

**SERVICE BRIEF**

**HEWLETT-PACKARD  
MODEL 64672A  
6800/02 INTERFACE MODULE**

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LOGIC SYSTEMS DIVISION  
COLORADO SPRINGS, COLORADO, U.S.A.

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Service Brief Part Number 64672-90901  
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## **CERTIFICATION**

*Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.*

## **WARRANTY**

This Hewlett-Packard system product is warranted against defects in materials and workmanship for a period of 90 days from date of installation. During the warranty period, HP will, at its options, either repair or replace products which prove to be defective.

Warranty service of this product will be performed at Buyer's facility at no charge within HP service travel areas. Outside HP service travel areas, warranty service will be performed at Buyer's facility only upon HP's prior agreement and Buyer shall pay HP's round trip travel expenses. In all other cases, products must be returned to a service facility designated by HP.

For products returned to HP for warranty service. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

## **LIMITATION OF WARRANTY**

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

## **EXCLUSIVE REMEDIES**

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

## **ASSISTANCE**

*Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.*

*For any assistance, contact your nearest Hewlett-Packard Sales and Service Office.*

## **SAFETY SUMMARY**

***The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.***

### **GROUND THE INSTRUMENT.**

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

### **DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.**

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

### **KEEP AWAY FROM LIVE CIRCUITS.**

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

### **DO NOT SERVICE OR ADJUST ALONE.**

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

### **DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.**

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

### **DANGEROUS PROCEDURE WARNINGS.**

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

**WARNING**

**Dangerous voltages, capable of causing death, are present in this instrument.  
Use extreme caution when handling, testing, and adjusting.**

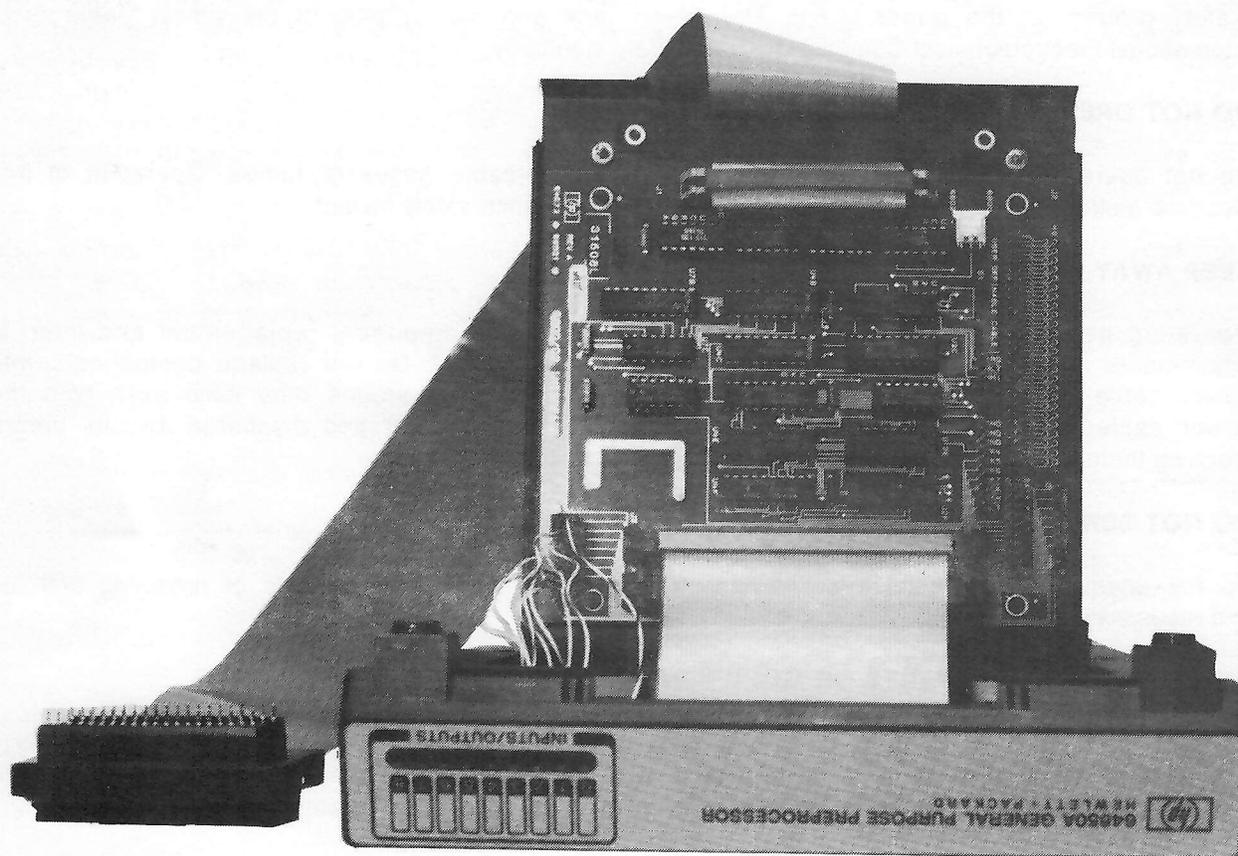


Figure 1. Model 64672A Interface Module

GENERAL INFORMATION.

