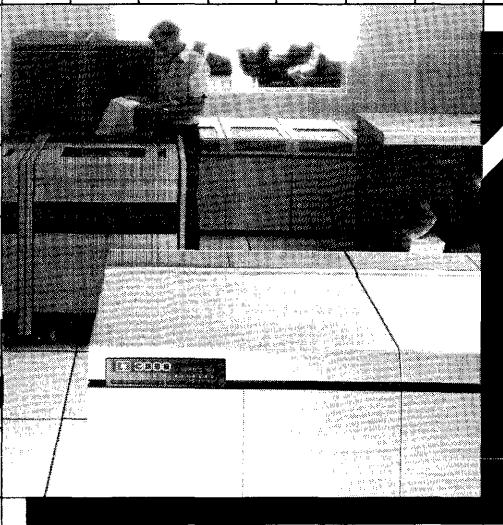
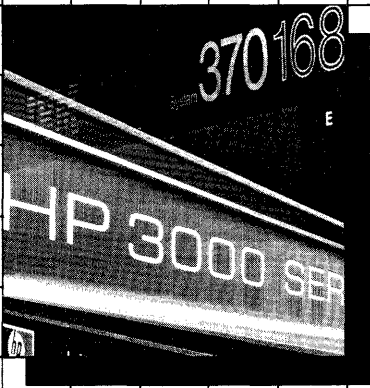


Distributed Systems Network



HP 30020B
Intelligent Network Processor
(INP)
installation and service manual



HP 3000 HP-IB Version Computer Systems

HP 30020B Intelligent Network Processor (INP) Installation and Service Manual



**INFORMATION NETWORKS DIVISION
19420 Homestead Road, Cupertino, California 95014**

NOTICE

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

HEWLETT-PACKARD MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance or use of this material.

Hewlett-Packard assumes no responsibility for the use or reliability of its software on equipment that is not furnished by Hewlett-Packard.

This document contains proprietary information which is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced or translated to another program language without the prior written consent of Hewlett-Packard Company.

LIST OF EFFECTIVE PAGES

The List of Effective Pages gives the date of the current edition and of any pages changed in updates to that edition. Within the manual, any page changed since the last edition is indicated by printing the date the changes were made on the bottom of the page. Changes are marked with a vertical bar in the margin. If an update is incorporated when an edition is reprinted, these bars are removed by the dates remain. No information is incorporated into a reprinting unless it appears as a prior update.

First Edition Jan 1982

PRINTING HISTORY

New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The date on the title page and back cover of the manual changes only when a new edition is published. When an edition is reprinted all the prior updates to the edition are incorporated. No information is incorporated into a reprinting unless it appears as a prior update. The edition does not change.

The software product part number printed alongside the date indicates the version and update level of the software product at the time the manual edition or update was issued. Many product updates and fixes do not require manual changes, and conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one to one correspondence between product updates and manual updates.

First Edition Jan 1982

PREFACE

This manual contains installation and servicing information for the HP 30020B Intelligent Network Processor (INP). The INP is a functionally flexible, single-channel data processor that provides I/O capability between the HP 3000 HP-IB Version Computer Systems and other computer systems via either modulator/demodulators (modems) and telephone lines or direct connection. In this manual, the HP 3000 HP-IB Version Computer Systems refers to the HP 3000 Series 30,33,40,44 and 64 Computer Systems.

This manual was written with the assumption that the reader has a thorough knowledge of the HP 3000 HP-IB Version I/O system and is familiar with the latest data communications techniques.

This manual is organized as follows:

Section I, General Information, briefly describes the main features of the INP and how it operates. This section also describes how the INP is configured in the computer system, lists the equipment supplied with the INP, and lists its specifications.

Section II, Installation, contains instructions for installing the INP printed circuit assembly (PCA) and its interconnecting cabling into an HP 3000 HP-IB Version Computer System.

Section III, Principles of Operation, is a description of the hardware operation of the INP and its associated communication channels. Since this is a brief overview, intended only to give the user a better understanding of how the INP does its job, some minor operational details have been omitted.

Section IV, Maintenance, contains general servicing information, troubleshooting procedures, repair instructions, and a description of applicable maintenance aids.

PREFACE (Continued)

This manual should be retained and used with related documentation for the HP 3000 HP-IB Version Computer System and the INP. Related documents include the following technical manuals:

HP 3000 Series 33 and HP 3000 Series 30 Reference/Training Manual, part no. 30070-90003

HP 3000 Series 33 and HP 3000 Series 30 Customer Engineer Handbook, part no. 30070-90010

HP 3000 Series 33 Installation Manual, part no. 30070-90021

HP 3000 Series 30 Installation Manual, part no. 30080-90001

HP 3000 Computer Systems, Series 30/33 Console Operator's Guide, part no. 30070-90025

HP 3000 Series 33 and HP 3000 Series 30 Diagnostic Manual Set, part no. 30070-60068

HP 30010A,30020A/B Intelligent Network Processor Diagnostic Procedures Manual, part no. 30010-90002

HP 3000 Computer Systems, Communications Handbook, part no. 30000-90105

HP 3000 Computer Systems, System Manager / System Supervisor Reference Manual, part no. 30000-90014.

HP 3000 Computer Systems, Series 44 Installation Manual, part no. 30090-90002.

HP 3000 Computer Systems, Series 44 Reference/Training Manual, part no. 30090-90001.

HP 3000 Computer Systems, Series 40 Installation Manual, part no. 30170-90002.

HP 3000 Series 64 Reference/Training Manual, part no. 30140-90005.

HP 3000 Series 64 Installation Manual, part no. 30140-90007.

HP 3000 Series 64 Customer Engineer Handbook, part no. 30140-90006.

HP 3000 Series 64 Diagnostic Manual Set, part no. 32342-60001.

CONTENTS

Section I - GENERAL INFORMATION

Introduction	1-1
General Description	1-1
Equipment Supplied	1-4
Features	1-8
Interface to System	1-8
Specifications	1-10

Section II - INSTALLATION

Unpacking and Initial Inspection	2-1
Preparation for Installation	2-2
Power Requirements	2-2
PCA Jumpers and Switches	2-2
Hardware Installation Procedures	2-4
Installation of the INP PCA	2-4
Installation of the Communication Cables	2-5
Software Installation	2-7
Installation Verification	2-7
Multiple INP Installations	2-11
Auto Call Unit Installation	2-12

Section III - PRINCIPLES OF OPERATION

Functional Description	3-1
INP Microprocessor	3-2
Read-Only Memory (ROM)	3-2
Random Access Memory (RAM)	3-2
Direct Memory Access (DMA)	3-4
SDLC and BISYNC Data Communication	3-4
Communication Line Interfaces	3-4
Auto Call Unit Interface	3-4
Functional-Level Operation	3-4
System-Level Operation	3-6

CONTENTS (Continued)

Section IV - MAINTENANCE

Safety Precautions	4-1
Repair Philosophy	4-2
Maintenance Aids	4-2
Self Test	4-3
ROM Test	4-4
Timer Interrupt Test	4-4
RAM Test	4-4
Basic Instruction Set Test	4-4
Chip Tests	4-5
BISYNC Test	4-5
SDLC Test	4-5
Troubleshooting	4-5
Customer-user Troubleshooting Procedures	4-5
HP Support Troubleshooting Procedures	4-7
Off-board Loopback Testing	4-10
Field Repair	4-11
Field Replacement of a RAM Chip	4-11
Replacement of the PCA Board	4-12
Reshipment Instructions	4-13

Appendix A - CONFIGURING MPE

Configuration Overview	A-1
The Configuration Dialogue	A-2

Appendix B - INP DUMP FACILITY

B-1

Appendix C - COMMUNICATIONS CABLING DIAGRAMS

C-1

Index	Index-1
-------------	---------

ILLUSTRATIONS

Figure	Title	Page
1-1.	HP 30020B Intelligent Network Processor and Related Cabling	1-2
1-2.	HP 30020B Intelligent Network Processor and Auto Call Unit Cabling	1-3
1-3.	Typical Interface to System	1-9
1-4.	INP Auto Call Hardware Configuration	1-11
2-1.	Location of PCA Switch	2-3
2-2.	Communication Cable Routing (HP 3000-30/40)	2-8
2-3.	Communication Cable Routing (HP 3000-33/44)	2-9
2-4.	Communication Cable Routing (HP 3000-64)	2-10
2-5.	Self-test Switch and LED Indicators	2-12
2-6.	HP 37210T Modem to Auto Call Unit Connection ...	2-13
3-1.	HP 30020B INP Block Diagram	3-3
4-1.	Location of Pertinent Components on INP PCA	4-6

TABLES

Table	Title	Page
1-1.	Interconnecting Cable Assemblies	1-5
1-2.	Test Equipment Compatibility	1-7
1-3.	Specifications	1-10
4-1.	Meanings of Self-test LED Indicator Patterns	4-8
4-2.	Identifying Defective RAM Data Chips	4-9

GENERAL INFORMATION

SECTION

I

1-1. INTRODUCTION

This section describes the functional and physical characteristics of the HP 30020B Intelligent Network Processor (INP) shown in figure 1-1. Related publications that may be required for operation and service of the INP are listed in the Preface. In this manual, the HP 3000 HP-IB Version Computer Systems refers to the HP 3000 Series 30,33,40,44 and 64 Computer Systems.

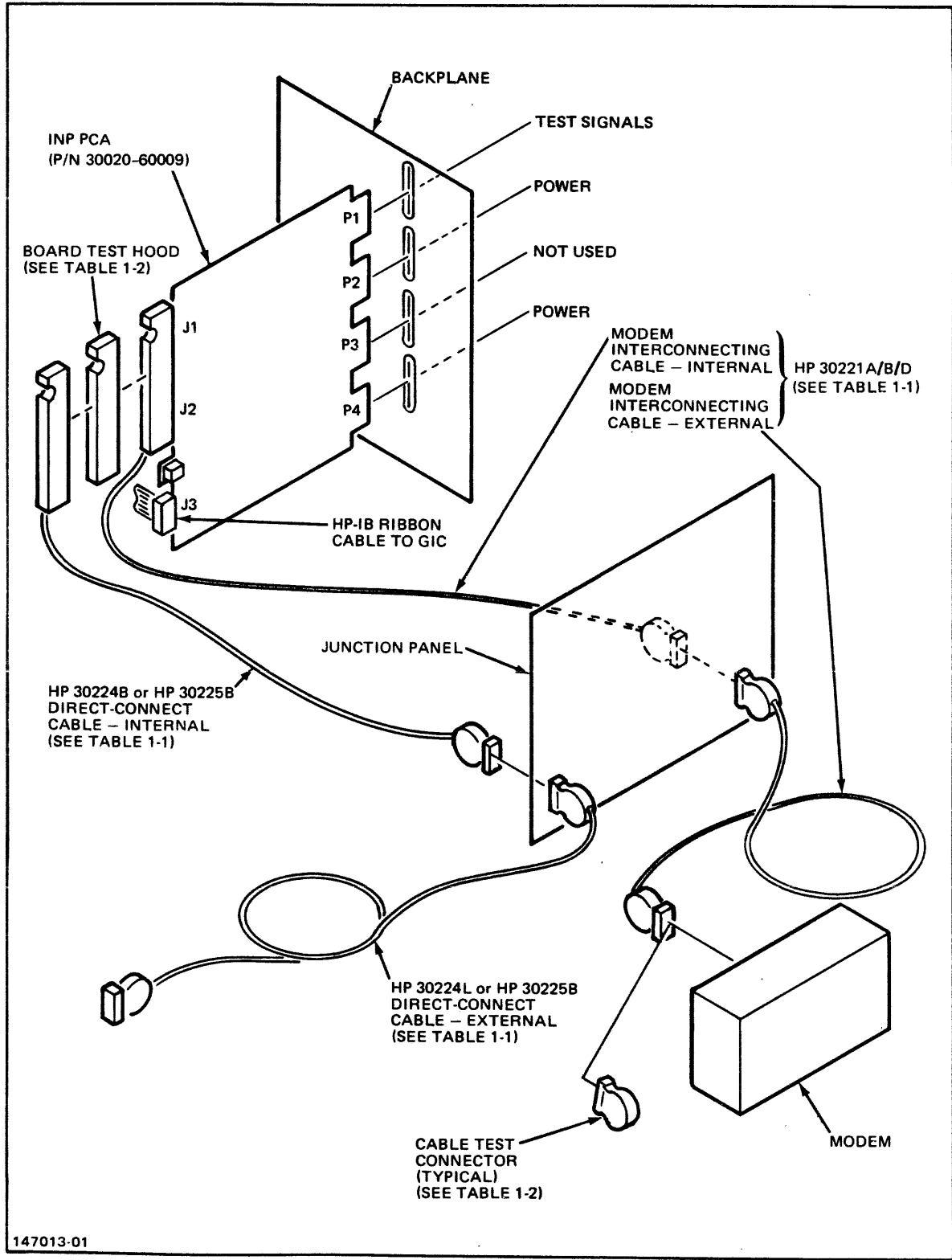
1-2. GENERAL DESCRIPTION

The HP 30020B Intelligent Network Processor (frequently referred to hereafter as the INP) provides the HP 3000 HP-IB version Computer Systems with data communication capabilities in high-speed as well as low-speed modem environments.

A microprocessor within the INP performs the communications protocol management, thus relieving the HP 3000 processor of that task. As power is applied, the INP initializes itself, runs a mini-diagnostic routine, reports to the system that it is functionally operational, and requests configuration parameters. When a request for data communication performance is made (for example, when a user at a terminal opens a DS line), the system loads the appropriate driver onto the INP. The INP then transfers control to the driver from its background loader program. The driver opens the communications channel and passes buffered data back and forth between the HP 3000 CPU and the data communication channel.

Serialization, protocol management, frame/block management, modem management, and data buffering are all performed by the INP. The CPU must still process message formats and higher level link procedures. While the INP is transferring the last correctly received block of data to the CPU, the INP is also processing and buffering the next block of data coming from the communication channel.

General Information



147013-01

Figure 1-1. HP 30020B Intelligent Network Processor and Related Cabling

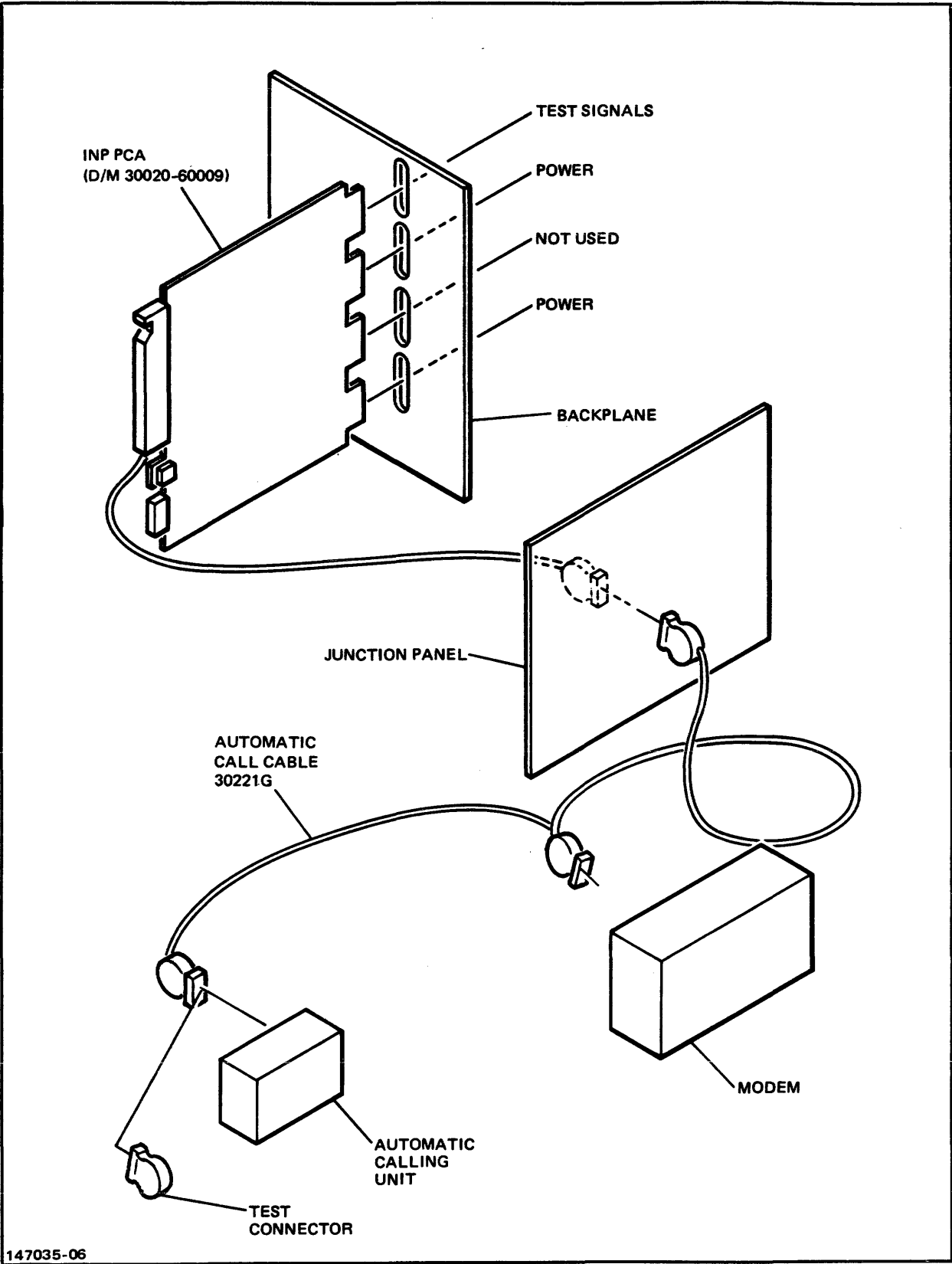


Figure 1-2. HP 30020B Intelligent Network Processor and Auto Call Unit Cabling

General Information

1-3. Equipment Supplied

The HP 30020B Intelligent Network Processor consists of the following:

- One Intelligent Network Processor (INP) printed circuit assembly (PCA), part number 30020-60009.
- One HP-IB Ribbon Cable, part no. 30090-60051.
- One HP 30020B Intelligent Network Processor Installation and Service Manual, part no. 30020-90005.
- One HP 30010A/30020A/B Intelligent Network Processor Diagnostic Procedures Manual, part number 30010-90002.

Although a complete INP subsystem must include one or more INP-to-modem cables, INP-to-INP direct-connect cables, or INP-to-SSLC direct-connect cables, these cables are not included under the HP 30020B product number. Each interconnecting cable or set of cables required for the various configurations is ordered separately under its own product number. See table 1-1 for a list of the available cables.

CAUTION

Use of the longer lengths of the external interconnect cables requires special precautions. Long cables are very susceptible to induced transients. DO NOT run cables outdoors or near electrically "noisy" equipment.

The following test equipment is used to verify the proper operation of the INP while troubleshooting the data communications network:

- Cable test connector.
- Board test hood.

These items of test equipment are supplied by the HP Customer Engineer (contained in Product Support Package 30010-67801). Different part numbers of test connectors and test hoods are required for different cable connection configurations. Table 1-2 shows which test items are compatible with each set of interconnecting cables.

