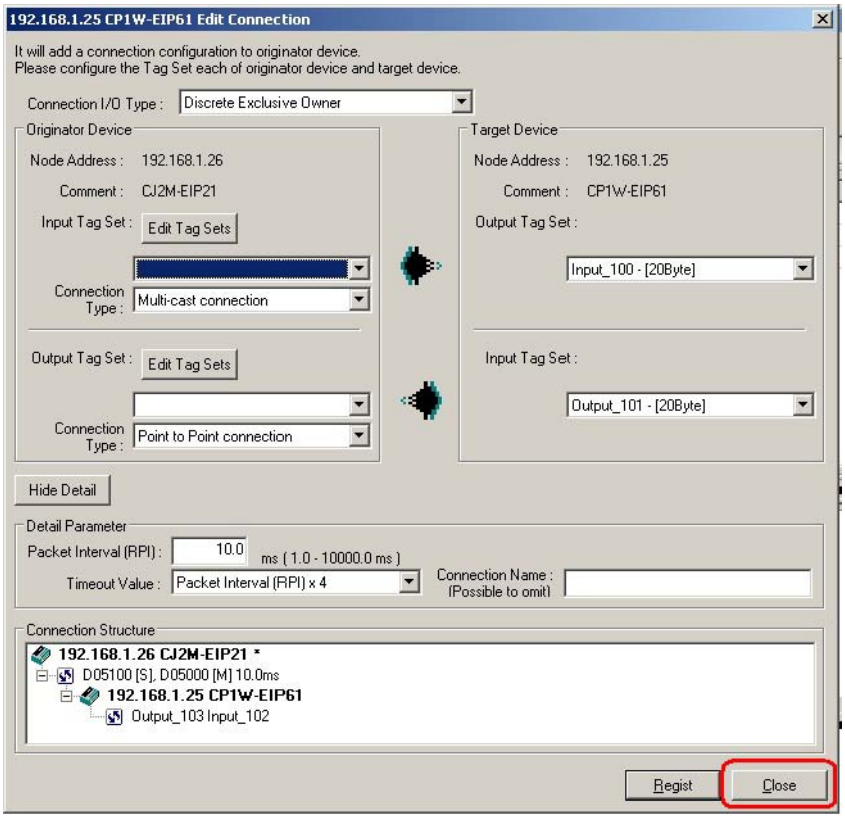
18 Click on the **Connections** tab, highlight the CP1W-EIP61 and click the **Down Arrow** as shown to move the device from the Unregistered Device List to the Registered Device List.



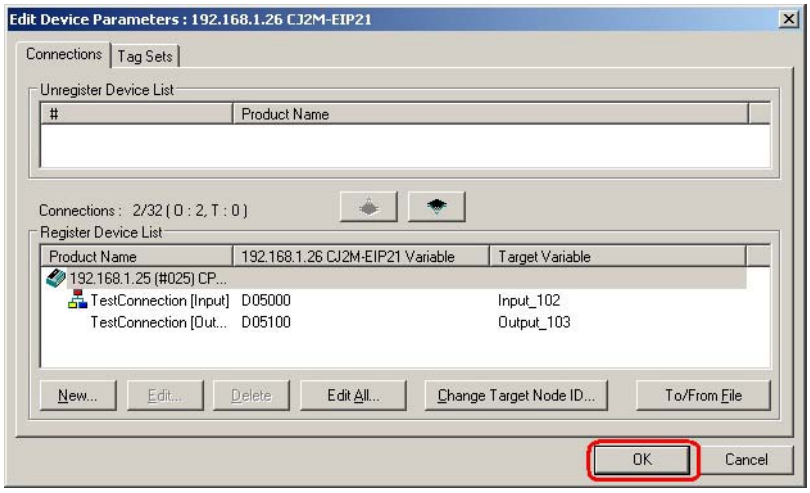
19 Double click on the device in the Registered Device List. Create a new connection as shown. Click **Regist** when finished.



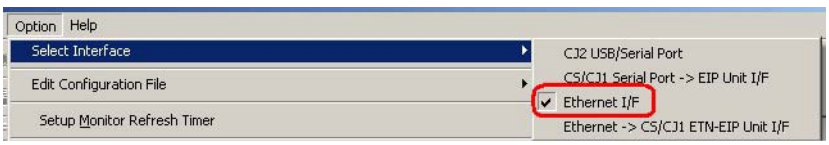
20 Click **Close** after creating the connection, as the software assumes that another connection will be created.



