7220/7221

GRAPHICS PLOTTERS

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SECTION I

PRODUCT INFORMATION

1-1. DESCRIPTION

1-2. The 7220 and 7221 Graphics Plotters are serial interface devices conforming to the EIA Standard RS-232-C and the CCITT Recommendation V.24. The plotters are designed to be installed in series between the host computer and a terminal, either by means of a modem or by hardwire connection.

1-3. The 7220 plotters respond to instructions in HP Graphics Language (HP-GL), and the 7221 plotters respond to instructions in compacted binary.

1-4. The 7220A and 7220C will support the Paper Advance Feature, Models S and T, respectively. The 7221B and 7221C will also support the Models S and T of the Paper Advance. The Paper Advance consists of two electromechanical modules which advance a continuous roll of paper across the plotter and cut the completed plots under program control.

1-5. The majority of the Model C electronic circuits are on one large PCA, which greatly simplifies troubleshooting and repair in the field.

Table 1-1. Plotter Specifications

PLOTTING AREA: 40 cm × 28 cm. Platen will accommodate 11- × 17-inch or ISO A3 chart paper.

PLOTTING ACCURACY: ±0.2% of deflection. ±0.2 mm (includes linearity and repeatability).

REPEATABILITY:
Single Pen: ±0.1 mm from any given point approached from any direction.
Pen to Pen: ±0.2 mm without resetting zero coordinates.

ADDRESSABLE RESOLUTION: 0.025 mm is the smallest addressable move.

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Table 1-1. Plotter Specifications (Continued)

ENVIRONMENTAL LIMITS:
Operating:
Temperature: 0°C to 55°C.
Humidity: 5% to 95% relative (below 40°C).
Altitude: Up to 4600 metres (15 000 feet).
Storage:
Temperature: −40°C to +75°C.
Humidity: 95% relative (below 40°C).
Altitude: Up to 15 500 metres (50 000 feet).

POWER REQUIREMENTS: 100, 120, 220, 240 Vac; −10% +5%; 48-66 Hz.
Models A and B 180 Watts maximum.
Model C 100 Watts maximum.

Table 1-2. Supplemental Characteristics

MAXIMUM VELOCITY: 360 mm/s in each axis.

PROGRAMMABLE VELOCITY: 36 speeds from 10 mm/s to 360 mm/s.

VECTOR LENGTH: Any length within the plotter's mechanical limit.

CHARACTER PLOTTING: Typically 2 characters per second for 2.5 mm characters.

CHARACTER SETS: Six resident sets: ASCII, 9825A compatible ASCII, European, Scandinavian, Spanish/Latin American sets, and Graphics Symbols sets.

PAPER HOLDDOWN: Electrostatic.

WRITING MECHANISM: Disposable fiber-tip ink pens.

WEIGHT:
Models A and B 18.2 kg net (40 lb)
Model C 18 kg net (39 lb).

DIMENSIONS:
Models A and B 189 mm high × 497 mm wide × 455 mm deep.
Model C 189 mm high × 497 mm wide × 477 mm deep.

INTERFACE: RS-232-C/CCITT V.24 asynchronous serial ASCII, full duplex Bell 103A protocol, with switch selectable baud rates of 75, 110, 150, 200, 300, 600, 1200, or 2400 baud. Two port, female 25 pin EIA connectors.

Table 1-3. Recommended Test Equipment

1. HP Model 85H Personal Computer
   HP 82939A RS-232-C Interface
   HP 82936A ROM Drawer
   00085-15003 I/O ROM
2. HP 85 Service Tape
3. Digital Multimeter
4. Extender PCA 12P 5060-5914
5. Digitizing Sight

Table 1-4. Tools Required

1. Screwdrivers
   Pozidrive
   #0
   #1
   #2 long
   Common
   Jewelers
2. Nut drivers
   3/16 in.
   1/4 in.
   3/8 in. (with hole through handle axis)
   7/16 in.
   1/2 in.
3. Open-end wrench 3/8 in.
4. Allen wrenches
   0.05 in.
   1/16 in.
   5/64 in.
   3/32 in.
   7/64 in.
   9/64 in.
5. Gram gauge
   0–150 g 8750-0091
   0–700 g 8750-0324
6. Diagonal wire cutter
7. Needlenose pliers
8. Ball Driver hex 8710-0523
9. Release Tool 09872-20043
10. Masking tape

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SECTION II

ENVIRONMENTAL/INSTALLATION/PM

2-1. LINE VOLTAGE AND FUSE SELECTION

CAUTION

Applying 220/240 V line voltage when the plotter is set for 100/120 V operation will cause damage to the plotter circuits.

