Bailey Hartmann & Braun

symphony™

Instruction
Harmony

Cnet-to-Computer Communication Interface

INICI03

Preface

The INICI03 Cnet-to-Computer Interface is a Harmony rack communication interface. It provides a host computer or human system interface access to Control Network (Cnet) in the Bailey Hartmann & Braun Symphony Enterprise Management and Control System.

This instruction explains Cnet-to-computer interface features, specifications, and operation. It includes installation, troubleshooting, maintenance, and replacement procedures for the INICI03 interface modules.

NOTE: The INICI03 interface is fully compatible with existing INFI 90® OPEN Strategic Enterprise Management Systems using the INFI-NET® communication system.

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Introduction

Section 1

Overview

The INICI03 Cnet-to-Computer Interface is a Harmony rack communication interface. It provides a host computer or human system interface (HSI) access to Control Network (Cnet) in the Symphony Enterprise Management and Control System. Figure 1-1 shows the computer interface.

NOTE: The INICI03 interface is fully compatible with existing INFI 90 OPEN Strategic Enterprise Management Systems using the INFI-NET communication system.

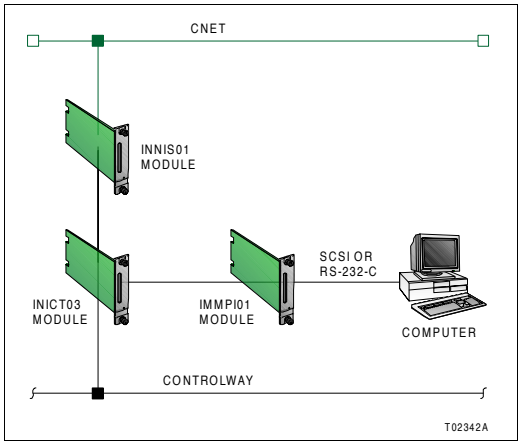

Figure 1-1. Cnet-to-Computer Interface

Control Network

Cnet is a unidirectional, high speed serial data network that operates at a ten-megabaud communication rate. It supports a central network with up to 250 system node connections. Multiple satellite Cnet networks can link to a central network. Each satellite network supports up to 250 system node connections. Interfacing a maximum number of satellite networks

gives a system capacity of 62,500 nodes. Redundant Cnet communication capability is a standard feature.

On the central network, nodes can be satellite networks, Harmony control units, human system interfaces, and computers each connected through a Cnet communication interface. On a satellite network, nodes can be HCU cabinets, human system interfaces, and computers.

Computer

A computer can access Cnet for data acquisition, system configuration, and process control. It connects to Cnet through a Cnet-to-computer interface. The computer connection to Cnet enables plant personnel, for example, to develop and maintain control configurations, manage the system database, and create HSI displays remotely using Composer engineering tools. There are additional Composer and Performer series tools and applications that can access plant information through a Cnet-to-computer interface.

Human System Interface

A human system interface such as a Signature Series workstation running Conductor Series software provides the ability to monitor and control plant operations from a single point. It connects to Cnet through a Cnet-to-computer interface. The number of workstations in a Symphony system varies and depends on the overall control plan and size of a plant. The workstation connection to Cnet gives plant personnel access to dynamic plant-wide process information, and enables monitoring, tuning, and control of an entire plant process from workstation color graphics displays and pushbutton keyboard.

Intended User

Personnel installing, operating, or maintaining a Cnet-to-computer interface should read this instruction before performing any installation, operation, or maintenance procedures. Installation requires an engineer or technician with experience handling electronic circuitry and familiarity with communication networks.

Interface Description

The Cnet-to-computer interface is made up of the INNIS01 Network Interface module, the INICT03 Computer Transfer module, and the IMMPI01 Multifunction Processor Interface module (Fig. 1-1). This interface gives a host computer access to point data over Cnet. The computer connects through either an RS-232-C serial link at rates up to 19.2 kilobaud or through a SCSI parallel port. The interface is command driven through software on the host computer. It receives a command from the host computer, executes it, then replies to the host computer.

NOTE: Conductor NT interfaces to Cnet through an INICI03 Cnet-to-Computer Interface. Conductor VMS does not use the INICI03 interface but instead has its own dedicated version of the Cnet-to-computer interface (IIMCP02 and IIMLM01).

INNIS01 Network Interface

The INNIS01 Network Interface module is the front end of every Cnet communication interface. It is the intelligent link between a node and the Cnet network. In this case, it works in conjunction with the INICT03 module. The INNIS01 module allows any node to communicate with any other node within the Symphony system.

The INNIS01 module is a single printed circuit board that occupies one slot in a module mounting unit (MMU). The circuit board contains microprocessor based communication circuitry that enables it to interface with the INICT03 module over a dedicated I/O expander bus.

Two latching screws on the faceplate secure the INNIS01 module to the module mounting unit. There are 16 LEDs on the faceplate that display error codes and event/error counts.

The INNIS01 module has three card edge connectors for external signals and power (P1, P2, and P3). Connector P1 connects to common and +5, +15, and -15 VDC power. Connector P2 connects the INNIS01 module to the I/O expander bus to communicate with the INICT03 module.

The INNIS01 module connects to its Cnet communication network through a cable attached between its P3 connector and an NTCL01 termination unit. Communication between nodes

is through coaxial or twinaxial cables that connect the termination units of each node.

INICT03 Computer Transfer

The INICT03 Computer Transfer module handles all communication with a host computer. The module is command driven through software on the host computer. The INICT03 module receives a command from the host computer, executes it, then replies. The INICT03 module firmware enables the host computer to issue commands for data acquisition, process monitoring, and process control, and to perform system functions such as security, time-synchronization, status monitoring, and module configuration. The INICT03 module can store up to 30,000 point definitions (depending on point types). It uses an IMMPI01 module for host computer connection.

The INICT03 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 directly communicate with its INNIS01 module, to directly communicate with an IMMPI01 module, and to interface to Controlway.

Two latching screws on the faceplate secure the INICT03 module to the module mounting unit. There are 17 LEDs on the faceplate and a stop/reset pushbutton.

The INICT03 module has three card edge connectors for external signals and power (P1, P2, and P3). Connector P1 connects to common, +5 VDC power, and Controlway. Connector P2 connects the INICT03 module to the I/O expander bus to communicate with the INICT03 module. Control and data signals connect from the INICT03 module to the IMMPI01 module through a 60-pin ribbon cable. The cable connects between the INICT03 P5 connector and the IMMPI01 P6 connector.

IMMPI01 Multifunction Processor Interface

The IMMPI01 Multifunction Processor Interface module handles the I/O interface between the host computer and the INICT03 module. The IMMPI01 module supports either SCSI or RS-232-C computer interface. When communicating through the RS-232-C port, the module can act as data communication equipment (DCE) or data terminal equipment (DTE).

The IMMPI01 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 communicate with its INICT03 module through the ribbon cable connection.

The IMMPI01 module has three card edge connectors for external signals and power (P1, P2, and P3). Connector P1 connects to common and +5 VDC power. Connector P2 is not used. Connector P3 is used to cable connect the module to an NTMP01 termination unit. The P6 connector is used to cable connect the IMMPI01 module to the INICT03 module.

For RS-232-C computer interface, the module cable connects to an NTMP01 termination unit. Two RS-232-C ports are located on the termination unit. The NTMP01 jumper configuration determines DTE or DCE operation. For SCSI computer interface, the SCSI port (P5) is located at the module faceplate. In this case, no termination unit is required.

Host Computer

The host computer can connect to the INICI03 interface in two ways. It can connect using a SCSI communication cable from the SCSI port on the IMMPI01 faceplate to the SCSI port on the host computer. Or, it can connect from its RS-232-C port to an RS-232-C port of an NTMP01 termination unit. The termination unit cable connects to the IMMPI01 module. Two RS-232-C ports are located on the termination unit.

Features

The Cnet-to-computer interface has the following features:

- Cnet provides a plant-wide communication network.
- Cnet provides time-synchronization across the control system plant wide.
- Each node can operate independently of other Cnet nodes.
- Computer interface modules provide localized startup and shutdown on power failure without operator intervention.
- Fast response time. The ten-megabaud communication rate gives timely information exchange.

- The INICT03 module packages process information for maximum transmission efficiency.
- The computer interface modules handle four message types: broadcast, time-synchronization, multicast and NIS poll.
- All messages contain cyclic redundancy check codes (CRC) and checksums to insure data integrity.

Instruction Content

This instruction consists of following sections:

Introduction	Provides an overview of the computer interface. It contains module descriptions, features, and specifications.
Description and Operation	Explains 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 corrective actions.
Maintenance	Contains a maintenance schedule for the modules.
Repair and Replacement	Explains how to replace the modules.
Replacement and Spare Parts	Provides a list of part numbers and nomenclatures.
Appendices	Provides information on termination unit configuration.

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. Read and perform all steps in the installation section.

2. Thoroughly read the operating procedures section before applying power to the computer interface.

3. Refer to the troubleshooting section if a problem occurs. This section will help to diagnose and correct a problem.

4. Refer to the maintenance section for scheduled maintenance requirements.

5. Go to the repair and replacement section to find instructions on how to replace a module.

Glossary of Terms and Abbreviations

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

Table 1-1. Glossary of Terms and Abbreviations

Term	Definition
Cnet	Symphony system advanced data communication highway.
Controlway	High speed, redundant, peer-to-peer communication link. Used to transfer information between intelligent modules within a Harmony control unit.
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 period of time.
I/O expander bus	Parallel communication bus between the Harmony rack controllers and rack I/O modules.
INFI-NET	INFI 90 OPEN system advanced data communication highway.
MMU	Module mounting unit. A card cage that provides electrical and communication support for Harmony rack modules.
Termination unit	Provides input/output connection between plant equipment and the Harmony rack modules.

Document Conventions

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

Reference Documents

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

Table 1-2. Reference Documents

Document Number	Title
WBPEEUI210504?0	Function Code Application Manual, Symphony
WBPEEUI260039?0	Multifunction Processor Termination Unit (NTMP01)
WBPEEUI260040?0	Communication Termination Unit (NTCL01)
WBPEEUI270002?0	Primary Interface, Composer
WBPEEUI270003?0	Automation Architect, Composer

Related Nomenclatures

Table 1-3 lists nomenclatures related to the Cnet-to-computer interface.

Table 1-3. Related Nomenclatures

Nomenclature	Description
IEMMU11, EMMU12, IEMMU21, IEMMU22	Module mounting unit
NFTP01	Field termination panel

Specifications

Refer to Table 1-4 for the specifications of the modules making up the Cnet-to-computer interface.

