GE Fanuc Automation

Programmable Control Products

TCP/IP Ethernet Communications for the Series 90™-70 PLC

User's Manual

GFK-1004B *January 1996*

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CIMSTAR	Logicmaster	Series 90	Workmaster
Field Control			

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Content of this Manual

Chapter 1. Introduction: Discusses the TCP / IP Ethernet Interface, the communications software, and the GEnet System Manager.

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. The GEnet System Manager-Station Configuration: Describes the installation and operation of the GEnet System Manager and how to configure a Series 90-70 PLC Ethernet Station.

Chapter 4. Programming Communications Requests: Describes the ladder programming necessary for communications between PLCs.

Chapter 5. The Station Manager: Describes how to use the Station Manager to provide on-line supervisory access to the TCP / IP Ethernet Interface.

Chapter 6. Troubleshooting: Describes troubleshooting and problem isolation for the TCP / IPEthernet Interface.

Appendix A. Glossary of Terms

Appendix B. Communications Port Characteristics

Appendix C. Soft Switch Parameters

Appendix D. DOS System Files

Appendix E. Data Link Error Codes

Appendix F. Forms

Appendix G. Assigning IP and MAC Addresses

Appendix H Sample Ladder Program

Related Publications

GFK-0262	*Series 90™ -70 Programmable Controller Installation and Operation*
GFK-0263	*Logicmaster 90™ Programming Software User's Manual*
GFK-0265	*Logicmaster 90™ Programming Software Reference Manual*
GFK-1029	*Logicmaster 90™ -70-Ethernet TCP/IP User's Manual*
GFK-0870	*Host Communications Toolkit for C/C++ Applications User's Manual*
GFK-1026	*Host Communications Drivers for Microsoft® Windows™ User's Manual*
GFK-1063	*Host Communications Toolkit for Visual Basic™ Applications User's Manual*
GFK-1186	*TCP/IP Ethernet Communications for the Series 90™ -30 PLC Station Manager Manual*
GFK-1084	*TCP/IP Ethernet Communications for the Series 90™ -30 PLC 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.

Chapter 1 Introduction 1-1

The Ethernet Communications System 1-1
The Ethernet Interface 1-2
The GEnet System Manager (GSM) 1-4
How to Make it Work 1-6
Quick Guide to the Manual 1-7

Chapter 2 Installing the Ethernet Interface 2-1

Ethernet Interface Hardware Overview 2-1
Board Indicators 2-3
Restart Button 2-3
Battery 2-4
Serial Port 2-4
AUI (Transceiver) Port 2-4
Default Station Address Label 2-4
Serial Number Label 2-4

Procedure 1: Installing the Ethernet Controller Board in the PLC 2-5

Equipment Required to Perform the Installation Procedures 2-5
Ethernet Controller Board Installation 2-5

Procedure 2: Verifying Proper Power-Up of the Ethernet Interface 2-7

Using the GSM "Access Station Manager" Function 2-7
States of the Ethernet Interface 2-8
Powering-Up the Ethernet Interface 2-9
Problems During Power-Up 2-10

Procedure 3: Configuring the Ethernet Interface with Logicmaster 90-70 (PLC Module Configuration) 2-11

PLC Systems with CPU Firmware Version 5.03 or Later 2-12
PLC Systems with CPU Firmware Versions Prior to 5.03 2-16

Procedure 4: Configuring and Downloading a Station 2-20

Configuring a Station 2-20
Downloading a Station 2-21
Initiating the Download 2-22
Problems During the Download 2-23
How to Issue the LOAD Command from the Station Manager 2-23

Procedure 5: Testing the Ethernet Interfaces on the Network ... 2-24

Field Network Test Utility 2-24
Invoking the Field Network Test Utility 2-25
Running Field Network Test 2-26

Procedure 6: Pinging the TCP/IP Interfaces on the Network 2-30

Chapter 3 The GEnet System Manager–Station Configuration 3-1

What is the GSM? 3-2
Why Does a Station Have to be Configured and Downloaded? 3-2
Connecting the GSM to the LAN Interface 3-3

Section 1: Installing and Starting-Up the GSM 3-4

Hardware Requirements 3-4
Installing the PC Network Card (for Network GSM Operation) 3-5
Installing the GEnet System Manager (GSM) Software 3-6
Setting-Up DOS System Files 3-8
Local GSM Operation (Exclusively) 3-8
Network GSM Operation (or Both Local and Network) 3-8
Unusual Procedures 3-12
Updating or Adding to Existing GSM Software 3-12
Changing the PC Network Card 3-12
Starting-Up the GSM 3-13
Working Your Way through the GSM Menus 3-14
GSM Keyboard Functions 3-15
GSM Menu Structure 3-16

Section 2: Configuring a Station 3-17

Information Needed to Configure a TCP / IP Ethernet Interface Station ... 3-17
Configure a Station Screen 3-17
Creating a Station Configuration File 3-18
Selecting a Station Configuration File 3-20
Deleting a Station Configuration File 3-20
Structure of the MAC Address 3-20
Configuration Editor Menu for Series 90-70 PLCs 3-21
Saving Changes Before Exiting the Configuration Editor Main Menu .. 3-21
TCP / IPParameters Screen 3-22
Advanced Parameters Menu 3-24
Data Link Parameters Screen 3-25
System Parameters Screen 3-27

Section 3: Downloading a Station 3-29

Download Station Screen 3-29
Downloading Locally (Over the Serial Port) 3-29
Downloading Over the Network 3-30

Section 4: Accessing the Station Manager 3-32
Access Station Manager Screen 3-32
Section 5: Using the GSM Support Functions 3-33
List All Stations Screen 3-33
Setup GSM Menu 3-35
Changing the GSM Password Screen 3-35
Set Download Mode Screen 3-36
Set Station Manager Mode Screen 3-36
Exit to DOS 3-36

Chapter 4 Programming Communications Requests 4-1

Section 1: The Communications Request 4-2
Structure of the Communications Request 4-2
COMMREQ Function Block 4-3
COMMREQ Command Block 4-3
Channel Commands 4-3
Status Data 4-4
The Logic Program Controlling Execution of the COMMREQ Function Block 4-4
Operation of the Communications Request 4-5
Section 2: The COMMREQ Function Block and Command Block 4-6
The COMMREQ Function Block 4-6
The COMMREQ Command Block 4-7
Section 3: Channel Commands 4-9
Establishing a Channel 4-9
Aborting and Re-tasking a Channel 4-9
Retrieving Detailed Status on the Channel 4-10
Specifying the Location of the Channel Status 4-10
Establish Read Channel (2003) 4-11
Establish Write Channel (2004) 4-15
Send Information Report (2010) 4-18
Abort Channel (2001) 4-21
Retrieve Detailed Channel Status (2002) 4-22
Assign Channel Status Vector (2000) 4-24
Section 4: Status Data 4-25
Types of Status Data 4-25
Description of the Status Data 4-26
OK Output of the COMMREQ Function Block 4-26
FT Output of the COMMREQ Function Block 4-26
Status Bits 4-26
Communications Status Words 4-29
Minor Error Codes 4-31

Section 5: Controlling Communications in the Ladder Program . 4-34

Essential Elements of the Ladder Program 4-34
Troubleshooting Your Ladder Program 4-37
Monitoring the Communications Channel 4-38
Sequencing Communications Requests 4-39
Data Transfers with One Repetition 4-39

Chapter 5 The Station Manager 5-1

Station Manager Services 5-1

Section 1: Accessing the Station Manager 5-2

Accessing the Station Manager Using the GSM 5-3
Accessing the Station Manager Using an ASCII Terminal 5-4
Remote Operation of the Station Manager 5-4

Section 2: Using the Station Manager 5-5

Using the Monitor Commands 5-6
Using the Modify Commands 5-7
Station Manager Command Syntax 5-8
Task Identification 5-9
Display Data Representation 5-9
Numeric Values 5-9
Byte String Values 5-10
IP Address 5-10
Station Manager in Utility Programs 5-11
Soft Switch Entry Utility 5-11
Field Network Test Utility 5-13

Section 3: Command Descriptions 5-15

CHANNEL Command 5-16
BPS Command 5-17
CHBPS Command 5-17
CHDATE Command 5-17
CHLTIME Command 5-18
CHSOSW Command 5-18
CHTIME Command 5-20
CLEAR Command 5-21
CLSOSW Command 5-21
DATE Command 5-22
EXS Command 5-22
HELP Command 5-22
LOAD Command 5-24
LOG Command 5-24
LOGIN Command 5-25
LOGOUT Command 5-26
LTIME Command 5-26
NET Command 5-26
NODE Command 5-27
OK Command 5-27
PING Command 5-27
PROG Command 5-28
REM Command 5-28
REPORT Command 5-29
REPP Command 5-30
RESTART Command 5-30
SHOW Command 5-31
SOSW Command 5-34
STAT Command 5-34
STOPP Command 5-35
STOPT Command 5-35
TALLY Command 5-36
TEST Command 5-42
TIME Command 5-43
TRACE Command 5-43

Chapter 6 Troubleshooting 6-1

Overview 6-1
Using this Chapter 6-2
What to do if you Cannot Solve the Problem 6-4
The Power-Up State 6-5
The Soft Switch Entry State 6-5
The Field Network Test State 6-6
The Loader State 6-7
The Operational State 6-8
Troubleshooting When STATUS OK LED is OFF 6-8
Troubleshooting When the STATUS OK LED is ON 6-9
Exception Log Event Error Codes 6-10

Appendix A Glossary A-1

Commonly Used Acronyms and Abbreviations A-1
Glossary of Terms A-2

Appendix B Communications Ports Characteristics B-1

Serial Port for Local GSM Communications B-1
Serial Port Settings B-1
Serial Port Pinouts B-1
Serial Cable B-2
Display Terminal Settings B-2
The AUI Port for the Ethernet Interface B-3
Ethernet AUI Port Pinouts B-3
AUI (Transceiver Cable) B-4
Transceiver Description B-4

Appendix C Soft Switch Parameters C-1

Config Mode C-1
Station Address C-2
Load Source C-3
LAN Online C-3
Backplane Online C-3
Network Load Address C-3
Modify Soft Switch Settings C-4
Configuring Soft Switch Parameters C-5
Configuring Soft Switch Parameters Using the GSM C-5
Correct Results of Soft Switch Configuration C-7

Appendix D Sample DOS System Files D-1

3Com Etherlink II D-2
3Com Etherlink 3 ..... D-3
3Com Etherlink 16 ..... D-4
3Com Etherlink / MC D-5
Western Digital EtherCard PLUS, EtherCard PLUS Elite 16, EtherCard PLUS / A D-6
Intel 82593 ..... D-7
Xircom Pocket Adapter (PE2) D-8
Xircom Pocket Adapter (PE3) D-9
SMC EtherCard PLUS, EtherCard PLUS Elite 16, EtherCard PLUS / A D-10
IBM PCMCIA D-11
Optimizing the GSM for Network Operation D-12

Appendix E GEnet System Manager Data Link Error Codes E-1

Appendix F Network Test Form F-1

Test Form F-1

Appendix G Advanced Information About IP and MAC Addresses G-1

IP Addresses G-1
Gateways G-2
Subnets G-3
MAC Addresses G-4

Appendix H Sample Ladder Program H-1

Contents

Figure 1-1. Major Components of the TCP / IP LAN 1-1
Figure 1-2. The Main Tasks for Installing the TCP / IP Ethernet Communications System 1-6
Figure 2-1. Ethernet Controller Board 2-2
Figure 2-2. Ethernet Controller Installation in the Series 90-70 PLC 2-6
Figure 2-3. States of the Ethernet Interface 2-8
Figure 3-1. GEnet System Manager (GSM) on 802.3 LAN 3-1
Figure 3-2. GSM Main Menu 3-13
Figure 3-3. GSM Menu Structure 3-16
Figure 3-4. Configure a Station Screen 3-18
Figure 3-5. Configuration Editor Menu 3-21
Figure 3-6. TCP / IP Parameters Screen 3-22
Figure 3-7. Advanced Parameters Menu 3-24
Figure 3-8. Data Link Parameters Screen 3-25
Figure 3-9. System Parameters Screen 3-27
Figure 3-10. Download Station Screen 3-29
Figure 3-11. Access Station Manager Screen 3-32
Figure 3-12. List All Stations Screen 3-33
Figure 3-13. Setup GSM Menu 3-35
Figure 4-1. Elements of the Communications Request 4-2
Figure 4-2. Operation of the Communications Request for an Establish Read ChannelCommand .. 4-5
Figure 4-3. Format of the COMMREQ Status Word (CRS Word) 4-29
Figure 4-4. Format of the Detailed Channel Status Words (DCS Words) 4-29
Figure 5-1. Station Manager Accessed Locally through the 9–pin Serial Port by a GSM in Local Station Manager Mode (or an ASCII Terminal) 5-2
Figure 5-2. Station Manager Accessed Directly over the Network by a GSM in Network Station Manager Mode 5-2
Figure 5-3. Station Manager Accessed Remotely over the Network by a GSM in Local Station Manager Mode using the REM (Remote) Command 5-3
Figure 6-1. Determining the State of the Ethernet Interface 6-4
Figure B-1. Serial Cable to Connect GSM (25–Pin Connector) to Ethernet Interface B-2
Figure B-2. Serial Cable to Connect GSM (9–Pin Connector) to Ethernet Interface B-2
Figure B-3. Transceiver Cable Connection B-4
Figure B-4. 10Base2 Transceiver Configuration B-4
Figure G-1. IP Address Format for Network Classes A, B, C G-1
Figure G-2. Connecting Two Networks with a Gateway G-2
Figure G-3. Network Configuration Using a Subnet Mask G-3

Table 2-1. Ethernet Controller Board Indicators 2-3
Table 3-1. 802.3 / Ethernet Cards for the PC 3-5
Table 3-2. Default PC Hardware Settings for 802.3 / Ethernet Cards 3-6
Table 3-3. GSM Keyboard Functions (Alt-K) 3-15
Table 4-1. Time Unit Values for Read / Write Repetition Period 4-12
Table 4-2. Series 90-70 PLC Memory Types 4-13
Table 4-3. Status Bits (LIS Bits and Channel Status Bits) 4-27
Table 4-4. Major Error Codes 4-30
Table 4-5. Minor Error Codes for Major Error Codes 05H (at Remote Server PLC) and 85H (at Client PLC) 4-31
Table 4-5. Minor Error Codes for Major Error Codes 5H and 85H (Continued) 4-32
Table 4-6. Minor Error Codes for Major Error Code 11H (at Remote Server PLC) 4-32
Table 4-7. Minor Error Codes for Major Error Code 90H (at Client PLC) 4-33
Table 5-1. Monitor Commands 5-6
Table 5-2. Modify Commands 5-8
Table 5-3. Task Identifiers 5-9
Table 5-4. Soft Switch Entry Utility Commands 5-12
Table 5-5. Field Network Test Utility Commands 5-14
Table 5-6. Control Characters 5-15
Table 5-7. Load Source Parameters 5-19
Table 5-8. Soft Switch Default Values for the Ethernet Interface 5-20
Table 5-9. Log Event Definitions 5-25
Table 5-10. Configuration Parameters 5-32
Table 5-11. PLC Driver Tallies (Tally c) 5-36
Table 5-12. Address Resolution Protocol (ARP) Driver Tallies (Tally f) 5-37
Table 5-13. Channel API Tallies (Tally h) 5-37
Table 5-14. Internet Protocol (IP) Tallies (Tally i) 5-38
Table 5-15. Internet Control Message Protocol (ICMP) Tallies (Tally j) 5-39
Table 5-16. Data Link Tallies (part of Tally l) 5-40
Table 5-17. MAC Layer Tallies (part of Tally l) 5-40
Table 5-18. Service Request Transfer Protocol (SRTP) Server Tallies (Tally v) 5-41
Table 5-19. Transmission Control Protocol (TCP) Tallies (Tally w) 5-41
Table 6-1. Ethernet Interface Diagnostic Tools 6-2
Table 6-2. Power-Up State 6-5
Table 6-3. Soft Switch Entry State 6-6
Table 6-4. Field Network Test State 6-6
Table 6-5. Loader State 6-7
Table 6-6. Operational State 6-8

Table 6-7. Troubleshooting with ONLINE LED OFF 6-9
Table 6-8. Troubleshooting with ONLINE LED ON 6-10
Table 6-9. Exception Log Event Definitions 6-10
Table 6-10. Exception Log Event Codes 6-11
Table B-1. Pinouts of the Serial Port B-2
Table B-2. Pinouts of the AUI Port B-3
Table B-3. 10Base5 Transceiver Configuration B-5
Table C-1. Soft Switch Settings C-4
Table E-1. GEnet System Manager Data Link Error Codes E-1
Table E-2. NDIS Error Codes E-3

Chapter 1 Introduction

This manual describes the Series 90-70 *Ethernet Interface* and the *GEnet™ System Manager Software (GSM).*

The Series 90-70 *Ethernet Interface* and the *GSM,* together with applications running on other Series 90-70 or 90-30 PLCs and host computers, form a complete TCP / IP Communications System for the Series 90-70 PLC. The host application can be Logicmaster 90-70-TCP / IP Software or an application developed using the Host Communications Toolkit (HCT). GE Fanuc offers the Logicmaster 90-70-TCP / IP software product and the Host Communications Toolkit product separate from the *Ethernet Interface* and *GSM*.

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

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

The Ethernet Communications System

The Figure 1-1 shows the major components of the Ethernet Communications System, along with a third- party compatible device, together on one Ethernet cable. Note especially the two main parts of the Ethernet Communications system, the *Ethernet Interface* and the *GEnet System Manager Software,* and the separation of functions between them.

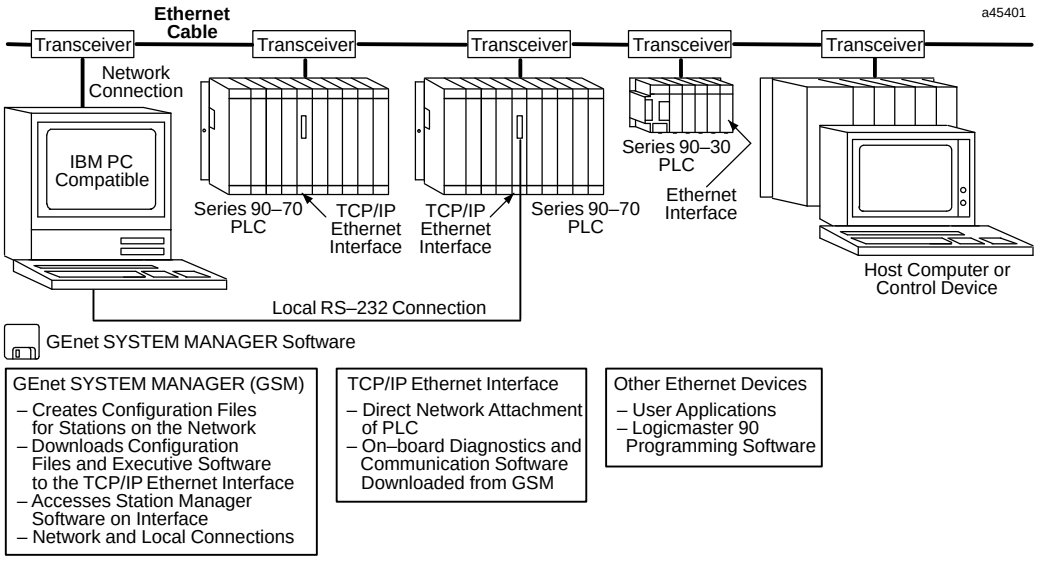

Figure 1-1. Major Components of the TCP/IP LAN

The *Ethernet Interface* allows you to directly attach the Series 90-70 PLC to an Ethernet LAN via a user-supplied transceiver and AUI cable, and to communicate with other PLCs, hosts, and other control devices on the network.

The Ethernet Interface for the Series 90-70 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 90-70 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.

The Ethernet Interface

An operational *Ethernet Interface* consists of the Ethernet controller board with resident firmware and the *Ethernet Interface* software downloaded from the *GEnet System Manager*. (It is the TCP / IP-Ethernet software that distinguishes this product from the similar MMS-Ethernet product.) The Ethernet controller board provides a physical connection from the PLC to the Ethernet LAN. It also is shipped with on–board diagnostics, a download program to complement the downloader on the *GEnet System Manager*, and a utility program that permits testing the cable plant. The controller board becomes a fully functional communications interface only after downloading additional software from the *GEnet System Manager*.

Capabilities of the Ethernet Interface

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

- **Directly attach your PLC to an Ethernet network.** The Ethernet Interface allows you to directly attach the Series 90-70 PLC to an Ethernet LAN via a user-supplied transceiver and AUI cable, and to communicate with host computers and other Series 90 PLCs on the local network.
- **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 90-70 PLC through the server capability of the Ethernet Interface. Supported computer operating systems include Windows™ for Workgroups, 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.

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

  It is also compatible with GE Fanuc Logicmaster 90-70 TCP / IP Ethernet and GE Fanuc HCT Ethernet products available on DEC, HP, IBM, and other computer platforms runningTCP / 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 the network or the 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 thus allowing it to communicate to the Series 90 PLC via the Ethernet Interface.

Attachment of the Ethernet Interface to the LAN

The AUI port provides the electrical and mechanical interface to the user-provided Ethernet transceiver cable, which connects the AUI port to an external user-provided 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”.

The Ethernet Controller 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. 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 thickwire Ethernet segment.

10Base2 Coax: 10Base2 uses a 0.2 inch diameter 50–ohm coaxial cable. The maximum length of a cable segment is 185 meters. A maximum of 30 stations is allowed on a thinwire 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 fiberoptic 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 Ethernet Software

As stated above, the *Ethernet Interface* becomes fully functional only after additional software is downloaded from the *GEnet System Manager*. The downloaded software consists of:

The Station Manager. The Station Manager provides On–Line supervisory access to the Ethernet Interface, through either the serial port on the controller board or over the Ethernet cable. These 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.

Note

The Ethernet Interface firmware provides some Station Manager functions. Downloaded software adds commands to provide more functionality.

Communications Software. This software consists of the TCP / IP protocol stack and interface software interfacing the protocol stack with the PLC.

Configuration File. This configuration data consists of an IP address for the Interface, a subnet mask, and the IP address of a gateway. This data is overridden by any TCP mode configuration configured for the Ethernet Interface in the LM90 configurator.

The GEnet System Manager (GSM)

The *GEnet System Manager* is a menu–driven software package that runs on a user–provided Workmaster or IBM PC. The GSM provides various management and configuration tools. The GSM can be connected to the *Ethernet Interface* either with a serial RS–232 cable, or over the Ethernet cable. When used over Ethernet, one GSM can conveniently access any of the *Ethernet Interfaces* on that cable.

The most essential GSM tools are:

- The Configuration Editor
- The Downloader
- Access to the Station Manager on the Ethernet Interface

In addition, the GSM has the following functions:

- Examine the list of configured *Ethernet Interfaces*.
- Examine and modify network–wide configuration parameters.

Note

Typically, there will be only one GSM on the network. It will contain configuration information and communications software for all the GEnet stations on the network.

The Configuration Editor

The Configuration Editor is a menu–driven software package that is part of the GSM. It is used offline to examine and modify configuration parameters for the GE Fanuc Series 90-70 *Ethernet Interfaces* on your network. These configuration parameters are stored in files on the PC hard disk and subsequently downloaded to the interface using the GSM Downloader.

The Downloader

The Downloader is a utility which transfers the Communications Software and the Configuration File to the *Ethernet Interface*. The Downloader operates in two modes, *local (RS232)* and *network*. The Downloader and the download mode are selected in the main screen of the GSM.

Access to the Station Manager on the Ethernet Interface

The *Ethernet Interface* provides an interactive maintenance interface called the Station Manager (described in Chapter 5). The Station Manager allows you to view current and historical information about the operation of the Ethernet Interface. The GSM provides access to the Ethernet Interface and Station Manager in both *local* and *network* modes. Access to the Station Manager and the access mode are selected in the main screen of the GSM.

How to Make it Work

There are a number of tasks required to get your Ethernet Communications System working. These tasks involve not only the *Ethernet Interface* and the *GEnet System Manager Software*, but also *Logicmaster Configuration and Programming Software*. The figure below illustrates what the tasks are for each part of the system.

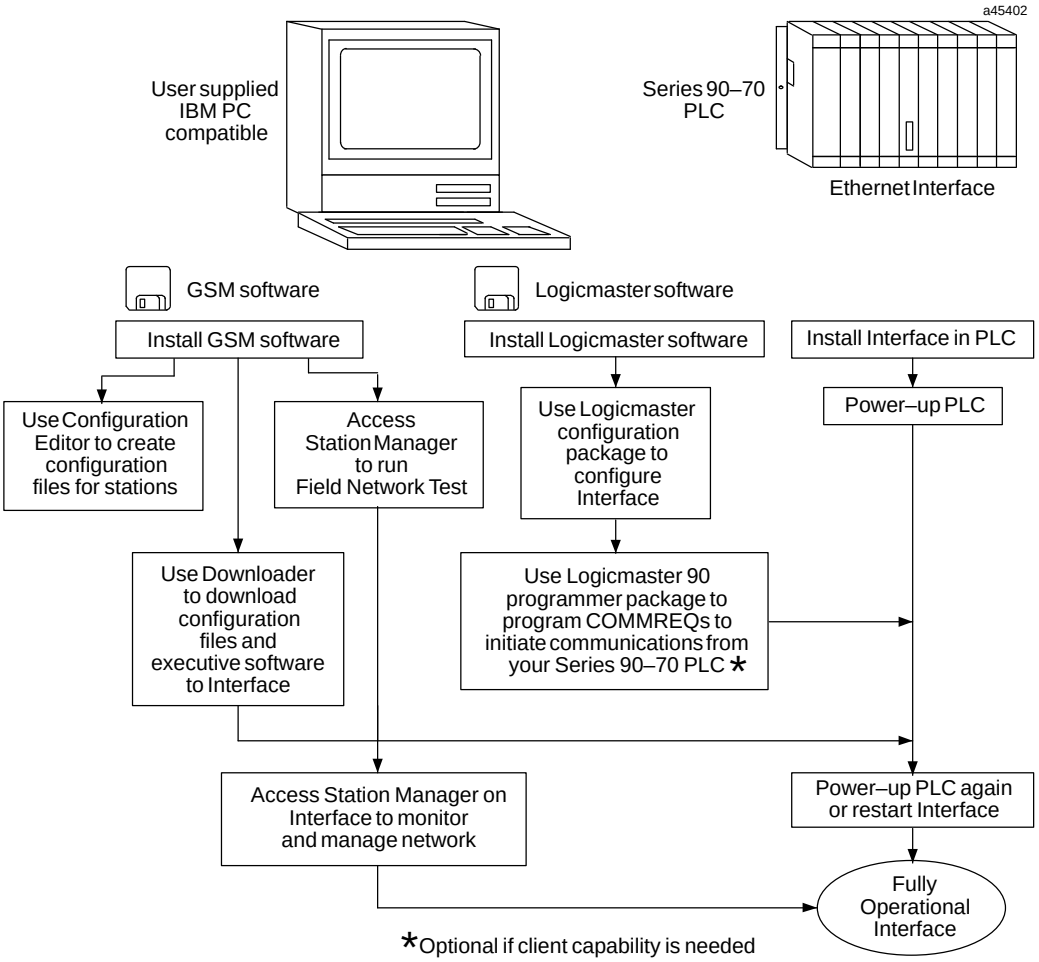


Figure 1-2. The Main Tasks for Installing the TCP/IP Ethernet Communications System

Quick Guide to the Manual

As you can see from Figure 1–2, the tasks to install the TCP / IP Communications System fall into three categories:

1. GEnet System Manager (GSM) Tasks
2. Ethernet Interface Tasks
3. Logicmaster Configuration and possibly Programming Tasks

The table below breaks down these tasks and identifies where in the manual they are described.

Tasks	Where to go in the Manual
GEnet System Manager (GSM)	
Installing, Starting Up, and Using the GSM	Chapter 3. The GEnet System Manager Section 1. Installing and Starting–Up the GSM
Configuring Stations	Chapter 3. The GEnet System Manager Section 2. Configuring Stations
Downloading a Station	Chapter 3. The GEnet System Manager Section 3. Downloading a Station
Accessing the Station Manager (Terminal Emulation Mode)	Chapter 3. The GEnet System Manager Section 4. Accessing the Station Manager Chapter 5. The Station Manager
Ethernet Interface	
Installing the Interface	Chapter 2. Installing the Ethernet Interface Procedure 1. Installing the Interface
Powering–Up the Interface	Procedure 2. Verifying Proper Power–Up of the Interface
Configuring the Module (Setting Soft Switch Configuration)	Procedure 3. Configuring the Interface with the Logicmaster 90-70 Configurator
Field Network Tests	Procedure 5. Testing the TCP/IP Interfaces on the Network
PING Application Connection Tests	Procedure 6. Pinging the TCP/IP Interfaces on the Network
Monitoring the Station and Managing the Network	Chapter 5. The Station Manager
Troubleshooting the Interface on the Network	Chapter 6. Troubleshooting
Logicmaster Configuration/Programming	
Configuring the Module	Chapter 2. Procedure 3. Configuring the Interface with the Logicmaster 90-70 Configurator
PLC Ladder Programming (COMMREQ)	Chapter 4. Programming Communications Requests

Chapter 2 Installing the Ethernet Interface

This chapter describes the basic features of the Ethernet Interface, its installation, and a procedure for its initial checkout on your Ethernet cable. The chapter first provides an overview of the Ethernet Controller Board, which is the hardware component of the Ethernet Interface. It is then divided into six sequential Installation Procedures, each providing an overview of the procedure, explaining the steps to be performed, and describing the expected results.

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: Installing the TCP / IP Ethernet Controller Board in the PLC Rack - *Required*
- Procedure 2: Verifying Proper Power-Up of the Ethernet Interface - *Required*
- Procedure 3: Configuring the Ethernet Interface with the Logicmaster 90-70 Configurator - *Required*
- Procedure 4: Configuring and Downloading a Station - *Required*
- Procedure 5: Testing the Ethernet Interfaces on the Network - *Optional*
- Procedure 6: Pinging the Ethernet Interfaces on the Network - *Optional*

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

After 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 equipment is working properly.

Ethernet Interface Hardware Overview

The Ethernet Controller board is mounted in the Series 90-70 PLC rack. It is connected to an external transceiver via a user-provided transceiver cable. The external transceiver is then connected to the Ethernet cable. The figure below shows the layout of the Ethernet Controller board.

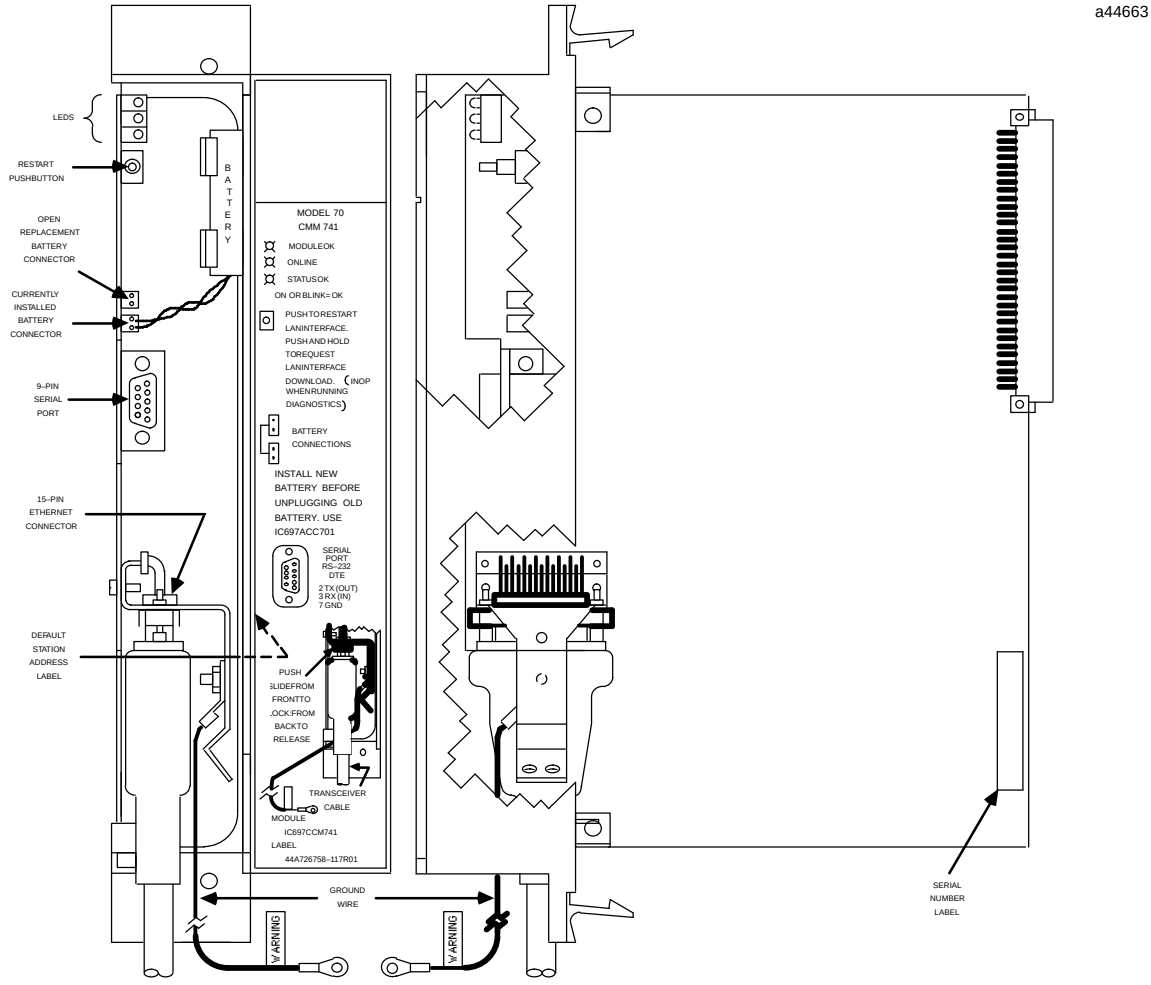


Figure 2-1. Ethernet Controller Board

The Ethernet Controller board has several user-accessible elements.

Three LEDs are located at the top of the board. The Restart pushbutton is located immediately below the LEDs. The battery and battery holder is located to the right of the LEDs. The battery connectors are located on the controller board between the Restart button and the 9-pin connector to the serial port. The 15-pin connector, located beneath the serial port and facing downward, is the transceiver port. The Default Station Address label is affixed on the outside of the plastic housing.

Board Indicators

There are three LEDs on the Ethernet Controller board. The table below describes the meaning of the LED patterns for all possible states.

Table 2-1. Ethernet Controller Board Indicators

Indicator	Status	Description
MODULE OK	ON	MODULE OK is ON if the Ethernet Interface has passed diagnostics and its hardware is operating properly.
	OFF	It is OFF if the module fails a diagnostic test or if a fatal failure is detected while the board is running.
	BLINKING	This LED is blinking if the module is running diagnostics or is in Soft Switch Entry state. If this LED and the STATUS OK LED are blinking together, diagnostics have completed and the operator is being given a chance to enter Field Network Test.
ONLINE	ON	ONLINE is ON when the Ethernet Interface is connected to and ready to communicate on the network.
	OFF	This LED is OFF when: ■ the station is not communicating on the network due to disconnection or a disruption of the cable. ■ the local station has malfunctioned, or the Ethernet Interface has been commanded not to enter the network, or is in a state where network operation is inappropriate, such as Soft Switch Entry state or localloading.
	BLINKING	It is BLINKING when the module is transferring data on the network or loading over the network.
STATUS OK	ON	STATUS OK is ON if the module is running without exceptionconditions.
	OFF	This LED is OFF if the module is running and detects an event that calls for supervisory attention. In this case you should connect the GSM and follow the instructions in Chapter 5 to obtain further information.
	BLINKING	This LED is BLINKING if the module is loading or looking for a load source for the Ethernet Interfacesoftware.

Restart Button

The Restart button serves two functions: Restart, and Restart and Reload. The Restart button is inaccessible when the door to the Ethernet Controller board is closed.

Restart: Pressing the Restart button (for fewer than 5 seconds) forces a restart of the Ethernet Interface. The power-up diagnostics run and the software on the module is restarted when the pushbutton is released.

Restart and Reload: Pressing and holding the Restart button for 5 seconds or more forces a restart and requests a reload of the Ethernet Interface. When the Restart button is pressed, all LEDs go out. After 5 seconds have elapsed, the STATUS OK LED comes ON, to indicate that the Ethernet Interface will request a reload. After the Restart pushbutton is released, the power-up diagnostics run and the Ethernet Interface requests to be loaded.

Notes

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

The Restart Pushbutton will not be operable during the Ethernet Controller board diagnostic phase. The Ethernet Controller board is in diagnostic phase when the BOARD OK LED is BLINKING and the ONLINE and STATUS OK LEDs are off.

Battery

When connected, the battery preserves the contents of RAM when there is no power to the board. The battery will maintain RAM contents for a minimum of six months.

Warning

The lithium battery presents a fire, explosion, or severe burn risk. Do NOT: recharge it, remove its polarized connector, disassemble it, heat it above 100C (212F), incinerate it, or expose its cell contents to water. Dispose of the battery as required by applicable ordinances or regulations. When replacing the battery, use only Catalog No. IC697ACC701. Use of another battery could result in ignition or explosion of the battery. Replacement batteries can be ordered from GE Fanuc Automation - NA or any GE Fanuc Authorized Distributor.

Serial Port

The 9-pin serial port (RS-232 interface) is used to connect to the GEnet System Manager (GSM). The communication software on the distribution diskette may be loaded through this port. A cable is needed to connect the GSM to the Ethernet Interface (see Appendix B, Communications Ports Characteristics). The faceplate of the Ethernet Interface must be open to connect the cable. The serial port may also be used with a serial terminal for local Station Management.

AUI (Transceiver) Port

The 15-pin AUI port provides the electrical and mechanical interface to the user-provided IEEE 802.3 transceiver cable, which connects the AUI Port to an external Ethernet-compatible transceiver (see Appendix B for the characteristics of the AUI Port). The external transceiver is directly connected to the Ethernet cable.

Default Station Address Label

The Default Station Address label lists the station address to be used by this module, unless changed by the user via soft switches.

Serial Number Label

The Serial Number Label indicates the serial number of this controller board.

Procedure 1: Installing the Ethernet Controller Board in the PLC

This section describes the physical installation of the Ethernet Controller board into the Series 90-70 PLC rack. For information on the installation procedures for the rack, 90-70 CPU, Power Supply, and other Series 90-70 modules, refer to GFK-0262, *Series 90-70 Programmable Controller Installation and Operation User's Manual*.

Equipment Required to Perform the Installation Procedures

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

- A Series 90-70 PLC rack.
- A Series 90-70 power supply.

Note

The Ethernet Interface requires a power supply that can provide +5 Vdc and +12 Vdc. Use one of the following power supplies:

IC697PWR711 IC697PWR724
IC697PWR721 IC697PWR748
IC697PWR731

- A Series 90-70 CPU.
- An operating Logicmaster™ 90-70 system (serial, parallel, or network version).
- A Workmaster®, or IBM-compatible personal computer.
- The Ethernet Interface software diskette.
- A copy of the data sheet applicable to your Ethernet Controller board and cable plant.
- A certified Ethernet-compatible transceiver and Ethernet cables.
- A serial cable for the RS-232 connector on the Ethernet Controller board (see Appendix B).

Ethernet Controller Board Installation

The Ethernet Controller board installation is summarized here.

1. Read and record the 12-digit default station address (MAC address) from the printed label on the Ethernet Controller board. A Station Configuration Data Form is provided in Appendix F for your convenience in recording the station configuration information.
2. Be sure the Series 90-70 PLC rack power is OFF.
3. Connect the battery to either of the battery connectors on the controller board.
4. Slide the Ethernet Controller into the Series 90-70 PLC slot for which it was configured in the system - normally the first available slot to the right of the CPU. The controller must be placed in the main rack.

Press firmly to lock the board in place, but do not force the board.

Note

The Ethernet Controller board will not operate properly if there are empty slots to the left of the slot you select.

5. Connect the free end of the safety wire (18 inch long green wire attached to the Ethernet Controller board) to the ground lug at the side of the Series 90-70 PLC rack. (See Figure 2-2).

Warning

The ground wire must be securely fastened to the chassis of the Series 90-70 PLC rack and the rack must be properly grounded. Failure to do so may cause personal injury and/or improper operation of the LAN.

6. Connect the transceiver cable into the 15-pin AUI Port of the Ethernet Controller board. Secure the cable with the slide latch mechanism. 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. ***SQE must be enabled on the transceiver.***
7. Set the CPU Run / Stop switch to STOP.
8. Continue with Procedure 2: Verifying Ethernet Interface Power-Up.

Ethernet Controller Board Installed in Series 90-70 PLC Rack

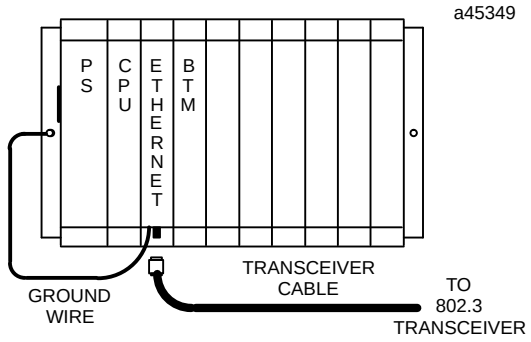


Figure 2-2. Ethernet Controller Installation in the Series 90-70 PLC

Note

The Ethernet Controller board must be installed in the main rack; installation in an expansion rack is not supported.

Procedure 2: Verifying Proper Power-Up of the Ethernet Interface

Before powering–up the Ethernet Interface, you may wish to connect the GEnet System Manager (GSM) *locally* to the Ethernet Interface, and select the "Station Manager" function from the GSM Main menu. This allows you to observe the progress of the power–up diagnostics via the Station Manager software on the Ethernet Interface. The GSM is also used to perform other operations in subsequent Installation Procedures.

Refer to Chapter 3, "The GEnet System Manager", for instructions on installing the GSM software on a user-supplied PC-compatible computer.

Note

Alternately, you can use a dumb terminal, or another terminal emulation product on a PC. However, you will probably find it most convenient to use the GSM since you will be using the GSM for other configuration purposes in subsequent steps.

If you do not use the GSM, configure the terminal for 9600 bps, 8 bits, no parity, and 1 stop bit. See Appendix B, for instructions on making the serial cable.

Using the GSM "Access Station Manager" Function

The Station Manager software on the Ethernet Interface is accessed by connecting the Ethernet Interface to a Workmaster or other computer running the GSM software and selecting the "Station Manager" function from the GSM main menu.

1. There are two ways the GSM can be physically connected to an Ethernet Interface: Local Connection and Network Connection.

Note

To observe the progress of Power–Up Diagnostics described in this procedure and to invoke the Field Network Test Utility described in Installation Procedure 5, the GSM must be connected *locally* and put in the Local Station Manager Mode.

   A. **GSM Using Local Connection.** Connect the COM1 RS–232 serial port on the device running the GSM to the 9–pin connector on the Ethernet Interface. Refer to Appendix B, for instructions on how to make the RS–232 cable.

   B. **GSM Using Network Connection.** Connect the Ethernet card on the device running the GSM to the Ethernet Network.

   C. For now, use the Local connection.

2. Power–up the computer (on which you have previously installed the GSM software) into DOS. Refer to Chapter 3 for the GSM installation procedure.

3. Set the PC default directory to the GSM directory, by typing:

   ```
   C:\> cd \gsm
   ```

4. Start–up the GSM by typing:

   ```
   C:\GSM> gsm
   ```

5. At the password screen, type in the password. The default password is “gsm”.

6. Once the GSM Main Menu appears, go into the Setup GSM functions to set the Station Manager communications mode to Local, exiting with <ALT-U>.

7. From the GSM Main Menu, cursor to the “Station Manager” function and press Enter to select.

   If you selected *Local Mode* in step 6, the GSM will automatically access the Station Manager of the locally connected Ethernet Interface. If you are prompted for “Station Name”, you did not select Local Station Manager mode. Repeat step 6.

States of the Ethernet Interface

The figure below shows the 5 possible states of the Ethernet Interface. The states are distinguished by LED patterns and by unique Station Manager NODE command and prompt outputs.

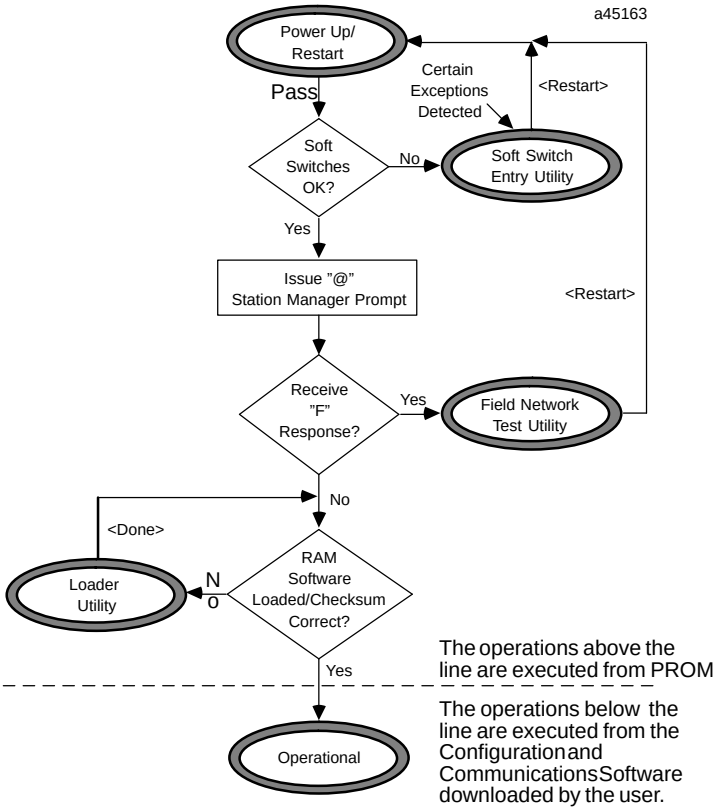


Figure 2-3. States of the Ethernet Interface

The Ethernet Interface will normally transition from the Power–Up State to the Operational State without entering any other state.

If there is a problem with the Soft Switch data, however, the Ethernet Interface will transition automatically to the Soft Switch Entry utility (see Appendix C for instructions). And if you have not previously downloaded a station configuration to the Ethernet Interface, the Ethernet Interface will transition automatically to the Loader utility (see Procedure 4 for instructions). Also, the operator may manually cause the Ethernet Interface to enter the Field Network Test utility.

Powering-Up the Ethernet Interface

Follow the procedure below to verify that the Ethernet Interface is operating correctly.

1. Power–up the PLC. This will initiate a series of diagnostic tests.

   Upon power–up the *Module OK* LED blinks, *On Line* and *Status OK LEDs* are OFF.

2. Observe the *local* Station Manager screen if connected. If power–up is successful, then a Station Manager message similar to the following will be displayed, normally within 15 seconds

```
IC697 PLC Factory LAN Interface
Copyright (c) 1990-1995.  All rights reserved.
PROM version 2.00 (XXAx),Software version (xxAx)
TCP/IP Ethernet
IP address = 3.0.0.1
MAC address = <<080019010177>> MAC default = <<080019010177>>
EM7A2
```

3. Also, the LEDs will have the following pattern upon successful power up. At this time the Ethernet Interface is in the Operational State and Online with no exception conditions

LED	Ethernet Interface Online
Module OK	ON
On Line	ON/Traffic Blink
Status OK	ON

Problems During Power-Up

The Ethernet Interface may not transition directly to the Operational State upon power–up or restart. It may stop in another state or a fault may have been detected. Refer to the table below for possible states your Ethernet Interface can assume after completion of power-up diagnostics.

LED Pattern	Where Stopped	Possible Cause	Corrective Actions
MODULE OK On STATUS OK Blinking	Loader utility	Interface requires a (re)load of communications software.	Load the Communication Software. See Procedure 4.
MODULE OK On ONLINE Off	Operational	Transceiver or transceiver cable not (properly) connected. SQE not enabled on transceiver. LAN Online Soft Switch* set to NO.	Connect cable & transceiver. Set SQE ON on transceiver in accord with manufacturer's instructions. Use LM90 configurator to set LAN Online Soft Switch* to "YES". See Procedure 3.
MODULE OK On ONLINE On STATUS OK Off	Operational	Exception condition occurred.	Use the Station Manager LOG command as explained in Chapter 6 under the section, "Troubleshooting When STATUS OK LED is OFF".
MODULE OK Blinking Slowly	Soft Switch Entry utility	Invalid Soft Switch Data. Soft Switch Data checksum invalid. System Software detected incompatible MAC address assignments. Certain system errors. IP address = 0.0.0.0	Correct Soft Switch Data and Restart or Reload Ethernet Interface. See Procedures 3 and / or 4.
MODULE OK Off	Power-Up / Restart	Fatal Error.	Inspect the Interface for loose components, reseat the Interface, and Restart. Recheck Logicmaster 90 Configuration. Examine PLC Fault Table for clues. If the problem persists, replace the Interface.

* MMS-ETHERNET configuration mode only

Procedure 3: Configuring the Ethernet Interface with Logicmaster 90-70 (PLC Module Configuration)

Before you can use the Ethernet Interface with the Series 90-70 PLC, you must define the Ethernet Interface to the PLC. This is called *module configuration*. This is done through the Logicmaster™ 90-70 configuration software. The Logicmaster 90-70 configuration software allows you to specify the modules and I/O that will reside in your Series 90-70 PLC rack(s).

As of Logicmaster 90-70 release 6, you may define either a TCP/IP configuration mode or an MMS-ETHERNET configuration mode for the Series 90-70 Ethernet Interface. All Logicmaster 90-70 configuration software earlier than release 6 provided only MMS-ETHERNET configuration mode.

MMS-ETHERNET configuration mode is primarily used for configuring the Ethernet Interface for running the MMS-Ethernet software (refer to GFK-0868, *MMS-Ethernet Communications for the Series 90-70 PLC User's Manual*). The MMS-Ethernet software cannot operate with a TCP/IP configuration mode. The TCP/IP Ethernet software can run with either MMS-ETHERNET configuration mode or TCP/IP configuration mode, but certain new features are supported differently. For example, the location of the sixty-four (64) Channel Status bits is configured by Logicmaster 90-70 in TCP/IP configuration mode, but must be specified in an Assign Channel Status Vector COMMREQ in MMS-ETHERNET configuration mode. See Chapter 4, Programming Communications Requests, for more details.

