symphony™

Instruction
Harmony Series

Cnet-to-Computer Communication Interface

INICI12

ABB

Preface

The INICI12 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 Symphony Enterprise Management and Control System.

This instruction explains INICI12 interface features, specifications, and operation. It includes installation, troubleshooting, maintenance, and replacement procedures for the rack modules and terminations that make up the INICI12 interface.

NOTE: The INICI12 interface is fully compatible with existing INFI 90® OPEN Strategic Enterprise Management Systems using the INFI-NET® communication system.

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Electrical Shock Hazard During Maintenance
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SPECIFIC WARNINGS

Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting installation, retrofit, upgrade, or wiring procedures. Failure to do so could result in severe or fatal shock. Do not turn the power on until the installation, retrofit, upgrade, or wiring procedures are complete. (p. 3-2, 7-1, PR1-1, PR2-1, PR8-1, PR9-1, PR10-1)

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Introduction

Section 1

Overview

The INICI12 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.

NOTE: The INICI12 interface is fully compatible with existing INFI 90 OPEN Strategic Enterprise Management Systems using the INFI-NET communication system.

The INICI12 interface mainly consists of the INNIS01 Network Interface Module and the INICT12 Computer Transfer Module (Fig. 1-1). This interface gives a host computer access to point data over Cnet along with other control system capabilities. It supports a tag database capacity of 10,000 tags (i.e., point definitions). The computer connects through an RS-232-C serial port that operates at rates up to 19.2 kilobaud. The interface is command driven through software on the host computer. It receives a command from the host computer, executes it, then replies.

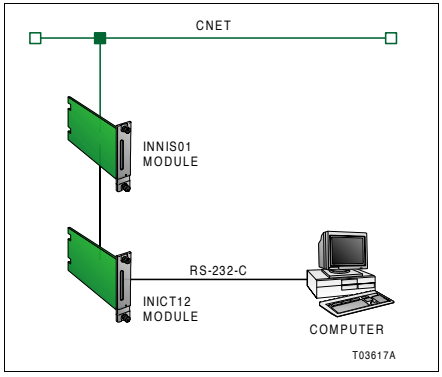

Figure 1-1. Cnet-to-Computer Interface

Control Network

Cnet is a unidirectional, high speed serial data network that operates at a 10-megahertz or two-megahertz communication rate. It supports a central network with up to 250 system node connections. Multiple satellite Cnets can link to the central network. Each satellite network supports up to 250 system node connections. Interfacing a maximum number of satellite networks gives a system capacity of over 62,000 nodes.

On the central network, a node can be a satellite network, a human system interface, a Harmony control unit (HCU), or a computer connected through a Cnet communication interface. On a satellite network, a node can be a human system interface, an HCU cabinet, or a computer. A human system interface is a workstation that runs Conductor software. A Harmony control unit is comprised of a controller and its I/O devices. A computer can run Composer™ tools, Performer applications, and third-party semAPI applications.

Cnet is used by system nodes to:

- Communicate field input values and states for process monitoring and control.
- Send or receive control instructions from plant personnel through human system interfaces to adjust process field outputs.
- Provide feedback to plant personnel of actual output changes through human system interfaces.
- Communicate controller function block configuration information and parameters. These parameters determine the operation of functions such as process control, data acquisition, alarming, trending, and logging.
- Report status.
- Download firmware.

Data is transferred in messages that contain system data, control, and configuration information and also in exception reports.

Computer

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

Human System Interface

A human system interface such as a workstation running Conductor software provides the ability to monitor and control plant operations from a single point. It connects to Cnet through the 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 the keyboard. Each HSI workstation has a dedicated computer interface.

NOTE: A workstation running Conductor NT software can interface to Cnet through an INICI12 interface. A workstation running Conductor VMS does not use the INICI12 interface but instead has its own dedicated version of the Cnet-to-computer interface (IIMCP02 and IIMLM01).

Intended User

Personnel installing, operating, or maintaining the INICI12 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.

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 10-megahertz communication rate gives timely information exchange.
- The INICT12 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 the following sections:

Introduction	Provides an overview of the computer interface. It contains module descriptions, features, and specifications.
Description and Operation	Provides a functional block diagram level description of the computer interface modules and explains module operating theory.
Installation	Covers handling guidelines and describes the computer interface installation and connection sequence.
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 computer interface.
Repair and Replacement	Provides replacement procedures for the components that make up the computer interface.
Replacement and Spare Parts	Provides a list of part numbers and nomenclature.

Procedures — Individual procedure sections (e.g., PR1, PR6, PR10, etc.) detail installation, maintenance, and replacement actions. A procedure section typically gives the steps for a single task. Installation flowcharts and replacement flowcharts indicate the order in which these procedures are to be performed.

How to Use this Instruction

To use the instruction:

1. Read the introduction section and the description and operation section to gain an understanding of the computer interface and its functionality.

1. Perform all steps in the installation section. The section provides an installation flowchart.

2. 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 common problems.

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

5. Refer to the repair and replacement section for computer interface replacement procedures. The section provides a replacement flowchart.

Glossary of Terms and Abbreviations

Table 1-1 contains those terms and abbreviations that are unique to ABB 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.
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.

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

Term	Definition
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
WBPEEUI210502??	Modular Power System II
WBPEEUI210504??	Function Code Application Manual, Symphony
WBPEEUI270002??	Primary Interface, Composer
WBPEEUI270003??	Automation Architect, Composer

Related Nomenclature

Table 1-3 lists nomenclature related to the INICI12 interface.

Table 1-3. Related Nomenclature

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 that make up the INICI12 interface.

Table 1-4. Specifications

Property	Characteristic/Value
INICT12	
Memory	512 kbytes ROM, 512 kbytes RAM, 128 kbytes NVRAM
Power requirements	+5 VDC at 2.0 A; 10.0 W
Communication rates (user-selectable)	2,400 baud; 4,800 baud; 9,600 baud; 19,200 baud
Communication ports	2 full duplex, serial RS-232-C
Tag capacity (point definitions)	10,000
INNIS01	
Memory	208 kbytes RAM, 64 kbytes ROM
Power requirements	+5 VDC at 900 mA; 4.5 W typical +15 VDC at 5 mA; 0.1 W typical -15 VDC at 200 mA; 3.0 W typical
System capability	Over 62,000 nodes in the system; 250 nodes on a network. Any combination of Cnet-to-Cnet, Cnet-to-HCU, and Cnet-to-computer interfaces.
Communication rates	10 MHz or 2 MHz
Common	
Mounting	Occupies one slot in a standard module mounting unit
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	(Pending for INICT12)
Canadian Standards Association (CSA)	Certified for use as process control equipment in an ordinary (nonhazardous) location
Factory Mutual (FM)	Approved for use in Class I; Division 2; Groups A, B, C, D; hazardous locations.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Description and Operation

Section 2

Introduction

This section explains the functionality of the INICI12 interface. Figure 2-1 shows the Harmony components that make up the interface.

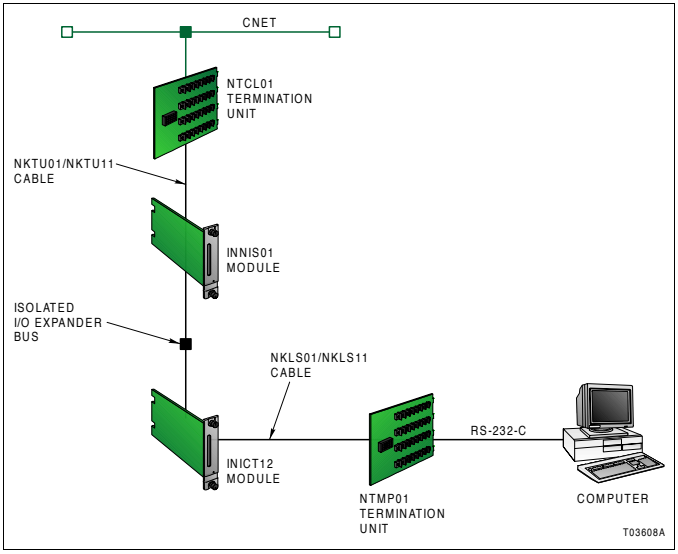

Figure 2-1. INICI12 Interface

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. In this case, it works in conjunction with the INICT12 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 Cnet, and with the INICT12 module over a dedicated I/O expander bus segment.

Two latching screws on the faceplate secure the INNIS01 module to the module mounting unit (Fig. 2-2). There are 16 LEDs on the faceplate that display event or error counts and error codes.

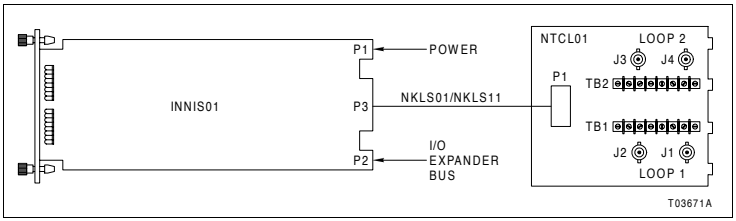

Figure 2-2. INNIS01 Module and NTCL01 Termination Unit

The INNIS01 module has three card edge connectors for external signals and power (P1, P2, and P3). P1 connects to common and +5, +15, and -15 VDC power. P2 connects the INNIS01 module to the I/O expander bus to communicate with its INICT12 module. P3 connects the module to its NTCL01 communication termination unit.

Communication between Cnet nodes is through coaxial or twinaxial cable that connects between the termination units of each node. An NTCL01 unit provides the redundant Cnet connection points for the INICI12 interface node (coaxial J1 through J4 or twinaxial TB1 and TB2). The INNIS01 module connects to the NTCL01 unit through an NKLS01 or NKLS11 cable attached between its P3 connector and P1 on the termination unit. The termination unit provides isolation circuitry for Cnet.

Block Diagram

Figure 2-3 is a functional block diagram of the INNIS01 module. The module contains a central processing unit (CPU), memory, I/O expander bus interface, and a Cnet interface that supports redundant Cnet (loop one and loop two).

CPU

The CPU contains a 32-bit microprocessor running at 10 megahertz and associated support circuitry (i.e., control logic, address decoder, buffer control, etc.). The CPU interprets and executes instructions to control communication and run diagnostics. Since the microprocessor is responsible for overall module operation, it communicates with all the functional blocks.

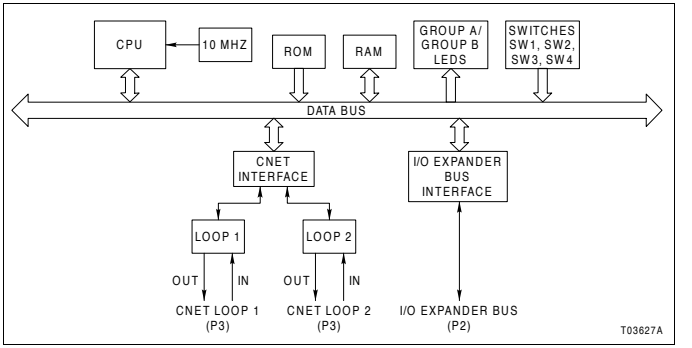

Figure 2-3. INNIS01 Functional Block Diagram

Cnet

The INNIS01 module handles all Cnet communication for the INICI12 interface. This includes transmitting Cnet messages originated from the node, receiving messages intended for the node, and forwarding Cnet messages destined for other Cnet nodes. The Cnet interface contains a transceiver, loop one and loop two transmit drivers, and loop one and loop two receivers. The INNIS01 module has the ability to isolate itself from Cnet in the event of a component failure or to perform diagnostics.

NOTE: The INNIS01 module supports INFI-NET communication in existing INFI 90 OPEN systems.

Receive

On the receive side, the module has two independent channels with separate memory for each channel to temporarily store incoming messages. Messages are received on both channels simultaneously and stored. The data is automatically checked for integrity and various data protocol errors. If a message is

intended for the node, it is stored. If a message is intended for another Cnet node, it is passed to the transmit side.

Transmit

On the transmit side the module has one transmitter but two independent transmit driver circuits. Messages originated by the node and forwarded messages are transmitted on both channels. Messages are first checked and formatted by the CPU before they are transmitted. Messages are transmitted using a transmit/acknowledge sequence.

Memory

The INNIS01 module memory consists of ROM memory and static-RAM (SRAM) memory. The ROM memory holds the operating system instructions for the microprocessor (i.e., firmware). SRAM memory provides temporary storage for the CPU. The Cnet and I/O expander bus interfaces also use a portion of the SRAM memory to store received messages and messages to be transmitted.

I/O Expander Bus

The I/O expander bus is an eight-bit parallel bus that provides the communication path for data between the INNIS01 module and the INICT12 module. The I/O expander bus interface is implemented using a custom integrated circuit utilizing an ABB Automation designed communications protocol. This interface provides the following functions:

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

The I/O expander bus used by the INICI12 interface is isolated from any other rack modules.

NOTE: I/O expander bus is strictly used for internal cabinet communication.

Switches and LEDs

The CPU reads one of several internal event and error counters and writes count data to data latches to control the front panel LEDs. It reads switches SW1 through SW4 through data buffers to determine its operating mode and operating addresses.

Operation

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

Exception Reports

Exception reported data is available to all Cnet nodes. Harmony nodes exception report data on Cnet automatically. A controller, for example, generates an exception report periodically to update data, after a process point reaches a defined alarm limit or changes state, or after a significant change in value occurs. An exception reporting route must be established, however, for the node to begin acquiring the exception reported data. The data typically appears as dynamic values, alarms, and state changes on displays and in reports generated by human system interfaces and other system nodes.

Exception reports can have data values in the following formats: digital, analog, and status. Exception reports are time-stamped to reflect their processing sequence. Some examples of information contained in exception report parameters include:

- Analog process value.
- Alarm level.
- Deviation (rate of change).
- Digital process state.
- Alarm state.
- Quality.

A function block address is included in each exception report to identify the source of the report. The address is a loop, node, module, and block number.

