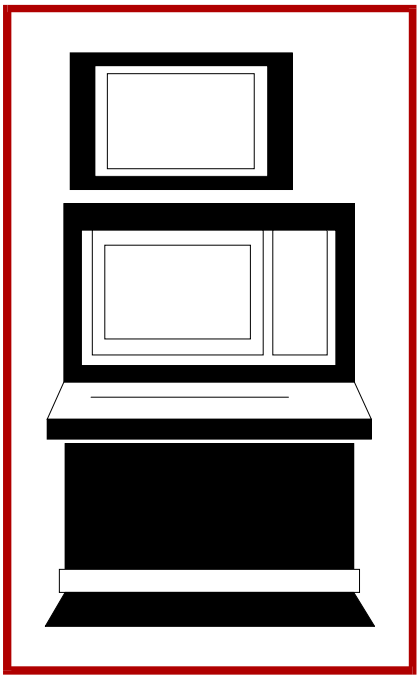
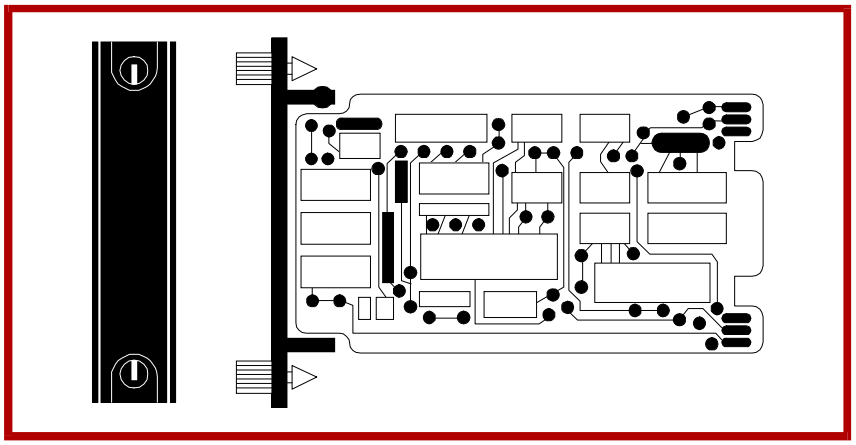
Bailey® infi 90®

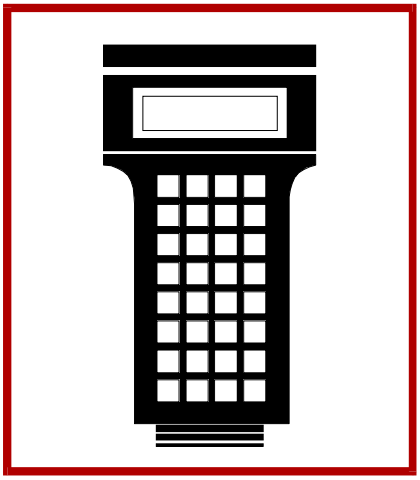
E96-225

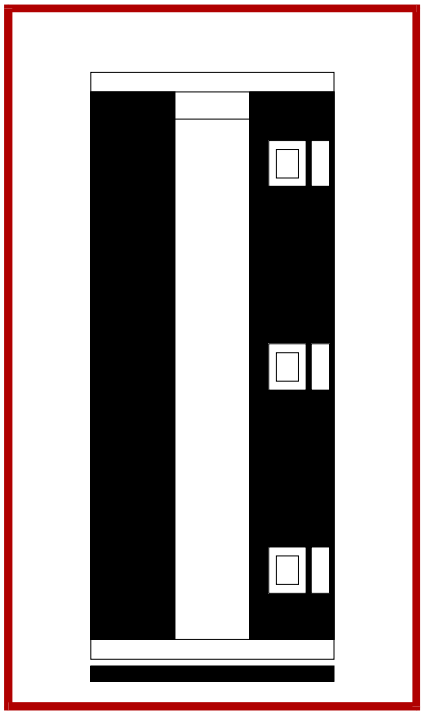
Instruction

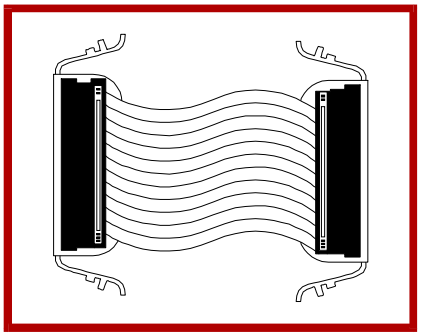
Communication Port Module
(IMCPM03)

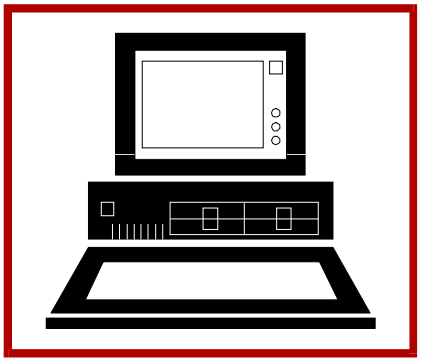












Bailey® Process Control and Automation Solutions from Elsag Bailey Group

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

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

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

WARNING

INSTRUCTION MANUALS

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

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

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.

AVERTISSEMENT

MANUELS D'OPÉRATION

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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

The IMCPM03 Communication Port Module connects the CTT02 Configuration and Tuning Terminal, an engineering work station (EWS) or a process control view (PCV®) work station to a single INFI 90® Open process control unit (PCU). This instruction explains how to install and use the IMCPM03 module in the INFI 90 Open system. It contains sections that describe module setup and operation. The appendices contain information about the NIMP01 Termination Module and NTMP01 Termination Unit.

This publication is for the use of technical personnel responsible for the installation, calibration, operation and maintenance of the IMCPM03 Communication Port Module.

It is important for safety and operating reasons to first read and understand this manual completely; do not install or complete any tasks or procedures related to operation before reading it.

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List of Effective Pages

Total number of pages in this instruction is 58, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through viii	Original
1-1 through 1-6	Original
2-1 through 2-5	Original
3-1 through 3-13	Original
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6-1 through 6-3	Original
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8-1	Original
A-1 through A-2	Original
B-1 through B-3	Original
C-1 through C-3	Original
Index-1 through Index-3	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 insure that contact with energized parts is avoided when servicing. **Special Handling** This module uses electrostatic sensitive devices.
SPECIFIC WARNINGS	Never clean electrical parts or components with the power on. Doing so exposes you to a fatal electrical shock hazard. (p. 6-2) 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. 6-2)
SPECIFIC CAUTIONS	When the IMCPM03 module is being used as a LAN-90 PCV interface, insure a restart command is not issued from an engineering work station. This command will delete the LAN-90 PCV established database. (p. 2-2) 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. 3-2) Only qualified personnel should configure these dipswitches. Damage or misoperation could occur if dipswitches are improperly configured. (p. 3-7) It is strongly recommended that all power (cabinet, I/O, etc.) be turned off before doing any wiring. Verify all connections before applying power. Failure to observe these precautions could result in equipment damage. Do no apply power to the termination unit when uncut dipshunts are installed. This may result in damage to the termination unit. (p. 3-13) Verify that all termination unit dipshunts are configured before applying power. Failure to do so may result in damage to the termination unit. (p. 3-13)

Sommaire de Sécurité

AVERTISSEMENT D'ORDRE GENERAL	**Environnement de l'équipement** Ne pas soumettre les composants à une atmosphère corrosive lors du transport, de l'entreposage ou l'utilisation. **Possibilité de chocs électriques durant l'entretien** Débrancher l'alimentation ou prendre les précautions pour éviter tout contact avec des composants sous tension durant l'entretien. Précautions de manutention Ce module contient des composants sensibles aux décharges électrostatiques.
AVERTISSEMENT D'ORDRE SPECIFIQUE	Il ne faut jamais nettoyer des piècesou des composants électriques lorsqu'ils sont sous tension. Cedi présente un risque d'électrocution fatale. (p. 6-2) Portez toujours des lunettes de protection lorsque vous utilisez des solvants de nettoyage. L'aircomprimé servant à enlever le solvant des cartes de circuits imprimés provoque des éclaboussures qui risquent d'atteindre les yeux. (p. 6-2)
ATTENTION D'ORDRE SPECIFIQUE	S'assurer qu'une commande de redémarrage n'est pas émise à partir d'un pose de configuration (EWS). Cette commande effacerait la base de données établie de LAN-90 PCV. (p. 2-2) Pour éviter d'endommager des modules, évaluez la compatibilité de votre système avant de les y brancher. L'uage que fait ce module de certianes connexions au fond de panier du châssis de montage diffère de l'assignation prévue par le système Network 90 original. (p. 3-2) Seulement un personnel qualifié devrait configurer ces micro-interupteurs. Un mauvais fonctionnement ou des dommages pourraient se produire suite à une mauvaise configuration des micro-interupteurs. (p. 3-7) Il est fortement recommandé de débrancher toute source d'alimentation (armoire, E/S, etc.) avant d'effectuer du travail au câblage. Vérifiez toutes les connexions avant de rétablir l'alimentation. Ces précautions permettent d'éviter des dommages a l'équipement. (p. 3-13)

Sommaire de Sécurité (suite)

ATTENTION D'ORDRE SPECIFIQUE (suite)	S'assure que tous les dipshunts de la carte de raccordment sont configurés avant de mettre sous tension. Un dommage à la carte de raccordement peut être causé si on ne prend pas cette précaution. (p. 3-13)

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SECTION 1 - INTRODUCTION

OVERVIEW

The IMCPM03 Communication Port Module connects the CTT02 Configuration and Tuning Terminal and an engineering work station (EWS) or a LAN-90™ Process Control View PCV work station to a single INFI 90 Open process control unit (PCU). The IMCPM03 module provides all the functions of the IMSPM01, IMCPM01 and IMCPM02 modules. It can be installed in PCUs that use either Controlway or module bus. The IMCPM03 also provides the database capability of the Elsag Bailey family of network interface units.

This instruction explains the purpose, operation and maintenance of the IMCPM03 module. It explains handling cautions and steps for installation. Refer to Figure 1-1 for the INFI 90 Open communication levels and where the IMCPM03 module resides within these levels.

Applications that require local tuning and configuration of modules in an INFI 90 Open PCU unit can use the IMCPM03 module. The IMCPM03 module interfaces to a CTT terminal, an EWS work station or a LAN-90 PCV operator console. The IMCPM03 module minimizes hardware requirements.

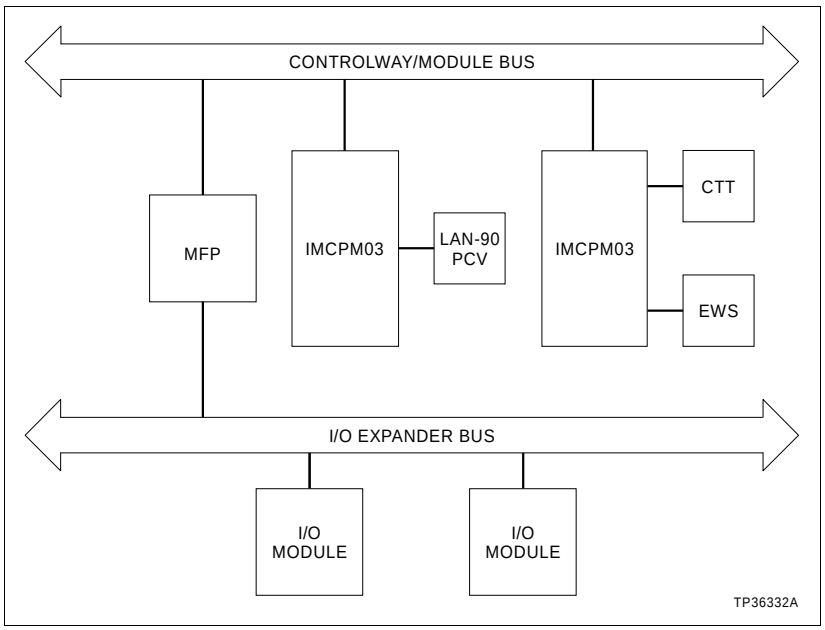

Figure 1-1. IMCPM03 Module Application Example

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INTENDED USER

The installation engineer needs to know how to handle and work with electronic equipment safely. Installers should have formal training in INFI 90 Open processes and configuration.

