ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

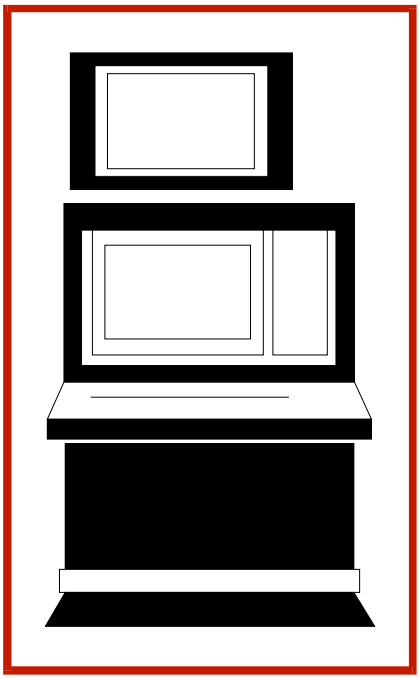
All trademarks, brand names, and brands appearing herein are the property of their respective owners.

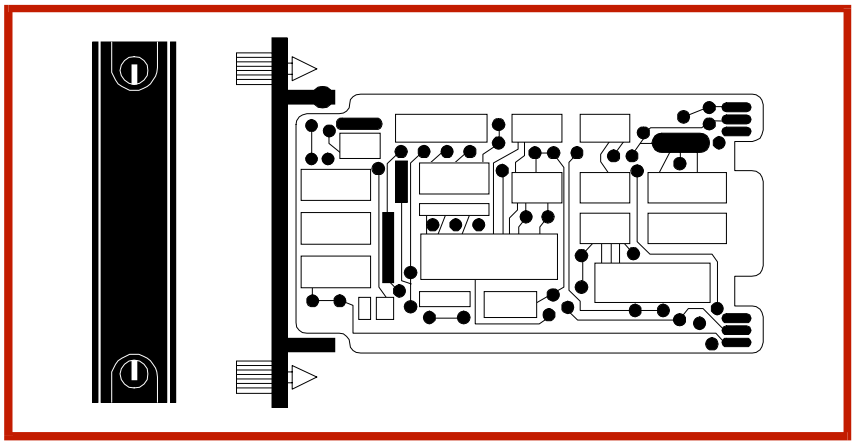
Find the *Bailey NSBM01* at our website: ***Click HERE***

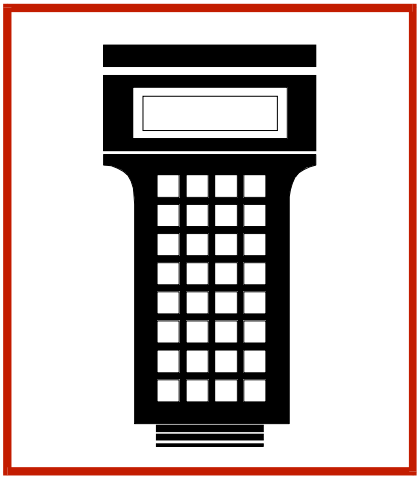
Bailey® infi 90®

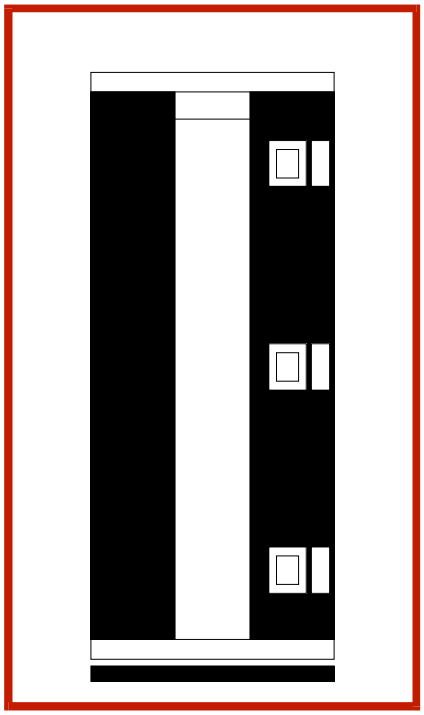
Instruction

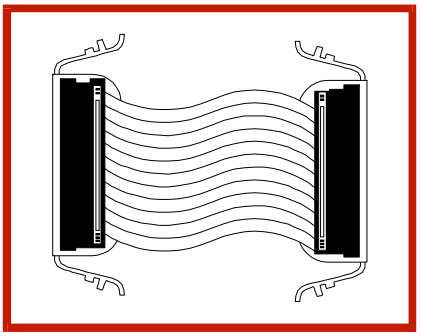
Network Interface Slave Module (INNIS01)\ Network Processing Module (INNPM11)

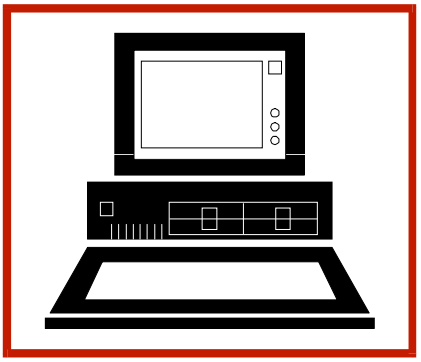












Bailey Process Control and Automation Solutions from Elsag Bailey Group

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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

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

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

WARNING

INSTRUCTION MANUALS

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

RADIO FREQUENCY INTERFERENCE

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

POSSIBLE PROCESS UPSETS

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

NOTICE

The information contained in this document is subject to change without notice.

Elsag Bailey, its affiliates, employees, and agents, and the authors and contributors to this publication specifically disclaim all liabilities and warranties, express and implied (including warranties of merchantability and fitness for a particular purpose), for the accuracy, currency, completeness, and/or reliability of the information contained herein and/or for the fitness for any particular use and/or for the performance of any material and/or equipment selected in whole or part with the user of/or in reliance upon information contained herein. Selection of materials and/or equipment is at the sole risk of the user of this publication.

This document contains proprietary information of Elsag Bailey, Elsag Bailey Process Automation, and is issued in strict confidence. Its use, or reproduction for use, for the reverse engineering, development or manufacture of hardware or software described herein is prohibited. No part of this document may be photocopied or reproduced without the prior written consent of Elsag Bailey.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Preface

The INNIS01 Network Interface Slave Module (NIS) and the INNPM11 Network Processing Module (NPM) make up a process control unit interface. This process control unit interface provides control modules in a process control unit with access to an INFI-NET® communication system.

This instruction explains process control unit interface features, specifications and operation. It also includes installation and troubleshooting procedures for each module.

The system engineer or technician using this interface should read and understand this instruction before installing any modules. In addition, a complete understanding of the INFI 90® OPEN system is beneficial.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

List of Effective Pages

Total number of pages in this instruction is 57, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through vii	Original
1-1 through 1-7	Original
2-1 through 2-4	Original
3-1 through 3-13	Original
4-1 through 4-4	Original
5-1 through 5-5	Original
6-1 through 6-4	Original
7-1	Original
8-1	Original
A-1 through A-3	Original
B-1 through B-3	Original
C-1 through C-3	Original
Index-1 through Index-2	Original

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

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table of Contents

Page

SECTION 1 - INTRODUCTION 1-1
- OVERVIEW 1-1
- INTENDED USER 1-1
- PROCESS CONTROL UNIT INTERFACE DESCRIPTION 1-1
- INNIS01 NETWORK INTERFACE SLAVE MODULE 1-1
- INNPM11 NETWORK PROCESSING MODULE 1-2
- FEATURES 1-3
- INSTRUCTION CONTENT 1-4
- HOW TO USE THIS INSTRUCTION 1-4
- GLOSSARY OF TERMS AND ABBREVIATIONS 1-5
- REFERENCE DOCUMENTS 1-5
- DOCUMENT CONVENTIONS 1-5
- NOMENCLATURE 1-6
- SPECIFICATIONS 1-6

SECTION 2 - DESCRIPTION AND OPERATION 2-1
- INTRODUCTION 2-1
- MODULE INTEGRITY 2-1
- INNIS01 NETWORK INTERFACE SLAVE MODULE 2-1
  - Exception Reports 2-1
  - Messages 2-2
    - BROADCAST 2-2
    - TIME SYNCHRONIZATION 2-2
    - MULTICAST 2-2
    - NIS POLL 2-2
    - MESSAGE FORMAT 2-2
    - MESSAGE TRANSMISSION 2-3
  - Data Integrity 2-3
    - RETRY LOGIC 2-3
    - NODE STATUS TABLE 2-3
    - POLLING 2-3
- INNPM11 NETWORK PROCESSING MODULE 2-4
  - Exception Reports 2-4
  - Data Transfer 2-4

SECTION 3 - INSTALLATION 3-1
- INTRODUCTION 3-1
- SPECIAL HANDLING 3-1
- UNPACKING AND INSPECTION 3-2
- INNIS01 NETWORK INTERFACE SLAVE MODULE CONFIGURATION 3-2
  - Dipswitch Settings 3-2
    - DIPSWITCH SW1 - NODE ADDRESS 3-2
    - DIPSWITCH SW2 - LOOP ADDRESS 3-3
    - DIPSWITCH SW3 - LOOP MODE 3-3
    - DIPSWITCH SW4 - I/O EXPANDER BUS ADDRESS AND COUNTERS 3-4
  - Jumper Settings 3-7
  - Power System Status 3-7
- INNIS01 MODULE INSTALLATION 3-8
- INNPM11 NETWORK PROCESSING MODULE CONFIGURATION 3-8
  - Dipswitch SW3 - Operating Modes 3-9
  - Dipswitch SW4 - Options 3-10
  - Jumper Settings 3-11

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table of Contents (continued)

Page

SECTION 3 - INSTALLATION *(continued)*
INNPM11 MODULE INSTALLATION 3-11

SECTION 4 - OPERATING PROCEDURES 4-1
INTRODUCTION 4-1
INNIS01 NETWORK INTERFACE SLAVE MODULE START-UP PROCEDURES 4-1
Event Counters 4-1
Error Counters 4-1
INNPM11 NETWORK PROCESSING MODULE LEDs AND CONTROLS 4-2
Status LED 4-2
CPU LEDs 4-2
Stop/Reset Pushbutton 4-3
INNPM11 MODES OF OPERATION 4-3
Execute Mode 4-4
Error Mode 4-4

SECTION 5 - TROUBLESHOOTING 5-1
INTRODUCTION 5-1
ERROR COUNTERS 5-1
INNIS01 MODULE ERROR CODES 5-1
INNPM11 MODULE ERROR CODES 5-2
INNIS01 MODULE EDGE CONNECTORS 5-3
INNPM11 MODULE EDGE CONNECTORS 5-4

SECTION 6 - MAINTENANCE 6-1
INTRODUCTION 6-1
PREVENTIVE MAINTENANCE SCHEDULE 6-1
EQUIPMENT/TOOLS REQUIRED 6-2
PREVENTIVE MAINTENANCE PROCEDURES 6-2
Printed Circuit Board Cleaning 6-2
GENERAL CLEANING AND WASHING 6-3
EDGE CONNECTOR CLEANING 6-3
Checking Connections 6-4

SECTION 7 - REPAIR/REPLACEMENT PROCEDURES 7-1
INTRODUCTION 7-1
MODULE REPLACEMENT PROCEDURE 7-1
TERMINATION UNIT OR MODULE REPLACEMENT PROCEDURE 7-1

SECTION 8 - SUPPORT SERVICES 8-1
INTRODUCTION 8-1
REPLACEMENT PARTS AND ORDERING INFORMATION 8-1
TRAINING 8-1
TECHNICAL DOCUMENTATION 8-1

APPENDIX A - NTCL01 TERMINATION UNIT CONFIGURATION A-1
INTRODUCTION A-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table of Contents (continued)

