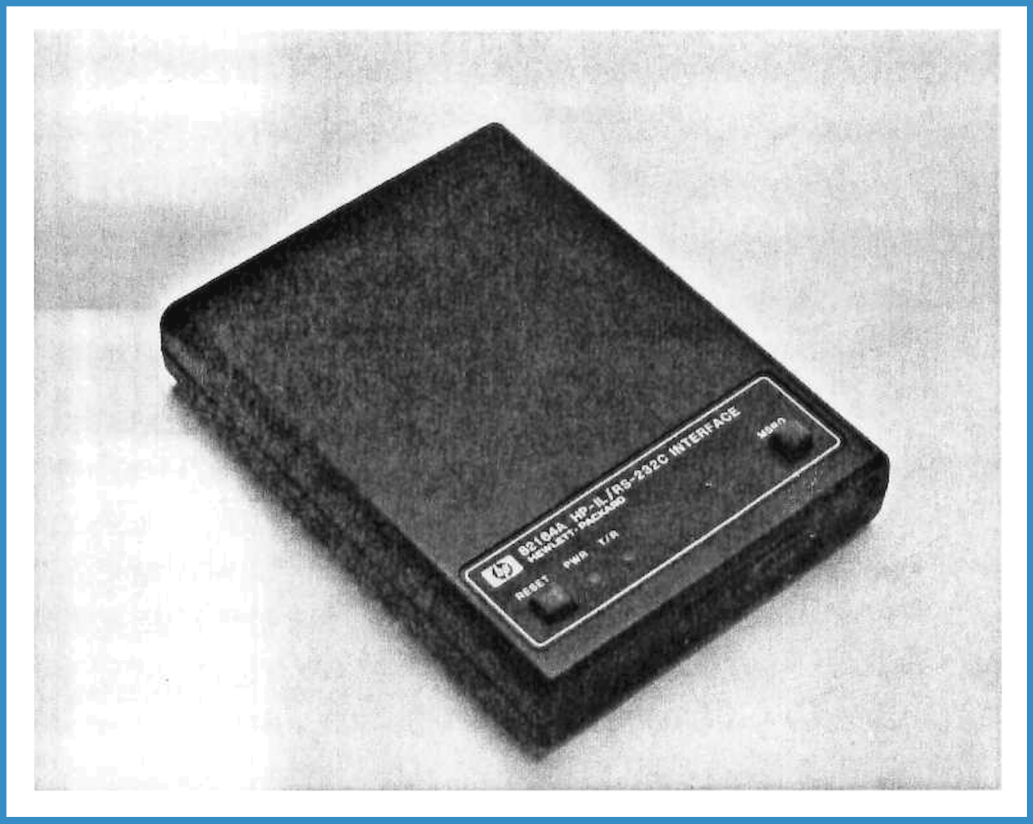
HP 82164A

HP-IL/RS-232-C INTERFACE

SERVICE MANUAL



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SERVICE MANUAL

82164-90001

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I

General Information

1-1. INTRODUCTION

1-2. This service manual contains information necessary to troubleshoot and repair the HP 82164A HP-IL/RS-232-C Interface.

1-3. The manual is divided into seven sections, which give:

- o A description of the interface (section I).
- o An explanation of how it works (section II).
- o Steps for disassembling and reassembling it (section III).
- o Steps for troubleshooting, testing, and repairing it (section IV).
- o Information for testing its electrical accessories (section V).
- o Lists of replaceable parts (section VI).
- o Reference diagrams (section VII).

1-4. DESCRIPTION

1-5. The HP 82164A HP-IL/RS-232-C Interface is a peripheral device that provides the capability for the calculators and computers that control the HP-IL (Hewlett-Packard Interface Loop) to interface with an external device having serial input/output (RS-232-C) capabilities.

1-6. IDENTIFICATION

1-7. The serial number of the interface is used for identification and determination of warranty status. It is located on the bottom case. Its format is described below.

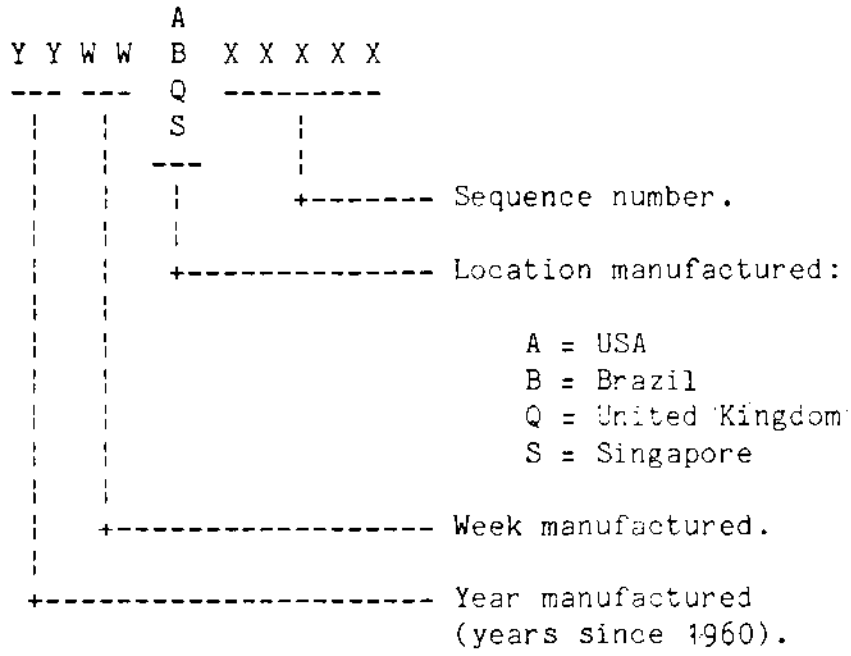


Table 1-1. Specifications

Physical Properties

- Width: 12.1 centimeters (4.75 inches).
- Length: 16.0 centimeters (6.31 inches).
- Height: 3.0 centimeters (1.19 inches).
- Weight: 278 grams (9.8 ounces).

Power Requirements

- Primary source: ac adapter.
- Usage: 1.75 watts.

Temperature Limits

- Operating: 0 to 65 degrees C (32 to 131 degrees F).
- Storage: -40 to 75 degrees C (-40 to 167 degrees F).

SECTION
II

Theory of Operation

2-1. FUNCTIONAL DESCRIPTION

2-2. The HP 82164A HP-IL/RS-232-C Interface consists of five basic electrical circuits (see figure 2-1):

- o The HP-IL interface circuit.
- o The RS-232-C interface circuit.
- o The processor circuit.
- o The keyboard circuit.
- o The power supply circuit.

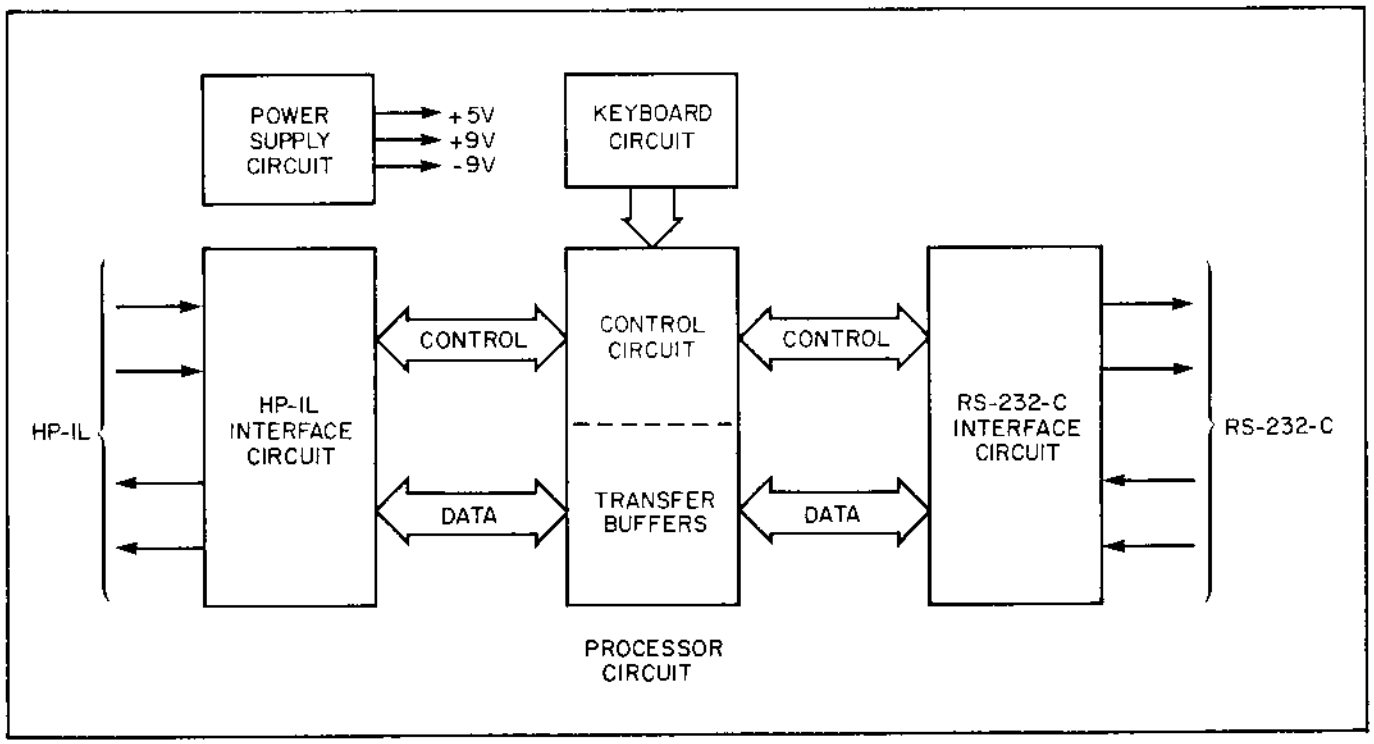


Figure 2-1. Interface Block Diagram

2-3. These circuits are contained on the logic PCA (printed circuit assembly). CMOS (complementary metal-oxide-semiconductor) circuitry is used in the HP-IL IC (integrated circuit). The processor and UART (universal asynchronous receiver transmitter) circuits use NMOS (N-channel metal-oxide-semiconductor) circuitry. Other circuits use conventional bipolar circuits.