Note

GE Fanuc LAN Interfaces are assigned a unique location for LAN Interface Status (LIS) in the Logicmaster 90-70 Configurator Package. The location of the LIS is set when configuring the slot for the Ethernet Interface.

Note

The Logicmaster 90-70 Configurator is distinct from the GEnet System Manager (GSM) Configuration Editor. The Logicmaster 90-70 Configurator defines a module in the Series 90-70 PLC to the PLC CPU. The GSM Configuration Editor defines the Ethernet Interface relative to other nodes in the network.

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

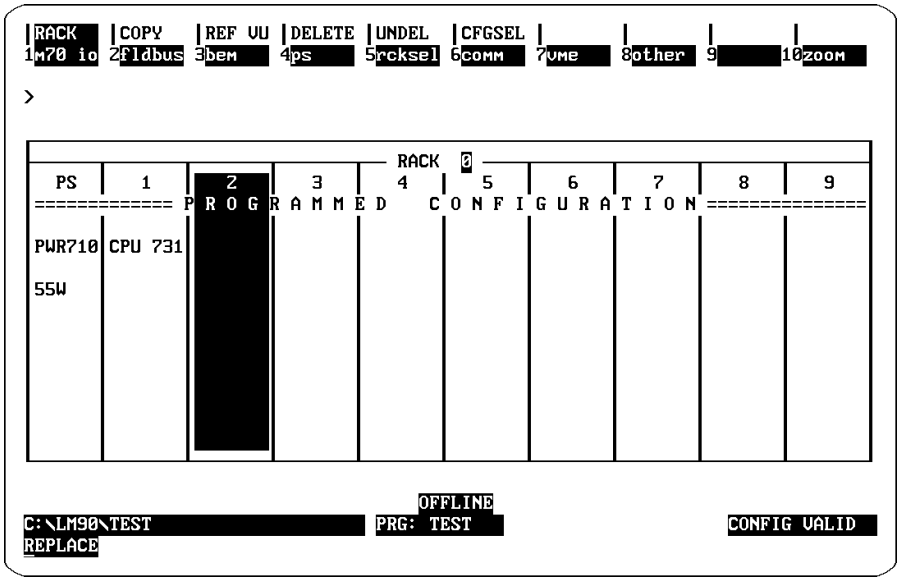
- Define the configuration mode for the Ethernet Interface (TCP/IP or MMS-ETHERNET).
- Define the status address of the Ethernet Interface.
- Assign the IP Address for the Ethernet Interface, and optionally the Subnet Mask and the Gateway Address (TCP mode only).
- Configure the GSM parameters (optional).

To configure the Ethernet Interface:

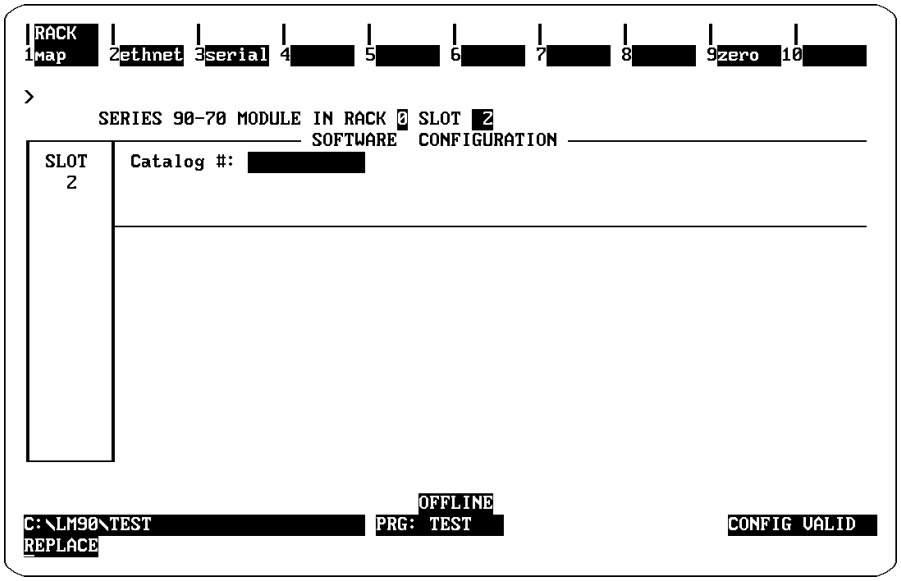
Go to the I/O Configuration rack screen in the Logicmaster 90-70 Configuration Package, and follow the steps listed in the appropriate section below: PLC Systems with CPU Firmware Version 5.03 or later, or PLC Systems with CPU Firmware Version prior to 5.03.

PLC Systems with CPU Firmware Version 5.03 or Later

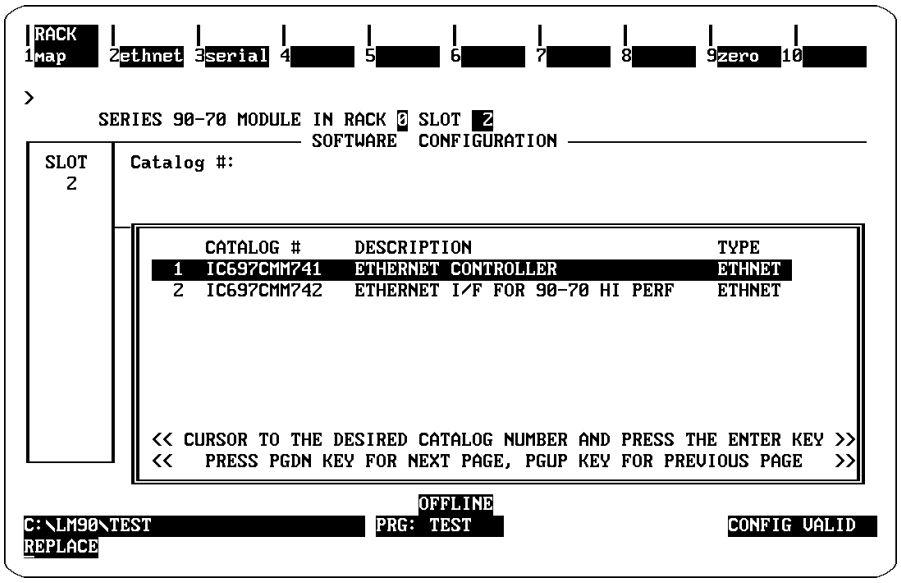
1. Move the cursor to the desired rack and slot location. The slot may be either unconfigured or previously configured.



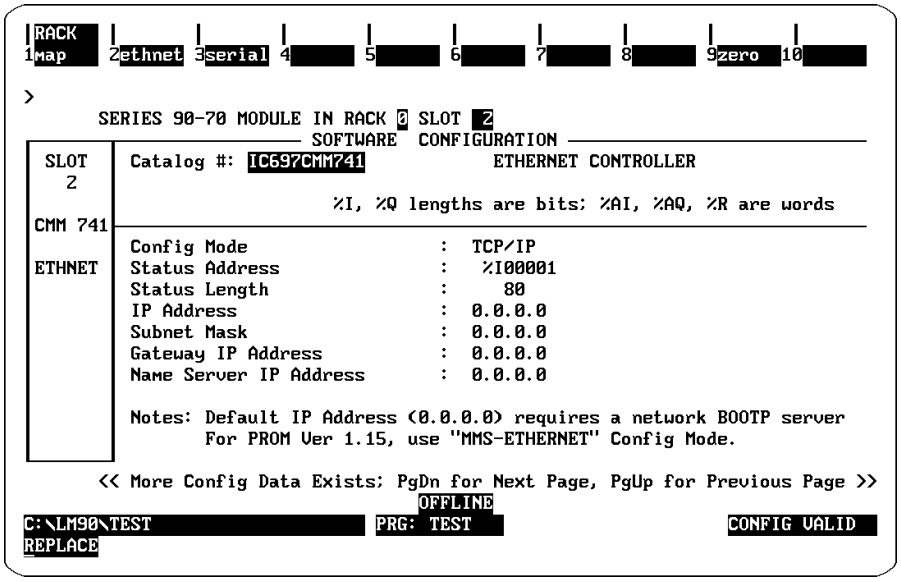
2. Press the **Communications** softkey, i.e., **Comm (F6)**. Your screen display will change to the one shown on the following page.



3. Press **ethnet (F2)**. Your screen display will change to the one shown below.



4. Make sure Ethernet Interface IC697CMM741 is selected and press **Enter**. The configuration screen for the Ethernet Interface will appear.



Configuration Mode: This currently defaults to TCP / IP. If your Ethernet Interface PROM version is 1.15 or earlier, or if its TCP / IP software is version 1.28 or earlier, you must use MMS-ETHERNET configuration mode.

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: For TCP / TP configuration mode, 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

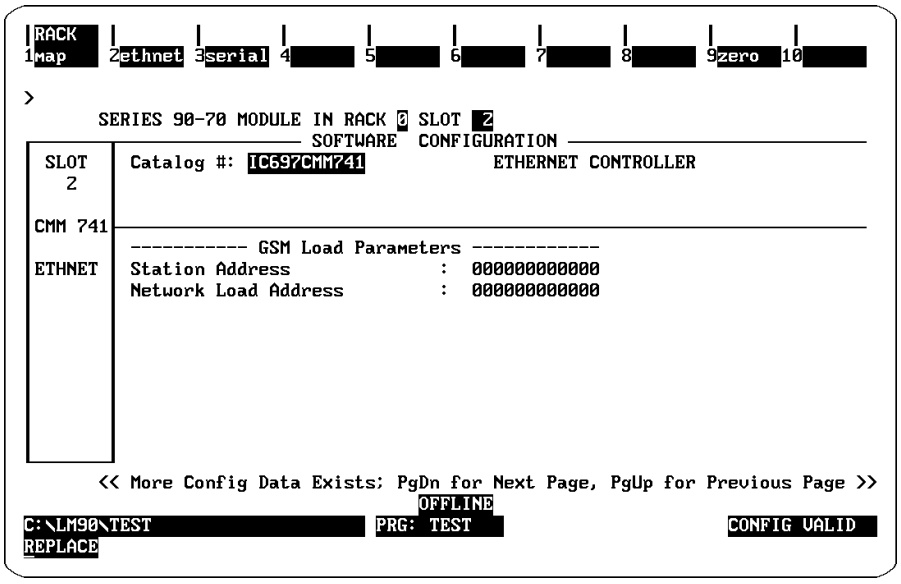
Also, on an *isolated network*, the Subnet Mask, Gateway IP address, and Name Server IP address can all be 0.0.0.0. (The Name Server IP address is not currently used and is reserved for future use.)

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.



The Logicmaster 90-70 Configurator also allows you to optionally configure the MAC (Station) Address and Network Load Address in TCP / IP configuration mode.

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.

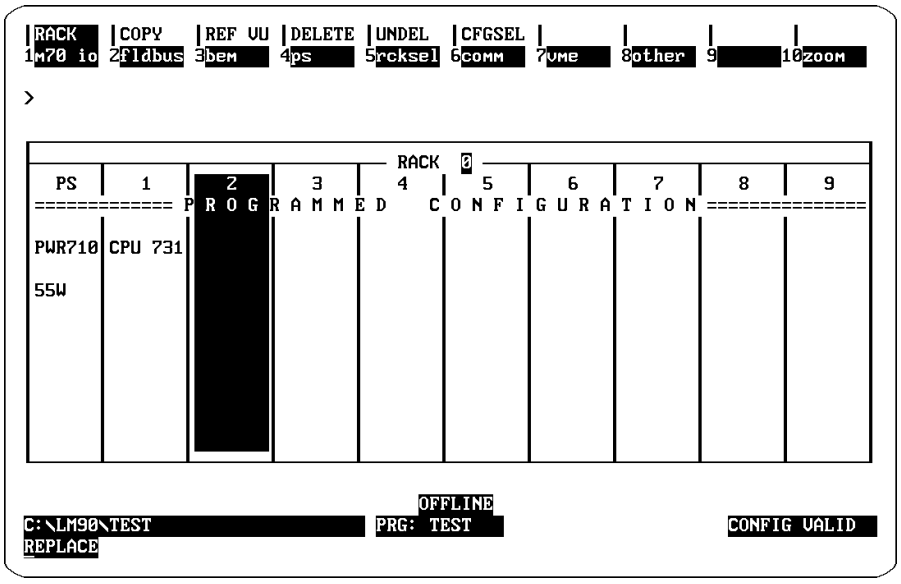
Refer to GFK-0263, *Logicmaster 90 Series 90-70 Programming Software User's Manual* for more information on configuring the Ethernet Interface using Logicmaster 90-70 software.

PLC Systems with CPU Firmware Versions Prior to 5.03

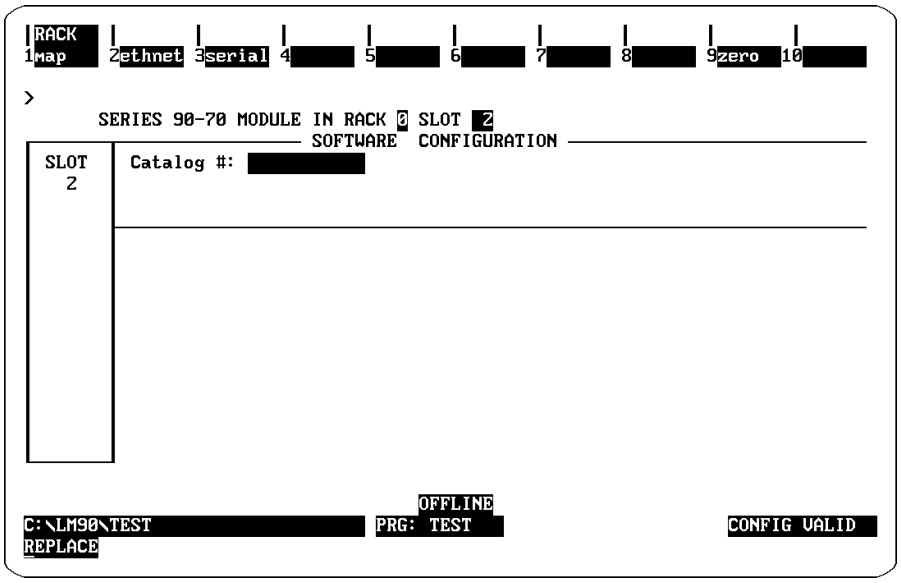
In order to support TCP / IP configuration mode, you must have Logicmaster 90-70 release 6 and PLC CPU firmware version 5.03 or later. Certain CPU models (CPU 780, 788, and 789) cannot support firmware version 5.03 or later. To allow support of TCP / IP Client features (COMMREQs) in pre-5.03 CPUs that cannot support TCP / IP configuration mode. We support reduced functionality Client support through MMS-Ethernet configuration mode.

To compensate for the lack of TCP / IP configuration mode, the pre-5.03 CPU user must take two additional steps that the users of TCP / IP configuration mode do not: (1) configure TCP / IP parameters (including the IP address of the Ethernet Interface) in the GSM, and (2) use the Assign Channel Status Vector COMMREQ to specify the location of the sixty-four (64) Channel Status bits.

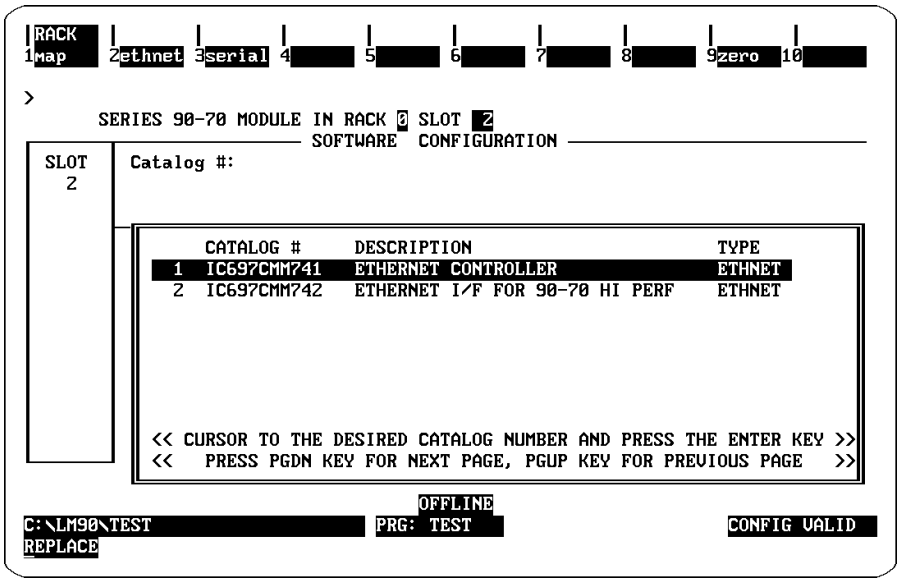
1. Move the cursor to the desired rack and slot location. The slot may be either unconfigured or previously configured.



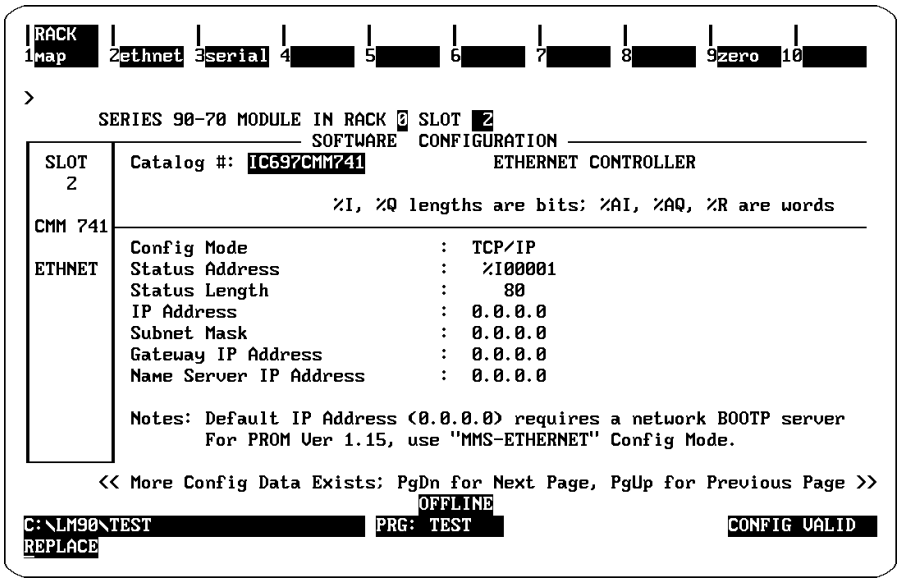
2. Press the **Communications** softkey, i.e., **Comm (F6)**. Your screen display will change to the one shown on the following page.



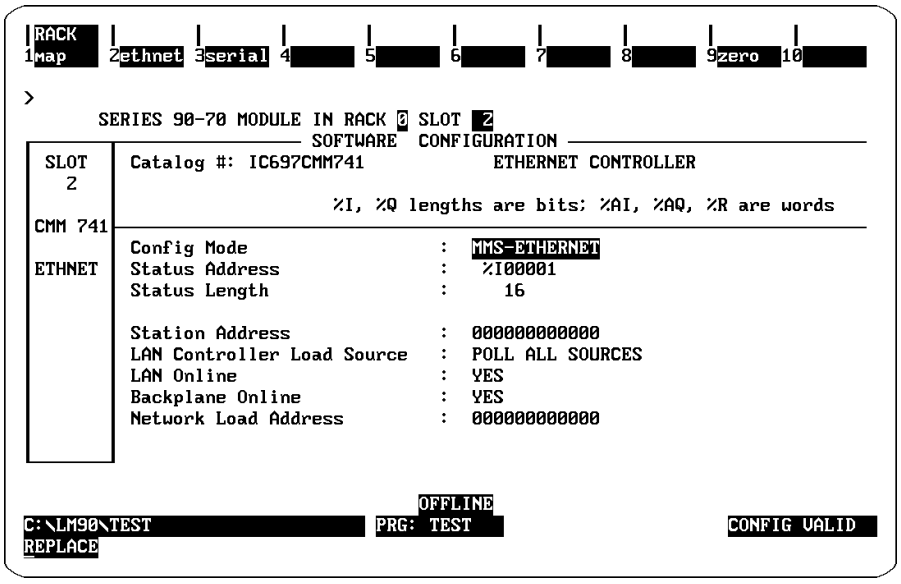
3. Press Ethernet **(F2)**. Your screen display will change to the one shown below.



4. Make sure Ethernet Interface IC697CMM741 is selected and press **Enter**. You will then see the screen shown below.



5. Move the cursor to the Config Mode field showing TCP / IP and press **Tab**. This changes the field to MMS-ETHERNET. Press **Enter** to accept the change. The fields in the screen will change as shown below.



Configuration Mode: This defines the Logicmaster configuration mode. MMS-Ethernet mode is required for Ethernet Interface firmware 1.15 or earlier.

Status Address: This is the location in PLC CPU memory of the sixteen (16) LAN Interface Status (LIS) bits. To specify the location of the Channel Status bits, use the Assign Channel Status Vector COMMREQ.

Note

Do not use the 16 bits assigned to the LIS bits for other purposes or your data will be overwritten.

Status Length: For MMS-Ethernet configuration mode, this is fixed at 16 bits.

Station Address: The Station address is the MAC address of the Ethernet Interface. If this field is left as all zeroes, the factory-assigned default MAC address (see the label on the Ethernet Interface's faceplate).

LAN Controller Load Source: This identifies where the Ethernet Interface should look for a GSM download. The choices are:

- SERIAL PORT - Only look for a download through the 9-pin serial port on the front of the Ethernet Interface.
- NETWORK - Only look for a download through the Ethernet network.
- POLL ALL SOURCES - Alternate looking for a download from the serial port and from the Ethernet network.

LAN Online: This parameter allows the Ethernet Interface to access the Ethernet network (YES) or not (NO) after completing its power-up diagnostics. A setting of NO will prevent any network activity until a configuration with a YES setting is received by the Ethernet Interface.

Backplane Online: This parameter allows (YES) or disallows (NO) data transfer across the PLC VME backplane. A setting of NO will prevent any COMMREQs and prevent any host-requested data transfers from occurring until a configuration with a YES setting is received by the Ethernet Interface.

Network Load Address: This specifies the GSM "group" to which this Ethernet Interface belongs. If there is only one GSM on the network, or if this Ethernet Interface will only be loaded serially, then this parameter should be left at the default value of all zeroes.

Procedure 4: Configuring and Downloading a Station

For the Ethernet Interface to become a fully *Operational* station, you must perform two GSM operations.

- Create a station configuration file for the Ethernet Interface.
- Download the configuration file and communications software to the Ethernet Interface.

Each Ethernet Interface requires configuration information and communications software in order to operate. The configuration information must be created and stored in a file using the GSM Configuration Editor for that type of Ethernet Interface. This configuration file is downloaded to the Ethernet Interface along with the communications software. The file is retained on the PC hard disk for a permanent record of the configuration for each Ethernet Interface in the network.

The configuration information consists of an IP address, a subnet mask, and an IP address of a gateway. Configuring a station also associates particular communications software with the MAC address of the station for subsequent downloading (communications software for GE Fanuc CNC Ethernet Interfaces and for GE Fanuc Series 90-70 PLC Ethernet Interfaces is different). Therefore, a unique configuration file must be created for each Ethernet Interface.

Configuring a Station

The configuration procedure is performed offline on a personal computer. It is not explained here, but is found in Chapter 3, "The GEnet System Manager" as described below.

- ***To install the GSM software on a user–supplied Workmaster or PC Compatible, refer to Chapter 3, Section 1, "Installing and Starting–Up the GSM".***
- ***To configure a station refer to Chapter 3, Section 2, "Configuring a Station".***

The type of parameters you may need to configure include:

- Station Name, Type, and MAC Address (always required)
- TCP / IPParameters (IP address, subnet mask, and IP address of a gateway)

Downloading a Station

The software that handles the Ethernet Interface communication services must be loaded into each Ethernet Interface on the network. This software is loaded together with the configuration file for each station. The software can be loaded into the Ethernet Interface through the serial port (locally) or across the network.

When Must a Station Be Downloaded?

- When the Ethernet Interface is initially configured.
- When you wish to reload the Ethernet Interface with new parameters (i.e., configuration was modified).
- When you wish to reload the Ethernet Interface with a different software version.
- When an Ethernet Interface is replaced for any reason.

Note

An Ethernet Interface must be configured on the GSM before it can be downloaded by the GSM. See instructions immediately preceding.

Setting-Up the GSM and the Ethernet Interface for the Download

Start by deciding whether you will load *locally* or over the *network*. Downloading requires a physical connection (communication cable) between the Ethernet Interface and the GSM. This may be either the *local* RS-232 cable (described in Appendix B) or an Ethernet *network* connection.

The Network Download Mode is recommended (if you have an Ethernet Interface installed in the device running the GSM) because the time to download is less than 30 seconds. A download in Local Download Mode takes about 2 minutes due to the lower data rate of the RS–232 link.

Downloading requires cooperation between the Ethernet Interface and the GSM. *Both* must be in appropriate states, and *both* must be using the same download communication facility, i.e., *local* or *network*.

Before attempting the download make sure you have fulfilled the conditions in the following table.

Note

The MAC Address and Load Source Soft Switch of the Ethernet Interface are normally determined by the Logicmaster configuration, as set in “Procedure 3: Configuring the Ethernet Interface with Logicmaster 90-70 (PLC Module Configuration)”.

	GSM	Ethernet Interface
MAC Address	You must configure a station with the *MAC Address* of the Ethernet Interface you are going to download.	The *MAC Address* of the station must match the MAC Address of the configuration to be downloaded from the GSM
Download Mode/ Load Source	*Download Mode* The *Download Mode* must be set so that it is compatible with the physical connection to be used. Set the *Download Mode* to local or network as appropriate using the "Setup GSM" function in the GSM Main Menu.	*Load Source* The *Load Source* Soft Switch parameter* must be compatible with the physical connection used to connect to the GSM. The *Load Source* options are: ALT - Accepts either a local or a network download, wherever it finds the Download Server. Factory Default. LOC - Accepts only a local download. NET - Accepts only a network download.
Loader State	After putting the Ethernet Interface into the *Loader State* (right column), see instructions immediately below, "Initiating the Download".	The Ethernet Interface must be in the *Loader State* to receive a download. a. If the Ethernet Interface is new from the factory, it will automatically enter the *Loader State* when powered up. Also, unless overridden by the PLC CPU configuration (set in Procedure 3), the MAC Address will be the default address (shown on a label on the board, see Figure 2-1), and the *Load Source* will be ALT. b. For a previously installed Ethernet Interface, if you are physically close to it, press and hold the Restart/Load Button on the front of the Ethernet Interface until the STATUS OK LED comes ON (about 5 seconds). If you are not physically close to the Ethernet Interface and it is not in the *Loader State*, you can issue the Station Manager *LOAD* command to the Ethernet Interface. See the section below entitled "How to Issue the *LOAD* Command from the Station Manager."

* MMS-ETHERNET configuration mode only

Initiating the Download

When the conditions above have been satisfied, initiate the download by selecting the Download Station function from the GSM Main Menu.

Local Downloading

If the GSM was in the *Local* Download mode when you initiated the download, you will be prompted for the STATION_NAME of the station to be downloaded. Type in the name and press Enter. (The STATION_NAME parameter is the name that you assigned to the station when it was initially configured.) Then the download will proceed.

When the local download is complete, the GSM changes automatically to Local Station Manager access. At this time the Ethernet Interface MODULE OK LED should remain ON, and the STATUS OK LED should stop blinking and remain ON. The ONLINE LED should be ON if the station is connected to the Ethernet network. A sign-on message (NODE command output) should appear on the Station Manager screen of the GSM.

Network Downloading

If the GSM was in the *Network* Download mode when you selected Download Station, the download will proceed automatically, assuming the Ethernet Interface is connected to the Ethernet network and is Online.

When the network download is complete, the GSM remains in the Download Server mode waiting for a download request (from any other stations requesting to be downloaded). At this time the Ethernet Interface MODULE OK LED should remain ON, and the STATUS OK LED should stop BLINKING and remain ON, and the ONLINE LED should be ON.

Problems During the Download

After the download, the Ethernet Interface should transition to the Operational State. This is indicated by the MODULE OK and the STATUS OK LEDs remaining ON. If this is not the case, refer to "Problems During Power-Up" in Procedure 2.

How to Issue the *LOAD* Command from the Station Manager

If the Ethernet Interface is not already in the *Loader State*, you must place it in the *Loader State* before attempting a download to it. You can press and hold the Restart/Load push-button until the STATUS OK LED comes on, or you can issue the *LOAD* command to the Ethernet Interface from the Station Manager as explained below.

1. Go to the Setup GSM functions from the GSM Main Menu and set the Station Manager Mode to "Local" or "Network" depending on how the GSM is connected to the Ethernet Interface.
2. Select the Access Station Manager function from the GSM Main Menu.
3. If you selected the Local Station Manager mode, skip to step 4.

   If you selected the Network Station Manager mode the Station Name window will appear. Enter the STATION_NAME of the station you wish to access and press **Enter**. (The STATION_NAME parameter is the name that was assigned to the station when it was initially configured.) NOTE: If the station cannot access the network, you will not receive any response to this command. You will need to correct that problem before proceeding further.
4. Log on to the station. Type "login system" and press **Enter**. If you are prompted to enter a password, type "system" ("system" is the default station password) and press **Enter** again. NOTE: If the station cannot communicate over the link you're using, you will not receive any response to this command. You will need to correct that problem before proceeding further.
5. Type "load" and press Enter. This causes the station to request a load.
6. Press **Esc** to exit the Station Manager and return to the GSM Main Menu. Continue at the preceding section, "Initiating the Download".

Procedure 5: Testing the Ethernet Interfaces on the Network

This procedure shows you how to verify operation of the physical network to provide the necessary foundation for reliable communications.

This procedure will ensure that:

- The cable plant is functional,
- The physical connection of each node is functional,
- All transmission paths meet or exceed the expected low bit error rate.

When you are testing the network, be sure there is an adequate explanation for anything unusual. Logging of exceptions should be the exception, not the rule. Properly setup nodes and networks can run for long periods (weeks or months) without logging exceptions.

Field Network Test Utility

This section describes the use of the Field Network Test Utility that is built into the Ethernet Interface.

All software and configuration needed to perform these tests is contained in the Ethernet Interface as it is shipped from the factory. You do not need to download the communications software from the GSM for these tests, however, you may optionally change Soft Switch parameters as described previously. (However, if you have loaded communications software, the Field Network Test Utility will still operate properly, and the software you loaded will be preserved.) The default parameters provided will work on any network with up to 50 nodes. For larger networks, consult GE Fanuc Automation – NA if you need assistance to determine how to test your network.

Note

After you have established confidence in your particular application and configuration parameters, you can periodically re–test your physical network *while the applications are running*. This is done by using the *TEST* Station Manager command, but without invoking the Field Network Test Utility. All the Station Manager commands available in Field Network Test Utility are also available when the Ethernet Interface is fully operational.

Invoking the Field Network Test Utility

To invoke the Field Network Test Utility you need to connect the GSM *locally* to one of the Ethernet Interfaces on the network.

- ***Refer to Chapter 3, "The GEnet System Manager", for instructions on installing the GSM software on a user supplied Workmaster or IBM–PC Compatible computer.***
- ***See Installation Procedure 2 in this chapter for instructions on using the terminal emulation feature of the GSM.***

Note

Alternately, you can use a dumb terminal, or another terminal emulation product on a PC. However, you will probably find it most convenient to use the GSM terminal emulation feature since you will be using the GSM for other configuration purposes. Configure the terminal for 9600 bps, 8 bits, no parity, and 1 stop bit.

Perform the following steps to invoke the *Field Network Test Utility.*

1. Connect the GSM *locally* to one of the Ethernet Interfaces on the Network you are testing.
2. Power up the PLC (if power is already on, you need to cycle power or press the Restart push–button on the Ethernet Interface).
3. After step 7 of the power–up diagnostic is complete, the "@" symbol will appear on the terminal device. After the "@" symbol appears, you have 3 seconds to enter the single character ("F" or "f") to invoke the Field Network Test Utility. The "F" will not be echoed back. Any characters other than "f" or "F" are ignored. If you do not see a startup message displayed like the one shown below, press the Restart button on the Ethernet Interface (or cycle power on the station) and repeat this step.

   The expected startup message upon entering the Field Network Test Utility is similar to the one shown here:

```
@
IC697 PLC Factory LAN Interface
Copyright (c) 1990-1995.  All rights reserved.
PROM Version 2.00 (xxAn)
MAC address = <<08001901001f>>, MAC default = <<08001901001f>>
EM7A2


<<< Field Network Test Utility >>>
$
```

4. Repeat steps 1 through 3 for each Ethernet Interface to be tested.

Running Field Network Test

Once all stations are running the Field Network Test Utility, you will use the Station Manager to run tests to verify that the cable plant is operating correctly and to examine statistics about network performance.

The procedure below describes the steps to be performed for the Field Network Test.

1. Select a station to be the test initiator and connect the GSM to this station. This may be any Ethernet Interface. If your application uses a particular node to communicate with most others, we suggest you designate this node as the test initiator.

Note

All commands described in this procedure are issued from your test initiator.

2. Enter the command:

```
$ test all              :   Lists all nodes on operating network.
```

or

```
$ test 010000000000     :   Lists all GE Fanuc nodes on operating network.
```

The response to "test all" will return a list of the MAC addresses of all nodes attached to the network and presently operating. (This list may include other vendor's nodes since the standard IEEE 802.2 test response mechanism is used. Testing other vendor's nodes is, however, beyond the scope of this procedure. Ignore responses from these nodes.)

Caution

Using either of the addresses "all" or "01000000000" to access stations on the network is recommended *only* under controlled test conditions. Execution of Station Manager commands on an operational network using these addresses may generate a great deal of traffic and might degrade network or node performance temporarily.

Compare this list with the nodes in the network. If all expected nodes are not listed, double-check that each node is powered up, is running the Field Network Test Utility, and has its drop cable or transceiver cable connected.

Correct any deficiencies and repeat steps 1 and 2 until all nodes to be tested are in the response list.

This procedure assumes that all stations attached to the network remain either powered or not powered continuously from step 2 through step 6. Turning any node(s) ON or OFF or Restarting any node during this test will artificially inflate the error count.

3. Clear the error log and LLC and MAC tallies in all GE Fanuc *test responde*rs in the test. This step cannot be performed for non–GE Fanuc devices using the Station Manager.

   This step can be done for all Ethernet Interfaces at one time by executing the following *REM*ote commands:

```
$ rem 010000000000 login system   :   Logon to all GE Fanuc stations
$ rem 010000000000 clear log      :   Clear logs of all GE Fanuc stations
$ rem 010000000000 clear tally    :   Clear tallies of all GE Fanuc stations
```

Note

   Pressing ***Ctrl–R*** will display the last command executed. This is especially helpful when you are repeating similar commands. Simply display the previous command, change the desired part of the command, and press Enter.

   This step can be done for individual Ethernet Interfaces by executing the following set of *REM*ote commands for *each* Ethernet Interface to be tested.

```
$ rem <node> login system
$ rem <node> clear log
$ rem <node> clear tally
```

   where <node> is the 12–digit MAC address of the target node.

4. To clear the error log and LLC and MAC tallies in the *test initiator* Ethernet Interface, issue the following commands:

```
$ clear log
$ clear tally
```

5. Issue the desired *TEST* command to initiate the network test.

```
$ test 010000000000 1000 50 256   :Tests all GE Fanuc stations on the
                                       network
```

   or

```
$ test all 1000 50 256            :Tests all stations on the network
```

   The *TEST* command causes the test initiator to broadcast 1000 test command frames of varying lengths and data patterns to all GE Fanuc nodes or all nodes of all types on the network. All nodes receiving these commands are expected to send a similar test response back to the initiating node. The initiating node counts all responses from each responding node.

   This command will take about 10 minutes to complete. When the command is complete, a report like the following should be displayed.

```
<<< Test Results >>>                                    Page 1 of 1

Command:  test  <<ffffffffffff>>   3e8H 32H 100H ALT
Init Node: <<08001901001f>> Frames sent: 3e8H Nodes responding: 4H
Responding nodes    Response recd  Response w/err    No Response
<<08001901027d>>      3e8H               0H              0H
<<080019010163>>      3e8H               0H              0H
<<080019010043>>      3e8H               0H              0H
<<08001901012c>>      3e8H               0H              0H
```

This *TEST ALL* command and report shows performance over the network between the initiating node and each responding node, at a rate comparable to what an application might experience. For further information, see the descriptions of the *TEST* and *REPORT* commands in Chapter 4.

Verify that all GEnet stations under test are included in the list, either as the initiating node or as a responding node. Also, all GEnet stations should report,

- 3e8H Responses received,
- 0H Responses with error, and
- 0H No Responses. (A No Response will occur occasionally. But, on average, a No Response should occur no more than *once* with the *TEST* command above executed with 40,000 frames instead of 1,000 frames.)

Transcribe this report onto a clean copy of the Ethernet Network Test Data Sheet found in Appendix F, Forms. If you are testing a network with many nodes, you may need more than one data sheet.

6. When the *TEST ALL* command has completed and its results have been transcribed, gather the accumulated error log and LLC and MAC tallies from all GEnet stations by sending the following commands to each station. Transcribe all non–zero results to the Data Sheet.

```
$ rem <node> log
$ rem <node> tally l
```

7. Get the exception log and LLC and MAC tallies from the initiator by issuing the following commands:

```
$ log
$ tally l
```

Transcribe all non–zero results to the Data Sheet.

The LOG response from each node, including the initiator, should appear as follows:

```
REM$ <<<Exception Log>>>
REM$ Exception log empty
```

Make a notation on the Network Test Data Sheet that the log is empty, or record the values, if any, reported in the log response message.

The TALLY L response from *each* station should appear as follows:

```
REM> <<< Data Link Tallies >>>
REM> Unreg    = 0000H   Lsap0    = 0000H   LsapOfl  = 0000H   EthUnreg = 0000H
REM> MacErr   = 0000H   BufProb  = 0000H   UnrecPdu = 0000H   TstRcvd  = 0000H
REM> TstResp  = 0000H
REM>
REM> <<< MAC Tallies >>>
REM> SQEErr   = 0000H   MisdPack = 0000H   FrameErr = 0000H   SuccOne  = 0000H
REM> CrcErr   = 0000H   RbufErr  = 0000H   LateCol  = 0000H   LostCarr = 0000H
REM> BsyCar   = 0000H   NoRtry   = 0647H   SuccMore = 0000H   FRtry    = 0000H
```

The *TALLY L* report provides more detailed information about faults than the TEST ALL command. Acceptable tally rates are indicated on the Network Test Data Sheet. Note that certain tallies should always be 0, while other tallies are acceptable if their average rate is not excessive.

Record the *LOG* and *TALLY L* results for each Interface under test.

8. At this point, you have completed your initial checkout of the Ethernet Interface and its operation on the network. If the acceptance criteria is met, your Interface and network meets requirements and no further testing is necessary. If the criteria is *not* met, refer to Chapter 6, "Troubleshooting", for the meaning of the log data and refer to Chapter 5, "The Station Manager", for meaning of the tally data.

Procedure 6: Pinging the TCP/IP Interfaces on the Network

PING (Packet InterNet Grouper) is the name of a program used in the Internet to test reachability of destinations by sending them an ICMP echo request and waiting for a reply. Most hosts, as nodes on the Internet are called, including the 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 configuration information and communications software have been downloaded to the interface.

The *ping* can be executed from a UNIX host or PC (most TCP / IP communications software provides a *PING* command) or from an Ethernet Interface. When using a PC, 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, "ping 3.0.0.1".

Perform the following steps to *ping* from an Ethernet Interface.

1. Connect the GSM *locally* to one of the Ethernet Interfaces. Refer to **Using the GSM "Access Station Manager" Function** in Procedure 2.

2. Enter the **NODE** command to verify that the local interface has the correct IP address.

```
> node

IC697 PLC Factory LAN Interface
Copyright (c) 1990-1995. All rights reserved.
PROM version 2.00 (xxAx), Software version 2.00 (xxAx)
IP address = 3.0.0.1
MAC address = <<080019010688>>, MAC default = <<080019010688>>
EM7A2
```

3. Login to be able to use the *PING* command. (The LOGIN command is described in Chapter 4).

```
> login
Password :  (The default password is "system".)
Logged in

=
```

4. Enter the *PING* command supplying in turn the IP address for each remote Ethernet Interface to be tested.

```
= ping 3.0.0.2
<<<Ping Initiated>>>

<<< Ping Results >>>
Command:  ping  3.0.0.2 1 100 64
Sent = 1, Received = 1, No Timely Response = 0
Late/Stray Response = 0
Round-trip (ms) min/avg/max 0/1/10
```

5. The most recent *PING* results (and the parameters used to obtain them) can be viewed using the *REPP* command. Both commands, as well as the *STOPP* command are described in detail in Chapter 5.

   Alternately, *remote* Station Manager connection may be used. Again, refer to the section "Using the GSM 'Access Station Manager' Function" in Procedure 2.

```
REM>
REM> > login system
REM>
REM= Logged in
REM= =
REM= ping 3.0.0.2
<<<Ping Initiated>>>
REM= <<< Ping Results >>>
REM= Command:  ping  3.0.0.2 1 100 64
Sent = 1, Received = 1, No Timely Response = 0
Late/Stray Response = 0
Round-trip (ms) min/avg/max 10/10/10
REM=
REM= =
```

Chapter 3 The GEnet System Manager–Station Configuration

This chapter describes how to install the GEnet System Manager (GSM), and how to use it to configure your Ethernet Interface. The chapter includes an overview of the GSM and a detailed guide to the basic menus that are used in configuring and managing your Ethernet Interface.

The chapter is divided into 5 sections.

Section 1. Installing and Starting-Up the GSM

Section 2. Configuring a Station for a Basic Network

Section 3. Downloading a Station via the GSM

Section 4. Accessing the Station Manager

Section 5. GSM Support Functions

Note

The GSM is used to maintain a variety of LAN Interfaces. Parts of this chapter are written so as to reflect this generality. Thus, you may see occasional references to LAN Interfaces other than the type(s) you use.

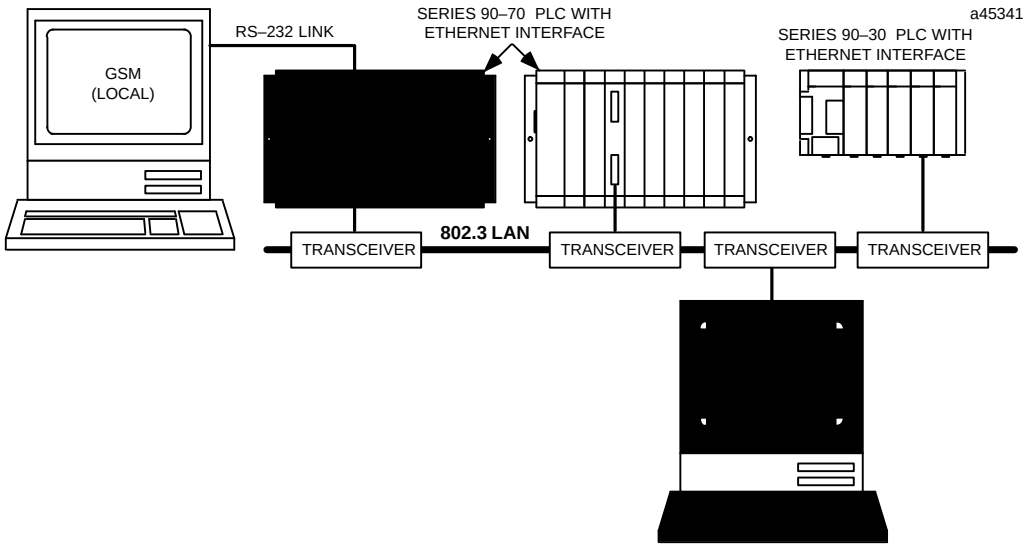


Figure 3-1. GEnet System Manager (GSM) on 802.3 LAN

What is the GSM?

The GEnet System Manager (GSM) is a menu-driven software package that runs on a user-provided personal computer (PC). The GSM is used to perform management functions for LAN Interfaces. The GSM software operates under the MS-DOS environment.

The *primary* GSM functions are:

- *Configure* Station Parameters

  Access is provided to one or more LAN Interface Configuration Editors. The Configuration Editor is used to examine and modify the configuration information for each LAN Interface on the network. There is a unique Configuration Editor for each type of LAN Interface. The Configuration Editor is supplied with your LAN Interface Software, and is integrated with the GSM during installation. Station configuration is performed off-line on the PC and results in a configuration file on the hard disk unique to each station.

- *Download* the Configuration and Communications Software to a LAN Interface

  This function is used to download initial or revised configuration parameters or LAN Interface software. The download can occur either over a local serial cable or over the network.

- *Access* the Station Manager software on a LAN Interface

  For this function, the GSM becomes a simple terminal emulator that connects to the LAN Interface Station Manager either over a local serial cable or over the network.

The GSM also provides the following support functions.

- List All Configured Stations
- Change GSM Password
- Set Download and Station Manager Communication Modes (Local or Network)

Why Does a Station Have to be Configured and Downloaded?

LAN Interfaces consist of a circuit board with processor and Ethernet circuitry, loaded with configuration information and communications software.

The *power-up diagnostics and loader software* reside in Programmable Read Only Memory (PROM) on the board, and cannot be changed without physically disassembling the LAN Interface.

Some very *basic parameters, known as Soft Switch Parameters*, are stored in another kind of memory, Electronically Erasable PROM (EEPROM). In the future, other configuration parameters may be stored here.

These Soft Switches are set to default values during manufacture of the LAN Interface and are retained indefinitely until changed by the user, normally via the Logicmaster 90 Configurator. For a LAN Interface, the Logicmaster 90 Configurator has access only to these Soft Switch parameters. All other parameters of the LAN Interface are set using the GSM.

The *communications software, along with all other configuration information*, is set and maintained on the GSM, and must be downloaded to the LAN Interface when a software or configuration change is required. This information is stored on the LAN Interface in either battery-backed RAM . This memory technology permits ready change of the memory content (via downloading from the GSM).

Connecting the GSM to the LAN Interface

The GSM may be carried to the station and connected to the LAN Interface with an RS-232 cable. We refer to this method of connection as *local* communications mode or *local* GSM operation.

Alternatively, the GSM can reside at a central location on the network and "logically" connect to any station over the Ethernet network. We refer to this method of connection as *network* communications mode or *network* GSM operation.

You must choose which mode of operation you desire.

When using RS-232, the serial cable is connected between the LAN Interface 9-pin connector and the personal computer COM1 port. See Appendix B for serial port characteristics.

To connect to the LAN over the network, you must have an appropriate network card or PCMCIA adapter for your PC-Compatible computer. See Table 3-1 for a list of supported interfaces.

Figure 3-1 illustrates these alternative connection means of the GSM. The GSM may use either an internal or external transceiver; or none if used exclusively for local operation.

Note

We recommend there be only one GSM on the network. It will contain configuration information and communications software for all the GEnet stations on the network.

Section 1: Installing and Starting-Up the GSM

This section describes the hardware requirements for running the GEnet System Manager (GSM) software, and tells you how to install the GSM on the hard disk of your personal computer.

Topics covered are:

- Hardware Requirements
- Installing the PC Network Interface Card (for Network GSM Operation)
- Installing the GEnet System Manager Software
- Setting-Up the DOS System Files
  - For Local GSM Operation (Exclusively)
  - For Network GSM Operation (or both Local and Network)
- Unusual Procedures
- Starting Up the GSM

LAN Interface Software is licensed separately from your LAN Interface hardware. For PLC LAN Interfaces, this software is provided in 3 1/2-inch double-density format; for CNC, 3 1/2-inch high-density diskette format only. The GSM software is part of this LAN Interface Software.

These diskettes **do not** contain the MS-DOS operating system. You must boot your computer from your hard drive or another diskette containing this operating system software.

Hardware Requirements

The following hardware is required in order to support the GSM software on the PC:

- PC Compatible, DOS Version 5.0 or later.
- RAM: Minimum of 525,000 bytes free ("largest executable program size" on DOS MEM command).
- 2 MBytes of free hard disk space.
- 3 1/2 inch double-density diskette drive (for CNC, 3 1/2-inch high-density also supported).
- Color or monochrome monitor.
- *For network GSM operation*, an NDIS-compliant, 802.3/Ethernet card installed in the PC. A list of supported cards is shown in the next section.

Installing the PC Network Card (for Network GSM Operation)

The table below lists the 802.3 / Ethernet cards that GE Fanuc has tested for proper network GSM operation. If you wish to access stations from the GSM across the network, you must have a network card or PCMCIA adapter in your PC. The PC network card must support NDIS (Network Driver Interface Specification). If you use a PC network card not in the list below, GE Fanuc cannot guarantee proper operation of the GSM.

Table 3-1. 802.3/Ethernet Cards for the PC

Vendor	Model	Size	PC Bus	Width
3Com	Etherlink II™ (3C503)	Half slot	XT, AT	8-bit
3Com	Etherlink 16™ (3C507)	1 slot	XT, AT	8-bit
3Com	Etherlink / MC™ (3C523)	1 slot	Micro Channel	8-bit
SMC® / Western Digital	EtherCard PLUS™	Half slot	XT, AT	8-bit
SMC / Western Digital	EtherCard PLUS Elite 16™	1 slot	AT	16-bit
SMC / Western Digital	EtherCard PLUS / A™	1 slot	Micro Channel	16-bit
Intel	Intel® 82593	Interface is built-in to Zenith Z-note™ PC		
Xircom	Xircom® Pocket Adapter	External	Enhanced Printer Port	N / A
NDIS supporting network card	Vendor-dependent			

™ Etherlink II, Etherlink 16, and Etherlink M / C are trademarks of 3Com Corporation.
™ EtherCard PLUS, EtherCard PLUS Elite16, and EtherCard PLUS / A are trademarks of Western Digital Corp.
™ Z-Note is a trademark of Zenith Data Systems.
® Intel is a Registered Trademark of Intel Corporation.
® Xircom is a Registered Trademark of Xircom Incorporated.
® SMC is a Registered Trademark of Standard Microsystems Corporation.

Note

The PC can lock-up if you make setup errors when installing PC network cards and device drivers in a PC. Be sure you have a system boot diskette to recover from possible setup errors.

When installing the network card in your PC, be sure to do the following.

1. Install the network card into the computer according to the manufacturer's instructions. Setup the hardware as described in the table below; these are the default settings of the card. If you do not use the default settings, you will need to record your settings for later use in the section, "Setting-Up DOS System Files".

