HP 3000 Computer Systems

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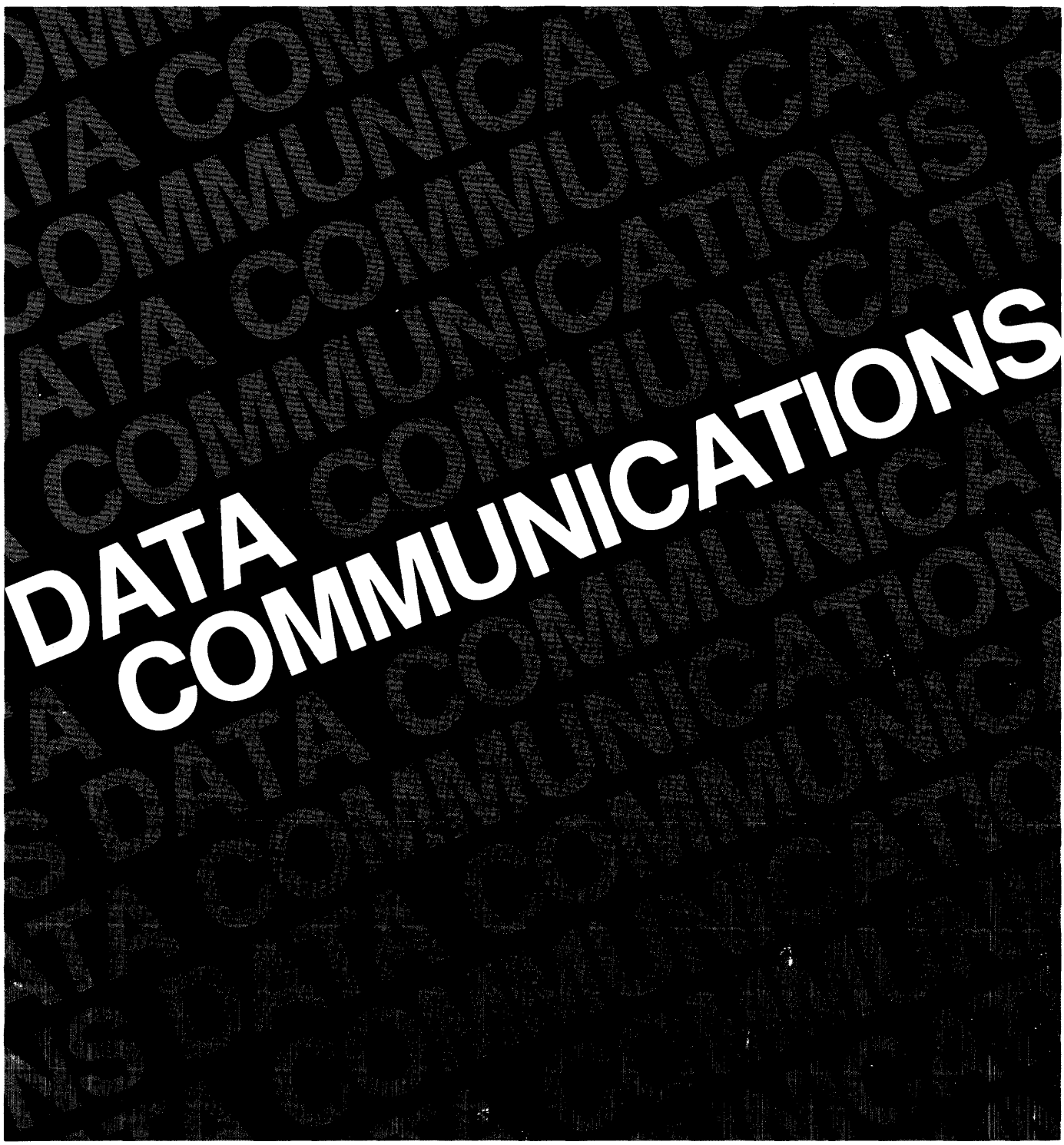
HP 30010A
Intelligent Network Processor (INP)
installation and service manual



HP 3000 Computer Systems

HP 30010A Intelligent Network Processor (INP)

Installation and Service Manual

19447 PRUNERIDGE AVENUE, CUPERTINO, CALIFORNIA 95014

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First Edition. . . . . Oct 1979
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PREFACE

This manual contains installation and servicing information for the HP 30010A Intelligent Network Processor (INP). The INP is a functionally flexible, single-channel data processor that provides I/O capability between the HP 3000 Series II or Series III Computer System and other computer systems via either modulator/demodulators (modems) and telephone lines or direct connection.

This manual was written with the assumption that the reader has a thorough knowledge of the HP 3000 Series II/III 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 assemblies (PCAs) and their interconnecting cabling into an HP 3000 Series II or Series III Computer System.

Section III, Programming Information, states the fact that the INP is preprogrammed and requires no field programming.

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

This manual should be retained and used with related documentation for the HP 3000 Series II/III Computer System and INP. Related documents include the following technical manuals:

HP 3000 Computer Systems, Console Operator's Guide,
part no. 30000-90013

HP 3000 Computer Systems, System Reference Manual,
part no. 30000-90020

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

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

HP 3000 Series II, CE Handbook, part no. 30000-90099

HP 3000 Series III Computer System, System Service Manual, part no. 30000-90152

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

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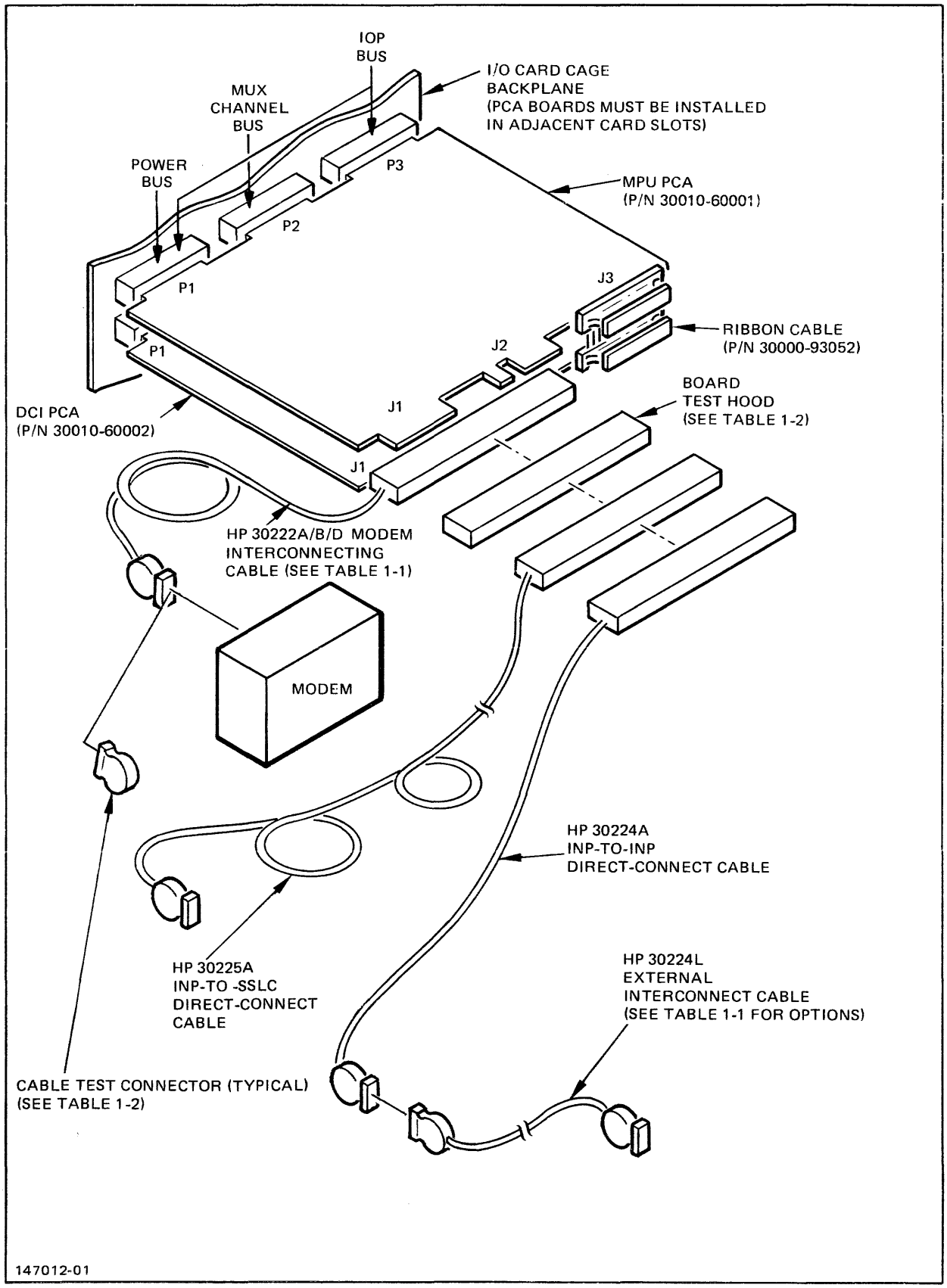

Figure 1-1. HP 30010A Intelligent Network Processor and Related Cabling

GENERAL INFORMATION

SECTION I

1-1. INTRODUCTION

This section describes the functional and physical characteristics of the HP 30010A 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.

1-2. GENERAL DESCRIPTION

The HP 30010A Intelligent Network Processor (frequently referred to hereafter as the INP) provides the HP 3000 Series II and Series III 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.