2-4. HP-IL Interface Circuit

2-5. The HP-IL interface circuit consists of the input/output transformer (T1), the HP-IL IC (U3), and associated components located in U5. The interface circuit performs the standard operations required by the interface loop, such as maintaining the interface's talker or listener status, and accepting and passing HP-IL messages around the loop. The HP-IL IC contains its own 2-MHz timing circuit, the frequency of which is determined by L1 and C1.

2-6. RS-232-C Interface Circuit

2-7. The RS-232-C interface circuit consists of the UART (U2), a male 25-pin subminiature RS-232 receptacle, and two converters (U4 and U6). Under the control of the processor the interface circuit provides for the interface handshake signals and the transfer of data, and converts the incoming and outgoing signals to voltage levels compatible with the receiving device. A jumper is included to enable easy change from a DTE (data terminal equipment) to a DCE (data communication equipment) configuration.

2-8. Processor Circuit

2-9. The processor circuit consists of U1 and U7. U1 contains the system timing circuitry, the control logic, and the transfer buffers. The frequency of the 11-MHz timing signal is controlled by crystal Y1. The processor circuit also includes registers that store operating information, the control registers and the status registers.

2-10. The control logic selects the appropriate transfer buffer, executes the transfer of data when the proper handshake signals have been received, and causes the circuit in U7 to turn the T/R (transmit/receive) light on when data is being transmitted across the interface.

2-11. The transmit and receive transfer buffers provide for temporary storage of data being transmitted or received by the interface. The transmit buffer can hold 84 bytes waiting to be sent on RS-232, and the receive buffer can hold 109 bytes waiting to be sent on HP-IL.

2-12. Keyboard Circuit

2-13. The keyboard circuit consists of the RESET key and the MSRQ (manual service request) key located on the logic PCA and accessible through the top case.

2-14. Power Supply Circuit

2-15. The power supply circuit consists of two diode bridges (CR1 through CR8), three voltage regulators (VR1, VR2, and VR3), a power transformer (T2), a filter transformer (T3), and associated capacitors and resistors. This circuit provides regulated voltages of +5V, +9V, and -9V.

2-16. SYSTEM OPERATION

2-17. The HP-IL/RS-232 interface can transmit data from talkers on the HP-IL to an RS-232 device. It can also send data from the RS-232 device to listeners on the HP-IL.

2-18. The processor monitors the HP-IL interface to see if it has received data intended for the RS-232-C device. It also monitors the RS-232-C interface to determine the state of the external device.

2-19. When data for the RS-232-C device is received by the HP-IL interface, the processor causes it to be placed temporarily in the transmit buffer. When the proper handshake signals have been received, indicating the device is ready to receive data, the processor places the data on the data bus and causes the UART to transmit the data.

2-20. If the RS-232-C device transmits data to the interface, it is stored temporarily in the UART. When the processor indicates its readiness to receive data, the UART places the data on the data bus and the processor causes it to be placed temporarily in the receive buffer. A service request is sent to the HP-IL controller, and when the proper response is received the processor causes the HP-IL interface to read the data and send it on the HP-IL. (Additional technical details can be found in the HP 82164A HP-IL/RS-232-C Interface Owner's Manual, part number 82164-90002.)

SECTION
III

Disassembly and Reassembly

3-1. INTRODUCTION

3-2. This section describes the procedures for disassembling and reassembling the HP-IL/RS-232-C interface in order to repair components that are faulty.

CAUTION

Be sure that adequate precautions are taken regarding electrostatic protection. Work at a bench setup that is electrostatically protected. Otherwise, components may be damaged.

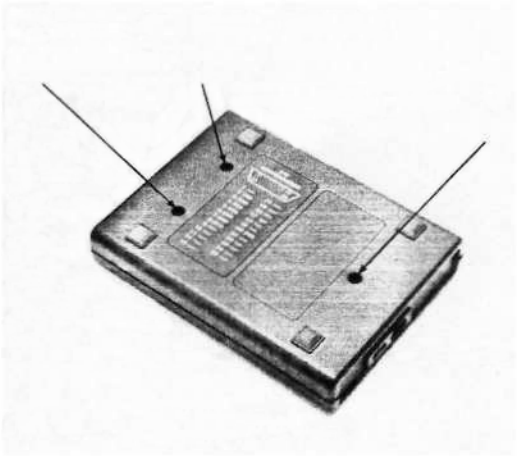
3-3. The only tool required to disassemble and reassemble the HP-IL/RS-232-C interface is a #2 Pozidriv screwdriver.

3-4. SEPARATING THE CASE

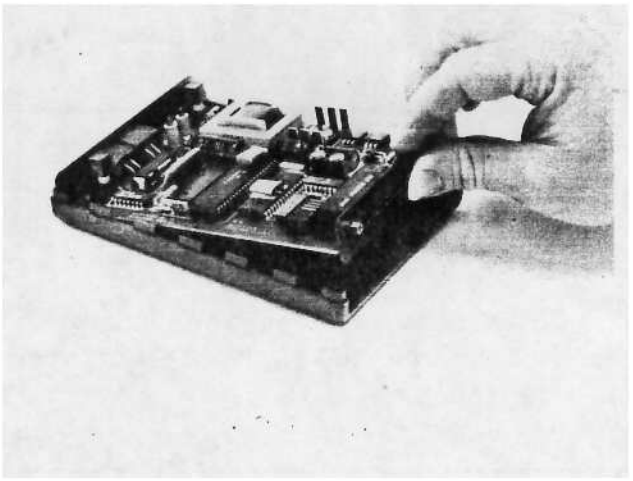
To separate the case of the interface, perform the following steps:

a. Remove the three screws from the bottom case using a Pozidriv screwdriver.

b. Carefully lift off the top case.



c. If it is necessary to remove the logic PCA, grasp either one of the end panels and lift the whole assembly out of the bottom case.



3-5. REASSEMBLING THE CASE

To reassemble the unit, reverse the procedure of steps a through c. Make sure the end panels are seated properly in the slots in the top and bottom cases and that the top case is aligned with the RESET and MSRQ keys.

SECTION
IV

Troubleshooting and Testing

4-1. INTRODUCTION

4-2. This section contains the procedures you should follow to isolate the cause of a problem in the HP 82164A HP-IL/RS-232-C Interface. The same procedures verify that a unit is functioning properly. Tools that facilitate service are listed in table 4-1.

CAUTION

Ensure that adequate precautions are taken regarding electrostatic protection. Work at a bench setup that is electrostatically protected. Otherwise, components may be damaged.

Table 4-1. Recommended Tools

HP PART/MODEL NUMBER	DESCRIPTION
HP 82167A	HP-IL cable
00041-15043	HP-IL development module
HP 82160A	HP-IL module
HP 5004A*	Logic probe on the signature analyzer
HP 3469B*	Multimeter
HP 180C/1801A/1820C*	Oscilloscope
HP 10004*	Oscilloscope probe
1251-4946**	RS-232 test plug
HP-41C/HP-41CV	Test calculator

* Or equivalent.
** RS-232 25-pin D-subminiature female connector wired in accordance with figure 4-1.

4-3. The procedure of paragraph 4-8h should be repeated each time a component is replaced to determine whether the fault has been repaired.

4-4. A diagnostic test program is your primary troubleshooting procedure. With the interface and test calculator connected in an HP-IL loop, you

will execute the test program; resulting error messages identify potentially failed components and suggest further test procedures.

4-5. INITIAL PREPARATION

4-6. Perform the following steps before attempting to troubleshoot the interface.

a. Visually inspect the unit for physical damage. Replace any components that are visibly damaged.

b. Determine the customer's concern, if possible. Frequently the customer includes with the unit a message describing the problem.

- o If the problem relates to the ac adapter, test it according to the procedure in paragraph 5-6.
- o For other problems with the unit, perform the procedures of paragraph 4-7.

4-7. TEST AND REPAIR PROCEDURES

4-8. Perform the following steps to determine which components are faulty. Before replacing any IC, be sure to check for the presence of dc supply voltage at the appropriate pin of the IC (+ and - 8.1 to 9.9 Vdc at U6; 4.8 to 5.2 Vdc at all other ICs) and that the ground connection at the IC is good. If the proper voltage is not present, check the traces, then refer to table 4-4. (Pin numbers are shown in figure 7-2.)

a. Plug the HP 82160A HP-IL Module and the 00041-15043 HP-IL Development Module into the test calculator.

b. Load the diagnostic test program into the test calculator. (The program is listed in table 4-8.)

c. Remove the top case of the unit under test according to the procedure of paragraph 3-4.

d. Connect an ac adapter to the interface unit. The power light and the T/R light should both turn on. An internal self-test is automatically executed at turn on. The power light should remain on as long as the ac adapter is connected to the unit.

