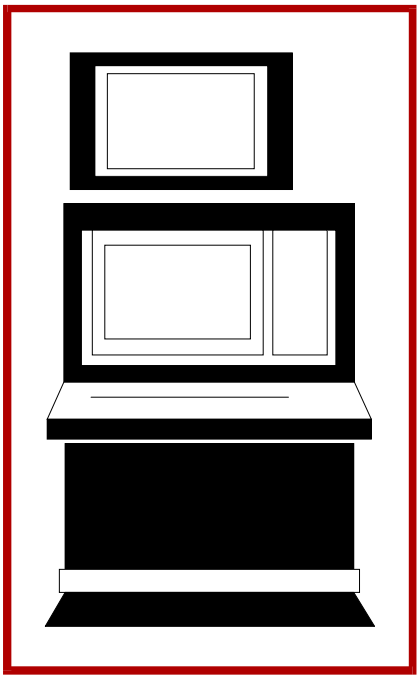
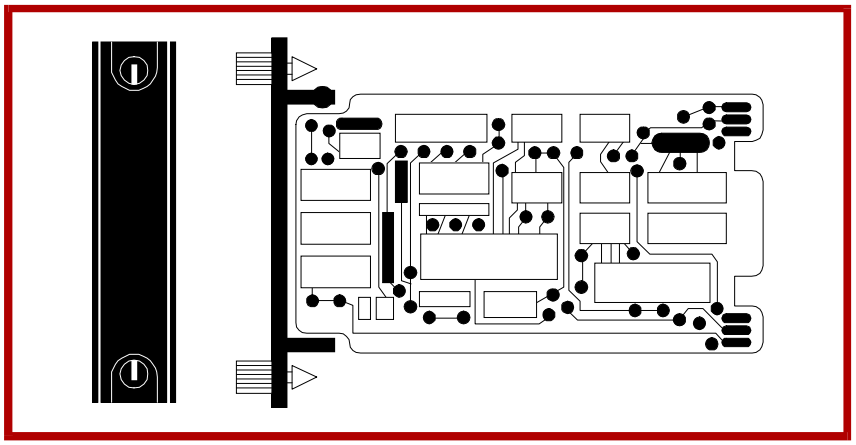
Bailey® infi 90®

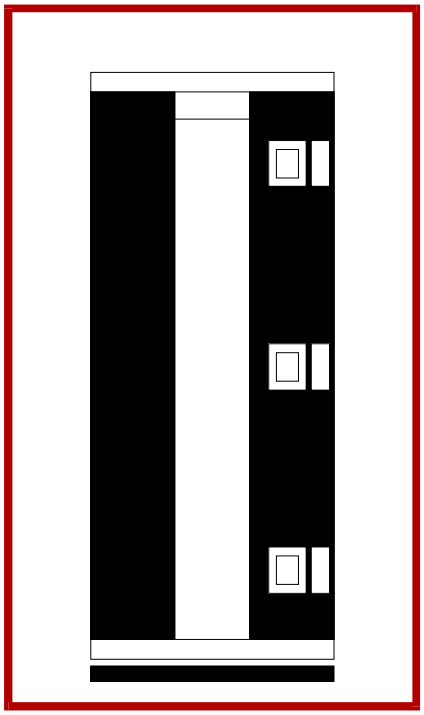
E96-613

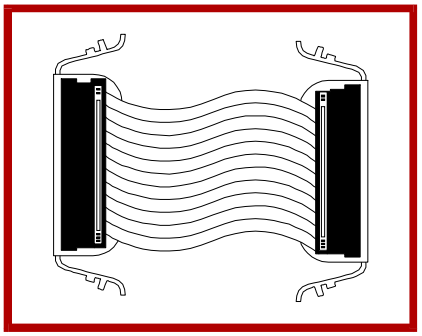
Instruction

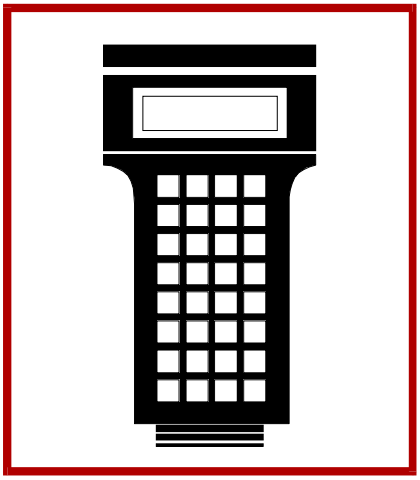
INFI-NET to Plant Loop Remote Interface
(INIPR01)

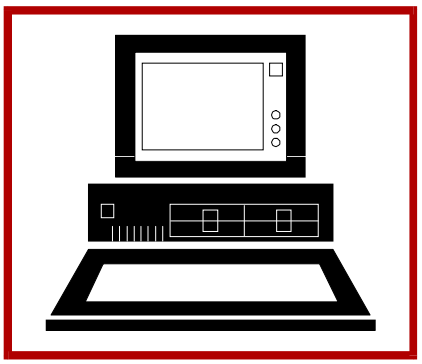












Bailey Process Control and Automation Solutions from Elsag Bailey Group

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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MOST ELECTRONIC EQUIPMENT IS INFLUENCED BY RADIO FREQUENCY INTERFERENCE (RFI). CAUTION SHOULD BE EXERCISED WITH REGARD TO THE USE OF PORTABLE COMMUNICATIONS EQUIPMENT IN THE AREA AROUND SUCH EQUIPMENT. PRUDENT PRACTICE DICTATES THAT SIGNS SHOULD BE POSTED IN THE VICINITY OF THE EQUIPMENT CAUTIONING AGAINST THE USE OF PORTABLE COMMUNICATIONS EQUIPMENT.

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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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L'ENTRETIEN DOIT ÊTRE ASSURÉ PAR UNE PERSONNE QUALIFIÉE EN CONSIDÉRANT L'ASPECT SÉCURITAIRE DES ÉQUIPEMENTS CONTRÔLÉS PAR CE PRODUIT. L'AJUSTEMENT ET/OU L'EXTRACTION DE CE PRODUIT PEUT OCCASIONNER DES À-COUPS AU PROCÉDÉ CONTRÔLE LORSQU'IL EST INSÉRÉ DANS UNE SYSTÈME ACTIF. CES À-COUPS PEUVENT ÉGALEMENT OCCASIONNER DES BLESSURES OU DES DOMMAGES MATÉREILS.

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Preface

The INIPR01 INFI-NET® to Plant Loop Remote Interface links a remote satellite Plant Loop and a central INFI-NET loop. The INFI-NET to Plant Loop remote interface (IPR) permits the exchange of exception reports, configuration and control messages, and system status data between INFI-NET and Plant Loop communication systems.

An INNIS01 Network Interface Slave Module, an INIPT02 INFI-NET to Plant Loop Transfer Module, and an IMMPI01 Multi-Function Processor Interface Module make up an IPR remote interface. Two IPR interfaces, one connected to the Plant Loop system and one connected to the INFI-NET system, are required for a complete link.

This instruction explains the IPR interface features, specifications and operation. It also includes installation and troubleshooting procedures for each module.

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List of Effective Pages

Total number of pages in this manual is 88, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through ix	Original
1-1 through 1-7	Original
2-1 through 2-6	Original
3-1 through 3-19	Original
4-1 through 4-5	Original
5-1 through 5-10	Original
6-1 through 6-4	Original
7-1 through 7-2	Original
8-1 through 8-2	Original
A-1 through A-3	Original
B-1 through B-3	Original
C-1 through C-5	Original
D-1 through D-5	Original
E-1 through E-6	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 updated page, the changed text or table is indicated by a vertical bar in the outer margin of the page at 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.

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. 3-9, 3-18) 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 IPT 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. 3-14) To avoid potential module damage, evaluate your system for compatibility prior to module installation. The INIPT02 module uses connections to the module mounting unit backplane that served other functions in early Network 90 systems. (p. 3-17)

Sommaire de Sécurité

AVERTISSEMENTS D'ORDRE GÉNÉRAL	**Environnement de l'équipement** Ne pas soumettre les composants à une atmosphère corrosive lors du transport, de l'entreposage ou l'utilisation. **Possibilité de chocs électriques durant l'entretien** Débrancher l'alimentation ou prendre les précautions pour éviter tout contact avec des composants sous tension durant l'entretien. **Precautions de manutention** Ce module contient des composantes sensibles aux decharges electro-statiques.
AVERTISSEMENTS D'ORDRE SPÉCIFIQUE	Interrompez l'alimentation avant d'installer des dipshunts sur le fond de panier du châssis de montage des modules. Sinon, tout contact avec cette zone entraîne des risques d'électrocution sérieuse ou fatale. (p. 3-9, 3-18) Des lunettes de protection devraient être portées lors de travail avec des solvants nettoyants. Lorsqu'on enlève les solvants des circuits imprimés à l'aide d'air comprimé, les éclaboussures de solvant pourraient causer des blessures aux yeux. (p. 6-1)
ATTENTIONS D'ORDRE SPÉCIFIQUE	N'utilisez jamais un module IPT sans l'usage de sa minuterie de détection de défaillance (MFT). Sinon, les sorties du module pourraient prendre des valeurs ou des états imprévisibles. Le comportement imprévisible des sorties pourrait perturber la totalité du système de communication. (p. 3-14) Afin d'éviter tout dommage au module, évaluer la compatibilité avec votre système avant l'installation du module. Le module INIPT02 utilise des connexions sur le panneau arrière du chassis de montage des modules qui servaient à d'autres fonctions dans les systèmes Network 90 de premières générations. (p. 3-17)

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

List of Figures

List of Tables

SECTION 1 - INTRODUCTION

OVERVIEW

INFI-NET is a unidirectional, high speed serial data communication highway shared by all INFI 90® nodes. Plant Loop is a unidirectional, medium speed serial data communication highway. The INIPR01 INFI-NET to Plant Loop Remote Interface (IPR) provides for data exchange between a central INFI-NET system and a remote Plant Loop system.

INTENDED USER

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

INTERFACE DESCRIPTION

Two interconnected IPR interfaces provide a communication path between a central INFI-NET system and a remote satellite Plant Loop system (see Figure 1-1). Bidirectional communication between the central system and the remote satellite system is through standard RS-232-C ports. A single serial channel is required for communications while two serial ports can be used for increased throughput or redundancy. The actual link between the central IPR interface and the remote satellite IPR interface must be supplied by the customer.

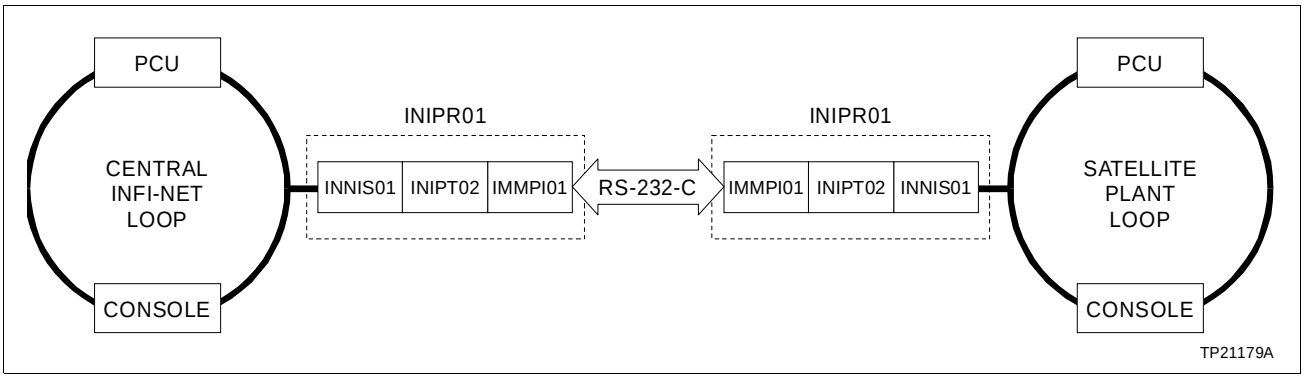

Figure 1-1. INFI-NET to Plant Loop Remote Interface

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The IPR interfaces transfer system data, control and configuration messages, and exception reports between the central and remote satellite systems. Many of the operating characteristics of the IPT module are determined by the specifications in the INFI-NET to Plant Loop remote transfer module executive block (function code 203). Configure these specifications to fit the needs of the application.

MODULE DESCRIPTION

The IPR interface is made up of one INNIS01 Network Interface Slave Module (NIS), one INIPT02 INFI-NET to Plant Loop Transfer Module (IPT), and one IMMPI01 Multi-Function Processor Interface Module. The central INFI-NET system and the remote satellite Plant Loop system each require one IPR interface.

INNIS01 Network Interface Slave Module

The INNIS01 Network Interface Slave Module (NIS) works in conjunction with the IPT module. This allows nodes within the system to communicate with any other node.

The NIS module is a single printed circuit board that occupies one slot in the module mounting unit. The circuit board contains microprocessor based communication circuitry that enables it to interface with either local IPT module (one in the central INFI-NET system and one in the remote Plant Loop system).

Two captive latches on the front-mounted faceplate secure the module to the module mounting unit. There are 16 LEDs on the faceplate that display error codes and event/error counts.

Each NIS module connects to its communication loop by a cable connected to an NTCL01 Communication Termination Unit (TCL) or an NICL01 Communication Termination Module (ICL). Communication between nodes is through coaxial or twinaxial 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 modules (P1 for power, P2 for I/O expander bus). Connector P3 connects the NIS module to the NTCL01 or NICL01 termination device.

INIPT02 INFI-NET to Plant Loop Transfer Module

The INIPT02 INFI-NET to Plant Loop Transfer Module (IPT) supports bidirectional communication through two RS-232-C ports on the IMMPI01 Multi-Function Processor Interface Module (MPI). Ports one and two pass system data. Connector P4 is

a dedicated diagnostic port. The central INFI-NET IPT module can use a variety of means to link to the remote satellite Plant Loop IPT module such as a modem, microwave or transceiver. The IPT module communicates directly with an NIS module through the I/O expander bus.

The IPT module is a single printed circuit board that occupies one slot in the module mounting unit, adjacent to its NIS and MPI module. Two captive latches on the IPT 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 pushbutton.

The IPT module is terminated through a 60-pin ribbon cable connected to the IMMPI01 module. Power and I/O expander bus connections follow the same connector assignments common to most INFI 90 modules (P1 for power, P2 for I/O expander bus). Connector P3 is unused at this time.

IMMPI01 Multi-Function Processor Interface Module

The IMMPI01 Multi-Function Processor Interface Module (MPI) provides the INIPT02 INFI-NET to Plant Loop Transfer Module (IPT) with two RS-232-C communication ports. The MPI module is an interface device that handles I/O to and from the IPT module. Control and data signals from the IPT module travel through a 60-pin ribbon cable to the MPI module.

The MPI module connects to an NTMP01 Multi-Function Processor Termination Unit, NIMP01 or NIMP02 Multi-Function Processor Termination Module. Input and output signals enter and leave the MPI circuit board connector P3 through an NKTU01, NKTU02, NKTU11 or NKTU12 cable to the termination device.

FEATURES

The INFI-NET to Plant Loop remote interface has the following features:

- The IPR interface modules provide localized start-up/shutdown on power failure without operator intervention.
- Each node can operate independently of other nodes.
- The IPR 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.
- The IPT module on the INFI-NET loop has full INFI-NET communications diagnostics capability.

INSTRUCTION CONTENT

This instruction consists of eight sections and five appendices.

Introduction — Provides an overview of the interface. It contains module descriptions, features and specifications.

Description and Operation — Explains module and interface operation.

Installation — Covers handling guidelines and explains how to configure the modules before placing them into operation.

Operating Procedures — Provides information about normal module operation.

Troubleshooting — Explains how to troubleshoot the modules using error codes and lists the corrective action.

Maintenance — Contains a maintenance schedule for the module and guidelines to assist in establishing a preventive maintenance program.

Repair/Replacement Procedures — Explains how to replace the modules.

Support Services — Explains the customer training Bailey Controls Company provides and information about ordering replacement parts.

Appendices — Provide quick reference information about termination device configuration and various redundant interface configurations.

HOW TO USE THIS INSTRUCTION

Read this instruction in sequence. It is important to become familiar with the entire contents of this instruction before using the modules. This instruction is organized to enable quick information retrieval.

1. Do the steps in Section 3.

2. Read Section 4 thoroughly before applying power to the interface modules.

3. Refer to Section 5 if a problem occurs. This section will help to diagnose and correct a problem.

4. Refer to Section 6 for scheduled maintenance requirements.

5. Go to Section 7 to find instructions on how to replace a module.

6. Refer to Section 8 for a list of replacement parts and warranty information.

GLOSSARY OF TERMS AND ABBREVIATIONS

Table 1-1 lists definitions of terms used in this instruction that are unique to Bailey Controls Company.

Table 1-1. Glossary of Terms and Abbreviations

Term	Definition
Controlway	High speed, redundant, peer-to-peer communication link. Used to transfer information between intelligent modules within a process control unit.
Dipswitch	A dual in-line package that contains switches.
Exception Report	Information update generated when the status or value of a point changes by more than a specified significant amount or after a specified time elapses; abbreviated as XR.
Executive Block	Fixed function block that determines overall module operating characteristics.
Function Block	The occurrence of a function code at a block address of a module.
Function Code	An algorithm which manipulates specific functions. These functions are linked together to form the control strategy.
INFI-NET	Advanced data communication highway.
I/O Expander Bus	Parallel communication bus between the control and I/O modules.
Module Address	A unique identifier of a specific device or a communication channel. Refers to Controlway or module bus address.
Module Bus	Peer-to-peer communication link used to transfer information between intelligent modules within a process control unit.
Node	A point of interconnection to a network.
Plant Loop	Network 90® data communication highway.
Termination Module	Provides input/output connection between plant equipment and the INFI 90/Network 90 modules.
Termination Unit	Provides input/output connection between plant equipment and the INFI 90/Network 90 modules.

REFERENCE DOCUMENTS

Table 1-2 lists documents that provide additional information for related hardware/software. Refer to them as needed.

Table 1-2. Reference Documents

Document Number	Title
I-E96-200	Function Code Application Manual
I-E96-309	IMDSM05 Digital Slave I/O Module[1]
I-E96-310	IMDSO01/02/03 Digital Slave Output Module
I-E96-313	IMDSO04 Digital Slave Output Module
I-E96-401	NIMP01/02 Multi-Function Processor Termination Module
I-E96-408	NICL01 Communication Termination Module

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Table 1-2. Reference Documents (continued)

Document Number	Title
I-E96-410	NIDI01 Digital Input Termination Module
I-E96-422	NTCL01 Communication Termination Unit
I-E96-424	NTDI01 Digital I/O Termination Unit
I-E96-428	NTMP01 Multi-Function Processor Termination Unit

NOTE:
1. This module is not recommended for use in new installations.

NOMENCLATURE

Table 1-3 lists the modules that make up the INFI-NET to Plant Loop remote interface and other associated equipment.

Table 1-3. Nomenclature

Nomenclature	Description
INIPR01 IMMPI01 INIPT02 INNIS01	INFI-NET to Plant Loop remote interface. Includes: Multi-function processor interface module INFI-NET to Plant Loop transfer module Network interface slave module
IEMMU01/02/04	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
NFTP01	Field termination panel
NICL01	Communication termination module
NIDI01	Digital input termination module
NIMP01	Multi-function processor termination module
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)
NKTU01	Termination unit cable, INIPT02 to NTMP01 (PVC)
NKTU02	Termination module cable, INIPT02 to NIMP01 (PVC)
NKTU11	Termination unit cable, INIPT02 to NTMP01 (non-PVC)
NKTU12	Termination module cable, INIPT02 to NIMP01 (non-PVC)
NTCL01	Communication termination unit
NTDI01	Digital I/O termination unit
NTMP01	Multi-function processor termination unit
NTMU01/02	Termination mounting unit

SPECIFICATIONS

Refer to Table 1-4 for the specifications of the modules making up the INFI-NET to Plant Loop remote interface.

Table 1-4. Specifications

Property	Characteristic/Value
INNIS01 module	
Power requirements	+5 VDC at 900 mA; 4.50 W nominal +15 VDC at 5 mA; 0.08 W nominal -15 VDC at 200 mA; 3.00 W nominal
Memory	208 kbytes RAM 64 kbytes ROM
Communication rates	10 Mbaud (INFI-NET), 2 Mbaud (INFI-NET) or 500 kbaud (Plant Loop)
System capability	62,500 INFI-NET system nodes 250 INFI-NET loop nodes 63 Plant Loop nodes
Mounting	Occupies one slot in a standard INFI 90 module mounting unit
INIPT02 module	
Power requirements	5 VDC at 2 A; 10 W nominal
Memory	512 kbytes ROM 2 Mbytes RAM 512 kbytes NVRAM
Communication rates between INIPT02 modules	300 to 38,400 baud (user-selectable)
Mounting	Occupies 1 slot in a standard INFI 90 module mounting unit
IMMPI01 module	
Power requirements	5 VDC at 415 mA; 2.08 W nominal
Communication ports	2 full duplex serial EIA standard RS-232-C
Mounting	Occupies 1 slot in a standard INFI 90 module mounting unit
All 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	5% to 95% up to 55°C (131°F) noncondensing 5% to 45% above 55°C (131°F) noncondensing
Atmospheric pressure	Sea level to 3 km (1.86 mi)
Air quality	Noncorrosive
Installation category	Category III
Certification	CSA certified for use as process control equipment in an ordinary (nonhazardous) environment. Factory Mutual approved for use in Class I, Division 2, hazardous locations.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

SECTION 2 - DESCRIPTION AND OPERATION

INTRODUCTION

INFI-NET and Plant Loop are unidirectional, serial data highways that all INFI 90 nodes can utilize. The INIPR01 INFI-NET to Plant Loop Remote Interface (IPR) enables communication between a central INFI-NET node and a remote satellite Plant Loop node. The INIPT02 INFI-NET to Plant Loop Transfer Module (IPT), IMMPI01 Multi-Function Processor Interface Module (MPI), and INNIS01 Network Interface Slave Module (NIS) make up an IPR interface. Communication between a central INFI-NET loop and a remote Plant Loop requires an interface on each loop. This section of the product instruction provides an overview of the interface module operating theory.