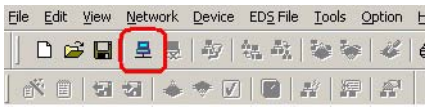
21 Click **OK** to close the Edit Device Parameters window.



22 To select the connection method to connect to the EtherNet/IP network, click on the **Options / Select Interface** menus and select **Ethernet I/F**.

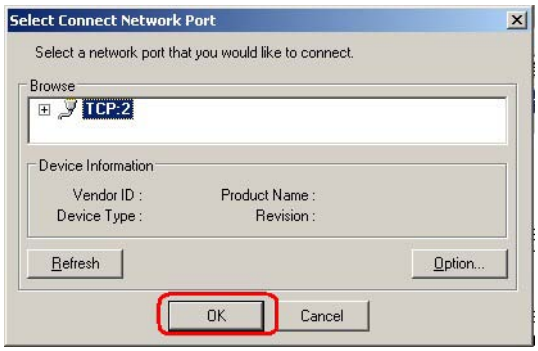


23 Click the **Connect** icon as shown.

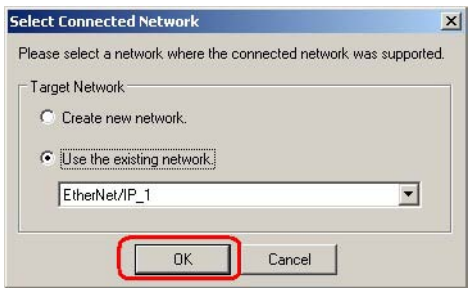


24 Select the appropriate network adapter, and click **OK**.

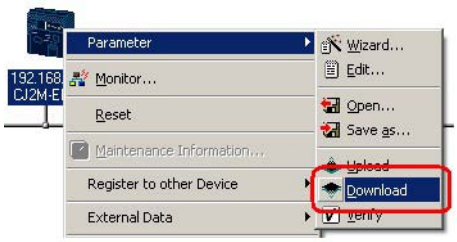
25 Click **OK** to select TCP port 2 to connect to the network directly.



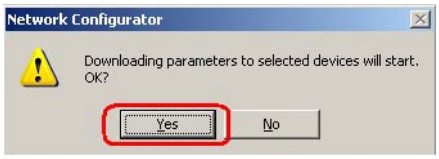
26 Select **Use the existing network**, and click **OK.**



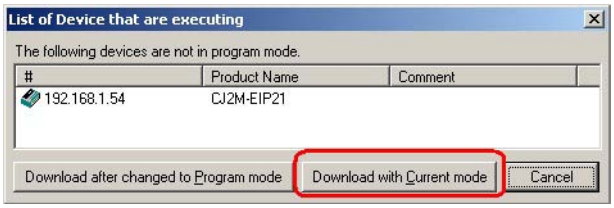
27 Right click on the CJ2M-EIP21 module in the network diagram, and select **Download**.



28 Click **Yes** to download the parameters.



29 To download to the EIP module without changing the PLC to Program mode, click **Download with Current mode**.



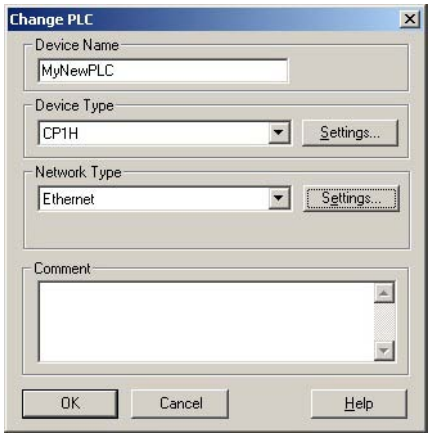
30 When the download is complete, click **OK**.

31 Using CX Programmer, verify that the data is exchanged as shown. Once the data is verified, the connection process is complete.