DESCRIPTION

The IMCPM03 module is a microprocessor-based INFI 90 Open interface module that provides a local (within the PCU) means of system data monitoring, configuration, tuning and diagnostics; it handles all communications with a LAN-90 PCV operator station. The module was specifically designed for exclusive use in interfacing Elsag Bailey's consoles, software tools and software application products with the INFI 90 Open system. Elsag Bailey offers a full range of other products for integrating non-Elsag Bailey applications with the INFI 90 Open system. The IMCPM03 interfaces the CTT terminal and EWS station to the Controlway or module bus through faceplate connectors. The IMCPM03 module enables the user to configure, tune and monitor the controller modules and their function blocks. It can communicate with controller modules in a single PCU that uses either module bus or Controlway. The IMCPM03 can also be used for data acquisition and control between controller modules and PC-based Elsag Bailey software (i.e., LAN-90 PCV work station).

The IMCPM03 module has one two-color (red/green) LED and eight red LEDs for module status indication. There are two eight-pole dipswitches that set the Controlway or module bus address, select baud rate and enable diagnostic testing. A reset switch is available through the faceplate.

The IMCPM03 has three connectors. A DB-25 connector for the RS-232-C cable from the EWS station or the LAN-90 PCV and a round five-pin connector for the CTT terminal are on the faceplate. A DB-9 connector for the EWS is located on the component side of the module close to the faceplate. Both the DB-25 and the DB-9 connectors are optically isolated.

The IMCPM03 module occupies a single slot in a standard INFI 90 Open module mounting unit (MMU). An optional termination unit can be connected through a cable for permanent mounting.

Faceplate

The faceplate measures 35.5 millimeters (1.4 inches) wide by 177.8 millimeters (7 inches) high. Two concentric screws lock the module assembly into the module mounting unit. A window on the faceplate shows the CPU LEDs during operation. The faceplate also protects the circuit components and creates a chimney for proper air flow within the cabinet.

Circuit Board

The circuit board has static random access memory (SRAM), read-only memory (ROM), a processor running at 16 megahertz and direct memory access (DMA) circuits. The circuit board also has custom bus circuits and support circuitry. The board attaches to the faceplate with two screws.

INSTRUCTION CONTENT

This instruction provides installation, operation, troubleshooting and maintenance information. Read and understand this instruction thoroughly before putting the module into operation. Refer to the sections in this list as required for more information.

Introduction — Provides an overview of the module, a description of the hardware, a glossary of terms and abbreviations and a table of physical, electrical and environmental specifications.

Description and Operation — Uses a block diagram to explain what the key circuits do.

Installation — Explains the handling, inspection, configuration and installation aspects of the module.

Operation — Describes start-up procedures and discusses the faceplate indicators and controls.

Troubleshooting — Contains tables that explain LED codes and corrective action and connector pinout information.

Maintenance — Provides a preventive maintenance schedule for the IMCPM03 module.

Repair/Replacement Procedures — Describes how to replace the module.

Support Services — Lists replacement parts, technical training and documentation information.

Appendix A — Describes the enhanced module status block.

Appendix B — Contains the jumper settings and cable connections for the NIMP01 termination module.

Appendix C — Contains the jumper settings and cable connections for the NTMP01 termination unit.

HOW TO USE THIS INSTRUCTION

Read this instruction in sequence. To get the best use out of this instruction, read it from cover to cover, then go back to

specific sections. Elsag Bailey strongly advises against putting the module into operation until all the installation steps have been read and completed.

Be sure to read the notes which provide:

- Additional information.
- Information that should be considered before performing a certain operation or function.

This instruction is organized into multiple sections. It limits the information presented in each section to only those specific items required to complete the desired task. This organization enables finding of specific information quickly, as well as use of this instruction as a reference after becoming fully familiar with the module.

1. Read and do all steps in the installation section.

2. Thoroughly read the operation section before applying power to the module.

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

4. Refer to Section 6 to maintain the module.

5. Refer to Section 7 to replace the module.

6. Refer to Section 8 for replacement part information.

REFERENCE DOCUMENTS

Refer to Table 1-1 for the reference documents for the IMCPM03 module.

Table 1-1. Reference Documents

Number	Title
I-E92-501-2	Configuration and Tuning Terminal Type CTT02
I-E96-401	Multi-Function Processor Termination Modules NIMP01/02
I-E96-428	Multi-Function Processor Termination Unit NTMP01

GLOSSARY OF TERMS AND ABBREVIATIONS

Refer to Table 1-2 for those terms and abbreviations that are unique to Elsag Bailey or have a definition that is different from standard industry usage.

Table 1-2. Glossary of Terms and Abbreviations

Term	Description
EWS	Engineering work station.
MFP	Multi-function processor module. A multiple-loop controller with data acquisition and information processing capabilities.
MMU	Module mounting unit. A card cage that provides electrical and communication support for INFI 90 Open/Network 90 modules.
Termination module	Provides input/output connection between plant equipment and the INFI 90 Open/ Network 90 modules.
Termination unit	Provides input/output connection between plant equipment and the INFI 90 Open/ Network 90 modules.

NOMENCLATURE

Refer to Table 1-3 for the nomenclature of associated equipment used in this instruction.

Table 1-3. Nomenclature

Nomenclature	Description
CTT02	Configuration and tuning terminal
EWS	Engineering work station
IMCPM02	Communication port module
IMCPM03	Communication port module
IMMFP0□	Multi-function processor modules
IMSPM01	Serial port module
INBIM02	Bus interface module
INNPM01	Network processing module, Controlway
LAN-90 PCV	LAN-90 Process Control View
NIMP01	Multi-function processor termination module
NKTU01	Termination unit cable
NKTU02	Termination module cable
NSBM01	Superloop bus module
NTMP01	Multi-function processor termination unit

SPECIFICATIONS

Refer to Table 1-4 for the specifications for the IMCPM03 module.

Table 1-4. Specifications

Property	Characteristics
Current Consumption	0.81 A maximum, 750 mA typical, at +5 VDC
Power Dissipation	4.1 W maximum, 3.8 W typical
Microprocessor	32 bit processor (16 bit external bus) running at 16 MHz
Memory	256 kbytes of ROM 512 kbytes of RAM
Database Capability	Up to 3,000 point definitions (depending on point types)
Serial Ports	2 - isolated RS-232-C at up to 19.2 kbaud
Installation Category	5 V power - Category III RS-232-C port - Category III
Electromagnetic/ Radio Frequency Interference	Values not available at this time. Keep cabinet doors closed. Do not use communication equipment any closer than 2 m (6 ft) from the cabinet.
Dimensions	
Height	279.4 mm (11 in.)
Width	76.2 mm (3 in.)
Depth	355.6 mm (14 in.)
Weight	0.68 kg (1.5 lb)
Environmental	
Ambient Temperature	0° to +70°C (32° to 158°F)
Relative Humidity	5% to 90% R.H. up to 55°C (131°F) (noncondensing) 5% to 40% R.H. at 70°C (158°F) (noncondensing)
Atmospheric Pressure	Sea level to 3 km (1.86 mi)
Certification	CSA certified for use as process control equipment in ordinary (nonhazardous) locations.

Specifications subject to change without notice.

SECTION 2 - DESCRIPTION AND OPERATION

INTRODUCTION

The IMCPM03 module hardware contains several functional blocks working together. To understand how they work, this section shows them in a block diagram and then explains each block in the text. Refer to Figure 2-1.

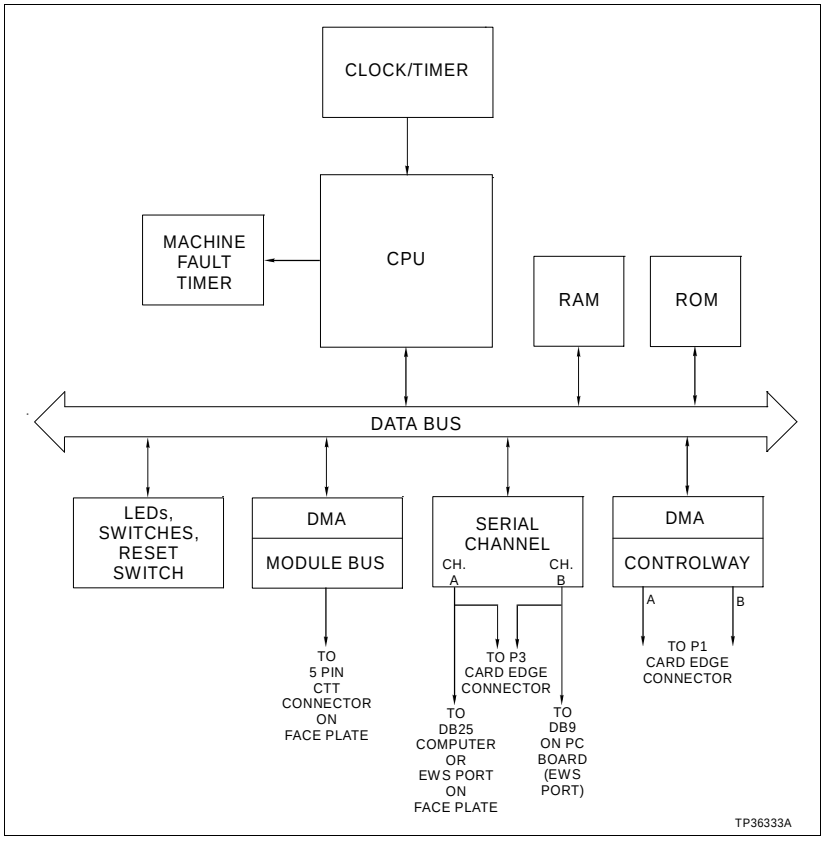

Figure 2-1. Block Diagram of the IMCPM03 Module

THEORY OF OPERATION

When functioning as a CTT interface, the IMCPM03 module accepts a module bus message from the CTT terminal and sends the message to the destination module through the Controlway or module bus. The module reply is then received by the IMCPM03 module and returned to the CTT interface. The CTT interface and DB-9 EWS port can be used at the same time as the DB-25 computer port.

When functioning as an EWS interface, the IMCPM03 module receives commands, forwards them to the destination

module, and sends the reply to the EWS station over the RS-232-C channel. The CTT interface and EWS interface may both be used at the same time. Communications between the EWS station and IMCPM03 module can take place through either the DB-25 or DB-9 connector.

When functioning as the LAN-90 PCV console interface, the IMCPM03 module receives commands from the LAN-90 PCV interface. The commands are forwarded to the correct destination module or are acted on by the IMCPM03 module. Replies are returned to the LAN-90 PCV console software. Communications between the LAN-90 PCV console and IMCPM03 module can only take place through the DB-25 connector.

CAUTION	**When the IMCPM03 module is being used as a LAN-90 PCV interface, insure a restart command is not issued from an engineering work station. This command will delete the LAN-90 PCV established database.**
ATTENTION	**S'assurer qu'une commande de redémarrage n'est pas émise à partir d'un pose de configuration (EWS). Cette commande effacerait la base de données établie de LAN-90 PCV.**

DB-25 COMPUTER PORT

The DB-25 computer port on the IMCPM03 module is capable of supporting standard baud rates up to 19.2 kilobaud. It is a full duplex serial data EIA standard RS-232-C type Z (an Elsag Bailey defined binary interchange). The DB-25 connector on the IMCPM03 faceplate is optically isolated. Optical isolation eliminates ground currents caused by isolated grounding of external equipment.

The serial channel is normally used to interface the Elsag Bailey hardware when the IMCPM03 module is in the data communication equipment (DCE) mode (determined by jumper configuration). It also may be connected to a modem when the IMCPM03 module is in data terminal equipment (DTE) mode (determined by jumper configuration). Dipswitch SW2 selects the desired baud rate and data framing options. Refer to ***JUMPER SETTINGS*** and ***DIPSWITCH SETTINGS*** in Section 3. For more permanent installations, the IMCPM03 module can be connected to the NIMP01 termination module or NTMP01 termination unit through the NKTU02 and NKTU01 cables, respectively. Refer to Appendix B and Appendix C.

CTT PORT

The IMCPM03 module communicates with the CTT terminal via the round five-pin connector on the faceplate. Messages received from the CTT terminal are transmitted on Controlway or module bus, but using the source module address of the IMCPM03 module in place of the module address of the CTT terminal. Only replies to messages initiated by the CTT terminal are transmitted to the CTT terminal. A CTT terminal connected to the Controlway through an IMCPM03 module is a message-initiating device only. The IMCPM03 module cannot relay messages to the CTT terminal that are initiated from other modules within the process control unit.

DB-9 EWS PORT

An optically isolated DB-9 connector is located inside the faceplate on the circuit board (P6) for use as an EWS port.

MICROPROCESSOR

A 16-megahertz microprocessor is responsible for module operation and control. The operating system instructions reside in the read-only memory (ROM). The processor constantly retriggers the machine fault timer (MFT) circuit. If the processor or software fails and the MFT circuit is not reset, the MFT issues a board-wide reset and the status LED turns red. In this state, the IMCPM03 module will not function until it is reset.

CLOCK AND TIMER

The clock section provides the clock signals to drive the module at 16 megahertz. Additionally, it supplies the clock signals for the on-board serial port. The timer section is the system clock that keeps the processor task scheduling at the proper intervals.

MEMORY

There are 256 kilobytes of ROM and 512 kilobytes of RAM. The ROM holds the operating system instructions for the processor. The RAM provides temporary storage.

A key feature of the module memory is that it requires no wait states. The processor does not need to wait any clock cycles (zero wait states) before it can check the data in memory. This results in quicker operation.

MODULE BUS AND CONTROLWAY

Controlway is a one megabaud peer-to-peer communication link capable of supporting up to 32 drops. The Controlway interface is provided by a custom Elsag Bailey integrated circuit that links the IMCPM03 module to Controlway. It has full direct memory access (DMA) capabilities which permit quicker operation, and two redundant independent channels. Module bus is a nonredundant version of the peer-to-peer communication channel that operates at 83.33 kilobaud.

There are two separate traces on the MMU backplane circuit for Controlway. Data is transmitted over both channels simultaneously and received in separate receivers where it is checked for integrity. A failed channel on the Controlway is flagged and shut down to allow Controlway communication to continue on the other channel.

As the point data between modules travels on the bus, the Controlway does a bit-by-bit comparison that provides collision avoidance, maximizing efficiency and throughput.

LEDs

The IMCPM03 module has a single two-color status LED on the faceplate to indicate the execute or failed status of the IMCPM03 module. It has eight red status LEDs on the faceplate for diagnostic purposes and an activity indicator. The LEDs are arranged vertically and numbered from one through eight, top to bottom.

In normal operation mode, the IMCPM03 module uses the nine LEDs on the faceplate to indicate its status. The two-color status LED indicates the mode of the IMCPM03 module; green for execute mode and red for failed mode. When in execute mode, the IMCPM03 module uses LEDs 1 through 8 as activity indicators.

When the IMCPM03 module is in failed mode, LEDs 1 through 8 display a code indicating the error condition. Refer to ***LED ERROR CODES*** in Section 5. In diagnostic mode, the LEDs indicate the status of the diagnostic test. Refer to ***DIAGNOSTIC TESTS*** in Section 5.

DIPSWITCHES AND JUMPERS

The IMCPM03 module has two configurable dipswitches and eight jumpers.

Dipswitches

- Each dipswitch has eight poles.
- Dipswitch SW2 sets module options.
- Dipswitch SW3 sets the module address.
- A reset switch (SW1) accessed through the faceplate resets the module.

Jumpers

- Jumpers J1 through J3 enable handshake functions for the EWS port.
- Jumper J4 connects the EWS connector cable shield to ground.
- Jumper array J5 selects DTE, DCE or loopback operating mode for the DB-25 EWS port (P4).
- Jumper array J6 selects DTE, DCE, or loopback operating mode for the DB-9 connector mounted on the circuit board.
- Jumper J11 allows the CTT terminal to communicate on Controlway or module bus under IMCPM03 module control. Jumper J11 must always be set shorting pin 2 to pin 3 to ensure correct operation of the IMCPM03 module and the CTT terminal.
- Jumper J12 disconnects -30 VDC from the module when installing it in an MMU backplane with modules that require -30 VDC. The Controlway can not be used in systems that use -30 VDC.

SECTION 3 - INSTALLATION

INTRODUCTION

This section explains how to install the IMCPM03 Communication Port Module. Do not proceed with operation until the procedures are read and understood. Refer to the product instructions for NIMP01 and NIMP02 modules and NTMP01 termination unit for termination device wiring instructions.

> **NOTE:** This module uses connections to the MMU backplane that serve other functions in early Network 90 systems. To avoid potential module damage, check the system for compatibility before module installation. In INFI 90 Open systems, pins 3 and 4 of connector P1 are used for the redundant Controlway bus. Set J12 for the application before installing the IMCPM03 module into the system. Refer to ***Jumper Installation***.

SPECIAL HANDLING

Always use the Elsag Bailey 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 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 static sensitive devices on modules in the cabinet. Use grounded equipment and static safe practices when working with static sensitive devices. Observe these steps when handling electronic circuitry:

1. ***Use Static Shielding Bag.*** Keep the modules in 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 static sensitive devices, touch it to the equipment housing or ground to equalize charges.

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

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

5. Ground Test Equipment.

6. ***Use an Antistatic Field Service Vacuum.*** Remove dust from the circuit boards 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 switch contacts that can result in circuit board malfunction, do not use a lead pencil to set a dipswitch.

GENERAL HANDLING

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.**
ATTENTION	**Pour éviter d'endommager des modules, évaluez la compatibilité de votre système avant de les y brancher. L'uage que fait ce module de certianes connexions au fond de panier du châssis de montage diffère de l'assignation prévue par le système Network 90 original.**

Early Network 90 systems applied -30 VDC to pins 3 and 4 of P1 (top connector of the module). This voltage can cause damage to INFI 90 Open modules. Verify J12 jumper setting before installing the module. Refer to ***Jumper Installation***.

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

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.

JUMPER SETTINGS

The module has eight configurable jumpers, J1 through J6 and J11 and J12. Refer to Figure 3-1 for locations.

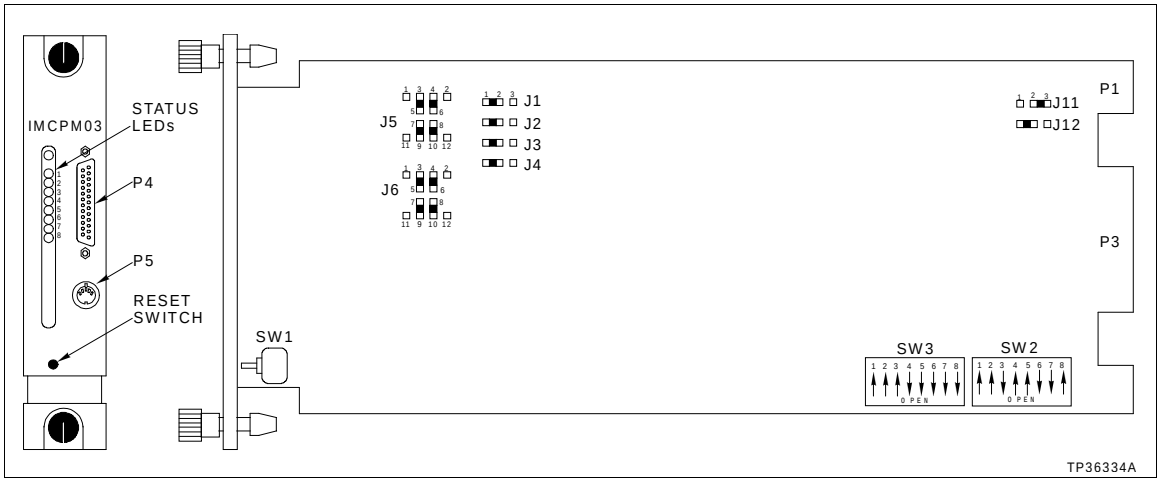

Figure 3-1. Switch and Jumper Positions

The eight jumpers on the module perform the following functions:

- Jumpers J1 through J3 enable handshake functions for the DB-25 computer port (P4).
- Jumper J4 connects the DB-25 computer port (P4 connector cable shield to ground).
- Jumper array J5 selects DTE, DCE, or loopback operating mode for the DB-25 computer port (P4).
- Jumper array J6 selects DTE, DCE, or loopback operating mode for the DB-9 EWS connector mounted on the circuit board.
- Jumper J11 allows the CTT terminal to communicate on Controlway or module bus under IMCPM03 module control. Jumper J11 must always be set shorting pin 2 to pin 3 to ensure correct operation of the IMCPM03 module and the CTT terminal.
- Jumper J12 disconnects -30 VDC from the module when installing it in an MMU backplane with modules that require -30 VDC. The Controlway can not be used in systems that use -30 VDC.

Jumper Installation

Refer to Figure 3-1 for the location of jumpers J1 through J6. Refer to Figure 3-2 for a schematic diagram of jumpers J1 through J5. Note that Jumper J6 is not shown but must be set. Jumper J6 has the same pin configuration as Jumper J5. Refer to ***JUMPER ARRAYS J5 AND J6***.

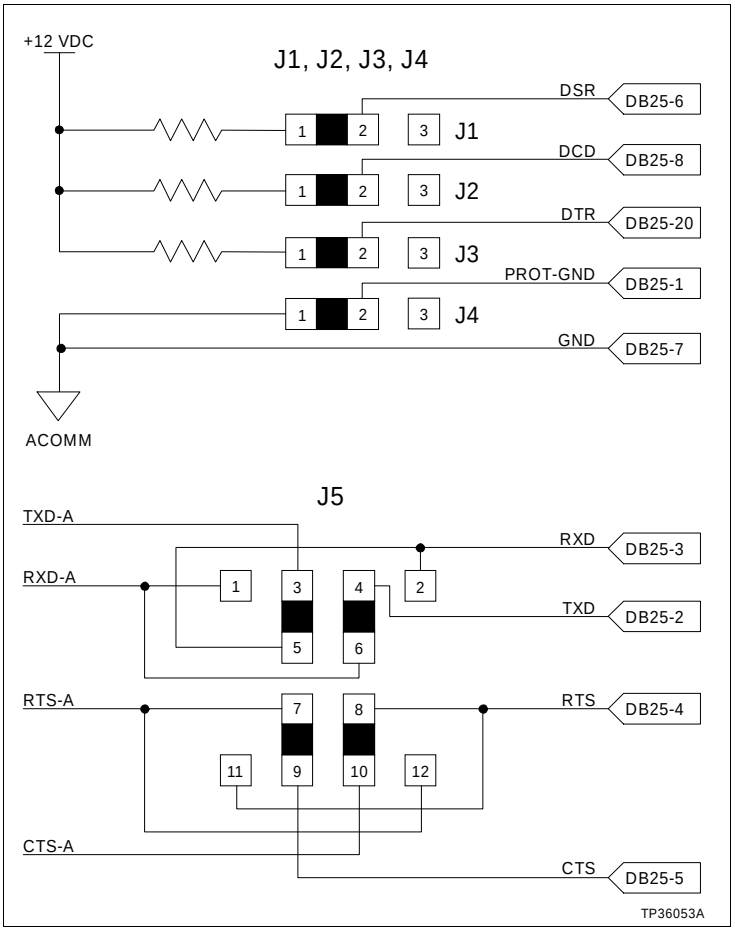

Figure 3-2. Schematic Diagram of Jumpers J1 through J5

JUMPERS J1 THROUGH J3

Jumpers J1, J2 and J3 enable the handshake functions for the DB-25 computer port (P4) and must be set to match the equipment used. The IMCPM03 module is shipped with these jumpers installed for +12 VDC (logic 0). Removing the jumpers allows the signals to float and may prevent the IMCPM03 module from communicating with the LAN-90 PCV console or EWS station.

These jumpers provide an additional layer of communication integrity. They enable the transmitting device to send a notice to the receiving device that a message is being sent. The message is sent when the receiving device replies to the request. These jumpers should remain in place for normal operation. They are provided for applications requiring special communications.

JUMPER J4

Jumper J4 connects the shield of the RS-232-C connector cable to chassis ground through the IMCPM03 module. The cable shield should be grounded at either end, but never both ends. If the cable shield is grounded at the console or station end, short pins 2 and 3 of jumper J4. This opens the ground connection between the cable shield and the IMCPM03 module.

JUMPER ARRAYS J5 AND J6

Set jumper arrays J5 and J6 to match the type of equipment (DTE or DCE mode) communicating with the IMCPM03 module. Jumper array J5 selects DTE, DCE, or loopback operating mode for the DB-25 computer port. Jumper array J6 selects DTE, DCE or loopback operating mode for the DB-9 EWS port mounted on the circuit board. Either port can be DCE or DTE mode.

For connection to DCE equipment (modems), set up the IMCPM03 module as DTE mode. For connection to DTE equipment (consoles or stations such as the EWS), set up the IMCPM03 module as DCE mode. For DCE equipment (modems), install CPM jumpers J5 and J6 as shown in Figure 3-3.

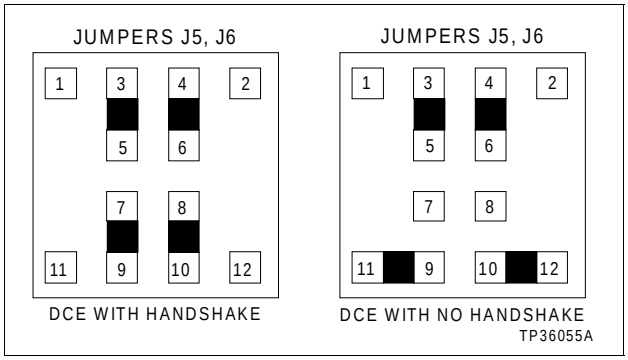

Figure 3-3. DCE Setting for Jumper Array J5 and J6

For DTE type equipment (such as the EWS), install the jumpers as shown in Figure 3-4. Confirm the equipment pin out to verify the RS-232-C standard before setting jumpers. Refer to Figure 3-5 for the settings for jumper arrays J5 and J6 during diagnostics (loopback mode).

The handshake function provides an additional layer of communication integrity. It enables the transmitting device to send a notice to the receiving device before a message is sent. The

message is then sent after the receiving device replies to the request. The handshake function may be disabled for applications requiring special communications.

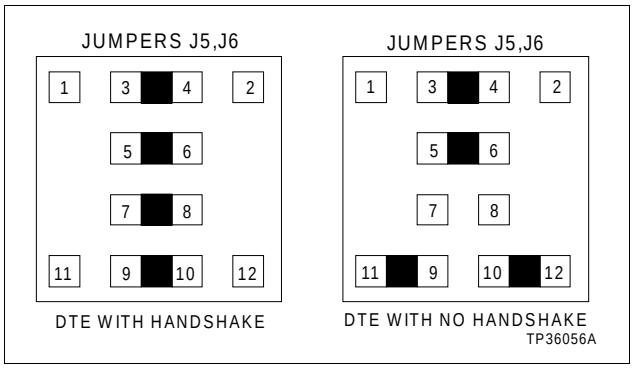

Figure 3-4. DTE Setting for Jumper Array J5 and J6

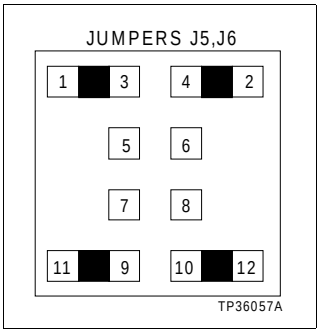

Figure 3-5. Loopback Setting for Jumper Array J5 and J6

JUMPERS J11 AND J12

Jumper J11 must be set shorting pin 2 to pin 3. This allows the CTT02 terminal to talk on the Controlway under IMCPM03 module control.

> **NOTE:** If jumper J11 is set to short pin 1 to pin 2, the CTT will not be functional.

Jumper J12 is normally set shorting pin 1 to pin 2. This avoids potential damage if the board is connected to the MMU backplane in early Network 90 systems. Early Network 90 systems applied -30 VDC to pins 3 and 4 of connector P1. This voltage can cause damage to INFI 90 Open modules. In INFI 90 Open systems, pins 3 and 4 of connector P1 are used for the redundant Controlway bus. In this case, pins 2 and 3 of jumper J12 are shorted to allow the IMCPM03 module to use the Control-

way in redundant mode. Refer to Figure 3-6 for the schematic of jumpers J11 and J12.

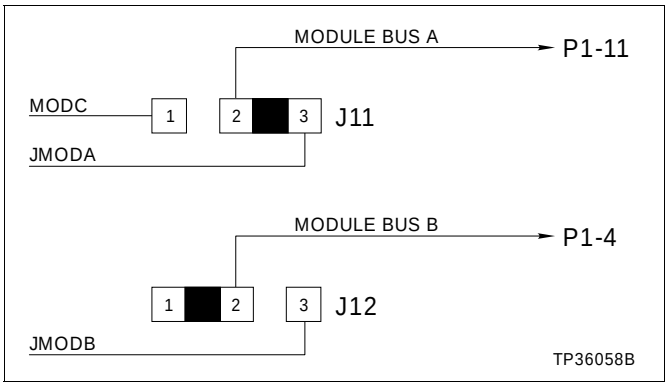

Figure 3-6. Schematic Diagram of Jumpers J11 and J12

DIPSWITCH SETTINGS

The module has two configurable dipswitches, SW2 and SW3. The dipswitches have eight poles. Refer to Figure 3-1 for locations. The poles of each dipswitch are numbered 1 through 8.

CAUTION	**Only qualified personnel should configure these dipswitches. Damage or misoperation could occur if dipswitches are improperly configured.**
ATTENTION	**Seulement un personnel qualifié devrait configurer ces micro-interupteurs. Un mauvais fonctionnement ou des dommages pourraient se produire suite à une mauvaise configuration des micro-interupteurs.**

The IMCPM03 module has two modes:

- ***Normal operation mode***.
  (includes SPM/CPM02 mode and database mode)

- **Diagnostic mode**.

Normal operation mode - Normal operation mode occurs whenever the module is not operating in the diagnostic mode. Additionally, the normal operation mode provides for the IMCPM03 to operate in either the SPM/CPM02 mode or the database mode. These selections are accomplished by setting dipswitches SW2 and SW3. Dipswitch SW2 sets a variety of module options in this normal operating mode, e.g., LED display, database mode, command/reply checksums, etc. Dipswitch SW3 sets the operation mode (normal or diagnostic), module communication mode and the module address.

Diagnostic mode - When operated in the diagnostic mode, the IMCPM03 does not function as an IMCPM03 module. The diagnostic mode tests the operation of the module components and circuitry. Refer to Section 5 for diagnostic dipswitch setting information.

Dipswitch SW2 - Normal Operation Mode

Refer to Table 3-1. Dipswitch SW2 provides the following option settings in normal operation mode:

- One pole to select the display of the computer port or CTT interface activity on the LEDs.
- One pole to enable the database mode.
- One pole to enable the command and reply checksum for the DB-25 computer port.
- Two poles to select stop bits and parity bits for the DB-25 computer port.
- Three poles to select the baud rate for the DB-25 computer port.

Table 3-1. Dipswitch SW2 Option Settings for Normal Mode

Option[1]	SW2 Pole Settings[2]							
	1	2	3	4	5	6	7	8
LED display								
Console or station activity	***0***							
CTT interface activity	1							
Database mode								
Disabled		***0***						
Enabled		1						
Command/reply checksums								
Disabled			0					
Enabled			***1***					
DB-25 computer port and DB9 EWS port characteristics								
No parity, 1 stop bit				***0***	***0***			
Even parity, 1 stop bit				0	1			
Odd parity, 1 stop bit				1	0			
No parity, 2 stop bits				1	1			

Table 3-1. Dipswitch SW2 Option Settings for Normal Mode (continued)

Option[1]	SW2 Pole Settings[2]							
	1	2	3	4	5	6	7	8
DB-25 computer port baud rate and DB-9 EWS port baud rate[3]								
Computer EWS								
19200 1200						0	0	0
19200 2400						0	0	1
19200 9600						***0***	***1***	***0***
1200 1200						0	1	1
2400 2400						1	0	0
9600 2400						1	0	1
9600 9600						1	1	0
19200 19200						1	1	1

NOTES:
1. Bold values indicate default settings.
2. 0 = CLOSED or ON, 1 = OPEN or OFF.
3. The baud rate is determined by the device connected to the port.

Dipswitch SW3 - Normal Operation Mode

Dipswitch SW3 sets the IMCPM03 operation mode (normal or diagnostics), the communication mode (Controlway or module bus), and the module address (SPM/CPM02 mode or database mode). Refer to Figure 3-1 for the dipswitch location.

In SPM/CPM02 and database modes, dipswitch SW3 provides the following functions:

- One pole to put the module in either diagnostic or normal operation mode.
- One pole to enable or disable the on-line ROM checksum verification.

  NOTE: On-line ROM checksum verification is always used for normal operation. It should not be disabled.

- One pole to select Controlway or module bus mode.
- Five poles to select the module address for SPM/CPM02 mode.

  - or -

  One pole to select the module address for database mode.

When the IMCPM03 module is operating in the SPM/CPM02 mode, the module can have an address from 0 through 31.

When the IMCPM03 is operating in database mode, the module can only have a module address of 0 or 1.

NOTE: If a CTT terminal is used, set the CTT terminal and the IMCPM03 module to the same module address to avoid duplicate address conflicts with the other modules of the process control unit.

SPM/CPM02 MODE

When the IMCMP03 module is functioning in SPM/CPM02 mode, the IMCPM03 accepts a command from the station or console, validates the command, performs any actions required by the command, including communications with any modules of the PCU using either Controlway or module bus, and finally returns a reply/message to the station or console. The IMCPM03 is then ready to process another command from the host station or console. Refer to Table 3-2 for the dipswitch assignments.

Table 3-2. Dipswitch SW3 Settings for SPM/CPM02 or Database Mode

Function	SW3 Pole Settings[1,2]							
	1	2	3	4	5	6	7	8
Operation mode								
Normal	***0***							
Hardware diagnostics	1							
ROM checksum								
Enabled		***0***						
Disabled		1						
Module communication mode								
Controlway (1 Mbaud)			***0***					
Module bus (83.3kbaud)			1					
Module address for SPM/ CPM02 mode:								
address 0				0	0	0	0	0
address 1				0	0	0	0	1
address 2				0	0	0	1	0
:								
:								
address 29				1	1	1	0	1
address 30				1	1	1	1	0
address 31				1	1	1	1	1
Module address for database mode:[3]				—	—	—	—	0

NOTES:
1. Bold values indicate default settings.
2. 0 = CLOSED or ON, 1 = OPEN or OFF.
3. Poles 4, 5, 6 and 7 are not used for database mode and should be set to 0.

DATABASE MODE

NOTE: Because an IMCPM03 module in database mode is responsible for collecting all exception reports in a PCU, there are some important considerations for its use. No more than one IMCPM03 module operating in the database mode can operate on the Controlway or module bus at the same time. The IMCPM03 module cannot coexist with loop interface hardware when operating in the database mode. The IMCPM03 module cannot be used in the same PCU as an NPM, SBM or BIM module.

When the IMCPM03 module is functioning in the database mode, the IMCPM03 scans all modules of the PCU for exception reports to update its import database. The IMCPM03 then forwards each updated exception report to the work station or console. The IMCPM03 also scans its export database for exception reports that need to be sent to any other modules of the PCU. All commands supported by the IMCPM03 in the SPM/CPM02 mode are valid when the IMCPM03 is operating in the database mode. Refer to Table 3-2 for the dipswitch assignments.

NOTE: Since factory settings may not match default settings, it is important to check all dipswitch settings before putting the module into operation.

PREPARING THE MODULE MOUNTING UNIT

This section explains how to connect the Controlway to two MMU backplanes. Refer to Figure 3-7 for the location of the Controlway cable.

Verify the Controlway cable installation as follows:

1. Verify connection of one end of the twisted 3-wire to the second column of two tabs on the lower left of the MMU backplane.

2. Verify connection of the other end of the cable to the first column of two tabs on the lower left of the next MMU backplane.

NOTE: Because of high-speed transaction constraints, install a maximum of eight related (Controlways linked by cable) MMU backplanes within one cabinet. Do not cable link Controlways in separate cabinets. The connecting three-wire lengths between MMU backplanes should be minimized to prevent crosstalk and interference.

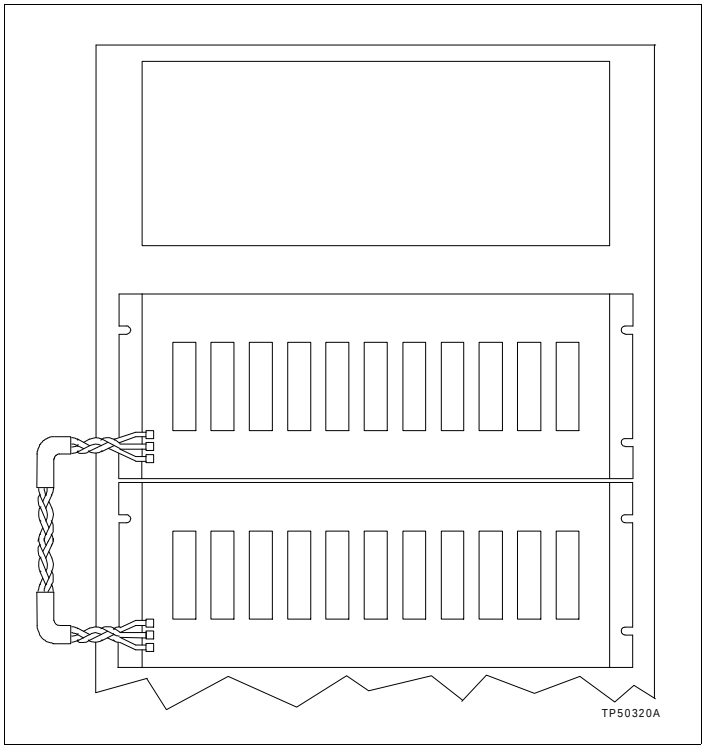

Figure 3-7. Controlway Cable Installation

INSTALLING THE MODULE

NOTE: Before installing the IMCPM03 module, check the MMU backplane for -30 VDC. If the system uses an NAMM01, NAMM02, NLMM01, NCOM01 or NCOM02 module, then -30 VDC is required. Set J12 before installing the IMCPM03 module into the system.

1. Face the rear of the cabinet. Locate the -30 VDC Faston™ connector. It is the second Faston from the top of the MMU backplane.

2. Check for -30 VDC with respect to system common at the -30 VDC Faston. The -30 VDC is not connected in INFI 90 Open systems.

3. If the system does not require -30 VDC, disconnect the -30 VDC supply wiring Faston or set jumper J12 before installing the IMCPM03 module.

4. Set jumper J12 correctly. Refer to ***Jumper Installation***.

5. For additional information or assistance, contact Elsag Bailey technical support.

™ Faston is a trademark of Amp Incorporated.

6. Before installing the module, check all dipswitch and jumper settings, and ensure that respective module cables are attached to the MMU backplane.

The IMCPM03 module can be installed and removed under power. Installing the module with power applied causes the status LED to turn red momentarily and then turn green. If it does not, refer to Section 5.

To install module:

1. Guide the top and bottom edges along the top and bottom rails of the MMU backplane.

2. Slide the module into the slot. Push it until the rear edge is firmly seated in the backplane connectors.

3. Turn the two concentric screws ½-turn clockwise to lock the modules in place.

INSTALLING THE TERMINATION UNIT OR MODULE

CAUTION	**It is strongly recommended that all power (cabinet, I/O, etc.) be turned off before doing any wiring. Verify all connections before applying power. Failure to observe these precautions could result in equipment damage. Do not apply power to the termination unit when uncut dipshunts are installed. This may result in damage to the termination unit.**
ATTENTION	**Verify that all termination unit dipshunts are configured before applying power. Failure to do so may result in damage to the termination unit.** **Il est fortement recommandé de débrancher toute source d'alimentation (armoire, E/S, etc.) avant d'effectuer du travail au câblage. Vérifiez toutes les connexions avant de rétablir l'alimentation. Ces précautions permettent d'éviter des dommages a l'équipement.** **S'assure que tous les dipshunts de la carte de raccordment sont configurés avant de mettre sous tension. Un dommage à la carte de raccordement peut être causé si on ne prend pas cette précaution.**

For permanent mounting, the IMCPM03 module can connect to a termination unit or termination module. Refer to Appendix B and Appendix C for information about these termination devices.

SECTION 4 - OPERATION

INTRODUCTION

This section explains what happens during start-up, what the LED indicators mean, and how to reset the module.

START-UP

The IMCPM03 module checks its hardware at start-up by using power up diagnostics to verify that it is working. The eight red status LEDs turn off when this operation is complete. The IMCPM03 module performs a series of tests at power up to verify correct operation of the hardware before enabling communication with the Controlway or module bus and serial channels. Any error causes the IMCPM03 module to halt immediately and display an error code on the faceplate LEDs.

RED/GREEN STATUS LED

The red/green status LED shows the IMCPM03 module operating condition. There are three possible states:

Off No power (momentarily off when processor initializes on power up).

Green Execute mode.

Red The IMCPM03 module has detected a hardware failure or an internal error and stopped the module. Additionally, the eight status LEDs light to display the error code (refer to Section 5).

FACEPLATE LEDS 1 THROUGH 8

The IMCPM03 module uses LEDs 1 through 8 as activity indicators in execute mode.

If pole 1 of dipswitch SW2 is set to 0 (console or station activity), LEDs 1 through 8 display the number of commands and replies transferred through the computer port. The LEDs increment once for each command and once for each reply.

If pole 1 of dipswitch SW2 is set to 1 (CTT interface activity), LEDs 1 through 6 display the number of messages and replies transferred through the CTT interface. The LEDs increment once for each message received from the CTT terminal and once for each reply sent to the CTT terminal. LED 7 displays

the status of the Controlway channel A (on=ok), and LED 8 displays the status of Controlway channel B (on = ok).

When the IMCPM03 is in the failed mode, these LEDs indicate module error codes. If an error occurs, the IMCPM03 module status LED turns red and LEDs 1 through 8 light up to display the error code (refer to Table 5-1). Note that LEDs 1 through 8 are all on when the system first starts up. This is normal - it means that the module is not yet on-line. In diagnostic operation mode, the LEDs indicate the status of the diagnostic test (refer to ***ON-LINE HARDWARE DIAGNOSTICS***).

RESET SWITCH

The reset switch resets the module. Access this switch through the opening on the faceplate (Figure 3-1) below the LEDs. Use a thin, nonmetallic object to press the switch. Press the switch once to recover from an error condition.

ON-LINE HARDWARE DIAGNOSTICS

The IMCPM03 module provides periodic on-line testing of the Controlway communication channels if Controlway communication mode is enabled. If the module finds a failed channel, it disables the failed channel. LEDs 7 and 8 indicate the status of the Controlway communication channels A and B if CTT terminal activity is selected on SW2 pole 1. The module also performs periodic ROM checksum verification. Refer to ***DIAGNOSTIC TESTS*** in Section 5.

SECTION 5 - TROUBLESHOOTING

INTRODUCTION

This section contains faceplate LED error codes, edge connector pinouts, cable connector pinouts, and explains the use of diagnostic tests.

LED DISPLAY

The IMCPM03 module has one two-color status LED on the faceplate to indicate the execute or failed status of the module (refer to Figure 3-1). Eight red status LEDs on the faceplate are for diagnostic purposes and activity counters. The LEDs are arranged vertically and numbered from one through eight, top to bottom (refer to Table 5-1). For LED functions, refer to ***FACEPLATE LEDS 1 THROUGH 8*** in Section 4.

In normal operation, the LEDs indicate activity through either the CTT or DB-25 computer port (refer to Section 4). When the IMCPM03 module is in a failed state, LEDs one through eight display a code indicating the error condition (refer to ***LED ERROR CODES***). In diagnostic operation mode, the LEDs indicate the status of the diagnostic test (refer to ***DIAGNOSTIC TESTS***).

LED ERROR CODES

If an error occurs within the IMCPM03 module, the two-color status LED on the front panel turns red and LEDs one through eight display the applicable error code (refer to Table 5-1). For undefined LED error codes, reset the IMCPM03 module. If the error recurs, replace the module.

Table 5-1. Red Status LED Error Codes

Code (Hex)	LEDs 8 7 6 5 4 3 2 1	Error Condition	Corrective Action
0E	0 0 0 0 1 1 1 0	Duplicate Controlway address	Change the IMCPM03 module Controlway address to an unused address (dipswitch SW3, poles 4 through 8).
13	0 0 0 1 0 0 1 1	ROM checksum	Replace the IMCPM03 module.
18	0 0 0 1 1 0 0 0	Database enabled in network PCU	Disable database commands (dipswitch SW2, pole 2 = 0).
31	0 0 1 1 0 0 0 1	Memory or CPU fault	Replace IMCPM03 module.

Table 5-1. Red Status LED Error Codes (continued)

Code (Hex)	LEDs 8 7 6 5 4 3 2 1	Error Condition	Corrective Action
32	0 0 1 1 0 0 1 0	Address or bus error	Reset IMCPM03 module. If error recurs, replace the module.
33	0 0 1 1 0 0 1 1	Illegal instruction	
34	0 0 1 1 0 1 0 0	Trace or privilege violation	
35	0 0 1 1 0 1 0 1	Spurious interrupt	
36	0 0 1 1 0 1 1 0	Divide by zero	
38	0 0 1 1 1 0 0 0	Board level hardware error	Replace the IMCPM03 module.

CONNECTORS

The IMCPM03 module interfaces to external devices through cable connections of five separate connectors. P1 and P3 are board edge connectors. P4 and P5 are faceplate connectors. P6 is the DB-9 EWS port on the component side of the PC board.

Power

The IMCPM03 module connects to the signals of the MMU backplane through the P1 edge connector (refer to Table 5-2).