MODULE INTEGRITY

All INFI-NET communication modules have normal INFI 90 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 this happens, 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.

INFI-NET to Plant Loop Messages

Central INFI-NET messages destined for the remote satellite Plant Loop are received by the central INFI-NET NIS module. The central INFI-NET NIS module sends messages over the I/O expander bus to the central INFI-NET IPT module. The central INFI-NET IPT module converts the messages to the appropriate Plant Loop serial link format and transmits all commands and replies through the central INFI-NET MPI module to the remote satellite Plant Loop MPI module over the serial link. The remote satellite MPI module passes the commands and replies to the remote satellite Plant Loop IPT module which issues the appropriate Plant Loop formatted message to the remote satellite Plant Loop NIS module for transmission around the Plant Loop.

Plant Loop to INFI-NET Messages

Remote satellite Plant Loop messages destined for the central INFI-NET loop are received by the remote satellite Plant Loop NIS module. The remote satellite Plant Loop NIS module sends the messages over the I/O expander bus to the remote satellite Plant Loop IPT module. The remote satellite Plant Loop IPT module converts all messages to the serial link format. These commands and replies are transmitted through the remote satellite Plant Loop MPI module and across the serial link to the central INFI-NET MPI module. The central INFI-NET MPI module passes the commands and replies to the central INFI-NET IPT module. The central INFI-NET IPT module issues the appropriate INFI-NET messages to the central INFI-NET NIS module for transmission around the INFI-NET loop.

INNIS01 NETWORK INTERFACE SLAVE MODULE

The NIS module serves as an I/O module for the IPT module. This section provides an overview of the NIS module operating theory.

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 ON-LINE*, *NODE OFF-LINE*, *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 to be used for sequencing exception reports accessing trend data and 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, sequence, source, 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 exceeds 255, 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 cyclic redundancy check (CRC) fields verify data integrity.

MESSAGE TRANSMISSION

Any NIS module can transmit a message at any time without regard to the activities of any other NIS module on the system. Each NIS module can transmit and receive messages simultaneously. NIS module start-up/shutdown is local and requires no interaction with other NIS modules on the INFI-NET or Plant 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.

Data Integrity

There are two methods the NIS module uses to insure data integrity: Retry logic and polling.

RETRY LOGIC

If, on the first message transmission, the NIS module does not receive a positive acknowledgment or negative acknowledgment from the destination node, it transmits the message again 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 network processing module of the negative acknowledgment message.

POLLING

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.

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 network processing module.

INIPT02 INFI-NET TO PLANT LOOP TRANSFER MODULE

The IPT module passes exception reports, control data messages and configuration data messages from the Controlway to the NIS module or from the module bus to the NIS module. The IPT modules take the responsibility of retrying failed messages and informing the original source of any failure. Other modules interface with the IPT module within the node status protocol rules of INFI-NET and Plant Loop. The interface generates on-line, off-line and busy status for nodes on other loops and expects to receive node status for every node on the local loop.

Exception Reporting

The IPT module maintains a database of all points that send or receive exception reports to or from the remote loop. The IPT module database contains specifications for each point that helps the IPT 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 IPT 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 IPT 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 IPT 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 IPT module reports its own status. Exception reporting for status occurs whenever there is a change in status or every 60 seconds if no change occurs.

Communication Protocol

The IPT 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 application layer in both the central and remote satellite loop IPT modules uses the link control layer to transport control and configuration information and exception reports.

FRAMING

The IPT module uses message framing to help it track data bytes that pass through the asynchronous communication link. The receiving IPT module looks for a one-byte 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 IPT modules use the sequence number to keep track of outstanding, lost and bad messages.

LINE CONTROL

Line control limits the transmission time of each IPT module when both IPT modules are in the half duplex mode. There are two limits. They are the window of outstanding sequenced messages and the maximum transmission time set by executive block (function code 203) specifications. 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.

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 IPT module notifies the sending IPT module of the last sequence number it receives. The sending module then knows which message packet to send again.

START-UP CONTROL

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

Redundancy

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

OPERATION OF SERIAL DATA CHANNELS

Command and data transfer across the IPR interface is through an asynchronous RS-232-C interface. This interface operates in half or full duplex modes at 300 to 38,400 baud using eight-bit characters and various combinations of parity and stop bits.

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

SECTION 3 - INSTALLATION

INTRODUCTION

This section explains what must be done before placing any INFI-NET to Plant Loop Remote Interface (IPR) modules into operation. Read, understand and complete the steps in the order they appear before operating the modules.

SPECIAL HANDLING

Observe the following steps when handling electronic circuitry:

> **NOTE:** Always use 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 Semiconductor.*** 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 is connected to cabinet chassis 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 for shipping damage.

2. Notify the nearest 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.

TERMINATION DEVICE CONFIGURATION AND INSTALLATION

Verify the appropriate termination units or modules are properly configured and installed before installing any of the INFI-NET to Plant Loop remote interface modules.

The INNIS01 Network Interface Slave Module terminates through an NTCL01 Communication Termination Unit or an NICL01 Communication Termination Module. Appendices A and B contain quick reference information about jumper settings, circuit board layout, and cable connections for these termination devices. Refer to the NTCL01 termination unit or NICL01 termination module instruction for more complete configuration and installation information.

The INIPT02 INFI-NET to Plant Loop Transfer Module terminates through the IMMPI01 Multi-Function Processor Interface Module. The IMMPI01 module terminates through an NTMP01 Multi-Function Processor Termination Unit, an NIMP01 or NIMP02 Multi-Function Processor Termination Module. Appendices C and D contain quick reference information about jumper settings, circuit board layout, and cable connections for these termination devices. Refer to the NTMP01 termination unit or NIMP01/NIMP02 termination module instruction for more complete configuration and installation information.

INNIS01 NETWORK INTERFACE SLAVE MODULE CONFIGURATION

The INFI-NET to Plant Loop Remote Interface includes an INNIS01 Network Interface Slave Module (NIS). Configure the NIS dipswitches and jumpers as follows.

NOTE: Two IPR interfaces are required for a complete INFI-NET to Plant Loop connection.

Dipswitch Settings

There are four dipswitches on the NIS module. The dipswitches and their functions are described below. See Figure 3-1 for dipswitch locations.

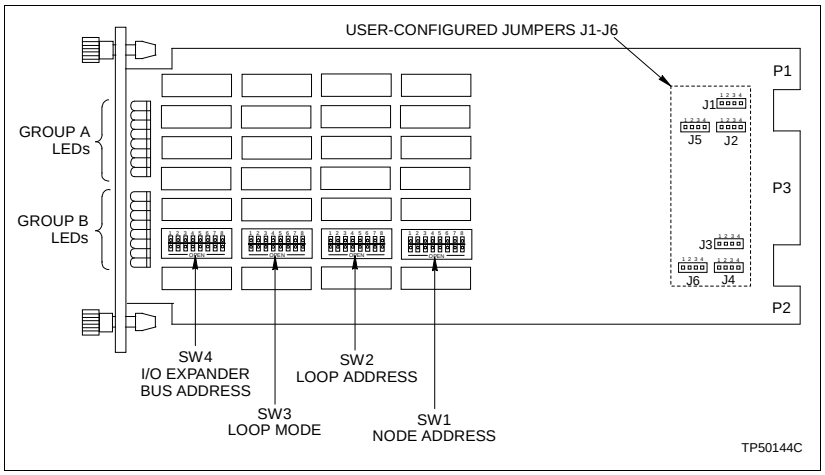

Figure 3-1. INNIS01 Dipswitch and Jumper Locations

DIPSWITCH SW1 - NODE ADDRESS

This dipswitch sets the node address. Valid INFI-NET node addresses are one through 250. Valid Plant Loop node addresses are one through 63 (refer to Table 3-1). Pole one is the most significant bit with a binary weight of 128. Pole eight is the least significant bit with a binary weight of one. Record the dipswitch SW1 settings in the space provided.

Table 3-1. INNIS01 Dipswitch SW1 Settings

Node Address Example	Dipswitch Pole (Binary Value)							
	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
63	0	0	1	1	1	1	1	1
250	1	1	1	1	1	0	1	0
User setting								

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

DIPSWITCH SW2 - LOOP ADDRESS

This dipswitch sets the number of the loop on which the IPR interface resides. The only valid INFI-NET loop number is one. Valid Plant Loop numbers are two through 250 (refer to Table 3-2). Record the dipswitch SW2 setting in the space provided.

Table 3-2. INNIS01 Dipswitch SW2 Settings

Loop Address Example	Dipswitch Pole (Binary Value)							
	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
64	0	1	0	0	0	0	0	0
250	1	1	1	1	1	0	1	0
User setting								

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

DIPSWITCH SW3 - LOOP MODE

Dipswitch SW3 enables or disables ROM checksums, identifies the loop as a Plant Loop or INFI-NET loop, identifies the NIS module in a node, and sets the loop communication speed to 500 kilobaud (Plant Loop), 2 megabaud (INFI-NET) or 10 megabaud (INFI-NET). Refer to Table 3-3. Record the dipswitch SW3 settings in the space provided.

Table 3-3. INNIS01 Dipswitch SW3 Settings

Pole	Setting[1,2]	Function[2]	User Setting
1	1	NIS module is part of a network-to-network connecting device.	
	0	NIS module is part of an independent interface.	
2	1	ROM checksumming enabled.	
	0	ROM checksumming disabled.	
3	1	Test mode: no time-out for handshake failure.	
	0	Normal operating mode.	
4[3]	1	All loop messages return a busy negative acknowledgment.	
	0	Normal operating mode.	
5[3]	1	Group A LEDs will toggle on and off if loop 1 is idle or shorted. Group B LEDs will toggle on and off if loop 2 is idle or shorted. Normal display otherwise.	
	0	LED display as defined by dipswitch SW4.	
6[3]	1	Diagnostic mode.	
	0	Normal operating mode.	

Table 3-3. INNIS01 Dipswitch SW3 Settings (continued)

Pole	Setting[1,2]	Function[2]	User Setting
7/8	0/0	10 Mbaud INFI-NET mode.	
	0/1	2 Mbaud INFI-NET mode.	
	1/0	Unused.	
	1/1	500 kbaud Plant Loop mode.	

NOTES:
1. 0 = CLOSED or ON, 1 = OPEN or OFF.
2. Shaded areas designate normal operating positions.
3. Applies to INNIS01 modules with revision B or later ROMs. For modules with revision A ROMs, poles 4 through 6 must be set to 0.

Dipswitch SW3 pole one determines the node type. Set pole one to position one for IPR interfaces. Pole two enables or disables ROM checksumming. 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. This condition is used by Bailey Controls Company personnel only. Pole five enables the loop idle condition display for the front panel LEDs. If loop one is idle, the group A LEDs will flash on and off about twice per second. If loop two is idle, the group B LEDs will flash. The loop idle display is intended to serve as a warning that a loop integrity problem exists. Pole six enables diagnostic tests that preclude normal NIS module operation. Poles seven and eight determine loop speed and loop mode.

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

DIPSWITCH SW4 - I/O EXPANDER BUS ADDRESS AND 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 I/O expander bus address of the NIS module (see Figure 3-2). Refer to Table 3-4 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 using the group A and B faceplate LEDs (see Figure 3-2). LED B8 is the most significant bit. LED A1 is the least significant bit. Table 3-5 lists the event counters. Table 3-6 lists the error counters. Record the dipswitch SW4 settings in the space provided.

Example of Counter Usage: A counter setting with a hexadecimal value of 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 as follows: pole 4 = 0, 5 = 1, 6 = 0, 7 = 0, and 8 = 1.

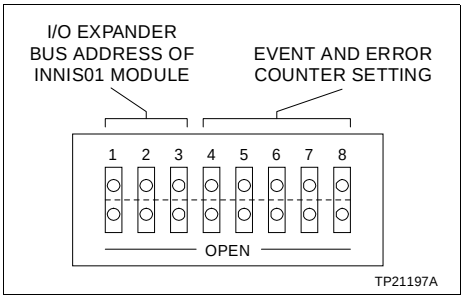

Figure 3-2. Dipswitch SW4 Pole Assignments

Table 3-4. INNIS01 Address Settings

Address Example	Dipswitch Pole (Binary Value)		
	1 (4)	2 (2)	3 (1)
0	0	0	0
3	0	1	1
7	1	1	1
User setting			

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

Table 3-5. INNIS01 Event Counters

Dipswitch Pole[1,2] (Binary Value)					Hexadecimal Value[2]	Description[2]
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
0	0	0	0	0	00	No. of timer interrupts.
0	1	0	0	1	09	No. of multicast messages received (excluding originated messages).
0	1	0	1	0	0A	No. of multicast destinations received.
0	1	0	1	1	0B	No. of time sync messages received (excluding originated messages).
0	1	1	0	0	0C	No. of broadcast messages received (excluding originated messages).
0	1	1	0	1	0D	No. of NIS poll messages received (excluding originated messages).
0	1	1	1	0	0E	No. of poll messages acknowledged by this node.
0	1	1	1	1	0F	No. of poll messages busy-negative acknowledged by this node.
1	0	0	0	0	10	No. of messages transmitted (total loop traffic).
1	0	0	0	1	11	No. of loop messages received and forwarded by this node.
1	0	0	1	0	12	No. of messages originated by this node (including retries).

Table 3-5. INNIS01 Event Counters (continued)

Dipswitch Pole[1,2] (Binary Value)					Hexadecimal Value[2]	Description[2]
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
1	0	0	1	1	13	No. of message retries originated by this node.
1	0	1	0	0	14	No. of transmitted message watchdog expirations.
1	0	1	0	1	15	No. of messages put into the receive buffer and retained.
1	0	1	1	0	16	No. of bytes originated by this node (including retries).
1	0	1	1	1	17	No. of bytes received and forwarded by this node.
1	1	0	0	0	18	No. of I/O expander bus to NIS handshakes.
1	1	0	0	1	19	No. of I/O expander bus to transmit buffer signals.
1	1	0	1	0	1A	No. of I/O expander bus PCU status requests.
1	1	0	1	1	1B	No. of I/O expander bus NIS status requests.
1	1	1	0	0	1C	No. of I/O expander bus interrupts with invalid status.
1	1	1	0	1	1D	No. of transmit buffer realignments due to invalid contents.
1	1	1	1	0	1E	No. of receive buffer realignments.
1	1	1	1	1	1F	No. of status buffer realignments.
						User setting.

NOTES:
1. 0 = CLOSED or ON, 1 = OPEN or OFF.
2. Shaded areas designate normal operating positions.

Table 3-6. INNIS01 Error Counters

Dipswitch Pole (Binary Value)					Hexadecimal Value	Description
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
0	0	0	0	1	01	No. of receive errors on loop 1.
0	0	0	1	0	02	No. of receive errors on loop 2.
0	0	0	1	1	03	No. of transmitter errors for this node.
0	0	1	0	0	04	No. of messages lost to receive queue overflow.
0	0	1	0	1	05	No. of messages dumped with circulation count errors.
0	0	1	1	0	06	No. of messages dumped with destination count or message-type errors.
0	0	1	1	1	07	No. of messages dumped with source-state errors.
0	1	0	0	0	08	No. of messages dumped with source-sequence mismatch.
						User setting.

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

Jumper Settings

There are six jumpers on the NIS module that set the communication rate of the receiver analog circuit (see Figure 3-1 for jumper locations). All six jumpers must be set in the same position. Jumper setting instructions are silk screened on the upper left corner of the NIS circuit board. The jumper setting must match the communication rate set by poles seven and eight of dipswitch SW3. Figure 3-3 shows which pins to jumper for various loop modes. This figure shows placement of the pins when looking at the top of the NIS circuit board with the faceplate on the left.

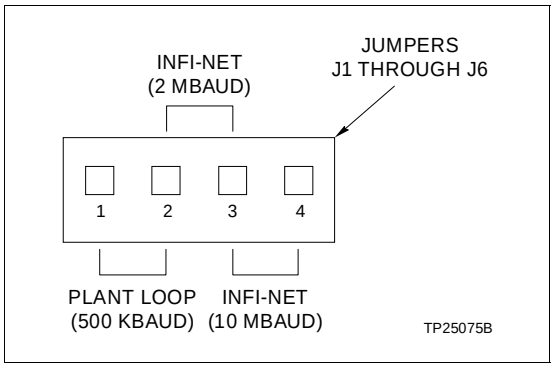

Figure 3-3. INNIS01 Jumper Settings

Power System Status

The communication system provides a means to monitor the status of the power system 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 NTCL01 and NICL01 termination device labeled PSS1 or PSS2. Two sets of terminals are available on each termination device for interconnecting the power system status output.

This power system status signal is fed through the termination device cable to the P3 connector on the NIS module. The power system status input is a TTL-compatible signal. A high voltage level on power system status indicates good status. A low voltage level indicates bad status. When no connection is made to either of the power system status inputs, a pull-up resistor on the NIS module causes a high level signal on the power system status input, thereby reporting good status.

INNIS01 MODULE INSTALLATION

If the NIS dipswitches and jumpers are properly configured, it is ready to be installed in the module mounting unit. Figure 3-4 shows example installations of the NIS module. To install the NIS module:

1. Verify the NIS 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.**
AVERTISSEMENT	**Interrompez l'alimentation avant d'installer des dipshunts sur le fond de panier du châssis de montage des modules. Sinon, tout contact avec cette zone entraîne des risques d'électrocution sérieuse ou fatale.**

2. Verify that a 24-pin dipshunt is installed in the I/O expander bus sockets between the module mounting unit slot to be used by the NIS module and the slot to be used by the IPT module.

> **NOTE:** When installing the INNIS01, IMMPI01 and INIPT02 modules, there must be continuity between the INNIS01 and INIPT02 modules.

3. Remove any 24-pin dipshunts from the I/O expander bus sockets that would connect the NIS module to any module other than the INIPT02 or IMMPI01 module and any required I/O modules.

4. Attach the hooded end of the NKLS01, NKLS02, NKLS11 or NKLS12 cable to the module mounting unit backplane cable connector opening for the NIS module.

5. Slide the NIS module in while guiding the top and bottom edges of the circuit board along the top and bottom rails of the module mounting unit.

6. Push on the faceplate until the rear edge of the module is firmly seated in the backplane connector.

7. Turn the 2 latching screws $^{1}/_{2}$-turn to lock the module in place. The module is locked into place when the open side of the slot on the latching screws faces the center of the faceplate.

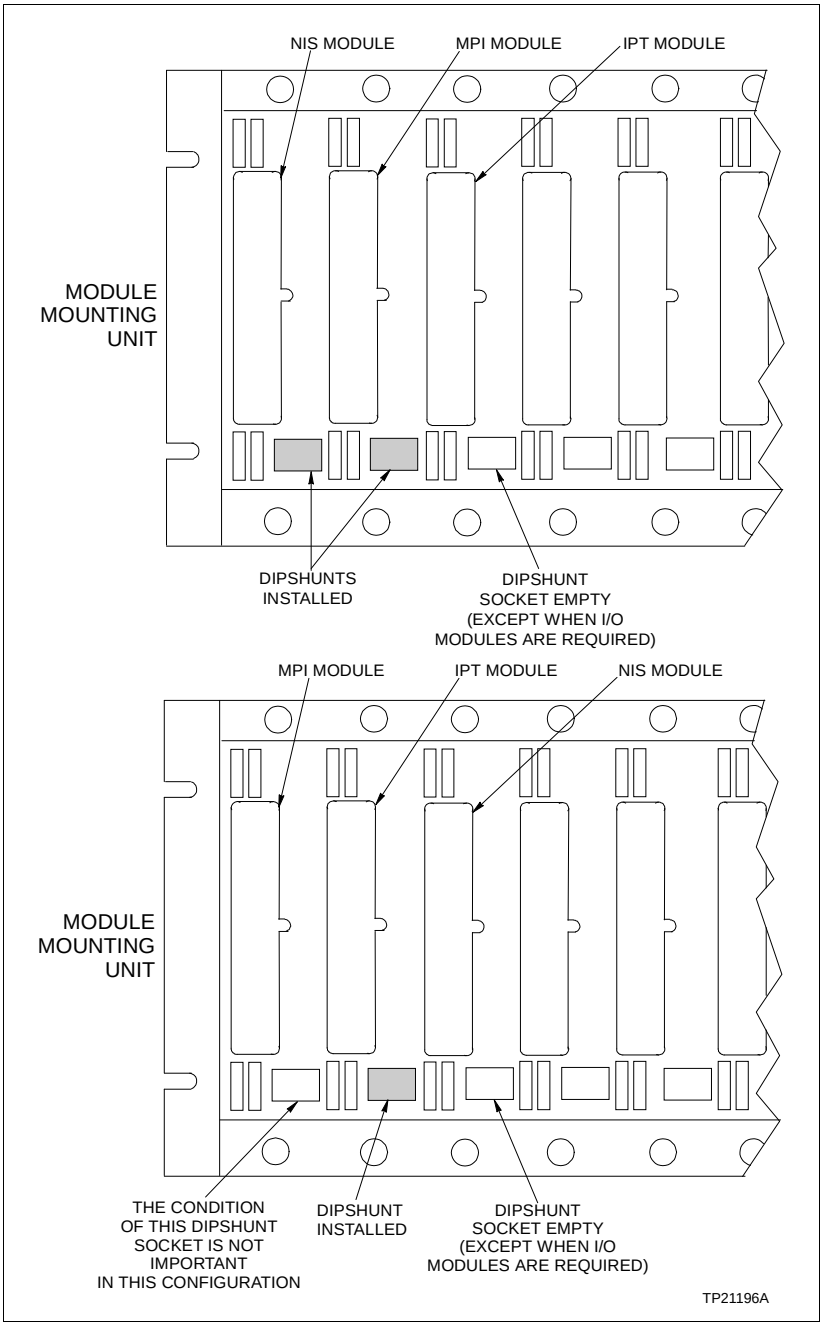

Figure 3-4. Example Module Installations

INIPT02 INFI-NET TO PLANT LOOP TRANSFER MODULE CONFIGURATION

The INIPR01 INFI-NET to Plant Loop Remote Interface (IPR) includes an INIPT02 INFI-NET to Plant Loop Transfer Module (IPT). Configure the IPT module as follows.