Page

APPENDIX B - NICL01 TERMINATION MODULE CONFIGURATION B-1
INTRODUCTION B-1

APPENDIX C - WARM FAILOVER FEATURE C-1
INTRODUCTION C-1
OPERATION C-1
PERFORMANCE C-2
RESTRICTIONS C-3

List of Figures

No.	Title	Page
1-1.	Redundant Process Control Unit Interfaces	1-2
3-1.	INNIS01 Module Dipswitch and Jumper Locations	3-2
3-2.	INNIS01 Module Jumper Setting	3-7
3-3.	INNPM11 Module Dipswitch and Jumper Locations	3-9
4-1.	INNIS01 Module Faceplate LEDs	4-2
4-2.	INNPM11 Module Faceplate LEDs and Controls	4-3
A-1.	NTCL01 Connector and Jumper Locations (Revision F or Greater)	A-1
A-2.	NTCL01 Coaxial Cable Connections to INNIS01 Modules	A-2
A-3.	NTCL01 Twinaxial Cable Connections to INNIS01 Modules	A-2
A-4.	Redundant Process Control Unit Interface NTCL01 Connections	A-3
B-1.	NICL01 Connector and Jumper Locations (Revision D or Greater)	B-1
B-2.	NICL01 Coaxial Cable Connections to INNIS01 Modules	B-2
B-3.	NICL01 Twinaxial Cable Connections to INNIS01 Modules	B-2
B-4.	Redundant Process Control Unit Interface NICL01 Connections	B-3

List of Tables

No.	Title	Page
1-1.	Glossary of Terms and Abbreviations	1-5
1-2.	Reference Documents	1-5
1-3.	Nomenclature	1-6
1-4.	Specifications	1-6
3-1.	INNIS01 Module Dipswitch SW1 Settings	3-3
3-2.	INNIS01 Module Dipswitch SW2 Settings	3-3
3-3.	INNIS01 Module Dipswitch SW3 Settings	3-3
3-4.	INNIS01 I/O Expander Bus Address Settings	3-5
3-5.	INNIS01 Module Event Counters	3-5
3-6.	INNIS01 Module Error Counters	3-6
3-7.	INNPM11 Module Dipswitch SW3 Settings	3-9
3-8.	INNPM11 Module Dipswitch SW4 Settings	3-10
3-9.	INNPM11 Jumpers J1 through J5 Settings	3-11

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

List of Tables (continued)

No.	Title	Page
4-1.	INNPM11 Module Status LED States	4-3
5-1.	INNIS01 Module Error Codes	5-1
5-2.	INNPM11 Module Error Codes	5-2
5-3.	INNIS01 Module Edge Connector P1 Pin Assignments	5-3
5-4.	INNIS01 Module Edge Connector P2 Pin Assignments	5-3
5-5.	INNIS01 Module Edge Connector P3 Pin Assignments	5-4
5-6.	INNPM11 Module Edge Connector P1 Pin Assignments	5-4
5-7.	INNPM11 Module Edge Connector P2 Pin Assignments	5-5
5-8.	INNPM11 Module Edge Connector P3 Pin Assignments	5-5
6-1.	Preventitive Maintenance Schedule	6-2
8-1.	Spare Parts List	8-1
A-1.	NTCL01 Jumper Settings for Revisions D and E	A-3
A-2.	NTCL01 Jumper Settings for Revision F or Greater	A-3
B-1.	NICL01 Jumper Settings for Revision C	B-3
B-2.	NICL01 Jumper Settings for Revision D or Greater	B-3
C-1.	Warm Failover Performance Data	C-3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Safety Summary

GENERAL WARNINGS	**Equipment Environment** All components, whether in transportation, operation or storage, must be in a noncorrosive environment. **Electrical Shock Hazard During Maintenance** Disconnect power or take precautions to insure that contact with energized parts is avoided when servicing. **Special Handling** This module uses electrostatic sensitive devices.
SPECIFIC WARNINGS	Disconnect power before installing dipshunts on the module mounting unit backplane. Failure to do so will result in contact with cabinet areas that could cause severe or fatal shock. (p. 3-8, 3-13) 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. (p. 6-1)
SPECIFIC CAUTIONS	Always operate the NPM module with the machine fault timer circuit enabled. Unpredictable module outputs may result if the machine fault timer circuit is disabled. These unpredictable module outputs may adversely affect the entire communication system. (p. 3-11) To avoid potential module damage, evaluate your system for compatibility prior to module installation. This module uses connections to the module mounting unit backplane that served other functions in early Network 90 systems. (p. 3-12)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Trademarks and Registrations

Registrations and trademarks used in this document include:

® INFI 90	Registered trademark of Elsag Bailey Process Automation
® INFI-NET	Registered trademark of Elsag Bailey Process Automation
® Network 90	Registered trademark of Elsag Bailey Process Automation

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 1 - INTRODUCTION

OVERVIEW

INFI-NET is a unidirectional, high-speed serial data highway shared by all INFI 90 OPEN nodes. INFI-NET provides sophisticated interfaces for data exchange. This process control unit interface is made up of state-of-the-art INFI 90 OPEN modules.

INTENDED USER

Personnel installing, operating or maintaining the process control unit 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 who is familiar with communication networks.

PROCESS CONTROL UNIT INTERFACE DESCRIPTION

The process control unit interface is made up of the INNIS01 Network Interface Slave Module (NIS) and INNPM11 Network Processing Module (NPM). Through this interface the process control unit has access to INFI-NET. At the same time the NPM module communicates with the control modules via the Controlway.

The process control unit interface can support hardware redundancy (refer to Figure 1-1). In a redundant configuration, there are two NIS modules and two NPM modules. One pair of modules is the primary. If the primary modules fail, the backup modules come on-line. Redundant data highway communication capability is a standard feature.

INNIS01 NETWORK INTERFACE SLAVE MODULE

The NIS module is an I/O module that works in conjunction with the NPM module. This allows a node to communicate with any other node on the INFI-NET loop.

The NIS module is a single printed circuit board that occupies one slot in the module mounting unit. The circuit board contains microprocessor based communication circuitry that enables it to interface with the NPM module.

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

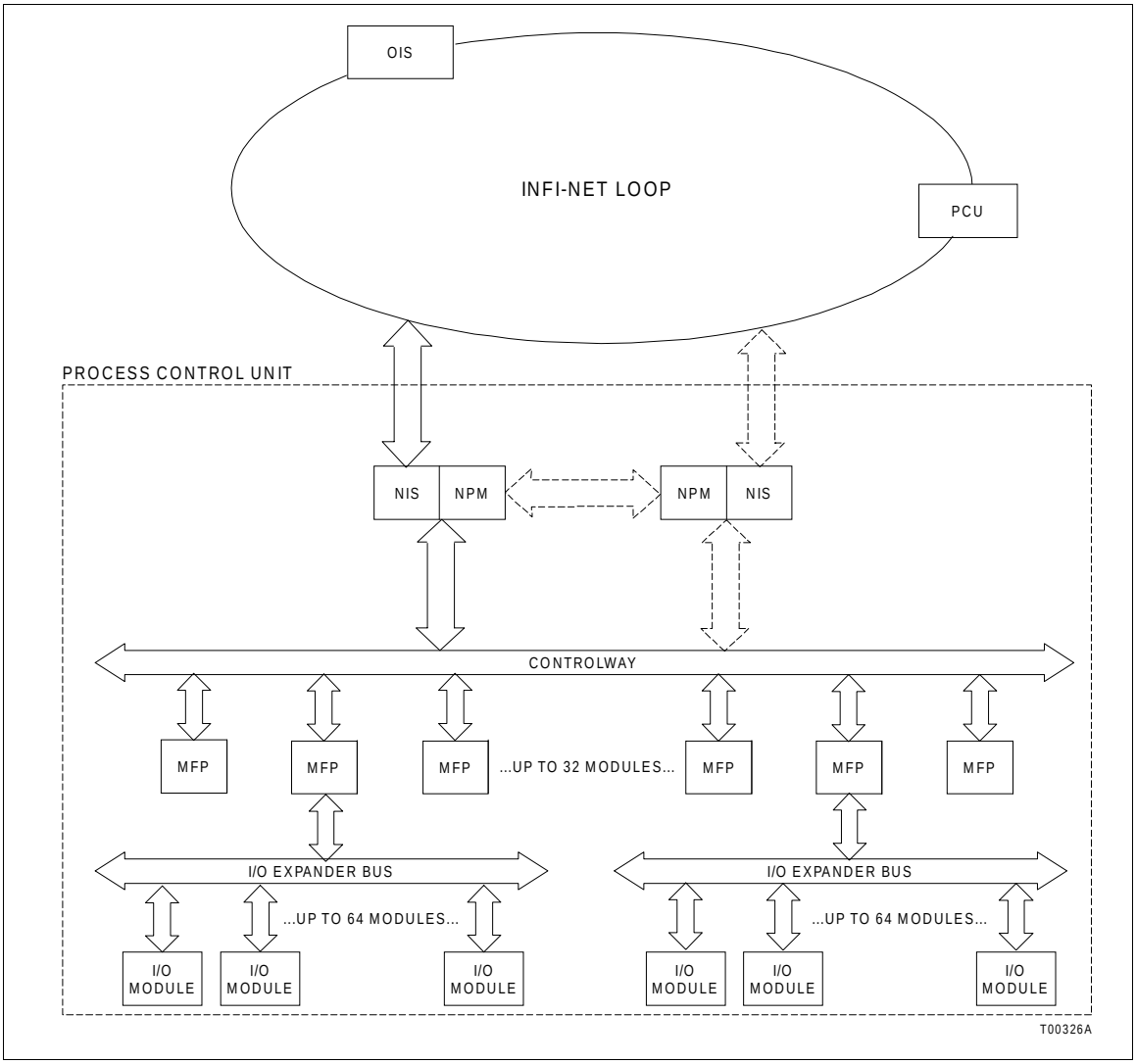


Figure 1-1. Redundant Process Control Unit Interfaces

The NIS module has three card edge connectors for external signals and power (P1, P2 and P3). Connector P1 connects to the module power source. Connector P2 connects the NIS module to the I/O expander bus to communicate with the NPM module. Serial communication to other nodes is through connector P3 using a cable connected to a termination unit or termination module. Communication between nodes is through coaxial or twinaxial cables that connect the termination units or modules on each node.

INNPM11 NETWORK PROCESSING MODULE

The NPM module acts as a translator between INFI-NET and Controlway. The NPM module holds the process control unit database and directs the communication process between the modules residing on Controlway and the NIS module.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The NPM module is a single printed circuit board that occupies the slot adjacent to the NIS module in the module mounting unit. The circuit board contains microprocessor based communication circuitry that enables it to interface with the NIS module and all Controlway modules.

Two latching screws on the NPM module faceplate secure the module in the module mounting unit. The faceplate contains eight CPU LEDs, a status LED, and a stop/reset pushbutton.

The NPM module has three card edge connectors for external signals and power (P1, P2 and P3). Connector P1 connects to common (ground), +5 VDC power, and the Controlway. Connector P2 connects the NPM module to the NIS module. Connector P3 provides for communication between primary and backup process control unit interfaces. The NPM module communicates with the NIS module within its process control unit through the I/O expander bus.

FEATURES

The process control unit interface has the following features:

- INFI-NET provides a plant wide communication network.
- INFI-NET provides time synchronization across the control system plant wide.
- Each node, depending on configuration, can operate independently of other INFI-NET nodes.
- The process control unit interface modules provide localized start-up/shutdown on power failure without operator intervention.
- The ten-megabaud communication rate gives timely information exchange.
- The NPM module packages process information for maximum transmission efficiency.
- The process control unit 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.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

INSTRUCTION CONTENT

This instruction consists of eight sections and two appendices.

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

Description and Operation — Explains module operation.

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

Operating Procedures — Provides information about normal module operation.

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

Maintenance — Contains a maintenance schedule for the modules.

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

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

Appendices — Provide information on termination unit and module configuration.