Table 3-2. Default PC Hardware Settings for 802.3/Ethernet Cards

Vendor	Vendor Model [Restrictions]	Default Hardware Settings
3Com	EtherlinkII (3C503)	I/O base address = 0x0300, IRQ3
3Com	Etherlink 16 (3C507)	I/O base address = 0x0300, IRQ3
3Com	Etherlink/MC [ELNKMC.SYS v 2.0 min]	N/A
SMC/Western Digital	EtherCard PLUS	I/O base address = 0x0280, IRQ3, Memory Address = 0D00H
SMC/Western Digital	EtherCard PLUS Elite 16	I/O base address = 0x0280, IRQ3, Memory Address = 0D00H
SMC/Western Digital	EtherCard PLUS/A	I/O base address = 0x0280, IRQ3, Memory Address = 0D00H
Intel	Intel 82593	I/O base address = 0x0300, IRQ15,
Xircom	Xircom Pocket Adapter [PE2NDIS.EXE v 1.44 min]	None
NDIS supporting network card	Vendor-dependent	

2. Install the device driver software provided with your network card.
3. Run any diagnostic software provided by the manufacturer of the network card to ensure that the card is working properly.

Installing the GEnet System Manager (GSM) Software

To become fully operational, your GEnet LAN Interface hardware requires corresponding GEnet LAN Interface Software. This software is provided on floppy diskettes.

For PLC LAN Interfaces, each diskette contains the GSM software as well as the Communications Software and Configuration Editor for your LAN Interface. Select the size of diskette you wish to use.

For CNC LAN Interfaces, each diskette contains the GSM software as well as the Communications Software and Configuration Editor for one Station Type/LoadType (e.g., Series 15MA, Series 15TT, Series 16MA, etc.). Select the diskette that is compatible with your Station Type/LoadType.

Caution

Preserve the original software diskette as a master. Set the diskette write protection to avoid damage to the diskette, copy the diskette, and retain the original as master software. Only working copies should be used for running the software.

During the installation of the GSM and LAN Interface software, sample DOS system files will be created in the C:\GSM directory. When the software installation is complete, you will need to modify your DOS system files based on the sample files. Refer to the sections on setting-up the DOS system files after you have completed the GSM software installation.

Perform the steps described below to install the GSM software onto your hard disk.

1. Power-up the PC into DOS.
2. Go to the root directory (\) of the drive on which you want to install the GSM. We recommend that you install the GSM on C: because the sample DOS System Files for your PC Interface card are created using C: (see Appendix D).

3. Create a directory for the GSM by typing:

```
C:\> mkdir gsm
```

4. Change the default directory to the GSM directory by typing:

```
C:\> cd gsm
```

Note

Do not simply copy all of the files from the GSM diskette. Follow the installation procedure.

5. With the GSM directory as the default; place the LAN Interface software diskette into drive A or drive B. If you use drive A, type the instruction below.

```
C:\GSM>  a:install
```

If you use drive B, type the instruction below.

```
C:\GSM>  b:install
```

The files that make up the Configuration Editor, the Communications Software, and the GSM executable software are now installed in the GSM directory.

6. After the GSM files are installed, the following message will be displayed.

```
Current GSMCFG pathname is  :  C:\GSM\CFILES
Specify GSMCFG pathname     :     _
```

Where GSMCFG is the GSM environment variable which specifies the location of the station configuration files you will later create with the GSM.

The environment variable must be specified in your AUTOEXEC.BAT to take effect. The current step, however, defines it *only* in the AUTOEXEC.GSM sample file in the GSM directory.

It is recommended that you use the default pathname which is C:\GSM\CFILES (when installing on drive C).

To accept the default pathname, press Enter.

Note

If you ever move your GSM station configuration files, you must redefine the GSMCFG variable in AUTOEXEC.BAT to specify the new location.

7. Next, you will be prompted to specify the type of network card installed in your PC.

   A. If you are going to use the GSM for local operation only, enter “0” (for no LAN interface installed).

   B. If you are going to use the GSM for network operation only or for both network and local operation, specify the type of PC network card installed in your PC. Selections in the menu include the PC network card types listed in Table 3-1. Enter the number for the desired PC Network card type and press Enter.

This completes the installation of the software for Network GSM operation. You must now set up the various DOS system files as explained below before the GSM will run properly.

Setting-Up DOS System Files

After you have completed the GSM software installation procedure, you will need to modify your DOS system files for proper operation of the GSM. Refer to the appropriate section below for setting-up your DOS system files.

Local GSM Operation (Exclusively)

During the GSM installation for local operation, two sample files were created in the C:\GSMdirectory. These files are,

```
CONFIG.GSM
AUTOEXEC.GSM
```

These sample files contain the requirements for the files, CONFIG.SYS and AUTOEXEC.BAT, located in the root directory.

1. To set up your PC so the GSM software will run, you *must* ensure that your CONFIG.SYS file and AUTOEXEC.BAT file contain certain commands. The commands needed have been included in the sample files. You may enter these commands individually into your existing CONFIG.SYS and AUTOEXEC.BAT files using an editor, or you may use DOS commands to copy the .GSM files.

   CONFIG.GSM

   ```
   FILES = 20
   BUFFERS = 48
   ```

   AUTOEXEC.GSM

   ```
   SET GSMCFG=C:\GSM\CFILES
   ```

   (The statement above defines the environment variable GSMCFG. There must be no spaces on either side of the "=" sign.)

2. If installing the GSM software on a PC with a monochrome monitor, add the following command to the AUTOEXEC.BAT file:

   ```
   MODE  CO80
   ```

3. Restart the PC so that the modifications to the AUTOEXEC.BAT and CONFIG.SYS will take effect.

Network GSM Operation (or Both Local and Network)

For network operation, the GSM uses an NDIS-compliant PC network card for connection to the 802.3 network. NDIS-related files will be installed in a C:\GEFNDIS directory created by the install program. NDIS (Network Driver Interface Specification) defines the interconnection between a PC network card and the PC application software (GSM in this case).

During GSM installation for network operation, sample DOS system configuration files will be created in the GSM directory.

These files are,

```
CONFIG.GSM
AUTOEXEC.GSM
PROTOCOL.GSM
```

After installing the software, these files will contain the requirements for the DOS system files, CONFIG.SYS and AUTOEXEC.BAT, located in the root directory and the PROTOCOL.INI file located in the GEFNDIS directory. When the software installation is complete, be sure to look in the .GSM sample files to see the requirements to run the GSM software. Then, refer to the appropriate sub-section below for setting-up the DOS system files.

Checking for Existing NDIS Applications on Your PC

Before you setup your DOS system files for network operation, you must first determine whether another NDIS network application has already been installed on your computer. To do this, check your CONFIG.SYS file for a PROTMAN.xxx device definition. If this definition is in CONFIG.SYS, then a network application does already exist. In this case, skip the section below and refer to the section, "Adding the GSM When an NDIS Application Already Exists". If you do not find a PROTMAN.xxx device definition in your CONFIG.SYS file, follow just the instructions immediately below.

When the GSM is the *Only* NDIS Application on the PC

1. To set up your DOS system files so the GSM software will run, you *must* ensure that your CONFIG.SYS file and AUTOEXEC.BAT file contain certain commands. Sample files, showing the commands needed have been created for you during the installation procedure. These sample files are named CONFIG.GSM and AUTOEXEC.GSM and are located in the GSM directory. Sample contents are shown in Appendix D. Note that the content is different for different PC network cards.

   Please enter these commands individually into your existing CONFIG.SYS and AUTOEXEC.BAT files using an editor.

   If installing the GSM software on a PC with a monochrome monitor, add the following command to the AUTOEXEC.BAT file:

   ```
   MODE  CO80
   ```

2. When you selected the PC network card during the GSM installation, the file, PROTOCOL.GSM, was created. This file contains default information about the communications driver of the PC network card. If you used default hardware settings on your PC network card, you will not have to edit this file. Just copy it to C:\GEFNDIS\PROTOCOL.INI. Otherwise, you must edit any non-default information into the PROTOCOL.GSM and then copy it into C:\GEFNDIS\PROTOCOL.INI.

3. Restart the PC so that the modifications to the AUTOEXEC.BAT, CONFIG.SYS, and PROTOCOL.INI files will be used.

When an NDIS Application Already Exists

To set DOS system files when an NDIS network application already exists, you need to understand more about how an NDIS application is setup. The following files must be installed for an NDIS application.

PROTMAN.xxx	NDIS Protocol Manager Driver. Extension varies. GE Fanuc uses PROTMAN.DOS
(Network Card Driver)	Provided by PC network card manufacturer. Name varies.
PROTOCOL.INI	File listing each driver and operating parameters for each.

For GE Fanuc applications, the LLC driver, GEFNDIS.DOS, must also be installed. For the GSM, all these files, and some others, are located in the GEFNDIS directory. But, if an NDIS application has been installed previously, other versions of the files described above, except for GEFNDIS.DOS, will already have been placed in another location.

The steps below will explain what to do with these NDIS files to ensure proper network GSM operation.

1. To set up your PC so the GSM software and another NDIS network application can both run, you *must* ensure that your CONFIG.SYS file and AUTOEXEC.BAT file contain certain commands. Sample files showing the commands needed *when the GSM is the only application* have been created for you during the installation procedure. These sample files are named CONFIG.GSM and AUTOEXEC.GSM and are located in the GSM directory. Sample contents are shown in Appendix D. Note that the content is different for different PC network cards.

   Since you are adding the GSM when a Network application already exists, some of these commands may already exist, so you will *not* need to add all of these commands. Edit your CONFIG.SYS and AUTOEXEC.BAT as explained below.

2. CONFIG.SYS Include all entries from CONFIG.GSM *except* the following command.

   ```
   device=\gefndis\protman.dos /i:\gefndis
   ```

   The CONFIG.SYS file will already have a valid Protocol Manager (protman.xxx) device definition from the existing network application, and need not be changed. This file will also already have one or more PC network card device definitions from the existing network application. If a valid definition exists for the PC network card selected for the Network GSM, that definition need not be changed.

3. AUTOEXEC.BAT Include the SET GSMCFG command in this file, but *not* the NETBIND command:

   ```
   set cfiles = C:\GSM\CFILES (assuming default directory)
   rem Bind NDIS drivers
   rem \gefndis\netbind
   ```

   The NETBIND command is a call to an NDIS driver binding utility. Since an NDIS application already exists, that application must have a call which does the same thing although it may not be obvious by looking at AUTOEXEC.BAT. When the PC is started, binding must occur only once.

   If installing the GSM software on a PC with a monochrome monitor, add the following command to the AUTOEXEC.BAT file:

   ```
   MODE  CO80
   ```

4. PROTOCOL.INI Do *not* copy PROTOCOL.GSM to PROTOCOL.INI; the existing network application will already have a PROTOCOL.INI file, and you would destroy its contents.

   The PROTOCOL.GSM file created during GSM installation contains a separate section for defining the operating parameters of each NDIS device: the Protocol Manager driver [PROTMGR], the GSM application driver [GEFNDIS], and all network card drivers [(name varies)].

   The location of the existing PROTOCOL.INI file is specified by the "/i" parameter in the Protocol Manager (protman.xxx) device specification in the CONFIG.SYS file. Make sure the network card driver parameters match the settings for your network card. Refer to Table 3-2 for default settings.

   The sample PROTOCOL.GSM file shown below is created if you selected the 3Com EtherlinkII network card during software installation.

```
[protocol manager]
 DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = ETHERLINKII
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;                  configurations for many Ethernet Adapters.  For example,
;                  interrupt IRQ3 is commonly used for the COM2 serial port
;                  and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.

[ETHERLINKII]
  DRIVERNAME = ELNKII$
  DMACHANNEL   = 1
  INTERRUPT    = 3
  IOADDRESS    = 0x300
  MAXTRANSMITS = 8
```

   *You must add the device definition sections for **only** the [GEFNDIS] device and any new network card [name varies] device from the PROTOCOL.GSM file into your existing PROTOCOL.INI file.*

5. Restart the PC so that the modifications to the AUTOEXEC.BAT, CONFIG.SYS, and PROTOCOL.INI files will be used.

Unusual Procedures

Updating or Adding to Existing GSM Software

Whenever you purchase the TCP / IP Ethernet Software, whether for the first time or as an update, you receive all three parts: the Configuration Editor, the Communications Software, and the GSM Software.

Normally, you will install all three parts of this software when you purchase it the first time. If you receive an update, or are adding a new GEnet product, you may install all or part of this software as appropriate. To install a specific part, follow the instructions below.

1. To install *only* the LAN Interface *Configuration Editor,* type:

   ```
   C:\GSM> a:install c
   ```

2. To install *only* the LAN Interface *Communications Software,* type:

   ```
   C:\GSM> a:install x
   ```

3. To install *only* the *GSM Software,* type:

   ```
   C:\GSM> a:install g
   ```

4. To install all 3 components, type:

   ```
   C:\GSM> a:install
   ```

Changing the PC Network Card

If you change the PC network card type for any reason, follow the instructions below.

1. Power down the PC. Remove the existing PC network card. Follow the manufacturer's instructions to install the new PC network card.

2. Power up the PC. Change directory to the GSM directory.

   ```
   C:\> cd\gsm
   ```

3. Run the LANIFSET utility.

   ```
   C:\GSM> lanifset
   ```

4. This utility accesses the same menu as found in step 7 of the section, "Installing the GEnet System Manager (GSM) Software". Complete the remaining steps of that section. This section describes the hardware requirements for running the GEnet System Manager (GSM) software, and tells you how to install the GSM on the hard disk of your personal computer.

Starting-Up the GSM

To start-up the GSM software on the PC, follow the steps listed below:

1. Set the default directory to the GSM directory, and then type:

```
C:\GSM>  gsm
```

2. Proceed past the copyright notice by pressing any key. The GSM will then prompt you for the main menu password. The default password is "gsm" (lower case). After the correct password has been entered, the GSM will then display the main menu.

Note

If an error occurs in the Data Link software or hardware when starting up the GSM configured for *network* operation, an error code is displayed on the screen. In this case, carefully review your installation steps again. Appendix E lists the possible error codes and descriptions.

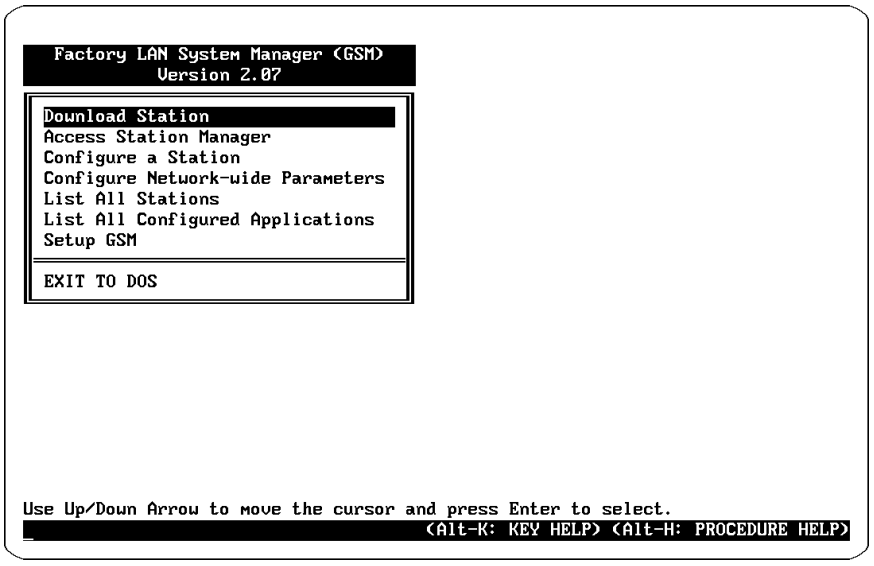


Figure 3-2. GSM Main Menu

The GSM Main Menu lists the functions available in the GSM software. The functions are ordered generally by their frequency of use with the most used function listed first.

Use the Arrow keys to highlight the desired function and press Enter to select. The functions are summarized here, and then described in more detail later in this chapter.

- ***Download*** communications software and configuration information to the LAN Interface.
- ***Access Station Manager*** allows the PC to run in a terminal mode of operation for access to the Station Manager residing on a LAN Interface.

- ***Configure a Station*** provides the means for setting the various parameters of the LAN Interface. The Configuration Editor is a menu-driven software package that is called from the GSM main menu. There is a unique Configuration Editor for each type of LAN Interface. For example, there are different Configuration Editors for PLCs and CNCs. The Configuration Editor is used to examine and modify the configuration parameters for a station. These configuration parameters are stored in files on the PC hard disk and subsequently downloaded to the LAN Interface.
- ***Configure Network-wide Parameters*** allows a set of system-wide parameters to be set (such as the GSM Loader Multicast Address).
- ***List All Stations*** displays a list of all LAN interfaces known to this GSM.
- ***List all Configured Applications*** provides a listing of all Applications that have previously been configured under this GSM. (Not used for the TCP/IP Ethernet Interface.)
- ***Setup GSM*** provides for certain settings affecting the operation of the GSM (such as local or network attachment).

The remainder of this chapter discusses various sub-menus used to configure a LAN Interface for a basic network.

Working Your Way through the GSM Menus

The GSM is a menu-driven software package that is comprised of a single main menu and a number of sub-menus. Using the PC keyboard, you can move easily through the menus. The GSM uses the PC screen to display its information. Certain areas of the screen are reserved for error, warning, or help messages, while the center is typically used to display the menus.

The GSM uses monitor display lines 1 through 25, with line 1 at the top. The lines display the following type of information:

Line 1: displays error messages. For example, if you enter an invalid character in a field, or if the field value is out of range, an error message is displayed on line 1 to indicate the nature of the problem.

Lines 2-22: displays the current GSM menu and its related set of fields.

Line 23: displays a help line for the current field that is being examined or modified. This line gives a description of the field, along with the field value ranges, and the field's default value.

Line 24: provides instructions for using the screen in general.

Line 25: displays important function keys for the current menu. Always present are the keys: Alt-K for Key help and Alt-H for Procedure help.

When a sub-menu is displayed, the parent menu(s) are overlaid by the sub menu. This gives a visual indication of where you are located in the GSM menu hierarchy.

Fields on the GSM screen have a field name and a field value. A sample field name is FIELD_1_1. Field entries which are marked by reverse-video are input / display fields. You may modify the data in these fields. A field may require the entry of an alphanumeric, hexadecimal, or decimal value. Fields that display an "*" require you to press the Tab key to cycle through the possible selections.

For systems which have color graphics hardware, the GSM menus are displayed in color. Selection menus (like the main menu) are displayed as WHITE text on a RED background. Menus with data input / display fields are displayed as WHITE text on a BLUE background.

GSM Keyboard Functions

The functions of the GSM keys are shown in the table below. In each screen, pressing the Esc key will return you to the previous screen without saving changes.

Note

If you change the value of a field or fields you must press Alt-U to save the changes. Pressing Alt-U after a field change will also cause you to return to the previous screen.

If you press Esc from a screen in which you have made field changes, those changes will be lost and you will return to the previous screen.

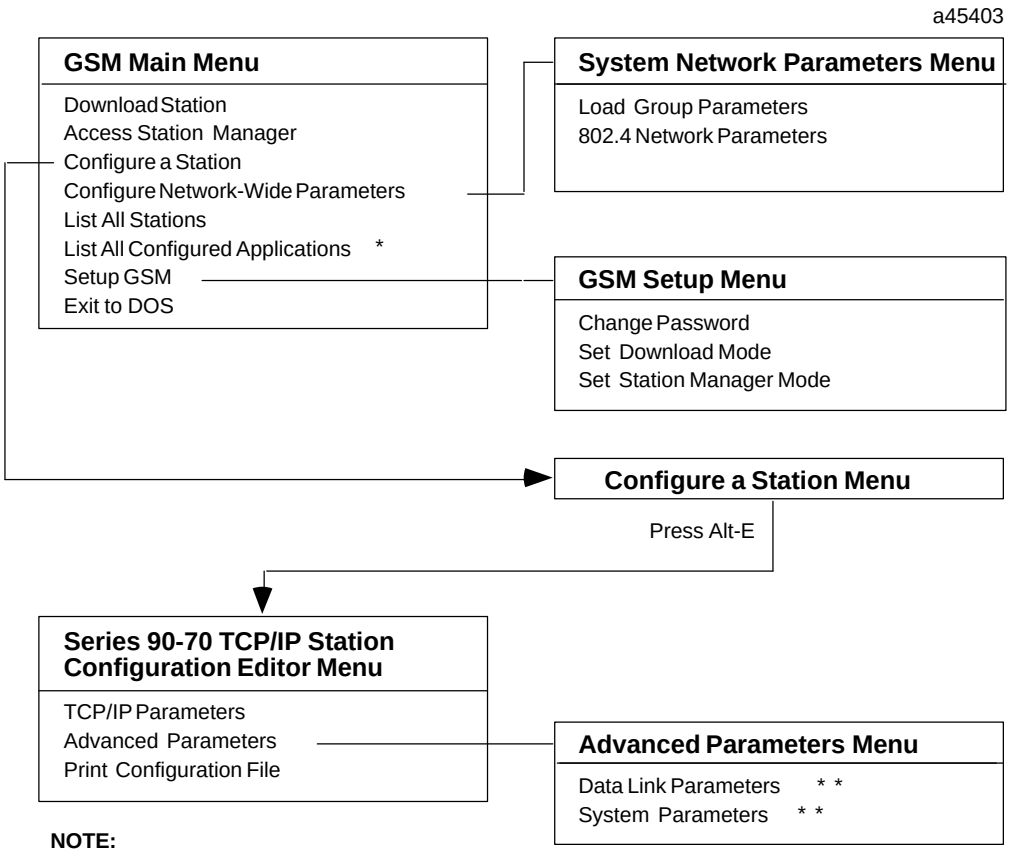
On all screens, pressing Alt-K will display a table describing the special keys used with the GSM. Pressing Alt-H displays a help screen (or a series of help screens) describing how to use the screen that is currently displayed.

Table 3-3. GSM Keyboard Functions (Alt-K)

GSM Keyboard Keys	Function
Esc (or F1)	Return to previous menu.
Enter	Accept field contents, move to next field.
Backspace	Delete character to left of cursor.
Del (Delete)	Delete character.
Alt-A	Abort procedure.
Alt-C	Clear field contents.
Alt-D (or F3)	Delete entry.
Alt-E	Enter Selected Configuration Editor from Configure a Station screen.
Alt-F	If in Station Manager Access, enables logging to a file.
Alt-H	Display procedure help screen.
Alt-K	Display key help.
Alt-L	Display list of stations for selection.
Alt-P	Create printable file of station's configuration. If the GSM is in Station Manager Access and you have enabled Station Manager logging to a file (Alt–F), Alt–P will close the file.
Alt-U (or F2)	Save current menu data, return to previous menu.
Alt-V	View contents of table entry.
Alt-S	Search for specified table entry.
Tab (or F9)	Cycle forward through field entries.
Shift-Tab (or F10)	Cycle backward through field entries.
Ins	Character insert or replace mode.
↑ (Up Arrow)	Move to previous field.
↓ (Down Arrow)	Move to next field.
→	Move right one character in field.
←	Move left one character in field.
PgUp (Page Up)	Display previous page, or previous entry.
PgDn (Page Down)	Display next page, or next entry.
Home	Display first page, or first entry.
End	Display last page, or last entry.

GSM Menu Structure

The menu structure of the of the GEnet System Manager software is shown below.



NOTE:

* **Not applicable to the TCP/IP Ethernet Interface.**

* * **These parameters are not normally changed by the user.**

Figure 3-3. GSM Menu Structure

Section 2: Configuring a Station

Aside from possibly using the GSM to access the Station Manager for field network testing, the first major GSM operation you will perform in bringing-up your network is configuring a station.

Within the GSM there are various configuration screens. There are screens for configuring stations, for tuning a network for ultimate performance, and for routing communications through network routers.

Information Needed to Configure a TCP/IP Ethernet Interface Station

The most important information you will need to know before configuring a station is:

- Station Name
- Station Type
- Station MAC Address (the default MAC address can be found on the label on the faceplate of the TCP / IP Ethernet Interface).
- IP Address

If your network includes a gateway, you will also need the following information.

- Subnet Mask
- Gateway Address

Configure a Station Screen

A number of different LAN Interface products may be present on the LAN. Each LAN Interface must be configured using that product's Configuration Editor before it can be downloaded. Before entering the Configuration Editor you must first access the *Configure a Station Screen* from the *GSM Main Menu*.

The Configure a Station Screen allows you to perform 3 main functions.

- Create a Station Configuration File
- Select an Existing Station Configuration File
- Delete a Station Configuration File

The *Configure a Station Screen,* shown below, is used to specify the Station Type and to assign a logical name (STATION_NAME) to the station. The STATION_NAME corresponds to the unique MAC_ADDRESS which physically identifies the station on the network. It is also used to modify certain configuration parameters for a station.

When the Edit configuration keys (Alt-E) are pressed in this menu, the GSM calls the Configuration Editor required for that specific Station Type.

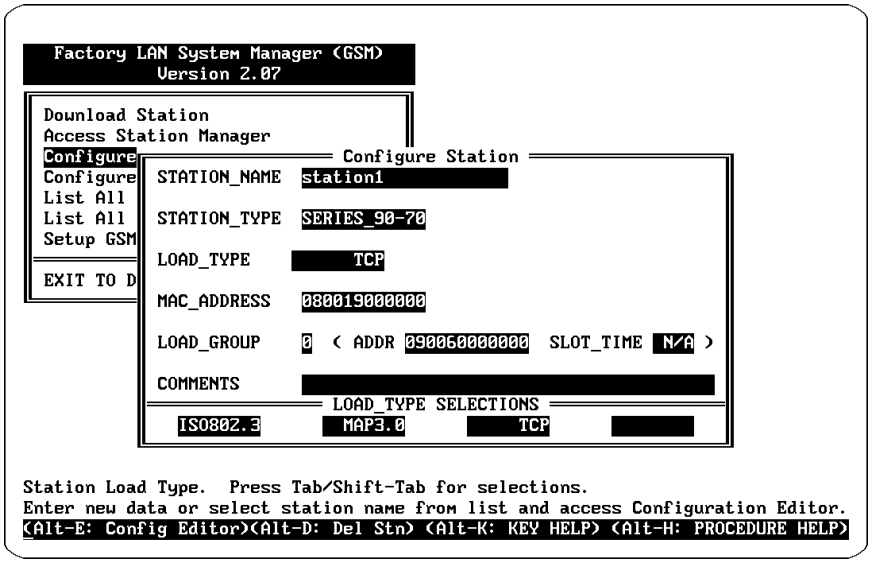


Figure 3-4. Configure a Station Screen

Creating a Station Configuration File

1. Type in or select desired values for the STATION_NAME, STATION_TYPE fields, etc. See the description of screen fields below.
2. Press Alt-E to enter the Configuration Editor.

Field Definitions for the Configure a Station Screen

STATION_NAME - A name (1 to 20 characters) which is used to uniquely identify the station on the GSM hard disk.

STATION_TYPE - The type of device containing the LAN Interface.

- The value for this field is selected from a set of choices; press the Tab key to view the choices. The available choices depend on what products have been installed into the GSM system.
- To configure a TCP / IP Ethernet station, press the Tab key until SERIES 90-70 appears.

LOAD_TYPE - The type of station being configured. For the TCP / IP Ethernet station press the Tab key until TCP appears.

MAC_ADDRESS - The 12 hex digit MAC address of the station being configured. This will be either the Default MAC Address as delivered with your board, or a Locally Administered MAC Address in the case where you have specified the MAC address yourself. See the description on the structure of the MAC Address later in this section and in Appendix G.

Each LAN Interface is delivered with a Default Station Address already set. There are several ways to determine this value:

- Look at the label located on the LAN Interface
- Use the Station Manager NODE command.
- Press the Restart button to see the MAC address appear on the Local Station Manager terminal screen (be sure the Station Manager terminal is connected to the Interface).

The Default Station (MAC) Address is a globally administered address; the global administration process assures that each default MAC address is unique. Your organization may have its own scheme of how addresses are administered. In this case you will not use the default address, but will assign a different address from a set of numbers established by your address administrator.

LOAD_GROUP - The number of the selected download group for the station. The Load Group selects which multicast address is used when loading the station. The multicast addresses and slot times are assigned to the Load Groups via the System Network Parameters menu. Value may be 0 to 4 (default is 0).

Note

The LOAD_GROUP is only needed when more than one network GSM is in use. Otherwise you can let this field stay at its default value.

COMMENTS - This field is optional, but may be used to insert a comment line up to 40 characters long for the station being configured. These comments will be displayed on the List All Stations Screen.

Note

To keep a record of IP addresses you can add the IP address in the COMMENTS field for each station .

Selecting a Station Configuration File

Select a station by filling in the STATION_NAME field in one of three ways.

- Type in the Station Name, or
- Type in a << MAC Address>> specified as exactly 12 hexadecimal digits within a double set of brackets (for example, <<08001901001d>>). The GSM will convert the MAC address into the corresponding station name, or
- Select a station from a list of stations. Press Alt-L for the list. From this list, you select the desired station, which is then displayed on the *Configure a Station Menu*.

The Up Arrow, Down Arrow, Pg Up, Pg Dn, Home, and End keys may be used to move within the list. You may also begin a search by pressing Alt-S. When the desired station is displayed at the top of the list, press the Enter key to select that station. The selected station name is then displayed on the Configure a Station Screen.

After selecting a station, you may press Alt-E to enter the Configuration Editor.

Deleting a Station Configuration File

1. Select the station you want to delete. (See description above on Selecting a Station.)
2. Press Alt-D.

Structure of the MAC Address

The MAC Address is a 12-digit hexadecimal number that identifies the station on the physical network. This 12-digit number is organized as 6 bytes, each byte is represented by a pair of hexadecimal digits. A typical default MAC Address is shown below.

Byte	1	2	3	4	5	6
Hex No.	0_8	0_0	1_9	0_0	5_3	1_2

For more information on assigning MAC Addresses, refer to Appendix G.

Configuration Editor Menu for Series 90-70 PLCs

Once a station has been defined in the Configure a Station Menu, you may proceed to the Configuration Editor Menu (by pressing Alt-E) to define that station's communication parameters in more detail. Or, you can return to this menu at any time in the future to examine or modify these parameters. The screen below is the Configuration Editor for the STATION_TYPE, SERIES_90-70 and LOAD_TYPE,TCP.

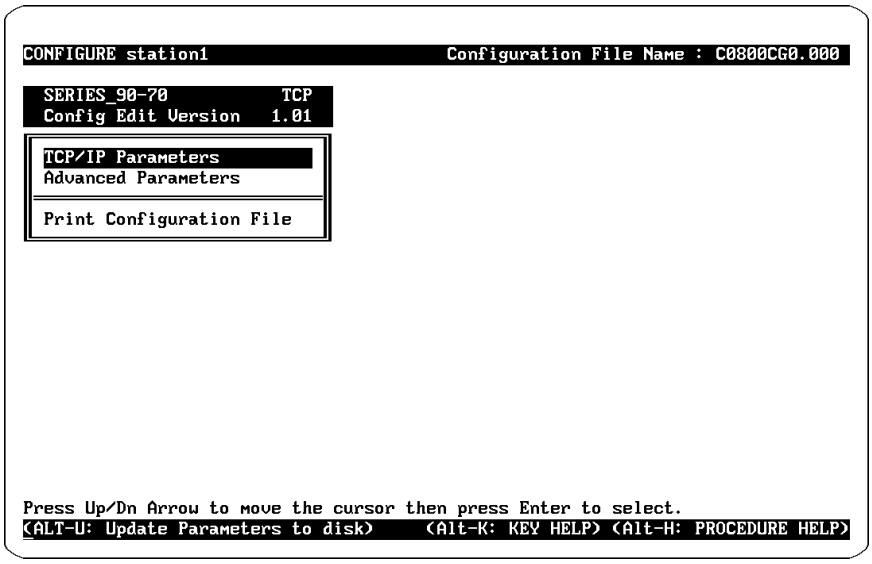


Figure 3-5. Configuration Editor Menu

From this menu you can access the screens that allow you to enter the IP address, and if needed, the Subnet Mask and the Gateway address.

Saving Changes Before Exiting the Configuration Editor Main Menu

The *Configuration Editor Main Menu* is the first screen displayed when entering the Configuration Editor and is the last displayed before exiting the Configuration Editor.

Typically, after you have entered the Configuration Editor, you will go into sub-screens and enter or change values for the parameters included in them. After you have made changes in a sub-screen, you must press Alt-U to save them temporarily while you go to other sub-screens.

After you have finished making changes in the sub-screens and back-out to the Configuration Editor Main Menu, you must press Alt-U *again* to permanently save the changes to disk. If you press Esc to exit the *Configuration Editor Main Menu*, a prompt will appear requesting you to confirm the exit without saving to disk; if you confirm exit, your changes are discarded.

Note

The first time you create a station configuration, you must enter Alt-U to save the file even if you make no changes to default configuration parameters.

TCP/IP Parameters Screen

The TCP / IP Parameters screen is used to set the IP_ADDRESS of the station and if your network includes a gateway, the IP_NETWORK_MASK and the DEFAULT_GATEWAY address.

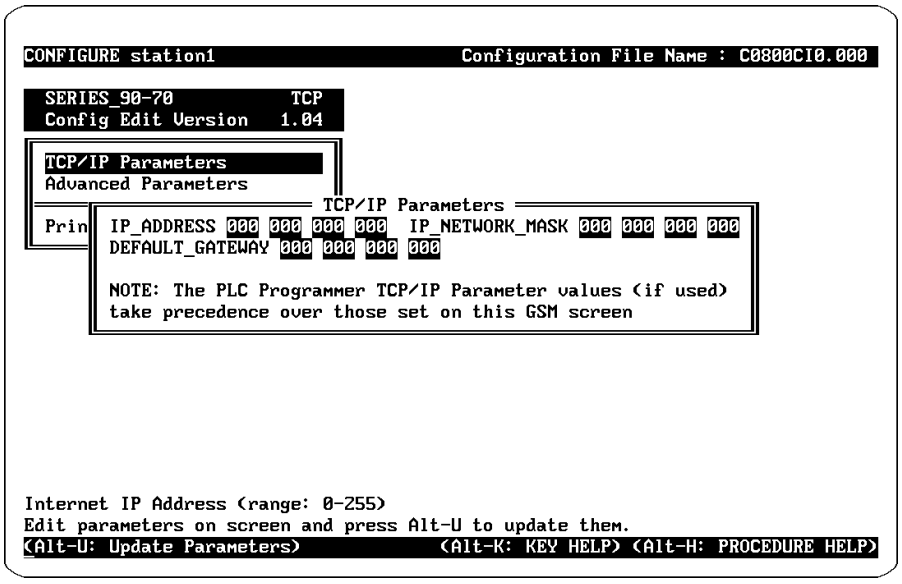


Figure 3-6. TCP/IP Parameters Screen

The values for these parameters (IP_ADDRESS, IP_NETWORK_MASK, and DEFAULT_GATEWAY) should be assigned by the person in charge of the network (the network administrator). TCP / IP network administrators are familiar with these parameters and they are not described in this manual. 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.

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

IP Address	Address as Configured on the Screen
3.0.0.1	003 000 000 001
3.0.0.2	003 000 000 002
3.0.0.3	003 000 000 003
...	...
3.0.0.255	003 000 000 255

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. The IP addresses must be assigned so that they are compatible with the connected network. Refer to Appendix G for more information on IP addressing.

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 Series 90-70 TCP / IP-Ethernet station with the same IP address as another station, disconnect the station in question from the LAN, then try a PING command to that IP address from another station. If you get an answer to the PING, then the chosen IP address is already in use.

Precedence of TCP/IP Parameter Sources

The Ethernet Interface receives TCP / IP parameters from the GEnet System Manager (GSM) each time the board is downloaded from the GSM. It is also possible that a Logicmaster 90 system which uses TCP / IP configuration mode ("Config Mode") will be able to specify the same TCP / IP parameters to the PLC CPU, which passes them on to the Ethernet Interface through Soft Switches. With two sources for the same information, it is important to understand which set of parameters apply in any given situation.

As a general rule, the TCP / IP parameters for the Series 90-70 TCP / IP Ethernet Interface will be applied in the following prcedence order:

1. If Logicmaster 90 configures the Ethernet Interface in TCP / IP Config Mode and this configuration information is passed from the PLC CPU through Soft Switches, the Logicmaster parameters will be used.
2. If Logicmaster configures the Ethernet Interface in MMS-Ethernet Config Mode and this configuration information is passed from the PLC CPU through Soft Switches, the GSM paramters will be used.
3. If the Ethernet Interface is in an unconfigured slot (no configuration in the PLC CPU, or Logicmaster configuration in the PLC CPU not showing an Ethernet Interface) and therefore not receiving soft switches, the Ethernet Interface will use the last set of TCP / IP parameters it received. This is true whether they originally came from Logicmaster or GSM. This will remain true through power cycles and Ethernet Interface restarts until either the Ethernet Interface receives Soft Switches from the PLC or until the Ethernet Interface is downloaded from the GSM.
4. If the Ethernet Interface is in an unconfigured slot and is downloaded from the GSM, the Ethernet Interface will assume MMS-Ethernet Config Mode and use the parameters from the GSM.

Note

For Logicmaster 90 to be able to use TCP / IP Config Mode, the PLC CPU must have firmware version 5.03 or later, and the Ethernet Interface firmware and software must be version 2.00 or later.

Advanced Parameters Menu

The Advanced Parameters menu (shown below) provides access to the Data Link Parameters, the System Parameters, and the Station Manager password. These parameters should only be changed by authorized personnel.

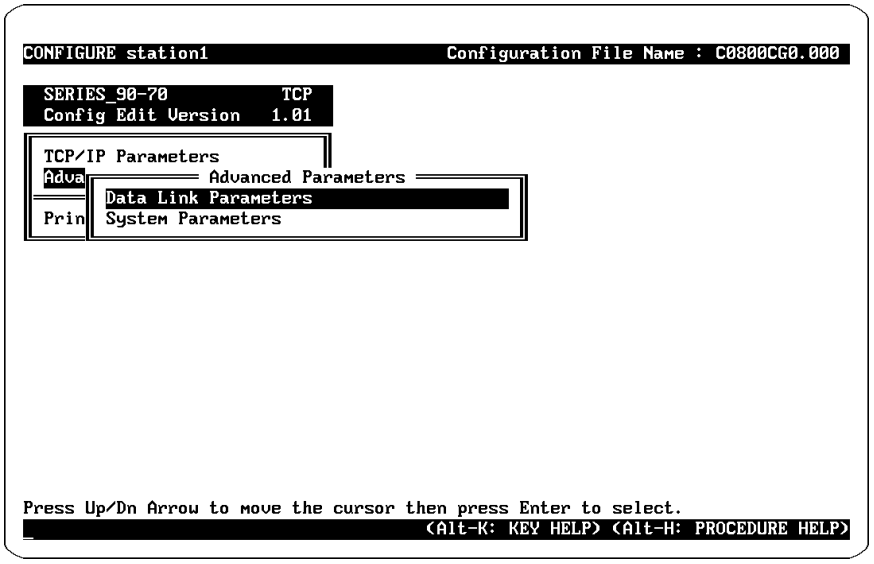


Figure 3-7. Advanced Parameters Menu

Data Link Parameters Screen

The Data Link Parameters Screen allows you to modify the Data Link Layer communications parameters. In most cases the values of these parameters will remain the default values. The Data Link Parameters menu is shown below.

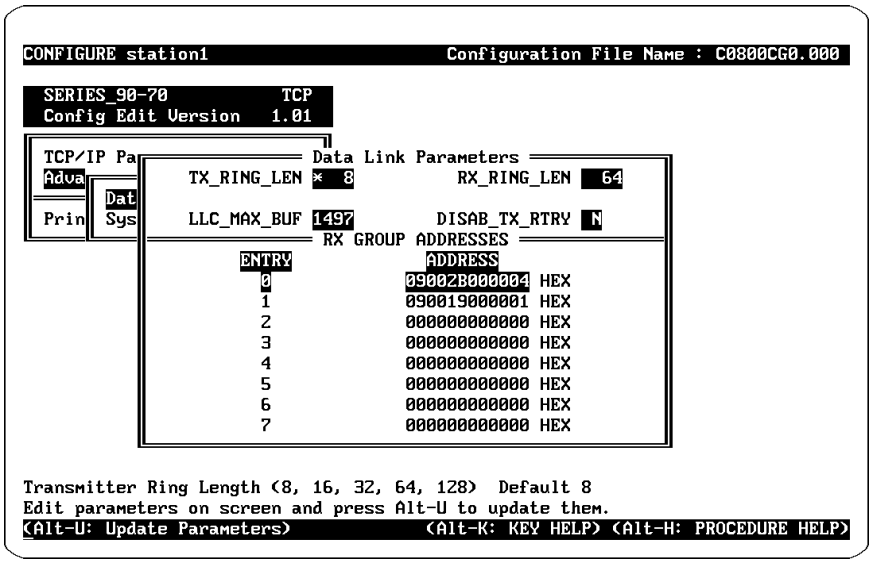


Figure 3-8. Data Link Parameters Screen

The Data Link Parameters are defined as follows:

TX_RING_LEN - The maximum number of frames which can be queued for transmission on the network. Valid values are 8, 16, 32, 64, and 128 frames. Defaults to 8 frames. Value selected by Tab or Shift-Tab keys. Corresponds to Station Manager Parameter *ltxringlen.*

RX_RING_LEN - The maximum number of incoming frames received by this station which can be queued for processing. Valid values are 8, 16, 32, 64, and 128 frames. Defaults to 64 frames. Value selected by Tab or Shift-Tab keys. Corresponds to Station Manager Parameter *lrxringlen.*

LLC_MAX_BUF - The maximum data size of Link Layer receive buffers. This the largest possible receive frame for the Link Layer. Valid range of 128 to 1497 bytes. Defaults to 1497 bytes. Should be at least 70 less than the Maximum Buffer Size (see the SystemParameters Menu). Corresponds to Station Manager Parameter *lmaxdb.*

DISAB_TX_RTRY - Prevents the normal automatic TX retries when a frame collision occurs during transmission. Valid values are “Y” and “N”. “Y” specifies that TX retries are disabled. “N” specifies that each TX frame will be retried up to 16 times. Defaults to “N”. Corresponds to Station Manager Parameter *ldrtry.*

Up to 8 Receive data Group Addresses may be programmed for frame reception. Multicast receive frames are accepted if they match one of these Group Addresses.

ADDRESS - One of 8 Group Addresses used for reception of multicast frames. A 6-byte hexadecimal byte string which represents a valid multicast address. Individual station addresses, or the broadcast address <<FFFFFFFFFFFF>> are not permitted. Entry 0 defaults to <<09002B000004>>,which is the All-ES MAC address; all other entries default to zero<<000000000000>> to indicate that the entry is not used. Corresponds to Station Manager Parameter *lgrpmsk0 - lgrpmsk7*.

System Parameters Screen

The System Parameters Screen selection is used to modify parameters which determine how the Ethernet Interface allocates its available buffer memory. This screen is also used to modify Station Manager parameters.

The System Parameters Screen is shown below:

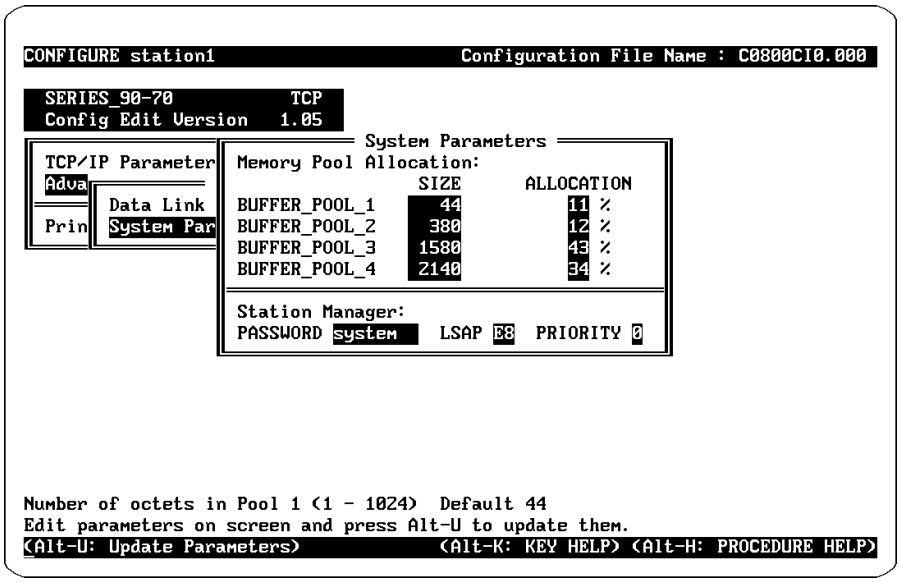


Figure 3-9. System Parameters Screen

Memory Pool Allocation Parameters

The Memory Pool Allocation fields define the buffer pools used by the Ethernet Interface. The Ethernet Interface RAM memory available after all the Ethernet Interface executive software and configuration information has been loaded is broken into four fixed size pools.

The MEMORY ALLOCATION parameter specifies the percentage of available memory to be allocated to each pool. For example, a value of 10 in this field would assign 10 percent of available memory to be allocated to this pool. The total of the MEMORY ALLOCATION for all buffer pools cannot exceed 100 percent. If the total is less than 100 percent, some of the available memory will not be used.

Buffers are used to hold messages which are sent or received on the network and to save state information regarding the communications software. IN ALL CASES, there must be buffers available and of sufficient size to contain the messages sent or received.

Note

You should not change Memory Pool Allocation parameters without first consulting GE Fanuc Automation

The Buffer Size of the Buffer Pools must be specified in increasing order as follows:

Buffer Size Pool 1 < Buffer Size Pool2 < Buffer Size Pool3 < Buffer Size Pool 4

The ranges for the Buffer Pool Parameter values are:

BUFFER_POOL_1 - Buffer Pool 1 memory allocation

BUFFER SIZE - Valid range of 1 to 1024 bytes. Defaults to 44. Corresponds to Station Manager Parameter *bbuff1*.

MEMORY ALLOCATION - Valid range of 1 to 97 percent. Defaults to 11 percent. Corresponds to Station Manager Parameter *balloc1*.

BUFFER_POOL_2 - Buffer Pool 2 memory allocation

BUFFER SIZE - Valid range of 1 to 2048 bytes. Defaults to 380. Corresponds to Station Manager Parameter *bbuff2*.

MEMORY ALLOCATION - Valid range of 1 to 97 percent. Defaults to 12 percent. Corresponds to Station Manager Parameter *balloc2*

BUFFER_POOL_3 - Buffer Pool 3 memory allocation

BUFFER SIZE - Valid range of 1 to 4096 bytes. Defaults to 1580. Corresponds to Station Manager Parameter *bbuff3*.

MEMORY ALLOCATION - Valid range of 1 to 97 percent. Defaults to 43 percent. Corresponds to Station Manager Parameter *balloc3*

BUFFER_POOL_4 - Buffer Pool 4 memory allocation

BUFFER SIZE - Valid range of 1 to 8192 bytes. Defaults to 2140. Corresponds to Station Manager Parameter *bbuff4*.

MEMORY ALLOCATION - Valid range of 1 to 97 percent. Defaults to 34 percent. Corresponds to Station Manager Parameter *balloc4*.

The Station Manager Parameters are as follows:

PASSWORD - The password that is used to modify the secure mode of the Station Manager. Case sensitive. Consists of up to 8 characters. Defaults to “system” (lower case).

LSAP - The Station Manager Link Service Access Point (LSAP) to be used to send and receive Station Manager REMote commands and responses. Defaults to E8 (hexadecimal). Corresponds to Station Manager Parameter *bremlsap*.

PRIORITY - The Link Layer priority used to send Station Manager REMote commands and responses. Valid range of 0 to 7. Defaults to 0. Corresponds to Station Manager Parameter *brempri*.

Section 3: Downloading a Station

This section describes only the activities at the GSM associated with downloading a station. For a complete procedure on downloading communication software and configuration information to a station, see Chapter 2, Procedure 4.

Download Station Screen

The Download Station screen provides a means to download LAN Interfaces via local serial port or the network (depending on selection in the System Network Parameters Menu). After a configuration file has been created and saved, the communication software and configuration file must be loaded into the desired station. The GSM Downloader Screen is used to load the station.

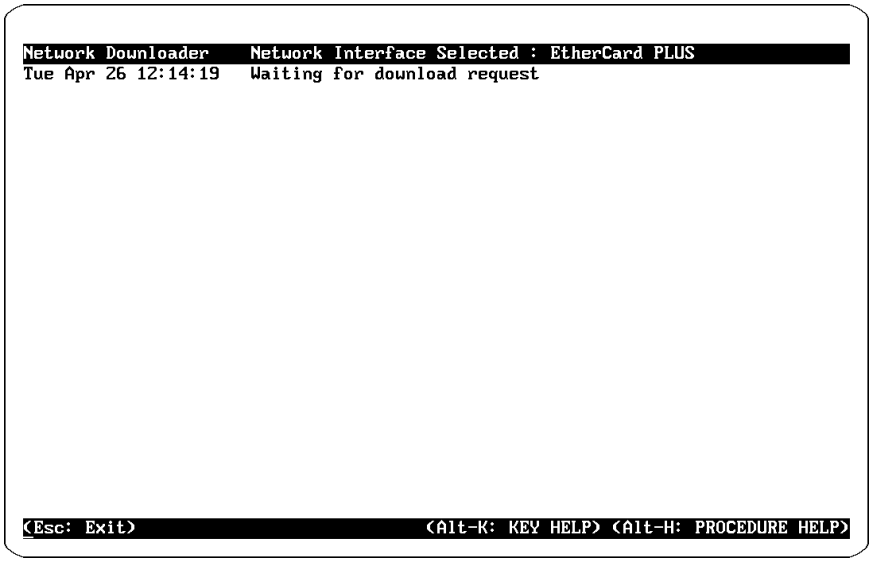


Figure 3-10. Download Station Screen

Downloading Locally (Over the Serial Port)

If you have selected Local Download Mode in the GSM Setup menu, you will be prompted for the name of the station to be downloaded. This is the same 20 character name you used when you configured the station from the Configure a Station menu. Note that the station must be previously configured. As an alternate method of identifying the station to be downloaded, you may enter its MAC address, or you may select the station name from a list by entering Alt-L.

After you enter the STATION_NAME, the GSM will download the communications software and configuration file over the serial link. It takes 5 minutes or more to serially load a station, but it is necessary only to perform the procedure when you are performing a software or configuration upgrade to your LAN Interface.