Table 5-2. Module Mounting Unit Signals, P1 Edge Connector

Pin	Signal	Pin	Signal
1	+5 VDC	7	+15 VDC (NC)
2	+5 VDC	8	-15 VDC (NC)
3	Power status (NC)	9	Power fail interrupt
4	Controlway channel B	10	(NC)
5	Common	11	Controlway channel A
6	Common	12	(NC)

NOTE: (NC) means no connection for IMCPM03 module.

Input and Output

The IMCPM03 module provides the signals required for a termination unit or termination module on the P3 edge connector (refer to Table 5-3).

Table 5-3. Termination Unit Signals, P3 Edge Connector

Pin	Signal	Pin	Signal
1	(NC)	16	(NC)
2	(NC)	17	(NC)
3	(NC)	18	(NC)
4	(NC)	19	(NC)
5	(NC)	20	(NC)
6	(NC)	21	(NC)
7	Serial RXD A-	22	Serial RXD A+
8	Serial RXD B-	23	Serial RXD B+
9	Serial CTS A-	24	Serial CTS A+
10	Serial CTS B-	25	Serial CTS B+
11	Serial TXD A-	26	Serial TXD A+
12	Serial TXD B-	27	Serial TXD B+
13	Serial RTS A-	28	Serial RTS A+
14	Serial RTS B-	29	Serial RTS B+
15	(NC)	30	(NC)

NOTE: Serial Channel A is the DB-25 computer port. Serial Channel B is the DB-9 EWS port. (NC) means no connection for IMCPM03 module.

CTT Port

The IMCPM03 module supports the signals required for the CTT terminal through the round, five-pin male connector (P5) mounted on the faceplate (refer to Table 5-4).

Table 5-4. CTT Port Signals, P5 Connector

Pin	Signal
1	+5 VDC
2	Common
3	Common
4	Power fail interrupt
5	Module bus

DB-25 Computer Port

The IMCPM03 module supports the signals required for the console or station (serial channel A) through the DB-25 computer port female connector (P4) mounted on the faceplate (refer to Table 5-5). Jumper J5 configures DCE (data communications) or DTE (data terminal) operation.

Table 5-5. Computer Port Signals, P4 Connector

Pin	Signal
1	Protective ground
2	Transmitted data (TXD)
3	Received data (RXD)
4	Request to send (RTS)
5	Clear to send (CTS)
6	Data set ready (DSR)
7	Common
8	Data carrier detect (DCD)
20	Data terminal ready (DTR)

DB-9 EWS Port

The IMCPM03 provides a DB-9 connector inside the faceplate on the circuit board for use as an EWS port. This port can also be used for development and diagnostic purposes (refer to Table 5-6).

Table 5-6. EWS Port Signals

Pin	Signal
1	Data carrier detect (DCD)
2	Received data (RXD)
3	Transmitted data (TXD)
4	Data terminal ready (DTR)
5	Ground
6	Data set ready (DSR)
7	Request to send (RTS)
8	Clear to send (CTS)
9	Ring indicator (RI)

DIAGNOSTIC TESTS

The IMCPM03 module firmware contains diagnostic tests that can be invoked from power up to test the operation of the module components and circuitry. When in the diagnostic mode, the IMCPM03 module does ***not*** function as an IMCPM03 module. This section provides a brief description of each diagnostic test and describes how to use them (refer to ***Test Descriptions***).

1. Set pole 1 of SW3 to off (OPEN) to enable hardware diagnostics. Faceplate LEDs display the test results. SW2 selects the group test or individual tests to be run.

2. Select a diagnostic test to run, then set the dipswitches and reset the module. Observe the test results on the faceplate LED display. The selected test runs repeatedly until the IMCPM03 module is reset or another test is selected on dipswitch SW2.

Test Descriptions

The IMCPM03 module has 12 self-contained diagnostic tests that can be run to identify hardware failures. Refer to Table 5-7 for test descriptions and Table 5-8 for test switch settings.

Table 5-7. Diagnostic Test Descriptions

No.	Diagnostic	Description
00	Switches and LEDs	The byte values of the two switches are exclusive ORed and the result displayed on the LEDs. The 0 and 1 states of each pole on both switches are summed, and the status LED is turned off for an even sum or turned on (green) for an odd sum.
01	CPU	Verifies that the processor instruction set is operational.
02	ROM	Calculates a checksum value of the EPROM and verifies that this value matches the checksum value which was stored in the EPROM during programming.
04	Static RAM	Data words containing fifteen 0s and one 1 are written and read from the full range of static RAM; the 1 then shifts to the next of 16 bit places and the new data word is written and read from RAM. A similar zero test is executed. All RAM is cleared and verified, then all RAM is set and verified. Includes byte, word and long word accesses.
09	Module bus and Controlway	After initializing the Controlway integrated circuit, sends a series of bytes to the module bus in loopback mode. The module address and bus speed are determined by dipswitch SW3. The timing and status of the transfer must be within tolerance.
0A	Timer interrupt	Initializes the timer for a one-millisecond timer interrupt, then waits for the timer interrupt event to occur. The test fails if a second interrupt does not occur within 1.008 milliseconds.
0B	Dispatcher interrupt	Issues a software dispatcher request (sets latch), then waits for an interrupt to occur. If an interrupt does not occur, the test fails.
0C	RS-232-C duart	Exercises both serial channels of the DUART in local loopback mode. If all parts of the test pass, the DUART is functioning properly.
0E	CTT module bus	Sends a series of bytes to the CTT terminal module bus in loopback mode. The timing and status of the transfer must be within tolerance.
0F	Null	The IMCPM03 module always passes this test.
10	Group	Continuously runs tests 01 through 0F in sequence to verify proper operation of a single IMCPM03 module (no external modules or cables required). For a more complete checkout of IMCPM03 module functionality, tests 00 (switches and LEDs) and 11 (DUART external loopback test) should also be executed.
11	RS-232-C duart external loopback	Exercises both channels of the DUART in external loopback mode. Jumpers J5 and J6 must be positioned in their loopback settings. If all parts of the test pass, the DUART and its support circuitry are functioning properly.

Dipswitch Settings

This section describes the settings and function of dipswitches SW2 and SW3 for diagnostic mode. Refer to Figure 5-1 for the dipswitch locations on the IMCPM03 module.

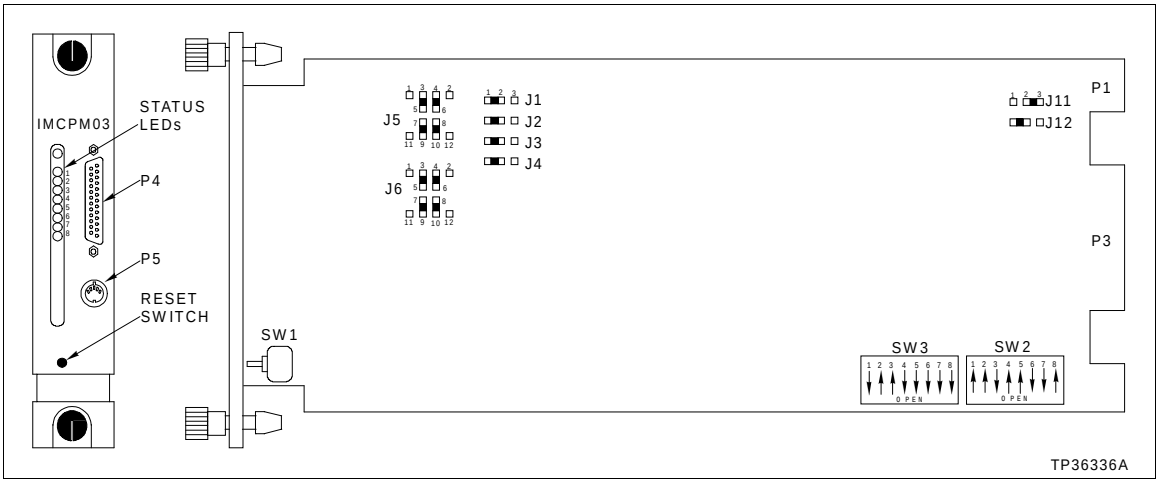

Figure 5-1. Diagnostic Dipswitch Positions

DIPSWITCH SW2 SETTINGS - DIAGNOSTICS

Pole 1 of dipswitch SW2 selects the LED display mode. Pole 2 of dipswitch SW2 selects a halt on error feature. In this mode, the IMCPM03 module will halt test execution whenever the selected test detects an error. The number of the failing test is displayed on the front panel LEDs.

On dipswitch SW2, poles 3 through 8 select a diagnostic test to run. Pole 8 is the least significant bit (binary weight 1). Pole 3 is the most significant bit (binary weight 32). Refer to Table 5-8 for dipswitch SW2 settings for diagnostic mode and test ID values.

Table 5-8. Dipswitch SW2 Settings for Diagnostic Mode

Test No.	Diagnostic Test	SW2 Pole Settings							
		1	2	3	4	5	6	7	8
—	LED display								
	Test number	0							
	Success or failure tally	1							
—	Action on error								
	Continue		0						
	Halt		1						
00	Test switches and LEDs			0	0	0	0	0	0

Table 5-8. Dipswitch SW2 Settings for Diagnostic Mode (continued)

Test No.	Diagnostic Test	SW2 Pole Settings							
		1	2	3	4	5	6	7	8
01	Test CPU			0	0	0	0	0	1
02	ROM (verify ROM check-sum)			0	0	0	0	1	0
04	Test RAM			0	0	0	1	0	0
09	Test module bus or Control-way			0	0	1	0	0	1
0A	Test DUART timer interrupt			0	0	1	0	1	0
0B	Test dispatcher interrupt			0	0	1	0	1	1
0C	Test DUART serial channels (local loopback mode)			0	0	1	1	0	0
0E	Test CTT module bus			0	0	1	1	0	1
0F	Null test			0	0	1	1	1	1
10	Group test (runs tests 01 through 0F)			0	1	0	0	0	0
11	DUART serial channels external loopback. Set jump-ers J5 and J6 to loopback settings.[1]			0	1	0	0	0	1

NOTES:
1. Refer to Figure 3-5 for loopback settings.
2. 0 = CLOSED or ON, 1 = OPEN or OFF.

DIPSWITCH SW3 SETTINGS - DIAGNOSTICS

Set pole 1 of dipswitch SW3 to 1 (OFF position) to put the module into the diagnostic mode. Pole 2 of dipswitch SW3 is not used in diagnostic mode. The remaining poles select module address and Controlway or module bus. The function of each pole of dipswitch SW3 is the same in either diagnostic or normal mode (except pole 2).

LED Display

During diagnostic mode operation, the faceplate LEDs display test results (refer to Figure 5-2). On module reset, all eight LEDs illuminate, the dipswitches are read, the selected test is executed and the result is displayed on the LEDs.

The format of the LED display depends upon the setting of pole 1 on SW2. If this pole is in the ON position, the test number is displayed in LEDs 1 through 6. LED 8 illuminates if the test fails. This display format is latched on for $^1/_4$ second for viewing ease, then the LEDs blank out for about $^1/_8$ second, and the test is repeated.

If pole 1 on SW2 is OFF, a running tally of successes and failures will be displayed on the LEDs. LEDs 1 through 4 tally the passes, LEDs 5 through 8 tally the failures.

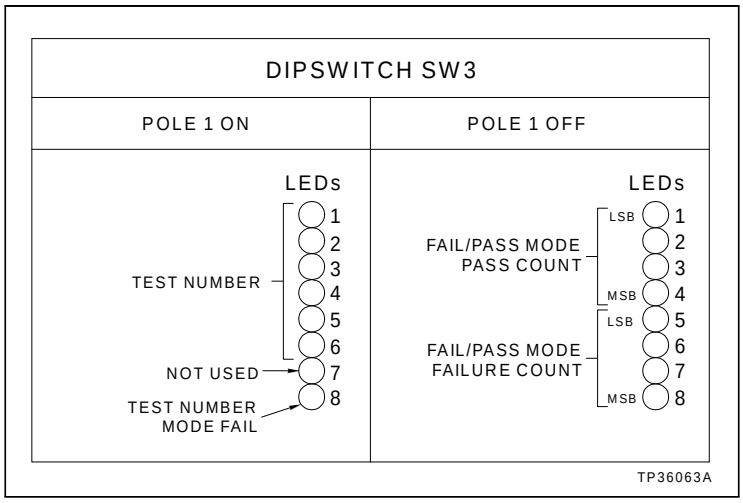

Figure 5-2. LEDs - Pass or Fail

If a test fails with halt on error selected (SW2, pole 2 OFF), the status LED turns red one second after the test status is displayed.