Maximum and minimum report time parameters insure that an exception report is generated for static data and limit reports for 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.

The host computer can source exception reports. The INICT12 module packages together exception reports having a common

node destination. Packing places all exception reports for a destination (or multiple destinations) into one message. The INNIS01 module then 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 efficiency.

> **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 FC 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 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. 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 INICT12 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 INICT12 module.

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.

INICT12 Computer Transfer

The INICT12 Computer Transfer Module handles all communication with a host computer. The module is a single printed circuit board that occupies one slot in a module mounting unit. The circuit board contains communication circuitry that enables it to directly communicate with its INNIS01 module over a dedicated I/O expander bus.

Two latching screws on the faceplate secure the INICT12 module to the module mounting unit (Fig. 2-4). There are nine LEDs on the faceplate and a stop/reset pushbutton.

The INICT12 module has three card edge connectors for external signals and power (P1, P2, and P3). Connector P1 connects to common, +5 VDC power. Connector P2 connects the INICT12 module to the I/O expander bus to communicate with its INNIS01 module. P3 connects the module to its NTMP01 Multifunction Processor termination unit.

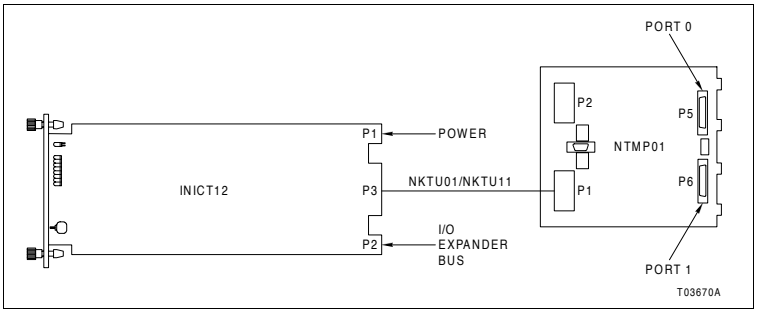

Figure 2-4. INICT12 Module and NTMP01 Termination Unit

The INICT12 module supports RS-232-C protocol for computer interface. An NTMP01 termination unit provides two RS-232-C ports: port zero (P5) is normally for computer connection and port one (P6) is normally for diagnostic terminal or security key connection. Diagnostic port or security key capability must first be enabled for the INICT12 module (SW4). Control and data signals connect to the INICT12 module through a NKTU01 or NKTU11 cable attached between its P3 connector and P1 of the NTMP01 termination unit.

When communicating through the RS-232-C ports, the INICT12 module can support either data terminal equipment (DTE) or data communication equipment (DCE). The NTMP01 unit has jumpers to configure DTE or DCE operation. The termination unit provides optical isolation for the RS-232-C ports.

Block Diagram

Figure 2-5 is a functional block diagram of the INICT12 module. The module primarily contains a central processing unit (CPU), memory, and I/O expander bus and RS-232-C serial channel interfaces. Refer to ***I/O Expander Bus*** previously in this section for an explanation of the I/O expander bus interface.

CPU

The CPU contains a 32-bit microprocessor running at 16 megahertz and associated support circuitry (i.e., control

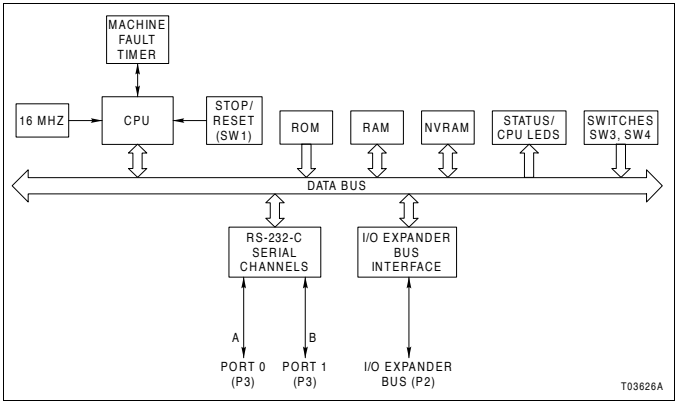

Figure 2-5. INICT12 Functional Block Diagram

logic, address decoder, interrupt interface, system timer, etc.). The CPU interprets and executes instructions to perform its computer interface functions, control communication, and run diagnostics. Since the microprocessor is responsible for overall module operation, it communicates with all the functional blocks.

Memory

The INICT12 module memory consists of ROM memory, SRAM memory, and nonvolatile-RAM (NVRAM) memory. The ROM memory holds the operating system instructions for the microprocessor (i.e., firmware). The SRAM memory provides temporary storage and a copy of the point definition database. The NVRAM memory holds the point definition database. The information stored in NVRAM is retained when power is lost.

RS-232-C Serial Channels

The INICT12 module contains two independent RS-232-C serial channels (A and B). These channels are connected to port zero and port one of the NTMP01 termination unit. The module uses a dual universal asynchronous receiver/transmitter (DUART) circuit to direct data transfer through the serial channels. Each channel supports standard baud rates up to 19.2 kilobaud.

The termination unit provides optical isolation for each of the channels. The isolation eliminates the need to tie chassis ground to system common and alleviates the potential of damage from ground currents.

Machine Fault Timer

The machine fault timer (MFT) is a security feature built into the INICT12 module. The timer is a one-shot timer that must be periodically reset by the CPU to prevent it from timing out. If an error condition exists that causes the module to fail or operate incorrectly, the timer will not be reset and will cause a time-out condition. A time-out condition triggers a reset signal to shut down the module.

The module performs a series of on-line diagnostics to verify circuit integrity. A detected hardware failure may cause a time-out condition. If the cause of the problem is not a hardware failure, the module and timer can be reset by the stop/reset pushbutton accessed through the front panel.

Stop/Reset

Control logic determines the stop/reset pushbutton (SW1) operation. The pushbutton is used to halt the module operation and to reset the module. It is accessible through a small hole in the front panel. Pressing the pushbutton once causes the module to perform an orderly shutdown. Pressing the pushbutton a second time resets the module.

Switches and LEDs

To control the front panel, the CPU writes data to latches connected to the CPU LEDs (LEDs one through eight) and the status LED. This data includes operating status, command/reply count, and error codes. The CPU reads switches SW3 and SW4 through data buffers to determine its operating mode and RS-232-C serial port operating characteristics.

Operation

The INICT12 module communicates with the host computer using RS-232-C protocol. The module can store up to 10,000 point definitions (i.e., tags) depending on point type. The module is command driven through software on the host computer. It receives and interprets commands, executes the

commands, then replies. The module maintains the point database, and directs all interaction between the host computer and the Cnet. The INICT12 module firmware enables the host computer to issue commands for data acquisition, process monitoring and control, and to perform system functions such as security, time-synchronization, status monitoring, and configuration control.

The INNIS01 module receives data frames from the Cnet and passes them on to the INICT12 module for processing. The INICT12 module 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. When the host computer is ready to process more data, it issues a command to the INICT12 module that forwards the data as a reply.

Host Computer

The host computer connects to the INICI12 interface from its RS-232-C port to an RS-232-C port of the NTMP01 termination unit. Two RS-232-C ports are located on the termination unit. The computer normally connects to port zero.

Computer Interface Commands

The INICT12 module receives a command from a host computer, performs the desired action, and then replies to the host computer. The computer interface uses numerous commands for data acquisition, process monitoring and control, and system functions (i.e., security, time, and configuration control). These commands fall into four basic command types: data acquisition, configuration, process control, and system status.

The host computer uses establish point and establish report commands to create the database in the INICT12 module. The module has the capacity to store 10,000 point definitions depending on the point type. The host computer has access to the module database through data acquisition commands.

Data Acquisition

The host computer uses data acquisition commands to acquire process data and system data from controllers in the Symphony system. This includes point data, exception reported data, trend data, module status, and performance statistics for example.

Configuration

The host computer uses configuration commands to define, modify, and view the function block configurations in controllers:

- Download function block configuration.
- Tune function block specifications. Tuning is the process of changing certain function code specifications while the controller is online or executing.
- Read function block outputs.

Process Control

The host computer uses process control commands to handle analog and digital process requirements:

- Change process values: set point, control output, and ratio index.
- Set digital switches.
- Define constants.
- Output values in exception reports.

System

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 status and system performance, and provide password protection.

Mounting Hardware

Harmony rack modules and termination units mount in standard ABB Automation enclosures (CAB-01, CAB-04, CAB-12). The number of modules that can be mounted in a single cabinet varies.

An IEMMU11, IEMMU12, IEMMU21, or IEMMU22 module mounting unit and an NFTP01 field termination panel (FTP) are used for module and termination unit mounting respectively (Fig. 2-6). The mounting unit and termination panel both attach to the side rails in standard 483-millimeter (19-inch) enclosures. Front mount and rear mount MMU versions are available to provide flexibility in enclosure mounting.

A module mounting unit is required to mount and provide power to rack modules. The unit is for mounting controllers, I/O modules, and communication interface modules. The MMU backplane connects and routes:

- Controlway.
- I/O expander bus.
- Logic power to control, I/O, and interface modules.

The Controlway and I/O expander bus are internal cabinet, communication buses. Communication between rack controllers and communication interface modules is over Controlway.

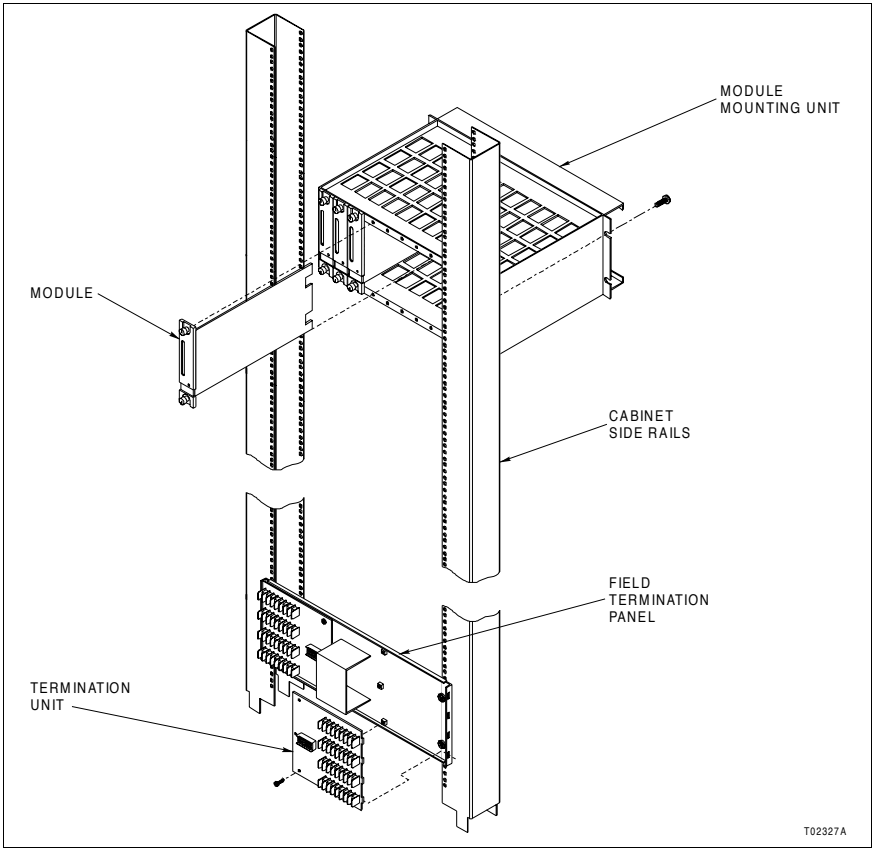

Figure 2-6. Mounting Hardware

Installation

Section 3

Introduction

This section explains the steps necessary to install an INICI12 interface. This instruction discusses only computer interface installation requirements. The instruction does not provide any planning information, and assumes all components have already been purchased and are ready to be installed.

Special Handling

Observe these steps when handling electronic circuitry:

1. ***Use Static Shielding Bag.*** Keep an assembly in its static shielding bag until ready to install it in the system. Save the bag for future use.

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

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

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

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

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

7. ***Use a Grounded Wrist Strap***. Use ABB Automation's field static kit (part number 1948385A1 - consisting of two wrist straps, ground cord assembly, alligator clip, and static dissipative work surface) when working with modules. The kit grounds a technician and the static dissipative work surface to the same ground point to prevent damage to the circuitry by electrostatic discharge. Connect the wrist strap to the appropriate grounding plug on the power entry panel. The ground-

ing plug must be effectively connected to the earth grounding electrode system through the AC safety ground.

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

Unpacking and Inspection

1. Examine the hardware immediately to verify that it has not been damaged in transit.

2. Notify the nearest ABB sales office of any 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 and corrosives.

Installation and Connection Sequence

WARNING	**Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting installation, retrofit, upgrade, or wiring procedures. Failure to do so could result in severe or fatal shock. Do not turn the power on until the installation, retrofit, upgrade, or wiring procedures are complete.** **A rack module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous.**

Figure 3-1 is the INICI12 interface installation and connection flowchart. This flowchart applies whether installing the interface in a new system or in an existing system.

In the flowchart, each flowchart block represents a single task. The PR code in the flowchart block identifies the procedure section that describes the steps to complete the indicated task. For example, turn to section PR3 to read about module

installation. Some steps are self-explanatory and have no related procedure section. Complete all steps given in a procedure section before continuing to the next flowchart block. The procedure sections are located towards the back of the instruction.

