SERVICE BRIEF

HEWLETT-PACKARD
MODEL 64671A
6809/6809E INTERFACE MODULE

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

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Service Brief Part Number 64671-90901
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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.

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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.

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ASSISTANCE

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

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CW&A 2/81

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.

SS-1-1 / 76

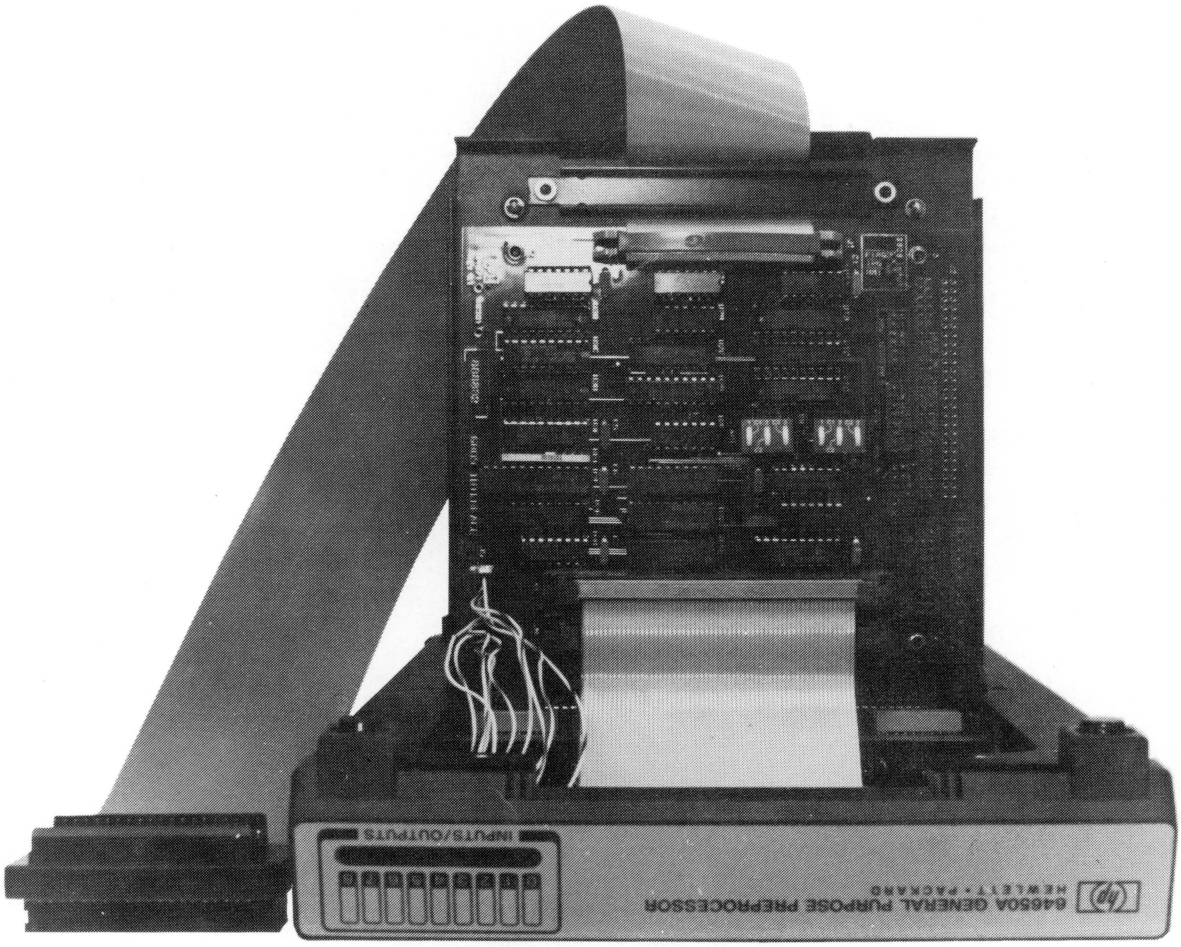


Figure 1. Model 64671A Interface Module

GENERAL INFORMATION.