For the group test (10), each individual test is run in numerical order. Upon failure, the test number that failed is displayed when the test number display mode is selected. A failure of a test within the group terminates the group test at that point. All tests after the failing test in the group will not be run until the fault is removed.

SECTION 6 - MAINTENANCE

INTRODUCTION

This section contains a preventive maintenance schedule for the IMCPM03 module. Follow the warnings. Put boards containing semiconductors into antistatic bags when stored or shipped back to the factory. Do not repair printed circuit boards in the field.

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

This section presents procedures that the customer should be able to perform on-site. These preventive maintenance procedures should be used as a guideline to assist in establishing good preventive maintenance practices. Select the minimum steps required to meet the cleaning needs of the system.

Personnel performing preventive maintenance should meet the following qualifications.

- Maintenance personnel should be qualified electrical technicians or engineers who know the proper use of test equipment.
- Maintenance personnel should be familiar with the IMCPM03 module, have experience working with process control systems, and know what precautions to take when working on live AC voltage wiring.

PREVENTIVE MAINTENANCE SCHEDULE

Refer to Table 6-1 for the preventive maintenance schedule for the IMCPM03 module. The table lists the preventive maintenance tasks according to the 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***.

Table 6-1. Preventive Maintenance Schedule

Task	Frequency
Check module for dust. Clean as necessary using an antistatic vacuum.	3 months

Table 6-1. Preventive Maintenance Schedule (continued)

Task	Frequency
Inspect and check the module giving particular attention to edge connectors. Clean as necessary. Refer to procedure.	12 months
Complete all tasks in this table.	Shutdown

EQUIPMENT AND TOOLS REQUIRED

Following are the tools and equipment required for maintenance procedures.

- Antistatic vacuum.
- Lint-free cloths.
- Isopropyl alcohol (99.5 percent electronic grade).
- Eberhard Faber (400A) pink pearl eraser or equivalent.
- Fiberglass burnishing brush.

PREVENTIVE MAINTENANCE PROCEDURES

Never clean electrical parts or components with the power on. Doing so exposes you to a fatal electrical shock hazard.

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.

Il ne faut jamais nettoyer des piècesou des composants électriques lorsqu'ils sont sous tension. Cedi présente un risque d'électrocution fatale.

AVERTISSEMENT

Portez toujours des lunettes de protection lorsque vous utilisez des solvants de nettoyage. L'aircomprimé servant à enlever le solvant des cartes de circuits imprimés provoque des éclaboussures qui risquent d'atteindre les yeux.

This section covers tasks from Table 6-1 that require specific instructions or further explanation. It contains the specific instructions on cleaning printed circuit boards and edge connectors.

Cleaning the Printed Circuit Boards

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

Do all cleaning and handling of the printed circuit boards at static safe work stations. Always observe the proper electrostatic discharge handling precautions when handling printed circuit boards.

General Cleaning and Washing

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

Another method of cleaning the printed circuit board is:

1. Clean the printed circuit board by spraying or wiping the board with isopropyl alcohol (99.5% electronic grade). Use a foam-tipped swab to wipe the circuit board.

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 ESD by using the 80% isopropyl alcohol to 20% 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.

SECTION 7 - REPAIR/REPLACEMENT PROCEDURES

INTRODUCTION

Repair procedures are limited to module replacement. If the IMCPM03 module fails, remove and replace it with another module. Verify that firmware revision levels match and that replacement switch settings are the same as the failed module. Refer to Table 7-1 for a list of recommended spare parts.

MODULE REPLACEMENT

Use the following procedure to replace the IMCPM03 module.

> **NOTE:** The IMCPM03 module can be removed while power is applied.

1. Turn the two concentric screws ½-turn either way to release them.

2. Grasp the screws and slide the module out.

3. Set switches SW2 and SW3 on the replacement to match the settings of the CPM module recently removed.

4. Make certain jumpers J1 through J12 are set correctly.

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

6. Turn the two concentric screws ½-turn clockwise either way to lock the module into the module mounting unit.

Table 7-1. Recommended Spare Parts List

Part Number	Description	Quantity
IMCPM03	Module, communication port module	1
NKTU01	Cable, IMCPM03 to termination unit	1
NKTU02	Cable, IMCPM03 to termination module	1

SECTION 8 - SUPPORT SERVICES

INTRODUCTION

Bailey Controls Company is always ready to assist in the operation and repair of its products. Send requests for sales or application services to the nearest sales or service office. Bailey Controls Company can also provide installation, repair and maintenance contract services.

REPLACEMENT PARTS AND ORDERING INSTRUCTIONS

Order replacement parts through a Bailey Controls Company sales or service office. Provide the following information when ordering parts:

1. Part description, part number or nomenclature and quantity.

2. Model and serial number (if applicable) and ratings of the assembly the part has been ordered for.

3. Publication number and reference used in identifying the part.

When ordering parts, use part numbers and part descriptions from equipment instructions. Parts with no commercial description must be ordered from the nearest sales or service office. Recommended spare parts lists on standard assemblies, including prices, are available through the nearest sales or service office.

TRAINING

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

TECHNICAL DOCUMENTATION

Additional copies of this instruction, or other Bailey Controls Company instructions, can be obtained through the nearest Bailey Controls Company sales office at a reasonable charge.

APPENDIX A - ENHANCED MODULE STATUS

ENHANCED MODULE STATUS

This section contains the enhanced module status format of the IMCPM03. This block is displayed when the **Demand Module Status** command is issued on the CTT. Refer to Table A-1 for the enhanced module status block and Table A-2 for the enhanced module status block code description.

Refer to the ***Configuration and Tuning Terminal Type CTT02*** instruction for more information on using this command. For more troubleshooting information for the module, refer to Section 5.

Table A-1. Enhanced Module Status Block

Status Byte	Bit							
	7	6	5	4	3	2	1	0
1	ES	MODE		Module type (= 21)				
2	FTX		RIO	LIO				
3		MEM				Node type		
4							DBASE	ONLINE
5	Network interface status							
6	Enhanced module type (= 41)							
7	CWA	CWB						
8...13	Not used							
14	Module nomenclature (= 3 for IMCPM03)							
15	Major revision level (ASCII letter, i.e., ***A***)							
16	Minor revision level (ASCII letter, i.e., ***O***)							

Table A-2. Enhanced Module Status Block Code Description

Field	Description
ES (Error summary)	0 = no errors 1 = error exists (check other fields)
MODE	0 = configure 1 = failed (not used) 3 = execute
Module type (= 21)	Enhanced module type (refer to ***Enhanced module type*** field)
RIO	0 = no remote I/O errors 1 = remote I/O error exists
LIO	0 = no local I/O errors 1 = local I/O error exists
MEM	0 = configuration memory available 1 = configuration memory exhausted
Node type	Set by the station or console with the **SET CIU STATUS** command
Network interface status	
Enhanced module type (= 41)	For IMCPM03 module
CWA	0 = Controlway channel A OK 1 = Controlway channel A failure
CWB	0 = Controlway channel B OK 1 = Controlway channel B failure
DBASE	0 = Database capability disabled 1 = Database capability enabled
ONLINE	0 = IMCPM03 off-line 1 = IMCPM03 on-line

APPENDIX B - NIMP01/02 TERMINATION MODULE

INTRODUCTION

The IMCPM03 module can use the NIMP01/02 termination module for termination. Refer to Figure B-1 for the jumper configuration required for connection to a modem. Refer to Figure B-2 for the jumper configuration required to operate as an EWS port. Refer to Figure B-3 for the jumper assignments for handshake signals. Refer to Figure B-4 for the required jumper settings for J14 through J17. Refer to Figure B-5 for the required jumper setting for J18. Refer to Figure B-6 for the NIMP01/02 connector assignments and jumper locations. Refer to Figure B-7 for the cable connection.

NOTE: Port 1 is the EWS port. Port 2 is the utility port and is unavailable.