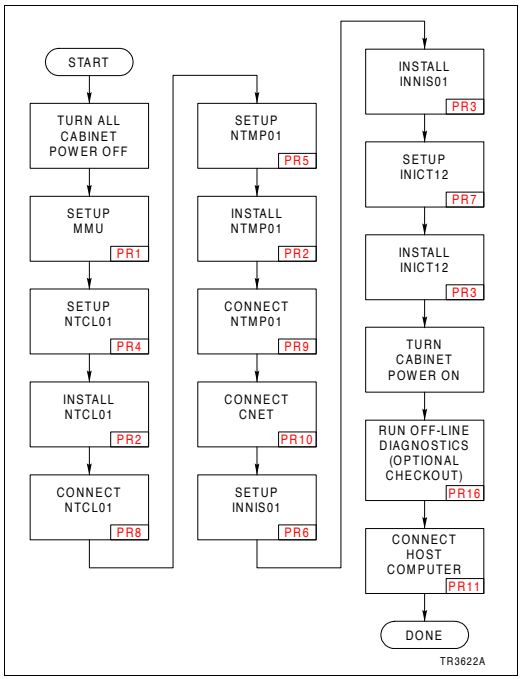

Figure 3-1. Installation and Connection Flowchart

Operating Procedures

Section 4

Introduction

After completing the steps detailed in the installation section, the modules of the INICI12 interface 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. On power up, the INNIS01 module microprocessor stays in reset until the INICT12 module removes the reset and allows the firmware to execute self-diagnostic routines. The INICT12 module determines when the INNIS01 module will go online. The INNIS01 module comes online in the network mode set by switch SW3, with the type of counter display set by switch SW4.

Group A and B LEDs

Use the faceplate group A and B 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. The group A and B LEDs on the module faceplate display a binary value of the event counter selected with switch SW4. LED B8 is the most significant bit; LED A1 is the least significant bit. Refer to Table PR6-5 for a list of event types and their counter addresses.

Error Counters

Errors such as receive errors, transmit errors, and dumped messages are maintained in internal counters like events are.

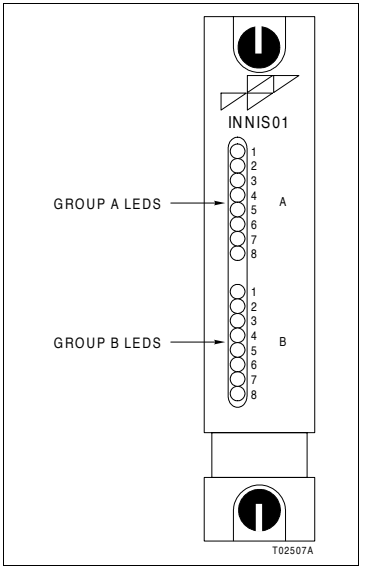

Figure 4-1. INNIS01 Faceplate

Refer to Table PR6-6 for a list of error types and their counter addresses. Table 5-1 lists the error codes and corrective actions for errors that can display on the INNIS01 module faceplate LEDs.

INICT12 Computer Transfer

Figure 4-2 shows the INICT12 module faceplate. It has the following features:

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

Status LED

The status LED displays the operating status of the INICT12 module. It is a two-color LED that has three possible states described in Table 4-1. Refer to Section 5 for corrective actions if the status LED indicates that an error exists.

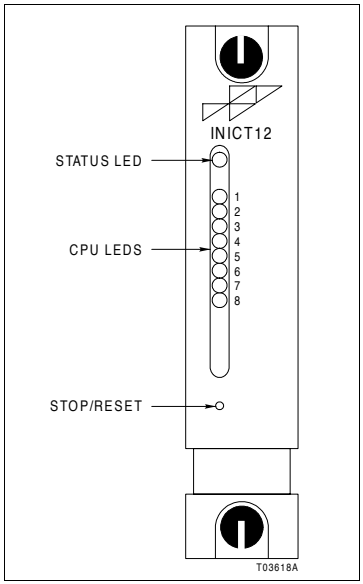

Figure 4-2. INICT12 Faceplate

Table 4-1. INICT12 Status LED

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

CPU LEDs

During normal operation the eight CPU LEDs keep a count of the commands and replies that pass through the INICT12 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

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

First Press Stop — Press the button once to halt operation. The electronics conduct an orderly shutdown after stop is initiated then turn the status LED on red. Wait for the status LED to turn red before removing the INICT12 module (or the INNIS01 module) from the module mounting unit.

Second Press Reset — Press the button a second time to initiate a hardware reset. A hardware reset is required to recover from a module time-out or a manual stop (single press). This also restores the module to power up values.

NOTE: If the module has already stopped due to an error (i.e., status LED on red), a single press resets the module.

Operating Modes

The INICT12 module has two modes of operation: execute and error.

Execute

Execute mode is the normal mode of operation. In this mode the INICT12 module performs its computer interface functions as described in Section 2 giving the host computer access to Cnet and Cnet nodes. The interface firmware permits the configuration of the interface from the host computer.

Error

The INICT12 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.

Module Integrity

All communication modules have normal Symphony system security functions that insure module integrity. The INICT12

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

Hardware Checks

The INICT12 module performs the following hardware checks:

Illegal Address Detection — Detecting an illegal address generates a bus error and the module halts operation. It also displays an error code on the faceplate LEDs.

Machine Fault Timer — The microprocessor updates the machine fault timer. If the microprocessor fails to reset the MFT timer, it expires. When a time-out occurs, the module stops and the status LED turns red.

Software Checks

The INICT12 module performs the following software checks:

Module Diagnostics — The module diagnostic routines execute automatically on system power up. If the diagnostic tests fail, the faceplate LEDs display error conditions, the status LED turns on 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 computer interface utilities are available by attaching a computer or diagnostic terminal to port one of the NTMP01 termination unit. Enable the utilities with the INICT12 module switch SW4 (Table PR7-1). The following utility options are available:

1 --> TALK90
2 --> Configure/View callup password
3 --> Computer command/reply sequence (off)
4 --> Set local time/date
5 --> Monitor mode (off)
6 --> Real Value Conversion

7 --> Port address (-1)
9 --> Default Time Sync accuracy (3)

NOTE: The *HyperTerminal* option in Windows NT® can be used to access the utilities from a computer connected to port one.

TALK90

Enter **1** to select the *TALK90* option. A menu of all the TALK90 commands available to the computer interface will display. The INICT12 module must be online and must be properly licensed to use most of the commands. An unlicensed INICI12 interface will display the following message when attempting to use any of the utility options:

Security Startup Needed

To use any of the listed utilities, enter the number associated with the desired command to execute at the *Select Command:* prompt, then press **ENTER**. Follow the prompts on the screen. While using the TALK90 utilities, the CPU LEDs on the INICT12 module will display the count of commands and replies that were sent and received.

Restart

Use the *Restart* command to put the module online if it is not already. To execute the restart command:

1. Type:

   19 ENTER

2. Enter the following values when prompted:

   Key? **0 ENTER**

   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:
8 = New Checksumming Algorithm
4 = Bad Quality Alarm Management
2 = Add Wall Clock Offset to Time Stamp
1 = Return Time Stamp

Sum? **0 ENTER**

The computer interface should return a reply code of zero followed by the node and loop address. For example:

Response → 0
No Error

Node Number: 2
Loop Number: 1

<RET> to continue

If the computer interface is functioning properly, the utilities menu will appear again. The INNIS01 module should then go online and the computer interface will be able to communicate with Cnet nodes.

3. Type **ENTER** to continue. The TALK90 utility menu should appear.

Configure/View Call-Up Password

Enter **2** to select the *Configure/View callup password* option. This option allows a password to be created or 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 define a password. 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 return to the utilities menu.

NOTE: This option defines the password for the INICT12 ports. To use this feature, the password protection option (switch SW4) on the INICT12 module must be enabled (Table PR7-1).

Computer Command/Reply Sequences

Enter **3** to toggle the *Computer command/reply sequence* option. When enabled, the computer interface will 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*. The following example shows a restart command followed by a demand module status command.

```
CS 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
```

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

Set Local Time and Date

Enter **4** to select the *Set local time/date* option. The following information will display:

0:0:0 Saturday 3/1/1980 Change (Y/N)?

Answer **Y** to cause the time utilities menu to display:

TIME Utilities

0 –> Read Time
1 –> Read Absolute Time
2 –> Display Clock
3 –> Set Absolute Time
4 –> Set Wall Time
5 –> Set Loop Time
6 –> Convert Time Stamp to Date and Time
Q –> Quit (to main menu)

Select option:

Select the desired function and follow the screen prompts to complete the task.

Monitor Mode

Enter **5** to toggle the *Monitor Mode* option. When enabled (on), 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

Enter **6** to select the *Real Value Conversion* option. The utility performs real value conversions and displays them on the screen. The following information displays:

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

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

Enter **7** to select the *Port Address* option. This 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.

NOTE: To use this feature, the port addressing mode (switch SW4) on the INICT12 module must be enabled (Table PR7-1).

Time-Sync Accuracy

Enter **9** to select the *Default Time Sync accuracy* option. The 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:

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

This section provides troubleshooting information necessary to isolate INICI12 interface errors. It is not meant to be all inclusive. If a problem exists that cannot be corrected using the information provided in this instruction, contact a local ABB service office for assistance.

Troubleshooting Procedures

Troubleshooting the INICI12 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 the specific HSI workstation being used for information on module status reports.

Error Codes

All Cnet communication modules have faceplate LEDs that serve as error code displays. The INNIS01 module has event and error counters that are selectable.

INNIS01

The INNIS01 module error counters total errors in the same manner as the event counters total events. Table PR6-6 lists the types of error counters. The module halts operation if a fatal error condition occurs. Group A LEDs on the module faceplate display error codes. Group B LEDs are off when group A LEDs are displaying any error code. Refer to Table 5-1 for a list of error codes and associated corrective actions.

INICT12

If errors occur while the INICT12 module is operating, the status LED turns on red and the CPU LEDs on the module faceplate display error codes. Table 5-2 lists the INICT12 module

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.
32	0 0 1 1 0 0 1 0	Address or bus error	1. Reset INICT12 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 switches SW1 through SW4.
3E	0 0 1 1 1 1 1 0	INNIS01/device handshake failure	1. Verify that a dipshunt exists between INNIS01 and INICT12 modules. 2. If dipshunt exists, replace INNIS01 or INICT12 module.

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

Table 5-2. INICT12 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	
31	0 0 1 1 0 0 0 1	Memory or CPU fault	Replace IINICT12 module.
32	0 0 1 1 0 0 1 0	Address or bus error	1. Reset INICT12 module. 2. Replace INICT12 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.

Table 5-2. INICT12 Error Codes *(continued)*

Code	LEDs	Condition	Corrective Action
	8 7 6 5 4 3 2 1		
3F	0 0 1 1 1 1 1 1	Module halted. Stop pushbutton on INICT12 module pressed	Reset INICT12 module.

NOTE: 0 = LED off, 1 = LED on.
1. Codes are displayed only when the INICT12 module is halted and the status LED is red.

error codes and associated corrective actions. The module displays error codes only when it is halted.

A code that is not on the list may appear if a machine fault time-out occurs. Reset the INICT12 module if this happens. The module has failed if the status LED remains red. Replace the module in this case.

Diagnostics

The firmware of the INICT12 and INNIS01 modules contain various diagnostic routines used to verify proper operation of components and circuitry. Some are run automatically during startup and normal operation (online), and others can be invoked manually (offline). If any of the online checks detect a hardware problem, the module will provide error status code indications (if possible) and will halt. Refer to Tables 5-1 and 5-2 to decipher the status codes.

The offline tests can be run to verify operation of a suspect INICT12 module or to check module integrity before putting the module into operation. The offline diagnostics should only be run during installation or when the system is down. Refer to procedure section PR16 for the steps to run offline diagnostics. Putting the INICT12 module into diagnostic mode allows the module to perform a variety of diagnostic tests but suspends normal operation.

INICT12 Status Summary

The INICT12 module has a 16-byte module status record that provides summary flags for error conditions, module type, and firmware revision level. Table 5-3 lists the fields that make up the INICT12 module status report and Table 5-4 describes each field within the module status record.

The status report can be viewed from a human system interface. To interpret the status bytes:

1. Convert each hexadecimal byte to its binary equivalent. For example:

Byte 1	0x75 = 01110101

Refer to Tables 5-3 and 5-4 and for an explanation of each byte and data bit.

Bit 7	0 = no errors.
Bit 6/5	11 = execute mode.
Bit 4-0	10101 = enhanced node type; reference byte 6 (ETYPE) for actual type.

Table 5-3. INICT12 Status Byte Description

Byte	Bit							
	7	6	5	4	3	2	1	0
1	ES	MODE		TYPE				
2	FTX		RIO	LIO	CFM			ERM
3	CSP	MOV		LOP	SDF	NODE TYPE		
4	NSF	LR1	LR2	LT1	LT2	RI1	RI2	RCF
5	HOST							
6	ETYPE							
7 - 8	Reserved							
9	NDT1	NDT2			NCD1	NCD2		
10 - 13	Reserved							
14	Module nomenclature							
15	Revision letter (ASCII)							
16	Revision number (ASCII)							

Table 5-4. INICT12 Status Bit Descriptions

Byte	Field	Field Size or Value	Description
1	ES	80	Error summary: 0 = good, 1 = errors.
	MODE	60	Module mode: 10 = error, 11 = execute.
	TYPE	1F	Module type: 0x15 = enhanced status (ETYPE).

