9864A
DIGITIZER
SERVICE MANUAL

HEWLETT hp PACKARD

9864A DIGITIZER SERVICE MANUAL

(with 9800 Series Calculators)

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SCOPE OF THE MANUAL

This manual provides the information necessary to perform on-site service on the -hp- 9864A Digitizer. Virtually all service is accomplished by a board or assembly exchange procedure.

Simplified digitizer operating instructions are provided in this manual. The performance of the digitizer is highly susceptible to human or operating error. In addition, the finite resolution of the digitizer can introduce significant errors in some problems. Certain progamming techniques called smoothing will reduce both types of errors. For complete operating instructions, refer the following manuals:

PERIPHERAL CONTROL BLOCK I OPERATING MANUAL	(9810A)
PERIPHERAL CONTROL BLOCK I OPERATING MANUAL	(9820A)
PERIPHERAL CONTROL BLOCK II OPERATING MANUAL	(9820A)
9864A DIGITIZER PERIPHERAL MANUAL	(All)

BRIEF DESCRIPTION OF DIGITIZER

The 9864A Digitizer adds a significant new dimension to the 9800 Series Calculator. The digitizer converts graphical information into rectangular (Cartesian) coordinates and enters the coordinates into the calculator. The digitizer consists of a mainframe which contains logic, control, and power supplies; a table or platen which is the active digitizing surface; a cursor that is used for tracing the curves that are to be digitized; and an I/O assembly that interfaces the 9864A to the calculator. Except for the cursor , each assembly is permanently interconnected to the mainframe by means of a cable. The cursor is permanently connected to the platen. The I/O assembly plugs into the slots in the back of the calculator.

In the previous discussion, the digitizer interconnections were refered to as being of a permanent nature. Actually, the cables do have connectors which allow for their removal. It is recommended, however, that the cables not be removed as the connectors are somewhat fragil. If it becomes necessary to remove the cables, the following information will assist you in connecting and disconnecting the cables without causing unecessary damage to the connectors.

REMOVING THE CONNECTORS

The connectors may be removed by firmly squeezing on the finger grip ridges and gently pulling the connectors apart. (The outer shell of the connector is slightly oval)

> CAUTION
>
> THE CONNECTORS ARE SOMEWHAT FRAGIL. CARE SHOULD BE USED WHEN CONNECTING THE DIGITIZER CABLES AND DISCONNECTING THE CONNECTORS AS THE CONNECTORS MAY BE DAMAGED DUE TO STRESS OR MISALIGNMENT.

CONNECTING THE DIGITIZER CABLES

The connectors may be connected by merely snapping the two sections together. Care should be taken to insure that the two connector sections are properly aligned.

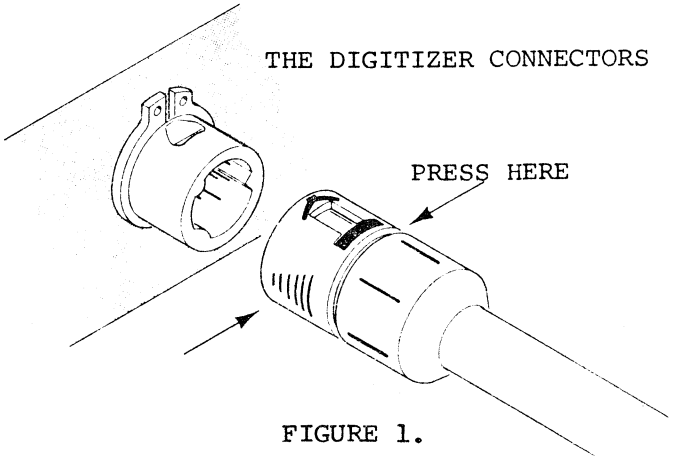
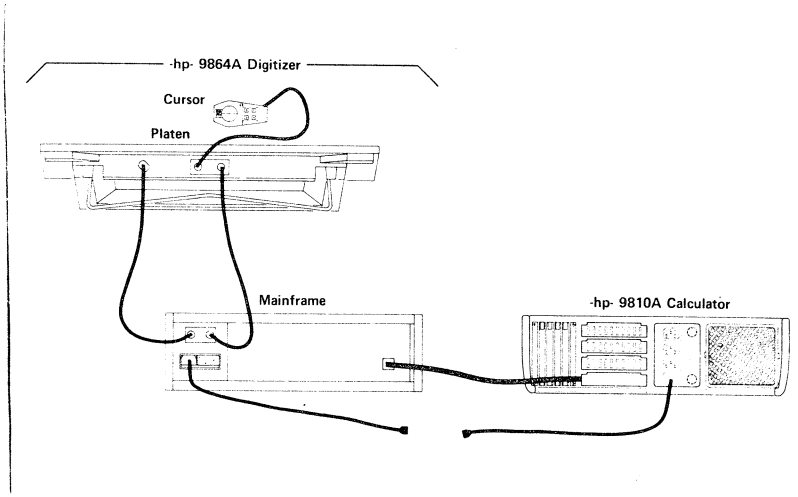


FIGURE 1.

CAUTION
BEFORE INSTALLING THE DIGITIZER PERFORM THE FOLLOWING PROCEDURE AND INSURE THAT ALL UNITS ARE PROPERLY FUSED AND SET FOR THE CORRECT LINE VOLTAGE.

INSTALLATION PROCEDURE

1. Insure that the digitizer has been set for the normal line voltage and that the correct fuse has been installed. To check or reset the line voltage switch, first remove the power cord. Slide the clear window next to the power input to the left. Pull the FUSE PULL lever to release the fuse. Set the line voltage switch to the left for 240V operation or to the right for 120V operation. Install a 1 amp fuse for 240V, or a 2 amp fuse for 120V operation, and slide the clear window back over the power module. DO NOT CONNECT THE POWER CORD AT THIS TIME.
2. Connect the digitizer units as shown in figure 2, taking care not to damage the digitizer cable connectors.



DIGITIZER CABLE INTERCONNECTIONS
FIGURE 2

3. Plug the I/O Card into the slot in the back of the 9800 Series Calculator. There are four slots and any vacant slot may be used. Each slot is keyed so that the I/O Card cannot be installed incorrectly.
4. Check all connections to insure that they are properly seated.
5. Connect the calculator and digitizer to an AC power source.
6. Turn the calculator and digitizer power switches to ON and perform the Electricial Inspection Procedure that is applicable for the system that you are installing.

COMMAND/CONTROL	FUNCTION	REMARKS
[O]	Sets the origin. When Origin is pressed, the point directly under the cross hairs is taken as the origin	Requires no FMT command. May be used any time, however, [O] resets hold.
9810A: FMT 3 (select code) [.] 9820A:* RED (select code), R_x,R_y	Requests coordinate data from the digitizer.	Not used by itself. Used in conjunction with [S] or [C] .
[S]	Enters one set of coordinates into the calculator each time it is pressed.	Requires a data request for each entry.
[C]	Activates a continuous mode of operation that automatically enters one set of coordinates for each data request.	Must be pressed again to deactivate the continuous mode.
[H]	Activates 'HOLD'. Hold is generally used to translate the origin.	Must be pressed again to deactivate hold.
9810A: FMT 4 (select code) PNT/SPC 9820A: † WRT (select code)	Causes one "Beep" which lasts about 1/10 of a second.	
[STOP]	Halts the execution of a program in the calculator.	From keyboard: Nullifies any previous data request, halts any entry process, and cancels continuous mode. From Program: No effect on the digitizer status.

*READ, (SELECT CODE), REGISTER(X),REGISTER(Y)-9820A Command
†WRITE, (SELECT CODE) - 9820A Command
9820A Commands only take place when used in a program or when followed by EXECUTE
The SELECT CODE for each digitizer is indicated on the mainframe front panel.