Table 1-4. Specifications

Property	Characteristic/Value
IMMPI01	
Communication ports	Two RS-232-C and one SCSI
Power requirements	+5 VDC at 415 mA; 2.08 W typical

Table 1-4. Specifications *(continued)*

Property	Characteristic/Value
INICT03	
Memory	512 kbytes ROM 2 Mbytes RAM
Power requirements	+5 VDC at 1.958 A; 9.8 W typical
Communication rates	50 to 19,200 baud (RS-232-C ports) or 4 Mbytes/sec (SCSI port)
INNIS01	
Memory	208 kbytes RAM 64 kbytes ROM
Power requirements	+5 VDC at 900 mA; 4.5 W typical +15 VDC at 5 mA; 0.08 W typical -15 VDC at 200 mA; 3 W typical
System capability	62,500 nodes in the system; 250 nodes on a loop. Any combination of Cnet-to-Cnet, Cnet-to-HCU, and Cnet-to-computer interfaces.
Communication rates	10 Mbaud or 2 Mbaud
All Cnet Communication Modules	
Mounting	Occupies one slot in standard module mounting unit.
Electromagnetic/radio frequency interference	Values 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 90% up to 55°C (131°F) noncondensing 5% to 40% above 55°C (131°F) noncondensing
Atmospheric pressure	Sea level to 3 km (1.86 mi.)
Air quality	Noncorrosive
Certification	
Canadian Standards Association (CSA)	Certified for use as process control equipment in an ordinary (nonhazardous) environment.
Factory Mutual (FM) (pending for INICT03)	Approved for use in Class I, Division 2, hazardous locations

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Description and Operation

Section 2

Introduction

This section explains the functionality of the INICI03 Cnet-to-Computer Interface: INNIS01 Network Interface module, INICT03 Computer Transfer module, and IMMPI01 Multifunction Processor Interface module.

Module Integrity

All communication modules have normal Symphony system security functions that insure module integrity. The module hardware checks for illegal addresses and monitors the machine fault timer (MFT) 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 microprocessor fails to reset the MFT 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 causing the module to stop.

INNIS01 Network Interface

The INNIS01 module is the communication front end for the computer interface. This section provides an overview of its operating theory.

Exception Reports

Symphony devices establish exception reporting routes for process inputs (points). Some examples of exception report parameters are high/low alarm limits, minimum/maximum report time intervals, and percent of change in span. When a point changes more than a given parameter, or an alarm state changes, the module generates an exception report.

The INICT03 module packages together exception reports having a common node destination. Packing places all exception reports for a destination (or multiple destinations) into one

message and the INNIS01 module sends them to other Cnet nodes as a single message. This process reduces the number of transmissions required, and adjusts the message size for maximum Cnet network efficiency.

Exception reports can have data values in the following formats: digital, analog, and status report. Exception reports are time-stamped to reflect their processing sequence.

The maximum and minimum report time parameters insure that an exception report is generated for static or rapidly changing data. The minimum report time parameter controls the quantity of exception reports a single rapidly changing point generates. The maximum report time parameter generates a periodic report of data items that do not change.

NOTE: If a point goes into or out of alarm, the time parameters are ignored and the value is reported immediately. Minimum and maximum exception report times are set through function code 82.

Messages

The INNIS01 module processes four different message types. They are broadcast, time-synchronization, multicast, and NIS poll.

Broadcast

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

- Node online.
- Node offline.
- Node restart.
- Node busy.

Time-Synchronization

The time-synchronization message is a high priority broadcast type of message. The INNIS01 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 human system interface such as a workstation running Conductor NT or Conductor VMS software.

Multicast

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

NIS Poll

The NIS poll message is a single destination message. The INNIS01 module uses this message type to request 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 INNIS01 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 INNIS01 module uses the message type to determine how to process the message. The checksum and cyclic redundancy check code fields verify data integrity.

Message Transmission

Any INNIS01 module can transmit a message at any time without regard to the activities of any other INNIS01 module on the Cnet network. Each INNIS01 module can transmit and receive messages simultaneously. Startup and shutdown is local and requires no interaction with other INNIS01 modules on the network. Each 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 INNIS01 module to transmit, the module transmits flag characters (null packets) as the loop synchronizing condition to keep the receivers in lock.

Data Integrity

There are three methods by which the INNIS01 module insures data integrity. They are retry logic, node status table, and polling.

Retry Logic

If, on the first transmission of a message, the INNIS01 module does not receive positive acknowledgment from the destination node, it retransmits the message 11 times. If after this series of retries there is still no response, the destination node is marked offline.

Node Status Table

The INNIS01 module maintains an internal table of system wide node status such as offline and busy. The INNIS01 module relays node status changes to the INICT03 module. When the INNIS01 module periodically polls nodes, it updates this table accordingly.

Polling

The INNIS01 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 offline or busy. After polling the destination, the INNIS01 module updates its table and forwards pertinent information to the INICT03 module.

INICT03 Computer Transfer

The INICT03 module handles all communication with the host computer through its IMMPI01 module using either SCSI or RS-232-C communication. When communicating through an RS-232-C serial port, the IMMPI01 module can act as data communication equipment (DCE) or data terminal equipment (DTE). The jumper configuration on the NTMP01 termination unit determines DTE or DCE operation.

The INICT03 module has enough memory to store up to 30,000 point definitions (depending on point types). The module firmware enables the host computer to issue commands for data acquisition, process monitoring and control, and system

functions such as security, time, and configuration control. The module maintains the point table and interprets commands coming from the host computer. It directs all interaction between the host computer and the Cnet network.

The INICT03 module receives data from Harmony controllers over Controlway, then sorts, organizes, and stores the data in a database. The INNIS01 module receives frames from the Cnet network and passes them on to the INICT03 module for processing. The INICT03 module then sorts this incoming data, storing exception reports and incoming requests until the host computer is ready for the data. This buffering action allows the host computer to operate completely asynchronously to the Cnet network. When the host computer is ready to process more data, it issues a command to the INICT03 module that forwards the data as a reply.

The IMMPI01 module provides the INICT03 module with serial ports and a SCSI interface. It contains a single SCSI port and connects to two RS-232-C ports.

Computer Interface Commands

The INICT03 module receives a command from a host computer, performs the desired action, and then replies to the host computer. The computer interface uses over 80 commands for data acquisition, process monitoring and control, and system functions (security, time, and configuration control). These commands fall into four basic command types: data acquisition, configuration, process control, and system status.

Data Acquisition

The host computer uses the ESTABLISH POINT and ESTABLISH REPORT commands to establish a database in the INICT03 module. This database has the capacity for 30,000 points, depending on point types. The host computer has access to the module database through data acquisition commands. Any trend block configured in the system can be read using the TREND DATA POLL command.

Configuration

The computer interface can be used to download control configurations to Harmony controllers. Also, the TUNE BLOCK and READ BLOCK OUTPUT commands are used to tune and monitor outputs.

Process Control

Computer interface commands provide process control abilities for the host computer. Using these commands, the host computer is able to handle analog and digital process requirements such as changing set points and control outputs, supplying data values as exception reports, controlling, and setting digital remote switches and constants.

System Status

Time-synchronization is a critical function of the computer interface and part of overall status. It enables the host computer to set and display system time and date, and provides a mechanism for relating the time-stamp to system time and date. The host computer is able to monitor individual module statuses and provide password protection.

Installation

Section 3

Introduction

This section explains the steps necessary to install the modules of an INICI03 Cnet-to-Computer Interface: INNIS01 Network Interface, INICT03 Computer Transfer, and IMMPI01 Multifunction Processor Interface. Read, understand, and complete the steps in the order they appear before operating the modules.

Special Handling

Observe these steps when handling electronic circuitry:

NOTE: Always use Elsag Bailey's field static kit (part number 1948385A1 - consisting of two wrist straps, ground cord assembly, alligator clip, and static dissipating work surface) when working with the modules. The kit is designed to connect the technician and the static dissipating 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 packaging for future use.

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

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

4. ***Avoid Partial Connection of Semiconductors***. Verify that all devices connected to the module are properly grounded before using them.

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

6. ***Use 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 the 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 Elsag Bailey sales office of any such damage.

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

4. Use the original packing material and container to store the hardware.

5. Store the hardware in an environment of good air quality, free from temperature and moisture extremes.

INICI03 Wiring and Cabling

Figure 3-1 is a wiring and cabling diagram for the INICI03 interface. Refer to this figure when installing and connecting the interface modules.

INNIS01 Network Interface

The Cnet-to-computer interface requires an INNIS01 Network Interface module. Both dipswitches and jumpers must be set before putting the module into operation. Figure 3-2 shows the dipswitch and jumper locations on the module.

Dipswitch Settings

The INNIS01 module has four dipswitches that set the module operating characteristics. The dipswitches set the node address, loop address, loop mode, I/O expander bus address (i.e., module address), and event and error counter options. Refer to Figure 3-2 for dipswitch locations.

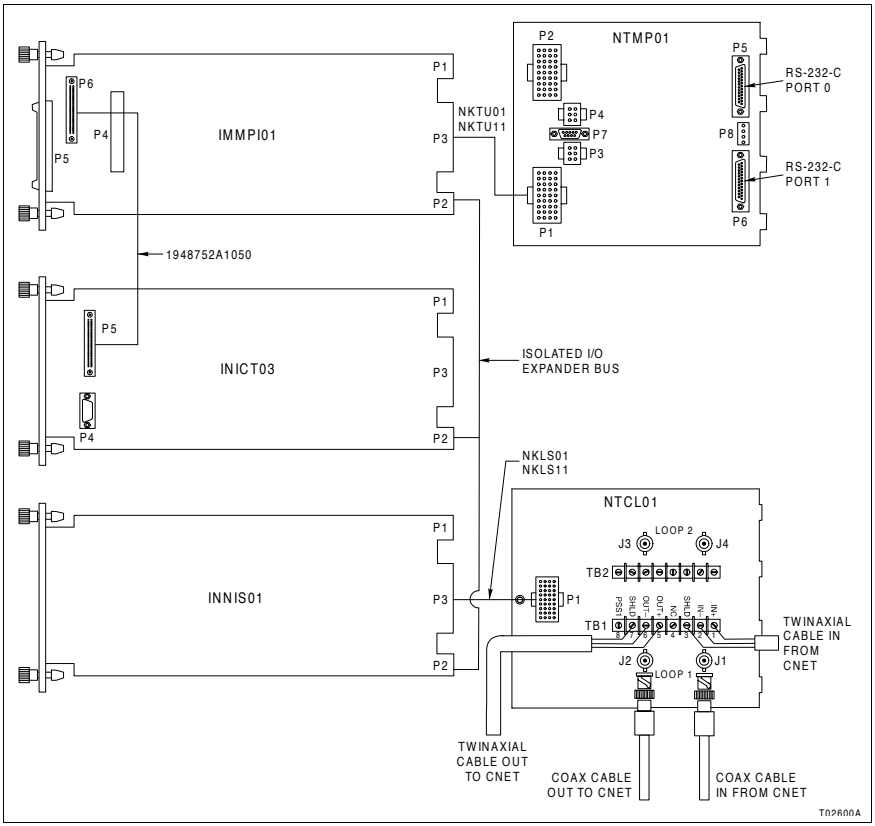

Figure 3-1. INICI03 Wiring and Cabling

Dipswitch SW1 - Node Address

This dipswitch sets the node address. Valid node addresses are one through 250 (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.

