Ethernet Communications Modules

Manual Number H24–ECOM–M

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Manual Revisions

If you contact us in reference to this manual, be sure and include the revision number.

Title: Ethernet Communication Modules
Manual Number: H24–ECOM–M

Issue	Date	Description of Changes
Original	4/98	Original Issue
1st Edition, Rev A	8/02	Added DL250–1 and DL260 references Removed DL250 references Minor changes (Note: DL250 has the same functionality as the DL250–1 except for local expansion capability.)

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Chapter 2: Setup and Installation

Chapter 3: RLL Programming for Communications

1

Introduction

In This Chapter. . . .

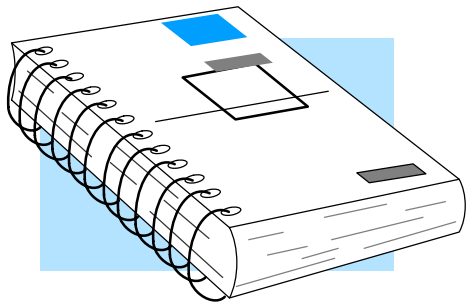
— Manual Overview
— ECOM Module Introduction
— Frequently Asked Questions

Manual Overview

The Purpose of this Manual

This manual describes how to use the **Ethernet Communication (ECOM) Modules.** You will find information about:

- Setting up the ECOM module
- Network layouts
- PC-to-PLC communications
- PLC-to-PLC communications
- RLL programming examples
- Maintenance and troubleshooting



Other Reference Materials

Other ***Direct***LOGIC™ manuals may be useful for your application.

User Manuals

- DL205 User Manual part number D2–USER–M
- DL405 User Manual part number D4–USER–M
- ***Direct***SOFT User Manual (with part number PC–PGMSW v2.3 or later)
- DSData Server User Manual (with part number PC–DSDATA–M)

Who Should Read this Manual

If you need a high-speed communications link between your ***Direct***LOGIC PLC and PCs or other ***Direct***LOGIC PLCs and you understand the basics of installing and programming PLCs, this is the right manual for you. This manual gives you the information you need to set up and install a communication link to an ECOM module.

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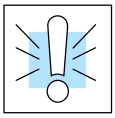
- **Table of Contents** – chapter and section listing of contents, in the front of this manual
- **Quick Guide to Contents** – chapter summary listing on the next page
- **Appendix** – module specifications and Ethernet standards
- **Index** – alphabetical listing of key words at the end of this manual

If you have a comment or question about any of our products, services, or manuals please fill out and return the ‘Suggestions’ card that came with this manual.

Conventions Used

When you see the “light bulb” icon in the left–hand margin, the paragraph to its immediate right will give you a **special tip**.
The word **TIP:** in boldface will mark the beginning of the text.

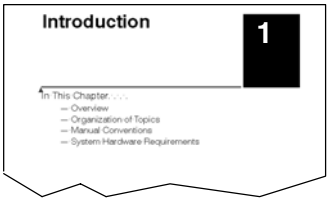
When you see the “notepad” icon in the left–hand margin, the paragraph to its immediate right will be a **special note**.
The word **NOTE:** in boldface will mark the beginning of the text.



When you see the “exclamation mark” icon in the left–hand margin, the paragraph to its immediate right will be a **warning**. This information could prevent injury, loss of property, or even death (in extreme cases).
The word **WARNING:** in boldface will mark the beginning of the text.

Key Topics for Each Chapter

The beginning of each chapter will list the key topics that can be found in that chapter.



ECOM Module Introduction

Four Ethernet Communication (**ECOM**) modules are currently available for use with DL205 and DL405 PLC systems. The four ECOM modules are shown below. These modules provide a low-cost, high-speed Ethernet link for PLC systems. The modules are easy to set up and install on 10BaseT (twisted pair, copper wire) or 10BaseFL (fiber optic) Ethernet networks.

LEDs on the face of each module give vital information about the status of the module and the communication link. The 10BaseT modules use standard RJ45 modular connectors, and the 10BaseFL modules use ST style bayonet connectors.

H2–ECOM **H2–ECOM–F** **H4–ECOM** **H4–ECOM–F**

NOTE: We recommend using a dedicated network for your PLC control applications. For more information see Chapter 2, Setup and Installation.

ECOM Communication Possibilities

You can use the ECOM modules to share data between two or more ***Direct***LOGIC PLCs or between ***Direct***LOGIC PLCs and personal computers. Communication between PLCs is accomplished by using the Read/Write (RX/WX) instructions which are available in the ***Direct***SOFT32 Programming Software. Chapter 3 explains the use of RX/WX instructions.

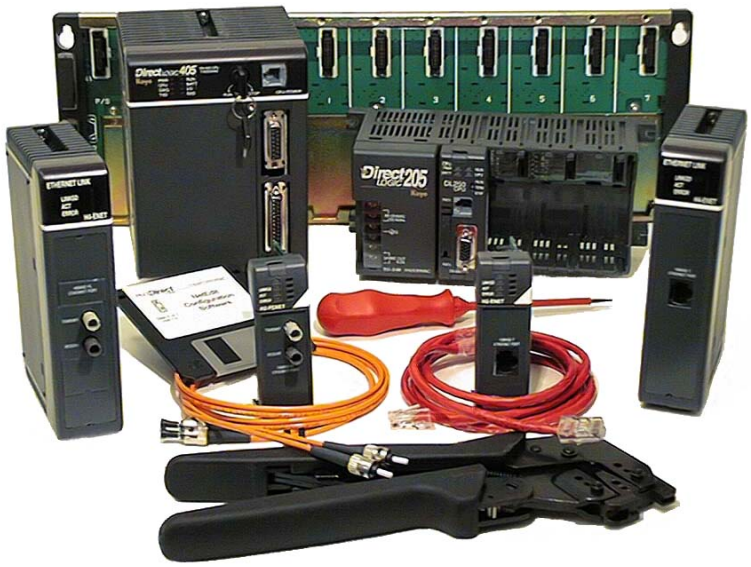
You can also use a personal computer running ***Direct***SOFT32 Programming Software to program your PLCs over the Ethernet network. It is just like programming through the programming port on the CPU, but with the convenience of doing it from a single location.

Use catalog number PC–PGMSW to program the complete ***Direct***LOGIC family of PLCs (only the DL205 series and the DL405 series can be programmed over Ethernet). You can use catalog number PC–PGM–205 for programming just the 205 series. You will need version 2.3 (or newer) of ***Direct***SOFT software to recognize the ECOM module. Chapter 2 lists the CPUs which can be used with the ECOM modules.

PCs running our DSData Server software can establish Ethernet links for exchanging information with ***Direct***LOGIC 205/405 PLCs.

Your Network PC

You can use a personal computer equipped with a 10BaseT or 10BaseFL network adapter card and NetEdit software to configure the ECOM module over the network. You can also use NetEdit for troubleshooting certain communication problems. The NetEdit utility is included with this manual and is available for download at http://www.automationdirect.com.



Frequently Asked Questions

Q. What is Ethernet?

A. Ethernet is a communication specification which defines cable type and signalling methods to be used in a local-area-network (LAN). An Ethernet network transmits *packets* of information between computers at speeds of 10 to 100 million bits per second (Mbps). Currently the most widely used version of the Ethernet standard is 10BaseT. Using the Ethernet standard allows products from many vendors to communicate using common software protocols and hardware.

Q. Will my PC communicate with the ECOM without the use of special software?

A. No, you must use a compatible software package. Popular Windows-based spreadsheet and database software or Human Machine Interface (HMI) software can share data via our DSData software. The DSData Server offers ready-to-use software drivers. Also, ***Direct***SOFT V2.3 (or later) programming software will allow *online setup* of the ECOM modules and *programming* of the ***Direct***LOGIC PLCs.

Q. Which protocols are supported by the ECOM module?

A. A protocol is a set of rules that allows computers to connect with one another specifying the format, timing, sequencing, and error checking for data packet transmission. The ECOM module supports Novel IPX and UDP/IP (Universal Datagram Protocol/Internet Protocol) in addition to a proprietary high-performance ECOM Ethernet protocol.

Q. Which Ethernet packets are recognized by the ECOM module?

A. The Ethernet Communication Module supports IEEE 802.2, IEEE 802.3, Ethernet 2, and SNAP Ethernet packets. The module will respond to IPX or UDP/IP messages which are initiated using compatible interface software. Using off-the-shelf Windows-based OPC/DDE-compliant software or HMI software and our DSData software, you can link to your PLC and access PLC data.

Q. How do I connect to an Ethernet network?

A. Ethernet devices can be directly connected to a Local Area Network or they can be connected using media adapter products. Media adapters (or transceivers) provide interconnection between different types of Ethernet cabling.

Q. Can I use the ECOM module to allow two PLCs to exchange data with each other?

A. You can use the ECOM to make it possible for two (or more) PLCs to exchange data (contents of memory locations) with each other.

The initiating PLC sends a Read/Write (RX/DX) request that says to the other PLC, “I want to tell you something” or “I want to ask you something.” Once the data has been exchanged, the communication channel is closed, and the PLCs resume their program execution.

Q. Can I create multiple networks by putting more than one ECOM in a single PLC base?

A. Yes, but be sure to consult Chapter 2 for important installation information, and be sure not to exceed the PLC power budget (see the module specifications in Appendix A and the PLC User Manual).

Q. What does it mean to "set up" the ECOM module?

A. The ECOM module must have a network identifier in order for other PLCs or PCs to find it on the network. The network identifier can be set using a DIP switch or using software utilities (see Chapter 2).

Q. Are Ethernet specification documents required to install an ECOM system?

A. No. Detailed Ethernet specifications are not necessary for connecting the ECOM module to an Ethernet network. If you want more information about Ethernet networks, many books are available which give guidelines for implementing Ethernet 10BaseT or 10BaseFL networks.

Q. Which LAN technology should I use?

A. ECOM modules are available for connecting to 10BaseT or 10BaseFL (fiber optic) networks. The cable distances and environmental conditions often dictate which media type should be used. The most popular and flexible technology currently is 10BaseT, but 10BaseT is susceptible to electrical noise and is limited to relatively short cable runs. On the other hand, it is very simple and inexpensive, and repeaters can be used to extend its cable length limitations. 10BaseFL allows much longer cable runs with immunity to electrical noise. The fiber optic cable and hubs are currently more expensive than those for 10BaseT.

2

Setup and Installation

In This Chapter. . . .

- — ECOM Network Identifiers
- — Setting the Module ID with the DIP Switch
- — Running NetEdit Software
- — Features of the NetEdit Screen
- — Inserting the ECOM Module in the PLC Base
- — ECOM Network Layouts
- — Network Cabling
- — Maximum Cable Length
- — Maximum Number of ECOM Modules on the Network

ECOM Network Identifiers

This section describes the various methods of assigning a network identifier to the ECOM module. Each module must be assigned at least one unique identifier to make it possible for PCs or other ECOMs to recognize it on the network. Four methods of identifying the ECOM module give it the flexibility to fit most networking schemes.

The four ECOM identifiers are:

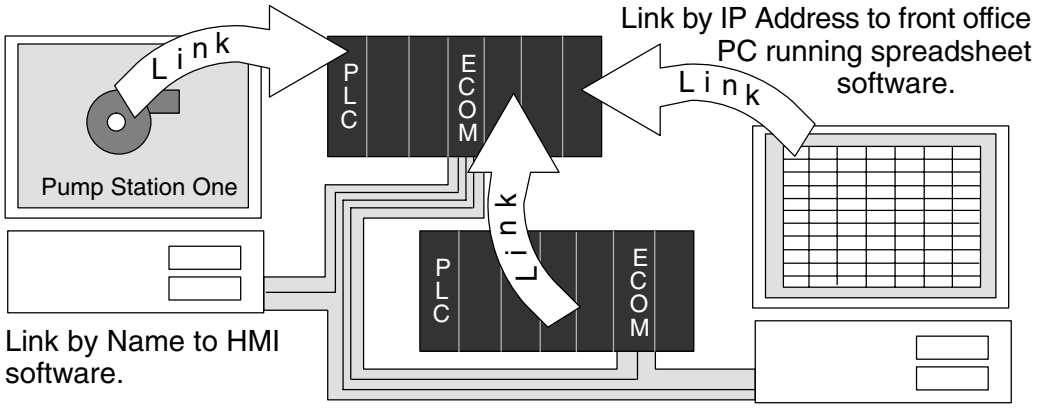
- Module ID
- Name
- IP (Internet Protocol) Address
- Ethernet Address

The first three are user-selectable. The last one is set at the factory. Each of the identifiers is discussed below (also see the chart on page 2-11). If you have more than a few ECOMs on your network, consider making a chart or spreadsheet of network IDs, as shown below:

Ethernet Address	Module ID	Name	IP Address
00 E0 62 20 01 20	3	PumpStationTwo	192.168.100.005
00 E0 62 20 01 58	8	Effluent	255.255.255.255
00 E0 62 20 01 8D	17	BldgThree	192.168.100.001
00 E0 62 20 01 94	2	PumpStationOne	192.168.100.002
00 E0 62 20 01 DE	61		192.168.100.003
00 E0 62 20 01 F1	33		192.168.100.004
00 E0 62 20 01 FB	1	Control Room	255.255.255.255
00 E0 62 20 01 F0	5	Mixer	192.168.100.006

The decision about which type of identifier to use is an important one. Much of the decision depends on the requirements of your particular application. PC-to-PLC communications are generally better accommodated with one type of identifier while PLC-to-PLC communications require a different type. Ease of maintenance and troubleshooting also must be considered before deciding which type to use.

The identifiers are used to **link** your PC to your PLC or one PLC to another PLC. The flexible design of the module allows you to use different identifiers for different links to the same module. This is particularly important if you require both PC-to-PLC and PLC-to-PLC communications on the same network.

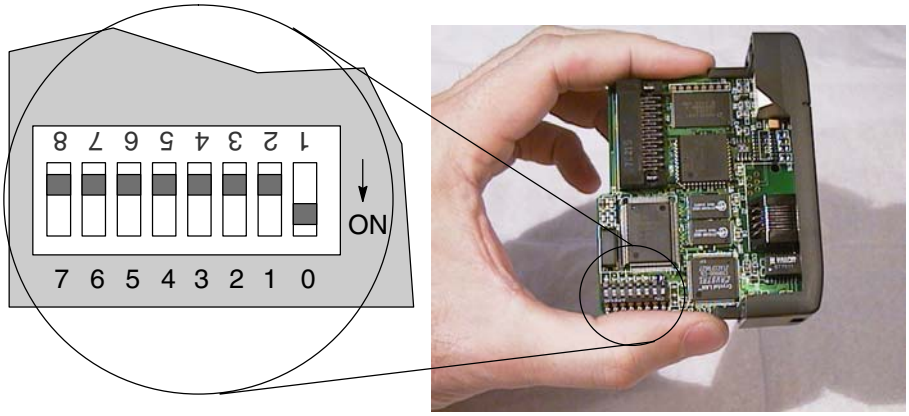


Module ID

A Module ID is *required* for PLC-to-PLC communications, and it can be set either of two ways. You can assign the Module ID:

- using the DIP switches on the module.
- using the configuration tools in NetEdit, ***Direct***SOFT32 or our DSData Server.

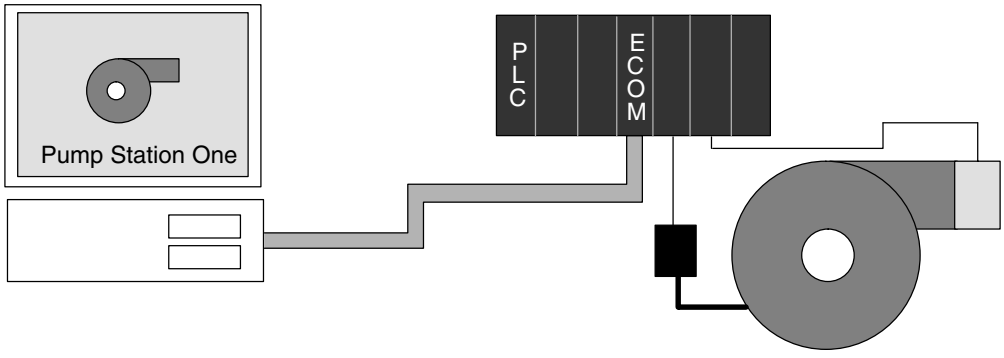
Use the DIP switch if you want the ability to install or change modules *without using a PC* to set the Module ID. Set the module's DIP switch, insert the module in the base, and connect the network cable. Your Module ID is set on powerup, and your ECOM is ready to communicate on the network. We step through setting the DIP switch on pages 2-5 and 2-6.



If you prefer to be able to set or change all Module IDs on your network from a single PC, use the tools in NetEdit, ***Direct***SOFT32 or our DSData Server software. Starting on page 2-7, we step through the use of NetEdit and the network identifier options.

Name

A Name makes it easy to recognize the PLC by its function. An example of a Name is "PumpStationOne." The Name can be up to 32 alphanumeric characters in length. A Name can be assigned using NetEdit, ***Direct***SOFT32 or our DSData Server. See page 2-10 to learn how to assign a Name to an ECOM module.



PUMP STATION ONE

NOTE: Some HMI software products will not accept Names with numbers as the first character, spaces or certain other non-alphanumeric ASCII characters. Also, your HMI product may not accept Names longer than 16 characters. Consult your HMI product documentation about its naming conventions.

IP Address
IP Netmask

An IP Address can be assigned to the ECOM module if your network requires one. Usually, the IP Address is required in cases where PLCs are sharing the same network with PCs, and some of the PCs are carrying out functions unrelated to PLC control. Normally, a network administrator will assign an IP Address and to each device on the network. If you have a separate dedicated network for your PLCs, you do not have to use the IP Address, unless you are using the UDP/IP protocol (see page 2-8). You can use the Module ID or a Name for each communication link.

You can use NetEdit, ***Direct***SOFT32, or our DSData Server to give your ECOM module an IP Address. See page 2-10 to learn how to change an IP Address.

The module ships from the factory with an IP Address of 255.255.255.255. This is not a usable IP Address for normal communications. It only serves as a default setting which can be changed using NetEdit, ***Direct***SOFT32 or our DSData Server. The **valid settings** are **0 through 254**. You do not have to change the default IP Address unless you are using the IP Address to link to your ECOM module. The default setting does not cause conflicts with other network communications.