There are 3 files that are downloaded to the LAN Interface. While the station is being downloaded, the name of the current file being loaded is displayed along with the file block count. The download may be aborted by pressing Alt-A key or Esc key. Once aborted, the download may not be resumed, but must be restarted from the beginning.

If an error occurs during the download process, an error message is displayed on the screen to indicate the nature of the error.

Once the download is complete, a message is displayed on the screen indicating that the download was successful. Control is then transferred automatically to the Local Station Manager Terminal screen so you may view the LAN Interface initialization messages.

Downloading Over the Network

The Network Downloader uses a special download protocol to transfer information to the GEnet LAN Interfaces on the network that require a download. The download protocol is described in this section.

1. The Network Downloader transmits a download multicast message once per second, when idle, to a specified multicast address.
2. The LAN Interface requiring a download receives the download multicast message and sends a “Request for Load” message to the Network Downloader. Download multicast addresses are defined in the GSM System Network Parameters menu. A Load Group number is assigned to each multicast address. Each LAN Interface must define a Load Group number so it obtains its download using the correct multicast address.

Notes

The Network Downloader will support up to five different Load Groups each with a unique load multicast address and IEEE 802.4 slot time. This feature is not applicable to Ethernet (IEEE 802.3) networks and so the default Load Group 0 is sufficient.

3. When the Network Downloader receives a “Request for Load” message from a LAN Interface, it loads the necessary files into the LAN Interface across the LAN.

While the station is being downloaded, the name of the current file being loaded is displayed along with the file block count. If an error occurs during the download process, an error message is displayed on the screen to indicate the nature of the error.

If an error occurs in the Data Link software or hardware, an error code is displayed on the screen. Appendix E lists the error codes that can be displayed, along with their descriptions.

When the download is complete, a message is displayed on the screen indicating that the download was successful.

The Downloader transfers three files to the LAN Interface (in this order):

- *.XFM - LAN Interface communications software.
- Cxxxxxx.xxx - LAN Interface configuration file.
- GO - Commands the LAN Interface to start execution of loaded software.

Before the LAN Interface is downloaded, the GSM Downloader will check the GSM System Files to see if the configuration file needs to be updated. The System Files consist of the System Slot Time and the Application DIBs. If any of these files have been updated more recently than the configuration file, the Downloader displays the following message.

```
System files integrated for Station:  Station Name
```

Note

The DOS time and date on the PC must be correct whenever the GSM is run, as the GSM uses the date and time associated with each file to determine if configuration files need to be updated.

The Network Downloader can also be entered directly from the DOS prompt by typing:

```
C:\GSM> gsm dnld
```

This can be used to invoke the Network Downloader from a batch file. This can be used to automatically run the Network Downloader after a power outage of the PC.

The Alt-F and Alt-P keys are used to enable and disable the logging of downloader activity to a user-specified file. The log file is automatically closed when returning to the GSM main menu.

The Esc key is used to exit the Network Downloader and to return to the GSM main menu.

Notes

1. A LAN Interface MUST be configured on the GSM before it can be downloaded.
2. The LAN Interface Soft Switch, Network Load Address(LDMAC), must match one of the LOAD_MULTICAST_ADDR parameters on the GSM in order for a Network download to take place for the LAN Interface.
3. The MAC Address of the Station selected MUST match the LAN Interface MAC Address Soft Switch parameter (MAC) in order for the LAN Interface to be fully operational after loading.

Section 4: Accessing the Station Manager

This section describes how to access the Station Manager software that resides on the Ethernet Interface.

Access Station Manager Screen

The Access Station Manager Screen is used to access the Station Manager on the Ethernet Interface. This access will occur over either the serial port, or the network (depending on the selection in the System Network Parameters Menu). If you are using network access, you will be prompted for the name of the station you wish to access.

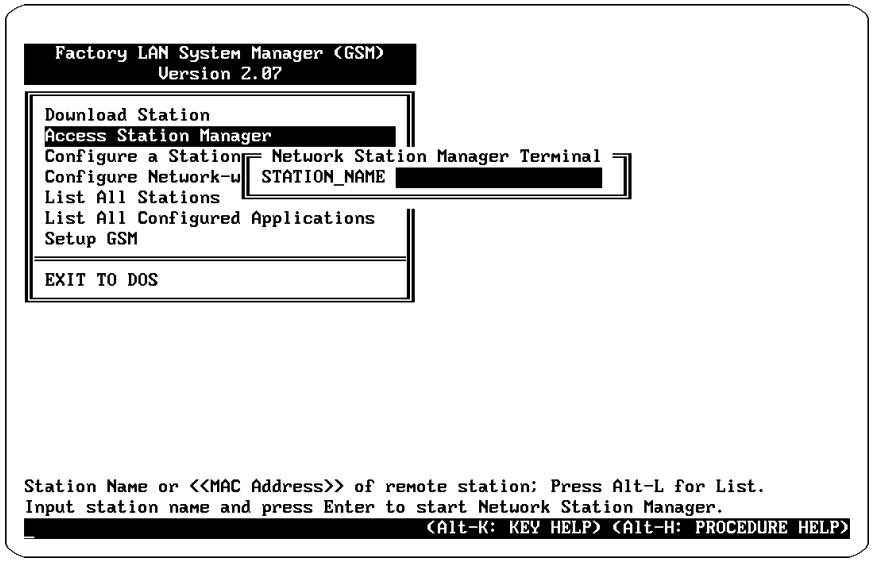


Figure 3-11. Access Station Manager Screen

Once you are in the Access Station Manager screen, the PC acts like a dumb terminal connected to the Ethernet Interface. The GSM sets up the screen to display the interactions with the local Ethernet Interface Station Manager.

The logging of Station Management activity can be started or stopped from this menu. To request logging to start, press Alt-F. You will be prompted for the log file name. The log file is automatically closed when leaving this menu, or when you press Alt-P.

Section 5: Using the GSM Support Functions

This section describes the GSM support functions. The GSM Menu topics discussed in this section are:

- List All Stations
- List all Configured Applications
- Setup GSM
- Exit to DOS

List All Stations Screen

The List All Stations screen displays a list of all of stations that are configured in the GSM directory on the hard disk. A typical List All Stations screen is shown below.

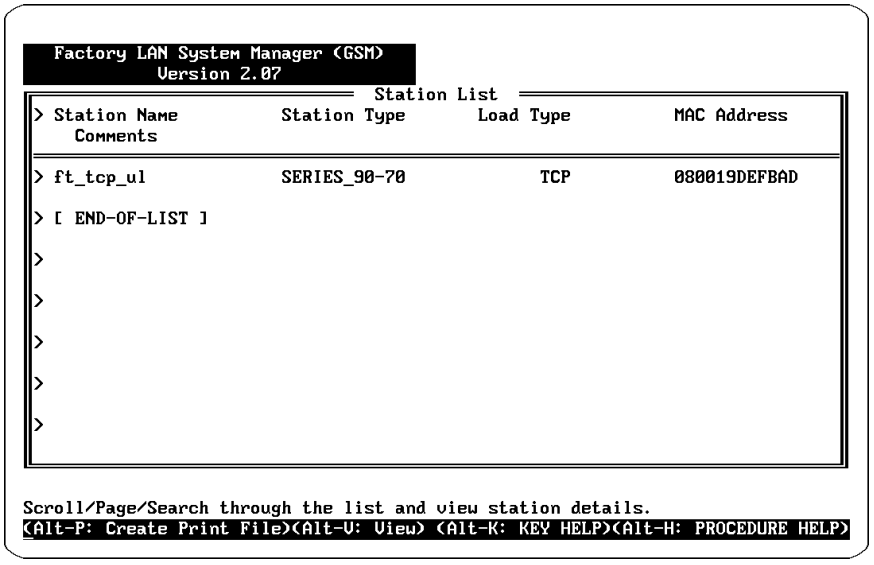


Figure 3-12. List All Stations Screen

This screen displays the following information about each station:

- Station Name
- Station Type
- Load Type
- Station MAC Address
- Comments

Use the Up Arrow, Down Arrow, PgUp, PgDn, Home, and End keys to examine the list of configured stations. The details about a specific station can be examined by pressing the Alt-V key. When you press the Alt-V key, you are prompted for the name of the station to examine. If you enter a blank field, the top item in the menu is examined.

The detailed information about a specific station additionally includes:

- Configuration File Name
- Date and time Last configured
- Date and time Last Downloaded
- Station's Load Group (with values selected by the Load Group)

The Alt-S key is used to search the list of stations for a specified entry. When you press the Alt-S key, you select the data field and value to seek and select the search direction. Press the Alt-S key again to initiate the search, or the Esc key to abort the search.

Press the Alt-P key to create a list file, "STANAMES.LIS", of the configured stations. Press the Esc key to exit the Show Stations screen and to return to the GSM Main menu.

Setup GSM Menu

The Setup GSM screen (shown below) includes the following functions.

- Change the password that must be entered to access the GSM main menu
- Set Download Mode (Local or Network)
- Set Station Manager Mode (Local or Network)

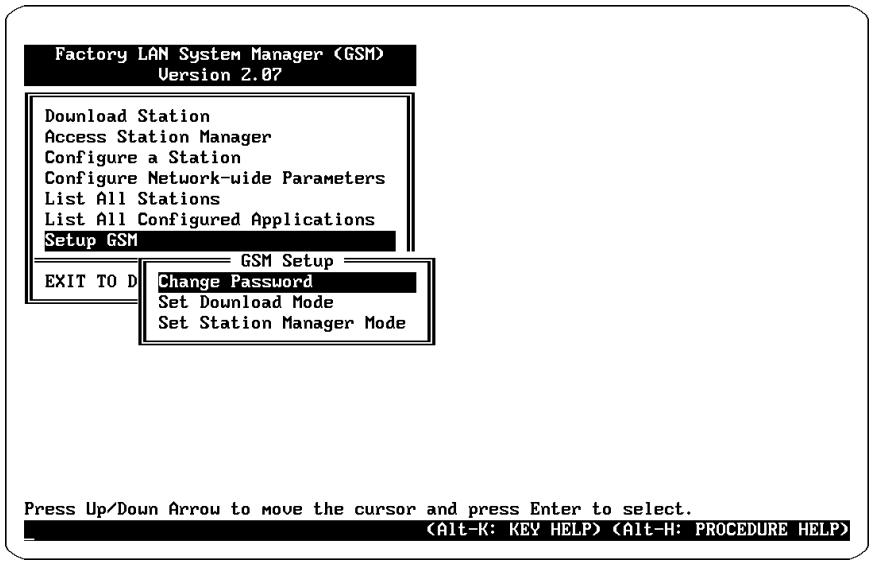


Figure 3-13. Setup GSM Menu

Changing the GSM Password Screen

When you select this function, the GSM clears the screen, and prompts for the following information:

Enter old password:
Enter new password:
Verify new password:

You are given three chances to enter the above information properly. Please note that all characters which are typed after the password prompt except for the Return key are assumed to be part of the password. Specifically, the delete and backspace characters do not have their usual meaning and are interpreted simply as password characters. When this process is completed (successfully or unsuccessfully), control is returned to the GSM main menu.

Note

The password is case sensitive.

Set Download Mode Screen

This screen permits you to toggle the download mode between Local and Remote.

To Set the Download Mode:

1. Enter the Set Download Mode Screen.
2. Press Tab to toggle the Mode.
3. Press Alt-U to update.
4. Press Esc to return to the GSM Main Menu.

Set Station Manager Mode Screen

This screen permits you to toggle the Station Manager mode between Local and Remote.

To Set the Station Manager Mode:

1. Enter the Set Station Manager Mode Screen.
2. Press Tab to toggle the Mode.
3. Press Alt-U to update.
4. Press Esc to return to the GSM Main Menu.

Note

You can also toggle the Station Manager Mode by pressing Alt-M from the GSM Main Menu.

Exit to DOS

When the EXIT TO DOS menu item is selected, the GSM clears the screen, and returns control to the PC operating system.

Chapter 4 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* TCP / IP 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:

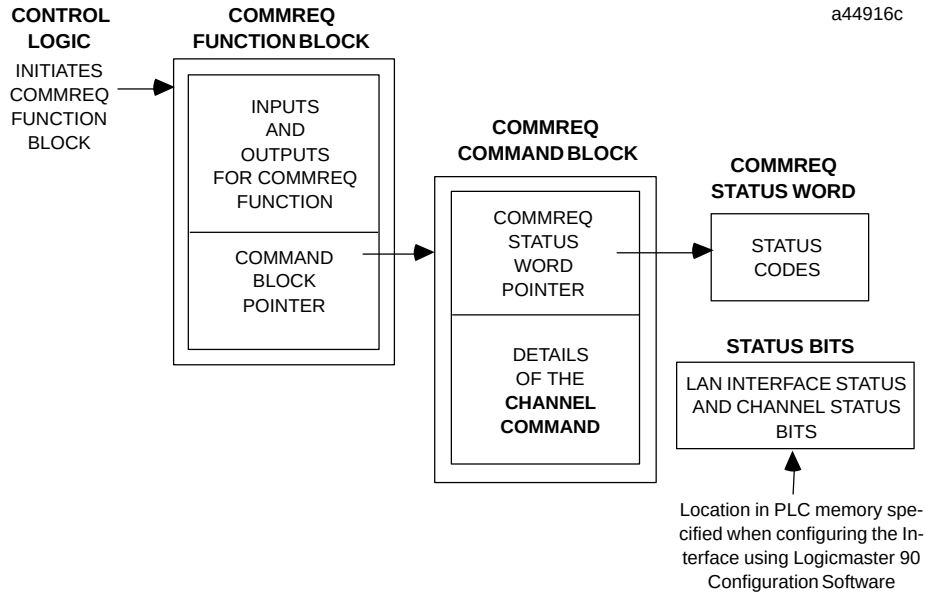


Figure 4-1. Elements of the Communications Request

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 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.

* This Section assumes you have configured your Ethernet Interface in TCP / IP configuration mode rather than MMS-ETHERNET configuration mode. MMS-ETHERNET configuration mode provides only 16 bits of LIS.

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.

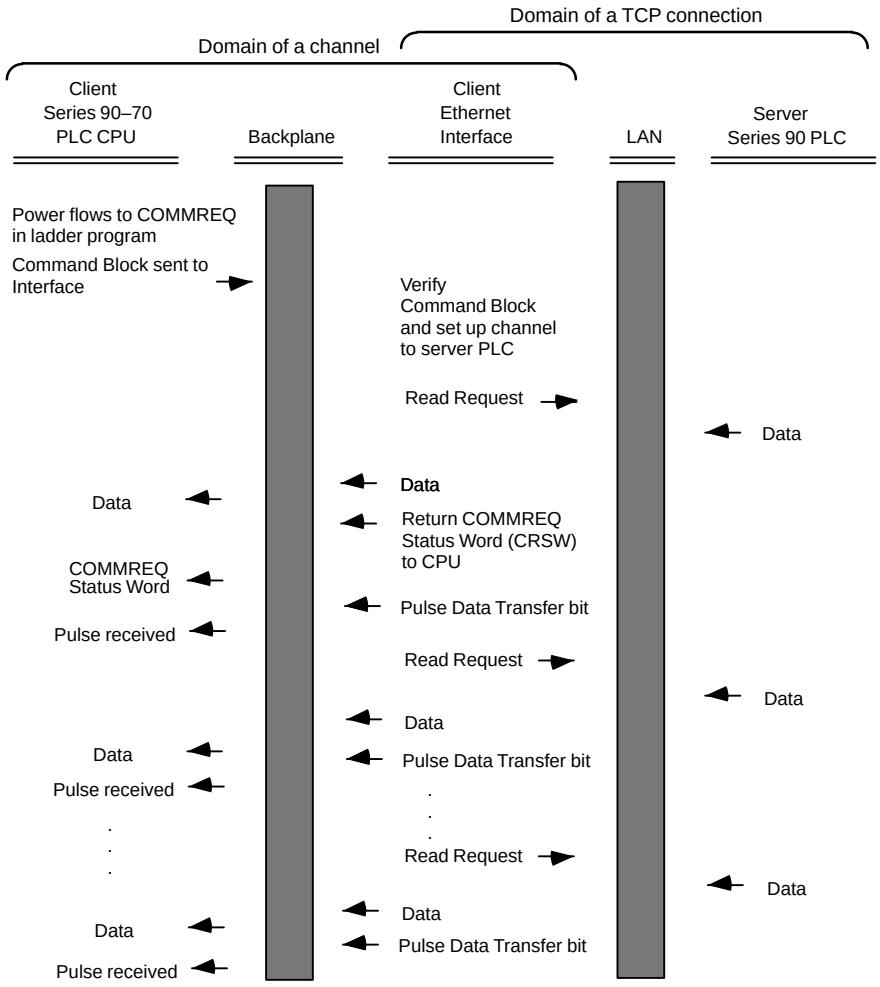


Figure 4-2. Operation of the Communications Request for an Establish Read Channel-Command

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 next significant event: upon failure to establish a channel correctly and in a timely manner or upon the first successful transfer of data.

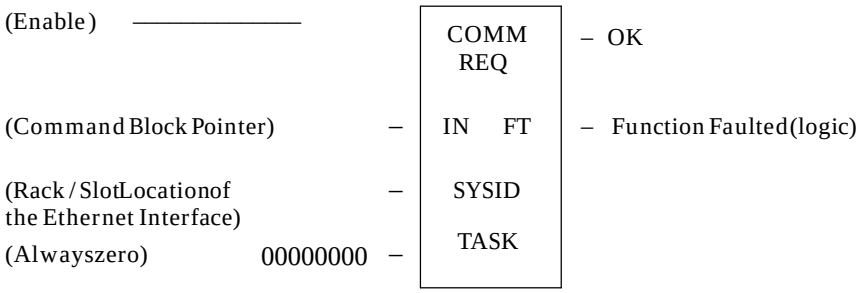
   Once the channel is successfully set up to the server PLC, the Ethernet Interface performs the periodic reads as specified in the Command Block.

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 90-70 PLC, the COMMREQ Function Block has four inputs and two outputs:



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

Note

This Series 90-70 Ethernet Interface is only supported in the main PLC rack (rack number 0).

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

Caution

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

OK Output: The OK output is set if the PLC CPU was successful in handing off the COMMREQ to the Ethernet Interface.

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 up to 31 (decimal)	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 (up to 25 words-decimal). 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 - 31) 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. Abort Channel
4. Retrieve Detailed Channel Status
5. Assign Channel Status Vector

Establishing a Channel

The Ethernet 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

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 4 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 Read Channel or Establish Write Channel 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 the Location of the Channel Status

The Assign Channel Status Vector (ACSV) command tells the Ethernet Interface what the PLC reference table memory location will be used for the 64-bit Channel Status bits.

This Channel Command is *required* for users who have configured the Ethernet Interface using MMS-ETHERNET configuration mode with Logicmaster 90-70. If Logicmaster 90-70 configuration software has been used to configure the client Ethernet Interface in TCP / IP configuration mode, this Channel Command *must not* be used.

Note

Using TCP / IP configuration mode requires both Logicmaster 90-70 release 6.02 (or later) *and* Series 90-70 CPU firmware release 5.03 (or later).

If TCP / IP configuration mode has been used, then Logicmaster 90-70 has already specified an 80-bit area to hold the sixteen LAN Interface Status (LIS) bits and the sixty-four Channel Status bits. In this case, the PLC CPU will update these 80 bits once each scan with the latest data from the Ethernet Interface. Attempting to specify an additional 64-bit area would mean that the PLC CPU would update the Logicmaster-specified 80-bit area and the Ethernet Interface would update the user-specified 64-bit area. This would be wasteful in addition to slowing down overall PLC system performance. If possible, GE Fanuc recommends using TCP / IP configuration mode when using the TCP client capability of this Ethernet Interface.

If MMS-ETHERNET configuration mode must be used (such as when using a CPU 780, which will never be updated to firmware level 5.03 or later), then this Channel Command is the only way you may specify the location of the sixty-four Channel Status bits to the Ethernet Interface. Note that in MMS-ETHERNET configuration mode, Logicmaster 90-70 still specifies the location of the sixteen LIS bits.

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 Command Block

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 units 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 - PLC (node) address type (IP Address)
Word 19	00004 (0004)	Remote PLC - PLC (node) 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 Units 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 4-1.

Table 4-1. Time Unit Values for Read/Write Repetition Period

Value	Meaning
1	hundredths of seconds
2	tenths of seconds
3	seconds
4	minutes
5	hours

(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, 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 4-2.

Table 4-2. Series 90-70 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.

(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).

(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 - PLC (Node) Address Type: Word 18 specifies the format of the remote PLC address. In this release, Word 18 must contain the value one (1), indicating a dotted-decimal IP address expressed using a separate register for each decimal digit.

(Word 19) Remote PLC - PLC (Node) Address Length: Word 19 specifies the length in words of the remote PLC IP address. In this release Word 19 must contain four (4).

(Words 20-23) Remote PLC - PLC (Node) 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.

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 Command Block

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 units 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 - PLC (node) address type (IP address)
Word 19	00004	(0004)	Remote PLC - PLC (node) 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, reads 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 4-1.

(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; 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 4-2.

(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 4-2. 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 - PLC (Node) Address Type: Word 18 specifies the format of the remote IP address. In this release Word 18 must contain one (1), the address type indicating a word-oriented, dotted-decimal IP address of a remote PLC.

(Word 19) Remote PLC - PLC (Node) Address Length: Word 19 specifies the length in words of the remote IP address. In this release Word 19 must contain four (4).

(Words 20-23) Remote PLC - PLC (Node) 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 414D in the first word and 5952 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.

Example Command Block

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 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 CPU - memory type from which to send data (%R)
Word 14	00050	(0032)	Local PLC CPU - starting address from which to send data (%R50)
Word 15	00008	(0008)	Local PLC CPU - number of memory units (8 registers)
Word 16	00000	(0000)	Reserved
Word 17	00000	(0000)	Reserved
Word 18	00001	(0001)	SRTP Server Host Address Type (IP Address)
Word 19	00004	(0004)	SRTP Server Host Address Word Length (4)
Word 20	00003	(0003)	SRTP Server Host Address Data Word 1 (3)
Word 21	00000	(0000)	SRTP Server Host Address Data Word 2 (0)
Word 22	00000	(0000)	SRTP Server Host Address Data Word 3 (0)
Word 23	00001	(0001)	SRTP Server Host Address Data Word 4 (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 Units 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 4-1.

(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; 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 4-2.

(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 - Node Address Type: Word 18 specifies the format of the remote IP address. Word 18 must contain one (1), the address type indicating a word-oriented, dotted-decimal IP address of a remote PLC.

(Word 19) Remote Host - Node Address Length: Word 19 specifies the length in words of the remote IP address. Word 19 must contain four (4).

(Words 20-23) Remote Host - Node 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.

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, Retrieve Detailed Channel Status, and Assign Channel Status Vector 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.

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

	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)

* 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 4-2).

(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, Retrieve Detailed Channel Status, and Assign Channel Status Vector 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.

Assign Channel Status Vector (2000)

The Assign Channel Status Vector (ACSV) command specifies the location in local PLC CPU reference table memory of the sixty-four (64) Channel Status bits. This command is *required for COMMREQ support* when the Ethernet Interface has been configured by Logicmaster 90-70 to be in MMS-ETHERNET configuration mode. If, however, the Ethernet Interface has been configured in TCP / IP configuration mode, this command *must not be used.* When in TCP / IP configuration mode, Logicmaster 90-70 configures the location of the sixteen LAN Interface Status (LIS) bits as well as the sixty-four Channel Status bits, and all eighty (80) status bits are updated once each PLC scan.

Example Command Block

Specify %T56 (in bit mode) as the starting location for the sixty-four Channel Status bits. Return the COMMREQ Status (CRS) word in %AQ14.

	Dec	**(Hex)**	
Word 1	00003	(0003)	Length of Assign Channel Status Vector data block (3 words)
Word 2	00000	(0000)	Always 0 (no-wait mode request)
Word 3	00012	(000c)	Memory type of CRS word (%AQ)
Word 4	00013	(000d)	CRS word address minus 1 (%AQ14)
Word 5	00000	(0000)	Reserved
Word 6	00000	(0000)	Reserved
Word 7	02000	(07d0)	Assign Channel Status Vector command number
Word 8	00074	(0040)	Memory type where to put Channel Status bits (%T)
Word 9	00056	(0038)	Starting address of Channel Status bits

* 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 the sixty-four (64) bits of Channel Status be assigned to a local reference table address (specified in Words 8 and 9). If the command is processed successfully, the CRS word will indicate successful completion. From that point on, the Ethernet Interface will update sixty-four bits at the specified location each time the status changes. This will continue until either the channel is aborted or another ACSV command is issued.

(Word 8) Memory Type: Words 8 and 9 specify the starting address in local PLC memory for the sixty-four (64) bits of Channel Status. Word 8 specifies the memory type (see Table 4-2).

(Word 9) Starting Address: Starting address to store the Channel Status bits.

Note

If both Word 8 and Word 9 are zero (0), this means “none”, which will cause the Ethernet Interface to stop updating memory with the Channel Status bits. If the address in Words 8 and 9 is valid, the Ethernet Interface will update that memory location with 64 bits of information each time one of those bits change.

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 by Logicmaster 90-70 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 AUI 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 Logicmaster 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 32 bits comprise the Channel Status bits (2 for each channel). The last 32 bits are reserved for future use. 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.

Note

If you use the Logicmaster "MMS-Ethernet configuration mode" (instead of "TCP / IP configuration mode") you will only have the sixteen (16) LIS bits transferred automatically from the Ethernet Interface to the PLC CPU memory on each input scan. You may assign an additional location into which the Ethernet Interface will store the sixty-four (64) Channel Status bits by using the Assign Channel Status Vector COMMREQ.

Table 4-3. Status Bits (LIS Bits and Channel Status Bits)

Status Bits	Brief Description
1-7	Reserved
8	AUI Fuse Blown
9	Any Channel Error (error on any channel)
10-12	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 8) AUI Fuse Blown: This bit is set to 1 when the AUI 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

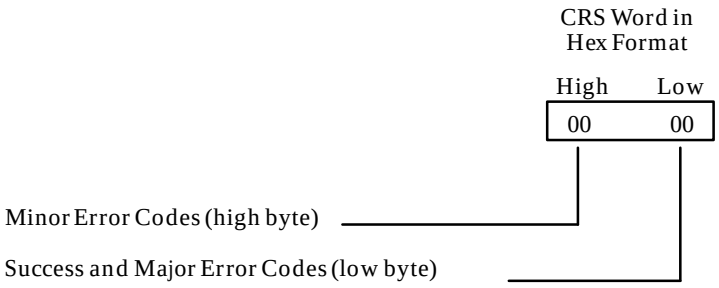


Figure 4-3. Format of the COMMREQ Status Word (CRS Word)

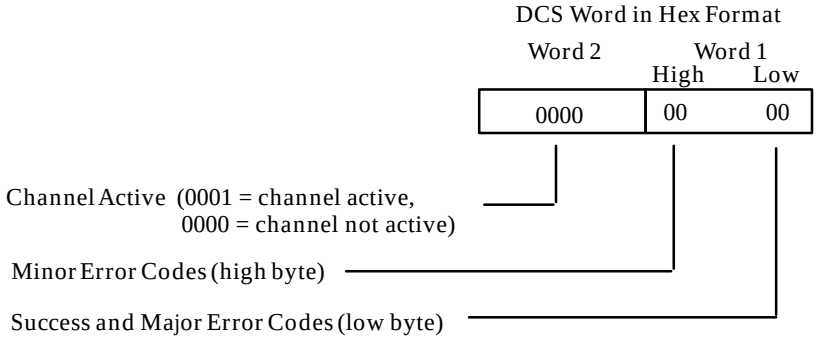


Figure 4-4. Format of the Detailed Channel Status Words (DCS Words)

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 4-4. 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. 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 4-5. 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 4-6. 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.
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.

Table 4-7. 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 bytes)
8890H	Invalid channel number.
8990H	Invalid time unit for period. (Maximum permitted 3965 hours)
8a90H	Period value is too large.
8b90H	Zero server 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	Server host address length value is too short for server host 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.

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.

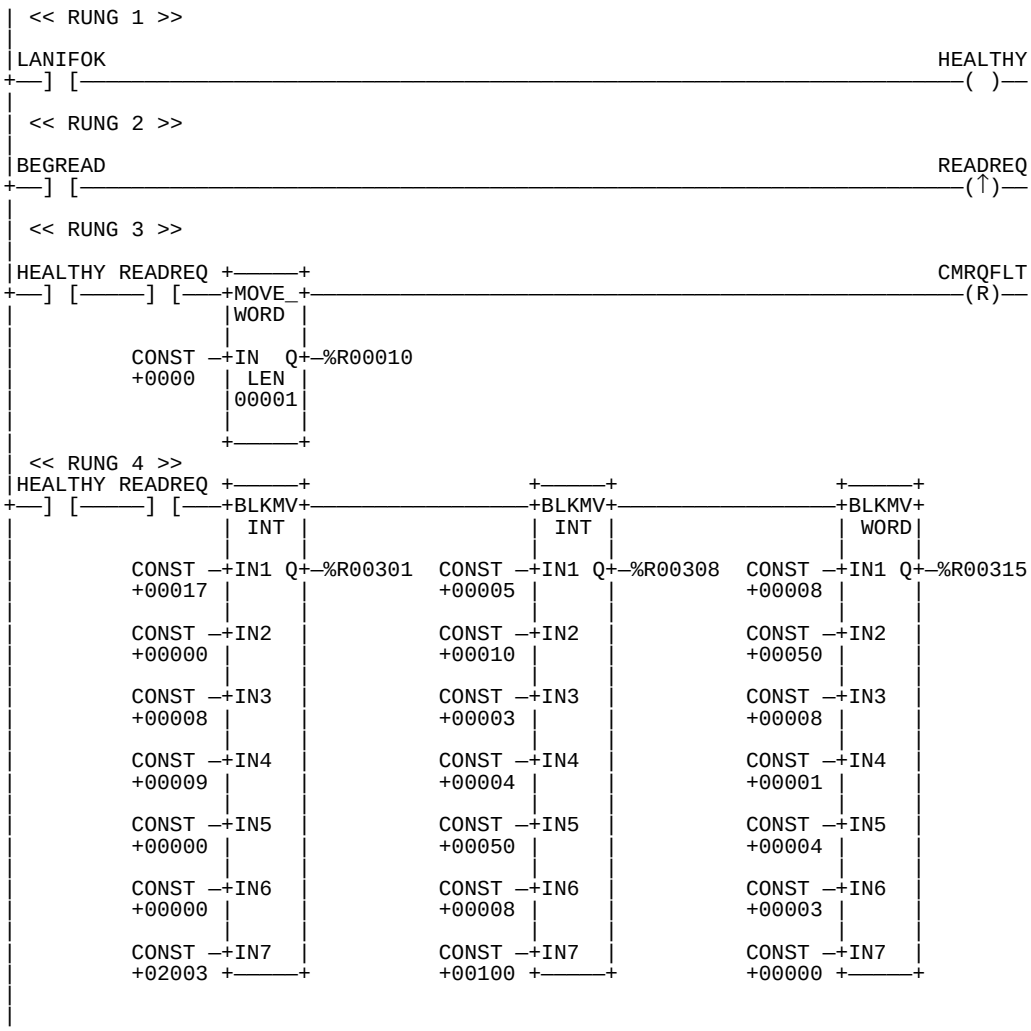
1. Initiate the COMMREQ function with a one-shot transitional coil or contact. This prevents accidentally sending the same COMMREQ Command Block more than once.
2. Include at least the LAN Interface OK bit in the LAN Interface Status Word as an interlock contact for the COMMREQ function. You may choose to add more interlocks.
3. Zero the word location you specify for the COMMREQ Status (CRS) word, and OK and FT Outputs 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.

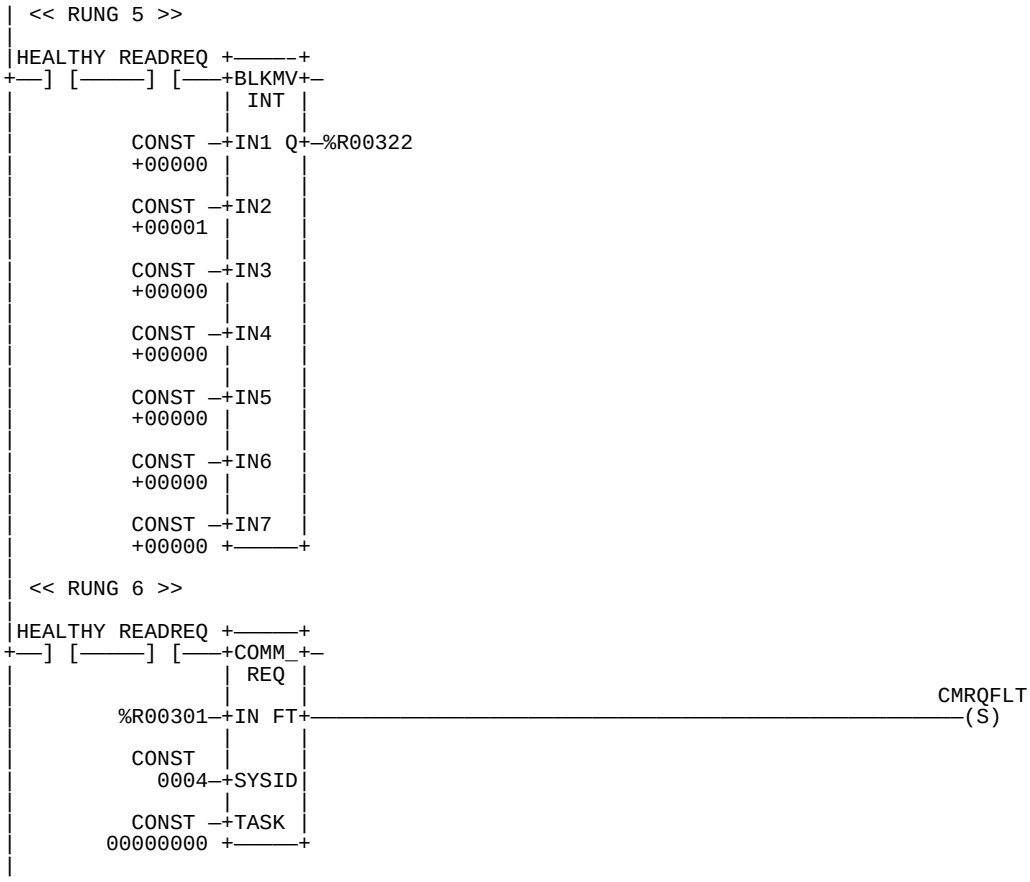
The ladder program segment below illustrates how to incorporate these important points in your program.

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: 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 BEGREAD 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 two output parameters.

- 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.

Note

The OK output is not used in this example so that the sample code can equally apply to a 90-70 or a 90-30 PLC.

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 to a non-zero value 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.

Chapter 5 The Station Manager

This chapter describes how to access and use the Station Manager software which resides on the Ethernet Interface. Each command is also defined here. The chapter is divided into three sections.

- Section 1. Accessing the Station Manager
- Section 2. Using the Station Manager
- Section 3. Command Descriptions

The Station Manager is a part of the communications software in the Ethernet Interface. The Station Manager executes as a background function on the Ethernet controller board to provide interactive supervisory access to the Ethernet Interface.

The Station Manager is available when the Ethernet Interface is fully operational or when it is running either the Soft Switch Entry or Field Network Test utilities. The Station Manager is not available when running Power-Up Diagnostics or the Loader Utility.

Station Manager Services

The Station Manager provides the following services:

- An interactive set of commands to interrogate and control the Ethernet Interface.
- Access to observe internal statistics, an exception log, and configuration parameters.
- Password security for commands that change the Ethernet Interface parameters or states.

The Station Manager allows you to monitor the operation of the local station and the network. If a problem occurs at the local station or on the network, the Station Manager may be used to pinpoint the source of the problem through the various Monitor commands.

Section 1: Accessing the Station Manager

The Station Manager on the Ethernet Interface can be accessed in three primary ways:

1. ***Through the 9–pin serial port on the Ethernet Interface*** by a GEnet System Manager (GSM) in Local Station Manager Mode or by an ASCII terminal. See Figure 5-1.
2. ***Directly over the Ethernet network*** by a GSM in Network Station Manager Mode. See Figure 5-2.
3. ***Remotely over the Ethernet network via another Ethernet Interface*** with an attached GSM in Local Station Manager Mode or by an ASCII terminal. This method requires the use of the REM (Remote) command to access the remote station. See Figure 5-3.

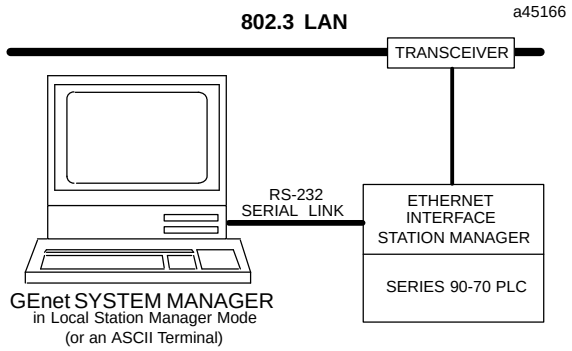


Figure 5-1. Station Manager Accessed Locally through the 9–pin Serial Port by a GSM in Local Station Manager Mode (or an ASCII Terminal)

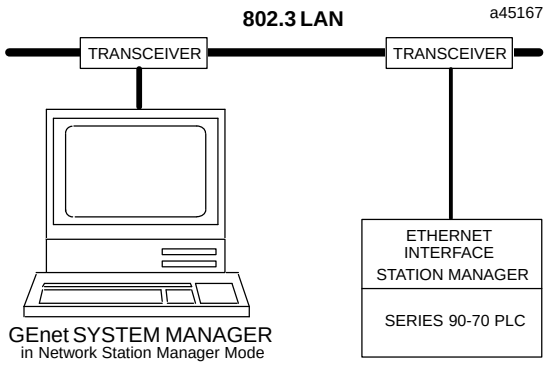


Figure 5-2. Station Manager Accessed Directly over the Network by a GSM in Network Station Manager Mode

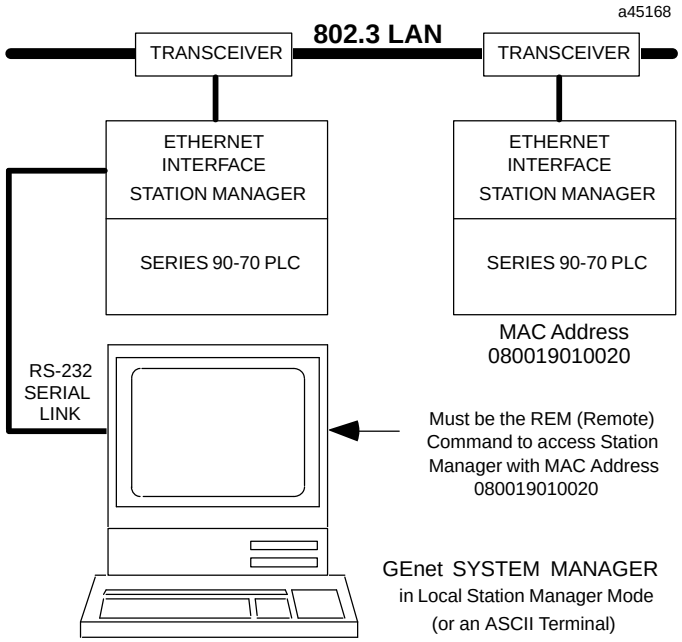


Figure 5-3. Station Manager Accessed Remotely over the Network by a GSM in Local Station Manager Mode using the REM (Remote) Command

Accessing the Station Manager Using the GSM

The Station Manager may be accessed by connecting the Ethernet Interface to a Workmaster or IBM PC Compatible computer running the GSM software in Local or Network Station Manager mode.

1. Do either A or B below as desired.
   A. **Local Connection.** Connect the COM1 RS–232 serial port on the device running the GSM to the 9–pin connector on the Ethernet Interface. Refer to Appendix B, for instructions on how to make the RS–232 cable.
   B. **Network Connection**. Connect the PC network card on the device running the GSM to the Ethernet Network.
2. Power–up the computer running the GSM into DOS. (See Chapter 3. The GEnet System Manager for installation of the GSM).
3. Set the PC default directory to the GSM directory, by typing:

   ```
   C:\> cd gsm
   ```

4. Start–up the GSM by typing:

   ```
   C:\GSM> gsm
   ```

5. Once the GSM Main Menu appears, go into the Setup GSM functions to set the Station Manager Mode to Network or Local.
6. From the GSM Main Menu, cursor to the Access Station Manager function and press Enter.
   A. **Local Mode**. If you are in Local Mode you will automatically go into the Station Manager of the locally connected Ethernet Interface.

Note

When you enter the Local Station Manager or the Local Downloader, the GSM automatically configures COM1 of the PC as follows:

```
9600 bits per second
8 data bits
No parity
1 stop bit
```

COM1 will retain this configuration even after exiting the Local Station Manager or Local Downloader.

B. **Network Mode**. If you are in Network Mode, you will be prompted to enter the Station Name or MAC address of the station you want to access.

Accessing the Station Manager Using an ASCII Terminal

1. Connect a serial cable from the ASCII terminal to the 9–pin connector of the Ethernet Interface. Refer to Appendix B, for instructions on making the cable.
2. Set up the communication parameters of the terminal as follows:

```
9600 bits per second
8 data bits
No parity
1 stop bit
```

3. Press the Enter key to see the Station Manager prompt character.

Remote Operation of the Station Manager

The Station Manager commands can be invoked over the network from other GEnet devices (other Series 90-70 and Series 90-30 PLC Ethernet Interfaces, GE Fanuc CNC OSI–Ethernet Interfaces, or Series Six PLC LAN Interfaces) by using the *REM* command. When invoked remotely, the Station Manager software processes the command as if it had been entered from a device attached to the serial port but automatically directs output from the command over the LAN to the station which issued the request. There is no indication on the local station serial device when a remote command is being processed. Refer to Figure 5–2 for LAN configurations that use remote Station Manager operations.

Note

Both the local console and any remote access share the same security level. See the “LOGIN” and “LOGOUT” commands descriptions.

Section 2: Using the Station Manager

The Station Manager commands are divided into two groups:

- Monitor commands
- Modify commands

The *Monitor* commands provide information about the station and the network. Executing these commands will not affect the operation of the station or the network, and they are available to anyone using the Station Manager. See Table 5-1 for a list of Monitor commands.

The *Modify* commands perform functions that may change the operation of the station and the network. These commands are secure and may only be executed when the secure level of operation has been selected by "logging in" with the current password. These commands will be printed in italics. See Table 5-2 for a list of Modify commands.

The complete sets of Monitor commands and Modify commands are available when the Ethernet Interface is in the fully operational state. Subsets of these commands are available when in the Soft Switch Entry and Field Network Test Utilities.

The Station Manager is a "background" task. It only executes when communication processing is not occurring. Because of this, the command response time is sensitive to the communication load of the station—the greater the load, the longer it takes for the commands to execute.

Using the Monitor Commands

All of the Monitor commands can be executed from either the Monitor ">" prompt or the Modify "=" prompt. To display a list of the Monitor commands on the screen, type:

```
HELP  <RET>      or
?  <RET>
```

The following table provides a brief description of the Monitor commands.

Table 5-1. Monitor Commands

Command	Description
?	Display list of commands
bps	Display serial port data rate
chan-nel	Display the status of a communication channel
date	Display current date
exs	Display Extended Status buffer (Unused by the TCP / IP Ethernet Interface.)
help	Display list of commands
log	Display Exception log
login	Login for Modify mode
ltime	Display login timeout
node	Display sign-on message
prog	Display the name of the PLC program in the CPU
show	Display a configuration parameter's value, or list the configuration parameters for a task(s)
sosw	Display current Soft Switch data
stat	Display task(s) status
tally	Display task(s) tallies
time	Display current time

For most commands, simply enter the command and press Enter. Some commands require additional information to be entered along with the command. Those arguments should be separated from the command and from each other by one or more spaces. The Command Descriptions section in this chapter provides a complete description of each command.

The LOGIN command is required to access the Modify commands. To execute the LOGIN command you must know the current password.

Using the Monitor Commands to Troubleshoot the Network

There are three Monitor commands that are especially useful to troubleshoot the network:

- The NODE command
- The EXS command
- The LOG command
- The TALLY command

NODE Command: The NODE command displays the TCP / IP Ethernet sign-on message, identifying the node by its MAC and IP addresses and identifying the resident firmware and software.

EXS Command: The EXS command displays the Extended Status Buffer. This buffer maintains information about COMMREQs issued to this Ethernet Interface from the PLC ladder program of the local station.

LOG Command: The LOG command displays a log of exception conditions occurring at the local station. The events are counted, time stamped, and differentiated by an error code.

TALLY Command: The TALLY command displays counts of transactions of the specific tasks.

Using the Modify Commands

To use any of the Modify commands you must obtain the modify "=" prompt using the LOGIN command. To do this you must know the current password. The default password is "system" (lower case characters).

To log in, type from the ">" prompt:

```
LOGIN   <RET>
```

The password prompt will then be displayed.

```
Password:
```

Type in the current password and press Enter. If the entered password matches the current password for the station, the modify "= " prompt is displayed. The password is case sensitive.

One may execute all Monitor and Modify commands from the Modify "=" prompt. If no commands are executed within 10 minutes, the Modify login will time-out and you will have to login again. This 10 minute timeout between commands can be changed if desired by using the *CHLTIME* command.

Note

The security feature is intended to prevent inadvertent misuse of the Modify commands. It is not a foolproof mechanism to prevent unauthorized changes. For the greatest protection, restrict the number of people who know the password, restrict access to the Station Manager terminal, and always log off when you leave the Station Manager.

To list the Monitor commands and Modify commands on the screen, type:

```
HELP  <RET>     or

?  <RET>
```

The following table provides a brief description of the Modify commands.

Table 5-2. Modify Commands

Command	Description
chbps	Change serial port data rate
chdate	Change date (Not recommended if PLC CPU is configured properly.)
chltime	Change login timeout
chsosw	Change Soft Switch data (Not recommended .)
chtime	Change time (Not recommended if PLC CPU is configuredproperly.)
clear	Clear Extended Status buffer, Exception Log, Tallies, or Heap
clsosw	Clear Soft Switch values on TCP / IP Ethernet Interface (Not recommended.)
load	ForceTCP / IPEthernet Interface to be loaded
logout	Exit modify mode
net	Disable / Enablenodefromnetwork
ok	Turns on STATUS OK LED
ping	Issues ICMP echo request
rem	Send command to remote station
report	Report test results
repp	Report ping results
restart	RestarttheTCP / IPEthernet Interface
stopp	Stop ping command
stopt	Stop test command
test	Send test commands to station(s)
trace	Turn on specific task trace flags

Date and Time

The Station Manager provides commands to examine the date and time. Any time the TCP / IPEthernet Interface is restarted or power to it is cycled, it will attempt to read the date and time from the PLC CPU. If this fails, the time reverts to midnight and the date to January 1, 1989; it is only in the case of failure to read date / time from the CPU that you must set it using the Station Manager. If accurate time stamp information is to be generated in the Exception Log, the system date and time must be set using the Station Manager.

Station Manager Command Syntax

The Command Descriptions section which follows provides an alphabetical listing of the commands. Each entry describes the input and output for each command.

All commands have the format of a command followed by a variable number of arguments separated by spaces. Details about the arguments are discussed with each com-

mand. All arguments to the commands, will be automatically converted to all lower case characters unless they are enclosed in double quotation marks (e.g., "A").

Task Identification

Several commands refer to "tasks" or subsystems of the operating software. Each task has a unique identifying letter which is used to select the desired task or tasks. The following table shows the task identifiers and their associated tasks.

Table 5-3. Task Identifiers

Identifier	Task
b	System Memory
c	PLC Driver
f	ARP
h	Channel API
i	IP Layer
j	ICMP
l	Data Link Layer
v	SRTP Server Agent
w	TCP Layer

Display Data Representation

The data that is displayed by the Station Manager is formatted in one of several ways depending on the type of data being input or output.

Note

The Ethernet Interface has a limited output buffer for storing Station Manager command results. If a command's output exceeds this size, part of the command output will be lost, and will not be displayed.

Numeric Values

Numeric values are displayed as decimal values with the hexadecimal equivalent printed in parenthesis beside it. An exception is baud rate which are printed only in decimal. Hexadecimal values are represented with a "H" as their last character.

An example of numeric output is shown below.

bbuff4 = 2140 (085cH)

When numeric values are entered, they may be entered as either a decimal value or as a hexadecimal value. Hexadecimal values must be entered using the trailing "H" (either upper or lower case) as their last character.

Byte String Values

Byte strings represent each successive byte as a pair of hexadecimal digits enclosed in double angle brackets (<<...>>). An examples of a byte string output is shown below.

```
MAC address = <<080019010842>>
```

IP Address

IP addresses are displayed and entered in dotted decimal format. An example is shown below:

```
= ping 3.4.5.6 10

<<< Ping Results >>>
Command:  ping  3.4.5.6  10 100 64
Sent = 10, Received = 10, No Timely Response = 0
Late/Stray Response = 0
Round-trip (ms) min/avg/max 0/1/10
```

Station Manager in Utility Programs

The Ethernet Interface has two utility functions provided as a part of the PROM-based software. These utilities allow selected station management functions to be performed, even when no operating software is loaded. This allows the Ethernet Interface hardware and the network to be verified without requiring that any software be loaded into the Ethernet Interface.

Soft Switch Entry Utility

The Ethernet Interface stores its Soft Switch data in an EEPROM. If Soft Switches have not been configured through Logicmaster 90-70 and the values in the EEPROM are invalid, the Soft Switch Entry utility is entered. Also, when certain other faults are detected, control will revert to the Soft Switch Entry utility.

Caution

The Soft Switch parameters are critical to proper startup of the Ethernet Interface. Improper settings of Soft Switch values can prevent the station from functioning with the PLC, from being loaded, or from being accessible to other stations on the network.

The Soft Switch Entry utility is entered if the data in the Soft Switches are determined to be invalid on power-up or restart of the Ethernet Interface, or if certain other faults occur.

The Soft Switch Entry utility runs a subset of the Station Manager commands. It provides a unique prompt, an asterisk ("*"). The Station Manager commands shown in the following table can be used while in the Soft Switch Entry utility. Some of the commands have restrictions due to the limited services available in this utility.