NOTES:

1. Two IPR interfaces are required for a complete INFI-NET to Plant Loop connection.

2. The INIPT02 module uses connections to the module mounting unit backplane that served other functions in early Network 90 systems. To avoid potential module damage, evaluate your system for compatibility prior to module installation. Early Network 90 systems applied -30 VDC to pins three and four of the module connector P1. This voltage is not required for INFI 90 modules. In INFI 90 systems, pin four is used for the Controlway bus. If your system contains modules that require -30 VDC, set jumper J5 to the 30 VDC position. Doing so allows the installation of the IPT module in a module mounting unit that uses -30 VDC and limits communication to the module bus.

Dipswitch Settings

The IPT module consists of one circuit board. The board has four dipswitches. These dipswitches select module operation options, and serial port communication characteristics and baud rate. Figure 3-5 shows the dipswitch locations. Module placement within the module mounting unit is important when installing an IPT module with the MPI module. Installing an MPI module with the IPT module requires two adjacent slots in a module mounting unit. The IPT module must occupy the right slot (when facing the front of the module mounting unit) and the MPI module must occupy the left slot.

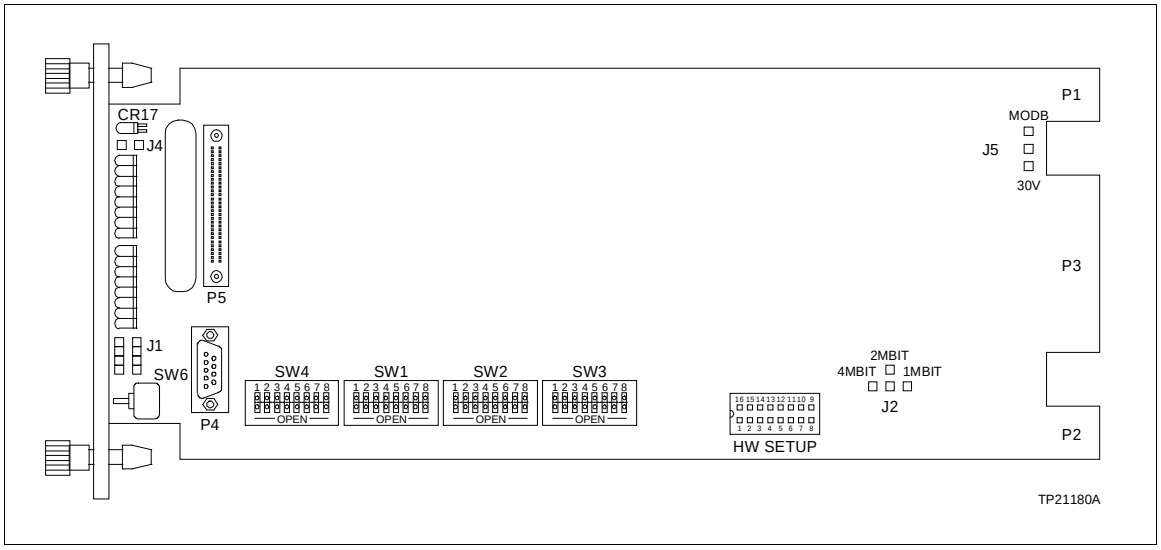

Figure 3-5. INIPT02 Dipswitch and Jumper Locations

DIPSWITCH SW1 - NORMAL MODE DIAGNOSTIC PORT CHARACTERISTICS

Dipswitch SW1 is an eight-pole dipswitch that enables ROM checksumming, enables NIS handshake time-outs, enables the normal mode diagnostic port, sets the normal mode diagnostic port communication rate, and sets the normal mode diagnostic port data characteristics. Table 3-7 shows the pole settings for normal operation (pole one of dipswitch SW4 set to zero). Table 3-8 shows the pole settings for hardware diagnostic operation (pole one of dipswitch SW4 set to one). Record the dipswitch SW1 settings in the space provided.

Table 3-7. INIPT02 Dipswitch SW1 Settings (Normal Operation)

Pole	Setting[1,2]	Function[2]	User Setting
1	1	ROM checksumming disabled.	
	0	ROM checksumming enabled.	
2	1	NIS handshake time-out disabled.	
	0	NIS handshake time-out enabled.	
3	1	Unused.	
	0	Normal operating mode.	
4	1	Normal mode diagnostic port (connector P4) enabled.	
	0	Normal mode diagnostic port (connector P4) disabled.	
5/6	0/0	Normal mode diagnostic port baud rate of 1200.	
	0/1	Normal mode diagnostic port baud rate of 2400.	
	1/0	Normal mode diagnostic port baud rate of 9600.	
	1/1	Normal mode diagnostic port baud rate of 19200.	
7/8	0/0	Normal mode diagnostic port data: 8 data bits, 1 stop bit, no parity.	
	0/1	Normal mode diagnostic port data: 8 data bits, 1 stop bit, even parity.	
	1/0	Normal mode diagnostic port data: 8 data bits, 1 stop bit, odd parity.	
	1/1	Normal mode diagnostic port data: 8 data bits, 2 stop bits, no parity.	

NOTES:
1. 0 = CLOSED or ON, 1 = OPEN or OFF.
2. Shaded areas designate normal operating positions.

Table 3-8. INIPT02 Dipswitch SW1 Settings (Hardware Diagnostic Mode)

Pole	Setting	Function	User Setting
1	1	ROM checksumming disabled.	
	0	ROM checksumming enabled.	
2	1	Single hardware diagnostic test execution.	
	0	Continuous hardware diagnostic test execution.	
3 - 8	–	Hardware diagnostic tests (refer to Table 5-13 for a complete listing).	

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

DIPSWITCH SW2

Dipswitch SW2 is an eight-pole dipswitch which is not used by the IPT module. The dipswitch settings do not affect module operations.

DIPSWITCH SW3 - CACHE OPTIONS

Dipswitch SW3 selects certain cache operating options. Table 3-7 shows the dipswitch settings.

Table 3-9. INIPT02 Dipswitch SW3 Settings

Pole	Setting[1,2]	Function[2]	User Setting
1	1	Unused.	
	0	Normal operating mode.	
2	1	Unused.	
	0	Normal operating mode.	
3	1	Unused.	
	0	Normal operating mode.	
4	1	Unused.	
	0	Normal operating mode.	
5	1	Unused.	
	0	Normal operating mode.	
6	1	Cache burst fill enabled.	
	0	Cache burst fill disabled.	
7	1	Data cache enabled.	
	0	Data cache disabled.	
8	1	Instruction cache enabled.	
	0	Instruction cache disabled.	

NOTES:
1. 0 = CLOSED or ON, 1 = OPEN or OFF.
2. Shaded areas designate normal operating positions.

DIPSWITCH SW4 - OPTIONS

Dipswitch SW4 determines the operating options of the module. Table 3-10 lists the option settings. Record the dipswitch SW4 settings in the space provided.

Table 3-10. INIPT02 Dipswitch SW4 Settings

Pole	Setting[1,2]	Function[2]	User Setting
1	1	Hardware diagnostic mode (refer to Table 3-8).	
	0	Normal operating mode (refer to Table 3-7).	

Table 3-10. INIPT02 Dipswitch SW4 Settings (continued)

Pole	Setting[1,2]	Function[2]	User Setting
2[3]	1	Unused.	
	0	Normal operating mode.	
3	1	Module bus.	
	0	Controlway.	
4	1	Unused.	
	0	Normal operating mode.	
5	1	Initialize NVRAM.	
	0	Normal operating mode.	
6	1	Enables power system status failure.	
	0	Disables power system status failure.	
7	1	Redundancy configured.	
	0	Redundancy not configured.	
8	1	IPT module address = 1.	
	0	IPT module address = 0.	

NOTES:
1. 0 = CLOSED or ON, 1 = OPEN or OFF.
2. Shaded areas designate normal operating positions.
3. When hardware diagnostic mode is selected, the settings for pole 2 change to 0 = halt on error disabled, 1 = halt on error enabled.

Jumper Settings

CAUTION

Always operate the IPT 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.

ATTENTION

N'utilisez jamais un module IPT sans l'usage de sa minuterie de détection de défaillance (MFT). Sinon, les sorties du module pourraient prendre des valeurs ou des états imprévisibles. Le comportement imprévisible des sorties pourrait perturber la totalité du système de communication.

There are four jumpers (J1, J2, J4, and J5) on the IPT module. They define the RS-232-C diagnostic port (connector P4) as data terminal equipment (DTE) or data communication equipment (DCE), define the type of SRAM contained on the SRAM modules, enable the machine fault timer and enable the module to operate in a module mounting unit that uses -30 VDC.

Jumper J5 disconnects -30 VDC, supplied in early Network 90 systems, from the IPT module. This jumper is factory set in the 30V position. This setting allows the module to function in early Network 90 systems (-30 VDC supplied to modules) or limits communication to the module bus in INFI 90 systems.

Set the jumper to the MODB position to use the module on the Controlway. Refer to Table 3-11 for the jumper settings.

Table 3-11. INIPT02 Jumpers J1, J2, J4 and J5 Settings

Jumper	Setting[1]	Function[1]	User Setting
J1[2]	Vertical	Set the RS-232-C diagnostic port to operate as DCE.	
	Horizontal	Set the RS-232-C diagnostic port to operate as DTE.	
J2	4 - 3	Normal operating mode.	
	4 - 2	Unused.	
	4 - 1	Unused.	
J4	Open	Machine fault timer enabled. This jumper must remain open for normal operation.	
J5[3]	30V	Disconnects Controlway channel B for operation in early Network 90 module mounting units (-30 VDC used).	
	MODB	Connects Controlway channel B for operation in module mounting units utilizing the Controlway.	

NOTES:
1. Shaded areas designate normal operating positions.
2. This feature is used by Bailey Controls service personnel only. The jumper J1 setting does not affect the module during normal operation.
3. This setting sets up the IPT module for operation in systems using early Network 90 modules that require -30 VDC.

HW SETUP Socket Jumper

Refer to Table 3-12 for the jumper settings.

Table 3-12. INIPT02 HW SETUP Socket Jumper Settings

Socket Position	Jumper Settings
1 to 16	Open.
2 to 15	Install this jumper for INIPT02 modules.
3 to 14	Open.
4 to 13	
5 to 12	
6 to 11	
7 to 10	
8 to 9	

IMMPI01 MULTI-FUNCTION PROCESSOR INTERFACE MODULE CONFIGURATION

The IMMPI01 Multi-Function Processor Interface Module (MPI) provides the INIPT02 INFI-NET to Plant Loop Transfer Module (IPT) with two serial ports. A 60-pin ribbon cable (supplied with MPI modules) connects the MPI module to the IPT module.

The MPI module has two sets of jumpers that select handshake signal types: Request to send (RTS) and clear to send (CTS). These signals leave the module through a cable connection to the multi-function processor termination unit or the multi-function processor termination module. Figure 3-6 shows the jumper locations on the MPI module. Jumpers J1 and J2 must be set as shown in Figures 3-7 and 3-8 to enable signal handshaking.

Module placement within the module mounting unit is important when installing an IPT module with the MPI module. Installation requires two adjacent slots in a module mounting unit. The IPT module must occupy the right slot (when facing the front of the module mounting unit) and the MPI module must occupy the left slot.

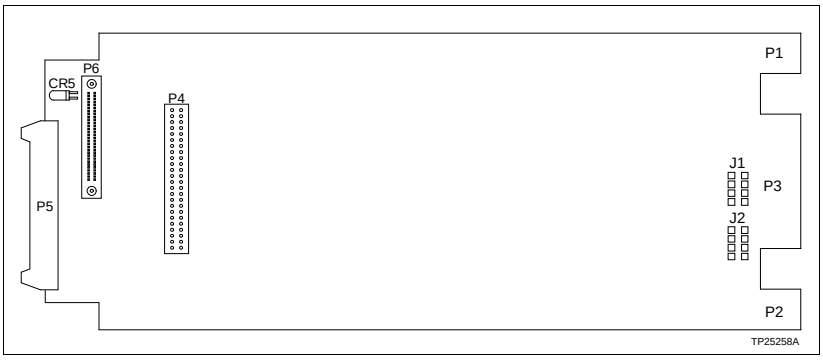

Figure 3-6. IMMPI01 Jumper Locations

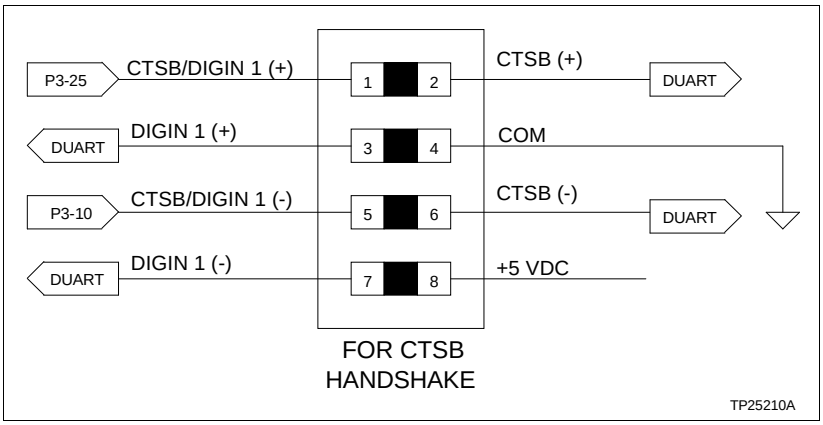

Figure 3-7. IMMPI01 Jumper J1 Settings

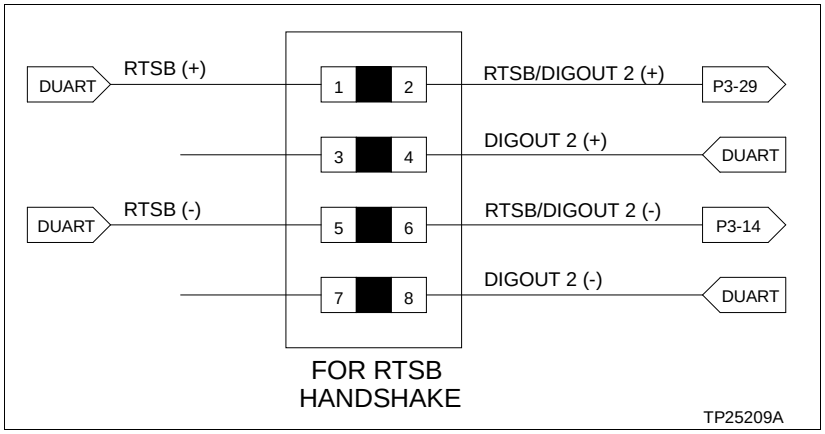

Figure 3-8. IMMPI01 Jumper J2 Settings

INIPT02 AND IMMPI01 MODULE INSTALLATION

If the INIPT02 and IMMPI01 dipswitches and jumpers are properly configured, the modules are ready to be installed in the module mounting unit.

CAUTION	**To avoid potential module damage, evaluate your system for compatibility prior to module installation. The INIPT02 module uses connections to the module mounting unit backplane that served other functions in early Network 90 systems.**
ATTENTION	**Afin d'éviter tout dommage au module, évaluer la compatibilité avec votre système avant l'installation du module. Le module INIPT02 utilise des connexions sur le panneau arrière du chassis de montage des modules qui servaient à d'autres fonctions dans les systèmes Network 90 de premières générations.**

To determine if the NMMU0☐ module mounting unit uses -30 VDC:

1. Locate the -30 VDC faston. It is the second faston from the top when viewing the module mounting unit from the rear.

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

3. If -30 VDC is present, set the jumper J5 of the IPT module to the appropriate positions.

To install the IPT and MPI modules (see Figure 3-4):

1. Verify the IPT and MPI slot assignments (IPT module in the right slot, MPI module in the left slot) in the module mounting unit are adjacent to its associated NIS module.

2. Push one end of the 60-pin ribbon cable through the cable slot and connect it to connector P5 on the IPT module (see Figure 3-5).

3. Connect the other end of the cable to connector P6 on the MPI module (see Figure 3-6).

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.**
AVERTISSEMENT	**Interrompez l'alimentation avant d'installer des dipshunts sur le fond de panier du châssis de montage des modules. Sinon, tout contact avec cette zone entraîne des risques d'électrocution sérieuse ou fatale.**

4. Verify that a 24-pin dipshunt is installed in the I/O expander bus sockets between the module mounting unit slot to be used by the NIS module and the slots to be used by the IPT and MPI modules.

NOTES: When installing the NIS, MPI and IPT modules, there must be continuity between the NIS and IPT modules. Observe the following:

1. Install one dipshunt in the I/O expander bus socket between the NIS slot and IPT slot if the NIS module is mounted to the right of the MPI/IPT combination.

2. If the NIS module is mounted to the left of the IPT module, two dipshunts are required. Install one dipshunt between the NIS slot and MPI slot. Install the second dipshunt between the MPI slot and the IPT slot.

5. Remove any 24-pin dipshunts from the I/O expander bus sockets that would connect the IPT or MPI modules to any module other than those making up the IPR interface and any required I/O modules.

6. Attach the hooded end of the NKTU01, NKTU02, NKTU11 or NKTU12 cable to the module mounting unit backplane cable connector opening for the IPT module. The other end of the cable attaches to the termination device or to the termination mounting unit backplane.

7. Slide the IPT and MPI modules in while guiding the top and bottom edges of the circuit boards along the top and bottom rails of the module mounting unit.

8. Push on the faceplate until the rear edges of the modules are firmly seated in the backplane connectors.

9. Turn the 2 latching screws of each faceplate 1/2-turn to lock the module in place. The modules are locked into place when the open end of the slot on the latching screws faces the center of the faceplate.

FUNCTION BLOCK CONFIGURATION

The central INFI-NET and remote Plant Loop IPT modules must have their executive block function code configured. The INFI-NET to Plant Loop transfer module executive function code (function code 203) is located at function block address one. The remote Plant Loop IPT module also requires a data point definition function code (function code 201) to be configured for all data points that are imported from the INFI-NET system to Plant Loop system. Refer to the ***Function Code Application Manual*** for more information.

OPTIONAL DIGITAL I/O MODULES

Digital I/O modules may be used to control external communications equipment attached to the communication link serial ports. Digital I/O modules also allow IPR interfaces to operate in half duplex mode. Two digital I/O modules are required for redundant applications (refer to Appendix E). Digital I/O modules must have an I/O expander bus address of eight. The IPT module uses the digital outputs in the following manner. Digital output one enables any device (usually a modem) connected to port one. Digital output two enables any device (usually a modem) connected to port two. Digital outputs one and two are kept in sync with the RTS timing patterns. Digital output three selects between redundant communication equipment. Digital output four enables any transmitter equipment connected to port one. Digital output five enables any transmitter equipment connected to port two. Digital outputs four and five are kept in sync with the message timing patterns used by the transmitter equipment.

Select one of the digital I/O modules from Table 3-13 that match the input specifications of the communication equipment used. Refer to the appropriate instruction for configuration and installation information.

Table 3-13. Optional Digital I/O Modules

Module	Output Voltage Levels
IMDSM05 Digital I/O Slave Module[1]	24 VDC
IMDSO01 Digital Slave Output Module	24 VDC to 240 VAC
IMDSO02 Digital Slave Output Module	4 VDC to 50 VDC
IMDSO03 Digital Slave Output Module	5 VDC to 160 VDC
IMDSO04 Digital Slave Output Module	24 VDC

NOTE:
1. It is not recommended that this module be used in new installations.

SECTION 4 - OPERATING PROCEDURES

INTRODUCTION

After completing the steps detailed in Section 3, the INFI-NET to Plant Loop remote interface modules are ready to be put into operation. This section provides the necessary information for daily operation of the INFI-NET to Plant Loop remote interface modules.