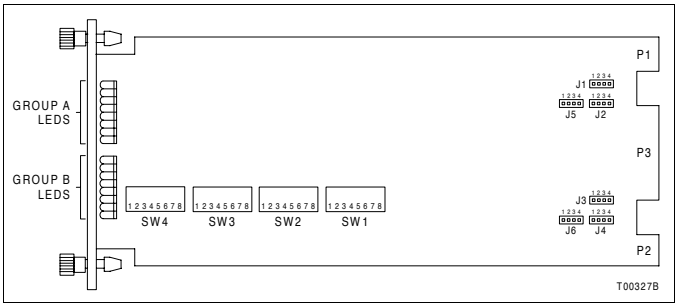

Figure 3-2. INNIS01 Board Layout

Table 3-1. Dipswitch SW1 (INNIS01)

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: 1 = open or off, 0 = closed or on.

Dipswitch SW2 - Loop Address

This dipswitch sets the number of the loop on which the computer interface resides. Valid loop numbers are one through 250 (refer to Table 3-2). Record the dipswitch SW2 setting in the space provided.

Dipswitch SW3 - Loop Mode

Dipswitch SW3 enables or disables ROM checksums, identifies the operating mode as a Cnet-to-computer interface, and sets the communication speed to two megabaud or ten megabaud (refer to Table 3-3). Record the dipswitch SW3 settings in the space provided.

Pole 1 Dipswitch SW3 pole one determines INICT03 module compatibility. Set pole one to closed (on) for a computer interface.

Table 3-2. Dipswitch SW2 (INNIS01)

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: 1 = open or off, 0 = closed or on.

Table 3-3. Dipswitch SW3 (INNIS01)

Pole	Setting	Function	User Setting
1	1	Module is part of a Cnet-to-Cnet interface.	0
	0	Module is part of a Cnet-to-computer interface (or Cnet-to-HCU interface).	
2	1	ROM checksumming enabled; normal operating mode.	
	0	ROM checksumming disabled.	
3	1	Test mode: no time-out for handshake failure.	
	0	Normal operating mode.	
4[1]	1	All loop messages return a busy negative acknowledgment.	
	0	Normal operating mode.	
5[1]	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 dispwitch SW4.	
6[1]	1	Diagnostic mode.	
	0	Normal operating mode.	
7/8	0/0	10-Mbaud network mode.	
	0/1	2-Mbaud network mode.	
	1/0	Not used.	
	1/1	Not used.	

NOTE: 1 = open or off, 0 = closed or on.
1. Applies to revision B or later ROMs. For Revision A ROMs, poles 4 through 6 must be set to 0.

Pole 2 — Pole two enables or disables ROM checksumming. Elsag Bailey recommends that the INNIS01 module be installed with checksumming enabled to take full advantage of the on-board diagnostics.

Pole 3/4 — 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 Elsag Bailey personnel only.

Pole 5 — Pole five enables the channel idle condition display for the front panel LEDs. If channel one is idle, the group A LEDs will flash on and off about twice per second. If channel two is idle, the group B LEDs will flash. The channel idle display is intended to serve as a warning that a loop integrity problem exists.

Pole 6 — Pole six enables diagnostic tests that preclude normal INNIS01 module operation.

Pole 7/8 — Poles seven and eight determine loop speed and loop mode.

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

Dipswitch SW4 - I/O Module Address and Counters

The INNIS01 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 module. 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 INNIS01 module displays using the group A and B faceplate LEDs. LED B8 is the most significant bit. LED A1 is the least significant bit. Table 3-5 lists the possible event counter addresses. Table 3-6 lists the possible error counter addresses. Record the dipswitch SW4 settings in the space provided.

Example of Counter Usage — A counter setting with the hexadecimal value of 0x09 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: position 4 = closed (off), 5 = open (on), 6 = closed (off), 7 = closed (off), and 8 = open (on).

Table 3-4. I/O Expander Bus Address (INNIS01)

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

NOTE: 1 = open or off, 0 = closed or on.

Table 3-5. Event Counters (INNIS01)

Dipswitch Pole (Binary Value)					Hex Value	Description
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
0	0	0	0	0	00	Number of timer interrupts.
0	1	0	0	1	09	Number of multicast messages received (excluding originated messages).
0	1	0	1	0	0A	Number of multicast destinations received.
0	1	0	1	1	0B	Number of time-sync messages received (excluding originated messages).
0	1	1	0	0	0C	Number of broadcast messages received (excluding originated messages).
0	1	1	0	1	0D	Number of NIS poll messages received (excluding originated messages).
0	1	1	1	0	0E	Number of poll messages acknowledged by this node.
0	1	1	1	1	0F	Number of poll messages busy negative acknowledged by this node.
1	0	0	0	0	10	Number of messages transmitted (total loop traffic); ***normal operation***.
1	0	0	0	1	11	Number of loop messages received and forwarded by this node.
1	0	0	1	0	12	Number of messages originated by this node (including retries).
1	0	0	1	1	13	Number of message retries originated by this node.
1	0	1	0	0	14	Number of transmitted message watchdog expirations.
1	0	1	0	1	15	Number of messages put into the receive buffer and retained.

Table 3-5. Event Counters (INNIS01) *(continued)*

Dipswitch Pole (Binary Value)					Hex Value	Description
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
1	0	1	1	0	16	Number of bytes originated by this node (including retries).
1	0	1	1	1	17	Number of bytes received and forwarded by this node.
1	1	0	0	0	18	Number of I/O expander bus to INNIS01 handshakes.
1	1	0	0	1	19	Number of I/O expander bus to transmit buffer signals.
1	1	0	1	0	1A	Number of I/O expander bus HCU status requests.
1	1	0	1	1	1B	Number of I/O expander bus INNIS01 status requests.
1	1	1	0	0	1C	Number of I/O expander bus interrupts with invalid status.
1	1	1	0	1	1D	Number of transmit buffer realignments due to invalid contents.
1	1	1	1	0	1E	Number of receive buffer realignments.
1	1	1	1	1	1F	Number of status buffer realignments.
						User setting

NOTES: 1 = open or off, 0 = closed or on.

Table 3-6. Error Counters (INNIS01)

Dipswitch Pole (Binary Value)					Hex Value	Description
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
0	0	0	0	1	01	Number of receive errors on loop 1.
0	0	0	1	0	02	Number of receive errors on loop 2.
0	0	0	1	1	03	Number of transmit errors for this node.
0	0	1	0	0	04	Number of messages lost to receive queue overflow.
0	0	1	0	1	05	Number of messages dumped with circulation count errors.
0	0	1	1	0	06	Number of messages dumped with destination count or message-type errors.
0	0	1	1	1	07	Number of messages dumped with source-state errors.
0	1	0	0	0	08	Number of messages tempted with source-sequence mismatch.
						User setting

NOTE: 1 = open or off, 0 = closed or on.

Jumper Settings

There are six jumpers on the INNIS01 module that set the communication rate of the receiver analog circuit (refer to Figure 3-2 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 INNIS01 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 network modes. This figure shows placement of the pins when looking at the top of the INNIS01 circuit board with the faceplate on the left.

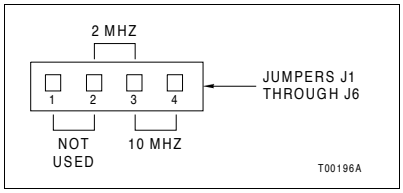

Figure 3-3. Jumpers (INNIS01)

Module Installation

If the INNIS01 dipswitches and jumpers are properly configured, it is ready to be installed in the module mounting unit. Refer to Figure 3-1 for cable connections. To install the module:

1. Verify the module slot assignment in the module mounting unit.

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

2. Verify that a 24-pin dipshunt is installed in the I/O expander bus sockets between the MMU slot to be used by the INNIS01 module and the slot to be used by the INICT03 module.

3. Remove any 24-pin dipshunts from the I/O expander bus sockets that would connect the INNIS01 module to any module other than the INICT03 and IMMPI01 modules.

4. Attach the hooded end of the NKLS01 or NKLS11 cable to the MMU backplane cable connector opening for the INNIS01 module.

5. Slide the INNIS01 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 two latching screws ½-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.

Refer to the NTCL01 termination unit instruction for complete termination device information. Appendix A provides quick reference information about the termination unit.

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 a human system interface. 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 termination unit labeled PSS1 or PSS2. Two sets of terminals are available on the termination unit for interconnecting the power system status output.

This power system status signal is fed through the termination unit cable to the P3 connector on the INNIS01 module. The power system status input is a TTL-compatible signal. A high voltage level (5 VDC) on power system status indicates good status. A low voltage level (0 VDC) indicates bad status. When no connection is made to either of the power system status inputs, a pull-up resistor on the INNIS01 module causes a high level signal on the power system status input, thereby reporting good status.

INICT03 Computer Transfer

The Cnet-to-computer interface requires an INICT03 Computer Transfer module. Dipswitches, jumpers, and a dispshunt must be set before putting the module into operation. Figure 3-4 shows the dipswitch and jumper locations on the module.

NOTE: This module uses connections to the MMU backplane that served other functions in earlier 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 Symphony and INFI 90 OPEN modules. In Symphony and INFI 90 OPEN 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 INICT03 module in a module mounting unit that uses -30 VDC and limits communication to module bus.

