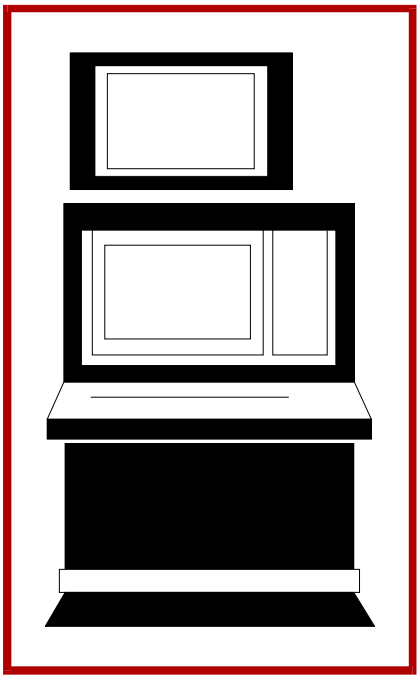
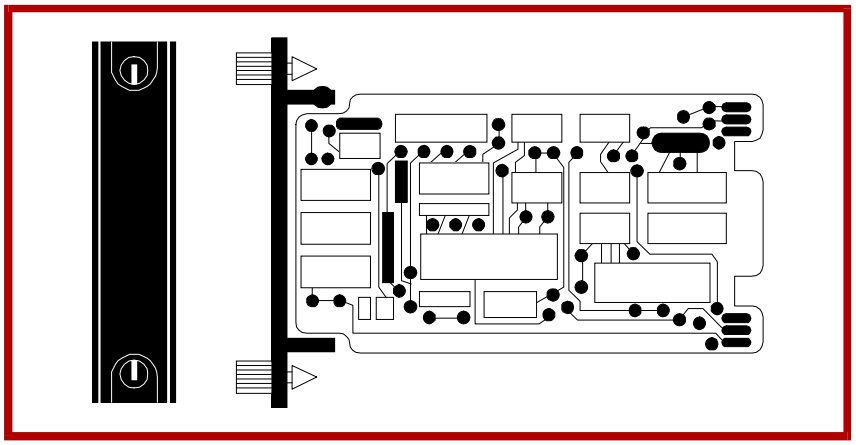
Bailey® infi 90®

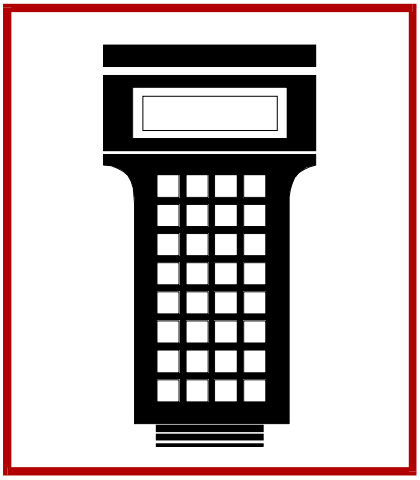
E96-434

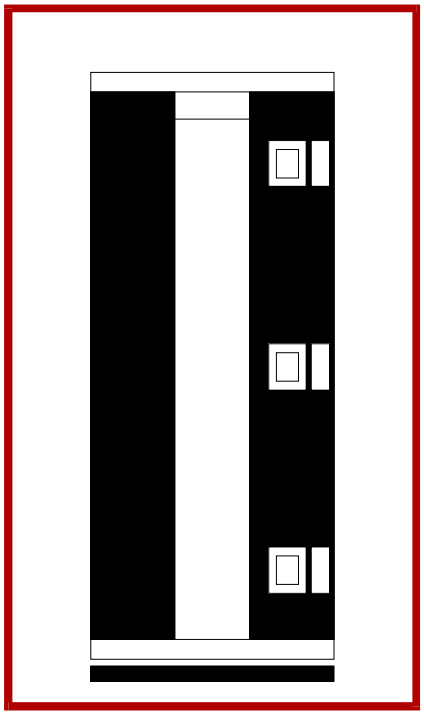
Instruction

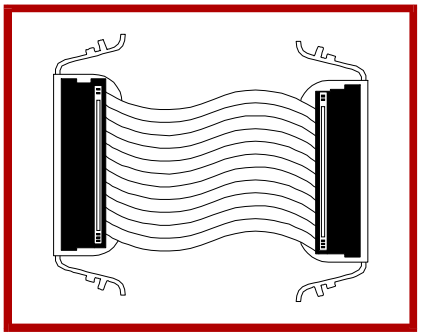
Analog Input Termination Module
(NIAI02)