All commands in the Soft Switch Entry utility are accessible at the initial security level. It is not necessary to login to use the Modify commands while in the Soft Switch Entry utility.

A typical initialization message from the Soft Switch Entry utility is shown below:

```
IC697 PLC Factory LAN Interface
Copyright (c) 1990-1995.  All rights reserved.
PROM Version 2.00 (xxAx) Ethernet
MAC address = <<08001901001f>>  MAC default = <<08001901001f>>
EM7A2
<<< Soft Switch Entry Utility >>>

Soft Switch Values Not Defined
*
```

Just before the "*" prompt is printed, the reason for entry into the Soft Switch Entry utility is printed. Some examples of entry reasons are: soft switch values not defined,

PROM / software versions are incompatible, or station MAC address in soft switches does not match downloaded configuration.

Table 5-4. Soft Switch Entry Utility Commands

Command	Restrictions
bps	
chbps	
chdate	(Not recommended if the PLC CPU is configured properly.)
chsosw	(Not recommended if the PLC CPU is configured properly.)
chtime	(Not recommended if the PLC CPU is configured properly.)
clear	Limited to clear tally, clear log, and clear heap
clsosw	(Not recommended if the PLC CPU is configured properly.)
date	
help or ?	
load	
log	
login	
node	
ok	
restart	
show	Only task identifiers "b" and "c" are supported
sosw	
stat	Only task identifiers "b" and "c" are supported
tally	Only task identifiers "b" and "c" are supported
time	

Monitor Commands are not in italics. Modify Commands are shown in *italics*.

If the Soft Switch values are not defined or disagree with other evidence, the problem must be satisfactorily resolved by one or more of the following actions:

1. Set the MAC address or IP address to the correct value via Logicmaster 90 Configurator.
2. If not configured via Logicmaster 90, use the *CHSOSW* Station Manager command described in this chapter.
3. Adjust the GSM configuration for the Ethernet Interface.
4. Download the Ethernet Interface from the GSM.

Other wise, you will be continually placed back into this utility after each restart. For proper usage of the *CHSOSW* command, see the *CHSOSW* command description in this chapter.

The Soft Switch Entry utility is exited by restarting the Ethernet Interface. This can be accomplished by entering the *RESTART* or *LOAD* commands, pressing the Ethernet Interface Restart pushbutton, or by cycling power on the Series 90-70 PLC.

Field Network Test Utility

It is often useful to check the proper operation of the network before all of the station configuration parameters are finalized. The Field Network Test utility provides access to a subset of the Station Manager commands that allow the station to operate as a member of the network without requiring any software or configuration data to be loaded. Installation Procedure 5 (in Chapter 2) provides detailed instructions for checking the operation of a node across the physical network to all other nodes.

The Field Network Test utility can be entered only during a brief interval at the end of power-up diagnostics. When power-up diagnostics are completed, the character "@" is displayed on the Station Manager terminal and a three-second opportunity to enter the Field Network Test utility begins. If the character "F" or "f" is entered at the local Station Manager terminal during this three-second window, the Field Network Test utility will be entered. Any character except "F" or "f" is ignored. After three seconds, the window for entering the Field Network Test utility closes and system initialization proceeds. Note that these characters are not echoed back.

A typical invocation of the Field Network Test utility is shown below:

```
@        ("F" or "f" character is entered within 3 seconds)
IC697 PLC Factory LAN Interface
Copyright (c) 1990-1995.  All rights reserved.
PROM Version 2.00 Ethernet
MAC address = <<08001901001f>>  MAC default = <<08001901001f>>
EM7A2

<<< Field Network Test Utility >>>
$
```

After the station enters the network, the Station Manager commands shown in the following table can be used to test the network. Some of the commands have restrictions due to the limited resources available in this utility.

Table 5-5. Field Network Test Utility Commands

Command	Restrictions
bps	
chbps	
chdate	(Not recommended if the PLC CPU is configured properly.)
chsosw	(Not recommended if the PLC CPU is configured properly.)
chtime	(Not recommended if the PLC CPU is configured properly.)
clear	Limited to clear tally, clear log, clear heap, and clear exs.
clsosw	(Not recommended if the PLC CPU is configured properly.)
date	
help or ?	
load	
log	
login	
net	
node	
ok	
rem	
report	
restart	
show	Only task identifiers “b”, “c”, and “l” are supported.
sosw	
stopt	
stat	Only task identifiers “b”, “c”, and “l” are supported
tally	Only task identifiers “b”, “c”, and “l” are supported
test	
time	

Monitor Commands are not in italics.
Modify Commands are shown in *italics*.

The Field Network Test utility is exited by restarting the Ethernet Interface. This can be accomplished by entering the RESTART or LOAD commands, pressing the Ethernet Interface Restart button, or by cycling power on the Series 90-70 PLC.

Section 3: Command Descriptions

Symbols are used to denote options or alternatives in the command parameters. These symbols are used to help give a clear and complete description of the command and are not part of the command. The use of these symbols is briefly described below:

Arguments to commands are often given symbolic names which are enclosed in angle brackets (< >). For example; "<PAGE>" is an argument to many commands. The command specification for "<PAGE>" is described as a number which specifies the page number of the display. It is important to remember to enter the argument and not its symbolic name. For example, to see the second page of the Test Results, you should enter:

REPORT 2 - not - REPORT <PAGE>

Optional arguments are surrounded by square brackets, for example *REPORT* [<PAGE>]. Again, the brackets should not be entered as part of the command.

Sometimes there are several *alternatives* for an argument. The alternatives are listed in the command description separated by a vertical bar (|) and enclosed in braces ({|}). For example, when using the *NET* command, only one of the alternatives should be selected:

```
NET { ON | OFF }
```

Command Input Processing

Anything in a command description that is not one of the constructs discussed above should be entered exactly as it is shown. All data entered for the command is converted to lower case unless it is enclosed in double quotes (""). To use a double quote character within an argument string, the double quote should be entered twice, for example: "This string would contain one " "character."

The Station Manager accepts several ASCII control characters for various functions. The control characters accepted by the Station Manager are listed in the following table. All other control characters are ignored on normal command inputs. Illegal control characters sent to the Station Manager result in a BEL character being sent to the terminal.

Table 5-6. Control Characters

Control Character	Usual Keyboard Function	Function
BS	Ctrl-H (Backspace)	Delete previous character
DEL	Delete	Delete previous character
DC1	Ctrl-Q	Resume output to the display
DC2	Ctrl-R	Recall previous command line
DC3	Ctrl-S	Stop output to the display
CAN	Ctrl-X	Cancel the current input line
CR	Return (Enter)	Terminate line and execute command

If a command line becomes too long to easily type on a single display line, the character pair "\<RET>" can be used to continue the command on the next line on the display. The "\" (backslash) character will not be used as a part of any argument.

CHANNEL Command

The CHANNEL command has the form:

```
CHANNEL  [<channel number>]
```

This command displays detailed information about a specified communication channel (activated via COMMREQ command) originating within the local PLC. A typical CHANNEL command for an active channel is shown below:

```
> channel 1
<<< Individual Channel Information >>>
Type: read, State: AWAIT_BPX
Application-Visible Detailed Channel Status Information:
  Status Code: 0001H, Active: 1
Application-Invisible Detailed Channel Status Information:
  Transfers Completed: 138, Error Transfer Number: 0
Establish Channel COMM_REQ Information:
  CRSW Reference Address (zero-based): 00008:00009
  Command Code: 2003, Channel Number: 1, Reps: 0
  Period Time Unit Code: 3, Repetition Period: 0
  Timeout: 50 10ms tics
  Local Reference Address: 00008:00100
  Remote Reference Address: 00008:00050
  Number of Remote References to Access: 8
  Remote Address Type: 1, Remote Address Word Length: 4
  Remote IP Address: 3.0.0.1
```

The channel numbers range from 1 to 16.

BPS Command

The BPS command has the form:

```
BPS
```

This command causes the current serial port data rate to be displayed. A typical BPS command is shown below:

```
> bps
bps = 9600
```

CHBPS Command

The *CHBPS* command has the form:

```
CHBPS { 9600 | 2400 | 1200 | 300 }
```

where one of the data rate selection values is entered

This command is used to change the data rate on the serial port of the Ethernet Interface. Any input or output from the serial port after the command has been successfully entered will use the modified data rate. The data rate remains in effect until it is again explicitly changed or until the Ethernet Interface is restarted. The default data rate is 9600 bps.

A typical *CHBPS* command is shown below:

```
= chbps 1200
bps = 1200
```

If the output device attached to the serial port is not set to the new data rate, the BPS command message will be lost or garbled.

CHDATE Command

(Not recommended if the PLC CPU is configured properly.)

The *CHDATE* command has the form:

```
CHDATE  <DD-MMM-YYYY>

(an example date is:   01-JAN-1989)
```

This command is used to change the system date to the date specified in the command. No date earlier than Jan 1, 1989 may be entered. If an invalid date is entered, the current date is not changed. Date changes remain in effect until the Ethernet Interface is powered-up or restarted.

A typical *CHDATE* command is shown below:

```
= chdate 24-MAY-1996
Date = 24-MAY-1996
```

CHLTIME Command

The *CHLTIME* command has the form:

```
CHLTIME  <minutes>
```

where <minutes> is a login timeout value expressed in minutes which has a range of 0 to 32767.

The *CHLTIME* command is used to change the login timeout value. This change remains in effect until it is explicitly changed or until the next *LOGOUT* command is entered. If the number of minutes specified is zero, no timeout is enforced.

A typical *CHLTIME* command is shown below:

```
= chltime 5

Login timeout = 5 min
```

CHSOSW Command

When the Ethernet Interface is using a MMS-ETHERNET configuration mode, the *CHSOSW* command has the form:

```
CHSOSW     {<soft switch data>|def}
```

where <soft switch data> is the parameter string

```
[mac <MAC_address>]
[ldsrc <load_source>] [lanonline <yes_no>]
[bponline <yes_no>]   [ldmac <load_addr>]
[mms <enable>]*        [pgmr <enable>]
```

and where

```
<yes_no> = {yes | no}
<load_source> = {alt | net | loc}
<enable> = {dc | req | prhb}
```

and "CHSOSW def " causes default values to be set.

* The MMS parameter is not used by the TCP / IP Ethernet Interface.

The *CHSOSW* command causes new data to be placed into the Soft Switches (EEPROM) of the Ethernet Interface.

Notes

1. The changes made with either the Logicmaster 90 Configurator or the *CHSOSW* command will not take effect until the next Ethernet Interface restart.
2. If the PLC CPU has been properly configured through the Logicmaster 90 Configurator (the normal case), the *CHSOSW* Command will not be honored.

In TCP / IP configuration mode, the only permitted use of CHSOSW is CHSOSW MMS MODE. This changes the configuration mode to MMS-ETHERNET.

The Soft Switch data parameters must be entered as specified above. The parameter label (mac, ldsrc, lanonline, bponline, ldmac, mms, or pgmr) must precede the new parameter value.

The <MAC_address> parameter is the station's working MAC address. This parameter is entered as a byte string. A value of all 0's for this parameter means that the permanent globally administered station address (Default Station Address) is used. This parameter may not be a multicast or a broadcast address. See the section titled "The MAC Address" in Appendix G.

The <load_source> parameter indicates the source of the communications software download. This parameter should be one of the ASCII string values shown in the table below.

Table 5-7. Load Source Parameters

Parameter Value	Description
ALT *	Alternate between all possible load sources
LOC	Load from local serial port
NET	Load from network

* Default Value

The <yes_no> parameter indicates whether the Ethernet Interface will initialize and enter the network or initialize the Backplane Communications with the CPU. This parameter has a value of YES or NO.

The <load_addr> parameter is the multicast address used by the Ethernet Interface for network loads. This parameter is entered as a byte string. A value of all 0's for this parameter means the default multicast load address <<090060000000>> is used. This parameter may not be the broadcast address, but must be a multicast address.

The pgmr <enable> parameter defines the type of communications software which can download the Ethernet Interface. pgmr refers to the communications software downloaded by Logicmaster 90 software. <enable> = {dc | req | prhb} defines further conditions of the download (where dc = Don't Care, req = Required, prhb = Prohibited. The default is Don't Care).

For example, the command "*CHSOSW* PGMR PRHB" prohibits the Logicmaster 90 Network Utilities from downloading this Ethernet Interface. Only the GSM can download this Interface. In addition, once the Interface is downloaded, Logicmaster 90-TCP / IPUtilities will be prevented from connecting to this PLC system. Refer also to the *Logicmaster 90-TCP/IP Communications User's Manual*, GFK-1029.

The *CHSOSW* command does not require that every parameter be entered. If a Soft Switch label / value pair is omitted, one of two results occur depending on the current Soft Switch data. If the current data is determined to be valid, any parameters that are not entered are left unchanged. However, if the Soft Switch data is determined to be invalid, all parameters omitted are set to their respective default values. Default values are shown in the the table below. At least one parameter label / value pair must be entered.

Using the *CHSOSW* command with the single parameter "def" causes all Soft Switch values to be set to their defaults.

If the Soft Switches have been determined to be invalid, the Soft Switch Entry utility is entered upon power-up or restart. Once in this utility, you MUST correct the problem either with the Logicmaster 90 Configurator or with a *CHSOSW* command before exiting. Otherwise, the Soft Switch Entry utility will automatically be re-entered after a power-up or restart.

Table 5-8. Soft Switch Default Values for the Ethernet Interface

Soft Switch	Default Value
	Config Mode MMS-ETHERNET
MAC address	<<000000000000>>
Load source	ALT
LAN online	YES
BP online	YES
Network load address	<<090060000000>>
MMS enable*	Don't Care
PGMR enable	Don't Care

*Unused by the TCP / IP Ethernet Interface.

A typical output from the *CHSOSW* command is shown below.

```
= chsosw ldsrc loc
<<< Soft Switch Data >>>
Config Mode:  MMS-Ethernet
MAC address = <<080019011234>> (default used)
Load source = Serial
Network Online = Online after powerup
Backplane Online = Online after powerup
Network load addr = <<090060000000>> (default used)
MMS Enable = Don't Care
Pgmr Enable = Don"t Care
Source of Soft Switches:  Internal Backup
Updating, please wait ...
```

CHTIME Command

(Not recommended if the PLC CPU is configured properly.)

The *CHTIME* command has the form:

```
CHTIME  <HH[:MM [:SS]]>
```

where <HH> is an hour in the range 0-23
<MM> is an optional minute in the range 0-59 which defaults to 0
<SS> is an optional second in the range 0-59
which defaults to 0

This command sets the current system time to the value specified. If an invalid time is entered, the current time is not changed. Leading zeros do not need to be entered when entering the new time value. Time changes remain in effect until the Ethernet Interface is powered-up or restarted. A typical *CHTIME* command is shown below:

```
= chtime 8:03
Time = 8:03:00.0
```

CLEAR Command

The *CLEAR* command has the form:

```
CLEAR { EXS | LOG | TALLY | HEAP }
```

The *CLEAR* command sets various Ethernet Interface data structures to initial values, usually zeros.

- If the *CLEAR EXS* command is entered, the Extended Status Buffer is cleared to an initial state where only the 2 software versions are non-zero. (Not necessary with the TCP / IP Ethernet Interface.)
- If the *CLEAR LOG* command is entered, all Exception log entries are discarded and the log is set to an empty state. The *CLEAR LOG* command also turns on the STATUS OK LED on the Ethernet Interface.
- If the *CLEAR TALLY* command is entered, all tallies are set to a value of zero, with the exception of the System Memory Tallies: TimReset and Restart and the PLC Driver Tallies: Regs, KbLogic, and uCode.
- If the *CLEAR HEAP* command is entered, the minimum system buffer free count values maintained by the STAT B command are reset to the current free count values.

A typical *CLEAR TALLY* command is shown below:

```
= clear tally
Tallies cleared
```

CLSOSW Command

(Not recommended if the PLC CPU is configured properly.)

Notes

The changes made with either the Logicmaster 90 Configurator or the *CLSOSW* command will not take effect until the next Ethernet Interface restart.

The *CLSOSW* command clears the SOSW valid bit in the soft switches stored in the Ethernet Interface EEPROM. This ensures that the LAN controller board must receive new soft switch values before it can be restarted and put into service. On the next restart, if the Ethernet Interface is configured in the Series 90-70 PLC CPU then new soft switch values will automatically be accepted and saved in EEPROM. If the Ethernet Interface is not configured in the CPU, the Ethernet Interface will go into the Soft Switch Entry utility after the completion of diagnostics. Refer to Appendix C for more discussion of the Soft Switch Entry utility.

The *CLSOSW* command is shown below:

```
= clsosw

Updating, please wait ...
```

DATE Command

The DATE command has the form:

```
DATE
```

This command causes the current system date to be displayed. This date is used in generating time stamps for the Exception Log. The initial value of the date is read from the PLC on Restart or, if unavailable, is set to 1-JAN-1989 on restart or power-up. The Modify command *CHDATE* can be used to set the date.

The DATE command is shown below:

```
> date
Date = 28-FEB-1990
```

EXS Command

Note

This command is not used by the TCP / IP executive software.

This command has the form:

```
EXS
```

This command displays extended status of COMMREQs initiated by the local ladder program. This command is usually used during troubleshooting.

The EXS command is shown below:

```
> exs
<<< Extended Status >>>
Last command               0 (0000H)
Last Sta Mgr cmd           0 (0000H)
Software version           200
PROM version               200
Error code            0 (0000H)
Last MDB in error  0000H 0000H 00000H 0000H 0000H 0000H 0000H 0000H
```

The error codes shown in the next to last line of output are the same codes returned in the COMMREQ Status (CRS) word to the ladder program. See Tables 4–4 through 4–7. If a non-zero error code is displayed, the last line also displays up to eight words of the COMMREQ Command Block, beginning with the Command word (word 7)

HELP Command

The HELP command has the form:

```
HELP      - or -      ?
```

The HELP command (or the single character command "?") can be used to display a short reminder of the valid commands. If you are logged in to use modify commands, you will see the <<<Modify Commands>>> in the command list (see Table 5-2,

"Modify Commands"). If you are not logged in, you will not see the modify command listing.

A typical HELP command when you are not logged in, i.e., you are in Monitor level, is shown below:

```
> help
<<< Monitor Commands >>>
?         bps       channel   date      exs       help      log
login     ltime     prog      node      show      sosw      stat
tally     time
```

A typical HELP command when you are logged in is shown below:

```
= help
<<< Monitor Commands >>>
?         bps       channel   date      exs       help      log
login     ltime     prog      node      show      sosw      stat
tally     time

<<< Modify Commands >>>
chbps     chdate    chltime   chsosw    chtime    clear     clsosw
load      logout    net       ok        ping      rem       report
repp      restart   stopp     stopt     test      trace
```

LOAD Command

The *LOAD* command has the form:

```
LOAD
```

The *LOAD* command causes the Ethernet Interface to enter the "load" state as described in Chapter 2, Installation Procedure 4: Configuring and Downloading a Station. After the *LOAD* command is entered, the module must have its software reloaded and reinitialized before any further processing may take place. Any data transfer between the Series 90-70 PLC and the network when the *LOAD* command is issued is permanently lost.

A typical *LOAD* command is shown below:

```
= load
Forcing software load
```

LOG Command

This command prints entries from the Exception Log. Log entries remain in the log until they are explicitly cleared by using the *CLEAR LOG* command or until they are overwritten by more recent data. The log is maintained as a circular list where new data overwrites the oldest data in the list. An arrow points to the most recently logged event.

The LOG command has the form:

```
LOG
```

A typical LOG command is shown below:

```
> log
<<< Exception Log >>>                        Entry
Date            Time          Event  Count   1    2     3     4     5     6
  01-FEB-1996   00:00:00.0     1H      1H    00H 0000H 0000H 0000H 0000H 0000H
->01-FEB-1996   04:37:15.3     cH     14H    00H 0103H 0000H 0000H 0000H 0000H
```

The Date and Time columns contain a time stamp of the last occurrence of the logged event. The Event column gives the kind of event which occurred. The following table lists the possible values for events. The Count column contains a repetition count for the event. If events which are identical occur regularly, they can easily flood the log with useless entries. Instead of recording each such repeated event in detail, the log simply keeps the time stamp of the latest and a count of the number of repetitions of the repeated event. The log Entry contains detailed information about the event.

Note

The timestamp used is the current date and time of day as known by the TCP / IP Ethernet Interface. This is the same time that is displayed by the *DATE* and *TIME* commands and changed by the *CHDATE* and *CHTIME* commands.

Table 5-9. Log Event Definitions

Log Event (Hexadecimal)	Cause
1	Powerup. A log entry of this event will appear every time the Ethernet Interface is restarted or powered up.
2	System events.
8	PLC Driver events.
b	Service Agent events.
c	LLC events.
11	IP Layer events
12	TCP Layer events
16	ARP Layer events
18	Network Layer events
1b	SRTP Server events
1c	Channel API

Refer to Chapter 6, Troubleshooting, for information on interpreting the logged events.

LOGIN Command

The LOGIN command has the form:

```
LOGIN
```

The LOGIN command will be followed by a prompt of the form:

```
Password:
```

You should enter your password (which will not be echoed). If the password matches the current password for the Modify level, you will receive a confirmation message and you will be allowed access to the Modify commands. If the password does not match, then an error message is displayed and the security level is not changed.

Please note that all characters which are typed after the password prompt except for the Enter key are assumed to be part of the password. Specifically, the delete and backspace characters do not have their usual meaning and are interpreted simply as password characters. Passwords are limited to 8 characters and all characters after the eighth are ignored. Unlike other inputs, the password does not need to be enclosed with double quotes to achieve case sensitivity.

The factory default password is: system (lower case).

Note

There is a special variation of the LOGIN command that can only be used in conjunction with the *REM* (remote) command to login on a remote system. Refer to the *REM* command for a discussion of this variation.

LOGOUT Command

The *LOGOUT* command has the form:

```
LOGOUT
```

This command causes the secure login to be terminated. Any Modify commands entered after the logout will receive an error message. Logging out causes the login timeout value to return to 10 minutes. A typical *LOGOUT* command is shown below:

```
= logout
Logged out
```

LTIME Command

The LTIME command has the form:

```
LTIME
```

This command causes the current login timeout value to be displayed. A typical LTIME command is shown below:

```
> ltime
Login timeout = 10 min
```

The login timeout value can be changed using the *CHLTIME* command.

NET Command

The NET command has the form:

```
NET { ON | OFF }
```

This command causes the MAC to either ignore incoming Ethernet frames (when NET OFF is specified) or to accept incoming Ethernet frames (when NET ON is specified). This can be used to remove stations from the network without the need to physically disconnect them or restart the hardware.

A typical NET OFF command is shown below:

```
= net off
Interface off network
```

Note

If the “lanonline” Soft Switch is set to NO, this command has no effect.

NODE Command

The NODE command has the form:

```
NODE
```

This command causes the TCP / IP Ethernet Interface sign-on message to be printed out on the screen. When the TCP / IP Ethernet Interface is executing the Soft Switch Entry Utility, the reason that the utility was entered is also displayed.

A typical NODE command is shown below:

```
> node
IC697 PLC Factory LAN Interface
Copyright (c) 1990-1995.  All rights reserved.
PROM version 2.00 (xxAx), Software version 2.00 (xxAx)
TCP/IP Ethernet
IP address = 3.16.18.47
MAC address = <<080019010177>>  MAC default = <<080019010177>>
EM7A2
```

OK Command

This command causes the STATUS OK LED to turn ON. It has no effect on the contents of the exception log.

The OK command has the form:

```
OK
```

A typical OK command is shown below:

```
= ok
Display modified
```

PING Command

The *PING* command has the form:

```
PING  <node> [ <cnt> [ <sch> [ <len> ] ] ]
```

where <node> is the Internet address of the destination.
<cnt> is the number of ICMP echo requests to send to the destination.
<sch> is the number of 10 millisecond intervals to wait for a reply from the destination, and send the next ICMP echo.
<len> is the length of the ICMP echo message (minimum of 8 bytes).

A typical *PING* command is shown below.

```
= ping 3.16.18.76 10

<<< Ping Results >>>
Command:  ping  3.0.0.1 10 100 64
Remote IP Address = 3.0.0.1, Sent = 10, Received = 10, No Response = 0
Round-trip (ms) min/avg/max 0/1/10
```

The bounds for <cnt> are 0 through ffffH; the default is 1. The bounds for <sch> are 0 through 7fffH; the default is 100 (1 second). A value of 0 for <sch> results in the default value of 100 being used. The bounds for <len> are 8 through 7fffH and are limited by system buffer memory; the default is 64.

PROG Command

The PROG command has the form:

```
> PROG
```

This command causes the name of the current PLC CPU program to be displayed. A typical PROG command is shown below:

```
> PROG
> CPU Program Name is "JEFF914"
>
```

Note that there is a prompt (">") before the output of the command. This is because the PROG command retrieves the program name from the CPU asynchronously and prints the name when it arrives, possibly interspersed with other Station Manager output.

REM Command

The *REM* command has the form:

```
REM  <node> <cmd> [<cmd parms>]
```

where <node> is the MAC address of a remote Ethernet Interface
<cmd> is any station manager command except REM
<cmd parms> is a list of any parameters required by <cmd>.

The *REMote* command sends the Station Manager command which is its argument and any associated parameters to the node whose address is specified. The Station Manager on the remote node acts on the command as if it had been entered at its local serial port, but directs all output from processing the command back over the network to the station where the *REM* command originated. The results are displayed at the local station with the notation "REM" along with the prompt from the remote station to denote that the data was returned from the remote station. (A *REM* command cannot be issued to the node on which it is entered.)

A typical *REM* command is shown below:

```
= rem 08001901001f node
REM> IC697 PLC Factory LAN Interface
REM> Copyright (c) 1990-1995.  All rights reserved.
REM> PROM version 2.00 (xxAx), Software version 2.0000 (xxAx)
REM> TCP/IP Ethernet
REM> IP address = 3.16.18.47
REM> MAC address = <<08001901001f>>  MAC default = <<08001901001f>>
REM> EM7A2
REM>
```

The LOGIN command is treated as a special case when it is specified in the *REM* command. The following command is used to login to a remote device.

```
REM <node> LOGIN <password>
```

Note that this prevents the prompt for the password value and displays the remote password in a readable form.

Note

When using the *REM* command, the password should be placed in double quotes if it contains any uppercase letters because the password is case sensitive.

Security is enforced on the remote system just as if the command had been entered locally. Thus the remote user and any local users of a given node all see the same security level.

REPORT Command

The *REPORT* command has the form:

```
REPORT [<page>]
```

where <page> is an optional page number which defaults to 1

This command causes the current results of the most recent *TEST* command to be reported. It can be used to get intermediate reports for long running tests. Test results are maintained, and may be displayed until another test is started, or until the Modify security level is exited.

A typical *REPORT* command is shown below:

```
= report
<<< Test Results >>>                                    Page 1 of 1
Command: test <<080019010021>> 1H 32H 0H NULL
Init node: <<08001901001f>>  Frames sent : 1H  Nodes responding :1H
Responding nodes    Response recd   Response w/ err   No Response
<<080019000121>>              1H                0H            0H
```

Interpretation of Test Results

The line of output that begins "Command: . . ." lists all the parameters that were specified (explicitly or implicitly) in the preceding *TEST* command, in the order <mode>, <cnt>, <sch>, <len>, <pat>. These numbers are displayed in hexadecimal regardless of how you entered them.

The line beginning "Init node . . . " identifies the MAC address of the initiating node, how many test command frames it sent, and how many nodes responded.

Following this, there is a list (perhaps a list of one) of the responding nodes' MAC Addresses with the corresponding number of test Responses received, Responses with error, and No Responses.

"Responses received" is the total number of responses received from that node. Frames containing CRC or other communication errors are not received but are discarded.

"Response with error" refers to frames that were received, i.e., they were included in the count of "Responses received", The initiating node compares the test data of all responses to the current test data (which always varies from the preceding frame because of the sequence number in the first byte position). Any received frame that does not compare is counted as a Response with error. The most common cause of this indication is that the <sch> parameter in the *TEST* command is set to too short an interval. This should be avoided by increasing <sch>. Also, some manufacturers' products, while replying to the test command, do not return the data field; this will cause all their Responses received to also tally a Response with error.

"No Response" is computed as the difference between the number of test commands sent by the initiating node minus the number of Responses received from the subject node. This number of frames were "lost" either outbound from the initiator, inbound to the initiator, or internally (e.g., lack of buffers) to either the initiator or responder.

REPP Command

The *REPP* command has the form:

```
REPP
```

This command causes the results of the *PING* command to be reported. The results may be for a currently running *PING* or otherwise the most recent *PING* command. Ping results are maintained, and may be displayed until another ping command is started, or until the Modify security level is exited.

A typical *REPP* command is shown below:

```
= repp
<<< Ping Results >>>
Command:  ping  3.0.0.1  10 100 64
Sent = 10, Received = 10, No Timely Response = 0
Late/Stray Response = 0
Round-trip (ms) min/avg/max 0/1/10
```

RESTART Command

The *RESTART* command has the form:

```
RESTART
```

The *RESTART* command causes the Ethernet Interface to be restarted without causing the software to be reloaded. It has the same effect as pressing the Restart pushbutton on the front edge of the Ethernet Interface quickly (2-3 seconds). Any data transfer between the Series 90-70 PLC and the network at the time the *RESTART* command is entered is permanently lost.

A typical *RESTART* command is shown below:

```
= restart
Restarting LAN Interface
```

SHOW Command

The SHOW command has the form:

```
SHOW { <parm name> | PARMS <task(s)> }
```

where <par m name> is the name of one of the parameters from Table 5-10.
or PARMS is entered just as shown and <tasks(s)> is a set of one or more task identifier letters from the Table 5-3.

The SHOW command has one of two forms. If the argument to the SHOW command is the string PARMS, then task identification letter(s) are also required. The list of configuration parameters for the specified task(s) is displayed.

A typical SHOW PARMS command is shown below:

```
> show parms i
<<< IP Parameters >>>
iaddr       inetmaskz   idefgateway  iname server   ittl
ifrag_q_sz  imax_frag   ifrag_ttl    ifrag_tmr
```

If a configuration parameter name is entered with the SHOW command, the current value of that parameter is displayed. Valid configuration parameter names are listed in the tables below.

A typical SHOW command is shown below:

```
> show ittl
ittl = 64  <0040H>
```

Note

Note that these parameters can not be changed using the Station Manager. And only some (IP address, Subnet Mask, and Default Gateway) can be changed using the PLC Programmer or GSM. All others are fixed.

Configuration Parameters

Table 5-10. Configuration Parameters

Parameter	Description	Default Value	
		DEC	HEX
	System Memory Configuration Parameters		
balloc1	Buffer pool 1 percent	11	000B
balloc2	Buffer pool 2 percent	12	000C
balloc3	Buffer pool 3 percent	43	002B
balloc4	Buffer pool 4 percent	34	0022
bbuff1	Buffer pool 1 buffer size	44	002C
bbuff2	Buffer pool 2 buffer size	380	017C
bbuff3	Buffer pool 3 buffer size	1580	062C
bbuff4	Buffer pool 4 buffer size	2140	085C
bremlsap	Remote command LSAP	232	00E8
brempri	Remote command priority	0	0000
	Data Link Configuration Parameters		
ldrtry	Retry option	0	0000
lgrpmsk0-7	Group RX addresses 0-7	0= <<010000000000>>, 1-7=0	
lmacaddr	Station MAC address	<<000000000000>>	
lmaxdb	Maximum LLC buffer size	1497	05D9
lrxringlen	Size of receive ring	32	0020
ltxringlen	Size of transmit ring	8	0008
lxidtime	XID frame response timeout	100	0064

Table 5-10. Configuration Parameters - Continued

Parameter	Description	Default Value	
		DEC	HEX
	IP Configuration Parameters		
iaddr	Local IP address *	0.0.0.0	
inetmask	Subnet Mask *	0.0.0.0	
idefgateway	Default Gateway *	0.0.0.0	
iname server	Name Server	0.0.0.0	
ittl	Time to live	69	0040
ifrag_q_sz	Fragment queue size	5	0005
ifrag_q_s	Maximum fragment size	5	0005
ifrag_ttl	Fragment time to live	15	000F
ifrag_tmr	Fragment timer	100	0064
	TCP Configuration Parameters		
wmin_to	Minimum timeout value	100	0064
wmax_to	Maximum timeout value	1000	03E8
wmax_conn	Maximum number of connections	16	0010
wretries	Maximum number of retries	10	000A
wtwo_seq_lt	Two minimum segment life times	1	0001
wpersist	Persist time	3000	0BB8
wackdelay	ACK delay time	50	0032
winput_q	Maximum input queue length	2	0002
wurg_q	Maximum urgent queue length	2	0002
wsegmt_sz	Maximum segment size	1460	05B4
wsend_buf	Send buffer size	2104	0838
wrcv_buf	Receive buffer size	2104	0838
	ARP Configuration Parameters		
fretries	Maximum number of retries	4	0004
frun_time	Run time interval	100	0064
fttl	Time to live	600	0258
fcache_sz	Cache size	16	0010
	SRTP Server Configuration Parameters		
vbufsz	Buffer Size	<<00080000>>	
	Channel API Configuration Parameters		
hmax_bpx_sz	Maximum bytes of data per transfer.	<<00080000>>	

* The SHOW command displays IP addresses in hexadecimal. For example “3.4.5.6” would be shown as <<03040506>>.

SOSW Command

(Not recommended if the PLC CPU is configured properly.)

This command displays the current setting of the Ethernet Interface Soft Switches or a message indicating that no Soft Switch values are defined. If not defined, the operator must set Soft Switch values, using the *CHSOSW* command, before the Ethernet Interface can proceed to any state beyond the Soft Switch Entry utility.

The command output is different depending upon the Logicmaster configuration mode (TCP / IP or MMS-ETHERNET). When Config Mode is MMS-ETHERNET, the SOSW command has the form:

```
SOSW
```

A typical MMS-Ethernet configuration mode SOSW command is shown below:

```
> sosw
<<< Soft Switch Data >>>
Config Mode:  MMS-Ethernet
MAC address = <<080019010177>> (Using default)
Load source = Serial
Network Online = Online after powerup
Backplane Online = Online after powerup
Networkload addr = <<090060000000>> (using default)
MMS Enable = Don't care *
Pgmr Enable = Don't care
Source of Soft Switches:  CPU
```

* Unused by the TCP / IP Ethernet Interface.

Also displayed is the source, CPU or Internal Backup, of the Soft Switch data.

STAT Command

The STAT command has the form:

```
STAT <task(s)>
```

where <task(s)> is one or more task identification letters from Table 5-3.

This command causes the current status of the task or tasks specified by the task identification letters to be displayed. An example STAT command is shown below:

```
= stat i
<<< IP Status >>>
Local IP Addr = 3.16.16.18, Subnet Mask = 255.255.252.0
Gateway Addr = 3.16.19.240
```

STOPP Command

The *STOPP* command has the form:

```
STOPP
```

This command causes an active *PING* sequence to stop at its next iteration and to print the results of the terminated test. It is used to terminate a long running *PING* sequence.

STOPT Command

The *STOPT* command has the form:

```
STOPT
```

This command causes an active *TEST* sequence to stop at its next iteration and to print the results of the terminated test. It is used to terminate a long running test before its completion.

A typical *STOPT* command is shown below:

```
= stopt
Test stopped by operator

=                                                              Page 1 of 1
<<< Test Results >>>
Command: test <<0800190100fb>> 100H 32H 0H NULL
Init node: <<08001901001f>>  Frames sent : 87H  Nodes responding : 1H
Responding nodes   Response recd   Response w/err   No Response
<<0800190100fb>>     87H              0H                 0H
```

TALLY Command

The TALLY command has the form:

```
TALLY <task(s)>
```

where <task(s)> is one or more task identification letters from Table 5-3

This command causes the current value of the tallies for the specified task or tasks to be displayed. Some of these tallies simply indicate load and performance information about the station. Others can indicate whether or not there are problems either within the station or within the network. See Chapter 5, Troubleshooting, for more information on using the tallies to help isolate and resolve problems.

An example TALLY command is shown below:

```
> tally c
<<< PLC Driver Tallies >>>
PlcQFull = 0000H    PlcSweep = 03c9H    MsgRcv   = 0038H    PLCReq   = 001aH
PlcAbt   = 0000H    MsgSent  = 0036H    MyAbt    = 0000H    Write    = 0023H
Read     = 0010H    Timeout  = 0000H    Regs     = 0400H    AnInput  = 0040H
AnOutput = 0040H    uCode    = 0300H
```

Table 5-11. PLC Driver Tallies (Tally c)

Tally	Meaning
PlcQFull	Count of the number of times a request of the PLC was retried because of congestion in the PLC.
PlcSweep	Count of the number of executive windows received by the Ethernet Interface.
MsgRcv	Count of the number of messages received from the CPU.
PlcReq	Count of the number of COMMREQs received from the application program.
PlcAbt	Count of the number of times the CPU aborted a data transfer.
MsgSent	Count of the number of messages sent to the CPU.
MyAbt	Count of the number of times the Ethernet Interface aborted a data transfer.
Write	Count of the number of times the Ethernet Interface successfully wrote to the PLC memory.
Read	Count of the number of times the Ethernet Interface successfully read from the PLC memory.
Timeout	Count of the number of times the Ethernet Interface timed out waiting for a response from the CPU.
uCode	The microcode revision level of the firmware in the CPU.

Table 5-12. Address Resolution Protocol (ARP) Driver Tallies (Tally f)

Tally	Meaning
InReq	The number of ARP requests received by ARP.
InRsp	The number of ARP responses received by ARP.
InErrors	The number of ARP packets received where the protocol or hardware types do not match the types of this entity.
OutReq	The number of ARP requests sent by ARP.
OutRsp	The number of ARP responses sent by ARP.
Filtered	The number of ARP packets ignore because they were not addressed to this node.

Table 5-13. Channel API Tallies (Tally h)

Tally	Meaning
InPDU	The number of new incoming SRTP PDUs that have arrived.
OutPDU	The number of outgoing SRTP PDUs that were sent.
BadPDU	Some detected error prevented handling an SRTP PDU.
OutConRq	The number of Connect Request SRTP PDUs that were sent.
InConRp	The number of Response SRTP PDUs that have arrrived.
OutSesRq	The number of Session Request SRTP PDUs that were sent.
OutDatRq	The number of Data Request SRTP PDUs that were sent
InDatRp	The number of Data Response SRTP PDUs that have arrived.
InErrRq	The number of Error Request SRTP PDUs That have arrived.
OutDisRq	The number of Disconnect Requests that were sent.
InDisRrq	The number of Disconnect Requests that have arrived.
InCmd	The number of COMMREQs that have arrived.
BadCmd	The number of COMMREQs that have arrived with an unrecognized command.

Table 5-14. Internet Protocol (IP) Tallies (Tally i)

Tally	Meaning
Forward (ipForwarding)	The indication of whether this entity is acting as an IP gateway with respect to the forwarding of datagrams
DefltTTL (ipDefaultTTL)	The default value inserted into the Time-To-Live field of the IP header of datagrams originated at this entity.
InRecv (ipInReceives)	The total number of input datagrams received from interfaces, including those received in error.
InHdrErr (ipInHdrErrors)	The number of input datagrams discarded due to errors in their IP headers.
InAdrErr (ipInAddrErrors)	The number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received at this entity.
ForwDgms (ipForwDatagrams)	The number of input datagrams for which this entity was not their final IP destination, as a result of which an attempt was made to find a route to forward them to that final destination.
InUnkPro (ipInUnknownProtos)	The number of locally-addressed datagrams received successfully but discarded because of an unknown or unsupported protocol.
InDiscds (ipInDiscards)	The number of input IP datagrams for which no problems were encountered to prevent their continued processing, but which were discarded (e.g., for lack of buffer space).
InDelivs (ipInDelivers)	The total number of input datagrams successfully delivered to IP user-protocols (including ICMP).
OutReq (ipOutRequests)	The total number of IP datagrams which local IP user-protocols (including ICMP) supplied to IP in requests for transmission.
OutDiscd (ipOutDiscards)	The number of output IP datagrams for which no problem was encountered to prevent their transmission to their destination, but which were discarded (e.g. for lack of buffer space).
OutNoRts (ipOutNoRoutes)	The number of IP datagrams discarded because no route could be found to transmit them to their destination.
ReasmTO (ipReasmTimeout)	The maximum number of seconds which received fragments are held while they are awaiting reassembly at this entity.
ReasmReq (ipReasmReqds)	The number of IP fragments received which needed to be reassembled at this entity.
ReasmOKs (ipReasmOKs)	The number of IP datagrams successfully re-assembled.
ReasmFai (ipReasmFails)	The number of failures detected by the IP re-assembly algorithm (for whatever reason: timed out, errors, etc.).
FragOKs (ipFragOks)	The number of IP datagrams that have been successfully fragmented at this entity.
FragFail (ipFragFails)	The number of IP datagrams that have been discarded because they needed to be fragmented at this entity but could no be, e.g., because their "Don't Fragment" flag was set.
FragCrea (ipFragCreate)	The number of IP datagrams that have been generated as a result of fragmentation at this entity.
Filtered	The number of IP datagrams ignored because they were sent to an unreachable IP user and not directly addressed to this "node".

Table 5-15. Internet Control Message Protocol (ICMP) Tallies (Tally j)

Tally	Meaning
InMsgs (icmpInMsgs)	The total number of ICMP messages received.
InErrors (icmpInErrors)	The number of ICMP messages received that have errors (bad checksums, etc.).
InDstUnr (icmpInDestUnreachs)	The number of ICMP Destination Unreachable messages received.
InTimeEx (icmpInTimeExcds)	The number of ICMP Time Exceeded messages received.
InParmPr (icmpInParmProbs)	The number of ICMP Parameter Problem messages received.
InSrcQch (icmpInSrcQuenchs)	The number of ICMP Source Quench messages received.
InRedir (icmpInRedirects)	The number ICMP Redirect messages received.
InEchos (icmpInEchos)	The number of ICMP Echo (requests) messages received.
InEchoRp (icmpInEchoReps)	The number of ICMP Echo Reply messages received.
InTmSp (icmpInTimestamps)	The number of ICMP Timestamp (request) messages received.
InTmSpRp (icmpInTimestampReps)	The number of ICMP Timestamp Reply messages received.
InAdrM (icmpInAddrMasks)	The number of ICMP Address Mask Request messages received.
InAdrMRp (icmpInAddrMaskReps)	The number of ICMP Address Mask Reply messages received.
OtMsgs (icmpOutMsgs)	The total number of ICMP messages attempted to send.
OtErrors (icmpOutErrors)	The number of ICMP messages not sent due to problems discovered within ICMP.
OtDstUnr (icmpOutDestUnreachs)	The number of ICMP Destination Unreachable messages sent.
OtTimeEx (icmpOutTimeExcds)	The number of ICMP Time Exceeded messages sent.
OtParmPr (icmpOutParmProbs)	The number of ICMP Parameter Problem messages sent.
OtSrcQch (icmpOutSrcQuenchs)	The number of ICMP Source Quench messages sent.
OtRedir (icmpOutRedirects)	The number of ICMP Redirect messages sent.
OtEchos (icmpOutEchos)	The number of ICMP Echo (request) messages sent.
OtEchoRp (icmpOutEchoReps)	The number of ICMP Echo Reply messages sent.
OtTmSp (icmpOutTimestamps)	The number of ICMP Timestamp (request) messages sent.
OtTmSpRp (icmpOutTimestampReps)	The number of ICMP Timestamp Reply messages sent.
OtAdrM (icmpOutAddrMasks)	The number of ICMP Address Mask Request messages sent.
OtAdrMRp (icmpOutAddrMaskReps)	The number of ICMP Address Mask Reply messages sent.

Table 5-16. Data Link Tallies (part of Tally I)

Tally	Meaning
Unreg	Number of 802.3 frames received and discarded because the destination LSAP was not configured in the node.
Lsap0	Number of frames received and discarded because the destination LSAP had the value zero.
LsapOfl	Number of LLC service requests rejected due to lack of LSAP table space. A non-zero value in this tally indicates an Ethernet Interface system software error and should be reported to GE Fanuc Automation immediately.
EthUnreg	Number of Ethernet frames received and discarded because the destination Protocol was not configured in the node..
MacErr	A severe network fault prevented transmission of a frame for more than one second. See Exception Log, Event c, Entry 2 = 10b.
BufProb	A received LLC frame was lost due to the inability of the LLC software to acquire a system buffer. This may indicate a memory configuration problem or a temporary overload of traffic at the station.
UnrecPdu	Number of 802.3 frames received and discarded because the LLC control field is invalid.
TstRcvd	Number of test frames received.
TstResp	Number of test frame responses sent.
PadErr	Number of frames received which had a padding and the padding was more than 48 bytes.

Table 5-17. MAC Layer Tallies (part of Tally I)

Tally	Meaning
SQEErr	Number of times the SQE test failed.
MisdPack	The number of packets a receiver lost due to a lack of receive buffers.
FrameErr	The number of incoming packets that did not contain a multiple of eight bits.
SuccOne	The number of times a successful transmission was made with exactly one retry.
CrcErr	The number of incoming packets detected with a CRC error.
RbufErr	The number of times the next buffer was unavailable while receiving a chained data packet.
LateColl	The number of times a collision occurred after the slot time of the channel had elapsed.
LostCarr	The number of times the carrier was lost during a transmission.
BsyCarr	The number of times the transmitter had to wait because it sensed a busy carrier signal.
NoRtry	The number of times a successful transmission was made with no retries needed.
SuccMore	The number of times a successful transmission was made with more than one retry.
FRtry	The number of times the transmission failed despite using the maximum of 15 retries.

Table 5-18. Service Request Transfer Protocol (SRTP) Server Tallies (Tally v)

Tally	Meaning
InPDU	The total number of SRTP PDUs received (both good and bad PDUs).
OutPDU	The total number of SRTP PDUs sent.
BadPDU	The number of bad PDUs received.
InConRq	The number of Connect Request PDUs received.
OutConRp	The number of Connect Request PDUs sent.
InDatRq	The number of Data Request and Session Request PDUs received.
OutDatRp	The number of Data Response PDUs sent.
InUncRq	The number of Unconfirmed Request PDUs received.
OutUncRq	The number of Unconfirmed Response PDUs sent.
InErrRq	The number of Error Request PDUs received.
OutErrRq	The number of Error Request PDUs sent.
InDisRq	The number of disconnect requests received.
OutDisRq	The number of disconnect requests sent.
InDstRq	The number of Destinations Request PDUs received.
OutDstRp	The number of Destinations Response PDUs sent.
InSesRq	The number of Session Request PDUs received

Table 5-19. Transmission Control Protocol (TCP) Tallies (Tally w)

Tally	Meaning
RtoAlgm (tcpRtoAlgorithm)	The algorithm used to determine the timeout value used for retransmitting unacknowledged bytes.
RtoMin (tcpRtoMin)	The minimum value permitted by a TCP implementation for the retransmission timeout, measured in milliseconds.
RtoMax (tcpRtoMax)	The maximum value permitted by a TCP implementation for the retransmission timeout, measured in milliseconds.
MaxConn (tcpMaxConn)	The limit on the total number of TCP connections the entity can support.
ActOpens (tcpActiveOpens)	The number of times TCP connections have made a direct transition to the SYN-SENT state from the CLOSED state.
PasOpens (tcpPassiveOpens)	The number of times TCP connections have made a direct transition to the SYN-RCVD state from the LISTEN state.
AtmptFai (tcpAttemptFails)	The number of times TCP connections have made a direct transition to the CLOSED state from either the SYN-SENT state or the SYN-RCVD state, plus the number of times TCP connections have made a direct transition to the LISTEN state from the SYN-RCVD state.
EstabRes (tcpEstabResets)	The number of times TCP connections have made a direct transition of the CLOSED state from either the ESTABLISHED state or the CLOSE-WAIT state.
CurEstab (tcpCurrEstab)	The number of TCP connections for which the current state is either ESTABLISHED or CLOSE-WAIT
InSegs (tcpInSegs)	The total number of segments received, including those received in error. This count includes segments received on currently established connections.
OutSegs (tcpOutSegs)	The total number of segments sent, including those on current connections but excluding those containing only retransmitted bytes.
RetranSeg (tcpRetransSegs)	The total number of segments retransmitted - that is, the number of TCP segments transmitted containing one or more previously transmitted bytes.

TEST Command

The *TEST* command has the form:

```
TEST { <node> | ALL } [<cnt> [<sch> [<len> [<pat>]]]]
```

where <node> is a destination MAC address and ALL is a synonym for the broadcast address, ffffffffffff .

<cnt> is an optional number specifying the number of test frames to be sent, which defaults to 1.

<sch> is an optional number of 10 millisecond time intervals between consecutive test frame outputs. The default value for this parameter is 50 (500 milliseconds or 1/2 second). This parameter's value can range from 0 to 7fffH (32767), or about 6 minutes. A value of 0 for this parameter results in the default value of 50 being used.

<len> is an optional length of user data in the test frame which defaults to 0 (no data in the test frame). The range of values for this parameter is from 0 to the value of configuration parameter lmaxdb - 16. The test frame data length may be further modified by the <pat> parameter, as described below.

<pat> is an optional value to be used as the data pattern in the user data. This parameter's value can range from 0 to ffH (255). If a value is supplied for the <pat> parameter, each test frame will contain <len> bytes of data, and each byte of test data will be <pat>. However, if the <pat> parameter is omitted and a non-zero <len> value is supplied, a special testing byte sequence is used. In this test sequence, successive test frames are sent with an alternating data pattern (00H, 55H, aaH, ffH, and a counting pattern) and an incremental frame length of 1 byte up to <len> bytes.

For example, the data for the first six test frames would consist of: 00H (len = 1), 55H 55H (len = 2), aaH aaH aaH (len = 3), ffH ffH ffH ffH (len = 4), 00H 01H 02H 03H 04H (len = 5), and 00H 00H 00H 00H 00H 00H (len = 6).

This command causes one or more LLC test frames to be sent to the specified address. Test frames are output at frequency <sch> until <cnt> frames have been sent. The optional <len> and <pat> parameters can be used to specify the form of user data sent on the test frames. A lengthy *TEST* command can be terminated by using the *STOPT* command.

The *TEST ALL* command can be used to return a list of all the other stations on the network. For the MAP Interface, the output from the *TEST* command shows the token passing order of stations in the logical ring.

The results of the last *TEST* command are maintained until the Modify security level is exited (either by a timeout or by the *LOGOUT* command). Also, the *REPORT* command can be used to view the results of a test which has been completed or the current results of a test in progress.