HOW TO USE THIS INSTRUCTION

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

1. Perform all steps in Section 3.

2. Thoroughly read Section 4 before applying power to the process control unit interfaces.

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

4. Refer to Section 6 for scheduled maintenance requirements.

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

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

GLOSSARY OF TERMS AND ABBREVIATIONS

Table 1-1 lists the terms and abbreviations used in this instruction that are unique to Elsag Bailey Process Automation.

Table 1-1. Glossary of Terms and Abbreviations

Term	Definition
Checksum	A value computed from a data stream by treating each element as a number and computing a sum of the elements.
Controlway	High speed, redundant, peer-to-peer communication link. Used to transfer information between intelligent modules within a process control unit.
Exception Report	Information update generated when the status or value of a point changes by more than a specified significant amount or after a specified period of time; abbreviated as XR.
Module Bus	Peer-to-peer communication link used to transfer information between intelligent modules within a process control unit.
Node	A point of interconnection to a network.
NVM	Nonvolatile random access memory. Retains stored information when power is removed.
Process Control Unit	A node on the plant wide communication network containing control and I/O modules.
Termination Module	Provides input/output connection between plant equipment and the INFI 90/Network 90® modules.
Termination Unit	Provides input/output connection between plant equipment and the INFI 90/Network 90 modules.

REFERENCE DOCUMENTS

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

Table 1-2. Reference Documents

Document Number	Title
I-E96-200	Function Code Application Manual
I-E96-408	NICL01 Communication Termination Module
I-E96-422	NTCL01 Communication Termination Unit

DOCUMENT CONVENTIONS

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOMENCLATURE

Table 1-3 lists the modules that make up the process control unit interface and other associated equipment.

Table 1-3. Nomenclature

Nomenclature	Description
IEMMU01/02/04	Module mounting unit
IEMMU11/12/21/22	Module mounting unit
INNIS01 INNPM11	Process control unit interface. Requires: Network interface slave module Network processing module
NFTP01	Field termination panel
NICL01	Communication termination module
NKLS01/11	Termination cable, INNIS01 to NTCL01
NKLS02/12	Termination cable, INNIS01 to NICL01
NKMP01/11	Redundancy cable, INNPM11 to INNPM11
NTCL01	Communication termination unit
NTMU01/02	Termination mounting unit

SPECIFICATIONS

Refer to Table 1-4 for the specifications of the modules making up the process control unit interface.

Table 1-4. Specifications

Property	Characteristic/Value
INNIS01	
Memory	208 kbytes RAM 64 kbytes ROM
Power requirements	+5 VDC at 900 mA; 4.50 W nominal +15 VDC at 5 mA; 0.08 W nominal -15 VDC at 200 mA; 3.00 W nominal
System capability	62,500 nodes in the system; 250 nodes on a loop. Any combination of PCU, MCS, OIS or ICI interfaces.
Communication rates	10 Mbaud or 2 Mbaud
Mounting	Occupies one slot in standard INFI 90 OPEN module mounting unit
INNPM11	
Memory	256 kbytes ROM 512 kbytes RAM
Power requirements	+5 VDC at 2 A; 10 W nominal
Communication rates	1 Mbaud (Controlway) 83.3 kbaud (module bus)
Mounting	Occupies one slot in standard INFI 90 OPEN module mounting unit

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1-4. Specifications (continued)

Property	Characteristic/Value
All INFI-NET Communication Modules	
Electromagnetic/radio frequency interference	Values not available at this time. Keep cabinet doors closed. Do not use communication equipment any closer than 2 meters from the cabinet.
Ambient temperature	0° to 70°C (32° to 158°F)
Relative humidity	5% to 90% up to 55°C (131°F) noncondensing 5% to 40% above 55°C (131°F) noncondensing
Atmospheric pressure	Sea level to 3 km (1.86 mi.)
Air quality	Noncorrosive
Certification	CSA certified for use as process control equipment in an ordinary (nonhazardous) environment Factory Mutual approved for use in Class I, Division 2, hazardous locations

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 2 - DESCRIPTION AND OPERATION

INTRODUCTION

INFI-NET is a unidirectional, high-speed serial data highway that can be used by all INFI 90 OPEN modules. The INNIS01 Network Interface Slave Module (NIS) and the INNPM11 Network Processing Module (NPM) make up the process control unit interface.

MODULE INTEGRITY

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

INNIS01 NETWORK INTERFACE SLAVE MODULE

The NIS module is the communication front end for the NPM module. This section provides an overview of INFI-NET communication module operating theory.

Exception Reports

Each INFI 90 OPEN module establishes exception reporting routes for process inputs (points). Some examples of exception report parameters are high/low alarm limits, minimum/ maximum report time intervals, and percent of change in span. When a point changes more than a given parameter, or an alarm state changes, the module generates an exception report.

The NPM module polls control modules (via the Controlway or module bus) for exception reports, and packages together the exception reports having a common node destination. Packing places all exception reports for a destination (or multiple destinations) into one message and the NIS module sends them to other INFI-NET nodes as a single message. This process reduces the number of transmissions required, and adjusts the message size for maximum INFI-NET loop efficiency.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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

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

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

Messages

The NIS 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* and *NODE BUSY*.

TIME SYNCHRONIZATION

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

MULTICAST

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

NIS POLL

The NIS poll message is a single destination message. The NIS 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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

bytes. The control field contains time of origination, sequence, source, size, circulation count, message type, destinations, and checksum.

The NIS module increments the circulation count field of all incoming messages. When a message count field exceeds 255, the message is discarded. This is useful in keeping retry and spurious message traffic to a minimum. The NIS module uses the message type to determine how to process the message. The checksum and cyclic redundancy check code fields verify data integrity.

MESSAGE TRANSMISSION

Any NIS module can transmit a message at any time without regard to the activities of any other NIS module on the system. Each NIS module can transmit and receive messages simultaneously. NIS start-up/shutdown is local and requires no interaction with other NIS modules on the INFI-NET loop. Each NIS module receives all incoming messages and transmits a new stream of messages in a store and forward fashion to the next node. When there are no messages for the NIS module to transmit, the NIS module transmits flag characters (null packets) as the loop synchronizing condition to keep the receivers in lock.

Data Integrity

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

RETRY LOGIC

If, on the first transmission of a message, the NIS 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 off-line.

NODE STATUS TABLE

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

POLLING

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

INNPM11 NETWORK PROCESSING MODULE

The NPM module holds the exception report routing database and directs the operation of the process control unit interface. It acts as the translator between the INFI-NET loop and the Controlway. It communicates directly to the NIS module on the I/O expander bus. Communication to all control modules within a process control unit is over the Controlway.

Exception Reports

The NPM module polls the control modules within the process control unit for exception reports. Process control unit control modules generate an exception report when:

- A designated point changes by a significant amount.
- The maximum time expires.
- An alarm condition changes.

The NPM module polls all modules for exception reports. The poll rate is selected through a dipswitch setting on the NPM circuit board. The NPM module has poll rates of one, two, four or eight polls per second.

Data Transfer

Data transfer between the NPM module and the NIS module occurs over the I/O expander bus. The NPM module is responsible for:

- Writing commands to the NIS module.
- Requesting NIS module status.
- Writing data to the NIS module.
- Reading data from the NIS module.

The NPM module always initiates a data transfer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 3 - INSTALLATION

INTRODUCTION

This section explains what must be done before placing any process control unit interface modules into operation. Read, understand, and complete the steps in the order they appear before operating the modules.

SPECIAL HANDLING

Observe these steps when handling electronic circuitry:

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

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

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

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

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

5. Ground Test Equipment.

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

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

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

UNPACKING AND INSPECTION

1. Examine the hardware immediately for shipping damage.

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

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

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

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

INNIS01 NETWORK INTERFACE SLAVE MODULE CONFIGURATION

The process control unit interface requires an INNIS01 Network Interface Slave Module (NIS). Configure the NIS module dipswitches and jumpers as follows.

Dipswitch Settings

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

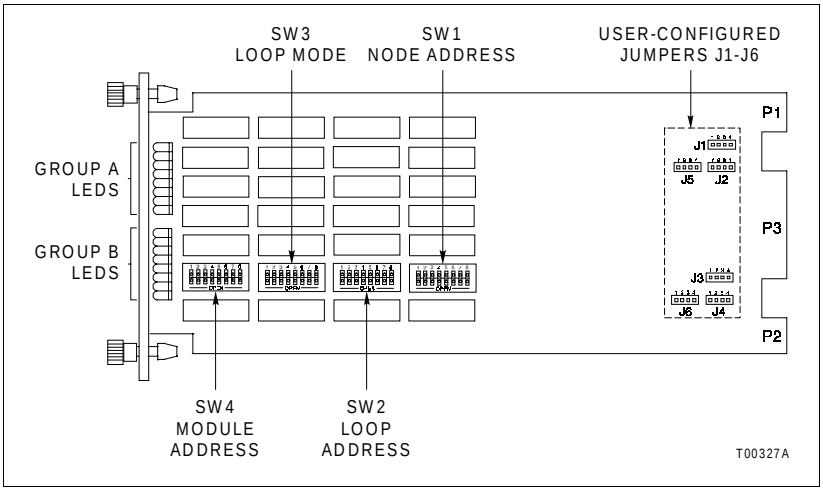


Figure 3-1. INNIS01 Module Dipswitch and Jumper Locations

DIPSWITCH SW1 - NODE ADDRESS

This dipswitch sets the node address. Valid node addresses are one through 250 (refer to Table 3-1). Pole one is the most significant bit with a binary weight of 128. Pole eight is the least

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

significant bit with a binary weight of one. Record the dipswitch SW1 settings in the space provided.

Table 3-1. INNIS01 Module Dipswitch SW1 Settings

Node Address Example	Dipswitch Pole (Binary Value)							
	1 (128)	2 (64)	3 (32)	4 (16)	5 (8)	6 (4)	7 (2)	8 (1)
1	0	0	0	0	0	0	0	1
64	0	1	0	0	0	0	0	0
250	1	1	1	1	1	0	1	0
User setting								

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

DIPSWITCH SW2 - LOOP ADDRESS

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

Table 3-2. INNIS01 Module Dipswitch SW2 Settings

Node Address Example	Dipswitch Pole (Binary Value)							
	1 (128)	2 (64)	3 (32)	4 (16)	5 (8)	6 (4)	7 (2)	8 (1)
1	0	0	0	0	0	0	0	1
64	0	1	0	0	0	0	0	0
250	1	1	1	1	1	0	1	0
User setting								

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

DIPSWITCH SW3 - LOOP MODE

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

Table 3-3. INNIS01 Module Dipswitch SW3 Settings

Pole	Setting[1,2]	Function[2]	User Setting
1	1	Unused.	
	0	**This NIS module is part of a process control unit or INFI-NET to computer interface.**	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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

Pole	Setting[1,2]	Function[2]	User Setting
2	**1**	**ROM checksumming enabled.**	
	0	ROM checksumming disabled.	
3	1	Test mode: no time-out for handshake failure.	
	0	**Normal operating mode.**	
4[3]	1	All loop messages return a busy negative acknowledgment.	
	0	**Normal operating mode.**	
5[3]	**1**	**Group A LEDs will toggle on and off if loop 1 is idle or shorted. Group B LEDs will toggle on and off if loop 2 is idle or shorted. Normal display otherwise.**	
	0	LED display as defined by dispwitch SW4.	
6[3]	1	Diagnostic mode.	
	0	**Normal operating mode.**	
7/8	0/0	10-Mbaud INFI-NET mode.	
	0/1	2-Mbaud INFI-NET mode.	
	1/0	Unused.	
	1/1	Unused.	

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

Dipswitch SW3 pole one determines network processing module compatibility. Set pole one to zero for a process control unit interface. Pole two enables or disables ROM checksumming. Elsag Bailey recommends that the NIS module be installed with checksumming enabled to take full advantage of the on-board diagnostics. Pole three enables internal testing which must be disabled for normal operation. Pole four, in conjunction with pole three, makes the node appear to be busy to other nodes. This condition is used by Elsag Bailey personnel only. Pole five enables the loop idle condition display for the front panel LEDs. If loop one is idle, the group A LEDs will flash on and off about twice per second. If loop two is idle, the group B LEDs will flash. The loop idle display is intended to serve as a warning that a loop integrity problem exists. Pole six enables diagnostic tests that preclude normal NIS module operation. Poles seven and eight determine loop speed and loop mode.