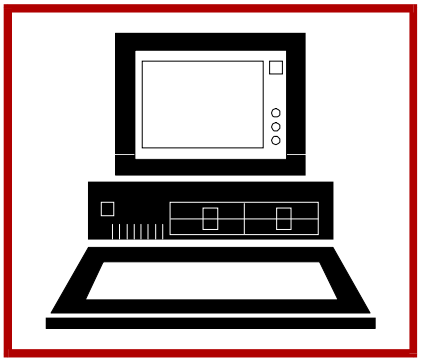












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WARNING notices as used in this instruction apply to hazards or unsafe practices that could result in personal injury or death.

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.

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LA PLUPART DES ÉQUIPEMENTS ÉLECTRONIQUES SONT SENSIBLES AUX PERTURBATIONS PAR FRÉQUENCE RADIO. DES PRÉCAUTIONS DEVRONT ÊTRE PRISES LORS DE L'UTILISATION DU MATÉRIEL DE COMMUNICATION PORTATIF. LA PRUDENCE EXIGE QUE LES PRÉCAUTIONS À PRENDRE DANS CE CAS SOIENT SIGNALÉES AUX ENDROITS VOULUS DANS VOTRE USINE.

PERTURBATIONS DU PROCÉDÉ

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

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Preface

Termination modules provide an input connection from the plant equipment to the INFI 90® process modules. The Analog Input Termination Module (NIAI02) interfaces thermocouple or millivolt inputs to the Analog Input Slave Module (IMASM02).

This manual explains how to install and use the NIAI02 on the INFI 90 system. It has sections that describe the setup and cabling. The appendix contains information about the IMASM02 module that uses the NIAI02.

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List of Effective Pages

Total number of pages in this manual is 22, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through vi	Original
1-1 through 1-4	Original
2-1 through 2-6	Original
3-1 Original	
4-1 through 4-2	Original
5-1	Original
A-1	Original
Index-1	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.

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 ensure that contact with energized parts is avoided when servicing.
SPECIFIC CAUTIONS	Remove modules from their assigned slots before installing a cable to that slot. Failure to do so could result in damage to the module or station. (p. 2-4, 4-1) It is strongly recommended that all power (cabinet, I/O, etc.) be turned off before doing any termination module wiring. Failure to do so could result in equipment damage. Do not apply power until all connections are verified. (p. 2-5, 4-1) If input or output circuits are a shock hazard after disconnecting system power at the power entry panel, then the door of the cabinet containing these externally powered circuits must be marked with a warning stating that multiple power sources exist. (p. 2-6)

Sommaire de Sécurité

AVERTISSEMENTS D'ORDRE GÉNÉRAL	**Environment de l'equipement** Ne pas soumettre les composants a une atmosphere corrosive lors du transport, de l'entreposage ou de l'utilisation. **Risques de chocs electriques lor de l'entretien** S'assurer de debrancher l'alimentation ou de prendre les precautions necessaires a eviter tout conatact avec des composants sours tension lors de l'entretien.

ATTENTIONS D'ORDRE SPÉCIFIQUE	Retirer les modules de leur position assignée avant d'installer un câble à cette position. Des dommages au module ou au poste pourraient résulter d'un manquement à cette procédure. (p. 2-4, 4-1) Ll est fortement recommande que toutes les alimentations (armoire, E/S, etc.) soient coupees avant d'effectuer quelque raccord que ce soit sur une carte de raccordement. Un manquement a ces instructions pourrait causer des dommages a l'equipment. Ne pas rebrancher les alimentations avant d'avoir verifie tous les raccordements. (p. 2-5, 4-1) Si des circuits d'entree ou de sortie sont alimentes a partir de sources externes, ils presentent un risque de choc electrique meme lorsque l'alimentation du systeme est debranchee du panneau d'entree l'alimentation. Le cas echeant, un avertissement signalant la presence de sources d'alimentation multiples doit etre appose sur la porte de l'armoire. (p. 2-6)

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SECTION 1 - INTRODUCTION

OVERVIEW

One Thermocouple Input Termination Module (NIAI02) is required for each Thermocouple Slave Module (IMASM02). Each NIAI02 can input eight thermocouple or millivolt signals from field equipment to the thermocouple input slave module. The signals pass through the slave module to the Analog Master Module (IMAMM03).

