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SECTION I

PRODUCT INFORMATION

1-1. PRODUCT DESCRIPTION

1-2. The Hewlett-Packard Model 9111A Graphics Tablet is a microprocessor-based peripheral that provides the host computer with data corresponding to the position of a stylus relative to the tablet platen. Position data is capacitively coupled from the electrostatic field of the platen to the stylus and transmitted via HP-IB (IEEE 488) to the controller.

1-3. The 9111A platen will accommodate an ISO A4 size (210 × 297 mm) (8.8 × 11 in.) drawing. Also included on the platen are 16 user definable 'softkeys' which allow faster input of frequently used symbols or commands.

1-4. The tablet is divided into four functional areas: platen assembly, main PCA assembly, stylus, and chassis. For service, the platen and main PCA assemblies may be replaced on an exchange basis.

1-5. Extensive built-in self-tests simplify on-site troubleshooting and fault isolation in the 9111A.

1-6. SAFETY CONSIDERATIONS

1-7. BEFORE APPLYING POWER verify that the line voltage selector switches are matched to the available line voltage, that the correct value of fuse is installed, and that all safety precautions are observed (see the following warnings).

1-8. MODEL 9111A WARNINGS

1-9. The following warning statement should be observed when operating or maintaining the 9111A tablet.

WARNING

Servicing instructions are for use by qualified personnel only. To avoid potential hazards, do not perform any servicing unless qualified to do so.

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1-10. OPTIONS

1-11. OPTION 050. The 9111A Option 050 is designed for use with the HP 1350S or 1351S graphics display systems. This option applies only to tablets with serial prefix numbers below 2251A or to tablets having a main PCA A1 with the part number 09111-66501. The option 050 tablet accepts special instructions from the host computer allowing the tablet to communicate through the graphics translator directly to the display. This provides faster data transfer and cuts down on computer time.

1-12. SERIAL PREFIX CHANGE

1-13. Tablets with a serial prefix below 2251A had a main PCA A1 with the HP part number 09111-66501. For detailed information concerning these older PCAs refer to the 9111A Service Manual. The information in this handbook applies to either PCA.

Table 1-1. Tablet Characteristics

RESOLUTION: 0.100 mm (0.00394 in.)

ACCURACY: ±0.600 mm (0.0236 in.) at 20 °C for each measured point. Changes 0.004 mm per °C from 20 °C.

REPEATABILITY: ±1 resolution unit

DATA RATE: Programmable from 1 to 60 coordinate pairs per second. Actual rate ±2 Hz from the selected rate.

ACTIVE DIGITIZING AREA: 218.5 × 300.8 mm (8.6 × 11.8 in.) Can be extended to include the area occupied by the 16 softkeys.

DOCUMENT MATERIAL: Single sheet, electrically non-conductive, homogeneous, less than 0.5 mm thick.

INTERFACE: HP-IB (IEEE 488-1978)

POWER REQUIREMENTS: 100, 120, 220, or 240 Vac; 48 to 66 Hz; 25 W maximum.

DIMENSIONS: 85 mm high × 440 mm wide × 440 mm deep (3.35 × 17.3 × 17.3 in.)

WEIGHT:
Net: 5.8 kg (12.8 lb)
Shipping: 10.8 kg (23.8 lb)

Table 1-1. Tablet Characteristics (Continued)

ENVIRONMENTAL RANGE:

Operating:
- Temperature: 0 °C to 55 °C
- Humidity: 5% to 90% relative (below 40 °C) (noncondensing)
- Altitude: up to 4600 metres (15 000 ft)

Storage:
- Temperature: −40 °C to +75 °C
- Humidity: 90% relative (below 40 °C)
- Altitude: up to 15 500 metres (50 000 ft)

Table 1-2. Accessories Supplied

Lexan overlay	1	4040-1748
Refill pack	1 (includes)	09111-68701
Cartridge		
Inkless	3	9298-0888
Ink	2	9282-0887
Spring	2	1460-1861
O rings	5	0905-0887
Line cord set	1	as appropriate to destination

Table 1-3. Recommended Test Equipment

1. HP 85A Personal Computer
2. HP 82937A HP-IB Interface
3. HP 82936A ROM Drawer
4. 00085-15003 I/O ROM

Table 1-4. Tools Required

1. Screwdriver
   Pozi Drive
   #1
   #2
2. Socket wrench
   9/32 in.
3. Pliers
   Needle nose

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SECTION II

ENVIRONMENTAL/INSTALLATION/PM

2-1. POWER REQUIREMENTS

2-2. The HP Model 9111A will operate with a voltage source of 100, 120, 220, or 240 Vac ±10%; 48 to 66 Hz; single phase; 25 W maximum.

CAUTION

Applying 220/240 V line voltage when the selector switches are set for 100/120 V operation will cause damage to the tablet circuits.

2-3. LINE VOLTAGE SELECTION

2-4. When shipped from the factory, the line voltage selector switches and fuse are set according to the tablet destination.

Table 2-1. Line Fuses

VOLTAGE	FUSE	HP P/N
100 Vac	0.50 A 250 V	2110-0012
120 Vac	0.50 A 250 V	2110-0012
220 Vac	0.25 A 250 V	2110-0004
240 Vac	0.25 A 250 V	2110-0004

2-5. To change the 9111A operating voltage, proceed as follows:

a. Set the ac LINE switch to the OFF (O) position.

b. Remove the ac line cord set.

c. Set the line voltage selector switches for the required operating voltage. See Figure 2-1.

d. Install the proper fuse for the selected operating voltage.

e. Connect the appropriate line cord set and apply power.

