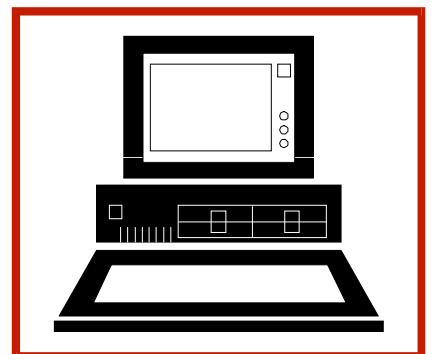
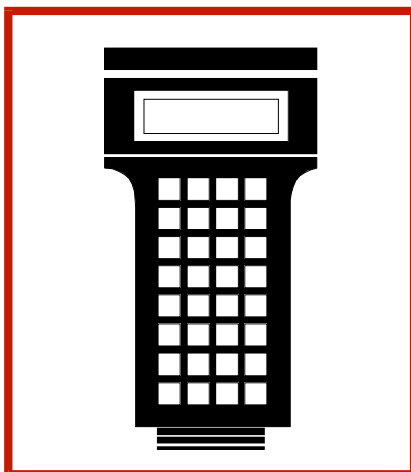
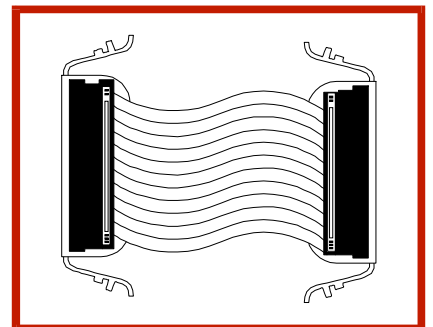
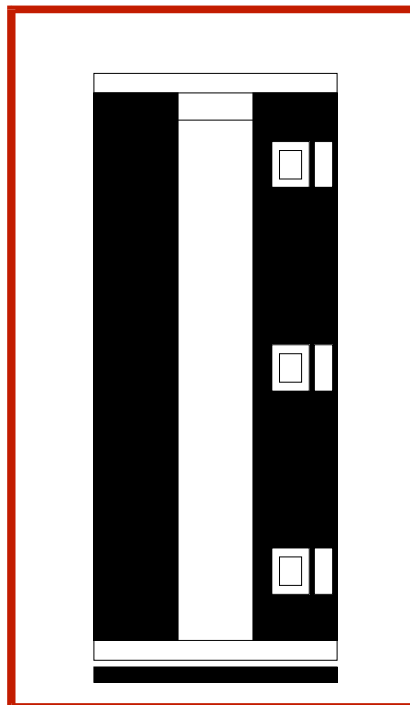
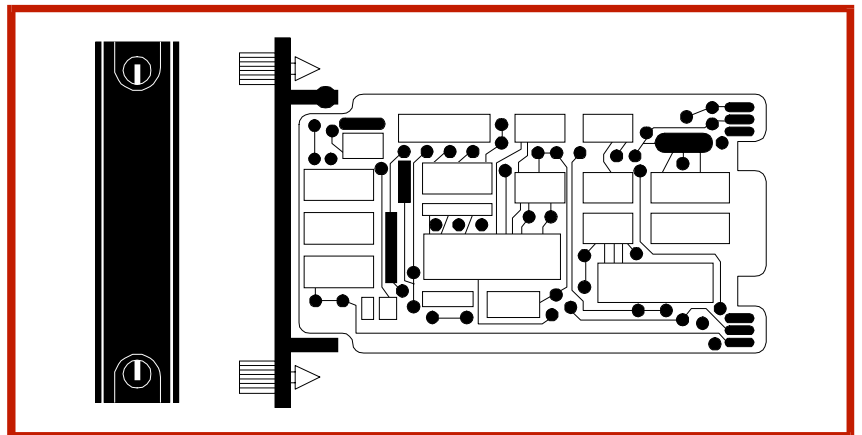
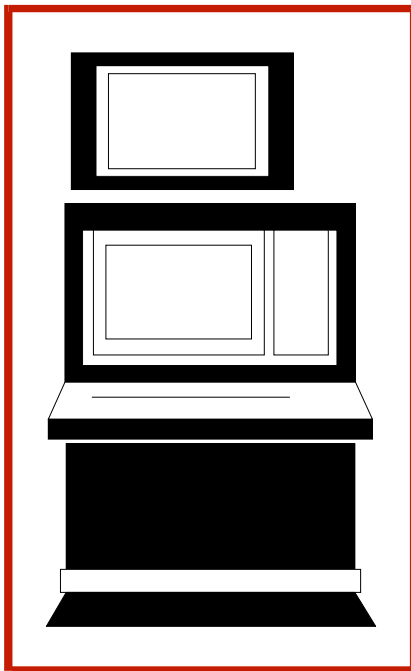


Bailey®
infi 90

Instruction

INFI-NET® to INFI-NET Interface Modules



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

INSTRUCTION MANUALS

DO NOT INSTALL, MAINTAIN, OR OPERATE THIS EQUIPMENT WITHOUT READING, UNDERSTANDING, AND FOLLOWING THE PROPER **Elsag Bailey** INSTRUCTIONS AND MANUALS; OTHERWISE, INJURY OR DAMAGE MAY RESULT.

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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 INFI-NET to INFI-NET interface modules provide communication links between two local or two remote INFI-NET communication loops. All INFI-NET to INFI-NET interface modules are directly upward compatible to existing Superloop interfaces.

The INNISO1 Network Interface Slave (NIS) is the front end of every INFI-NET interface. It provides the intelligent link between a node and an INFI-NET loop. An INFI-NET to INFI-NET transfer module and one or more NIS modules make up a specific node of an INFI-NET to INFI-NET interface. Each loop of the communication system (central and satellite loop) requires an INIIR01 INFI-NET to INFI-NET Remote Interface consisting of one NIS module and one INIIT12 INFI-NET to INFI-NET Transfer Module. Two NIS modules and one INIIT03 INFI-NET to INFI-NET Transfer Module make up an INIIL02 INFI-NET to INFI-NET Local Interface. The INIIL02 local interface supersedes and replaces the INIIL01 local interface. Termination devices and cables are required for both interfaces.

This instruction explains INFI-NET to INFI-NET interface module features, specifications and operation. It includes installation, troubleshooting, maintenance and replacement procedures for each module.

List of Effective Pages

Total number of pages in this instruction is 94, consisting of the following:

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iii through x	Original
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2-1 through 2-7	Original
3-1 through 3-25	Original
4-1 through 4-9	Original
5-1 through 5-8	Original
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B-1 through B-2	Original
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D-1 through D-4	Original
E-1 through E-5	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.

Special Handling

This module uses electrostatic sensitive devices.

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. 3-13, 3-15, 3-24)

Never clean electrical parts or components with live power present. Doing so exposes you to an electrical shock hazard. (p. 6-1)

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. 6-1)

SPECIFIC CAUTIONS

Always operate the IIT module with the machine fault timer circuit enabled. Unpredictable module outputs may result if the machine fault timer circuit is disabled. These unpredictable module outputs may adversely affect the entire communication system. (p. 3-9, 3-21)

To avoid potential module damage, evaluate your system for compatibility prior to module installation. This module uses connections to the module mounting unit backplane that served other functions in early Network 90 systems. (p. 3-11, 3-22)

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SECTION 1 - INTRODUCTION

INTRODUCTION

INFI-NET is a unidirectional, high speed serial data highway shared by all INFI 90[®] OPEN nodes. The INFI-NET to INFI-NET interface modules provide sophisticated interfaces for data exchange between nodes on an INFI-NET communication network. These network interface units use state-of-the-art INFI 90 OPEN modules.

INTENDED USER

Anyone who installs, operates or performs maintenance on the INFI-NET to INFI-NET interfaces should read this manual before placing an interface into service. Installation requires an engineer or technician with experience handling electronic circuitry and who is familiar with communication networks.

INTERFACE DESCRIPTION

The INFI-NET to INFI-NET interfaces are the INIIR01 INFI-NET to INFI-NET Remote Interface and the INIIL02 INFI-NET to INFI-NET Local Interface. The INNIS01 Network Interface Slave Module is the front end of the INFI-NET to INFI-NET interfaces. It is the intelligent link between a node and the INFI-NET loop. The network interface slave (NIS) module and an INFI-NET to INFI-NET transfer module create a specific node interface.

INFI-NET to INFI-NET Remote Interface

The INIIR01 INFI-NET to INFI-NET Remote Interface is made up of the NIS module and the INIIT12 INFI-NET to INFI-NET Transfer Module. This interface is a node on a central loop that can communicate to an interface node on a remote satellite loop (two interfaces are required, refer to Figure 1-1). Bidirectional communication from the central loop to the remote satellite loop is through standard RS-232-C ports. The INFI-NET to INFI-NET remote interface can support hardware redundancy. Refer to [Appendix E](#) for information on hardware redundancy.

This interface transfers system data, control and configuration messages, and exception reports between the central and remote INFI-NET loops. Many of the operating characteristics of the INIIT12 module are determined by specifications in the INIIT12 executive block (function code 202). These specifications are configurable to fit the needs of the application.

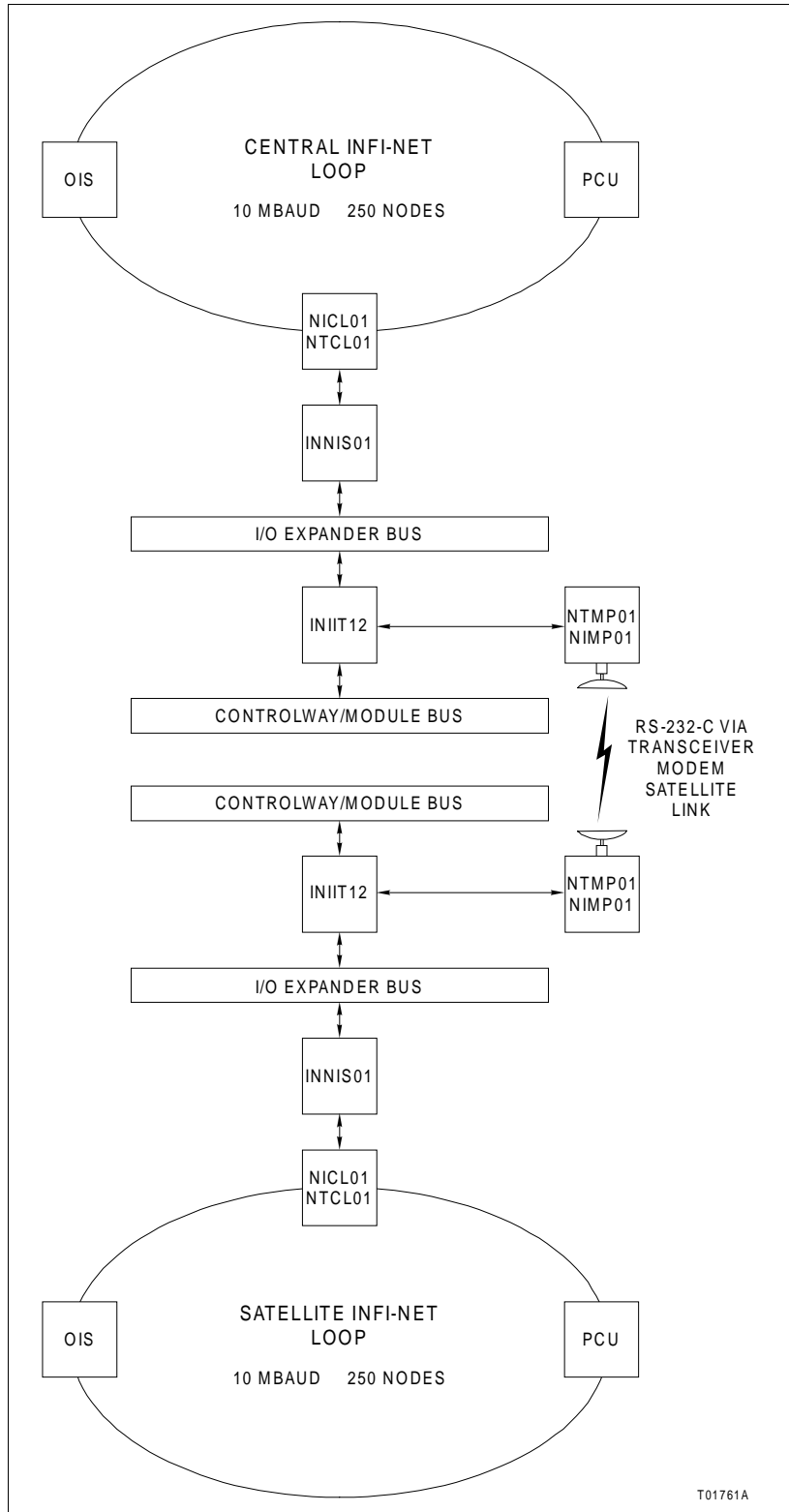


Figure 1-1. INFI-NET to INFI-NET Remote Interface

INFI-NET to INFI-NET Local Interface

The INIIL02 INFI-NET to INFI-NET Local Interface is made up of two NIS modules and the INIIT03 INFI-NET to INFI-NET Transfer Module.

This interface provides a communication path between a central INFI-NET loop and a local satellite INFI-NET loop (Figure 1-2). The maximum distance between termination

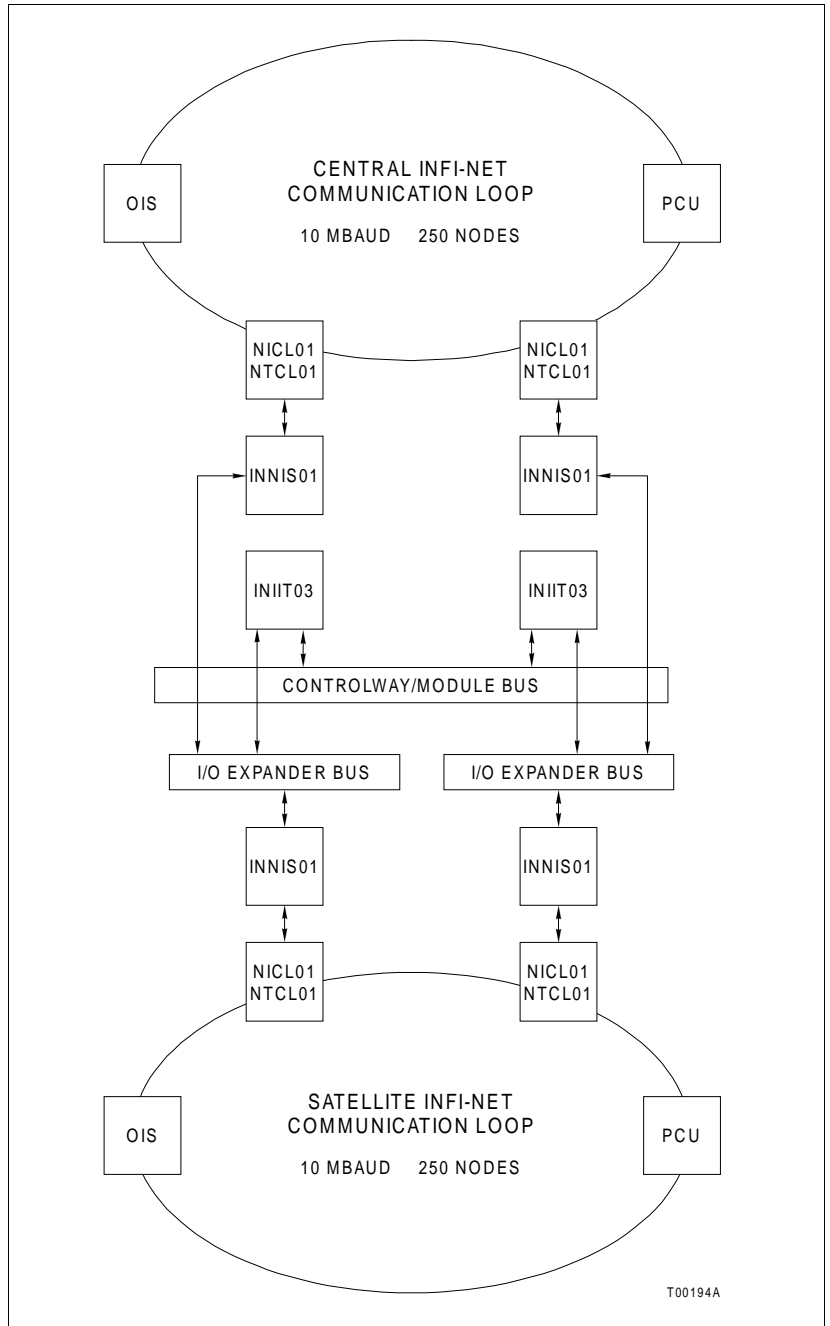


Figure 1-2. INFI-NET to INFI-NET Local Interface

units on the two communication loops is 45.8 meters (150 feet). Bidirectional communication from the central communication loop is through cable connection to the NTCL01 Communication Termination Unit or NICL01 Communication Termination Module.

This interface transfers system data, control and configuration messages, and exception reports between two INFI-NET communication networks. The INFI-NET to INFI-NET local interface can support hardware redundancy.

MODULE DESCRIPTION

Network Interface Slave Module

The NIS module works in conjunction with the INFI-NET to INFI-NET transfer modules. This allows any node to communicate with any other node within the INFI-NET system.

The NIS module is a single printed circuit board that occupies one slot in the module mounting unit (MMU). The circuit board contains microprocessor based communication circuitry that enables it to interface with the INFI-NET to INFI-NET transfer modules via the I/O expander bus. Both the INFI-NET to INFI-NET interfaces require a specific interface module and an NIS module (the INIIL02 module requires two NIS modules).

Two captive latches on the front-mounted faceplate secure the module to the MMU card cage. There are 16 LEDs on the faceplate that display error codes or event/error counts.

Each NIS module connects to its INFI-NET communication loop by a cable connected to an NTCL01 Communication Termination Unit or NICL01 Communication Termination Module. Communication between nodes is through coax or twinax cables that connect the termination units or modules on each node. Power and I/O expander bus connections follow the same connector assignments common to most INFI 90 OPEN modules (P1 for power, P2 for I/O expander bus).

INIIT12 INFI-NET to INFI-NET Transfer Module

The INIIT12 INFI-NET to INFI-NET Transfer Module supports bidirectional communication through two RS-232-C ports. Port one passes system data only. Port two passes system data or can be used as a diagnostic port. The central INIIT12 module can use a variety of means to link to the satellite INIIT12 module such as modems, microwave and transceivers. The INIIT12 module communicates directly with an NIS module through the I/O expander bus.

The INIIT12 module is a single printed circuit board that occupies one slot in the module mounting unit, adjacent to its NIS

module. The circuit board contains the serial communication circuitry necessary for it to communicate with another INIIT12 module.

Two captive latches on the INIIT12 faceplate secure the module in the MMU card cage. The faceplate contains eight CPU LEDs, a red/green status LED, and a stop/reset switch.

Interface termination is through a cable connection between P3 of the INIIT12 module and an NTMP01 Multi-Function Processor Termination Unit or NIMP01 Multi-Function Processor Termination Module. INIIT12 module power and I/O expander bus connections follow the same connector assignments common to most INFI 90 OPEN modules (P1 for power, P2 for I/O expander bus).

INIIT03 INFI-NET to INFI-NET Transfer Module

The INIIT03 INFI-NET to INFI-NET Transfer Module serves as the link between two local INFI-NET communication loops. It holds the node database and is responsible for transferring all messages between loops. Messages include exception reports, configuration data, control data and system status. This module communicates directly with the NIS module on each loop of the interface.

The INIIT03 module consists of one printed circuit board that occupies one slot in the module mounting unit. The circuit board contains the circuitry necessary for it to pass communication from the central communication loop to the satellite communication loop.

Two captive latches on the INIIT03 module faceplate secure the module in the module mounting unit. The faceplate contains 16 CPU LEDs, a red/green status LED, and a stop/reset switch.

FEATURES

- INFI-NET provides a plantwide communication network. INFI-NET time synchronizes the control process plantwide.
- Each node can operate independently of other INFI-NET nodes. INFI-NET communication modules provide localized start-up/shutdown on power failure without operator intervention.
- Response time is fast. The ten-megabaud loop communication rate gives timely information exchange.
- The INFI-NET interface modules handle four message types: Broadcast, time synchronization, multicast and NIS

poll. All messages contain cyclic redundancy check codes (CRC) and checksums to insure data integrity.

INSTRUCTION CONTENT

This manual provides introductory, installation, operation, troubleshooting and maintenance information. Read and understand this document before placing the communication system into service.

Introduction	Provides an overview of the interfaces and modules, description of hardware, glossary of unique terms, reference documentation, and physical and electrical specifications.
Description and Operation	Explains how key parts of the system operate.
Installation	Covers handling, inspection, location and safety considerations, and explains how to set up module dipswitches and install the interfaces before placing them in operation.
Operating Procedures	Explains how to start up and use the interfaces and individual controls.
Troubleshooting	Contains error indications, corrective actions, problem determination and verification.
Maintenance	Provides guidelines to assist in establishing a preventive maintenance program.
Repair/Replacement Procedures	Provides procedures for user repair and replacement.
Support Services	Contains replacement parts, warranty policy and customer training.
Appendices	Contain quick reference material, information on termination unit or module configurations, and how to set up redundant interfaces.

HOW TO USE THIS MANUAL

Read this manual in sequence. To get the best use of this manual, read it from cover to cover, then go back to specific sections.

1. Do the steps in **Section 3**.
2. Read **Section 4** thoroughly before powering up the system.
3. Refer to **Section 5** for what to do if a problem occurs.

4. Refer to **Section 6** for scheduled maintenance requirements.
5. Read **Section 7** if system repair or replacement is needed.
6. Refer to **Section 8** for ordering information, training and documentation.

REFERENCE DOCUMENTS

Table 1-1 lists documents with additional information that is related to the INFI-NET to INFI-NET interfaces.

Table 1-1. Reference Documents

Document Number	Title
I-E96-200	Function Code Application Manual
I-E96-309	Digital Slave I/O Module (IMDSM05)
I-E96-310	Digital Slave Output Module (IMDSO01/02/03)
I-E96-313	Digital Slave Output Module (IMDSO04)
I-E96-401	Multi-Function Processor Termination Module (NIMP01/02)
I-E96-408	Communication Termination Module (NICL01)
I-E96-422	Communication Termination Unit (NTCL01)
I-E96-428	Multi-Function Processor Termination Unit (NTMP01)

NOMENCLATURE

Table 1-2 lists nomenclatures associated with the INFI-NET to INFI-NET interfaces.

Table 1-2. Nomenclature

Nomenclature	Description
IEMMU01/02	Module mounting unit
IEMMU11/12/21/22	Module mounting unit
IMDSM05	Digital slave I/O module
IMDSO01	Digital slave output module
IMDSO02	Digital slave output module
IMDSO03	Digital slave output module
IMDSO04	Digital slave output module
INIIL02	INFI-NET to INFI-NET local interface
INIIR01	INFI-NET to INFI-NET remote interface
INIIT12	INFI-NET to INFI-NET transfer module (remote)
INIIT03	INFI-NET to INFI-NET transfer module (local)
INNIS01	Network interface slave module
NFTP01	Field termination panel

Table 1-2. Nomenclature (continued)

Nomenclature	Description
NICL01	Communication termination module
NIMP01	Multi-function processor termination unit
NKLS01	Termination cable, INNIS01 to NTCL01 (PVC)
NKLS02	Termination cable, INNIS01 to NICL01 (PVC)
NKLS11	Termination cable, INNIS01 to NTCL01 (non-PVC)
NKLS12	Termination cable, INNIS01 to NICL01 (non-PVC)
NKMR02	RS-232-C cable, DB9 to DB25
NKTM01	Termination module cable, INIIT12 to NIMP01 (PVC)
NKTU01	Termination unit cable, INIIT12 to NTMP01 (PVC)
NKTU02	Termination module cable, INIIT12 to NIMP01 (PVC)
NKTU11	Termination unit cable, INIIT12 to NTMP01 (non-PVC)
NKTU12	Termination module cable, INIIT12 to NIMP01 (non-PVC)
NTCL01	Communication termination unit
NTDI01	Digital I/O termination unit
NTMP01	Multi-function processor termination unit
NTMU01	Termination mounting unit, rear mount
NTMU02	Termination mounting unit, front mount

DOCUMENT CONVENTIONS

The ? in a nomenclature or a part number indicates a variable for that position (e.g., IMMFP1?).

GLOSSARY OF TERMS AND ABBREVIATIONS

Table 1-3 lists definitions of terms used in this manual.

Table 1-3. Glossary of Terms and Abbreviations

Term	Definition
ACK	Acknowledge. Destination node received message.
Controlway	High-speed, redundant, peer-to-peer communication link. Used to transfer information between intelligent modules within a process control unit.
Exception Report	Information update generated when the status or value of a point changes by more than a specified significant amount; abbreviated as XR.
MMU	Module mounting unit. A card cage that provides electrical and communication support for INFI 90 OPEN/Network 90® modules.
NAK	Negative acknowledge. Destination node did not receive message, or error occurred.
Node	A point of interconnection to a network.
NVRAM	Nonvolatile random access memory. Memory that retains stored information when power is removed.

Table 1-3. Glossary of Terms and Abbreviations (continued)

Term	Definition
Termination Module	Provides input/output connection between plant equipment and the INFI 90 OPEN/Network 90 modules.
Termination Unit	Provides input/output connection between plant equipment and the INFI 90 OPEN/Network 90 modules.

SPECIFICATIONS

Table 1-4 contains INFI-NET to INFI-NET interface module specifications.

Table 1-4. Specifications

Property	Characteristic/Value												
INNIS01 module													
Power requirements	<table border="1"> <thead> <tr> <th>Voltage (VDC)</th> <th>Current (mA)</th> <th>Power (W)</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>900</td> <td>4.5</td> </tr> <tr> <td>+ 15</td> <td>5</td> <td>0.075</td> </tr> <tr> <td>- 15</td> <td>200</td> <td>3.0</td> </tr> </tbody> </table>	Voltage (VDC)	Current (mA)	Power (W)	5	900	4.5	+ 15	5	0.075	- 15	200	3.0
Voltage (VDC)	Current (mA)	Power (W)											
5	900	4.5											
+ 15	5	0.075											
- 15	200	3.0											
Memory	128 kbytes processor RAM 80 kbytes other RAM 64 kbytes processor ROM												
Communication rates	2 Mbaud or 10 Mbaud												
System capability	62,500 system nodes, 250 nodes per loop												
Mounting	Occupies one slot in a standard INFI 90 OPEN module mounting unit												
INIIT12 module													
Power requirements	<table border="1"> <thead> <tr> <th>Voltage (VDC)</th> <th>Current (mA)</th> <th>Power (W)</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>2</td> <td>10</td> </tr> </tbody> </table>	Voltage (VDC)	Current (mA)	Power (W)	5	2	10						
Voltage (VDC)	Current (mA)	Power (W)											
5	2	10											
Memory	256 kbytes ROM 512 kbytes RAM 256 kbytes NVRAM												
Ports	2 full duplex serial EIA standard RS-232-C												
Communication rates	75 to 19,200 baud (user-selectable)												
Mounting	Occupies one slot in a standard INFI 90 OPEN module mounting unit												
INIIT03 module													
Power requirements	<table border="1"> <thead> <tr> <th>Voltage (VDC)</th> <th>Current (mA)</th> <th>Power (W)</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>2</td> <td>10</td> </tr> </tbody> </table>	Voltage (VDC)	Current (mA)	Power (W)	5	2	10						
Voltage (VDC)	Current (mA)	Power (W)											
5	2	10											
Memory	2 Mbytes RAM 512 kbytes ROM												
Mounting	Occupies one slot in a standard INFI 90 OPEN module mounting unit												

Table 1-4. Specifications (continued)

Property	Characteristic/Value
All INFI-NET interface modules	
Electromagnetic/radio frequency interference	Values are not available at this time. Keep cabinet doors closed. Do not use communication equipment any closer than 2 meters from the cabinet.
Ambient temperature	0° to 70°C (32° to 158°F)
Relative humidity	0% to 95% up to 55°C (131°F) noncondensing 0% to 45% above 55°C (131°F) noncondensing
Atmospheric pressure	Sea level to 3 km (1.86 mi)
Air quality	Noncorrosive
Certification	All INFI-NET interface modules are CSA certified for use as process control equipment in an ordinary (nonhazardous) environment.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

SECTION 2 - DESCRIPTION AND OPERATION

INTRODUCTION

INFI-NET is a unidirectional, high-speed serial data highway that all INFI 90 OPEN nodes share. The INNIS01 Network Interface Slave Module and the INIIT12 INFI-NET to INFI-NET Transfer Module make up an INIIR01 INFI-NET to INFI-NET Remote Interface. Two network interface slave (NIS) modules and the INIIT03 INFI-NET to INFI-NET Transfer Module make up an INIIL02 INFI-NET to INFI-NET Local Interface. This section of the product instruction provides an overview of INFI-NET interface module operating theory.

MODULE INTEGRITY

All INFI-NET communication modules have normal INFI 90 OPEN security functions that insure module integrity. Module hardware checks for illegal addresses, and monitors the machine fault timer and the I/O expander bus clock. If a module detects an illegal address, it generates a bus error and displays an error code on the faceplate LEDs. If the processor fails to reset the machine fault timer, it expires. When the machine fault timer expires, the communication module stops and the status LED turns red. Module hardware also monitors the I/O expander bus clock. If there is no clock signal, the module hardware generates an interrupt causing the module to stop.

NIS MODULE

The NIS module interfaces both the INIIT12 and INIIT03 transfer modules to an INFI-NET loop. The NIS module operates with each type of transfer module in the same manner.

Messages

The NIS module processes four different message types: Broadcast, time synchronization, multicast and NIS poll.

BROADCAST

A node generates a broadcast message when sending information to all system nodes. Typically, these messages announce changes in node status. Broadcast messages include node online, node offline, node restart and node busy.

TIME SYNCHRONIZATION

The time synchronization message is a high priority broadcast type of message. The NIS module services this message type immediately. Time synchronization provides a common system time base for sequencing exception reports, and accessing trend data for display on a system console.

MULTICAST

A message that contains data for multiple destinations is a multicast message. This message can have one to 64 destinations.

NIS POLL

The NIS poll is a single destination message. The NIS module uses this message type to poll the operational status of another node.

Message Format

Messages exist as frames of information. Each frame consists of a message control field that follows an information field. The information field contains the message data. It can consist of multiple messages and vary in size to a maximum of 1,500 bytes. The control field contains time of origination, source node message sequence number, source node number, size, circulation count, message type, destinations and checksum.

The NIS module increments the circulation count field of all incoming messages. When a message count field reaches 256, the message is discarded. This is useful in keeping retry and spurious message traffic to a minimum. The NIS module uses the message type to determine how to process the message. The checksum and CRC fields verify data integrity.

Message Transmission

Any NIS module can transmit a message at any time regardless of the activities of other NIS modules on the system. Each NIS module can transmit and receive messages simultaneously. NIS module start-up and shutdown is local and requires no interaction with other NIS modules on the INFI-NET loop. Each NIS module receives all incoming messages and transmits a new stream of messages in a store and forward fashion to the next node. When there are no messages for the NIS module to transmit, the NIS module transmits flag characters (null packets) as the loop synchronizing condition to keep the receivers in lock.

NIS MODULE DATA INTEGRITY

Retry Logic

If, on the first message transmission, the NIS module does not receive an acknowledge (ACK) or busy negative acknowledge (NAK) from the destination node, it transmits the message again up to 11 times. If, after this series of retries, there is still no response, the destination node is marked off-line and the NIS module informs the transfer module of the negative acknowledge.

Node Status Table

The NIS module maintains an internal table of system-wide status such as off-line and busy nodes. The NIS module relays node status changes to the transfer module. When the NIS module periodically polls nodes, it updates this table accordingly.

Polling

The NIS module uses the information in its status table for polling purposes. As it scans the status table, it picks out destinations targeted for multicast messages that have been marked off-line or busy. After polling the destination, the NIS module updates its table and forwards pertinent information to the transfer module.

INIIT12 INFI-NET TO INFI-NET TRANSFER MODULE

The INIIT12 module passes exception reports, and control and configuration data between the central INFI-NET loop and a satellite INFI-NET loop. Operation of the interface is transparent to the user. The INIIT12 modules take the responsibility of retrying failed messages and informing the original source of any failure. Other INFI-NET communication modules interact with the INIIT12 module within the node status protocol rules of INFI-NET. The interface generates on-line, off-line and busy status for nodes on other loops and tracks node status for every node on the local loop.

Blown Fuse Detection

The INIIT12 module can detect a blown fuse on the loop termination unit or module. If the loop termination unit or module blows a fuse, or power is removed from the loop termination unit or module, the INIIT12 module status LED turns red and CPU LEDs three through six turn on. This feature is available only on NIS modules with firmware revision E.1 or later and INIIT12 modules with firmware revision B.1 or later.

Exception Reporting

The INIIT12 module maintains a database of all points that send or receive exception reports to or from the remote loop. The INIIT12 database contains specifications for each point that helps the INIIT12 module sort and package requests from other points more efficiently. The interface generates a report for all destinations every time it receives an exception report from a point. The INIIT12 module does not monitor the data in the exception report. Each node is responsible for verifying any information it receives in an exception report. The INIIT12 module monitors nodes for their status (off-line, on-line, busy).

Control and Configuration Messages

Control and configuration messages do not require a database within the INIIT12 module. The interface simply passes these messages through to their destination (unless they are destined for the transfer module). The messages are placed in a circular buffer through which they pass to the remote loop.

Status Reporting

The INIIT12 module will report its own status. Exception reporting for status occurs whenever there is a change in status or every 60 seconds if no change occurs.

OPERATION OF SERIAL DATA CHANNELS

Command and data transfers between INIIR01 interfaces are via asynchronous RS-232-C channels. These channels operate in half or full duplex modes at 75 to 19,200 baud using eight-bit characters and various combinations of parity and stop bits.

Messages passed across the serial data channels are formatted in proprietary message formats optimized for transfer of INFI-NET data. A sliding window acknowledge protocol is used wherein each end of the INIIR01 interface can have several messages outstanding that are acknowledged in sequential order by the opposite side. Messages are automatically retried until they are received correctly and acknowledged by the opposite end.

INIIT12 COMMUNICATION PROTOCOL

The INIIT12 communication protocol consists of two layers:

- Link control layer.
- Application layer.

The link control layer is a sequenced delivery system with positive acknowledgment and automatic repeat request for error

recovery. The INFI 90 OPEN application layers in both the central and satellite loop INIIT12 modules use the link control layer to transport control and configuration information and exception reports.

Framing

The INIIT12 module uses message framing to help it track data bytes that pass through the asynchronous communication link. The receiving INIIT12 module looks for a one-byte synchronization character at the start of every transmission. Once it recognizes the synchronization character, it looks at a byte count field in each message to determine the framing of successive messages.

Sequence Control

All messages have a sequence number. The transmitting and receiving communication modules use the sequence number to keep track of outstanding, lost and bad messages.

Line Control

Line control limits the transmission time of each INIIT12 module when they are in the half duplex mode. There are two limits: The window of outstanding sequenced messages and the maximum transmission time set by executive block specifications S5 and S6. When the transmitting module reaches one of the limits (or has no more data to send), it flags the last message in the transmission. When the receiving module sees this flag it can then start a transmission sequence of its own. If the transfer modules are in the full duplex mode they do not use line control; they can transmit independently of each other.

When external communication equipment (i.e., transceiver) is used and the INIIT12 module is operating in half duplex mode, the INIIT12 module requires a digital I/O module to provide a switching signal to the communication equipment. A digital I/O module is also required for systems that have redundant external communication equipment (refer to Figure E-1).

Error Detection and Recovery

A 16-bit cyclic redundancy check (CRC) code assures the integrity of each transmission. The transfer module uses an automatic repeat request to recover from errors. The receiving INIIT12 module notifies the sending INIIT12 module of the last sequence number it receives. The sending module then knows which message packets to resend.

Start-Up Control

If either INIIT12 module is restarted, it sends a message to the other INIIT12 module so that it can take the steps needed to synchronize itself with the restarted transfer module.

Redundancy

Redundancy requires a full set of duplicate modules (two INNIS01 modules and two INIIT12 modules on each loop). The secondary transfer module continuously monitors the primary. A flavor occurs when the secondary IIT module detects a primary module failure on Controlway. When this happens, the secondary interface takes over and the primary interface is taken off-line.

INIIT03 INFI-NET TO INFI-NET TRANSFER MODULE

The INIIT03 module passes exception reports, and control and configuration data between a central INFI-NET loop and a satellite INFI-NET loop that have termination points within 150 feet of each other. Operation of the interface is transparent to the user.

Blown Fuse Detection

The INIIT03 module can detect a blown fuse on the loop termination unit or module. If the loop termination unit or module blows a fuse, or power is removed from the loop termination unit or module, the INIIT03 module status LED turns red and CPU LEDs three through six turn on. This feature requires an NIS module with firmware revision E.1 or later.

Data Flow

When an NIS module receives a message, it determines the destination of the message (in or out of its loop). If the message has a destination on the other side of the INIIL02 interface or the interface node itself is a destination, then the NIS module acknowledges the message and notifies the INIIT03 module (through the I/O expander bus) that there is an incoming message. The INIIT03 module transfers the message from the NIS module. If the received message contains exception reports, these are stored in its exception report database. The interface packages exceptions to a common destination for transmission, thus minimizing traffic through the interface.

When the local interface transmits a message it waits for acknowledgment from the destination node. If it does not receive an acknowledge (ACK) or busy negative acknowledge (NAK), the NIS module initiates retries. The NIS module attempts up to 11 retries before it marks a node that does not

respond as node off-line (NOL). Some messages, such as control and configuration messages, pass through the INIIT03 module unchanged and the original source of the message is responsible for retrying them.

The local interface notifies the message source node when there is a destination node off-line. It is then the responsibility of the message source to refrain from sending messages to off-line nodes.

Redundancy

Redundancy requires a full set of duplicate modules (four INNIS01 modules and two INIIT03 modules). The secondary transfer module continuously monitors the primary. A failover occurs when the secondary IIT detects a primary module failure on Controlway. When this happens, the secondary assumes responsibility and the primary is taken off-line. The new primary INIIT03 module brings its NIS modules on-line.

SECTION 3 - INSTALLATION

INTRODUCTION

This section covers the proper handling of devices susceptible to electrostatic discharge, dipswitch and jumper settings, and termination unit or module installation. Follow the steps in this section to install and prepare a specific interface for operation.

SPECIAL HANDLING

The INFI-NET to INFI-NET interface modules have components that are sensitive to electrostatic discharge. Follow these handling procedures:

NOTE: Always use Eltag Bailey's field static kit (part number 1948385?1 - consisting of two wrist straps, ground cord assembly, alligator clip, and static dissipative work surface) when working with the modules. The kit grounds a technician and the static dissipative work surface to the same ground point to prevent damage to the modules by electrostatic discharge.

1. **Use Static Shielding Bag.** Keep the modules in the static shielding bag until you are ready to install them in the system. Save the bag for future use.
2. **Ground Bag Before Opening.** Before opening a bag containing an assembly with semiconductors, touch it to the equipment housing or a ground to equalize charges.
3. **Avoid Touching Circuitry.** Handle assemblies by the edges; avoid touching the circuitry.
4. **Avoid Partial Connection of Semiconductors.** 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 module 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 on the power entry panel must be effectively connected to the earth grounding electrode system through the AC safety ground.
8. **Do Not Use Lead Pencils To Set Dipswitches.** To avoid contamination of dipswitch contacts that can result in unnecessary circuit board malfunction, do not use a lead pencil to set a dipswitch.

UNPACKING AND INSPECTION

1. Examine the hardware immediately to verify that it has not been damaged in transit.
2. Notify the nearest Elsag Bailey sales office of any such damage.
3. File a claim for any damage with the transportation company that handled the shipment.
4. Use the original packing material and container to store the hardware.
5. Store the hardware in an environment of good air quality, free from temperature and moisture extremes.

INIIR01 INFI-NET TO INFI-NET REMOTE INTERFACE INSTALLATION

Install the modules, termination devices and cables that make up an INIIR01 INFI-NET to INFI-NET Remote Interface. Two complete interfaces are required, one for each loop. The required modules are:

- Two INIIT12 modules, one for each loop.
- Two INNIS01 modules, one for each loop.
- Two NTCL01 Communication Termination Units or NICL01 Communication Termination Modules, one for each INNIS01 module.
- One termination unit cable or one termination module cable for each NTCL01 or NICL01 termination device. The NTCL01 termination unit uses NKLS01 or NKLS11 termination cables. The NICL01 termination module uses NKLS02 or NKLS12 termination cables.
- Two NTMP01 Multi-Function Termination Units or NIMP01 Multi-Function Termination Modules, one for each INIIT12 module.
- One termination unit cable or one termination module cable for each NTMP01 or NIMP01 termination device. The NTMP01 termination unit uses NKTU01 or NKTU11 termination cables. The NIMP01 termination module uses NKTU02 or NKTU12 termination cables.
- One external serial communication link is required such as a modem or transceiver.

For redundant INFI-NET to INFI-NET remote interfaces, double the required modules, termination units or modules, cables and

external serial communication link. Refer to [Appendix E](#) for more information on how to set up redundant remote interfaces.

To install an INFI-NET to INFI-NET remote interface:

1. Set the jumpers on all the termination units or modules.
2. Install all the termination units or modules and their cables.
3. Set the dipswitches and jumpers on the INNIS01 and INIIT12 modules.
4. Verify that the module mounting unit does not use -30 VDC.
5. Install the INNIS01 and INIIT12 modules.
6. Install and connect the external communication equipment to the NTMP01 or NIMP01 termination devices.

Termination Unit/Module Configuration and Installation

Configure and install the required termination units or modules and their cables before installing any of the interface modules.

NTCL01 OR NICL01 INSTALLATION

The INNIS01 module terminates through an NTCL01 Communication Termination Unit or an NICL01 Communication Termination Module. These devices terminate the INFI-NET communication loop through either twinax or coax terminals.

Appendices [A](#) and [B](#) contain a quick reference of termination unit or module jumper settings, board layout and cable connections. Refer to the ***Communication Termination Unit (NTCL01)*** instruction or the ***Communication Termination Module (NICL01)*** instruction for specific directions on configuring jumpers, mounting, termination cable installation, and twinax/coax cable lengths.

NTMP01 OR NIMP01 INSTALLATION

The INIIT12 module terminates through the NTMP01 Multi-Function Processor Termination Unit or NIMP01 Multi-Function Processor Termination Module. Jumpers select the RS-232-C signals required for the INIIT12 module to act as data communication equipment (DCE) or data terminal equipment (DTE). The NTMP01 termination unit provides DB-25 connectors; the NIMP01 termination module provides DB-9 connectors to terminate the remote communication device.

Appendices [C](#) and [D](#) contain NTMP01 and NIMP01 jumper configuration information. [Appendix E](#) explains several ways to terminate redundant INIIR01 interfaces and provides an exam-

ple of redundant communication equipment setup. Refer to the **Multi-Function Processor Termination Unit (NTMP01)** instruction or the Multi-Function Processor Termination Module (NIMP01/02) instruction for specific directions on configuring jumpers, mounting, termination cable installation, and RS-232-C cable lengths.

INNIS01 Module Dipswitches

Each INFI-NET to INFI-NET interface requires two INNIS01 Network Interface Slave Modules. For redundant interfaces, double the required number of INNIS01 modules. There are four user-configured dipswitches on the network interface slave (NIS) module. Refer to Figure 3-1 for dipswitch locations.

NOTE: Dipswitch positions marked not used or **reserved** must be set to the indicated position, otherwise the INNIS01 module will not operate properly. Since factory settings may not reflect the default settings, it is imperative to check all dipswitch and jumper settings before putting the module into operation.

INNIS01 DIPSWITCH SW1, NODE ADDRESS

This dipswitch sets the resident node address. Valid node addresses are one through 250 (refer to Table 3-1). Pole one is the most significant bit (MSB) with a binary weight of 128; pole eight is the least significant bit (LSB) with a binary weight of one. Record the dipswitch SW1 setting in the space provided.

INNIS01 DIPSWITCH SW2, LOOP ADDRESS

This dipswitch assigns a loop address to the INNIS01 module in relation to the main INFI-NET loop. Valid satellite loop addresses are two through 250. The central loop address must be one. Refer to Table 3-1, and record the dipswitch SW2 setting in the space provided.

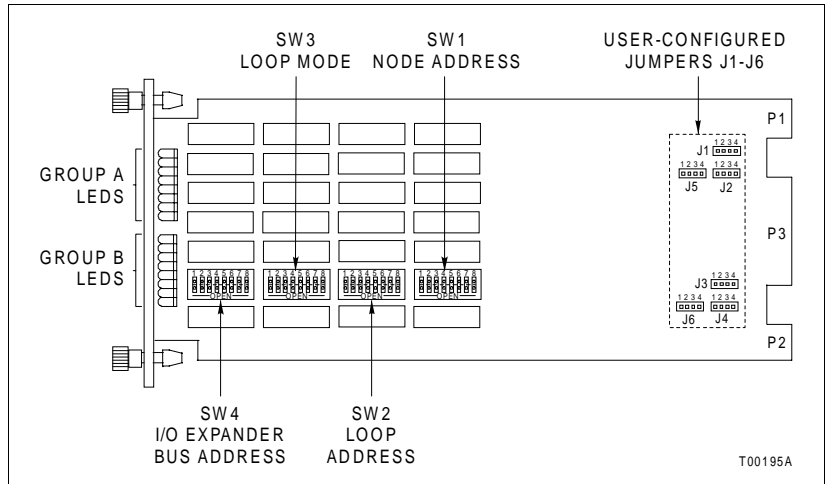


Figure 3-1. INNIS01 Module Circuit Board Layout

Table 3-1. INNIS01 Dipswitch SW1/SW2, Node Address/Loop Address Example Settings

Example Address	Pole (Binary Value) ¹							
	1 (128)	2 (64)	3 (32)	4 (16)	5 (8)	6 (4)	7 (2)	8 (1)
1	0	0	0	0	0	0	0	1
32	0	0	1	0	0	0	0	0
250	1	1	1	1	1	0	1	0
User Settings – SW1								
User Settings – SW2 ²								

NOTES:

1. 0 = CLOSED or ON, 1 = OPEN or OFF.

2. The central loop must have a loop address of 1. Valid satellite loop addresses are two through 250.

INNIS01 DIPSWITCH SW3, LOOP MODE

Dipswitch SW3 pole one determines the node type (refer to Table 3-2). Set pole one to the one position for all INFI-NET to INFI-NET interfaces. Pole two enables or disables ROM checksumming. Elsasg Bailey recommends that the NIS module be installed with checksumming enabled to take full advantage of the on-board diagnostics. Pole three enables internal testing which must be disabled for normal operation. Pole four in conjunction with pole three makes the node appear to be busy to other nodes. Pole five enables the channel idle condition display for the front panel LEDs. If channel one is idle, the A group of LEDs will flash on and off twice per second. If channel two is idle, the B group of LEDs will flash. The channel idle display serves as a warning that a loop integrity problem exists.

Pole six enables diagnostic tests which preclude normal NIS module operation. Poles seven and eight determine loop speed.

NOTE: Testing modes involving poles three, four and six interfere with normal node operation.

Table 3-2. INNIS01 Dipswitch SW3, Loop Mode

Pole								Function	User Setting
1	2	3	4	5	6	7	8		
1								INFI-NET to INFI-NET interface node.	1
0								Do not use.	
	1							ROM checksum enabled.	
	0							ROM checksum disabled.	
		1						Test mode; no time-out for handshake failure.	
		0						Normal operating mode.	
			1					Busy NAK all loop messages.	
			0					Normal operating mode.	
				1				Toggle group A LEDs if loop 1 is idle or shorted. Toggle group B LEDs if loop 2 is idle or shorted.	
				0				LED display defined by SW4.	
					1			Diagnostic mode.	
					0			Normal operating mode.	
						0	0	10 Mbaud INFI-NET communication rate.	
						0	1	2 Mbaud INFI-NET communication rate.	
						1	0	Do not use.	—
						1	1	Do not use.	—

NOTE: 0 = CLOSED or ON, 1 = OPEN or OFF.

INNIS01 DIPSWITCH SW4, EVENT AND ERROR COUNTERS

The NIS module can have an I/O expander bus address from zero to seven. Poles one through three of dipswitch SW4 set the NIS module address. Refer to Table 3-3 for I/O expander bus address settings. Poles four through eight set the address of the on-board event and error counters that the NIS module displays on 16 faceplate LEDs. Table 3-4 lists the event addresses. Table 3-4 lists error counter addresses. Assign the module address, and select an event or error counter and set dipswitch SW4 accordingly. Keep a record of the dipswitch SW4 settings in the space provided.

Example of Counter Usage Counter 09 keeps track of the number of multicast messages received excluding those originated. To display this counter on the front panel LEDs,

set dipswitch SW4 (Table 3-4) as follows: pole 4 = 0, 5 = 1, 6 = 0, 7 = 0, and 8 = 1.

NOTE: The two INNIS01 modules in an INIIL02 interface must have different I/O expander bus addresses (set by dipswitch SW4, poles one through three).

Table 3-3. INNIS01 Dipswitch SW4, I/O Expander Bus Address Example Settings

Example Address	Pole (Binary Value)							
	1 (4)	2 (2)	3 (1)	4	5	6	7	8
1	0	0	1	x	x	x	x	x
3	0	1	1	x	x	x	x	x
7	1	1	1	x	x	x	x	x
User Settings								

NOTE: 0 = CLOSED or ON, 1 = OPEN or OFF, x = event/error counter address (refer to Tables 3-4 and 3-5).

Table 3-4. INNIS01 Dipswitch SW4, Event Counter Address

4	5	Pole			Hex	Description	User Setting
		6	7	8			
0	0	0	0	0	00	Number of timer interrupts.	
0	0	0	0	1	01	Number of channel 1 receive errors.	
0	0	0	1	0	02	Number of channel 2 receive errors.	
0	0	0	1	1	03	Number of transmitter errors.	
0	0	1	0	0	04	Number of receive queue overflow errors.	
0	0	1	0	1	05	Number of messages dumped with circulation count errors.	
0	0	1	1	0	06	Number of messages dumped with message type or destination count errors.	
0	0	1	1	1	07	Number of messages dumped with source state errors.	
0	1	0	0	0	08	Number of messages dumped with source sequence mismatch.	
0	1	0	0	1	09	Number of multicast messages received, excluding originated messages.	
0	1	0	1	0	0A	Number of multicast destinations received.	
0	1	0	1	1	0B	Number of time sync messages received, excluding originated messages.	
0	1	1	0	0	0C	Number of broadcast messages received, excluding originated messages.	
0	1	1	0	1	0D	Number of NIS poll messages received, excluding originated messages.	
0	1	1	1	0	0E	Number of NIS poll messages acknowledged (ACK) by this node.	
0	1	1	1	1	0F	Number of NIS poll messages busy negative acknowledged (NAK) by this node.	
1	0	0	0	0	10	Number of messages transmitted, total loop traffic.	

Table 3-4. INNIS01 Dipswitch SW4, Event Counter Address (continued)

4	5	Pole			Hex	Description	User Setting
		6	7	8			
1	0	0	0	1	11	Number of messages received and forwarded by this node.	
1	0	0	1	0	12	Number of messages originated by this node, including retries.	
1	0	0	1	1	13	Number of message retries originated by this node.	
1	0	1	0	0	14	Number of transmitted message watchdog expirations.	
1	0	1	0	1	15	Number of messages put into receive buffer and retained.	
1	0	1	1	0	16	Number of bytes originated by this node, including retries.	
1	0	1	1	1	17	Number of bytes received and forwarded by this node.	
1	1	0	0	0	18	Number of I/O expander bus to NIS module handshakes.	
1	1	0	0	1	19	Number of I/O expander bus message to transmit buffer signals.	
1	1	0	1	0	1A	Number of I/O expander bus PCU status requests.	
1	1	0	1	1	1B	Number of I/O expander bus NIS status requests.	
1	1	1	0	0	1C	Number of I/O expander bus interrupts with invalid status.	
1	1	1	0	1	1D	Number of transmit buffer realignments due to invalid contents.	
1	1	1	1	0	1E	Number of receive buffer realignments.	
1	1	1	1	1	1F	Number of status buffer realignments.	

NOTE: 0 = CLOSED or ON, 1 = OPEN or OFF.

USER-CONFIGURED JUMPERS

There are six user-configured jumpers on the NIS module that set the communication rate of the receiver analog circuit (refer to Figure 3-1 for jumper locations). All six jumper (J1 through J6) settings must be the same. Instructions (for jumper settings) are silk screened on the NIS circuit board (upper left corner). The jumper settings must match the communication rate set by dipswitch SW3, poles seven and eight. Figure 3-2 shows how to set the jumpers for each communication rate.

POWER SYSTEM STATUS

The communication system provides a way to monitor the power system status of each node. This status information can be displayed on the operator console. Electronics within the power entry panel monitor the power system status. A single status output is made available to the communication system. To use this feature, wire the status output to the terminal block on the termination unit or module labeled PSS1 or PSS2. Two sets of terminals are available on each termination so that other termination devices can be connected to the power system status output.

This signal is fed through the termination unit cable to the P3 connector on the NIS module. The power system status input

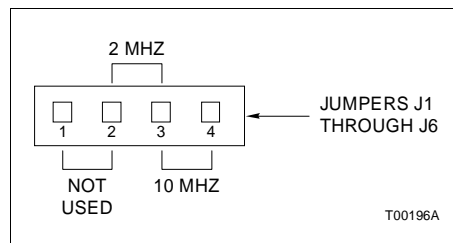


Figure 3-2. User-Configured Jumpers

is a TTL-compatible signal. A five-VDC signal (logic high) on power system status indicates good status; a zero-VDC signal (logic low) indicates bad status. When no connection is made to either of the power system status inputs, a pull-up resistor on the NIS module puts a logic high on the power system status input, thereby reporting good status.

INIIT12 Module Dipswitches

There are two user-configured dipswitches and six jumpers on the INIIT12 module that set the module operating characteristics. Figure 3-3 shows dipswitch locations on the INIIT12 module circuit board.

INIIT12 MODULE JUMPERS

CAUTION	Always operate the IIT module with the machine fault timer circuit enabled. Unpredictable module outputs may result if the machine fault timer circuit is disabled. These unpredictable module outputs may adversely affect the entire communication system.
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There are six jumpers on the INIIT12 module. Jumpers one through four have no usable function and must be set as shown in Figure 3-3. Jumper J5 opens pin four of P1 so that it has no continuity with the module mounting unit. Pin four of P1 is normally used for Controlway. Older systems use this pin for -30 VDC. Refer to **INIIR01 Interface Mounting Unit Preparation** for more information on setting J5 and installation options. Refer to Figure 3-3 for the location of the machine fault timer (MFT) jumper posts. These jumper pins must be open so that that MFT timer is enabled.

INIIT12 TEST/MODULE ADDRESS DIPSWITCHES SW3

Dipswitch SW3 is an eight-position dipswitch that sets the module address and operational mode. Table 3-5 lists the SW3 option settings. Record the settings in the space provided.

INIT12 DIPSWITCH SW4, OPTIONS

Dipswitch SW4 is an eight-position dipswitch that determines the operating options of the module. Table 3-6 lists the options and dipswitch settings. Record the option settings in the space provided.

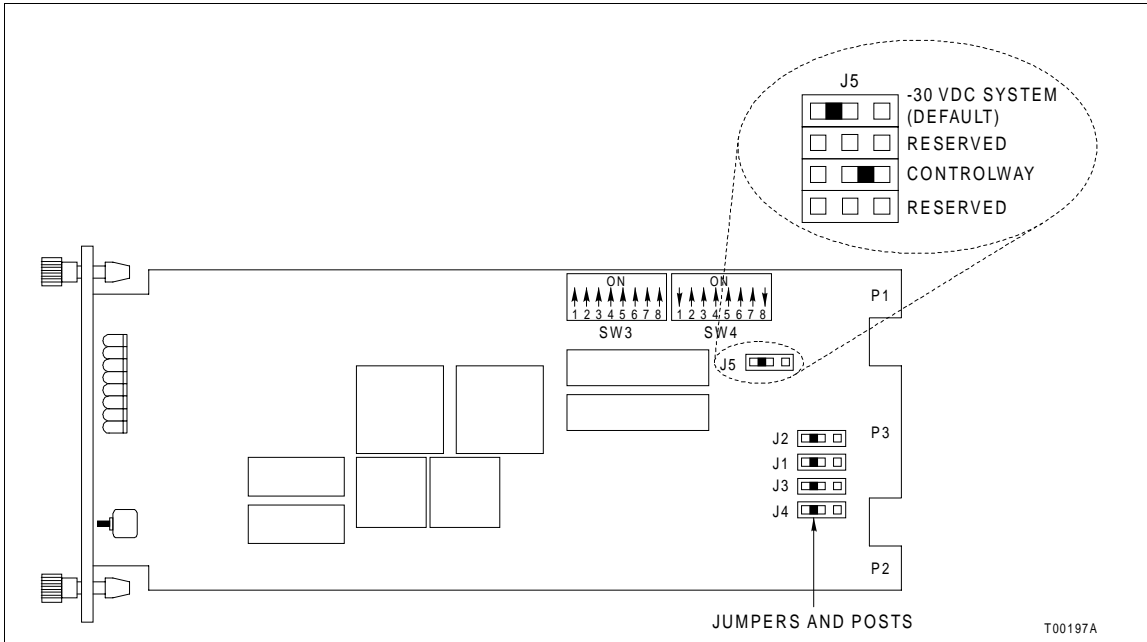


Figure 3-3. INIT12 Module Circuit Board Layout

Table 3-5. INIT12 Dipswitch SW3, Test/Module Address

Pole		Function	User Setting
1	2 3 4 5 6 7 8		
0		Normal operating mode.	
1		Diagnostic mode.	
0		Not used. Must be set as shown.	0
1		Not used.	
0		Controlway (1 Mbaud).	
1		Module bus (83.3 kbaud).	
0		Not used. Must be set as shown.	0
1		Not used.	
0		Do not dump NVRAM on crash.	
1		Dump NVRAM on crash.	
0		Both loops on same time base.	
1		Separate time bases on loops.	
0		No redundancy.	
1		Redundancy configured.	

Table 3-5. INIIT12 Dipswitch SW3, Test/Module Address (continued)

Pole								Function	User Setting	
1	2	3	4	5	6	7	8			
								0	Controlway/module bus address 0.	
								1	Controlway/module bus address 1.	

NOTE: 0 = CLOSED or ON, 1 = OPEN or OFF.

Table 3-6. INIIT12 Dipswitch SW4, Options

Pole ¹								Function	User Setting
1	2	3	4	5	6	7	8		
0								ROM checksum enabled.	
1								ROM checksum disabled.	
0								RS-232-C DTE mode (direct connections).	
1								RS-232-C DCE mode (modem connections).	
0								Equipment select output initially de-energized.	
1								Equipment select output initially energized.	
0								Enable port 2 as data channel. ²	
1								Enable port 2 as diagnostic channel. ³	
				0	0			1200 baud rate on diagnostic port.	
				0	1			2400 baud rate on diagnostic port.	
				1	0			9600 baud rate on diagnostic port.	
				1	1			19200 baud rate on diagnostic port.	
0								Do not initialize NVRAM.	
1								Initialize NVRAM.	
0								Disable alternate default baud rate.	
1								Enable alternate default baud rate. ⁴	

NOTES:

1. 0 = CLOSED or ON, 1 = OPEN or OFF.

2. If the diagnostic port is not enabled, then port 2 data characteristics and baud rate are taken from the configuration of the INIIT12 executive block.