If you change the default IP Address for linking to other network devices, you must change all four "255" fields. If any field contains **the number 255 *and* other fields have been changed, the module will *not* be recognized on the network.**

Example

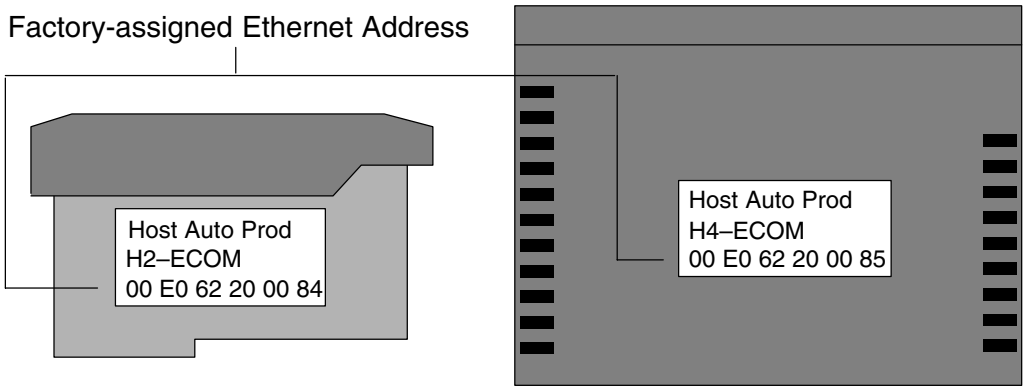
Valid IP Address: 192.168.100.002

No! ~~255~~.168.100.002

WARNING: It is extremely important not to have duplicate IP Addresses on your network. If you are using the IP Address to link the ECOM to **any** network devices (PCs or PLCs), the ECOM must have a unique number.

Ethernet Address

A unique Ethernet Address is assigned to each module at the factory and will not change. It is printed on a label attached to each ECOM module. The Ethernet Address is recognized by NetEdit, ***Direct***SOFT32 and our DSData Server. The Ethernet Address is a twelve digit number with no deliberate relationship to your network or functional areas of your plant. It does not usually serve as a convenient and easily remembered identifier for your ECOM.



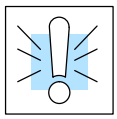
Using Multiple Network Identifiers

You can use the IP Address to satisfy network requirements, a Name for PCs running HMI software and the Module ID for PLCs to share data among themselves. Using one type of identifier does not limit your use of the other identifier types.

Setting the Module ID with the DIP Switch

You can use the DIP switch on the ECOM module to set the Module ID to a number from one to sixty-three. Each module on a given network must be assigned a **unique** Module ID if the Module ID is to be used for communications. Do not use Module ID "0" *for communications*.

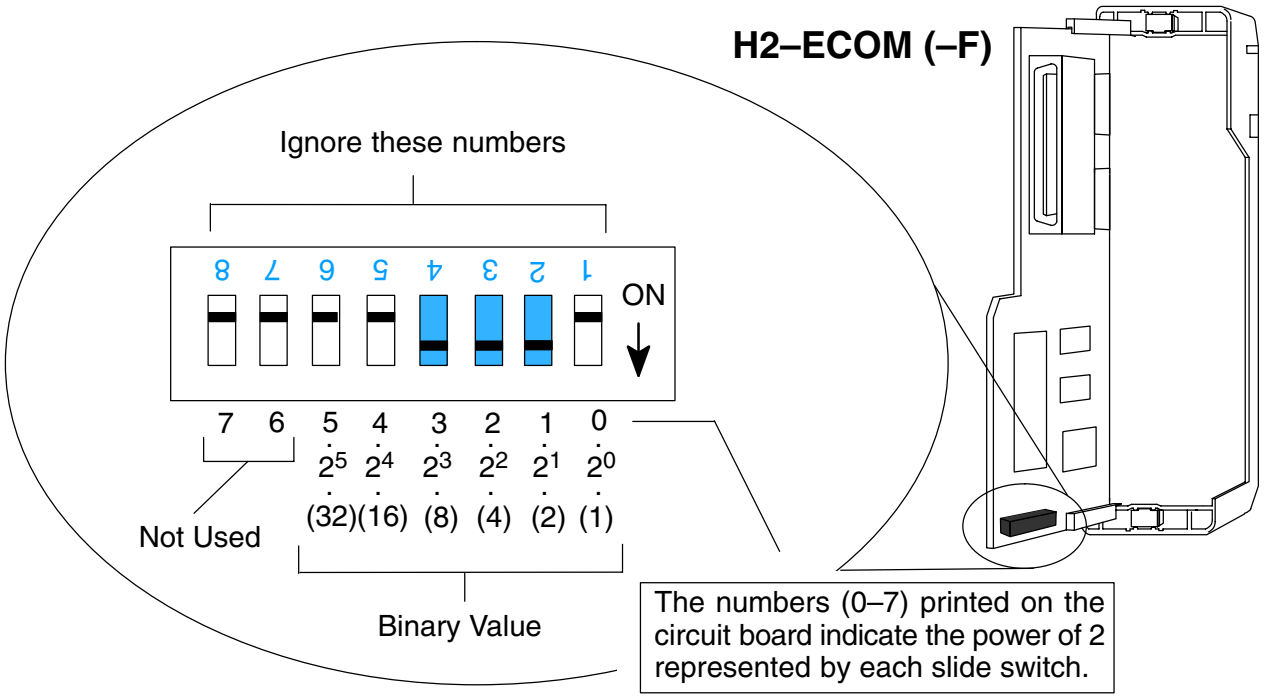
If the DIP switch is set to a number greater than 0, the software tools are disabled from setting the Module ID. The software tools will only allow changes to the Module ID if the DIP switch setting is 0 (zero, all switches OFF). The DIP switch settings are read at powerup. You *can use* the software tools to set the Name and IP Address even if you use the DIP switch for setting the Module ID.



WARNING: Using duplicate Module IDs on a single network will cause unreliable PLC-to-PLC communications.

The H2–ECOM (–F) DIP Switch

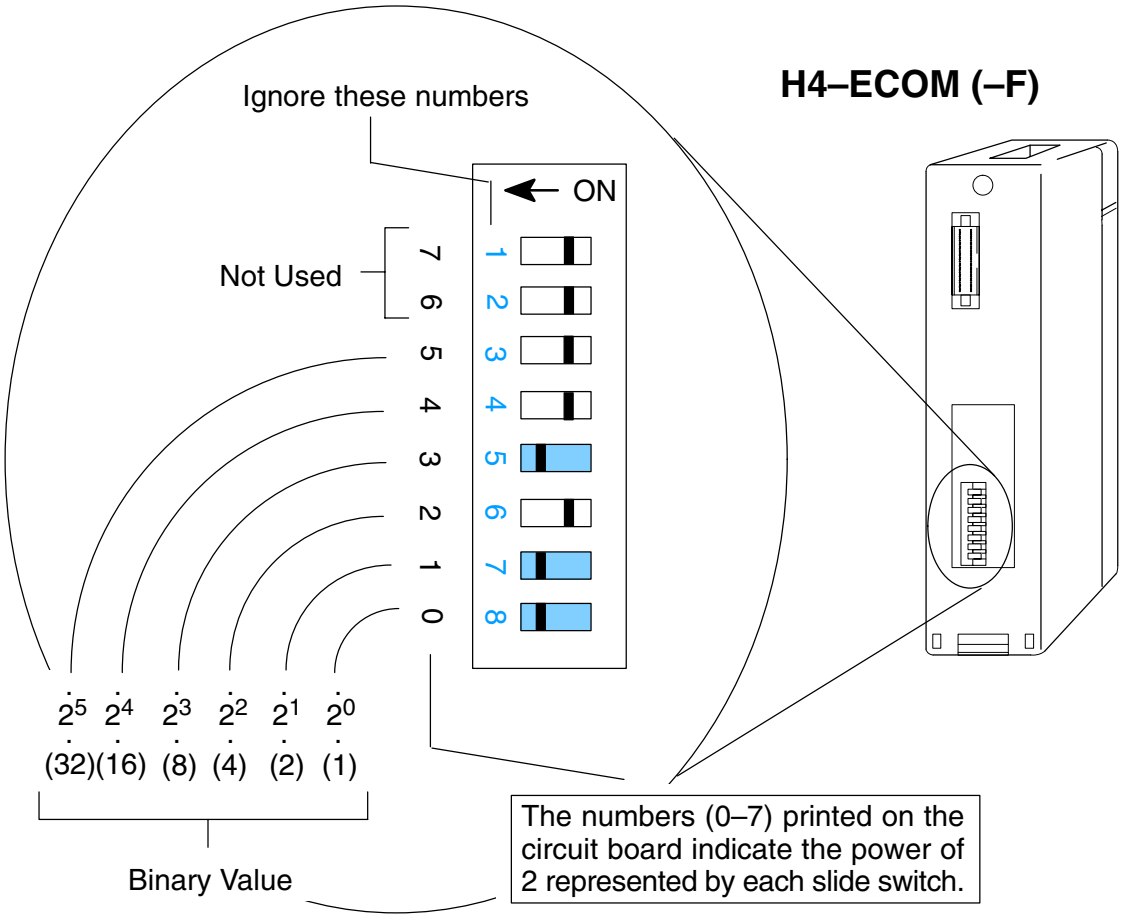
The H2–ECOM DIP switch contains eight individual slide switches, but only six of these are active. Two are not used. Notice that the individual slide switches are labeled 1 through 8 on the body of the DIP switch (upside down in the figure below). You will also find that the printed circuit board is labeled 0 (zero) through 7. We use the labeling *on the printed circuit board* in describing how to set the switch. The numbers on the printed circuit board indicate the power of 2 represented by each slide switch. For example, switch 0 represents 2^0 (or 1), switch 1 is 2^1 (or 2), switch 2 is 2^2 (or 4), and so on. The figure below shows the binary value of each switch in parentheses ( ).



The Module ID equals the *sum* of the binary values of the slide switches set in the ON position. For example, if you set slide switches 1, 2, and 3 to the ON position, the Module ID will be 14. This is found by adding 8+4+2=14. The maximum value you can set on the DIP switch is 32+16+8+4+2+1=63. This is achieved by setting switches 0 through 5 to the ON position.

The H4–ECOM (–F) DIP Switch

The H4–ECOM DIP switch contains eight individual slide switches, but only six of these are active. Two are not used. Notice that the individual slide switches are labeled 1 through 8 on the body of the DIP switch. You will also find that the printed circuit board is labeled 0 (zero) through 7 (as shown in the figure below). We use the labeling *on the printed circuit board* in describing how to set the switch. The numbers on the printed circuit board indicate the power of 2 represented by each slide switch. For example, switch 0 represents 2^0 (or 1), switch 1 is 2^1 (or 2), switch 2 is 2^2 (or 4), and so on. The figure below shows the binary value of each switch in parentheses ( ).



The Module ID equals the *sum* of the binary values of the slide switch set in the ON position. For example, if you set slide switches 0, 1, and 3 to the ON position, the Module ID will be 11. This is found by adding 8+2+1=11. The maximum value you can set on the DIP switch is 32+16+8+4+2+1=63. This is achieved by setting switches 0 through 5 to the ON position.

NOTE: When all the switches are set to OFF (Module ID = 0), the Module ID can be set using the software utilities in NetEdit and ***Direct***SOFT32. **Do not use Module ID "0" for normal communications.** It is okay to leave the Module ID set at zero if you are using the Name or IP Address for communications.

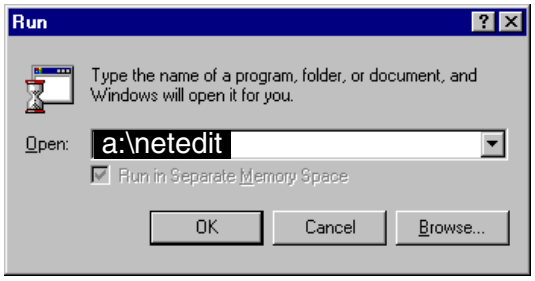
Running NetEdit Software

NetEdit is a software utility that can be used to set network identifiers (Module ID, Name, and IP Address) for the ECOM modules, and it can be used for diagnostic and troubleshooting tasks. NetEdit came prepackaged with this manual on 3.5" floppy disk. When ***Direct***SOFT32 programming software is installed on your PC, NetEdit installs into the PLC>Tools menu directly from the ***Direct***SOFT32 CD. It is also available for download from Host Engineering's web site www.hosteng.com. You can also use ***Direct***SOFT32 programming software or DSData Server Link Wizard to set network identifiers, but these products lack the troubleshooting aids of NetEdit.

Operating System Requirements

You can run NetEdit on Windows 98/NT/2000/XP. There are several ways to run NetEdit:

1) To run the NetEdit program, insert the NetEdit 3.5" floppy disk into drive A: (or the appropriate drive if you are not using drive A:). Click on the **Start** button and select **Run...** from the pop-up menu. Within the **Run** window, enter the letter of the drive, colon, backslash and the name NetEdit, and click OK.



2) If you prefer, you can copy the NetEdit files from the 3.5" floppy disk to your hard drive. In Explorer, locate the following three files on the floppy disk:

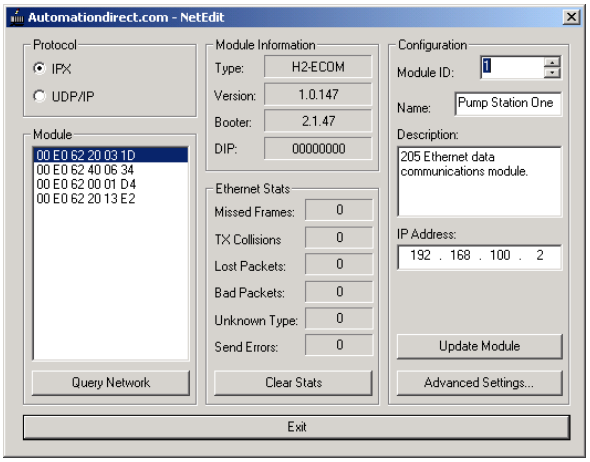
- Hei32_2.dll
- Netedit.exe
- Netedlib.dll

Copy all three files to a single directory on your hard drive, and start NetEdit by double clicking on NetEdit.exe.

3) NetEdit can also be launched from ***Direct***SOFT32 by clicking on PLC>Tools>NetEdit.

The NetEdit Screen

Either method of starting NetEdit brings up this screen. All NetEdit functions are accessed from this one screen. We examine each portion of this screen in the pages that follow.



Features of the NetEdit Screen

In this section, we will step through the features of the NetEdit screen. To see the full screen, you can start NetEdit as described on page 2-7, or you can refer to the figure at the bottom of page 2-7. If you examine the NetEdit screen, you will find five boxes on the screen outlined in gray:

- Protocol
- Module
- Module Information
- Ethernet Stats
- Configuration

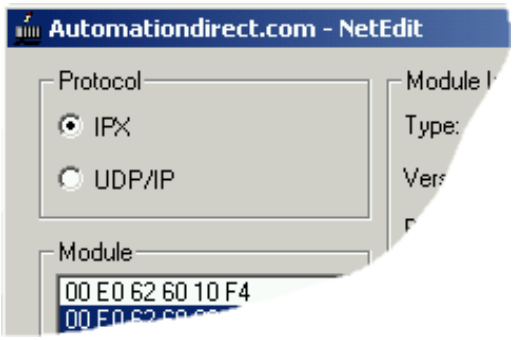
We describe the function of each box below.

Protocol

In the upper left corner of the NetEdit screen, you will find a box labeled Protocol. In the box, there are two choices: IPX and UDP/IP. The ECOM module understands IPX *and* UDP/IP protocols. Both protocols are *permanently resident* in the firmware of the module. Select the protocol you want your PC to use to communicate with the ECOM module. IPX is a Novell standard in widespread use, and UDP/IP is a popular protocol supported by the TCP/IP suite of protocols in your PC.

One network device can send a message in IPX protocol to the ECOM module, and another device can send a message in UDP/IP protocol. The ECOM module understands both messages without changing the configuration of the module.

The figure to the right shows the Protocol selection box in the upper left corner of the NetEdit screen. The choice you make here tells **your PC** which protocol to send to the ECOM to link NetEdit to the module. You are not selecting which protocol the ECOM understands. It understands both. You could use IPX protocol to link NetEdit or ***Direct***SOFT32 to your ECOM module, and you could use UDP/IP to link an HMI software product. The ECOM would understand both transmissions.



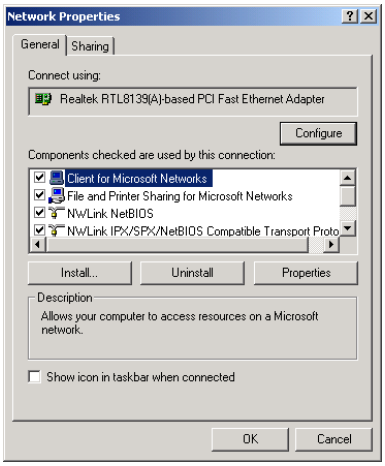
NOTE: We strongly recommend you load IPX protocol on your PC and use it for your PLC links. Use UDP/IP in your application, if required, but also add IPX to your list of active protocols. Having IPX loaded on your PC gives you a backup for troubleshooting communication problems.

Adding Network Protocol Support to Your PC

You may have already set up your PC with selected networking protocols for Ethernet communications. If not, you will need to select the protocols now for communication with the ECOM module. We strongly recommend that you include the IPX protocol. The description below applies to Windows 2000 (Windows 98/NT have slightly different steps). If you are not familiar with this procedure, you may need to have your Network Administrator perform this task.

For Windows 2000, go from My Computer on your Windows desktop to Control Panel. Double click on Network and Dial–up Connections, then double click on the desired Network Device to see the installed Protocols. If IPX is not listed among the protocols already loaded, add it now by clicking on the Install button. For Windows XP, go from Start>Settings>Control Panel. The steps are the same as Windows 2000 from this point.

Add the TCP/IP protocol if it is necessary for your application. Choose the TCP/IP selection to get UDP/IP support. Also add the IPX protocol if it is not already active.

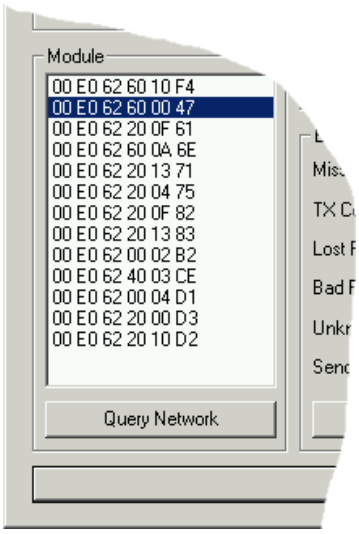


Module

The lower left corner of the NetEdit screen displays the Ethernet Address of the modules currently on the network.

If modules are added or removed from the network, click on the Query Network button to update the list. Notice that the Ethernet Address is the factory-assigned address that is on the permanent label on the module. See page 2-4.

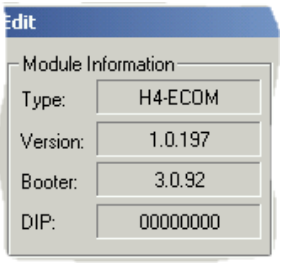
Select a specific module here by clicking on the Ethernet Address or by using the arrow keys. The selected module is highlighted.



NOTE: The Module box lists the Ethernet Addresses of ECOM modules and Ethernet Base Controllers (EBCs).

Module Information

The Module Information box gives the ECOM module Type, firmware Version, Booter firmware version and the address DIP switch setting.

