GE Fanuc

GE Fanuc Automation

Programmable Control Products

TCP/IP Ethernet Communications
for the Series 90™ -30 PLC

User's Manual

GFK-1084B   *August, 1997*

Warnings, Cautions, and Notes
as Used in this Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Caution

Caution notices are used where equipment might be damaged if care is not taken.

Note

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

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CIMPLICITY PowerTRAC	Genius PowerTRAC	PROMACRO	VuMaster
CIMPLICITY 90-ADS	Helpmate	Series Five	Workmaster
CIMSTAR	Logicmaster	Series 90	

Preface

Content of This Manual

Chapter 1.   **Introduction:** Discusses the TCP/IP Ethernet Interface, its communications capabilities, and generally how to get your system running. Also included is a quick guide to the manual.

Chapter 2.   **Installing the TCP/IP Ethernet Interface:**   Describes the basic features of the TCP/IP Ethernet Interface, the installation and power-up of the Interface, and a procedure for the initial checkout of the Interface on your Ethernet cable.

Chapter 3.   **Programming Communications Requests:** Describes the ladder programming necessary for communications between PLCs.

Chapter 4.   **Troubleshooting:** Describes troubleshooting and problem isolation for the Ethernet Interface.

Appendix A.   **Glossary of Terms**

Appendix B.   **Communications Port Characteristics**

Appendix C.   **Advanced Information About IP and MAC Addresses**

Appendix D.   **Sample Ladder Program**

Appendix E.   **PC Software loader**

Related Publications

GFK-1186   *TCP/IP Ethernet Communications for the Series 90 PLC Station Manager Manual*

GFK-0356   *Series 90™-30 Programmable Controller Installation Manual*

GFK-0466   *Logicmaster 90™ Series 90™-30/20/Micro Programming Software User's Manual*

GFK-1295   *Using CIMPLICITY® Control*

GFK-0467   *Series 90™-30/20/Micro Programming Software Reference Manual*

GFK-0870   *Host Communications Toolkit for C/C++ Applications User's Manual*

GFK-1063   *Host Communications Toolkit for Visual Basic Applications User's Manual*

GFK-1026   *Host Communications Drivers for Microsoft® Windows® User's Manual*

We Welcome Your Comments and Suggestions

At GE Fanuc Automation, we strive to produce quality technical documentation. After you have used this manual, please take a few moments to complete and return the Reader's Comment Card located on the next page.

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1</td><td>*Introduction*</td></tr>
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This manual describes the *Ethernet Interface* (IC693CMM321) for the Series 90-30 PLC.

This chapter provides an overview of the Ethernet Interface and covers the following topics.

- The Ethernet Interface,
- How to Make the System Work,
- Quick Guide to the Manual.

The Ethernet Interface

The *Ethernet Interface* enables the Series 90-30 PLC to communicate with other Series 90-30 PLCs, with Series 90-70 PLCs, with Logicmaster 90-30 TCP/IP Ethernet (IC641SWP313), with CIMPLICITY® Control (IC641CTL9xx) and with applications developed using the *Host Communications Toolkit* (IC641SWP05x). GE Fanuc offers the *Host Communications Toolkit* separately from the *Ethernet Interface*.

The Ethernet Interface for the Series 90-30 PLC has "client/server" capability. As a "client" it can initiate communications with other Series 90 PLCs containing Ethernet Interfaces. This is done from the PLC ladder program using the COMMREQ function. As a "server" it responds to requests from other devices such as Logicmaster 90-30 TCP/IP Ethernet, a Host computer running a Host Communications Toolkit application, or another Series 90 PLC acting as a "client". No PLC programming is required for server operation.

Figure 1-1 shows the Series 90-30 PLC in a basic Ethernet Communications System.
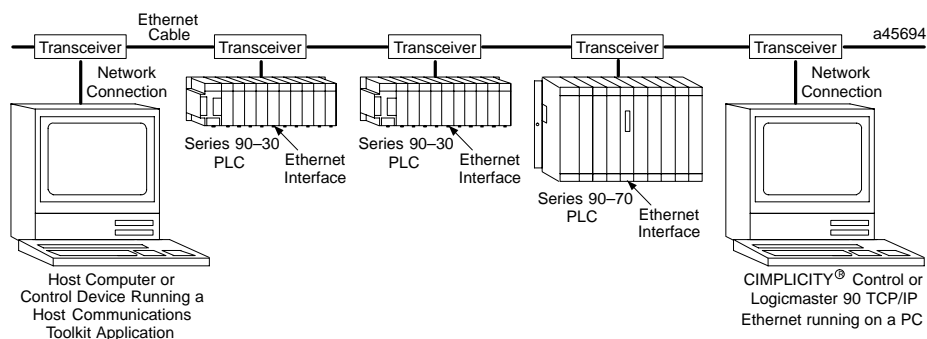
Figure 1-1. Ethernet Communications System

Capabilities of the Ethernet Interface

The Ethernet Interface brings to your PLC a great deal of capability. It will allow you to:

- **Become operational quickly.** The Ethernet Interface is made operational with very little effort. You need only install the Interface in the baseplate and, use the Logicmaster configuration package or CIMPLICITY Control to store basic configuration information to the module to make the basic server capability functional. Client capability, that is, the capability to initiate communications, can be added using the COMMREQ function in the ladder program.

- **Directly attach your PLC to an Ethernet network.** The Ethernet Interface allows you to directly attach the Series 90-30 PLC to an Ethernet LAN via a user-supplied transceiver and AAUI cable, and to communicate with host computers and other Series 90 PLCs on the local network. All Series 90-30 models and all rack styles are supported.

- **Transfer data between PLCs.** The Ethernet Interface provides client capability, the capability to initiate communications to other Series 90 Ethernet Interfaces, using COMMREQ functions in the ladder program.

- **Access data using a Host computer.** Computer applications which use the GE Fanuc Host Communications Toolkit can access data within the Series 90-30 PLC through the server capability of the Ethernet Interface. Supported computer operating systems include Windows®, Windows NT®, HP-UX 9000, DEC VAX/VMS™, and DEC Alpha AXP/VMS™.

- **Communicate simultaneously to multiple devices.** The multiplexing capabilities of the Ethernet Interface, along with Ethernet network's high capacity, allow the PLC to communicate with several other devices at the same time.

- **Maintain compatibility with other GE Fanuc devices, as well as with devices from other vendors.** The GE Fanuc Series 90-30 PLC with TCP/IP Ethernet Interface is compatible with the Series 90-70 PLC with TCP/IP Ethernet Interface.

  It is also compatible with GE Fanuc Logicmaster 90-30 TCP/IP Ethernet, CIMPLICITY Control and GE Fanuc HCT Ethernet products available on DEC, HP, IBM, and other computer platforms running TCP/IP.

- **Diagnose and maintain your system, using diagnostic and station management tools.** You can find problems before they become serious. In the event that communications software upgrades are needed, you can use a built-in serial port to download the software to the Interface.

- **Indirectly attach to other Local Area Networks and/or wide area networks via third party IP routers.** When configured to use an IP gateway (router), the Ethernet Interface can communicate with remote PLCs and other nodes reachable through the router.

- **Communicate with remote computers via Serial Line Internet Protocol (SLIP) using modems and/or serial lines.** Using third party SLIP software, a remote host computer can be attached to a TCP/IP network.

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Attachment of the Ethernet Interface to the LAN

The AAUI port provides the electrical and mechanical interface to the user-provided Ethernet transceiver cable, which connects the AAUI port to an external user-provided transceiver. (The transceiver cable may be separate or built-in to the transceiver.) The external transceiver is directly connected to the Ethernet cable.

Various Ethernet baseband media (10Base...) can be interconnected by appropriate repeaters. Capabilities and limitations are defined in IEEE 802.3 Chapter 13, "System Considerations for Multi-Segment Networks". This document is published by the Institute of Electrical and Electroncs Engineers, Inc., 345 East 47th Street, New York, NY 10017-2394 USA.

The Ethernet Interface can operate on any of the following media with the appropriate user-supplied transceiver cable and transceiver. IEEE 802.3 specifies the definitive requirements of each medium.

10Base5 Coax: 10Base5 uses a 0.4 inch diameter 50-ohm coaxial cable and is commonly called "thick wire". The maximum length of a cable segment is 500 meters. The distance between any two stations must be a multiple of 2.5 meters. A maximum of 100 stations is allowed on a 10Base5 Ethernet segment.

10Base2 Coax: 10Base2 uses a 0.2 inch diameter 50-ohm coaxial cable and is commonly called "thin wire". The maximum length of a cable segment is 185 meters. A maximum of 30 stations is allowed on a 10Base2 Ethernet segment.

10BaseT: 10BaseT uses a twisted pair cable of up to 100 meters in length between each node and a hub or repeater. Typical hubs or repeaters support 6 to 12 nodes connected in a star wiring topology.

10BaseF: 10BaseF has two variations that both use the same type of fiber-optic cable: 10BaseFP can support up to 33 nodes at distances of up to 500 meters from a passive star; 10BaseFL supports up to 2000 meters between a node and a repeater (a multi-port repeater would thus constitute a star). Additionally, 10BaseFB provides a means of interconnecting (only) repeaters by up to 2000 meters of (the same) fiber-optic cable.

10Broad36: 10Broad36 uses 75-ohm coaxial cable and CATV-like media components (taps, amplifiers, headend translators, etc.) to support hundreds of nodes at distances of up to 2800 meters. Broadband cannot be connected to baseband via repeaters. Broadband cable plant design and installation must be in accordance with IEEE 802.7 and requires special expertise. GE Fanuc recommends you contract professional specialists for these services. Consult your GE Fanuc sales representative or field service office for help in identifying local specialists.

The Station Manager Software

The built-in Station Manager software provides on-line supervisory access to the Ethernet Interface, through either Serial Port 1 or over the Ethernet cable. The Station Manager services on the Ethernet Interface include:

- An interactive set of commands for interrogating and controlling the station.
- Unrestricted access to observe internal statistics, an exception log, and configuration parameters.
- Password security for commands that change station parameters or operation.

Access to the Station Manager is attained through a user-provided computer terminal or terminal emulator. See GFK-1186 for more information on the Station Manager.

The PC Software Loader

The PC Software Loader is a separate software utility which updates the communications software stored in "flash" memory in the Ethernet Interface. This utility is supplied with any updates to the Ethernet Interface software.

How to Make the System Work

There are only a few simple tasks required to get your Ethernet Communications System working. These tasks are addressed in detail later in this manual.

1. Install the Ethernet Interface into the Series 90-30 baseplate and connect it to the network.

2. Configure the Ethernet Interface using Logicmaster 90 Configuration software or CIMPLICITY Control.

3. Power up the Series 90-30 PLC, store the configuration, and power-up the PLC again.

4. Add COMMREQ functions in your ladder program if you need client capability.

The figure below illustrates these tasks:
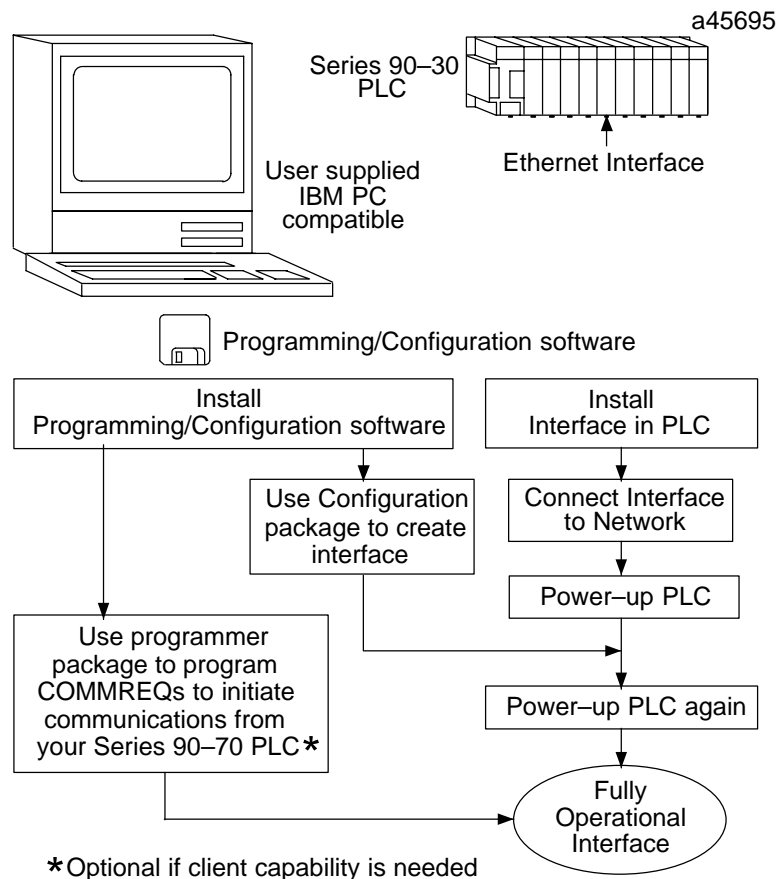
Figure 1-2. The Main Tasks for Installing the Ethernet Interface

Quick Guide to the Manual

The table below breaks down the tasks shown in Figure 1-2 and identifies where in the manual they are described.

Tasks	Where to go in the Manual
Installing the Interface	Chapter 2. Installing the Ethernet Interface Procedure 1. Installing the Interface
Configuring the Interface	Procedure 2. Configuring the Interface

Powering-up the PLC	Procedure 3. Verifying Proper Power-Up
	          Operation of the Configured
	          Interface

PING Application Connection Tests	Procedure 4. Pinging the TCP/IP Interfaces on the Network
PLC Ladder Programming (COMMREQ)	Chapter 3 Programming Communications Requests
Troubleshooting the Interface on the Network	Chapter 4. Troubleshooting

Installing the Ethernet Interface

This chapter describes the basic features of the Ethernet Interface, its installation, config-uration, and a procedure for its initial checkout on your Ethernet cable. The chapter first provides a hardware overview of the Ethernet Interface. It is then divided into four Installation Procedures, each providing an overview of the procedure and then explain-ing the detailed steps to be performed.

As you work through a procedure you may encounter references to the appendices and other chapters in this manual. These references provide more detailed information about the subject under discussion.

The installation procedures described in this chapter are listed below:

- Procedure 1: Mounting the Ethernet Interface on the PLC Baseplate - ***Required***
- Procedure 2: Configuring the Ethernet Interface - ***Required***
- Procedure 3: Verifying Proper Power-Up of the Ethernet Interface - ***Required***
- Procedure 4: "Pinging" the Ethernet Interfaces on the Network - ***Optional***

Some of the procedures require prior Ethernet cable plant design and installation.

By completing the Installation Procedures you will gain an understanding of the parts of the network and how they fit together. You will also have confidence that your equip-ment is working properly.

Ethernet Interface Hardware Overview

The Ethernet Interface is mounted on the Series 90-30 PLC baseplate. It is connected to an Ethernet network via a user-provided transceiver cable and transceiver. The follow-ing figure shows the layout of the Ethernet Interface.

a45481c
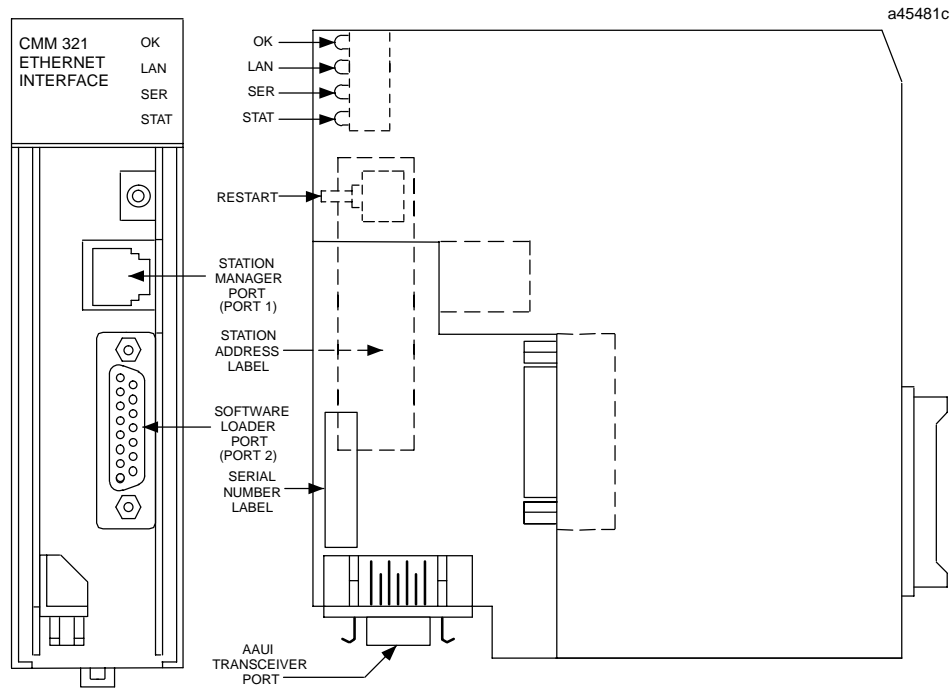
Figure 2-1. Ethernet Interface

The Ethernet Interface has several user-accessible elements.

Four LEDs are located at the top of the board. The Restart button is located immediately below the LEDs. The RS-232 serial port with the RJ-11 connector (similar to a modular telephone connector) is the Station Manager port. The RS-485 serial port with the 15-pin "D" connector located below the Station Manager port is the module's Software Loader port. The 14-pin AAUI connector, facing downward, is the Transceiver port.

The Restart button, Station Manager port, Software Loader port, MAC address label, and serial number label are normally concealed by the front cover. Remove the front cover to access them.

Board Indicators

There are four LEDs on the Ethernet Interface: OK, LAN, SER, and STAT. Each of these LEDs can be ON, OFF, BLINKING slow, or BLINKING fast. They indicate the state of the Interface, traffic on the network port (LAN ONLINE LED), and that an exception event has occurred.

All LEDs are briefly turned ON whenever the Restart button (described below) is released. This permits the operator to verify that all LEDs are operational.

See "Procedure 3. Verifying Proper Power-Up of the Ethernet Interface" for more LED information.

Restart Button

The Restart button serves four functions: LED test, Restart, Restart and enter Software Load state, and Restart and enter Maintenance state. These four functions behave similarly in all states except for the Software Load state. While in this state, pressing the button will cause an immediate restart into the Operational state if the software in the Ethernet Interface has not been corrupted or erased. If the software has been corrupted or erased, pressing the button will cause an immediate restart back into the Software Load state. The following text describes Restart button behavior while not in the Software Load state.

Pressing the Restart button will disrupt communications.

LED Test: Any time the Restart button is released *all* the LEDs flash ON. The operator should visually verify that all the LEDs go OFF and then ON at this time. Then the Interface performs either a restart, a restart and enter Software Load state, or a restart and enter Maintenance state, depending on the duration that the operator depresses Restart.

Restart: Pressing the Restart button momentarily (less than 5 seconds) requests a restart of the Ethernet Interface. When the Restart button is pressed, all LEDs go out. When it is released, all LEDs flash ON, then power-up diagnostics run, and the software on the Interface is restarted into the Operational state.

Restart and Enter Software Load State: Pressing and holding the Restart button for between 5 and 10 seconds forces a restart and requests entrance to the Software Load state. A reload is used to install a software update into the module and is not part of normal operation. When the Restart button is pressed, all LEDs go out. After 5 seconds have elapsed, the STAT LED (bottom LED) comes ON, to indicate that the Ethernet Interface will request a reload. After the Restart button is released, all LEDs flash ON, then power-up diagnostics run, and the Ethernet Interface waits to be loaded with all LEDs blinking in unison.

Notes

Reloading the Ethernet Interface requires the attachment of the PC Software Loader to the Software Loader port and initiating a load with the PC Software Loader. The PC Software Loader is a separate software utility which updates the communications software in the Ethernet Interface. This utility is supplied with any updates to the Ethernet Interface software. See Appendix E for more information.

At any time before you initiate a load with the PC Software Loader, you can restart the Ethernet Interface by pressing the Restart button. Pressing this button will immediately cause the board to restart. If the reload has been initiated, see Appendix E for more information.

Restart and Enter Maintenance State: Pressing and holding the Restart button for more than 10 seconds forces a restart and requests entrance to the Maintenance state. Maintenance state must be invoked to change Advanced Parameters. While in Maintenance state, all Advanced Parameters revert to their default value. When the Restart button is pressed, all LEDs go out. After 5 seconds, the STAT LED comes ON, then after 10 seconds have elapsed, the STAT and SER LEDs both come ON, to indicate that the Ethernet Interface will request entry to the Maintenance state. After the Restart button is released, all LEDs flash ON then power-up diagnostics run and the Ethernet Interface enters the Maintenance state.

Notes

In any case, any data being transferred by the Ethernet Interface at the time of the Restart will be lost.

The Restart button is not operable during the diagnostic phase of power-up. The Ethernet Interface is in diagnostic phase when the OK LED is BLINKING fast and other LEDs are OFF.

Serial Ports

There are two serial ports on the Ethernet Interface: the Station Manager port (port 1) and the Software Loader port (port 2).

The Station Manager Port

The 6-pin, RJ-11 "phone jack", RS-232 port is used to connect a terminal or terminal emulator to access the Station Manager software on the Ethernet Interface. A cable is needed to connect the terminal or emulator to the Ethernet Interface (see Appendix B, Communications Ports Characteristics).

The Software Loader Port

The 15-pin, D-type, RS-485 port is used to connect to the PC Software Loader in case the communications software in the Ethernet Interface needs to be updated. The characteristics of this port are given in Appendix B, Communications Ports Characteristics.

AAUI (Transceiver) Port

The 14-pin AAUI port provides the electrical and mechanical interface to the user-provided IEEE 802.3 transceiver cable, which connects the AAUI Port to an external Ethernet-compatible transceiver (see Appendix B for the characteristics of the AAUI Port). The external transceiver is directly connected to the Ethernet cable.

Default Station Address Label

The Default Station Address label lists the MAC address to be used by this Interface.

Serial Number Label

The Serial Number Label indicates the serial number of this Interface.

Procedure 1: Installing the Ethernet Interface in the PLC

This section describes the physical mounting of the Ethernet Interface onto the Series 90-30 PLC baseplate. For information on the installation procedures for the baseplate, Series 90-30 CPU, Power Supply, and other Series 90-30 modules, refer to GFK-0356, *Series 90-30 Programmable Controller Installation Manual.*

Equipment Required to Perform the Installation Procedures

In addition to the Ethernet Interface, make sure you have the items listed below before you begin.

- A Series 90-30 PLC CPU baseplate, or any Series 90-30 baseplate and a Series 90-30 CPU (version 5.03 or higher) with power supply.

- An operating Logicmaster ™ 90-30 system release 6.0 or higher, or CIMPLICITY Control (runs on a personal computer).

- An Ethernet-compatible AAUI transceiver and Ethernet cables. (See Appendix B for more information.)

- A serial cable for the Station Manager port on the Ethernet Interface (see Appendix B). *Optional*

- A terminal or IBM-compatible personal computer equipped with terminal emulation software. *Optional*

Note

If your installation requires CE Mark compliance, please refer to GFK-1179, *Installation Requirements for Conformance to Standards*, shipped with the PLC programming software, for additional guidelines.

Ethernet Interface Installation

Use the following instructions as a guide when inserting a module into a slot in a baseplate. These instructions assume that the power suppy on the baseplate is to your left.

Warning

Do not insert or remove modules with power applied. This could cause the PLC to Stop, damage the module, or result in personal injury.

1. Be sure the Series 90-30 PLC baseplate power is OFF.

2. Align the module with the desired base slot and connector. Tilt the module upwards so that the top rear hook of the module engages the slot on baseplate.

3. Swing the module downward until the connectors mate and the lock-lever on the bottom of the module snaps into place engaging the baseplate notch.

4. Visually inspect the module to be sure that it is properly seated.

5. Remove the front cover of the Interface.

6. Connect the transceiver cable into the 14-pin AAUI Port of the Ethernet Interface. Secure the cable. The other end of the transceiver cable should be connected to an external IEEE 802.3 compatible transceiver which is attached to the Ethernet network. ***If the transceiver has a switch or jumper for SQE, it must be enabled.*** (Note: The transceiver cable may be built-in to the transceiver or removable.)

7. Replace the front cover and restore power to the baseplate.

8. Use Logicmaster software, CIMPLICITY Control, or a Hand Held Programmer to stop the CPU.

9. Continue with Procedure 2: Configuring the Ethernet Interface.

Note

An Ethernet Interface can be mounted on a CPU baseplate, an expansion baseplate, or a remote baseplate. However, due to power requirements, only *two* Ethernet Interfaces are permitted per baseplate.

Procedure 2a: Configuring the Ethernet Interface with Logicmaster 90-30 Configuration Software

Before you can use the Ethernet Interface with the Series 90-30 PLC, you must configure the Interface using Logicmaster™ 90-30 configuration software or CIMPLICITY® Control (see Procedure 2b for configuring using CIMPLICITY Control). The Logicmaster 90-30 configuration software allows you to specify the modules and I/O that will reside in your Series 90-30 PLC rack(s). The Hand Held Programmer may *not* be used to configure the Interface.

For the Ethernet Interface specifically, the configuration software allows you to:

■ Define the status address of the Ethernet Interface

■ Assign the IP Address for the Ethernet Interface, and optionally the Subnet Mask and the Gateway Address.

■ Configure the serial ports (optional).

To configure the Ethernet Interface, access the I/O Configuration rack screen in the Logicmaster 90-30 Configuration Package, and do the following:

1. Move the cursor to the desired rack and slot location. The slot may be either unconfigured or previously configured.

```
 ┌──────────────────────────────────────────────────────────────────────┐
 │ RACK   │COPY    │REF VU │DELETE │UNDEL  │      │      │      │      │      │
 │ 1 M30 io 2genius 3         4ps     5rcksel 6comm  7      8other 9      10zoom │
 │                                                                        │
 │ >                                                                      │
 │                                                                        │
 │  ┌─────────────────────── RACK 0 ──────────────────────────────────┐  │
 │  │  PS  │  1  │  2  │  3  │  4  │  5  │  6  │  7  │  8  │  9  │  10  │  │
 │  │ ============ P R O G R A M M E D   C O N F I G U R A T I O N ===== │
 │  │                                                                   │  │
 │  │ PWR321 CPU331                                                     │  │
 │  │                                                                   │  │
 │  │                                                                   │  │
 │  │                                                                   │  │
 │  └───────────────────────────────────────────────────────────────┘  │
 │                                        OFFLINE                         │
 │  C:\LM90\TEST1                      PRG: TEST1            CONFIG VALID  │
 │  REPLACE                                                               │
 └──────────────────────────────────────────────────────────────────────┘
```

2. Press the **Communications** softkey, i.e., **Comm (F6)**. Your screen display will change to the one shown on the following page.

```
┌────────────────────────────────────────────────────────────────┐
│ RACK  │     │     │     │     │     │     │     │     │     │    │
│ 1     2ethnet 3serial 4     5     6     7     8     9zero  10    │
│                                                                  │
│ >                                                                │
│          SERIES 90-30 MODULE IN RACK 0 SLOT 2                    │
│                   ────── SOFTWARE  CONFIGURATION ──────────      │
│   ┌────────┐   Catalog #:  ▊▊▊▊▊▊▊▊                              │
│   │ SLOT   │                                                     │
│   │  2     │─────────────────────────────────────────────       │
│   │        │                                                     │
│   │        │                                                     │
│   │        │                                                     │
│   │        │                                                     │
│   │        │                                                     │
│   │        │                                                     │
│   │        │                                                     │
│   │        │                                                     │
│   └────────┘                                                     │
│                                     OFFLINE                      │
│   C:\LM90\TEST1              PRG: TEST1            CONFIG VALID   │
│   REPLACE                                                        │
└────────────────────────────────────────────────────────────────┘
```
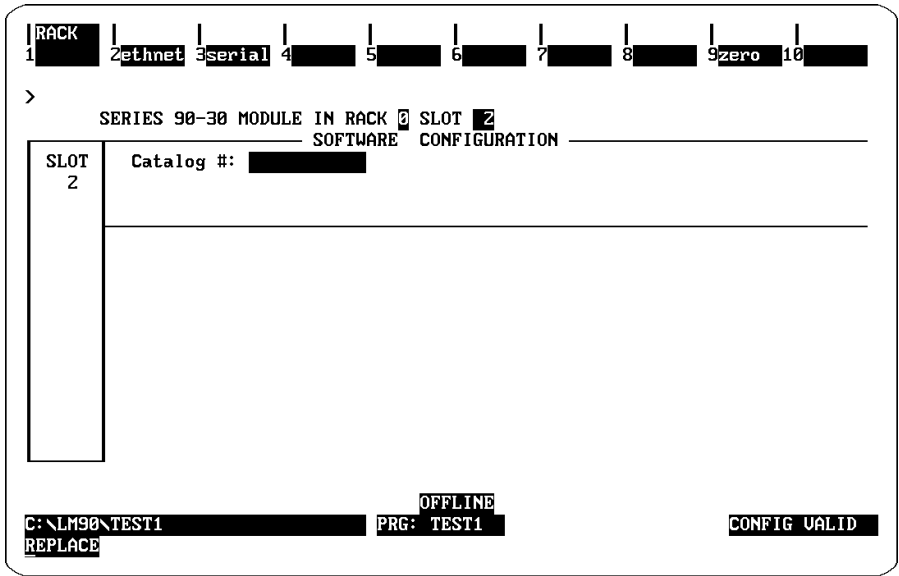
3. Press **ethnet (F2)**. Your screen display will change to the one shown below.

```
┌────────────────────────────────────────────────────────────────┐
│ RACK  │     │     │     │     │     │     │     │     │     │    │
│ 1     2ethnet 3serial 4     5     6     7     8     9zero  10    │
│                                                                  │
│ >                                                                │
│          SERIES 90-30 MODULE IN RACK 0 SLOT 2                    │
│                   ────── SOFTWARE  CONFIGURATION ──────────      │
│   ┌────────┐   Catalog #:                                        │
│   │ SLOT   │                                                     │
│   │  2     │  ┌────────────────────────────────────────────┐    │
│   │        │  │    CATALOG #     DESCRIPTION         TYPE   │    │
│   │        │  │ 1  IC693CMM321   ETHERNET INTERFACE  ETHNET │    │
│   │        │  │                                             │    │
│   │        │  │                                             │    │
│   │        │  │                                             │    │
│   │        │  │                                             │    │
│   │        │  │ << CURSOR TO THE DESIRED CATALOG NUMBER AND │    │
│   │        │  │       PRESS THE ENTER KEY >>                │    │
│   │        │  │ <<  PRESS PGDN KEY FOR NEXT PAGE, PGUP KEY  │    │
│   └────────┘  │       FOR PREVIOUS PAGE     >>              │    │
│               └────────────────────────────────────────────┘    │
│                                     OFFLINE                      │
│   C:\LM90\TEST1              PRG: TEST1            CONFIG VALID   │
│   REPLACE                                                        │
└────────────────────────────────────────────────────────────────┘
```
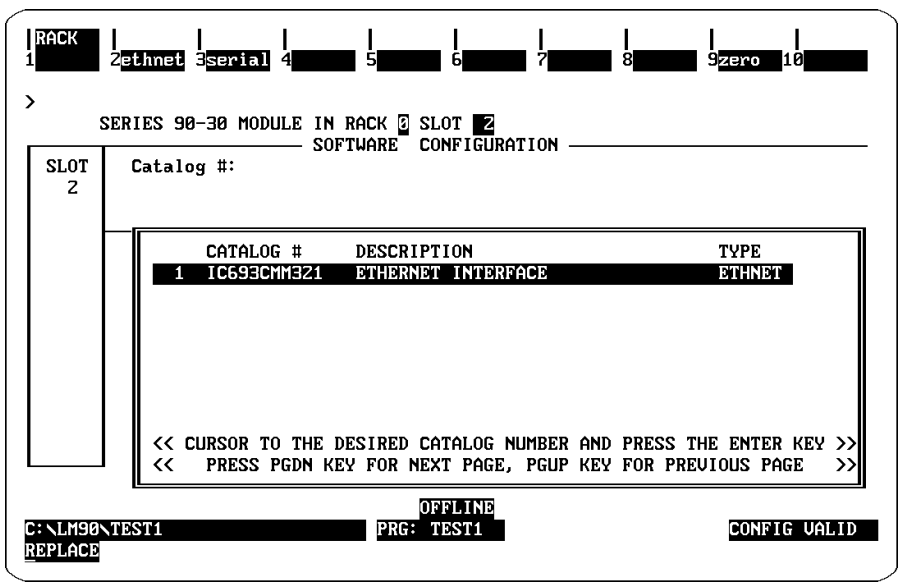
4. Press **Enter** to select the Ethernet Interface. You will then see the screen shown on the following page.

```
┌─────────────────────────────────────────────────────────────────────────────┐
│ │RACK │      │      │      │      │      │      │      │      │             │
│ 1▓▓▓▓│ 2ethnet 3serial 4▓▓▓▓ 5▓▓▓▓ 6▓▓▓▓ 7▓▓▓▓ 8▓▓▓▓ 9zero 10▓▓           │
│ >                                                                           │
│         SERIES 90-30 MODULE IN RACK 0 SLOT 2                                 │
│ ┌──────┬──────────── SOFTWARE  CONFIGURATION ───────────────────────        │
│ │ SLOT │  Catalog #: IC693CMM321              ETHERNET INTERFACE             │
│ │  2   │                                                                     │
│ │      │ ─────────────────────────────────────────────────────────         │
│ │CMM321│                                                                     │
│ │      │  Config Mode             :  TCP/IP                                  │
│ │ETHNET│  Status Address          :    %I0001                               │
│ │      │  Status Length           :    80                                   │
│ │      │                                                                     │
│ │      │  IP  Address             :  0.0.0.0                                 │
│ │      │  Subnet Mask             :  0.0.0.0                                 │
│ │      │  Gateway IP Address      :  0.0.0.0                                 │
│ │      │  Name Server IP Address  :  0.0.0.0                                 │
│ │      │                                                                     │
│ │      │   Note: Default IP Address (0.0.0.0) requires a network BOOTP server│
│ └──────┘                                                                     │
│        << More Config Data Exists; PgDn for Next Page, PgUp for Previous Page >>│
│                                  OFFLINE                                     │
│ C:\LM90\TEST1              PRG: TEST1                        CONFIG VALID     │
│ REPLACE                                                                      │
└─────────────────────────────────────────────────────────────────────────────┘
```

Configuration Mode: This is currently fixed as TCP/IP.

Status Address: The Status Address is the location of the LAN Interface Status (LIS) bits (16 bits) and the Channel Status bits (64 bits). The Channel Status bits are always located immediately following the LAN Interface Status bits.