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

DIPSWITCH SW4 - I/O EXPANDER BUS ADDRESS AND COUNTERS

The NIS module can have an I/O expander bus address from zero to seven. Poles one through three of dipswitch SW4 set the I/O expander bus address of the NIS module. Refer to Table

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-4 for I/O expander bus address settings. Poles four through eight set the address of the on-board event and error counters that the NIS module displays using the group A and B face-plate LEDs. LED B8 is the most significant bit. LED A1 is the least significant bit. Table 3-5 lists the possible event counter addresses. Table 3-6 lists the possible error counter addresses. Record the dipswitch SW4 settings in the space provided.

Example of Counter Usage

A counter setting with the hexadecimal value of 09 keeps track of the number of multicast messages received excluding those originated. To display this counter on the front panel LEDs, set dipswitch SW4 as follows: position 4 = 0, 5 = 1, 6 = 0, 7 = 0, and 8 = 1.

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

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

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

Table 3-5. INNIS01 Module Event Counters

Dipswitch Pole[1] (Binary Value)					Hexadecimal Value	Description[2]
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
0	0	0	0	0	00	Number of timer interrupts.
0	1	0	0	1	09	Number of multicast messages received (excluding originated messages).
0	1	0	1	0	0A	Number of multicast destinations received.
0	1	0	1	1	0B	Number of time sync messages received (excluding originated messages).
0	1	1	0	0	0C	Number of broadcast messages received (excluding originated messages).
0	1	1	0	1	0D	Number of NIS poll messages received (excluding originated messages).
0	1	1	1	0	0E	Number of poll messages acknowledged by this node.
0	1	1	1	1	0F	Number of poll messages busy negative acknowledged by this node.
1	**0**	**0**	**0**	**0**	**10**	**Number of messages transmitted (total loop traffic).**
1	0	0	0	1	11	Number of loop messages received and forwarded by this node.
1	0	0	1	0	12	Number of messages originated by this node (including retries).
1	0	0	1	1	13	Number of message retries originated by this node.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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

Dipswitch Pole[1] (Binary Value)					Hexadecimal Value	Description[2]
4 (16)	5 (8)	6 (4)	7 (2)	8 (1)		
1	0	1	0	0	14	Number of transmitted message watchdog expirations.
1	0	1	0	1	15	Number of messages put into the receive buffer and retained.
1	0	1	1	0	16	Number of bytes originated by this node (including retries).
1	0	1	1	1	17	Number of bytes received and forwarded by this node.
1	1	0	0	0	18	Number of I/O expander bus to NIS handshakes.
1	1	0	0	1	19	Number of I/O expander bus to transmit buffer signals.
1	1	0	1	0	1A	Number of I/O expander bus process control unit status requests.
1	1	0	1	1	1B	Number of I/O expander bus NIS status requests.
1	1	1	0	0	1C	Number of I/O expander bus interrupts with invalid status.
1	1	1	0	1	1D	Number of transmit buffer realignments due to invalid contents.
1	1	1	1	0	1E	Number of receive buffer realignments.
1	1	1	1	1	1F	Number of status buffer realignments.
						User setting

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

Table 3-6. INNIS01 Module Error Counters

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

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Jumper Settings

There are six jumpers on the NIS module that set the communication rate of the receiver analog circuit (refer to Figure 3-1 for jumper locations). All six jumpers must be set in the same position. Jumper setting instructions are silk screened on the upper left corner of the NIS circuit board. The jumper setting must match the communication rate set by poles seven and eight of dipswitch SW3. Figure 3-2 shows which pins to jumper for various loop modes. This figure shows placement of the pins when looking at the top of the NIS circuit board with the faceplate on the left.

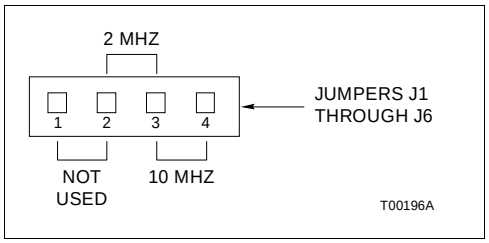


Figure 3-2. INNIS01 Module Jumper Setting

Power System Status

The communication system provides a means to monitor the status of the power system of each node. This status information can be displayed on the operator console. Electronics within the power entry panel monitor the power system status. A single status output is made available to the communication system. To use this feature, wire the status output to the terminal block on the termination device (NTCL01 or NICL01) labeled PSS1 or PSS2. Two sets of terminals are available on each termination device for interconnecting the power system status output.

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

INNIS01 MODULE INSTALLATION

If the NIS dipswitches and jumpers are properly configured, it is ready to be installed in the module mounting unit. To install the NIS module:

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

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

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

3. Remove any 24-pin dipshunts from the I/O expander bus sockets that would connect the NIS module to any module other than the NPM module.

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

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

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

7. Turn the 2 latching screws ½-turn to lock the module in place. The module is locked into place when the open side of the slot on the latching screws faces the center of the faceplate.

Refer to the NTCL01 termination unit or NICL01 termination module instruction for complete termination device information. Appendices A and B provide quick reference information about these termination devices.

INNPM11 NETWORK PROCESSING MODULE CONFIGURATION

Install one NPM module with one NIS module to make a process control unit interface. The NPM module has two dipswitches that set the module operating characteristics. These dipswitches select module operation options, communication characteristics, and baud rate. Figure 3-3 shows the dipswitch and jumper locations on the NPM module. The NPM module dipswitches and jumpers must be configured before it can be installed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

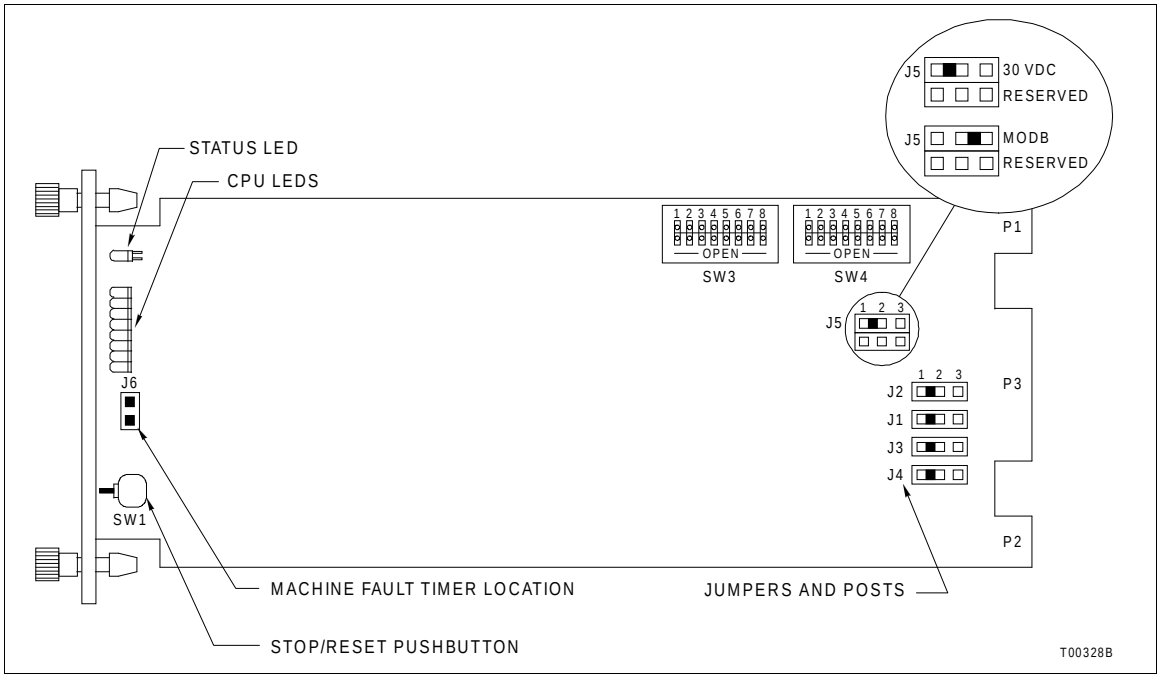


Figure 3-3. INNPM11 Module Dipswitch and Jumper Locations

The NPM module supports the warm failover feature which is the ability to switch from the primary process control unit interface to the redundant backup process control unit without losing any information or functionality. An NKMP01 or NKMP11 cable is required for redundant module operations. For optimum warm failover performance, the NIS module firmware revision should be E.0 or later. In redundant NPM module applications, the dipswitches on the primary and backup NPM module must be set identically except for the module address setting, which must be unique. Configure the NPM module as follows.

Dipswitch SW3 - Operating Modes

Dipswitch SW3 is an eight-pole dipswitch that determines the operating modes and Controlway address of the NPM module. Table 3-7 lists dipswitch SW3 settings. Record the dipswitch SW3 settings in the space provided.

Table 3-7. INNPM11 Module Dipswitch SW3 Settings

Pole	Setting[1,2]	Function[2]	User Setting
1	1	Hardware diagnostics enabled.	
	0	**Hardware diagnostics disabled.**	
2	**0**	**Unused.**	
3	1	Module bus mode (800 kbaud).	
	0	Controlway mode[3] (1 Mbaud).	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3-7. INNPM11 Module Dipswitch SW3 Settings (continued)

Pole	Setting[1,2]	Function[2]	User Setting
4 - 7	**0**	**Unused.**	
8[4]	1	Controlway module address one.	
	0	Controlway module address zero.	

NOTES:
1. 1 = OPEN or OFF, 0 = CLOSED or ON.
2. Shaded areas designate normal operating positions.
3. To operate in Controlway mode all modules must be operating in the Controlway mode
4. Each NPM module of a redundant pair must have a unique address.

Dipswitch SW4 - Options

Dipswitch SW4 is an eight-pole dipswitch that sets the operating options of the NPM module. Refer to Table 3-8 for option settings. Record the dipswitch SW4 settings in the space provided.

Table 3-8. INNPM11 Module Dipswitch SW4 Settings

Pole	Setting[1,2]	Function[2]	User Setting
1	1	ROM checksumming disabled.	
	0	**ROM checksumming enabled.**	
2	1	Failover on power system status failure enabled.	
	0	**Failover on power system status failure disabled.**	
3	1	Redundant module expected.	
	0	Redundant module not expected.	
4[3]	1	INFI-NET diagnostics enabled.	
	0	**INFI-NET diagnostics disabled.**	
5/6	0/0	Exception report poll rate: 1 poll per second (slow).	
	0/1	Exception report poll rate: 2 polls per second (slow).	
	1/0	**Exception report poll rate: 4 polls per second (standard).**	
	1/1	Exception report poll rate: 8 polls per second (fast).	
7	1	Test mode enabled.	
	0	**Test mode disabled.**	
8	**0**	**Unused.**	

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Jumper Settings

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

There are five jumpers on the NPM circuit board. Refer to Figure 3-3 for jumper locations. Jumpers J1 through J4 direct signals to the termination unit or module. These jumpers are factory set with pin one and pin two connected together. ***Do not change these jumper settings.***

Jumper J5 disconnects -30 VDC, supplied in early Network 90 systems, from the NPM module. This jumper is factory set with pin one and pin two connected. This setting allows the module to function in early Network 90 systems (-30 VDC supplied to modules) or limits communication to the module bus in INFI 90 OPEN systems. Connect pin two and pin three together to use the module on the Controlway. Refer to Table 3-9 for more information.

NOTE: Two through holes labeled J6 are located at the front of the NPM circuit board. These are for Elsag Bailey development personnel only. Connecting header pins and a jumper will disable the machine fault timer circuit. If this function is disabled and a problem develops in the NPM module, the module will not halt which may result in configuration corruption and unpredictable module outputs.