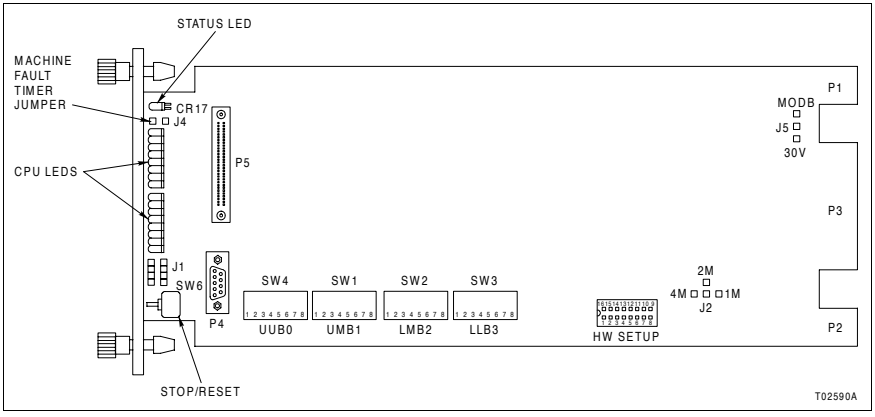

Figure 3-4. INICT03 Board Layout

Dipswitch Settings

The INICT03 module has four dipswitches that set the module operating characteristics. The dipswitches select module

operation options, serial port communication characteristics, and baud rate. Refer to Figure 3-4 for dipswitch locations.

Dipswitch SW1 UMB1 - Serial Port Communication Rate

Dipswitch SW1 UMB1 is an eight pole dipswitch that sets the serial port (RS-232-C) communication rate. The communication rate directly affects data throughput. Refer to Table 3-7 for communication rates. Record the dipswitch SW1 UMB1 settings in the space provided.

Table 3-7. Dipswitch SW1 UMB1 (INICT03)

Dipswitch Position		Baud Rate	Dipswitch Position	
Port 0	Port 1		Port 0	Port 1
1 2 3 4	5 6 7 8		1 2 3 4	5 6 7 8
0 0 0 0	0 0 0 0	50		
1 0 0 0	1 0 0 0	75		
0 1 0 0	0 1 0 0	110		
1 1 0 0	1 1 0 0	134.5		
0 0 1 0	0 0 1 0	150		
1 0 1 0	1 0 1 0	300		
0 1 1 0	0 1 1 0	600		
1 1 1 0	1 1 1 0	1,200		
0 0 0 1	0 0 0 1	1,800		
1 0 0 1	1 0 0 1	2,000		
0 1 0 1	0 1 0 1	2,400		
1 1 0 1	1 1 0 1	3,600		
0 0 1 1	0 0 1 1	4,800		
1 0 1 1	1 0 1 1	7,200		
0 1 1 1	0 1 1 1	9,600		
1 1 1 1	1 1 1 1	19,200		

NOTE: 1 = open or off, 0 = closed or on.

Dipswitch SW2 LMB2 - Diagnostics

Dipswitch SW2 LMB2 selects certain operating options and enables diagnostics that are meaningful to qualified Elsag Bailey service personnel (refer to Table 3-8). All poles on dipswitch SW2 LMB2 must be closed (on) for normal operation.

Table 3-8. Dipswitch SW2 LMB2 (INIIT03)

Pole	Setting	Function
1	1	INNIS01 handshake time-out disabled.
	0	INNIS01 handshake time-out enabled; normal operation.
2	1	INNIS01 module diagnostics enabled.
	0	INNIS01 module diagnostics disabled; normal operation.
3	1	Cnet/INFI-NET diagnostics enabled.
	0	Cnet/INFI-NET diagnostics disabled; normal operation.
4	1	Hardware diagnostics enabled.
	0	Hardware diagnostics disabled; normal operation.
5 - 8	0	Not used.

NOTE: 1 = open or off, 0 = closed or on.

Dipswitch SW3 LLB3 - SCSI Port

Dipswitch SW3 LLB3 enables or disables the SCSI port and sets the SCSI port address. Table 3-9 shows the dipswitch settings. If the SCSI port is enabled, serial port one is disabled. Record the dipswitch SW3 LLB3 settings in the space provided.

Table 3-9. Dipswitch SW3 LLB3 (INICT03)

Pole	Setting	Function	User Setting
1	1	SCSI port enabled.	
	0	SCSI port disabled.	
2/3/4	0/0/0	Address = 0	
	0/0/1	Address = 1	
	0/1/0	Address = 2	
	0/1/1	Address = 3	
	1/0/0	Address = 4	
	1/0/1	Address = 5	
	1/1/0	Address = 6	
	1/1/1	Address = 7	
5	1	SCSI parity checking enabled.	
	0	SCSI parity checking disabled.	

Table 3-9. Dipswitch SW3 LLB3 (INICT03) *(continued)*

Pole	Setting	Function	User Setting
6 - 8		Not used.	0

NOTE: 1 = open or off, 0 = closed or on.

Dipswitch SW4 UUB0 - Options

Dipswitch SW4 UUB0 determines module operating options. Table 3-10 lists the dipswitch settings. Record the dipswitch SW4 UUB0 settings in the space provided.

Table 3-10. Dipswitch SW4 UUB0 (INICT03)

Pole	Setting	Function	User Setting
1	1	ROM checksumming disabled.	
	0	ROM checksumming enabled.	
2/3	0/0	8 data bits, 1 stop bit, no parity (ports 0 and 1)	
	0/1	8 data bits, 1 stop bit, even parity (ports 0 and 1)	
	1/0	8 data bits, 1 stop bit, odd parity (ports 0 and 1)	
	1/1	8 data bits, 2 stop bits, no parity (ports 0 and 1)	
4	1	Port 1 utility option.[1]	
	0	Port 1 option serial port to host computer.	
5	1	Modem password protection enabled.	
	0	Modem password protection disabled.	
6	1	Port addressing mode enabled.[2]	
	0	Port addressing mode disabled.	
7	1	Checksumming option enabled.[3]	
	0	Checksumming option disabled.	
8	N/A	Not used.	

NOTES: 1 = open or off, 0 = closed or on.
1. Selecting this option automatically overrides dipswitch poles two and three and sets port one data characteristics to eight data bits, one stop bit, and no parity bit. Dipswitch poles two and three retain full functionality when this option is not selected.
2. When this option is enabled, the INICT03 module expects all commands from the host computer to send the port address configured through the utilities menu as the first character of each command.
3. When this option is enabled, the INICT03 module expects all commands from the host computer to include a checksum byte as the last character before the carriage return. The module includes a checksum in each reply.

Jumper Settings

CAUTION	**Never operate the INICT03 module with the machine fault timer circuit disabled (jumper pins connected). Unpredictable module outputs may result. These unpredictable module outputs may adversely affect the entire communication system.**

There are four jumpers (jumper J1, J2, J4, and J5) on the INICT03 module. These jumpers are for special INICT03 hardware applications. They define the RS-232-C diagnostic port as data terminal equipment (DTE) or data communication equipment (DTE), 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. Refer to Table 3-11 for the jumper settings.

Table 3-11. Jumpers J1, J2, J4, and J5 (INICT03)

Jumper	Setting	Function	User Setting
J1	Vertical[1]	Set the RS-232-C diagnostic port to operate as DCE.	
	Horizontal	Set the RS-232-C diagnostic port to operate as DTE.	
J2[2]	4 - 3	1 Mbit SRAM device (128k × 8).	4 - 3
	4 - 2	2 Mbit SRAM device (256k × 8).	
	4 - 1	4 Mbit SRAM device (512k × 8).	
J4	Open	Machine fault timer disabled. This jumper must remain open for normal operation.	Open
J5[3]	30V	Disconnects Controlway channel B for 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. This feature is used by Elsag Bailey service personnel. The J1 setting does not affect the module during normal operation.
2. Defines the type of SRAM memory. Jumper J2 must be set to 4 - 3 for the current release.
3. This setting is for INICT03 module operation in systems using early Network 90 modules that require -30 VDC.

Dipshunt

The HW SETUP dipshunt defines the number of SRAM memory banks installed and selects wait states for ROM and SRAM memory. Refer to Table 3-12 for the jumper settings.

Table 3-12. HW SETUP Dipshunt (INICT03)

Socket Position	Jumper Settings
1 - 16	Install this jumper for INICT03 modules containing firmware revision B.0. Remove this jumper for firmware revisions later than B.0.
2 - 15	Install this jumper for INICT03 modules containing firmware revision C.0 and later. Remove this jumper for firmware revisions prior to C.0.
3 - 14	Open.
4 - 13	
5 - 12	
6 - 11	
7 - 10	
8 - 9	

IMMPI01 Multifunction Processor Interface

The Cnet-to-computer interface requires an IMMPI01 Multifunction Processor Interface module. The IMMPI01 module provides the INICT03 module with two serial ports and a SCSI parallel port. A 60-pin ribbon cable connects the IMMPI01 module to the INICT03 module. Jumpers must be set before putting the module into operation. Figure 3-5 shows the jumper locations on the module.

IMMPI01 Jumper Settings

The IMMPI01 module has two sets of jumpers that select handshake signal types: request to send (RTS) or clear to send (CTS). These signals leave the module through a cable connection to the NTMP01 termination unit. Jumpers J1 and J2 must be set as shown in Figures 3-6 and 3-7.

INICT03 and IMMPI01 Module Installation

If the INICT03 and IMMPI01 modules are properly configured, they are ready to be installed in the module mounting unit.

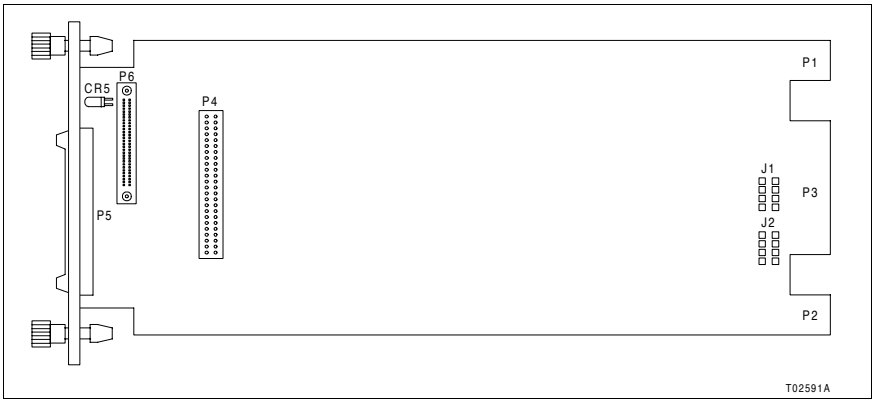

Figure 3-5. IMMPI01 Board Layout

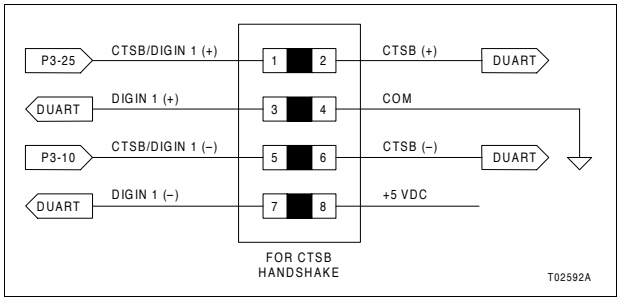

Figure 3-6. Jumper J1 (IMMPI01)

These modules must be installed together and at the same time. Refer to Figure 3-1 for cable connections.