The Model 64672A Processor Interface, with the General Purpose Preprocessor, 64620S/10269A Logic State Analyzer. The interface module connects the signals from the 6800/6802 Processor to the state analyzer inputs generating all status and clock signals required for inverse assembly of the 6800/02 Instruction Set. Status is generated on the interface module to indicate an opcode fetch. This signal is used by the inverse assembler to provide a decoded listing of the data bus. The CPU can operate at clock rates up to 2 MHz.

INTERFACE DESCRIPTION.

The primary function of the interface module is to connect the target processor, thru the preprocessor, to the state analyzer in such a way that the address, data, and the status are available for the state analyzer to use. The 6800/02 Processor does not differentiate between a memory read and an opcode fetch. The 64672A makes this possible by means of a state machine on the interface module. The state machine takes the information on the data bus of the 6800/02 Target System and generates 5 bits of status for the state analyzer.

The data bus from the processor is buffered before it is sent directly to the state analyzer and to the state machine on the interface module (see block diagram, figure 2). The state machine on the 64672A Interface Module consists of three PROMs that interperate the data to generate the status.

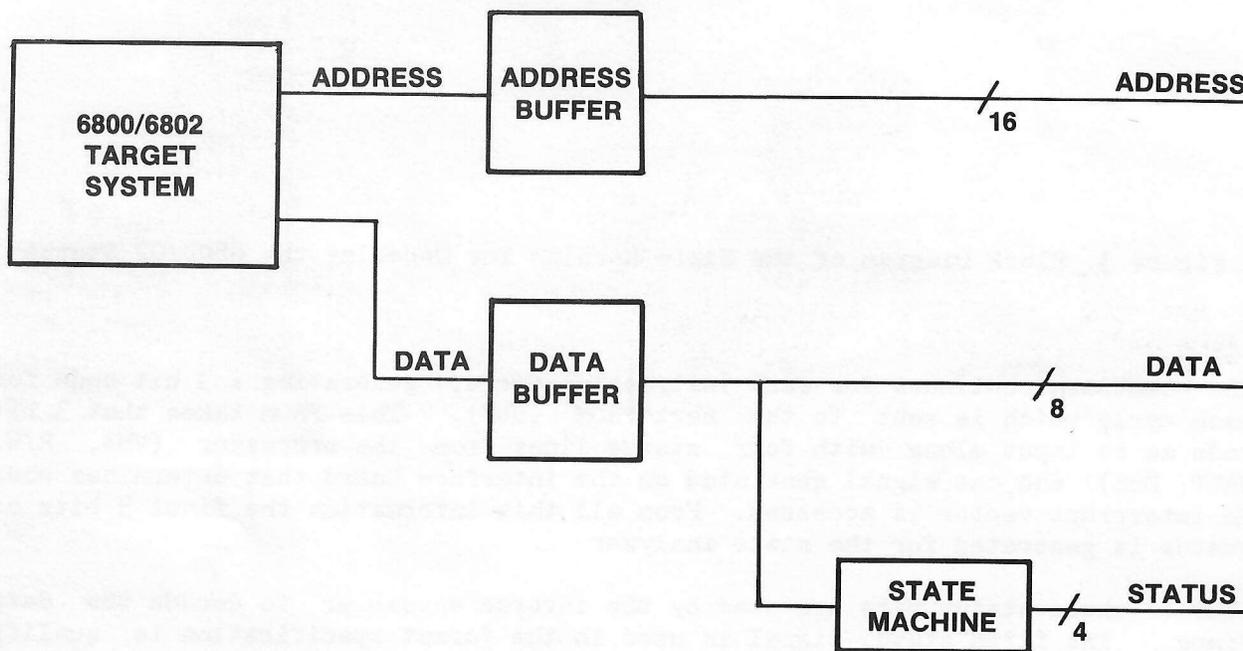


Figure 2. Block Diagram of the 6800/02 Interface Board

The inputs to the first PROM (U4E) are the 8 buffered data lines (D0 - D7) from the processor (see figure 3). This PROM checks for all illegal opcode references and outputs one of 31 different codes. The code is based on the number of and type of cycles in the instruction. One of the codes is for an illegal opcode and another is to indicate that the state machine is out of sync with the processor. This 5 bit code is sent thru a latch to the next PROM (U2E) where the number of cycles is determined and that information is sent thru the latch to the inputs of U2E where the cycle count is decremented.

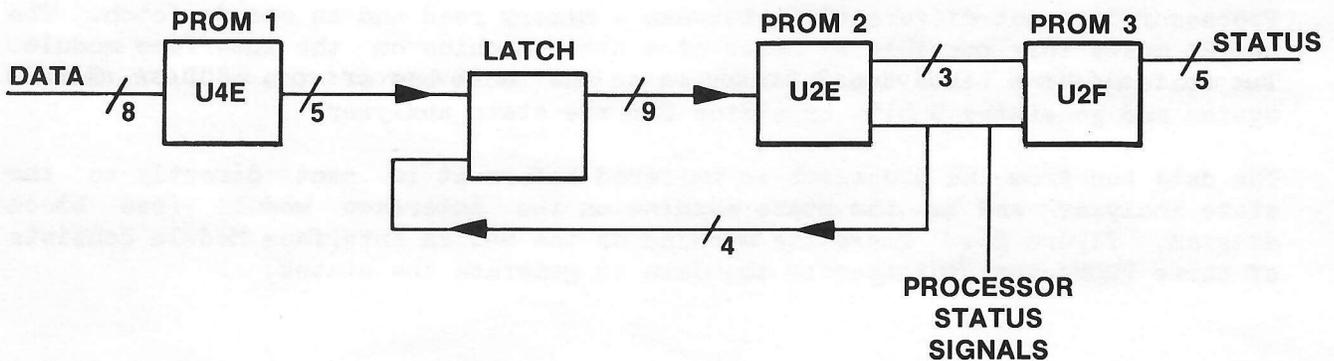


Figure 3. Block Diagram of the State Machine for Decoding the 6800/02 Status

The countdown continues for each instruction cycle, generating a 3 bit code for each cycle which is sent to the next PROM (U4F). This PROM takes that 3 bit code as an input along with four status lines from the processor (VMA, R/W, HALT, DBE) and one signal generated on the interface board that determines when an interrupt vector is accessed. From all this information the final 5 bits of status is generated for the state analyzer.

Four of these status bits are used by the inverse assembler to decode the data lines. The fifth status signal is used in the format specification to qualify out the prefetches and unused states of the 6800/02. If, at any time in this chain of events, an illegal opcode is encountered, the procedure is restarted until the state machine is in sync with the processor.

## OPERATION.

6800/02 SELECTION. Because the two processors are so similar, the 64672A Interface Module is capable of connecting either a 6800 or 6802 Processor to the state analyzer. The difference between the two processors are the on-board clock and memory of the 6802.

The interface module and cable avoid the possibility of loading the on-board clock of the 6802 by not connecting it to those pins. Switch S1 must be set for the correct processor in order for the module to operate properly. This switch should be set to the proper position before the state analyzer software is entered from the 64000 monitor, so the data will be decoded properly. If the switch is set to the wrong position, there will be no electrical damage to either processor. The only area which will be affected is the inverse assembler.

STATUS ENCODING. The total status field sent to the state analyzer by the interface module is 12 bits wide. These 12 bits are divided into 2 fields. The first consists of 4 of the 5 status bits generated by the state machine on the 64672A Interface Module (the fifth bit is used as a clock qualifier). The second field is 8 individual status signals from the processor. These signals are VMA, R/W, DBE, IRQ, NMI, BA, and RESET.

In order to easily define commands in the trace specification, the 4 bits of the status field are defined in the symbol map "STAT\_MAP". Each absolute value of the status field is given a description. Table 4 shows the symbol map which is the default map for the status field.

Table 1. Symbol Map for the Status Field

## SYMBOL MAP

Symbol	Value
ILLEGAL	0
INST	1
EX_SUB	2
EN_SUB	3
SS-PUL	4
SS_PSH	5
HALT	6
VECTOR	7
DC	8
OPCODE	9
DMA_RD	A
DMA_WR	B
DATA_RD	C
DATA_WR	D
OUT_SYNC	E
INT_ACK	F

The module contains circuitry required to interface the Logic Analyzer to the 6800/02 Microprocessor. The Logic Analyzer mainframe supplies +5 volts to the Interface Module for operating power at TTL logic levels. The 6800/02 Interface Module I.D. code is 72 decimal.

CAUTION

Remove Power from the System Before Preceding with the Installation

#### INSTALLATION IN MODEL 64650A GENERAL PURPOSE PREPROCESSOR

1. Connect W6 from the small General Purpose Preprocessor card (A2) to J4 on the 6800/02 Interface Module.
2. Connect W3 from the large General Purpose Preprocessor card (A1) to J3 on the 6800/02 Interface Module.
3. Lower the Interface Module into the Preprocessor so that the component side fits inside the pod.
4. Fit the Pod Cover hinges into hinge slots on the General Purpose Preprocessor pod. Lower the cover over the Interface Module and fasten down with screws.

CAUTION

To avoid possible damage from static discharge, always connect the wire assembly (W4) from the preprocessor end cap to J5 on the 6800/02 Interface Module.

#### INSTALLATION IN MODEL 10269A INTERFACE (for 1630A/D/W).

1. Connect W1 from J4 on the General Purpose Interface Card in the 10269A to J4 on the Dedicated Interface Module.
2. Connect W2 from J3 on the General Purpose Interface card in the 10269A to J3 on the Dedicated Interface Module.
3. Fit the Dedicated Interface Module assembly into hinge slots on the 10269A General Purpose Probe Interface Pod. Lower the cover and fasten down with screws.

INTERFACE REQUIREMENTS.

The 64672A Interface Module will operate with an 6800/02 Microprocessor clocked at rates up to 2 MHz. The card adds one LS TTL load to all monitored lines and an interface capacitance of approximately 35 pF.

The Interface Module has user definable wirewrap pins (P/O J1, J2, and J5). Inputs must meet the following setup and hold specifications:

	64620S Logic Analyzer	1630A/D/W Logic Analyzer
Setup	22 nS	20 nS
Hold	15 nS	0 nS min

PERFORMANCE VERIFICATION AND ADJUSTMENT PROCEDURE

Equipment Needed (or Equivalent)

Logic Probe.....HP 10525T  
 Logic Pulser.....HP 10526T

There are no automatic performance tests and no adjustments for the Model 64672A.