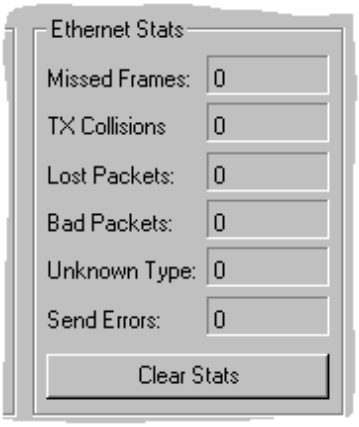


NOTE: The module information and settings on this page apply to the selected (highlighted) module. To select a module, click on its Ethernet Address in the Module box. See page 2-9 for more information about selecting a module.

Ethernet Stats

The Ethernet Stats are statistics related to communication errors. These statistics are explored in Chapter 4, Maintenance and Troubleshooting.

Click on the Clear Stats button to reset all categories to 0 (zero).



Configuration

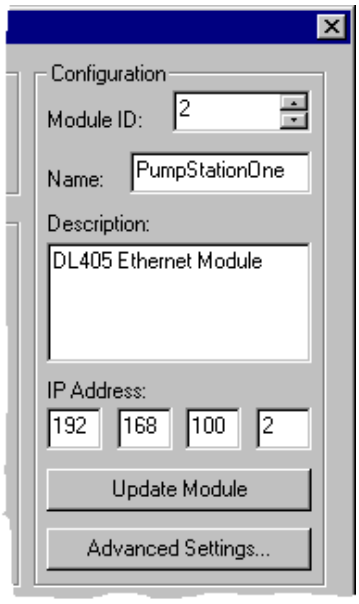
The Configuration box allows you to assign network identifiers and a description to the ECOM module. Use the up/down buttons to set the **Module ID** to a number between one and ninety (if you are using the ECOM for PLC-to-PLC communications). Module IDs must be unique for each PLC, but they do not have to be in sequence.

The **Name** field accepts 32 alphanumeric characters and can be used by most HMI software packages to identify the ECOM module.

The Description field accepts 32 alphanumeric characters of free-form descriptive information.

To set an **IP Address,** highlight the number in each of the four boxes, and overwrite the number. Use the number assigned to the ECOM module by your network administrator.

The Update Module button sends all entries to the module's flash memory. The Advanced Settings button displays a pop-up window described on the next page.



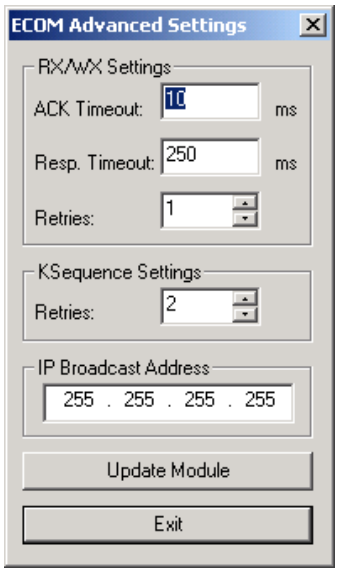
See pages 2-2 through 2-4 for more information about **Module IDs**, **Names** and **IP Addresses**.

The following table summarizes NetEdit's Network Identifiers and their uses:

	How to Set	Format	Communication	Restrictions/Notes
Module ID	DIP Switch	Number 1-63	PLC-to-PLC or PC-to-PLC	Disables Module ID in NetEdit, ***Direct***SOFT32, DSData Server
	NetEdit or ***Direct***SOFT32	Number 1-90	PLC-to-PLC or PC-to-PLC	DIP Switch must be set to "0"
	NetEdit or ***Direct***SOFT32	Number 1-999,999,999	PC-to-PLC Only	> 90 (Not for PLC-to-PLC)
Name	NetEdit or ***Direct***SOFT32	32 Alphanumeric Characters	PC-to-PLC Only	HMI Software may have restrictions
IP Address	NetEdit or ***Direct***SOFT32	4 Three-digit Numbers xxx.xxx.xxx.xxx (See Page 2-4)	PC-to-PLC Only	See Your Network Administrator, Only for UDP/IP
Ethernet Address	Set at Factory	12 Hex digits	PC-to-PLC Only	Factory-assigned, for IPX

RX/WX Settings

The Advanced Settings button in the Configuration box of Net Edit (page 2-10) brings up the ECOM Advanced Settings window.



RX/WX – Settings box in this window provides a place to make changes that affect PLC-to-PLC communications.

ACK Timeout – sets the time limit for receiving the acknowledge (ACK) response to an RX or WX instruction. The ECOM sends a message across the LAN. The acknowledge response comes back directly from the ECOM module receiving the transmission. This timeout is the maximum for transmission and acknowledgement from ECOM to ECOM across the LAN. It is not dependent on the PLC scan time.

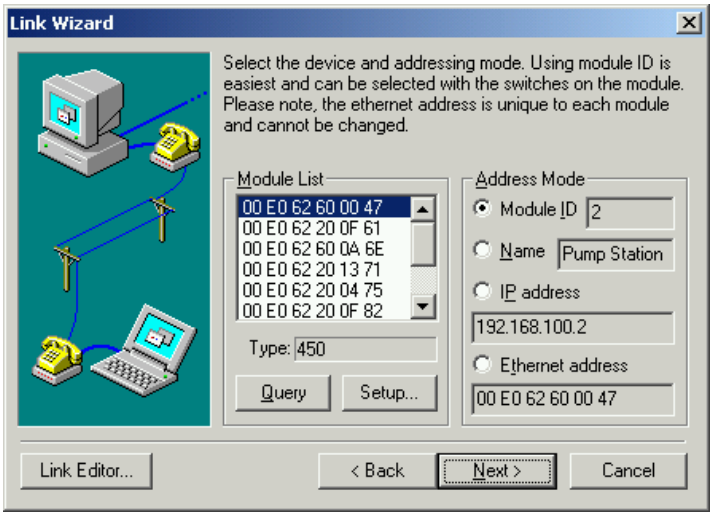
Resp. Timeout – sets the maximum time for the receiving PLC CPU to respond to the ECOM that initiated the communication. The instruction has travelled from the initiating PLC CPU to the initiating ECOM, across the Ethernet LAN to the receiving ECOM, then to the receiving PLC CPU, and back again to the initiating ECOM. Multiple PLC scans may be required to execute an RX/WX instruction so the Resp. Timeout should allow for multiple scans. Also, communication errors may result in retries which require more time. Your response timeout setting must accommodate retries as well.

The **Retries** field shows the number of times the transmission is to be retried if the first attempt is unsuccessful. The Update Module button loads the communication settings in the ECOM module's flash memory. The Exit button takes you back to the main NetEdit screen.

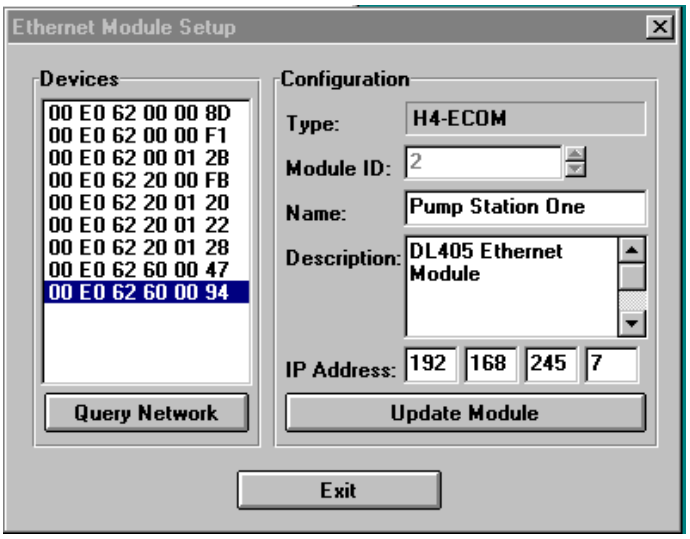
The **IP Broadcast Address** field is used to allow for non–standard broadcast address configurations. Some older Unix based systems did not use 255.255.255.255 for their broadcast address. This would prevent ECOMs from responding to network broadcast queries. Only change this value when using something other than 255.255.255.255 for broadcasts.

Using *Direct*SOFT32 for ECOM Setup

If you are planning to use ***Direct***SOFT32 to set network identifiers in your ECOM module, refer to the ***Direct***SOFT32 User Manual for more information. Briefly, you can begin by right clicking on Comm Links at the Launch Window>Add Link. Use Link Wizard to select the Ethernet port. Click on **Next >**. Select your Transport and Transport Protocol. Again, click on **Next >**. You will see the screen below. Now, click on the **Setup...** button, and you will see a screen that looks like the one at the bottom of this page.



To make changes, select a module in the Devices box. Make the desired changes, and click on **Update Module**. When you have finished setting the network identifiers and updating the module, click on **Exit** to return to the Link Wizard. Click on **Next >**, and name your Link, then click on **Finish**.

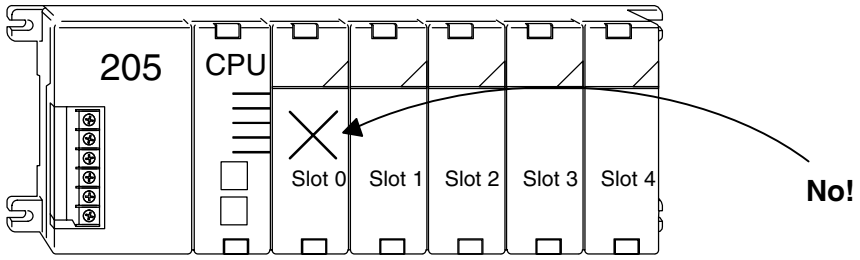


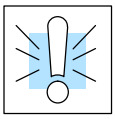
NOTE: When all the slide switches on the DIP switch are set to OFF (Module ID = 0), the Module ID can be set using the software utilities in NetEdit and ***Direct***SOFT32. **Do not use Module ID "0"** for normal communications. See pages 2-5 and 2-6 for more information about the DIP switches.

Inserting the ECOM Module in the PLC Base

DL205 Slot Choices

The DL205 system supports placement of the ECOM module in the **CPU-base *only*** (not in local expansion bases or remote I/O bases). It does not support installation of the ECOM in remote bases. The number of usable slots depends on how many slots your base has. The module does not work in slot 0 of the DL205 series PLCs, the slot next to the CPU. The D2–240, D2–250–1 and DL260 CPUs support the ECOM modules. The D2–230 CPU does not.

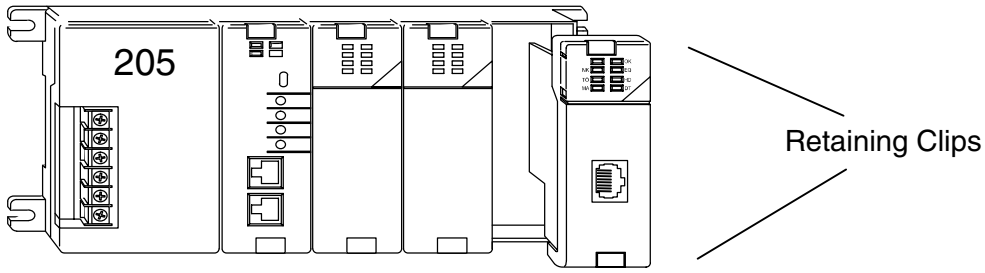




WARNING: Your system can be damaged if you install or remove system components before disconnecting the system power. To minimize the risk of equipment damage, electrical shock, or personal injury, always disconnect the system power before installing or removing any system component.

Module Type	CPU	CPU-Base	Usable Slots
H2–ECOM (–F)	DL240 DL250–1 DL260	D2–03B–1, D2–03BDC1–1, D2–03BDC–2	1
		D2–04B–1, D2–04BDC1–1, D2–04BDC–2	1, 2
		D2–06B–1, D2–06BDC1–1, D2–06BDC2–1	1, 2, 3, 4
		D2–06B–1, D2–06BDC1–1, D2–06BDC2–1	1, 2, 3, 4, 5, 6, 7

H2–ECOM (–F) Module Installation



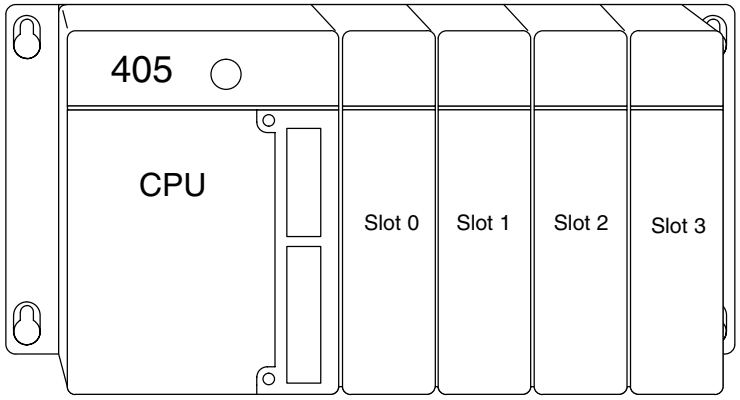
To install the ECOM module, line up the module's printed circuit board with the grooves in the base and push the module until it is flush with face of the DL205 base power supply. If you feel more than moderate resistance when you push the module into the base, the circuit board may not be aligned with the grooves in the base. When the module is firmly seated in the slot, depress the top and bottom retaining clips to lock the module in place.

NOTE: When adding modules to your PLC always confirm that your **power budget** will accommodate the added module. See the User Manual for your PLC for more information about calculating the power budget. See Appendix A for the power consumption of the ECOM modules.

DL405 Slot Choices

For PLC systems with D4–430 and D4–440 CPUs, the ECOM modules can reside in any I/O slot but **only** in the CPU-base. The D4–450 CPU allows the installation of the ECOM module in the CPU-base or in **local expansion** bases.

If the ECOM module is used in a local expansion base, *all bases in the system* must be the "–1" type bases. The valid part numbers for these bases are D4–04B–1, D4–06B–1, and D4–08B–1. The "–1" on the end of the part number indicates that the base supports specialty modules including the ECOM. The "–1" bases can be connected as **local expansion** bases or **remote** bases. They are not the same thing. Remote bases **do not** support the ECOM modules!



WARNING: Your system can be damaged if you install or remove system components before disconnecting the system power. To minimize the risk of equipment damage, electrical shock, or personal injury, always disconnect the system power before installing or removing any system component.

Module Type	CPU	Base	Usable CPU-Base Slots	Usable Expansion Base Slots
H4–ECOM (–F)	D4–430/440	D4–04B, D4–04B–1	0, 1, 2, 3	N/A
		D4–06B, D4–06B–1	0, 1, 2, 3, 4, 5	N/A
		D4–08B, D4–08B–1	0, 1, 2, 3, 4, 5, 6, 7	N/A
H4–ECOM (–F)	D4–450	D4–04B	0, 1, 2, 3	N/A
		D4–06B	0, 1, 2, 3, 4, 5	N/A
		D4–08B	0, 1, 2, 3, 4, 5, 6, 7	N/A
H4–ECOM (–F)	D4–450	D4–04B–1	0, 1, 2, 3	0, 1, 2, 3*
		D4–06B–1	0, 1, 2, 3, 4, 5	0, 1, 2, 3, 4, 5*
		D4–08B–1	0, 1, 2, 3, 4, 5, 6, 7	0, 1, 2, 3, 4, 5, 6, 7*

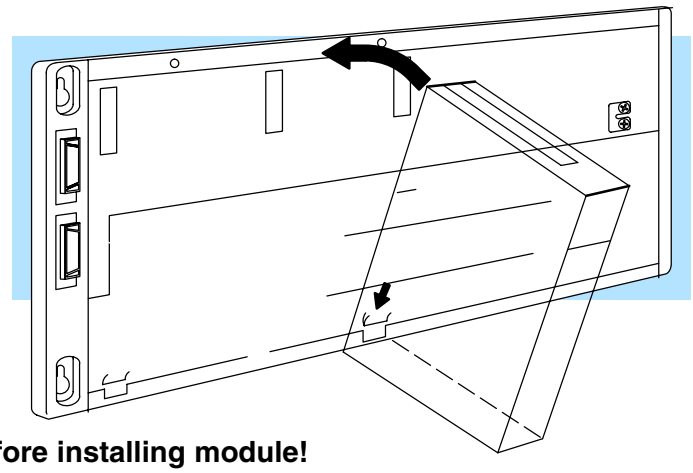
* You must use the "–1" base for the CPU-base and all local expansion bases.

NOTE: Before installing the ECOM module, confirm that your **power budget** will accommodate the added module. See the **DL205** or **DL405 User Manual** for your PLC for more information about calculating the power budget. See Appendix A for the power consumption of the ECOM modules.

H4–ECOM (–F) Module Installation

To insert the ECOM module in a DL405 base, place the bottom tab of the module into the notch at the bottom of the base. Pivot the module toward the base as shown below. Ensure that each module is tightly seated and secured with the captive screw at the top of the module.

DL405 Base



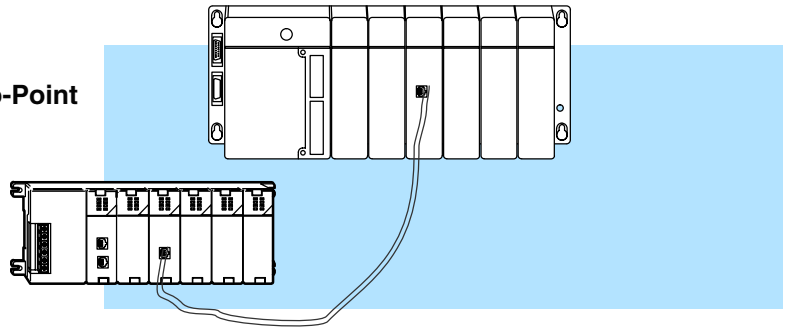
Disconnect power before installing module!