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

Module placement within the module mounting unit is important when installing an INICT03 module with the IMMPI01 module. Installing the modules requires two adjacent slots in a module mounting unit. The INICT03 module must occupy the

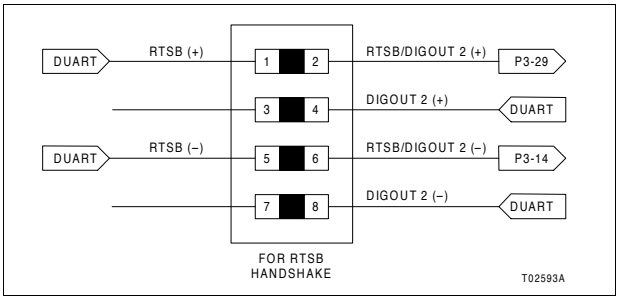

Figure 3-7. Jumper J2 (IMMPI01)

right slot (when facing the front of the module mounting unit) and the IMMPI01 module must occupy the left slot.

-30 VDC Pre-Installation Check

To determine if the 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 INICT03 module to the appropriate positions.

Installation

To install the INICT03 and IMMPI01 modules:

1. Verify the INICT03 and IMMPI01 module slot assignments (INICT03 module in the right slot, IMMPI01 module in the left slot) in the module mounting unit are adjacent to its associated INNIS01 module.

2. Connect one end of the 60-pin ribbon cable to connector P5 on the INICT03 module (Fig. 3-1).

3. Connect the other end of the cable to connector P6 on the IMMPI01 module.

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

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 INNIS01 module and the slots to be used by the INICT03 and IMMPI01 modules.

When installing the computer interface modules, there must be continuity between the INNIS01 and INICT03 modules. Observe the following:

- Install one dipshunt in the I/O expander bus socket between the INNIS01 slot and INICT03 slot if the INNIS01 module is mounted to the right of the INICT03/IMMPI01 combination.
- If the INNIS01 module is mounted to the left of the INICT03/IMMPI01 combination, two dipshunts are required. Install one dipshunt between the INNIS01 slot and IMMPI01 slot. Install the second dipshunt between the IMMPI01 slot and the INICT03 slot.

5. Remove any 24-pin dipshunts from the I/O expander bus sockets that would connect the INICI03 interface modules to any module other than those making up the interface.

6. Attach the hooded end of the NKTU01 or NKTU11 cable to the module mounting unit backplane cable connector opening for the IMMPI01 module. The other end of the cable attaches to the NTMP01 termination unit.

7. Slide the INICT03 and IMMPI01 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 two latch screws of each module ½-turn to lock the modules in place. A module is locked into place when the open end of the slot on the latching screws faces the center of the faceplate.

Operating Procedures

Section 4

Introduction

After completing the steps detailed in the installation section, the Cnet-to-computer interface modules are ready to be put into operation. This section provides the necessary information for daily operation of the modules.

INNIS01 Network Interface

Figure 4-1 shows the INNIS01 module faceplate.

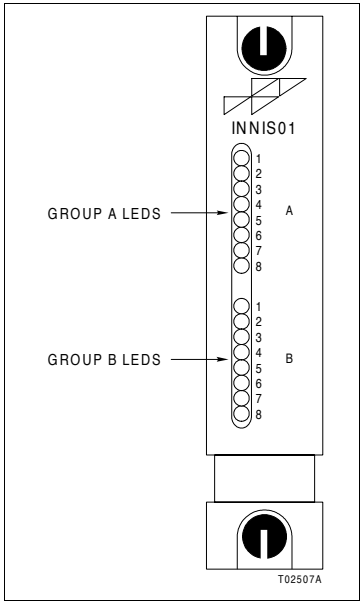

Figure 4-1. INNIS01 Faceplate

On power up, the INNIS01 module microprocessor stays in reset until the INICT03 module removes the reset and allows

the firmware to execute self-diagnostic routines. The INICT03 module determines when the INNIS01 module will go online. The INNIS01 module comes online in the network mode set by poles seven and eight of dipswitch SW3, with the type of counter display set by poles four through eight of dipswitch SW4.

Use the counter display (faceplate LEDs) to check the INNIS01 module operation. If communication errors occur, the host module sets the INNIS01 module communication status bits in the module status. View the module status by using a human system interface.

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 counter address settings. Table 5-1 lists the error codes that appear on the INNIS01 module faceplate LEDs.

INICT03 Computer Transfer

The faceplate of the INICT03 module has the following features (Fig. 4-2):

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

Status LED

The status LED is a two-color LED (red and green) that displays the operating status of the INICT03 module. It has three

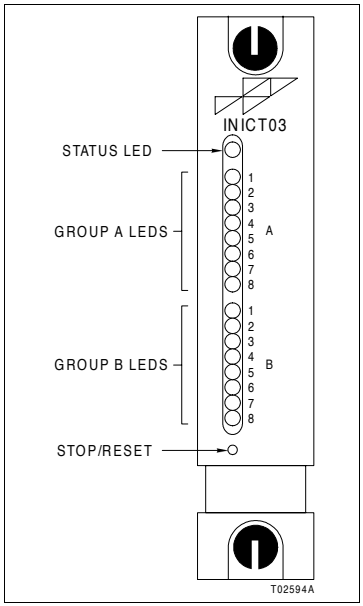

Figure 4-2. INICT03 Faceplate

possible states. Table 4-1 lists the meaning of the status LED states. Refer to Section 5 for corrective actions if the status LED indicates that an error exists.

Table 4-1. Status LED States (INICT03)

LED State	Description
Off	No power.
Solid green	Module is in execute mode.
Solid red	Diagnostics detected a hardware failure or configuration problem. CPU LEDs display an error code when the status LED is red.

CPU LEDs

There are two groups of eight CPU LEDs. Group A LEDs display a moving pattern to indicate the module is functioning. Group B LEDs, during normal operation, keep count of the

commands and replies that pass through the INICT03 module. 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 actions.

Stop/Reset

Push the stop/reset pushbutton once and wait for the status LED to turn red before removing an INICT03 module from the module mounting unit. Pressing the stop/reset pushbutton again causes the restoration of the INICT03 module to power up values after a halt. It is also used to recover from an operator-initiated stop or a module time-out.

Operating Modes

The INICT03 module has two modes of operation: execute and error.

Execute

Execute mode is the normal mode of operation. In this mode, the host computer and Cnet network (or INFI-NET system) interact through the computer interface. The interface firmware permits the configuration of the computer interface and Harmony controllers from the host computer. Refer to the ***Function Code Applications Manual*** for more information. The INICT03 module, while in execute mode, can:

- Collect exception reports.
- Exercise control.
- Allow the operator to adjust tunable module specifications.
- Configure modules within a node residing on Cnet.
- Perform routine system security functions.

Error

The INICT03 module enters error mode if the internal system diagnostic routines detect a hardware or execution error. If the module detects an error, the module halts and displays an error code on the CPU LEDs. Refer to Section 5 for corrective actions when the INICT03 module enters the error mode.

Security Functions

The INICT03 module performs both hardware and software security checks to insure module integrity.

Hardware Checks

The INICT03 module performs the following hardware checks:

Illegal Address Detection Detecting an illegal address generates a bus error and the module halts operation.

Machine Fault Timer The microprocessor updates the machine fault timer. A machine fault time-out halts module operation.

Software Checks

The INICT03 module performs the following software checks:

Module Diagnostics The module diagnostic routines execute automatically on system powerup. If the diagnostic tests fail, the faceplate LEDs display error conditions, the status LED goes red, and the module operation halts.

ROM Checksum The ROM checksum test verifies checksums of the ROM memory. Discrepancies cause the module status LED to go solid red and the module operation halts.

Utilities

The utilities menu shown in Figure 4-3 is available by attaching a diagnostic monitor to port one of the NTMP01 termination unit. Enable this option through the INICT03 module dipswitches.

TALK90

Selecting the *TALK90* option displays a menu of all the commands available to the computer interface. Figure 4-4 shows an example TALK90 command menu.

The INICT03 module must be online to use most of these commands. Use the *Restart* command to put the module online. To execute the restart command, select command 19 from the menu. Enter the following values when prompted:

Key? **0 ENTER**

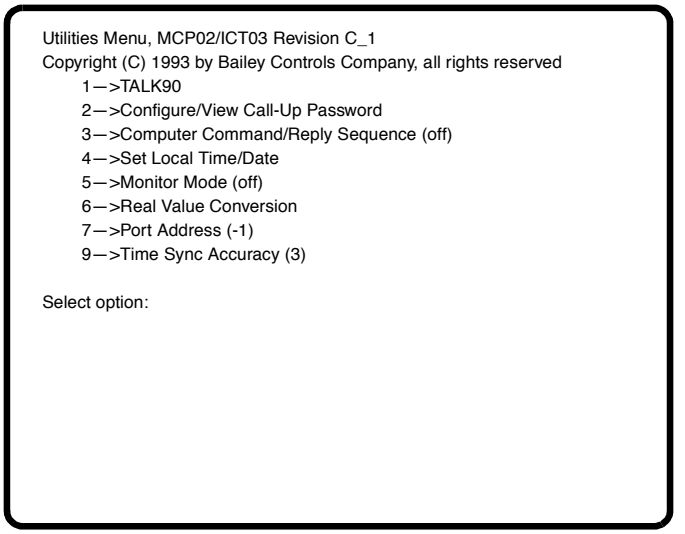

Figure 4-3. Utilities Menu

Watchdog? **0 ENTER**

Restart Options:
128 = enhanced mode
64 = separate command exceptions from XR's
32 = time-sync enabled
16 = XR screening
8 = return work-flag in replies
4 = XON/XOFF protocol
2 = primary mode
1 = stations can be put into computer mode

Sum? **130 ENTER**

Reply Delay? **0 ENTER**

Additional Options:
4 = Bad Quality Alarm Management
2 = add Wall Clock Offset to Time Stamp
1 = return Time Stamp

Sum? **0 ENTER**

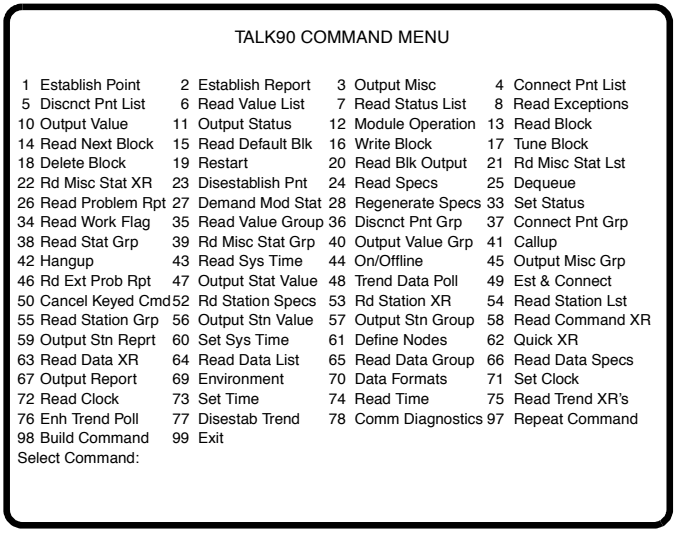

Figure 4-4. TALK90 Command Menu

If the computer interface is functioning properly, the utilities menu will appear again. Select TALK90 to continue. The computer interface should return a reply code of zero followed by the node and loop address as follows:

Response → 0
No Error

Node Number: 2
Loop Number: 1

<RET> to continue

The CPU LEDs on the INICT03 module will display the count of commands and replies that were sent and received. The INNIS01 module should then go online and the computer interface will be able to communicate with Cnet nodes. The utilities menu will appear again. Select TALK90 to continue.

Use any of the available commands on the TALK90 menu to check the system.

Configure/View Call-Up Password

Selecting *Configure/View Call-Up Password* option allows the password to be viewed and changed. The following information displays:

Current Password: 1 2 3 4 5 6 7 8

Define new password (Y/N)?

Answer **Y** to cause the following information to be displayed. The following information is an example password entry:

Input 8 hexadecimal password bytes, example:
? **BB CC DD EE FF 11 22 33 ENTER**
? 11 22 33 44 55 66 77 88

New password written!

Answer **N** to cause the terminal to return to the utilities menu.

NOTE: This option defines the password for the INICT03 ports. To use this feature, the password protection option (position five, dipswitch SW4 UUB0) on the INICT03 module must be enabled.

Computer Command/Reply Sequences

Selecting the *Computer Command/Reply Sequence* option, when enabled, causes the computer interface to echo computer commands and replies in hexadecimal format on the terminal. Commands on the serial port are preceded by a *CS*; replies on the serial port are preceded by an *RS*. Commands on the parallel port are preceded by a *CP*, and replies on the parallel port are preceded by an *RP*. Press **3** to toggle this feature on and off. Figure 4-5 shows an example of a restart command followed by a demand module status command.

NOTE: This option slows computer interface response time and should be disabled when not in use.

Set Local Time and Date

Selecting the *Set Local Time/Date* option causes the following information to display:

0:0:0 Saturday 3/1/1998 Change (Y/N)?

```
CD  13  00  00  0A  00  00  1D  0D
RS  00  05  00  05  0D

CS  1B  1B  00  00  32  00  00  4D  0D
RS  00  E1  00  80  00  61  0D
```

Figure 4-5. Computer Command/Reply Sequences Example

Answer **Y** to cause the time utilities menu to display (Fig. 4-6). Select the desired function and follow the screen prompts to complete the task. Answer **N** to cause the terminal to return to the utilities menu.

Monitor Mode

Selecting the *Monitor Mode* option enables or disables monitor mode. When enabled, all control commands from the terminal or the host computer are ignored by the computer interface. The terminal or host computer can monitor data only.

Real Value Conversion

Selecting the *Real Value Conversion* option allows performing real value conversions on the terminal screen. The following information displays:

Value or REAL 2/3/4/8 conversion (V or R)?

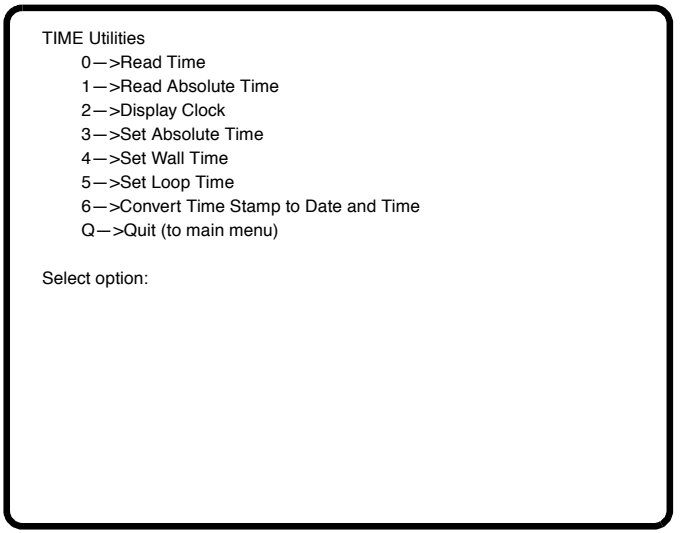

Figure 4-6. Time Utilities Menu

Answer **V** to enable decimal to real number conversion. The following prompt appears:

Enter value:

Entering a sample value of 1.0 causes the following information to display:

Enter value: **1.0 ENTER**

REAL2 = D2 00
REAL3 = 02 80 00
REAL4 = 3F 80 00 00
REAL8 = 3F F0 00 00 00 00 00 00

Enter value:

Press **ENTER** to continue or exit. The original prompt appears:

Value or REAL 2/3/4/8 conversion (V or R)?

Answer **R** to enable real to decimal number conversion. The following prompt appears:

Enter REAL 2/3/4/8:

Entering a sample value of 3F 00 00 00 causes the following information to display:

Enter REAL 2/3/4/8: **3F 00 00 00 ENTER**

0.500000

Enter REAL 2/3/4/8:

Press **ENTER** to continue or exit.

Port Address

Selecting the *Port Address* option allows the port address to be changed. The following information displays:

Port Address is currently 0
Change Port Address (Y/N)?

Answer **Y** and the following prompt appears:

Enter new Port Address (0 to 31):

The new port address appears next to the option on the utilities menu. The utilities menu automatically returns after executing this option.

Time-Sync Accuracy

Selecting the *Time Sync Accuracy* option displays the current time-synchronization accuracy and prompts to enter a new rating. The rating indicates the accuracy (lack of drift) of the host clock device where:

0 = No clock (lowest accuracy rating)

3 = Default

6 = Low accuracy battery-backed clock

9 = High accuracy battery-backed clock

12 = Satellite clock (highest accuracy rating)

Troubleshooting

Section 5

Introduction

Troubleshooting the computer interface is limited to deciphering module LED error codes and viewing the contents of the error counters and the module status report from any human system interface (HSI). Refer to the instruction for your specific HSI interface for information on module status reports.

Error Counters

All Cnet communication modules have faceplate LEDs that serve as error code displays. The INNIS01 module has event and error counters that are selectable (refer to Tables 3-5 and 3-6).

INNIS01 Error Codes

The INNIS01 module error counters total errors in the same manner as the event counters total events. Table 3-6 lists the types of error counters. The module halts operation if a fatal error condition occurs. Group A LEDs display error codes. 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 actions.

Table 5-1. INNIS01 Error Codes

Code	LEDs	Condition	Corrective Action
	8 7 6 5 4 3 2 1		
13	0 0 0 1 0 0 1 1	ROM checksum error	Replace INNIS01 module.
16	0 0 0 1 0 1 1 0	Loopback test failure	1. Check cabling and termination unit. 2. Replace INNIS01 module.
31	0 0 1 1 0 0 0 1	Memory or CPU fault	Replace INNIS01 module.

Table 5-1. INNIS01 Error Codes *(continued)*

Code	LEDs	Condition	Corrective Action
	8 7 6 5 4 3 2 1		
32	0 0 1 1 0 0 1 0	Address or bus error	1. Reset INICT03 module. 2. Replace INNIS01 module if error recurs.
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 INNIS01 module	Check dipswitches SW1 through SW4.
3E	0 0 1 1 1 1 1 0	INNIS01/device handshake failure	1. Verify that dipshunt exists between INNIS01 and INICT03 modules. 2. If dipshunt exists, replace INNIS01 or INICT03 module.

NOTE: 0 = LED off, 1 = LED on.

INICT03 Error Codes

If errors occur while the INICT03 module is operating, the status LED turns red and the CPU LEDs on the module faceplate display error codes. Table 5-2 lists the INICT03 module error codes and associated corrective actions. The module displays error codes only when it is halted.

Table 5-2. INICT03 Error Codes

Code	LEDs	Condition	Corrective Action
	8 7 6 5 4 3 2 1		
0D	0 0 0 0 1 1 0 1	I/O expander bus errors	Check I/O expander bus for connections to other modules.
12	0 0 0 1 0 0 1 0	INNIS01 module not responding	Replace INNIS01 module.
13	0 0 0 1 0 0 1 1	ROM checksum error	Replace INNIS01 module.
19	0 0 0 1 1 0 0 1	SCSI port error	1. Check cabling and termination unit. 2. Replace INNIS01 module.
31	0 0 1 1 0 0 0 1	Memory or CPU fault	Replace IINICT03 module.

Table 5-2. INICT03 Error Codes *(continued)*

Code	LEDs	Condition	Corrective Action
	8 7 6 5 4 3 2 1		
32	0 0 1 1 0 0 1 0	Address or bus error	1. Reset INICT03 module. 2. Replace INICT03 module if error persists.
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 zero/checksum/ format error	
39	0 0 1 1 1 0 0 1	Duplicate node number on loop	Change node number.
3F	0 0 1 1 1 1 1 1	INICT03 stopped because the user pressed the stop pushbutton	Reset INICT03 module.

NOTE: 0 = LED off, 1 = LED on.
1. Codes are displayed only when the INICT03 module is halted and the status LED is red.

A code that is not on the list may appear if a machine fault time-out occurs. Reset the INICT03 module if this happens. The module has failed if the status LED remains red. Replace the module in this case.

INICT03 Status Summary

The INICT03 module has a 16-byte module status record that provides summary flags for error conditions, module type, and firmware revision level. Refer to the ***Function Code Application Manual*** for a listing of the fields that make up the INICT03 module status report and the definition of each field within the module status report. Refer to the applicable human system interface instruction for an explanation of how to access the module status report.

INNIS01 Edge Connectors

Tables 5-3, 5-4, and 5-5 list the INNIS01 module edge connector pin assignments.

Table 5-3. P1 Pin Assignments (INNIS01)

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. P2 Pin Assignments (INNIS01)

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. P3 Pin Assignments (INNIS01)

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 (-)

INICT03 Edge Connectors

Tables 5-6, 5-7, and 5-8 list the INICT03 module edge connector pin assignments.

Table 5-6. P1 Pin Assignment (INICT03)

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	Power fail interrupt
11	Controlway A/module bus	12	Unused

Table 5-7. P2 Pin Assignments (INICT03)

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. P3 Pin Assignments (INICT03)

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

IMMPI01 Edge Connectors

Tables 5-9 and 5-10 list the IMMPI01 module edge connector pin assignments.

Table 5-9. P1 Pin Assignment (IMMPI01)

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 5-10. P3 Pin Assignments (IMMPI01)

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 (-)

Maintenance

Section 6

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 blown off the printed circuit board.**

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

This section presents procedures that the customer should be able to perform on site. These preventive maintenance procedures should be used as a guideline 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 Cnet network (or INFI-NET system), have experience working with process control systems, and know what precautions to take when working around live electrical systems.

Preventive Maintenance Schedule

Table 6-1 is the preventive maintenance schedule for the modules that make up the INICI03 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 computer interface module for dust. Clean as necessary using an antistatic vacuum.	
Check all computer interface signal, power and ground connections within the cabinet. Verify that they are secure. See procedure.	
Check computer interface circuit boards, giving special attention to power contacts and edge connectors. Clean as necessary. See procedure.	12 months
Complete all tasks in this table.	Shutdown

Equipment/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-blade screwdriver suitable for terminal blocks.
- Isopropyl alcohol (99.5% electronic grade).
- Natural bristle brush.

Preventive Maintenance Procedures

This section covers tasks from Table 6-1 (preventive maintenance schedule) that require specific instruction or further explanation. The tasks and instruction covered are:

- Printed circuit board cleaning.
- How to check 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, cleaning edge connectors and circuit board laminate between edge connectors. Use the procedures that meet the needs of each circuit board. Remove all dust, dirt, oil, corrosion or any other contaminant from the circuit board.

Do all cleaning and handling of the printed circuit boards at static safe work stations. Always observe the steps under ***Special Handling*** in Section 3 of this instruction 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 be used also.

2. Minimize electrostatic discharge by using the 80/20 isopropyl alcohol and 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.

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 must be off while performing this preventive maintenance task.

Check and verify that all cable connections are secure.

Repair and Replacement

Section 7

Introduction

This section explains repair and replacement procedures for Cnet-to-computer interface modules. There are no special tools required to replace any of the modules.

Repair

Repair procedures are limited to module replacement. If a 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 the INICT03 module under power unless the stop/reset pushbutton has been depressed and module operation has been halted.

Module Replacement

The following steps describe module replacement. Observe the steps listed under ***Special Handling*** in Section 3 when handling interface modules.

1. Press the stop/reset pushbutton if the module is not already halted.

2. Turn the two latching screws on the defective interface module ½-turn either way to release it.

NOTE: The INICT03 and IMMPI01 modules are connected by ribbon cable. Both modules must be removed and disconnected.

3. Grasp the screws and slide out the module (or modules).

4. If necessary, disconnect the cable connecting the modules and replace only the defective module.

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

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

7. Hold the module by the faceplate and slide it into its assigned slot; push until the rear edges of the module are firmly seated in the backplane connectors.

8. Turn the two latching screws on the module ½-turn to lock the module in place. A module is 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 Replacement

Refer to the ***Communication Termination Unit (NTCL01)*** and ***Multifunction Processor Termination Unit (NTMP01)*** instruction for termination unit step-by-step replacement procedures and spare parts information.

Replacement and Spare Parts

Section 8

Parts

Order parts without commercial descriptions from the nearest Elsag Bailey sales office. Contact Elsag Bailey for help determining the quantity of spare parts to keep on hand for your particular system. Tables 8-1 through 8-3 list Cnet-to-computer interface related parts.

Table 8-1. Miscellaneous Nomenclatures

1	2	3	4	5	6	7	
I	M	M	P	I	0	1	Multifunction processor interface module
I	N	I	C	I	0	3	Cnet-to-computer interface: INICT03, INNIS01, IMMPI01
I	N	I	C	T	0	3	Computer transfer module
I	N	N	I	S	0	1	Network interface module
N	T	C	L	0	1	_	Communication termination unit
N	T	M	P	0	1	_	Multifunction processor termination unit

Table 8-2. Cable Nomenclatures

1	2	3	4	5	6	
N	K	L	S	0	1	INNIS01-to-NTCL01 termination unit cable (PVC)
N	K	L	S	1	1	INNIS01-to-NTCL01 termination unit cable (non-PVC)
N	K	T	U	0	1	IMMPI01-to-NTMP01 termination unit cable (PVC)
N	K	T	U	1	1	IMMPI01-to-NTMP01 termination unit cable (non-PVC)

Table 8-3. Miscellaneous Parts

Part Number	Description
1946715A8	Dipshunt (8-position, 16-pin)
1946984A1	Jumper
1948752A1050	INICT03-to-IMMPI01 ribbon cable

NTCL01 Termination Unit

Appendix A

Description

The INNIS01 Network Interface module uses the NTCL01 termination unit. Jumpers on the NTCL01 unit select the type of cable used to connect the INNIS01 module to Cnet (or INFI-NET). Refer to the ***Communication Termination Unit (NTCL01)*** instruction for complete information.

Figure A-1 shows the location of jumpers and connectors. Table A-1 lists the jumper settings used on NTCL01 unit circuit board revision levels D and E. Table A-2 lists the jumper settings used on NTCL01 unit circuit board revision levels F and later.

Figures A-2 and A-3 show the coaxial and twinaxial cable connections for nonredundant applications.

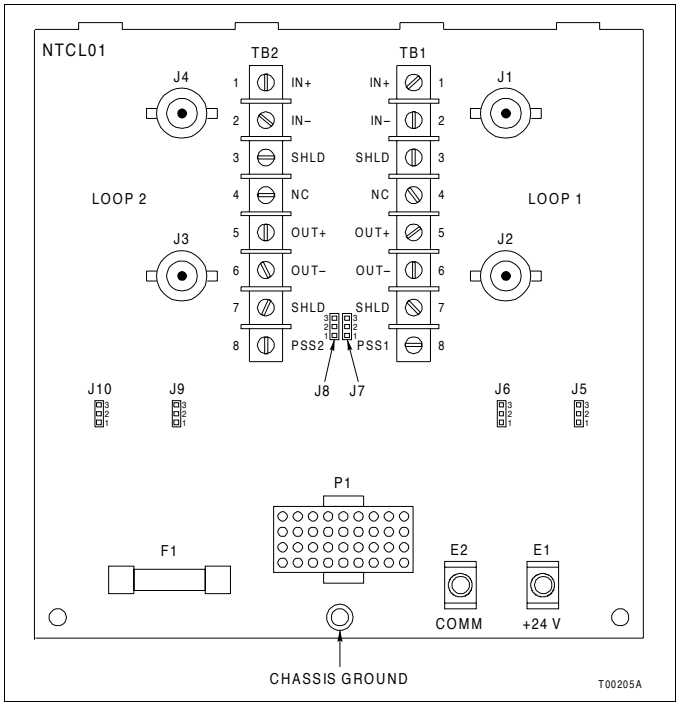

Figure A-1. NTCL01 Board Layout (Revision F and Later)

Table A-1. Revisions D and E Jumpers (NTCL01)

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

Table A-2. Revisions F and Later Jumpers (NTCL01)

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

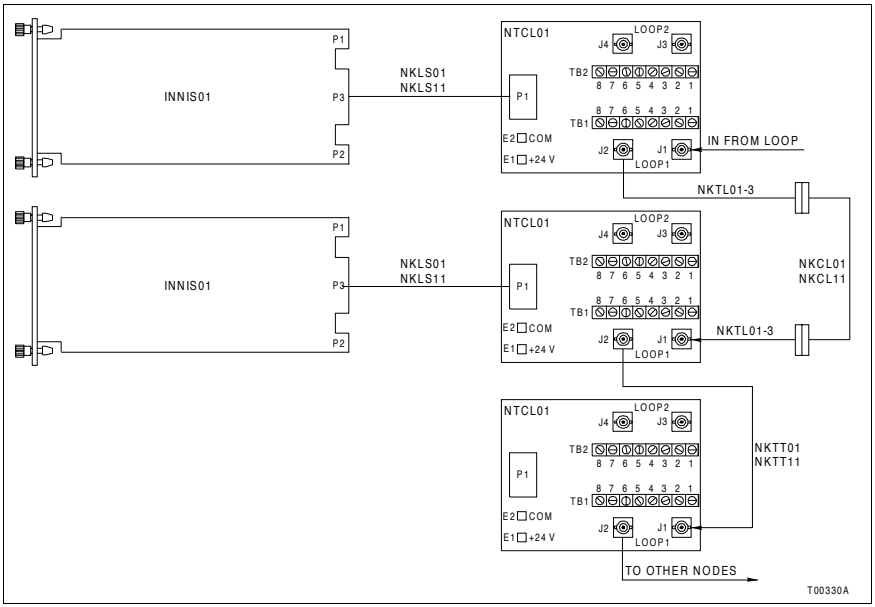

Figure A-2. Coaxial Cable Connections (NTCL01)

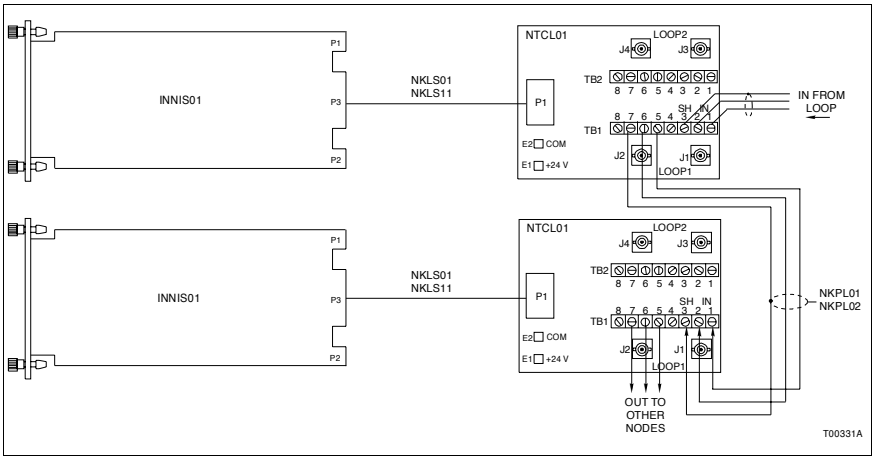

Figure A-3. Twinaxial Cable Connections (NTCL01)

NTMP01 Termination Unit

Appendix B

Description

The IMMPI01 module uses the NTMP01 termination unit. Jumpers on the NTMP01 unit set up the communication ports. Refer to the ***Multifunction Processor Termination Unit (NTMP01)*** instruction for complete information.