INNIS01 NETWORK INTERFACE SLAVE MODULE START-UP PROCEDURES

On power up, the INNIS01 Network Interface Slave Module (NIS) microprocessor stays in reset mode until its associated transfer module (INIPT02) removes the reset mode and allows the firmware to execute self-diagnostic routines. The IPT module determines when the NIS module will go on-line. The NIS module comes on-line in the loop mode set by poles seven and eight of dipswitch SW3, with the counter display set by poles four through eight of dipswitch SW4.

Use the counter display (faceplate LEDs) to check the NIS module operation. If communication errors occur, the host module sets the NIS module communication status bits in the module status report. View the module status using a monitoring device (console, computer, etc.) on the loop.

Event Counters

Internal counters maintain a count of events such as the number of messages transmitted, retries, and number of messages lost. Table 3-5 has a complete list of event counters. The group A and B LEDs on the module faceplate display a binary value of the event counters (LED B8 is the most significant bit, LED A1 is the least significant bit). Figure 4-1 shows the location of the group A and group B LEDs.

Error Counters

Errors such as receive errors, messages with circulation count errors, etc., are maintained in internal counters just like the event counters. Refer to Table 3-6 for a listing of error counters. Table 5-1 lists the error codes that appear on the NIS module faceplate LEDs.

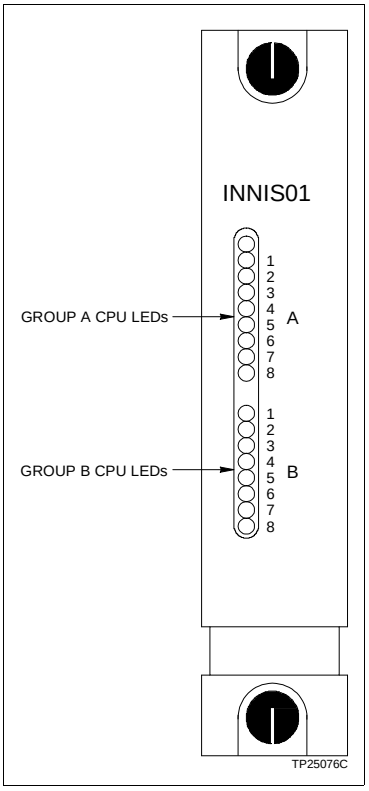

Figure 4-1. INNIS01 Faceplate LEDs

INIPT02 INFI-NET TO PLANT LOOP TRANSFER MODULE LEDs AND CONTROLS

The faceplate of the INIPT02 module has the following components (see Figure 4-2):

- Status LED.
- 16 CPU LEDs.
- Stop/reset pushbutton.

Status LED

The status LED is a two-color (red and green) LED that displays the operating status of the IPT module. It has three possible states. Table 4-1 lists the meaning of the status LED states. Refer to Section 5 for corrective action if the status LED indicates that an error exists.

CPU LEDs

There are two groups of eight CPU LEDs. Group A LED one will flash when the link is in restart mode. Group A LEDs seven and eight are illuminated on the primary IPT module. Only group A LED eight is illuminated on the secondary IPT module. Group B LEDs keep count of the commands and replies that

pass through the INIPT02 module during normal operation. If an error occurs, these LEDs display an error code and the status LED turns red. Refer to Table 5-2 for a list of CPU LED error codes and associated corrective action.

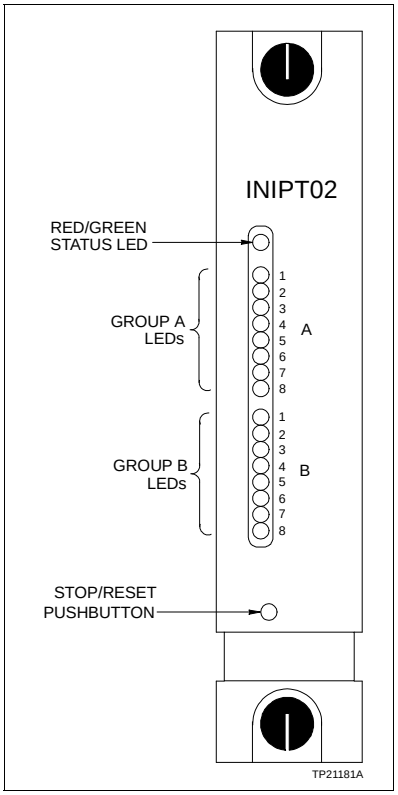

Figure 4-2. INIPT02 Faceplate LEDS and Controls

Table 4-1. INIPT02 Status LED States

LED State	Description
Off	No power to the IPT module.
Solid green	The IPT module is in execute mode.
Flashing green (every 1/2 second)	The module is in configure mode.
Flashing green (every 2 seconds)	The IPT diagnostics detect a configuration error.
Solid red	The IPT diagnostics detect a hardware failure or configuration problem. CPU LEDs display an error code when the status LED is red.

Stop/Reset Pushbutton

Push the stop/reset pushbutton once and wait for the status LED to turn red before removing an IPT module from the module mounting unit. Pressing the stop/reset pushbutton again causes the restoration of the IPT module to power up values after a halt. It is also used to recover from an operator initiated stop or a module time-out.

INIPR01 MODES OF OPERATION

The INIPR01 INFI-NET to Plant Loop Remote Interfaces have two modes of operation: Execute and configure.

Execute Mode

This is the normal mode of operation for the IPR interface. In the execute mode, the IPT module on the INFI-NET system communicates with the IPT module on the Plant Loop system. The IPT module (while in execute mode) can process exception reports, allow the operator to adjust tunable module specifications, and configure modules within a node residing on the INFI-NET system.

Configure Mode

The configure mode allows the executive block configuration to be modified. While in configure mode, all IPT module functions continue to operate normally. Any changes made to the executive block (function code 203) of the IPT module have no effect until the module returns to execute mode. Use an INFI 90 operator interface device to do any configuration tasks. Refer to the product instruction for the operator interface used for details.

INIPT02 MODULE EXECUTIVE BLOCK CONFIGURATION

To change the IPT executive block specifications, the module must be in the configure mode. New (changed) specification values will not become effective until the module is reset or the module is placed in execute mode. Changing the mode to execute will cause the module to do a software reset.

Use CAD/TXT release 5.3 or later to configure the INIPT02 executive block (function code 203). A configuration tuning module (CTM) can be used to configure the executive block of the IPT module. To use a CTM module, set the IPT module to module bus communication and set the CTM module to address the IPT module. A configuration tuning terminal (CTT) along with an IMCPM01 or IMCPM02 Communication Port Module can also be used to configure the executive block of the IPT module.

DETERMINING INIPT02 POINT COUNT

It is important when using the IPT module to be aware of the data point limitations of the device. The absolute restrictions imposed by the design of the INIPR01 interface are:

- The index table size of the IPT module limits the device to 9,999 exception report points imported from the Plant Loop to the INFI-NET loop.
- A maximum number of 9,969 data point definition blocks can be configured. These blocks are used to import exception report data from the INFI-NET loop to the Plant Loop.
- The total RAM memory available for the database is approximately 1,024 kilobytes.

Table 4-2 lists the IPT module database record sizes. The data in the tables applies to both the central INFI-NET loop and the remote satellite Plant Loop databases. Table 4-3 lists the bytes of memory required for block records.

Table 4-2. INIPT02 Database Memory Use

Database Record Type	Bytes Required
Loop	18
Node	62
Module	14
Route	16
Function block	Refer to Table 4-3

Table 4-3. Bytes Required per Function Block Type

Function Block Type	Bytes Required
Analog (real-3)	60
Analog (real-4)	64
DAANG (real-4)	86
Digital	44
Extended module status	58
Module status	58
RCM	46
RMSC (real-4)	64
Station (real-3)	76
Station (real-4)	86

SECTION 5 - TROUBLESHOOTING

INTRODUCTION

Troubleshooting the INFI-NET to Plant Loop remote interface modules can be achieved by viewing the contents of the error counters (faceplate LEDs) and the module status report from any INFI 90 operator interface. Refer to the product instruction for the operator interface used for information about accessing module status reports. The ***Function Code Application Manual*** also contains information about how to access module status information.

ERROR COUNTERS

All INFI-NET communication modules have faceplate LEDs that serve as error code displays. The NIS module has event and error counters that are selectable (refer to Tables 3-5 and 3-6).

INNIS01 ERROR CODES

The NIS module halts operation and displays an error code if a module failure or hardware error occurs. Group A LEDs display error codes. Table 3-6 lists the types of error counters. Group B LEDs are off when group A LEDs are displaying error codes. Refer to Table 5-1 for a list of error codes and associated corrective action.

Table 5-1. INNIS01 Error Codes

Code	LED 8	7	6	5	4	3	2	1	Condition	Corrective Action
13	0	0	0	1	0	0	1	1	ROM checksum error	Replace NIS.
16	0	0	0	1	0	1	1	0	Loopback test failure	Replace NIS, check cabling and termination unit.
31	0	0	1	1	0	0	0	1	Memory or CPU fault	Replace NIS.
32	0	0	1	1	0	0	1	0	Address or bus error	Reset IPT, replace NIS if error continues.
33	0	0	1	1	0	0	1	1	Illegal instruction	
34	0	0	1	1	0	1	0	0	Trace/privilege violation	
35	0	0	1	1	0	1	0	1	Spurious/unassigned exception	
36	0	0	1	1	0	1	1	0	Divide by 0/checksum/format error	
37	0	0	1	1	0	1	1	1	Trap instruction	
38	0	0	1	1	1	0	0	0	Invalid dipswitch setting on NIS	Check dipswitch SW1 through SW4.
3E	0	0	1	1	1	1	1	0	NIS/device handshake failure	Verify that dipshunt exists between NIS and IPT. If dipshunt exists, replace NIS or IPT.

NOTE: 0 = LED OFF, 1 = LED ON.

INIPT02 ERROR CODES

If module errors occur while the IPT module is operating, the module halts operation and the status LED turns red and the CPU LEDs on the module faceplate display error codes. Table 5-2 lists the IPT error codes and associated corrective action. Nonfatal module errors appear in the module status report from the operator interface.

Table 5-2. INIPT02 Error Codes

Code	LED 8	7	6	5	4	3	2	1	Condition	Corrective Action
01	0	0	0	0	0	0	0	1	NVRAM error. NVRAM not initialized or bad checksum.	Initialize NVRAM.
02	0	0	0	0	0	0	1	0	NVRAM write error	Initialize NVRAM.
0B	0	0	0	0	1	0	1	1	NVRAM initialized	Set dipswitch SW4 pole 5 to 0 and reset the module.
0D	0	0	0	0	1	1	0	1	Intermodule link error	Check cable between primary and secondary IPT modules. Check cable between IPT and termination device.
0E	0	0	0	0	1	1	1	0	Redundancy switches	Verify pole 8 of dipswitch SW4 is set properly. Set pole 7 of dipswitch SW4 to 1.
12	0	0	0	1	0	0	1	0	NIS not responding	Check dipshunt between NIS and IPT. Replace NIS.
13	0	0	0	1	0	0	1	1	ROM checksum error	Replace NIS.
14	0	0	0	1	0	1	0	0	I/O expander bus message failure	Reset IPT. Replace if error recurs.
15	0	0	0	1	0	1	0	1	Loop failure	Correct loop integrity problem.
16	0	0	0	1	0	1	1	0	NIS loopback test failure	Check cabling between NIS and loop termination device.
17	0	0	0	1	0	1	1	1	Power system status failure	Check power system. Call Bailey field service if error recurs.
21 thru 2F	0 0	0 0	1 1	0 0	0 1	0 1	0 1	1 1	Software error	Call Bailey field service.
31	0	0	1	1	0	0	0	1	Memory or CPU fault	Replace IPT.
32	0	0	1	1	0	0	1	0	Address or bus error	Reset IPT, replace IPT if error continues.
33	0	0	1	1	0	0	1	1	Illegal instruction	
34	0	0	1	1	0	1	0	0	Trace/privilege violation	
35	0	0	1	1	0	1	0	1	Spurious/unassigned exception	
36	0	0	1	1	0	1	1	0	Divide by 0/checksum/format error	
37	0	0	1	1	0	1	1	1	Any trap instruction	
38	0	0	1	1	1	0	0	0	Invalid NIS dipswitch setting	Configure the NIS dipswitches correctly.

Table 5-2. INIPT02 Error Codes (continued)

Code	LED 8	7	6	5	4	3	2	1	Condition	Corrective Action
39	0	0	1	1	1	0	0	1	Duplicate node number on loop	Change node number.
3C	0	0	1	1	1	1	0	0	Relay or fuse failure on loop termination device	Replace blown fuse or damaged relay. Replace termination device if error recurs.
3D	0	0	1	1	1	1	0	1	NIS compatibility error	Replace NIS firmware with compatible revision.
3E	0	0	1	1	1	1	1	0	NIS/device handshake error	Call Bailey field service.
3F	0	0	1	1	1	1	1	1	The IPT has stopped because the user pressed the stop pushbutton	Reset IPT.

NOTE: Codes are displayed only when the IPT module is halted and the status LED is red (0 = LED OFF, 1 = LED ON).

INNIS01 EDGE CONNECTORS

Tables 5-3 through 5-5 list the NIS edge connector pin assignments.

Table 5-3. 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	10	Power fail interrupt
11	Unused	12	Unused

Table 5-4. INNIS01 Edge Connector P2 Pin Assignments

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

Table 5-5. INNIS01 Edge Connector P3 Pin Assignments

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

INIPT02 EDGE CONNECTORS

Tables 5-6 through 5-8 list the IPT edge connector pin assignments. Table 5-9 lists the diagnostic port pin assignments.

Table 5-6. INIPT02 Edge Connector P1 Pin Assignments

Pin	Signal	Pin	Signal
1	+5 VDC	2	+5 VDC
3	Power supply status	4	Controlway B
5	Common	6	Common
7	Unused	8	-15 VDC
9	Power fail interrupt	10	Unused
11	Controlway A/module bus	12	Unused

Table 5-7. INIPT02 Edge Connector P2 Pin Assignments

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

Table 5-8. INIPT02 Edge Connector P3 Pin Assignments

Pin	Signal	Pin	Signal
1	Red1 parity	16	Ground
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	Ground	21	Ground
7	Red1 clock	22	Red2 clock
8	Ground	23	Ground
9	Red1 busy	24	Red2 busy
10	Ground	25	Ground
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	Ground	30	Red2 parity

Table 5-9. INIPT02 RS-232-C Diagnostic Port P4 Pin Assignments

Pin	Signal	
	Port configured as DCE	Port Configured as DTE
2	Receive data	Transmit data
3	Transmit data	Receive data
5	Ground	Ground
7	Request to send	Clear to send
8	Clear to send	Request to send

IMMPI01 EDGE CONNECTORS

Tables 5-10 and 5-11 list the MPI edge connector pin assignments.

Table 5-10. IMMPI01 Edge Connector P1 Pin Assignments

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

Table 5-11. IMMPI01 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	Unused	18	Unused
4	Unused	19	Unused
5	Unused	20	Unused
6	Unused	21	Unused
7	Receive data A (–)	22	Receive data A (+)
8	Receive data B (–)	23	Receive data B (+)
9	Clear to send A (–)	24	Clear to send A (+)
10	Clear to send B (–)	25	Clear to send B (+)
11	Transmit data A (–)	26	Transmit data A (+)
12	Transmit data B (–)	27	Transmit data B (+)
13	Request to send A (–)	28	Request to send A (+)
14	Request to send B (–)	29	Request to send B (+)
15	Digital output 1 (+)	30	Digital output 1 (–)

DIAGNOSTICS

The IPT firmware contains diagnostic routines that can be invoked during module power-up. These routines verify the proper operation of the modules components and circuitry. Putting the IPT module in the diagnostic mode allows the module to perform a variety of diagnostic tests but suspends normal operation. Therefore, use it during installation to check module integrity, when the system is down, or transfer control to a backup IPT module. The information that follows describes how to use the diagnostic routines and gives a brief description of each test routine.

Overview

Select the required diagnostic routine using the IPT dipswitches. Diagnostic test results display on the IPT front panel LEDs. Both group and individual tests can be executed. The typical procedure is to select a diagnostic to execute, set the module dipswitches accordingly, reset the module, and observe the results on the faceplate LEDs. If the halt on error feature is disabled, the selected test runs repeatedly until the IPT module is reset and another test is selected. If halt on error feature is enabled, the test stops and the LEDs display the failure.

An additional module is required for I/O expander bus communication tests. To do this test:

1. Set the dipswitches on the IMDSO04 (DSO) module and the IPT module to the settings in Table 5-12.

2. Insert the DSO module in the same module mounting unit as the IPT module.

3. There must be continuity between the DSO module and the IPT module on the I/O expander bus (i.e., I/O expander bus dipshunts inserted with straps intact between the DSO and IPT modules). The modules do not need to be in adjacent slots.

An additional NTMP01 termination unit, NIMP01 or NIMP02 termination module is required for redundancy link and SAC/DCS link tests.

Table 5-12. DSO and IPT Module Setup for I/O Expander Bus Test

Dipswitch	Pole 1	2	3	4	5	6	7	8
IMDSO04 address dipswitch S1	0	0	0	0	1	1	1	1
INIPT02 dipswitch SW2	0	0	0	0	1	1	1	1

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

Dipswitch Selection

Pole one of dipswitch SW4 must be set to one (OFF position) to put the module into the diagnostic mode. The remaining poles are used to select module address and Controlway or module bus communication. They should remain in their normal operating position. Dipswitch SW1 enables or disables the halt on error feature and selects the diagnostic test. Figure 5-1 shows the definition of the dipswitch poles.

On dipswitch SW1, poles three through eight select the diagnostic test. Pole eight is the least significant bit (binary weight one), pole three is the most significant bit (binary weight 32). Refer to Table 5-13 for test ID values. Pole one selects a halt on error feature. When enabled, the IPT module will halt test execution whenever the selected test detects an error. The number of the failing test is displayed on the group B LEDs (see Figure 5-2). The group A LEDs display the pass/fail count.

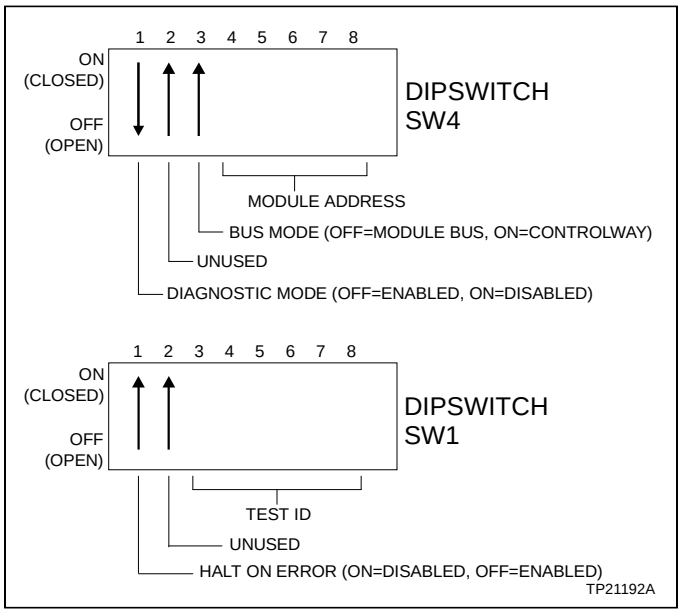

Figure 5-1. Diagnostic Dipswitch Positions

Table 5-13. Diagnostic Tests

Test Name	Test-ID	Description
Switches and LEDs	00	Byte value of all dipswitches are exclusive ORed together. Results are displayed on LEDs. Status LED is OFF for even or ON for odd total.
CPU	01	Verifies CPU instruction set is operational.
ROM	02	Calculates checksum of ROM memory and compares it to value stored in ROM memory during programming.
Quick RAM	03	Verifies read, write, and data retention functions of RAM.
NVRAM	04	Verifies read, write, and data retention functions of NVRAM. Sets test patterns for test 22.
Immediate IRQ	05	Verifies operation of interrupt control registers.
Timer	06	Verifies operation of system 1 msec timer.
Local RS-232-C, DUART #1	07	Verifies local loopback capability of DUART #1.
Local RS-232-C, DUART #2	08	Verifies local loopback capability of DUART #2.
Real time clock time and NVRAM	09	Verifies time, date, and watchdog capability of real time clock. Sets test patterns for test 23.
DMA controller	0A	Verifies read and write access to DMA controller.
RAM burst mode	0B	Verifies correct operation of burst mode access to RAM.
ROM burst mode	0C	Verifies correct operation of burst mode access to ROM, if enabled.
Expander bus stall	0D	Verifies correct operation of expander bus stall detector.
SCSI controller	0E	Verifies read, write and interrupt interfaces to SCSI controller.
Unused	0F	–
Group test 1[1]	10	Executes tests 01 through 0F in a loop until stopped.