The Model 64671A Processor Interface, along with the 64620S (with the 64650A General Purpose Preprocessor) or with the 1630A/D/W (with the 10269A General Purpose Preprocessor), connects the signals from the 6809/6809E Processor to the state analyzer generating all status and clock signals required for inverse assembly of the 6809/6809E instruction set. Status is generated on the interface module to indicate opcode fetches. These signals are 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 64671A 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 6809/6809E Target System and generates 5 bits of status for the state analyzer.

The data bus signals from the processor are buffered and latched before they are sent to the state analyzer and to the state machine on the interface module. The state machine on the 64671A Interface Module consists of three PROMs that interperate the data to generate the status.

CIRCUIT DESCRIPTION.

The circuitry on the 64671A Interface board is divided into three groups: 1) LATCHES, 2) TIMING/CONTROL, and 3) STATE MACHINE. Each group is explained in this section.

CPU BUS LATCHES. There are six 74LS574 octal flip-flops that are the front end of the interface module. They are U1B, U1C, U1D, U1H, U2C, and U3B. These devices capture address, data, and status information at the end of every 6809 bus cycle. Information is sampled on the falling edge of the 6809/6809E "E" clock signal. The "E" clock is buffered and inverted by U3C before going to the flipflops.

TIMING AND CONTROL LOGIC. The control logic section receives the "E and Q" clocks, R/W (Read/low Write), BS (Bus Status), and BA (Bus Available) input signals from the microprocessor. These signals control the State Machine U2F, U2G, U2H. They also clock and generate status signals for the state analyzer. Each signal is described in the next five paragraphs.

The PCLOCK signal is the clock for the state machine. It runs at the same frequency as the "E" or "Q" clock, but it is active only during cycles when the processor is executing instructions. The PCLOCK signal is generated by U2D.

The LCLEAR signal initializes the state machine each time the 6809/6809E reads an interrupt or reset vector (BA=0 and BS=1), or when the 6809/6809E performs a data write. The next read the processor makes from other than address FFFFH will be an opcode fetch.

The HINT signal indicates that the current instruction that the 6809/6809E is fetching will be aborted due to a hardware interrupt. During the second cycle of any instruction, the 6809/6809E will perform a memory read from the location following where the opcode was read. The only time this will not occur is if the processor is going to abort the instruction because of a hardware interrupt.

By monitoring the lowest address line (A0) from the 6809/6809E and comparing it to A0 from the previous processor bus cycle, the interrupt can be detected. If they are both high or both low, the instruction is being interrupted. U2D makes this comparison at each bus cycle.

The STAT7 signal indicates that the current bus cycle is useful for instruction analysis. There are two types of bus cycles that are qualified out in the generation of this signal. The first is when the BA and BS lines indicate that the processor is in the sync acknowedge or halt/bus grant mode. The second is when the state machine indicates that the current bus cycle is not useful. This line is used as both a status line and as CLOCK0 to the state analyzer.

STATE MACHINE. The purpose of the state machine is to track the bus cycles performed by the 6809/6809E, decode instructions, and generate status to indicate opcode fetches and other simular cycles. The state machine does this by decoding each instruction. It then follows a sequence of states for that instruction that identify each cycle and when the next opcode occurs.

The state machine is composed of a nine bit state register (U3G and half of U1G) and three 512 x 8 bit PROMs. U2G and the lowest bit of U2H give the next state value. The remainder of U2H is several control lines for the state machine. U2F produces status about the current states.

Latches U3D and U3E hold opcodes and other code bytes. When needed, the output of latch U3D or U3E is enabled and input to U3F (2K x 8 bit PROM). This PROM decodes the data value and produces a five bit code. The code is used as the lower five bits of the next state and gives a 32 way branch capability.

The state machine advances one state for each bus cycle the processor executed in instruction. When the processor stops executing instructions, as in a halt/bus grant, the state machine stops also. This is controlled by PCLOCK.

GENERAL INFORMATION

The 64671A module contains circuitry required to interface the Logic Analyzer to the 6809 Microprocessor. The mainframe supplies +5 volts to this module for operating power at TTL logic levels. The 6809/6809E Interface Module ID code is 71 decimal.