Note

Do not use the 80-bits assigned to the LIS bits and Channel Status bits for other purposes or your data will be overwritten.

Status Length: This is fixed at 80 bits (the sum of the LIS bits and the Channel Status bits).

IP Address, Subnet Mask, Gateway Address, and Name Server IP Address: The values for the IP Address, Subnet Mask, and Gateway Address should be assigned by the person in charge of your network (the network administrator). TCP/IP network administrators are familiar with these parameters. It is important that these parameters are correct, otherwise the Ethernet Interface may be unable to communicate on the network and/or network operation may be corrupted. It is especially important that each node on the network is assigned a *unique* IP address.

However, if you have no network administrator and a simple isolated network with no gateways, you can use the following range of values for the assignment of local IP addresses:

3.0.0.1	First PLC
3.0.0.2	Second PLC
3.0.0.3	Third PLC
.	.
.	.
.	.
3.0.0.255	Logicmaster TCP or host

Also, on an *isolated network*, the Subnet Mask, Gateway IP address, and Name Server IP address can all be 0.0.0.0. (The Name Server IP address is not currently used and is reserved for future use.)

Note

If the isolated network is ever connected to another network, the IP addresses 3.0.0.1 through 3.0.0.255 must not be used and the Subnet Mask and Gateway IP address must be assigned by the Network Administrator The IP addresses must be assigned so that they are compatible with the connected network. Refer to Appendix C for more information on addressing.

See also the section "Determining If an IP Address Has Already Been Used" in Procedure 4.

5. Optionally, after you have assigned the IP address, etc., press **Page Down** to display the following screen.

```
|RACK |      |      |      |      |      |      |      |      |
1          2ethnet 3serial 4      5      6      7      8      9zero  10

>
          SERIES 90-30 MODULE IN RACK 0 SLOT 2
 _____ SOFTWARE  CONFIGURATION _____
 SLOT    Catalog #: IC693CMM321            ETHERNET INTERFACE
  2
 _____
 CMM321  _____
          _____ PORT CONFIGURATION _____
 ETHNET   -- Station Mgr Port --  -- S/W Load Port --
          Data Rate : 9600        Data Rate : 19200
          Parity    : NONE        Parity    : ODD
          Stop Bits : 1           Stop Bits : 1
          Flow Contrl: NONE       Flow Contrl: NONE
          TurnA Delay: NONE       TurnA Delay: NONE
          Timeout   : LONG        Timeout    : LONG


          << More Config Data Exists; PgDn for Next Page, PgUp for Previous Page >>
                                    OFFLINE
 C:\LM90\TEST1                  PRG: TEST1                    CONFIG VALID
 REPLACE
```

The Logicmaster 90-30 Configurator also allows you to optionally configure the Data Rate, Parity, Stop Bits, Flow Control, Turn-around Delay, and Timeout for each of the two serial ports (Station Manager Port and Software Loader Port. The defaults for both ports are shown on the previous screen.

Data Rate: Data rate (bits per second or bps) for the port. Choices are `300`, `600`, `1200`, `2400`, `4800`, `9600`†, or `19200*`.

Parity: Type of parity to be used for the port. Choices are `NONE`†`, EVEN,` or `ODD*`.

Stop Bits: Enter the number of stop bits. Choices are `1*`† or `2`.

Flow Control: Type of flow control to be used for the port. Choices are `HARDWARE` or `NONE*`†.

Turnaround Delay: Turnaround delay time to be used for the port. Choices are `NONE*`†, `10 ms`, `100 ms`, or `500 ms`.

Timeout: Length of timeouts used for the port. Choices are `LONG*`†, `MEDIUM`, `SHORT`, or `NONE`.

* Default selection for the Software Loader Port.
† Default selection for the Station Manager Port

6. Press the **Escape** key to return to the rack display. Press **Escape** again to save the configuration to disk.

7. Power up the PLC. (See Procedure 3 to verify proper power-up of the Ethernet Interface.)

8. Store the configuration to the PLC via the built-in serial port on the power supply.

Refer to GFK-0466, *Logicmaster 90 Series 90-30/20/Micro Programming Software User's Manual* for more information on configuring the Ethernet Interface using Logicmaster 90-30 software.

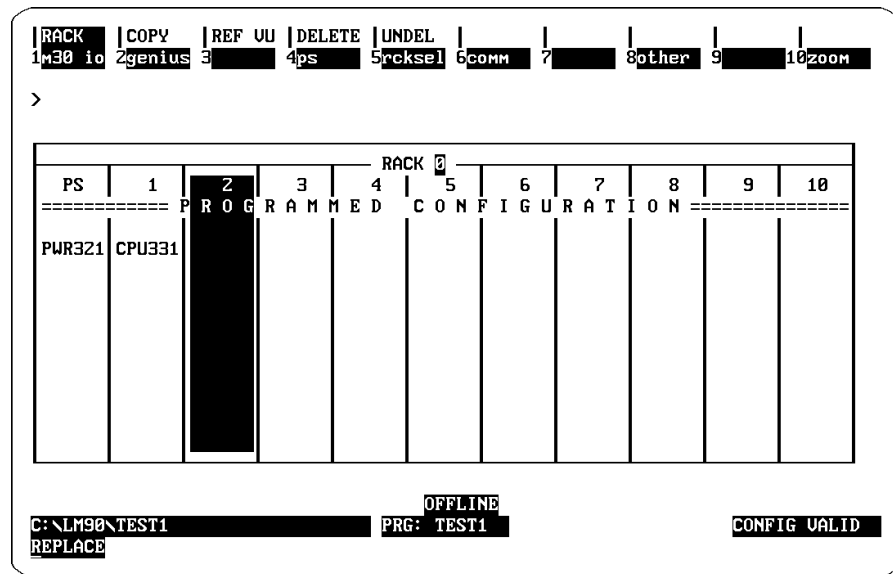# Procedure 2b: Configuring the Ethernet Interface using CIMPLICITY Control

Before you can use the Ethernet Interface with the Series 90-30 PLC, you must configure the Interface using CIMPLCITY® Control or Logicmaster™ 90-30 configuration software. The CIMPLICITY Control software allows you to specify the modules and I/O that will reside in your Series 90-30 PLC rack(s). The Hand Held Programmer can *not* be used to configure the Ethernet Interface.

To configure the Ethernet Interface in CIMPLICITY Control, do the following:

1. From the Browser, double-click the 90-30 Rack System – Local Rack icon. The Local Rack Window will appear:
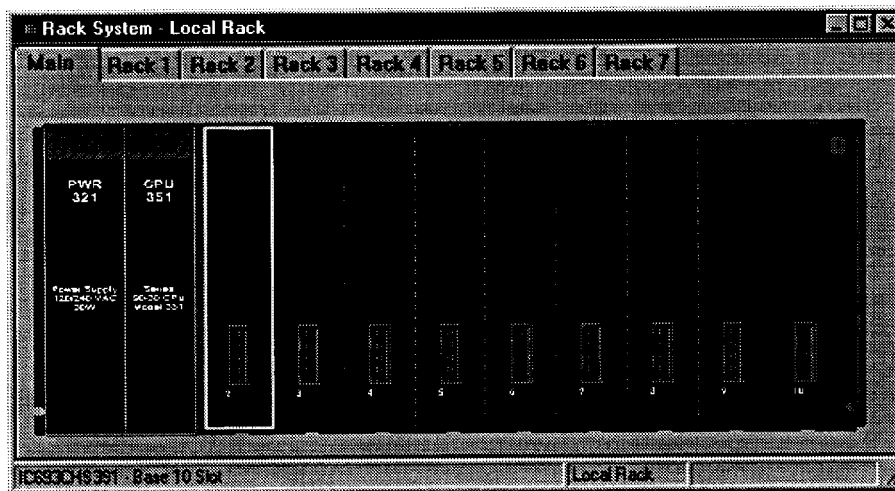
2. Click the tab corresponding to the desired rack.

3. Click the desired slot, press the right mouse button, and choose Add Module from the menu. (If the slot already contains a module, choose Replace Module.) The Module Catalog dialog box will appear:
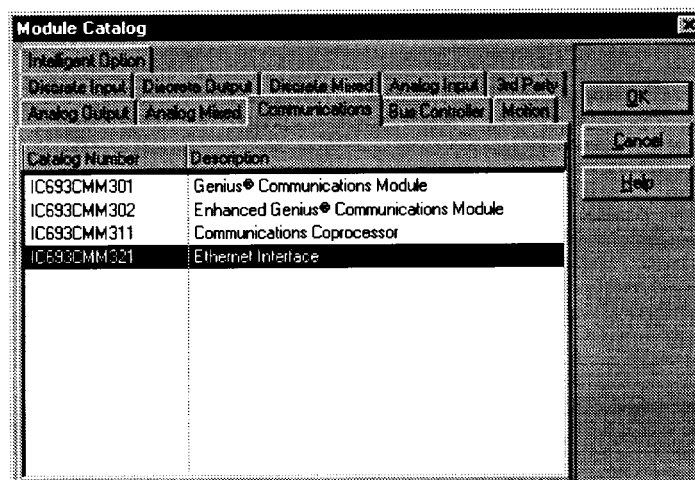
4. In the Module Catalog dialog box, click the Communications tab, select IC693CMM321 Ethernet Interface, then click the OK button. The Parameters dialog box will appear:
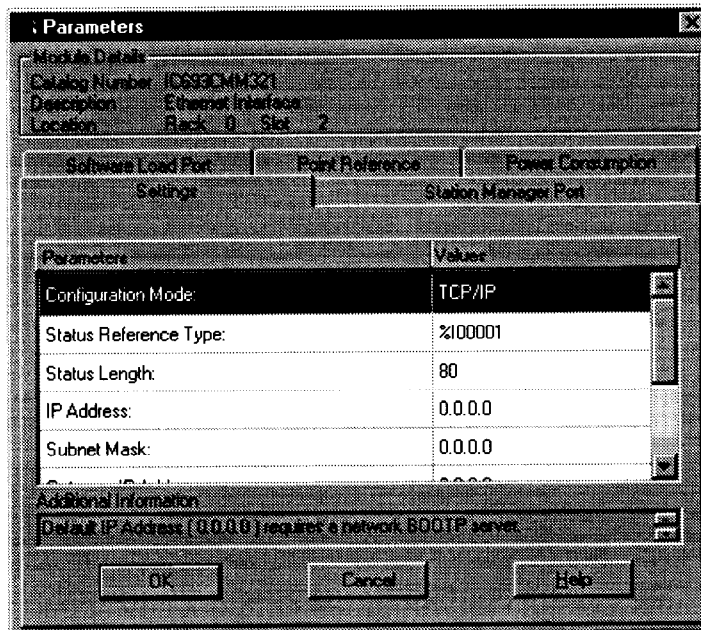
5. This dialog box will allow you to edit the module's parameters. To edit a parameter value, click in the appropriate Values field. The details of the Settings tab are as follows:

- **Configuration Mode:** This is currently fixed as TCP/IP.

- **Status Reference Type:** The Status Reference Type is the location of the LAN Interface Status (LIS) bits (16 bits) and the Channel Status bits (64 bits). The Channel Status bits are always located immediately following the LAN Interface Status bits. The default is the next available %I address.

Note

Do not use the 80-bits assigned to the LIS bits and Channel Status bits for other purposes or your data will be overwritten.

- **Status Length:** This is fixed at 80 bits (the sum of the LIS bits and the Channel Status bits).

- **IP Address, Subnet Mask, Gateway IP Address, and Name Server IP Address:** The values for the IP Address, Subnet Mask, and Gateway Address should be assigned by the person in charge of your network (the network administrator). TCP/IP network administrators are familiar with these parameters. It is important that these parameters are correct; otherwise, the Ethernet Interface may be unable to communicate on the network and/or network operation may be corrupted. It is especially important that each node on the network is assigned a *unique* IP address.

  However, if you have no network administrator and are using a simple *isolated network* with no gateways, you can use the following range of values for the assignment of local IP addresses:

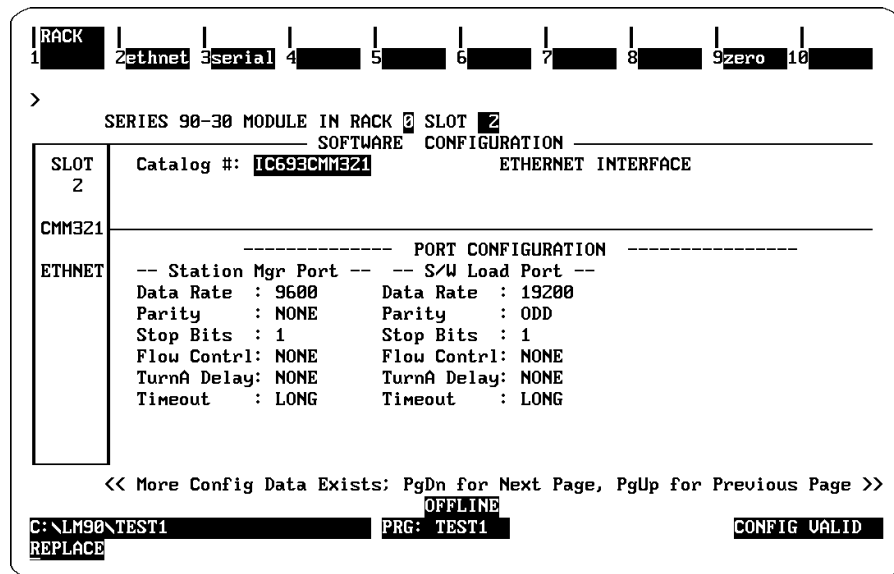|	
3.0.0.1	First PLC
3.0.0.2	Second PLC
3.0.0.3	Third PLC
.	.
.	.
.	.
3.0.0.255	Logicmaster TCP or host

On an *isolated network*, the Subnet Mask, Gateway IP address, and Name Server IP address can all be 0.0.0.0.

Note

If the isolated network is ever connected to another network, the IP addresses 3.0.0.1 through 3.0.0.255 must not be used and the Subnet Mask and Gateway IP address must be assigned by the Network Administrator The IP addresses must be assigned so that they are compatible with the connected network. Refer to Appendix C for more information on addressing.

See also the section "Determining If an IP Address Has Already Been Used" in Procedure 4.

- **Converter:** Allows you to account for the power consumption added by a serial port converter (measured in watts). Choices are 0, 0.500, and 0.600.

- **AAUI Transceiver:** Allows you to account for the power consumption added by the AAUI Transceiver attached to the Ethernet module (measured in watts). The valid range is 0.250 to 1.75.

6. Optionally, after you have completed the Settings tab, you can configure parameters for the Station Manager and Software Load ports by clicking the appropriate tab. The details of the parameter settings for these ports are as follows:

- **Data Rate:** Data rate (bits per second or bps) for the port. Choices are 1200**,** 2400**,** 4800**,** 9600†**, or** 19200*.

- **Parity:** Type of parity to be used for the port. Choices are None†, Even, or Odd*.

- **Stop Bits:** Enter the number of stop bits. Choices are 1*† or 2.

- **Flow Control:** Type of flow control to be used for the port. Choices are Hardware or None*†.

- **Turnaround Delay:** Turnaround delay time to be used for the port. Choices are None* †, 10 ms, 100 ms, or 500 ms.

- **Timeout:** Length of timeouts used for the port. Choices are Long*†, Medium, Short, or None.

  * Default selection for the Software Loader Port.
  † Default selection for the Station Manager Port

7. If you want to assign variable names to specific points on the Ethernet card, click the Point Reference tab. To assign a variable to a point, double-click the reference address you want. The Insert Variable dialog box will appear, which will allow you to fill in a variable name and description.

8. If you want to view the power consumption of this module, click the Power Consumption tab. After you have configured all of the module's applicable parameters, click the OK button. The module will now appear in the selected slot:
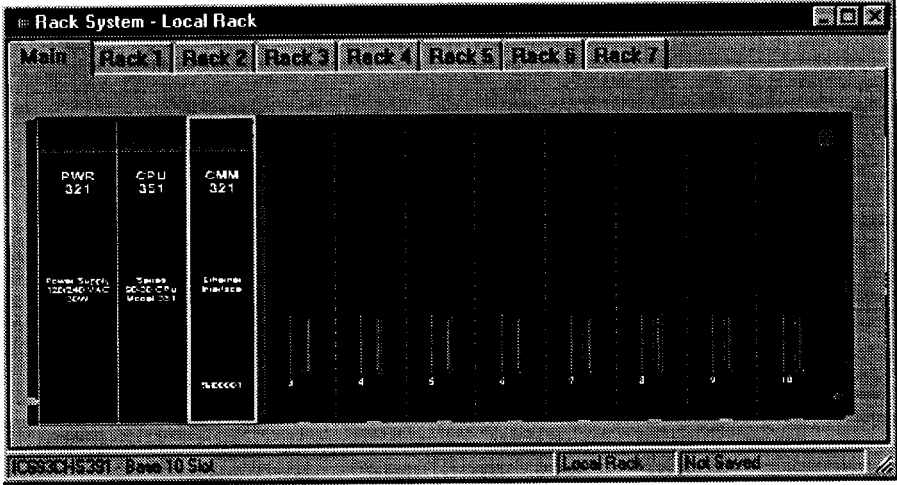
Refer to GFK–1295, *Using CIMPLICITY Control*, for more information on using CIMPLICITY Control 90-30 software.

Procedure 3: Verifying Proper Power-Up of the Ethernet Interface

Powering-up the Ethernet Interface

After configuring the Interface as explained in Procedure 2, follow the procedure below to verify that the Ethernet Interface is operating correctly.

1. Turn power OFF to the PLC for 3–5 seconds, then turn the power back ON. This will initiate a series of diagnostic tests.

    The OK LED will blink indicating the progress of power-up.

2. The LEDs will have the following pattern upon successful power-up. At this time the Ethernet Interface is fully operational and on-line.

LED	Ethernet Interface Online
OK	● (On)
LAN	●/✳ (On/Traffic)
SER	○ (Off)
STAT	● (On)

If STAT LED is OFF, check the PLC Fault Table. Alternatively, use the Station Manager LOG command as explained in GFK-1186, *TCP/IP Ethernet Communications Station Manager Manual*.

Problems During Power-up

If a problem is detected during power-up, the Ethernet Interface may not transition directly to the Operational State. If the Interface does not transistion to Operational, check the LED pattern on the Interface and refer to Figure 2-2 to find out where the Interface stopped. Refer to Table 2-1 for corrective actions.

The Ethernet Interface is initialized by
– Powering-up the PLC
– Storing a new configuration to the PLC with changes for the Ethernet Interface
– Pressing the Restart button
– Issuing a Station Manager RESTART, LOAD, or MAINT command
– Internal System Error occurring when Interface is Operational

★
○ Ethernet Interface
○ Initializing
○ (approx. 10 seconds)

Diagnostics Pass? — No → **A** Hardware Failure

Yes

Load Request or Software Corrupted? — Yes → **B** Software Load

Load Request Caused By
– Restart Pushbutton pushed for 5–10 seconds
– Station Manager LOAD command issued
– Detection of corrupt software

No

☆
○ **C**
○ Waiting for
○ Configuration from
PLC CPU
(max. 2 minutes)

Done

IP address = 0.0.0.0 — Yes → **D** Waiting for IP Address

Waiting for IP Address Caused By
– Not configuring Interface using Logicmaster 90
– Configuring Interface with IP address = 0.0.0.0
– New CPU with no configuration
– CPU failure to communicate with Interface

Continue to Maintenance or Operational Caused By
– IP address received from network BOOTP server
– IP address entered by BOOTP Station Manager command

No

IP Address Received

Maintenance Request or Fatal System Error? — Yes → **E** Maintenance

Maintenance Request Caused By
– Restart Pushbutton pushed for more than 10 seconds
– Station Manager MAINT command issued
– Fatal System Error while in Operational State forced a restart

No

Maintenance
– Client and server capability disabled
– Uses default Advanced Parameters

F Operational

Operational
– Full support for client and server capability
– Uses user defined Advanced Parameters

Symbols

The LEDs are labeled from top to bottom as follows:
OK
LAN
SER
STAT

The symbols used for the LEDs are defined as follows:
○ = OFF
● = ON
☆ = Slow Blink; multiple slow blinking LEDs blink in unison
★ = Fast Blink
✳ = Traffic (blinks when there is traffic on the line)

The process symbols are defined as follows:
▭ = Temporary condition; requires no intervention
◇ = Decision point during power-up
◯ = Interface State; normally the Interface remains in a State unless there is user intervention

Figure 2-2. States of the Ethernet Interface

Table 2-1. Problems During Power-Up

LED Pattern	Where Stopped	Possible Cause	Corrective Actions
○ OK (Off) ○ LAN (Off) ○ SER (Off) ○ STAT (Off)	**A** **Hardware Failure**	Fatal Hardware Error.	■ Make sure the PLC has power. ■ Examine PLC Fault Table for clues.* ■ Recheck configuration. ■ Power off baseplate, inspect the Interface for loose components, reseat the Interface, and Restart. ■ Try a different slot. ■ If the problem persists, replace the Interface or PLC hardware.
☆ OK (Slow blink) ☆ LAN (Slow blink) ☆ SER (Slow blink) ☆ STAT (Slow blink) *All LEDs blink in unison.*	**B** **Software Loader**	■ Restart button pressed for 5–10 seconds. ■ Station Manager LOAD command issued. ■ Software corrupt.	■ Connect a PC Software Loader and load new software. See Appendix E. ■ Cycle power or press Restart button again for less than 5 seconds to restart the Interface and clear the load request.
☆ OK (Slow blink) ○ LAN (Off) ○ SER (Off) ○ STAT (Off)	**C** **Waiting for Configuration from PLC**	■ Did not configure slot. ■ New CPU with no configuration. (Condition can last a maximum of 2 minutes.) ■ PLC in STOP/FAULT.	■ Use configuration software to configure the Interface then store the configuration to the PLC CPU. ■ Make sure Interface is in the correct slot on the baseplate. ■ Power cycle the PLC. ■ Clear faults and reset Interface.
☆ OK (Slow blink) ●/☀/○ LAN (On/Traffic/Off) ○ SER (Off/Slow blink) ☆ STAT (Slow blink) *OK and STAT blink in unison.*	**D** **Waiting for IP Address**	Interface's IP address has not been configured or has been configured as 0.0.0.0.	■ Configure the Interface with a non-zero IP address. ■ Use a BOOTP server to provide Interface with a non-zero IP address.
☆ OK (Slow blink) ●/☀/○ LAN (On/Traffic/Off) ☆ SER (Slow blink) ●/○ STAT (On/Off) *OK and SER blink in unison.*	**E** **Maintenance**	■ Restart button pressed for more than 10 seconds. ■ Station Manager MAINT command issued. ■ Internal System Error when Interface was Operational caused a restart and entrance into Maintenance.	■ If you did not intend to enter Maintenance press the Restart button for less than 5 seconds. This clears the Maintenance request. ■ Examine PLC Fault Table for clues.* ■ If you need to use the Station Manager to troubleshoot a problem, see GFK-1186, TCP/IP Ethernet Communications Station Manager Manual.
● OK (On) ●/☀/○ LAN (On/Traffic/Off) ○ SER (Off) ●/○ STAT (On/Off)	**F** **Operational**	If the LAN LED is Off, the problem may be: ■ Transceiver not connected to Interface or tranceiver not connected to Ethernet cable or bad transceiver ■ Network cable not terminated properly. ■ SQE not enabled on transceiver If the STAT LED is Off, an exception condition has occurred.	■ Connect cable and transceiver properly. Replace transceiver. ■ Terminate network cable properly. ■ Set SQE ON on transceiver in accord with manufacturer's instructions. ■ Examine PLC Fault Table to find out why the STAT LED is Off. *

* Identify the PLC fault message using Logicmaster 90 or CIMPLICITY Control then refer to Table 4-1 in Chapter 4, Troubleshooting, for corrective actions.

Procedure 4: Pinging TCP/IP Ethernet Interfaces on the Network

PING (Packet InterNet Grouper) is the name of a program used on TCP/IP networks to test reachability of destinations by sending them an ICMP echo request message and waiting for a reply. Most nodes on TCP/IP networks, including the Series 90-30 Ethernet Interface, implement a *PING* command.

The user should *ping* each installed Ethernet Interface. When the Ethernet Interface responds to the *ping,* it verifies that the interface is operational and configured properly. Specifically it verifies that acceptable TCP/IP configuration information has been stored to the Interface.

Pinging the Interface from a UNIX host or a PC Running TCP/IP Software

The *ping* can be executed from a UNIX™ host or PC running TCP/IP (since most TCP/IP communications software provides a *ping* command) or from another Ethernet Interface. When using a PC or UNIX host, the user can refer to the documentation for the *ping* command, but in general all that is required is the IP address of the remote host as a parameter to the *ping* command. For example, at the command prompt type:

```
ping  3.0.0.1
```

Determining If an IP Address Has Already Been Used

It is very important not to duplicate IP addresses. To determine if you have configured your Ethernet Interface with the same IP address as another node:

1. Disconnect your Interface from the LAN.

2. Ping the disconnected Interface's IP address. If you get an answer to the ping, then the chosen IP address is already in use by another node. You *must* correct this situation by assigning unique IP addresses.

Chapter 3

Programming Communications Requests

This chapter describes how to program PLC to PLC communications over the Ethernet Network. Details of the COMMREQ function and the Channel commands are presented here. The chapter is divided into 5 sections:

■ Section 1: The Communications Request

■ Section 2: The COMMREQ Function Block and Command Block

■ Section 3: Channel Commands

■ Section 4: Status Data

■ Section 5: Controlling Communications in the Ladder Program

Note

This chapter applies *only* to PLCs being used as client PLCs to *initiate* communications. No programming is required for server operation.

Section 1: The Communications Request

"Communications Request" is a term used to describe all the user elements required for correctly *initiating* Channel Commands from a Series 90 PLC. This section describes the elements of the Communications Request.

No programming of Communications Requests is required for PLCs acting as servers which are merely targets of other systems' requests but do not themselves initiate requests.

Structure of the Communications Request

The Communications Request is made up of the following elements.

- The COMMREQ Function Block (ladder instruction)

- The COMMREQ Command Block

- The Channel Command

- Status Data (COMMREQ Status word, LAN Interface Status and Channel Status bits)

- The logic program controlling execution of the COMMREQ Function Block

The figure below illustrates the relationship of these elements:

CONTROL LOGIC
INITIATES COMMREQ FUNCTION BLOCK

COMMREQ FUNCTION BLOCK

INPUTS AND OUTPUTS FOR COMMREQ FUNCTION

COMMAND BLOCK POINTER

COMMREQ COMMAND BLOCK

COMMREQ STATUS WORD POINTER

DETAILS OF THE **CHANNEL COMMAND**

COMMREQ STATUS WORD

STATUS CODES

STATUS BITS

LAN INTERFACE STATUS AND CHANNEL STATUS BITS

Location in PLC memory specified when configuring the Interface using Configuration Software

Figure 3-1. Elements of the Communications Request

COMMREQ Function Block

The COMMREQ Function Block is the ladder instruction that triggers the execution of the Channel Command. In the COMMREQ Function Block, you specify the rack and slot location of the Ethernet Interface and a pointer to a location in memory that contains the Command Block. There is also a fault output on the COMMREQ Function Block that indicates certain programming errors. See Section 2 for details.

COMMREQ Command Block

The COMMREQ Command Block is a structure that contains information about the Channel Command to be executed. The Command Block consists of two parts:

Common Area - includes a pointer to the COMMREQ Status word (CRS word)

Data Block Area - describes the Channel Command to be executed.

When the COMMREQ function is initiated, the Command Block is transferred to the Ethernet Interface for action.

See Section 2 for a description of the common area of the Command Block and Section 3 for details on the Data Block area and Channel Commands.

Channel Commands

The Channel Commands are a set of client PLC commands used to communicate with a server PLC.

Advantages of Channel Commands

The advantage of Channel Commands is their ability to establish a channel to execute multiple *periodic* reads or writes-with a single initiation of a COMMREQ function. A Channel Command can also be used to execute a single read or write.

Up to 16 channels (numbered 1-16) can be established by a client PLC. The channel number is specified in the Command Block for the Channel Command. The channel can be monitored using the Channel Status bits and the Detailed Channel Status words.

See Section 3 for more information.

Status Data

There are several types of status available to the client PLC logic program.

LAN Interface Status Bits (LIS Bits): The LIS bits comprise bits 1-16 of an 80-bit status area. The location of this 80-bit status area is assigned using the Logicmaster 90 Configuration Package or CIMPLICITY Control in the "Status Address" field. The LIS bits contain information on the status of the Local Area Network (LAN) and the Ethernet Interface itself. See Section 4 for more information.

Channel Status Bits: The Channel Status bits comprise bits 17-80 (64 bits) of the status indication area. The first 32 bits consist of an *error* bit and a *data transfer* bit for each of the 16 channels that can be established. The last 32 bits are reserved for future use and set to zero by the Ethernet Interface. See Section 4 for more information.

COMMREQ Status Word (CRS Word): The 16-bit CRS word will receive the initial status of the communication request. The location of the CRS word is assigned for each COMMREQ function in the COMMREQ Command Block. See Section 4 for more information.

Detailed Channel Status Words (DCS Words): This detailed status data is retrieved for a particular channel using the Retrieve Detailed Channel Status Command. See Section 3 for information on the command and Section 4 for the contents and format of the retrieved channel status.

FT Output of the COMMREQ Function Block: This output indicates that the PLC CPU detected errors in the COMMREQ Function Block and/or Command Block and did not pass the Command Block to the Ethernet Interface. See Section 4 for details.

The Logic Program Controlling Execution of the COMMREQ Function Block

Care must be taken in developing the logic that controls the execution of the COMMREQ function. The COMMREQ function must be initiated by a one-shot to prevent the COMMREQ from being executed repeatedly each CPU scan, as this will overrun the capability of the Ethernet Interface and possibly require a manual restart. Checking certain status bits before initiating a COMMREQ function is also important. In particular, the LAN Interface OK bit should be used as an interlock to prevent execution of the COMMREQ function when the Ethernet Interface is not operational.

See Section 5 and Appendix D for tips on developing your program.

Operation of the Communications Request

The figure and text below explains how a Communications Request is executed. The figure specifically illustrates the operation of an Establish Read Channel Command.
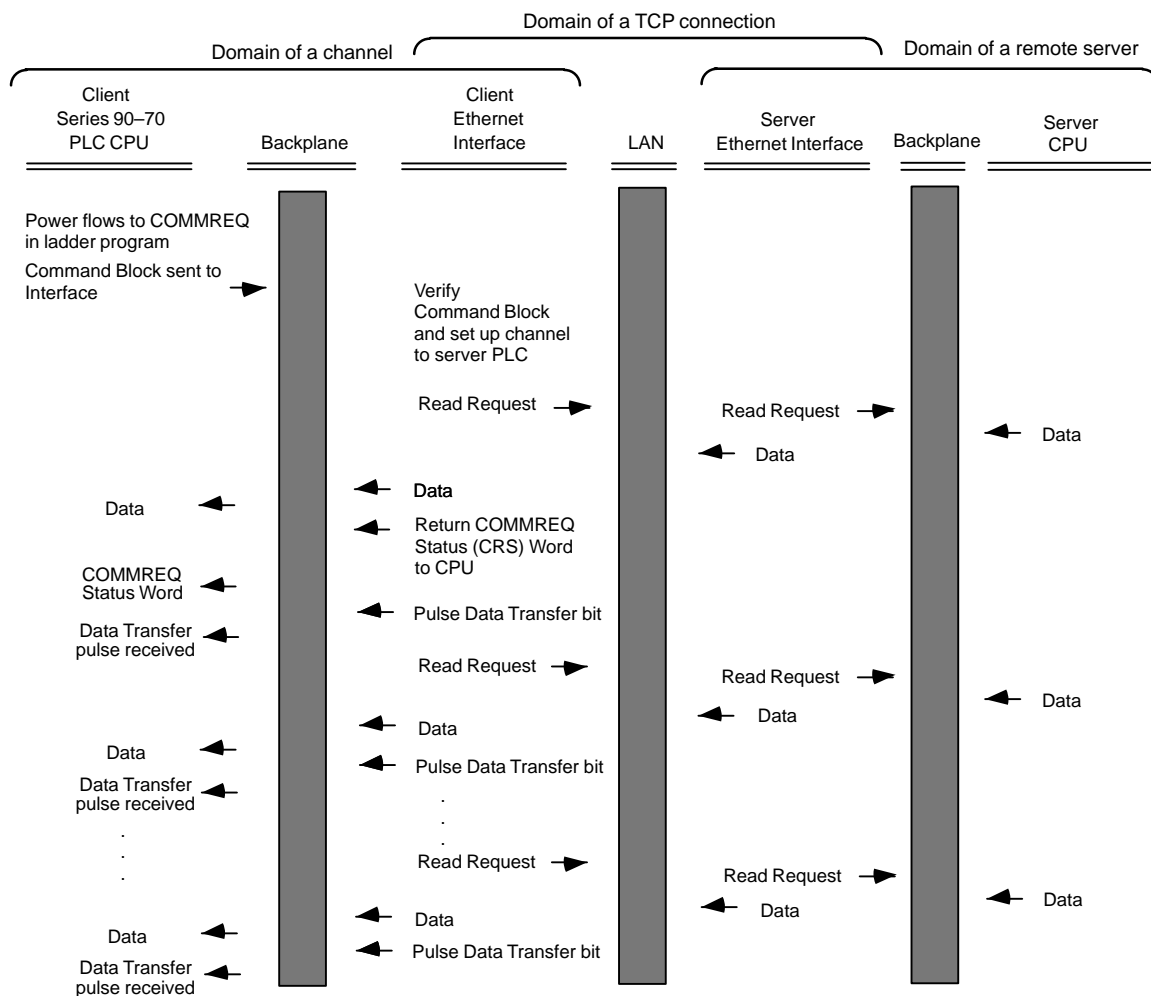
Figure 3-2. Operation of the Communications Request for an Establish Read Channel Command

1. A Communications Request begins when there is power flow to a COMMREQ function in the client PLC. At this time, the Command Block data is sent from the PLC CPU to the Ethernet Interface.

2. For the Establish Read Channel Channel command, the COMMREQ Status word (CRS word) is returned immediately if the Command Block is invalid. If the syntax is correct, then the CRS word is returned after the first significant event: upon failure to establish a channel correctly and in a timely manner or upon the first successful transfer of data.

   Once the channel is successfully set up to the server PLC, the Ethernet Interface performs the periodic reads as specified in the Command Block.

Section 2: The COMMREQ Function Block and Command Block

This section describes the programming structures common to all Communications Requests: the COMMREQ Function Block and the Command Block.