3. If port 2 is connected to a remote INIIT12 port, disconnect it before enabling it as a diagnostic port. Failure of all serial link communication may result if this precaution is not observed. If the diagnostic is enabled, port 2 data characteristics are 8 data bits, 1 stop bit, and no parity. Port 1 baud rate is selected by poles 5 and 6.

4. If the alternate default baud rate is enabled, and the INIIT12 module NVRAM is initialized (pole 7 =1), then specifications S9 and S10 of the INIIT12 executive block are set to the baud rate selected by poles 5 and 6.

INIIR01 Interface Mounting Unit Preparation

CAUTION

To avoid potential module damage, evaluate your system for compatibility prior to module installation. This module uses connections to the module mounting unit backplane that served other functions in early Network 90 systems.

The INIIR01 INFI-NET to INFI-NET Remote Interface requires a dedicated module mounting unit. If the module mounting unit is part of an older system, it must be checked for -30 VDC. The next three subsections explain how to check the module mounting unit for -30 VDC, INIIT12 module installation options available for systems that use -30 VDC, and how to isolate the MMU card cage for the INIIR01 interface. **Do not** attempt to install the INIIR01 interface until all the steps in the next three subsections have been completed.

CHECKING THE MODULE MOUNTING UNIT FOR -30 VDC

To check the module mounting unit for -30 VDC:

1. Face the rear of the cabinet. Locate the -30 VDC faston. It is the second faston from the top on the back of the MMU backplane.

NOTE: If the module mounting unit does not use -30 VDC, the second faston from the top on the back of the MMU backplane supplies 5 VDC.

2. Check for -30 VDC with respect to system common at the -30 VDC faston.
3. If there is -30 VDC present then either set INIIT12 jumper J5 to the 30 V position or disconnect -30 VDC from the module mounting unit (refer to **INIIT12 INSTALLATION OPTIONS**). Turn off power to the cabinet. Remove -30 VDC from the module mounting unit by removing the supply wiring from the -30 VDC faston.
4. For additional information and/or assistance, contact Elsag Bailey technical support.

INIIT12 INSTALLATION OPTIONS

There are two installation options available. The first option applies to systems that do not have -30 VDC power. The second option is for systems that have -30 VDC power.

1. Set J5 to MODB when installing the INIIT12 module in a module mounting unit that does not have -30 VDC on the module mounting unit. Pole three of dipswitch SW3 is set to zero for Controlway.

or

2. Set J5 to 30 V when installing the INIIT12 module in a module mounting unit that has -30 VDC on the module mounting unit. Pole three of dipswitch SW3 is set to one for module bus.

ISOLATING CONTROLWAY AND I/O EXPANDER BUS

The INIIT12 INFI-NET to INFI-NET Transfer Module must have a Controlway or module bus that is dedicated to the INIIR01 interface. In redundant applications, both the primary and secondary INIIT12 module share this isolated Controlway or module bus. Additionally, each INIIT12 module in a redundant interface must have its own I/O expander bus. The INNIS01 modules communicate to their respective INIIT12 modules through these isolated I/O expander buses. To isolate a module mounting unit:

1. Select the module mounting unit that will be dedicated to the INIIR01 interface.
2. Disconnect the Controlway/module bus cable from the module mounting unit to be isolated for the interface. Figure 3-4 shows an example of how the Controlway is disconnected to isolate Controlway or module bus on that module mounting unit.

NOTE: The I/O expander bus for each set of one INNIS01 module and one INIIT12 module must be as short as possible. Eltag Bailey recommends that adjacent MMU slots be connected for each set of interface modules. Failure to keep the I/O expander bus short results in unreliable operation.

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.

3. There is no set procedure for isolating the I/O expander bus because system architectures differ so widely from system to system. The example in Figure 3-4 shows one way to isolate the I/O expander bus. Using the methods (i.e., by removing a dipshunt or a ribbon cable) shown in Figure 3-4, isolate an I/O expander bus for each interface.

Installing the INIIR01 Interface Modules

The INIIR01 interface modules are ready to install if:

- Both INIIT12 modules have their dipswitches and jumpers set (four INIIT12 modules on redundant interfaces).
- Both INNIS01 modules have their dipswitches and jumpers set (four INNIS01 modules on redundant interfaces).
- The required number of NTCL01 termination units or NICL01 termination modules and cables are installed.

- The required number of NTMP01 termination units or NIMP01 termination modules and cables are installed.
- The module mounting unit has been checked for -30 VDC and modified if necessary.

To install the INIIT12 and INNIS01 modules:

1. There must be two empty slots (side by side) available in one module mounting unit (on each loop) to install one interface. Redundant interfaces require four slots or more depending on the application (refer to Figure 3-5). Additional slots will be needed if using redundant digital I/O modules to enable a transceiver. Prepare the module mounting units in which to mount the interface so that the required slots are available.
2. Install a 24-pin dipshunt in the I/O expander bus socket between the MMU slot to be used by the NIS module and the MMU slot to be used by the INIIT12 module in each module mounting unit. If using redundant interfaces, the primary INIIT12/INNIS01 module pair and the secondary INIIT12/INNIS01 module pair within the same module mounting unit must be on separate I/O expander buses.
3. Verify that there are no other modules on the I/O expander bus of each INIIT12/INNIS01 pair.
4. Mount each module in its assigned MMU slot one at a time.
5. Guide the top and bottom edges of each circuit card along the top and bottom rails of its MMU slot.
6. Slide the module into the slot; push the module until the front panel is flush with the top and bottom of the MMU frame and seated within the cable connector at the rear of the MMU card cage.
7. Turn the two captive latches ½-turn to lock the module in place.

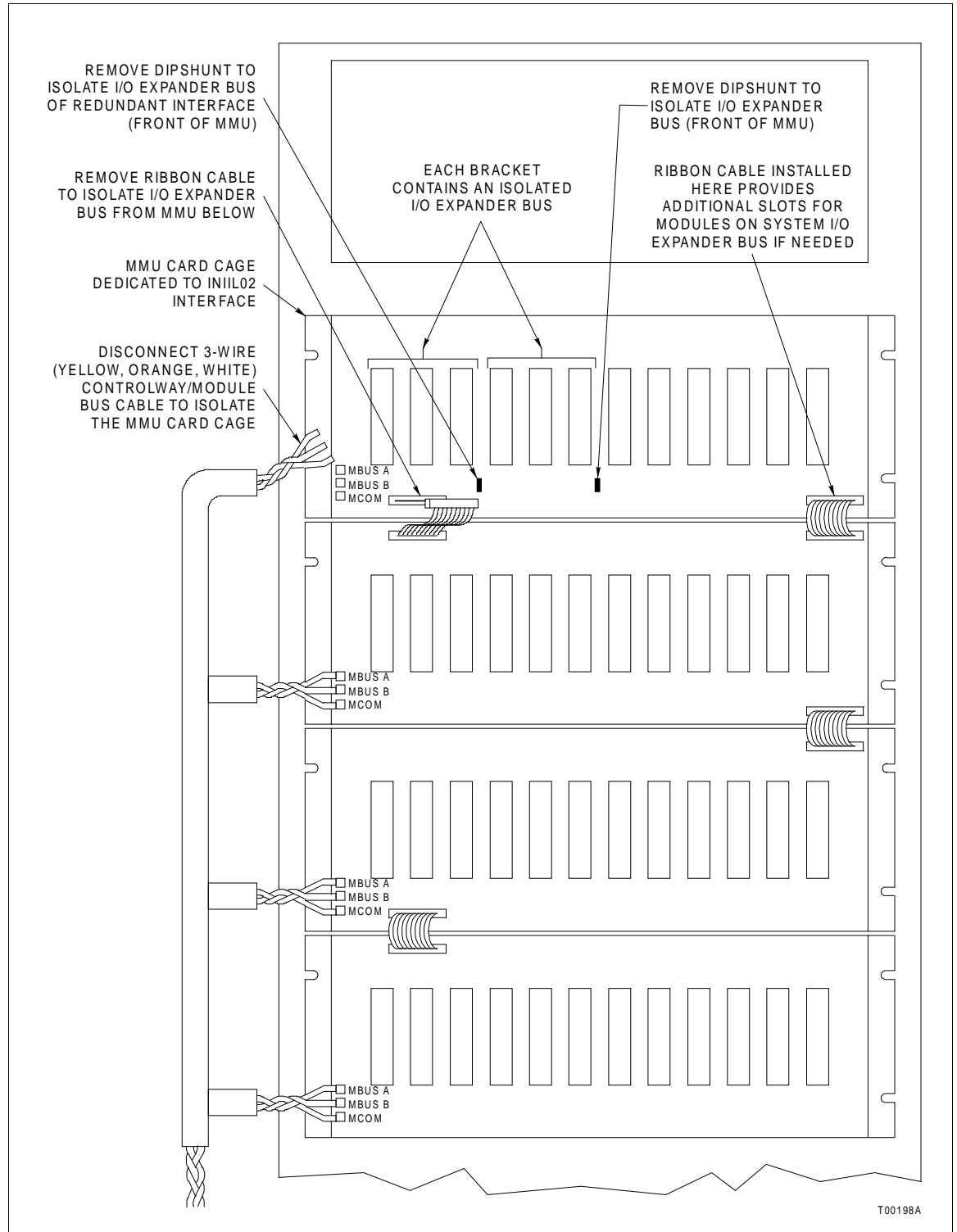


Figure 3-4. Example of How to Isolate a Module Mounting Unit

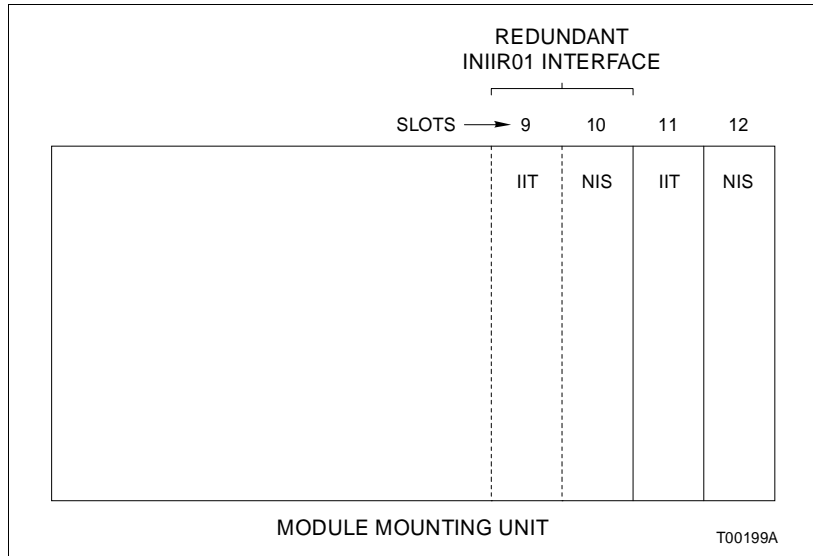


Figure 3-5. Typical INIRO1 Module Slot Assignment in the Module Mounting Unit

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.

INIIT12 Executive Block Initialization

To initialize the INIIT12 module executive block specifications to their default value:

1. Set dipswitch SW4 position seven to one (open).
2. Install the INIIT12 module in its MMU slot and wait for it to initialize. The module halts and CPU LEDs one, two and four are on when the module is initialized.
3. Remove the module from the module mounting unit and set dipswitch SW4 position seven to 0 (closed).
4. Insert the module into its MMU slot.
5. The INIIT12 module will enter the configure mode with executive block specifications at their default value.

Installing the Optional Digital I/O Module

Install the optional digital I/O module when the interface is set up to run in half duplex mode or requires enable/disable signals for redundant external communication equipment. Redundant applications require two digital I/O modules.

Select one of the digital I/O modules whose output specifications match those of the communication equipment being used. Refer to the product instruction for that I/O module for directions on installing the module. The available I/O modules, their output specifications and their document numbers are listed in Table 3-7. Refer to Appendix E for more information on redundant hardware configuration.

Table 3-7. Optional Digital I/O Modules

Nomenclature	Output	Document No.
IMDSM05	24 VDC	I-E96-309
IMDSO01	24 to 240 VAC	I-E96-310
IMDSO02	4 to 50 VDC	
IMDSO03	5 to 160 VDC	
IMDSO04	24 VDC	I-E96-313

INIIL02 INFI-NET TO INFI-NET LOCAL INTERFACE INSTALLATION

Install the modules and termination devices and cables that make up an INIIL02 INFI-NET to INFI-NET Local Interface. The required modules are:

- One INIIT03 INFI-NET to INFI-NET Transfer Module.
- Two INNIS01 modules, one for each loop.
- Two NTCL01 Communication Termination Units or two NICL01 Communication Termination Modules, one for each INNIS01 module.
- One termination unit cable or one termination module cable for each NTCL01 or NICL01 termination device. The NTCL01 termination unit uses NKLS01 or NKLS11 termination cables. The NICL01 termination module uses NKLS02 or NKLS12 termination cables.

For redundant INFI-NET to INFI-NET local interfaces, double the required modules and termination units or modules and cables. To install an INFI-NET to INFI-NET local interface:

1. Set the jumpers on all termination units or modules.
2. Install all the termination units or modules and their cables.
3. Set the dipswitches and jumpers on the INNIS01 modules and INIIT03 module.
4. Check the module mounting unit for -30 VDC and modify if necessary.

5. Prepare an isolated module mounting unit for the INIIL02 interface.
6. Install the INNIS01 modules and INIIT03 module.

NTCL01 or NICL01 Installation

Configure and install the required termination units or modules and their cables before installing any of the interface modules.

The INNIS01 module terminates through an NTCL01 Communication Termination Unit or an NICL01 Communication Termination Module. These devices terminate the INFI-NET communication loop through either twinax or coax terminals.

Appendices **A** and **B** contain a quick reference of termination unit or module jumper settings, board layout and cable connections. Refer to the **Communication Termination Unit (NTCL01)** instruction or the Communication Termination Module (NICL01) instruction for specific directions on configuring jumpers, mounting, termination cable installation, and twinax/coax cable lengths.

INNIS01 Dipswitches and Jumpers

Configure the dipswitches and jumpers on the INNIS01 module. Refer to **INNIS01 Dipswitches and Jumpers** for information on these dipswitches and jumpers.

NOTE: The INIIL02 interface uses two INNIS01 modules. The two INNIS01 modules must have different I/O expander bus addresses (set by dipswitch SW4 on the NIS module).

INIIT03 Dipswitches and Jumpers

The INIIT03 module consists of one circuit board. The circuit board has four dipswitches, four jumpers and one dipshunt that set the module operating characteristics and options. Figure 3-6 shows the dipswitch and jumper locations on the INIIT03 circuit board.

NOTE: Dipswitch positions marked not used or **reserved** must be set to the indicated position, otherwise the INIIT03 module will not operate properly. Since factory settings may not reflect the default settings, it is imperative to check all dipswitch and jumper settings before putting the module into operation.

INIIT03 DIPSWITCH UUB0, MODULE ADDRESS

Dipswitch UUB0 sets the INIIT03 module Controlway or module bus address, enables module diagnostics and sets its communication rate for Controlway or module bus. Table 3-8 explains the function of dipswitch UUB0. Dipswitch poles one through three set normal operation and communication speed.

Poles four through eight set the INIIT03 module address. The INIIT03 module must have an address of either zero or one.

NOTE: The preferred setting for position three of dipswitch UUB0 is Controlway because of its high speed communication and redundancy. In redundant configurations, dipswitch UUB0 should be identical on the primary and secondary INIIT03 modules, except pole eight.

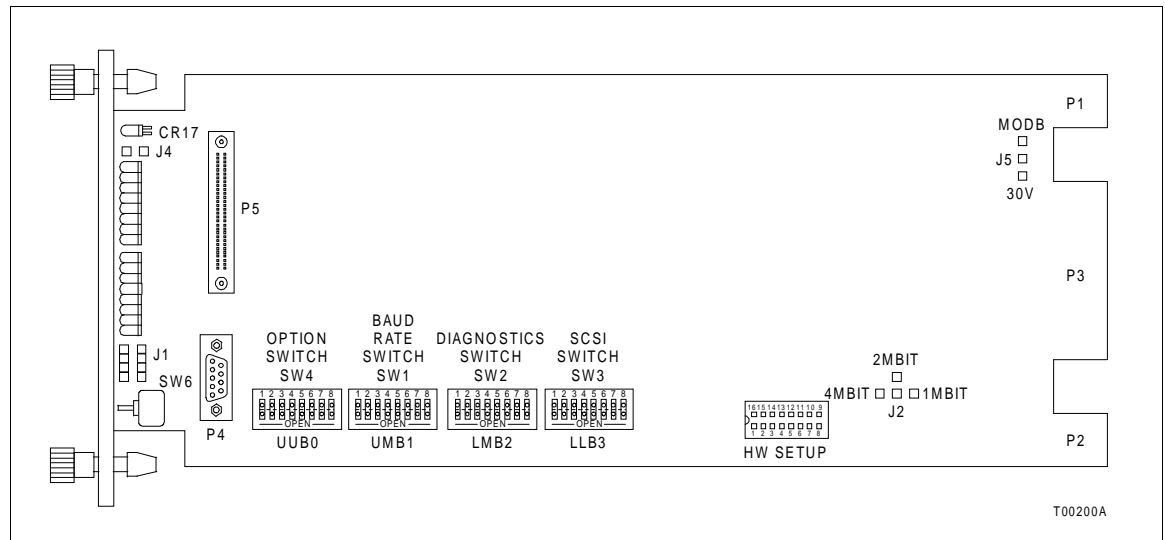


Figure 3-6. INIIT03 Module Circuit Board Layout

Table 3-8. INIIT03 Dipswitch UUB0, Operation/Module Address

Pole								Function	User Setting
1	2	3	4	5	6	7	8		
0								Normal run.	0
1								Not used. Must be set as shown.	
0								Not used. Must be set as shown.	0
1								Not used.	
0								Controlway (1 Mbaud).	
1								Module bus (83.3 kbaud).	
0 0 0 0 0								Module address = 0.	
0 0 0 0 1								Module address = 1.	

NOTE: 0 = CLOSED or ON, 1 = OPEN or OFF.

INIIT03 DIPSWITCH UMB1, MODULE OPTIONS AND DIAGNOSTICS

Dipswitch UMB1 is not used by the INIIT03 module and is reserved for future use. All poles of dipswitch UMB1 must be set to zero or closed.

INIT03 DIPSWITCH LMB2, MODULE OPTIONS

Dipswitch LMB2 is an eight-position dipswitch that determines additional operating options of the module. Table 3-9 lists the LMB2 option settings. Record the LMB2 dipswitch settings in the space provided. The normal setting for pole one of dipswitch LMB2 is zero.

Table 3-9. INIT03 Dipswitch LMB2, Module Options

Pole								Function	User Setting
1	2	3	4	5	6	7	8		
0								ROM checksumming enabled.	
1								ROM checksumming disabled.	
0 0								Diagnostic port (P4) data characteristics: 8 data bits, 1 stop bit, no parity.	
0 1								8 data bits, 1 stop bit, even parity.	
1 0								8 data bits, 1 stop bit, odd parity.	
1 1								8 data bits, 2 stop bits, no parity.	
0 0								Exception reporting rate (time between scans):	
0 1								2.0 seconds.	
1 0								1.0 second.	
1 1								0.5 second.	
0								No failover to secondary module on power system status alarm.	1
1								Failover to secondary module on power system status alarm.	
0								Not used. Must be set as shown.	0
1								Not used.	
0								No redundancy.	
1								Redundancy configured.	

NOTE:0 = CLOSED or ON, 1 = OPEN or OFF.

INIT03 DIPSWITCH LLB3, DIAGNOSTICS

Dipswitch LLB3 selects certain operating options and enables diagnostics that are meaningful to qualified Elsas Bailey service personnel.

All switch positions on LLB3 should be set as shown for normal operation. Table 3-10 shows the dipswitch settings for LLB3. Verify that all dipswitch positions on LLB3 are set as marked in the user setting column.