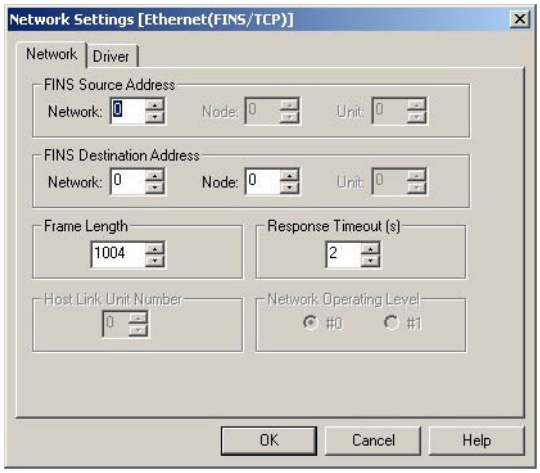
2-6 Connecting with CX-Programmer

Use the following settings and method to establish an online connection to the CP1L/H using the CP1W-EIP61 Unit.

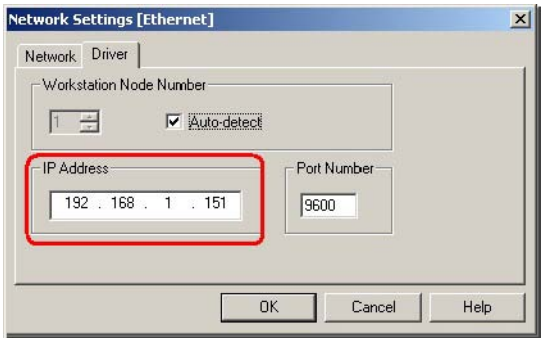
1 Within the CX-Programmer project containing the CP1L/H to use for online connection, select **Ethernet** as the Network Type, and click **Settings** for Network Type.



2 Leave all the settings on the Network tab at the default values.

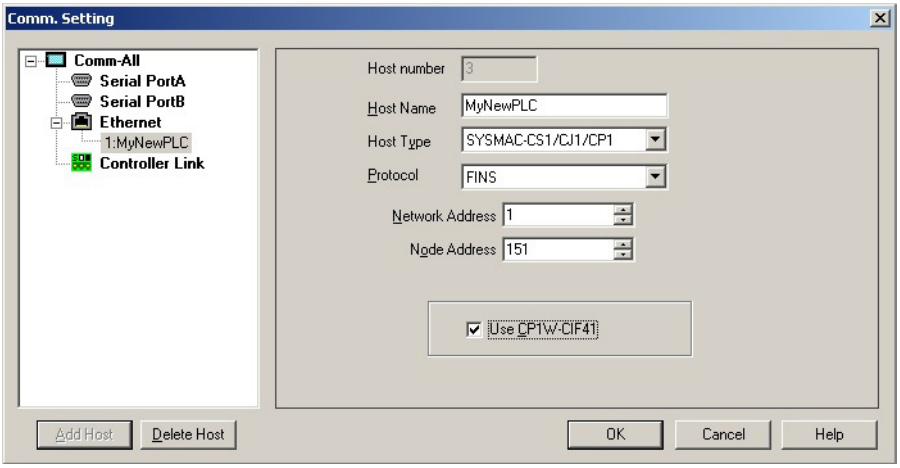


3 In the Driver tab, specify the IP address of the CP1W-EIP61. 192.168.1.151 is shown as an example. Set the UDP Port Number to match that configured on the CP1W-EIP61. 9600 (default) is shown as an example.



2-7 Using an NS-series HMI with a CP1W-EIP61 Unit

When adding the CP1H or CP1L PLC as a Host in CX-Designer, specify the Host Type as Sysmac-CS1/CJ1/CP1, the Network Address as 1, and the Node Address as the last octet of the IP address of the CP1W-EIP61. 151 would be the Node Address if the IP address were 192.168.1.151. Select 'Use CP1W-CIF41' as shown below. This limits the Frame Length of the packets sent to the CP1W-EIP61 to the appropriate size.



2-8 Performance

2-8-1 Response Time

The average response times for produced and consumed data connections between an Omron CS/CJ-series Controller and a CP1L/CP1H PLC are shown below for an adapter used in Normal Mode.

Method	20 Bytes	40 bytes	100 Bytes	200 Bytes
Produced	25 ms	30 ms	35 ms	45 ms
Consumed	25ms	30ms	35ms	45ms

These values are based upon a 10 ms RPI setting, and an increased Peripheral Servicing time in the CP1L / CP1H. Other factors such as network bandwidth, PLC scan time, FINS communications traffic, etc may affect the actual throughput.