The COMMREQ Function Block

The Communications Request is triggered when the logic program passes power to the COMMREQ Function Block. For the Series 90-30 PLC, the COMMREQ Function Block has four inputs and two outputs:

```
(Enable )      ──────────────      ┌─────────┐
                                   │  COMM   │
                                   │  REQ    │
                                   │         │
(Command Block Pointer)       ─    │  IN  FT │    ─  Function Faulted (logic)
                                   │         │
(Rack/Slot Location of        ─    │  SYSID  │
 the Ethernet Interface)           │         │
(Always zero)     00000000    ─    │  TASK   │
                                   └─────────┘
```
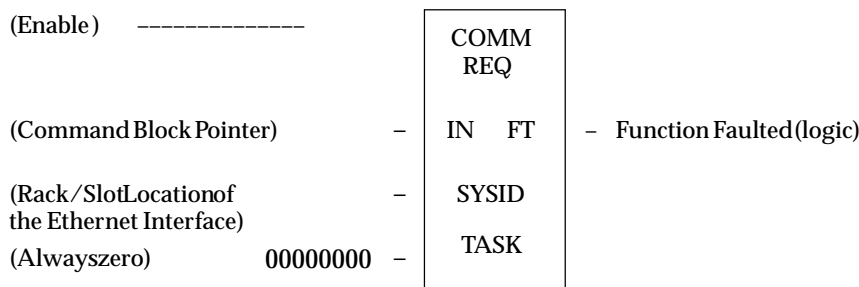
Each of the inputs and the output are discussed in detail below. It is important to understand that the Command Block pointer points to the location in memory you are using for the Command Block.

Enable: Control logic for activating the COMMREQ Function Block. See Section 5 and Appendix D for tips on developing your program.

IN: The location of the Command Block. It may be any valid address within a word-oriented area of memory (%R, %AI, %AQ, %P, or %L).

SYSID: A hexadecimal value that gives the rack (high byte) and slot (low byte) location of the Ethernet Interface.

Examples:

Rack	Slot	Hex Word Value
0	4	0004h
3	4	0304h
2	9	0209h
4	2	0402h

TASK: This must always be set to zero for the Ethernet Interface

<div style="text-align:center">

Caution

</div>

Entering a number other than zero for TASK may cause the Ethernet Interface to fail.

FT Output: The FT output is set if the PLC (rather than the Ethernet Interface) detects that the COMMREQ fails. In this case, the other status indicators are not updated for this COMMREQ. See Section 3 for more information.

The COMMREQ Command Block

When the COMMREQ function is initiated, the Command Block is sent from the PLC CPU to the Ethernet Interface. The Command Block contains the details of a Channel Command to be performed by the Interface.

The address in CPU memory of the Command Block is specified by the IN input of the COMMREQ Function Block. This address may be in any word-oriented area of memory (%R, %AI, or %AQ). The Command Block is set up using an appropriate programming instruction (the BLOCK MOVE Function Block is recommended).

The Command Block has the following structure:

Word 1	Data Block Length (words)
Word 2	WAIT/NOWAIT Flag = 0
Word 3	CRS Word Pointer Memory Type
Word 4	CRS Word Pointer Offset
Word 5	*Reserved*
Word 6	*Reserved*
Words 7 and up	Data Block (Channel Command Details)

When entering information for the Command Block, refer to these definitions:

(Word 1) Data Block Length: This is the length in words of the Data Block portion of the Command Block. The Data Block portion starts at Word 7 of the Command Block. The length is measured from the beginning of the Data Block at Word 7, not from the beginning of the Command Block. The correct value for each command, and the associated length of each command, is specified in Section 3.

(Word 2) WAIT/NOWAIT Flag: This flag must be set to zero for TCP/IP Ethernet Communications.

COMMREQ Status Word: The Ethernet Interface updates the CRS word to show success or failure of the command. Command words 3 and 4 specify the PLC memory location of the CRS word.

(Word 3) COMMREQ Status Word Pointer Memory Type: This word specifies the memory type for the CRS word. The memory types are listed in the table below.

Type	Value (Decimal)	Value (Hex.)	Description
%R	8	08h	Register memory (word mode)
%AI	10	0Ah	Analog input memory (word mode)
%AQ	12	0Ch	Analog output memory (word mode)
%I	16	10h	Discrete input memory (byte mode)
	70	46h	Discrete input memory (bit mode)
%Q	18	12h	Discrete output memory (byte mode)
	72	48h	Discrete output memory (bit mode)
%T	20	14h	Discrete temporary memory (byte mode)
	74	4Ah	Discrete temporary memory (bit mode)
%M	22	16h	Discrete momentary internal memory (byte mode)
	76	4Ch	Discrete momentary internal memory (bit mode)
%G	56	38h	Discrete global data table (byte mode)
	86	56h	Discrete global data table (bit mode)

(Word 4) COMMREQ Status Word Pointer Offset: This word contains the offset within the memory type selected. ***The status word pointer offset is a zero-based number.*** For example, if you want %R1 as the location of the CRS word, you must specify a zero for the offset. The offset for %R100 would be 99. Note, however, that this is the only zero-based field in the Channel commands.

For information on the contents of the COMMREQ Status word, see Section 4.

(Word 5): Reserved. Set to zero.

(Word 6): Reserved. Set to zero.

(Words 7 and up) Data Block: The Data Block defines the Channel command to be performed. For information on how to fill in the Channel command information, see Section 3.

Section 3: Channel Commands

This section describes the Channel Commands. A detailed description and example of each channel command is included. There are five Channel Commands.

1. Establish Read Channel

2. Establish Write Channel

3. Send Information Report

4. Abort Channel

5. Retrieve Detailed Channel Status

Establishing a Channel

The Ethernet Interface transfers data to or from another PLC using a *channel*. There are two channel commands for transferring data between PLCs.

■   Establish Read Channel

■   Establish Write Channel

The Ethernet Interface also transfers data to a *host*, another computer on the network, which is running Host Communications Toolkit (HCT) software. There is one channel command for transferring data to a host computer.

■   Send Information Report

These Channel Commands are based on the concept of periodic data transfers. The client (local) PLC uses a single COMMREQ function to establish a channel (connection) to a server (remote) PLC and to request that specific data be periodically transferred between the PLCs.

Note

To simplify the discussion of the Command Blocks, we make the assumption that the operator/programmer is *local* to the *client* PLC and the *server* is *remote* from this operator/programmer.

The Ethernet Interface automatically manages the establishment of communications and the periodic data transfer. Parameters in the Command Block specify the frequency and direction of the transfer, and the memory locations in the client and server to be used in the transfer.

Aborting and Re-tasking a Channel

There are four ways a channel can be aborted.

1. When the PLC CPU is stopped, all channels in use are aborted.

2. A channel (or all channels) can be aborted by issuing an Abort Channel command.

3. A channel in use can be re-tasked by issuing an establish command for its channel number. This aborts the previous channel operation and then performs the new channel operation.

4. A channel is also automatically aborted if a fatal error occurs.

Retrieving Detailed Status on the Channel

As discussed before, there are several forms of status available to the ladder program. These are all discussed in Section 4. One form of status is obtained through the Retrieve Detailed Channel Status (RDCS) command described later in this section.

Specifying a Network Address

All establish commands must identify the remote server device with which data will be transferred. The remote device may be specified in two ways: By IP address, or by a name previously defined with the proper IP address. Examples of each network address type are provided for all establish commands. (For further information on the use of network address names, see Appendix F.)

Establish Read Channel (2003)

The Establish Read Channel Command requests that a channel be associated with a remote PLC and that data from the remote PLC be transferred (periodically) to the local PLC. The Command Block specifies the period, the number of reads from the remote to perform, and the timeout allowed in waiting for each transfer to complete. The first read is performed immediately, regardless of the period specified.

Example 1 Command Block–Basic Example

Establish a channel (channel 5) to a remote PLC at IP address 3.0.0.1. Return the COMMREQ Status word to %R10. Read remote PLC registers %R50-%R57 to local PLC registers %R100-%R107. Repeat the read 10 times once every 7 seconds with a timeout of 500 ms for each read.

	Dec	(Hex)	
Word 1	00017	(0011)	Length of Channel Command Data Block (17 - 25 words)
Word 2	00000	(0000)	Always 0 (no-wait mode request)
Word 3	00008	(0008)	Memory type of CRS word (%R)
Word 4	00009	(0009)	CRS word address minus 1 (%R10)*
Word 5	00000	(0000)	Reserved
Word 6	00000	(0000)	Reserved
Word 7	02003	(07d3)	Establish Read Channel Command number
Word 8	00005	(0005)	Channel number (5)
Word 9	00010	(000A)	Number of read repetitions (read 10 times)
Word 10	00003	(0003)	Time unit for read period (3=seconds)
Word 11	00007	(0007)	Number of time units for read period (every 7 seconds)
Word 12	00050	(0032)	Timeout for each read (500 ms)
Word 13	00008	(0008)	Local PLC - Memory type at which to store data (%R)
Word 14	00100	(0064)	Local PLC - Starting address at which to store data (%R100)
Word 15	00008	(0008)	Remote PLC - Memory type from which to read data (%R)
Word 16	00050	(0032)	Remote PLC - Starting address from which to read data (%R50)
Word 17	00008	(0008)	Remote PLC - Number of memory units (8 registers)
Word 18	00001	(0001)	Remote PLC - Network address type (IP Address)
Word 19	00004	(0004)	Remote PLC - Network address length in words (4)
Word 20	00003	(0003)	Remote PLC - Register 1 of IP address (3)
Word 21	00000	(0000)	Remote PLC - Register 2 of IP address (0)
Word 22	00000	(0000)	Remote PLC - Register 3 of IP address (0)
Word 23	00001	(0001)	Remote PLC - Register 4 of IP address (1)
Word 24 - 27			Remote PLC - Program Name (needed for access to remote %P or %L) (zero terminated and padded)
Word 28 - 31			Remote PLC - Program Block (needed for access to remote %L) (zero terminated and padded)

*The term **local PLC** is used here to identify the **client PLC**-the PLC that initiates the communications request.*

*The term **remote PLC** is used here to identify the **server PLC**-the PLC that responds to the request.*

* Word 4 (CRS word address) is the only zero-based address in the Command Block. Only this address requires subtracting 1 from the intended address.

(Word 7) Channel Command Number: Word 7 requests that a read channel be set up. If the command is processed successfully, it will result in attempting the specified number of transfers from the server to the client.

(Word 8) Channel Number: Word 8 specifies the channel to be used for the read. This value must be in the range of 1 to 16. If the channel is out of range, a command error indication will be placed in the COMMREQ Status word. If the channel number is the same as a channel already in use, the channel will be retasked to perform this new command.

(Word 9) Number of Read Repetitions: Word 9 specifies the number of reads to be performed before automatically completing the communications request and closing the channel. If this value is set to 1, only a single read will be issued. If this value is set to 0, reads will be issued on the requested period until the channel is aborted.

(Word 10) Time Unit for Read Period: Words 10-11 together define how often the read is to be performed (*read period*). Word 10 specifies the time unit such as seconds or minutes for the read period. Word 11 specifies the number of those units. The choices for the time units are specified in Table 3-1.

Table 3-1. Time Unit Values for Read/Write Repetition Period

Value	Meaning
1	hundredths of seconds (10 ms)
2	tenths of seconds (100 ms)
3	seconds
4	minutes
5	hours

Note: If Time Unit Value is 5 (hours), then the maximum usable value of Number of Time Units is 5965.

(Word 11) Number of Time Units for Read Period: Word 11 specifies the number of time units for the read period. The read period is in effect even when the Channel Command is setup to issue a single read.

Example Read Period Calculation: If Word 10 contains a value of 3 specifying seconds as the time unit and Word 11 contains a value of 20, then the read period is 20 seconds.

*A Channel Command set up to issue a single read can have only one **pending** read transfer.*

A read will normally be issued at the start of each read period. If the *pending* read transfer has not completed during the read period, the Channel Error bit and Detailed Channel Status words will be set to indicate a non-fatal period error. The pending transfer can still complete after the period error occurs. For Channel Commands set up to issue multiple reads, the next read transfer will be issued only after the pending read transfer completes.

If the Number of Time Units is zero, a subsequent transfer will be issued as soon as the previous transfer completes. In this case, no period errors can occur.

(Word 12) Timeout for Each Read: Word 12 specifies the time (in hundredths of a second) the Ethernet Interface will wait for a read transfer to complete before setting the Channel Error bit and Detailed Channel Status words to indicate a non-fatal timeout error. The transfer can still complete even after a timeout occurs. As a result, an application can choose what to do if one occurs. If the timeout value is specified as zero, no timeout errors will be reported.

For most applications a timeout need not be specified because the read period, in effect, acts as a timeout. (Word 12 should be zero for no timeout). However, there are two special circumstances in which specifying a timeout is recommended:

■ When the number of time units (word 11) is zero, so that a subsequent transfer will be issued as soon as the previous transfer completes and no period errors are reported. In this case a timeout value can be specified so that timeout errors will be reported by the Channel Error bit.

■ When the read period is very long (minutes or hours). In this case a shorter timeout value can be specified so the application doesn't have to wait for the read period to expire before taking action.

(Word 13) Local PLC - Memory Type: Words 13-14 specify the location in the local PLC where the Ethernet Interface will store data received from the remote PLC. The size of this area is set by the size of the data read from the remote PLC (Word 17). The user is responsible for assuring that this area is large enough to contain the requested data without overwriting other application data. Valid memory types are listed in Table 3-2.

Table 3-2. Series 90 PLC Memory Types

Type	Value (Decimal)	Description
%L*	0	Program Block Local register memory (word mode)
%P*	4	Program register memory (word mode)
%R	8	Register memory (word mode)
%AI	10	Analog input memory (word mode)
%AQ	12	Analog output memory (word mode)
%I	16	Discrete input memory (byte mode)
	70	Discrete input memory (bit mode)
%Q	18	Discrete output memory (byte mode)
	72	Discrete output memory (bit mode)
%T	20	Discrete temporary memory (byte mode)
	74	Discrete temporary memory (bit mode)
%M	22	Discrete momentary internal memory (byte mode)
	76	Discrete momentary internal memory (bit mode)
%SA	24	Discrete system memory group A (byte mode)
	78	Discrete system memory group A (bit mode)
%SB	26	Discrete system memory group B (byte mode)
	80	Discrete system memory group B (bit mode)
%SC	28	Discrete system memory group C (byte mode)
	82	Discrete system memory group C (bit mode)
%S †	30	Discrete system memory (byte mode)
	84	Discrete system memory (bit mode)
%G	56	Discrete global data table (byte mode)
	86	Discrete global data table (bit mode)

† Read-only memory, cannot be written to.
* Can only be accessed in the Remote PLC (%L and %P are available in Series 90-70 PLCs only).

(Word 14) Local PLC - Memory Starting Address: Word 14 specifies the starting address in the local PLC in which the data from the remote PLC is to be stored (1-based). The user is responsible for assuring that this area is large enough to contain the requested data without overwriting other application data.

(Word 15) Remote PLC - Memory Type: Words 15-16 specify the memory type and starting address in the remote PLC from which the data is to be read. Valid values for Word 15 are given in Table 4-2. If %P memory is used, you must specify a Program name in words 24 - 27. If %L memory is used, you must specify a Program name in words 24 - 27 and a Program Block name in Words 28 - 31.

(Word 16) Remote PLC - Memory Starting Address: Word 16 specifies starting address in the remote PLC from which the data is to be read (1-based). Valid ranges of values depend on the remote PLC .

(Word 17) Remote PLC - Number of Memory Units: Word 17 specifies the number of bits, bytes or words to be read, determined by the remote PLC memory type specified. For example, if the memory type is %I in bit mode this is the number of bits. If the memory type is %R, this is the number of words. A maximum of 16384 bits/2048 bytes/1024 words of data may be specified.

(Word 18) Remote PLC - Network Address Type: Word 18 specifies the format of the remote PLC address. In this release, Word 18 must contain the value 1 or 3. A value of 1 indicates a dotted-decimal IP address expressed using a separate register for each decimal digit. A value of 3 indicates a Network Address name. See Example 2 for information on using address type 3.

(Word 19) Remote PLC - Network Address Length: Word 19 specifies the length in words of the remote PLC IP address. When an address type of 1 is specified Word 19 must contain 4.

(Words 20 - 23) Remote PLC - IP Address: Words 20-23 specify the four integers, one integer per word, of the dotted-decimal IP address of the remote PLC to be accessed.

(Words 24 - 27) Remote PLC - Program Name: Word 24 - 27 specify the case-sensitive, zero-terminated and padded program name (also called task name, which can be found through the PROG Station Manager command on the server Ethernet Interface) to be used with access to remote %P or%L memory. These words are required only for access to such memory and will be ignored if the Memory Type field is not %P or %L. See Note below.

(Word 28 - 31) Remote PLC - Program Block Name: Words 28 - 31 specify the case-sensitive, zero-terminated and padded program block name (which can be found in the program block declaration in the server ladder program) to be used with access to remote %L memory. These words are required only for access to such memory and will be ignored if the Memory Type field is not %P or %L.

Note

The Program Name (words 24 - 27) and Program Block Name (words 28 - 31) must have each pair of ASCII characters reversed within the PLC memory. For example, the name "MARY" ("M" = 4DH, "A" = 41H, "R" = 52H, "Y" = 59H) would have 414D in the first word and 5952 in the second word.

Example 2 Command Block–Example using a Network Address Name

This example is the same as example 1 except that the Network Address name of the Remote PLC ("PLC_1aa") is used instead of its IP address. For more information on Network Address names, see Appendix F.

Establish a channel (channel 5) to a remote PLC at IP address 3.0.0.1. Return the COMMREQ Status word to %R10. Read remote PLC registers %R50-%R57 to local PLC registers %R100-%R107. Repeat the read 10 times once every 7 seconds with a timeout of 500 ms for each read.

	Dec	(Hex)	
Word 1	00045	(002d)	Length of Channel Command Data Block (45 - 53 words)
Word 2	00000	(0000)	Always 0 (no-wait mode request)
Word 3	00008	(0008)	Memory type of CRS word (%R)
Word 4	00009	(0009)	CRS word address minus 1 (%R10)*
Word 5	00000	(0000)	Reserved
Word 6	00000	(0000)	Reserved
Word 7	02003	(07d3)	Establish Read Channel Command number
Word 8	00005	(0005)	Channel number (5)
Word 9	00010	(000A)	Number of read repetitions (read 10 times)
Word 10	00003	(0003)	Time unit for read period (3=seconds)
Word 11	00007	(0007)	Number of time units for read period (every 7 seconds)
Word 12	00050	(0032)	Timeout for each read (500 ms)
Word 13	00008	(0008)	Local PLC - Memory type at which to store data (%R)
Word 14	00100	(0064)	Local PLC - Starting address at which to store data (%R100)
Word 15	00008	(0008)	Remote PLC - Memory type from which to read data (%R)
Word 16	00050	(0032)	Remote PLC - Starting address from which to read data (%R50)
Word 17	00008	(0008)	Remote PLC - Number of memory units (8 registers)
Word 18	00003	(0003)	Remote PLC - Network address type (3=Symbolic Name)
Word 19	00032	(0020)	Remote PLC - Network address length in words (32)
Word 20	19536	(4c50)	Remote PLC - Network address name, char 1-2 ("PL")
Word 21	16451	(4043)	Remote PLC - Network address name, char 3-4 ("C_")
Word 22	24881	(6131)	Remote PLC - Network address name, char 5-6 ("1a")
Word 23	00097	(0061)	Remote PLC - Network address name, char 7-8 ("a ")
Word 24	00000	(0000)	Remote PLC - Network address name, char 9-10
Word 25	00000	(0000)	Remote PLC - Network address name, char 11-12
Word 26	00000	(0000)	Remote PLC - Network address name, char 13-14
Word 27	00000	(0000)	Remote PLC - Network address name, char 15-16
Word 28	00000	(0000)	Remote PLC - Network address name, char 17-18
Word 29	00000	(0000)	Remote PLC - Network address name, char 19-20
Word 30	00000	(0000)	Remote PLC - Network address name, char 21-22
Word 31	00000	(0000)	Remote PLC - Network address name, char 23-23
Word 32	00000	(0000)	Remote PLC - Network address name, char 24-25
Word 33	00000	(0000)	Remote PLC - Network address name, char 26-27
Word 34	00000	(0000)	Remote PLC - Network address name, char 28-29
Word 35	00000	(0000)	Remote PLC - Network address name, char 30-31
Word 36 - 51			Reserved: set to zero

*The term **local PLC** is used here to identify the **client PLC**-the PLC that initiates the communications request.*

*The term **remote PLC** is used here to identify the **server PLC**-the PLC that responds to the request.*

Word 52 - 55	Remote PLC - Program Name (needed for access to remote %P or %L) (zero terminated and padded)
Word 56 - 59	Remote PLC - Program Block (needed for access to remote %L) (zero terminated and padded)

* Word 4 (CRS word address) is the only zero-based address in the Command Block. Only this address requires subtracting 1 from the intended address.

(Words 7 –17): See the descriptions in Example 1.

(Word 18) Network Address Type: Word 18 specifies the format of the remote PLC address. In this release, Word 18 must contain the value 1 or 3. A value of 1 indicates a dotted-decimal IP address expressed using a separate register for each decimal digit. A value of 3 indicates a Network Address name. See Example 1 for information on using address type 1.

(Word 19) Network Address Length: Word 19 specifies the length in words of the remote PLC Network Name address. With an address type of 3 specified, Word 19 must contain 32.

(Words 20-35) Network Address Name: Works 20–35 specify the Network Address name of the remote PLC as an ASCII character string. The Network Address name may contain up to 31 characters, is case-sensitive, and must be terminated with a null. An error will result if the Network Address name is empty or if the name could not be resolved into the address of an actual device.

The Network Address name must have each pair of ASCII characters reversed within the PLC memory. For example, the name "PLC_1aa" ("P" = 50H, "L" = 4cH, "C" = 43H, "_" = 40H, "1" = 31H, "a" = 61H, "a" = 61H) would have 4c50H in Word 20, 4043H in Word 21, 6131H in Word 22, and 0061H in Word 23. Words 24 - 35 all contain 0000H.

Note

The Network Address name of the remote PLC must be defined in the Name Table in this Ethernet Interface, or be defined as the Network Address name of the remote PLC, or else be defined at a reachable DNS Name Server. See Appendix F for more information.

(Words 36-51): Reserved, set to 0.

(Words 52 - 55) Remote PLC - Program Name: Word 52 - 55 specify the case-sensitive, zero-terminated and padded program name (also called task name, which can be found through the PROG Station Manager command on the server Ethernet Interface) to be used with access to remote %P or%L memory. These words are required only for access to such memory and will be ignored if the Memory Type field is not %P or %L. See Note below.

(Word 56 - 59) Remote PLC - Program Block Name: Words 56 - 59 specify the case-sensitive, zero-terminated and padded program block name (which can be found in the program block declaration in the server ladder program) to be used with access to remote %L memory. These words are required only for access to such memory and will be ignored if the Memory Type field is not %P or %L.

Note

The Program Name (words 52 - 55) and Program Block Name (words 56 - 59) must have each pair of ASCII characters reversed within the PLC memory. For example, the name "MARY" ("M" = 4dH, "A" = 41H, "R" = 52H, "Y" = 59H) would have 414dH in the first word and 5952H in the second word.

Establish Write Channel (2004)

The Establish Write Channel command requests that a channel be connected to a remote PLC and that data from the local PLC be transferred (periodically) to the remote PLC. The Command Block specifies the period, the number of writes to the server to perform, and the timeout allowed in waiting for each transfer to complete. The first write is performed immediately, regardless of the period specified.

Example 1 Command Block–Basic Example

Establish a write channel (channel 6) to a remote PLC at IP address 3.0.0.1. Return the COMMREQ Status word to %R10. Write local PLC registers %R50-%R57 to remote PLC registers %R100-%R107. Repeat the write indefinitely once every 7 seconds with a timeout of 500 ms for each write.

	Dec	(Hex)	
Word 1	00017	(0011)	Length of Channel Command Data Block (17 - 25 words)
Word 2	00000	(0000)	Always 0 (no-wait mode request)
Word 3	00008	(0008)	Memory type of CRS word (%R)
Word 4	00009	(0009)	CRS word address minus 1 (%R10) *
Word 5	00000	(0000)	Reserved
Word 6	00000	(0000)	Reserved
Word 7	02004	(07d4)	Establish Write Channel Command number
Word 8	00006	(0006)	Channel number (6)
Word 9	00000	(0000)	Number of write repetitions (write indefinitely)
Word 10	00003	(0003)	Time unit for write period (3=seconds)
Word 11	00007	(0007)	Number of time units for write period (every 7 seconds)
Word 12	00050	(0032)	Timeout for each write (500 ms)
Word 13	00008	(0008)	Local PLC - Memory type from which to write data (%R)
Word 14	00050	(0032)	Local PLC - Starting address from which to write data (%R50)
Word 15	00008	(0008)	Remote PLC - Memory type at which to store data (%R)
Word 16	00100	(0064)	Remote PLC - Starting address at which to store data (%R50)
Word 17	00008	(0008)	Remote PLC - Number of memory units (8 registers)
Word 18	00001	(0001)	Remote PLC - Network address type (IP address)
Word 19	00004	(0004)	Remote PLC - Network address length in words (4)
Word 20	00003	(0003)	Remote PLC - Register 1 of IP address (3)
Word 21	00000	(0000)	Remote PLC - Register 2 of IP address (0)
Word 22	00000	(0000)	Remote PLC - Register 3 of IP address (0)
Word 23	00001	(0001)	Remote PLC - Register 4 of IP address (1)
Word 24 - 27			Remote PLC - Program Name (needed for access to remote %P or %L) (zero terminated and padded)
Word 28 - 31			Remote PLC - Program Block (needed for access to remote %L) (zero terminated and padded)

*The term **local PLC** is used here to identify the **client PLC**-the PLC that initiates the communications request.*

*The term **remote PLC** is used here to identify the **server PLC**-the PLC that responds to the request.*

* Word 4 (CRS word address) is the only zero-based address in the Command Block. Only this address requires subtracting 1 from the intended address.

(Word 7) Channel Command Number: Word 7 requests that a write channel be set up. If the command is processed successfully, it will result in attempting the specified number of transfers from the client to the server.

(Word 8) Channel Number: Word 8 specifies the channel to be used for the write. This value must be in the range of 1 to 16. If the channel is out of range, a command error indication will be placed in the COMMREQ Status word. If the channel number is the same as a channel already in use, the channel will be re-tasked to perform this new command.

(Word 9) Number of Write Repetitions: Word 9 specifies the number of writes to be performed before automatically completing the communications request and closing the channel. If this value is set to 1, only a single write will be issued. If this value is set to 0, writes will be issued on the requested period until the channel is aborted.

(Word 10) Time Units for Write Period: Words 10-11 together define how often the write is to be performed (*write period*). Word 10 specifies the time unit such as seconds or minutes for the write period. Word 11 specifies the number of those units. The choices for the time units are specified in Table 3-1.

(Word 11) Number of Time Units for Write Period: Word 11 specifies the number of time units for the write period. The write period is in effect even when the Channel Command is setup to issue a single write.

Example Write Period Calculation: If Word 10 contains a value of 3 specifying seconds as the time unit and Word 11 contains a value of 20, then the write period is 20 seconds.

*A Channel Command setup to issue a single write can have only one **pending** write transfer.*

A write will normally be issued at the start of each write period. If the *pending* write transfer has not completed during the write period, the Channel Error bit and Detailed Channel Status words will be set to indicate a non-fatal period error. The pending transfer can still complete after the period error occurs. For Channel Commands set up to issue multiple writes, the next write transfer will be issued only after the pending write transfer completes.

If the Number of Time Units is zero, a subsequent transfer will be issued as soon as the previous transfer completes. In this case, no period errors are reported by the Channel Error bit.

(Word 12) Timeout for Each Write: Word 12 specifies the time (in hundredths of a second) the Ethernet Interface will wait for a write transfer to complete before setting the Channel Error bit and Detailed Channel Status bits to indicate a non-fatal timeout error. The transfer can still complete even after a timeout occurs. As a result, an application can choose what to do if one occurs. If the timeout value is specified as zero, no timeout errors will be reported.

For most applications a timeout need not be specified because the write period, in effect, acts as a timeout. (Word 12 should be zero for no timeout.) However, there are two special circumstances in which specifying a timeout is recommended:

- When the number of time units (word 11) is zero, so that a subsequent transfer will be issued as soon as the previous transfer completes and no period errors are reported. In this case a timeout value can be specified so that timeout errors will be reported by the Channel Error bit.

- When the write period is very long (minutes or hours). In this case a shorter timeout value can be specified so the application doesn't have to wait for the write period to expire before taking action.

(Word 13) Local PLC - Memory Type: Words 13-14 specify the location in the local PLC from where the Ethernet Interface will get the data to be written to the remote PLC. The size of this area is set by the size of the data written to the remote PLC. Permissible memory types are given in Table 3-2.

(Word 14) Local PLC - Memory Starting Address: Word 14 specifies the starting address in the local PLC from which the data is to be written (1-based).

(Word 15) Remote PLC - Memory Type: Words 15-16 specify the memory type and starting address in the remote PLC to which the data is to be stored. Valid memory types are listed in Table 3-2. The user is responsible for assuring that this area is large enough to contain the requested data without overwriting other application data.

(Word 16) Remote PLC - Memory Starting Address: Word 16 specifies starting address in the remote PLC to which the data is to be stored. Valid ranges of values depend on the remote PLC (1-based).

(Word 17) Remote PLC - Number of Memory Units: Word 17 specifies the number of bits, bytes or words to be written, determined by the remote PLC memory type specified. For example, if the memory type is %I, this is the number of bits. If the memory type is %R, this is the number of words. A maximum of 16384 bits/2048 bytes/1024 words of data may be specified.

(Word 18) Remote PLC - Network Address Type: Word 18 specifies the format of the remote PLC address. In this release, Word 18 must contain the value 1 or 3. A value of 1 indicates a dotted-decimal IP address expressed using a separate register for each decimal digit. A value of 3 indicates a Network Address name. See Example 2 for information on using address type 3.

(Word 19) Remote PLC - Network Address Length: Word 19 specifies the length in words of the remote PLC IP address. When an address type of 1 is specified, Word 19 must contain 4..

(Words 20-23) Remote PLC - IP Address: Words 20-23 specify the four integers, one integer per word, of the dotted-decimal IP address of the remote PLC to be accessed.

(Words 24 - 27) Remote PLC - Program Name: Word 24 - 27 specify the case-sensitive, zero-terminated and padded program name (also called task name, which can be found through the PROG Station Manager command on the server Ethernet Interface) to be used with access to remote %P or%L memory. These words are required only for access to such memory and will be ignored if the Memory Type field is not %P or %L.

(Word 28 - 31) Remote PLC - Program Block Name: Words 28 - 31 specify the case-sensitive, zero-terminated and padded program block name (which can be found in the program block declaration in the server ladder program) to be used with access to remote %L memory. These words are required only for access to such memory and will be ignored if the Memory Type field is not %P or %L.

Note

The Program Name (words 24 - 27) and Program Block Name (words 28 - 31) must have each pair of ASCII characters reversed within the PLC memory. For example, the name "MARY" ("M" = 4dH, "A" = 41H, "R" = 52H, "Y" = 59H) would have 414dH in the first word and 5952H in the second word.

Example 2 Command Block–Example using a Network Address name

This example is the same as example 1 except that the Network Address name of the Remote PLC ("PLC_1aa") is used instead of its IP address. For more information on Network Address names, see Appendix F.

Establish a write channel (channel 6) to a remote PLC at IP address 3.0.0.1. Return the COMMREQ Status word to %R10. Write local PLC registers %R50-%R57 to remote PLC registers %R100-%R107. Repeat the write indefinitely once every 7 seconds with a timeout of 500 ms for each write.

	Dec	(Hex)	
Word 1	00045	(002d)	Length of Channel Command Data Block (45 - 53 words)
Word 2	00000	(0000)	Always 0 (no-wait mode request)
Word 3	00008	(0008)	Memory type of CRS word (%R)
Word 4	00009	(0009)	CRS word address minus 1 (%R10) *
Word 5	00000	(0000)	Reserved
Word 6	00000	(0000)	Reserved
Word 7	02004	(07d4)	Establish Write Channel Command number
Word 8	00006	(0006)	Channel number (6)
Word 9	00000	(0000)	Number of write repetitions (write indefinitely)
Word 10	00003	(0003)	Time unit for write period (3=seconds)
Word 11	00007	(0007)	Number of time units for write period (every 7 seconds)
Word 12	00050	(0032)	Timeout for each write (500 ms)
Word 13	00008	(0008)	Local PLC - Memory type from which to write data (%R)
Word 14	00050	(0032)	Local PLC - Starting address from which to write data (%R50)
Word 15	00008	(0008)	Remote PLC - Memory type at which to store data (%R)
Word 16	00100	(0064)	Remote PLC - Starting address at which to store data (%R50)
Word 17	00008	(0008)	Remote PLC - Number of memory units (8 registers)
Word 18	00003	(0003)	Remote PLC - Network address type (3=Symbolic Name)
Word 19	00032	(0020)	Remote PLC - Network address length in words (32)
Word 20	19536	(4c50)	Remote PLC - Network address name, char 1-2 ("PL")
Word 21	16451	(4043)	Remote PLC - Network address name, char 3-4 ("C_")
Word 22	24881	(6131)	Remote PLC - Network address name, char 5-6 ("1a")
Word 23	00097	(0061)	Remote PLC - Network address name, char 7-8 ("a ")
Word 24	00000	(0000)	Remote PLC - Network address name, char 9-10
Word 25	00000	(0000)	Remote PLC - Network address name, char 11-12
Word 26	00000	(0000)	Remote PLC - Network address name, char 13-14
Word 27	00000	(0000)	Remote PLC - Network address name, char 15-16
Word 28	00000	(0000)	Remote PLC - Network address name, char 17-18
Word 29	00000	(0000)	Remote PLC - Network address name, char 19-20
Word 30	00000	(0000)	Remote PLC - Network address name, char 21-22
Word 31	00000	(0000)	Remote PLC - Network address name, char 23-23
Word 32	00000	(0000)	Remote PLC - Network address name, char 24-25
Word 33	00000	(0000)	Remote PLC - Network address name, char 26-27
Word 34	00000	(0000)	Remote PLC - Network address name, char 28-29
Word 35	00000	(0000)	Remote PLC - Network address name, char 30-31
Word 36 - 51			Reserved: set to zero

*The term **local PLC** is used here to identify the **client PLC**-the PLC that initiates the communications request.*

*The term **remote PLC** is used here to identify the **server PLC**-the PLC that responds to the request.*

| Word 52 - 55 | Remote PLC - Program Name (needed for access to remote %P or %L) (zero terminated and padded) |
| Word 56 - 59 | Remote PLC - Program Block (needed for access to remote %L) (zero terminated and padded) |

* Word 4 (CRS word address) is the only zero-based address in the Command Block. Only this address requires subtracting 1 from the intended address.