This manual explains the purpose, setup, handling precautions and steps to install the NIAI02 module.

INTENDED USER

System engineers and technicians should read this manual before installing and using the termination module (TM). Put the module into operation only after reading and understanding this instruction. Refer to the ***Table of Contents*** to find the information. Refer to the ***HOW TO USE THIS MANUAL*** entry in this section to get started.

MODULE DESCRIPTION

The NIAI02 is a single printed circuit board that uses one slot in a Termination Mounting Unit (NTMU01/02). The termination module (TM) has one card edge connector, P1. It connects to the slave module through a cable. The terminal blocks for field wiring are on the TM. The NIAI02 handles up to 8 thermocouple inputs for the IMASM02. Each input may be thermocouple or millivolt from -100 to +100 millivolts or 0 to 100 millivolts. Figure 1-1 shows an application example for the NIAI02.

FEATURES

The design of the NIAI02, as with all INFI 90 devices, allows for flexibility in creating a process management system. Refer to the ***NOMENCLATURE*** entry of this section for the list of devices that can be used with the TM in an INFI 90 system.

- A standard factory-wired cable connects the TM to the slave module.
- Connect I/O wires on terminals at the front edge of the TM.
- Each TM fits in a standard termination mounting unit.
- Field wire termination for eight thermocouple or millivolt inputs.
- Input signal routing to the IMASM02.
- Source of the local cold junction reference.

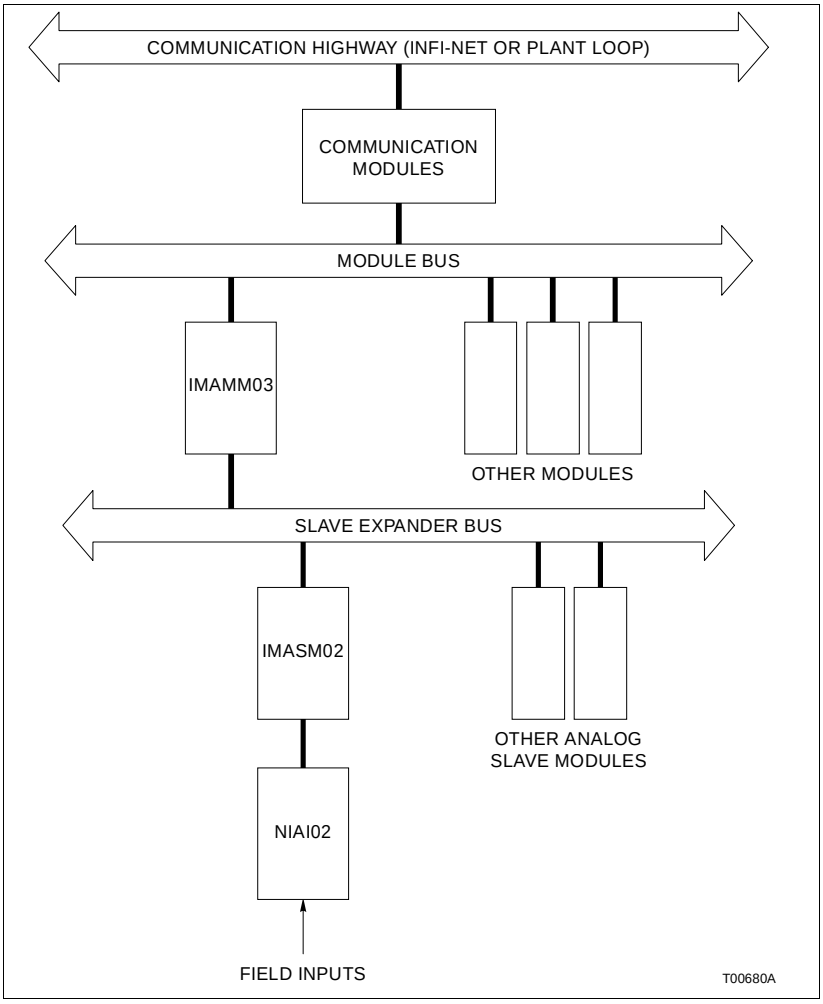

Figure 1-1. Application Example for NIAI02

INSTRUCTION CONTENT

This manual has five sections and an appendix.

Introduction — Contains an overview of the features, description and specifications and a description of the NIAI02.

Installation — Describes cautions to observe when handling the TM. It shows the steps to install and connect the terminal wiring before applying power.