1-3. Equipment Supplied

The standard HP 30010A Intelligent Network Processor consists of the following:

- One INP Microprocessor Unit (MPU) printed circuit assembly (PCA) board, part no. 30010-60001.
- One INP Data Communications Interface (DCI) PCA board, part no. 30010-60002.
- One Flat Cable (ribbon cable for interconnecting the two INP PCA boards), part no. 30000-93052.
- One Memory Power Jumper PCA board, part no. 30380-60033 (plus attaching screws and washers).
- One I/O Memory Power Cable, part no. 30380-60034.
- One I/O Memory Jumper Cable, part no. 30380-60035.
- One HP 30010A Intelligent Network Processor Installation and Service Manual, part no. 30010-90001.
- One HP 30010A / 30020A Intelligent Network Processor Diagnostic Procedures Manual, part no. 30010-90002.

All of the items in the standard version of the HP 30010A INP (as listed above) are required for the installation of the first INP (and also for the fifth INP in the case of multiple INP installations) in all HP 3000 Series II computers and in the Model 32421A of the Series III. When installing the second, third, fourth, sixth, or seventh INP in the same HP 3000 Series II or Model 32421A of the Series III computers, the Memory Power Jumper PCA board and its related cables and attaching hardware are not needed. Likewise, all INP installations in the HP 3000 Series III Model 32435A computers do not use the Memory Power Jumper PCA, I/O Memory Power Cable, I/O Memory Jumper Cable, and related attaching hardware.

An Option 001 version of the HP 30010A INP is also available. Option 001 consists of a new Card Cage Backplane, part no. 30002-60006. The Option 001 version (obtained by ordering both the standard version HP 30010A INP and Option 001) is required only for INP installations in HP 3000 computers that were field-upgraded to the Series II configuration from a pre-Series II model.

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 30010A 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.
30222A		RS232C Synchronous Modem Cable (10-meter)	30222-60001
30222B		RS232C Asynchronous Modem Cable (10-meter)	30222-60002
30222D		V.35 High-speed Synchronous Modem Cable (10-meter)	30222-60004
30224A		INP-to-INP Direct-Connect Cable	5061-2524
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
30224L	005	External Interconnect Cable (500-meter)	30224-60006
30224L	006	External Interconnect Cable (1000-meter)	30224-60007
30225A		INP-to-SSLC Direct-Connect Cable (5-meter)	30225-60002

Table 1-2. Test Equipment Compatibility

Description	Part No.	Used With Cable Product No.
Board Test Hood	5061-2527	30222A 30222B 30225A
	5061-2530	30224A
Cable Test Connector	5061-2507	30222A 30222B
	5061-2512	30224L
	5061-2533	30224A
	30225-60004	30225A

1-4. Features

Important features of the INP are:

- Hardware data transfer rates to 56,000 bits per second.
- 32 K bytes of random access memory (RAM) for driver and support program storage and for character and message buffering.
- 4 K 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 201, 208, and 209 modems.
- Direct-connect capability between two HP 3000 computers.
- Retention of buffered data during power fail/restore periods.
- Stand-alone, user-initiated, self-test capability.

1-5. Interface to System

The HP 30010A INP consists of two PCA boards that are backplane compatible with the HP 3000 Series II and Series III Computer Systems. The INP PCAs are installed in two adjacent slots in the I/O section of the card cage. The INP receives power from the system through connectors P1 on both boards, and the INP interfaces with the IOP bus via connectors P1 and P3 and with the MUX channel bus via connector P2. The INP then communicates with the other systems in the data communications network through connectors J1 and J2 either by modem or by direct connection. The two INP PCA boards are interconnected through their J3 connectors. (See figure 1-2.)

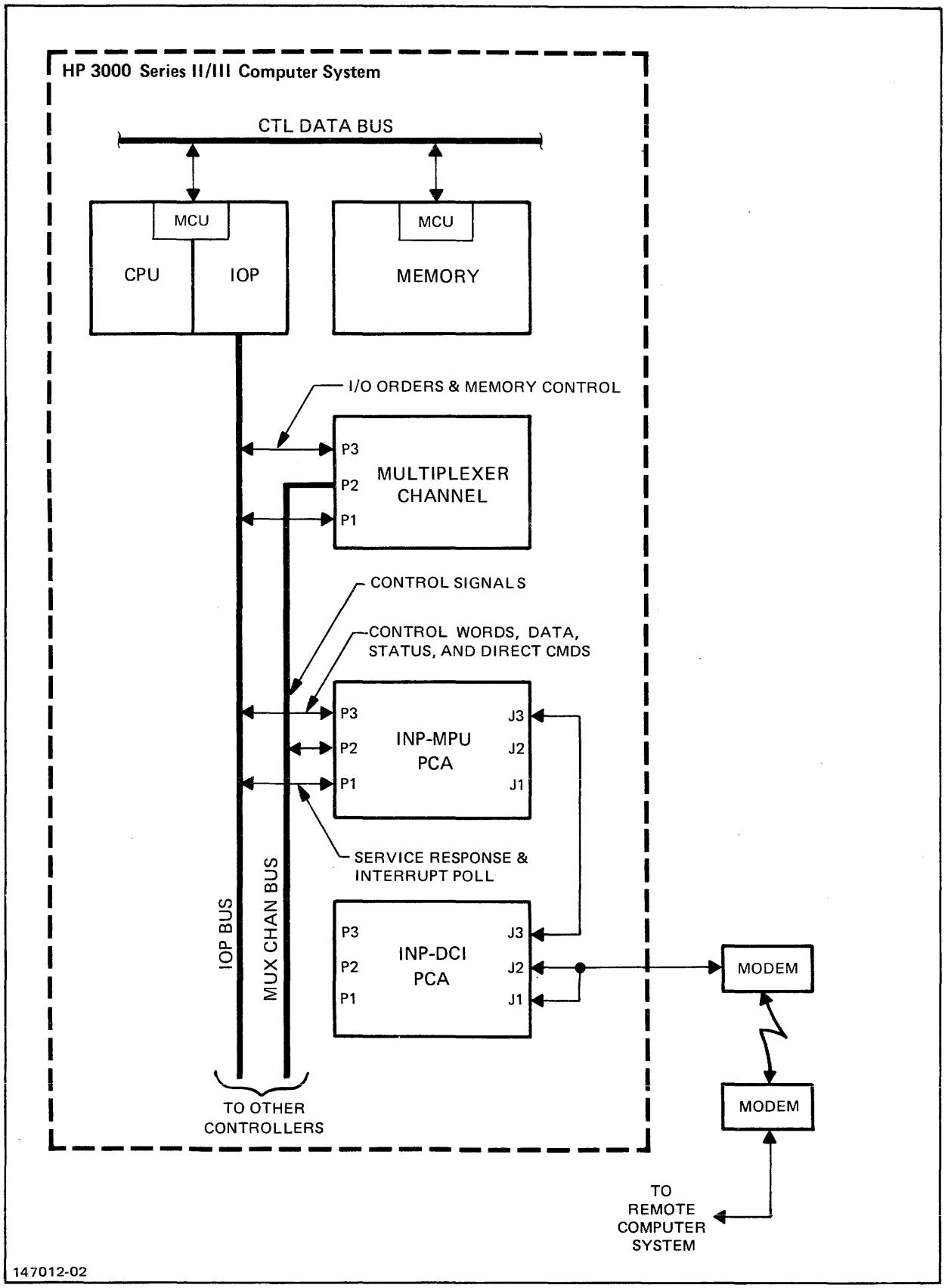

Figure 1-2. Typical Interface to System

1-6. SPECIFICATIONS

The specifications for the HP 30010A Intelligent Network Processor are presented in table 1-3.

Table 1-3. Specifications

Model:	HP 30010A Intelligent Network Processor
PCA Part No.:	30010-60001 and 30010-60002
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 Hardwired - 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
Maximum Number of INPs per HP 3000:	7
Power Fail Protection:	Buffered data can be restored after a power failure.

SECTION II
INSTALLATION

This section contains information for unpacking, inspecting, installing, and initially testing an HP 30010A Intelligent Network Processor (INP) that is to be added to an existing HP 3000 Series II or Series III Computer System.

2-1. UNPACKING AND INITIAL INSPECTION

If the INP printed circuit assemblies (PCAs) 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 PCAs or the 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.

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 30010A INP requires the following operating power:

Supply		Current (amps) Regular	/	Backup
+ 5V	at	3.40	/	0.0
+12V	at	0.300	/	0.0
-12V	at	0.040	/	0.0
- 5V	at	0.040	/	0.0
+ 5VB	at	0.265	/	0.265
+12VB	at	0.260	/	0.040
- 5VB	at	0.003	/	0.002

The INP PCAs obtain their operating power directly from the computer system power supply. Before installing the INP PCAs into the computer system's I/O card cage, determine that the power supply is adequate for the increased electrical current requirements as follows:

a. When the INP is delivered as an original part of a new HP 3000 computer installation, no further checking is required, since the appropriate power supply was installed at the factory.

b. When the INP is being added to an existing HP 3000 Series III, Model 32421A, computer installation, check the nameplate on the power supply to determine its type. If the power supply is identified with the product number HP 30311 and a date code of 1822 or higher, it is capable of supplying power for the new INP. If, however, your HP 3000 contains an HP 30311 power supply with an earlier date code (lower number), an upgraded power supply must be installed prior to the installation of the INP.

NOTE

This requirement applies only to the early Series III (Model 32421A). The HP 3000 Series II will support the INPs with an HP 30311 power supply having a date code earlier than 1822.

c. All Model 32435 Series III computer systems have appropriate power supplies.

2-4. Backplane Compatibility

Some of the existing HP 3000 Series II Computer Systems are the result of a modification program that upgraded the earlier pre-Series II systems to Series II status. If your HP 3000 Series II computer is one of these modified systems, it is necessary to check the backplane in the I/O card cage for compatibility with the INP. If the backplane is identified with the HP part number 30002-60006, it is compatible; so proceed with the INP installation. If, however, your Series II system still has the earlier backplane, it is necessary to replace it with the part no. 30002-60006 backplane before installing the INP. The appropriate backplane is obtained by ordering Option 001 (see paragraph 1-3).

2-5. PCA Jumpers and Switches

The jumpers used on the INP PCA boards have all been preset during board calibration at the factory, and no field alterations are required. There are, however, four blocks of miniature rocker switches (called "rocker switch packs") on the INP-MPU board that must be manually set to configure the INP for your specific system and application. Figure 2-1 shows the location of these switches.

Two sets of these rocker switch packs are used to manually set the MUX service requests (SR0 through SR15). Another block of switches is used to set the DRT number in octal notation. The fourth block of switches selects the functions outlined in table 2-3.

Set the switches as follows before installing the PCA boards in the computer card cage.

a. The MUX service request switches are the two rocker switch packs located on the INP-MPU board (part no. 30010-60001) in columns 12 and 13, at row 7, as shown in figure 2-1. Each rocker switch pack consists of eight miniature two-position switches in a block. Both sets of switches are labeled with numbers 1 through 8, and the OPEN position is also labeled on the switch block. To set the MUX service request, close only one of the 16 rocker switches while leaving the others in the OPEN position. Service requests SR0 through SR7 are set into the switch block on the right (column 13, row 7) and SR8 through SR15 are set into the switch block on the left (column 12, row 7) as listed in table 2-1.

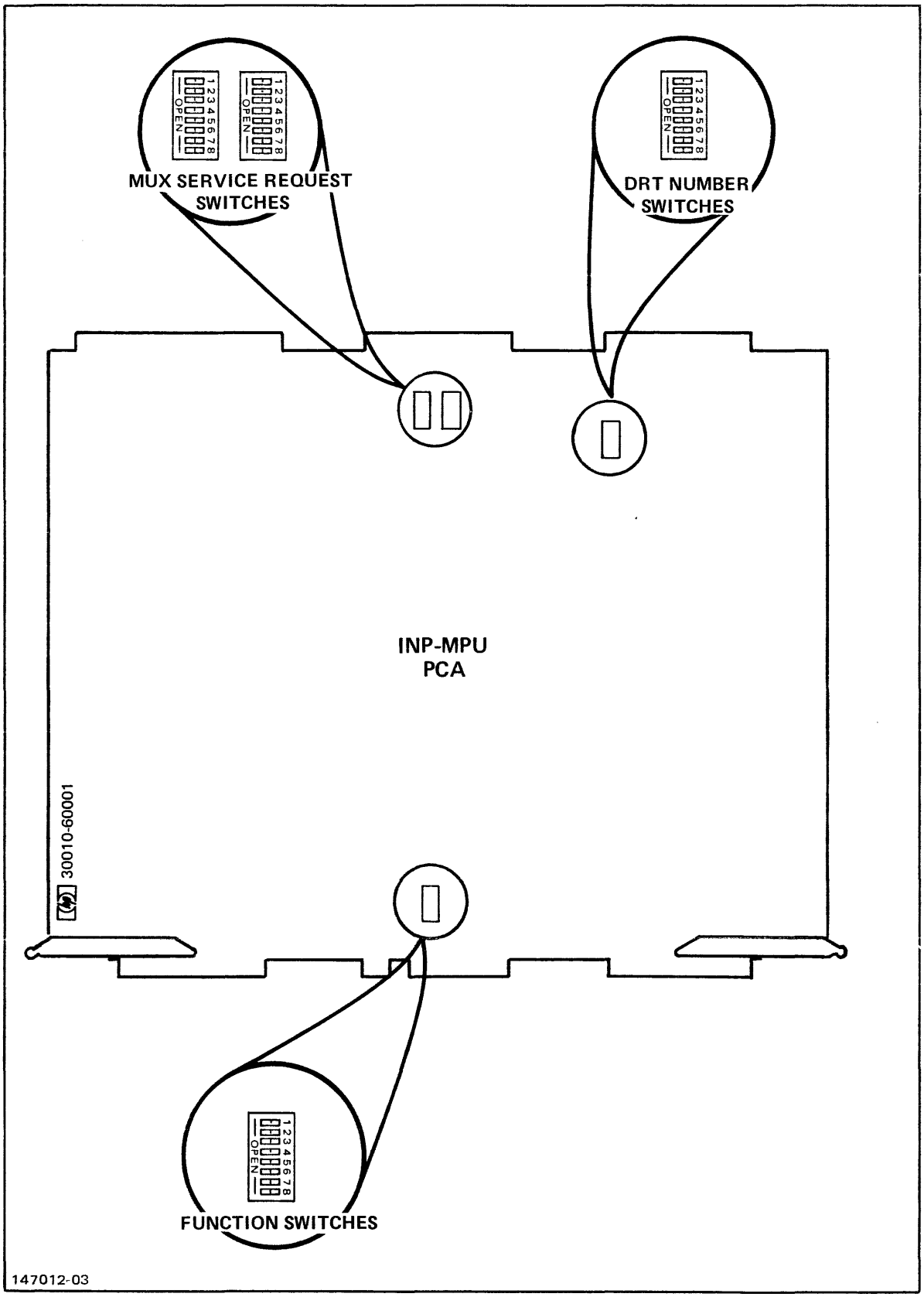

Figure 2-1. Location of PCA Switches

Table 2-1. Service Request Switch Settings

Service Request No.	Rocker Switch No. to be Closed (closed = true)	Switch Block Location (left or right)
SR0	1	Right
SR1	2	Right
SR2	3	Right
SR3	4	Right
SR4	5	Right
SR5	6	Right
SR6	7	Right
SR7	8	Right
SR8	1	Left
SR9	2	Left
SR10	3	Left
SR11	4	Left
SR12	5	Left
SR13	6	Left
SR14	7	Left
SR15	8	Left

The recommended service request number to be set into the INP is either SR8 or SR9. If special circumstances require a different INP service request number for your system, it should still be located at a lower priority level (larger number) than the Hardwired Serial Interface (HSI) and the Synchronous Single-Line Controller (SSLC) but at a higher priority level (smaller number) than the line printer and other slower devices. (See Appendix A for an example of a typical sequence of device priorities.)

b. The DRT number switches are eight miniature two-position rocker switches in a single block (identical in appearance to the switch blocks used for setting the MUX service requests in step a). The DRT number switch block is located in column 18, row 6, of the INP-MPU board (as shown in figure 2-1). Set the DRT number into switches 2 through 8 in octal notation (open = true), using switch number 2 to represent the most significant bit and switch number 8 to represent the least significant bit. Switch number 1 serves as an odd parity jumper. Set switch number 1 to the appropriate position (open or closed), so that an odd number of switches (including the parity switch) is opened.

The recommended DRT number to be set into the INP is either 25 or 26 (decimal). (See table 2-2.)

Table 2-2. DRT Number Switch Settings

DRT Number	Switch No. 1	2	3	4	5	6	7	8
25 (decimal)	X	X	X	O	O	X	X	O
26 (decimal)	X	X	X	O	O	X	O	X
Legend:	O = open X = closed							

c. The fourth block of miniature rocker switches (identical in appearance to the other three blocks described in steps a and b) is located in column 12, row 1, of the INP-MPU board (as shown in figure 2-1). These switches have been preset at the factory, but it is advisable to visually check their settings against those listed in table 2-3 in the column entitled "Required Position for System Use". (This visual check is to verify that no inadvertent changes occurred during transit.) Switches 1 through 7 should always be left in the positions shown. Switch 8 is normally left in the OPEN position, but it can optionally be closed to cause the self test to repeat in a continuing loop.

Table 2-3. Function Switch Settings

Switch No.	Function	Enable Position	Required Position for System Use
1	Unassigned	Open	Open
2	Watchdog Timer	Closed	Closed
3	Access INP ROM (see note 1)	Closed	Closed
4	Execute from ET PROM instead of self test after reset of INP	Closed	Open
5	Access ET PROM exclusively (see note 1)	Closed	Open
6	System Interface Indicator	Closed	Closed
7	Unassigned	Open	Open
8	Loop Self Test (see note 2)	Closed	Open

Notes:
1. Simultaneous closure of switches 3 and 5 defaults to ET PROM access.
2. With HP-supplied SOS ROMs, the self-test program will loop when switch 8 is closed.

2-6. HARDWARE INSTALLATION PROCEDURES

2-7. Installation of the INP PCAs

Install the two INP PCA boards as follows:

a. Ensure that all PCA switches are properly configured. (Refer to paragraph 2-5.)

b. Turn off the power.

   On the HP 3000 Series II and the Model 32421A of the Series III, set the SYSTEM DC POWER switch and both MEMORY DC POWER switches to the STANDBY position. (These three switches are located inside of the main cabinet front door, behind the register displays, as shown in figure 2-2.)

   On the HP 3000 Series III, Model 32435A, set both DC POWER switches (the LOGIC switch and the MEMORY switch) to the DISABLE position. (These switches are located inside of the main cabinet front door, as shown in figure 2-3.)