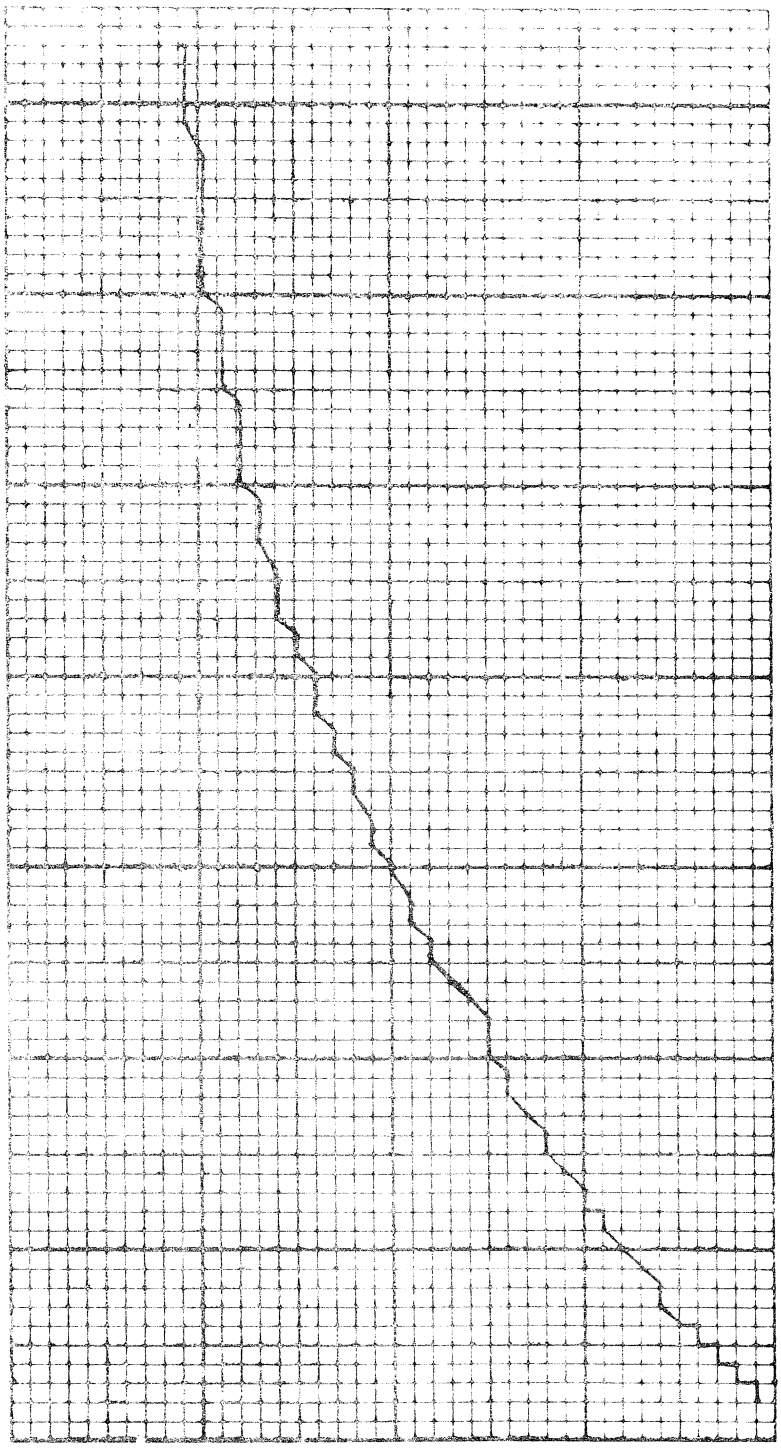
A WORD ABOUT ACCURACY

The 9864A Digitizer is specified to be accurate to .01 inch anywhere on the platen. However, it is very difficult to visually position the cursor consistently with .01 inch accuracy. Therefore, only with great caré and experience can a user begin to approach the actual specified accuracy of the instrument. Most -hp- instruments are designed so that human error cannot affect the measurement. However, the digitizer can measure only as accurately as the cursor is placed and the cursor is, naturally, positioned by human hands.

In addition to human error, the finite resolution of the digitizer can introduce significant errors in certain types of measurements. Because of the finite resolution of the digitizer, points digitized along a curved line will generally tend to follow a zig-zag path, rather than a smooth curve. If line length is the measurement of interest, the zig-zag effect is very apparent because the figure has magnified 10 times.

Generally, digitizing errors will be minimized by digitizing in single samples. If it is inconvient to digitize singuarly, point by point, a smoothing program may be used to increase accuracy. The Digitizer Peripheral Manual (operating hints chapter) gives a complete description of the use of smooting routines.

A WORD ABOUT ACCURACY (cont'd)



MAGNIFIED VIEW OF MEASUREMENTS TAKEN
ON 1/8th OF A CIRCLE
FIGURE 3

This section contains procedures to check the performance of the 9864A Digitizer and the 11264A Peripheral Control Block. Two procedures are contained in this section. The first procedure is used to ensure that the digitizer and peripheral block's digitizer commands are fully operational. The second procedure is used to verify the accuracy of the digitizer.

> NOTE
>
> The ELECTRICAL INSPECTION PROCEDURE for the 9820A/9864A may be found in the 'MODEL 20 SYSTEM ELECTRICAL INSPECTION BOOKLET..

If, after successfully performing both procedures, you suspect that the digitizer is not operating properly, refer to the 'Servicing the 9864A Digitizer' section of this manual.

During the accuracy check, you might find it helpful to use a magnifying glass to aid in positioning the cross hairs of the cursor. However, it is possible to achieve satisfactory results without the aid of a magnifying glass.

EQUIPMENT REQUIRED

The procedures require the following equipment:

1. One 9810A Calculator and one 11264 Peripheral Control Block.
2. One 9864A Digitizer
3. One sample Data Overlay (-hp- P/N 09107-90002). A Sample Data Overlay is supplied with the digitizer. The overlay is shown in Figure 4.
4. One straight-edge, at least 6" long.

EQUIPMENT REQUIRED (cont'd)

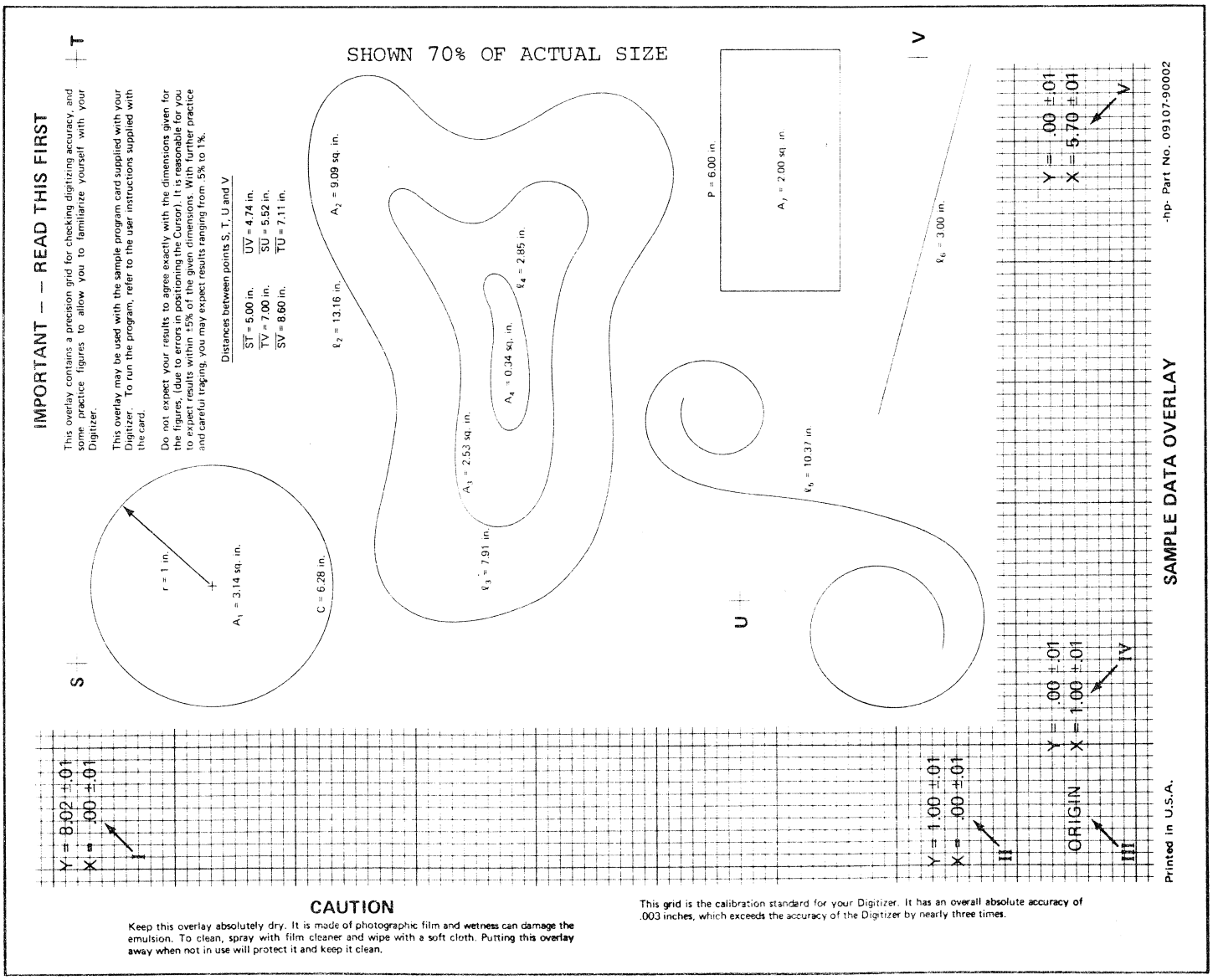
5. One sheet of paper, 8 1/2 X 11".