Table 1-1. Interconnecting Cable Assemblies

Product No.	Option	Description	Part No.
30221A		RS232C Synchronous Internal Cable RS232C 10 meter External Cable	30221-60001 5061-2514
30221B		RS232C Asynchronous Internal Cable RS232C 10-meter External Cable	30221-60002 5061-2514
30221D		V.35 High-speed Synchronous Internal Cable V.35 10-meter External Cable	30221-60010 5061-2517
30221G		Auto Call Cable (Internal) (External)	30221-60007 8120-3576
30224B		INP-to-INP Direct-Connect Cable (Internal)	30224-60014
30224L		External Interconnect Cable (10-meter)	30224-60001
30224L	001	External Interconnect Cable (25-meter)	30224-60002
30224L	002	External Interconnect Cable (50-meter)	30224-60003
30224L	003	External Interconnect Cable (100-meter)	30224-60004
30224L	004	External Interconnect Cable (250-meter)	30224-60005

General Information

Table 1-1. Interconnecting Cable Assemblies (continued)

Product No.	Option	Description	Part No.
30224L	005	External Interconnect Cable (500-meter)	30224-60006
30224L	006	External Interconnect Cable (1000-meter)	30224-60007
30225B		INP-to-SSLC Direct-Connect Cable (Internal)	30221-60001
		INP-to-SSLC Direct-Connect Cable (5-meter External)	30225-60006
30221F		HP 3000 to 1000 Direct Connect Cable (Internal) (External)	30221-60006 5061-3422
30221H		X.21 Digital Network Direct Connect Cable (internal) (external)	30221-60012 5061-2535

Table 1-2. Test Equipment Compatibility

Description	Part No.	Used With Cable Product No.
Board Test Hood	30020-60012	30221A 30221B 30225B 30221G
	5061-2522	30224B
Cable Test Connector	5061-2507	30221A 30221B
	5061-2512	30224L
	5061-2533	30224B
	30225-60004	30225B
	30020-60013	30221G
	5061-2536	30221F

General Information

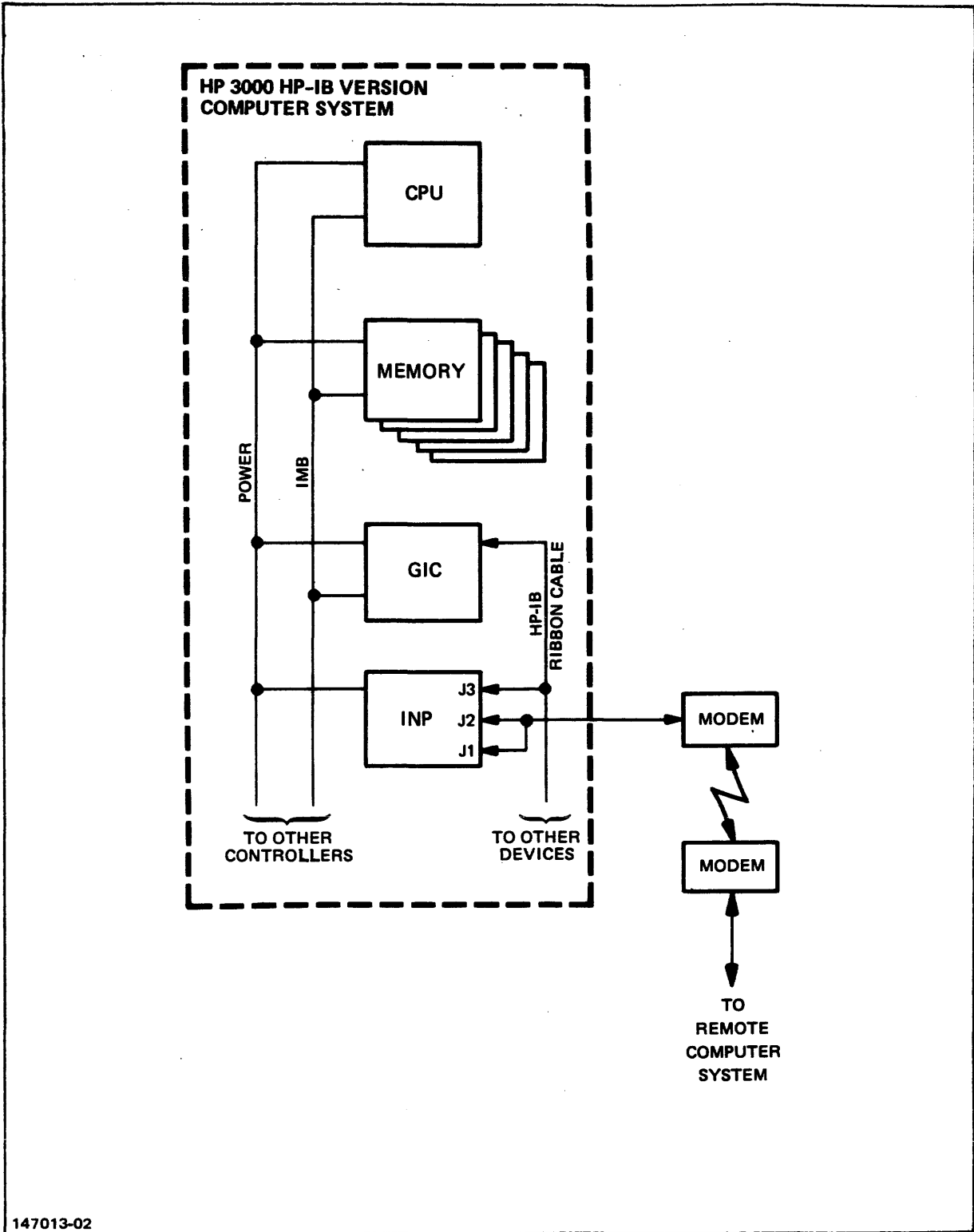
1-4. Features

Important features of the INP are:

- Hardware data transfer rates to 56,000 bits per second.
- 32K bytes of random access memory (RAM) for driver and support program storage and for character and message buffering.
- 8K bytes of read-only memory (ROM).
- Protocol and link processing without computer system intervention.
- High-speed, silicon-on-sapphire (SOS) microprocessor.
- Compatible with IBM Binary Synchronous Communications protocol.
- EIA RS232C, and CCITT V.24 and V.35 compatibility.
- Full- or half-duplex operation.
- Compatible with HP 37210T, HP 37220T, and HP 37230A modems and with Bell 201C, 208, and 209 modems.
- Direct-connect capability between two HP 3000, or HP 3000 to HP 1000 computers.
- Retention of buffered data during power fail/restore periods.
- Stand-alone, user-initiated, self-test capability.
- Auto Call Interface which allows automatic dial-up of phone lines. HP supports the Racal Vadic VA811 auto call unit used with the HP 37210T modem, and the Bell 801C auto call unit used with the Bell 201C or 208B modems.

1-5. Interface to System

The HP 30020B INP has one PCA board that is backplane compatible with the HP 3000 HP-IB Version Computer Systems. The INP PCA is installed in the "device" section of the I/O card cage. The INP communicates with the General I/O Channel (GIC) via connector J3, and with the modem via connectors J1 and J2. (See figure 1-3.) The INP receives power from the system via connectors P2 and P4. Connector P1 is used for test signals, and connector P3 is not currently used.



147013-02

Figure 1-3. Typical Interface to System

1-6. SPECIFICATIONS

The specifications for the HP 30020B Intelligent Network Processor are presented in table 1-3.

Table 1-3. Specifications

Model:	HP 30020B Intelligent Network Processor
PCA Part No.:	30020-60009
Interface:	EIA RS232C, CCITT V.24 and V.35, or hardwired
Data Rate:	Modem - Up to 19,200 bits per second in half- or full-duplex mode for RS232C Up to 56,000 bits per second in half- or full-duplex mode for V.35 Directly Connected - Up to 56,000 bits per second for INP-to-INP Up to 9600 bits per second for INP-to-SSLC
Data Buffer:	Greater than 2 K bytes
Modem Compatibility:	HP 37210T, 37220T, 37230A Bell 201, 208, 209, and Data Service Units
ACU Compatibility	Bell 801C with Bell 201C or 208B modems. Racal Vadic VA811 with HP 37210T modems.

NOTE

The Racal Vadic VA811 should be ordered as a VA811D-SSR. The ACU will be strapped by Racal Vadic.

Table 1-3. Specifications (continued)

Maximum Number of INPs per HP 3000:	
Series 30/40	3
Series 33/44	7
Series 64	10 supported at 56,000 bps. 16 supported at 19,200 bps.
Power Fail Protection:	Buffered data can be restored after a power failure.

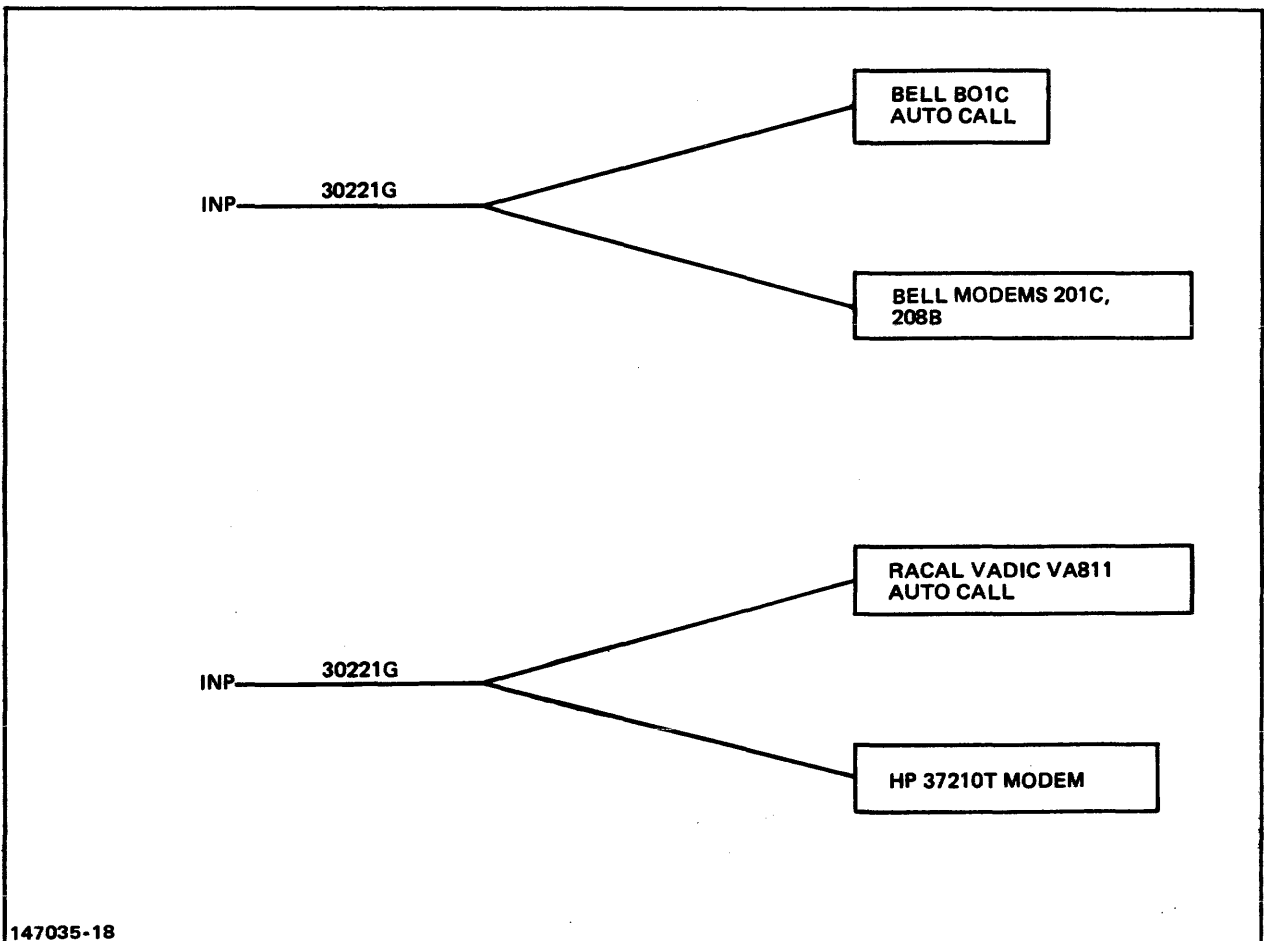


Figure 1-4. INP Auto Call Hardware Configuration

This section contains information for unpacking, inspecting, installing, and initially testing an HP 30020B Intelligent Network Processor (INP) that is to be added to an existing HP 3000 HP-IB Version Computer System. In this manual, the HP 3000 HP-IB Version Computer System refers to the HP 3000 Series 30,33,40,44 and 64 Computer Systems.

2-1. UNPACKING AND INITIAL INSPECTION

If the INP printed circuit assembly (PCA) and associated cable assemblies are received separately from the computer system, inspect the carton containing the items before opening. If there is evidence of external damage to the carton, notify the nearest HP Sales and Service Office and request that the carrier's agent be present when the carton is opened.

Inspect each item as the carton is unpacked. If the INP PCA or cable assemblies are damaged or fail to meet specifications, notify the carrier and the nearest HP Sales and Service Office immediately. Retain the shipping carton and packing material for the carrier's inspection. The HP Sales and Service Office will arrange for repair or replacement of the damaged item without waiting for any claims against the carrier to be settled.

NOTE

It is important that you ground yourself before touching the INP-B board. This is necessary to avoid any electrostatic discharge damage to the board. Grounding can be achieved by simply touching the CPU frame.

2-2. PREPARATION FOR INSTALLATION

Before beginning any INP installation activities, ensure that the system operator has backed up the system files. This precaution will prevent the possible inadvertent loss of the data residing on the disk.

2-3. Power Requirements

The HP 30020B INP requires the following operating power:

Supply	Current (amps)			
		Regular	/	Backup
-----		-----		-----
+ 5V	at	2.99	/	0.0
+12V	at	0.15	/	0.0
-12V	at	0.213	/	0.0
+ 5VB	at	0.50	/	0.38

The INP PCA obtains its operating power directly from the computer system power supply. All HP 3000 HP-IB Version Computer Systems have an adequate power supply to accommodate the addition of an INP or multiple INPs without the need for any power supply modification.

2-4. PCA Jumpers and Switches

The jumpers used on the INP PCA board have all been preset during board calibration at the factory, and no field alterations are required. There is, however, the HP-IB address switch (a single rotary switch), which must be manually set to configure the INP for your specific system and application.

Figure 2-1 shows the location of this switch.

Set the HP-IB address switch as follows before installing the PCA board in the computer card cage.

The HP-IB address switch is a thumbwheel switch with eight numbered positions (0 through 7). The setting of this switch identifies the device number assigned to this INP and is read by the processor. Rotate the switch to display the appropriate number, as described below.

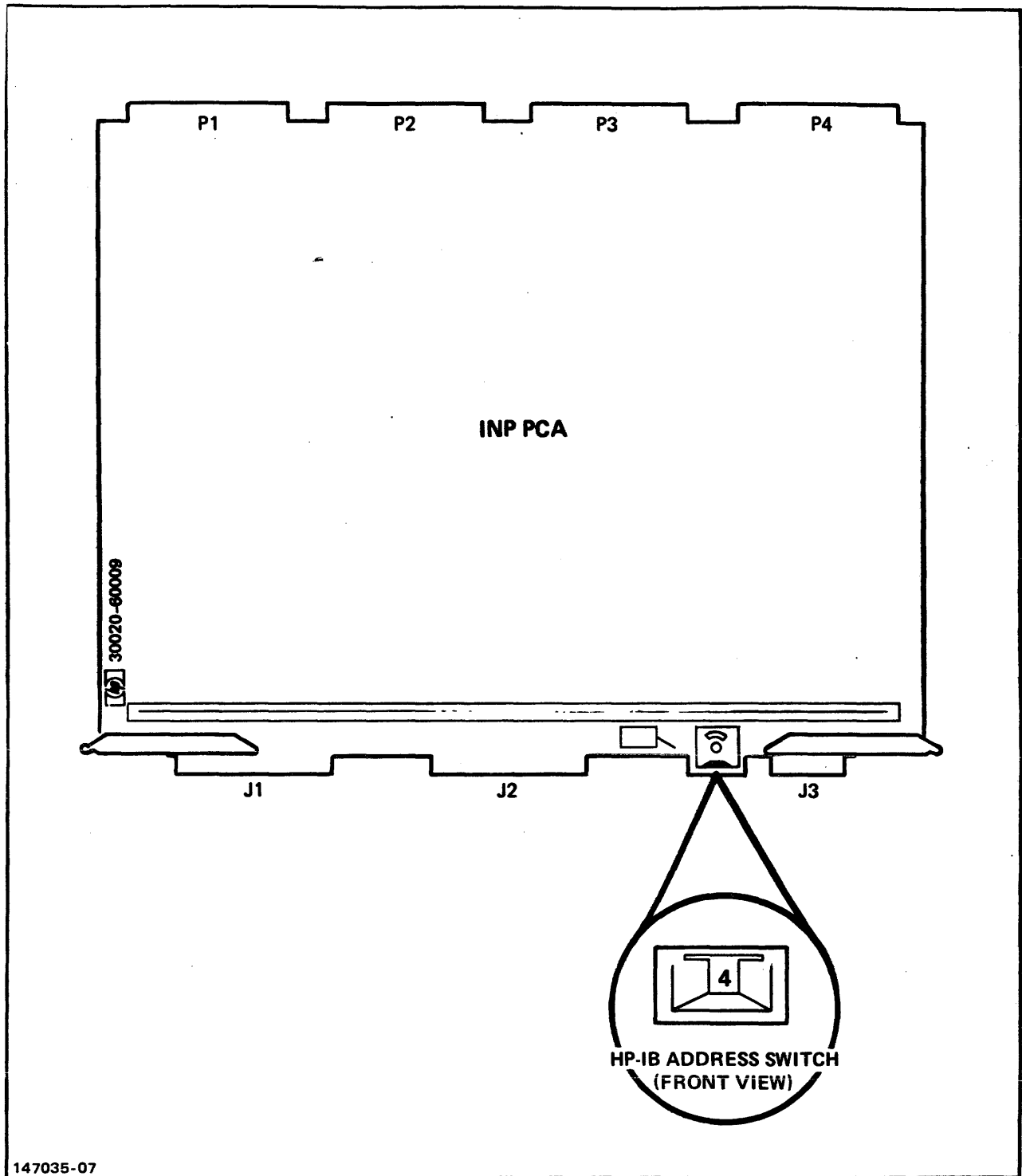


Figure 2-1. Location of the PCA Switch

Installation

To set the device number setting on the HP-IB Address Switch, the following steps should be followed:

1. Identify the number of devices allowed, and the mix requirements for the GIC (General Interface Channel) to be used. For configuration details and limitations, refer to the Configuration Guide for your system.
2. Identify the number of devices attached to the GIC, and the highest device number used.
3. Set the INP device number setting on the HP-IB Address Switch at the next available device number, as long as this does not exceed number seven.

2-5. HARDWARE INSTALLATION PROCEDURES

2-6. Installation of the INP PCA

Install the INP PCA as follows:

- a. Ensure that the HPIB switch is properly configured. (Refer to paragraph 2-4.)
- b. Turn off all system power.

CAUTION

All power must be off when inserting or removing any device or card in the system.

- c. Open the door of the I/O section card cage on the back of the HP 3000 HP-IB Version mainframe.
- d. Insert the INP PCA board into a vacant card cage slot within the "device" range (color-coded blue). Any available card within the specified range can be used, since the device sequence is determined by the setting of each INP's HP-IB Address Switch rather than by the card slot it occupies.

Installation

On the HP 3000 Series 30, the INP can be installed in any convenient slot in the range of 6 through 15 where the HP-IB ribbon cable will reach all needed connectors. (The recommended slots for the INP in a typical installation are slots 9 and 10.)

On the HP 3000 Series 33, the INP can be installed in any convenient slot in the range of 14 through 24.

On the HP 3000 Series 40, the INP can be installed in any convenient slot in the range of 17 through 25.

On the HP 3000 Series 44, the INP can be installed in any convenient slot in the range of 17 through 19 (card cage 1) and any slot in the range of 17 through 20 (card cage 2).

On the HP 3000 Series 64, the INP can be installed in any slot in card cage 1 or card cage 2. If multiple INP's are used, the only restriction is that slot number 1 and slot number 2 may not be occupied by INP's simultaneously. Also, Slot number 9 and Slot number 10 may not be occupied by INP's simultaneously.

- e. Record the location of the INP PCA in the configuration section of the System Support Log.
- f. Connect the INP to the General I/O Channel (GIC) by attaching the HP-IB Ribbon Cable (part no. 30090-60051) to the INP PCA connector J3.

2-7. Installation of the Communication Cables

Install the INP communication interconnecting cable assemblies as follows:

- a. Connect the hood connector of the appropriate internal cable to connectors J1 and J2 of the INP PCA board. Refer to table 1-1 for a list of the available INP-to-modem cables, INP-to-INP direct-connect cables, and INP-to-SSLC direct-connect cables. Also refer to figure 1-1 as an aid in visualizing the relationship of the hardware components of the INP subsystem.
- b. Route the internal cable (which you already attached to the INP PCA in step a) to the point where it will mate with the external cable.

On the HP 3000 Series 30/40, route the internal cable downward, through a cable clamp, and out of the cabinet with the other computer cabling (as shown in figure 2-2).

Installation

On the HP 3000 Series 33/44, route the internal cable in the cable channel along the lower front edge of the inside of the card cage. Attach the cable connector to the inside of the bulkhead connection panel on the end of the card cage. (See figure 2-3.)

On the HP 3000 Series 64, route the internal cable downward and along the cable channel (located below the front lower edge of the card cage) to the appropriate place on the junction panel. (see figure 2-4)

c. Attach the external cable to the internal cable.

On the HP 3000 Series 30/40, the two cables are joined with their connectors outside of the computer cabinet. The internal cable connector has a mounting plate which should be removed and discarded.

On the HP 3000 Series 33/44, attach the external cable to the outside of the card cage bulkhead connection panel so that it connects with the internal cable installed in step b.

On the HP 3000 Series 64, the external cable attaches to the internal cable at the junction panel. It is then routed down the external cable channel to the floor. (see figure 2-4)

- d. If an INP-to-modem connection is being made, route the external segment of the data communication cable assembly directly to the local modem and attach the connector to the modem.
- e. If an INP-to-modem/Auto Call Unit connection is being made, route the external segment of the data communication cable assembly directly to the local modem and to the automatic calling unit. Attach the connectors to the proper devices as is labeled on the connectors.
- f. If a direct INP-to-INP connection is being made (bypassing all modems), route the external interconnect cable (one of the HP 30224L-series of cables listed in table 1-1) directly to the other computer in your data communications system. The other end of the external interconnect cable connects to another INP-to-INP direct-connect cable for the remote computer.

CAUTION

Use of the longer lengths of the external interconnect cables requires special precautions. Long cables are very susceptible to induced transients. DO NOT run cables outdoors or near electrically "noisy" equipment.

- g. If a direct INP-to-SSLC connection is being made (from your local computer with its INP to a remote computer with an SSLC), route the external INP-to-SSLC direct-connect cable (part no. 30225-60003) directly to the remote computer. Connect the other end of the external direct-connect cable to the remote computer's modem interconnecting cable (completely bypassing all modems).

2-8. SOFTWARE INSTALLATION

The INP has been preprogrammed at the factory and requires no field programming. All INP software, including the self test, is contained within the circuitry of the INP PCA board. Therefore, no separate software installation procedure is required.

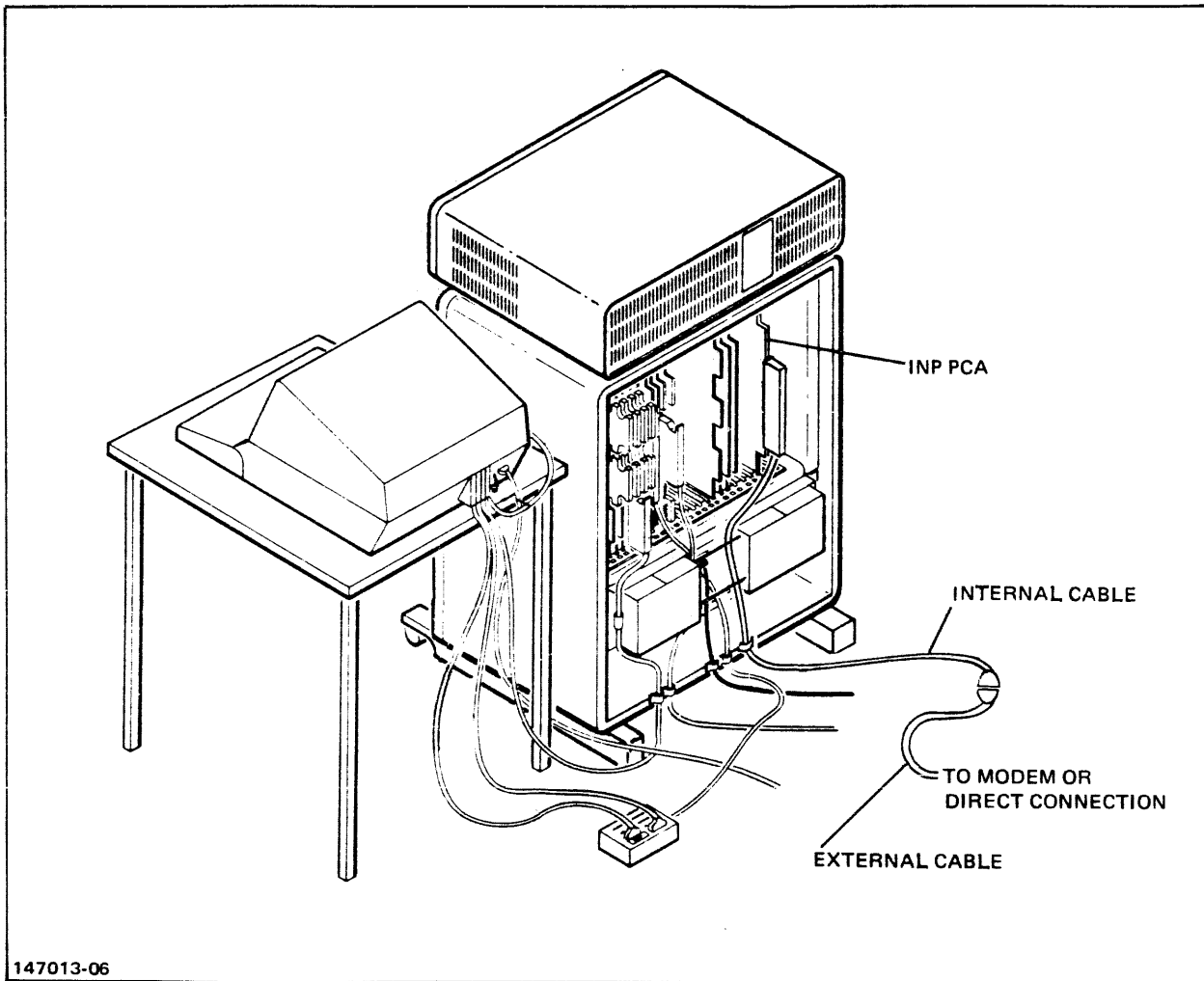
The diagnostic software (DSM) used for troubleshooting INP problems is separate from the INP's own software. This diagnostic program is included with your updated operating system and, likewise, requires no separate software installation procedure.

2-9. INSTALLATION VERIFICATION

Verify that the INP has been properly installed and that it now functions accordingly as follows:

- a. Turn on the power.
- b. Start up the system in accordance with the appropriate HP 3000 Console Operator's Guide.

Installation



147013-06

Figure 2-2. Communication Cable Routing (HP 3000 Series 30/40)

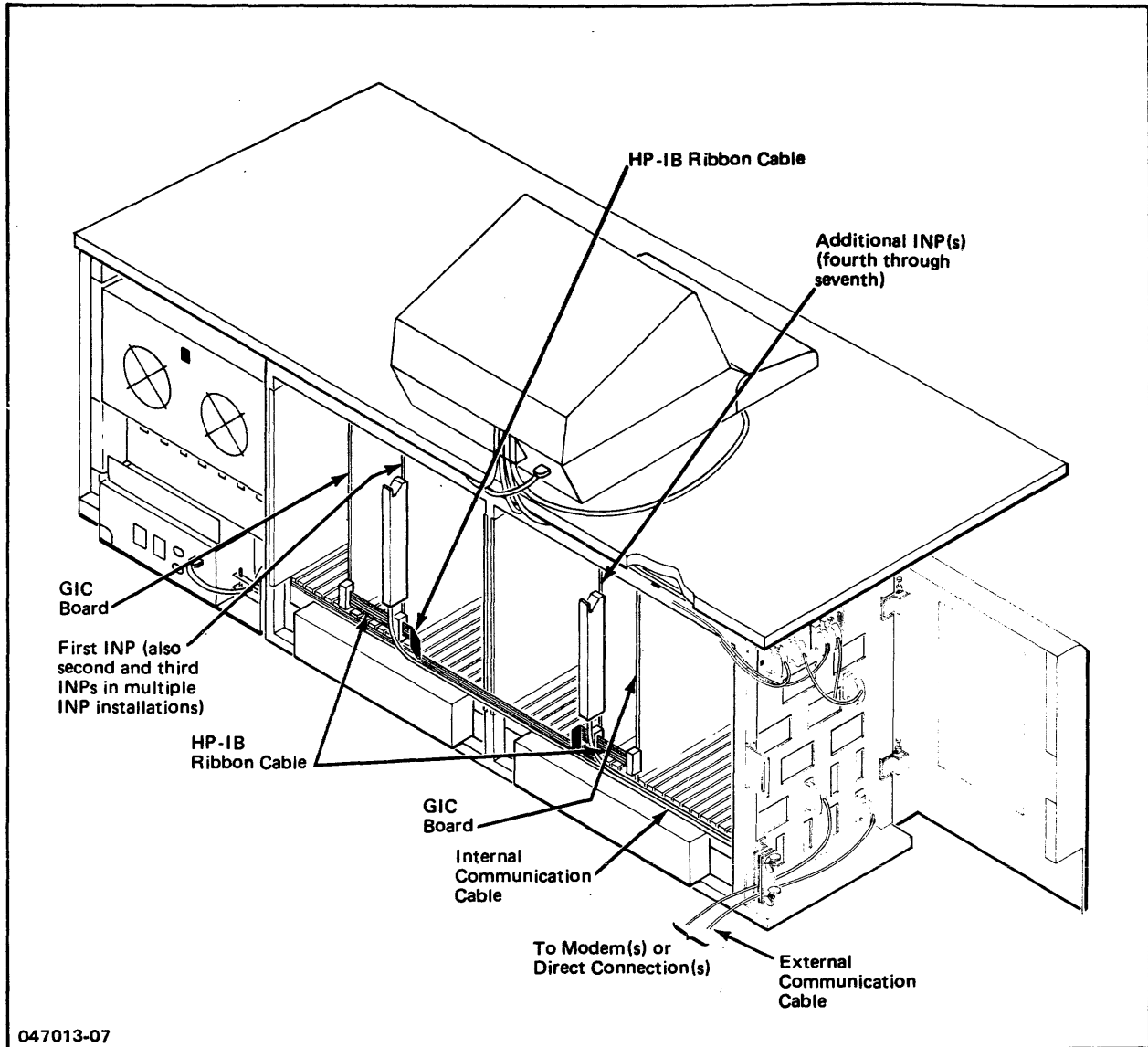


Figure 2-3. Communication Cable Routing (HP 3000 Series 33/44)

Installation

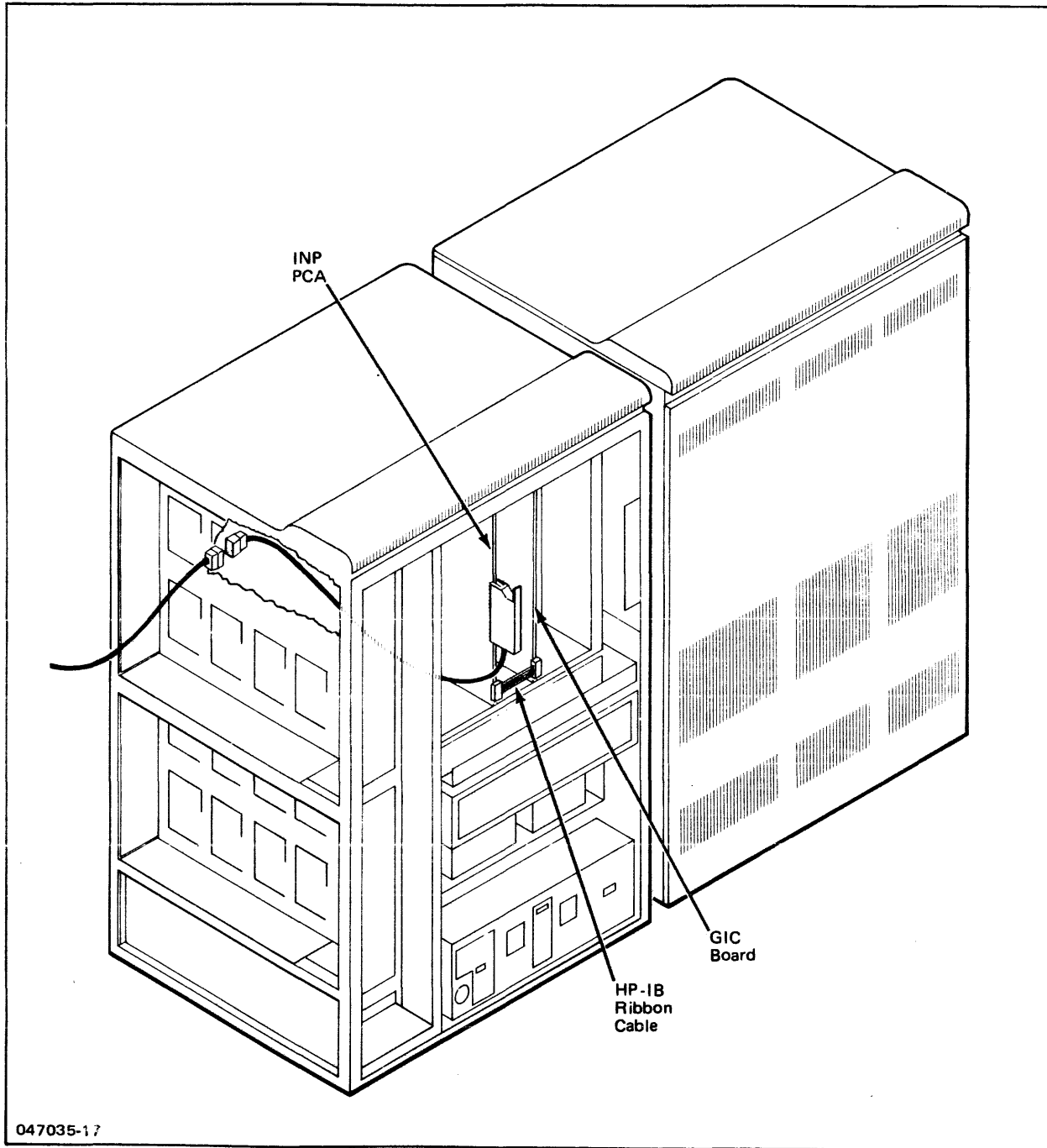


Figure 2-4. Communication Cable Routing (HP 3000 Series 64)

- c. Press the chrome, spring-loaded RESTART switch on the edge of the INP PCA board (figure 2-5) to manually initiate the self test.
- d. Watch the self-test light-emitting-diode (LED) indicators (figure 2-5) as the self-test program goes through its cycle. Upon completion of the self test (approximately 2 seconds in duration), the LEDs will stop blinking and will display a steady pattern. If the two LEDs at each end (0 and 7) are lighted while all the others are off, the INP is working properly. If any other pattern of lighted LEDs is being displayed, the INP is malfunctioning.
- e. If a properly functioning INP is indicated, close and lock the card cage door. The system is now ready for operation.
- f. If a malfunctioning INP is indicated, refer to Section V, Maintenance, for troubleshooting information.

2-10. MULTIPLE INP INSTALLATIONS

For additional data communication capability, more than one INP can be installed in the same HP3000 HP-IB Version Computer System. The maximum number of INPs that one HP 3000 Series 33/44 can accommodate is seven. A maximum of three INPs can be installed in the HP 3000 Series 30/40, and a maximum of 16 INP's can be installed in the HP 3000 Series 64 (see table 1-3).

After the first INP has been installed, subsequent INPs are installed by following the same procedures as outlined in the previous paragraphs in this section. Any available card slot within the specified range can be used, since the device sequence is determined by the setting of each INP's HP-IB address switch, rather than by the card slot it occupies.

When multiple INPs are installed in an HP 3000 33/44, no more than three INPs can be located in the first card cage (the middle section of the HP 3000/33 mainframe, as shown in figure 2-3). The fourth through seventh INPs must be located in the second card cage.

Installation

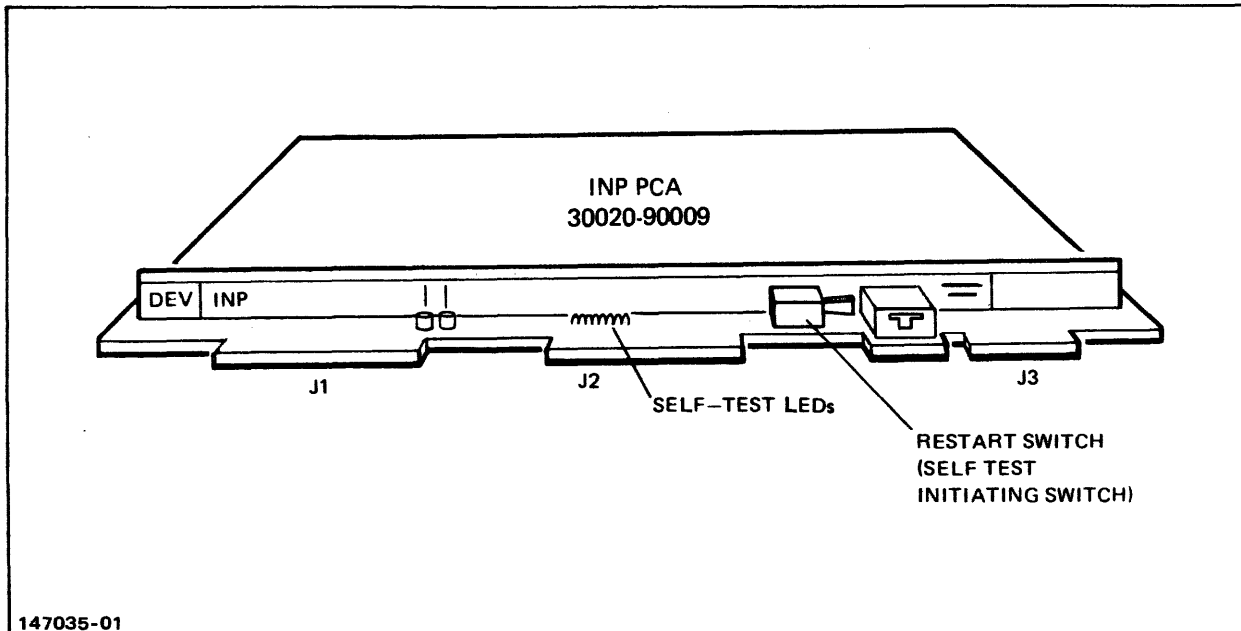


Figure 2-5. Self-test Switch and LED Indicators

The following describes how to physically attach the HP 37210T modem to a Racal Vadic VA811 Auto Call Unit, and to the Telco phone line.

The 37210T modem should have option 3 installed, and be strapped in the factory recommended 2-wire configuration. If desired, the Output Power Programming Resistor option can be enabled. In this case, the leads for the external resistor are passed through the Auto Call Unit, and the Telco "programs" the output power in the normal manner. Note that the normal RJ45S jack supplied with the modem option 3 will work with or without the programming resistor.

The Racal Vadic VA811 should be ordered as a VA811D-SSR. The ACU will be strapped by Racal Vadic as a single line ACU with the characteristics shown in option table 2 of the attached strapping table for the VA811. This also specifies the cable types supplied by Racal Vadic.