Table 5-4. INICT12 Status Bit Descriptions *(continued)*

Byte	Field	Field Size or Value	Description
2	FTX	80	First time in execute: 0 = no, 1 = yes
	RIO	20	Summary remote input status: 0 = good, 1 = bad
	LIO	10	Summary local input status: 0 = good, 1 = bad
	CFM	08	Module in configure mode: 0 = no
	ERM	01	Module in error mode (MODE = 10): 0 = no, 1 = yes
3	CSP	80	Communication status problem: 0 = no, 1 = yes
	MOV	40	Memory overflow: 0 = good, 1 = bad
	LOP	10	Offline bridge for remote loop: 0 = no, 1 = yes
	SDF	01	Security device failure
	NODE TYPE	07	Node type: 0 = computer interface
4	NSF	80	Node environment status flag: 0 = good, 1 = bad
	LR1	40	Cnet 1 receive error: 0 = no, 1 = yes
	LR2	20	Cnet 2 receive error: 0 = no, 1 = yes
	LT1	10	Cnet 1 transmit error: 0 = no, 1 = yes
	LT2	08	Cnet 2 transmit error: 0 = no, 1 = yes
	RI1	04	Receiver idle on channel 1 of central loop: 0 = no, 1 = yes
	RI2	02	Receiver idle on channel 2 of central loop: 0 = no, 1 = yes
	RCF	01	Ring communication failure: 0 = no, 1 = yes
5	HOST	FF	Value set by the computer (when nonzero, ES = 1)
6	ETYPE	20	Enhanced module type: 0x20 = INICT12
7 - 8	—	00	Reserved
9	NDT1	01	NIS loop relay drive transistor 1 failure
	NDT2	01	NIS loop relay drive transistor 2 failure
	NCD1	01	NIS receive channel 1 disable
	NCD2	01	NIS receive channel 2 disable
10 - 13	—	—	Reserved
14	—	FF	Module nomenclature: 0x0C = INICT12
15	—	FF	Revision letter (in ASCII code). For example, 0x41 = A
16	—	FF	Revision number (in ASCII code). For example, 0x30 = 0

INNIS01 Edge Connectors

Tables 5-5, 5-6, and 5-7 list the INNIS01 module edge connector pin assignments.

Table 5-5. 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 5-6. 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 5-7. 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 (-)

INICT12 Edge Connectors

Tables 5-8, 5-9, and 5-10 list the INICT12 module edge connector pin assignments.

Table 5-8. P1 Pin Assignment (INICT12)

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

Table 5-9. P2 Pin Assignments (INICT12)

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 5-10. P3 Pin Assignments (INICT12)

Pin	Signal	Pin	Signal
1	Unused	16	Unused
2	Unused	17	Unused
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 (+)	30	Digital output (-)

NOTE: A = port 0; B = port 1.

Maintenance

Section 6

Introduction

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

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

Personnel responsible for maintenance should be familiar with the Harmony rack modules, have experience working with process control systems, and know what precautions to take when working on live AC systems.

Preventive Maintenance Schedule

Table 6-1 is the preventive maintenance schedule for the INICI12 interface modules. The table lists the preventive maintenance tasks in groups according to their specified maintenance interval. Some tasks in Table 6-1 are intuitive or self explanatory. Instructions for tasks that require further explanation are covered in the indicated procedure section.

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

Table 6-1. Preventive Maintenance Schedule

Task	Procedure	Frequency
General cleaning. Use a lint-free cloth and mild, all-purpose, non-flammable, commercial spray cleaner to remove dirt, fingerprints, and grease from the module. Spray the cleaner on the cloth and not directly on the equipment.	N/A	As required
Check and clean modules and termination units.	PR14	

Table 6-1. Preventive Maintenance Schedule *(continued)*

Task	Procedure	Frequency
Check module for dust. Clean as necessary using an antistatic vacuum. Insure air vents are free of dust and lint.	N/A	3 months
Check all signal, power, ground, and cable connections associated with the modules; verify they are secure.	PR15	
Complete all tasks in this table.	N/A	Shutdown

Repair and Replacement

Section 7

Introduction

This section explains repair and replacement procedures for INICI12 interface.

Repair

INICI12 interface repair is limited to assembly replacement. If a module or termination unit fails, remove and replace it with another. Do ***not*** attempt to replace discrete components in any Harmony device.

Replacement

WARNING	**Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting the termination unit removal procedure. Failure to do so could result in severe or fatal shock. Do not turn the power on until the replacement procedure is complete.** **A rack module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous.**

The replacement procedures for most parts and assemblies are intuitive. Figure 7-1 is the INICI12 interface replacement flowchart, which contains replacement procedures for those parts and assemblies that need explanation.

In the flowchart, each flowchart block represents a single task. The PR code in the flowchart block identifies the procedure section that describes the steps to complete the indicated task. Some steps are self-explanatory and have no related procedure section. Complete all steps given in a procedure section before continuing to the next flowchart block. The procedure sections are located towards the back of the instruction.

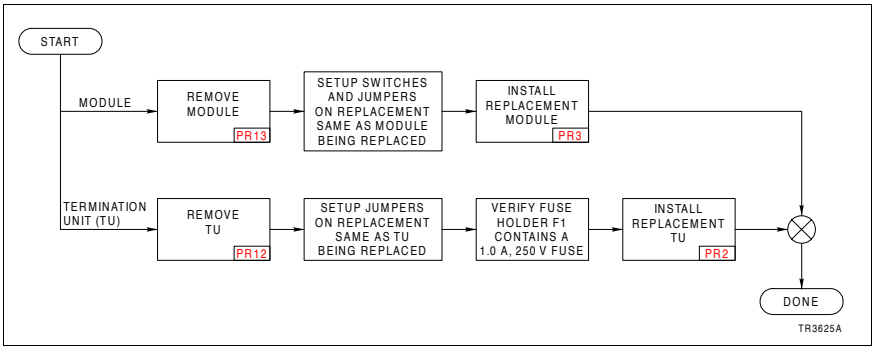

Figure 7-1. Replacement Flowchart

Replacement and Spare Parts

Section 8

Parts

Order parts without commercial descriptions from the nearest ABB sales office. Contact ABB Automation for help determining the quantity of spare parts to keep on hand for your particular system. Tables 8-1 through 8-3 list INICI12 interface related parts.

Table 8-1. Miscellaneous Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12	
I	**N**	**I**	**C**	**I**	**1**	**2**	**-**	**2**	**3**	**2**	**L**	**Cnet-to-Computer Interface: INICT12, INNIS01, NTCL01, NTMP01, and Cables**
I	**N**	**I**	**C**	**T**	**1**	**2**						**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 Nomenclature

1	2	3	4	5	6	7	8	9	10	
N	**K**	**L**	**S**	**0**	**1**	**-**	**1**	**0**		**INNIS01 to NTCL01 Termination Unit Cable (PVC)**
N	**K**	**L**	**S**	**1**	**1**	**-**	**1**	**0**		**INNIS01 to NTCL01 Termination Unit Cable**
N	**K**	**T**	**U**	**0**	**1**	**-**	**1**	**0**		**INICT12 to NTMP01 Termination Unit Cable (PVC)**
N	**K**	**T**	**U**	**1**	**1**	**-**	**1**	**0**		**INICT12 to NTMP01 Termination Unit Cable**
N	**K**	**T**	**L**	**0**	**1**	**-**	**3**			**Cnet Termination Cable -** 0.9 m (3 ft.)
N	**K**	**T**	**T**	**0**	**1**	**-**	_	_	_	**Node to Node Cnet Termination Cable**
										Cable Length
							x	x	x	1 to 500 for 0.3 to 152.4 m (1 to 500 ft.)

Table 8-3. Miscellaneous Parts

Part Number	Description
1946715A12	Dipshunt (12-position, 24-pin)
1946715A8	Dipshunt (8-position, 16-pin)
1946984A1	Jumper
194776A11001	1.0 A, 250 V, normal fuse
NFWAB17010	0.19-16 (no.10) × 5/8 in., Phillips-head, thread-forming screw
NTLAC19000	0.19 in. (no. 10), external tooth, lockwasher

Module Mounting Unit Setup

PR1

Purpose/Scope

10 min.

This procedure describes the steps required to properly set up the IEMMU11, IEMMU12, EMMU21, or IEMMU22 Module Mounting Unit for the INICI12 interface.

Prerequisites

- Module mounting unit installed.

Parts

Number	Qty	Description
1946715A12	1	Dipshunt (12-position, 24-pin)

Tools

None.

Safety Considerations

WARNING

1. Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting installation, retrofit, upgrade, or wiring procedures. Failure to do so could result in severe or fatal shock. Do not turn the power on until the installation, retrofit, upgrade, or wiring procedures are complete.

Procedure

☐ 1. Verify the MMU slot assignments for the INNIS01 and INICT12 modules.

☐ 

2. From the front of the module mounting unit insert a 24-pin dipshunt with all pins intact in the I/O expander bus socket (XU1 to XU11) between the MMU slot to be used by the INNIS01 module and the slot to be used by the INICT12 module.

☐ 3. Remove any 24-pin dipshunts from the I/O expander bus sockets that would connect the INNIS01 and INICT12 modules to any other modules.

Figure PR1-1 shows an example MMU configuration.

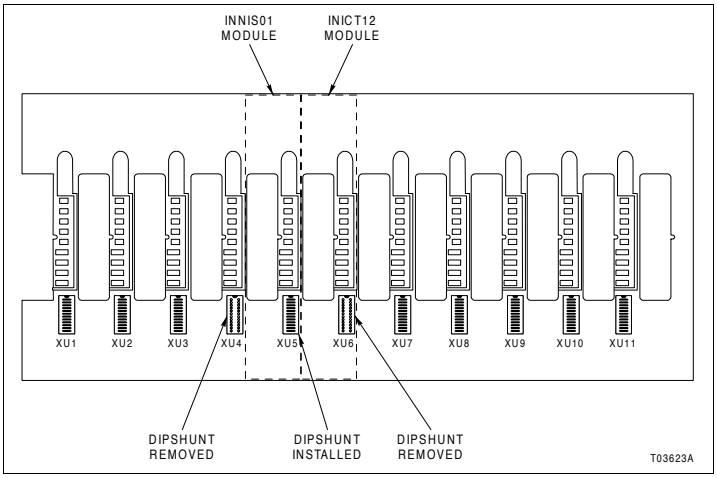

Figure PR1-1. MMU Configuration Example (Front View)

Termination Unit Installation

PR2

Purpose/Scope

5 min.

This procedure describes the steps required to mount an NTCL01 or NTMP01 termination unit on the NFTP01 Field Termination Panel.

Prerequisites

- NTFP01 panel installed.

Parts

Number	Qty	Description
NFWAB17010	3	0.19-16 (no.10) × 5/8 in., Phillips-head, thread-forming screw
NTLAC19000	1	0.19 in. (no. 10), external tooth, lockwasher

Tools

- Phillips screwdriver.

Safety Considerations

WARNING

1. Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting installation, retrofit, upgrade, or wiring procedures. Failure to do so could result in severe or fatal shock. Do not turn the power on until the installation, retrofit, upgrade, or wiring procedures are complete.

Procedure

☐ 

1. Position the termination unit on the NTFP01 panel. Insert the tabs of the termination unit into the slots of the panel standoff as shown in Figure PR2-1.

☐ 2. Attach the termination unit to the panel using two screws.

☐ 3. Connect chassis ground to the termination unit by installing a screw with lockwasher in the location shown in Figure PR2-2.

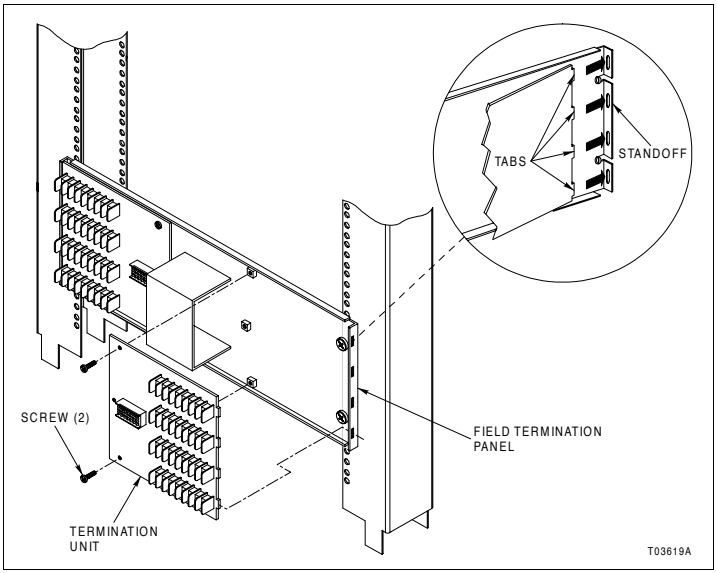

Figure PR2-1. Termination Unit Attachment

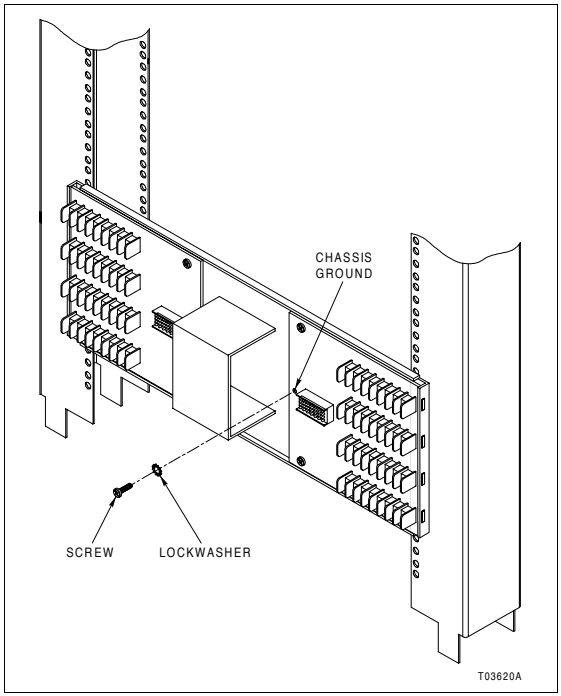

Figure PR2-2. Chassis Ground Connection

Module Installation

PR3

Purpose/Scope

1 min.

This procedure describes the steps required to install an INNIS01 or INICT12 module into the module mounting unit (MMU). A rack module can be installed with power on.

Parts None.

Tools None.

Safety Considerations

WARNING	**1. A rack module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous.**

Procedure

☐ 1. Verify the MMU slot assignment for the module.

☐ 

2. Align the module with the top and bottom guide rails, then slide the module into the module mounting unit (Fig. PR3-1).

☐ 3. Push on the faceplate until the module is firmly seated into the MMU backplane connectors. The module faceplate should be flush with the MMU frame.

☐ 4. Turn the two latching screws ½-turn to lock the module in place. The slot on both latching screws should face the center of the module faceplate.

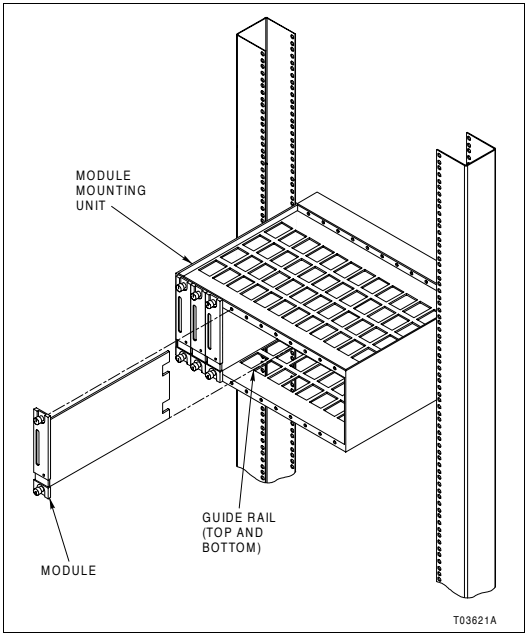

Figure PR3-1. Module Installation

Purpose/Scope

2 min.

This procedure describes the steps required to set up the NTCL01 termination unit for use with the INICI12 interface (Fig. PR4-1).

Parts None.

Tools
- Needlenose pliers (optional).

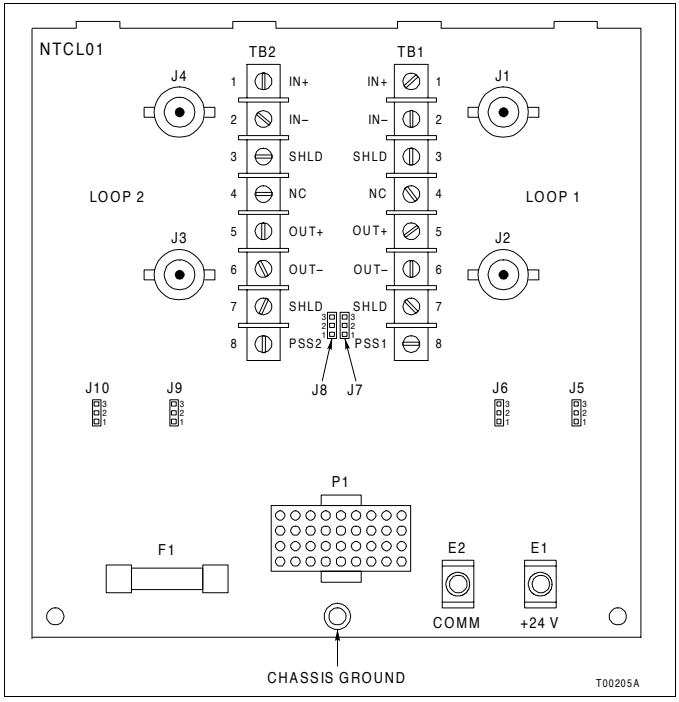

Figure PR4-1. NTCL01 Layout

Procedure

☐ 1. Set jumpers J5 through J10 according to the type of Cnet cable being used (Table PR4-1). J5, J6, and J7 are for loop one and J8, J9, and J10 are for loop two.

Table PR4-1. NTCL01 Jumpers J5 to J10

Cable Type	J5 - J7 (Loop 1)	J8 - J10 (Loop 2)
Twinaxial		
Coaxial		

☐ 2. Verify there is a 1.0 A, 250 V fuse in the F1 fuse holder.

Purpose/Scope

5 min.

This procedure describes the steps required to set up the NTMP01 termination unit for use with the INICI12 interface (Fig. PR5-1).

Parts None.

Tools
- Needlenose pliers (optional).

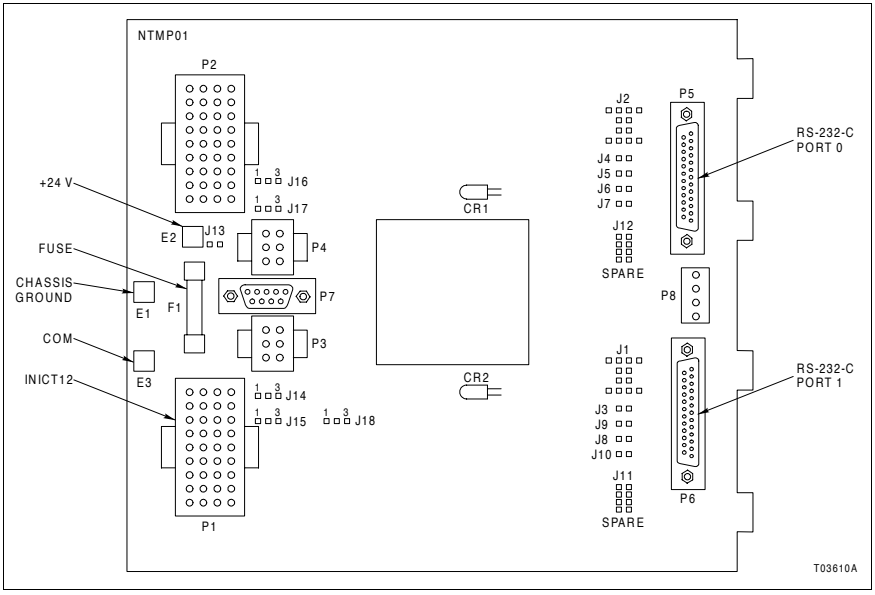

Figure PR5-1. NTMP01 Layout

Normally, port zero (P5) is used for host computer connection and port one (P6) is used for diagnostic terminal or security key connection. Jumpers on the NTMP01 unit along with the INICT12 module switches determine the operation of the ports.

Procedure

NOTES:

1. Jumpers J11 and J12 are storage posts for extra jumpers.

2. Baud rate, data bits, parity, and stop bits for the RS-232-C ports are set by switches on the INICT12 module.

☐ 1. Determine the requirements of the application and set the desired serial port operation with jumpers J1 (P6, port one) and J2 (P5, port zero): DTE, DCE, loopback test, nonhandshake, and security key (Table PR5-1). These jumpers configure the RXD, TXD, RTS, and CTS signals. Figure PR5-1 shows the jumper signal connections.

Table PR5-1. NTMP01 Jumpers J1 and J2 - Port Operation

Option	J2 (Port 0)	J1 (Port 1)
DTE	1 3 4 2 5 6 7 8 11 9 10 12	1 3 4 2 5 6 7 8 11 9 10 12
DCE	1 3 4 2 5 6 7 8 11 9 10 12	1 3 4 2 5 6 7 8 11 9 10 12
Loopback	1 3 4 2 5 6 7 8 11 9 10 12	1 3 4 2 5 6 7 8 11 9 10 12
Nonhandshake	1 3 4 2 5 6 7 8 11 9 10 12	1 3 4 2 5 6 7 8 11 9 10 12
Security key	Not applicable	1 3 4 2 5 6 7 8 11 9 10 12

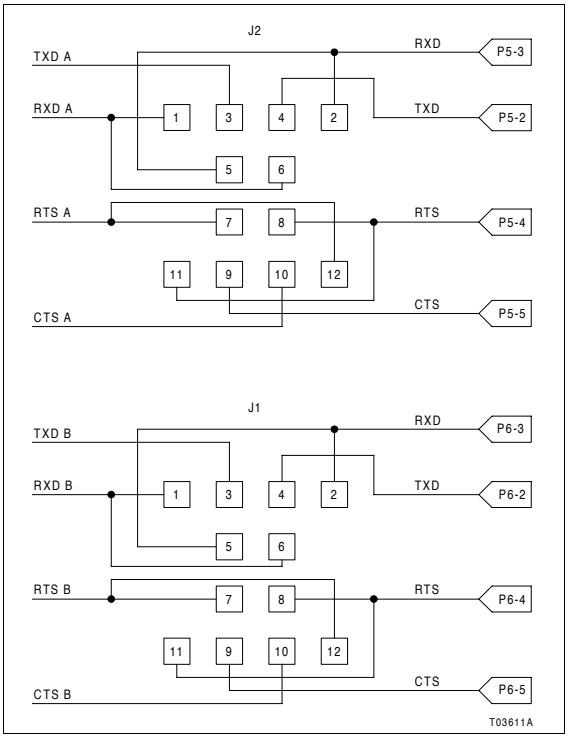

Figure PR5-2. NTMP01 Jumpers J1 and J2 - Port Operation

☐ 2. Jumpers J3 (port one) and J4 (port zero) connect the cable shield at pin one (protective ground) to chassis ground (Table PR5-2). The cable shield should be grounded at either end but never both ends.

Table PR5-2. NTMP01 Jumpers J3 and J4 - Cable Shield

Option	J4 (Port 0)	J3 (Port 1)
Connect cable shield (default setting)	[1 2]	[1 2]
Disconnect cable shield	1 2	1 2

☐ 3. Jumpers J5 through J10 set the handshake signals for the serial ports (DSR, DCD, and DTR) and must be set to match the equipment being connected. Set the port zero handshake control signals with J5, J6, and J7 and the port zero handshake control signals with J8, J9, and J10 (Table PR5-3). Figure PR5-3 shows the jumper signal connections.

NOTE: Normally jumpers J5 through J10 are installed to the +12 VDC supply which corresponds to a logic zero. Removing any of these jumpers allows the signal to float.

Table PR5-3. NTMP01 Jumpers J5 to J10 - Handshake Signals

Option	J5, J6, and J7 (Port 0)	J8, J9, and J10 (Port 1)
Enable (default setting)	1 2	1 2
Disable	1 2	1 2

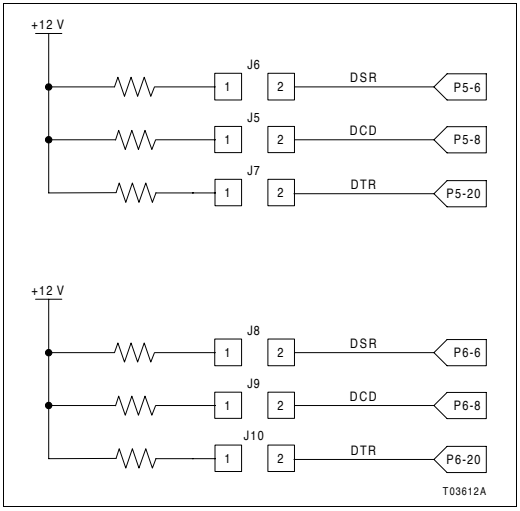

Figure PR5-3. NTMP01 Jumpers J5 to J10 - Handshake Control

☐ 4. Jumpers J13 through J 18 are not used in this application. Verify they are set as shown in Table PR5-4.

Table PR5-4. NTMP01 Jumpers J13 to J18

Jumper	Setting
J13	[1 2]
J14, J15, J16, J17	[1 2] 3
J18	1 [2 3]

☐ 5. Verify there is a 1.0 A, 250 V fuse in the F1 fuse holder.

Purpose/Scope

10 min.

This procedure describes the steps required to set up the INNIS01 module of the INICI12 interface (Fig. PR6-1). Both dipswitches and jumpers must be set before putting the module into operation.

Parts None.

Tools Needlenose pliers (optional).

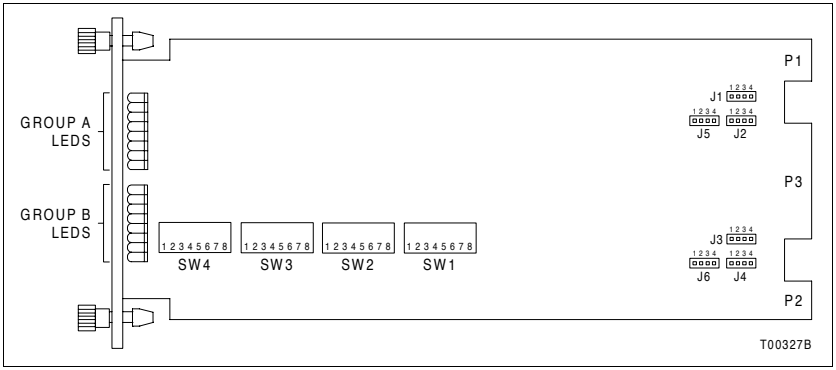

Figure PR6-1. INNIS01 Layout

Procedure

☐ 1. Set the node address with switch SW1 (Fig. PR6-1). The address must be unique. Valid node addresses are from one to 250. Table PR6-1 provides some example node address settings.

Table PR6-1. INNIS01 Switch SW1 - Node Address

Address Example	Switch 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

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

☐ 2. Set the Cnet loop number on which the interface resides with switch SW2. All nodes on a loop must be set to the same loop number. Valid loop numbers are from one to 250. Table PR6-2 provides some example loop number settings.

Table PR6-2. INNIS01 Switch SW2 - Loop Number

Address Example	Switch 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

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

☐ 3. Set the module operating mode with switch SW3 (Table PR6-3).

Table PR6-3. INNIS01 Switch SW3 - Operating Mode

Pole	Setting	Function
1	0	Normal operation; Cnet-to-computer interface mode.
2	0	Disable ROM checksums.
	1	Enable ROM checksums; normal operation. It is recommended to leave checksums enabled to take full advantage of the on-board diagnostics.
3[1]	0	Disable test mode; normal operation.
	1[2]	Enable test mode; no time-out for handshake failure.
4[1]	0	Disable test mode; normal operation.
	1[2]	Enable test mode; all loop messages return a busy negative acknowledgment.

Table PR6-3. INNIS01 Switch SW3 - Operating Mode *(continued)*

Pole	Setting	Function
5	0	Disable loop idle condition display; LED display as defined by switch SW4.
	1	Enable loop idle condition display; 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.
6	0	Disable diagnostics mode; normal operation.
	1[2]	Enable diagnostics mode.
7/8	0/0	10-MHz network mode.
	0/1	2-MHz network mode.
	1/0	Unused.
	1/1	Unused.