Table 3-10. INIIT03 Dipswitch LLB3, Diagnostics

Pole								Function	User Setting
1	2	3	4	5	6	7	8		
0								NIS handshake time-out enabled.	
1								NIS handshake time-out disabled.	
0								Not used. Must be set as shown.	0
1								Not used.	
0								INFI-NET diagnostic utilities disabled.	
1								INFI-NET diagnostic utilities enabled.	
0								Common time synchronization between loops.	
1								Time synchronization isolation.	
0								Not used. Must be set as shown.	0
1								Not used.	
0								Cache burst fill disabled.	0
1								Cache burst fill enabled.	
0								Data cache disabled.	
1								Data cache enabled.	
0								Instruction cache disabled.	
1								Instruction cache enabled.	

NOTE: 0 = CLOSED or ON, 1 = OPEN or OFF.

JUMPERS J1, J2, J4, J5

CAUTION

Always operate the INIIT02/12 module with the machine fault timer circuit enabled. Unpredictable module outputs may result if the machine fault timer circuit is disabled. These unpredictable module outputs may adversely affect the entire communication system.

Jumpers J1, J4 and J5 define module functions and operation. Jumper J1 determines if the RS-232-C diagnostic port (P4) operates as data communication equipment (DCE) or data terminal equipment (DTE). Jumper J4 enables the machine fault timer (MFT). Jumper J5 disengages -30 VDC from the module when installing it in an MMU card cage that uses -30 VDC. Jumper J2 is set at the factory and should not be changed. Refer to Table 3-11 for those jumpers that have default settings.

HW SETUP DIPSHUNT

The HW SETUP dipshunt is factory installed. There should be a jumper installed in the second dipshunt position (i.e., pin two is shorted to pin 15). Verify that the jumper is installed in the correct position. The INIIT03 module will not operate properly

if this dipshunt position is open. All other dipshunt positions should be open.

Table 3-11. INIT03 Jumper Settings for J1, J2, J4 and J5

Jumper	Setting	Function	User Setting
J1 ¹	Vertical	Sets the RS-232-C diagnostic port (P4) to operate as DCE.	
	Horizontal	Sets the RS-232-C diagnostic port (P4) to operate as DTE.	
J2	4-3	Factory setting.	Shorted
	4-2	Not used.	Open
	4-1	Not used.	Open
J4	Open	MFT disable jumper. This jumper must remain open for normal operation.	Open
J5 ²	30 V	Disconnects Controlway for operation in module mounting units that have -30 VDC (early Network 90).	
	MODB	Connects Controlway channel B for operation in module mounting units that have Controlway (INFI 90).	

NOTES:

1. This feature is used by Elsasg Bailey service personnel. The J1 setting does not affect the module during normal operation.

2. Refer to **INIT03 INSTALLATION OPTIONS** for an explanation of the installation options available when installing the INIIL02 interface in a system that uses -30 VDC.

INIIL02 Interface Module Mounting Unit Preparation

CAUTION

To avoid potential module damage, evaluate your system for compatibility prior to module installation. This module uses connections to the module mounting unit backplane that served other functions in early Network 90 systems.

The INIIL02 INFI-NET to INFI-NET Local Interface requires a dedicated module mounting unit. If the module mounting unit is part of an older system, it must be checked for -30 VDC. The next three subsections explain how to check the module mounting unit for -30 VDC, INIT03 installation options available for systems that use -30 VDC, and how to isolate the MMU card cage for the INIIL02 interface. **Do not** attempt to install the INIIL02 interface until all the steps in the next three subsections have been completed.

CHECKING THE MODULE MOUNTING UNIT FOR -30 VDC

1. Face the rear of the cabinet. Locate the -30 VDC faston. It is the second faston from the top on the back of the MMU backplane.

2. Check for -30 VDC with respect to system common at the -30 VDC faston.

NOTE: If the module mounting unit does not use -30 VDC, the second faston from the top on the back of the MMU backplane supplies 5 VDC.

3. If there is -30 VDC present then either set INIIT03 jumper J5 to the 30 V position or disconnect -30 VDC from the module mounting unit (refer to **INIIT03 INSTALLATION OPTIONS**). Remove -30 VDC from the module mounting unit by removing the supply wiring from the -30 VDC faston.

4. For additional information and/or assistance, contact Elsas Bailey technical support.

INIIT03 INSTALLATION OPTIONS

There are two installation options available. The first option applies to systems that do not have -30 VDC power. The second option is for systems that have -30 VDC power.

1. Set J5 to MODB when installing the INIIT03 module in a module mounting unit that does not have -30 VDC on the module mounting unit. Position three of dipswitch UUB0 is set to zero for Controlway.

or

2. Set J5 to 30 V when installing the INIIT03 module in a module mounting unit that has -30 VDC on the module mounting unit. Pole three of dipswitch UUB0 is set to one for module bus.

ISOLATING CONTROLWAY AND I/O EXPANDER BUS

The INIIT03 INFI-NET to INFI-NET Transfer Module must have a Controlway or module bus that is dedicated to the INIIL02 interface. In redundant applications both the primary and secondary INIIT03 modules share this isolated Controlway or module bus. Additionally, each INIIT03 module in a redundant interface must have its own I/O expander bus. The INNIS01 modules communicate to their respective INIIT03 modules through these isolated I/O expander buses. Figure 1-2 shows a diagram of a redundant interface with isolated Controlway/module bus and two isolated I/O expander buses in a redundant interface. To isolate a module mounting unit:

1. Select the module mounting unit that will be dedicated to the INIIL02 interface.
2. Disconnect the Controlway/module bus cable from the module mounting unit to be isolated for the interface.

Figure 3-4 shows an example of how the Controlway is disconnected to isolate the Controlway or module bus on that module mounting unit.

NOTE: The I/O expander bus for each set of two INNIS01 modules and one INIIT03 module must be as short as possible. Eltag Bailey recommends that three adjacent MMU slots be connected for each set of interface modules. Failure to keep the I/O expander bus short results in unreliable operation.

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.

3. There is no set procedure for isolating the I/O expander bus because system architectures differ so widely from system to system. The example in Figure 3-4 shows one way to isolate the I/O expander bus. Using the methods (i.e., by removing a dipshunt or a ribbon cable) shown in Figure 3-4, isolate an I/O expander bus for each interface.

INSTALLING THE INTERFACE MODULES

The INIIL02 interface modules are ready to install if:

- The INIIT03 module has its dipswitches and jumpers set (two INIIT03 modules for redundant interfaces).
- Both INNIS01 modules have their dipswitches and jumpers set (four NIS modules for redundant interfaces).
- The required number of NTCL01 termination units or NICL01 termination modules and their cables are installed.
- The module mounting unit has been checked for -30 VDC and modified if necessary.
- An isolated module mounting unit has been prepared for the INIIL02 interface.

To install the INIIT03 and INNIS01 modules:

1. There must be three empty slots (side by side, refer to Figure 3-7) available in one MMU card cage to install one interface (6 slots for a redundant interface).
2. Verify that there are 24-pin dipshunts installed in the I/O expander bus sockets between the MMU slots to be used by both NIS modules and the slot to be used by the INIIT03 module. When installing a redundant interface, the modules that make up the primary IIL interface must be on a separate I/O expander bus from the modules that make up the secondary IIL interface.

3. Mount each module in its assigned MMU slot one at a time.
4. Guide the top and bottom edges of the circuit card along the top and bottom rails of its assigned MMU card cage slot.
5. Slide the module into the slot; push the module until the front panel is flush with the top and bottom of the MMU frame and seated within the cable connector at the rear of the MMU card cage.
6. Turn the two captive latches ½-turn to lock the module in place.

The modules can be installed under power. Install the INIIT03 module last, otherwise the status LED turns red. When installing a module under power, the status LED will turn red momentarily and then turn green. If it does not, refer to [Section 5](#).

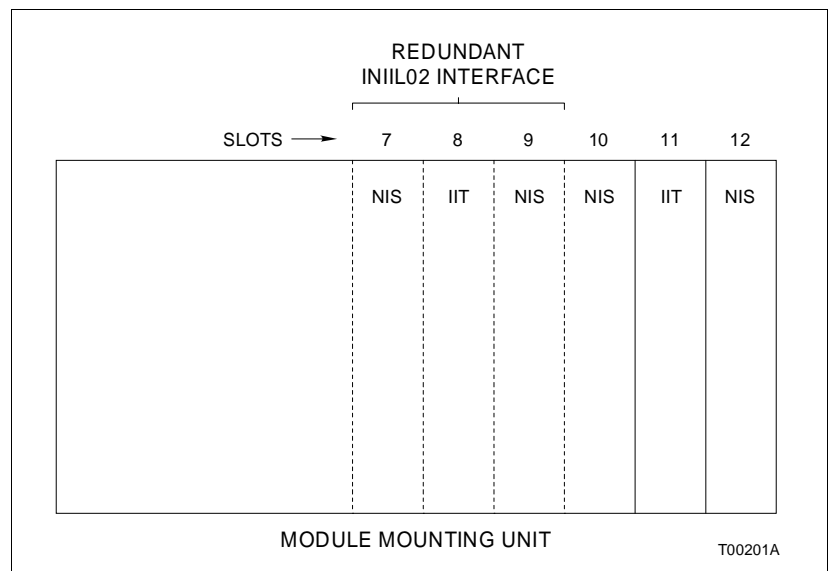


Figure 3-7. Typical INIIL02 Module Slot Assignment in the Module Mounting Unit

SECTION 5 - TROUBLESHOOTING

INTRODUCTION

Troubleshooting the INFI-NET interface modules is limited to viewing the contents of the error counters (CPU LEDs) and the module status report from any INFI 90 OPEN operator interface. Refer to the product instruction for your specific interface for information on accessing module status reports.

INNIS01 ERROR CODES

The NIS module halts operation and displays an error code if a module failure or hardware error occurs. Group A CPU LEDs display error codes. Group B CPU LEDs are off when group A CPU LEDs are displaying error codes. Refer to Table 5-1 for a list of error codes and corrective action.

Table 5-1. INNIS01 Module Error Codes

Group A LEDs 8 7 6 5 4 3 2 1	Code	Error Condition	Corrective Action
0 0 0 1 0 0 1 1	13	ROM checksum error.	Replace NIS.
0 0 0 1 0 1 1 0	16	Loopback test failure.	Check cabling and termination unit; replace NIS.
0 0 1 1 0 0 0 1	31	Memory or CPU fault.	Replace NIS.
0 0 1 1 0 0 1 0	32	Address or bus error.	Reset INIIT12/03; replace NIS if error continues.
0 0 1 1 0 0 1 1	33	Illegal instruction.	
0 0 1 1 0 1 0 0	34	Trace/privilege violation.	
0 0 1 1 0 1 0 1	35	Spurious/unassigned exception.	
0 0 1 1 0 1 1 0	36	Divide by 0/checksum/ format error.	
0 0 1 1 0 1 1 1	37	Trap instruction.	
0 0 1 1 1 0 0 0	38	Invalid dipswitch setting on INNIS01.	Check dipswitches SW1 through SW3.
0 0 1 1 1 1 0 0	3C	Termination unit failure.	Check termination unit fuse, power and relays.
0 0 1 1 1 1 1 0	3E	INNIS01 handshake failure.	Check dipshunt on module mounting unit backplane between INNIS01 and INIIT12/03. If dipshunt exists, replace INNIS01 or INIIT12/03.

INIIT12 ERROR CODES

If module errors occur while the INIIT12 INFI-NET to INFI-NET Transfer Module is operating, the module halts, the status LED turns red, and the eight CPU LEDs display an error code. Table 5-2 lists the INIIT12 error codes, their meaning and corrective action. Nonfatal module errors appear in the module status report from the operator interface (i.e., operator interface station, engineering work station etc.).

Table 5-2. INIIT12 Module Error Codes

CPU LEDs								Code	Error Condition	Corrective Action
8	7	6	5	4	3	2	1			
0	0	0	0	0	0	0	1	01	NVRAM error. NVRAM not initialized or bad checksum.	Initialize NVRAM.
0	0	0	0	1	0	1	1	0B	NVRAM initialized.	Set dipswitch SW4 pole 7 to 0 on INIIT12 and reset.
0	0	0	0	1	1	0	1	0D	Redundancy failure.	Check I/O expander bus. Check dipswitch SW3 pole 7 on INIIT12.
0	0	0	1	0	0	1	0	12	NIS handshake failure.	Check INIIT12 and NIS seating and cable connection. Replace INIIT12 or NIS.
0	0	0	1	0	0	1	1	13	ROM checksum error.	Reset INIIT12; replace if error continues.
0	0	0	1	0	1	0	0	14	I/O expander bus message failure.	
0	0	0	1	0	1	0	1	15	Loopback test failure.	Check cabling and termination unit/ module. Replace NIS if error continues.
0	0	1	1	0	0	0	1	31	Memory or CPU fault.	Replace INIIT12.
0	0	1	1	0	0	1	0	32	Address or bus error.	Reset INIIT12; replace if error continues.
0	0	1	1	0	0	1	1	33	Illegal instruction.	
0	0	1	1	0	1	0	0	34	Trace/privilege violation.	
0	0	1	1	0	1	0	1	35	Spurious/unassigned exception.	
0	0	1	1	0	1	1	0	36	Divide by 0/checksum/ format error.	Reset INIIT12, repeat module initialization, replace if error continues.
0	0	1	1	1	0	0	0	38	Dipswitch mismatch between primary and secondary INIIT12/ INNIS01.	Check primary and secondary INIIT12/ INNIS01 dipswitch settings.
0	0	1	1	1	0	0	1	39	Duplicate node address on loop.	Select another node address on NIS dipswitch SW1.
0	0	1	1	1	1	0	0	3C	Termination unit failure.	Check termination unit fuse, power and relays. Replace if error persists.
0	0	1	1	1	1	1	1	3F	INIIT12 was stopped with the stop/ reset pushbutton.	Reset INIIT12.

INIIT12 MODULE STATUS SUMMARY

INIIT12 INFI-NET to INFI-NET Transfer Module has a 16-byte module status record that provides summary flags for error conditions, module type and firmware revision level. Refer to the **Function Code Application Manual** for a listing of the fields that make up the INIIT12 module status report and the definition of each field within the module status report. Refer to the applicable operator interface product instruction for an explanation of how to access the module status report.

INIIT03 ERROR CODES

If module errors occur while the INIIT03 INFI-NET to INFI-NET Transfer Module is operating the module halts, the status LED turns red and the Bank B CPU LEDs display an error code. If a redundant module is installed, it takes over operation. Table 5-3 lists the INIIT03 error codes, their meaning and corrective action. Nonfatal module problems will appear in the module status report, through an operator interface such as the operator interface station.

Table 5-3. INIIT03 Module Error Codes

Bank B CPU LEDs 8 7 6 5 4 3 2 1	Code	Error Condition	Corrective Action
0 0 0 0 1 1 0 1	0D	Intermodule link error.	Check for I/O expander bus connection between primary and secondary INNIS01. Check cable to termination unit/module.
0 0 0 0 1 1 1 0	0E	Module addresses are the same on primary and redundant INIIT03.	Change dipswitch UUB0 pole 8 on one of the INIIT03 modules.
x 0 0 1 0 0 0 1	11	INNIS01 handshake failure.	Replace INIIT03 or INNIS01. ¹
x 0 0 1 0 0 1 0	12	INNIS01 not responding.	Check I/O expander bus address and INNIS01 seating. ¹
0 0 0 1 0 0 1 1	13	ROM checksum error.	Reset INIIT03; replace if error continues.
0 0 0 1 0 1 0 0	14	I/O expander bus message failure.	
x 0 0 1 0 1 0 1	15	Loop failure.	Replace INNIS01; check cabling and termination unit/module. ¹
x 0 0 1 0 1 1 0	16	Loopback test failure.	
x 0 1 0 1 0 1 1	2B	Attempt to de-allocate block not allocated.	Reset INIIT03. Review system configuration, particularly ASCII tags, incomplete console databases, or missing XR source nodes. If error continues contact Elsig Bailey technical support.
0 0 1 1 0 0 0 1	31	Memory or CPU fault.	Replace INIIT03.
0 0 1 1 0 0 1 0	32	Address or bus error.	Reset INIIT03; replace if error continues.

Table 5-3. INIIT03 Module Error Codes (continued)

Bank B CPU LEDs 8 7 6 5 4 3 2 1	Code	Error Condition	Corrective Action
0 0 1 1 0 0 1 1	33	Illegal instruction.	Reset INIIT03; replace if error continues.
0 0 1 1 0 1 0 0	34	Trace/privilege violation.	
0 0 1 1 0 1 0 1	35	Spurious/unassigned exception.	
0 0 1 1 0 1 1 0	36	Divide by 0/checksum/ format error.	
x 0 1 1 1 0 0 0	38	Option dipswitches do not match between primary and secondary modules.	Check for compatible dipswitch settings on INNIS01/INIIT03 pairs. ¹
x 0 1 1 1 0 0 1	39	Duplicate node number.	Select another node address on loop (dipswitch SW1 on INNIS01 module). ¹
x 0 1 1 1 1 0 0	3C	Loop termination unit/ module failure.	Check loop termination unit/module fuse. Check power to termination unit/ module. Replace if error persists. ¹
0 0 1 1 1 1 1 1	3F	INIIT03 was stopped with the stop/reset pushbutton.	Reset INIIT03.
1 1 1 1 1 1 1 1	FF	Power fail interrupt or I/O expander bus clock failure.	Check 5 VDC and ±15 VDC power. Check I/O expander bus dipshunts and MMU backplane. Replace module if error continues.

NOTE: 1. Bit 8 indicates which communication loop is in error. If bit 8 = 0, the error code applies to the central loop. If bit 8 = 1, the error code applies to the satellite loop.

INIIT03 MODULE STATUS SUMMARY

The INIIT03 INFI-NET to INFI-NET Transfer Module has a 16-byte module status record that provides summary flags for error conditions, module type, and firmware revision level. Refer to the **Function Code Application Manual** for a listing of the fields that make up the INIIT03 module status report and the definition of each field within the module status report. Refer to the applicable operator interface product instruction for an explanation of how to access the module status report.

EDGE CONNECTOR PIN ASSIGNMENTS

Tables 5-4, 5-5, and 5-6 list INNIS01 edge connector pin assignments. Tables 5-7, 5-8, and 5-9 list INIIT12 edge connector assignments. Tables 5-10, 5-11, 5-12, and 5-13 list INIIT03 edge connector assignments.

Table 5-4. INNIS01 Edge Connector P1 Pin Assignments

Pin	Signal	Pin	Signal
1	+5 VDC	2	+5 VDC
3	Unused	4	Unused
5	Common	6	Common
7	+15 VDC	8	-15 VDC
9	Power fail interrupt ¹	10	Power fail interrupt ¹
11	Unused	12	Unused

NOTE: 1.Active low.

Table 5-5. INNIS01 Edge Connector P2 Pin Assignments

Pin	Signal	Pin	Signal
1	Addr. 1, data bit 1	2	Addr. 0, data bit 0
3	Addr. 3, data bit 3	4	Addr. 2, data bit 2
5	Addr. 5, data bit 5	6	Addr. 4, data bit 4
7	Data bit 7	8	Data bit 6
9	Clock ¹	10	Sync ¹
11	Unused	12	Unused

NOTE: 1.Active low.

Table 5-6. INNIS01 Edge Connector P3 Pin Assignments

Pin	Signal	Pin	Signal
A	Receive 1 +	1	Receive 1 –
B	Ground	2	Ground
C	Ground	3	Ground
D	Bypass control +	4	Bypass control –
E	Ground	5	Ground
F	Transmit 1 + (phase 2)	6	Transmit 1 – (phase 2)
H	Transmit 1 – (phase 1)	7	Transmit 1 + (phase 1)
J	Ground	8	Ground
K	Transmit 2 + (phase 1)	9	Transmit 2 – (phase 1)
L	Transmit 2 – (phase 2)	10	Transmit 2 + (phase 2)
M	Ground	11	Ground
N	Power system status 1	12	Power system status 2
P	Ground	13	Ground
R	Ground	14	Ground
S	Receive 2 –	15	Receive 2 +

Table 5-7. INIIT12 Edge Connector P1 Pin Assignments

Pin	Signal	Pin	Signal
1	+5 VDC	2	+5 VDC

Table 5-7. INIIT12 Edge Connector P1 Pin Assignments

Pin	Signal	Pin	Signal
3	No connection	4	Controlway
5	Common	6	Common
7	Not used	8	Not used
9	Power fail interrupt ¹	10	Power fail interrupt ¹
11	Controlway 1	12	No connection

NOTE: 1.Active low.

