HP 9000 Series 500 Computer Systems

HP 27140A

Asynchronous 6-Channel Multiplexer (with Modem Control)

Hardware Reference Manual

Card Assembly: 27140-60001

(hp) HEWLETT PACKARD

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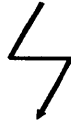
Safety Considerations

General

This product and related documentation must be reviewed for familiarization with safety markings before operation.

Safety Symbols

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.

Indicates hazardous voltages.

Indicates earth (ground) terminal. This symbol is sometimes used in the manual to indicate circuit common connected to a grounded chassis.

Warning

The warning sign denotes a hazard. It calls attention to a procedure, practice,or the like, which, if not correctly performed or adhered to, could result in injury. Do not proceed beyond a warning sign until the indicated conditions are fully understood and met.

Caution

The caution sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

Servicing

General

Caution   STATIC SENSITIVE DEVICES

When any two materials make contact, their surfaces are crushed on the atomic level and electrons pass back and forth between the objects. On separation, one surface comes away with excess electrons (negatively charged) while the other is electron deficient (positively charged). The level of charge that is developed depends on the type of material. Insulators can easily build up charges in excess of 20,000 volts. A person working at a bench or walking across a floor can build up a charge of many thousands of volts. The amount of static voltage developed depends on the rate of generation of the charge and the capacitance of the body holding the charge. If the discharge happens to go through a semiconductor device and the transient current pulse is not effectively diverted by protection circuitry, the resulting current flow through the device can raise the temperature of internal junctions to their melting points. MOS structures are also susceptible to dieletric damage due to high fields.

The resulting damage can range from complete destruction to latent degradation. Small geometry semiconductor devices are especially susceptible to damage by static discharge.

The MUX card is shipped in a transparent static shielding bag. The card should be kept in this bag at all times until it is installed in the system. Save this bag for storing or transporting the card. When installing the card in the system, do not touch any components. Hold the card only by its edges or extractor levers.

Preface

This manual describes the HP 27140A Asynchronous 6-Channel Multi-
plexer Interface Card with Modem Control. This multiplexer is used in
HP 9000 Series 500 computer systems.

The multiplexer accesses up to six remote or local terminals conforming to
EIA specifications RS-232-C or CCITT recommendations V.24 and V.28.
These protocols are designed specifically for use with modems to transmit
data over telephone networks worldwide. (CCITT V.24 is the signal
naming and specification recommendation, and CCITT V.28 is concerned
with the electrical characteristics of those signals.)

To ensure proper installation and operation, use this manual along with
the instructions found in the computer system manuals.

Table of Contents

1 General Information

This manual describes the the HP 27140A Asynchronous 6-Channel Multi-plexer (MUX) Interface. We use the terms "multiplexer", "MUX", "HP 27140A", and its full name interchangeably to describe the entire product. The terms "board", "card" and "PCA" designate the printed circuit assembly as distinct from the entire product.

Description

The HP 27140A accesses any of the computers using the Hewlett-Packard Channel Input/Output backplane standard. (Channel I/O is a Hewlett-Packard standard defining the electrical and physical characteristics for an Input/Output system.) The multiplexer supports RS-232-C and CCITT V.24 and V.28 communications standards.

The factory setting for the information transmission rate is 9600 baud. The MUX is also programmable to process rates from 50 to 19200 baud. See Chapter 2, "Installation and Configuration", for the information needed to use the six communications ports.

This multiplexer provides for Input and Output (I/O) through multiple modems from remote locations via telephone lines. This product has the appropriate control lines for connection to any modem which adheres to RS-232-C or CCITT V.24 and V.28. There are no modems included with this multiplexer. The MUX also communicates with local, direct-connect devices, and supports any mix of six peripherals while using only one card slot in the computer backplane.

Your local telephone company or your long distance carrier will be able to install conditioned telephone lines if your modems or applications require them.

Specifications

Features

Six full duplex asynchronous serial I/O ports with 10 wire modem control capability (satisfies European licensing requirements).

EIA RS-232-C and CCITT V.28 compatibility.

Full duplex modem operation only.

Support for use as a *local* system console on port 0.

Programmable data rates for each channel.

Programmable number of stop bits: 1, 1.5, 2.

Programmable parity: odd, even, none.

Programmable character size: 5, 6, 7, or 8 data bits.

Parity, overrun, framing error check detects transmission faults.

Firmware based self test helps assure card integrity.

Programmable device XON/XOFF handshaking to pace MUX output data transmission.

On-board buffering with DMA capability to send/receive data for multiple ports in a single transfer.

Functional Specifications

Capacity

Channels:	Six channels — full duplex.
Buffering:	On card buffering with DMA capability to send/receive for multiple ports in a single transfer to reduce host CPU interrupts and increase throughput.
Transmit Buffer Size:	255 bytes per port.
Receive Buffer Size:	Effective 1Kbyte buffer allocated dynamically over all six ports.

Communications   **Interface Level:**   RS-232-C and CCITT V.28.

Data Rates: Defaults to 9600; software programmable to any of 16 transfer rates: 50, 75, 110, 134.5, 150, 300, 600, 900, 1200, 1800, 2400, 3600, 4800, 7200, 9600, and 19,200 baud.

Throughput: Supports six interactive terminal users running character mode at 19,200 baud. Other RS-232-C applications receiving and sending simultaneously should be run at 9600 baud or slower. (Refer to Table 1-1 for details on transmission rates.)

Modem Support: Originate mode.
Auto-answer mode.
Modem connection timer.
Lost receiver ready timer.
No-activity timer.
Host control of every card output modem line.

Communications Mode: Asynchronous, bit serial.

Break Detection: Break conditions are recognized by the card and cause interrupts to the host. The MUX can also generate break conditions as they are needed. A break is a "space" condition for two consecutive character times.

Optional Handshaking: All handshaking is optional and programmable. The protocol characters are also programmable. Device controlled XON/XOFF is performed at the card level.

Edit Functions

The MUX passes edit functions (i.e., backspace, character delete, etc.) to the host. They are then managed by the host operating system.

Electrical and Physical Specifications

Direct Current Requirements

Voltage	Typical Current	+ Two σ (Standard Deviation)
+5	1.380 A	2.298 A
+12	0.084 A	0.159 A
-12	0.125 A	0.150 A

Physical Dimensions

Length:	17.72 cm	(7 in)
Width:	17.70 cm	(7 in)
Thickness:	2.95 mm	(0.12 in)
Weight (card only):	270 grams	(9.5 oz)

Environmental Specifications

The MUX card is sensitive to humidity and temperature. The card operates between 0 and 50°C and should be stored only where the temperature will range from -40 to 75°C. Humidity (@ 40°C non-condensing) should be maintained between 5% and 95%.

Firmware

The PCA includes one EPROM (Erasable, Programmable, Read Only Memory) chip. The EPROM contains the on board self test and download monitor programs. Self test is described in Chapter 4, "Troubleshooting". The download monitor directs the downloading of control codes for board operation and insures that they are correct and stored properly. The EPROM also provides enough on board intelligence to use port 0 for communications with a terminal. This feature is typically used for the system control console for the initial system boot-up.

Equipment Supplied

The HP 27140A is designed for HP 9000 Series 500 computers:

Description	Part Number
Multiplexer PCA	27140-60001
RS-232-C Junction Panel	28659-60005
Cable, PCA-to-Panel, 1 metre	28659-63002
This Reference Manual	27140-90007

Options and Additional Equipment

The following items are also available through HP Sales and Support Offices if you did not order them with the system. The 10-metre extension cable connects to the standard cable for greater flexibility in installation. Use of the Test Hood is described in Chapter 4, "Troubleshooting".

27140A

Option #001:	Extension cable 10 metre, p/n 28659-63004
Option #019:	19 inch Rack Mounting Bracket Kit, p/n 5061-4962
Option #540:	Mounting Bracket Kit for 9040A Systems, p/n 5061-4963
Option #550:	Mounting Bracket Kit for 92211R Cabinet, p/n 5001-5280

27140-60003   Test Hood

Suggested Cables for Use with Terminals

The following cables are designed to connect the MUX RS-232-C Junction Panel to your terminals:

- HP 13242M (5 metres)

- HP 13242N (5 metres)

- HP 13242Y (5 metres)

- HP 92219Q (3.8 metres).

Suggested Cable for Modem Installations

The HP 92219Q cable, 5 metres long, is designed to connect the MUX to a modem.

RS-232-C Junction Panel

The RS-232-C Junction Panel (28659-60005) is a six-port junction box which provides serial, asynchronous interconnections between the multiplexer card and a modem or terminal device. See Figure 1-1. This panel has one 62-pin receptacle and six 25-pin D subminiature female connectors on the front.

Note

This RS-232-C Junction Panel is considered a field replaceable unit and should be replaced on failure. Hewlett-Packard does not support user maintenance of this component. Contact your HP Sales and Support Office for additional information.
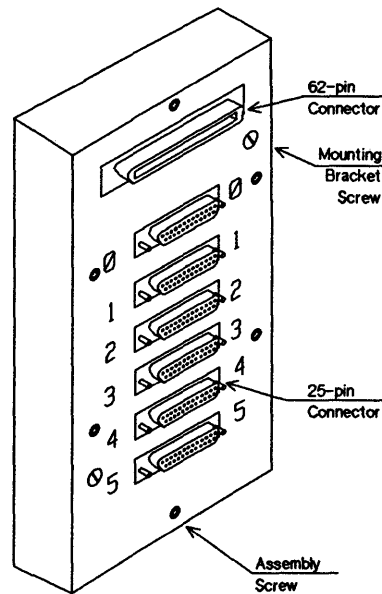
Figure 1-1. RS-232-C Junction Panel HP 28659-60005

Documentation Required for Installation

To insure proper installation of the multiplexer, you should study this manual, the computer system reference manual, and the reference and installation manuals for all of the peripherals you intend to attach to the MUX.

Product Identification

The interface card supplied with the HP 27140A product is identified by a part number (27140-60001) and a date code consisting of a letter and four digits (A-2450) printed below the part number. This information is printed on a label affixed to the card. The label also has two other alphameric fields. Both are production sequence numbers, and will not affect you. However, your CE may need to refer to them occcasionally, so it is a good idea to record all of this information.

The sticker will look like this:

    27140-60001   XX
        A-2450   XXXXXX

Above, "X" represents any alphanumeric character. Do not remove the identification label. If it is missing, service for your MUX may be delayed while the board is identified.

Support Strategy

The HP 27140A Multiplexer Interface card is a Field Replaceable Unit (FRU). The electronic components and circuitry on the card are not repairable except under factory conditions. Exchanging boards also significantly reduces downtime compared to removing, repairing and replacing the original card. Whenever the PCA is replaced, remove the EPROM and retain it for insertion in the replacement card, as the new card will not have an EPROM on it. Insure that precautions are taken to protect the EPROM from static discharge.

Component level repair is not supported by Hewlett-Packard. Users who attempt repair at this level may invalidate their warranties. The sole exception to this guideline is the EPROM. Your HP Customer Engineer will remove it, have it tested and replace it if necessary.

Cable Repair

The multiplexer is designed with an extremely compact cable connector. Because of the tolerances for the cable connector it is impossible to repair or modify the board connector end of the PCA-to-Panel cable. **Any failure of the cable at the board connector end requires replacement of the cable assembly.**

The junction panel end of the cable was fabricated using a conventional connector. Tables in Chapter 6, "Reference", list the pin assignments for this cable.

User Responsibility

There are no physical adjustments to make on this card nor is any special preventive maintenance required. You may want to clean the computer card cage occasionally. If so, your computer manual will have instructions on this subject. In case of apparent card failure, run the self test described in Chapter 4. If the board fails, call your HP Customer Engineer.

System Console

If the system console is attached to port 0 of the RS-232-C Junction Panel, the resident firmware on this card will transmit to and receive from the console at 9600 baud, using 8 bit ASCII characters with no parity check bit. There will be one stop bit.

Buffer Capacity

The HP 27140A uses a 4Kbyte buffer to temporarily store data to be sent to the host computer. Because of the distinctive system used to identify each character received, this capacity provides actual character storage equal to 1Kbyte. Buffer space is dynamically allocated to the six ports as they require it. Thus, no one port has specific buffer address space dedicated to it. This buffer capacity limits the throughput of the MUX. Table 1-1 lists four possible combinations of baud rates for the HP 27140A.

Table 1-1. Buffer Capacity Baud Rate Limits

Port	Baud Rate			
	1	2	3	4
0	19200	19200	19200	9600*
1	4800*	19200	19200	9600*
2	4800*	19200	2400*	9600*
3	4800*	unused	2400*	9600*
4	4800*	unused	2400*	9600*
5	4800*	unused	2400*	9600*
*Slower rates may be used.				

All of these speeds assume full duplex operation and near 100% utilization of channel capacity. Operation at higher speeds than noted may result in DATA OVERRUN errors.

| Note |

When all six terminals are being used by people in interactive programs, it is unlikely that the users could overload the buffer, since human beings do not enter data rapidly enough to use the potential of 19200 baud. In this case, all six ports could be programmed to 19200.

2   Installation / Configuration

Please read all of the sections of this chapter which apply to your computer before proceeding with the installation of your HP 27140A Multiplexer.

Installing this PCA involves the following steps:

1. Unpacking and examining the card (temporary storage is also discussed).

2. Inserting the card into the computer card cage.

3. Testing the unit.

4. Attaching MUX-to-Junction Panel, Modem, and RS-232-C direct connect cables.

After installation, the card is configured by programmatic instructions.

| Caution | Many of the components of the HP 27140A are susceptible to destruction or degradation by electrostatic discharge. See the safety considerations in the front of this manaul. To handle this card, use only the edges and extractor levers to avoid damage to components. |

Site Preparation

There is no site preparation required for this product other than proper installation of the host computer.

Using the MUX will require that several cables be attached to the RS-232-C Junction Panel. Consideration must be given to locating the RS-232-C Junction Panel mounting bracket so that these cables present no problems to traffic or maintenance of the computer. The RS-232-C standard limits the length of cable from the card itself to any terminal device to a total of 15 metres (50 feet).

Unpacking and Examining the PCA

Remove the PCA from its protective envelope and place it *on anti-static material* in a clean workspace. Inspect the card itself for damage or missing parts, and verify the part number. Also, check the other subassemblies for damage.

Storage

If you store the card for any reason, place it in an electrically and mechanically safe container. The safest place for the PCA is in the computer card cage. If you must store the PCA outside of the computer, use the original packaging material or have the card packed by a commercial firm. You must protect this PCA from static electricity and impact. Place the package containing the card upright (like a book on a shelf), to avoid crushing.

Checking Power Requirements

This card draws its electrical requirements from the host computer. You must verify that the computer can accommodate this additional power load. Refer to Table 2-1 for the power requirements of the MUX.

Table 2-1. Power Requirements for the HP 27140A

Voltage	Power	
	Mean level	2σ level
+5	6.90W	12.06W
+12	1.01W	1.90W
-12	1.62W	1.80W

Power Availability Formula

Mean power required can be thought of as the nominal power requirement of the card. For the purposes of calculating probable power usage, use the mean power level figures plus 20% as the maximum power requirement. Check the computer system manual for the total power supplied to the backplane at each voltage level. After summing the power figures (in watts) for the other cards in the computer, subtract this total from the wattage available. This difference is the power available for use by the HP 27140A.

$$\text{Power Available for the MUX} = \text{Power Supplied by the Host} - \Sigma \left\{ \begin{array}{l} \text{Power Loads of} \\ \text{all other cards} \end{array} \right\}$$

There must be more power available to the MUX than the requirement at each voltage level.

$$\text{Power Available for the MUX} > \text{Power Required by the MUX}$$

If the power available is too low to meet the requirements of the MUX at each voltage level, you must augment the computer power supply, or remove another board before installing the card. Contact your HP Sales and Support Office for details.

Inserting the Card

Refer to the *System Installation and Configuration Guide* included with your system for the proper placement and positioning of the card.

Warning

Before attempting to install this (or any) PCA, follow the computer "shut down" procedure and TURN OFF the computer power supply. Failure to disconnect the current could result in an electrical shock, and it may damage both the computer and the card. Any resultant damage will not be covered by warranty.

The 27140A MUX card uses friction at the backplane contacts to hold the card in place. Hold the card firmly by the extractor levers and gently push it into the track-like guides of the slot. Once the card touches the backplane connectors (you'll notice the resistance), press it firmly into the backplane. As the card reaches its limit of travel, the free ends of the extractor levers will start to fold down against the card. Press on them until the card is fully seated in the backplane.

Removing the Card

To remove the card, grasp the free ends of the extractor levers, and pivot them toward you (away from the card cage). This will force the card out slightly from the connectors at the backplane. Continue pulling, but be careful to pull both levers evenly to avoid jamming the PCA or breaking its components. Use the same caution against static build-up and discharge discussed in the paragraph on unpacking the card while handling the board once you have removed it.

Note

Repair or replacement of other electronic components could invalidate your warranty.

Testing the Unit

Once you have correctly installed the PCA you should test it to verify proper operation of the MUX. While self test may be run with or without the connecting cable attached to the board, you should initially run the test before attaching it. Self test is executed automatically on power up. The information you need to interpret the results of self test are found in Chapter 4. Basically, if the LED on the card stays off after 45 seconds, the card is working correctly.

Attaching the Cables

The cables you will use are the MUX-to-Junction Panel cable and the RS-232-C cables attached to your peripheral devices. Before attaching the peripheral cables to the junction panel, check the manuals for any specific cabling requirements.

MUX-to-Junction Panel Cable

The MUX-to-Junction cable is a 62-conductor cable with a proprietary female connection which fits the card edge connector. This fitting is black plastic with a metal ground strip on the back. The RFI grounding clip (grommet) approximately two inches (5 cm) from the connection will help you identify it. Press this connection firmly onto the PCA mounted connector with the cable exiting the connector on the bottom. Press the grommet firmly into the slot on the cable grounding bus below the card cage. If your computer is equipped with a retaining spring below the grounding bus, ensure the grommet is fully seated in the spring. These steps are critical to reducing Radio Frequency Interference from an ungrounded cable.

Since this cable is one metre long (just less than 40 inches), you should mount the RS-232-C mounting bracket on the computer body, or very near it. The 10-metre optional extension cable will allow you to place the panel in a more convenient location, should this be necessary. If you have the extension cable, remember to include its length in all card to device cable length totals. Figures 2-1 through 2-3 show the various mounting bracket options available. Once the cable end is outside the computer, and the bracket with the RS-232-C Junction Panel is mounted, the 62-pin female connector at the free end of the cable is pressed into the male connector on the panel front. Using the mounting bolts provided, secure the connector to the receptacle.
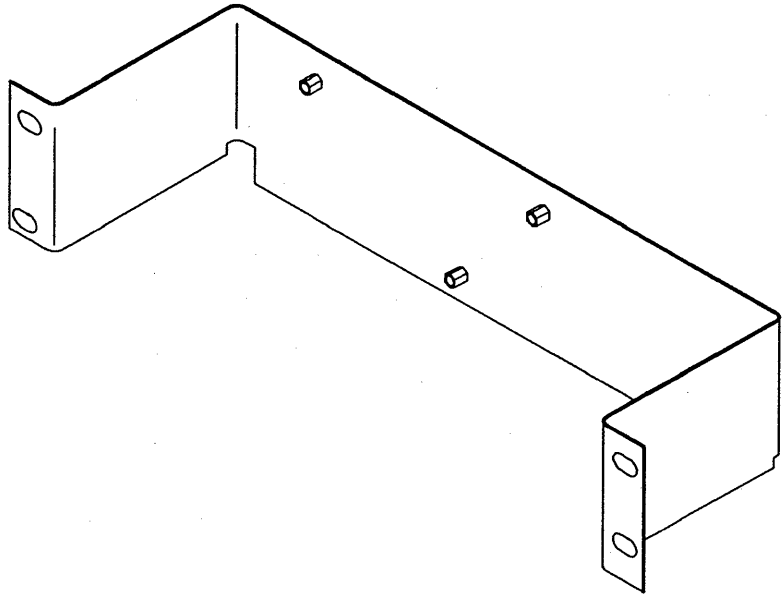
Figure 2-1. HP 27140A Option #019
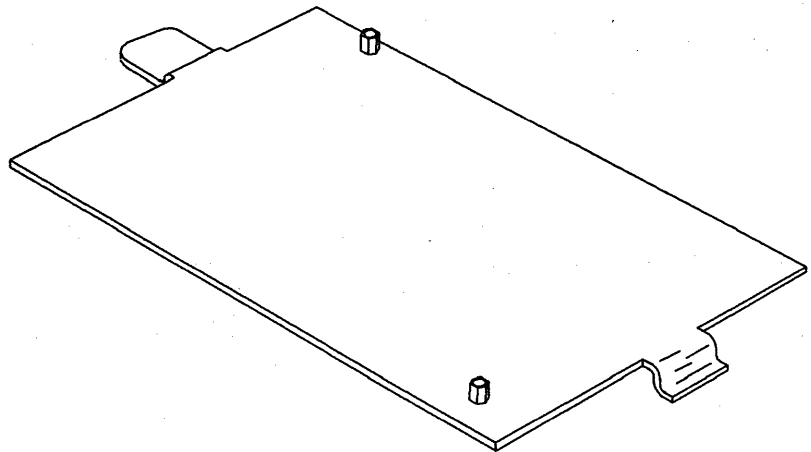
Figure 2-2. HP 27140A Option #550
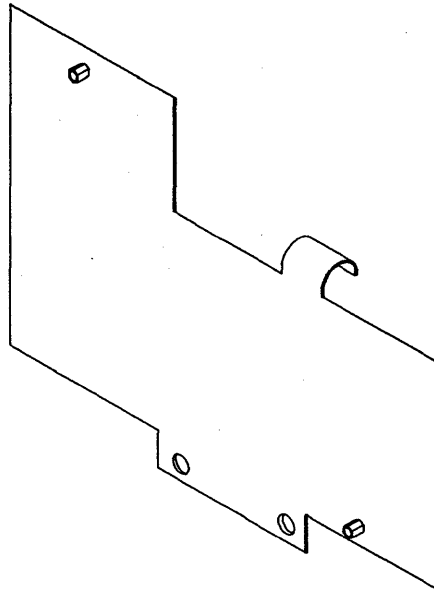
Figure 2-3. HP 27140A Option #540

RS-232-C Cables

The peripheral devices must be connected to the panel according to the directions in their manuals. Generally, one terminal of an RS-232-C cable will be connected to the receptacles on the panel, and the opposite ends will be connected to their respective receptacles on the device. Cable connectors should be secured in place with screws if they are provided.

For customers fabricating their own cables, Chapter 6 contains tables with the pin assignment specifications. When making these cables, remember that the ports are each wired to emulate DCE.

Configuration

As stated in Chapter 1, "General Information", the MUX is fully programmable.

To configure port 0 for baud rates other than 9600, and to program ports 1 through 5, please see your *HP-UX System Administrator's Guide*. This information is presented in Chapter 5, "The System Administrator's Toolbox" for Series 500 Computers.

3   Functional Description

The HP 27140A Asynchronous 6-Channel Multiplexer with Modem Control is, in most cases, the primary RS-232-C interface for your computer. Your control of this MUX may be through a high level language, such as C or FORTRAN, a "turn-key" application program, or some other type of program which uses the computer operating system to control the interface. Since the user contact with the MUX is at such a high level, the functional description below defines the interface organization in terms of a few large functional blocks. This manual does not contain a component level description of the operation of the interface.

Main Sub-assemblies

Three major sub-assemblies constitute the 27140A: the Multiplexer PCA, the 6-port RS-232-C Junction Panel, and the Multiplexer-to-Panel cables. Figure 3-1 shows these sub-assemblies. See "Equipment Supplied" in Chapter 1 for sub-assembly part numbers.

Printed Circuit Assembly

A Channel Input/Output (CIO) PCA fits into a CIO backplane, gets its power from the backplane, and receives data from the host computer and peripheral devices. The multiplexer PCA converts signals and data from the CIO backplane protocol to the RS-232-C protocol used by peripherals. Conversely, the MUX also converts data from up to six RS-232-C peripherals to the CIO protocol.

Multiplexer-to-Panel Cables

These cables are used to carry signals to and from the RS-232-C Junction Panel in a single, manageable package. The cable contains six sets of wire. Each set is dedicated to one of the communication channels. The braided shield just under the cable outer jacket connects the safety ground on the card to the safety ground on the panel.

Depending on how your computer is installed, the standard MUX-to-Panel cable may go to a RS-232-C Junction Panel that is on the inside or the outside of the computer main cabinet. The cable 62-pin male connector plugs into the large RS-232-C Junction Panel receptacle. If the panel must be located farther from the computer, an extension cable is available as an option.
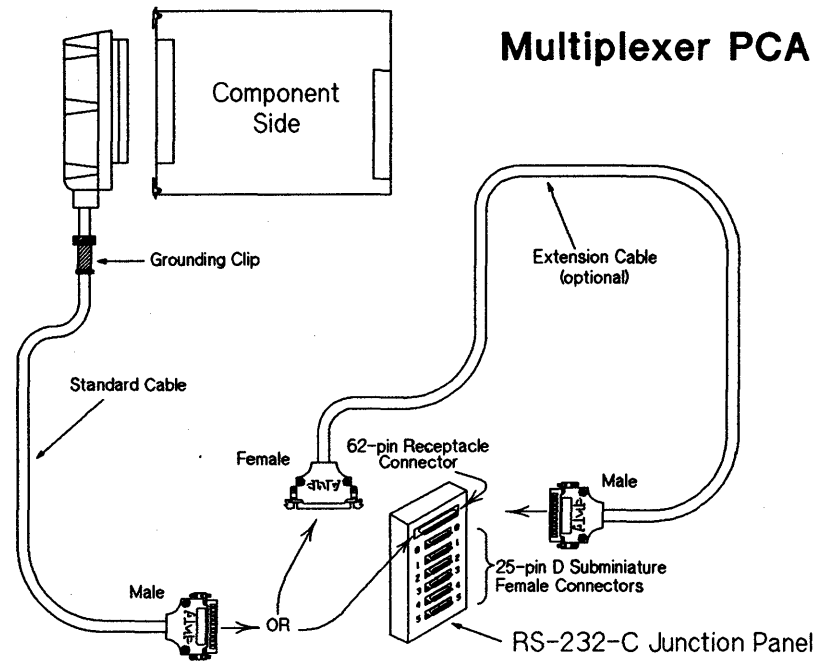
Figure 3-1. HP 27140A Sub-assemblies

RS-232-C Junction Panel

The RS-232-C Junction Panel has six 25-pin female data-communication connectors. Each 25-pin connector on the panel is the port to a particular communications channel. The data lines, on pins 2, 3, and 7, are protected from overvoltage by transorbs inside the panel.

For information about attaching peripherals to the RS-232-C Junction Panel, see Chapter 2, "Installation/Configuration", the computer system manuals and the manual for the peripheral you are attaching. If you intend to make your own cables for a non-Hewlett-Packard peripheral, see Chapter 6, and please read the next two paragraphs carefully.

Device Types Accepted

Each port has the signal lines to support both Data Communication Equipment (DCE), such as modems, and Data Terminal Equipment (DTE), such as terminals. The data lines are arranged to accept data directly from DTE. This feature makes the computer appear to be a data communications device to the terminal. If you are going to attach DCE to one of the ports, the connecting cable must redirect the data by crossing the lines from pins 2 and 3 of the DCE to pins 3 and 2 at the port.

Variations from RS-232-C

Two of the signals from a peripheral must go to non-standard locations in ports on this panel. If the peripheral has a ring indicator signal (RI), it must enter the port on pin 9. The clear to send signal (CS) from a peripheral must enter the port on pin 22.

Organization

To understand how the MUX card circuitry is organized, it is convenient to think of the card as being divided into three planes of circuits. While each plane would theoretically perform specific tasks, the planes actually work in concert to accomplish some operations. The three major circuits are:

● Backplane interface circuits

● Midplane circuits

● Frontplane interface circuits

Figure 3-2 is a functional block diagram of the PCA circuitry. It shows additional subdivisions, outlined with broken lines, within each plane. We have also shown the card internal data bus. Data move in either direction on the data bus to all of the circuit planes.

The Circuit Planes

Backplane Interface Circuits

These circuits handle all data transfer, control, and handshaking lines between the card and the CIO backplane. The backplane interface assembles data headed to the computer into the format used on the CIO backplane. Data from the computer are decoded and routed to whatever controller or data storage locations are dictated by the computer.

Midplane Circuits

The midplane circuits manipulate data which come into the RAM from either the backplane or the frontplane. By following programs in the EPROM and the RAM, the Z-80 microprocessor controls the frontplane. Based on those programs, the microprocessor rearranges data or interprets it as commands.

Frontplane Circuits

The frontplane circuits convert the form of the data prepared by the microprocessor to the form required by the communication protocols RS-232-C and V.24. These circuits also do the reverse conversion on data from the peripherals.

As Figure 3-2 indicates, in this plane, the data move on separate transmit and receive lines. Each of the six channels for peripherals has individual transmit and receive lines. Data on these lines move more slowly than data on the interface internal data bus.
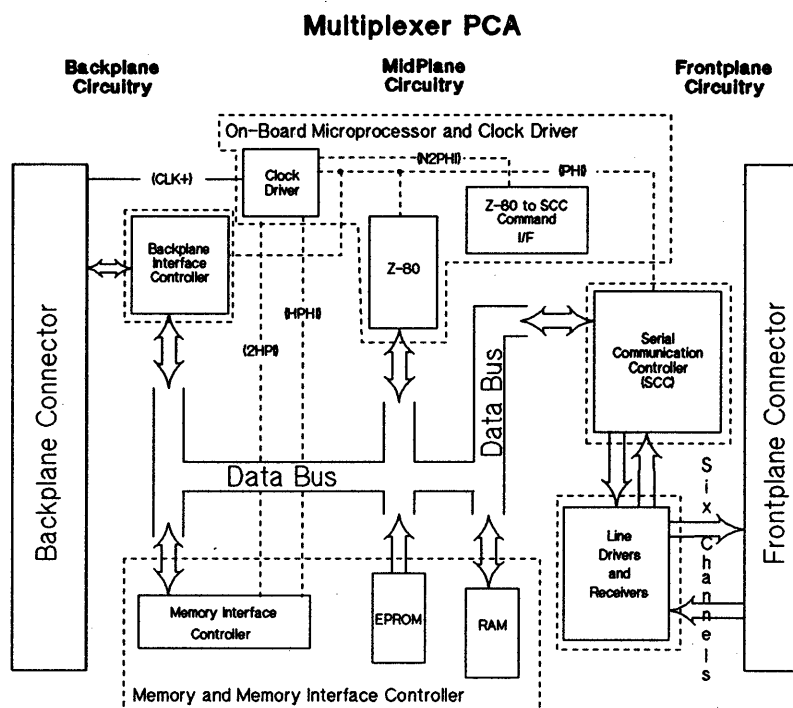
Multiplexer PCA

Figure 3-2. Multiplexer PCA Block Diagram

Functional Blocks

The Backplane Interface Controller (BIC) is a custom gate array IC which handles all communication control and handshaking with the CIO backplane. It is accessed by the Z-80 microprocessor as an I/O device for control signals.

The BIC also holds the CIO backplane "open" while the Memory Interface Controller (MIC) makes a DMA transfer of data to or from the RAM on the PCA. During a DMA transfer, the CIO backplane reads and/or writes a packet of six bytes to or from the BIC data register. The MIC gate array transfers these data between the BIC data register and the card RAM by means of DMA transfers.

Memory Interface Controller

The Memory Interface Controller (MIC) is a custom CMOS gate array which handles memory refresh and address multiplexing for the on-board RAM. The MIC also contains the card's Direct Memory Access (DMA) controller. In addition, it provides address decoding, RESET signals for the entire card, and wait states required during certain memory operations.

Clock Driver   The HP 27140A uses the 14.7456 MHz clock signal from the host computer (CLK+) as a basis for each of the four on-board clock signals. These four synchronized clock signals are:

  ● 3.6864 MHz (PHI) -- system clock for Z-80B CPU, SCCs, the backplane and the MIC

  ● 7.3728 MHz (2PHI) -- drives the MIC

  ● 7.3728 MHz (N2PHI) -- (inverted 2PHI) drives the Z-80 to SSC Command Interface

  ● 1.8432 MHz (HPHI) -- drives the Request Hold Off (wait state) clock of the MIC

Microprocessor   The Z-80B microprocessor commands the circuits that control the frontplane and organizes data for transmission to the computer or peripherals. The Z-80 reads its instructions on how to carry out its tasks from the EPROM or the RAM. The EPROM permanently stores the programs the Z-80 will need to get the card started.

With the programs in the EPROM, the Z-80 can control port 0 and check programs loaded into the RAM. In some computer systems, port 0 is where the system control console will be attached. The Z-80 is able to control ports 1 to 5 only after the computer loads an additional frontplane control program into the RAM. This additional program comes with your computer operating system. The microprocessor also arranges data in the RAM for DMA transfers. This saves the computer processsor time.

Z-80 to SCC Command Interface   This interface is a PAL, Programmable Array Logic. The PAL has been programmed to allow signals on the microprocessor control lines to control the Serial Communication Controllers and associated circuits on the frontplane.

EPROM   The EPROM is the permanent memory for the MUX. The self test, DMA monitor, and primary port 0 control programs are stored on the EPROM.

RAM   The RAM is a volatile memory where data and programs can be stored. The Z-80 and MIC can take exclusive control of the RAM for some data manipulations.

Serial Communications Controllers

The Serial Communication Controllers (SCC) do the data format conversions for data going to or coming from peripherals. The SCCs also monitor most of the modem control lines. A Counter-Timer Parallel I/O controller associated with the SCCs controls the SR and DM modem control signals of the RS-232 ports. The Z-80 controls and monitors the SCC via the Z-80 to SCC command interface.

Line Drivers and Receivers

The line drivers and receivers convert signals being sent at one voltage-level to another. Since peripherals require signals at higher voltages and different polarities than the computer, these components are required to complete the interface.

4　Troubleshooting

The MUX has an on-board self test to verify operation of the card. This chapter explains how to initiate self test and how to interpret the results.

Description of Self Test

The HP 27140A card has a self-test program stored in the EPROM chip mounted on the board. The program executes each time the card is RESET, or on command from the operator. The test operates on a GO/NO-GO basis and determines whether the card will reliably pass data in both directions.

There are, in fact, two self tests. The first, without the optional test hood, verifies the on-board circuitry of the EPROM itself, the RAM, operation of the Z-80 microprocessor, and resident DMA and timer chip operation. The test hood allows further testing of the Z-80 Serial Communications Controller (SCC) circuits, the line drivers and receivers. (See "Options and Additional Equipment" in Chapter 1 for test hood part number.)

Results

The normal method of receiving the results of the self test is through the system console. In some cases, however, this may be impossible due to hardware or software failure in the system console circuit.

Warning

Never attempt to defeat an interlock system. It is there to protect you from shock and the computer from damage. (Please note that HP engineers have special tools which allow them to by-pass an interlock safely.)

If the I/O channel fails, and does not allow the results to be read from the host, an LED mounted on the board may be used to interpret the test results. If the optional test hood is in place, a second LED mounted on the hood itself also shows whether the tests were successful. Using the test hood does not change the length of time that the self test takes to run.

The LED mounted on the board (and the one on the hood) will light up for approximately 2 seconds, go out and blink again if the test was executed due to a RESET (or power on) condition. This sequence will repeat up to five times while the computer verifies backplane operations. A second method for initiating self test is through the DEVICE CLEAR/ DEVICE ENABLE sequence, which will light the LED(s) for 13 to 15 seconds. In either case, if the LED fails to go out, self test has failed.

In Case of Failure

In the event the board fails the EPROM-controlled self test, repeat the operation (RESET or DEVICE CLEAR/DEVICE ENABLE) using the on board LED(s) to verify the failure. You should call your HP Customer Engineer and give him the results of the self test. This will enable him to resolve any problem more quickly.

Troubleshooting

Since the MUX is the hub of a network of devices, including the host computer, it may appear to malfunction when another device has actually failed. When you are faced with such a failure, the troubleshooting tree in Figure 4-1 will help isolate the problem.

When checking the device protocol settings, you should also check the system control panel for error status messages.

When we ask you to test the terminal, remember that all Hewlett-Packard terminals have a self-test function built in. For terminals built by other manufacturers, you will have to refer to their literature to determine how to test the terminal.

When checking the RS-232-C physical connection, you should check the cable connector on the card and at the RS-232-C Junction Panel, and each peripheral cable as it leaves the junction panel. You should also check the connection at the peripheral connector. Check the continuity of the cables; rats and mice like to chew on them.

When you try another cable, you should use a known good cable in place of the one being tested. This might mean "borrowing" one from a device that is working. Likewise, the card-to-junction panel cable can be exchanged for one from another working MUX card.

The asterisks "*" in the diagram tie the phrase "*Tests xxx" to the cell "Replace with new Sub-assembly*". You should permanently replace the sub-assembly being tested at the branch which directed you to this cell.

Switching the cables between two peripherals at the panel will help determine if the trouble is in the RS-232-C Junction Panel. If the trouble moves to the new port terminal, then the problem was on the computer-to-junction panel side of the circuit. At this point, having eliminated the others, the junction panel is the only remaining suspect component.

If you must contact HP resources, please begin with you HP Sales and Support Office. (A list of these offices is included at the end of this manual.) If the solution is beyond their capabilities, the Sales and Support Office will contact the appropriate HP entities to get the problem solved.
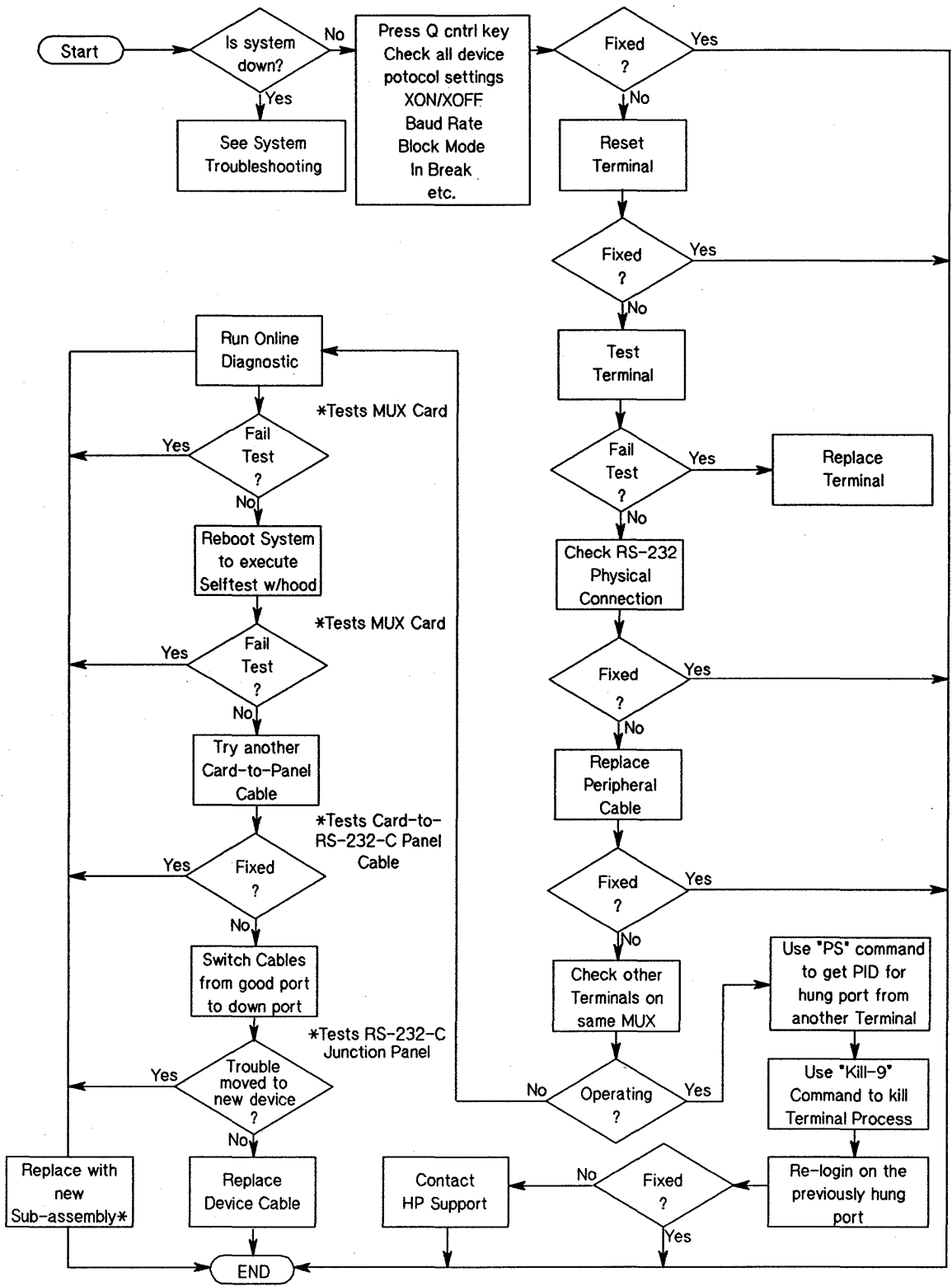
Figure 4-1. Troubleshooting Tree for the HP 27140A

Start → Is system down?
- No → Press Q cntrl key, Check all device potocol settings, XON/XOFF, Baud Rate, Block Mode, In Break, etc.
- Yes → See System Troubleshooting

Press Q cntrl key → Fixed?
- Yes → (to END)
- No → Reset Terminal

Reset Terminal → Fixed?
- Yes → (to END)
- No → Test Terminal

Test Terminal → Fail Test?
- Yes → Replace Terminal
- No → Check RS-232 Physical Connection

Check RS-232 Physical Connection → Fixed?
- Yes → (to END)
- No → Replace Peripheral Cable

Replace Peripheral Cable → Fixed?
- Yes → (to END)
- No → Check other Terminals on same MUX

Check other Terminals on same MUX → Operating?
- Yes → Use "PS" command to get PID for hung port from another Terminal
- No → Run Online Diagnostic

Use "PS" command to get PID for hung port from another Terminal → Use "Kill-9" Command to kill Terminal Process → Re-login on the previously hung port → Fixed?
- Yes → END
- No → Contact HP Support

Run Online Diagnostic *Tests MUX Card → Fail Test?
- Yes → (back)
- No → Reboot System to execute Selftest w/hood

Reboot System to execute Selftest w/hood *Tests MUX Card → Fail Test?
- Yes → (back)
- No → Try another Card-to-Panel Cable

Try another Card-to-Panel Cable *Tests Card-to-RS-232-C Panel Cable → Fixed?
- Yes → (back)
- No → Switch Cables from good port to down port

Switch Cables from good port to down port *Tests RS-232-C Junction Panel → Trouble moved to new device?
- Yes → (back)
- No → Replace Device Cable

Replace with new Sub-assembly*

Contact HP Support → END

Replace Device Cable → END

4-4 Troubleshooting

5   Component Parts

Note	Only the MUX card, the cable(s), the RS-232-C Junction Panel, and the EPROM are treated by Hewlett-Packard Company as Replaceable Parts. Users who attempt component level repair or replacement may invalidate their warranties.

Component Parts

This chapter contains information for ordering component parts for the HP 27140A PCA. Figure 7-4 shows the locations of the PCA components. Table 5-1 is the listing of all component parts for the MUX in reference designation order. The following information is provided in the table.

1. Reference designation of the part.

2. The Hewlett-Packard part number.

3. Part number check digit (CD).

4. Total quantity (QTY).

5. Description of the part.

6. A five-digit manufacturer's code number of a typical manufacturer of the part. Refer to Table 5-2 for a cross reference of the manufacturers.

7. The manufacturer's part number.

Ordering Information

To order component parts or to obtain information on parts, address the order or inquiry to the nearest Hewlett-Packard Sales and Support Office listed at the back of this manual.

To order a part listed in the component parts table, quote the Hewlett-Packard part number (with the check digit) and indicate the quantity required. The check digit will insure accurate and timely processing of your order.

To order a part that is not listed in the table, specify the following information:

1. Identification of the product containing the part.

2. Description and function of the part.

3. Quantity required.

Table 5-1. HP 27140A Component Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	27140-60001	8	1	PCA-6CH MOD MUX	28480	27140-60001
C1	0160-4835	7	6	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C2	0160-6500	7	15	CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C3	0160-4810	8	54	CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C4	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C6	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C7	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C8	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C9	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C10	0180-1746	5	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
C11	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C12	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C13	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C14	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C15	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C16	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C17	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C18	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C19	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C20	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C21	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C22	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C23	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C24	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C25	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C26	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C27	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C28	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C29	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C30	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C31	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C32	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C33	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C34	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C35	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C36	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C37	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C38	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C39	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C40	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C41	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C42	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C43	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C44	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C45	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C46	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
C47	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C48	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C49	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C50	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810

Table 5-1. HP 27140A Component Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
C51	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C52	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C53	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C54	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C55	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C56	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C57	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
C58	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C59	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C60	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C61	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C62	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C63	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C64	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C65	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C66	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C67	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C68	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C69	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C70	0160-4807	3	2	CAPACITOR-FXD 33PF +-5% 100VDC CER 0+-30	28480	0160-4807
C71	0160-4807	3		CAPACITOR-FXD 33PF +-5% 100VDC CER 0+-30	28480	0160-4807
C72	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C73	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C74	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C75	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	02802	CAC02X7R103K100C
C76	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C77	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C78	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C79	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
C80	0160-4810	8		CAPACITOR-FXD 330PF +-5% 100VDC CER	28480	0160-4810
CR1	1901-0620	3	2	DIODE-SWITCHING 60V 400MA DO-35	9N171	1N4607
CR2	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	9N171	1N4607
CR3	1901-0518	8	2	DIODE-SM SIG SCHOTTKY	28480	1901-0518
CR4	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
CR5	1990-0968	9	1	LED-LAMP LUM-INT=1.5MCD IF=15MA-MAX	28480	HLMP-5060
EXL2	0403-0547	6	1	EXTR-PC BD ORN NYL 1.6-MM-BD-THKNS	52111	50831-42-HS(MUX/6)
EXL2	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
EXR1	0403-0527	2	1	CIO EXT HNDL BLK	28480	0403-0527
EXR1	1480-0116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
J1	1251-7276	0	1	CONN-POST TYPE .100-PIN-SPCG 80-CONT	28480	1251-7276
J2	1251-8205	7	1	CONN-POST TYPE .100-PIN-SPCG 72-CONT	28480	1251-8205
J2	1252-1742	5	1	CONN-POST TYPE .100-PIN-SPCG 72-CONT	22526	78228-003
R1	0698-0082	7	4	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
R2	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
R3	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
R4	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
R5	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
R6	0757-0405	4	1	RESISTOR 162 1% .125W F TC=0+-100	24546	CT4-1/8-T0-162R-F
R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
R8	0811-3716	2	2	RESISTOR ZERO OHM	28480	0811-3716
R9	0811-3716	2		RESISTOR ZERO OHM	28480	0811-3716

Table 5-1. HP 27140A Component Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
U11	1820-2862	7	2	IC RCVR TTL S BUS OCTL	27014	DS3667N
U13	1820-2862	7		IC RCVR TTL S BUS OCTL	27014	DS3667N
U14	1820-1633	8	3	IC BFR TTL S INV OCTL 1-INP	01295	SN74S240N
U15	1820-1633	8		IC BFR TTL S INV OCTL 1-INP	01295	SN74S240N
U17	27140-81003	4	1	PROG. 1820-3359	28480	27140-81003
U23	1820-1633	8		IC BFR TTL S INV OCTL 1-INP	01295	SN74S240N
U24	1820-0683	6	1	IC INV TTL S HEX 1-INP	01295	SN74S04N
U27	1820-2692	1	1	IC GATE TTL F EXCL-OR QUAD 2-INP	07263	74F86PC
U28	1820-1804	5	1	TRANSISTOR ARRAY 14-PIN PLSTC TO -116	04713	MPQ6842
U33	27140-81002	3	1	PROG. 1820-3358	28480	27140-81002
U34	1810-0122	7	2	NETWORK-RES 14-DIP 3.3K OHM X 13	73138	899-1-R3.3K
U36	27140-81001	2	1	PROG. 1818-3447	28480	27140-81001
XU36	1200-0567	1	1	SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0567
U38	1818-3059	1	8	IC NMOS 65536(64K) DYN RAM 150-NS 3-S	28480	1818-3059
U42	1820-2975	3	1	IC GATE-ARY CMOS	S0166	C-2000
U43	1820-1144	6	1	IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
U48	1818-3059	1		IC NMOS 65536(64K) DYN RAM 150-NS 3-S	28480	1818-3059
U52	1820-0684	7	1	IC INV TTL S HEX 1-INP	01295	SN74S05N
U55	1820-2649	8	1	IC- Z80B-CPU	28480	1820-2649
U57	1820-3267	8	1	IC GATE-ARY CMOS	S0166	C2000 MASKED
U58	1818-3059	1		IC NMOS 65536(64K) DYN RAM 150-NS 3-S	28480	1818-3059
U68	1818-3059	1		IC NMOS 65536(64K) DYN RAM 150-NS 3-S	28480	1818-3059
U73	1820-3331	7	3	IC-SERIAL COMMUNICATIONS CONTROLLER	07653	Z8530PS
U75	1820-3825	4	1	IC-COUNTER TIMER, PARALLEL I/O	28480	1820-3825
U78	1818-3059	1		IC NMOS 65536(64K) DYN RAM 150-NS 3-S	28480	1818-3059
U83	1820-3331	7		IC-SERIAL COMMUNICATIONS CONTROLLER	07653	Z8530PS
U85	1820-3331	7		IC-SERIAL COMMUNICATIONS CONTROLLER	07653	Z8530PS
U87	1810-0122	7		NETWORK-RES 14-DIP 3.3K OHM X 13	73138	899-1-R3.3K
U88	1818-3059	1		IC NMOS 65536(64K) DYN RAM 150-NS 3-S	28480	1818-3059
U91	1820-3321	8	8	IC RCVR DTL NAND LINE QUAD	04713	MC1489AL
U92	1820-3321	8		IC RCVR DTL NAND LINE QUAD	04713	MC1489AL
U93	1820-3321	8		IC RCVR DTL NAND LINE QUAD	04713	MC1489AL
U94	1820-3321	8		IC RCVR DTL NAND LINE QUAD	04713	MC1489AL
U95	1810-0485	5	1	NETWORK-RES 14-DIP22.0K OHM X 7	28480	1810-0485
U97	1820-3467	0	1	IC DRVR TTL ALS OR HEX 2-INP	01295	SN74ALS832N
U98	1818-3059	1		IC NMOS 65536(64K) DYN RAM 150-NS 3-S	28480	1818-3059
U105	1820-3321	8		IC RCVR DTL NAND LINE QUAD	04713	MC1489AL
U107	1820-3321	8		IC RCVR DTL NAND LINE QUAD	04713	MC1489AL
U108	1818-3059	1		IC NMOS 65536(64K) DYN RAM 150-NS 3-S	28480	1818-3059
U201	1820-3322	5	6	IC DRVR DTL COMM EIA RS-232C QUAD	04713	MC1488L
U202	1820-3322	5		IC DRVR DTL COMM EIA RS-232C QUAD	04713	MC1488L
U203	1820-3322	5		IC DRVR DTL COMM EIA RS-232C QUAD	04713	MC1488L
U204	1820-3322	5		IC DRVR DTL COMM EIA RS-232C QUAD	04713	MC1488L
U205	1820-3322	5		IC DRVR DTL COMM EIA RS-232C QUAD	04713	MC1488L
U206	1820-3322	5		IC DRVR DTL COMM EIA RS-232C QUAD	04713	MC1488L
U207	1820-3321	8		IC RCVR DTL NAND LINE QUAD	04713	MC1489AL
U208	1820-3321	8		IC RCVR DTL NAND LINE QUAD	04713	MC1489AL
	9320-5509	3	2	LBL-LNE-PTR; .937-IN-WD X .312-IN-LG	80509	TABX 1505 MW4 P5
	27140-60003	9	1	PCA TEST HOOD	28480	27140-60003
	27140-80001	0	1	PC BOARD	28480	27140-80001

Table 5-2. Code List of Manufacturers

Code	Manufacturer	Location	
S0166	Fuji Kohki Ltdc Co	Japan	
01295	Texas Instrument Inc, Semicond Compnt Div	Dallas, Texas	75222
02802	American Safety Razor Co, Div Philip	Staunton, Virginia	24401
04713	Motorola Inc, Semi-cond Prod	Phoenix, Arizona	85008
07263	Fairchild Corp	Mountain View, California	94042
07653	Fidelity Chemical Products Co	Newark, New Jersey	07114
22525	Dupont Connector Systems	Camp Hill, Pennsylvania	17011
24546	Corning Electronics	Santa Clara, California	95050
27014	National Semiconductor Corp	Santa Clara, California	95052
28480	Hewlett-Packard Co, Corporate Hq	Palo Alto, California	94304
52111	Airco Welding Products	Union, New Jersey	07083
56289	Sprague Electric Co	North Adams, Massachusetts	01247
73138	Beckman Industrial Corp	Fullerton, California	92632
80509	Avery Label Co	Monrovia, California	91016
9N171	Unitrode Corp	Lexington, Massachusetts	02173

6   Reference

This chapter contains a list of other technical manuals and related documents which will be of assistance to you. A Glossary is provided to clarify technical terms used throughout this manual.

Other References

Below is a list of reference books and manuals which will provide pertinent information beyond the scope of this manual.

- Carr, Joseph J., *Z80 Users Manual*. Reston, Virginia: Reston Publishing Company, 1980.

- CCITT Recommendation V.24, 1972

- CCITT Recommendation V.28, 1972

- EIA Standard RS-232-C, August 1969

- McGilton, Henry and Morgan, Rachel, *Introducing the Unix© System*. New York: McGraw-Hill Book Company, 1983.

- McNamara, John E., *Technical Aspects of Data Communication*, second edition. Bedford, Massachussetts: Digital Press, 1982

- Zaks, Rodnay, *Programming the Z80*, third revised edition. Berkeley: Sybex, 1982.

Glossary

Baud
Unit of signalling speed expressed as the number of signal event changes per second. It is a function of the modulation scheme and of the transmission carrier. It is rarely the same as "bits per second".

CCITT
Comite Consultatif International de Telegraphe et de Telephone -- International Telegraphy and Telephony Consultative Committee. A part of the International Telecommunications Union of the United Nations. Responsible for establishing communications protocols for the Post, Telegraph and Telephone (PTT) ministries of most countries except the U.S.A. and Canada. (See also EIA)

Conditioned Telephone Lines
Using additional equipment, telephone companies can guarantee certain levels of transmission quality. This service is called conditioning, and for AT&T, in the U.S.A., there are seven types or levels. These are graded "basic", C1 through C5, and D1. Conditioning affects several characteristics of transmission, and each level affects different characteristics differently, or not at all. There are also various combinations of conditioning which may be required or desirable for your application. Conditioning may be applied only to leased circuits.

Console, System
The terminal which is used by the computer operator to control the running of the computer.

Duplex Transmission
Duplex transmission is the simultaneous, bi-directional transmission of data between two points. It is frequently called "Full Duplex".

EIA
Electrical Industry Association. An association of electrical manufacturers who have agreed to adhere to standards for designing and producing communications equipment. The most common for modems is the RS-232-C standard to which the HP 27140A was designed. (See also CCITT)

EPROM
Erasable, Programmable, Read Only Memory. A semiconductor memory device which cannot be altered by the user. Access to memory addresses which hold program code for execution by the Central Processing Unit (CPU) is completely random. It is available instantly on power up, since it is not power dependent (that is, it is non-volatile). EPROMs can be erased, usually by exposure to ultraviolet light sources.

Modem
MOdulator/DEModulator. A device which takes a digital signal from the computer or the terminal device and modulates it into an analog electrical signal. This new, modulated signal may now be passed over telecommunications networks, and with a suitable modem located at the distant end, it can be demodulated or translated into the original digital signal.

RAM Random Access Memory (RAM) is power dependent (or volatile) read and write capable memory which accepts downloaded code and then is accessed by the Central Processing Unit as required for program execution. Since it is volatile, it must be refreshed continually.

Simplex Transmission In simplex transmission, data is transferred in one direction only and no provision is made for transmission in the other direction. (See also Duplex)

Transorb A voltage limiter made by pairing two zener diodes. The resulting restriction to voltage is bi-polar and varies according to design.

V.24 The CCITT recommended standard defining the signals and their characteristics for use in transmissions on international switched telephone networks.

V.28 The CCITT recommended standard for the electrical specifications for use in transmissions on international switched telephone networks.

Table 6-1. Pin Assignment Guide for the HP 27140A

Pair Number	Conductor Color	Terminal Pin Number	Mnemonic Code
1	Blue	25	RD0
1	White	46	SD0
2	Orange	52	CS0
2	White	51	RS0
3	Green	50	DM0
3	White	48	TR0
4	Brown	47	RR0
4	White	54	SR0
5	Gray	53	IC0
5	White	49	SG0
6	Blue	56	RD1
6	Red	55	SD1
7	Orange	16	CS1
7	Red	17	RS1
8	Green	58	DM1
8	Red	37	TR1
9	Brown	57	RR1
9	Red	59	SR1
10	Gray	18	IC1
10	Red	38	SG1
11	Blue	39	RD2
11	Black	60	SD2
12	Orange	42	CS2
12	Black	21	RS2
13	Green	41	DM2
13	Black	61	TR2
14	Brown	40	RR2
14	Black	19	SR2
15	Gray	20	IC2
15	Black	62	SG2

Table 6-1. Pin Assignment Guide for the HP 27140A

Pair Number	Conductor Color	Terminal Pin Number	Mnemonic Code
16	Blue	15	RD3
16	Yellow	36	SD3
17	Orange	12	CS3
17	Yellow	33	RS3
18	Green	13	DM3
18	Yellow	35	TR3
19	Brown	14	RR3
19	Yellow	32	SR3
20	Gray	11	IC3
20	Yellow	34	SG3
21	Blue	05	RD4
21	Purple	26	SD4
22	Orange	44	CS4
22	Purple	23	RS4
23	Green	43	DM4
23	Purple	01	TR4
24	Brown	04	RR4
24	Purple	45	SR4
25	Gray	24	IC4
25	Purple	22	SG4
26	Blue	10	RD5
26	Pink	31	SD5
27	Orange	28	CS5
27	Pink	07	RS5
28	Green	29	DM5
28	Pink	30	TR5
29	Brown	09	RR5
29	Pink	27	SR5
30	Gray	06	IC5
30	Pink	08	SG6

Safety Ground

The electrical safety or earth ground, and the signal ground are wholly separate. The signal ground is carried in a dedicated conductor for each port. The electrical ground is common for all ports and is wired from pin 1 at each port to pin 1 in the RS-232-C panel 62-pin connector. This pin is then connected to the cable metallic shield, which, in turn, is connected to the computer chassis ground.

Supported Modems

As explained in Chapter 1, the MUX complies with RS-232-C and CCITT V.24 standards for communications. Table 6-2 classifies the supported modem lines. Both RS-232-C and CCITT V.24 identify a circuit irrespective of point of view. The mnemonics used in this manual are identified *as seen from the computer end of the circuit.*

Each of the six channels of the multiplexer controls and monitors seven modem control lines. Various designations for the two data lines, the signal ground, and these control lines are correlated in Table 6-1. Table 6-3 lists the pin assignments for the RS-232-C cable ports on the junction panel. All six ports are wired the same way, internal traces route the signal to the proper pins on the 62-pin conector at the top of the panel.

Table 6-2. Modem Lines Supported by the HP 27140A

RS-232-C	CCITT V.24	Mnemonic Code	Description	I/O
BB	104	RD	Received Data	I
BA	103	SD	Send Data	O
CB	106	CS	Clear to Send	I
CF	109	RR	Received Line Signal Detector	I
CC	107	DM	Data Set Ready (Data Mode)	I
CE	125	IC	Ring Indicator	I
CA	105	RS	Request to Send	O
CD	108.2	TR	(Data) Terminal Ready	O
CH/CI	111/112	SR	Select Rate	
AB	102	SG	Signal Ground	

Table 6-3. Port Pin Assignment for HP 28658-60005 RS-232-C Junction Panel

Common Code	Mnemonic Code	Port Pin Number
FG	Shield	1
RD	RD	2
SD	SD	3
DCD	RR	4, 5
DTR	TR	6
SG	SG	7
RTS	RS	8
RI	IC	9
DSR	DM	20
CTS	CS	22
SR	SR	23

Connecting Cables (RS-232-C)

Special cables for attaching terminals and modems to the multiplexer are ordered separately through your Hewlett-Packard Sales and Support Office.

Table 6-4. Special Cables for Connection to Terminals

HP 13242M	5m, 25-pin male to 25-pin male; all conductors wired end-to-end
HP 13242N	5m, 25-pin male to 25-pin male; 11, 19 switched, other conductors wired end-to-end
HP 13242Y	5m, 25-pin male to 25-pin male; conductors 1-3, 7 wired end-to-end
HP 92219G	3.8m, 25-pin male to 25-pin male; conductors 1-8, 11, 12, 19, 20, 22, 23, 25 wired end-to-end

Table 6-5. Suggested Cable for Modem Installations

HP 92219Q   5 m, 25-pin male to 25-pin male;
                 conductors wired as follows:

Computer End Pin Number	Data Set End Pin Number
1	1
2	3
3	2
4	8
6	20
7	7
8	4
9	22
20	6
22	5
23	23

7   Diagrams

HP 27140A Multiplexer diagrams presented here are:

Figure 7-1 — Schematics

- Sheet 1 — Backplane Interface Circuit

- Sheet 2 — Microprocessor Circuit

- Sheet 3 — Memory Interface Circuit

- Sheet 4 — Serial Communications Controller

- Sheet 5 — Frontplane Interface Circuit

Figure 7-2

- Locator diagram for 62-pin connector

Figure 7-3

- Locator diagram for 25-pin connector on RS-232-C panel

Figure 7-4

- Locator diagram for components of PCA (27140-60001)

Figure 7-1. Schematic Diagram
Backplane Interface Circuit
Sheet 1 of 5
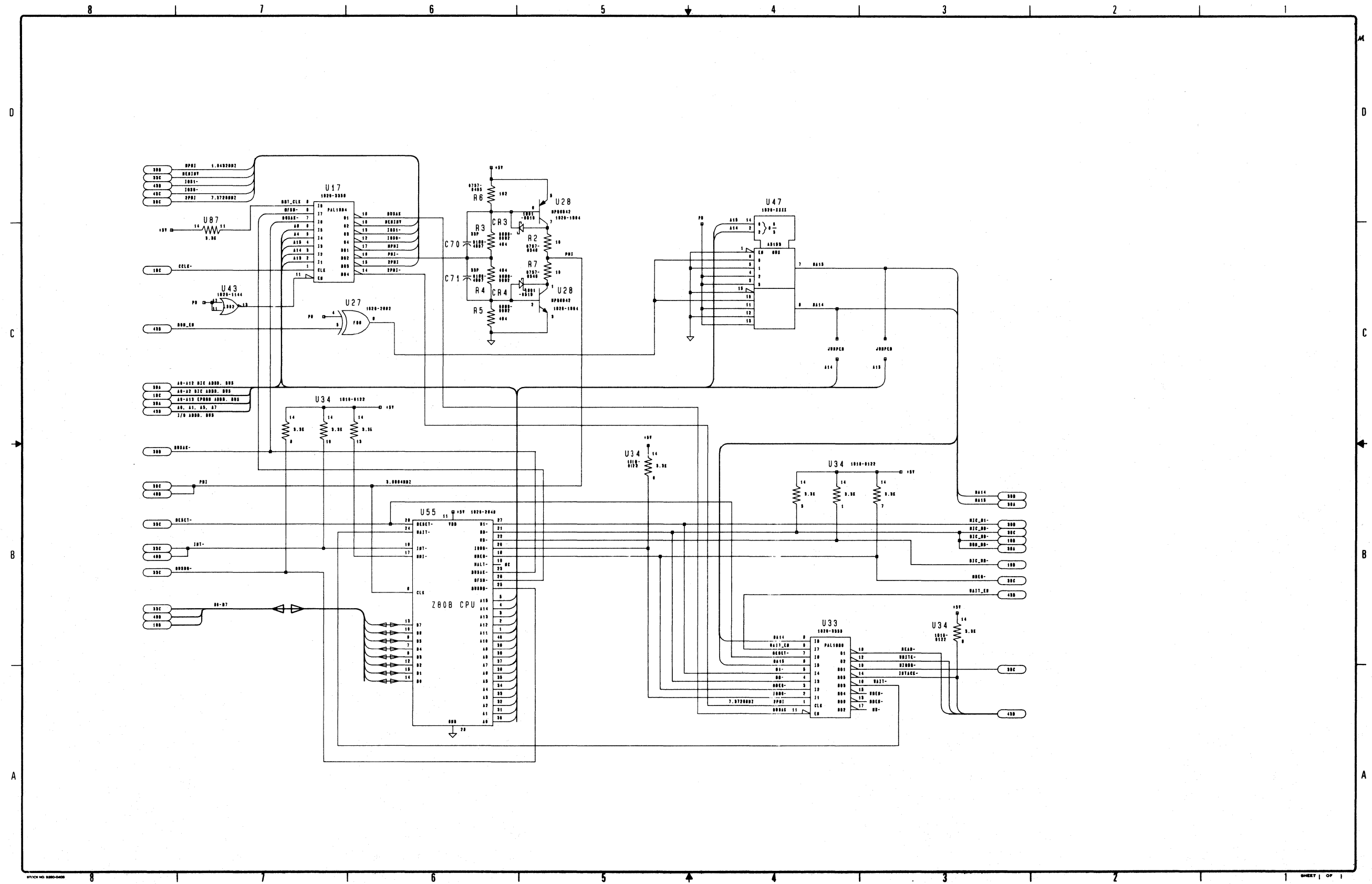
Figure 7-1. Schematic Diagram
Microprocessor Circuit
Sheet 2 of 5
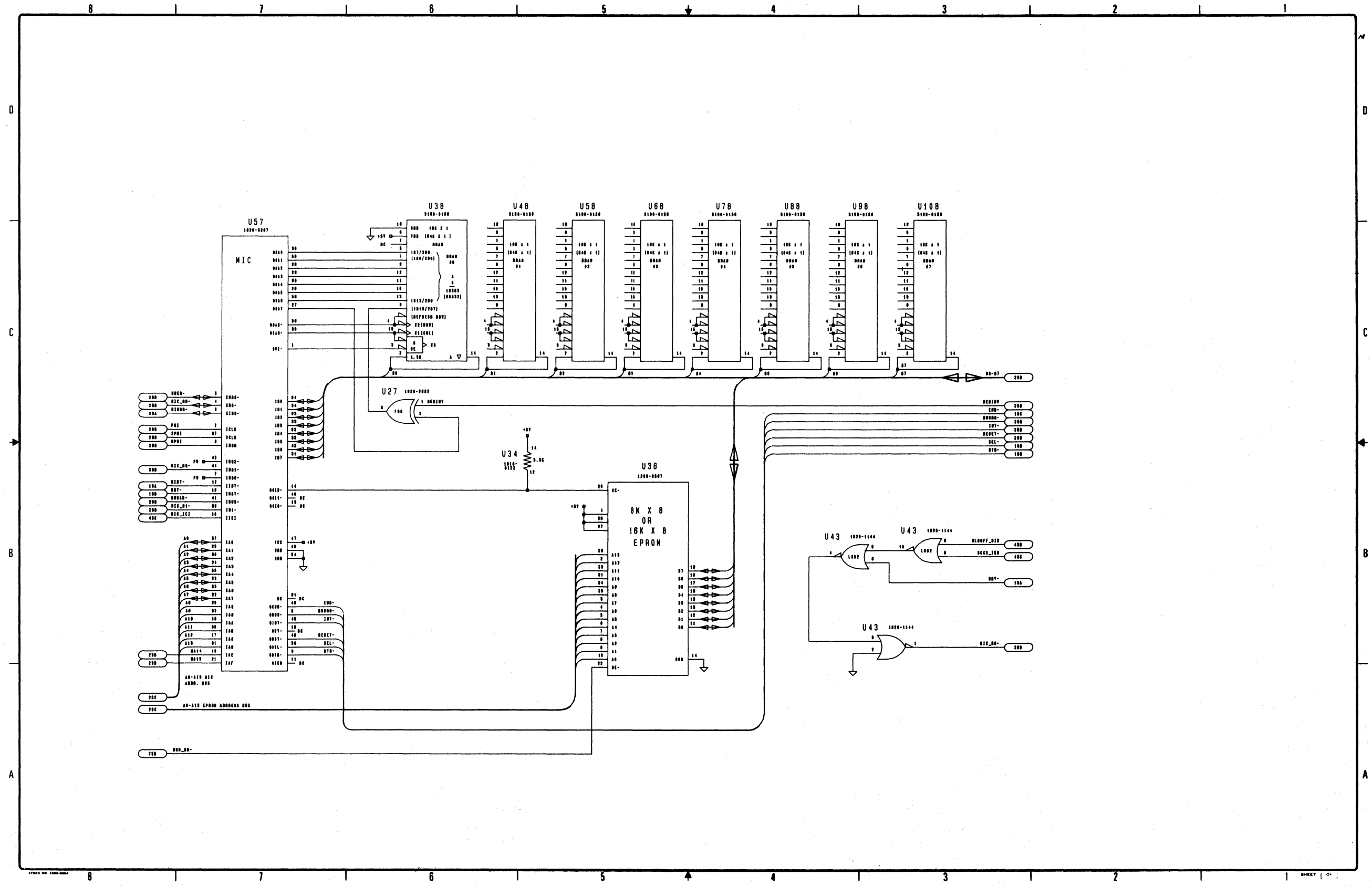
Figure 7-1. Schematic Diagram
Memory Interface Circuit
Sheet 3 of 5
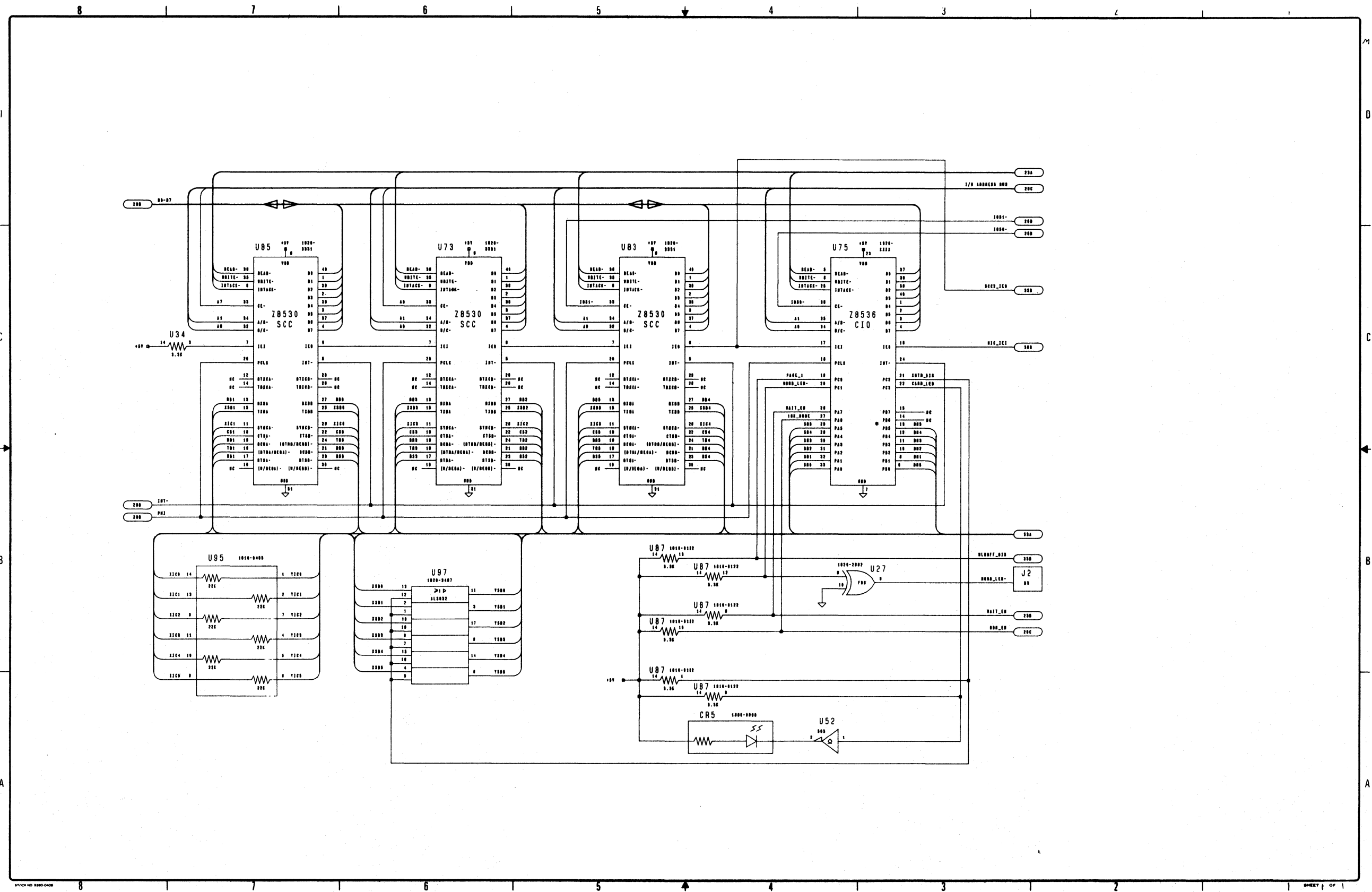
Figure 7-1. Schematic Diagrams
Serial Communications Controller
Sheet 4 of 5
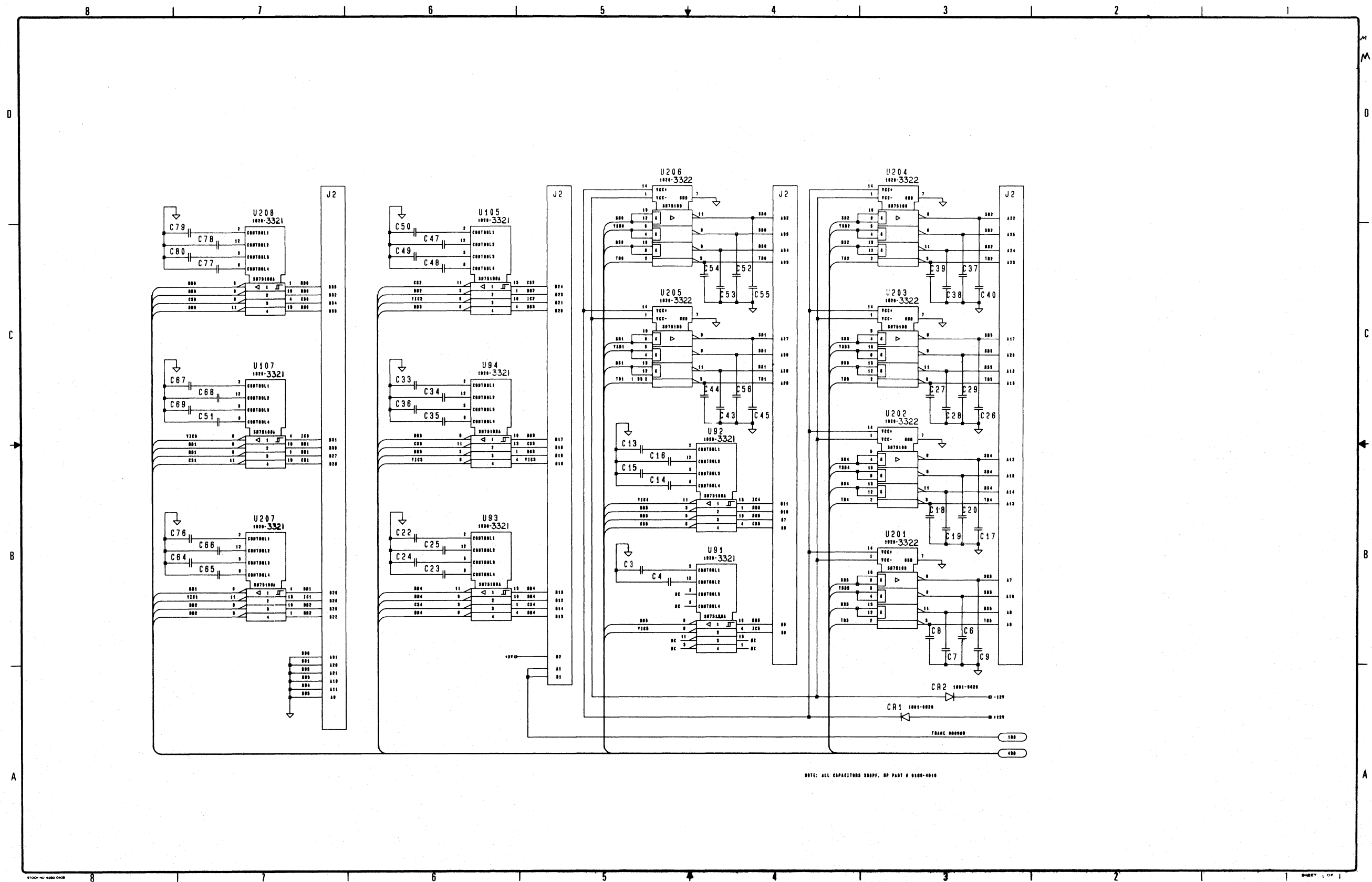
Figure 7-1. Schematic Diagram
Frontplane Interface Circuit
Sheet 5 of 5
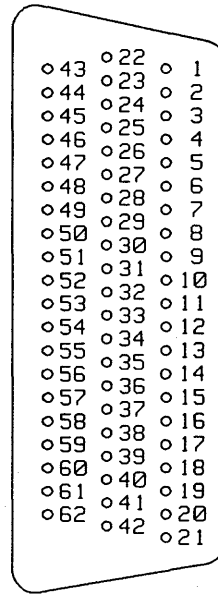
Figure 7-2. Locator Diagram for 62-pin Connector on RS-232-C Panel

See Table 6-3 for further information regarding the pin assignment of the 62-pin connector.

GND	1	
RD	2	14
TD	3	15
RR	4	16
RR	5	17
TR	6	18
SG	7	19
RS	8	20 DM
IC	9	21
	10	22 CS
	11	23 SR
	12	24
	13	25
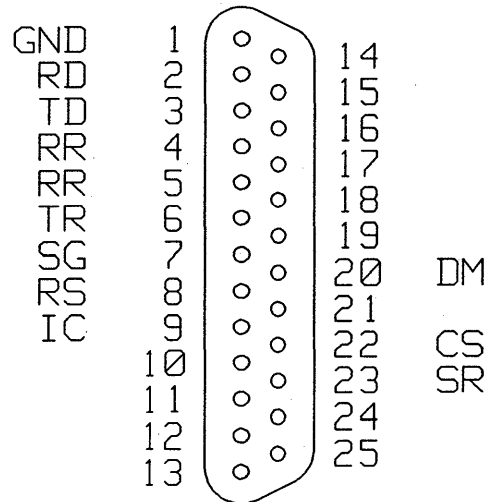
Figure 7-3. Port Pin Assignments
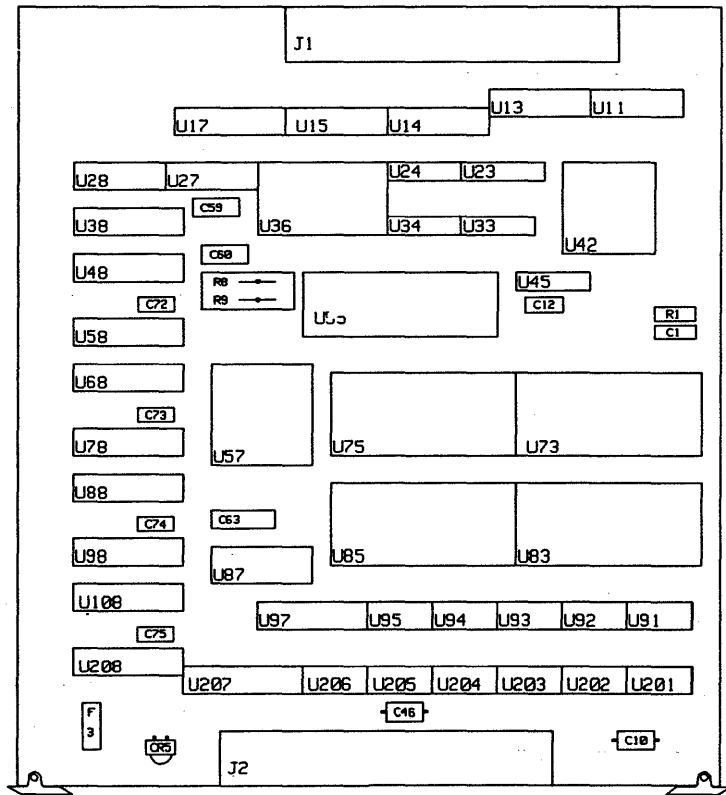
Figure 7-4. Component Location Diagram

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MANUAL UPDATE

</div>

MANUAL IDENTIFICATION

UPDATE IDENTIFICATION

Title: HP 27140A Asynchronous
6-Channel Multiplexer
(with Modem Control)
Hardware Reference Manual

Update Number: 1 (October 1988)

This update also includes:
none

Part Number: 27140-90007 — *WAIT FOR THIS MANUAL ORDERED 1·27·89*

This Update Goes With: First Edition (June 1988)

THE PURPOSE OF THIS MANUAL UPDATE
is to provide new information for your manual to bring it up to date. This is important because it ensures that your manual accurately documents the current version of the product.

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this cover sheet, a printing history page (if any), any replacement pages, and write-in instructions (if any). Replacement pages are identified by the update number at the bottom of the page. A vertical line (change bar) in the outside margin indicates new or changed text material. The change bar is not used for typographical or editorial changes that do not affect the content of the text.

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(27140-90007)

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1	A. Replace the following pages with pages supplied: Title*/ii 3*/4 1-7/1-8*

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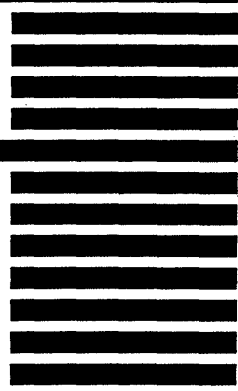
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