OPERATION MANUAL

Codex 6040 Series
Intelligent Network Processor

codex
corporation

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DOCUMENTATION UPDATE

An addendum at the end of this manual describes the new type of power supply assemblies currently being shipped with 6000 Series INP's. This information reflects changes in paragraphs 3.4 and 3.5 of this manual.

PROPRIETARY MATERIAL

This document is for information purposes only and is subject to change without notice.

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

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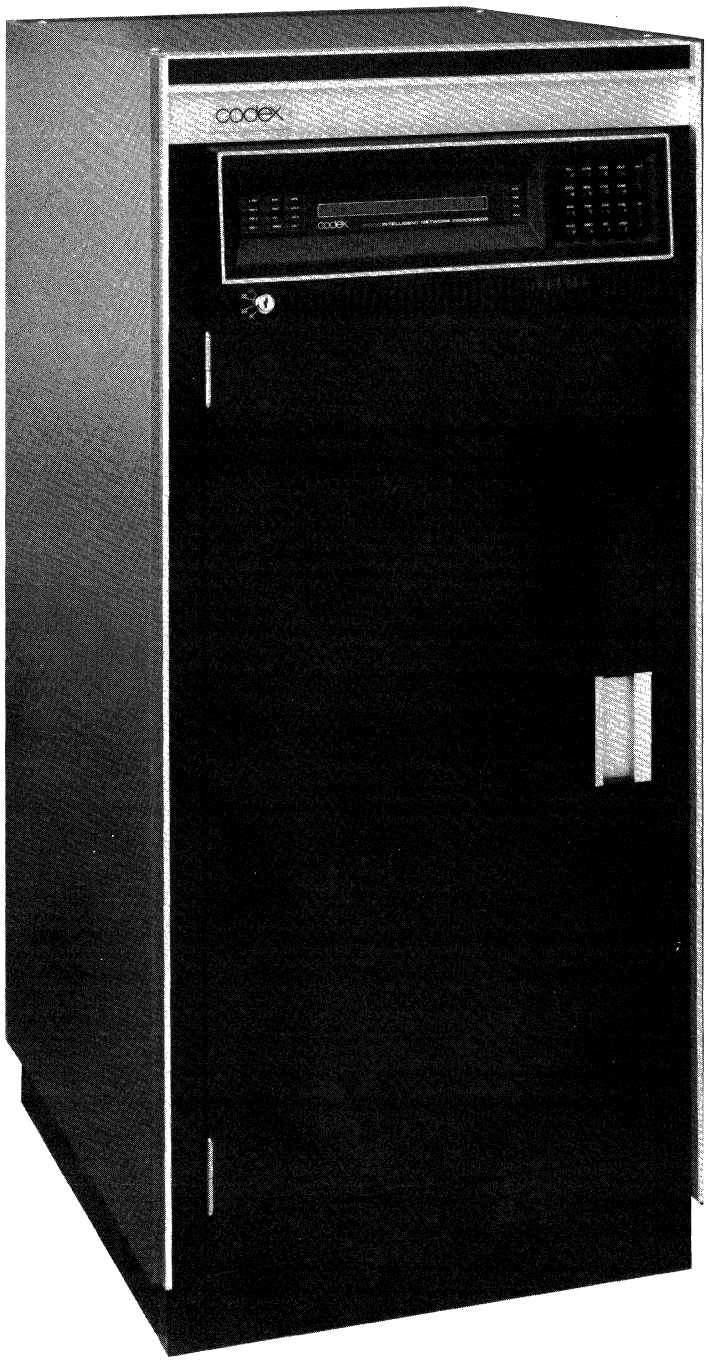


Figure 1-1. Codex Intelligent Network Processor

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW OF THE 6040 SERIES INP

The 6040 Series (hereafter referred to as the 6040) Intelligent Network Processor (INP)^{TM} shown in Figure 1-1 is a multi-microprocessor communications network controller. Essentially, the INP is a transparent communications system which can provide a point-to-point connection between any two ports in a multi-node network. It makes use of statistical multiplexing and data compression to provide high bandwidth utilization on the network links. It guarantees error-free data between nodes by using a go-back-n ARQ scheme.

The INP also provides many other features, including:

- Autospeed recognition
- Statistics on network operation
- Real-time monitoring of critical functions and parameters
- Network control from either a control panel or a control terminal port
- Data compression
- Off-line diagnostics of hardware functions

Table 1-1 lists the main features of all models of the 6040 INP's. The options available with the 6040 INP's are listed in Appendix B.

A 6040 Series INP operates in a multinode network that is typified in Figure 1-2. At each node the 6040 appears as a data communication equipment (DCE). Thus configured, the INP will pass both data and control signals transparently.

Data is received from the local terminals, processed within the node, and assembled into a message frame which is transmitted via the communications link to the adjacent node. This node receives the frame, disassembles it, verifies error-free transmission, and outputs the data to the destination terminal ports or central process unit (CPU).

TABLE 1-1. FEATURES OF 6040 SERIES INP's

Model	Feature
6041	Basic 6000 Intelligent Network Processor, rack-mountable with one port nest. Includes buffer RAM and nonvolatile configuration memory for up to 24 ports (12 modules).
6042	Basic 6000 Intelligent Network Processor, rack-mountable with two port nests. Includes buffer RAM and nonvolatile configuration memory for up to 56 ports (28 port modules).
6043	Basic 6000 Intelligent Network Processor, rack-mountable with three port nests. Includes buffer RAM and nonvolatile configuration memory for up to 88 ports (44 port modules).
6044	Basic 6000 Intelligent Network Processor, rack-mountable with four port nests. Includes buffer RAM and nonvolatile configuration memory for up to 120 ports (60 port modules).
6045	Basic 6000 Intelligent Network Processor, rack-mountable with five port nests. Includes buffer RAM and nonvolatile configuration memory for up to 152 ports (76 port modules).
6046	Basic 6000 Intelligent Network Processor, rack-mountable with six port nests. Includes buffer RAM and nonvolatile configuration memory for up to 184 ports (92 port modules).
6047	Basic 6000 Intelligent Network Processor, rack-mountable with seven port nests. Includes buffer RAM and nonvolatile configuration memory for up to 216 ports (108 port modules).
6048	Basic 6000 Intelligent Network Processor, rack-mountable with eight port nests. Includes buffer RAM and nonvolatile configuration memory for up to 248 ports (124 port modules).

In a 6040, some of the data from frame may be processed and reassembled into another frame at an intermediate node for retransmission to a third node via a different network link.

Like a time division multiplexer (TDM), the INP provides user transparency: that is, the remote terminal and the CPU of the host computer communicate with each other "directly," ust as though INP's were not present. End-to-end delay is minimal. Use of a 6040 INP does not require modifying either hardware or software of the user's existing system.

1.2 NETWORK CONFIGURATION

The logical communication paths between terminals constitute the network topology. This topology is retained in a nonvolatile configuration memory (CMEM)

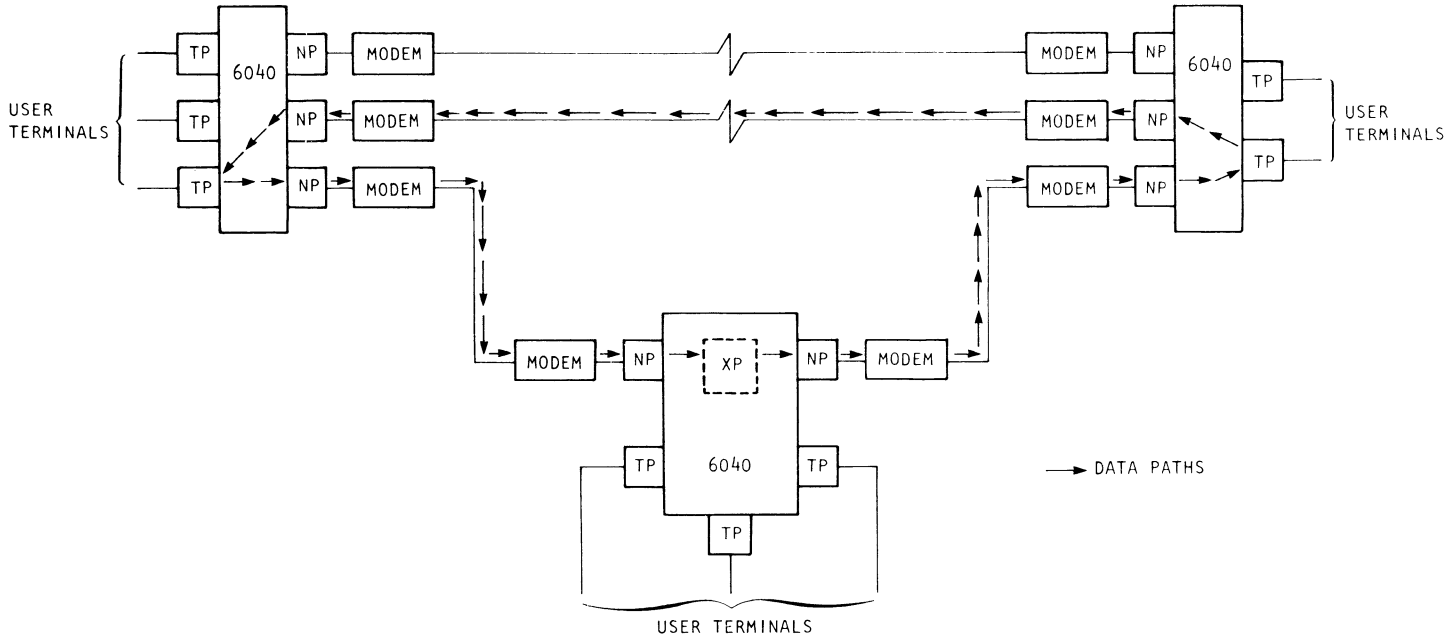


Figure 1-2. Codex 6040 Multinode System Configuration

on the option module. The topology is defined by programming (loading) the memory via an operator's console or a control terminal port (CTP).

The parameters defining the network topology include:

- Port characteristics (type, speed, code type, data bits, etc.);
- Transmit path parameters (adjacent node number, adjacent port number, slot weight); and
- Receive path parameters (adjacent node number, adjacent port number).

The BOOT n command causes the specified off-line configuration (where n = the number of the off-line memory) to be copied to C0 (the active or on-line memory from which the equipment operates). In addition to the C1 standard memory, a 6040 may have up to three additional configurations (C2, C3, and C4) as options (see Figure 1-3). C5 and C6 are standard and cannot be altered.

An alternate system network configuration (C2) may be desirable; for example, in applications where the network is used for interactive terminals during the day and for batch operations at night. To change from day to night mode of operation, the operator would only be required to issue the command BOOT 2.

Other uses for C2 include applications where it is desirable to retain one network configuration (C2) to use in making temporary changes. The quantity of C2 (Option 66122) does not have to agree with the size of C1. For example, C1 may be large enough to support 60 terminals, but C2 might support only 28 terminals.

The 6040 permits the system operator to alter most node and port network configuration parameters in the active configuration via the operator console. Changes made to parameters in the on-line configuration, which is contained in RAM, are automatically entered into the last booted configuration.

1.2.1 BOOTING THE SYSTEM

In the event of a power failure, a boot of the last running configuration is automatically issued upon restoral. There are two additional BOOT commands which can be issued. BOOT 5 loads a null system configured with only network ports in full-duplex mode. BOOT 6 loads a diagnostic system that has only network ports configured in loopback mode. These provide tests of limited configurations that verify proper operation of those configurations.

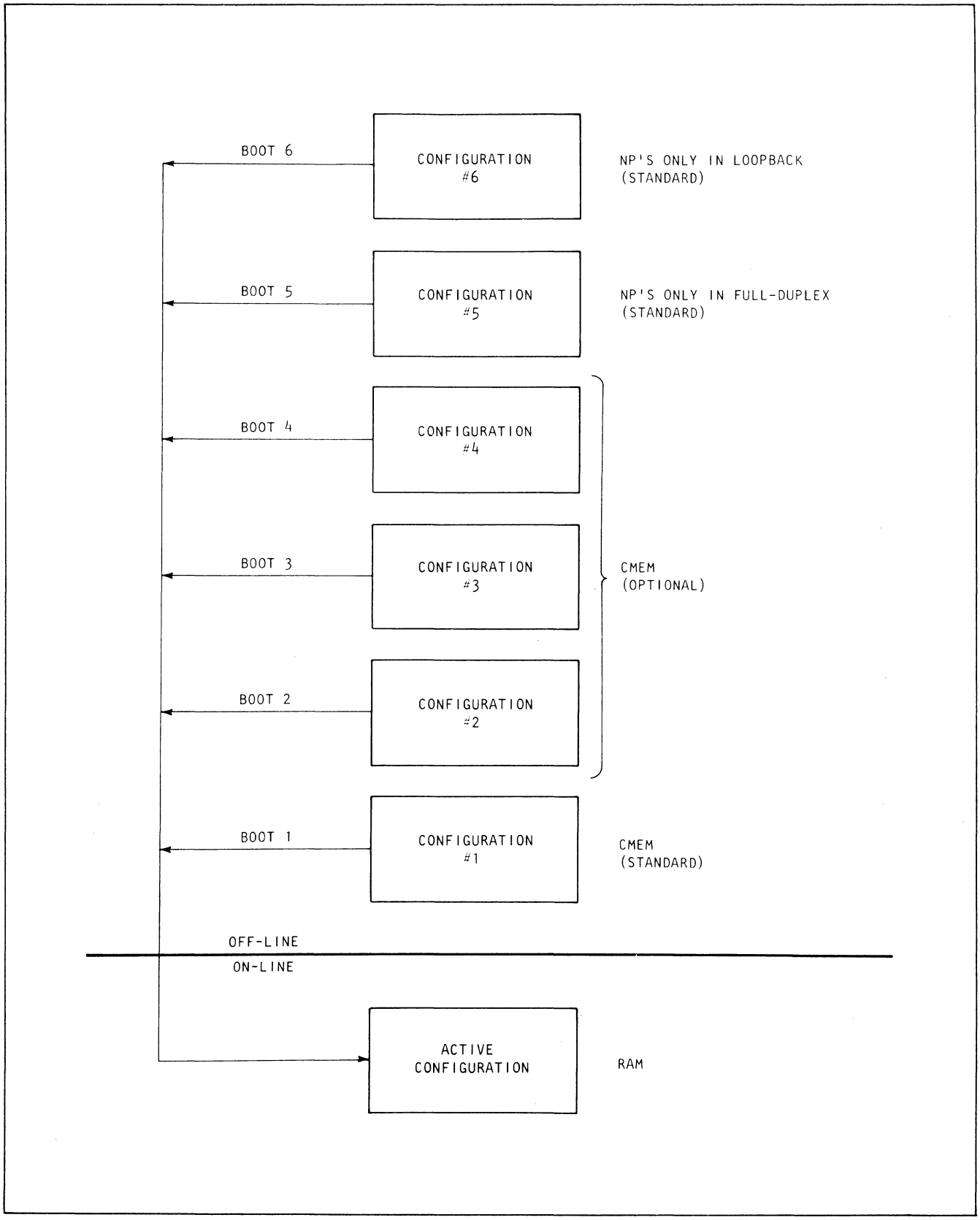


Figure 1-3. Configuration Control

1.2.2 POWER-UP STATE

In order to prevent unexpected reboots from new nodes which power-up in an operational 6000 network, these nodes will power-up with C5 active. When the power-up boot is complete, the new node will send a system message to all nodes in the network announcing its presence.

If the new node is to be added to the network, it is the responsibility of the network operator to reboot the network explicitly to a configuration which includes the new node.

1.3 TYPICAL NETWORKS

A 6040 may be used in a great variety of networks. An example of a multinode terminal port transmit/receive path has already been shown in Figure 1-2.

In Figure 1-4, a typical ring network topology is shown. In this example, two CPU's exist. Data sources at remote nodes 3 and 4 require access to CPU's at nodes 1 and 2. In addition, there is a requirement for communications paths from node 3 and 4.

Traffic from node 3 to 2 is routed through an intermediate node (1 or 4). This is accomplished with the use of a logical path, internal to the 6040, and referred to as a transfer port. A transfer port is unidirectional, thus providing independent transmit and receive paths that may be routed via physically different high-speed links.

Figure 1-5 illustrates a typical star structure with 6030's and 6040's to statistically multiplex data between asynchronous and BSC synchronous devices and a host processing system. Data originating at a remote device is passed to the 6000 to which it is attached, statistically multiplexed with other data, and transmitted to the host 6040 via a high-speed link. At the host site, the 6040 demultiplexes all data streams and routes data from the individual sources to the appropriate ports on the CCU. In this example, a 6040 was selected for node 3 to provide two high-speed links required for a total higher node-to-node transmission capacity.

A combination ring/star network, also called a fully-distributed network, is illustrated in Figure 1-6. This type of structure permits direct communication between any two nodes as well as through intermediate nodes.

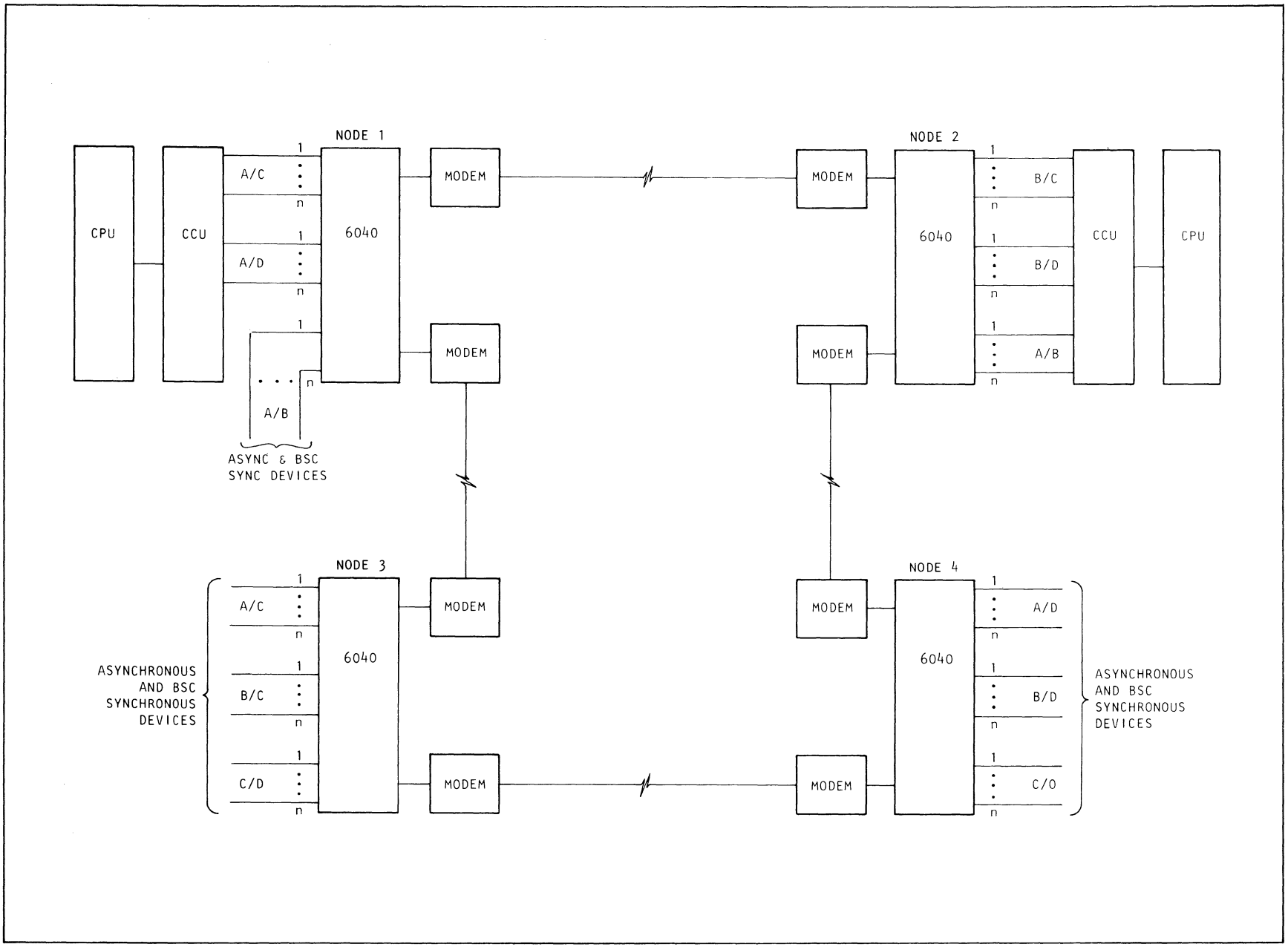


Figure 1-4. Typical Ring Network

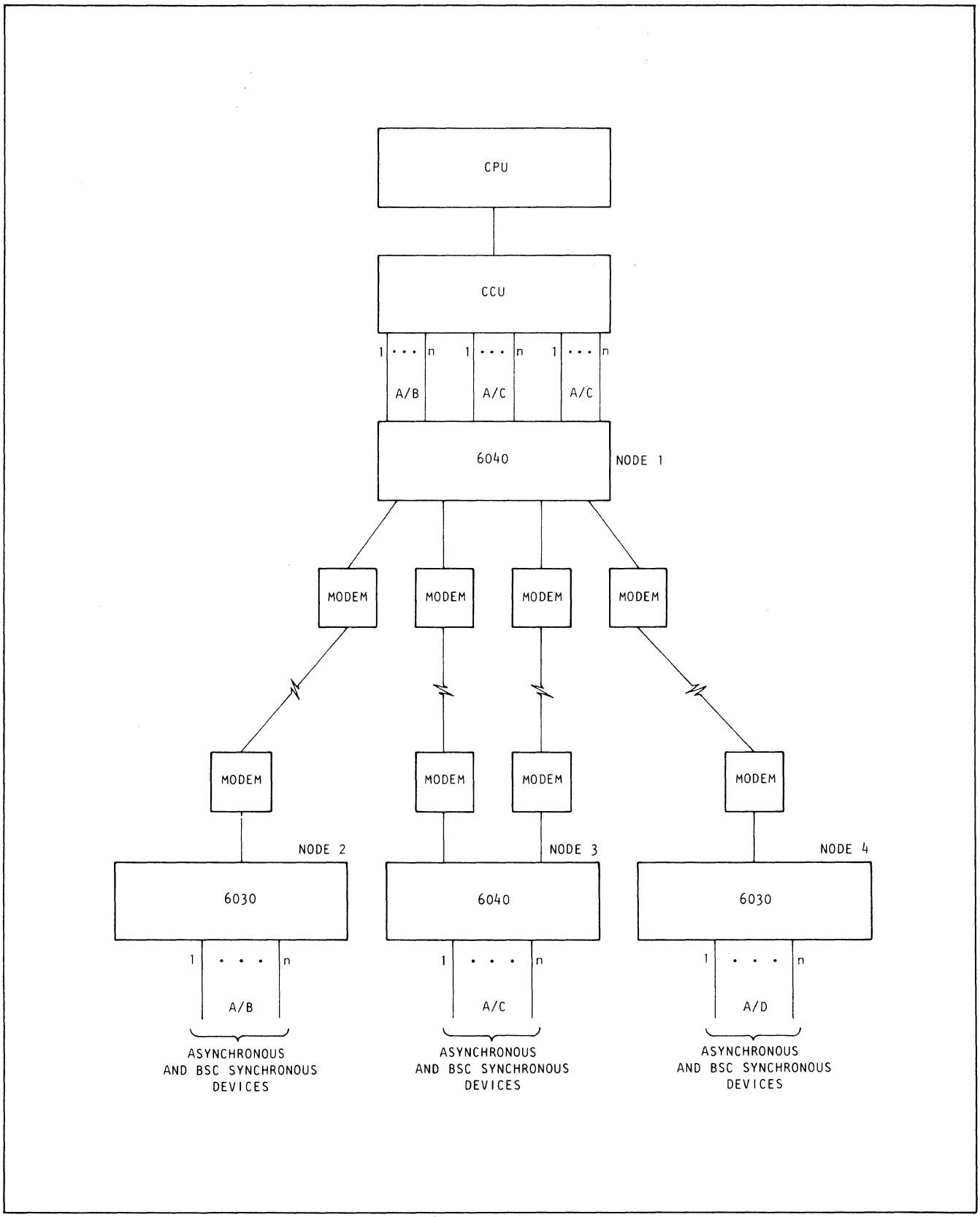


Figure 1-5. Typical Star Network

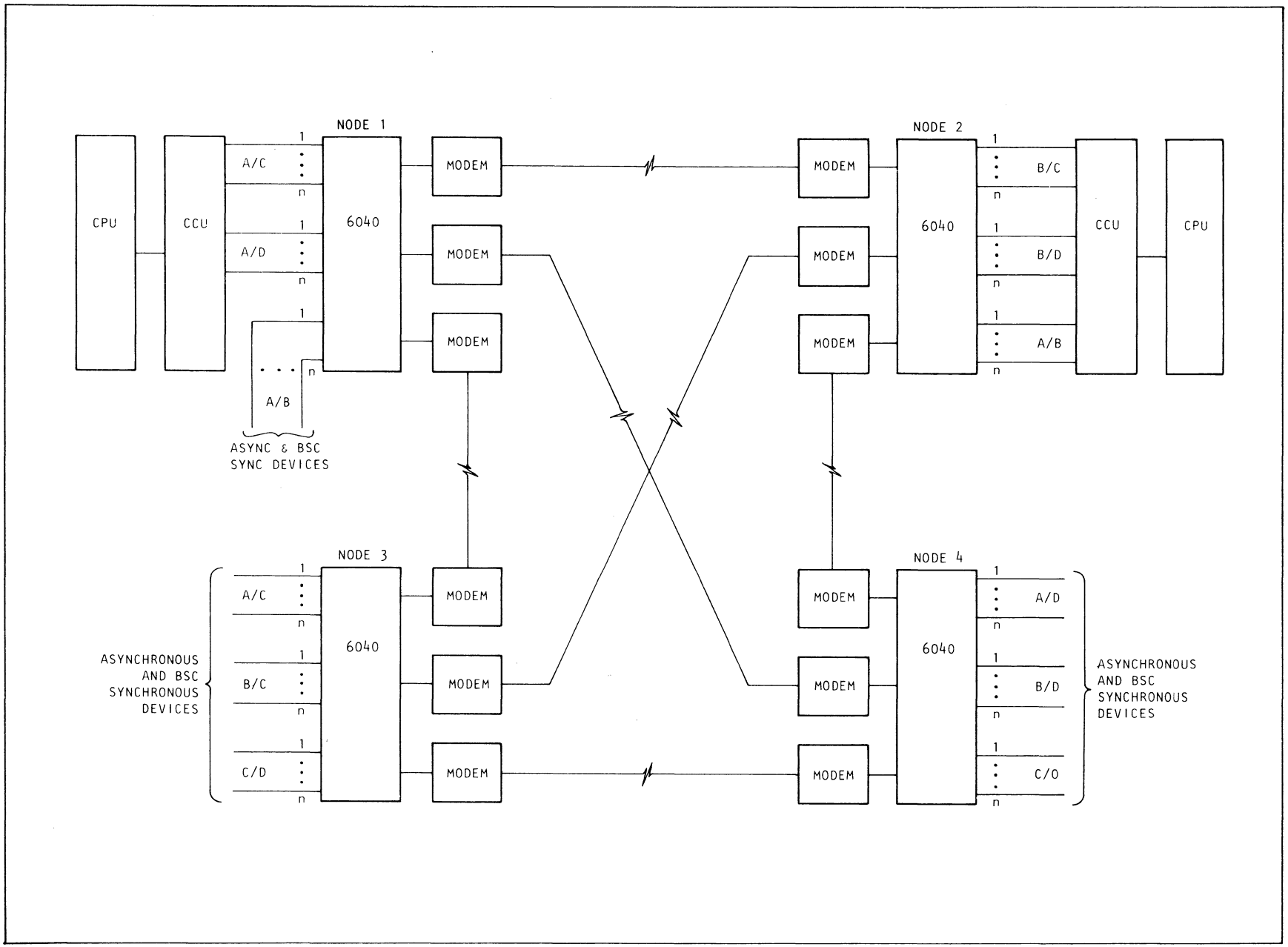


Figure 1-6. Combination Ring/Star Network

1.3.1 TRANSFER PORTS

A transfer port is a software option that sends data to a nonadjacent destination node via an adjacent intermediate node. It passes data through the intermediate node without processing. By not processing the data at the intermediate node, it reduces processor loading and throughput delay. The data is forwarded to the destination, and if the return path is through the same intermediate node, a second transfer port is used since transfer ports are unidirectional.

1.4 FEATURES OF 6040 INP's

Salient physical and functional features of all models of 6040 INP's are listed and described in Table 1-1.

What distinguishes the INP from a conventional TDM is its ability to provide higher throughput efficiency and error-free data transmission. The primary method used to achieve high throughput efficiency is statistical multiplexing. A typical TDM allocates a fixed portion of the high-speed link's time to each port. If there is no data for this port to send, its portion of the time is unused. In contrast, the INP allocates the time dynamically. If a particular port has no data to transmit, a short place-holding character is sent for it and its used time is assigned to the next port that does have data.

A second method that achieves throughput efficiency is data compression. To minimize the number of bits to be transmitted over a data link, the data is compressed by use of variable-length codes for characters and by bit-stripping.

Variable-length coding offers a significant improvement in compression. Short codes, 3 bits for example, are used to represent frequently-used characters such as e, t, and space, and longer codes up to 14 bits for the less frequent characters such as z and @. The substitution of variable length codes reduces the average bit lengths of received characters by about 30 percent. This method of data compression was developed in 1952 by D.A. Huffman.

Bit-stripping is the method commonly used by multiplexers. It consists of removing overhead information: start, stop, and parity bits from asynchronous data, and the idle and filler bits from BSC data.

Code conversion of specified code sets may be feasible as a result of the data compression. Since the data must be converted back from its variable length

code set to a fixed-length character code, the conversion may be performed by providing a table to be used for decoding into the new character set.

1.5 SPECIFICATIONS AND PHYSICAL CHARACTERISTICS

1.5.1 PERFORMANCE SPECIFICATIONS

1.5.1.1 THROUGHPUT. The overall efficiency provided by the INP depends upon its specific application. Typically, statistical multiplexing increases throughput 2 to 4 times over TDM efficiency. Data compression further increases throughput by a factor from 1.2 to 1.5.

1.5.1.2 NODE-TO-NODE DELAY. Since the node-to-node protocol utilizes variable length frames, the node-to-node delay introduced by the 6030 will vary. For most applications it ranges from 35 to 50 ms.

1.5.1.3 INTERFACES. The 6040 series INP offers the following interfaces: EIA RS-232-C, CCITT V.24, or MIL-STD-188C. In addition, 20/60 mA current loop interface may be provided.

1.5.1.4 TERMINAL SUPPORT. The INP supports terminals using BSC ASCII, BSC EBCDIC, EBCDIC without transparency, BSC Transcode, 2741 Correspondence, and, on special order, special customer requirements.

1.5.1.5 CLOCK ACCURACY. A 6040 accepts clock accurate to ±0.10% and provides clock accurate to ±0.05%.

1.5.2 PHYSICAL SPECIFICATIONS

a. Environmental

Temperature: 0-50°C (32-122°F).
Relative Humidity: 0-95% (without condensation).
Altitude: 0-10,000 ft (0-3 km).

b. Power Requirements

115/230 Vac ±10%.
47 to 63 Hz.

c. Terminal and Network Port Connectors

Cannon or Cinch DB-19604-43 or equivalent (standard 25-pin EIA connector).

d. Port Nest Space Availability and Allocation

First Nest - 12 card slots.
Second through eighth nests - 16 card slots each.

One terminal port module provides for two terminal interfaces and occupies one card slot. Any of three types of terminal ports may be used.

One 6140 Network Port Module provides one communication trunk and occupies two card slots.

1.5.3 DIMENSIONS, WEIGHTS, AND POWER CONSUMPTION

Tables 1-2 and 1-3 respectively show dimensions and weights, and power consumption of the 6040 Series INP's.

TABLE 1-2. 6040 DIMENSIONS AND WEIGHTS

Model	Width	Height	Length	Weight
6041	19 in. 48 cm	19 in.* 48 cm	19 in. 48 cm	50 lbs 23 kg
6042	19 in. 48 cm	30 in.* 76 cm	25 in. 64 cm	68 lbs 31 kg
6043	19 in. 48 cm	41 in.* 104 cm	25 in. 64 cm	86 lbs 39 kg
6044	19 in. 48 cm	52 in.* 132 cm	25 in. 64 cm	94 lbs 43 kg
6045	19 in. 48 cm	63 in.* 160 cm	25 in. 64 cm	112 lbs 51 kg
6046	19 in. 48 cm	74 in.* 188 cm	25 in. 64 cm	120 lbs 55 kg
6047	19 in. 48 cm	85 in.* 216 cm	25 in. 64 cm	138 lbs 63 kg
6048	19 in. 48 cm	96 in.* 244 cm	25 in. 64 cm	146 lbs 67 kg

*Overall vertical mounting space required.

TABLE 1-3. 6040 POWER CONSUMPTION

Model	Power Consumption, Amperes	
	115 Vac	230 Vac
6041	3.5	2
6042	7.0	4
6043	10.5	6
6044	10.5	6
6045	14.0	8
6046	14.0	8
6047	17.5	10
6048	17.5	10

CHAPTER 2

DESCRIPTION

2.1 INTRODUCTION

A Codex 6040 Series Intelligent Network Processor consists of an operator's console (or, optionally, a front panel), a mainframe, and one or more port nests, interconnected by an I/O bus, (see Figure 2-1). Dc power for the chassis is furnished by one or more power supplies. Figure 2-2 shows the chassis of a rack mounted 6041 INP with the major components identified. The operator's console, mainframe, and power supply are mounted in one drawer of the rack, and the port nest in another.

The INP's are modular in design. They offer a variety of options and capabilities that tailor them quite precisely to the needs of a given communication network. This modularity assures the customer of the services that are needed, but requires purchase of only the options that provide those services. If the system requirements change, the INP may be modified to match the new requirements by inclusion of the appropriate options.

Certain features are standard requirements, others are options. These options are classed as either hardware or firmware. In the following system description, the hardware components are described according to their physical locations in the INP.

2.2 OPERATOR'S CONSOLE AND FRONT PANEL

The operator's console is located on the front of the INP (see Figure 1-1). Every network must have at least one operator's console for configuring the network topology, monitoring system operation, gathering system operational statistics, and performing diagnostics of hardware operation. Only the operator's console can be used for performing diagnostics, although a control terminal port may perform the other operator's console functions.

If a 6040 does not have an operator's console, it has a front panel instead (see Figure 2-3), the front of which has only an On/Off POWER switch for the node and access to a 50-pin connector to which a portable operator's console may be attached.

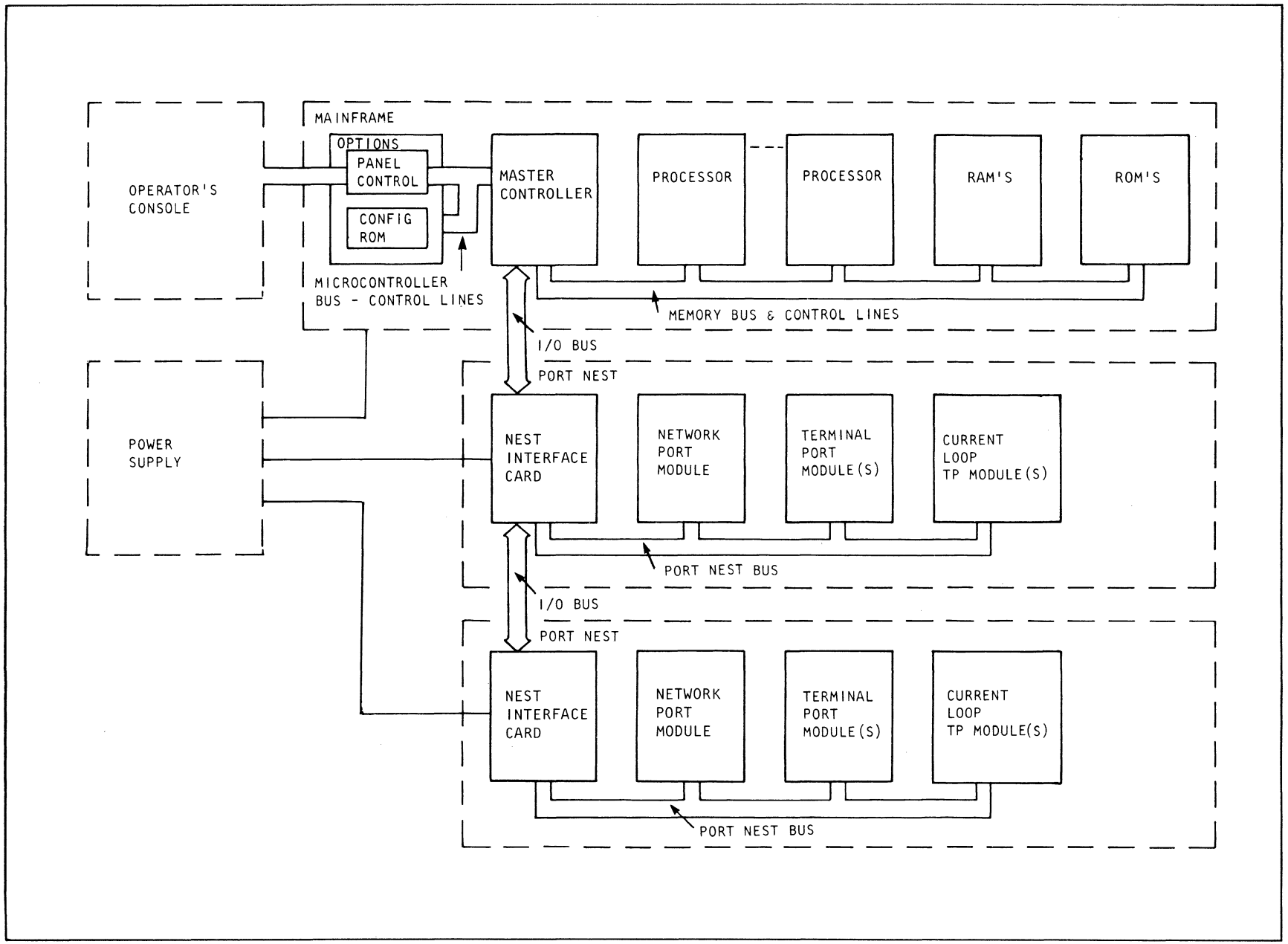


Figure 2-1. 6040 Series Functional Block Diagram

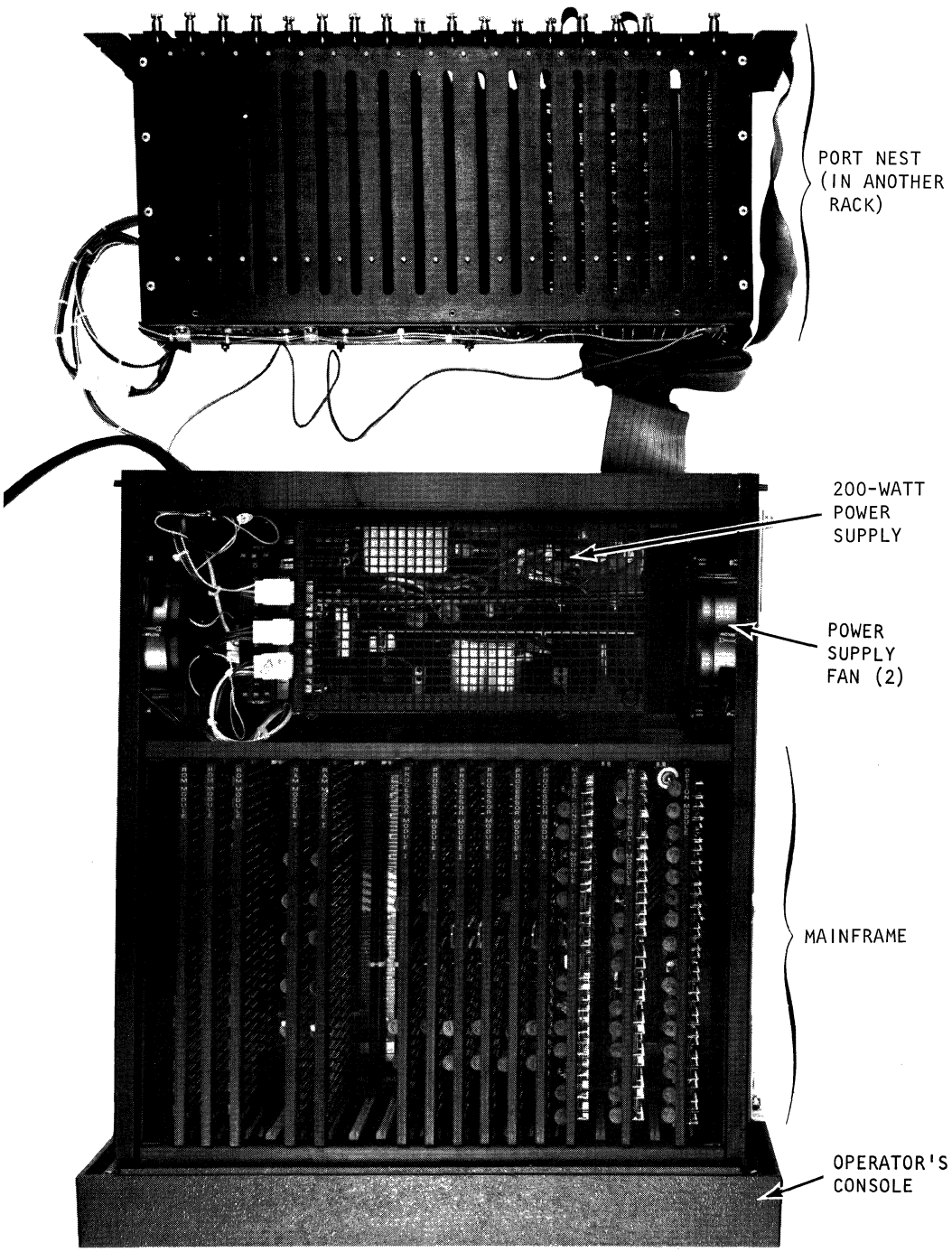


Figure 2-2. Top View of Rack-Mounted 6041 INP

Figure 2-3. Front Panel with Portable Operator's Console Attached

When a node has only a front panel, a portable operator's console may be attached to it on those occasions when operational reports or statistics are needed.

WARNING

On the inner surface of the logic card for the operator's panel there is a daughterboard that supplies 250 Vdc to drive the self-scan display. This voltage is dangerous.

2.2.1 OPERATOR'S CONSOLE

The operator's console is used for programming and display, and for hardware diagnostics and testing. Operator inputs to the INP are made via the keyboard; outputs are via the self-scan display.

The front of an operator's console is shown in Figure 2-4. The console presents, from left to right: a row of processor ID lamps, a row of processor status lamps, a row of interrupt level lamps, a 32-character 5x7 dot alphanumeric self-scan display, a row of operating mode indicator lamps, and an 18-key keyboard. The functions of the controls and lamps are listed in Table 2-1.

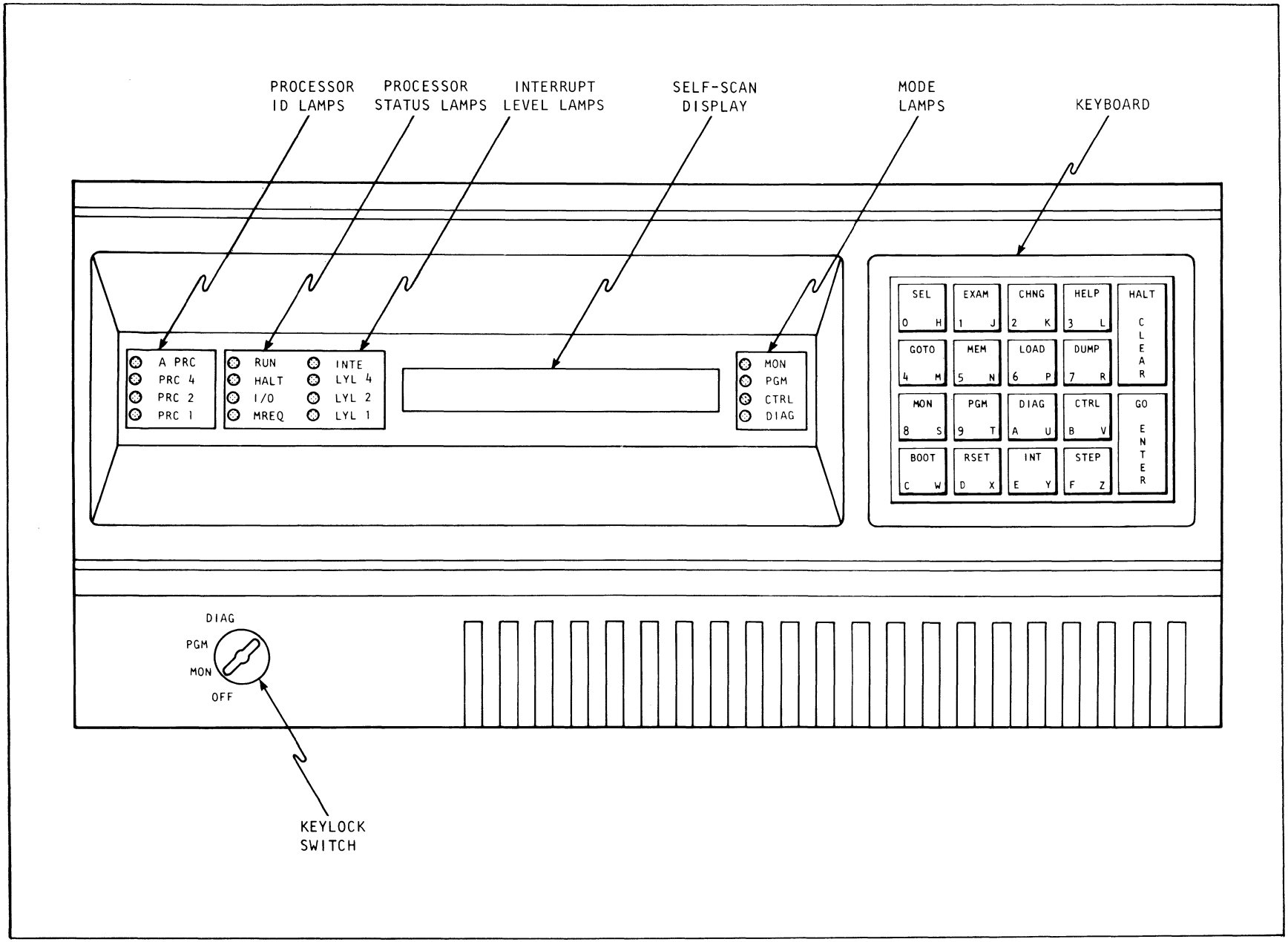


Figure 2-4. Codex 6030/6040 Series INP Operator Console

TABLE 2-1. CONTROLS AND INDICATORS

Control/Indicator	Function
Processor ID Lamps	
A PRC lamp (green)	Indicates all processors in use.
PRC 4, PRC 2, PRC 1 lamps (yellow)	Indicates binary code of processor status being displayed.
Processor Status Lamps	
RUN lamp (green)	Indicates processor is running.
HALT lamp (red)	Indicates processor has halted.
I/O lamp (yellow)	Indicates input/output operation is in progress.
MREQ lamp (yellow)	Indicates memory request.
Interrupt Level Lamps	
INTE lamp (green)	Indicates interrupt enabled.
LVL 4, LVL 2, LVL 1 lamps (yellow)	Indicates priority level in binary code.
Self-Scan Display	Displays alphanumeric data.
Mode Lamps	
MON lamp (green)	Indicates operator console is in monitor mode.
PGM lamp (yellow)	Indicates operator console is in program mode.
CTRL lamp (red)	Indicates operator console is in control mode.
DIAG lamp (red)	Indicates operator console is in diagnostic mode.
Keyboard	Used to enter commands (see paragraph 2.2.2).
Keylock Switch Position (See Figure 2-4.)	
OFF	Shuts off power to system.
MON	Restricts operation to monitor mode only.
PGM	Allows only monitor, program, and control modes.
DIAG	Permits selection of any mode.

The alphanumeric self-scan screen is used to display configuration information, commands, error conditions, and network statistics. In Program and Monitor modes, character positions 2 through 6 of the self-scan screen continually display the currently-selected node number, configuration number, port type, and port number. This information may be displayed by the EXAM and CHNG commands. A sample format of this display is shown in Figure 2-5. Character position 1 contains an asterisk that notifies the operator when a system report is waiting to be displayed.

2.2.2 KEYBOARD DESCRIPTION

The keyboard consists of 18 pushbutton keys, as shown in Figure 2-4. Each key has more than one function depending upon the type of command being used. Therefore, each key has two or three different words or symbols printed on it, to facilitate ease of operation. The operator must wait for a system response (normally the echoing of the entered character) before pressing another key. This is the result of the keystroke interlock design of the keyboard.

In the lower left-hand corner of each of the 16 square keys is a number or letter indicating the hexadecimal digits 0 to F (see Figure 2-6). Port addresses are in hexadecimal.

The mnemonic code set consists of the alphabetic characters printed on the keys (see Figure 2-7). Therefore, the hexadecimal digits A through F double as alphabetic characters for the mnemonic code set. The character "0" doubles as both the number "Zero" and the letter "O," and the character "1" doubles as both the number "One" and the letter "1."

The control character set for Monitor and Program modes is shown in Figure 2-8(A). The additional control characters used for the Control and Diagnostic modes are shown in Figure 2-8(B).

The four keys across the top, SEL, EXAM, CHNG, and HELP are command keys. SEL (select) is used to select a mode or parameter. EXAM (examine) is used to examine system parameters. CHNG (change) is used to change system parameters. HELP is used as an aid in explaining commands.

The four keys in the third row, MON (monitor), PGM (program), DIAG (diagnostic), and CTRL (control) are mode keys. They are used following the SELect key to change the system mode.

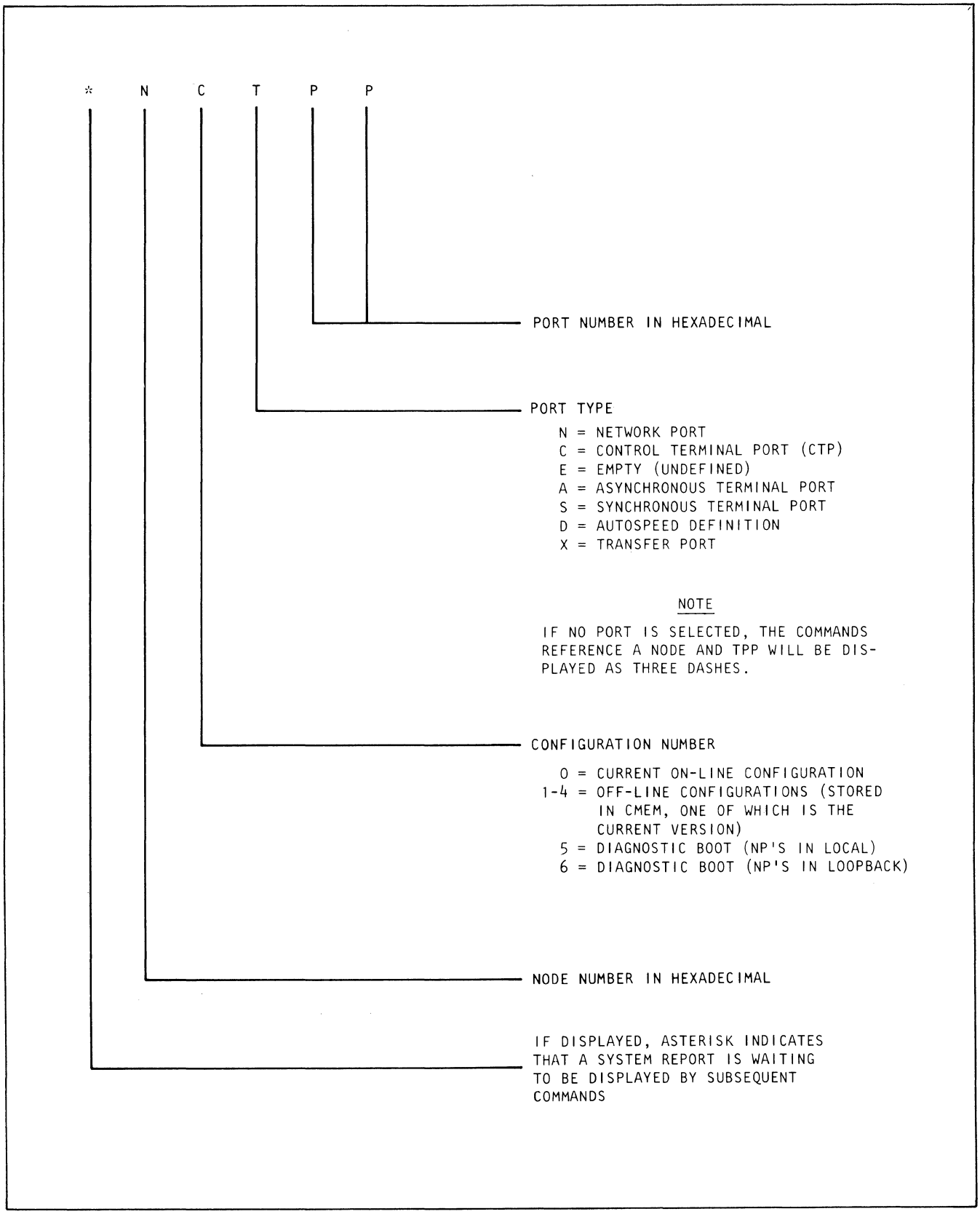


Figure 2-5. Display Format

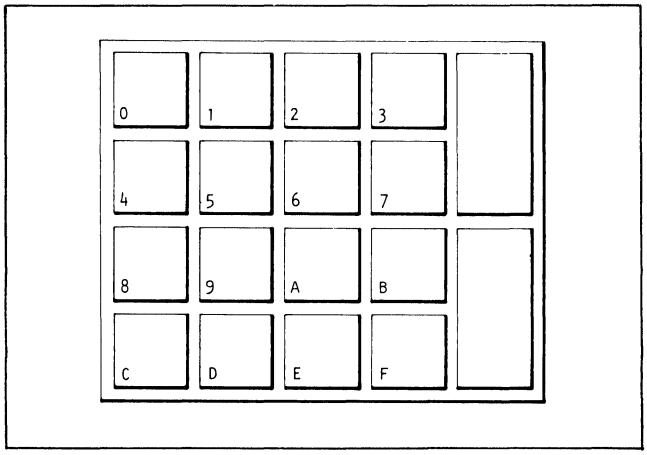


Figure 2-6. Hexadecimal Key Set

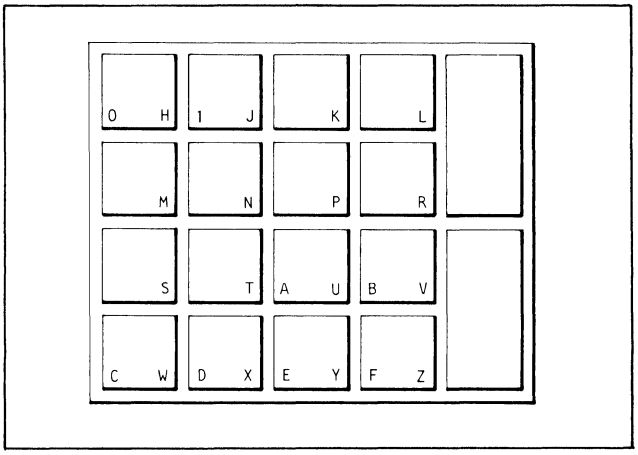


Figure 2-7. Mnemonic Code Set

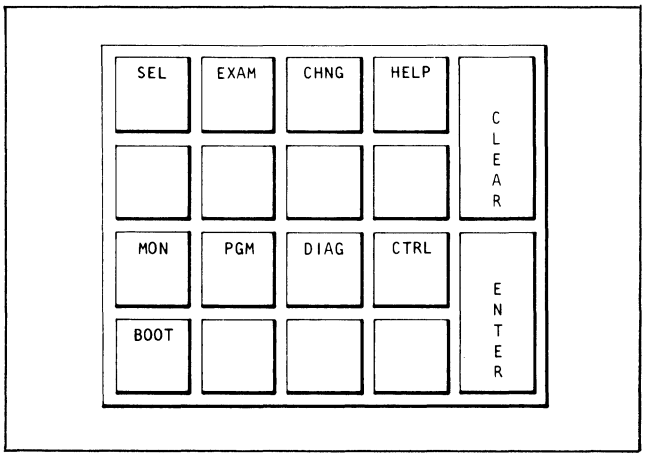


Figure 2-8(A). System Control Key Set, Monitor and Program Modes

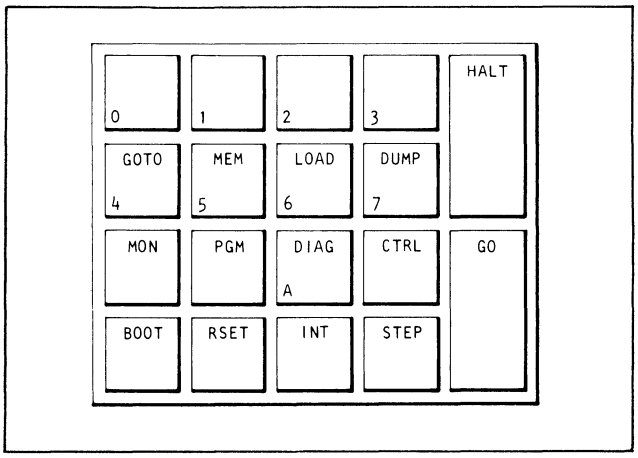


Figure 2-8(B). System Control Key Set, Control and Diagnostic Modes

The BOOT key is used for bootstrapping, i.e., loading the system with a desired predetermined configuration.

2.2.3 FRONT PANEL

A front panel is used at a remote node that is usually unmanned. It can be used only to apply power to the node via an On/Off POWER switch. A 50-pin connector allows attachment of a portable operator's console for test purposes.

2.2.4 PORTABLE OPERATOR'S CONSOLE

Since a front panel can be used only to power-up a node, Codex Customer Service Engineers are provided with a portable operator's console to give commands, query the system, and perform diagnostics at that node. This is an operator's console (Option 66120) that has a specially made protective rear cover. It is attached to the front panel 50-pin connector, with the power cord attached to power supply J2 or J3, as shown in Figure 2-3.

2.3 MAINFRAME

The mainframe, shown in Figure 2-9, is a card rack that is mounted directly behind the operator's console. It holds up to 17 circuit boards. These boards are of five types: an option module, two master control modules, up to six processor modules, and memory (ROM's and RAM's). They process data (processors), control operation of the system (master controllers), store software (ROM's) and configurations (RAM's), and contain the clocks to drive the logic and interfaces to other functional units of the INP. Master Controller 1 (MC1) is the I/O controller. MC2 performs interface functions between MC1 and the processors and memories. The Option card contains logic that interfaces the operator's console and the configuration memory with the MC1.

The boards are edge-connected to the mainframe memory and control bus on a horizontal printed circuit (PC) motherboard that is the floor of the mainframe. A 50-pin connector at the right rear edge of the motherboard terminates the I/O bus: a ribbon bus between the motherboard (master controller) and the next downstream interface card in the first port nest (see Figure 2-1).

A key on each edge connector on the motherboard allows only the correct type of module to be installed in each slot. The key engages a slot in the edge of the module.

2.3.1 OPTION MODULE

The Option Module holds information about the configuration of the system. Its logic provides the interface between the Master Controller and the operator's console and/or the control terminal port, as well as the configuration memory. It also contains mainframe hardware reset logic and node number switching.

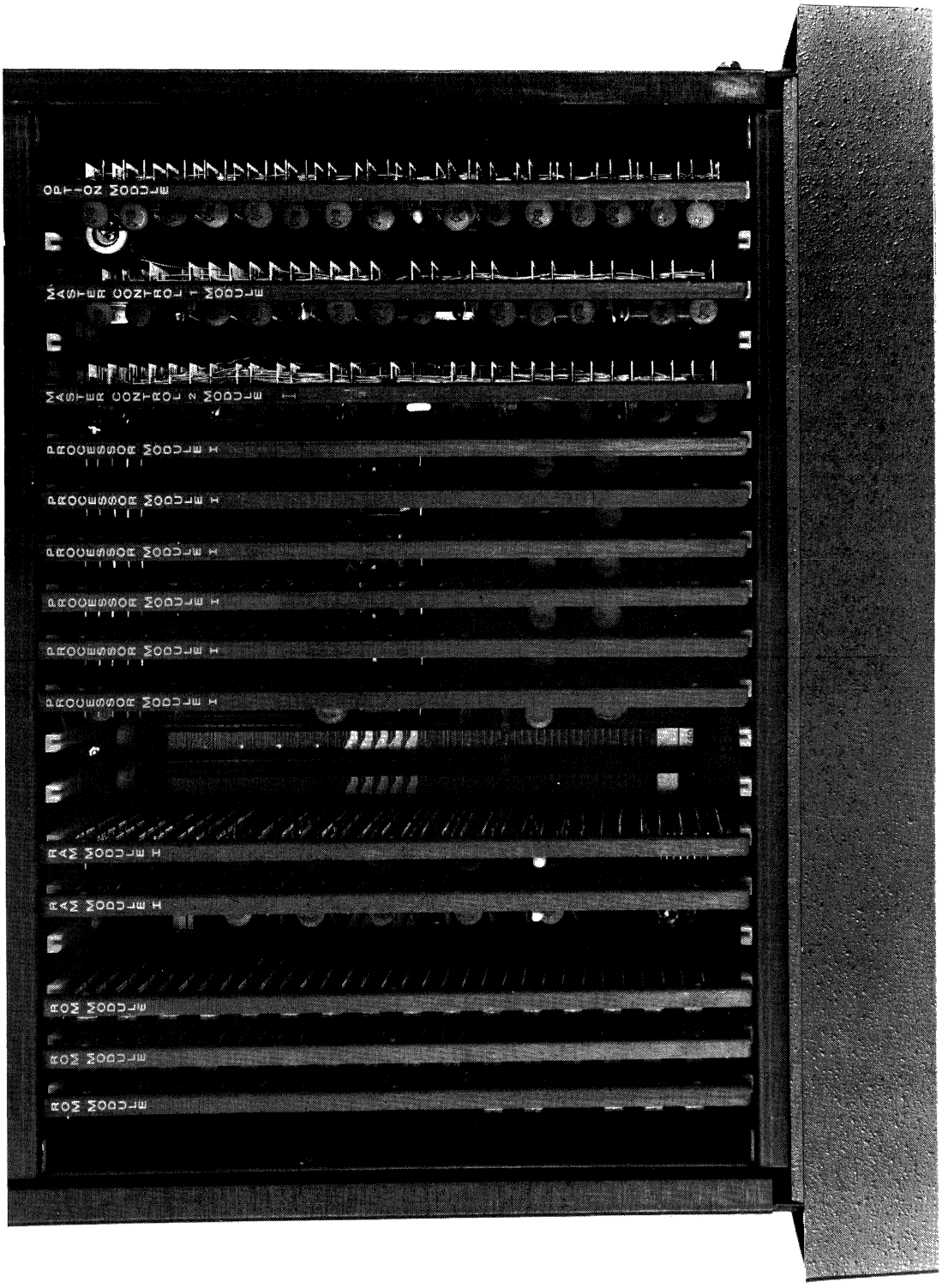


Figure 2-9. INP Mainframe

Two type of modules are used. They are the wirewrap version (see Figure 2-10A), and the printed circuit version (see Figure 2-10B, 2-10C) which consists of a mother/daughter card. The mother card contains the logic, memory retention battery and Write Protect Switch and the daughter card contains the configuration memory. Setting the Write Protect Switch in the Protect Position prevents changes in the information contained in the configuration memories.

2.3.1.1 CONFIGURATION MEMORY EXPANSION (Option 66122). The configuration memory (CMEM) consists of nonvolatile (battery backed up) CMOS RAM's.

CAUTION

If the Option module is removed from the mainframe, it is possible to discharge the battery by wrapping the board in conductive packing material or by attaching a protective edge connector cover to the edge connector. Use only clear colorless polyethylene material for wrapping. Do not use an edge protector. Do not place a removed board on any electroconductive material.

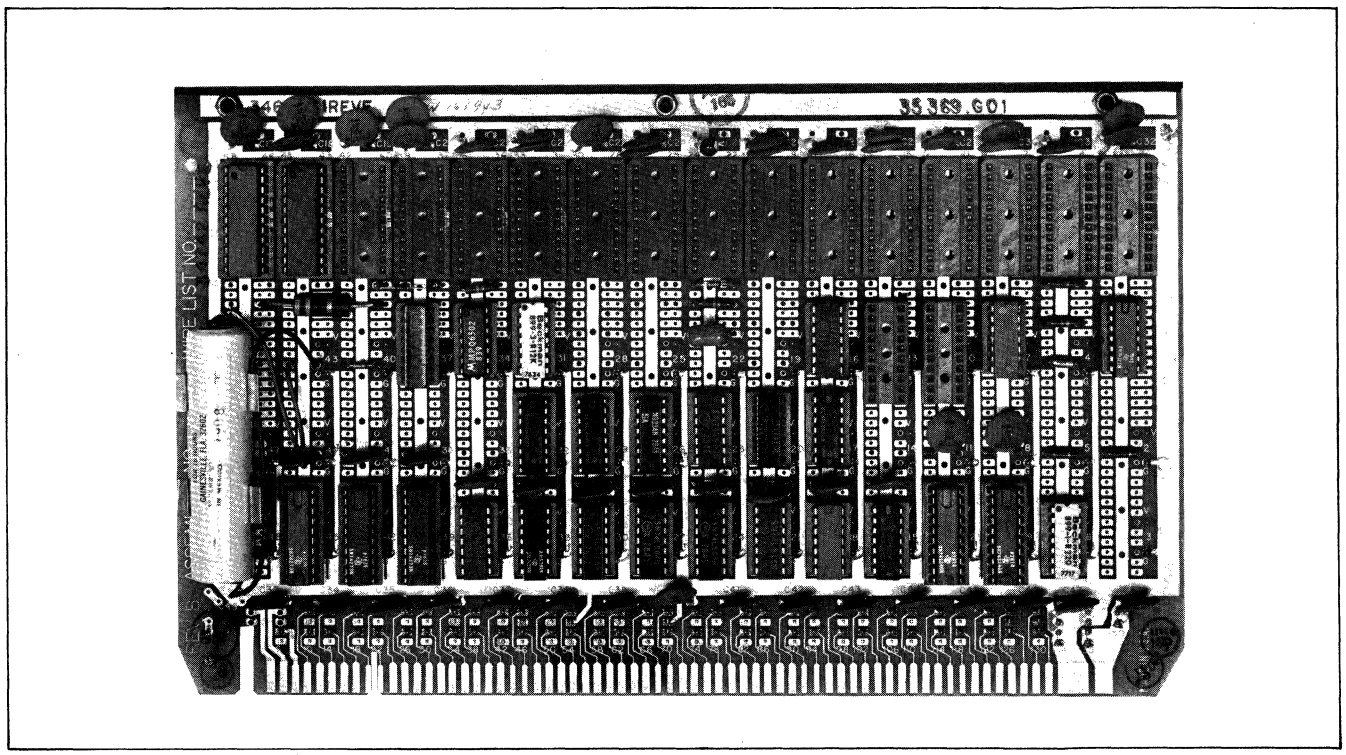


Figure 2-10A. Wire Wrap Option Module

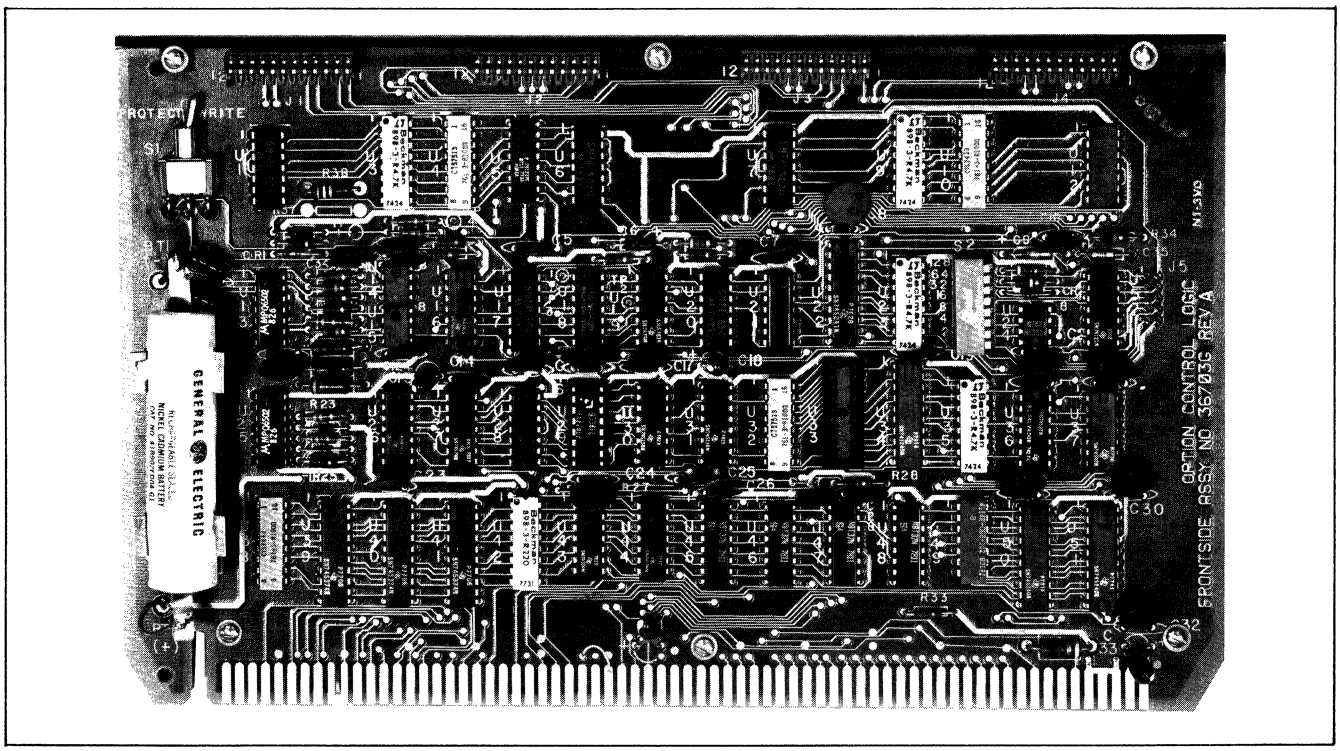


Figure 2-10B. Printed Circuit Option Module (Mother Card)

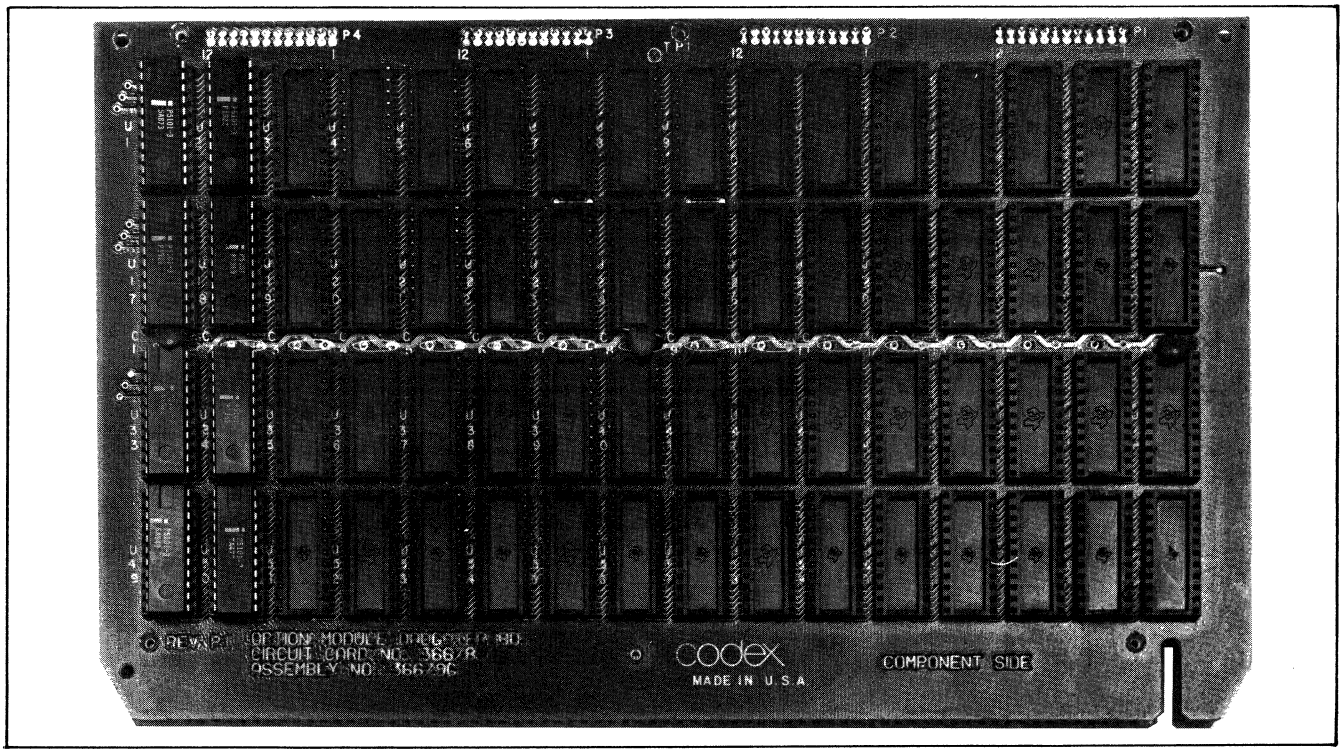


Figure 2-10C. Printed Circuit Option Module (Daughter Card)

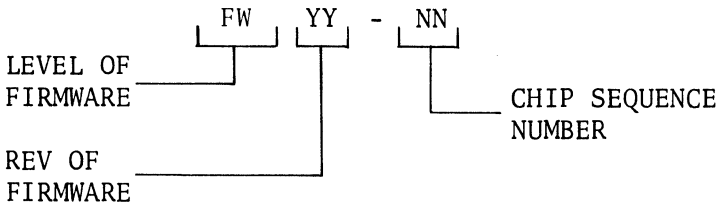
The CMEM needed for any model of a 6040 Series INP is furnished as standard equipment with that model. This provides one basic configuration (C1) as defined for the model. If additional configurations (C2 through C4) are needed to perform the required system functions, additional CMEM (Option 66122) must be ordered. Each 66122 module consists of 256 bytes of CMEM, and can support up to 32 terminal ports. Beginning with S47 software, the maximum capacity of PC CMEM is 680 ports at 12 bytes per port. Tables 2-2 and 2-3 present the relationship between model number, CMEM, and the number of terminals supported.

2.3.1.2 CONFIGURATION MEMORY LAYOUT. There are two versions of the Option module: wirewrap and printed circuit. The wirewrap version consists of only one board, with the configuration memory chips laid out across the top of the board. The PC version consists of a motherboard and a daughterboard. The CMEM daughterboard carries the configuration memory chips. Figures 2-11 through 2-14 show the memory chip layouts for INP Models 6041 through 6048.

2.3.2 MASTER CONTROLLER 1 (MC1)

MC1 is a PC board that performs the CPU functions for the master controller (see Figure 2-15). It contains the central processor (Intel 3000 Series microcontroller), the firmware* program, local memory, and the pipeline registers, as well as the control and data interface for the port nest. It also contains the real-time clock and port clock generator. There is one MC1 per mainframe. The card rail of MC1's used with S49 software are marked "S49." Those that are not so marked operate under S47 or S46.

The MC1 firmware chips are marked as follows:



An MC1 is compatible in speed with any INP processor card.

*In the Codex INP's, "firmware" refers to the programmable ROM's on the MC1; they contain the programs for the Intel 3000 microcontroller. "Software" refers to the programs in the ROM cards.

TABLE 2-2. TP'S SUPPORTED BY PRINTED CIRCUIT CMEM (64 CHIPS)

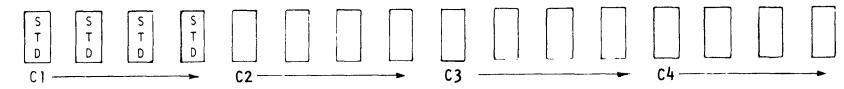
Model	TP's Supported			
	C1	C2	C3	C4
6041	170	170	170	170
6042	170	170	170	170
6043	170	170	170	170
6044	170	170	170	170
6045	170	170	170	170
6046	192	192	192	106
6047	256	256	170	--
6048	256	256	170	--

TABLE 2-3. SUPPORTED BY WIREWRAP CMEM

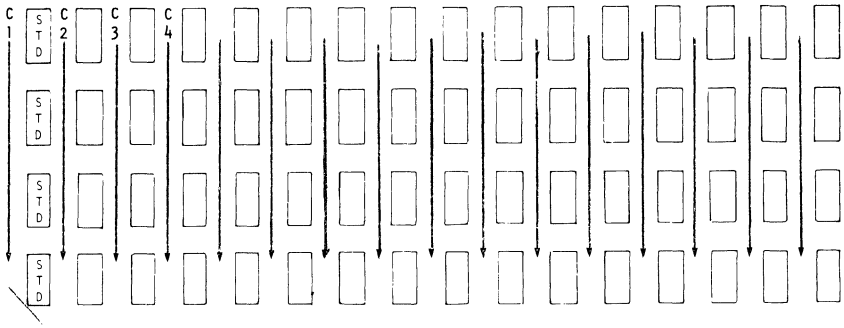
Model	TP'S Supported			
	C1	C2	C3	C4
6041	85	85	--	--
6042	85	85	--	--
6043	106	64	--	--
6044	128	42	--	--
6045	170	--	--	--
6046*				
6047*				
6048*				
*Not available.				

MODEL 6041

WIREWRAP



PRINTED CIRCUIT



MODEL 6042

WIREWRAP

PRINTED CIRCUIT

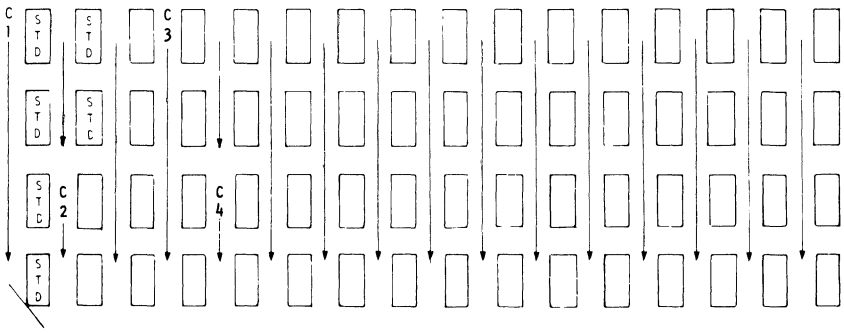
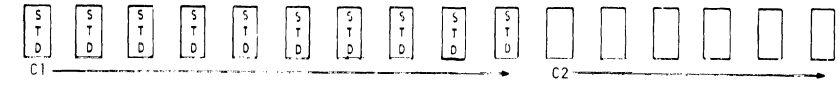


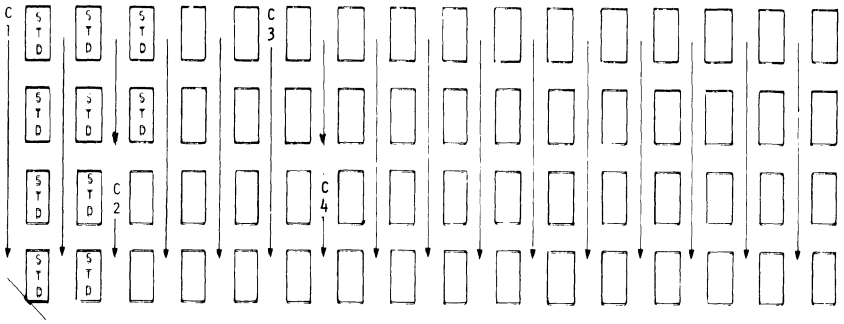
Figure 2-11. Configuration Memory Chip Layout (6041, 6042)

MODEL 6043

WIREWRAP

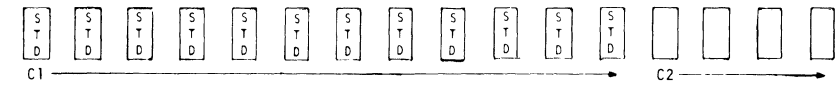


PRINTED CIRCUIT



MODEL 6044

WIREWRAP



PRINTED CIRCUIT

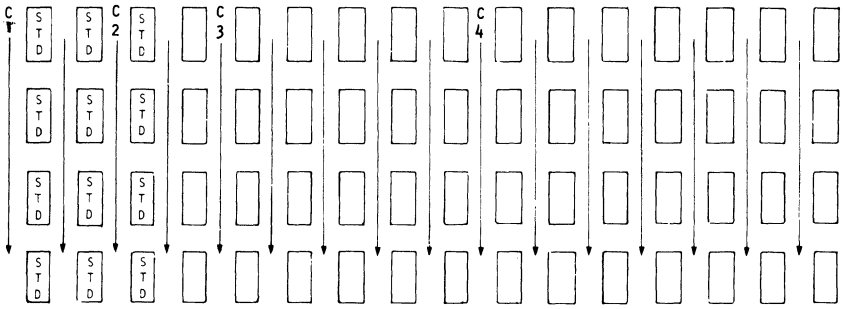
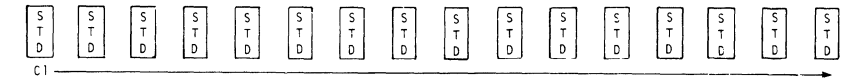


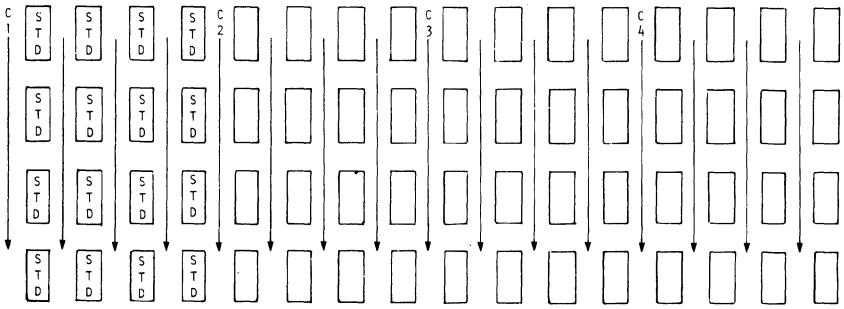
Figure 2-12. Configuration Memory Chip Layout (6043, 6044)

MODEL 6045

WIREWRAP



PRINTED CIRCUIT



MODEL 6046

PRINTED CIRCUIT

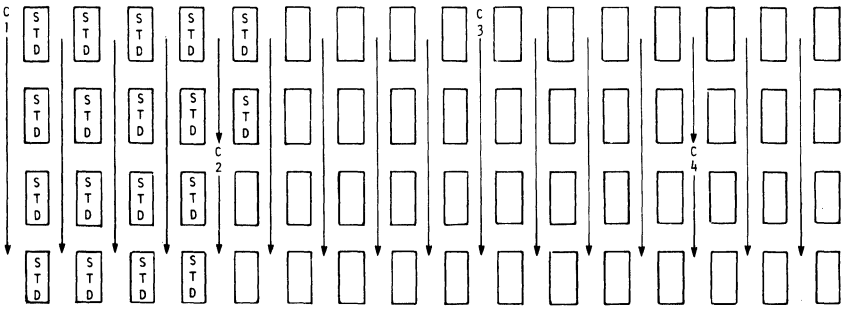
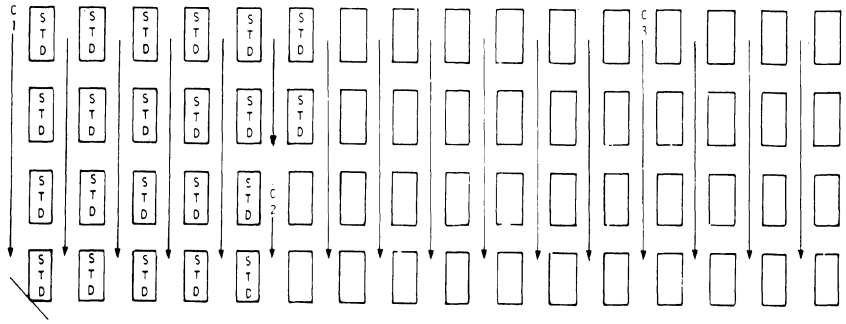


Figure 2-13. Configuration Memory Chip Layout (6045, 6046)

MODEL 6047

PRINTED CIRCUIT



MODEL 6048

PRINTED CIRCUIT

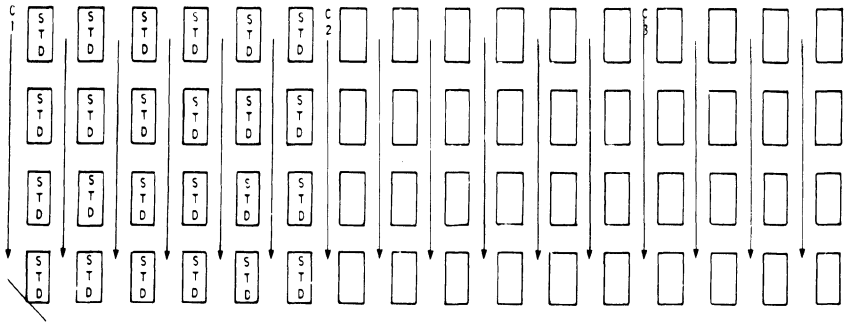


Figure 2-14. Configuration Memory Chip Layout (6047, 6048)

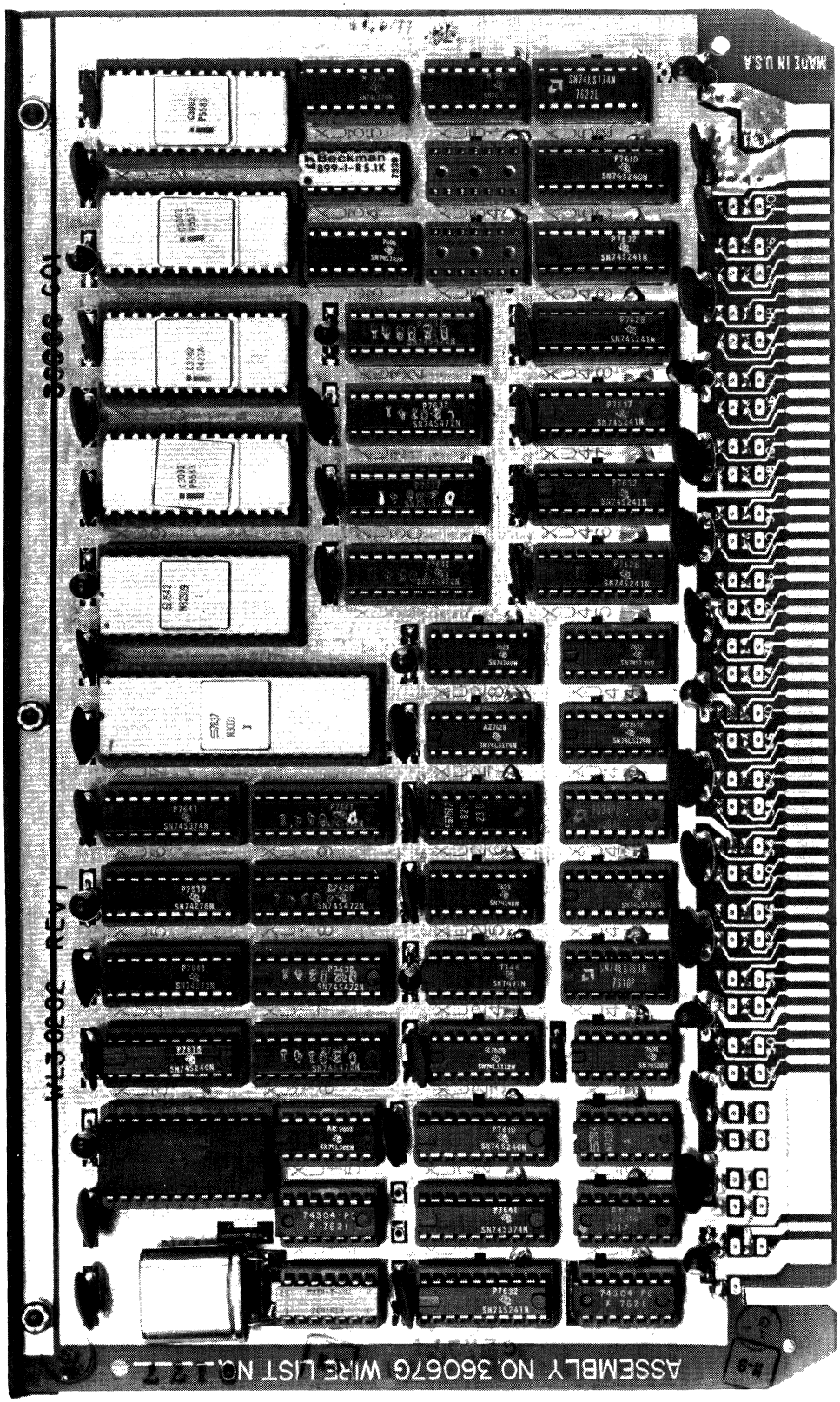


Figure 2-15. Master Controller 1 (MC1)

2.3.3 MASTER CONTROLLER 2 (MC2)

MC2 is a PC board that performs the interface functions between the master controller and the processors and memory (see Figure 2-16). MC2 also contains the system master clock generator, memory refresh control for the RAM's, and memory addressing and memory read/write. There is one MC2 per mainframe. MC2's that operate in a 5 MHz system are marked with "I" on the rail. Those that are not so marked operate with 4 MHz processors.

MC2 has straps for controlling the size of the lock byte area and for the rate of the system clock. The lock byte area is physically on the RAM, but is controlled from the U40 platform on MC2.

2.3.3.1 LOCK BYTE AREA. The lock byte area is an area of memory that is common to all processors. It provides processors with temporarily exclusive access to 256-byte segments of RAM. This prevents interruption of a critical program by other processors. The key to each segment is an 8-bit "lock byte." When a processor addresses the byte and reads it, it clears the byte. Another processor addressing the same byte finds all 0's and retries at the cycle rate until the first processor has written the byte back.

The size of the lock byte area is dependent on the INP model (see Table 2-4) and is selected by soldered straps on platform U40 of the MC2 board.

2.3.4 PROCESSOR

The processor, a PC module, performs processing of information passed between the terminal ports and the network ports.

The processor (see Figure 2-17) contains the Motorola M6800 micro processor, associated bus and interrupt logic, and phase clock generation logic. There may be up to six processors in a 6040 Series mainframe.

Processors that operate at 5 MHz are marked "I" on the rail; those that are not so marked operate at 4 MHz. If 5 MHz processors are used in the same mainframe as 4 MHz processors, they must be strapped for 4 MHz. The 4 MHz processors cannot be strapped for 5 MHz.

A processor provides two areas of strapping. One of these, platform U34 (Figure 2-18) provides for "fast" or "slow" operation: a function of internal signal timing on the processor board. All current systems are strapped fast.

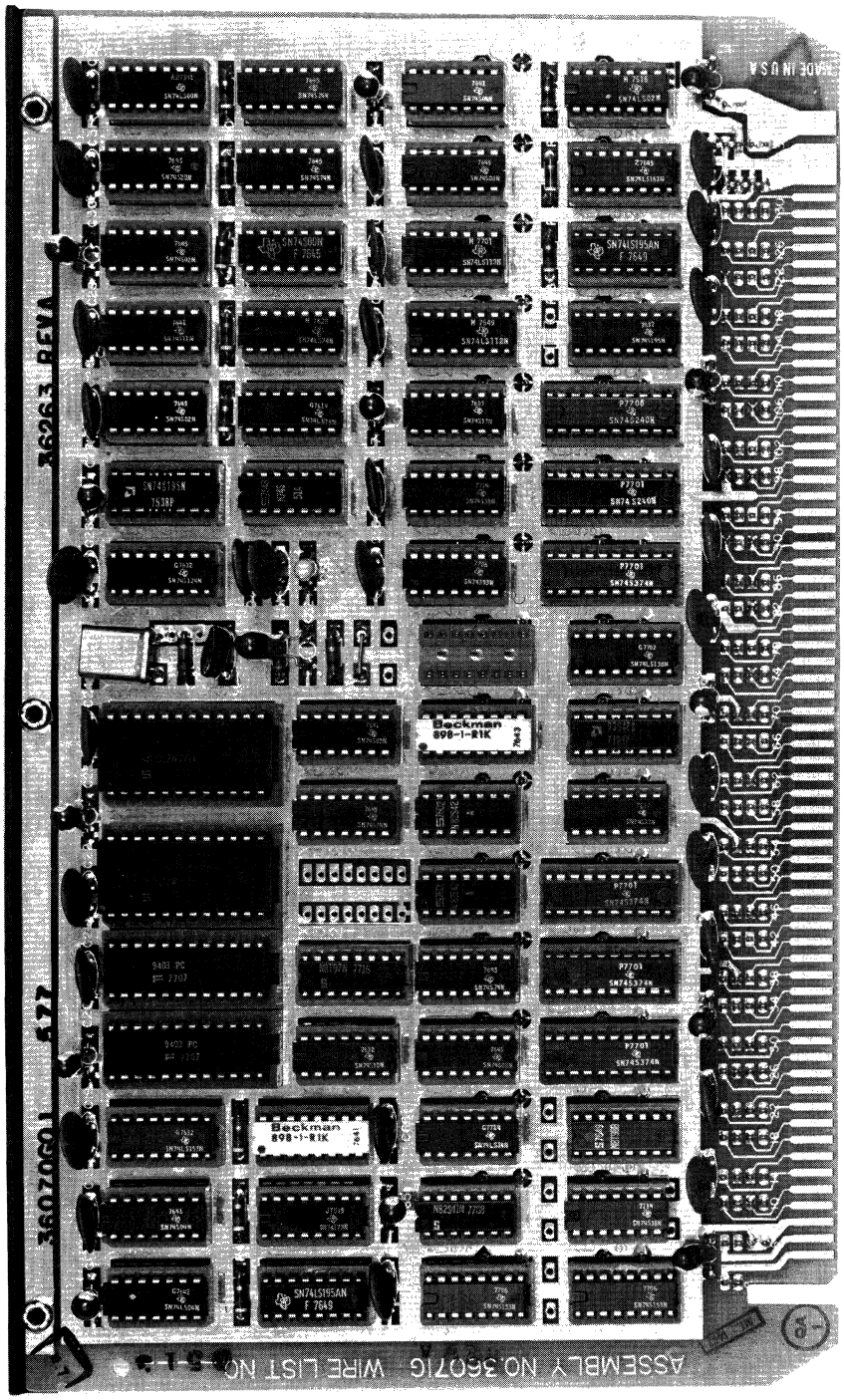


Figure 2-16. Master Controller 2 (MC2)

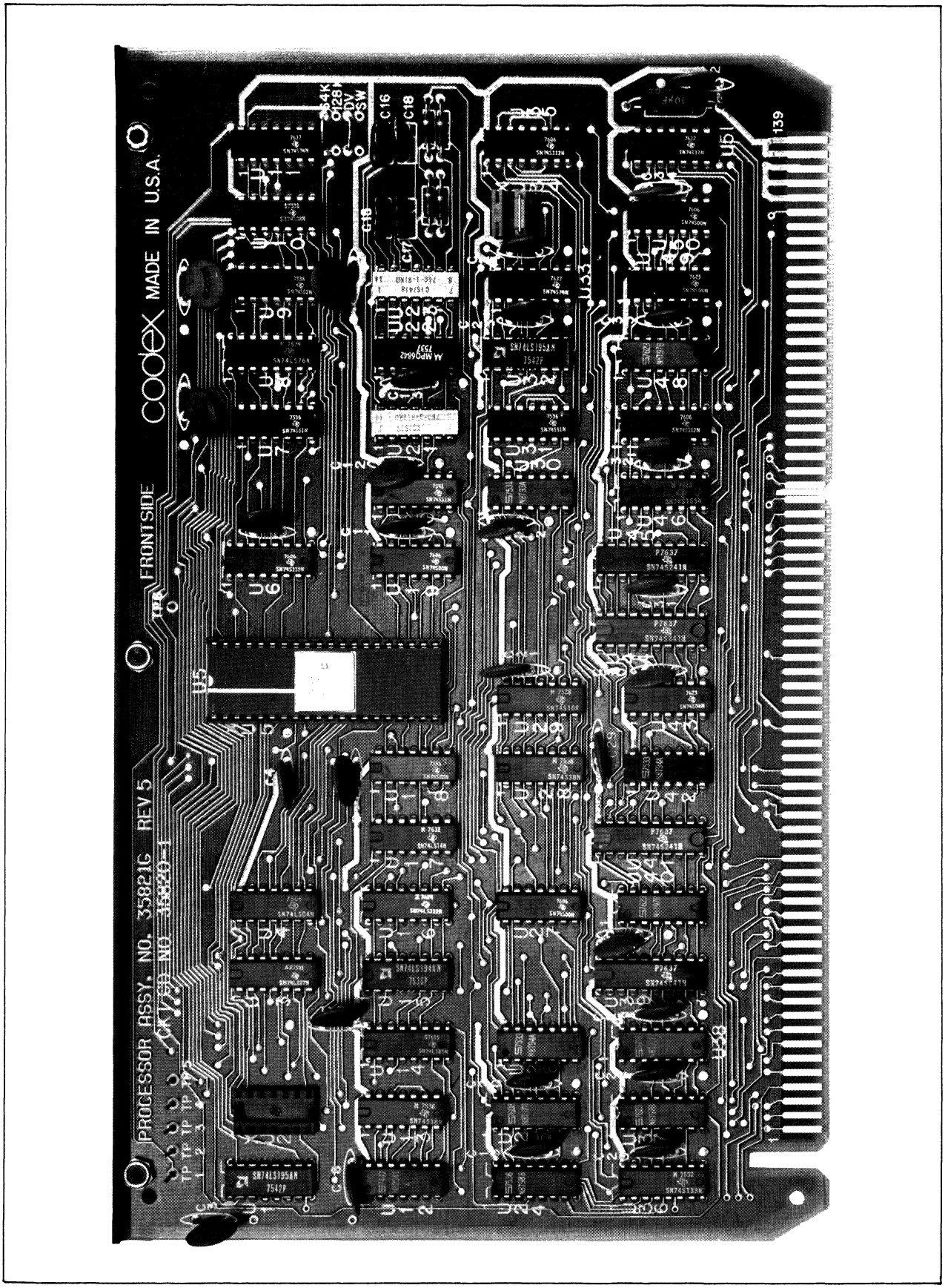


Figure 2-17. Processor

TABLE 2-4. SIZE OF LOCK BYTE AREAS

INP Model	Size of Lock Byte Area, Bytes
6041	1024
6042	1024
6043	1024
6044	1024
6045	2048
6046	2048
6047	2048
6048	2048

The second area of strapping is in the upper right corner of the processor, just below U11. These connections are soldered staples (see Figure 2-19), and depend on the software used. For S46 and S47 software, the connections are across DV and 64K. For S49 they are across DV and 128K; it is the 128K strap that permits addressing the third ROM which holds some options available only with S49. This feature also requires firmware changes on the master control cards. The compatible MC1 can be identified by "S49" stamped on the rail.

2.3.5 16K PROM'S (ROM'S)

The ROM's provide storage to support software* options ordered by the customer. These options are listed below and are described in Appendix B.

Product Code	Description
66301	Statistics and Performance Monitoring
66320	Operator Console Support

*In these Codex INP's, "software" refers to the programs contained in the ROM cards; "firmware" refers to the PROM's on the MC1 module that contain the program for the Intel 3000 microcontroller.

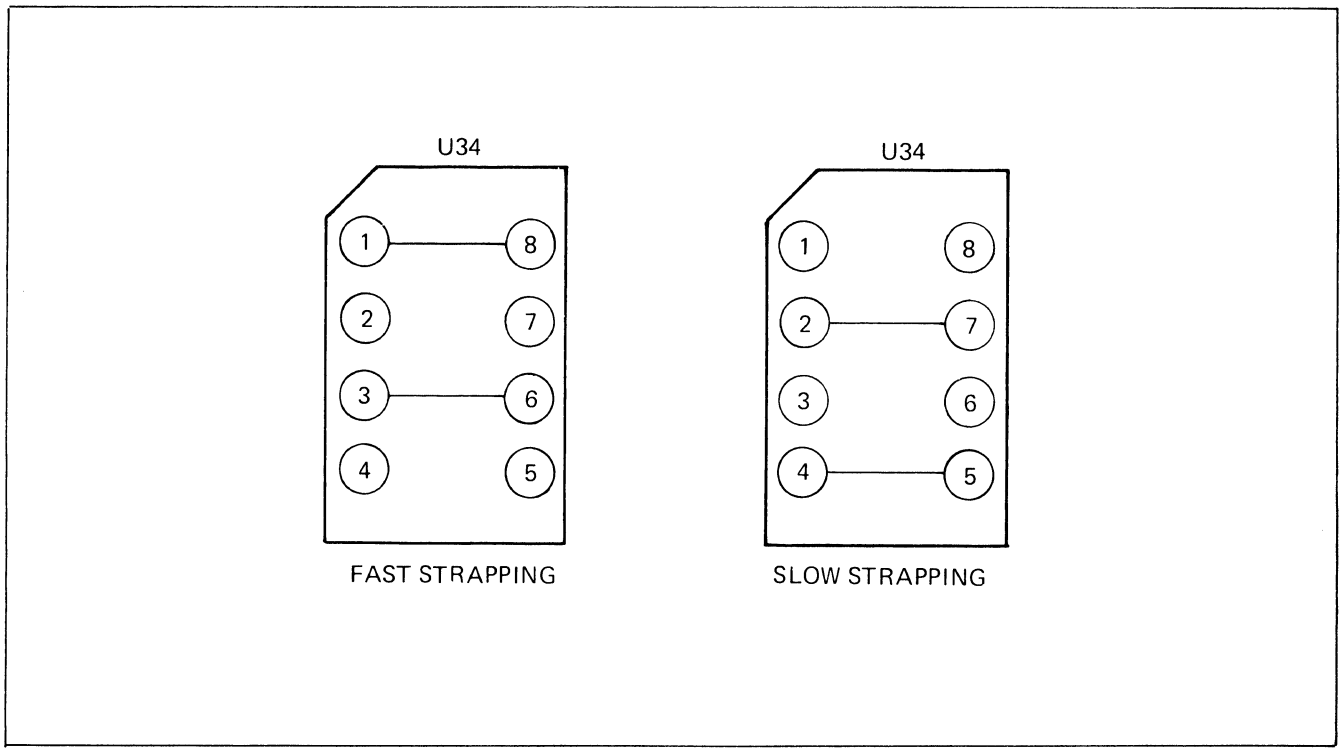


Figure 2-18. Processor Card Cycle Speed Strapping, Platform U34

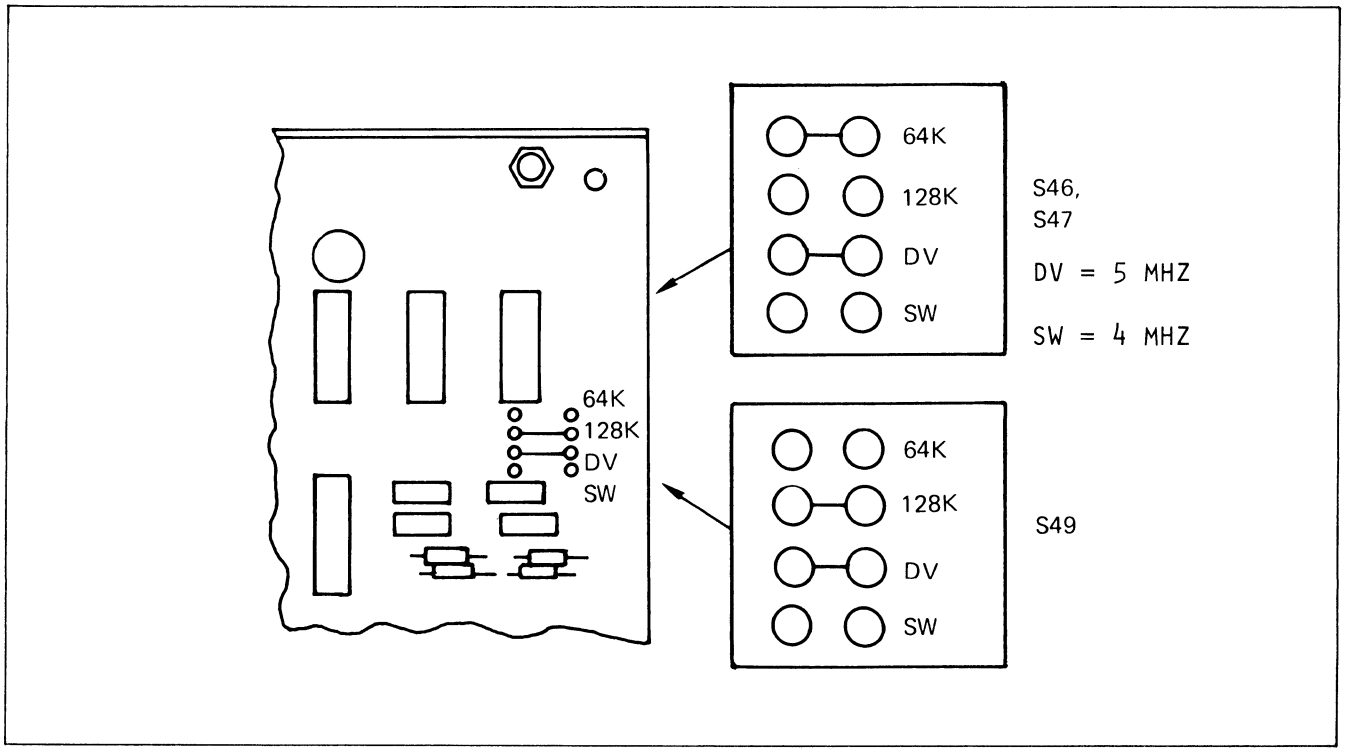


Figure 2-19. Processor Card Software Strapping

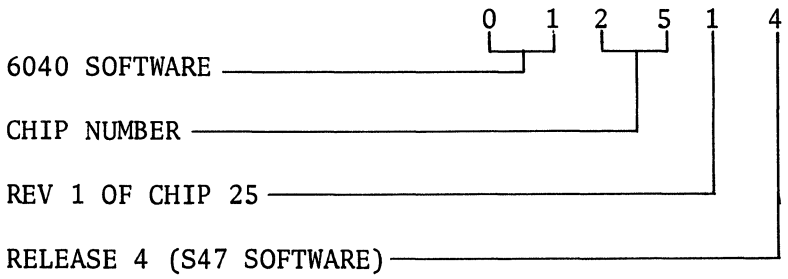
Product Code (Cont)	Description (Cont)
66321	Control Terminal Interface Support
66322	Operator Console and Control Terminal Support
66323	Supervisory Communications Support
66324	Report Logging Control Terminal Support
66330	Asynchronous Terminal Support
66331	Autospeed
66332	Autoecho
66335	BSC Terminal Support
66344	Satellite Link Option
66345	Variable Length ARQ Option
66347	6030/6040 Interface Support

The software is contained on two or three PC ROM cards, depending on the software used and the options required (see Figure 2-20). Each ROM has strapping on platform U52 (Figures 2-21 and 2-22) that addresses the software. Because this strapping defines the addresses, the sequence of the three cards in the mainframe is immaterial. The chips accross the top of the board are PROM's, programmed by Codex to provide the required memory.

The ROM's will run at either 4 MHz or 5 MHz, and are not identified according to speed.

2.3.5.1 IDENTIFYING ROM'S FOR SOFTWARE APPLICATIONS. Inspection of the strapping and chip marking of a ROM will disclose its application.

2.3.5.1.1 S47 ROM's. S47 software resides on two ROM cards. ROM chips used with S47 software are identified with a number having the format:



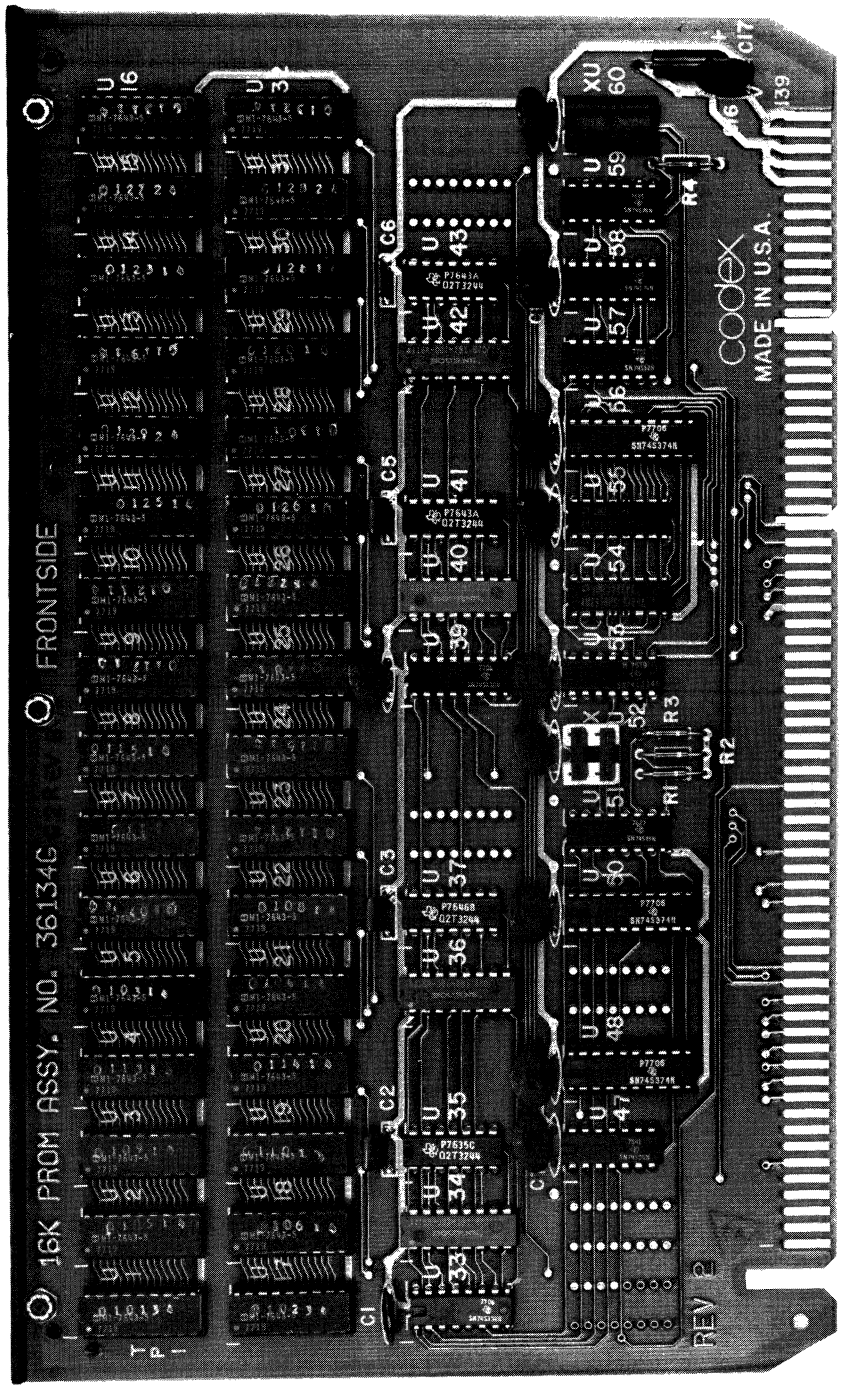


Figure 2-20. 16K PROM (ROM)

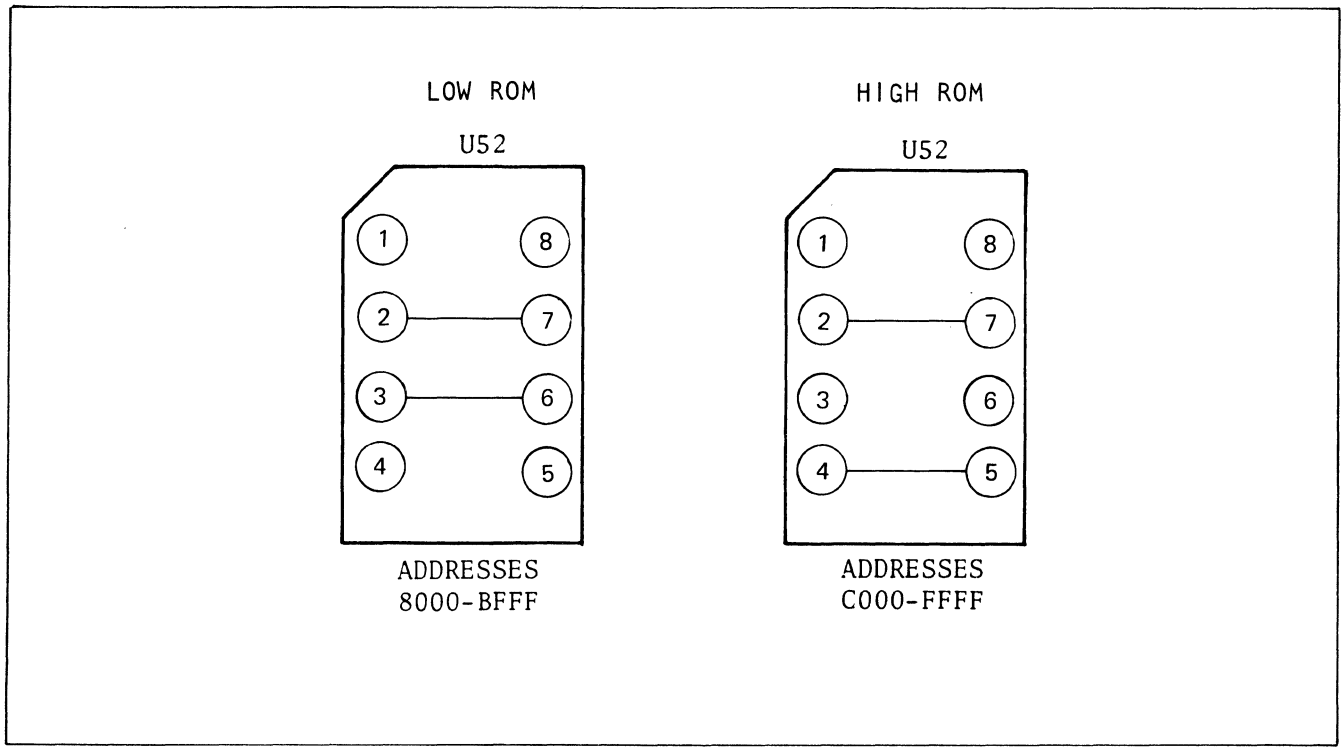


Figure 2-21. ROM Card S47 Address Strapping, Platform U52

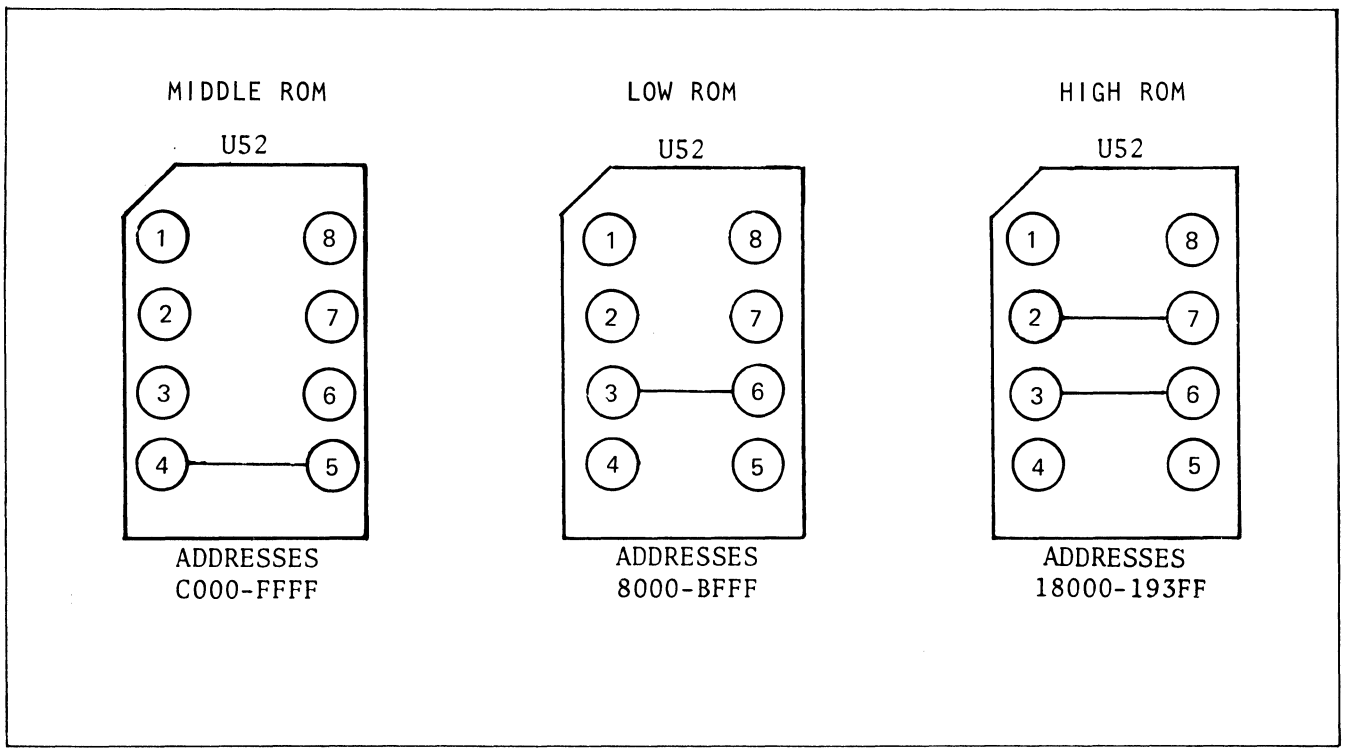
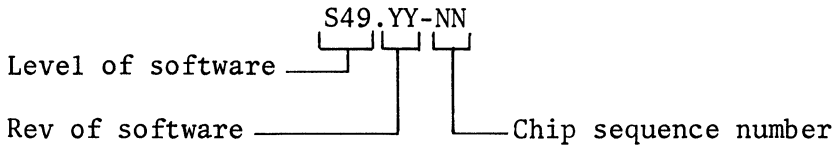


Figure 2-22. ROM Card S49 Address Strapping, Platform U52

NOTE

Chips 1 through 8 used for the code tables start with the digits 04. These chips replace chips number 57 to 64 inclusive.

2.3.5.1.2 S49 Applicable ROM's. S49 software resides on three cards. ROM chips that contain S49 software are marked:



ROM chips that contain the code tables are marked:

CT.YY-NN

where YY and NN have the same meanings as above.

2.3.5.2 MEMORY MAP. Figure 2-23 is an example of the address ranges used in an INP. The upper and lower limits of the code tables are fixed, but the address of the first byte of software is variable. It is a function of the Rev of the software. There may be some empty space between the top of the code tables and the lowest address of software; this may be used for "customer specials." The upper limit of software depends on the options needed by the user. Locations FFF0 through FFF8 hold information on software Rev levels, checksums, and customer specials. Physically, the ROM memory chips are laid out in two rows of 16 each.

2.3.6 DIAGNOSTIC ROM (Options 66950 and 66951)

The diagnostic ROM is a PC test board that is used for identifying hardware-caused operating faulty boards. It does not test the system software. The test procedure is described in separate user's manuals: Hardware Diagnostic ROM Rev 11 (for systems operating under S47 software) or Rev 12 (for systems operating under S49 software).

Physically, the diagnostic ROM is a standard ROM board containing specially programmed ROM's. Option 66950 is used to test INP's that operate under S47; Option 66951 is for INP's that operate under S49.

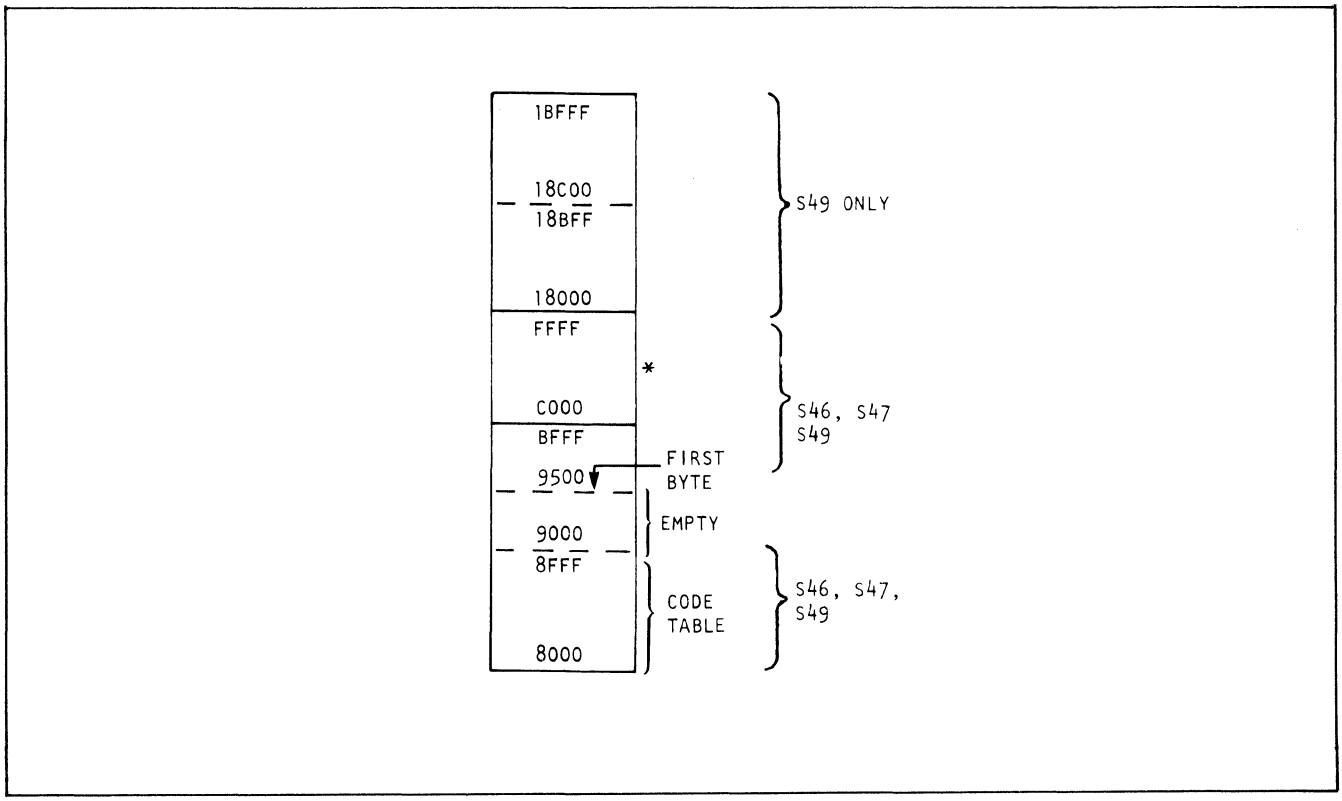


Figure 2-23. ROM Memory Map - S46, S47, and S49

To run diagnostics, the standard ROM's are removed and the diagnostic ROM is inserted in any empty ROM slot. It is removed as soon as the testing is completed.

2.3.7 RANDOM ACCESS MEMORY (RAM) MODULE

The 16K RAM module (see Figure 2-24) provides temporary storage for all data processing activities within the INP mainframe. The RAM, a PC board, interfaces with the processors and the MC2 via the mainframe bus to perform read, write, and read-write-modify functions. Additional logic circuitry provides all the control signals required by the RAM chips, as well as address multiplexing, address range decoding, and interleaving. The on-line configuration (CO) of the network is stored in RAM.

The 16K memory is organized as four banks of 4K each and consists of 32 4Kx1 dynamic random access chips. These chips are supported by refresh logic on the RAM card and on MC2.

RAM's that are compatible with a 5 MHz system are marked "I" on the rail. Those that are not so marked are compatible with a 4 MHz system.

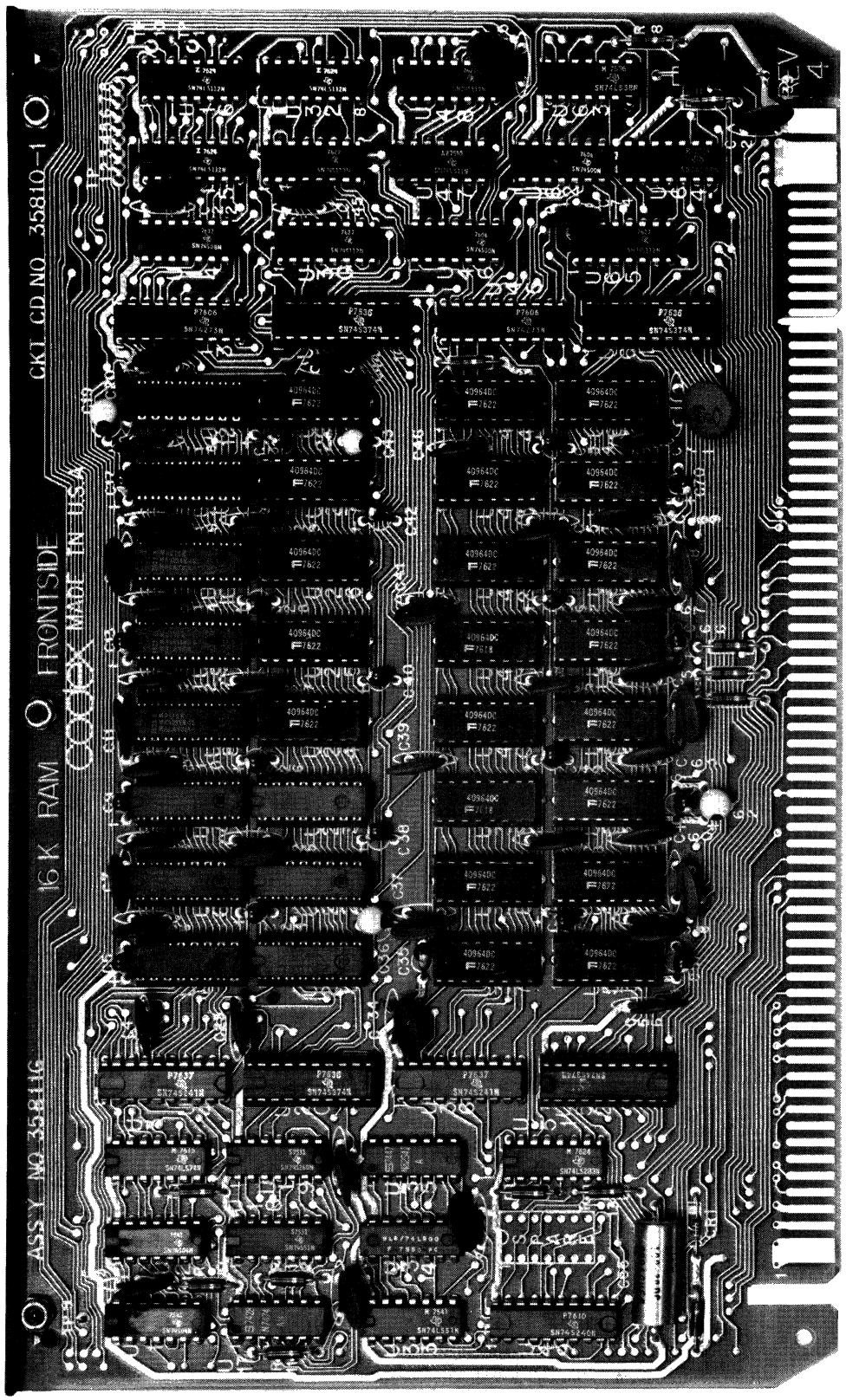


Figure 2-24. 16K RAM Board

RAM's must be installed in consecutive slots in the mainframe, beginning with the rightmost slot that is keyed for RAM cards.

2.4 PORT NEST

A port nest is a card rack with connections for 18 circuit boards (see Figure 2-25). It contains one Nest Interface Card (NIC) and up to 16 port cards, the types and quantities of which are application-dependent. The types of port cards are network ports (NP's) consisting of a set of two cards, an NP1 and an NP2; Dual Universal Terminal Ports (TP's), Activity Indicator Terminal Ports, and/or Current Loop Ports (CLP's). If the INP has the Report Logging CTP option, a time-of-day module (TODM) is installed in slot 1E/1F. Port cards are connected to the nest interface card by a PC backplane port nest bus.

Every INP has as many port nests as needed to hold the required number of terminal port cards. Multiple port nests are cascaded from the mainframe by way of I/O busses in the form of 50-conductor ribbon cables between NIC's (see the block diagram of Figure 2-1).

2.4.1 PORT ADDRESSES AND PHYSICAL LOCATIONS

The nest interface card is mounted in the leftmost slot in the nest, marked "NI." It has no address. The next slot is empty, and also has no address. The two boards of the first network port are mounted in physical slots 00/01 and 02/03; the network port address is X'02' (the first card is not addressed). Addresses are hexadecimal. The locations and addresses for eight port nests are shown in Figure 2-26. Terminal port cards have two channels each. The address of the J1 channel is the upper of the two addresses for the card, and the upper addresses are even. The address of the J2 channel is at the bottom which is an odd address.

2.4.2 INSTALLATION OF PORT CARDS

Terminal and network port cards that are located downstream of one empty slot in the port nest will operate normally because they are able to generate an interrupt. However, they cannot if they are downstream of two consecutive empty slots. For this reason it is good practice to insert cards in consecutive slots. This allows removal of a port card while the INP is running.

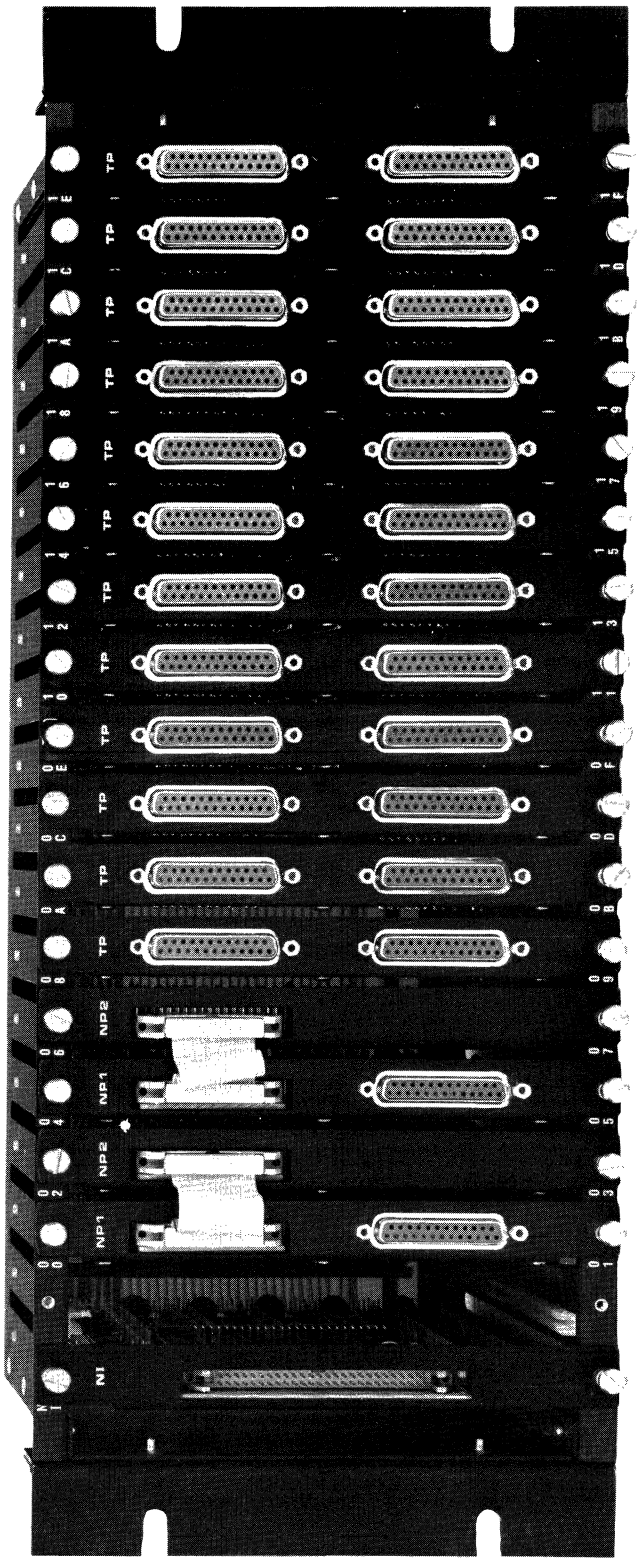


Figure 2-25. 6040 INP Port Nest

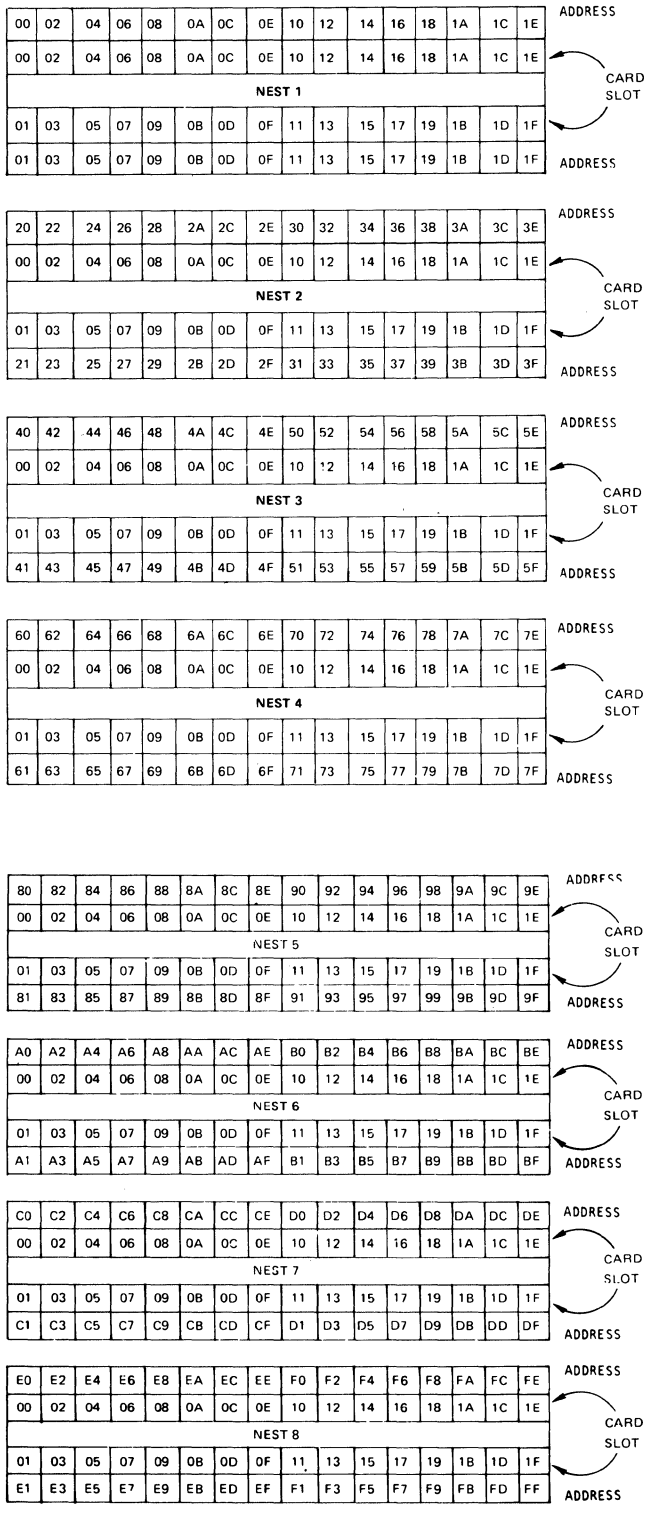


Figure 2-26. Locations and Addresses of Network Port Cards

2.4.3 NEST INTERFACE CONTROL MODULE

The Nest Interface (NI) control module (Figure 2-27) in each port nest recognizes and passes I/O signals from the mainframe (or the adjacent upstream NI if there are two or more port nests) addressed in the I/O ports in its nest, as well as the adjacent downstream NI. The NI contains nest-selection logic, read-write controls, local chip select logic, interrupt service logic, clock buffers, a downstream address generator, and an 8-bit bidirectional Data Access Line (DAL) bus. In a 6040 series INP, as many as eight nests can be daisy-chained via their respective NI modules and I/O busses.

2.4.4 NETWORK PORT

A 6040 Series INP has one network port (consisting of two cards, NP1 and NP2) for each adjacent node assigned.

The network port is the synchronous node interface to the highspeed trunk modem and, ultimately, to the INP at the remote node. It performs the functions of serializing, deserializing, and buffering data; inserting and detecting flags; and generating and checking block error check sequences. It also generates level 4 and level 6 service requests and receives, and transmits ACK's and NACK's.

A network port (NP) operates at synchronous speeds of 1200, 2400, 4800, 7200, and 9600 bps, and presents a Data Terminal Equipment (DTE) interface at its EIA connector on NP1. The NP consists of two modules: NP1, which contains the transmit circuits, and NP2, which contains the receive circuits (see Figures 2-28 and 2-29).

NP1 and NP2 are joined logically (daisy-chained) by a ribbon cable I/O bus, connected to the J1 connector of each module. Removal of either NP breaks the daisy-chain. Connection to the highspeed modem is via J2 on the NP1 module. J2 presents a DTE interface to the high-speed modem. NP1 and NP2 should be treated as a matched pair because two cards of different Rev's may be incompatible.

2.4.4.1 FIFO. The FIFO (first-in, first-out) register on the network port is a serial shift register that functions as a transmit buffer, so its size (in bits) is related to trunk speed (see Table 2-5). The FIFO acts as a serial bit delay to the highspeed trunk. It smooths out the flow of data so as to minimize NP generated interrupts.

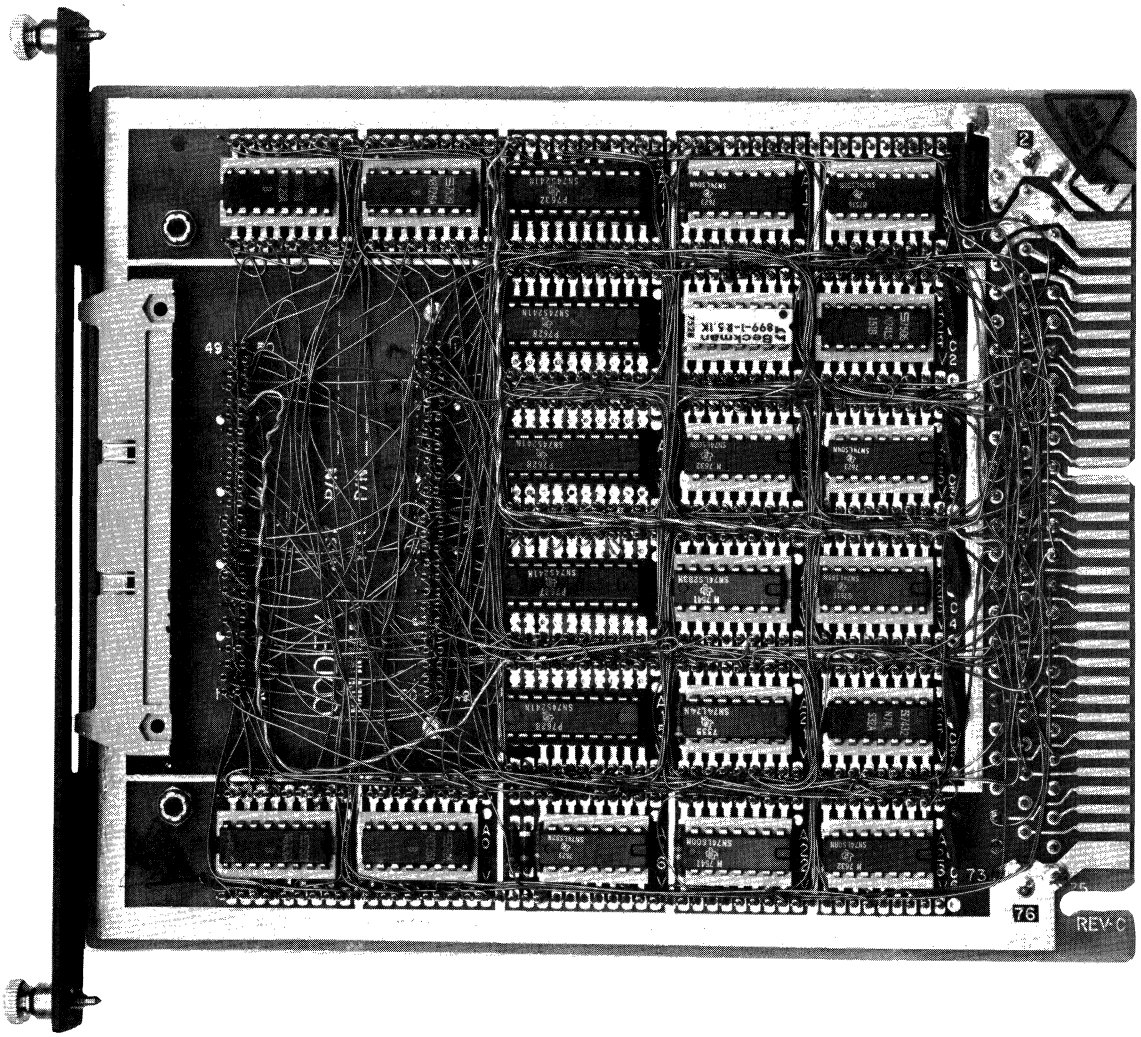


Figure 2-27. Nest Interface Control Module

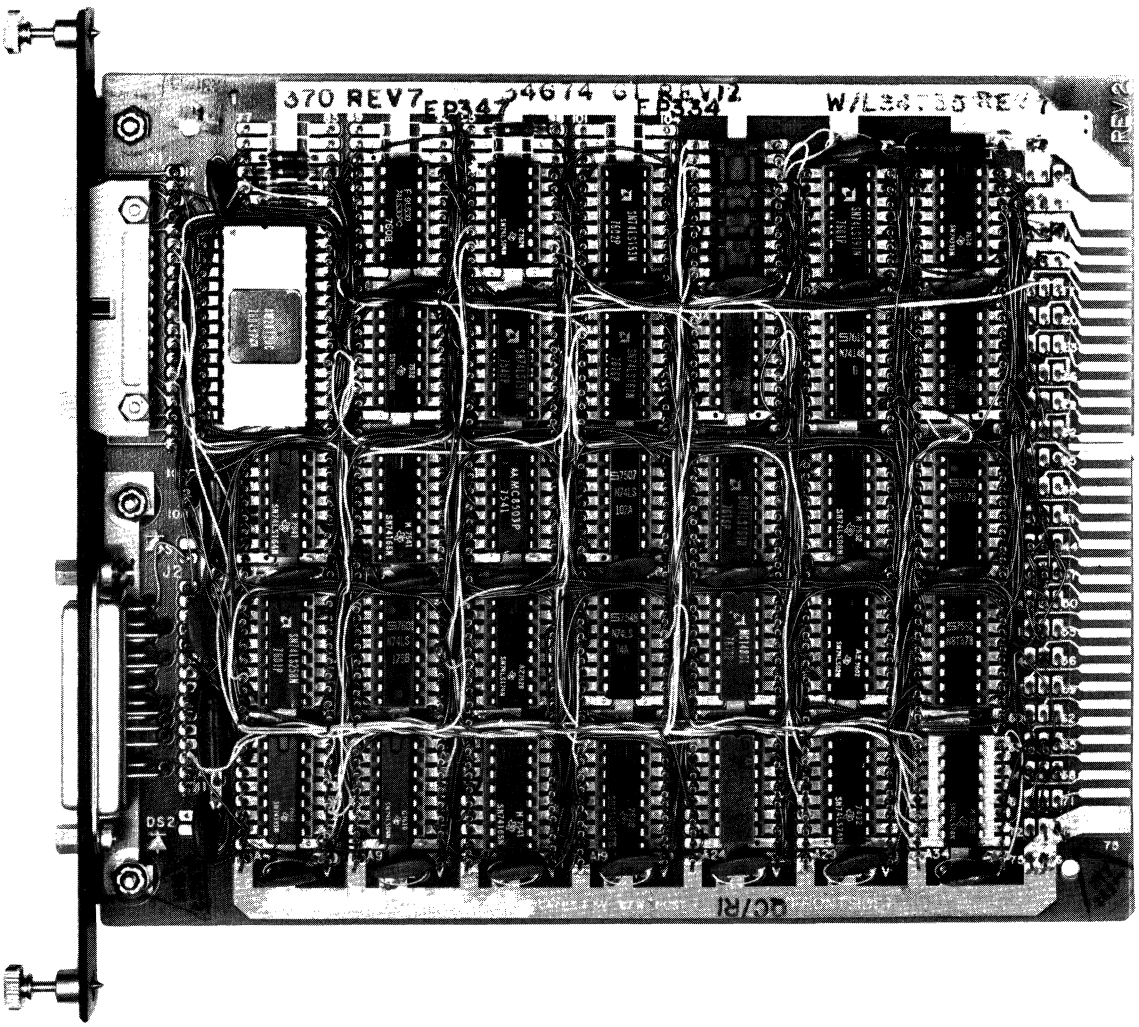


Figure 2-28. Network Port 1 Card (NP1)

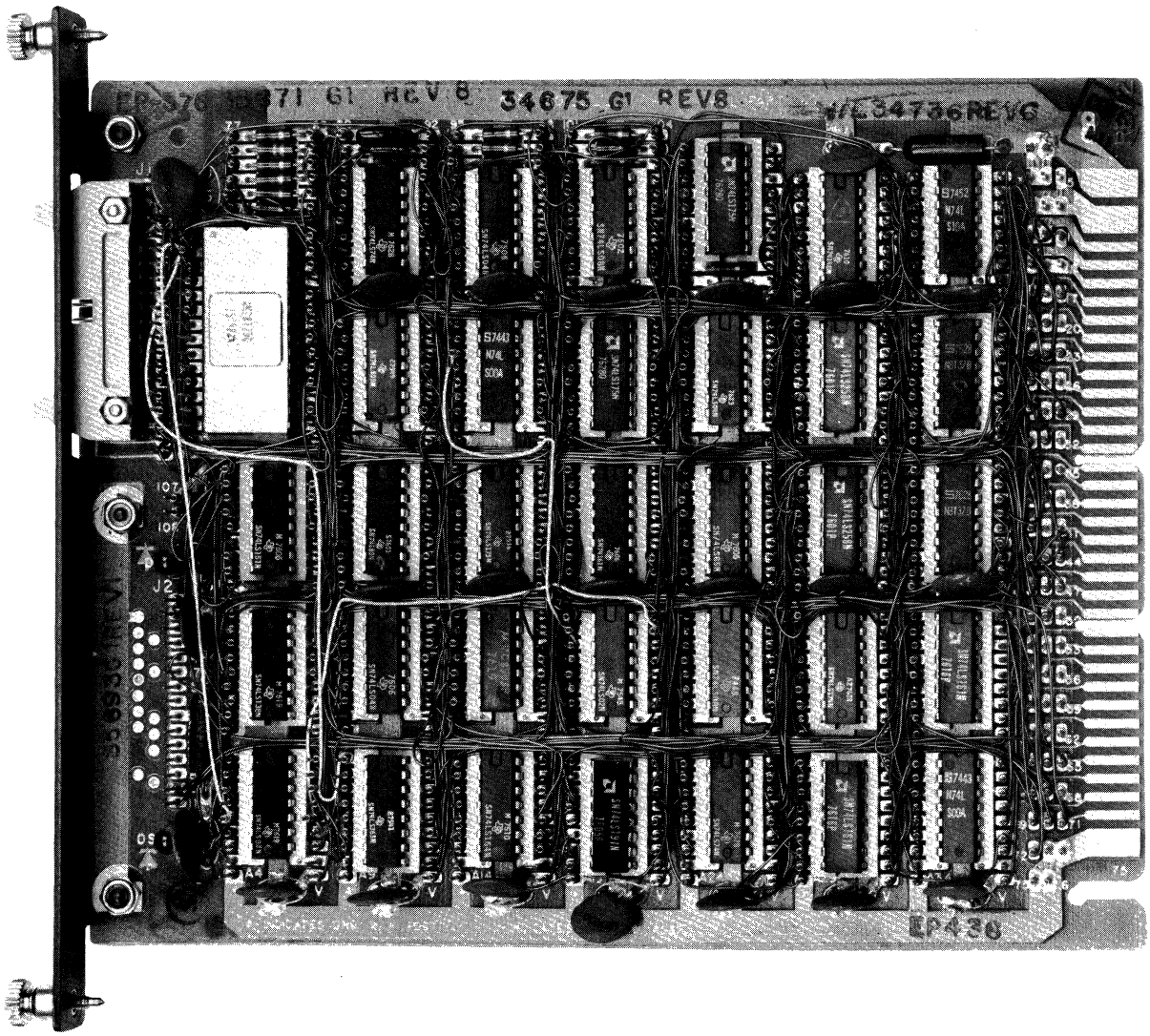


Figure 2-29. Network Port 2 Card (NP2)

TABLE 2-5. TRUNK SPEED, FIFO RELATIONSHIP

Trunk Speed (bps)	FIFO Value (bits)
1200	32
2400	64
4800	128
9600	256

2.4.5 DUAL UNIVERSAL TERMINAL PORT (Option 66130)

This terminal port (TP) provides RS-232-C or CCITT V.24 interface between an Intelligent Network Processor and the data terminal attached to it. The TP module (see Figure 2-30) contains two channels, each independently capable of full-duplex operation in either asynchronous or BSC synchronous mode. (The mode is determined when the system is configured.) Each interface can appear as a modem (DCE) or as a data terminal (DTE), depending on the interface cable used to connect the terminal port channel to its I/O device. Terminal port interface signals and the interfaces for each type of cable are listed in Appendix C.

The TP contains hardware for generating and selecting clock rates, and selecting clock sources, EIA control signals, and signal delays. Two separate sets of clock rates are provided: one for asynchronous (low-speed) terminals, the other for synchronous (high-speed) terminals. Seven standard asynchronous clock rates are supplied: 75, 110, 134.5, 150, 300, 600, and 1200 bps. Other customer-selected speeds can be provided via Option 66136, each at the sacrifice of one standard speed.

ASCII or EBCDIC codes are supported when operating in BSC synchronous mode, as well as the transparent text mode. The following code-dependent functions are implemented: (1) character framing via SYN characters, (2) recognition of transparent/nontransparent text mode transitions, and (3) strip/insertion of idle time-fill characters.

Synchronous clocks are strap-selectable on the module. The terminal port (DCE) receiver clock can be selected from the receive or the transmit clocks supplied by the Data Terminal Equipment (up to 9600 bps), or from a set of six clocks supplied by the sync clock generator U22 on the TP module itself: 1200, 2400, 3600, 4800,

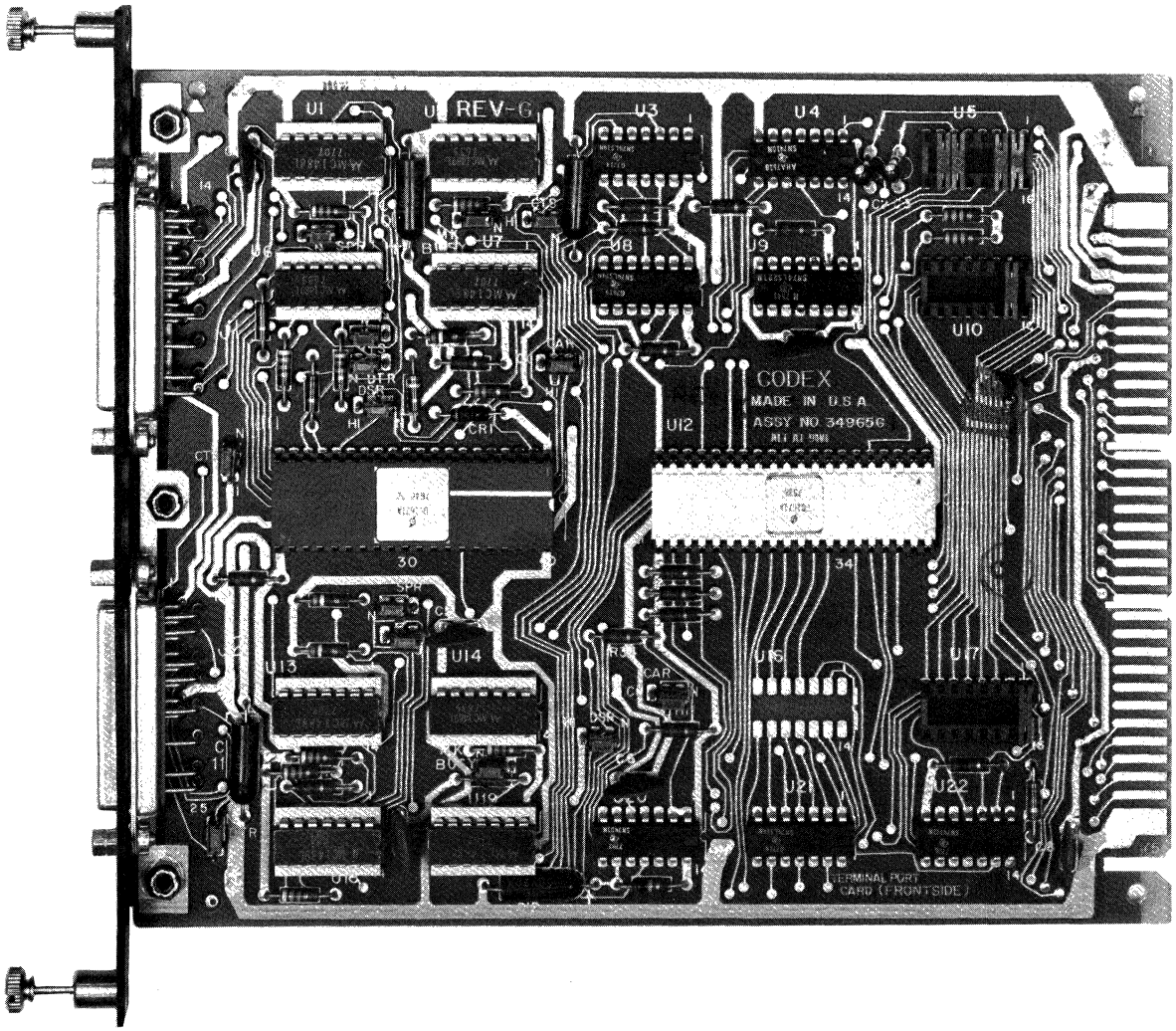


Figure 2-30. Standard (Dual Universal) Terminal Port Module

7200, or 9600 bps. The terminal port transmit clock can be selected as the DTE transmit clock, or it can be the same as the terminal port receive clock. Output transmit and receive clocks are generated from the selected DCE receive clock.

2.4.5.1 TP MODULE LAYOUT. When the TP card is plugged in the port nest, the upper connector is for the J1 channel, the lower connector for J2. Strapping capabilities and the ASTRO for the J1 channel are illustrated in Figure 2-31. Strapping platform U5 is common to both channels. The clock sources and control signal delays for channel J1 are also shown in this figure. The corresponding numbers for the J2 channel's ASTRO and strapping platforms are shown in the corner of the illustration.

2.4.6 ACTIVITY INDICATOR TERMINAL PORT (Option 66131)

Option 66131 performs the same functions as the standard (dual universal) terminal port module. The activity indicator terminal port incorporates the following enhancements:

a. Four LED's are mounted on the rail of the card. They show input and output signal activity for each channel on the card.

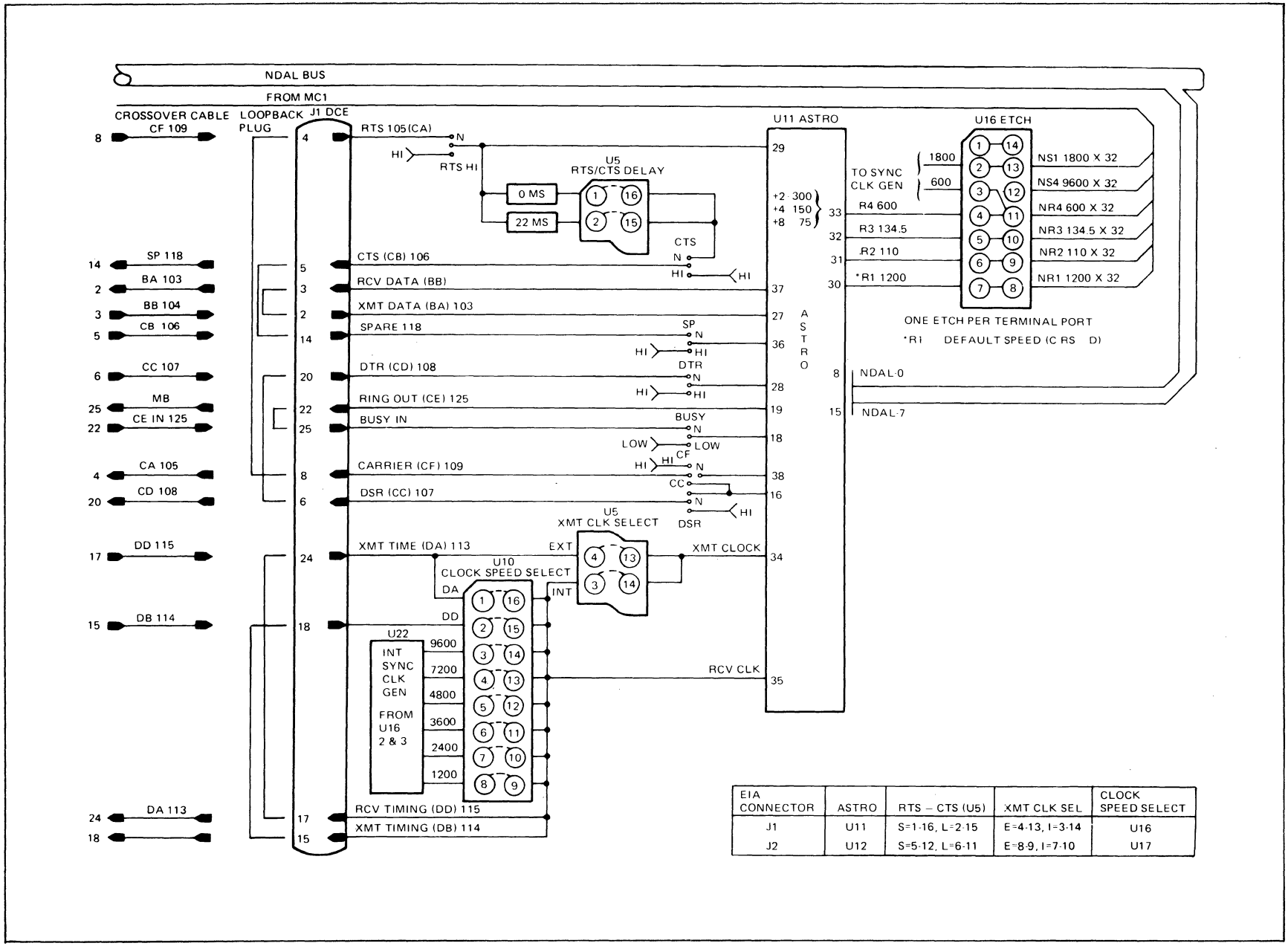
b. Control signal strapping capabilities have been improved.

Like the standard (dual universal) terminal port, Option 66131 is strappable to select clock sources and rates and to activate control signals and associated delays.

2.4.6.1 MODULE LAYOUT. When the module is plugged into the port nest, the J1 connector is on top, J2 is below. All circuitry and strapping platforms for each channel are located on the associated (upper or lower) half of the board. Figure 2-32 shows the choices available for control signals and signal delays, and clock speeds and sources for the J1 channel. The corresponding J2 channel ASTRO and strapping platform are shown in the corner of Figure 2-33.

2.4.6.2 ACTIVITY INDICATOR LED DISPLAY. There are four LED's mounted on the rail of each activity indicator terminal port module. The two LED's on the left are associated with the J1 channel, and the two on the right with the J2 channel. The top two LED's indicate output activity, and the bottom two indicate input activity.

Table 2-6 summarizes the LED conditions. Each LED responds to three signals: a primary control signal, a secondary control signal, and a data signal. For an



EIA CONNECTOR	ASTRO	RTS – CTS (U5)	XMT CLK SEL	CLOCK SPEED SELECT
J1	U11	S=1-16, L=2-15	E=4-13, I=3-14	U16
J2	U12	S=5-12, L=6-11	E=8-9, I=7-10	U17

Figure 2-31. Dual Universal Terminal Port J1 Channel Signals

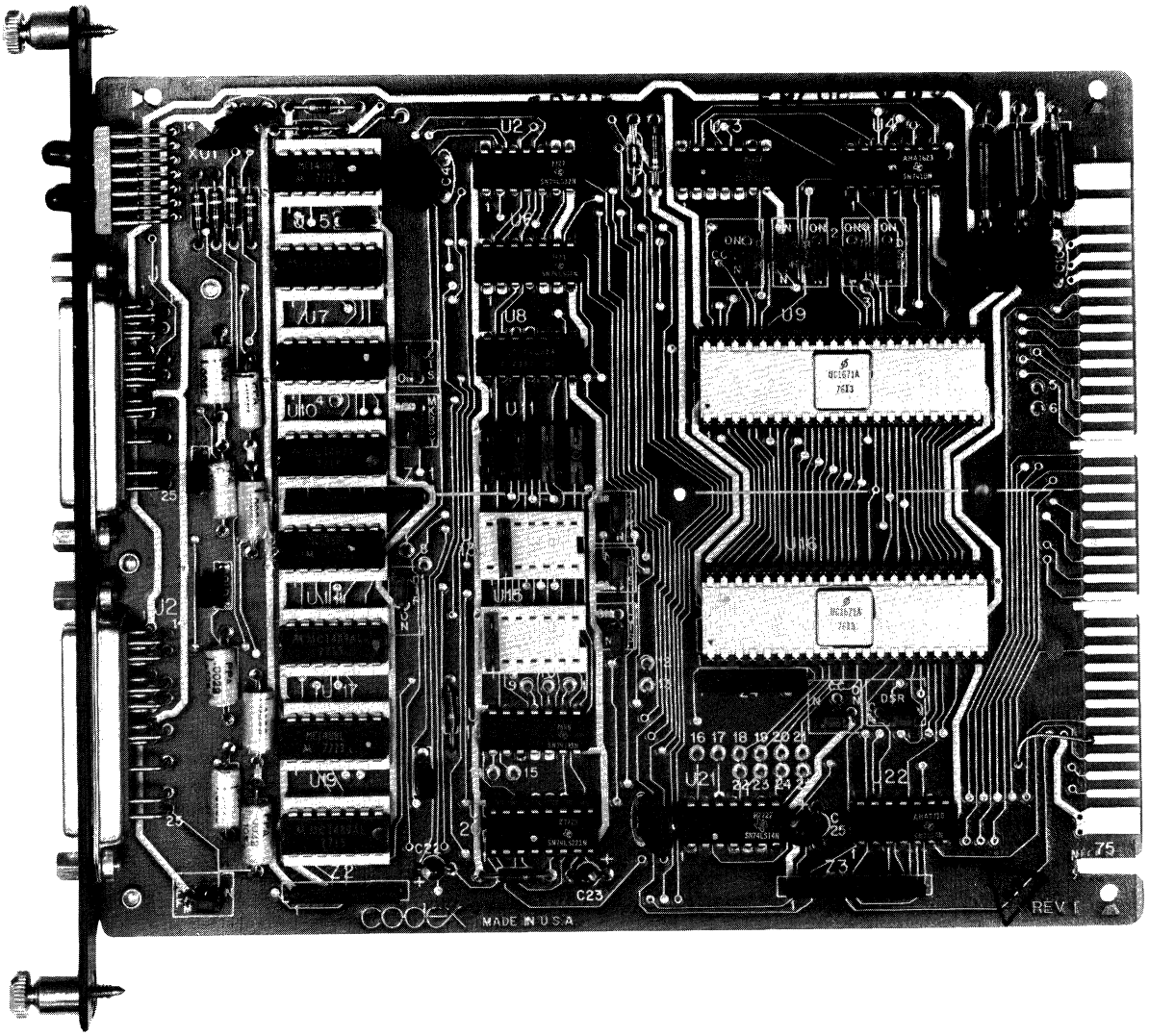
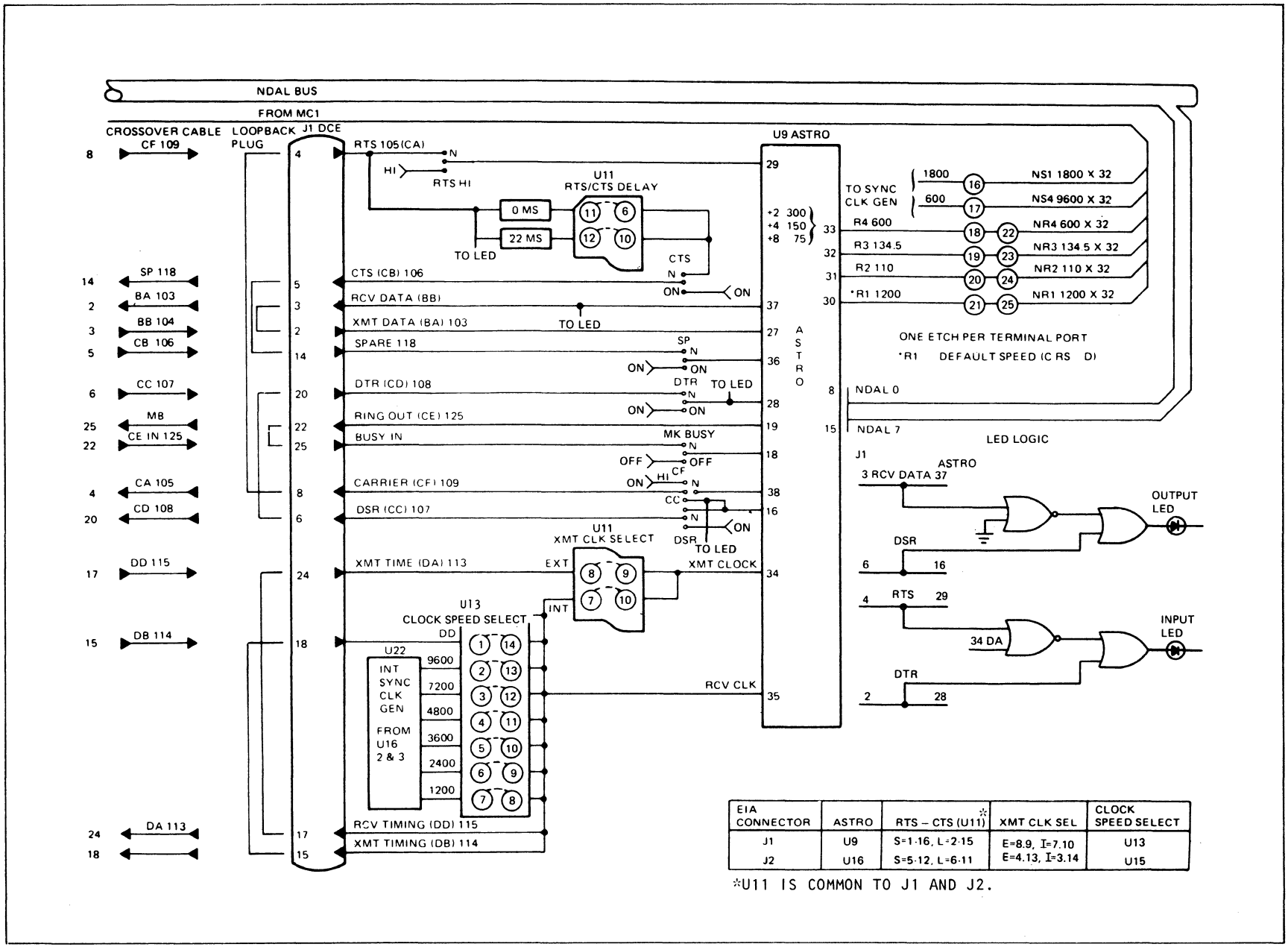


Figure 2-32. Activity Indicator Terminal Port



EIA CONNECTOR	ASTRO	RTS – CTS (U11)*	XMT CLK SEL	CLOCK SPEED SELECT
J1	U9	S=1-16, L=2-15	E=8.9, I=7.10	U13
J2	U16	S=5-12, L=6-11	E=4.13, I=3.14	U15

*U11 IS COMMON TO J1 AND J2.

Figure 2-33. Activity Indicator Terminal Port J1 Channel Signals

TABLE 2-6. LED CONDITIONS

	Primary Control Signal	Secondary Control Signal	Data Signal	LED State
Output	DSR	CAR	BB	
	Inactive	Don't care	Don't care	Off
	Active	Inactive	Don't care	On
	Active	Active	Space 0	Off
	Active	Active	Mark 1	On
Input	DTR	RTS	BA	
	Inactive	Don't care	Don't care	Off
	Active	Inactive	Don't care	On
	Active	Active	Space 0	Off
	Active	Active	Mark 1	On

output indicator the primary control signal is DSR, the secondary control signal is CARRIER and the data signal is BB. For an input indicator the primary control signal is DTR, the secondary control signal is RTS, and the data signal is BA.

A LED will be ON if its primary control signal is active and its secondary control signal or its data signal is inactive. (A data signal is inactive if marking). A LED will be OFF if its primary control signal is inactive or if its primary control signal, secondary control signal, and data are all active. All control signals are detected at the ASTRO interface, not at the EIA interface. Under normal active conditions, a channel will have its primary and secondary control signals active while its data signal shifts from Mark to Space and back. The associated LED will blink on and off in this situation.

2.4.7 DUAL CURRENT LOOP PORT (Option 66150)

The current loop terminal port module, Figure 2-34, provides two independent current loop interfaces to two current loop data terminals, such as send/receive teleprinters, at standard asynchronous speeds.

Such asynchronous terminals operate either half-duplex or full-duplex. The maximum voltage swing is 125 Vdc with polar signaling or 85 Vdc with neutral signaling, and the maximum standard current is 60 mA. The high voltage is used by common carriers and customers who need it to transmit over substantial distances (over 1500 feet). The loop current compensates for resistance in the wire and the inter-

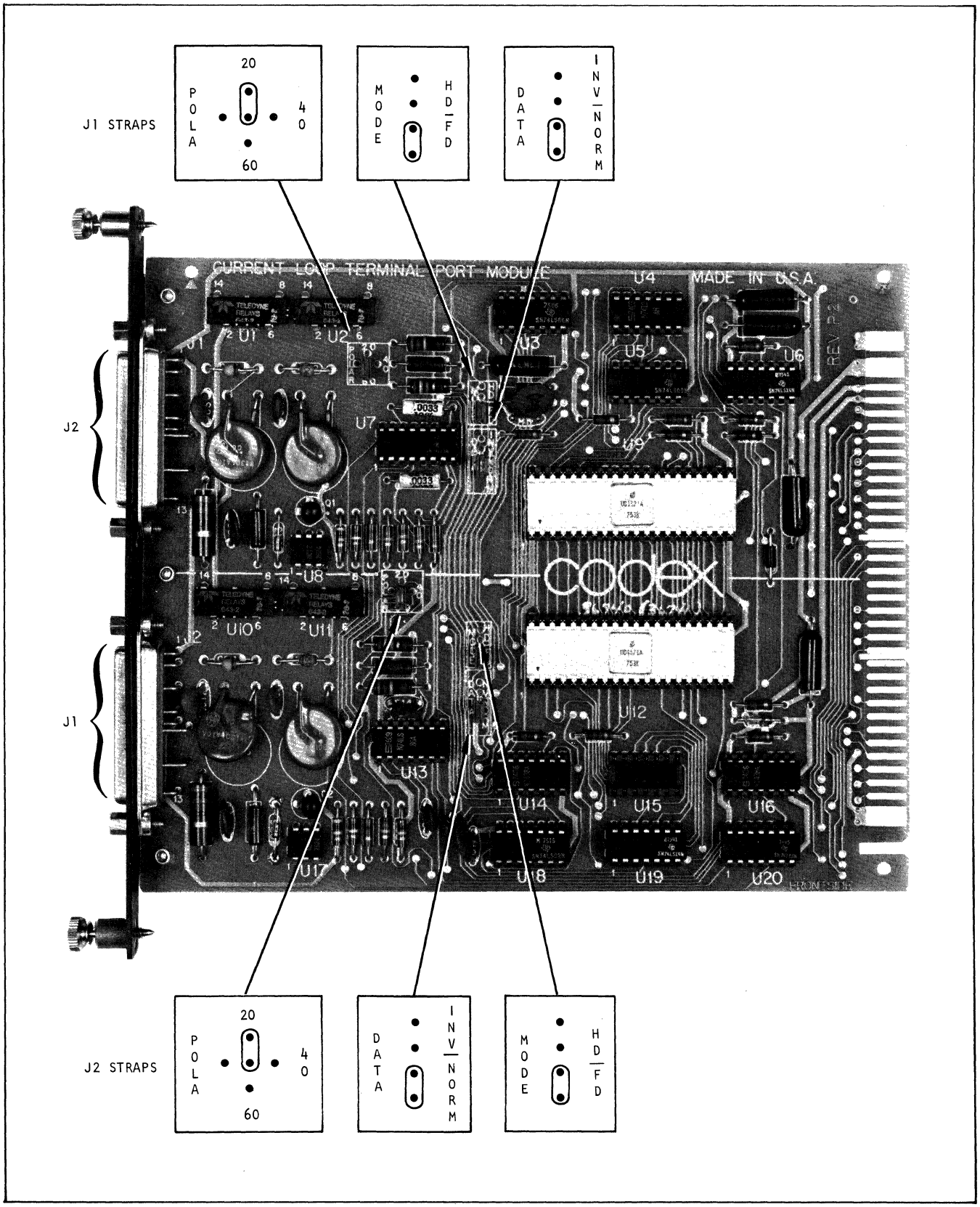


Figure 2-34. Current Loop Port

face of the terminal equipment since it must provide 20 to 25 mA at the receiving terminal to minimize noise from the contacts in the terminal.

2.4.7.1 CURRENT LOOP SIGNALS. The signals may be either polar or neutral working, as required by the attached terminal. Neutral working signals may be either positive or negative.

In polar working signals, Mark is current flow in one direction, while Space is current flow in the other direction. In neutral working, Mark is current flow, either positive or negative (see Figure 2-35) while Space is no current.

2.4.7.2 CURRENT LOOP MODULE STRAPPING. The accommodation to polar or neutral working signals generated by the terminal, and to the customer-provided loop current, is made by performing the appropriate strapping on platforms on the board. (See Figure 2-34.)

Each of the two channels has strap positions for 20, 40, or 60 mA polar current; normal or invert data; and half-duplex or full-duplex operating mode. The common carrier normally provides the dc power source and current limiting devices.

2.4.7.3 ACCESSORIES. To prevent connecting an EIA connector to a current loop port, the male and female connectors have been exchanged. The female is on the current loop cable, not on the card. The card connectors are male.

Two 40-inch cables, each with a standard 25-pin EIA connector at one end and a terminal block at the other (see Figure 2-36) are provided as part of the option.

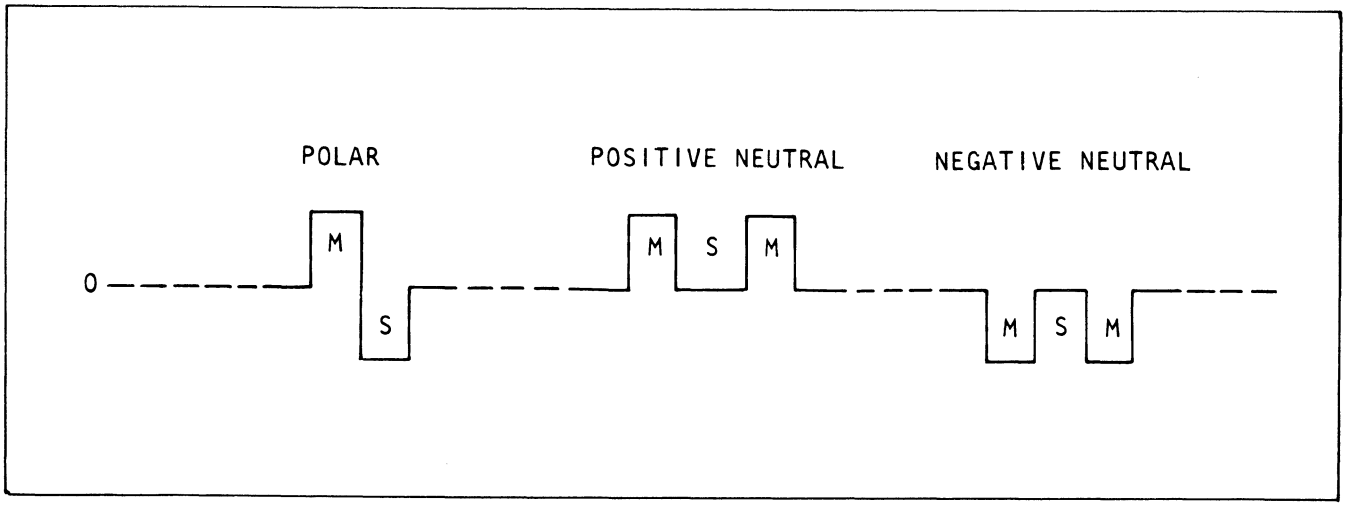


Figure 2-35. Current Loop Signals

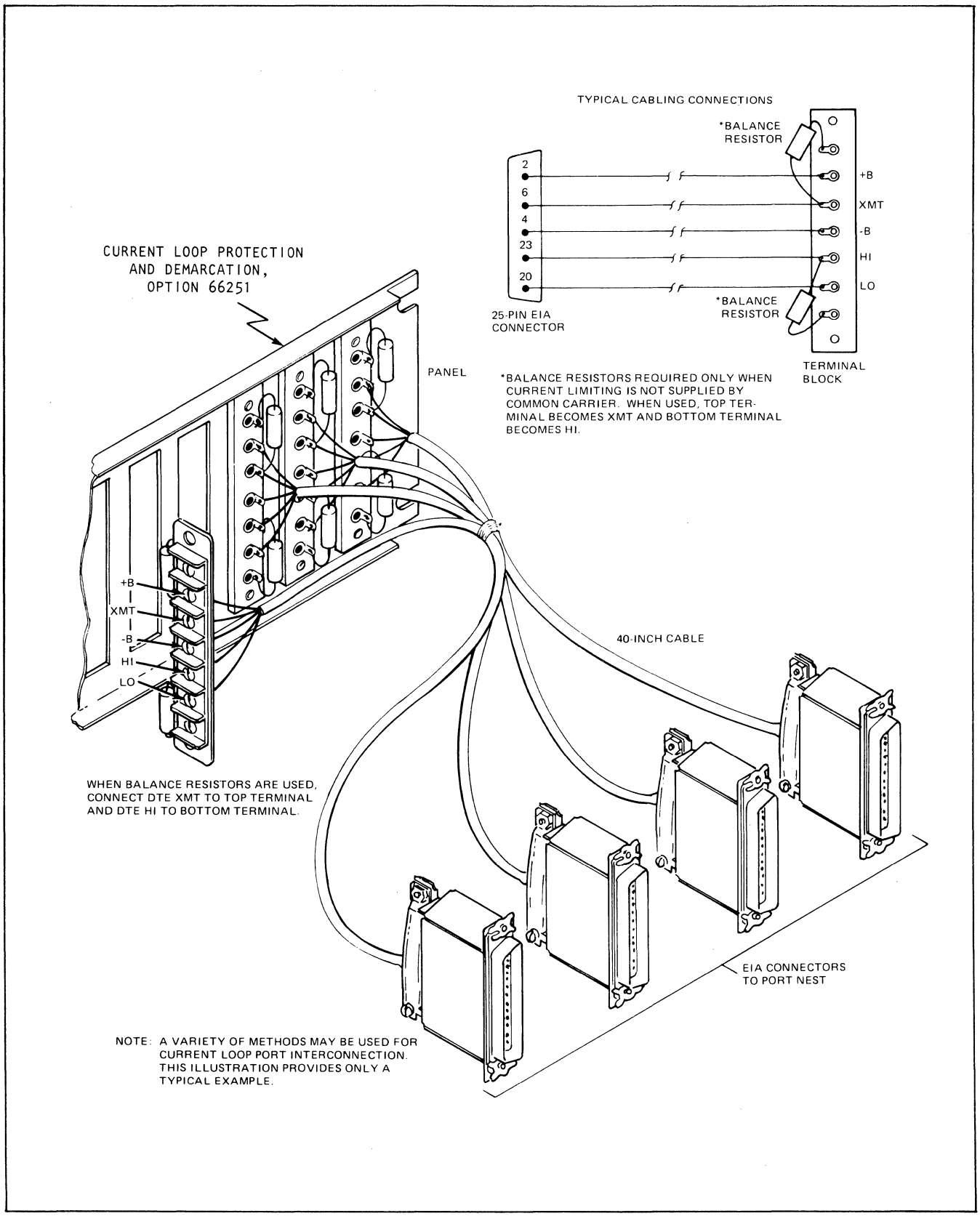


Figure 2-36. Current Loop Cabling Accessories

THE EIA connectors (of which only five pins are active) plug into J1 and J2 of the current loop port. Ther terminal block at the other end of a cable mounts into a specially designed demarcation strip which is also available as an accessory (Option 66251).

The demarcation strip is mounted on vertical rails at the rear of a rack. The strip contains 16 slots into which current loop terminal blocks may be mounted, allowing up to 16 current loop ports to be supported by one panel.

The port nest backplane and terminal block panel have protective cover to guard operators and maintenance personnel from the high voltage present at the backplane etches and terminals. The covers are held in place by a set of spacers and screws.

Such terminals are asynchronous and operate either half-duplex or full-duplex. The maximum voltage swing is 180 Vdc with neutral signaling or 85 Vdc with polar signaling, and the maximum standard current is 60 mA. The high voltage is used by common carriers and customers who need it to transmit over substantial distances, (over 1500 feet). The loop current compensates for resistance in the wire and the interface for the terminal equipment; it must provide 20 to 25 mA at the receiving terminal to minimize noise from the contacts in the terminal.

CHAPTER 3

INP INSTALLATION

3.1 INTRODUCTION

Each model of a 6040 Series INP has a basic physical configuration, described briefly in Chapter 1, with the components detailed in Chapter 2. In this chapter we are concerned only with the mechanical and electrical requirements for interconnecting the components delivered by Codex Corporation, and for assuring and verifying their proper operation.

The installation may be performed either by the customer's personnel or by Codex personnel, as determined when the equipment is ordered.

3.2 SITE PREPARATION

The 6040 Series INP's should be installed within 5 feet (1.5m) of a grounded ac outlet that has no other equipment on the line and is capable of furnishing the appropriate power specified in paragraph 1.5.2 and Table 1-3. The installation area should be clean, well-lighted, and free from extremes of temperature, humidity, and vibration. One power outlet is required for each power supply in user-supplied racks. If Codex racks are used, only one outlet is required.

No other equipment should be driven from the electrical circuit used to power the INP.

3.3 INSTALLATION PROCEDURE

Personnel should become familiar with the following installation procedure before attempting to install the equipment.

3.3.1 UNPACKING

After unpacking the equipment shipping crate, check the contents against the packing list. Inspect the equipment carefully for any damage that may have occurred in shipment. If any damage is noted, contact the shipper's agent. In the event of damage or a material shortage, contact the nearest Codex representative or the Codex Corporation, 20 Cabot Boulevard, Mansfield, Massachusetts 02048, for advice and

and assistance. It is suggested that the shipping crate and packing material be retained for use in future repackaging and shipment.

3.4 MECHANICAL ASSEMBLY

3.4.1 RACK-MOUNTED MODELS

Refer to Figures 3-1 through 3-4. Assembly of rack-mounted equipment is performed by installing the INP hardware in the appropriate racks, then connecting the port nest and power supply cables. These figures show the configuration with 400W power supplies. Figure 3-5 shows the sequence of modules (cards) in the mainframe.

3.4.2 CUSTOMER-PROVIDED RACKS

Users who elect to install a 6040 Series INP in their own racks must use installation techniques similar to those described in this manual. Codex Corporation may refuse to service locations where adequate provisions for accessibility, strain relief, and ventiliation have not been provided.

3.5 ELECTRICAL ASSEMBLY

Electrical installation consists of connecting all cables according to drawings, verifying that boards in the mainframe and port nest are properly located and seated, and verifying the positions of movable straps on the boards. Only then should power be applied to the system.

In the mainframe, the edge connectors on the motherboard are keyed to provide dedicated slots for boards, right to left, as follows: option card, MC1, MC2, 8 for processors, and 6 for RAM's and ROM's (see Figure 3-5).

Slots in the port nest are not keyed, but the placement of cards in the nest is subject to a few rules: The nest interface card occupies the leftmost slot, while the next slot is always open. The network port cards follow: NP1 in slot 00/01 and NP2 in slot 02/03, with other pairs of NP cards following in sequence. Terminal port cards follow in any type or order. If there is a time-of-day module (TODM) for a report logging CTP, it occupies slot 1E/1F. Terminal port modules should be installed in consecutive card slots.

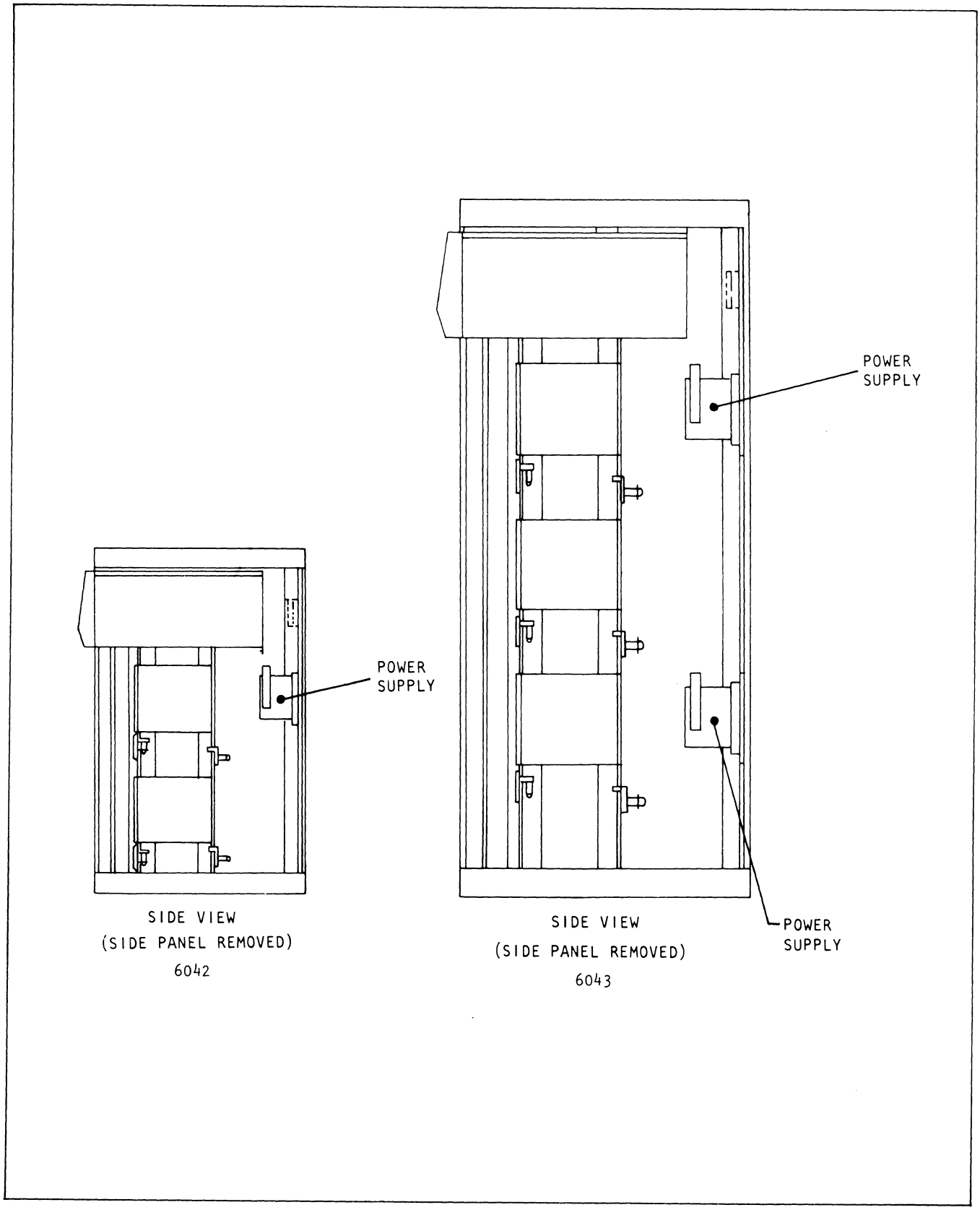


Figure 3-1. Models 6042 and 6043 INP Cabinet Installation

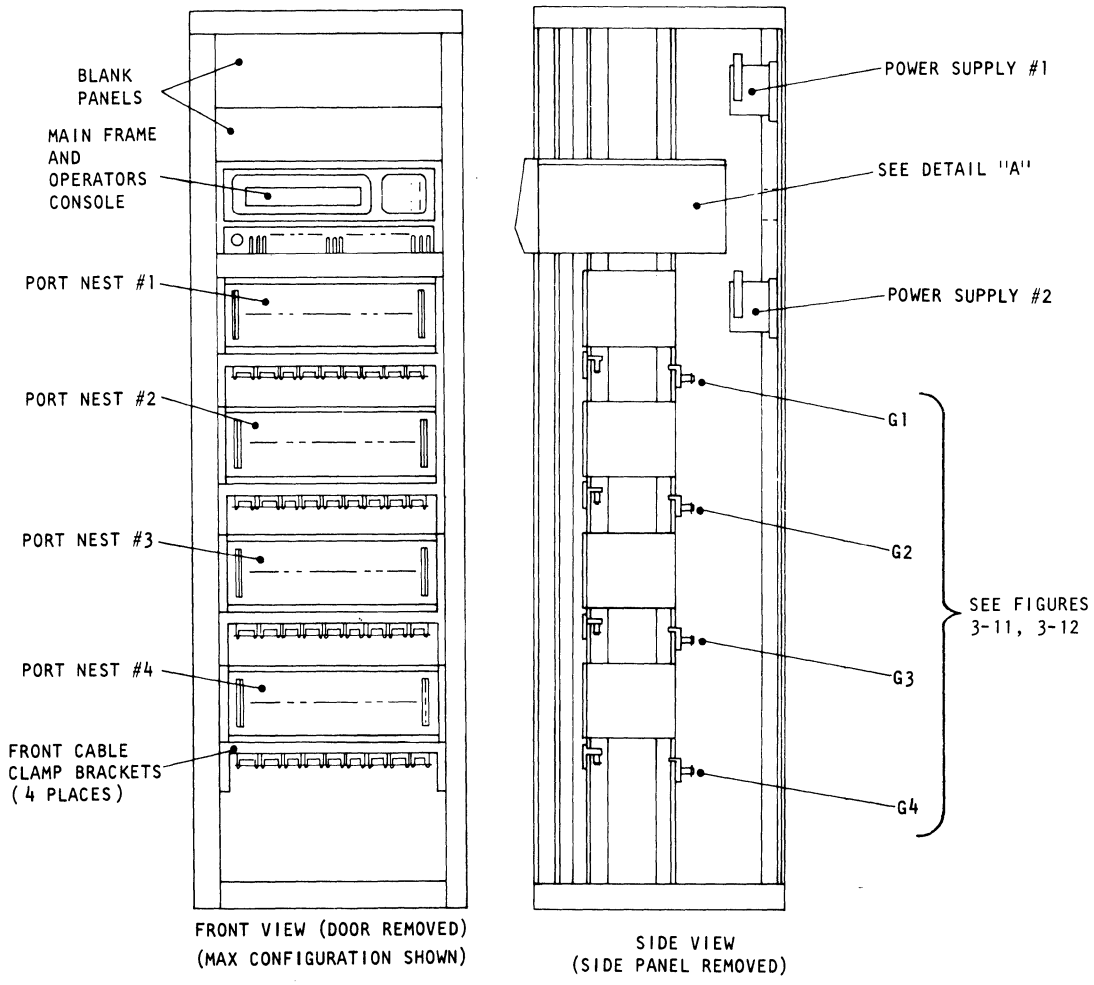


Figure 3-2. Model 6044 INP Cabinet Installation

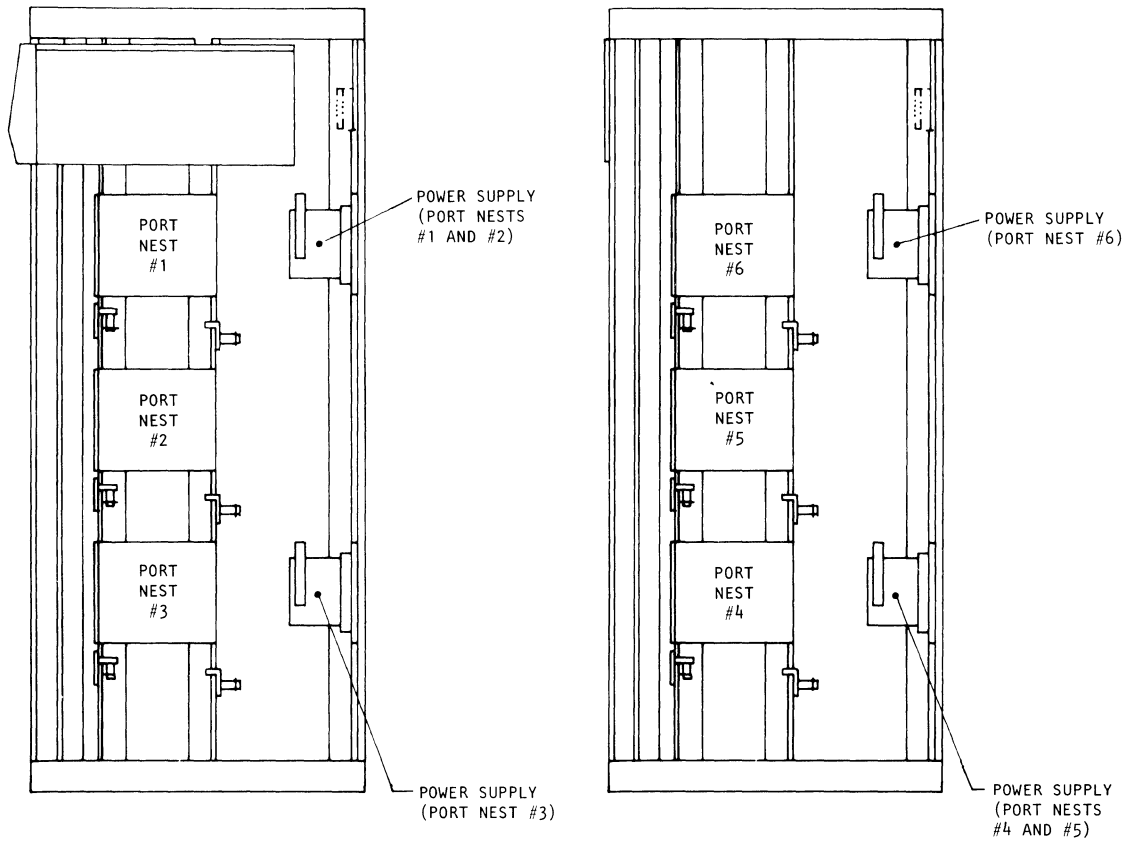


Figure 3-3. Models 6045 and 6046 INP Cabinet Installation

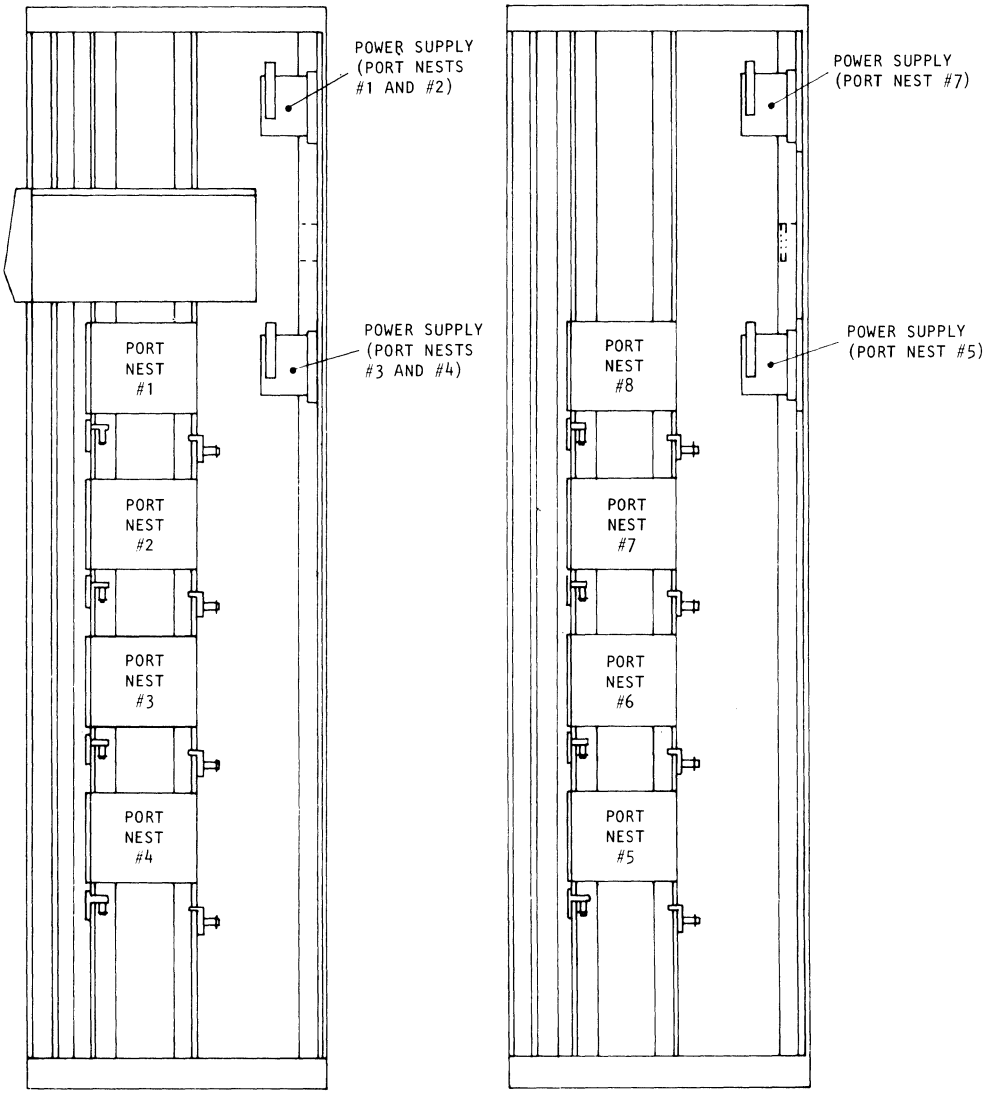


Figure 3-4. Models 6047 and 6048 INP Cabinet Installation

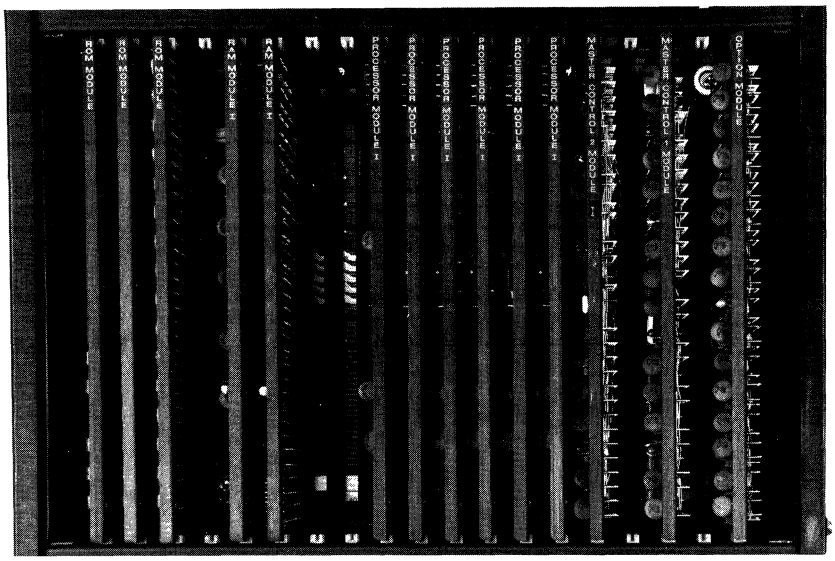


Figure 3-5. Mainframe Card Location

3.5.1 CABLING

Figures 3-6, 3-7, and 3-8 show the cables and connections used in installation of the various models of 6040 INP's.

Figure 3-6 shows a 6041 rack-mounted INP with one power supply. When a 200W power supply is used and a second port nest is added (Figure 3-7) it is preferable to attach both port nests to the second power supply to equalize the loads on the power supplies. No more than two port nests should be attached to a 200W rack-mounted power supply. With a 400W rack-mounted supply, two units will supply up to eight port nests (see Figure 3-8).

The equipment and cabling required for each model is indicated by the levels of the dashed lines at the left of the diagrams. For example, a 6042 (Figure 3-7) consists of all equipment above the level of the dashed line: one operator's console, one mainframe, two port nests, and two 200W power supplies; or if a single 400W supply is provided, it is capable of supporting the same quantity of equipment (see Figure 3-8).

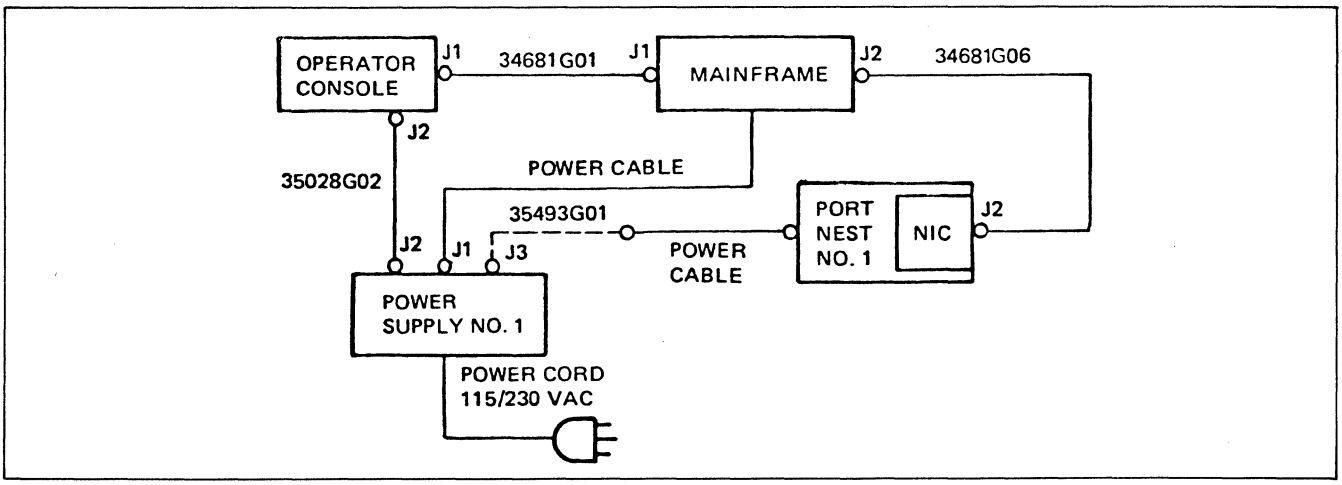


Figure 3-6. Cabling for 6041 INP's

Table 3-1 lists the product codes and descriptions of standard cables used in INP installations. The Codex part numbers given in Table 3-1 consist of two parts. The first five digits indicate the general application, e.g., crossover cable 35861, while the letter G and the last two digits indicate the length: G01, G02, etc. Customers should order parts by product code number.

In Figures 3-6, 3-7, and 3-8, cable 35493G01, product code 66938 (port nest to power supply) is shown as a dotted line. This cable is an extension to the port nest power cable, and is installed only if the added length is needed.

Figure 3-9 shows the cabling used on a port nest of a 6040 INP. The product number of the cable from NP1 J2 to the high-speed modem depends on the length required (see Table 3-1). Figure 3-10 shows the applications of INP to DTE direct cables, and INP to DCE crossover cables.

3.5.1.1 STRAIN RELIEF. A fully cabled 6044 or 6048 INP would put considerable strain on ports and port nests. To prevent misalignment and possible disconnections, this weight is borne by front and rear cable brackets on the racks. Cable clamps on the brackets separate and hold groups of cables that run from the port connectors, down the rack, to terminals and modems as shown in Figures 3-11 and 3-12. Cables from one port nest are separated into two groups, clamped in front, and led back beneath the nest to the rear brackets. Cables from nest 1 are bundled downward at the extreme left and right clamp locations (Figure 3-11), with those from nest 2 just inboard, and so on. Since a 6044 may have up to 124 port cables, this makes it considerably easier to find and run a cable to its proper terminal.

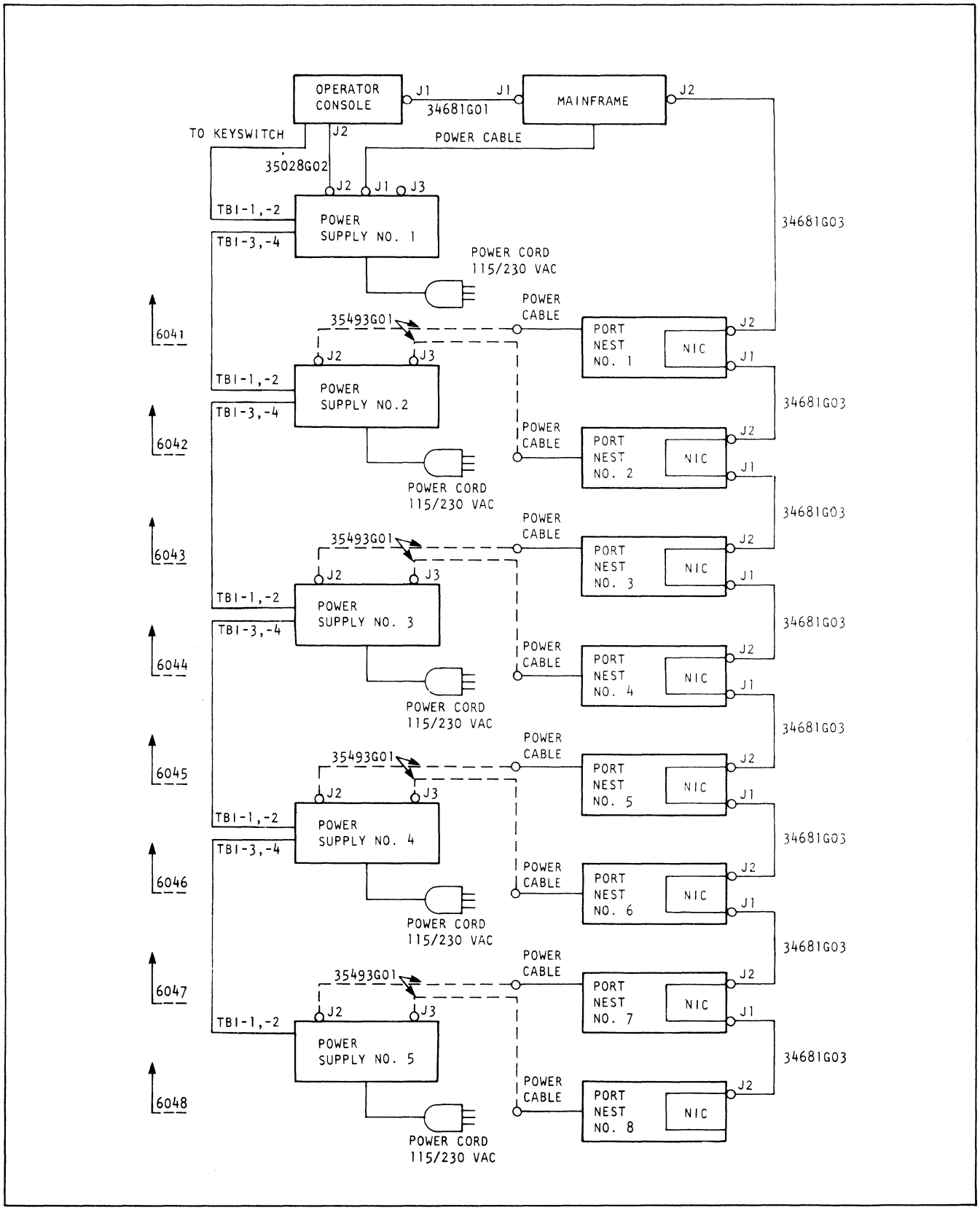


Figure 3-7. Cabling and Connections for 6040 Series INP's with 200-Watt Power Supplies

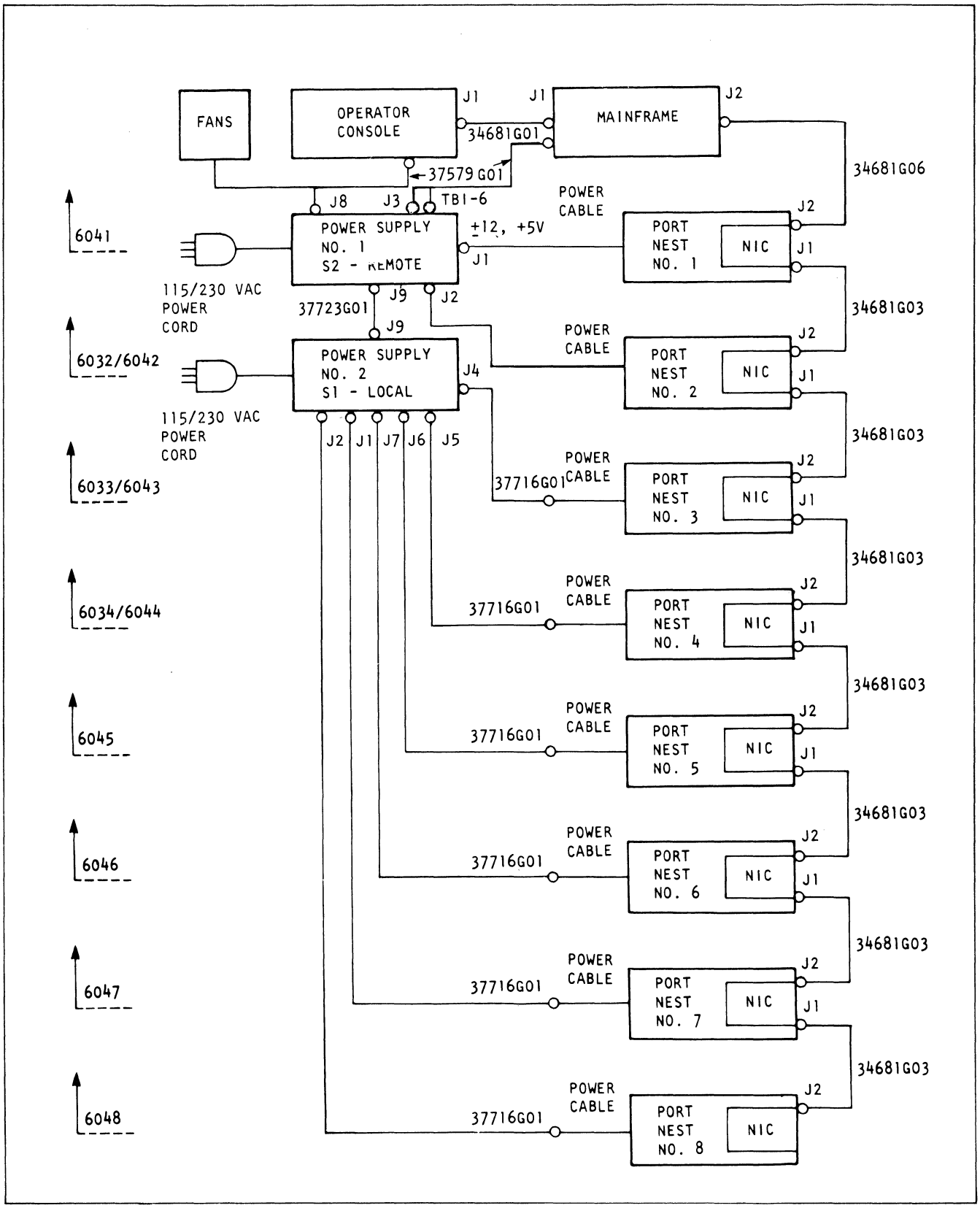


Figure 3-8. Cabling and Connections for 6040 Series INP's with 400-Watt Power Supplies

TABLE 3-1. CABLES FOR 6040 SERIES INP's

Product Code	Part Number	Part Name	Part Description
66180	35795G01	15-ft EIA modem crossover cable	Male-male cable for connecting a terminal port to its modem (DCE).
66181	35795G02	30-ft EIA modem crossover cable	
66182	35795G03	50-ft EIA modem crossover cable	
66183	35861G01	15-ft EIA terminal cable	Male-female cable for connecting a terminal port to its terminal or CPU (DTE).
66184	35861G02	30-ft EIA terminal cable	
66185	35861G03	50-ft EIA terminal cable	
66186	34196G01	15-ft EIA network port cable	Male-male cable for connecting a 6000 network port (NP1 J2) to the high-speed trunk modem.
66187	34196G02	30-ft EIA network port cable	
66188	34196G03	50-ft EIA network port cable	
66935	34681G06	180-in. interface cable	Connects mainframe to NIC between racks.
66937	34681G02	25-in. interface cable	Connects mainframe to port nest (desk model).
66938	35493G01	36-in. power cable	Connects port nest power cable to 200W power supply.
66939	34681G03	15-in. interface cable	Connects port nest to port nest.
66944	34681G01	5-in. interface cable	Connects console to mainframe.
66945	35028G02	25-in. power cable	Connects console J2 to 200W power supply J2.
66953	35028G01	28.5 in. power cable	Connects port nest J3 to 200W power supply, +5V, +12V ground.
66954	34681G04	58-in. interface cable	Connects mainframe to port (rack-mounted).
66955	34681G05	48-in. interface cable	Connects NIC to NIC between racks.

TABLE 3-1. CABLES FOR 6040 SERIES INP's (Cont)

Product Code	Part Number	Part Name	Part Description
Part of Option 6151	37214G01	40-in. current loop cable	Current loop terminal port to connector panel
-	37579G01	59-in. power cable	400W power supply to operator's console, mainframe, and fans.
-	37723G01	24-in. power cable	400W power supply J9 to 400W power supply J9.
-	37716G01	72-in. power cable extension	400W power supply J1, J3, J4, J5, J6, J7 to port nest power.

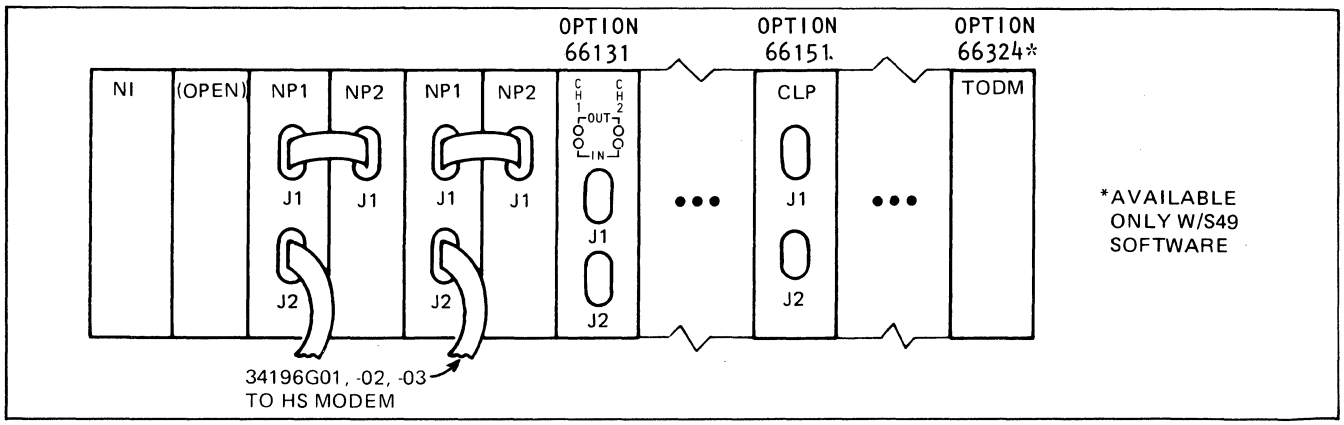


Figure 3-9. Port Nest Cabling

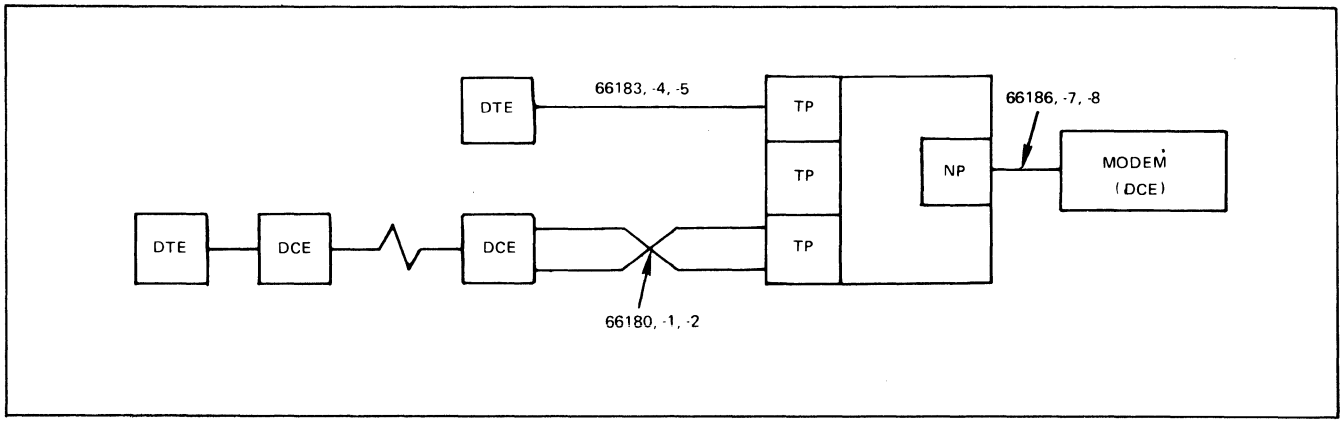


Figure 3-10. Cables from INP to DTE's and DCE's

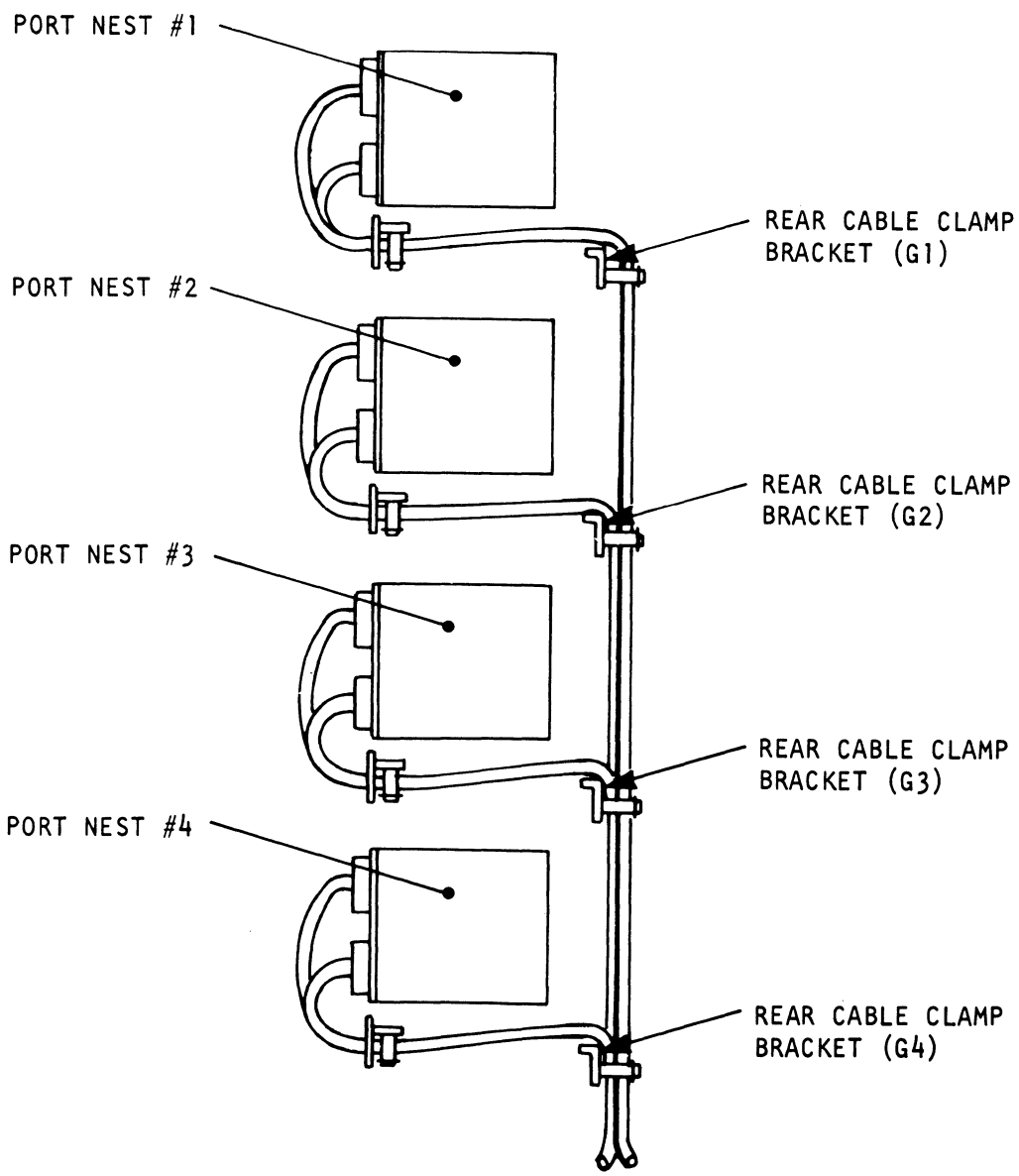
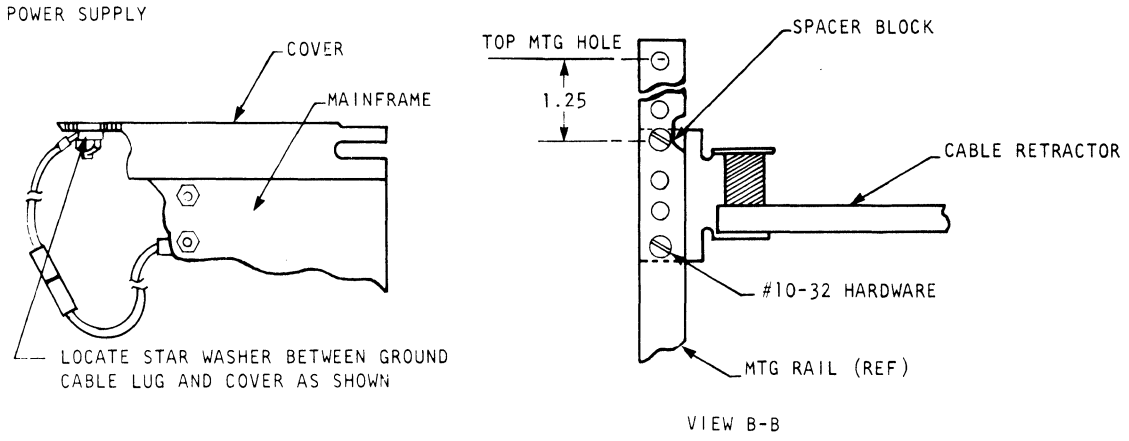
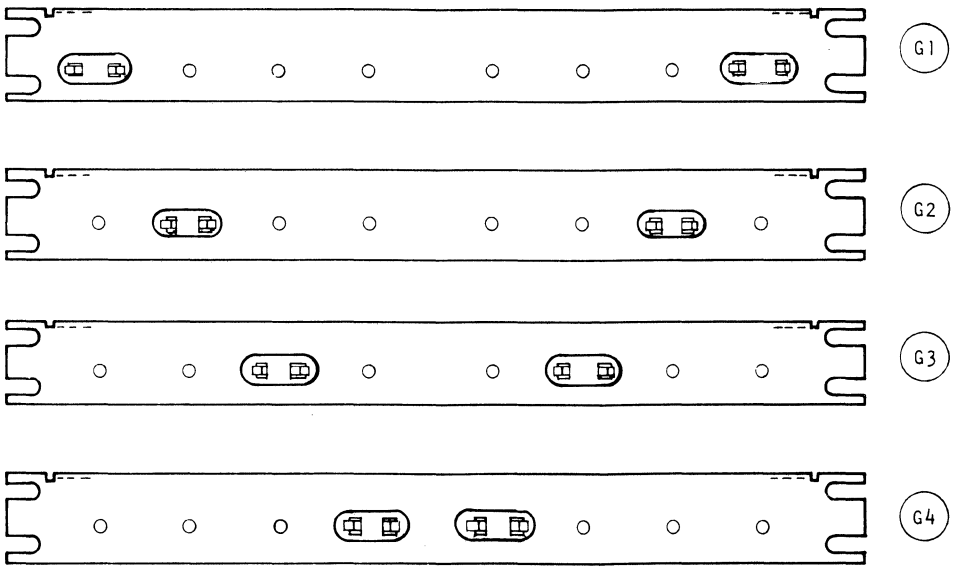


Figure 3-11. Trunk Cable Routing



VIEW B-B



VIEW A-A
REAR BRACKET CLAMPS

NOTE: IT IS IMPORTANT THAT THE REAR BRACKET CLAMPS BE USED AS SHOWN TO RELIEVE STRAIN ON THE CABLE CONNECTORS AND THE CIRCUIT BOARDS.

Figure 3-12. Cabinet Installation

3.5.2 STRAPPING

When the mechanical installation and cabling connections have been completed, check the positions of the straps and switches on the printed circuit boards before applying power to the system.

3.5.2.1 MASTER CONTROLLER 2 (MC2). The MC2 has straps for controlling the size of the lock byte area and for the rate of the system clock.

Soldered straps on the U40 platform control the size of the lock byte area (1024 bytes or 2048 bytes). If an MC2 has insufficient lock byte area for the model of the INP, the error message IL (insufficient lock byte area) will be displayed at BOOT time. Figure 3-13 shows the strapping for each model of the INP, and should be referred to if the cards are swapped.

System clock is solder-strapped at location DV near the center of the board, just above U40. DV is 5 MHz, SW is no longer used. There are two versions of this board: one with a 40 MHz crystal, and one with a 32 MHz crystal. The cases of the crystals are marked for speed. Each is divided by 8 to provide 5 MHz or 4 MHz processor speed.

3.5.2.2 PROCESSOR. There may be up to six processors in a 6040 Series mainframe. All processors in the same mainframe must be strapped for the same speed: 5 MHz or 4 MHz. The current boards operate at 5 MHz (strapped U34-1 to -8 and U34-3 to -6), but there are some 4 MHz processors in the field strapped U34-2 to -7, and U34-4 to -5 (see Figure 3-14).

S49 software takes advantage of an extended memory address technique. This technique requires that the strap in the upper right corner of the processor card, just below U11, be placed in the 128K position instead of the 64K position required by S46 and S47 (Figure 3-15). S49 also requires firmware changes on the Master Control cards. The compatible MC's are marked "S49" on the card rail.

3.5.2.3 16K PROM (ROM). ROM's for S47 software are treated as a set of two of the same release and revision number, so that if one fails, both are replaced. They are interchangeable in the two ROM slots in the mainframe because the addresses are strapped on platform U52 as shown in Figure 3-16. If three ROM's are required for S49, they are strapped as shown in Figure 3-17. S49 ROM's are identified by "S49" printed on the rail.

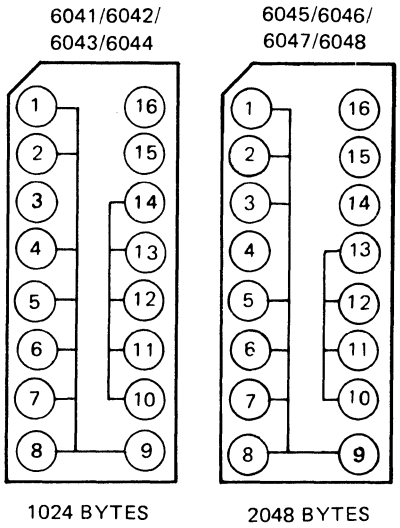


Figure 3-13. MC2 Lock Byte Platform U40

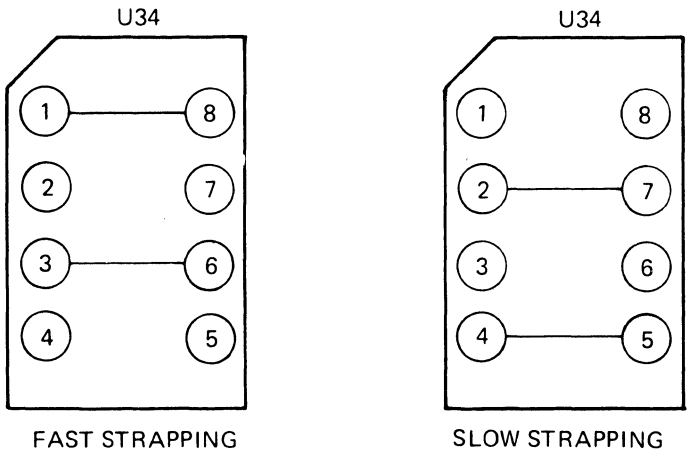


Figure 3-14. Processor Cycle Speed Strapping, Platform U34

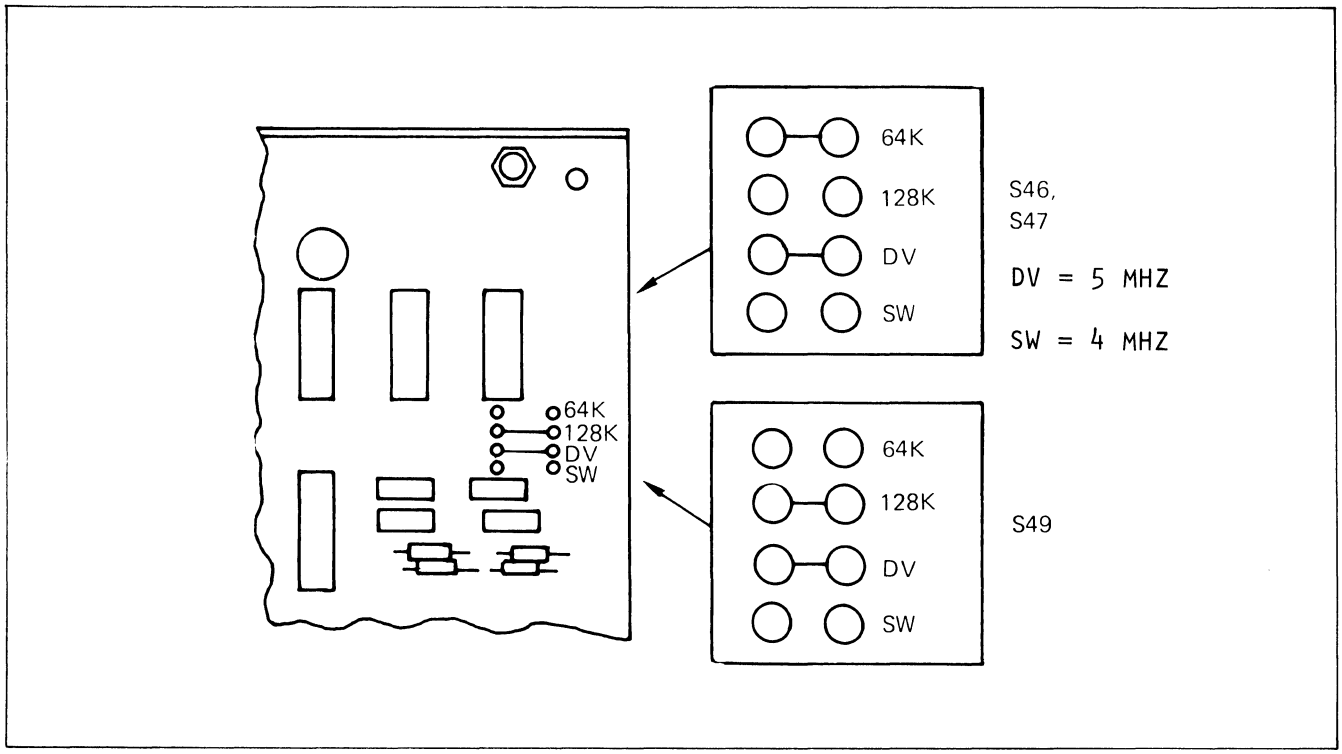


Figure 3-15. Processor Card Strapping, S46, S47 and S49

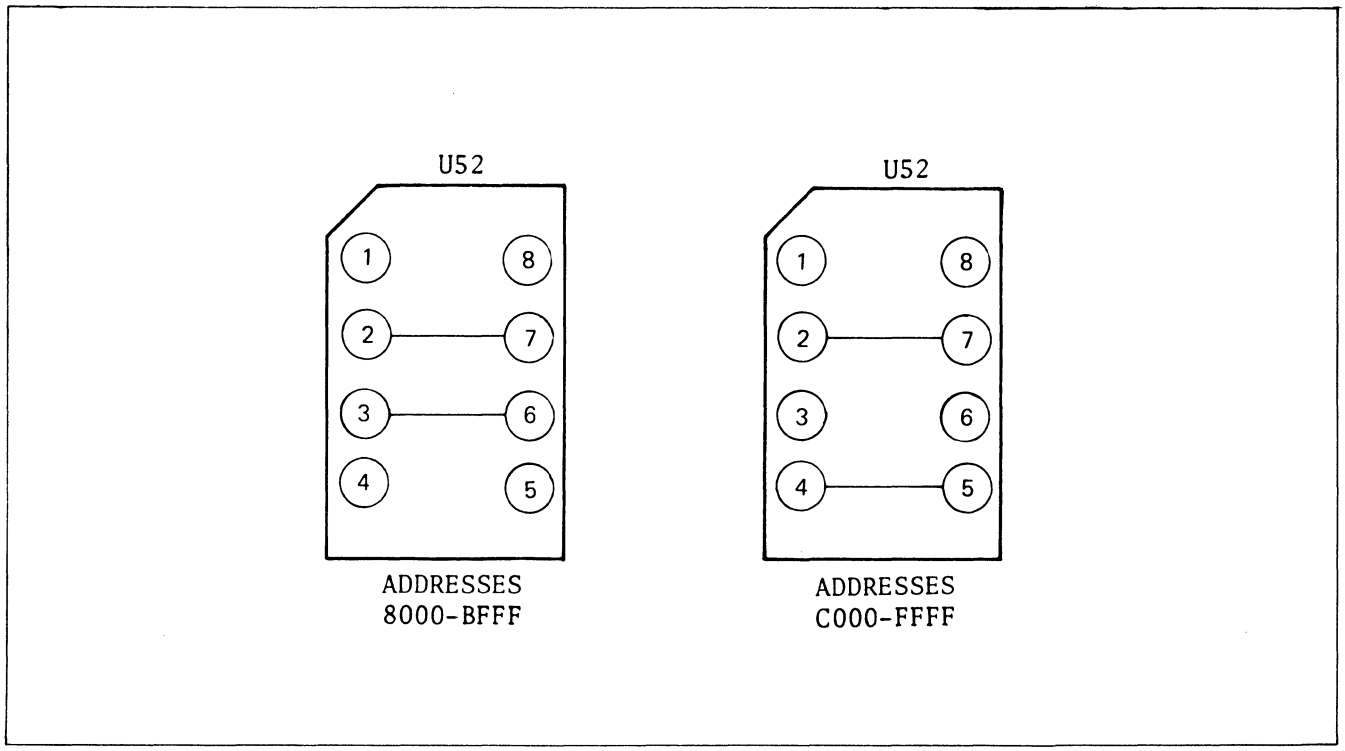


Figure 3-16. ROM Card S46 and S47 Address Strapping, Platform U52

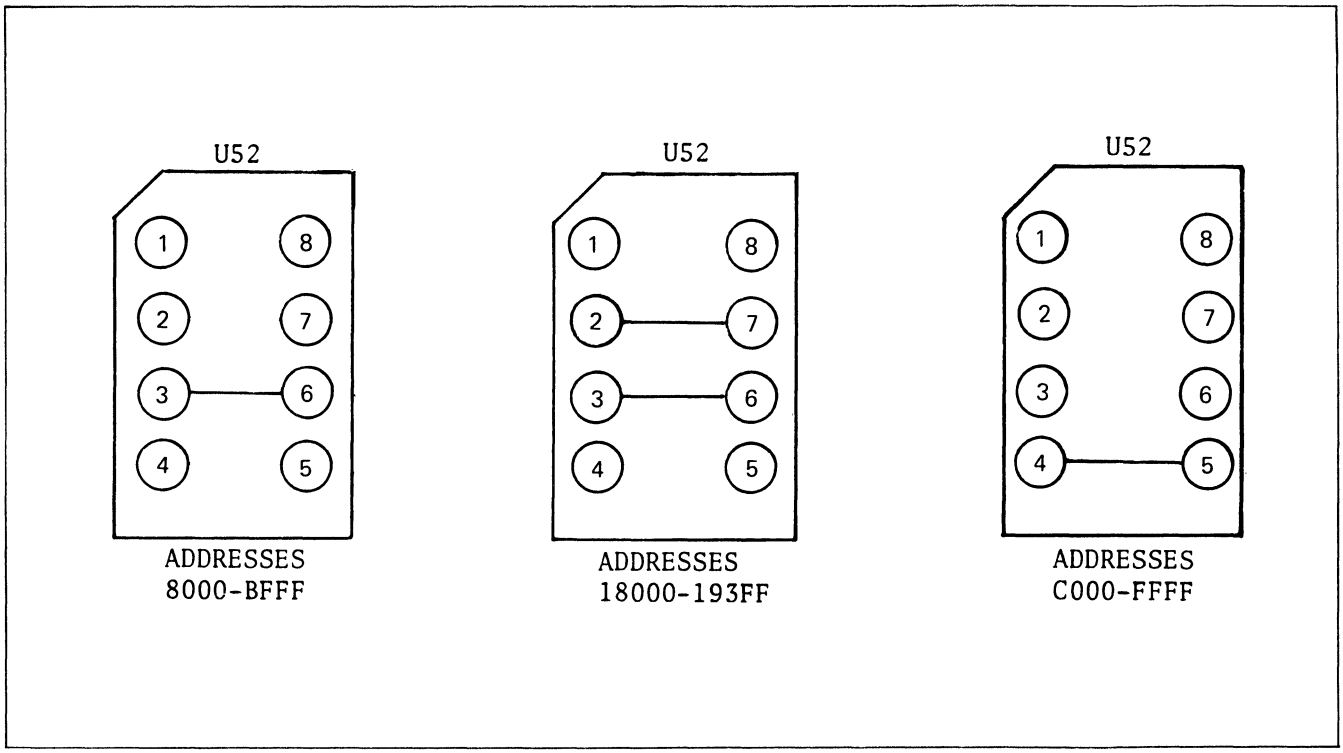


Figure 3-17. ROM Card S49 Address Strapping, Platform U52

3.5.2.4 NETWORK PORT 1 (NP1). The NP1 output clock (see Figures 3-18 and 3-19) used to clock data out of the network prot to the high-speed trunk modem may be selected from either the modem's DB clock (via U20, 4-17) or the modem's DD clock (via U20, 5-16).

Control signals DTR and RTS may be strapped to be either always high (via U20, 15-6 and 13-8) or to change state as the node is initialized (via U10, 15-6 and 13-8).

When the mode parameter of the network port is such that the network port is operating in a double-ended loopback, the electronic switches (labeled 1 through 5) change to the opposite position. Under these conditions, NP1 can be strapped for either internal or external loopback timing to be used as the NP1 output clock through switch 1 transferred and appropriate U20 strapping. Normally, the loopback clock is strapped for internal at 1800 bps (via U20, 1-20). Additional strapping capabilities include the internal speed of 7200 (via U20, 2-19) or using one of the modem clocks (via U20, 3-18 and either U20, 4-17 DB or U20, 5-16 DD).

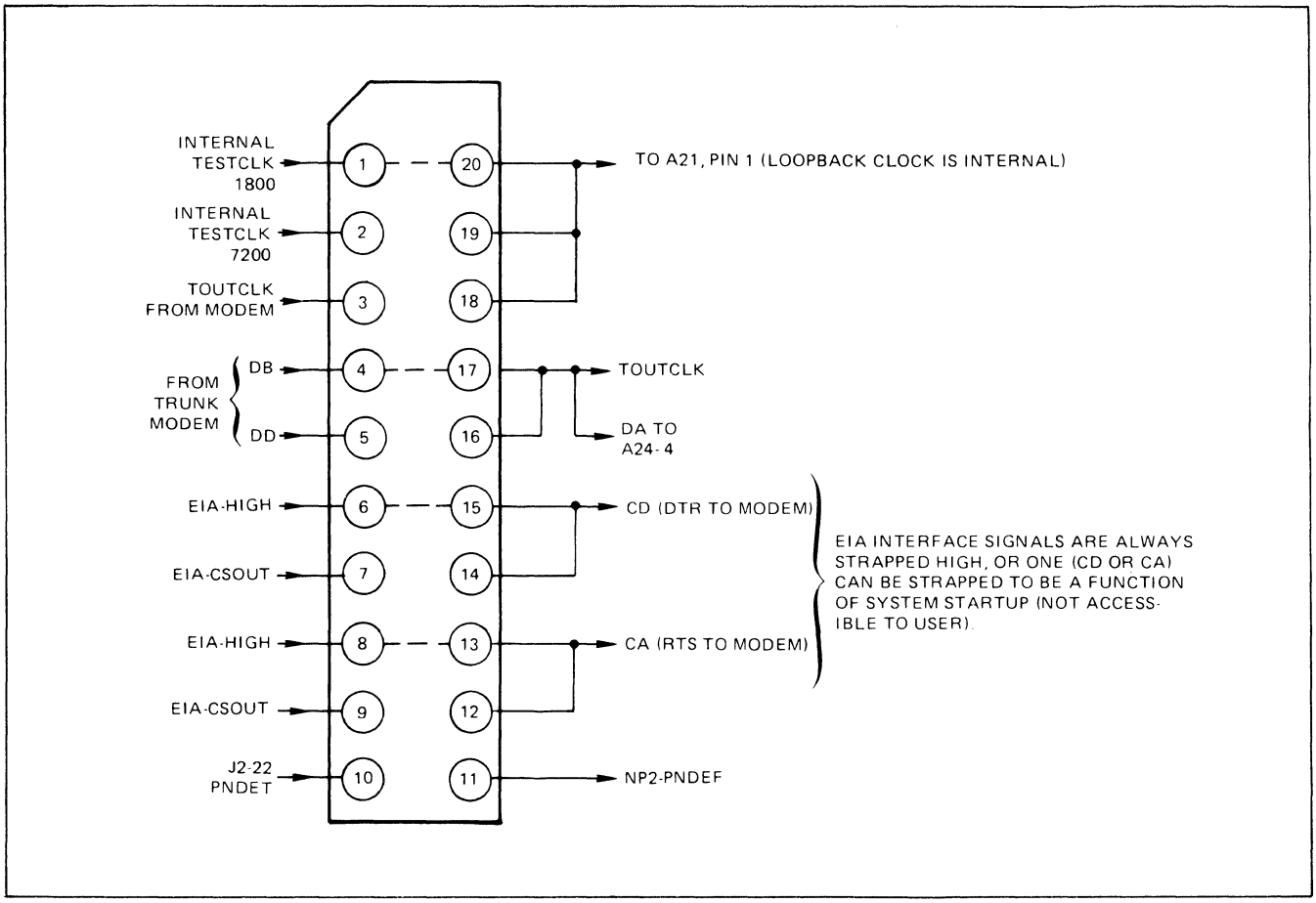


Figure 3-18. NP1 Platform U20, Normal Strapping

NP1 and NP2 should be considered as a "matched pair." (It is good practice to replace both if one must be replaced, which will prevent incompatibility that could be caused by mixing cards with different revision levels.) Chapter 2, Figure 2-26, shows locations and addresses of NP's in nest slots of multiple-nest layouts.

Always insert the first NP card set as follows: NP1 in card slot 00/01 and NP2 in card slot 02/03. For configuration purposes, the address would be Port 02.

3.5.2.5 STANDARD (DUAL UNIVERSAL) TERMINAL PORT (Option 66130). The dual universal terminal prot (Option 66130) has two channels, each of which can be configured independently to operate in either BSC or asynchronous mode. The mode is selected when the TP is configured.

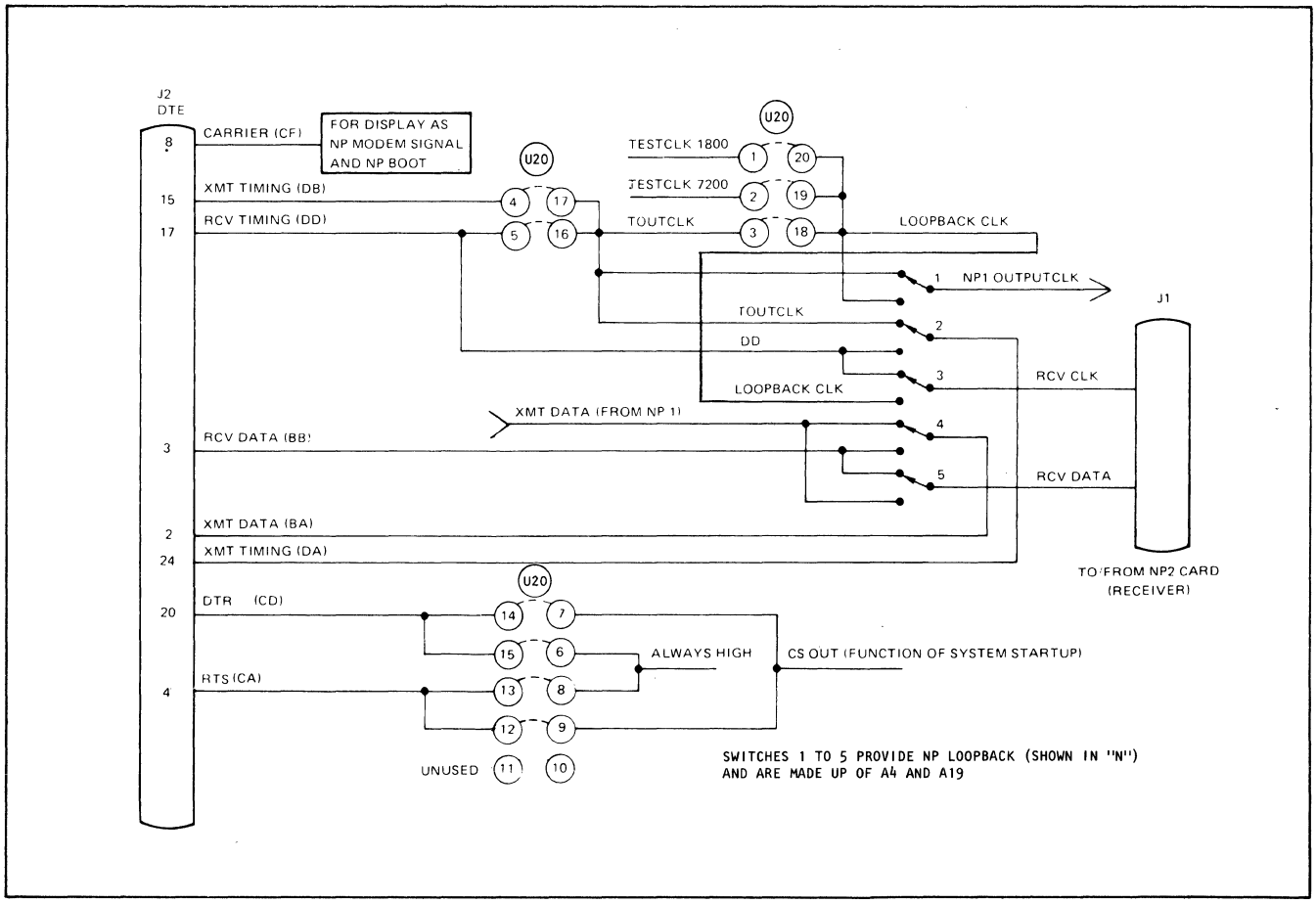


Figure 3-19. NP1 I/O Signals and Loopback Strapping

Signals that must be strapped on the TP module are: EIA control signals, clock rates, clock sources, and signal delays.

Figure 3-20 shows the strapping locations on the TP card. In this figure, a dashed dividing line, approximately across the middle of the board, separates components for the even channel (EIA connector J1) and odd channel (J2). Both J1 and J2 are wired as DCE interfaces. Platform U5, in the upper right corner of the board, is common to both channels. It is used to select internal or external clock sources as well as CTS delay. On U5, pins 1 to 4, and 13 to 16, serve the even channel; and 5 to 12 serve the odd channel.

Figure 3-21 is a schematic of the even (J1) channel on a TP. The schematic for the odd channel is identical except for the strapping points on U5 and the component location numbers of the ASTRO and clock speed select platform.

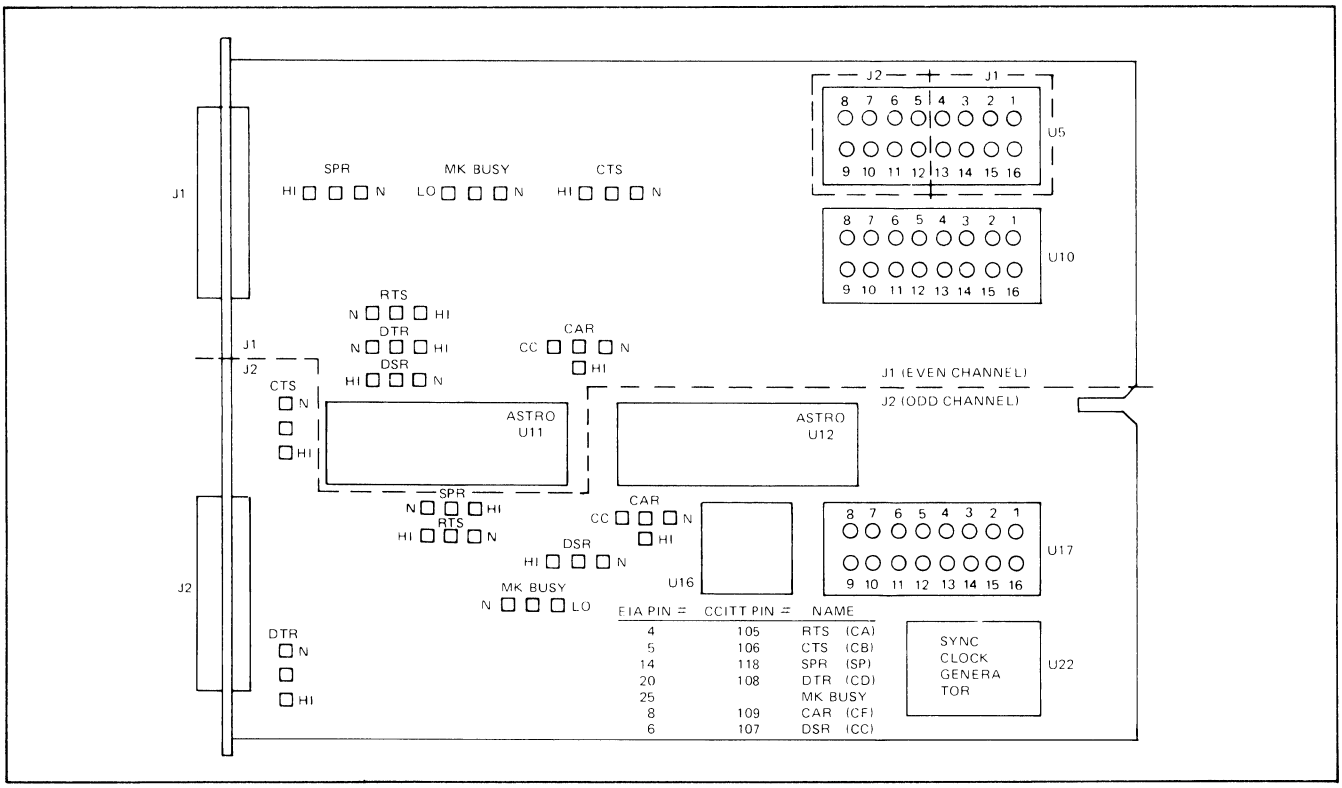


Figure 3-20. Standard TP Card Strap Locations

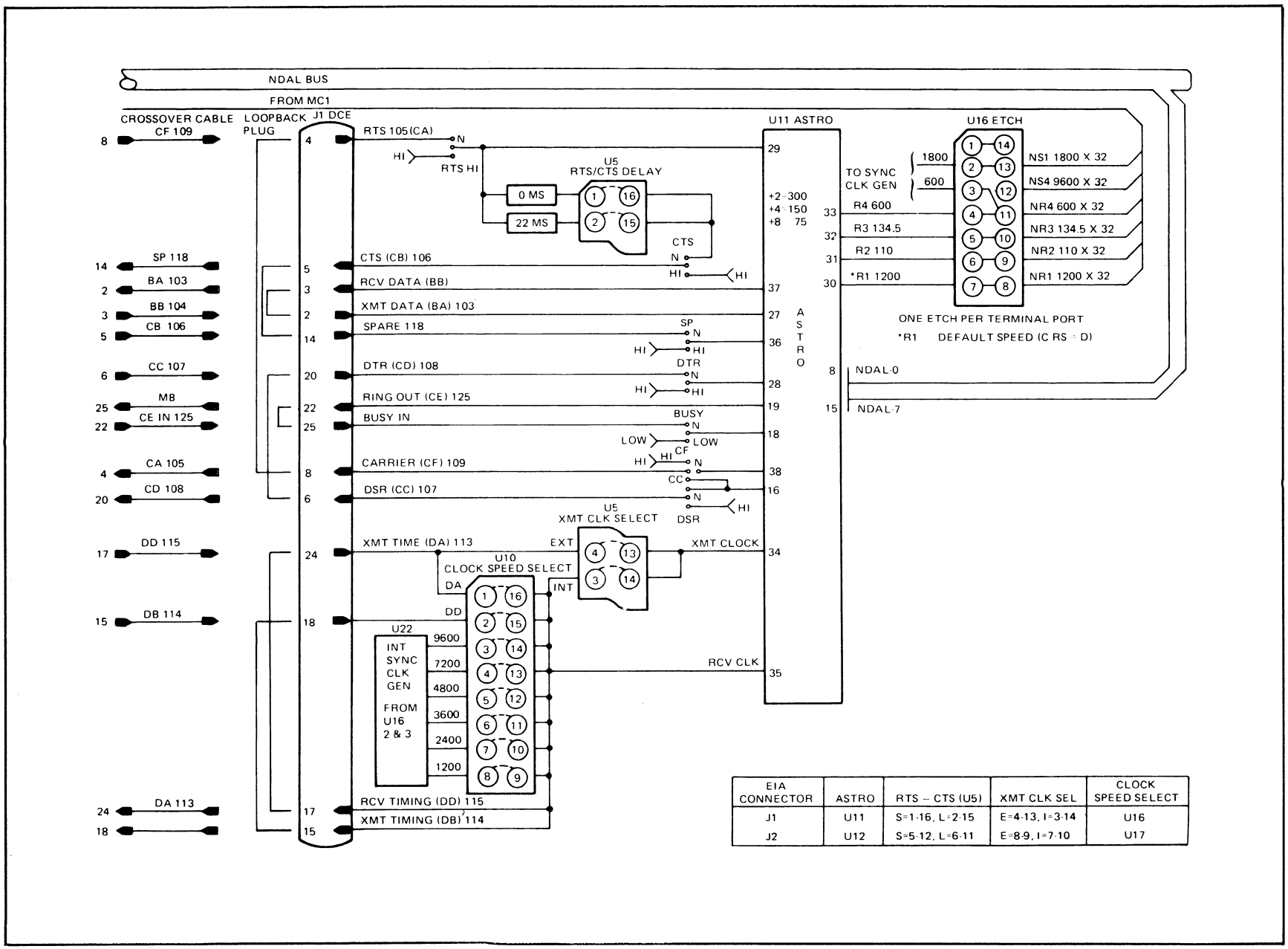
3.5.2.5.1 Control Signals

CAUTION

Remote unattended terminals must have at least one control signal strapped Normal. If all control signals are strapped HI or ON, the terminal will always appear to passing control signals, even if it is not.

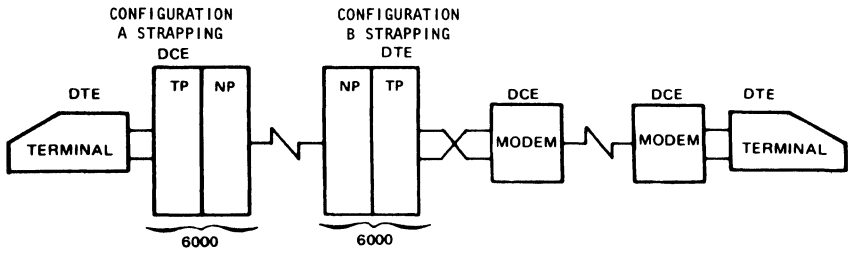
Figure 3-22 shows recommended strapping of control signals for dedicated DCE and for dedicated DTE equipment. Figure 3-23 shows the strapping for dial DCE and DTE equipment.

For a dedicated DCE (marked "A" in Figure 3-22), the connection is via a one-to-one cable. Straps on the local port provide a continuous data path, with the appropriate control signals to the local and the remote port. Signals CC and CF are strapped N (normal) if a modem is attached to the remote port. With this strapping, the local port will signal the terminal if the remote tail circuit fails.



EIA CONNECTOR	ASTRO	RTS – CTS (U5)	XMT CLK SEL	CLOCK SPEED SELECT
J1	U11	S=1-16, L=2-15	E=4-13, I=3-14	U16
J2	U12	S=5-12, L=6-11	E=8-9, I=7-10	U17

Figure 3-21. Terminal Port Even Channel (J1) Signals



STRAPPING

STRAP NAME	EIA SIGNAL	EIA PIN NO.	CCITT PIN NO.	INPUT TO OR OUTPUT FROM	CONFIG. A STRAPPING	CONFIG. B STRAPPING
RTS	CA	4	105	INPUT	HI	*HI
CTS	CB	5	106	OUTPUT	HI	HI
DSR	CC	6	107	OUTPUT	*HI	HI
DTR	CD	20	108	INPUT	HI	*HI
	CE	22	125	OUTPUT	NO STRAP	NO STRAP
CAR	CF	8	109	OUTPUT	*HI	HI
SPARE	SP	14	118	INPUT	HI	HI
BUSY IN	BSY IN	25	- - -	INPUT	LO	LO

*A STRAP TO N IF DEVICE AT REMOTE PORT IS MODEM. LOCAL PORT SIGNALS TERMINAL IF REMOTE TAIL CIRCUIT FAILS.

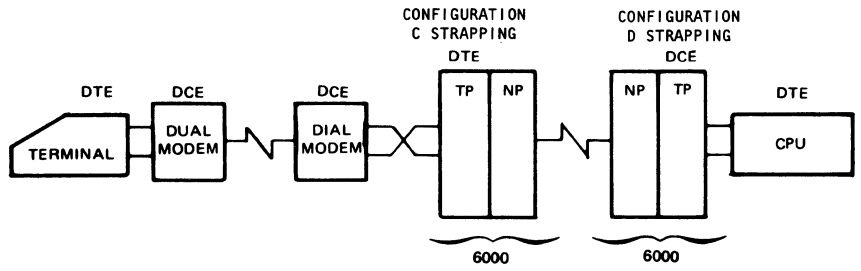
*B STRAP TO N IF DEVICE AT REMOTE TERMINAL PORT IS TERMINAL OR CPU AND MUST BE NOTIFIED IF TAIL CIRCUIT FAILS.

Figure 3-22. Control Signal Strapping for Dedicated DCE(A) and DTE(B) TP

For a dedicated DTE (marked "B" in Figure 3-22), the connection is via a crossover cable to the modem. RTS and DTR are strapped to N (normal) if the device attached to the remote port is a terminal or CPU that requires notification of a tail circuit failure.

Control signals for terminal ports that appear as dial DCE's and DTE's should be strapped according to Figure 3-23. A terminal port that appears as a dial DTE, marked "C," is connected via a crossover cable to a modem. Control signals are strapped as shown in the table. A terminal port that appears as a dial DCE, marked "D," is connected via a one-to-one cable to a terminal or CPU. All straps pass control signals dynamically between the terminal ports. If a signal is not available, strap it to a dedicated DCE signal (marked "A" in Figure 3-22). Strap the remaining signals as in Figure 3-23. BUSY IN is not always available, so it is strapped OFF to prevent noise pickup. If BUSY IN is provided by the terminal, it is strapped N (normal).

Figure 3-24 shows the relationships of control signals for local and remote terminal ports. For example, transmit data (BA) on EIA pin 2 of the local port



STRAPPING

STRAP NAME	EIA SIGNAL	EIA PIN NO.	CCITT PIN NO.	INPUT TO OR OUTPUT FROM	CONFIG. C STRAPPING	CONFIG. D STRAPPING
RTS	CA	4	105	INPUT	N	N
CTS	CB	5	106	OUTPUT	HI	N
DSR	CC	6	107	OUTPUT	N	N
DTR	CD	20	108	INPUT	N	N
	CE	22	125	OUTPUT	NO STRAP	NO STRAP
CAR	CF	8	109	OUTPUT	N	N
SPARE	SP	14	118	INPUT	N	HI
BUSY IN	BSY IN	25	---	INPUT	N	*LO

*C STRAP TO N IF TERMINAL PROVIDES SIGNAL, STRAP TO LO IF SIGNAL NOT AVAILABLE.

Figure 3-23. Control Signal Strapping for Dial DTE(C) and DCE(D) TP

appears in pin 3 at the remote port as receive data (BB). The figure shows all these changes, as well as the signal paths resulting from crossover cables.

3.5.2.5.2 Clock Rates.

a. Synchronous Clock Rates. Internally-generated clock rates, supplied by the synchronous clock generator U22 on the TP, can be strapped on U10 (even channel J1) and U17 (odd channel J2). The appropriate strapping is shown in Figure 3-25. Externally-generated clock rates of 1200 bps to 9600 bps, supplied from the modem, are strapped on platforms U10 (even channel, J1) and U17 (odd channel, J2). Patching 1 to 16, as shown in Figure 3-26, on either U10 or U17 selects external clock DA from EIA pin 24 (connected to DTE). Patching 2 to 15 on either platform selects external clock DD from EIA pin 18 (connected to DCE).

b. Asynchronous Clock Rates. Seven standard asynchronous internal clock speeds (75, 110, 134.5, 150, 300, 600, or 1200 BPS) are provided, and are selected during configuration of the port. Any other asynchronous clock speeds are special

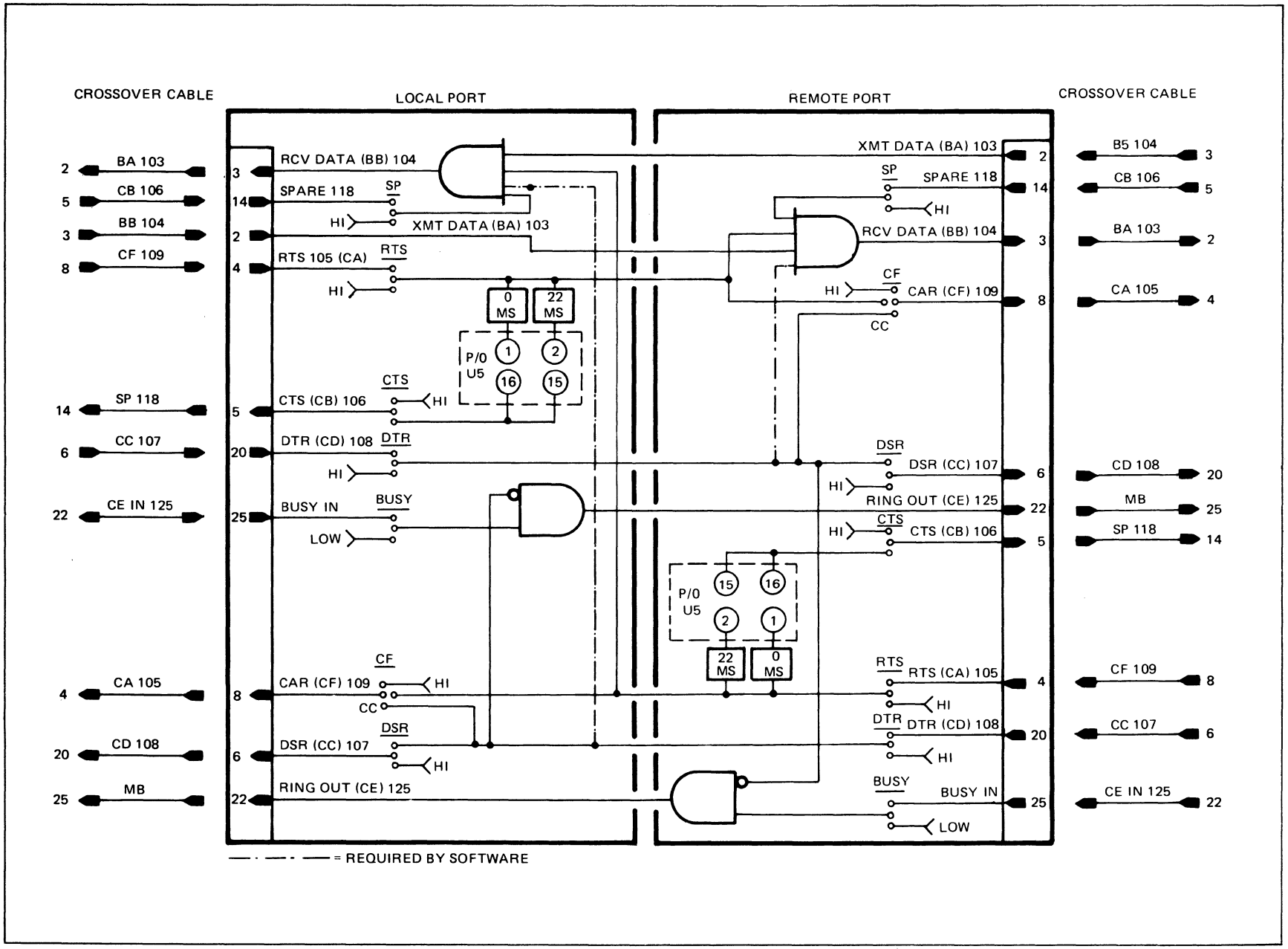


Figure 3-24. Control Signals at Local and Remote Ports

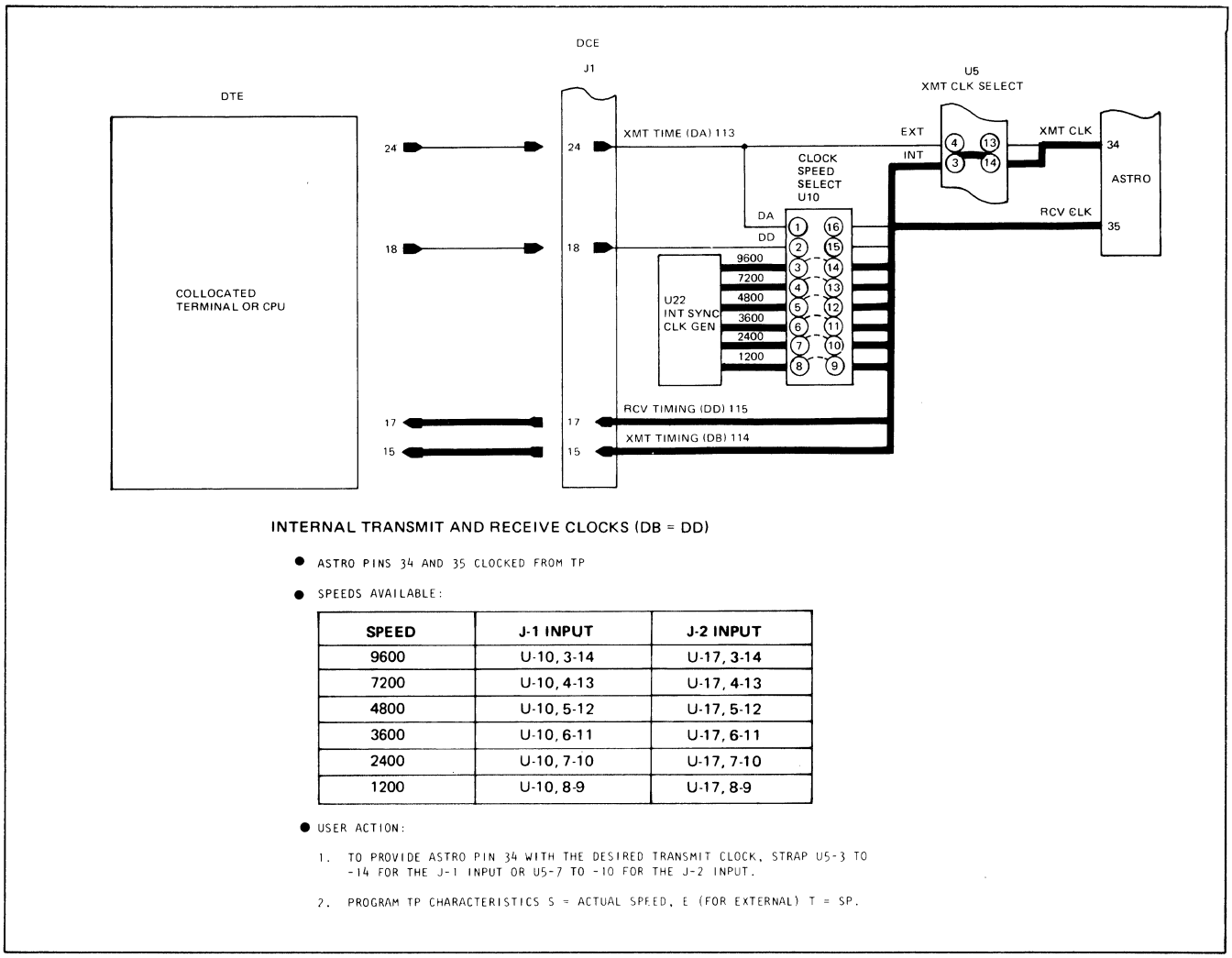


Figure 3-25. Internally-Generated Clock Rates on Standard TP

rates, available at RPQ items under Option 66136. Each special rate replaces one of the seven standard rates. Additionally, the software is modified to both recognize the special rate and provide statistical information relative to that rate. Special speeds are typically generated by the bit rate generator on the MC1 card and selected by the appropriate etch on U16 of the 66130 TP card (Figure 3-21).

3.5.2.5.3 Clock Sources. (See Figure 3-21.) The synchronous transmit clock sources are selected on platform U5: for the even (J1) channel, strapping 3 to 14 provides an internal clock from the internal clock sync generator U22; strapping 4 to 13 provides external clock from the modem. For the odd (J2) channel, 7 to 10 provides internal clock and 8 to 9 provides external clock.

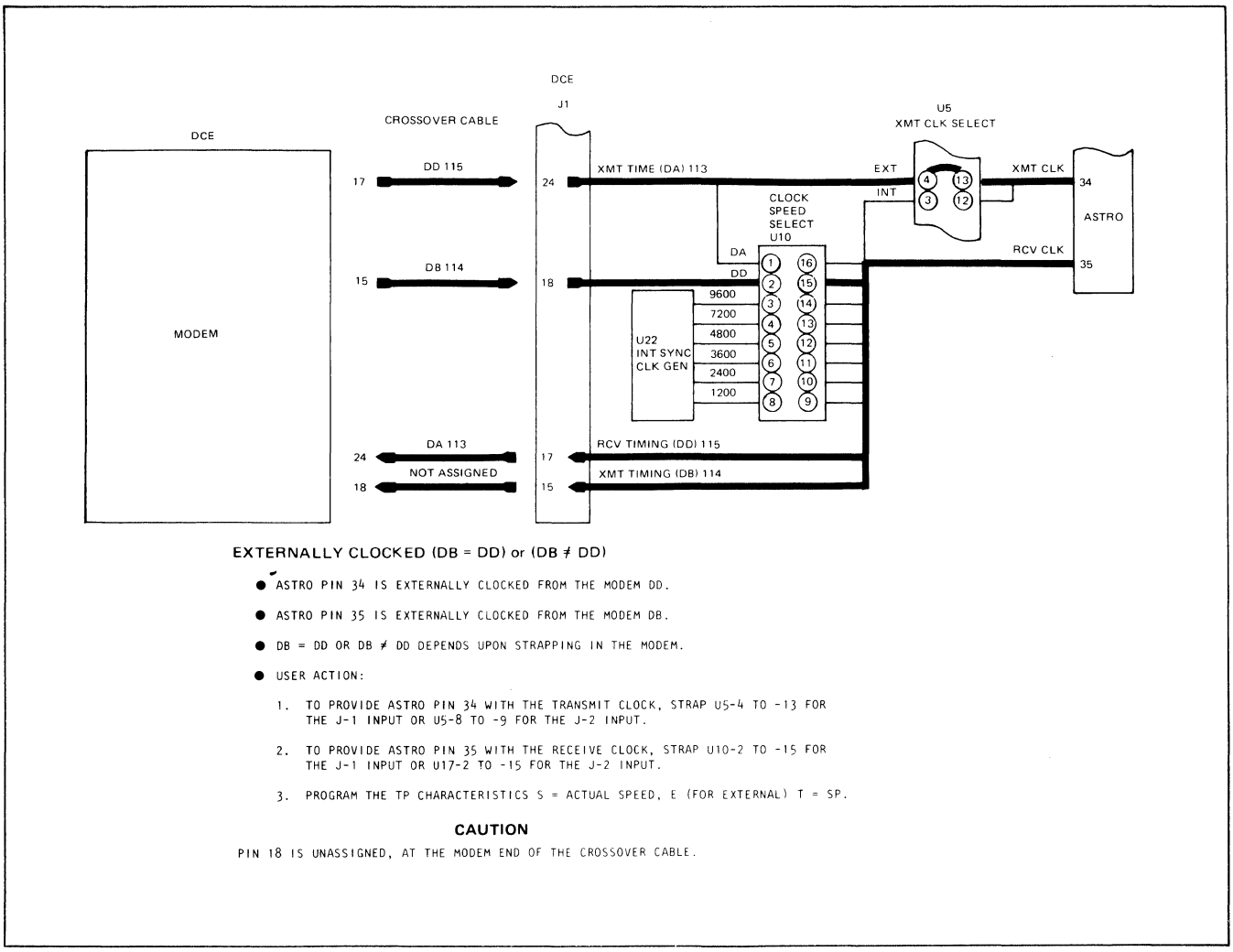


Figure 3-26. Externally-Generated (Modem) Clock Strapping on Standard TP

3.5.2.5.4 Autospeed Clock Source and Speed. (See Figure 3-21.) A non-CPU autospeed terminal port using S49 software operates at 4800 bps, achieved by strapping the J1 channel U10-5 to U10-12, with internal timing on U5-3 to U5-14. The J2 channel is strapped U17-5 to U17-12, and U5-7 to U5-10.

3.5.2.5.5 RTS/CTS Delay. The RTS/CTS delay refers to the OFF-to-ON transitions of RTS. There is no RTS/CTS delay for the ON-to-OFF transition. The delay choices are 0 and 22 ms. The 22 ms delay can be changed when necessary. Directions for this are given in Chapter 3 of the 6030/6040 Technical Manual.

3.5.2.6 ACTIVITY INDICATOR TERMINAL PORT (Option 66131). Strapping locations on the card are illustrated in Figure 3-27. Note that the dividing line through

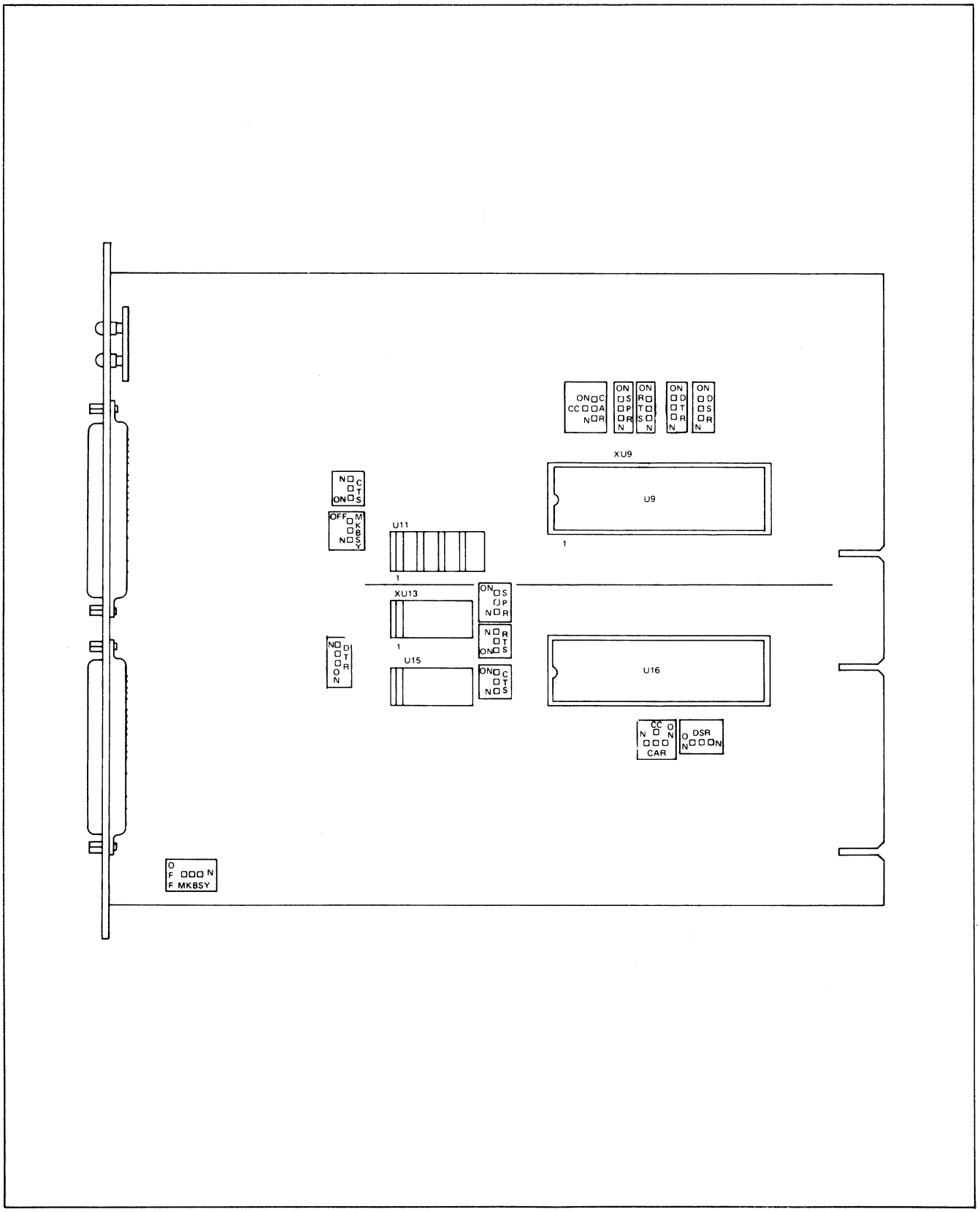


Figure 3-27. Activity Indicator Terminal Port Strap Locations

the middle of the card denotes the J1 straps from the J2 straps with the exception of U11, which is common to both.

Figure 3-28 illustrates the J1 portion of the card; Figure 3-29 illustrates the J2 portion.

3.5.2.6.1 Control Signals. Table 3-2 illustrates the most common applications for control signal strapping.

TABLE 3-2. TERMINAL PORT STRAPPING

Recommended TP Strapping		
Signal	For Dedicated Terminal Applications:	
	Terminal End TP	CPU End TP
CTS (106)	HI	HI
CAR (109)	N	N
SPR (118)	HI	HI
RTS (105)	HI	HI
DTR (108)	HI	HI
DSR (107)	N	N
MK BSY	LOW	LOW
Signal	For Tail-Circuit Applications:	
	Tail Circuit End	CPU End
CTS (106)	N	N
CAR (109)	N	N
SPR (118)	N	HI
RTS (105)	N	N
DTR (108)	N	N
DSR (107)	N	N
MK BSY	N	LOW

3.5.2.6.2 Clock Rates. Timing is strapped according to the requirements of the attached device. For the J1 input this is accomplished via platform U13; for the J2 input via platform U15.

Transmit clock selection is provided for the J1 input via platform U11, positions 8 to 9 or 7 to 10; for the J2 input via U11, positions 4 to 13 or 3 to 14.

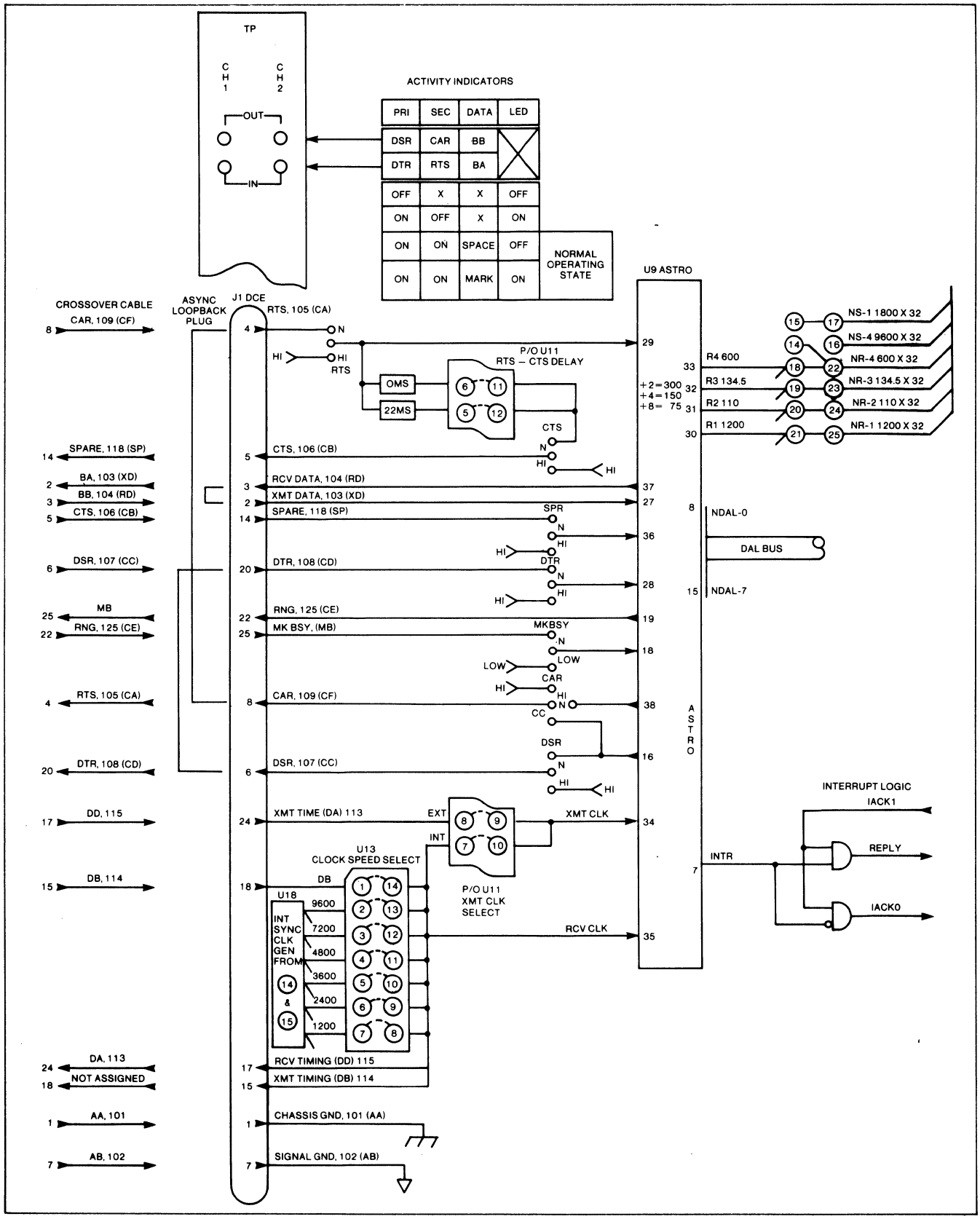


Figure 3-28. Terminal Port Block Diagram, J1 Input

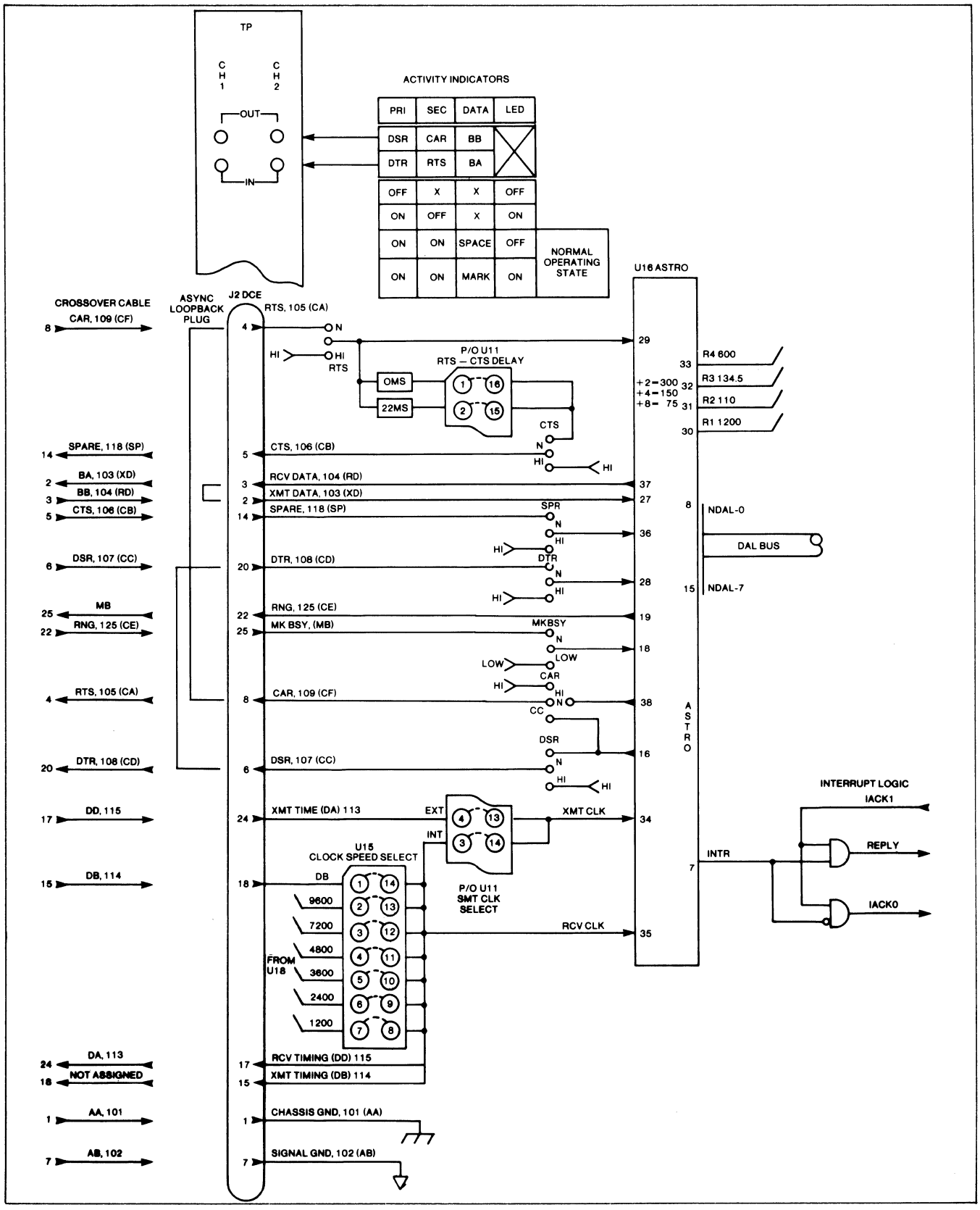


Figure 3-29. Terminal Port Block Diagram, J2 Input

3.5.2.6.3 RTS/CTS Delay. RTS/CTS with or without delay are strap-selectable via platform U11 as follows:

Delay	Port	Strap U11 Location
None	J1	6-11
None	J2	1-16
Delay	J1	5-12
Delay	J2	2-15

3.5.2.6.4 Internal and External Clock. Figure 3-30 shows internally generated clock rates; Figure 3-31 shows externally generated rates.

3.5.2.7 CURRENT LOOP TERMINAL PORT (Option 66151).

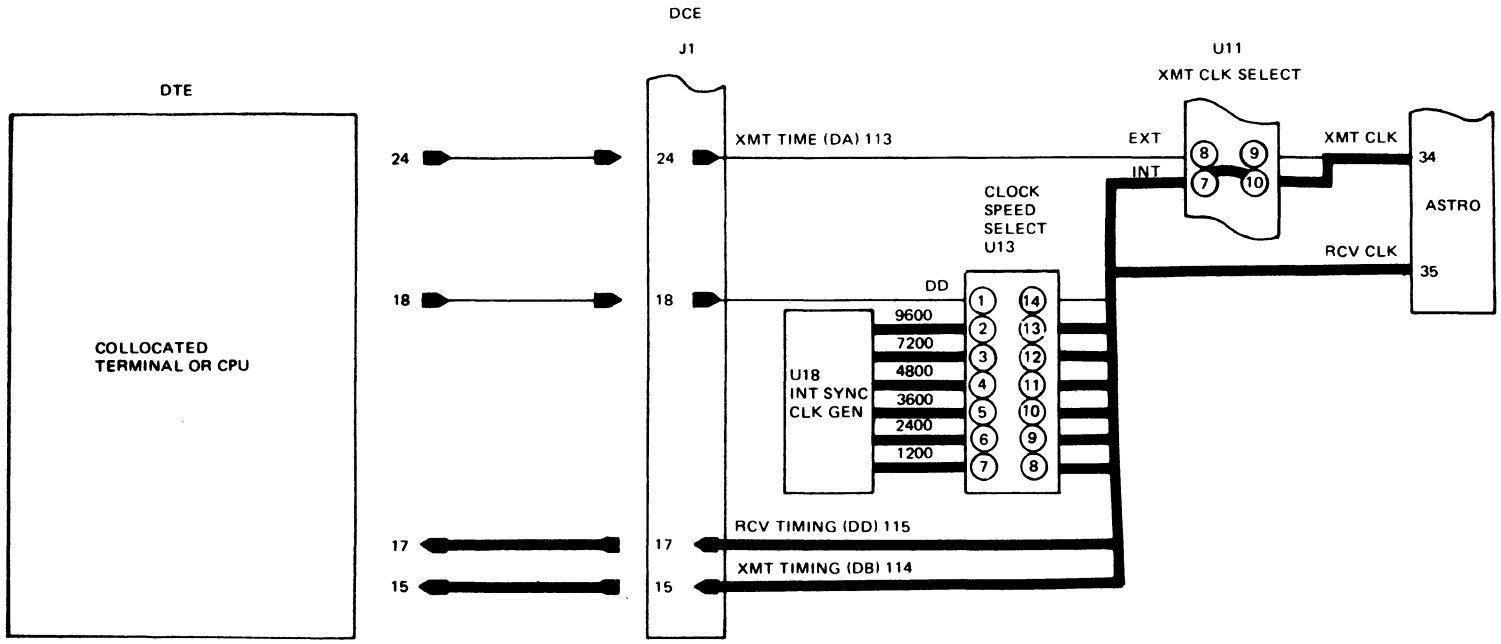
WARNING

Dangerous high voltage may be present at all 6000 INP current loop port interfaces. INJURY TO SERVICE PERSONNEL AND DAMAGE TO EQUIPMENT may result unless the following precautionary procedures are followed during installation of any current loop port module.

3.5.2.7.1 Cabling Accessories. To prevent accidental connection of a current loop DTE to an EIA type port module, the male and female connectors have been exchanged. The card connectors are male, the cable connectors are female.

Two 40-inch cables with a standard 25-pin EIA connector at one end and a terminal block at the other end are furnished with each port module (see Figure 3-32). The EIA connector (of which only five pins are active) plugs into J1 or J2 of the current loop port. The terminal block at the other end of the cable mounts into a specially designed demarcation strip which also is available as an accessory (Option 66251).

The demarcation strip mounts on vertical mounting rails at the rear of a rack. The strip contains 16 slots into which current loop terminal blocks may be mounted.



INTERNAL TRANSMIT AND RECEIVE CLOCKS (DB = DD), J-1 AND J-2 CHANNELS

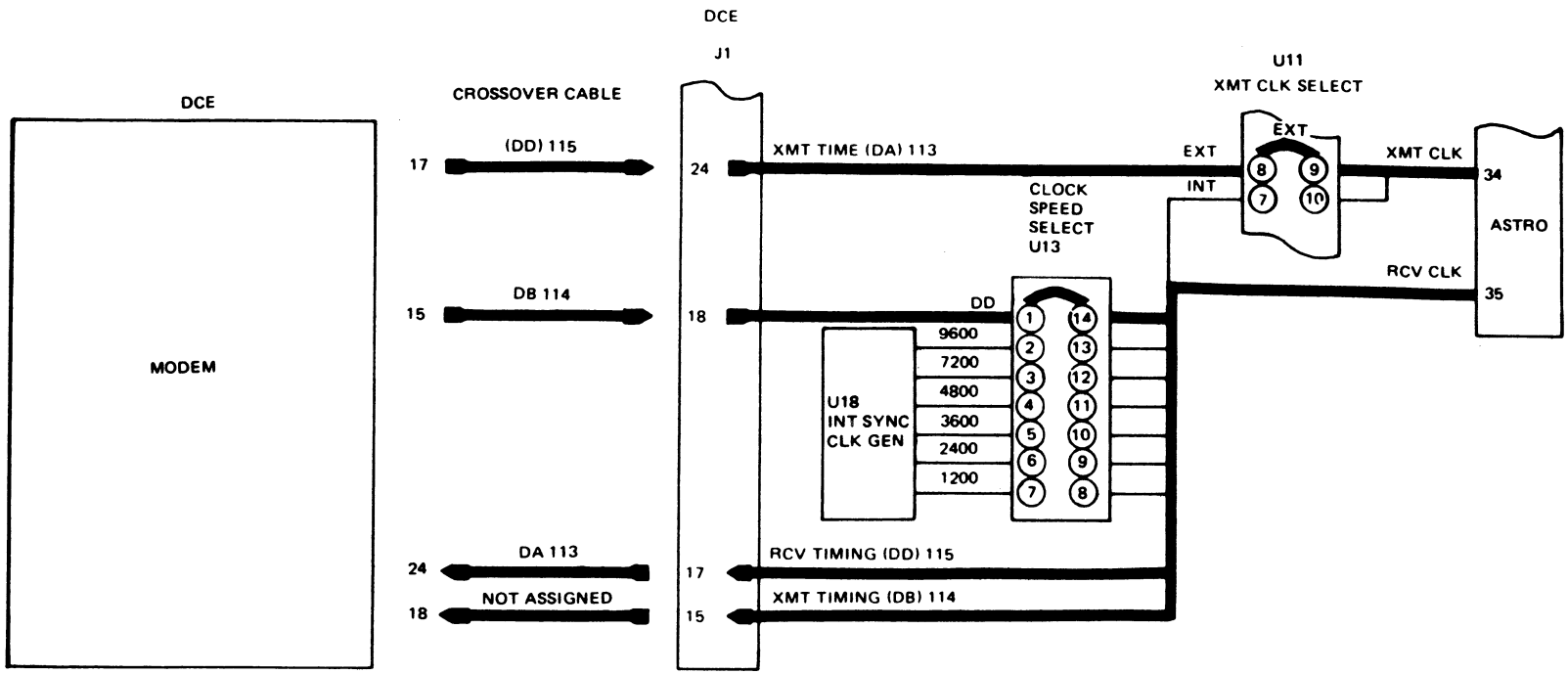
- ASTRO PINS 34 AND 35 CLOCKED FROM TP
- USER ACTION:

1. TO PROVIDE ASTRO PIN 34 WITH THE DESIRED TRANSMIT CLOCK STRAP U11-7 TO -10 FOR THE J-1 INPUT OR U11-4 TO -13 FOR THE J-2 INPUT.
2. STRAP THE SPEEDS AS FOLLOWS:

SPEED	J-1 INPUT	J-2 INPUT
9600	U13-2 TO -13	U15-2 TO -13
7200	U13-3 TO -12	U15-3 TO -12
4800	U13-4 TO -11	U15-4 TO -11
3600	U13-5 TO -10	U15-5 TO -10
2400	U13-6 TO -9	U15-6 TO -9
1200	U13-7 TO -8	U15-7 TO -8

3. PROGRAM TP CHARACTERISTIC S = ACTUAL SPEED, E (FOR EXTERNAL) T = SP

Figure 3-30. Internally Generated Clock Rates



EXTERNALLY CLOCKED (DB = DD) OR (DB ≠ DD)

- ASTRO PIN 34 IS EXTERNALLY CLOCKED FROM THE MODEM DD
- ASTRO PIN 35 IS EXTERNALLY CLOCKED FROM THE MODEM DB
- DB = DD OR DB ≠ DD DEPENDS UPON STRAPPING IN THE MODEM
- USER ACTION:

1. TO PROVIDE ASTRO PIN 34 WITH THE TRANSMIT CLOCK, STRAP U11-8 TO -9 FOR THE J1 INPUT OR U11-4 TO -13 FOR THE J2 INPUT.
2. TO PROVIDE ASTRO PIN 34 AND J1 PIN 17 WITH THE RECEIVE CLOCK, STRAP U11-7 TO -10 FOR THE J1 INPUT OR U11-3 TO -14 FOR THE J2 INPUT
3. PROGRAM THE TP CHARACTERISTIC S = ACTUAL SPEED, E (FOR EXTERNAL) T = SP

Figure 3-31. Externally Generated Clock Rates

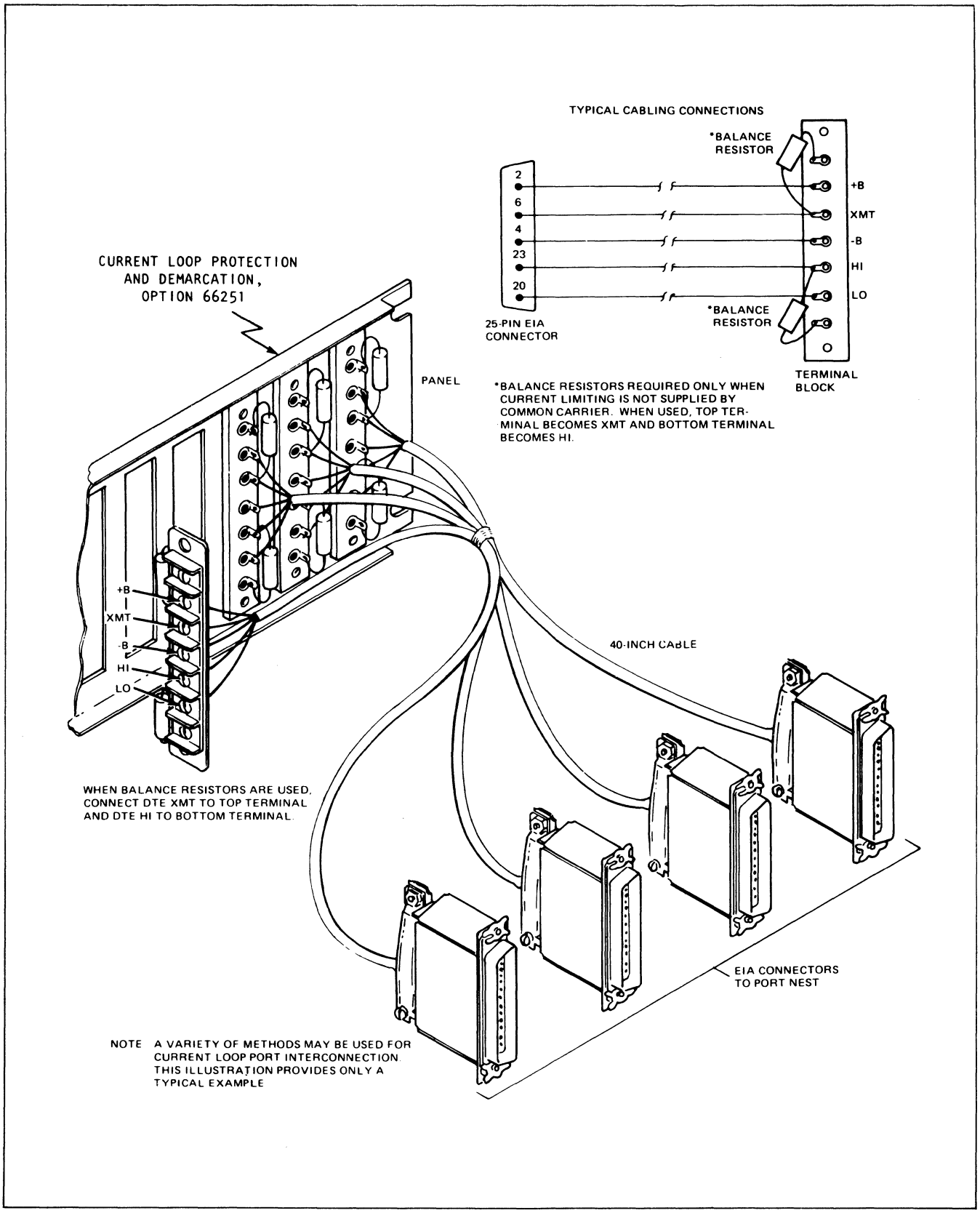


Figure 3-32. Cabling Accessories (Neutral Configuration Shown)

3.5.2.7.2 Terminal Block Panel Covers.

WARNING

Install the protective cover over the terminal block panel upon completion of any current loop port installation. The cover protects operators and service personnel from the high voltage present at the terminals. The cover is held in place by several plastic spacers. Avoid contact with terminals while installing the covers.

3.5.2.7.3 Strapping. Three jumpers per channel (see Figure 3-33) are located on the current loop port module to allow selection of various operational modes for the current loop channel. Each is described as follows:

One jumper is used to adapt the current loop module to the current that is being supplied to the channel by the customer. Normally, a channel will be adjusted for a 20, 40, or 60 mA neutral loop, or for polar configuration; the customer provides the dc power source and current limiting devices to supply these specifications. The current loop module can be strapped to within ±15% of any one of these parameters by positioning a jumper across the appropriate pins.

The current loop terminal port can be modified at the factory to accept any other "special" current between 10 and 60 mA. This accommodates customers which supply current different than the standards listed above. This "special" current loop module requires that the customer provide line balance to within 10% of the "special" current value.

The jumper labeled DATA allows the current loop module to accept either normal data (SPACE = OPEN loop and MARK = CLOSED loop) or INVerted data (SPACE = CLOSED loop and MARK = OPEN loop) from the data terminal.

The jumper labeled MODE is used to adapt the port module to either half-duplex or full-duplex operation, according to customer requirements.

3.5.2.7.4 User Cabling Connections. Figures 3-34, 3-35, and 3-36 illustrate the cabling connections for the more common current loop port configurations.

3.5.2.8 POWER SUPPLY STRAPPING AND CABLING. Figure 3-37 shows strapping and cabling for the INP's (one power supply) and between multiple power supplies. The

terminal board shown has the ten connection points used in the supply that has two 4-Amp fuses.

In all versions of the power supply, the logic ground (TB1-6) and earth ground (TB1-7) are shipped strapped together, although the customer's application may require the strapping to be removed.

3.5.2.8.1 Ground Strapping. Check to see whether the grounds AA and AB (EIA pins 1 and 7) are strapped together in the INP and also in the trunk modem. Both pieces of equipment are shipped with the straps in place because the straps are special and may be difficult to obtain in the field. Strap either the INP or the trunk modem, but not both.

3.6 INSTALLATION CHECKOUT PROCEDURES

After performing all internal cabling as shown in Figure 3-7 or 3-8, verify that all strapping is correct for network configuration. If the equipment is available, connect the network ports to the modems.

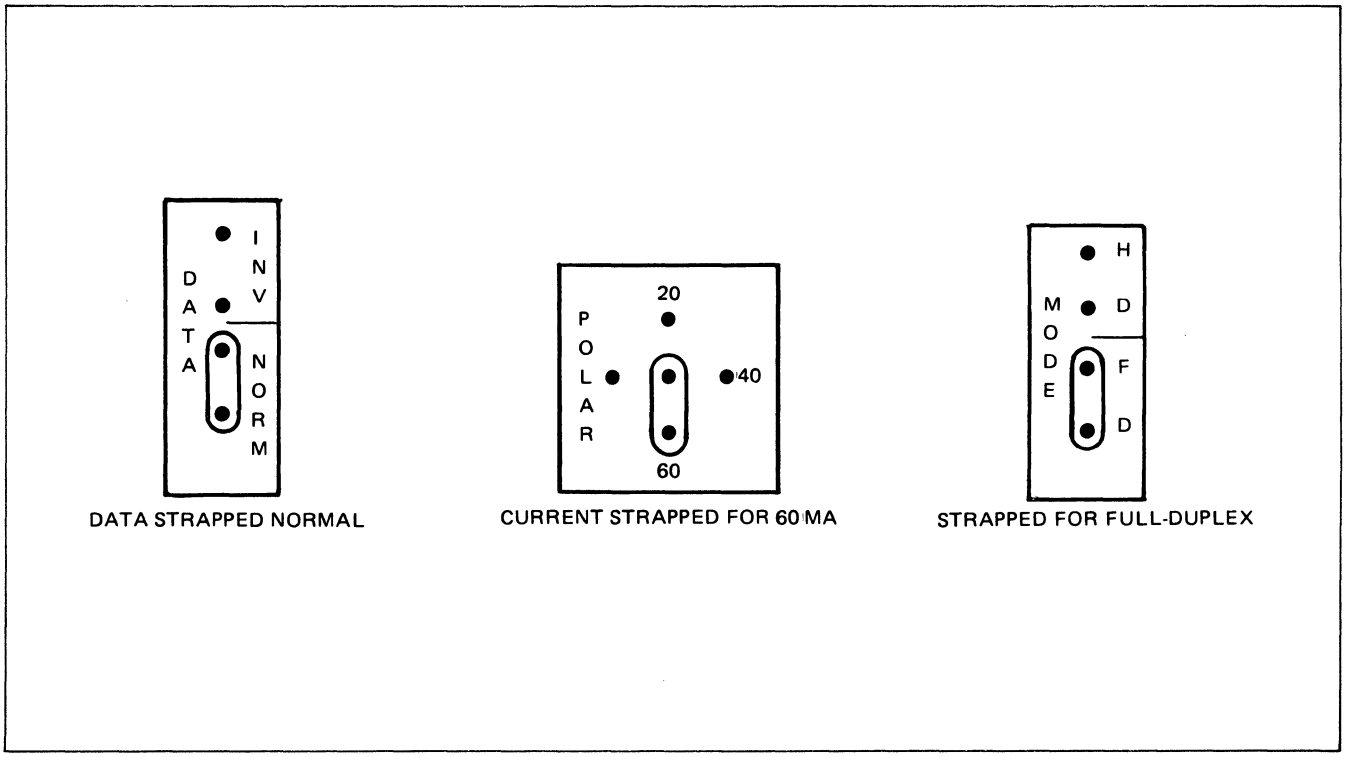
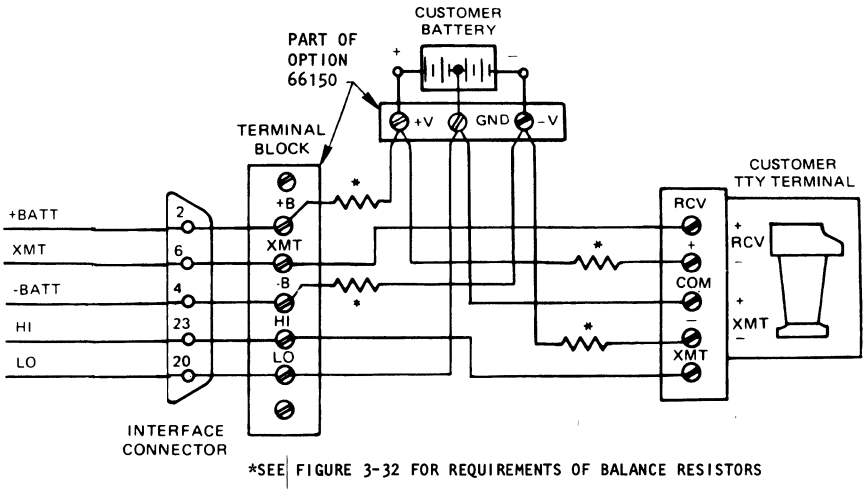


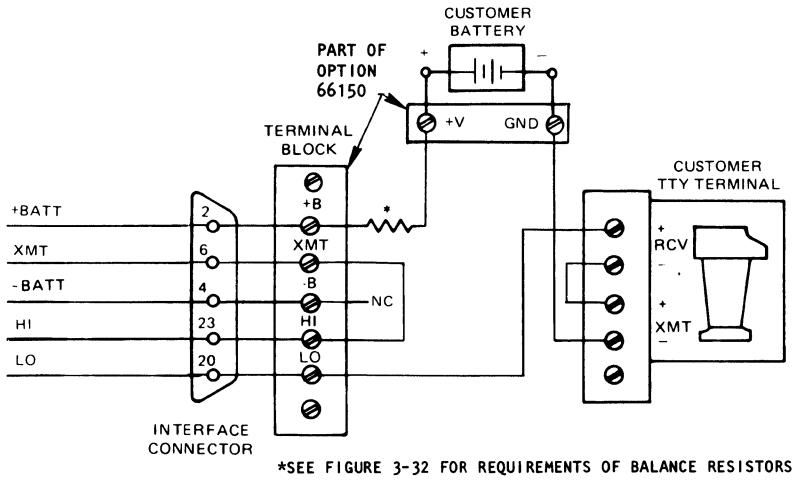
Figure 3-33. Strapping for Data, Current, and Mode



NOTES:

1. SET NORMAL/INV DATA STRAPPING ACCORDING TO CUSTOMER EQUIPMENT. FOR NEGATIVE POLAR OPERATION, COMMON IN THE UNITED KINGDOM AND BRITISH COMMONWEALTH COUNTRIES, SET NORMAL/INV DATA TO INV.
2. FD/HD STRAPPING TO FD.

Figure 3-34. Polar Loop Operation



NOTES:

1. SET NORMAL/INV DATA STRAPPING TO NORMAL.
2. FD/HD STRAPPING TO HD.

Figure 3-35. Positive Neutral Loop, 2-Wire Half-Duplex Operation

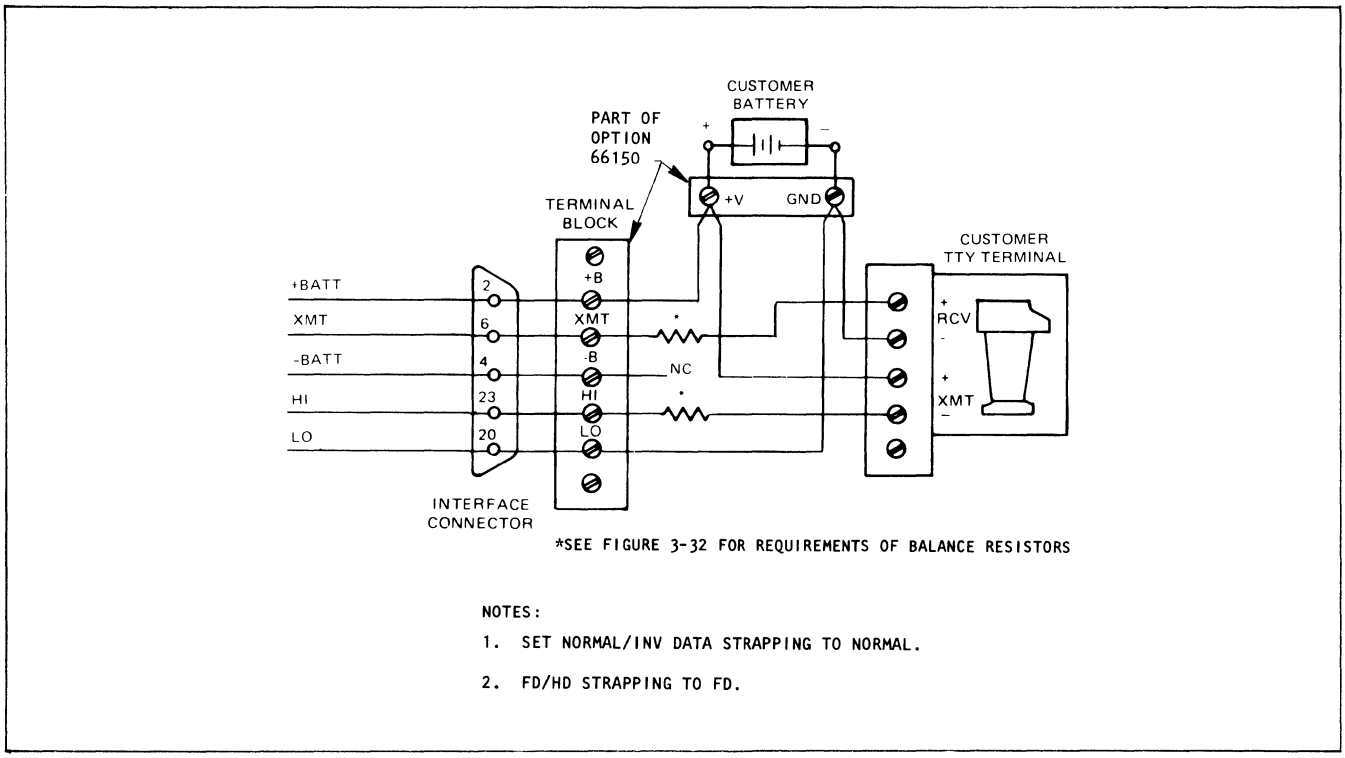


Figure 3-36. Positive Neutral Loop, 4-Wire Full-Duplex Operation

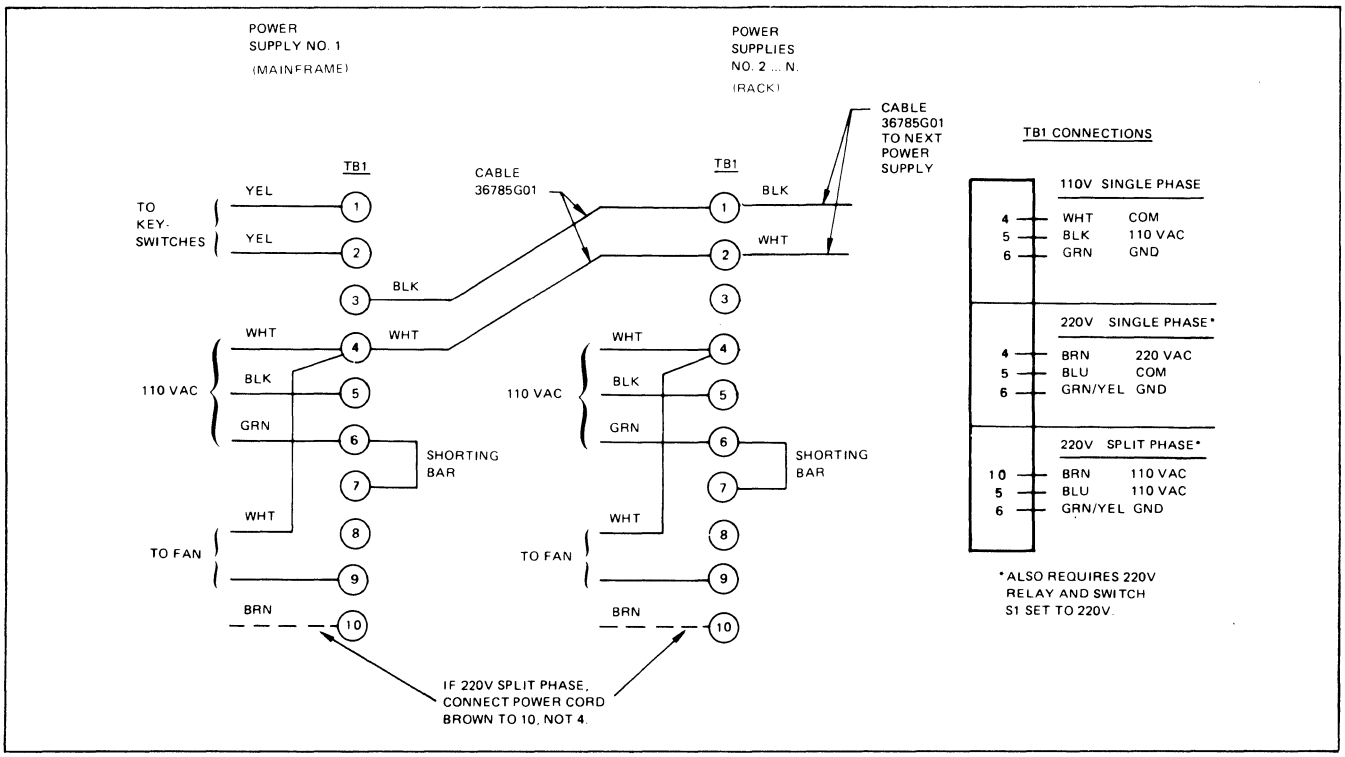


Figure 3-37. Connections on 200-Watt Power Supply with Two 4-Amp Fuses

NOTE

Before applying power to the system, pause to consider that the INP automatically boots the last booted configuration. Since the last configuration may not be known, the results may be unpredictable. It is better to boot configuration 6 (BOOT 6) after powering up the system, to verify operation of the node.

3.6.1 BOOTING THE SYSTEM

Turn the Keylock switch to PGM. If the PGM mode LED is not on, press SEL PGM ENTER, followed by BOOT n ENTER, where n is the number of the configuration to be booted. An asterisk will appear on the self-scan display, indicating that a message is waiting.

The recommended procedure is to BOOT 6 at each node, verify correct operation, and then BOOT 5, which permits the adjacent nodes to communicate with each other. Next, the desired configuration may be entered into the appropriate CMEM at each node.

3.6.1.1 DIAGNOSTIC BOOT: BOOT 6 ENTER. The Diagnostic Boot causes the local node to load a configuration with the network port in local loopback. The response should be: CC and FA (or FA and CC).

Any other response, or the lack of a response, indicates a system failure. All cabling and strapping should be checked, then the Diagnostic Boot command reissued. If CC and FA messages are not received now, contact Codex Customer Service.

A successful Diagnostic Boot permits configuration of the local node only: the node at which the BOOT command was issued.

3.6.1.2 DIAGNOSTIC BOOT: BOOT 5 ENTER. After testing each individual node via BOOT 6 and receiving the correct messages, connect the INP's to each other over the communication facility.

NOTE

Additional testing of the communication facility may be required to provide a viable path from node to node.

Issue the command: BOOT 5 ENTER. Successful indication of the command is via the CC and FA messages at each node. Any other messages or the lack of both of the above indicate a malfunction.

NOTE

Each node having an operator console will have the messages displayed for that node only.

3.6.1.3 CUSTOMER CONFIGURATION BOOT. Upon successful BOOT 6 and BOOT 5 activity, enter the customer configuration data into each node and BOOT the configuration. Successful indication of the BOOT is via the CC and FA messages (displayed at the reporting node (RN) and reporting port (RP) of that node.

Once a configuration is loaded, checked, and booted successfully, individual port problems can be diagnosed.

To examine a port's EIA interface signals, select the appropriate node, and port and issue the command:

(EXAM) (M) (ENTER)

This results in a display of all of the active EIA interface signals for the specified port.

If DTR (CD) and RTS (CA) are not active, the local port's receiver and the remote port's transmitter will not function. If DSR (CC) and CAR (CF) are not active, the local port's transmitter will not function. If DSR and CAR are not active, check the remote port's DTR and RTS signals. If they are not active, check the terminal and the cable for a bad connection.

If all of the interface signals appear to be correct and data does not pass correctly, check the system network configuration (characteristics, activity, transmit data path, and receive data path) for end-to-end compatibility and consistency with the terminals being used.

If further testing of a terminal port path is required, each terminal port can be placed in either local or remote loopback. Select the appropriate node, port, and configuration; then issue the following commands:

(CHNG) (A) (M) (ENTER)	
(L) (ENTER)	For local loopback.
or	
(R) (ENTER)	For remote loopback.

3.6.2 REMOTE REBOOT OF THE SYSTEM

Setting the network port mode (M=) parameter to BT (boot) will cause the adjacent node to boot the configuration that is active at the node requesting the boot.

Setting the mode of the network port to BT permits N02 to reboot N01 (see Figure 3-38). An NB (network port boot) message will be displayed on the self-scan screen, and an NP boot sequence will be sent every 10 seconds as long as a framing lost (FL) condition exists. After the first NP boot sequence, the N02 mode parameter reverts to M=N (even though the NP boot sequences continue to be sent). N01 will then boot the configuration active at N02, which subsequently causes N02 to reboot the same configuration.

If a framing lost condition has occurred, set the adjacent NP's mode to BT. The system should reboot almost immediately, using the currently running configuration, e.g., the configuration at N02.

Example:

(SEL) (N) (#) (#) (ENTER)	(#) (#) = Number of the adjacent node.
(SEL) (P) (#) (#) (ENTER)	(#) (#) = Number of the network port.
(CHNG) (A) (M) (ENTER)	Change mode to BT.
(B) (T) (ENTER)	

If, Node 1 has established communication with itself, the NP boot sequence is sent only once since there is no FL (framing lost) condition (see Figure 3-39).

NOTE

Node 1 will NOT be rebooted by its own boot sequence.

N0 will boot the configuration that is active at N01, which subsequently causes N01 to reboot the same configuration.

If a frame lost condition has not occurred, but it is suspected that the content of C0 at one of the nodes is not correct, issue a BOOT 5 command, then set

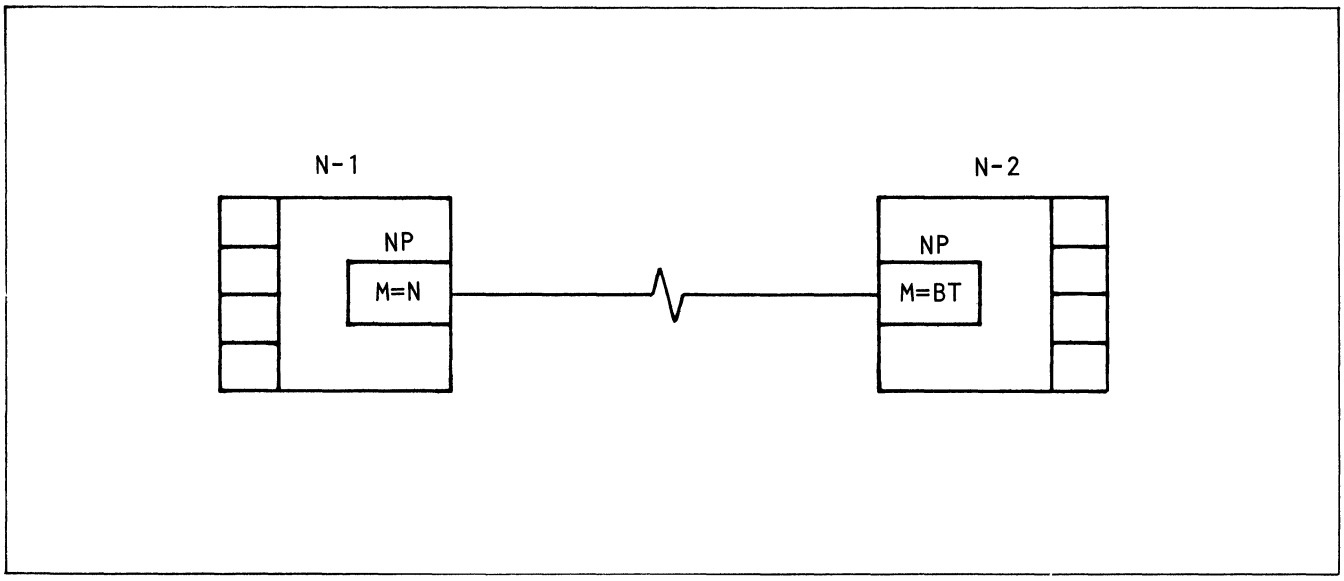


Figure 3-38. Network Port BT Mode (Remote Mode = N)

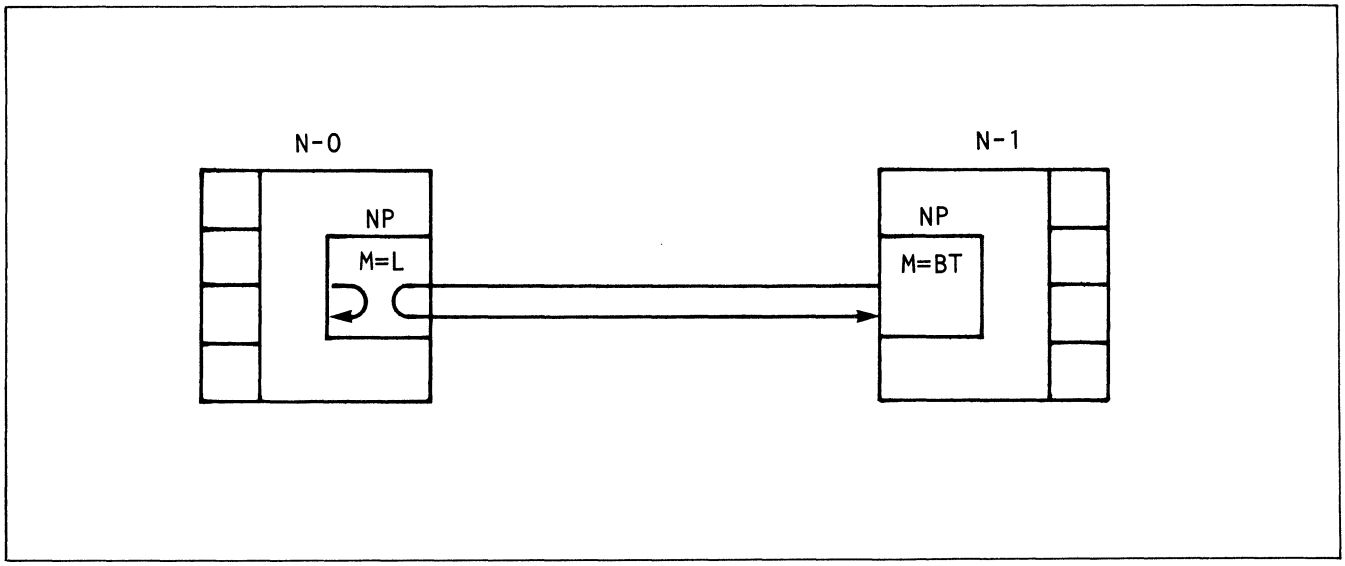


Figure 3-39. Network Port BT Mode (Remote Mode = L)

the local node's NP mode parameter to BT. This should cause the remote node to also boot C5. Once both nodes have C5 active, the content of the suspected incorrect configuration memory may be examined and/or changed, then booted.

Example:

(BOOT) (5) (ENTER)	
(SEL) (N) (#) (ENTER)	# = number of local node,
(SEL) (P) (#) (#) (ENTER)	## = number of NP.
(CHNG) (A) (M) (ENTER)	
(B) (T) (ENTER)	

3.7 INSTALLATION HINTS

3.7.1 GROUNDING THE SYSTEM

To eliminate the possibility of establishing a ground loop potential, all communications equipment at each location should have both their signal grounds and chassis grounds connected in series except at one point in the system, normally the host computer's INP (see paragraph 3.5.2.8).

3.7.2 "DEAD" PORTS (S47)

In many cases a TP that fails to respond does not indicate a bad port. If the TP card is removed while the system is operating, the software will cease to recognize the port even after it is replaced until a CHNG C S ENTER command is issued via the operator console or CTP.

3.7.3 PRECONFIGURATION ACTIVITY

Before attempting to configure a new system, make sure that all configuration parameters for the CMEM are "empty." Use the following procedure:

SEL C n	n = Number of CMEM to be configured.
ENTER	
CHNG E C E	Change configuration to empty.
ENTER	
TO:	Display requests verification before execution.
n	Repeat the CMEM number selected above.
ENTER	

CHAPTER 4

COMMANDS FOR PROGRAM AND MONITOR MODES

4.1 INTRODUCTION

This chapter describes the functions and formats of all Program Monitor mode commands. It also describes the command format conventions used.

Program mode is used to select, examine, and change each configuration parameter at a specified node. Monitor mode is used in the same way as Program mode to examine and select the configuration parameters, and to display the local node number and active configuration. It is a subset of the Program mode and exists so that the Keylock switch can be set and the key removed to prevent either changes of configuration information or a reboot of the system, while enabling the other capabilities.

Both modes are interactive. After a mode is entered, the INP automatically displays a series of prompting messages according to an hierarchical plan. The operator responds to each message, and his response prompts the next message.

In this chapter commands in Program or Monitor mode are presented on the left-hand pages. Right-hand pages are devoted to notes, explanatory text, and examples. Both right-hand and left-hand pages are used for tables and figures related to the text.

After the execution of a command, the keyboard is locked until a response message is displayed. The CTP is similarly locked while waiting for a response message. If the command or the format is invalid, an error code is displayed on the operator console, the command is cancelled, and another command may be issued.

A command may be cancelled at any time (up to the pressing of the ENTER key which causes execution of the command) by pressing the CLEAR key. This action leaves the operator console in its initial state; i.e., waiting for a command key to be pressed.

Three Program mode commands are also available as Monitor mode commands. They are SEL, HELP, and EXAM. Their use and meaning are unchanged. Monitor mode commands, in effect, are a subset of Program mode commands.

Although this chapter discusses the commands as printed on the 6000 keyboard, the user should be aware that these same commands may be initiated from terminals

used as CTP's. Table 4-1 presents the CTP terminal keyboard equivalents of the standard 6000 Series keyboard.

TABLE 4-1. CTP COMMANDS/FUNCTIONS

Operator Console Command/Function Key	Control Terminal Port (CTP) Command/Function Key
ENTER	RETURN (RET)
CLEAR	ESCAPE (ESC)
HELP	H
SEL	S
CHNG	C
EXAM	E
BOOT	B
MON	M
PGM	P
DIAG	Not available on a CTP
CTRL	Not available on a CTP
STEP	F

4.2 CONVENTIONS

4.2.1 COMMAND FORMATS

Throughout this chapter a number of conventions are used to present command formats. They are listed below.

COMMAND — Upper-case letters and numbers, boxed individually or in groups, represent a single key.

(parameter) — Lower-case letters, individually or in groups, bounded by parentheses, represent variable data which must be entered by the operator by pressing the appropriate key(s); e.g., a numeric key to enter a terminal port number.

4.2.2 FORMAT OF EXAMPLES

Examples are presented in three columns: command (keystrokes); display (on the operator console screen or CTP display); and remarks on the effect of the command.

The commands are shown as a series of keys. To emphasize the command under discussion, it is shown clear. All others will be shaded.

The term "standard screen display" refers to the first 6 characters (*NCTPP) of the 32 character self-scan display (see Figure 2-5) on the operator's console. This chapter assumes the display of 01A04, meaning node 0, configuration 1, port 04 (hex), as asynchronous terminal port. The actual display varies with the commands issued, as shown in Chapter 5.

4.3 COMMAND TERMINATORS

There are two command terminators: ENTER and CLEAR. Each takes effect immediately.

4.3.1 ENTER COMMAND TERMINATOR (ENTER)

Function: Terminates and executes the command just entered via the keyboard. The resulting display is a function of the executed command.

Format: (COMMAND) (parameters, if any) (ENTER) (parameter values, if any) (ENTER)

4.3.2 CLEAR COMMAND TERMINATOR (CLEAR)

Function: Terminates and cancels all of the command that precedes it. The system then waits for a new command to be issued. The screen clears except for the standard screen display.

Format: (COMMAND) (parameters) (CLEAR)

NOTE

CLEAR does not require an ENTER command following it to be effective.

4.4 COMMANDS

There are five Program mode commands:

- SEL = Select a mode, node, port, or configuration.
- EXAM = Examine displays a specified parameter or groups of parameters.
- HELP = Help displays the local node number and active configuration number.
- CHNG = Change: display (and optionally, change) a specified parameter.
- BOOT = Bootstrap: loads a copy of an off-line configuration to the on-line configuration.

There are three Monitor mode commands: SEL, EXAM, HELP. They have the same meanings and formats as in Program mode.

COMMAND	SCREEN DISPLAY	REMARKS
⋮	01A04	Standard screen display (see paragraph 2.2.1).
EXAM C S	01A04 EXAM C S	The screen echoes the command to examine the characteristic "speed."
ENTER	01A04 S = 1200	The transmit speed of the terminal port is 1200 bps.
ENTER	01A04 C = 2	Displays the next characteristic for the terminal port: code type.

COMMAND	SCREEN DISPLAY	REMARKS
⋮	01A04	Standard screen display (see paragraph 2.2.1).
EXAM C B	01A04 EXAM C B	An incorrect parameter, B, has been specified.
CLEAR	01A04	The incorrect command is eliminated.
EXAM C S	01A04 EXAM C S	Re-enter the command with a correct parameter.
ENTER	01A04 S = 1200	

4.4.1 SELECT COMMAND (SEL)

Function 1: Select a mode.

Format 1: (SEL) (K1) (ENTER)

where K1 = MON (Monitor mode)
= PGM or P (Program mode)
= CTRL or C (Control mode)
= DIAG (Diagnostic mode)

See Table 4-2 for restrictions

Function 2: Select and display a configuration number, node number, or port number as the referenced entity in subsequent EXAM or CHNG commands.

TABLE 4-2. SEL MODE RESTRICTIONS

Keylock Position	Mode That May Be Selected
MON PGM DIAG	MON MON PGM CTRL* MON PGM CTRL DIAG*
*CTRL and DIAG modes are not available from a Control Terminal Port (CTP).	

Format 2: (SEL) (K1) (K2) (ENTER)

or

(SEL) (K1) (K2) (K3) (ENTER)

where K1 = C to select a Configuration, K2 = configuration number*

= N to select a Node number.

= P to select a Port number.

where K2, K3 = One or two hexadecimal numbers which specify the configuration, port, or node to be referenced. If K3 is not entered, a leading Zero is supplied automatically.

NOTES

*If K1 = C, the allowable values for K2 are:

0 = On-line configuration,

1,2,3, or 4 = Off-line configurations (CMEM).

COMMAND	SCREEN DISPLAY	REMARKS
⋮	01A04	Standard screen display (see paragraph 2.2.1)
SEL PGM	01A04 SEL PGM	Select Program mode.
ENTER	01A04	PGM mode LED lights.
SEL P 7 A	01A04 SEL P 7A	The address of the terminal port used as a reference in subsequent EXAM and CHNG commands is 7A.
ENTER	01A7A	

4.4.2 EXAMINE COMMAND (EXAM)

Function: Examine (display) the value of one or more system, status, or performance parameters.

Formats:

(EXAM) (K1) (ENTER) or	Displays all items of a given category for the node, configuration, or port previously selected. (See Table 4-3.)
(EXAM) (K1) (K2) (ENTER)	Displays the value of a specified item within the K1 category.
(EXAM) (STEP) (ENTER)	Causes the port number to be incremented by 1, and the current EXAM command to be re-executed for the new port number.

where K1 = The mnemonic of the category in which the parameter is listed. (See Table 4-6.)

K2 = The mnemonic of the item whose value is to be displayed. (See Table 4-6.)

STEP (or F on a CTP) = Increment the current port number by one and re-execute the current EXAM command for the new port number.

NOTE

Once an EXAM command has been issued, successive ENTER commands will cause scrolling to occur. The value of (K2) will change to the next valid item in the Item Mnemonics list of Table 4-6. Wraparound will occur; i.e., after the last item, the first item will be repeated. Pressing the CLEAR Key will conclude the ENTER command.

COMMAND	SCREEN DISPLAY	REMARKS
• • •	01N02	Standard screen display (see paragraph 2.2.1).
SEL P 0 6	01N02 SEL P 06	Select terminal port 6.
ENTER	01A06	Port 6 previously defined as asynchronous.
EXAM C	01A06 EXAM C	Examine the characteristics of TP6.
ENTER	01A06 T = AP, ST = 2,	As many characteristics as can be displayed are displayed in the last 26 characters of the self-scan.
ENTER	01A06 OM = O,P = E, DB = 7,	Successive ENTER commands cause scrolling to occur.

COMMAND	SCREEN DISPLAY	REMARKS
CLEAR	01A06	Terminate the command.
EXAM C S	01A06 EXAM C S	Examine the speed characteristic for TP6.
ENTER	01A06 S = 1200	
CLEAR	01A06	Terminate the command.

4.4.3 HELP COMMAND (HELP)

Function: Display the local node number and current configuration number.

Format: (HELP) (ENTER)

COMMAND	SCREEN DISPLAY	
• • •	01A04	Standard screen display (see paragraph 2.2.1).
HELP	01A04 HELP	
ENTER	01---	Upon execution of the command the following information is displayed: LOCAL N = ____ ACTIVE C = ____

TABLE 4-3. ITEM PARAMETER MNEMONICS

Item	Mnemonics (K4)
TP Characteristics	
Port Type	AP = Asynchronous Terminal Port, SP = Synchronous Terminal Port, C = Control Terminal Port, AD = Autospeed Definition, E = Empty.
Subtype	For AP: 1 = Start/Stop, 2 = Autospeed, For SP: 1 = BSC, 2 = CDC 200 UT, 4 = Univac 1004 For C: 1 = Control Terminal Port, 2 = SCP, 3 = LCTP
Speed	Decimal value (e.g., 1200) and, if SP externally clocked, an "E" suffix (e.g., 1200E).
Code Type	0 through 7 (see Tables 4-4 and 4-5).

TABLE 4-3. ITEM PARAMETER MNEMONICS (Cont)

Item	Mnemonics (K4)
TP Characteristics	
Operation Mode (S46 and S47)	0 = Full-duplex, AP and SP (no delay). In this mode, the terminal port will provide sync characters to the device when no data is available as might be the case in the event of a 6000 frame retransmission, and also between blocks of data. 1 = Half-duplex, AP and SP (no delay). Same as 0 only in half-duplex. Receiver is off if CF out is on; turned on if CF out is off. 2 = Full-duplex, SP only (sends constant Mark when idle, no delay). This mode would be selected for use with devices which cannot tolerate a sync character inserted between data blocks. A sync character would still be inserted within the data block. In order to maintain a Mark condition between data blocks, the EIA signal CF is dropped to the device. If it is desired to keep CF high during this time, strap the terminal port CF strap to track DSR. 3 = Not used. 4 = Full-duplex, SP only (delay one frame before sending data to the device from the terminal port). Selection of this mode enables a reservoir of two frames worth of data to be accumulated before releasing it to the device. This would minimize the likelihood of a sync character being sent to the device. If the reservoir becomes exhausted, a sync character is sent to the device. 5 = Half-duplex, SP only (delay one frame before sending data to the device from the terminal port). Same as 4 only half-duplex. 6 = Full=duplex, SP only (delay one frame before sending data to the device, send constant Mark when idle). This mode is a combination of modes 2 and 4.
Operation Mode (S49)	Op Mode Bit No. / Port Type, Operation / Description 0 — SP connected to modem that echoes xmt data (Bell 201-A3) — OMO = 1 prevents normal echo from modem by turning off the port transmitter and not passing RTS (port pin 4) when CF (port pin 8) is on.

TABLE 4-3. ITEM PARAMETER MNEMONICS (Cont)

Item	Mnemonics (K4)		
TP Characteristics			
Operation Mode (S49) (Cont)	Op Mode Bit No.	Port Type, Operation	Description
	1	SP only	OM1 = 1 prevents SYN insertion between BSC message blocks by turning on CF (port pin 8) when sending data, and dropping CF when no data is available. (CF must be strapped normal on TP card.) This results in an idle mark condition on the line between data blocks. If the attached device cannot tolerate CF turning on and off, CF should be strapped to track CC (DSR).
	2		Unassigned bit. OM2 is available for use in filling a customer's special needs.
	3	SP only	OM3 = 1 prevents SYN insertion at the beginning of a BSC message block. This is accomplished by delaying the receive data output BB (port pin 3) for the quantity of characters specified in decimal by the characteristic CD, while waiting for characters to be accumulated. If OM = 1, then BB will be kept in a marking condition. Setting OM3 = 0 will accomplish the same purpose that OM3 = 1 accomplishes, except that the receive data output BB is delayed for the quantity of frames specified in decimal by the characteristic CD. For either setting of OM3, CD = 0 means that there will be no delay of BB.

TABLE 4-3. ITEM PARAMETER MNEMONICS (Cont)

Item	Mnemonics (K4)		
TP Characteristics			
Operation Mode (S49) (Cont)	Op Mode Bit No.	Port Type, Operation	Description
			NOTE OM3 = 1 is not downward-compatible with old software releases, so OM3 = 0 is mandatory for networks using both S49 and earlier software.
	4	AP and SP	OM4 = 1 for AP's provides a delay while the typing element returns to the left margin. This action is permitted by setting the hex value for the characteristic FB. When the hex value entered for FB is matched by the same value in the data stream sent to the device, three pad characters (FF, FF, FF) are injected into the data stream to give the typing element time to return to the left margin. OM4 = 1 for SP's causes leading SYN character to be stripped from the message block. Some protocols leave up to 20 SYN characters that would be passed through the network if not stripped. OM4 = 1 will also strip idle SYN's that occur between message blocks. This is done by buffering blocks so there are no gaps between blocks, in which SYN's can be inserted. OM4 may also be used for protocols that do leave idle SYN between blocks; it strips these SYN's.

TABLE 4-3. ITEM PARAMETER MNEMONICS (Cont)

Item	Mnemonics (K4)		
TP Characteristics			
Operation Mode (S49) (Cont)	Op Mode Bit No.	Port Type, Operation	Description
	5	SP's only, half-duplex	OM5 = 1 must be configured for both ports logically connected. It prevents duplication of message blocks by turning off the port transmitter after each block is sent. The transmitter is turned on again only after a new block is received. This interlock works in both directions. CAUTION OM5 = 1 cannot be used for any protocol that may send two consecutive blocks, such as IBM 3270 polling protocol.
	6	SP only	OM6 = 1 must be configured for both ports logically connected and located at adjacent nodes. At high synchronous speeds, a SYN character may be inserted in the block just before the pad character that terminates the block. Setting OM6 = 1 causes the FF pad character to be stripped off at the transmitting port and reconstituted at the remote port. So, the block ends with pad rather than SYN - pad.
	7		Unassigned bit. OM7 is available for use in filling a customer's needs.
TP Characteristics			
Parity for AP	N = No parity or Space parity, E = Even, O = Odd, M = Mark.		
Parity for SP	N = None E = Even, O = Odd 5 = Space.		

TABLE 4-3. ITEM PARAMETER MNEMONICS (Cont)

Item	Mnemonics (K4)
TP Characteristics	
Data Bits	Actual values (5, 6, 7, 8) including parity.
Stop Bits	Actual values 1 or 2; for 5 data bits, enter 2 stop bits - it defaults to 1.5.
Autoecho	E = Enabled, D = Disabled.
Receive Speed	T = Same as Transmit, D = Default to specific clock value.
Autospeed Substitution Character	Autospeed character required by host machine entered as 2 hexadecimal digits.
NP Characteristics	
Type	NP = Network Port.
Speed	Decimal value externally clocked, always requires an "E" suffix (e.g., 1200E).
Fifo Size	Actual value (32, 64, 128, or 256).
Activity	
Condition	T = Transmit up, receive down; R = Receive up, transmit down; UP = Both up; DN = Both down.
Mode	N = Normal, i.e., Full-duplex (FDX), L= Local loopback, R = Remote loopback, BT = Causes the adjacent node to boot the configuration active at the local node.
System Report	None.
Time Constant	Actual value; 1 to 240, in 0.1 hours, i.e., 0.1 hours to 24 hours.
Statistics	E = Enabled, D = Disabled.
Buffer Multiplier	Decimal numeric value.
ARQ Frames	Actual decimal values (7, 15, 31, 63, 127).
Report Destination Node Port	 RN = Hexadecimal value of terminal port. RP = or 00 (if Operator console).

TABLE 4-3. ITEM PARAMETER MNEMONICS (Cont)

Item	Mnemonics (K4)
Thresholds	Actual values for all items.
Statistics	Actual (integer) percentages for all items.
Transmit/Receive Paths	Actual values for all items.

TABLE 4-4. CODE TYPE CHARACTERISTICS (S46 AND S47 SOFTWARE)

Code Type No.	Uses	Compression	Number Of Data Bits (Including Parity*, If Any)	Control Character (Applicable Only to BSC Terminals)**
0	a. BSC ASCII. b. Any S/S terminal with 8 or less data bits. c. Autospeed terminal if cannot use 2.	None	8 or less	ASCII
1	BSC EBCDIC	None	8	EBCDIC
2	a. BSC ASCII with no transparency. b. Any S/S terminal using 8 data bits with parity, e.g., ASCII. c. Any S/S terminal using 7 or less data bits. d. Autospeed terminal with 2b/2c characteristics.	None	8 with parity; otherwise, 7 or less.	ASCII
3	ASCII with parity (S/S or BSC with no transparency).	Standard	8 with parity	ASCII
4	a. BSC Transcode b. Any S/S terminal using 7 data bits with parity, e.g., 2731. c. Any S/S terminal using 6 or less data bits.	None	7 with parity; otherwise, 6 or less.	Transcode
5	2741 Correspondence	None	7 with parity	--

*Parity = odd/even/Mark/none or Space for AP; odd/even/none or space for SP.
**Garble character = n (ASCII); X or x (2740 Correspondence); ? or / (2740 EBCD).

TABLE 4-4. CODE TYPE CHARACTERISTICS (46 AND S47 SOFTWARE) (Cont)

Code Type No.	Uses	Compression	Number Of Data Bits (Including Parity*, If Any)	Control Character (Applicable Only to BSC Terminals)**
6	a. Any S/S using 6 data bits with parity. b. Any S/S terminal using 5 or less data bits, e.g., Baudot.	None	6 with parity; otherwise, 5 or less.	
7	Custom Applications.	As specified	As specified	As specified

*Parity = Odd/even/Mark/none or Space for AP; odd/even/none or Space for SP.
**Garble character = n (ASCII); X or x (2740 Correspondence); ? or / (2740 EBCD).

TABLE 4-5. CODE TYPE CHARACTERISTICS (S49 SOFTWARE)

Code Type No.	Uses	Compression	Number Of Data Bits (Including Parity*, If Any)	Control Character List (Applicable Only to BSC Terminals)**
0	a. BSC ASCII. b. Any S/S terminal with 8 or less data bits. c. Auto speed terminal if cannot use 2.	None	8 or less	ASCII
1	BSC EBCDIC.	None	8	EBCDIC
2	a. BSC ASCII with no transparency. b. Any S/S terminal using 8 data bits with parity, e.g., ASCII. c. Any S/S terminal using 7 or less data bits. d. Autospeed terminal with 2b/2c characteristics.	None	8 with parity; otherwise, 7.	ASCII
3	ASCII with parity (S/S or BSC with no transparency).	Standard	8 with parity	ASCII
4	a. BSC Transcode. b. Any S/S terminal using 7 data bits with parity. c. Any S/S terminal using 6 or less data bits.	None	7 with parity; otherwise 6 or less	Transcode

*Parity = Odd/even/Mark/none or Space for AP; only odd/even/none or Space for SP.
**Garble characters produced by incorrect parity are: (ASCII; X or x (2742 Correspondence); ? or / (2740 EBCD).

TABLE 4-5. CODE TYPE CHARACTERISTICS (S49 SOFTWARE) (Cont)

Code Type No.	Uses	Compression	Number Of Data Bits (Including Parity*, If Any)	Control Character List (Applicable Only to BSC Terminals)**
5	a. Any S/S terminal using 7 data bits with parity. b. Any S/S terminal using 6 or less data bits.	None	7 with parity	
6	a. Any S/S terminal using 6 data bits with parity. b. Any S/S terminal using 5 or less data bits, e.g., Baudot.	None	6 with parity; otherwise, 5 or less.	
7 on	Custom Applications.	As specified	As specified	As specified

*Parity = Odd/even/Mark/none or Space for AP; only odd/even/none or Space for SP.
**Garble characters produced by incorrect parity are: (ASCII; X or x (2741 Correspondence); ? or / (2740 EBCD).

TABLE 4-6. MNEMONICS FOR EXAMINE AND CHANGE COMMANDS

Category Mnemonics (K1)	Item Mnemonics (K2)	Used With	E*	C*
C = Characteristics	T = Type	TP, NP		X
	ST = Subtype	TP		X
	S = Speed	TP, NP		X
	C = Code Type	TP		X
	OM = Operation Mode	TP		X
	P = Parity	TP		X
	DB = Data Bits	TP		X
	SB = Stop Bits	TP		X
	E = Auto Echo (enable/disable)	TP		X
	RS = Receive Speed	TP		X
	F = Fifo Size (transmit)	NP		X
	DN = Destination Node Address	NP, TP	X	
	DP = Destination Port Address	NP	X	
	A = Autospeed Character	TP		X
	CD = Character Delay	TP		X
	FB = Flyback	TP		X
A = Activity (status)	C = Condition (state)	TP	X	
	M = Mode	TP, NP		X
	R = System Report	Node	X	
	T = Time Constant	Node		X
	S = Statistics (enable/disable)	TP, NP		X
	RN = Report Destination (node)	Node		X
	RP = Report Destination (port)	Node		X
	B = Buffer Multiplier	Node		X
	AF = ARQ Frames	NP		X
	P = Presence of TP. It has the values.	TP	X	
	NE = Port nonexistence			
	PR = Port present (this is not displayed)			

*E = Examine only. C = Examine or change designated node.

TABLE 4-6. MNEMONICS FOR EXAMINE AND CHANGE COMMANDS (Cont)

Category Mnemonics (K1)	Item Mnemonics (K2)	Used With	E*	C*
E = Entry (definition)	P = Port	CHNG		
	C = Configuration	Command		
	CE = Configuration empty			
M = Modem signals	DSR = Data Set Ready (CC)	TP, NP	X	
	DTR = Data Terminal Ready (CD)	TP	X	
	CAR = Carrier Detect (CF)	TP, NP	X	
	RNG = Ring (CE)	TP	X	
	RTS = Request To Send (CA)	TP	X	
	RN = Ring	TP		X
	CTS = Clear To Send (CB)	NP	X	
X = Xmt (transmit) data path	NP = Network Port	TP		X
	SW = Slot Weight	TP		X
S = Statistics	ED = Error Density	NP	X	
	CE = Compression Efficiency	TP	X	
	CN = Compression Efficiency, node	Node	X	
	ER = Error Rate	TP	X	
	SL = Statistical Loading	TP	X	
	SN = Statistical Loading, node	Node	X	
	PL = Processor Loading	Node	X	
	TD = Traffic Density	NP	X	
	TN = Traffic Density, node	Node	X	
	CL = Compressed Loading	TP	X	
	AE = Apparent Efficiency	NP	X	
	BU = Buffer Utilization	Node	X	
	FR = Frame Rate	NP	X	
	RR = Retransmission Rate	NP	X	X

*E = Examine only. C = Examine and change designated node.

TABLE 4-6. MNEMONICS FOR EXAMINE AND CHANGE COMMANDS (Cont)

Category Mnemonics (K1)	Item Mnemonics (K2)	With	E*	C*
T = Thresholds (for monitoring)	ED = Error Density	Node		X
	CE = Error Rate	Node		X
	ER = Error Rate	Node		X
	BU = Buffer Utilization	Node		X
	PL = Processor Loading	Node		X
	RR = Retransmission Rate	NP	X	X

*E = Examine only. C = Examine and change designated node.

4.4.4 CHANGE COMMAND (CHNG)

Function 1: Display and, optionally, change the current value of each system parameter.

Format 1: (CHNG) (K1) (K2) (ENTER)
(DISPLAY)
(n) (ENTER)

where (K1) = Mnemonic of the category in which the item to be modified is listed (see Table 4-6).

(K2) = Mnemonic of the item whose value is to be changed (see Table 4-6).

(DISPLAY) = The self-scan screen display which results from the (CHNG) (K1) (K2) (ENTER) command.

(n) = The new value for K2. If omitted, the display scrolls to the next parameter without changing the value of K2.

Description: The CHNG command performs two functions with parameters:

1. Examine the specified parameter, and optionally.
2. Change the specified parameter at the currently selected node. If no change is wanted, press ENTER, which scrolls to the next parameter. If the value of the parameter is to be changed, specify the new value and press ENTER, which executes the new value and scrolls to the next parameter.

Successive ENTER commands will result in scrolling (displaying subsequent data) until all of the parameters have been displayed. Wraparound will occur, i.e., when the last parameter has been displayed, ENTER will cause the first to be displayed again. A CLEAR command will terminate the command.

COMMAND	SCREEN DISPLAY	REMARKS
⋮	01A04	Standard screen display (see paragraph 2.2.1).
[CHNG] [C] [S]	01A04 CHNG C S	The value of the characteristic, Speed, for TP4 will be displayed.
[ENTER]	01A04 S = 1200/	The operator may respond with: a new value, or ENTER, causing the next value to be displayed; or CLEAR, to terminate the command. Note the prompt (/) in the display line.

	SCREEN DISPLAY	REMARKS
CLEAR	01A04	
CHNG C P	01A04 CHNG C P	Display parity for TP04, for change.
ENTER	01A04 P = E/	Parity is even.
N	01A04 P = E/N	Change parity to "No Parity."
ENTER	01A04 DB = 8/	The next item value is displayed automatically.
CLEAR	01A04	The command is terminated.
CHNG E P	01A04 CHNG E P	Copy the configuration of TP04.
ENTER	01A04 TO	The INP asks for new port number.
A	01A04 TO OA	The copy is numbered OA.
ENTER	01A04 TO	The INP asks for a second new port number.
CLEAR	01A04	The command is terminated.
CLEAR	01A04	
CHNG E C	01A04 CHNG E C	Copy configuration 1.
ENTER	01A04 TO	
2	01A04 TO 2	Number the copy as configuration 2.
ENTER	01A04	Copy into configuration 2.
CLEAR	01A04	The command is terminated.
CHNG E C E	01A04	Change entire configuration empty (clearing memory).
ENTER	01A04 TO	Enter the configuration number.
1		
ENTER	01A04	This configuration is empty.
CLEAR	01A04	The command is terminated.

The operator may respond with any one of three responses:

(n) = A new value for the specified item.
(ENTER) = Step to the next item in the list, or
(CLEAR) = Terminate the command.

NOTE

Some characteristics may be changed only in the off-line configuration. If an attempt is made to change such a characteristic on-line, error message ER06 is displayed (parameter is read-only in configuration 0).

Function 2: Duplicate (copy) a port or configuration to create a new entry or replace an existing entry.

Format 2: (CHNG) (E) (K1) (ENTER)
(TO) (v) (ENTER)

where (E) = Entry

(K1) = C to copy, i.e., duplicate, the selected Configuration.
= P to copy the selected Port description.

(v) = One or two hexadecimal digits identifying the configuration or port to be modified.

Description: The Copy command returns the prompting message "TO," and requires the insertion of a one- or two-digit hexadecimal number to identify the configuration or port to be modified. The previously executed configuration or port K1, K2, is copied and identified as (v).

The copy command may be used to copy (1) port parameters: CHNG Entry Port; (2) a configuration, CHNG Entry Configuration; and (3) node activities or thresholds, CHNG, E NO A (or T).

4.4.5 DEFINITION OF STATISTICS ITEM MNEMONIC ABBREVIATIONS

The following are definitions of the statistics that appear in Table 4-6.

CE = Compression Efficiency (TP). The ratio of the total number of bits including start, stop, data, and parity bits) from the data source to the number of bits resulting from code compression, times 100%.

SL = Statistical Loading (TP). The ratio of the number of characters from the data source to the maximum number of characters which that source could have sent in the elapsed time, times 100%.

CL = Compressed Loading (TP). The ratio of the total number of bits (including start, stop, data, and parity bits) resulting from code compression to the maximum number of data bits the source could have sent in the elapsed time, times 100%.

ER = Character Error Rate (TP) (with parity). The ratio of the number of characters with bad parity received from the data source to the total number of characters received, times 100%.

TD = Traffic Density (NP). The ratio of the number of data bits (i.e., bits other than idle bits) to the number of bits sent, times 100%.

ED = Error Density (NP). The ratio of NAK's received to frames transmitted, times 100%.

AE = Apparent Efficiency (NP). The ratio of the summation of the nominal data rates of all TP's routed through the selected NP to the nominal data rate of that NP, times 100%.

FR = Frame Rate (NP). The average number of new frames transmitted per second.

RR = Retransmission Rate (NP). The average number of frames retransmitted per second.

CN = Compression Efficiency, Node. The weighted average of CE's of the enabled TP's at the selected node, with weights proportional to the port speeds.

SN = Statistical Loading, Node. The weighted average of SL's of the enabled TP's at the selected node.

TN = Traffic Density, Node. The weighted average of TD's of the enabled NP's at the selected node.

PL = Processor Loading, Node. The fraction of the time the processor(s) are not idle, times 100%.

BU = Buffer Utilization, Node. The fraction of the total available buffer space which is in use, times 100%.

Table 4-7 lists the menmonics that may be changed, and the configuration(s) in which the mnemonic may be changed. Some item mnemonics (K2) may not be changed while others may be changed only in the off-line configurations.

4.4.6 BOOT COMMAND (BOOT)

Function: Perform a system startup (boot) in Program mode.

Format: (BOOT) (K1) (ENTER)

Where (K1) = 0 To boot the current (last active) configuration.

= 1-2 To boot the stored, off-line version of configuration 1 or 2.

TABLE 4-7. ALLOWABLE CONFIGURATION CHANGES

Item Mnemonic (K2)	Change Off-Line Configuration	Change Current Configuration
Type	X	
Subtype	X	X
Speed	X	X
Code	X	
Operation mode	X	X (TP only)
Parity	X	X
Data bits	X	X
Stop bits	X	X
Autoecho	X	X
Receive speed	X	X
Fifo size (xmt)	X	X
Autospeed character	X	X
Mode	X	X (TP only)
Time constant	X	X
Statistics	X	X
Report destination, node	X	X
Report destination, port	X	X
ARQ frames	S	X
Buffer multiplier	X	
Slot weight (xmt)	X	
Adjacent node address	X	
Adjacent port address	X	

= 5 Test BOOT. Isolates TP's and configures only network ports in normal mode.

= 6 Same as 5 except it performs a diagnostic local loopback of network ports(s).

If K1 is not provided, C5 will be loaded.

4.5 SYSTEM MESSAGES

Three types of system messages or system reports are displayed by 6040 Series INP's. They are:

Status = System status and normal operating responses,
Monitor Alert = Monitoring thresholds exceeded,
Configuration = Notification of boot and/or configuration errors.

System reports are generated by the 6040 whenever conditions exist which should be called to the attention of the operator. The reports are queued at the report destination until they are examined by the operator. Counts of duplicate messages are maintained and displayed along with the message.

The queueing of the first system report causes an asterisk to be displayed in the first character position of the self-scan screen if the message destination is the operator console, or the word REPORT to be displayed on the CTP if the CTP is the destination.

4.5.1 MESSAGE DESTINATION

The message destination is defined as the device on which error messages are to be displayed. If it is the operator's console, it is designated via (CHNG) (RN or RP) (ENTER) (0) (ENTER) (CLEAR). If it is a terminal port previously defined as a CTP, it is designated by the same command, except that 0 is replaced by the port number in hexadecimal.

If the node has more than one device (operator's console or CTP), only one may be used to access system reports.

4.5.2 MESSAGE DISPLAY

To display system reports in the queue, issue an (EXAM) (A) (R) (ENTER) command from the destination device. This causes the oldest message in the queue to be displayed. Successive (ENTER) commands will cause subsequent messages, if any, to be displayed in first-in-first-out sequence, until the word EMPTY appears. A (CLEAR) command will terminate the (EXAM) command at any point.

System Reports (from Monitoring) have the format

Nn Ppp xx yy

where

N = Node and is displayed.
n (hex) = The originating node number.

P = Port and is displayed.

pp (hex) = The originating port number (pp = 00 if this report refers to the entire node).

xx = Mnemonic of the report (see paragraph 4.5.3).

yy = Number (hex) of times this report has been received.

4.5.3 SYSTEM REPORT MNEMONICS

The following are definitions of the mnemonics xx used in the system reports.

4.5.3.1 CONFIGURATION/BOOT MESSAGES

AN = Nonexistent Adjacent Node. An adjacent node may be nonexistent because the high-speed link is out or because it simply does not exist. Check the network configuration worksheet.

AP = Nonexistent Adjacent Port. The port specified as adjacent does not exist at the specified node. Check the network configuration worksheet.

CC = Configuration Complete. The specified node has finished performing a system boot. pp contains the number of the configuration which has been booted.

DN = Down. This NP has had an outage.

IC = Incompatible Code Type. Before two terminal ports can pass data between them, the codes used internally must be the same. This does not mean that the code-types must be the same. As the data comes into the TP it is converted into variable length internal code before it is passed to the remote TP. At the remote TP the data must then be converted into the code that is to be output. To allow this, the remote TP's code type must result in the same internal code being used. If it is not, the remote TP cannot decode the variable length internal code, and this error is generated. Check code types in Tables 4-4 and 4-5.

IL = Insufficient Lock Byte Area. The patch on MC2 U4 is wrong for this model INP. (See Figure 3-13.)

IM = Insufficient Memory. Each port requires a certain amount of memory, and memory is also required for various system tables. If the system detects that there is insufficient memory to build the necessary tables and create enough buffers to operate the system, it will not continue to configure. Instead, it configures only the operator console panel, control terminal ports, and network ports, then sends an error code of IM to the report destination. The memory size must then be increased or the number of ports decreased before attempting to BOOT again. Install additional memory (Option 66122).

IT = Incompatible Port Type. Both TP's in a connected pair must have the same port type. If they have different types, an incompatible port type error

code is generated and the ports are not connected. Change the off-line configuration TP types so that they match, then BOOT the modified configuration.

IU = Adjacent TP is already in use, connected in some other path.

IX =Incompatible transfer port (XP).

NB = Network port boot started (6030 only).

NE = The port configured is nonexistent.

ST = Invalid subtype parameters.

UC = Unavailable Code Type. This error occurs if the code type specified for a terminal port is not available on the system. Check code types in Tables 4-4 and 4-5.

UN = Network port undefined.

UL = Unsupported link (no Option 66347) between 6030 and 6040.

WX = Incorrect slot weight for transfer port (XP). All ports in one directior must have the same slot weight, although all ports in the opposite direction may have a different slot weight.

4.5.3.2 MONITOR ALERT MESSAGES.

BR = Buffer overflow is receive direction. Data has been lost.

BU = Buffer utilization above BU-threshold.

BX = Buffer overflow in transmit direction. Data has been lost.

CE = Compression efficiency below CE-threshold.

DN = Down. This NP has had an outage.

ED = NP error density above ED threshold.

ER = Character error rate above ER threshold.

FA = Framing acquired.

FL = Framing lost.

OV = Overload. This node too busy to perform monitoring task.

PL = Processor loading above PL threshold.

PR = Configured port is present; a removed TP card has been replaced and the TP is reprogrammed.

RR = Retransmission rate above designated threshold.

TO = Operator console or CTP time out (lost packet).

UP = Network port that was down is now up and operational.

4.6 OPERATOR ERROR MESSAGES

Error messages in the form of 2-digit hex numbers are generated in response to incorrect entries from the operator console or control terminal port. The message is displayed as ER xx where xx is a hexadecimal number listed and defined below.

1 = Nonexistent port error

2 = Command invalid for system

3 = Nonexistent configuration

5 = Command invalid for port type

6 = Parameter is read only in active configuration

7 = Illegal value for parameter or modify

9 = Information not available in off-line configuration memory. Valid only for configuration 0

0A = Unpurchased option error

10 = Improper command

11 = Boot in MON mode or improper Boot number

12 = Invalid command

13 = CHNG in MON mode

14 = Invalid command

15 = Item invalid or CHNG not allowed

16 = Improper data level entry

17 = "CHNG TO" mnemonic not found

18 = No valid item in category

1A = Node not found

1B = Statistics not defined or enabled

1C = Insufficient data

1D = Command timeout (packet lost)

CHAPTER 5

CREATING AND USING A 6040 NETWORK

5.1 INTRODUCTION

This chapter illustrates the step-by-step procedures that must be taken to create the initial configuration memory parameters used for a hypothetical 6040 network that operates under S49 software. Each step is a series of commands which must be issued in sequence.

Before performing the steps involved in creating this configuration in memory, the user must be familiar with the operator console and keyboard (see paragraphs 2.2.1 and 2.2.2). The steps in creating a network configuration are:

a. Preliminary Design.

   1. Provide a sketch of your network. (See Figure 5-1 for a sample sketch.) Indicate quantities of: terminal ports (one for each terminal connected to a node), and network ports (one for each communication link attached to a node).

   2. Make lists of the terminals at each node which have identical characteristics. Each such list can be included in the configuration by describing the characteristics for one terminal, copying that description for each of the other terminals, then modifying those descriptions (change the original port number, etc., to reflect the new port's characteristics).

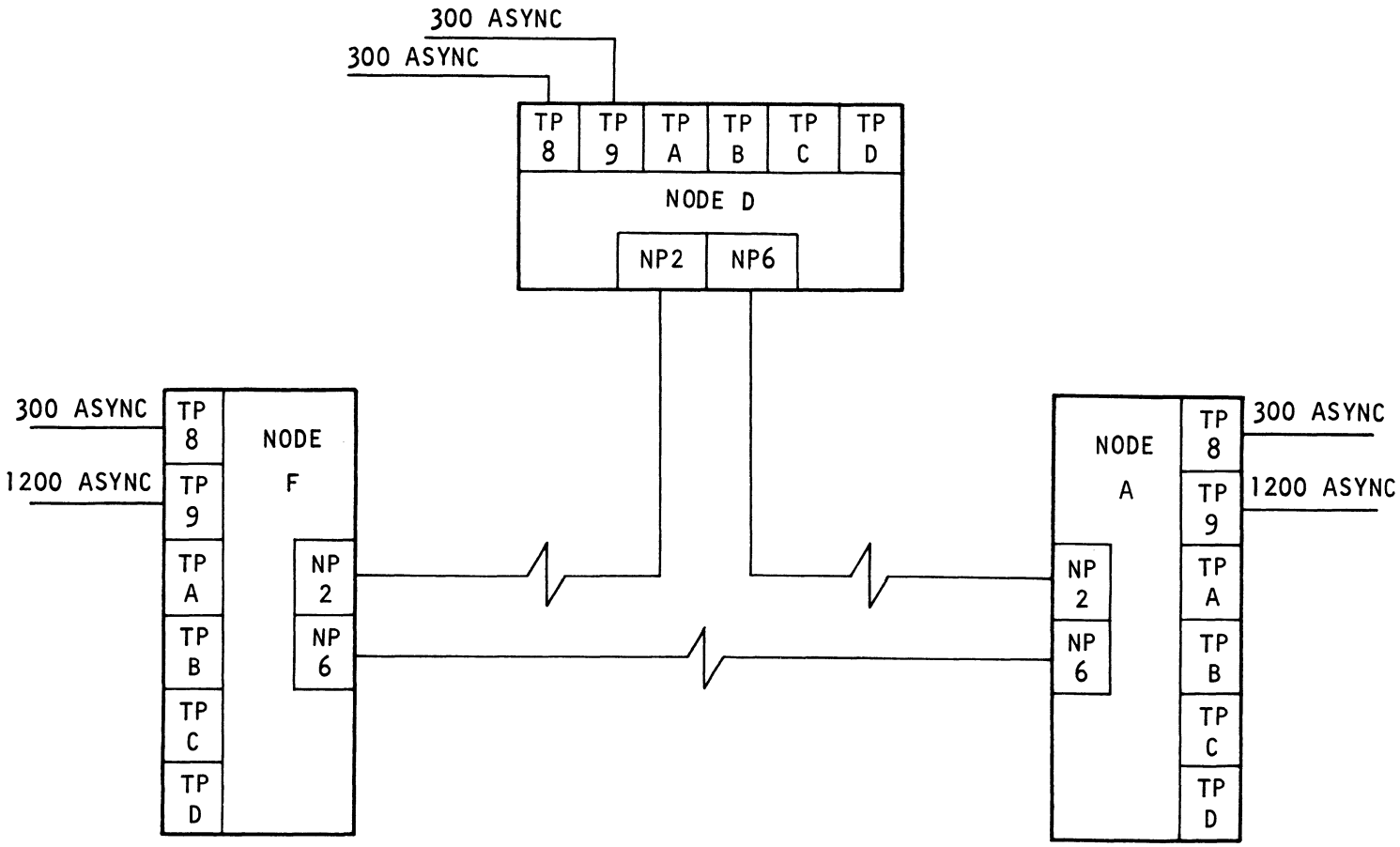
b. Circuit Worksheet. (See Figure 5-2.)

   1. Using your basic sketch of the network and the list of ports developed in step a.2 above, describe every individual circuit actually used between a transmitting node and a receiving node.

   2. It is suggested that circuits be described in pairs, i.e., from A to B, then from B to A, to ensure that all circuits are described.

c. Node Worksheets. (See Figures 5-3, 5-4, and 5-5.)

   1. Using node number and line number from the circuit worksheet, transfer circuit data to the node worksheet for all ports for a single node.



The Circuit Worksheet and Node Worksheets on the following pages present a complete description of the sample system network. Following the worksheets is the list of commands issued to configure the network.

Figure 5-1. Basic 6040 Ring Configuration

6000 SERIES CIRCUIT WORKSHEET CONFIGURATION # C-1

			CHARAC-TERISTICS		TRANSMIT DATA PATH			RECEIVE DATA PATH					CHARAC-TERISTICS		TRANSMIT DATA PATH			RECEIVE DATA PATH	
LINE NO. FOR CROSS REF ONLY	NODE NO.	PORT NO.	TYPE	CODE TYPE	ADJ NODE	ADJ PORT	SLOT WT	ADJ NODE	ADJ PORT	LINE NO. FOR CROSS REF ONLY	NODE NO.	PORT NO.	TYPE	CODE TYPE	ADJ NODE	ADJ PORT	SLOT WT	ADJ NODE	ADJ PORT
1	A	2	NP		D	2				31									
2	A	6	NP		F	6				32									
3	A	8	AP		D	8				33									
4	A	9	AP		F	9				34									
5	D	2	NP		A	2				35									
6	D	6	NP		F	2				36									
7	D	8	AP		A	8				37									
8	D	9	AP		F	8				38									
9	F	2	NP		D	6				39									
10	F	6	NP		A	6				40									
11	F	8	AP		D	9				41									
12	F	9	AP		A	9				42									
13										43									
14										44									
15										45									
16										46									
17										47									
18										48									
19										49									
20										50									
21										51									
22										52									
23										53									
24										54									
25										55									
26										56									
27										57									
28										58									
29										59									
30										60									

XP's ONLY XP's ONLY

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Figure 5-2. Circuit Worksheet

6030/6040 SERIES — S49 SOFTWARE NODE WORKSHEET — Page 1 of 2

NODE # A CONFIGURATION # C1

CIRCUIT CROSS-REFERENCE PAGE NO.	CIRCUIT CROSS-REFERENCE LINE NO.	PORT NO.	CHARACTERISTICS C= PORT TYPE T=	SUB-TYPE ST=	TRANSMIT SPEED S=	CODE TYPE C=	DATA BITS DB=	PAR. P=	STOP BITS SB=	AUTO-ECHO E=	RECEIVE SPEED RS=	OP MODE OM=	CHAR DELAY CD=	FLY-BACK FB=	AUTOSPEED RECOG CHAR AR=	AUTOSPEED SUB CHAR AS=	FIFO SIZE F=	ACTIVITY A= STAT S=	MODE M=	ARQ FRAME AF=	TRANSMIT DATA-PATH X= ADJ NODE AN=	ADJ PORT AP=	SLOT WT SW=	RECEIVE DATA PATH R= ADJ NODE AN=	ADJ PORT AP=
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1	2	NP		9600E												256	E	N	7					
1	2	6	NP		9600E												256	E	N	7					
1	3	8	AP	1	300	Ø	7	E	1	E	T	10						E	N		D	8	2		
1	4	9	AP	1	1200	Ø	7	E	1	E	T	00						E	N		F	9	6		

6040 ONLY

PARAMETERS REQUIRED TO CONFIGURE THE VARIOUS PORT TYPES. (● = REQUIRED)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
NP		●													●	●	●	●					
AP	●	●	●	●	●	●	●	●	●		●					●	●		●	●	●		
SP	●	●	●	●	●				●	●						●	●		●	●	●		
C	●	●		●	●	●	●	●		●													
E																							
AD		●	●	●	●	●	●	●	●				●	●									
XP			●																●	●	●	●	●

6040 ONLY

ENTRY DESCRIPTIONS FOR NODAL PARAMETERS CAN BE FOUND ON REVERSE SIDE

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Figure 5-3. Node Worksheet Node A (Sheet 1 of 2)

6030/6040 SERIES

S49 SOFTWARE NODE WORKSHEET
SUGGESTED STARTING VALUES

NODE NO. A CONFIGURATION C1

1 PORT TYPES
NP = NETWORK PORT
AP = ASYNCHRONOUS TERMINAL PORT
SP = SYNCHRONOUS TERMINAL PORT
C = CONTROL TERMINAL PORT
E = EMPTY PORT
AD = AUTOSPEED DEFINITION
XP = TRANSFER PORT

2 SUBTYPES
FOR AP: 1 = START/STOP
2 = AUTOSPEED
FOR SP: 1 = BSC
FOR C: 1 = CONTROL TERMINAL PORT
2 = SUPERVISORY COMMUNICATIONS PORT
3 = LOGGING CONTROL TERMINAL PORT
NOTE: 0 IS AN ILLEGAL VALUE

3 TRANSMIT SPEED
AP = 75, 110, 135, 150, 300, 600, 1200
SP = 1200, 2400, 3600, 4800, 7200, 9600
NOTE: FOR EXTERNAL CLOCK USE SUFFIX E (1200E)

5 DATA BITS
ACTUAL VALUE INCLUDING PARITY

6 PARITY
FOR AP: O = ODD, E = EVEN, N = NONE
FOR SP: 0 = ODD, E = EVEN, N = NONE

4 CODE TYPE CHARACTERISTICS

Code Type	Uses	Terminal Characteristics	Program the 6000 for:	Compression	Idle Code Bits	Hex Sync Character
0	a BSC ASCII b Start/Stop Terminals	8 Data Bits No Parity	DB=8 and P=N	NO	6	a 16 b –
1	a BSC EBCDIC	8 Data Bits No Parity	DB=8 and P=N	NO	6	32
2	a BSC ASCII b Start/Stop Terminals	7 Data Bits plus a Parity Bit or 7 Data Bits No Parity	DB=8 and P=E or O or DB=7 and P=N	NO	2	a E=96 O=16 b –
3	a BSC ASCII b Start/Stop Terminals	7 Data Bits plus a Parity Bit or 7 Data Bits No Parity	DB=8 and P=E or O or DB=7 and P=N	YES	3	a E=96 O=16 b –
4	a BSC Transcode b Start/Stop Terminals	6 Data Bits plus a Parity Bit or 6 Data Bits No Parity	DB=7 and P=E or O or DB=6 and P=N	NO	2	a – b –
5	Start/Stop Terminals	6 Data Bits plus a Parity Bit or 6 Data Bits No Parity	DB=7 and P=E or O or DB=6 and P=N	NO	2	–
6	Start/Stop Terminals	5 Data Bits plus a Parity Bit or 5 Data Bits No Parity	DB=6 and P=E or O or DB=5 and P=N	NO	2	–
7	EBCDIC	8 Data Bits No Parity	DB=8 and P=N	YES	4	32
8 and on	Custom Applications	As Specified	As Specified	As Specified	As Specified	As Specified

7 STOP BITS
1 or 2 NOTE: DB = 5 WITH 2 STOP BITS DEFAULTS TO 1.5 STOP BITS.

8 AUTOECHO
E = ENABLED D = DISABLED

9 RECEIVE SPEED
T = SAME AS TRANSMIT SPEED
D = DEFAULT TO AN INTERNAL CLOCK VALUE (1200 BPS)

10 OPERATION MODE
OPERATION MODE IS TWO HEX CHARACTERS (C_1 AND C_2), EACH OF WHICH IS FOUR BITS.

OM = C_1 (b_7 b_6 b_5 b_4) C_2 (b_3 b_2 b_1 b_0)

FOR ASYNCHRONOUS APPLICATIONS:
OM = 00 IF NO FLYBACK (FB) IS USED.
OM = 10 IF FLYBACK (FB) IS USED.

FOR SYNCHRONOUS APPLICATIONS:
b0 = 1 PREVENTS ECHO OF DATA COMMON TO 201 MODEM IN DIAL UP.
b1 = 1 PREVENTS SYN INSERTION BETWEEN BSC MESSAGE BLOCKS.
b2 = NOT USED
b3 = 1 PREVENTS SYN INSERTION IN QUANTITY OF BSC *CHARACTERS* SPECIFIED BY CD.
b3 = 0 PREVENTS SYN INSERTION IN THE QUANTITY OF NETWORK PORT *FRAMES* SPECIFIED BY CD.

10 OPERATION MODE *(continued)*
b4 = 1 STRIPS LEADING SYN FROM MESSAGE BLOCKS.
b5 = 1 FOR ADJACENT PORTS, PREVENTS DUPLICATE MESSAGE BLOCKS (NOT FOR PROTOCOLS SENDING CONSECUTIVE BLOCKS.)
b6 = 1 FOR ADJACENT PORTS, STRIPS PAD CHARACTERS AT TRANSMITTING PORT AND RESTORES THEM AT RECEIVING PORT.
b7 = NOT USED

11 CHARACTER DELAY
ACTUAL VALUE IS 0-255

12 FLYBACK
TWO HEX CHARACTERS CORRESPONDING TO CARRIAGE RETURN AS FOLLOWS:
0D = EBCDIC, ODD-PARITY ASCII, 7-BIT ASCII
8D = EVEN-PARITY ASCII, 8-BIT ASCII
6D = SELECTRIC EBCD
08 = BAUDOT, 6-BIT TYPESETTER

13 AUTOSPEED RECOGNITION CHARACTER
SEE 6030/6040 OPERATION MANUAL FOR LIST

14 AUTOSPEED SUBSTITUTION CHARACTER
ANY CHARACTER IN HEX CODE

15 FIFO-SIZE

TRUNK SPEED	FIFO VALUE
1200	32
2400	64
4800	128
9600	256

16 STATISTICS
E = ENABLED D = DISABLED

17 MODE
N = NORMAL (FDX)
L = LOCAL LOOPBACK
R = REMOTE LOOPBACK (TP'S ONLY)

18 ARQ FRAMES
ACTUAL VALUES ARE 7, 15, 31, 63, 127

19 ADJACENT NODE
ACTUAL NUMBER OF ADJACENT NODE TO WHICH DATA IS TRANSMITTED

20 ADJACENT PORT
ACTUAL NUMBER OF ADJACENT PORT TO WHICH DATA IS TRANSMITTED

21 SLOT WEIGHT

TERMINAL SPEED	SLOT WEIGHT
150 BPS OR LESS	1
300 BPS	2
600 BPS	3
1200 BPS	6

21 SLOT WEIGHT *(continued)*

2400 BPS (ASYNC)	12
(SYNC)	16
4800 BPS (SYNC)	32
9600 BPS (SYNC)	64

22 ADJACENT NODE
ACTUAL NUMBER OF ADJACENT NODE FROM WHICH DATA IS RECEIVED

23 ADJACENT PORT
ACTUAL NUMBER OF ADJACENT PORT FROM WHICH DATA IS RECEIVED

NODAL PARAMETERS

ACTIVITY A =		
TIME CONSTANT (1-240)	T =	1
REPORT DESTINATION NODE (# #)	RN =	A
REPORT DESTINATION PORT (# #)	RP =	Ø
BUFFER MULTIPLIER	B =	5

SUGGESTED VALUES:
T 1
RP 0
B 5
NOTE: FOR RP, 0 = OPERATOR'S CONSOLE

THRESHOLDS (%) T =		
NETWORK PORT ERROR DENSITY	ED =	3
TERMINAL PORT COMPRESSION EFFICIENCY	CE =	100
TERMINAL PORT CHARACTER ERROR RATE	ER =	3
BUFFER UTILIZATION	BU =	90
PROCESSOR LOADING	PL =	90
RETRANSMISSION RATE, FRAMES/SEC	RR =	1

SUGGESTED THRESHOLDS:
ED 3%
CE 100%
ER 3%
BU 90%
PL 90%
RR 7 FRAMES/SEC

Figure 5-3. Node Worksheet Node A (Sheet 2 of 2)

6030/6040 SERIES S49 SOFTWARE NODE WORKSHEET

Page ____ of ____

NODE # D CONFIGURATION # C1

CIRCUIT CROSS-REFERENCE PAGE NO.	CIRCUIT CROSS-REFERENCE LINE NO.	PORT NO	CHARACTERISTICS C= PORT TYPE T=	SUB-TYPE ST=	TRANSMIT SPEED S=	CODE TYPE C=	DATA BITS DB=	PAR. P=	STOP BITS SB=	AUTO-ECHO E=	RECEIVE SPEED RS=	OP MODE OM=	CHAR DELAY CD=	FLY-BACK FB=	AUTOSPEED RECOG CHAR AR=	AUTOSPEED SUB CHAR AS=	FIFO SIZE F=	ACTIVITY A= STAT S=	MODE M=	ARQ FRAME AF=	TRANSMIT DATA PATH X= ADJ NODE AN=	ADJ PORT AP=	SLOT WT SW=	RECEIVE DATA PATH R= ADJ NODE AN=	ADJ PORT AP=
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	5	2	NP		9600E												256	E	N	7					
1	6	6	NP		9600E												256	E	N	7					
1	7	8	AP	1	300	Ø	7	E	1	E	T	10		ØA				E	N		A	8	2		
1	8	9	AP	1	300	Ø	7	E	1	E	T	10		ØA				E	N		F	8	2		

6040 ONLY

PARAMETERS REQUIRED TO CONFIGURE THE VARIOUS PORT TYPES. (● = REQUIRED)

	PORT TYPE T=	SUB-TYPE ST=	TRANSMIT SPEED S=	CODE TYPE C=	DATA BITS DB=	PAR. P=	STOP BITS SB=	AUTO-ECHO E=	RECEIVE SPEED RS=	OP MODE OM=	CHAR DELAY CD=	FLY-BACK FB=	AUTOSPEED RECOG CHAR AR=	AUTOSPEED SUB CHAR AS=	FIFO SIZE F=	ACTIVITY A= STAT S=	MODE M=	ARQ FRAME AF=	TRANSMIT DATA PATH X= ADJ NODE AN=	ADJ PORT AP=	SLOT WT SW=	RECEIVE DATA PATH R= ADJ NODE AN=	ADJ PORT AP=
NP		●								●					●	●	●	●					
AP	●	●	●	●	●	●	●	●	●	●		●				●	●		●	●	●		
SP	●	●	●	●	●					●	●					●	●		●	●	●		
C	●	●		●	●	●	●	●			●												
E																							
AD		●	●	●	●	●	●	●	●	●			●	●									
XP				●															●	●	●	●	●

6040 ONLY

ENTRY DESCRIPTIONS FOR NODAL PARAMETERS CAN BE FOUND ON REVERSE SIDE

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Figure 5-4. Node Worksheet Node D (Sheet 1 of 2)

6030/6040 SERIES

S49 SOFTWARE NODE WORKSHEET
SUGGESTED STARTING VALUES

NODE NO. D CONFIGURATION C1

1 PORT TYPES
NP = NETWORK PORT
AP = ASYNCHRONOUS TERMINAL PORT
SP = SYNCHRONOUS TERMINAL PORT
C = CONTROL TERMINAL PORT
E = EMPTY PORT
AD = AUTOSPEED DEFINITION
XP = TRANSFER PORT

2 SUBTYPES
FOR AP: 1 = START/STOP
2 = AUTOSPEED
FOR SP: 1 = BSC
FOR C: 1 = CONTROL TERMINAL PORT
2 = SUPERVISORY COMMUNICATIONS PORT
3 = LOGGING CONTROL TERMINAL PORT
NOTE: 0 IS AN ILLEGAL VALUE

3 TRANSMIT SPEED
AP = 75, 110, 135, 150, 300, 600, 1200
SP = 1200, 2400, 3600, 4800, 7200, 9600
NOTE: FOR EXTERNAL CLOCK USE SUFFIX E (1200E)

5 DATA BITS
ACTUAL VALUE INCLUDING PARITY

6 PARITY
FOR AP: O = ODD, E = EVEN, N = NONE
FOR SP: 0 = ODD, E = EVEN, N = NONE

4 CODE TYPE CHARACTERISTICS

Code Type	Uses	Terminal Characteristics	Program the 6000 for:	Compression	Idle Code Bits	Hex Sync Character
0	a. BSC ASCII b. Start/Stop Terminals	8 Data Bits No Parity	DB=8 and P=N	NO	6	a 16 b –
1	a. BSC EBCDIC	8 Data Bits No Parity	DB=8 and P=N	NO	6	32
2	a. BSC ASCII b. Start/Stop Terminals	7 Data Bits plus a Parity Bit or 7 Data Bits No Parity	DB=8 and P=E or O or DB=7 and P=N	NO	2	a E=96 O=16 b –
3	a. BSC ASCII b. Start/Stop Terminals	7 Data Bits plus a Parity Bit or 7 Data Bits No Parity	DB=8 and P=E or O or DB=7 and P=N	YES	3	a E=96 O=16 b –
4	a. BSC Transcode b. Start/Stop Terminals	6 Data Bits plus a Parity Bit or 6 Data Bits No Parity	DB=7 and P=E or O or DB=6 and P=N	NO	2	a – b –
5	Start/Stop Terminals	6 Data Bits plus a Parity Bit or 6 Data Bits No Parity	DB=7 and P=E or O or DB=6 and P=N	NO	2	–
6	Start/Stop Terminals	5 Data Bits plus a Parity Bit or 5 Data Bits No Parity	DB=6 and P=E or O or DB=5 and P=N	NO	2	–
7	EBCDIC	8 Data Bits No Parity	DB=8 and P=N	YES	4	32
8 and on	Custom Applications	As Specified	As Specified	As Specified	As Specified	As Specified

7 STOP BITS
1 or 2 NOTE: DB = 5 WITH 2 STOP BITS DEFAULTS TO 1.5 STOP BITS.

8 AUTOECHO
E = ENABLED D = DISABLED

9 RECEIVE SPEED
T = SAME AS TRANSMIT SPEED
D = DEFAULT TO AN INTERNAL CLOCK VALUE (1200 BPS)

10 OPERATION MODE
OPERATION MODE IS TWO HEX CHARACTERS (C_1 AND C_2), EACH OF WHICH IS FOUR BITS.

OM = C_1 (C_2)
b7 b6 b5 b4 b3 b2 b1 b0

FOR ASYNCHRONOUS APPLICATIONS:
OM = 00 IF NO FLYBACK (FB) IS USED.
OM = 10 IF FLYBACK (FB) IS USED.

FOR SYNCHRONOUS APPLICATIONS:
b0 = 1 PREVENTS ECHO OF DATA COMMON TO 201 MODEM IN DIAL UP.
b1 = 1 PREVENTS SYN INSERTION BETWEEN BSC MESSAGE BLOCKS.
b2 = NOT USED
b3 = 1 PREVENTS SYN INSERTION IN QUANTITY OF BSC *CHARACTERS* SPECIFIED BY CD.
b3 = 0 PREVENTS SYN INSERTION IN THE QUANTITY OF NETWORK PORT *FRAMES* SPECIFIED BY CD.

10 OPERATION MODE *(continued)*
b4 = 1 STRIPS LEADING SYN FROM MESSAGE BLOCKS.
b5 = 1 FOR ADJACENT PORTS, PREVENTS DUPLICATE MESSAGE BLOCKS (NOT FOR PROTOCOLS SENDING CONSECUTIVE BLOCKS.)
b6 = 1 FOR ADJACENT PORTS, STRIPS PAD CHARACTERS AT TRANSMITTING PORT AND RESTORES THEM AT RECEIVING PORT.
b7 = NOT USED

11 CHARACTER DELAY
ACTUAL VALUE IS 0-255.

12 FLYBACK
TWO HEX CHARACTERS CORRESPONDING TO CARRIAGE RETURN AS FOLLOWS:
0D = EBCDIC, ODD-PARITY ASCII, 7-BIT ASCII
8D = EVEN-PARITY ASCII, 8-BIT ASCII
6D = SELECTRIC, EBCD
08 = BAUDOT, 6-BIT TYPESETTER

13 AUTOSPEED RECOGNITION CHARACTER
SEE 6030/6040 OPERATION MANUAL FOR LIST.

14 AUTOSPEED SUBSTITUTION CHARACTER
ANY CHARACTER IN HEX CODE.

15 FIFO-SIZE

TRUNK SPEED	FIFO VALUE
1200	32
2400	64
4800	128
9600	256

16 STATISTICS
E = ENABLED D = DISABLED

17 MODE
N = NORMAL (FDX)
L = LOCAL LOOPBACK
R = REMOTE LOOPBACK (TP'S ONLY)

18 ARQ FRAMES
ACTUAL VALUES ARE 7, 15, 31, 63, 127

19 ADJACENT NODE
ACTUAL NUMBER OF ADJACENT NODE TO WHICH DATA IS TRANSMITTED.

20 ADJACENT PORT
ACTUAL NUMBER OF ADJACENT PORT TO WHICH DATA IS TRANSMITTED.

21 SLOT WEIGHT

TERMINAL SPEED	SLOT WEIGHT
150 BPS OR LESS	1
300 BPS	2
600 BPS	3
1200 BPS	6

21 SLOT WEIGHT *(continued)*

2400 BPS (ASYNC)	12
(SYNC)	16
4800 BPS (SYNC)	32
9600 BPS (SYNC)	64

22 ADJACENT NODE
ACTUAL NUMBER OF ADJACENT NODE FROM WHICH DATA IS RECEIVED.

23 ADJACENT PORT
ACTUAL NUMBER OF ADJACENT PORT FROM WHICH DATA IS RECEIVED.

NODAL PARAMETERS

ACTIVITY A =		
TIME CONSTANT (1-240)	T =	1
REPORT DESTINATION NODE (# #)	RN =	A
REPORT DESTINATION PORT (# #)	RP =	Ø
BUFFER MULTIPLIER	B =	5

SUGGESTED VALUES:
T 1
RP 0
B 5
NOTE: FOR RP, 0 = OPERATOR'S CONSOLE

THRESHOLDS (%) T =		
NETWORK PORT ERROR DENSITY	ED =	3
TERMINAL PORT COMPRESSION EFFICIENCY	CE =	100
TERMINAL PORT CHARACTER ERROR RATE	ER =	3
BUFFER UTILIZATION	BU =	90
PROCESSOR LOADING	PL =	90
RETRANSMISSION RATE FRAMES/SEC	RR =	1

SUGGESTED THRESHOLDS:
ED 3%
CE 100%
ER 3%
BU 90%
PL 90%
RR 7 FRAMES/SEC

Figure 5-4. Node Worksheet Node D (Sheet 2 of 2)

6030/6040 SERIES — S49 SOFTWARE NODE WORKSHEET — Page 1 of 2

NODE # F CONFIGURATION # C1

CIRCUIT CROSS-REFERENCE PAGE NO.	CIRCUIT CROSS-REFERENCE LINE NO.	PORT NO.	CHARACTERISTICS C= PORT TYPE 1 T=	SUB-TYPE 2 ST=	TRANSMIT SPEED 3 S=	CODE TYPE 4 C=	DATA BITS 5 DB=	PAR. 6 P=	STOP BITS 7 SB=	AUTO-ECHO 8 E=	RECEIVE SPEED 9 RS=	OP MODE 10 OM=	CHAR DELAY 11 CD=	FLY-BACK 12 FB=	AUTOSPEED RECOG CHAR 13 AR=	AUTOSPEED SUB CHAR 14 AS=	FIFO SIZE 15 F=	ACTIVITY A= STAT 16 S=	ACTIVITY MODE 17 M=	ACTIVITY ARQ FRAME 18 AF=	TRANSMIT DATA PATH X= ADJ NODE 19 AN=	TRANSMIT DATA PATH ADJ PORT 20 AP=	TRANSMIT DATA PATH SLOT WT 21 SW=	RECEIVE DATA PATH R= ADJ NODE 22 AN=	RECEIVE DATA PATH ADJ PORT 23 AP=
1	9	2	NP		9600E												256	E	N	7					
1	10	6	NP		9600E												256	E	N	7					
1	11	8	AP		300	Ø	7	E	1	E	T	10		0A				E	N		D	9	2		
1	12	9	AP		1200	Ø	7	E	1	E	T	00		0				E	N		A	9	6		

6040 ONLY

PARAMETERS REQUIRED TO CONFIGURE THE VARIOUS PORT TYPES. (● = REQUIRED)

	T=	ST=	S=	C=	DB=	P=	SB=	E=	RS=	OM=	CD=	FB=	AR=	AS=	F=	S=	M=	AF=	AN=	AP=	SW=	AN=	AP=
NP		●													●	●	●	●					
AP	●	●	●	●	●	●	●	●	●	●		●				●	●		●	●	●		
SP	●	●	●	●	●					●	●					●	●		●	●	●		
C	●	●		●	●	●	●	●			●												
E																							
AD		●	●	●	●	●	●	●	●	●			●	●									
XP			●																●	●	●	●	●

6040 ONLY

ENTRY DESCRIPTIONS FOR NODAL PARAMETERS CAN BE FOUND ON REVERSE SIDE

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Figure 5-5. Node Worksheet Node F (Sheet 1 of 2)

6030/6040 SERIES

S49 SOFTWARE NODE WORKSHEET
SUGGESTED STARTING VALUES

NODE NO. F CONFIGURATION C1

1 PORT TYPES
NP = NETWORK PORT
AP = ASYNCHRONOUS TERMINAL PORT
SP = SYNCHRONOUS TERMINAL PORT
C = CONTROL TERMINAL PORT
E = EMPTY PORT
AD = AUTOSPEED DEFINITION
XP = TRANSFER PORT

2 SUBTYPES
FOR AP: 1 = START/STOP
2 = AUTOSPEED
FOR SP: 1 = BSC
FOR C: 1 = CONTROL TERMINAL PORT
2 = SUPERVISORY COMMUNICATIONS PORT
3 = LOGGING CONTROL TERMINAL PORT
NOTE: 0 IS AN ILLEGAL VALUE

3 TRANSMIT SPEED
AP = 75, 110, 135, 150, 300, 600, 1200
SP = 1200, 2400, 3600, 4800, 7200, 9600
NOTE: FOR EXTERNAL CLOCK USE SUFFIX E (1200E)

5 DATA BITS
ACTUAL VALUE INCLUDING PARITY

6 PARITY
FOR AP: O = ODD E = EVEN N = NONE
FOR SP: 0 = ODD E = EVEN N = NONE

4 CODE TYPE CHARACTERISTICS

Code Type	Uses	Terminal Characteristics	Program the 6000 for:	Compression	Idle Code Bits	Hex Sync Character
0	a. BSC ASCII b. Start/Stop Terminals	8 Data Bits No Parity	DB=8 and P=N	NO	6	a. 16 b. –
1	a. BSC EBCDIC	8 Data Bits No Parity	DB=8 and P=N	NO	6	32
2	a. BSC ASCII b. Start/Stop Terminals	7 Data Bits plus a Parity Bit or 7 Data Bits No Parity	DB=8 and P=E or O or DB=7 and P=N	NO	2	a. E=96 O=16 b –
3	a. BSC ASCII b. Start/Stop Terminals	7 Data Bits plus a Parity Bit or 7 Data Bits No Parity	DB=8 and P=E or O or DB=7 and P=N	YES	3	a. E=96 O=16 b –
4	a. BSC Transcode b. Start/Stop Terminals	6 Data Bits plus a Parity Bit or 6 Data Bits No Parity	DB=7 and P=E or O or DB=6 and P=N	NO	2	a – b –
5	Start/Stop Terminals	6 Data Bits plus a Parity Bit or 6 Data Bits No Parity	DB=7 and P=E or O or DB=6 and P=N	NO	2	–
6	Start/Stop Terminals	5 Data Bits plus a Parity Bit or 5 Data Bits No Parity	DB=6 and P=E or O or DB=5 and P=N	NO	2	–
7	EBCDIC	8 Data Bits No Parity	DB=8 and P=N	YES	4	32
8 and on	Custom Applications	As Specified	As Specified	As Specified	As Specified	As Specified

7 STOP BITS
1 or 2 NOTE: DB = 5 WITH 2 STOP BITS DEFAULTS TO 1.5 STOP BITS.

8 AUTOECHO
E = ENABLED D = DISABLED

9 RECEIVE SPEED
T = SAME AS TRANSMIT SPEED
D = DEFAULT TO AN INTERNAL CLOCK VALUE (1200 BPS)

10 OPERATION MODE
OPERATION MODE IS TWO HEX CHARACTERS (C_1 AND C_2), EACH OF WHICH IS FOUR BITS.

OM = C_1 (C_2)
b7 b6 b5 b4 b3 b2 b1 b0

FOR ASYNCHRONOUS APPLICATIONS:
OM = 00 IF NO FLYBACK (FB) IS USED.
OM = 10 IF FLYBACK (FB) IS USED.

FOR SYNCHRONOUS APPLICATIONS:
b0 = 1 PREVENTS ECHO OF DATA COMMON TO 201 MODEM IN DIAL UP.
b1 = 1 PREVENTS SYN INSERTION BETWEEN BSC MESSAGE BLOCKS.
b2 = NOT USED
b3 = 1 PREVENTS SYN INSERTION IN QUANTITY OF BSC *CHARACTERS* SPECIFIED BY CD.
b3 = 0 PREVENTS SYN INSERTION IN THE QUANTITY OF NETWORK PORT *FRAMES* SPECIFIED BY CD.

10 OPERATION MODE *(continued)*
b4 = 1 STRIPS LEADING SYN FROM MESSAGE BLOCKS.
b5 = 1 FOR ADJACENT PORTS, PREVENTS DUPLICATE MESSAGE BLOCKS (NOT FOR PROTOCOLS SENDING CONSECUTIVE BLOCKS.)
b6 = 1 FOR ADJACENT PORTS, STRIPS PAD CHARACTERS AT TRANSMITTING PORT AND RESTORES THEM AT RECEIVING PORT.
b7 = NOT USED

11 CHARACTER DELAY
ACTUAL VALUE IS 0-255.

12 FLYBACK
TWO HEX CHARACTERS CORRESPONDING TO CARRIAGE RETURN AS FOLLOWS:
0D = EBCDIC, ODD-PARITY ASCII, 7-BIT ASCII
8D = EVEN-PARITY ASCII, 8-BIT ASCII
6D = SELECTRIC, EBCD
08 = BAUDOT, 6-BIT TYPESETTER

13 AUTOSPEED RECOGNITION CHARACTER
SEE 6030/6040 OPERATION MANUAL FOR LIST.

14 AUTOSPEED SUBSTITUTION CHARACTER
ANY CHARACTER IN HEX CODE.

15 FIFO-SIZE

TRUNK SPEED	FIFO VALUE
1200	32
2400	64
4800	128
9600	256

16 STATISTICS
E = ENABLED D = DISABLED

17 MODE
N = NORMAL (FDX)
L = LOCAL LOOPBACK
R = REMOTE LOOPBACK (TP'S ONLY)

18 ARQ FRAMES
ACTUAL VALUES ARE 7, 15, 31, 63, 127

19 ADJACENT NODE
ACTUAL NUMBER OF ADJACENT NODE TO WHICH DATA IS TRANSMITTED.

20 ADJACENT PORT
ACTUAL NUMBER OF ADJACENT PORT TO WHICH DATA IS TRANSMITTED.

21 SLOT WEIGHT

TERMINAL SPEED *	SLOT WEIGHT
150 BPS OR LESS	1
300 BPS	2
600 BPS	3
1200 BPS	6

21 SLOT WEIGHT *(continued)*

2400 BPS (ASYNC)	12
(SYNC)	16
4800 BPS (SYNC)	32
9600 BPS (SYNC)	64

22 ADJACENT NODE
ACTUAL NUMBER OF ADJACENT NODE FROM WHICH DATA IS RECEIVED.

23 ADJACENT PORT
ACTUAL NUMBER OF ADJACENT PORT FROM WHICH DATA IS RECEIVED.

NODAL PARAMETERS

ACTIVITY A =		
TIME CONSTANT (1-240)	T =	1
REPORT DESTINATION NODE (# #)	RN =	A
REPORT DESTINATION PORT (# #)	RP =	Ø
BUFFER MULTIPLIER	B =	5

SUGGESTED VALUES:
T 1
RP 0
B 5
NOTE: FOR RP, 0 = OPERATOR'S CONSOLE

THRESHOLDS (%) T =		
NETWORK PORT ERROR DENSITY	ED =	3
TERMINAL PORT COMPRESSION EFFICIENCY	CE =	100
TERMINAL PORT CHARACTER ERROR RATE	ER =	3
BUFFER UTILIZATION	BU =	90
PROCESSOR LOADING	PL =	90
RETRANSMISSION RATE, FRAMES/SEC	RR =	1

SUGGESTED THRESHOLDS:
ED 3%
CE 100%
ER 3%
BU 90%
PL 90%
RR 7 FRAMES/SEC

Figure 5-5. Node Worksheet Node F (Sheet 2 of 2)

2. Repeat step 1 for each node. Use separate node worksheets for each node.

3. Complete the description of TP's for each node using the information generated in step a.2 above and Table 5-1.

4. Describe each network port in a node using the network sketch (Figure 5-1) and Table 5-1. Note that NP's are numbered 02, 06, 0A, and so on: every four numbers beginning with 02.

5. Now describe each node, using the node worksheet. Activity parameters RN and RP should be identical throughout the system, at least until the network has been loaded and tested for system integrity.

6. Establish the statistical/monitoring thresholds for the system. These will ultimately be determined by user experience and operating needs. Some initial guidelines are offered on the back of the node worksheet.

d. Begin Configuration.

1. Set Keylock switch to PGM.

2. Select PGM or CTRL mode.

3. Verify the system network's integrity by issuing a Boot 5 command. (See Chapter 4 for diagnostic Boot commands.)

4. Select PGM mode.

5. Begin configuring the network (paragraph 5.3).

5.2 SAMPLE SYSTEM CONFIGURATION GENERATION

This example assumes that C1, the configuration memory to be configured is empty, and that the active configuration will be C5, thus enabling inter-node communication with a known good configuration.

The example begins by explaining what the user is going to do. This text is followed by a command sequence that will configure the proposed network.

The command sequence is divided into three columns. The first contains a series of labeled squares and rectangles representing keys on the operator console.

TABLE 5-1. CONFIGURATION WORKSHEET DATA LOCATOR

Parameter	Location
Type	Table 4-3.
Subtype	Table 4-3.
Speed	Table 4-3.
Code Type	Table 4-3 and Table 4-4.
Operation Mode	Table 4-3.
Parity	Table 4-3.
Data Bits	Table 4-3 and Appendix F.
Stop Bits	Table 4-3.
Autoecho	Table 4-3.
Receive Speed	Table 4-3.
Autospeed Character	Table 4-3 and Appendix H. Autospeed Definition only.
FIFO Size	Table 4-3, Paragraph 1.3, and Table 5-2.
Mode	Table 4-3.
Statistics	Table 4-3.
ARQ Frames	Table 4-3.
Adjacent Node	Table 4-3.
Adjacent Port	Table 4-3.
Slot Weight	Table 4-3, Paragraph 1.3, and Table 5.2.
Remote Node Address	Table 4-3.
Remote Port Address	Table 4-3.
Time Constant	Table 4-3. In tenths of an hour.
Report Address, Node	Table 4-3.
Report Address, Port	Table 4-3.
Buffer Multiplier	Table 4-3 and Table 5-2.
NP Error Density Threshold	Table 4-3.
TP Compression Efficiency Threshold	Table 4-3.
TP Character Error Rate Threshold	Table 4-3.
Buffer Utilization Threshold	Table 4-3.
Processor Loading Threshold	Table 4-3.

The keys are shown, left to right, in the sequence in which they are to be pressed to create a valid command. The middle column represents the self-scan display screen after the last key in the line has been pressed. The third column contains explanatory remarks. At the beginning of the sequence these remarks are given in detail; later they are simplified or eliminated.

As the example progresses, repetitive actions are noted in less detail.

The circuit worksheet and the node worksheets for the example are Figures 5-2 through 5-5. The node worksheets are the basis for the command sequences in the example.

In the sample configuration, certain arbitrary values have been assigned to slot weight, FIFO value, and buffer multiplier parameters (see Appendix A for definition of these terms). The recommended values for the 6040 Series INP's are shown in Table 5-2.

TABLE 5-2. 6040 INP SUGGESTED VALUES FOR SLOT WEIGHT, FIFO VALUE, AND BUFFER MULTIPLIER

Slot Weight	Terminal Speed
0	Illegal value
1	75, 110, 134.5, 150 bps
2	300 bps
3	600 bps
6	1200 bps
12	2400 bps (Async)
16	2400 bps (Async)
32	4800 bps (Sync)
64	9600 bps (Sync)
FIFO Value	**Network Port Speed**
32	1200 bps and lower
64	2400 bps
128	4800 bps
256	9600 bps and higher
Buffer Multiplier	
5	

5.3 CONFIGURING THE SAMPLE SYSTEM

The sample system is configured by issuing SEL (select), EXAM (examine), and CHNG (change) commands. See Chapter 4 for an explanation of these commands.

The basic system consists of three nodes connected in the form of a Ring (see Figure 5-1). All three nodes have two network ports and six terminal ports. The network ports are designated NP2 and NP6 in each mode. Only two of six available terminal ports are used for the initial basic configuration. They are designated TP8 and TP9. The remaining four terminal ports in each node, (TPA, TPB, TPC, TPD) are designated empty (T = E) at this time.

Node activity parameters are established as a time constant of 1 (sampling every 0.1 hour), system error reports for all nodes are to be displayed on the operator console and the buffer multiplier is defined as 5.

The following command sequences are used to configure the network:

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
Turn keylock switch to PGM		Applies power to the node. (Power-up the other nodes in the system.)
SEL PGM	---SEL PGM	Selects Program mode.
ENTER	A0---	Executes command to enter Program mode. (Monitor mode light extinguished, PGM mode light comes on.)
BOOT 5	A0--- BOOT 5	Upon execution of Enter command, loads node with Null Configuration. A system report message is waiting in the message queue.
ENTER	*	
EXAM A R	*EXAM A R	Examine the Activity Report Register.
ENTER	*NAP02 FA 01	Framing acquired on Network Port 02.
ENTER	*NAP06 FA 01	Framing acquired on Network Port 06.
ENTER	NAP05 CC 01	Configuration complete. The off-line configuration (C-5) has been successfully mapped into the on-line configuration (C-0).
ENTER	EMPTY	All messages in the message queue have been displayed.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
CLEAR	A0---	Node A, Configuration 0.
SEL PGM	A0--- SEL PGM	Selects Program mode.
ENTER	A0---	Executes command to enter the Program mode.
SEL C 1	A0--- SEL C 1	Selects C1. The following entries create in Configuration Memory 1 the configuration shown in Figure 5-1.
ENTER	A1---	Executes "Select" command.
SEL P 2	A1--- SEL P 2	Selects Port Nest address 02 (the location of the first Network Port cards).
ENTER	A1E02	Any changes made will be done to Port Address 02.
CHNG C T	A1E02 CHNG C T	Change the Port Characteristic parameters.
ENTER	A1E02 T = E/	The port is presently configured as EMPTY. The slash is a prompt, asking if you wish to change the displayed "TYPE."
N P	A1E02 T = E/NP	Change port configuration to Network Port.
ENTER	A1E02 S = 9600E/	Port type change command executed. Screen display scrolls to next valid configurable parameter for a Network Port.
ENTER	A1N02 F = 256/	The present Network Port speed is at the desired value; by pressing the ENTER key without adding any change, the value will remain the same and the screen display will scroll to next value.
ENTER	A1N02 T = NP/	The present FIFO value is at the desired value, so the ENTER key is pressed and the display scrolls back to the beginning.
CLEAR	A1N02	Exit "CHNG C" mode.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
CHNG A S	A1N02 CHNG A S	Change Port Activity parameters.
ENTER	A1N02 S = E/	Statistics are enabled.
ENTER	A1N02 M = N/	Mode is Normal (i.e., not in loop-back).
ENTER	A1N02 AF = 127/	Frame buffer size is 127 frames.
7	A1N02 AF = 127/7	Change frame buffer size to 7.
ENTER	A1N02 S = E/	Executes change command and screen display scrolls to next value.
CLEAR	A1N02	Exit "CHNG A" mode.
SEL P 6	A1N02 SEL P 6	Selects Port Address 06 (the location of second set of Network Port cards).
ENTER	A1E06	Executes SELECT command.
		NOTE: The remarks for Configuring Port 06 are the same for Port 02. Refer to those remarks to answer any questions.
CHNG C T	A1E06 CHNG C T	
ENTER	A1E06 T = E/	
N P	A1E06 T = E/NP	
ENTER	A1E06 S = 9600E/	
ENTER	A1N06 F = 256/	
ENTER	A1N06 T = NP/	
CLEAR	A1N06	
CHNG A S	A1N06 CHNG A S	
ENTER	A1N06 S = E/	
ENTER	A1N06 M = N/	
ENTER	A1N06 AF = 127/	
7	A1N06 AF = 127/7	

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
ENTER	A1N06 S = E/	
CLEAR	A1N06	
SEL P 8	A1N06 SEL P 8	Selects Port Address 08 (the first Terminal Port Address in a node with two Network Ports).
ENTER	A1E08	Executes SELECT command.
CHNG C T	A1E08 CHNG C T	Change the Port Characteristic parameters.
ENTER	A1E08 T = E/	CHNG Port Characteristic command executed, indicating that the port is configured as EMPTY.
A P	A1E08 T = E/AP	CHNG Port Characteristic type to asynchronous port.
ENTER	A1E08 ST = 00/	Enters Asynchronous Port type into configuration memory and scrolls to the next valid configurable sub-type parameter.
1	A1E08 ST = 00/1	Indicates sub-type of 1 to be entered (1 = Start/Stop Terminal).
ENTER	A1A08 S = 9600E/	Sub-type parameter entered into configuration memory, screen display scrolls to Terminal Port Speed.
3 0 0	A1A08 S=9600E/300	Terminal Speed of port to be 300 bps.
ENTER	A1A08 C = 3F/	Speed parameter entered, prompt now for Code Type.
0	A1A08 C = 3F/0	Change Code Type to 0.
ENTER	A1A08 DB = 5/	Code Type change command executed, prompting now for Data bit characteristic.
7	A1A08 DB = 5/7	Change Data Bit parameter to 7 bits. (Note: Data Bit value <u>includes</u> parity.)
ENTER	A1A08 P = 0/	Seven data bits entered into configuration memory, change of Parity next.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
[E]	A1A08 P = O/E	Change Parity Characteristic to "Even."
[ENTER]	A1A08 SB = 1/	Parity change command entered, scroll to Stop Bit parameter.
[ENTER]	A1A08 RS=T/	STOP BIT characteristic remains at the one screen display, scrolls to the Receive Speed parameter.
[ENTER]	A1A08 OM=FF/	RECEIVE SPEED parameter remains at T (i.e., the receive speed will be the same as the transmit speed, in this case, 300 bps.) Screen display automatically scrolls to the Op Mode parameter.
[1] [0]	A1A08 OM=FF/10	Change Op Mode to 10.
[ENTER]	A1A08 FB=FF/	Op Mode change command entered, scroll to next parameter, FLYBACK RECOGNITION CHARACTER.
[0] [A]	A1A08 FB=FF/0A	FLYBACK RECOGNITION CHARACTER changed to 0A (i.e., in 7 bit, even parity ASCII, 0A represents LINE FEED).
[ENTER]	A1A08 T=AP/	FLYBACK RECOGNITION CHARACTER change command has been executed. Automatic scroll back to the beginning.
[CLEAR]	A1A08	Exit "CHNG C" mode.
[CHNG] [A] [S]	A1A08 CHNG A S	Change Port Activity parameters.
[ENTER]	A1A08 S=E/	Change enabling of statistics monitoring.
[ENTER]	A1A08 M=N/	Statistics continue to be enabled, scroll to mode parameter.
[ENTER]	A1A08 S=E/	Mode to Stay NORMAL.
[CLEAR]	A1A08	Exit "CHNG A" mode.
[CHNG] [X] [A] [N]	A1A08 CHNG X AN	Change the Transmit path Adjacent Node parameter.
[ENTER]	A1A08 AN=OF/	Transmit path Adjacent Node is F (/ = Do you want to change?)

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
D	A1A08 AN=OF/D	Change Adjacent Node to D.
ENTER	A1A08 AP=FF/	Adjacent Node changed to D. Transmit path Adjacent port parameter scrolls next.
8	A1A08 AP=FF/8	Change Adjacent Port parameter to 08.
ENTER	A1A08 SW=255/	Adjacent Port parameter changed, display scrolls to the slot weight parameter.
2	A1A08 SW=255/2	Change slot weight parameter from 255 to 2.
ENTER	A1A08 AN=OD/	Slot weight parameter changed, display scrolls to the beginning.
CLEAR	A1A08	Exit "CHNG X" mode.
SEL P 9	A1A08 SEL P 9	Select the next Terminal Port address (i.e., TP 09).
ENTER	A1E09	SELECT command executed. All changes will now be addressed to Terminal Port 09.
CHNG C T	A1E09 CHNG C T	Change the Port characteristic parameters.
ENTER	A1E09 T=E/	CHNG Port Characteristic command executed, indicating that the Port is configured as EMPTY.
A P	A1E09 T=E/AP	CHNG Port Characteristic type to Asynchronous Port.
ENTER	A1E09 ST=00/	PORT TYPE change command is executed and the screen display automatically scrolls to next parameter.
1	A1E09 ST=00/1	1 indicates Start/Stop Terminal.
ENTER	A1A09 S=9600E/	PORT SUB-TYPE CHANGE command executed, display scrolls to speed parameter.
1 2 0 0	A1A09 S-9600E/1200	CHANGE Speed characteristic to 1200.
ENTER	A1A09 C=3F/	SPEED change command executed, scroll to Code Type parameter.

0	A1A09 C=3F/0	Change Code Type to 0.
ENTER	A1A09 DB=5/	CODE TYPE change command executed, the screen display automatically scrolls to the Data Bit parameter.
7	A1A09 DB=5/7	Change Data Bit parameter to 7. NOTE: Data Bit parameter includes Parity bit.
ENTER	A1A09 P=0/	DATA Bit change executed, display scrolls to Parity.
E	A1A09 P=0/E	Change Parity from Odd parity to Even.
ENTER	A1A09 SB=1/	Parity change executed, display scrolls to STOP BITS.
ENTER	A1A09 RS=T/	No change in 1 STOP BIT, scroll to Receive Speed.
ENTER	A1A09 OM=FF/	Receive Speed to stay the same as Transmit Speed. Scroll to Op Mode.
0 0	A1A09 OM=FF/00	Change Op Mode to 00.
ENTER	A1A09 FB=FF/	Op Mode change entered, scroll to Flyback Recognition character.
0 0	A1A09 FB=FF/00	Change FLYBACK RECOGNITION CHARACTER to 00. (Because of Op Mode 00, no Flyback will be utilized at this Terminal Port.)
ENTER	A1A09 T=AP/	FLYBACK RECOGNITION CHARACTER changed, screen display automatically scrolls to the beginning.
CLEAR	A1A09	Exit "CHNG C" mode.
CHNG A S	A1A09 CHNG A S	Change PORT ACTIVITY parameters.
ENTER	A1A09 S=E/	Change enabling of Statistics Monitoring (if you wish).
ENTER	A1A09 M=N/	Statistics continue to be enabled, scroll to Mode parameter.
ENTER	A1A09 S=E/	Mode parameter to stay at NORMAL (i.e., NOT loopback).
CLEAR	A1A09	Exit "CHNG A" mode.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
CHNG X A N	A1A09 CHNG X AN	Change the Transmit Path Adjacent Node parameter.
ENTER	A1A09 AN=OF/	Transmit path adjacent node parameter is OF.
ENTER	A1A09 AP=FF/	Adjacent Node OF remains in Configuration Memory. Scroll to Transmit Path Adjacent Port parameter.
9	A1A09 AP=FF/9	Change trnasmit path adjacent port parameter from FF to 09.
ENTER	A1A09 SW=255/	Adjacent Port change command executed. Scroll to the slot weight parameter.
6	A1A09 SW=255/6	Change slot weight parameter to 6.
ENTER	A1A09 AN=OF/	Slot weight change command executed, display scrolls back to the beginning.
CLEAR	A1A09	Exit "CHNG X" mode. NOTE: The remainder of the parameters to be configured at this NODE are for the NODE as a whole (NODAL PARAMETERS). Consequently, we must address ourselves to only the NODE and not a particular Port Address.
SEL N A	A1A09 SEL N A	Selects Node A (the local node).
ENTER	A1---	We are now addressed to the node, and not to a particular Port Address.
CHNG A T	A1--- CHNG A T	CHANGE NODAL Activity parameter, Time Constant.
ENTER	A1--- T=255/	TIME CONSTANT set at 255, slash (/) prompts operator to change if necessary.
1	A1--- T=255/1	Change Time Constant to 1.
ENTER	A1--- RN=FF/	Time Constant change executed, scroll to the Report Node parameter.
A	A1--- RN=FF/A	Change REPORT NODE to 0A (Local Node).
ENTER	A1--- RP=FF/	REPORT NODE change command executed. Scroll to the Report Port parameter.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
0 0	A1--- RP=FF/00	Change Report Port parameter to 00 (00 = screen display).
ENTER	A1--- B=255/	REPORT PORT change command executed. Scroll to BUFFER MULTIPLIER value.
5	A1---B=255/5	Change BUFFER MULTIPLIER value to 5 (as recommended on rear of Node Worksheet).
ENTER	A1---T=1/	BUFFER MULTIPLIER change command executed. Scroll back to the beginning.
CLEAR	A1---	Exit "CHNG A" mode.
CHNG T E D	A1--- CHNG T ED	Change Error Density Threshold.
ENTER	A1--- ED=255/	Error Density Threshold at default value of 255%.
3	A1---ED=255/3	Change Error Density Threshold value to 3%.
ENTER	A1---CE=255/	ED Threshold value changed. Scroll to Compression Efficiency Threshold.
1 0 0	A1---CE=255/100	Change CE to 100%.
ENTER	A1---ER=255/	Execute CE change.
3	A1---ER=255/3	Change ER to 3%.
ENTER	A1---BU=255/	Execute ER change.
9 0	A1---BU=255/90	Change BU to 90%.
ENTER	A1---PL=255/	Execute BU to change.
9 0	A1---PL=255/90	Change PL to 90%.
ENTER	A1---RR=255/	Execute PL change.
1	A1---RR=255/1	Change RR to 1.
ENTER	A1---ED=3/	Execute RR to change.
CLEAR	A1---	Exit "CHNG T" mode. NOTE: Values entered for the Thresholds are values and may be found on the rear of the Node Worksheet.

Node 0A is now configured for Two network ports, two asynchronous terminal ports and the Nodal Activities and Thresholds have been set to the suggested values. We will now configure NODE 0D from the local node (node 0A) in the following manner:

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
[SEL] [N] [D]	A1---SEL N D	Select Adjacent Node 0D.
[ENTER]	D1---	Execute SELECT command. NOTE: All commands issued will now be addressed to Node D only.
[SEL] [P] [2]	D1---Sel P 2	Selects Port Nest address 02 (the location of the first Network Port cards.
[ENTER]	D1E02	Any changes made will be done to Port Address 02.
[CHNG] [C] [T]	D1E02 CHNG C T	Change the Port.
[ENTER]	D1E02 T=E/	The port is presently configured as EMPTY, the slash is a prompt, asking if you wish to change the displayed "TYPE."
[N] [P]	D1E02 T=E/NP	Change port configuration to Network Port.
[ENTER]	D1E02 S=9600E/	Port Type change command executed. Screen display scrolls to the next valid configurable parameter for a Network Port.
[ENTER]	D1N02 F=256/	The present Network Port speed is at the desired value. Press the ENTER key to scroll to next parameter.
[ENTER]	D1N02 T=NP/	The present FIFO value is at the desired value, so the ENTER key is pressed and the display scrolls back to the beginning.
[CLEAR]	D1N02	Exit "CHNG C" mode.
[CHNG] [A] [S]	D1N02 CHNG A S	Change Port Activity parameters.
[ENTER]	D1N02 S=E/	Statistics are enabled.
[ENTER]	D1N02 M=N/	Mode is Normal, (i.e., <u>not</u> in loopback).

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
ENTER	D1N02 AF=127/	Frame buffer size is 127 frames.
7	D1N02 AF=127/7	Change frame buffer size to 7.
ENTER	D1N02 S=E/	Executes change command and the screen display scrolls to next value.
CLEAR	D1N02	Exit "CHNG A" mode.
SEL P 6	D1N02 SEL P 6	Selects Port Address 06. (The location of the second set of Network Port cards.)
ENTER	D1E06	Executes SELECT command. NOTE: The remarks for Configuring Port 06 are the same for Port 02. Refer to those remarks to answer any questions.
CHNG C T	D1E06 CHNG C T	
ENTER	D1E06 T=E/	
N P	D1E06 T=E/NP	
ENTER	D1E06 S=9600E/	
ENTER	D1N06 F=256/	
ENTER	D1N06 T=NP/	
CLEAR	D1N06	
CHNG A S	D1N06 CHNG A S	
ENTER	D1N06 S=E/	
ENTER	D1N06 M=N/	
ENTER	D1N06 AF=127/	
7	D1N06 AF=127/7	
ENTER	D1N06 S=E/	
CLEAR	D1N06	
SEL P 8	D1N06 SEL P 8	Selects Port Address 08. (The first Terminal Port Address in a Node with two Network Ports.)

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
[ENTER]	D1E08	Executes SELECT command.
[CHNG] [C] [T]	D1E08 CHNG C T	Change the Port Characteristic parameters.
[ENTER]	D1E08 T=E/	Change Port Characteristic command executed, indicating that the port is configured as EMPTY.
[A] [P]	D1E08 T=E/AP	CHNG Port Characteristic type to Asynchronous Port.
[ENTER]	D1E08 ST=00/	Enters Asynchronous Port type into configuration memory and scrolls to the next valid configurable parameter sub-type.
[1]	D1E08 ST=00/1	Indicates sub-type of 1 to be entered. (1 = Start/Stop terminal.)
[ENTER]	D1A08 S=9600E/	Sub-type parameter entered into configuration memory, scan scrolls to terminal port speed.
[3] [0] [0]	D1A08 S-9600E/300	Terminal Speed to port to be 300 bps.
[ENTER]	D1A08 C=3F/	Speed parameter entered, prompt now for Code Type.
[0]	D1A08 C=3F/0	Change Code Type to 0.
[ENTER]	D1A08 DB=5/	Code Type change command executed, prompting now for Data Bit characteristic.
[7]	D1A08 DB=5/7	Change Data Bit parameter to 7 bits. NOTE: Data Bit value includes parity.
[ENTER]	D1A08 P=0/	7 Data Bits entered into configuration memory, change to Parity next.
[E]	D1A08 P=0/E	Change Parity Characteristic to "Even."
[ENTER]	D1A08 SB=1/	Parity Change Command entered, scroll to Stop Bit parameter.
[ENTER]	D1A08 RS=T/	"STOP BIT" characteristic remains at the one screen display, scrolls to the Receive Speed parameter.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
ENTER	D1A08 OM=FF/	RECEIVE SPEED. Parameter remains at T (i.e., the receive speed will be the same as the Transmit Speed, in this case, 300 bps.) Screen display automatically scrolls to the Op mode parameter.
1 0	D1A08 0M=FF/10	Change Op Mode to 10.
ENTER	D1A08 FB=FF/	Op Mode change command entered, scroll to next parameter, FLYBACK RECOGNITION CHARACTER.
0 A	D1A08 FB=FF/0A	FLYBACK RECOGNITION CHARACTER changed to 0A (i.e., in 7 bit, even parity ASCII, 0A represents LINE FEED).
ENTER	D1A08 T=AP/	FLYBACK RECOGNITION CHARACTER change command has been executed. Automatic scroll back to the beginning.
CLEAR	D1A08	Exit "CHNG C" mode.
CHNG A S	D1A08 CHNG A S	Change Port Activity parameters.
ENTER	D1A08 S=E/	Change enabling of statistics monitoring.
ENTER	D1A08 M=N/	Statistics continue to be enabled, scroll to mode parameter.
ENTER	D1A08 S=E/	Mode to stay NORMAL.
CLEAR	D1A08	Exit "CHNG A" mode.
CHNG X A N	D1A08 CHNG X AN	Change the Transmit path adjacent node parameter.
ENTER	D1A08 AN=0F/	Transmit path Adjacent Node is F. (/ = Do you want to change?)
A	D1A08 AN=0F/A	Change Adjacent Node to A.
ENTER	D1A08 AP=FF/	Adjacent Node changed to A. Transmit path Adjacent Port parameter scrolls next.
8	D1A08 AP=FF/8	Change Adjacent Port parameter to 08.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
ENTER	D1A08 SW=255/	Adjacent Port parameter changed, display scrolls to the slot weight parameter.
2	D1A08 SW=255/2	Change Slot weight parameter from 255 to 2.
ENTER	D1A08 AN=0A/	Slot weight parameter changed, scrolls to the beginning.
CLEAR	D1A08	Exit "CHNG X" mode.
SLE P 9	D1A08 SEL P 9	Select the next Terminal Port address (i.e., TP09).
ENTER	D1E09	SELECT command executed. All changes will now be addressed to Terminal Port 09.
CHNG C T	D1E09 CHNG C T	Change the Port characteristic parameters.
ENTER	D1E09 T=E/	Change Port Characteristic command executed, indicating that the port is configured as EMPTY.
A P	D1E09 T=E/AP	Change Port Characteristic Type to Asynchronous Port.
ENTER	D1E09 ST=00/	PORT TYPE change command is executed and the screen display automatically scrolls to the next valid parameter.
1	D1E09 ST=00/1	1 indicates Start/Stop Terminal.
ENTER	D1A09 S=9600E/	PORT SUB-TYPE CHANGE command executed, display scrolls to Speed parameter.
3 0 0	D1A09 S=9600E/300	CHANGE Speed characteristic to 300.
ENTER	D1A09 C=3F/	SPEED Change command executed, scroll to Code Type parameter.
0	D1A09 C=3F/0	Change Code Type to 0.
ENTER	D1A09 DB=5/	CODE TYPE change command executed, the screen display automatically scrolls to the Data Bit parameter.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
[7]	D1A09 DB=5/7	Change Data Bit parameter to 7. NOTE: Data Bit parameter includes Parity bit.
[ENTER]	D1A09	DATA BIT change executed, display scrolls to Parity.
[E]	D1A09 P=0/E	Change Parity from Odd parity to Even parity.
[ENTER]	D1A09 SB=1	Parity change command executed, display scrolls to STOP BITS.
[ENTER]	D1A09 RS=T/	No change in 1 STOP BIT, scroll to receive Speed.
[ENTER]	D1A09 BM=FF/	Receive Speed to stay the same as Transmit Speed. Scroll to Op Mode.
[1] [0]	D1A09 OM=FF/10	Change Op Mode to 10.
[ENTER]	D1A09 FB=FF/	Op Mode change executed. Scroll to Flyback Recognition Character.
[0] [A]	D1A09 FB=FF/0A	Flyback Recognition Character to 0A. (ASCII, 0A represents Line Feed.)
[ENTER]	D1A09 T=AP/	Flyback Recognition Character changed, screen display automatically scrolls to the beginning.
[CLEAR]	D1A09	Exit "CHNG C" mode.
[CHNG] [A] [S]	D1A09 CHNG A S	Change PORT ACTIVITY parameters.
[ENTER]	D1A09 S=E/	Change enabling of Statistics Monitoring (if you wish).
[ENTER]	D1A09 M=N/	Statistics continue to be enabled, scroll to Mode parameter.
[ENTER]	D1A09 S=E/	Mode parameter to stay at NORMAL (i.e., NOT loopback).
[CLEAR]	D1A09	Exit "CHNG A" mode.
[CHNG] [X] [A] [N]	D1A09 CHNG X AN	Change the Transmit Path Adjacent Node parameter.
[ENTER]	D1A09 AN=0F/	Transmit Adjacent Node parameter is 0F.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
ENTER	D1A09 AP=FF/	Adjacent Node 0F remains in Configuration Memory. Scroll to Transmit Path Adjacent Port parameter.
8	D1A09 AP=FF/8	Change Transmit Path Adjacent Port parameter from FF to 08.
ENTER	D1A09 SW=255/	Adjacent Port change command executed. Scroll to the Slot weight parameter.
2	D1A09 SW=255/2	Change Slot Weight parameter to 2.
ENTER	D1A09 AN=0F/	Slot Weight change command executed. Display scrolls tack to the beginning.
CLEAR	D1A09	Exit "CHNG X" mode. NOTE: The remainder of the parameters to be configured at this Node are for the Node as a whole (Nodal Parameters). Consequently we must address ourselves to only the Node and not to a particular Port Address.
SEL N D	D1A09 SEL N D	Selects Node D.
ENTER	D1---	We are now addressed to the Node, and not to a particular Port Address.
CHNG A T	D1---CHNG A T	CHANGE NODAL Activity parameter, Time Constant.
ENTER	D1---T=255/	Time Constant set at 255, slash (/) prompts operator to change if necessary.
1	D1---T=255/1	Change Time Constant to 1.
ENTER	D1---RN=FF/	Time Constant change executed, scroll to the Report Node parameter.
A	D1---RN=FF/A	Change Report Node to 0A. By designating Node A as the Report Node, all Error Messages, Boot Messages and Monitor Alert Messages generated by this Node (F) will be sent to Node A for display. Please note that NO Asterisk will be displayed at this Node.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
[ENTER]	D1--- RP=FF/	Report Node change command executed. Scroll to the Report Port parameter.
[0] [0]	D1--- RP=FF/00	Change Report Port parameter to 00. (00 = screen display.)
[ENTER]	D1--- B=255/	Report Port change command executed. Scroll to Buffer Multiplier value.
[5]	D1--- B=255/5	Change Buffer Multiplier value to 5 (as recommended on rear of Node Worksheet.)
[ENTER]	D1--- T=1/	Command Buffer Multiplier change executed. Scroll back to the beginning.
[CLEAR]	D1---	Exit "CHNG A" mode.
[CHNG] [T] [E] [D]	D1--- CHNG T ED	Change Error Density Threshold.
[ENTER]	D1--- ED=255/	Error Density Threshold at default value of 255%.
[3]	D1--- ED=255/3	Change Error Density Threshold value to 3%.
[ENTER]	D1--- CE=255/	ED Threshold value changed. Scroll to Compression Efficiency Threshold.
[1] [0] [0]	D1--- CE=255/100	Change CE to 100%.
[ENTER]	D1--- ER=255/	Execute CE change.
[3]	D1--- ER=355/3	Change ER to 3%.
[ENTER]	D1--- BU=255/	Execute ER change.
[9] [0]	D1--- BU=255/90	Change BU to 90%.
[ENTER]	D1--- PL=255/	Execute BU change.
[9] [0]	D1--- PL-255/90	Change PL to 90%.
[ENTER]	D1--- RR=255/	Execute PL change.
[1]	D1--- RR=255/1	Change RR to 1.
[ENTER]	D1--- ED=3/	Execute RR change.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
CLEAR	D1---	Exit "CHNG T" mode. NOTE: The values entered for the thresholds are suggested values only and may be found on the rear of the Node Worksheet.

Node 0D is now configured for two network ports, two asynchronous terminal ports and the Nodal Activities and Thresholds have been set to the suggested values. We will now configure Node 0F from the local node (Node 0A) in the following manner:

SEL N F	D1--- SEL N F	Select Adjacent Node 0F.
ENTER	F1---	Execute SELECT command. NOTE: All commands issued will now be addressed to Node 0F only.
SEL P 2	F1--- SEL P 2	Selects Port Nest address 02 (the location of the first network port cards).
ENTER	F1E02	Any changes mode will be done to Port Address 02.
CHNG C T	F1E02 CHNG C T	Change the Port Characteristic parameters.
ENTER	F1E02 T=E/	The port is presently configured as EMPTY. The slash is a prompt, asking if you wish to change the displayed "TYPE."
N P	F1E02 T=E/NP	Change port configuration to Network Port.
ENTER	F1E02 S=9600E/	Port Type change command executed. Screen display scrolls to next valid configurable parameter for a Network Port.
ENTER	F1N02 F=256/	The present Network Port speed is at the desired value. Press the ENTER key to scroll to the next valid parameter.
ENTER	F1N02 T=NP/	The present FIFO value is at the desired value, so the ENTER key is pressed and the display scrolls back to the beginning.
CLEAR	F1N02	Exit "CHNG C" mode.
CHNG A S	F1N02 CHNG A S	Change Port Activity parameters.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
ENTER	F1N02 S=E/	Statistics are enabled.
ENTER	F1N02 M=N/	Mode is Normal, i.e. not in loopback.
ENTER	F1N02 AF=127/	Frame buffer size is 127 frames.
7	F1N02 AF=127/7	Change frame buffer size to 7.
ENTER	F1N02 S=E/	Executes change command and the screen display scrolls to next value.
CLEAR	F1N02	Exit "CHNG A" mode.
SEL P 6	F1N02 SEL P 6	Selects Port Address 06 (the location of the second set of Network Port cards.
ENTER	F1E06	Executes SELECT command. NOTE: The remarks for Configuring Port 06 are the same for Port 02. Refer to those remarks to answer any questions.
CHNG C T	F1E06 CHNG C T	
ENTER	F1E06 T=E/	
N P	F1E06 T=E/NP	
ENTER	F1E06 S=9600E/	
ENTER	F1N06 F=256/	
ENTER	F1N06 T=NP/	
CLEAR	F1N06	
CHNG A S	F1N06 CHNG A S	
ENTER	F1N06 S=E/	
ENTER	F1N06 M=N /	
ENTER	F1N06 AF=127/	
7	F1N06 AF=127/7	
ENTER	F1N06 S=E/	
CLEAR	F1N06	

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
SEL P 8	F1N06 SEL P 8	Selects Port Address 08 (the first Terminal Port Address in a Node with Two Network Ports).
ENTER	F1E08	Executes SELECT command.
CHNG C T	F1E08 CHNG C T	Change the Port Characteristic parameters.
ENTER	F1E08 T=E/	Change Port Characteristic command executed, indicating that the port is configured as EMPTY.
A P	F1E08 T=E/AP	CHNG Port Characteristic type to asynchronous Port.
ENTER	F1E08 ST=00/	Enters Asynchronous Port type into configuration memory and scrolls to the next valid configurable parameter Sub-Type.
1	F1E08 ST=00/1	Indicates Sub-Type of 1 to be entered. (1 = Start/Stop Terminal.)
ENTER	F1A08 S=9600E/	Sub-Type parameter entered into configuration Memory, scan scrolls to Terminal Port Speed.
3 0 0	F1A08 S=9600E/300	Terminal Speed of port to be 300 bps.
ENTER	F1A08 C=3F/	Speed parameter entered, prompt now for Code Type.
0	F1A08 C=3F/0	Change Code Type to 0.
ENTER	F1A08 DB=5/	Code Type change command executed, prompting now for Data Bit characteristic.
7	F1A08 DB=5/7	Change Data Bit parameter to 7 bits. NOTE: Data Bit value includes parity.
ENTER	F1A08 P=0/	7 data bits entered into configuration memory, change of Parity next.
E	F1A08 P=0/E	Change Parity Characteristic to "Even."
ENTER	F1A08 SB=1	Parity Change Command entered, scroll to Stop Bit parameter.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
[ENTER]	F1A08 RS=T/	"STOP BIT" characteristic remains at the one screen display, scrolls to the Receive Speed parameter.
[ENTER]	F1A08 OM=FF/	RECEIVE SPEED parameter remains at T, i.e. the receive speed will be the same as the Transmit Speed, in this case, 300 bps. Screen display automatically scrolls to the Op Mode parameter.
[1] [0]	F1A08 OM=FF/10	Change Op Mode to 10.
[ENTER]	F1A08 FB=FF/	Op Mode change command entered, scroll to next parameter, Flyback Recognition character.
[0] [A]	F1A08 FB=FF/0A	Flyback Recognition Character changed to 0A, i.e. in 7 bit, even parity ASCII, 0A represents LINE FEED.
[ENTER]	F1A08 T=AP/	Flyback Recognition Character change command has been executed. Automatic scroll back to the beginning.
[CLEAR]	F1A08	Exit "CHNG C" mode.
[CHNG] [A] [S]	F1A08 CHNG A S	Change Port Activity parameters.
[ENTER]	F1A08 S=E/	Change enabling of Statistics Monitoring.
[ENTER]	F1A08 M=N/	Statistics continue to be enabled, scroll to mode parameter.
[ENTER]	F1A08 S=E/	Mode to stay NORMAL.
[CLEAR]	F1A08	Exit "CHNG A" mode.
[CHNG] [X] [A] [N]	F1A08 CHNG X AN	Change the Transmit Path Adjacent Node parameter.
[ENTER]	F1A08 AN=OF/	Transmit Path Adjacent Node is F. (/ = Do you want to change?)
[D]	F1A08 AN=OF/D	Change Adjacent Node to D.
[ENTER]	F1A08 AP=FF/	Adjacent Node changed to D. Transmit path Adjacent Port parameter scrolls next.
[9]	F1A09 AP=FF/9	Change the Adjacent Port parameter to 09.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
ENTER	F1A08 SW=255/	Adjacent Port parameter changed, display scrolls to the Slot Weight parameter.
2	F1A08 SW=255/2	Change Slot Weight parameter from 255 to 2.
ENTER	F1A08 AN=OD/	Slot Weight parameter changed, display scrolls to the beginning.
CLEAR	F1A08	Exit "CHNG X" mode.
SEL P 9	F1A08 SEL P 9	Select the next Terminal Port address, i.e. TP09.
ENTER	F1E09	SELECT command executed. All changes will now be addressed to Terminal Port 09.
CHNG C T	F1E09 CHNG C T	Change the Port Characteristic parameters.
ENTER	F1E09 T=E/	Change Port Characteristic command executed, indicating that the part is configured as EMPTY.
A P	F1E09 T=E/AP	Change Port Characteristic type to Asynchronous Port.
ENTER	F1E09 ST=00/	Port Type change command is executed and the screen display automatically scrolls to the next valid parameter.
1	F1E09 ST=00/1	1 indicates Start/Stop Terminal.
ENTER	F1A09 S=9600E/	Port Sub-Type Change command executed, display scrolls to Speed parameter.
1 2 0 0	F1A09 S=9600E/1200	Change speed characteristic to 1200.
ENTER	F1A09 C=3F/	Speed Change Command executed, scroll to Code Type parameter.
0	F1A09 C=3F/0	Change Code Type to 0.
ENTER	F1A09 DB=5 /	Code Type change command executed, the screen display automatically scrolls to the Data Bit parameter.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
7	F1A09 DB=5/7	Change Data Bit parameter to 7. NOTE: Data Bit parameter includes Parity bit.
ENTER	F1A09 P=O/	Data Bit change executed, display scrolls to Parity.
E	F1A09 P=O/E	Change Parity from Odd parity to Even parity.
ENTER	F1A09 SB=1/	Parity change command executed, display scrolls to STOP BITS.
ENTER	F1A09 RS=T/	No change in 1.STOP BIT, scroll to Receive Speed.
ENTER	F1A09 OM=FF/	Receive Speed to stay the same as Transmit Speed. Scroll to Op Mode.
0 0	F1A09 OM=FF/00	Change Op Mode to 00.
ENTER	F1A09 FB=FF/	Op Mode change executed. Scroll to Flyback Recognition Character.
0 0	F1A09 FB=FF/00	Change Flyback Recognition Character to 00. (Because of Op Mode 00, no Flyback will be utilized at this Terminal Port.)
ENTER	F1A09 T=AP/	Flyback Recognition Character changed, screen display automatically scrolls to the beginning.
CLEAR	F1A09	Exit "CHNG C" mode.
CHNG A S	F1A09 CHNG A S	Change PORT ACTIVITY parameters.
ENTER	F1A09 S=E/	Change enabling of statistics monitoring (if you wish).
ENTER	F1A09 M=N/	Statistics continue to be enabled, scroll to Mode parameter.
ENTER	F1A09 S=E/	Mode parameter to stay at NORMAL, i.e. NOT loopback.
CLEAR	F1A09	Exit "CHNG A" mode.
CHNG X A N	F1A09 CHNG X AN	Change the Transmit Path Adjacent Node parameter.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
ENTER	F1A09 AN=OF/	Transmit adjacent node parameter is OF.
A	F1A09 AN=OF/A	Change Transmit Adjacent Node parameter from OF to OA.
ENTER	F1A09 AP=FF/	Transmit Adjacent Node change command executed, then the screen display scrolls to the Transmit Adjacent Port parameter.
9	F1A09 AP=FF/9	Change Transmit Adjacent Port parameter from FF to 09.
ENTER	F1A09 SW=255/	Adjacent Port change command executed. Scroll to the slot weight parameter.
6	F1A09 SW=255/6	Change Slot weight parameter to 6.
ENTER	F1A09 AN= /	Slot weight change command executed. Display scrolls back to the beginning.
CLEAR	F1A09	Exit "CHNG X" mode. NOTE: The remainder of the parameters to be configured at this node are for the node as a whole (NODAL PARAMETERS). Consequently, we must address ourselves to only the node and not to a particular Port Address.
SEL N F	F1A09 SEL N F	Selects Node F.
ENTER	F1---	We are now addressed to the node, and not to a particular Port Address.
CHNG A T	F1--- CHNG A T	Change NODAL Activity parameter, Time Constant.
ENTER	F1--- T=255/	Time constant set at 255, slash (/) prompts operator to change if necessary.
1	F1--- T=255/1	Change Time Constant to 1.
ENTER	F1--- RN=FF/	Time Constant change executed, scroll to the Report Node parameter.
A	F1--- RN=FF/A	Change REPORT NODE to 0A. By designating Node A as the Report Node, all Error Messages, Boot Messages and

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
A	F1--- RN=FF/A (Cont.)	Monitor Alert Messages generated by this Node (F) will be sent to Node A for display. Please note that NO Asterisk will be displayed at this Node.
ENTER	F1--- RP=FF/	REPORT Node change command executed. Scroll to the Report Port parameter.
0 0	F1--- RP=FF/00	Change Report Port parameter to 00. NOTE: 00=screen display.
ENTER	F1--- B=255/	REPORT PORT change command executed. Scroll to BUFFER MULTIPLIER value.
5	F1--- B=255/5	Change BUFFER MULTIPLIER value to 5 (as recommended on rear of Node Worksheet).
ENTER	F1--- T=1/	BUFFER MULTIPLIER change command executed. Scroll back to the beginning.
CLEAR	F1---	Exit "CHNG A" mode.
CHNG T E D	F1--- CHNG T ED	Change Error Density Threshold.
ENTER	F1--- ED=255/	Error Density Threshold at default value of 255%.
3	F1--- ED=255/3	Change Error Density Threshold value to 3%.
ENTER	F1--- CE=255/	ED Threshold value changed. Scroll to Compression Efficiency Threshold.
1 0 0	F1--- CE=255/100	Change CE to 100%.
ENTER	F1--- ER=255/	Execute CE change.
3	F1--- ER=255/3	Change ER to 3%.
ENTER	F1--- BU=255/	Execute ER change.
9 0	F1--- BU=255/90	Change BU to 90%.
ENTER	F1--- PL=255/	Execute BU change.
9 0	F1--- PL=255/90	Change PL to 90%.
ENTER	F1--- RR=255/	Execute PL change.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
[1]	F1--- RR=255/1	Change RR to 1.
[ENTER]	F1--- ED=3/	Execute RR change.
[CLEAR]	F1---	Exit "CHNG T" mode. NOTE: The values entered for the thresholds are SUGGESTED values only and may be found on the rear of the NODE WORKSHEET.

Node 0F is now configured for Two Network Ports, Two Asynchronous Terminal Ports and the Nodal Activities and Thresholds have been set to the suggested values.

This completes the configuration of C-1 memory in each Node of the system. In order to implement this configuration, the operator checks that all Network Ports are operating in the Normal Mode, i.e. NOT in loopback, that the Trunk Modems are operational (not in any Test Function) and all lines are "up." The operator then enters the following commands at the Local Node (A):

[SEL] [N] [A]	F1---	Selects the Local Node.
[ENTER]	A1	Select command executed.
[BOOT 1]	A1--- BOOT 1	Selects the configuration stored in C-1 memory to mapped into the on-line memory (C-0).
[ENTER]	*	The Boot command has been executed, and ALL Nodes in the system have mapped C-1 memory into C-0. The Asterisk indicates that System reports and messages are waiting in the message queue. NOTE: The operating mode of the system has changed. The Nodes are now in the Monitor and NOT the Program Mode. If any changes are to be performed, the Operator must Select the Program Mode.
[EXAM A] [R]	* EXAM A R	Upon execution of the command, the operator will Examine the Activity Register.
[ENTER]	* NAP02 FA 01	Framing acquired on Network Port 02, Node A.
[ENTER]	* NAP06 FA 01	Framing acquired on Network Port 06, Node A.

ACTION OR COMMAND	SCREEN DISPLAY	REMARKS
ENTER	* NAP01 CC 01	Configuration Complete, i.e. C-1 memory has been successfully mapped into C-0 memory.
ENTER	* NDP02 FA 01	Framing acquired on Network Port 02, Node D.
ENTER	* NDP06 FA 01	Framing acquired on Network Port 06, Node D.
ENTER	* NDP01 CC 01	Configuration Complete
ENTER	* NFP02 FA 01	Framing acquired on Network Port 02, Node F.
ENTER	* NFP06 FA 01	Framing acquired on Network Port 06, Node F.
ENTER	NFP01 CC 01	Configuration Complete.
ENTER	EMPTY	No more System Messages or Reports are waiting in the Message queue.

This completes the Configuration process and the Boot sequence used to establish the "Ring Configuration" illustrated in Figure 5-1.

APPENDIX A

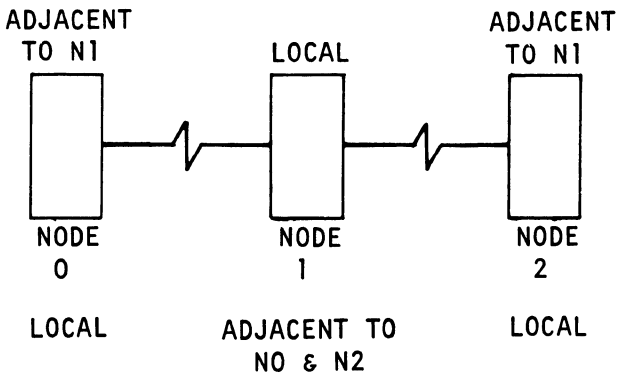
GLOSSARY

This glossary defines terms as used in manuals about the 6030/6040 series of Intelligent Network Processors.

For convenience and brevity, the 6030 and 6040 series of intelligent network processors are referred to collectively as the 6000 INP's, or even more simply, INP.

ACK — Affirmative acknowledgement sent by a receiver to a transmitter that a message frame was received intact.

ADJACENT NODE — The next node logically in the communications link.



ADJACENT PORT — The port in an adjacent node to which a port in the local node is connected.

ARQ — Automatic Repeat Request. In the 6000, an error-detection scheme is employed so that the reception of erroneous data initiates a request for retransmission of all frames following the last frame received intact.

AUTOECHO — Automatic serial loopback of data received in asynchronous mode from a local TP.

AUTOSPEED — Automatic determination of the baud rate of incoming data. The rate is defined by the first character - the control character - sent by the terminal. The local 6000 transmits this to the receiving node, which converts it to the ASCII or EBCDIC hex equivalent that can be read by the receiving host computer.

BSC	Binary Synchronous Communication. An IBM synchronous half-duplex line protocol, and hardware interface specification. Three code sets will be used: EBCDIC, USASCII, and 6-bit Transcode.
BUFFER	Temporary memory storage for data.
BUFFER MULTIPLIER	A nodal parameter to limit the maximum number of data buffers that any port can use at a given node. The maximum number is proportional to a port's slot weight times the buffer multiplifer. A buffer multiplier of 5 is recommended for standard systems.
CONFIGURATION MEMORY (CMEM)	A non-volatile memory used to maintain off-line configuration information. Modified when the configuration is changed via control terminal port or operator console.
CONTROL TERMINAL PORT	A standard terminal port that (1) is asynchronous, (2) has an ASCII, start/stop asynchronous terminal attached, and (3) is designated as a Control Terminal Port when the network is configured. It communicates interactivity with the 6000 in half-duplicates. The attached terminal can be used in place of an Operator's Console to configure the network and perform all the other functions of an Operator's Console in the Program and Monitor modes. However, it cannot be used for diagnostics. The attached terminal may be the terminal control unit of a host computer.
ENTROPY	The theoretical average minimum number of bits required to represent all characters of a code.
FRONT END	A processor attached locally to a host computer through a terminal handler. It assumes management of the telecommunications network and presents error-free data from the net to the host computer, in a defined, constant format from a single source.
GO-BACK-N-ARQ	An automatic repeat request that compensates for path delays in satellite circuits. Frames are transmitted continuously with no wait for an ACK, until a NACK is received. Then the transmitter goes back n frames to the beginning of its buffer, and retransmits. The value of n is set to account for path delay.
LOCK BYTE	An addressable byte used to control access to a common area of RAM (a lock byte area) that is used by all processors, so that a processor cannot access the area if another processor is using it. The purpose is to protect critical programs that are running.
LOCK BYTE AREA	An area of memory that is common to all processors. It provides processors with exclusive access to 256-byte segments of RAM. This prevents interruption of a critical program by other processors. The key to each segment is an 8-bit "lock byte." When a processor addresses the byte and reads it, it

clears the byte to all 0's. Another processor addressing the same byte finds all 0's and retries at the cycle rate until the first processor has written the byte back.

NACK — Negative Acknowledgement. A message sent by a receiver to a transmitter that an incomplete or garbled frame was received.

NEST INTERFACE CARD — A hardware module used to terminate the incoming bus from the mainframe, drive the port nest I/O bus, and redrive the mainframe I/O bus to the next port nest.

NETWORK PORT — A physical port through which data is transferred to and from a communication link to another INP.

NIC — See Nest Interface Card.

NODE — A point in a communication network where an INP resides.

NP — See Network Port.

NP BOOT — The NP BOOT function, which is automatically implemented, causes the adjacent node to reload the last booted configuration. The NP BOOT occurs when the local node does not receive any response to the frames sent as governed by the AF = (ARQ Frame size) parameter.

The following chart lists the timeouts before the first NP BOOT occurs:

ARQ SIZE	TIME
7	40 sec.
15	90 sec.
31	135 sec.
63	185 sec.
127	240 sec.

After the first NP BOOT occurs, an NP BOOT is sent every 10 seconds. During the 10-second period, any queued frames are transmitted.

If the carrier signal from the trunk modem is low, the NP BOOT function is not allowed.

PORT — A logical or physical communication entity, through which data enters and leaves the 6040.

PORT NEST — A chassis containing a nest control card, network ports, and terminal ports.

PROCESSOR — A hardware module (card) containing a microprocessor.

RAM — Random Access Memory.

ROM — Read-Only Memory

SLOT WEIGHT — A value used to control the maximum rate of service for a terminal port. For uniformly proportional servicing, the following formula can be used:

$$\frac{\text{terminal speed}}{300} = \text{slot weight}$$ (rounded to nearest integer, but at least one)

TAIL CIRCUIT	A point-to-point circuit that connects a remote terminal to a port in a local node. Since the terminal is remote, the connecting communication link requires a modem at each end to assure error-free data reception. A special crossover cable connects the local modem to the net port.
TERMINAL PORT	A physical port through which data is transferred to and from a local user terminal. Two ports reside on one terminal port card. There is one terminal port for each terminal; multi-dupped terminals are connected to a terminal handler which functions as a single-terminal in the net.
TP	See Terminal Port.
TRANSFER PORT	A unidirectional intermediate port in a multinode terminal port transmit or receive data path.
UNIVERSAL TERMINAL PORT	See Terminal Port.
XP	See Transfer Port.
TERMINAL PORT BUFFER	Storage for character received from the terminal port. Each terminal port is allocated an emitted amount of buffer space. The limit is defined by the buffer multiplier.

APPENDIX B

6040 SYSTEM OPTIONS

B.1 HARDWARE OPTIONS

Both hardware and firmware options are available to interface the communciations processing capabilities of the 6040 Series INP's. Brief descriptions of the options follow.

66103 PROCESSOR MODULE

This option is a plug-in assembly that provides the 6040 series with an additional processor for incremental processing and throughput capabilities.

66114 BUFFER MEMORY

This option is a plug-in assembly that provides an additional 16K byte increment of RAM buffer storage.

66120 OPERATOR CONSOLE

An operator Console is available to select, examine, and modify configuration, status, and performance data anywhere in the network. It also serves as a hardware diagnostic/test panel during installation and maintenance.

The Operator Console contains a self-scan alphanumeric 32-character (5x7 dot) display, an 18-key multifunction keyboard, indicators, and a locking power/function switch.

Alternately, using the Control Terminal Port Support Option 66321, any unassigned terminal port can be designated a control terminal port, enabling most asynchronous terminals or a host computer to perform the tasks of monitoring, interrogation, and reconfiguration.

66122 CONFIGURATION MEMORY EXPANSION

This option provides additional nonvolatile configuration memory for up to 32 ports. The incorporation of this option provides the 6040 with the capability of storing alternate network topologies having different characteristics. This is particularly useful in day/night operations where different types of terminals are used or when a fallback configuration or alternate network topology is desired.

66131 ACTIVITY INDICATOR TERMINAL PORT

The activity indicator terminal port incorporates the following:

Four LED's are mounted on the rail of the card. They show input and output signal activity for each channel on the card.

66136 NONSTANDARD DATA RATES

This option provides nonstandard terminal port data rates for those applications which require other than standard Codex-supported data rates. Each nonstandard raterreplaces any one of the following standard rates:

a. Asynchronous: 75, 110, 134.5, 150, 300, 600, 1200 bps.

b. Synchronous: 1200, 2400, 3600, 4800, 7200, 9600 bps.

66140 NETWORK PORT MODULE

This option consists of two plug-in assemblies that provide an additional high-speed output port. Each 6040 base unit includes two 66140 modules and will accommodate additional network ports as a function of its processing capabilities, throughput requirements, and the trunk utilization. The network port is capable of operating at speeds up to 19.2 kbps and presents a Data Terminal Equipment Interface (DTE) at its EIA type port connector.

66151 DUAL CURRENT LOOP TERMINAL PORT MODULE

The 66161 is a single plug-in module that provides two independent high level current interfaces to current loop Data Terminal Equipment at standard asynchronous speeds. The voltage swing may be up to 125V with neutral signaling or 85V with polar signaling, at 20 to 60 mA. The current loop interface is provided on the port module 25-pin connector.

Pin	Signal
2	+Batt
4	-Batt
6	Xmt
23	Hi
20	Lo

The 66151 may be field strapped to provide any of the following operations:

Polarity	Current
Positive neutral	20, 40 or 60 mA
Positive polar	20, 40 or 60 mA
Negative neutral	20, 40 or 60 mA
Negative polar	20, 40 or 60 mA
Half-duplex neutral	20, 40 or 60 mA

The current loop converter module provides a high-level conversion for neutral or polar current signaling.

The option provides for asynchronous type data flow in the same manner as standard asynchronous data. However, no EIA control information is passed, and if the loop is broken, constant break characters (continuous Space) is sent to the remote end.

66161-66166 MIL-STD-188C PORT MODULES

This series of modules provide EIA to MIL-STD-188 level conversion between the 66130 Terminal Port Module and Data Terminal Equipment or Data Communications Equipment at speeds up to 9600 bps. The 66160 universal option nest is used to house up to 16 of the MIL-STD-188C modules. Two 25-pin female connectors (wired as DCE) are provided on each module. One provides the EIA connection to the 6040 port module via a crossover cable included with the option. The other connector provides the MIL-STD-188 interface to customer equipment.

Model Number	Provides Level Conversion Between	Speed
66161	Terminal Port and Terminal	To 2400 bps
66162	Terminal Port and Terminal	Over 2400 bps to 9600 bps
66163	Terminal Port and Modem	To 2400 bps
66164	Terminal Port and Modem	Over 2400 bps to 9600 bps
66166	Network Port Trunk Modem	To 9600 bps

66155 220-VOLT POWER OPTION

This option provides for the necessary conversion from 110-volt operation to 220-volt operation.

66156 RACK-MOUNTABLE POWER SUPPLY

This option provides a rack-mountable power supply for use with the 66161-66166 MIL-STD-188C converter modules.

B.2 FIRMWARE OPTIONS

NONSTANDARD FIRMWARE MODULES. The following optional 6030 modules are included with the basic 6040.

66301 STATISTICS AND PERFORMANCE MONITORING PACKAGE

The Statistics and Performance Monitoring Option provides an on-line facility for the collection, computation, and reporting of statistical measures of network performance. Additionally, it reports when abnormal conditions occur or user-preset threshold levels are exceeded. Information is reported via the Operator Console or a Control Terminal Port.

This option provides a two part facility: statistics gathering for network and terminal ports, and the monitoring of certain crucial information (i.e., abnormal or critical system conditions). The monitoring function is a background activity and is always enabled. Statistics gathering is performed in real time and can be selectively enabled/disabled on an individual port basis by operator command, in order to prevent unnecessary loading of the 6000 processor. Statistics gathering is concerned with long-term averages, while monitoring functions deal with real-time conditions.

66330 ASYNCHRONOUS TERMINAL SUPPORT

The 66330 option provides the necessary firmware to support asynchronous communications at seven standard speeds (75, 110, 134.5, 150, 300, 600, and 1200 bps) with corresponding code/data bit/stop bit format. Up to three control signals are passed bidirectionally (DSR, CAR, RNG, or DTR, RTS and Spare).

66335 BSC SYNCHRONOUS TERMINAL SUPPORT

The 66335 option provides the necessary firmware to support IBM Binary Synchronous Communications with ASCII or EBCDIC codes, including the transparent text mode of operation.

In addition, the 6040 includes as standard firmware functions: Basic Multinode Support, which allows implementation of multinode networks, including transfer ports; ASCII and 2741 Data Compression, which provide coding tables which compress typical ASCII or 2741 source data using variable-length (Huffman) codes.

B.3 OPTIONAL FIRMWARE MODULES

66320 OPERATOR CONSOLE SUPPORT

This option provides the necessary firmware to support the 66120 Operator Console.

66321 CONTROL TERMINAL PORT SUPPORT

This option provides the necessary firmware to support any specifically designated asynchronous ports as a Control Terminal Port. Any start/stop ASCII terminal, or CPU port, may be attached to the CTP and thereby provide the capabilities equivalent to the program and monitor modes of the Operator's Console.

66322 OPERATOR CONSOLE AND CONTROL TERMINAL SUPPORT

This option combines the features of 66320 and 66321 into one firmware package.

66323 SUPERVISORY COMMUNICATION SUPPORT

Supervisory Communication Support (SCS) is a firmware option that provides users of the 6000 INP with the capability to send addressed messages (datagrams) between Supervisory Communications Ports (SCP's) in a 6000 network.

An SCP is an asynchronous ASCII terminal which connects to the 6000 through an EIA terminal port (TP) interface. The SCP is configured as a control terminal port (CTP) with subtype 2. Messages consist of a decimal message sequence number supplied by the 6000, and destination address(es) and text body supplied by the user. Messages are transmitted using the address packet system currently implemented in the 6000. At an SCP, received messages are identified by node of origin and the message sequence number. Since SCP's use a half-duplex protocol, messages are buffered at the output so that received messages will not be lost while the SCP is inputting.

Both flow control and error control procedures are used to deliver messages efficiently without significantly impacting normal system performance.

No new hardware is required for the SCS option.

66324 REPORT LOGGING CONTROL TERMINAL PORT

The Report Logging Control Terminal Port (RL/CTP), provides the 6040 INPs with the capability of presenting system reports to attached Data Terminal Equipment. Reports may be output as they occur, or may be queued and output on a time interval basis. A data and time stamp is generated when the report is output.

The option provides:

- Centralized logging of all system reports generated by all network nodes.
- User-selectable reporting interval.
- Usable in conjunction with any asynchronous ASCII terminal equipment.
- Provides standard control terminal function in addition to report logging.

The Report Logging Control Terminal option consists of a firmware module and a Time of Day Module which incorporates all of the logic necessary to generate the time stamp data. It is installed in the 6000 INP port nest and occupies one nest slot. The module is battery protected to assure no information is lost in the event of a power failure.

The user interface to the report logging function is via a standard 66131, or 66151 Terminal Port module. This port is condigured as an RL/CTP by setting the appropriate port characteristics and parameters. The date, time, and logging interval are also configurable node parameters. The RL/CTP must be configured from the node which it is attached.

The logging interval is specified in tenths of hours from 0 to 240. A value of 0 results in report logging as system reports occur. For values other than 0, reports will be queued and output with a single time and date stamp when the time interval lapses. If there are no reports in the queue, the RL/CTP outputs "EMPTY."

66331 AUTOSPEED

The 66331 autospeed option provides the 6040 Intelligent Network Processor with the ability to automatically determine the speed and character format of asynchro-

nous data and thereby dynamically configure the terminal ports for this rate. This feature permits a single terminal port to support a variety of asynchronous terminal speeds without requiring that an operator manually modify configuration information.

NOTE

This option requires that the host computer connected to the local 6040 Series INP also have autospeed capability, since output data will be reconverted to the original speed.

This feature is particularly advantageous in systems where a variety of terminals, operating at different speeds, all have access to a terminal port through a dial network. With this option, the necessity of fragmenting incoming communications lines into 2 or 3 or 4 speed groups is eliminated. Thus, the minimum number of lines required to support a pool of terminals is more easily achieved. Furthermore, the statistical multiplexing capability of the 6040 Series allows the 6040 to dynamically allocate high-speed bandwidth as a function of the specific terminal speed (in contrast to TDM schemes), thereby optimizing data throughput. Figure B1 illustrates the implementation of the Autospeed option; Appendix H contains an example S49 Autospeed configuration.

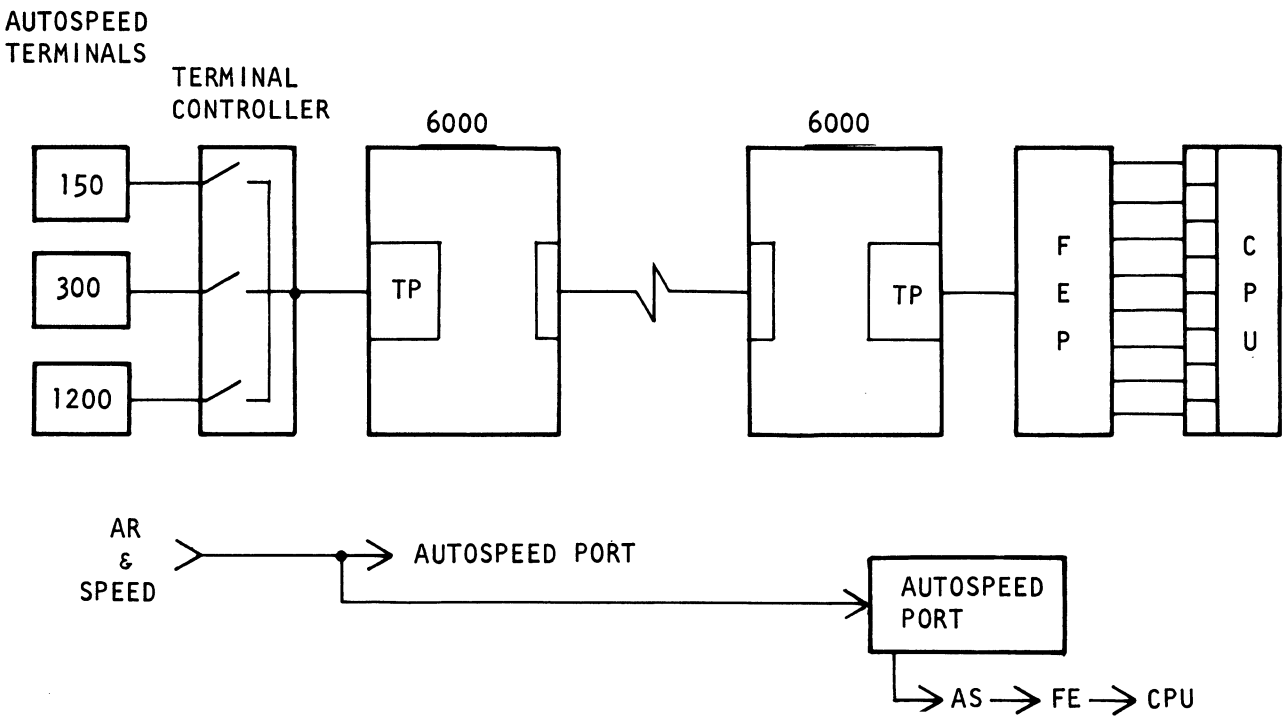


Figure B1. Autospeed Implementation

The user can designate the character used to recognize the speed. This offers the following advantages:

a. The user may program more than one recognition character for the same speed. This is useful when the customer has several terminals with the same speed but with different character lengths and different modes. The system can distinguish between them if each is designated by a unique recognition character.

b. The customer can also program the same recognition character for all terminals. Terminals with the same character set but different speeds can be recognized because both the speed and the recognition character identify a specific terminal.

OPERATION OF AUTOSPEED

When an asynchronous terminal starts to communicate with a CPU via a data link, the first character it transmits is the "autospeed recognition character." This character contains implicit information about the speed of the terminal. The CPU receives the character and by various algoriths recognizes the speed and adjusts to it. However, a CPU recognizes a limited set of recognition characters, which varies with the manufacturer and model of CPU.

When the communications net includes a 6000 at each node, this limitation is removed to a great extent because the 6000 recognizes a large set of characters. When it receives a recognition character, it adjusts to the appropriate speed and transmits the character to the 6000 at the CPU node. The receiving 6000 translates the recognition character into a "substitution character" that the CPU can recognize. The CPU then adjusts to the appropriate speed and communication begins between the CPU and the terminal.

TP STRAPPING FOR AUTOSPEED

The autospeed port operates at a speed of 4800 bps, which is achieved by strapping that speed on the TP card as follows:

a. For model 66130 cards:

   J-1 input: U10, 5-12 and U5, 3-14.

   J-2 input: U17, 5-12 and U5, 7-10.

b. For model 66131 cards:

   J-1 input: U13, 4-11, and U11, 7-10.

   J-2 input: U15, 4-11, and U11, 3-14.

CAUTION

Strapping the X1 speed on the TP card puts high speed clock signals on the EIA interface and the cable. This causes crosstalk with the control signals (DTR, Make Busy, and RTS), resulting in repetitive interrupts.

With crossover cables, the 4800 bps is connected to pin 18 on the modem, and may disturb it.

The cure for these problems is to cut the appropriate wires on the cable, NOT to modify the EIA connector on the TP card.

RECOGNIZING THE CHARACTER AND SPEED

The autospeed port samples the incoming character at 4800 bps. Since the character is transmitted at some slower speed (1200 bps to 75 bps), the autospeed samples each bit repeatedly; 4 times for 1200 bps to 64 times for 75 bps. Autospeed counts these repeats and recognizes the speed when the whole character has been sampled.

ALLOWABLE ERROR

The maximum allowable deviation in speed is ±25% for 1200 bps and ±12.5% for 600 bps and under. Excessive deviation will probably result in failure to recognize the character.

CHOICE OF RECOGNITION CHARACTER

Table B-1 lists those recognition characters recommended by Codex.

If it is necessary to select a character other than those listed in Table B-1, ensure that the character chosen is not listed in Table B-2 which lists invalid recognition characters.

As an example, in Table B-2 see the first list (1200 bps/600 bps). The heading indicates that all characters to the left of the slashes are for 1200 bps and all characters to the right of the slashes are for 600 bps. The first item, 00/E0 means that the autospeed software cannot distinguish between 00 transmitted at 1200 bps and E0 transmitted at 600 bps, so this combination and all the others in the lists are invalid.

TABLE B-1
SUGGESTED AUTOSPEED RECOGNITION CHARACTERS

Terminal	Speed	Recognition Character (Choose 1 Column)				
ASCII	1200		CR			>
ASCII	600	0	CR			S
EBCDIC	600	0				
ASCII	300	0	CR	0	0	0
EBCDIC	300	0				
ASCII	150	0	CR	Y	Y	Y
EBCDIC	150	0				
2741	134.5		Ⓓ	Ⓓ	Ⓓ	Ⓓ
ASCII	110		CR	0	S	S
ASCII	75		CR			

TABLE B2
INVALID AUTOSPEED RECOGNITION CHARACTERS

1200 bps/600 bps

00/E0, 00/F0, 00/F8, 00/FC, 06/F1, 06/F9, 0C/F2, 0C/F9, 0E/F3, 0E/F9, 18/F2, 18/FA, 1C/E6, 1C/F2, 1C/F3, 1C/F6, 1C/F9, 1C/FA, 1C/FB, 1C/FD, 1E/F3, 1E/FB, 30/F4, 30/FA, 38/F6, 38/FA, 3C/F6, 3C/FB, 3E/F7, 3E/FB, 80/F0, 80/F8, 80/FC, 86/F9, 8C/F2, 8C/F9, 8C/FA, 8C/FD, 8E/F3, 8E/F9, 8E/FB, 8E/FD, 98/FA, 9C/F6, 9C/FA, 9C/FB, 9C/FD, 9E/FB, C0/F0, C0/F8, C0/FC, C6/F9, C6/FD, CC/FA, CC/FD, CE/FB, CE/FD, E0/F8, E0/FC, E0/FE, E6/FD, F0/FC, F0/FE, F8/FE, FC/FE, FC/FF, FE/FF

1200 bps/300 bps

00/FC, 00/FE, 1C/FD, 80/FE, C0/FE, E0/FE, E0/FF, F0/FF, F8/FF, FC/FF

1200 bps/150 bps

00/FF, 80/FF, C0/FF, 80/FF

1200 bps/134.5 bps

00/FF, 80/FF, C0/FF

1200 bps/110 bps

00/FF, 80/FF

1200 bps/75 bps

600 bps/300 bps

00/F0, 00/F8, 06/F1, 06/F9, 30/F4, 30/FA, 3E/F7, 3E/FB, 80/F0, 80/F8, 86/F9, 98/FA, 9E/FB, C0/F8, C0/FC, E0/FC, E6/FD, F0/FC, F0/FE, F8/FE, FE/FF

600 bps/150 bps

00/FE, 80/FE, C0/FE, F0/FF, F8/FF

TABLE B2 (Cont.)

600 bps/134.5 bps

00/FE, 80/FE, C0/FE, F0/FF, F8/FF

600 bps/110 bps

00/FE, E0/FF, F0/FF, 06/F9, 30/F4, 30/FA, 3E/F7, 3E/FB, 80/F0, 80/F8, 86/F9, 98/FA, 9E/FB, C0/F8, C0/FC, E0/FC, E6/FD, F0/FC, F0/FE, F8/FE, FE/FF

600 bps/75 bps

00/FF, 80/FF, C0/FF

300 bps/150 bps

00/F0, 00/F8, 06/F1, 06/F9, 30/F4, 30/FA, 3E/F7, 3E/FB, 80/F0, 80/F8, 86/F9, 98/FA, 9E/FB, C0/F8, C0/FC, E0/FC, E6/FD, F0/FC, F0/FE, F8/FE, FE/FF

300 bps/134.5 bps

00/F0, 00/F8, 06/F9, 30/FA, 3E/FB, 80/F8, 80/FC, 86/F9, 98/FA, 9E/FB, C0/F8, C0/FC, E0/FC, E6/FD, F0/FE, F8/FE, FE/FF

300 bps/110 bps

00/F8, 00/FC, 1C/FD, 80/FC, C0/FC, E0/FE, F0/FE, FC/FF

300 bps/75 bps

00/FE, 80/FE, C0/FE, F0/FF, F8/FF

150 bps/134.5 bps

00/00, 00/80, 00/C0, 01/01, 01/81, 02/02, 02/82, 03/03, 03/83, 04/04, 04/84, 05/05, 05/85, 06/06, 06/86, 07/07, 07/87, 08/08, 08/84, 08/88, 08.04, 09/09, 09/89, 0A/0A, 0A/8A, 0B/0B, 0B/8B, 0C/0C, 0C/8C, 0D/0D, 0D/8D, 0E/0E, 0E/0E, 0F/0F, 0F/87, 0F/8F, 0F/C7, 10/10, 10/88, 11/11, 12/12, 13/13, 14/14, 15/15, 16/16,

TABLE B2 (Cont.)

150 bps/134.5 bps (continued)

17/17, 18/18, 18/8C, 19/19, 1A/1A, 1B/1B, 1C/1C, 1D/1D, 1E/1E,
1E/8E, 1F/1F, 1F/8F, 20/20, 20/90, 21/21, 21/91, 22/22, 23/23,
24/24, 25/25, 26/26, 27/27, 28/28, 28/94, 29/29, 2A/2A, 2B/2B,
2C/2C, 2D/2D, 2E/2E, 2F/2F, 2F/97, 30/30, 30/98, 31/31, 32/32,
33/33, 34/34, 35/35, 36/36, 37/37, 38/38, 38/9C, 39/39, 3A/3A,
3B/3B, 3C/3C, 3C/9C, 3D/3D, 3D/9D, 3E/3E, 3E/9E, 3F/3F, 3F/9F,
40/40, 40/A0, 41/41, 41/A1, 42/42, 42/A2, 43/43, 43/A3, 44/44,
45/45, 46/46, 47/47, 48/48, 48/A4, 49/49, 4A/4A, 4B/4B, 4C/4C,
4D/4D, 4E/4E, 4F/4F, 4F/A7, 50/50, 50/A8, 51/51, 52/52, 53/53,
54/54, 56/56, 57/57, 58/58, 58/AC, 59/59, 5A/5A, 5B/5B, 5C/5C,
5D/5D, 5E/5E, 5E/AE, 5F/5F, 5F/AF, 60/60, 60/B0, 61/61, 61/B1,
62/62, 63/63, 64/64, 65/65, 66/66, 67/67, 68/68, 68/B4, 69/69,
6A/6A, 6B/6B, 6C/6C, 6D/6D, 6E/6E, 6F/6F, 6F/B7, 70/70, 70/B8,
71/71, 72/72, 73/73, 74/74, 75/75, 76/76, 77/77, 78/78, 78/B8,
78/BC, 78/DC, 79/79, 79/B9, 7A/7A, 7A/BA, 7B/7B, 7B/BB, 7C/7C,
7C/BC, 7D/7D, 7D/8D, 7E/7E, 7E/BE, 7F/7F, 7F/BF, 80/00, 80/80,
80/C0, 80/E0, 81/81, 81/C1, 82/82, 82/C2, 83/83, 83/C3, 84/84,
84/C4, 85/85, 85/C5, 86/86, 86/C6, 87/87, 87/C7, 88/88, 88/C4,
89/89, 8A/8A, 8B/8B, 8C/8C, 8D/8D, 8E/8E, 8F/8F, 8F/C7, 90/90,
90/SC, 91/91, 92/92, 93/93, 94/94, 95/95, 96/96, 97/97, 98/98,
98/CC, 99/99, 9A/9A, 9B/9B, 9C/9C, 9D/9D, 9E/9E, 9E/CE, 9F/9F,
9F/CF, A0/A0, A0/D0, A1/A1, A1/D1, A2/A2, A3/A3, A4/A4, A5/A5,
A6/A6, A7/A7, A8/A8, A8/D4, A9/A9, AA/AA, AB/AB, AC/AC, AD/AD,
AE/AE, AF/AF, AF/D7, B0/B0, B0/D8, B1/B1, B2/B2, B3/B3, B4/B4,
B5/B5, B6/B6, B7/B7, B8/B8, B8/DC, B9/B9, BA/BA, BB/BB, BC/BC,
BC/DC, BD/BD, BD/DD, BE/BE, BE/DE, BF/BF, BF/DF, C0/80, C0/C0,
C0/E0, C1/C1, C1/E1, C2/C2, C2/E2, C3/C3, C3/E3, C4/C4, C5/C5,
C6/C6, C7/C7, C8/C8, C8/E4, C9/C9, CA/CA, CB/CB, CC/CC, CD/CD,
CE/CE, CF/CF, CF/E7, D0/D0, D0/E8, D1/D1, D2/D2, D3/D3, D4/D4,
D5/D5, D6/D6, D7/D7, D8/D8, D8/EC, D9/D9, DA/DA, DB/DB, DC/DC,
DD/DD, DE/DE, DE/EE, DF/DF, DF/EF, E0/E0, E0/F0, E1/E1, E1/F1,
E2/E2, E3/E3, E4/E4, E5/E5, E6/E6, E7/E7, E8/E8, E8/F4, E9/E9,
EA/EA, EB/EB, EC/EC, ED/ED, EE/EE, EF/EF, EF/F7, F0/F0, F0/F8,

TABLE B2 (Cont.)

150 bps/134.5 bps (continued)

F1/F1, F2/F2, F3/F3, F4/F4, F5/F5, F6/F6, F7/F7, F8/F8, F8/FC,
F9/F9, FA/FA, FB/FB, FC/FC, FD/FD, FE/FE, FF/FF

150 bps/110 bps

00/80, 00/C0, 00/#0, 1C/E6, 80/C0, 80/E0, 80/F0, C0/E0, C0/F0,
E0/F0, E0/F8, F0/F8, F0/FC, F8/FC, FC/FE

150 bps/75 bps

00/F0, 00/F8, 06/F1, 06/F9, 30/F4, 30/FA, 3E/F7, 3E/FB, 80/F0,
80/F8, 86/F9, 98/FA, 9E/FB, C0/F8, C0/FC, E0/FC, E6/FD, F0/FC,
FD/FE, F8/FE, FE/FF

134.5 bps/110 bps

00/00, 00/80, 00/C0, 00/E0, 01/01, 01/81, 01/C1, 02/02, 02/82,
02/C2, 03/03, 03/83, 03/C3, 04/04, 04/82, 04/84, 04/C2, 05/05,
05/85, 06/06, 06/86, 07/07, 07/83, 07.87, 07/C3, 08/08, 08/84,
08/88, 08/C4, 09/09, 09/89, 0A/0A, 0A/8A, 0B/0B, 0B/8B, 0C/0C,
0C/86, 0C/8C, 0C/C6, 0D/0D, 0D/8D, 0E/0E, 0E/86, 0E/8E, 0E/C6,
0F/0F, 0F/87, 0F/8F, 0F/C7, 10/10, 10/88, 10/90, 10/C8, 11/11,
11/89, 11/91, 11/C9, 12/12, 12/92, 13/13, 13/93, 14/14, 14/8A,
14/94, 14/CA, 15/15, 15/95, 16/16, 16/96, 17/17, 17/8B, 17/97,
17/CB, 18/18, 18/8C, 18/98, 18/CC, 19/19, 19/99, 1A/1A, 1A/9A,
1B/1B, 1B/9B, 1C/1C, 1C/8C, 1C/8E, 1C/9C, 1C/C6, 1C/CC, 1C/CE,
1C/E6, 1D/1D, 1D/8D, 1D/9D, 1D/CD, 1E/1E, 1E/8E, 1E/9E, 1E/CE,
1F/1F, 1F/8F, 1F/9F, 1F/CF, 20/20, 20/90, 20/C8, 21/21, 21/91,
22/22, 22/92, 23/23, 23/93, 24/24, 24/92, 25/25, 26/26, 27/27,
27/93, 28/28, 28/94, 29/29, 2A/2A, 2B/2B, 2C/2C, 2C/96, 2D/2D,
2E/2E, 2E/96, 2F/2F, 2F/97, 30/30, 30/98, 31/31, 31/99, 32/32,
33/33, 34/34, 34/9A, 35/35, 36/36, 37/37, 37/9B, 38/38, 38/98,
38/9C, 38/CC, 39/39, 39/99, 3A/3A, 3A/9A, 3B/3B, 3B/9B, 3C/3C,
3C/9C, 3C/9E, 3C/CE, 3D/3D, 3D/9D, 3E/3E, 3E/9E, 3F/3F, 3F/9F,
3F/CF, 40/40, 40/A0, 40/D0, 41/41, 41/A1, 42/42, 42/A2, 43/43,

TABLE B2 (Cont.)

134.5 bps/110 bps (continued)

43/A3, 44/44, 44/A2, 44/A4, 44/D2, 45/45, 45/A5, 46/46, 46/A6,
47/47, 47/A3, 47/A7, 47/D3, 48/48, 48/A4, 49/49, 4A/4A, 4B/4B,
40/40, 4C/A6, 4D/4D, 4E/4E, 4E/A6, 4F/4F, 4F/A7, 50/50, 50/A8,
51/51, 51/A9, 52/52, 53/53, 54/54, 54/AA, 56/56, 57/57, 57/AB,
58/58, 58/AC, 59/59, 5A/5A, 5B/5B, SC/5C, 5C/AC, 5C/AE, 5C/D6,
5D/5D, 5D/AD, 5E/5E, 5E/AE, 5F/5F, 5F/AF, 60/60, 60/B0, 60/D8,
61/61, 61/B1, 62/62, 62/B2, 63/63, 63/B3, 64/64, 64/B2, 65/65,
66/66, 67/67, 67/B3, 68/68, 68/B4, 69/69, 6A/6A, 6B/6B, 6C/6C,
6C/B6, 6D/6D, 6E/6E, 6E/B6, 6F/6F, 6F/B7, 70/70, 70/B0, 70/B8,
70/D8, 71/71, 71/B1, 71/B9, 71/D9, 72/72, 72/B2, 73/73, 73/B3,
74/74, 74/B4, 74/BA, 74/DA, 75/75, 75/B5, 76/76, 76/B6, 77/77,
77/B7, 77/BB, 77/DB, 78/78, 78/D8, 78/BC, 78/DC, 79/79, 79/B9,
7A/7A, 7A/BA, 7B/7B, 7B/BB, 7C/7C, 7C/BC, 7C/BE, 7C/DE, 7D/7D,
7D/BD, 7E/7E, 7E/BE, 7E/DE, 7F/7F, 7F/BF, 7F/DF, 80/80, 80/C0,
80/E0, 81/81, 81/C1, 81/E1, 82/82, 82/C2, 83/83, 83/C3, 84/84,
84/C2, 84/C4, 84/E2, 85/85, 85/C5, 86/86, 86/C6, 87/87, 87/C3,
87/C7, 87/E3, 88/88, 88/C4, 88/C8, 88/E4, 89/89, 89/C9, 8A/8A,
8A/CA, 8B/8B, 8B/CB, 8C/8C, 8C/C6, 8C/CC, 8C/E6, 8D/8D, 8D/CD,
8E/8E, 8E/C6, 8E/CE, 8E/E6, 8F/8F, 8F/C7, 8F/CF, 8F/E7, 90/90,
90/C8, 91/91, 91/C9, 92/92, 93/93, 94/94, 94/CA, 95/95, 96/96,
97/97, 97/CB, 98/98, 98/CC, 99/99, 9A/9A, 9B/9B, 9C/9C, 9C/CC,
9C/CE, 9C/E6, 9D/9D, 9D/CD, 9E/9E, 9E/CE, 9F/9F, 9F/CF, A0/A0,
A0/D0, A0/E8, A1/A1, A1/D1, A2/A2, A2/D2, A3/A3, A3/D3, A4/A4,
A4/D2, A5/A5, A6/A6, A7/A7, A7/D3, A8/A8, A8/D4, A9/A9, AA/AA,
AB/AB, AC/AC, AC/D6, AD/AD, AE/AE, AE/D6, AF/AF, AF/D7, B0/B0,
B0/D8, B1/B1, B1/D9, B2/B2, B3/B3, B4/B4, B4/DA, B5/B5, B6/B6,
B7/B7, B7/DB, B8/B8, B8/D8, B8/DC, B8/EC, B9/B9, B9/D9, BA/BA,
BA/DA, BB/BB, BB/DB, BC/BC, BC/DC, BC/DE, BC/EE, BE/BD, BD/DD,
BE/BE, BE/DE, BF/BF, BF/DF, BF/EF, C0/C0, C0/E0, C0/F0, C1/C1,
C1/E1, C2/C2, C2/E2, C3/C3, C3/E3, Cf/C4, C4/E2, C4/E4, C4/F2,
C5/C5, 05/E5, 06/06, 06/E6, C7/C7, C7/E3, C7/E7, C7/F3, C8/C8,
C8/E4, C9/C9, CA/CA, CB/CB, CC/CC, CC/E6, CD/CD, CE/CE, CE/E6,
CF/CF, CF/E7, D0/D0, D0/E8, D1/D1, D1/E9, D2/D2, D3/D3, D4/D4,

TABLE B2 (Cont.)

134.5 bps/110 bps (continued)

D4/EA, D5/D5, D6/D6, D7/D7, D7/EB, D8/D8, D8/EC, D9/D9, DA/DA,
DB/DB, DC/DC, DC/EC, DC/EE, DC/F6, DD/DD, DD/ED, DE/DE, DE/EE,
DF/DF, DF/EF, E0/E0, E0/F0, E0/F8, E1/E1, E1/F1, E2/E2, E2/F2,
E3/E3, E3/F3, E4/E4, E4/F2, E5/E5, E6/E6, E7/E7, E7/F3, E8/E8,
E8/F4, E9/E9, EA/EA, EB/EB, EC/EC, EC/F6, ED/ED, EE/EE, EE/F6,
EF/EF, EF/F7, F0/F0, F0/F8, F1/F1, F1/F9, F2/F2, F3/F3, F4/F4,
F4/FA, F5/F5, F6/F6, F7/F7, F7/FB, F8/F8, F8/FC, F9/F9, FA/FA,
FB/FB, FC/FC, FC/FE, FD/FD, FE/FE, FF/FF

134.5 bps/75 bps

00/E0, 00/F0, 00/F8, 06/F1, 0C/F2, 0E/F3, 18/F2, 1C/E6, 1E/F3,
30/F4, 38/F6, 3C/F6, 3E/F7, 80/F0, 80/F8, 86/F9, 8C/F2, 8E/F3,
98/FA, 9C/F6, 9E/FB, C0/F8, C6/F9, CC/FA, CE/FB, E0/F8, E0/FC,
E6/FD, F0/FC, F8/FE, FC/FE, FE/FF

110 bps/75 bps

00/C0, 00/E0, 00/F0, 1C/E6, 80/E0, 80/F0, C0/E0, C0/F0, C0/F8,
E0/F0, E0/F8, F0/F8, F0/FC, F8/FC, FC/FE

66332 AUTOECHO

Autoecho allows the 6000 INP to serially echo received data on an asynchronous terminal port, thereby providing a primitive form of error control. Autoecho is selectively enabled or disabled on a port by port basis.

66344 SATELLITE LINK OPTION

The 66344 option alters the GO-BACK-N ARQ scheme from the standard N = 7 to N = 15, 31, 63, or 127, thus permitting additional frame buffering to accommodate the delays introduced in single-hop satellite circuits.

66347 6030/6040 INTERFACE SUPPORT

The 6030/6040 interface support allows a 6030 to be connected to a 6040 via a communications link. This provides a "tail circuit" capability to a 6040 communications network.

66950 DIAGNOSTIC ROM, REV 11 (For Users of S47 Software)

66951 DIAGNOSTIC ROM, REV 12 (For Users of S49 Software)

The diagnostic ROM is a special ROM board used to perform diagnostics of hardware faults. Its use is described in the applicable user's guide.

APPENDIX C

INTERFACE SIGNAL LISTS

TABLE C-1 NETWORK PORT INTERFACE SIGNAL LISTS

EIA RS232C	CCITT V.24	Pin	Name	Description
AA	101	1	Protective Ground	Chassis ground.
AB	102	7	Signal Ground	Common signal and dc power supply ground.
BA	103	2	Transmit Input Data	Serial digital data from a data terminal or other digital data source. If accompanied by an external data rate clock (DA), data transitions must occur on positive-going transitions of the external transmit input clock.
BB	104	3	Receive Output Data	Serial digital data at the output of the modem receiver. The data is accompanied by an internal data rate clock (DD) whose positive-going transitions occur on the data transitions.
CA	105	4	Request to Send	A positive level to the modem when data transmission is desired.
CB	106	5	Clear to Send	A positive level from the modem with a selectable delay, after receipt of Request to Send (CA) and when the modem is ready to transmit; i.e., not in the Test mode. CB is low during training or when CA is low.
CC	107	6	Data Set Ready	A positive level to the INP when not in the Test mode.
CF	109	8	Received Line Signal Detector	A positive level from the modem except when a loss of the received input signal is detected.
CD	108.2	20	Data Terminal Ready	A positive level from the terminal indicating the system is powered up and ready to receive.

TABLE C-1 NETWORK PORT INTERFACE SIGNAL LIST (Cont)

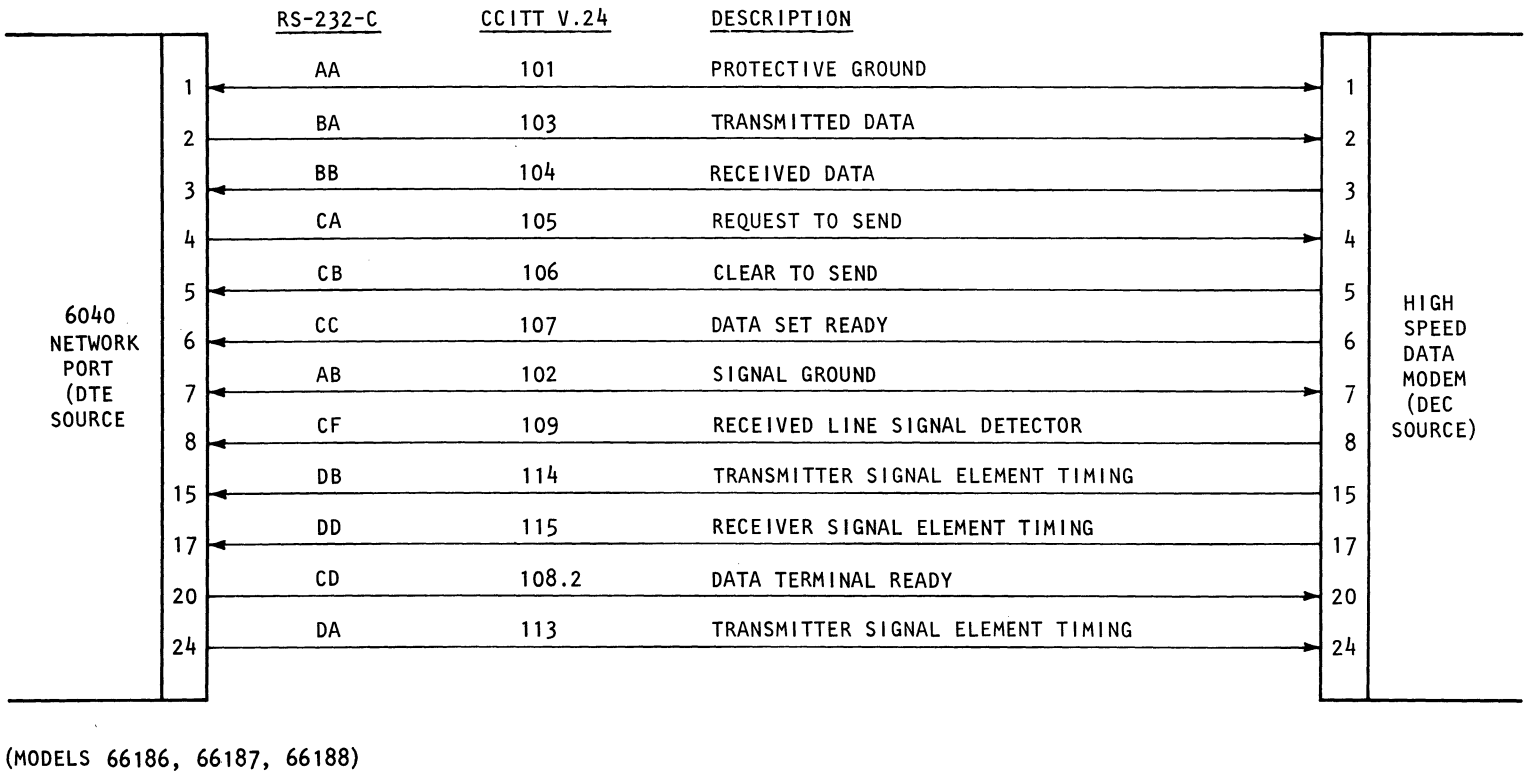
EIA RS232C	CCITT V.24	Pin	Name	Description
DA	113	24	External Transmit Serial Clock	A serial data rate clock input from the data source. Positive clock transitions correspond to data transitions.
DB	114	15	Transmit Signal Element Timing	DCE Source Transmit Clock.
DD	115	17	Receiver Signal Element Timing	A receive data rate clock output for use by the external data sink. Positive clock transitions correspond to data transitions.

TABLE C-2 TERMINAL PORT INTERFACE SIGNAL DESCRIPTIONS

EIA RS232C	CCITT V.24	Pin	Name	Description
AA	101	1	Protective Ground (Earth)	Chassis ground.
AB	102	7	Signal Ground Common Return	Common signal and dc power ground.
BA	103	2	Transmitted Data	Serial digital data from a data terminal or other digital data source.
BB	104	3	Received Data	Serial digital data at the output of the INP (received from a remote end).
CA	105	4	Request to Send	A positive level from the terminal to the INP when data transmission is desired.
CB	106	5	Clear to Send	A positive level from the INP port module to the terminal after receipt of Request to Send (CA), indicating the INP is ready to transmit.

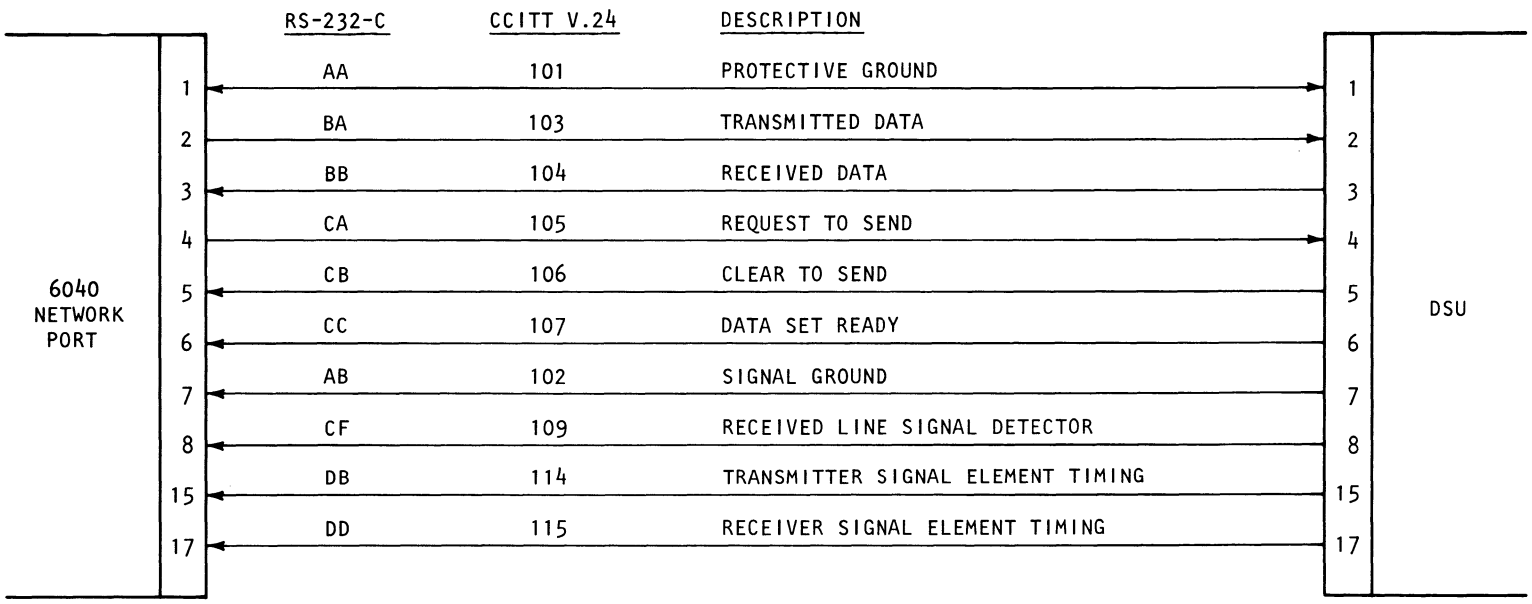
TABLE C-2 TERMINAL PORT INTERFACE SIGNAL DISCRIPTIONS (Cont)

EIA RS232C	CCITT V.24	Pin	Name	Description
CC	107	6	Data Set Ready	An output signal controlled from the remote TP interface (pin 20). Data Set Ready for a modem, Data Terminal Ready for a terminal.
CF	109	8	Received Line Signal Detector	An output signal controlled from the remote TP interface (pin 4). Carrier Detect for a modem, Request To Send for a terminal.
SPARE	---	14	Spare	
DB	114	15	Transmitter Signal Element Timing	A transmit data clock output for use by an external data source. An external source to supply data on data transitions (external only).
DD	115	17	Receiver Signal Element Timing	A receive data rate clock output for use by the external data sink. Positive clock transitions correspond to data transitions (external only).
--	---	18	External Receive Clock	Accepts an external DB for transmission to DCE from crossover cable.
DA	113	24	Transmitter Signal Element Timing	A serial data rate clock input from the data source. Positive clock transitions correspond to data transitions (external only).
CD	108	20	Data Terminal Ready	A positive level from the terminal indicating the system is powered up and ready to receive.
CE OUT	125	22	Ring Indicator	A positive level indicates a ring is being detected.
MB	---	25	Make Busy	



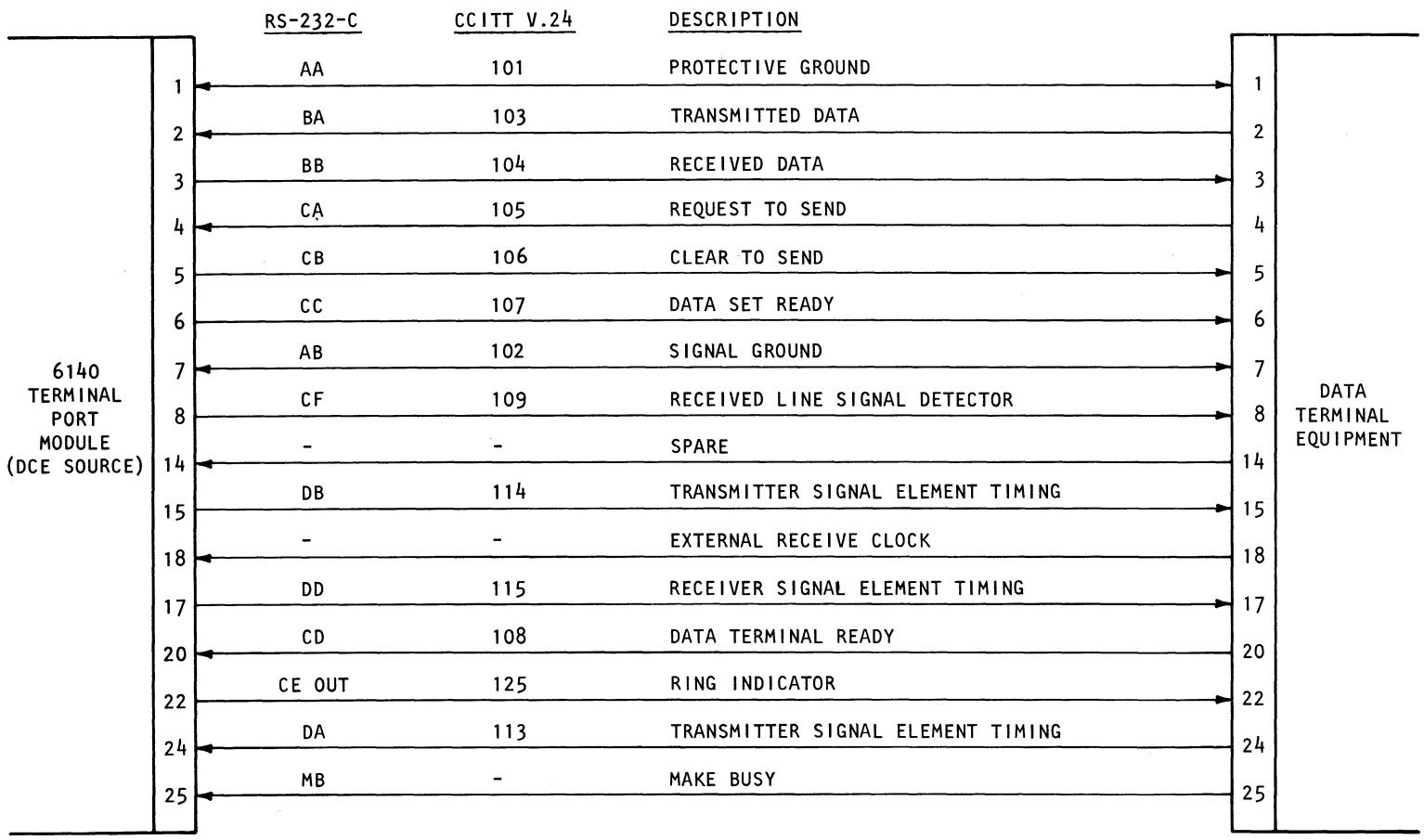
(MODELS 66186, 66187, 66188)

Figure C-1. Network Port to Trunk Modem Interface



(MODELS 66186, 66187, 66188)

Figure C-2. Network Port to Digital Network Interface via a Data Service Unit for 2400, 4800 and 9600 bps Transmission Rates



(MODELS 66183, 66184, 66185)

Figure C-3. 6130 Terminal Port Module Attached to Data Terminal Equipment

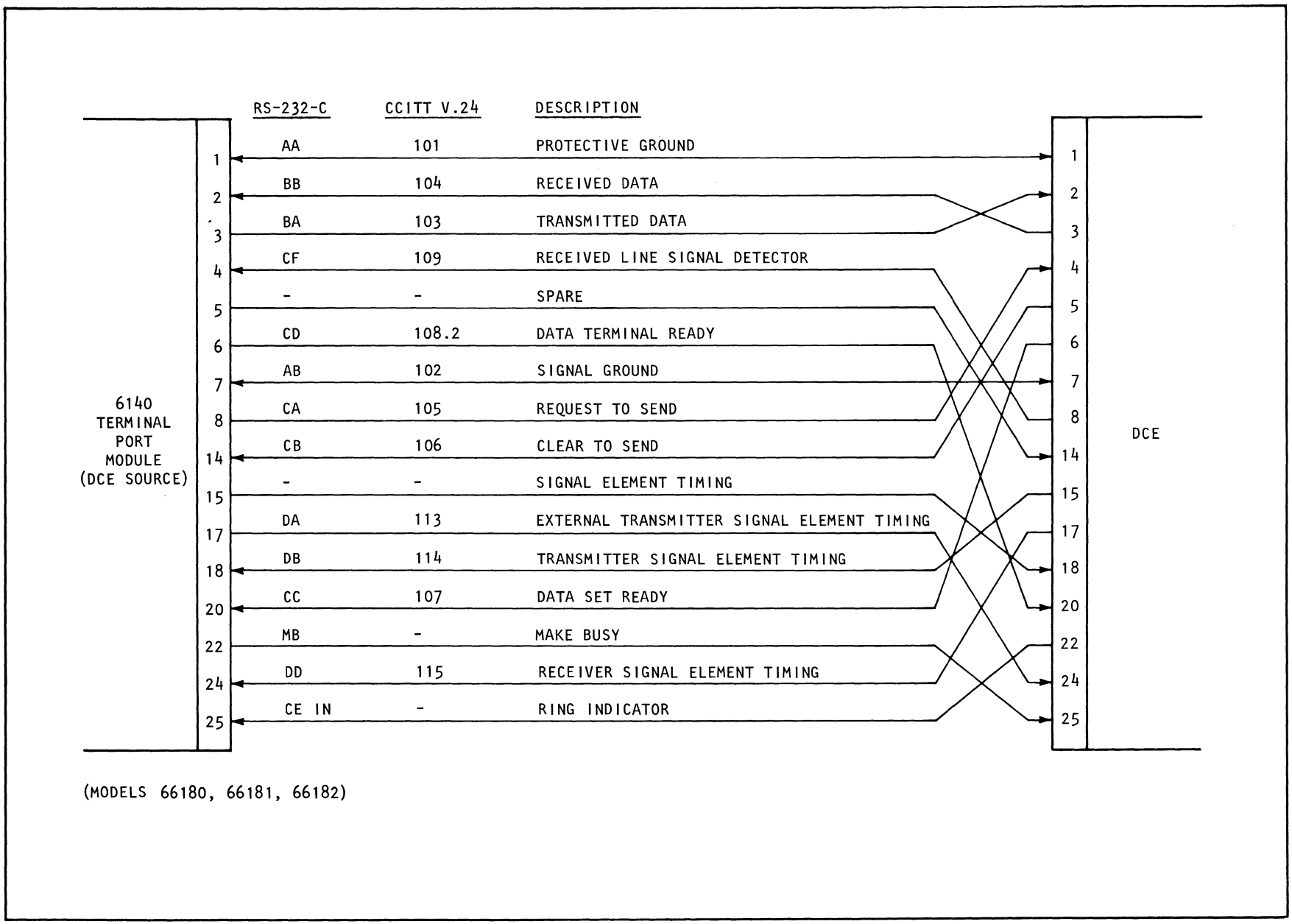


Figure C-4. 6140 Terminal Port Module Interface Signal Crossover Attached to Data Communications Equipment

UNIVERSAL CODE CHART FOR DATA COMMUNICATIONS

8 BIT ASCII		7-BIT ASCII		EVEN PARITY ASCII		ODD PARITY ASCII		EBCDIC		6-BIT TRANSCODE		6-BIT TYPESETTER		EBCD		SELECTRIC		FIELD DATA		BAUDOT	
	BINARY HEX		BINARY HEX		BINARY HEX		BINARY HEX		BINARY HEX		BINARY HEX		BINARY HEX		BINARY C 1248AB HEX		BINARY C 1248AB HEX		BINARY HEX		BINARY HEX
A	11 000 001 C1	A	1 000 001 41	A	01 000 001 41	A	11 000 001 C1	A	11 000 001 C1	A	000 001 01	A	000 011 03	A	0 100 011 23	A	1 111 001 79	A	000 110 06	A	– 00 011 03
B	11 000 010 C2	B	1 000 010 42	B	01 000 010 42	B	11 000 010 C2	B	11 000 010 C2	B	000 010 02	B	011 001 19	B	0 010 011 13	B	1 110 110 76	B	000 111 07	B	' 11 001 19
C	11 000 011 C3	C	1 000 011 43	C	11 000 011 C3	C	01 000 011 43	C	11 000 011 C3	C	000 011 03	C	001 110 0E	C	1 110 011 73	C	1 111 010 7A	C	001 000 08	C	01 110 0E
D	11 000 100 C4	D	1 000 100 44	D	01 000 100 44	D	11 000 100 C4	D	11 000 100 C4	D	000 100 04	D	001 001 09	D	0 001 011 08	D	0 101 010 2A	D	001 001 09	D	$ 01 001 09
E	11 000 101 C5	E	1 000 101 45	E	11 000 101 C5	E	01 000 101 45	E	11 000 101 C5	E	000 101 05	E	000 001 01	E	1 101 011 6B	E	1 001 010 4A	E	001 010 0A	E	3 00 001 01
F	11 000 110 C6	F	1 000 110 46	F	11 000 110 C6	F	01 000 110 46	F	11 000 110 C6	F	000 110 06	F	001 101 0D	F	1 011 011 5B	F	1 110 011 73	F	001 011 0B	F	' 01 101 0D
G	11 000 111 C7	G	1 000 111 47	G	01 000 111 47	G	11 000 111 C7	G	11 000 111 C7	G	000 111 07	G	011 010 1A	G	0 111 011 3B	G	0 100 011 23	G	001 100 0C	G	8 11 010 1A
H	11 001 000 C8	H	1 001 000 48	H	01 001 000 48	H	11 001 000 C8	H	11 001 000 C8	H	001 000 08	H	010 100 14	H	0 000 111 07	H	0 100 110 26	H	001 101 0D	H	= 10 100 14
I	11 001 001 C9	I	1 001 001 49	I	11 001 001 C9	I	01 001 001 49	I	11 001 001 C9	I	001 001 09	I	000 110 06	I	1 100 111 67	I	0 011 001 19	I	001 110 0E	I	8 00 110 06
J	11 001 010 CA	J	1 001 010 4A	J	11 001 010 CA	J	01 001 010 4A	J	11 010 001 D1	J	010 001 11	J	001 011 0B	J	1 100 001 61	J	1 000 011 43	J	001 111 0F	J	01 011 0B
K	11 001 011 CB	K	1 001 011 4B	K	01 001 011 4B	K	11 001 011 CB	K	11 010 010 D2	K	010 010 12	K	001 111 0F	K	1 010 001 51	K	0 011 010 1A	K	010 000 10	K	(01 111 0F
L	11 001 100 CC	L	1 001 100 4C	L	11 001 100 CC	L	01 001 100 4C	L	11 010 011 D3	L	010 011 13	L	010 010 12	L	1 000 110 46	L	1 000 110 46	L	010 001 11	L	) 10 010 12
M	11 001 101 CD	M	1 001 101 4D	M	01 001 101 4D	M	11 001 101 CD	M	11 010 100 D4	M	010 100 14	M	011 100 1C	M	1 001 001 49	M	1 100 001 61	M	010 010 12	M	11 100 1C
N	11 001 110 CE	N	1 001 110 4E	N	01 001 110 4E	N	11 001 110 CE	N	11 010 101 D5	N	010 101 15	N	001 100 0C	N	0 101 001 29	N	1 010 010 52	N	010 011 13	N	. 01 100 0C
O	11 001 111 CF	O	1 001 111 4F	O	11 001 111 CF	O	01 001 111 4F	O	11 010 110 D6	O	010 110 16	O	011 000 18	O	0 011 001 19	O	1 000 101 45	O	010 100 14	O	9 11 000 18
P	11 010 000 D0	P	1 010 000 50	P	01 010 000 50	P	11 010 000 D0	P	11 010 111 D7	P	010 111 17	P	010 110 16	P	1 111 001 79	P	0 001 011 08	P	010 101 15	P	0 10 110 16
Q	11 010 001 D1	Q	1 010 001 51	Q	11 010 001 D1	Q	01 010 001 51	Q	11 011 000 D8	Q	011 000 18	Q	010 111 17	Q	1 000 101 45	Q	1 011 011 5B	Q	010 110 16	Q	1 10 111 17
R	11 010 010 D2	R	1 010 010 52	R	11 010 010 D2	R	01 010 010 52	R	11 011 001 D9	R	011 001 19	R	001 [illegible] 0A	R	0 100 101 25	R	0 101 001 29	R	010 111 17	R	4 01 010 0A
S	11 010 011 D3	S	1 010 011 53	S	01 010 011 53	S	11 010 011 D3	S	11 100 010 E2	S	100 010 22	S	000 101 05	S	1 010 010 52	S	0 100 101 25	S	011 000 18	S	Bell 00 101 05
T	11 010 100 D4	T	1 010 100 54	T	11 010 100 D4	T	01 010 100 54	T	11 100 011 E3	T	100 011 23	T	010 000 10	T	0 110 010 32	T	0 000 010 02	T	011 001 19	T	5 10 000 10
U	11 010 101 D5	U	1 010 101 55	U	01 010 101 55	U	11 010 101 D5	U	11 100 100 E4	U	100 100 24	U	000 111 07	U	1 001 010 4A	U	0 110 010 32	U	011 010 1A	U	7 00 111 07
V	11 010 110 D6	V	1 010 110 56	V	01 010 110 56	V	11 010 110 D6	V	11 100 101 E5	V	100 101 25	V	011 110 1E	V	0 110 001 31	V	0 110 001 31	V	011 011 1B	V	11 110 1E
W	11 010 111 D7	W	1 010 111 57	W	11 010 111 D7	W	01 010 111 57	W	11 100 110 E6	W	100 110 26	W	010 011 13	W	0 011 010 1A	W	1 110 101 75	W	011 100 1C	W	2 10 011 13
X	11 011 000 D8	X	1 011 000 58	X	11 011 000 D8	X	01 011 000 58	X	11 100 111 E7	X	100 111 27	X	011 101 1D	X	1 111 010 7A	X	1 100 010 62	X	011 101 1D	X	/ 11 101 1D
Y	11 011 001 D9	Y	1 011 001 59	Y	01 011 001 59	Y	11 011 001 D9	Y	11 101 000 E8	Y	101 000 28	Y	010 101 15	Y	1 000 110 46	Y	1 100 111 67	Y	011 110 1E	Y	6 10 101 15
Z	11 011 010 DA	Z	1 011 010 5A	Z	01 011 010 5A	Z	11 011 010 DA	Z	11 101 001 E9	Z	101 001 29	Z	010 001 11	Z	0 100 110 26	Z	1 010 100 54	Z	011 111 1F	Z	" 10 001 11
a	11 100 001 E1	a	1 100 001 61	a	11 100 001 E1	a	01 100 001 61	a	10 000 001 81												
b	11 100 010 E2	b	1 100 010 62	b	11 100 010 E2	b	01 100 010 62	b	10 000 010 82												
c	11 100 011 E3	c	1 100 011 63	c	01 100 011 63	c	11 100 011 E3	c	10 000 011 83	(NO LOWER CASE)		CAPS = "SHIFT" LC = "UNSHIFT" UNSHIFT 011 111 1F SHIFT 011 011 1B		CAPS = "UC" LC = "LC" LC 00 011 111 1F UC 00 011 100 1C		CAPS = "UC" LC = "LC" LC 00 011 111 1F UC 00 011 100 1C		(NO LOWER CASE)		(NO LOWER CASE) "LETTERS" 11 111 1F "FIGURES" 11 011 1B	
d	11 100 100 E4	d	1 100 100 64	d	11 100 100 E4	d	01 100 100 64	d	10 000 100 84												
e	11 100 101 E5	e	1 100 101 65	e	01 100 101 65	e	11 100 101 E5	e	10 000 101 85												
f	11 100 110 E6	f	1 100 110 66	f	11 100 110 E6	f	01 100 110 66	f	10 000 110 86												
g	11 100 111 E7	g	1 100 111 67	g	11 100 111 E7	g	01 100 111 67	g	10 000 111 87												
h	11 101 000 E8	h	1 101 000 68	h	11 101 000 E8	h	01 101 000 68	h	10 001 000 88												
i	11 101 001 E9	i	1 101 001 69	i	01 101 001 69	i	11 101 001 E9	i	10 001 001 89												
j	11 101 010 EA	j	1 101 010 6A	j	01 101 010 6A	j	11 101 010 EA	j	10 010 001 91												
k	11 101 011 EB	k	1 101 011 6B	k	11 101 011 EB	k	01 101 011 6B	k	10 010 010 92												
l	11 101 100 EC	l	1 101 100 6C	l	01 101 100 6C	l	11 101 100 EC	l	10 010 011 93												
m	11 101 101 ED	m	1 101 101 6D	m	11 101 101 ED	m	01 101 101 6D	m	10 010 100 94												
n	11 101 110 EE	n	1 101 110 6E	n	11 101 110 EE	n	01 101 110 6E	n	10 010 101 95												
o	11 101 111 EF	o	1 101 111 6F	o	01 101 111 6F	o	11 101 111 EF	o	10 010 110 96												
p	11 110 000 F0	p	1 110 000 70	p	11 110 000 F0	p	01 110 000 70	p	10 010 111 97												
q	11 110 001 F1	q	1 110 001 71	q	01 110 001 71	q	11 110 001 F1	q	10 011 000 98												
r	11 110 010 F2	r	1 110 010 72	r	01 110 010 72	r	11 110 010 F2	r	10 011 001 99												
s	11 110 011 F3	s	1 110 011 73	s	11 110 011 F3	s	01 110 011 73	s	10 100 010 A2												
t	11 110 100 F4	t	1 110 100 74	t	01 110 100 74	t	11 110 100 F4	t	10 100 011 A3												
u	11 110 101 F5	u	1 110 101 75	u	11 110 101 F5	u	01 110 101 75	u	10 100 100 A4												
v	11 110 110 F6	v	1 110 110 76	v	11 110 110 F6	v	01 110 110 76	v	10 100 101 A5												
w	11 110 111 F7	w	1 110 111 77	w	01 110 111 77	w	11 110 111 F7	w	10 100 110 A6												
x	11 111 000 F8	x	1 111 000 78	x	01 111 000 78	x	11 111 000 F8	x	10 100 111 A7												
y	11 111 001 F9	y	1 111 001 79	y	11 111 001 F9	y	01 111 001 79	y	10 101 000 A8												
z	11 111 010 FA	z	1 111 010 7A	z	11 111 010 FA	z	01 111 010 7A	z	10 101 001 A9												
0	10 110 000 B0	0	0 110 000 30	0	00 110 000 30	0	10 110 000 B0	0	11 110 000 F0	0	110 000 30	0	110 110 U 36	0	01 010 100 L 54	0	01 100 100 L 64	0	110 000 30	0	10 110 F 16
1	10 110 001 B1	1	0 110 001 31	1	10 110 001 B1	1	00 110 001 31	1	11 110 001 F1	1	110 001 31	1	111 101 U 3D	1	00 100 000 L 20	1	00 100 000 L 20	1	110 001 31	1	10 111 F 17
2	10 110 010 B2	2	0 110 010 32	2	10 110 010 B2	2	00 110 010 32	2	11 110 010 F2	2	110 010 32	2	110 011 U 33	2	00 010 000 L 10	2	00 010 000 L 10	2	110 010 32	2	10 011 F 13
3	10 110 011 B3	3	0 110 011 33	3	00 110 011 33	3	10 110 011 B3	3	11 110 011 F3	3	110 011 33	3	100 001 U 21	3	00 110 000 L 30	3	01 110 000 L 70	3	110 011 33	3	00 001 F 01
4	10 110 100 B4	4	0 110 100 34	4	00 110 100 B4	4	10 110 100 34	4	11 110 100 F4	4	110 100 34	4	101 010 U 2A	4	00 001 000 L 08	4	00 000 100 L 04	4	110 100 34	4	01 010 F 0A
5	10 110 101 B5	5	0 110 101 35	5	00 110 101 35	5	10 110 101 B5	5	11 110 101 F5	5	110 101 35	5	110 000 U 30	5	01 101 000 L 68	5	00 001 000 L 08	5	110 101 35	5	10 000 F 10
6	10 110 110 B6	6	0 110 110 36	6	00 110 110 36	6	10 110 110 B6	6	11 110 110 F6	6	110 110 36	6	110 101 U 35	6	01 011 000 L 58	6	01 011 000 L 58	6	110 110 36	6	10 101 F 15
7	10 110 111 B7	7	0 110 111 37	7	10 110 111 B7	7	00 110 111 37	7	11 110 111 F7	7	110 111 37	7	100 111 U 27	7	00 111 000 L 38	7	01 101 000 L 68	7	110 111 37	7	00 111 F 07
8	10 111 000 B8	8	0 111 000 38	8	10 111 000 B8	8	00 111 000 38	8	11 111 000 F8	8	111 000 38	8	100 110 U 26	8	00 000 100 L 04	8	00 111 000 L 38	8	111 000 38	8	11 010 F 1A
9	10 111 001 B9	9	0 111 001 39	9	00 111 001 39	9	10 111 001 B9	9	11 111 001 F9	9	111 001 39	9	111 000 U 38	9	01 100 100 L 64	9	00 110 100 L 34	9	111 001 39	9	11 000 F 18
SP	10 100 000 A0	SP	0 100 000 20	SP	10 100 000 A0	SP	00 100 000 20	SP	01 000 000 40	SP	011 010 1A	SP	000 100 S U 04	SP	01 000 000 40	SP	01 000 000 40	SP	000 001 05	SP	00 100 04
!	10 100 001 A1	!	0 100 001 21	!	00 100 001 21	!	10 100 001 A1	!	01 011 010 5A			!	100 011 S 23		01 110 101 U 75	!	00 000 001 L 01	!	101 101 2D	!	01 101 F 0D
"	10 100 010 A2	"	0 100 010 22	"	00 100 010 22	"	10 100 010 A2	"	01 111 111 7F						00 110 100 U 34		01 001 001 U 49				10 001 F 11
#	10 100 011 A3	#	0 100 011 23	#	10 100 011 A3	#	00 100 011 23	#	01 111 011 7B	#	111 011 3B			#	00 110 100 L 34	#	01 110 000 U 70	#	100 110 26	#	10 100 F 14
$	10 100 100 A4	$	0 100 100 24	$	00 100 100 24	$	10 100 100 A4	$	01 011 011 5B	$	011 011 1B	$	100 011 U 23	$	01 110 101 L 75	$	00 000 100 U 04	$	100 111 27	$	01 001 F 09
%	10 100 101 A5	%	0 100 101 25	%	10 100 101 A5	%	00 100 101 25	%	01 101 100 6C	%	101 100 2C			%	01 101 000 U 68	%	00 001 000 U 08	%	101 010 2A		
&	10 100 110 A6	&	0 100 110 26	&	10 100 110 A6	&	00 100 110 26	&	01 010 000 50	&	010 000 10	&	111 000 S 38	&	01 000 011 L 43	&	01 101 000 U 68	&	000 001 01		
'	10 100 111 A7	'	0 100 111 27	'	00 100 111 27	'	10 100 111 A7	'	01 111 101 7D						01 011 000 U 58		01 001 001 L 49		111 010 3A		01 011 F 0B
(	10 101 000 A8	(	0 101 000 28	(	00 101 000 28	(	10 101 000 A8	(	01 001 101 4D				110 001 S 31	(	01 100 100 U 64	(	00 110 100 U 34		101 001 29	(	01 111 F 0F
)	10 101 001 A9	)	0 101 001 29	)	10 101 001 A9	)	00 101 001 29	)	01 011 101 5D	)	110 001 U 31	)	00 100 100 U 54	)	00 100 100 U 64	)	00 000 100 U 04	)	100 000 20	)	10 010 F 12
*	10 101 010 AA	*	0 101 010 2A	*	10 101 010 AA	*	00 101 010 2A	*	01 011 100 5C	*	011 100 1C			*	00 000 100 U 04	*	00 111 000 U 38	*	101 000 28		
+	10 101 011 AB	+	0 101 011 2B	+	00 101 011 2B	+	10 101 011 AB	+	01 001 110 4E					+	01 000 111 U 43	+	00 010 011 U 13	+	100 010 22		
,	10 101 100 AC	,	0 101 100 2C	,	10 101 100 AC	,	00 101 100 2C	,	01 101 011 6B		101 011 2B				01 110 110 L 76		00 111 011 * 3B		101 110 2E		01 100 F 0C
-	10 101 101 AD	-	0 101 101 2D	-	00 101 101 2D	-	10 101 101 AD	-	01 100 000 60		100 000 20		101 001 U 29		00 000 001 * 01		00 110 111 L 37	-	100 001 21		00 011 F 03
.	10 101 110 AE	.	0 101 110 2E	.	10 101 110 2E	.	00 101 110 2E	.	01 001 011 4B		001 011 0B		111 100 S U 3C		00 110 111 L 37		01 010 001 * 51		111 101 3D		11 100 F 1C
/	10 101 111 AF	/	0 101 111 2F	/	10 101 111 AF	/	00 101 111 2F	/	01 100 001 61		100 001 21				01 100 010 L 62		00 000 111 L 07		111 100 3C		11 101 F 1D

STOP BITS

START BITS

COURTESY OF

ATLANTIC RESEARCH CORPORATION

5390 CHEROKEE AVENUE ALEXANDRIA, VIRGINIA 22314

703-354-3400

MANUFACTURERS OF INTERSHAKE and DATA TEK 9600

UPPER CASE (U)
LOWER CASE (L)
EITHER (*)

UPPER CASE (U)
LOWER CASE (L)
EITHER (*)

UNIVERSAL CODE CHART FOR DATA COMMUNICATIONS

8-BIT ASCII			7-BIT ASCII			EVEN PARITY ASCII			ODD PARITY ASCII			EBCDIC			6-BIT TRANSCODE			6-BIT TYPESETTER			EBCD				SELECTRIC				FIELD DATA		BAUDOT	
	BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY C 12 4 8 A 8		HEX		BINARY C 12 4 8 A 8		HEX		BINARY	HEX	BINARY	HEX
:	10 111 010	BA	:	0 111 010	3A	:	00 111 010	3A	:	10 111 010	BA	:	01 111 010	7A				:	111 010 S	3A	:	00 001 000	U	08	:	01 101 011	U	68	:	101 011	2B	: 01 110	F 0E
;	10 111 011	BB	;	0 111 011	3B	;	10 111 011	BB	;	00 111 011	3B	;	01 011 110	5E				;	111 010 U	3A	;	00 110 000	U	30	;	01 101 011	L	68	;	111 011	3B	; 11 110	F 1E
<	10 111 100	BC	<	0 111 100	3C	<	00 111 100	3C	<	10 111 100	BC	<	01 001 100	4C	<	001 100	0C				<	00 010 000	U	10					<	100 011	23		
=	10 111 101	BD	=	0 111 101	3D	=	10 111 101	BD	=	00 111 101	3D	=	01 111 110	7E							=	00 100 000	U	20	=	00 010 011	L	13	=	100 100	24		
>	10 111 110	BE	>	0 111 110	3E	>	10 111 110	BE	>	00 111 110	3E	>	01 101 110	6E							>	00 111 000	U	38					>	100 101	25		
?	10 111 111	BF	?	0 111 111	3F	?	00 111 111	3F	?	10 111 111	BF	?	01 101 111	6F				?	110 110 S	36	?	01 100 010	U	62	?	00 000 111	U	07	?	101 100	2C	? 11 001	F 19
@	11 000 000	C0	@	1 000 000	40	@	11 000 000	C0	@	01 000 000	40	@	01 111 100	7C	@	111 100	3C	@	101 001 S	29	@	00 000 010	L	02	@	00 010 000	U	10	@	101 111	2F		
[	11 011 011	DB	[	1 011 011	5B	[	11 011 011	DB	[	01 011 011	5B																	[	00 100 000	U	20	[	000 011	03		
\	11 011 100	DC	\	1 011 100	5C	\	01 011 100	5C	\	11 011 100	DC	\	11 100 000	E0																				
]	11 011 101	DD	]	1 011 101	5D	]	11 011 101	DD	]	01 011 101	5D																	]	00 100 000	L	20	]	000 100	04		
^	11 011 110	DE	^	1 011 110	5E	^	11 011 110	DE	^	01 011 110	5E																					^	000 010	02		
–	11 011 111	DF	–	1 011 111	5F	–	01 011 111	5F	–	11 011 111	DF	–	01 101 101	6D															–	00 110 111	U	37					
			`	1 100 000	60	`	01 100 000	60	`	11 100 000	E0	`	01 111 001	79																						
{	11 111 011	FB	{	1 111 011	7B	{	01 111 011	7B	{	11 111 011	FB	{	11 000 000	C0							UPPER CASE (U) LOWER CASE (L) EITHER (*)							UPPER CASE (U) LOWER CASE (L) EITHER (*)								
:	11 111 100	FC	:	1 111 100	7C	:	11 111 100	FC	:	01 111 100	7C	:	01 101 010	6A																						
}	11 111 101	FD	}	1 111 101	7D	}	01 111 101	7D	}	11 111 101	FD	}	11 010 000	D0																						
~	11 111 110	FE	~	1 111 110	7E	~	01 111 101	7E	~	11 111 110	FE	~	10 100 001	A1																						
												¢	01 001 010	4A							¢	00 000 010	U	02	¢	01 011 000	U	58					
												¬	01 011 111	5F							¬	00 110 111	U	37									
												¦	01 001 111	4F					V 101 000 S/U 28		¦	01 110 110	U	76									
																					±	00 100 000	U	20									
																						00 000 001	U	01									
																			UNSHIFT 011 111 1F SHIFT 011 011 1B			UC 00 011 100 1C LC 00 011 111 1F				UC 00 011 100 1C LC 00 011 111 1F						FIGS 11 011 1B LTRS 11 111 1F		
ACK	10 000 110	86	ACK	0 000 110	06	ACK	00 000 110	06	ACK	10 000 110	86	ACK	00 101 110	2E																						
BEL	10 000 111	87	BEL	0 000 111	07	BEL	00 000 111	87	BEL	00 000 111	07	BEL	00 101 111	2F	BEL	001 101	0D	BEL	101 011	2B														
BS	10 001 000	88	BS	0 001 000	08	BS	00 001 000	08	BS	00 001 000	08	BS	00 010 110	16							BS	01 011 101		5D	BS	01 011 101		5D						
												BYP	00 100 100	24							BYP	00 001 110		0E	BY	00 001 110		0E					
CAN	10 011 000	98	CAN	0 011 000	18	CAN	00 011 000	18	CAN	10 011 000	98	CAN	00 011 000	18																						
												CC	00 011 010	1A																						
CR	10 001 101	8D	CR	0 001 101	0D	CR	10 001 101	8D	CR	00 001 101	0D	CR	00 001 101	0D				RET	001 000	08												CR	111 111	3F	CR 01 000	08
DC1	10 010 001	91	DC1	0 010 001	11	DC1	00 010 001	11	DC1	10 001 001	91	DC1	00 010 001	11																						
DC2	10 010 010	92	DC2	0 010 010	12	DC2	00 010 010	12	DC2	10 010 010	92	DC2	00 010 010	12																						
DC3	10 010 011	93	DC3	0 010 011	13	DC3	10 010 011	93	DC3	00 010 011	13	DC3	00 010 011	13																						
DC4	10 010 100	94	DC4	0 010 100	14	DC4	00 010 100	14	DC4	10 010 100	94	DC4	00 011 100	3C																						
DEL	11 111 111	FF	DEL	1 111 111	7F	DEL	11 111 111	FF	DEL	01 111 111	7F	DEL	00 000 111	07	DEL	111 111	3F	RUBOUT 111 111		3F	DEL	01 111 111		7F	DEL	01 111 111		7F						
DLE	10 010 000	90	DLE	0 010 000	10	DLE	10 010 000	90	DLE	00 010 000	10	DLE	00 010 000	10	DLE	011 111	1F																		
												DS	00 100 000	20				ELEVATE 000 010 02																		
EM	10 011 001	99	EM	0 011 001	19	EM	10 011 001	99	EM	00 011 001	19	EM	00 011 001	19	EM	111 110	3E	THIN SP 100 000 20																		
ENQ	10 000 101	85	ENQ	0 000 101	05	ENQ	00 000 101	05	ENQ	10 000 101	85	ENQ	00 101 101	2D	ENQ	101 101	2D	ADD TH SP 100 100 24																		
												EOB	00 100 110	26				EM SP 100 101 25			EOB	01 011 110		5E	EOB	01 011 110		5E					
EOT	10 000 100	84	EOT	0 000 100	04	EOT	10 000 100	84	EOT	00 000 100	04	EOT	00 110 111	37	EOT	011 110	1E	EN SP 101 110 2E			EOT	01 111 100		7C	EOT	01 111 100		7C						
ESC	10 011 011	9B	ESC	0 011 011	1B	ESC	00 011 011	1B	ESC	10 011 011	9B	ESC	00 100 111	27	ESC	101 010	2A	QR 101 111 2F																		
ETB	10 010 111	97	ETB	0 010 111	17	ETB	00 010 111	17	ETB	10 010 111	97	ETB	00 100 110	26	ETB	001 111	0F	V RULE 110 010 32																		
ETX	10 000 011	83	ETX	0 000 011	03	ETX	00 000 011	03	ETX	10 000 011	83	ETX	00 000 011	03	ETX	101 110	2E	EM LEAD 110 100 34																		
																			EN LEAD 110 111 37																	
FF	10 001 100	8C	FF	0 001 100	0C	FF	00 001 100	0C	FF	10 001 100	8C	FF	00 001 100	0C					U RAIL 111 001 39														FF	111 110	3E		
FS	10 011 100	9C	FS	0 011 100	1C	FS	10 011 100	9C	FS	00 011 100	1C	FS	00 100 010	22					L RAIL 111 011 3B																		
GS	10 011 101	9D	GS	0 011 101	1D	GS	00 011 101	1D	GS	10 011 101	9D								Q CENT 111 110 3E																		
HT	10 001 001	89	HT	0 001 001	09	HT	00 001 001	09	HT	10 001 001	89	HT	00 000 101	05	HT	101 111	2F				HT	00 101 111		2F	HT	00 101 111		2F						
												IFS	00 011 100	1C																						
												IGS	00 011 101	1D																						
												IL	00 010 111	17							IL	00 111 101		3D	IL	00 111 101		3D					
												IRS	00 011 110	1E																						
												IUS	00 011 111	1F																						
												LC	00 000 110	06							LC	00 011 111		1F	LC	00 011 111		1F					
LF	10 001 010	8A	LF	0 001 010	0A	LF	00 001 010	0A	LF	10 001 010	8A	LF	00 100 101	25							LF	01 101 110		6E	LF	01 101 110		6E				LF	00 010	02
NAK	10 010 101	95	NAK	0 010 101	15	NAK	00 010 101	95	NAK	10 010 101	95	NAK	00 111 101	3D	NAK	111 101	3D																		
												NL	00 010 101	15							NL	01 101 101		6D	NL	01 101 101		6D					
NUL	10 000 000	80	NUL	0 000 000	00	NUL	00 000 000	00	NUL	10 000 000	80	NUL	00 000 000	00																		PER 111 101 3D			
												PF	00 000 100	04				PF 100 010		22	PF	01 001 111		4F	PF	01 001 111		4F					
												PN	00 110 100	34							PN	01 001 100		4C	PN	01 001 100		4C					
												PRE	00 100 111	27							PRE	00 111 110		3E	PRE	00 111 110		3E					
												RES	00 010 100	14							RES	00 001 101		0D	RES	00 001 101		0D					
												RLF	00 001 001	09																						
RS	10 011 110	9E	RS	0 011 110	1E	RS	00 011 110	1E	RS	10 011 110	9E	RS	00 110 101	35							RS	00 101 100		2C	RS	00 101 100		2C						
SI	10 001 111	8F	SI	0 001 111	0F	SI	00 001 111	0F	SI	10 001 111	8F	SI	00 001 111	0F																						
												SM	00 101 010	2A																						
												SMM	00 001 010	0A																						
SO	10 001 110	8E	SO	0 001 110	0E	SO	10 001 110	8E	SO	00 001 110	0E	SO	00 001 110	0E																						
SOH	10 000 001	81	SOH	0 000 001	01	SOH	10 000 001	81	SOH	00 000 001	01	SOH	00 000 001	01	SOH	000 000	00																		
												SOS	00 100 001	21																						
STX	10 000 010	82	STX	0 000 010	02	STX	10 000 010	82	STX	00 000 010	02	STX	00 000 010	02	STX	001 010	0A																		
SUB	10 011 010	9A	SUB	0 011 010	1A	SUB	10 011 010	9A	SUB	00 011 010	1A	SUB	00 111 111	3F	SUB	001 110	0E																		
SYN	10 010 110	96	SYN	0 010 110	16	SYN	10 010 110	96	SYN	00 010 110	16	SYN	00 110 010	32	SYN	111 010	3A																		
												UC	00 110 110	36							UC	00 011 100		1C	UC	00 011 100		1C					
US	10 011 111	9F	US	0 011 111	1F	US	10 011 111	9F	US	00 111 111	1F				US	011 101	1D																		
VT	10 001 011	8B	VT	0 001 011	0B	VT	10 001 011	8B	VT	00 001 011	0B	VT	00 001 011	0B																						

HEX TO CHARACTER CODE FOR DATA COMMUNICATIONS

EBCDIC	EVEN PARITY ASCII	ODD PARITY ASCII	7-BIT ASCII	EBCD UC	EBCD LC	SELECTRIC UC	SELECTRIC LC
00 NUL	NUL		00 NUL				
01 SOH		SOH	01 SOH			O	!
02 STX		STX	02 STX	¢	@	T	t
03 ETX	ETX		03 ETX				
04 PF		EOT	04 EOT	•	8	$	4
05 HT	ENQ		05 ENQ				
06 LC	ACK		06 ACK				
07 DEL		BEL	07 BEL	H	h	?	1
08		BS	08 BS	:	4	%	5
09 RLF	HT		09 HT				
0A SMM	LF		0A LF				
0B VT		VT	0B VT	D	d	P	p
0C FF	FF		0C FF				
0D CR		CR	0D CR	RES		RES	
0E SO		SO	0E SO	BYP		BY	
0F SI	SI		0F SI				
10 DLE		DLE	10 DLE	<	2	@	2
11 DC1	DC1		11 DC1				
12 DC2	DC2		12 DC2				
13 DC3		DC3	13 DC3	B	b	+	=
14 RES	DC4		14 DC4				
15 NL		NAK	15 NAK				
16 BS		SYN	16 SYN				
17 IL	ETB		17 ETB				
18 CAN	CAN		18 CAN				
19 EM		EM	19 EM	O	o	I	i
1A CC		SUB	1A SUB	W	w	K	k
1B	ESC		1B ESC				
1C IFS		FS	1C FS	UPPER CASE		UPPER CASE	
1D IGS	GS		1D GS				
1E IRS	RS		1E RS				
1F IUS		US	1F US	LOWER CASE		LOWER CASE	
20 DS		SP	20 SP	=	1	[·]	1
21 SOS	!		21 !				
22 FS	"		22 "				
23		#	23 #	A	a	G	g
24 BYP	$		24 $				
25 LF		%	25 %	R	r	S	s
26 EOB/ETB		&	26 &	Z	z	H	h
27 ESC/PRE	'		27 '				
28	(		28 (				
29		)	29)	N	n	R	r
2A SM		*	2A *	V	v	D	d
2B	+		2B +				
2C	,		2C ,	RS		RS	
2D ENQ	–		2D –				
2E ACK	.		2E .				
2F BEL		/	2F /	HT		HT	
30	0		30 0	;	3		
31		1	31 1	L	l	V	v
32 SYN		2	32 2	T	t	U	u
33	3		33 3				
34 PN		4	34 4	"	#	(	9
35 RS	5		35 5				
36 UC	6		36 6				
37 EOT		7	37 7	¬		–	-
38		8	38 8	>	7	*	8
39	9		39 9				
3A	:		3A :				
3B		;	3B ;	G	g	`	`
3C DC4	<		3C <				
3D NAK		=	3D =	IL		IL	
3E		>	3E >	PRE		PRE	
3F SUB	?		3F ?				

EBCDIC	EVEN PARITY ASCII	ODD PARITY ASCII	7-BIT ASCII	EBCD UC	EBCD LC	SELECTRIC UC	SELECTRIC LC
40 SP		@	40 @	SP		SP	
41	A		41 A				
42	B		42 B				
43		C	43 C	+	&	J	j
44	D		44 D				
45		E	45 E	Q	q	O	o
46		F	46 F	Y	y	L	l
47	G		47 G				
48	H		48 H				
49		I	49 I	M	m	"	
4A ¢		J	4A J			E	e
4B •	K		4B K	U	u		
4C <		L	4C L	PN		PN	
4D (	M		4D M				
4E +	N		4E N				
4F |		O	4F O	PF		PF	
50 &	P		50 P				
51		Q	51 Q	K	k	•	•
52		R	52 R	S	s	N	n
53	S		53 S				
54		T	54 T	)	0	Z	z
55	U		55 U				
56	V		56 V				
57		W	57 W				
58		X	58 X		6	¢	6
59	Y		59 Y				
5A !	Z		5A Z				
5B $		[	5B [	F	f	Q	q
5C *	\	\	5C \				
5D)		]	5D]	BS		BS	
5E ;		^	5E ^	EOB		EOB	
5F ¬	–		5F –				
60 -	`		60 `				
61 /		a	61 a	J	j	M	m
62		b	62 b	?	/	X	x
63	c		63 c				
64		d	64 d	(	9	)	0
65	e		65 e				
66	f		66 f				
67		g	67 g	I	i	Y	y
68		h	68 h	%	5	&	7
69	i		69 i				
6A ¦	j		6A j				
6B .		k	6B k	E	e	:	;
6C %	l		6C l				
6D –		m	6D m	NL		NL	
6E >		n	6E n	LF		LF	
6F ?	o		6F o				
70		p	70 p			=	3
71	q		71 q				
72	r		72 r				
73		s	73 s	C	c	F	f
74	t		74 t				
75		u	75 u	!	$	W	w
76		v	76 v			B	b
77	w		77 w				
78	x		78 x				
79 \		y	79 y	P	p	A	a
7A :		z	7A z	X	x	C	c
7B #	{		7B {				
7C @	¦		7C ¦	EOT		EOT	
7D '	}		7D }				
7E =	~		7E ~				
7F "		DEL	7F DEL	DEL		DEL	

EBCDIC	EVEN PARITY ASCII	ODD PARITY ASCII	8-BIT ASCII	EBCDIC	EVEN PARITY ASCII	ODD PARITY ASCII	8-BIT ASCII		FIELD DATA	6-BIT TYPESETTER SHIFT	6-BIT TYPESETTER UNSHIFT	6-BIT TRANSCODE	BAUDOT LTRS	BAUDOT FIGS
80		NUL	NUL	C0 {	@		@		00			SOH		
81 a	SOH		SOH	C1 A		A	A		01 &	E	e	A	E	3
82 b	STX		STX	C2 B		B	B		02 ^	ELEVATE		B	LF	
83 c		ETX	ETX	C3 C	C		C		03 [	A	a	C	A	
84 d	EOT		EOT	C4 D		D	D		04]	SPACE		D	SP	
85 e		ENQ	ENQ	C5 E	E		E		05 SP	S	s	E	S	BEL
86 f		ACK	ACK	C6 F	F		F		06 A	I	i	F	I	8
87 g	BEL		BEL	C7 G		G	G		07 B	U	u	G	U	7
88 h	BS		BS	C8 H		H	H		08 C	RETURN		H	CR	
89 i		HT	HT	C9 I	I		I		09 D	D	d	I	D	$
8A		LF	LF	CA	J		J		0A E	R	r	STX	R	4
8B	VT		VT	CB		K	K		0B F	J	j		J	'
8C		FF	FF	CC	L		L		0C G	N	n	<	N	,
8D	CR		CR	CD		M	M		0D H	F	f	BELL	F	!
8E	SO		SO	CE		N	N		0E I	C	c	SUB	C	:
8F		SI	SI	CF	O		O		0F J	K	k	ETB	K	(
90	DLE		DLE	D0 }		P	P		10 K	T	t	&	T	5
91 j		DC1	DC1	D1 J	Q		Q		11 L	Z	z	J	Z	"
92 k		DC2	DC2	D2 K	R		R		12 M	L	l	K	L	)
93 l	DC3		DC3	D3 L		S	S		13 N	W	w	L	W	2
94 m		DC4	DC4	D4 M	T		T		14 O	H	h	M	H	#
95 n	NAK		NAK	D5 N		U	U		15 P	Y	y	N	Y	6
96 o	SYN		SYN	D6 O		V	V		16 Q	P	p	O	P	0
97 p		ETB	ETB	D7 P	W		W		17 R	Q	q	P	Q	1
98 q		CAN	CAN	D8 Q	X		X		18 S	O	o	Q	O	9
99 r	EM		EM	D9 R		Y	Y		19 T	B	b	R	B	?
9A	SUB		SUB	DA		Z	Z		1A U	G	g	SPACE	G	8
9B		ESC	ESC	DB	[		[		1B V	SHIFT		$	FIGS	
9C	FS		FS	DC	\		\		1C W	M	m	*	M	
9D		GS	GS	DD	]		]		1D X	X	x	US	X	/
9E		RS	RS	DE	^		^		1E Y	V	v	EOT	V	;
9F	US		US	DF		–	–		1F Z	UNSHIFT		DLE	LTRS	
A0	SP		SP	E0 \					20)	THIN SPACE		–		
A1 ~		!	!	E1	a		a		21 –		3	/		
A2 s		"	"	E2 S	b		b		22 +	PF		S		
A3 t	≠		#	E3 T		c	c		23 <	!	$	T		
A4 u		$	$	E4 U	d		d		24 =	ADD THIN SPACE		U		
A5 v	%		%	E5 V		e	e		25 >	EM SPACE		V		
A6 w	&		&	E6 W		f	f		26 ≠		8	W		
A7 x		'	'	E7 X	g		g		27 $		7	X		
A8 y		(	(	E8 Y	h		h		28 *	↓	↓	Y		
A9 z	)		)	E9 Z		i	i		29 (	@	–	Z		
AA	*		*	EA		j	j		2A %		4	ESC		
AB		+	+	EB	k		k		2B :	BELL		.		
AC	.		.	EC		l	l		2C ?			%		
AD		–	–	ED	m		m		2D !			ENQ		
AE				EE	n		n		2E .	EN SPACE		ETX		
AF	/		/	EF		σ	σ		2F @	OR		HT		
B0		0	0	F0 0	p		p		30 0		5	0		
B1	1		1	F1 1		q	q		31 1	(	)	1		
B2	2		2	F2 2		r	r		32 2	V RULE		2		
B3		3	3	F3 3	s		s		33 3		2	3		
B4	4		4	F4 4		t	t		34 4	EM LEADER		4		
B5		5	5	F5 5	u		u		35 5		6	5		
B6		6	6	F6 6	v		v		36 6	?	0	6		
B7	7		7	F7 7		w	w		37 7	EN LEADER		7		
B8	8		8	F8 8		x	x		38 8	&	9	8		
B9		9	9	F9 9	y		y		39 9	UPPER RAIL		9		
BA		:	:	FA	z		z		3A '	:	;	SYN		
BB	;		;	FB		{	{		3B ;	LOWER RAIL		#		
BC		<	<	FC	!		!		3C /	.	.	@		
BD	=		=	FD		}	}		3D .		1	NAK		
BE	>		>	FE		~	~		3E FF	QUAD CENTER		EM		
BF		?	?	FF	DEL		DEL		3F CR	RUBOUT		DEL		

APPENDIX E

BINARY TO HEX CONVERSION

This appendix contains binary to hexadecimal conversion for op modes from bit settings.

Binary	Hexadecimal
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F

APPENDIX F

BINARY SYNCHRONOUS COMMUNICATION

F.1 PROTOCOL

Binary synchronous communication (BSC) protocol is a set of rules for transmitting binary-coded data from point to point. BSC accommodates three standard transmission codes: ASCII, which is the most common for terminals; EBCDIC, or Transcode. BSC also provides transparency, which allows the transmission of control characters as data. These features permit use of a wide range of high-speed and medium speed terminals and transmission equipment.

Under BSC protocol, data is transmitted synchronously as a continuous stream of bits in one direction at a time. Synchronization is achieved by the transmission of a unique bit pattern - the sync signal - that is recognized by any receiver and used to time the receiver to operate in step (synchronously) with the transmitter.

The communications systems that use BSC may operate via leased or switched lines in either a point-to-point or a multinode configuration. In a point-to-point configuration the nodes contend for use of the line; the node that persists or that is fortunate in timing wins the line.

In a multinode configuration, one node is typically the control node. It controls all transmissions in the net by either polling it tributary stations or by selection of one. Selection is by request to receive; the control node designates both the transmitting and receiving nodes by address. An address is unique, and may consist of one to seven characters, the first of which identified the node, while the remainder identify the terminals attached to the node.

F.2 MESSAGE CONTENT

A BSC message block consists of data plus control characters. The data is the contents of the message that is to be transmitted; the control characters provide message identification, addressing, error checking, etc., and show the limits of the functional portions of the transmission block. It should be noted that in transparent text, the control characters are passed as data.

BSC messages are divided into blocks to provide tight error control, and each block in turn is divided into functional segments marked SOH, ETX, ITB, and ETB, as well as error-checking characters. These are all explained below.

F.3 ERROR CHECKING

Error checking is performed in a variety of ways depending on the transmission code used. ASCII with odd parity employs a vertical redundancy check (VRC) that checks the message character-by-character as it is received.

Longitudinal redundancy checking (LRC) checks the entire received block, in the following manner: all data and control characters (except sync's) are accumulated independently at both the transmitter and receiver to form a block check character (BCC) that is transmitted after ETB, ETX, or ITB. The BCC sent by the transmitter is compared at the receiver with the BCC accumulated there; if the BCC's match, the transmission is error-free.

The control signals STX (start of text) or SOH (start of header) mark the beginning of a new message block; they reset the LRC and a new BCC is started.

When a receiver has gotten an error-free message block it sends back an ACK0 or ACK1 to the transmitter to mark the event. ACK0 and ACK1 are sent in response to alternate blocks; they identify the block being ACK'd.

When a receiver detects an error in transmission it sends a NAK to the transmitter, which then retransmits the previous block.

If an ACK or NAK is garbled, the transmitter sends ENQ (enquiry) to the receiver, which then retransmits the acknowledgement.

Cyclical redundancy checking (CRC) for error control may have two forms: CRC 12 used for six-bit codes, or CRC 16 used for eight-bit codes. Like the LRC, the CRC is computed at both transmitter and receiver.

Appendix D contains the binary and hex codes for keyboard characters.

F.3.1 EOT/NAK PAD FORMAT CHECK

BSC stations add eight one's to EOT or NAK as trailing pad bits. This assures accurate reception of these characters as data. Without the pads they might be interpreted as control characters if timing variations resulted in clipping some bits from them. The receiver actually needs only four one's; the rest provide insurance.

In the Codex 6030/6040, this is expanded so that pads are added to any character that turns the line around.

F.4 DATA LINK CONTROL

The data link is controlled by the control characters and sequences described below. There are several variations in the code sets (ASCII, EBDCIC, and Transcode). These variations are shown in the character conversion chart shown in Figure 1.

SYN - synchronous idle. Used to establish and maintain synchronization, and as a time fill in the absence of data or any control character. Two contiguous SYN's start each transmission. (They are represented by 0 in the accompanying figures and format examples.)

SOH - Start of heading. Precedes a block of heading characters that identify routing and priority and are necessary to process the text of the message. Initiates the accumulation of the BCC, but an initial SOH is not part of the accumulation.

STX - start of text. Text is a block of characters that are transmitted through to the ultimate destination without change. STX also terminates a heading.

ETB - end of transmission block. ETB terminates a block of characters starting with SOH or STX. (This transmission block is not necessarily related to the processing format.) ETB is followed immediately by the block check character. ETB requires an acknowledgement: ACK0, ACK1, NAK or WACK or RVI.

ITB - end of intermediate transmission block. Divides a message for error checking purposes without causing a turnaround. ITB is followed by a BCC and resets the block check count. After ITB, successive intermediate blocks need not be preceded by STX or SOH. (For transparent data, each successive intermediate block begins with DLE STX.) However, if one intermediate block is data and the next is text, STX begins the text block.

The last intermediate block is terminated by ETB or ETX (DLE ETB or DLE ETX for transparency). The receiver acknowledges the entire transmission, but is an error is detected in any intermediate block, a NAK is sent for that block, and it and all subsequent blocks are retransmitted.

All BSC stations must be able to receive ITB and its BCC, but the ability to transmit ITB is optional.

Some stations permit ITB's in transparent data at predetermined, fixed intervals in the transparent text. The receiver must be aware of the interval length.

ETX - end of text. ETX terminates a block that begins with STX or SOH and is transmitted as an entity. ETX is followed immediately by the BCC, and requires an acknowledgement.

EOT - end of transmission. The transmission may contain one or more blocks, including text and associated headings. EOT causes reset of error check at all stations. EOT is also used as:

1. A response to a poll when the polled station has nothing to transmit.

2. An abort signal that indicates that the transmitter can no longer transmit due to a system malfunction or an operational difficulty.

ENQ - enquiry. ENQ is used to:

1. Obtain a transmission of a ACK or NAK that was garbled or not received when expected.

2. Bid for the line in point-to-point transmission.

3. Indicate the end of a poll or selection sequence.

ACK0/ACK1 - affirmative acknowledgement. Used to indicate that the last block was received without error and the receiver is ready for the next block. ACK0 is sent first, and alternates with ACK1. ACK0 is also the positive response to selection (multipoint) or line bid (point-to-point) to provide a sequential check for a series of acknowledgements.

WACK - wait acknowledge. Receiver temporarily not ready to receive. WACK is sent in response to text, heading block, line bid or selection sequence, or, in a switched net, to an identification (ID) line bid. WACK is positive acknowledgement of the received data block, or of selection.

The transmitter's response to WACK is ENQ, but EOT and DLE EOT are also valid. If ENQ is received, the receiver continues to reply WACK until ready to continue.

All BSC stations must be able to receive WACK, but the ability to send it is optional.

NAK - negative acknowledgement. Indicates that the previous block was received in error, and should be retransmitted. NAK is also sent in response to station selection or line bid, if not ready to receive.

DLE - data link escape. Used only with line control characters, or transparent mode control characters, as follows:

DLE STX, DLE ETX, DLE ITB, DLE ETB	Initiate and terminate transparent text
DLE ENQ, DLE DLE, DLE EOT	Active control characters within transparent text

DLE SYN	Inserted in heading and text data at 1-second intervals to maintain sync. Cannot establish phase

RVI - reverse interrupt. If sent by a receiver in place of ACK0 or ACK1, RVI requests termination of current transmission so receiver can send high priority message to transmitter. Also, in multipoint net, sent by control station that is receiving, so that it can send message to any station in the network. Successive RVI's cannot be sent, except in response to ENQ.

The sending station treats RVI as ACK, and transmits all data that prevents it from receiving (i.e., empties its buffers). More than one block transmission may be required.

BSC stations must be able to receive RVI. The ability to transmit RVI is optional.

TTD - temporary text delay. If a transmitter has a line and wishes to retain it, but is not ready to transmit within two seconds, it sends TTD. This two-second timeout avoids the nominal three-second receive timeout at the receiver.

The response to TTD is NAK. If the sender is still not ready to transmit, TTD can be repeated one or more times.

TTD is used when the sender's buffer is not full due to intrinsic machine timing, and also to abort the current transmission when the sender is in message transfer mode. After receiving NAK to the TTD sequences, the sender sends EOT, resetting the stations to control mode (forward abort).

DLE EOT - disconnect for a switched line. DLE EOT is sent by either the calling or the called station, to indicate that the sender is going "on hook" (usually after all message exchanges are complete). It may be used optionally in place of EOT.

ID - Identification. Line bid for a switched network.

APPENDIX G

CHARACTERISTICS OF USER'S TERMINALS

Terminal	Type	Transmit Speed	Receive Speed	Code Type	Parity	Data Bits	Stop Bits	Auto Echo	Auto Speed	Inter-Face

APPENDIX H

S49 AUTOSPEED CONFIGURATION

This appendix provides information necessary to configure the autospeed option. The example chosen adds autospeed capability to the example used in Chapter 5. Figure H-1 represents the network topology.

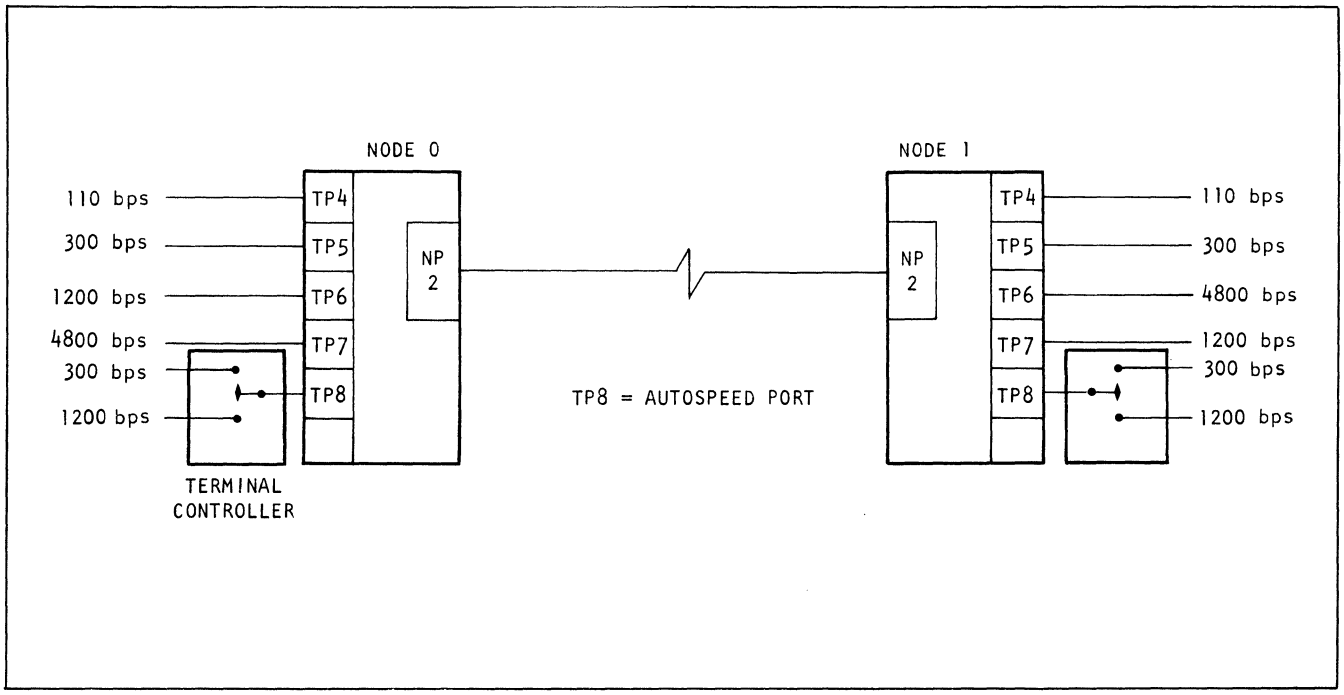


Figure H-1. Autospeed Network Topology

To use the autospeed option it is necessary to define the port to which the terminals are connected as an autospeed port. This is done by entering the subtype (ST=) as 2 (autospeed). (See Figure H-2).

CIRCUIT CROSS-REFERENCE		PORT NO.	CHARACTERISTICS														C=
			PORT TYPE	SUB-TYPE	TRANSMIT SPEED	CODE TYPE	DATA BITS	*PAR.	STOP BITS	AUTO-ECHO	RECEIVE SPEED	OP MODE	CHAR DELAY	FLY-BACK	AUTOSPEED		FIFO SIZE
															RECOG CHAR	SUB CHAR	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PAGE NO.	LINE NO.		T =	ST =	S =	C =	DB =	P =	SB =	E =	RS =	OM=	CD =	FB =	AR =	AS =	F =
		8	AP	2													

Figure H-2. Node Worksheet Entry for TP

After completing the required entries for the port to which the terminal is connected, (Port #, T, ST) additional entries are made which define the parameters for the various speeds. These entries are referred to as autospeed definitions (AD). In addition to async port characteristics operator must specify an autospeed recognition character (AR) and if need be, a substitution character (AS) for each auto speed definition. See Figure H-3.

CIRCUIT CROSS-REFERENCE		PORT NO.	CHARACTERISTICS C=												AUTOSPEED		
			PORT TYPE	SUB-TYPE	TRANSMIT SPEED	CODE TYPE	DATA BITS	*PAR.	STOP BITS	AUTO-ECHO	RECEIVE SPEED	OP MODE	CHAR DELAY	FLY-BACK	RECOG CHAR	SUB CHAR	FIFO SIZE
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PAGE NO.	LINE NO.		T =	ST =	S =	C =	DB =	P =	SB =	E =	RS =	OM=	CD =	FB =	AR =	AS =	F =
		•	AD		•	•	•	•	•	•	•	•		•	•	•	
		•	AD		•	•	•	•	•	•	•	•		•	•	•	

Figure H-3. Node Worksheet Entry for AD's

Upon completing the entries on the node worksheets the actual configuration may begin.

	Command	Display		Delimiter
1.	Clear	*00_ _ _		
2.	SEL PGM	*00_ _ _	SEL PGM	ENTER
3.	SEL C1	*00_ _ _	SEL C 1	"
4.	SEL P8	*01_ _ _	SEL P 8	"
5.	CHNG CT	*01E08	CHNG CT	"
6.	AP	*01E08	T = E/AP	"
7.	2	*01A08	ST = 00/2	"
8.	Clear	NOTE: Ignore any other characteristic parameters that appear but do load activity and transmit data path parameters. Hexadecimal port addresses for autospeed definitions need not actually be physically available in the nest.		
9.	SEL P20	*01_ _ _	SEL P20	ENTER
10.	CHNG CT	*01E20	CHNG CT	"
11.	AD	*01E20	T = E/AD	"

12.	300	*01E20	S = 9600E/300	ENTER
13.	7	*01D20	DB = S/7	"
14.	E	*01D20	P = 0/E	"
15.		*01D20	SB = 1/	"
16.		*01D20	E = E/	"
17.		*01D20	RS = T/	"
18.	00	*01D20	OM = FF/00	"
19.	00	*01D20	FB = FF/00	"
20.	0A	*01D20	AR = FF/0A	"
21.	00	*01D20	AS = FF/00	"
22.		*01D20	T = AD/	CLEAR
23.	SEL P21	*01D20	SEL P21	ENTER
24.	CHNG CT	*01E21	CHNG CT	"
25.	AD	*01E21	T = E/AD	"
26.	1200	*01E21	S = 9600E/1200	"
27.	8	*01D21	DB = S/8	"
28.	E	*01D21	P = 0/E	"
29.		*01D21	SB = 1/	"
30.		*01D21	E = E/	"
31.		*01D21	RS = T/	"
32.	10	*01D21	OM = FF/10	"
33.	8A	*01D21	FB = FF/8A	"
34.	8A	*01D21	AR = FF/8A	"
35.		*01D21	AS = FF/00	"
36.		*01D21	T = AD/	CLEAR
37.		*01D21		

APPENDIX I

SYSTEM CALCULATIONS

I.1 SYSTEM THROUGHPUT

To calculate system throughput for 6000 networks, the following formula should be used:

operations = Σ average traffic into buffers + Σ average traffic out of buffers + 5 Σ frames received + 5 Σ frames transmitted + Σ idle codes received + Σ idle codes transmitted

Idle codes are calculated based on one idle code per frame per port during the portion of time a terminal is idle.

I.2 SYSTEM OUTAGE DURATIONS

Table I-1 illustrates the ralationship between slot-weights and buffer multiplier values which result in approximate outage duration times.

TABLE I-1 PARAMETER RELATIONSHIP

		A	B	C = Bx5	D = Cx14	$C = \frac{D}{A}$
	Speed	CPS	Slot Weight	Buffers	Approximate Number of Buffered Char.	Outage Duration In Seconds
	75	10	1	5	70	7
A	110	10	1	5	70	7
S	134.5	15	1	5	70	4.6
Y	150	15	1	5	70	4.6
N	300	30	2	10	140	4.6
C	600	60	3	15	210	3.5
	1200	120	6	30	420	3.5
	1200	150	8	40	560	3.7
S	2000	250	14	70	980	3.9
Y	2400	300	16	80	1120	3.7
N	3600	450	24	120	1680	3.7
C	4800	600	32	160	2240	3.7
	7200	900	48	240	3360	3.7
	9600	1200	64	320	4480	3.7

I.3 RAM BUFFER POOL SIZE

The following chart may be used to calculate the approximate (±5%) size of the RAM buffer pool.

	RAM Bytes Required	Lock Bytes Required
Node	350	16
Each Code Table	62	--
Each TP	68	6
Each NP	63	11
Each XP	52	2
Each CTP	28	6
Each Autospeed Definition	6	--
Lock Byte Area	256, 512, or 1024	

For example, consider a 6040 with 512 bytes available for the lock byte area and the following:

Node	350	16
7 Code Tables	434	--
2 NP's	126	22
30 TP's	2040	180
20 XP's	1040	40
1 CTP	28	6
5 AD's	30	
	Total RAM = 4048	Total Lock byte = 248

The total RAM area required is 4048 + 512 (of which only 248 are used) = 4560 bytes. Each RAM has a capacity of 16,384 bytes. If only 4560 are used, 11,824 remain available for buffers. If each buffer requires 16 bytes, then approximately 739 buffers are available.

I.4 CHARACTER DELAY

Figure I-1 shows character delay through an INP as a function of traffic density. Two line speeds are assumed, 4800 and 7200 bps, with 23 terminals.

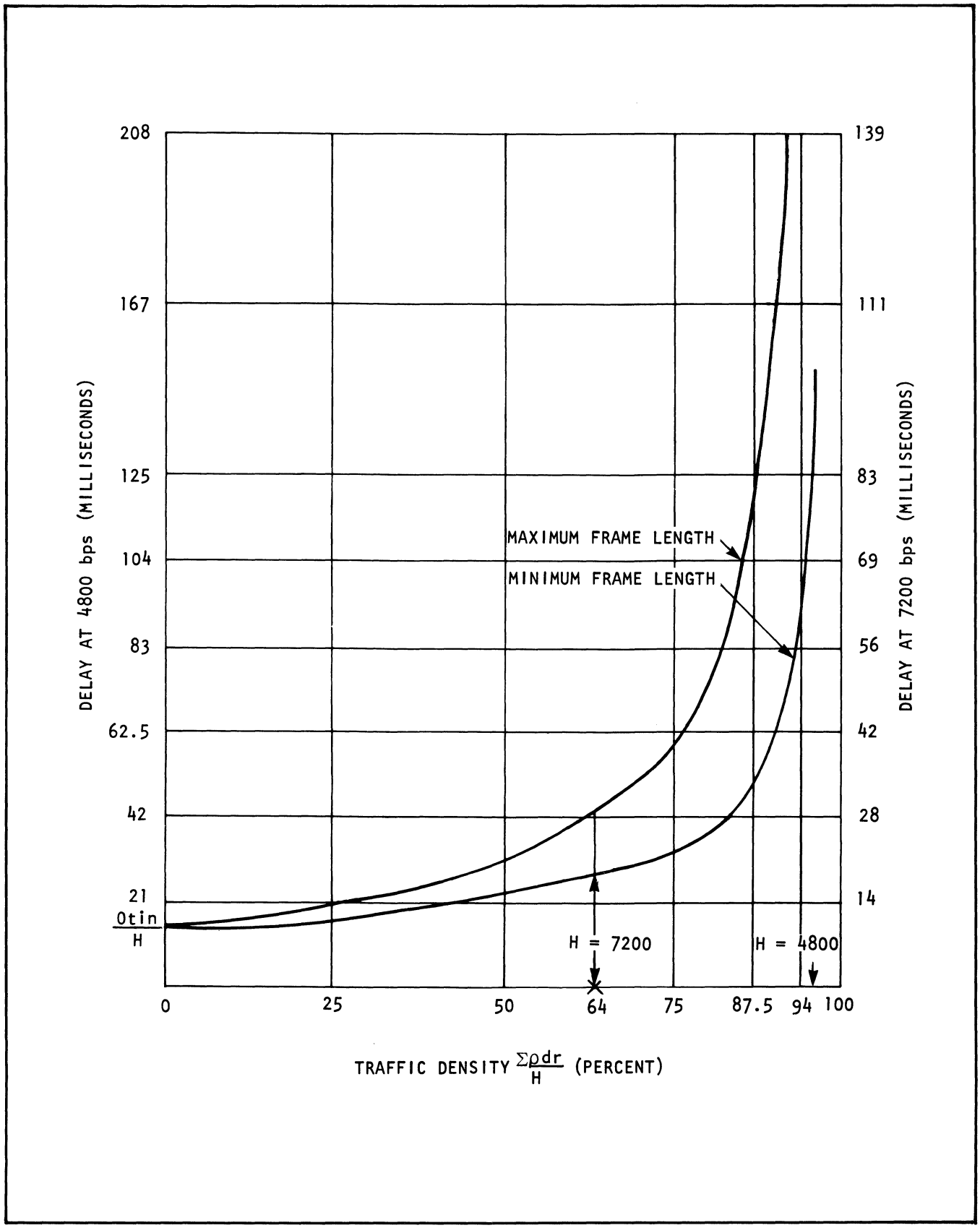


Figure I-1. Character Delay Thru 6000 as a Function of Traffic Density

I.5 AVERAGE FRAME LENGTH

The average 6000 Series frame length can be calculated from the following formula (which assumes no idle codewords).

$$\text{Average Frame size} = \frac{27 - \text{ARQ size}}{100 - \text{Traffic Density}} \times 100$$

I.6 BUFFER MULTIPLIER VALUE

$$\text{Buffer Multiplier} = \frac{720}{\sum_{4}^{N} \text{Slot weight}}$$

where 720 = approximate number of buffers per RAM

Example:

10 terminals, each with a speec of 1200, and a slot weight = 12.

$$\text{Then: } BM = \frac{720}{10 \times 12} = \frac{720}{120}$$

$$BM = 6$$

I.7 CALCULATING AVERAGE FRAME LENGTH

$$\text{AVG. FR. LEN.} = \frac{\text{FR. OVHD + IDLE CODE LEN. X NO. OF TERM.}}{H - \sum_{4}^{N} p\ d\ r} \times H$$

Where:

H = high speed line rate

p = terminal utilization factor

d = data compression factor

r = terminal speed

Example:

10 terminals

p = 50%

d = .7

r = 1200

Idle code length = 2 bits

Then:

$$\text{Avg. fr. len.} = \frac{30 + 20}{9600 - 10 \times 50 \times .7 \times 1200} \times 9600$$

$$= \frac{50}{9600 - 4200} \times 9600$$

$$= \frac{50}{5400} \times 9600$$

$$= .009 \times 9600$$

$$= 89 \text{ bits}$$

NOTE: p X d = CL (compressed loading)
CL X speed = pdr

I.8 CALCULATING MINIMUM FRAME TIME

Minimum frame time = FIFO size

Example:

trunk speed = 9600 bps

FIFO size = 256

Then:

256 = number of bits per frame

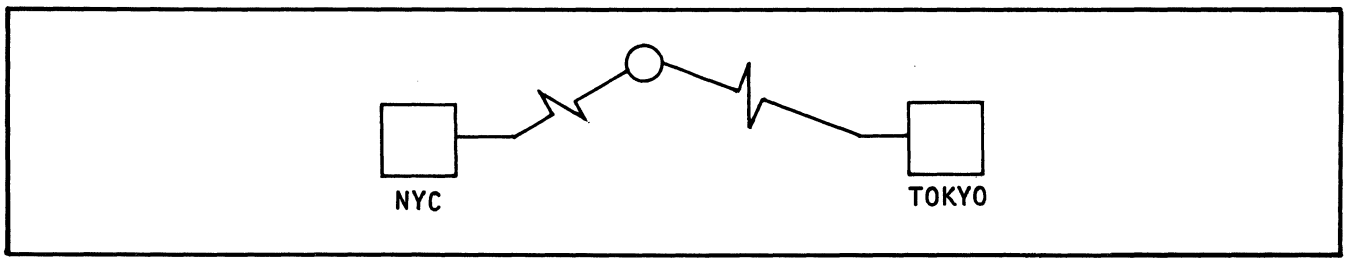
At 9600 bps, each bit takes 104 μsec to transmit

256 x 104 μsec = 26 ms per frame

I.9 CALCULATING ARQ SIZE

Example:

Consider a 6000 network operating between NYC and Tokyo, operating over a satellite.



ASSUME: one-way path delay = 350 ms
round trip path delay = 700 ms
trunk speed = 9600
FIFO = 256

FIRST: calculate the MINIMUM frame time

256 bits

At 9600 BPS, each bit takes 104 μsec to transmit

$$\frac{\text{256 bits per frame x 104 } \mu\text{sec per bit}}{\text{.26 ms per frame}}$$

THEN: calculate the ARQ value

```
   26    =  number of frames transmitted before first ACK received
26/700      (path delay)
  52
  180
  156
   24
```

THEREFORE: the calculated size is 26 but the valid parameters are 7, 15, 31, 63, 127.

So the parameter would be set to 31.

I.10 FRAME TRANSMISSION TIME

$$\text{Frame Transmission Time} = \frac{\text{frame length}}{\text{line speed}}$$

Frame length = ΣSW * 8 bits + overhead

Overhead = 27 bits per frame

ADDENDUM A

6030/6040 POWER SUPPLY ASSEMBLIES

AD.1 GENERAL

The external power supply shown in Figure AD-1 provides both ac and dc power requirements for the 6030/6040 Series INPs. It consists of a rack-mounted chassis that includes a power supply module, ac and dc distribution brackets, a transformer, and a relay.

Two models of the power supply are available: the dual +5 Vdc output assembly 37317G01 and the single +5 Vdc output assembly 37317G02. Both models are capable of meeting the power requirements of the 6030/6040 mainframe and two port nests. An auxiliary power supply is required for additional port nests: 37317G01 supports up to six port nests; 37317G02 provides power for up to four.

The assembly is installed in the rear of the equipment rack which must be equipped with intermediate rails to meet the mounting requirements of the power supply (refer to Figure AD-5). All Codex-supplied cabinets with 6030/6040 equipment have the required rails for the 6030/6040 mainframe, port nests, and external power supply. Equipment racks not having adjustable rails are not recommended. In the event that a cabinet must have intermediate rails installed, consult a Codex Applications Engineer about retrofitting.

AD.2 DESCRIPTION

The power supply assembly is made up of two parts, an ac distribution section and a dc distribution section, which are described separately in the following paragraphs.

AD.2.1 AC DISTRIBUTION

The ac power distribution consists of a transformer, relay, and an ac distribution bracket. The transformer is used to supply the low voltage for remote turn-on and to support the 115V fans for both 115 and 230 Vrms operation. The relay is a 4-pole, normally open, 24 Vac solenoid in which three of the four contacts are used; one for the power supply, and the other two for the fans.

The ac distribution bracket shown in Figure AD-2 contains three connectors (J8, J9, and J10), a 2-position slide switch (S2), a fuse (F1), a terminal board

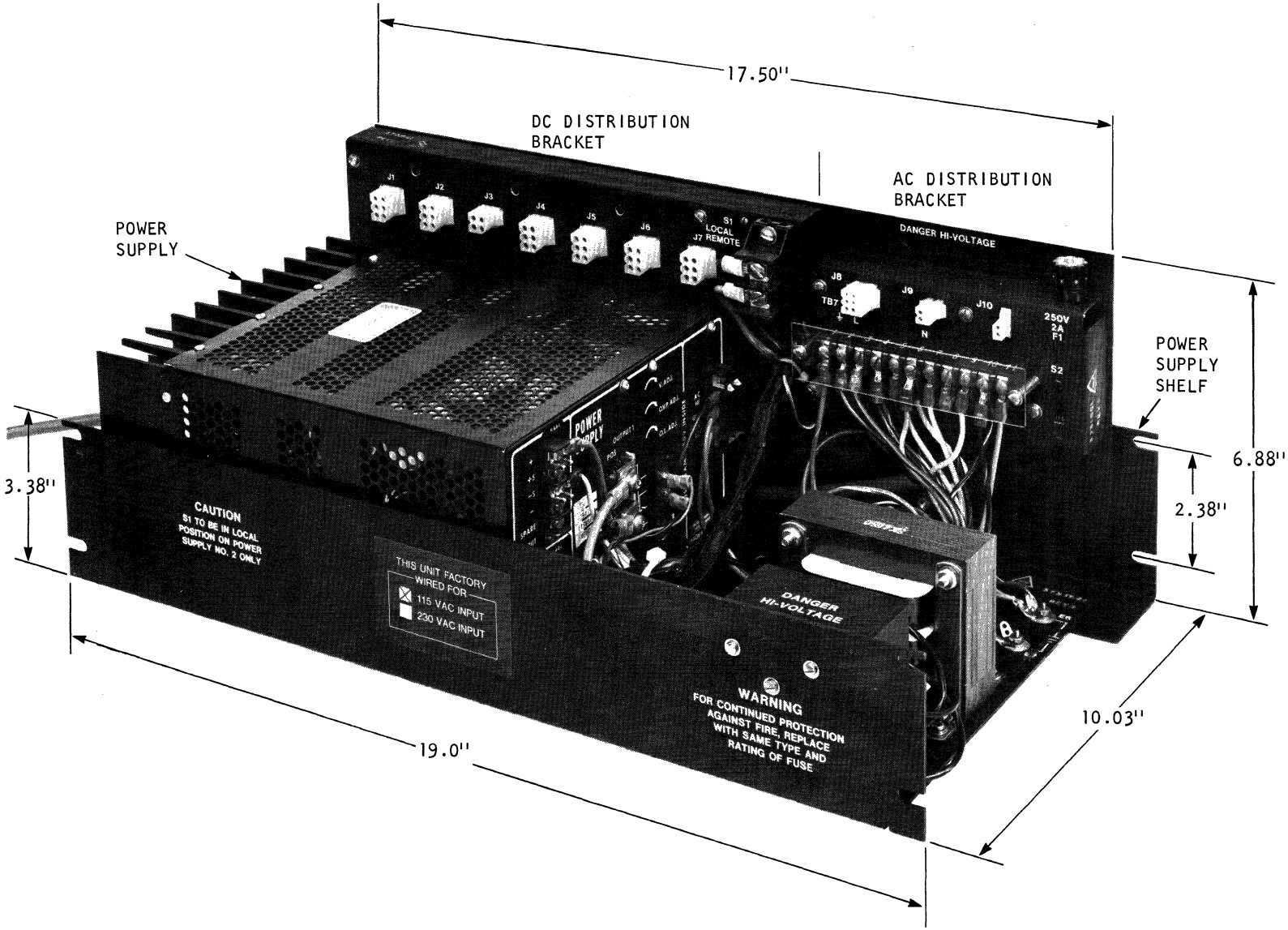


Figure AD-1. 6030/6040 Series INP's External Power Supply Assembly

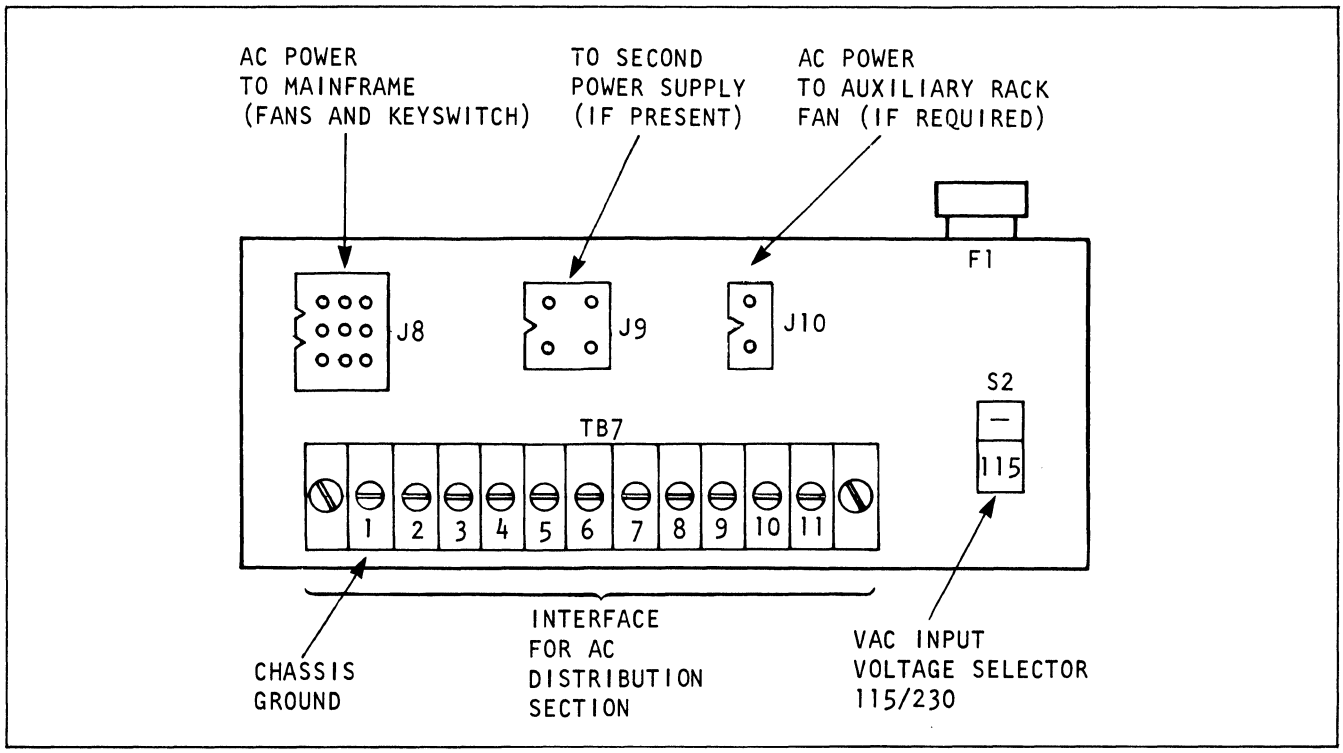


Figure AD-2
Ac Distribution Bracket

(TB7, and an isolated terminal (E5). Connector J8 is used to supply ac power to the fans in the mainframe and to the solenoid for the remote turn-on switch. J9 is used to connect a second power supply assembly's relay control winding in parallel with the primary power supply assembly so that both may be controlled by the remote turn-on switch. Connector J10 supplies 115 Vrms to power a rear-mounted fan assembly (if required).

The fuse on the ac distribution bracket provides protection for the transformer and cooling fans. Slide switch S2 selects the transformer's primary wiring configuration for either 115 or 230 Vrms operation.

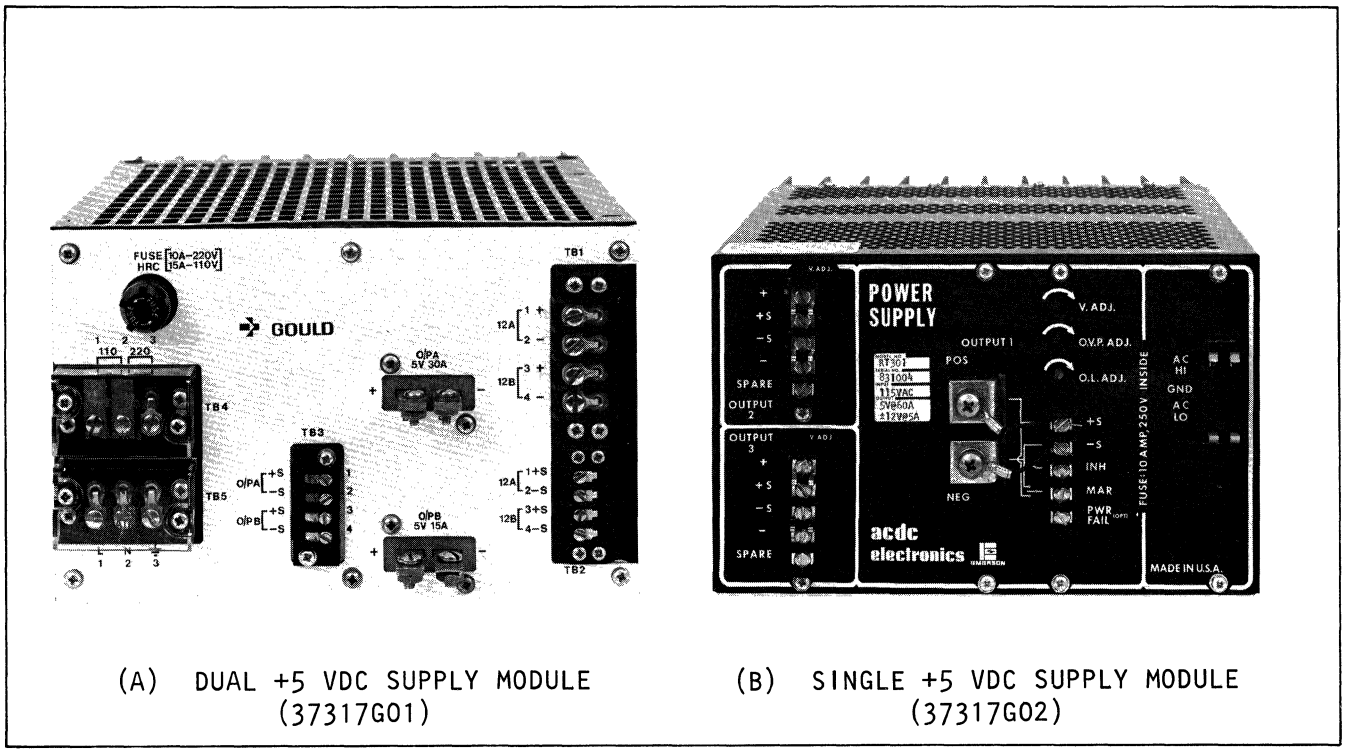
The terminal board (TB7) provides the interface for all components of the ac distribution section. Terminal TB7-1 provides the chassis ground connection for signal ground from the dc distribution bracket. When the chassis and signal grounds need to be tied together, a green wire with a yellow stripe coming from the dc distribution bracket is connected to TB7-1.

If the chassis and signal grounds must be isolated, then the wire is connected to E5 which is insulated from chassis ground. Terminals E6 and E7 are chassis ground connections for the entire power supply assembly.

AD.2.2 DC DISTRIBUTION

The dc power distribution consists of a purchased power supply module and a dc distribution bracket. Two types of power supply modules are available, based on the power requirements of the model 6030/6040 INP ordered. They include a dual +5 Vdc output and a single +5 Vdc output module (see Figure AD-3).

When used as the primary power supply, the dual +5 Vdc output assembly (37317G01) provides a +5 Vdc supply for the mainframe and another +5 Vdc output supply for two port nests. When 37317G01 is used as a second supply, the +5 Vdc output used for the mainframe can support up to four port nests (connectors J4-J7). These connectors must be used first, before connectors J1 and J2 can be connected to port nests 5 and 6. Two +12 Vdc outputs support additional system power requirements.



(A) DUAL +5 VDC SUPPLY MODULE (37317G01)

(B) SINGLE +5 VDC SUPPLY MODULE (37317G02)

Figure AD-3. Types of Power Supply Modules

The single +5 Vdc output power supply assembly (37317G02) provides just +5 Vdc supply to support the mainframe and two port nests. When used as a second supply, a maximum of four port nests can be supported. Two +12 Vdc outputs are also provided for additional system support.

The dc distribution bracket shown in Figure AD-4 contains seven connectors (J1 through J7), a terminal board (TB6), and a 2-position slide switch (S1). For 37317G01, connectors J1, J2, J4, J5, J6, and J7 supply power to the port nest when the power supply assembly is used as a second supply. For 37317G02, connectors J1 and J2 do not have +5 Vdc connected, and therefore cannot be used for port nest support. In both assemblies, connector J3 contains both the positive and negative 12-volt supply and the remote sense for the +5 volts to the mainframe.

CAUTION

For 37317G01, J1 and J2 port nest connections should be used when the mainframe is connected to the power supply assembly. For 37317G02, J4 and J5 are port nest connections when the mainframe is connected.

Terminal board (TB6) provides the interface for +5 Vdc to the mainframe (the red lead supplies +5 Vdc).

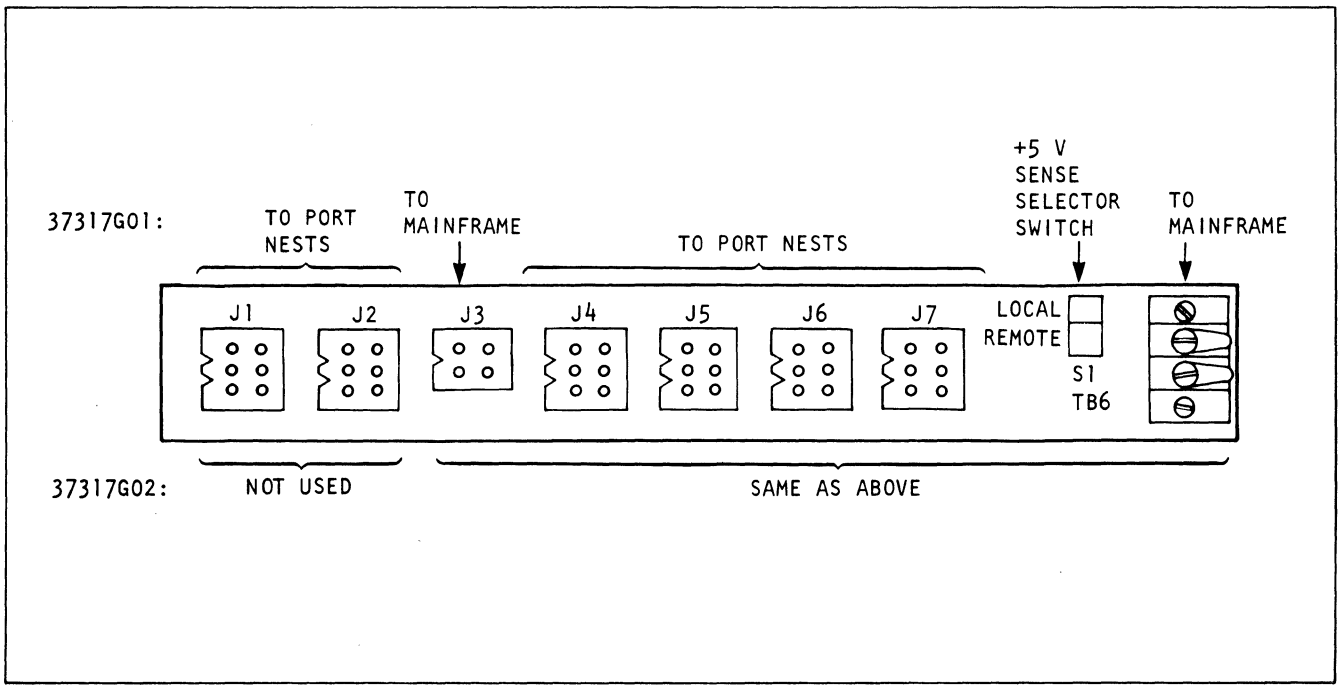


Figure AD-4. DC Distribution Bracket

The 2-position slide switch (S1) selects the location of the +5 V sense. In the remote position, the 5 volts are sensed in the mainframe. In the local position, the 5 volts are sensed at connectors J4 through J7.

AD.3 INSTALLATION

Installation of the power supply assembly is accomplished by positioning the unit in place, and then connecting the appropriate cables. This section provides the information required to plan and accomplish the mechanical and electrical installation of the assembly. Service personnel should become familiar with the complete installation procedure before attempting to install the unit.

AD3.1 TOOLS/EQUIPMENT/MATERIAL REQUIRED

The following tools and equipment should be available for use during installation.

a. Standard field service tool kit.
b. Digital voltmeter.

AD.3.2 MECHANICAL INSTALLATION

The power supply assembly is designed for installation in the rear of a 19-inch Codex-supplied equipment that has intermediate rails (see Figure AD-5). Users who already have 6030/6040 equipment installed in a Codex rack with these rails meet the mounting requirements of the external power supply. For a cabinet that must have intermediate rails installed, consult a Codex Applications Engineer about retrofitting.

Mechanical installation is illustrated in Figure AD-6 and accomplished as follows:

NOTE

The external power supply and its shelf is secured to the rails by the following pieces of equipment normally found in the rack cabinet.

Speed Nuts:	P/N 02502
Screws:	P/N 04355
or	
Black Screws:	P/N 34645-01
Black Washers:	P/N 03145

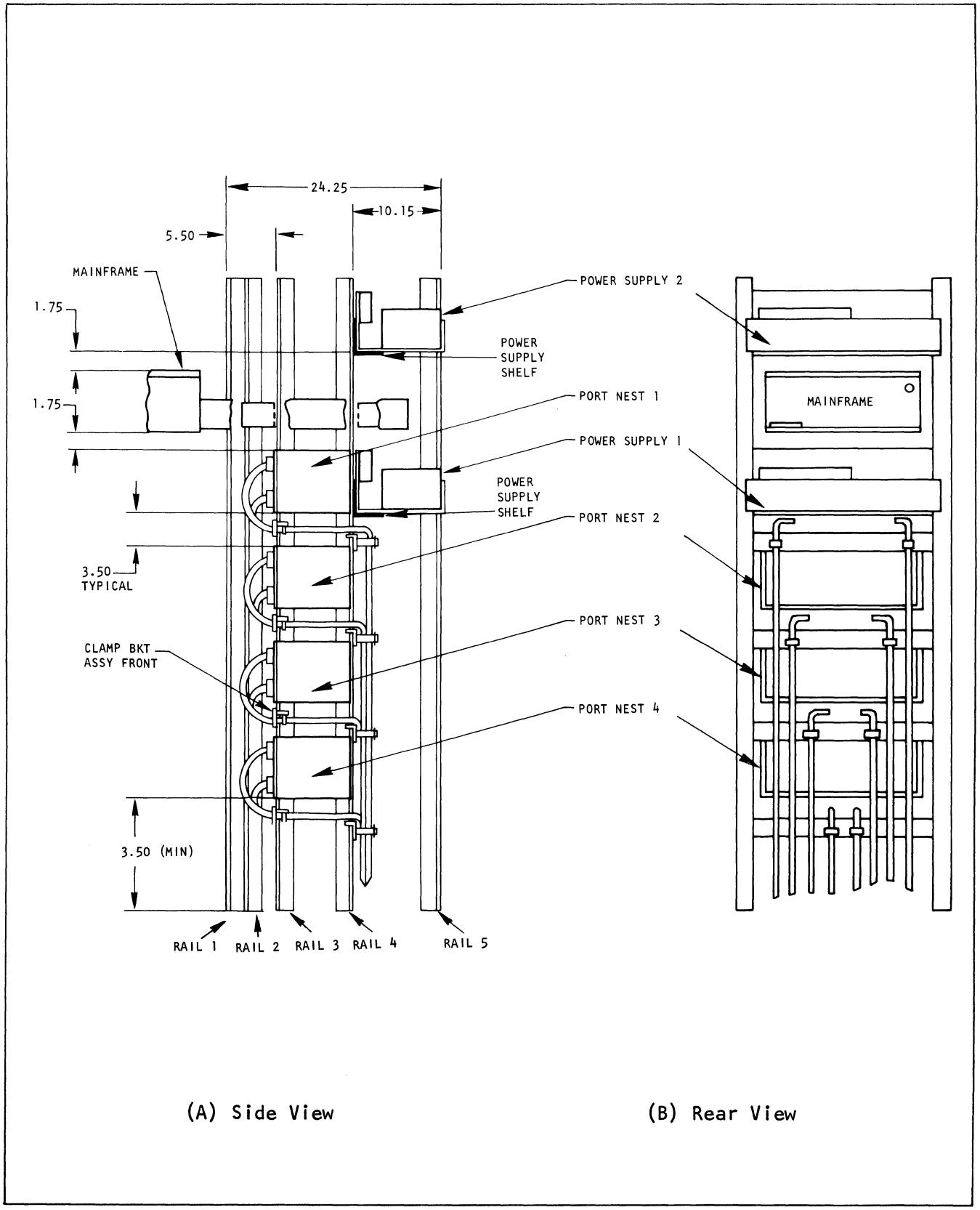


Figure AD-5. Typical Rack Configuration

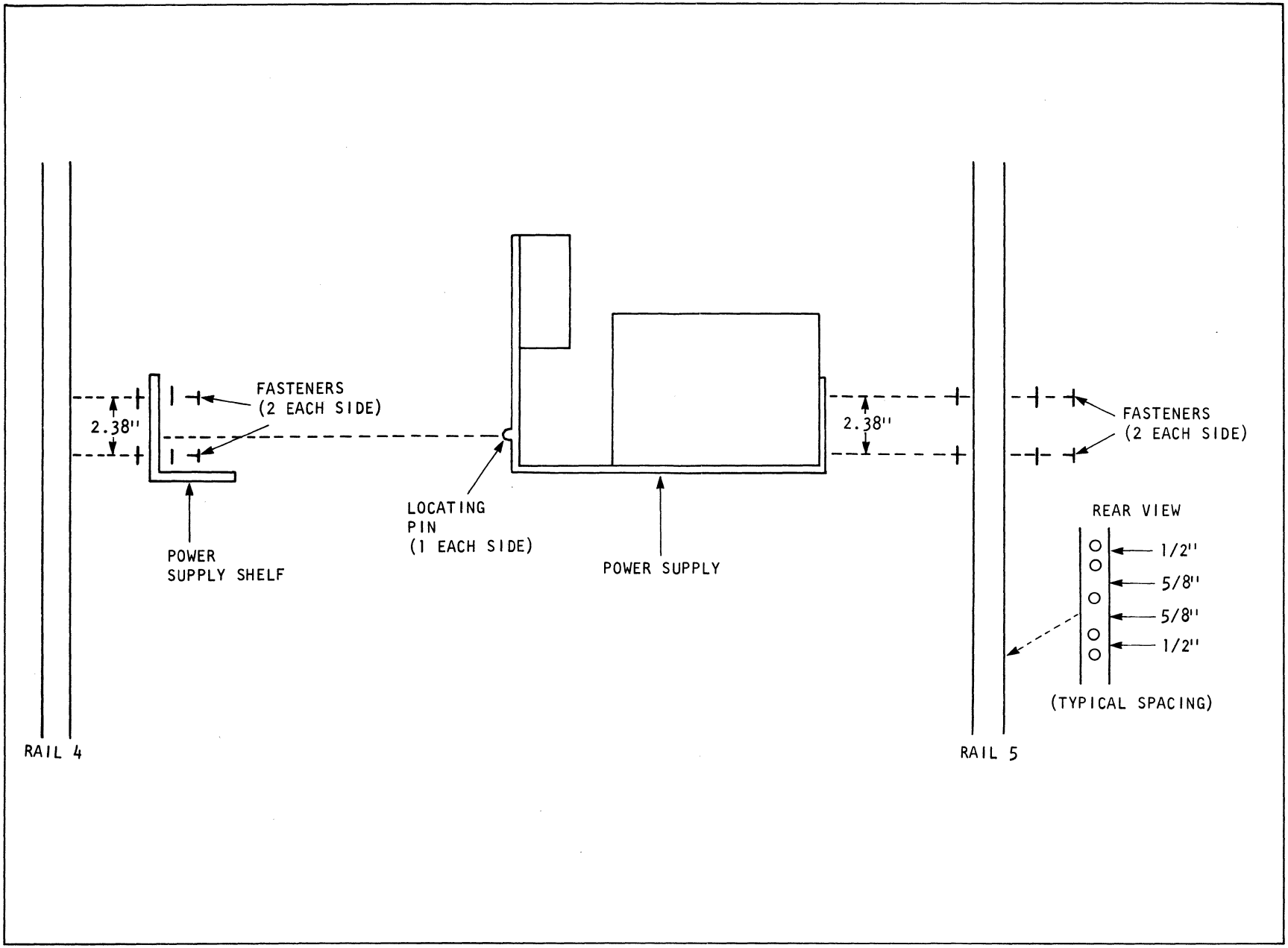


Figure AD-6. Mechanical Installation, Side View

a. Secure the power supply shelf bracket to rail pair #4 of the equipment rack by four speed nuts, washers, and screws in the angle brackets in the following positions:

1. For Power Supply 1 (located behind Port Nest 1): the bottom of the shelf should be flush with the bottom of Port Nest 1.

NOTE

This power supply furnishes power for the mainframe and two port nests.

2. For Power Supply 2 (located at the top of the rack): the bottom of the shelf should be 1.75" (4.45 cm) higher than the mainframe's top cover.

NOTE

A 37317G01 supply furnishes power for up to 6 additional port nests.

A 37317G02 supply furnishes power for up to 4 additional port nests.

b. Place the external power supply assembly on the support shelf, using the locating pins on the back of the power supply to ensure proper positioning.

c. Secure the power supply to rail pair #5 by fasteners in the angle brackets.

AD.3.3 ELECTRICAL INSTALLATION

Electrical installation consists of connecting all cables and wires to the appropriate connectors. Figures AD-7 and AD-8 depict the cabling configuration for power supply assembly 37317G01 and 37317G02, respectively (see Table AD-1). Connectors J1 through J5 support different functions based on the power supply assemblies unless otherwise specified.

NOTE

For 37317G01, connectors J1 and J2 support port nests when the power supply assembly is connected to a mainframe. For 37317G02, J4 and J5 provide support for port nests when the power supply assembly is connected to a mainframe.

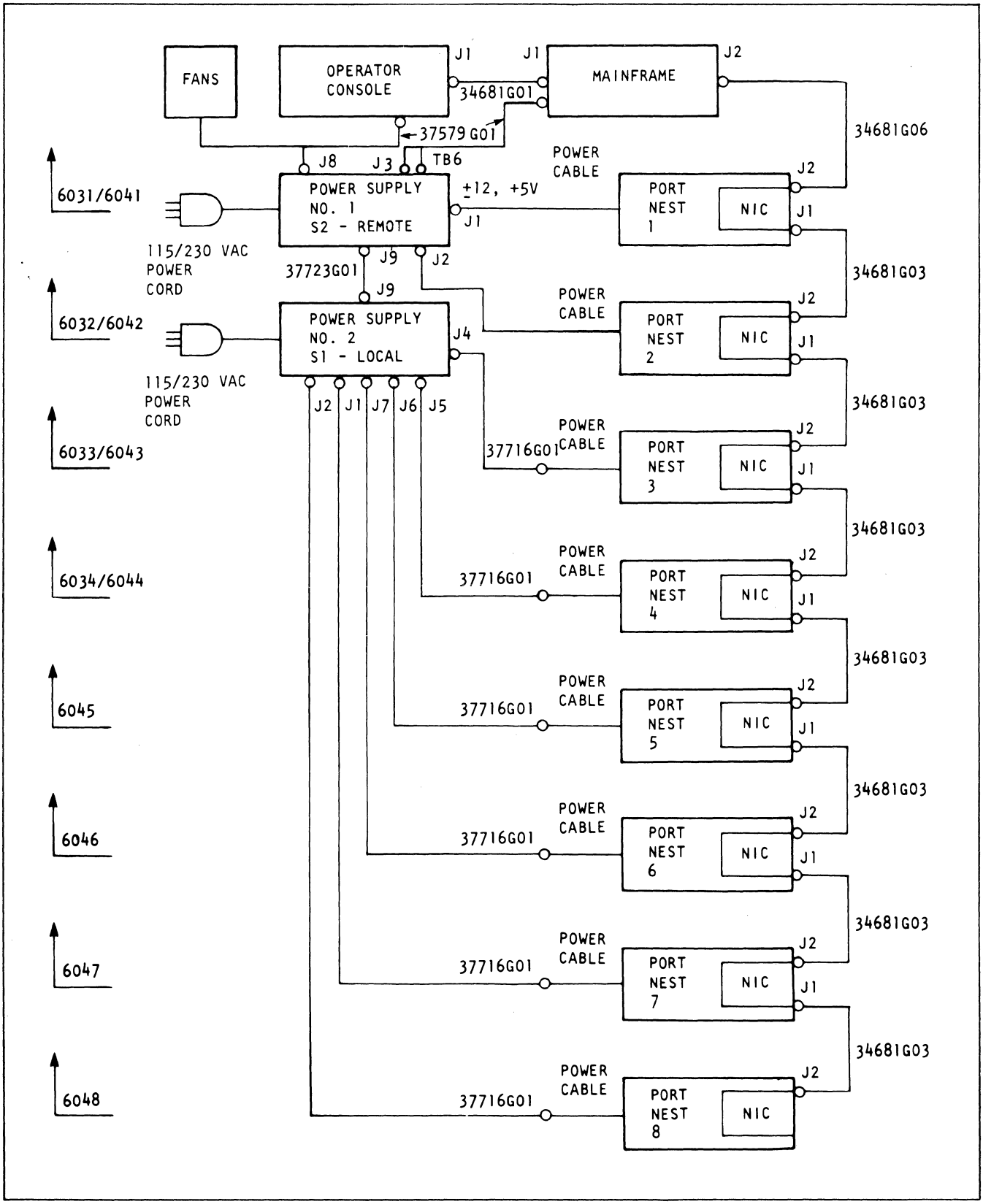


Figure AD-7. Cabling and Connections for 6030/6040 Series INP's with Power Supply Assembly (37317G01)

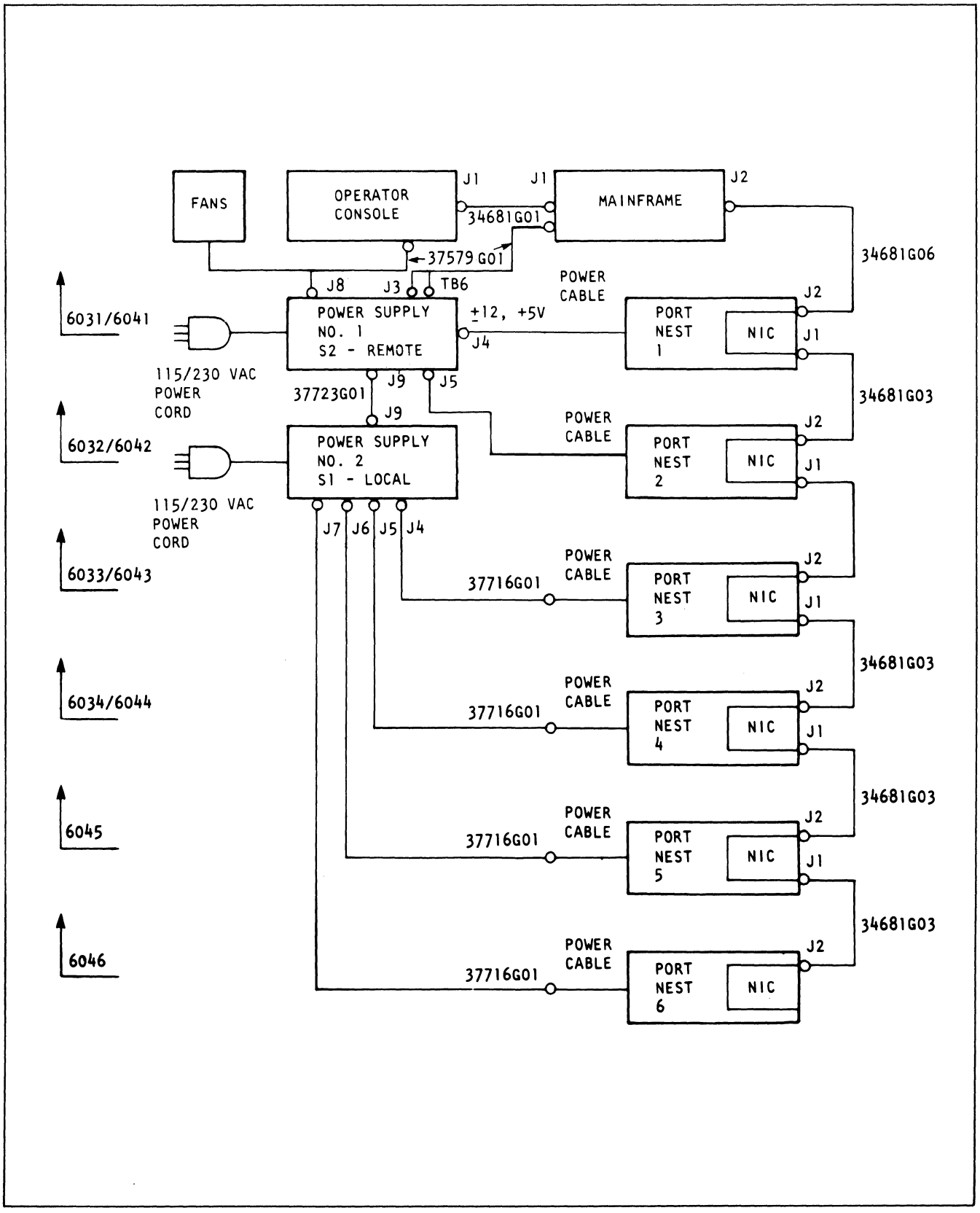


Figure AD-8. Cabling and Connections for 6030/6040 Series INP's with Power Supply Assembly (37317G02)

TABLE AD-1. INTERCONNECT GUIDE

Connector	Function
J1	Supports port nest for 37317G01; for 37317G02, this connector is not used.
J2	Supports port nest for 37317G01; for 37317G02, this connector is not used.
J3	Supports mainframe dc voltage requirements for both the 37317G01 and 37317G02.
J4	Supports port nest when 37317G01 is used as a second supply; for 37317G02, this connector supports a port nest.
J5	Supports port nest when 37317G01 is used as a second supply; for 37317G02, this connector supports a port nest.
J6	Supports port nest when used as a second supply.
J7	Supports port nest when used as a second supply.
J8	Supports mainframe ac voltage requirements.
J9	Used to interconnect two power supply assemblies.
J10	Supports an auxiliary rack fan (if required).
TB4	110/220 Vrms straps on the dc supply module (37317G01 only).
TB6	+5 Vdc interface to mainframe.
TB7	Interface for ac distribution throughout assembly.
E5	Insulated terminal for signal gound at the ac distribution bracket.
E6	Chassis (earth) ground.
E7	Chassis (earth) ground.

To configure the power supply assembly for either 115 or 230 Vac power input, set switch S2 on the ac distribution bracket and the external strap TB4 for 37317G01 or the internal strap for 37317G02 to the proper position. Connectors J3, J8 and TB6 support the mainframe and J1 and J2 of 37317G01 or J4 and J5 of 37317G02 support the two port nests.

NOTE

When connecting mainframe cable 37579G01 to the power supply, clamp the cable as shown in Figure AD-9 using the clamp assembly.

CAUTION

When 37317G01 is used as a second supply, connectors J4 through J7 must be used first, with J1 and J2 used only for connection to port nests 5 and 6.

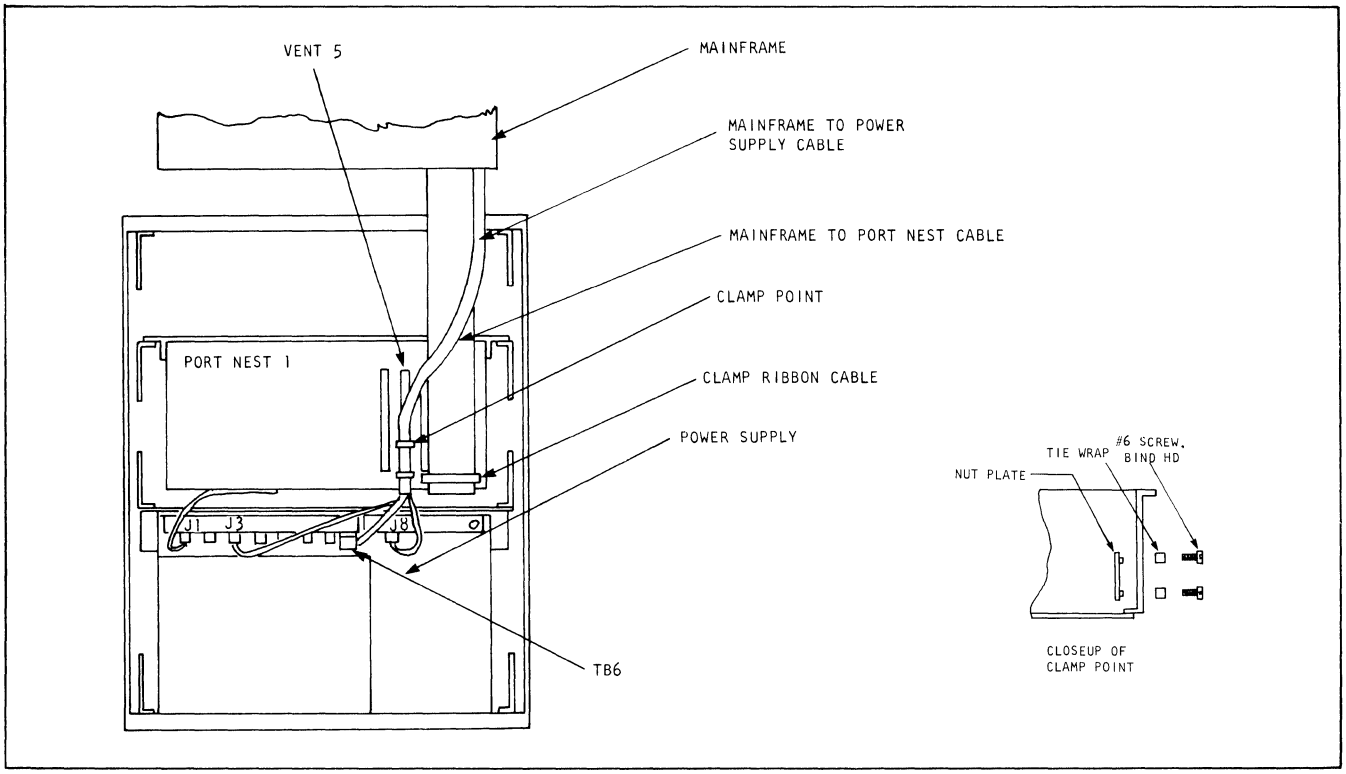


Figure AD-9. Mainframe Cable Routing

When used as a second supply, 37317G01 will support a maximum of six port nests and 37317G02 will support a maximum of four nests. Connector J9 is cabled to J9 of the first supply and switch S1 on the dc distribution bracket should be set to the LOCAL position. If this switch is not in the LOCAL position, the +5 Vdc supply for connectors J4 through J7 will not be regulated. Port nests are connected to J4 through J7, J1, and J2 for 37317G01 and to J4 through J7 for 37317G02.

AD.4 MAINTENANCE

The power supply assembly requires no special maintenance to keep it in good working order when operated in an environment free from extremes of temperature, humidity, appreciable shock, and vibration. However, the operator can perform routine inspections at varied intervals to ensure that the ac line cord and interconnect cabling are free of cuts, cracks, or any other damage. He should also inspect each terminal board connection for signs of corrosion.

AD.4.1 FIELD SERVICE REPAIR/REPLACEMENT

Field repair of defective power supply assemblies to the component level is not recommended. The major objective of effective maintenance is to restore the system to operational status as soon as possible; therefore, it is recommended that faulty power supply assemblies be entirely replaced with a spare unit.

AD.4.2 RETURN OF UNITS

Defective units must be returned to Codex Corporation, Department ERR, 100 Hampshire St., Mansfield, Massachusetts 02048, for repair. An equipment repair tag, indicating the type of failure, part number, etc., should be attached to each returned unit (see Figure AD-10).

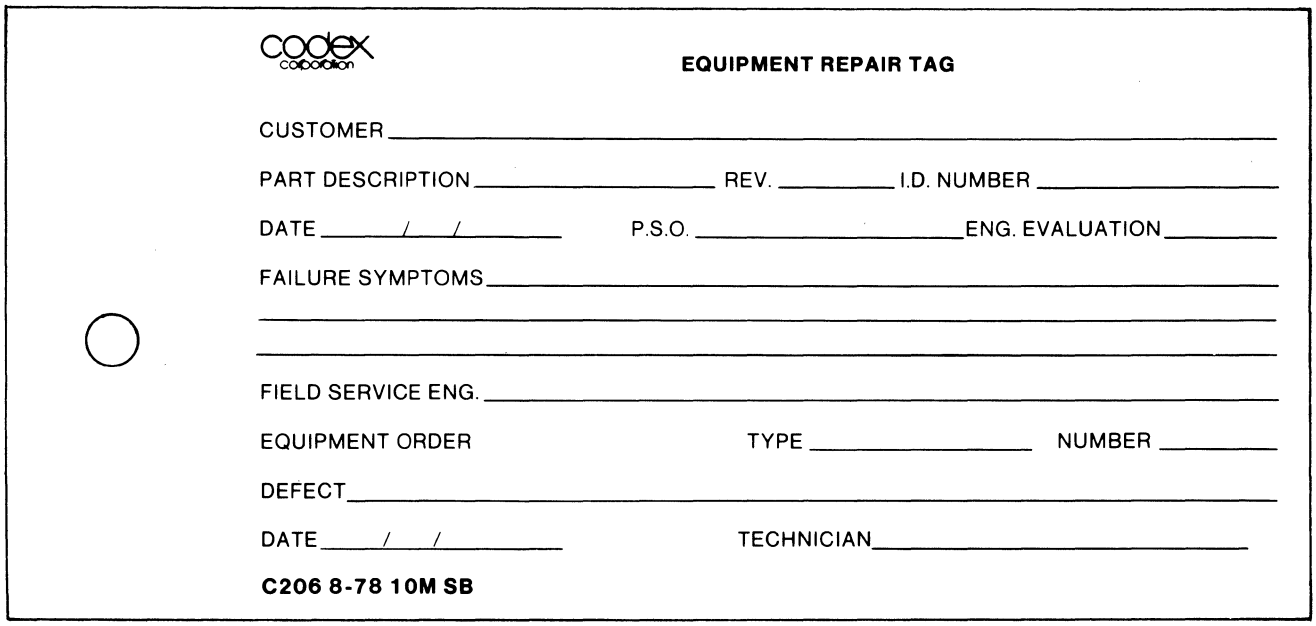
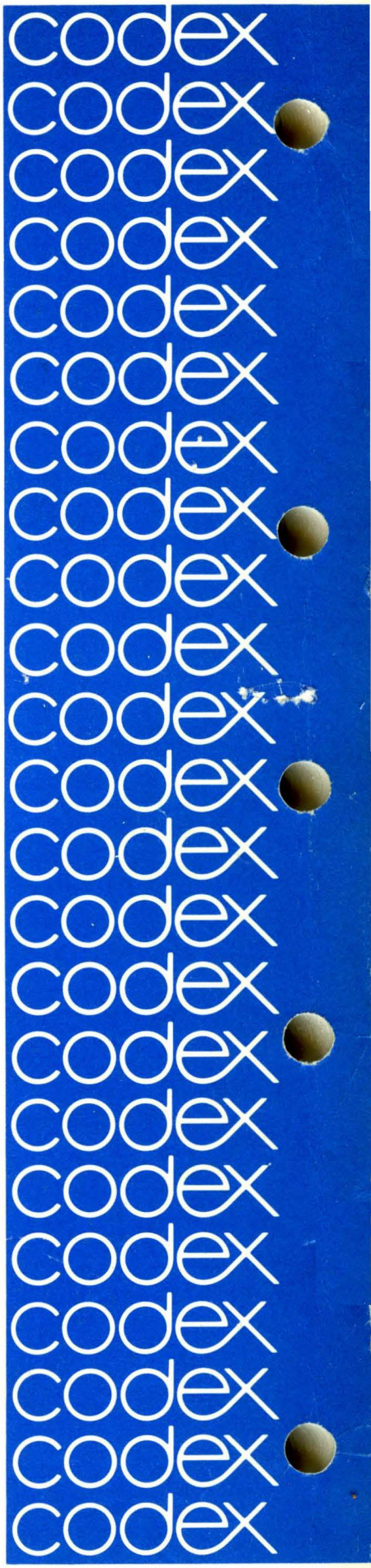


Figure AD-10. Equipment Repair Tag

codex
corporation

CODEX CORPORATION
20 Cabot Boulevard
Mansfield, Massachusetts 02048 U.S.A.
CODEX EUROPE S.A.
Brussels, Belgium
CODEX FAR EAST
Tokyo, Japan
ESE LIMITED
Toronto, Canada



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