6. A pencil or pen.

7. A roll of tape (preferably masking tape).

8. One shim, made of non-magnetic material. The shim should be .025" thick, and approximately 3 X 5" in its other dimensions. If such a shim is not available, a substitute can be made by stacking four 3 X 5" index cards together.

9. A magnifying glass (optional).



SAMPLE OVERLAY

FIGURE 4
P-9864-3-(9)

FUNCTION CHECK

The procedure given in this section verifies proper digitizer operation, with the exception of accuracy. Since the procedure in this section is long and perhaps tedious, it is recommended that you read the entire procedure before attempting to perform it. Your success is assured if you carefully follow the directions at each step.

> CAUTION
>
> DO NOT CONNECT THE CALCULATOR OR THE DIGITIZER TO AN AC POWER SOURCE UNTIL INSTRUCTED TO DO SO.

1. Referring to Figure 5 , assemble the digitizer and connect it to the Model 10 Calculator.

> CAUTION
>
> BE SURE THAT BOTH THE CALCULATOR AND THE DIGITIZER ARE TURNED 'OFF' WHILE THE CONNECTIONS ARE BEING MADE.

If you are not familiar with the digitizer assembly and installation procedure, refer to the Installation section of this manual.

> IMPORTANT NOTE
>
> This procedure assumes that your digitizer is set to Select Code 9. If your digitizer is not set to Select Code 9, each key in this procedure, which is accompanied by an *, must be changed to indicate the select code of your digitizer.

FUNCTION CHECK

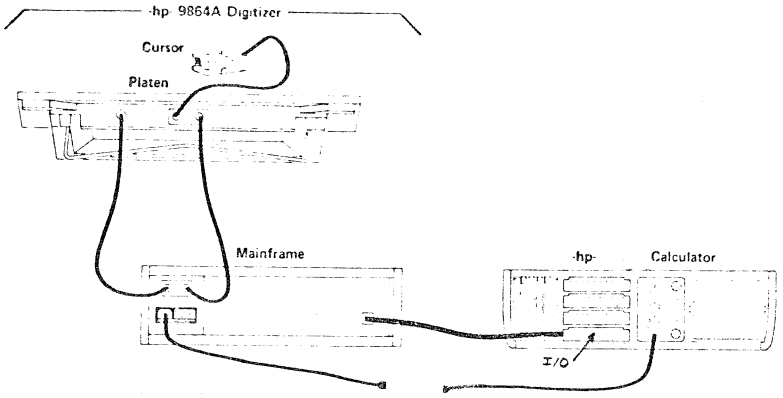
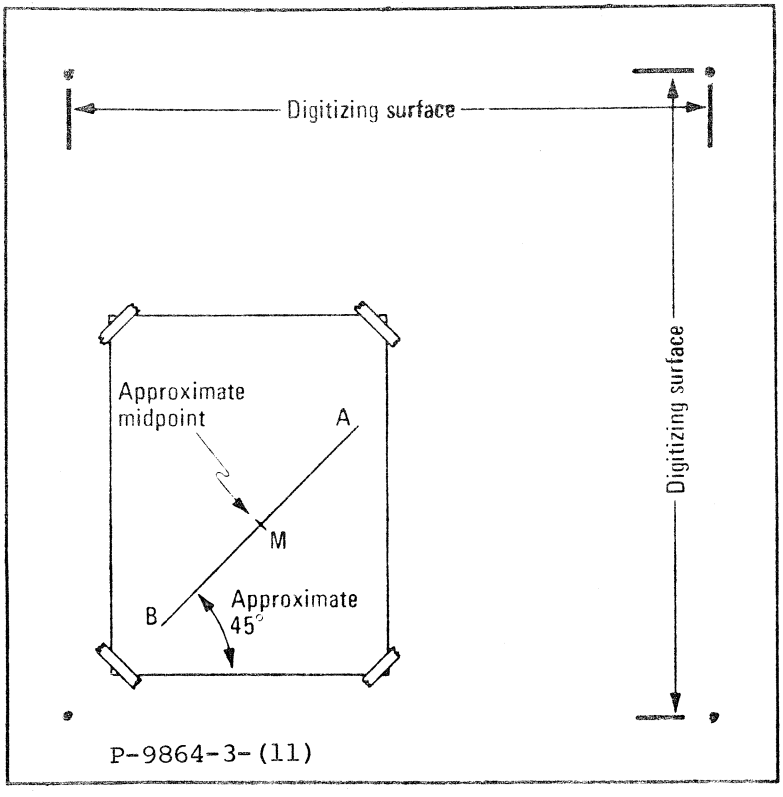


FIGURE 5. The Digitizer, Assembled & Connected to the -hp- Calculator.

2. Connect the calculator and the digitizer to the AC power source.

3. Referring to Figure 6, place a sheet of 8-1/2" X 11" paper on the lower left-hand corner of the digitizing area. Attach the sheet of paper with tape. (The actual position of the paper is not critical.) Using a straight-edge and a pencil, draw a line on the paper, approximately 45° across the paper. Approximate and mark the midpoint of the line. Label the line as shown in Figure 6.

FIGURE 6



4. Turn the calculator ON. After the display appears:

PRESS: [RUN] [STOP] [END] [PRGM]

PRESS: [CLR] [FMT] [3] [9*] [.] [PAUSE]

PRESS: [GOTO] [0] [END] [RUN]

PRESS: [FIX()] [2]

5. Switch the digitizer 'ON'. The LINE lamp should light and you should hear a "Beep" lasting approximately three-quarters of a second. You should also be able to hear the fan in the digitizer.

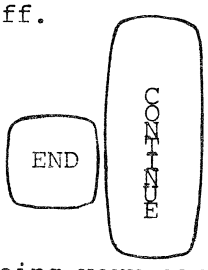
> NOTE
>
> From this point until the end of this procedure, move the cursor only as directed. When directed to move the cursor from one point to another, do so by sliding the cursor; do not lift the cursor from the digitizer surface unless specifically instructed to do so. Also, do not slide the cursor outside the digitizing are (limits are marked on the platen) unless instructed to do so.

6. Place the cursor on the paper which was taped to the digitizing surface. Position the cross hairs such that they are approximately over point M. (Placement of the cross hairs here is not critical.)

FUNCTION CHECK

> NOTE
>
> The controls [S], [C], [O], and [H] are located on the cursor.

7. While being careful not to move the cursor, press [O]. Do not move the cursor. The (red) sample light on the cursor should light, if it was off. Prior to pressing [O] the sample light may have been on or off.

8. PRESS: 

9. While being very careful not to move the cursor, press [C]. The sample light should begin to blink approximately five times a second (the actual rate is not critical).

10. The calculator display should be blinking and appear as shown below.

.00→ Y
.00→ X

If either or both X and Y are not .00, but are some (possibly different) small numbers (say, a few hundredths), you probably moved the cursor when you pressed [O] or [C]. In such a case, return to step 6 and proceed from there.

FUNCTION CHECK

NOTE
Read Step 11 before performing it.

11. Slowly slide the cursor along the line form point M toward point A. As you move the cursor the digits in the display will change. The object of this step is to verify that the digits in X and in Y change in the proper fashion.

Interest is not in the numerical values of the numbers in X and Y; rather, that 5 is entered following an entry of 4, which followed an entry of 3, etc. Also, verify that all ten digits can be entered.

The number in X and the number in Y should both be positive numbers in the form:

$$Y_3.Y_2Y_1$$
$$X_3.X_2Y_1$$

X_1 and Y_1 will change as the cursor is moved. X_1 and Y_1 will not necessarily be the same number, nor will they necessarily change at the same time. However, if the cursor is moved slowly enough, you will be able to see X_1 and Y_1 cycle through a complete cycle of digits in the order:

....0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0....

For every complete cycle of X_1, X_2 should increment by one. It should increment when X_1 changes from 9 to 0. The same relationship exists between Y_2 and Y_1. Continue moving the cursor until you have verified that both X_2 and Y_2 cycle correctly through the sequence shown above. X_3 and Y_3 are checked later in the procedure.

FUNCTION CHECK

12. Slide the cursor to point B. The numbers in X and in Y should be negative.

13. PRESS: [C] . The sample light should stop blinking, and the calculator display should be blank.

14. PRESS: [C] . The sample light should resume blinking, and the calculator display should return.

15. PRESS: STOP

The sample light and the display should stop blinking.

16. PRESS: END CONTINUE

The sample light should not resume blinking, and the display should be blank.