TROUBLESHOOTING

If a failure is suspected in the HP 64672A Interface Module, troubleshooting can be done using a Logic Pulser and a Logic Probe. The Model 64672A must be connected to the Model 64650A or the Model 10269A. Remove the ZIF connector from the system under test. Remove the 6800/02 Microprocessor from the ZIF connector. Pulse each pin of the ZIF socket, and, using the schematic, look for a pulse on the appropriate pin of J3 and J4.

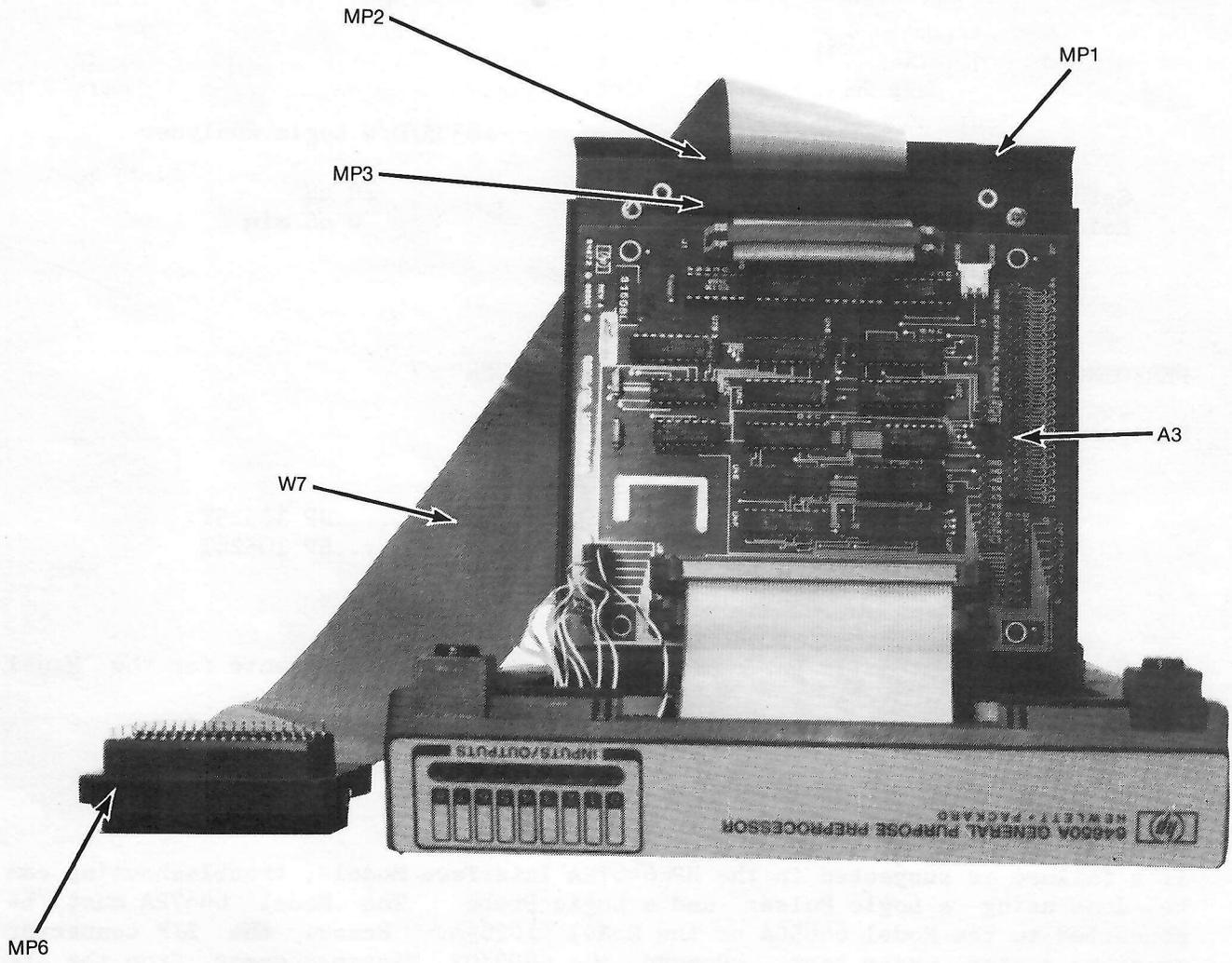


Figure 4. Replaceable Parts Breakdown

# NOTICE

## CONDUCTIVE FOAM OR PLASTIC OVER EMULATOR PINS MAY CAUSE ERRATIC OPERATION.

The emulator and preprocessor user probe assembly pins are covered at the time of shipment with either a conductive foam wafer or a conductive plastic pin protector. This is done for two reasons: 1) to protect the user interface circuitry within the emulator or preprocessor from electro-static discharge (ESD), 2) to protect the delicate gold plated pins of the probe assembly from damage due to impact.

Both the foam and plastic protection devices are conductive. This may cause erratic performance of the emulation or analysis system during operation and also during option\_\_test performance verification. Therefore, it is recommended that the foam or plastic device be removed before using the emulation or analysis system or before running option\_\_test performance verification.

When not using the emulator or preprocessor, the foam or plastic assembly should be replaced to retain protection for the probe pins and protection from ESD.

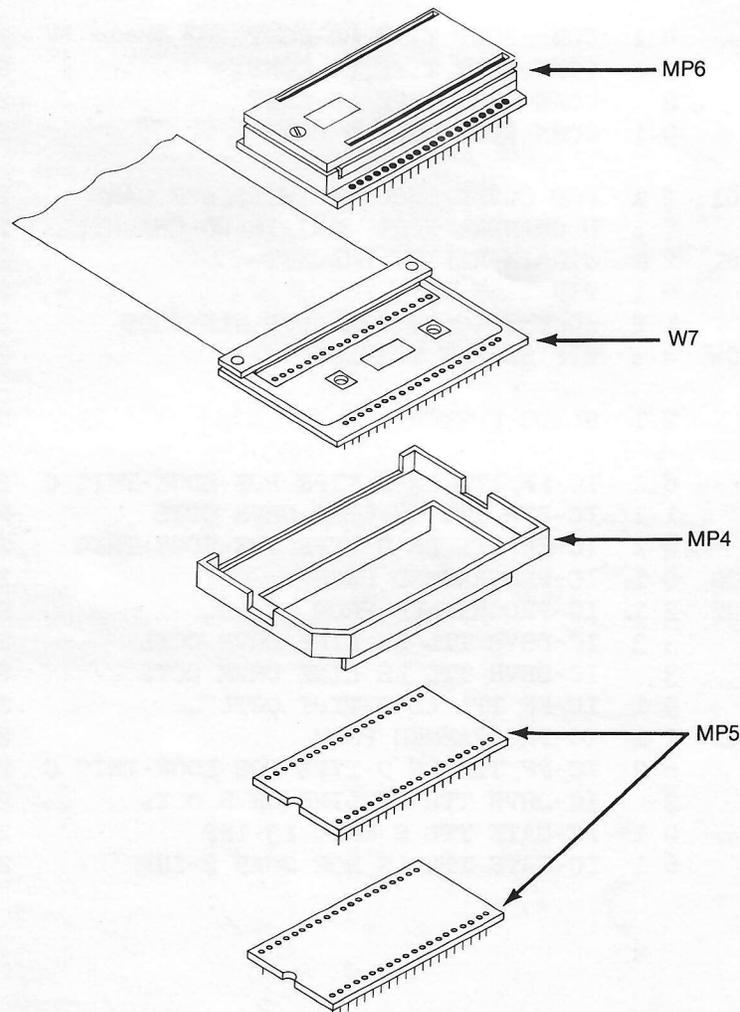


Figure 5. Exploded View User Plug

Table 2. Replaceable Parts List

Ref. Des.	HP Part Number	C Qty. D	Description	Mfr. Code	Mfr. Part Number
A3	64672-66501	2 1	6800/02 BOARD ASSEMBLY	28480	64672-66501
C1	0160-5246	6 6	CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-2055
C2	0160-5246	6	CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-2055
C3	0160-5246	6	CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-2055
C4	0160-5246	6	CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-2055
C5	0160-5246	6	CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-2055
C6	0160-5246	6	CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-2055
J1	1251-3004	4 1	CONN-POST TYPE 40-CONT	28480	1251-3004
J3	1251-7575	2 2	CONN-POST TYPE 60-CONT	28480	1251-7575
J4	1251-7575	2	CONN-POST TYPE 60-CONT	28480	1251-7575
J5	1251-7613	9 1	CONN-POST TYPE 9-CONT	28480	1251-7613
MP1	64672-04101	2 1	POD COVER 6800/02 INTERFACE CARD	28480	64690-04101
MP2	4320-0095	7 1	U CHANNEL NPRN .047-IN-WD-CHANNEL	28480	4320-0095
MP3	64651-01201	2 1	STRAIN RELIEF BRACKET	28480	64651-01201
MP4	5041-3163	5 1	PIN BASE 40	28480	5041-3163
MP5	1200-0682	1 2	SOCKET-IC 40-CONT DIP DIP-SLDR	28480	1200-0682
MP6	64651-66504	4 1	ZIF SOCKET BOARD-40	28480	64651-66504
S1	3101-0459	2 1	SLIDE SWITCH	28480	3101-0459
U2B	1820-1730	6 2	IC-FF TTL LS D-TYPE POS-EDGE-TRIG C	28480	74LS273N
U2C	1820-1917	1 1	IC-BFR TTL LS LINE DRVR OCTL	28480	74LS240N
U2D	1820-1112	8 1	IC-FF TTL LS D-TYPE POS-EDGE-TRIG	28480	74LS74AN
U2E	64672-80000	0 1	IC-PROGRAMMED PROM	28480	64672-80000
U2F	64672-80002	2 1	IC-PROGRAMMED PROM	28480	64672-80002
U4B	1820-2024	3 3	IC-DRVR TTL LS LINE DRVR OCTL	28480	74LS244N
U4C	1820-2024	3	IC-DRVR TTL LS LINE DRVR OCTL	28480	74LS244N
U4D	1820-1858	9 1	IC-FF TTL LS D-TYPE OCTL	28480	74LS377N
U4E	64672-80001	1 1	IC-PROGRAMMED PROM	28480	64672-80001
U4F	1820-1730	6 2	IC-FF TTL LS D-TYPE POS-EDGE-TRIG C	28480	74LS273N
U7B	1820-2024	3	IC-DRVR TTL LS LINE DRVR OCTL	28480	74LS244N
U7C	1820-1130	0 1	IC-GATE TTL S NAND 13-INP	28480	74S133N
U7D	1820-1144	6 1	IC-GATE TTL LS NOR QUAD 2-INP	28480	74LS02N

Table 2. Replaceable Parts List (Cont'd)

Ref. Des.	HP Part Number	C Qty. D	Description	Mfr. Code	Mfr. Part Number
UCR1A	1906-0202	7 4	IC-DIODE ARRAY 40V 400MA	28480	1906-0202
UCR3A	1906-0202	7	IC-DIODE ARRAY 40V 400MA	28480	1906-0202
UCR5A	1906-0202	7	IC-DIODE ARRAY 40V 400MA	28480	1906-0202
UCR6A	1906-0202	7	IC-DIODE ARRAY 40V 400MA	28480	1906-0202
W7	8120-3813	3 1	6800/02 CABLE ASSEMBLY	28480	8120-4125
WT1	1251-7697	9 1	CONNECTOR 9-PIN M POST TYPE	28480	1251-7697
WT2	1251-4773	6 2	CONNECTOR 25-PIN M POST TYPE	28480	1251-4773
WT3	1251-4773	6	CONNECTOR 25-PIN M POST TYPE	28480	1251-4773
WT4	1251-3958	7 3	CONNECTOR 10-PIN M POST TYPE	28480	1251-3958
WT5	1251-3958	7	CONNECTOR 10-PIN M POST TYPE	28480	1251-3958
WT6	1251-4682	6 1	CONNECTOR 3-PIN M POST TYPE	28480	1251-4682
WT7	1251-3958	7	CONNECTOR 10-PIN M POST TYPE	28480	1251-3958
XU2E	1200-0639	8 1	SOCKET-IC 20-PIN DIP DIP SLDR	28480	1200-0639
XUCR1A	1200-0638	7 4	SOCKET-IC 14-PIN DIP DIP SLDR	28480	1200-0638
XUCR3A	1200-0638	7 4	SOCKET-IC 14-PIN DIP DIP SLDR	28480	1200-0638
XUCR5A	1200-0638	7 4	SOCKET-IC 14-PIN DIP DIP SLDR	28480	1200-0638
XUCR6A	1200-0638	7 4	SOCKET-IC 14-PIN DIP DIP SLDR	28480	1200-0638

Table 3. Manufacturers' Code

Mfr No.	Manufacturer Name	Address	Zip Code
01295	Texas Instr Inc Semicond Component Div	Dallas Tx	75222
28480	Hewlett-Packard Co. Corporate HQ.	Palo Alto Ca	94304

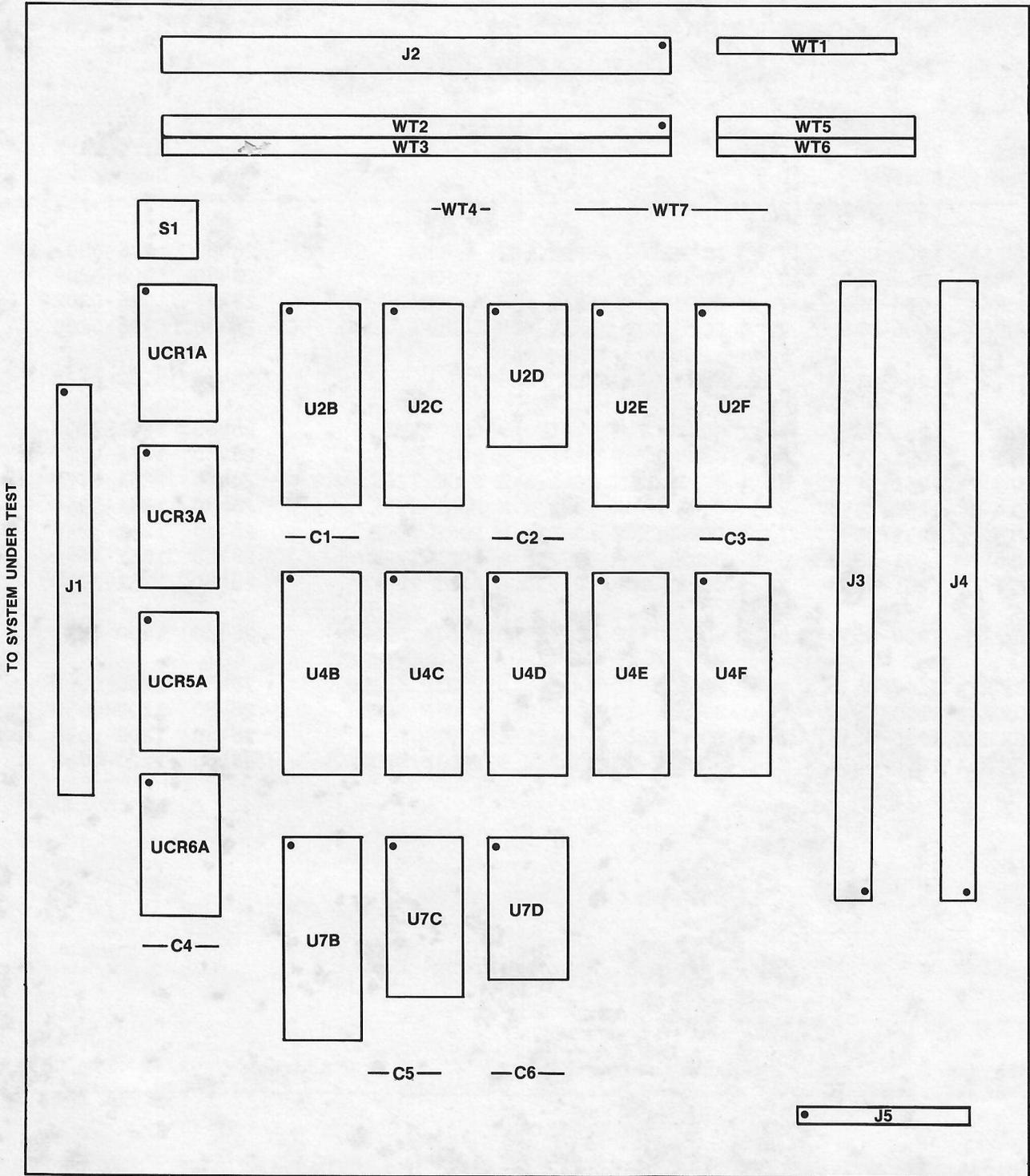
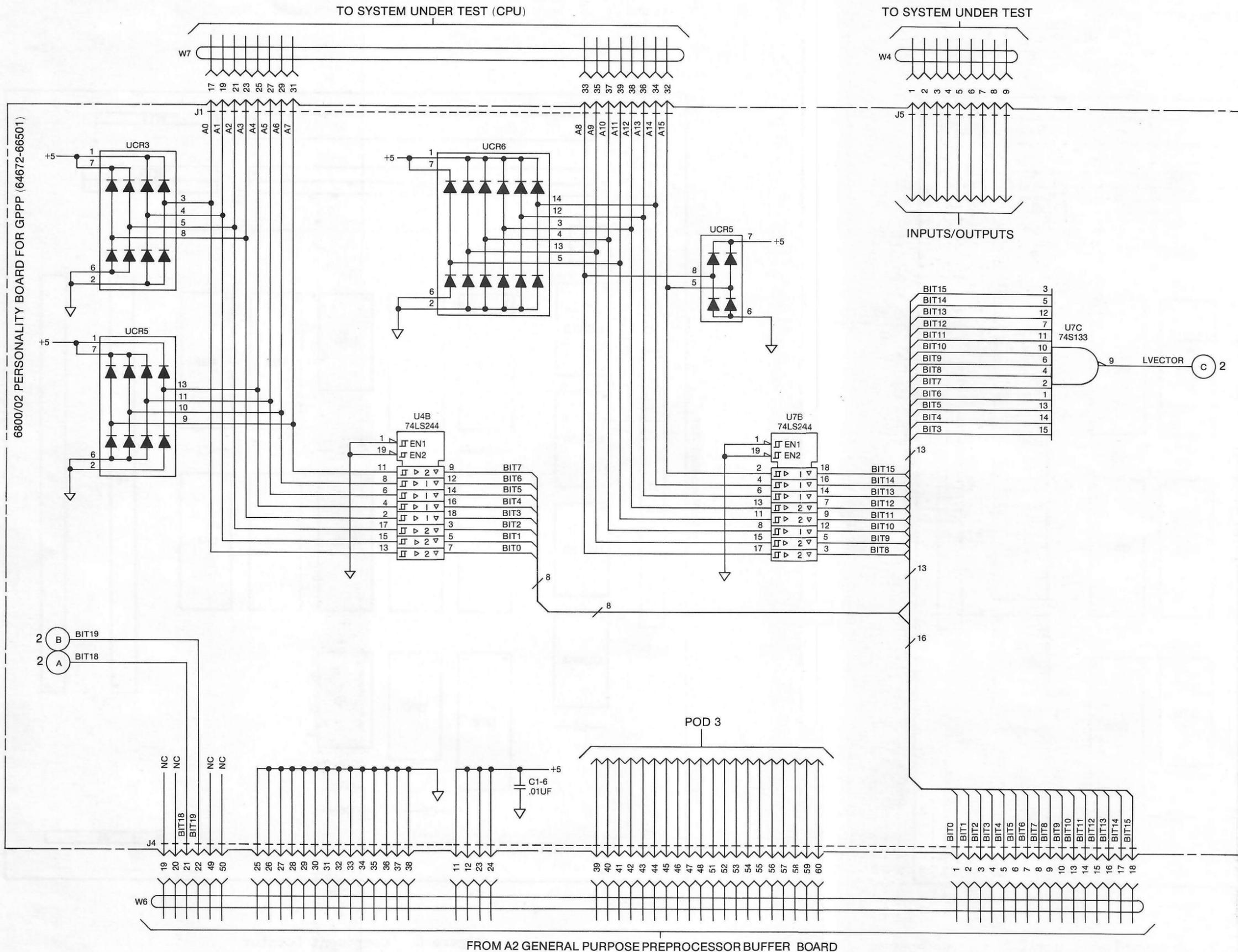


Figure 6. Component Locator



IC's on This Schematic

Ref. Des.	HP Part Number	Description
UCR3	1906-0202	DIODE ARRAY
UCR5	1906-0202	DIODE ARRAY
UCR6	1906-0202	DIODE ARRAY
U4B	1820-2024	74LS244N
U7B	1820-2024	74LS244N
U7C	1820-1130	74S133N

IC Power Configuration

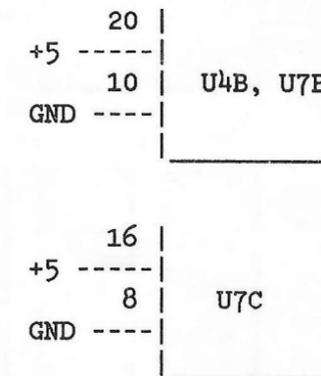


Figure 7.  
64672-66501 Schematic (sheet 1 of 2)  
11

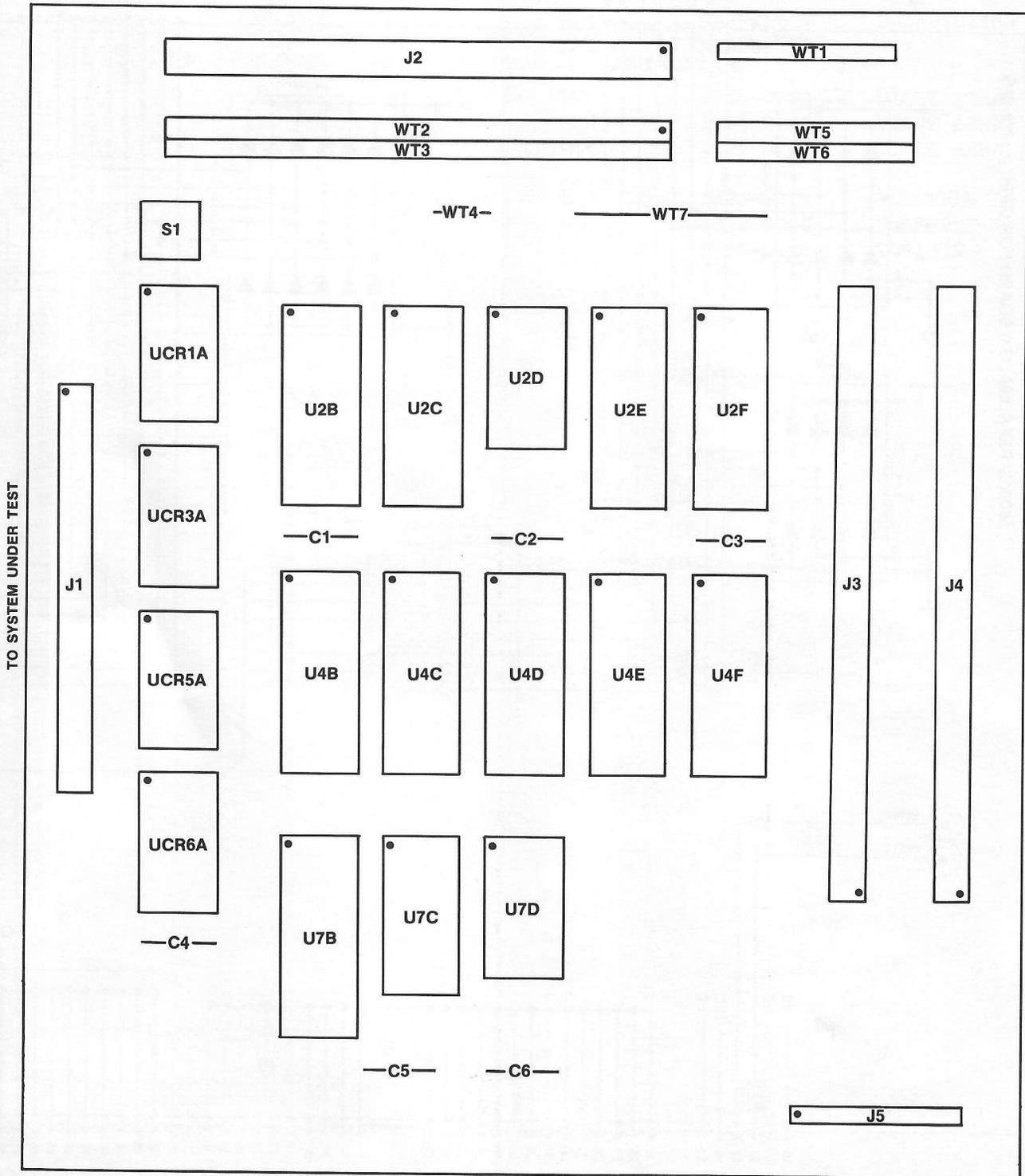


Figure 6. Component Locator