The VA811 is a board product, and does not come with a chassis

Installation

for use with the 37210T modem. The Racal Vadic VA1601U Stand Alone chassis is recommended. The Telco needs to supply either a RJ45S Data Jack (for operation without a handset), or a RJ47S data jack (for operation with a handset). An RJ-47S data jack is a RJ45S data jack attached to an RTS phone via an RJ-36X connecting cable. The handset can only be used if the INP is configured for manual dialing.

The modem should connect to the ACU via the RJ45S cable (HP 8120-2972) supplied with option 3. This connection should be made at the post connectors of option 3 of the modem, and the plug labeled MODEM (J2) on the ACU. The ACU connects to the phone line via a RJ45S plug (supplied with the ACU). This connection is made at the plug labeled MODEM (J2) on the ACU. The modem and ACU connect to the INP via the HP 30221G cable. The cable should be plugged into the modem and ACU as indicated by the molded labels on the connectors.

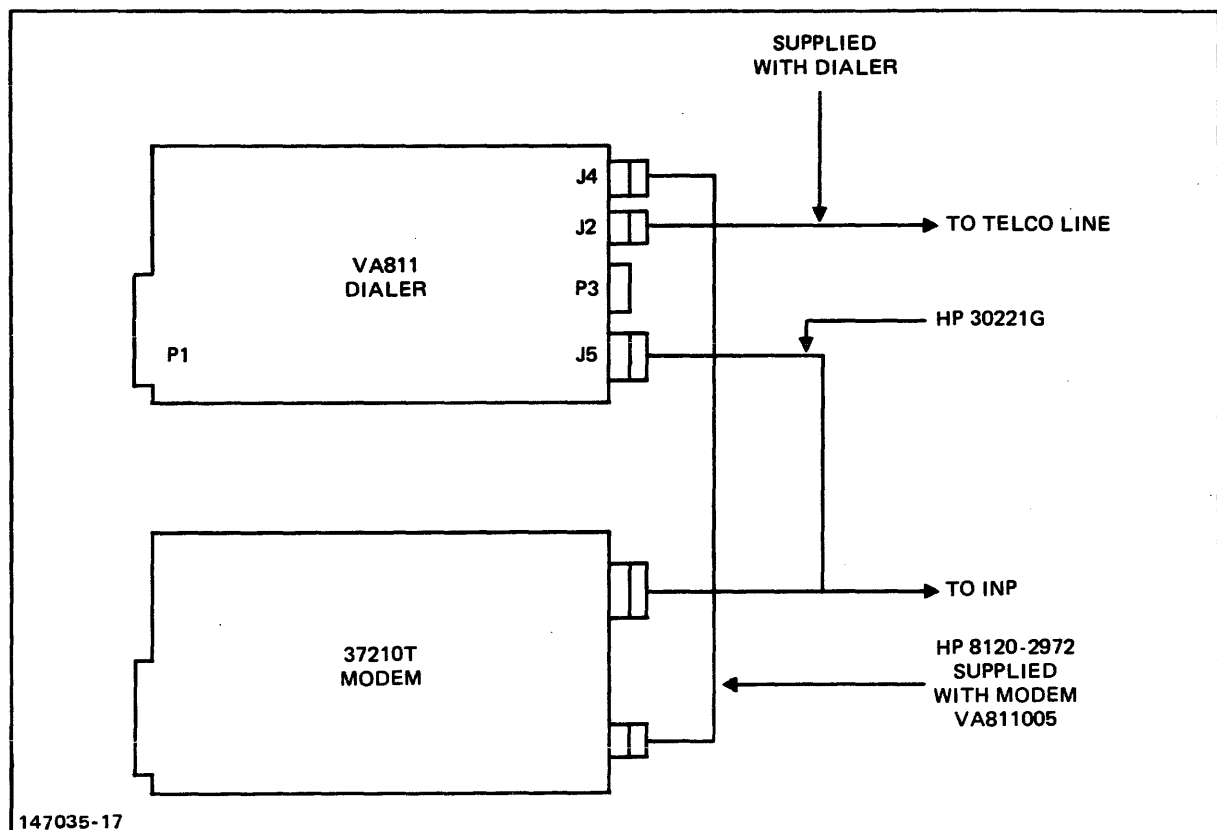


Figure 2-6. HP 37210T modem to auto call unit connection

This section contains functional and system-level descriptions of the HP 30020B Intelligent Network Processor (INP). The functional description lists the major functional areas and briefly describes each of them. An example of a typical functional-level operation follows, which serves to summarize the functional description. Then, an overview of the system-level operation briefly discusses INP operations in relation to the HP 3000 HP-IB Version Computer System. In this manual, the HP 3000 HP-IB Version Computer System refers to the HP 3000 Series 30,33,40,44 and 64 Computer Systems.

3-1. FUNCTIONAL DESCRIPTION

The HP 30020B Intelligent Network Processor includes the following major functional areas:

- INP Microprocessor
- Read-Only Memory (ROM)
- Random Access Memory (RAM)
- Direct Memory Access (DMA)
- SDLC and BISYNC Datacomm
- Communication Line Interfaces
- Auto Call Unit Interface

A block diagram of INP organization of the major functional areas is shown in figure 3-1. The solid interconnecting lines in the block diagram represent data paths while the broken lines indicate service request paths.

3-2. INP Microprocessor

The Complementary-Metal-Oxide-Semiconductor/Silicon-on-Sapphire (CMOS/SOS) Microprocessor is the heart of the INP. It is a high-performance, low-power-consumption microprocessor primarily used in controller applications. It offers a one-microsecond typical instruction cycle time to execute any of the fixed-width, 16-bit instructions. These instructions can process one-, four-, eight-, or sixteen-bit fields.

The INP Microprocessor instruction set has been optimized for efficient operations performed directly on the I/O registers.

The INP Microprocessor is designed to facilitate functions such as logical decision making, indexed branches, and external event synchronization. These capabilities allow the INP Microprocessor to efficiently perform the functions required of an intelligent network processor.

3-3. Read-Only Memory (ROM)

The INP has a 8K byte, high-speed CMOS/SOS ROM. The ROM contains power-on and reset programs, functional diagnostics, loader/dumper routines, and RAM fault location code.

3-4. Random Access Memory (RAM)

The INP has 32K bytes of dynamic RAM that stores the protocol driver in use (such as BISYNC point-to-point), the INP's control program, the HP 3000 interface driver, and data buffers for the communication channel.

Several circuits are required to support and insure the reliable operation of the RAM. A refresh circuit is provided to refresh (or renew) the contents of the dynamic RAM at regular intervals. An LSI chip also aids in performing this function. A parity circuit calculates a parity bit on each byte written to RAM and verifies the bit on each read from RAM. Memory-protect circuitry and separate power supply lines are provided for the RAM, RAM refresh circuitry, and other associated support circuitry to assure that no data will be lost in the event of a power failure or "brownout".

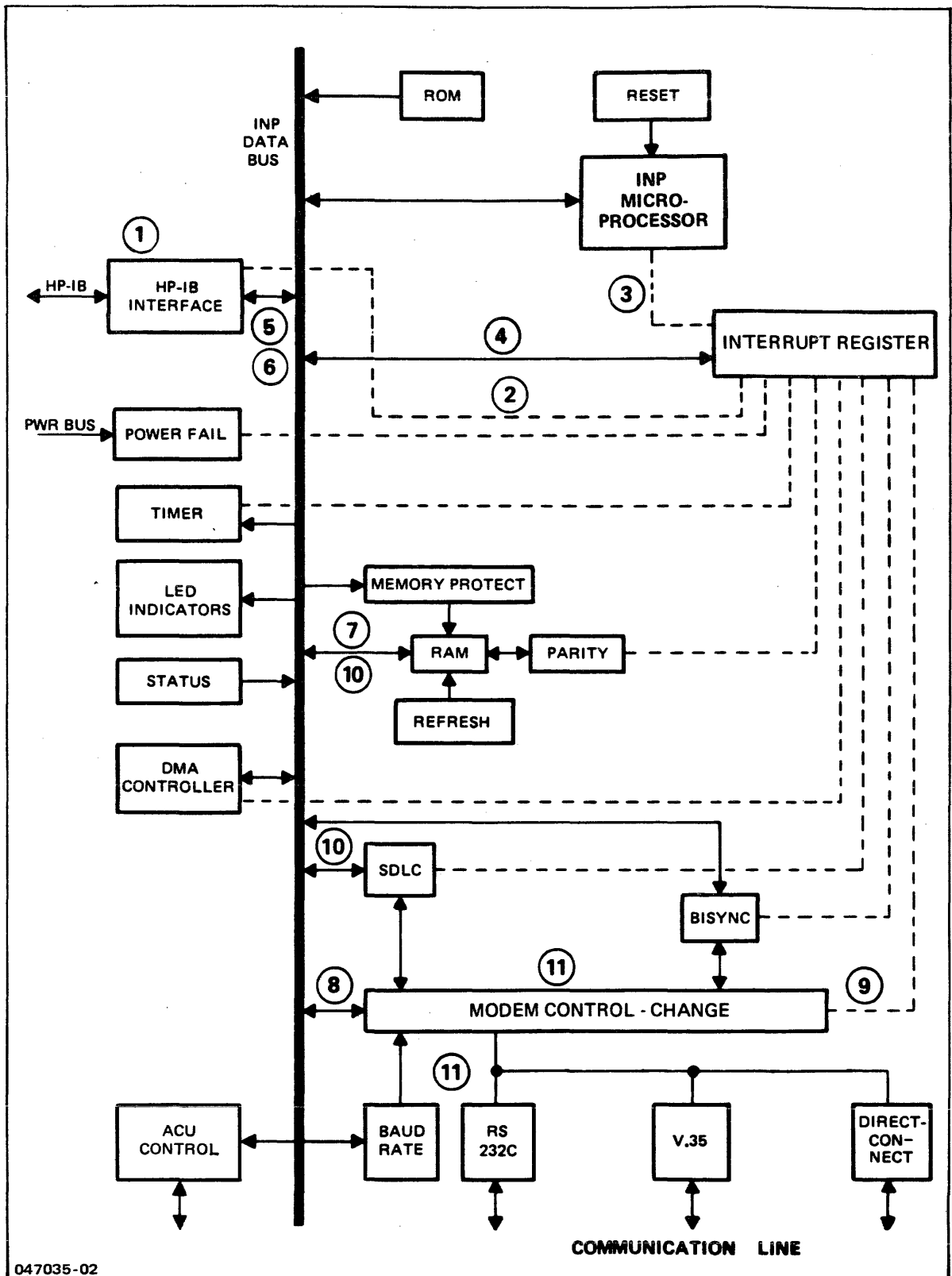


Figure 3-1. HP 30020B INP Block Diagram

3-5. Direct Memory Access (DMA)

The INP uses an LSI DMA-controller chip to provide three high speed channels between data buffers in RAM and the HP-IB Interface, as well as between RAM and datacomm LSI devices. The function of the DMA logic is to move bytes between external devices and RAM in such a way that they will be transparent to the INP Microprocessor software. This ability to transfer data concurrently with instruction execution enables the INP to achieve high throughput rates.

3-6. SDLC and BISYNC Data Communication

The INP uses LSI datacomm devices that are programmed by the INP Microprocessor to operate with BISYNC and SDLC protocols. When transmitting, these devices receive data and control bytes in parallel from the INP Microprocessor and convert them into a continuous serial stream for transmission. Simultaneously, they can receive a serial stream of data and control information and assemble it into a series of parallel data bytes for the INP Microprocessor.

3-7. Communication Line Interfaces

The communication line interfaces, such as RS232C, Bell DDS, Direct-connect, etc., translate data and control lines into signals that are electrically and mechanically compatible with the respective standards.

3-8. AUTO CALL UNIT INTERFACE

The ACU interface uses a single cable which combines the RS 232 and RS 366 standards. Therefore, the INP can be connected to both the modem and the ACU without using two cables. The ACU interface will allow automatic dial-up of phone lines through programmatic or command accesses. HP supports the Bell 801C Auto Call Unit (used with Bell modems), and the Racal Vadic VA811 Auto Call Unit (used with the HP 37210T modem).

3-9. FUNCTIONAL-LEVEL OPERATION

In the following typical message transmission sequence, a modem telephone line is assumed as the communications medium. References are made to the functional areas, data paths, and service request paths within the block diagram in figure 3-1. The data paths and service request paths being referenced are identified in the diagram by circled numbers.

Principles of Operation

Initially, the HP 3000 is powered up, and the communication line has been installed, but is not currently operational. The process of powering up invokes the ROM-resident control program. The control program both resets the INP logic and verifies INP operation. The results of the operation verification are available to the HP 3000 on request.

To initiate transmission, the system issues a control parameter over the Hewlett-Packard Interface Bus (HP-IB) to the HP-IB Interface of the INP, (1). This action causes an interrupt bit to be set, (2), which interrupts the INP Microprocessor, (3). The INP Microprocessor then reads the interrupt register, (4), to determine which device is requesting service. Next, the INP Microprocessor interrogates the HP-IB Interface, (5), to determine the nature of the service being requested (new control word, new data word, etc.).

In this example, the control word read in (5) tells the INP microprocessor to start transferring data words from the HP-IB Interface to the INP RAM for local buffering. Typically, the INP reads a whole buffer or block from the HP 3000 before beginning to transfer data over the data communication line.

The following steps occur between the INP and the auto call unit in the process of establishing a connection between two remote points:

The INP performs a DLO (data line occupied) and then, if the data line is unoccupied, raises DLO and performs a CALL REQUEST. The auto call unit responds with a PND (present next digit). The INP then sends a DIGIT PRESENT along with NB1, NB2, NB3, NB4 (representing the phone digits). After the phone digits are sent, the auto call unit responds with a DSS (data set status), which indicates that a connection is established.

The flows from the HP 3000 into memory are represented by (6) and (7) in figure 3-1. Upon receiving a full block, the INP Microprocessor raises RTS, (8), and sets up an interrupt for when the modem returns CTS. When CTS becomes active, an interrupt is generated to the INP Microprocessor, (9). The INP Microprocessor then sends data from the INP RAM to the datacomm LSI devices, (10). The datacomm device that is being used serializes the data and sends it over the line, (11), effectively completing the initialization of data transmission.

The INP initiates the data reception function by initializing the modem control lines to indicate that data can be received. It then begins monitoring the communication line for a start-of-message sequence.

Having initialized the transmission and reception of data, the INP Microprocessor now performs functions such as managing

Principles of Operation

special characters in the data stream, calculating and comparing CRCs, transferring blocks to and from the HP 3000, and managing modem signals.

When an end-of-message sequence is detected, the CRC is calculated and checked. If there is no error, the message is accepted and transferred to the HP 3000. The INP returns to its task of monitoring the line for the next start-of-message sequence.

Terminating the transmission sequence involves sending the necessary end-of-message information and changing the appropriate modem control lines to indicate the end of transmission.

3-10. SYSTEM-LEVEL OPERATION

The following discussion demonstrates the functioning of an INP at the system level. A very basic DSN/DS example is given here, but INP usage with other data communications subsystems (such as DSN/RJE, DSN/MRJE, etc.) can easily be construed.

INP operation begins with the system operator opening the DS line (by means of the :DSCONTROL OPEN console command). At this time the INP hardware logic is reset and the ROM-resident verification test (SELF TEST) is invoked. Upon the successful completion of SELF TEST, the respective communications line protocol software is downloaded to the INP RAM. The HP 3000 then commands the INP software to begin execution.

The software initializes itself to conform to the DSLINE as configured on the mainframe. At this time, a read command is issued to the INP, so that messages coming from the remote computer through the data communications line can be received. When a message is received from the remote computer, the local HP 3000 is notified (and data is moved to the mainframe RAM) only at successful completion of the read.

Closing the DSLINE causes any current INP - to - HP 3000 messages to be completed. The INP then becomes dormant until the next :DSCONTROL command.

MAINTENANCE

SECTION

IV

This section contains general servicing information for the HP 30020B Intelligent Network Processor (INP). This information includes safety precautions, repair philosophy, maintenance aids, use of the self-test capability, troubleshooting, and field-level repair. In this manual, the HP 3000 HP-IB Version Computer System refers to the HP 3000 Series 30,33,40,44 and 64 Computer Systems.

4-1. SAFETY PRECAUTIONS

Whenever the INP printed circuit assembly (PCA) is installed or removed, ensure that the computer system's PROCESSOR power switch is set to OFF.

Whenever the INP PCA is being connected or disconnected to a modem (by attaching or removing the INP-to-modem interconnecting cable), ensure that the PROCESSOR power switch is set to OFF and that the modem power is also turned off.

Be particularly cautious when selecting the routing for the longer lengths of the interconnecting data cables. DO NOT run these cables outdoors! Lightning induced transients can have a devastating effect on data communication links; and a more direct lightning strike can, of course, be a very real safety hazard to personnel as well as to the equipment. Indoor routing must be planned to avoid sources of electrical "noise", such as arc welders.

Failure to observe these precautions could result in damage to the components of the computer system, the INP, and/or the modem.

NOTE

It is important that you ground yourself before touching the INP-B board. This is necessary to avoid any electrostatic discharge damage to the board. Grounding can be achieved by simply touching the CPU frame.

4-2. REPAIR PHILOSOPHY

Field repair of the INP PCA is limited to the replacement of the Random Access Memory (RAM) chips. Any other malfunction must be remedied on an exchange basis. To exchange the INP PCA, remove it from the system and prepare it for reshipment to Hewlett-Packard in accordance with the instructions in paragraph 4-19. When troubleshooting procedures have verified a RAM malfunction, remove the INP PCA from the system and replace the defective RAM chip as described in paragraph 4-17.

4-3. MAINTENANCE AIDS

The INP consists of more than just the apparent hardware. It is actually a sophisticated system of both hardware and software. To support such a system, a support package has been provided for verification and troubleshooting. This support package consists of the following:

- INP Self Test
- Diagnostic/Support Monitor
- CS/Trace
- INP Dump

The INP hardware self test can be manually implemented by the customer user or by the HP Customer Engineer. Light-emitting-diode (LED) indicators give status information which can be used as an initial verification/troubleshooting procedure. The INP self test is described further in paragraph 4-4.

The Diagnostic/Support Monitor (DSM) is available for on-line diagnostic support purposes. (Off-line diagnostics are not available for field use.) DSM provides comprehensive and flexible testing capability and allows problems to be checked in an operational environment. Since the operation of the INP is closely integrated with the computer system software, a more meaningful and effective check of the INP is accomplished by using the system itself. DSM begins by verifying the INP hardware and then extends its testing as far into the communications network as possible. If modems with local and/or remote loopback are installed, DSM uses these facilities to test that portion of the link. DSM operates interactively with either a customer user or an HP support user, offering appropriate tests and replies for each level of user. The use of the Diagnostic/Support Monitor is described in detail in the HP 30010A / 30020A/B Intelligent Network Processor Diagnostic Procedures Manual. (Refer to the Preface for manual part numbers for ordering.)

CS/Trace is a software fault-isolation tool that can be used in the field by HP support personnel. It builds disc records that contain all transactions that have occurred over the transmission facility. Upon termination of an operation, a utility program is run to format and output the individually accumulated trace records for analysis.

The INP Dump facility is used only as a factory-level support tool. It dumps the contents of the INP memory for analyzing the exact state of the INP. The INP Dump facility is described further in Appendix B.

4-4. SELF TEST

A self-test capability is included in the read-only memory (ROM) of the INP. A small set of routines, diagnostics, and checkpoints are included. The intention of the self-test feature is to provide a quick indication of whether the communications board is functioning properly, without either shutting down the system or changing the hardware components. This self test can be actuated either by a software command from the host computer system or by the pressing of a hardware pushbutton switch. Results of the test are available to the host system as a status word or to the pushbutton operator visually through an LED indicator bank located on the front edge of the INP printed circuit assembly (PCA) board.

When the self test is initiated (either manually or programmatically), a series of tests or checks is set into operation. These tests that comprise the self-test program include the following:

- ROM Test
- Timer Interrupt Test
- RAM Test
- Basic Instruction Set Test
- BISYNC Chip Test
- SDLC Chip Test

As each test is successfully completed, the next test in the sequence is started until the self-test cycle has been completed. The red LED indicators (located on the edge of the INP PCA board, as shown in figure 4-1) blink on and off during the test cycle

Maintenance

(approximately 2 seconds in duration) and stop in a pattern that shows the test results. If LEDs 0 and 7 (the ones at each end of the array) are the only ones lighted, all tests have been completed successfully. Any other pattern indicates a failure. Table 4-1 (under "Troubleshooting") shows the meanings of various LED patterns.

The following paragraphs briefly describe each test in the self-test program.

4-5. ROM Test

The second portion of the self-test program tests a calculated checksum. The ROM contains a "burned-in" constant that is used in the calculation of the current ROM checksum. A net result of zero should result when the old and new checksums are compared. This is the only test conducted on the ROM.

4-6. Timer Interrupt Test

The third portion of the self-test program checks to determine that a timer interrupt occurs. This test includes a timing routine that executes in 12 milliseconds. During that interval, a timer interrupt should have occurred. This test does not check the accuracy of the timer, but rather it verifies that the interrupt has actually occurred.

4-7. RAM Test

The fourth portion of the self-test program is the RAM Test, which consists of two routines. In the first routine, each memory location has its address written into it and then read from it, starting at location !0001 and progressing to !3FFF. The second routine fills memory downward with the complement of the address and reads it upward.

A further test is performed on the memory refresh circuitry. Every 2 milliseconds, all of memory must be read from and written to by the hardware to prevent data loss. If the refresh circuitry were to fail, it would show up as a failure in a read from memory after this test wrote to memory.

4-8. Basic Instruction Set Test

The first portion of the INP microprocessor self-test program is a basic instruction set test. Most of the instructions of the CMOS/SOS microprocessor instruction set are tested.

4-9. Chip Tests

The fifth portion of the self-test program performs tests on the remaining portions of the PCA board, namely the communication chips and the I/O controllers.

4-10. BISYNC TEST

The first part of the Universal Synchronous/Asynchronous Receiver/Transmitter (BISYNC) Test sets up the communications interface and then transmits and receives 100 data characters. Errors detected will be data overruns, data parity errors, and any differences between data transmitted and data received.

The second part of the BISYNC Test takes the data written in low memory and transmits it to higher memory via the BISYNC chip and DMA.

4-11. SDLC TEST

The first part of the Universal Synchronous Receive and Transmit (SDLC) Test sets up the communication interface and then transmits and receives 100 data characters. Errors detected will be receive errors, receive overruns, and receive aborts.

The second part of the SDLC Test takes the data written in low memory and transmits it to higher memory via the SDLC chip and DMA.

4-12. TROUBLESHOOTING

4-13. Customer-User Troubleshooting Procedures

If a malfunction is suspected, the customer user can verify proper operation of the INP by initiating the self-test program described in paragraphs 4-4 through 4-11. (Actually, the self test is initiated automatically from time to time by the system software during normal operations. When no malfunction is reported, operations continue without the operator necessarily being aware that a self test has occurred.)

CAUTION

Before manually initiating a self test, be sure that no other computer operations are in progress that may be destroyed by the self-testing process.

Maintenance

There are two ways of manually initiating the self test. One way is by using the INP Diagnostic/Support Monitor (DSM) to invoke the self test. This technique requires a simple interactive dialogue on a computer terminal between the customer user and DSM. The customer-user/DSM operations are described in the HP 30010A / 3002A/B Intelligent Network Processor Diagnostic Procedures Manual.

The other way of initiating the self test is to press the RESTART switch. (Refer to the Installation Verification instructions in Section II for details on this method of initiating the self test. Also, the exact location of the INP within the card cage can be obtained from the installation notation in the configuration section of the System Support Log.)

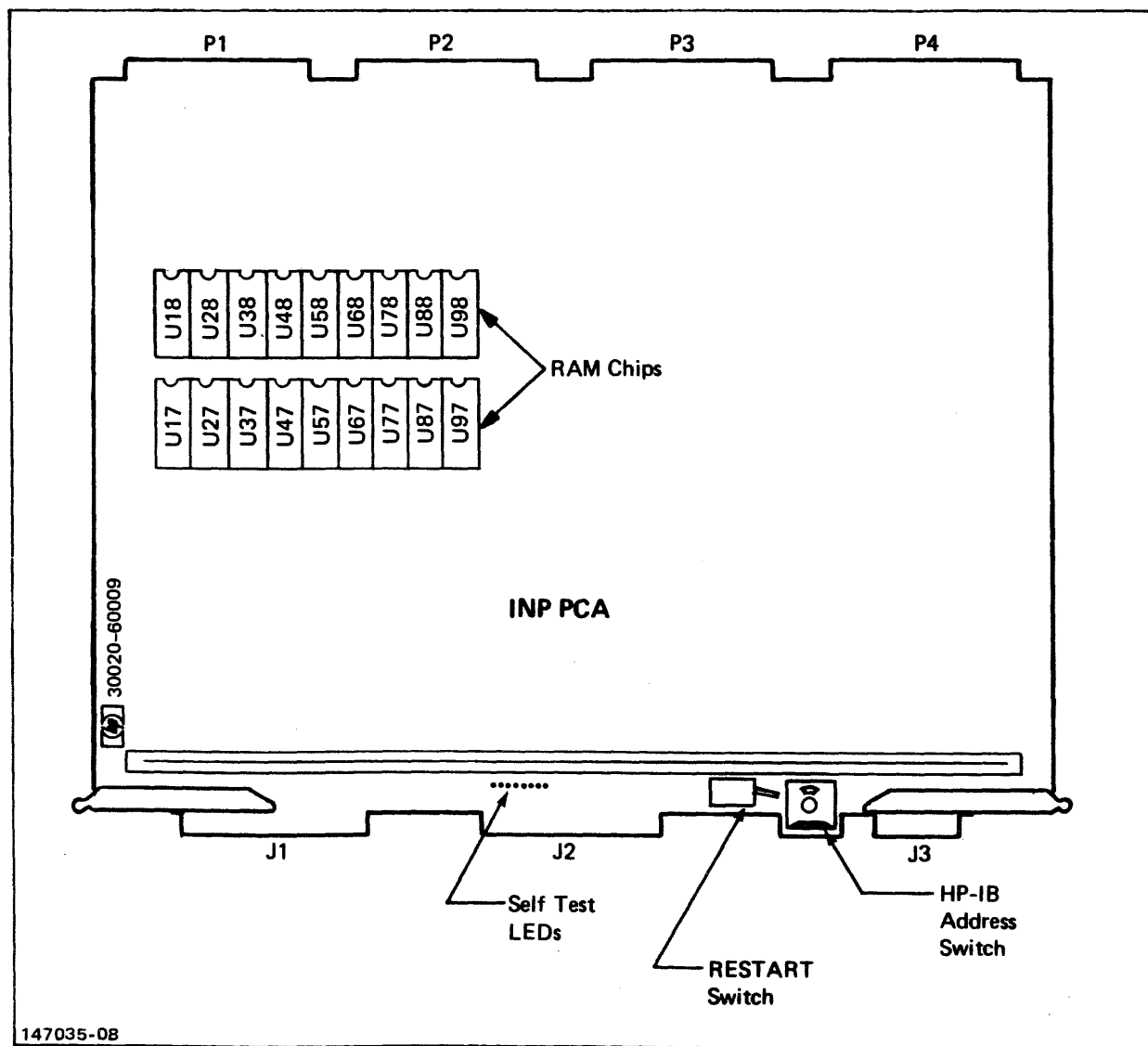


Figure 4-1. Location of Pertinent Components on INP PCA

The self test checks most of the circuitry of the INP PCA board. If, upon completion of the self test, the self-test LED indicator lights (figure 4-1) are displaying 0 and 7 (only the two lights at each end are lighted), there is no detectable hardware malfunction within the INP PCA board. If any other combination of lights is being displayed or if you still suspect a malfunction beyond the physical limits of the PCA boards, call your Hewlett-Packard Customer Engineer (CE).

4-14. HP Support Troubleshooting Procedures

More extensive troubleshooting can be done by the HP Customer Engineer by using the support-user interactive dialogue of DSM. When support-user diagnostic testing of the INP identifies a malfunction within the INP PCA board, field repair of the board is limited to the replacement of the Random Access Memory (RAM) chips. Any other malfunction must be remedied on an exchange basis. (See paragraph 4-2, "Repair Philosophy".)

When the HP Customer Engineer arrives at the computer site, the recommended troubleshooting sequence is as follows:

- a. Determine that the INP is not currently in use.
- b. Before initiating any other action, open the computer card cage door and observe the INP self-test LEDs (see figure 4-1 for the location of the LEDs). Note whether the LEDs are flickering or a static pattern is being displayed, and make a written record of which LEDs are lighted. This information may be needed later if the problem persists beyond the initial steps of troubleshooting.
- c. Disconnect the modem cable (or the direct-connect cable) from the edge connector of the INP PCA board to physically isolate the INP subsystem for testing.
- d. Press the manual RESTART switch (figure 4-1) to initiate the self test.
- e. Observe the INP self-test LEDs. (Refer to table 4-1 for interpretation of the meaning of the various LED light patterns.)
- f. If LED 3 is lighted in combination with any of the other LEDs, a RAM data chip failure is indicated. To determine which RAM chip is defective, note the light pattern being displayed by LEDs 7 through 4 and compare this pattern with the information shown in table 4-2. (If LED 3 is not lighted, skip steps g through h and go directly to step i.)

Maintenance

Table 4-1. Meanings of Self-test LED Indicator Patterns

LED PATTERN BEING DISPLAYED								TEST FAILURE SIGNIFIED BY LED PATTERN (WHICH TEST FAILED)
7	6	5	4	3	2	1	0	
*							*	None
*						*	*	Basic Instruction Set Test
	*					*	*	ROM Test
		*				*	*	SDLC Test
*	*					*	*	SDLC Test with DMA
			*			*	*	BISYNC Test
*		*				*	*	BISYNC Test with DMA
0	0	0	0	*		*	*	RAM Test
*	*					*	*	RAM Test Parity Error
	*	*				*	*	Timer Interrupt Test
*	*	*				*	*	BISYNC and SDLC Tests w/DMA
<p>Legend:</p> <p>* = LED lighted</p> <p>0 = When lighted, the coded pattern signifies which chip (bit) has failed (see table 4-2)</p>								

- g. Replace the RAM chip that was identified in table 4-2 as being defective. (See paragraph 4-17, "Field Replacement of a RAM Chip".)
- h. Repeat steps d through g (to cover the possibility that more than one RAM chip had failed simultaneously).
- i. If the LED 7-6-1-0 combination is lighted, one of the parity-bit RAM chips has failed. Replace both parity-bit RAM chips (U97 and U98). (See paragraph 4-17, "Field Replacement of a RAM Chip".)

Table 4-2. Identifying Defective RAM Data Chips

LED Display 7 6 5 4	Bit No.	Defective RAM Chip
0 0 0 0	0	U87
0 0 0 1	1	U77
0 0 1 0	2	U67
0 0 1 1	3	U57
0 1 0 0	4	U47
0 1 0 1	5	U37
0 1 1 0	6	U27
0 1 1 1	7	U17
1 0 0 0	8	U18
1 0 0 1	9	U28
1 0 1 0	10	U38
1 0 1 1	11	U48
1 1 0 0	12	U58
1 1 0 1	13	U68
1 1 1 0	14	U78
1 1 1 1	15	U88
Parity		U97&U98

Legend:

1 = LED lighted

0 = LED off

Maintenance

- j. If LED combination 7-0 is being displayed (indicating the successful completion of the self test), run DSM for more extensive troubleshooting. (Refer to the support-user/DSM operations described in the HP 30010A/30020A/B Intelligent Network Processor Diagnostic Procedures Manual.)
- k. If any other combination of lighted LEDs (not already covered in steps f through j) is being displayed as a result of your having pressed the RESTART switch in step d, replace the INP PCA board (part no. 30020-60009). (See paragraph 4-18, "Replacement of the PCA Board".)

NOTE

When sending PCA boards to the factory for replacement, refer to paragraph 4-19, "Reshipment Instructions". Include in the package your noted observations from step b; they may be helpful during factory-level troubleshooting. Also, if a 5-0 or 3-0 LED pattern was observed in step b, an INP dump file may have been created in PUB.SYS (labeled INPLOGnn, where nn is in the range from 00 to 99). If they can be located, these INPLOG files should also be included in the package with the defective equipment. (See Appendix B for further information on the INP dump files.)

4-15. Off-Board Loopback Testing

When support-user diagnostic testing is required beyond the physical limits of the INP PCA board, certain portions of the data communications network can be synthesized. A test hood and/or a test connector are needed for testing with certain cable options (see table 1-2 for test equipment compatibility information). These test attachments are used with the off-board loopback tests described in the HP 30010A/30020A/B Intelligent Network Processor Diagnostic Procedures Manual. The test hood and test connector are illustrated in figure 1-1 and listed by part number in table 1-2. The test attachments are used as follows:

Maintenance

- a. With the data communications cable (direct-connect or modem cable) disconnected from the edge connector of the INP PCA board, attach the appropriate test hood in its place. Run Test Group 6 of DSM.
- b. If Test Group 6 passes step a, this indicates that the problem is originating farther "downstream" on the communications line. Remove the test hood, and reconnect the data communications cable to the INP PCA board. Disconnect the other end of the cable, and attach the appropriate test connector to the data communications cable. Repeat Test Group 6 of DSM. A failing test indicates the fault is located in the cable.
- c. If your data communications system uses the modem cable and if the modems include analog and digital loopback options, testing in Test Group 6 can continue as long as step b. did not fail. Connect the modem cable to the modem. Select the analog loopback option on the modem. Run Test Group 6 in DSM. A failing test indicates that the problem lies in the local modem.
- d. Disable the loopback option on the local modem, and select the digital loopback option on the remote modem. Run Test Group 6 again. A failure of this test indicates that the problem lies with the telephone line or the remote modem. Repeating steps a, b, c, and d on the remote computer system will isolate the problem source.

4-16. FIELD REPAIR

Field repair of the INP is limited to the following procedures and is to be accomplished only by Hewlett-Packard support personnel.

4-17. Field Replacement of a RAM Chip

The Random Access Memory (RAM) chips are the only components on the INP PCA board that are field replaceable. (See figure 4-1 for their location on the board.) If troubleshooting procedures (such as use of the self test) indicate that a RAM chip is faulty, replace it as follows:

- a. Ensure that the system operator has backed up the system files before beginning this procedure.

Maintenance

- b. Turn off the system power.

CAUTION

All power must be off when inserting or removing any device or card in the system.

- c. Disconnect the cable hood connector and the ribbon cable connector from the edge of the INP PCA board.
- d. Remove the INP PCA board (part no. 30020-60009) from the card cage.
- e. With the PCA board lying on a smooth, firm surface, withdraw the defective RAM chip out of its socket with a chip extractor tool.
- f. Immediately discard the removed RAM chip, or mark it as scrap, to avoid the possibility of its being inadvertently reinstalled as a new replacement part.

NOTE

Bending the pins of the defective RAM chip immediately upon removal is an effective way of marking it as scrap.

- g. Press a new RAM chip into the socket.
- h. Reinstall the INP PCA board in the computer card cage, using the procedure described under "Hardware Installation Procedures" in Section II, Installation.
- i. Verify that the INP is now working properly as described under "Installation Verification" in Section II, Installation.

4-18. Replacement of the PCA Board

When the troubleshooting procedures outlined in paragraph 4-14 indicate the need for replacement of the INP PCA board, proceed as follows:

- a. Ensure that the system operator has backed up the system files before beginning this procedure.

- b. Turn off the system power.

CAUTION

All power must be off when inserting
or removing any device or card in the
system.

- c. Disconnect the cable hood connector and the ribbon cable connector from the edge of the INP PCA board.
- d. Remove the INP PCA board (part no. 30020-60009) from the computer card cage.
- e. Install the factory replacement INP PCA board in the same slot in the computer card cage, using the procedure described under "Hardware Installation Procedures" in Section II, Installation.
- f. Verify that the INP is now working properly as described under "Installation Verification" in Section II, Installation.

4-19. RESHIPMENT INSTRUCTIONS

If the INP PCA and/or the associated cables are to be shipped to Hewlett-Packard for service or repair, attach a tag to each item identifying the owner and indicating the type of service or repair to be accomplished. Include the part number and date code of each item.

Package the item(s) in the original factory packaging material, if available. If the original packaging material is not available, standard factory packaging material can be obtained from the nearest Hewlett-Packard Sales and Service Office. If standard packaging material is not available, wrap the item(s) in suitable cushioning material (Air Cap TH-240 Cushioning or equivalent) and place the item(s) in a corrugated carton (200-pound test material). Seal the carton securely and mark it **FRAGILE** to ensure careful handling.

This appendix briefly describes how to configure the MPE Operating System to include the HP 30020B Intelligent Network Processor (INP).

CONFIGURATION OVERVIEW

The programs and intrinsics that comprise your data communications subsystems (such as DSN/DS, DSN/RJE, etc.) are supplied as part of your MPE Operating System. Only the MPE I/O configuration needs to be modified to include the Intelligent Network Processor (INP) and any pseudo devices that may be required for subsystem operation.

Before configuring MPE, install the INP as described in Section II, Installation. The DRT number configured on the INP PCA board (determined from the device number established in step a of paragraph 2-4, "PCA Jumpers and Switches") should be noted because it is requested during the configuration dialogue.

If the I/O configuration is compatible, the same INP can be used for DSN/DS, DSN/RJE, or DSN/MRJE remote activities. Some information provided in the MPE configuration dialogue may be relevant only when the INP is used with one particular subsystem. Any configuration differences or special considerations are noted in the following dialogue.

Besides configuring the INP and subsystem pseudo devices, you must, of course, configure any terminals and line printers that are to be used for the Pass-Through Mode of operation. These are standard MPE I/O configurations as described in the System Manager / System Supervisor Reference Manual.

THE CONFIGURATION DIALOGUE

The following instructions deal only with configuring an INP. The complete configuration dialogue is given in the System Manager / System Supervisor Reference Manual.

To begin, log onto the system, define the output files, and initiate a SYSDUMP as shown:

NOTE

Where it is necessary to distinguish user input from computer output, the input is underlined>.

```
:HELLO MANAGER.SYS
```

```
:FILE T;DEV=TAPE
```

```
:FILE L;DEV=LP
```

```
:SYSDUMP *T,*L
```

Step No.

Prompt and Response

1. ANY CHANGES? YES
2. SYSTEM ID=HP 32002 v.uu.ff? return
3. MEMORY SIZE? return
4. I/O CONFIGURATION CHANGES? YES
5. LIST I/O DEVICES? YES or NO
6. LIST CS DEVICES? YES or NO
7. HIGHEST DRT = xx.?
xx is the current highest hardware device address that can be assigned. Press RETURN if xx is satisfactory. Otherwise, enter a higher DRT number.

Configuration of individual devices begins here.

Step No.**Prompt and Response**

- 8 LOGICAL DEVICE #?
Enter the logical device number of the INP.

After you respond to all the prompts for one device, this LOGICAL DEVICE #? prompt is repeated to allow for configuring additional devices. If I/O configuration is complete, press RETURN and the system configuration dialogue continues with step 51.

- 9 DRT #?
0 Removes the device specified in the previous prompt from the current MPE configuration.
xx Enters the hardware DRT number for the INP.

10 UNIT #? 0

11 SOFTWARE CHANNEL #? 0

12 TYPE? 17

- 13 SUBTYPE?
0 or 1 (DSN/RJE and DSN/MRJE)
1 (DSN/IMF)
0, 1, or 3 (DSN/DS)
0,1,3 or 7 (DSN/MTS)

0 = Synchronous switched line with a modem
1 = Synchronous nonswitched line with a modem
3 = Synchronous nonswitched line, hardwired
7 = Asynchronous hardwired line

NOTE

If the INP is hardwired directly to an SSLC, always configure both the INP and the SSLC as Subtype 1, and Transmission Mode 1.