Table 5-13. Diagnostic Tests (continued)

Test Name	Test-ID	Description
Remote RS-232-C, DUART 1	11	Verifies RS-232-C line drivers and receivers for data and handshake lines connected to DUART 1. Requires loopback jumpers for data and handshake lines.
Remote RS-232-C, DUART 2	12	Verifies RS-232-C line drivers and receivers for data and handshake lines connected to DUART 2. Requires loopback jumpers for data and handshake lines.
Expander bus communications	13	Verifies expander bus communication with digital output.
Unused	14-1F	–
Group test 2	20	Executes tests 01 through 1F in a loop until stopped.
Long RAM	21	Performs test 03 plus walking-1 and walking-0 tests to verify RAM operation.
NVRAM data detection	22	Reads NVRAM for pattern set in test 04. Interruption of power between test 04 and test 22 is preferred.
Real time clock NVRAM data retention	23	Reads real time clock NVRAM for pattern set in test 09. Interruption of power between test 09 and test 22 is preferred.
Machine fault timer	24	Verifies correct operation of machine fault timer.
Stop/reset pushbutton	25	Verifies correct operation of stop/reset pushbutton.
Expander bus assassin	26	Verifies correct operation of expander bus assassin circuit.

NOTE:
1. Must have the IMMPI01 I/O module installed to pass.

LED Display

The front panel LEDs (see Figure 5-2) are used during diagnostic mode operation to display test results.

On module reset, all front panel LEDs turn on. Next, the IPT module reads the dipswitches, executes the selected test and displays the result on the group A and group B LEDs. Group B LEDs display the test number on LEDs one through six. If LED eight is on, the test failed. The display is latched on for $^{1}/_{4}$-second for viewing ease, then the LEDs blank out for about $^{1}/_{8}$-second, and the test is repeated. Group A LEDs display a running tally of successes and failures. LEDs one through four tally the passes, LEDs five through eight tally the failures.

If a test fails with the halt-on error feature selected (dipswitch SW1, pole one ON), the status LED turns red. The test number that failed is displayed on the group B LEDs.

For group tests (10, 20), each test is run in numerical order. On a failure, group B LED eight (see Figure 5-2) flashes and LEDs one through six display the test number that failed. When all tests in the group are done, the error count is incremented and displayed on the group A LEDs.

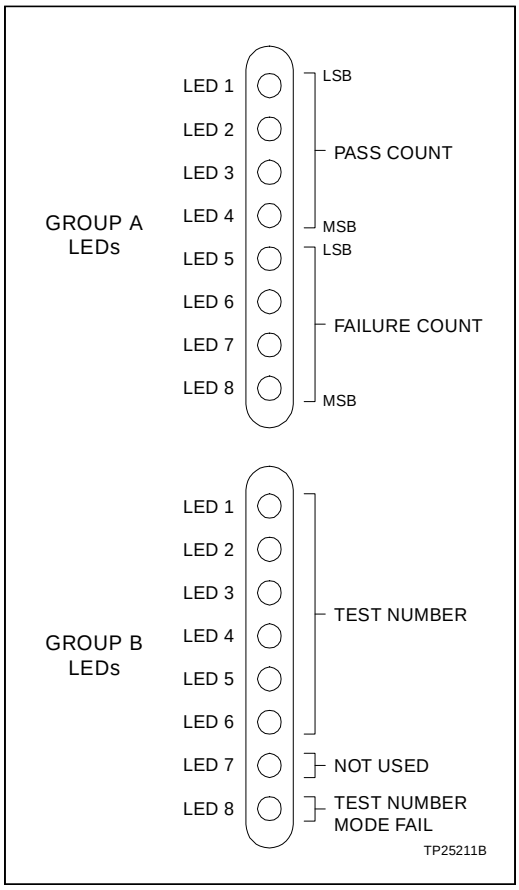

Figure 5-2. INIPT02 LED Functions (Diagnostic Mode)

SECTION 6 - MAINTENANCE

INTRODUCTION

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.**
AVERTISSEMENT	**Des lunettes de protection devraient être portées lors de travail avec des solvants nettoyants. Lorsqu'on enlève les solvants des circuits imprimés à l'aide d'air comprimé, les éclaboussures de solvant pourraient causer des blessures aux yeux.**

The reliability of any stand-alone product or control system is affected by the maintenance of the equipment. Bailey Controls Company 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 the customer should be able to perform 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.

Personnel performing preventive maintenance should meet the following qualifications.

- Maintenance personnel should be qualified electrical technicians or engineers that know the proper use of test equipment.
- Maintenance personnel should be familiar with the modules that make up the INIPR01 INFI-NET to Plant Loop Remote Interface (IPR), have experience working with process control systems, and know what precautions to take when working on live electrical systems.

PREVENTIVE MAINTENANCE SCHEDULE

Table 6-1 is the preventive maintenance schedule for the modules that make up the IPR interface. 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 is for general purposes only. Your application may require special attention.

Table 6-1. Preventive Maintenance Schedule

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

EQUIPMENT AND TOOLS REQUIRED

Listed below are the tools and equipment required for maintenance procedures.

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

PREVENTIVE MAINTENANCE PROCEDURES

This section covers tasks from Table 6-1 that require specific instruction or further explanation.

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

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 it with isopropyl alcohol (99.5% electronic grade) or wiping the board with a foam tipped swab wetted in isopropyl alcohol.

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

EDGE CONNECTOR CLEANING

To clean edge connector contacts:

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

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

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

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

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

To clean tarnished or deeply stained edge connector contacts:

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

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

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

4. Wipe the contacts 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 the 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.

Checking Connections

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

> **NOTE:** Power to the cabinet should be off while performing this preventive maintenance task.

Verify that all cable connections are secure.

SECTION 7 - REPAIR/REPLACEMENT PROCEDURES

INTRODUCTION

Repair procedures are limited to module replacement. If an INFI-NET to Plant Loop remote interface module fails, remove and replace it with another. Verify that the replacement module dipswitch and jumper settings are the same as those of the failed module.

> **NOTE:** Do not remove INIPT02 modules under power unless the stop/reset pushbutton has been depressed and module operation has been halted.

MODULE REPLACEMENT PROCEDURE

Follow Steps 1 through 7 to replace interface modules. Observe the steps listed in ***SPECIAL HANDLING*** in Section 3 when handling interface modules.

1. Turn the 2 latching screws on the defective interface module 1/2-turn either way to release them. When removing either the INIPT02 or IMMPI01 module, remember that these modules are connected by a cable that must be disconnected.

2. Grasp the screws and slide out the module or modules.

3. If necessary, disconnect the cable connecting the modules and remove only the defective module.

4. Set any dipswitches and jumpers on the replacement module to match the settings of the removed module.

5. If necessary, connect the replacement module with any interconnecting modules.

6. Hold the module or modules by the faceplate and slide them into their assigned slots. Push until the rear edges of the modules are firmly seated in the backplane connectors.

7. Turn the 2 latching screws on the module or modules 1/2-turn to lock the modules in place. Modules are locked into the module mounting unit when the open end of the slots on the latching screws faces the center of the module faceplate.

TERMINATION UNIT OR MODULE REPLACEMENT PROCEDURES

To replace the following termination devices, refer to the appropriate instructions for step by step replacement procedures and spare parts information:

- NTCL01 Communication Termination Unit.
- NICL01 Communication Termination Module.
- NTMP01 Multi-Function Processor Termination Unit.
- NIMP01 and NIMP02 Multi-Function Processor Termination Modules.

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, 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 number, page number and reference figure that identifies the part.

Order parts without commercial descriptions from the nearest Bailey Controls Company sales office. Table 8-1 provides a list of spare parts.

Table 8-1. Spare Parts List

Part Number	Description
1946984_1	Jumper
1948720_60	Auxiliary I/O ribbon cable (60-pin)
1948936_1	Jumper (HW SETUP socket)
IMMPI01	Multi-function processor interface module
INIPT02	INFI-NET to Plant Loop transfer module
INNIS01	Network interface slave module
NICL01	Communication termination module
NIMP01/02	Multi-function processor termination module
NKLS01	Termination unit cable, INNIS01 to NTCL01 (PVC)
NKLS02	Termination module cable, INNIS01 to NICL01 (PVC)
NKLS11	Termination unit cable, INNIS01 to NTCL01 (non-PVC)
NKLS12	Termination module cable, INNIS01 to NICL01 (non-PVC)
NKTU01	Termination unit cable, INIPT02 to NTMP01 (PVC)
NKTU02	Termination module cable, INIPT02 to NIMP01 (PVC)
NKTU11	Termination unit cable, INIPT02 to NTMP01 (non-PVC)

Table 8-1. Spare Parts List (continued)

Part Number	Description
NKTU12	Termination module cable, INIPT02 to NIMP01 (non-PVC)
NTCL01	Communication termination unit
NTMP01	Multi-function processor termination unit

NOTE: It is impractical to specify a recommended quantity of spare parts because Bailey custom designs every system. Contact Bailey Controls Company for help determining the quantity of spare parts to keep on hand for your particular system.

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 manuals, can be obtained from the nearest Bailey Controls sales office at a reasonable charge.

APPENDIX A - NTCL01 TERMINATION UNIT CONFIGURATION

INTRODUCTION

The INNIS01 Network Interface Slave Module (NIS) can use the NTCL01 Communication Termination Unit (TCL) for termination. Jumpers on the TCL unit select the type of cable used to connect the NIS module to an INFI-NET or Plant Loop system. Refer to the NTCL01 instruction for complete information. Figure A-1 shows the location of jumpers and connectors. Figures A-2 and A-3 show the coaxial and twinaxial cable connections. Table A-1 lists the jumper settings used on TCL unit circuit board revision levels D and E. Table A-2 lists the jumper settings used on TCL unit circuit board revision levels F or higher.

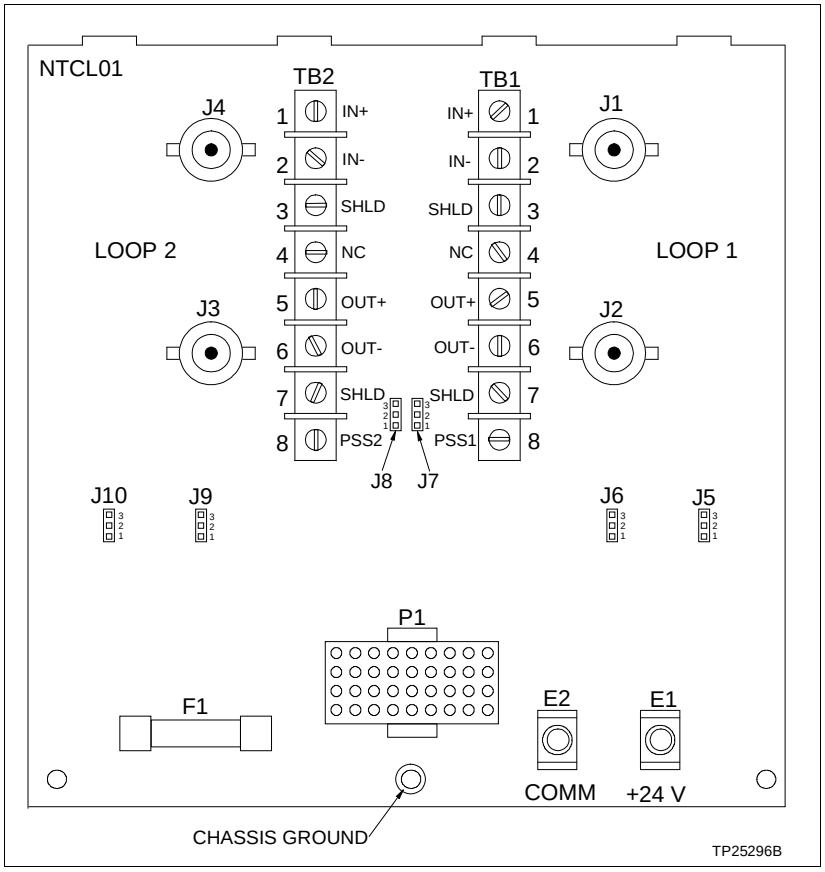

Figure A-1. NTCL01 Connector and Jumper Locations (Revision F or Greater)

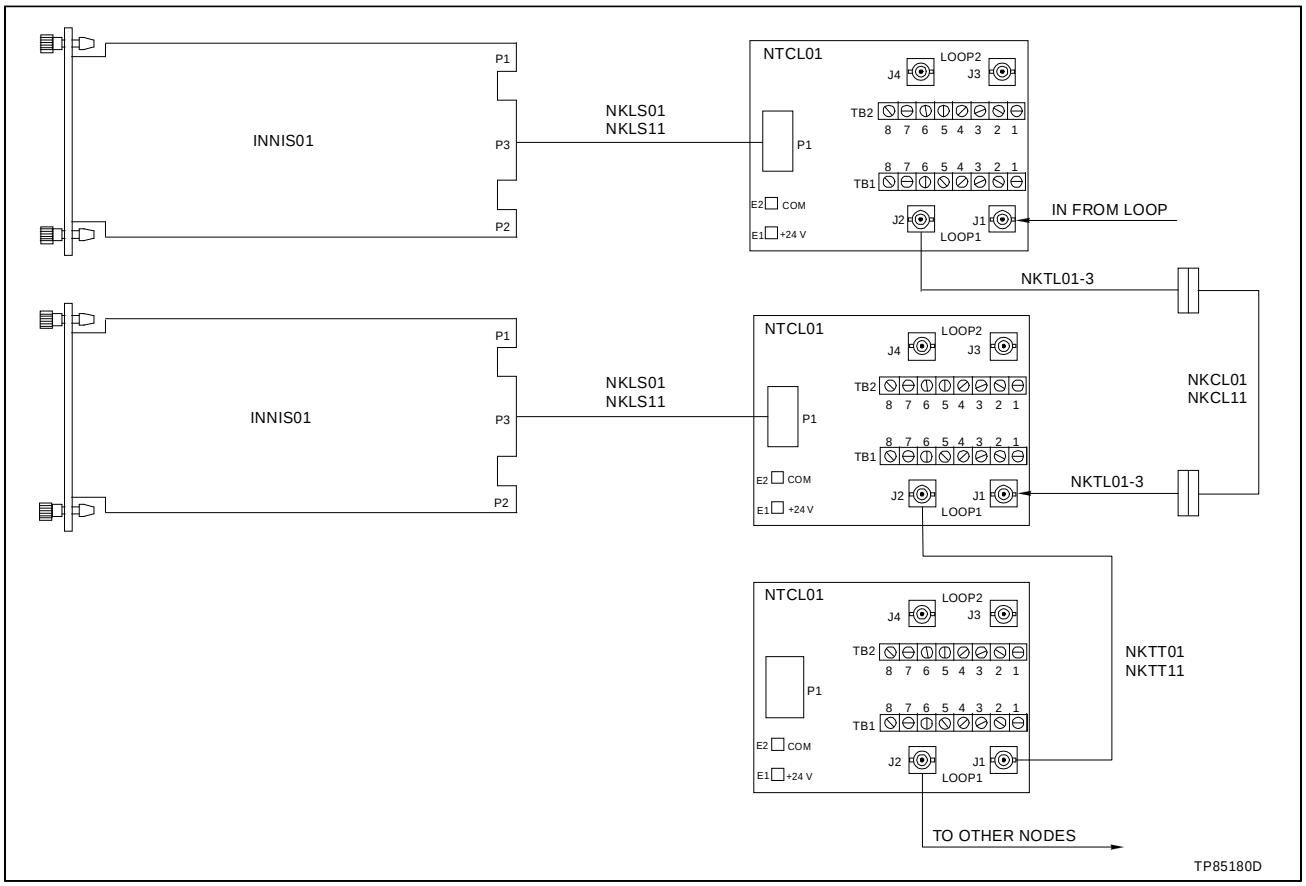

Figure A-2. NTCL01 Coaxial Cable Connections to INNIS01 Modules

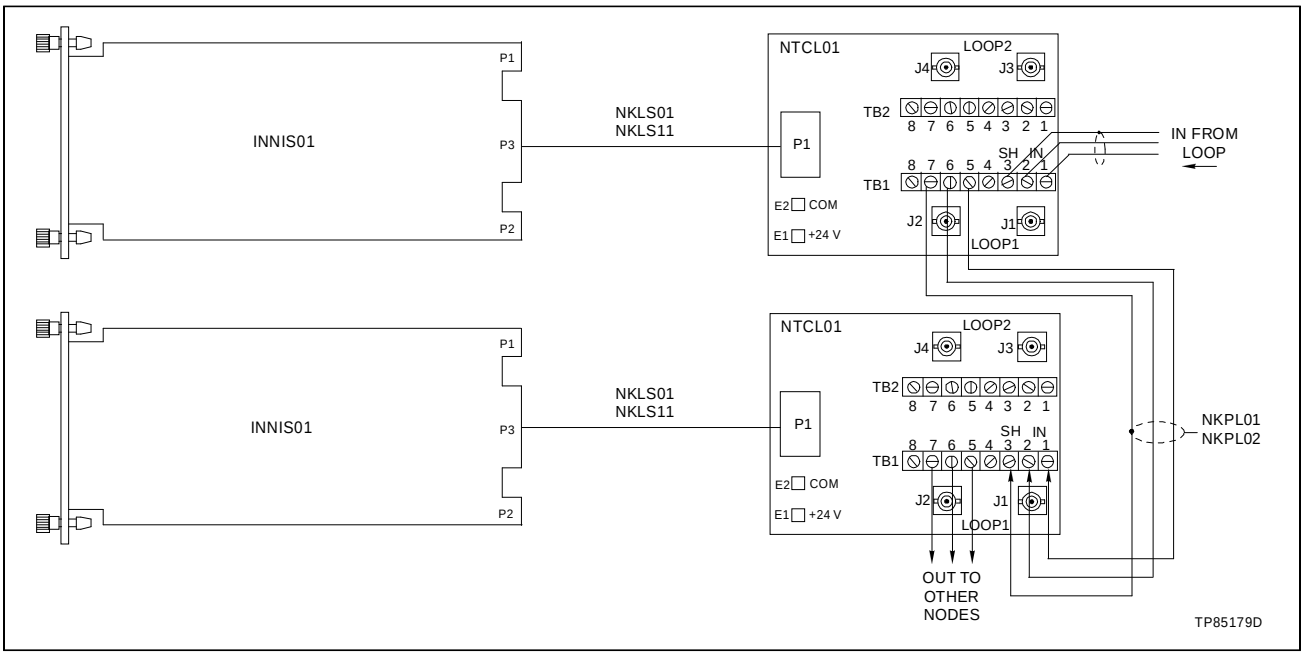

Figure A-3. NTCL01 Twinaxial Cable Connections to INNIS01 Modules

Table A-1. NTCL01 Jumper Settings for Revisions D and E

Jumper Number	Twinaxial Cable Jumper Settings	Coaxial Cable Jumper Settings
J5 - J12	2 - 3	2 - 3
J13 - J18	1 - 2	2 - 3

Table A-2. NTCL01 Jumper Settings for Revision F or Greater

Jumper Number	Twinaxial Cable Jumper Settings	Coaxial Cable Jumper Settings
J5 - J10	1 - 2	2 - 3

APPENDIX B - NICL01 TERMINATION MODULE CONFIGURATION

INTRODUCTION

The INNIS01 Network Interface Slave Module (NIS) can use the NICL01 Communication Termination Module (ICL) for termination. Jumpers on the ICL module select the type of cable used to connect the NIS module to an INFI-NET or Plant Loop system. Refer to the NICL01 instruction for complete information. Figure B-1 shows the location of jumpers and connectors. Figures B-2 and B-3 show the coaxial and twinaxial cable connections. Table B-1 lists the jumper settings used on ICL module circuit board revision level C. Table B-2 lists the jumper settings used on ICL module circuit board revision levels D or higher.