- o If both lights turn on, and then the T/R light turns off after about three seconds, the unit has passed the self-test. Continue testing.
- o If neither light turns on, proceed to table 4-3.

- If the T/R light does not turn off, proceed to table 4-4.

- If the power light turns on, but the T/R light does not turn on, proceed to table 4-4.

- If the power light does not turn on but the T/R light does turn on and then turns off after about three seconds, check the traces to DS1 and R8, then replace DS1 and R8 in order.

e. Connect the HP-IL module to the unit under test.

f. Plug the RS-232 test plug into the connector on the unit under test.

g. Make sure pin 1 of jumper A2 is near the label "DTE" on the PC board. (Use a small screwdriver to remove A2 if necessary.)

h. Execute test program "82164A".

- If PASSED is displayed, the unit is good. Stop testing.

- If any other message is displayed, proceed to table 4-2.

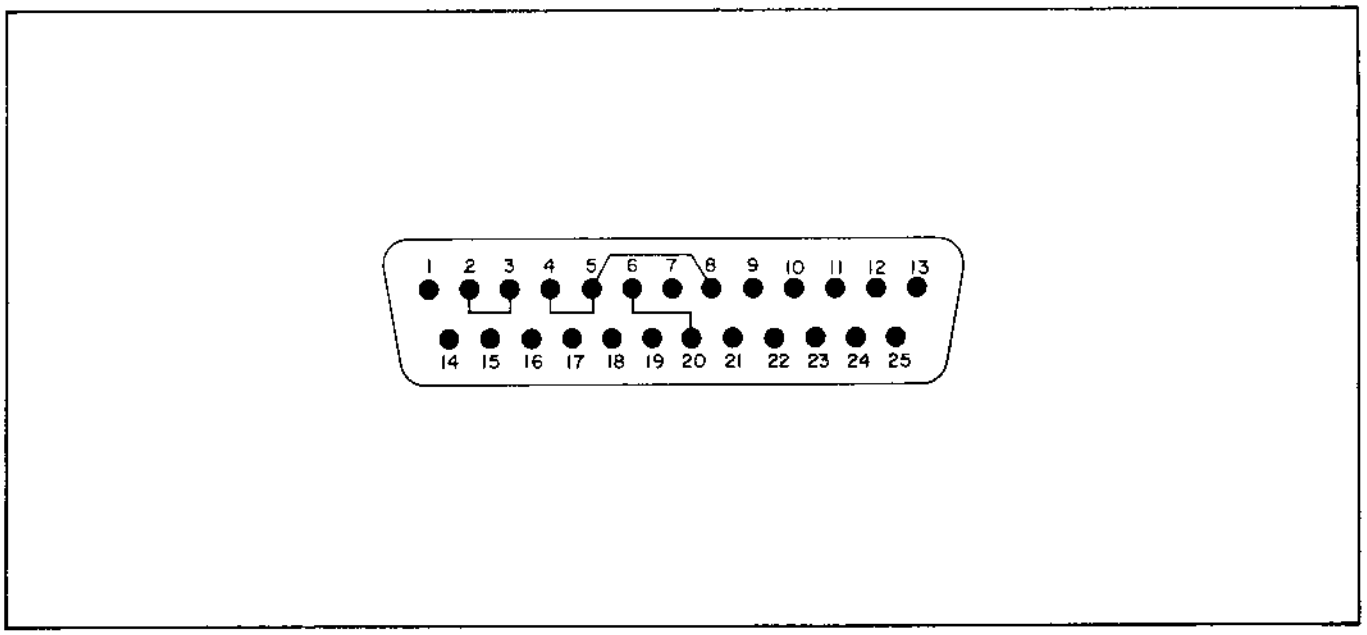


Figure 4-1. RS-232 Test Plug Wiring Diagram

Table 4-2. Diagnostic Test Results

The following special messages may be generated during the running of the diagnostic program. Error messages may be generated by the test calculator and its associated modules. Refer to the appropriate owner's manual for an explanation of those messages.

MESSAGES	ACTION
TIME OUT	Check Y1 for presence of an 11-MHz signal. If the signal is absent, replace Y1. If the signal is present, replace U1 and U3 in order.
LOOP DEAD	Check L1 for presence of a 2-MHz signal. If the signal is absent, replace L1 and C1 in order. If the signal is present, proceed to table 4-8.
CPU ERROR	Check U1-2 for presence of an 11-MHz signal. If the signal is absent, replace Y1. If the signal is present, replace U1.
AAD ERROR	Replace U1 and U3 in order.
HSHK ERROR	Perform the procedures in tables 4-6 and 4-7 in order. If the error persists, replace U1.
DATA ERROR	Perform in order the procedures in table 4-6 and 4-7 and steps 9 through 13 of table 4-5. If the error persists, replace U2 and U1 in order.

Table 4-3. Power Supply Troubleshooting

Use the procedures in this table if the PWR light and/or the T/R light do not turn on properly. All voltage measurements are made relative to ground unless otherwise specified.

STEP	SPECIFICATION	ACTION
1. Measure the voltage at VR1-3.	4.8 to 5.2 Vdc	If in specification, proceed to step 4.
2. Measure the voltage at VR1-1.	7.0 to 13.0 Vdc	If in specification, replace C7 and VR1 in order.
3. Test the ac adapter (refer to paragraph 5-6).	Refer to paragraph 5-6.	If in specification, repalce C1, CR1, CR2, CR3, and CR4 in order.
4. Measure the voltage at VR2-2.	8.1 to 9.9 Vdc	If in specification, proceed to step 8.
5. Measure the voltage at VR2-3.	17.5 to 22.5 Vdc	If in specification, replace C5, VR2, R1, and R2 in order.
6. Measure the voltage at T2-8.	15.6 to 19.6 Vac	If in specification, replace CR5, CR6, CR7, CR8, and C3 in order.
7. Measure the voltage between T2-1 and T2-4.	7.5 to 9.5 Vac	If in specification, replace T2.
8. Measure the voltage at VR3-3.	-8.1 to -9.9 Vdc	If in specification, proceed to table 4-5.

Table 4-3. Power Supply Troubleshooting (Continued)

STEP	SPECIFICATION	ACTION
9. Measure the voltage at VR3-2.	-17.5 to -22.5 Vdc	If in specification, replace C6, VR3, R3, R4, and C4 in order.

Table 4-4. Integrated Circuit U7 Test

Use the procedures in this table to test the operation of U7. The "A" specification in steps 5 through 8 applies while the self-test is running; the "B" specification applies after the self-test is completed. Both specifications must be met. Use a logic probe to test the state of the test points in steps 9 through 13. To initiate the self-test, press the RESET key. All voltages are relative to ground.

STEP	SPECIFICATION	ACTION
1. Measure the voltage at U1-33.	2.4 to 5.2 Vdc	If out of specification, replace U1.
2. Measure the voltage at U7-9 and -10.	2.4 to 5.2 Vdc	If out of specification, check the traces to the pins.
3. Measure the voltage at U7-8.	0 to 0.5 Vdc	If out of specification, replace U7.
4. Measure the LED side of R8.	1.5 to 2.7 Vdc	If out of specification, replace DS1 and R8 in order.
5. Measure the voltage at U1-34.	A: 2.4 to 5.2 Vdc B: 0 to 0.5 Vdc	If out of specification, replace U1.
6. Measure the voltage at U7-12 and -13.	A: 2.4 to 5.2 Vdc B: 0 to 0.5 Vdc	If out of specification, check the traces to the pins.

Table 4-4. Integrated Circuit U7 Test (Continued)

STEP	SPECIFICATION	ACTION
7. Measure the voltage at U7-11.	A: 0 to 0.5 Vdc B: 4.25 to 5.0 Vdc	If out of specification, replace U7.
8. Measure the LED side of R6.	A: 1.5 to 2.7 Vdc B: 4.25 to 5.0 Vdc	If out of specification, replace DS2 and R6 in order.
9. Probe U1-8.	High	If out of specification, replace U1.
10. Probe U1-10.	High	If out of specification, replace U1.
11. Probe U7-1 and -2.	High	If out of specification, check the traces to the pins.
12. Probe U7-3.	Low	If out of specification, replace U7.
13. While probing U7-3, ground U7-1 and U7-2 in turn.	High (while either pin is grounded)	If out of specification, replace U7.

Table 4-5. Integrated Circuit U4 Test

Use the procedures in this table to test the operation of U4. Remove the RS-232 test plug before testing. Use a logic probe to test the state of the test points.

STEP	SPECIFICATION	ACTION
1. Probe U4-1, -4, -10, and -13.	Low	If out of specification, check the traces, then
2. Probe U4-6.	High	If out of specification, replace U4 and U2 in order.

Table 4-5. Integrated Circuit U4 Test (Continued)

STEP	SPECIFICATION	ACTION
3. Probe U4-3, -8, and -11.	High	If out of specification, replace U4 and U1 in order.
4. Probe the following outputs, and then apply 5 Vdc to the corresponding inputs: Output Input U4-3 U4-1 U4-6 U4-4 U4-8 U4-10 U4-11 U4-13	Each output should go low when the 5 Vdc is applied to the corresponding input.	If any output remains high, replace U4.