NOTE: 1 = open or off, 0 = closed or on.
1. Pole four in conjunction with pole three makes the node appear to be busy to other nodes. This setting is used by ABB personnel only.
2. Testing modes interfere with normal operation.

☐ 4. Set the I/O expander bus address to zero with poles one through three of switch SW4 (Table PR6-4).

Table PR6-4. INNIS01 Switch SW4 - I/O Expander Bus Address

Address	Switch Pole (Binary Value)		
	1 (4)	2 (2)	3 (1)
0	0	0	0

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

☐ 5. Set the faceplate LED display option with poles four through eight of switch SW4. The poles select the address of an on-board event and error counter that the INNIS01 module is to display using the group A and B faceplate LEDs. LED B8 is the most significant bit. LED A1 is the least significant bit. Table PR6-5 lists the event counter addresses. Table PR6-6 lists the error counter addresses.

Example of Counter Usage

A counter setting with the hexadecimal value of 0x10 keeps track of the number of messages transmitted or the total loop traffic. To display this counter on the front panel LEDs, set dipswitch SW4 as follows: position 4 = open (on), 5 = closed (off), 6 = closed (off), 7 = closed (off), and 8 = closed (off).

Table PR6-5. INNIS01 Switch SW4 - Event Counter Address

Switch Pole (Binary Value)					Value	Description
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
0	0	0	0	0	0x00	Number of timer interrupts.
0	1	0	0	1	0x09	Number of multicast messages received (excluding originated messages).
0	1	0	1	0	0x0A	Number of multicast destinations received.
0	1	0	1	1	0x0B	Number of time-sync messages received (excluding originated messages).
0	1	1	0	0	0x0C	Number of broadcast messages received (excluding originated messages).
0	1	1	0	1	0x0D	Number of NIS poll messages received (excluding originated messages).
0	1	1	1	0	0x0E	Number of poll messages acknowledged by this node.
0	1	1	1	1	0x0F	Number of poll messages busy negative acknowledged by this node.
1	0	0	0	0	0x10	Number of messages transmitted (total loop traffic); **normal operation**.
1	0	0	0	1	0x11	Number of loop messages received and forwarded by this node.
1	0	0	1	0	0x12	Number of messages originated by this node (including retries).
1	0	0	1	1	0x13	Number of message retries originated by this node.
1	0	1	0	0	0x14	Number of transmitted message watchdog expirations.
1	0	1	0	1	0x15	Number of messages put into the receive buffer and retained.
1	0	1	1	0	0x16	Number of bytes originated by this node (including retries).
1	0	1	1	1	0x17	Number of bytes received and forwarded by this node.
1	1	0	0	0	0x18	Number of I/O expander bus to INNIS01 handshakes.
1	1	0	0	1	0x19	Number of I/O expander bus to transmit buffer signals.
1	1	0	1	0	0x1A	Number of I/O expander bus HCU status requests.
1	1	0	1	1	0x1B	Number of I/O expander bus INNIS01 status requests.
1	1	1	0	0	0x1C	Number of I/O expander bus interrupts with invalid status.
1	1	1	0	1	0x1D	Number of transmit buffer realignments due to invalid contents.
1	1	1	1	0	0x1E	Number of receive buffer realignments.
1	1	1	1	1	0x1F	Number of status buffer realignments.

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

Table PR6-6. INNIS01 Switch SW4 - Error Counter Address

Switch Pole (Binary Value)					Value	Description
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
0	0	0	0	1	0x01	Number of receive errors on loop 1.
0	0	0	1	0	0x02	Number of receive errors on loop 2.
0	0	0	1	1	0x03	Number of transmit errors for this node.
0	0	1	0	0	0x04	Number of messages lost to receive queue overflow.
0	0	1	0	1	0x05	Number of messages dumped with circulation count errors.
0	0	1	1	0	0x06	Number of messages dumped with destination count or message-type errors.
0	0	1	1	1	0x07	Number of messages dumped with source-state errors.
0	1	0	0	0	0x08	Number of messages tempted with source-sequence mismatch.

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

☐ 6. Set the communication rate of the receiver analog circuit with jumpers J1 through J6 (Table PR6-7). All six jumpers must be set in the same position. The jumper setting must match the communication rate set on switch SW3 (refer to Table PR6-3).

Table PR6-7. INNIS01 Jumpers J1 to J6 - Loop Mode

Option	J1 - J6
10 Mhz	1 2 [3 4]
2 MHz	1 [2 3] 4

INICT12 Setup

PR7

Purpose/Scope

10 min.

This procedure describes the steps required to set up the INICT12 module of the INICI12 interface (Fig. PR7-1). Both dipswitches and jumpers must be set before putting the module into operation. The switches determine both the operation of the module and the operation of the RS-232-C ports located on the NTMP01 termination unit.

Parts None.

Tools Needlenose pliers (optional).

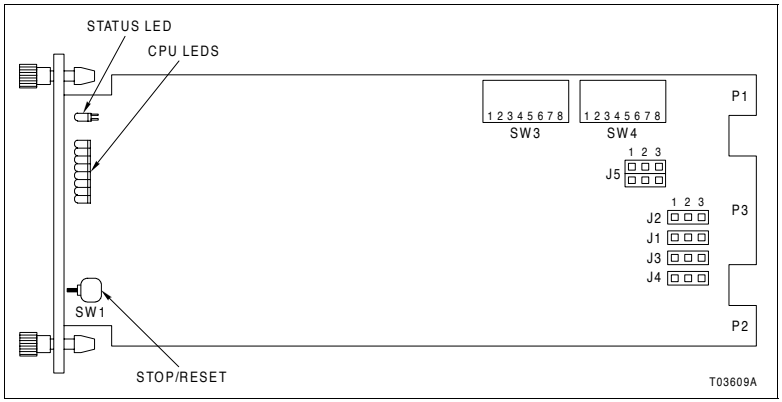

Figure PR7-1. INICT12 Layout

Procedure

☐ 1. Set the module operating mode with switch SW3 (Table PR7-1).

☐ 2. Set the port options with switch SW4 (Table PR7-2).

Table PR7-1. INICT12 Switch SW3 - Operating Mode

Pole	Setting	Function
1	0	Disable offline hardware diagnostics; normal operation.
	1	Enable offline hardware diagnostics.
2	0	Disable NIS diagnostics; normal operation.
	1	Enable NIS diagnostics.
3	0	Disable Cnet diagnostics; normal operation.
	1	Enable Cnet diagnostics.
4	0	Enable NIS handshake time-out; normal operation.
	1	Disable NIS handshake time-out.
5	0	Enable ROM checksums; normal operation. It is recommended to operate with checksums enabled to take full advantage of the on-board diagnostics.
	1	Disable ROM checksums.
6	0	Disable modem password protection.
	1	Enable modem password protection. Refer to ***Utilities*** in Section 4.
7[1]	0	Disable port addressing mode.
	1	Enable port addressing mode. Refer to ***Utilities*** in Section 4.
8[2]	0	Disable port 1 utility option; use when connecting a host computer or security key to port 1.
	1	Enable port 1 utility option; use when connecting a diagnostic terminal to port 1. Refer to ***Utilities*** in Section 4.

NOTE: 1 = open or off, 0 = closed or on.
1. When this option is enabled, the module expects all commands from the host computer to include the port address configured through the utilities menu as the first character of each command.
2. Enabling the port one utility option automatically overrides switch SW4 port one settings. Port one defaults to eight data bits, one stop bit, and no parity bit.

Table PR7-2. INICT12 Switch SW4 - Port Options

Pole	Setting	Function
1/2	0/0	Ports 0 and 1: 8 data bits, 1 stop bit, no parity
	0/1	Ports 0 and 1: 8 data bits, 1 stop bit, even parity
	1/0	Ports 0 and 1: 8 data bits, 1 stop bit, odd parity
	1/1	Ports 0 and 1: 8 data bits, 2 stop bits, no parity
3/4	0/0	Port 0: 2,400 baud
	0/1	Port 0: 4,800 baud
	1/0	Port 0: 9,600 baud
	1/1	Port 0: 19,200 baud

Table PR7-2. INICT12 Switch SW4 - Port Options *(continued)*

Pole	Setting	Function
5/6	0/0	Port 1: 2,400 baud
	0/1	Port 1: 4,800 baud
	1/0	Port 1: 9,600 baud
	1/1	Port 1: 19,200 baud
7[1]	0	Disable message checksums.
	1	Enable message checksums.
8[2]	0	Disable security key compatibility on port 1.
	1	Enable security key compatibility on port 1.

NOTES: 1 = open or off, 0 = closed or on.
1. When message checksums are enabled, the 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.
2. When the security key is enabled, port one is set to 9,600 baud, eight data bits, one stop bit, and no parity by default.

☐ 3. Jumpers J1 through J4 direct signals to the termination unit and are factory set. Verify they are set as shown in Table PR7-3.

Table PR7-3. INICT12 Jumpers J1 to J4

Jumper	Setting
J1, J2, J3, J4	

☐ 4. Jumper J5 is for compatibility with older systems (Table PR7-4).

Table PR7-4. INICT12 Jumper J5

Option	J5
Normal Controlway operation.	
Disconnects Controlway channel B. This setting allows the module to function in early Network 90® systems that supplied -30 VDC to modules.	

NTCL01 Connection

PR8

Purpose/Scope

10 min.

This procedure gives the steps required to properly connect the NTCL01 termination unit (Fig. PR8-1). The termination unit cable connects to its associated INNIS01 module and requires 24 VDC power connection.

Parts

Number	Qty	Description
NKLS01	1	INNIS01-to-NTCL01 cable (PVC)
NKLS11		INNIS01-to-NTCL01 cable

Tools

Modular Power System II instruction.

Safety Considerations

WARNING

1. Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting installation, retrofit, upgrade, or wiring procedures. Failure to do so could result in severe or fatal shock. Do not turn the power on until the installation, retrofit, upgrade, or wiring procedures are complete.

Procedure

☐ 1. Verify the MMU slot assignment for the INNIS01 module.

☐ W1 2. From the back of the module mounting unit (MMU) attach the hooded end of the NKLS01 or NKLS11 cable to the MMU backplane slot assigned to the INNIS01 module.

☐ 3. Insert the socket connector end of the cable into P1 of the NTCL01 unit (Fig. PR8-1).

☐ 4. Attach a 2.1 square millimeter (14 AWG) wire terminated with a Faston connector from a +24 VDC source within the enclosure to the E1 terminal.

☐ 5. Attach a 2.1 square millimeter (14 AWG) wire terminated with a Faston connector from system common within the enclosure to the E2 terminal.

☐ 6. To monitor the power system status, use 0.83 to 2.1 square millimeter (18 to 14 AWG) wire to connect the status output (TB3, OUT) on the power module chassis backplane to the TB1-8 (PSS1) or TB2-8 (PSS2) terminal on the NTCL01 unit.

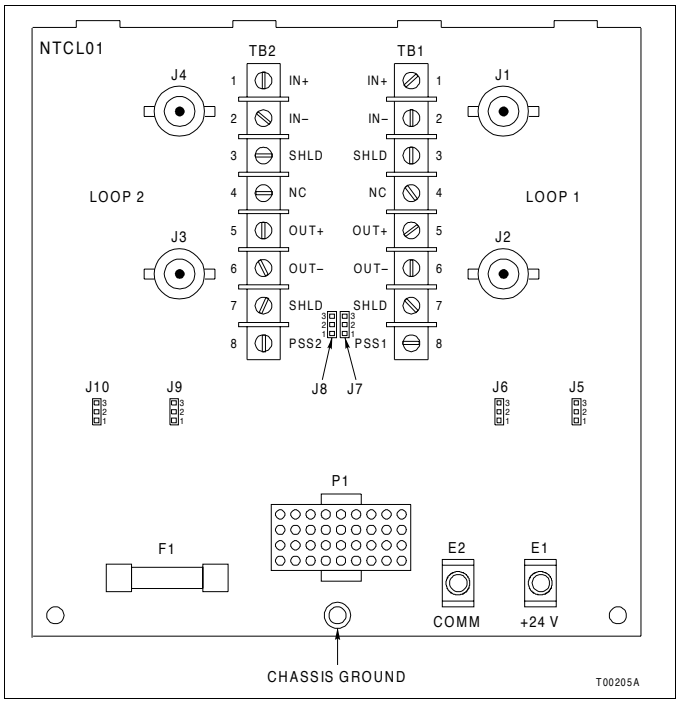

Figure PR8-1. NTCL01 Layout

NTMP01 Connection

PR9

Purpose/Scope

10 min.

This procedure gives the steps required to properly connect the NTMP01 termination unit (Fig. PR9-1). The termination unit cable connects to its associated INICT12 module and requires 24 VDC power connection.

Parts

Number	Qty	Description
NKTU01	1	INICT12 to NTMP01 cable (PVC)
NKTU11		INICT12 to NTMP01 cable

Tools None.

Safety Considerations

WARNING

1. Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting installation, retrofit, upgrade, or wiring procedures. Failure to do so could result in severe or fatal shock. Do not turn the power on until the installation, retrofit, upgrade, or wiring procedures are complete.

Procedure

☐ 1. Verify the MMU slot assignment for the INICT12 module.

☐ W1 2. From the back of the module mounting unit (MMU) attach the hooded end of the NKTU01 or NKTU11 cable to the MMU backplane slot assigned to the INICT12 module.

☐ 3. Insert the socket connector end of the cable into P1 of the NTMP01 unit (Fig. PR9-1).

☐ 4. Attach a 2.1 square millimeter (14 AWG) wire terminated with a Faston connector from a +24 VDC source within the enclosure to the E2 terminal.

☐ 5. Attach a 2.1 square millimeter (14 AWG) wire terminated with a Faston connector from system common within the enclosure to the E3 terminal.

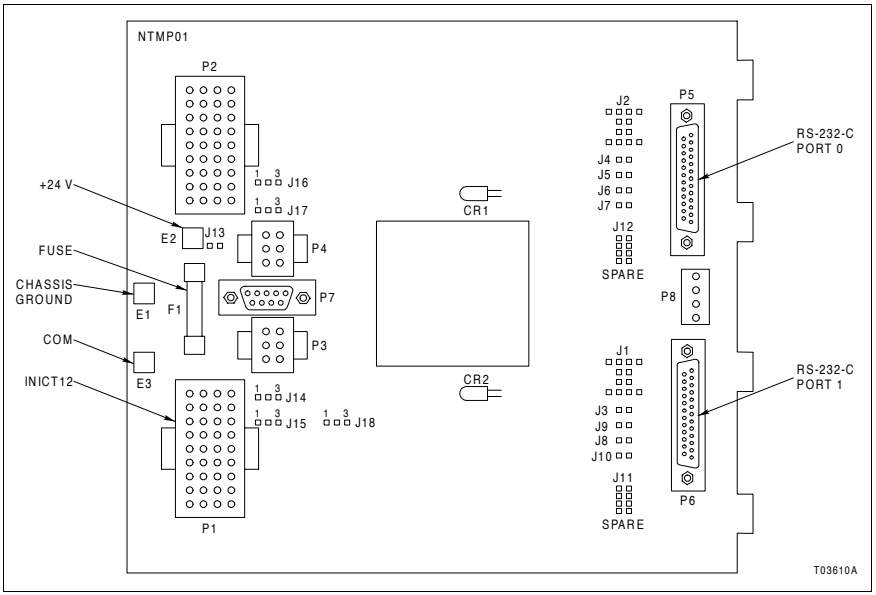

Figure PR9-1. NTMP01 Layout

Cnet Connection

PR10

Purpose/Scope

10 min.

This procedure describes Cnet connection to the NTCL01 termination unit. It includes the connections between:

- Nodes located within the same enclosure (intracabinet).
- Nodes located in different enclosures (intercabinet).

Parts

Number	Qty	Description
NKTL01-3	System dependent	Cnet termination cable
NKTT01	System dependent	Node to node Cnet termination cable

Tools None.

Cnet is isolated through transformers and operates at 5 VDC. The BNC housing is not grounded.

NOTE: All figures in this section show nonredundant Cnet loop one connection only. Connect both loop one and loop two in the same way for redundant Cnet.

Safety Considerations

WARNING

1. Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting installation, retrofit, upgrade, or wiring procedures. Failure to do so could result in severe or fatal shock. Do not turn the power on until the installation, retrofit, upgrade, or wiring procedures are complete.

Coaxial Connection Procedure

☐ 

1. Use an NKTT01 cable to make coaxial connections between NTCL01 units that are located within the same enclosure (Fig. PR10-1).

☐ 2. Use an NKTL01-3 cable to make coaxial connections to the NTCL01 unit when the:

- NKCL01 or NKCL11 cable enters from another node in another enclosure.
- NKCL01 or NKCL11 cable leaves the enclosure to connect to a node in another enclosure.

Refer to Figure PR10-2.

Twinaxial Connection Procedure

☐ 

Connect the cables directly to TB1 and TB2 of the NTCL01 unit when using NKPL01 or NKPL11 twinaxial cable (Fig. PR10-3). This method can be used for both intercabinet and intracabinet connections. Figure PR10-4 shows the terminal block connections.

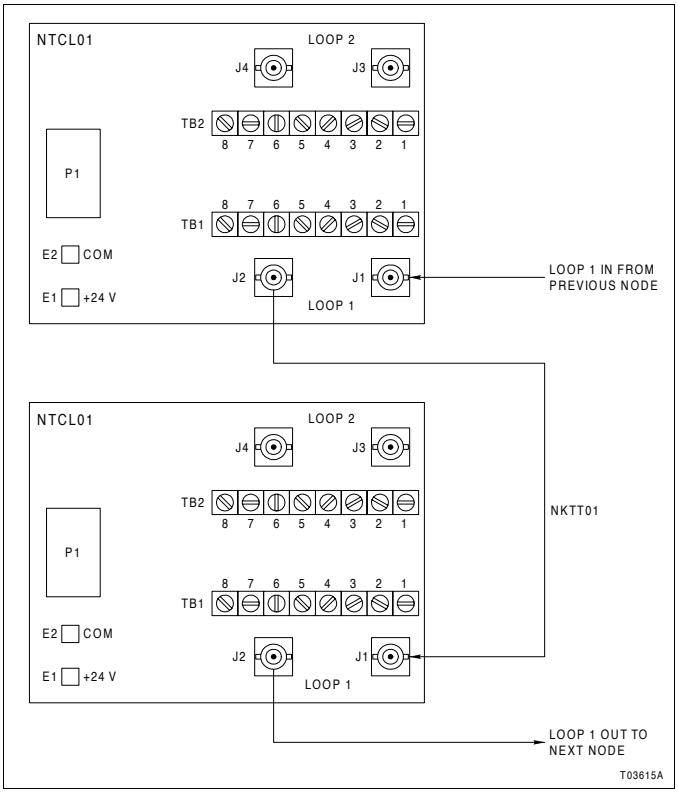

Figure PR10-1. Intracabinet Coaxial Cnet Cable Connection

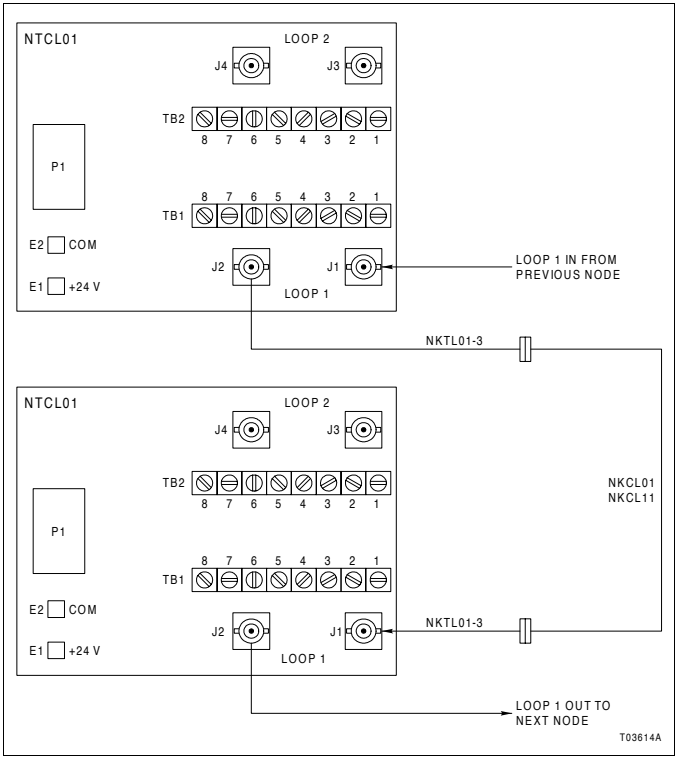

Figure PR10-2. Intercabinet Coaxial Cnet Cable Connection

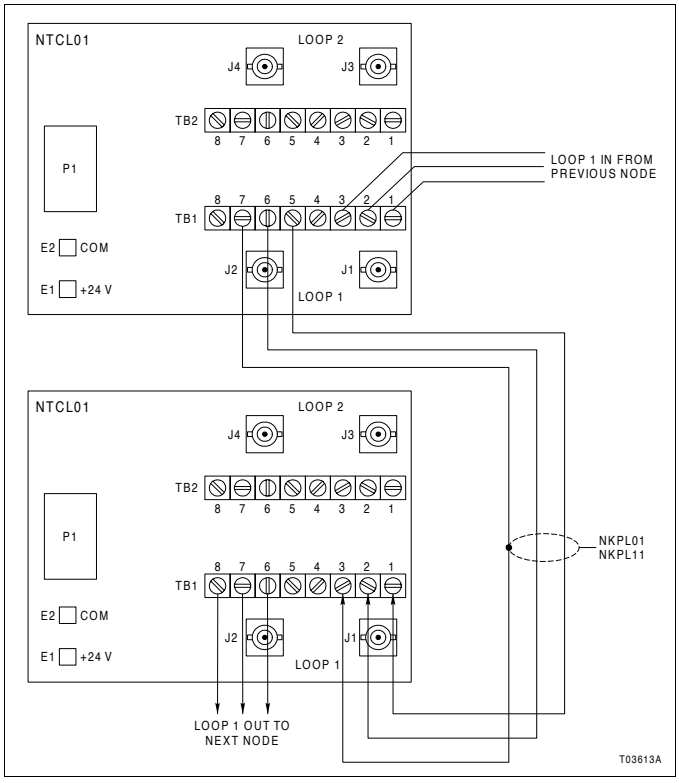

Figure PR10-3. Twinaxial Cnet Cable Connection

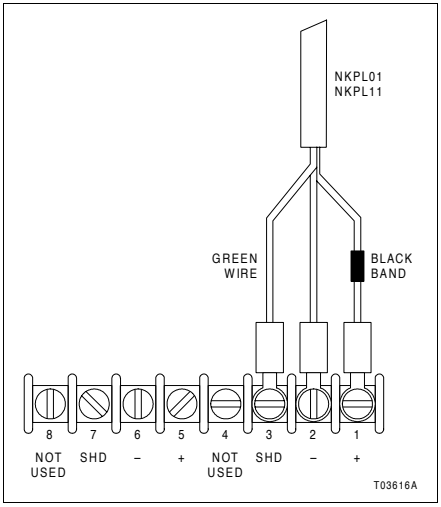

Figure PR10-4. Twinaxial Cable Terminal Block Connections

Host Computer Connection

PR11

Purpose/Scope

5 min.

This procedure gives the steps required to connect a host computer to the RS-232-C port of the NTMP01 termination unit.

Parts

- RS-232-C cable with a DB-25 connector.

Tools

None.

The RS-232-C port zero (P5) and port one (P6) are standard DB-25 connectors. Normally, port zero is used for host computer connection and port one is used for diagnostic terminal or security key connection. The host computer can either connect directly to the NTMP01 unit or connect through a modem. The RS-232-C ports on the NTMP01 unit are isolated.

NOTE: The INICI12 interface supports only one host computer connection.

Procedure

☐ 1. Connect the DB-25 end of the RS-232-C cable to port zero (P5) of the NTMP01 unit (Fig. PR11-1). Table PR11-1 shows the P5 and P6 connector pin assignments.

☐ 2. Connect the other end of the RS-232-C cable to the external serial device (i.e., host computer or modem).

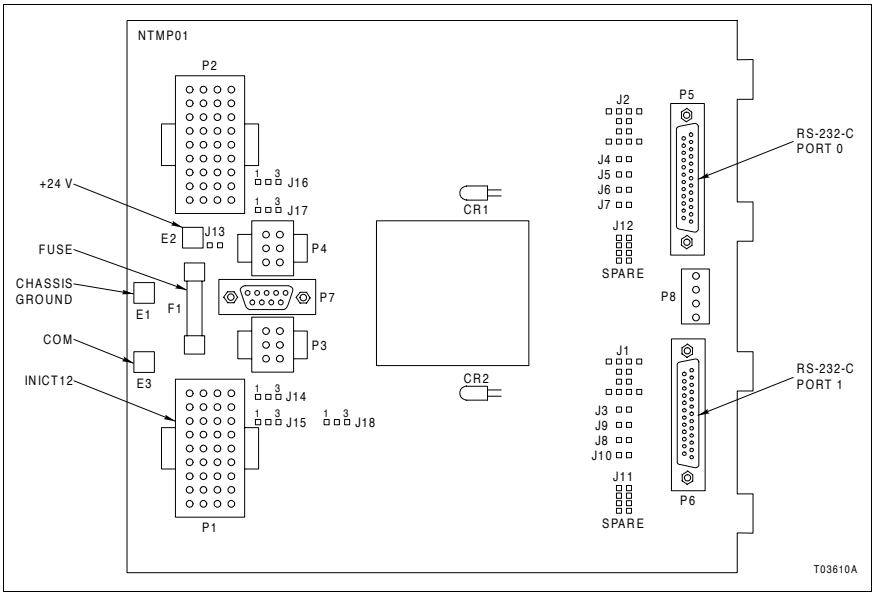

Figure PR11-1. NTMP01 Layout

Table PR11-1. NTMP01 P5 and P6 Pin Assignments

Pin	Signal
1	Protective ground
2	TXD - transmitted data
3	RXD - received data
4	RTS - request to send
5	CTS - clear to send
6	DSR - data set ready
7	Signal ground
8	DCD - primary data carrier detect
20	DTR - data terminal ready

Termination Unit Removal

PR12

Purpose/Scope

5 min.

This procedure describes the steps required to remove a termination unit.

Parts None

Tools
- Phillips screwdriver.

Safety Considerations

WARNING	**1. Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting the termination unit removal procedure. Failure to do so could result in severe or fatal shock. Do not turn the power on until the replacement procedure is complete.**

Procedure

☐ 1. Record any wiring and cabling information necessary so it can be easily reconnected.

☐ 

2. Disconnect any cables.

☐ 3. Disconnect the +24 VDC power and common from the Faston connectors.

☐ 4. Remove the chassis ground screw and lockwasher (Fig. PR12-1).

☐ 5. Remove the two screws that attach the termination unit to the NTFP01 Field Termination Panel (Fig. PR12-2).

☐ 6. Slide the termination unit tabs out of the slots of the panel standoff.