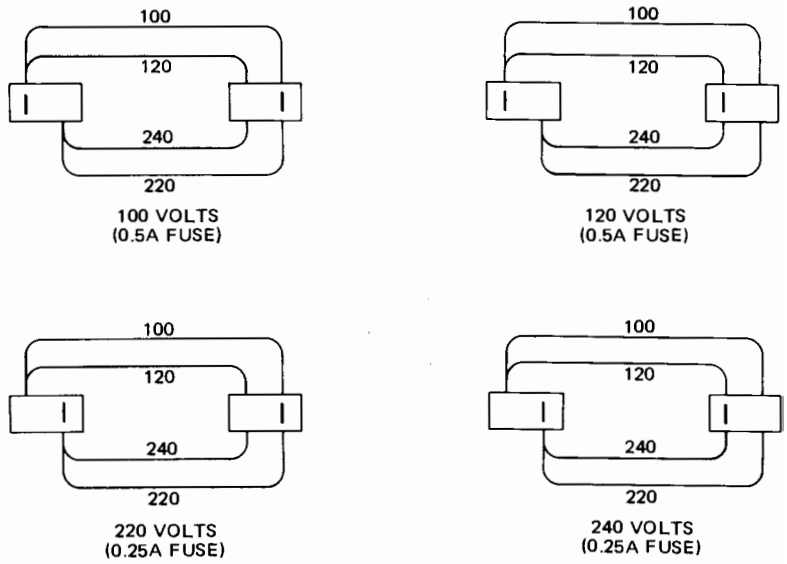

Figure 2-1. Line Voltage Selection

2-6. FUSE REPLACEMENT

2-7. To replace the ac line fuse, proceed as follows:

a. Set the LINE switch to the OFF (O) position.

b. Remove the ac line cord set.

c. Using a screwdriver, twist the fuseholder cap counter-clockwise. Remove the cap and fuse.

d. Install the selected fuse in the cap and replace the cap, turning it in a clockwise direction to lock.

e. Install the line cord set and apply power.

2-8. MAINTENANCE

2-9. CLEANING

NOTE

The primary responsibility for cleaning the tablet rests with the customer. The cleaning procedures listed here are for reference.

WARNING

Disconnect the ac line cord and the interface cable from the 9111A before cleaning.

Do not allow moisture to enter the interior of the tablet. A shock hazard could result.

CAUTION

Do not use isopropyl alcohol to clean the 9111A case. Damage to the finish may result.

NOTE

The platen must be kept clean. Conductive contaminents, including pencil lead will affect accuracy.

2-10. The case of the 9111A may be cleaned with a soft moist cloth. Mild soap may be used if required.

2-11. The platen may be cleaned with any nonabrasive glass cleaner and a soft cloth. Dry thoroughly before use.

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SECTION IV

TROUBLESHOOTING

4-1. BUILT-IN TESTS

4-2. The primary troubleshooting aid for the 9111A Tablet is the Power On Self-Test. The Power On Self-Test and the User Interactive Self-Test are desribed in Section V of this handbook.

4-3. PLATEN TRACE AND SHIFT REGISTER TROUBLESHOOTING

4-4. A reduction in platen accuracy may be caused by conductive contamination on the platen. Clean the platen thoroughly before taking any other steps. Refer to Section II of this handbook for cleaning instructions. If the problem is not corrected by cleaning, continue with the platen troubleshooting tests.

4-5. Equipment required to perform the platen tests is:

a. HP 85A Personal Computer.

b. 12 in. nonconductive straight edge.

4-6. To perform the tests, proceed as follows:

a. Enter the DRAW Program into the controller. See Figure 4-1.

```
 10 INTEGER X,Y,A,B
 20 SCALE 0,256,0,192
 30 GCLEAR
 40 OUTPUT 706 ;"OP"
 50 ENTER 706 ; A,B,C,D
 60 A=(C-A)/256
 70 B=(D-B)/192
 80 OUTPUT 706 ;"OC"
 90 ENTER 706 ; X,Y,P
100 X=X/A
110 Y=Y/B
120 IF P=1 THEN DRAW X,Y
130 IF P=0 THEN MOVE X,Y
140 GOTO 80
150 END
```

9111-A-44-1

Figure 4-1. DRAW Program

b. Perform the 9111A User Interactive Self-Test (UIST) by turning the rear panel SELF-TEST switch ON (I) and then OFF (O) and digitizing the UIST Test Point. If the error tone is heard, check the front panel LEDs for the error code. Refer to Table 4-1 for code interpretation.

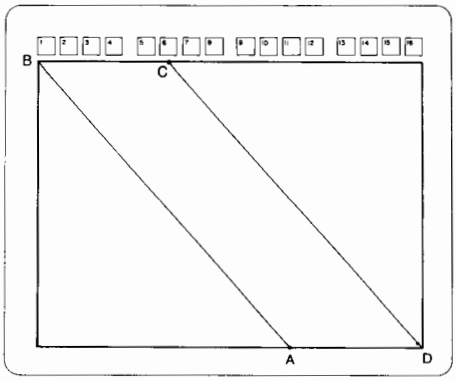
Table 4-1. UIST Error Codes

CODE	DEFINITION
50	Illegal proximity signal at time of self-test request.
51	Illegal pen press at time of self-test request.
52	Pen press detected before proximity = 1.
53	Missed self-test dot or platen/stylus problem.

c. To determine the drive condition of the platen traces, digitize point A on the bottom line of the digitizing area, 4 inches in from the vertical boundry. See Figure 4-2. Next digitize point B in the upper left-hand corner of the platen area.

d. Place the nonconductive straight edge on the platen connecting point A and point B and slowly move the stylus from point A to point B while holding the stylus switch activated (pressing down on the platen).

e. Digitize point C on the upper boundry of the platen four inches in from the right-hand boundry. See Figure 4-2. Next digitize point D in the lower right-hand corner of the digitizing area.



9111-A-45-1

Figure 4-2. Platen Troubleshooting

f. Place the nonconductive straight edge on the platen connecting points C and D and slowly move the stylus from point C to point D while holding the stylus switch activated.

g. If the platen X- and Y-axis traces are functioning properly, two diagonal lines will be displayed on the controller CRT.

h. Compare the controller display with Figures 4-3 and 4-4 to determine if a X- or Y-axis trace problem exists.