Configuring MPE

Step No.	Prompt and Response
20	RECEIVE TIMEOUT? (20-second default) 0-32000 or return (DSN/DS, DSN/MTS, DSN/IMF and DSN/RJE) return (DSN/MRJE overrides this option)
21	LOCAL TIMEOUT? (60-second default) 0-32000 or return (DSN/DS, DSN/MTS, DSN/IMF and DSN/RJE) return (DSN/MRJE overrides this option)
22	CONNECT TIMEOUT? (900-second default) 0-32000 or return (DSN/DS, DSN/IMF and DSN/RJE) return (DSN/MRJE overrides this option)
Prompts 23 through 25 appear only when subtype 0 was specified in prompt 13 (DSN/DS, DSN/RJE, DSN/MTS and DSN/MRJE)	
23	DIAL FACILITY? NO- if no dial fac- (DSN/DS, DSN/MTS and DSN/RJE) cility is required. YES- if manual dial up is required. INP LDEV#-if the AUTO DIAL feature is used. return (DSN/MRJE, DSN/IMF overrides this)
24	ANSWER FACILITY? YES or NO (DSN/DS, DSN/MTS and DSN/RJE) return (DSN/MRJE, DSN/IMF overrides this option)
25	AUTOMATIC ANSWER? YES or NO (DSN/DS and DSN/RJE) return (DSN/MRJE overrides this option)
26	DUAL SPEED? YES or NO (DSN/DS, DSN/RJE AND DSN/MRJE-yes for European modems only) NO (DSN/MTS) (DSN/IMF does not use response)

- | Step No. | Prompt and Response |
|----------|--|
| 27 | HALF SPEED?
YES or NO
(Asked only if your response to prompt 26 was YES) |
| 28 | SPEED CHANGEABLE?
YES or NO
(response overridden if modems providing internal clocking are used) |
| 29 | TRANSMISSION SPEED? (in characters per second)
250, 300, 600, 1200, 2400, 3600, 4800, or 7000
(DSN/DS)

250, 300, 600, or 1200
(DSN/RJE and DSN/MRJE) |

NOTE

The transmission speed you specify is ignored for modems that provide internal clocking signals. This feature allows modems of different speeds to be used without reconfiguring the operating system. It also allows the console operator to change the speed of hardwired lines through the use of the ;SPEED= parameter when the line is opened.

- | | |
|----|---|
| 30 | TRANSMISSION MODE? 0 or 1

0 = Full Duplex
1 = Half Duplex |
|----|---|

NOTE

Subtype 3 requires full duplex, except when the INP is hardwired to an SSLC. For hardwired INP-toSSLC, always configure both devices as Subtype 1 and Transmission Mode 1.

- | | |
|----|--|
| 31 | PREFERRED BUFFER SIZE? (in words)
0-1024
(DSN/DS -- 1024 recommended)
(DSN/MTS- 500 recommended)
(DSN/RJE, DSN/IMF and DSN/MRJE overrides this option) |
| 32 | DRIVER CHANGEABLE? NO |
| 33 | DRIVER OPTIONS? 0 |

Configuring MPE

Prompts 44 through 47 appear only when subtype 0 has been specified in prompt 13. (DSN/DS, DSN/RJE, and DSN/MRJE)

Step No.	Prompt and Response
43	DRIVER NAME? IOINPO
44	PHONELIST? YES or NO (DSN/DS, DSN/MTS and DSN/RJE) return (DSN/MRJE AND DSN/IMF)
45	PHONE NUMBER? xxx-xxx-xxxx (asked if your response to 44 was yes)

NOTE

European modems and auto call units require a character to be configured into the phone number. This delay is achieved by the letter "D".

The configurator file will receive only one phone number. The phone number is configured with hyphens--not parenthesis.

The character set needed for the phone number is:
0 through 9
/ (separator used for ACU's that have a second dial tone detect)
E (end of number)
D (delay of 1 second)
(defined by the local telephone system)
* (defined by the local telephone system)

46	LOCAL ID SEQUENCE? ID sequence or return (DSN/MRJE ignores your response)
47	REMOTE ID SEQUENCE? ID sequence or return (DSN/MRJE, DSN/RJE AND DSN/MTS ignores your response)

Step No.	Prompt and Response
48	DEVICE CLASSES? return No class name will be assigned. name list A list of one or more names, separated by commas. A name must begin with a letter and can have no more than eight characters. (DSN/RJE requires the device class name RJLINE. Additional class names are optional.) (DSN/MRJE ignores your response)

The dialogue now prints the LOGICAL DEVICE #? prompt described in step 8. If all I/O configuration is complete, press RETURN and the dialogue continues at step 51. Otherwise, enter a logical device number, and repeat the configuration procedure from step 8.

51	MAX # OF OPENED SPOOLFILES = xxx ? return
52	LIST I/O DEVICES? YES
53	LIST CS DEVICES? YES
54	CLASS CHANGES? return
66	LIST I/O DEVICES? return

You receive the prompt in step 67 only if a communications device is currently configured in your system, or if additional drivers exist.

67	ADDITIONAL DRIVER CHANGES? return
74	SYSTEM TABLE CHANGES? return
92	MISC CONFIGURATION CHANGES? return
108	LOGGING CHANGES? return
115	DISC ALLOCATION CHANGES? return
129	SCHEDULING CHANGES? return

Configuring MPE

Step No.	Prompt and Response
130	SEGMENT LIMIT CHANGES? return
137	SYSTEM PROGRAM CHANGES? return
139	SYSTEM SL CHANGES? return
148	ENTER DUMP DATE? return Copies the modified MPE. When this copy is used to COLDSTART the system, the account structure and all files remain intact. mm/dd/yy where mm/dd/yy is some date in the future. Copies the modified MPE and the current accounting structure (but no files). mm/dd/yy where mm/dd/yy is usually the date of the most recent system backup. Copies the modified MPE, the current accounting structure, and any files that were changed on or since the specified date. 0 Copies the entire system (MPE, the current accounting structure, and all files).
149	ENTER DUMP FILE SUBSETS? return
150	LIST FILES DUMPED? return

The console operator must now use the =REPLY command to assign the tape drive on which a fresh tape reel has been mounted.

INP DUMP FACILITY

APPENDIX

B

The INP Dump facility is used only by factory-level support personnel. It dumps the contents of the INP memory for analyzing the exact state of an INP in use. Invoked by either an INP hardware problem or an INP software problem, the dump data can be returned to the factory either on magnetic tape or in the form of a listing.

Dumping the INP and saving the data is done automatically by the system software. As dumps are completed, the data is stored into files named "INPLOGnn", where nn is a number not greater than the maximum number of dump files for the system. This limit assures that multiple INP dumps cannot adversely affect system storage.

Messages regarding INP dumps are directed to the system console. The initial message announces the dump and specifies which INP is dumping:

INP BOARD FAILURE - LDEV xx

where xx is the logical device number. Notification that the data has been saved and identification of the dump file appears next:

INP RAM DUMPED IN INPLOGnn

If the creation of this new INP dump file attains the maximum number allowed, another message is generated:

STORE AND PURGE ALL INPLOGnn FILES

Any further INP dumps will not be saved until the previous dump files are processed.

As previously mentioned, either of two media can be used for returning the INP dump data to the factory: magnetic tape or listing. The more obvious method is to store the INPLOG files onto a tape and send the tape to the factory. The other alternative is to run the INP Dump Analyzer against each INPLOG file. Each file then generates a listing of approximately 50 pages. These listings can be sent to the factory, thus eliminating the need for shipping magnetic tapes.

The latter method requires only a few simple MPE commands. The first step is to define the list file for the Analyzer. By default, the Analyzer will output to \$STDLIST for job execution or to a device class of LP for session execution. If another output device is desired, a file or device equation to INPLIST

INP Dump Facility

will assign the proper file/device.

The required command to identify the dump file is:

```
FILE INPDUMP = INPLOGnn
```

The command that invokes the Analyzer is:

```
RUN INPDPAN.PUB.SYS
```

Note that INPDPAN does not purge the dump file; it must be done manually.

The following is a sample stream job:

```
!JOB INPDUMP,MANAGER/PSWD.INP  
!FILE INPDUMP=INPLOG01.PUB.SYS  
!RUN INPDPAN.PUB.SYS  
!EOJ
```

COMMUNICATIONS CABLING DIAGRAMS

APPENDIX

C

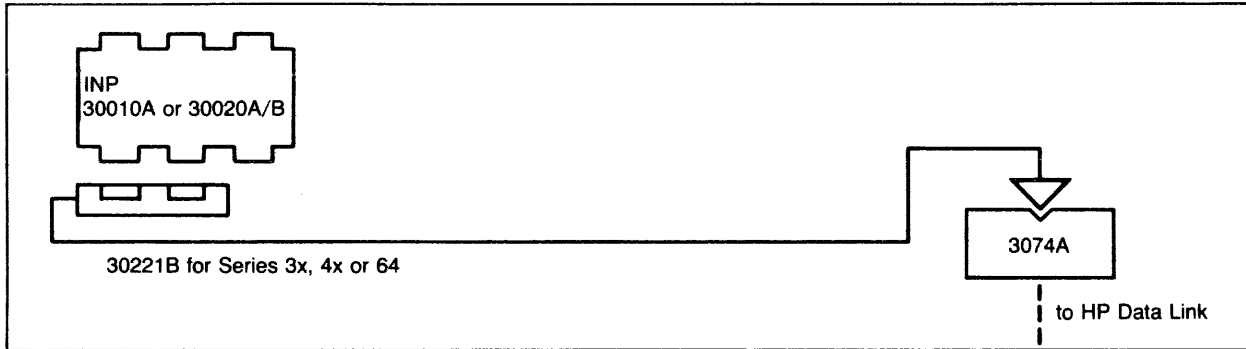
This appendix provides cabling diagrams for important Inp communication cable assemblies. This information will aid in troubleshooting cable problems associated with the INP.

The following cables are represented in this appendix:

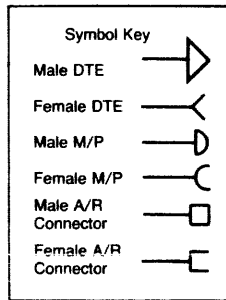
- RS232C Synchronous Internal Cable part no. 30221-60001
- RS232C 10 Meter External Cable part no. 5061-2514
- RS232C Asynchronous Internal Cable part no. 30221-60002
- V.35 High-Speed Synchronous Internal Cable part no. 30221-60010
- V.35 10 Meter External Cable part no. 5061-2517
- INP-to-INP Direct Connect Cable part no. 30224-60014
- External Interconnect Cable part no. 30224-60001
- INP-to-SSLC Direct-Connect Cable part no. 30225-60006

Communications Cabling Diagrams

MTS/3000 Asynchronous Hardwired Connections



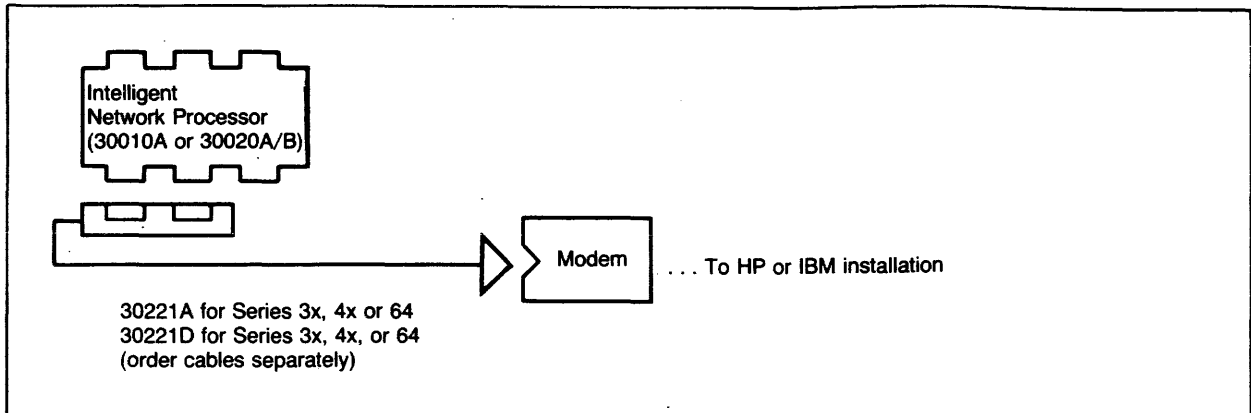
147035-03



INP Communications Cabling Diagrams

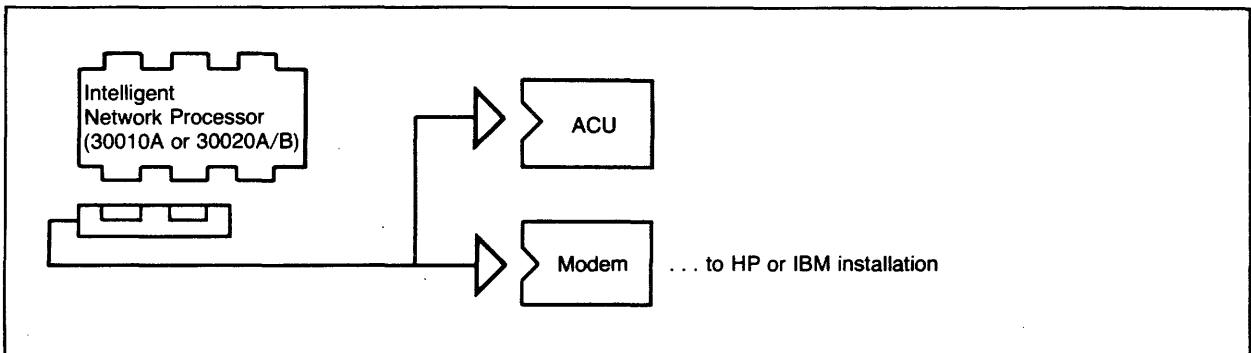
Communications Cabling Diagrams

INP Modem Connection



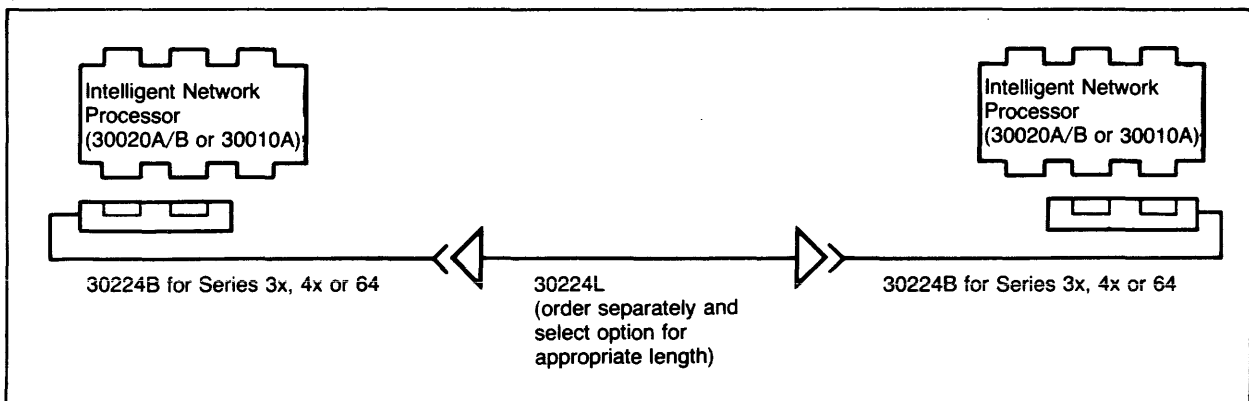
Note: May be used for DS/3000, RJE/3000, MRJE 3000, IML 3000, or MTS 3000 synchronous modem communication.

INP Modem - Auto Call Unit Connection



Note: May be used for DS/3000, RJE/3000, MRJE 3000, IML 3000, or MTS 3000 synchronous modem communication.