Maintenance — Provides a maintenance schedule.

Repair/Replacement Procedures — Details how to replace a TM.

Support Services — Describes the support services (repair parts, training, documentation, etc.) available from Bailey Controls Company.

Appendix A — Shows the cabling needed for the Thermocouple Slave Input Module (IMASM02).

HOW TO USE THIS MANUAL

Read this manual before handling the TM. Refer to the sections in this list as needed for more information.

1. Read Section 2 before connecting the NIAI02.
2. Refer to Appendix A for the IMASM02 slave module.
3. Refer to Section 3 for the maintenance schedule.
4. Refer to Section 4 and Section 5 when needed.

GLOSSARY OF TERMS AND ABBREVIATIONS

Table 1-1 contains the glossary of terms for this manual.

Table 1-1. Glossary of Terms and Abbreviations

Term	Definition
Analog	Continuously variable as opposed to discretely variable.
Cold Junction Reference	The ambient temperature at the bimetallic junction at the termination point of thermocouple wires.
Slave Module	One of a series of modules designed to perform high or low level operations as directed by a master module.
Thermocouple	A bimetallic sensor used for temperature measurements.
TM	Termination Module. Provides input/output connection between plant equipment and the INFI 90/Network 90® modules.
TMU	Termination Mounting Unit. A card cage that provides housing for INFI 90/Network 90 termination modules.

REFERENCE DOCUMENTS

Table 1-2 contains the reference documents for the NIAI02.

Table 1-2. Reference Documents

Document Number	Description
I-E96-205	Analog Master Module and Analog Slave Modules (IMAMM03 and IMASM01/02/03/04)
I-E96-420	Thermocouple Calibration Module (NIAC02)
I-E96-437	Analog Master Termination Module (NIAM02)
I-E96-500	Site Planning and Preparation

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NOMENCLATURE

Table 1-3 contains the modules and equipment that can be used with the NIAI02 module:

Table 1-3. Nomenclature

Nomenclature	Description
IMASM02	Thermocouple and Millivolt Input Slave Module
NIAC02	Thermocouple Calibration Module
NIAM02	Analog Master Termination Module
NKTM01	Cable, Termination Module (Ribbon)
NKTU02	Cable, Termination Module (PVC)
NKTU12	Cable, Termination Module (non-PVC)
258436A1	Cable retaining kit used when a round cable connects to the TMU
NTMU01	Termination Mounting Unit (Rear Mount)
NTMU02	Termination Mounting Unit (Front Mount)

SPECIFICATIONS

Refer to Table 1-4 for the specifications of the NIAI02 Termination Unit.

Table 1-4. Specifications

Property	Characteristic/Value
Power Requirements	24 VDC at 10 mA.
Mounting	Slides into a single slot in the termination mounting unit NTMU01/02.
Environmental Electromagnetic/ Radio Frequency Interference	No values available at this time. Keep cabinet doors closed. Do not use communication equipment closer than 2 meters from the cabinet.
Ambient Temperature	0 to 70°C (32 to 158°F)
Relative Humidity	5% to 90% ± 5% up to 55°C (131°F) (noncondensing). 5% to 40% ± 5% up to 70°C (158°F) (noncondensing).
Atmospheric Pressure	Sea level to 3 km (1.86 miles).
Air Quality	Noncorrosive.
Cooling Requirements	No cooling is necessary when used in Bailey Controls cabinets and operated within stated limits.
Surge Protection	Meets IEEE-472-1974 Surge Withstand Capability Test[1].
Certification	CSA certified for use as process control equipment in an ordinary (non-hazardous) location.

NOTE: 1. Do not use the NKTM01 cable when compliance with IEEE-472-1974 is necessary.

Specifications are subject to change without notice.

SECTION 2 - INSTALLATION

INTRODUCTION

This section explains how to install the Thermocouple Analog Input Termination Module (NIAI02). Read, understand, and complete the steps in the order they appear before using the NIAI02 module.

SPECIAL HANDLING

Observe these steps when handling electronic circuitry:

> **NOTE:** Always use the Bailey Controls Field Static Kit (part number 1948385A1 - consisting of two wrist straps, ground cord assembly, alligator clip, and static dissipating work surface) when working with 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.
>
> Use the static grounding wrist strap when installing and removing modules. Static discharge may damage MOS devices on modules in the cabinet. Use grounded equipment and static safe practices when working with modules.