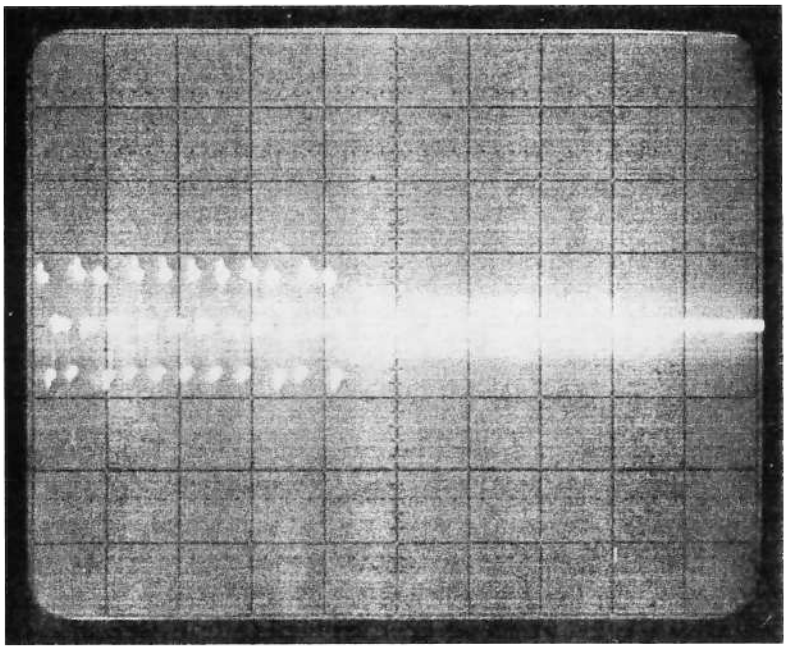
Table 4-6. Integrated Circuit U6 Test

Use the procedures in this table to test the operation of U6. Remove the RS 232 test plug before testing. Use a logic probe to test the state of the test points. High = +9 Vdc. Low = -9 Vdc.

STEP	SPECIFICATION	ACTION
1. Probe U2-10.	High	If out of specification, replace U2.
2. Probe U6-2.	High	If out of specification, check the traces to the pins.
3. Probe U6-3.	Low	If out of specification, replace U6.

Table 4-7. Troubleshooting the HP-IL Circuit (Continued)

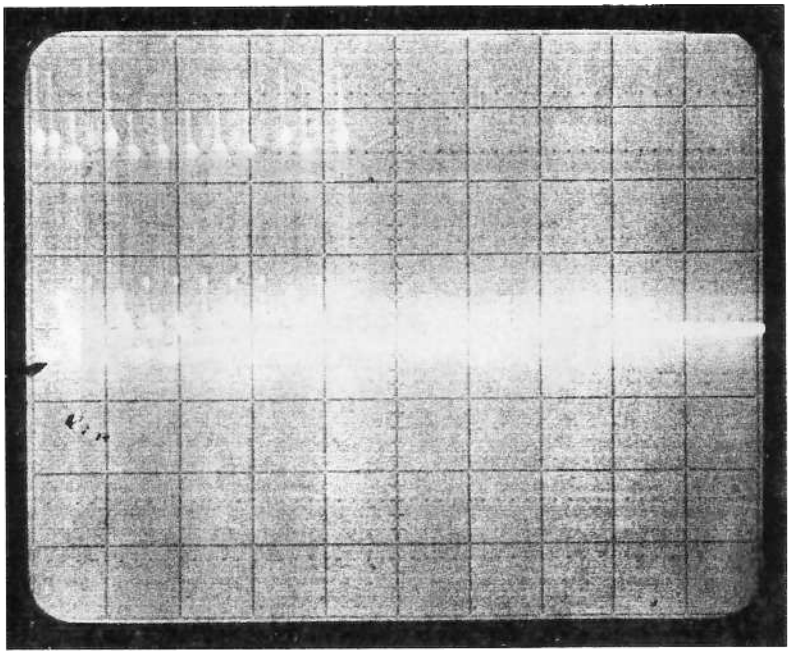
STEP	SPECIFICATION	ACTION
4. Monitor any one of the following pins: T1-12, T1-13, T1-14, or T1-16. The ground lead of the oscilloscope should be connected to J3-2.	Signal shown in photo below.	If the signal is not similar to that shown, replace in order T1 and U5.



Vertical: 0.5 V/div. Horizontal: 10 us/div.

Table 4-7. Troubleshooting the HP-IL Circuit (Continued)

STEP	SPECIFICATION	ACTION
5. Monitor any one of the following: T1-4, T1-6, U1-17, or U1-18.	Signal shown in photo below.	If the signal is not similar to that shown, replace in order T1, U5, and U1.

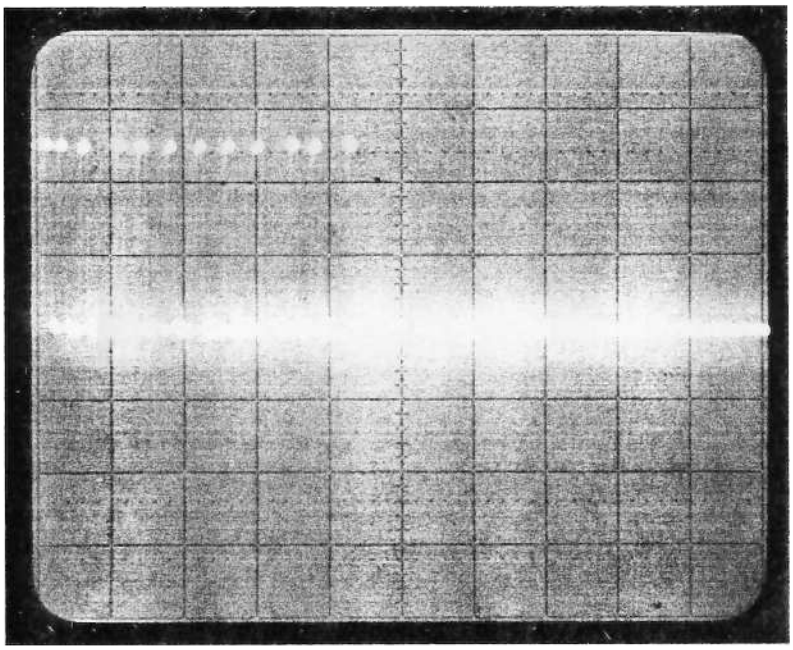


Vertical: 2 V/div. Horizontal: 10 us/div.

6. Measure the resistance of T1-4.	6.75K to 8.25K	If out of specification, replace U1.

Table 4-7. Troubleshooting the HP-IL Circuit (Continued)

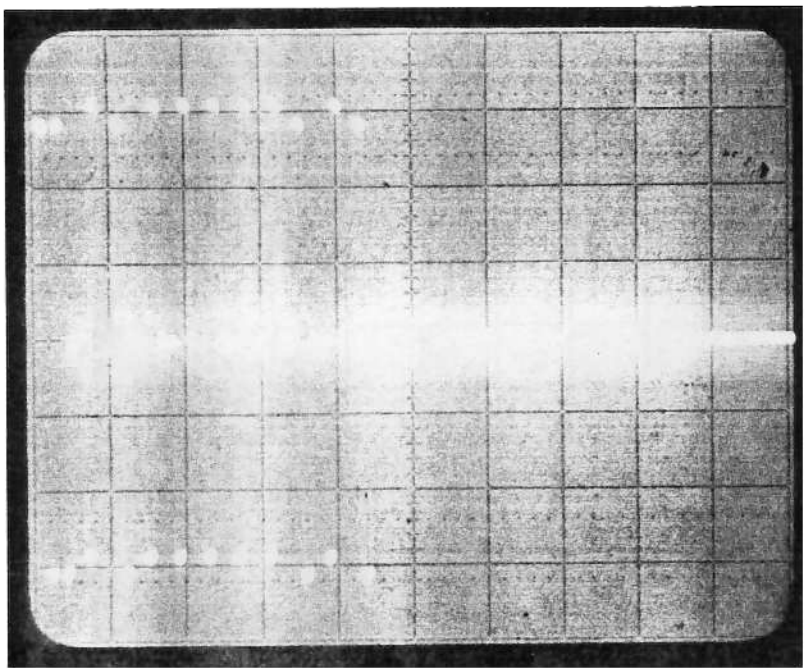
STEP	SPECIFICATION	ACTION
7. Monitor any one of the following: T1-7, T1-8, U1-19, or U1-20.	Signal shown in photo below.	If the signal is not similar to that shown, replace in order U1, T1, and U5.



Vertical: 2 V/div. Horizontal: 10 us/div.

Table 4-7. Troubleshooting the HP-IL Circuit (Continued)

STEP	SPECIFICATION	ACTION
8. Monitor across pins T1-9 and T1-10.	Signal shown in photo below.	If the signal is not similar to that shown, check the continuity of the loop and then replace T1.
9. Disconnect the oscilloscope.		



Vertical: 0.5 V/div. Horizontal: 10 us/div.