Caution

Care should be exercised in invoking the TEST command on a network in a production environment. Invoking the TEST command increases the load on all nodes, especially the initiating node. Be especially cautious if you are using values of <sch> smaller than the default, or values of <len> larger than the default. Also, be careful if you are using the ALL synonym, which broadcasts to all nodes in the network.

A typical *TEST* command is shown below:

```
  Page 1 of 1
= test 0800190100fb 100H
Test initiated

=
<<< Test Results >>>
Command: test <<08001901001f>> 100H 32H 1H ALT
Init node: <<08001901001f>>  Frames sent : 100H  Nodes responding : 1H
Responding nodes   Response recd   Response w/err   No Response
<<0800190100fb>>        100H             0H             0H
```

TIME Command

The TIME command has the form:

```
TIME
```

This command causes the current system time to be displayed. This time is used in generating time stamps for messages which require them. This time is also used as a time stamp for events in the exception log displayed by the LOG command. The initial value of the time on restart, power up, or load is read from the local PLC CPU. If this is not available, it is set to 00:00:00.0 (midnight). Time values are based on a 24 hour clock. The Modify command *CHTIME* is used to change the time value.

A typical TIME command is shown below:

```
> time
Time = 15:46:02.3
```

TRACECommand

The *TRACE* command has the form:

```
TRACE  {<task(s)> [<minutes> [<len_ref>]] | !}
```

where <task(s)> is one or more task identifier letters from Table 5–3 or “z” to add PDU trace.

<minutes>is an optional parameter that specifies how long *TRACE* will remain active. Default is 10 minutes. This parameter is a character string that specifies an integer which can be 0, or a value from 1 to 32767. If 0 is specified then time out is not enforced. Any non-zero value specifies the duration in minutes after which the trace activity will automatically cease. Login will be maintained (automatic logout will be inhibited) until after the trace has terminated.

<len_ref> is an optional parameter that limits the amount of PDU (z) data to be displayed. The PDU display format is a character string that specifies an integer value ranging from 1 to 32767. If omitted from the command line, the value 48 will be substituted. This parameter provides the flexibility to view the PDU in its entirety or just a portion of it. Since each line of display consists of 16 bytes, and, if truncating of the PDU does take place (always at the end of a line and trailed by '...' on the next line), the actual number of bytes displayed will be rounded up to the next multiple of 16 from <len_ref>. There is, of course, a performance penalty for displaying large PDU's when they occur frequently.

The identifier "!" disables all tracing and should only be used by itself.

This command causes a diagnostic trace of the specified task or tasks to be displayed at the terminal where the *TRACE* command is invoked. This trace information shows each protocol exchange at the selected task and can be used by protocol experts to diagnose problems at the node or in a remote host.

The format of the display is the same at both the local and the remote terminal.

The *TRACE* command issued last, either locally or remotely, determines where the display takes place.

Tracing of the Data Link layer (l) is not allowed if the *TRACE* command is issued at a remote terminal.

Caution

Enabling trace output has severe performance penalties for the communications software. This command should only be used in debugging problems. It should *NEVER* be left enabled in operational nodes.

The trace output is enabled for only the tasks specified with the most recent *TRACE* command; trace output is disabled for all tasks not specified.

Trace output is generated by the selected tasks until either the *TRACE* command is issued again, to disable tracing or to select a new set of tasks, or the timeout specified for the *TRACE* command has expired. The command, *TRACE*, with no arguments, shows what tasks are currently printing trace information, the time remaining for an active trace, and the active len_ref value. The command, *TRACE !*, causes all tracing to be disabled.

Caution

Once trace has been initiated from a remote Station Manager, trace output continues to be sent to that remote Station Manager until terminated as described above. Trace output continues even if the remote Station Manager is disconnected or logged into another station. Be sure to stop your traces.

Detailing the interpretation of the trace data is beyond the scope of this document. It requires expertise in the internal operation of the TCP / IP protocols that is not needed by most users of the network.

A typical *TRACE* command is shown below:

```
= trace i
Trace enabled for: i
minutes remaining   = 10
len_ref             = 48
```

If you attempt a trace of the Data Link layer when it is not allowed, a response similar to the example above will be displayed, then followed by the message:

```
Trace not allowed for Data Link layer in remote mode.
```

Chapter 6 Troubleshooting

This chapter is a guide to troubleshooting and problem isolation for the Series 90-70 TCP / IPEthernet Interfaces.

This chapter includes the sections listed below:

- Overview
- Using this Chapter
- What to do if you Cannot Solve the Problem
- The Power-Up State
- The Soft Switch Entry State
- The Field Network Test State
- The Loader State
- The Operational State
  - Troubleshooting When the STATUS OK LED is OFF
  - Troubleshooting When the STATUS OK LED is ON
  - Log Event Error Codes

Overview

There are several tools to assist you in diagnosing problems with the Series 90-70 Ethernet Interface and the network.

- The Ethernet Interface LEDs provide an immediate visual summary of the operational state of the Ethernet Interface.
- The Series 90-70 PLC Fault Table provides a record of exceptions logged by the PLC, the Ethernet Interface, and other Series 90-70 modules. The PLC Fault Table may be accessed through the Logicmaster 90-70 Configurator or Programmer software. Refer to the *Series 90-70 Programmable Controller Reference Manual* for more information.

Also, when displaying a PLC Fault Table entry on the Logicmaster 90-70, striking <CTRL -F> will display an additional line of numeric data on the Message Line (third line from the top). For GEnet Ethernet Interfaces the leftmost 16 digits of the long string of digits on the right half of the Message Line show the corresponding GEnet log Events and Entries 2, 3, and 4 (in that order). This information can be used to refer directly to detailed fault descriptions in this chapter (Table 6-10) without using a GSM.

For detailed information about these tools, refer to the appropriate references in the table below.

Table 6-1. Ethernet Interface Diagnostic Tools

Diagnostic Tool	Description	Reference
LEDs	Visual observation of Ethernet Interface	Chapters 2, 6
Log	Access from Station Manager	Chapters 5, 6
Tallies	Access from Station Manager	Chapter 5
PLC Fault Table	Ethernet Interface exceptions logged with CPU	Chapter 6 Also GFK-0265

Using this Chapter

This chapter contains five troubleshooting sections that correspond to the five main states of the Ethernet Interface.

If you have a problem, first identify in which state the problem occurred. Then, go to the corresponding section in this chapter for further information.

The following tables are included to assist you in troubleshooting.

- LED Display Codes - Tables 6-2 through 6-6.
- Troubleshooting with ONLINE LED OFF - Tables 6-7.
- Troubleshooting with ONLINE LED ON - Table 6-8.
- Log Events Codes - Tables 6-9 and 6-10.

The following information indicates the state of the Ethernet Interface:

1. **Power-Up State** - The board is executing power-up diagnostics.
   - The MODULE OK LED is BLINKING fast or OFF.
   - The ONLINE LED is OFF.
   - The STATUS OK LED is BLINKING or OFF.

   In the power-up state, the Station Manager and the Restart pushbutton are inoperative.
2. **Soft Switch Entry State** - Soft Switch configuration may be (in some cases must be) entered via the Logicmaster 90-70 Configurator or the Ethernet Interface local Station Manager (when the Ethernet Interface is not configured in the CPU).
   - The MODULE OK LED is BLINKING slowly.
   - The ONLINE LED is OFF.
   - The STATUS OK LED is OFF.

A NODE command at the Station Manager will indicate “Soft Switch Entry Utility”. The Station Manager prompt in this case is an asterisk (“*”).

3. **Field Network Test State** - Test frames may be exchanged with other nodes on the network, using a factory-set configuration.

   - The MODULE OK LED is ON.
   - The ONLINE LED may be ON, OFF, or BLINKING.
   - The STATUS OK LED may be ON or OFF.

   A NODE command at the Station Manager will indicate “Field Network Test Utility”. The Station Manager prompt in this case is a dollar sign (“$”).

4. **Loader State** - The communications software must be loaded or is being loaded.

   - The MODULE OK LED is ON.
   - The ONLINE LED may be ON, OFF, or BLINKING.
   - The STATUS OK LED is BLINKING.

   A NODE command at the Station Manager will indicate “Software Load Utility”. There is no Station Manager prompt while in the loader. If the Ethernet Interface is looking for a download from the serial port, repeated “ipl“ messages will be displayed at the Station Manager terminal.

5. **Operational State** - The communications software has been loaded, and is running.

   - The MODULE OK LED is ON.
   - The ONLINE LED may be ON, OFF, or BLINKING.
   - The STATUS OK LED may be ON or OFF.

   A NODE command at the Station Manager will identify the node without indicating any of the other “special” states. The default Station Manager prompt in this case is a greater-than sign (“>“).

The figure below shows the control flow upon restarting the Ethernet Interface. This flow determines the state of the Ethernet Interface.

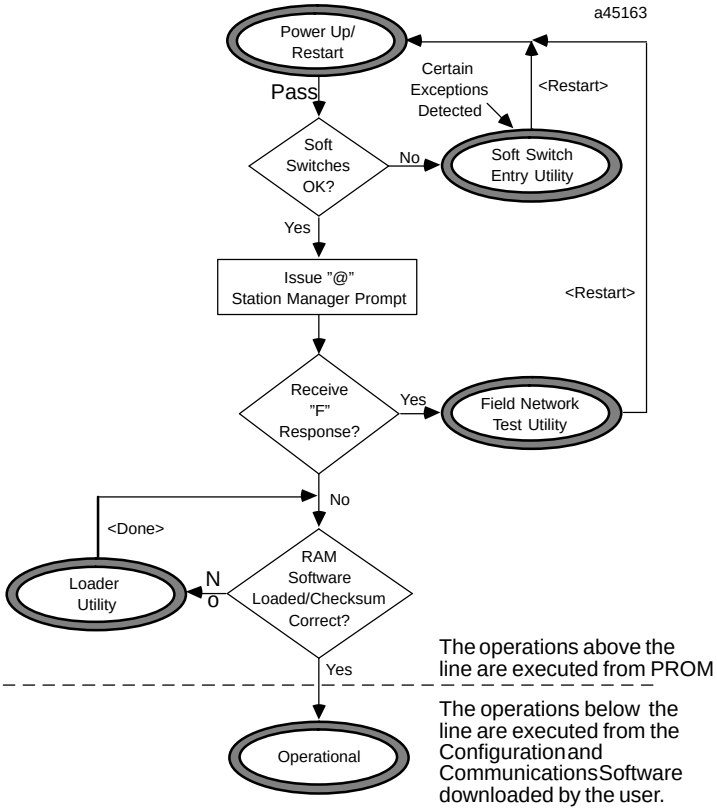


Figure 6-1. Determining the State of the Ethernet Interface

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 (on hinged door in front of controller board).
- The PROM version (printed in the output from the NODE command).
- The Software version (printed in the output from the NODE command).
- 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 station 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).

The Power-Up State

When power is cycled on the Series 90-70 PLC, or whenever the Ethernet Interface is restarted, power-up diagnostics run. Diagnostics running is indicated by the MODULE OK LED blinking fast, while the other LEDs remain OFF. If the Ethernet Interface detects an error in the hardware, it reports this error to the CPU, then shuts down. All LEDs turn OFF if the Ethernet Interface fails a diagnostic test. If this happens, refer to the PLC Fault Table for detailed information.

Note

The Restart / Load Pushbutton is not operable during the Ethernet Interface diagnostic phase nor is the Station Manager active. The Ethernet Interface is in diagnostic phase when the MODULE OK LED is BLINKING and the ONLINE and STATUS OK LEDs remain OFF.

After diagnostics complete, both the MODULE OK LED and STATUS OK LED blink slowly for 2-3 seconds. (The ONLINE LED is OFF during this time.) This LED sequence identifies the time you may enter the Field Network Test State by entering an "F" or "f" at the Station Manager terminal. The table below shows the LED patterns for the power-up diagnostics phase.

Table 6-2. Power-Up State

LED	Running Diagnostics (15 sec)	Wait for Field Network Test (2-3 sec)	Wait for PLC & CPU Handshake (to 60 sec)	Diagnostic Failed
MODULE OK	Blink	Slow Blink	Slow Blink	OFF
ONLINE	OFF	OFF	OFF	OFF
STATUS OK	OFF	Slow Blink	OFF	OFF

The PLC Fault Table can be especially helpful in detailing faults that are detected in the Power-Up State. In the Power-Up State, the Station Manager is not operational. The Ethernet Interface has likely failed and is far less able to report such failures in detail. See GFK-0265, *Logicmaster 90 Programming Software Reference Manual* for information on the PLC Fault Table.

Note

If all LEDs go out after completing power-up diagnostics, then power-up diagnostics has failed. Refer to the PLC fault table for more information.

The Soft Switch Entry State

The Soft Switch Entry State is indicated by the MODULE OK LED blinking slowly (every 2 seconds) while the other LEDs remain OFF. The Soft Switch Entry state is automatically entered when the Soft Switch data in the Ethernet Interface is invalid and has not been set up by the Logicmaster 90-70 Configurator. The Soft Switch Entry state is also entered when certain configuration faults that preclude full operation are detected. A limited subset of Station Manager commands is provided in this state. Refer to Chapter 5, "Soft Switch Entry Utility", for further description of the Soft Switch entry state.

The operator must correct the fault forcing entry into this state before the Ethernet Interface may proceed. In most cases this may be done by using the Logicmaster 90-70 Configurator or the Station Manager *CHSOSW* command. It cannot be performed remotely from the network. After entering new Soft Switch information or correcting another fault, the Ethernet Interface must be restarted to begin using these new values.

In the Soft Switch Entry state, a NODE command to the Station Manager will yield a "Soft Switch Entry Utility" message following the station identification information; also, the Station Manager prompt is an asterisk ("*").

Table 6-3. Soft Switch Entry State

LED	Soft Switch Entry State
MODULE OK	Slow Blink
ONLINE	OFF
STATUS OK	OFF

Slow Blink = Blink ON every 2 seconds.

The Field Network Test State

The Field Network Test state is selected by entering a "F" or "f" in response to the "@" prompt at the local Station Manager terminal at the end of power-up diagnostics. The "f" will not be echoed back. A limited subset of Station Manager commands is provided in this state. Refer to Chapter 5, "Field Network Test Utility" for a detailed description of the Field Network Test state and to Chapter 2, "Installation Procedure 5 - Testing the Ethernet Interfaces on the Network" for an application. The table below shows the LED patterns for Field Network Test State.

In the Field Network Test State, a NODE command to the Station Manager will indicate "Field Network Test Utility". The Station Manager prompt is a dollar sign ("$").

Table 6-4. Field Network Test State

LED	Connected to LAN		Not Connected to LAN
	Operating w/o Exceptions	An Exception has Occurred	
MODULE OK	ON	ON	ON
ONLINE	ON / Blink[1]	ON / Blink[1]	OFF
STATUS OK	ON	OFF[2]	OFF[2]

1. ONLINE blinking indicates this node is sending or receiving data.
2. When MODULE OK is ON and STATUS OK is OFF, it is necessary to use the Station Manager NODE, LOG, and SOSW commands to distinguish among the possible causes.

The Loader State

The Loader State is indicated by the MODULE OK LED ON and the STATUS OK LED blinking. The ONLINE LED may go on and off while the Ethernet Interface waits for a download to start. The table below shows the LED patterns for the Loader State and describes the expected progression of the LEDs.

In the Loader State, when the Ethernet Interface is requesting a local (serial) download, a series of "ipl, ipl, ipl, ..." messages will be output to the local serial port. When the Ethernet Interface is requesting a network download, a NODE command will indicate "Software Load Utility". There is no prompt character at the local Station Manager terminal in this state.

Table 6-5. Loader State

LED	Ethernet Interface is Looking for Load:			Ethernet Interface is Receiving Load:	
	Local Load	Network Load		Over Network	Local Serial Port
		GSM Downloader not on Network	GSM Downloader on Network		
MODULE OK	ON	ON	ON	ON	ON
ONLINE	OFF	OFF	ON	Fast Blink	OFF
STATUS OK	Slow Blink	Slow Blink	Slow Blink	Fast Blink	Fast Blink

Slow Blink = Blink ON every 2 seconds
Fast Blink = Blink ON every 1 second

The Operational State

The Operational State is the state of normal operation of the Ethernet Interface. This section identifies the possible symptoms of problems which may occur while the module is operating.

During normal operation of the Ethernet Interface, the MODULE OK LED is ON. The other two LEDs (ONLINE, STATUS OK) provide information about the health of the Ethernet Interface and activity on the LAN. The table below shows the LED patterns you might see and their possible meanings.

In the Operational State, no ". . . Utility" message follows the station ID in the NODE command. The prompt character at the local Station Manager terminal is a greater-than symbol (">").

Table 6-6. Operational State

LED	Connected to LAN		Not Connected to LAN
	Operating w/o Exceptions	An Exception has Occurred	
MODULE OK	ON	ON	ON
ONLINE	ON / Blink[1]	ON / Blink[1]	OFF
STATUS OK	ON	OFF[2]	OFF[2]

1. ONLINE blinking indicates this node is sending or receiving data.
2. When MODULE OK is ON and STATUS OK is OFF, it is necessary to use the Station Manager NODE, LOG, and SOSW commands to distinguish among the possible causes.

Troubleshooting When STATUS OK LED is OFF

If the Ethernet Interface is in the Operational State and the STATUS OK LED is OFF and the MODULE OK LED is ON, then the Ethernet Interface has detected an exception condition and has made an entry in the Exception Log. Each new (not repeating) log event is also sent to the PLC Fault Table, where it can be viewed using Logicmaster 90-70 Software.

The format of a log event as displayed by the Station Manager is shown below:

```
                                        Entry
Date         Time        Event   Count      1    2    3    4    5    6
dd-mmm-yyyy  hh:mm:ss.s  xx      xxxx       xx  xxxx xxxx xxxx xxxx xxxx
```

Date - The Date column contains the system date of the last occurrence of the logged event.

Time - The Time column contains the system time of the last occurrence of the logged event.

Event - The Event column gives the kind of event which occurred. Table 6-9 and 6-10 lists the possible values for events.

Count - The Count column contains a repetition count for the event. If events which are identical occur regularly, they might otherwise flood the log with useless entries. Instead of recording each repeated event in detail, the log simply keeps the time of the latest event and a count of the number of repetitions of the repeated event. Log entries are retained on restart and reloads of the Ethernet Interface.

Entry - The Entry columns contain detailed information about the event and is subdivided into 6 entries, Entry 1 - Entry 6.

Troubleshooting When the STATUS OK LED is ON

Sometimes problems can occur even when the STATUS OK LED is ON, indicating normal operation. In this case, follow the troubleshooting procedure below.

Table 6-7. Troubleshooting with ONLINE LED OFF

LED Indicators	Possible Cause and Resolution
The ONLINE LED is OFF	This indicates that an attempt to send a frame resulted in a local fault indication. This usually results from a hardware problem. If this occurs follow the procedure below. - Check to be sure the LAN ONLINE Soft Switch is set to "YES". By issuing the Soft Switch Station Manager command checking the Network Online field. - Check to be sure the drop cable is securely fastened to the controller board connector and to the transceiver. - Make sure the transceiver is securely fastened to the Ethernet network trunk cable. - Issue a TALLY L Station Manager. If either the *MacErr* or the *SQEErr* tally is non-zero, the local station may be experiencing an unstable network. In this case follow the procedure below. If this station is the only one experiencing problems: - Verify that the SQE jumper is enabled on the transceiver connected to the Ethernet Interface. - Re-tighten all transceiver cable connections. - Make sure the slide lock on the Ethernet Controller board is locked. - Replace the transceiver cable with a known good cable. - Verify that the Series 90-70 PLC power supply is properly grounded. - Make sure that the Ethernet Controller board ground safety wire is securely fastened. - Replace the transceiver with a known good transceiver. If all stations are experiencing the problem, the cable plant is probably at fault. - Recertify the cable plant. If the problem still exists, call GE Fanuc Automation for support.

Table 6-8. Troubleshooting with ONLINE LED ON

LED Indicators	Possible Cause and Resolution
The ONLINE LED is ON, but there is no network activity.	There are several possible causes if a station cannot transfer data on the network. These causes are described below with the appropriate action to be taken. **PLC Access Problem** To verify that the Ethernet Interface can access the PLC, issue successive TALLY C Station Manager commands. If the *PlcSweep* tally is not increasing, there are no windows being provided by the PLC. - If any of the tallies *PlcAbt*,*MyAbt*, or *Timeout* are incrementing, there may be a hardware problem with the Series 90-70 PLC backplane interface. Check the PLC Fault Table for entries for the Ethernet Interface. - Make sure to set the Soft Switch parameter *bponline* to "YES". - Replace the digital controller board with a known good board.

Exception Log Event Error Codes

The error codes below appear in the Event column of a log event. To view the log, issue the LOG command from the Station Manager.

Table 6-9. Exception Log Event Definitions

Log Event	Cause
1	Powerup. A log entry of this event will appear every time the Ethernet Interface is Restarted or powered up.
2	System events.
8	PLC driver events.
b	Service Agent events.
c	LLC events.
11	IP events
12	TCP events
16	ARP events
18	ICMP events
1b	SRTP Server events
1c	Channel API events

Table 6-10. Exception Log Event Codes

Log Event Code	Possible Cause and Resolution
Event "1" Powerup	This is an event logged on every initialization of the Ethernet Interface. This event is meant to indicate the boundaries between Restarts. By checking the count for this event, you may find how many Restarts are occurring. This event never causes the STATUS LED to go OFF. **Entry 2** indicates the type of system initialization, as described below: 0 Normal Ethernet Interface startup (operational state). 1 Soft Switch Entry Utility. 2 Factory Network Test Utility. 3 Field Network Test Utility. Field Network Test has been explicity requested 4 Software Load Utility selected. **Entry 3** indicates the event that caused the system initialization to occur: 0 Normal powerup. 1 Restart request through pushbutton. 2 Load request through pushbutton. 3 Station Manager restart request. 4 Station Manager load request. 5 Automatic restart due to system error (see preceding log event 2). 6 Automatic load due to system error (see preceding log event 2). 7 Entry from loader. 8 Ethernet Interface restarted itself after receiving Soft Switch parameters from the CPU which are different from the parameterscurrently in use. **Entry 4** shows the state of Soft Switches that may limit the extent of operation of the Ethernet Interface. **Entry 4 — LAN Online — BP Online** 0 — YES — YES 1 — YES — NO 2 — NO — YES 3 — NO — NO
Event "2" System events	This event is logged by the system when a catastrophic system error occurs. Check for the value of the system error in **Entry 2** of the log event and follow the instructions below. System Error: 01 "LANPROM / software mismatch; running soft Sw util" This error indicates that incorrect software has been loaded into the Ethernet Interface. **Entry 3** indicates the lowest required RAM software version; **Entry 4** indicates the actual RAM software version. The system cannot initialize with incorrect software. Check that the proper Ethernet Interface software is being downloaded by the GSM. If the Ethernet Interface PROM firmware has been recently upgraded, be sure that compatible software is being downloaded. This fault causes entry into the Soft Switch Entry Utility. System Error: 02 "LANPROM / software mismatch; running soft Sw util" This error indicates that the loaded Ethernet Interface software requires a higher revision of the PROM firmware than is installed on the Ethernet Interface. **Entry 3** indicates the lowest required PROM firmware version; **Entry 4** indicates the actual installed PROM firmware version.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "2" System events (Continued)	System Error: 03 "LANPROM / softwaremismatch;running soft Sw util" This error indicates that an outdated configuration data file has been loaded into the Ethernet Interface along with the software. **Entry 3** indicates the lowest required configuration data file version for the software; **Entry 4** indicates the actual loaded configuration data version. Check that the proper configuration data file is being downloaded by the GSM. If the Ethernet Interface software, or the GSM itself, has been recently upgraded, it may be necessary to update the configuration data file for this station. This fault causes entry into the Soft Switch Entry Utility. System Error: 04 "LANPROM / softwaremismatch;running soft Sw util" This error indicates that an improper configuration file has been loaded for this station. The MAC address within the configuration file does not match the MAC address supplied by the Soft Switches. The system cannot initialize with an improper configuration file. Check that the proper MAC address is set in the Soft Switches. Also check that the station is configured with the proper MAC address in the GSM, and that the proper configuration file is being downloaded by the GSM. **Entries 3, 4,** and **5** indicate the 12-digit MAC address obtained from the configuration file. The MAC address obtained from Soft Switches may be displayed with the NODE and SOSW Station Manager commands. This fault causes entry into the Soft Switch Entry Utility. System Error: 08 (Not reported to CPU Fault Table) Soft Switch values are not defined. This fault causes entry to the Soft Switch Entry Utility. **Entry 3** distinguishes the reason for reporting Soft Switches not defined: 0 *CLSOSW* Station Manager command was issued. 1 EEPROM checksum was incorrect. System Error: 09 "LAN system - software fault; resuming" Unable to set the Ethernet Interface date and time to the same values as the PLC CPU. This error may occur at system startup. The Ethernet Interface time and date are initialized to 00:00:00, 01-JAN-1989. **Entry 3** indicates the reason for this error: 0 Unable to retrieve information from the PLC CPU. This error will occur if the Ethernet Interface is not configured in the PLC CPU via the LM90 Configuration Software. 1 Invalid date / time value retrieved from the PLC CPU. The Ethernet Interface cannot accept dates prior to 01-JAN-1989. Check that the current date and time are established in the PLC CPU via the LM90 Configuration Software.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "2" System events (Continued)	System Error: 0a "Unsupported feature in configuration" The PLC CPU firmware does not meet the minimum version level required by the Ethernet communications software. **CAUTION: Logicmaster-TCP/IP or HCT applications may not work properly. Entry 3** indicates the lowest required CPU microcode version. **Entry 4** indicates the actual installed CPU microcode version. System Error: 0b (Not reported to CPU Fault Table) This error indicates that TCP / IP parameter values (part of the soft switch configuration in TCP / IP configuration mode for the Ethernet Interface) were not received from the PLC CPU. Verify that the Ethernet Interface is configured in the PLC CPU. System Error: 0c "LAN system - software fault; resuming" The Ethernet Interface was unable to obtain the minimum required privilege from the PLC CPU. Ensure that the PLC CPU protection settings (e.g., passwords) are set so as to allow access. Entry 3 contains the privilege level obtained. Entry 4 contains the minimum privilege level needed. System Error: 20 "LAN system - software fault; resuming" The IP address of the Ethernet Interface was not configured with a non-zero value. Use the PLC Programmer (or GSM configuration editor) to configure the Ethernet Interface with an IP address other than 0.0.0.0. The Ethernet Interface is automatically restarted into the Soft Switch Entry utility. System Error: 385 "LAN data memory exhausted - check parms; resuming" This error occurs when a request is made for memory and no memory of the requested size or larger is available. The size of the request is stored in **Entry 3** of the log event. This error can be caused by: - Misconfigured memory pool sizes or percentages. - Misconfigured parameter (lmaxdb) causing excessive LLC demands for memory on the Ethernet Interface. - True exhaustion of memory resources due to insufficient processing capacity at the station, excessively long PLC scan time, or excessive network traffic addressed to the station. - System software error. System Error: 386 "LAN system - software fault; restarted LAN I / F" This error is caused by a request to release a buffer which is not a recognizable buffer from the system. This is a catastrophic system software error and should be reported to GE Fanuc - NA. The Ethernet Interface is automatically restarted. If this error occurs within the first 60 seconds after the Ethernet Interface was restarted or power cycled, the automatic restart will force the Ethernet Interface into the Soft Switch Entry Utility.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "2" System events (Continued)	System Error: 3e7 "LANI/F can't init-check parms; running soft Sw util" This error is caused by a request to release a buffer which is either still on a queue or not on an even boundary. This is a catastrophic system software error and should be reported to GE Fanuc - NA. The Ethernet Interface is automatically restarted. If this error occurs within the first 60 seconds after the Ethernet Interface was restarted or power cycled, the automatic restart will force the Ethernet Interface into the Soft Switch Entry Utility. System Error: bbbb "Low battery signal" This error occurs when the battery is disconnected or running low. **Entry 3** indicates what type of transition has occurred: 0 Battery went from good to bad. 1 Battery went from bad to good (does not cause the STATUS LED to go OFF). System Error: cccc "Module hardware fault" This error occurs when the system detects an incorrect checksum in the software or configuration data loaded into memory. This is a catastrophic error. The Ethernet Interface is restarted with entry into the Software Load Utility. **Entry 3** indicates the correct checksum value. **Entry 4** indicates the actual computed value. **Entry 5** indicates the internal range number within the software; range 0 indicates an error within the configuration data; Range ee indicates an error within the copy of EEPROM data. Occurrence of this error should be reported to GE Fanuc - NA.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "8" PLC Driver events	This event is logged by the PLC Backplane Driver when an unexpected event occurs. **Entries 1** and **6** of the event log will be zero. For some events, **Entries 3, 4** and **5** will give more information on the event. **Entry 2** of the event log is an exception code which indicates what error occurred. In general, **Entry 2** codes 1 - 1F are PLC backplane communication faults, codes 20 - 2F are resource errors, and codes 30 and up are miscellaneous errors. **Entry 2** may have the following values. 1 "LAN System-Software Fault; Resuming" Could not open VME mailbox. **Entry 4** contains the status returned from the MBU_OPEN routine. **Entry 5** contains the number of open attempts we made. 2 "LAN System-Software Fault; Resuming" Could not enable interrupt capability for incoming mail. **Entry 4** contains the returned status from the MBU_ENAB_INT routine. 3 "LAN System-Software Fault; Resuming" Mail packets from PLC for a read response are out of order. **Entry 4** contains the received packet sequence number. **Entry 5** contains the expected packet sequence number. 4 "LAN System-Software Fault; Resuming" PLC completed a response earlier than expected. **Entry 4** contains the current transfer state. 5 "LAN System-Software Fault; Resuming" Message from PLC for unknown Ethernet Interface task. **Entry 4** contains the task ID received from the PLC. 6 "LAN System-Software Fault; Resuming" Received PLC response for unknown request. **Entry 4** contains the mailbox sequence number of the stray response. 7 "LAN System-Software Fault; Resuming" Bad message type from PLC. **Entry 4** contains the message type code received. 8 "LAN System-Software Fault; Resuming" Timed out waiting for PLC response. **Entry 4** contains the mailbox sequence number for this transaction. **Entry 5** contains the transfer state when the timeout occurred. 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. 9 "LAN System-Software Fault; Resuming" CPU completed program download before Ethernet Interface was ready. A "LAN System-Software Fault; Resuming" CPU still wants program upload data when Ethernet Interface finished. 20 "LANI/Fcan'tinit-checkparms; running soft Sw utl" QCreate call failed. 21 "LANI/Fcan'tinit-checkparms; running soft Sw utl" PoolAlloccallfailed.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "8" PLC Driver events (Continued)	22 "Backplane communications with PLC fault; lost request" QAlloc call failed. **Entry 4** contains the byte size requested. 23 "Backplane communications with PLC fault; lost request" BuffAlloc call failed. **Entry 4** contains the byte size requested. 24 "Backplane communications with PLC fault; lost request" Circular mail queue is full and incoming message from the PLC CPU was lost. **Entry 4** contains the number of lost entries so far. 25 "LANI / FCapacityExceeded; Discarded Request" A Dual Port Memory allocation attempt for a given length failed. **Entry 4** contains the length of the allocation. 26 "LAN System-Software Fault; Resuming" An attempt was made to free a Dual Port Memory buffer that is out of range. 27 "LAN System-Software Fault; Resuming" An attempt was made to free a Dual Port Memory buffer that is not allocated. 30 "Backplane communications with PLC fault; lost request" Could not generate work queue entry. **Entry 4** contains the event that was trying to be scheduled, which is one of the following: **Entry 4** Description 1 Mail message received from PLC 2 Ethernet Interface timed out waiting for a response from the CPU 3 Received mail message for diagnostics task 4 Circular queue full, mail message dropped 5 Retrying VME mailbox initialization **Entry 5** contains additional information related to the event type. **Entry 5** Interpretation 1 Ethernet Interface task ID to which message was sent 2 Index into Data Transfer table of transaction 3 Ethernet Interface task ID to which message was sent 4 Number of messages dropped so far 5 Number of open attempts so far 31 "Backplane communications with PLC fault; lost request" Backplane Driver scheduled with illegal event. **Entry 4** contains the event code received. 32 "Module state doesn't permit Comm–Req; request discarded" Illegal COMMREQ from application program was discarded. **Entry 4** contains the command code received. 33 "Module state doesn't permit Comm–Req; request discarded" COMMREQ received outside of normal system operation (e.g., while in the Soft Switch Entry utility). 34 "LAN System-Software Fault; Resuming" Backplane Driver initializing without Soft Switches from the CPU. This will occur if the LAN Interface is not configured in the PLC via the Logicmaster 90-70 Configuration Software. 35 "LAN System-Software Fault; Resuming" Series 90-70 Ethernet Interface / CPU communications timeout during restart or load.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "8" PLC Driver events (Continued)	36 "Module state doesn't permit Comm–Req; request discarded" COMMREQs are not allowed if no Soft Switches have been received. 37 "LAN System-Software Fault; Resuming" A task that has not registered with the Backplane driver is attempting to send messages to the PLC. 38 (Not reported to CPU Fault Table) A Backplane driver user's attempt to send a message to the PLC failed. **Entry 3** indicates the error code returned. 39 (Not reported to CPU Fault Table) An attempt to release CPU text buffers failed. **Entry 3** indicates the status returned from the Mailbox Utilities. 40 (Not reported to CPU Fault Table) Backplane driver's attempt to send a message to the PLC failed. **Entry 3** indicates the status code returned from the CPU. See Tables 4–5 through 4-7 for the meaning of this status code. 41 (Not reported to CPU Fault Table) Backplane driver could not find a state machine for an unsolicited message. 42 (Not reported to CPU Fault Table) Backplane driver could not find a state machine for a response message. 43 (Not reported to CPU Fault Table) Backplane driver detected that the CPU firmware revision is too low for use with TCP / IP configuration mode (soft switches). You must either configure your Ethernet Interface in MMS-ETHERNET configuration mode or upgrade your CPU firmware. **Entry 4** indicates your CPU's firmware revision level while **Entry 5** indicates the revision level needed for TCP / IP configuration mode. Unpredictable operation will result if you operate with this error.
Event "b" Service Agent events	This event is logged when the MMS Service Agent encounters an unexpected event. **Entry 2** of the logged event contains one of the following error codes. 1 "LAN System-Software Fault; Resuming" Could not find the index into the Data Transfer Table. This error can occur when sending any fault table information to the PLC CPU. 2 "LAN System-Software Fault; Resuming" Backplane driver returned a bad status. **Entry 3** contains status code. 3 "Backplane Communications with PLC Fault; Lost Request" CPU Nacked a request. **Entry 3:** Major status. **Entry 4:** Minor Status. These are error codes returned by the CPU. See Table 16 and 17 in GFK-0582B. 4 "Backplane Communications with PLC Fault; Lost Request" A read request returned an unexpected amount of data. **Entry 3** contains the actual data size; **Entry 4** contains the expected data size. 5 "LAN System-Software Fault; Resuming" Unexpected "More follows" condition was indicated by the Backplane driver. 6 "Backplane Communications with PLC Fault; Lost Request" Unexpected Unsolicited message type was received. **Entry 3** contains the message type code. 7 "Backplane Communications with PLC Fault; Lost Request" CPU NACKed a request 3 times due to congestion. **Entry 3** contains the status code; **Entry 4** contains additional status data.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "c" LLC events	This event is logged when the LLC layer encounters an unexpected condition. **Entry 2** of the logged event contains the error code as shown below. 102 "LAN Transceiver Fault; Attempting Recovery": Either the Transceiver or Transceiver cable failed or became disconnected. Reattach the cable or replace the Transceiver or cable. If SQEErr is incrementing but LostCarr is not, the Transceiver SQE–test switch may be set incorrectly. Transceivers used on GEnet must have the IEEE 802.3 SQE_TEST enabled. Use the TALLY L cmd to distinguish whether the SQE test, done on each transmitted frame, failed (SQEErr) or the transceiver lost carrier while transmitting (LostCarr). Online operation should resume within 10 seconds after repair. 103 "LAN Data Memory Exhausted – Check Parms;Resuming": The MAC device discarded a receive frame because there was no buffer to receive the frame into. More input buffers should be allocated to the MAC by increasing the parameter *lrxringlen*. The TALLY L cmd will distinguish whether there were simply no receive buffers (MisdPack) or an excessively long frame that required chaining of multiple buffers (RbufErr). 105 "LAN Controller Tx Underflow; Attempting Recovery": During transmission, the MAC was unable to get data from memory quickly enough. This indicates a LAN Controller design flaw; it should not occur. This error may cause loss of both tx and rx messages that are in process, since the MAC must be reinitialized (done automatically). Online operation should resume within 10 seconds after repair. 106 "Bad Remote Application Request; Discarded Request": An incoming frame was received that exceeded the size specified by the parameter, *lmaxdb*. For frame types other than TEST frames, the frame was discarded; for TEST frames, the data within the frame was discarded and the frame was processed without data. Check the remote (sending) station for correct frame length. If the local station must correctly receive frames of large size, it will be necessary to increase the parameters *lmaxdb* and *bbuff4* and possibly reallocate data memory via *balloc1*,*balloc2*þ*balloc3*, and *balloc4*. Consult GE Fanuc if you need assistance. 107 "Bad Remote Application Request; Discarded Request ": An unsolicited XID response frame was received. This can be caused by a protocol error in a remote station. 108 "Bad Remote Application Request; Discarded Request": An unsolicited TEST response frame was received. This is usually caused when a remote station responds too slowly to a TEST Station Manager command from the reporting station. Increase the value of the TEST <sch> parameter. If the problem persists and the reporting station is not sending a TEST cmd, then some remote station on the network is generating a protocol error.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "c" LLC events (Continued)	10a "LAN Severe Network Problem; AttemptingRecovery": Repeated collisions caused the transmitter to fail 16 attempts to send a frame. If the LAN stays Offline, it is likely caused by a damaged or unterminated trunk cable. (This report may occasionally be caused by extremely heavy network traffic.) Online operation should resume within 10 seconds after repair. 10b "LAN Severe Network Problem; AttemptingRecovery": During attempted transmission, either some external condition prevented transmission of a frame for at least one second (MacErr) or a late collision occurred (LateColl). Use the TALLY L cmd to distinguish. If MacErr is incrementing every 10 seconds, the transceiver is likely hearing constant carrier on the network. This can be caused by disconnection of the transceiver from the network or by a faulty connection of the transceiver to the network; it can also be caused by test equipment attached to the network, or to a remote failed transceiver. Are other nodes reporting the same fault? (MacErr may occasionally be caused by extremely heavy network traffic.) LateColl indicates a protocol violation by a remote station; the tx frame may be lost. Online operation should resume within 10 seconds after repair. 10e "LAN Controller Underrun / Overun;Resuming": During receiving, the MAC was unable to write data into memory quickly enough. This indicates a LAN Controller design flaw; it should not occur. The frame being received is discarded. Online operation continues. 10f "Network Traffic Prevented Tx; Discarded Request": 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. 110 "Bad Local Application Request; Discarded Request": The LLC rejected a local application request to send a frame because the frame length was invalid. IEEE 802.3 frames must not exceed 1497 bytes of LLC data. Ethernet frames must contain 46-1500 bytes of LLC data. 111 "LAN Severe Network Problem; AttemptingRecovery ": A frame was received in which the Source 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 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "c" LLC events (Continued)	120* "LAN Controller Fault;RestartedLANI/F" or 121* "LAN Interface Hardware Failure; Switched Off Network": Fuse F1 on the LAN Controller board, which protects the PLC Power Supply from overload from the externaltransceiver, is blown.. This fuse is not field replaceable. Correct the external fault and replace the LAN Controllerboard. 122* "LAN Controller Fault;RestartedLANI/F" or 23* "LAN Interface Hardware Failure; Switched Off Network": The MAC chip failed its internal loopback test. Replace the LAN Controllerboard. 124* "LAN Controller Fault;RestartedLANI/F" or 125* "LAN Interface Hardware Failure; Switched Off Network": The MAC chip failed to initialize. Replace the LAN Controller Board. 126* "LAN Controller Fault;RestartedLANI/F" or 127* "LAN Interface Hardware Failure; Switched Off Network" The MAC reported a "babble" fault; more than 1518 bytes of data have been transmitted in a frame. Replace the LAN Controller board. 128* "LAN Controller Fault;RestartedLANI/F" or 129* "LAN Interface Hardware Failure; Switched Off Network" : The MAC reported a handshaking error in accessing the LAN Controller memory. Replace the LAN Controller board. 12a* "LAN Controller Fault;RestartedLANI/F" or 12b* "LAN Interface Hardware Failure; Switched Off Network": The MAC reported a broken "chain" of buffers in a transmit frame. Since the LAN Controller does not chain buffers, this should not occur. Replace the LAN Controller board. If this fault recurs, please report it to GE Fanuc.
	* Same fault for both reports. It is remotely possible that error codes 120 - 12b may occur due to a transient system fault. Because of this possibility, an attempt is made to recover without manual intervention, by restarting the LAN Controller (thus rerunning power–up diagnostics). If a hardware fault is detected, the LAN Controller will be held in reset. To prevent repeated restarts and to protect the network, the LAN IF will instead Switch Offline from the Network (rather than Restart) if this fault occurs within 5 minutes of startup.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "11" IP events	This event is logged by the Internet Protocol (IP) layer. **Entry 3** of any IP exception is a code uniquely identifying the software component of IP which reported the exception. **Entry 2** identifies the type of error: 1 "Config'd gateway addr bad; can't talk off local net" Configured default gateway address does not have same network ID as the Interface's IP address. During initialization, the netid part of the "Gateway Address" (configured for this station) was found to be different from the netid part of the "IP Address" (configured for this station). Since the gateway must be on the same local network as this station, there is an error in configuration; this error must be corrected using the Logicmaster 90 Configurator or (if LM90 Config Mode is "MMS-Ethernet") the GSM. How to determine the netid: When a Subnet Mask is configured, the station's netid is found by ANDing the Subnet Mask with the IP Address. Likewise, the gateway's netid is found by ANDing the Subnet Mask with the Gateway Address. When a Subnet Mask has not been configured (equals 0.0.0.0), the netid of the station and netid of the gateway are determined by the address class. For further information on IP addressing, see Appendix G of GFK-1084. 2 "Config'd gateway addr bad; can't talk off local net" An outgoing IP datagram was addressed to a host that is not on the local network, and a default gateway is not defined. **Entries 5 & 6** contain the IP address bytes of the unreachable destination displayed as two hexadecimal words. For example, 3.0.0.1 would be shown as 0300H 0001H. The user should verify that the IP address of the remote host is correct. If correct, then the Gateway Address must be configured using the Logicmaster 90 Configurator or (if LM90 Config Mode is "MMS-Ethernet") the GSM. Refer to Appendix G of GFK-1084 for more information on IP addressing. 3 "LANsystem-softwarefault;resuming" Internal error: An IP request to send an ICMP Destination Unreachable message failed. **Entry 4** indicates 3, the code for a Destination Unreachable ICMP message. **Entries 5 & 6** contain the IP address bytes of the node to which the ICMP message would have been sent displayed as two hexadecimal words. For example, 3.0.0.1 would be shown as 0300H 0001H. 4 "LANsystem-softwarefault;resuming" Internal error: An attempt to set a timer with STIMreq failed. **Entry 4** contains the time intervalrequested. 5 "Local request to send was rejected; discarded request" An attempt to send an Ethernet frame with EDATreq failed. PossibleEthernet cable problems. Check that the LAN LED is ON or Blinking. **Entry 4** contains the value used for the Ethernet protocol type field.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "12" TCP events	This event is logged by the (Transmission Control Protocol (TCP) layer. **Entry 1** will always be zero. **Entry 2** identifies the type of error: 1 "LANI/Fcapacityexceeded;discardedrequest" Unable to allocate a TCB in tcpmopen. **Entry 3** contains the endpoint identifier number used in the tcpmopen call. 2 "LANsystem-softwarefault;resuming" Internal error: NULL event function pointer used in call to tcpmopen. **Entry 3** contains the endpoint identifier number used in the tcpmopen call. 3 "LANsystem-softwarefault;resuming" Internal error: Lqsize size parameter of tcpmopen call used intcpmopen call is invalid. **Entry 3** contains the endpoint identifier number used in the tcpmopen call. **Entry 4** contains the offending lqsize parameter value. 4 "LANsystem-softwarefault;resuming" Internal error: Invalid itcb parameter in tcpaccept call. **Entry 4** contains the offending itcb parameter value. 5 "LANsystem-softwarefault;resuming" Internal error: Empty listen queue when tcpaccept was called. 6 "LANsystem-softwarefault;resuming" Internal error: Invalid itcb parameter used in tcpattach call. **Entry 3** contains the endpoint identifier number used in call. **Entry 4** contains the offending itcb parameter value. 7 "LANsystem-softwarefault;resuming" Internal error: TCB not in ESTABLISHED state when tcpattach was called.**Entry 3** contains the endpoint identifier number used in call. **Entry 4** contains a code indicating the current state of the TCP connection.Valid state codes are listed in the description of Entry 2 = f. 8 "LANsystem-softwarefault;resuming" Internal error: Illegal parameter specified in call to tcpread. **Entry 3** contains an internal error code of interest to developers. 9 "LANsystem-softwarefault;resuming" Internal error: TCB not in ESTABLISHED state when tcpread was called. **Entry 4** contains a code indicating the current state of the TCP connection. Valid state codes are listed in the description of Entry 2 = f. **Entry 5** contains an internal error code of interest to developers. a "LANsystem-softwarefault;resuming" Internal error: Illegal parameter specified in call to tcpwr**. Entry 3** contains an internal error code of interest to developers. b "LANsystem-softwarefault;resuming" Internal error: TCB not in ESTABLISHED state when tcpwr was called. c "LANsystem-softwarefault;resuming" Internal error: Invalid itcb parameter used in tcpclose call. **Entry 3** contains the offending itcb parameter value. d "LANsystem-softwarefault;resuming" Internal error: Invalid itcb parameter used in tcpclose call. **Entry 3** contains the offending itcb parameter value. e "LANsystem-softwarefault;resuming" Internal error: TCP function called before TCP task was initialized.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "12" TCP events (Continued)	f "Connection to remote node failed; resuming" This error is reported when an RST has been received. If the error persists, verify that applications are using proper IP addresses and that the remote host is not experiencing resource limitations. **Entry 3** is the endpoint (TCP connection identifier). **Entry 4** is the TCP state: 1 = CLOSED 2 = LISTEN 3 = SYN-SENT 4 = SYN-RECEIVED 5 = ESTABLISHED 6 = FIN-WAIT-1 7 = FIN-WAIT-2 8 = CLOSE-WAIT 9 = LAST-ACK 10 = CLOSING 11 = TIME-WAIT **Entry 5** contains TCP flags. 10 "Connection to remote node failed; resuming" This error is reported when a TCP connection has been aborted. The TCP layer has retransmitted a segment the maximum number of times and the remote host has failed to ACK the segment. Check network connectivity and the remote host's operational status. **Entry 3** is the endpoint (TCP connection identifier). **Entry 4** is the number of retransmissions. 11 "Connection to remote node failed; resuming" This error is reported when a connection has been aborted after the remote host failed to respond to "keep-alive" probes. Check network connectivity and the remote host's operational status. **Entry 3** is the endpoint (TCP connection identifier). **Entry 4** is the TCP state as shown above. **Entry 5** is always zero. 12 "Connection to remote node failed; resuming" This error is reported when an SYN has arrived in an improper state. If the error persists, verify that applications are using proper IP addresses and that the remote host is not experiencing resource limitations. 13 "LAN system - software fault; resuming" 14 "LANPROM / software mistmatch; running soft Sw util" Trouble encountered initializing TCB. **Entry 3** is the endpoint (TCP connection identifier). 15 "LANPROM / software mistmatch; running soft Sw util" Trouble encountered sending SYN. **Entry 3** is the endpoint (TCP connection identifier). **Entry 4** is a developer-significant error code. 16 "LANPROM / software mistmatch; running soft Sw util" Deallocating TCB before close. **Entry 3** is the endpoint (TCP connection identifier). **Entry 4** is the TCP state as shown above. 17 "Connection to remote node failed; resuming" Sent RST in state processing due to clash in packet fields and their expected values in this state. **Entry 3** is the local endpoint, **Entry 4** is the state, and **Entry 5** is the value of the code field of the offending packet.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event"12" TCP events (Continued)	18 "Connection to remote node failed; resuming" Sent RST in tcpacked( ). **Entry 3** is the endpoint (TCP connection identifier). **Entry 4** is the TCP state as shown above. **Entry 5** is the code field of the offending packet. 19 "Connection to remote node failed; resuming" Sent a TCP RST to a remote node aborting a failed TCP connection. This abort was done due to a mismatch in local and remote connection status. **Entry 3** is the endpoint (TCP connection identifier). **Entry 4** is the TCP state: 1 = CLOSED 2 = LISTEN 3 = SYN-SENT 4 = SYN-RECEIVED 5 = ESTABLISHED 6 = FIN-WAIT-1 7 = FIN-WAIT-2 8 = CLOSE-WAIT 9 = LAST-ACK 10 = CLOSING 11 = TIME-WAIT **Entry 5** contains TCP flags. 1a "Connection to remote node failed; resuming" Sent a TCP RST to a remote node aborting its TCP connection. This abort was done because the connection was unknown to the local Interface. **Entry 3** is the source TCP port. **Entry 4** is the destination TCP port. **Entry 5** is the code field of the offending TCP packet. 1b "Connection to remote node failed; resuming" Gave up on TCP connection establishment due to exceeding the limit on the listen queue size. 1c "Connection to remote node failed; resuming" Closed a connection that has not yet been set up **Entry 3** contains the end-point, and **Entry 4** contains the TCP state. This exception may serve to explain a subsequent event 12, **Entry 2** = 1a exception. ff (Not reported to PLC Fault Table) An error has occurred while retrieving program task names, but the software is unable to clear an entry in the PSM transfer table. **Entry 3** is the returned status code and is significant to developers.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event"16" ARP events	This event is logged by the Address Resolution Protocol (ARP) layer. **Entry 1** will always be zero. **Entry 3** of any ARP exception is a code uniquely identifying the software component of ARP which reported the exception. **Entry 2** identifies the type of error. 2 "Local request to send was rejected; discarded request" Internal error: An attempt by ARP to send an Ethernet frame with EDATreq() failed. Possible Ethernet cable problems. Check that the LAN LED is ON or Blinking. 3 "LAN system-software fault;resuming" Internal error: An attempt by ARP to register itself with LLC as an Ethernet user with EREGreq() failed. 4 "LAN system-software fault;resuming" Internal error: An attempt by ARP to set a timer with STIMreq() failed. 5 "LAN data memory exhausted - check parms;resuming" Internal error: An attempt by ARP to allocate a buffer with BuffAlloc() failed. 6 "Can't locate remote node; discarded request" This error is reported when ARP is unable to resolve an IP address to a MAC address. **Entry 4** is the number of attempts to resolve the IP address. **Entries 5 & 6** are the unresolved IP address bytes displayed as two hexadecimal words. For example, 3.0.0.1 would be shown as 0300H 0001H. This error may indicate that the remote host is not operational on the network. Verify that the local and remote nodes are both connected and that both applications are specifying proper IP addresses. 7 "Bad remote application request, discarded request" Received a response from more than one remote node when resolving an IP address to a MAC address. This means two remote nodes have the same IP address. Reconfigure the remote nodes to use unique IP addresses. **Entries 5 & 6** are the offending IP address displayed as hexadecimal values. 9 "Bad remote application request, discarded request" Received an ARP message from a remote node with this local node's IP address. This means there is an IP address conflict. Reconfigure the nodes to use unique IP addresses.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event"18" ICMP events	**Entry 3** of any Internet Control Message Protocol (ICMP) exception is a code uniquely identifying the software component of ICMP which reported the exception. **Entry 2** (hexadecimal) codes are as follows: 2 "Can't locate remote node; discarded request" A remote IP entity returned a "Destination Unreachable ICMP message." It was unable to route the message to the destination. Entry 4 indicates the ICMP message code field value present in the message. (See an ICMP reference document for a description of field code values.) **Entries 5 & 6** contain the IP address bytes of the unreachable destination displayed as two hexadecimal words. For example, 3.0.0.1 would be shown as 0300H 0001H. Verify that the local and remote nodes are both connected and that both applications are specifying proper IP addresses. 6 "Local request to send was rejected; discarded request" A call to icmp_out failed. Possible Ethernet cable problems. Check that the LAN LED is ON or Blinking. **Entry 4** contains a message type code for Echo Response (0). **Entries 5 & 6** contain the IP address bytes of the node to which we are responding displayed as two hexadecimal words. For example,3.0.0.1 would be shown as 0300H 0001H. 8 "LAN data memory exhausted-checkparms;resuming" A call to BuffAlloc failed. 9 "Local request to send was rejected; discarded request" Internal error: An attempt to send an IP datagram with ipsend failed. Possible Ethernet cable problems. Check that the LAN LED is ON or Blinking. **Entry 4** contains the length of the datagram. **Entries 5 & 6** contain the IP address bytes of the destination IP address of the datagram displayed as two hexadecimal words. For example, 3.0.0.1 would be shown as 0300H 0001H.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event"1b" SRTP Server events	This event is logged by the Service Request Transfer Protocol (SRTP) Server module when an exceptional condition occurs. **Entry 1** will always be zero. **Entry 2** contains a code unique to each type of unexpected event. **Entry 3** contains a code identifying the SRTP Server software component which logged the event. **Entries 4, 5, and 6** identify additional information specific to the type of event described in entry 2. **Entry 2** codes are given below. 1 "LAN data memory exhausted-checkparms;resuming" Internal error: QCreate failed to create a queue header. 2 "LAN data memory exhausted-checkparms;resuming" Internal error: Failed to QAlloc a buffer. **Entry 4** contains the buffer size in bytes. 3 "LANI/Fcan'tinit-checkparms; running soft Sw utl" Internal error: Failed to PoolAlloc a buffer pool. This event causes the Ethernet Interface to restart. If this error occurs within the first 60 seconds after the Ethernet Interface was restarted or power cycled, the automatic restart will force the Ethernet Interface into the Soft Switch Entry utility. 4 "LAN data memory exhausted-checkparms;resuming" Internal error: Failed to BuffAlloc a buffer. Entry 4 contains the buffer size in bytes. 6 "LANsystem-softwarefault;resuming" Internal error: An endpoint identifier other than that of the parent has appeared in a context in which a parent endpoint is expected. Entry 4 contains the offending endpoint identifier. 7 "LANsystem-softwarefault;resuming" A TCP error event was issued to the SRTP Server. In many cases there may be a log entry immediately preceding this one which has an event code of "0x12"; this entry may indicate the reason for sending the TCP error event. **Entry 4** contains the number of the local endpoint (0H-0fH) to which the error was issued. 8 "LANsystem-softwarefault;resuming" Internal error: Failed to tcpmopen a parent endpoint as part of SRTP Server task initialization. As a result, any incoming TCP connections to SRTP will be rejected by TCP (via RST). 9 "LANsystem-softwarefault;resuming" Internal error: Failed to tcpaccept an incoming TCP connection. a "LANsystem-softwarefault;resuming" Internal error: Failed to tcpattach an endpoint identifier to an incoming TCP connection. b "LANsystem-softwarefault;resuming" An attempt to tcpread from a TCP connection failed. **Entry 4** contains the number of bytes requested to read. **Entries 5 and 6** are a segment:offset base address of the memory to receive the read bytes. c "LANsystem-softwarefault;resuming" An attempt to tcpwr to a TCP connection failed. **Entry 4** contains the number of bytes requested to write. **Entries 5 and 6** are a segment:offset base address of the memory to supply the written bytes. d "LANsystem-softwarefault;resuming" Internal error: Detected a NULL mailbox pointer.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event"1b" SRTP Server events (Continued)	e-13 "Backplane communications with PLC fault; lost request" The Backplane (PLC) Driver module returned bad status in response to a request. The specific value of entry 2 is internally significant. **Entry 4** provides the list of status codes that may be returned by the Backplane Driver. These status codes are as follows: 2 The Backplane Driver could not access the PLC. 3 Invalid binding on the message sent to the Backplane Driver. 4 The message could not be sent to its destination because the mailbox was not open. 5 The maximum number of transfers to the destination are already taking place. 6 The maximum number of transfers of this transfer type are already taking place. 7 Can not obtain a Dual-Port RAM buffer. 8 Can not obtain resources (other than Dual-Port RAM). 9 Connection ID or block transfer ID is not valid. a Timed out waiting for CPU response. b The CPU aborted the request. c An invalid message type was specified. d The specified task is not registered. e The mailbox offset specified is invalid. f Argument "msg_rsp" may not be NULL. 10 Argument "unsol_rsp" may not be NULL. 11 Parameter pointer unexpectedly NULL. 12 More than allowable byte length in a single transfer. 13 Bad sequence number in the request. 14 Invalid command in request. 15 Actual response length not expected size. 16 Service Request Processor not available. 17 No text buffer available. 14 "LAN system-software fault; resuming" Internal error: Unexpected event indication routine call. 15 "LAN system-software fault; resuming" Internal error: Unrecognized TCP event code. Entry 4 contains the TCP endpoint identifier. **Entry 5** contains the unrecognized TCP event code. 16 "LAN system-software fault; resuming" Internal error: Event routine indication for an endpoint identifier that should not receive such an indication. **Entry 4** contains the endpoint identifier. 18 "LAN system-software fault; resuming" An event has arrived to an SRTP Server state machine and no transition exists for the event in the machine's current state. **Entry 4** contains an internally-significant event code. 19 "LAN system-software fault; resuming" Internal error: NULL transaction machine pointer detected. 1a "LAN system-software fault; resuming" Internal error: NULL connection machine pointer detected.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event"1b" SRTP server event (Continued)	20 "LAN system-software fault; resuming" Internal error: A work block with NULL transaction and connection machine pointers was detected. **Entry 4** contains the event code associated with the work. 21 "Bad remote application request; discarded request" A PDU arrived in a state in which the SRTP connection cannot handle it. **Entry 4** contains a code indicating the PDU type. Valid PDU type codes are as follows: 0 Connect Request 1 Connect Response 2 Data Request 3 Data Response 4 Unconfirmed Request 5 Error Request 6 Destinations Request 7 Destinations Response 8 Session Request **Entry 5** contains a code indicating the state of the SRTP connection. Valid state codes are as follows: 0 IDLE 1 OPENING (TCP connection established, SRTP connection not established) 2 ESTABLISHED 3 READONLY 4 CLOSING 5TERMINATE 22 "LANI/F capacity exceeded; discarded request" An SRTP connection could not be created due to either the enforcement of a maximum limit on the number of SRTP connections (16) or system resource exhaustion. In the latter case, other log entries should indicate the exhaustion of such resources. 23 "LAN system-software fault; resuming" Internal error: Failed to map a TCP endpoint identifier to a connection machine. **Entry 4** contains the offending endpoint identifier. 24 "LAN system-software fault; resuming" Internal error: Failed to map a Backplane (PLC) Driver task identifier to a connection machine. **Entry 4** contains the offending task identifier. 25 "LAN system-software fault; resuming" Internal error: No read was active on a transaction machine when one was expected. 26 "Bad remote application request; discarded request" A PDU arrived with a **version** field number higher than the SRTP protocol version supported by the SRTP Server. **Entry 4** contains the version number of the PDU. **Entry 5** contains the SRTP version supported by the SRTP Server. 27 "Bad remote application request; discarded request" A PDU arrived with an invalid **pdu_type** field code. The value of the **pdu_type** field is contained in **Entry 4**. Valid PDU type codes are listed above in the description of **Entry 2** = 21H.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event"1b" SRTP server event (Continued)	28 "Bad remote application request; discarded request" A PDU arrived with a non-zero **data_length** field, but was of a class of PDU's which must have zero (0) in this field. **Entry 4** contains the PDU's type code. Valid PDU type codes are listed above in the description of entry 2 = 21H. The value of the **data_length** field is contained in **Entries 5 and 6**. 29 "Bad remote application request; discarded request" An Error Request PDU arrived from a remote SRTP endpoint. **Entry 4** contains the SRTP error code. **Entry 5** contains the invoke ID of the SRTP PDU causing the Error Request to be sent. 2b "Bad remote application request; discarded request" A valid SRTP PDU arrived, but the SRTP Server does not support handling it. The value of the **pdu_type** field is contained in **Entry 4**. Valid PDU type codes are listed above in the description of **Entry 2** = 21H. 2c "LANsystem-softwarefault;resuming" Internal error: An attempt to write an SRTP Connect Response was made prematurely. 2d "LANsystem-softwarefault;resuming" Internal error: More response data arrived from the Backplane (PLC) Driver when more data was unexpected. Entry 4 contains the SRTP PDU type associated with the response data. Valid PDU type codes are listed in the description of **Entry 2** = 21H. 2e "LANsystem-softwarefault;resuming" Internal error: A mismatched Backplane (PLC) Driver transfer identifier was detected in the context of reading TCP data. **Entry 4** contains the transfer identifier. 2f "LANsystem-softwarefault;resuming" Internal error: Failed to allocate a new transaction machine. 30 "LANsystem-softwarefault;resuming" Internal error: Failed to find a transaction machine on the send queue matching the desired Backplane (PLC) Driver task identifier and transfer identifiers. **Entry 4** contains the task identifier, and **Entry 5** contains the transferidentifier. 31 "LANsystem-softwarefault;resuming" Internal error: An attempt was made to activate an idle PDU machine. 32 "LANsystem-softwarefault;resuming" Internal error: A PDU machine was in an unexpected state. 33 "LANsystem-softwarefault;resuming" An attempt to read more TCP data for a transaction machine failed. 34 "LANsystem-softwarefault;resuming" Internal error: Failed the setup required to read the data field of an SRTP PDU.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "1b" SRTP Server events (Continued)	35 "LANsystem-softwarefault;resuming" An attempt to write more TCP data for a transaction machine failed. 36 "LANsystem-softwarefault;resuming" Internal error: Failed to allocate a work block. 38 "LANsystem-softwarefault;resuming" An attempt was made to use the SRTP Server task when it was not initialized. 39 "LANsystem-softwarefault;resuming" Internal error: Failed to QAlloc a buffer. **Entry 4** contains the buffer size in bytes. 3a "LANsystem-softwarefault;resuming" Internal error: An attempt to allocate a new session tracking structurefailed. 3b "LANsystem-softwarefault;resuming" A service request processor address of 0 was detected in the context of automatic session termination. Such an address is the result of the use of 0 in the DEST field of a session establish mailbox. SRTP Server can not support the use of DEST address 0 with automatic session termination. 3c "LANsystem-softwarefault;resuming" Internal error: An attempt to automatically terminate a dangling session failed. **Entries 5 and 6** contain the DEST address of the service request processor with the session. 3d "LANsystem-softwarefault;resuming" Internal error: Failed to synchronize SRTP Server operating parameters with configuredvalues. 3e "LANsystem-softwarefault;resuming" Internal error: An event arrived to a transaction machine in an invalid state. **Entry 4** contains the offending state code. **Entry 5** contains the event code. 3f "LANsystem-softwarefault;resuming" Internal error: An event arrived to a connection machine in an invalid state. **Entry 4** contains the offending state code. **Entry 5** contains the event code. 40 "LANsystem-softwarefault;resuming" Internal error: An attempt to set a timer with STIMreq failed. 41 (Not reported to CPU Fault Table) Internal error: Unknown Task ID encountered.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "1c" Channel API events	**Entry 6** of any Channel API exception is a code uniquely identifying the software component of the Channel API which reported the exception. **Entry 2** (hexadecimal) codes are as follows: 1 "LAN system-software fault; resuming" Internal error: The Channel API software encountered an internal use (as opposed to user application use) of a channel number that is out-of-range. **Entry 3** contains the offending channel number. 3 "LAN data memory exhausted-check parms; resuming" Internal error: An attempt to allocate a buffer failed. **Entry 3** contains the channel number. **Entry 4** contains the number of bytes the Channel API was attempting to allocate. 4 "LAN system-software fault; resuming" Internal error: The Channel API detected the improper internal use of a NULL pointer to a channel machine. 5 "LAN system-software fault: aborted assoc. & resuming" Internal error: A Channel API event arrived in a channel machine state that is not intended to handle the event. **Entry 3** contains the aborted channel number. **Entry 4** contains a code uniquely identifying the event. Valid event codes are: 1 TCP_DATA_RDY 2 TCP_ERROR 3 TCP_CONN_OK 4 TCP_FIN_RCVD 5 TCP_USER_RESET 6 TCP_CONN_IND 7 TCP_OKTOSND 8 BPX_FRESH_DATA 9 BPX_WR_DATA_ACK a CMD_EC b TIMER_INTERVAL c TIMER_TIMEOUT d XFER_ERROR e END_OF_SWEEP f UPDATE_WAIT_EXPIRE 6 "Backplane communications with PLC fault; lost request" Internal error: An attempt to write to the user-specified reference address to be used to hold the COMMREQ Status (CRS) bits failed internally. **Entry 3** contains the CRS word value to be written. **Entry 4** contains the Segment Selector of the reference addressed. **Entry 5** contains the (zero-based) Offset of the reference address.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "1c" Channel API events (Continued)	7 "LAN system-software fault: aborted assoc. & resuming" Internal error: An attempt to set a timer failed. **Entry 3** contains the aborted channel number. **Entry 4** contains the high word of the time value used in the attempt to set the timer. **Entry 5** contains the low word of the time value used in the attempt to set the timer. a "LAN system-software fault: aborted assoc. & resuming" Internal error: A channel machine's write PDU submachine was accessed in its IDLE state. **Entry 3** identifies the channel number of the aborted channel machine. b "Bad remote application request; discarded request" An SRTP PDU arrived to the Channel API having an unexpected value in its version field. This suggests that the remote SRTP endpoint may be running software that is incompatible with your version of the Channel API. **Entry 3** contains the aborted channel number. **Entry 4** contains the version number found in the arrived PDU. **Entry 5** contains the version number expected by the Channel API. c "Bad remote application request; discarded request" An SRTP PDU arrived with a non-zero data field; however, the PDU is of the type where data is not allowed. **Entry 3** contains the aborted channel number. **Entry 4** contains the PDU type code. Valid PDU type codes are: 0 Connect Request 1 Connect Response 2 Data Request 3 Data Response 4 Unconfirmed Request 5 Error Request 6 Destinations Request 7 Destinations Response 8 Session Request **Entry 5** contains the low word of the data field. d "Bad remote application request; discarded request" An SRTP PDU arrived with a PDU type code that the Channel API does not support. At present, the Channel API only supports the arrival of the following PDU types: Connect Response, Data Response, and Error Request. **Entry 3** contains the aborted channel number. **Entry 4** contains the offending PDU type code. e "LAN data memory exhausted-check parms; resuming" Internal error: An attempt to allocate a buffer failed. 11 "LAN system-software fault; resuming" The Channel API software was accessed by other internal software, but the Channel API has not yet been initialized. 12 "LAN system-software fault; resuming" Internal error: An attempt to find the channel machine corresponding to a given TCP connection has failed. **Entry 3** contains the TCP endpoint identifier of the particular TCP connection.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "1c" Channel API events (Continued)	13 "LAN system-software fault: aborted assoc. & resuming" Internal error: An attempt to allocate a work block failed. **Entry 3** contains the aborted channel number. 14 "LAN system-software fault; resuming" Internal error: Additional unsolicited mail or service response data arrived from the Backplane (PLC) Driver when such data was unexpected. 15 "LAN system-software fault; resuming" Internal error: A mailbox buffer pointer was found to be NULL. 17 "LAN system-software fault: aborted assoc. & resuming" The Backplane (PLC) Driver returned bad status in response to a request. **Entry 3** may contain the aborted channel number or 0 if no channel was aborted. **Entry 4** contains a status code indicating the type of failure. Valid values for these codes are listed under the description of SRTP Server (event 1b) Entry 2 codes e-13. **Entry 5** uniquely identifies the request that failed. 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. 18 "LAN system-software fault: aborted assoc. & resuming" Mailbox traffic of unwanted type arrived from the Backplane (PLC) Driver. **Entry 3** may contain the aborted channel number or "C00" if no channel was aborted. **Entry 4** identifies the offending traffic type. 19 "LAN system-software fault: aborted assoc. & resuming" Internal error: The Channel API received a backplane transfer response of an unwanted transfer class. **Entry 3** contains the aborted channel number. **Entry 4** contains a code identifying the class. Valid class codes are: 0 UNKNOWN 1 READ_DATA 2 WRITE_DATA 3 WRITE_DCS 4 WRITE_CRSW 5 WRITE_CSB 1a "LAN system-software fault; resuming" Internal error: A Backplane (PLC) Driver event indication routine was invoked, but the Channel API does not have any use for such an event. **Entry 4** contains a Backplane (PLC) Driver task identification. **Entry 5** contains a request identification number. 1c "LAN system-software fault: aborted assoc. & resuming" Internal error: A NULL buffer pointer was detected. **Entry 3** can contain the aborted channel number. 1d "Backplane communications with PLC fault; lost request" Internal error: A request to notify the Channel API of the next CPU scan failed. 1e "LAN system-software fault: aborted assoc. & resuming" Internal error: An attempt to allocate a new channel machine failed. **Entry 3** contains the requested channel number. 1f "Bad local application request; discarded request" A COMMREQ arrived to the Channel API containing a command code that was not recognized as a Channel API command. **Entry 3** contains the command code.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "1c" Channel API events (Continued)	20 "Backplane communications with PLC fault; lost request" Internal error: An attempt to write to the user-specified reference address to be used to hold the Detailed Channel Status Words failed internally. 21 "LAN system-software fault; resuming" The Service Request Processor component of PLC CPU rejected a request. **Entry 3** contains the major-minor error code of the request. **Entry 4** contains a unique request identification number. 22 "LAN system-software fault; resuming" Internal error: An attempt to find the channel machine corresponding to a given channel number has failed. **Entry 3** contains the particular channel number. 23 "LAN system-software fault; resuming" Internal error: An attempt to synchronize Channel API operating parameters with those configured by the user failed. 24 "Backplane communications with PLC fault; lost request" Internal error: An attempt to register with the Backplane (PLC) Driver failed. **Entry 3** contains an error status code describing the failure. Many error codes are defined, the most noteworthy is ffff. This indicates that the Backplane (PLC) Driver is not initialized. Consult GE Fanuc for the meaning of any other codes. 25 "LAN IF can't init-check parms; running soft Sw Utl" Internal error: An attempt to allocate a queue header failed. This event causes the Ethernet Interface to restart. If this error occurs within the first 60 seconds after the Ethernet Interface was restarted or power cycled, the automatic restart will force the Ethernet Interface into the Soft Switch Entry utility. 26 "LAN IF can't init-check parms; running soft Sw Utl" Internal error: An attempt to allocate a buffer pool failed. This event causes the Ethernet Interface to restart. If this error occurs within the first 60 seconds after the Ethernet Interface was restarted or power cycled, the automatic restart will force the Ethernet Interface into the Soft Switch Entry utility. 27 "LAN system-software fault: aborted assoc. & resuming" Internal error: A Channel Machine was issued an event when in an invalid state. **Entry 3** identifies the aborted channel number. **Entry 4** identifies the state. **Entry 5** identifies the event. Valid state and event codes are defined in the description for Entry 2 = 5. 28 "Backplane communications with PLC fault; lost request" Internal error: An internal attempt to send a request to the Backplane (PLC) Driver failed. **Entry 3** contains an error status code describing the failure. Valid codes are described in the description for Entry 2 = 24H. The backplane transfer class code associated with the transfer is contained in **Entry 4**. Valid class codes are defined in the description for Entry 2=19H 29 "LAN data memory exhausted-check parms; resuming" Internal error: An attempt to allocate a new backplane transfer tracking structure failed. The backplane transfer class code to be used with the transfer is contained in **Entry 3.** Valid class codes are defined in the description for Entry 2=19H. 2a "Backplane communications with PLC fault; lost request" Internal error: An attempt to allocate a status update structure failed. 2b "LAN system-software fault; resuming" Internal error: A NULL COMMREQ data block pointer was detected.