(Words 7 –17): See the descriptions in Example 1.

(Word 18) Network Address Type: Word 18 specifies the format of the remote PLC address. In this release, Word 18 must contain the value 1 or 3. A value of 1 indicates a dotted-decimal IP address expressed using a separate register for each decimal digit. A value of 3 indicates a Network Address name. See Example 1 for information on using address type 1.

(Word 19) Network Address Length: Word 19 specifies the length in words of the remote PLC Network Name address. With an address type of 3 specified, Word 19 must contain 32.

(Words 20-35) Network Address Name: Works 20–35 specify the Network Address name of the remote PLC as an ASCII character string. The Network Address name may contain up to 31 characters, is case-sensitive, and must be terminated with a null. An error will result if the Network Address name is empty or if the name could not be resolved into the address of an actual device.

The Network Address name must have each pair of ASCII characters reversed within the PLC memory. For example, the name "PLC_1aa" ("P" = 50H, "L" = 4cH, "C" = 43H, "_" = 40H, "1" = 31H, "a" = 61H, "a" = 61H) would have 4c50H in Word 20, 4043H in Word 21, 6131H in Word 22, and 0061H in Word 23. Words 24 - 35 all contain 0000H.

Note

The Network Address name of the remote PLC must be defined in the Name Table in this Ethernet Interface, or be defined as the Network Address name of the remote PLC, or else be defined at a reachable DNS Name Server. See Appendix F for more information.

(Words 36-51): Reserved, set to 0.

(Words 52 - 55) Remote PLC - Program Name: Word 52 - 55 specify the case-sensitive, zero-terminated and padded program name (also called task name, which can be found through the PROG Station Manager command on the server Ethernet Interface) to be used with access to remote %P or%L memory. These words are required only for access to such memory and will be ignored if the Memory Type field is not %P or %L. See Note below.

(Word 56 - 59) Remote PLC - Program Block Name: Words 56 - 59 specify the case-sensitive, zero-terminated and padded program block name (which can be found in the program block declaration in the server ladder program) to be used with access to remote %L memory. These words are required only for access to such memory and will be ignored if the Memory Type field is not %P or %L.

Note

The Program Name (words 52 - 55) and Program Block Name (words 56 - 59) must have each pair of ASCII characters reversed within the PLC memory. For example, the name "MARY" ("M" = 4dH, "A" = 41H, "R" = 52H, "Y" = 59H) would have 414dH in the first word and 5952H in the second word.

Send Information Report (2010)

The Send Information Report COMMREQ requests that a particular block of memory within the PLC CPU reference tables be transferred periodically from an Ethernet Interface (SRTP Client) to a Host Application SRTP Server. The Command Block specifies the repetition period, the number of transfers to the server to perform, and the timeout allowed in waiting for each transfer to complete. The first send is performed immediately, regardless of the period specified.

Example1 Command Block–Basic Example

Establish a channel (channel 7) to a remote Host application server at IP address 3.0.0.1. Return the COMM_REQ Status word to %R10. Send local PLC registers %R50–%R57 to remote host. Repeat the send 10 times once every 7 seconds with a timeout of 500 ms for each read.

	Dec	(Hex)	
Word 1	00017	(0011)	Length of Send Information Report Data Block (17 words)
Word 2	00000	(0000)	Always 0 (no–wait mode request)
Word 3	00008	(0008)	Memory type of CRS word (%R)
Word 4	00009	(0009)	CRS word address minus 1 (%R10)*
Word 5	00000	(0000)	Reserved
Word 6	00000	(0000)	Reserved
Word 7	02010	(07DA)	Send Information Report Channel Command number
Word 8	00007	(0007)	Channel number (7)
Word 9	00010	(000A)	Number of repetitions (send 10 times)
Word 10	00003	(0003)	Time unit for send period (3=seconds)
Word 11	00007	(0007)	Minimum interval between host accesses (every 7 seconds)
Word 12	00050	(0032)	Timeout on each individual transfer response (500 ms)
Word 13	00008	(0008)	Local PLC - Memory type from which to send data (%R)
Word 14	00050	(0032)	Local PLC - Starting address from which to send data (%R50)
Word 15	00008	(0008)	Local PLC - Number of memory units (8 registers)
Word 16	00000	(0000)	Reserved
Word 17	00000	(0000)	Reserved
Word 18	00001	(0001)	Remote Network address type (IP Address)
Word 19	00004	(0004)	Remote Network address length in words (4)
Word 20	00003	(0003)	Remote Host - Register 1 of IP address (3)
Word 21	00000	(0000)	Remote Host - Register 2 of IP address (0)
Word 22	00000	(0000)	Remote Host - Register 3 of IP address (0)
Word 23	00001	(0001)	Remote Host - Register 4 of IP address (1)

*The term **local PLC** is used here to identify the **client PLC**–the PLC that initiates the communications request.*

*The term **SRTP Server** is used here to identify the **Host server***

* Word 4 (CRS word address) is the only zero–based address in the Command Block.
  Only this address requires subtracting 1 from the intended address.

(Word 7) Channel Command Number: Word 7 requests that a Send Information Report channel be set up. If the command is processed successfully, it will result in attempting the specified number of transfers from the client to the server.

(Word 8) Channel Number: Word 8 specifies the channel to be used for the send. This value must be in the range of 1 to 16. If the channel is out of range, a command error indication will be placed in the COMMREQ Status word. If the channel number is the same as a channel already in use, the channel will be re-tasked to perform this new command.

(Word 9) Number of Send Repetitions: Word 9 specifies the number of transfers to be performed before automatically completing the communications request and closing the channel. If this value is set to 1, only a single transfer will be issued. If this value is set to 0, transfers will be issued on the requested period until the channel is aborted.

(Word 10) Time Unit for Send Period: Words 10-11 together define how often the transfer is to be performed (*transfer period*). Word 10 specifies the time unit such as seconds or minutes for the send period. Word 11 specifies the number of those units. The choices for the time units are specified in Table 3-1.

(Word 11) Number of Time Units for Send Period: Word 11 specifies the number of time units for the send period. The send period is in effect even when the Channel Command is setup to issue a single send.

Example Send Period Calculation: If Word 10 contains a value of 3 specifying seconds as the time unit and Word 11 contains a value of 20, then the send period is 20 seconds.

*A Channel Command setup to issue a single send can have only one **pending** send transfer.*

A send will normally be issued at the start of each send period. If the *pending* transfer has not completed during the send period, the Channel Error bit and Detailed Channel Status words will be set to indicate a non-fatal period error. The pending transfer can still complete after the period error occurs. For Channel Commands set up to issue multiple sends, the next transfer will be issued only after the pending transfer completes.

If the Number of Time Units is zero, a subsequent transfer will be issued as soon as the previous transfer completes. In this case, no period errors are reported by the Channel Error bit.

(Word 12) Timeout for Each Send: Word 12 specifies the time (in hundredths of a second) the Ethernet Interface will wait for a send transfer to complete before setting the Channel Error bit and Detailed Channel Status bits to indicate a non-fatal timeout error. The transfer can still complete even after a timeout occurs. As a result, an application can choose what to do if one occurs. If the timeout value is specified as zero, no timeout errors will be reported.

For most applications a timeout need not be specified because the send period, in effect, acts as a timeout. (Word 12 should be zero for no timeout.) However, there are two special circumstances in which specifying a timeout is recommended:

When the number of time units (word 11) is zero, so that a subsequent transfer will be issued as soon as the previous transfer completes and no period errors are reported. In this case a timeout value can be specified so that timeout errors will be reported by the Channel Error bit.

When the send period is very long (minutes or hours). In this case a shorter timeout value can be specified so the application doesn't have to wait for the send period to expire before taking action.

(Word 13) Local PLC - Memory Type: Words 13-14 specify the location in the local PLC from where the Ethernet Interface will get the data to be written to the remote SRTP server. Permissible memory types are given in Table 3-2.

(Word 14) Local PLC - Memory Starting Address: Word 14 specifies the starting address in the local PLC from which the data is to be sent (1-based).

(Word 15) Local PLC - Number of Memory Units: Word 15 specifies the number of memory units that are to be transferred. The units associated with the memory may be bits, bytes, or words depending on the memory type specified in Word 13. For example, if the memory type is %I, this is the number of bits. If the memory type is %R, this is the number of words. A maximum of 16384 bits/2048 bytes/1024 words of data may be specified.

(Word 16) Reserved: Word 16 is reserved and should contain the value zero.

(Word 17) Reserved: Word 17 is reserved and should contain the value zero.

(Word 18) Remote Host - Network Address Type: Word 18 specifies the format of the remote PLC address. In this release, Word 18 must contain the value 1 or 3. A value of 1 indicates a dotted-decimal IP address expressed using a separate register for each decimal digit. A value of 3 indicates a Network Address name. See Example 2 for information on using address type 3.

(Word 19) Remote Host - Network Address Length: Word 19 specifies the length in words of the remote PLC IP address. When an address type of 1 is specified, Word 19 must contain 4..

(Words 20-23) Remote Host - IP Address: Words 20-23 specify the four integers, one integer per word, of the dotted-decimal IP address of the remote PLC to be accessed.

Example 2 Command Block–Example using a Network Address name

This example is the same as example 1 except that the Network Address name of the Remote PLC ("PLC_1aa") is used instead of its IP address. For more information on Network Address names, see Appendix F.

Establish a channel (channel 7) to a remote Host application server at IP address 3.0.0.1. Return the COMM_REQ Status word to %R10. Send local PLC registers %R50–%R57 to remote host. Repeat the send 10 times once every 7 seconds with a timeout of 500 ms for each read.

	Dec	(Hex)	
Word 1	00045	(002d)	Length of Send Information Report Data Block (45 words)
Word 2	00000	(0000)	Always 0 (no–wait mode request)
Word 3	00008	(0008)	Memory type of CRS word (%R)
Word 4	00009	(0009)	CRS word address minus 1 (%R10)*
Word 5	00000	(0000)	Reserved
Word 6	00000	(0000)	Reserved
Word 7	02010	(07DA)	Send Information Report Channel Command number
Word 8	00007	(0007)	Channel number (7)
Word 9	00010	(000A)	Number of repetitions (send 10 times)
Word 10	00003	(0003)	Time units for send period (3=seconds)
Word 11	00007	(0007)	Minimum interval between host accesses (every 7 seconds)
Word 12	00050	(0032)	Timeout on each individual transfer response (500 ms)
Word 13	00008	(0008)	Local PLC - Memory type from which to send data (%R)
Word 14	00050	(0032)	Local PLC - Starting address from which to send data (%R50)
Word 15	00008	(0008)	Local PLC - Number of memory units (8 registers)
Word 16	00000	(0000)	Reserved
Word 17	00000	(0000)	Reserved
Word 18	00003	(0003)	Remote Host - Network address type (3=Symbolic Name)
Word 19	00032	(0020)	Remote Host - Network address length in words (32)
Word 20	19536	(4c50)	Remote Host - Network address name, char 1-2 (PL)
Word 21	16451	(4043)	Remote Host - Network address name, char 3-4 (C_)
Word 22	24881	(6131)	Remote Host - Network address name, char 5-6 (1a)
Word 23	00097	(0061)	Remote Host - Network address name, char 7-8 (a)
Word 24	00000	(0000)	Remote Host - Network address name, char 9-10
Word 25	00000	(0000)	Remote Host - Network address name, char 11-12
Word 26	00000	(0000)	Remote Host - Network address name, char 13-14
Word 27	00000	(0000)	Remote Host - Network address name, char 15-16
Word 28	00000	(0000)	Remote Host - Network address name, char 17-18

*The term **local PLC** is used here to identify the **client PLC**-the PLC that initiates the communications request.*

*The term **SRTP Server** is used here to identify the **Host server***

Word 29	00000 (0000)	Remote Host - Network address name, char 19-20
Word 30	00000 (0000)	Remote Host - Network address name, char 21-22
Word 31	00000 (0000)	Remote Host - Network address name, char 23-23
Word 32	00000 (0000)	Remote Host - Network address name, char 24-25
Word 33	00000 (0000)	Remote Host - Network address name, char 26-27
Word 34	00000 (0000)	Remote Host - Network address name, char 28-29
Word 35	00000 (0000)	Remote Host - Network address name, char 30-31

Word 36-51   Reserved: set to zero

*   Word 4 (CRS word address) is the only zero-based address in the Command Block. Only this address requires subtracting 1 from the intended address.

(Words 7 –17):   See the descriptions in Example 1.

(Word 18) Network Address Type: Word 18 specifies the format of the remote PLC address. In this release, Word 18 must contain the value 1 or 3. A value of 1 indicates a dotted-decimal IP address expressed using a separate register for each decimal digit. A value of 3 indicates a Network Address name. See Example 1 for information on using address type 1.

(Word 19) Network Address Length: Word 19 specifies the length in words of the remote PLC Network Name address. With an address type of 3 specified, Word 19 must contain 32.

(Words 20-35) Network Address Name: Works 20–35 specify the Network Address name of the remote PLC as an ASCII character string. The Network Address name may contain up to 31 characters, is case-sensitive, and must be terminated with a null. An error will result if the Network Address name is empty or if the name could not be resolved into the address of an actual device.

The Network Address name must have each pair of ASCII characters reversed within the PLC memory. For example, the name "PLC_1aa" ("P" = 50H, "L" = 4cH, "C" = 43H, "_" = 40H, "1" = 31H, "a" = 61H, "a" = 61H) would have 4c50H in Word 20, 4043H in Word 21, 6131H in Word 22, and 0061H in Word 23. Words 24 - 35 all contain 0000H.

Note

The Network Address name of the remote PLC must be defined in the Name Table in this Ethernet Interface, or be defined as the Network Address name of the remote PLC, or else be defined at a reachable DNS Name Server. See Appendix F for more information.

(Words 36-51):   Reserved, set to 0.

Abort Channel (2001)

The Abort Channel command immediately disconnects an active channel from its remote PLC and renders the channel idle. The Channel Transfer bit, the Channel Error bit, and the Detailed Channel Status words for the channel are set to zero.

Example Command Block

Abort Channel 5. Return the CRS word to %R10.

	Dec	**(Hex)**	
Word 1	00002	(0002)	Length of Channel Command Data Block (2 words)
Word 2	00000	(0000)	Always 0 (no-wait mode request)
Word 3	00008	(0008)	Memory type of CRS word (%R)
Word 4	00009	(0009)	CRS word address minus 1 (%R10)*
Word 5	00000	(0000)	Reserved
Word 6	00000	(0000)	Reserved
Word 7	02001	(07d1)	Abort Channel Command number
Word 8	00005	(0005)	Channel number 5

* Word 4 (CRS word address) is the only zero-based address in the Command Block. Only this address requires subtracting 1 from the intended address.

(Word 7) Channel Command Number: This command parameter requests that a channel be aborted. If the command is processed successfully, it will terminate the processing on the channel by the time success is indicated in the COMMREQ Status word.

(Word 8) Channel Number: The channel number specifies the channel to be disconnected (1-16). As a convenient way to abort all channels, if the channel number parameter is -1 (ffffH), all channels in use will be aborted. It is *not* an error to abort all channels when there are none in use. Neither is it an error to abort an idle channel.

Note

For the Abort Channel and Retrieve Detailed Channel Status commands, no actual data is transmitted on the network. Communication occurs between the client PLC CPU and the local Ethernet Interface only. For these commands, the actual function is performed locally and then the COMMREQ Status word is sent immediately to the CPU.

Retrieve Detailed Channel Status (2002)

The Retrieve Detailed Channel Status command requests that the *current* Detailed Channel Status words be returned for a channel. The Detailed Channel Status words contain an active/inactive channel indicator and the last channel error codes seen (see Section 4 for more details). These two words of detailed status supplement the information available in the COMMREQ Status word and the Channel Status bits. The command has no effect on the value of the Channel Status bits.

Be aware that the Detailed Channel Status words are updated every time the status of the channel changes. If, for example, the channel is operating with a fast repetition period, the status words may change faster than the ladder executes the COMMREQ to retrieve them. Therefore, some status values will be missed from the ladder's point of view.

Example Command Block

Retrieve detailed channel status for channel 5. Store the Detailed Channel Status words to Registers 100-101. Return the COMMREQ Status word to %R10.

	Dec	(Hex)	
Word 1	00004	(0004)	Length of Channel Command Data Block (4 words)
Word 2	00000	(0000)	Always 0 (no-wait mode request)
Word 3	00008	(0008)	Memory Type of CRS word (%R)
Word 4	00009	(0009)	CRS word address minus 1 (%R10)*
Word 5	00000	(0000)	Reserved
Word 6	00000	(0000)	Reserved
Word 7	02002	(07d2)	Retrieve Detailed Channel Status Command number
Word 8	00005	(0005)	Channel number 5
Word 9	00008	(0008)	Local PLC - Memory type to store Detailed Chan. Stat. (%R)
Word 10	00100	(0064)	Local PLC - Starting address (%R100)

*The term **local PLC** is used here to identify the **client PLC**-the PLC that initiates the communications request.*

* Word 4 (CRS word address) is the only zero-based address in the Command Block. Only this address requires subtracting 1 from the intended address.

(Word 7) Channel Command Number: The command parameter in Word 7 requests that Detailed Channel Status words be returned. If the command is processed successfully, the Detailed Channel Status words will be written to the location specified in Words 9 and 10. Then the CRS word will indicate successful completion of the command. If the specified channel is not currently in use, the latest status will be returned.

(Word 8) Channel Number: The channel number in Word 8 specifies the channel whose status is to be read. This value must be a channel number in the range of 1 to 16 decimal.

(Word 9) Local PLC - Memory Type: Words 9 and 10 specify the starting point in the client CPU memory where the Detailed Channel Status words are to be written. The length of the transfer is implied and is equal to 2 words. Section 4 describes the format of the DCS words. Word 9 specifies the memory type (See Table 3-2).

(Word 10) Local PLC - Memory Starting Address: Starting address to store the Detailed Channel Status words.

For more information on detailed channel status, see Section 4.

Note

For the Abort Channel and Retrieve Detailed Channel Status commands, no actual data is transmitted on the network. Communication occurs between the client PLC CPU and the local Ethernet Interface only. For these commands, known as "local" commands, the actual function is performed locally and then the COMMREQ Status word is sent immediately to the CPU.

Section 4: Status Data

This section describes all the status data that is available to the ladder program to determine the state of the Ethernet Interface and its channels.

Types of Status Data

There are four main types of status data available to your ladder program.

1. **OK Output of the COMMREQ Function Block.** This output is set if the PLC CPU was successful in transferring the COMMREQ data from the reference table memory specified by the COMMREQ function block into the memory local to the Ethernet Interface. This does not indicate that the Ethernet Interface has processed the COMMREQ, only that it has been received by the Ethernet Interface.

    Barring ladder programming errors, the OK and FT outputs should not both be set in the same scan by the same COMMREQ.

2. **FT Output of the COMMREQ Function Block.** This output is set if there is a programming error in the COMMREQ Function Block itself, if the rack and slot specified in the COMMREQ Task parameter is not configured to contain an Ethernet Interface, or if the data block length specified in the Command Block is out of range. This output also may indicate that no more COMMREQ functions can be initiated in the ladder program until the Ethernet Interface has time to process some of the pending COMMREQ functions.

    If the FT Output is set, the CPU does not transfer the Command Block to the Ethernet Interface. In this case, the other status indicators are not updated for this COMMREQ.

3. **Status Bits.** The status bits are updated in the CPU once each PLC scan by the Ethernet Interface. These bits are generally used to prevent initiation of a COMMREQ function when certain errors occur or to signal a problem on an established channel. The status bits include the LAN Interface Status bits and the Channel Status bits. The starting location of these bits is user-configurable. See Chapter 2 for more information.

    The LAN Interface Status bits monitor the health of the Ethernet Interface itself such as the LAN Interface OK bit and the AAUI Fuse Blown bit. The Channel Status bits monitor the health and progress of a channel established using the Establish Read/ Write Channel Commands.

4. **Communications Status Words.** There are two types of words that provide detailed information: The COMMREQ Status word (CRS word) and the Detailed Channel Status words (DCS words). The communications status words are not updated in the CPU each scan as are the status bits. They are generally used to determine the *cause* of a communications error after the COMMREQ function is initiated. The cause is reported in the form of an error code described later in this section.

The COMMREQ Status word (CRS word) is returned from the Ethernet Interface to the CPU immediately if the Command Block contains a syntax error or if the command is local. For remote commands with no syntax error, it is returned either after the channel is established successfully and the first transfer has completed or if there is an error establishing the channel. The location of the CRS word is defined in the Command Block for the COMMREQ function.

The Detailed Channel Status words (DCS words) are returned to the CPU only by executing the Retrieve Detailed Channel Status Command. If a channel error is indicated (by the Channel Error bit) after the channel is established, the first word of the DCS words will contain an error code indicating the cause of the error. The second word of the DCS words indicates whether the channel is active or idle.

Be aware that the Detailed Channel Status words are updated every time the status of the channel changes. If, for example, the channel is operating with a fast repetition period, the status words may change faster than the ladder executes the COMMREQ to retrieve them. Therefore, some status values may be missed from the ladder's point of view.

Description of the Status Data

The errors and status reported in each type of status data are described below.

OK Output of the COMMREQ Function Block

The OK output passes power when the COMMREQ has successfully been deposited into memory local to the target Ethernet Interface.

FT Output of the COMMREQ Function Block

The FT Output passes power upon the following errors.

- Invalid rack/slot specified. The module at this rack/slot is unable to receive a COMMREQ.
- Task ID not valid. (Task ID should be set to zero.)
- Data Block length is zero or greater than 128.
- Too many simultaneous active COMMREQs (overloading either the PLC CPU or the Ethernet Interface).

Status Bits

The status bits normally occupy a single block of memory. The location of this block is specified during module configuration in the Configuration Software (see Chapter 2 for details). The first 16 bits of the block (see table below) comprise the LAN Interface Status (LIS) bits. The next 64 bits comprise the Channel Status bits (2 for each channel). A detailed explanation of the status bits is given following the table.

Note

Unless the "LAN Interface OK" bit is set (bit 16 in the following table), the other status bits are invalid.

Table 3-3.   Status Bits (LIS Bits and Channel Status Bits)

Status Bits	Brief Description
1-6	Reserved
7	Serial Port #2 Fuse Blown
8	AAUI Fuse Blown
9	Any Channel Error (error on any channel)
10	Reserved
11	Reserved
12	Reserved
13	LAN OK
14	Resource Problem
15	Reserved
16	LAN Interface OK
17	Data Transfer - Channel 1
18	Channel Error - Channel 1
...	...
47	Data Transfer - Channel 16
48	Channel Error - Channel 16
49-80	Reserved for future use

Note

Unless the "LAN Interface OK" bit is set (Status Bit 16), the other status bits are invalid.

(Status Bit 7) Serial Port #2 Fuse Blown: This bit is set to 1 when the Serial Port #2 fuse is blown. Otherwise it is set to 0.

(Status Bit 8) AAUI Fuse Blown: This bit is set to 1 when the AAUI Fuse is blown. Otherwise it is set to 0.

(Status Bit 9) Any Channel Error: This bit is set to 1 if there is presently an error on any of the established channels; i.e., if the individual Channel Error bit is set for any channel.

(Status Bit 13) LAN OK: This input will be held at the value 1 as long as the Ethernet Interface software is able to communicate on the network. If the network should become inaccessible from this Interface, due either to local or network problems, this bit will be set to 0. If LAN communication becomes possible, it is set to 1.

(Status Bit 14) Resource Problem: This input is set to 1 whenever the Ethernet Interface software experiences a resource problem (i.e., lack of data memory). The bit is reset to 0 on a subsequent PLC sweep. The Ethernet Interface may or may not be able to continue functioning, depending on the severity of the problem. Use the PLC Fault Table to understand the problem.   See Chapter 6, Troubleshooting, for further information. In addition, you can use the Station Manager *STAT B* and *LOG* commands to further understand the problem. See Chapter 5, The Station Manager, for more information.

(Status Bit 16) LAN Interface OK Bit: This input is set to 1 by the Ethernet Interface each PLC scan. If the Ethernet Interface cannot access the PLC, the CPU will set this bit to 0. *When this bit is 0, all other Ethernet Interface Status bits are invalid.*

Each channel has a dedicated pair of bits as follows:

(Status Bits 17, 19, 21 ... 47) Data Transfer Bit: This bit is normally set to 0. It is pulsed to 1 and back to 0 on successive PLC scans each time a transfer completes successfully. *Do not assume that when the Data Transfer bit goes to 1 that a transfer has just completed during the last scan.* The Data Transfer bit is not closely synchronized in time with the transfer. The bit only indicates that a transfer has occurred during the preceding read (or write) period. A rising edge on the Data Transfer bit indicating that a transfer has completed successfully does not guarantee that the next transfer has not begun or completed. In the case of an Establish Channel command, the CRS word is always updated *before* the Data Transfer bit is set to 1.

(Status Bits 18, 20, 22 ... 48) Channel Error Bit: This bit is set to 1 when an error is detected on this channel. It is set to 0 when the channel is initially established and if the channel resumes normal operation after a transient error condition subsides. The Channel Error bit is also set to 0 when the channel is aborted by an Abort Channel command or when the PLC CPU transitions from RUN to STOP. In the case of an Establish Channel command, the CRS word is always updated *before* the Channel Error bit is set to 1.

Communications Status Words

The COMMREQ Status word (CRS word) and the first word of the two Detailed Channel Status words (DCS words) report status and errors in the same format, as shown below. The second word of the DCS words indicates when the channel is active.

The CRS word location is specified in Words 3 and 4 of the Command Block. The DCS words location is specified in the Retrieve Detailed Channel Status Command. The contents of these status words are defined below:

The initial value of the Detailed Channel Status words is all zeros. DCS words are reset to zero when:

- The Ethernet Interface is powered up or restarted
- The CPU transitions from STOP to RUN
- A channel abort COMMREQ aborts the channel

CRS Word in
Hex Format

High   Low

| 00 | 00 |

Minor Error Codes (high byte) ————

Success and Major Error Codes (low byte)
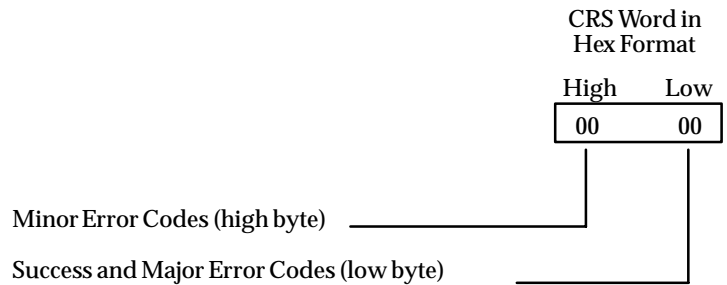
Figure 3-3. Format of the COMMREQ Status Word (CRS Word)

DCS Word in Hex Format

Word 2   Word 1
               High   Low

| 0000 | 00 | 00 |

Channel Active (0001 = channel active,
               0000 = channel not active)

Minor Error Codes (high byte) ————

Success and Major Error Codes (low byte)
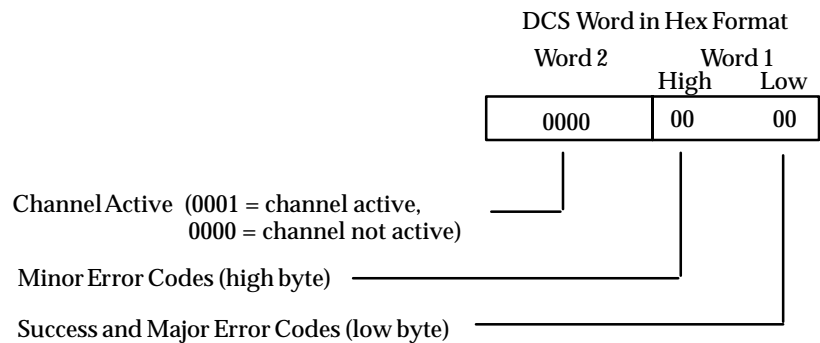
Figure 3-4. Format of the Detailed Channel Status Words (DCS Words)

There are several points to remember when interpreting the contents of the COMMREQ Status word and Word 1 of the Detailed Channel Status words:

1. *Display the Status Words in hexadecimal form* to more easily differentiate the high and low bytes. A good way to do this is to use a MOVE WORD function block to display the hexadecimal value within the ladder program.

2. The Ethernet Interface will never send a zero for the COMMREQ Status word to the PLC CPU. The user program should zero the COMMREQ Status word *before* issuing

the COMMREQ function and then check for a non-zero value indicating that the Ethernet Interface is responding to the COMMREQ. A good way to do this is to use a MOVE WORD function block to zero the CRS word.

3. A status code of 1 in the low byte and 0 in the high byte indicates that the request was successful. All other non-zero values indicate errors. Refer to the tables below for a complete listing of major and minor error codes.

The following tables list the error codes that are reported in the COMMREQ Status word after the execution of a COMMREQ function. These codes also may appear in Word 1 of the Detailed Channel Status words.

Table 3-4. Major Error Codes

Error Status Hexadecimal	Major Error Description
01H	Successful Completion. (This is the expected completion value in the COMMREQ Status word.)
02H	Insufficient Privilege at server PLC. For a Series 90-70 server PLC, the minor error code contains the privilege level required for the service request.
04H	Protocol Sequence Error. The server CPU has received a message that is out of order. *Call GE Fanuc Automation for assistance.*
05H	Service Request Error at server PLC. The minor error code contains the specific error code. See table of Minor Error codes below.
06H	Illegal Mailbox Type at server PLC. Service request mailbox type is either undefined or unexpected. *Call GE Fanuc Automation for assistance.*
07H	The server PLC CPUs Service Request Queue is full, usually due to heavy CPU loading. The client should retry later. It is recommended that the client wait a minimum of 10 milliseconds before sending another service request.
0bH	Illegal Service Request. The requested service is either not defined or not supported at the server PLC. (This value is returned in lieu of the actual service request error (01h), to avoid confusion with the normal successful COMMREQ completion.) *Call GE Fanuc Automation for assistance.*
11H	SRTP Error Codes at server. An error was detected at the SRTP server. See table of Minor Error codes below.
82H	Insufficient Privilege at client PLC. For Series 90-70 PLC, the minor error code contains the privilege level required for the service request.
84H	Protocol Sequence Error. The CPU has received a message that is out of order. *Call GE Fanuc Automation for assistance.*
85H	Service Request Error at the client PLC. The minor error code contains the specific error code. See table of Minor Error codes below.
86H	Illegal Mailbox Type. Service request mailbox type is either undefined or unexpected. *Call GE Fanuc Automation for assistance.*
87H	The client PLC CPUs Service Request Queue is full. The client should retry later. It is recommended that the client wait a minimum of 10 milliseconds before sending another service request.
8bH	Illegal Service Request. The requested service is either not defined or not supported. (This value is returned in lieu of the actual service request error (01h), to avoid confusion with the normal successful COMMREQ completion.). *Call GE Fanuc Automation for assistance.*
90H	Client API error. See table of Minor Error codes below.

Minor Error Codes

The meaning of each Minor Error Code depends upon the Major Error Code for which it is defined. Consult the appropriate Minor Error Code table for the indicated Major Error Code.

Table 3-5. Minor Error Codes for Major Error Codes 05H (at Remote Server PLC) and 85H (at Client PLC)

Error Status (Hexadecimal)	Service Request Error Description
c105H/c185H	Invalid block state transition.
c305H/c385H	Text length does not match traffic type.
c605H/c685H	Control Program (CP) tasks exist but requestor not logged into main CP.
c705H/c785H	Passwords are set to inactive and cannot be enabled or disabled.
c805H/c885H	Password(s) already enabled and cannot be forced inactive.
c905H/c985H	Login using non-zero buffer size required for block commands.
ca05H/ca85H	Device is write-protected.
cb05H/cb85H	A comm or write verify error occurred during save or restore.
cc05H/cc85H	Data stored on device has been corrupted and is no longer reliable.
cd05H/cd85H	Attempt was made to read a device but no data has been stored on it.
ce05H/ce85H	Specified device has insufficient memory to handle request.
cf05H/cf85H	Specified device is not available in the system (not present).
d105H/d185H	Packet size or total program size does not match input.
d205H/d285H	Invalid write mode parameter.
d505H/d585H	Invalid block name specified in datagram.
d605H/d685H	Total datagram connection memory exceeded.
d705H/d785H	Invalid datagram type specified.
d805H/d885H	Point length not allowed.
d905H/d985H	Transfer type invalid for this Memory Type selector.
da05H/da85H	Null pointer to data in Memory Type selector.
db05H/db85H	Invalid Memory Type selector in datagram.
dc05H/dc85H	Unable to find connection address.
dd05H/dd85H	Unable to locate given datagram connection ID.
de05H/de85H	Size of datagram connection invalid.
df05H/df85H	Invalid datagram connection address.
e005H/e085H	Service in process cannot login.
e405H/e485H	Memory Type for this selector does not exist.
e905H/e985H	Memory Type selector not valid in context.
ea05H/ea85H	Not logged in to process service request.
ee05H/ee85H	Could not return block sizes.
ef05H/ef85H	Programmer is already attached.
f005H/f085H	Request only valid in stop mode.
f105H/f185H	Request only valid from programmer.
f205H/f285H	Invalid program cannot log in.
f405H/f485H	Invalid input parameter in request.
f505H/f585H	Invalid password.
f605H/f685H	Invalid sweep state to set.

Table 4-5. Minor Error Codes for Major Error Codes 5H and 85H (Continued)

Error Status (Hexadecimal)	Service Request Error Description
f705H/f785H	Required to log in to a task for service.
f805H/f885H	Invalid task name referenced.
f905H/f985H	Task address out of range.
fc05H/fc85H	I/O configuration is invalid.
fe05H/fe85H	No privilege for attempted operation.
ff05H/ff85H	Service request has been aborted.