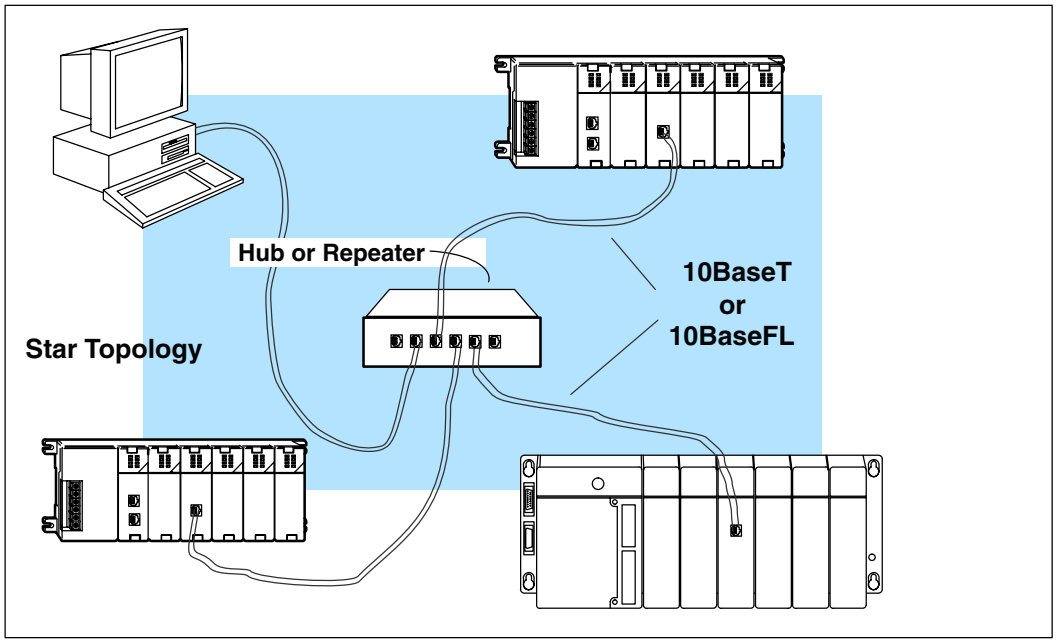
ECOM Network Layouts

The ECOM Ethernet network is a peer-to-peer network. Using Read or Write instructions, any PLC on the network can initiate communications with any other PLC on the network. A PC running our DSData Server can also initiate communications with any ECOM that is on the same network, but a PLC cannot initiate communication with the PC. A PLC cannot literally broadcast to all other PLCs at the same time, but a PLC can sequence through communication connections with each other PLC on the network, one at a time.

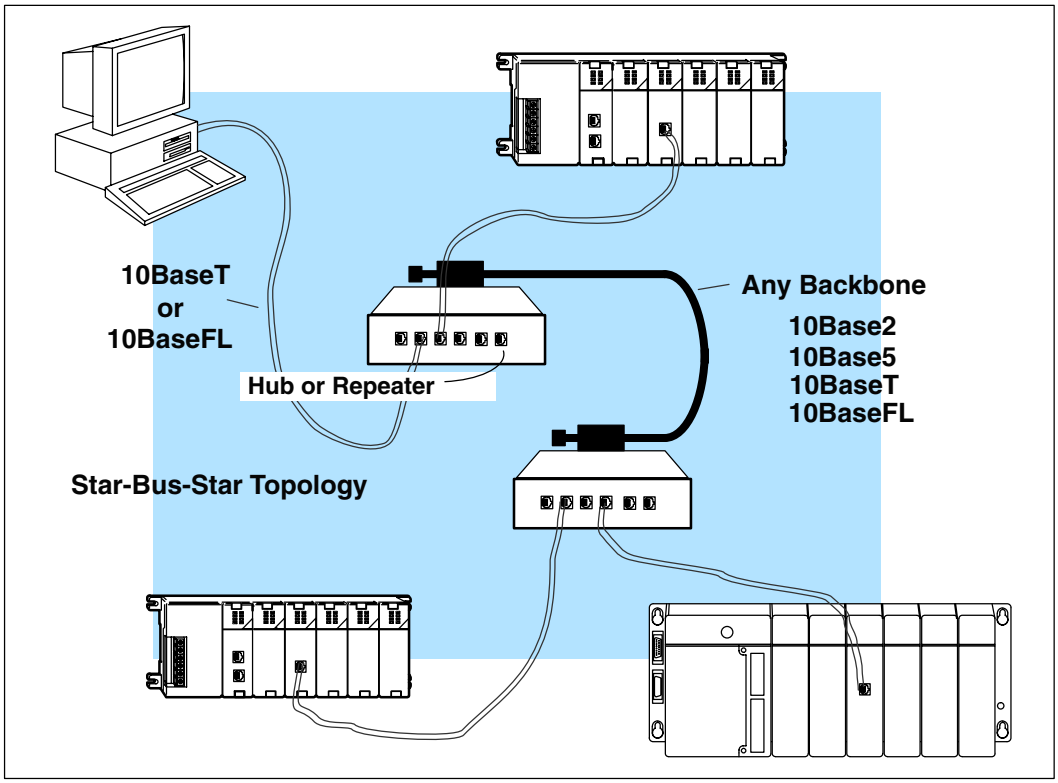
The ECOM products inherently support two network layouts: point-to-point and star. The point-to-point layout can be used to link together two PLCs or a PC and a PLC. A hub or repeater connects multiple networkable devices into a star topology. Multiple hubs or repeaters are used to modify the star topology so that it becomes a star-bus-star topology. See the figures below and on the next page.

Point-to-Point





Hubs or repeaters can connect together to make it possible to connect more devices to the network or to extend the range of the network.



NOTE: Hubs or repeaters often designate one port for *uplinks* to another hub. This port cannot be used to connect to a PLC. If the uplink port is used to connect to another hub, it may disable the adjacent port.

Network Cabling

ECOM Supports Two Standards

Two types of ECOMs are available. One type supports the 10BaseT standard, and the other supports the 10BaseFL standard. The 10BaseT standard uses twisted pairs of copper wire conductors, and the 10BaseFL standard is for fiber optic cabling.

10BaseT

Unshielded Twisted-Pair cable with **RJ45** connectors

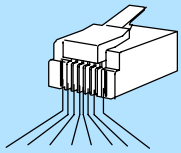
10BaseFL

62.5/125 MMF fiber optics cable with **ST-style** connectors

10BaseT Networks

The cable used to connect a PLC (or PC) to a hub or repeater is called a **patch** (straight-through) **cable**. The cable used to connect together two PLCs, or a PC and a PLC or two hubs is a **crossover cable**. We recommend that you purchase cables pre-assembled with connectors for convenient and reliable networking.

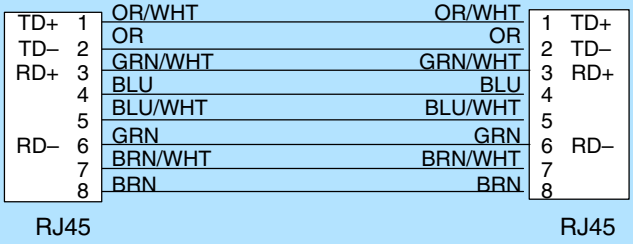
10BaseT



1 2 3 4 5 6 7 8

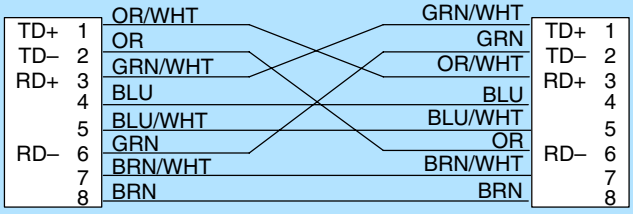
8-pin RJ45 Connector (8P8C)

Patch (Straight–through) Cable



RJ45 RJ45

Crossover Cable



RJ45 RJ45

This diagram illustrates the standard wire positions in the RJ45 connector. We recommend all ECOM 10BaseT cables to be **Category 5**, UTP cable.

10BaseT Connections

Most 10BaseT hubs or repeaters use a **patch** (straight-through) cable for connecting the network devices (PLCs or PCs). For hub-to-hub connections a **crossover** type cable is commonly required. The figures on page 2-17 show pin assignments and insulation color codes for patch (straight-through) and crossover type Ethernet cables.

UTP Cable

The ECOM has an eight-pin modular port that accepts RJ45 type connectors. UTP (Unshielded Twisted-Pair) cable is rated according to its data-carrying ability (bandwidth) and is given a “category” number. We strongly recommend using a category 5 cable for all ECOM connections.

NOTE: See page 2–19 for 10BaseT distance limitations.

10BaseFL Connections

Each module has two bayonet ST-style connectors. The ST-style connector uses a quick release coupling which requires a quarter turn to engage or disengage. The connectors provide mechanical and optical alignment of fibers.

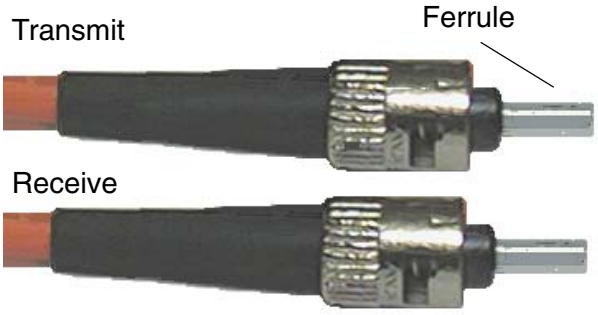
Each cable segment requires two strands of fiber: one to transmit data and one to receive data. The ST-style connectors are used to connect the H2–ECOM–F or H4–ECOM–F module to another H2–ECOM–F or H4–ECOM–F module or a fiber optic hub or repeater.

Fiber Optic Cable

The H2–ECOM–F and H4–ECOM–F modules accept 62.5/125 multimode fiber optic (MMF) cable. The glass core diameter is 62.5 micrometers and the glass cladding is 125 micrometers. The fiber optic cable is highly immune to noise and permits communications over much greater distances than 10BaseT.

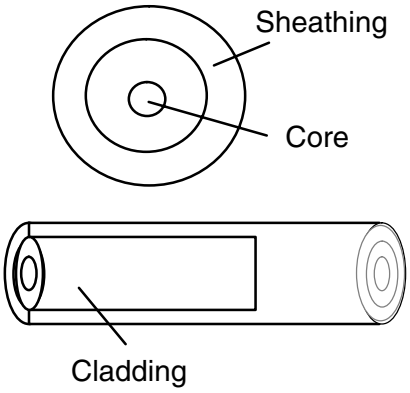
Fiber Optic Module ST Connector

Multimode Fiber Optic (MMF) Cable

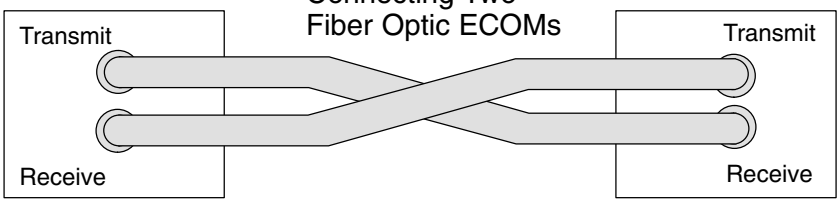


62.5/125 MMF cable with bayonet ST-style connectors

Fiber cross-section



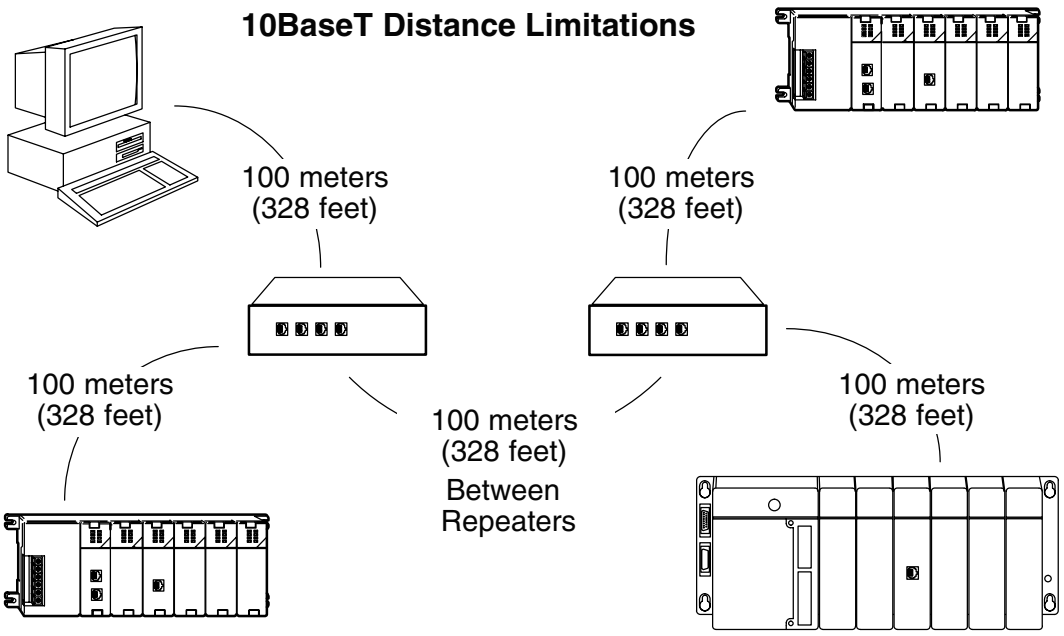
Connecting Two Fiber Optic ECOMs



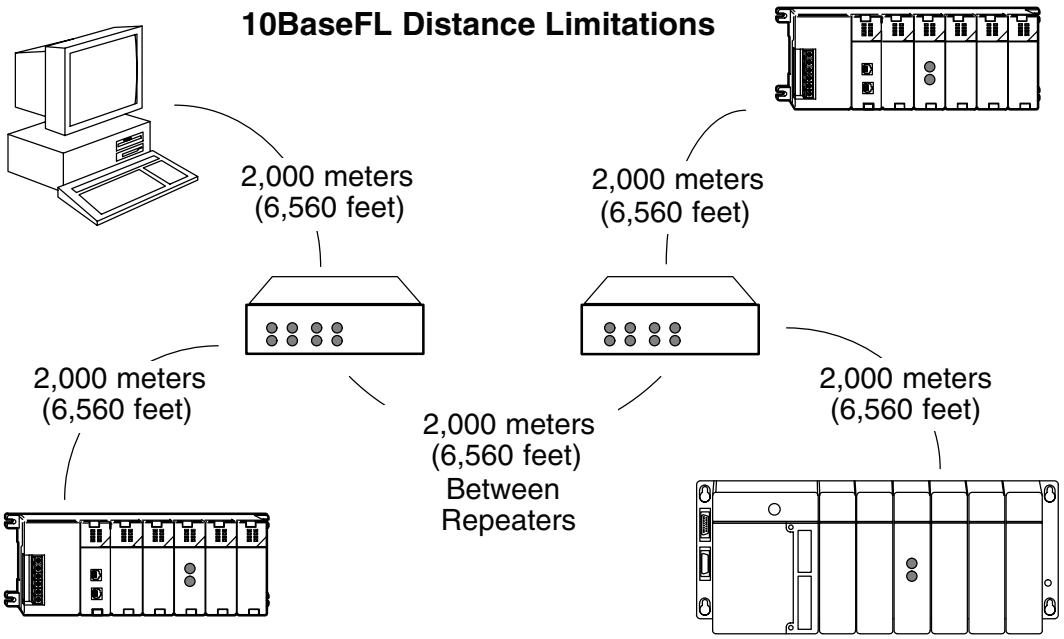
NOTE: See page 2–19 for 10BaseFL distance limitations.

Maximum Cable Length

The **maximum distance** per **10BaseT** cable segment is **100 meters** or **328 feet**. Repeaters extend the distance. Each cable segment attached to a repeater can be 100 meters. Two repeaters connected together extend the total range to 300 meters.



The **maximum distance** per **10BaseFL** cable segment is **2,000 meters** or **6,560 feet**. Repeaters extend the distance. Each cable segment attached to a repeater can be 2,000 meters. Two repeaters connected together extend the total range to 6,000 meters.



Maximum Number of ECOM Modules on the Network

The maximum number of nodes that can be connected to a 10BaseT or 10BaseFL network is a function of the topology used in constructing the network. Therefore, it is not possible to state an absolute maximum number of nodes that would apply in all cases.

The IEEE 802.3 specification defines the maximum node limit for an Ethernet *segment* in terms of the ability to detect and avoid data collisions. A “legal” network can have any number of devices provided that they can:

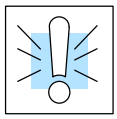
- detect all data collisions that may occur during the communication process *and*
- respond to these collisions appropriately.

You must take into consideration the network limitations imposed by all cabling and network devices. Consider the limitations imposed on your network if your network uses:

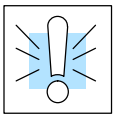
- a combination of cabling standards, such as 10BaseT and 10Base2, or
- intermediate devices, such as switches or routers.

Each ECOM module can be assigned a Module ID ranging from 1 to 999,999,999. Theoretically, you could have this many Ethernet modules coexisting on a single network. Other network limitations would restrict the network size before reaching this limit. For the majority of network PLC applications there is practically no limit to the number of ECOM modules you can access from the ***Direct***SOFT32 Programming software or the ***Direct***SOFT32 DSData Server.

There *is* a node limit for PLC-to-PLC communications. The network Read and Write instructions performed by the initiating (master) PLC are only capable of accessing PLCs with Module IDs of 1 through 90. This effectively sets the maximum number of nodes available for PLC-to-PLC communications at 90.



WARNING: We recommend against connecting Ethernet modules to the same network that serves as your primary office network. While Ethernet networks can handle a very large number of data transmissions, and normally handle them very quickly, heavy Ethernet traffic can adversely affect the reliability and speed of the network.



WARNING: Your system can be damaged if you install or remove system components before disconnecting the system power. To minimize the risk of equipment damage, electrical shock, or personal injury, always disconnect the system power before installing or removing any system component.

3

RLL Programming for Communications

In This Chapter. . . .

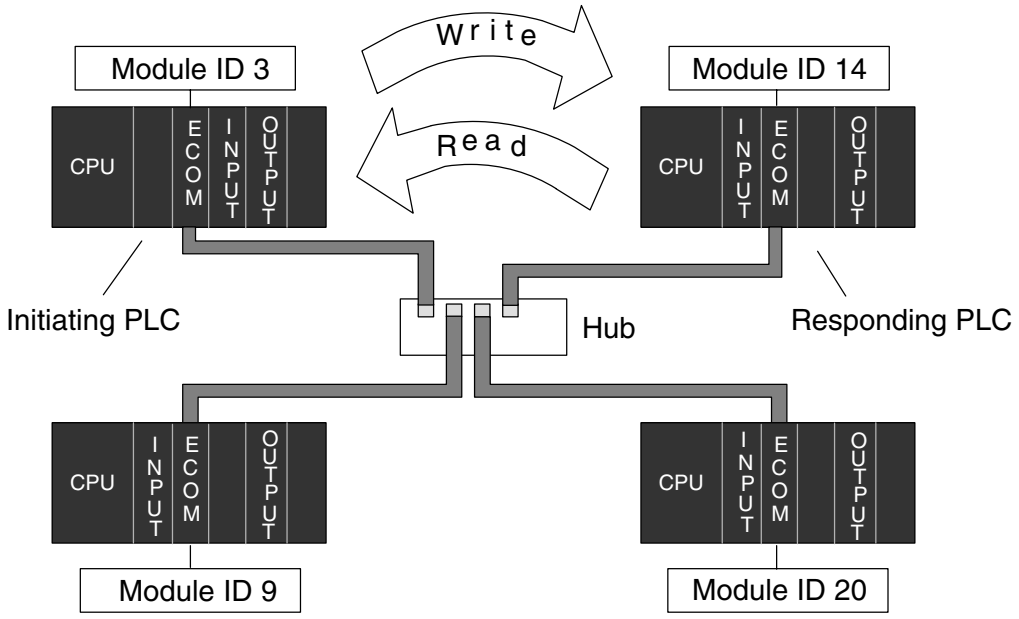
PLC-to-PLC Communications

This chapter steps you through the development of a Relay Ladder Logic (RLL) program to enable one PLC to communicate with another PLC. For the experienced programmer of ***Direct***LOGIC PLCs, the communication programs presented in this chapter will be simple to follow. If you have never programmed a ***Direct***LOGIC PLC, you may want to refer to the ***Direct***SOFT32 Programming Software User Manual and the User Manual for your PLC for additional information.