Table 3-9. INNPM11 Jumpers J1 through J5 Settings

Jumper	Setting	Function	User Setting
J1	**1-2**	**Factory setting. Do not change this setting.**	
J2			
J3			
J4			
J5	1-2	Disconnects Controlway for operation in module mounting units that have -30 VDC (early Network 90).	
	2-3	Allows operation in module mounting units that have Controlway communication. This setting must be used if dipswitch SW3 selects the Controlway.	

NOTE: Shaded areas designate mandatory jumper settings.

INNPM11 MODULE INSTALLATION

If the NPM module dipswitches and jumpers are properly configured, it is ready to be installed in the module mounting unit.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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

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

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

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

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

To install the NPM module:

1. Verify the NPM module slot assignment in the module mounting unit is adjacent to its associated NIS module.

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

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

> **NOTE:** When installing redundant NPM modules, each NPM module must be connected to its own NIS module on the I/O expander bus. Do not connect the individual I/O expander buses that belong to each set of redundant modules.

3. Remove any 24-pin dipshunts from the I/O expander bus sockets that would connect the NPM module to any module other than the NIS module.

4. In redundant process control unit interface applications, connect one end of the NKMP01 or NKMP11 cable to the rear of the module mounting unit slot assigned to the primary NPM module.

5. Connect the other end of the NKMP01 or NKMP11 redundancy cable to the rear of the module mounting unit slot assigned to the backup NPM module.

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7. Push on the faceplate until the rear edges of the module are firmly seated in the backplane connectors.

8. Turn the two latch screws ½-turn to lock the module in place. The module is locked into place when the open end of the slot on the latching screws faces the center of the faceplate.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 4 - OPERATING PROCEDURES

INTRODUCTION

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

INNIS01 NETWORK INTERFACE SLAVE MODULE START-UP PROCEDURES

On power up, the INNIS01 Network Interface Slave Module (NIS) microprocessor stays in reset until the INNPM11 Network Processing Module (NPM) removes the reset and allows the firmware to execute self-diagnostic routines. The NPM module determines when the NIS module will go on-line. The NIS module comes on-line in the loop mode set by poles seven and eight of dipswitch SW3, with the type of counter display set by poles four through eight of dipswitch SW4.

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

Event Counters

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

Error Counters

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

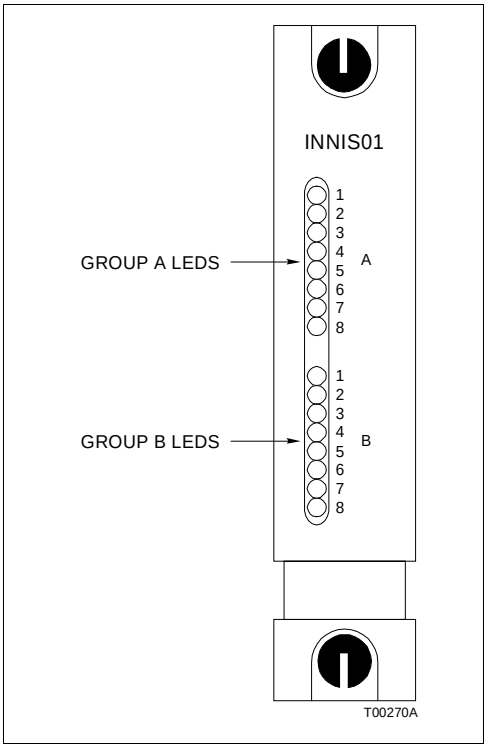


Figure 4-1. INNIS01 Module Faceplate LEDs

INNPM11 NETWORK PROCESSING MODULE LEDs AND CONTROLS

The faceplate of the INNPM11 module has the following components (refer to Figure 4-2):

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

Status LED

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

CPU LEDs

During normal operation, LEDs seven and eight are illuminated. In redundant configurations, LED eight on the backup NPM module is illuminated. If an error occurs, these LEDs display an error code and the status LED turns red. Refer to Table 5-2 for a list of CPU LED error codes and associated corrective action.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

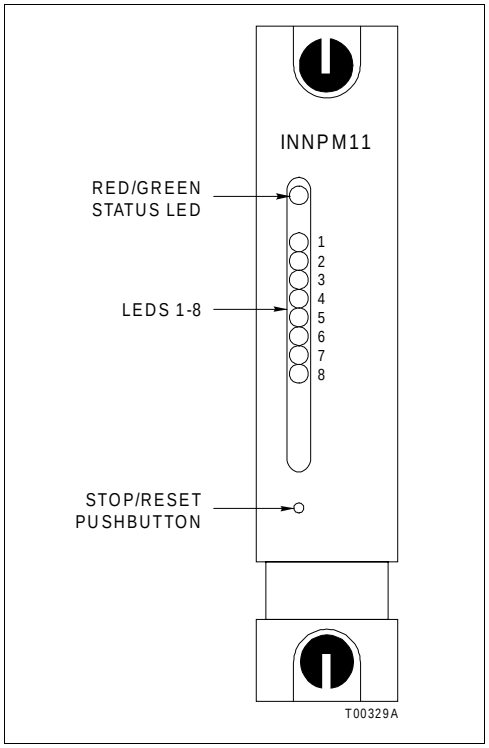


Figure 4-2. INNPM11 Module Faceplate LEDs and Controls

Table 4-1. INNPM11 Module Status LED States

LED State	Description
Off	No power to the NPM.
Solid green	The NPM is in execute mode.
Solid red	The NPM diagnostics detect a hardware failure or configuration problem. CPU LEDs display an error code when the status LED is red.

Stop/Reset Pushbutton

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

INNPM11 MODES OF OPERATION

The NPM module has two modes of operation: Execute and error.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Execute Mode

Execute mode is the normal mode of operation. In this mode, the INFI-NET system and modules in the process control unit interact through the process control unit interface. The NPM module can request exception reports, collect exception reports, allow the operator to adjust tunable module specifications, and configure modules within a node residing on the INFI-NET system.

Error Mode

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 5 - TROUBLESHOOTING

INTRODUCTION

Troubleshooting the process control unit interface is limited to viewing the contents of the error counters and the module status report from any INFI 90 OPEN operator interface. Refer to the instruction for your specific computer interface for information on module status reports.

ERROR COUNTERS

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

INNIS01 MODULE ERROR CODES

The NIS module error counters total errors in the same manner as the event counters total events. Table 3-6 lists the types of error counters. The NIS module halts operation if a fatal error condition occurs. Group A LEDs display error codes. Group B LEDs are off when group A LEDs are displaying error codes. Refer to Table 5-1 for a list of error codes and associated corrective action.

Table 5-1. INNIS01 Module Error Codes

Code	LEDs 8 7 6 5 4 3 2 1	Condition	Corrective Action
13	0 0 0 1 0 0 1 1	ROM checksum error	Replace NIS.
16	0 0 0 1 0 1 1 0	Loopback test failure	Check cabling and termination unit. Replace NIS.
31	0 0 1 1 0 0 0 1	Memory or CPU fault	Replace NIS.
32	0 0 1 1 0 0 1 0	Address or bus error	Reset NPM. replace NIS 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 NIS	Check dipswitches SW1 through SW4.
3E	0 0 1 1 1 1 1 0	NIS/device handshake failure	Verify that dipshunt exists between NIS and NPM modules. If dipshunt exists, replace NIS or NPM.

NOTE: 0 = LED OFF, 1 = LED ON

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

INNPM11 MODULE ERROR CODES

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

Table 5-2. INNPM11 Module Error Codes

Code	LEDs 8 7 6 5 4 3 2 1	Condition	Corrective Action
0D	0 0 0 0 1 1 0 1	Intermodule link errors	Check I/O expander bus connection between primary and secondary NPM modules.
0E	0 0 0 0 1 1 1 0	Dipswitch SW3 position 8 is set the same on redundant NPM modules	Change position 8 on one of the NPM modules. Check for another module at NPM Controlway address.
12	0 0 0 1 0 0 1 0	NIS handshake failure	Replace NIS or NPM.
13	0 0 0 1 0 0 1 1	ROM checksum error	Reset NPM, replace NPM if error continues.
14	0 0 0 1 0 1 0 0	I/O expander bus message failure	
15	0 0 0 1 0 1 0 1	Loopback test failure	Check cabling and termination device. Replace NIS.
31	0 0 1 1 0 0 0 1	Memory or CPU fault	Replace NPM.
32	0 0 1 1 0 0 1 0	Address or bus error	Reset NPM. replace NPM if error continues.
33	0 0 1 1 0 0 1 1	Illegal instruction	
34	0 0 1 1 0 1 0 0	Trace/privilege violation	
35	0 0 1 1 0 1 0 1	Spurious/unassigned exception	
36	0 0 1 1 0 1 1 0	Divide by 0/checksum/format error	
38	0 0 1 1 1 0 0 0	Option dipswitch settings do not match between primary and backup NIS or NPM modules.	Check option dipswitches settings.
39	0 0 1 1 1 0 0 1	Duplicate node number on loop	Change node number. Check primary and backup NPM configuration (NKMP01/11 cable not installed).
3C	0 0 1 1 1 1 0 0	Relay or fuse failure on termination device or power supply failure	Check relay or fuse. Check power supply. Replace termination device if error continues.
3D	0 0 1 1 1 1 0 1	Incompatible NIS module firmware	NPM firmware revision C.1 or later requires NIS firmware revision E.1 or later.
3F	0 0 1 1 1 1 1 1	NPM has stopped because the user pressed the stop button	Reset NPM.

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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

INNIS01 MODULE EDGE CONNECTORS

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

Table 5-3. INNIS01 Module Edge Connector P1 Pin Assignments

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

NOTE: 1. Power fail interrupt.

Table 5-4. INNIS01 Module Edge Connector P2 Pin Assignments

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 5-5. INNIS01 Module Edge Connector P3 Pin Assignments

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

INNPM11 MODULE EDGE CONNECTORS

Tables 5-6 through 5-8 list the NPM module edge connector pin assignments.

Table 5-6. INNPM11 Module Edge Connector P1 Pin Assignments

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 5-7. INNPM11 Module Edge Connector P2 Pin Assignments

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

Table 5-8. INNPM11 Module Edge Connector P3 Pin Assignments

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 6 - MAINTENANCE

INTRODUCTION

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

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

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

Personnel performing preventive maintenance should meet the following qualifications:

- Should be qualified electrical technicians or engineers that know the proper use of test equipment.
- Should be familiar with the modules that make up the process control unit interface, have experience working with process control systems, and know what precautions to take when working on live electrical systems.

PREVENTIVE MAINTENANCE SCHEDULE

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

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Preventitive Maintenance Schedule

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

EQUIPMENT/TOOLS REQUIRED

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

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

PREVENTIVE MAINTENANCE PROCEDURES

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

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

Printed Circuit Board Cleaning

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

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

GENERAL CLEANING AND WASHING

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

Another method of washing the printed circuit board is:

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

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

EDGE CONNECTOR CLEANING

To clean edge connector contacts:

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

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

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

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

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

To clean tarnished or deeply stained edge connector contacts:

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

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

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

4. Wipe the contacts clean with a lint free cloth.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Checking Connections

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

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

Verify that all cable connections are secure.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 7 - REPAIR/REPLACEMENT PROCEDURES

INTRODUCTION

Repair procedures are limited to module replacement. If an INNIS01 or INNPM11 module fails, remove and replace it with another. Verify that the replacement module dipswitch and jumper settings are the same as those of the failed module.

> **NOTE:** Do not remove interface modules under power unless module operation has been halted.

MODULE REPLACEMENT PROCEDURE

Follow Steps one through five to replace INNIS01 and INNPM11 modules. Observe the steps listed under ***SPECIAL HANDLING*** in Section 3 when handling interface modules.

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

2. Grasp the screws and slide out the module.

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

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

5. Turn the two latching screws on the module ½-turn to lock the module in place. A module is locked into the module mounting unit when the open end of the slots on the latching screws faces the center of the module faceplate.