2-2. When shipped from the factory, the line voltage and fuse rating are set according to the plotter destination.

2-3. The Models A and B plotters will operate with a voltage source of 100, 120, 220, or 240 Vac; −10% +5%; 48 to 66 Hz; single phase; 180 Watts maximum.

VOLTAGE	FUSE	HP P/N
100/120 Vac	F1 3.0 AT	2110-0029
	F2 0.5 AT	2110-0202
220/240 Vac	F1 1.5 AT	2110-0304
	F2 0.25 AT	2110-0201

2-4. The Model C plotter will operate with a voltage source of 100, 120, 220, or 240 Vac; −10% +5%; 48 to 66 Hz; single phase; 100 Watts maximum.

VOLTAGE	FUSE	HP P/N
100/120 Vac	1.5 A SB	2110-0304
220/240 Vac	800 mA	2110-0567

2-5. The line voltage identification plate on the rear of the plotter indicates the voltage setting and the fuse installed.

2-6. LINE VOLTAGE SELECTION

2-7. MODELS A AND B

2-8. Three switches on the rear panel are set to match the plotter primary circuitry to the applied line voltage. Before operating the

plotter with a different line voltage, change the switches as follows:

a. Switch the plotter off (O), and disconnect the power cord set and the interface cable.

b. Position the switches for the desired voltage according to the legend on the rear panel.

c. Install fuses of the correct type and rating for the new line voltage.

d. Install the correct power cord for the selected line voltage.

2-9. MODEL C

2-10. Three jumpers located on the Primary PCA, A5, are set to match the plotter primary circuitry to the applied line voltage. Before operating the plotter with a different line voltage, change the jumpers as follows:

a. Switch the plotter off (O), and disconnect the power cord set and the interface cable.

b. Open the plotter.

c. Remove the shield from the Primary PCA, A5.

d. Position the jumpers for the desired voltage according to the legend on the primary shield.

e. Install a line fuse of the correct type and rating for the new line voltage.

f. Replace and secure the primary shield.

g. Remove the line voltage plates from the rear of the plotter.

h. Rearrange and install the plates so that the new line voltage setting is visible.

i. Close the plotter, and secure the upper deck assembly and the rear hood.

j. Install the correct power cord set for the selected line voltage.

2-11. PREVENTIVE MAINTENANCE

2-12. CLEANING

NOTE

The following cleaning procedures are the responsibility of the user and have been included here for reference.

WARNING

Disconnect the plotter from the power source prior to performing any maintenance. When cleaning, apply water with a lint-free tissue. DO NOT allow water to run onto electrical components and circuits or through openings in the case as it may create a shock hazard.

Scratches or punctures in the electrostatic table may expose high voltage conductors. Plotters damaged in this way should not be operated.

2-13. GENERAL CLEANING

2-14. Clean the outer surface as follows:

a. Blow away dust accumulation, using compressed air if available.

b. Clean the outer surface of the plotter with a damp sponge or cloth. Use a mild soap and water solution if necessary. Wipe dry after cleaning.

2-15. ELECTROSTATIC TABLE CLEANING

2-16. Dust and other contaminants will lower the paper-holding capability. Although pen ink will not affect holddown performance, it may be desirable to remove ink stains as well. Cleaning moderate contamination can be accomplished as follows:

a. Prepare a mixture of 50% isopropyl alcohol and 50% water by volume, or use a commercial liquid glass cleaner.

b. Apply the alcohol/water mixture or cleaner to the surface using a lint-free tissue. Immediately wipe any moisture from the surface. Never let any liquid stand on the surface as it may become permanently damaged.