Table 3-6. Minor Error Codes for Major Error Code 11H (at Remote Server PLC)

Error Status (hexadecimal)	SRTP Error Description
0111H	Generic SRTP error.
0211H	The PLC is inaccessible.
0311H	Reserved.
0411H	Unexpected SRTP version encountered in received message.
0511H	Unrecognized SRTP message received.
0611H	Data present in SRTP message which should not contain data.
0711H	Generic resource problem detected.
0811H	SRTP message encountered in inappropriate connection state.
0911H	Generic refusal by backplane driver to handle request.
0a11H	Recognized but unsupported SRTP message received.
0b11H	Lost transaction in server.
1411H	Request failed due to an error in the remote device. The Remote device log will have more information.
2411H	Invalid Address found in message sent to backplane driver.
2711H	Backplane driver not initialized.
2a11H	The backplane driver could not access the PLC.
2b11H	Invalid binding on the message sent to the backplane driver.
2c11H	The message could not be sent to its destination because the mailbox was not open.
2d11H	The maximum number of transfers to the destination is already taking place.
2e11H	The maximum number of transfers of this transfer type is already taking place.
2f11H	Cannot obtain a backplane transfer buffer.
3011H	Cannot obtain resources other than backplane transfer buffers.
3111H	Connection ID or block transfer ID is not valid.
3211H	Timed out waiting for PLC CPU response.
3311H	The PLC CPU aborted the request.
3411H	An invalid message type was specified.
3511H	The specified task is not registered.
3611H	The mailbox offset specified is invalid.
3a11H	More than the allowable byte length in a single transfer.
3b11H	Bad sequence number in the request.
3c11H	Invalid command in request.
3f11H	Request failed due to error on remote device, most likely running out of Dual-Port RAM text buffers.
fe11H	Request failed due to mailbox error on remote device. The remote device log will have more information.

Table 3-7. Minor Error Codes for Major Error Code 90H (at Client PLC)

Error Status (Hexadecimal)	Application Interface Error Description
0190H	Timeout expired before transfer completed; still waiting on transfer.
0290H	Period expired before transfer completed; still waiting on transfer.
8190H	COMMREQ data block too short for the command.
8290H	COMMREQ data block too short for server PLC node address.
8390H	Invalid server memory type.
8490H	Invalid Program Name.
8590H	Invalid Program Block Name.
8690H	Zero server unit length is not allowed.
8790H	Server unit length is too large. (Maximum permitted 1024 words)
8890H	Invalid channel number.
8990H	Invalid time unit for period. (Maximum permitted 3965 hours)
8a90H	Period value is too large.
8b90H	Zero server memory starting address is not allowed.
8c90H	Invalid client memory type.
8d90H	Invalid server host address type.
8e90H	Invalid IP address integer value. (Must be 0-255)
8f90H	Invalid IP address class.
9090H	Insufficient TCP connection resources to do request.
9190H	Zero local starting address is not allowed.
9290H	Address length value invalid Must be 4 for address type.
9390H	COMMREQ data block too short for Program Block name (including 0 pad).
9490H	COMMREQ data block too short for Program name (including 0 pad).
9590H	Internal API error. See PLC fault table or exception log for details. This problem may occur due to the Ethernet Interface being asked to perform beyond its capacity. Try transferring less data per message or establishing fewer simultaneous connections.
9690H	Underlying TCP connection aborted (reset) by server end point.
9790H	Underlying TCP connection aborted by client end point.
9890H	The remote server has no Service Request Processor
9a90H	Response to session request did not arrive in proper order.
9b90H	Session denied by server PLC.
9c90H	Data response did not arrive in proper order.
9d90H	Data response had unexpected size.
9e90H	Unrecognized COMMREQ command code.
a190H	Invalid CRS word memory type.
a290H	Failed an attempt to update the CRS word.
a490H	Address length value invalid. Must be 32 for address type.
b090H	Network Address name length error. The name cannot exceed 31 ASCII characters and must be terminated with a NUL character (zero).
b190H	Specified Network Address name could not be resolved into an IP address.
b390H	Internal name resolultion error. See PLC fault table or exception log for details.

Section 5: Controlling Communications in the Ladder Program

This section provides tips on how to control communications in your ladder program. Only segments of actual ladder logic are included. For a sample of a complete working program, see Appendix D. Topics discussed are:

- Essential Elements of the Ladder Program

- Troubleshooting Your Ladder Program

- Monitoring Communications in the Ladder Program

- Sequencing Communications Requests

Essential Elements of the Ladder Program

Every ladder program, whether in the developmental phase or the operational phase, should do the following before initiating a COMMREQ function.

1. Initiate the COMMREQ function with a one-shot transitional coil. This prevents accidentally sending the same COMMREQ Command Block more than once.

2. Include at least the LAN Interface OK bit in the LAN Interface Status Word as an interlock contact for the COMMREQ function. You may choose to add more interlocks.

3. Zero the word location you specify for the COMMREQ Status word (CRS word) and the FT Output of the COMMREQ Function Block before the COMMREQ function is initiated.

4. Move the command code and parameters for the Channel Command into the memory location specified in IN input of the COMMREQ Function Block before the COMMREQ function is initiated.

The ladder program segment below illustrates how to incorporate these important points in your program.

Note

The input values for the Block Move Functions in this example are taken from the Establish Read Channel Command example in Section 3 of this chapter.

Nicknames have used in this example to make the ladder program easier to follow. LANIFOK is bit 16 of the LAN Interface Status bits. All other nicknames can be assigned as you desire.

```
|  << RUNG 1 >>
|
|LANIFOK                                                                 HEALTHY
+—] [——————————————————————————————————————————————————————————————————( )—
|
|  << RUNG 2 >>
|
|BEGREAD                                                                 READREQ
+—] [——————————————————————————————————————————————————————————————————(↑)—
|
|  << RUNG 3 >>
|
|HEALTHY READREQ +———+                                                   CMRQFLT
+—] [———] [—+MOVE_+—————————————————————————————————————————————————————(R)—
|                | WORD |
|                |      |
|        CONST —+IN  Q+—%R00010
|        +0000  | LEN  |
|               | 00001|
|               |      |
|               +———+
|  << RUNG 4 >>
|HEALTHY READREQ +———+                      +———+                      +———+
+—] [———] [—+BLKMV+——————————————————+BLKMV+——————————————————+BLKMV+
|                | INT |                      | INT |                      | WORD|
|                |     |                      |     |                      |     |
|        CONST —+IN1 Q+—%R00301   CONST —+IN1 Q+—%R00308   CONST —+IN1 Q+—%R00315
|        +00017 |     |           +00005 |     |           +00008 |     |
|                |     |                      |     |                      |     |
|        CONST —+IN2  |           CONST —+IN2  |           CONST —+IN2  |
|        +00000 |     |           +00010 |     |           +00050 |     |
|                |     |                      |     |                      |     |
|        CONST —+IN3  |           CONST —+IN3  |           CONST —+IN3  |
|        +00008 |     |           +00003 |     |           +00008 |     |
|                |     |                      |     |                      |     |
|        CONST —+IN4  |           CONST —+IN4  |           CONST —+IN4  |
|        +00009 |     |           +00004 |     |           +00001 |     |
|                |     |                      |     |                      |     |
|        CONST —+IN5  |           CONST —+IN5  |           CONST —+IN5  |
|        +00000 |     |           +00050 |     |           +00004 |     |
|                |     |                      |     |                      |     |
|        CONST —+IN6  |           CONST —+IN6  |           CONST —+IN6  |
|        +00000 |     |           +00008 |     |           +00003 |     |
|                |     |                      |     |                      |     |
|        CONST —+IN7  |           CONST —+IN7  |           CONST —+IN7  |
|        +02003 +———+           +00100 +———+           +00000 +———+
|
```

```
|  << RUNG 5 >>
|
|HEALTHY READREQ +——————+
+——] [———————] [———+BLKMV+—
|                  |  INT |
|                  |      |
|          CONST —+IN1  Q+—%R00322
|          +00000 |      |
|                  |      |
|          CONST —+IN2   |
|          +00001 |      |
|                  |      |
|          CONST —+IN3   |
|          +00000 |      |
|                  |      |
|          CONST —+IN4   |
|          +00000 |      |
|                  |      |
|          CONST —+IN5   |
|          +00000 |      |
|                  |      |
|          CONST —+IN6   |
|          +00000 |      |
|                  |      |
|          CONST —+IN7   |
|          +00000 +——————+
|
|  << RUNG 6 >>
|
|HEALTHY READREQ +——————+
+——] [———————] [———+COMM_+
|                  | REQ  |                                        CMRQFLT
|                  |      |                                       ——( S )
|        %R00301—+IN  FT+————————————————————————————————————————
|                  |      |
|          CONST   |      |
|           0004—+SYSID|
|                  |      |
|          CONST —+TASK  |
|        00000000 +——————+
|
```

Rung # 1: Input LANIFOK (bit 16 of the LAN Interface Status bits) monitors the health of the Ethernet Interface. If it is OK to send a COMMREQ, the HEALTHY coil is ON. HEALTHY is used as an interlock for Rungs 3-6.

Rung # 2: Input BEGREAD triggers READREQ, which enables execution of the MOVE and COMMREQ functions. READREQ is a one-shot coil, activating once when BE-GREAD transitions from OFF to ON.

Rung # 3: The MOVEWORD function moves a zero to the CRS word referenced in the Command Block (see rung #4). This clears the CRS word. This rung also resets the FT output coil of the COMMREQ Function Block in rung #6.

It is vital that the CRS Status Word be cleared and the COMMREQ fault output coil be cleared each time before initiating a COMMREQ function.

Rungs # 4-5: The BLKMVINT functions set up the COMMREQ Command Block contents. When these rungs are activated, the constant operands are moved into the memory beginning at the address indicated in the instruction. The constant operands in this example are defined in the Establish Read Channel Example in Section 3 of this chapter.

Rung # 6: The COMMREQ Function Block has 3 input parameters and one output parameter.

■ The IN field points to the starting location of the Command Block parameters (%R00301 in this example).

- The SYSID field of the COMMREQ Function Block defines the target rack and slot of the Ethernet Interface to receive the command data. The first two digits of SYSID (00 in this example) indicate the rack number, the last two digits (04 in this example) indicate the slot number of the Ethernet Interface.

- The TASK field of the COMMREQ Function Block indicates which mailbox task ID to use for the specified rack and slot. This field should always be zero (0) for the Ethernet Interface.

- The FT output (CMRQFLT in this example) is turned on (set to 1) if there were problems preventing the delivery of the Command Block to the Ethernet Interface. In this case, the other status indicators are not updated for this COMMREQ.

Troubleshooting Your Ladder Program

As explained in Section 4 of this chapter, there are several forms of status data which can be used in your ladder program. The use of the LAN Interface OK bit in the LAN Interface Status Word was described in the ladder program fragment above. Some of the status data can be used to troubleshoot your program in its developmental stage. The two primary sources of this data are the FT Output on the COMMREQ Function Block and the COMMREQ Status word (CRS word).

FT Output is ON

If after executing a COMMREQ Function, the FT Output is ON, then there is a programming error in one or more of the following areas.

- Invalid rack/slot specified. The module at this rack/slot is unable to receive a COMMREQ Command Block.

- Task ID not valid. (Should be set to 0.)

- Data Block length is specified as 0 or greater than 128.

COMMREQ Status Word is Zero (0) and FT Output is OFF

If after executing a COMMREQ function, the CRS word is zero (0) and the FT Output is OFF, then the Command Block has been sent to the Ethernet Interface, but no status has been returned yet. If this condition persists, check the PLC fault table for information.

COMMREQ Status Word is Not One (1)

If after executing a COMMREQ function, the CRS word is not one (1) indicating success, then there were:

- Errors in the Command Block (the Channel Command code or parameters), or

- For an Establish Read or Write Channel Command, the command parameters were valid but there was an error in establishing a channel.

If the CRS word does not contain a 1 indicating success, then it contains either a 0 or a code indicating what error occurred. See Section 4 of this chapter for CRS word error codes.

Monitoring the Communications Channel

Once you have a working ladder program, you can use the status data to monitor your communications activity and take the desired action upon certain events. The primary indicators of a communications channel are the Channel Status bits: Channel Error bit and Data Transfer bit. In addition, the CRS word and the DCS words can be used to more precisely troubleshoot any problems that may occur.

Monitoring the COMMREQ Status Word

It is critical to monitor the CRS word for each COMMREQ function you initiate. First, zero the associated CRS word before executing the COMMREQ function. Then when the CRS word becomes non-zero, you know the Ethernet Interface has updated it. If the CRS word is updated to a one (1), then the Command Block was processed successfully by the Ethernet Interface. If the CRS word is updated to a value other than 1, then an error has occurred in processing the Command Block. See Section 4 of this chapter for CRS word error codes.

Do not use data received from a server until the CRS word for that channel is 1 or the Data Transfer bit goes to 1.

Monitoring the Channel Error Bit

This bit (normally 0) is the primary indicator for an error on a channel. It indicates any channel error, fatal or non-fatal. It does not necessarily indicate that the channel is down (idle). You may want to monitor this bit and simply reinitiate the Read or Write command if the bit indicates an error. Or you may want to execute the Retrieve Detailed Channel Status Command to find out if the channel is down and possibly why it went down. Keep in mind, however, that the status code may change from between the time the Channel Error bit indicates an error and the time the Retrieve Detailed Channel Status Command retrieves the code.

The Channel Error bit for a channel is not meaningful until after the Ethernet Interface updates the CRS word confirming the Read or Write command for that channel. In the case of an Establish Channel command, the CRS word is updated before the Channel Error bit is set to 1.

Monitoring the Data Transfer Bit

Typically you will set up a channel to perform repetitive reads or writes. The Data Transfer bit pulses ($0 \rightarrow 1 \rightarrow 0$) each time there is a successful read or write. This can be an indicator to the ladder program to move the most recent data to another location.

The Data Transfer bit for a channel is not meaningful until after the Ethernet Interface updates the CRS word confirming the Read or Write command for that channel.

Do not use data received from a server until the CRS word confirming the Read command for that channel is 1 or the Data Transfer bit goes to 1. *Do not assume that when the Data Transfer bit goes to 1 that a transfer has just completed during the last scan.* The Data Transfer bit is not closely synchronized in time with the transfer. The bit only indicates that a transfer has occurred in a past scan. A rising edge on the Data Transfer bit indicating that a transfer has completed successfully does not guarantee that the next transfer has not begun or completed.

Sequencing Communications Requests

If the Ethernet Interface receives Command Blocks from the PLC faster than the Interface can process them, the Interface will log an exception event 08, Entry 2=0024 and will log the PLC Fault Table entry:

"Backplane Communications with PLC Fault; Lost Request"

Only one COMMREQ function per channel can be pending at one time. A COMMREQ function is pending from the time it is initiated in the ladder program until its CRS word has been updated by the Ethernet Interface.

Data Transfers with One Repetition

If your ladder program for issuing COMMREQs is constructed so it does all the following, all available TCP connections can quickly be used up.

- The number of repetitions (word 9 in an Establish Channel COMMREQ) is set to 1 and a new COMMREQ is issued immediately upon completion of the prior one.

- Each successive COMMREQ is directed to the same target device (same IP address).

- Each successive COMMREQ is directed to the same channel number.

To avoid using up all TCP connections, set the number of repetitions (COMMREQ word 9) to 2 and set the read/write period (COMMREQ words 10 and 11) to be very large, for example, 60 seconds. With these parameters the ladder program will issue the first COMMREQ, wait for the COMMREQ Status (CRS) word to turn to 1, then issue the next COMMREQ, wait for the CRS word to turn to 1, and so forth.

By interrupting an active channel, you allow the reuse of an existing TCP connection, while a repetition count of 1 started the time-consuming TCP connection teardown immediately.

- A Channel will continue its repetitions if the remote server (CPU PSR) rejects the request with an Error NAK. The transfer bit and error bit will be set for this given transfer, but Channels will proceed to the next iteration.

- A Channel will continue its repetitions if an attempt to read/write data to the local CPU is rejected with an Error NAK. The transfer bit and error bit will be set for this given transfer, but Channels will proceed to the next iteration.

- A Channel will **not** continue its repetitions if the remote server (Enet I/F) rejects the request with an SRTP Error PDU. The transfer bit and error bit will be set for this given transfer, and Channels will not proceed to the next iteration.

- A Channel will **not** continue its repetitions if an attempt to update the CRSW to the local CPU is rejected with an Error NAK. The transfer bit and error bit will be set for this given transfer, and Channels will not proceed to the next iteration.

Troubleshooting

This chapter is a guide to troubleshooting and problem isolation for the Series 90-30 TCP/IPEthernet Interface. This chapter includes the sections listed below:

- Diagnostic Tools Available for Troubleshooting
- What to do if you Cannot Solve the Problem
- The PLC Fault Table

Diagnostic Tools Available for Troubleshooting

There are several tools to assist you in diagnosing problems with the Series 90-30 Ethernet Interface and the network.

- Use the ***Ethernet Interface LEDs*** to troubleshoot a problem on power-up of the Ethernet Interface and for an immediate visual summary of the operational state of the Interface. Refer to Chapter 2, Installation, for more information.

- Use the ***Series 90-30 PLC Fault Table*** to troubleshoot a problem once the Interface is running. It provides a record of exceptions logged by the PLC, the Ethernet Interface, and other Series 90-30 modules. The PLC Fault Table may be accessed through the Logicmaster 90-30 Configurator or Programmer software or CIMPLICITY Control. Refer to the *Series 90-30 Programmable Controllers Reference Manual,* GFK-0467, for more information. Look in the PLC Fault Table for a logged fault, then refer to the PLC Fault Table section in this chapter for instructions on what action to take.

- Use the ***Status Data*** to troubleshoot ladder programs containing COMMREQ functions that initiate communications. The status data consists primarily of the Status bits and the Communications Status words. Refer to Chapter 3, Programming Communications Requests, for more information.

- Use the ***Station Manager software*** to troubleshoot a problem with the Interface, with the network, with PLC backplane communication, or with your application. The LOG, TALLY, EXS, and STAT Station Manager commands are especially useful.

  - The LOG command provides a complete record of exceptions occurring with the network and Interface.

  - The TALLY command provides statistics about operation and performance of the network and Interface.

  - The EXS command provides information about COMMREQs.

  - The STAT command provides the current status on the operation of the Interface.

  Refer to GFK-1186, *TCP/IP Ethernet Communications Station Manager Manual*, for information on how to access and use the Station Manager software.

What to do if you Cannot Solve the Problem

If, after using the troubleshooting guide, you still cannot solve your problem, call GE Fanuc Automation. Please have the following information available when you call.

■ The Name and Catalog Number marked on the product (label on the outside of the side wall of the Interface cover).

■ Description of symptoms of problem. *Depending on the problem, you may also be asked for the following information:*

   □ The ladder logic application program running at the time the problem occurred.

   □ A listing of the configuration parameters for the Ethernet Interface that failed.

   □ A description of the network configuration (number of stations, length of trunk cable, number of taps or transceivers, and the manufacturer and model of all devices connected to the network at the time of failure).

PLC Fault Table

The PLC Fault Table can be accessed in Logicmaster 90 configuration or programming software or CIMPLICITY Control. If you are experiencing a problem with the Ethernet Interface, check the PLC Fault Table for a fault message, then refer to Table 4-1 in this chapter for instructions on what to do about the problem.

When displaying a PLC Fault Table entry in Logicmaster 90-30, pressing <CTRL -F> will display an additional line of numeric data on the Message Line (third line from the top). An example of this line is shown below.

```
00 1AC042 00020000 1602 1F00 16000600030005000000000000000000000000000000000000
```

For Ethernet Interfaces the leftmost 14 digits of the long string of digits on the right half of the Message Line (underlined in the example above) show the corresponding log Events (2 digits) and Entries 2, 3, and 4 (in that order, 4 digits each). The example above is reporting an Event 16, Entry 2=6, Entry 3=3, and Entry 4=5.

This information can be used to refer directly to detailed fault descriptions included in the LOG event table under the LOG command in GFK-1186, *TCP/IP Ethernet Communications Station Manager Manual.*

Table 4-1. PLC Fault Table Descriptions

PLC Fault	User Action
Backplane communications with PLC fault; lost request	User Action: Check to make sure you are not sending COMMREQs faster than the Ethernet Interface can process them. If problem persists, contact GE Fanuc Automation.
Bad local application request; discarded request	User Action: Check for valid COMMREQ command code. If problem persists, contact GE Fanuc Automation.
Bad remote application request; discarded request	User Action: Try to validate the operation of the remote node. If problem persists, contact GE Fanuc Automation.
Can't locate remote node; discarded request	Error reported when message received where IP/MAC address cannot be resolved. Error may indicate that remote host is not operational on the network. User Action: Check that remote host is operational on network and its addresses are correct.
Comm_req - Bad task ID programmed	Message from PLC for unknown Ethernet Interface task. User Action: Check COMMREQ function block.
Comm_req - Wait mode not allowed	User Action: Check COMMREQ to make sure sent in no-wait mode.
Config'd gateway addr bad; can't talk off local net	Error in configuration. Verify IP address, Subnetwork Mask, and default Gateway IP address are correct.
Connection to remote node failed; resuming without it	Underlying communications software detects error transferring data; resuming. If persistent error, check connection to LAN and operation of remote node.
LAN controller fault; restart LAN I/F	User Action: HW fault, perform power cycle. If problem persists, contact GE Fanuc Automation.
LAN controller Tx underflow; attempt recovery	Internal system error. User Action: If problem persists, contact GE Fanuc Automation.
LAN controller underrun/overrun; resuming	Internal system error. User Action: If problem persists, contact GE Fanuc Automation.
LAN data memory exhausted - check parms; resuming	The Ethernet Interface does not have free memory to process communications. User Action: If problem persists, contact GE Fanuc Automation.
LAN duplicate MAC Address; resuming	A frame was received in which the source MAC Address was the same as this station's MAC Address. All stations on a network must have a unique MAC address. Immediately isolate the offending station; it may be necessary to turn it off or disconnect it from the network. This station remains Online unless you intervene to take it Offline.

Table 4-1. PLC Fault Table Descriptions (Continued)

PLC Fault	User Action
LAN I/F can't init - check parms; running soft Sw utl	Internal system error. User Action: If problem persists, contact GE Fanuc Automation.
LAN I/F capacity exceeded; discarded request	Verify that connection limits are not being exceeded.
LAN interface hardware failure; switched off network	User Action: Replace Ethernet Interface.
LAN network problem exists; performance degraded	Excessive backlog of transmission requests due to excessive traffic on the network. For a sustained period the MAC was unable to send frames as quickly as requested. User Action: If problem persists, contact GE Fanuc Automation.
LAN severe network problem; attempting recovery	External condition prevented transmission of frame in specified timeframe. Could be busy network or network problem. User Action: Check transceiver to make sure it is securely attached to the network. Check for unterminated trunk cable.
LAN system-software fault; aborted connection resuming	Internal system error. User Action: If problem persists, contact GE Fanuc Automation.
LAN system-software fault; restarted LAN I/F	Internal system error. User Action: If problem persists, contact GE Fanuc Automation.
LAN system-software fault; resuming	Internal system error. User Action: If problem persists, contact GE Fanuc Automation.
LAN transceiver fault; OFF network until fixed	Transceiver or transceiver cable failed or became disconnected. User Action: Reattach the cable or replace the transceiver cable. Check SQE test switch if present on transceiver.
Local request to send was rejected; discarded request	Internal error. Check that the Ethernet Interface is online. User Action: If problem persists, contact GE Fanuc Automation.
Memory backup fault; may lose config/log on restart	Internal error accessing FLASH device. User Action: If problem persists, contact GE Fanuc Automation. Replace Ethernet Interface.
Module software corrupted; requesting reload	Catastrophic internal system error. Contact GE Fanuc Automation.
Module state doesn't permit Comm_Req; discarded	COMMREQ received when Ethernet Interface cannot process COMMREQ. User Action: Make sure Ethernet Interface is configured and online.
Unsupported feature in configuration	PLC firmware does not support ethernet communications software. User Action: Check CPU revision, order upgrade kit for CPU.

Appendix *Glossary*
A

In communications, a number of special terms are used, many of these terms are referenced by acronyms.

This appendix contains a concise, alphabetized listing of conventional communications terms and (where applicable) their associated acronyms. Most of these terms (but not necessarily all) are used in this manual.

Commonly Used Acronyms and Abbreviations

This is a listing of acronyms, and their derivation, that are commonly used throughout this manual.

ARP	Address Resolution Protocol
ASCII	American National Standard Code for Information Interchange
AUI	Attachment Unit Interface
AAUI	Apple Attachment Unit Interface
BOOTP	Boot Strap Protocol
BPS	Bits Per Second
CPU	Central Processing Unit
CRS	COMMREQ Status
CSMA/CD	Carrier Sense Multiple Access with Collision Detection
DCE	Data Communications Equipment
DCS	Detailed Channel Status
DHCP	Dynamic Host Configuration Protocol
DOS	Disk Operating System
DTE	Data Terminal Equipment
GSM	GEnet System Manager
H	Hexadecimal
I/O	Input/Output
ICMP	Internet Control Message Protocol
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
K	1024
KB	Kilobyte (1024 bytes)
LAN	Local Area Network
LED	Light Emitting Diode
LISW	LAN Interface Status Word
LLC	Logical Link Control
LSAP	Link Layer Service Access Point
MAC	Medium Access Control
MB	Megabyte (1,048,576 bytes)

PC	Personal Computer, IBM compatible
PDU	Protocol Data Unit
PLC	Programmable Logic Controller
RAM	Random Access Memory
SQE	Signal Quality Error
SRTP	Service Request Transfer Protocol
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
UDP	User Datagram Protocol

Glossary of Terms

AAUI Port   The connector on the network interface.

AAUI Cable   The cable between the AAUI port and the transceiver (some transceivers plug directly into the AAUI port, thus requiring no separate AAUI cable).

Address Administration   The assignment of LAN addresses locally or on a universal basis.

Address Field   The part of a Protocol Data Unit (PDU) that contains an address.

Address Resolution Protocol   The Internet Protocol that binds dynamically a high-level Internet Address to a low-level physical hardware address such as a MAC address.

Apple Attachment Unit Interface (AAUI)   A lower power, smaller connector adaptation of the IEEE 802.3 AUI.

ASCII Code   The American Standard Code for Information Interchange is an information code standard by which digits, letters, symbols and control characters can be encoded as numbers.

Attachment Unit Interface (AUI)   In a network node on a Local Area Network, the interface between the medium attachment unit (MAU) and the data terminal equipment. Often called "transceiver cable".

Bit   Contraction of Binary Digit. The smallest unit of memory. Can be used to store one piece of information that has only two possible states or values (e.g., One/Zero, On/Off, Yes/No). Data that requires more than two states or values (e.g., numerical values) requires multiple bits (see Word).

BOOTP   BOOTP is a bootstrap protocol that allows a TCP/IP network node (such as a Series 90 PLC with Ethernet Interface) to discover its own IP address, the address of a file server host, and the name of a file to be loaded into memory and executed.

Broadcast Address   A LAN group address that identifies the set of all nodes on a Local Area Network.

Bridge   A functional unit that interconnects two Local Area Networks (LANs) that use the same logical link control protocol, but may use different medium access control protocols.

Broadcast   Sending of a frame that is intended to be accepted by all other nodes on the same Local Area Network.

Bus Network   A Local Area Network in which there is only one path between any two network nodes and in which data transmitted by any node is available to all other nodes connected to the same transmission medium. NOTE: A bus network may be linear, star, or tree topology.

Byte   A group of bits, typically 8 bits, operated on as a single unit. A single ASCII character typically occupies one byte. (See Octet).

Carrier Sense   In a Local Area Network, an ongoing activity of a network node to detect whether another node is transmitting.

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)   A bus network in which the medium access control protocol requires carrier sense and in which exception conditions caused by collision are resolved by retransmission.

Channel   An association in a client PLC between the PLC application program and an Ethernet module in that same PLC. The ladder program initiates the channel when it issues a Communications Request (CommReq) to its local Ethernet module. In turn, this local Ethernet module initiates a *connection* to a remote server and then makes periodic data transfers between the client and server PLCs. *Channel*, however, is an entirely client function; the server knows nothing of the channel. See also Connection.

Channel Status Bits   The Channel Status bits comprise bits 17-80 (64-bits) of the status indication area. The first 32 bits consist of an *error* bit and a *data transfer* bit for each of the 16 channels that can be established. The last 32 bits are reserved for future use and set to zero by the Ethernet Interface.

Client   A node that requests network services from a server. A client PLC initiates a communications request. (See also Server.)

Collision   A condition that results from concurrent transmissions by two or more nodes on the transmission medium.

Collision Domain   A single CSMA/CD network. If two or more nodes are within the same collision domain and both transmit at the same time, a collision will occur. Nodes separated by a repeater are within the same collision domain. Nodes separated by a bridge are within different collision domains.

Command Dictionary   Provides an alphabetical listing of the LAN Interface commands.

Command Field   That part of a protocol data unit (PDU) that contains commands, as opposed to the address field and information field.

COMMREQ Function Block   The COMMREQ Function Block is the Series 90 PLC ladder instruction used to initiate a communications request.

COMMREQ Status Word   The 16-bit CRS word receives the initial status of the Series 90 PLC communication request from the Series 90 module to which the communication request was addressed. The location of the CRS word is assigned, for each COMMREQ function, in the common area of the COMMREQ Command Block.

Communications Window   A part of the PLC scan that provides an opportunity for the LAN Interface to read and write PLC memory. The window is executed automatically once per PLC scan.

Connection   An association between a client and server on a network, used to reliably transfer data between the two. Here, usually refers to a TCP or an SRTP connection, where the client server, or both are PLCs. See also Channel.

CRS Word   See COMMREQ Status Word.

CSMA/CD   See Carrier Sense Multiple Access with Collision Detection.

DCS Words   See Detailed Channel Status Words.

Detailed Channel Status Words   Two status words containing detailed information on a single Series 90 channel. The DCS words are retrieved using the Retrieve Detailed Channel Status Command.

Data Communications Equipment (DCE)   Examples: Modems and transceivers. Distinct from DTE, Data Terminal Equipment.

Data Link Layer   In Open Systems Interconnection architecture, the layer (Layer 2) that provides services to transfer data over a physical link between open systems. Consists of the LLC and MAC sublayers.

Data Terminal Equipment   Examples: computers, terminals, printers. Distinct from DCE, Data Communications Equipment.

Dotted Decimal   The notation for IP, gateway, and name server addresses as well as the subnet mask. It consists of 4 decimal numbers (0-255) separated by periods. Example IP address: 3.0.0.1

Ethernet Interface   The general term used in this manual to identify the GEnet hardware module, with or without software, that connects a PLC (or CNC) to a network. It may also appear in the shortened form, "Interface". (See also LAN Interface.)

Flash Memory   A type of read-only memory that can be erased and reprogrammed under local software control. It is used to store data that must be preserved when power is off..

Frame   A data structure that consists of fields, predetermined by a protocol, for the transmission of user data and control data.

Gateway   A special purpose, dedicated computer that attaches to two or more networks and routes packets from one to the other. In particular, an Internet gateway routes IP datagrams among the networks to which it connects. Gateways route packets to other gateways until they can be delivered to the final destination directly across the physical network. (Also sometimes referred to as a router.)

Global Address Administration   Address administration in which all LAN individual addresses are unique within the same or other Local Area Networks. (See also, Local Address Administration.)

Group Address   An LLC address that identifies a group of network nodes on a Local Area Network.

Host   A computer or workstation that communicates with stations such as PLCs or CNCs across a network, especially one that performs supervisory or control functions. Note that this same term is widely used in TCP/IP literature to refer to any network node that can be a source or destination for network messages. (See also Hostid.)

Hostid   The hostid is the part of the IP address identifying the host on the network. (See also Netid.)

IEEE 802   The IEEE 802 LAN series of standards are as follows:

IEEE 802   Overview and Architecture.

IEEE 802.2   The Logical Link Control (LLC) sublayer of OSI Data Link Layer common above all IEEE 802 Medium Access Control (MAC) sublayers.

IEEE 802.3 CSMA/CD(Ethernet) MAC and Physical Layer standard.

IEEE 802.4 Token Bus (MAP LANs) MAC and Physical Layer standard.

IEEE 802.5 Token Ring (IBM) MAC and Physical Layer standard.

Information Field That part of a protocol data unit (PDU) that contains data, as opposed to the address field and command field.

Initiating Station The station from which an instance of communication (a transaction) originates. Also referred to as "client".

Interface Shortened form for "Ethernet Interface". The general term used in this manual to identify the GEnet hardware module, with or without software, that connects a PLC (or CNC) to a network. (See also LAN Interface.)

Internet Any collection of networks and gateways that use the TCP/IP protocols and function as a single, cooperative virtual network, specifically, the world-wide *Connected Internet*

Internet Address A unique Internet address identifies each node on an IP network (or system of connected networks). The Internet address is assigned to the node by the user. (Also known as an IP address.) (See also Physical Address.)

Internet Control Message Protocol (ICMP) The Internet Protocol that handles error and control messages.

Internet Protocol (IP) The Internet standard protocol that defines the Internet datagram and provides the basis for the Internet packet delivery service. See also Transmission Control Protocol (TCP).

Inter Repeater Link (IRL) A mechanism for interconnecting two and only two repeater units.

IP Address See Internet Address.

Jabber A transmission by a network node beyond the time interval allowed by the protocol.

LAN Interface A term used in this manual to identify the GEnet hardware module, with or without software, that connects a PLC or CNC to a network.

LAN Interface Status Bits (LIS Bits) The LIS bits comprise bits 1-16 of an 80-bit status bit area. The location of this 80-bit status area is assigned using the Logicmaster 90 Configuration Package or CIMPLICITY Control in the "Status Address" field. The LIS bits contain information on the status of the Local Area Network (LAN) and the Ethernet Interface itself.

Linear Topology A network topology in which nodes are each connected at a point along a common continuous cable which has no loops and only two endpoints.

Link Service Access Point (LSAP) A Data Link layer SAP. A single byte that identifies the routing of data received by the network node.

Local Address Administration Address administration in which all LAN individual addresses are unique within the same Local Area Network. (See also, Global Address Administration.)

Local Area Network (LAN) A computer network located on a user's premises within a limited geographical area.

Local Station   The station at your immediate location, i.e., "here". (See also "Remote Station").

Log Events   Events recorded in the system exception log for the LAN Interface. The maximum number of events in the exception log is 16.

Logical Link Control (LLC) Protocol   In a Local Area Network, the protocol that governs the exchange of frames between network nodes independently of how the transmission medium is shared.

MAC Address   The Medium Access Control (MAC) address is a 12–digit hexadecimal number that identifies a node on a local network. Each Ethernet Interface has its own unique MAC address.

Medium Access Control (MAC)   In a local area network (LAN), the part of the protocol that governs access to the transmission medium independently of the physical characteristics of the medium, but taking into account the topological aspects of the network, in order to enable the exchange of data between network nodes.

Medium Access Control Protocol   In a Local Area Network, the protocol that governs access to the transmission medium, taking into account the topological aspects of the network, to enable the exchange of data between network nodes.

Medium Attachment Unit (MAU)   In a network node on a Local Area Network, a device used to couple the data terminal equipment (DTE) to the transmission medium. Often called "transceiver". The MAU may be built into the DTE or it may be a separate unit that attaches to the DTE through an AUI.