PRESS: STOP

The display should return and the STATUS light should come on.

17. PRESS: END FMT 3 9* .

The display should be blank.

While watching the sample light, press [C] . The sample light should blink only once.

18. PRESS: [C]

19. PRESS: (END) (CONTINUE)

20. Press [S] several times. Each time [S] is pressed the sample light and the display should blink once.

21. Pick up the cursor. You should hear a "Beep" lasting approximately three quarters of a second, and the sample light should go out. Remove the paper and the tape from the digitizing surface.

The Digitizer Platen

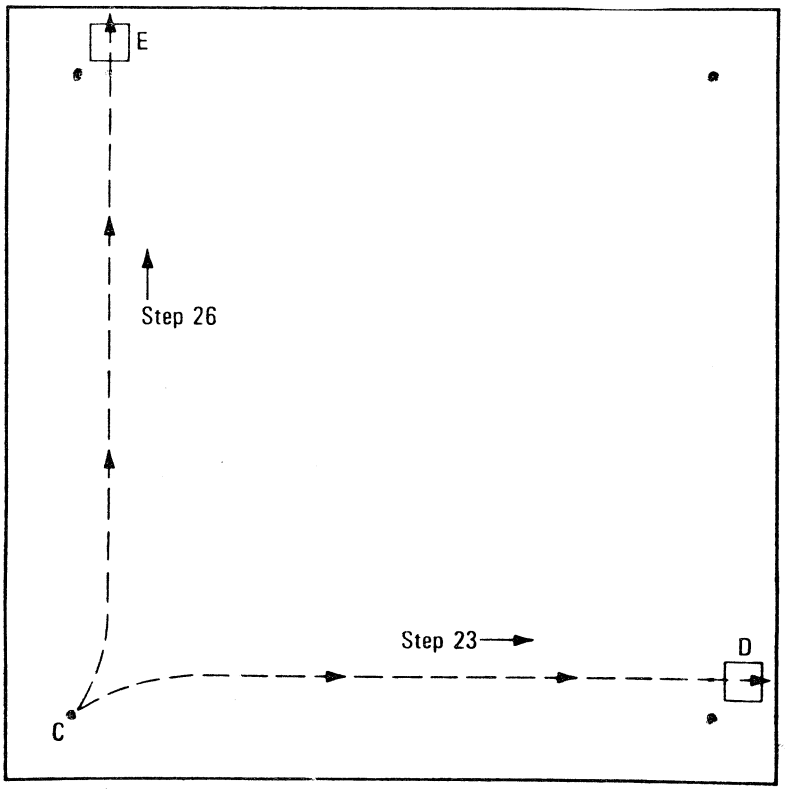


FIGURE 7. CURSOR MOTION DURING STEP 22.

22. Referring to Figure 7, positon the cross hairs over point C.

PRESS: STOP END CONTINUE

Press [O] and then [C] . The sample light should begin blinking.

23. Referring to Figure 7, slide the cursor along the path indicated by the horizontal dotted line. Slide the cursor off the edge of the platen. As the cursor moves through the region marked D, you should hear a "Beep" lasting approximately three-quarters of a second, and the sample light should go out.

24. You should see the following display:

.00 → Z
(anything) → Y
(17 or greater) → X

The test at this step is passed if the number in X is 17 or greater.

25. Referring to Figure 7, position the cross hairs over point C.

PRESS: STOP END CONTINUE

Press (O) and then press (C) . The sample light should begin blinking.

FUNCTION CHECK

26. Referring to Figure 7, slide the cursor along the path indicated by the vertical dotted line. Slide the cursor off the edge of the platen. As the cursor moves through the region marked E, you should hear a "Beep" lasting approximately three-quarters of a second, and the sample light should go out.

27. You should see the following display:

.00 → Z
(17 or greater) → Y
(anything) → X

The test at this step is passed if the number in Y is 17 or greater.

> NOTE
>
> Steps 28 through 48 constitute the [H] check. If you make an error during the check, begin again with step 28.

28. Referring to Figure 8, position the cross hairs over point C.

PRESS: [O]

29. PRESS: STOP END CONTINUE

30. Press [C] . The sample light should begin blinking.

> NOTE
>
> Read step 31 before performing it.

FUNCTION CHECK

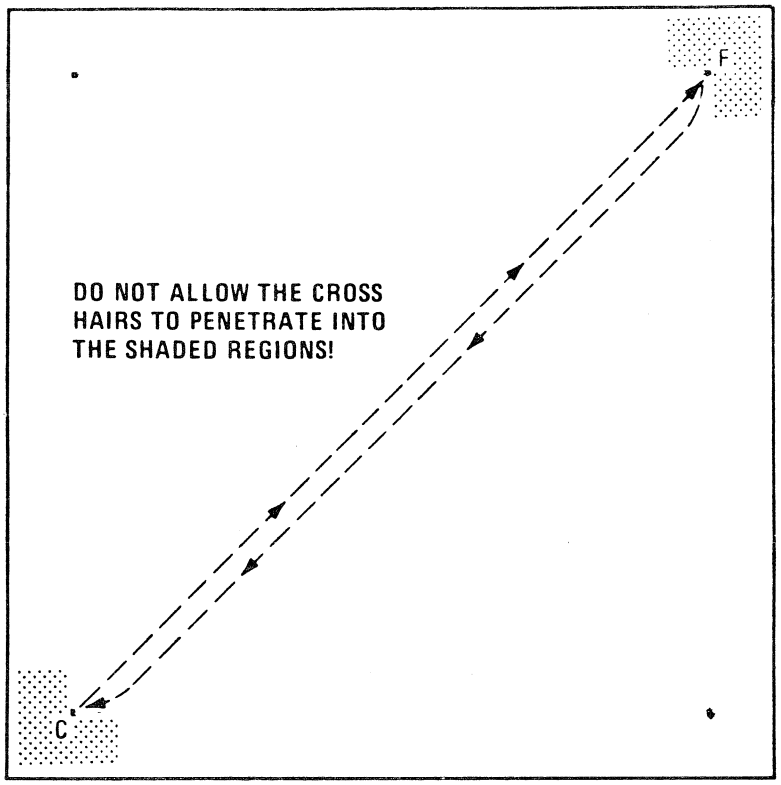


FIGURE 8

31. Referring to Figure 8, slowly slide the cursor toward point F in the manner indicated. As the cursor is moved you should see numbers in X and in Y in the form:

$$Y_3.Y_2Y_1$$
$$X_3.X_2X_1$$

Verify that, each time X_2 changes from 9 to 0, X_3 increments by one count. Also, verify that, each time Y_2 changes from 9 to 0, Y_3 increments by one count.

A little past midway from point C toward point F, the numbers in X and in Y will (but not necessarily at the same time) assume the following form:

$$Y_4Y_3.Y_2Y_1$$
$$X_4X_3.X_2X_1$$

FUNCTION CHECK

31. (cont'd)
While proceeding with the remaining steps of the check, verify that X_4 increments by one count each time X_3 changes from 9 to 0, and verify that Y_4 increments by one count each time Y_3 changes from 9 to 0.

32. When the cross hairs are positioned over point F, note the numbers in X and in Y, and press [H] . The sample light should continue to blink.

33. Pick up the cursor. You should not hear a "Beep" and the sample light should continue to blink.

34. Referring to Figure 8, position the cross hairs over point C. Without moving the cursor, press [H] .

35. The numbers in X and in Y should be the same as they were noted in step 32. If the numbers are not the same, but differ from their previous values by only a few hundredths, you probably moved the cursor during step 34. In such a case, return to step 28.

36. Referring to Figure 8, slowly slide the cursor toward point F, press [H] .

37. When the cross hairs are positioned over point F, press [H] .

38. Slide the cursor back to point C. Press [H] again.

FUNCTION CHECK

39. Repeat steps 36, 37, and 38 three additional times

40. Referring to Figure 8, slowly slide the cursor toward point F. Continue to verify that X_4 and Y_4 increment properly. Somewhat after midway from point C toward point F, the numbers in X and in Y should change from 99.99 to .00 (X and Y probably will not change at the same time). It is not necessary to observe the actual change (although it is possible if the cursor is moved slowly enough); it is sufficient to observe that the numbers appear to increment from .00.

41. When the cross hairs are positioned over point F, press [H] . Pick up the cursor, and while holding it several inches above the digitizing surface, press [O] . You should hear a "Beep" lasting approximately three-quarters of a second, and the sample light should go out.

42. Place the cursor somewhere inside of the digitizing area. Press [O] . The sample light should come on.

43. PRESS: STOP END PRGM FMT 4 9*

44. PRESS: PNT/SPC GoTo 0 END RUN

45. PRESS: END CONTINUE

45. (cont'd)
You should hear "Beep"..."Beep"..."Beep"... The "Beep"s should be approximately one-tenth of a second long, and occur at a rate of approximately eight per second; however, these timings are not critical.