Table 4-8. Diagnostic Program Listing

```
01 LBL "82164A"
02 25                    Creates an I/O buffer in
03 BSIZEX                the HP-41C.
04 AIPT
05 SF33                  Disables the HP-IL module functions.
06 0
07 ENTER^                Clears the HP-IL IC.
08 225
09 WREG
10 SDA
11 SIN
12 ORAV?
13 GTO 01                Checks the continuity of the loop.
14 "LOOP DEAD"
15 XEQ "ALARM"
16 PROMPT
17 LBL 01
18 IFC
19 SIN
20 IFCR?                 Checks for CPU response.
21 GTO 02
22 "CPU ERROR"
23 XEQ "ALARM"
24 PROMPT
25 LBL 02
26 RFRM
27 AAU
28 1
29 AAD
30 2                     Checks the loop addressing.
31 -
32 X=0?
33 GTO 03
34 "AAD ERROR"
35 XEQ "ALARM"
36 PROMPT
```

Table 4-8. Diagnostic Program Listing (Continued)

```
37 LBL 03
38 .255
39 STO 00
40 1
41 LAD
42 LBL "LOOP"
43 OUTBIN
44 X-BUF
45 ST+ 00
46 2
47 *
48 ISG 00
49 GTO "LOOP"
50 UNL
51 CF33
52 CLA
53 INA
54 0
55 PT=
56 A=BUF?
57 GTO 04
58 "DATA ERROR"
59 XEQ "ALARM"
60 PROMPT
61 LBL "ALARM"
62 TONE 9
63 TONE 9
64 TONE 9
65 TONE 9
66 TONE 9
67 RTN
68 LBL "CR5=?"
69 STO 01
70 1
71 TAD
72 0
73 DDT
74 PT=
75 14
76 INBUFX
```

Transmits data to the transmit buffer and to the HP-41C I/O buffer.

Enables the HP-IL module functions.
Reads the data from the receive buffer.

Compares the data transmitted to the transmit buffer and received from the receive buffer.

Tests the contents of the control register #5 in the unit under test.

Table 4-8. Diagnostic Program Listing (Continued)

```
 77 UNT
 78 5
 79 PT=
 80 1
 81 BUF-XB
 82 RCL 01
 83 X=Y?
 84 RTN
 85 "HSHK ERROR"
 86 XEQ "ALARM"
 87 PROMPT
 88 LBL 04
 89 55
 90 XEQ "CR5=?"
 91 4
 92 PT=
 93 12
 94 X-BUF
 95 1
 96 LAD
 97 0
 98 DDL
 99 PT=
100 14
101 OUTBUFX
102 48
103 XEQ "CR5=?"
104 "PASSED"
105 BEEP
106 PROMPT
107 GTO 82164A
108 END
```

Tests control register #5 for all handshake lines true.

Sets all handshake lines false.

Tests control register #5 for all handshake lines false.

SECTION
V

Accessories

5-1. INTRODUCTION

5-2. This section identifies electrical accessories that are available for the HP 82164A HP-IL/RS-232-C Interface. Defective accessories should be replaced rather than repaired since the cost of a new unit is usually less than the cost of repair.

5-3. AC ADAPTERS

5-4. Various ac adapters (listed in table 5-1 and shown in figure 5-1) are available for use with the HP 82164A HP-IL/RS-232-C Interface.

Table 5-1. AC Adapters

MODEL NUMBER	VOLTAGE*	IDENTIFICATION
HP 82059B	110	US
HP 82066B	220	Europe
HP 82067B	220	UK desktop
HP 82067B Opt 001	220	UK with RSA plug
HP 82068B	220	Australia
HP 82069B	110	Europe

* Indicates nominal voltage; acceptable ranges are 210 to 250 Vac and 90 to 120 Vac.

5-5. The serial number on the ac adapter indicates the month that the unit was manufactured. The format is described below:

```
Y Y M M
--- ---
 ¦   ¦
 ¦   +--------- Month manufactured.
 ¦
 +------------- Year manufactured (years since 1960).
```

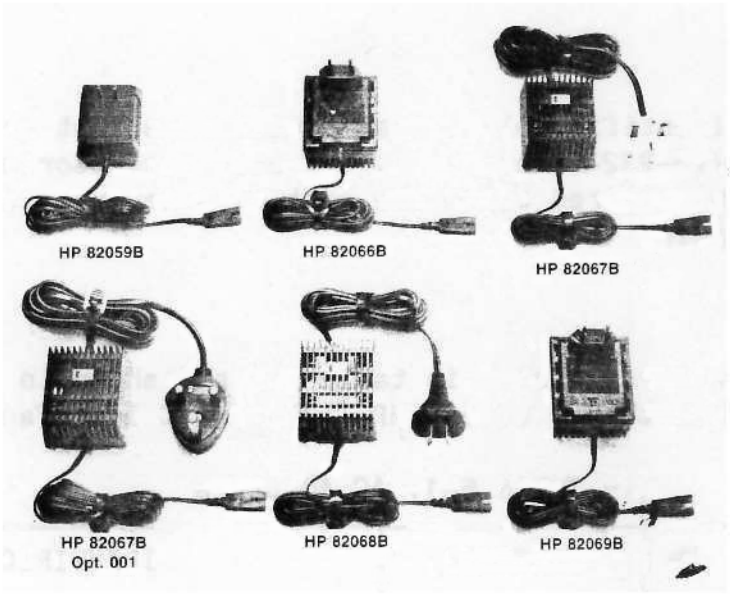


Figure 5-1. AC Adapters

5-6. To determine whether the ac adapter is functioning properly, perform the following procedure:

a. Plug the adapter into an outlet of the proper voltage. (Refer to table 5-1.) Measure the power-outlet voltage (VIN) using an ac voltmeter.

b. Measure the adapter ac output voltage (VOUT) under no-load conditions using an ac voltmeter. VOUT should be between 9.9 and 13.3 Vac when VIN is 110 or 220 Vac. More generally, VOUT should equal (VIN / 110) x 11.6 Vac $\pm$1.7V or (VIN / 220) x 11.6 Vac $\pm$ 1.7V.

   - o If VOUT is outside the allowable range, the adapter is bad and should be discarded.
   - o If VOUT is inside the allowable range, continue with step c.

c. Connect a 12-ohm, 5%, 5W resistor across the adapter output contacts.

d. Measure the ac voltage across the load using an ac voltmeter.

- o If the voltage is between 5.3 and 7.3 Vac, the adapter is good.
- o If the voltage is outside the 5.3 to 7.3 Vac range, the adapter is bad and should be discarded.

5-7. HP-IL CABLES

5-8. The following HP-IL cables are available for use with the HP-IL/RS-232-C interface:

Table 5-2. HP-IL Cables

MODEL NUMBER	LENGTH
HP 82167A	0.5 meter (1.5 feet)
HP 82167B	1.0 meter (3.3 feet)
HP 82167D*	5.0 meters (16.5 feet)
* Not available in all countries.	

5-9. To test the cables, check for continuity from one end to the other.

SECTION
VI

Replaceable Parts

6-1. INTRODUCTION

6-2. This section lists the replaceable parts and assemblies of the HP 82164A HP-IL/RS-232-C Interface. The reorder number of the complete interface is 82164-69901.

6-3. Parts descriptions, HP part numbers, quantities, and reference designations (where applicable) for the interface are listed in table 6-1. (The interface is illustrated in figure 6-1.)

6-4. Replaceable parts information for the logic PCA is listed in table 6-2. (The logic PCA component location diagram is shown in figure 7-1, and the schematic diagram is shown in figure 7-2.)

6-5. ORDERING INFORMATION

6-6. To order replacement parts or assemblies, address your order or inquiry to Corporate Parts Center or Parts Center Europe. Specify the following information for each part ordered.

a. Product model and serial number.

b. HP part number.

c. Part description.

d. Complete reference designation (if possible).

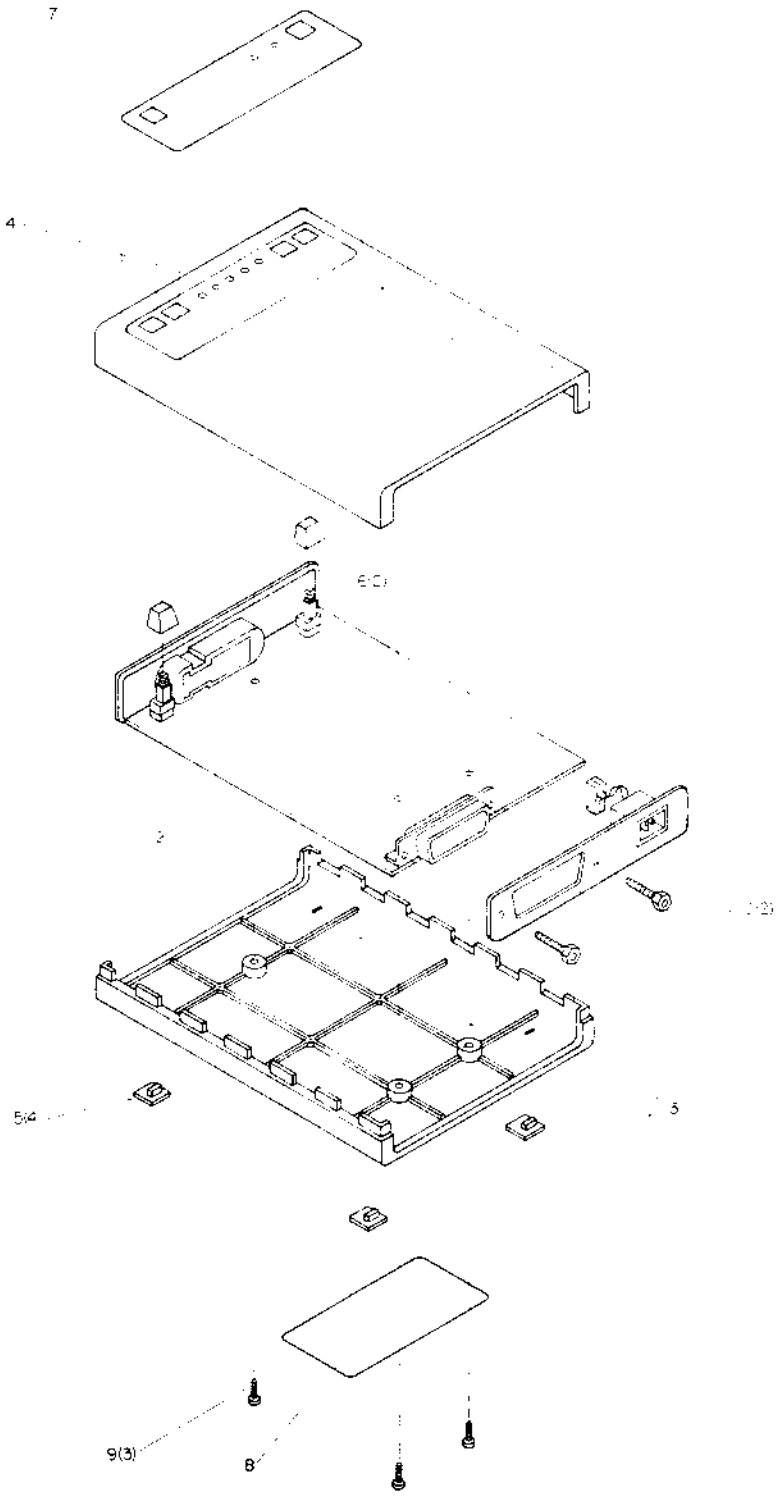


Figure 6-1. HP 82164A HP-IL/RS-232-C Interface Exploded View

Table 6-1. HP 82164A HP-IL/RS-232-C Interface Replaceable Parts

INDEX NUMBER, FIGURE 6-1	HP PART NUMBER		DESCRIPTION	QUANTITY
1	82164-60016		ASSEMBLY, back panel	1
2	82164-60001	60902	ASSEMBLY, logic PCA	1
3	5041-4110		CASE, bottom	1
4	5041-4111		CASE, top	1
5	5040-9207		FOOT, rubber	4
6	5041-0399		KEYTOP, unlit	2
7	82164-90012		LABEL, identification	1
8	82164-90013		LABEL, information, bottom	1
9	0624-0400		SCREW, self tapping, 6-19 X 0.5 inch	3
10	1251-7788		SCREWLOCK, female	2

Table 6-2. Logic PCA Replaceable Parts

REFERENCE DESIGNATION	HP PART NUMBER	DESCRIPTION	QTY
A1	82164-60003	ASSEMBLY, front panel	1
A2	82164-60015	ASSEMBLY, DTE/DCE jumper	1
C1	0180-3167	CAPACITOR, 1000 uF	1
C3,4	0180-3297	CAPACITOR, 100 uf, 63V	2
C5-7	0180-3295	CAPACITOR, 100 uF, 25V	3
C12-18	0160-4571	CAPACITOR, 0.1 uF, +80%-20%	7
C20	0180-3314	CAPACITOR, 1.0 uF, 50V	1
C21	0160-4800	CAPACITOR, 120 pF, 5%, 100V	1
CR1-4	1901-0868	DIODE, Schottky, 25V	4
CR5-8	1901-0937	DIODE, Schottky, 63V	4
DS1,2	1990-0719	LED, visible	2
H3	0590-0305	NUT, hex, with lockwasher, for VR1	1
H4	1205-0483	HEAT SINK, for VR1	1
J1	1251-7833	CONNECTOR, 25 pin, D-subminiature, male	1
J2	1251-5750	CONNECTOR, 2 pin	1
J3	1251-8313	HEADER, post, 10 pin	1
L1	9100-1631	INDUCTOR, 56 uH, 5%	1
MP1,2	0380-1343	SPACER, round, for DS1 and DS2	2
MP3	0460-1802	TAPE, for Y1 and Y2	1
R1,R4	0698-3442	RESISTOR, 237 ohm, 1%, 1/8W	2
R2,R3	0757-1094	RESISTOR, 1.47K, 1%, 1/8W	2
R5	0757-0442	RESISTOR, 10K, 1%, 1/8W	1
R6,R8	0683-3315	RESISTOR, 330, 5%, 1/4W	2
R7	1810-0367	NETWORK, resistance, SIP	1
S1-2	3101-2646	SWITCH, pushbutton	2
S4	3101-2676	SWITCH, jumper, SPST	1
T1	9100-4226	TRANSFORMER, input/output	1
T2	9100-4307	TRANSFORMER, 12V	1
U1	1820-3218	INTEGRATED CIRCUIT, processor	1
U2	1820-2577	INTEGRATED CIRCUIT, UART	1
U3	1LB3-0003	INTEGRATED CIRCUIT, HP-IL	1
U4	1820-0990	INTEGRATED CIRCUIT, quad inverter	1
U5	1810-0651	NETWORK, RCD	1
U6	1820-0509	INTEGRATED CIRCUIT, quad NAND	1
U7	1820-1197	INTEGRATED CIRCUIT, control	1
VR1	1826-0904	VOLTAGE REGULATOR, 5V	1
VR2	1826-0393	VOLTAGE REGULATOR, +9	1
VR3	1826-0527	VOLTAGE REGULATOR, -9V	1
Y1	0410-1222	CRYSTAL, 11 MHz	1
Y2	0410-1485	CRYSTAL, 1.8432 MHz	1

SECTION
VII

Reference Diagrams

7-1. This section includes reference diagrams for the HP 82164A HP-IL/RS-232-C Interface.

7-2. The component location diagram for the logic PCA is shown in figure 7-1. (Replaceable parts are listed in table 6-2.)

7-3. The HP 82164A HP-IL/RS-232-C Interface schematic diagram is shown in figure 7-2.

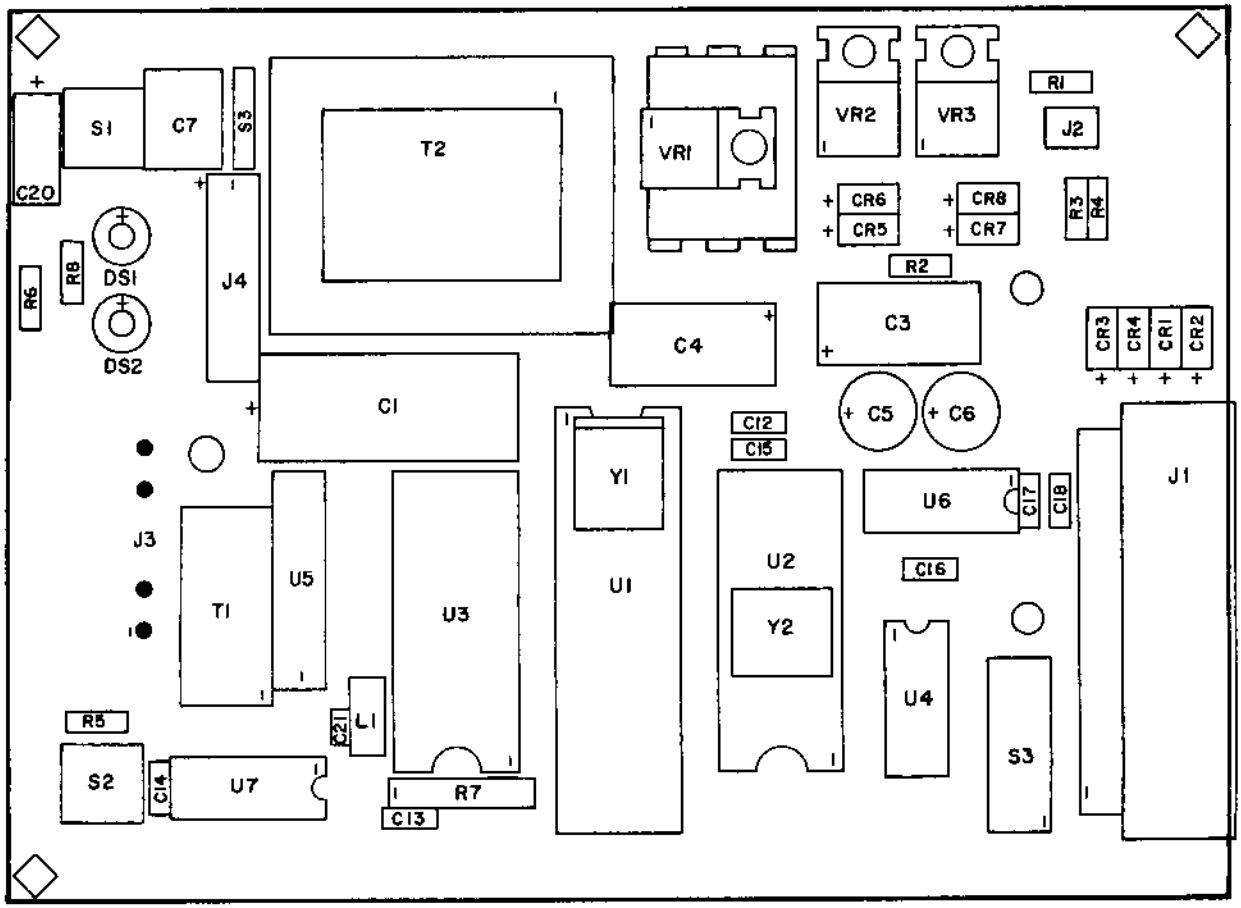
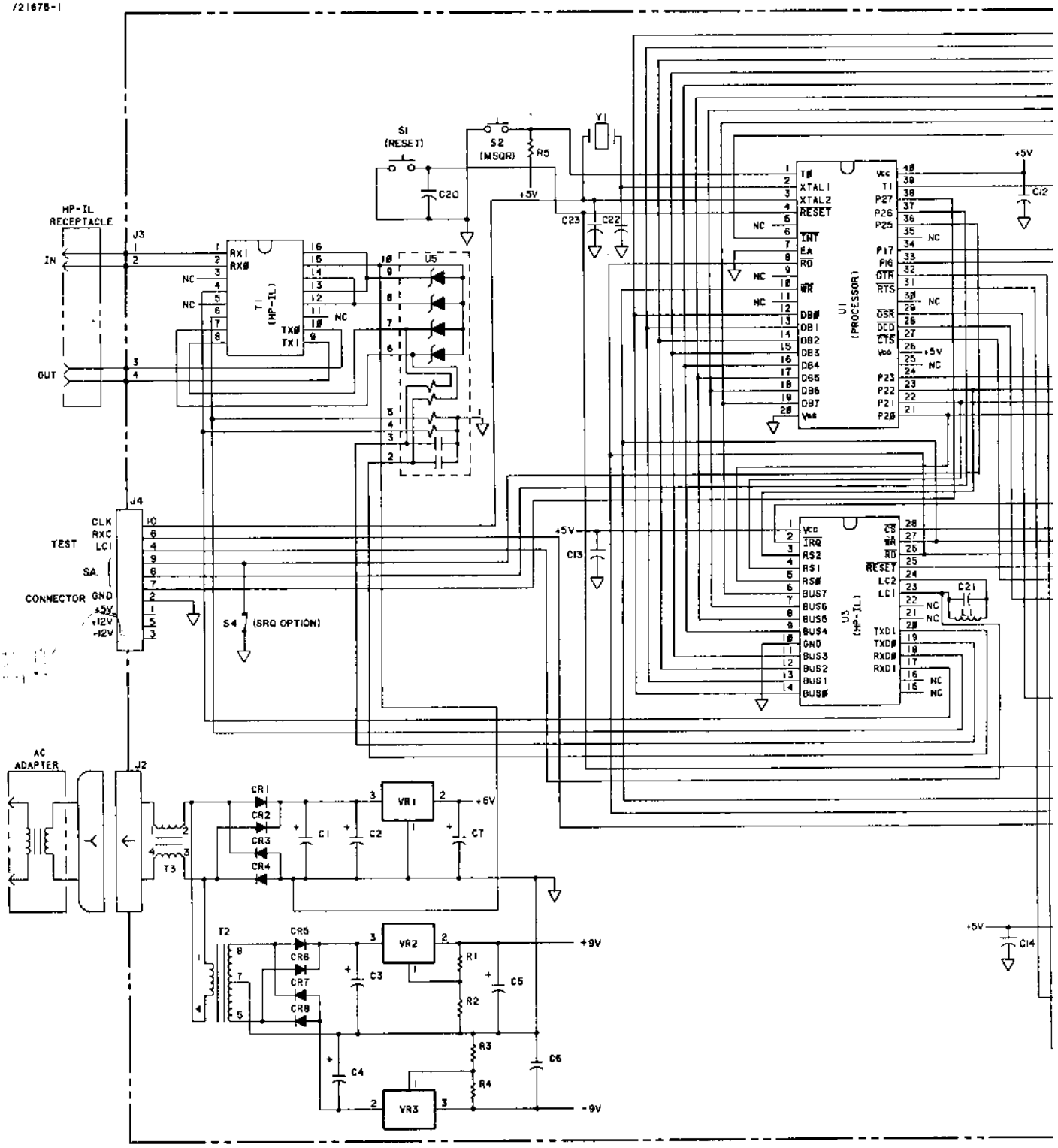


Figure 7-1. Logic PCA Component Location Diagram


/21678-1
HP-IL RECEPTACLE
IN
OUT
J3
T1 (HP-IL)
U5
S1 (RESET)
S2 (MSGR)
R5
C20
Y1
C22
C23
U1 (PROCESSOR)
C12
+5V
J4
CLK
RXC
TEST
LCI
SA
CONNECTOR
GND
+5V
+12V
-12V
S4 (SRQ OPTION)
C13
U3 (HP-IL)
C21
AC ADAPTER
J2
T3
CR1
CR2
CR3
CR4
VR1
C1
C2
C7
T2
CR5
CR6
CR7
CR8
VR2
C3
R1
R2
C5
C4
R3
R4
C6
VR3
+9V
-9V
C14

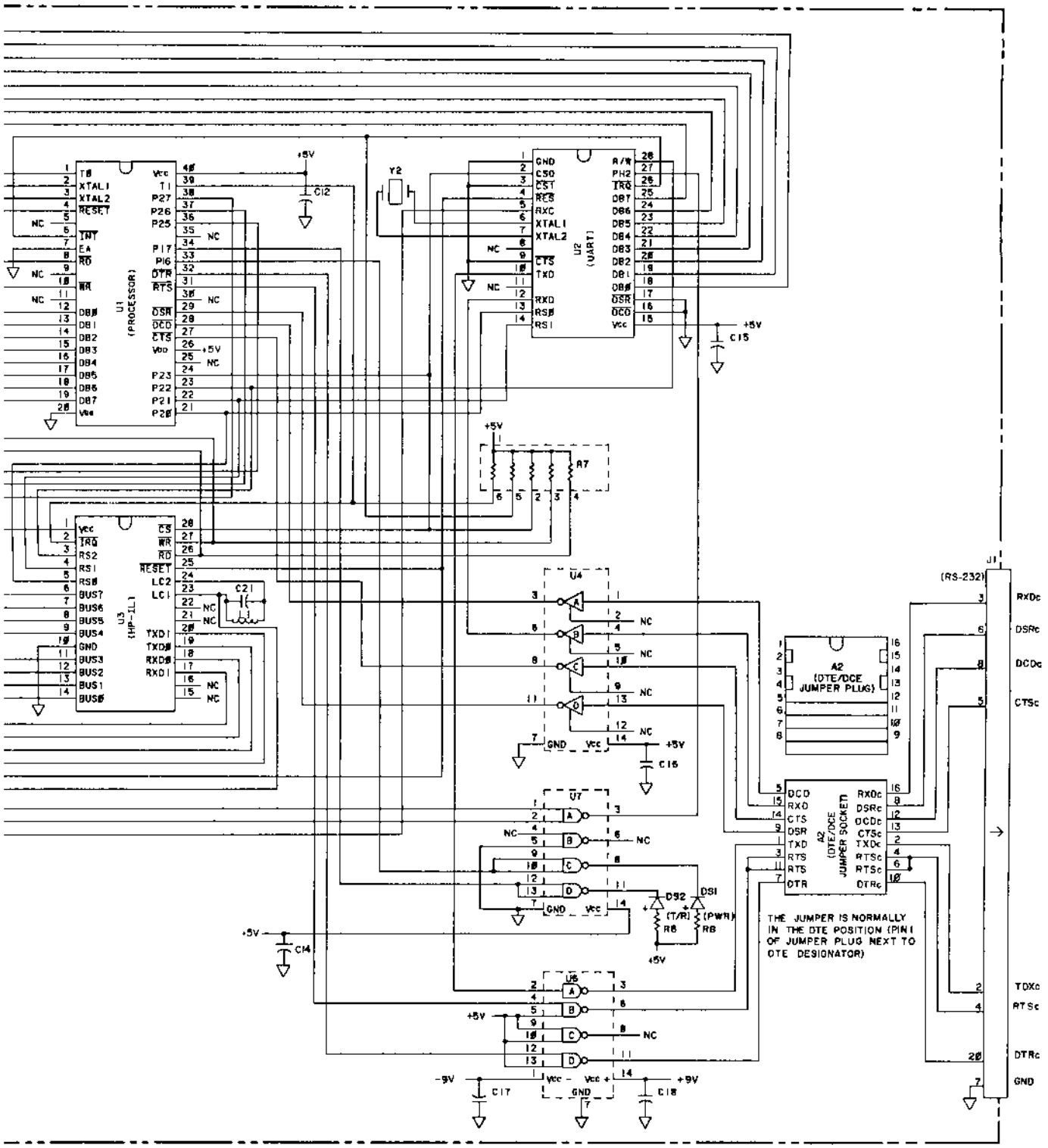


Figure 7-2. HP 82164A
HP-IL/RS-232-C Interface
Schematic Diagram
7-3/7-4

IN TRAY > R6

Start of Item 6.

Message. Dated: 13.02.85 at 1834.
Subject: SERVICE NOTE
Sender: Bernie COLER / HP3900/20 Contents: 2.

Part 1.

FROM: Bernie COLER / HP3900/20

TO: DISTRIBUTION

Part 2.

Package. Dated: 13.02.85 at 1836.
Subject: SERVICE NOTE
Creator: Bernie COLER / HP3900/20 Contents: 1.

Part 2.1.

HEWLETT-PACKARD PORTABLE COMPUTER DIVISION SERVICE NOTE

PRODUCTS :HP82164A HPIL/RS232 CONVERTER SERVICE NOTE#82164A-07

SUBJECT:REPAIR MANUAL 82164-90001 SUPERSEDES:NONE

APPLIES TO:ALL UNITS
PERFORM:INFO.ONLY
WARRANTY: EXT.
PARTS X
LABOR X

SERVICE INV:N.A.
WARR.EXT.UNTIL:N.A.

DISCUSSION: THE SCHEMATIC DIAGRAM, FIGURE 7-2 OF THE SUBJECT REPAIR MANUAL DEPICTS CAPACITORS C22,C23 IN THE VICINITY OF MICROPROCESSOR CRYSTAL Y1. THIS SERVICE NOTE IS TO ADVISE THAT MANUFACTURING ENGINEERING DETERMINED THAT THESE CAPACITORS WERE UNNECESSARY, AND NO UNITS HAVE BEEN DELIVERED WITH C22,23 IN PLACE. SERVICE CENTERS SHOULD NOT ADD THESE CAPACITORS TO UNITS RECEIVED FOR REPAIR.

ACTION TO BE TAKEN: THIS NOTE IS ADVISORY ONLY. NO AFFECT ON PARTS.

BAC 2/13/85

End of Item 6.

Table 4-8. Diagnostic Program Listing

```
01 LBL "82164A"
02 25
03 BSIZEX
04 AIPT
05 SF33
06 0
07 ENTER↑
08 225
09 WREG
10 SDA
11 SIN
12 ORAV?
13 GTO 01
14 "LOOP DEAD"
15 XEQ "ALARM"
16 PROMPT
17 LBL 01
18 IFC
19 SIN
20 IFCR?
21 GTO 02
22 "CPU ERROR"
23 XEQ "ALARM"
24 PROMPT
25 LBL 02
26 RFRM
27 AAU
28 1
29 AAD
30 2
31 -
32 X=0?
33 GTO 03
34 "AAD ERROR"
35 XEQ "ALARM"
36 PROMPT
37 LBL 03
38 XEQ "DATACHK"
39 GTO 04
40 LBL "ALARM"
41 TONE 9
42 TONE 9
43 TONE 9
44 TONE 9
45 TONE 9
46 RTN
47 LBL "CR5=?"
48 STO 01
49 1
50 TAD
51 0
52 DDT
53 PT=
54 14
55 INBUFX
56 UNT
57 5
58 PT=
59 1
60 BUF-XB
61 RCL 01
62 X=Y?
63 RTN
64 "HSHK ERROR"
65 XEQ "ALARM"
66 PROMPT
67 LBL 04
68 55
69 XEQ "CR5=?"
70 4
71 PT=
72 12
73 X-BUF
74 1
75 LAD
76 0
77 DDL
78 PT=
79 14
80 OUTBUFX
81 48
82 XEQ "CR5=?"
83 "PASSED"
84 BEEP
85 PROMPT
86 GTO "82164A"
87 LBL "DATACHK"
88 CF33
89 BSIZE?
90 119
91 X=Y?
92 GTO 02
93 BSIZEX
94 AIPT
95 1.028
96 STO 01
97 LBL 00
98 2857740885
99 X-BUF
100 ISG 01
101 GTO 00
102 LBL 02
103 0
104 STO 00
105 PT=
106 XEQ "SETUP"
107 LBL 08
108 RCL 00
109 PT=
110 1
111 LAD
112 109
113 OUTBUFX
114 RCL 00
115 PT=
116 REMOTE
117 1279865866
118 OUTBIN
119 NRE
120 82
121 OUTBUFX
122 RCL 00
123 PT=
124 1.005
125 STO 01
126 LBL 11
127 INA
128 RCL 00
129 PT=
130 A=BUF?
131 GTO 10
132 LBL 06
133 "DATA ERROR"
134 XEQ "ALARM"
135 PROMPT
136 SF33
137 RTN
138 LBL 10
139 ISG 01
140 GTO 11
141 REMOTE
142 "LI3"
143 59
144 X-AR
145 OUTA
146 NRE
147 1.004
148 STO 01
149 LBL 05
150 INA
151 RCL 00
152 PT=
153 A=BUF?
154 GTO 07
155 GTO 06
156 LBL 07
157 ISG 01
158 GTO 05
159 RCL 00
160 X=0?
161 GTO 09
162 SF33
163 RTN
164 LBL 09
165 1
166 STO 00
167 GTO 08
168 LBL "SETUP"
169 CF 17
170 REMOTE
171 "R0"
172 59
173 X-AR
174 "▶R1"
175 59
176 X-AR
177 "▶C0"
178 59
179 X-AR
180 "▶SL0"
181 59
182 X-AR
183 OUTA
184 NRE
185 RTN
186 END
```

Portable Computer Division
1000 N.E. Circle Blvd, Corvallis, OR 97330, U.S.A.

82164-90001 English

Printed in U.S.A.

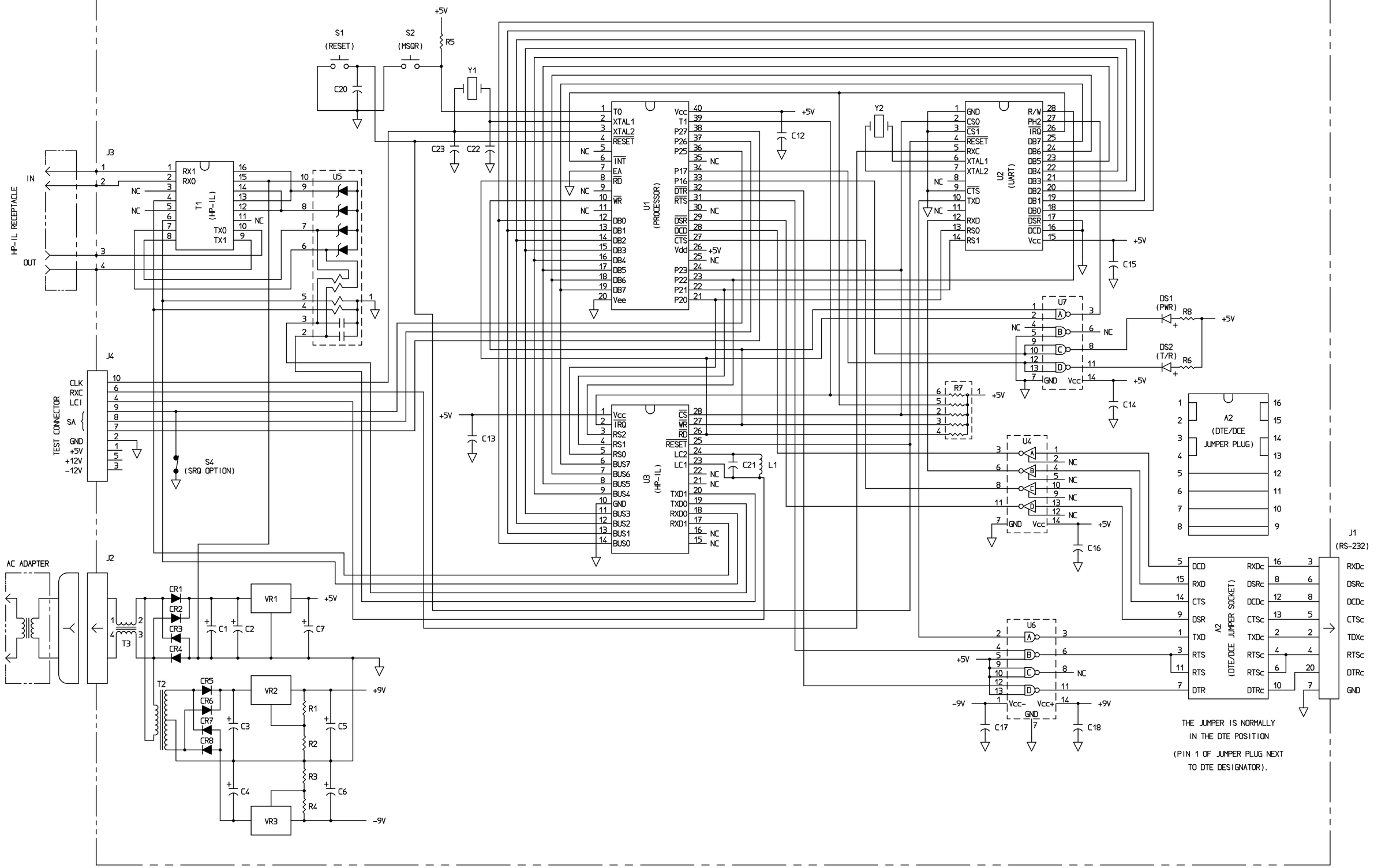


Figure 7-2. HP 82164A HP-IL/RS-232 Interface Schematic Diagram