NOTE: The programs described in this chapter are not used for communication between a PC and a PLC. For PC-to-PLC communications, please see the product documentation for the PC software you are using. If you are using our DSData Server software, the manual you will need is the ***Direct***SOFT32 DSData Server User Manual.

How RLL is Used for Communications

DirectSOFT32 Programming Software provides **Read** and **Write** instructions (RX/WX) for PLC-to-PLC communication over a network. The Read and Write instructions are part of the ladder logic program running in the CPU of the *initiating*, or master, PLC. These instructions tell the initiating CPU to send a message over the Ethernet network to a *responding*, or slave, PLC. The ECOM module is the connecting point to the network for each PLC. The initiating PLC's Read or Write communication finds its destination by the **Module ID** of the responding PLC's ECOM module. See Chapter 2 for information about assigning Module IDs.



In the figure above, the initiating PLC sends a Read or Write message to the responding PLC's ECOM module which is designated as "Module ID 14." The responding PLC processes the message. Any one of the PLCs could initiate communication with any one of the others.

Network Instructions

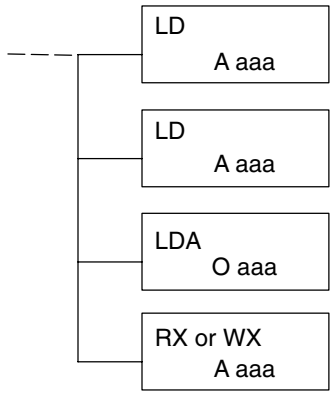
Read (RX) and Write (WX) Instructions

The Read (**RX**) and Write (**WX**) instructions are used by the initiating PLC to Read a block of data *from* another PLC or Write a block of data *to* another PLC. To perform their functions, the RX and WX *boxes* must be **preceded** in the ladder logic program by two Load instructions and one Load Address instruction.

The Load and Load Address instructions load communication parameters into the **accumulator** and the first and second level of the **accumulator stack**. The RX or WX instruction takes these parameters from the stack and the accumulator and prepares the data to be sent over the network. If you need to know more about the function of the accumulator and the accumulator stack, refer to the User Manual for your PLC.

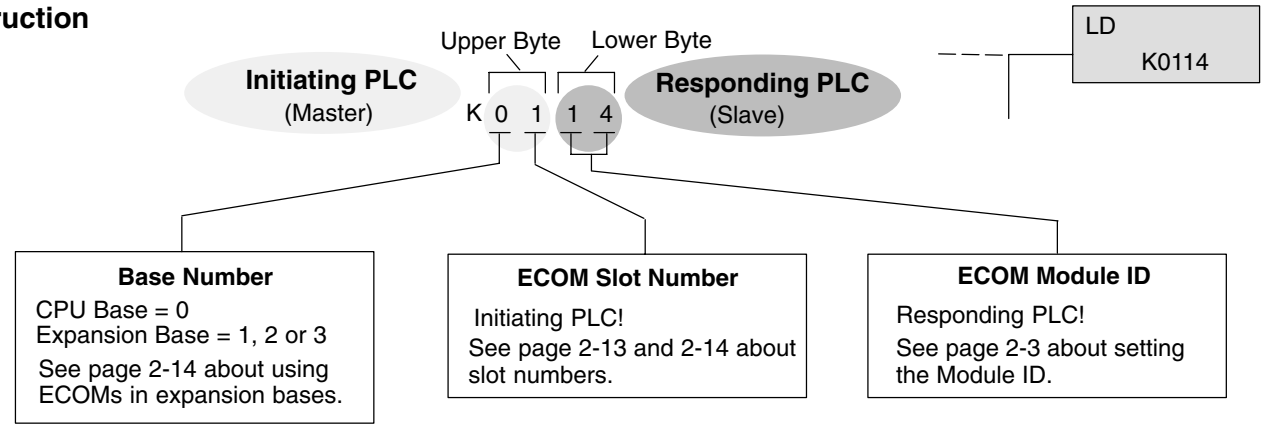
Building the Read (RX) or Write (WX) Routine

For network communications, you build the Read (RX) or Write (WX) instructions into a **routine** which requires the four instructions you see to the right. The function of each of these instructions is explained below or on the next page. They must be used in the sequence shown.



The first Load (LD) instruction accepts either a constant or a variable. Use a “K” to designate the number as a constant. Use a “V” if you are entering the address of a register. The contents of that register perform the same function as the constant shown below. For example, you could use V2000 in place of K0114. If the contents of V2000 is the number “114,” the function would be the same. Using a variable allows changing parameters while the program is running.

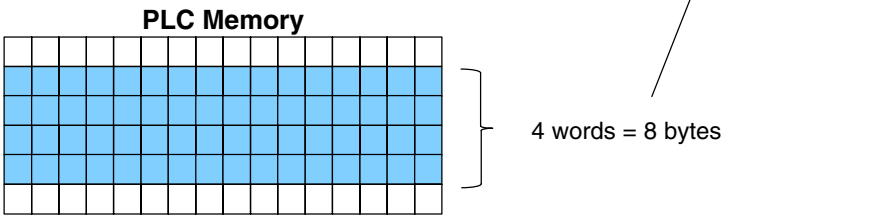
The First LD Instruction



The Second LD Instruction

The second Load (LD) instruction determines the length of the data block to be transmitted during the Read or Write communication. This instruction will also accept two data types. Use a “K” to designate the number as a constant. Use a “V” if you are entering the address of a register.

For Word Memory data, you must use a multiple of two bytes between 2 and 128. For Bit Memory data, you can use any multiple of one byte between 1 and 128. For more information about addressing Word and Bit Memory, see page 3-6.

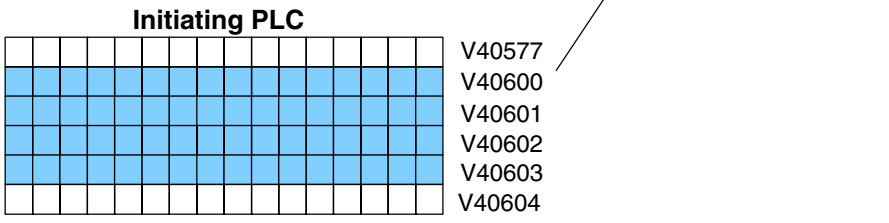


The LDA Instruction

The Load Address (LDA) instruction specifies the V-memory address of the *beginning* memory register in the **initiating**, or master, PLC. The data block to be transmitted will begin at this address and extend the number of bytes specified in the preceding LD instruction. The leading “O” indicates this is an octal number. Simply substitute the letter “O” for the “V” in the V-memory designation. For example, V40600 becomes O40600.

Read instructions copy the data block from the responding PLC memory into the initiating PLC memory.

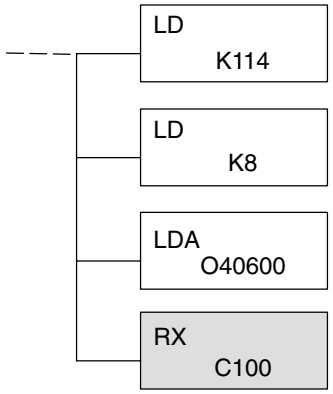
Write instructions copy the data block from the initiating PLC memory into the responding PLC memory.

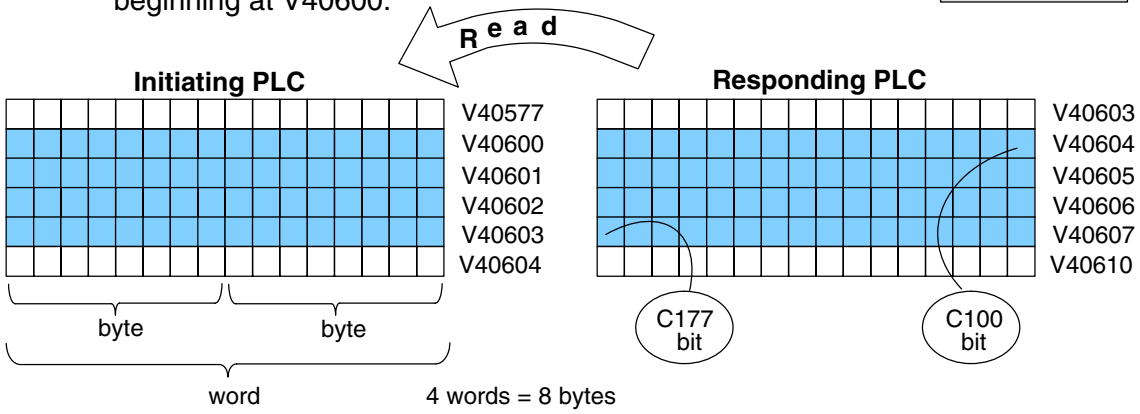


The Read (RX) instruction specifies the memory location to be *read from* the responding PLC.

A block of data is read that begins at the specified memory location and extends the number of bytes specified in the second LD instruction.

In this example, the eight byte block of data beginning at C100 and ending at C177 in the *responding*, or slave, PLC is read (copied) into the initiating PLC's memory beginning at V40600.



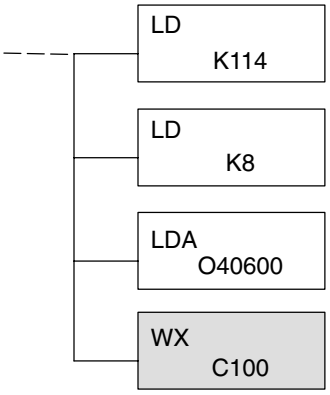


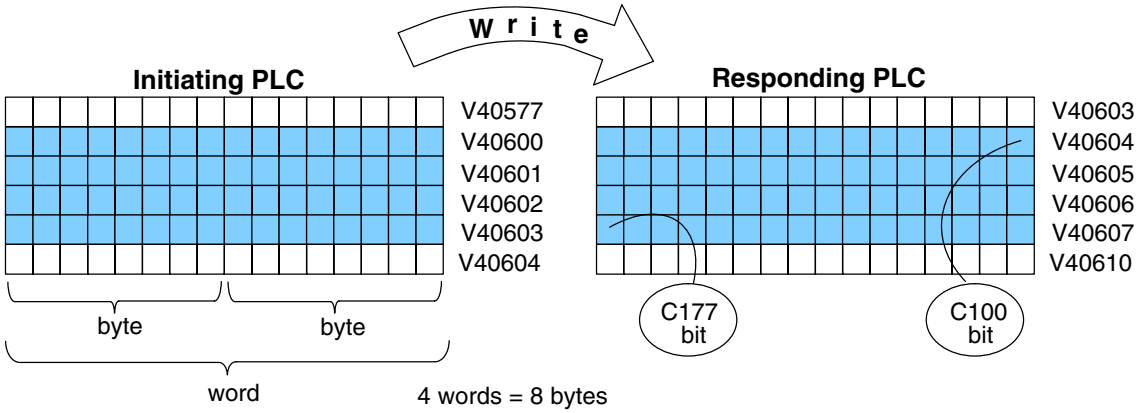
Write (WX) Instruction

The Write (WX) instruction specifies the memory location to be *written to* in the responding PLC.

A block of data is written that begins at the specified memory location and extends the number of bytes specified in the second LD instruction.

In the example, the 8-byte block of data beginning at V40600 and ending at V40603 in the *initiating*, or master, PLC is written (copied) into the responding PLC's memory beginning at C100 and ending at C177.





Addressing the Different Memory Types

Some data types are inherently 16 bits long, for example timer and counter current values. Other data types are 1 bit long, for example: discrete inputs and outputs. Word-length and bit-length data are mapped into Word Memory, also known as V-memory, which allows you to address *any* of the different memory types as 16-bit words.

Bit Memory

Bit memory can be addressed in Read and Write instructions by the name of the first bit of any byte. If your second LD instruction contains the constant K8, eight bytes will be transmitted. If you use C0 in your RX or WX instruction, you will transmit the eight bytes from C0 through C77.

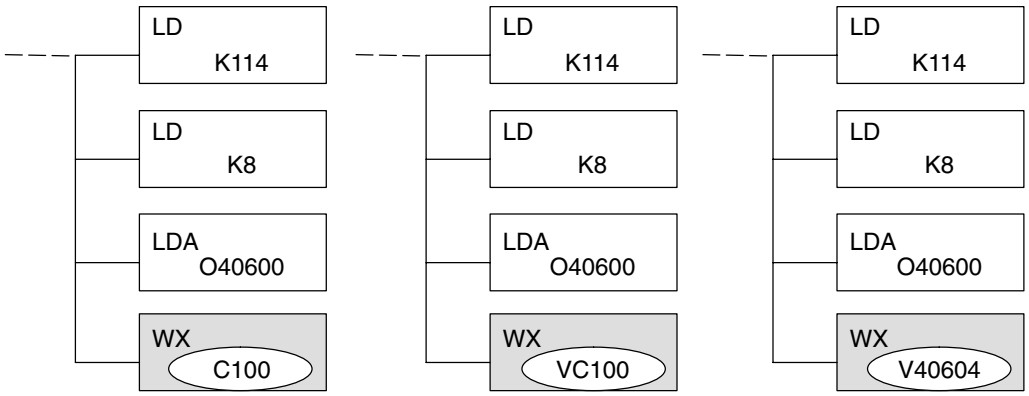
Word Memory and Aliases

In the example below, V40600 is the V-memory designation for the sixteen bits from C0 through C17. *Aliases* are a convenient substitute for V-memory designations, and can be used interchangeably in Read and Write instructions. VC0 is the alias for V40600. Either nomenclature addresses the same 16 bits.

The alias is simply the name of the first bit in a group of sixteen bits, with V added as a prefix. For example, VC0 represents the 16 bits beginning with C0. Word Memory, Bit Memory and Aliases all use the **octal** numbering system.

Word Memory Address V40600 = VC0 (Alias)	C17	C16	C15	C14	C13	C12	C11	C10	C7	C6	C5	C4	C3	C2	C1	C0
V40601 = VC20	C37	C36	C35	C34	C33	C32	C31	C30	C27	C26	C25	C24	C23	C22	C21	C20
V40602 = VC40	C57	C56	C55	C54	C53	C52	C51	C50	C47	C46	C45	C44	C43	C42	C41	C40
V40603 = VC60	C77	C76	C75	C74	C73	C72	C71	C70	C67	C66	C65	C64	C63	C62	C61	C60

The following Write routines are all equivalent. ***Direct***SOFT gives you the flexibility to identify the responding PLC's memory area in three different ways, as shown below.



*Direct*SOFT32 is Flexible

You can address the different data types by any available convention shown in the tables that follow. The largest block of data that can be sent in a single Read or Write operation is 128 bytes. The smallest block of data is one byte for Bit Memory types and two bytes, or one word for Word Memory types. The **octal** numbering system is used for all addresses in these tables.

D2–240 CPU

NOTE: The D2–230 CPU does not support the ECOM modules.

D2–240 CPU			
Data Types	**Bit Memory**	**Word Memory**	**Alias**
Timer Current Values	None	V0 – V177	TA0 – TA177
Counter Current Values	None	V1000 – V1177	CTA0 – CTA177
User Data Words	None	V2000 – V3777 V4000 – V4377	None
Input Points	X0 – X477	V40400 – V40423	VX0 – VX460
Output Points	Y0 – Y477	V40500 – V40523	VY0 – VY460
Control Relays	C0 – C377	V40600 – V40617	VC0 – VC360
Special Relays	SP0 – SP137 SP540 – SP617	V41200 – V41205 V41226 – V41230	VSP0 – VSP120 VSP540 – VSP600
Timer Status Bits	T0 – T177	V41100 – V41107	VT0 – VT160
Counter Status Bits	CT0 – CT177	V41040 – V41147	VCT0 – VCT160
Stages	S0 – S777	V41000 – V41037	VS0 – VS760

D2–250–1 CPU

D2–250–1 CPU			
Data Types	**Bit Memory**	**Word Memory**	**Alias**
Timer Current Values	None	V0 – V377	TA0 – TA377
Counter Current Values	None	V1000 – V1377	CTA0 – CTA377
User Data Words	None	V1400 – V7377 V10000 – V17777	None
Input Points	X0 – X777	V40400 – V40437	VX0 – VX760
Output Points	Y0 – Y777	V40500 – V40537	VY0 – VY760
Control Relays	C0 – C1777	V40600 – V40677	VC0 – VC1760
Special Relays	SP0 – SP777	V41200 – V41237	VSP0 – VSP760
Timer Status Bits	T0 – T377	V41100 – V41117	VT0 – VT360
Counter Status Bits	CT0 – CT177	V41140 – V41147	VCT0 – VCT160
Stages	S0 – S1777	V41000 – V41077	VS0 – VS1760

D2–260 CPU

D2–260 CPU			
Data Registers	**Bit Memory**	**Word Memory**	**Alias**
Timer Current Values	None	V0 – V377	TA0 – TA377
Counter Current Values	None	V1000 – V1377	CTA0 – CTA377
User Data Words	None	V400 – V777 V1400 – V7377 V10000 – V37777	None
Input Points	X0 – X1777	V40400 – V40477	VX0 – VX1760
Output Points	Y0 – Y1777	V40500 – V40577	VY0 – VY1760
Control Relays	C0 – C3777	V40600 – V40777	VC0 – VC3760
Special Relays	SP0 – SP137 SP320 – SP717	V41200 – V41205 V41215 – V41234	VSP0 – VSP120 VSP320 – VSP700
Timer Status Bits	T0 – T377	V41100 – V41117	VT0 – VT360
Counter Status Bits	CT0 – CT377	V41140 – V41157	VCT0 – VCT360
Stages	S0 – S1777	V41000 – V41077	VS0 – VS1760
Remote I/O	GX0 – GX3777 GY0 – GY3777	V40000 – V40177 V40200 – V40377	VGX0 – VGX3760 VGY0 – VGY3760

D4–430 CPU

D4–430 CPU			
Data Registers	**Bit Memory**	**Word Memory**	**Alias**
Timer Current Values	None	V0 – V177	TA0 – TA177
Counter Current Values	None	V1000 – V1177	CTA0 – CTA177
User Data Words	None	V1400 – V7377	None
Input Points	X0 – X477	V40400 – V40423	VX0 – VX460
Output Points	Y0 – Y477	V40500 – V40523	VY0 – VY460
Control Relays	C0 – C737	V40600 – V40635	VC0 – VC720
Special Relays	SP0 – 137 SP320 – SP617	V41200 – V41205 V41215 – V41230	VSP0 – VSP120 VSP320 – VSP600
Timer Status Bits	T0 – T177	V41100 – V41107	VT0 – VT160
Counter Status Bits	CT0 – CT177	V41140 – V41147	VCT0 – VCT160
Stages	S0 – S577	V41000 – V41027	VS0 – VS560
Remote I/O	GX0 – GX777	V40000 – V40037	VGX0 – VGX760