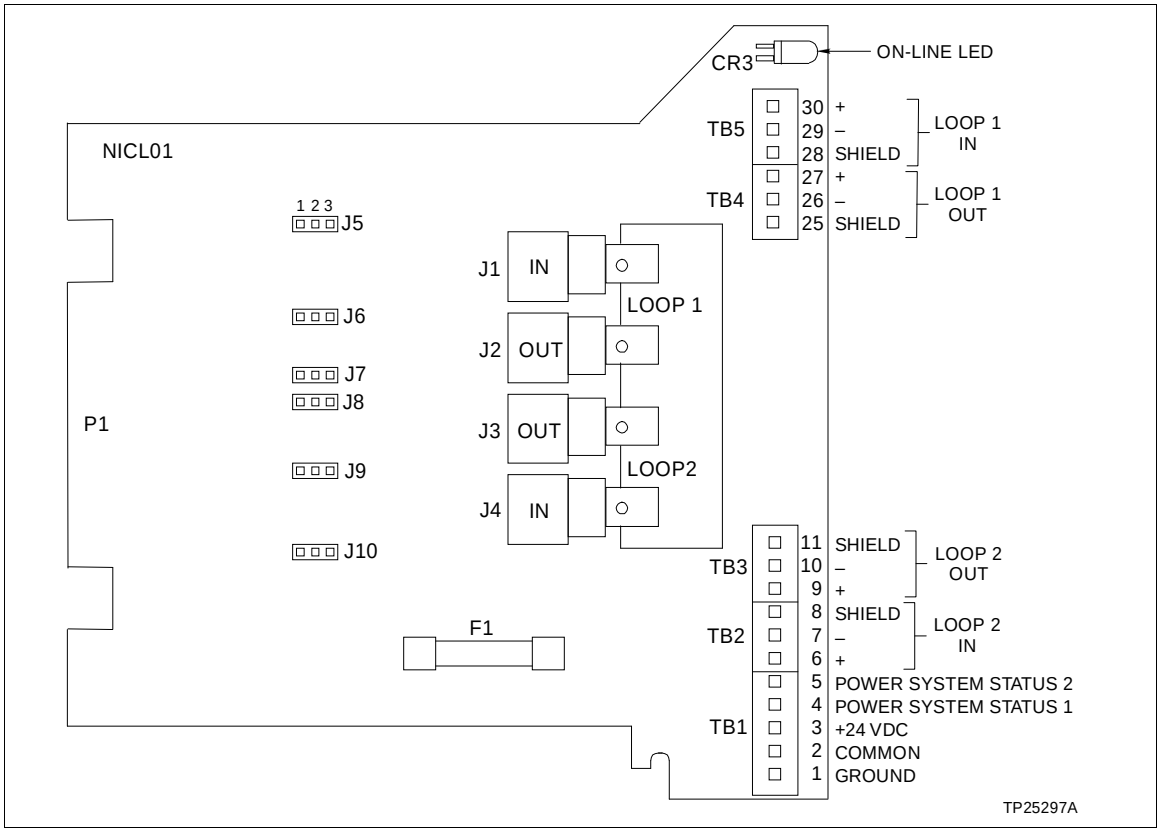

Figure B-1. NICL01 Connector and Jumper Locations (Revision D or Greater)

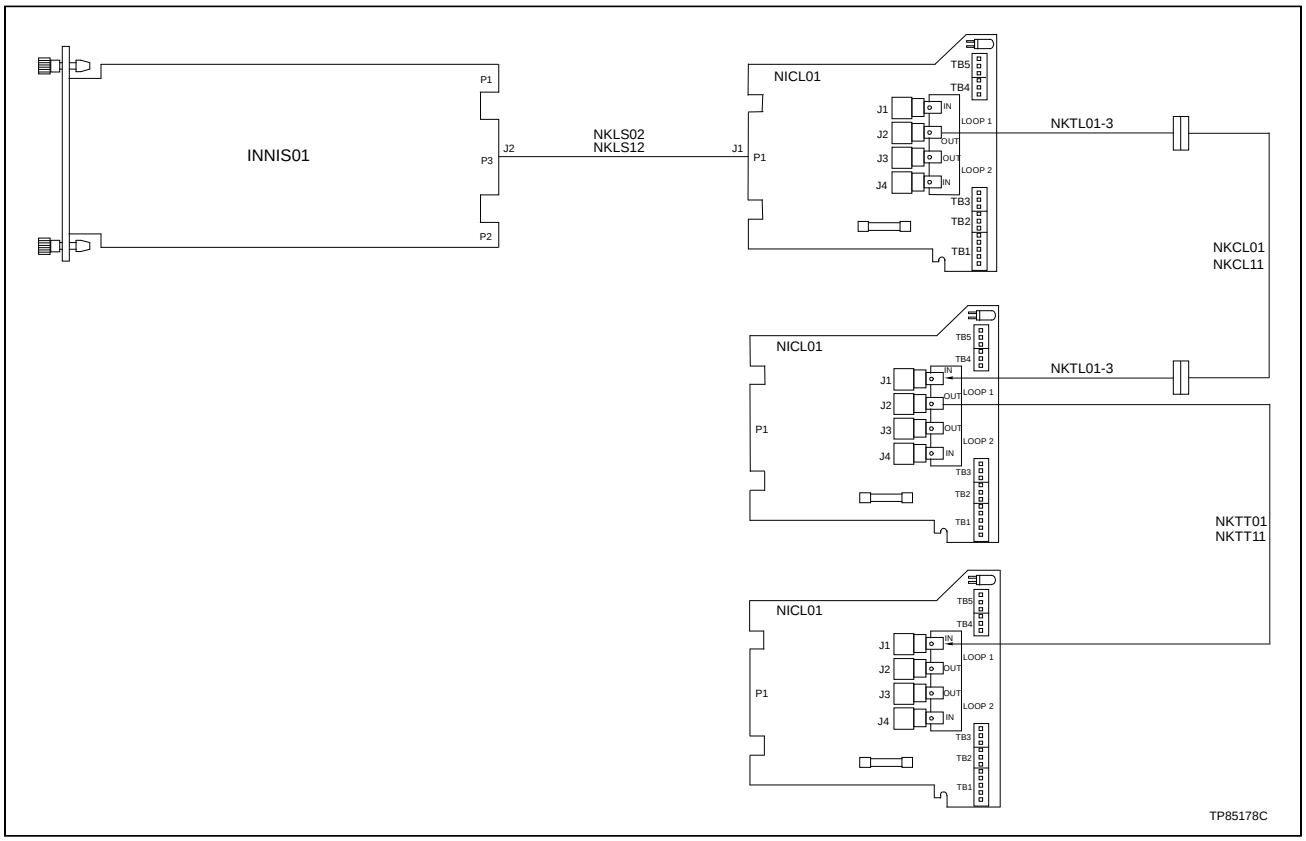

Figure B-2. NICL01 Coaxial Cable Connections to INNIS01 Modules

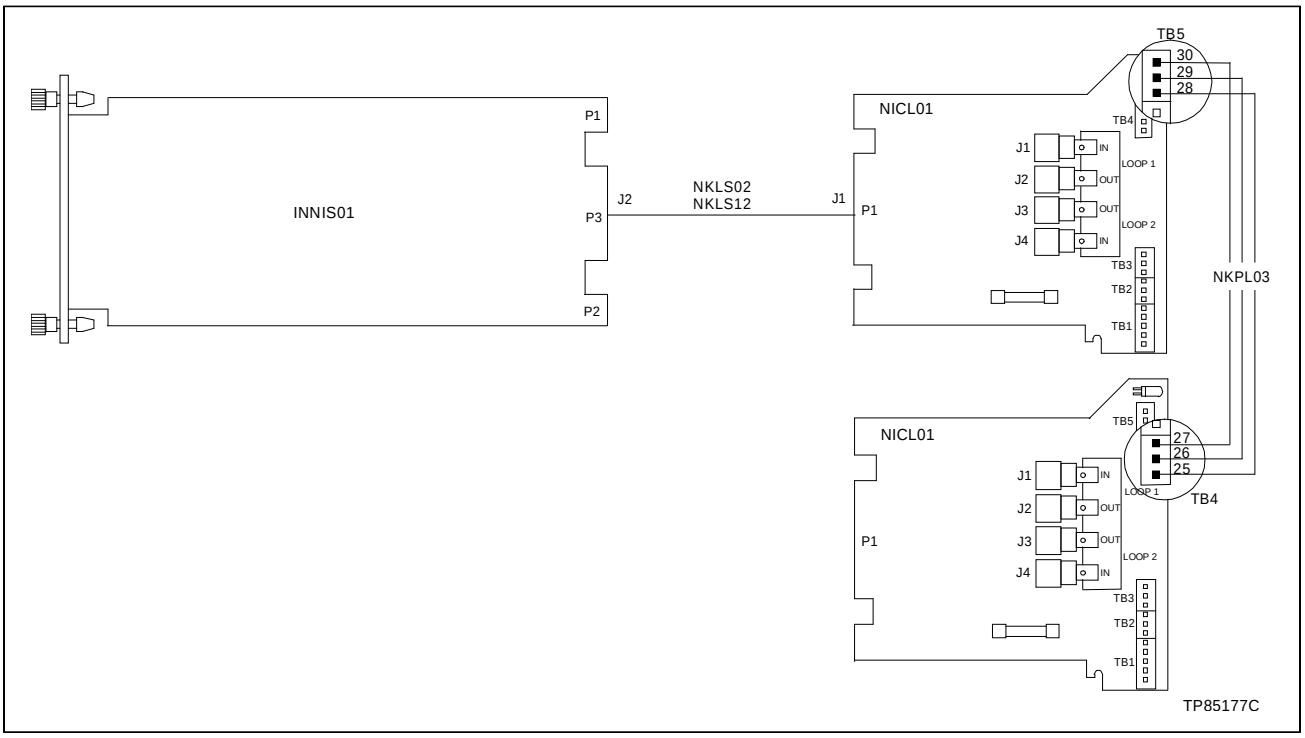

Figure B-3. NICL01 Twinaxial Cable Connections to INNIS01 Modules

Table B-1. NICL01 Jumper Settings for Revision C

Jumper Number	Twinaxial Cable Jumper Settings	Coaxial Cable Jumper Settings
J5 - J12	2 - 3	2 - 3
J13 - J18	1 - 2	2 - 3

Table B-2. NICL01 Jumper Settings for Revision D or Greater

Jumper Number	Twinaxial Cable Jumper Settings	Coaxial Cable Jumper Settings
J5 - J10	1 - 2	2 - 3

APPENDIX E - REDUNDANT CONFIGURATIONS

INTRODUCTION

This section provides information on various ways to terminate redundant INIPR01 INFI-NET to Plant Loop Remote Interfaces. Redundant interfaces provide an additional level of operational security against module or communication system component failure.

REDUNDANT CONFIGURATIONS

Redundant INIPT02 INFI-NET to Plant Loop Transfer Modules (IPT) must share a common Controlway or Module Bus. The IPT modules use Controlway for redundancy communication and for transfer of the executive block (function code 203) configuration between the primary and secondary IPT module.

An I/O expander bus connection must exist between each IPT module and its associated INNIS01 Network Interface Slave (NIS) Module. Do not connect the I/O expander bus between the primary and secondary IPT module. Keep each I/O expander bus as short as possible.

Switch Settings for Redundancy

To enable redundancy, dipswitch SW4 pole seven must be set to one on both IPT modules. IPT executive block specifications and the serial port configuration determine what conditions will lead to a failover from primary IPT module to secondary IPT module. If the primary IPT module stops executing for any reason, the backup IPT module will attempt to come on-line.

The IPT module supports external equipment switching on failover. This feature requires redundant digital I/O modules and associated termination device. IPT executive block specifications determine the state of digital output number three. In redundant configurations, the primary IPT module (using digital output three) enables the primary transceiver while the primary IPT module is on-line. Insure the executive block of the secondary IPT module is identically configured so it will enable 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 IPT module to connect the antenna to the primary transceiver. If failover occurs, the secondary IPT module connects

the antenna to the redundant transceiver. The INFI-NET to Plant Loop Transfer Module Executive Block (INIPT02), function code 203 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.

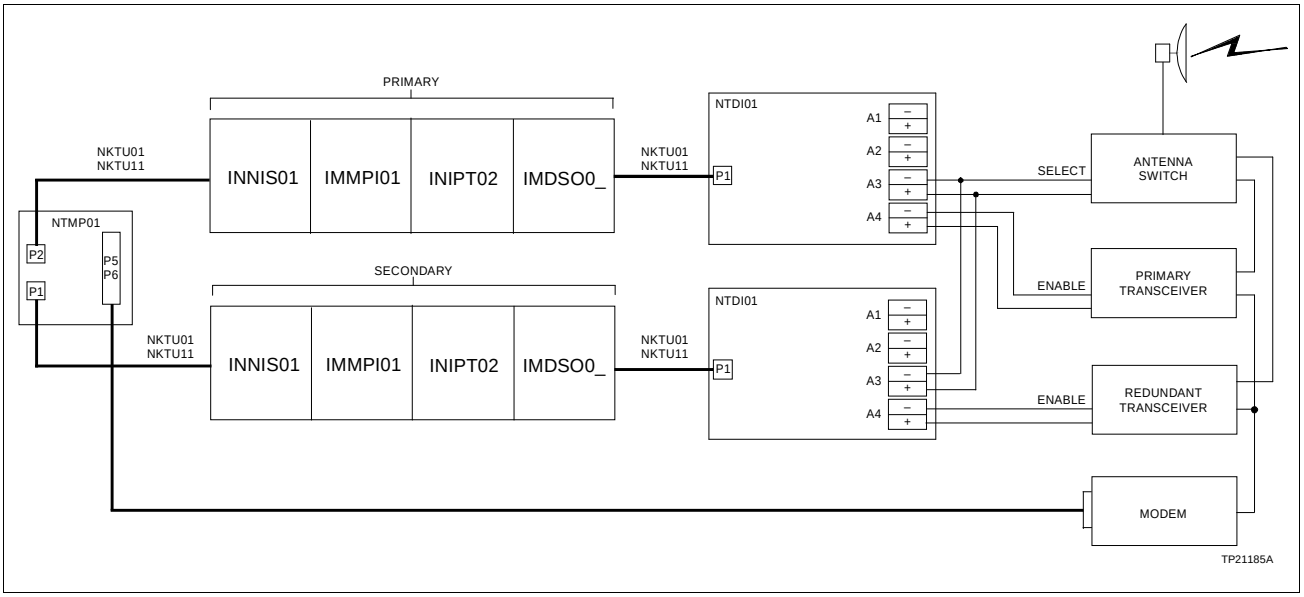

Figure E-1. Redundant Communication Equipment Connections

Redundant Termination Devices

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-3 through E-5 show redundant interfaces using various termination unit or module configurations.

Figure E-3 illustrates redundant IPT modules using a single NTMP01 Multi-Function Processor Termination Unit. In this configuration, the IPT modules share a single termination unit and communicate through one or two serial channels. The primary IPT module controls the termination unit.

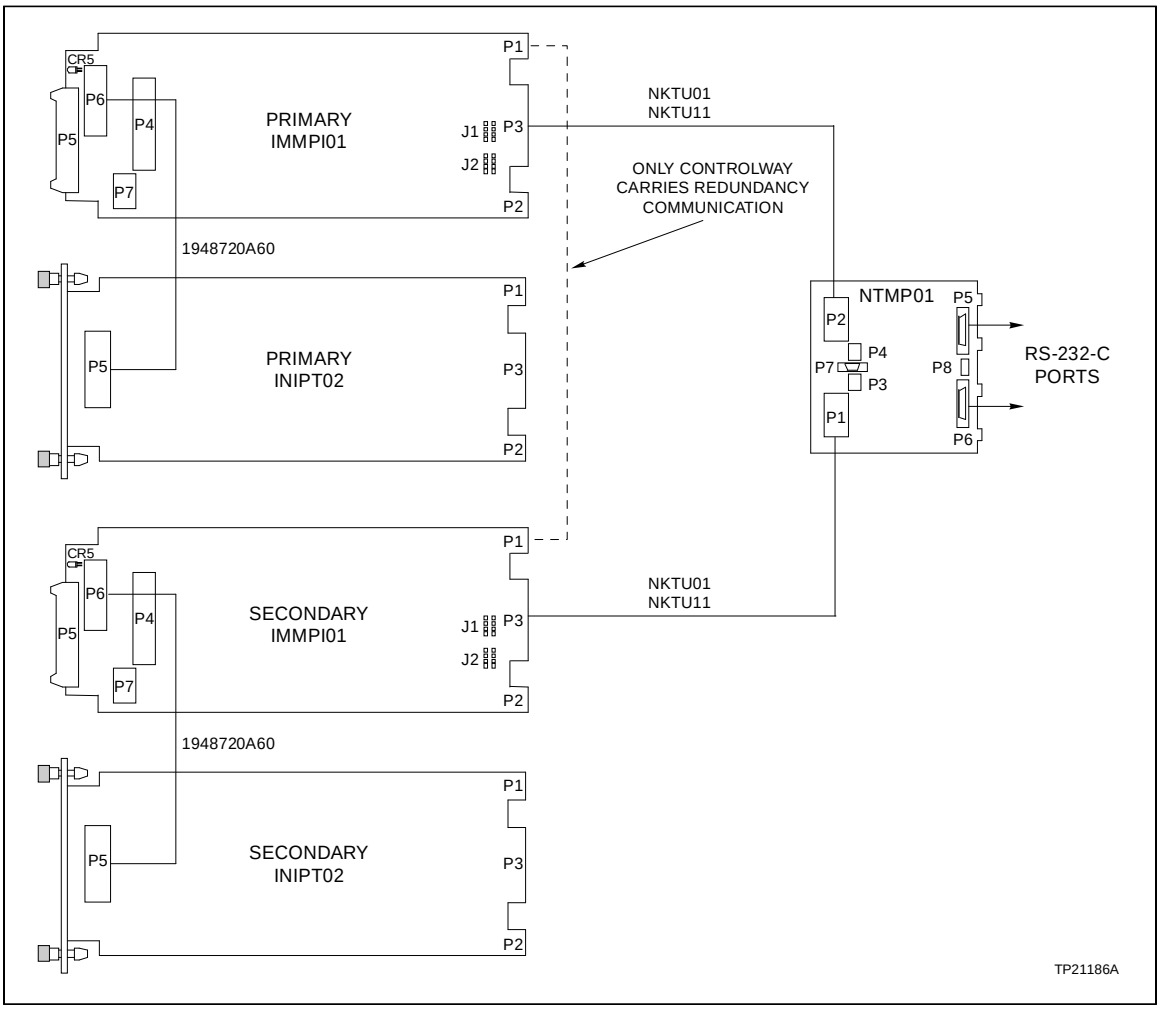

Figure E-2. Redundant IPT Modules Using NIMP01 and NIMP02 Termination Modules

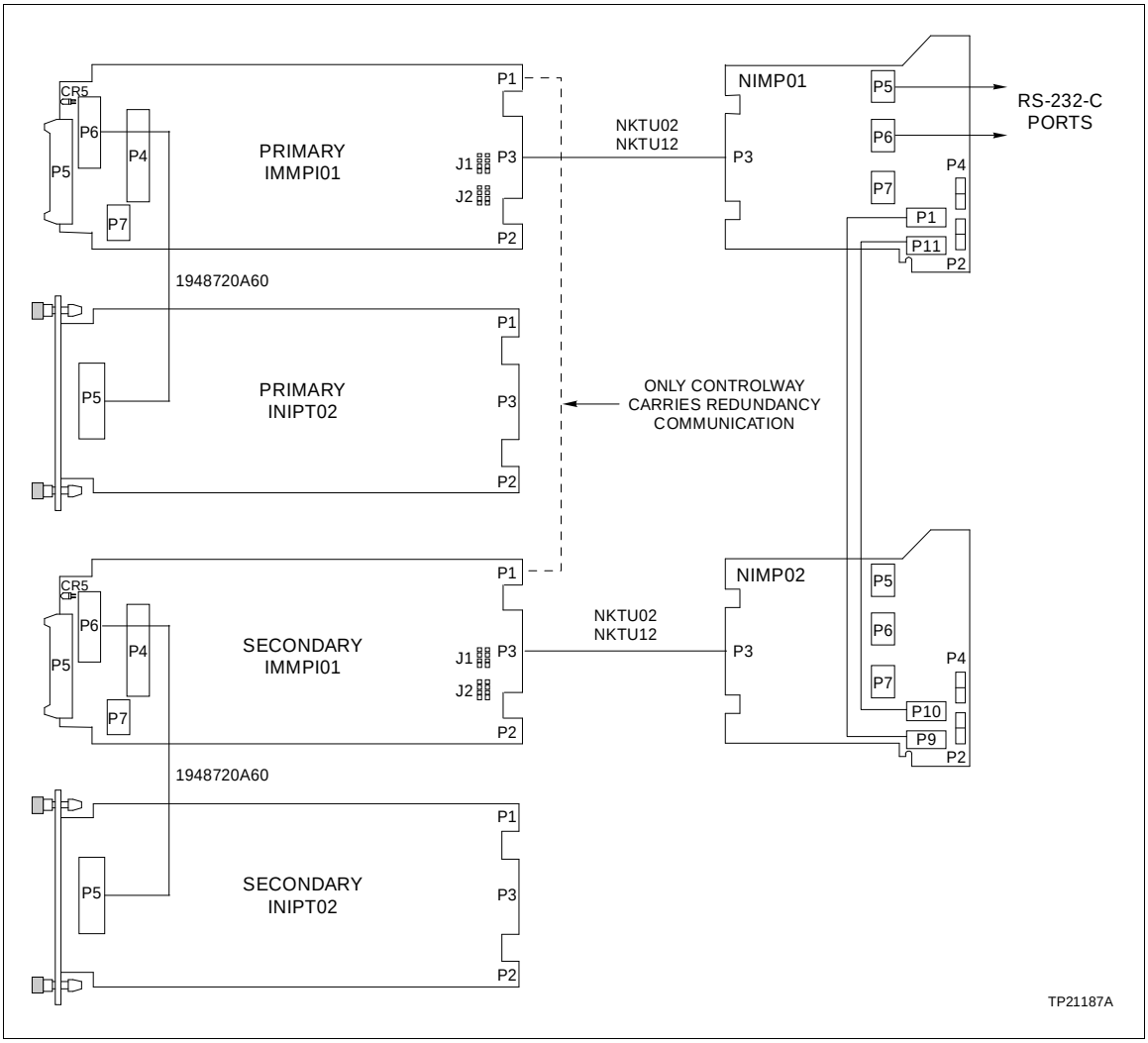

Figure E-3. Redundant IPT Modules Using an NTMP01 Termination Unit

Figure E-2 shows redundant IPT modules using NIMP01 and NIMP02 Multi-Function Processor Termination Modules. This configuration gives redundant IPT modules access to the two RS-232-C channels on the NIMP01 termination module. The secondary IPT module must access the serial channels on the NIMP01 termination module through its connection to the NIMP02 termination module. The primary IPT module controls the NIMP01 termination module.

