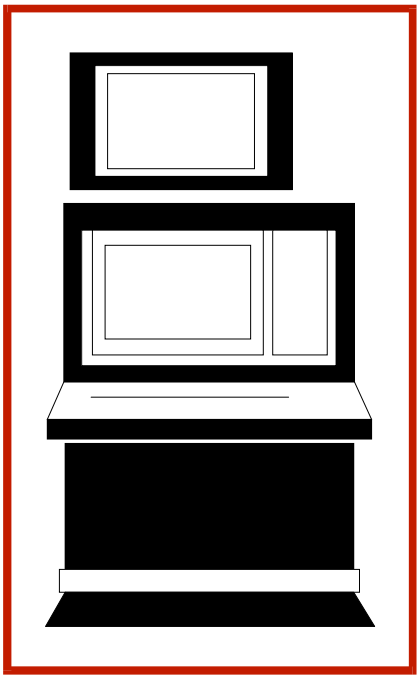
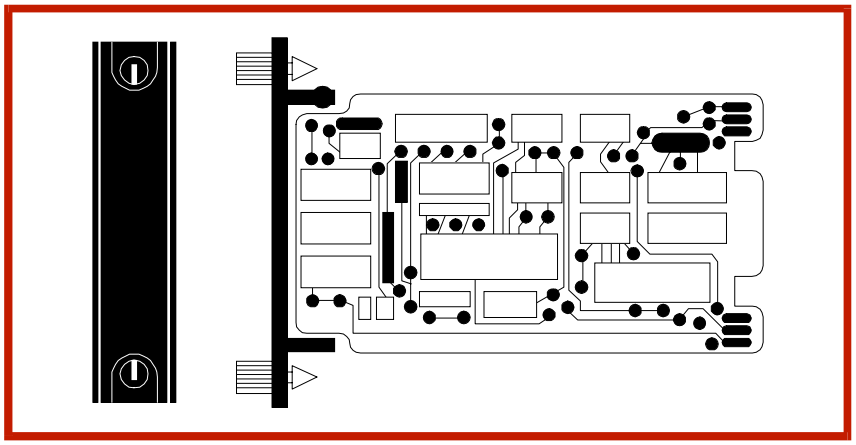
Bailey® infi 90®

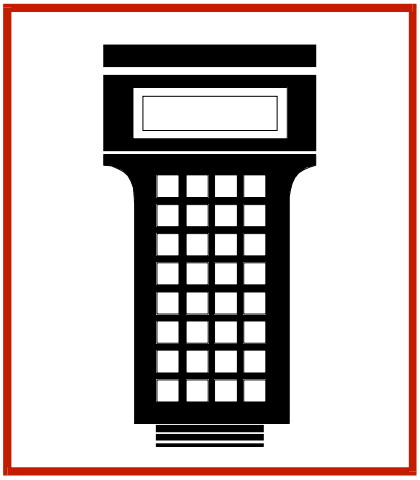
IMEDI01

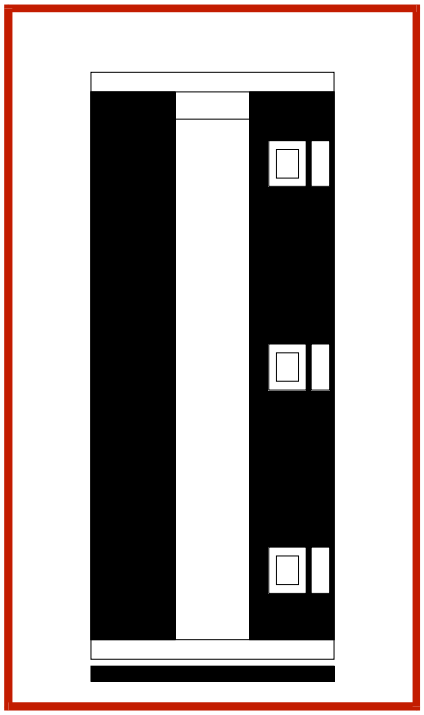
Instruction

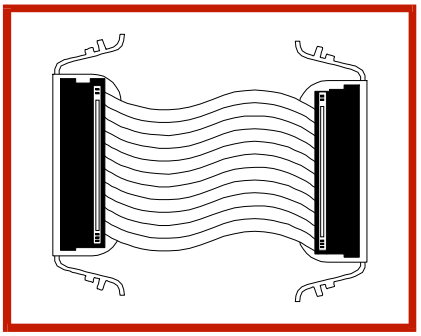
Ethernet Device Interface

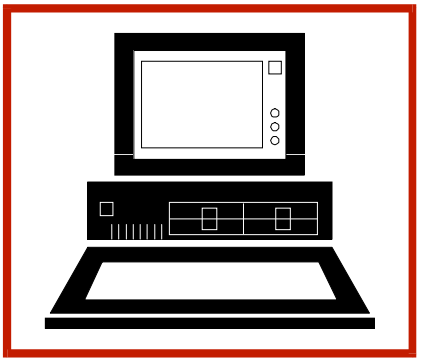












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WARNING notices as used in this instruction apply to hazards or unsafe practices that could result in personal injury or death.

CAUTION notices apply to hazards or unsafe practices that could result in property damage.

NOTES highlight procedures and contain information that assists the operator in understanding the information contained in this instruction.

WARNING

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POSSIBLE PROCESS UPSETS

MAINTENANCE MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL AND ONLY AFTER SECURING EQUIPMENT CONTROLLED BY THIS PRODUCT. ADJUSTING OR REMOVING THIS PRODUCT WHILE IT IS IN THE SYSTEM MAY UPSET THE PROCESS BEING CONTROLLED. SOME PROCESS UPSETS MAY CAUSE INJURY OR DAMAGE.

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Preface

The IMEDI01 Ethernet Device Interface module provides an interface between third-party Ethernet programmable logic controllers (PLC) and the INFI 90 OPEN Strategic Process Management System. This instruction provides information about how to install and operate the module.

List of Effective Pages

Total number of pages in this instruction is 86, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through viii	Original
1-1 through 1-6	Original
2-1 through 2-3	Original
3-1 through 3-8	Original
4-1 through 4-12	Original
5-1 through 5-4	Original
6-1 through 6-6	Original
7-1 through 7-4	Original
8-1 through 8-2	Original
9-1	Original
A-1 through A-15	Original
B-1 through B-15	Original
Index-1 through Index-2	Original

When an update is received, insert the latest changed pages and dispose of the superseded pages.

NOTE: On an update page, the changed text or table is indicated by a vertical bar in the outer margin of the page adjacent to the changed area. A changed figure is indicated by a vertical bar in the outer margin next to the figure caption. The date the update was prepared will appear beside the page number.

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Safety Summary

GENERAL WARNINGS	**Equipment Environment** All components, whether in transportation, operation or storage, must be in a noncorrosive environment. **Electrical Shock Hazard During Maintenance** Disconnect power or take precautions to insure that contact with energized parts is avoided when servicing.
SPECIFIC WARNINGS	Disconnect power before installing dipshunts on the module mounting unit backplane. Failure to do so will result in contact with cabinet areas that could cause severe or fatal shock. (p. 3-6) There are exposed AC and DC connections inside the cabinet. These exposed electrical connections present a shock hazard that can cause injury or death. If input or output circuits are a shock hazard after disconnecting system power at the power entry panel, then the door of the cabinet containing these externally powered circuits must be marked with a warning stating that multiple power sources exist. (p. 7-2) Never clean electrical parts of components with live power present. Doing so exposes you to an electrical shock hazard. Wear eye protection whenever working with cleaning solvents. When removing solvents from printed circuit boards using compressed air, injury to the eyes could result from splashing solvent as it is removed from the printed circuit board. (p. 7-3)

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® INFI 90	Registered trademark of Elsag Bailey Process Automation
® Microsoft	Registered trademark of Microsoft Corporation.
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SECTION 1 - INTRODUCTION

OVERVIEW

The IMEDI01 Ethernet Device Interface module provides an interface between third-party Ethernet programmable logic controllers (PLC) and the INFI 90 OPEN Strategic Process Management System. Figure 1-1 shows an EDI module application. The EDI module communicates with the PLCs over a dedicated Ethernet LAN.

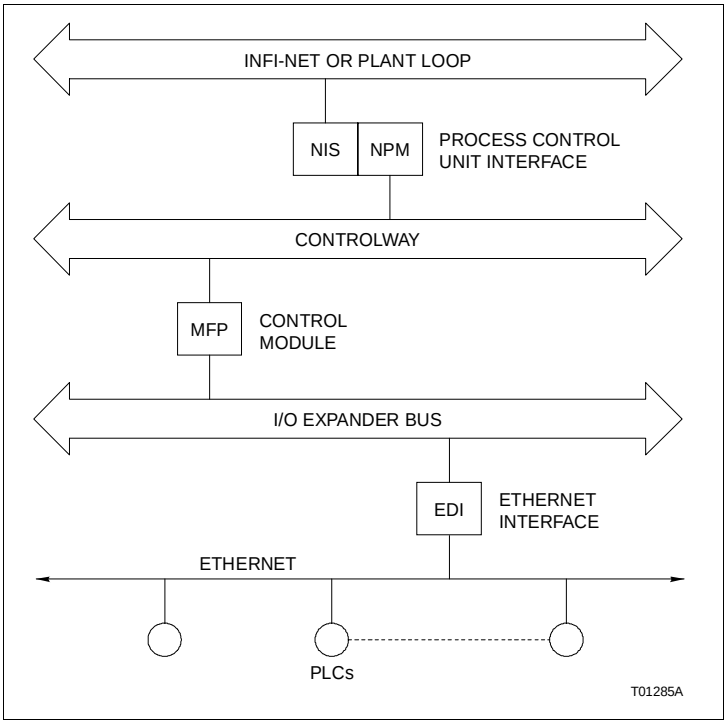

Figure 1-1. IMEDI01 Ethernet Device Interface Application

The EDI module can cable connect directly to a 10Base2 local network without requiring any additional hardware or can connect to a 10Base5 local network using an IKEDI01 cable and an external third-party transceiver (i.e., MAU). The module utilizes TCP/IP as the communications protocol.

On the INFI 90 OPEN system side, the EDI module communicates with a multifunction processor module (IMMFP01, IMMFP02, or IMMFP03) over the I/O expander bus. The MFP module performs the actual process control and monitoring. The EDI module acts as a generic node on the Ethernet LAN.

NOTE: The MFP module can operate on either Controlway or module bus.

INTENDED USER

This instruction is intended for personnel responsible for installing, operating, and maintaining the EDI module. Installation requires an engineer or technician with experience handling electronic circuitry, and is familiar with the INFI 90 OPEN system and Ethernet networks.

COMPATIBILITY

The IMEDI01 module is compatible with and can be used to interface the following third-party Ethernet PLCs:

- Allen Bradley PLC-5E and higher.
- Triconex Systems Tricon V6 PLC and higher (with Network Communications Module).

HARDWARE REQUIREMENTS

An IMMFP01, IMMFP02, or IMMFP03 Multi-Function Processor module with firmware revision G.0 or later is required to operate the IMEDI01 module.

Additionally, the IMEDI01 module must contain the proper interface protocol for the third-party Ethernet PLC being interfaced. Check the protocol label on the IMEDI01 module to verify the protocol installed. Refer to the appendices for protocol identification information.

FEATURES

- Downloadable firmware residing in FLASH memory.
- Ethernet connection using TCP/IP communication.
- Serial engineering and diagnostic port.
- High performance 32-bit microprocessor running at 25 megahertz.
- Standard INFI 90 OPEN packaging and power system.
- Interfaced to process control unit via I/O expander bus.
- Configuration via standard INFI 90 OPEN function codes.
- High capacity local data table (over 1,000 points).
- High data exchange rate (ten megabaud).

INSTRUCTION CONTENT

This instruction consists of the following sections and appendices.

Introduction — Overviews the EDI module. It contains features, a description, reference documents, and specifications.

Description and Operation — Explains the theory of module operation.

Installation — Covers handling precautions, switch and jumper settings, and EDI module installation and connection.

Operating Procedures — Explains how to start up and operate the EDI module.

Troubleshooting — Describes how to check for EDI errors and the corrective actions to take.

Maintenance — Contains a maintenance schedule for the EDI module.

Repair and Replacement Procedures — Explains how to replace an EDI module.

Support Services — Provides information about ordering parts from your local Elsag Bailey sales office. It also explains other areas of support that Elsag Bailey provides.

Appendix A — Provides IMEDI01 module information necessary to interface to an Allen Bradley controller (PLC-5E and higher).

Appendix B — Provides IMEDI01 module information necessary to interface to a Triconex Systems PLC.

HOW TO USE THIS INSTRUCTION

Read this instruction before placing the EDI module in operation. Refer to the sections in this list as needed for more information.

1. Perform the steps in Section 3 to install the EDI module.
2. Read Section 4 for function code configuration information.
3. Read Section 5 before placing the EDI module into operation.
4. Refer to Section 6 if a problem occurs.
5. Refer to Section 7 for general guidelines for EDI module maintenance.
6. Refer to Section 9 for procedures to replace a module.

7. Use Section 9 for parts ordering information. This section also tells of additional services that Elsag Bailey offers.

DOCUMENT CONVENTIONS

This document uses standard text conventions to represent keys and user data inputs:

Key Identifies a keyboard key.

Example:

Press **ENTER**.

File name Bold-italic - Identifies a file name and file extension.

User data input Bold - Identifies any part of a command line that is ***not*** optional or variable and must be entered exactly as shown.

Italic - Identifies a variable parameter entered in a command line.

Example:

drive:**\DWNL_EDI** *filename x*

? Identifies any part number positions that are variable positions.

Example:

1948385?1

GLOSSARY OF TERMS AND ABBREVIATIONS

Table 1-1 contains those terms and abbreviations that are unique to Elsag Bailey or have a definition that is different from standard industry usage.

Table 1-1. Glossary of Terms and Abbreviations

Term	Definition
Control module	Directs field processes through an I/O module; the multifunction processor is an example.
Function code	An algorithm which manipulates specific functions. These functions are linked together to form the control strategy.
I/O expander bus	Parallel communication bus between the control and I/O modules.
MFP	Multifunction processor module. A multiple loop controller with data acquisition and information processing capabilities.
MMU	Module mounting unit. A card cage that provides electrical and communication support for INFI 90 OPEN modules.

Table 1-1. Glossary of Terms and Abbreviations (continued)

Term	Definition
TM	Termination module; provides input/output connection between plant equipment and the INFI 90 OPEN modules.
TU	Termination unit; provides input/output connection between plant equipment and the INFI 90 OPEN modules.

REFERENCE DOCUMENTS

Table 1-2 lists Elsag Bailey instructions referenced in this instruction.

Table 1-2. Reference Documents

Number	Title
I-E96-200	Function Code Application Manual
I-E96-201	IMMFP01 Multi-Function Processor
I-E96-202	IMMFP02 Multi-Function Processor
I-E96-203	IMMFP03/03B Multi-Function Processor
WBPEEUI310013B0	Module Configuration Tools (WCAD)
WBPEEUI200501A0	Module Mounting Unit (IEMMU11/12/21/22)

NOMENCLATURE

The complete nomenclature for the Ethernet device interface module is IMEDI01. This nomenclature is used throughout this instruction to refer to the module and is used for ordering purposes. Table 1-3 lists additional hardware nomenclature related to the EDI module.

Table 1-3. Related Nomenclatures

Nomenclature	Description
IKEDI01	Cable, IMEDI01 to MAU

SPECIFICATIONS

Table 1-4 contains the specifications for the IMEDI01 module.

Table 1-4. Specifications

Property	Characteristic/Value
Processor	32-bit microprocessor running at 25 Mhz
Memory	
DRAM	4Mb
FLASH RAM	512kb

Table 1-4. Specifications (continued)

Property	Characteristic/Value
Power requirements	
Operating power	5 VDC, ±5% at 1.8 A typical +15 VDC, ±5% at 250 mA maximum
Power dissipation	10 W
Common mode isolation	500 V_{rms} at 45 to 65Hz/1 min
Insulation resistance (100 VDC)	1.2M Ω
Environmental	
Ambient temperature	0° to 70°C (0° to 158°F) (noncondensing)
Relative humidity	10% to 90% up to 55°C (131°F) 10% to 45% from 56°C to 70°C (132°F to158°F) (noncondensing)
Atmospheric pressure	Sea level to 2.4 km (1.49 mi)
Air quality	Noncorrosive
Mounting	Occupies a single slot in a standard INFI 90 OPEN module mounting unit (MMU)
Certification (pending)	CSA certified for use as process control equipment in an ordinary (nonhazardous) location. Overvoltage (installation) category II
CE mark declaration	The product, when installed in an INFI 90 OPEN cabinet, complies with the following directives/standards requested for CE marking: **EMC directive 89/336/EEC**: EN 50081-2 Generic emission standard - Part 2: Industrial environment EN 50082-2 Generic immunity standard - Part 2: Industrial environment **Low voltage directive 73/23/EEC**: EN61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirement

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

SECTION 2 - DESCRIPTION AND OPERATION

INTRODUCTION

This section provides theory of operation for the IMEDI01 module. It discusses module operation, gives a module block diagram description, and lists the function codes used to configure the EDI module.

MODULE OPERATION

The EDI module acts as a gateway between the INFI 90 OPEN system and third-party Ethernet PLCs. It provides the interface necessary to communicate and share data.

The EDI module communicates with a multifunction processor (MFP) module over the I/O expander bus (Fig. 1-1). Function codes configured in the MFP module enable the EDI and MFP modules to communicate and exchange data over the bus.

The EDI module connects to Ethernet LAN to communicate with third-party PLCs (Fig. 1-1). The EDI module must contain the appropriate interface protocol for the specific PLC family being interfaced to enable this communication.

The EDI module can connect directly to a 10Base2 thinwire network through its front panel BNC connector (P8). It can also connect to a 10Base5 thickwire network utilizing an external medium attachment unit (MAU) and IKEDI01 cable.

MODULE DESCRIPTION

The EDI module is a standard Elsag Bailey module that occupies one slot in a module mounting unit. Inserting the module into the MMU connects it to the I/O expander bus (X-bus) for communication with the MFP module, and connects it to operating power (+5 VDC and +15 VDC).

Figure 2-1 is a block diagram of the EDI module circuitry.

CPU

The central processing unit of the EDI module is an integrated communications controller (ICC) that contains a 32-bit microprocessor running at 25 megahertz. The ICC has a built-in clock, Ethernet coprocessor, and serial channels.

Memory

The EDI module utilizes two types of memory:

- 512 kilobytes of FLASH RAM which contains the boot and application programs. Utilizing FLASH memory provides the ability to download firmware to either update or change

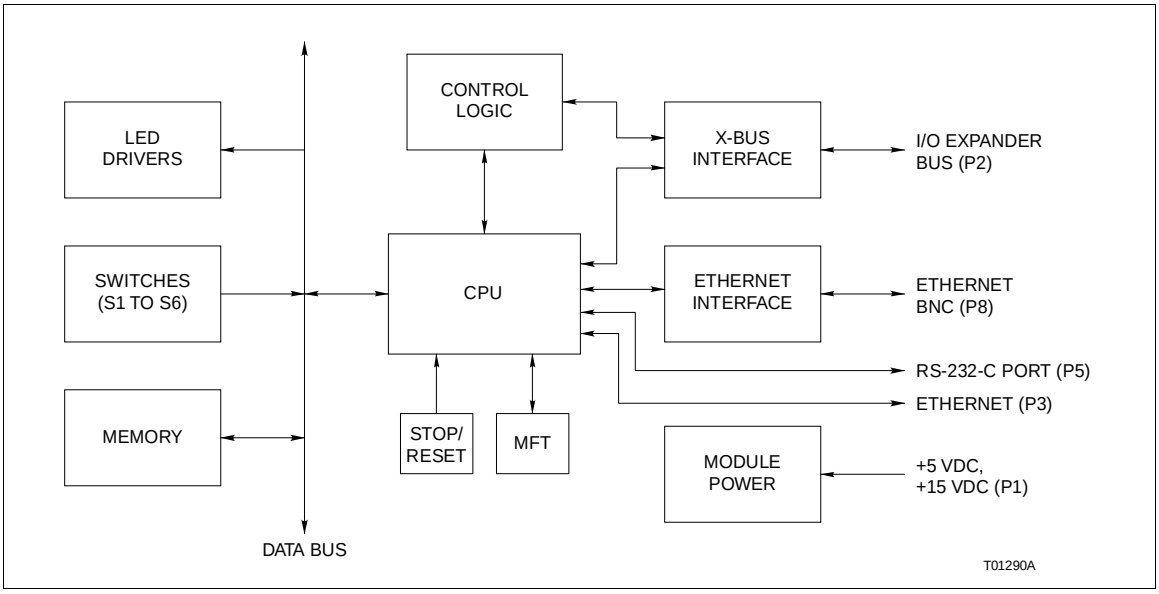

Figure 2-1. Block Diagram

the operation of the module without having to physically replace discrete components.

- Four megabytes DRAM for microprocessor use. The memory is a 72-pin SIMM DRAM module mounted on the circuit board.

Ethernet Interface (P8)

The Ethernet interface consists of onboard isolation transformers, a transceiver, and a DC/DC converter which allows for direct 10Base2 thinwire connection. The EDI module connects to Ethernet LAN through the BNC connector (P8) located on the front panel.

Ethernet (P3)

The EDI module has a built-in Ethernet coprocessor. The module can connect to 10Base5 thickwire network by connecting an IKEDI01 cable from the P3 connector to an external MAU with a 15-pin, D-type connector.

X-Bus Interface

The I/O expander bus interface circuitry consists mainly of a custom integrated circuit found on all INFI 90 OPEN I/O modules. All the control logic and communication protocol are built into the integrated circuit. This circuit provides the following functions:

- Address comparison and detection.
- Function code latching and decoding.
- Read strobe generation.
- Data line filtering of bus signals.
- On-board bus drivers.

It manages the requests for data coming from the MFP module and the data exchange between the EDI module and MFP mod-

ule. The interface operates independent of the microprocessor. The microprocessor and I/O expander bus interface access shared memory to transfer data.

Additionally, the EDI module incorporates a custom gate array to perform the I/O expander bus interface function.

RS-232-C Interface

The EDI module uses a universal asynchronous receiver/transmitter (UART) that is integrated into the ICC circuitry for RS-232-C interface. The RS-232-C port is a nine-pin, D-type connector (P5) located on the front panel and is mainly used for firmware/protocol downloading.

Dipswitches

The EDI module contains six dipswitches for setting:

- IP address (S1 through S4).
- Hardware options (S5).
- I/O expander bus address (S6).

LED Drivers

Front panel LEDs show:

- Module state as either normal operation, halted, or off.
- Normal and error codes.

MFT

The machine fault timer (MFT) is a security feature built into the EDI module and most microprocessor based devices. The timer is a one-shot timer that must be periodically reset by the CPU to prevent it from timing out. If an error condition exists that causes the EDI module to fail or operate incorrectly, the timer will not be reset and will cause a time out condition. A time out condition triggers a reset signal to halt the module (i.e., module state LED lit red).

Stop/Reset

The stop/reset switch provides the ability to both halt the EDI module and to restart the module after it halts.

FUNCTION CODES

The EDI module is configured using a set of five function codes:

- Factory Instrumentation Protocol Handler (FC 184).
- Digital Input Subscriber (FC 185).
- Analog Input Subscriber (FC 186).
- Analog Output Subscriber (FC 187).
- Digital Output Subscriber (FC 188).

These function codes reside in the MFP module as part of its control configuration. Refer to Section 4 for function code configuration information.

SECTION 3 - INSTALLATION

INTRODUCTION

This section explains how to install the IMEDI01 module. Do ***not*** proceed with operation until reading, understanding, and performing the steps in the order in which they appear.

EDI module installation requires:

1. Setting switches.

2. Setting jumpers.

3. Module mounting unit (MMU) installation which requires configuring the MMU and inserting the EDI module.

4. Connecting the EDI module to the Ethernet LAN.

After installing the EDI module, function codes must be configured in the multifunction processor (MFP) module. Refer to Section 4 for function code configuration information.

This section also includes a firmware/protocol software download procedure used when upgrading or changing the operation of the EDI module. The firmware is stored in FLASH memory.

SPECIAL HANDLING

Use the static grounding wrist strap when installing and removing modules. Static discharge may damage static sensitive devices on modules in the cabinet. Use grounded equipment and static safe practices when working with static sensitive devices. Observe these steps when handling electronic circuitry:

> **NOTE:** Always use Elsag Bailey's field static kit (part number 1948385?1 - consisting of two wrist straps, ground cord assembly, alligator clip, and static dissipating work surface) when working with static sensitive devices. The kit is designed to connect the technician and the static dissipating work surface to the same ground point to prevent damage to the static sensitive devices by electrostatic discharge.

1. ***Use Static Shielding Bag.*** Keep the module in the static shielding bag until you are ready to install it in the system. Save the bag for future use.

2. ***Ground Bags Before Opening.*** Before opening a bag containing an assembly with static sensitive devices, touch it to the equipment housing or ground to equalize charges.

3. ***Avoid Touching Circuitry.*** Handle assemblies by the edges; avoid touching the circuitry.

4. ***Avoid Partial Connection of Static Sensitive Devices.*** Verify that all devices connected to the modules are properly grounded before using them.

5. ***Ground Test Equipment.***

6. ***Use an Antistatic Field Service Vacuum.*** Remove dust from the modules if necessary.

7. ***Use a Grounded Wrist Strap.*** Connect the wrist strap to the appropriate grounding plug on the power entry panel. The grounding plug is connected to the cabinet chassis ground.

8. ***Do Not Use Lead Pencils to Set Dipswitches.*** To avoid contamination of switch contacts that can result in circuit board malfunction, do not use a lead pencil to set a dipswitch.

UNPACKING AND INSPECTION

For general handling:

1. Examine the module to make sure that no damage has occurred in transit.

2. Notify the nearest Elsag Bailey sales office of any damage.

3. File a claim for any damage with the shipping company that handled the shipment.

4. Use the original packing material to store the module.

5. Store the module in a place with clean air, free from extremes of temperature and humidity. Refer to Table 1-4 for the module specifications.

SWITCHES

The following EDI module switches must be set before installing and operating the module:

- IP address - S1 through S4.
- Hardware options - S5.
- I/O expander bus address - S6.

Refer to Figure 3-1 for switch, jumper, and connector locations.

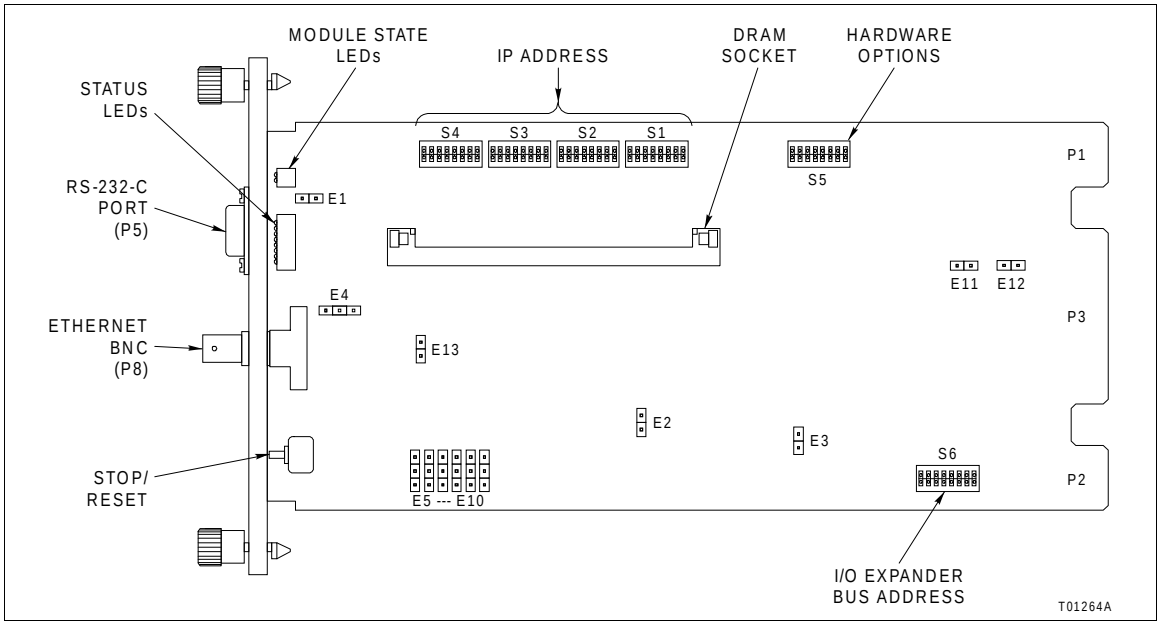

Figure 3-1. Module Layout

IP Address (S1, S2, S3, S4)

The EDI module acts as a generic node on the Ethernet LAN. Set switches S1 through S4 to the IP address assigned to the module. The address must be converted to binary format to set the switches. Table 3-1 provides examples of IP address settings.

NOTES:

1. Switch position one is the most significant bit.

2. Maximum for switch S4 is 191 for a class B network and 223 for a class C network.

Table 3-1. Example IP Address Switch Settings

Address	S4								S3								S2								S1							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
177.12.1.28	1	0	1	1	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0
10.41.4.17	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1

NOTE: 0 = ON or closed; 1 = OFF or open.

Hardware Options (S5)

Refer to Tables 3-2 and 3-3 for hardware options (S5) switch settings.

Table 3-2. Hardware Options (S5)

Pole	Setting	Function
1	***0***	Not used; must be 0
2	—	Not used
3	***0***	Enable Ethernet test
	1	Disable Ethernet test
4	***0***	Enable DRAM test
	1	Disable DRAM test
5	***0***	Disable XON/XOFF
	1	Enable XON/XOFF
6	***0***	9,600 baud
	1	38,400 baud
7 - 8	***0***	Normal operation
	1	Firmware/protocol download

NOTE: 0 = ON or closed; 1 = OFF or open.
1. ***Bold-italic*** indicates normal operation setting.

Table 3-3. Normal and Download Modes (S5)

Operating Mode	Pole							
	1	2	3	4	5	6	7	8
Normal operation	0	0	0	0	0	0	0	0
Firmware/protocol download	0	0	0	0	1	0	1	1

NOTE: 0 = ON or closed; 1 = OFF or open.

I/O Expander Bus Address (S6)

The EDI module must have a unique address on the I/O expander bus. The address can be any available address from zero to 63. Set the address with the eight-position address dipswitch (S6) shown in Figure 3-1. Switch positions three through eight set the six-bit address. Positions one and two are not used and must remain in the ON (or closed) position (Fig. 3-2). Refer to Table 3-4 for examples of address settings.

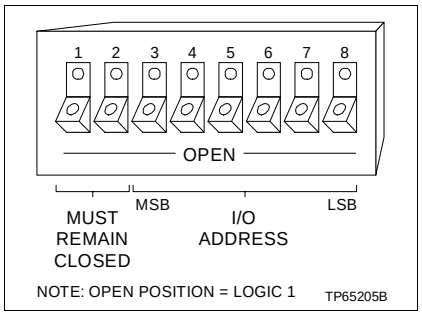

Figure 3-2. Address Switch (S6)

Table 3-4. Example I/O Expander Bus Address Switch Settings (S6)

Address	Switch Position[1,2] (Binary Value)					
	3 (32)	4 (16)	5 (8)	6 (4)	7 (2)	8 (1)
08	0	0	1	0	0	0
32	1	0	0	0	0	0
63	1	1	1	1	1	1

NOTES:
1. Switch positions one and two must be ON (closed).
2. 0 = ON or closed; 1 = OFF or open.

JUMPERS (E1 TO E13)

Verify the jumpers E1 to E13 are set as shown in Table 3-5 for normal operation. Jumpers E5 to E13 configure the module for either front panel BNC connection or card edge P3 connection using an IKED01 cable. Refer to Figure 3-1 for switch, jumper, and connector locations.

Table 3-5. Jumper Settings (E1 to E13)

Jumper	Setting	Description
E1	***Jumper installed***	Enable MFT
	Jumper removed	Disable MFT[1]
E2	Jumper installed	Enable P6/P7 connectors[1]
	Jumper removed	Disable P6/P7 connectors
E3	***Jumper installed***	TCK signal low
	Jumper removed	TCK signal high (floating)[1]
E4	***1-2***	Enable heartbeat check
	2-3	Disable heartbeat check[1]
E5 - E10	1-2	Enable Ethernet signals at P3 connector (card edge)
	2-3	Enable Ethernet at BNC connector (front panel)
E11 - E12	Jumper installed	Enable Ethernet +12 VDC at P3 connector
	Jumper removed	Disable Ethernet +12 VDC at P3 connector
E13	Jumper installed	Enable BNC connector
	Jumper removed	Disable BNC connector

NOTE: ***Bold-italic*** indicates normal operation setting.
1. For testing purposes only.

MMU INSTALLATION

The EDI module inserts into a standard INFI 90 OPEN module mounting unit (MMU) and occupies one slot. To install:

1. Verify the MMU slot assignment for the module.

WARNING	**Disconnect power before installing dipshunts on the module mounting unit backplane. Failure to do so will result in contact with cabinet areas that could cause severe or fatal shock.**

2. Install 24-pin dipshunts in all I/O expander bus sockets on the MMU backplane that are between the slot assigned to the EDI module and the slot assigned to its MFP module.

3. If connecting the EDI module to a 10Base5 thickwire network, attach the hooded end of the IKEDI01 cable to the MMU backplane. To do this, insert the connector into the backplane slot in the same slot as the one assigned to the EDI module. The latches should snap securely into place.

4. Align the module with the guide rails in the module mounting unit. Slide the module into the module mounting unit until the front panel is flush with the top and bottom of the MMU frame.

> **NOTE:** If the MFP module is not already inserted in the MMU and in execute mode, the EDI module will red light when powered up or inserted. If this occurs, reset the EDI module after inserting the MFP module.

5. Turn the two captive latches on the module faceplate ½-turn to lock the module in place.

> **NOTE:** Refer to ***START-UP SEQUENCE*** in Section 5 for good start-up indications.

CABLE CONNECTIONS

Figure 3-3 shows EDI module to 10Base2 thinwire network connection and Figure 3-4 shows EDI module to 10Base5 thickwire network connection. Make sure the jumpers are set appropriately for the connection method being used. Refer to ***JUMPERS (E1 TO E13)*** for jumper setting information.

If connecting an engineering work station, connect the null-modem cable from the work station to the RS-232-C connector on the front panel.

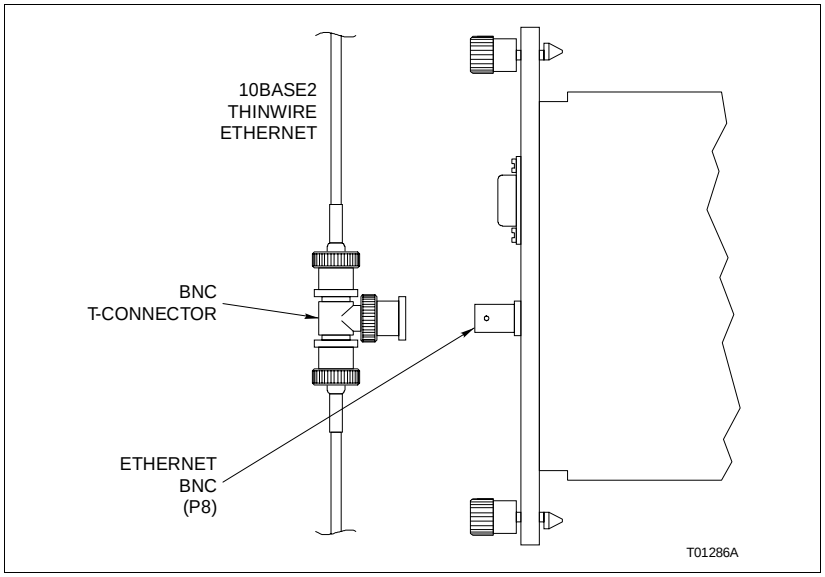

Figure 3-3. IMEDI01 Module to 10Base2 Thinwire Connection

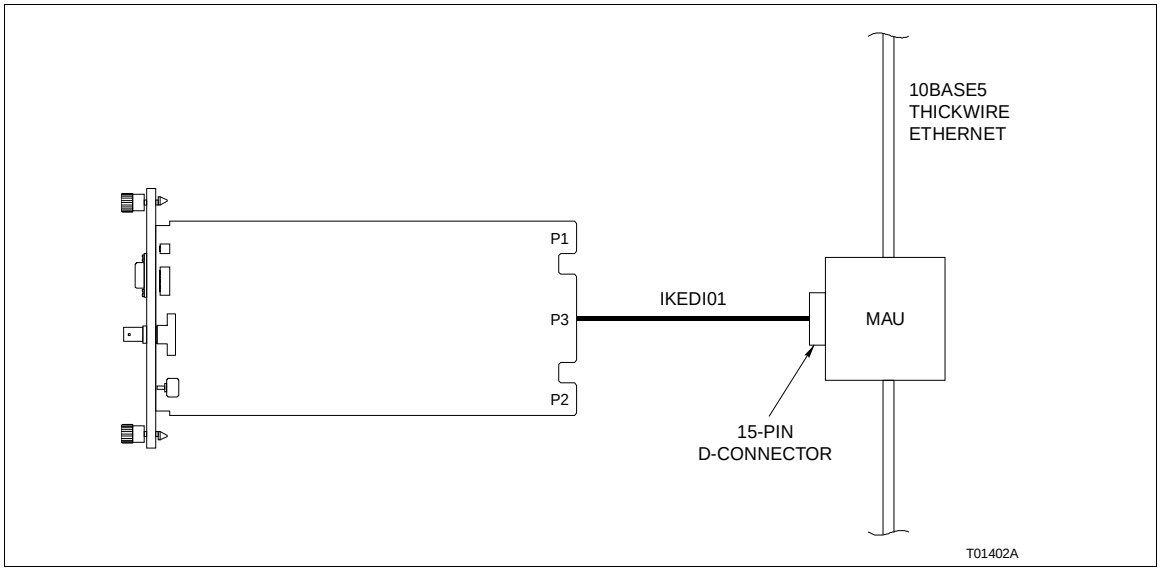

Figure 3-4. IMEDI01 Module to 10Base5 Thickwire Connection

FIRMWARE/PROTOCOL DOWNLOAD

This section describes the procedures necessary to download firmware and the interface protocol to the EDI module. The EDI module comes with the Allen Bradley interface protocol already installed. The download procedure must be run if the firmware needs to be updated or if the module is to be used to interface some other third-party Ethernet PLC.

The download utility is a DOS-based batch file (***BAT***) that can run from a DOS window in Microsoft® Windows® 3.1, Windows 95, and Windows NT®. To start the download:

Important

1. Use the IMEDI01 utilities (option A) to check the current version of interface protocol installed in the EDI module. Refer to ***IMEDI01 UTILITIES*** in Section 6 for the procedures to run the utilities. Ensure that the firmware/protocol being downloaded is the desired for the module. Refer to the appendices for firmware/protocol identification information.

2. Set switch S5 for firmware/protocol download mode; refer to Table 3-3.

3. Use a null-modem cable to connect the PC from one of its COM ports (COM1 or COM2) to the EDI module front panel RS-232-C port. Set the following parameters for the PC COM port:

   Bits per second (baud) — 9600
   Data bits — 8
   Parity — No
   Stop bits — 1
   Flow control — XON/XOFF

4. Insert the firmware floppy disk into the floppy disk drive and run the following command, then follow the prompts on the screen:

   drive:**\DWNL_EDI** *filename x* ENTER

where:

drive	Floppy disk drive designator.
filename	Name of the firmware file to be downloaded without its ***ABS*** extension.
x	1 = COM1 2 = COM2

NOTE: Use the file manager or Windows explorer to find the name of the firmware file. The file has an ***ABS*** extension.

5. Set switch S5 for normal operation mode; refer to Table 3-3.

SECTION 4 - FUNCTION CODE CONFIGURATION

INTRODUCTION

This section describes IMEDI01 module function code configuration. An example configuration is provided.

FUNCTION CODES

The EDI module utilizes the following function codes to interface a third-party Ethernet PLC.

- Factory Instrumentation Protocol Handler (FC 184).
- Digital Input Subscriber (FC 185).
- Analog Input Subscriber (FC 186).
- Analog Output Subscriber (FC 187).
- Digital Output Subscriber (FC 188).

Factory Instrumentation Protocol Handler

The factory instrumentation protocol (FIP) handler function code (FC 184) is mainly used to organize the different input and output subscriber function codes. The specifications contain the starting block address for linked subscriber blocks. This function code is also responsible for reporting module status to the MFP module.

Digital Input Subscriber

The digital input subscriber function code (FC 185) acquires a group of digital values from an Ethernet PLC device. Each digital input subscriber can handle up to eight digital inputs. The digital input subscriber function code has eight outputs corresponding to the eight digital values acquired with quality.

Analog Input Subscriber

The analog input subscriber function code (FC 186) acquires a group of analog values from an Ethernet PLC device. Each analog input subscriber can handle up to eight analog inputs. The analog input subscriber function code has eight outputs corresponding to the eight analog values acquired with quality.

Analog Output Subscriber

The analog output subscriber function code (FC 187) sends a group of analog outputs to an Ethernet PLC device. Each analog output subscriber can handle up to eight analog outputs. The analog output subscriber function code has one output which gives the quality of the communication between the EDI module and the MFP module.

Digital Output Subscriber

The digital output subscriber function code (FC 188) sends a group of digital outputs to an Ethernet PLC device. Each digital output subscriber can handle up to eight digital outputs. The digital output subscriber function code has one output which gives the quality of the communication between the EDI module and the MFP module.

PLC Support

Function code specifications determine the EDI module operation. The definition of these specifications varies slightly depending on the family of PLC being interfaced. Currently, the EDI module interfaces Allen Bradley controllers and Triconex Systems controllers. Refer to the following appendices for function code specifications:

- Appendix A – Allen Bradley PLC-5E and higher.
- Appendix B – Triconex Systems Tricon V6 PLC and higher.

Configuration

The function codes can be added to the MFP module configuration in the same way as other function codes. Refer to the ***Function Code Application Manual***, ***Multifunction Processor Module***, and ***Module Configuration Tools (WCAD)*** instructions for an explanation of function codes and module configuration (Table 1-2).

Because the EDI module is dependent on the MFP module, an EDI module must only be driven by one MFP module. One MFP module can drive multiple EDI modules however.

On-line configuration cannot be used to add points to an EDI module that has already been configured by the MFP module. A new EDI module can be added on-line however.

PLC Performance

NOTE: All performance is based on the EDI module and PLCs operating on a dedicated Ethernet network.

The EDI module is able to support fast scan rates of 125 milliseconds. The performance is primarily dependent on the load of the PLC:

- Size of message packets.
- Synchronous or asynchronous operations.
- Frequency of data requests.
- Whether or not the file being written is being shared.
- Implementation of ladder logic on the PLC.
- Network load.
- Programming software on-line and off-line.

The performance measured using HP9000/745 computer running Interchange software and a PLC-5E handled approximately 50 to 54 transactions per second for synchronous read and write operations and 57 to 63 transactions per second for asynchronous read and write operations.

It is recommended to keep the total number of requests made to the PLC at 50 to 60 maximum. To stay within this threshold, much care should be taken in configuring the function codes. The following guidelines should be observed to configure the function codes for optimum performance:

- All points must be grouped in contiguous order with little or no addressing gaps between logically grouped points.

- Fast scan rates should only be selected for points critical to the interface. Again, these points must be grouped in contiguous order with little or no addressing gaps between logically grouped points.

- Use the aperiodic or periodic options to determine the most efficient means of sending data to the PLC (refer to ***Data Output Options***).

EDI Performance

NOTES:

1. The performance data provided in this section is based on the EDI module using Allen Bradley interface protocol.

2. All performance is based on the EDI module and PLCs operating on a dedicated Ethernet network.

The following information should be considered when configuring function codes to obtain maximum performance from the EDI module.

- The EDI module is capable of generating messages (i.e., request, replies, acknowledgments, etc.) at a typical rate of one message every four to five milliseconds.

- Each EDI module transaction message can contain a maximum of 243 bytes of information. This equates to the following for a single transaction:

  58 float values.
  116 integer values.
  1,856 boolean values.

- The PLC turn-around time, which refers to the time interval between a request received from the EDI module and a reply to the request, varies dependent on data type and can range from approximately 20 milliseconds for digital values up to approximately 150 milliseconds for some analog values.

- To insure that a variable is updated at its desired scan rate (i.e., 125 milliseconds, 250, milliseconds, 500 milliseconds, and one second), the maximum number of transactions per second should not exceed 160. For example, this equates to:

  20 transactions at 125 millisecond scan class (eight times per second).

  40 transactions at 250 millisecond scan class (four time per second).

  80 transactions at 500 milliseconds scan class (two times per second).

  160 transactions at one second scan class.

  NOTE: Any combination can be used as long as the 160 maximum is not exceeded.

  The 160 transactions per second rate allows for a transfer of:

  9,280 float values per second.
  18,560 integer values per second.
  296,960 boolean values per second.

Example

As an example based on the previous data, 58 floating point values per transaction means that seven MFP function blocks configured with function code 186 and grouped together can be updated in a single transaction.

Data Output Options

The MFP module (i.e., output subscriber function codes) can be configured for either aperiodic or periodic data output operation. Aperiodic means data will only be sent to the PLC on an MFP module exception basis (i.e., periodically, after reaching

an alarm limit or a change in state, or after a significant change in value). Periodic means data will be sent based on the MFP module's scan cycle. In either case, the EDI module reads and forwards values each time the MFP module updates them.

Aperiodic

Using the aperiodic option, if any one piece of data changes for a particular message, the entire message will be sent. This means that if one element changes in a message which is setup to handle 50 elements, the other 49 elements will also be sent. This option reduces the number of network messages forwarded to the PLC.

> **NOTE:** On PLC recovery, the EDI module does not automatically update data (i.e., write) upon PLC reconnection when using the aperiodic option. The PLC data is not updated until an exception report is generated. Only on EDI module start-up and MFP module transition to execute will data be updated automatically.

Periodic

Using the periodic option, messages will be sent on every execution cycle of the MFP. This is recommended to guarantee data alignment when tight process control is required.

For ***process control***, it is recommended that the periodic option be used along with the stalled writes option. Refer to the appendices for specification information to select these options.

CALCULATING IP ADDRESS SPECIFICATIONS

The following example describes how to calculate the IP address specification for function codes 184 through 188. The IP address for the EDI module is set with switches S1 through S4 (refer to ***IP Address (S1, S2, S3, S4)*** in Section 3). To associate the function codes with a specific EDI module, function code 184, specification S10 contains the first two bytes of the IP address; function codes 185 and 186, specification S6 and function codes 187 and 188, specification S14 contain the last two bytes of the IP address.

Example

IP address:

151.89.202.128

1. Convert each number to binary.

   151 = 10010111

   89 = 01011001

   202 = 11001010

   128 = 10000000

2. Calculate the decimal equivalent of the first two bytes of the IP address to be used in FC 184.

1001011101011001 (151.89) = 38,745

If the result is greater than 32,767, subtract 65,536.

38,745 - 65,536 = –26,791 (S10)

3. Calculate the decimal equivalent of the last two bytes of the IP address to be used in FC 185, 186, 187, and 188.

1100101010000000 (202.128) = 51,840 (S6/S14)

LINKING SUBSCRIBERS

Specification one (S1) is used to link subscriber function codes. Figure 4-1 shows the method used. The first function code in the chain connects to FC 184. Only the same type of function codes can be linked (i.e., FC 185 can only link to another FC 185). The number of subscriber function codes that can be linked together is only limited by module memory utilization.

GROUPING SUBSCRIBERS

The subscriber function codes are defined in groups with up to four subscriber function codes per group. Each group can handle up to 32 inputs or outputs. The group identifier specification (S2) is used to identify the members of a particular group. Keep the following guidelines in mind when setting up subscriber groups:

1. All function codes within a group must be of the same type (i.e., AI, AO, DI, DO).

2. Maximum of four subscriber function codes per group.

3. All function codes in a group must use the same, unique group identifier (S2).

4. All function codes with the same IP address can be grouped.

5. All function codes with the same scan class can be grouped.

If any of these are different, then a new group must be created.

EXAMPLE CONFIGURATION

Figures 4-2 through 4-6 comprise an EDI module function

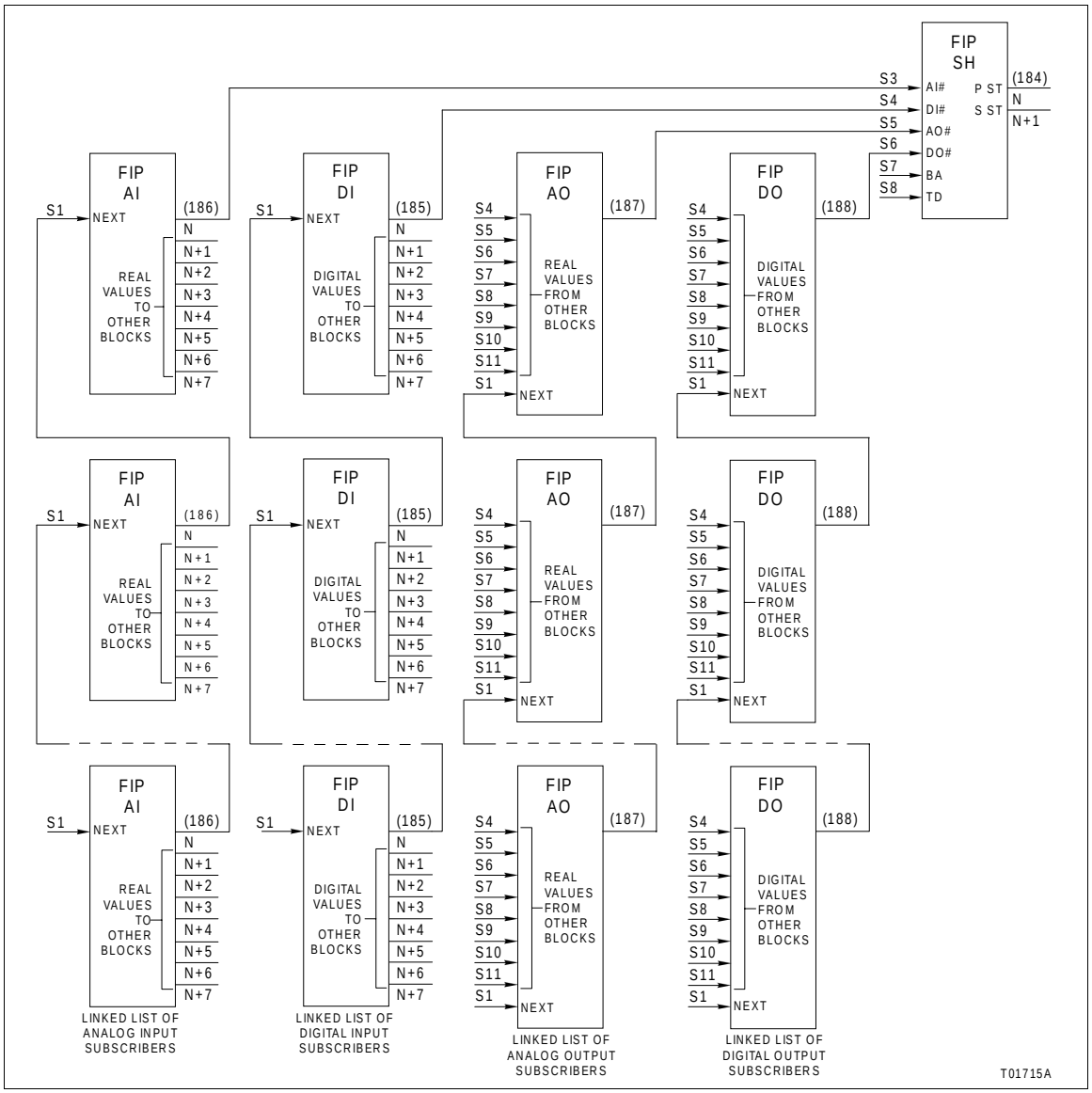

Figure 4-1. Function Code Linking

code configuration example. The example is primarily intended to show the function code linking and grouping. Some specifications have different meanings depending on the type of PLC being interfaced and are shown as X.X in the example configuration. This does not mean they are not required. Refer to the appropriate appendix for function code specification descriptions.

Analog Input Example

Figure 4-3 shows the definition of an analog input group. Notice that in all four function codes S2 is set to 11.0 for each

member of the group. This group identifier must be unique for each new group.

Specification S3 is used to identify which member in the group the function code is and how many elements the member has. In this example, the analog inputs (Fig. 4-3) break down into the following components based on the definition of specifications S2 and S3:

Group (S2)	S3	
	Subgroup	Elements
11.0	0	8
	1	8
	2	8
	3	5

This group handles 29 elements, or inputs in this case.

The analog output, digital input, and digital output subscriber groups are configured in the same way; refer to Figures 4-4, 4-5, and 4-6.

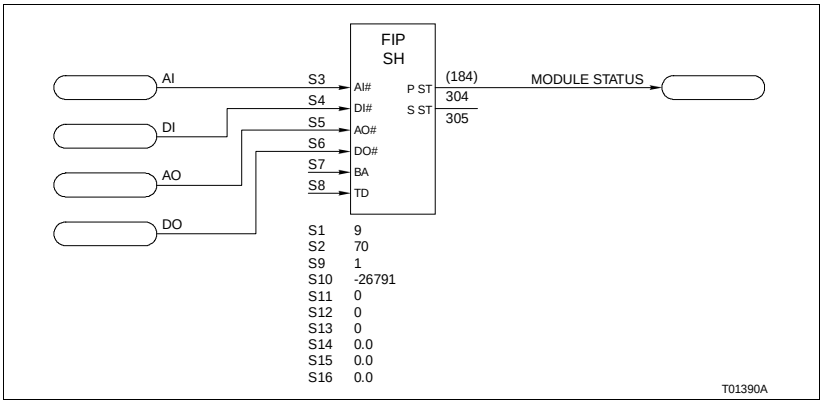

Figure 4-2. Function Code 184

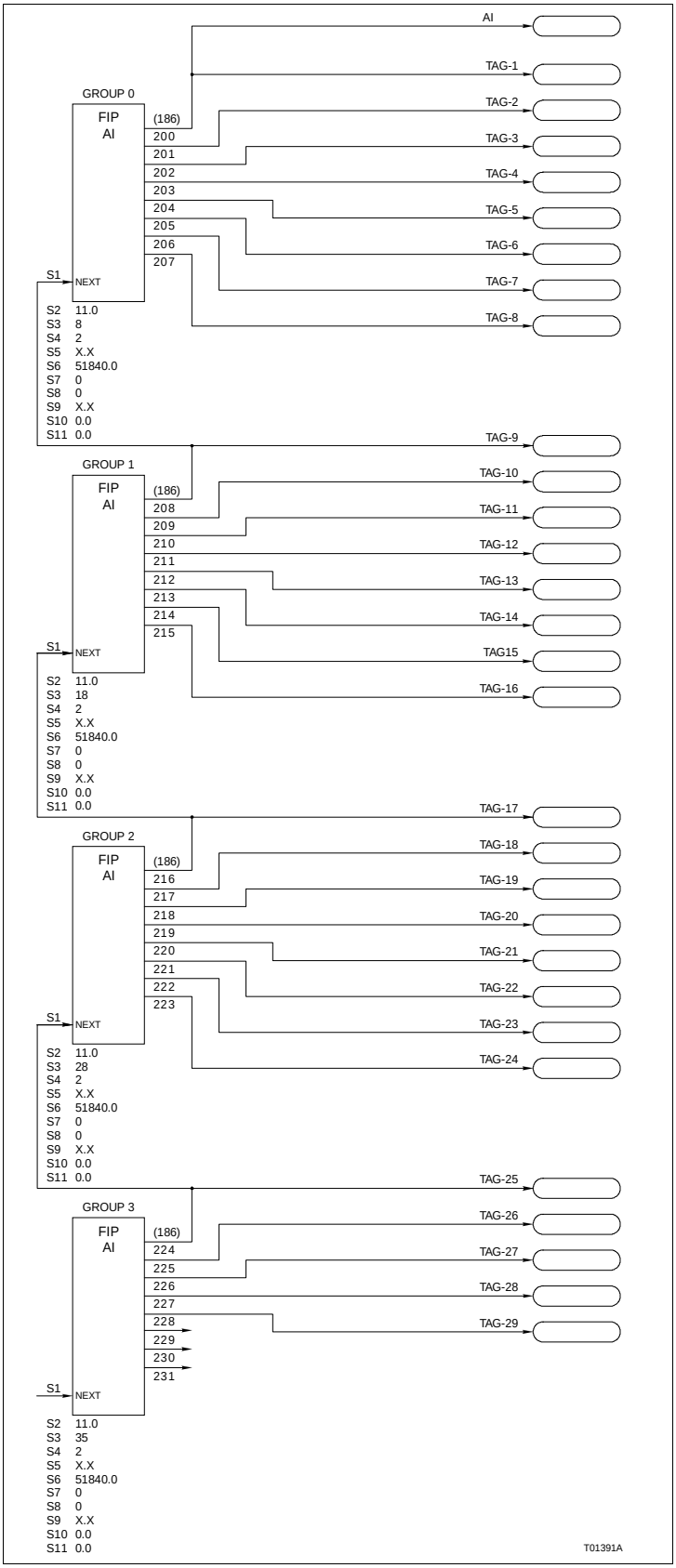

Figure 4-3. Function Code 186 – Analog Inputs

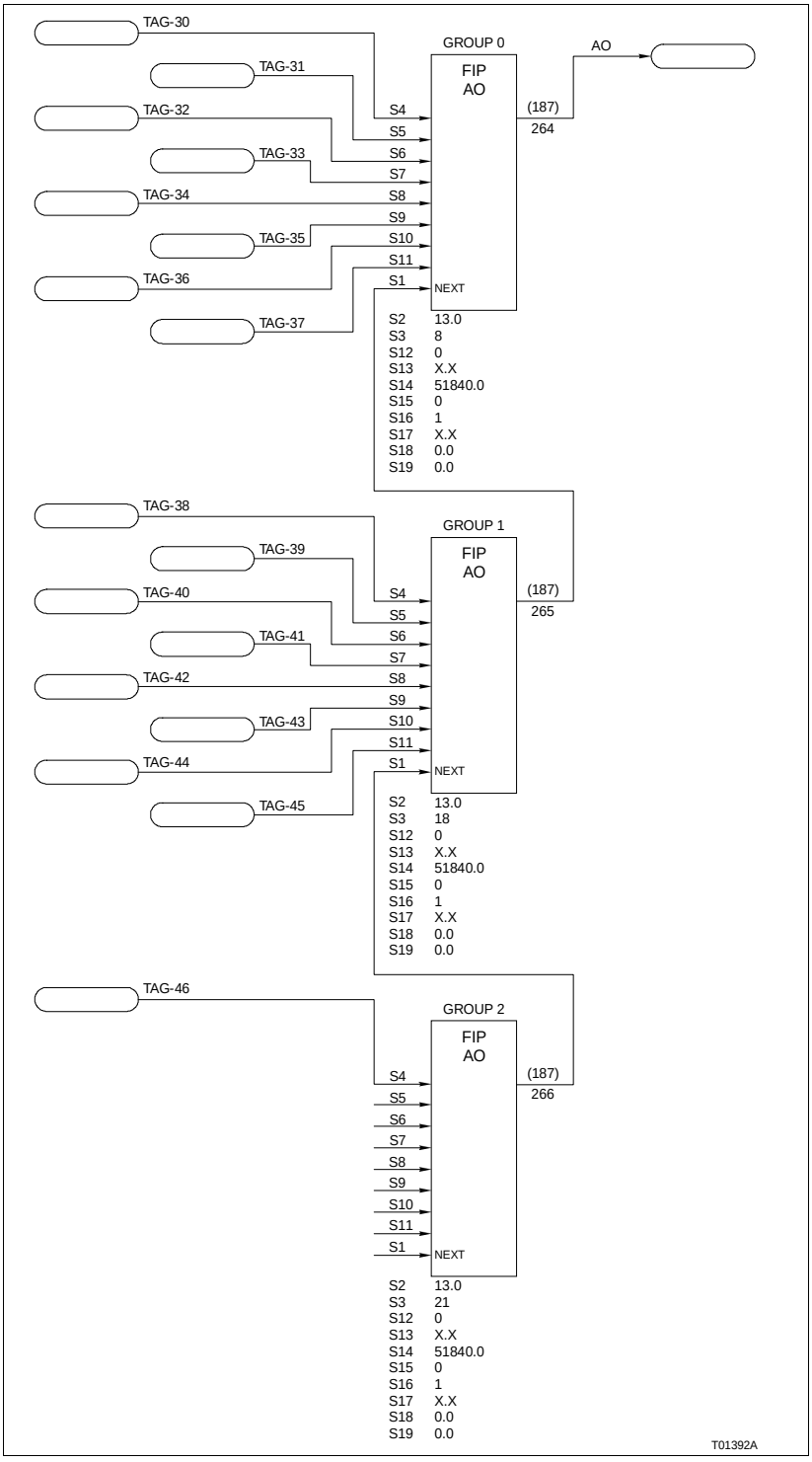

Figure 4-4. Function Code 187 – Analog Outputs

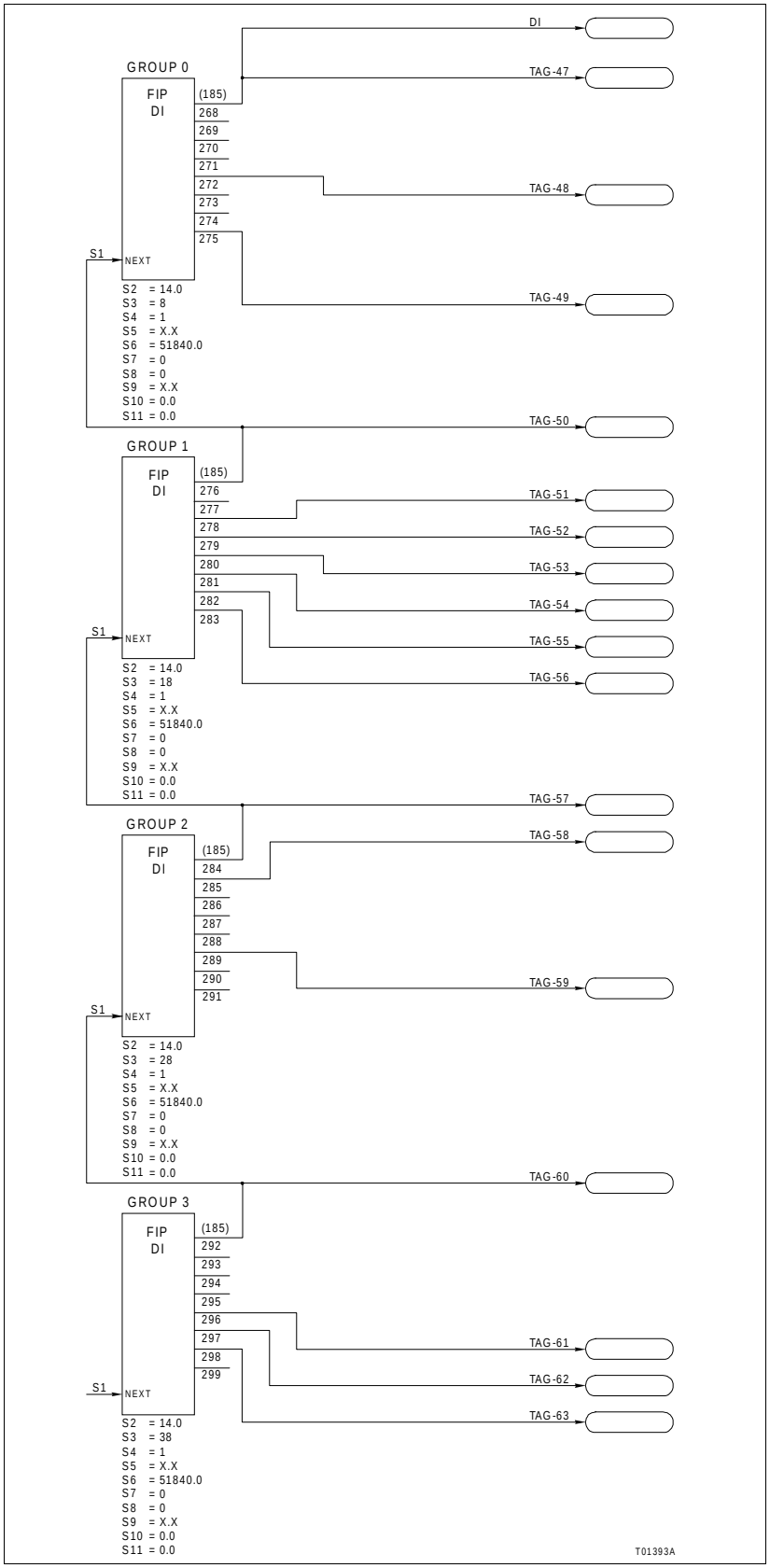

Figure 4-5. Function Code 185 – Digital Inputs

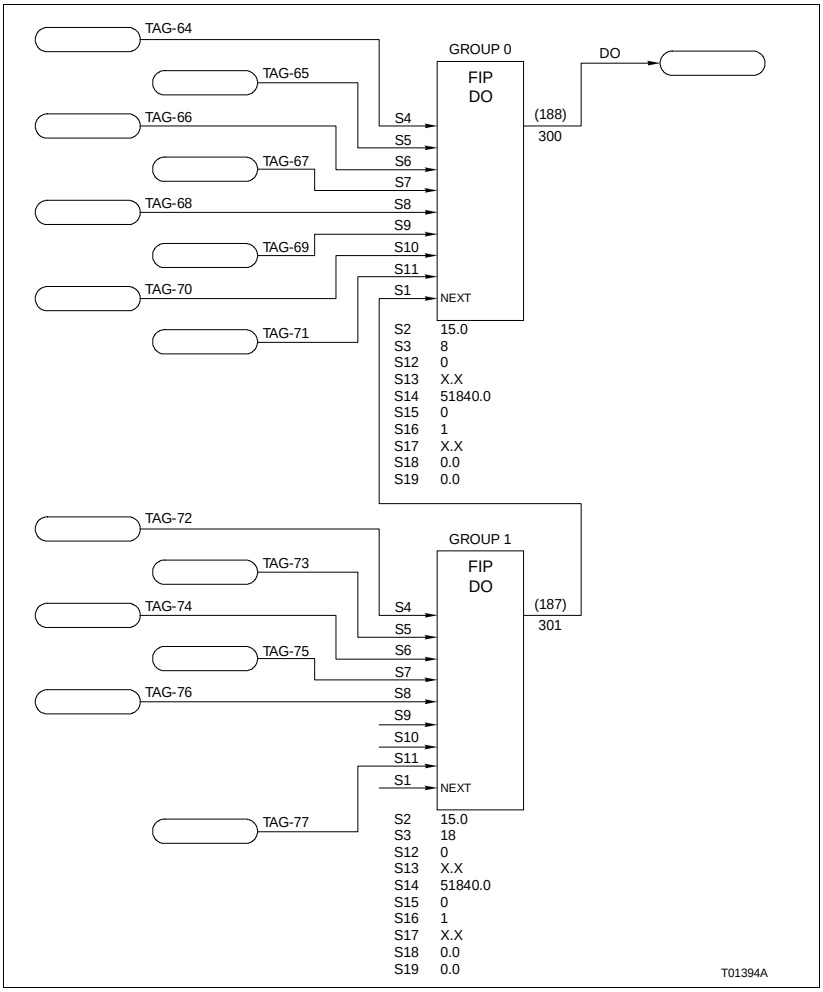

Figure 4-6. Function Code 188 – Digital Outputs

SECTION 5 - OPERATING PROCEDURES

INTRODUCTION

This section details the IMEDI01 module front panel indications, and gives start-up and stop/reset procedures for the module.

FRONT PANEL

Figure 5-1 describes the EDI module front panel items. The status LEDs provide a visual indication of current module state and status.

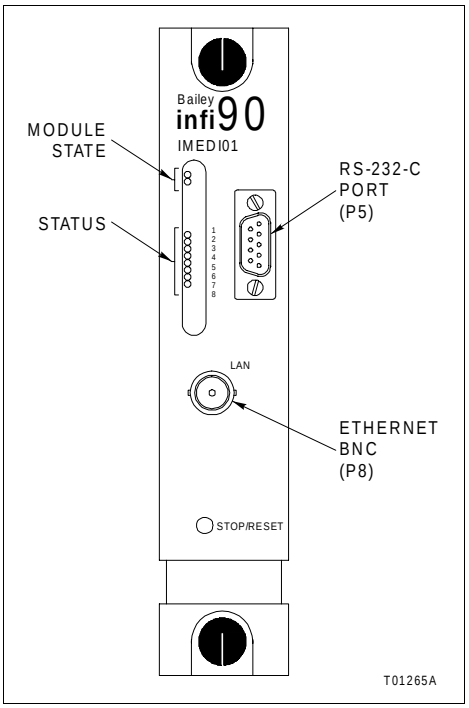

Figure 5-1. Front Panel

Module State

Table 5-1 describes the module state LED indications.

Table 5-1. Module State LED Indications

State	Green	Red
No power, power-up, and reset	Off	Off

Table 5-1. Module State LED Indications (continued)

State	Green	Red
Normal operation (execute)	On	Off
Start-up — reading configuration from MFP	Flashing	Off
Error[1]	Off	On
Stop	Off	On

NOTE:
1. Refer to ***Status LEDs*** in this section for error code information.

Status LEDs

The module status LEDs give module start-up and normal operation indications, and also indicate any errors (i.e., module state lit red). Refer to ***START-UP SEQUENCE*** in this section for the start-up indications and Table 6-2 to interpret error indications.

START-UP SEQUENCE

The EDI module performs a start-up sequence after power-up or a reset. The start-up sequence consists of running a series of self diagnostics to verify module hardware integrity, establishing communication with the MFP module, then receiving module configuration information. Any problems that occur during the start-up will be indicated by the front panel LEDs. Refer to Section 6 for a description of the self diagnostics.

Table 5-2 details the LED indications for a good EDI module start-up. Refer to Table 6-2 to decipher any status LED error indications.

Table 5-2. Start-Up Sequence

Condition	Module State (Green LED)	Status LEDs							
		8	7	6	5	4	3	2	1
Initial value at power on or reset	Off	1	1	1	1	1	1	1	1
Boot sequence	On (one sec)	x	x	x	x	x	x	x	x
Boot sequence complete	Off	0	0	0	0	0	0	0	0
Read configuration from MFP	Flashing	1	1	0	0	0	0	0	0
Normal operation	On	1	1	0	0	0	0	0	0

NOTE: 0 = off; 1 = on; x = toggle.

NORMAL OPERATING CONDITIONS

In order for the EDI module to operate, an MFP module must be inserted into the MMU and be in execute mode before the EDI module. The EDI module requires this since the MFP module provides the I/O expander bus clock and contains the EDI module configuration. If an MFP module is not present, the EDI module will red light. If this occurs, insert the MFP module and reset the EDI module.

The MFP module notifies the EDI module when it transitions from configure to execute mode. This notification triggers the EDI module to read the MFP function codes (FC 184 to FC 188) and configure the appropriate protocol messages. When the MFP module transitions from execute to configure, the EDI module continues to read from the PLC but stops sending data to the PLC.

If the MFP module is stopped, reset, or removed, the EDI module will red light. If the EDI module is removed, a problem report will be generated by the MFP module.

Table 5-3 describes the operation of the EDI module in relationship to the MFP module operating mode.

Table 5-3. Operations Summary

MFP Mode	EDI Condition	EDI Operation
Execute	Power on (start-up)	1. Read configuration from MFP module (flashing green LED). 2. Execute (solid green LED).
Configure to execute	Normal operation (solid green LED)	1. Reset. 2. Read configuration from MFP module (flashing green LED). 2. Execute (solid green LED).
Execute to configure	Normal operation (solid green LED)	Monitors input values but does not send data.

STOP/RESET

The stop/reset button is used to interrupt module execution and to initiate a hardware reset. The button is accessed through the small opening on the front panel. Some type of thin rod, preferably nonmetallic, is required to press the button.

1st Press Press the button once to halt operation. The electronics conducts an orderly shutdown after stop is initiated and turns on the red module state indicator.

2nd Press Press the button a second time to initiate a hardware reset. A hardware reset is required to recover from a module time-out or a manual stop (single press). After the hardware reset completes, the module begins its start-up sequence. Refer to ***START-UP SEQUENCE*** in this section.

> **NOTE:** If the module has already stopped due to an error (i.e., red module state indicator lit), a single press resets the module.

SECTION 6 - TROUBLESHOOTING

INTRODUCTION

This section provides troubleshooting information necessary to isolate IMEDI01 module errors. It is not meant to be all inclusive. If a problem exists that cannot be corrected using the information provided in this instruction, contact a local Elsag Bailey service office for assistance.

SELF DIAGNOSTICS

During start-up, the EDI module performs the following checks to verify its operation:

- CPU including Ethernet coprocessor and UARTs.
- DRAM.
- FLASH EPROM.
- MFT (machine fault timer).
- I/O expander bus interface including shared memory.

A failure of any of the diagnostic tests will halt the module and an error code will appear on the status LEDs.

MODULE STATE

Front panel LEDs indicate the current module state as either operating normally or in an error condition. Table 6-1 lists module state LED indications and probable causes and corrective actions.

NOTE: If the corrective actions in Table 6-1 do not correct a problem with the EDI module, replace the module.

Table 6-1. Module State LED Indications and Correction Actions

LED State	Indication	Probable Cause	Corrective Action
Solid green	EDI module operating normally and communicating with MFP module	Normal operation	No action required
Flashing green	EDI module operating normally and reading configuration from MFP module	Normal operation	No action required
Off	I/O module not enabled	No MFP module currently inserted in MMU	Insert an MFP module into the MMU and reset the EDI module
	No power to EDI module	Module not completely inserted in MMU	Verify module is completely inserted in MMU: faceplate flush with MMU and captive retaining screws latched

Table 6-1. Module State LED Indications and Correction Actions (continued)

LED State	Indication	Probable Cause	Corrective Action
Solid red (FAIL)	Bus fault timer error (time-out)	I/O expander bus clock failure	Check MFP module for proper operation
		Dipshunt not installed between MFP and EDI modules	Verify dipshunt is installed in the I/O expander bus socket on the MMU back-plane between MFP and EDI modules

STATUS CODES

Table 6-2 lists EDI module status codes and gives corrective actions for errors. The codes appear on the front panel status LEDs.

Table 6-2. Status Codes

LED Code 87654321	Description	Corrective Action
11111111	Reset	No action required
Start-Up Errors[1] (11xxxxxx)		
11111110	QUICC is running and CS1 to 6 configured	Reset the module. If error persists, contact Elsag Bailey.
11111100	I/O port A configured bit by bit	
11111010	I/O port B configured bit by bit	
11111000	I/O port C configured bit by bit	
11110110	True size detected	
11110100	DRAM test passed	
11110010	FLASH first sector checksum checked	
11110000	CPU instruction set and addressing modes tested	
11101110	Stack to top of DRAM filled with pattern	
11101100	MSTAT (memory controller status) checked	
11101010	DRAM error detection works fine	
11101000	VECTAB copied to RAM	
11100110	Priority lowered to 0 (verify no undesired interrupt)	
11100100	SDMA BERR and BKPT interrupts are quiet	
11100010	PIT turned on and tested	
11100000	TIMER1 test	
11011110	TIMER2 test	
11011100	TIMER3 test	
11011010	TIMER4 test	
11011000	IDMA1, several tests	
11010111	IDMA2, several tests	
11010110	SDMA, several tests	
11010100	SI and NMSI configuration	

Table 6-2. Status Codes (continued)

LED Code 87654321	Description	Corrective Action
11010010	SCC1 configured and tested as Ethernet	Reset the module. If error persists, contact Elsag Bailey
11010000	SCC2 configured and tested as UART	
11001110	SCC3 configured and tested as UART	
11001100	SCC4 configured and tested as UART	
11001010	SMC1 configured and tested as UART	
11001000	Configuration and test of TIMER2 used as MFT	
11000110	Test remaining interrupts (i.e., DISPATCHER)	
11000100	Both LCAs configured correctly	
11000010	Static test of X-bus shared RAM	
11000000	Registers in upper part of SHRAM OK, MFP welcome	
Firmware Errors (01xxxxxx)		
01000001	Severe hardware fault before CS configure	Reset the module. If error persists, contact Elsag Bailey
01000010	Double bus fault	
01000011	SWT fault	
01000100	Software reset	
01000101	Error during download	
01000110	Parity error	
01000111	Bus error during DMA	
01001000	Write cycle to EPROM area	
01001001	Run-time error on diagnostic port (RS-232-C)	
01001010	Run-time checksumming of FLASH memory failed	
01001011	ROS error setting up TCBs	
Microprocessor Errors (01xxxxxx)		
01010000	Bus error	Reset the module. If error persists, contact Elsag Bailey
01010001	Address error	
01010010	Illegal instruction	
01010011	Divide by zero	
01010100	CHK instruction	
01010101	TRAPV instruction	
01010110	Privilege error	
01010111	Trace exception	
01011000	Emul. 1010 exception	
01011001	Emul. 1111 exception	
01011010	Unassigned interrupt	
01011011	TRAPX exception	
01011100	Nonmaskable interrupt	
01011101	Spurious interrupt	
01011110	Hardware break	

Table 6-2. Status Codes (continued)

LED Code 87654321	Description	Corrective Action
Internal Interrupt Errors (01xxxxxx)		
01011110	Uninitialized interrupt	Reset the module. If error persists, contact Elsag Bailey
01011111	Uninitialized interrupt from CPM	
01100000	CPM-error interrupt	
External Interrupt Errors (01xxxxxx)		
01100001	STOP switch pressed	Reset the module.
01100010	DSP interrupt before configuration	Reset the module. If error persists, contact Elsag Bailey
01100011	LVL3 interrupt before configuration	
01100100	X-bus interrupt before configuration	
01100101	LVL5 interrupt before configuration	
01100110	X-bus clock is missing (i.e., MFP module stopped)	1. Check the MFP module; refer to MFP module documentation. 2. Check I/O expander bus dipshunts; refer to ***MMU INSTALLATION*** in Section 3.
01100111	PFI (power fail input) from the system power	Check the power system; refer to power system documentation.

NOTE:
1. The start-up errors appear if a diagnostic check fails during the start-up sequence. If an error occurs, the module will halt and display the code of the last successful test.

IMEDI01 UTILITIES

The IMEDI01 utilities provide the ability to read the following information from the module:

- Firmware revision.
- Ethernet address.
- IP address.
- Microprocessor error counters.
- Variable counters.
- PLC counters.
- Transmit message counters.
- Transmit queue status.
- Receive queue status.

To run the utilities:

1. Use a null-modem cable to connect the PC from one of its COM ports (COM1 or COM2) to the EDI module front panel RS-232-C port.

2. Open a terminal window and set the following communications parameters:

Bits per second (baud) — 9600
Data bits — 8
Parity — No

Stop bits — 1
Flow control — XON/XOFF

Figure 6-1 shows the utility options. Select an option by pressing its associated keyboard key.

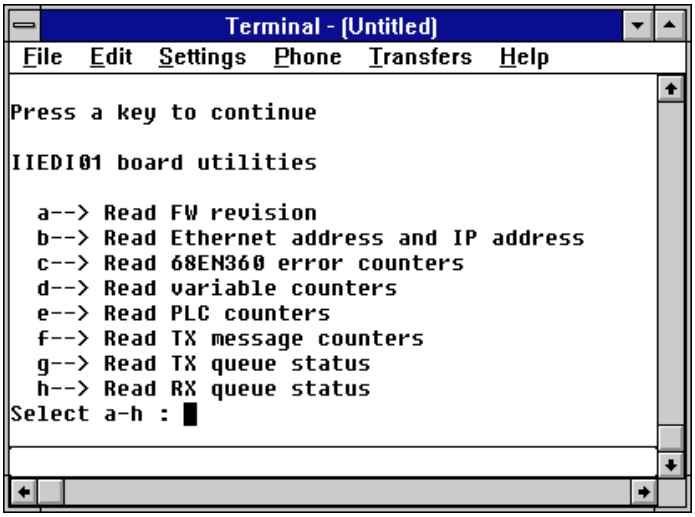

Figure 6-1. IMEDI01 Utilities

CONNECTOR PIN ASSIGNMENTS

Tables 6-3 through 6-6 list the pin assignments for the EDI connectors P1, P2, P3, and P5.

Table 6-3. P1 Edge Connector

Pin	Signal	Pin	Signal
1	+5 VDC	2	+5VDC
3	Unused	4	Unused
5	Common	6	Common
7	+15 VDC	8	Unused
9	PFI	10	Unused
11	Unused	12	Unused

Table 6-4. P2 Edge Connector

Pin	Signal	Pin	Signal
1	Data bit 1	2	Data bit 0
3	Data bit 3	4	Data bit 2
5	Data bit 5	6	Data bit 4
7	Data bit 7	8	Data bit 6
9	Bus clock	10	Sync
11	Unused	12	Unused

Table 6-5. P3 Edge Connector

Pin	Signal	Pin	Signal
1	Ethernet collision (–)	A	Ethernet collision (+)
2	Ethernet receive (–)	B	Ethernet receive (+)
3	Not used	C	Not used
4	Ethernet transmit (–)	D	Ethernet transmit (+)
5	Not used	E	Not used
6	Ethernet common	F	Ethernet +12 VDC
7	RS-485 receive data A (–)	H	RS-485 receive data A (+)
8	RS-485 receive data B (–)	J	RS-485 receive data B (+)
9	RS-485 clear to send A (–)	K	RS-485 clear to send A (+)
10	RS-485 clear to send B (–)	L	RS-485 clear to send B (+)
11	RS-485 transmit data A (–)	M	RS-485 transmit data A (+)
12	RS-485 transmit data B (–)	N	RS-485 transmit data B (+)
13	RS-485 request to send A (–)	P	RS-485 request to send A (+)
14	RS-485 request to send B (–)	R	RS-485 request to send B (+)
15	TU LED (–)	S	TU LED (+)

Table 6-6. P5 Connector (DTE)

Pin	Signal
1	Unused
2	Receive data (in)
3	Transmit data (out)
4	Unused
5	Common
6	Unused
7	Ready to send (out)
8	Clear to send (in)
9	Unused

SECTION 7 - MAINTENANCE

INTRODUCTION

The reliability of any stand-alone product or control system is affected by the maintenance of the equipment. Elsag Bailey recommends that all equipment users practice a preventive maintenance program that will keep the equipment operating at an optimum level.

This section presents procedures that can be performed on-site. These preventive maintenance procedures should be used as guidelines to assist in establishing good preventive maintenance practices. Select the minimum steps required to meet the needs of your system.

Personnel performing preventive maintenance should meet the following qualifications.

- Should be qualified electrical technicians or engineers that know the proper use of test equipment.
- Should be familiar with the IMEDI01 module and the INFI 90 OPEN system, have experience working with process control systems, and know what precautions to take when working on live AC systems.

PREVENTIVE MAINTENANCE SCHEDULE

Table 7-1 is the preventive maintenance schedule for the EDI module. The table lists the preventive maintenance tasks in groups according to their specified maintenance interval. Some tasks in Table 7-1 are self explanatory. Instructions for tasks that require further explanation are covered under ***PREVENTIVE MAINTENANCE PROCEDURES***.

NOTE: The preventive maintenance schedule is for general purposes only. Your application may require special attention.

Table 7-1. Preventive Maintenance Schedule

Task	Frequency
Check cabinet air filters. Clean or replace them as necessary. Check the air filter more frequently in excessively dirty environments.	3 months
Check cabinet and module for dust. Clean as necessary using an antistatic vacuum.	
Check all module signal, power and, ground connections within the cabinet. Verify that they are secure. See procedure.	
Check module circuit board, giving special attention to power contacts and edge connectors. Clean as necessary. See procedure.	12 months
Complete all tasks in this table.	Shutdown

EQUIPMENT AND TOOLS REQUIRED

Tools and equipment required for maintenance procedures include:

- Antistatic vacuum.
- Clean, lint free cloth.
- Compressed air.
- Eberhard Faber (400A) pink pearl eraser or equivalent.
- Fiberglass or nylon burnishing brush.
- Foam tipped swab.
- Bladed screwdriver suitable for terminal blocks.
- Isopropyl alcohol (99.5 percent electronic grade).
- Natural bristle brush.

PREVENTIVE MAINTENANCE PROCEDURES

This section covers tasks from Table 7-1 that require specific instruction or further explanation:

- Checking signal, power, and ground connections.
- Cleaning printed circuit boards.

Checking Connections

WARNING

There are exposed AC and DC connections inside the cabinet. These exposed electrical connections present a shock hazard that can cause injury or death.

If input or output circuits are a shock hazard after disconnecting system power at the power entry panel, then the door of the cabinet containing these externally powered circuits must be marked with a warning stating that multiple power sources exist.

Check all signal wiring, power and ground connections within the cabinet to verify their integrity. When checking connections, always turn a screw, nut or other fastening device in the direction to tighten only. If the connection is loose, it will be tightened. If the connection is tight, the tightening action will verify that it is secure. There must not be any motion done to loosen the connection.

NOTE: Power to the cabinet must be off while performing this preventive maintenance task.

Verify that all cable connections are secure.

Printed Circuit Board Cleaning

WARNING	**Never clean electrical parts of components with live power present. Doing so exposes you to an electrical shock hazard.** **Wear eye protection whenever working with cleaning solvents. When removing solvents from printed circuit boards using compressed air, injury to the eyes could result from splashing solvent as it is removed from the printed circuit board.**

There are several circuit board cleaning procedures in this section. These procedures cover circuit board cleaning and washing, cleaning edge connectors and circuit board laminate between edge connectors. Use the procedures that meet the needs of each circuit board. Remove all dust, dirt, oil, corrosion or any other contaminant from the circuit board.

Do all cleaning and handling of the printed circuit boards at static safe work stations. Always observe the steps listed under ***SPECIAL HANDLING*** in Section 3 when handling printed circuit boards.

GENERAL CLEANING AND WASHING

If the printed circuit board needs minor cleaning, remove dust and residue from the printed circuit board surface using clean, dry, filtered compressed air or an antistatic field service vacuum cleaner.

Another method of washing the printed circuit board is:

1. Clean the printed circuit board by spraying it with isopropyl alcohol (99.5% electronic grade) or wiping the board with a foam tipped swab wetted in isopropyl alcohol.

2. When the circuit board is clean, remove excess solvent by using compressed air to blow it free of the circuit board.

EDGE CONNECTOR CLEANING

To clean edge connector contacts:

1. Use a solvent mixture of 80% isopropyl alcohol (99.5% electronic grade) and 20% distilled water.

2. Soak a lint free cloth with the solvent mixture.

3. Work the cloth back and forth parallel to the edge connector contacts.

4. Repeat with a clean cloth that is soaked with the solvent mixture.

5. Dry the edge connector contact area by wiping with a clean lint free cloth.

To clean tarnished or deeply stained edge connector contacts:

1. Use an Eberhard Faber (400A) pink pearl eraser or equivalent to remove tarnish or stains. Fiberglass or nylon burnishing brushes may also be used.

2. Minimize electrostatic discharge by using the 80/20 isopropyl alcohol/water solution during burnishing.

3. Do not use excessive force while burnishing. Use only enough force to shine the contact surface. Inspect the edge connector after cleaning to assure no loss of contact surface.

SECTION 8 - REPAIR AND REPLACEMENT PROCEDURES

INTRODUCTION

This section explains repair and replacement steps for an IMEDI01 module. There are no special tools required to replace the module.

MODULE REPAIR

Repair of the IMEDI01 module is limited to assembly replacement. If the module fails, remove and replace it with another. Do ***not*** attempt to replace discrete components; replacing components may affect the performance of the module.

MODULE REPLACEMENT

If the IMEDI01 module is faulty, replace it with a new one. To replace a module:

1. Press the reset button to halt the module.

2. If required, disconnect the Ethernet BNC cable from the front panel connector

3. Push and turn the two front panel captive latches ½-turn to release the module.

4. Grasp the module faceplate and pull the module out of the module mounting unit (MMU).

5. Configure the replacement module switch and jumper settings. Insure they are set the same as the original module.

6. Verify the replacement module has the correct firmware/protocol installed. Compare the information on the label affixed to the module against the protocol identification information shown in the appendices. If the firmware/protocol is not correct, a download procedure must be run after the module is inserted into the MMU. Continue with the next step.

7. In the same slot assignment as the original module, align the replacement module with the guide rails in the module mounting unit. Slide it in until the faceplate is flush with the top and bottom of the MMU frame.

8. Push and turn the two captive latches on the module faceplate ½-turn to lock the module in place.

> **NOTE:** If the MFP module is not already inserted in the MMU and in execute mode, the EDI module will red light when inserted. If this occurs, reset the EDI module after inserting the MFP module.

9. If required, connect the Ethernet BNC cable to the front panel connector.

10. If the firmware/protocol was found to be incorrect in step 4, run the procedure described in ***FIRMWARE/PROTOCOL DOWNLOAD*** in Section 3.

11. Return to normal operation.

SECTION 9 - SUPPORT SERVICES

INTRODUCTION

Elsag Bailey is always ready to assist in the operation and repair of its products. Send requests for sales or application services to the nearest sales or service office. Elsag Bailey can also provide installation, repair and maintenance contract services.

REPLACEMENT PARTS AND ORDERING INFORMATION

Order replacement parts through an Elsag Bailey sales or service office. Provide the following information:

1. Part description, part number and quantity.

2. Model and serial number (if applicable) and ratings of the assembly for which the part has been ordered.

3. Elsag Bailey instruction number, page number and reference figure that identifies the part.

When ordering parts, use part numbers and part descriptions from equipment manuals. Parts with no commercial description must be ordered from the nearest sales or service office. Recommended spare parts lists, including prices, on standard assemblies are available through the nearest sales or service office.

TRAINING

Elsag Bailey has a modern training facility available for training your personnel. On-site training is also available. Contact an Elsag Bailey sales office for specific information and scheduling.

TECHNICAL DOCUMENTATION

Additional copies of this instruction, or other Elsag Bailey instructions, can be obtained from the nearest Elsag Bailey sales office at a reasonable charge.

APPENDIX A - ALLEN BRADLEY PLC

INTRODUCTION

This appendix provides IMEDI01 module information necessary to interface to an Allen Bradley controller (PLC-5E and higher). Specifically, it describes the label information that identifies that the EDI module contains the Allen Bradley interface protocol. And it describes function code outputs and specifications. Refer to Section 4 for function code descriptions and further explanation of function code configuration.

> **NOTE:** This appendix assumes familiarity with Allen Bradley controllers. It may be necessary to refer to Allen Bradley documentation for additional information when defining function code specifications.

PROTOCOL IDENTIFICATION

A label should be affixed to the EDI module that identifies the interface protocol contained in the module. Additionally, the IMEDI01 utilities can be run to view the current interface protocol (i.e., firmware/protocol) installed. Refer to ***IMEDI01 UTILITIES*** in Section 6 for the procedures to run the utilities.

The Allen Bradley interface protocol will be identified as:

AB 1.00 (or higher)

FACTORY INSTRUMENTATION PROTOCOL HANDLER (FC 184)

Table A-1. FC 184 Output

Blk	Type	Description
N	B	Module status: 0 = good 1 = bad
N+1	B	Not used; always good

Table A-2. FC 184 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	0	I	0 - 63	IMEDI01 module address
S2	N	0	I	0 - 63	Must be set to a value greater than 63
S3	N	2	I	0 - 9998	Block address of analog input subscriber block
S4	N	2	I	0 - 9998	Block address of digital input subscriber block
S5	N	2	I	0 - 9998	Block address of analog output subscriber block
S6	N	2	I	0 - 9998	Block address of digital output subscriber block
S7	N	2	I	0 - 9998	Reserved
S8	N	0	I	0 - 9998	Reserved
S9	N	0	I	0 - 1	Must be set to 1
S10	N	0	I	–32767 - 32767	First two bytes of PLC device IP address
S11	N	0	I	0 - 60000	Reserved
S12	N	0	I	0 - 60000	Reserved
S13	N	0	I	0 - 100	Not used
S14	Y	0.000	R	Full	Not used
S15	Y	1.0	R	0.0 - 255.0	Not used
S16	Y	0.000	R	Full	Spare

Specifications Explanation

S1 Specification S1 is the I/O expander bus address of the EDI module.

S2 Specification S2 is not used; it must be set to a value greater than 63.

S3 Specification S3 is the block address of the first analog input subscriber (function code 186).

S4 Specification S4 is the block address of the first digital input subscriber (function code 185).

S5 Specification S5 is the block address of the first analog output subscriber (function code 187).

S6 Specification S6 is the block address of the first digital output subscriber (function code 188).

S9 Specification S9 is not used; it must be set to 1.

S10 Specification S10 defines the first two high order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of xxx.xxx. If the decimal value is greater than the specification range, subtract 65,536 from the value and enter the negative result.

Example IP address = 151.89.202.127. The first two bytes (151.89) convert to a binary equivalent of:

100101111011001

The decimal equivalent is 38,745 which is greater than 32,767. In this case the value to enter in S10 is 32,767 – 65,536 = –26,791.

NOTE: The limits for class B and C networks are as follows:

B = 191.255.yyy.yyy (49,151 – 65,536 = –16,385)

C = 223.255.yyy.yyy (57,343 – 65,536 = –8,193)

DIGITAL INPUT SUBSCRIBER (FC 185)

Table A-3. FC 185 Outputs

Blk	Type	Description
N	B	First digital input with quality
N+1	B	Second digital input with quality
N+2	B	Third digital input with quality
N+3	B	Fourth digital input with quality
N+4	B	Fifth digital input with quality
N+5	B	Sixth digital input with quality
N+6	B	Seventh digital input with quality
N+7	B	Eighth digital input with quality

Table A-4. FC 185 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	2	I	0 - 9998	Block address of next digital input subscriber block
S2	N	0.000	R	0 - 60000	Group identifier[1]
S3	N	0	I	01 - 38	Subgroup number (x) and number of elements (y): x = 0, 1, 2, or 3 y = 8 **x y Spec** 0 8 8 1 8 18 2 8 28 3 8 38
S4	N	0	I	0 - 3	Input type: 0 = digital 1 = digital with quality
S5	N	0.000	R	Full	PLC-5 file type and file number in xyyy format. File type (x): 0 = binary 1 = input 2 = output File number (yyy): Binary file type = 0 - 999 Output file type = 000 Input file type = 001
S6	N	0.000	R	Full	Last two bytes of the PLC device IP address
S7	N	00	I	0 or 1	Not used
S8	N	00	I	00, 01, 10, or 11	Scan class: 00 = 125 msec 01 = 250 msec 10 = 500 msec 11 = 1 sec
S9	Y	0.000	R	Full	PLC-5 element number: 0 - 999
S10	Y	0.000	R	Full	Spare
S11	Y	0.000	R	Full	Spare

NOTE:
1. The group identifier ***must*** be unique for each group.

Specifications Explanation

S1 Specification S1 is the block address of the next digital input subscriber block.

S2 Specification S2 is the group identifier which must be unique for each input group defined. Up to four digital input subscribers can be grouped together. All subscribers in a group must have the same unique group identifier.

S3 Specification S3 is the subgroup number and its number of elements. Each digital input subscriber can handle up to eight inputs for a maximum of 32 inputs per group. For digital inputs, the number of elements is always eight. Performance is enhanced by grouping as many points together as possible.

Valid entries for specification S3 are defined in Table A-5. Any other values may cause problems between the MFP module and EDI module.

Table A-5. Digital Input Group

Subgroup Number (x)	Number of Elements (y)	S3 (xy)
0	8	08
1	8	18
2	8	28
3	8	38

S4 Specification S4 is the input type.

0 = digital
1 = digital with quality

S5 Specification S5 defines the Allen Bradley file type and file number in a format of xyyy.

where:

x — File type:
0 = binary
1 = input
2 = output

yyy — File number:
0 to 999 = binary file
000 = output file
001 = input file

Examples
Binary file at file number 100 = 100.
Input file = 1001.
Output file = 2000.

S6 Specification S6 defines the last two low order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of yyy.yyy.

Example IP address = 151.89.202.127. The last two bytes (202.127) convert to a binary equivalent of:

1100101001111111

The decimal equivalent is 51,839 which is the value to enter in S6.

S8 Specification S8 defines the scan class to request data. This field must be entered in binary format.

Scan class:

00 = 125 milliseconds
01 = 250 milliseconds
10 = 500 milliseconds
11 = 1 seconds

S9 Specification S9 defines the Allen Bradley element number (or register address); range is from 0 to 999.

ANALOG INPUT SUBSCRIBER (FC 186)

Table A-6. FC 186 Outputs

Blk	Type	Description
N	R	First analog input with quality
N+1	R	Second analog input with quality
N+2	R	Third analog input with quality
N+3	R	Fourth analog input with quality
N+4	R	Fifth analog input with quality
N+5	R	Sixth analog input with quality
N+6	R	Seventh analog input with quality
N+7	R	Eighth analog input with quality

Table A-7. FC 186 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	2	I	0 - 9998	Block address of next analog input subscriber block
S2	N	0.000	R	0 - 60000	Group identifier[1]
S3	N	0	I	01 - 38	Subgroup number (x) and number of elements (y): x = 0, 1, 2, or 3 y = 1 - 8 **x y Spec** 0 1 - 8 1 - 8 1 1 - 8 11 - 18 2 1 - 8 21 - 28 3 1 - 8 31 - 38
S4	N	0	I	0 - 3	Input type: 0 = analog real 1 = analog real with quality 2 = analog integer 3 = analog integer with quality
S5	N	0.000	R	Full	PLC-5 file type and file number in xyyy format. File type (x): 3 = integer 4 = floating 5 = BCD File number (yyy): 0 - 999
S6	N	0.000	R	Full	Last two bytes of the PLC device IP address
S7	N	00	I	0 or 1	Not used
S8	N	00	I	00, 01, 10, or 11	Scan class: 00 = 125 msec 01 = 250 msec 10 = 500 msec 11 = 1 sec
S9	Y	0.000	R	Full	PLC-5 element number: 0 - 999
S10	Y	0.000	R	Full	Spare
S11	Y	0.000	R	Full	Spare

NOTE:
1. The group identifier ***must*** be unique for each group.

Specifications Explanation

S1 Specification S1 is the block address of the next analog input subscriber block.

S2 Specification S2 is the group identifier which must be unique for each input group defined. Up to four analog input subscribers can be grouped together. All subscribers in a group must have the same unique group identifier.

NOTES:
1. All function codes in a group must use the same input type.

2. All function codes in a group must use the same storage type (i.e., file type).

S3 Specification S3 is the subgroup number and its number of elements. Each analog input subscriber can handle up to eight inputs for a maximum of 32 inputs per group. The number of elements can range from one to eight. Performance is enhanced by grouping as many points together as possible.

Valid entries for specification S3 are defined in Table A-8.

Table A-8. Analog Input Group

Subgroup Number (x)	Number of Elements (y)	S3 (xy)
0	1 - 8	1 - 8
1	1 - 8	11 - 18
2	1 - 8	21 - 28
3	1 - 8	31 - 38

S4 Specification S4 is the input type.

0 = analog real
1 = analog real with quality
2 = analog integer
3 = analog integer with quality

All analog real data (0 or 1) is interpreted as four-byte, IEEE float data between the MFP module and EDI module shared memory.

All analog integer data (2 or 3) received from the PLC is interpreted as two-byte, unsigned integer data with a range of 0 to 65,535.

S5 Specification S5 defines the Allen Bradley file type and file number in a format of xyyy.

where:

x	File type: 3 = integer 4 = floating 5 = BCD
yyy	File number: 0 to 999 = all file types

Examples
Integer file at file number 100 = 3100.
Float file at file number 100 = 4100.

S6 Specification S6 defines the last two low order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of yyy.yyy.

Example
IP address = 151.89.202.127. The last two bytes (202.127) convert to a binary equivalent of:

1100101001111111

The decimal equivalent is 51,839 which is the value to enter in S6.

S8 Specification S8 defines the scan class to request data. This field must be entered in binary format.

Scan class:

00 = 125 milliseconds
01 = 250 milliseconds
10 = 500 milliseconds
11 = 1 seconds

S9 Specification S9 defines the Allen Bradley element number (or register address); range is from 0 to 999.

ANALOG OUTPUT SUBSCRIBER (FC 187)

Table A-9. FC 187 Output

Blk	Type	Description
N	B	Quality of output

Table A-10. FC 187 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	2	I	0 - 9998	Block address of next analog output subscriber block
S2	N	0.000	R	0 - 60000	Group identifier[1]
S3	N	0	I	01 - 38	Subgroup number (x) and number of elements (y): x = 0, 1, 2, or 3 y = 1 - 8 **x y Spec** 0 1 - 8 1 - 8 1 1 - 8 11 - 18 2 1 - 8 21 - 28 3 1 - 8 31 - 38
S4	N	2	I	0 - 9998	Block address of output 1
S5	N	2	I	0 - 9998	Block address of output 2
S6	N	2	I	0 - 9998	Block address of output 3
S7	N	2	I	0 - 9998	Block address of output 4
S8	N	2	I	0 - 9998	Block address of output 5
S9	N	2	I	0 - 9998	Block address of output 6
S10	N	2	I	0 - 9998	Block address of output 7
S11	N	2	I	0 - 9998	Block address of output 8
S12	N	0	I	0 - 3	Output type: 0 = analog real 1 = analog real with quality 2 = analog integer 3 = analog integer with quality
S13	N	0.000	R	Full	PLC-5 file type and file number in xyyy format. File type (x): 3 = integer 4 = floating 5 = BCD File number (yyy): 0 - 999
S14	N	0.000	R	Full	Last two bytes of the PLC device IP address
S15	N	0	I	0 or 1	Aperiodic and periodic variable[2]: 0 = aperiodic variable 1 = periodic variable
S16	N	0	I	00, 01, 10 or 11	Nonstalled and stalled write: 0 = nonstalled 1 = stalled
S17	Y	0.000	R	Full	PLC-5 element number: 0 - 999
S18	Y	0.000	R	Full	Spare
S19	Y	0.000	R	Full	Spare

NOTES:
1. The group identifier ***must*** be unique for each group.
2. Periodic means MFP module will update the variable value at every execution cycle; aperiodic means the MFP module will update the variable only if it changes.

Specifications Explanation

S1 Specification S1 is the block address of the next analog output subscriber block.

S2 Specification S2 is the group identifier which must be unique for each output group defined. Up to four analog output subscribers can be grouped together. All subscribers in a group must have the same unique group identifier.

NOTES:
1. All function codes in a group must use the same input type.

2. All function codes in a group must use the same storage type (i.e., file type).

S3 Specification S3 is the subgroup number and its number of elements. Each analog output subscriber can handle up to eight outputs for a maximum of 32 outputs per group. The number of elements can range from one to eight. Performance is enhanced by grouping as many points together as possible.

Valid entries for specification S3 are defined in Table A-11.

Table A-11. Analog Output Group

Subgroup Number (x)	Number of Elements (y)	S3 (xy)
0	1 - 8	1 - 8
1	1 - 8	11 - 18
2	1 - 8	21 - 28
3	1 - 8	31 - 38

S4 through S11 Specifications S4 through S11 are the block addresses of outputs one through eight.

S12 Specification S12 is the output type.

0 = analog real
1 = analog real with quality
2 = analog integer
3 = analog integer with quality

If the PLC supports two byte signed integers (2 or 3), the EDI module (i.e., MFP module) can send negative two-byte signed integer values.

S13 Specification S13 defines the Allen Bradley file type and file number in a format of xyyy.

where:

x	File type: 3 = integer 4 = floating 5 = BCD
yyy	File number: 0 to 999 = all file types

Examples Integer file at file number 100 = 3100.
Float file at file number 100 = 4100.

S14 Specification S14 defines the last two low order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of yyy.yyy.

Example IP address = 151.89.202.127. The last two bytes (202.127) convert to a binary equivalent of:

1100101001111111

The decimal equivalent is 51,839 which is the value to enter in S14.

S15 Specification S15 is the periodic and aperiodic variable setting.

Periodic means that the MFP module will update the variable value at every MFP module execution cycle. Aperiodic means that the MFP module will update the variable value on an exception report basis (i.e., as the values change). This option reduces the number of network messages forwarded to the PLC. In either case, the EDI module reads and forwards the variable value each time the MFP module updates it.

S16 Specification S16 defines the stalled and nonstalled write options.

Stalled writes means that EDI module will delay sending data to the PLC on start-up of the EDI module, and during any reestablishment of communications with the PLC. This delay allows data alignment in the INFI 90 OPEN system to occur before any writes are forwarded to the PLC.

Nonstalled writes means that EDI module will ***not*** delay in sending data to the PLC on start-up of the EDI module, and during any reestablishment of communications with the PLC. This means that no time is allowed for data alignment to occur in the INFI 90 OPEN system.

S17 Specification S17 defines the Allen Bradley element number (or register address); range is from 0 to 999.

DIGITAL OUTPUT SUBSCRIBER (FC 188)

Table A-12. FC 188 Output

Blk	Type	Description
N	B	Quality of output

Table A-13. FC 188 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	2	I	0 - 9998	Block address of next digital output subscriber block
S2	N	0.000	R	0 - 60000	Group identifier[1]
S3	N	0	I	01 - 38	Subgroup number (x) and number of elements (y): x = 0, 1, 2, or 3 y = 8 **x y Spec** 0 8 8 1 8 18 2 8 28 3 8 38
S4	N	0	I	0 - 9998	Block address of output 1
S5	N	0	I	0 - 9998	Block address of output 2
S6	N	0	I	0 - 9998	Block address of output 3
S7	N	0	I	0 - 9998	Block address of output 4
S8	N	0	I	0 - 9998	Block address of output 5
S9	N	0	I	0 - 9998	Block address of output 6
S10	N	0	I	0 - 9998	Block address of output 7
S11	N	0	I	0 - 9998	Block address of output 8
S12	N	0	I	0 - 3	Output type: 0 = digital 1 = digital with quality
S13	N	0.000	R	Full	PLC-5 file type and file number in xyyy format. File type (x): 0 = binary 1 = input 2 = output File number (yyy): Binary file type = 0 - 999 Output file type = 000 Input file type = 001
S14	N	0.000	R	Full	Last two bytes of the PLC device IP address
S15	N	0	I	0 or 1	Aperiodic and periodic variable[2]: 0 = aperiodic variable 1 = periodic variable
S16	N	0	I	00, 01, 10 or 11	Nonstalled and stalled write: 0 = nonstalled 1 = stalled
S17	Y	0.000	R	Full	PLC-5 element number: 0 - 999
S18	Y	0.000	R	Full	Spare
S19	Y	0.000	R	Full	Spare

NOTES:
1. The group identifier ***must*** be unique for each group.
2. Periodic means MFP module will update the variable value at every execution cycle; aperiodic means the MFP module will update the variable only if it changes.

Specifications Explanation

S1 Specification S1 is the block address of the next digital output subscriber block.

S2 Specification S2 is the group identifier which must be unique for each output group defined. Up to four digital output subscribers can be grouped together. All subscribers in a group must have the same unique group identifier.

S3 Specification S3 is the subgroup number and its number of elements. Each digital output subscriber can handle up to eight outputs for a maximum of 32 outputs per group. For digital outputs, the number of elements is always eight. Performance is enhanced by grouping as many points together as possible.

Valid entries for specification S3 are defined in Table A-14. Any other values may cause problems between the MFP module and EDI module.

Table A-14. Digital Output Group

Subgroup Number (x)	Number of Elements (y)	S3 (xy)
0	8	08
1	8	18
2	8	28
3	8	38

S4 through S11 Specifications S4 through S11 are the block addresses of outputs one through eight.

S12 Specification S12 is the output type.

0 = digital
1 = digital with quality

S13 Specification S13 defines the Allen Bradley file type and file number in a format of xyyy.

where:

x — File type:
0 = binary
1 = input
2 = output

yyy — File number:
0 to 999 = binary file
000 = output file
001 = input file

Examples

Binary file at file number 100 = 100.
Input file = 1001.
Output file = 2000.

S14 Specification S14 defines the last two low order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of yyy.yyy.

Example

IP address = 151.89.202.127. The last two bytes (202.127) convert to a binary equivalent of:

1100101001111111

The decimal equivalent is 51,839 which is the value to enter in S14.

S15 Specification S15 is the periodic and aperiodic variable setting.

Periodic means that the MFP module will update the variable value at every MFP module execution cycle. Aperiodic means that the MFP module will update the variable value on an exception report basis (i.e., as the values change). This option reduces the number of network messages forwarded to the PLC. In either case, the EDI module reads and forwards the variable value each time the MFP module updates it.

S16 Specification S16 defines the stalled and nonstalled write options.

Stalled writes means that EDI module will delay sending data to the PLC on start-up of the EDI module, and during any reestablishment of communications with the PLC. This delay allows data alignment in the INFI 90 OPEN system to occur before any writes are forwarded to the PLC.

Nonstalled writes means that EDI module will ***not*** delay in sending data to the PLC on start-up of the EDI module, and during any reestablishment of communications with the PLC. This means that no time is allowed for data alignment to occur in the INFI 90 OPEN system.

S17 Specification S17 defines the Allen Bradley element number (or register address); range is from 0 to 999.

APPENDIX B - TRICONEX SYSTEMS PLC

INTRODUCTION

This appendix provides IMEDI01 module information necessary to interface to a Triconex Systems Tricon V6 PLC and higher (with Network Communications Module). Specifically, it describes the label information that identifies that the EDI module contains the Triconex Systems interface protocol. And it describes function code outputs and specifications. Refer to Section 4 for function code descriptions.

NOTES:

1. This appendix assumes familiarity with Triconex Systems controllers. It may be necessary to refer to Triconex Systems documentation for additional information when defining function code specifications.

2. Make sure that the Ethernet connection is to the NET2 port of the NCM module.

PROTOCOL IDENTIFICATION

A label should be affixed to the EDI module that identifies the interface protocol contained in the module. Additionally, the IMEDI01 utilities can be run to view the current interface protocol (i.e., firmware/protocol) installed. Refer to ***IMEDI01 UTILITIES*** in Section 6 for the procedures to run the utilities.

The Triconex Systems interface protocol will be identified as:

TRI 1.00 (or higher)

FACTORY INSTRUMENTATION PROTOCOL HANDLER (FC 184)

Table B-1. FC 184 Output

Blk	Type	Description
N	B	Module status: 0 = good 1 = bad
N+1	B	Not used; always good

Table B-2. FC 184 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	0	I	0 - 63	IMEDI01 module address
S2	N	0	I	0 - 63	Must be set to a value greater than 63
S3	N	2	I	0 - 9998	Block address of analog input subscriber block
S4	N	2	I	0 - 9998	Block address of digital input subscriber block
S5	N	2	I	0 - 9998	Block address of analog output subscriber block
S6	N	2	I	0 - 9998	Block address of digital output subscriber block
S7	N	2	I	0 - 9998	Reserved
S8	N	0	I	0 - 9998	Reserved
S9	N	0	I	0 - 1	Must be set to 1
S10	N	0	I	–32767 - 32767	First two bytes of PLC device IP address
S11	N	0	I	0 - 60000	Reserved
S12	N	0	I	0 - 60000	Reserved
S13	N	0	I	0 - 100	Not used
S14	Y	0.000	R	Full	Not used
S15	Y	1.0	R	0.0 - 255.0	Not used
S16	Y	0.000	R	Full	Spare

Specifications Explanation

S1 Specification S1 is the I/O expander bus address of the EDI module.

S2 Specification S2 is not used; it must be set to a value greater than 63.

S3 Specification S3 is the block address of the first analog input subscriber (function code 186).

S4 Specification S4 is the block address of the first digital input subscriber (function code 185).

S5 Specification S5 is the block address of the first analog output subscriber (function code 187).

S6 Specification S6 is the block address of the first digital output subscriber (function code 188).

S9 Specification S9 is not used; it must be set to 1.

S10 Specification S10 defines the first two high order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of xxx.xxx. If the decimal value is greater than the specification range, subtract 65,536 from the value and enter the negative result.

Example IP address = 151.89.202.127. The first two bytes (151.89) convert to a binary equivalent of:

100101111011001

The decimal equivalent is 38,745 which is greater than 32,767. In this case the value to enter in S10 is 32,767 – 65,536 = –26,791.

NOTE: The limits for class B and C networks are as follows:

B = 191.255.yyy.yyy (49,151 – 65,536 = –16,385)

C = 223.255.yyy.yyy (57,343 – 65,536 = –8,193)

DIGITAL INPUT SUBSCRIBER (FC 185)

Table B-3. FC 185 Outputs

Blk	Type	Description
N	B	First digital input with quality
N+1	B	Second digital input with quality
N+2	B	Third digital input with quality
N+3	B	Fourth digital input with quality
N+4	B	Fifth digital input with quality
N+5	B	Sixth digital input with quality
N+6	B	Seventh digital input with quality
N+7	B	Eighth digital input with quality

Table B-4. FC 185 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	2	I	0 - 9998	Block address of next digital input subscriber block
S2	N	0.000	R	0 - 60000	Group identifier[1]
S3	N	0	I	01 - 38	Subgroup number (x) and number of elements (y): x = 0, 1, 2, or 3 y = 8 **x y Spec** 0 8 8 1 8 18 2 8 28 3 8 38
S4	N	0	I	0 - 3	Input type: 0 = digital 1 = digital with quality
S5	N	0.000	R	Full	Tricon NCM (Network Communications Module) destination node number: 1 - 10
S6	N	0.000	R	Full	Last two bytes of the PLC device IP address
S7	N	00	I	0 or 1	Not used
S8	N	00	I	00, 01, 10, or 11	Scan class: 00 = 125 msec 01 = 250 msec 10 = 500 msec 11 = 1 sec
S9	Y	0.000	R	Full	Modbus alias address; message type (x) and point (yyyy): x = 0 - read/write discrete 1 - read only discrete 3 - read only register 4 - read/write register yyyy = 1 - 9999
S10	Y	0.000	R	Full	Spare
S11	Y	0.000	R	Full	Spare

NOTE:
1. The group identifier ***must*** be unique for each group.

Specifications Explanation

S1 Specification S1 is the block address of the next digital input subscriber block.

S2 Specification S2 is the group identifier which must be unique for each input group defined. Up to four digital input subscribers can be grouped together. All subscribers in a group must have the same unique group identifier.

S3 Specification S3 is the subgroup number and its number of elements. Each digital input subscriber can handle up to eight inputs for a maximum of 32 inputs per group. For digital inputs, the number of elements is always eight. Performance is enhanced by grouping as many points together as possible.

Valid entries for specification S3 are defined in Table B-5. Any other values may cause problems between the MFP module and EDI module.

Table B-5. Digital Input Group

Subgroup Number (x)	Number of Elements (y)	S3 (xy)
0	8	08
1	8	18
2	8	28
3	8	38

S4 Specification S4 is the input type.

0 = digital
1 = digital with quality

S5 Specification S5 defines the Tricon NCM (Network Communications Module) destination node number; range is from 0 to 10.

S6 Specification S6 defines the last two low order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of yyy.yyy.

Example IP address = 151.89.202.127. The last two bytes (202.127) convert to a binary equivalent of:

1100101001111111

The decimal equivalent is 51,839 which is the value to enter in S6.

S8 Specification S8 defines the scan class to request data. This field must be entered in binary format.

Scan class:

00 = 125 milliseconds
01 = 250 milliseconds
10 = 500 milliseconds
11 = 1 seconds

S9 Specification S9 is a five digit Modbus alias address in a format of xyyyy. The address contains a Modbus message type (x) and identifies a specific point within the Modbus message type (yyyy).

where:

x	Message type: 0 = read/write discrete 1 = read only discrete 3 = read only register 4 = read/write register
yyyy	Point: Range is from 1 to 9999.

ANALOG INPUT SUBSCRIBER (FC 186)

Table B-6. FC 186 Outputs

Blk	Type	Description
N	R	First analog input with quality
N+1	R	Second analog input with quality
N+2	R	Third analog input with quality
N+3	R	Fourth analog input with quality
N+4	R	Fifth analog input with quality
N+5	R	Sixth analog input with quality
N+6	R	Seventh analog input with quality
N+7	R	Eighth analog input with quality

Table B-7. FC 186 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	2	I	0 - 9998	Block address of next analog input subscriber block
S2	N	0.000	R	0 - 60000	Group identifier[1]
S3	N	0	I	01 - 38	Subgroup number (x) and number of elements (y): x = 0, 1, 2, or 3 y = 1 - 8 **x y Spec** 0 1 - 8 1 - 8 1 1 - 8 11 - 18 2 1 - 8 21 - 28 3 1 - 8 31 - 38
S4	N	0	I	0 - 3	Input type: 0 = analog real 1 = analog real with quality
S5	N	0.000	R	Full	Tricon NCM (Network Communications Module) destination node number: 1 - 10
S6	N	0.000	R	Full	Last two bytes of the PLC device IP address
S7	N	00	I	0 or 1	Not used
S8	N	00	I	00, 01, 10, or 11	Scan class: 00 = 125 msec 01 = 250 msec 10 = 500 msec 11 = 1 sec
S9	Y	0.000	R	Full	Modbus alias address; message type (x) and point (yyyy): x = 0 - read/write discrete 1 - read only discrete 3 - read only register 4 - read/write register yyyy = 1 - 9999
S10	Y	0.000	R	Full	Spare
S11	Y	0.000	R	Full	Spare

NOTE:
1. The group identifier ***must*** be unique for each group.

Specifications Explanation

S1 Specification S1 is the block address of the next analog input subscriber block.

S2 Specification S2 is the group identifier which must be unique for each input group defined. Up to four analog input subscribers can be grouped together. All subscribers in a group must have the same unique group identifier.

S3 Specification S3 is the subgroup number and its number of elements. Each analog input subscriber can handle up to eight inputs for a maximum of 32 inputs per group. The number of elements can range from one to eight. Performance is enhanced by grouping as many points together as possible.

Valid entries for specification S3 are defined in Table B-8.

Table B-8. Analog Input Group

Subgroup Number (x)	Number of Elements (y)	S3 (xy)
0	1 - 8	1 - 8
1	1 - 8	11 - 18
2	1 - 8	21 - 28
3	1 - 8	31 - 38

S4 Specification S4 is the input type.

0 = analog real
1 = analog real with quality

NOTE: Integer data is stored as 4-byte long in the PLC.

S5 Specification S5 defines the Tricon NCM (Network Communications Module) destination node number; range is from 0 to 10.

S6 Specification S6 defines the last two low order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of yyy.yyy.

Example IP address = 151.89.202.127. The last two bytes (202.127) convert to a binary equivalent of:

1100101001111111

The decimal equivalent is 51,839 which is the value to enter in S6.

S8 Specification S8 defines the scan class to request data. This field must be entered in binary format.

Scan class:

00 = 125 milliseconds
01 = 250 milliseconds
10 = 500 milliseconds
11 = 1 seconds

S9 Specification S9 is a five digit Modbus alias address in a format of xyyyy. The address contains a Modbus message type (x) and identifies a specific point within the Modbus message type (yyyy).

where:

x	Message type: 0 = read/write discrete 1 = read only discrete 3 = read only register 4 = read/write register
yyyy	Point: Range is from 1 to 9999.

ANALOG OUTPUT SUBSCRIBER (FC 187)

Table B-9. FC 187 Output

Blk	Type	Description
N	B	Quality of output

Table B-10. FC 187 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	2	I	0 - 9998	Block address of next analog output subscriber block
S2	N	0.000	R	0 - 60000	Group identifier[1]
S3	N	0	I	01 - 38	Subgroup number (x) and number of elements (y): x = 0, 1, 2, or 3 y = 1 - 8 **x y Spec** 0 1 - 8 1 - 8 1 1 - 8 11 - 18 2 1 - 8 21 - 28 3 1 - 8 31 - 38
S4	N	2	I	0 - 9998	Block address of output 1
S5	N	2	I	0 - 9998	Block address of output 2
S6	N	2	I	0 - 9998	Block address of output 3
S7	N	2	I	0 - 9998	Block address of output 4
S8	N	2	I	0 - 9998	Block address of output 5
S9	N	2	I	0 - 9998	Block address of output 6
S10	N	2	I	0 - 9998	Block address of output 7
S11	N	2	I	0 - 9998	Block address of output 8
S12	N	0	I	0 -3	Output type: 0 = analog real 1 = analog real with quality
S13	N	0.000	R	Full	Tricon NCM (Network Communications Module) destination node number: 1 - 10
S14	N	0.000	R	Full	Last two bytes of the PLC device IP address
S15	N	0	I	0 or 1	Aperiodic and periodic variable[2]: 0 = aperiodic variable 1 = periodic variable
S16	N	0	I	00, 01, 10 or 11	Nonstalled and stalled write: 0 = nonstalled 1 = stalled
S17	Y	0.000	R	Full	Modbus alias address; message type (x) and point (yyyy): x = 0 - read/write discrete 1 - read only discrete 3 - read only register 4 - read/write register yyyy = 1 - 9999
S18	Y	0.000	R	Full	Spare
S19	Y	0.000	R	Full	Spare

NOTES:
1. The group identifier ***must*** be unique for each group.
2. Periodic means MFP module will update the variable value at every execution cycle; aperiodic means the MFP module will update the variable only if it changes.

Specifications Explanation

S1 Specification S1 is the block address of the next analog output subscriber block.

S2 Specification S2 is the group identifier which must be unique for each output group defined. Up to four analog output subscribers can be grouped together. All subscribers in a group must have the same unique group identifier.

S3 Specification S3 is the subgroup number and its number of elements. Each analog output subscriber can handle up to eight outputs for a maximum of 32 outputs per group. The number of elements can range from one to eight. Performance is enhanced by grouping as many points together as possible.

Valid entries for specification S3 are defined in Table B-11.

Table B-11. Analog Output Group

Subgroup Number (x)	Number of Elements (y)	S3 (xy)
0	1 - 8	1 - 8
1	1 - 8	11 - 18
2	1 - 8	21 - 28
3	1 - 8	31 - 38

S4 through S11 Specifications S4 through S11 are the block addresses of outputs one through eight.

S12 Specification S12 is the output type.

0 = analog real
1 = analog real with quality

NOTE: Integer data is stored as 4-byte long in the PLC.

S13 Specification S13 defines the Tricon NCM (Network Communications Module) destination node number; range is from 0 to 10.

S14 Specification S14 defines the last two low order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of yyy.yyy.

Example IP address = 151.89.202.127. The last two bytes (202.127) convert to a binary equivalent of:

1100101001111111

The decimal equivalent is 51,839 which is the value to enter in S14.

S15 Specification S15 is the periodic and aperiodic variable setting.

Periodic means that the MFP module will update the variable value at every MFP module execution cycle. Aperiodic means that the MFP module will update the variable value on an exception report basis (i.e., as the values change). This option reduces the number of network messages forwarded to the PLC. In either case, the EDI module reads and forwards the variable value each time the MFP module updates it.

S16 Specification S16 defines the stalled and nonstalled write options.

Stalled writes means that EDI module will delay sending data to the PLC on start-up of the EDI module, and during any reestablishment of communications with the PLC. This delay allows data alignment in the INFI 90 OPEN system to occur before any writes are forwarded to the PLC.

Nonstalled writes means that EDI module will ***not*** delay in sending data to the PLC on start-up of the EDI module, and during any reestablishment of communications with the PLC. This means that no time is allowed for data alignment to occur in the INFI 90 OPEN system.

S17 Specification S17 is a five digit Modbus alias address in a format of xyyyy. The address contains a Modbus message type (x) and identifies a specific point within the Modbus message type (yyyy).

where:

x	Message type: 0 = read/write discrete 1 = read only discrete 3 = read only register 4 = read/write register
yyyy	Point: Range is from 1 to 9999.

DIGITAL OUTPUT SUBSCRIBER (FC 188)

Table B-12. FC 188 Output

Blk	Type	Description
N	B	Quality of output

Table B-13. FC 188 Specifications

Spec	Tune	Default	Type	Range	Description
S1	N	2	I	0 - 9998	Block address of next digital output subscriber block
S2	N	0.000	R	0 - 60000	Group identifier[1]
S3	N	0	I	01 - 38	Subgroup number (x) and number of elements (y): x = 0, 1, 2, or 3 y = 8 **x y Spec** 0 8 8 1 8 18 2 8 28 3 8 38
S4	N	0	I	0 - 9998	Block address of output 1
S5	N	0	I	0 - 9998	Block address of output 2
S6	N	0	I	0 - 9998	Block address of output 3
S7	N	0	I	0 - 9998	Block address of output 4
S8	N	0	I	0 - 9998	Block address of output 5
S9	N	0	I	0 - 9998	Block address of output 6
S10	N	0	I	0 - 9998	Block address of output 7
S11	N	0	I	0 - 9998	Block address of output 8
S12	N	0	I	0 - 3	Output type: 0 = digital 1 = digital with quality
S13	N	0.000	R	Full	Tricon NCM (Network Communications Module) destination node number: 1 - 10
S14	N	0.000	R	Full	Last two bytes of the PLC device IP address
S15	N	0	I	0 or 1	Aperiodic and periodic variable[2]: 0 = aperiodic variable 1 = periodic variable
S16	N	0	I	00, 01, 10 or 11	Nonstalled and stalled write: 0 = nonstalled 1 = stalled
S17	Y	0.000	R	Full	Modbus alias address; message type (x) and point (yyyy): x = 0 - read/write discrete 1 - read only discrete 3 - read only register 4 - read/write register yyyy = 1 - 9999
S18	Y	0.000	R	Full	Spare
S19	Y	0.000	R	Full	Spare

NOTES:
1. The group identifier ***must*** be unique for each group.
2. Periodic means MFP module will update the variable value at every execution cycle; aperiodic means the MFP module will update the variable only if it changes.

Specifications Explanation

S1 Specification S1 is the block address of the next digital output subscriber block.

S2 Specification S2 is the group identifier which must be unique for each output group defined. Up to four digital output subscribers can be grouped together. All subscribers in a group must have the same unique group identifier.

S3 Specification S3 is the subgroup number and its number of elements. Each digital output subscriber can handle up to eight outputs for a maximum of 32 outputs per group. For digital outputs, the number of elements is always eight. Performance is enhanced by grouping as many points together as possible.

Valid entries for specification S3 are defined in Table B-14. Any other values may cause problems between the MFP module and EDI module.

Table B-14. Digital Output Group

Subgroup Number (x)	Number of Elements (y)	S3 (xy)
0	8	08
1	8	18
2	8	28
3	8	38

S4 through S11 Specifications S4 through S11 are the block addresses of outputs one through eight.

S12 Specification S12 is the output type.

0 = digital
1 = digital with quality

S13 Specification S13 defines the Tricon NCM (Network Communications Module) destination node number; range is from 0 to 10.

S14 Specification S14 defines the last two low order bytes of the PLC device IP address. The IP address is in the format:

xxx.xxx.yyy.yyy

The specification is set to a decimal value derived from the binary equivalent of yyy.yyy.

Example IP address = 151.89.202.127. The last two bytes (202.127) convert to a binary equivalent of:

1100101001111111

The decimal equivalent is 51,839 which is the value to enter in S14.

S15 Specification S15 is the periodic and aperiodic variable setting.

Periodic means that the MFP module will update the variable value at every MFP module execution cycle. Aperiodic means that the MFP module will update the variable value on an exception report basis (i.e., as the values change). This option reduces the number of network messages forwarded to the PLC. In either case, the EDI module reads and forwards the variable value each time the MFP module updates it.

S16 Specification S16 defines the stalled and nonstalled write options.

Stalled writes means that EDI module will delay sending data to the PLC on start-up of the EDI module, and during any reestablishment of communications with the PLC. This delay allows data alignment in the INFI 90 OPEN system to occur before any writes are forwarded to the PLC.

Nonstalled writes means that EDI module will ***not*** delay in sending data to the PLC on start-up of the EDI module, and during any reestablishment of communications with the PLC. This means that no time is allowed for data alignment to occur in the INFI 90 OPEN system.

S17 Specification S17 is a five digit Modbus alias address in a format of xyyyy. The address contains a Modbus message type (x) and identifies a specific point within the Modbus message type (yyyy).

where:

x	Message type: 0 = read/write discrete 1 = read only discrete 3 = read only register 4 = read/write register
yyyy	Point: Range is from 1 to 9999.

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