Multicast Address   A LAN group address that identifies a subset of the network nodes on a Local Area Network.

Netid   The netid is the part of the IP address identifying the network on which the node resides. (See also Hostid.)

Network   An arrangement of nodes and interconnecting branches.

Node   The physical module that connects a node to the network. The Ethernet Interface is an example of a node. It connects a station (PLC or CNC) to a network (Factory LAN). A station may contain more than one Ethernet Interface and therefore contain more than one node.

Octet   A group of 8 bits operated on as a single unit. (See also Byte.)

One–Way Propagation Time   See Transmission Path Delay.

Path   The sequence of segments and repeaters providing the connectivity between two DTEs. In CSMA/CD networks, there is one and only one path between any two DTEs.

Peer   Another entity at the same level (layer) in the communication hierarchy.

Peer–Peer   Communication between nodes at the same level or layer in the hierarchy.

Physical Address   The unique physical layer address associated with a particular node on the Local Area Network (LAN). Ethernet physical addresses are typically assigned by the manufacturer. (See for comparison, Internet Address.)

Protocol   A set of rules for exchanging messages between two communicating processes.

Protocol Data Unit (PDU)   Information that is delivered as a unit between peer entities of a local area network (LAN) and that contains control information, address information, and may contain data.

Remote Station Station located elsewhere on the network. (See also "Local Station")

Repeater In a Local Area Network, a device that amplifies and regenerates signals to extend the range of transmission between network nodes or to interconnect two or more segments.

Responding Station A station which generates a message in response to a command that was directed to the station.

Round–Trip Propagation Time Twice the time required for a bit to travel between the two most distant nodes in a bus network.

NOTE: In a network using carrier sense, each frame must be long enough so that a collision or jam signal may be detected by the transmitting node while this frame is being transmitted. Its minimum length is therefore determined by the round–trip propagation time.

Router A device similar to a bridge that allows access to multiple LANs. (Also known as a gateway in Internet terminology.)

Server A network node that provides specific services to other network nodes (clients). (See also Client.)

EXAMPLE: File server, print server, mail server.

Service Request Transfer Protocol (SRTP) A proprietary protocol that encodes Series 90 "Service Requests", the native language of the Series 90 PLC CPUs, to provide general purpose communications with a Series 90 PLC. SRTP is presently available over 802.3/Ethernet networks. SRTP is also used by Logicmaster 90 to communicate over an Ethernet network.

Signal Quality Error (SQE) An indication from the MAU (transceiver) to the Ethernet Interface to indicate any of three conditions: 1) improper signals received from the medium, 2) collision detected, or 3) SQE message test.

Slot Time (in a CSMA/CD network) Minimum bitrate–dependent unit of time which, in case of collision, is used to determine the delay after which network nodes may attempt to retransmit. [Slot time for all IEEE 802.3 10 Mbps implementations is 51.2 μsec (512 bit times)].

Soft Switches Basic system information set up by the Logicmaster 90 Configurator or CIMPLICITY Control and transferred to the LAN Interface upon powerup or restart.

Station A computer, PLC, or other device that connects to one or more networks. (See also Node.)

Station Address Each node on an Ethernet network must have a unique MAC address which is different from all other nodes on the network. This is a 12–hexadecimal digit MAC address. (See also MAC Address.)

Subnet Mask The subnet mask is a mechanism to logically divide a large network into smaller *subnets* according to your local assignment of IP addresses to nodes on the network. Nodes on the network which have their IP addresses alike for the bits specified in the subnet mask can talk to each other *directly*; nodes whose IP addresses are not alike in these same bits must talk *indirectly*, via an intermediate gateway or router.

As described in an appendix to your Ethernet module user manual, the 32 bits of an IP address are divided between a *net id* part and a *host id* part. (The *class* of the IP address determines how many bits are in the *net id* and how many are in the *host id.)* In general, the *net id* portion of the IP address (on the left) is assigned by the Internet authorities. The *host id* portion (on the right) is assigned by your local network administrator. *Subnetting* is locally optional and consists of designating some (any number) of the *host id* bits as an extended *net id*, or *subnet id*. The added *subnet id* bits are normally taken from the *host id* bits adjacent to the *net id,* and the **subnet mask** identifies these bits. In your Ethernet module configuration, you specify these bits as one (1) and the remaining *host id* bits as zero (0). For example:

IP Address:	11.22.33.44		
Net Id bits:	255.0.0.0	*Net Id*:	11.0.0.0
Added *Subnet Id* bits:	0.255.0.0	*Subnet Id*:	0.22.0.0
Subnet Mask:	255.255.0.0	Extended *Net Id*:	11.22.0.0

All nodes on a *subnetted* network must use the same value for subnet mask; subnets are distinguished by different *subnet ids*, created by your local assignment of IP addresses.

For further information, refer to the appendix titled *Advanced Information About IP and MAC Addresses* in your Ethernet module user manual.

Station Manager A part of the basic Ethernet Interface communications software that executes as a background activity on the Ethernet Interface. The Station Manager provides interactive supervisory access to the Ethernet Interface. The Station Manager may be accessed locally via the serial port, or remotely over the LAN.

Tally Counters kept by the LAN Interface to indicate load and performance information.

Topology The pattern formed by the physical medium interconnecting the nodes of a network.

Transceiver See Medium Attachment Unit (MAU).

Transceiver Cable See Attachment Unit Interface (AUI).

Transmission Path Delay The time required for a bit to travel between the two most distant network nodes in a bus network.

Transmission Control Protocol (TCP) The Internet standard connection-oriented transport level protocol. See also Internet Protocol (IP).

Universal Address Administration See Global Address Administration.

Word A measurement of memory length, usually 4, 8, 16, or 32 bits long. In the Series 90 PLC, a word is always 16 bits.

Appendix B *Communications Ports Characteristics*

This appendix describes the Ethernet Interface serial ports and the AAUI port used to connect to the network transceiver.

What this Appendix Contains

Information pertaining to the Serial Ports: Station Manager Port and Software Loader Port

- Serial Port Pinouts
- Serial Cable Diagrams

Information pertaining to the Apple Attachment Unit Interface (AAUI) Port for Ethernet communications

- AAUI Port Pinouts
- AAUI Cable Diagram
- Transceiver Unit Description

Station Manager Port

This section presents the information you need to construct a cable for serial communications between the Ethernet Interface and a terminal or a PC with a terminal emulator. Information in this section includes serial port settings, pinouts, and cable diagrams.

Station Manager Port Settings

The serial port of the terminal or PC that is connected to the Ethernet Interface must use the same communications parameters as the Ethernet Interface. The default values for the Station Manager port are 9600 bps, 8 bits, no parity, and 1 stop bit. If the configuration for Serial Port 1 of the Ethernet Interface used the defaults, or the Ethernet Interface has not been performed using the Logicmaster 90-30 Configuration software or CIMPLICITY Control, use these default values. If the configuration for Serial Port 1 of the Ethernet Interface used different values, use those values for the serial port of the terminal or PC.

Station Manager Port Pinouts

The 6-pin, RJ-11 "modular phone jack", RS-232 port is used to connect a terminal or terminal emulator to access the Station Manager software on the Ethernet Interface. Connector pinouts are shown in Table B-1.

a45696

Station Manager
Serial Port
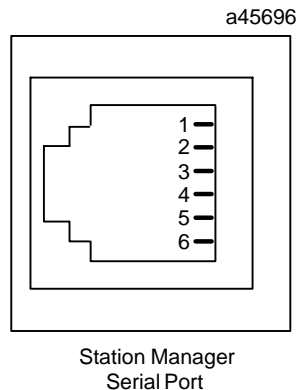
Table B-1. Station Manager Port Pinouts

RJ-11 Port Pin Number	Signal	Description
1	CTS	Clear To Send (input)
2	TD	Transmit Data (output)
3	SG	Signal Ground
4	SG	Signal Ground
5	RD	Receive Data (input)
6	RTS	Request to Send (output)

Station Manager Port Cable

Use the serial cable (IC693CBL316A) shown in Figure B-1 to connect your PC to the Station Manager.

If your terminal or PC is unable to communicate with the Ethernet Interface Station Manager, consult the documentation for your terminal or PC to verify that your adapter is wired correctly.
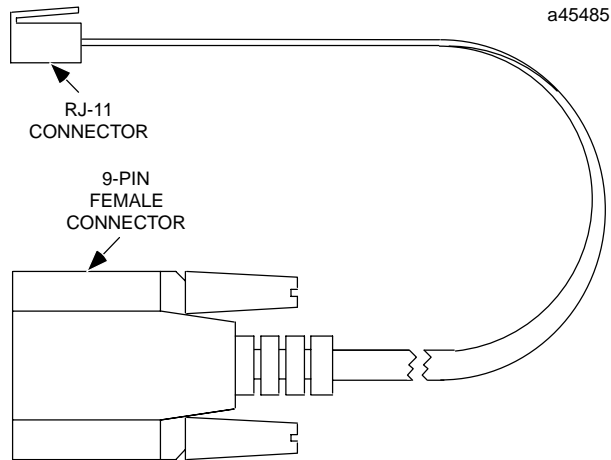
Figure B-1. Serial Cable (IC693CBL316A) to Connect the Personal Computer to the Station Manager Port

Table B-2. Serial Cable (IC693CBL316A) Connector Pinouts

9-Pin Connector Pin Number	RJ-11 Connector Pin Number
7	1 (Red)
2	2 (Yellow)
5	3 (Green)
5	4 (Brown)
3	5 (Black)
8	6 (Orange)

Software Loader Port (Serial Port 2)

This section presents the information you need to construct a cable for serial communications between the Ethernet Interface and a PC with the PC Loader software installed. Information in this section includes serial port settings, pinouts, and cable diagrams.

An RS-232 to RS-485 converter is required to interface to systems that provide RS-232 compatible interfaces.

Software Loader Port Pinouts

The 15-pin, D-type, RS-485 port is used to connect to the PC Software Loader when the communications software in the Ethernet Interface needs to be updated.

Table B-3.   Software Loader Port Pinout

Pin Number	Signal Name	Description
1	Shield	
2		No Connection
3		No Connection
4		No Connection
5	+5V *	+5V Power for RS-232/485 Converter
6	RTS (A)	Request To Send
7	Signal Ground	Signal Ground, OV
8	CTS (B')	Clear To Send
9	RT *	Terminating Resistor for RD **
10	RD (A')	Receive Data
11	RD (B')	Receive Data
12	SD (A)	Send Data
13	SD (B)	Send Data
14	RTS (B)	Request To Send
15	CTS (A')	Clear To Send

*   Signals available at the Connector but are not included in the RS-485 specification.
SD (Send Data) and RD (Receive Data) are the same as TXD and RXD (used in the Series Six PLC). (A) and (B) are the same as - and + . A and B denote outputs, and A' and B' denote inputs.

** Termination resistance for the Receive Data (RD) signal needs to be connected only on units at the end of multidrop lines. This termination is made by connecting a jumper between pins 9 and 10 inside the 15-pin D-shell; the termination is provided in the adapters and cables specified in Table B-3.

Part Numbers for GE Fanuc Cables and Converters

It is recommended that you use cables available from GE Fanuc Automation to connect your PC to the Software Loader Port. Refer to the table below for part numbers.

Table B-4.   Cables for Connecting the Software Loader Port to the RS-232 Port on Your PC

Part Number	Description
IC690ACC901	GE Fanuc/Honer Mini Converter with Cable (see the following figure.)
	or
IC690ACC900	GE Fanuc Converter only (requires cable IC690CBL303 and either IC690CBL702 or IC690CBL705 below)
IC690CBL303	15-pin RS-422 Serial Cable
IC690CBL702	9-pin RS-232 Serial Cable
IC690CBL705	25-pin RS-232 Serial Cable

Software Loader Port Cable

The figure below illustrates cable assembly IC690ACC901. This cable assembly is needed to connect the 9-pin or 25-pin serial port on a personal computer to the Software Loader Port on the Ethernet Interface. Use the 9-pin to 25-pin adapter to connect to the 25-pin serial port on the personal computer.
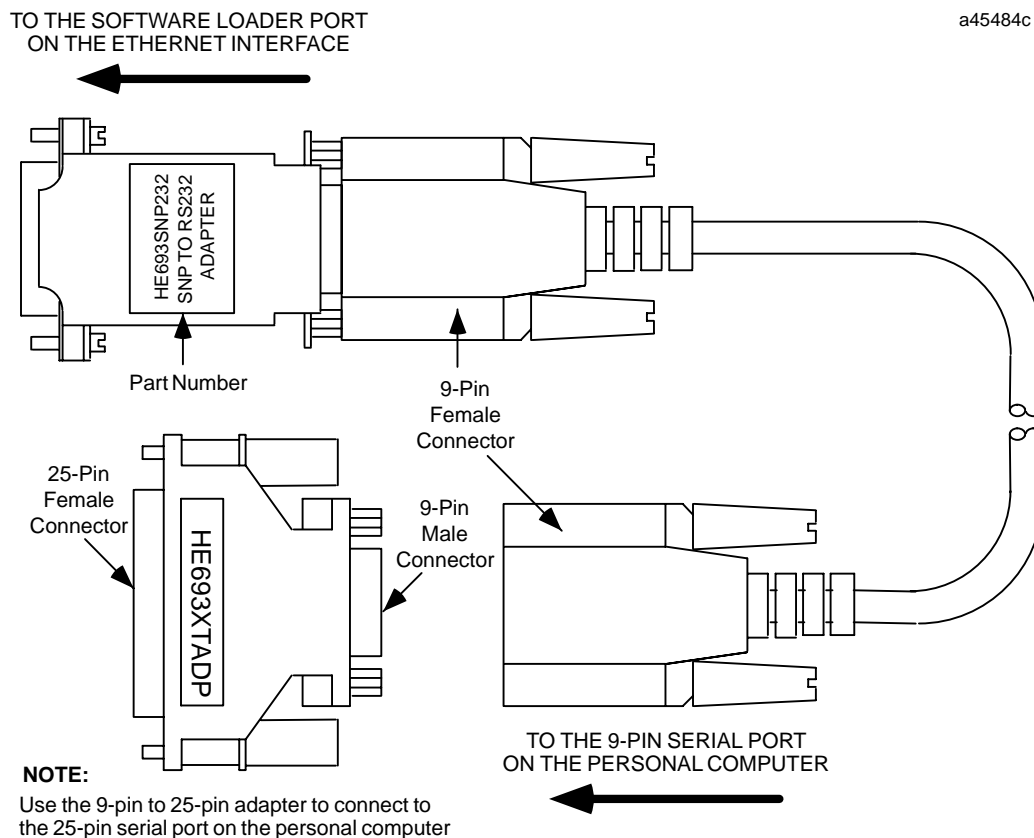
Figure B-2.   Software Loader Cable Assembly (IC690ACC901)

The AAUI Port for the Ethernet Interface

The Ethernet Interface is equipped with an Apple Attachment Unit Interface (AAUI) port for connecting to the network.   Compatible transceivers can be purchased that support 10Base5 and 10Base2 coaxial cables as well as twisted pair and fiber optic cables. The AAUI standard makes your selection of transceiver and trunk cable medium transparent to the Ethernet Interface.

Your network cables must meet the applicable 802.3 standards.

This section presents the information you need to specify the cables and related components required for Ethernet Communications. Information in this section includes AAUI port pinouts and AAUI cable diagrams.

Ethernet AAUI Port Pinouts

The AAUI port is located on the front edge of the Ethernet Interface. This port is a 14-pin D-type female connector. It is used to connect the Ethernet Interface to the 802.3 transceiver. Connector pinouts are shown in Table B-4.

Table B-5. Pinouts of the AAUI Port

Pin Number	Signal	Description
1	FN Pwr	+5V @ 1.9W
2	DI-A	Data In circuit A
3	DI-B	Data In circuit B
4	Vc	Voltage common
5	CI-A	Control In circuit A
6	CI-B	Control In circuit B
7	+5V	+5V from host
8	+5V	Secondary +5V from host
9	DO-A	Data Out circuit A
10	DO-B	Data Out circuit B
11	Vc	Secondary Voltage Common
12	-nc-	Reserved
13	-nc-	Reserved
14	FN Pwr	Secondary +5V
SHELL	PG	Protective Ground (Conductive shell and shield)

Note

Pinouts are provided for troubleshooting purposes only. Cables are readily available from commercial distributors. GE Fanuc recommends that you purchase rather than make transceiver cables.

Transceiver Configurations

Depending on your particular application, any of several types of user-supplied transceivers may be used. Typical configurations for 10Base2 (thin wire) and 10BaseT (twisted pair) and a configuration with an AAUI to AUI adapter for connection to 10Base5 (thick wire) and 10BaseF (fiber optic) are shown in the following figures.

Note

Transceivers must be 802.3-compatible and must have the SQE option Enabled.

Caution

PLC power must be OFF when connecting or disconnecting the transceiver.
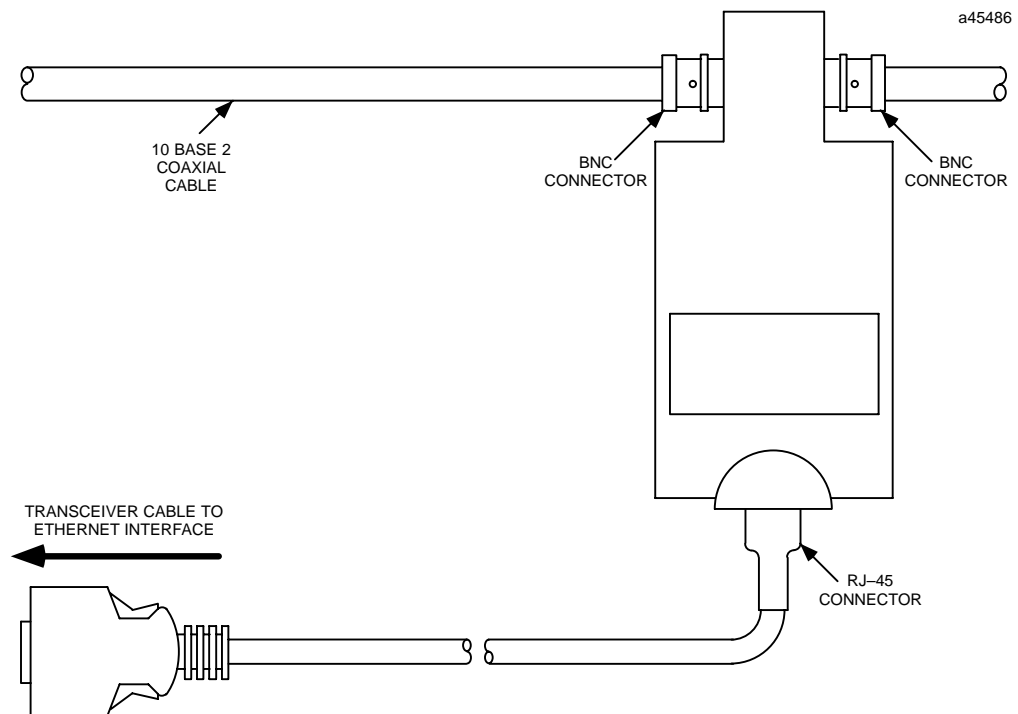
Figure B-3. 10Base2 Transceiver Configuration with Detachable Transceiver Cable (Available as GE Fanuc Part Number IC649AEA101

a45487

LED

10 BASE 2
COAXIAL
CABLE

BNC
CONNECTOR

BNC
CONNECTOR

TRANSCEIVER CABLE TO
ETHERNET INTERFACE
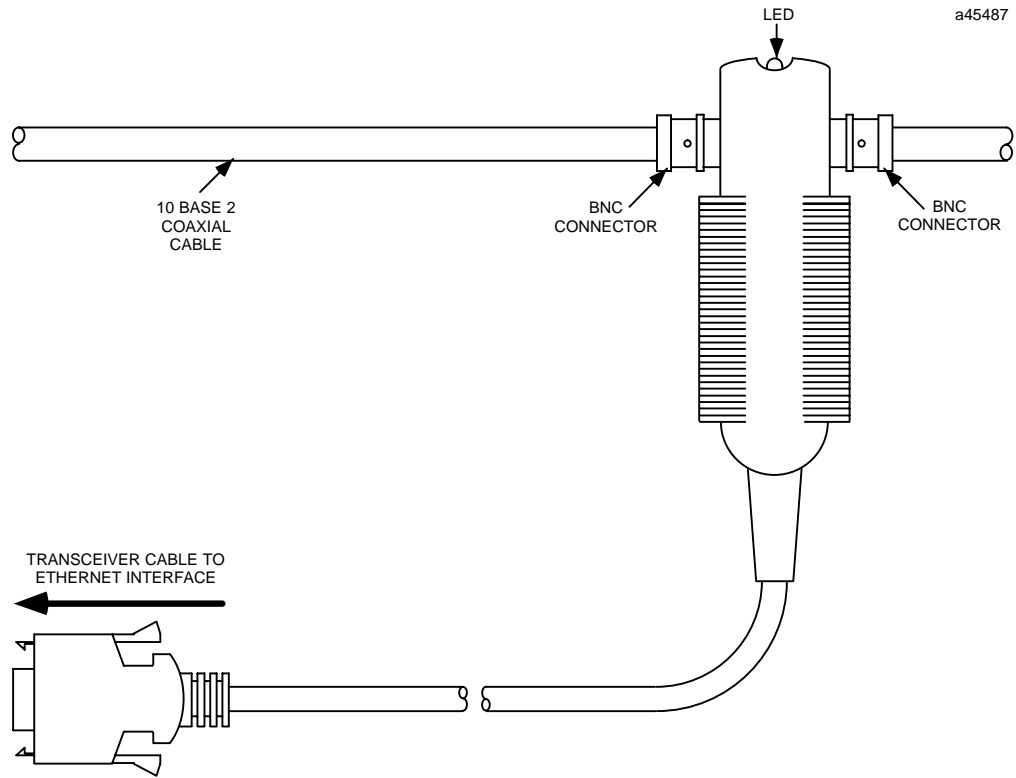
Figure B-4.   10Base2 Transceiver Configuration with Built-in Transceiver Cable

a45488

10 BASE 2
CABLE

BNC
CONNECTOR

BNC "T"

TRANSCEIVER CABLE TO
ETHERNET INTERFACE
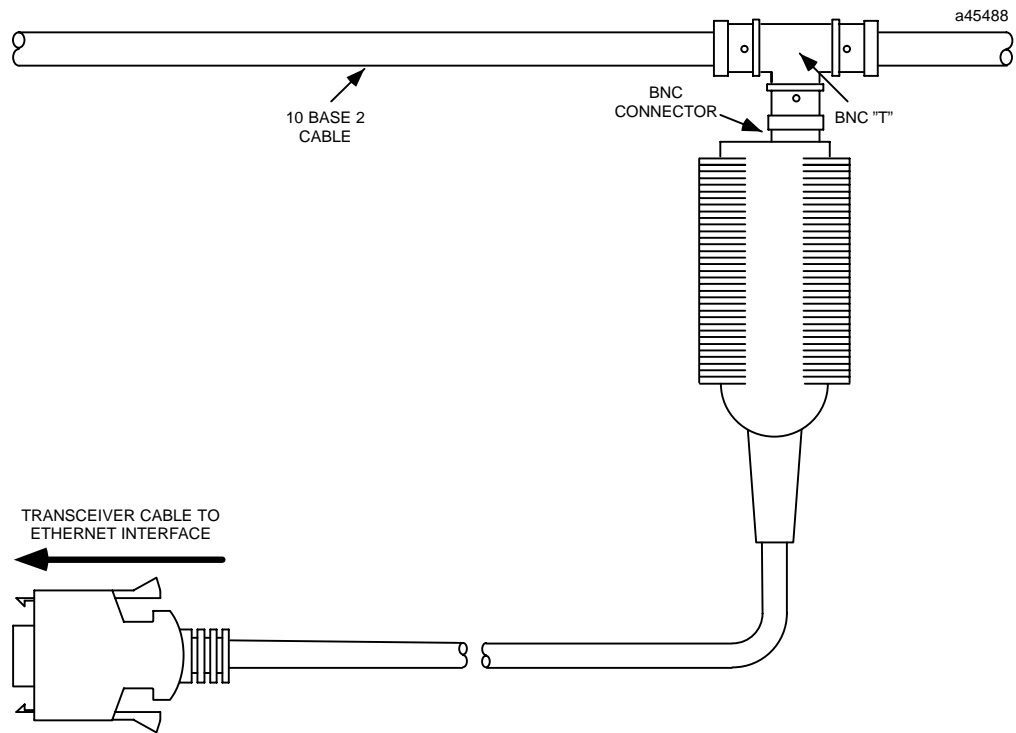
Figure B-5.   10Base2 Transceiver Configuration using BNC "T" Connector

a45490

10 BASE T
CABLE

RJ-45
CONNECTOR

TRANSCEIVER CABLE TO
ETHERNET INTERFACE
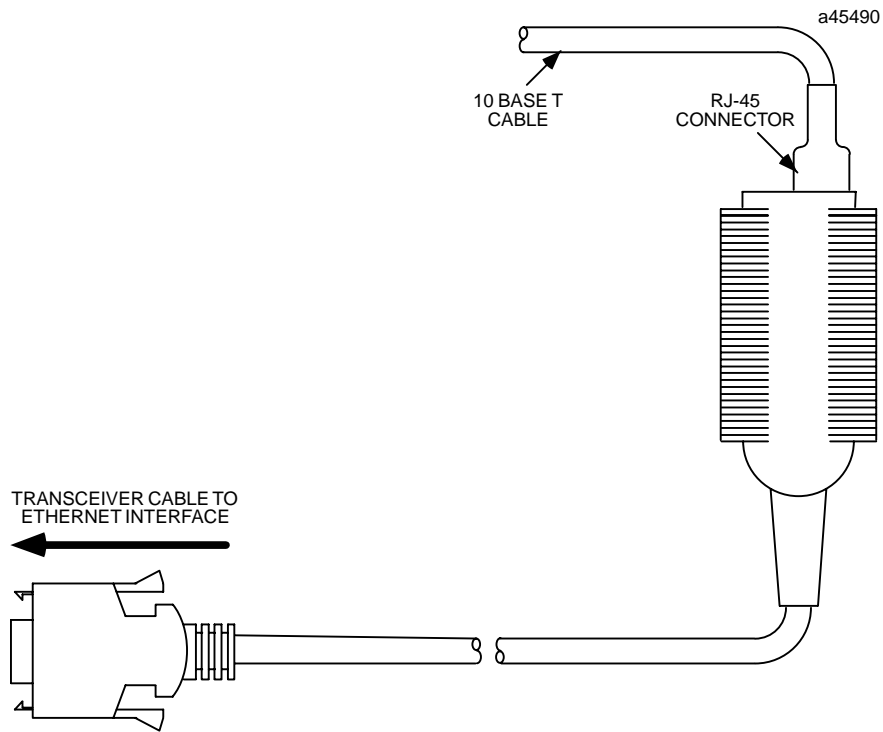
Figure B-6.   10BaseT Transceiver Configuration

TAP

a45489C

TRANSCEIVER CABLE TO
ETHERNET INTERFACE

10BASE5
COAXIAL
CABLE

STANDARD
MAU

AAUI TO AUI
ADAPTER

15–PIN
MALE
CONNECTOR

AC POWER
ADAPTER

PWR
SQE
XMT
RCV
CP

NOTE
SQE
must be
ON.

NOTE: THE AAUI TO AUI ADAPTER MAY BE CONNECTED TO THE STANDARD MAU
VIA A TRANSCEIVER CABLE (UP TO 50 METERS)
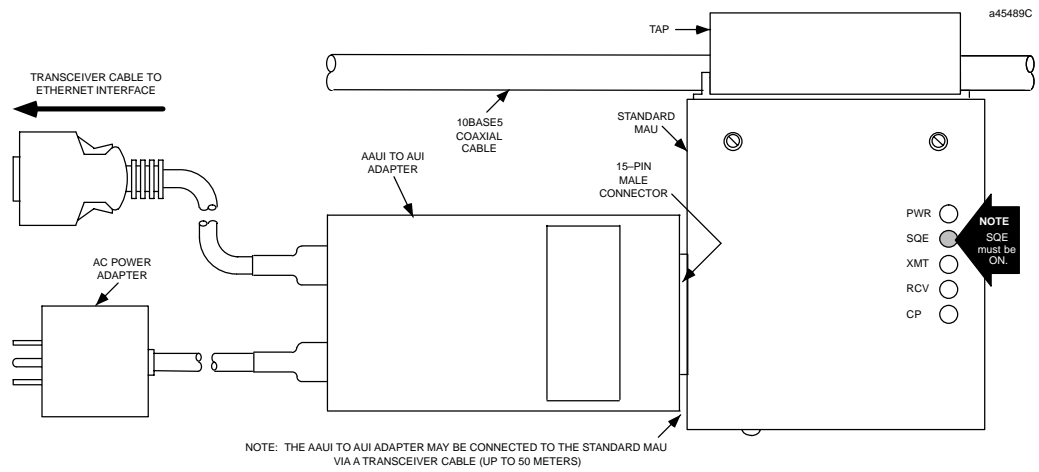
**Figure B-7.   AAUI to AUI Adapter. Can be used to connect to 10Base5 (shown above) or
10BaseF**

Display Terminal Settings

When used as a local Station Manager terminal, set the terminal to "Wrap-Around" or "Line Wrap" mode. This prevents loss of information in the event a Station Manager command response exceeds the display line width of the terminal. Local echo should be set to OFF.

Advanced Information About IP and MAC Addresses

This appendix gives an overview of IP addresses, gateways, subnet masks and MAC addresses.

IP Addresses

Each TCP/IP *node* on a network must have a unique *IP address.* The *TCP/IP Ethernet Interface* is such a node, as is a PC running TCP/IP. There may be other nodes on the network that are not involved with communications to the PLCs, but no matter what their function, each TCP/IP node must have its own *IP address.* It is the unique *IP address* that identifies each node on the IP network (or system of connected networks). (Note that Internet terminology often uses the term "host" to identify a node on a network.)

The *IP address* is 32 bits long and has a *netid* part and a *hostid* part. Each network is a Class A, Class B, or Class C network. The class of a network determines how the IP Address bits are aportioned between the *netid* and *hostid* parts:

a45404

	0 1	8	16	24	31
Class A	0 netid		hostid		

	0 1	8	16	24	31
Class B	1 0 netid		hostid		

	0 1 2	8	16	24	31
Class C	1 1 0 netid			hostid	

Figure C-1. IP Address Format for Network Classes A, B, C

Each node on the same local network must have an *IP address* of the same class and must have the same netid. Each node on the same network must have a different *hostid* thus giving it a unique *IP address.*

IP addresses are written as four decimal integers (0-255) separated by periods (called "dotted-decimal") where each integer gives the value of one byte of the IP address. For example, the 32-bit IP address

$$00000011 \quad 00000000 \quad 00000000 \quad 00000001$$

is written as

3.0.0.1

One can distinguish the class of an IP address from the first integer in its dotted-decimal IP address as follows.

Range of first integer	Class
0 - 127	A
128 - 191	B
192 - 223	C
224 - 255	other

Gateways

Gateways (also known as routers) connect individual physical networks into a system of networks. When a node needs to communicate with a node on another network, a gateway transfers the data between the two networks.

The following figure shows gateway G connecting Network 1 with Network 2.

a45405
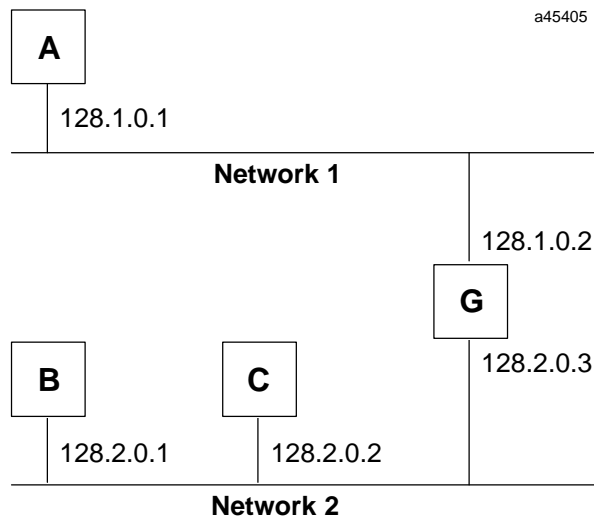
Figure C-2. Connecting Two Networks with a Gateway

When host B with IP address 128.2.0.1 communicates with host C, it knows from C's IP address that C is on the same network. In an Ethernet environment, B can then resolve C's IP address to a MAC address (via ARP) and communicate with C directly.

When host B communicates with host A, it knows from A's IP address that A is on another network (the *netids* are different). In order to send data to A, B must have the IP address of the gateway connecting the two networks. In this example, the gateway's IP address on Network 2 is 128.2.0.3.

Note that the gateway has two IP addresses (128.1.0.2 and 128.2.0.3). The first must be used by hosts on Network 1 and the second must be used by hosts on Network 2. To be usable, a host's gateway must be addressed using an IP address with a *netid* matching its own.

Subnets

Subnet addressing is an extension of the IP address scheme that allows a site to use a single netid for multiple networks. Routing outside the site continues as usual by dividing the IP address into a netid and a hostid via the class. Inside a site the *subnet mask* is used to re-divide the IP address into a custom netid portion and hostid portion.

Consider taking Network 2 (a Class B network) in the previous example and adding another network. Selecting the following subnet mask would add two additional *netid* bits allowing for four networks:

$$11111111 \quad 11111111 \quad 11000000 \quad 00000000 \quad = \quad 255.255.192.0$$

In effect, two bits of the Class B *hostid* have been used to extend the *netid.* Each unique combination of bits in the part of the hostid where subnet mask bits are 1 specifies a different network.

The new configuration would be:

a45406

```
        A
        128.1.0.1
                       Network 1        128.1.0.2
                                            G
        B          C                       128.2.64.3
        128.2.64.1  128.2.64.2
                       Network 2.1
                                            G2
        D          E                       128.2.128.3
        128.2.128.1  128.2.128.2
                       Network 2.2
```
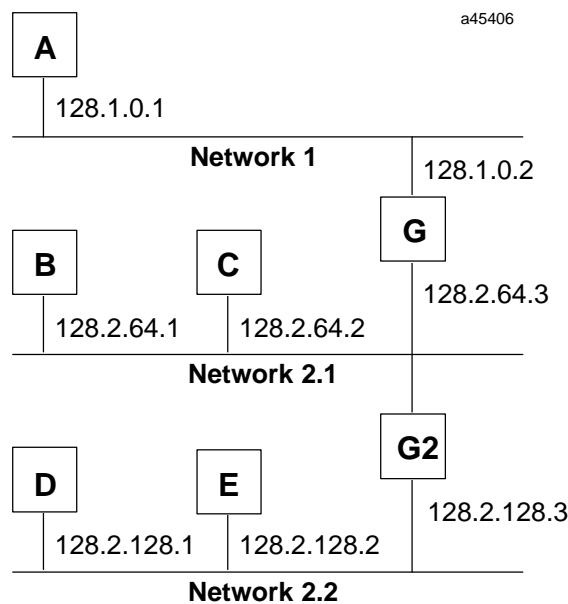
Figure C-3. Network Configuration Using a Subnet Mask

A second network with Hosts D and E has been added. Gateway G2 connects Network 2.1 with Network 2.2. Hosts D and E will use Gateway G2 to communicate with hosts not on Network 2.2. Hosts B and C will use Gateway G to communicate with hosts not on Network 2.1. When B is communicating with D, G (the configured Gateway for B) will route the data from B to D through G2.