CAUTION

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

c. Open the inner door of the I/O section card cage in the HP 3000 mainframe.

d. Insert the two INP PCA boards (the MPU, part no. 30010-60001, and the DCI, part no. 30010-60002) into any two adjacent card cage slots on the multiplexer bus.

e. Install the Interrupt Poll wire on the backplane. The INP MPU board is polled immediately after the HP 30215A Magnetic Tape Controller and before the HP 30209A Universal Interface.

f. Connect the two INP PCA boards together with the ribbon cable (part no. 30000-93052). Attach the ribbon cable's connectors to connector J3 on the MPU board (part no. 30010-60001) and to connector J3 on the DCI board (part no. 30010-60002). (Refer to figure 1-1.)

g. Record the location of the INP PCAs in the configuration section of the System Support Log.

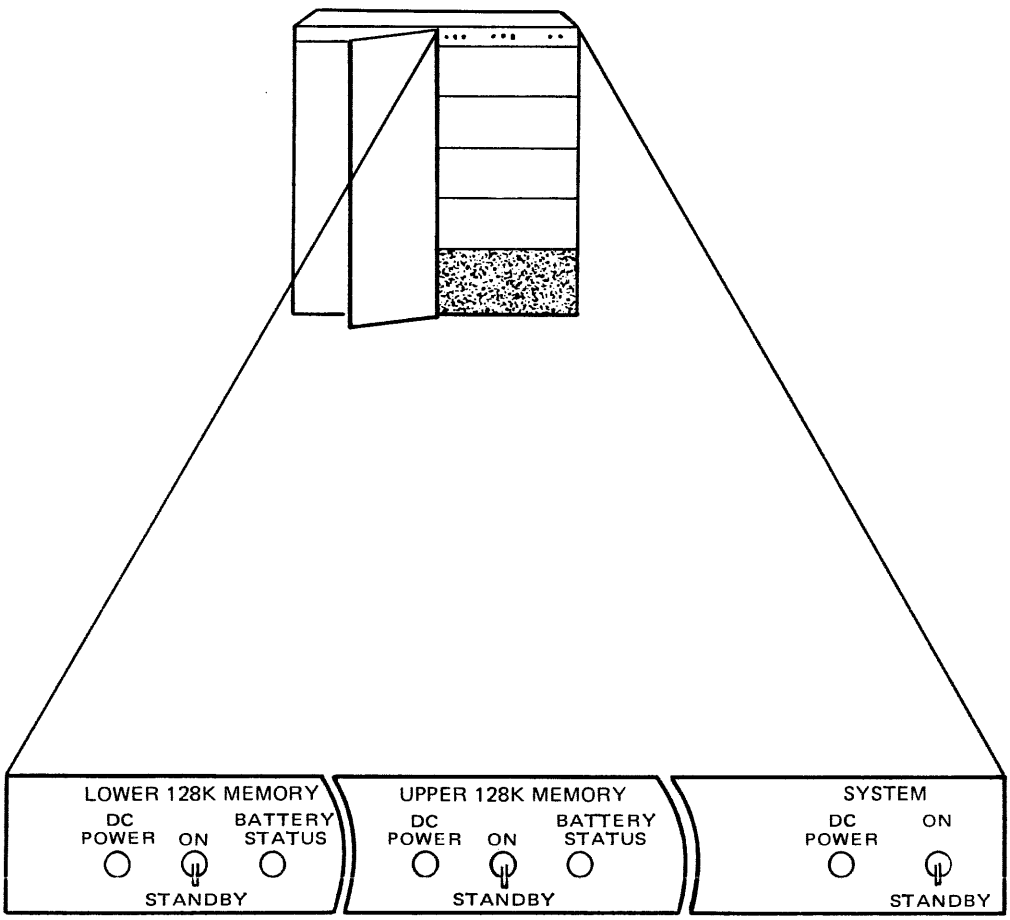

Figure 2-2. Location of DC POWER Switches (Series II and Early Series III)

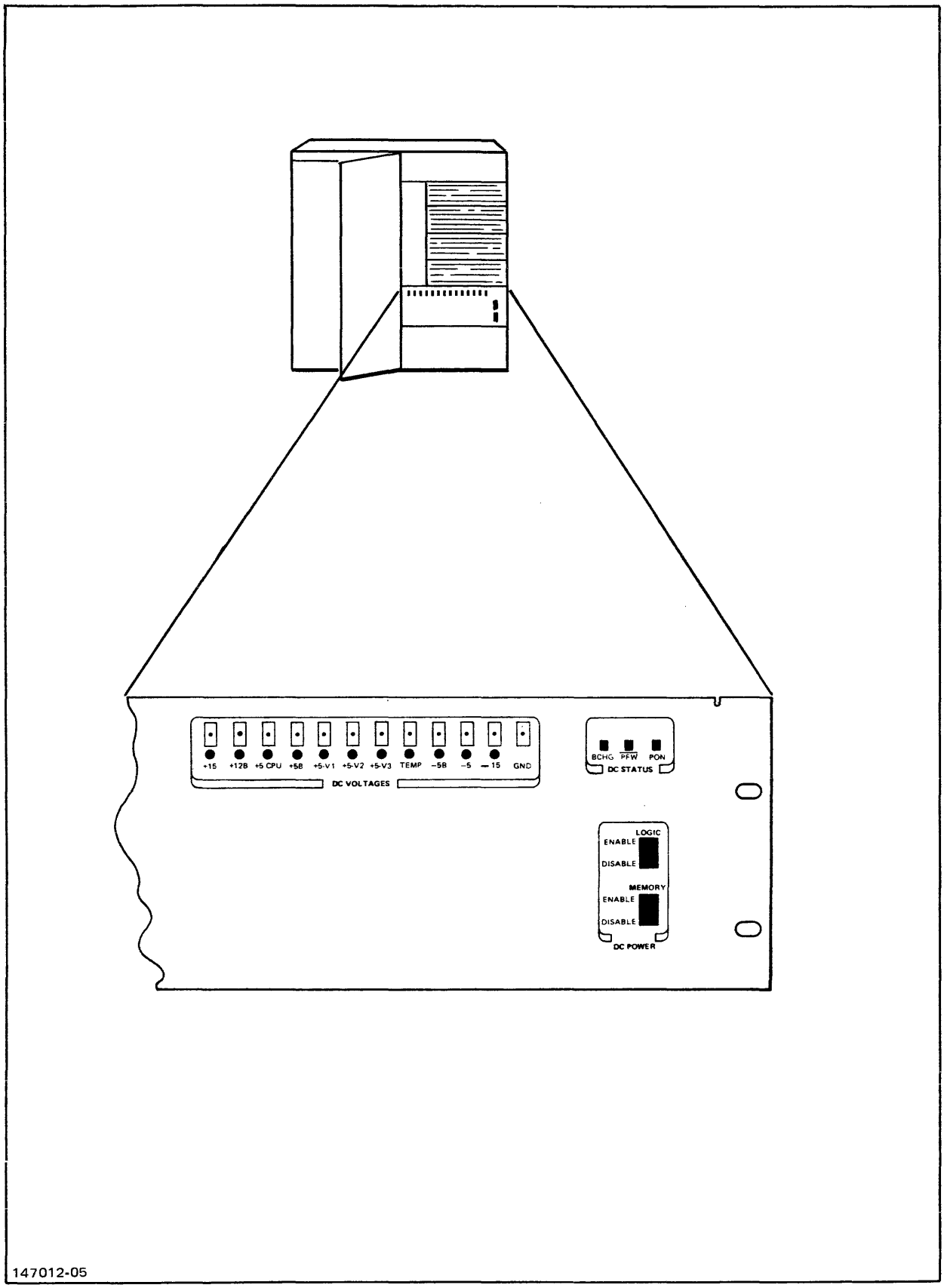

Figure 2-3. Location of DC POWER Switches (Later Series III)

2-8. Installation of Memory Power Equipment

The HP 3000 Series II and some of the earlier Series III computer systems had their I/O card cages supplied only with I/O power, because none of the I/O devices in existance at that time needed memory backup power. Now, the INP requires both I/O power and memory power; so this capability must be added to the card cages where INPs are to be installed in these systems. The necessary equipment for adding memory power is included with the HP 30010A INP. (See "Equipment Supplied" in Section I.)

If your HP 3000 Computer System is a Series III, Model 32435A, all necessary memory power equipment was built into it at the factory when it was manufactured; so no memory power modification is required in this model. Therefore, disregard the memory power installation procedure in this paragraph and proceed directly to the installation of the communication cables (paragraph 2-9).

If your computer system is an HP 3000 Series II or a Model 32421A of the Series III, and if this is the first INP to be installed, memory power must be added. In the case of multiple INP installations, the second, third, and fourth INPs (installed in the same card cage) require no additional memory power equipment, since they are supplied by the same source as the first INP. However, the fifth INP installed in the same HP 3000 computer must have an additional Memory Power Jumper PCA board added to another HP 30311 power supply. The sixth and seventh INP can use the same memory power source as the fifth INP. Therefore, if this is the installation of a second, third, fourth, sixth, or seventh INP, disregard the memory power installation procedure in this paragraph and proceed directly to the installation of the INP PCA boards (paragraph 2-8). If, however, you are installing the first or fifth INP, proceed as follows:

a. Determine that the power is still turned off (see step b of paragraph 2-7) before proceeding with this part of the installation.

b. Open the rear cabinet doors, and locate the HP 30311A Power Supply to be used (see figure 2-4).

c. Remove the two screws on the left upper and lower corners of the power supply. Mount the Memory Power Jumper PCA board (part no. 30380-60033) on the left edge of the power supply, using the two longer screws, two flat washers, and two lock-washers supplied with the jumper board. (Refer to figure 2-5.)

NOTE

If the location of the cable clamp brace interferes with mounting the jumper board on the power supply , the cable clamp brace can be loosened and slid either up or down on its mounting rails.

d. Unplug the existing cable connector from receptacle J2 on the power supply, and plug it into receptacle J7 on the newly attached jumper board. (Do not remove the other plugs in J3, J4, and J5.)

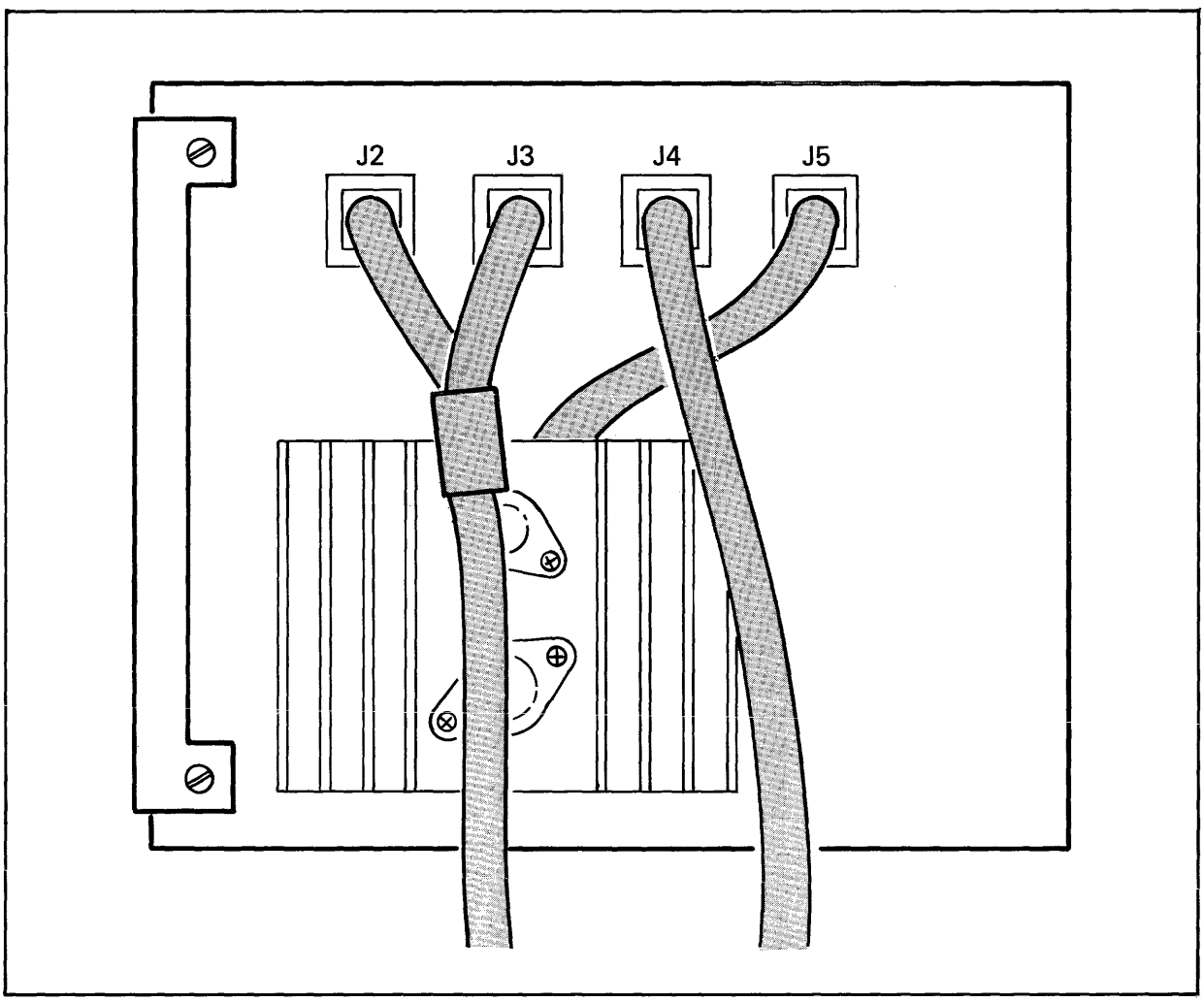

Figure 2-4. HP 30311A Power Supply with Existing Cables

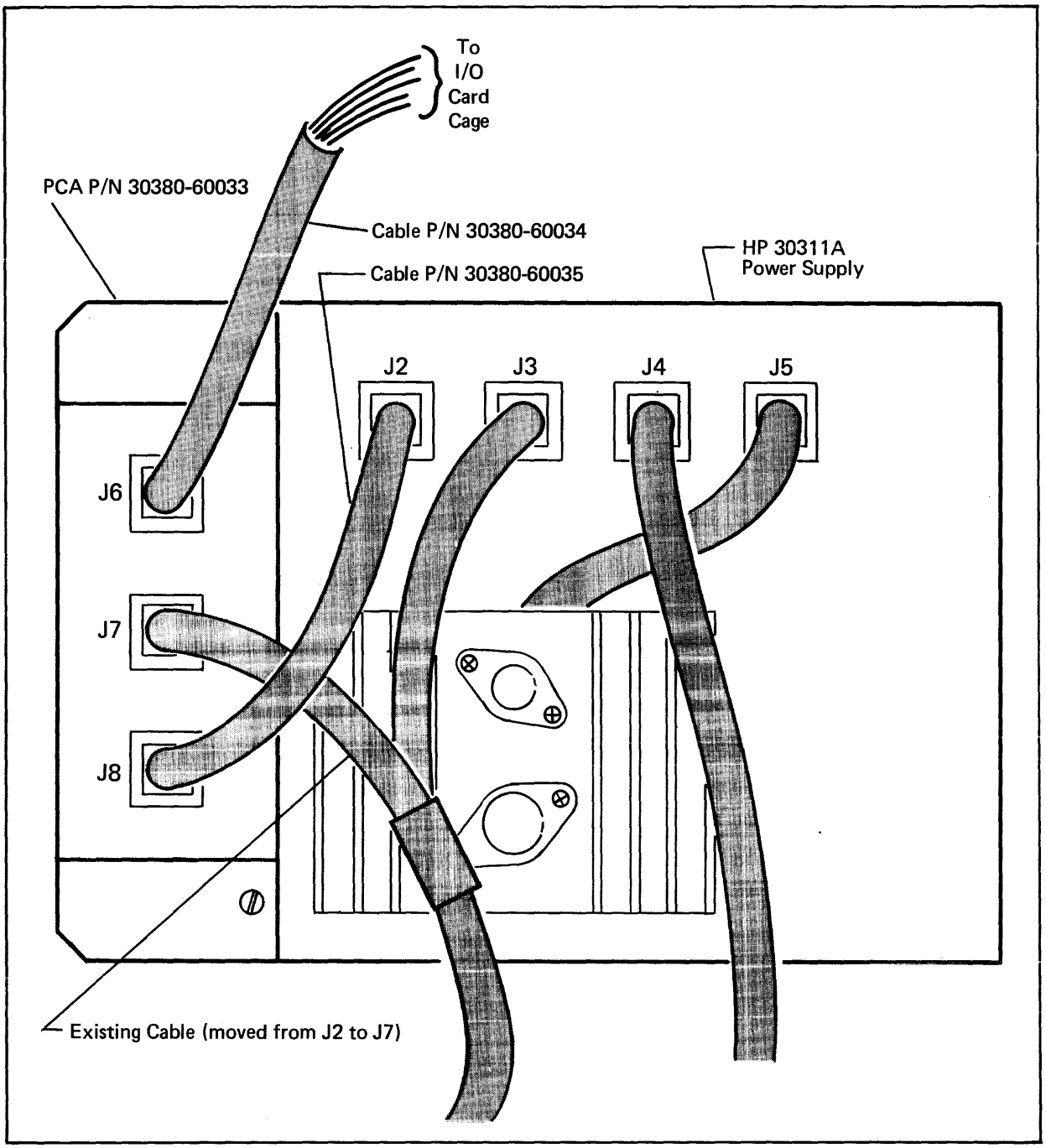

Figure 2-5. Memory Power Modification

e. Attach the I/O Memory Jumper Cable (part no. 30380-60035) to receptacle J2 on the power supply and receptacle J8 on the jumper board. (Note that the connectors on the jumper cable are labeled to match each connector to its mating receptacle.)

f. Attach the connector of the I/O Memory Power Cable (part no. 30380-60034) to receptacle J6 on the jumper board.

g. Route the power cable to the back of the I/O card cage containing the INP PCA boards (which you installed in step d of paragraph 2-7). Attach the spade lug connectors to the connector strip in the following sequence:

Wire Color Code	Screw Connector Identifier Label
White/grey/red	+12.7 B
White/violet/black	+12 B
Orange	+5 B
Black	↓ (ground)
White/grey	-5 B

2-9. Installation of the Communication Cables

Install the INP communication interconnecting cable assemblies as follows:

a. Connect the hood connector of the appropriate cable assembly to connectors J1 and J2 of the INP's DCI board (part no. 30010-60002). 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. If an INP-to-modem connection is being made, route the INP-to-modem interconnecting cable (which you already attached to the INP-DCI in step a) directly to the modem and plug the cable connector into the modem.

c. If a direct INP-to-INP connection is being made (bypassing all modems), connect the INP-to-INP direct-connect cable (which you already attached to the INP-DCI in step a) to the external interconnect cable (one of the HP 30224L-series of cables listed in table 1-1). The other end of the external interconnect cable connects to another INP-to-INP direct-connect cable for the remote computer in your data communications system.

d. 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 INP-to-SSLC direct-connect cable (which you already attached to the INP-DCI in step a) directly to the remote computer and connect it to the remote computer's modem interconnecting cable (completely bypassing all modems).

2-10. 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 PCA boards. 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.

2-11. INSTALLATION VERIFICATION

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

a. Turn on the power.

   On the HP 3000 Series II and the Model 32421A of the Series III, return the SYSTEM DC POWER switch and both MEMORY DC POWER switches to the ON position.

   On the HP 3000 Series III, Model 32435A, return both DC POWER switches (the LOGIC switch and the MEMORY switch) to the ENABLE position.

b. Power up the system in accordance with the HP 3000 Computer Systems Console Operator's Guide.

c. Press the red, spring-loaded RESTART switch on the edge of the INP-MPU board (figure 2-6) to manually initiate the self test.

d. Watch the self-test light-emitting-diode (LED) indicators (figure 2-6) as the self-test program goes through its cycle. Upon completion of the self test (approximately 2 seconds in duration), the LEDs will stop winking 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.

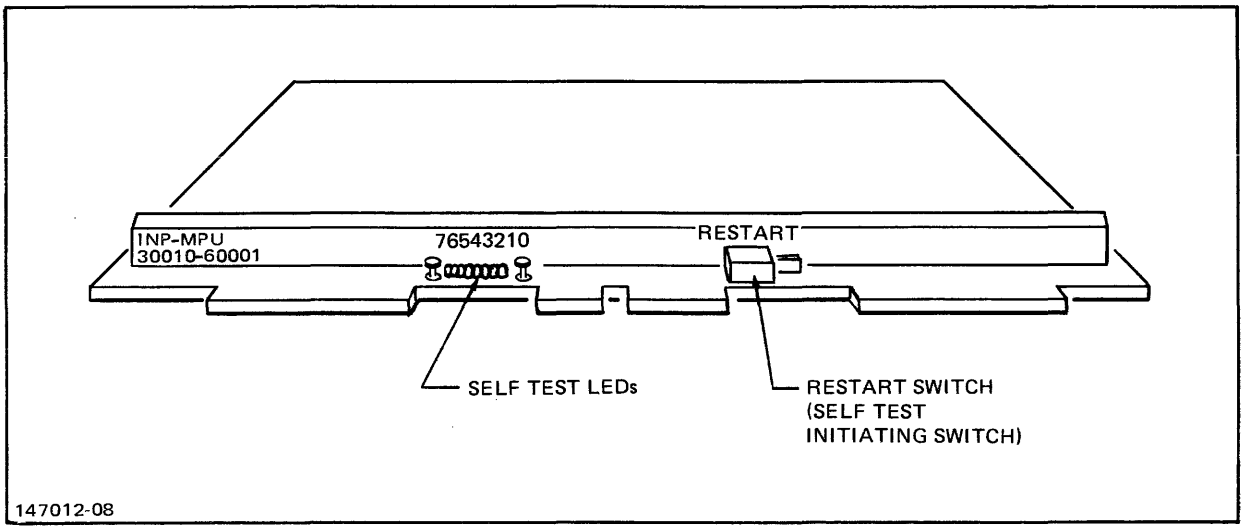

Figure 2-6. Self-test Switch and LED Indicators

2-12. MULTIPLE INP INSTALLATIONS

For additional data communication capability, more than one INP can be installed in the same HP 3000 Computer System. The maximum number of INPs that an HP 3000 can accomodate is seven. However, four INPs is the maximum number that can be connected to the original INP cabling from the HP 30311 power supply. Additional power supply cabling must be added for the fifth (and subsequent) INP(s).

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 pair of adjacent card slots within the specified range can be used, since the device sequence is determined by the setting of each INP's service request switches (see paragraph 2-5) rather than by the card slot it occupies.

PROGRAMMING INFORMATION

SECTION III

The HP 30010A Intelligent Network Processor (INP) is pre-programmed at the factory and requires no field programming for installation or operation. Furthermore, the use of the built-in self-test feature and the Diagnostic/Support Monitor (DSM) for verification testing and troubleshooting eliminates the need for field programming during these activities, as well.

PRINCIPLES OF OPERATION

SECTION IV

This section contains functional-level and system-level descriptions of the HP 30010A 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 Series II or Series III Computer System.

4-1. FUNCTIONAL DESCRIPTION

The HP 30010A 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

A block diagram of INP organization of the major functional areas is shown in figure 4-1. The solid interconnecting lines in the block diagram represent data paths while the broken lines indicate service request paths.

4-2. 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 fast instruction cycle time

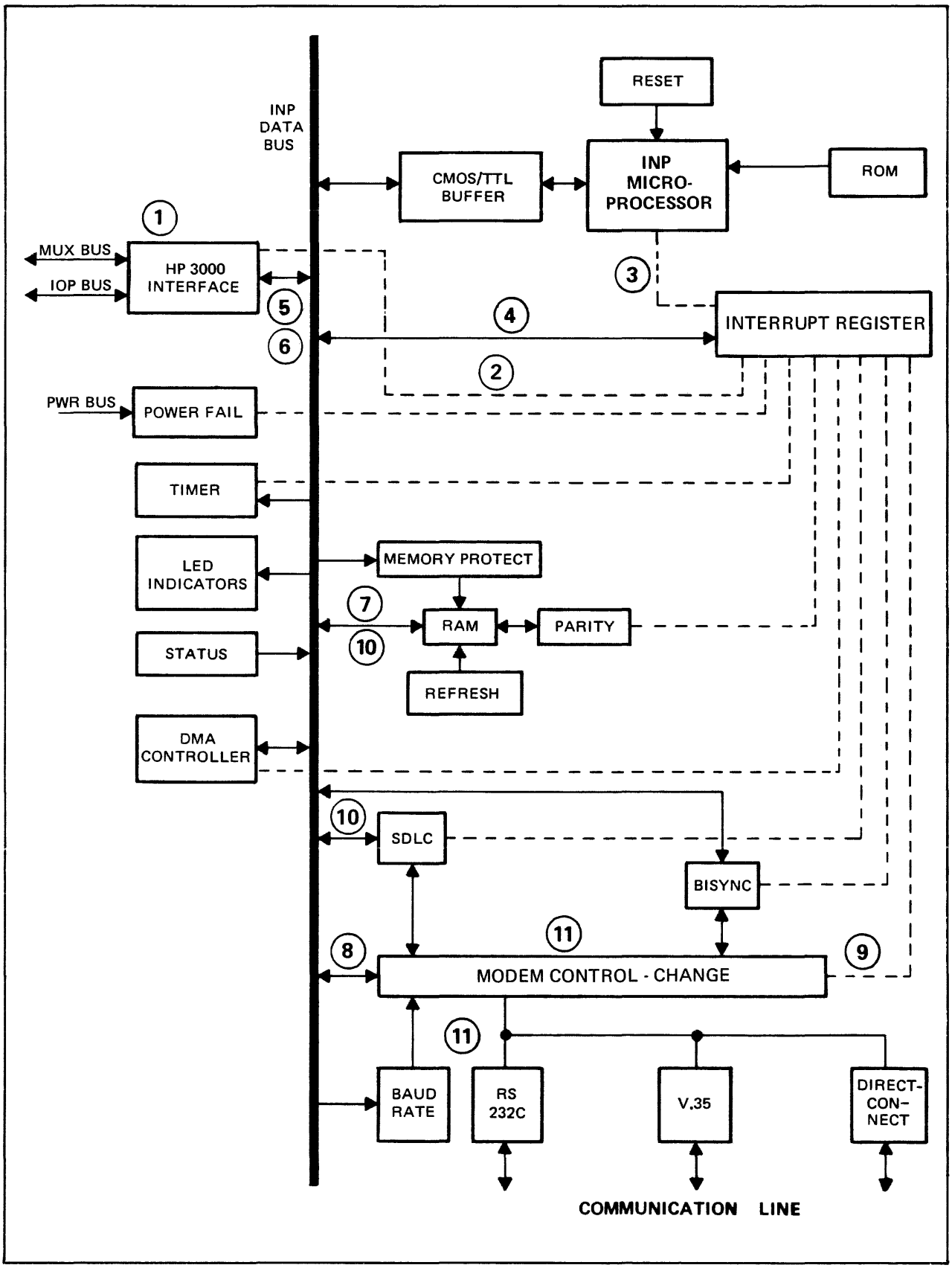

Figure 4-1. HP 30010A INP Block Diagram

requires the use of logic buffers that convert CMOS/SOS levels to the more conventional TTL signal levels. 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.

4-3. Read-Only Memory (ROM)

The INP has a 2K word, high-speed CMOS/SOS ROM. The ROM contains power-on and reset programs, functional diagnostics, loader/dumper routines, and RAM fault location code.

4-4. Random Access Memory (RAM)

The INP has 16K words of dynamic RAM that store 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".

4-5. 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 3000 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.

4-6. 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.

4-7. 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.

4-8. 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 4-1. The data paths and service request paths being referenced are identified in the diagram by circled numbers.

Initially, the HP 3000 has been powered up, and the previously attached communication line is not yet 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 MUX bus to the HP 3000 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 3000 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 3000 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 flows from the HP 3000 into memory are represented by (6) and (7) in figure 4-1. 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 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.

4-9. SYSTEM-LEVEL OPERATION

The following discussion demonstrates the functioning of an INP at the system level. A very basic DS/3000 example is given here, but INP usage with other data communications subsystems (such as RJE, MRJE, etc.) can easily be construed.

INP operation begins with the system operator opening the DSLINE (by means of the :DSCONTROL 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 V

This section contains general servicing information for the HP 30010A Intelligent Network Processor (INP). This information includes safety precautions, repair philosophy, maintenance aids, use of the self-test capability, troubleshooting, and field-level repair.

5-1. SAFETY PRECAUTIONS

Whenever the INP printed circuit assemblies (PCAs) are being installed or removed, ensure that the computer's SYSTEM DC POWER switch and both MEMORY DC POWER switches are set to the STANDBY position. (These switches are located inside of the main cabinet door, behind the register displays.)

Whenever an INP PCA is being connected or disconnected to a modem (by attaching or removing the INP-to-modem interconnecting cable), ensure that the SYSTEM DC POWER switch and both MEMORY DC POWER switches are set to the STANDBY position 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.

5-2. REPAIR PHILOSOPHY

Field repair of an 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 PCAs, remove

them from the system and prepare them for reshipment to Hewlett-Packard in accordance with the instructions in paragraph 5-19. When troubleshooting procedures have verified a RAM malfunction, remove the INP-MCU PCA from the system and replace the defective RAM chip as described in paragraph 5-17.

5-3. 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 (DSM)
- 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 5-4.

The Diagnostic/Support Monitor (DSM) is available for on-line diagnostic support purposes. 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 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, the utility program ,CSDUMP 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.

5-4. 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-MPU 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:

- Basic Instruction Set Test
- ROM Test
- Timer Interrupt Test
- RAM 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-MPU board, near the self-test initiating RESTART switch, as shown in figure 5-1) wink on and off during the test cycle (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 5-1 (under "Troubleshooting") shows the meanings of various LED patterns.

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

5-5. Basic Instruction Set Test

The first portion of the self-test program is a basic instruction set test. Most of the INP microprocessor's instructions are tested. LED 7 is lighted before the start of the test. If the test is successful, LED 7 is extinguished and LED 6 is lighted. If the test fails, LED 7 remains lighted.

5-6. 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. LED indicator 6 is lighted at the start of this test. If the test is successful, LED indicators 5 and 6 are lighted. If the test fails, indicator 6 stays lit.

5-7. 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. At the start of the test, LEDs 5 and 6 are lighted. At the successful completion of the test, LED 3 is lighted and LEDs 5 and 6 are turned off. If the test fails, LEDs 5 and 6 are left on.

5-8. 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. LED indicator 3 is lighted at the start of the test. If the test is successful, LED indicator 4 is lighted and indicator 3 is turned off. If it fails, LED indicator 3 stays lit.

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.

5-9. Chip Tests

The fifth portion of the self-test program performs tests on the remaining portions of the PCA boards, namely the communication chips and the I/O controllers. LED indicator 4 is lighted at the start of these tests. As each individual test in this group is completed, the LEDs are incremented. If all of the tests are successful, LEDs 0 and 7 are lighted. If any one fails, the tests are not halted, but the appropriate LEDs are lighted.

5-10. 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. At the successful completion of this test, LED indicator 5 is lighted.

5-11. 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. At the successful completion of this test, LED indicator 5 is turned off. If it fails, LED indicator 5 is left on.

5-12. TROUBLESHOOTING

5-13. 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 5-4 through 5-11. (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.

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 / 30020A 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.)

The self test checks most of the circuitry of both INP PCA boards. If, upon completion of the self test, the self-test LED indicator lights (figure 5-1) are displaying 0 and 7 (only the two lights at each end are lighted), there is no detectable hardware malfunction within the INP PCA boards. 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).

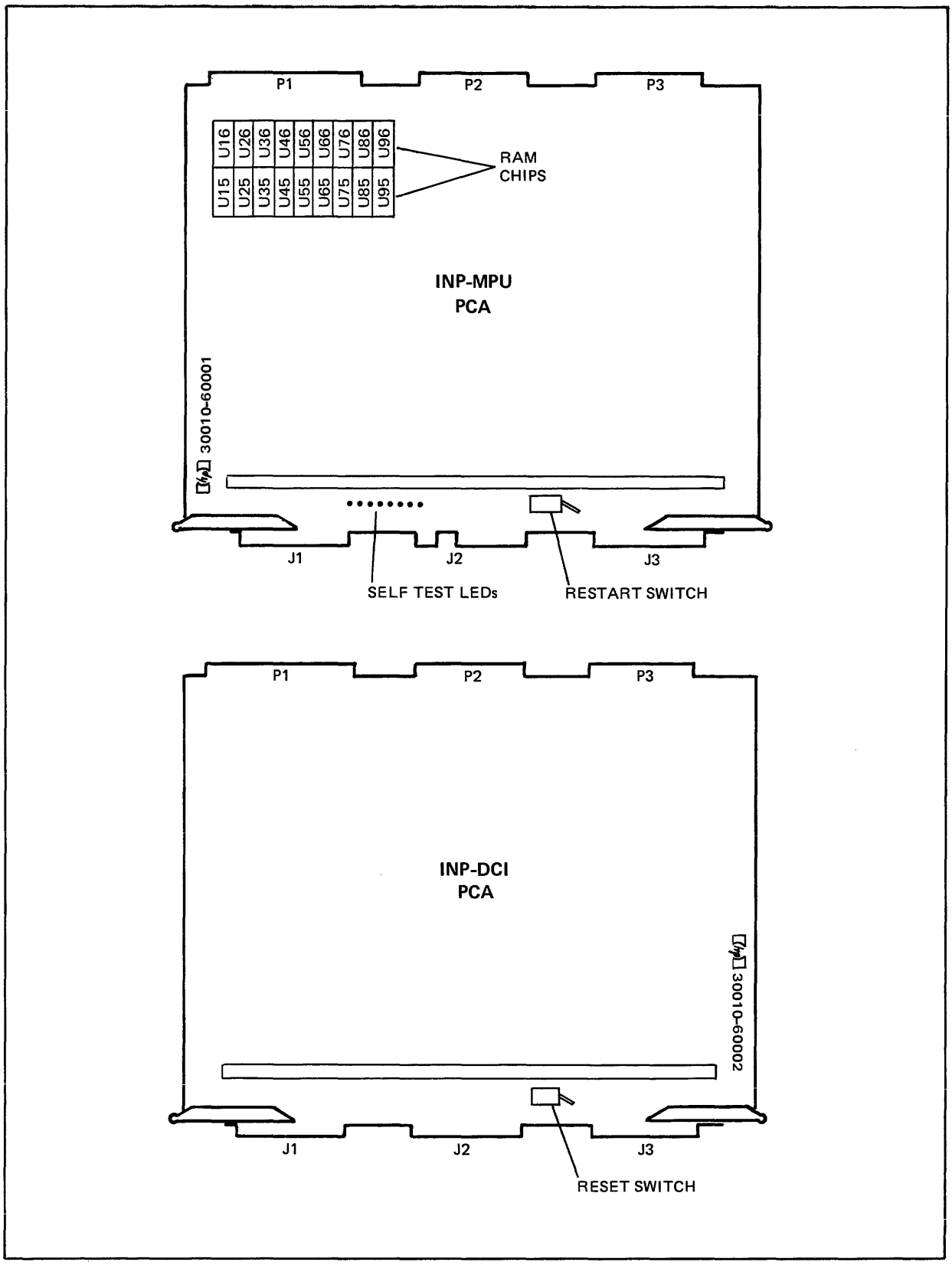

Figure 5-1. Location of Pertinent Components on INP PCAs

5-14. 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 boards, field repair of the boards is limited to the replacement of the Random Access Memory (RAM) chips. Any other malfunction must be remedied on an exchange basis. (See paragraph 5-2, "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 5-1 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 5-1) to initiate the self test.

e. Observe the INP self-test LEDs. (Refer to table 5-1 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 5-2. (If LED 3 is not lighted, skip steps g through h and go directly to step i.)

Table 5-1. 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
O	O	O	O	*		*	*	RAM Test
*	*					*	*	RAM Test Parity Error
	*	*				*	*	Timer Interrupt Test
*		*	*			*	*	BISYNC and SDLC Tests w/DMA

Legend:

* = LED lighted

O = When lighted, the coded pattern signifies which chip (bit) has failed (see table 5-2)

Table 5-2. Identifying Defective RAM Data Chips

LED Display 7 6 5 4	Bit No.	Defective RAM Chip
0 0 0 0	0	U15
0 0 0 1	1	U25
0 0 1 0	2	U35
0 0 1 1	3	U45
0 1 0 0	4	U55
0 1 0 1	5	U65
0 1 1 0	6	U75
0 1 1 1	7	U85
1 0 0 0	8	U16
1 0 0 1	9	U26
1 0 1 0	10	U36
1 0 1 1	11	U46
1 1 0 0	12	U56
1 1 0 1	13	U66
1 1 1 0	14	U76
1 1 1 1	15	U86

Legend:

1 = LED lighted

0 = LED off

g. Replace the RAM chip that was identified in table 5-2 as being defective. (See paragraph 5-17, "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 (U95 and U96). (See paragraph 5-17, "Field Replacement of a RAM Chip".)

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 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 both INP PCA boards (part no. 30010-60001 and 30010-60002). (See paragraph 5-18, "Replacement of the PCA Boards".)

NOTE

When sending PCA boards to the factory for replacement, refer to paragraph 5-19, "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.)

5-15. Off-board Loopback Testing

When support-user diagnostic testing is required beyond the physical limits of the INP PCA boards, 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 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:

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. Connect the modem cable to the modem. Configure the computer and modem for normal operation, but 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.

5-16. FIELD REPAIR

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

5-17. Field Replacement of a RAM Chip

The Random Access Memory (RAM) chips are the only components on either of the INP PCA boards that are field replaceable. (See figure 5-1 for their location on the board.) If troubleshooting procedures (such as use of the self test) indicate that a RAM is faulty, replace it as follows:

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

b. Turn off the power.

   On the HP 3000 Series II and the Model 32421A of the Series III, set the SYSTEM DC POWER switch and both MEMORY DC POWER switches to the STANDBY position. (These three switches are located inside of the main cabinet front door, behind the register displays, as shown in figure 2-2.)

   On the HP 3000 Series III, Model 32435A, set both DC POWER switches (the LOGIC switch and the MEMORY switch) to the DISABLE position. (These switches are located inside of the main cabinet front door, as shown in figure 2-3.)

CAUTION

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

c. Disconnect the ribbon cable from the INP PCA boards.

d. Remove the INP-MPU PCA board (part no. 30010-60001) from the card cage.

e. With the INP-MPU 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 MPU PCA board in the computer card cage, using the procedure described under "Installation of the INP PCAs" in Section II, Installation.

i. Verify that the INP is now working properly as described under "Installation Verification" in Section II, Installation.

5-18. Replacement of the PCA Boards

When the troubleshooting procedures outlined in paragraph 5-14 indicate the need for replacement of the INP PCA boards, proceed as follows:

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

b. Turn off the power.

On the HP 3000 Series II and the Model 32421A of the Series III, set the SYSTEM DC POWER switch and both MEMORY DC POWER switches to the STANDBY position. (These three switches are located inside of the main cabinet front door, behind the register displays, as shown in figure 2-2.)

On the HP 3000 Series III, Model 32435A, set both DC POWER switches (the LOGIC switch and the MEMORY switch) to the DISABLE position. (These switches are located inside of the main cabinet front door, as shown in figure 2-3.)

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 connectors from the edges of the INP PCA boards.

d. Remove both the MPU PCA board (part no. 30010-60001) and the DCI PCA board (part no. 30010-60002) from their respective slots in the computer card cage.

NOTE

When a PCA board replacement is required to correct an INP malfunction, both boards must be replaced as a matched set.

e. Install the factory replacement INP PCA boards in the same slots in the computer card cage, using the procedure described under "Installation of the INP PCAs" in Section II, Installation.

f. Verify that the INP is now working properly as described under "Installation Verification" in Section II, Installation.

5-19. RESHIPMENT INSTRUCTIONS

If the INP PCA boards 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 (200pound test material). Seal the carton securely and mark it FRAGILE to ensure careful handling.

MUX SERVICE REQUEST PRIORITIES

APPENDIX A

The following table shows the recommended sequence of Multiplexor Channel (MUX) service request priorities for a typical HP 3000 Series II or Series III Computer System.

Device Name	HP Product No.	Service Request No.	
HP 2888 Disk	30102A	0	(Highest Priority)
HP 7900 Disk	30110A	1	
HP 2660 Disk	30103A	2	
HP 7970 Magnetic Tape Unit	30215A	3	
Hardwired Serial Interface (HSI)	30360A	4	
Card Reader	30106/7A	5	
Synchronous Single Line Controller (SSLC)	30055A	6	
Intelligent Network Processor (INP)	30010A	7	
Intelligent Network Processor (INP)	30010A	8	
Plotter	30126A	9	
Paper Tape Punch	30105A	10	
Programmable Controller	30300/1A	11	
Line Printer	(All)	12	
Card Punch	30112A	13	
Paper Tape Reader	30104A	14	
Card Reader/Punch	30119A	15	(Lowest Priority)

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 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
```

CONFIGURING MPE

APPENDIX C

This appendix briefly describes how to configure the MPE Operating System to include the HP 30010A Intelligent Network Processor (INP).

CONFIGURATION OVERVIEW

The programs and intrinsics that comprise your data communications subsystems (such as DS/3000, RJE/3000, 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-MPU board (step b of paragraph 2-5, "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 DS/3000, RJE/3000, MRJE/3000, or IML/3000 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
3.1	I/O CONFIGURATION CHANGES? YES
3.2	LIST I/O DEVICES? YES or NO
3.3	LIST CS DEVICES? YES or NO
3.4	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.

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

Step No. **Prompt and Response**

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 3.80.

3.6 DRT #?

0 Removes the device specified in the previous prompt from the current MPE configuration.

xx Enters the hardware DRT number for the INP.

3.7 UNIT #? 0

3.8 SOFTWARE CHANNEL #? 0

3.9 TYPE? 17

3.10 SUBTYPE?

1	(IML/3000)
0 or 1	(RJE/3000 and MRJE/3000)
0, 1, or 3	(DS/3000)

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

(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.)

3.17 RECEIVE TIMEOUT? (20-second default)

0-32000 or return	(DS/3000 and RJE/3000)
return	(MRJE/3000 and IML/3000 override this option)

3.18 LOCAL TIMEOUT? (60-second default)

0-32000 or return	(DS/3000 and RJE/3000)
return	(MRJE/3000 and IML/3000 override this option)

3.19 CONNECT TIMEOUT? (900-second default)

0-32000 or return	(DS/3000 and RJE/3000)
return	(MRJE/3000 and IML/3000 override this option)

Step No.	Prompt and Response	
Prompts 3.20 through 3.22 specified in prompt 3.10.	appear only when subtype 0 was	(DS/3000, RJE/3000, and MRJE/3000)
3.20	DIAL FACILITY?	
	YES or NO	(DS/3000 and RJE/3000)
	return	(MRJE/3000 overrides this option)
3.21	ANSWER FACILITY?	
	YES or NO	(DS/3000 and RJE/3000)
	return	(MRJE/3000 overrides this option)
3.22	AUTOMATIC ANSWER?	
	YES or NO	(DS/3000 and RJE/3000)
	return	(MRJE/3000 overrides this option)
3.23	DUAL SPEED?	
	YES or NO	(DS/3000, RJE/3000, and MRJE/3000)
		(IML/3000, dual-speed modems are not supported; response not used)
3.24	HALF SPEED?	
	YES or NO	(Asked only if your response to prompt 3.23 was YES)
3.25	SPEED CHANGEABLE?	
	YES or NO	(DS/3000, RJE/3000, and MRJE/3000)
		(IML/3000 overrides this option)
3.26	TRANSMISSION SPEED?	(in characters per second)
	250, 300, 600, 1200, 2400, 3600, 4800, or 7000	(DS/3000)
	250, 300, 600, or 1200	(RJE/3000 and MRJE/3000)
		(IML/3000 overrides this option)

(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.)

Step No.	Prompt and Response	
3.27	TRANSMISSION MODE?	
	0	(IML/3000)
	0 or 1	(DS/3000, RJE/3000, and MRJE/3000)
	0 = Full Duplex; 1 = Half Duplex	
	(Note: Subtype 3 requires full duplex, except when the INP is hardwired to an SSLC. For hardwired INP-to-SSLC, always configure both devices as Subtype 1 and Transmission Mode 1.)	
3.28	PREFERRED BUFFER SIZE? (in words)	
	0-1024	(DS/3000 -- 1024 recommended)
		(MRJE/3000 ignores your response)
		(RJE/3000 and IML/3000 override this option)
3.29	DRIVER CHANGEABLE? NO	
3.30	DRIVER OPTIONS? 0	
3.50	DRIVER NAME? IOINP0	
Prompts 3.52 through 3.55 appear only when subtype 0 has been specified.		(DS/3000, RJE/3000, and MRJE/3000)
3.52	PHONELIST?	
	YES or NO	(DS/3000 and RJE/3000)
	return	(MRJE/3000)
3.53	PHONE NUMBER? telephone number or return	(Asked only if your response to 3.52 was YES.)
3.54	LOCAL ID SEQUENCE? id sequence or return	
		(MRJE/3000 ignores your response)
3.55	REMOTE ID SEQUENCE? id sequence or return	
		(MRJE/3000 ignores your response)

Step No. **Prompt and Response**

3.70 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.

(RJE/3000 requires the device class name RJLINE. Additional class names are optional.)

(MRJE/3000 ignores your response)

The dialogue now prints the LOGICAL DEVICE #? prompt described in step 3.5. If all I/O configuration is complete, press RETURN and the dialogue continues at step 3.80. Otherwise, enter a logical device number, and repeat the configuration procedure from step 3.5.

3.80 MAX # OF OPENED SPOOLFILES = xxx ? return

3.81 LIST I/O DEVICES? YES

3.82 LIST CS DEVICES? YES

3.83 CLASS CHANGES? return

3.93 LIST I/O DEVICES? return

You receive the prompt in step 3.94 only if a communications device is currently configured in your system, or if additional drivers exist.

3.94 ADDITIONAL DRIVER CHANGES? return

4. SYSTEM TABLE CHANGES? return

5. MISC CONFIGURATION CHANGES? return

6. LOGGING CHANGES? return

7. DISC ALLOCATION CHANGES? return

8. SCHEDULING CHANGES? return

Step No.	Prompt and Response

9. SEGMENT LIMIT CHANGES? return

10. SYSTEM PROGRAM CHANGES? return

11. SYSTEM SL CHANGES? return

12. 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).

12.01 ENTER DUMP FILE SUBSETS? return

12.1 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.

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HP 30010A
Intelligent Network Processor (INP)
Installation and Service Manual
30010-90001 Jun 1980

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Is this manual technically accurate?	Yes ☐ No ☐	(If no, explain under Comments, below.)
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