46. PRESS: [STOP]

The digitizer should stop "Beep"ing.

47. PRESS: [END] [FMT] [4] [9] [PNT/SPC]

The digitizer should produce a single short "Beep". It must not begin producing a series of "Beep"s.

NOTE
If the Shim Check fails while using a shim whose thickness is unknown, check the thickness of the shim before repairing. The shim should not be thicker than .025"; however, many digitizers will pass the Shim Test with shims somewhat thicker.

48. Remove the cursor from the digitizing surface. You might hear a "Beep".

49. Locate the shim and place it somewhere inside the digitizing area.

50. Place the cursor on top of the shim. Press [Q] . The sample light must come on, and there must be no "Beep" during or after pressing [Q] .

FUNCTION CHECK

51. Remove the cursor from the digitizing surface. You should hear a "Beep".

This concludes the FUNCTION CHECK. The Accuracy Check should also be performed ino order to completely verify digitizer operation.

ELECTRICAL INSPECTION

ACCURACY CHECK

The procedure in this section verifies the accuracy of the digitizer. The procedure assumes that the digitizer has successfully passed the preceeding FUNCTION CHECK.

1. If the calculator and digitizer are not connected, perform steps 1 and 2 of the previous procedure (refer to pages 10 and 11).

2. Referring to Figure 9, place the Sample Data Overlay on the digitizing surface. Place a single piece of tape across the upper left-hand corner of the overlay. Prepare three other short pieces of tape for the other corners. They will be used later.

3. Switch the calculator 'ON'. After the display appears:

PRESS: [RUN] [STOP] [END] [PRGM]

PRESS: [CLR] [FMT] [3] [9*] [.] [PSE]

PRESS: [GoTo] [0] [END] [RUN]

4. Switch the digitizer 'ON'.

5. Place the cursor somewhere on the middle of the overlay.

> NOTE
>
> From this point until the end of this procedure, move the cursor only as directed. If you hear a "Beep" (lasting about three-quarters of a second) and the red sample light goes out, return to step 6; however, if you have reached step 19, you need not return to step 6.

ACCURACY CHECK

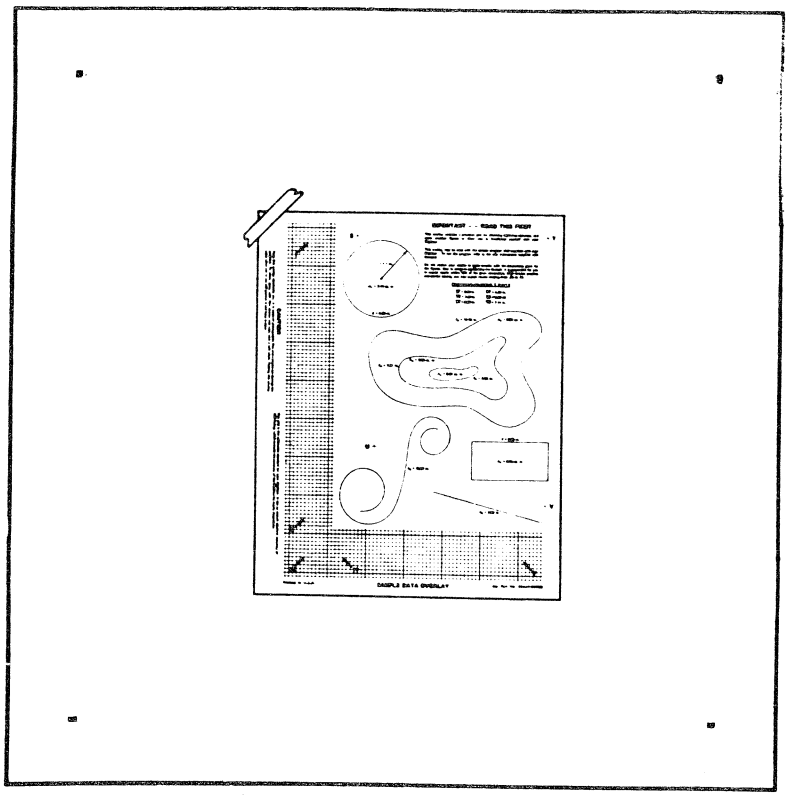


FIGURE 9.

6. PRESS: [O]

7. PRESS: [C]

8. PRESS: (END) (CONTINUE)

NOTE
The purpose of steps 9 through 18 is to align the overlay so that it is parallel with the axes of the digitizer platen.

9. Place one hand on the overlay to keep it from moving. Leave it on the overlay until step 15 has been completed.

ACCURACY CHECK

10. Slide the cursor to point I. Position the cross hairs exactly over point I.

11. Note the value in the X-register of the calculator.

12. Slide the cursor to point III. Position the cross hairs exactly over point III.

13. Without moving the overlay or the cursor, note the value in the X-register. If the new value is the same as the previous value obtained in step 10, proceed to step 15.

NOTE

Read step 14 before performing it.

14. If the new value (step 13) is greater than the old value (step 10) the overlay must be rotated clockwise by some amount. If the new value is less than the old value, the overlay must be rotated counter-clockwise by some amount. In each case, the upper left-hand corner of the overlay serves as the pivot-point for the rotation.

    Rotate the overlay a small amount in the appropriate direction.

    Return to step 10; when alignment is achieved, step 13 will direct you to step 15.

15. Without moving the overlay, tape the remaining three corners of the overlay. Then, if necessary, remove the tape from the first corner

ACCURACY CHECK

15. (cont'd)

taped, and retape the corner to the digitizing surface.

16. Slide the cursor to point I. Position the cross hairs exactly over point I. Note the value in X.

17. Slide the cursor to point III. Position the cross hairs exactly over point III.

18. The number now in X must be the same as the number obtained in step 16. If the numbers are not the same, the overlay is not properly aligned. In such a case, remove the tape from all of the corners of the overlay except the upper left-hand corner, and return to step 9.

19. Slide the cursor to point III. Position the cross hairs exactly over point III.

20. Without moving the cursor, press [O] .

21. PRESS: (STOP) (END) (CONTINUE)

22 PRESS: [C]

ACCURACY CHECK

23. Slide the cursor to each of the points I, II, IV, and V. At each point, position the cross hairs exactly over the point. While the cross hairs are exactly over each of the four points in turn, the numbers in X and in Y should be within the range for that point as indicated by Figure 10.

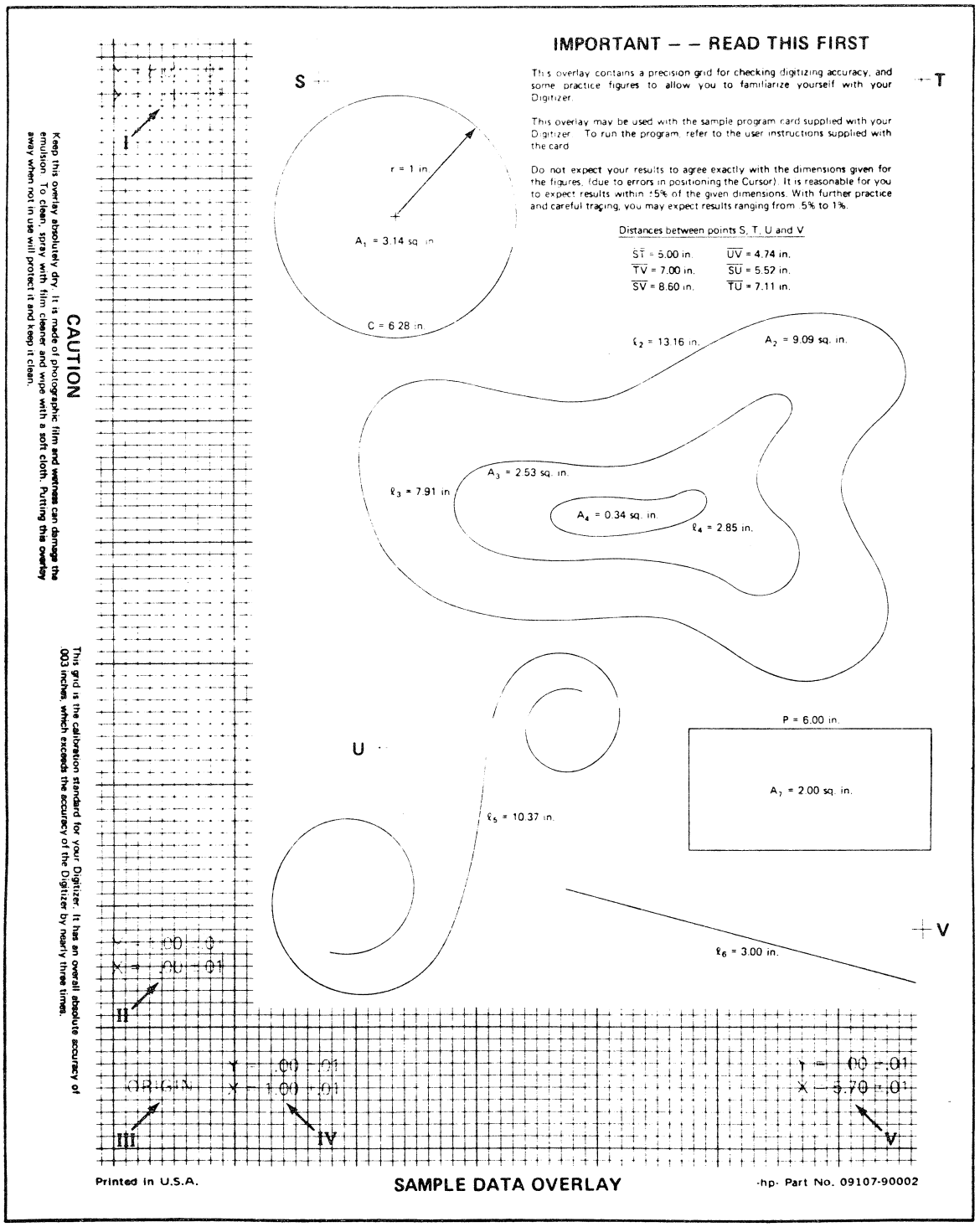
> NOTE
>
> The tolerance of ±.01" indicated by Figure 10 assumes that the ambient temperature is within the range of 15°C to 30°C. If the ambient temperature is within the range of 0°C to 15°C or within 30°C to 50°C, the tolerance is ±.03".