MAC Addresses

It is recommended that you use the default MAC address given by the factory, however, you may override that default with a MAC address of your own choosing with the Station Manager *CHPARM MACADDR* command (See GFK-1186.)

Each byte of the MAC Address is an 8-bit binary number. Thus, the 12-digit hex address is really a 48-bit binary number. The typical MAC Address shown above is represented as a binary number as follows:

```
Byte            1         2         3         4         5         6

            _____ _____ _____ _____ _____ _____
Hex          0    8    0    0    1    9    0    0    5    3    1    2
Binary      0000 1000 0000 0000 0001 1001 0000 0000 0101 0011 0001 0010
```

Another characteristic that is important, especially for multi-vendor networks, is the order of address-bit transmission on the physical medium. MAC Addresses are transmitted in ascending byte order, with the least significant bit of each byte transmitted first.

The example above is shown including bit transmission order as follows:

```
Byte             1        2        3        4        5        6

            _____ _____ _____ _____ _____ _____
Hex          0    8    0    0    1    9    0    0    5    3    1    2
Binary      0000 1000 0000 0000 0001 1001 0000 0000 0101 0011 0001 0010
Bit Order   8765 4321      ...9                               |
                 |                                    MSB of the MAC
    LSB of the MAC Address-first bit transmitted      Address-last bit
                                                      transmitted
```

If you assign your own MAC Addresses, there are 2 bits of the 48-bit address that you must set according to the instructions that follow:

- Bit 1 in Byte 1 must always be a 0 to indicate an individual station rather than a Group address.

- Bit 2 in Byte 1 must be a 1 to indicate that the address is locally administered. (In the typical default MAC Address shown above, bit 2 in Byte 1 is a 0 indicating that it is a globally administered address).

- All other bits can be set as desired as long as all stations on the network have unique addresses.

An example of a locally administered MAC Address is shown below.

```
Byte             1        2        3        4        5        6

            _____ _____ _____ _____ _____ _____
Hex          0    2    0    0    0    0    0    0    0    1    0    0
Binary      0000 0010 0000 0000 0000 0000 0000 0000 0000 0001 0000 0000
Bit Order   8765 4321      ...9                               |
                 |                                    MSB of the
    LSB of the MAC Address-first bit transmitted      MAC Address-last
                                                      bit transmitted
```

If you must change the Station MAC Address, check with the person administering your network to make sure that you select an address that fits into your local administration scheme.

Appendix

D

Sample Ladder Programs

This appendix contains the following:

- **Printout showing hardware configuration** for sample ladder programs.

- **Printout of sample program, LANRDWT.** This program shows a way to alternate reads and writes from a Series 90-30 client PLC to a Series 90-30 or Series 90-70 server PLC.

- **Printout of sample program, CHAN4.** This program establishes 4 channels on start-up from a Series 90-30 client PLC to 4 different Series 90-30 or Series 90-70 server PLCs. This program may be customized for a variety of applications.

```
         GGGG EEEEE      FFFFF AAA  N   N U   U CCCC
          G   E          F     A   A NN  N U   U C
         G GGG EEEE      FFF   AAAAA N N N U   U C
          G  G E         F     A   A N  NN U   U C
          GGG  EEEEE     F     A   A N   N  UUU  CCCC


        AAA  U   U TTTTT OOO  M   M AAA  TTTTT IIIII OOO  N   N
        A   A U   U   T   O   O MM MM A   A   T     I   O   O NN  N
        AAAAA U   U   T   O   O M M M AAAAA   T     I   O   O N N N
        A   A U   U   T   O   O M   M A   A   T     I   O   O N  NN
        A   A  UUU    T   OOO  M   M A   A   T   IIIII OOO  N   N
```

```
(*****************************************************************************)
(                                                                           )
(         CENTRAL PLC CONFIGURATION                                         )
(                                                                           )
(                                                                           )
(         TOTAL DISCRETE I/O (%I + %Q):    80                               )
(                                                                           )
(         HIGHEST CONFIGURED REFERENCES                                     )
(         _____                                     )
(         DISCRETE INPUT         (%I) :   112                               )
(         DISCRETE OUTPUT        (%Q) :     0                               )
(                                                                           )
(         ANALOG INPUT           (%AI) :    0                               )
(         ANALOG OUTPUT          (%AQ) :    0                               )
(                                                                           )
(         REGISTER MEMORY        (%R) :     0                               )
(                                                                           )
(*****************************************************************************)
```

Folder: C:\LM90\LAN\LANRDWT

```
+————————————————————————————————————————— RACK 0 —+————+————+————+————+————+————+
|     +————+————+————+————+————     ————+————+————+————+————+————|
|  PS | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
|============ P R O G R A M M E D   C O N F I G U R A T I O N ===============|
|     |    |    |    |    |    |    |    |    |    |    |
|PWR321|CPU331|CMM321|   |    |    |    |    |    |    |    |
|     |    |    |    |    |    |    |    |    |    |    |
|     |    |ETHNET|   |    |    |    |    |    |    |    |
|     |    |    |    |    |    |    |    |    |    |    |
|     |    |RefAdr|   |    |    |    |    |    |    |    |
|     |    |%I0033|   |    |    |    |    |    |    |    |
|     |    |    |    |    |    |    |    |    |    |    |
|     |    |    |    |    |    |    |    |    |    |    |
|     |    |    |    |    |    |    |    |    |    |    |
|     |    |    |    |    |    |    |    |    |    |    |
+—————+————+————+————+————+————+————+————+————+————+————+
```

Folder: C:\LM90\LAN\LANRDWT   Rack

```
        07—17—95  16:47    GE FANUC SERIES 90—30/90—20/MICRO (v6.01)      Page    3


           SERIES 90—30 MODULE IN RACK 0 SLOT   0
     +———————+———————————————————— SOFTWARE  CONFIGURATION ——————————————————————
     | SLOT  |  Catalog #: IC693PWR321          POWER SUPPLY 120/240 VAC 30 W
     |   0   |
     |       |
     |PWR321 |————————————————————————————————————————————————————————————————————
     |       |
     |       |
     |       |
     |       |
     |       |
     |       |
     |       |
     |       |
     |       |
     |       |
     +———————+



           SERIES 90—30 MODULE IN RACK 0 SLOT   1
     +———————+———————————————————— SOFTWARE  CONFIGURATION ——————————————————————
     | SLOT  |  Catalog #: IC693CPU331          SERIES 90—30 CPU, MODEL 331
     |   1   |
     |       |
     |CPU331 |————————————————————————————————————————————————————————————————————
     |       |  IOScan—Stop: NO      Baud Rate  : 19200
     |       |  Pwr Up Mode: LAST    Parity     : ODD
     |       |  Logic/Cfg  : RAM     Stop Bits  : 1
     |       |  Registers  : RAM     Modem TT   :   0      1/100 Second / Count
     |       |  Passwords  : ENABLED Idle Time  :  10      Seconds
     |       |
     |       |
     |       |  Chksum Wrds:   8     Sweep Mode : NORMAL
     |       |  Tmr Faults : DISABLED Sweep Tmr : N/A          msec
     |       |
     +———————+



        Folder: C:\LM90\LAN\LANRDWT                                    Slot
```

```
        SERIES 90—30 MODULE IN RACK 0 SLOT  2
+———+————————— SOFTWARE  CONFIGURATION ————————————
| SLOT | Catalog #: IC693CMM321          ETHERNET INTERFACE
|  2  |
|     |
|CMM321|—————————————————————————————————————————————————
|     | Config Mode              :  TCP/IP
|ETHNET| Status Address           :    %I0033
|     | Status Length            :    80
|     |
|     | IP  Address              :  3.0.0.1
|     | Subnet Mask              :  0.0.0.0
|     | Gateway IP Address       :  0.0.0.0
|     | Name Server IP Address   :  0.0.0.0
|     |
|     |  Note: Default IP Address (0.0.0.0) requires a network BOOTP server
+———+
```

```
        SERIES 90—30 MODULE IN RACK 0 SLOT  2
+———+————————— SOFTWARE  CONFIGURATION ————————————
| SLOT | Catalog #: IC693CMM321          ETHERNET INTERFACE
|  2  |
|     |
|CMM321|—————————————————————————————————————————————————
|     |        ————————— PORT CONFIGURATION —————————
|ETHNET| —— Station Mgr Port ——  —— S/W Load Port ——
|     | Data Rate  : 9600     Data Rate  : 19200
|     | Parity     : NONE     Parity     : ODD
|     | Stop Bits  : 1        Stop Bits  : 1
|     | Flow Contrl: NONE     Flow Contrl: NONE
|     | TurnA Delay: NONE     TurnA Delay: NONE
|     | Timeout    : LONG     Timeout    : LONG
|     |
|     |
+———+
```

Folder: C:\LM90\LAN\LANRDWT   Slot

```
        GGGG EEEEE      FFFFF AAA N   N U   U CCCC
        G    E          F     A  A NN  N U   U C
        G GGG EEEE      FFF   AAAAA N N N U   U C
        G   G E         F     A   A N  NN U   U C
         GGG  EEEEE     F     A   A N   N  UUU  CCCC


       AAA  U   U TTTTT  OOO  M   M  AAA  TTTTT IIIII  OOO  N   N
       A A  U   U   T   O   O MM MM A   A   T     I   O   O NN  N
      AAAAA U   U   T   O   O M M M AAAAA   T     I   O   O N N N
      A   A U   U   T   O   O M   M A   A   T     I   O   O N  NN
      A   A  UUU    T    OOO  M   M A   A   T   IIIII  OOO  N   N
```

```
(****************************************************************************)
(*                                                                          *)
(*                        Program:  LANRDWT                                  *)
(*                                                                          *)
(*      PLC PROGRAM ENVIRONMENT              HIGHEST REFERENCE USED          *)
(*    _____         _____     *)
(*              INPUT (%I):    512              INPUT:   %I0048              *)
(*             OUTPUT (%Q):    512             OUTPUT:     NONE              *)
(*           INTERNAL (%M):   1024           INTERNAL:     NONE              *)
(*        GLOBAL DATA (%G):   1280        GLOBAL DATA:     NONE              *)
(*          TEMPORARY (%T):    256          TEMPORARY:   %T0014              *)
(*           REGISTER (%R):   2048           REGISTER:   %R0158              *)
(*       ANALOG INPUT (%AI):   128       ANALOG INPUT:     NONE              *)
(*      ANALOG OUTPUT (%AQ):    64      ANALOG OUTPUT:     NONE              *)
(*                                                                          *)
(*              PROGRAM SIZE (BYTES):     608                               *)
(*                                                                          *)
(*                                                                          *)
(****************************************************************************)
```

```
Program: LANRDWT                 C:\LM90\LAN\LANRDWT
```

```
(*************************************************************************)
(*                                                                     *)
(*                      BLOCK:  _MAIN                                   *)
(*                                                                     *)
(*                                                                     *)
(*                 BLOCK SIZE (BYTES):   604                           *)
(*                 DECLARATIONS (ENTRIES):    24                       *)
(*                                                                     *)
(*                                                                     *)
(*                      HIGHEST REFERENCE USED                         *)
(*                 _____                    *)
(*                                                                     *)
(*                      INPUT (%I):   %I0048                           *)
(*                     OUTPUT (%Q):      NONE                          *)
(*                   INTERNAL (%M):      NONE                          *)
(*                GLOBAL DATA (%G):      NONE                          *)
(*                 TEMPORARY (%T):   %T0014                            *)
(*                  REGISTER (%R):   %R0158                            *)
(*               ANALOG INPUT (%AI):     NONE                          *)
(*              ANALOG OUTPUT (%AQ):     NONE                          *)
(*                                                                     *)
(*************************************************************************)
```

```
     Program: LANRDWT            C:\LM90\LAN\LANRDWT            Block: _MAIN
```

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|[START OF LD PROGRAM LANRDWT]   (*   *)
|
|[VARIABLE DECLARATIONS   ]

               V A R I A B L E   D E C L A R A T I O N   T A B L E

         REFERENCE   NICKNAME   REFERENCE DESCRIPTION
         _____   _____   _____
         %I0039   S2_FUSE   Fuse blown for Serial Port 2
         %I0040   AI_FUSE   Fuse blown for AAUI Port
         %I0045   LAN_OK   Bit set, LAN OK
         %I0046   RSOURCE   Set if resource problem
         %I0048   LANIFOK   LAN Interface OK
         %I0049   XFER_1   Successful Data Transfer
         %I0050   CH1_ERR   Error detected on Channel 1
         %T0001   FIRSTRD   First channel cmd after Fst_Scn
         %T0002   RD_OK   Commreq successful
         %T0003   RD_ERR   Error processing Commreq
         %T0004   RD_FLT   Fault output set for COMREQ
         %T0005   WRT_OK   Write Channel cmd successful
         %T0006   WRT_ERR   Error processing write channel
         %T0007   WRT_FLT   Write Chan COMREQ Fault output
         %T0008   DO_READ   Write done, do read comreq
         %T0009   DO_WRT   Read done, do write comreq
         %T0010   RESTART   Bit set if Enet card restarted
         %T0011   CH_ERR   Error on read/write, restart
         %T0012   PWR_DLY   Wait 2 sec. for system power—up
         %T0013   RS_READ   Read error detected, restart
         %T0014   RS_WRT   Write error detected, restart
         %R0001   RD_CRSW   COMREQ status word for read
         %R0002   WT_CRSW   COMREQ status word for write

               I D E N T I F I E R   T A B L E

         IDENTIFIER   IDENTIFIER TYPE   IDENTIFIER DESCRIPTION
         _____   _____   _____

         LANRDWT   PROGRAM NAME

|[BLOCK DECLARATIONS   ]
|
|[START OF PROGRAM LOGIC   ]
|

Program: LANRDWT   C:\LM90\LAN\LANRDWT   Block: _MAIN

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```
| (**************************************************************************)
| (* Overview:                                                          *)
| (*                                                                    *)
| (* This program provides an example of alternating reads and writes from a *)
| (* 90—30 client PLC to a 90—30 or 90—70 server PLC, using the Read Channel *)
| (* and Write Channel commands.                                        *)
| (*                                                                    *)
| (* The Read Channel command reads %R300 from the remote PLC into %R201 of *)
| (* this PLC.  The Write Channel command writes %R200 from this PLC to %R300 *)
| (* of the remote PLC.  You can change the value of %R200 in this PLC and *)
| (* see the new value in %R201 of this PLC, as the data is written to and *)
| (* read from the remote PLC.                                          *)
| (*                                                                    *)
| (* This ladder automatically restarts the read/write logic if the ethernet *)
| (* card is reset (LANIFOK 0 —> 1), or if an error is detected on a read or *)
| (* write command.                                                     *)
| (*                                                                    *)
| (* Hardware Configuration:                                            *)
| (*                                                                    *)
| (* This ladder is written for a 90—30 Ethernet Controller installed in *)
| (* Rack 0, Slot 2 of a 90—30 system.  The LAN Interface Status Word is *)
| (* configured for %I33.  The IP address for this Ethernet Controller is *)
| (* 3.0.0.1.  The IP address for the remote PLC is 3.0.0.2.            *)
| (*                                                                    *)
| (* First Scan Logic:                                                  *)
| (*                                                                    *)
| (* Rungs 5—8 initialize the data areas for the Read Channel and Write *)
| (* Channel Commands.                                                  *)
| (*                                                                    *)
| (* Rungs 5 and 6:  The BLKMV function is used to initialize data for the *)
| (* Read Channel Command.  The command block starts at %R101.  The Read *)
| (* Channel CRSW is located at %R1.                                    *)
| (*                                                                    *)
| (* Rungs 7 and 8: The BLKMV function is used to initialize data for the *)
| (* Write Channel Command.  The command block starts at %R131. The Write *)
| (* Channel CRSW is located at %R2                                     *)
| (*                                                                    *)
| (* PWR_DLY is set to start a 2 second timer.  This timer allows the system *)
| (* to initialize if first scan executes on power—up.  When the timer fires, *)
| (* the read and write channel CRSWs are cleared, and DO_READ is set on a *)
| (* one—shot.                                                          *)
| (*                                                                    *)
| (* Refer to Chapter 3 for detailed information about the channel commands. *)
| (**************************************************************************)
|
```

Program: LANRDWT   C:\LM90\LAN\LANRDWT   Block: _MAIN

```
| << RUNG 5  STEP #0002 >>
|
|FST_SCN
|%S0001  +——+                  +——+                      +——+
+—] [——+BLKMV+——————————+BLKMV+————————————+BLKMV+—————————<+>
|        | INT |                 | INT |                     | INT |
|        |     |                 |     |                     |     |
| CONST —+IN1 Q+—%R0101   CONST —+IN1 Q+—%R0108   CONST —+IN1 Q+—%R0115
| +00017 |     |          +00001 |     |          +00008 |     |
|        |     |                 |     |                 |     |
| CONST —+IN2  |          CONST —+IN2  |          CONST —+IN2  |
| +00000 |     |          +00001 |     |          +00300 |     |
|        |     |                 |     |                 |     |
| CONST —+IN3  |          CONST —+IN3  |          CONST —+IN3  |
| +00008 |     |          +00002 |     |          +00010 |     |
|        |     |                 |     |                 |     |
| CONST —+IN4  |          CONST —+IN4  |          CONST —+IN4  |
| +00000 |     |          +00000 |     |          +00001 |     |
|        |     |                 |     |                 |     |
| CONST —+IN5  |          CONST —+IN5  |          CONST —+IN5  |
| +00000 |     |          +00500 |     |          +00004 |     |
|        |     |                 |     |                 |     |
| CONST —+IN6  |          CONST —+IN6  |          CONST —+IN6  |
| +00000 |     |          +00008 |     |          +00003 |     |
|        |     |                 |     |                 |     |
| CONST —+IN7  |          CONST —+IN7  |          CONST —+IN7  |
| +02003 +——+          +00201 +——+          +00000 +——+
|
| << RUNG 6  STEP #0007 >>
|
|          +——+
|          |     |
+<+>——+BLKMV+————————————————————————————————————<+>
|          | INT |
|          |     |
| CONST —+IN1 Q+—%R0122
| +00000 |     |
|        |     |
| CONST —+IN2  |
| +00002 |     |
|        |     |
| CONST —+IN3  |
| +00000 |     |
|        |     |
| CONST —+IN4  |
| +00000 |     |
|        |     |
| CONST —+IN5  |
| +00000 |     |
|        |     |
| CONST —+IN6  |
| +00000 |     |
|        |     |
| CONST —+IN7  |
| +00000 +——+
```

Program: LANRDWT   C:\LM90\LAN\LANRDWT   Block: _MAIN

```
| << RUNG 7  STEP #0010 >>
|
|         +———+                 +———+                      +———+
+<+>——+BLKMV+———————+BLKMV+——————————————+BLKMV+—————————<+>
|         | INT |                 | INT |                      | INT |
|         |     |                 |     |                      |     |
| CONST —+IN1 Q+—%R0131   CONST —+IN1 Q+—%R0138    CONST —+IN1 Q+—%R0145
| +00017 |     |         +00001 |     |            +00008 |     |
|        |     |                |     |                   |     |
| CONST —+IN2 |          CONST —+IN2 |             CONST —+IN2 |
| +00000 |     |         +00001 |     |            +00300 |     |
|        |     |                |     |                   |     |
| CONST —+IN3 |          CONST —+IN3 |             CONST —+IN3 |
| +00008 |     |         +00002 |     |            +00001 |     |
|        |     |                |     |                   |     |
| CONST —+IN4 |          CONST —+IN4 |             CONST —+IN4 |
| +00001 |     |         +00000 |     |            +00001 |     |
|        |     |                |     |                   |     |
| CONST —+IN5 |          CONST —+IN5 |             CONST —+IN5 |
| +00000 |     |         +00500 |     |            +00004 |     |
|        |     |                |     |                   |     |
| CONST —+IN6 |          CONST —+IN6 |             CONST —+IN6 |
| +00000 |     |         +00008 |     |            +00003 |     |
|        |     |                |     |                   |     |
| CONST —+IN7 |          CONST —+IN7 |             CONST —+IN7 |
| +02004 +———+          +00200 +———+             +00000 +———+
|
| << RUNG 8  STEP #0015 >>
|
|                                                          PWR_DLY
|                                                          %T0012
|         +———+
+<+>——+BLKMV+———————————————————————————————————————————(S)——
|         | INT |
|         |     |
| CONST —+IN1 Q+—%R0152
| +00000 |     |
|        |     |
| CONST —+IN2 |
| +00002 |     |
|        |     |
| CONST —+IN3 |
| +00000 |     |
|        |     |
| CONST —+IN4 |
| +00000 |     |
|        |     |
| CONST —+IN5 |
| +00000 |     |
|        |     |
| CONST —+IN6 |
| +00000 |     |
|        |     |
| CONST —+IN7 |
| +00000 +———+

Program: LANRDWT              C:\LM90\LAN\LANRDWT              Block: _MAIN
```

```
| << RUNG 9  STEP #0018 >>
|
|PWR_DLY                                                              FIRSTRD
|%T0012  +———+                                                        %T0001
+—] [———+ TMR +——————————————————————————————————————————————————————(^)—
|        |0.10s|
|        |     |
| CONST —+PV   |
| +00020 |     |
|        +———+
|
|        %R0003
|
| << RUNG 10  STEP #0021 >>
|
|FIRSTRD                                                              PWR_DLY
|%T0001  +———+              +———+                                     %T0012
+—] [———+MOVE_+——————————————+MOVE_+——————————————————————————————————(R)—
|       | WORD|              | WORD|
|       |     |              |     |
|       |     | RD_CRSW      |     | WT_CRSW
| CONST —+IN  Q+—%R0001  CONST —+IN  Q+—%R0002
|   0000 | LEN |         0000 | LEN |
|        |00001|              |00001|
|        |     |              |     |
|        +———+              +———+
|
| (**************************************************************************)
| (* If RD_CRSW = 1, COMREQ complete without error.  Set RD_OK on one—shot to *)
| (* issue Write Channel Command.                                          *)
| (**************************************************************************)
|
| << RUNG 12  STEP #0026 >>
|
|ALW_ON                                                               RD_OK
|%S0007  +———+                                                        %T0002
+—] [———+ EQ_ |+——————————————————————————————————————————————————————(^)—
|        | INT ||
|        |     ||
|RD_CRSW |     ||
|%R0001 —+I1  Q++
|        |     |
| CONST —+I2   |
| +00001 +———+
|
| (**************************************************************************)
| (* If RD_CRSW is not equal to 0 and not equal to 1, an error occurred    *)
| (* processing the COMREQ.  Set RD_ERR to restart the read/write sequence. *)
| (*                                                                       *)
| (* Note:  The CRSW can assume a value that is represented as a negative    *)
| (* integer.  Therefore, you must check for not equal to 1 rather than      *)
| (* greater than 1.                                                       *)
| (**************************************************************************)
|
Program: LANRDWT              C:\LM90\LAN\LANRDWT              Block: _MAIN
```

```
| << RUNG 14  STEP #0030 >>
|
|
|ALW_ON                                                              RD_ERR
|%S0007  +———+                                                       %T0003
+—] [——+ NE_ |          +————————————————————————————————————————————(S)—
|      |  INT |          |
|      |     |          |
|      |     |          |
|RD_CRSW |     |          +———+|
|%R0001 —+I1  Q+————————+ NE_ ||
|      |    |          |  INT ||
|      |    |          |     ||
|      |    |          |     ||
|      |    | RD_CRSW |     ||
| CONST —+I2  | %R0001 —+I1  Q++
| +00000 +———+          |     |
|                       |     |
|                       |     |
|                 CONST —+I2  |
|                 +00001 +———+
|
| (********************************************************************)
| (* If WT_CRSW = 1, COMREQ complete without error.  Set WRT_OK on one—shot t *)
| (* o                                                                *)
| (* issue Read Channel Command.                                      *)
| (********************************************************************)
|
| << RUNG 16  STEP #0035 >>
|
|
|ALW_ON                                                              WRT_OK
|%S0007  +———+                                                       %T0005
+—] [——+ EQ_ |+————————————————————————————————————————————————————(^)—
|      |  INT ||
|      |     ||
|      |     ||
|WT_CRSW |     ||
|%R0002 —+I1  Q++
|        |    |
| CONST —+I2  |
| +00001 +———+
|
| (********************************************************************)
| (* If WT_CRSW is not equal to 0 and not equal to 1, an error occurred    *)
| (* processing the COMREQ.  Set WRT_ERR to restart the write/read sequence.  *)
| (*                                                                  *)
| (* Note:  The CRSW can assume a value that is represented as a negative   *)
| (* integer.  Therefore, you must check for not equal to 1 rather than    *)
| (* greater than 1.                                                  *)
| (********************************************************************)
|
```

Program: LANRDWT   C:\LM90\LAN\LANRDWT   Block: _MAIN

```
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  | << RUNG 18  STEP #0039 >>
  |
  |ALW_ON                                                               WRT_ERR
  |%S0007  +------+                                                     %T0006
  +---] [---+ NE_ |                      +--------------------------------(S)---
  |         | INT |                      |
  |         |     |                      |
  |WT_CRSW  |     |              +------+|
  |%R0002 --+I1  Q+--------------+ NE_  ||
  |         |     |              | INT  ||
  |         |     |              |      ||
  |         |     |  WT_CRSW     |      ||
  | CONST --+I2   |  %R0002 --+I1  Q++
  | +00000 +------+           |      |
  |                           |      |
  |                 CONST --+I2      |
  |                 +00001 +------+
  |
  | (****************************************************************************)
  | (* If RD_OK, fire one-shot DO_WRT to execute next Write Channel Command.   *)
  | (* If WRT_OK, fire one-shot DO_READ to execute next Read Channel Command.  *)
  | (* This interlock allows the ladder to alternate between read and write    *)
  | (* COMREQs.                                                                *)
  | (****************************************************************************)
  |
  | << RUNG 20  STEP #0044 >>
  |
  | RD_OK                                                               DO_WRT
  |%T0002                                                               %T0009
  +---] [---------------------------------------------------------------(^)---
  |
  | << RUNG 21  STEP #0046 >>
  |
  |WRT_OK                                                               DO_READ
  |%T0005                                                               %T0008
  +---] [---------------------------------------------------------------(^)---
  |
  | (****************************************************************************)
  | (* If LANIFOK transitions from 0->1, restart read/write logic.  This should *)
  | (* only happen if the Ethernet Controller initiating communications is     *)
  | (* restarted.                                                              *)
  | (****************************************************************************)
  |
  | << RUNG 23  STEP #0049 >>
  |
  |LANIFOK                                                              RESTART
  |%I0048                                                               %T0010
  +---] [---------------------------------------------------------------(^)---
  |
  | (****************************************************************************)
  | (* If an error is detected in a read or write, toggle bits to restart      *)
  | (* read or write.  This is done on a one-shot basis.                       *)
  | (****************************************************************************)
  |
  Program: LANRDWT             C:\LM90\LAN\LANRDWT             Block: _MAIN
```

```
|  << RUNG 25   STEP #0052 >>
|
|RD_ERR                                                                    RS_READ
|%T0003                                                                    %T0013
+—] [———————————————————————————————————————————————————————————————————(^)—
|
|  << RUNG 26   STEP #0054 >>
|
|RS_READ                                                                   RD_ERR
|%T0013                                                                    %T0003
+—] [———————————————————————————————————————————————————————————————————(R)—
|
|  << RUNG 27   STEP #0056 >>
|
|WRT_ERR                                                                   RS_WRT
|%T0006                                                                    %T0014
+—] [———————————————————————————————————————————————————————————————————(^)—
|
|  << RUNG 28   STEP #0058 >>
|
|RS_WRT                                                                    WRT_ERR
|%T0014                                                                    %T0006
+—] [———————————————————————————————————————————————————————————————————(R)—
|
| (*****************************************************************************)
| (* If FIRSTRD, RESTART,DO_READ, or RS_READ is set, and LANIFOK is 1,        *)
| (* zero CRSW and issue Read Channel COMREQ.  Set RD_FLT if the Fault        *)
| (* output is enabled.                                                       *)
| (*****************************************************************************)
|
|  << RUNG 30   STEP #0061 >>
|
|FIRSTRD LANIFOK                                                           RD_FLT
|%T0001  %I0048  +———+                    +———+                            %T0004
+—] [—+—] [———+MOVE_+————————————————————+COMM_|+—————————————————————————(S)—
|     |       | WORD|                     | REQ ||
|DO_READ|     |     |                     |     ||
|%T0008 |     |     |    RD_CRSW           |     ||
+—] [—+ CONST —+IN  Q+—%R0001  %R0101 —+IN FT++
|     |  0000 | LEN |                     |     |
|RS_READ|      |00001|                    |     |
|%T0013 |      |     |                     |     |
+—] [—+        +———+          CONST —+SYSID|
|     |                        0002 |     |
|RESTART|                            |     |
|%T0010 |                            |     |
+—] [—+                   CONST —+TASK |
|                       00000000 +———+
|
| (*****************************************************************************)
| (* If DO_WRT or RS_WRT is set, and LANIFOK is 1, zero CRSW and issue        *)
| (* Write Channel COMREQ.  Set WRT_FLT if the Fault output is enabled.       *)
| (*****************************************************************************)
|
Program: LANRDWT              C:\LM90\LAN\LANRDWT              Block: _MAIN
```

```
| << RUNG 32  STEP #0070 >>
|
|DO_WRT  LANIFOK                                                         WRT_FLT
|%T0009  %I0048  +———+                   +———+                            %T0007
+—] [—+—] [———+MOVE_+———————————————+COMM_|+————————————————————————————(S)—
|     |      | WORD|                 | REQ ||
|RS_WRT |      |    |                 |     ||
|%T0014 |      |    | WT_CRSW         |     ||
+—] [—+ CONST —+IN  Q+—%R0002  %R0131 —+IN FT++
|            0000 | LEN |                 |    |
|                 |00001|                 |    |
|                 |     |                 |    |
|                 +———+       CONST —+SYSID|
|                               0002  |    |
|                                     |    |
|                             CONST —+TASK |
|                             00000000 +———+
|
|[      END OF PROGRAM LOGIC      ]
|
```

Program: LANRDWT   C:\LM90\LAN\LANRDWT   Block: _MAIN

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***** L O G I C   T A B L E   O F   C O N T E N T S *****

Program: LANRDWT   C:\LM90\LAN\LANRDWT   TABLE OF CONTENTS

```
     GGGG EEEEE      FFFFF AAA  N   N U   U CCCC
     G    E          F    A   A NN  N U   U C
     G GGG EEEE      FFF  AAAAA N N N U   U C
     G   G E         F    A   A N  NN U   U C
      GGG  EEEEE     F    A   A N   N  UUU  CCCC


     AAA  U   U TTTTT OOO  M   M AAA  TTTTT IIIII OOO  N   N
    A   A U   U   T   O   O MM MM A   A   T     I   O   O NN  N
    AAAAA U   U   T   O   O M M M AAAAA   T     I   O   O N N N
    A   A U   U   T   O   O M   M A   A   T     I   O   O N  NN
    A   A  UUU    T   OOO  M   M A   A   T   IIIII OOO  N   N



(******************************************************************************)
(*                                                                            *)
(*                        Program:  CHAN4                                      *)
(*                                                                            *)
(*      PLC PROGRAM ENVIRONMENT                  HIGHEST REFERENCE USED        *)
(*    _____       _____     *)
(*              INPUT (%I):      512               INPUT:    %I0056            *)
(*             OUTPUT (%Q):      512              OUTPUT:     NONE             *)
(*           INTERNAL (%M):     1024            INTERNAL:     NONE             *)
(*        GLOBAL DATA (%G):     1280         GLOBAL DATA:     NONE             *)
(*          TEMPORARY (%T):      256           TEMPORARY:    %T0020            *)
(*           REGISTER (%R):     2048            REGISTER:    %R0218            *)
(*       ANALOG INPUT (%AI):     128        ANALOG INPUT:     NONE             *)
(*      ANALOG OUTPUT (%AQ):      64       ANALOG OUTPUT:     NONE             *)
(*                                                                            *)
(*             PROGRAM SIZE (BYTES):     960                                   *)
(*                                                                            *)
(*                                                                            *)
(******************************************************************************)
```

Program: CHAN4   C:\LM90\LAN\CHAN4

```
(********************************************************************************)
(*                                                                            *)
(*                         BLOCK:  _MAIN                                       *)
(*                                                                            *)
(*                                                                            *)
(*                   BLOCK SIZE (BYTES):   945                                 *)
(*                   DECLARATIONS (ENTRIES):    37                             *)
(*                                                                            *)
(*                                                                            *)
(*                   HIGHEST REFERENCE USED                                    *)
(*                   _____                           *)
(*                                                                            *)
(*                        INPUT (%I):   %I0056                                 *)
(*                       OUTPUT (%Q):     NONE                                 *)
(*                     INTERNAL (%M):     NONE                                 *)
(*                  GLOBAL DATA (%G):     NONE                                 *)
(*                   TEMPORARY (%T):   %T0020                                  *)
(*                    REGISTER (%R):   %R0218                                  *)
(*                 ANALOG INPUT (%AI):     NONE                                *)
(*               ANALOG OUTPUT (%AQ):     NONE                                 *)
(*                                                                            *)
(********************************************************************************)
```

        Program: CHAN4   C:\LM90\LAN\CHAN4   Block: _MAIN

```
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|[  START OF LD  PROGRAM  CHAN4  ]        (*                                    *)
|
|[      VARIABLE DECLARATIONS      ]