Table 6-10. Exception Log Event Codes - Continued

Log Event Code	Possible Cause and Resolution
Event "1c" Channel API events (Continued)	2c "Bad remote application request; discarded request" Mailbox traffic of unexpected type arrived from the remote Service Request Processor. **Entry 3** identifies the aborted channel number. **Entry 4** identifies the traffic type. 2d "Bad local application request; discarded request" A segment selector that the Channel API does not support was used in specifying the COMMREQ Status Word reference address. **Entry 3** contains the offending segment selector code value. **Entry 4** contains the COMMREQ command value of the command using the offending segment selector. 2f "Bad local application request; discarded request" Could not write the CRS word of a Channel COMMREQ command. **Entry 3** identifies the channel number. You should check your application to make sure it is using a legal CRS word pointer in its Channel command for the indicated channel. 30 "LAN system-software fault; resuming" Internal error: An unexpected state was encountered in a Channel Machine. 31 (Not reported to PLC Fault Table) Internal Error: An attempt to allocate a new action class failed.

Appendix A Glossary

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
LIS	LAN Interface Status
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

AUI Port The connector on the network interface.

AUI Cable The cable between the AUI port and the transceiver (some transceivers plug directly into the AUI port, thus requiring no separate AUI 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 immediately 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 A channel is an abstract term used to describe a connection between a client Series 90 PLC and a server Series 90 PLC and the periodic transfer of data between the two devices.

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 A logical communication link established between two end points and used to transfer information.

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 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 over802.3 / 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 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.)

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 port used to connect to the GSM and the AUI port used to connect to the network transceiver.

What this Appendix Contains

Information pertaining to the Serial Port for Local GSM communications

- Serial Port Pinouts
- Serial Cable Diagrams

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

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

Serial Port for Local GSM Communications

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

Serial Port Settings

The serial port (COM1) must be set to 9600 bps, 8 bits, no parity, and 1 stop bit.

Serial Port Pinouts

The serial port is located on the front edge of the Ethernet Interface. The serial port is a 9-pin D-type female connector that presents an RS–232 DTE Interface. It is used to connect the Ethernet Interface to the local GEnet System Manager (GSM). Connector pinouts are shown in Table B-1.

Table B-1. Pinouts of the Serial Port

Pin Number	Signal	Description
1	Shield	Chassis Ground (optional)
2	TXD	Transmit Data (output)
3	RXD	Receive Data (input)
7	Common	Signal Ground
(all others)		Unused

Serial Cable

A serial cable is needed to connect the GSM to the Ethernet Interface. The next two figures illustrate typical cable connection of a personal computer. Figure B-1 shows connections to a personal computer with a 25–pin serial port and Figure B-2 shows connections to a personal computer with a 9-pin serial port..

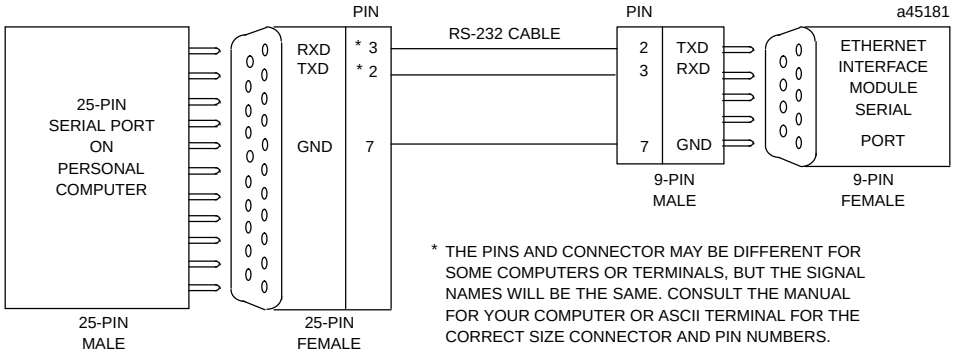


Figure B-1. Serial Cable to Connect GSM (25–Pin Connector) to Ethernet Interface

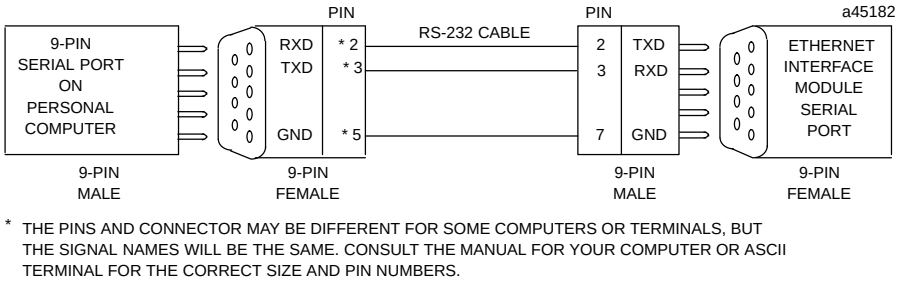


Figure B-2. Serial Cable to Connect GSM (9–Pin Connector) to Ethernet Interface

Display Terminal Settings

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

The AUI Port for the Ethernet Interface

The Ethernet Interface is equipped with an AUI port for connecting to the network. The IEEE 802.3 AUI (Attachment Unit Interface) is standard across a variety of different physical media. Compatible transceivers can be purchased that support 10Base5 and 10Base2 coaxial cables as well as twisted pair and fiber optic cables. The standard AUI makes your selection of transceiver and trunk cable medium transparent to the Ethernet Interface.

Your cables must meet the applicable IEEE 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 Attachment Unit Interface (AUI) port pinouts and AUI cable diagrams.

Ethernet AUI Port Pinouts

The AUI port is located on the front edge of the Ethernet Interface. This port is a 15-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-2.

Table B-2. Pinouts of the AUI Port

Pin Number	Signal	Description
1	GND	Signal Ground
2	CP+	Collision Presence +
3	TX+	Transmit +
4	GND	Signal Ground
5	RX+	Receive +
6	GND	Signal Ground
7	NC	Not Connected
8	GND	Signal Ground
9	CP–	Collision Presence –
10	TX–	Transmit –
11	GND	Signal Ground
12	RX–	Receive –
13	+12	+12 Volts
14	GND	Signal Ground
15	NC	Not Connected
SHELL		Chassis Ground

AUI (Transceiver Cable)

The figure below shows a typical cable configuration to connect the AUI port of the Ethernet Interface to an external transceiver.

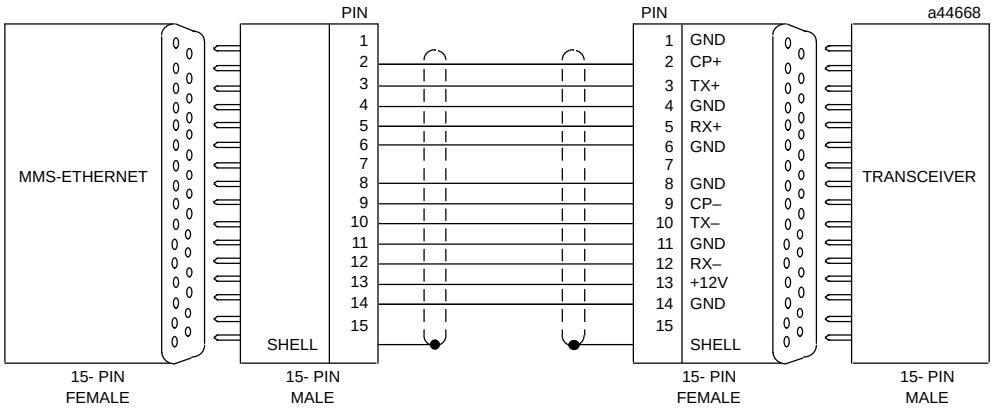


Figure B-3. Transceiver Cable Connection

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 Description

Depending on your particular application, any of several types of user-supplied transceivers may be used. The two most commonly used in industrial environments are: 10Base5 and 10Base2. A typical configuration for each unit is shown in Figures B-3 and B-4.

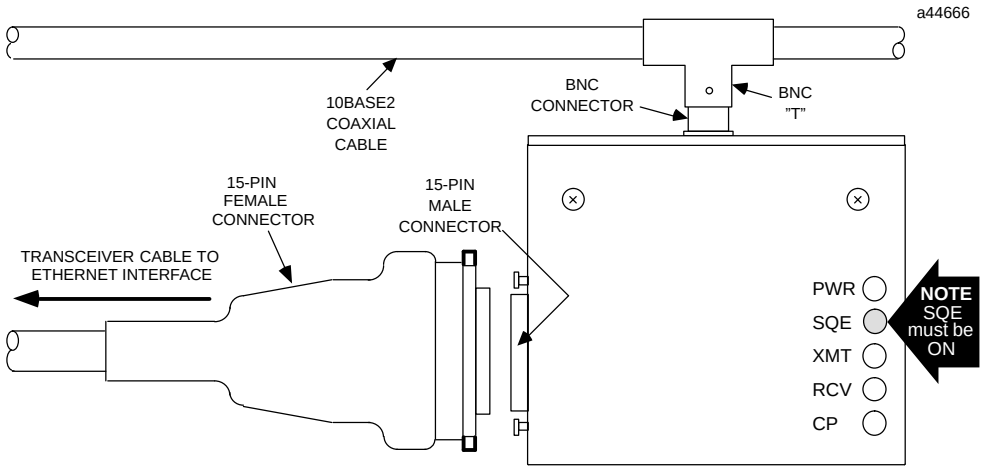


Figure B-4. 10Base2 Transceiver Configuration

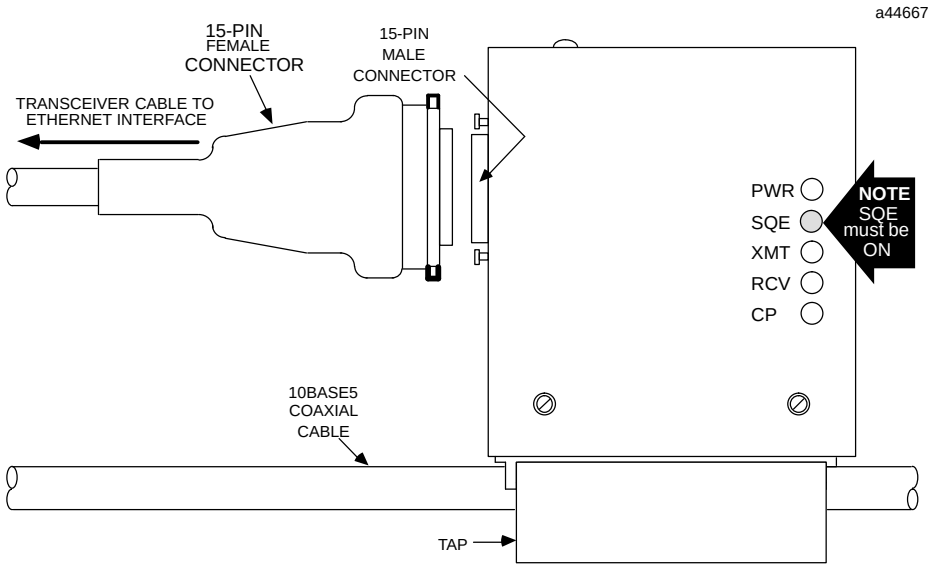


Table B-3. 10Base5 Transceiver Configuration

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.

Appendix C Soft Switch Parameters

This appendix describes the parameters and settings that may be modified when configuring the Ethernet Interfaces. It also describes the methods for configuring the Ethernet Interface through either the Station Manager or the Logicmaster™ 90-70 Configurator.

The Ethernet Interface has a set of fundamental parameters stored in non-volatile memory (retentive when power is off). This memory is called Electronically Erasable Programmable Read Only Memory (EEPROM). These parameters are maintained indefinitely with or without power. This set of parameters is called "Soft Switches." Soft Switches specify basic parameters in software rather than using hardware jumpers or switches. These parameters are required to support the loader and communications software of the Ethernet Interface. Soft Switches are set to default values at the factory that are correct for most LAN installations. Review the values in Table C-1 to determine if the factory default values are appropriate for your network.

Note

TCP / IP parameters IP Address, Subnet Mask, Gateway IP Address and Name Server IP Address are technically soft switches, but are neither displayable nor changeable with SOSW / CHSOSW nor described in this section.

Config Mode

The Logicmaster 90-70 configuration mode (set in the Config Mode field) has a major effect on which Soft Switch parameters are in use. When the configuration mode is MMS-ETHERNET, all Soft Switches described here are used. The switches may then be modified using the PLC Programmer or the CHSOSW command. When the configuration mode is TCP / IP, only the Station Address and Network Load Address Software Switches may be modified for the Ethernet Interface. These Software Switches may only be modified using the PLC Programmer; that is, they may not be set using the CHSOSW command. When using TCP / IP configuration mode, other Soft Switches are "hard-coded" as follows: Load Source is ALT, LAN Online is YES, and Backplane on line is YES.

The MMS-ETHERNET configuration mode is intended for those users who are using:

(a) an Ethernet Interface with PROM version less than 2.00 or
(b) a PLC CPU with firmware version less than 5.03.

The TCP / IP configuration mode is intended for those users who are using

(a) an Ethernet Interface with PROM version 2.00 or higher and
(b) a PLC CPU with firmware version 5.03 or higher.

The Config Mode Software switch may only be configured in Logicmaster 90-70 versions 6.01 and higher. The default setting is TCP / IP. If your Logicmaster 90-70 version is less than 6.01, the Config Mode field is not displayed on the Logicmaster 90-70 screen, but is automatically set to MMS-ETHERNET.

Station Address

The Station Address parameter defines the station's MAC address used on the network. Unless your network is using local address administration, this value should be left at the default value (all zeroes). This allows the factory assigned, unique default station address (which appears on the default station address label on the controller board) to be used as the MAC address.

If you are using local address administration, this Soft Switch parameter is used to set the station address to a valid locally-administered individual station address. If you are not familiar with MAC address formats, refer to "Structure of the MAC Address" in Chapter 3.

Caution

If you assign a new MAC address, record its value. Setting an improper MAC Address value, or duplicating the address of another station can disrupt other stations on the network.

Load Source

The Load Source parameter tells the Ethernet Interface the source for its software download.

- The default setting is "ALT". This cycles between local and network load sources, starting with local. This method selects the first available load source.
- This parameter may also select local or network downloading exclusively. See Table C-1 for more information.

LAN Online

The LAN Online parameter tells the Ethernet Interface whether or not it should connect to the network after diagnostics. The default setting is YES.

Backplane Online

This parameter tells the Ethernet Interface whether or not to allow backplane communications after initialization. The default setting is YES.

Network Load Address

The Network Load Address parameter specifies the multicast address used by this station to receive network download multicast messages. This parameter is used *only* for network downloading. The default value of zeroes means use the default network load address (090060000000).

A network GSM which is ready to provide network downloading identifies itself on the network by sending a message to one or more download multicast addresses. This message contains network data needed by a station to enter the network and request a download. Each station recognizes a network GSM downloader at only one specific download multicast address: the address specified in the Network Download Address parameter.

The Network Load Address must be a valid MAC multicast address; the Individual / Group address (I / G) bit must be set to "1". That is, the first byte of the address must have its least significant bit ON. If you are not familiar with address formats, refer to "Structure of the MAC Address" in Chapter 3.

Note

The Network Load Address parameter should be changed *ONLY* if there is a GEnet System Manager (GSM) which is configured to use this address. Changing the Network Load Address to an address not used by some GSM on the network will cause the station to be unable to receive a network download.

Modify Soft Switch Settings

Refer to the table below for the default Soft Switch settings and Soft Switch modification information.

Table C-1. Soft Switch Settings

Parameter	Description
Station Address	The station address parameter is the Medium Access Control (MAC) address of the station being configured. The MAC address is a 12-digit hexadecimal number which is organized as 6 bytes, each represented by a pair of hexadecimal digits. **Default Setting** - The default value is **<<000000000000>>** . This value instructs the Ethernet Interface to use the factory-set, globally-unique MAC address in its EEPROM. **Modification from Default Setting** - If changed, the Ethernet Interface will store the new Station Address in the EEPROM and use it instead of the factory default.
Load Source	The load source field defines the load source for the GEnet LAN software. **Default Setting** - The default setting for this field is **"ALT"**. This means that the Ethernet Interface module will try to obtain a load from the serial port and the network (in that order). The software will alternate between the two load sources until one is found. **Modification from Default Setting** - You may wish to specify the load source. The load source may be changed to: "LOC" (serial port) - only "NET" (network) - only If the load source specified is not available for the module, it will wait indefinitely for that load source to be made available.
LAN Online	This parameter tells the GEnet LAN Interface module whether to connect to the LAN after initialization. **Default Setting** - The default setting is **YES**. This means that the module will connect to the LAN. **Modification from Default Setting** - The default may be changed to NO. This means that the module will *not* connect to the LAN.
Backplane On-line	This parameter tells the GEnet LAN Interface module whether or not to allow back-plane communications. **Default Setting** - The default setting is **YES**. This means that the module will allow all forms of backplane communications. **Modification from Default Setting** - The default may be changed to NO. This means that the module will only allow diagnostics mail traffic. This setting will *not* permit application data transfer with the Series 90-70 CPU.
Network Load Address	The multicast address to be used by the LAN Interface to load across the LAN. It is in the same format as the Station Address. **Default Setting** - The default value is **<<000000000000>>** . This value instructs the LAN Interface to use the default network load address, **<<090060000000>>** , as its load address. **Modification from Default Setting** - If changed the Ethernet Interface will look for a network load from the specified multicast address. This MUST be a multicast address.

Configuring Soft Switch Parameters

The Series 90-70 Ethernet Interface supports two methods for setting Soft Switches:

- The Logicmaster 90-70 Configurator software package, which passes the data to the Series 90-70 PLC CPU.
- The Ethernet Interface Station Manager *CHSOSW* command.

Note

The *CHSOSW* command can only be used when the Ethernet Interface is not configured in the local PLC by the Logicmaster 90-70 Configurator. Logicmaster 90-70 is the primary method for configuring soft switches.

This manual does not describe Soft Switch configuration through the Logicmaster 90-70 Configurator software. Refer to GFK-0263 *Logicmaster™ 90 Programming Software User's Manual* for information on configuring your Ethernet Interface using Logicmaster 90-70 Configurator software.

To configure your Ethernet Interface using the GEnet Station Manager *CHSOSW* command, refer to the following information.

Configuring Soft Switch Parameters Using the GSM

Perform the steps described here to set the Soft Switch values using the GEnet Station Manager when:

- You wish to change the default Software Switch values, and do not have the Logicmaster 90 configurator software.
- A Ethernet Interface is in the Soft Switch Entry Utility as indicated by the Soft Switch LED pattern display (module OK LED blinking slowly, other LEDs OFF).

1. Connect a serial cable, as shown in Appendix B, from the 9-pin port on the Ethernet Interface Controller board to a GSM or other terminal device (9600 - 8 data bits, 1 stop bit, no parity). If using the GSM, proceed to step 2, otherwise skip to step 5.
2. Power up the personal computer into DOS, and select the proper drive and directory by typing the following command:

   ```
   C:\> cd gsm
   ```

3. To initiate the GSM, from the DOS prompt, type:

   ```
   \GSM> gsm term
   ```

4. The screen will display the GSM Local Station Manager Terminal menu.
5. Press the Ethernet Interface Restart button.

6. Text similar to that shown below will be displayed on the terminal after the diagnostics are run. The Soft Switch Entry Utility banner will appear only if the Ethernet Interface is in the Soft Switch Entry state. The *CHSOSW* command may be used in any of the Ethernet Interface states.

```
IC697 PLC Factory LAN Interface
Copyright (c) 1990-1995.  All rights reserved
PROM version 2.00 (xxAx) Ethernet
IP address = 3.16.18.47
MAC address = <<08001901001f>>  MAC default = <<08001901001f>>
EM7A2

<<< Soft Switch Entry Utility >>>
```

7. A "*" or other prompt character will be displayed on the terminal.

8. To display the current values of the Soft Switches, enter the command SOSW.

9. Set the values of the Soft Switches by entering the *CHSOSW* command. (Refer to Chapter 4, Station Manager, for a detailed definition of the command syntax.)

   The new values of the Soft Switches will be displayed. A typical *CHSOSW* command for the Ethernet Interface is shown below:

```
* chsosw  mac 020106000001  mms dc
<<< Soft Switch Data >>>
Config. Mode:  MMS-ETHERNET
MAC Address = <<08001901001f>> (default used)
Load source = Serial
Network Online   = Online after power up
Backplane Online = Online after power up
Network doad addr = <<090060000000>> (default used)
MMS Enable = Don't Care *
Pgmr Enable = Don't Care *
Source of Soft Switches:  Internal Backup
Updating, please wait ...
```

   * Not used by the TCP / IP Ethernet Interface.

10. If the Soft Switch data displayed in the *CHSOSW* command is correct for the station, press the LAN Interface Restart button to cause the new Soft Switch values to take effect. If the values shown are not what you want, repeat step 10, supplying the proper values.

Caution

Soft switch values set by the *CHSOSW* Station Manager command will be overridden by values configured in the Logicmaster 90-70 Configurator.

Correct Results of Soft Switch Configuration

- If the values displayed from the *CHSOSW* command are not correct, reenter the command with the desired parameters. Enter the command *SOSW* to see the current Soft Switch values.
- If the Soft Switch LED pattern is displayed but no “sign-on message” or prompt appears on the terminal, check the construction and connections of the serial cable and verify that the terminal is operating at the 9600 bps data rate. The sign-on message can be repeated by pressing the LAN Interface Restart button.

Appendix D Sample DOS System Files

This appendix shows prototypes for the DOS system files, CONFIG.SYS, AUTOEXEC.BAT, and PROTOCOL.INI, for each type of 802.3/Ethernet network card *which has been tested* with the GSM. Other network cards may be used at the user's discretion,

Note

Also, at the end of the appendix is a section on optimizing the GSM by adjusting parameters in the [GEFNDIS] section of the PROTOCOL.INI file.

3Com Etherlink II

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICEHIGH=\<DIRECTORY>\ELNKII.DOS
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = ETHERLINKII
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.

[ETHERLINKII]
  DRIVERNAME = ELNKII$
  DMACHANNEL   = 1
  INTERRUPT    = 3
  IOADDRESS    = 0x300
  MAXTRANSMITS = 8
```

3Com Etherlink 3

Note

The installation software does not generate this sample file.

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICEHIGH=\<DIRECTORY>\ELNK3.DOS
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = ELNK3
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.

[ELNK3]
  DRIVERNAME = ELNK3$
  IOADDRESS    = 0x300
  MAXTRANSMITS = 8
```

3Com Etherlink 16

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICEHIGH=<DIRECTORY>\ELNK16.DOS
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = ELNK16.DOS
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.


[ELNK16.DOS]
  DRIVERNAME = ELNK16$
```

3Com Etherlink /MC

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICEHIGH=<DIRECTORY>\ELNKMC.SYS
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = ETHERLINKMC
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.


[ETHERLINKMC]
  DRIVERNAME = ELNKMC$
```

Western Digital EtherCard PLUS, EtherCard PLUS Elite 16, EtherCard PLUS/A

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICEHIGH=\<DIRECTORY>\MACWD.DOS
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = MACWD_NIF
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.


[MACWD_NIF]
  DRIVERNAME = MACWD$
  irq = 3
  ramaddress = 0xd000
  iobase = 0x280
  receivebufsize = 1024
```

Intel 82593

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICEHIGH=<DIRECTORY>\I82593.DOS
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = MLM_NIF
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.

[MLM_NIF]
  DRIVERNAME = I82593$$
  IOADDRESS     = 0x300
  INTERRUPT     = 15
  DMACHAN0      = 6
  DMACHAN1      = 7
  INBUFFER(K)   = 8
  OUTBUFFERS(K) = 3
```

Xircom Pocket Adapter (PE2)

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICEHIGH=<DIRECTORY>\PE2NDIS.EXE
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = XIRCOMNET
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.


[XIRCOMNET]
  DRIVERNAME = XIRCOM$
```

Xircom Pocket Adapter (PE3)

Note

The installation software does not generate this sample file.

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICEHIGH=<DIRECTORY>\PE3NDIS.EXE
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = XIRCOMNET
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.


[XIRCOMNET]
  DRIVERNAME = XIRCOM$
```

SMC EtherCard PLUS, EtherCard PLUS Elite 16, EtherCard PLUS/A

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICEHIGH=\<DIRECTORY>\SMCMAC.DOS
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = SMCMAC_NIF
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.


[SMCMAC_NIF]
  DRIVERNAME = SMCMAC$
  irq = 3
  ramaddress = 0xd000
  iobase = 0x280
  receivebufsize = 1024
```

IBM PCMCIA

Note

The installation software does not generate this sample file.

\CONFIG.SYS

```
FILES=20
BUFFERS=48
DEVICE=\DOS\HIMEM.SYS
DEVICE=\DOS\EMM386.EXE RAM 1024
DOS=HIGH,UMB
rem
rem The Ethernet Adapter and its device driver must first be installed
rem into your computer.  Replace the string "<DIRECTORY>" in the
rem following DEVICEHIGH command with the directory which contains
rem the specified device driver for your Ethernet Adapter module.
rem
DEVICE=\<DIRECTORY>\POINTETH.SYS
DEVICE=\GEFNDIS\PROTMAN.DOS /I:\GEFNDIS
DEVICEHIGH=\<DIRECTORY>\PCMNICCS.DOS
DEVICEHIGH=\GEFNDIS\GEFNDIS.DOS
```

\AUTOEXEC.BAT

```
SET GSMCFG=C:\GSM\CFILES

rem Bind NDIS Drivers
\GEFNDIS\netbind
```

\GEFNDIS\PROTOCOL.INI

```
[protocol manager]
  DRIVERNAME = PROTMAN$

[GEFNDIS]
  DRIVERNAME = GEFNDIS$
  BINDINGS = PCMNICCS_NIF
  MAX_RX_SIZE = 560
  NUM_RX_BUFS = 8

; Caution:     Interrupt conflicts may arise when using default hardware
;              configurations for many Ethernet Adapters.  For example,
;              interrupt IRQ3 is commonly used for the COM2 serial port
;              and most Ethernet adapters.
;
; The following information must match the hardware configuration
; of the Ethernet Adapter as installed on your computer.  Please
; modify this information as necessary.