D4–440 CPU

D4–440 CPU			
Data Registers	**Bit Memory**	**Word Memory**	**Alias**
Timer Current Values	None	V0 – V377	TA0 – TA377
Counter Current Values	None	V1000 – V1177	CTA0 – CTA177
User Data Words	None	V1400 – V7377 V10000 – V17777	None
Input Points	X0 – X477	V40400 – V40423	VX0 – VX460
Output Points	Y0 – Y477	V40500 – V40523	VY0 – VY460
Control Relays	C0 – C1777	V40600 – V40677	VC0 – VC1760
Special Relays	SP0 – 137 SP320 – SP717	V41200 – V41205 V41215 – V41234	VSP0 – VSP120 VSP320 – VSP700
Timer Status Bits	T0 – T377	V41100 – V41117	VT0 – VT360
Counter Status Bits	CT0 – CT177	V41140 – V41147	VCT0 – VCT160
Stages	S0 – S1777	V41000 – V41077	VS0 – VS1760
Remote I/O	GX0 – GX1777	V40000 – V40077	VGX0 – VGX1760

D4–450 CPU

D4–450 CPU			
Data Registers	**Bit Memory**	**Word Memory**	**Alias**
Timer Current Values	None	V0 – V377	TA0 – TA377
Counter Current Values	None	V1000 – V1377	CTA0 – CTA377
User Data Words	None	V1400 – V7377 V10000 – V37777	None
Input Points	X0 – X1777	V40400 – V40477	VX0 – VX1760
Output Points	Y0 – Y1777	V40500 – V40577	VY0 – VY1760
Control Relays	C0 – C3777	V40600 – V40777	VC0 – VC3760
Special Relays	SP0 – SP137 SP320 – SP717	V41200 – V41205 V41215 – V41234	VSP0 – VSP120 VSP320 – VSP700
Timer Status Bits	T0 – T377	V41100 – V41117	VT0 – VT360
Counter Status Bits	CT0 – CT377	V41140 – V41157	VCT0 – VCT360
Stages	S0 – S1777	V41000 – V41077	VS0 – VS1760
Remote I/O	GX0 – GX3777 GY0 – GY3777	V40000 – V40177 V40200 – V40377	VGX0 – VGX3760 VGY0 – VGY3760

Special Relays for Communications

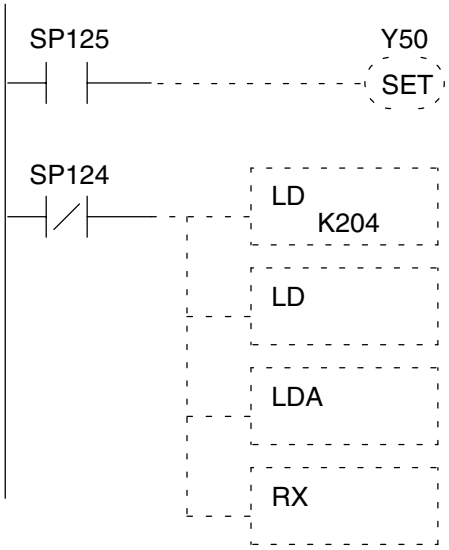
The ***Direct***LOGIC PLCs provide internal contacts (bits) for monitoring the status of communications. The internal contacts are called Special Relays (there are other Special Relays used for other purposes). There are two Special Relays for each slot in the base that will accept the ECOM module. The two relays perform the following functions:

- **Communication Busy** – This bit is on when the communication module is busy transmitting or receiving. You must use this bit, or relay contact, to prevent overwriting your Read or Write (RX/WX) instructions.
- **Communication Error** – This bit is on when an error occurred in the last RX or WX communication. This error automatically clears (the bit resets to zero) when another RX or WX instruction executes.

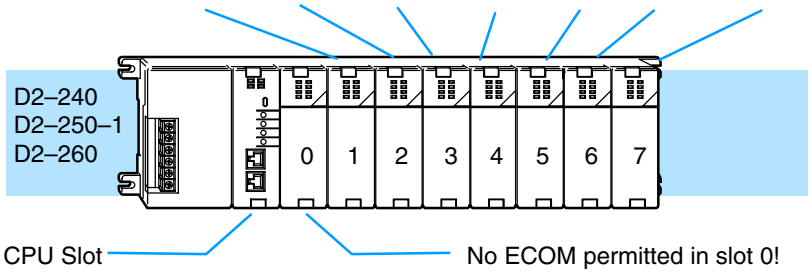
For example, Special Relays SP124 and SP125 correspond to an ECOM module in **slot 2** of the PLC base.

The Special Relay SP125 is used in the example to energize the output Y50, indicating a **communication error** has occurred. This Special Relay must appear earlier in the program than your RX or WX instruction because it is turned off (reset to zero) when a subsequent Read or Write instruction is executed.

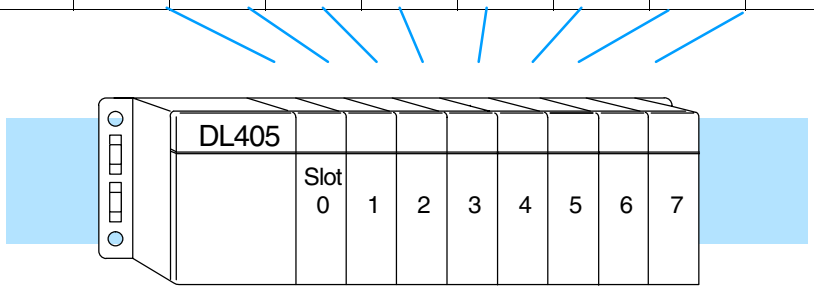
The Special Relay SP124 indicates the ECOM is **busy**. When SP124 is on, the normally closed contact opens to prevent executing another RX or WX instruction until the last one is completed.



DL240, DL250–1 and DL260 Special Purpose Communication Relays							
CPU-Base	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Communication busy	SP122	SP124	SP126	SP130	SP132	SP134	SP136
Communication error	SP123	SP125	SP127	SP131	SP133	SP135	SP137



D4–430 and D4–440 Special Purpose Communication Relays								
CPU-Base	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Communication busy	SP120	SP122	SP124	SP126	SP130	SP132	SP134	SP136
Communication error	SP121	SP123	SP125	SP127	SP131	SP133	SP135	SP137

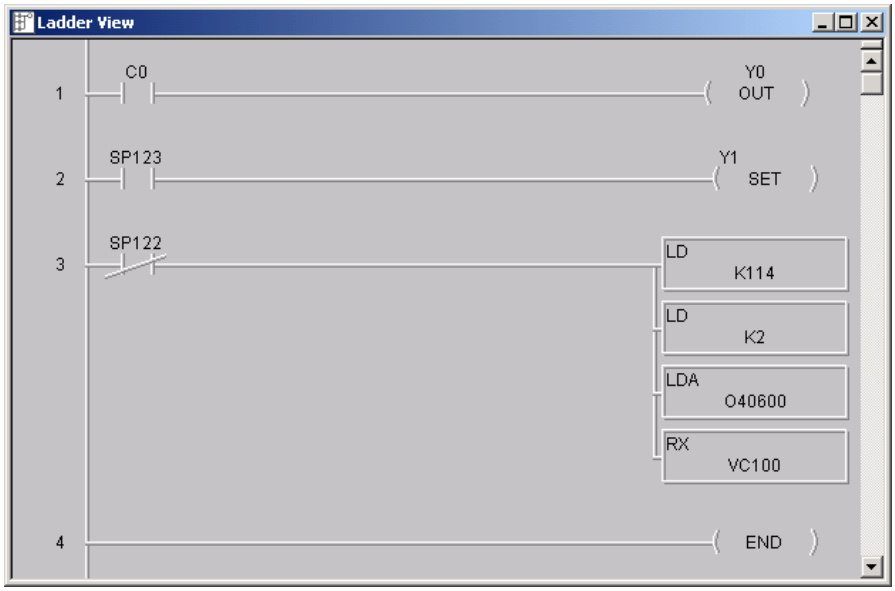


D4–450 Special Purpose Communication Relays								
CPU-Base	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Communication busy	SP120	SP122	SP124	SP126	SP130	SP132	SP134	SP136
Communication error	SP121	SP123	SP125	SP127	SP131	SP133	SP135	SP137
Expansion Base 1	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Communication busy	SP140	SP142	SP144	SP146	SP150	SP152	SP154	SP156
Communication error	SP141	SP143	SP145	SP147	SP151	SP153	SP155	SP157
Expansion Base 2	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Communication busy	SP160	SP162	SP164	SP166	SP170	SP172	SP174	SP176
Communication error	SP161	SP163	SP165	SP167	SP171	SP173	SP175	SP177
Expansion Base 3	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Communication busy	SP200	SP202	SP204	SP206	SP210	SP212	SP214	SP216
Communication error	SP201	SP203	SP205	SP207	SP211	SP213	SP215	SP217

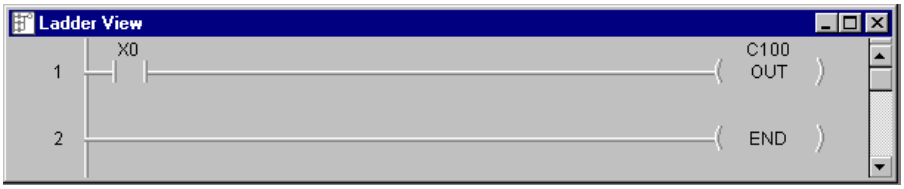
Program with One Read Instruction

The Ladder View screen below is the program development screen in ***Direct***SOFT32 Programming Software. This four rung program is explained in detail on page 3-14. This is a complete program although its function is very limited. There is also a two rung program that runs in the responding PLC, and it is also explained on page 3-14.

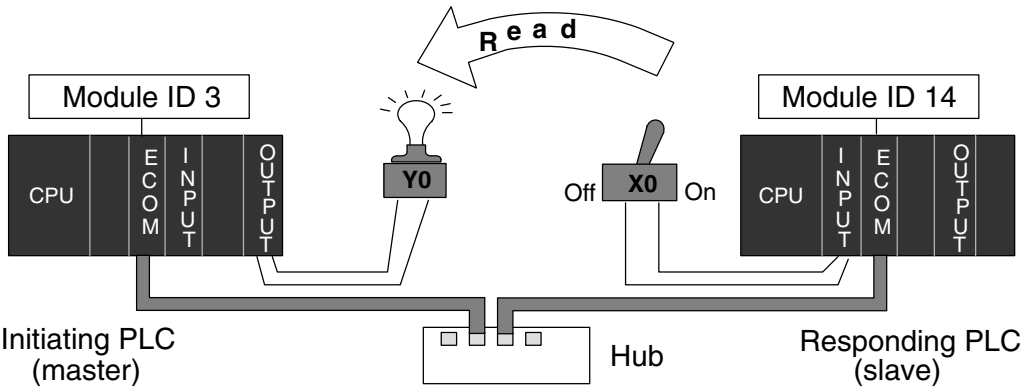
Program for the Initiating PLC



Program for the Responding PLC



When the toggle switch input to the *responding* PLC is turned on (transitions from 0 to 1), the C0 bit in the *initiating* PLC transitions from 0 to 1. The program in the initiating PLC causes Y0 to turn on in response to the C0 bit.



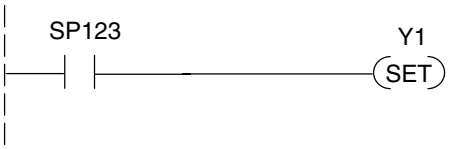
For the purpose of these example programs, both the initiating PLC and the responding PLC must be in **RUN Mode**.

Rung 1

In our example, the normally open contact labeled **C0** is an internal control relay. When C0 is on, discrete output **Y0** is energized.

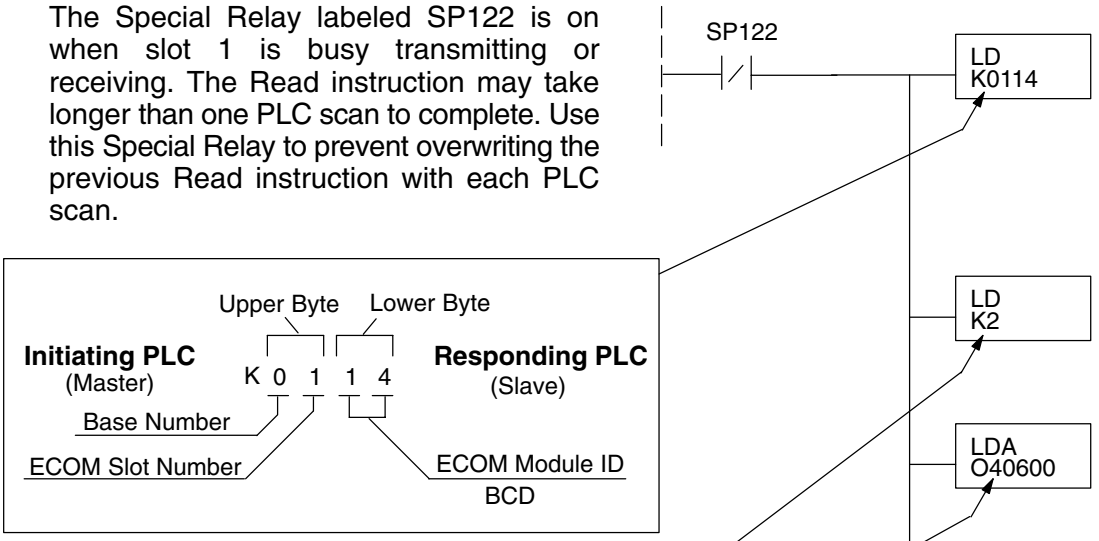
Rung 2

The second rung uses a Special Relay to identify a communication error. In the example, **SP123** is on if a communication error is present for *slot one*. Use different Special Relays if your ECOM module is in a different slot (see page 3-10 and 3-11). We use SP123 to turn on an indicator light connected to a discrete output.



Rung 3

The Special Relay labeled SP122 is on when slot 1 is busy transmitting or receiving. The Read instruction may take longer than one PLC scan to complete. Use this Special Relay to prevent overwriting the previous Read instruction with each PLC scan.



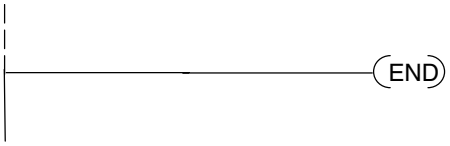
Number of bytes to be transferred. Max = 128 bytes.

Beginning address in the initiating PLC, expressed as an octal number.

Beginning address in the responding PLC.

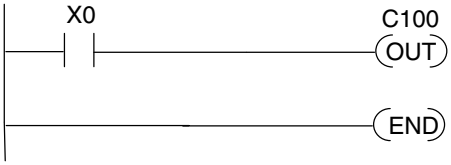
Rung 4

All ***Direct***LOGIC PLCs use an END statement to identify the final rung of the main body of the program.



Program for the Responding PLC

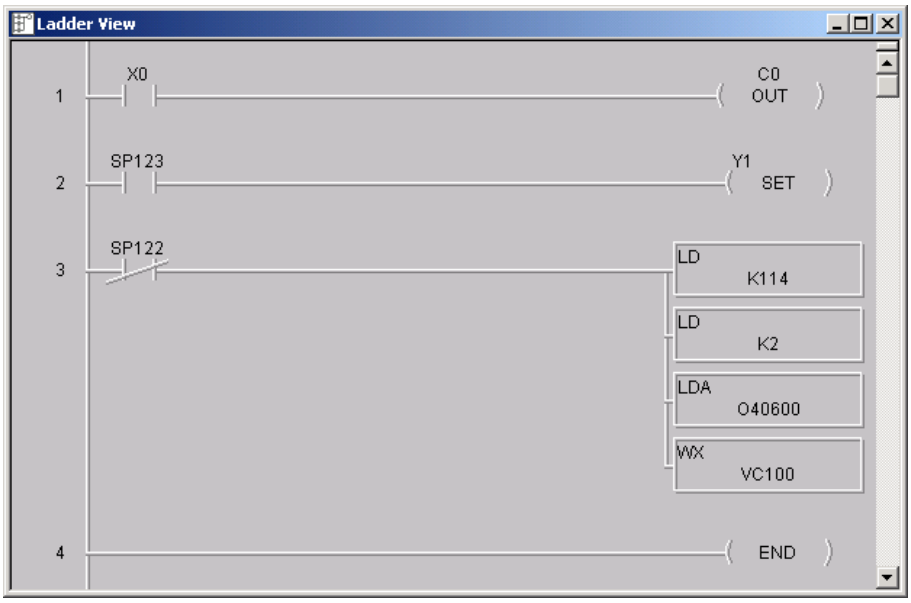
This two-rung program resides in the responding PLC's CPU. Its function is simply to use the X0 contact to turn on the internal control relay, C100.



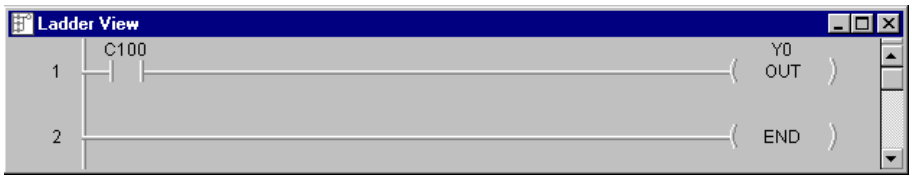
Example Program with One Write Instruction

The Ladder View screen below is the program development screen in ***Direct***SOFT32 Programming Software. This four-rung program is explained in detail on page 3-16. This is a complete program although its function is very limited. There is also a two-rung program that runs in the responding PLC. It is also explained on page 3-16.

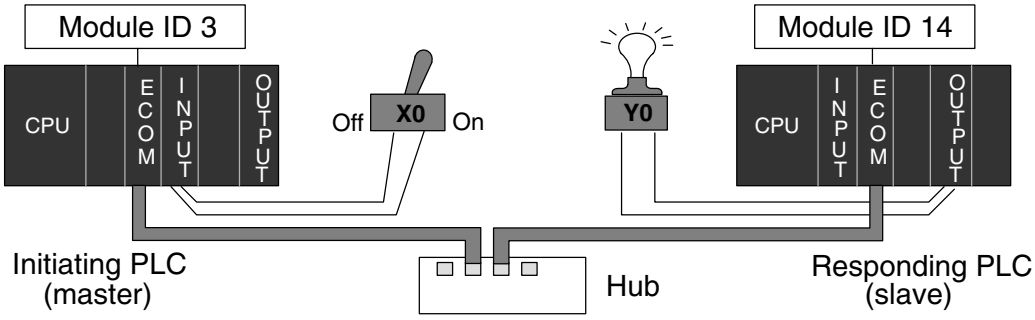
Program for the Initiating PLC



Program for the Responding PLC



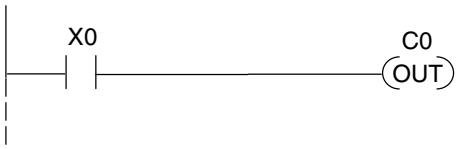
When the toggle switch input to the *initiating* PLC is turned on (transitions from 0 to 1), the C100 bit in the *responding* PLC also transitions from 0 to 1. The program in the responding PLC causes Y0 to turn on in response to the C100 bit.