The Datalink function of EtherNet/IP is a Producer / Consumer model function, as opposed to a Command and Response model. This makes the throughput from a single node not significantly different from the throughput of multiple nodes. Therefore, the data shown below holds true for 1 CP1L / CP1H PLC connected to 1 CS / CJ series PLC, or multiple CP1L / CP1H PLCs connected to 1 CS / CJ series PLC.

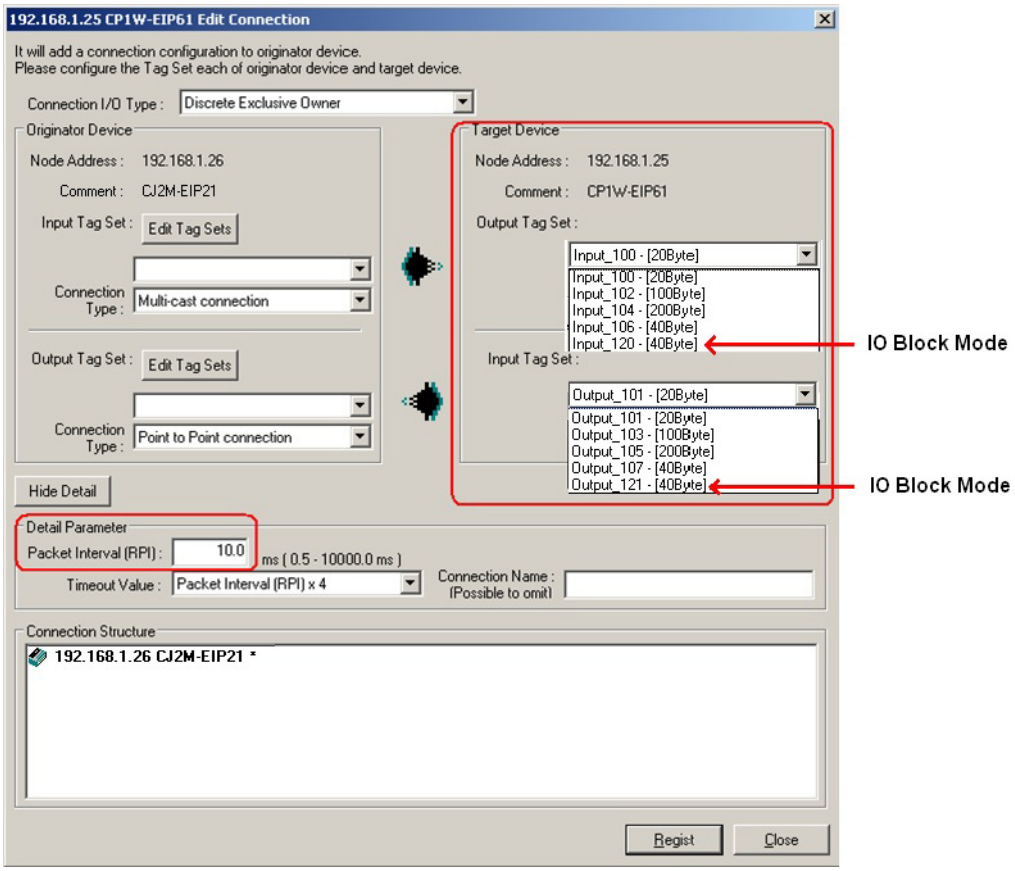
2-9 Requested Packet Interval and Connection Size Settings

The CP1W-EIP61 does not provide diagnostic information to the CP1L/H PLC about the status of the connection to other PLCs. A 'heartbeat' should be programmed into the produced and consumed data areas for this purpose.

When establishing a connection from a CJ or CS or NSJ series PLC, the user configures the Requested Packet Interval (RPI), which is the rate at which the CP1W-EIP61 and CJ or CS-series PLCs will produce data. The default rate set by the Network Configurator for EtherNet/IP is 50 ms. This can be reduced to 10 ms for faster data throughput.

The size of the connection used will affect the data update rate to and from the CP1L/H PLC through the CP1W-EIP61.

Use Network Configurator for EtherNet/IP to adjust the rate of the packet interval for the CJ or CS-series PLC as shown below.



Precautions for Correct Use

Setting the Requested Packet Interval to a value below 10 ms will not increase the network throughput and it will un-necessarily increase network traffic.

2-10 Additional Support

If additional support is required for the application or operation of the CP1W-EIP61, use the following resources provided below.

- Your local Omron representative
- www.omron247.com
- www.myOMRON.com

Authorized Distributor: