HP Computer Systems

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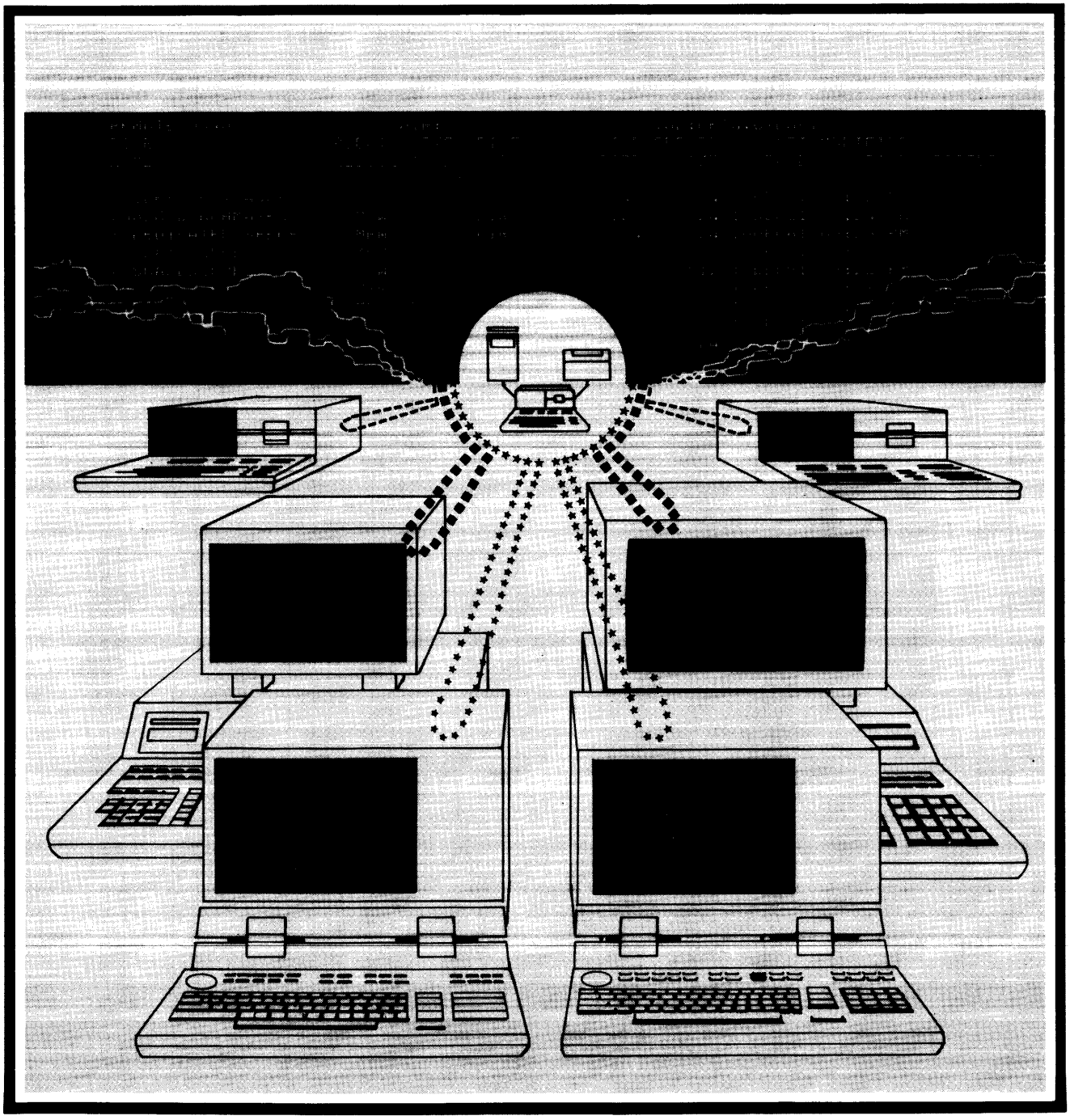
Hardware Installation Manual

for Shared Resource Management



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Hardware Installation Manual

for Shared Resource Management

Manual Part No. 98028-90000

Hewlett-Packard Desktop Computer Division
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Printing History

New editions of this manual will incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement and additional pages to be merged into the manual by the user. Each updated page will be indicated by a revision date at the bottom of the page. A vertical bar in the margin indicates the changes on each page. Note that pages which are rearranged due to changes on a previous page are not considered revised.

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

June 1982...First Edition

October 1982...Second Edition (Changes controller operating software part number and clarifies maximum HP-IB cable lengths on controller)

Table of Contents

Chapter 4: Service Information

Chapter 1
Introduction

The Hewlett-Packard Shared Resource Management System is a computer networking concept that enables users of HP 9845B/C and HP 9826/9836 computers to share many system resources such as mass storage and output peripherals. Multiple-user access to data files and other system resources results in more efficient use of capital and workspace, and can significantly increase productivity by making information and computing tools more accessible.

This manual contains information for configuring and installing the hardware components that comprise the Shared Resource Management System. Limited service and device repair information is also provided, including schematic diagrams.

Installation procedures and limited service information are included for the following:

- HP 98629 Resource Management Interface for HP 9826/9836.
- HP 98029 Resource Management Interface for HP 9845B/C.
- HP 98028 Resource Management Multiplexer.
- HP 97061 Resource Management Interface Cable.

Brief installation and configuration instructions are also included for other assemblies which have their own installation manuals (part numbers in parentheses). The information provided in this manual should be sufficient for most installations. For additional details, schematic diagrams, and parts lists, refer to the manual indicated which is shipped with the assembly. The assemblies are:

- HP 98256 256 K-byte Memory Assembly (98256-90000).
- HP 98625 High-speed Disc Interface (98625-90000).
- HP 98620 DMA Controller (98620-90000).

Prerequisites

It is assumed that you have read and are familiar with the System Planning Guide (98028-90001), and that the necessary site preparation has been completed. Be sure that you have filled out the System Map, or have drawn an equivalent to it if your system is more complex.

This section discusses the equipment that is shipped with your system so you can identify each unit and determine where it is to be installed.

Resource Management Controller

The controller consists of an HP 9826, Option 500 with special operating software that converts it into a controller for operating the shared resources used by remote workstations. The controller hardware package consists of the following components:

Standard Minimum Controller Hardware

Stock Number	Description
HP 9826A	Computer
HP 98256A	256 K-byte Memory Assembly
HP 98620A	DMA (Direct Memory Access) Controller
HP 98625A	High-speed HP-IB Disc Interface
HP 98629A	Resource Management Interface
HP 98028A	Resource Management Multiplexer
HP 98619A	
Option 655	SRM Operating System Software
HP 10833A	Shielded HP-IB Chaining Cable for use with shared printers
09826-87905	Shared Resource Management manual set

The 09826-87905 manual set includes one each of the following items:

System Manual Set

Stock Number	Description
09826-90080	Shared Resource Management Manual
98028-90000	Shared Resource Management Installation Manual
98028-90001	Shared Resource Management System Planning Guide
09826-90083	HP 9826/9836 Shared Resource Management Programming
09845-93071	HP 9845B/C Shared Resource Management Programming
9282-0898	3-ring Binder

If your system uses more than one multiplexer, additional Resource Management Interfaces and any additional memory are shipped in their own separate containers, and must be installed on site. HP 97061 interface cables are shipped with interfaces when they are ordered as an interface option.

Workstations

Workstations are HP 9826/9836 and/or HP 9845B/C computers, each of which must be equipped with a minimum of a Resource Management interface. Additional interfaces for other non-shared peripherals may also be needed, depending on the application. Each resource management interface in the system is connected to a multiplexer. The multiplexer has a short integral cable (1 metre long) that must be connected to an HP 98629 interface for power. Multiplexer installation is discussed in Chapter 2; workstation installation in Chapter 3.

Unpacking the Equipment

While unpacking equipment, inspect and verify that it matches the equipment shown on the packing lists. Unpack the equipment and place it near the final operating locations as follows:

1. Remove the controller and workstation computers from their boxes, and place them near their respective installation locations. If you desire, you can plug them in and run the System Test software to verify their operation, although this is usually done after interfaces and additional memory are installed.
2. After the computers have been located, identify the workstation Resource Management interfaces, and place them with their respective workstation computers. Do the same for any other workstation peripherals and interfaces in the system.
3. Unpack and place the shared peripherals in their operating location. Maintain proper clearances and spacing between printers and disc drives as specified in the System Planning Guide (98028-90001).
4. Place any additional memory or interfaces for the resource management controller near the controller.
5. Identify the individual HP 97061 interface cables and determine their proper routing between interfaces and multiplexers.

WARNING

BEFORE PLUGGING IN ANY EQUIPMENT, BE SURE TO CHECK ALL POWER RECEPTACLES AND VERIFY THAT THEY ARE CORRECTLY WIRED. VERIFY THAT EQUIPMENT GROUNDS, NEUTRAL AND LINE CONDUCTORS, AND ANY OTHER CONDUCTORS ARE CONNECTED TO THE CORRECT RECEPTACLE CONTACTS. IF ANY RECEPTACLE IN THE ENTIRE SYSTEM ENVIRONMENT IS INCORRECTLY WIRED, SERIOUS EQUIPMENT DAMAGE AND/OR PERSONAL INJURY CAN RESULT. EQUIPMENT WARRANTIES ARE VOID WHEN EQUIPMENT IS CONNECTED TO AN INCORRECTLY WIRED POWER SOURCE.

To verify receptacle wiring, use a receptacle wiring and polarity tester manufactured for that purpose. In addition, to ensure safe operation, test each receptacle with a standard receptacle tension tester used to verify the contact-retention ability of each contact in the receptacle. Be careful to check all contacts in each receptacle, and replace any defective devices. Both types of testers are available through electrical supply houses, and should be included in any electrician's standard tool collection.

You are now ready to begin system installation. The remainder of this chapter deals with planning node addresses and general topics pertaining to the installation.

Assigning Node Addresses

System message packets are routed according to source and destination node addresses combined with interface select codes. Recommended procedure is to assign single-digit addresses (0-9) to Resource Management controllers, and two-digit (10-63) addresses to workstations. This recommendation is for convenience only and is not a system requirement.

System minimum requirements are as follows:

- Node addresses can be arbitrarily assigned to any node, whether controller or workstation. If default remote mass storage unit specifiers are used by workstation programs and operators, all interfaces in the controller MUST be set to node address 0.
- Duplicate node addresses can be assigned in the same system PROVIDED no two computers having identical node addresses are connected to the same multiplexer. (It is recommended that each computer in the system be assigned its own UNIQUE node address.)
- If you assign duplicate node addresses in a system, you risk system malfunction whenever you move a computer or rearrange cabling because two computers with identical addresses may inadvertently get connected to the same multiplexer.

Recommendations

The following guidelines are adequate for most systems, and ensure reliable operation with minimum complexity and confusion.

- Assign node addresses to each controller in the system, beginning at node address 0. Address 0 is the default remote mass storage identifier. Default values can be used by any workstation connected to a controller having node address 0.
- If your system has more than one controller, use incrementing values for each controller, beginning with address 1 for the second controller, and so forth until all controllers have assigned node addresses.
- Assign node addresses for each workstation, beginning at address 10 (assuming there are not more than 10 controllers in the system). The usual technique is to simply assign node addresses in sequence, 10 through 63, one address for each workstation.

  If any workstation has more than one resource management interface, all interfaces can be assigned the same node address, provided the address does not conflict with any other computer sharing a common multiplexer.
- Never assign node address 0 to any workstation. Address 0 is reserved as a default controller address, and can cause system malfunction if another workstation inadvertently uses the default remote mass storage node address. Workstations cannot communicate correctly with other workstations.

Chapter 2
Controller Installation

This chapter explains how to install the Resource Management Controller, the interfaces that connect it to the shared peripherals, and the interconnecting network that provides communication with remote workstations in the Shared Resource Management System. Topics included are:

- Installing the Resource Management Controller and its shared peripherals.
- Installing the interconnection network between the Controller and remote user workstations.

Controller Installation

This section explains how to install the shared peripherals and connect them to the Resource Management controller. After the system hardware is installed, refer to Shared Resource Management operating manuals for information about how to operate and configure the controller and install the necessary software and firmware.

Installing Shared Peripherals

Carefully unpack the shared peripherals and place them in their proper operating positions as explained in the operating manuals that accompany each peripheral. Be sure the power switches are turned off, then plug each peripheral into its AC power source. Interface cables are installed later. Refer to the System Planning Guide (98028-90001)for information concerning cable routing, power line requirements, ventilation, and related topics.

Preparing the Controller

The HP 9826 Option 500 Resource Management Controller is shipped complete with interfaces, memory, and all operating software. Interface configuration is set to default or recommended operating values at the factory, and should need no changes for most applications. However, the following pages describe in detail how to install and configure memory and interfaces for those situations where you may want to change the configuration or convert a standard HP 9826 for use as a Resource Management controller. The procedure can also be used to verify that the hardware has been correctly installed.

Unpack the controller computer. If the interfaces are already installed, and you have no need to change any card configurations, set the computer in position and connect the interface cables as explained later. Otherwise, set the computer on a workbench, desktop, or other suitable surface with the rear panel in an accessible position for installing interfaces and memory options in the I/O Backplane card cage. Remove the four cover plates or interface covers over the card cage area by loosening the eight thumbscrews.

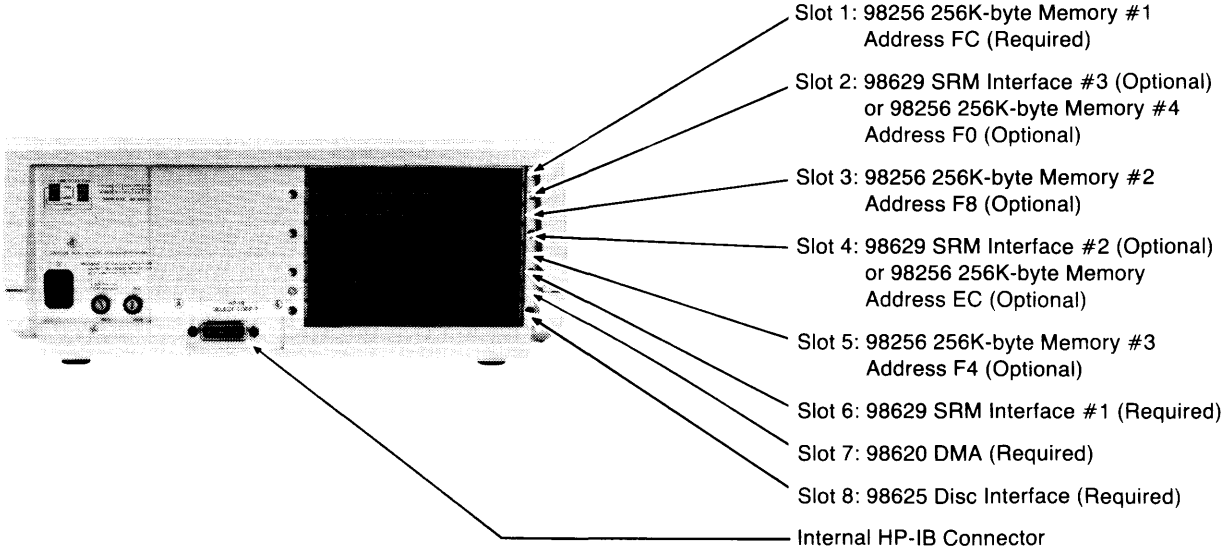
Interfaces

Three interfaces are commonly used in Resource Management controller computers. The internal HP-IB interface connects to line printers. The HP 98625 High-speed Disc Interface is used in conjunction with an HP 98620 DMA (Direct Memory Access) card to control up to four separate disc drives for mass storage use. Each HP 98629 Resource Management Interface is used to connect the controller to remote user workstations through one HP 98028 Resource Management Multiplexer.

The procedures which follow explain how to install and configure the controller interface cards and other boards that plug into the I/O backplane. The installation procedure for the HP 98629 Resource Management Interface applies to both controller and remote workstation installations.

Installing Cards in the I/O Backplane

The HP 9826/9836 computer has eight backplane slots that can be used for interface cards, memory boards, and other devices. Four slots are available for interfacing to external peripherals. The other four slots are reserved for the DMA controller card and memory boards when the computer is used as a Shared Resource Management (SRM) Controller. Memory/DMA and peripheral interface slots are alternated from the top to the bottom of the card cage. Interfaces fit in slots 2, 4, 6, and 8, while slots 1, 3, 5, 7, and any unused interface slots can be used for memory or a DMA controller. The following diagram shows the card arrangement that is recommended for most installations.



Backplane Slot Assignments

These slot assignment recommendations are based on keeping memory addresses in descending order, top to bottom, and keeping interface cables toward the bottom for better support. Maintenance is also simplified when all systems use a standardized card and cable arrangement. However, slot assignments are not mandatory.

Each of the four peripheral interface slots are located slightly below the pair of threaded fasteners that hold the interface cover thumbscrews when the card is inserted. If you insert the interface into a wrong slot, the thumbscrews in the interface cover cannot mate properly with the threaded fasteners in the computer's rear panel. If a peripheral interface slot is not used for interfacing, it can be used for memory or DMA; a blank cover is then used to conceal the boards after installation.

Handling Interface Cards

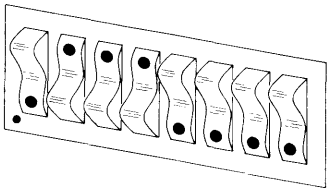
Interface cards and other boards in the I/O card cage contain components that are easily damaged by static electrical discharge caused by improper handling. To minimize the risk of component damage, the interfaces and other cards are shipped in special conductive plastic bags for protection. Do not remove the card from its bag until you are ready to install it. When installing the card, be sure there is no opportunity to create a static discharge. Hold the card by the extractors or backplane cover while removing it from the bag, and avoid touching the circuitry on the card. Touch the metal surface on the computer's rear cover panel with one hand and maintain that contact while plugging the interface into the computer with the other hand. After the card is seated into the backplane connector, the risk of damage is negligible.

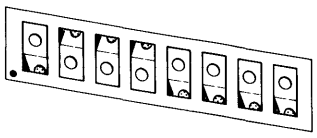
Whenever you need to remove a card from the computer for service or system changes, keep the card in its protective bag to prevent component damage, or place it on a work surface designed for servicing static-sensitive electronic components and assemblies.

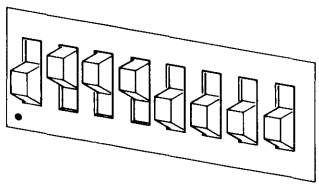
Be careful to avoid touching the printed circuit edge connector fingers on the interface. Fingerprints promote contamination that can lead to unreliable operation. If it becomes necessary to clean the fingers, use a cotton swab and isopropyl alcohol. Be sure to avoid the possibility of electrostatic discharges while cleaning the connector fingers; both for safety, and to prevent component damage.

Interface and Memory Configuration Switches

The interface and memory configuration switches are manufactured as clusters of two to eight individual single-pole, single-throw switches combined in a single molded plastic housing. Each switch is actuated by a slide or rocker. Switch rockers may be manufactured so that they are always flush with the housing, or they may protrude above the housing on one side or the other. The switch position is always determined by which end of the rocker is depressed. If the actuator is a slider, the switch position is determined by the position of the tab on the slider. The following illustrations show how to interpret switch settings correctly; each of the three switches have identical settings.







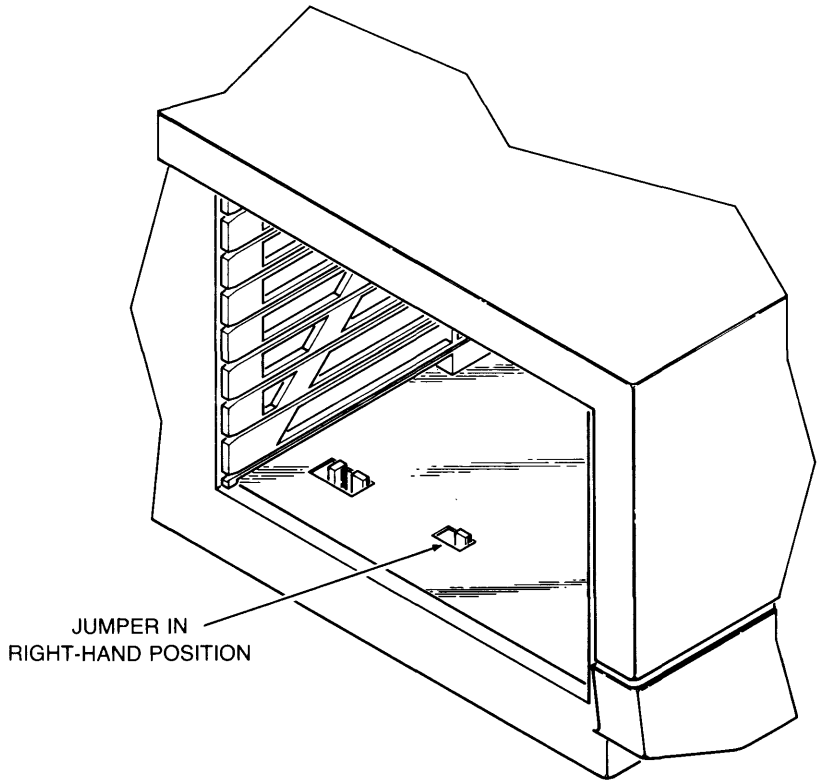
To set rocker switches, use a ball-point pen or other pointed tool to depress each switch rocker until it is fully seated. If the rocker or slider is not fully seated, erratic behavior may result. Slide switches can be changed by using your fingers or a suitable tool such as a small screwdriver.

Installation Procedure

This section explains how to configure and install all the interface cards and other assemblies that go in the card cage, and how to configure the internal HP-IB interface for proper operation with shared printers and any other devices operating from the interface. All explanations are based on the assumption that the computer is on a table or workbench, the rear panel is facing the person installing the cards in the card cage, no cards have been installed in the cage, and the power cord is disconnected.

HP-IB Interface Configuration

Before installing any cards in the card cage, the HP-IB interface must be configured as the **controller** of the interface bus. This is done by programming a plug-on jumper located on the circuit board below the card cage. The HP-IB configuration jumper is located approximately in the center of the bottom of the card cage opening. It should be plugged onto the center and right-hand pins. (The center and left-hand pins select the non-controller configuration.) There are also two plug-on jumpers in the left bottom area of the card cage. Do not change their configuration.



HP-IB Configuration Jumper Setting

After the HP-IB configuration is complete, you can install the DMA and disc interface cards as explained next.

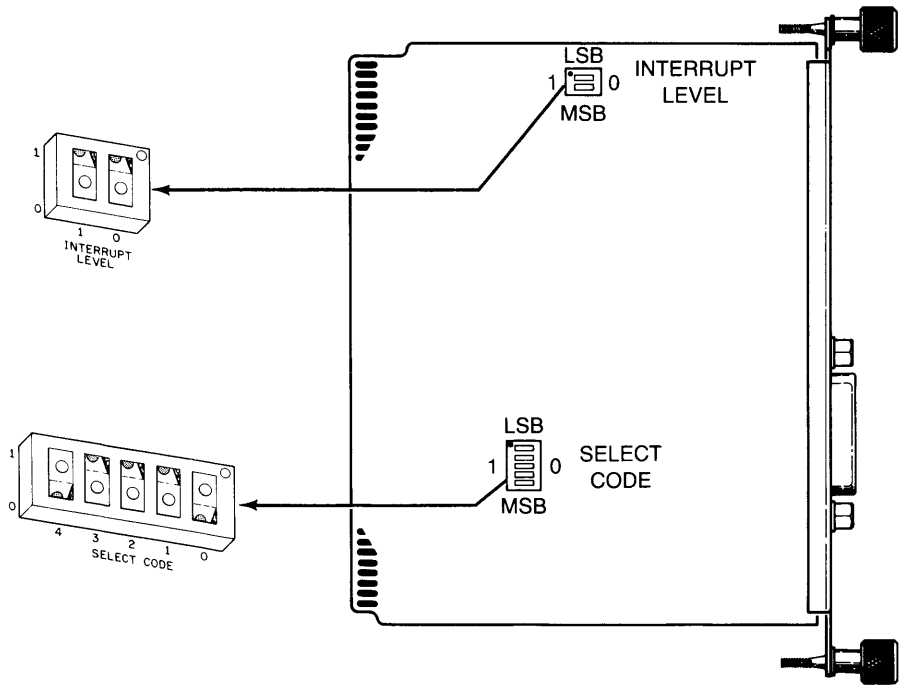
HP 98620A DMA Card Installation

Unpack the HP 98620A DMA Card and inspect for any damage, dirty edge connector fingers, or other problems. Plug the card into card cage slot 7 (just above the bottom slot). Handle the card as explained previously, and push the card into the cage until it is firmly seated in the backplane connector.

HP 98625A Disc Interface Card Installation

Carefully unpack and inspect the disc interface as explained earlier for the DMA card. Set the interface select code and hardware interrupt level to their proper values. The card is shipped from the factory preset to select code 14, but can be set to any non-conflicting value. **The hardware interrupt level must be set to 6**. For simplicity, use the factory preset values.

The following figure shows the two sets of configuration switches on the interface card: Interface Select Code and Hardware Interrupt Level. Note the position of the most significant (MSB) and least significant (LSB) bits on each switch. The switches are shown in their factory-set (default) positions.



HP 98625A Disc Interface Configuration Switches

Configuration Switch Function	Default Value	Allowable Range
Interface Select Code (S2)	14	8 thru 31
Hardware Interrupt Level (S1)	6	6 only

Binary/Decimal Table of Interface Select Codes

S2 Settings MSB 43210 LSB	Decimal Value	S2 Settings MSB 43210 LSB	Decimal Value
01000	8	10100	20
01001	9	10101	21
01010	10	10110	22
01011	11	10111	23
01100	12	11000	24
01101	13	11001	25
01110	**14**	11010	26
01111	15	11011	27
10000	16	11100	28
10001	17	11101	29
10010	18	11110	30
10011	19	11111	31

Binary/Decimal Table of Hardware Interrupt Levels

S1 Settings MSB LSB	Decimal Value	Interrupt Level
0 0	0	3
0 1	1	4
1 0	2	5
1 1	**3**	**6**

No other interface card can be set at the same hardware interrupt level as the HP 98625A. Otherwise, system failure results.

Default switch settings are recommended for most applications.

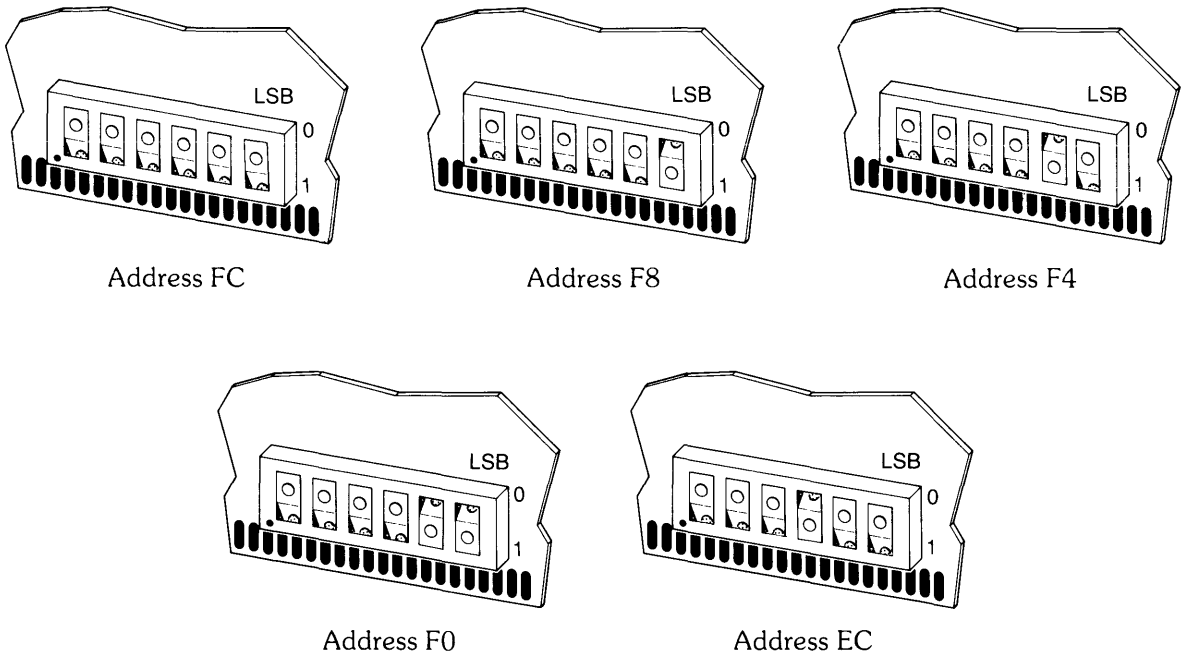
When the configuration switches on the interface have been set, install it in the bottom slot (Slot 8) in the card cage using the procedure previously described. Seat the card into the backplane connector by screwing in the thumbscrews until they are finger tight. Note that the interface cover plate conceals both slots 7 and 8. Do not attach the interface cable at this time.

HP 98256A 256K-byte Memory Assembly Installation

Up to three (or five if slots are available) 256K-byte memory assemblies can be installed in the controller. It is recommended that they be installed in slots 1, 3, and 5, and that the address configuration switches be set to FC, F8, and F4, respectively. If one board is installed, set it to address FC; if two, FC and F8, respectively.

If only one or two Resource Management interfaces are installed, the unused slots can be used for additional memory. Set memory cards four and five to addresses F0 and EC, respectively. If any memory is removed at any time, you must begin with the lowest-address card.

Memory address switch settings for each of the five available addresses are shown in the following figure:



Memory Address Configuration Switches

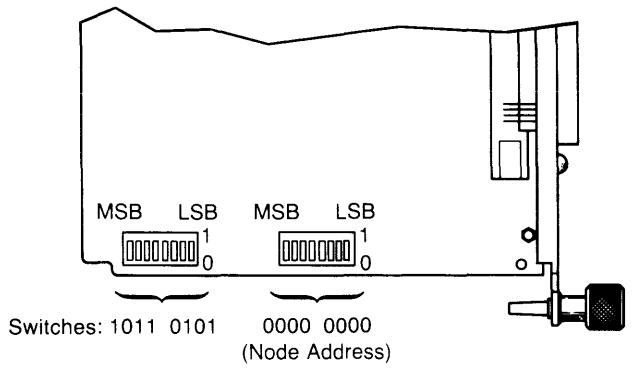
After the address has been properly configured on each card, insert the card into the proper slot in the backplane card cage as previously described, making sure the card is fully seated in the backplane connector. After the memory card(s) are installed, you are ready to install the Resource Management interface(s).

Note

If you remove a memory board from the System Controller for any reason, the remaining boards MUST include an FC board. An F8 board must be installed before an F4 board can be used, F4 before F0, and F0 before EC.

HP 98629 Resource Management Interface Installation

Unpack and inspect the Resource Management interface. As with the disc interface, there are two sets of configuration switches on the interface card. One determines the interface select code and hardware interrupt level; the other sets the interface Node Address. Note the positions of the most significant (MSB) and least significant (LSB) bits on each switch. The switches are shown in their factory-set (default) positions.



HP 98629 Resource Management Interface Configuration Switches

Select Code and Interrupt Level Switches

The switch cluster on the left configures the interface select code and hardware interrupt level for the interface. The switch on the extreme left of the cluster is not used, but should be set in the "1" position. The next two switches control the interrupt level. The left switch is the MSB; the right switch is the LSB. To ensure reliable system operation under all operating conditions, the hardware interrupt level must be set to 4. The remaining five switches on the right set the interface select code. Here are the allowable range of settings and the factory-set default values:

Configuration Switch Function	Default Value	Allowable Range
Interface Select Code	21	8 thru 31
Hardware Interrupt Level	4	4 only

The following table shows the switch settings for all allowable interface select code values:

Binary/Decimal Table of Interface Select Codes

MSB 43210 LSB	Decimal Value	MSB 43210 LSB	Decimal Value
01000	8	10100	20
01001	9	**10101**	**21**
01010	10	10110	22
01011	11	10111	23
01100	12	11000	24
01101	13	11001	25
01110	14	11010	26
01111	15	11011	27
10000	16	11100	28
10001	17	11101	29
10010	18	11110	30
10011	19	11111	31

Binary/Decimal Table of Hardware Interrupt Levels

Switch Settings MSB LSB	Decimal Value	Interrupt Level
0 0	0	3 Do not use
0 1	**1**	**4 Use ONLY this setting**
1 0	2	5 Do not use
1 1	3	6 Do not use

The default select code is adequate for most applications unless multiple interfaces are installed in a single controller. When multiple interfaces are installed, each must have a unique select code. Hardware interrupt level MUST be set to 4 on all Resource Management interfaces.

Node Address Switches

The switch cluster on the right configures the resource management Node Address. Any value from zero thru 63 can be selected provided it is not the same as the address for any other node connected to the same multiplexer. The right-hand six switches are used to set the Node Address. The two switches on the left in the cluster **must be set to their zero position**. To set a given switch to ZERO, depress the switch rocker on the side **nearest** the card edge. To program a ONE, depress the rocker on the side **away from** the card edge. Be sure the switch rockers are fully seated in their proper positions. Node Address assignments are discussed in Chapter 1. For greatest convenience, set the first controller to address 0, and use two-digit (10-63) node addresses for workstations.

The following table shows the switch settings for all allowable node addresses.

Node Address Switch Settings

MSB 76543210 LSB	Decimal Value	MSB 76543210 LSB	Decimal Value
00000000	0	00100000	32
00000001	1	00100001	33
00000010	2	00100010	34
00000011	3	00100011	35
00000100	4	00100100	36
00000101	5	00100101	37
00000110	6	00100110	38
00000111	7	00100111	39
00001000	8	00101000	40
00001001	9	00101001	41
00001010	10	00101010	42
00001011	11	00101011	43
00001100	12	00101100	44
00001101	13	00101101	45
00001110	14	00101110	46
00001111	15	00101111	47
00010000	16	00110000	48
00010001	17	00110001	49
00010010	18	00110010	50
00010011	19	00110011	51
00010100	20	00110100	52
00010101	21	00110101	53
00010110	22	00110110	54
00010111	23	00110111	55
00011000	24	00111000	56
00011001	25	00111001	57
00011010	26	00111010	58
00011011	27	00111011	59
00011100	28	00111100	60
00011101	29	00111101	61
00011110	30	00111110	62
00011111	31	00111111	63

Attempting to use values other than those specified in the table may result in improper system operation.

After you have set the configuration switches, insert the interface into the appropriate slot and tighten the thumbscrews until they are finger tight as explained earlier in this chapter. Install blank covers over any card cage slots that are not concealed by the interface cards. This completes the interface and memory installation.

The computer is now ready for connection to peripherals. Place it in its normal operating position, and install the power cord by plugging it into the rear panel and into the assigned electrical power receptacle.

Connecting Shared Peripherals

Now that the controller memory and interface cards are configured and installed, you are ready to connect the controller to its shared peripherals. If the system contains more than one controller, the procedures outlined in this section apply to each controller in the system.

Connecting HP-IB to Shared Peripherals

The HP-IB interface connector is attached to the main rear panel of the Resource Management controller, and must be connected to the shared printers that are connected to the controller. Connect one end of an HP 10833[1] HP-IB chaining cable to the rear panel HP-IB connector, then attach the other end to the first shared printer. Plug the cable into the connector on the computer or printer, then tighten the two retainer screws until they are finger tight.

Limitations

HP-IB shared printers can be connected in any configuration; either in a "star" or "tree" pattern, or in a serial "daisy-chain" configuration where interface cables are connected in a series path from one printer to the next until all are connected. The total length of cable that can be used to connect peripherals to a single HP-IB interface is a maximum of 20 metres[2]. A total of 8 printers can be connected to the controller (limited both by the HP-IB drivers and the number of spoolers in the controller operating system). These guidelines apply to controllers. Similar guidelines apply to workstations that are connected to other types of HP-IB peripherals.

Eight printer spoolers are provided in the controller operating system. Up to 8 printers can be connected to each controller, but only one can be an HP 2608A[3]. The others (or all eight) can be any mixture of HP 2631B/G printers.

Connecting the HP 98625 Interface to Disc Drives

The HP 98625A Disc Interface is intended ONLY for connecting the HP 9826/9836 Computer to Hewlett-Packard disc drives equipped with CS/80 controllers. Do not attempt to use the interface with any disc or controller that is not equipped for CS/80 disc commands. If you have any questions concerning compatibility of the interface and a specific drive, consult your nearest HP Sales and Service office. This section explains which interface cables can be used, and establishes guidelines for connecting multiple drives to a single interface.

1 HP 10833 Series chaining cables have special shielded connectors and additional cable shielding to comply with new RFI and EMC requirements. Avoid using earlier model cables. Cables can be identified by the model number printed on the cable jacket.

2 A maximum of 20 metres or 2 metres per device connected to the bus, whichever is less.

3 The HP 2608A Printer HP-IB interfaces must be configured to execute CR, LF, and FF characters. SRQ (service request) must be enabled. Command priority checking is optional, and can be enabled or disabled. Refer to the printer installation manuals for details on how to configure these options.

Interface Cables

Use only HP 10833 Series interface cables to connect the disc interface to disc drives. These cables are also used to chain multiple drives together. The HP 10833 Series cables are similar in appearance to standard HP-IB or IEEE-488 chaining cables, but they have additional shielding and other features to minimize RFI and improve noise characteristics. HP 10833 cables can be identified by the model number stamped on the cable jacket. Do not use any other model HP-IB cables to connect the interface to disc drives or controllers.

Chaining cables are usually supplied with disc drives, so none is included with the disc interface. If you need additional cables for connecting multiple drives or for changing system configuration, you can order any of the following lengths:

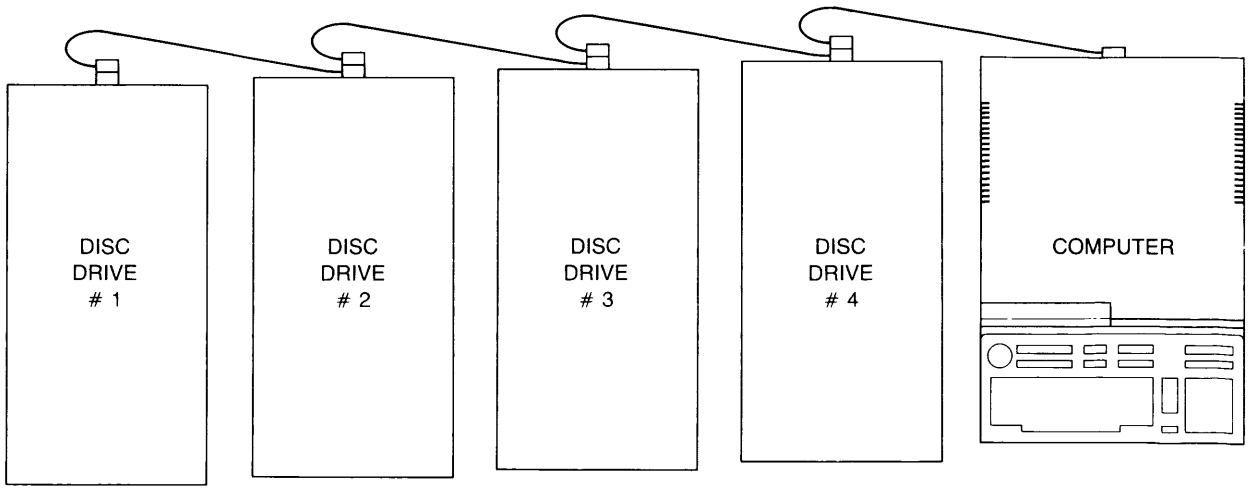
HP-IB Cables

Model Number	Cable Length
10833A	1 metre
10833B	2 metres
10833C	4 metres
10833D	0.5 metre

Note that the total cable length in any application must not exceed 10 metres.

Physical Arrangement of Equipment

The high data transfer rates supported by the disc interface require special consideration when installing interface cables. Cables behave like radio-frequency transmission lines, and can affect data settling time on the high-speed logic driver outputs. Improperly terminated or incorrectly configured cable connections can set up reflections and ringing that adversely affect signal reliability. To minimize these and related problems, configure the disc drives so that the cables are connected serially from drive to drive in a "daisy chain" pattern. For best results, avoid "star" configurations where individual cables are connected from the interface to each drive.



Recommended Arrangement of Computer and Disc Drives

Limitations
Electrical design limits require that the combined bus connections must not exceed 11 equivalent loads and 10 metres total line length for each interface. In addition, line length must not exceed **one** metre per equivalent load. (These restrictions are due to transmission line reflection characteristics and timing constraints for high data rates.) The interface presents seven equivalent loads. Most disc drive controllers in the CS/80 series present one equivalent load. Therefore, up to four discs can be connected to a single interface. The maximum length of cable that can be connected to a single interface and up to four discs or equivalent loads is as follows:

Disc Interface Cable Length Limits

Equivalent Loads	Maximum Total Cable Length
1	8 metres
2	9 metres
3	10 metres
4	10 metres

Consult disc operating manuals to verify the number of equivalent loads presented by each controller.

Connecting the Resource Management Controller to Remote Workstations

Before you install the interconnecting network between computers, install the System Workstations and their respective peripherals as explained in Chapter 3. After the workstations are installed and connected to their respective peripherals, you are ready to install the multiplexers and interconnecting cables as explained in this section. Refer to the System Map that was filled out during site planning and preparation to determine which computers are interconnected in the System.

Multiplexer Installation

At the heart of each interconnecting network is an HP 98028 Shared Resource Multiplexer. The multiplexer acts as a switching device that controls message flow among the computers that are connected to it. All network communications between computers must pass through a multiplexer. The system has no provision for passing information from one computer directly through a second computer and on to a third. All information transfers are between network controllers and user workstations.

The multiplexer obtains operating power through the short cable that is permanently attached to it. The cable **must** be connected to an HP 98629 Resource Management interface installed in a controller or remote workstation computer. Only two multiplexers can obtain power from a single controller because of power supply limitations. If three multiplexers are being used with a single Controller, at least one multiplexer must obtain power from a Resource Management interface installed in a different computer. When selecting a remote computer to supply power to the multiplexer, don't forget that the remote computer must have its power on at all times for other computers to be able to use the multiplexer. Only one multiplexer can obtain power from a given HP 98629-equipped workstation computer. HP 9845 computers have no provision for multiplexer power.

To connect the multiplexer to its power source, plug the connector on the short multiplexer cable into the connector on the HP 98629 Resource Management Interface. Snap the two retainer clips into place so the plug cannot come loose.

All System computer connections are handled through multiplexers. You cannot connect two multiplexers directly to each other through a cable, and you cannot connect computers together without using a multiplexer. The next section explains how to connect remote Resource Management interfaces to multiplexers.

Connecting Other Computers to the Multiplexer

The HP 98629A Resource Management Interface is designed to connect certain HP computers to Resource Management Systems. This section explains how to connect the interface to remote multiplexers.

At this point, it is assumed that all multiplexers in the system are connected to a host interface that supplies electrical power. Each multiplexer is a central switch for the computers that connect to it. Since more than one multiplexer can be connected to a single controller, there can be one, two, or three networks connected to a single controller, each multiplexer being the central switch for a single network of workstation computers.

All System connections are made with HP 97061 cables which come in various lengths as explained in the next section. Install each cable from the multiplexer to the appropriate computer by first routing the cable through wiring ducts, conduits, etc. as appropriate. After the cable is in place and protected from foot or vehicular traffic, connect the 50-pin connector on the HP 97061 cable assembly to the Resource Management interface, then snap the retainer clips into position. Plug the 15-pin connector on the opposite end of the cable into the multiplexer, then tighten the retainer screws to prevent the connector from coming loose. Do not overtighten the screws.

Cable Support

The heavy HP 97061 interconnection cables can apply excessive stress to the connectors on the computer and multiplexer connectors if they are not supported by external means. To minimize the potential for connector failure due to cable movement, use nylon or other suitable electronic cable clamps to support the cables by placing the clamps about 30 cm from the cable connector and attaching them with a screw or other suitable fastener to the table or surface that supports the multiplexer.

Note

Only two multiplexers can obtain power from a single System Controller. If three multiplexers are used, one must obtain power from another computer in the system that has an HP 98629 Resource Management Interface. Use an HP 97061 cable to complete the connection from the System Controller to the third multiplexer. Do not connect more than one multiplexer power cable to a given workstation.

Interface Cables

Use only HP 97061 interface cables to connect the Resource Management Interface to the network. Interface cables are available in the following four versions:

HP 97061A 10-metre cable with two connectors installed. The 50-pin connector on one end mates with the interface card. The 15-pin connector on the other end mates with the HP 98028 Resource Managment Multiplexer.

HP 97061B 25-metre cable with two connectors installed. Connectors are the same as those used on the 10-metre cable.

HP 97061C 60-metre cable with two connectors installed. Connectors are the same as those used on the 10-metre cable.

HP 97061D 60-metre cable with ONE connector installed. Connectors are the same as those used on the 10-metre cable, except that the 50-pin connector is not attached to the cable. This cable is used where the cable must be fished through conduit, or pulled through wiring ducts. All materials needed for installing the connector (except tools and solder) are included with the cable. Connector assembly procedure is described in the cable installation note (97061-90000).

Connecting Multiple Controllers

Some applications may require use of multiple Resource Management controllers. There are no special procedures when connecting multiple-controller systems. Just be sure that those workstations that access more than one controller are connected to the right multiplexer, and the remaining workstations are connected to their controllers through the right multiplexer. Remember that node addresses must be different for all computers connected to a given multiplexer.

Turning on the System

After all hardware has been installed and all interconnections are complete, turn on the power to the controller and its peripherals. The POWER light on the multiplexer(s) should be illuminated, but the BUSY light should be dark. If the system has more than one controller, repeat for the other controllers in the system.

Turn on power to the remote workstation computers and their peripherals. If a multiplexer is connected to a workstation, it should also indicate POWER is on, and the BUSY light should be dark.

The Shared Resource Management System is now ready for initial system testing and checkout. Refer to the System Manual for procedures.

In Case of Difficulty

In general, each computer in the system is turned on and checked out as a normal stand-alone computer. After operating integrity for each computer is established, the individual elements in the system network are verified. The procedures to be followed in checking and troubleshooting system operation are explained in the System Manual (09826-90080).

Chapter 3
Workstation Installation

This chapter explains how to install user workstations in the Resource Management System. Two interfaces are used as follows:

- The HP 98029 Resource Management Interface connects the HP 9845B/C Computer to a multiplexer through an HP 97061 Cable Assembly that is also available as an interface option.
- The HP 98629 Resource Management Interface connects HP 9826/HP 9836 computers to multiplexers, either directly or through an HP 97061 Cable Assembly. The cable assembly is also available as an interface option.

Workstations can be configured as stand-alone computational devices, or they can be complex test systems that share data files with other computers in the network. Because of the wide variety of applications, it is beyond the scope of this chapter to explain how to install workstation peripherals. Refer to operating and installation manuals for instructions on how to install workstation peripherals and equipment. This chapter addresses connecting the workstation to the Shared Resource network through a Shared Resource Multiplexer.

Installing the HP 9845B/C Workstation

Resource Management ROM Installation

The Resource Management ROM for the HP 9845B/C consists of two ROM assemblies; one with a green label, the other with a black label. The green label ROM plugs into the left-hand ROM drawer, and the black label ROM plugs into the right-hand ROM drawer.

To install each ROM, remove the drawer, plug in the ROM, and replace the drawer as follows:

1. Remove the ROM drawer by placing your thumb in the recess at the top of the drawer, then pressing up on the movable catch underneath the drawer face with your fingers. When the catch is pushed up, gently pull the drawer out.
2. Open the clear plastic cover plate by pressing in on the two ears on each side of the inside drawer face, then hinging the cover upward.
3. Plug the ROM pack into an available connector, being careful to maintain proper orientation of the package in the drawer, and being sure the ROM cap mates properly with the small keys on each side of the ROM connector. Inspect to be sure that the ROM is fully seated in the connector before closing the cover.
4. Hinge the cover back down, and snap it into place. Slide the drawer back into the computer and push it in until it is fully seated and the retainer catch is engaged. Repeat the procedure for the other drawer.

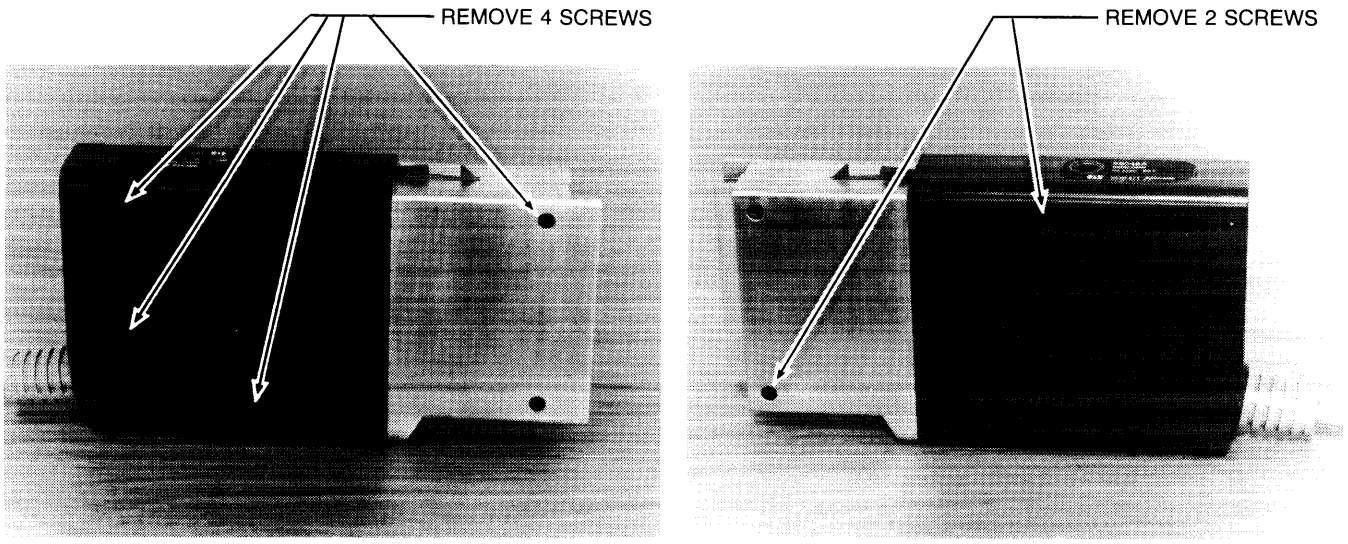
Resource Management Interface Installation

The HP 98029 Interface is used to connect the HP 9845B/C to its multiplexer. The interface is equipped with a female 50-pin connector at the end of its pigtail cable that mates with the male 50-pin connector on the HP 97061 Cable Assembly. The interface does not provide any power to the cable, so the HP 98028 Multiplexer cannot be connected directly to the interface for a power source connection. Multiplexer power is obtainable ONLY from the HP 98629 Interface used in HP 9826/9836 Computers.

Unpack the interface, and inspect for any damage during shipment. Before the interface can be installed, the Node Address must be configured.

Configuring the Interface Node Address

To set the interface Node Address, you must separate the housing shell, set the Node Address switches, then reassemble the housing. Refer to the photographs and follow the procedure outlined.



Side A Side B

Interface Access Screws

Configuration procedure:

1. Remove four screws from Side A and two screws from Side B as indicated in the photographs. Use a #1 POZIDRIV screwdriver.
2. Carefully separate the two halves of the interface housing. It should be unnecessary to use more than mild force. Be sure not to bend the connector pins that interconnect the two printed circuits. If you have difficulty separating the halves, verify that you have removed the correct screws.
3. The configuration switches are located on the printed circuit attached to housing side A next to the female connector socket that mates with the other side. Use a ball-point pen or other suitable tool to set the switch rockers or sliders as explained later in this section. Be sure all the switches are firmly seated in their correct positions. Use the figure accompanying the Node Address Table to determine the proper switch orientation.
4. After the Node Address has been set, carefully plug the two halves together again, then replace and tighten the screws. The interface is now ready to be installed in the computer.

Setting the Select Code

The interface select code can be set at any time before or after the interface has been installed in the computer. The select code is determined by the setting of the rotary switch that is accessible through the hole in the top of the interface housing. To set or change the select code, use a small flat-blade screwdriver to turn the switch rotor until the arrow points to the correct setting. The select code can be any value from 1 through 12, but must be different from any other interface connected to the same computer. The setting used in most applications is select code 5.

Note

Do not use node address 0 for workstations. The default remote mass storage unit specifier is assigned to Node Address 0 which must be a Resource Management controller. The Node Address must also be different from any other address connected to the same multiplexer. To use the default remote mass storage unit specifier, the interface select code must be set to 5.

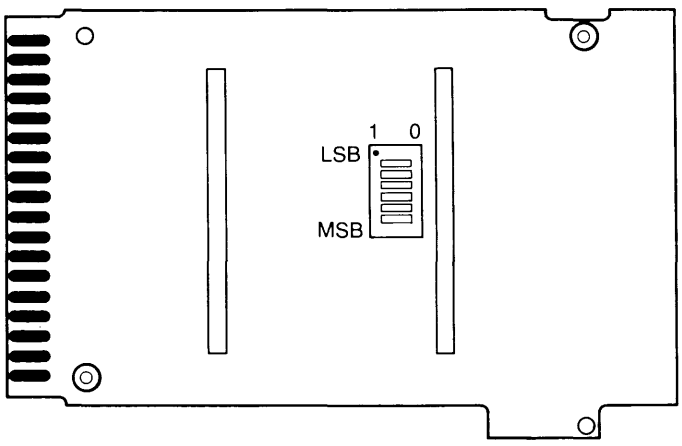
Installing the Interface

After the node address is correctly set and the housing is reassembled, install the interface as follows:

1. Be sure the power to the computer is turned OFF.
2. Insert the interface housing into any available slot in the I/O backplane. If an I/O expander is being used, the interface can also be plugged into it. Be sure the interface is fully seated into the backplane connector with the retainer clip engaged so that the interface cannot be removed unless the release is depressed.
3. Connect the interface to the HP 97061 cable that leads to the multiplexer. Snap the retainer clips into place so the connectors cannot accidentally separate. (See Chapter 2 for more information about cable and multiplexer installation.)
4. After the interface is installed and the Resource Management hardware is installed, turn the computer on and verify as explained at the end of Chapter 2.

Setting the Node Address Switches

The switch cluster in the center of the printed circuit card attached to housing side A configures the resource management Node Address. Any value from zero thru 63 can be selected provided it is not the same as the address for any other node that is connected to the same multiplexer. To set a given switch to a ONE, depress the switch rocker on the side **away from** the connector socket that mates with the other card. To program a ZERO, depress the rocker on the side **nearest** the connector. Be sure the switch rockers are fully seated in their proper positions. If a slide switch is used instead of rockers, move the slide toward or away from the connector to program a ZERO or ONE, respectively.



Locating Guide for Node Address Switches

The following table shows the switch settings for all allowable node addresses.

HP 98029 Node Address Switch Settings

MSB 543210 LSB	Decimal Value	MSB 543210 LSB	Decimal Value
000000	0	100000	32
000001	1	100001	33
000010	2	100010	34
000011	3	100011	35
000100	4	100100	36
000101	5	100101	37
000110	6	100110	38
000111	7	100111	39
001000	8	101000	40
001001	9	101001	41
001010	10	101010	42
001011	11	101011	43
001100	12	101100	44
001101	13	101101	45
001110	14	101110	46
001111	15	101111	47
010000	16	110000	48
010001	17	110001	49
010010	18	110010	50
010011	19	110011	51
010100	20	110100	52
010101	21	110101	53
010110	22	110110	54
010111	23	110111	55
011000	24	111000	56
011001	25	111001	57
011010	26	111010	58
011011	27	111011	59
011100	28	111100	60
011101	29	111101	61
011110	30	111110	62
011111	31	111111	63

Select the Node Address using the guidelines in Chapter 1.

Note

The HP 98029A Resource Management Interface is intended ONLY for connecting the HP 9845B/C Computer to HP Resource Management System networks. The interface card circuitry is not compatible with any other data communication protocols or techniques.

Installing the HP 9826/9836 Workstation

The HP 98629 Resource Management Interface is used to connect HP 9826/9836 Computers to the Shared Resource Management System through HP 98028 Resource Management Multiplexers. This section explains how to install the computers as workstations. Chapter 2 discusses the use of the same computers as Resource Management controllers. The primary difference between controller and workstation computers lies in the peripherals connected to the computer and the operating software that is installed in the computer.

Plan the memory and interface requirements of the workstation to fit the application of that particular workstation, reserving one I/O backplane slot for the Resource Management interface. Which slot is used is unimportant, but it is usually more convenient to place interfaces that require heavy cables close to the bottom of the card cage.

Resource Management Interface Installation

Unpack the interface from the shipping container, and inspect it for damage. Be careful to follow the handling procedures outlined in Chapter 2.

Before you install the interface, configure the Interface Select Code, Hardware Interrupt Level, and Node Address switches. The select code is usually set to 21. The hardware interrupt level must be 4. Set the Node Address to the value indicated on the System Map that was prepared during site planning. Refer to Chapter 1 for node address selection guidelines. Chapter 2 explains how to set the select code, interrupt level, and node address configuration switches.

Note

Do not use node address 0 for workstations. The default remote mass storage unit specifier is assigned to Node Address 0 which must be a System Controller. The Node Address must also be different from any other address connected to the same multiplexer. To use the default remote mass storage unit specifier, the interface select code must be set to 21.

After you have set up the interface configuration switches and verified that they are properly seated in position, plug the interface into the computer as explained in Chapter 2, then tighten the thumbscrews until they are finger tight. Place the computer in its normal operating position, and install the local peripheral interface cables. Attach the multiplexer or HP 97061 cable to the interface as explained in Chapter 2 to complete the connection to the Resource Management System. Be sure to snap the connector retainer clips onto the cable connector to prevent the connector from accidentally disconnecting.

When workstation installation is complete, turn on the equipment as explained at the end of Chapter 2.

Chapter 4
Service Information

The Resource Management System consists of one or more HP 9826 computers configured as controllers, one or more user workstations, and one or more HP 98028 Resource Management Multiplexers. Additional peripherals can be connected to individual computers in the system, and the interconnecting cables between computers and multiplexers complete the hardware network. This chapter discusses the theory of operation for individual devices in the system. It is provided to aid in troubleshooting at the device level **after** system diagnostics have been used to isolate the problem area. System diagnostics are discussed in the System Manual (09826-90080).

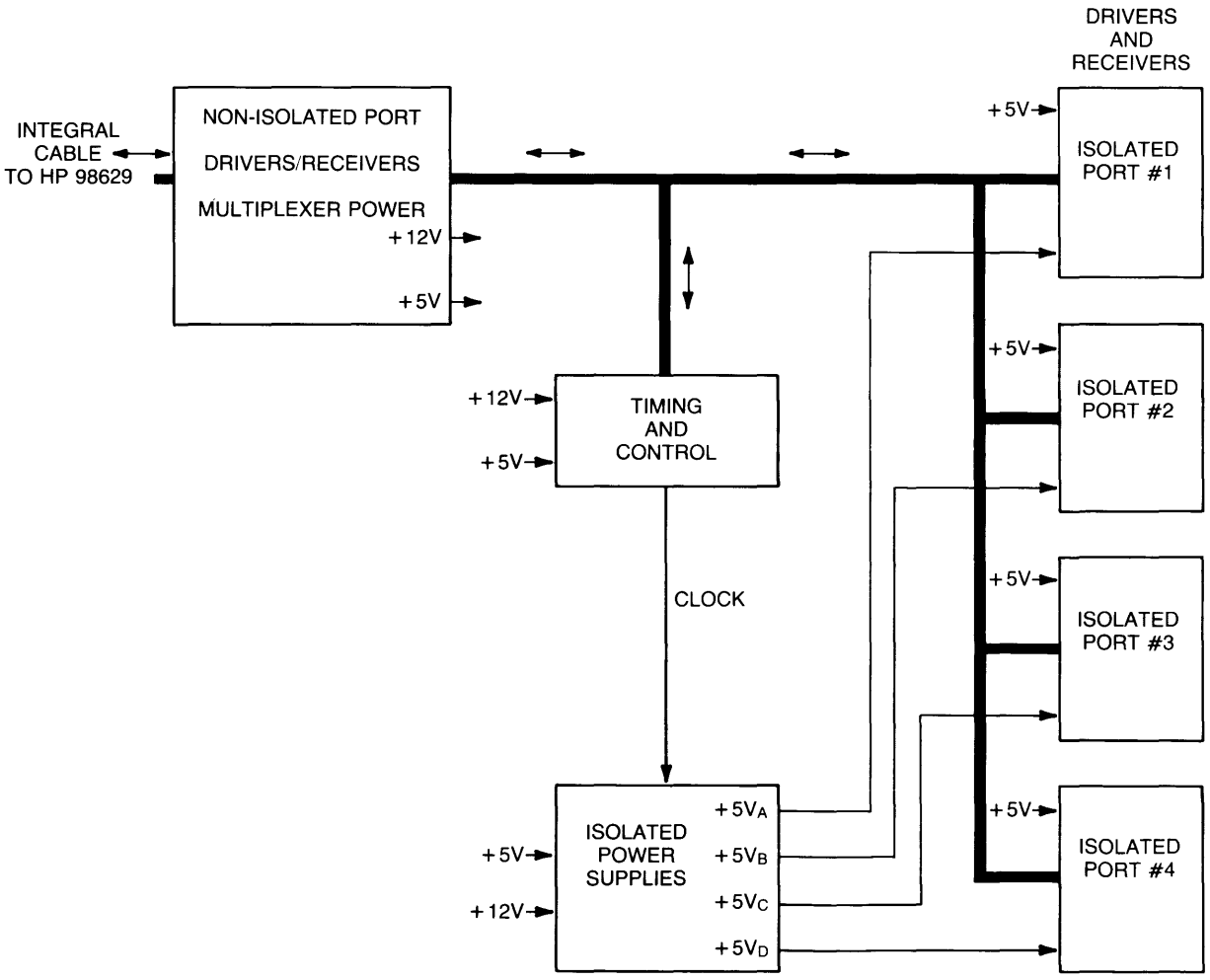
Topics discussed in this chapter include:

- HP 98028 Multiplexer theory of operation
- HP 98629 SRM Interface theory of operation
- HP 98029 SRM Interface theory of operation
- HP 97061 Interface Cable Assembly
- HP 98625 Disc Interface theory of operation
- Parts lists for multiplexer and Resource Managment interfaces
- Schematic diagrams for multiplexer and Resource Management interfaces.

Multiplexer Theory of Operation

The HP 98028 Resource Management Multiplexer is the heart of the interconnecting network between computers in the system. It performs the switching and electrical isolation functions that enable nodes in the network to communicate safely and reliably. All multiplexer ports are electrically isolated from each other. Isolated grounds and power for each port's drivers and receivers prevent ground loops and related noise problems. The multiplexer draws electrical power from an HP 98629 Resource Management Interface through the short cable that is permanently attached to the multiplexer housing. (Power cannot be supplied from the HP 9845B/C through an HP 98029 Resource Management Interface.) Up to two multiplexers can be connected to a single Resource Management controller, but only one multiplexer can be connected to a given workstation due to power supply considerations.

Here is a multiplexer block diagram that shows the relationship between the various circuit elements:



Multiplexer Block Diagram

Power Supplies and Port Isolation

The multiplexer has a self-contained DC-to-DC converter that chops the incoming power from the HP 98629 Resource Management Interface, converts it to AC power, then uses a transformer to provide four isolated power sources for the drivers and receivers that connect to remote nodes through HP 97061 cables. Opto-isolators are used to pass signals across the isolation barriers between ports.

Line Drivers and Receivers

The Line Drivers and Receivers communicate with Resource Management interfaces using balanced lines in both directions. The electrical characteristics are similar in some respects to EIA RS-422 standards, but differ in others. The four isolated ports are electrically separated from each other and the non-isolated port. There is no DC electrical continuity between any port and any other port including signal lines, power, and grounds. This isolation eliminates the potential ground-loop hazards that may arise when connecting computers together through long interconnecting cables.

Switching and Control Circuit

The switching and control circuit determines the direction of data flow through the multiplexer, and maintains proper timing between participating computers in the network. It uses the internal 700 khz clock oscillator to generate the timing signals sent to participating interfaces for controlling data transmission.

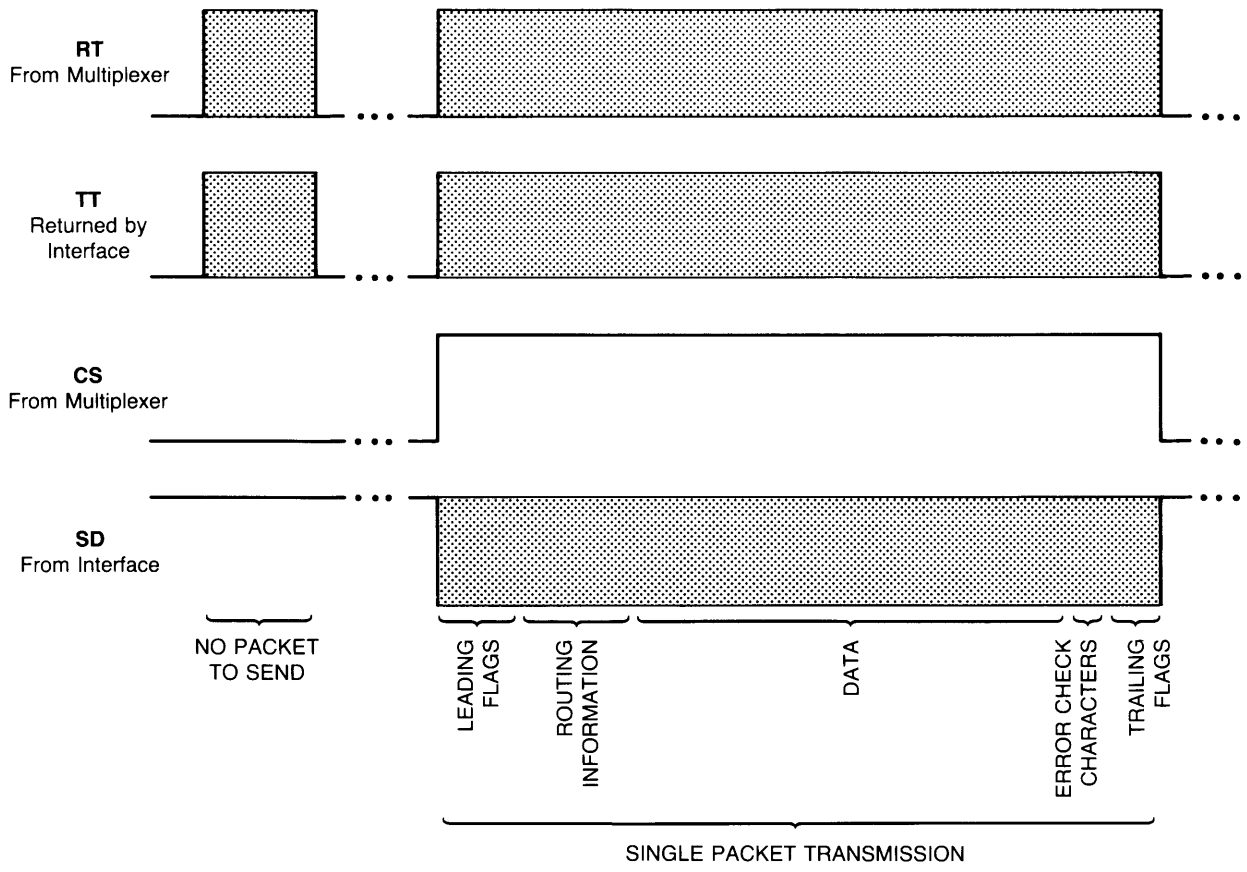
The term multiplexer is somewhat inaccurate. The switching circuit more closely resembles a digital rotary switch with five ports. Data input is taken from one port at a time in a rotary sequence. As the data arrives, it is sent out on all five ports in a "broadcast" fashion. When the data transmission from the first port is finished, the second input port is selected, and so forth until all ports have been sequenced. The process is then repeated, again beginning with the first port.

To maximize multi-user access to the network, data is handled in packets using a format similar to standard SDLC (Synchronous Data Link Control) protocol. Each participating computer is allowed to transmit one packet of data after which it must wait until all other ports have been serviced before it can send the next packet. Since the data packet includes source and destination information, it is unnecessary for the multiplexer to interpret routings. The task of identifying data destinations is left to the computer interfaces in the network.

As each interface receives data packets from the multiplexer, the interface decodes the packet destination node address. If the packet destination address does not match the programmed interface Node Address, the packet is ignored. If the address matches the interface node address, the interface accepts the packet and notifies the computer of its arrival.

Handshaking Between the Multiplexer and Interfaces

As with any computer and peripheral, it is imperative that data traffic be monitored and controlled so that an orderly flow of information can be maintained. This is accomplished by the handshake activites that occur between the multiplexer and the Resource Management interfaces connected to it.



Multiplexer-Interface Handshake Timing

As indicated in the timing diagram, when the multiplexer polls an interface, it sends 16 clock cycles (approximately 23 microseconds) on the RT (Receive Timing) line, then sets CS (Clear-to-send) if the interface responds to the clock. (Note that all lines are actually differential pairs.) As soon as the interface receives the RT clock signal, it returns the clock on its TT output. If the selected interface has data to send, it immediately starts sending the SDLC flag characters on its SD output, indicating the start of a frame (packet). If there is no data to send, the SD output remains idle. When there is no SD response, the multiplexer switches to the next port at the end of the 16 clock cycles.

If the selected interface has a packet ready, it responds by sending SDLC flag characters on SD (Send Data). If the multiplexer detects activity on SD and TT, it sets CS, then maintains the open channel to the interface by holding CS and RT active until the transmission is completed. The end of a transmission is determined by the detection of eight successive bits with no zeroes. U12 and U9 are used to detect eight successive ONEs received. U12 is an 8-bit shift register that holds the most recent data. If all outputs are low (indicating eight ONEs received), CS is cleared by U9, and the controller switches to the next port.

As data arrives on the SD (Send Data) line, it is sent directly to all RD (Receive Data) outputs. RT and CS are inhibited to the inactive input ports by the tri-state enable lines driven by U13. If CS is inactive on a given port, the interface on that port is expected to monitor incoming data and not attempt to transmit. However, if an interface should inadvertently transmit, the inputs on that port are also disabled by the same line that disables RT and CS, thus preventing data collisions.

Analog Circuits

Line impedances from the multiplexer to the interface are nominally 100 ohms. The output drivers are designed to feed a 100-ohm load. The resistor/diode and series resistor pair at each input form an approximately 100-ohm termination for the load end of the line, maintaining a balanced line with minimal reflections.

The rest of the circuitry is relatively straight-forward. The +12-volt supply is used to provide +5-volt power to the isolated ports. Opto-isolators provide signal passage across isolated boundaries. U14 is a frequency divider used to generate the clock signals for timing and power-supply switching.

HP 98629 Interface Theory of Operation

The HP 98629 Resource Management Interface handles all information transfers between the computer it resides in and one or more remote computers in the system. The interface performs the following functions:

- Assemble outbound data transmissions into data packets with proper routing information included in each packet.
- Recognize timing signals from the multiplexer, and transmit message packets at the appropriate time, thus preventing data collisions.
- Recognize incoming information, and accept message packets that have the proper node address. Ignore messages containing other node addresses.
- Decode incoming message packets and transfer them to the local computer operating system or other specified destination.
- Possible electrical power to the multiplexer if the multiplexer power cable is connected to the interface.

Data Transmission

When data is being sent by the interface, the following sequence of events occurs:

- Data messages are sent to the interface by the operating system.
- The interface assembles the information into packets and adds routing information.
- The multiplexer sequentially interrogates each interface. When the appropriate timing signals are received from the multiplexer, the interface transmits a message packet.
- The multiplexer broadcasts the message packet to all of the interfaces that are connected to it.
- After the packet is transmitted, the multiplexer switches to the next interface. Timing and Clear-to-send lines to the interface are disabled. If multiple packets are being sent, the interface must wait until its next turn to send the next packet.
- If the interface has no data to transmit, it ignores the select signals from the multiplexer. The multiplexer then switches to the next interface. Limiting transmissions to only one packet at a time improves response time when some users may be transferring large files while other users need access to system resources.

Data Input

Data input occurs only when an incoming packet is recognized, based on its destination node address. The following sequence of events occurs during data reception:

- The interface decodes the destination node address on all incoming data packets. If the address does not match the interface Node Address switch setting, the packet is ignored.
- If the Node Address is recognized by the interface, it accepts the packet, strips off destination and control information, and prepares the data for transfer to the operating system or other destination level.
- The processed data is then transferred to the specified destination level for further action.

Interface Operation

When the multiplexer activates RT (Receive Timing), the interface responds ONLY if it has a packet ready to transmit. If there is at least one packet waiting for transmission, the interface synchronizes on the incoming RT signal and begins sending its timing reference clock on TT (Terminal Transmit Timing). When CS is activated by the multiplexer, it begins sending the flag characters on the SD (Send Data) line, followed by the remainder of the SDLC frame when it receives the CS signal from the multiplexer. When the frame is complete, the multiplexer disables CS and RT, causing the interface to place its outputs in an idle state.

Interaction of the interface with the computer is not as straight-forward, and is beyond the scope of this manual, as is the operation of the processor and other control circuitry on the interface. It is sufficient to explain that the Node Address switch is used by the microprocessor on the card to input the interface node address during power-up and after a hard (RESET). The Select Code and Hardware Interrupt Level switches control interaction between the interface and the computer's I/O circuitry.

HP 98029 Interface Theory of Operation

The HP 98029 performs essentially the identical function on an HP 9845B/C computer as the HP 98629 performs on HP 9826/HP 9836 computers. Data transmission and reception are identical, and interaction with the multiplexer is also the same. The differences between the two interfaces lie in the interaction with the computer where they reside.

The interface consists of two printed circuit cards interconnected by two single-row connectors. The 98029-66502 board contains the Z-80 microprocessor, memory, datacomm SIO, and differential line drivers and receivers for the datacomm link to the multiplexer. The 98029-66501 contains interface circuitry between the Z-80 processor and the HP 9845 computer I/O backplane. It includes a master clock oscillator, hardware register selection circuits, and interrupt and handshake logic.

Data is transferred to and from the HP 9845 through the R4 registers, U6 and U7, one in each direction. Register contents are valid only if the flag is set. Register 5IN provides status and interface ID information; 5OUT is used to pass interface control information from the HP 9845 to the interface.

Registers 5IN and 5OUT are interpreted as follows:

R5IN:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
x	x	x	x	1	0	0	1	IES	x	0	0	x	DBS	DA	DBE

x = not used 1 = always 1 0 = always 0

Bit 0 (DBE) Data Buffer Enabled: When ANDed with Bit 7, this bit indicates, when set, that the data buffer can interrupt the mainframe when the data buffer has space available for another packet.

Bit 1 (DA) Data Available: When set, the interface has a packet of information available for the mainframe.

Bit 2 (DBS) Data Buffer Status: When set, the interface has space available for another outbound data packet.

Bit 7 (IES) Interrupt Enable Status: When set, indicates that the interface can interrupt the mainframe when the prescribed conditions are met.

Bits 4 and 5 set to zero means that the interface ID is contained in bits 11 thru 8. All other bits in this register are not implemented.

R5OUT:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
x	x	x	x	x	x	x	x	IEN	x	PR	x	x	x	DTE	DBE

x = not used

Bit 0 (DBE) Data Buffer Empty: Bit set enables (clear disables) interrupt when data buffer has space available for another outbound data packet.

Bit 1 (DTE) Diagnostic Test Enable: Bit set interrupts Z-80 CPU and causes it to execute a diagnostic test. Used for factory and System Diagnostic tests.

Bit 5 (PR) Programmable Reset: Bit set causes an interface hardware reset. Automatically cleared during reset.

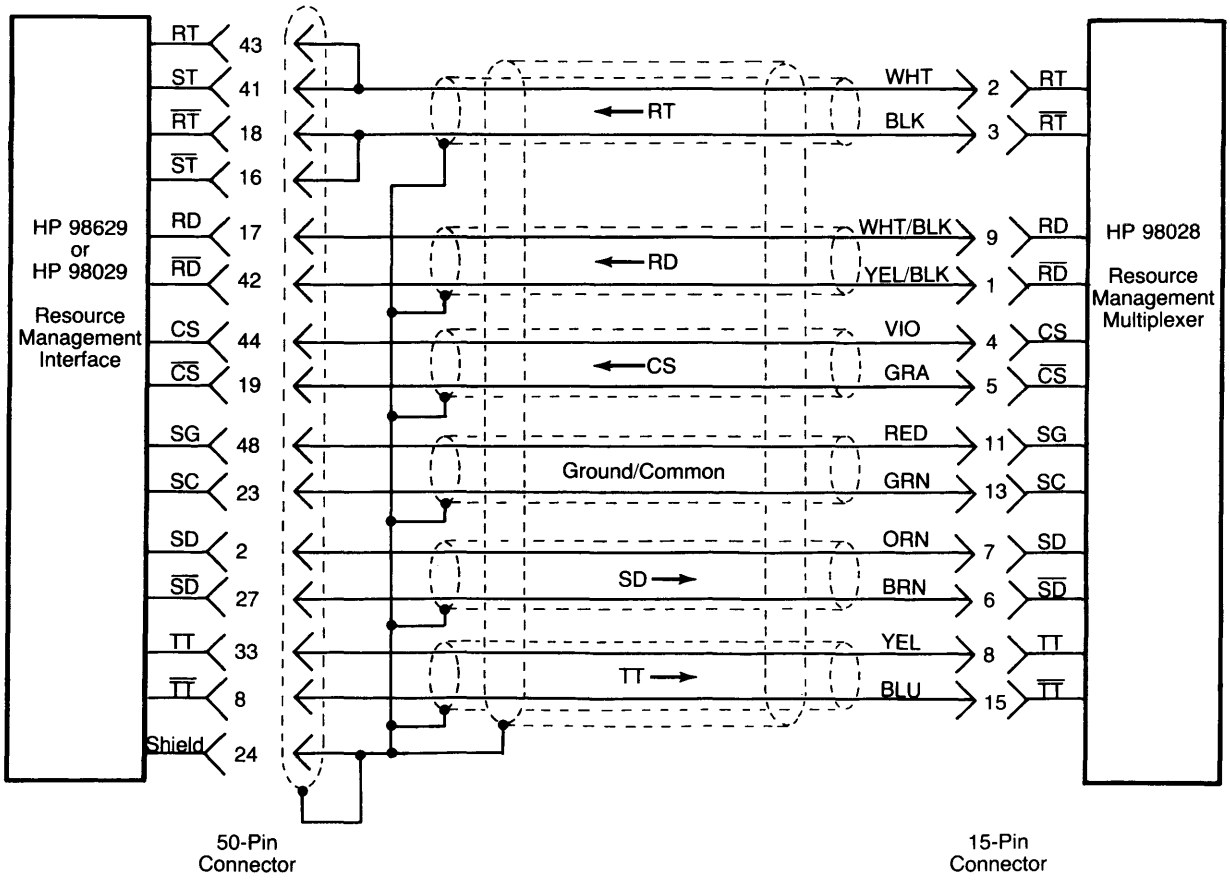
Bit 7 (IEN) Interrupt Enable: Enables interrupt of mainframe by interface when an incoming data packet has arrived, or when the outbound data buffer has space available for another packet (if Bit 0 is also set).

Operation of the combinatorial support logic is relatively straight-forward.

HP 97061 Cable

As mentioned earlier, the HP 97061 cable is available in 10, 25, and 60 metre lengths. It is used to connect multiplexers to Resource Management interfaces, and consists of 6 twisted-pair shielded two-wire cables enclosed within an outer shield that is covered with a plastic protective jacket. Each pair has a nominal balanced transmission line impedance of approximately 100 ohms. One end has a 50-pin connector that mates with the interface. The 15-pin connector on the other end mates with any one of the connectors on the multiplexer.

The following schematic diagram shows the pin connections and internal wiring of the cable for troubleshooting purposes. The molded connectors that are attached to the cables are not field repairable. Connector replacement requires the correct connector and the necessary tools to rewire the new connector, and is not generally recommended. Grounds must be correctly wired to ensure proper RFI performance and maintain noise immunity.



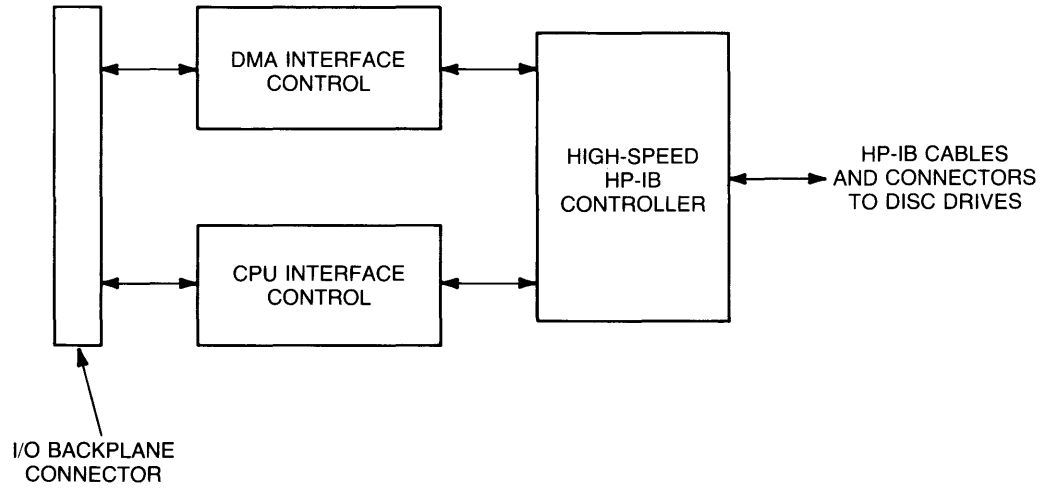
HP 97061 Cable Schematic Diagram

Disc Interface Theory of Operation

The HP 98625 Disc Interface is, conceptually, relatively simple. It consists of:

- a high-speed HP-IB controller contained in a single integrated circuit package,
- a DMA interface/control state machine that manages the interaction between the HP-IB controller and the DMA card, and
- interface select/control circuitry that interacts with the computer through the I/O backplane.

The following block diagram shows the relationship of the circuit functions:



Disc Interface Block Diagram

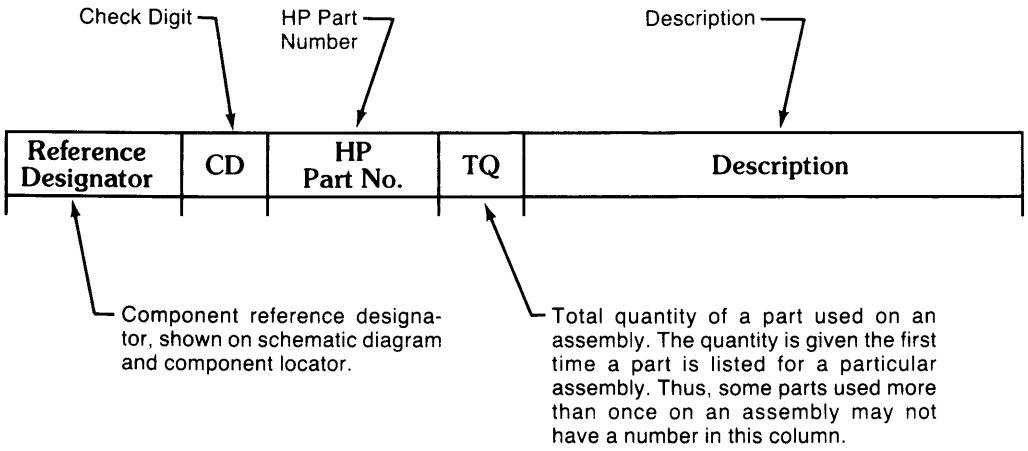
Data transfers are set up and initiated by the computer through interaction with the interface. A DMA channel is activated, and all data transmission and reception is handled through the DMA channel. Upon completion of the transfer, an interrupt to the computer is generated. The computer then suspends the DMA channel and deactivates the interface. DMA capability is required because the high data rates exceed the capabilities of normal CPU-based I/O drivers.

Installation information, parts lists, and schematic diagrams for the disc interface and DMA controller are contained in their installation manuals, 98620-90000 and 98625-90000, respectively. Refer to those manuals for additional information if needed.

Parts Lists and Schematic Diagrams

Most of the devices discussed in this chapter are normally serviced on a replacement basis. However, the following lists of replacement parts are provided for your convenience.

Tables 1 thru 3 list the replaceable parts. Here is a description of each table column.



Parts may be ordered from Corporate Parts Center. The address is:

Corporate Parts Center
333 Logue Avenue
Mountain View, California 94042

The telephone number is: (415) 968-9200

Manufacturer part numbers are also listed. The following list of manufacturers is provided for your convenience.

Manufacturers Code List

Mfr. No.	Manufacturer Name	Address		Zip Code
00000	Any Satisfactory Supplier			
01121	Allen-Bradley Co	Milwaukee	WI	53204
01295	Texas Instr Inc Semicond Cmpnt Div	Dallas	TX	75222
03508	GE Co Semiconductor Prod Div	Auburn	NY	13201
03888	K D I Pyrofilm Corp	Whippany	NJ	07981
04713	Motorola Semiconductor Products	Phoenix	AZ	85008
07263	Fairchild Semiconductor Div	Mountain View	CA	94042
11236	CTS of Berne Inc	Berne	IN	46711
14936	General Instr Corp Semicon Prod Gp	Hicksville	NY	11802
24546	Corning Glass Works (Bradford)	Bradford	PA	16701
28480	Hewlett-Packard Co Corporate Hq	Palo Alto	CA	94304
34355	Advanced Micro Devices Inc	Sunnyvale	CA	94086
50088	Mostek Corp	Carrollton	TX	75006
56289	Sprague Electric Co	North Adams	MA	01247
91506	Augat Inc	Attleboro	MA	02703
S4013	Hitachi	Tokyo, Japan		

Table 1. HP 98629A Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
C1	0160-3847	9	21	CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C2	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C3	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
C4	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C5	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C6	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C8	0180-1746	5	1	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
C9	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
C10	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C12	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C13	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C14	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C15	0160-4807	3	1	CAPACITOR-FXD 33PF +-5% 100VDC CER 0+-30	28480	0160-4807
C16	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C17	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C18	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C19	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C20	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C21	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C22	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C23	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C24	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C25	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C26	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
C27	0160-3847	9		CAPACITOR-FXD .01UF +100-0% 50VDC CER	28480	0160-3847
CR1	1901-0025	2	1	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
CR3	1901-0518	8	2	DIODE-SM SIG SCHOTTKY	28480	1901-0518
CR4	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
F1	2110-0297	4	1	FUSE .5A 125V NTD .281X.093	28480	2110-0297
F2	2110-0423	8	1	FUSE 1.5A 125V NTD .281X.093	28480	2110-0423
F3	2110-0592	2	1	FUSE 4A 125V NTD .281X.093	28480	2110-0592
Q1	1854-0019	3	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
Q2	1853-0015	7	1	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
R1	0698-8827	4	3	RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
R2	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
R3	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
R4	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
R5	0698-0082	7	3	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
R6	0757-0405	4	1	RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
R7	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
R8	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
R10	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
R12	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
R13	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
R14	1810-0561	8	1	NETWORK-RES 16-DIP6.8K OHM X 15	28480	1810-0561
R17	1810-0162	5	1	NETWORK-RES 14-DIP4.7K OHM X 13	11236	760-1-R4.7K
R18	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
R19	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
R20	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
SW1	3101-2510	0	2	SWITCH ASSEMBLY-ROCKER	28480	3101-2510
SW2	3101-2510	0		SWITCH ASSEMBLY-ROCKER	28480	3101-2510
U1	1820-2117	5	4	IC DRVR TTL LINE DRVR DUAL	07263	9636ATC
U2	1820-2117	5		IC DRVR TTL LINE DRVR DUAL	07263	9636ATC
U3	1820-2117	5		IC DRVR TTL LINE DRVR DUAL	07263	9636ATC
U4	1820-1201	6	1	IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
U5	1820-1491	6	1	IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
U6	1820-1997	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	01295	SN74LS374N
U7	1820-2117	5		IC DRVR TTL LINE DRVR DUAL	07263	9636ATC
U8	1820-2703	5	1	IC DRVR TTL DIFF LINE QUAD	28480	1820-2703
U9	1820-2594	2	2	IC RCVR TTL LS LINE RCVR QUAD 2-INP	28480	1820-2594
U10	1820-2594	2		IC RCVR TTL LS LINE RCVR QUAD 2-INP	28480	1820-2594
U11	1820-1244	7	1	IC MUXR/DATA-SEL TTL LS 4-TO-1-LINE DUAL	01295	SN74LS153N
U12	1820-2301	9	1	IC-Z80A CTC	28480	1820-2301
U13	1820-1112	8	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
U14	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
U15	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
U16	1820-2657	8	2	IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U17	1820-0693	8	2	IC FF TTL S D-TYPE POS-EDGE-TRIG	01295	SN74S74N
U18	1813-0225	7	1	CRYSTAL-CLOCK-OSCILLATOR	28480	1813-0225
U19	1820-0693	8		IC FF TTL S D-TYPE POS-EDGE-TRIG	01295	SN74S74N
U20	1820-1438	1	2	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS257AN

See introduction to this section for ordering information

Table 1. HP 98629A Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
U21	1820-1245	8	2	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS155N
U22	1820-1245	8		IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS155N
U23	1820-1440	5	1	IC LCH TTL LS QUAD	01295	SN74LS279N
U24	1820-2739	7	1	IC GATE TTL ALS NOR QUAD 2-INP	01295	SN74ALS02N
U25	1818-1611	7	2	IC	S4013	HM6116P-3
U26	1818-1611	7		IC	S4013	HM6116P-3
U27	1820-2300	8	1	IC-Z80A SIO/2	28480	1820-2300
U28	1820-2298	3	1	IC-Z80A CPU	28480	1820-2298
	1200-0817	4	1	SOCKET-IC 40-CONT DIP DIP-SLDR	28480	1200-0817
U29	1818-1739	0	1	IC-ROM 8K X BROM (MARKED 37000)	50088	MK37000N-5 MASKED
	1200-0861	8	1	SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0861
U30	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
U31	1820-1281	2	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS139N
U32	1820-1428	9	1	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS158N
U33	1820-1438	1		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS257AN
U34	1820-1427	8	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS156N
U35	1820-1568	8	1	IC BFR TTL LS BUS QUAD	01295	SN74LS125AN
U36	1820-1202	7	1	IC GATE TTL LS NAND TPL 3-INP	01295	SN74LS10N
U37	1820-2657	8		IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U38	1820-1905	7	1	IC GATE TTL LS NOR DUAL 5-INP	07263	74LS260PC
U39	1820-1444	9	4	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
U40	1820-1444	9		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
U41	1820-1444	9		IC MUXR/DATA-SEL TTL LS 2-TO-1 LINE QUAD	01295	SN74LS298N
U42	1820-1444	9		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
U43	1820-2740	0	1	IC COMPTR TTL LS MAGTD 2-INP 8-BIT	01295	SN74LS688N
U44	1820-2236	3	2	IC MISC TTL LS	01295	SN74LS640N
U45	1820-2206	3		IC MISC TTL LS	01295	SN74LS640N
W1	1258-0124	7	3	PIN-PROGRAMING JUMPER .30 CONTACT	91506	8136-4756-1
	1200-0455	6	4	SOCKET-IC 8-CONT DIP-SLDR	28480	1200-0455
W2	1258-0124	7		PIN-PROGRAMING JUMPER .30 CONTACT	91506	8136-4756-1
	1200-0455	6		SOCKET-IC 8-CONT DIP-SLDR	28480	1200-0455
	1200-0455	6		SOCKET-IC 8-CONT DIP-SLDR	28480	1200-0455
W4	1258-0124	7		PIN-PROGRAMING JUMPER .30 CONTACT	91506	8136-4756-1
	1200-0455	6		SOCKET-IC 8-CONT DIP-SLDR	28480	1200-0455
				MISCELLANEOUS		
	0360-1715	0	8	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1715
	0380-1324	9	2	STANDOFF-THD	28480	0380-1324
	0515-0104	8	2	SCREW-MACH M3 X 0.5 8MM-LG PAN-HD	28480	0515-0104
	0515-0145	7	2	SCREW-MACH M3 X 0.5 8MM-LG 90-DEG-FLH-HD	00000	ORDER BY DESCRIPTION
	0535-0004	9	2	NUT-HEX DBL-CHAM M3 X 0.5 2.4MM-THK	00000	ORDER BY DESCRIPTION
	1251-2248	6	2	LOCK SPRING-MICRO RBN CONN	28480	1251-2248
	1251-7119	0	2	END DISK-LATCH	28480	1251-7119
	1251-7161	2	1	CONNECTOR- 50 POST RTNG	28480	1251-7161
	2190-0003	8	2	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
	2190-0918	4	2	WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0918
	2380-0001	9	2	SCREW-MACH 6-32 .25-IN-LG FIL-HD-SLT	00000	ORDER BY DESCRIPTION
	5061-4247	0	1	CONNECTOR-TEST	28480	5061-4247
	7101-0613	4	1	I/O COVER	28480	7101-0613
	7121-1910	8	1	PC BOARD LABEL	28480	7121-1910
	7121-1957	3	1	SELECT CODE LABEL	28480	7121-1957
	98628-90000	2	1	INSTALLATION MANUAL	28480	98628-90000

See introduction to this section for ordering information

Table 2. HP 98028A Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	98028-66501	7	1	PC ASSEMBLY	28480	98028-66501
C3	0180-3207	7	5	CAPACITOR-FXD 22UF 25V+100%	28480	0180-3207
C4	0180-3207	7		CAPACITOR-FXD 22UF 25V+100%	28480	0180-3207
C5	0160-0576	5	3	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
C7	0180-3207	7		CAPACITOR-FXD 22UF 25V+100%	28480	0180-3207
C8	0180-3207	7		CAPACITOR-FXD 22UF 25V+100%	28480	0180-3207
C9	0160-4832	4	20	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C13	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C14	0160-3456	6	4	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
C15	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
C16	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C17	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C18	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C19	0180-3207	7		CAPACITOR-FXD 22UF 25V+100%	28480	0180-3207
C21	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C22	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C23	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C24	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C25	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C26	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C27	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C28	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
C29	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
C30	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C31	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C33	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C34	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C36	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C38	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C39	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C40	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
C42	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
CR1	1901-1065	2	4	DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
CR2	1901-1065	2		DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
CR3	1902-3107	9	4	DIODE-ZNR 5.76V 2% DO-35 PD=.4W	28480	1902-3107
CR4	1902-3107	9		DIODE-ZNR 5.76V 2% DO-35 PD=.4W	28480	1902-3107
CR5	1901-1065	2		DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
CR6	1901-1065	2		DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
CR7	1902-0956	0	1	DIODE-ZNR 8.2V 5% DO-35 PD=.4W TC=+.065%	28480	1902-0956
CR8	1902-3107	9		DIODE-ZNR 5.76V 2% DO-35 PD=.4W	28480	1902-3107
CR9	1902-3107	9		DIODE-ZNR 5.76V 2% DO-35 PD=.4W	28480	1902-3107
DS1	1990-0486	6	2	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
DS2	1990-0486	6		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
DS3	1990-0450	4	8	LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
DS4	1990-0450	4		LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
DS5	1990-0450	4		LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
DS6	1990-0450	4		LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
DS7	1990-0450	4		LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
DS8	1990-0450	4		LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
DS9	1990-0450	4		LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
DS10	1990-0450	4		LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
J1	1251-6312	3	4	CONNECTOR 15-PIN F HDP TYPE	28480	1251-6312
J2	1251-6312	3		CONNECTOR 15-PIN F HDP TYPE	28480	1251-6312
J3	1251-6312	3		CONNECTOR 15-PIN F HDP TYPE	28480	1251-6312
J4	1251-6312	3		CONNECTOR 15-PIN F HDP TYPE	28480	1251-6312
P1	1251-5265	3	1	CONNECTOR 18-PIN M POST TYPE	28480	1251-5265
Q1	1854-0739	4	4	TRANSISTOR NPN SI PD=1.5W FT=65MHZ	04713	MJE200
Q2	1854-0739	4		TRANSISTOR NPN SI PD=1.5W FT=65MHZ	04713	MJE200
Q3	1854-0635	9	2	TRANSISTOR NPN SI PD=50W FT=20MHZ	03508	D44H5
Q4	1854-0635	9		TRANSISTOR NPN SI PD=50W FT=20MHZ	03508	D44H5
Q5	1854-0739	4		TRANSISTOR NPN SI PD=1.5W FT=65MHZ	04713	MJE200
Q6	1854-0739	4		TRANSISTOR NPN SI PD=1.5W FT=65MHZ	04713	MJE200
R1	0698-3428	1	4	RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
R2	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-3830-F
R3	0698-3428	1		RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
R4	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
R5	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F

See introduction to this section for ordering information

Table 2. HP 98028A Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
R6	0757-0427	0	1	RESISTOR 1.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1501-F
R7	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
R8	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
R9	0698-3428	1		RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
R10	0698-3428	1		RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7 F
RP1	1810-0445	7	8	RESISTIVE NETWORK- 3 X .1K OHM SIP	11236	750-63-R100
RP2	1810-0445	7		RESISTIVE NETWORK- 3 X .1K OHM SIP	11236	750-63-R100
RP3	1810-0445	7		RESISTIVE NETWORK- 3 X .1K OHM SIP	11236	750-63-R100
RP4	1810-0445	7		RESISTIVE NETWORK- 3 X .1K OHM SIP	11236	750-63-R100
RP5	1810-0488	8	4	RESISTIVE NETWORK- 4 X 4.7K OHM SIP	28480	1810-0488
RP6	1810-0488	8		RESISTIVE NETWORK- 4 X 4.7K OHM SIP	28480	1810-0488
RP7	1810-0571	0	1	NETWORK-RESISTIVE 13 X .390K OHM DIP	28480	1810-0571
RP8	1810-0235	3	1	NETWORK-RESISTIVE 15 X 2.2K OHM DIP	01121	316A222
RP9	1810-0488	8		RESISTIVE NETWORK- 4 X 4.7K OHM SIP	28480	1810-0488
RP10	1810-0488	8		RESISTIVE NETWORK- 4 X 4.7K OHM SIP	28480	1810-0488
RP11	1810-0445	7		RESISTIVE NETWORK- 3 X .1K OHM SIP	11236	750-63-R100
RP12	1810-0445	7		RESISTIVE NETWORK- 3 X .1K OHM SIP	11236	750-63-R100
RP13	1810-0445	7		RESISTIVE NETWORK- 3 X .1K OHM SIP	11236	750-63-R100
RP14	1810-0445	7		RESISTIVE NETWORK- 3 X .1K OHM SIP	11236	750-63-R100
T1	9100-4197	7	1	TRANSFORMER	28480	9100-4197
TP1	1251-0600	0	8	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
U1	1820-2703	5	5	IC DRVR TTL DIFF LINE QUAD	28480	1820-2703
U2	1820-2703	5		IC DRVR TTL DIFF LINE QUAD	28480	1820-2703
U3	1990-0461	7	12	OPTO-ISOLATOR	28480	5082-4364
U4	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U5	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U6	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U7	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U8	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U9	1820-1272	1	1	IC BFR TTL LS NOR QUAD 2-INP	01295	SN74LS33N
U10	1820-1492	7	1	IC BFR TTL LS INV HEX 1-INP	01295	SN74LS368AN
U11	1813-0230	4	1	CRYSTAL-CLOCK-OSCILLATOR	28480	1813-0230
U12	1820-1433	6	1	IC SHF-RGTR TTL LS R-S SERIAL-IN PRL-OUT	01295	SN74LS164N
U13	1820-1245	8	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS155N
U14	1820-2096	9	1	IC CNTR TTL LS BIN DUAL 4-BIT	01295	SN74LS393N
U15	1820-1645	2	2	IC BFR TTL LS BUS QUAD	01295	SN74LS126AN
U16	1820-1429	0	1	IC CNTR TTL LS DECD SYNCHRO	01295	SN74LS160AN
U17	1820-1645	2		IC BFR TTL LS BUS QUAD	01295	SN74LS126AN
U18	1820-1917	1	2	IC BFR TTL LS LINE DRVR OCTL	01295	SN74LS240N
U19	1820-2203	0	1	IC RCVR TTL LS LINE RCVR QUAD	34335	AM26LS32PC
U20	1820-1209	4	1	IC BFR TTL LS NAND QUAD 2-INP	01295	SN74LS38N
U21	1820-1917	1		IC BFR TTL LS LINE DRVR OCTL	01295	SN74LS240N
U22	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U23	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U24	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U25	1820-2703	5		IC DRVR TTL DIFF LINE QUAD	28480	1820-2703
U26	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U27	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U28	1990-0461	7		OPTO-ISOLATOR	28480	5082-4364
U29	1820-2703	5		IC DRVR TTL DIFF LINE QUAD	28480	1820-2703
U30	1820-2703	5		IC DRVR TTL DIFF LINE QUAD	28480	1820-2703
				MISCELLANEOUS		
	0340-0972	7	1	INSULATOR POLYE	28480	0340-0972
	0515-0219	6	10	SCREW-MACH M3 X 0.5 6MM-LG 90-DEG-FLH-HD	00000	ORDER BY DESCRIPTION
	0360-2074	6	2	J-LUG .016 BRS	28480	0360-2074
	0590-1095	6	10	THREADED INSERT-NUT M3 X 0.5 .959-IN-LG	28480	0590-1095
	0624-0400	8	3	SCREW-TPG 6-19 .5-IN-LG PAN-HD-POZI STL	00000	ORDER BY DESCRIPTION
	0890-0097	2		TUBING-FLEX .032-ID TFE .016-WALL	00000	ORDER BY DESCRIPTION
	1251-2942	7	8	LOCK-SUBMIN D CONN	28480	1251-2942
	2190-0004	9	8	WASHER-LK INTL T NO. 4 .115-IN-ID	28480	2190-0004
	5040-9207	8	4	FOOT	28480	5040-9207
	5061-4253	8	1	POD CASE (TOP)	28480	5061-4253
	5061-4254	9	1	POD CASE (BOTTOM)	28480	5061-4254
	7101-0610	1	1	FRONT END PLATE	28480	7101-0610
	7101-0611	2	1	REAR END PLATE	28480	7101-0611
	7121-2204	5	1	LABEL	28480	7121-2204
	8120-3546	9	1	POWER DATA CABLE	28480	8120-3546
	98028-90000	2	1	MANUAL	28480	98028-90000

See introduction to this section for ordering information

Table 3. HP 98029A Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
	98029-66501	8	1	PC ASSEMBLY	28480	98029-66501
C1	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
C2	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C3	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C4	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C5	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C6	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C7	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C8	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C9	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C10	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C12	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
J1	1251-5956	9	2	CONNECTOR 22-PIN F POST TYPE	28480	1251-5956
J2	1251-5956	9		CONNECTOR 22-PIN F POST TYPE	28480	1251-5956
P3	1251-5265	3	1	CONNECTOR 18-PIN M POST TYPE	28480	1251-5265
RP1	1810-0424	2	1	NETWORK-RESISTIVE 15 X 4.7K OHM DIP	11236	761-1-R4.7K
SW1	3100-3364	2	1	SWITCH-ROTARY 16 PIN DIP 4PDT	28480	3100-3364
SW2	3101-2509	7	1	SWITCH-RKR DIP-RKR-ASSY 6-1A .1A 50VDC	28480	3101-2509
U1	1820-1427	8	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS156N
U2	1820-1491	6	1	IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
U3	1820-1438	1	1	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS257AN
U4	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
U5	1820-1208	3	2	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
U6	1820-2719	3	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	07263	74LS534PC
U7	1820-2719	3		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	07263	74LS534PC
U8	1820-2488	3	1	IC FF TTL ALS D-TYPE POS-EDGE-TRIG	01295	SN74ALS74N
U9	1813-0225	7	1	CRYSTAL-CLOCK-OSCILLATOR	28480	1813-0225
U10	1820-1201	6	1	IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
U11	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
U12	1820-1443	8	1	IC CNTR TTL LS BIN ASYNCHRO	01295	SN74LS293N
U13	1820-1198	0	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS03N
U14	1820-1297	0	1	IC GATE TTL LS EXCL-NOR QUAD 2-INP	01295	SN74LS266N
U15	1820-1245	8	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS155N
U16	1820-1440	5	1	IC LCH TTL LS QUAD	01295	SN74LS279N
U17	1820-1202	7	1	IC GATE TTL LS NAND TPL 3-INP	01295	SN74LS10N
U18	1820-1208	3		IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
U19	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
				MISCELLANEOUS		
	0380-0635	3	2	STANDOFF-RVT-ON .562-IN-LG 4-40THD	00000	ORDER BY DESCRIPTION

See introduction to this section for ordering information

Table 3. HP 98029A Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	98029-66502	9	1	PC ASSEMBLY	28480	98029-66502
C1	0160-4832	4	19	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C2	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C3	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C4	0160-4807	3	1	CAPACITOR-FXD 33PF +-5% 100VDC CER 0+-30	28480	0160-4807
C5	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C6	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C7	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C8	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C9	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
D1	1901-0518	8	2	DIODE-SM SIG SCHOTTKY	28480	1901-0518
D2	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
J3	1200-0853	8	1	SOCKET-IC 16-CONT DIP DIP-SLDR	28480	1200-0853
J3	1258-0177	0	1	SHUNT-PROGRAM	28480	1258-0177
P1	1251-7329	4	2	CONNECTOR- 22 PIN	28480	1251-7329
P2	1251-7329	4		CONNECTOR- 22 PIN	28480	1251-7329
Q1	1853-0015	7	1	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
Q2	1854-0019	3	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
R1	0698-0082	7	5	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
R2	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
R3	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
R4	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
R5	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
R6	0757-0405	4	1	RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
R7	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
R8	0757-0402	1	1	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
R9	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
R10	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
R11	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
RP1	1810-0162	5	1	NETWORK-RESISTIVE 13 X 4.7K OHM DIP	11236	760-1-R4.7K
U1	1820-1216	3	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
U2	1820-2300	8	1	IC-Z80A SIO/2	28480	1820-2300
U3	1820-2298	3	1	IC-Z80A CPU	28480	1820-2298
U4	1818-1763	0	1	IC-RAM 2K X 8 (MARKED 4816)	50088	MK4816N-5
U5	1818-1739	8	1	IC- 8K X 8ROM (MARKED 37000)	50088	MK37000N-5 MASKED
U6	1820-2703	5	1	IC DRVR TTL DIFF LINE QUAD	28480	1820-2703
U7	1820-1112	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
U8	1820-2594	2	1	IC RCVR TTL LS LINE RCVR QUAD 2-INP	28480	1820-2594
				MISCELLANEOUS		
	0380-1278	2	2	STANDOFF-HEX .688-IN-LG 4-40THD	00000	ORDER BY DESCRIPTION
	0624-0263	1	2	SCREW-TPG 6-32 .438-IN-LG PAN-HD-POZI	28480	0624-0263
	1390-0520	7	1	FASTENER-LATCH SPR SPRING LATCH	28480	1390-0520
	1400-1066	1	1	CLAMP HALF "TR"	28480	1400-1066
	1480-0225	0	1	PIN-GRV .093-IN-DIA .312-IN-LG STL	28480	1480-0225
	7101-0559	7	1	PLATE (REAR)	28480	7101-0559
	7121-2035	0	1	LABEL	28480	7121-2035
	8120-3478	6	1	CABLE	28480	8120-3478
	98028-90000	2	1	MANUAL-INSTALLATION	28480	98028-90000
	98046-64403	6	1	PAINTED CASE (LEFT)	28480	98046-64403
	98046-64404	7	1	PAINTED CASE (RIGHT)	28480	98046-64404

See introduction to this section for ordering information

ASSEMBLY 98028-66501 REV A

RP8 2.2K

U25

U19

+5V

+12V

C22 .01

+5V

$\overline{SD}_C$

$\overline{TT}_C$

Φ

CS_C

U15C

U10F

U10E

RP8 2.2K

U11 700 KHz OSC

U17D

RP8 2.2K

U14

1A 1CLR 2CLR 2A

Q_0 NC, Q_1 NC, Q_2, Q_3, Q_4 NC, Q_5 NC, Q_6, Q_7

+5V

RP8 2.2K

U20C

RP8 2.2K

U12

A B CK CLR

Q_0 Q_1 Q_2 Q_3 Q_4 Q_5 Q_6 Q_7

U9D U9C U9B U9A

+5V

RP7 390

DS2

+5V

RP8 2.2K

U20D

+5V

U16

ENAT ENAP LD CLR CK

D_0 D_1 D_2 D_3

Q_0 NC, Q_1, Q_2, Q_3 NC

U13

1C 1G A B 2C 2G

$1Y_0$ NC, $1Y_1$ NC, $1Y_2$ NC, $1Y_3$ NC

$2Y_0$, $2Y_1$, $2Y_2$, $2Y_3$

+12V

CR7 8.2V

R6 1.5K

43.75 KHz

CR5

T1

C7 22

R1 15

Q1

R2 390

C12 .01

C13 .01

$+5V_C$

$\overline{SD}_C$

$\overline{TT}_C$

Φ

CS_C

U10D

U15A

U18B

U15C

U10C

U17A

U21B

U10A

U15B

U18A

+5V

RP7 390

$+5V_C$

RP5 4.7K

U3

U4

U5

U1

J1

DS3

DS4

RP1 100

RP2 100

$+5V_D$

RP6 4.7K

U6

U7

U2

J2

DS5

DS6

RP3 100

RP4 100

U8

$+5V_B$

RP9 4.7K

U24

U23

U29

J3

RD

RT

$\overline{RT}$

CS

$\overline{CS}$

SD

$\overline{SD}$

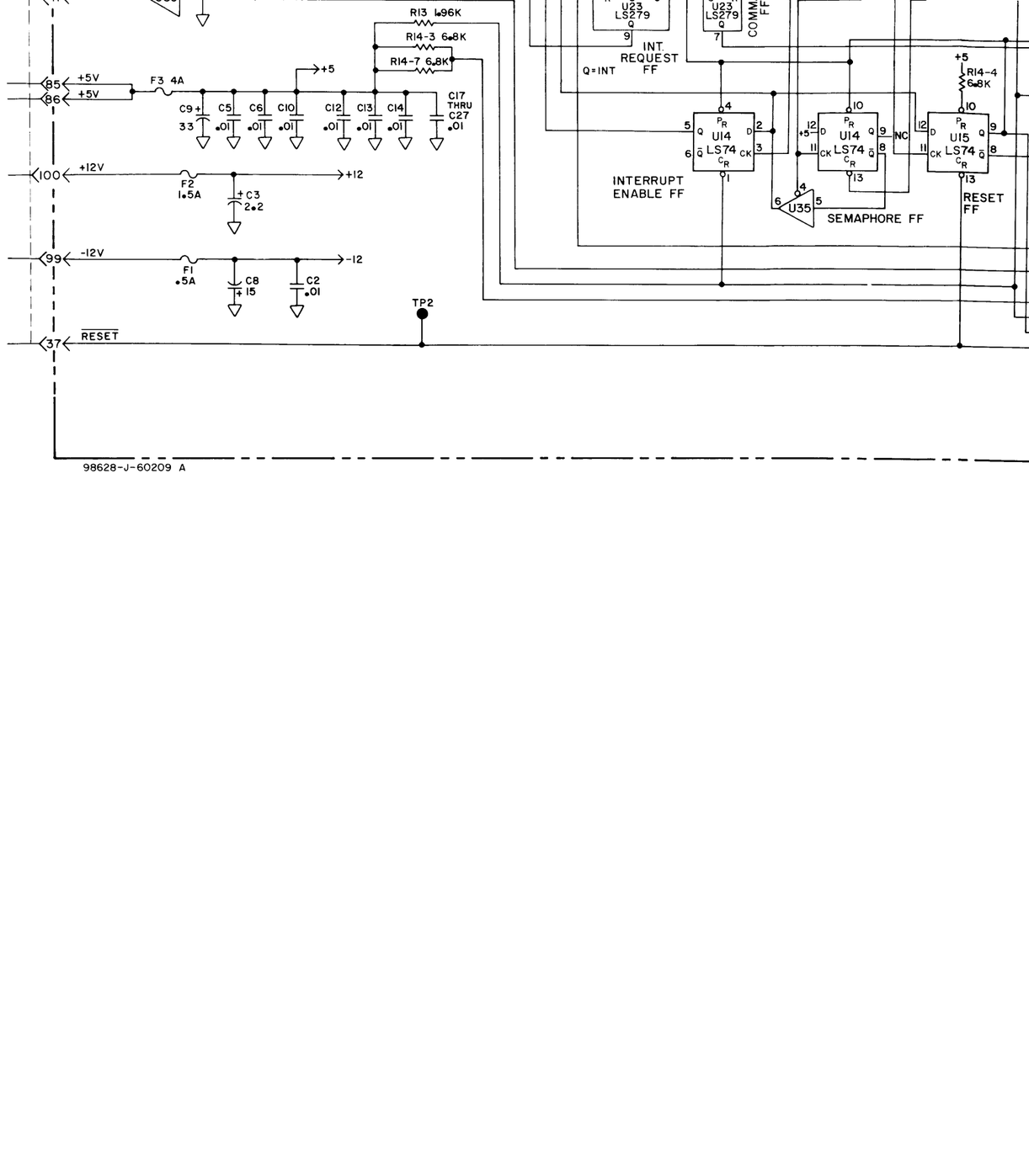
TT

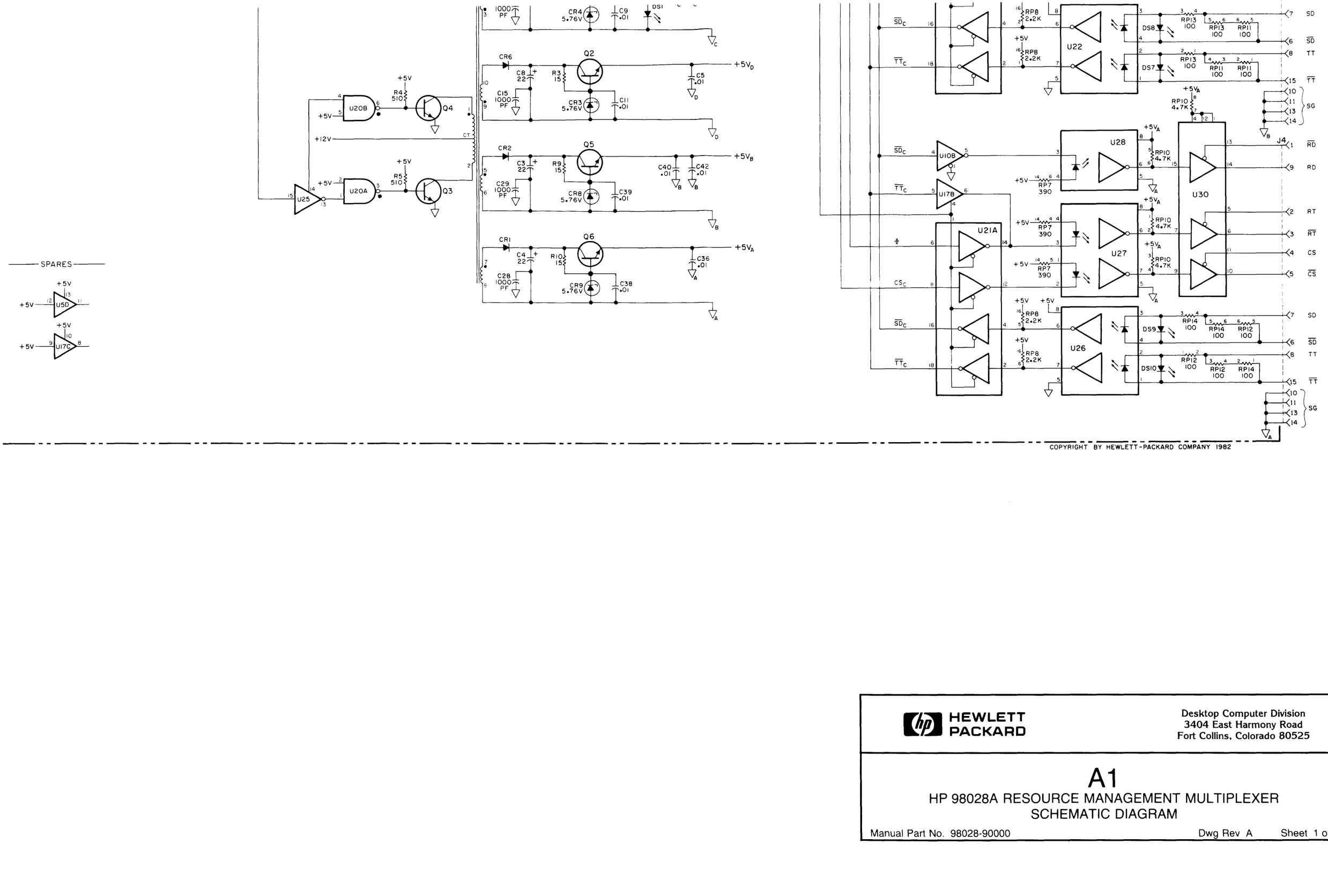
$\overline{TT}$

SG

SCHEMATIC NOTES

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX WITH ASSEMBLY OR SUBASSEMBLY DESIGNATION(S) OR BOTH FOR COMPLETE DESIGNATION.
2. COMPONENT VALUES ARE SHOWN AS FOLLOWS UNLESS OTHERWISE NOTED.
   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS
3. A CURVED LINE MEETING A BUS DENOTES THAT LINE ENTERS THE BUS, A STRAIGHT LINE MEETING THE BUS DENOTES THAT LINE DOES NOT ENTER THE BUS.
4. R18 — R20 LOADED FOR 98629. R15, R16, R9, CR2, & C7 NOT LOADED.
5. R15, R16, R9, CR2, &C7 LOADED FOR 98628. R18 — R20 NOT LOADED.





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A1

HP 98028A RESOURCE MANAGEMENT MULTIPLEXER SCHEMATIC DIAGRAM

Manual Part No. 98028-90000 Dwg Rev A Sheet 1 of 1

A1 COMPUTER INTERFACE LOGIC ASSEMBLY 98029-66501 REV A

COMPUTER I/O CONNECTOR

M FLG
N STS
S IOSB
P IC1
R IC2
T DOUT
13 PA0
14 PA1
15 PA2
16 PA3
10 INT
12 IRL
11 IRH
L INIT
17
A
6 IOD8
H IOD11

U13C U13B U14B U14A U14D U14C U10C U11E U13D U13A U16D U11A U11C U18D U17C U4C U18C U4A U5A U17A U11B U5B U18B U16A U16B U11D U10B U11F U5D U19B U19A U8B U2A U2D U2B U2E U2C U2F

RP1 4.7K +5V

MYPA

U15 U1 U7 U6 U3 U12

R4OUT R4IN R5IN R5OUT

IOD0 IOD1 IOD2 IOD3 IOD4 IOD5 IOD6 IOD7

PFLG

SEE NOTE 3

SELECT CODE SWITCH SW1

SHIELD GROUND TO BOARD PERIMETER AND 4 STANDOFFS

C1 33 +

C2-5 C8-12

INT ENABLE

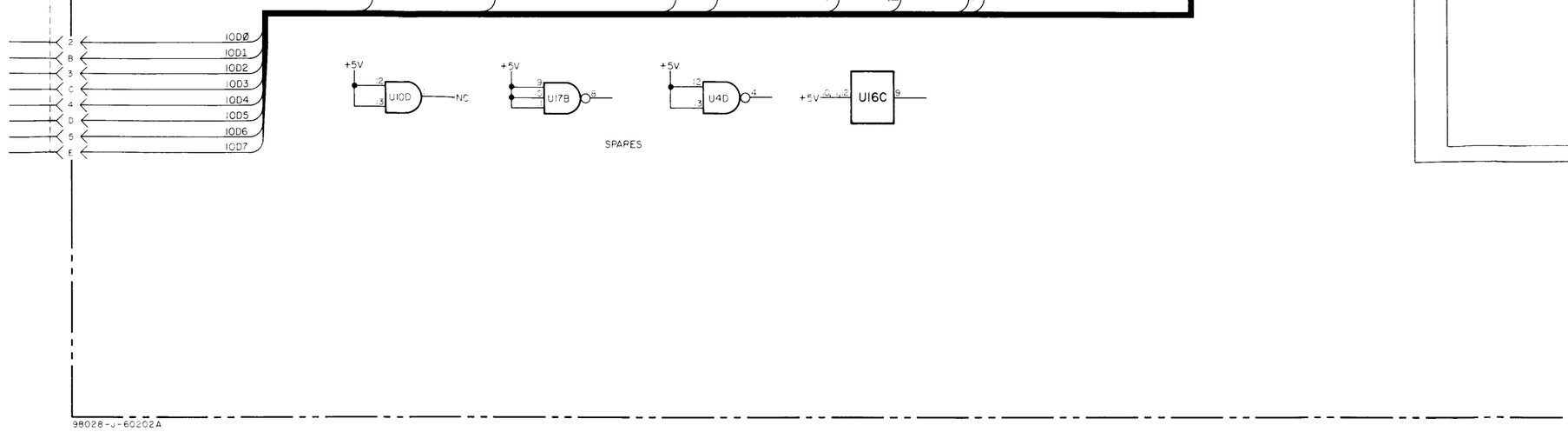
INT ENABLED

DBE INT ENABLED

TEST INT

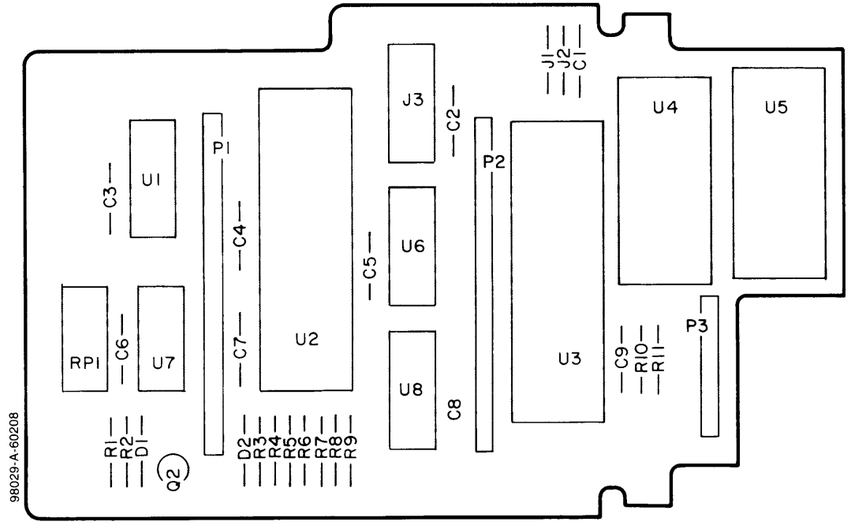
A2 INTERFACE MICROPROCESSOR ASSEMBLY 98029-66502 REV A

OUTBUFF
INBUFF
OUT BUFF
IN BUFF
REG
MREQ
RFSH
IORQ
RESET
SHIELD GROUND TO BOARD PERIMETER
NOT USED
LSB
MSB
NC NC
WIP2



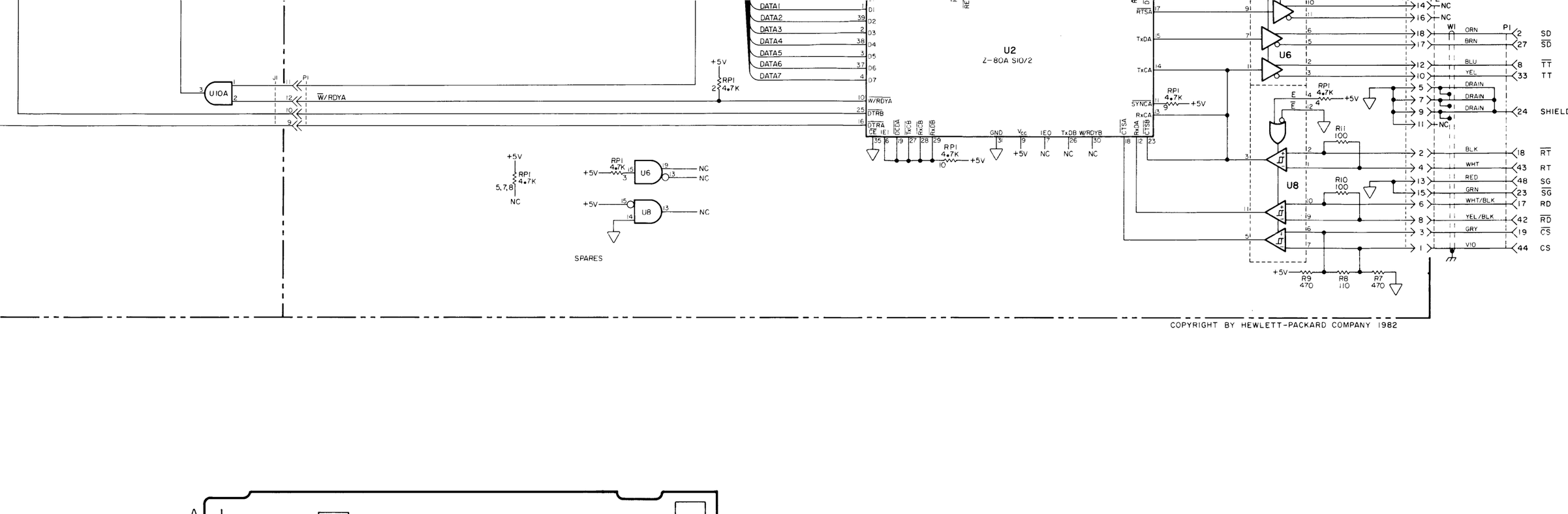
SCHEMATIC NOTES

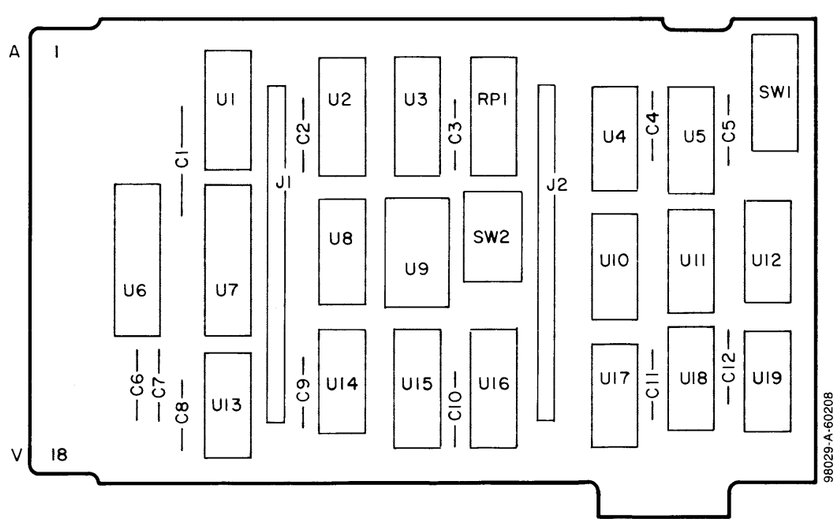
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX WITH ASSEMBLY OR SUBASSEMBLY DESIGNATION(S) OR BOTH FOR COMPLETE DESIGNATION.
2. COMPONENT VALUES ARE SHOWN AS FOLLOWS UNLESS OTHERWISE NOTED.
   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS
3. A "●" ON THE OUTPUT OF A GATE DENOTES AN OPEN COLLECTOR OUTPUT.
4. A CURVED LINE MEETING A BUS DENOTES THAT LINE ENTERS THE BUS, A STRAIGHT LINE MEETING THE BUS DENOTES THAT LINE DOES NOT ENTER THE BUS.



COMPONENT SIDE
A1

HP Part No. 98029-66501 Rev A





COMPONENT SIDE
A2

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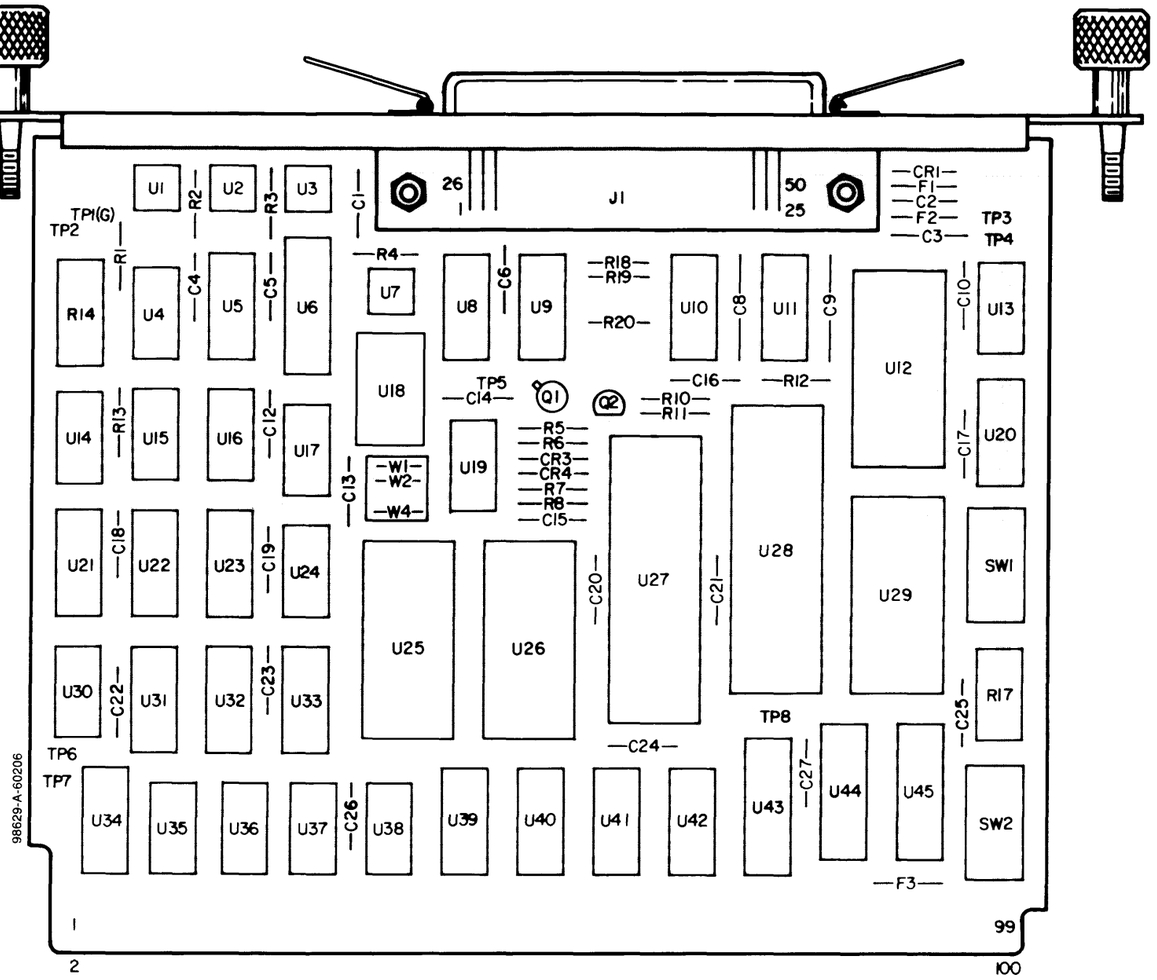
A1, A2

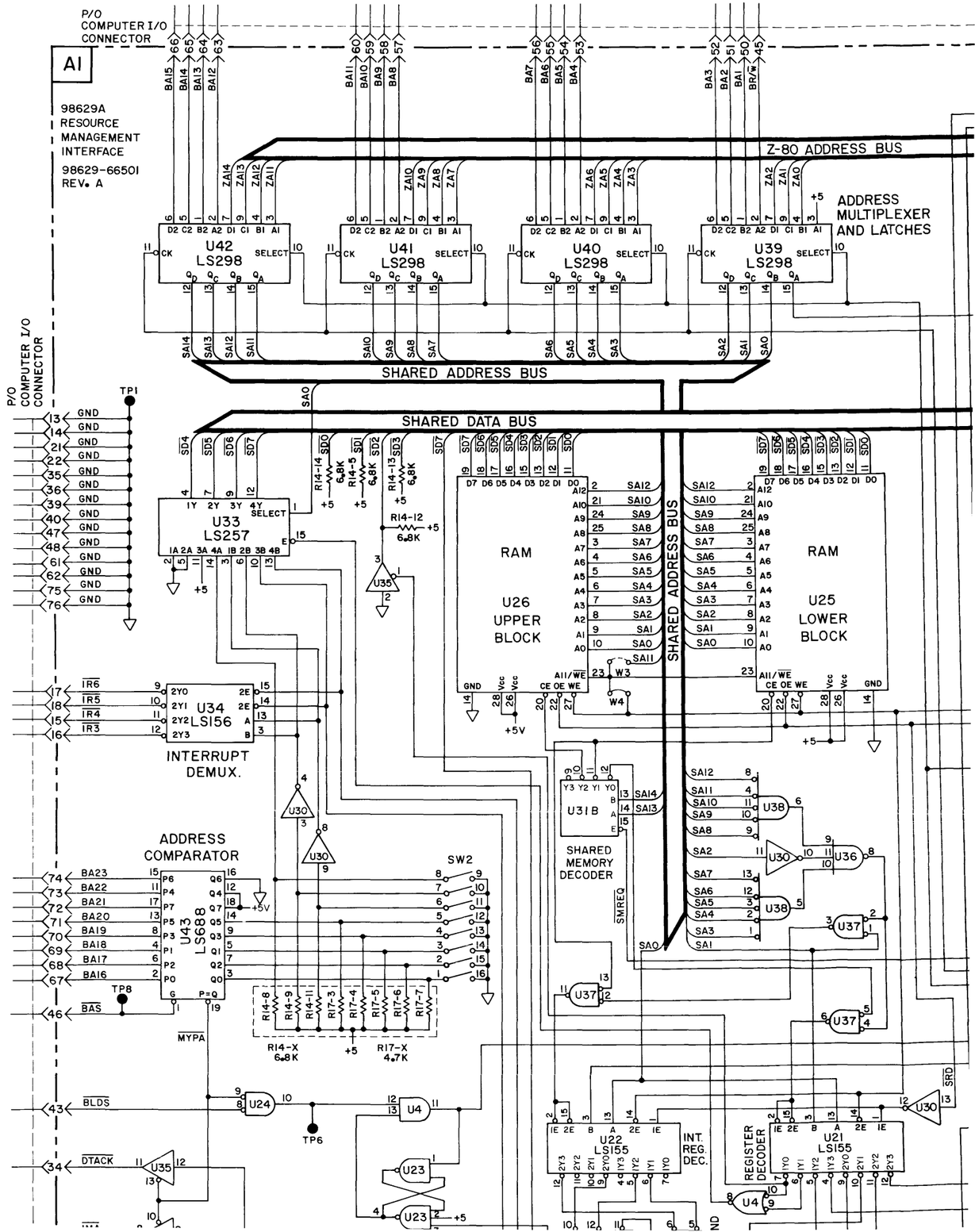
HP 98029A RESOURCE MANAGEMENT INTERFACE SCHEMATIC DIAGRAM

Manual Part No. 98028-90000 Dwg Rev A Sheet 1 of 1



COMPONENT SIDE
A1

HP Part No. 98629-66501 Rev A



ADDRESS BUS

ADDRESS MULTIPLEXER AND LATCHES

MAINFRAME DATA BUS TRANSCEIVER

U44 LS640

Z-80 DATA BUS TRANSCEIVER

U45 LS640

U23 LS279

Z-80 DATA BUS

SHARED MEMORY CONTROLLER

U32 LSI58

PROGRAM ROM U29

TRACES ON CIRCUIT SIDE

Z-80A CPU U28

SHARED DATA BUS

Z-80 ADDRESS BUS

Z-80 CONTROL BUS

Z-80 DATA BUS

MODEM CONTROL REG. LATCH

U6 LS374

Z-80A CTC UI2

Z-80A SIO/2 U27

NO CONNECT
16 DTRA
17 RTSA
25 DTRB
26 TxDB
30 W/RDYB
11 SYNCA

MODEM STATUS REG. BUFFER

U5 LS367

U13 LS74

U11 LS153

RS-232/RS-423 LINE DRIVERS

9636A U7

9636A U2

9636A U3

9636A U1

J1

OCD 4 1
OCD 3 26
OCD 2 15
OCD 1 40
TT (u) 7
SD (u) 12
TR (u) 14
RS (u) 13
TT (A) 33
TT (B) 8
SD (A) 27
SD (B) 2
TR (A) 29
TR (B) 4
RS (A) 28
RS (B) 3

RS-422 LINE DRIVER +5

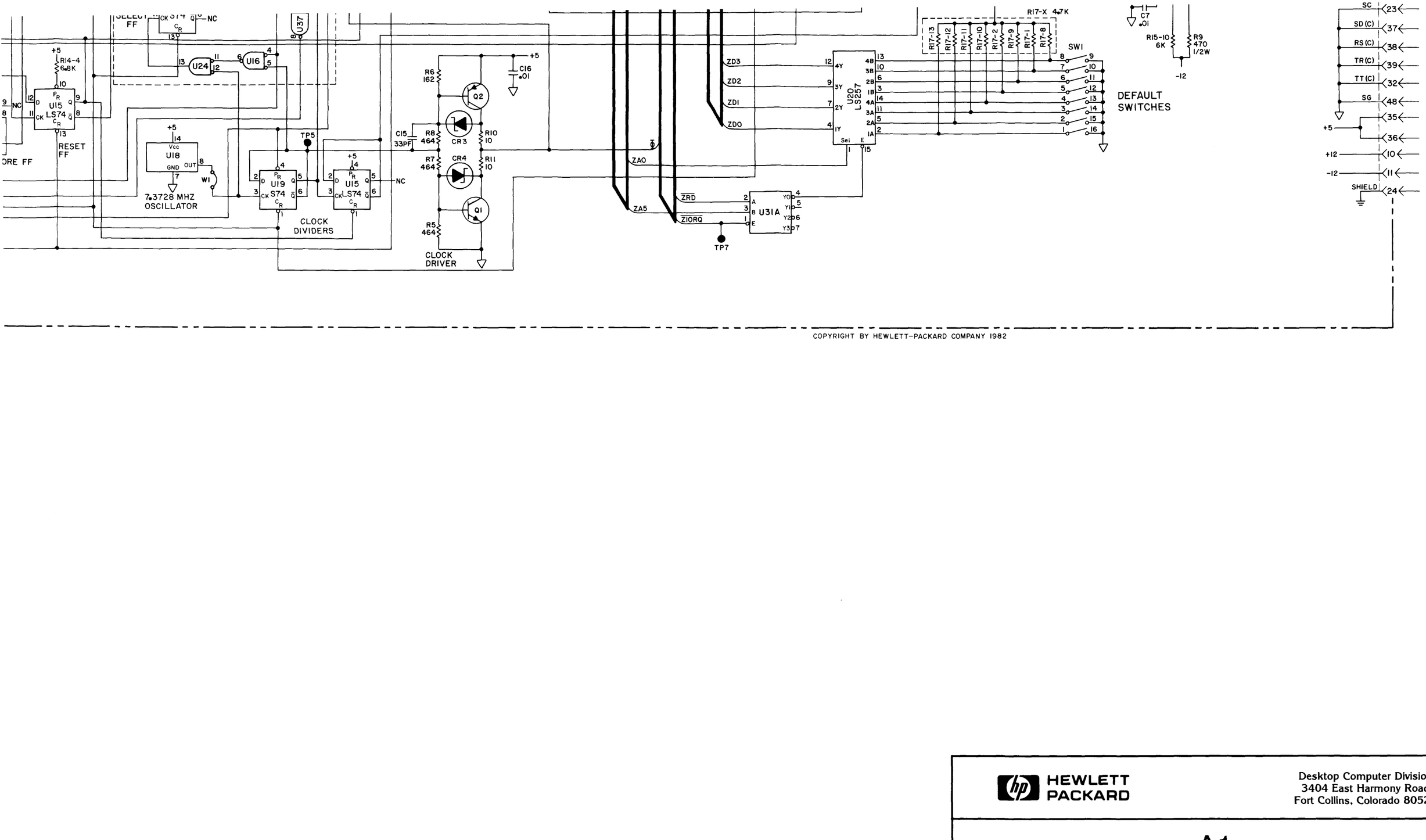
U9 26LS32A

LINE RECEIVERS

U10 26LS32A

ST (A) 41
ST (B/C) 16
RT (A) 43
RT (B/C) 18
RD (A) 42
RD (B/C) 17
CS (A) 44
CS (B/C) 19
OCR 2 47
RC 22
OCR 1 9
RR (A) 46
RR (B/C) 21
DM (A) (RS-449) 25
DM (A) (RS-232) 45

TP4
TP3



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