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

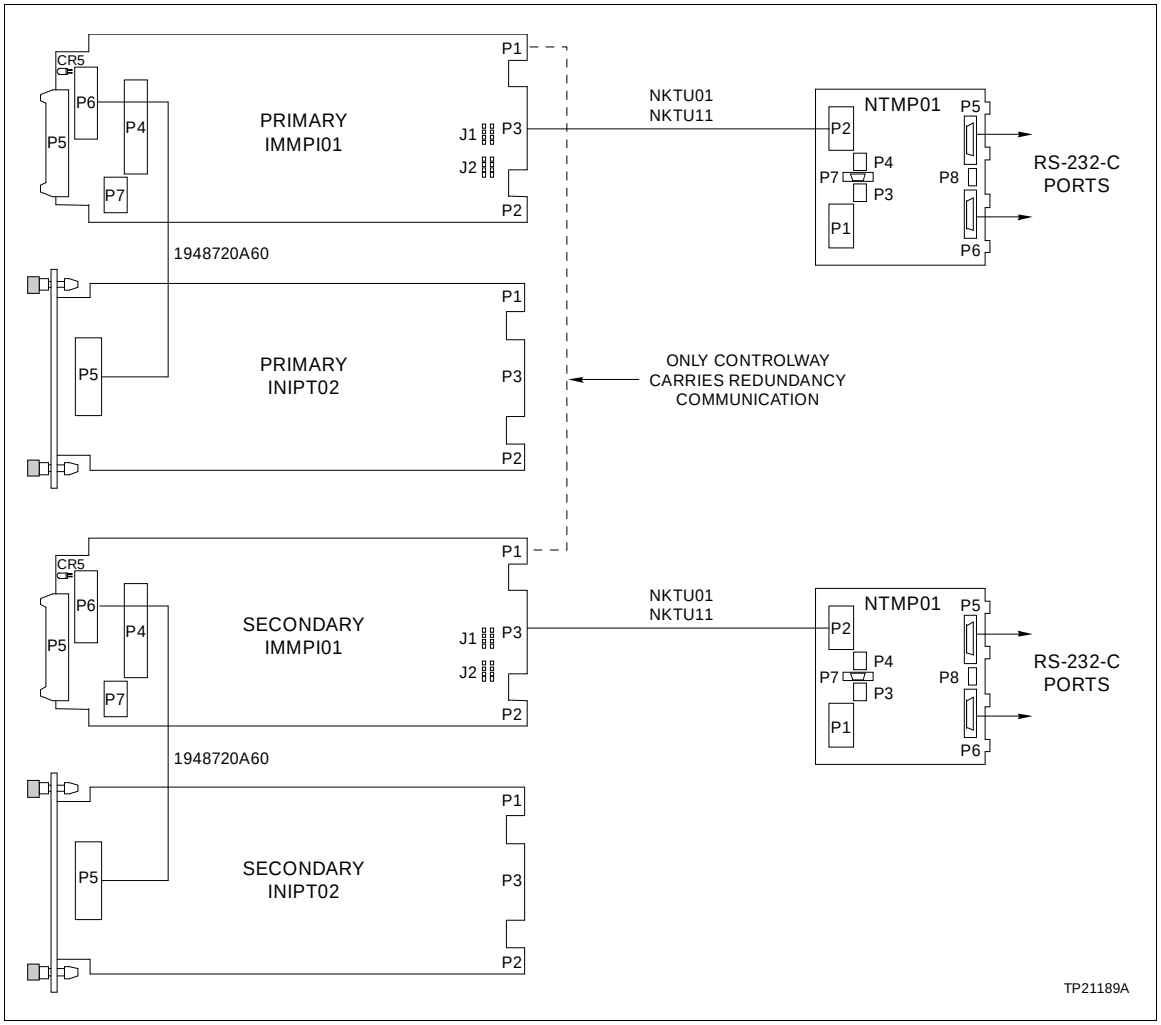

Figure E-4. Redundant IPT Modules Using Redundant NTMP01 Termination Units

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

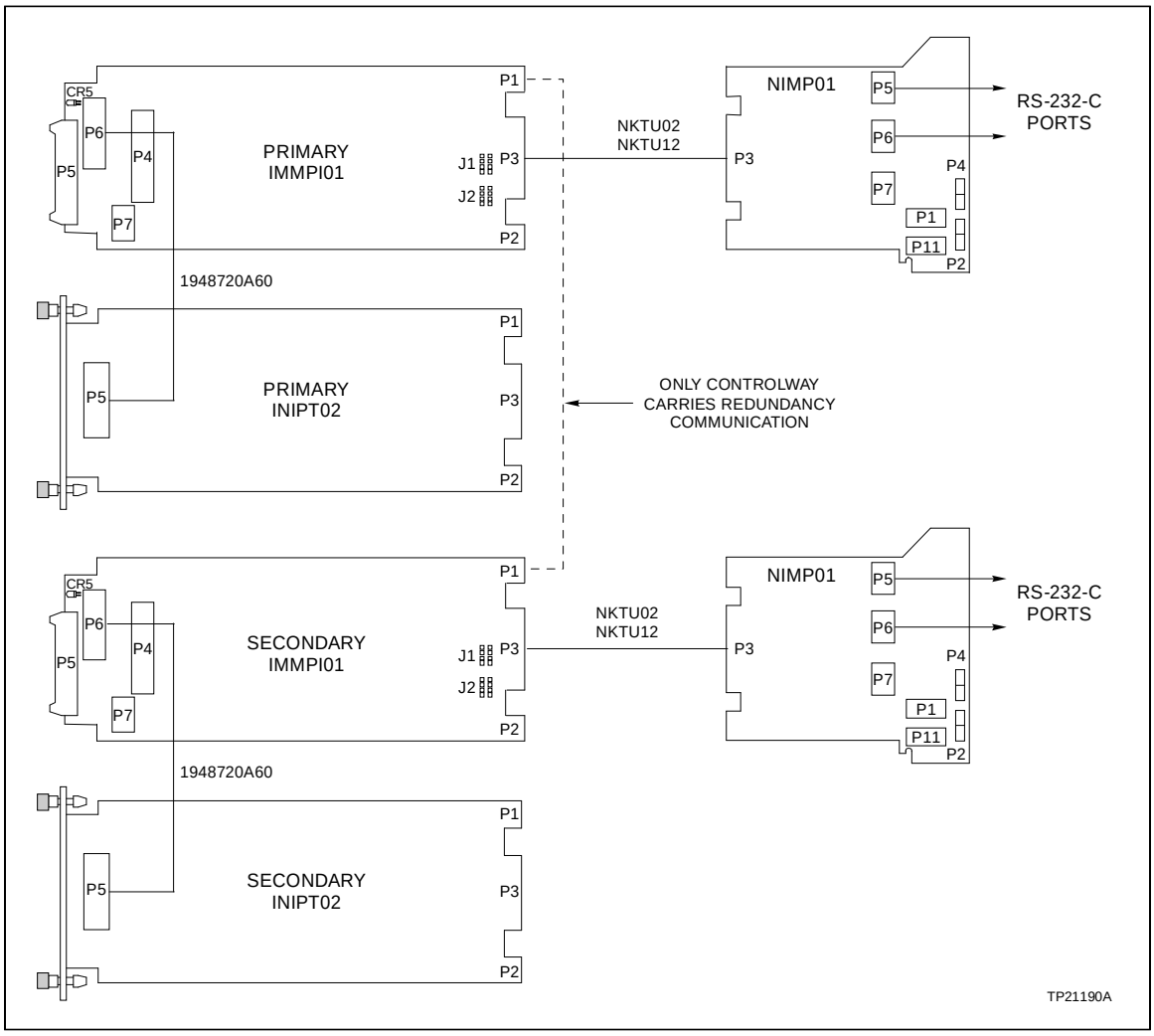

Figure E-5. Redundant IPT Modules Using Redundant NIMP01 Termination Modules

APPENDIX D - NIMP01/NIMP02 TERMINATION MODULE CONFIGURATION

INTRODUCTION

The INIPT02 INFI-NET to Plant Loop Transfer Module (through the IMMPI01 Multi-Function Processor Interface Module) can use the NIMP01 and NIMP02 termination module for termination. Jumpers on the NIMP01 module configure the two RS-232-C ports for data terminal equipment (DTE) or data communication equipment (DCE). One of the RS-232-C ports can be configured as an RS-485 port. The NIMP02 module is required when installing redundant IPT modules. Refer to the NIMP01 and NIMP02 instruction for complete information on termination module applications.

Figures D-1 through D-4 show the jumper configurations for jumpers J1 and J2. Figure D-5 shows the jumper configurations for jumpers J5 through J10. Figure D-6 shows the jumper configurations for jumpers J14 through J17. Figure D-7 shows the NIMP01 connector and jumper locations. Figure D-8 shows NIMP01 cable connections. Refer to Appendix E for cable diagrams and information on how to install redundant termination modules.

Jumpers J11 and J12 are storage posts for extra jumpers. Jumper J13 is normally set with pins one and two connected. Jumper J18 configures the terminal serial port for RS-485 operation when pins two and three are connected and connector P7 is used instead of connector P5.

NOTES:

1. RS-232-C port connections on the IMP module are through DB-9 connectors. Use Bailey Controls cable NKMR02 to connect a standard piece of equipment (computer or printer with a DB-25 connector) to the IMP module.

2. There are no jumper settings on the NIMP02 termination module.

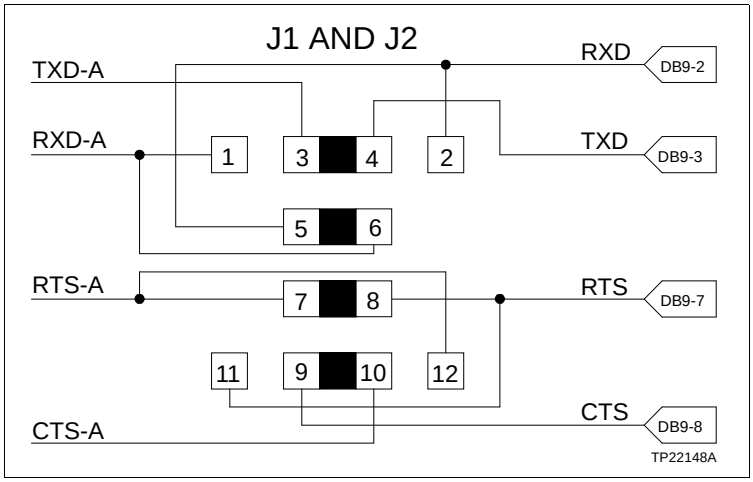

Figure D-1. DTE Jumper Configuration for NIMP01 Termination Module

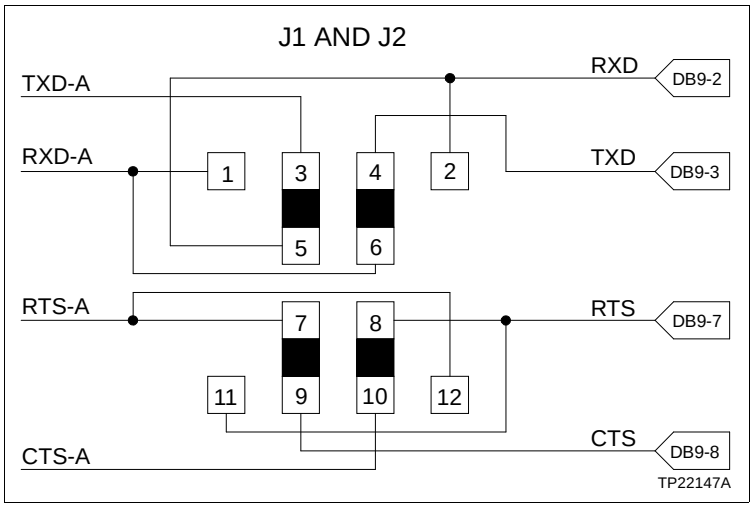

Figure D-2. DCE Jumper Configuration for NIMP01 Termination Module

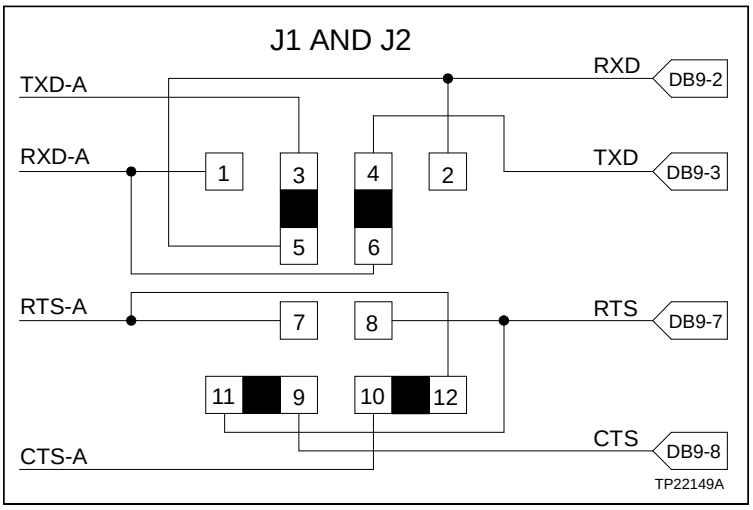

Figure D-3. NIMP01 Nonhandshake Jumper Configuration

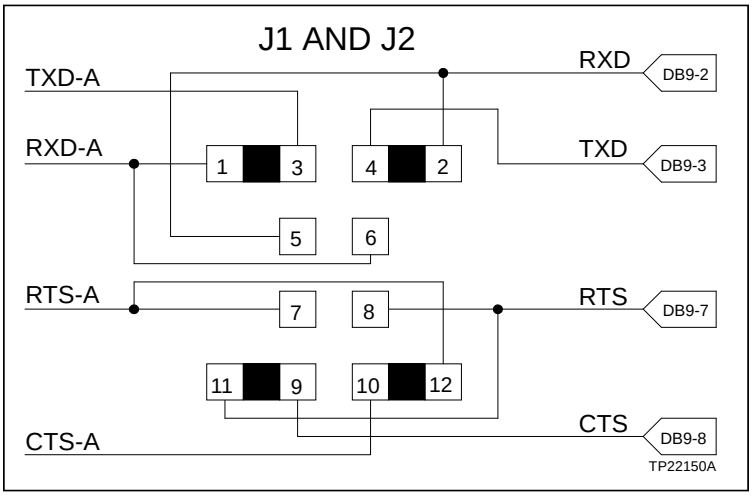

Figure D-4. NIMP01 Loopback Jumper Configuration

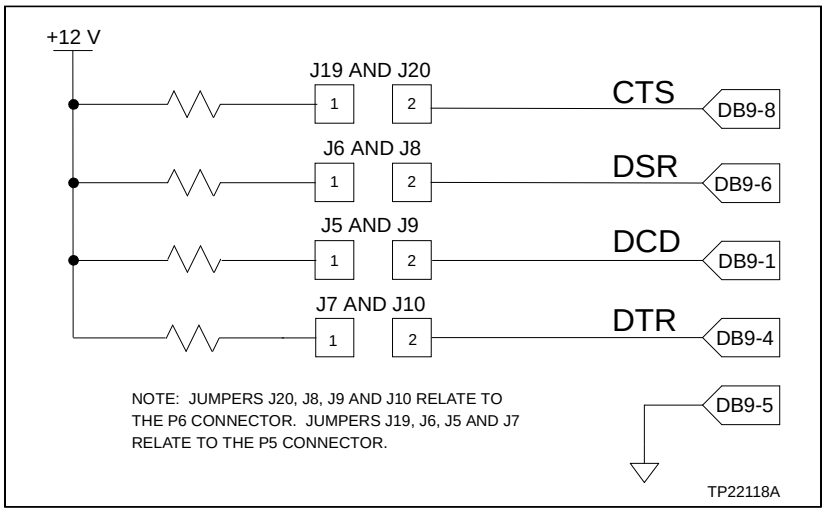

Figure D-5. NIMP01 Jumpers J5 through J10 Configuration

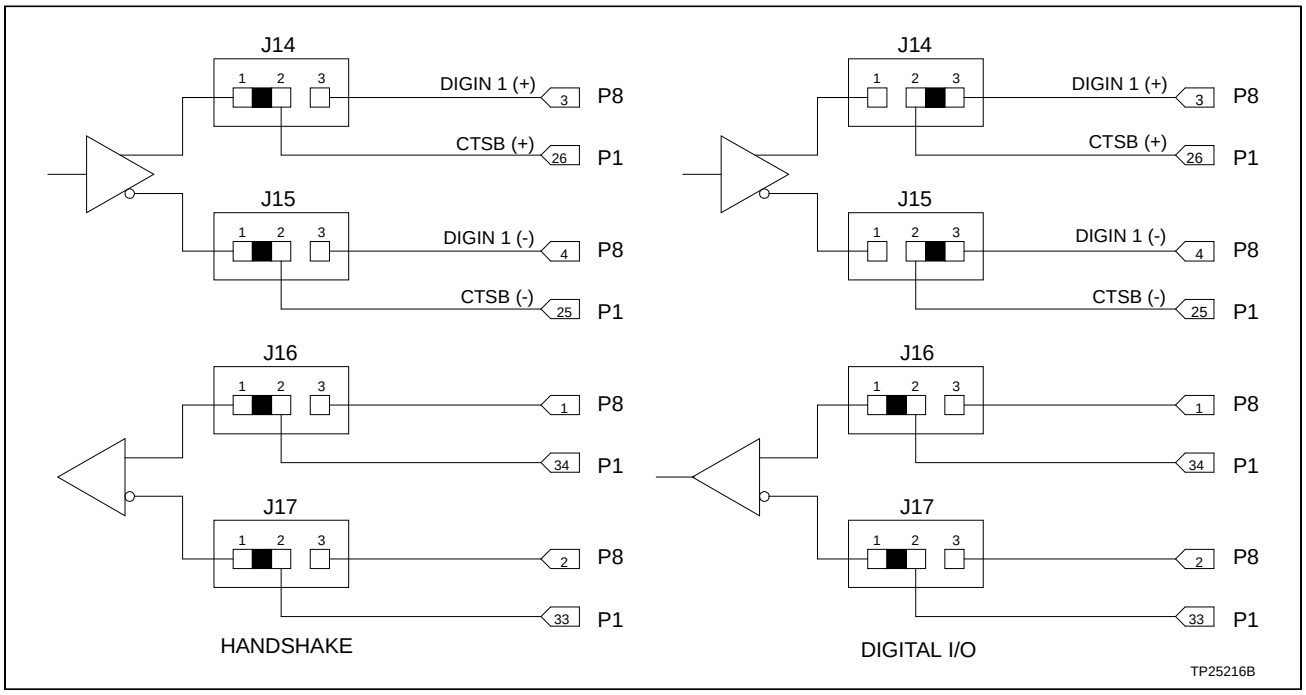

Figure D-6. NIMP01 Jumpers J14 through J17 Configuration

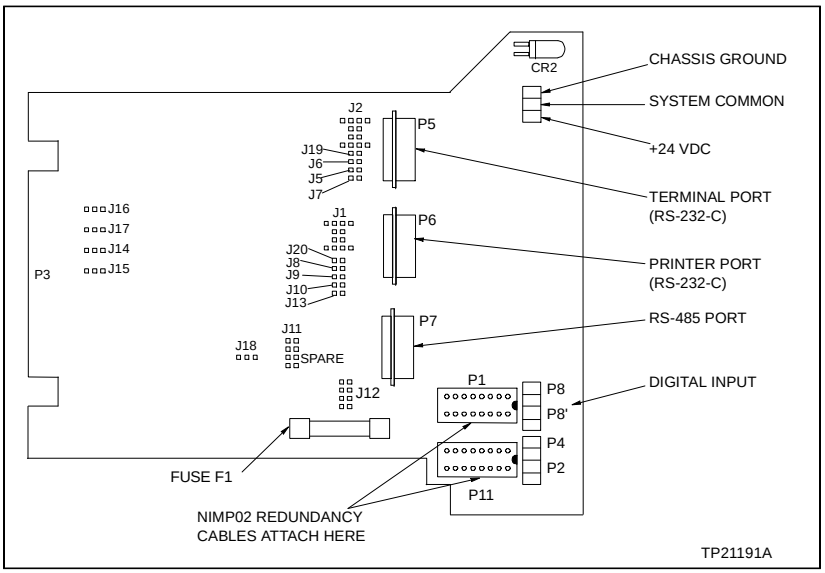

Figure D-7. NIMP01 Connector Assignments and Jumper Locations

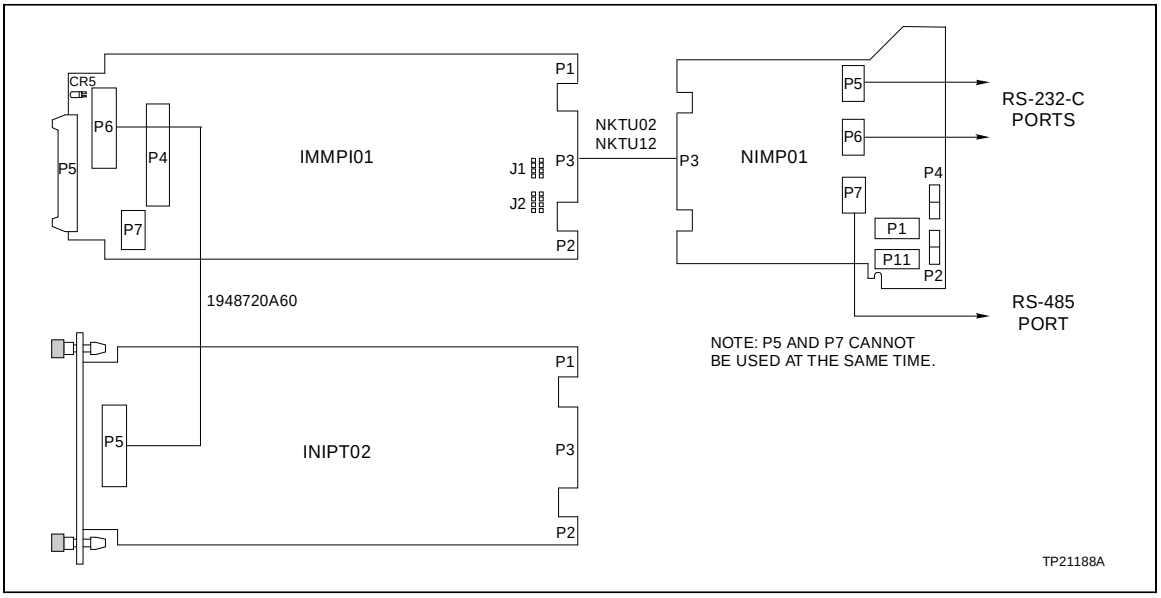

Figure D-8. NIMP01 Cable Connections

APPENDIX E - REDUNDANT CONFIGURATIONS

INTRODUCTION

This section provides information on various ways to terminate redundant INIPR01 INFI-NET to Plant Loop Remote Interfaces. Redundant interfaces provide an additional level of operational security against module or communication system component failure.