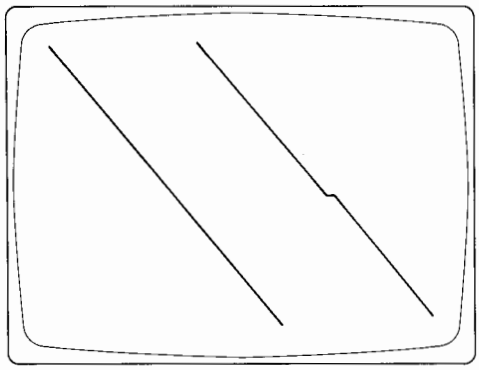


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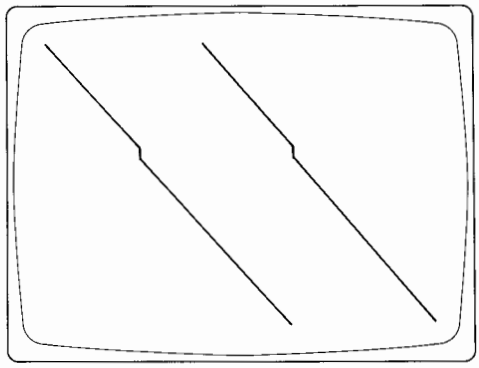
Figure 4-3. X-Trace Problem Display



9111-A-47-1

Figure 4-4. Y-Trace Problem Display

i. A shift register failure which prevents serial shifting of data will usually result in an error code being generated during digitizing of the UIST dot, and drawing of the diagonal lines will result in a display similar to Figures 4-5 or 4-6.

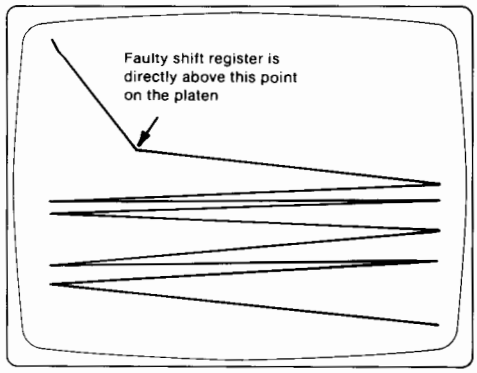


Figure 4-5. X-Shift Register Failure Display

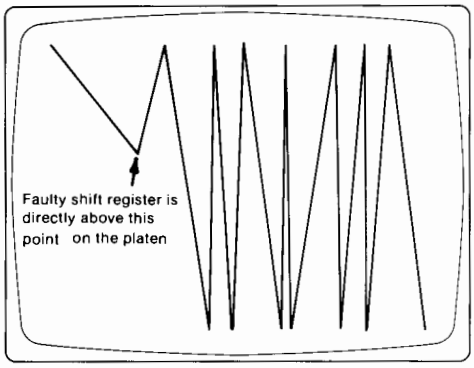


Figure 4-6. Y-Shift Register Failure Display

4-7. REMOVAL AND REPLACEMENT OF PARTS

4-8. The following paragraphs contain information concerning the removal and replacement of parts and assemblies on the 9111A.

4-9. TOP COVER REMOVAL

4-10. To remove the tablet top cover, proceed as follows:

a. Set the ac LINE switch to the OFF (O) position.

b. Remove the ac line cord and the interface cable.

c. Place the tablet face down on a nonabrassive surface.

d. Remove the 5 screws securing the cover. See Figure 4-7, Detail A.

CAUTION

The platen is held in place only by the top cover. Use extreme caution performing the next step.

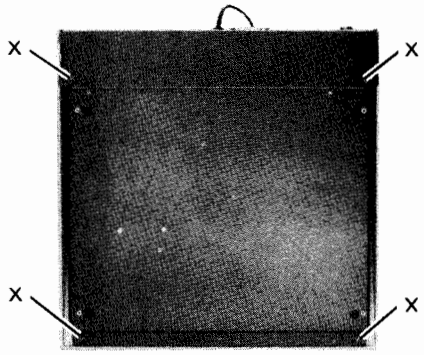
e. Grasp the tablet securely in both hands as shown in Figure 4-7, Detail B, and turn it upright.

f. Lift the top cover from the tablet.

CAUTION

When replacing the top cover, assure that the 4 front panel LEDs are properly aligned with the top cover openings.

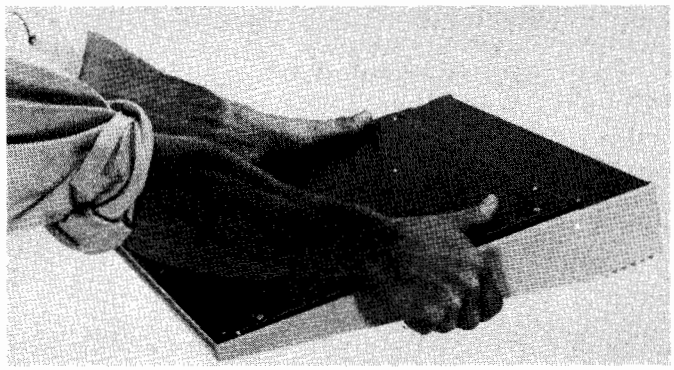
g. Reverse the procedure to replace the top cover.



X-REMOVE SCREWS

9111-A-69-1

DETAIL A



9111-A-70-1

DETAIL B

Figure 4-7. Top Cover Removal

4-11. PLATEN REMOVAL

4-12. To remove the platen assembly, proceed as follows:

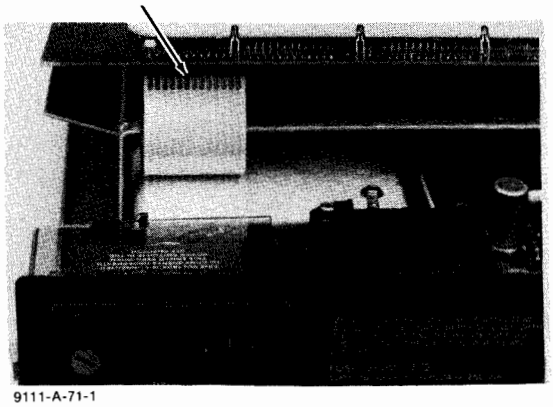
a. Remove the top cover using the procedure listed above.

b. Carefully unplug the ribbon connector from the platen assembly. See Figure 4-8.

c. The platen assembly has no attaching hardware. Lift the platen assembly from the support.

d. When replacing the platen assembly, assure that the ribbon cable W1 is properly connected to J1 of the platen assembly.

e. Replace the top cover using the procedure listed above.



9111-A-71-1

Figure 4-8. Ribbon Cable Removal

4-13. PLATEN SUPPORT REMOVAL

4-14. To remove the platen support, proceed as follows:

a. Remove the top cover and platen assembly as listed above.

b. Remove the 4 screws securing the platen support to the chassis. See Figure 4-9.

c. Lift the platen support from the chassis.

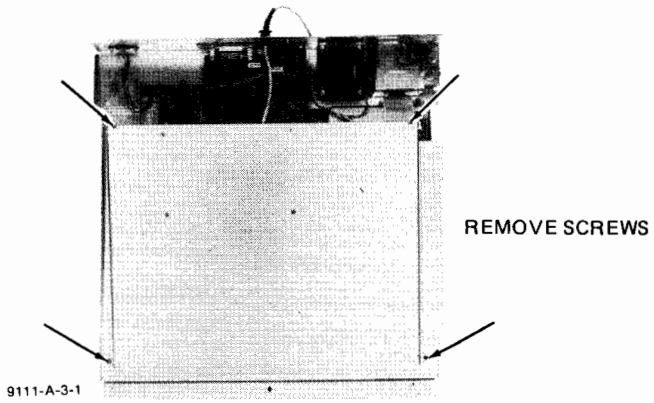


Figure 4-9. Platen Support Removal

4-15. MAIN PCA, A1, REMOVAL

NOTE

Removal of the Main PCA A1 differs on tablets with a serial number prefix below 2251A. Refer to paragraph 4-17 for instructions concerning these tablets.

4-16. To remove the main PCA, A1, proceed as follows:

a. Remove the top cover, platen assembly, and platen support assembly.

b. Unplug the power transformer leads from the PCA at J3 and J9. See Figure 4-10.

c. Unplug the voltage regulator leads at J2, and the speaker leads at J13.

d. Remove the metal shield from the filter circuit.

e. Unplug the stylus leads from the PCA at J5 and J8.

f. Remove the screws securing the HP-IB panel to the rear of the chassis.

g. Remove the 2 screws securing the main PCA to the chassis. Lift the PCA from the plastic standoffs on the chassis.

h. When replacing the PCA assure that the PCA is properly positioned over the standoffs and snap it into place. Secure with two 6 mm screws.

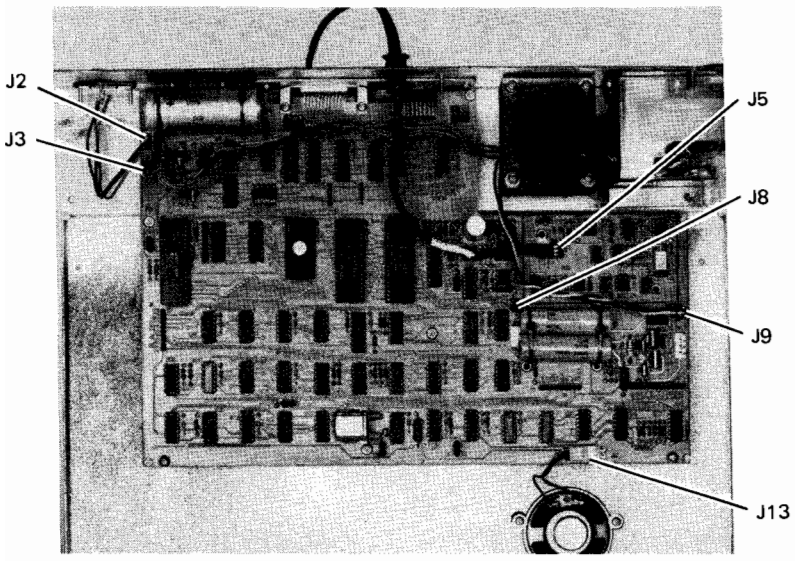


Figure 4-10. Connector Location

i. Install the two screws securing the HP-IB panel to the rear of the chassis.

j. Connect the stylus leads to J5 and J8 of the PCA, observing proper polarity.

k. Install the metal shield over the filter circuit, connecting the ground lead with one of the screws.

l. Connect the secondary leads from the power transformer to jacks J3 and J9 of the PCA. Observe the color code marked on the PCA beside each jack.

m. Connect the voltage regulator at J2, and the speaker at J13.

n. Reassemble the platen support, platen, and cover assembly. Assure that the ribbon cable W1 is properly connected between the platen and the main PCA, A1.

4-17. MAIN PCA REMOVAL (serial prefix numbers below 2251A)

4-18. The main PCA in tablets with a prefix number below 2251A has soldered connections for the speaker and the +5 V regulator. Observe the following procedure changes.

a. Follow the procedure above to step c.

b. Remove the screws securing the regulator to the back panel. Remove the regulator and socket.

c. Remove one of the screws holding the speaker to the chassis and slip the speaker from its mount.

d. Again follow the procedure listed above.

CAUTION

When replacing the +5 V regulator at the rear of the chassis be certain that the insulator is positioned between the regulator and chassis.

e. Install the regulator through the rear of the chassis and secure it to the socket with two #6 screws.

f. Replace the speaker and install the screw which was removed.

4-19. STYLUS ASSEMBLY REMOVAL AND REPLACEMENT

4-20. To remove the stylus assembly, proceed as follows:

a. Set the ac LINE switch to the OFF (O) position, remove the ac line cord and the interface cable.

b. Remove the top cover, platen assembly, and platen.

c. Remove the metal shield from the filter circuit on the main PCA.

d. Unplug the stylus assembly from jacks J5 and J8 on the PCA.

e. Compress the strain relief on the stylus cable at the rear of the chassis and slide the cable through the hole in the chassis.

f. To install the stylus assembly reverse the procedure.