Figure B-1 shows the NTMP01 connector assignments and jumper locations.

Figure B-2, B-3, B-4, and B-5 show the jumper configurations for J1 and J2. Figure B-6 shows the jumper configuration for J3 through J10. Figure B-7 shows the jumper configuration for J14 through J17. Jumper J18 configures the terminal serial port for RS-485 operation when pins two and three are connected (Fig. B-8) and connector P7 is used instead of connector P5.

Jumpers J11 and J12 are storage posts for extra jumpers. Jumper J13 is normally set with pins one and two connected. This connects the cable shielding pin of connector P7 to chassis ground.

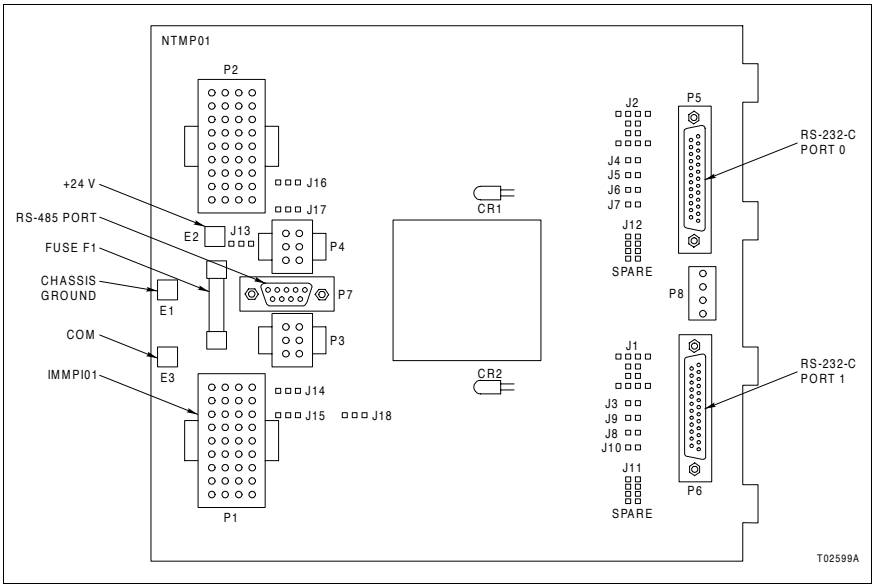

Figure B-1. NTMP01 Board Layout

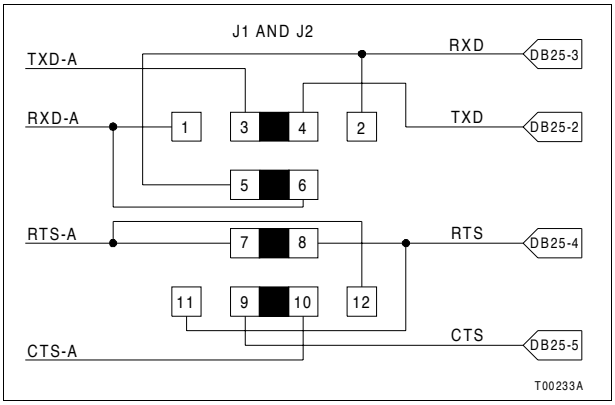

Figure B-2. DTE Jumper Configuration (NTMP01)

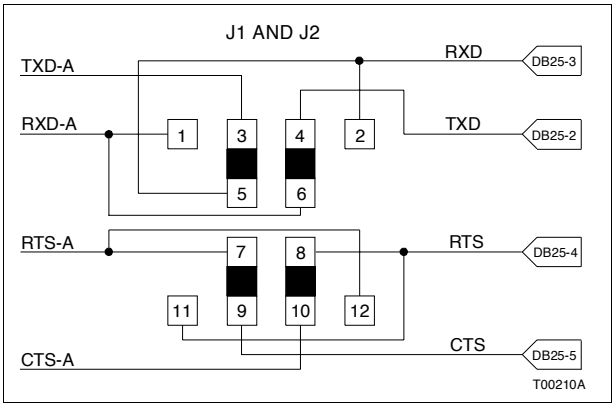

Figure B-3. DCE Jumper Configuration (NTMP01)

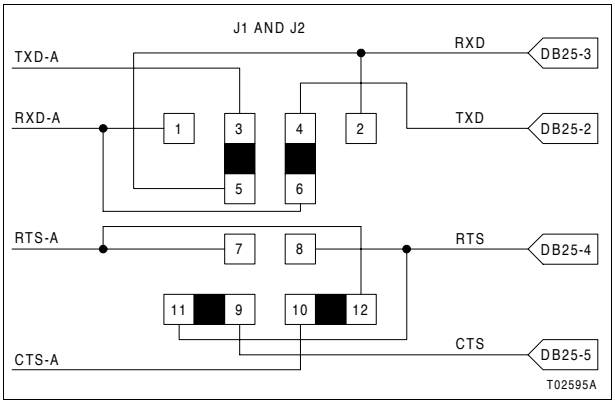

Figure B-4. Nonhandshake Jumper Configuration (NTMP01)

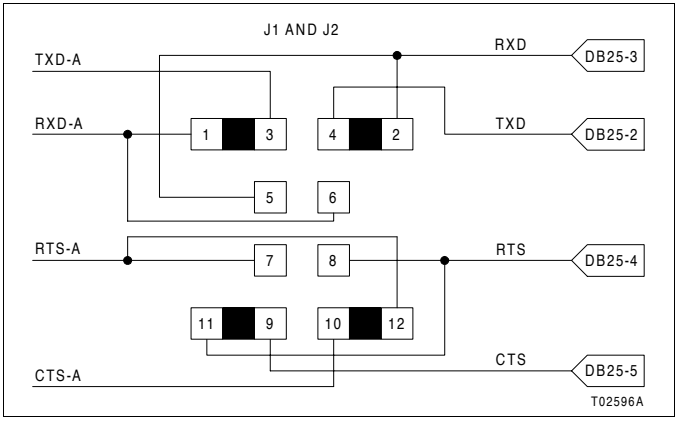

Figure B-5. Loopback Jumper Configuration (NTMP01)

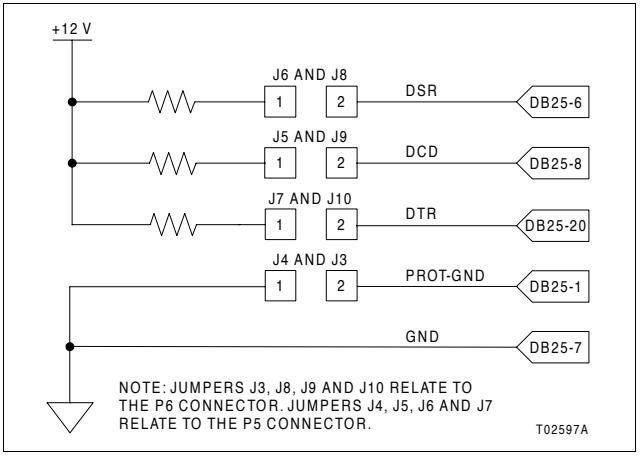

Figure B-6. J3 through J10 Jumper Setting (NTMP01)

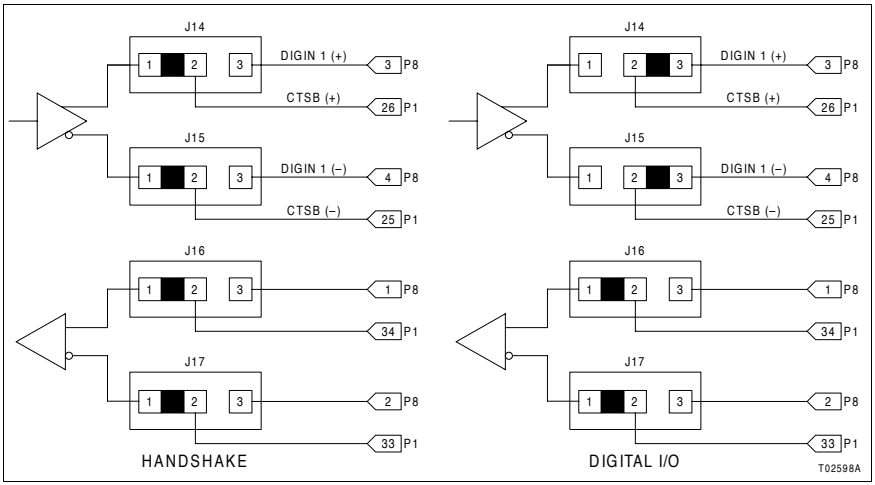

Figure B-7. J14 through J17 Jumper Setting (NTMP01)

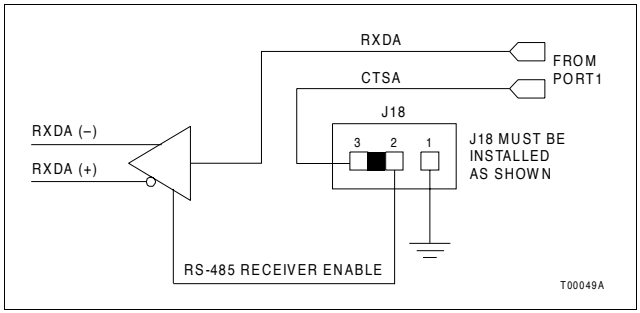

Figure B-8. J18 Jumper Setting (NTMP01)

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Index (continued)

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