2-17. For heavier surface contamination, proceed as follows:

a. Select a lint-free cloth that will not scratch the surface, or use a disposable paper wipe.

b. Remove transparency ink with solvent (HP P/N 5060-6828) and dry thoroughly before continuing the cleaning process.

c. Dampen the cloth with warm water or alcohol, and apply a small amount of nonabrasive commercial cleanser.

d. Wipe the surface until it is clean, then rinse the cloth and wipe away any remaining cleanser from the surface. Immediately wipe any moisture from the surface.

2-18. PEN STALL CLEANING

2-19. Before using overhead transparency pens, remove any ink from the rubber caps in the pen stalls with a cotton swab and solvent. This will prevent the transfer of other inks to the plot.

2-20. AIR FILTER CLEANING

2-21. The air filter located on the rear panel should be cleaned every three months or when dirt becomes visible on the filter surface. Wash the filter in warm, soapy water and rinse. Dry the filter thoroughly before replacing.

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SECTION III

CONFIGURATION

3-1. REAR-PANEL SWITCHES

3-2. When the position of any of the plotter rear-panel switches is changed, a power-up reset (cycling the ac LINE switch off and on, or pressing the internal RESET switch) should be performed. Certain rear-panel switches are read only at power-up. This step assures that all switches are read by the plotter.

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TROUBLESHOOTING

4-1. BUILT-IN TESTS

4-2. The primary troubleshooting aid for the plotters is the built-in Self Test. The Confidence Test, which the operator may use, is also a useful aid. These two tests are described in Section V of this handbook.

4-3. REMOVAL AND REPLACEMENT OF PARTS

4-4. The following paragraphs contain information concerning the removal and replacement of mechanical parts and assemblies.

WARNING

Any adjustment, maintenance, and repair of the opened plotter under voltage should be avoided as much as possible. Capacitors inside the plotter may still hold a charge even if the plotter has been disconnected from the power source.

4-5. Before performing any of the following disassembly procedures, the following steps must be performed:

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

b. Remove the power cord set (power cable) from the plotter.

c. Disconnect the interface cable(s).

4-6. Y-DRIVE CABLE REMOVAL

4-7. To remove the Y-cable, proceed as follows:

a. Place the pen carriage at the center of the arm, and position the arm over the deck locking assembly and fasten with two 6-32 screws.

NOTE

Newer plotters (Models C and T) are not equipped with the locking assembly. On these instruments, use tape to secure the plotter arm in the position described above.

b. Remove the pen cover.

CAUTION

While performing step c., use caution not to allow the dashpot piston to come free from the assembly.

c. Remove the screw from the dashpot assembly, and carefully swing the dashpot assembly and pen carriage away from the pen arm.

d. Tape the pen carriage top assembly and dashpot assembly securely together to prevent any parts from becoming lost.

e. Pull the trailing cable cover free of the arm.

f. Remove the two nuts and the trailing cable terminator from the top of the pen carriage assembly.

g. Replace the two nuts over the pulleys finger tight.

h. Loosen the Y-axis cable tensioner, and remove the cable end from the tensioner and the lower-left stud. See Y-cable illustration.

NOTE

On plotters with a serial prefix below 2148, the Y-axis pulley #2 may also be loosened to increase the slack on the Y-axis cable.

i. Remove the Y-drive cable from the pulleys and the motor.

4-8. Y-DRIVE CABLE INSTALLATION

4-9. To install a Y-drive cable, proceed as follows:

a. Turn the Y-motor pulley so that the pin hole is directly up. Refer to the Y-axis cable illustration.

b. Insert the cable pin into the pulley hole so that the long end of the cable (crimped end) is draped over the top deck assembly.

c. Wrap the short end (looped) of the cable four turns around the pulley, wrapping away from the body and to the right of the pin.

d. Holding the long end of the cable with one hand, pull the shorter end of the cable until four turns of the cable have been wrapped around the pulley to the left of the pin. Tape these four turns securely to the pulley.

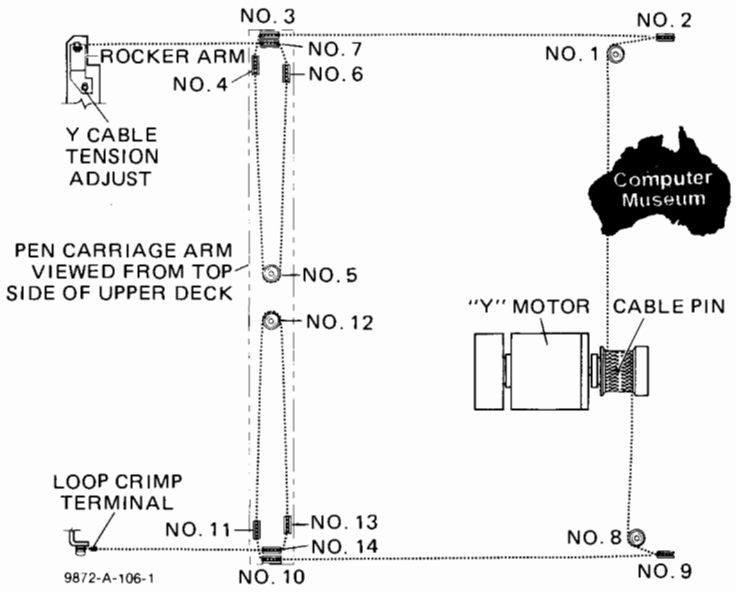

Figure 4-1A. Y-Axis Drive Cable Stringing Diagram
(serial prefix below 2148)

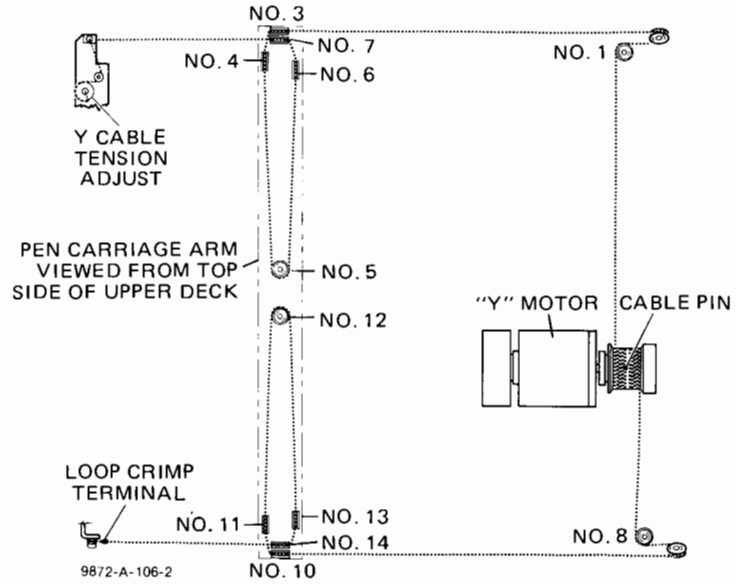

Figure 4-1B. Y-Axis Drive Cable Stringing Diagram
(serial prefix 2148 and above)

e. Refer to the Y-cable illustration, and thread the long end of the cable around pulleys #1 through #7 to the tensioner.

f. Remove the tape from the windings on the motor pulley. Thread the short end of the cable around the motor pulley, forming five turns to the right of the pin. Tape these turns to the pulley.

g. Thread the short end of the cable around pulleys #8 through #14, and hook the looped end of the cable over the lower-left stud.

h. Pull the loose end of the cable until it is tight, and securely crimp the cable terminal **twice.** Cut off the excess.

i. Remove all tape from the motor and pulleys.

j. Reassemble the pen holder assembly and the plotter arm.

k. Remove the locking screws or the tape holding the plotter arm in position.

l. Position the plotter arm at the left end of the plotter, as viewed from the rear, and the pen carriage at the top corner of the platen.

m. Adjust the cable tensioner until 325 ±25 grams of force is required to displace the cable to the edge of the track. Securely tighten the cap screw in the tensioner.

NOTE

On plotters with a serial prefix below 2148, the tension is adjusted at the rocker arm with a hex wrench. Pulley #2 may also be adjusted to vary the cable tension.

n. Manually exercise the pen carriage along the plotter arm several times and recheck the tension. Perform the Confidence Test to assure proper operation. Adjust the cable if necessary.

4-10. X-DRIVE CABLE REMOVAL

4-11. To remove the X-drive cable, proceed as follows:

a. Remove power and open the plotter.

b. Secure the plotter arm over the locking assembly with two 6-32 screws.

NOTE

Newer plotters (Models C and T) are not equipped with the locking assembly. On these instruments, use tape to secure the plotter arm in the specified position.

c. Loosen, but do not remove the X-tension adjusting nut. Refer to the X-axis cable illustration.

d. Unhook the X-drive cable from the two termination brackets, and remove the cable from the plotter.

4-12. X-DRIVE CABLE INSTALLATION

4-13. To install the X-drive cable, proceed as follows:

a. Turn the X-motor pulley so that the pin hole is directly up. Refer to the X-drive cable illustration.

b. Secure the motor with tape so that it will not turn.

c. Wind the cable around the motor pulley so that there are three turns above the pin and six turns below the pin.

d. Tape these cable turns securely to the motor pulley.

e. Thread the shorter length of the cable around pulleys #1 and #2, through the feed-through, and back to the upper right bracket, and anchor the crimp. Cut off excess cable.

f. Thread the longer cable end around pulleys #3, #4, and #5, and anchor the crimp in the lower-left bracket.

g. Remove the tape from the motor and motor pulley.

h. Remove the screws or tape securing the plotter arm.

i. Move the plotter arm to the extreme right of the plotter, as viewed from the back, and move the pen carriage to the top of the arm.

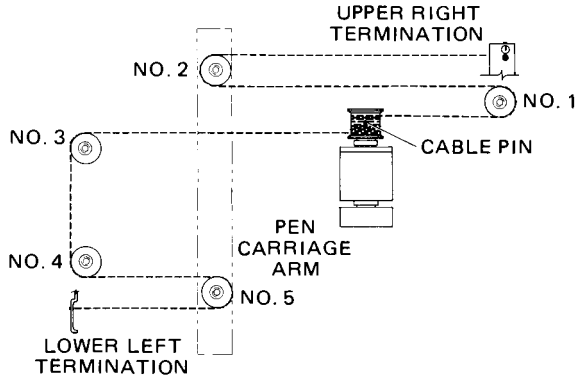

Figure 4-2. X-Axis Drive Cable
(viewed from underside of upper deck)

j. Adjust the X-tension adjustment nut until 325 ±25 grams of force is required to displace the cable to the edge of the track.

k. Manually move the plotter arm back and forth several times and recheck the cable tension. Readjust if necessary. Run the Confidence Test to verify performance.

4-14. X-CABLE REMOVAL

4-15. To remove the X-cable, proceed as follows:

a. Remove power from the plotter; remove the interface cable; and open the plotter.

b. Unplug and remove the electrostatic platen.

c. Position the plotter arm over the locking assembly and install two 6-32 screws.

NOTE

Newer plotters (Models C and T) are not equipped with the locking assembly. On these instruments, use tape to secure the plotter arm in the specified position.

d. Remove the X-tension adjustment nut and push the threaded block out of the bracket. Refer to the X-cable illustration.

e. Remove the defective X-cable.

4-16. X-CABLE INSTALLATION

4-17. To install the X-cable, proceed as follows:

a. Remove pulley #4, being careful not to lose the washer located under the pulley. Refer to the X-cable illustration.

b. Thread the cleated end of the cable through the space normally occupied by pulley #4, and anchor to the lower plotter arm bracket.

c. Replace pulley #4, making sure that the washer has been replaced under the pulley.

d. Bypass pulley #3, and thread the cable around pulley #2 to pulley #1.

e. Insert the cable end block into the bracket, and install the adjusting nut finger tight.

f. Assure that the cable is in place around pulley #1 and #2, and then complete the threading by placing the cable around pulley #3.

g. Tighten the adjusting nut until the cable is snug.

h. Remove the locking screws or tape securing the plotter arm, and manually move the plotter arm through its full range.

i. Position the plotter arm at the extreme left side of the plotter, as viewed from the rear.

j. Adjust the cable tension until 325 ±25 grams of force is required to displace the cable to the edge of the track.

k. Manually move the pen carriage several times, and recheck the tension. Perform the Confidence Test to verify proper operation. Readjust the tension if necessary.

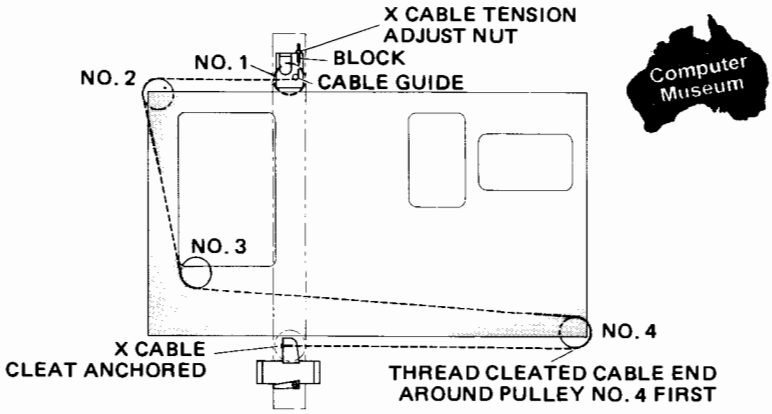

Figure 4-3. X-Cable Stringing Diagram
(viewed from underside of upper deck)

4-18. MODELS A AND B ASSEMBLY REMOVAL AND REPLACEMENT

4-19. PCAs

4-20. To remove a PCA, slip the PCA release tool over the latching stud and raise the PCA. To release the PCA from its hinges, slide the PCA toward the front of the plotter, and disconnect all cables from the PCA. To remove the RS-232-C PCA, A2, remove the four screws securing the PCA to the lower deck assembly. The Processor PCA, A3, is secured to the lower deck by three screws.

4-21. POWER SUPPLY ASSEMBLY

4-22. To remove and replace the power supply assembly, proceed as follows:

a. Turn OFF the plotter; remove the ac line cord and interface cable. Open the plotter.

b. Remove the four screws securing the power supply cover. Remove the cover.

c. Remove the two 6-32 screws securing the power supply back panel to the lower deck assembly.

d. Using a 1/4-inch wrench, remove the nut securing the ground lead to the power supply assembly.

e. Disconnect the cable assemblies to the platen and at J4 and J5.

f. Remove the standoffs that the cover was secured to, and lift out the power supply.

g. To replace the power supply assembly, carefully place the power supply assembly into the lower deck assembly, assuring that the connector J3 is properly seated on P3 of the Power Distribution PCA, A11.

h. To complete the installation, reverse the procedures listed above. Assure that the ground cable is securely fastened to the power supply.

4-23. MODEL C ASSEMBLY REMOVAL AND REPLACEMENT

4-24. MAIN PCA, A2

4-25. To remove the Main PCA, A2, proceed as follows:

a. Remove power and open the plotter.

b. **Label** and disconnect all interconnecting cables from the Main PCA, A2.

CAUTION

It is extremely important to correctly label all interconnecting cables. If installed improperly, severe damage could result to the Main PCA or the power supply assembly.

c. Remove the two 6-32 screws from the rear panel.

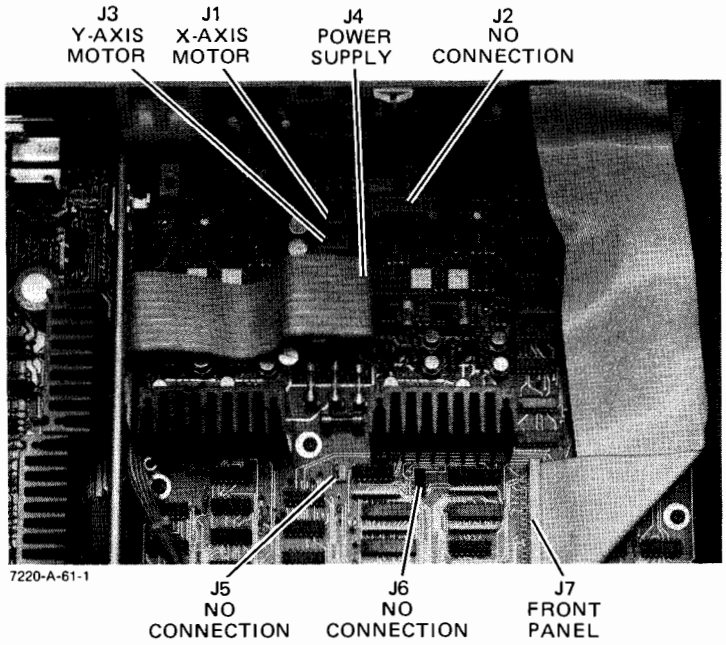

Figure 4-4A. Main PCA Cable Connections

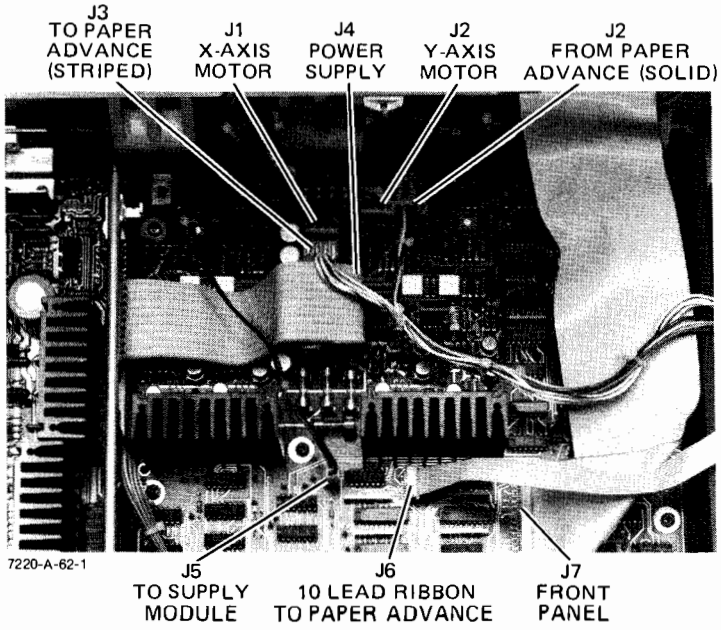

Figure 4-4B. Main PCA Cable Connections (with Paper Advance)

d. Remove the eight 6-32 screws from the Main PCA, and lift the Main PCA and Interconnect PCA from the plotter.

e. The Interconnect PCA, A1, may now be unplugged from the Main PCA.

f. To replace, reverse the procedure.

4-26. INTERCONNECT PCA, A1

4-27. To remove and replace the Interconnect PCA, A1, follow the procedures listed for removal and replacement of the Main PCA, A2.

4-28. POWER SUPPLY ASSEMBLY

4-29. To remove and replace the power supply assembly, proceed as follows:

a. Remove power and open the plotter.

b. Remove the 6-32 screw securing the safety cover over the Primary PCA, A5. Remove the cover.

c. Unplug the fan connector, and plug P1 to the primary of the power transformer.

d. Unplug the transformer secondary cable and the two power supply output cables from the Power Supply PCA, A4.

e. Unplug the leads to the platen and to the pen solenoid at the Chart Hold PCA, A6.

f. Remove the two 6-32 screws from the power supply back panel. Remove the five 6-32 screws securing the power supply to the case assembly.

g. Remove the two 6-32 × 1-3/8 screws extending through the Chart Hold PCA into the lower case assembly.

h. Remove the 6-32 screw securing the ground cable to the forward switch bracket.

i. Remove the power supply assembly from the plotter.

j. When replacing the power supply, assure that all ground cables are properly replaced.

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SECTION V

DIAGNOSTICS

5-1. CONFIDENCE TEST

5-2. To perform the Confidence Test, proceed as follows:

a. Turn the plotter LINE switch OFF (O).

b. Disconnect the interface cable(s) and install a male-to-male cable between the two I/O ports on the rear panel.

c. Tun the LINE switch ON (I).

d. Load a sheet of chart paper and a new pen.