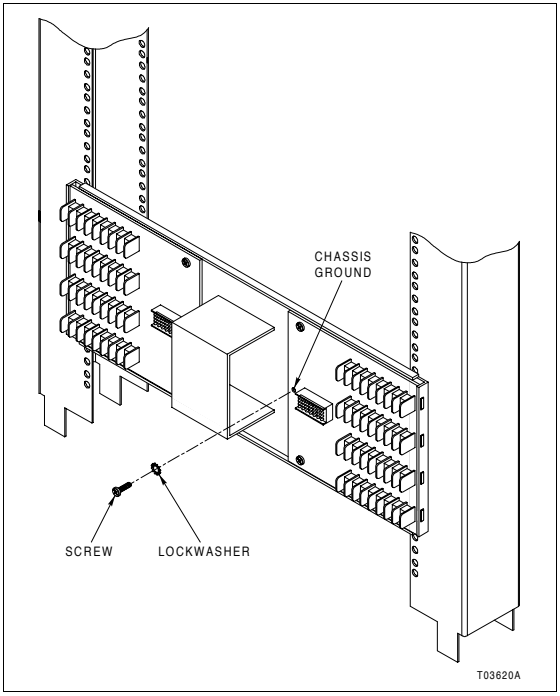

Figure PR12-1. Chassis Ground Connection

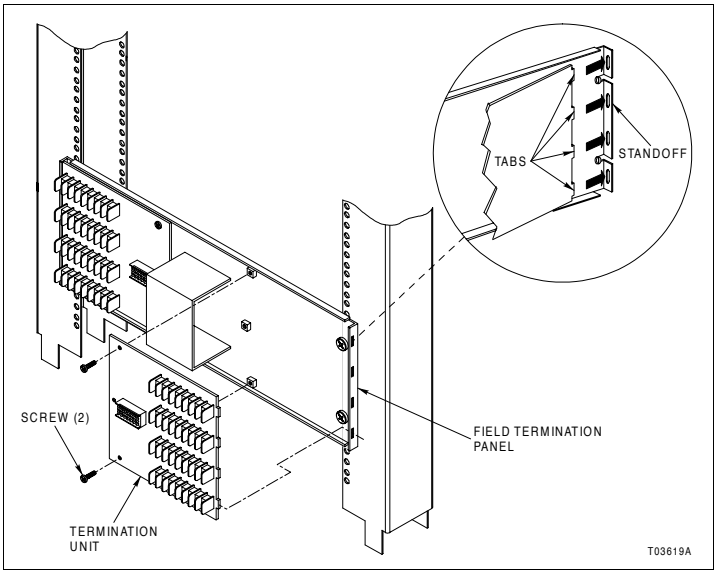

Figure PR12-2. Termination Unit Removal

Module Removal

PR13

Purpose/Scope

1 min.

This procedure describes the steps required to remove either the INNIS01 or INICT12 module from the module mounting unit (MMU). A module can be removed with power on.

Parts None.

Tools
- Thin rod for reset button, preferably nonmetallic.

Safety Considerations

WARNING	**1. A rack module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous.**

Procedure

☐ 1. Depress the stop/reset button on the INICT12 module once to halt operation if not already halted. This should be done when removing either or both modules.

☐ 

2. Turn the two latching screws ½-turn to unlock the module. The slot on both latching screws should face away from the center of the module faceplate.

☐ 3. Slide the module out of the module mounting unit (Fig. PR13-1).

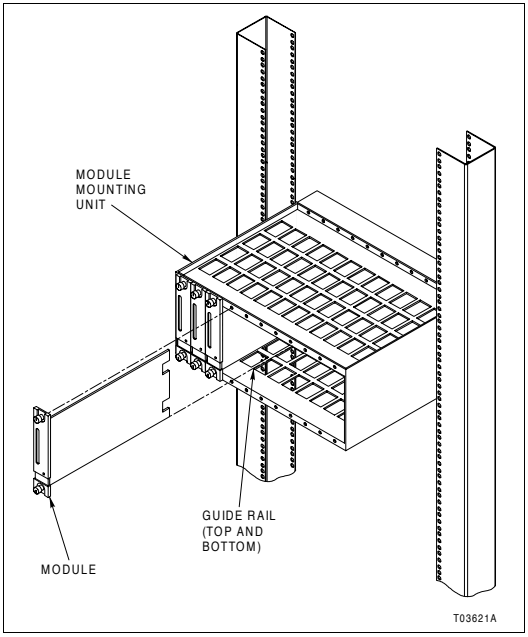

Figure PR13-1. Module Removal

Printed Circuit Board Cleaning

PR14

Purpose/Scope

30 min.

This procedure explains how to clean the printed circuit boards (i.e., module and termination unit boards).

Parts None.

Tools
- Clean, dry, filtered compressed air.
- Antistatic vacuum.
- Isopropyl alcohol (99.5 percent electronic grade).
- Foam-tipped swab.
- Distilled water.
- Nonabrasive eraser.
- Fiberglass or nylon burnishing brush.
- Piece of scrap printed circuit board.
- Soft lint-free cloths.

There are several cleaning procedures described. Use the procedures that meet the needs of the particular printed circuit board to remove all dust, dirt, oil, corrosion, or any other contaminants from the board.

Perform all cleaning and handling of the printed circuit boards at static safe workstations. Always observe electrostatic sensitive device handling precautions when handling printed circuit boards.

Safety Considerations

WARNING	**1. Wear eye protection whenever working with cleaning solvents. When removing solvents from printed circuit boards using compressed air, injury to the eyes could result from splashing solvent as it is blown off the printed circuit board.**

General Cleaning and Washing

☐ 1. Remove dust and residue from the printed circuit board surface using clean, dry, filtered compressed air or an anti-static field service vacuum.

- or -

☐ 

1. Spray or wipe the printed circuit board with isopropyl alcohol (99.5% electronic grade).

☐ 2. Use a foam-tipped swab to wipe the printed circuit board.

☐ 3. When the printed circuit board is clean, remove excess solvent using clean, dry, filtered compressed air.

Edge Connector Cleaning

☐ 

1. Make a solution of 80% isopropyl alcohol (99.5% electronic grade) and 20% distilled water.

☐ 2. Soak a soft lint-free cloth in the solvent mixture.

☐ 3. Work the soft lint-free cloth in a back and forth motion parallel to the edge connector contacts.

☐ 4. If necessary use the nonabrasive eraser to remove tarnish or stains. A fiberglass or nylon burnishing brush may also be used.

NOTES:

1. Minimize electrostatic discharge by using the 80% to 20% isopropyl alcohol to distilled water solution during burnishing.

2. 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.

☐ 5. With a clean soft lint-free cloth in a back and forth motion parallel to the edge connector contacts.

☐ 6. Dry the edge connector contact area by wiping with a clean soft lint-free cloth.

Connections Check

PR15

Purpose/Scope

30 min.

This procedure describes the connections check maintenance procedure. Check all signal wiring, power, ground, and cable connections within the enclosure to verify their integrity.

Parts None.

Tools
- Flat-blade screwdriver.
- Phillips screwdriver.

Safety Considerations

WARNING	**1. Turn off all power before attempting the connections check maintenance procedure. Failure to do so could result in severe or fatal shock, or equipment damage.**

Procedure

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 should ***not*** be any motion done to loosen the connection.

NOTE: ABB Automation recommends this preventive maintenance task be performed during power supply preventive maintenance while the power to the enclosure is off.

☐ 

1. Verify that power is removed before checking any connections for tightness.

☐ 2. Verify that all power wiring connections are secure.

☐ 3. Check all cable connections.

Offline Diagnostics

PR16

Purpose/Scope

45 min.

This procedure gives the steps necessary to run offline diagnostics. The diagnostics run in the INICT12 module.

Parts None.

Tools None.

Procedure

☐ 1. Verify the system is offline or run the diagnostics with the INICT12 module in a test enclosure.

☐ 2. Remove the module being tested from the module mounting unit. Refer to procedure section PR13 if necessary.

☐ 3. Enable diagnostic mode by setting switch SW3 as shown in Table PR16-1. Putting the INICT12 module into diagnostic mode allows the module to perform a variety of diagnostic tests but suspends normal operation.

Table PR16-1. INICT12 Switch SW3 - Diagnostic Mode

Pole	Description
1	1 = diagnostic mode.
2 - 8	x = setting ignored in diagnostic mode.

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

☐ 4. Select the test options with poles one and two of switch SW4 as shown in Table PR16-2.

Table PR16-2. INICT12 Switch SW4 - Test Options

Pole	Option	Description
1	Display mode: 0 = pass/fail count 1 = current test number	Refer to ***Display Mode*** in this section.
2	Halt on error: 0 = no 1 = yes	Refer to ***Halt On Error*** in this section.

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

☐ 5. Select the desired test by setting switch SW4 as shown in Table PR16-3.

☐ 6. Insert the module into the module mounting unit. Refer to procedure section PR3 if necessary.

☐ 7. Observe the front panel status indicators to determine if the test passed or failed (Fig. PR16-1). In general if a diagnostic test fails, replace the module. Table PR16-4 describes each test.

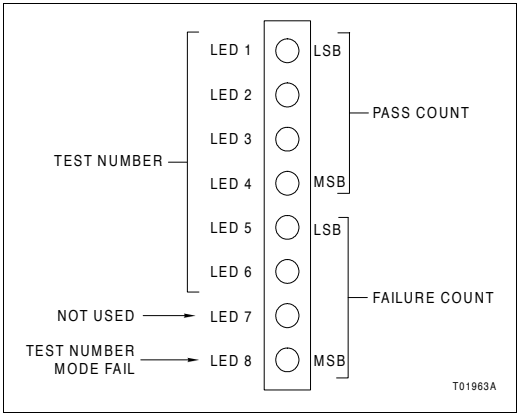

Figure PR16-1. Diagnostic Test LED Indications

Table PR16-3. INICT12 Switch SW4 - Diagnostic Tests

Test ID	Pole						Test
	3	4	5	6	7	8	
00	0	0	0	0	0	0	LEDs and switches[1]
01	0	0	0	0	0	1	CPU
02	0	0	0	0	1	0	ROM
03	0	0	0	0	1	1	MMU
04	0	0	0	1	0	0	RAM
05	0	0	0	1	0	1	NVRAM
06	0	0	0	1	1	0	PLD
07	0	0	0	1	1	1	Password
08	0	0	1	0	0	0	I/O expander bus stall
09	-	-	-	-	-	-	Unused
0A	0	0	1	0	1	0	Timer IRQ5
0B	0	0	1	0	1	1	Dispatcher IRQ2
0C	0	0	1	1	0	0	RS-232-C local
0D - 0F	-	-	-	-	-	-	Unused
10	0	1	0	0	0	0	Group test - 01 to 0C
11	0	1	0	0	0	1	I/O expander bus (external)
12	0	1	0	0	1	0	I/O expander bus IRQ3
13 - 25	-	-	-	-	-	-	Unused
26	1	0	0	1	1	0	NVRAM retention - data storage[1]
27	1	0	0	1	1	1	NVRAM retention - data check[1]
28	-	-	-	-	-	-	Unused
29	1	0	1	0	0	1	Stop/reset pushbutton

NOTES: 1 = off or open; 0 = on or closed.
1. Test is not continuous.

Display Mode

Test Number

The test number display mode uses LEDs one through six to display the diagnostic test number and LED eight to display whether the test passed or failed (Fig. PR16-1). If a diagnostic test is successful, LEDs one through six display the diagnostic test number and LED eight does not illuminate. If a diagnostic test is not successful, LEDs one through six still display the diagnostic test number but LED eight will illuminate. LED seven is not used in test number display mode.

Pass/Fail Count

The pass/fail display mode uses LEDs one through eight to display a combination of incrementing pass and fail counters (Fig. PR16-1). LEDs one through four display a binary count of the number of passed tests and LEDs five through eight display the number of failed tests.

Halt On Error

Disabled

If halt on error is disabled, the selected test runs repeatedly until the module is removed. Depending on the display mode, the status indicators will identify the test being run or will display a test count (Fig. PR16-1).

Enabled

If halt on error is enabled, the test stops if an error is encountered. Depending on the display mode, the status indicators will identify the test that failed or will display a test count. The test continues to run, however, if no error is detected.

Diagnostic Tests

Table PR16-4 describes the diagnostic tests.

Table PR16-4. Diagnostic Tests

Test ID		Description
00	LEDs and switches	Performs walking one test on the LEDs, then the byte value of SW3 and SW4 are exclusive ORed together. Results are displayed on LEDs. The status LED is off for even or on for odd total.
01	CPU	Verifies CPU and CPU instruction set operation.
02	ROM	Calculates checksum of ROM and compares it to an expected value. If the test fails: 1. Download firmware to the module. 2. Replace the module.
03	MMU	Test the onboard memory management unit.
04	RAM	Clears and verifies then sets and verifies all RAM memory. Test includes byte, word, and long word accesses.
05	NVRAM	Verifies read and write function of NVRAM memory.
06	PLD	Loads programmable logic devices. Verifies proper loading and operation.
07	Password	Verifies PAL password against a stored value.
08	I/O expander bus stall	Tests the I/O expander bus stall detection and IRQ7 interrupt handling.

Table PR16-4. Diagnostic Tests *(continued)*

Test ID		Description
0A	Timer IRQ5	Tests IRQ5 interrupt handling. Initializes DUART timer for 1-msec interrupt and then waits for it to time-out.
0B	Dispatcher IRQ2	Tests IRQ2 interrupt handling. Issues software dispatcher request and waits for interrupt to occur.
0C	RS-232-C local	Tests both serial channels of DUART circuitry in local loop back mode. Checks internal circuitry only.
10	Group test	Executes tests 01 to 0C.
11	I/O expander bus	Tests I/O expander bus communication with another module. Requires an IMDSO14 module set to module address 15. IMDSO14 LEDs count successful tests. Verify MMU backplane connection between INICT12 and IMDSO14 modules before starting test.
12	I/O expander bus IRQ3	Tests IRQ3 interrupt handling. Enables an interrupt level 3 and then writes a value to the I/O expander bus to initiate an interrupt.
26	NVRAM retention - data storage	Test NVRAM ability to retain stored data. Test 26 and 27 operate together. To run test: 1. Select test 26. Stores a known data pattern in NVRAM. Displays 0x55 on LEDs if successful. 2. Remove module and wait some period of time. Overnight if possible; one hour minimum. 3. Select test 27 and insert module.
27	NVRAM retention - data check	
29	Stop/reset pushbutton	Tests pushbutton operation. Displays code 0x55 on LEDs if successful.

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