For the purpose of these example programs, both the initiating PLC and the responding PLC must be in **RUN Mode**.

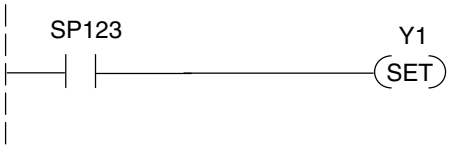
Rung 1

In our example, the normally open contact labeled **X0** is a toggle switch input to a discrete input module. When X0 is on, Control Relay **C0** is energized.



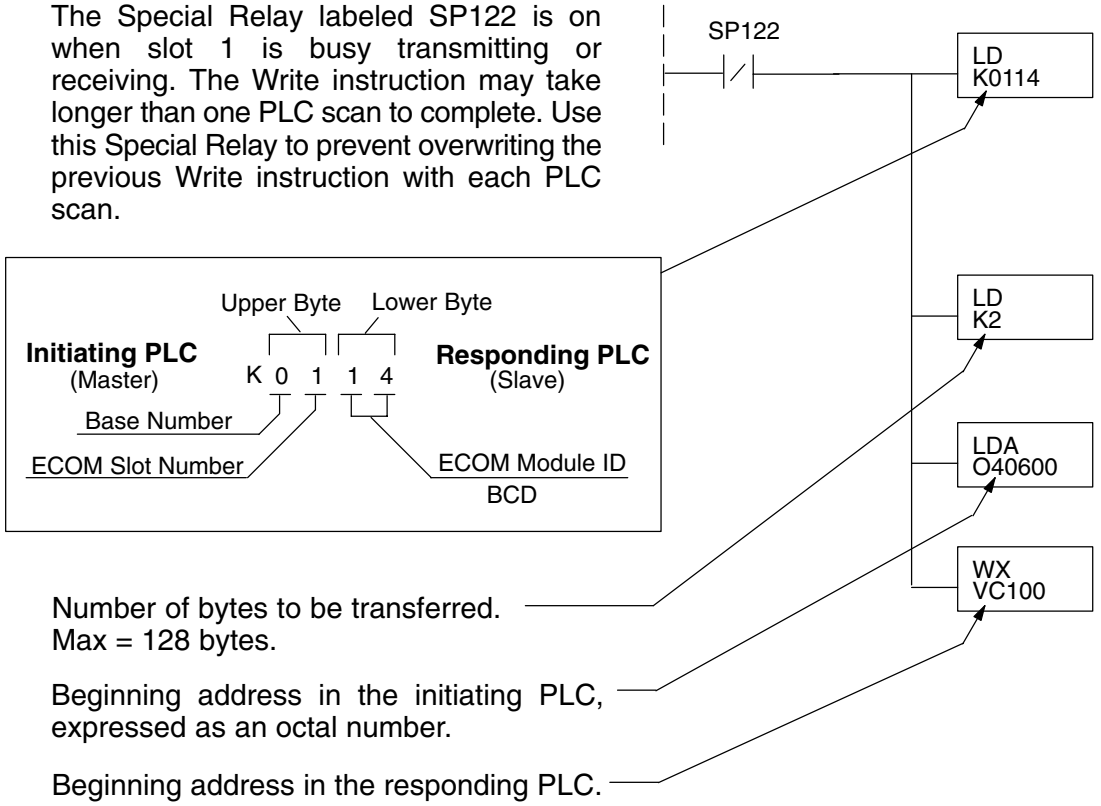
Rung 2

The second rung uses a Special Relay to identify a communication error. In the example, **SP123** is on if there is a communication error present *in slot one*. Use different Special Relays if your ECOM module is in a different slot (see page 3-11 and 3-12). We use SP123 to turn on an indicator light connected to a discrete output.



Rung 3

The Special Relay labeled SP122 is on when slot 1 is busy transmitting or receiving. The Write instruction may take longer than one PLC scan to complete. Use this Special Relay to prevent overwriting the previous Write instruction with each PLC scan.

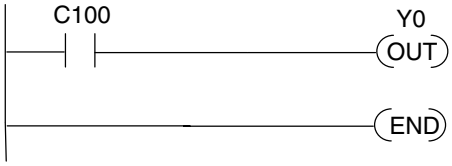


Rung 4

All ***Direct***LOGIC PLCs use an END statement to identify the final rung of the main body of the program.

Program for the Responding PLC

This two-rung program resides in the responding PLC's CPU. Its function is simply to take the C100 contact and convert it to a real output, Y0.



Integrating Multiple Read and Write Instructions

Multiple Read and Write instructions require *interlocks* for sequencing because only one RX/WX instruction can be processed per CPU scan. Using interlocks, one RX/WX instruction is processed in each scan until all RX/WX instructions have been executed. After the last instruction, the sequence then begins again at the first RX/WX instruction.

Without interlocks, the RX/WX instructions would be executed in an unpredictable order, and some might be executed many times before others are executed once. The interlocks serve to *open* (disconnect) the ladder circuits for all Read and Write instructions except the one that should be processed on the current CPU scan.

We show two methods of creating the interlocks necessary for sequencing multiple Read and Write instructions:

- Sequenced Internal Control Relays
- Shift Register

We will step you through the development of the interlocks using both methods. The two examples shown perform the same function. Only the interlocks are different.

NOTE: To fully understand the material in this section, you will first need to understand the Example Programs on pages 3-13 and 3-15, as well as the material in the Network Instructions section, beginning on page 3-3.

The following program segment sequences through three RX/WX instructions (two Write instructions and one Read instruction). You can develop your own program incorporating either of the two interlocking control strategies and expanding the number of interlocks to accommodate the number of RX/WX instructions in your program.

Interlocking Relays

It is easy to see the function of the interlocking relays if we construct a *truth table* first.

Across the top of the truth table we show internal control relays that we are considering using for our sequencing strategy. We have used C50 through C52 for our chart, but any contacts that are not used for other purposes in your program will work just as well.

Down the left side of the chart, we list the number of RX/WX instructions we may want to use in our RLL program.

Truth Table	C52	C51	C50
First RX/WX	0	0	0
Second RX/WX	0	0	1
Third RX/WX	0	1	0
Fourth RX/WX	0	1	1
Fifth RX/WX	1	0	0
Sixth RX/WX	1	0	1
Seventh RX/WX	1	1	0
Eighth RX/WX	1	1	1

The three contacts in this truth table will accommodate as many as eight Read or Write instructions. Our program only has three RX/WX instructions so we only need to use two contacts (see why on page 3-18). We will use C50 and C51. One additional contact (C53) would give us 32 combinations since the number of combinations expands as the power of 2.

Our three RX/WX instructions can be sequenced by the two contacts C50 and C51. Two contacts provide four different binary states:

- both off
- C50 on and C51 off
- C50 off and C51 on
- both on

We only need to use three of the four binary states (circled) since we only have three RX/WX instructions to sequence.

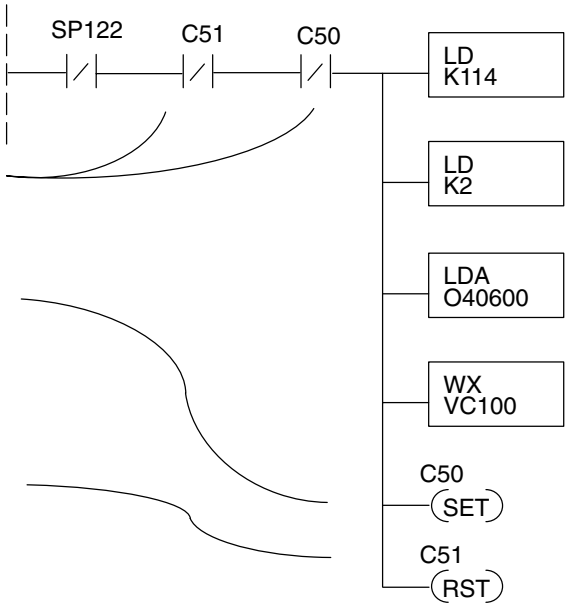
Truth Table	C52	C51	C50
First RX/WX	0	0	0
Second RX/WX	0	0	1
Third RX/WX	0	1	0
Fourth RX/WX	0	1	1
Fifth RX/WX	1	0	0
Sixth RX/WX	1	0	1
Seventh RX/WX	1	1	0
Eighth RX/WX	1	1	1

First RX/WX Instruction

C50 and C51 are interlocking contacts. They are normally closed in this rung to permit power flow to the first WX instruction. Both bits are off, corresponding to the first row of the truth table.

After the WX instruction is executed C50 is SET (turned on) which opens the contact in this rung and closes the C50 contact in the next rung.

C51 is RESET (turned off) which leaves the C51 contact closed for the next rung.

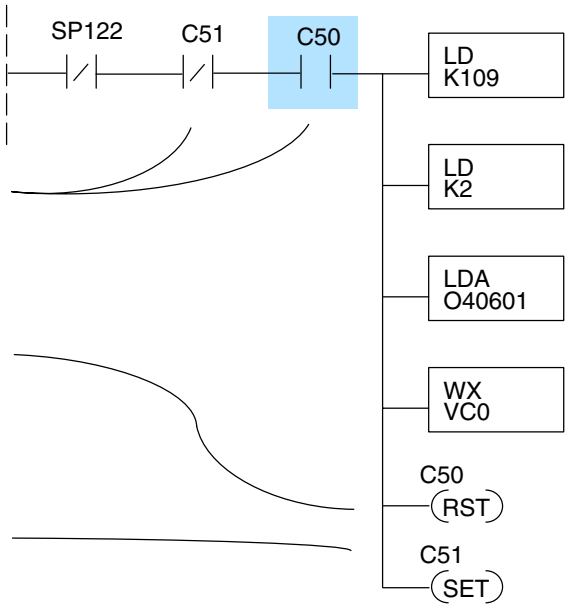


Second RX/WX Instruction

C50 is normally open and C51 is normally closed. For this rung to be executed, the C50 bit must be on and the C51 bit must be off, corresponding to the second row of the truth table. C50 was turned on in the previous rung. C51 was turned off in the previous rung.

After the WX instruction is executed C50 is RESET (turned off) which opens the C50 contact in this rung and closes it in the next rung.

C51 is SET (turned on), which closes the normally open C51 contact in the next rung.

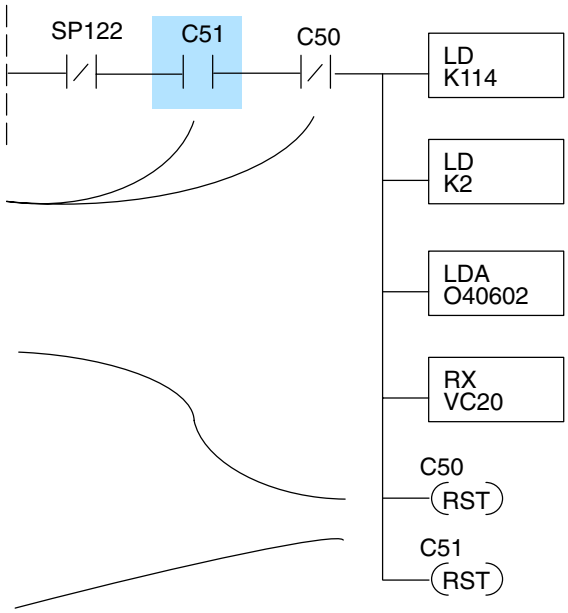


Third RX/WX Instruction

In this last rung, C50 is normally closed and C51 is normally open. For this rung to be executed, the C50 bit must be off and the C51 bit must be on, corresponding to the third row of the truth table. C51 was turned on in the previous rung.

After the RX instruction is executed, C50 is RESET which opens the C50 contact in this rung and allows it to close in preparation for repeating the first communication rung on the next CPU scan (page 3-18).

C51 is also RESET, which allows the C51 contact to close in preparation for repeating the first communication rung on the next CPU scan (page 3-18).



Returning to the First RX/WX Instruction

At the end of the third RX/WX instruction, we cycle back to the top row of the truth table on page 3-18. Both C50 and C51 are off, and the next CPU scan executes the first RX/WX instruction.

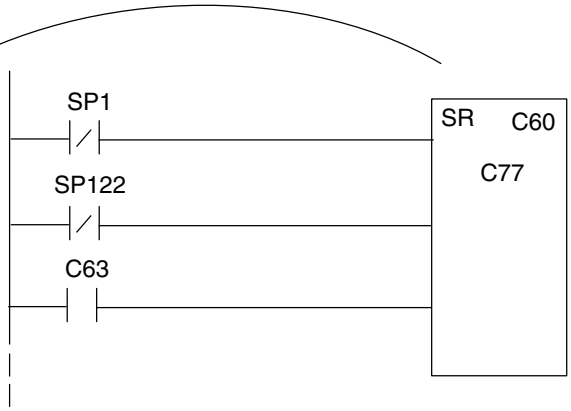
Shift Register

The Shift Register can be used for creating interlocks, as an alternative to using control relays. For a complete explanation of the function of the Shift Register, see the User Manual for your PLC. If you have more than a few RX/WX instructions, using control relays can become cumbersome. The Shift Register allows a single contact to be used in each communication rung as an interlock.

The data input to the Shift Register (SR) is Special Relay SP1. SP1 is the always-on bit. Combined with a normally closed contact it sends zeros to the Shift Register data input.

The clock input to the Shift Register is SP122, the communication busy bit. Each time one of the RX/WX instructions executes, the Shift Register moves the set bit over one place.

C63 is used in this example to reset the Shift Register to all zeros.



C77	C76	C75	C74	C73	C72	C71	C70	C67	C66	C65	C64	C63	C62	C61	C60

Shift Register after first scan.

C77	C76	C75	C74	C73	C72	C71	C70	C67	C66	C65	C64	C63	C62	C61	**C60**

Shift Register after second scan.

C77	C76	C75	C74	C73	C72	C71	C70	C67	C66	C65	C64	C63	C62	**C61**	C60

Shift Register after first RX/WX.

C77	C76	C75	C74	C73	C72	C71	C70	C67	C66	C65	C64	C63	**C62**	C61	C60

Shift Register after second RX/WX.

C77	C76	C75	C74	C73	C72	C71	C70	C67	C66	C65	C64	**C63**	C62	C61	C60

Shift Register after third RX/WX.

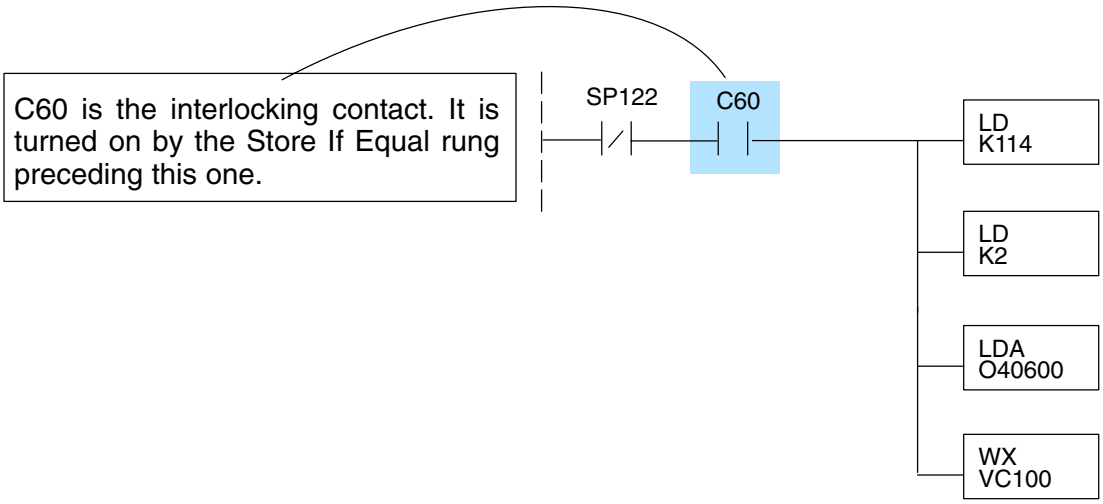
C77	C76	C75	C74	C73	C72	C71	C70	C67	C66	C65	C64	C63	C62	C61	C60

Shift Register after third RX/WX plus one scan.

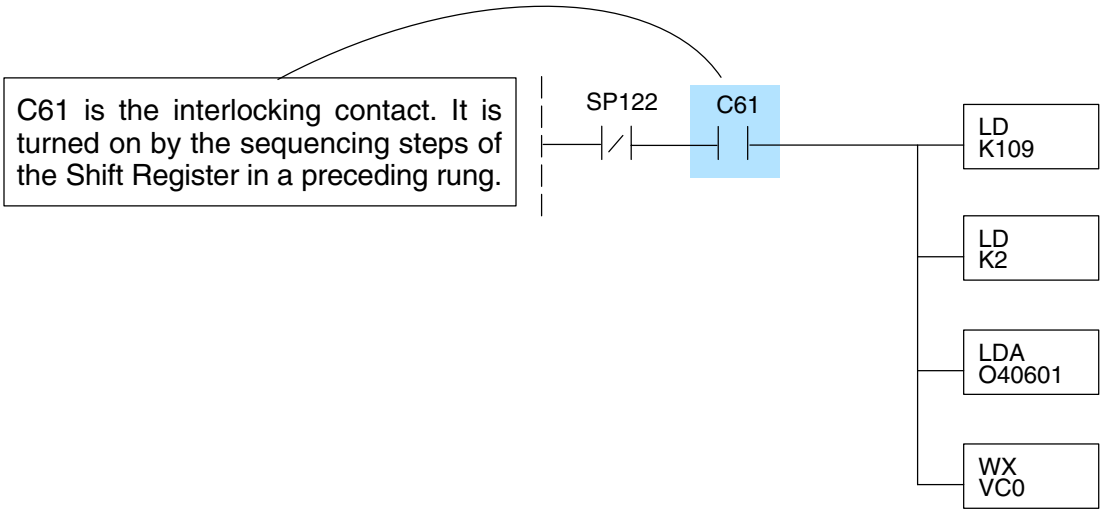
Store If Equal

The Store If Equal instruction detects when the Shift Register is reset to zeros. When that condition is true the C60 bit is SET by this rung. The C60 bit becomes the high bit shifted by the Shift Register until each RX/WX instruction is executed in turn.