This concludes the check of the digitizer's accuracy.

> CAUTION
>
> TURN THE CALCULATOR POWER SWITCH TO THE OFF POSITION AND INSURE THAT THE DIGITIZER POWER LAMP IS NOT LIGHT BEFORE DISCONNECTING ANY CABLES.

ACCURACY CHECK

FIGURE 10.



EQUIPMENT REQUIRED

1. 9864A Service Kit
2. DC Volt/Ohm Meter (-hp- 427A)
3. #2 Pozidrive phillips driver
4. 1/4" bit screwdriver (4" or longer shaft)

9864A SERVICE KIT

The 9864A Digitizer Service Kit contains all of the PC board assemblies used in the digitizer. A service kit is available which will update your 9107A Service Kit to a kit that can be used for 9864A servicing, or you may use a service kit that contains all of the 9864A assemblies. Part numbers for each of these kits can be found in the REPLACEABLE PARTS LIST in the back of this manual.

Below is a list of the assemblies that your service kit must contain for complete digitizer servicing:

Power Supply	09107-69001
Cursor	09107-69101
Analog Axis bd,(2)	09107-69501
Digital Axis bd.(2)	11204-69501
Coil Drive bd.	09107-69503
Input bd.	11204-69503
Control bd	11204-69502
I/O Card	11204-69591

CAUTION

BEFORE EXCHANGING ASSEMBLIES OR CONNECTING AND DISCONNECTING DIGITIZER CABLES, ALWAYS TURN BOTH THE DIGITIZER AND CALCULATOR OFF.

REPAIRING THE DIGITIZER

Before attempting to repair a defective digitizer, check the digitizer for Psuedo-hardware problems. Sometimes user error or unusual, but normal, digitizer operation can appear to be a digitizer failure. A list of Psuedo-hardware problems can be found in Table 1.

The repair of a defective digitizer is accomplished by replacing a digitizer assembly that is suspected of being defective with its associated kit assembly. If the replacement of the suspected assembly does NOT correct the digitizer malfunction, the next, logical, assembly should be replaced. This procedure should continue until the malfunction is corrected.

Once the digitizer has been repaired, all of the assemblies which were previously replaced in the customers digitizer should be checked by returning each assembly to the digitizer one at a time. (Do not, however, return the original defective assembly to the customers digitizer.) If the digitizer should fail when an assembly has been returned to the customers unit, it should also be replaced with its associated kit assembly.

The digitizer assemblies are exchanged on the -hp- Blue Stripe Exchange Program, and, when found to be defective, should be returned to CSC for credit on a replacement assembly for your service kit.

A trouble-shooting tree is provided to assist in the identification of the defective assembly. Virtually any defective assembly can be found if the trouble-shooting tree is properly used.

SERVICING THE DIGITIZER

ASSEMBLY ACCESS

The 9864A mainframe assemblies are accessable through the back of the digitizer mainframe. Below is the mainframe assembly access procedure:

1. Remove the assembly access cover from the 9864A back panel by removing the four screws that hold it on the back panel

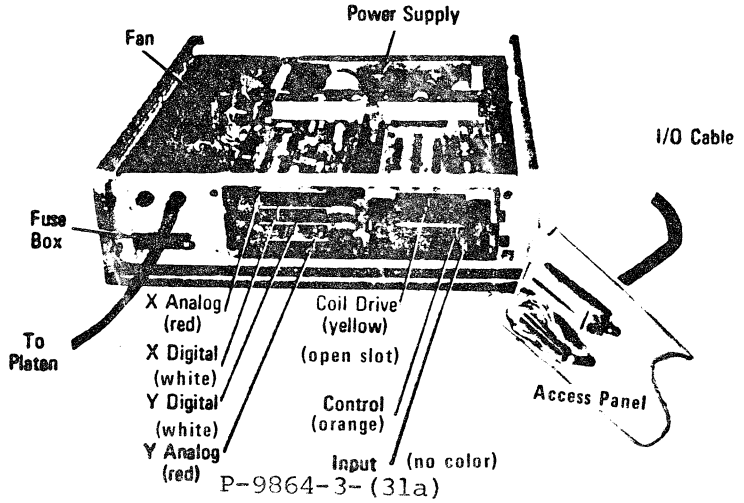
NOTE

Insure that both the digitizer and calculator have been switched 'OFF' before beginning this procedure.

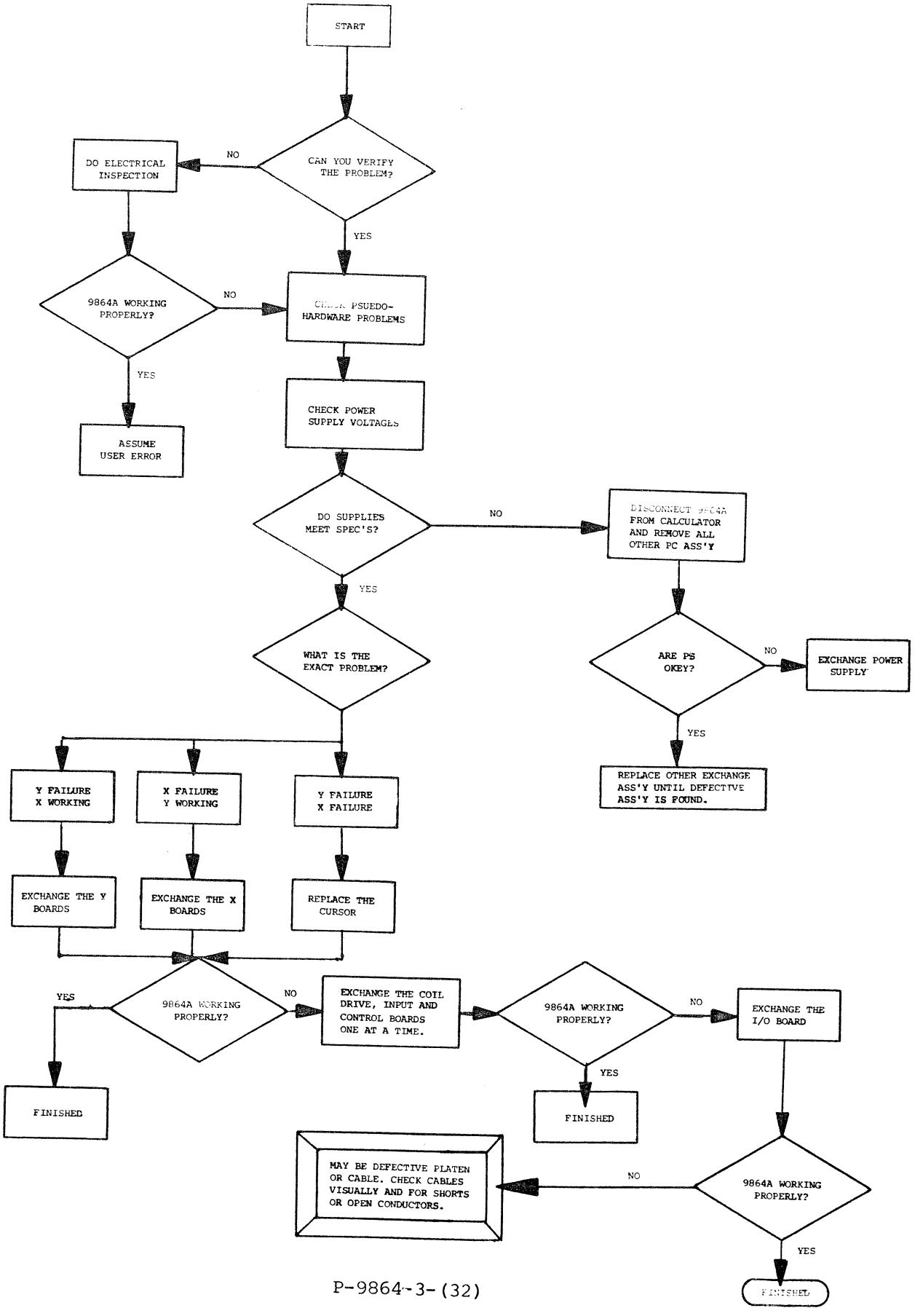
2. Perform the assembly replacement procedure using the 9864A Troubleshooting Tree.
3. Insure that all assemblies have been installed in the digitizer, and perform the checks in the Electrical Inspection Procedure.
4. Replace the assembly access cover.