TERMINATION UNIT OR MODULE REPLACEMENT PROCEDURE

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

- NTCL01 Communication Termination Unit.
- NICL01 Communication Termination Module.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 8 - SUPPORT SERVICES

INTRODUCTION

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

REPLACEMENT PARTS AND ORDERING INFORMATION

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

1. Part description, part number and quantity.

2. Model and serial numbers (if applicable).

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

Order parts without commercial descriptions from the nearest Bailey Controls Company sales office. Table 8-1 lists the parts shipped with the INNIS01 and INNPM01/11 modules.

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

Table 8-1. Spare Parts List

Part Number	Description
194698?1	Jumper

TRAINING

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

TECHNICAL DOCUMENTATION

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

APPENDIX A - NTCL01 TERMINATION UNIT CONFIGURATION

INTRODUCTION

The INNIS01 Network Interface Slave Module (NIS) can use the NTCL01 Communication Termination Unit (TCL) for termination. Jumpers on the TCL unit select the type of cable used to connect the NIS module to an INFI-NET system. Refer to the NTCL01 instruction for complete information. Figure A-1 shows the location of jumpers and connectors. Figures A-2 and A-3 show the coaxial and twinaxial cable connections for non-redundant applications. Figure A-4 shows the cable connections required for redundant process control unit interfaces. Table A-1 lists the jumper settings used on TCL unit circuit board revision levels D and E. Table A-2 lists the jumper settings used on TCL unit circuit board revision levels F or higher.

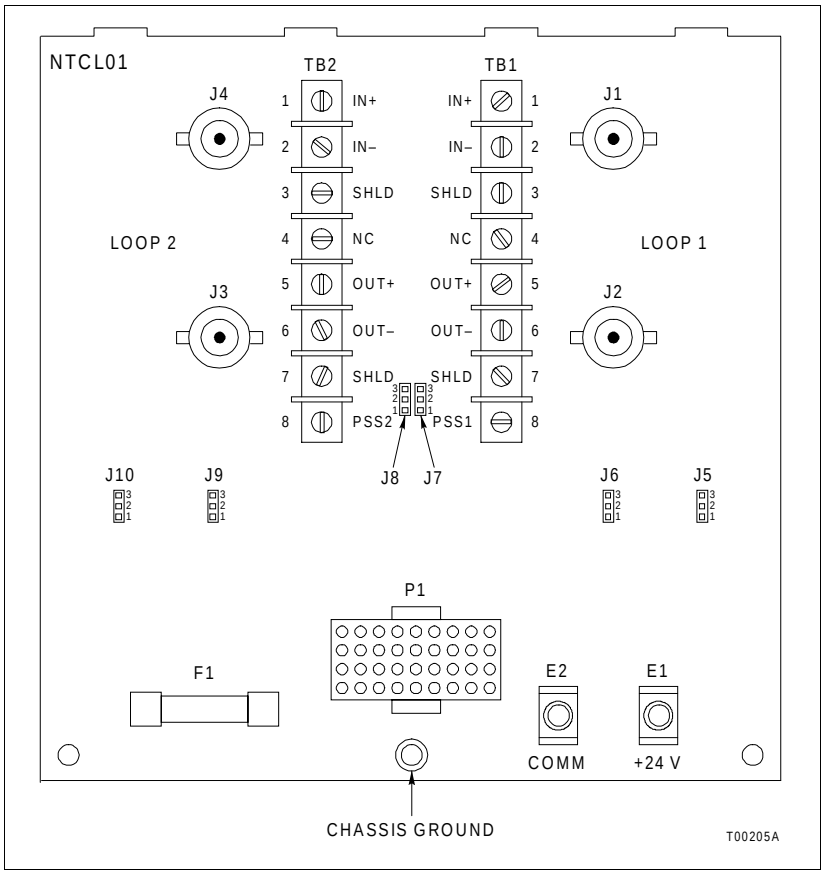


Figure A-1. NTCL01 Connector and Jumper Locations (Revision F or Greater)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