[PCMNICCS_NIF]
  DRIVERNAME = PCM_CS$
  INTERRUPT = 5
  RAMADDRESS = 0xd4000
  IOBASE = 0x300
```

Optimizing the GSM for Network Operation

There are two parameters in the [GEFNDIS] section of PROTOCOL.INI which can be adjusted to optimize the operation of your GSM. These parameters are described below.

Note

Only experienced network personnel should change the values of these parameters. Setting the parameters to values other than the defaults could cause unpredictable operation of the GSM.

NUM_RX_BUFS Number of RX frame buffers. This is usually the number of simultaneous messages that can be received and processed by the GSM. Defaults to 8 buffers of size specified in MAX_RX_SIZE. This parameter may be increased to handle additional test frame processing or network station management responses. This parameter can be decreased to free up PC memory usage.

MAX_RX_SIZE Maximum RX frame buffer size. This is the largest frame which may be received by the GSM. Incoming data frames which exceed this size will be ignored. A zero length response is returned when an incoming test frame is received which exceeds this size. Defaults to 560 bytes for Network GSM use. This appendix shows prototypes for the DOS system files, CONFIG.SYS, AUTOEXEC.BAT, and PROTOCOL.INI, for each type of 802.3 / Ethernet Interface supported by the GSM.

Note

Also, at the end of the appendix is a section on optimizing the GSM by adjusting parameters in the [GEFNDIS] section of the PROTOCOL.INI file.

Appendix E GEnet System Manager Data Link Error Codes

The GEnet System Manager Data Link error codes are described in this appendix. The NDIS error codes used by the Network GSM and by the NDIS Protocol Manager are also described.

Table E-1. GEnet System Manager Data Link Error Codes

Error Code	Description
1	Too many LSAPs.
2	LSAP not registered.
3	DLI task not registered.
4	Out of buffers - dliact routine.
5	Out of buffers - dlideact routine.
6	Out of buffers - dlisend routine.
7	Out of buffers - dligetbuf routine. Restart GSM.
8	Bad return code - dxprec routine.
9	Command error - bus boot.
10	Command error - open window.
11	Open load file error.
12	Command error - boot data.
13	Command error - end of file.
14	Command error - sense.
15	Out of buffers - GrantBuf routine.
16	Bad type - GrantBuf routine.
17	Power on diagnostics error.
18	Power on diagnostics timeout.
19	MP400 busy - DXPsend routine.
20	Controller failed to enter run state.
21	In ring failed.
22	Hardware reset failed.
23	Send maintenance interface block timeout.
24	Maintenance interface block response error.
25	Send communication block timeout.
26	Bad input command.
27	Received communication block response timeout.
28	Communication block status error.
29	Unknown LSAP.
30	Receive data timeout.
31	Send data timeout.

Table E-1. GEnet System Manager Data Link Error Codes - Continued

Error Code	Description
32	fmalloc error.
34	Deact error.
35	Recv error.
36	LSAP is active.
37	No act confirm.
38	No deact confirm.
39	Deact LSAP error.
40	Act error.
41	Post buffer error.
42	No send confirm.
43	Send error.
44	Programmed I/O timeout error.
45	GPIO Ready error. Restart LAN Interface.
46	Invalid LAN Interface type selection.
47-49	Reserved.
50	Error opening GEFNDIS driver.
51	Error closing GEFNDIS driver.
52	GEFNDIS device not open.
53	GEFNDIS driver not bound to MAC driver.
54	Error posting READ to GEFNDIS driver.
55	READ indication error from GEFNDIS driver.
56	Error WRITING TX frame to GEFNDIS driver.
57	WRITE confirm error from GEFNDIS driver.
58	No WRITE confirm from GEFNDIS driver.
59	Error during IOCTL READ to GEFNDIS driver.
60	IOCTL READ confirm error from GEFNDIS driver.
61	No IOCTL READ confirm from GEFNDIS driver.
62	Error during IOCTL WRITE to GEFNDIS driver.
63	IOCTL WRITE confirm error from GEFNDIS driver.
64	No IOCTL WRITE confirm from GEFNDIS driver.
65	NDIS MAC failure (Fatal Error). Restart PC.

Table E-2. NDIS Error Codes

Error Code (hexadecimal)	Description
	NDIS Error Codes 0000-000D and xxFF may be returned with Data Link Error Codes 54-64. (* NDIS codes 0001-0005 are returned to the MAC. These codes should never be indicated by the GSM.)
0000	Success or no additional error information.
0001*	ReceiveChain is keeping RX buffer.
0002*	Request was queued.
0003*	Frame was not recognized.
0004*	Frame was rejected.
0005*	Forward RX frame to other protocol(s).
0006	MAC out of resources.
0007	Invalid parameter.
0008	Invalid function code.
0009	Function is not supported.
000A	Hardware error during request (non-fatal). (may indicate network disconnection)
000B	Transmit error; frame was not sent. (may indicate network disconnection)
000D	Buffer was too small.
00FF	General failure (non fatal). (may indicate network disconnection)
F1FF	GEFNDIS resource error.
F2FF	GEFNDIS duplicate LSAP error.
F3FF	GEFNDIS LSAP not found error.
	NDIS Error Codes 0020-002F may be indicated during Protocol Manager installation (as PC is started) or when running Netbind utility. The error is displayed as PROnnnnE, where nnnn is the NDIS error code.
0020	Driver already started.
0021	Binding was not complete.
0022	Driver was not initialized.
0023	Interface hardware was not found.
0024	Interface hardware failure.
0025	Configuration failure.
0026	Hardware interrupt conflict.
0027	Incompatible MAC.
0028	Initialization failed.
0029	Binding did not occur.
002A	Network might not be connected.
002B	Incompatible DOS version.
002C	Driver is already registered.
002D	PROTMAN.DOS pathname incorrect.
002E	Insufficient DOS memory for PROTMAN.DOS to run.
002F	Cannot access PROTOCOL.INI image.

Appendix F Network Test Form

Test Form

A data form has been provided in this appendix for your convenience in recording test data for each station.

Network Test Data Sheet

	Init Node	Resp Node 1	Resp Node 2	Resp Node 3	Resp Node 4	Resp Node 5	Resp Node 6	Resp node 7	AcceptableRate
User's Node Description									N/A
<<< **Test Results** >>>									
Node Address									N/A
Frames Sent/ ResponseRecvd									>3e6H
ResponseW/Err									0
No Response									< once / 40K frames
<<< **Data Link Tallies** >>>									
LSap Ofl									0
MacErr									0
BufProb									0
TstRcvd									> 3e6H
TstResp									> 3e6H
<<< **MAC Tallies** >>>									
SQEErr									0
MisdPack									0
RbufErr									0
LateColl									0
LostCarr									0
FRtry									0
<<< **Exception Log** >>>									
Event									Empty
Count									
Entry(s)									

Appendix G 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 *host* on a network must have a unique *IP Address.* The *TCP/IP Ethernet Interface* is such a host, as is a PC running TCP / IP. There may be other hosts on the network that are not involved with communications to the PLCs, but no matter what their function, each TCP / IP host must have its own *IP Address.* It is the *IP Address* that identifies the host on the IP network (or system of connected networks).

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 an *IP address* is formatted:

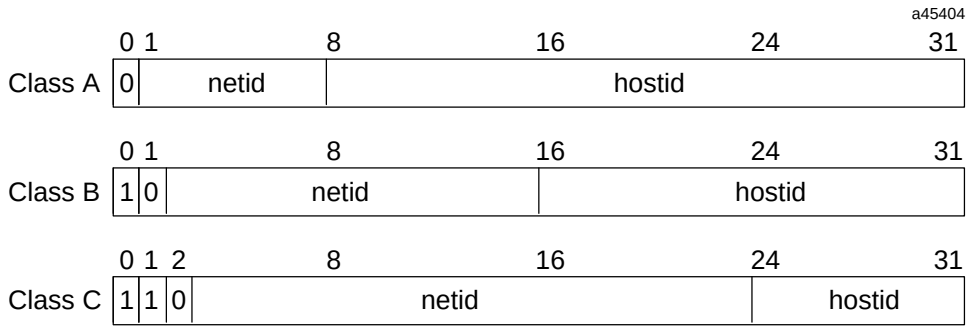


Figure G-1. IP Address Format for Network Classes A, B, C

Each host on the same physical network must have an *IP Address* of the same class and must have the same netid. Each host on the same network must have a different *hostid* thus giving it a unique *IP Address.*

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

00000011 00010000 00010010 00101111

is written as

3.16.18.47

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	reserved

Gateways

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

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

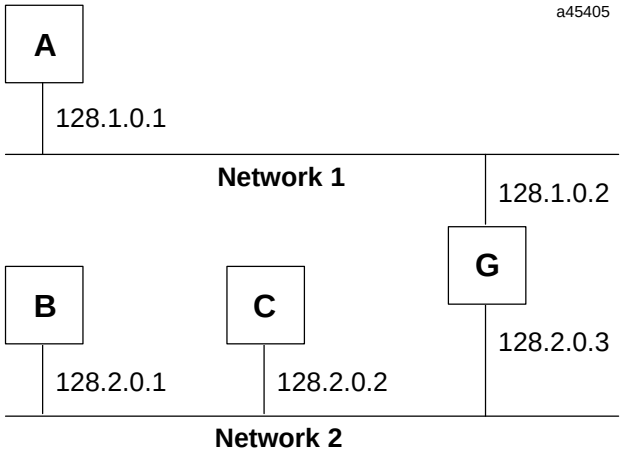


Figure G-2. Connecting Two Networks with a Gateway

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 our Ethernet environment it 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 physical networks. Routing outside of 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 physical network. Selecting the following subnet mask would add two additional *netid* bits allowing for four physical networks:

11111111 11111111 11000000 00000000 = 255.255.192.0

In effect, two bits of the Class B *hostid* have been used to extend the *netid*.

The new configuration would be:

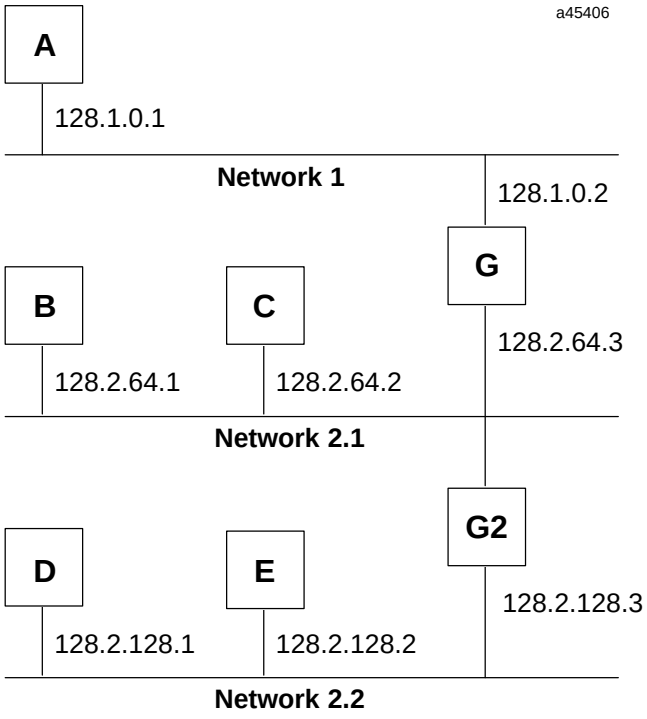


Figure G-3. Network Configuration Using a Subnet Mask

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 via the Logicmaster 90 Module Configuration screen for the Ethernet module.

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 H Sample Ladder Program

This appendix contains the following:

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

```
09–12–95  13:21          GE FANUC SERIES 90–70 (v6.01)              Page     1
```

```
 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:  LANRDWR                            *)
(*                                                                           *)
(*       PLC PROGRAM ENVIRONMENT            HIGHEST REFERENCE USED          *)
(*    ____________________________       ____________________________       *)
(*              INPUT (%I):     2048               INPUT:   %I00048         *)
(*             OUTPUT (%Q):     2048              OUTPUT:      NONE         *)
(*           INTERNAL (%M):     4096            INTERNAL:      NONE         *)
(*            UNBOUND (%U):     4096             UNBOUND:      NONE         *)
(*          TEMPORARY (%T):      256           TEMPORARY:   %T00014         *)
(*    PROGRAM REGISTER (%P):     NONE       PROGRAM REGISTER:      NONE     *)
(*           REGISTER (%R):     1024              REGISTER:   %R00158         *)
(*       ANALOG INPUT (%AI):      64          ANALOG INPUT:      NONE         *)
(*      ANALOG OUTPUT (%AQ):      64         ANALOG OUTPUT:      NONE         *)
(*   UNBOUND REGISTER (%UR):     9999       UNBOUND REGISTER:      NONE     *)
(*                                                                           *)
(*                      PROGRAM SIZE (BYTES):     1296                     *)
(*                                                                           *)
(*                                                                           *)
(*****************************************************************************)
```

```
Program: LANRDWR                    A:\LANRDWR
```

```
(*****************************************************************************)
(*                                                                           *)
(*                                BLOCK:  _MAIN                              *)
(*                                                                           *)
(*                                                                           *)
(*       PROGRAM REGISTER (%P) MEMORY SIZE (BYTES):     0                    *)
(*                             BLOCK SIZE (BYTES):  1245                     *)
(*                          DECLARATIONS (ENTRIES):    24                    *)
(*                                                                           *)
(*                                                                           *)
(*                          HIGHEST REFERENCE USED                           *)
(*                        ___________________________                        *)
(*                                                                           *)
(*                                INPUT (%I):   %I00048                      *)
(*                               OUTPUT (%Q):      NONE                      *)
(*                             INTERNAL (%M):      NONE                      *)
(*                               UNBOUND (%U):     NONE                      *)
(*                            TEMPORARY (%T):   %T00014                      *)
(*                       LOCAL REGISTER (%L):      NONE                      *)
(*                     PROGRAM REGISTER (%P):      NONE                      *)
(*                              REGISTER (%R):   %R00158                     *)
(*                        ANALOG INPUT (%AI):      NONE                      *)
(*                       ANALOG OUTPUT (%AQ):      NONE                      *)
(*                     UNBOUND REGISTER (%UR):     NONE                      *)
(*                                                                           *)
(*****************************************************************************)
```

```
|[  START OF LD  PROGRAM LANRDWR  ]       (*                                *)
|
|[     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
%I00039	S2_FUSE	Fuse blown for Serial Port 2
%I00040	AI_FUSE	Fuse blown lfor AAUI Port
%I00045	LAN_OK	Bit set, LAN OK
%I00046	RSOURCE	Set if resource problem
%I00048	LANIFOK	LAN Interface OK
%I00049	XFER_1	Successful Data Transfer
%I00050	CH1_ERR	Error detected on channel 1
%T00001	FIRSTRD	First channel cmd after Fst_Scn
%T00002	RD_OK	Commreq successful
%T00003	RD_ERR	Error processing Commreq
%T00004	RD_FLT	Fault output set for COMREQ
%T00005	WRT_OK	Write Channel cmd successful
%T00006	WRT_ERR	Error processing write channel
%T00007	WRT_FLT	Write Chan COMREQ Fault output
%T00008	DO_READ	Write done, do read comreq
%T00009	DO_WRT	Read done, do write comreq
%T00010	RESTART	Bit set if Enet card restarted
%T00011	CH_ERR	Error on read/write, restart
%T00012	PWR_DLY	Wait 2 sec. for system power–up
%T00013	RS_READ	Read error detected, restart
%T00014	RS_WRT	Write error dtected, restart
%R00001	RD_CRSW	COMREQ status word for read
%R00002	WT_CRSW	COMREQ status word for write

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

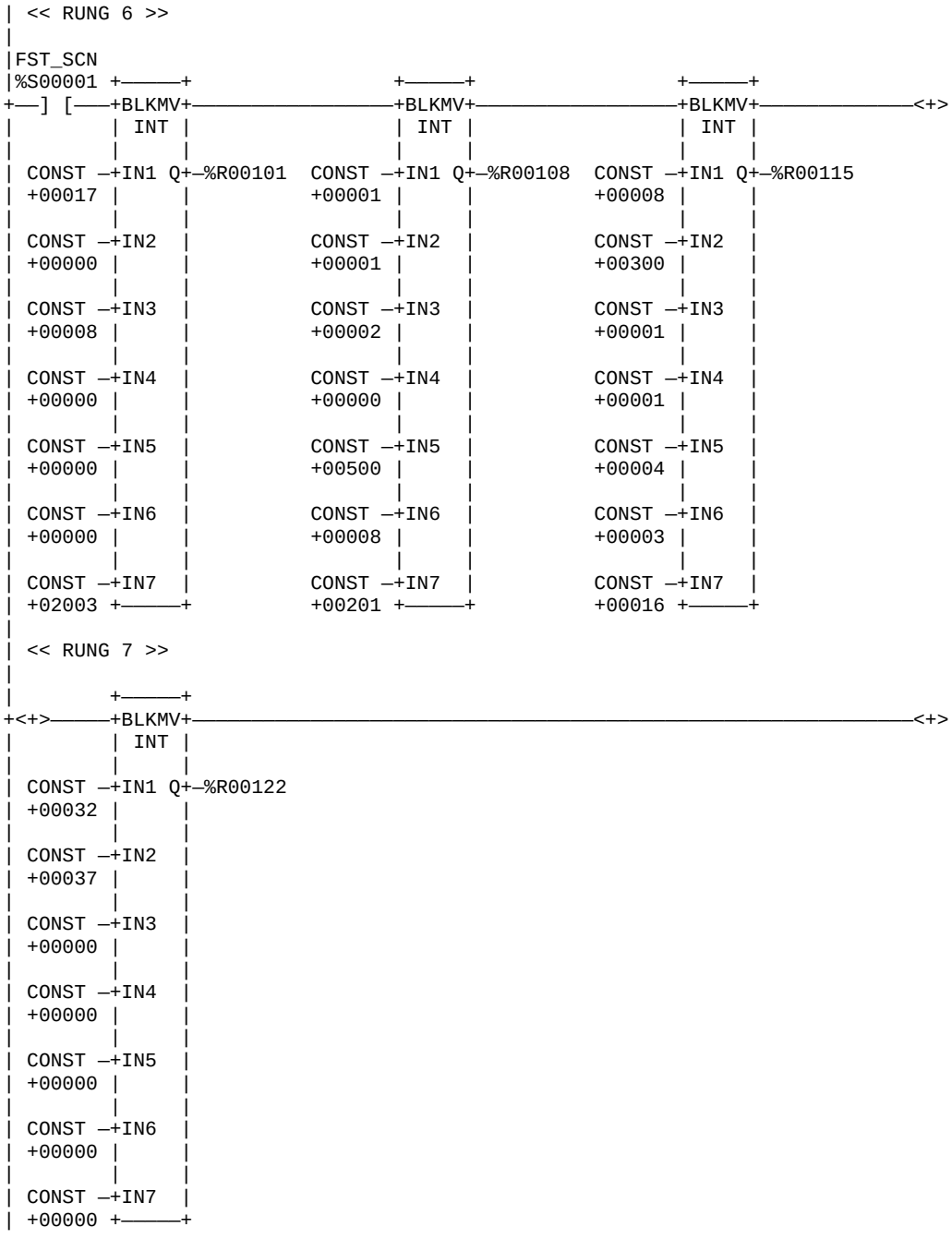
IDENTIFIER	IDENTIFIER TYPE	IDENTIFIER DESCRIPTION
LANRDWR	PROGRAM NAME	

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

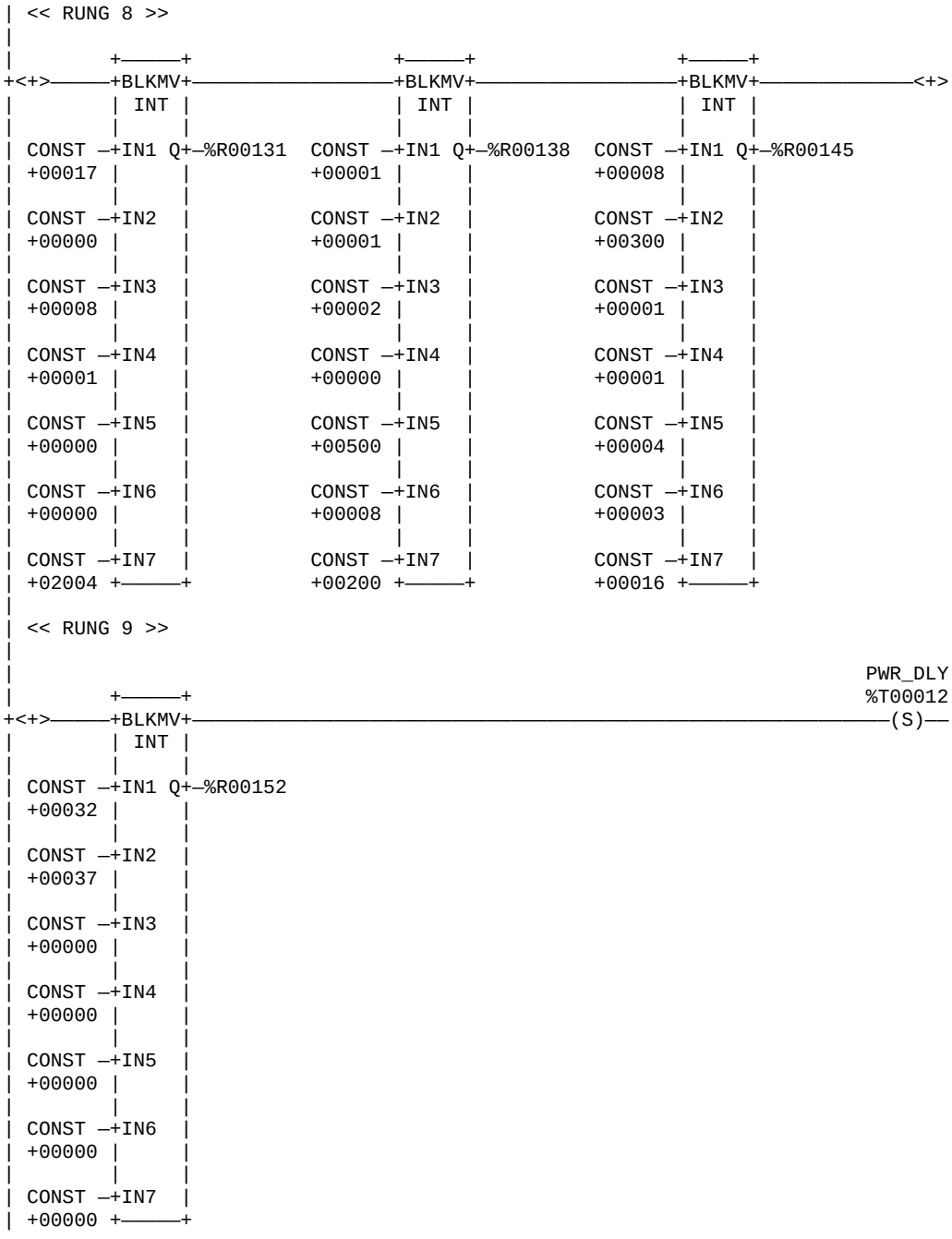
Program: LANRDWR A:\LANRDWR Block: _MAIN

```
| (*************************************************************************)
| (* Overview :                                                             *)
| (*                                                                        *)
| (* This program proviedes an example of alternating reads and write from a  *)
| (* 90–70 client PLC to a 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 lader is written for a 90–70 Ethernet Controller installed in      *)
| (* Rack 0, Slot 2 of a 90–70 system.  The LAN Interface Status Word is     *)
| (* coinfigured for %I33.  This IP address for this Ethernet Controller is  *)
| (* 3.16.32.83.  The IP address for the remote PLC is 3.16.32.37.           *)
| (*                                                                        *)
| (* 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 initalize 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.  *)
| (*************************************************************************)
|
```

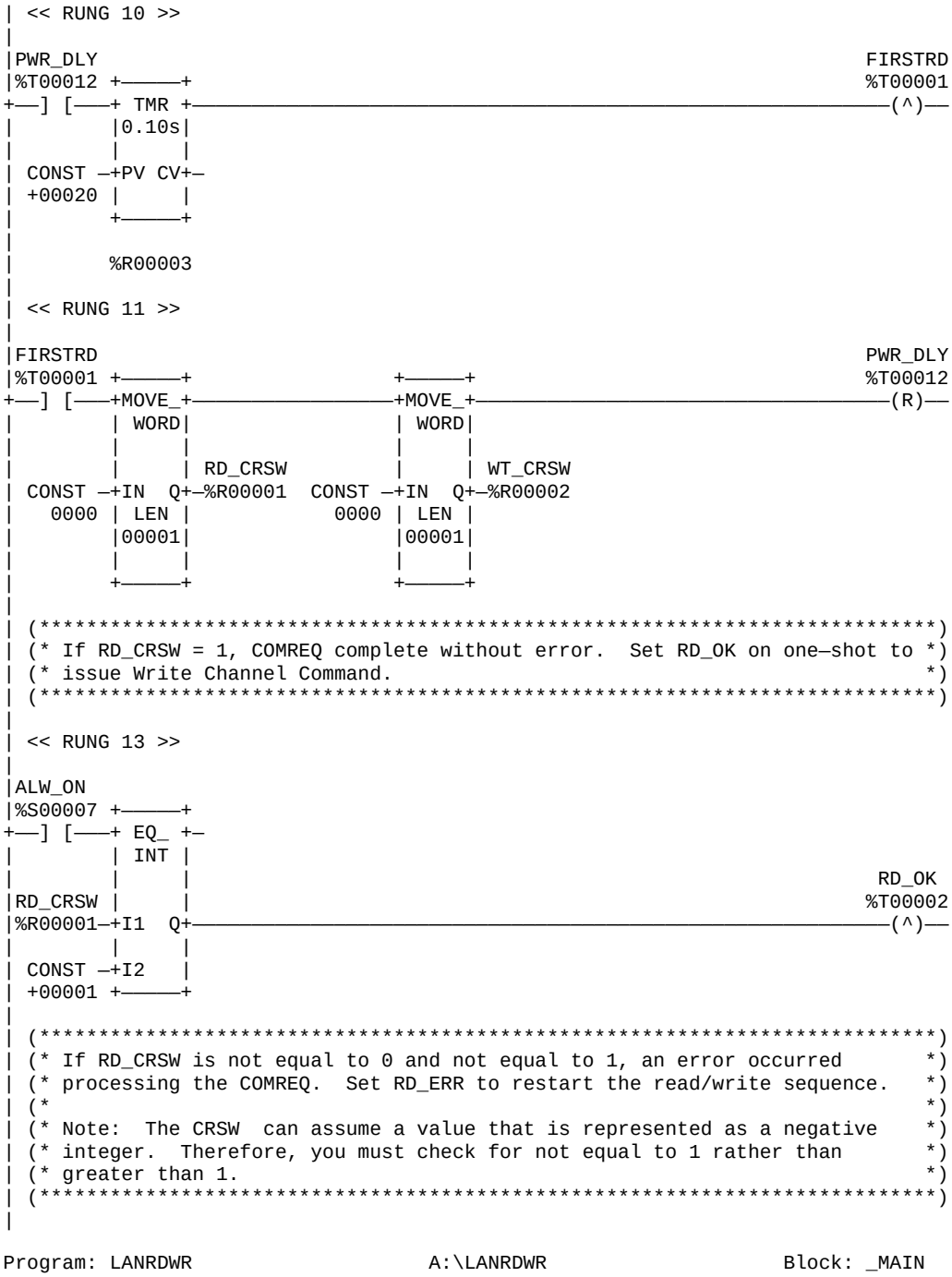
Program: LANRDWR A:\LANRDWR Block: _MAIN

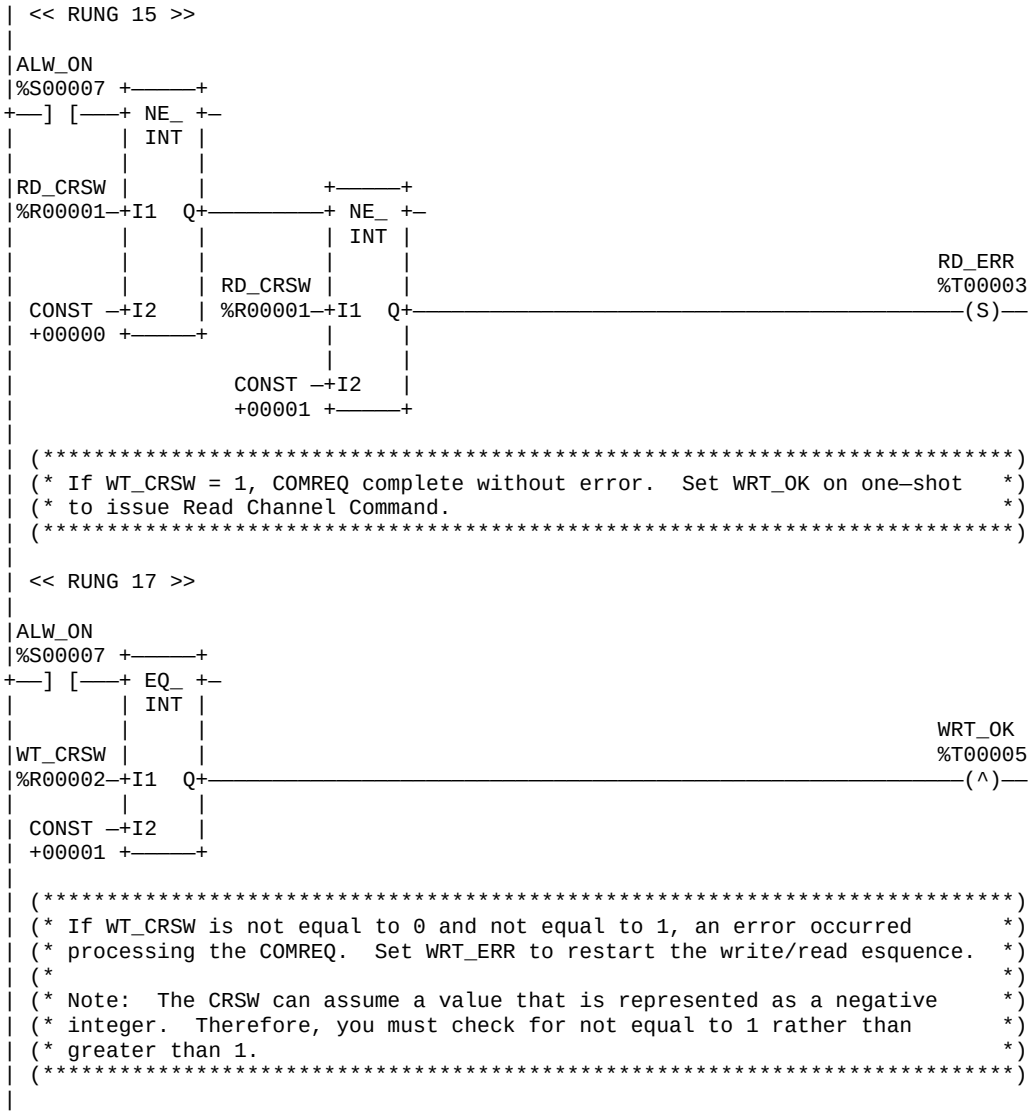


Program: LANRDWR A:\LANRDWR Block: _MAIN

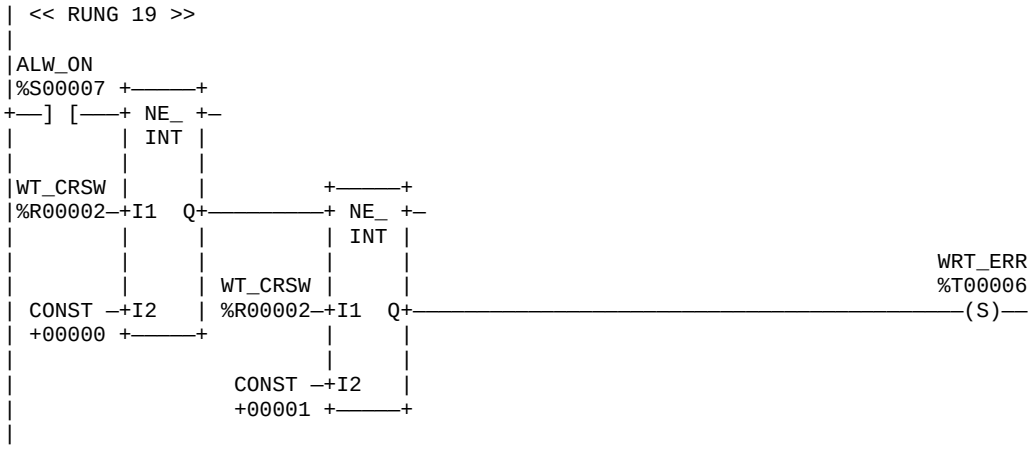


Program: LANRDWR A:\LANRDWR Block: _MAIN


| << RUNG 10 >>
|PWR_DLY
|%T00012
+–] [–––+ TMR +–––––––



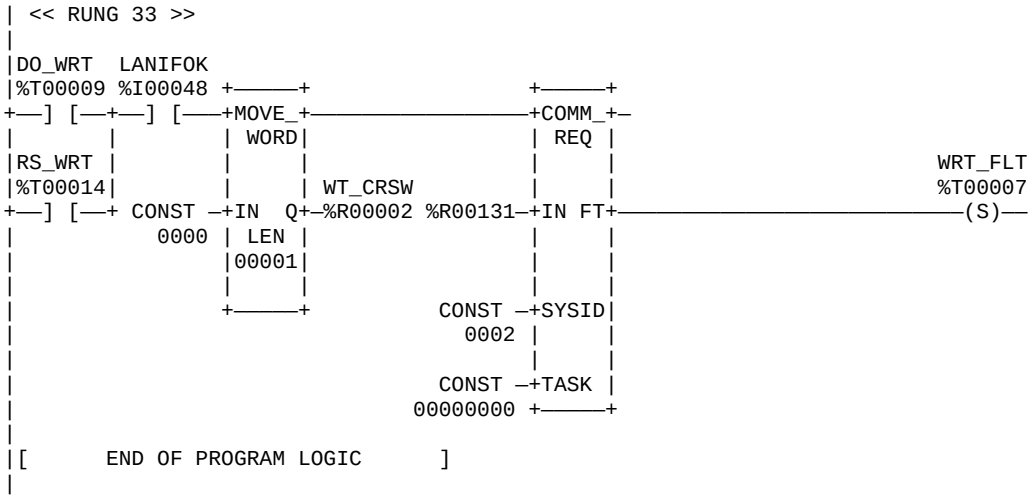
Program: LANRDWR A:\LANRDWR Block: _MAIN



Program: LANRDWR A:\LANRDWR Block: _MAIN

```
| << RUNG 26 >>
|
|RD_ERR                                                                  RS_READ
|%T00003                                                                 %T00013
+--] [-------------------------------------------------------------------(^)--
|
| << RUNG 27 >>
|
|RS_READ                                                                 RD_ERR
|%T00013                                                                 %T00003
+--] [-------------------------------------------------------------------(R)--
|
| << RUNG 28 >>
|
|WRT_ERR                                                                 RS_WRT
|%T00006                                                                 %T00014
+--] [-------------------------------------------------------------------(^)--
|
| << RUNG 29 >>
|
|RS_WRT                                                                  WRT_ERR
|%T00014                                                                 %T00006
+--] [-------------------------------------------------------------------(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 31 >>
|
|FIRSTRD LANIFOK
|%T00001 %I00048 +------+                +------+
+--] [--+--] [---+MOVE_+----------------+COMM_+-
|       |        | INT |                | REQ |
|DO_READ|        |     |                |     |                          RD_FLT
|%T00008|        |     | RD_CRSW        |     |                          %T00004
+--] [--+ CONST -+IN  Q+-%R00001 %R00101-+IN FT+-------------------------(S)--
|       | +00000 | LEN |                |     |
|RS_READ|        |00001|                |     |
|%T00013|        |     |                |     |
+--] [--+        +------+          CONST -+SYSID|
|       |                             0002 |     |
|RESTART|                                  |     |
|%T00010|                                  |     |
+--] [--+                           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: LANRDWR A:\LANRDWR Block: _MAIN



Program: LANRDWR A:\LANRDWR Block: _MAIN

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

LANRDWR 1

_MAIN 2
Variable Table 3
Logic 3

A

Abbreviations and Acronyms, A-1

Abort Channel command (2001), 4-21

Aborting a channel, 4-9

Access Station Manager, Function in the GSM, 2-7

Access Station Manager Screen, 3-32

Access to the Station Manager on the Ethernet Interface, 1-5

Accessing the Station Manager Using an ASCII Terminal, 5-4

Accessing the Station Manager Using the GSM, 5-3

Acronyms and Abbreviations, A-1

Addresses, IP and MAC, G-1

Advanced Parameters Menu, 3-24

Alt–H , 3-15

Alt–K, 3-15

Assign Channel Status Vector command (2000), 4-24

Attachment of the Ethernet Interface to the LAN, 1-3

AUI (Transceiver Cable), B-4

AUI (Transceiver) Port, 2-4

AUI Port for the Ethernet Interface, B-3

AUI Port Pinouts, B-3

AUTOEXEC.GSM, 3-8

B

Backplane Online, C-3

balloc1, 5-32

balloc2, 5-32

balloc3, 5-32

balloc4, 5-32

Battery, 2-4

bbuff1, 5-32

bbuff1–4, 3-28

bbuff2, 5-32

bbuff3, 5-32

bbuff4, 5-32

BPS Command, Station Manager, 5-17

bremlsap, 3-28 , 5-32

brempri, 3-28 , 5-32

BUFFER_POOL, 3-28

C

Cables
- AUI Transceiver Cable, B-4
- Serial, GSM to Ethernet Interface, B-2

Capabilities of the Ethernet Interface, 1-2

CFILES, 3-7

Changing the GSM Password Screen, 3-35

Changing the PC Network Card, 3-12

CHANNEL command, 5-16

Channel Command, 4-2 , 4-3

Channel Commands, 4-9
- Abort Channel (2001), 4-21
- Assign Channel Status Vector (2000), 4-24
- Channel number, 4-12 , 4-16 , 4-18 , 4-21 , 4-22
- Command period, 4-12 , 4-16 , 4-19
- Establish Read Channel (2003), 4-11
- Establish Write Channel (2004), 4-15
- Local, 4-21 , 4-23
- Number of repetitions, 4-12 , 4-16 , 4-19
- Retrieve Detailed Channel Status (2002), 4-22
- Send Information Report (2010), 4-18
- Timeout, 4-12 , 4-16 , 4-19

Channel Error bit, 4-27 , 4-28 , 4-38

Channel Status bits, 4-2 , 4-4 , 4-27

Channel Status words, 4-22

Channel Tallies (Tally f), 5-37

Channels
- Aborting, 4-9
- Establishing, 4-9
- Maximum that can be established, 4-3
- Monitoring, 4-38
- Numbers assigned, 4-12 , 4-16 , 4-18 , 4-21 , 4-22
- Re-tasking, 4-9
- Retrieving Detailed Status on, 4-10

CHBPS Command, Station Manager, 5-17

CHDATE Command, Station Manager, 5-17

Checking for Existing NDIS Applications on Your PC, 3-9

CHLTIME Command, Station Manager, 5-18

CHSOSW Command, Station Manager, 5-18

CHTIME Command, Station Manager, 5-20

CLEAR Command, Station Manager, 5-21

Client PLC, 4-11 , 4-15

CLSOSW Command, Station Manager, 5-21

Command Block, 4-2 , 4-3 , 4-7

COMMREQ Function Block, 4-2 , 4-3 , 4-6

COMMREQ functions, maximum pending, 4-39

COMMREQ Status word, 4-2 , 4-4 , 4-29 , 4-38
- Minor Error Codes, 4-31
- Pointer, 4-8

Communication Request, 4-2

Communications Ports Characteristics, B-1

Communications Status words, 4-25 , 4-29

Conditions for Downloading a Station, 2-21

CONFIG.GSM, 3-8

Configuration Editor, 1-5

Configuration Editor Menu for Series 90–70 PLCs, 3-21

Configuration File for a Station, 3-18

Configuration Parameters, Station Manager, 5-32

Configure a Station Screen, 3-17

Configuring a Station, 2-20

Configuring and Downloading a Station, 2-20

Configuring the Ethernet Interface with Logicmaster 90–70, 2-11

Connecting the GSM to the LAN Interface, 3-3

Control Characters, Station Manager, 5-15

CRS word, 4-4 , 4-29 , 4-38

D

Data Block, 4-3 , 4-8
- Length, 4-7

Data Link Error Codes (GSM), E-1

Data Link Parameters Screen, 3-25

Data Link Tallies (part of Tally l), 5-40

Data Transfer bit, 4-28 , 4-38

Data transfer bit, 4-4

Data Transfers with One Repetition, 4-39

Date, 5-8

DATE Command, Station Manager, 5-22

DCS words, 4-4 , 4-29

Default Station Address Label, 2-4

Deleting a Station Configuration File, 3-20

Detailed Channel Status words, 4-4 , 4-22 , 4-29

DISAB_TX_RTRY, 3-25

Display Data Representation, 5-9

Display Terminal Settings, B-2

DOS System Files for Network Operation of the GSM, 3-8

Download Mode / Load Source, 2-22

Download Station Screen, 3-29

Downloader, 1-5

Downloading a Station, 2-21

Downloading a Station, Conditions, 2-21

Downloading Locally (Over the Serial Port), 3-29

Downloading Over the Network, 3-30

E

Error bit, 4-4

Error Codes, COMMREQ, Minor Error Codes, 4-31

Error Codes, Data Link, GEnet System Manager, E-1

Error Codes, Exception Log Event , 6-10

Error Codes, NDIS, E-3

Establish Read Channel command (2003), 4-11

Establish Write Channel command (2004), 4-15

Establishing a channel, 4-9

EtherCard PLUS, EtherCard PLUS Elite 16, EtherCard PLUS / A, D-6

Etherlink / MC, D-5

Etherlink 16, D-4

Etherlink 3, D-3

Etherlink II, D-2

Ethernet Controller Board Installation, 2-5

Ethernet Interface, 1-2
Attachment to the LAN, 1-3
Operational States, 2-8
Powering–Up, 2-9
Capabilities, 1-2

Ethernet Interface Hardware Overview, 2-1

Ethernet Interface, Powering–up, 2-7

Ethernet Software, 1-4

Exception Log Event Error Codes, 6-10

Exit to DOS, 3-36

EXS command, 5-22

Extended Status, 5-22

F

fcache_sz, 5-33

Field Network Test State, 6-6

Field Network Test Utility, 2-24 , 5-13
Invoking, 2-25

Field Network Test Utility Commands, 5-14

fretries, 5-33

frun_time, 5-33

FT Output of the COMMREQ Function Block, 4-4 , 4-25 , 4-26

fttl, 5-33

G

Gateway address, 2-14

GatewayAddress, 3-17

Gateways, G-2

GEFNDIS directory, 3-8

GEnet System Manager, 1-1 , 1-4

Glossary of Terms, A-1 , A-2

GSM, 1-1

GSM functions, 3-2

GSM Keyboard Functions, 3-15

GSM Main Menu, 3-13

GSM Menu Structure, 3-16

GSM Menus, 3-14

GSM Software, Updating, 3-12

GSM Support Functions, 3-33

GSM Using Local Connection, 2-7

GSM Using Network Connection, 2-7

GSM, Hardware Requirements, 3-4

GSM, Installing and Operating, 3-1

GSM, Installing and Starting–Up , 3-4

H

Hardware Requirements for the GSM, 3-4

HELP Command, Station Manager, 5-22

HostCommunicationsToolkit(HCT), 1-1

How to Make it Work, 1-6

I

iaddr, 5-33

IBM PCMCIA, D-11

ICMP Tallies (Tally j), 5-39

idefgateway, 5-33

ifrag_q_s, 5-33

ifrag_tm, 5-33

ifrag_ttl, 5-33

inetmask, 5-33

Initiating the Download, 2-22

Installing and Operating the GSM, 3-1

Installing and Starting–Up the GSM, 3-4

Installing the Ethernet Controller Board in the PLC, 2-5

Installing the PC Network Card, 3-5
Intel 82593, D-7
Introducton, 1-1
IP Address, 3-17
IP address, 2-14
IP Addresses, G-1
IP Tallies (Tally, 5-38
ittl, 5-33

K

Keyboard Functions, GSM , 3-15

L

Ladder programming, 4-34
LAN Interface OK bit, 4-27
LAN Interface Status bits, 4-2
LAN Interface Status Word (LISW), 2-11
LAN OK bit, 4-27
LAN Online, C-3
ldrtry, 3-25 , 5-32
LEDs, 2-3
lgrpmsk0–7, 3-26 , 5-32
LIS bits, 4-4 , 4-27
List All Stations Screen, 3-33
LISW, 2-11
lmacaddr, 5-32
lmaxdb, 3-25 , 5-32
LOAD Station Manager Command, 2-23
LOAD Command, Station Manager, 5-24
Load Source, C-3
Load Source Parameters, 5-19
Load Source / Download Mode, 2-22
LOAD_GROUP, 3-19
LOAD_TYPE, 3-18
Loader State, 2-22 , 6-7
Local Channel commands, 4-21 , 4-23
Local Downloading, 2-22
Local PLC, 4-11 , 4-15
LOG Command, Station Manager, 5-24
Log Event Definitions, 5-25
Logic program controlling execution of the COMMREQ, 4-4
LOGIN Command, Station Manager, 5-25
LOGOUT Command, Station Manager, 5-26
lrxringlen, 3-25 , 5-32
LSAP, 3-28
LTIME Command, Station Manager, 5-26
ltxringlen, 3-25 , 5-32
lxidtime, 5-32

M

MAC Address, 2-22
MAC Address, Structure of, 3-20
MAC Addresses, G-4
MAC Layer Tallies (part of Tally l), 5-40
MAC_ADDRESS, 3-18
MAX_DATA_BUF, 3-25
Memory Pool Allocation Parameters, 3-27
Memory types, PLC, 4-13
Menus, GSM, 3-14
MMS-ETHERNET configuration mode, 2-11
Modify Commands, Station Manager , 5-7
MODULE OK LED, 2-3
Monitor Commands, Station Manager, 5-6
Monitoring the communications channel, 4-38

N

Name Server IP address, 2-14
NDIS Applications on Your PC, Checking for Existing, 3-9
NDIS Error Codes, E-3
NDIS–compliant, 3-8
NET Command, Station Manager, 5-26

Network Downloading, 2-23

Network Load Address, C-3

NODE Command, Station Manager, 5-27

Number of repetitions for a Channel Command, 4-12 , 4-16 , 4-19

O

OK Command, Station Manager, 5-27

ONLINE LED, 2-3

Operational State, 6-8

Optimizing the GSM for Network Operation, D-12

P

PASSWORD, 3-28

PC Network Card, Changing, 3-12

PC Network Card, Installing, 3-5

Period for Channel Commands, 4-12 , 4-16 , 4-19

PING Command, Station Manager, 5-27

PING Station Manager command, 2-30

Pinging the TCP / IP Interfaces on the Network, 2-30

PLC Driver Tallies (Tally c), 5-36 , 5-37

PLC memory types, 4-13

PLC Module Configuration, 2-11

Ports
AUI, 2-4 , B-3
Serial, 2-4

Power–Up Problems, 2-10

Power–up State, 6-5

Powering–Up the Ethernet Interface, 2-7 , 2-9

PRIORITY, 3-28

Problems During Power Up, 2-10

Problems During the Download, 2-23

PROG Command, Station Manager, 5-28

REM Command, Station Manager, 5-28

PROTMAN.xxx, 3-9

PROTOCOL.GSM, 3-9

Q

Quick Guide to the Manual, 1-7

R

Remote Operation of the Station Manager, 5-4

Remote PLC, 4-11 , 4-15

Repetitions, number of for Channel Commands, 4-12 , 4-16 , 4-19

REPORT Command, Station Manager, 5-29

REPP Command, Station Manager, 5-30

Requirements for Installing the Ethernet Interface, 2-5

Resource problem bit, 4-27

Restart Button, 2-3

RESTART Command, Station Manager, 5-30

Re-tasking a channel, 4-9

Retrieve Detailed Channel Status command (2002), 4-22

RX_RING_LEN, 3-25

S

Sample ladder program, 4-34

Send Information Report command (2010), 4-18

Sequencing communications requests, 4-39

Serial Cable, GSM to Ethernet Interface, B-2

Serial Number Label, 2-4

Serial Port, 2-4

Serial port configuration, 2-15

Serial Port for Local GSM Communications, B-1

Serial Port Pinouts, B-1

Serial Port Settings, B-1

Series 90-30 PLC memory types, 4-13
Server PLC, 4-11 , 4-15
Set Download Mode Screen, 3-36
Set Station Manager Mode Screen, 3-36
Setup GSM Menu, 3-35
SHOW Command, Station Manager, 5-31
Soft Switch Default Values for the Ethernet Interface, 5-20
Soft Switch Entry State, 6-5
Soft Switch Entry Utility, 5-11
Soft Switch Entry Utility Commands, 5-12
Soft Switch Settings, C-4
Soft Switches, 3-3
Software Loader port, Configuring, 2-15
SOSW Command, Station Manager, 5-34
SQE, 2-6 , 5-40 , 6-18
SRTP Server Tallies (Tally v), 5-41
Starting–Up the GSM, 3-13
STAT Command, Station Manager, 5-34
States of the Ethernet Interface, 2-8
Station Address, C-2
Station Configuration, 3-1
Station Configuration File, Deleting, 3-20
Station Configuration File, Selecting, 3-20
Station Manager
  Accessing the Station Manager Using an ASCII Terminal, 5-4
  BPS Command, 5-17
  CHBPS Command, 5-17
  CHDATE Command, 5-17
  CHLTIME Command, 5-18
  CHSOSW Command, 5-18
  CHTIME Command, 5-20
  CLEAR Command, 5-21
  CLSOSW Command, 5-21
  DATE Command, 5-22
  HELP Command, 5-22
  LOAD Command, 5-24
  LOG Command, 5-24
  LOGIN Command, 5-25
  LOGOUT Command, 5-26
  LTIME Command, 5-26
  NET Command, 5-26
  NODE Command, 5-27
  OK Command, 5-27
  PING Command, 5-27
  PROG Command, 5-28
  REM Command, 5-28
  Remote Operation of, 5-4
  REPORT Command, 5-29
  REPP Command, 5-30
  RESTART Command, 5-30
  Services, 5-1
  SHOW Command, 5-31
  SOSW Command, 5-34
  STAT Command, 5-34
  STOPP Command, 5-35
  STOPT Command, 5-35
  TALLY Command, 5-36
  TEST Command, 5-42
  TIME Command, 5-43
  TRACE Command, 5-43
  Using the Station Manager, 5-5
Station Manager Command Descriptions, 5-15
Station Manager Command Syntax, 5-8
Station Manager commands
  CHANNEL, 5-16
  EXS, 5-22
Station Manager Configuration Parameters, 5-32
Station Manager Control Characters, 5-15
Station Manager in Utility Programs, 5-11
Station Manager port, Configuring, 2-15
STATION_NAME, 3-18
STATION_TYPE, 3-18
Status address location, 2-14
Status bits, 4-2 , 4-4 , 4-25 , 4-26
Status data, 4-4
STATUS OK LED, 2-3
Status on a channel, 4-10
Status, Extended, 5-22
STOPP Command, Station Manager, 5-35
STOPT Command, Station Manager, 5-35
Subnet mask, 2-14 , 3-17 , G-3
Subnets, G-3
System Parameters Screen, 3-27

T

TALLY Command, Station Manager, 5-36

Task Identification, 5-9

TCP Tallies (Tally w), 5-41

TCP / IP configuration mode, 2-11

TCP / IPParameters Screen, 3-22

10Base2 (Thinwire), 1-3

10Base5, 1-3 , B-5

10BaseF, 1-3

10BaseT, 1-3

10Broad36, 1-4

Terms, Glossary, A-2

TEST ALL Station Manager command, 2-28

TEST Command, Station Manager, 5-42

Test Form, F-1

TEST Station Manager command, 2-24 , 2-26 , 2-27

Testing the Ethernet Interfaces on the Network, 2-24

Thickwire, 1-3

Time, 5-8

TIME Command, Station Manager, 5-43

Time units for command period, 4-12 , 4-16 , 4-19

Timeout for Channel Commands, 4-12 , 4-16 , 4-19

TRACE Command, Station Manager, 5-43

Transceiver, 6-18

Transceiver Description, B-4

Troubleshooting
  Ladder programs, 4-37
  Using the Status bits and Communications Status words, 4-26

TX_RING_LEN, 3-25

U

Updating Existing GSM Software, 3-12

Using the GSM Access Station Manager Function, 2-7

Using the Monitor Commands, 5-6

Using the Station Manager, 5-5

V

vbufsz, 5-33

Verifying Proper Power–Up of the Ethernet Interface, 2-7

W

wackdelay, 5-33

winput_q, 5-33

wmax_conn, 5-33

wmax_to, 5-33

wmin_to, 5-33

wpersist, 5-33

wrcv_buf, 5-33

wretries, 5-33

wsegmt_sz, 5-33

wsend_buf, 5-33

wtwo_seq_l, 5-33

wurg_q, 5-33

X

Xircom Pocket Adapter (PE2), D-8

Xircom Pocket Adapter (PE3), D-9