REDUNDANT CONFIGURATIONS

Redundant INIPT02 INFI-NET to Plant Loop Transfer Modules (IPT) must share a common Controlway or Module Bus. The IPT modules use Controlway for redundancy communication and for transfer of the executive block (function code 203) configuration between the primary and secondary IPT module.

An I/O expander bus connection must exist between each IPT module and its associated INNIS01 Network Interface Slave (NIS) Module. Do not connect the I/O expander bus between the primary and secondary IPT module. Keep each I/O expander bus as short as possible.

Switch Settings for Redundancy

To enable redundancy, dipswitch SW4 pole seven must be set to one on both IPT modules. IPT executive block specifications and the serial port configuration determine what conditions will lead to a failover from primary IPT module to secondary IPT module. If the primary IPT module stops executing for any reason, the backup IPT module will attempt to come on-line.

The IPT module supports external equipment switching on failover. This feature requires redundant digital I/O modules and associated termination device. IPT executive block specifications determine the state of digital output number three. In redundant configurations, the primary IPT module (using digital output three) enables the primary transceiver while the primary IPT module is on-line. Insure the executive block of the secondary IPT module is identically configured so it will enable 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 IPT module to connect the antenna to the primary transceiver. If failover occurs, the secondary IPT module connects

the antenna to the redundant transceiver. The INFI-NET to Plant Loop Transfer Module Executive Block (INIPT02), function code 203 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.

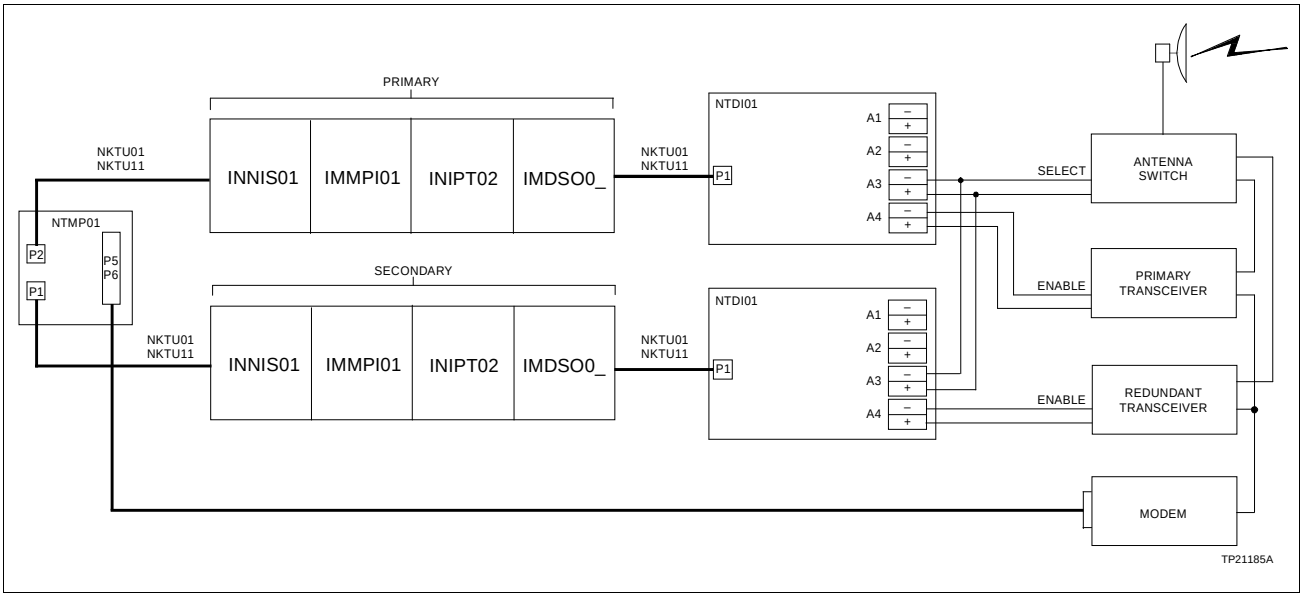

Figure E-1. Redundant Communication Equipment Connections

Redundant Termination Devices

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-3 through E-5 show redundant interfaces using various termination unit or module configurations.

Figure E-3 illustrates redundant IPT modules using a single NTMP01 Multi-Function Processor Termination Unit. In this configuration, the IPT modules share a single termination unit and communicate through one or two serial channels. The primary IPT module controls the termination unit.

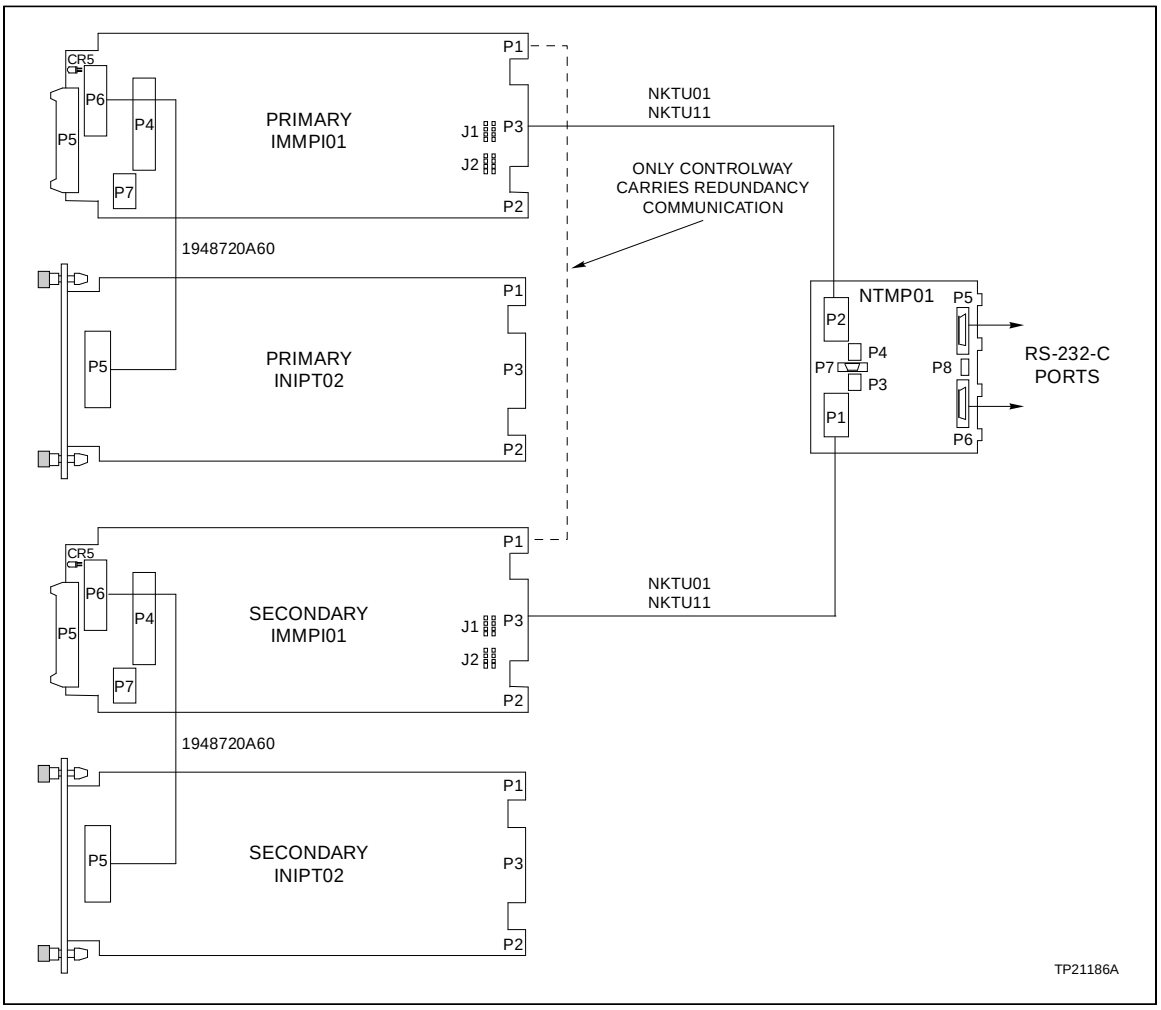

Figure E-2. Redundant IPT Modules Using NIMP01 and NIMP02 Termination Modules

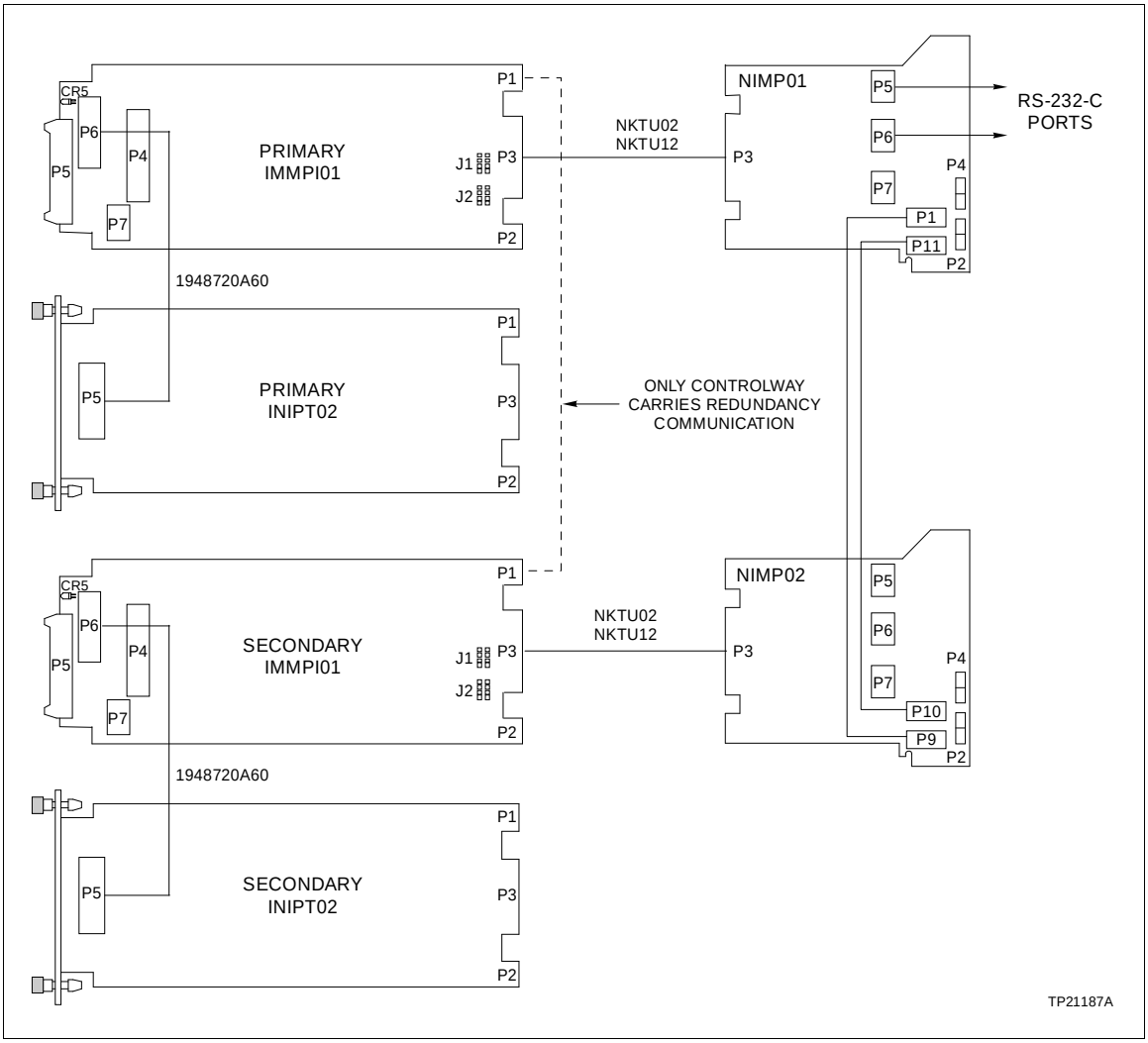

Figure E-3. Redundant IPT Modules Using an NTMP01 Termination Unit

Figure E-2 shows redundant IPT modules using NIMP01 and NIMP02 Multi-Function Processor Termination Modules. This configuration gives redundant IPT modules access to the two RS-232-C channels on the NIMP01 termination module. The secondary IPT module must access the serial channels on the NIMP01 termination module through its connection to the NIMP02 termination module. The primary IPT module controls the NIMP01 termination module.

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

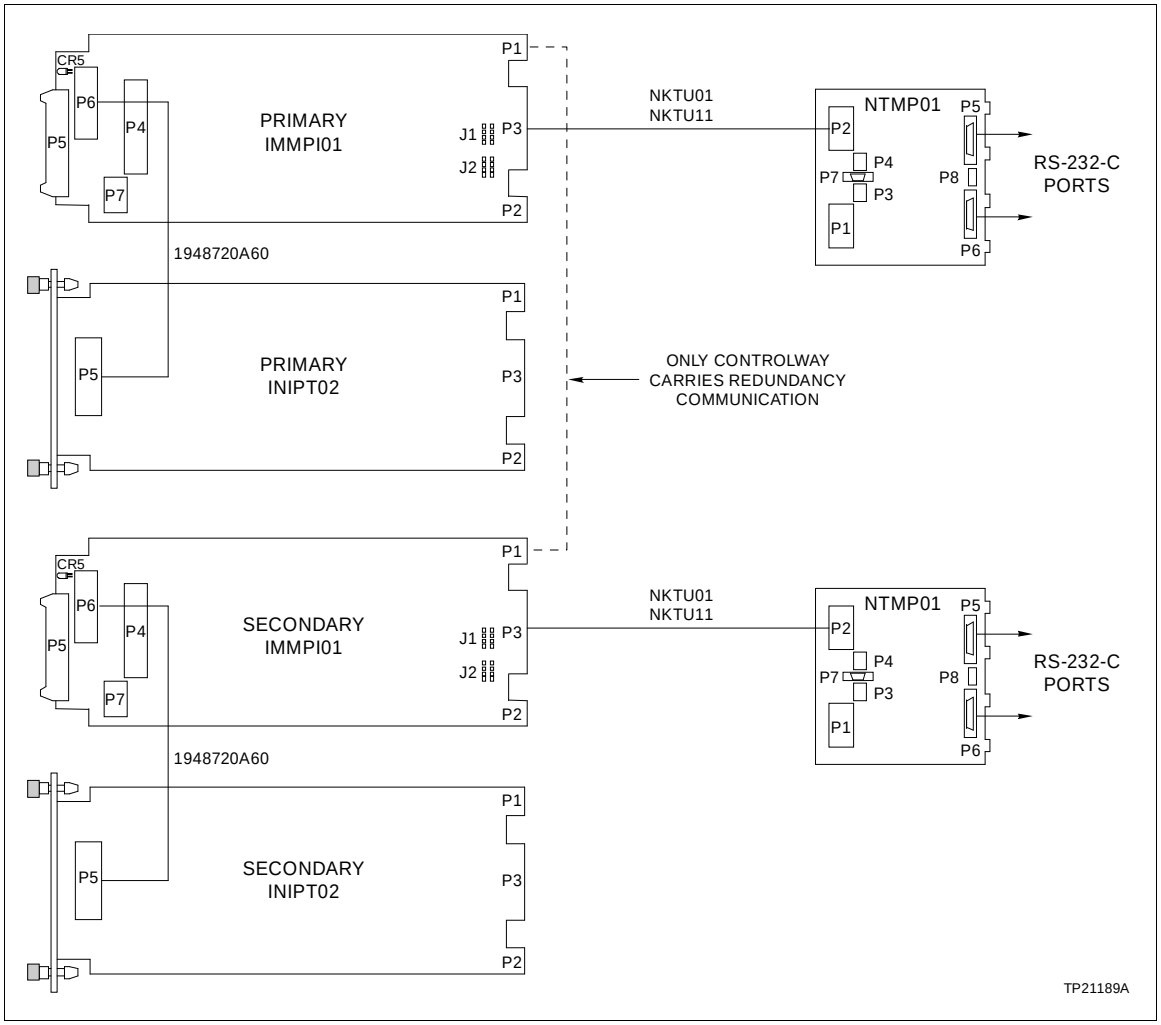

Figure E-4. Redundant IPT Modules Using Redundant NTMP01 Termination Units

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

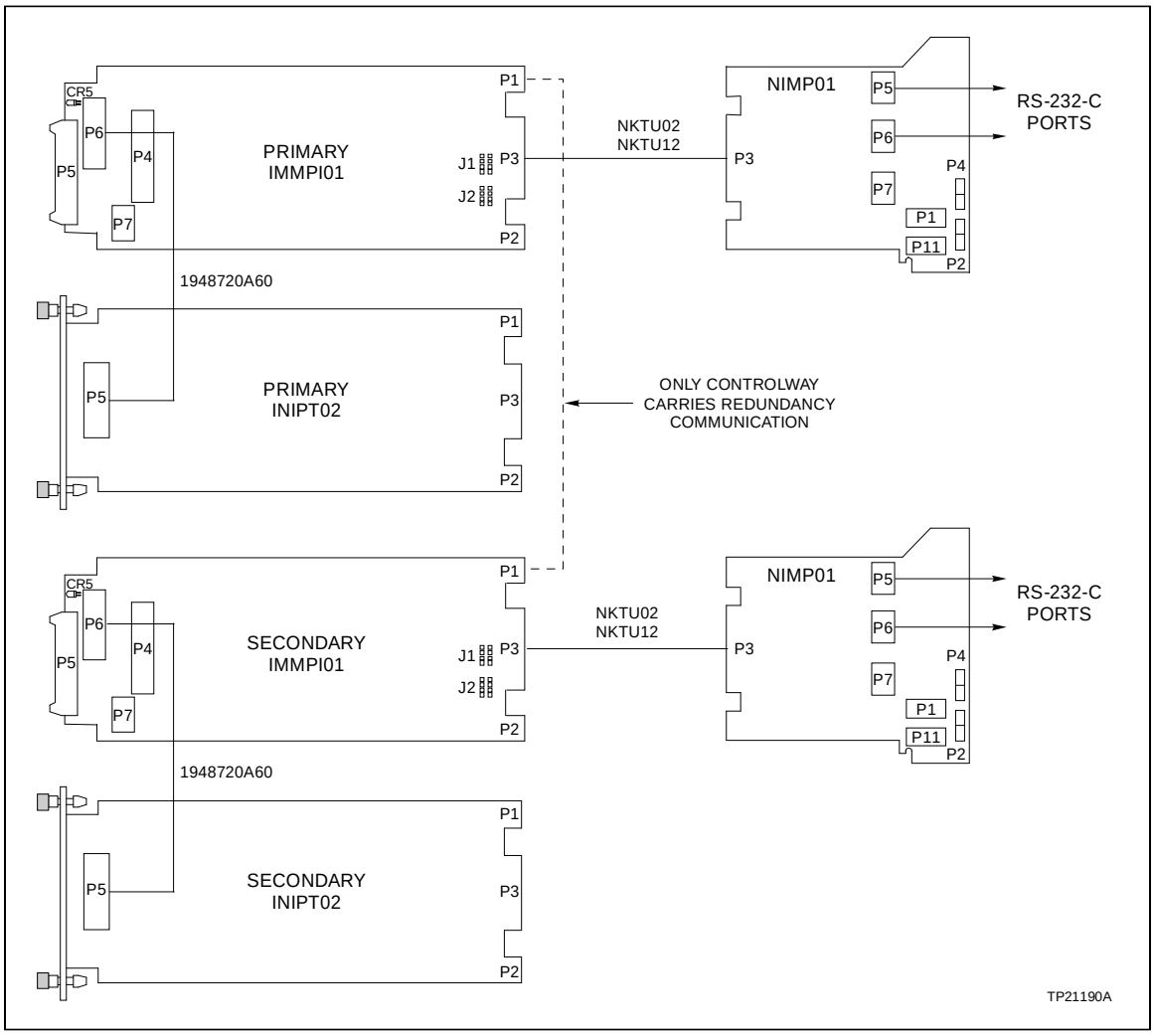

Figure E-5. Redundant IPT Modules Using Redundant NIMP01 Termination Modules

Index

Index (continued)

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