Table 5-8. INIIT12 Edge Connector P2 Pin Assignments

Pin	Signal ¹	Pin	Signal ¹
1	Data bit D1	2	Data bit D0
3	Data bit D3	4	Data bit D2
5	Data bit D5	6	Data bit D4
7	Data bit D7	8	Data bit D6
9	Clock	10	Sync
11	No connection	12	No connection

NOTE: 1.All data bits are active low.

Table 5-9. INIIT12 Edge Connector P3 Pin Assignments

Pin	Signal	Pin	Signal
1	SAC/DCS link A (-)	16	SAC/DCS link A (+)
2	SAC/DCS link B (-)	17	SAC/DCS link B (+)
3	Redundancy transmit (-)	18	Redundancy transmit (+)
4	Redundancy transmit clock (-)	19	Redundancy transmit clock (+)
5	Redundancy receive (-)	20	Redundancy receive (+)
6	Redundancy receive clock (-)	21	Redundancy receive clock (+)
7	Receive A (-)	22	Receive A (+)
8	Receive B (-)	23	Receive B (+)
9	Clear to send A (-)	24	Clear to send A (+)
10	Clear to send B (-)	25	Clear to send B (+)
11	Transmit A (-)	26	Transmit A (+)
12	Transmit B (-)	27	Transmit B (+)
13	Request to send A (-)	28	Request to send A (+)
14	Request to send B (-)	29	Request to send B (+)
15	Digital output (+)	30	Digital output (-)

Table 5-10. INIIT03 Edge Connector P1 Pin Assignments

Pin	Signal	Pin	Signal
1	+5 VDC	2	+5 VDC
3	No connection	4	Controlway B/NC
5	Common	6	Common
7	No connection	8	Not used
9	Power fail interrupt ¹	10	No connection
11	Controlway A / module bus	12	No connection

NOTE: 1.Active low.

Table 5-11. INIIT03 Edge Connector P2 Pin Assignments

Pin	Signal ¹	Pin	Signal ¹
1	Data bit D1	2	Data bit D0
3	Data bit D3	4	Data bit D2
5	Data bit D5	6	Data bit D4
7	Data bit D7	8	Data bit D6
9	Clock	10	Sync
11	Parity	12	Error

NOTE: All data bits are active low.

Table 5-12. INIIT03 Edge Connector P3 Link Pin Assignments

Pin	Signal	Pin	Signal
1	Red1 parity	16	GND
2	Red1 data 7	17	Red1 data 6
3	Red1 data 5	18	Red1 data 4
4	Red1 data 3	19	Red1 data 2
5	Red1 data 1	20	Red1 data 0
6	GND	21	GND
7	Red1 BLCK	22	Red2 BLCK
8	GND	23	GND
9	Red1 busy	24	Red2 busy
10	GND	25	GND
11	Red2 data 7	26	Red2 data 6
12	Red2 data 5	27	Red2 data 4
13	Red2 data 3	28	Red2 data 2
14	Red2 data 1	29	Red2 data 0
15	GND	30	Red2 parity

*Table 5-13. RS-232-C Diagnostic
Port P4 Pin Assignment*

Pin	Signal	
	P4 Configured as DCE	P4 Configured as DTE
2	RXD	TXD
3	TXD	RXD
5	GND	GND
7	RTS	CTS
8	CTS	RTS

NOTE: This terminal is useful only to qualified Eltag
Bailey personnel.

SECTION 6 - MAINTENANCE

INTRODUCTION

WARNING

Never clean electrical parts or components with live power present. Doing so exposes you to an electrical shock hazard.

WARNING

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.

The reliability of any stand alone product or control system is affected by the maintenance of the equipment. Elsas 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 you in establishing good preventive maintenance practices. Select the minimum steps required to meet the cleaning needs of your system.

- Maintenance personnel should be qualified electrical technicians or engineers that know the proper use of test equipment and how to handle electronic circuitry.
- Maintenance personnel should be familiar with the INFI-NET communication system, have experience working with process control systems, and know what precautions to take when working around live electrical systems.

PREVENTIVE MAINTENANCE SCHEDULE

Table 6-1 is the preventive maintenance schedule for the INFI-NET to INFI-NET interface modules. The table lists the preventive maintenance tasks in groups according to their specified maintenance interval. Some tasks in Table 6-1 are self explanatory. Instruction for tasks that require further explanation are covered under **PREVENTIVE MAINTENANCE PROCEDURES**.

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

Table 6-1. Preventive Maintenance Schedule

Task	Frequency
Check the INFI-NET to INFI-NET interface modules and module mounting unit for dust. Clean as necessary using an antistatic vacuum.	3 months
Check all signal, power and ground connections associated with the interface modules and the associated termination units or modules. Refer to procedure.	
Inspect the interface modules and associated termination units or modules, giving particular attention to power supply contacts and edge connectors. Clean as necessary. Refer to procedure.	12 months
Complete all tasks in this table.	Shutdown

EQUIPMENT REQUIRED

This is a list of tools and equipment required for the maintenance procedures.

- Antistatic vacuum.
- Compressed air.
- Two flathead screwdrivers (one suitable for termination unit terminals, one suitable for termination module terminals).
- Isopropyl alcohol (99.5 percent electronic grade).
- Eberhard Faber (400A) pink pearl eraser.
- Foam tipped swab.
- Fiberglass burnishing brush.
- Lint free cloths.
- Small needle nose pliers.

PREVENTIVE MAINTENANCE PROCEDURES

This section covers tasks from Table 6-1 that require specific instructions or further explanation:

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

Checking Connections

Check all signal wiring, power and ground connections to the interface modules and their associated termination unit or module. 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 should be off while performing this preventive maintenance task.

1. Verify module cable connections.
2. Verify that all power and field wiring connections to the interface termination units or termination modules are secure.

Printed Circuit Board Cleaning

There are several circuit board cleaning procedures in this section. These procedures cover circuit board cleaning and washing, and cleaning 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 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 or wiping the board with isopropyl alcohol (99.5% electronic grade). Use a foam tipped swab to wipe the circuit board.
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.
4. Wipe clean with a lint free cloth.

CLEANING FEMALE EDGE CONNECTORS

To clean the contacts on a female edge connector:

1. Use a foam tipped swab or a lint free cloth wrapped over a piece of scrap circuit board. Soak the swab or cloth in electronic grade isopropyl alcohol.
2. Insert the swab or cloth covered circuit board into edge connector and work it back and forth to clean the contacts.
3. Rinse the edge connector contacts by spraying with isopropyl alcohol.
4. Remove excess alcohol and dry using compressed air.

SECTION 7 - REPAIR/REPLACEMENT PROCEDURES

INTRODUCTION

This section covers INFI-NET to INFI-NET interface module replacement procedures. There are no special tools required to replace any of the INFI-NET to INFI-NET interface modules.

NOTE: Always use the Eltag Bailey field static kit (part number 1948385?1) when working with any INFI-NET interface module. This kit connects the static dissipative work surface and technician to the same ground point.

MODULE REPAIR/REPLACEMENT

If an INFI-NET to INFI-NET interface module is faulty, replace it with a new one. **Do not** try to repair the module; replacing components may affect module performance. The module can be removed while system power is supplied. When removing a module that is operating, use the stop/reset pushbutton to stop module operation before removing it from the module mounting unit (refer to [Section 4](#)). To replace a module:

1. Push and turn the two front panel captive retaining latches $\frac{1}{2}$ -turn to unlatch the module. It is unlatched when the slots on the latches are vertical and the open end of the slots face away from the module.
2. Slide the module out of the module mounting unit (MMU).
3. Configure the replacement module dipswitch and jumper settings to match the original module.
4. In the same slot assignment as the original module, align the replacement module with the plastic guide rails of the MMU card cage slot. Slide it in until the front panel is flush with the top and bottom of the MMU frame.
5. Push and turn the two captive retaining latches on the module faceplate $\frac{1}{2}$ -turn to the latched position. It is latched when the slots on the latches are vertical and the open ends face the center of the module.
6. Return to normal operation.

TERMINATION UNIT/MODULE REPLACEMENT

Refer to the termination unit or module product instruction for termination unit or module, or termination cable replacement instructions.

SECTION 8 - SUPPORT SERVICES

INTRODUCTION

Bailey Controls Company is ready to help in the use and repair of its products. Contact the nearest sales office to make requests for sales, applications, installation, repair, overhaul and maintenance contract services.

REPLACEMENT PARTS AND ORDERING INFORMATION

When making repairs at your facility, order replacement parts from a Bailey Controls Company sales office. Provide this information:

1. Part description, part number and quantity.
2. Model and serial numbers (if applicable).
3. Bailey Controls Company instruction manual number, page number and reference figure that identifies the part.

When ordering standard parts, use Bailey Controls Company part numbers and descriptions. Order parts without commercial descriptions from the nearest Bailey Controls Company sales office.

TRAINING

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

TECHNICAL DOCUMENTATION

Additional copies of this manual, or other Bailey Controls Company manuals, can be obtained from the nearest Bailey Controls Company sales office for a reasonable charge.

APPENDIX A - NTCL01 TERMINATION UNIT CONFIGURATION

INTRODUCTION

The INNIS01 Network Interface Slave Module terminates through an NTCL01 Communication Termination Unit via a cable connection (NKLS01 or NKLS11 termination cable). Twi-nax or coax cable may be used to connect the interface to the communication loop. Refer to the NTCL01 product instruction for information about termination unit mounting, cable lengths and fuse replacement.

Figure A-1 shows the NTCL01 circuit board layout. Table A-1 shows jumper settings for NTCL01 termination units having circuit board revisions D and E. Table A-2 shows jumper settings for NTCL01 termination units having circuit board revisions F and higher. Refer to Figure A-2 for a diagram of termination unit cable and coax cable connections.

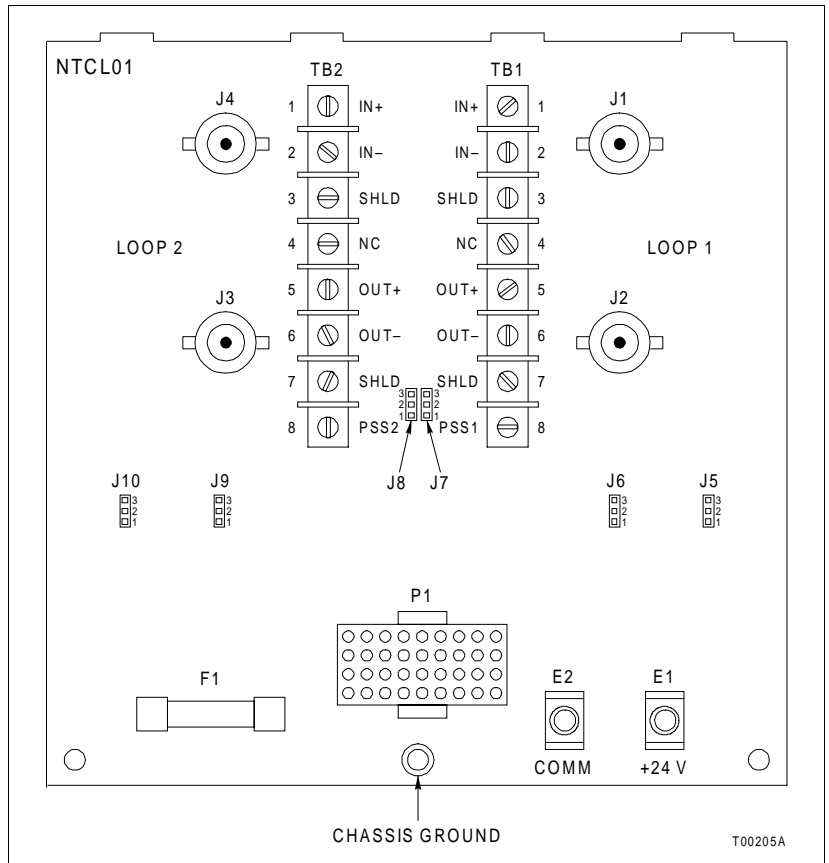


Figure A-1. NTCL01 Connector Assignments and Jumper Locations, Revision F Circuit Board

Table A-1. NTCL01 Jumper Settings, Circuit Board Revisions D and E

Jumper No.	Twinax	Coax												
J5 to J12	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td></tr> </table>	1	2	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td></tr> </table>	1	2	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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1	2	3												
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J13 to J18	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td></tr> </table>	1	2	3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td></tr> </table>	1	2	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1	2	3												
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>												
1	2	3												
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>												

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Table A-2. NTCL01 Jumper Settings, Circuit Board Revision F and Higher

Jumper No.	Twinax	Coax												
J5 to J10	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td></tr> </table>	1	2	3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td></tr> </table>	1	2	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1	2	3												
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>												
1	2	3												
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>												

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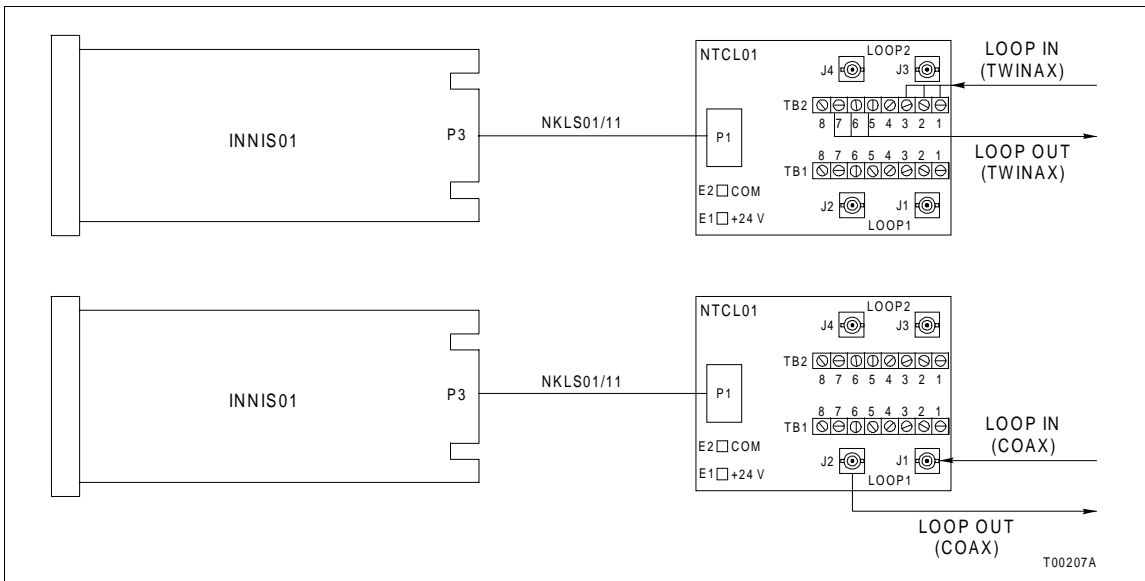


Figure A-2. NTCL01 Termination Unit Cable Connections

APPENDIX B - NICL01 TERMINATION MODULE CONFIGURATION

INTRODUCTION

The INNIS01 Network Interface Slave Module terminates through an NICL01 Communication Termination Module via a cable connection (NKLS02 or NKLS12 termination cable). Twi-nax or coax cable may be used to connect the interface to the communication loop. Refer to the NICL01 product instruction for information about termination module mounting, cable lengths and fuse replacement.

Figure B-1 shows the NICL01 circuit board revision D layout. Table B-1 contains jumper settings for NICL01 termination modules with circuit board revision C. Table B-2 contains jumper settings for NICL01 termination modules with circuit board revisions D and higher. Refer to Figure B-2 for a diagram of termination module and coax cable connections.

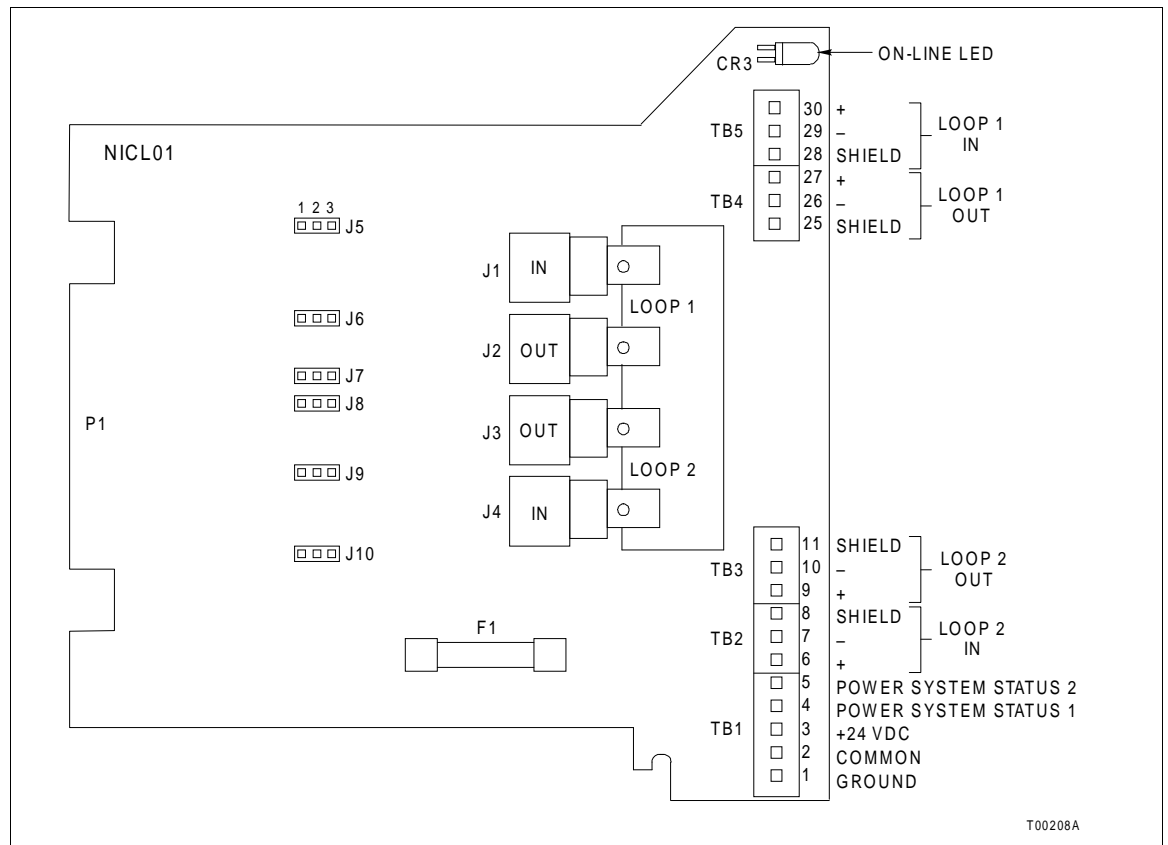


Table B-1. NICL01 Jumper Settings, Circuit Board Revision C

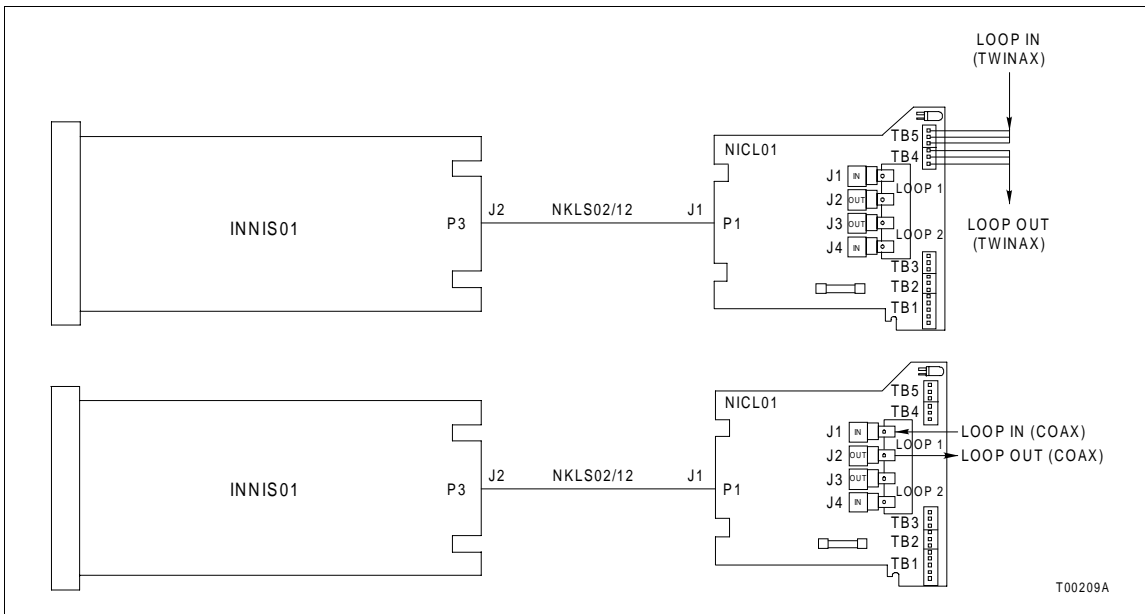
Jumper No.	Twinax	Coax
J5 to J12	<div style="display: flex; justify-content: space-around; width: 100px;"> 123 </div>	<div style="display: flex; justify-content: space-around; width: 100px;"> 123 </div>
J13 to J18	<div style="display: flex; justify-content: space-around; width: 100px;"> 123 </div>	<div style="display: flex; justify-content: space-around; width: 100px;"> 123 </div>

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Table B-2. NICL01 Jumper Settings, Circuit Board Revisions D and Higher

Jumper No.	Twinax	Coax
J5 to J10	<div style="display: flex; justify-content: space-around; width: 100px;"> 123 </div>	<div style="display: flex; justify-content: space-around; width: 100px;"> 123 </div>

T00206A



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Figure B-2. NICL01 Termination Module Cable Connections

APPENDIX C - NTMP01 TERMINATION UNIT CONFIGURATION

INTRODUCTION

The INIIT12 INFI-NET to INFI-NET Transfer Module uses the NTMP01 Multi-Function Processor Termination Unit for termination. Figure C-1 shows the dipshunt configuration required for ports one or two to operate as a data port. Figure C-2 shows the dipshunt configuration required for port two to drive a diagnostic terminal. Figure C-3 shows the jumper assignments for handshake signals. These jumpers are normally installed. Figure C-4 shows the required jumper settings for J14 through J17. Figure C-5 shows the required jumper setting for J18. Figure C-6 shows the NTMP01 connector assignments and jumper locations. Figure C-7 shows NTMP01 termination unit cable connections.