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SECTION V

DIAGNOSTICS

5-1. POWER ON SELF-TEST (POST)

5-2. In order for the user to easily verify that the essential functions of the tablet are operational, an automatic self-test is built into the tablet. See Figure 5-1 for the POST Logic Flow Chart. The test is performed each time the LINE switch is turned ON (I), or when the initialize command (IN) is received from the controller. The steps performed by the POST are as follows:

NOTE

The stylus should be placed in the stylus tray during the POST test. if the stylus is on the platen surface, a proximity error will occur.

a. All front panel LEDs, except the power-on LED, flash ON, then OFF. Failure of this step indicates that the LEDs are dead or the processor is not operational.

b. Processor internal registers are checked.

c. A checksum is run on the read-only memory (ROM).

d. Bit pattern tests are run on the random access memory (RAM).

e. The three I/O ports are checked for shift control and the phase counter is checked.

f. The phase counter is cleared and the normal operating bit pattern for reference adjustment and measurement summation is sent to the phase counter.

g. Communication with the HP-IB interface IC is verified.

h. The programmable countdown timer is tested. This timer interrupts the processor for the six platen modes and for the proper frequencies of the variable tone beeper.

5-3. If all electronic tests are passed the three-tone beeper sequence is heard. A failure is indicated by a loud warbling tone

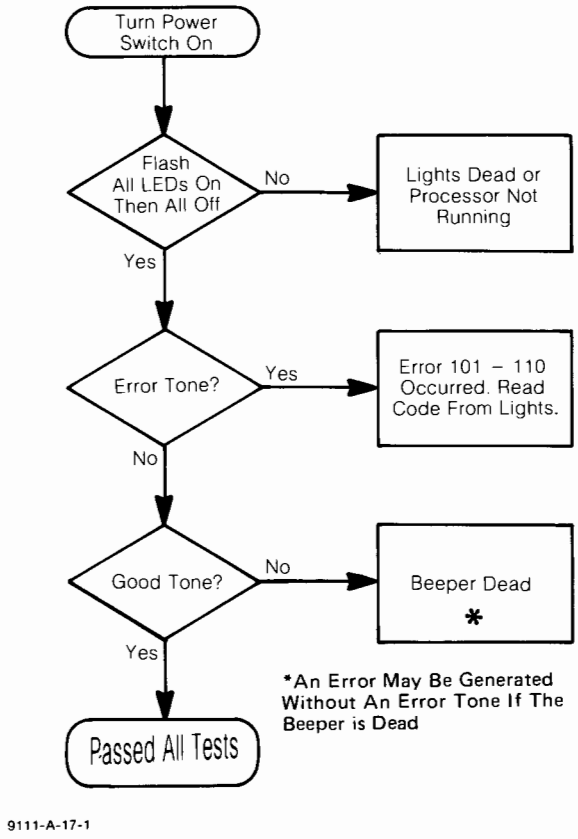


Figure 5-1. POST Logic Flow Chart

and the front-panel LEDs flashing the error code. Refer to Table 5-1 for the POST error codes. At the end of the error tone only the ERROR LED remains on.

Table 5-1. POST Error Codes

CODE	ERROR	LED STATUS DIGITIZE	MENU	ERROR
101	Processor register or Flag	off	off	on
102	ROM checksum	off	on	off
103	RAM test	off	on	on
104	I/O port	on	off	off
105	Interface Chip	on	off	on
106	Phase counter	on	on	off
107	Interrupt	on	on	on
108	153 Hz clock	on	on	on
109	RAM Timer Interrupt	on	on	on
110	HP-IB Chip Interrupt	on	on	on

5-4. USER INTERACTIVE SELF-TEST (UIST)

5-5. The User Interactive Self-Test provides a more complete indication of the tablet performance than does the POST. When the UIST is activated the tablet first completes the POST and then waits for the user to digitize a point in the lower-right corner of the platen. The UIST verifies the performance of the shift control, shift registers, filter, and the stylus.

NOTE

The stylus should be placed in the stylus tray prior to initiating the UIST. If the stylus is left on the platen a proximity error may occur.

5-6. The UIST is initiated by placing the SELF-TEST switch to the (I) position and then back to the (O) position. See Figure 5-2. The test may also be started by sending the Test Digitizer (TD) instruction to the tablet from the controller. If the UIST is initiated

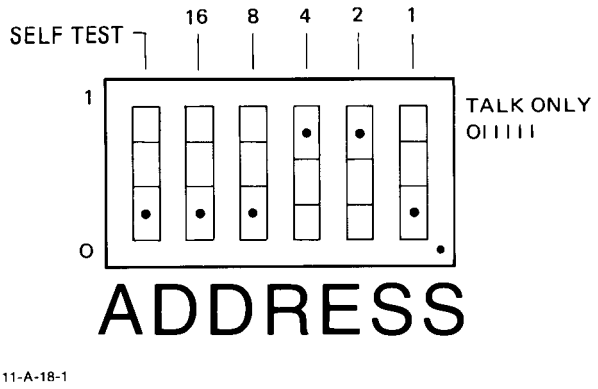


Figure 5-2. Self-Test Switch

by the TD instruction, the first LED test does not occur. See Figure 5-3 for the flow chart of the User Interactive Self-Test. Table 5-2 lists the error codes for the interactive portion of the test.

Table 5-2. UIST Error Codes

CODE	DEFINITION
50	Illegal proximity signal at time of self-test request.
51	Illegal pen press at time of self-test request.
52	Pen press detected before proximity = 1.
53	Missed self-test dot or platen/stylus problem.

5-7. After completion of the POST portion of the test the tablet waits for the user to digitize the test point at the lower-right corner of the platen. See Figure 5-4. The digitized point is checked for accuracy. An error is indicated if the signal is incorrect, weak, or nonexistent.

5-8. If the SELF-TEST switch is left in the (I) position, the test will continually cycle until the switch is set to the (O) position or an error between 101 and 110 is encountered. In case of an error the test will stop and the front panel LEDs will indicate the error code.

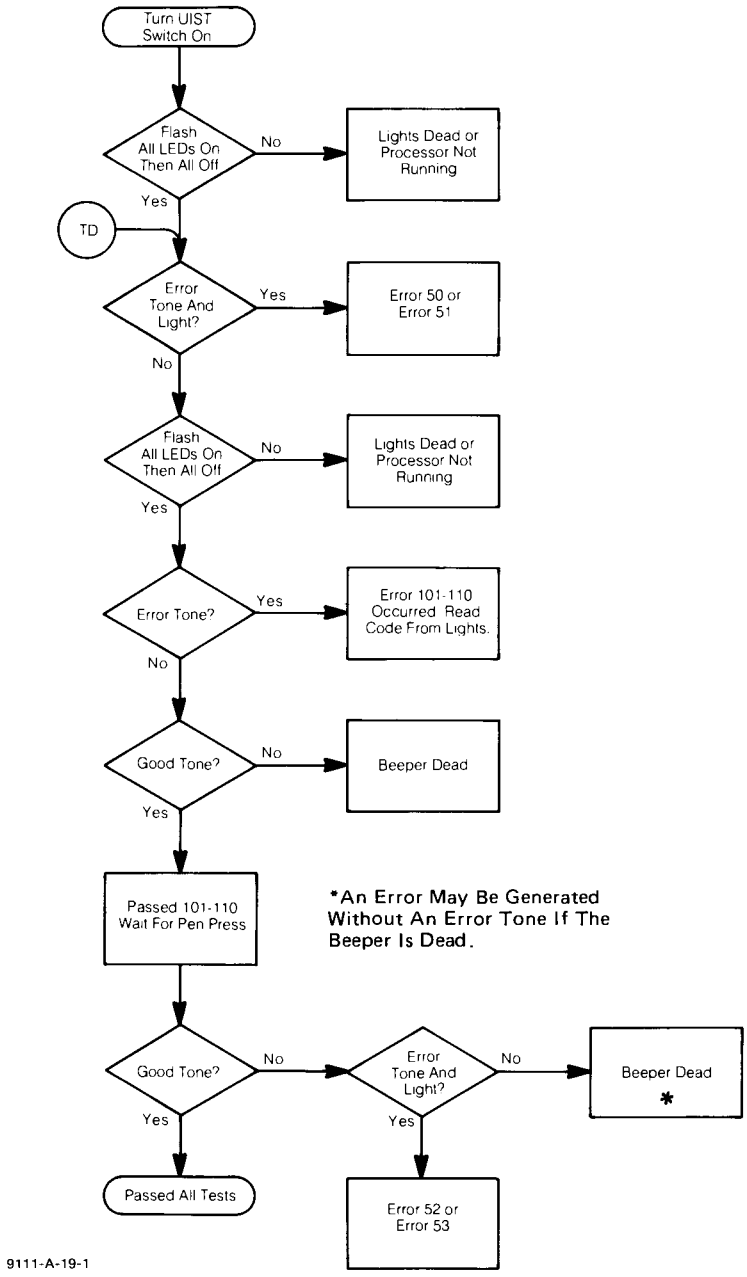
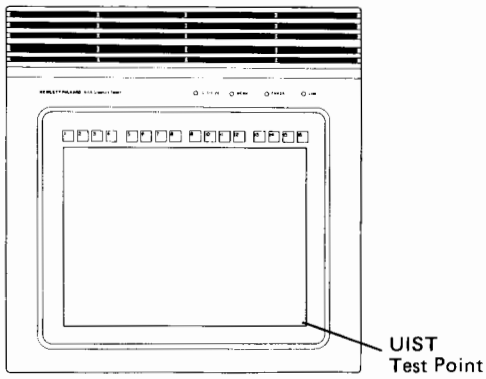


Figure 5-3. UIST Logic Flow Chart



9111-A-20-1

Figure 5-4. UIST Test Point

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ADJUSTMENTS

6-1. There are no electrical or mechanical adjustments on the 9111A.

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SECTION VII

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SECTION VIII

REPLACEMENT PARTS

Table 8-1. Exchange Assemblies

ASSEMBLY	PART NUMBER	
	NEW	EXCHANGE
Main PCA Assy	09111-66506	09111-69506 09111-69501*
Platen PCA Assy	09111-66502	09111-69502

*For tablets with serial prefix numbers below 2251A.

Table 8-2. Replacement Parts

DESCRIPTION	PART NUMBER
Top Case	09111-67902
Stylus Assembly	09111-61600
Line Fuse	
100/120 V 0.5 A	2110-0012
220/240 V 0.25 A	2110-0004

A complete list of parts is found in the service manual.

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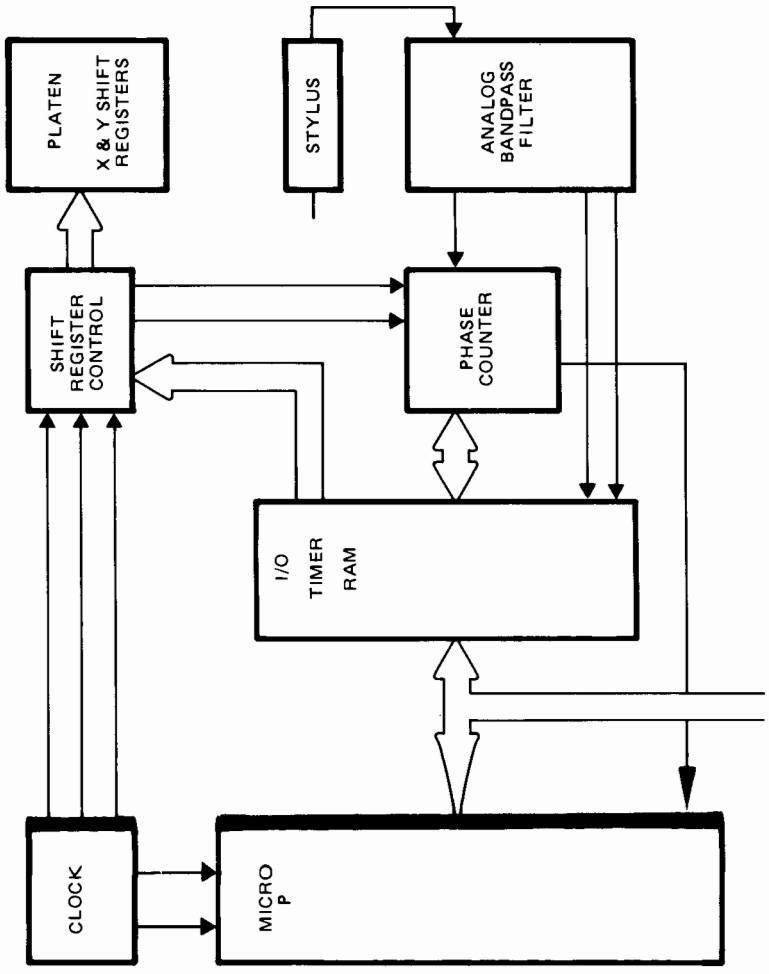
DIAGRAMS

9111A BLOCK DIAGRAM

9111A COMPONENT LOCATION

09111-66501

09111-66506


PLATEN
X & Y SHIFT REGISTERS
STYLUS
ANALOG BANDPASS FILTER
SHIFT REGISTER CONTROL
PHASE COUNTER
I/O TIMER RAM
CLOCK
MICRO P

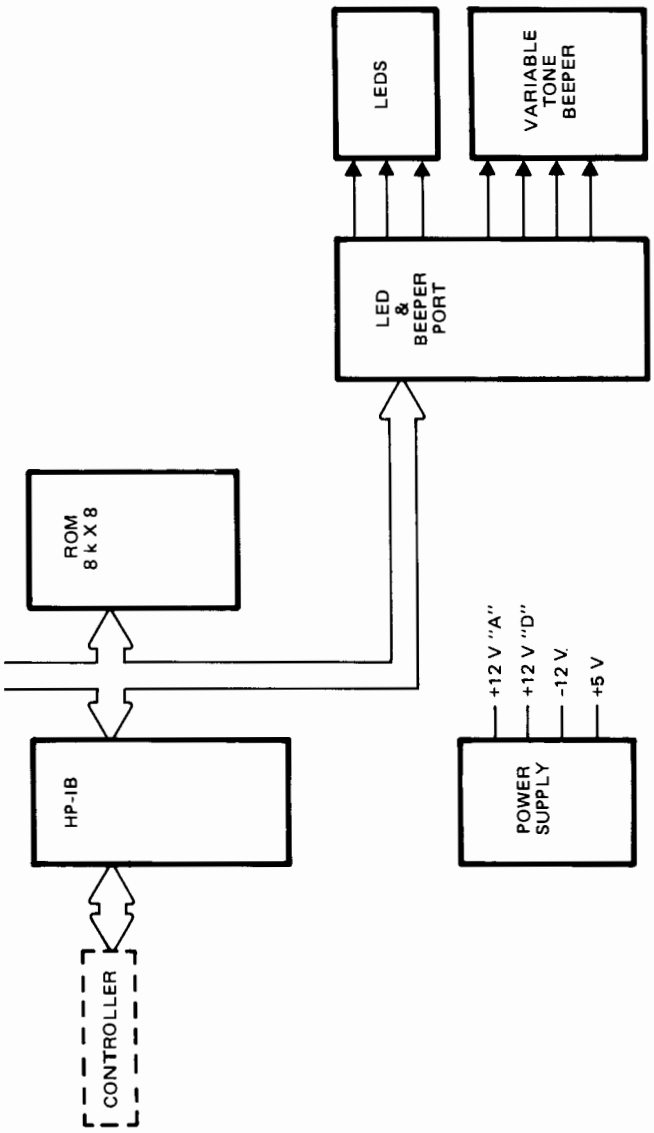


Figure 9-1. 9111A Block Diagram

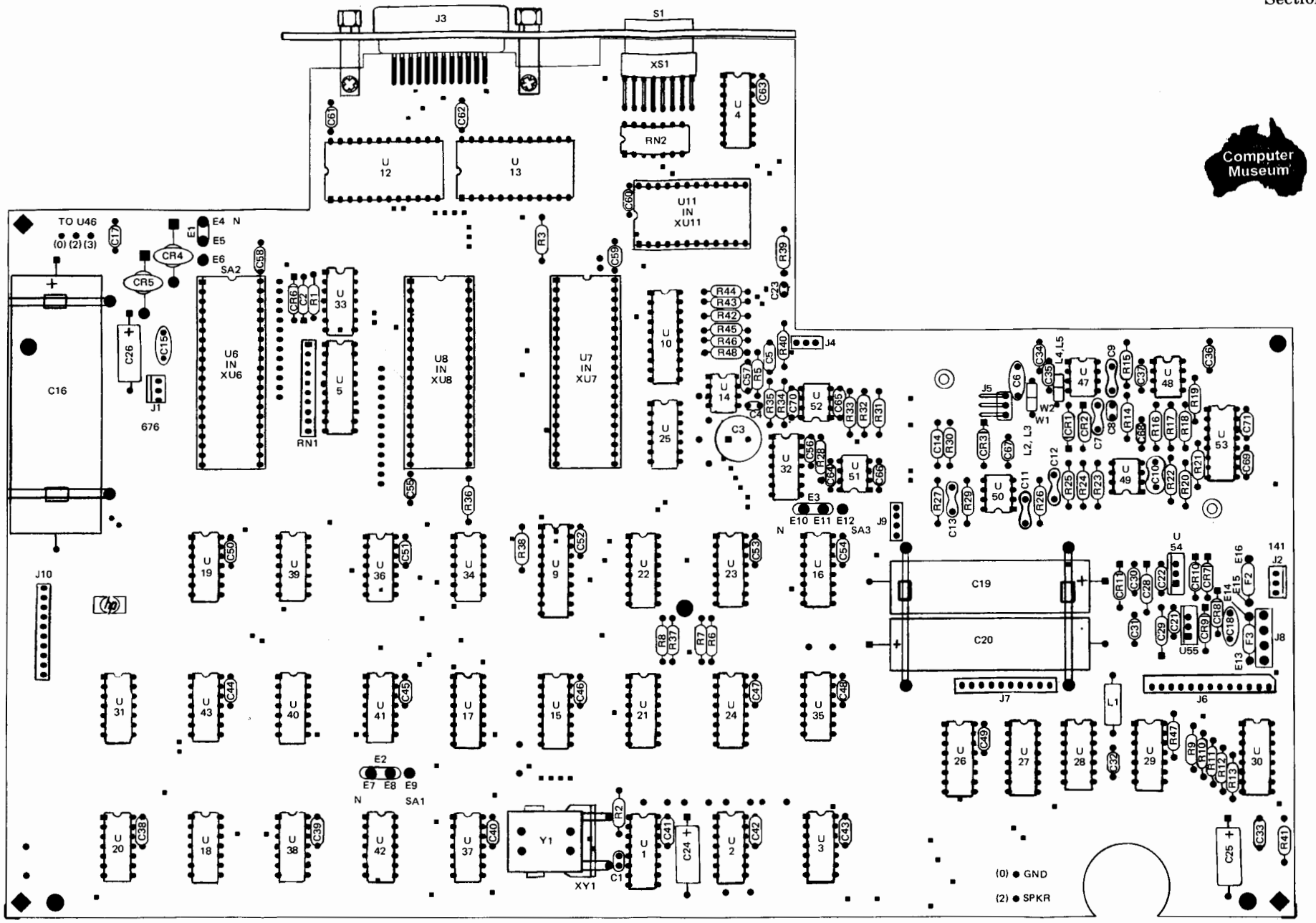


Figure 9-2. 09111-66501
Component Location

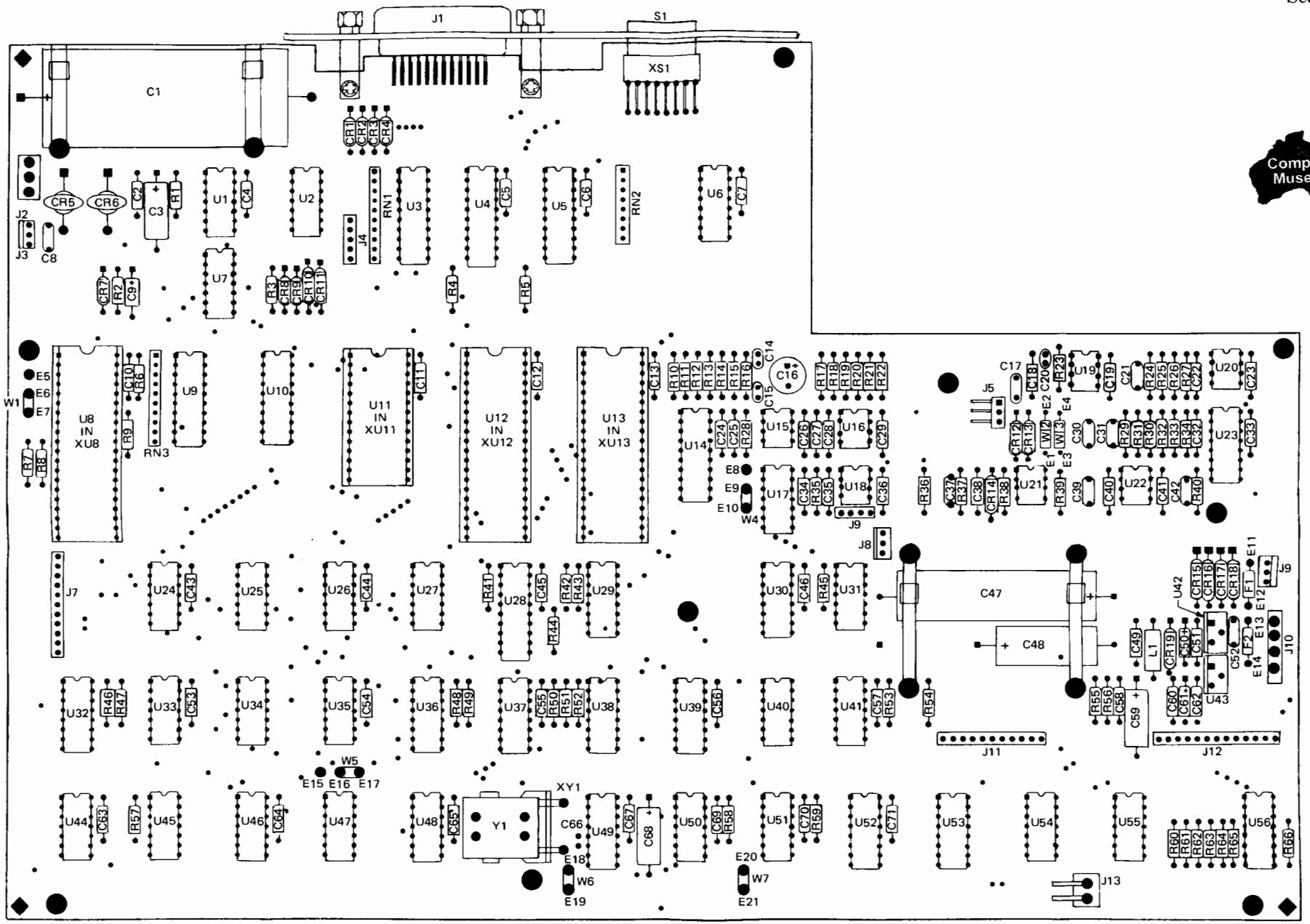


Figure 9-3. 09111-66506
Component Location