DS/3000 INP-INP Direct Connection

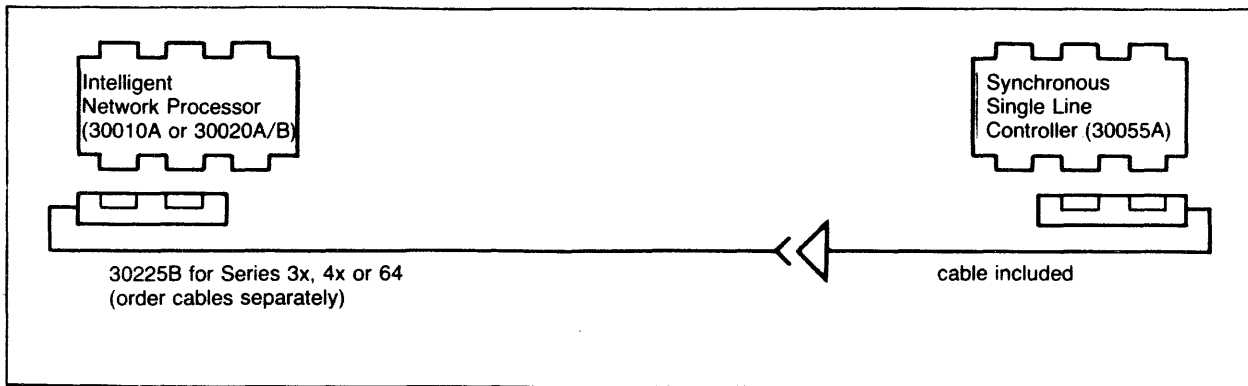


147035-05

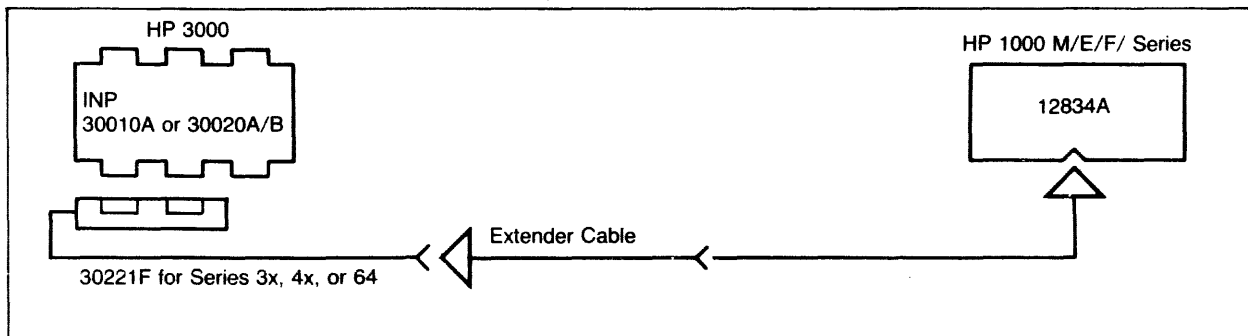
INP Communications Cabling Diagrams

Communications Cabling Diagrams

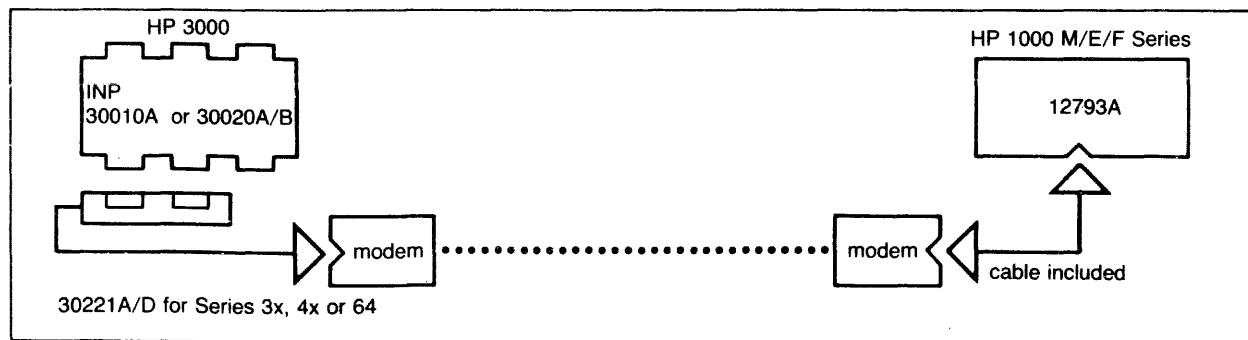
DS/3000 INP-SSLC Direct Connection



DS/3000-DS/1000 Hardwired Connection



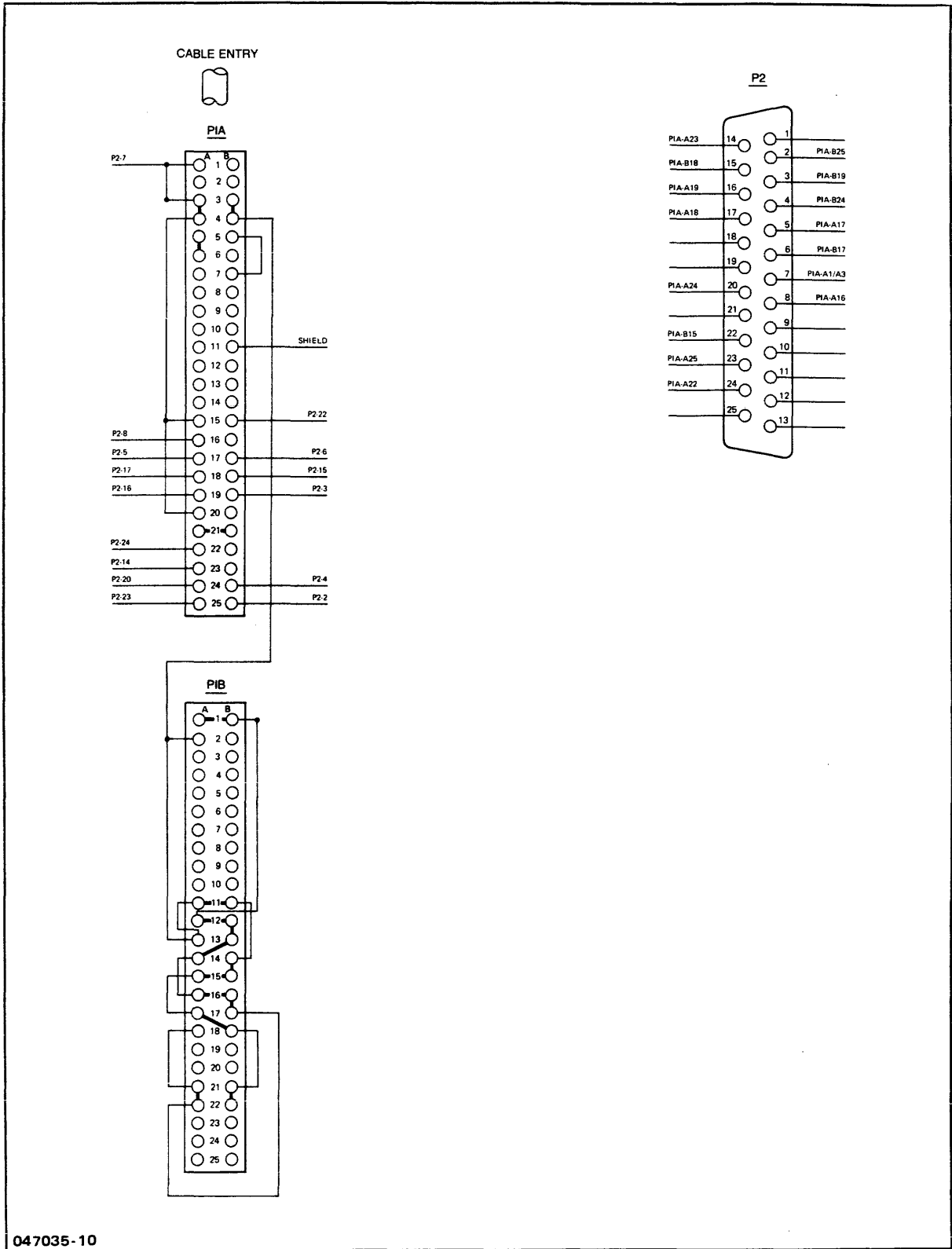
DS/3000-DS/1000 Modem Connection



147035-04

INP Communications Cabling Diagrams

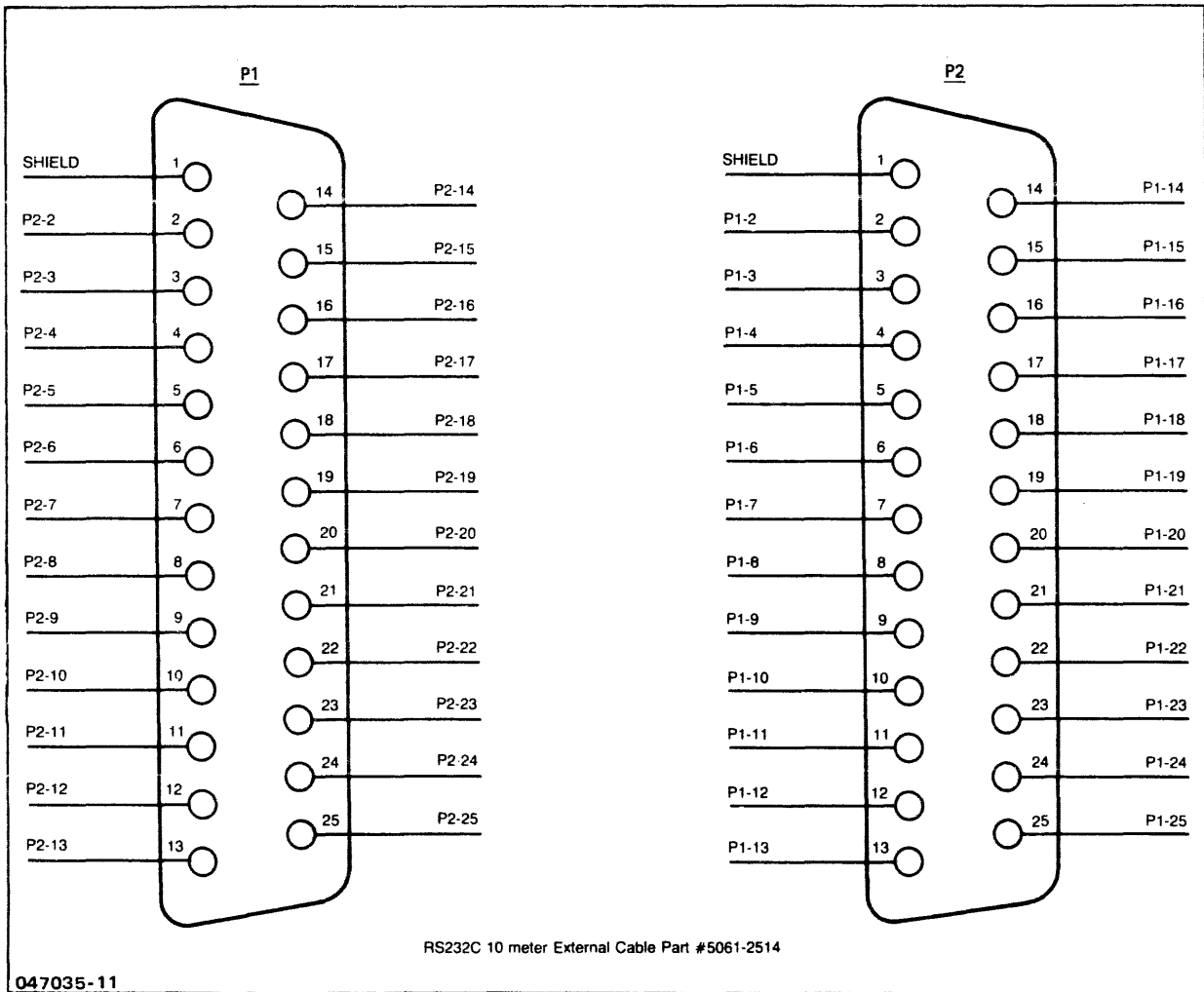
Communications Cabling Diagrams



047035-10

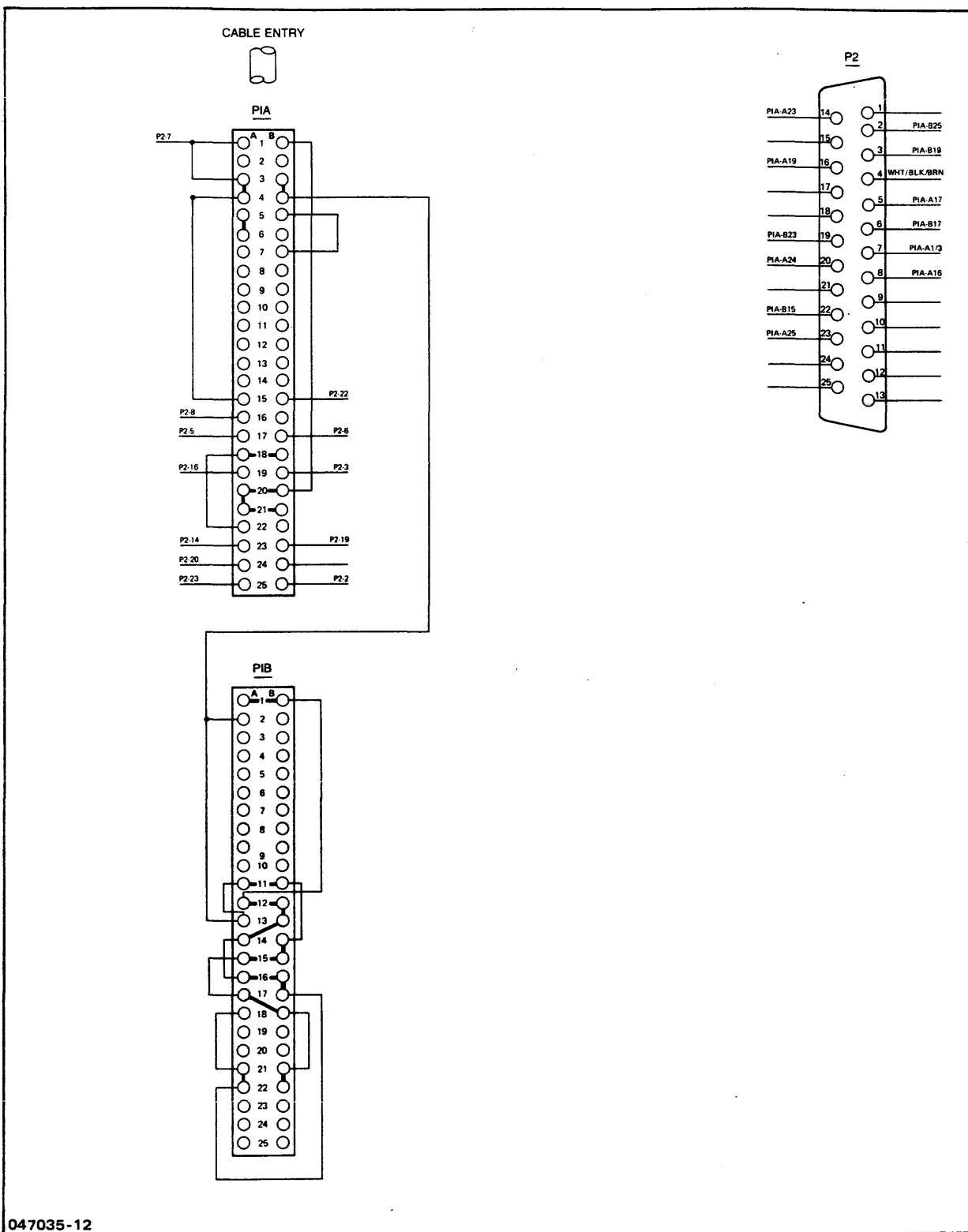
RS232C Synchronous Internal Cable part no. 30221-60001