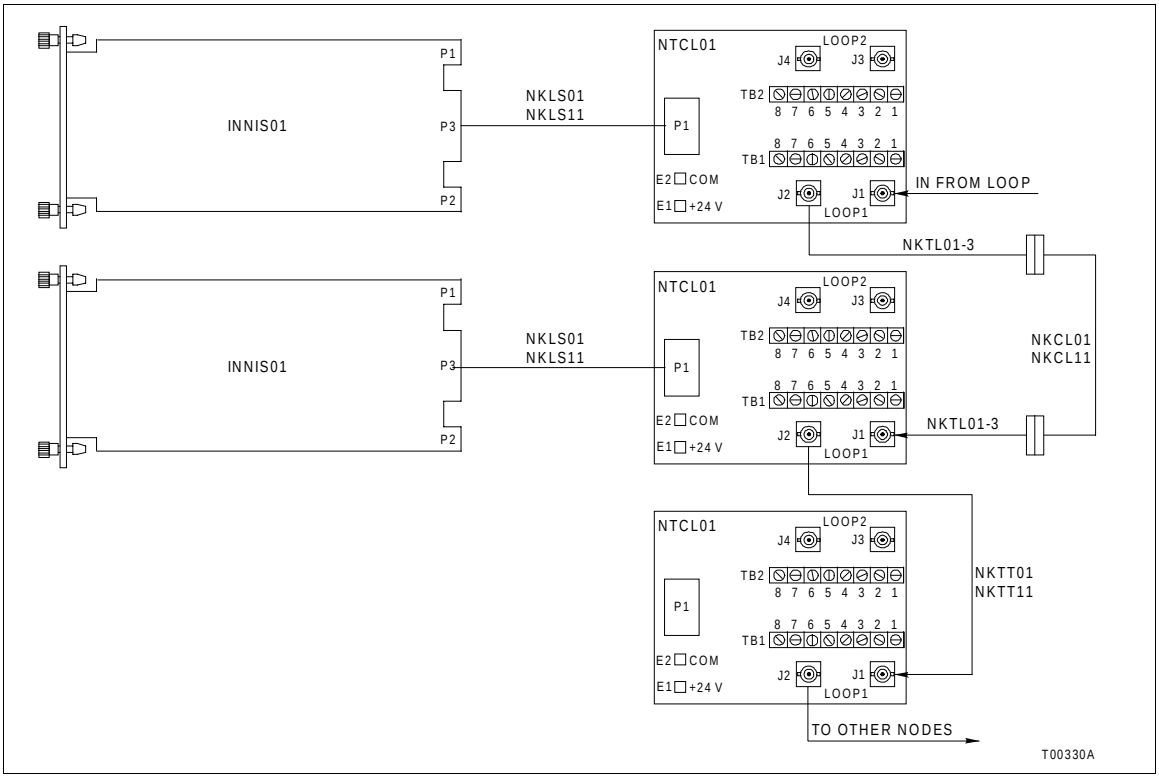


Figure A-2. NTCL01 Coaxial Cable Connections to INNIS01 Modules

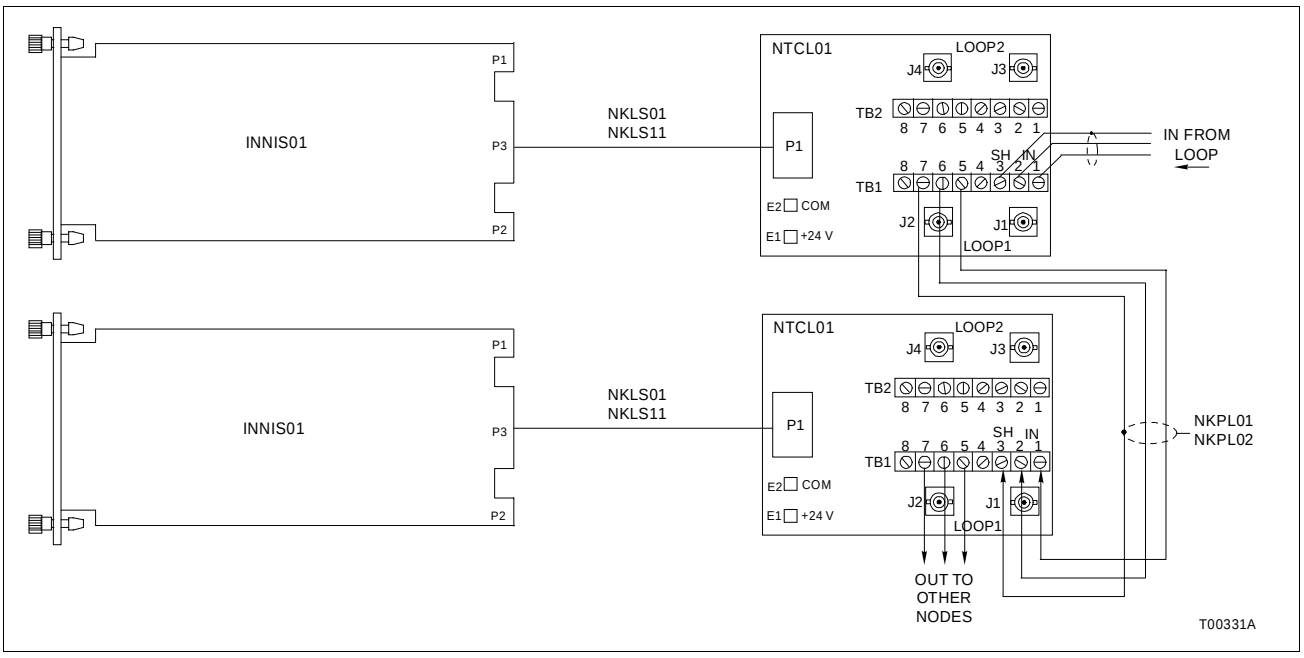


Figure A-3. NTCL01 Twinaxial Cable Connections to INNIS01 Modules

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

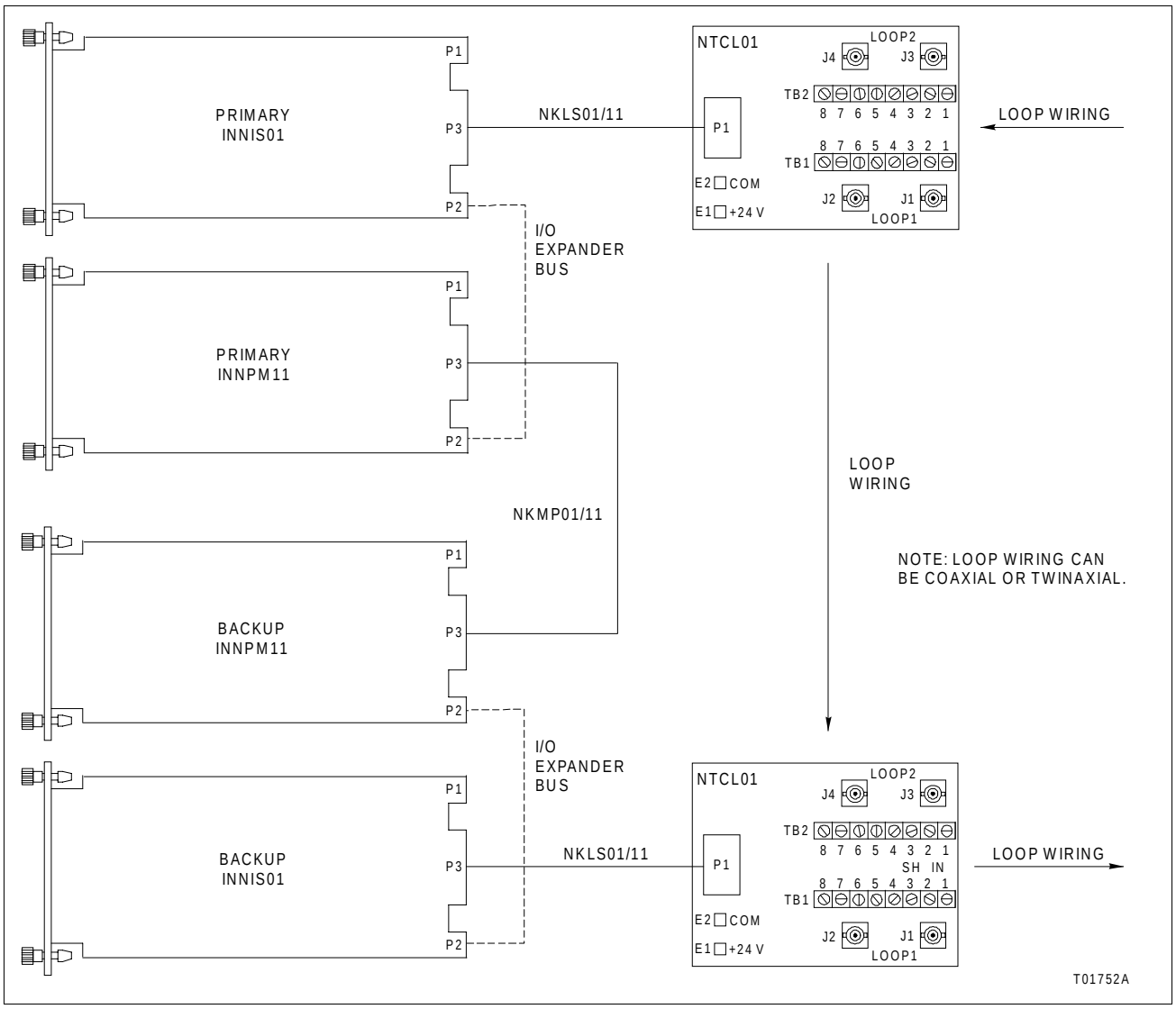


Figure A-4. Redundant Process Control Unit Interface NTCL01 Connections

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

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

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

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

APPENDIX B - NICL01 TERMINATION MODULE CONFIGURATION

INTRODUCTION

The INNIS01 Network Interface Slave Module (NIS) can use the NICL01 Communication Termination Module (ICL) for termination. Jumpers on the ICL module select the type of cable used to connect the NIS module to an INFI-NET system. Refer to the NICL01 instruction for complete information. Figure B-1 shows the location of jumpers and connectors. Figures B-2 and B-3 show the coaxial and twinaxial cable connections. Figure B-4 shows the cable connections required for redundant process control unit interfaces. Table B-1 lists the jumper settings used on ICL module circuit board revision level C. Table B-2 lists the jumper settings used on ICL module circuit board revision level D or higher.

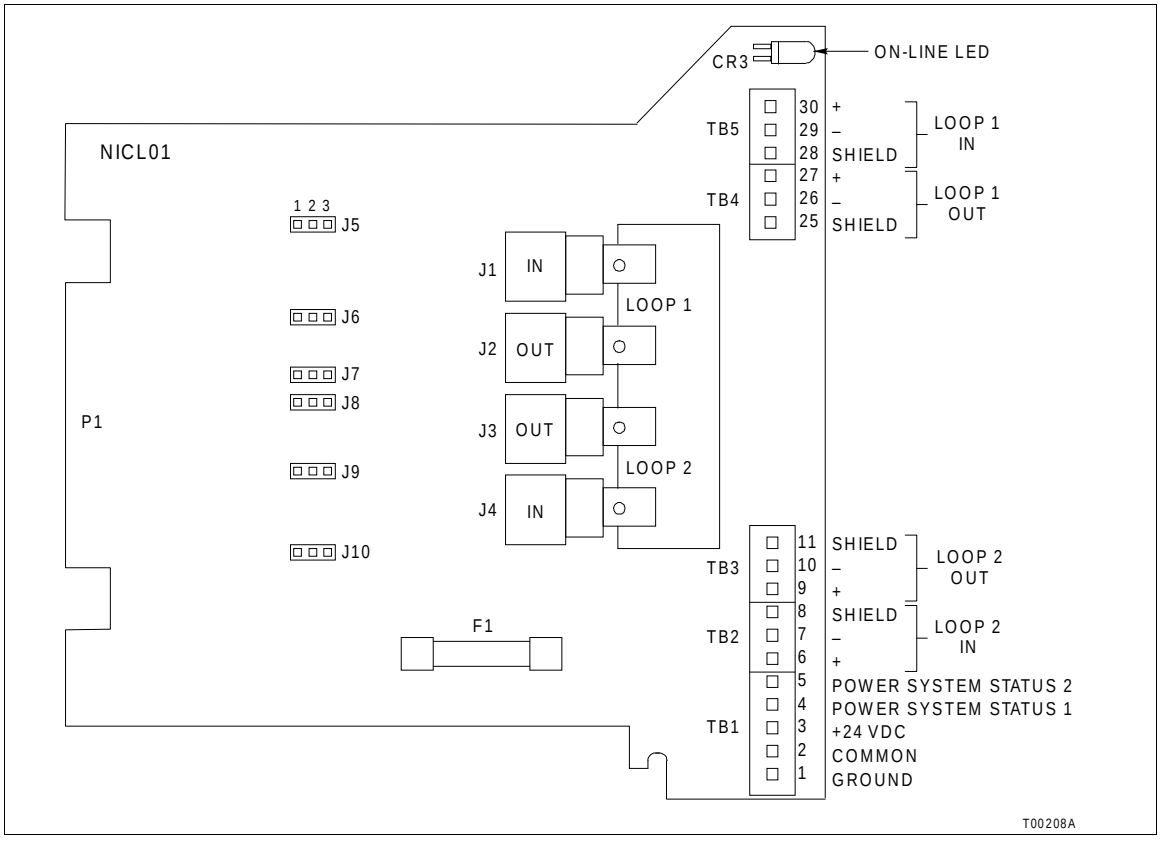


Figure B-1. NICL01 Connector and Jumper Locations (Revision D or Greater)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