The I/O card is replaced by removing the I/O assembly cover and exchanging the defective card with the kit card.

A complete description of power supply replacement is given beginning with page 34.



9864A DIGITIZER TROUBLESHOOTING TREE

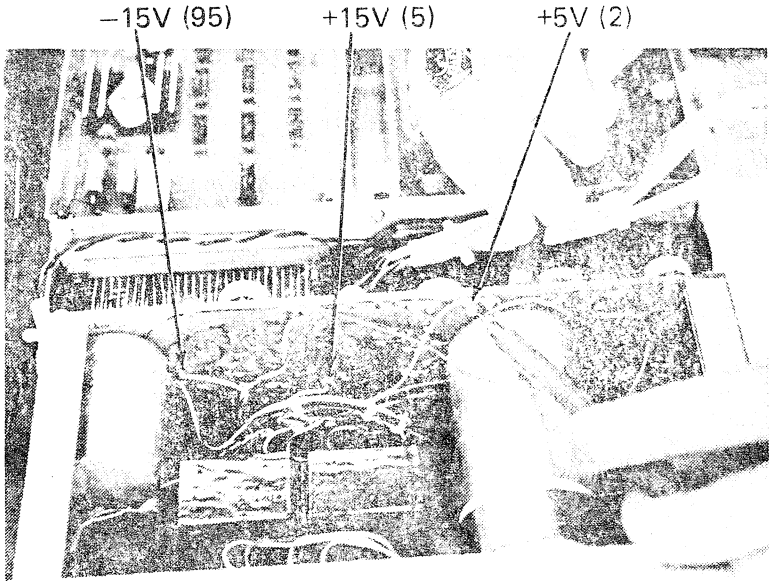


POWER SUPPLY TEST

To test the power supply, first remove the instrument top cover. Using an -hp- 427A voltmeter, measure the power supply voltages as shown in Figure 11. Refer to Figure 12 for the proper grounding point.

CAUTION

AC LINE POWER IS PRESENT IN THE POWER SUPPLY CAGE.



POWER SUPPLY TEST VOLTAGES AND TOLERANCES

Supply	Tolerance
+15V	±.5V
+ 5V	±.25V
-15V	±.5V

FIGURE 11.
POWER SUPPLY TEST POINTS

POWER SUPPLY TEST

If the power supply voltages do not meet the specifications in Figure 11, refer to Figure 12 for the power supply adjustments.

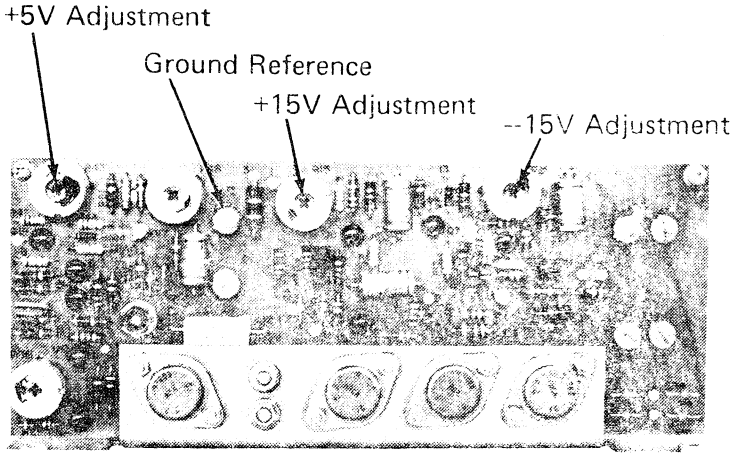


FIGURE 12
POWER SUPPLY ADJUSTMENTS AND GROUND POINT

Each supply may be adjusted independently and the adjustments should not interact. If the power supply cannot be adjusted to the specifications given in Figure 11, the power supply should be replaced.

POWER SUPPLY REPLACEMENT

The following procedure should be followed when exchanging the 9864A power supply.

1. Disconnect the AC power cord with both the Calculator and Digitizer switched 'OFF'.
2. Remove the 9864A top and bottom covers.
3. Disconnect the two connectors in the power supply cabling.
4. Turn the 9864A on its side and remove the four screws in the bottom of the power supply.
5. Turn the 9864A upright again.

6. Tip the power supply assembly up and out as shown in Figure 13.

FIGURE 13
REMOVING THE POWER SUPPLY

CAUTION
USE EXTREME CARE WHEN REMOVING THE POWER SUPPLY, THE WIRE-WRAP TERMINALS ON THE 9864A BACKPLANE ARE LONG, FRAGILE, AND EASILY BENT. AFTER REPLACING THE POWER SUPPLY, THOROUGHLY EXAMINE THE BACKPLANE FOR BENT TERMINALS. IF ANY TERMINALS ARE SHORTED, CAREFULLY STRAIGHTEN THEM.

7. Reverse steps 1 through 6 to install the replacement power supply.

8. If the power supplies fail when the power supply assembly has been replaced, remove all of the other PC boards and disconnect the digitizer from the calculator. Check each power supply for shorts.

PSUEDO-HARDWARE PROBLEMS

SYMPTOM	REMARKS
Digitizer is "dead": no entries and the LINE lamp is not on.	Is there AC power at the wall socket? Is the digitizer fuse blown?
Digitizer is "dead": no entries but the LINE lamp is light.	Are the cables connecting to the platen switched? Is the I/O card plugged into the calculator? Is the calculator ON?
Digitizer "Beep"s okey, but does not enter coordinates.	Did the user use proper addressing? Was the sample light ON prior to the expected entry?
Sample light does not come on when the digitizer is initially switched ON.	Was the cursor on the digitizing surface? If so, this may occur once in a while due to internal timing. Press O and proceede.
While digitizing in the continuous mode, the sample rate is nto the same for every program, or even differs in one program.	Sample time is directly proportional to execution time of the calculator. NORMAL OPERATION
A STOP in a program does not cancel the continuous mode.	NORMAL OPERATION
Sample light dois not come on when O is pressed, and possibly a "Beep" occurs for the length of time O is pressed	Cursor is off the surface, on to thick of a material, or on magnetic material.
Excessive error in the computed results	Possible operator error. Perform ACCURACY CHECK
Calculator display goes blank momentarily when digitizer is switched OFF.	NORMAL OPERATION

9864A DIGITIZER
REPLACEABLE PARTS LIST

-hp- PART NO.	TQ	DESCRIPTION
09864-90000	1	Peripheral Manual
09864-90001	1	Service Manual
09810-90073		Peripheral Control (Digitizer Chapter)
09864-90069		Sample Program Card
09107-90002		Sample Overlay
2140-0244	1	Lamp, Neon
2110-0303	1	Fuse, 2A (120V operation)
2110-0312	1	Fuse, 1A (240V operation)
09107-69507	1	Digitizing Table (Platen)
09107-61601	1	Interconnecting Cable
09107-69101	1	Cursor
09107-69503	1	Coil Drive Board
11204-69001	1	Power Supply Board
09107-69501	2	Analog Axis Boards
11204-69501	2	Digital Axis Boards
11204-69502	1	Control Board
11204-69503	1	Input Board
11204-69591	1	I/O Card
09864-00201	1	Panel; Front
09864-00202	1	Panel; Rear
09864-00203	1	Panel; access
11200-0401	1	Cover; I/O
11251-2188	1	Connector; PC (2X18)
1450-0153	1	Lamp Holder
1450-0157	1	Lens; Lamp holder
3101-1394	1	Switch; pushbutton
3160-0209	1	Fan
5040-5911	1	Boot; bottom
5040-5948	1	Boot; cable
5060-0222	1	Handle Ass'y
5060-0732		Frame Ass'y
5060-0767		Foot Ass'y
0960-0443		Power Module
7120-1254		Plate; Identification
7124-1651		Cable; info.
7124-1654		I.D. Plate
8120-1378		Cable; AC power
11258A		9107A UPDATE KIT (TO 9864A Service Kit)
11259A		9864A SERVICE KIT

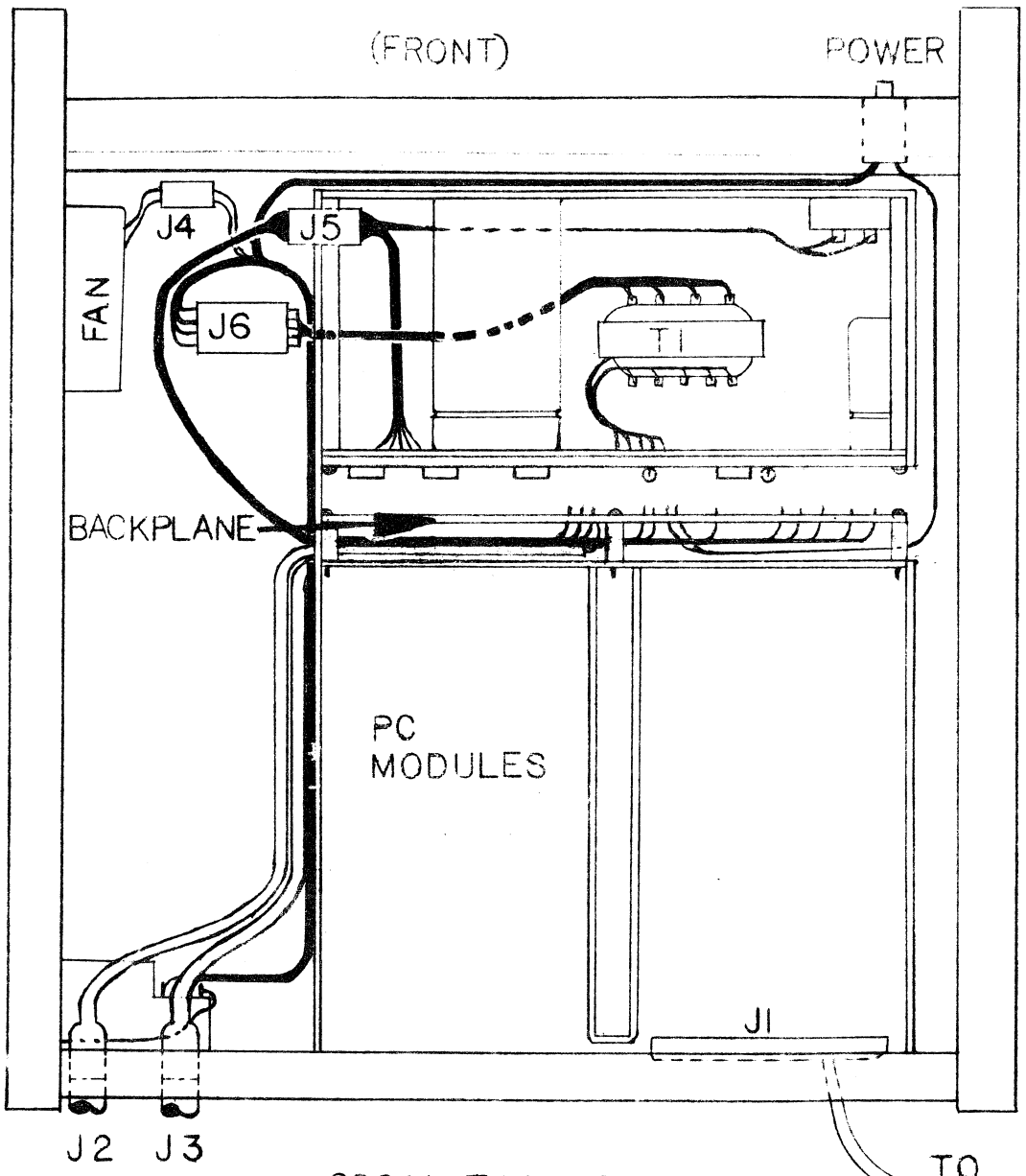
11259A SERVICE KIT

-hp-PART NO.	TQ	DESCRIPTION
09864-90001	2	9864A Service Manual
11204-69001	1	Power Supply (BENDIX 2426445)
11204-69501	1	Digital Axis Board
11204-69502	1	Control Board
11204-69503	1	I/O Board
11204-69591	1	Interface Board
09107-69101	1	Cursor
09107-69503	1	Coil Drive Board
09107-69501	1	Analog Axis Board
9211-1396	8	Carton
09107-90002	1	Sample Overlay

-

11258A Service Kit
(updates 9107 to 9864A)

-hp- PART NO.	TQ	DESCRIPTION
09864-90001	2	9864A Service Manual
11204-69001	1	Power Supply (Bendix 2426445)
11204-69501	1	Digital Axis Board (Bendix 2426576)
11204-69502	1	Control Board (Bendix 2426580)
11204-69503	1	I/O Board (Bendix 2426584)
11204-69591	1	Interface Board
9211-1396	4	Carton
09107-90002	1	Sample Overlay



9864A TOP VIEW
WIRING DIAGRAM

WIRING DESTINATIONS
AND COLORS

Pin No.	Color	From	To
J1			
1,2,A,B	Shield	INTER-	I/O Pins 1,2,A,B
3	Orn	CONNECTING	x
C	Yel		20
4	Blk/Gry/Wht		T
D	Brn/Red/Wht		16
5	Vio/Wht		E
E	Gry/Wht		5
6	Blk/Vio/Wht		H
F	Blk/Brn/Wht		7
7	Blk/Blu/Wht		U
H	Grn		17
8	Blk/Red/Wht		N
J	Blk/Orn/Wht		12
9	Grn/Wht		Y
K	Blu/Wht		21
10	Blk/Yel/Wht		Z
L	Blk/Grn/Wht		22
11	Gry		V
M	Wht		18
12	Yel/Wht		K
N	Blk		9
13	Blu		J
P	Vio		8
14	Brn		L
R	Red		10
15	Blk/Wht		M
S	Brn/Wht		11
16	Red/Wht		W
T	Orn/Wht		19
J2			
		(PLATEN Pin No.)	BACKPLANE
1	Red	1	R
3	Blu	3	H
6	Grn	6	Coil Drive
7	Wht/Grn	7	Coil Drive
8	Wht/Red	8	CUR GND
9	Wht/Blu	9	SON GND
10	Brn	10	1
11	Wht/Brn	11	2
12	Blk	Shield	C

WIRING DESTINATIONS
AND COLORS

Pin No.	Color	From	To
J3			
		(PLATEN Pin No.)	BACKPLANE
1	Red	1	yd
3	Blu	3	xa
6	Grn	6	ya
7	Wht/Grn	7	yb
8	Wht/Red	8	yc
9	Wht/Blu	9	xb
10	Brn	10	xc
11	Wht/Brn	11	xd
12	Blk	Shield	xe
J4			
		POWER MODULE	
	Blk/Red	Pin 6	FAN
	Wht/Grn/Gry	Pin 3	FAN
J5			
		POWER SUPPLY	BACKPLANE
1,2	Grn	+15V DC	A+ 15, D+ 15
3	Red	+ 5V DC	+5
4,5	Wht/Blk	analog gnd	A GND, D G
6	Blk	digital gnd	DIG GND
7,8	Wht/Grn	-15V DC	A- 15, D- 15
9	Orn	+5V BULK	+5V BULK
10	GRN	Backplane S	Beeper
11	Wht/Blk	J5 pin 6	Beeper gnd
J6			
		POWER MODULE	T1
	Blk/Red	pin 6	pin 4
	Wht/Grn/Gry	pin 4	pin 3
	Wht/Yel	pin 7	pin 2
	Blk	pin 3	pin 1
POWER SWITCH			
	Red	Backplane :panel lamp	
	Blk	Backplane :panel lamp	
	Gry	Power Module pin 2	
	Wht/Brn/Gry	" " Filter	
	Wht/Gry	" " Filter	
	Wht/Red/Gry	" " pin 5	

PART NO. 09864–90001

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