Communications Cabling Diagrams



RS232C 10 Meter External Cable part no. 5061-2514

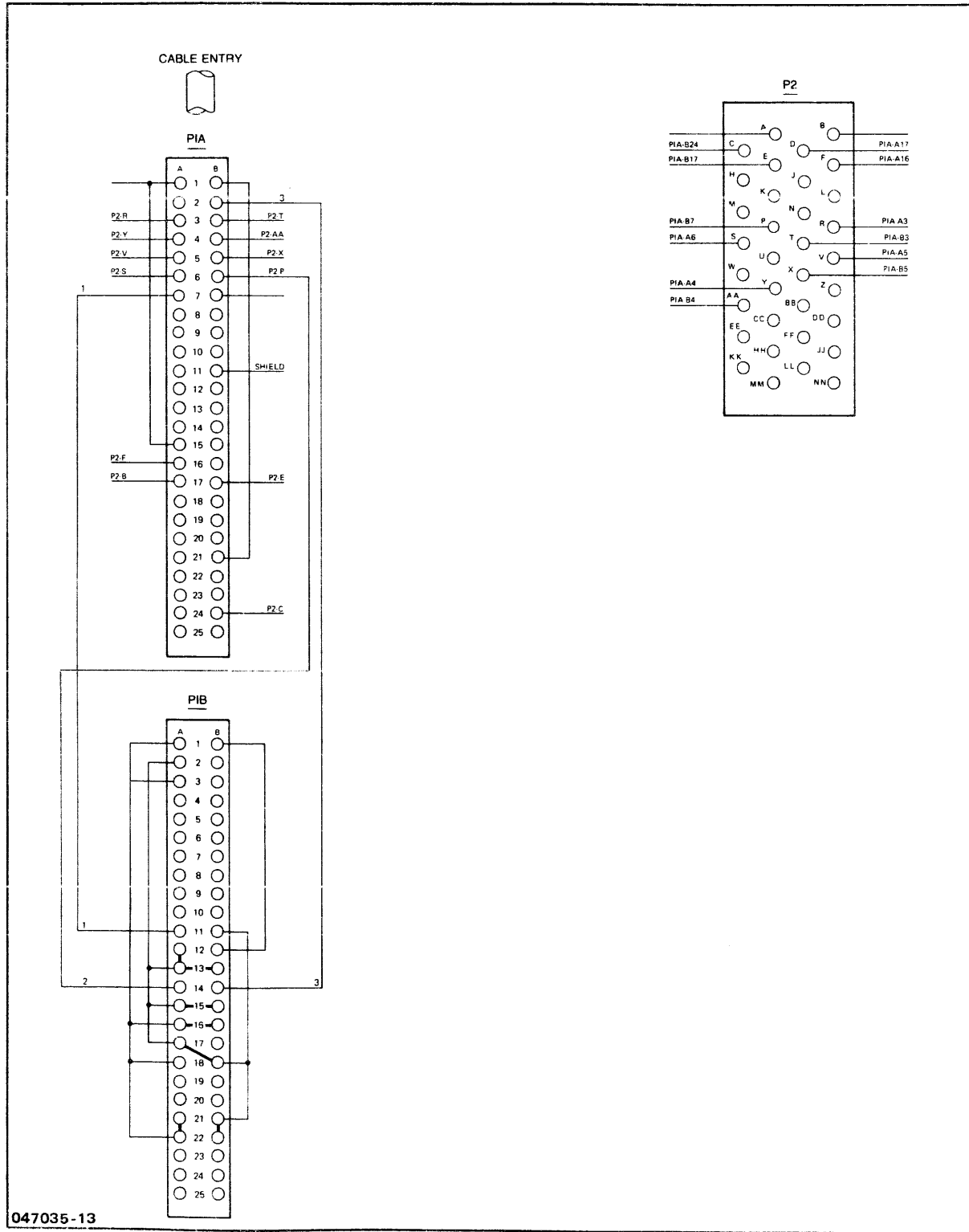
Communications Cabling Diagrams



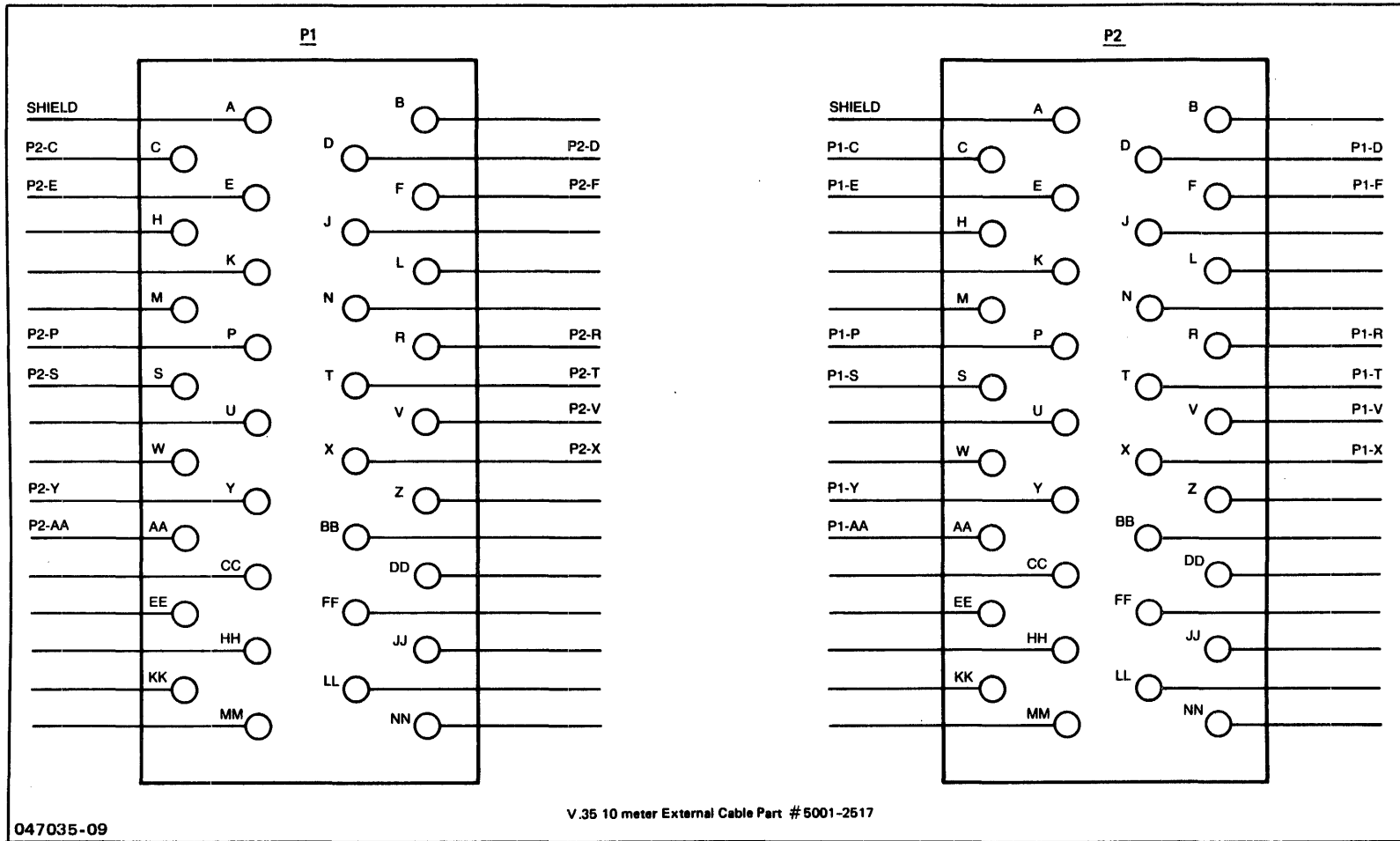
047035-12

RS232C Asynchronous Internal Cable part no. 30221-60002

Communications Cabling Diagrams

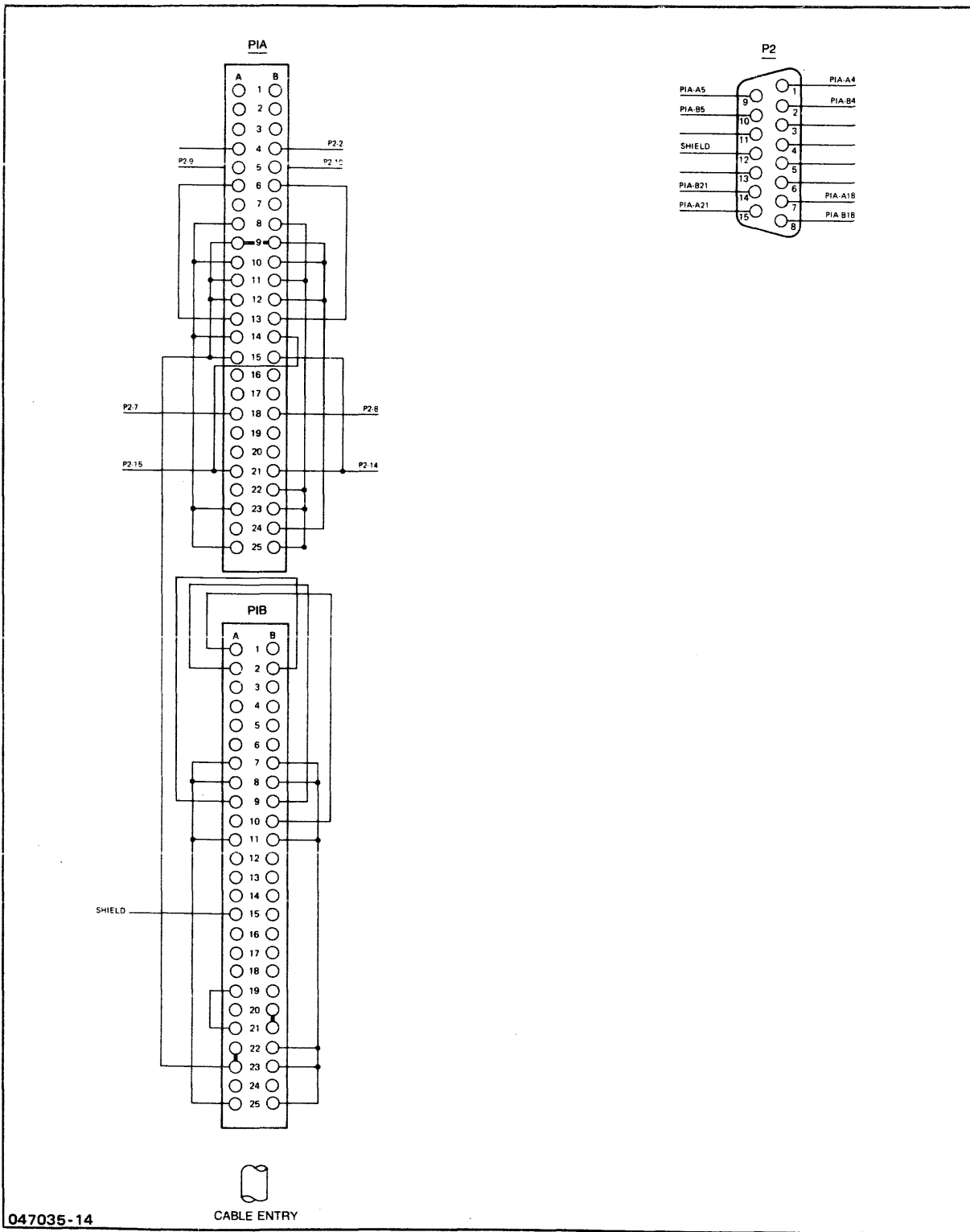


V.35 High-Speed Synchronous Internal Cable part no. 30221-60010



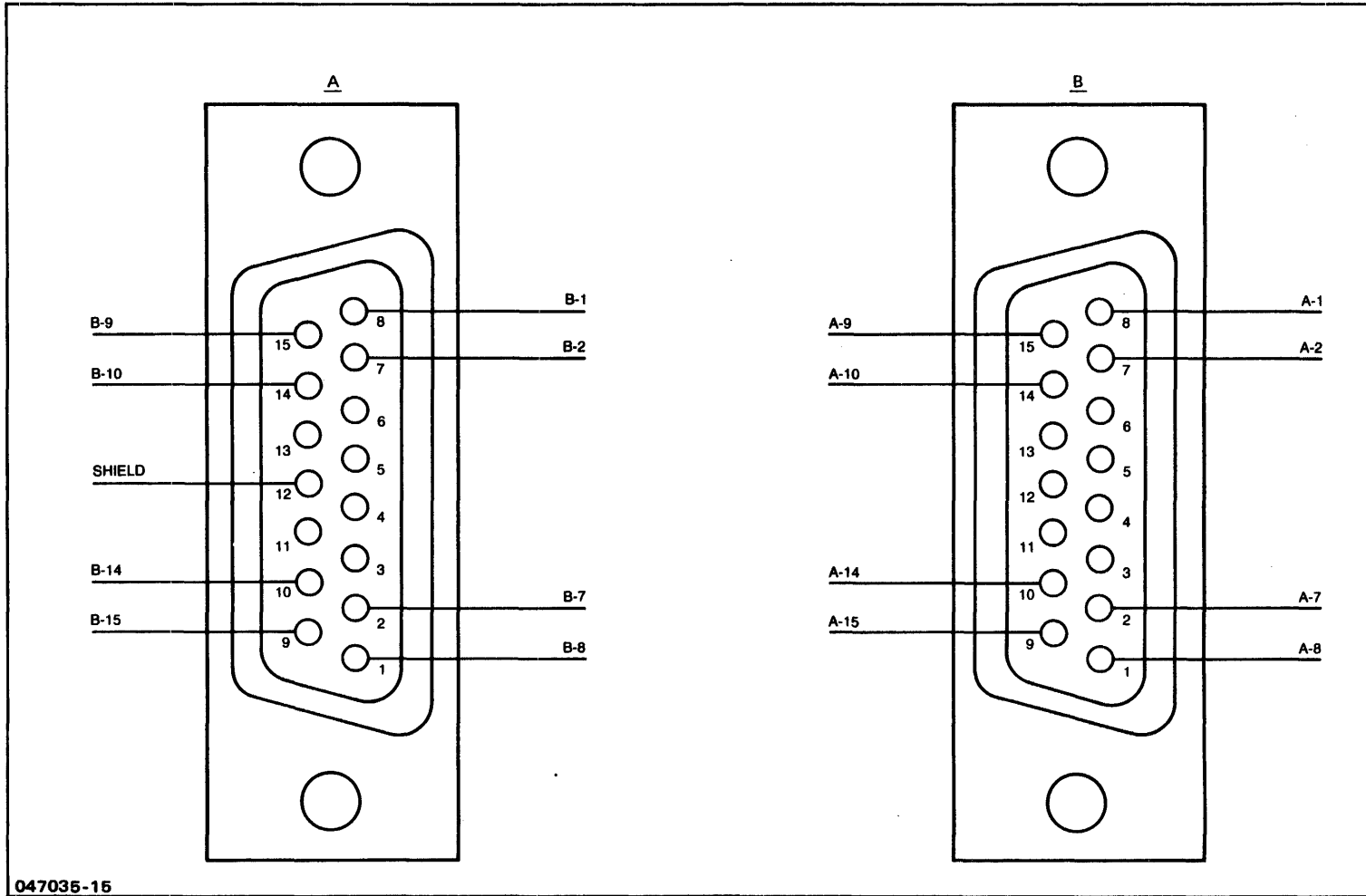
v.35 10 Meter External Cable part no. 5061-2517

Communications Cabling Diagrams



047035-14

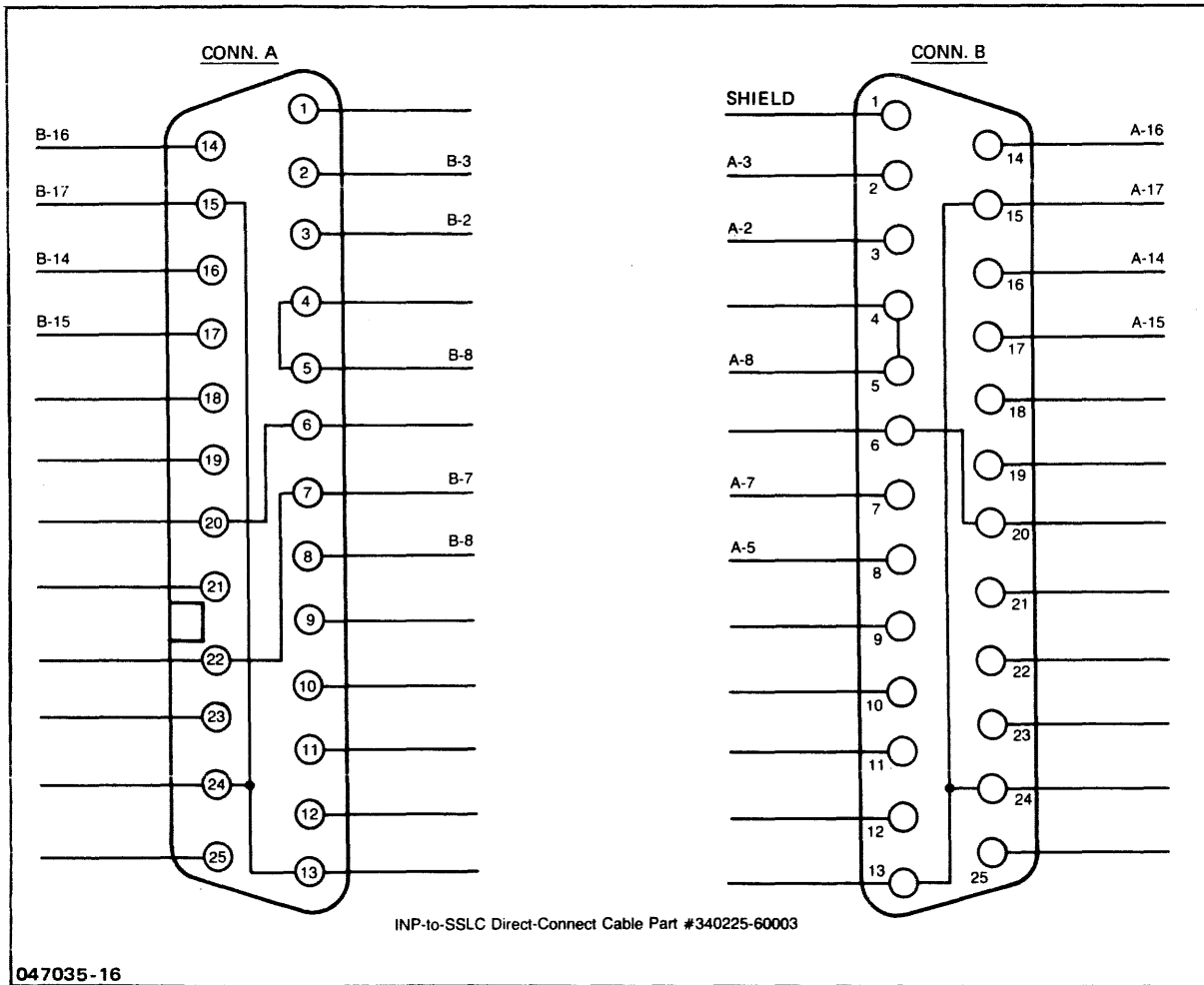
INP-to-INP Direct Connect Cable part no. 30224-60014



047035-15

External Interconnect Cable part no. 30224-60001

Communications Cabling Diagrams



INP-to-SSLC Direct-Connect Cable part no. 30225-60006

A

Apparatus used with Off-board Loopback tests, 1-3, 4-10
Auto Call Unit, 1-8, 1-9, 1-11, 2-13, 3-4

B

Basic Instruction Set Test, 4-4
BISYNC data communication, 3-4
BISYNC Test, 4-5
Block diagram, INP, 3-3
Board test hood, 1-4, 4-10

C

Cable diagrams, C-1
Cable routing, HP 3000 Series 30/40, 2-5, 2-8
Cable routing, HP 3000 Series 33/44, 2-5, 2-9
Cable routing, HP 3000 Series 64, 2-5, 2-10
Cable test connector, 1-4, 4-10
Cables, data communication, installation of, 2-5, C-1
Cables, data communication, list of, 1-5
CE-supplied test equipment, 1-4
Chip tests, 4-4
CMOS/SOS microprocessor, 3-2
Communication cable routing, 2-5, 2-8, 2-9, 2-10
Communication cables, installation of, 2-5, C-1
Communication line interfaces, 3-4
Compatibility, test equipment, 1-7
Components on INP PCA, location of pertinent, 4-6
Configuration dialogue, A-2
Configuration overview, A-1
Configuring MPE, A-1
Connector, cable test, 1-4, 4-10
Contents of this manual, vii
CS/Trace, 4-3

D

Data communication cables, installation of, 2-5
Data communication cables, list of, 1-4
Data transfer rate, 1-8
Defective RAM data chips, identifying, 4-9
Description of the INP Self Test, 4-3
Diagnostic/Support Monitor (DSM), 4-2

INDEX (continued)

Dialogue, configuration, A-2
Direct Memory Access (DMA), 3-4
DMA, 3-4
DSLIN, 3-6
DSM, 4-2

E

Equipment supplied, 1-4

F

Features of the INP, 1-8
Field repair, 4-11
Field replacement of a RAM chip, 4-11
Field-replaceable RAM chips, location of, 4-7
Functional description of INP, 3-1
Functional-level operation of INP, 3-4

G

General description, 1-3
General Information, 1-3

H

Hardware installation procedures, 2-4
Hood, board test, 1-4, 4-10
HP 3000 Series 30/40 communication cable routing, 2-5, 2-8
HP 3000 Series 33/44 communication cable routing, 2-5, 2-9
HP 3000 Series 64 communication cable routing, 2-5, 2-10
HP 30020B INP block diagram, 3-3
HP Support troubleshooting procedures, 4-7
HP-IB Address Switch settings, 2-2
HP-IB Address Switch, 2-2
HP-IB Address Switch, location of, 2-3, 4-6

I

Identifying defective RAM data chips, 4-9
Initial inspection, 2-1
INP block diagram, 3-3
INP Dump facility, 4-2, B-1
INP features, 1-8
INP Microprocessor, 3-2
INP PCA, installation of, 2-4
INP RAM, 3-2
INP ROM, 3-2

INP Self Test, 4-3
INP specifications, 1-10
Inspection, initial, 2-1
Installation, 2-1
Installation of multiple INPs, 2-11
Installation of the communication cables, 2-5, C-1
Installation of the INP PCA, 2-4
Installation procedures, hardware, 2-4
Installation, software, 2-7
Installation verification, 2-7
Interconnecting cable assemblies, 1-5
Interface to system, 1-5
Interpretation of LED patterns, 4-8

L

LED indicator patterns, meanings of, 4-8
LED indicators, self-test, location of, 2-12
List of illustrations, ix
List of interconnecting cable assemblies, 1-5
List of items that comprise the INP, 1-4
List of tables, ix
Location of PCA switches, 2-3
Location of pertinent components on INP PCA, 4-6
Location of POWER switch on HP 3000/30, 2-5
Location of power switch (PROCESSOR switch) on HP 3000/33, 2-8
Location of self-test initiating switch, 2-12
Location of self-test LED indicators, 2-12, 4-6
Logging onto the system, A-2

M

Maintenance, 4-1
Maintenance aids, 4-2
Manually initiating the self test, 2-10, 4-5, 4-6, 4-7
Manuals, supplemental, v, vi
Meanings of self-test LED indicator patterns, 4-8
Method of replacing a RAM chip, 4-11
Methods of field repair, 4-11, 4-12
MPE, configuring, A-1
Multiple INP installations, 2-11

O

Off-board loopback testing, 4-10
Operating power, 2-2
Operation of INP, functional-level, 3-3
Operation of INP, system-level, 3-6
Operation, principles of, 4-2
Organization of this manual, v

INDEX (continued)

Overview of INP operation, 3-4, 3-6
Overview of MPE configuration for INP, A-1

P

Part numbers of INP components, 1-4
Part numbers of interconnecting cables, 1-5
Part numbers of referenced manuals, v, vi
Part numbers of test equipment, 1-7
Patterns, lighted self-test LEDs, meanings of, 4-8
PCA board, installation of, 2-4
PCA board, replacement of, 4-12
PCA components, location of pertinent, 4-6
PCA jumpers and switches, 2-2
PCA switches, location of, 2-3
Philosophy, repair, 4-1
Power requirements, 2-2
Precautions, safety, 4-1
Preparation for installation, 2-1
Principles of Operation, 3-1
Procedures, hardware installation, 2-4
Procedures, troubleshooting, 4-5, 4-7
Programming Information, 2-7

R

RAM, 4-4
RAM chip, replacement of, 4-11
RAM chips, location of, 4-6
RAM Test, 4-4
Random Access Memory (RAM), 3-2
Rate of data transfer, 1-8
Read-Only Memory (ROM), 3-2
Recommended sequence of troubleshooting procedures, 4-7
Recommended switch settings, HP-IB Address Switch, 2-4
Recommended troubleshooting sequence, 4-7
Repair philosophy, 4-1
Repair, field, 4-11
Replacement of a RAM chip, 4-11
Replacement of the PCA board, 4-12
Requirements, power, 2-2
Reshipment instructions, 4-13
RESTART switch, location of, 2-12, 4-6
Returning PCA boards to the factory, 4-10, 4-13
ROM, 4-4
ROM Test, 4-4
Routing of the communication cables, 2-5, 2-8, 2-9, 2-10, 4-1

S

Safety precautions, 4-1
SDLC data communication, 3-4
SDLC Test, 4-5
Self Test, 4-3
Self Test
 Basic Instruction Set Test, 4-4
 BISYNC Test, 4-5
 RAM Test, 4-4
 ROM Test, 4-4
 SDLC Test, 4-5
 Timer Interrupt Test, 4-4
Self-test initiating switch, location of, 2-12
Self-test LEDs, location of, 2-12, 4-6
Sequence of troubleshooting procedures, recommended, 4-7
Setting the PCA switch, 2-2, 2-3, 2-4
Shipping instructions, 4-13
Software installation, 2-7
SOS microprocessor, 3-2
Specifications of the INP, 1-10
Supplemental manuals, v, vi
Support package, 4-2
Switch settings, HP-IB Address Switch, 2-4
System interfacing, 1-8, 1-9
System-level operation of INP, 3-6

T

Test equipment, 1-4, 1-7
Test equipment compatibility, 1-7
Test failure signified by LED patterns, 4-8
Theory of operation, 3-2
Timer Interrupt Test, 4-4
Troubleshooting, 4-5
Troubleshooting
 Customer-user troubleshooting procedures, 4-5
 HP Support troubleshooting procedures, 4-7
Troubleshooting procedures, customer-user, 4-5
Troubleshooting procedures, HP Support, 4-7
Troubleshooting procedures, recommended sequence, 4-7

U

Unpacking, 2-1

V

Verifying proper installation, 2-7

READER COMMENT SHEET

HP 30020B

**Intelligent Network Processor (INPB)
Installation and Service Manual**

30020-90005

Jan 1982

We welcome your evaluation of this manual. Your comments and suggestions help us improve our publications. Please use additional pages if necessary.

- Is this manual technically accurate?** Yes No (If no, explain under Comments, below.)
- Are the concepts and wording easy to understand?** Yes No (If no, explain under Comments, below.)
- Is the format of this manual convenient in size, arrangement, and readability?** Yes No (If no, explain or suggest improvements under Comments, below.)

Comments:

DATE: _____

FROM:

Name _____

Company _____

Address _____

FOLD

FOLD



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 1070 CUPERTINO,CALIFORNIA

POSTAGE WILL BE PAID BY ADDRESSEE

**Data Communications Support, 47L
Hewlett-Packard Company
19420 Homestead Road
Cupertino, California 95014**

Atten: DataComm Documentation Manager

FOLD

FOLD

Part No. 30020-90005
E0182
Printed in U.S.A. 1/82



**HEWLETT
PACKARD**