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

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

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

4. ***Avoid Partial Connection of CMOS Device.*** Verify that all devices connected to the modules 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 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.

UNPACKING AND INSPECTION

These are steps to follow for general handling:

1. Examine the module to make sure that no damage has occurred in transit.

2. Notify the nearest Bailey Controls sales office of any damage.

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

4. Use the original packing material or container to store the module.

5. Store the module in a place with clean air; free of extremes of temperature and humidity.

SETUP/PHYSICAL INSTALLATION

This section explains how to configure and install the NIAI02. The required procedures are installing the termination module into the TMU, and connecting the field wiring and communication cables.

Cable Connections

Before installing the IMASM02, connect either the NKTM01 or NKTU02/12 termination cable. Figure 2-1 shows the cabling for the NIAI02 to the IMASM02 and NIAM02.

Install the termination module cable (NKTM01 or NKTU02/NKTU12) to connect the TM to the slave. The NKTM01 is a flat ribbon cable. The NKTU02 is a round, shielded cable with PVC jacket. The NKTU12 is a round, shielded cable with non-PVC jacket.

NIAI02 modules can be interconnected through ribbon cable part number 6634408A2 supplied with the NIAI02. Up to eight NIAI02 TMs can connect to a single master module through a NIAM02 master termination module.

> **NOTE:** The NIAM02 is used to connect NIAI02 TMs to the IMAMM03 master for local cold junction compensation. The NIAI02 TMs for slaves 1 to 4 connect to J1 of NIAM02, and NIAI02 TMs for slaves 5 to 8 connect to J2 of the NIAM02.

Cable Installation

The NKTU02/12 and NKTM01 cable connects the NIAI02 to the IMASM02 slave module. The NIAM02 master termination module connects to the NIAI02 through the 6634408A2 ribbon cable. Table 2-1 lists the NIAI02 cable applications.