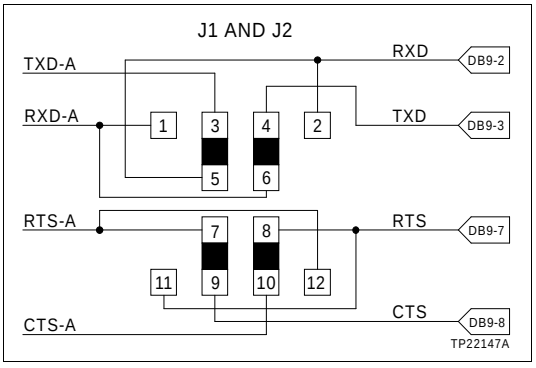

Figure B-1. Jumper Configuration for Modem (DCE) Connection

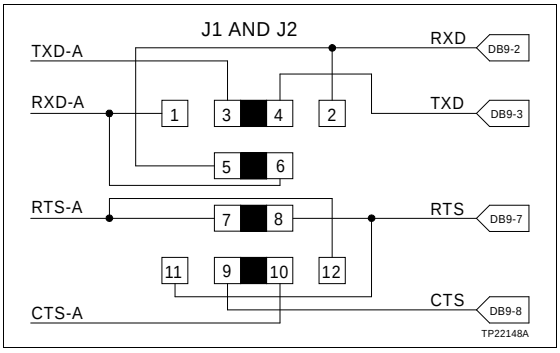

Figure B-2. Jumper Configuration for EWS (DTE) Connection

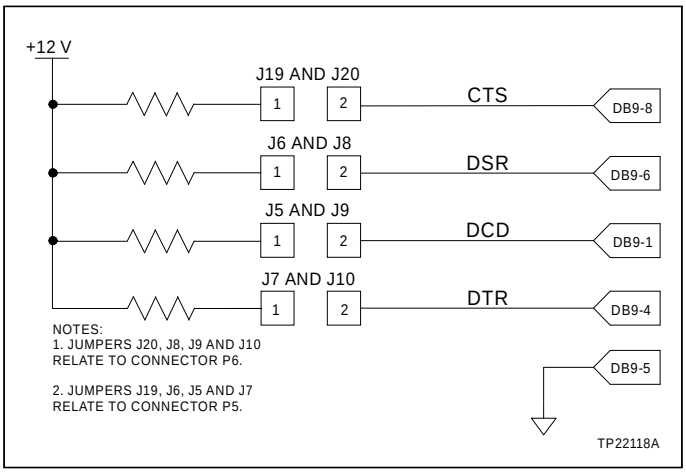

Figure B-3. Handshake Signal Schematic

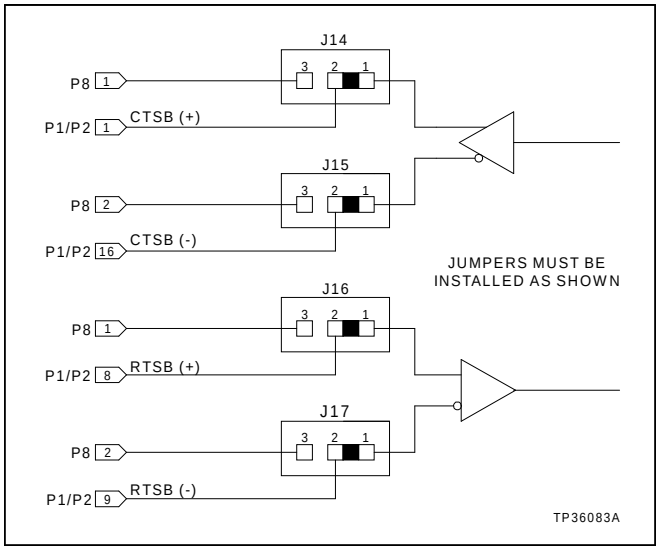

Figure B-4. Jumper Settings for J14 through J17

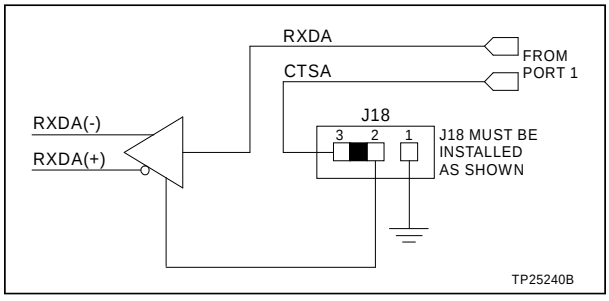

Figure B-5. Jumper Settings for J18 RS-232-C Operation

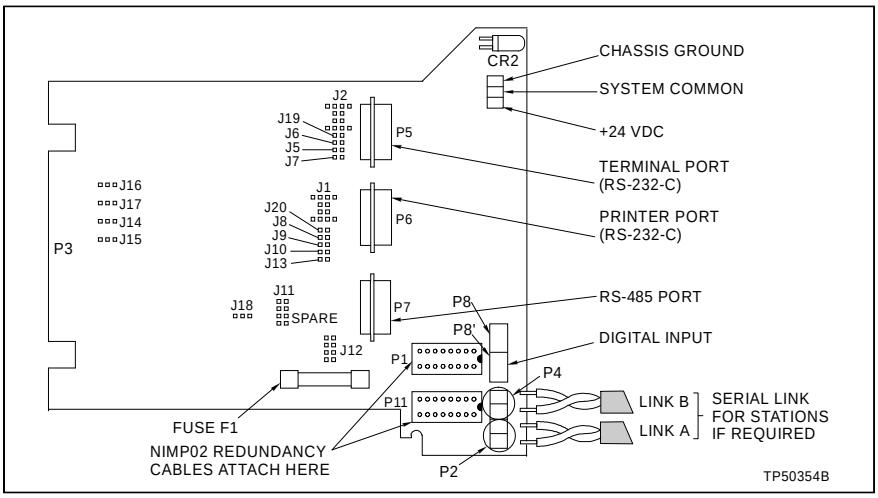

Figure B-6. Connector Assignments and Jumper Locations

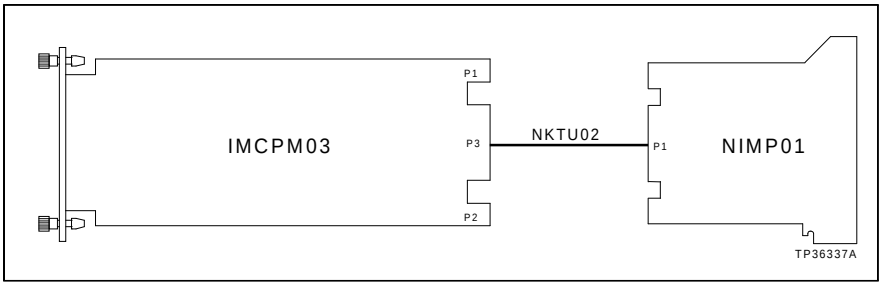

Figure B-7. NIMP01 Cable Connection

APPENDIX C - NTMP01 TERMINATION UNIT

INTRODUCTION

The IMCPM03 module can use the NTMP01 termination unit for termination. Refer to Figure C-1 for the jumper configuration required for connection to a modem. Refer to Figure C-2 for the jumper configuration required to operate as a computer port. Refer to Figure C-3 for the jumper assignments for handshake signals. Refer to Figure C-4 for the required jumper settings for J14 through J17. Refer to Figure C-5 for the required jumper setting for J18. Refer to Figure C-6 for the NTMP01 connector assignments and jumper locations. Refer to Figure C-7 for the NTMP01 cable connection.

NOTE: Port 1 is the computer port. Port 2 is the auxiliary.

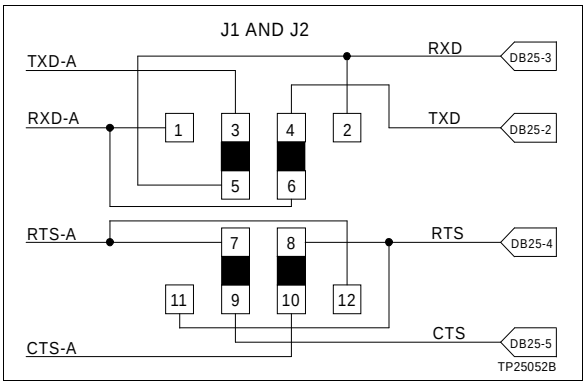

Figure C-1. Jumper Configuration for Modem (DCE) Connection

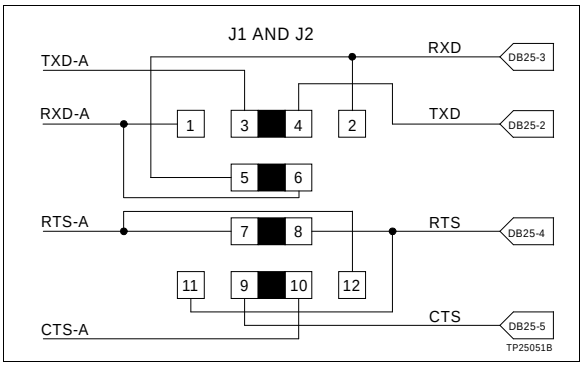

Figure C-2. Jumper Configuration for EWS (DTE) Connection

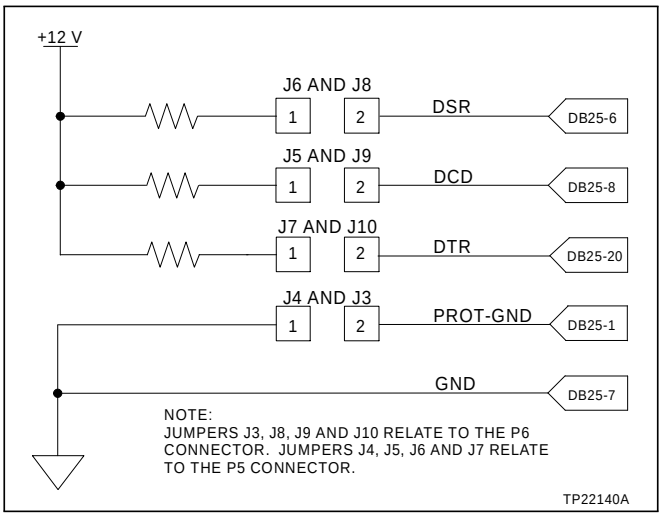

Figure C-3. Handshake Signal Schematic

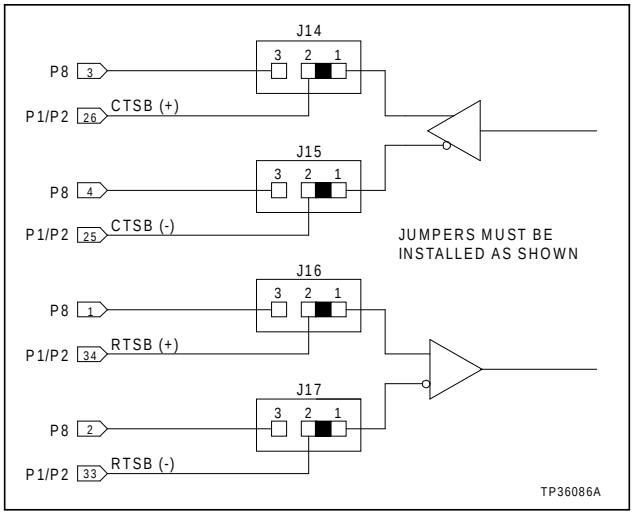

Figure C-4. Jumper Settings for J14 through J17

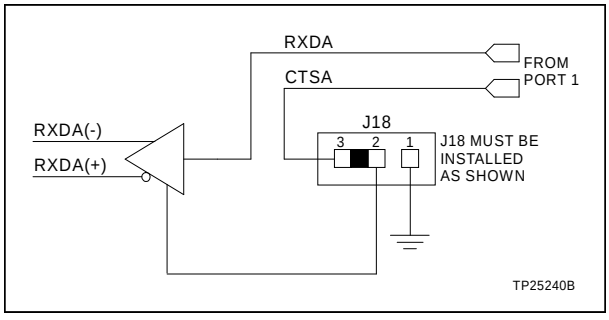

Figure C-5. Jumper Settings for J18 RS-232-C Operation

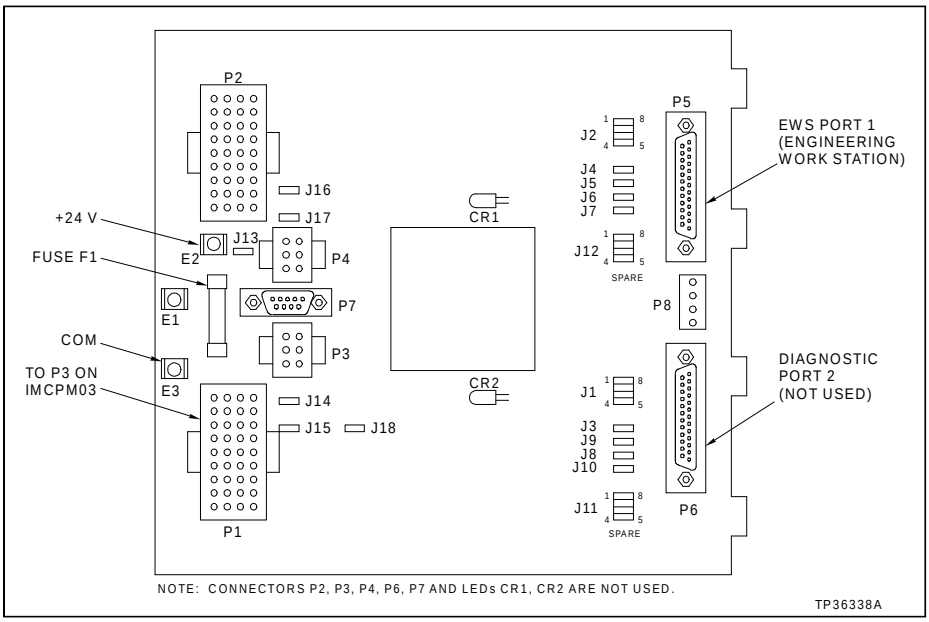

Figure C-6. Connector Assignments and Jumper Locations

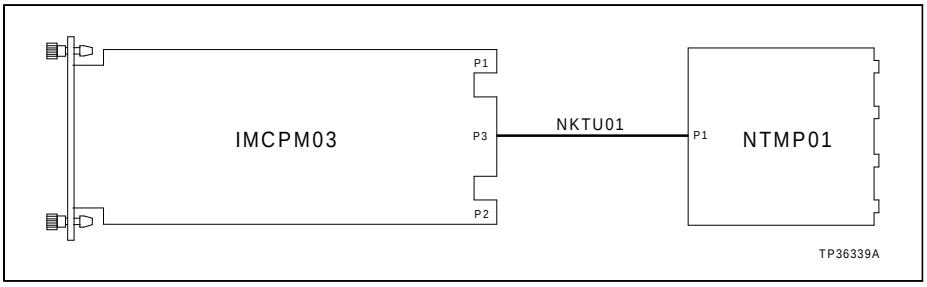

Figure C-7. Cable Connection

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