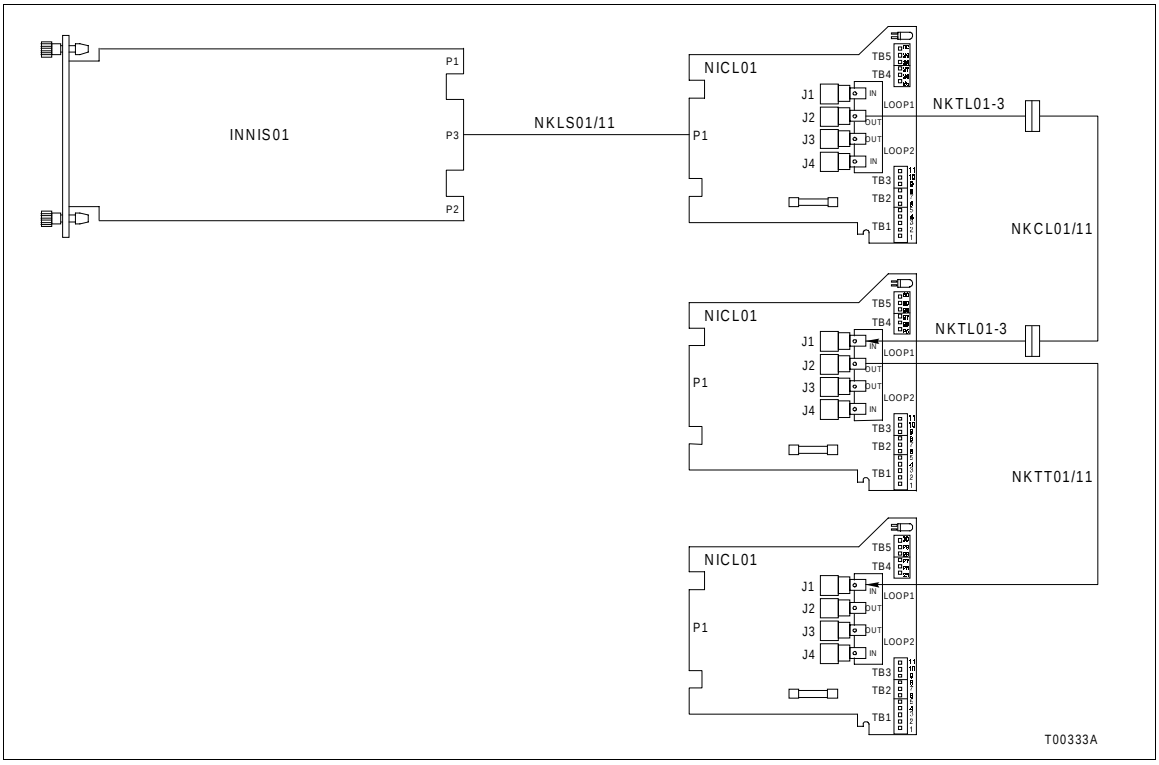


Figure B-2. NICL01 Coaxial Cable Connections to INNIS01 Modules

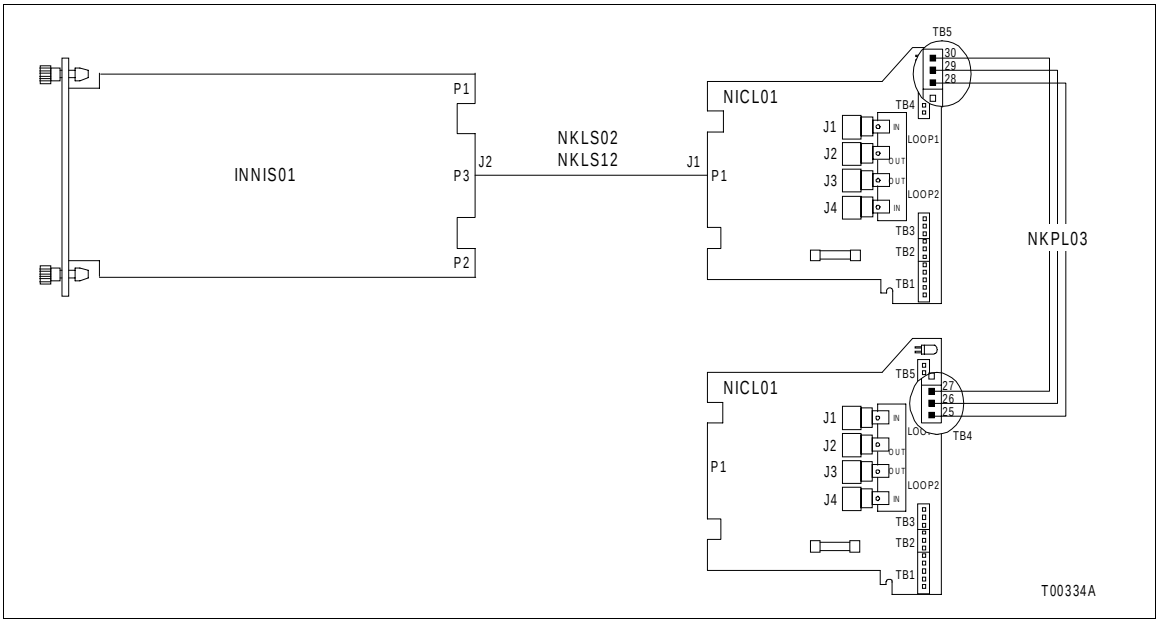


Figure B-3. NICL01 Twinaxial Cable Connections to INNIS01 Modules

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

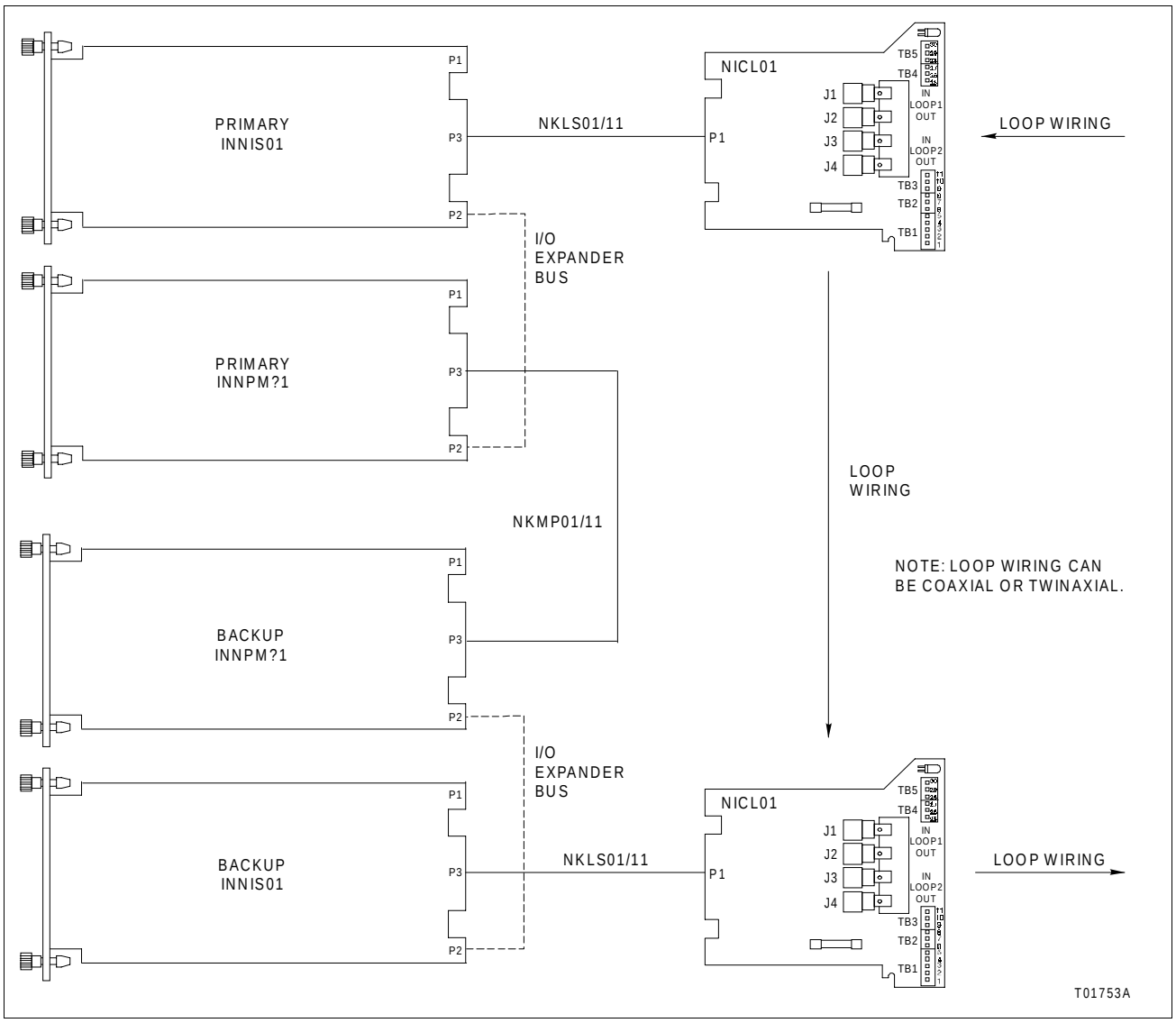


Figure B-4. Redundant Process Control Unit Interface NICL01 Connections

Table B-1. NICL01 Jumper Settings for Revision C

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

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

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

APPENDIX C - WARM FAILOVER FEATURE

INTRODUCTION

The warm failover feature was developed for the process control unit interface to minimize the interruption in the flow of exception reports that occurs when the backup process control unit interface re-establishes exception report routes once it becomes the primary process control unit interface. The elapsed time of this interruption is dependent on the number of exception report routes that need to be re-established prior to warm failover or for a cold failover. This interruption may exceed one minute for a process control unit interface with a large configuration.

During a warm failover, points configured in a process control unit interface that has failed do not reflect bad quality. In contrast, cold failover protocol dictates that all other nodes mark all exception report data from a process control unit interface that has failed as bad quality until all exception report routes are re-established and new good quality exception reports are received. Warm failover allows other nodes to maintain good quality briefly during a warm failover.

OPERATION

The warm failover feature requires an INNPM11 module with firmware revision level C_0 or later and an NKMP01 or NKMP11 cable. While the cabinet is powering up or whenever a backup NPM module is inserted into the module mounting unit, the two redundant NPM modules arbitrate for the primary and backup roles. This arbitration takes place over the Controlway. When the primary and backup roles are established, the backup module requests an image of the dipswitch settings of the primary NPM module. This image is transferred over the Controlway. All further redundancy communication takes place over the NKMP01 and NKMP11 cable.

Warm failover requires the primary NPM module to transfer a copy of its database of node, module, block, and exception report route records to the backup NPM module. On warm failover, the new primary NPM module broadcasts a warm failover node restart broadcast message on the loop and immediately obtains new exception reports from control modules in its node. These exception reports are sent to all nodes that have established exception report routes to the former primary NPM module. Other nodes that recognize the warm failover restart broadcast message will send the new primary NPM module updated exception reports for all points that the former primary NPM module requested. In this way the new primary NPM module transfers updated exception reports out of and

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

into its node without taking time to re-establish exception report routes.

The backup NPM module must receive a copy of the primary NPM module database (not exception report data) over the NKMP01 or NKMP11 cable, before it is ready for warm failover. The database in the primary NPM module must be stable for 15 seconds before it can be transferred to the backup NPM module. After 15 seconds with no changes, the primary NPM module transfers (one record at a time) a complete copy of its database to the backup NPM module. It takes about three minutes to completely transfer a large database. If the primary NPM module database changes before the transfer is complete, the transfer is aborted and will be restarted after 15 seconds without database changes. Once the entire database has been transferred, the backup NPM module is ready for warm failover. If the primary NPM module database changes after the backup NPM module is ready for warm failover, the changes are transferred to the backup NPM module in one of two ways. If only a few database records have changed, the changes are immediately transferred to the backup NPM module. If more than a few database record changes occur in a short time period, the primary NPM module resets the backup NPM module causing the entire database to be transferred to the backup NPM module.

CPU LEDs on the backup NPM module faceplate indicate the current state of readiness for warm failover. When the backup NPM module is initially powered up, LED seven is illuminated. This state indicates that the backup NPM module is not ready for warm failover. When the backup NPM module is ready for warm failover, LED seven goes out and LED eight is illuminated. If the primary NPM module fails before the backup NPM module is ready for warm failover, a cold failover will take place. As discussed earlier, cold failover protocol requires that all exception report routes must be re-established and points imported from the failed NPM module must be marked with bad quality until new good quality exception reports are received.

PERFORMANCE

Performance of the warm failover feature is measured in the elapsed time between failure of the primary NPM module and the backup NPM module assuming control. Table C-1 lists the results of warm failover testing between a redundant process control unit interface node and a nonredundant process control unit interface node. The primary NPM module of the redundant interface node was stopped to simulate failure. The nonredundant interface node imports exception reports from and exports exception reports to the redundant interface node. The time values listed in Table C-1 indicate the time required for the backup NPM module to recognize a primary NPM module failure, for the importing and exporting of various numbers

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

of exception reports, and for the backup NPM module to assume control. All test configurations are balanced in that both nodes import and export the same numbers and types of exception reports. Local time values represent the time required by the backup NPM module in a redundant interface node to recognize a primary NPM module failure, receive the indicated number of exception reports from and send the indicated number of exception reports to the nonredundant interface node, and to assume control. Remote time values represent the time required by the nonredundant NPM module to transmit all exception reports to and receive all exception reports from the redundant NPM module following a primary NPM module failure. The remote time values correspond roughly to the time required by the redundant interface node to export all of the configured exception reports following a warm failover.

Table C-1. Warm Failover Performance Data

Points Imported and Eported	Time (msec)	
	Local	Remote
50 analog	400	750
50 analog and 100 digital	725	1475
100 analog and 150 digital	950	2350
225 analog and 275 digital	1750	4400
300 analog and 450 digital	2550	6400
400 analog and 600 digital	33215	8500
600 analog and 900 digital	4925	12325

RESTRICTIONS

The following INFI-NET communication modules support the warm failover feature and recognize the warm failover node on-line broadcast message:

- INNPM11 Network Processing Module firmware revision C_0 or later.
- NSBM01 Superloop Bus Module firmware revision D_0 or later.

The following INFI-NET communication modules recognize the warm failover on-line broadcast message:

- INICT01 INFI-NET to Computer Transfer Module firmware revision F_0 or later.
- INICT03 INFI-NET to Computer Transfer Module firmware revision C_0 or later.
- IIMCP01 Multibus Communication Processor Module with IIIST01 firmware revision E_0 or later.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index

A

Abbreviations 1-5

C

Configuration
- INNIS01 3-2
  - NICL01 ..... B-1
  - NTCL01 ..... A-1
- INNIS01NICL01 ..... B-1
- INNIS01NTCL01 ..... A-1
- INNPM01 3-8

D

Data integrity 2-3
Description
- INNIS01 ..... 1-1, 2-1
- INNPM01 ..... 1-2, 2-4
- PCU interface 1-1

Dipswitches
- INNIS01 3-2
- INNPM01 3-8

Documentation 8-1

E

Error codes
- INNIS01 5-1
- INNPM01 5-2

Exception reports 2-1, 2-4

G

Glossary 1-5

I

INNIS01
- Configuration 3-2
- Description 1-1, 2-1
- Edge connectors 5-3
- Error codes 5-1
- Installation 3-8
- LEDs 4-1
- Replacement procedures 7-1
- Specifications 1-6
- Termination device
  - NICL01 ..... B-1
  - NTCL01 ..... A-1

INNPM01
- Configuration 3-8
- Description 1-2, 2-4
- Edge connectors 5-4
- Error codes 5-2
- Installation 3-12
- LEDs and controls 4-2
- Operating modes 4-3
- Replacement procedures 7-1
- Specifications 1-6

Installation
- INNIS01 3-8
- INNPM01 3-12

J

Jumpers
- INNIS01 3-7
- INNPM01 3-11
- NICL01 ..... B-3
- NTCL01 ..... A-3

M

Maintenance 6-1
- Procedures 6-2
- Schedule 6-1
- Tools/equipment required 6-2

Manual content 1-4
Message types 2-2

N

NICL01 termination module B-1
- Jumper settings B-3

Nomenclature 1-6
NTCL01 termination unit A-1
- Jumper settings A-3

O

Operating modes 4-3
Overview 1-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index (continued)

P

PCU interface description 1-1

R

Reference documents 1-5
Replacement
  Parts 8-1
  Procedures 7-1

S

Special handling precautions 3-1
Specifications 1-6

T

Termination devices
  NICL01 ..... B-1
  NTCL01 ..... A-1
Terms 1-5
Training 8-1
Troubleshooting 5-1

U

Unpacking and inspection 3-2
User qualifications 1-1

W

Warm failover C-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Visit Elsag Bailey on the World Wide Web at http://www.bailey.com

Our worldwide staff of professionals is ready to meet *your* needs for process automation.
For the location nearest you, please contact the appropriate regional office.

AMERICAS
29801 Euclid Avenue
Wickliffe, Ohio USA 44092
Telephone 1-216-585-8500
Telefax 1-216-585-8756

ASIA/PACIFIC
152 Beach Road
Gateway East #20-04
Singapore 189721
Telephone 65-391-0800
Telefax 65-292-9011

EUROPE, AFRICA, MIDDLE EAST
Via Puccini 2
16154 Genoa, Italy
Telephone 39-10-6582-943
Telefax 39-10-6582-941

GERMANY
Graefstrasse 97
D-60487 Frankfurt Main
Germany
Telephone 49-69-799-0
Telefax 49-69-799-2406

Form WBPEEUI250016A1 Litho in U.S.A. 897

Copyright © 1997 by Elsag Bailey Process Automation, As An Unpublished Work
® Registered Trademark of Elsag Bailey Process Automation
™ Trademark of Elsag Bailey Process Automation

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP