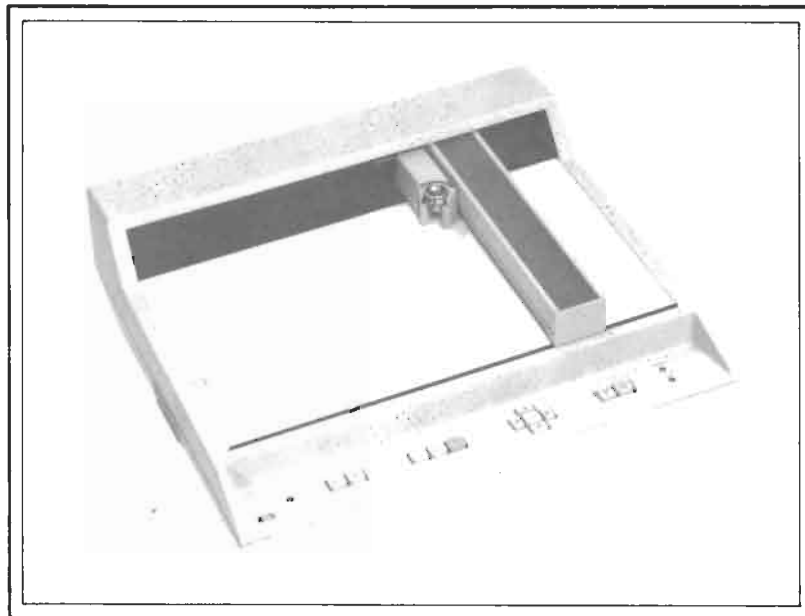


7225

GRAPHICS PLOTTER



7225

Section I

Section I

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SECTION I

PRODUCT INFORMATION

1-1. PRODUCT DESCRIPTION

1-2. The Model 7225A or Model 7225B is a microprocessor controlled graphics plotter which produces high quality graphic plots of computer program output data. Linear stepper motors are used to accomplish addressable moves, and accelerometers are used in feedback circuits to dampen the system and improve the line quality.

1-3. The Model 7225A/B requires one of the following plug-in I/O modules:

<u>MODULE</u>	<u>MODEL NO.</u>
General I/O	17600A
HP-IB I/O	17601A
Parallel I/O	17602A
RS-232-C/CCITT V.24 (Hardwired System)	17603A
RS-232-C/CCITT V.24 (Modem/Hardwired System)	17604A

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SECTION II

INSTALLATION

2-1. VERIFICATION

2-2. A pushbutton switch on the rear of the plotter allows the user to initiate the confidence test. Pressing this switch causes a sequence to be initiated in which:

- All front panel indicators are momentarily turned on.
- The plotter executes an initialization sequence.
- A fan-shaped test plot is drawn.
- The text "END OF TEST" is printed (only if a properly operating I/O module is installed).

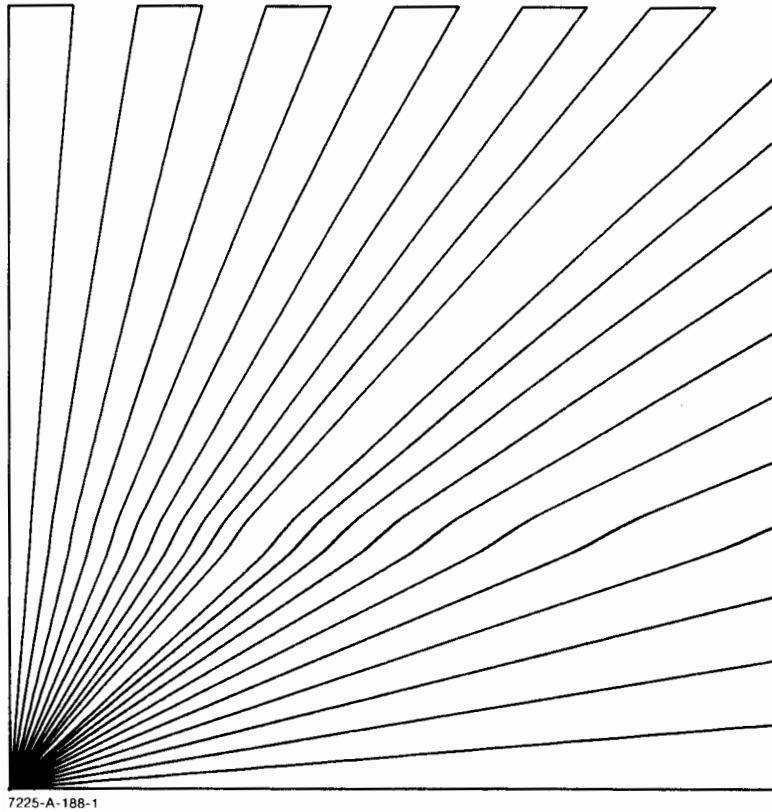
2-3. Perform the Confidence Test with paper and a new pen installed. The fan portion of the test checks the servo processor, motor drive, and feedback circuits of the main PCA, along with the motors and accelerometers. The text verifies the operation of the I/O module and its interface with the plotter. Figure 2-1 is a sample confidence test plot.



NOTE

The text "END OF TEST" is only printed when a functionally operational I/O module is installed in the plotter.

END OF TEST



7225-A-188-1

Figure 2-1. Confidence Test Plot

SECTION III

CONFIGURATION

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SECTION IV

TROUBLESHOOTING

4-1. PRELIMINARY CHECKS

4-2. Make sure all cable connectors are seated properly and that the I/O module (if present) is properly installed. Also make sure the microprocessor is seated firmly in its socket. Screws at the left end of the front panel PCA must be tight to ensure good connection to the main PCA. Tables 4-1 through 4-3 list possible problems and causes.



Table 4-1. Turn-on Problems

SYMPTOMS	CAUSES/CURES
No indicator lights and no motor response.	Line fuse. Power supply failure. +5 V fuse is on main PCA near I/O module. Excessive load on ± 20 V supplies. Check motor drivers and/or ± 20 V balance circuits.
Line indicator ON but no motor response.	Power supply failure. Motor drive logic. 4 MHz clock or timing circuits.
Pen carrier moves to upper right but either X or Y motor chatters against stop instead of moving to proper initialized position.	X or Y limit switch circuit. Check switch and continuity through cables to processor.
No X motor movement or erratic movement. Y motor appears normal.	X SIN or COS drive circuit. Check drive circuits, continuity through cable, and fuses. In the 7225A, fuses are on cable PCA under upper deck. In the 7225B, fuses are on the main PCA.
No Y motor movement or erratic movement. X motor appears normal.	Y SIN or COS drive circuit. Check drive circuits, continuity through cable, and fuses. In the 7225A, fuses are on cable PCA under upper deck. In the 7225B, fuses are on the main PCA.

Table 4-2. Pen Lift Problems

SYMPTOMS	CAUSES/CURES
When pen is up, does not clear the paper in some (or all) areas.	Contamination on chart table. Chart hold circuit. Pen height adjustment incorrect. X motor stator misaligned.
When pen is down, skips some areas or trace is too light.	Pen running out of ink. Pen height adjustment incorrect. X motor stator misaligned.
Pen does not respond to PEN DOWN key.	Pen drive circuit or solenoid. PEN DOWN key switch defective. Pen control buffer: U30 in 7225A U14 in 7225B
Pen does not respond to PEN UP key.	Pen carrier return spring. Replace pen carrier. Pen control buffer: U30 in 7225A U14 in 7225B

Table 4-3. Operating Problems

SYMPTOMS	CAUSES/CURES
Does not respond to one or more front panel keys or response is intermittent.	Defective switch. Replace front panel PCA. Poor connection between front panel PCA and main PCA. Make sure connector contacts are clean and front panel PCA mounting screws are tight. Replace main PCA
Does not respond to any front panel key.	If an I/O module is installed, remove it, then check front panel key operation. If correct, replace module. If no response with no module installed, replace main PCA.
Paper does not adhere properly to table.	Contamination on table. Chart hold circuits.
Wavy or irregular plot lines.	Refer to Section V.

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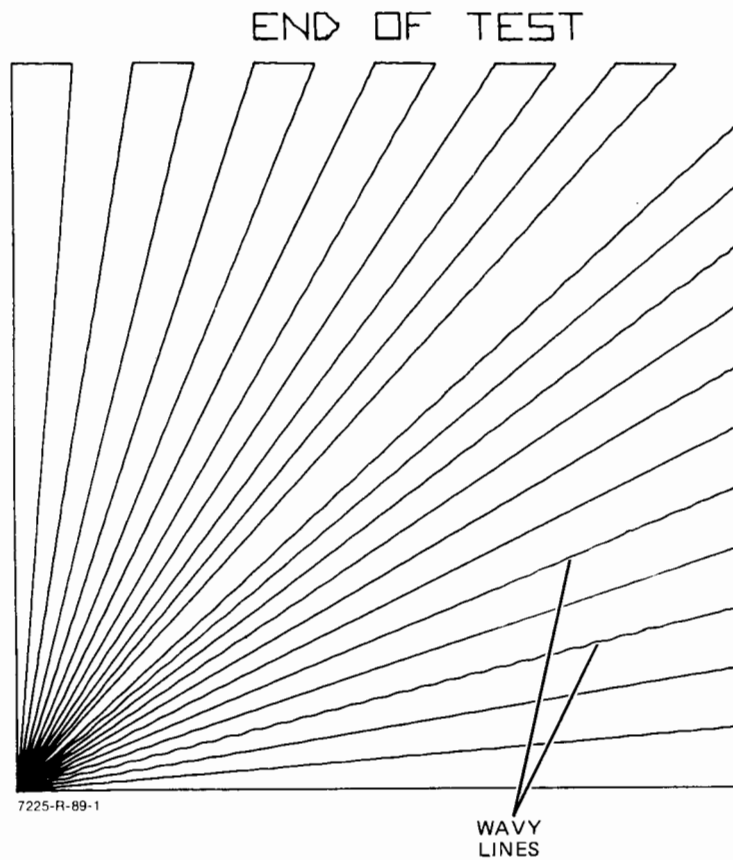
SECTION V

DIAGNOSTICS

5-1. CONFIDENCE TEST IRREGULARITIES

5-2. Certain irregularities in the confidence test plot give an indication of the source of problems. Some possible symptoms are illustrated in Figures 5-1 through 5-5. "END OF TEST" is printed only when an operating I/O module is installed

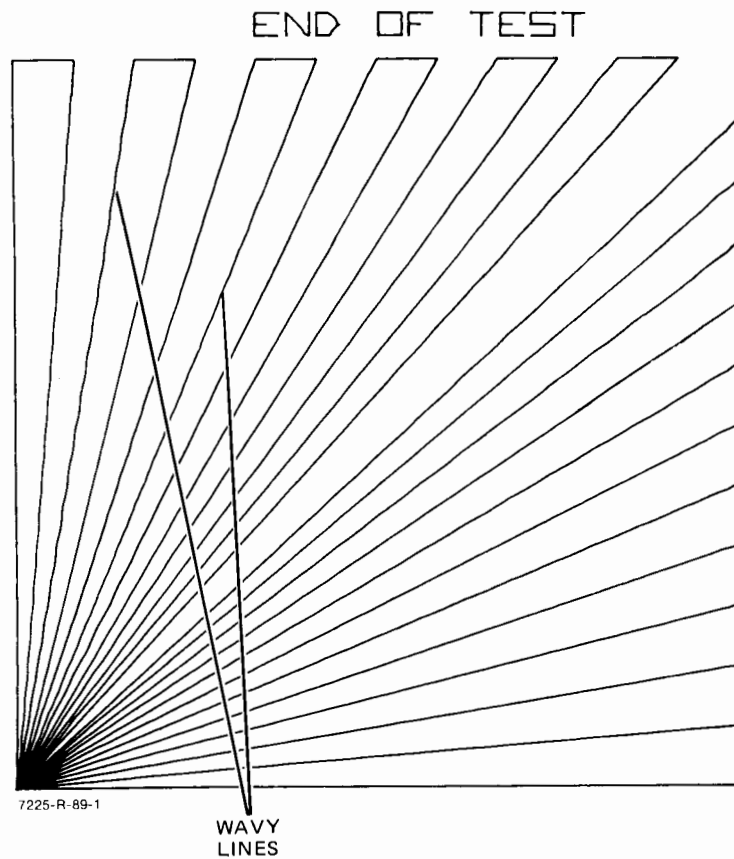




Vertical lines are straight but other lines are wavy, particularly those 5° to 20° from horizontal.

Y accelerometer signal is missing. The problem could be in the Y accelerometer, the Y motor cable, cable connections, or U11.

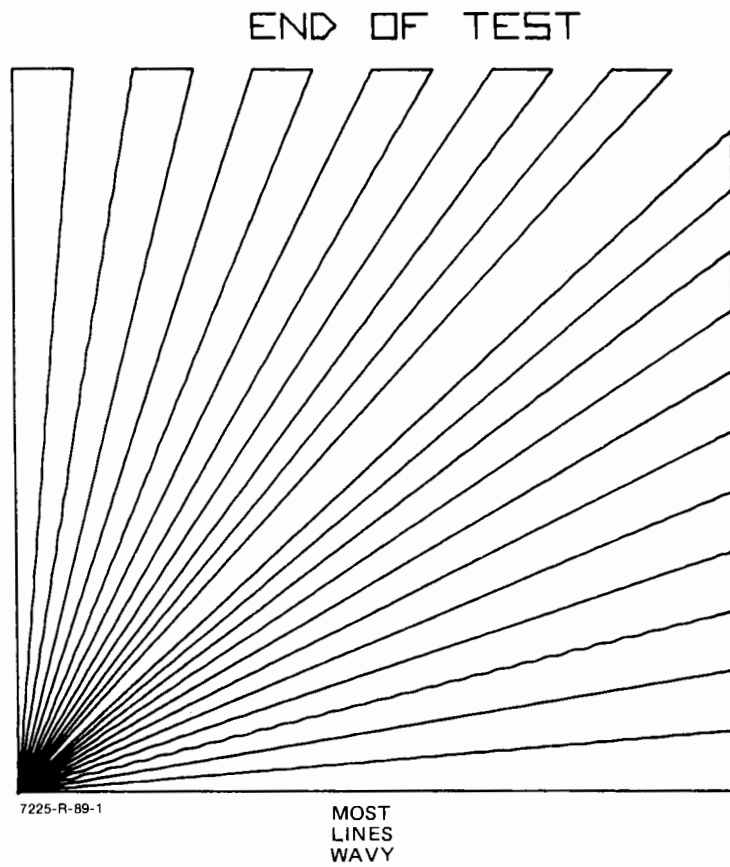
Figure 5-1. Y Accelerometer Signal



Horizontal lines are straight but other lines are wavy, particularly those 5° to 20° from vertical.

X accelerometer signal is missing. The problem could be in the X accelerometer, the X motor cable, cable connections, or U11.

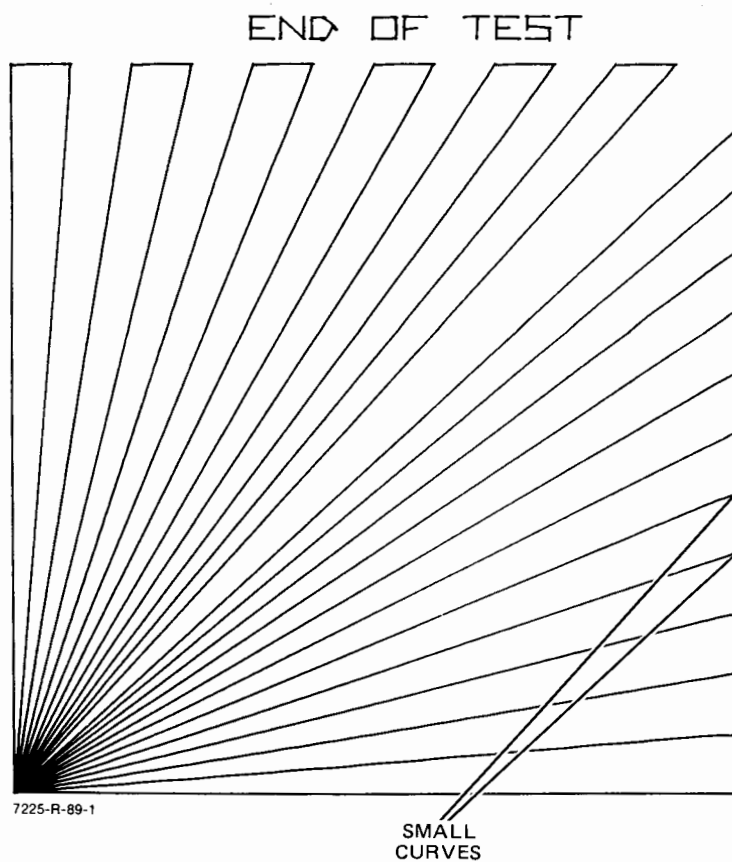
Figure 5-2. X Accelerometer Signal



No velocity feedback to phase step data.

Check X/Y velocity multiplexer U43, A/D converter circuits U42C, U40, U13, U5, U36, and adder U21.

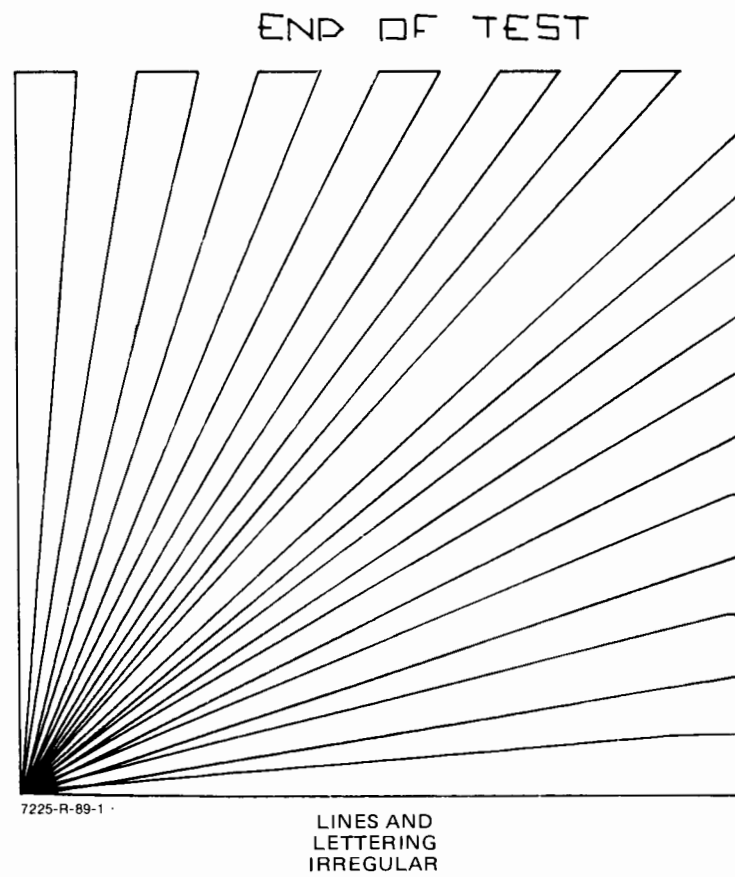
Figure 5-3. Velocity Feedback



Small overshoot or curve at beginning and/or end of straight lines.

Compensation signals are missing. Check compensation demultiplexer U41, multiplexer U22, timing and control circuits U32, U37, U33, U15.

Figure 5-4. Compensation Signals



Pen side play adjustment loose. See Adjustment in Section VI.

Figure 5-5. Pen Side Play

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SECTION VI

ADJUSTMENTS

6-1. MECHANICAL ADJUSTMENTS

6-2. The following mechanical adjustments are described in this section:

X Motor Stator Alignment

Pen Holder Adjustment

Pen Down Adjustment

Pen Lift Adjustment

Pen Side Play Adjustment

Pen Arm (Y Stator) Alignment

X Limit Switch Adjustment



6-3. ORDER OF ADJUSTMENTS

6-4. Certain adjustments must be preceded or followed by certain other adjustments. These requirements are noted in the procedures.

6-5. TOOLS REQUIRED

<u>TOOL</u>	<u>PART NO.</u>
Allen hex wrench 7/64 in.	8710-0096
Tension gauge	8750-0086
Feeler gauges 1.0 to 1.5 mm (0.040 to 0.060 in.)	N.A.
Scale (English or metric)	N.A.
Optical comparator	Bausch & Lomb 81-34-35

6-6. X MOTOR STATOR ALIGNMENT

6-7. This procedure should be performed any time the X motor stator is replaced or is out of alignment.

- a. Remove top cover and Y stator (pen arm) cover.
- b. Position the Y stator at the left edge of the platen with the Y motor (pen holder) about 5 cm (2.0 in.) up from the bottom of the Y arm.
- c. Measure the distance from the platen to the upper surface of the Y stator at the top and bottom of the platen. This should be 9.90 mm $\pm$ 0.25 mm (0.39 in. $\pm$ 0.01 in.).
- d. If adjustment is required, use a 7/64 in. hex key wrench and loosen the X motor stator screws. See Figure 6-1.

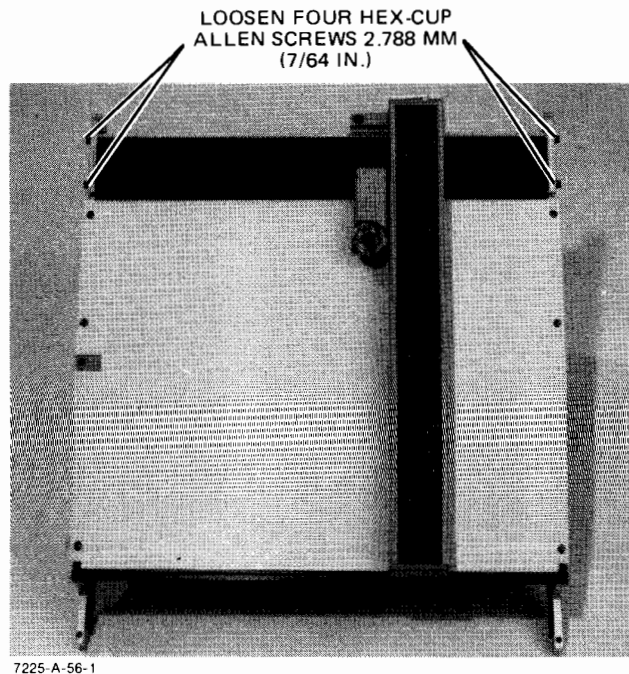


Figure 6-1. X Motor Stator

- e. With the scale placed near the top edge of the platen, raise or lower the X stator until the upper surface of the stator is 9.90 mm $\pm$ 0.25 mm (0.39 in. $\pm$ 0.01 in.) above the platen. See Figure 6-2. Snug tighten the hex cup screw nearest the platen.

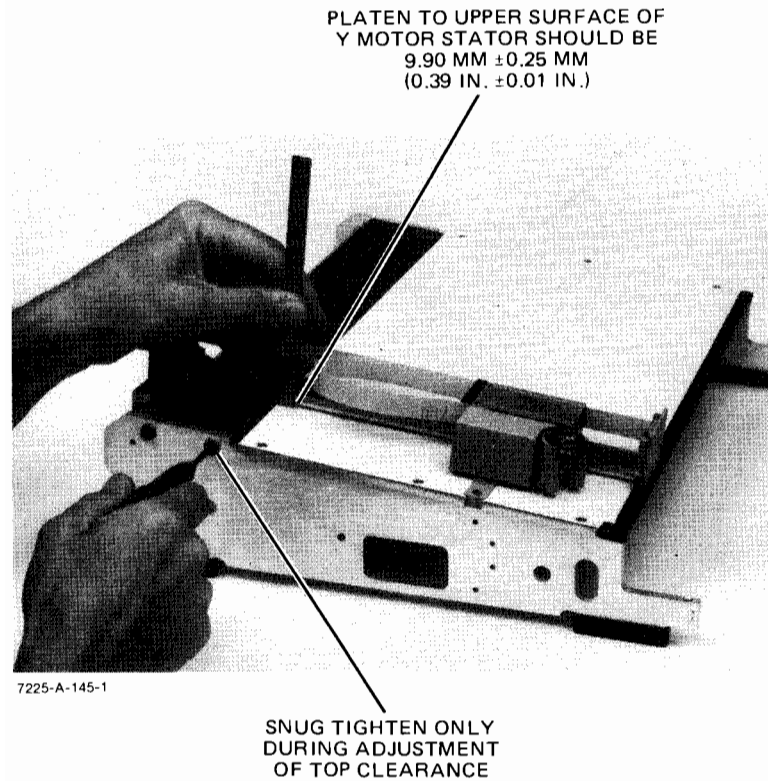


Figure 6-2. Top of Table

- f. With the scale placed near the bottom edge of the platen (see Figure 6-3), lightly twist the X stator until the upper surface of the Y stator is $9.90 \text{ mm} \pm 0.25 \text{ mm}$ ($0.39 \text{ in.} \pm 0.01 \text{ in.}$) above the platen. Snug tighten the other hex cup screw.

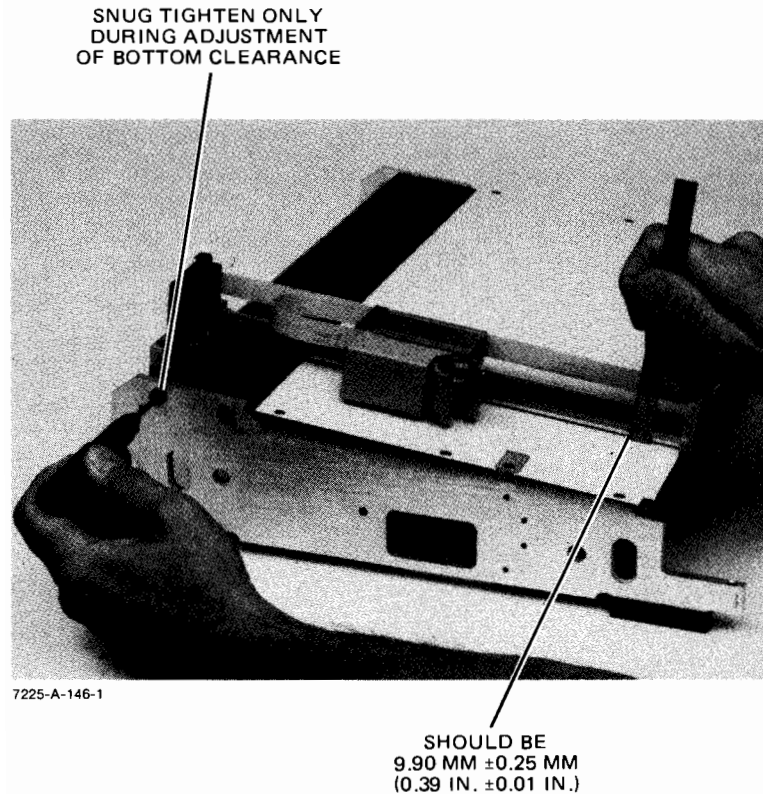


Figure 6-3. Bottom of Table

- g. Move the Y stator to the right end of the platen and repeat the two previous steps, tightening the screws at the right end of the stator.
- h. Recheck the measurements at the four points and, if correct, tighten all four screws securely.
- i. After the X motor stator alignment has been changed, the Pen Down and Pen Lift adjustments must be checked.

6-8. PEN HOLDER ADJUSTMENT

6-9. This adjustment sets the pen lift assembly height in relationship to the solenoid plate.

- a. Remove the top cover and Y stator (pen arm) cover.

- b. Remove the solenoid cover (two 2-56 screws). See Figure 6-4.

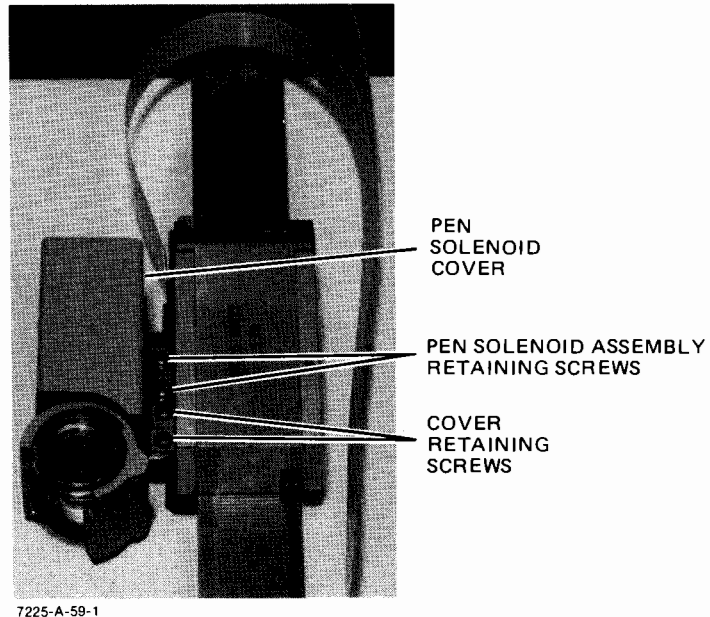


Figure 6-4. Pen Holder Access

- c. Remove the solenoid assembly from the Y motor (two 2-56 screws).
- d. Loosen the pen holder adjustment screws holding the pen lift assembly to the solenoid plate. See Figure 6-5.

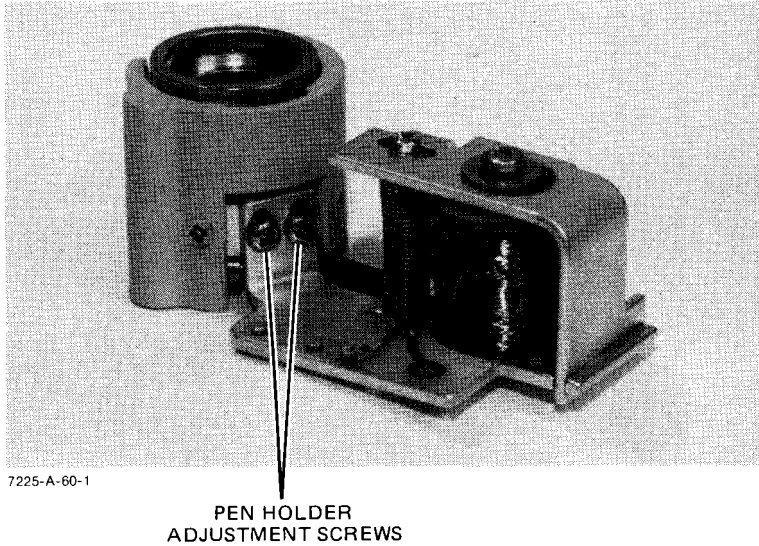
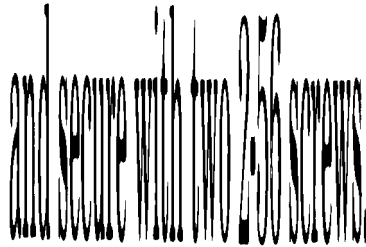


Figure 6-5. Pen Holder Alignment

- e. Position the pen lift assembly to center the screws in the slots in the solenoid plate.
- f. Align the pen lift assembly so that it is perpendicular to the solenoid plate.
- g. Securely tighten the screws making certain that the alignment does not change.
- h. Return the solenoid assembly to its position on the Y motor



- i. Perform the Pen Down and Pen Lift adjustments.

6-10. PEN DOWN ADJUSTMENT

6-11. This adjustment positions the pen so that when it is down, it will contact all points on the chart paper.

- a. Remove top cover and Y stator (pen arm) cover.
- b. Remove the solenoid cover.
- c. Apply ac power to the plotter.

- d. Load chart paper and install a new pen.
- e. With the pen positioned at the lower left corner of the platen, press the PEN DOWN key.
- f. With the pen tip resting on the paper, use a round wire feeler gauge and check the clearance between the pen slider and the pen-lift extension at each corner of the platen. The clearance should be between 1.0 mm and 1.5 mm (0.04 in. and 0.06 in.). See Figure 6-6.

NOTE

If a round feeler gauge is not readily available, a jumbo size paper clip can be straightened out and used as a substitute gauge.

- g. To adjust for correct clearance and/or proper pen contact with the paper, loosen the screw securing the lift extension to the solenoid top plate.
- h. Slide the pen-lift extension up or down to obtain proper clearance and/or pen contact and tighten the lift extension mounting screw.
- i. Recheck the clearance and pen-to-paper contact at each corner of the platen, and repeat adjustment if necessary.



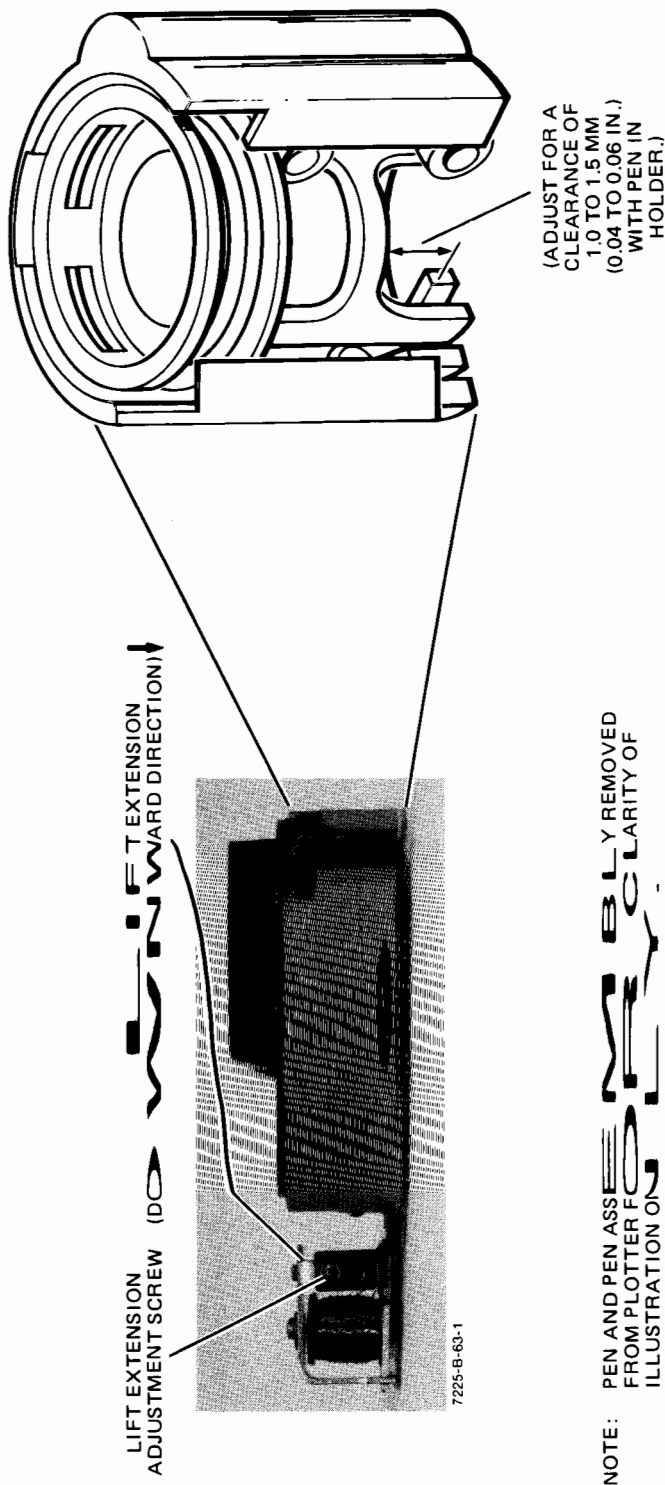


Figure 6-6. Pen Down Adjustment

6-12. PEN LIFT ADJUSTMENT

6-13. With the pen in the UP position, a clearance of between 1.0 mm and 1.5 mm (0.040 in. and 0.060 in.) should exist between the pen tip and all points on the chart paper. See Figure 6-7. If clearance is incorrect, adjust the pen lift as follows:

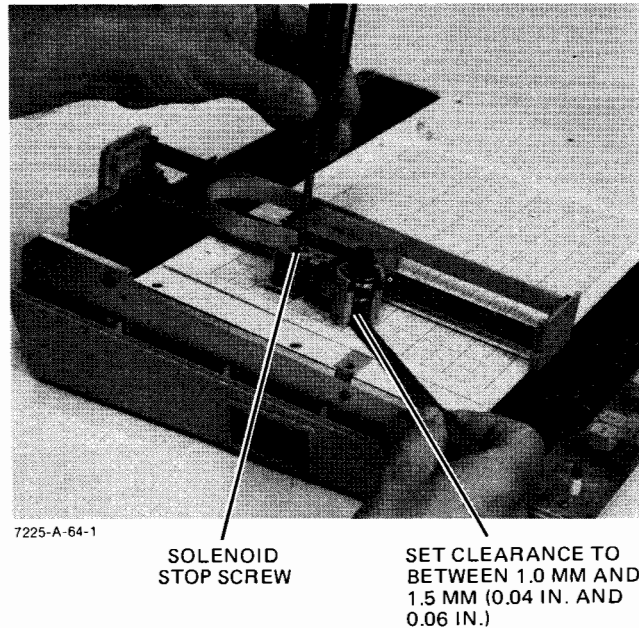


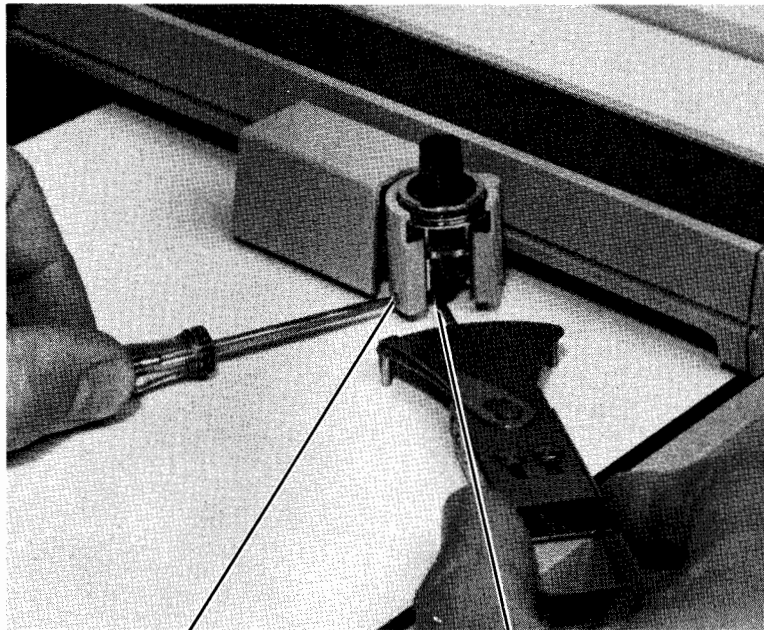
Figure 6-7. Pen Lift Clearance

- a. Remove top cover and Y stator (pen arm) cover.
 - b. Remove the solenoid cover.
 - c. With the pen in the UP position, use a round feeler gauge (see Pen Down Adjustment and NOTE) to determine pen lift clearance. Adjust the solenoid stop screw on the solenoid top plate for a clearance of 1.0 mm to 1.5 mm (0.04 in. to 0.06 in.).
 - d. Set for correct pen lift clearance by adjusting the solenoid stop screw which is located on the solenoid top plate.
 - e. Check the clearance at each corner and the center of the chart paper to assure proper overall clearance. Repeat adjustment if necessary.
- 6-14. PEN SIDE PLAY ADJUSTMENT
- 6-15. This adjustment minimizes pen wobble which causes irregular plotting.

CAUTION

Excessive tightening of the side play adjustment setscrew can cause binding of the pen lift or damage to the mechanism.

- a. Load chart paper to prevent marking the platen, and install a pen.
- b. Using a spring tension gauge, apply a force of 45 grams to the side of the pen tip. Push pen tip to the right (away from the adjustment screw). See Figure 6-8.



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ROTATE SIDE PLAY
ADJUSTMENT SCREW
TO OBTAIN 45 GRAMS
OF SIDE PRESSURE

PLACE TENSION GAUGE
BLADE AGAINST BOTTOM
OF PEN BODY

Figure 6-8. Pen Side Play

- c. If pen side play is observed, tighten the adjustment setscrew gradually until no play is observed.

- d. Recheck side play with a force of 45 grams from one or two angles to assure correct adjustment. *Do not overtighten.*
- e. To verify correct pen side play adjustment, install an I/O module and perform the Confidence Test. The quality of the lettering in the "END OF TEST" text will verify correct adjustment.

6-16. PAPER GUIDE ALIGNMENT

- a. Remove the top cover.
- b. Loosen the paper guide screws and position the guide against the platen edge.
- c. Tighten the paper guide screws.
- d. Apply ac power to the plotter.
- e. Carefully load a sheet of lined chart paper, making sure the edge of the paper is against the paper guide properly.
- f. Install a new pen.
- g. Move the pen to the left edge of the chart and position it just below a horizontal grid line.
- h. Press the PEN DOWN key.
- i. Plot a horizontal line across the full width of the chart paper by holding down the FAST and → pushbuttons simultaneously.
- j. Press PEN UP, then UPPER RIGHT.
- k. Using an optical comparator, measure the distance between the grid line and the plotted line at both the left and right ends. Allowable difference is ± 0.13 mm (0.005 in.).
- l. If the plotted line goes up on the right end, loosen the paper guide screws and lower the left end of the paper guide slightly more than the error measured. Tighten screws. See Figure 6-9.

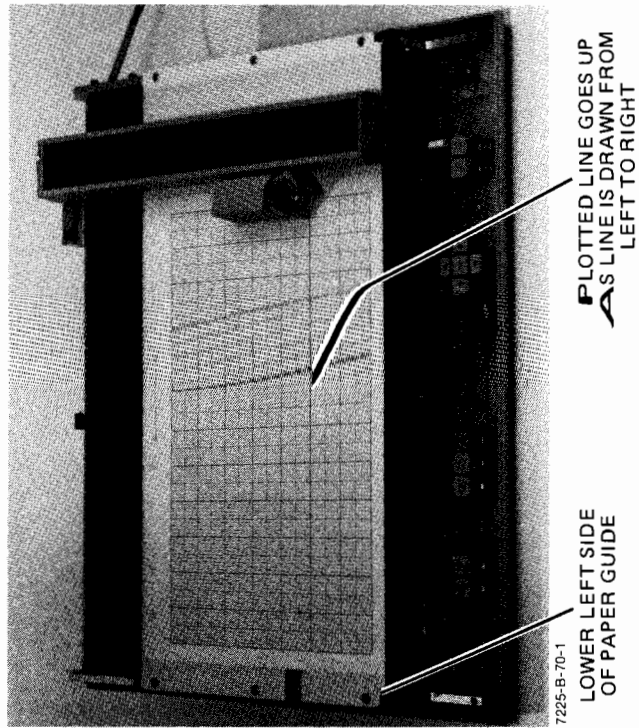
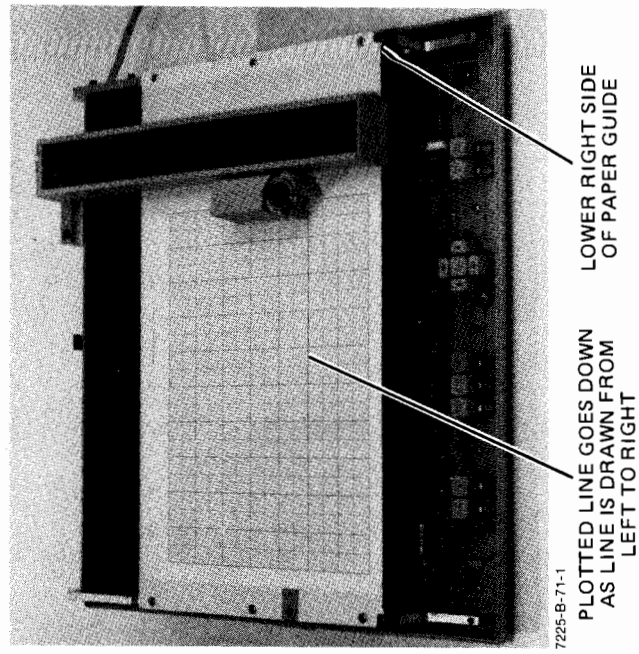


Figure 6-9. Paper Guide Alignment

- m. If the plotted line goes down on the right end, loosen the paper guide screws and lower the right end of the paper guide slightly more than the error measured. Tighten screws.
- n. Realign the chart paper to the guide and plot another horizontal line to check the paper guide alignment. Repeat alignment if necessary.
- o. Pen arm (Y stator) alignment must be checked after paper guide alignment.

6-17. PEN ARM (Y STATOR) ALIGNMENT

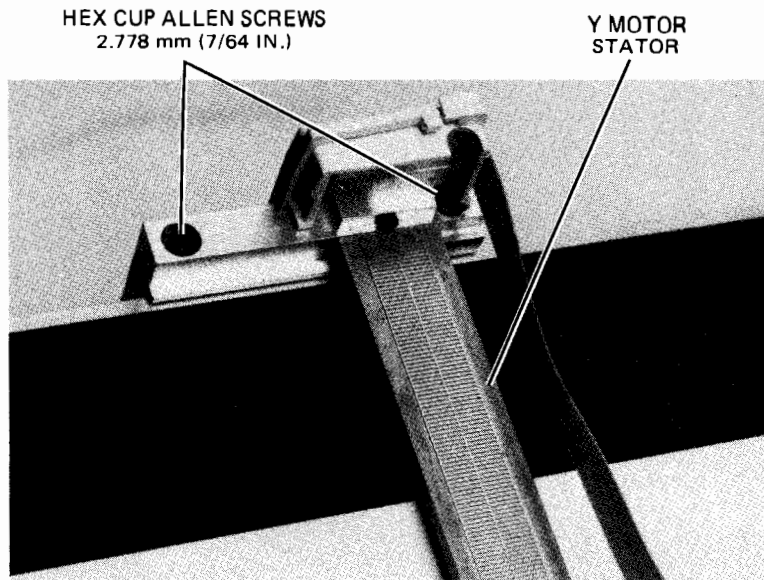
6-18. This procedure aligns the pen arm with the vertical grid lines on the chart paper.

NOTE

Paper guide alignment should always be checked before pen arm alignment is performed.

- a. Carefully load a sheet of grid chart paper onto the plotter and install a new pen.
- b. Position the pen at the upper edge of the chart next to a vertical grid line.
- c. Press the PEN DOWN key.
- d. Plot a vertical line to the bottom of the chart by holding down the FAST and ↓ pushbuttons simultaneously.
- e. Press PEN UP, then UPPER RIGHT.
- f. Using an optical comparator, measure the distance between the plot line and the grid line at both the top and bottom of the chart. Allowable difference is ± 0.13 mm (0.005 in.) or less.
- g. If pen arm alignment is required, remove the top cover and the Y stator (pen arm) cover.
- h. Using a 7/64 in. hex key wrench, loosen the two hex cup screws on the X motor. See Figure 6-10.





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Figure 6-10. Pen Arm Alignment

- i. Align the Y stator parallel to the chart grid lines.
- j. Tighten the two hex cup screws on the X motor.
- k. Repeat procedure to check the alignment.

6-19. X-LIMIT SWITCH ADJUSTMENT

6-20. This adjustment references the initial X limit of the pen arm mechanism in relation to the plotting area. This adjustment should not be required unless the switch is replaced or otherwise altered.

- a. Install a sheet of metric chart paper and install a new pen.
- b. Apply ac power to the plotter.
- c. Press ENTER, RESET, then UPPER RIGHT.
- d. Press PEN DOWN, then PEN UP to place an ink dot at the upper right of the chart paper. Press LOWER LEFT to permit viewing of the dot. It should be within 0.5 mm to the right and 2.0 mm to the left of the right hand border of the grid. If the dot is outside these limits, adjustment of the X limit switch is necessary.

NOTE

Normal adjustment consists of seating the X limit switch as fully counterclockwise in its mounting bracket holes as possible. Additional adjustment is done by carefully bending the X limit switch actuator arm to obtain the proper setting.

- e. Turn the plotter off and disconnect the power cord.
- f. Remove top cover.

CAUTION

Do not place the plotter on its side to remove the screws securing the upper deck assembly, or the cables and pen arm may be damaged when the assembly is released from the bottom cover.

- g. Extend one side (and then the other) of the plotter beyond the work surface far enough to remove the four screws underneath the plotter which secure the upper deck assembly.
- h. Lift the front edge of the chart table high enough to provide access to the two flat cables, the X limit switch cable, and the twisted pair cable to the chart table. Disconnect these cables from the main PCA.
- i. Place the upper deck assembly to the right of the lower deck assembly. See Figure 6-11.

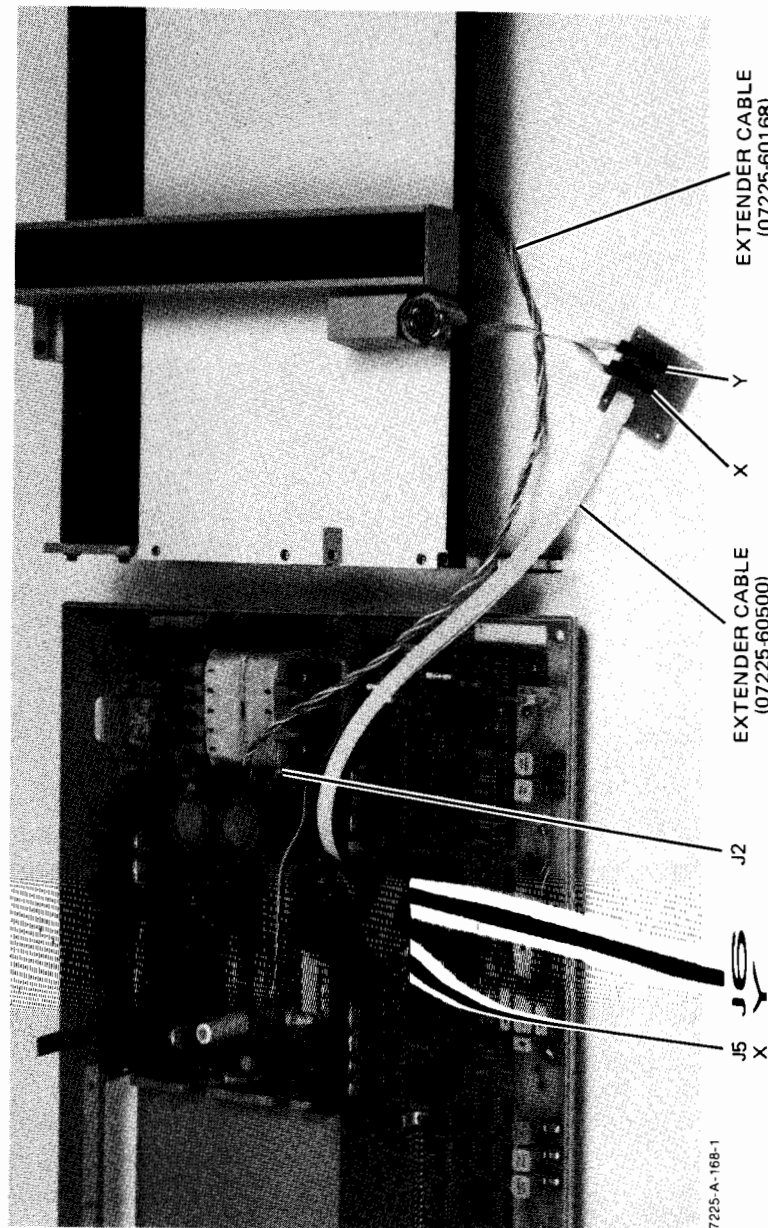


Figure 6-11. Extender Cables, 7225B

- j. Install extender cable (HP P/N 07225-60168) between the Main PCA, J2, and the X limit switch cable.
- k. Install the dual flat extender cable (HP P/N 07225-60500) between the Main PCA, J5 (X) and J6 (Y), and the X and Y motor cables.

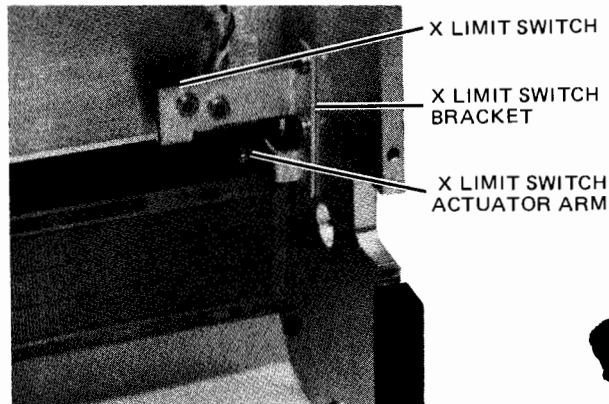
CAUTION

Make sure the X/Y extender cable is installed correctly as shown, or the plotter will not operate properly.

NOTE

For the 7225A, install the extender cable (HP P/N 07225-60115) between the Main PCA and Cable PCA beneath the table.

- l. Release the X limit switch bracket from the chassis, then loosen the two X limit switch retaining screws. See Figure 6-12. Seat the X limit switch as fully counterclockwise in its bracket holes as possible and tighten the screws.



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Figure 6-12. X Limit Switch



- m. Install X limit switch bracket to chassis.

NOTE

For proper limit switch actuation, make sure that the X limit switch actuator roller is not contacting the flat motor cables, but is contacting the X motor block. If necessary, reposition the cables for clearance.

- n. Recheck the X limit switch adjustment.

If further adjustment is necessary, perform the following:

- o. Very carefully bend the X limit switch actuator arm, either clockwise to move the reference ink dot to the left, or counter-clockwise to move the dot to the right.



Excessive bending of the actuator arm can weaken the arm and damage the switch assembly.

- p. Recheck the X limit switch adjustment and repeat if necessary.

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SECTION VII

PERIPHERALS

7-1. INPUT/OUTPUT PLUG-IN MODULES

<u>MODULE</u>	<u>MODEL NO.</u>
General I/O	17600A
HP-IB I/O	17601A
Parallel I/O	17602A
RS-232-C/CCITT V.24 (Hardwired System)	17603A
RS-232-C/CCITT V.24 (Modem/Hardwired System)	17604A



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SECTION VIII

REPLACEMENT PARTS

8-1. REPLACEMENT ASSEMBLIES

<u>PLOTTER/PLUG-IN MODEL NO.</u>	<u>EXCHANGE PCA PART NO.</u>
7225A	07225-66082
7225B	07225-66090
17600A	07225-66110 1915
17601A	07225-66081
17602A	07225-66113
17603A	07225-66123
17604A (Main PCA)	07225-66138
17604A (Eavesdrop PCA New, not exchange)	07225-60135

8-2. FUSES

8-3. LINE FUSES

<u>LINE VOLTAGE</u>	<u>RATING</u>	<u>PART NO.</u>
100 or 120 V~	1.5 AT	2110-0059
200 or 240 V~ (U.S.)	800 mAT	2110-0020
220 or 240 V~ (Europe, 5 × 20 mm)	800 mAT	2110-0496

8-4. MOTOR CIRCUIT FUSES

<u>DESIGNATION</u>	<u>CIRCUIT</u>	<u>RATING</u>	<u>PART NO.</u>
7225A:			
A3F1	X Motor	1.5 A	2110-0043
A3F2	X Motor	1.5 A	2110-0043
A3F3	Y Motor	0.75 A	2110-0063
A3F4	Y Motor	0.75 A	2110-0063
7225B:			
A1F2	X Motor	1.5 A	2110-0043
A1F3	Y Motor	0.75 A	2110-0063
A1F4	X Motor	1.5 A	2110-0043
A1F5	Y Motor	0.75 A	2110-0063

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