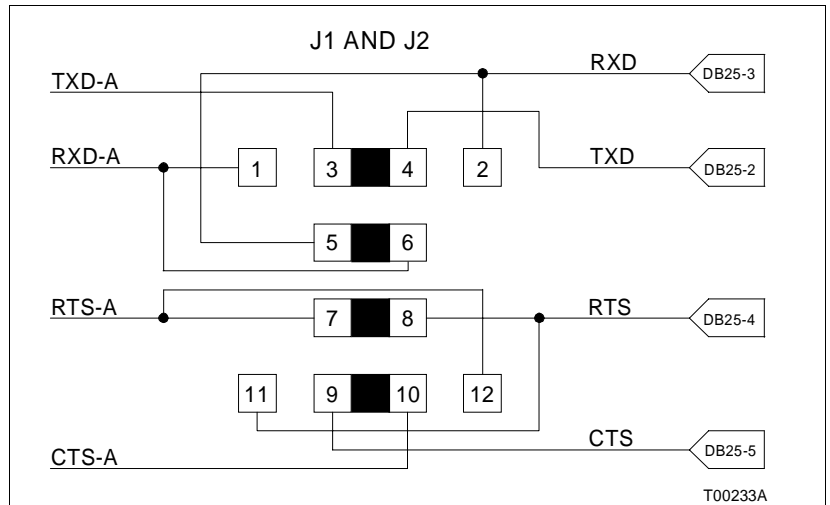


Figure C-1. Jumper Configuration for Data Port
(Port 1 or 2)

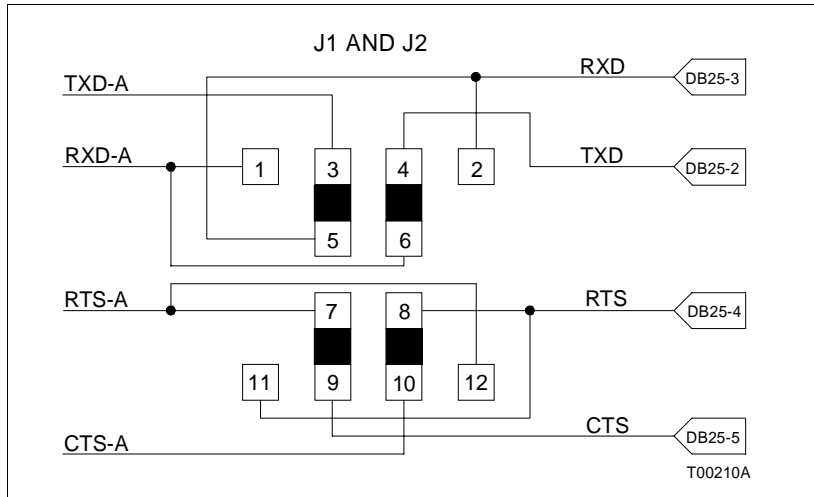


Figure C-2. Jumper Configuration for Diagnostic Port (Port 2 Only)

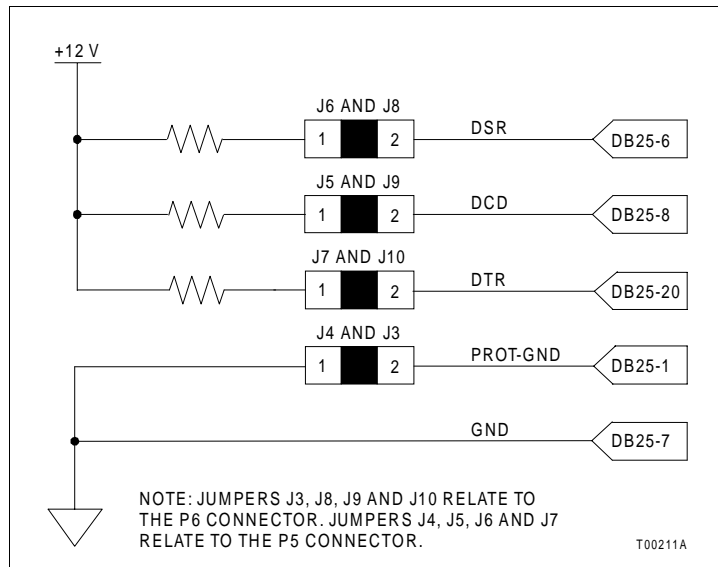


Figure C-3. Handshake Signal Jumpers (Normally Installed)

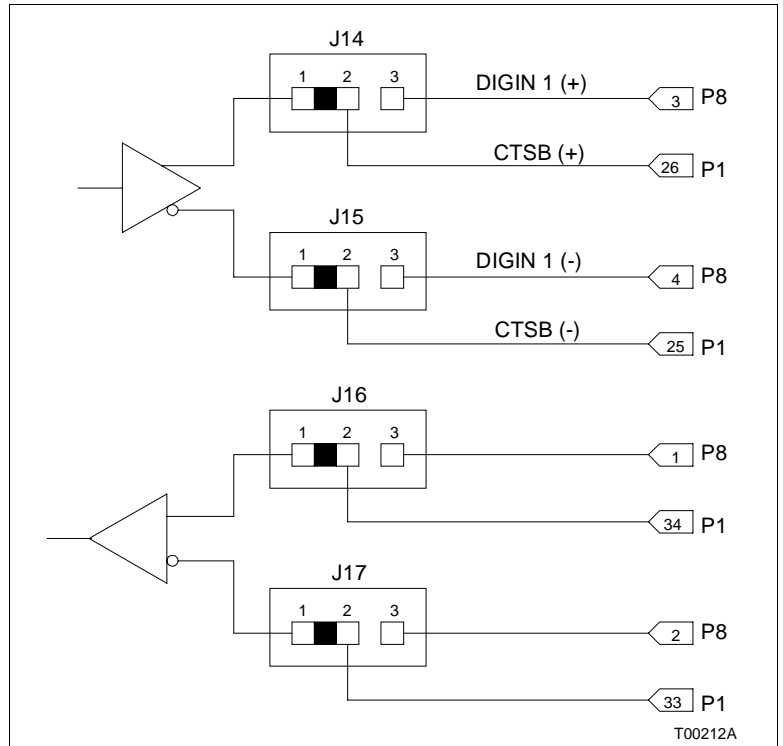


Figure C-4. Jumper Settings for J14 through J17

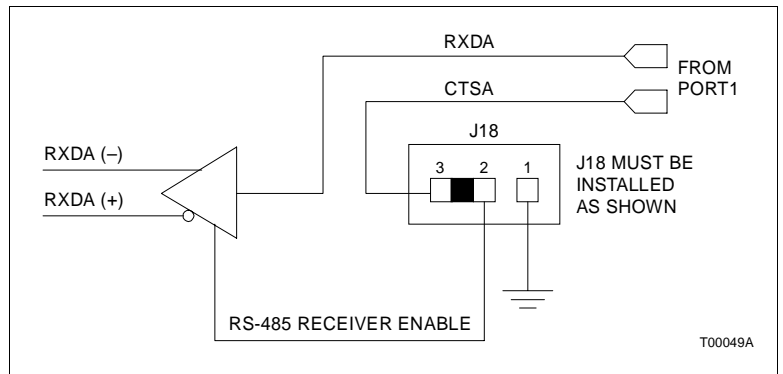


Figure C-5. Jumper Setting for J18

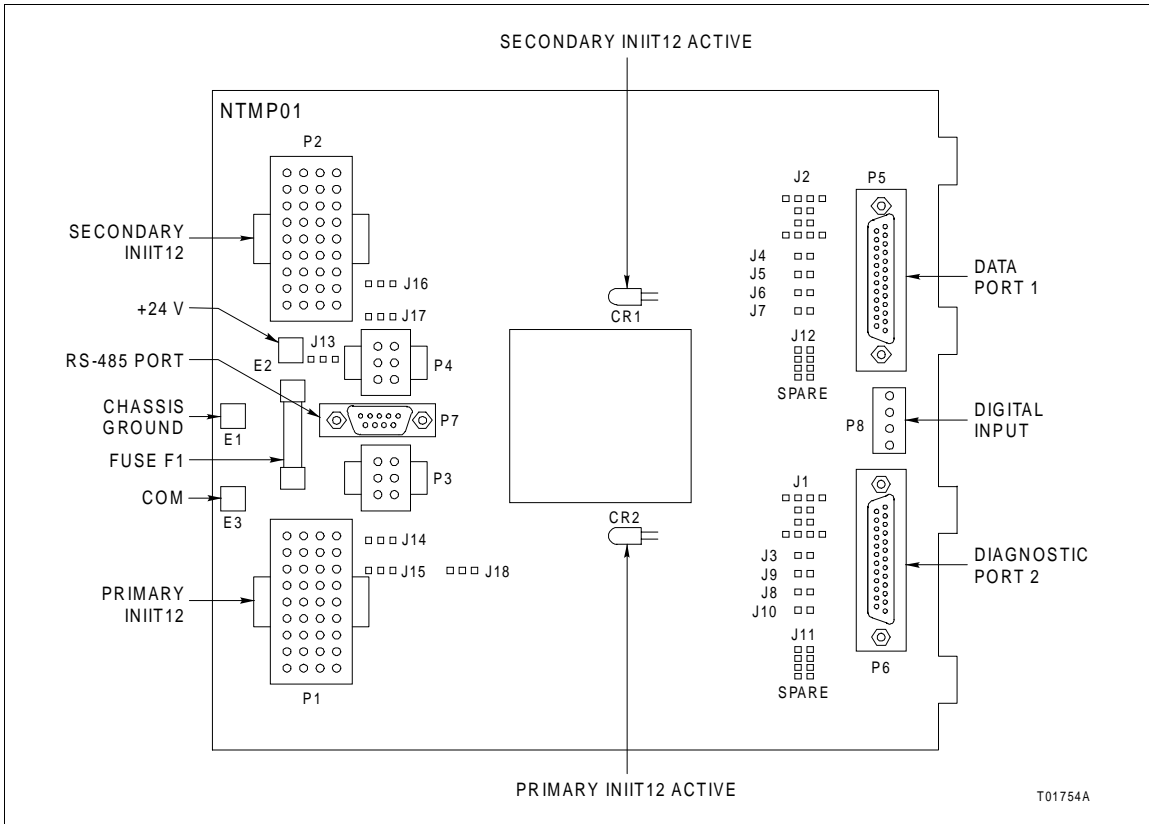


Figure C-6. NTMP01 Connector Assignments and Jumper Locations

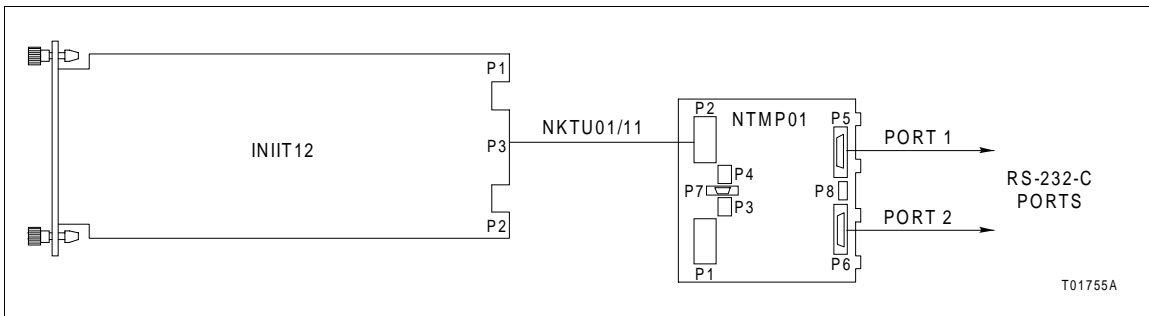


Figure C-7. NTMP01 Cable Connections

APPENDIX D - NIMP01 AND NIMP02 TERMINATION MODULE CONFIGURATION

INTRODUCTION

The INIIT12 INFI-NET to INFI-NET Transfer Module can use the NIMP01 or NIMP02 Multi-Function Processor Termination Module for termination. The NIMP02 termination module is required only for redundant INFI-NET to INFI-NET interfaces.

Figure D-1 shows the dipshunt configuration required for port one or two to operate as a data port. Figure D-2 shows the dipshunt configuration required for port two to drive a diagnostic terminal. Figure D-3 shows the jumper assignments for handshake signals. These jumpers are normally installed. Figure D-4 shows the required jumper settings for J14 through J17. Figure D-5 shows the required jumper setting for J18. Figure D-6 shows the NIMP01 connector assignments and jumper locations. Figure D-7 shows NIMP01 termination module cable connections. Refer to [Appendix E](#) for cable diagrams and information on how to install redundant termination modules.

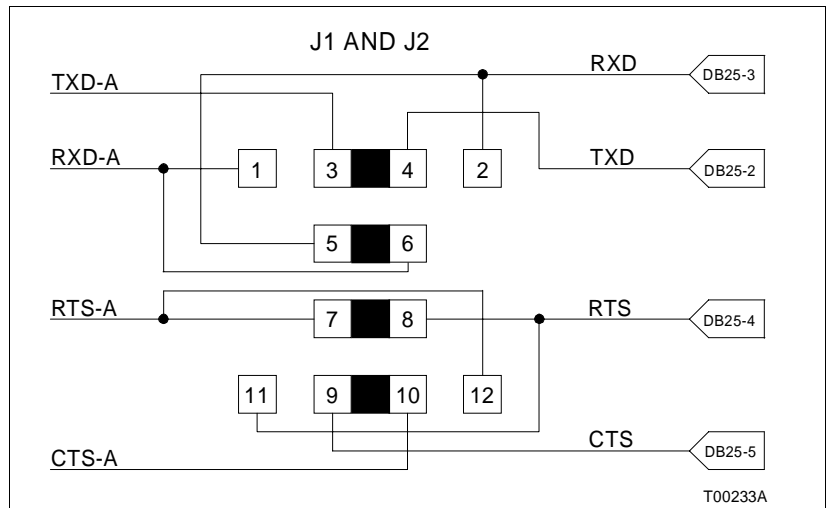


Figure D-1. Jumper Configuration for Data Port
(Port 1 or 2)

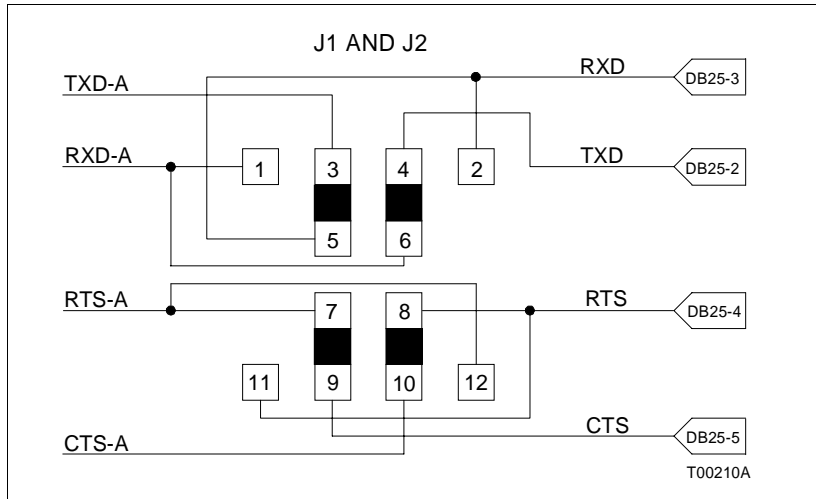


Figure D-2. Jumper Configuration for Diagnostic Port (Port 2 Only)

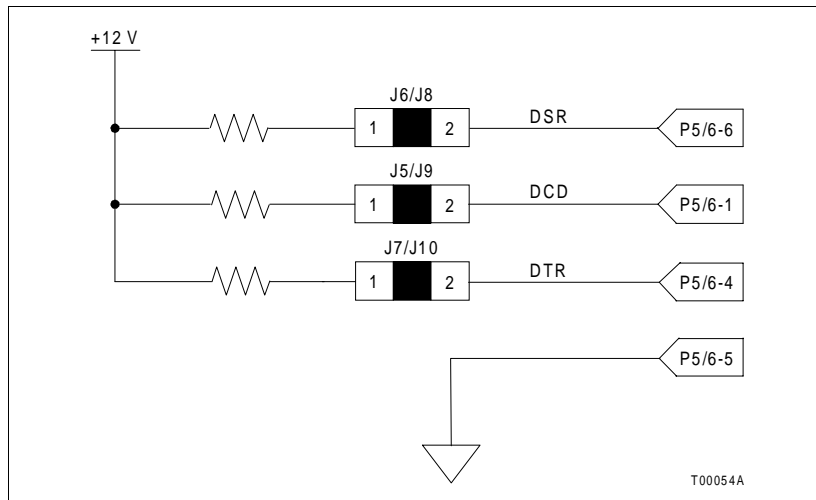


Figure D-3. Handshake Signal Schematic (Normally Installed)

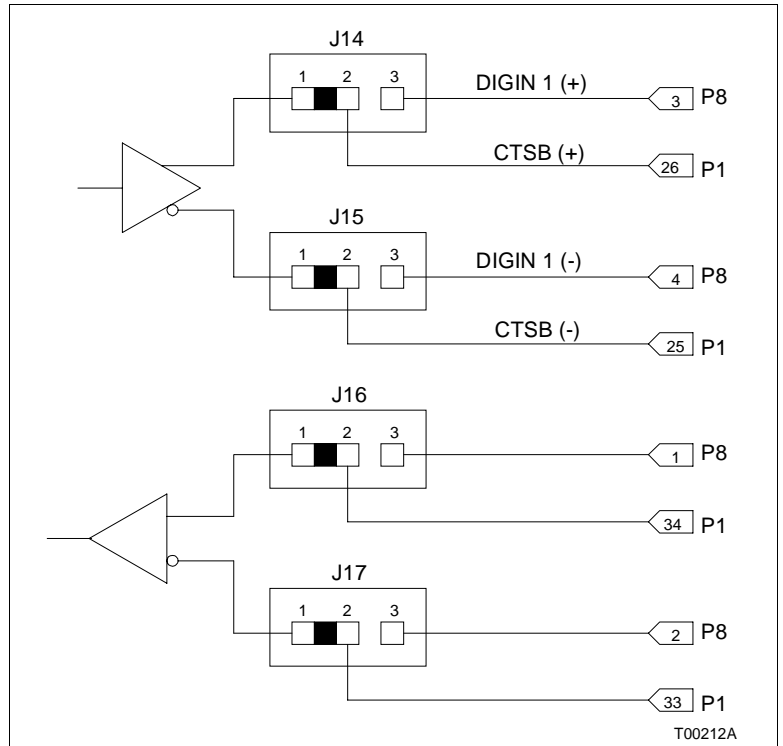


Figure D-4. Jumper Settings for J14 through J17

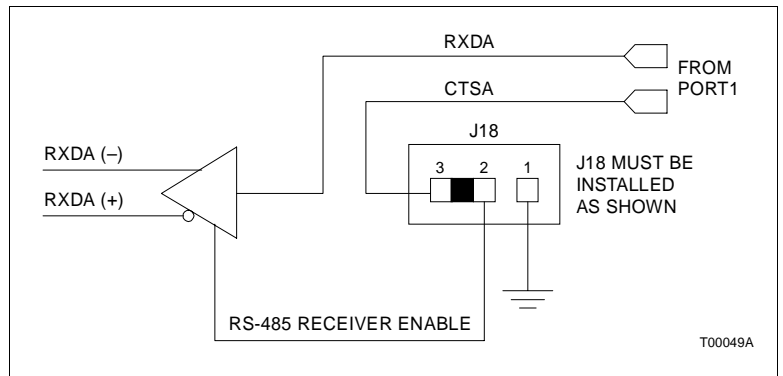


Figure D-5. Jumper Setting for J18

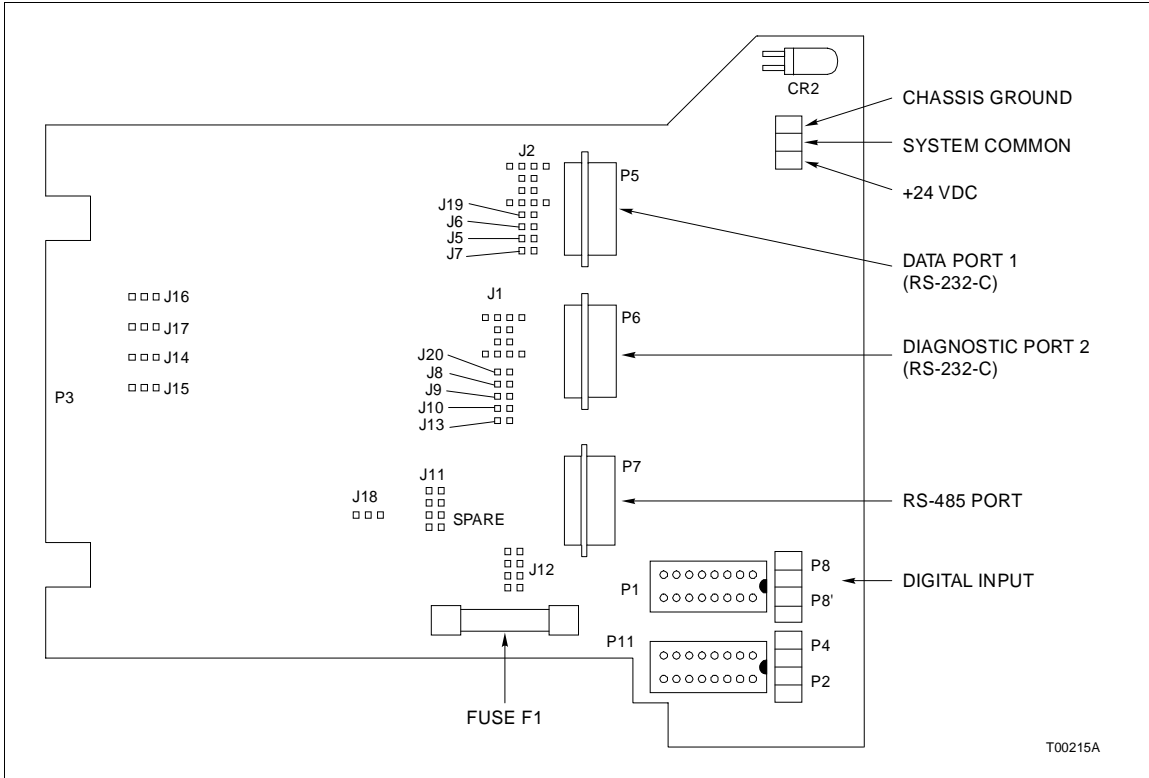


Figure D-6. NIMP01 Connector Assignments and Jumper Locations

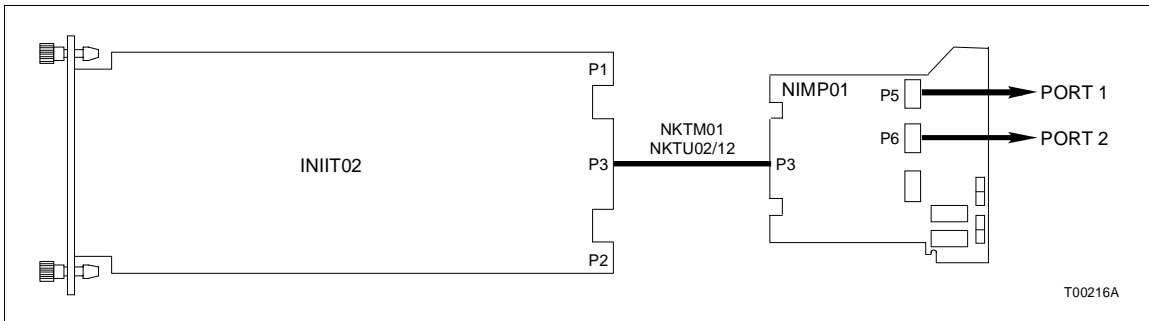


Figure D-7. NIMP01 Cable Connections

APPENDIX E - INIIR01 REDUNDANT CONFIGURATIONS

INTRODUCTION

This section provides information on various ways to terminate a redundant INIIR01 INFI-NET to INFI-NET Remote Interface. Redundant interfaces provide an additional level of operational security against module or communication system component failure.

REDUNDANT CONFIGURATIONS

Redundant INIIT12 INFI-NET to INFI-NET Transfer Modules must share a common Controlway or module bus. The transfer modules use Controlway for redundancy communication and for transfer of the executive block (function code 202) configuration between the primary and secondary INIIT12 module.

An I/O expander bus connection must exist between each INIIT12 module and its associated network interface slave (NIS) module. Do not connect the I/O expander bus between the primary and secondary INIIT12 module. Keep each I/O expander bus as short as possible.

Switch Settings for Redundancy

To enable redundancy, dipswitch SW3 pole seven must be set to one on both INIIT12 modules. Executive block specification S17 and the serial port configuration determine what conditions will lead to a failover from primary to secondary INIIT12 module. If the primary module stops executing for any reason, the backup INIIT12 module will attempt to come on-line.

The INIIT12 module supports external equipment switching on failover. This feature requires redundant digital I/O modules and associated termination unit or module. The setting of dipswitch SW4 pole three on the INIIT12 module (and specification S17 of function code 202) determines the initial or final state of digital I/O module output number three. In redundant applications, dipswitch SW4 pole three on the primary INIIT12 module enables the primary transceiver while the primary INIIT12 module is on-line. Setting the same switch to the opposite position on the secondary INIIT12 module enables the secondary transceiver if a failover occurs.

Redundant Hardware Configuration Example

Figure E-1 shows a block diagram of a configuration using redundant transceivers. The connections shown allow the primary INIIT12 module to connect the antenna to the primary

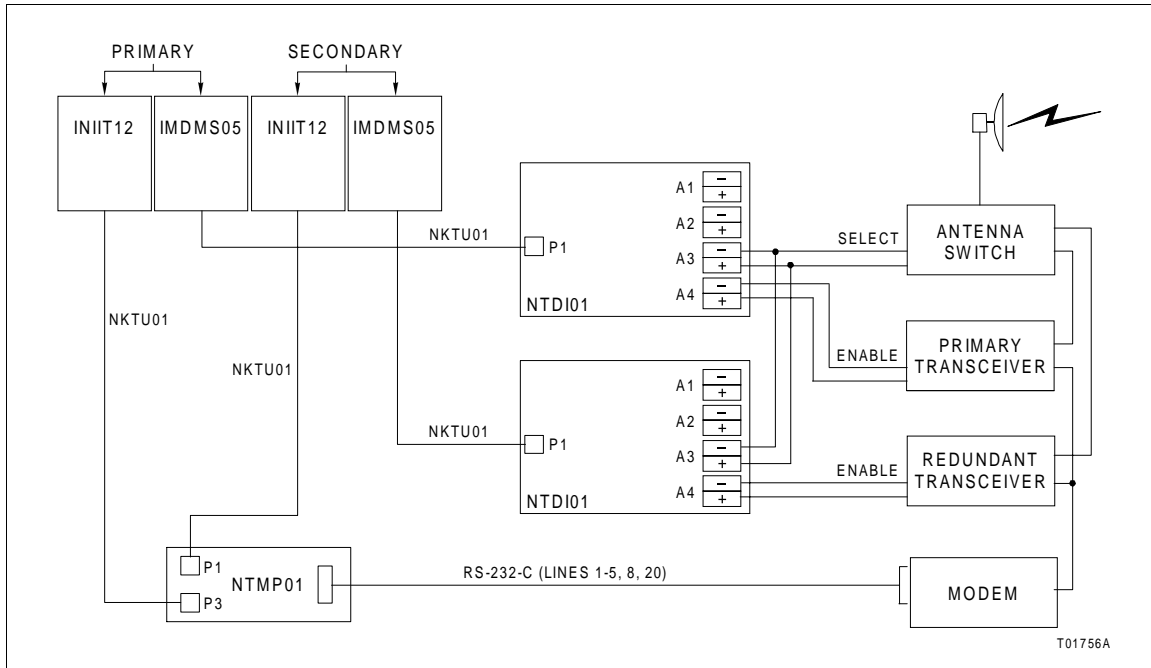


Figure E-1. Control of Redundant Communication Equipment

transceiver. If failover occurs, the secondary INIIT12 module connects the antenna to the redundant transceiver. **Function Code 202 - INFI-NET to INFI-NET Remote Transfer Module Executive Block (INIIT12)** in the **Function Code Application Manual** explains how to configure the executive block when using redundant transceivers.

Voltage levels and polarities of enable signals to transceivers and other communications equipment vary. Refer to the applicable user manuals for the operating specifications of transceivers or other communication equipment before making any connections to the IMDSO01, IMDSO02, IMDSO03 or IMDSO04 Digital Slave Output Modules, or IMDSM05 Digital Slave I/O Module.

Redundant Termination Units/Modules

Redundant configurations can be with or without redundant termination units or modules. In both cases, one or both serial ports can be used for data transfer depending on the needs of the application. Figures E-2 through E-5 show redundant interfaces using various termination unit and module configurations.

Figure E-2 illustrates redundant INIIT12 modules using a single NTMP01 Multi-Function Processor Termination Unit. In this configuration, the INIIT12 modules share a single termina-

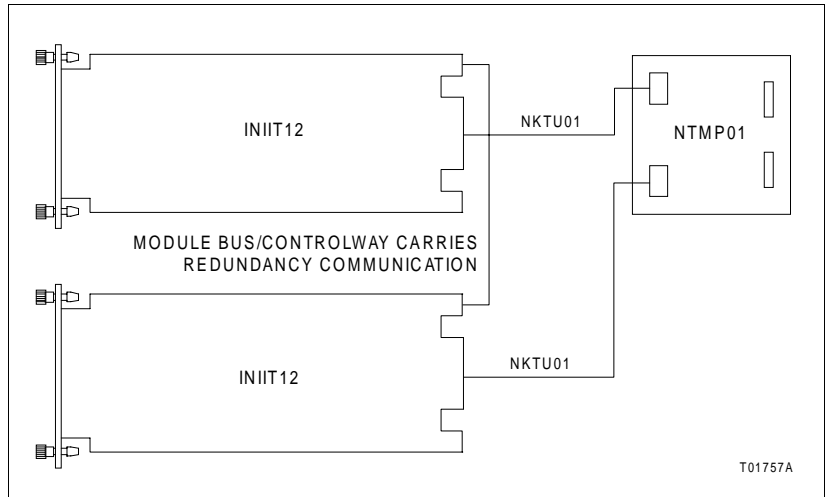


Figure E-2. Redundant Transfer Modules Using One Termination Unit

tion unit and communicate through one or two serial channels. The primary INIIT12 module controls the termination unit.

Figure E-3 shows redundant INIIT12 modules using NIMP01 and NIMP02 Multi-Function Processor Termination Modules. This configuration gives redundant INIIT12 modules access to the two RS-232-C channels on the NIMP01 termination module. The secondary INIIT12 module must access the serial channels on the NIMP01 termination module through its connection to the NIMP02 termination module. The primary INIIT12 module controls the NIMP01 termination module.

Figure E-4 illustrates how redundant INIIT12 modules use two NTMP01 termination units. This configuration gives each INIIT12 module control of a termination unit with two RS-232-C serial channels. Only the primary INIIT12 module will enable its termination unit. The secondary INIIT12 module will not attempt to enable its termination unit unless it becomes the primary transfer module.

Figure E-5 illustrates redundant INIIT12 modules using two NIMP01 termination modules. This configuration gives each INIIT12 module control of a termination module with two RS-232-C serial channels. Only the primary module can enable its termination unit. The secondary INIIT12 module will not enable its termination unit unless it becomes the primary transfer module.

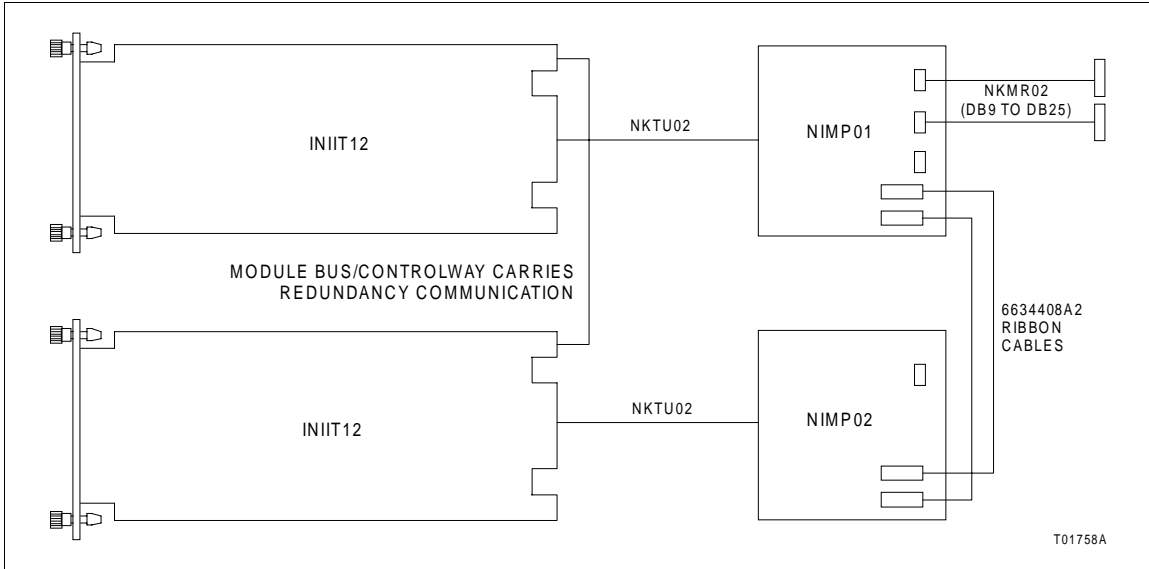


Figure E-3. Redundant Transfer Modules Using NIMPO1 and NIMPO2 Termination Modules

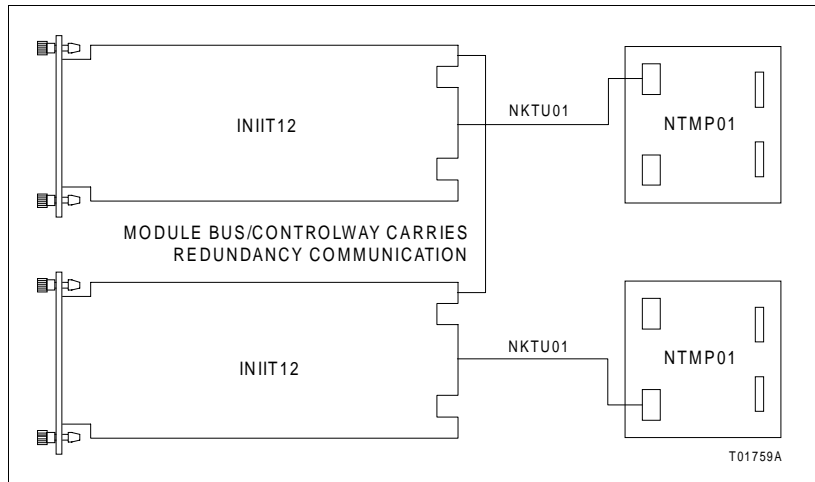


Figure E-4. Redundant Transfer Modules Using Redundant Termination Units

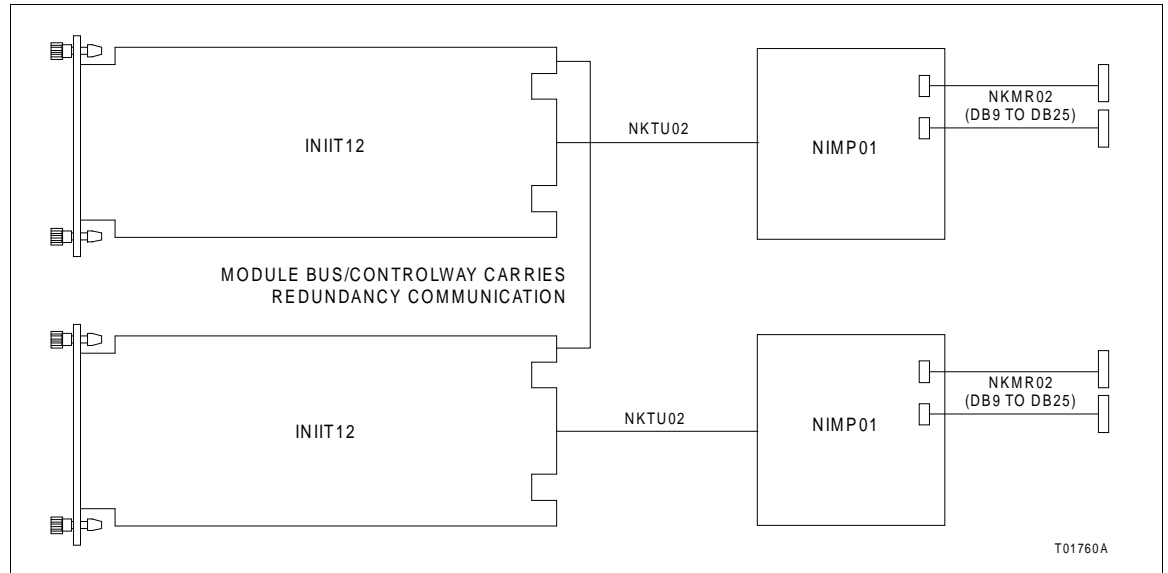


Figure E-5. Redundant Transfer Modules with Redundant NIMP01 Termination Modules

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