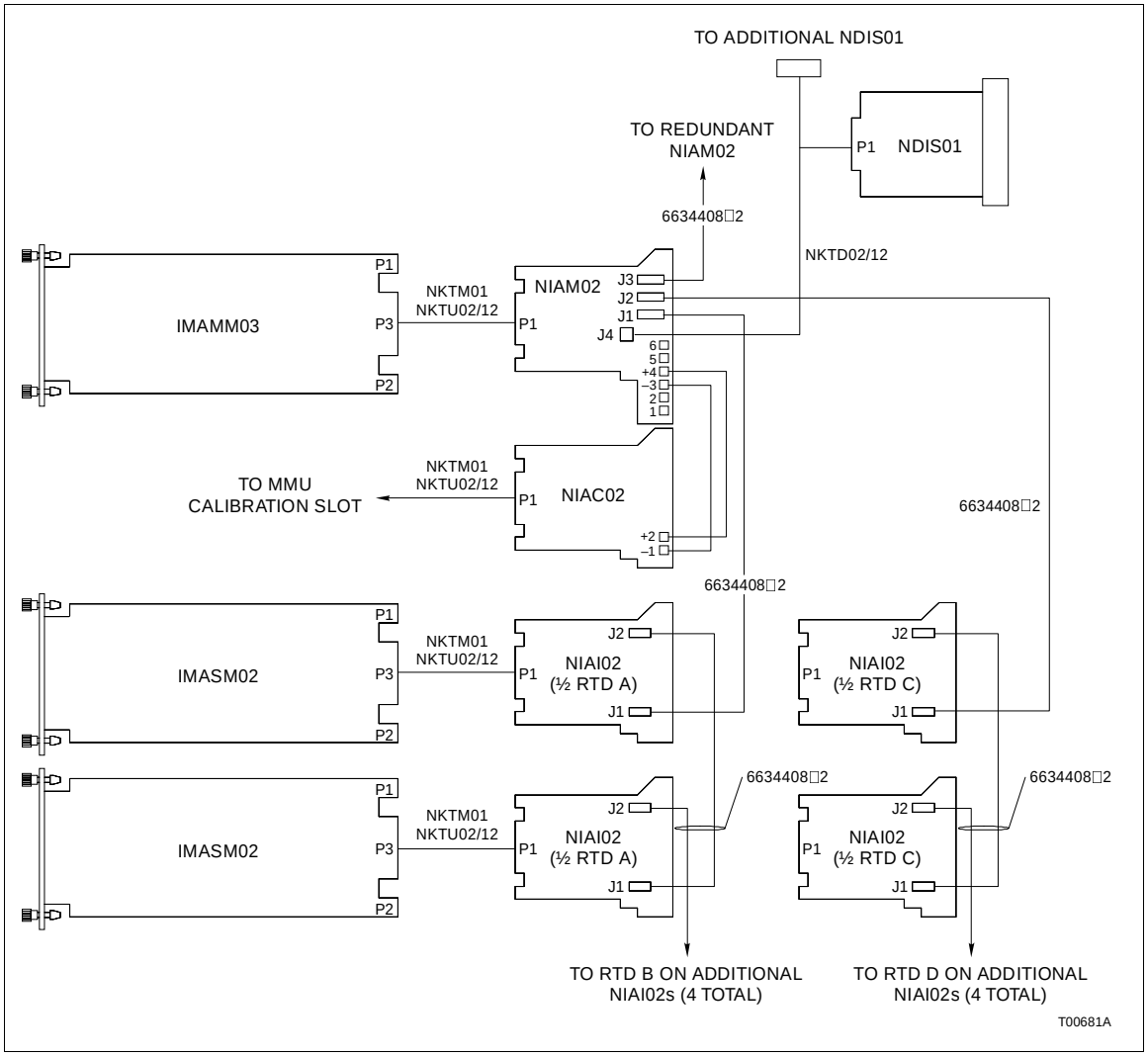

Figure 2-1. Cable Connections for NIAI02

Table 2-1. NIAI02 Cable Applications

Nomenclature/ Description	Application	Connector	Maximum Length
NKTU02 (PVC Jacket)	Connects NIAI02 to IMASM02.	P1 on TM to MMU backplane.	61 m (200 ft)
NKTU12 (non-PVC Jacket)			
NKTM01 (ribbon)	Connects NIAI02 to IMASM02.	P1 on TM to MMU backplane.	30 m (100 ft)
6634408A2 (one ribbon cable is shipped with each NIAI02)	Connects NIAI02 to NIAI02.	J2 on TM1 to J1 on TM2.	0.61m (2 ft)
	Connects NIAM02 to NIAM02.	J3 on TM1 to J3 on TM2.	
	Connects NIAM02 to NIAI02 1 thru 4.	J1 on NIAM02 to J1 on NIAI02.	
	Connects NIAM02 to NIAI02 5 thru 8.	J2 on NIAM02 to J1 on NIAI02.	

CAUTION	**Remove modules from their assigned slots before installing a cable to that slot. Failure to do so could result in damage to the module or station.**
ATTENTION	**Retirer les modules de leur position assignée avant d'installer un câble à cette position. Des dommages au module ou au poste pourraient résulter d'un manquement à cette procédure.**

To install the cable follow these steps:

1. Pull the termination module several inches from the TMU backplane.

2. If round type cables are already installed in the TMU, remove the cable retaining bracket (Bailey part number 258436A1). Use NKTU02/12 or NKTMU01 cables. Round cables and ribbon cables can be mixed when installing multiple TMs.

3. Insert the J2 end of the termination module cable into the MMU backplane slot assigned to the slave module. The cable should latch securely in place. Card edge connector P3 of the slave module connects to this end of the cable.

4. If NKTU02 or NKTU12 cables are used, connect the shield wire extending from the J2 end of the cable to the shield bar.

5. Insert the J1 end of the cable into the TMU backplane slot assigned to the NIAI02 module. The cable should latch securely in place. Card edge connector P1 of the NIAI02 module connects to this end of the cable.

6. Up to four NIAI02 TMs (1-4) can be interconnected by connecting J2 on the first TM to J1 on the second TM with ribbon cable part number 6634408A2. Install the 6634408A2 cable for each NIAI02.

7. Connect J1 of the first NIAI02 in the interconnection with TM-1 through TM-4 to J1 on the NIAM02.

8. Up to four additional NIAI02 TMs (5-8) can be interconnected by connecting J2 on the first TM to J1 on the second TM with ribbon cable part number 6634408A2. Install the 6634408A2 cable for each NIAI02.

9. Connect J1 of the first NIAI02 in the interconnection with TM-5 through TM-8 to J2 on the NIAM02.

10. Replace or add the cable retaining bracket if round type cables are installed in the TMU.

Termination Module Installation

The NIAI02 inserts into a standard INFI 90 termination mounting unit (TMU) and occupies one slot. To install:

1. Verify slot assignment of the NIAI02 module.

2. Align the NIAI02 module with the guide rails in the TMU and partially insert the module. Leave enough room to connect terminal wiring and cables.

Completely seat the module after cabling and termination wiring is attached.

Terminal Wiring

CAUTION	**It is strongly recommended that all power (cabinet, I/O, etc.) be turned off before doing any termination module wiring. Failure to do so could result in equipment damage. Do not apply power until all connections are verified**.
ATTENTION	**Il est fortement recommande que toutes les alimentations (armoire, E/S, etc.) soient coupees avant d'effectuer quelque raccord que ce soit sur une carte de raccordement. Un manquement a ces instructions pourrait causer des dommages a l'equipment. Ne pas rebrancher les alimentations avant d'avoir verifie tous les raccordements.**

Connect the wiring from the thermocouple or millivolt signal sensing the process to the termination module terminals. For new installations, refer to the ***Site Planning and Preparation*** manual for information on I/O wiring.

Figure 2-2 shows the terminal assignments for each input and a field input termination example.

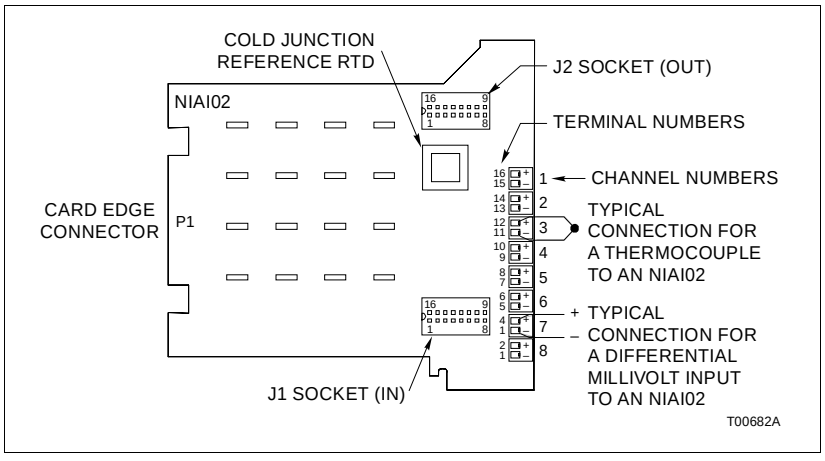

Figure 2-2. Terminal Assignments for NIAI02

Power Wiring

CAUTION	**If input or output circuits are a shock hazard after disconnecting system power at the power entry panel, then the door of the cabinet containing these externally powered circuits must be marked with a warning stating that multiple power sources exist.**
ATTENTION	**Si des circuits d'entree ou de sortie sont alimentes a partir de sources externes, ils presentent un risque de choc electrique meme lorsque l'alimentation du systeme est debranchee du panneau d'entree l'alimentation. Le cas echeant, un avertissement signalant la presence de sources d'alimentation multiples doit etre appose sur la porte de l'armoire.**

Connect field inputs with 14 to 22 gauge wire. To connect field wiring follow these steps:

1. Remove the front cover.

2. Ensure the NIAI02 module is pulled out far enough to gain access to the terminal strip.

3. Feed the field wiring into the terminal strip area and connect them to the appropriate terminals.

4. Insert the module until it locks securely into place.

5. Replace the front cover to maintain thermal stability for the local cold junction reference RTD.

The NIAI02 is ready for operation if:

1. The circuit board is mounted in the termination mounting unit.

2. All required cables are connected to the termination module.

3. All required field wires are connected to the termination module.

SECTION 3 - MAINTENANCE

INTRODUCTION

The Analog Input Termination Module (NIAI02) requires limited maintenance. This section contains a maintenance schedule.

MAINTENANCE SCHEDULE

Execute the tasks in Table 3-1 at the specified intervals.

Table 3-1. Maintenance Schedule

Task	Interval
Clean and tighten all power and grounding connections.	Every 6 months or during plant shutdown, whichever occurs first.
Use a static safe vacuum cleaner to remove dust from: Termination Mounting Unit Termination Modules	

SECTION 4 - REPAIR/REPLACEMENT PROCEDURES

INTRODUCTION

This section explains the replacement procedures for the Analog Input Termination Module (NIAI02). No special tools are required to replace the module.

REPLACEMENT PROCEDURES

If a NIAI02 is faulty, replace it with a new one. ***Do not*** try to repair the module. Replacing components may affect performance and certification.