              V A R I A B L E   D E C L A R A T I O N   T A B L E

       REFERENCE      NICKNAME        REFERENCE DESCRIPTION
       ─────────      ────────        ────────────────────────────────
       %I0039         S2_FUSE         Fuse blown for Serial Port 2
       %I0040         AI_FUSE         Fuse blown for AAUI Port
       %I0045         LAN_OK          Bit set, LAN OK
       %I0046         RSOURCE         Set if resource problem
       %I0048         LANIFOK         LAN Interface OK
       %I0049         XFER_1          Successful Data Transfer
       %I0050         CH1_ERR         Error detected on Channel 1
       %I0051         XFER_2          Successful Data Transfer
       %I0052         CH2_ERR         Error detected on Channel 2
       %I0053         XFER_3          Successful Data Transfer
       %I0054         CH3_ERR         Error detected on Channel 3
       %I0055         XFER_4          Successful Data Transfer
       %I0056         CH4_ERR         Error detected on Channel 4
       %T0001         RD1_OK          RD1CRSW OK
       %T0002         RD1_ERR         Read 1 failed
       %T0003         RD2_OK          RD2CRSW OK
       %T0004         RD2_ERR         Read 2 failed
       %T0005         RD3_OK          RD3CRSW OK
       %T0006         RD3_ERR         Read 3 failed
       %T0007         RD4_OK          RD4CRSW OK
       %T0008         RD4_ERR         Read 4 failed
       %T0009         DOREADS         Execute comreqs for 4 reads
       %T0010         CR1_ERR         COMREQ 1 Fault output set
       %T0011         CR2_ERR         COMREQ 2 Fault output set
       %T0012         CR3_ERR         COMREQ 3 Fault output set
       %T0013         CR4_ERR         COMREQ 4 Fault output set
       %T0014         RESTART         If LANIFOK 0 —> 1, restart reads
       %T0016         PWR_DLY         Power—up delay for comreq func
       %T0017         RS_CH1          Channel error detected, restart
       %T0018         RS_CH2          Channel error detected, restart
       %T0019         RS_CH3          Channel error detected, restart
       %T0020         RS_CH4          Channel error detected, restart
       %R0001         RD1CRSW         COMREQ status word for read 1
       %R0002         RD2CRSW         COMREQ status word for read 2
       %R0003         RD3CRSW         COMREQ status word for read 3
       %R0004         RD4CRSW         COMREQ status word for read 4




Program: CHAN4              C:\LM90\LAN\CHAN4                Block: _MAIN
```

```
                        I D E N T I F I E R   T A B L E

            IDENTIFIER      IDENTIFIER TYPE         IDENTIFIER DESCRIPTION
            _____    _____    _____

            CHAN4           PROGRAM NAME

|[       BLOCK DECLARATIONS       ]
|
|[     START OF PROGRAM LOGIC     ]
|
| (***************************************************************************)
| (* Overview:                                                            *)
| (*                                                                      *)
| (* This program establishes 4 channels on start—up from a 90—30 to 4    *)
| (* different 90—30 or 90—70 TCP/IP Ethernet Interfaces and issues reads *)
| (* on each channel every second.  This example may be customized for a  *)
| (* variety of applications.                                             *)
| (*                                                                      *)
| (* This program automatically restarts the read command if an error is  *)
| (* detected on a channel, and automatically restarts the read command if *)
| (* the Ethernet Controller is restarted.                                *)
| (*                                                                      *)
| (* Note:  If you plan to establish 16 channels on start—up, the error   *)
| (* handling code must explicitly issue an abort command for a channel in *)
| (* error, because you are limited to 17 COMREQs in any one scan.        *)
| (*                                                                      *)
| (* Hardware Configuration:                                              *)
| (*                                                                      *)
| (* This ladder is written for a 90—30 Ethernet Controller installed in  *)
| (* Rack 0, Slot 2 of a 90—30 system.  The LAN Interface Status Word is  *)
| (* configured for %I33.  The IP address for this Ethernet Controller is *)
| (* 3.0.0.1.  The IP address for the remote PLCs are 3.0.0.2 — 3.0.0.5.  *)
| (*                                                                      *)
| (* Rungs 5—12 use the BLKMV function to initialize data for the 4 Read  *)
| (* Channel commands.                                                    *)
| (*                                                                      *)
| (* Refer to Chapter 3 for more information on programming COMREQs.      *)
| (***************************************************************************)
|
```

```
Program: CHAN4                 C:\LM90\LAN\CHAN4                Block: _MAIN
```

```
| << RUNG 5  STEP #0002 >>
|
|FST_SCN
|%S0001  +————+                    +————+                        +————+
+——] [——+BLKMV+————————————————————+BLKMV+————————————————————————+BLKMV+——————————————<+>
|       | INT |                    | INT |                        | INT |
|       |     |                    |     |                        |     |
| CONST —+IN1 Q+—%R0101    CONST —+IN1 Q+—%R0108    CONST —+IN1 Q+—%R0115
| +00017 |     |           +00001 |     |           +00008 |     |
|        |     |                  |     |                  |     |
| CONST —+IN2 |            CONST —+IN2 |            CONST —+IN2 |
| +00000 |    |           +00000 |    |           +00200 |    |
|        |    |                  |    |                  |    |
| CONST —+IN3 |            CONST —+IN3 |            CONST —+IN3 |
| +00008 |    |           +00003 |    |           +00010 |    |
|        |    |                  |    |                  |    |
| CONST —+IN4 |            CONST —+IN4 |            CONST —+IN4 |
| +00000 |    |           +00001 |    |           +00001 |    |
|        |    |                  |    |                  |    |
| CONST —+IN5 |            CONST —+IN5 |            CONST —+IN5 |
| +00000 |    |           +00500 |    |           +00004 |    |
|        |    |                  |    |                  |    |
| CONST —+IN6 |            CONST —+IN6 |            CONST —+IN6 |
| +00000 |    |           +00008 |    |           +00003 |    |
|        |    |                  |    |                  |    |
| CONST —+IN7 |            CONST —+IN7 |            CONST —+IN7 |
| +02003 +————+           +00301 +————+           +00000 +————+
|
| << RUNG 6  STEP #0007 >>
|
|         +————+
|         |    |
+<+>——————+BLKMV+————————————————————————————————————————————————————<+>
|         | INT |
|         |     |
| CONST —+IN1 Q+—%R0122
| +00000 |    |
|        |    |
| CONST —+IN2 |
| +00002 |    |
|        |    |
| CONST —+IN3 |
| +00000 |    |
|        |    |
| CONST —+IN4 |
| +00000 |    |
|        |    |
| CONST —+IN5 |
| +00000 |    |
|        |    |
| CONST —+IN6 |
| +00000 |    |
|        |    |
| CONST —+IN7 |
| +00000 +————+

Program: CHAN4                 C:\LM90\LAN\CHAN4                  Block: _MAIN
```

```
| << RUNG 7  STEP #0010 >>
|
|          +———+                    +———+                    +———+
+<+>———+BLKMV+————————+BLKMV+————————+BLKMV+—————————<+>
|          | INT |                  | INT |                  | INT |
|          |     |                  |     |                  |     |
| CONST —+IN1 Q+—%R0131   CONST —+IN1 Q+—%R0138   CONST —+IN1 Q+—%R0145
| +00017 |     |          +00002 |     |          +00008 |     |
|        |     |                 |     |                 |     |
| CONST —+IN2 |          CONST —+IN2 |          CONST —+IN2 |
| +00000 |     |          +00000 |     |          +00200 |     |
|        |     |                 |     |                 |     |
| CONST —+IN3 |          CONST —+IN3 |          CONST —+IN3 |
| +00008 |     |          +00003 |     |          +00010 |     |
|        |     |                 |     |                 |     |
| CONST —+IN4 |          CONST —+IN4 |          CONST —+IN4 |
| +00001 |     |          +00001 |     |          +00001 |     |
|        |     |                 |     |                 |     |
| CONST —+IN5 |          CONST —+IN5 |          CONST —+IN5 |
| +00000 |     |          +00500 |     |          +00004 |     |
|        |     |                 |     |                 |     |
| CONST —+IN6 |          CONST —+IN6 |          CONST —+IN6 |
| +00000 |     |          +00008 |     |          +00003 |     |
|        |     |                 |     |                 |     |
| CONST —+IN7 |          CONST —+IN7 |          CONST —+IN7 |
| +02003 +———+          +00311 +———+          +00000 +———+
|
| << RUNG 8  STEP #0015 >>
|
|          +———+
+<+>———+BLKMV+———————————————————————————————————<+>
|          | INT |
|          |     |
| CONST —+IN1 Q+—%R0152
| +00000 |     |
|        |     |
| CONST —+IN2 |
| +00003 |     |
|        |     |
| CONST —+IN3 |
| +00000 |     |
|        |     |
| CONST —+IN4 |
| +00000 |     |
|        |     |
| CONST —+IN5 |
| +00000 |     |
|        |     |
| CONST —+IN6 |
| +00000 |     |
|        |     |
| CONST —+IN7 |
| +00000 +———+
|
Program: CHAN4                 C:\LM90\LAN\CHAN4              Block: _MAIN
```

```
| << RUNG 9  STEP #0018 >>
|
|        +———+                  +———+                   +———+
+<+>———+BLKMV+————————————+BLKMV+———————————+BLKMV+——————————————<+>
|        | INT |                | INT |                 | INT |
|        |     |                |     |                 |     |
| CONST —+IN1 Q+—%R0161  CONST —+IN1 Q+—%R0168  CONST —+IN1 Q+—%R0175
| +00017 |     |        +00003 |     |        +00008 |     |
|        |     |                |     |                 |     |
| CONST —+IN2  |         CONST —+IN2  |         CONST —+IN2  |
| +00000 |     |        +00000 |     |        +00200 |     |
|        |     |                |     |                 |     |
| CONST —+IN3  |         CONST —+IN3  |         CONST —+IN3  |
| +00008 |     |        +00003 |     |        +00010 |     |
|        |     |                |     |                 |     |
| CONST —+IN4  |         CONST —+IN4  |         CONST —+IN4  |
| +00002 |     |        +00001 |     |        +00001 |     |
|        |     |                |     |                 |     |
| CONST —+IN5  |         CONST —+IN5  |         CONST —+IN5  |
| +00000 |     |        +00500 |     |        +00004 |     |
|        |     |                |     |                 |     |
| CONST —+IN6  |         CONST —+IN6  |         CONST —+IN6  |
| +00000 |     |        +00008 |     |        +00003 |     |
|        |     |                |     |                 |     |
| CONST —+IN7  |         CONST —+IN7  |         CONST —+IN7  |
| +02003 +———+          +00321 +———+          +00000 +———+
|
| << RUNG 10  STEP #0023 >>
|
|        +———+
+<+>———+BLKMV+——————————————————————————————————————————————<+>
|        | INT |
|        |     |
| CONST —+IN1 Q+—%R0182
| +00000 |     |
|        |     |
| CONST —+IN2  |
| +00004 |     |
|        |     |
| CONST —+IN3  |
| +00000 |     |
|        |     |
| CONST —+IN4  |
| +00000 |     |
|        |     |
| CONST —+IN5  |
| +00000 |     |
|        |     |
| CONST —+IN6  |
| +00000 |     |
|        |     |
| CONST —+IN7  |
| +00000 +———+
|
Program: CHAN4                   C:\LM90\LAN\CHAN4              Block: _MAIN
```

```
| << RUNG 11  STEP #0026 >>
|
|         +———+              +———+              +———+
+<+>———+BLKMV+——————+BLKMV+——————+BLKMV+——————<+>
|       | INT |              | INT |              | INT |
|       |     |              |     |              |     |
| CONST —+IN1 Q+—%R0191  CONST —+IN1 Q+—%R0198  CONST —+IN1 Q+—%R0205
| +00017 |     |        +00004 |     |        +00008 |     |
|        |     |               |     |               |     |
| CONST —+IN2 |         CONST —+IN2 |         CONST —+IN2 |
| +00000 |     |        +00000 |     |        +00200 |     |
|        |     |               |     |               |     |
| CONST —+IN3 |         CONST —+IN3 |         CONST —+IN3 |
| +00008 |     |        +00003 |     |        +00010 |     |
|        |     |               |     |               |     |
| CONST —+IN4 |         CONST —+IN4 |         CONST —+IN4 |
| +00003 |     |        +00001 |     |        +00001 |     |
|        |     |               |     |               |     |
| CONST —+IN5 |         CONST —+IN5 |         CONST —+IN5 |
| +00000 |     |        +00500 |     |        +00004 |     |
|        |     |               |     |               |     |
| CONST —+IN6 |         CONST —+IN6 |         CONST —+IN6 |
| +00000 |     |        +00008 |     |        +00003 |     |
|        |     |               |     |               |     |
| CONST —+IN7 |         CONST —+IN7 |         CONST —+IN7 |
| +02003 +———+        +00331 +———+        +00000 +———+
|
| << RUNG 12  STEP #0031 >>
|
|                                                                   PWR_DLY
|                                                                   %T0016
|       +———+
+<+>———+BLKMV+————————————————————————(S)—
|       | INT |
|       |     |
| CONST —+IN1 Q+—%R0212
| +00000 |     |
|        |     |
| CONST —+IN2 |
| +00005 |     |
|        |     |
| CONST —+IN3 |
| +00000 |     |
|        |     |
| CONST —+IN4 |
| +00000 |     |
|        |     |
| CONST —+IN5 |
| +00000 |     |
|        |     |
| CONST —+IN6 |
| +00000 |     |
|        |     |
| CONST —+IN7 |
| +00000 +———+

Program: CHAN4            C:\LM90\LAN\CHAN4            Block: _MAIN
```

```
| (****************************************************************************)
| (* PWR_DLY activates a 2 second timer.  This timer provides a delay for the *)
| (* Ethernet Controller to complete diagnostics if power is cycled on the    *)
| (* rack.                                                                     *)
| (*                                                                          *)
| (* DOREADS is set on a one—shot to initiate the COMREQ function.            *)
| (****************************************************************************)
|
| << RUNG 14  STEP #0035 >>
|
|PWR_DLY                                                                 DOREADS
|%T0016  +——————+                                                        %T0009
+——] [————+ TMR +——————————————————————————————————————————————————————(^)———
|         |0.10s|
|         |     |
| CONST —+PV   |
| +00020 |     |
|         +——————+
|
|
|        %R0011
|
| << RUNG 15  STEP #0038 >>
|
|DOREADS                                                                 PWR_DLY
|%T0009  +——————+                                                        %T0016
+——] [————+MOVE_+——————————————————————————————————————————————————————(R)———
|         | WORD|
|         |     |
|         |     | RD1CRSW
| CONST —+IN  Q+—%R0001
|   0000 | LEN |
|        |00004|
|        |     |
|        +——————+
|
|
| (****************************************************************************)
| (* If LANIFOK transitions from 0 —> 1, restart all channel read commands.  *)
| (****************************************************************************)
|
| << RUNG 17  STEP #0042 >>
|
|LANIFOK                                                                 RESTART
|%I0048                                                                  %T0014
+——] [——————————————————————————————————————————————————————————————————(^)———
|
| (****************************************************************************)
| (* If any of the channel error bits are set in the LISW, restart read for  *)
| (* channel by setting RS_CHx bit on a one—shot.                            *)
| (****************************************************************************)
|
```

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```
| << RUNG 19  STEP #0045 >>
|
|CH1_ERR                                                              RS_CH1
|%I0050                                                               %T0017
+—] [———————————————————————————————————————————————————————————————(^)—
|
| << RUNG 20  STEP #0047 >>
|
|CH2_ERR                                                              RS_CH2
|%I0052                                                               %T0018
+—] [———————————————————————————————————————————————————————————————(^)—
|
| << RUNG 21  STEP #0049 >>
|
|CH3_ERR                                                              RS_CH3
|%I0054                                                               %T0019
+—] [———————————————————————————————————————————————————————————————(^)—
|
| << RUNG 22  STEP #0051 >>
|
|CH4_ERR                                                              RS_CH4
|%I0056                                                               %T0020
+—] [———————————————————————————————————————————————————————————————(^)—
|
| (****************************************************************************)
| (* The rungs below check the CRSW for each channel to see if the COMREQ is  *)
| (* successful (indicating that the FIRST read was not successful), or if     *)
| (* the COMREQ completed with error (indicating the first read was not        *)
| (* successful).  %T memory locations are set to reflect the CRSW value for   *)
| (* each channel.   Note:  If the channel is tasked to read multiple times,   *)
| (* the CRSW is updated to reflect the success or failure of the FIRST read.  *)
| (* The Channel Error bits are set to reflect the success or failure of       *)
| (* subsequent reads.                                                         *)
| (*                                                                           *)
| (* Note:  The program stops if the COMREQ completes with error(CRSW != 0,    *)
| (* CRSW != 1).  If the COMREQ completes with error (indicating the first     *)
| (* read was not successful) the problem is most likely an incorrect IP       *)
| (* address, or remote node not accessible through the network.  Check        *)
| (* network and COMREQ data block.                                            *)
| (*                                                                           *)
| (*                                                                           *)
| (****************************************************************************)
|
|
```

Program: CHAN4   C:\LM90\LAN\CHAN4   Block: _MAIN

```
| << RUNG 24   STEP #0054 >>
|
|ALW_ON                                                              RD1_OK
|%S0007  +———+                                                       %T0001
+—] [——+ EQ_ |+———————————————————————————————————————————————————————(S)——
|       | INT ||
|       |     ||
|RD1CRSW |     ||
|%R0001 —+I1   Q++
|       |     |
| CONST —+I2   |
| +00001 +———+
|
| << RUNG 25   STEP #0057 >>
|
|ALW_ON                                                              RD1_ERR
|%S0007  +———+              +——————————————————————————————————————————%T0002
+—] [——+ NE_ |              |                                          (S)——
|       | INT |             |
|       |     |             |
|RD1CRSW |     |        +———+|
|%R0001 —+I1   Q+————————+ NE_ ||
|       |     |        |  INT ||
|       |     |        |      ||
|       |     | RD1CRSW |      ||
| CONST —+I2   | %R0001 —+I1   Q++
| +00000 +———+        |      |
|                      |      |
|              CONST —+I2   |
|              +00001 +———+
|
| << RUNG 26   STEP #0061 >>
|
|ALW_ON                                                              RD2_OK
|%S0007  +———+                                                       %T0003
+—] [——+ EQ_ |+———————————————————————————————————————————————————————(S)——
|       | INT ||
|       |     ||
|RD2CRSW |     ||
|%R0002 —+I1   Q++
|       |     |
| CONST —+I2   |
| +00001 +———+
|
```

Program: CHAN4   C:\LM90\LAN\CHAN4   Block: _MAIN

```
| << RUNG 27  STEP #0064 >>
|
|ALW_ON                                                                  RD2_ERR
|%S0007  +———+                              +——————————————————————————   %T0004
+—] [——+ NE_ |                              +—————————————————————————————(S)—
|      | INT |                              |
|      |     |                              |
|RD2CRSW |     |            +———+|
|%R0002 —+I1  Q+—————————+ NE_ ||
|      |     |           | INT ||
|      |     |           |     ||
|      |     | RD2CRSW |     ||
| CONST —+I2  | %R0002 —+I1  Q++
| +00000 +———+            |    |
|                         |    |
|                  CONST —+I2  |
|                  +00001 +———+
|
| << RUNG 28  STEP #0068 >>
|
|ALW_ON                                                                  RD3_OK
|%S0007  +———+                             +—————————————————————————————  %T0005
+—] [——+ EQ_ |+———————————————————————————————————————————————————————————(S)—
|      | INT ||
|      |     ||
|RD3CRSW |     ||
|%R0003 —+I1  Q++
|      |     |
| CONST —+I2  |
| +00001 +———+
|
| << RUNG 29  STEP #0071 >>
|
|ALW_ON                                                                  RD3_ERR
|%S0007  +———+                             +—————————————————————————————  %T0006
+—] [——+ NE_ |                             +——————————————————————————————(S)—
|      | INT |                             |
|      |     |                             |
|RD3CRSW |     |            +———+|
|%R0003 —+I1  Q+—————————+ NE_ ||
|      |     |           | INT ||
|      |     |           |     ||
|      |     | RD3CRSW |     ||
| CONST —+I2  | %R0003 —+I1  Q++
| +00000 +———+            |    |
|                         |    |
|                  CONST —+I2  |
|                  +00001 +———+
|
```

Program: CHAN4   C:\LM90\LAN\CHAN4   Block: _MAIN

```
| << RUNG 30  STEP #0075 >>
|
|ALW_ON                                                                RD4_OK
|%S0007  +——————+                                                      %T0007
+——] [———+ EQ_  |+—————————————————————————————————————————————————————(S)——
|        | INT  ||
|        |      ||
|RD4CRSW |      ||
|%R0004 —+I1  Q++
|        |    |
| CONST —+I2   |
| +00001 +—————+
|
| << RUNG 31  STEP #0078 >>
|
|ALW_ON                                                                RD4_ERR
|%S0007  +——————+                                                      %T0008
+——] [———+ NE_  |                   +—————————————————————————————————————(S)——
|        | INT  |                   |
|        |      |                   |
|RD4CRSW |      |        +——————+    |
|%R0004 —+I1  Q+—————————+ NE_  ||
|        |    |          | INT  ||
|        |    |          |      ||
|        |    | RD4CRSW  |      ||
| CONST —+I2  | %R0004 —+I1  Q++
| +00000 +————+           |    |
|                         |    |
|                 CONST —+I2   |
|                 +00001 +—————+
|
| (*****************************************************************************)
| (* The rungs that follow execute COMREQs for all channels if DOREADS or     *)
| (* RESTART is set or if RS_CHx is set for any channel, and if LANIFOK is     *)
| (* set.   Note:  DOREADS, RESTART and RS_CHx bits are set on a one—shot      *)
| (* so the COMREQs execute once in the scan.                                  *)
| (*****************************************************************************)
|
```

Program: CHAN4   C:\LM90\LAN\CHAN4   Block: _MAIN

```
| << RUNG 33   STEP #0083 >>
|
|DOREADS LANIFOK                                                              CR1_ERR
|%T0009  %I0048  +———+                         +———+                          %T0010
+—] [—+—] [——+MOVE_+————————————————+COMM_|+——————————————————————————(S)——
|      |        | WORD|                        | REQ ||
|RS_CH1 |       |     |                        |     ||
|%T0017 |       |     | RD1CRSW                 |     ||
+—] [—+ CONST —+IN  Q+—%R0001  %R0101 —+IN FT++
|      |  0000 | LEN |                         |     |
|RESTART|       |00001|                         |     |
|%T0014 |       |     |                         |     |
+—] [—+        +———+        CONST —+SYSID|
|                                0002  |     |
|                                      |     |
|                          CONST —+TASK |
|                          00000000 +———+
|
| << RUNG 34   STEP #0090 >>
|
|DOREADS LANIFOK                                                              CR2_ERR
|%T0009  %I0048  +———+                         +———+                          %T0011
+—] [—+—] [——+MOVE_+————————————————+COMM_|+——————————————————————————(S)——
|      |        | WORD|                        | REQ ||
|RS_CH2 |       |     |                        |     ||
|%T0018 |       |     | RD2CRSW                 |     ||
+—] [—+ CONST —+IN  Q+—%R0002  %R0131 —+IN FT++
|      |  0000 | LEN |                         |     |
|RESTART|       |00001|                         |     |
|%T0014 |       |     |                         |     |
+—] [—+        +———+        CONST —+SYSID|
|                                0002  |     |
|                                      |     |
|                          CONST —+TASK |
|                          00000000 +———+
|
| << RUNG 35   STEP #0097 >>
|
|DOREADS LANIFOK                                                              CR3_ERR
|%T0009  %I0048  +———+                         +———+                          %T0012
+—] [—+—] [——+MOVE_+————————————————+COMM_|+——————————————————————————(S)——
|      |        | WORD|                        | REQ ||
|RS_CH3 |       |     |                        |     ||
|%T0019 |       |     | RD3CRSW                 |     ||
+—] [—+ CONST —+IN  Q+—%R0003  %R0161 —+IN FT++
|      |  0000 | LEN |                         |     |
|RESTART|       |00001|                         |     |
|%T0014 |       |     |                         |     |
+—] [—+        +———+        CONST —+SYSID|
|                                0002  |     |
|                                      |     |
|                          CONST —+TASK |
|                          00000000 +———+
|
Program: CHAN4                  C:\LM90\LAN\CHAN4                    Block: _MAIN
```

```
| << RUNG 36  STEP #0104 >>
|
|DOREADS LANIFOK                                                        CR4_ERR
|%T0009  %I0048  +——————+                    +——————+                    %T0013
+——] [——+——] [——+MOVE_+————————————————————+COMM_|+————————————————————————(S)——
|       |       | WORD|                     | REQ ||
|RS_CH4 |       |     |                     |     ||
|%T0020 |       |     | RD4CRSW             |     ||
+——] [——+ CONST —+IN  Q+—%R0004  %R0191 —+IN FT++
|       |  0000 | LEN |                   |     |
|RESTART|       |00001|                   |     |
|%T0014 |       |     |                   |     |
+——] [——+       +——————+        CONST —+SYSID|
|                               0002   |     |
|                                      |     |
|                               CONST —+TASK |
|                             00000000 +——————+
|
|[      END OF PROGRAM LOGIC      ]
|
```

Program: CHAN4   C:\LM90\LAN\CHAN4   Block: _MAIN

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***** L O G I C   T A B L E   O F   C O N T E N T S *****

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Appendix E
PC Software Loader

The GE Fanuc Series 90-30 Ethernet Interface has its operating firmware stored in FLASH memory as opposed to EPROMS. Firmware upgrades for this board are provided on floppy disk. The PC Software Loader utility controls downloading the new firmware from the floppy to the FLASH memory. This utility requires an IBM AT/PC compatible computer with at least 640K RAM, one 3.5 inch floppy drive, MS-DOS 3.3 (or higher), and one RS-232 serial port. This utility functions optimally with a hard drive with at least 1 Mbyte available space.

To install the new firmware, perform the following steps.

1. Stop the PLC CPU. This will allow any existing channels to be terminated gracefully.

2. Hold the Reset button on the Series 90-30 Ethernet Interface until the bottom LED (STAT) turns ON. Upon releasing the button, diagnostics are run and then all 4 LEDs will blink in unison. This signifies that the Interface is in the Software Loader state.

3. Connect the serial port of your computer to the Software Loader Port of the Ethernet Interface with the cable assembly shown below. You must use a port marked "COM1" or "COM2". See Appendix B for more information.

TO THE SOFTWARE LOADER PORT
ON THE ETHERNET INTERFACE   a45484c

HE693SNP232
SNP TO RS232
ADAPTER

Part Number

9–Pin
Female
Connector

25–Pin
Female
Connector

HE693XTADP

9–Pin
Male
Connector

TO THE 9–PIN SERIAL PORT
ON THE PERSONAL COMPUTER

NOTE:
Use the 9–pin to 25–pin adapter to connect to
the 25–pin serial port on the personal computer
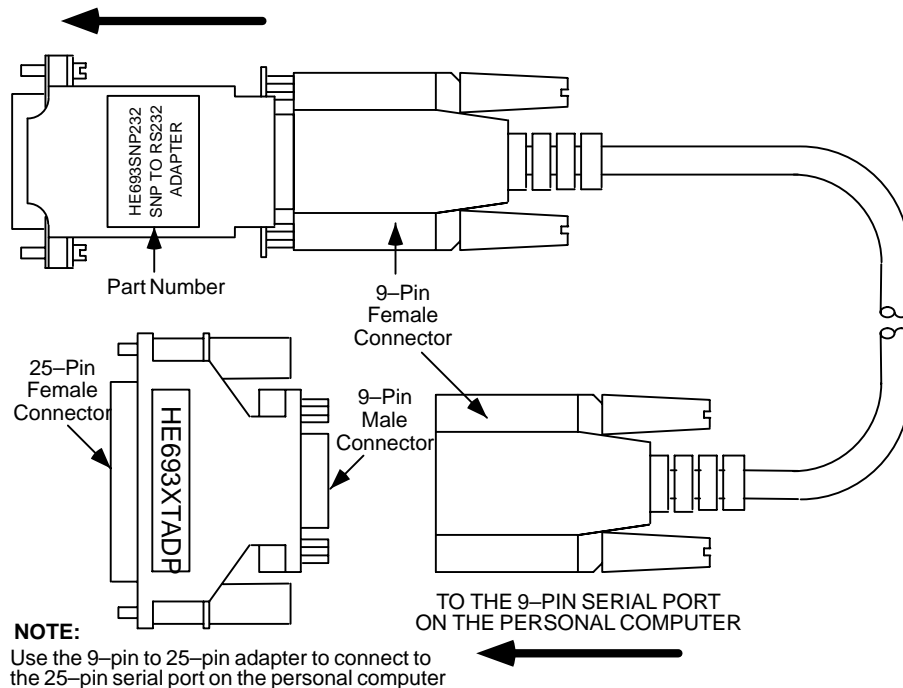
Figure E-1. Software Loader Cable Assembly (IC690ACC901)

4. Insert the supplied floppy disk into your A: or B: drive.

5. At the C:\> prompt, type **A:install** (or **B:install** if you inserted the disk into drive B). The install program will copy several files to the hard drive then invoke the PC Software Loader.

    Alternatively, the install can be run from the floppy drive directly if there is no hard drive or not enough space on the hard drive. To run from the floppy disk, type **A:** or **B:** to change to the drive containing the floppy disk, then type **install** from the A:\> or B:\> prompt. *Important: Running the PC Software Loader directly from the floppy diskette will result in slower operation than running it from the hard drive.* See the notes below if you are using non-default serial port settings or the COM2 port.

Note

If the Software Loader port configuration of the Ethernet Interface was changed from the default values (see Chapter 2, Procedure 2), the PC Software Loader serial port configuration must be changed to the same values before performing step 6 above. Press the **F2 key** at the main menu and select port settings that match the Ethernet Interface configuration.

If you connected the serial cable to COM2 in step 3, you must press the **F3 key** from the main menu and then press the **Tab key** to select COM2.

6. From the main menu, press the **F1 key** to attach to the Ethernet Interface.

7. Once attached, a menu will be displayed which allows the baud rate to be changed from the default 19200 if desired. Most PC compatibles will operate reliably at 38400. To change the baud rate, press the **F2 key**. Press the **TAB key** to toggle through the supported baud rates then press the **Enter key** to change the baud rates of both the PC Software Loader and the Ethernet Interface.

8. When the baud rate change operation is complete, press the **F1 key** to load the new firmware.

9. Press the **"Y" key** to confirm the operation. The load will take several minutes depending on the baud rate and the operating speed of the PC.

    If the load is interrupted prior to completion (power failure, disconnected cable, etc.), redo all the steps above.

Appendix F

Naming Architecture

This appendix gives an overview of the naming architecture concepts used within GE Fanuc Series 90 PLCs.

The goal of the naming architecture is to provide users the ability to think of their Ethernet Interfaces in terms of a symbolic name rather than a numerical address. Use of this symbolic name will be capable in all areas that require an IP Address. This name, commonly referred to as the *Network Address Name*, can be constructed from the following character set:

a-z,   A-Z,   0-9,   '~!@#$%^&*()_+|-=\{}[]:";'<>?,./

Name Assignment

Name assignment implies associating a symbolic name to an IP address. There exist three scenarios where name assignment occurs.

The first deals with the Ethernet Interface using a default mechanism for assigning itself a *Network Address Name*. If the Ethernet Interface has no source for a *Network Address Name* at startup, it will generate a name in the form "cmm742_xxxxxx" where xxxxxx is the ASCII representation of the last six hexadecimal digits of the MAC address used by this module. This mechanism will be used whenever there exists no other configuration source for a name (neither module configuration nor backup data).

The second scenario deals with the assignment of a *Network Address Name* to the Ethernet Interface by the PLC Programmer (if supported). The Network Address Name is configured for an Ethernet Interface and stored into the PLC. If a Network Address Name is not configured at the PLC Programmer, a Network Address Name may be locally defined or modified at the Ethernet Interface with the station manager command "*chmyname.*" This command is documented in the *TCP/IP Ethernet Communications Station Manager Manual*, GFK-1186.

The third scenario dealing with name assignment involves the building of a Name Table which contains a mapping of symbolic names to associated IP addresses. This table may be created at the PLC Programmer (if supported) and stored into the PLC. If a Name Table is not created at the PLC Programmer, a local Name Table may be created within the Ethernet Interface; entries in the local table are added, edited, and deleted using the station manager command "*chnametbl.*" This command is documented in full detail in the *TCP/IP Ethernet Communications Station Manager Manual.*, GFK-1186.

Name Resolution

Name Resolution involves resolving a symbolic name to its necessary address information required for communication. Currently today, a user is required to know this addressing information (i.e., IP address) to establish communication with a remote device. Name Resolution provides users with a means to also use a Symbolic Name to reach the remote destination.

For the purposes of this description, the *client* is the device which needs to resolve a symbolic name. This symbolic namel represents the IP address of the *server*. Possible *clients* include a user of the Host Communications Drivers and users of the client capability on the network adapter (e.g., SRTP Client API). Possible servers include the network adapter (e.g., SRTP Server) and the Host Communications Drivers (e.g., Unsol Msgs).

Name Resolution of a Symbolic Name into an IP address follows a strict precedence rule. Local Table resolution is attempted first, followed by DDP, then DNS. Each of these is described in more detail in the following sections.

Local Table Name Resolution

Local Table Name Resolution involves a simple table lookup to see if a mapping of the Symbolic Name to its IP Address information exists. Configuration of this table is described as the third scenario in the Name Assignment section of this Appendix.

DDP Name Resolution

If Local Table Name Resolution fails, DDP (a GE Fanuc Naming protocol) is used to dynamically resolve the Symbolic Name. This resolution is performed by having the client node broadcast a message on the network asking if anybody recognizes a particular name. If someone does recognize the name, they respond and supply the associated IP address. The client can then proceed with communication directly to that IP address. DDP uses broadcast traffic to perform name resolution. Certain routing configurations do not support routing of broadcast traffic, which implies that DDP Name Resolution will not work over such routers.

DNS Name Resolution

If DDP Name Resolution fails, DNS is attempted. This protocol is an industry standard for resolving symbolic names to IP Addresses. The format of DNS usage is defined by RFC 1034 and 1035. Our implementation conforms to the industry standard. A DNS server is required for this operation.

To use DNS Name Resolution, the IP address of the remote DNS Name Server must be supplied to the Ethernet Interface in the PLC configuration. The symbolic name must be defined at the DNS Name Server device.

Name Usage

Various areas of the PLC system support the use of this naming architecture. They can be broken into two categories: Channel API commands and Station Manager commands.

The Channel API commands have been enhanced to allow for the use of symbolic names in the remote node addressing fields of the COMMREQ Function Block. This is described in further detail in the Chapter 3 of this manual.

In addition to the Station Manager commands described previously in this appendix, the following commands involve use of the name services: *REM, PING, NAMETBL, MYNAME, RESOLVE,* and *BROWSEDDP.* These are described in detail in the *TCP/IP Ethernet Communications Station Manager Manual*, GFK-1186.

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