INSTALLATION PROCEDURES

***** 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 6809/6809E Interface Module.

2. Connect W3 from the large General Purpose Preprocessor card (A1) to J3 on the 6809/6809E 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 6809/6809E 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 64671A Interface Module will operate with an 6809/6809E Microprocessor clocked at rates up to 2 MHz. The card adds one ALS TTL load to all monitored lines and an interface capacitance of approximately 35 pF.

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 64671A.

TROUBLESHOOTING

If a failure is suspected in the HP 64671A Interface Module, troubleshooting can be done using a Logic Pulser and a Logic Probe. The Model 64671A must be connected to the Model 64650A or the Model 10269A. Remove the ZIF connector from the system under test. Remove the 6809/6809E 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.

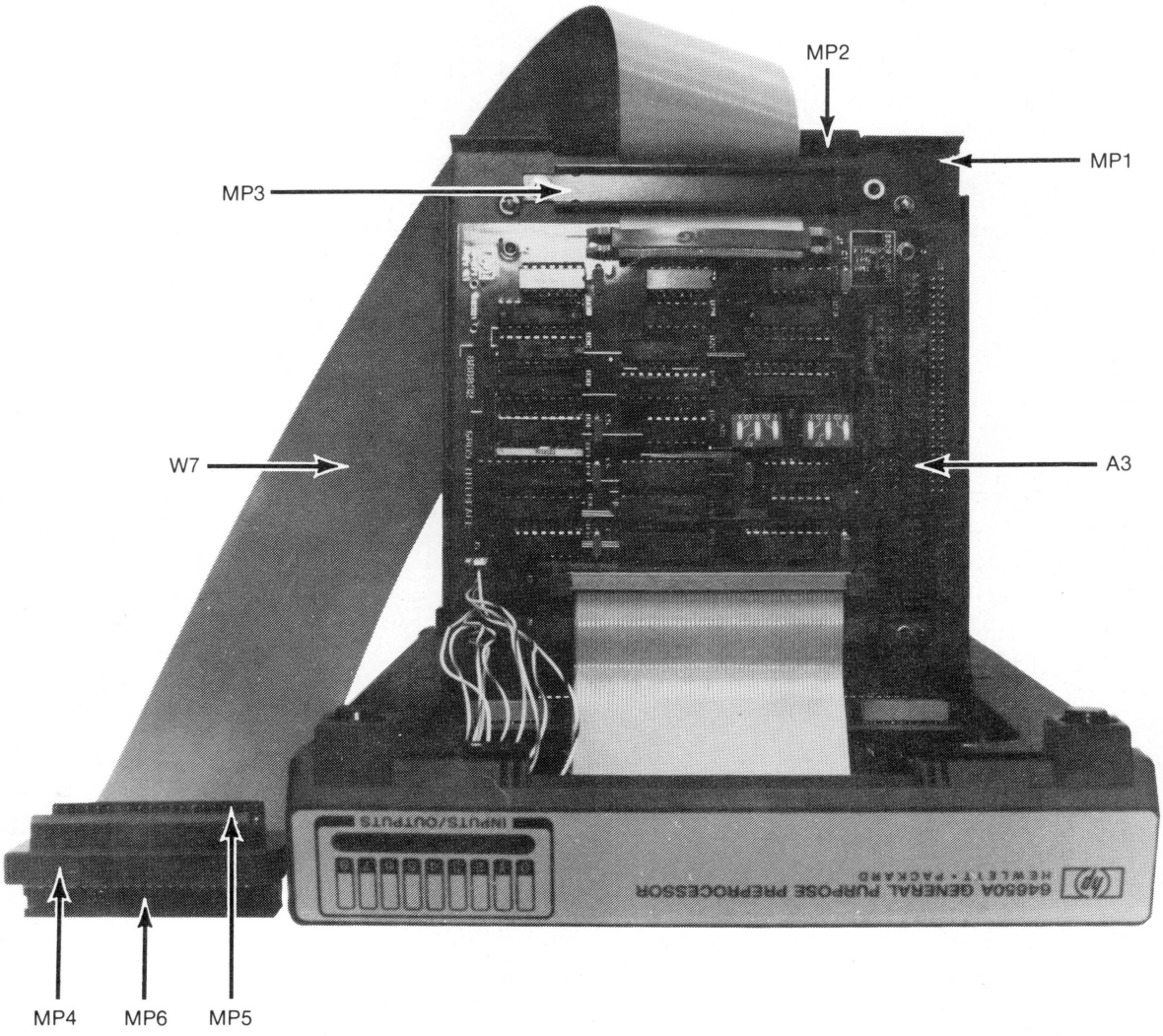


Figure 2. Replaceable Parts Breakdown

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.

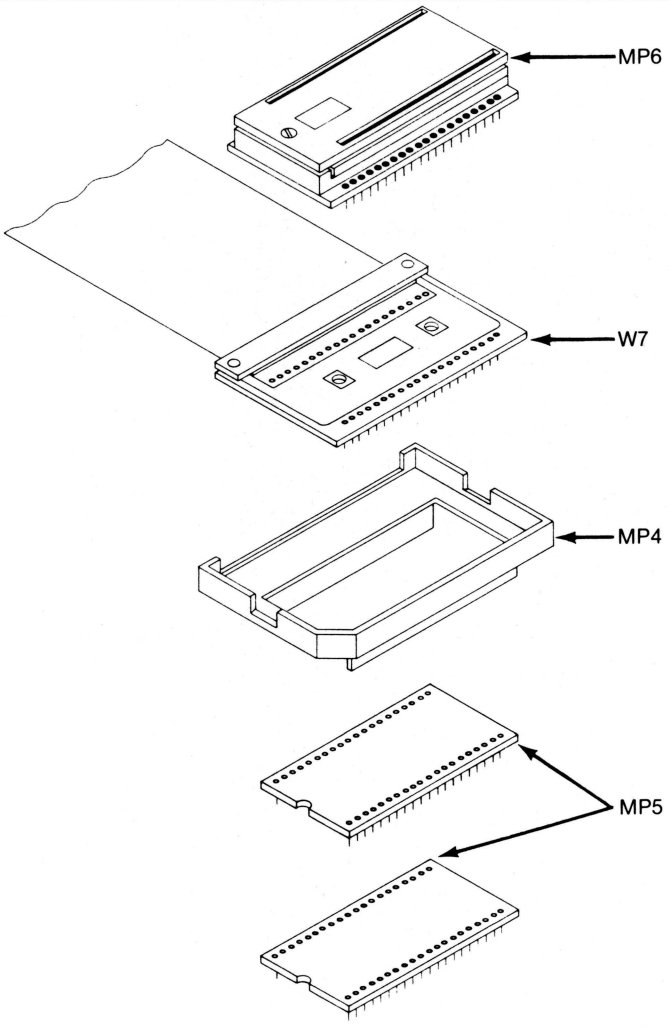


Figure 3. Exploded View User Plug

Table 1. Replaceable Parts List

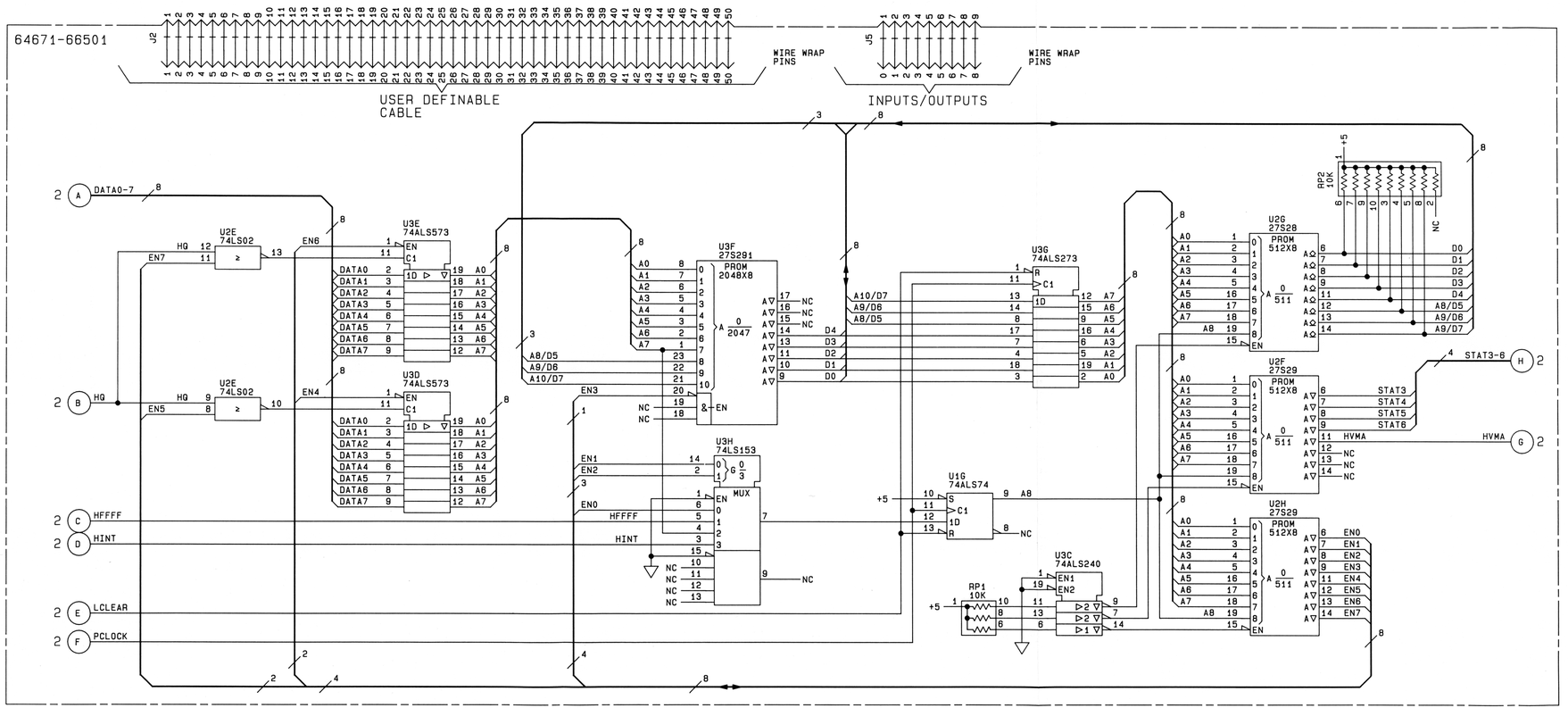
Ref. Des.	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
A3	64671-66501	5	1	6809/6809E INTERFACE BOARD ASSEMBLY	28480	64671-66501
C1	0160-5246	6	7	CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-5246
C2	0160-5246	6		CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-5246
C3	0160-5246	6		CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-5246
C4	0160-5246	6		CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-5246
C5	0160-5246	6		CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-5246
C6	0160-5246	6		CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-5246
C7	0160-5246	6		CAP-FXD 0.1UF +80-20% 100VDC CER	28480	0160-5246
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	64671-04101	1	1	POD COVER 6809/6809E INTERFACE CARD	28480	64671-04101
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
RP1	1810-0280	1	2	RESISTOR NETWORK 10K X 9	28480	1810-0280
RP2	1810-0280	1		RESISTOR NETWORK 10K X 9	28480	1810-0280
SW1	3101-2482	5	2	SWITCH RKR 3 PDT	28480	3101-2482
SW2	3101-2482	5		SWITCH RKR 3 PDT	28480	3101-2482
U1A	1906-0229	8	4	IC-DIODE ARRAY 50V 400MA	28480	MC1107P
U1B	1820-2757	9	6	IC-FF TTL ALS D-TYPE P-EDGE-TRG OCTL	28480	74ALS574N
U1C	1820-2757	9		IC-FF TTL ALS D-TYPE P-EDGE-TRG OCTL	28480	74ALS574N
U1D	1820-2757	9		IC-FF TTL ALS D-TYPE P-EDGE-TRG OCTL	28480	74ALS574N
U1F	1820-3372	6	1	IC-GATE TTL ALS NAND 13-INP	28480	74ALS133N
U1G	1820-2488	3	1	IC-FF TTL ALS D-TYPE POS-EDGE-TRIG	28480	74ALS74AN
U1H	1820-2757	9		IC-FF TTL ALS D-TYPE P-EDGE-TRG OCTL	28480	74ALS574N
U2A	1906-0229	8		IC-DIODE ARRAY 50V 400MA	28480	MC1107P
U2B	1906-0229	8		IC-DIODE ARRAY 50V 400MA	28480	MC1107P
U2C	1820-2757	9		IC-FF TTL ALS D-TYPE P-EDGE-TRG OCTL	28480	74ALS574N

Table 1. Replaceable Parts List (Cont'd)

Ref. Des.	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
U2D	64671-80005	4	1	IC-PROGRAMMED LOGIC ARRAY * 82S153 *	28480	64671-80005
U2E	1820-1144	6	1	IC-GATE TTL LS NOR QUAD 2-INP	28480	74LS02N
U2F	64671-80003	2	1	IC-PROGRAMMED PROM * 27S29 *	28480	64671-80003
U2G	64671-80001	0	1	IC-PROGRAMMED PROM * 27S28 *	28480	64671-80001
U2H	64671-80004	3	1	IC-PROGRAMMED PROM * 27S29 *	28480	64671-80004
U3A	1906-0229	8		IC-DIODE ARRAY 50V 400MA	28480	MC1107P
U3B	1820-2757	9		IC-FF TTL ALS D-TYPE P-EDGE-TRG OCTL	28480	74ALS574N
U3C	1820-2951	5	1	IC-DRVR TTL ALS BUS OCTL	28480	74ALS240N
U3D	1820-2724	0	2	IC-LATCH TTL ALS D-TYPE OCTL	28480	74ALS573N
U3E	1820-2724	0		IC-LATCH TTL ALS D-TYPE OCTL	28480	74ALS573N
U3F	64671-80002	1	1	IC-PROGRAMMED PROM * 27S291 *	28480	64571-80002
U3G	1820-1730	6	1	IC-FF TTL LS D-TYPE POS-EDGE-TRIG C	28480	74LS273N
U3H	1820-1244	7	1	IC-MUXR/DATA-SEL TTL LS 4-TO 1 DRVR	28480	74LS153N
W7	8120-3814	4	1	6809 CABLE ASSEMBLY	28480	8120-3814
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	2	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	1251-5835	3	2	CONNECTOR 6-PIN M POST TYPE	28480	1251-5835
WT8	1251-5835	3		CONNECTOR 6-PIN M POST TYPE	28480	1251-5835
WT9	1251-4367	4	1	CONNECTOR 8-PIN M POST TYPE	28480	1251-4367
XU1A	1200-0638	7	4	SOCKET-IC 14-PIN DIP DIP SLDR	28480	1200-0638
XU2A	1200-0638	7		SOCKET-IC 14-PIN DIP DIP SLDR	28480	1200-0638
XU2B	1200-0638	7		SOCKET-IC 14-PIN DIP DIP SLDR	28480	1200-0638
XU3A	1200-0638	7		SOCKET-IC 14-PIN DIP DIP SLDR	28480	1200-0638

Table 2. 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



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IC's on This Schematic

Ref. Des.	HP Part Number	Description
U1G	1820-2488	74ALS74AN
U2E	1820-1144	74LS02N
U2F	64671-80003	PROM PROG 27S29
U2G	64671-80001	PROM PROG 27S28
U2H	64671-80004	PROM PROG 27S29
U3C	1820-2951	74ALS240N
U3D	1820-2724	74ALS573N
U3E	1820-2724	74ALS573N
U3F	64671-80002	PROM PROG 27S291
U3G	1820-1730	74LS273N
U3H	1820-1244	74LS153N

IC Power Configuration

+5	20	U2F, 2G, 2H, U3C, 3F, 3G
GND	10	
+5	14	U1G, 2E
GND	7	
+5	16	U3D, 3E, 3H
GND	8	

Figure 5.
64671-66501 Schematic (sheet 1 of 2)

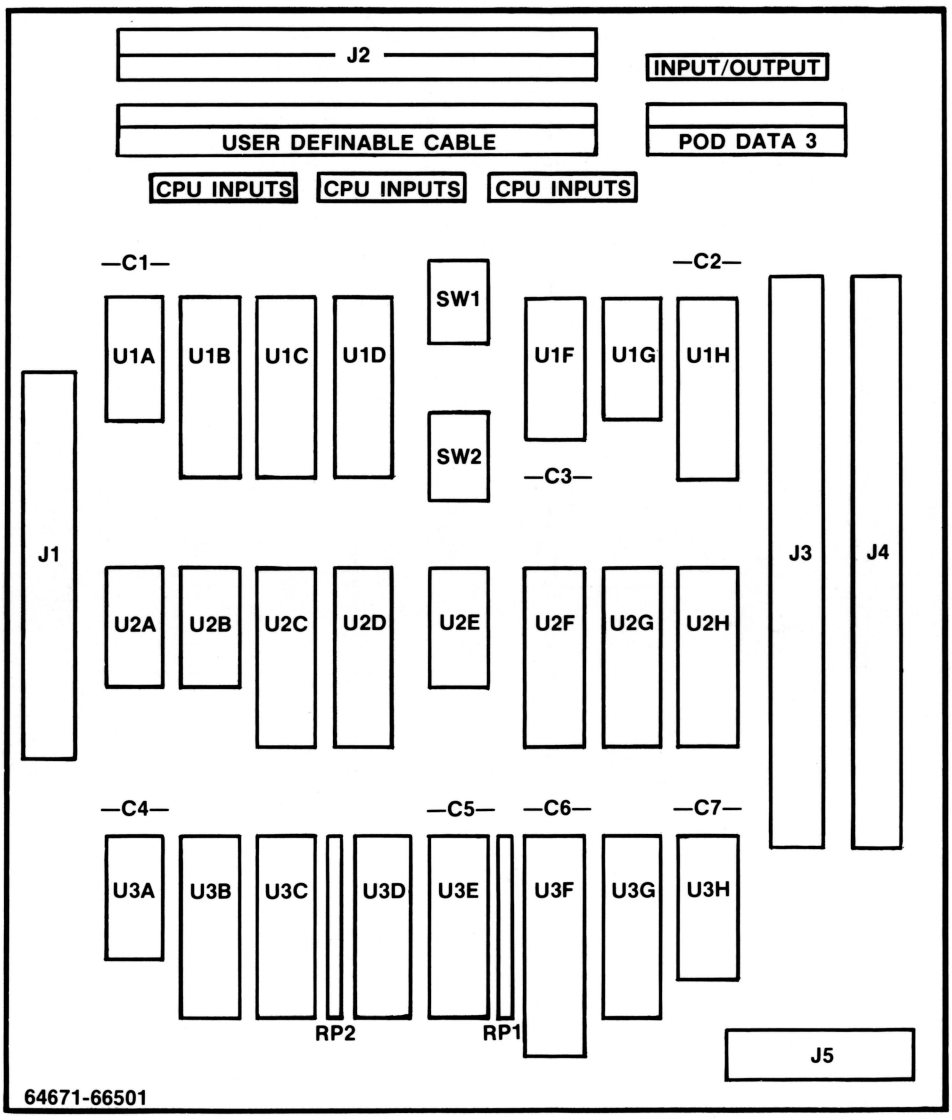
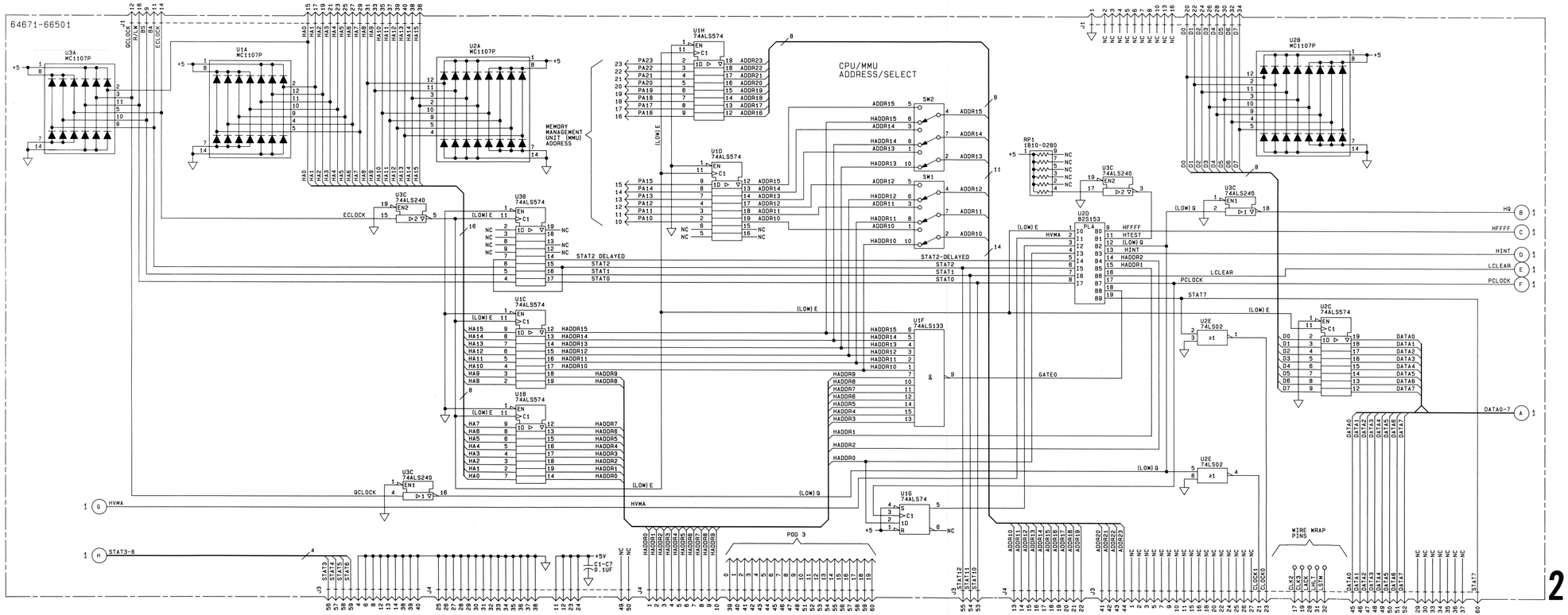


Figure 4. Component Locator



IC's on This Schematic

Ref. Des.	HP Part Number	Description
U1A	1906-0229	MC1107P
U1B	1820-2757	74ALS574N
U1C	1820-2757	74ALS574N
U1D	1820-2757	74ALS574N
U1F	1820-3372	74ALS133N
U1G	1820-2488	74ALS74AN
U1H	1820-2757	74ALS574N
U2A	1906-0229	MC1107P
U2B	1906-0229	MC1107P
U2C	1820-2757	74ALS574N
U2D	64671-80005	PLA 82S153
U2E	1820-1144	74LS02N
U3A	1906-0229	MC1107P
U3B	1820-2757	74ALS574N
U3C	1820-2951	74ALS240N

IC Power Configuration

+5	20	U1B, 1C, 1D, 1H, U2C, 2D, 3B, 3C
GND	10	
+5	14	U1G, 2E
GND	7	
+5	16	U1F
GND	8	

Figure 5.
64671-66501 Schematic (sheet 2 of 2)

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Doesn't cover enough (what more do you need?)	1	2	3	4	5	Covers everything

2. The information in this book is accurate:

Too many errors	1	2	3	4	5	Exactly right

3. The information in this book is easy to find:

I can't find things I need	1	2	3	4	5	I can find info quickly

4. The Index and Table of Contents are useful:

Helpful	1	2	3	4	5	Missing or inadequate

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No help	1	2	3	4	5	Very helpful
Too many now	1	2	3	4	5	I'd like more

6. What about the writing style:

Confusing	1	2	3	4	5	Clear

7. What about organization of the book:

Poor order	1	2	3	4	5	Good order

8. What about the size of the book:

too big/small	1	2	3	4	5	Right size

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