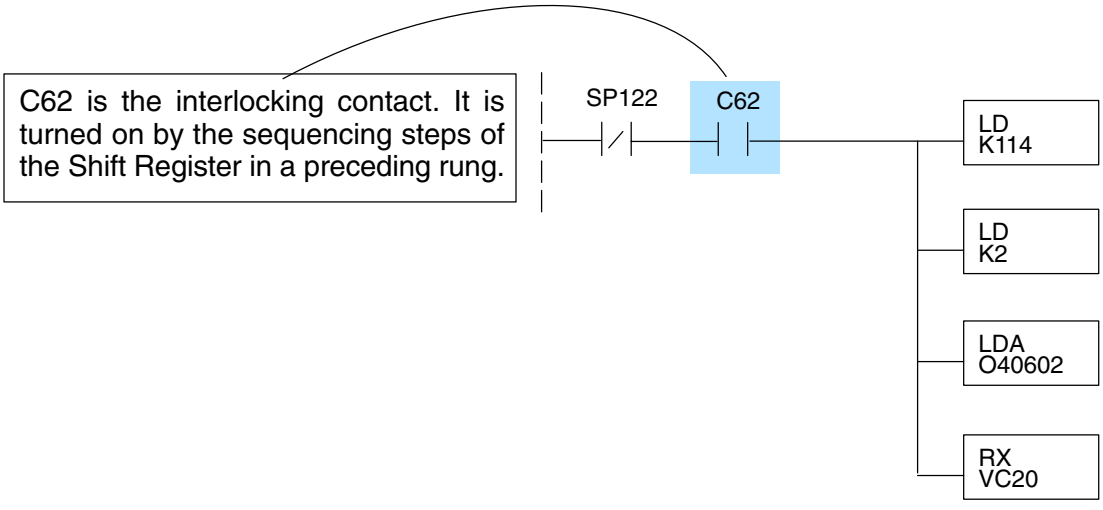
First RX/WX Instruction



Second RX/WX Instruction



Third RX/WX Instruction



After this rung is executed, the Shift Register shifts the high bit from C62 to C63 on the next CPU scan. C63 resets the Shift Register to zeros, the Store If Equal sets the C60 bit, and the CPU executes the first RX/WX instruction.

4

Maintenance and Troubleshooting

In This Chapter. . . .

Isolating a Communication Problem

If you are experiencing a problem communicating with an ECOM module, the problem can usually be isolated to one of four components of the communication link:

- the ECOM module itself (hardware or firmware)
- the communication program or the setup of the ECOM module
- the cabling and connections
- other external influences, such as electrical noise, heavy communication traffic on the network or exceeding the PLC power budget

Diagnostic Tools and Techniques

Several available tools and techniques can help you isolate a communication problem:

- The LEDs on the face of the module indicate the status of the link, the module, and the network communications.
- Replacing the module may determine whether the problem is in the module.
- NetEdit displays a list of the active modules on the network and their protocol and configuration settings.
- Cable testing devices can pinpoint short or open circuits or diagnose attenuation problems and other cabling problems.

Troubleshooting Chart

The following chart summarizes the different types of communication failures you could experience. In each case the **CPU PWR LED** must be **on**, and you must be attempting to communicate with the ECOM in question. You must be attempting to send or receive RX/WX instructions or you must be attempting to link to the ECOM using our DDE Server or other software driver.

The meaning of the **diagnostic LEDs** is explained on page 4-4.

Troubleshooting Chart	
Legend: ▭ Off ▬ On ▨ Flash	
ECOM Module LEDs	**Corrective Action**
LINKGD ▭ ACT ▭ ERROR ▬ OR LINKGD ▭ ACT ▭ ERROR ▨	1. Cycle power to the PLC. This will clear the ERROR if it was due to a transient condition. 2. Replace ECOM module

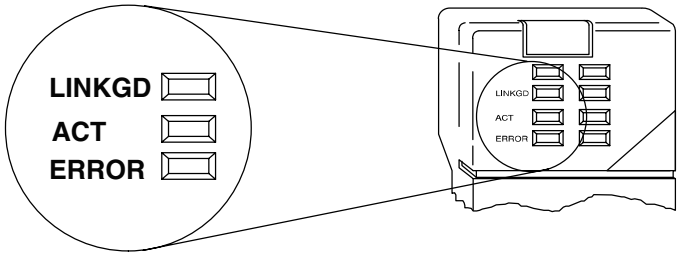
Troubleshooting Chart (Continued)	
Legend: ▭ Off ▬ On ▨ Flash	
ECOM Module LEDs	**Corrective Action**
LINKGD ▭ ACT ▭ ERROR ▭	1. Try another cable that you know works. Check pinouts (see page 2-17). 2. Try another port on the hub or another hub. 3. Replace ECOM module.
LINKGD ▬ ACT ▭ ERROR ▭	1. Are PLCs in RUN mode? Some communications require initiating and responding PLCs to be in RUN mode. 2. Try another cable between PC and hub or the other communicating ECOM and hub. 3. Try another port on the hub or another hub. 4. Make sure you have not exceeded the recommended cable length for your network cable. The link signal could arrive with sufficient strength even though the data transmission does not. 5. Could be related to Windows configuration. Consult Windows documentation.
Note: This is also the indication of proper operation! Troubleshoot only if you are failing to exchange data. LINKGD ▬ ACT ▨ ERROR ▭ OR LINKGD ▬ ACT ▬ ERROR ▭	1. Try another cable between PC and hub or other ECOM and hub. 2. Try another port on the hub or another hub. 3. Confirm that ECOM module is in a usable slot in the PLC base (see pages 2-13 and 2-14) and that the CPU and CPU firmware support the ECOM module. 4. Look for errors in the setup of the ECOM module or in the communication program.

ECOM Module Diagnostic LEDs

ECOM LEDs

The ECOM module has three indicator lights which show the status of the following:

- signal path between the ECOM and the hub (or between ECOMs)
- signal between ECOMs or between a PC and an ECOM
- ECOM module hardware



Link Good Indicator

The **green** Link Good (**LINKGD**) LED is **steady on** when the ECOM module is correctly connected to an active device on the network and is receiving 5VDC operating voltage from the PLC power supply. The LINKGD LED verifies that the proper cables are connected, and the ECOM module is functioning correctly. If a mismatch with the 10BaseT or 10BaseFL connections occurs this LED will not be illuminated.

ACT Indicator

The **red** Activity (**ACT**) LED **flashes** to indicate that the module sees data travelling on the network. If any network device is sending or receiving data, the ACT LED will be illuminated. In idle mode (no network traffic) this LED is OFF. During heavy communication loads this LED will be **steady on**.

Error Indicator

If the ECOM module's **red ERROR** indicator is **flashing** or **steady on**, a fatal error has occurred. The error may be in the ECOM module itself, or a network problem may be causing this symptom. The ERROR indication can be caused by a faulty ground, an electrical spike or other types of electrical disturbances. Cycle power to the system to attempt clearing the error.

Using NetEdit for Troubleshooting

NetEdit is a software utility which came with this manual. To review the procedures for running and using NetEdit, see pages 2-7 through 2-11. NetEdit allows you to:

- See active modules on the network.
- Examine and change the modules' configuration settings.
- See the firmware revision number.
- Review statistical information about communication errors by type.

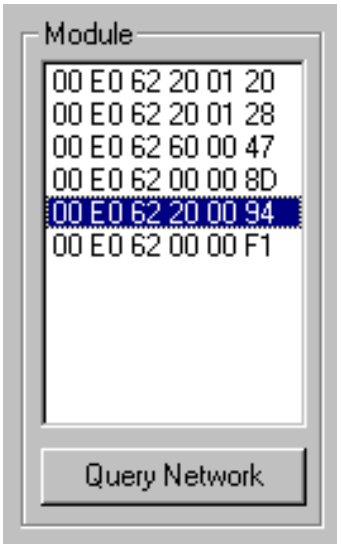
If you can see the ECOM module on the list in the Module box (described below), you are *linking* to the module from your PC. If you are linking to the module but failing to communicate with the module, you can conclude that:

- The module is working.
- The cabling is satisfactory from the PC to the hub and from the hub to the ECOM module.
- The hub is working.
- The problem is in one of the other components of the communication link.

Select a Module

The Module box shows the Ethernet Addresses of all modules which are currently linked to the NetEdit utility. If your ECOM module is not on this list, try the following:

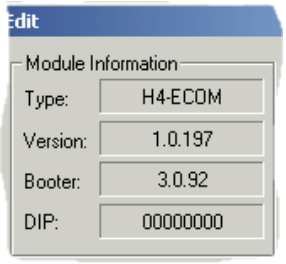
- Change Protocol selection and click on Query Network. See **Change Protocol** on the next page.
- Confirm that your PC has IPX or TCP/IP protocol loaded.
- Confirm that the ECOM module's LINKGD LED is on.



NOTE: The Ethernet Address is permanently assigned at the factory, and it is recorded on a label on the side of the ECOM module. See page 2-4 if you need help locating the label.

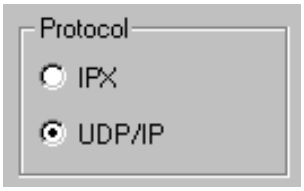
Module Information

The Module Information box gives the ECOM module Type, firmware Version, Booter firmware version and the address DIP switch setting. Verify that all modules *of the same type* have the same firmware version.



Change Protocol

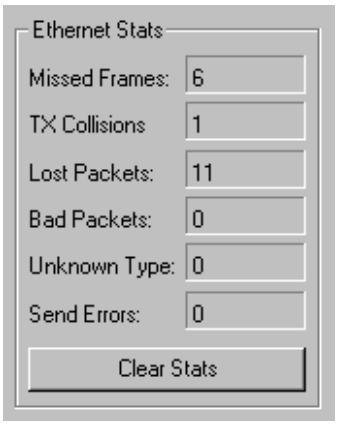
If you are experiencing a problem communicating from your PC to a module that *does not* appear on the list of active modules, try changing the protocol and clicking on Query Network. You may be able to link to your module with the other protocol.



If you are not sure which protocol you have loaded on your PC, refer to pages 2-8 and 2-9, as well as your Windows documentation. This protocol selection is only for PC-to-PLC communications and has no effect on PLC-to-PLC communications.

Ethernet Stats

If you are able to see the *problem* module on the list of modules currently active on the network, you can **select** the module to see the Ethernet Stats for that module. Select the module by clicking on the Ethernet Address in the Module box (see page 2-9).



To begin a new statistical record, click the Clear Stats button.

The diagnostic information available in the Ethernet Stats box is:

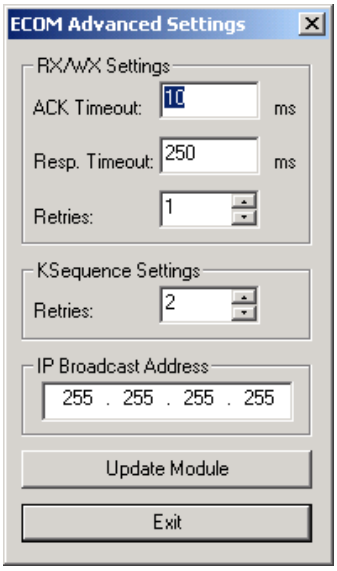
- Missed Frames – frames lost due to unavailability of buffer space.
- TX Collisions – detected when RXD+ and RXD– become active during a data transmission. Two devices are trying to communicate at the same time.
- Lost Packets – packets that overflow the queue.
- Bad Packets – packets that fit the Ethernet standard but are not in the right format for the ECOM module.
- Unknown Type – a foreign command was received and could not be interpreted. This will probably happen only during software driver development.
- Send Errors – the Ethernet standard number of retries were attempted for a transmission.

RX/WX Settings

The RX/WX Settings box in this window provides a place to make changes that affect PLC-to-PLC communications *only*.

Change these settings only if:

- The LINKGD LED is on.
- The ACT LED is flashing.
- You have explored the module configuration and RLL programming for possible errors.

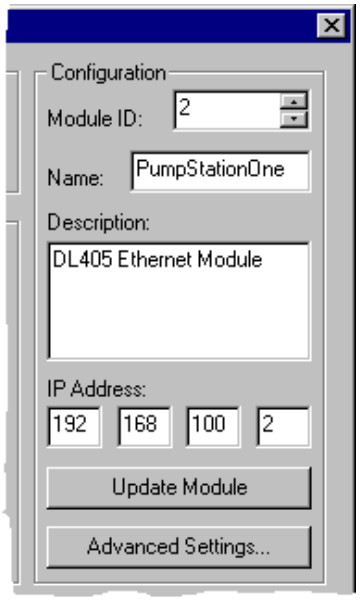


The **IP Broadcast Address** field is used to allow for non–standard broadcast address configurations. Some older Unix based systems did not use 255.255.255.255 for their broadcast address. This would prevent ECOMs from responding to network broadcast queries. Only change this value when using something other than 255.255.255.255 for broadcasts.

Record the Module Settings

If you are replacing an existing module, record the existing network identifier settings in the Configuration box. Set up the replacement module by linking to it with NetEdit and inserting the same network identifiers in the Configuration box. Click on Update Module to store the settings in the ECOM module's flash memory.

Each module on the network must have a unique network identifier.



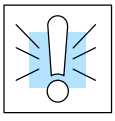
Replacing the ECOM Module

If you are experiencing a communication problem, and you think the ECOM may be defective, try replacing the ECOM module with a new one or one that you know is working properly. If that corrects the problem, then the original module is probably defective (assuming the replacement module was set up the same as the original and no changes have been made to the communication program or other network components). The diagnostic LEDs will help you determine which applies in this case. If replacing the module does not correct the problem, then the problem is probably not in the module.

If you are replacing an existing ECOM module with a new one, you need to set up the new module with the same network identifiers as the module you are replacing. If you used the **DIP switch** to set the **Module ID**, you will need to set the DIP switch on the replacement module to the same Module ID. See pages 2-5 or 2-6 to review the procedure for setting the Module ID using the DIP switch.

If you set up your original ECOM module using one of the **software utilities**, you will need to refer to your record of the module's network identifiers (see page 2-2) and duplicate the settings in the new module using the same procedures. See page 2-8 through 2-12 to review the procedures for using the software utilities.

To replace the ECOM module, disconnect power from the PLC and remove the original module. Insert the replacement ECOM module, connect the module to your network and apply power to the PLC. Links to other network devices will automatically be reestablished and communications between devices will resume.



WARNING: Your system can be damaged if you install or remove system components before disconnecting the system power. To minimize the risk of equipment damage, electrical shock, or personal injury, always disconnect the system power before installing or removing any system component.

Diagnosing Network Cable Problems

If you are experiencing communication problems, swapping cables is one of the simplest diagnostic procedures you can perform. If the network operates correctly with a different cable, you have isolated and cured the problem. If possible, use a short run of cable to test the network because problems with longer cable runs can be more difficult to diagnose and are more often intermittent.

If you are unable to swap cables, verify the proper operation of all other network components. You probably have a cable problem if you have verified that your:

- ECOM module is working correctly.
- ECOM module configuration is correct.
- RLL program or PC program is correct.
- hubs are working correctly.
- Windows configuration is correct.
- network adapter card is the correct type, and it is working correctly.

It is a good maintenance practice to test network cables periodically and maintain a permanent record of cable characteristics. A number of cable test instruments are available to test 10BaseT and 10BaseFL networks. These instruments will check the electrical or optical characteristics of your cabling, including:

- Continuity – This is a check to make sure the communication pairs are wired correctly, and that the wires are continuous from end to end. In the case of fiber optic network this is a test to be sure light is transmitted from one end of the cable to the other.
- Attenuation – This refers to the amount of signal loss over the cable segment at the signal frequency of interest. The 10BaseT specification allows for a maximum signal loss of 11.5 decibels (dB) for the entire link at the signal frequency used by 10Mbps Ethernet. The 10BaseFL specification calls for the optical loss in link segment to be no greater than 12.5 dB.
- Crosstalk – Crosstalk occurs when a signal in one pair of wires is electromagnetically coupled to an adjacent pair. This is critical for10BaseT networks which are susceptible to noise interference. 10BaseFL networks are virtually immune to noise interference.

NOTE: Any significant difference between the cable characteristics of the transmitter and receiver can cause communication errors.

Ethernet devices continually monitor the receive data path for activity as a means of verifying their link is working correctly. When the network is idle, each network device (including the ECOM module) sends a periodic *link test* signal to verify that the network is working. If the link test signal or other network activity is not received periodically, the LINKGD LED on the ECOM module is turned off.

A

Appendix A General Specifications

In This Appendix

- H2–ECOM and H4–ECOM Specifications
- H2–ECOM–F and H4–ECOM–F Specifications
- Ethernet Standards

General Specifications

ECOM Specifications

H2–ECOM / H4–ECOM General Specifications	
Module Type	Intelligent Data Communications Module
Quantity of Modules Per Base	Defined by CPU and base configuration
Diagnostics	LEDs/Network Monitoring Software (NetEdit)
Communications	10BaseT Ethernet
Data Transfer	10 Million bits per second
Extension Port	RJ45
Link Good Indicator (LINKGD)	Green LED
Activity Indicator (ACT)	Red LED
Error Indicator (ERROR)	Red LED
Power Consumption	320 mA (Supplied by DL205/DL405 base)
Operating Temperature	32° to 140° F (0° to 60° C)
Storage Temperature	–4° to 158° F (–20° to 70° C)
Relative Humidity	30% – 95% RH (non-condensing)
Environmental Air	No corrosive gases permitted
Networking Protocols Supported	TCP/IP, IPX
Manufacturer	Host Automation Products
Link Distance	100 meters (328 feet)

H2–ECOM–F / H4–ECOM–F General Specifications	
Module Type	Intelligent Data Communications Module
Quantity of Modules Per Base	Defined by CPU and base configuration
Diagnostics	LEDs, Network Monitoring Software (NetEdit)
Communications	10BaseFL Ethernet (fiber optic)
Data Transfer	10 Million bits per second
Extension Port	ST-style fiber optic connector
Link Good Indicator (LINKGD)	Green LED
Activity Indicator (ACT)	Red LED
Error Indicator (ERROR)	Red LED
Power Consumption	450 mA (Supplied by DL205/DL405 base)
Operating Temperature	32° to 140° F (0° to 60° C)
Storage Temperature	–4° to 158° F (–20° to 70° C)
Relative Humidity	30% – 95% RH (non-condensing)
Environmental Air	No corrosive gases permitted
Networking Protocols Supported	TCP/IP, IPX
Manufacturer	Host Automation Products
Link Distance	Up to 2,000 meters (2Km), 6,560ft (1.2 miles)

Ethernet Standards

Various institutes and committees have been involved in establishing Ethernet data communication standards. These specification standards assure Ethernet network compatibility for products from a broad variety of manufacturers.

The ECOM module complies with American National Standards Institute (ANSI) and Institute of Electrical and Electronic Engineers standard ANSI/IEEE 802.3, Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Methods and Physical Layer Specifications. This standard has been adopted by the International Organization for Standardization (ISO) as document ISO/IEC 8802–3.

The Electronic Industries Association (EIA) and Telecommunications Industries Commercial Building Telecommunications Wiring Standard designated EIA/TIA–568A defines implementation of 10BaseT (twisted pair) and 10BaseF (fiber optics) for Ethernet communications.

The same two organizations produced EIA/TIA TSB40–Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware. The purpose of this document is to specify transmission performance requirements and connecting hardware requirements.

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