CAUTION	**It is strongly recommended that all power (cabinet, I/O, etc.) be turned off before doing any termination module wiring. Failure to do so could result in equipment damage. Do not apply power until all connections are verified.**
ATTENTION	**Ll est fortement recommande que toutes les alimentations (armoire, E/S, etc.) soient coupees avant d'effectuer quelque raccord que ce soit sur une carte de raccordement. Un manquement a ces instructions pourrait causer des dommages a l'equipment. Ne pas rebrancher les alimentations avant d'avoir verifie tous les raccordements.**

CAUTION	**Remove modules from their assigned slots before installing a cable to that slot. Failure to do so could result in damage to the module or station.**
ATTENTION	**Retirer les modules de leur position assignée avant d'installer un câble à cette position. Des dommages au module ou au poste pourraient résulter d'un manquement à cette procédure.**

To replace a NIAI02 termination module:

1. Remove the termination module front cover.

2. Pull the termination module several inches from the TMU backplane.

3. Label and remove all power and field wiring from the terminal blocks.

4. Slide the TM out of the TMU.

5. Slide the new TM into the same slot as the module that was removed.

6. Connect all power and field wiring removed in Step 3.

7. Verify that wiring and cabling to the TM is correct.

8. Fully insert the termination module into the TMU.

9. Replace the termination module front cover.

10. Turn on the cabinet power supply that provides power to the TM.

11. Turn on any external power supplies providing I/O power.

SECTION 5 - SUPPORT SERVICES

INTRODUCTION

Bailey Controls Company is ready to help in the use, application 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 sales office. Provide this information:

1. Part description, part number and quantity.

2. Model and serial numbers (if applicable).

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

Order parts without commercial descriptions from the nearest Bailey Controls Company sales office.

TRAINING

Bailey Controls Company has modern training facilities that provide service and repair instruction. On-site training is also available. Contact a Bailey Controls Company sales office for specific information and scheduling.

TECHNICAL DOCUMENTATION

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

APPENDIX A - THERMOCOUPLE SLAVE INPUT MODULE (IMASM02)

INTRODUCTION

The Thermocouple Analog Slave Input Module (IMASM02) uses an NIAI02 for termination of field wiring. Each NIAI02 accepts up to eight thermocouple or millivolt inputs. This appendix contains figures and tables that show the dipswitch location on the IMASM02 and its settings. This information is provided as a quick reference guide for personnel installing the NIAI02. Figure A-1 shows the address select switch (SW1). Table A-1 lists the binary addresses for setting SW1. Refer to the IMAMM03 instruction for more detailed information to install and configure the slave.

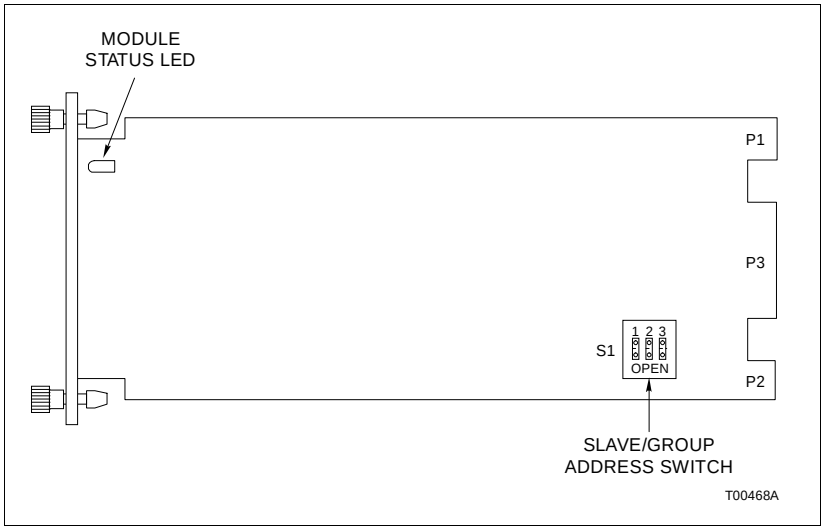

Figure A-1. Address Select Switch (SW1)

Table A-1. Address Switch Settings (SW1)

Addr	MSB 1	2	LSB 3	Addr	MSB 1	2	LSB 3
0	0	0	0	4	1	0	0
1	0	0	1	5	1	0	1
2	0	1	0	6	1	1	0
3	0	1	1	7	1	1	1

OPEN = OFF = 1
CLOSED = ON = 0

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