WARNING

When performing the next step, keep hands and clothing away from the plotter arm.

e. Place the Confidence Test switch in the ON (I) position. The Confidence Test begins immediately and runs automatically either to completion or a fault without operator intervention. Leave the Confidence Test switch in the ON (I) position throughout the test.

f. Upon completion of the Confidence Test, return the Confidence Test switch to the OFF (O) position. The plotter will initialize.

g. Turn the LINE switch OFF (O), and remove the jumper cable.

5-3. The steps performed in the Confidence Test are as follows:

a. The pen is raised and moved to the lower-left corner of the chart.

b. The internal electronic self test is performed.

c. The plot verification test is run, producing the Confidence Test Plot. See the test plot illustration.

d. All front panel indicator lamps are turned on.

e. The plotter waits until the Confidence Test switch is returned to the OFF (O) position.

f. The plotter reinitializes.

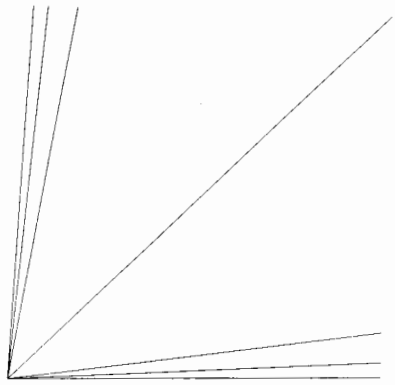

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Figure 5-1. Confidence Test Plot

5-4. POWER SUPPLY INDICATORS

5-5. MODELS A AND B

5-6. The Self Test indicator LEDs may be used as a power supply troubleshooting aid. If the cooling fan is running and the Self Test indicators are all off, the power supply has crow-barred. The indicators may be viewed between the platen edge and the front panel without having to open the plotter.

5-7. MODEL C

5-8. The indicators on the Model C power supply (see illustration) provide a means to isolate failures in the power supply. When the LEDs are on, they indicate proper operation.

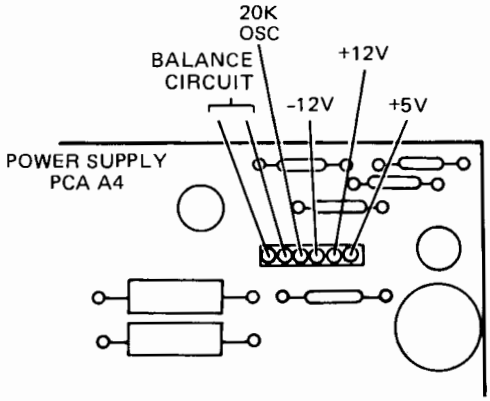

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Figure 5-2. Model C Power Supply Indicators

5-9. MODELS A AND B SELF TEST

5-10. A built-in Self Test provides a means to check the plotter performance and to isolate a problem to a particular PCA. The test is controlled by a series of switches located at the front of the Processor PCA, A3. See the Models A and B Self Test Controls illustration. The Models A and B Self Test table provides instructions and indications for the Self Test to isolate problems to a PCA. Detailed steps to isolate defects to a stage have been omitted. If this detailed information is required, refer to the Service Manual.

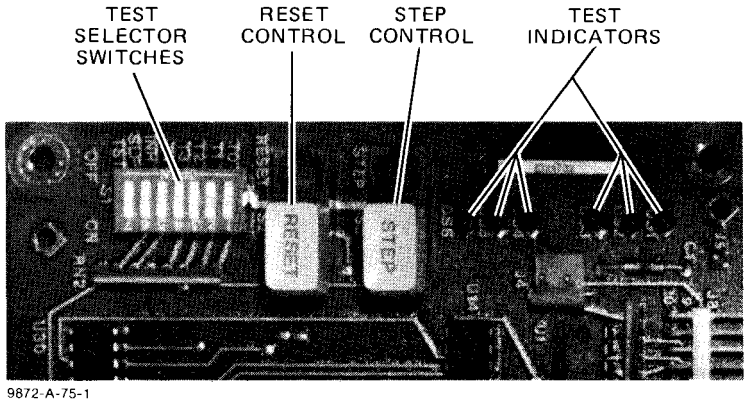


Figure 5-3. Models A and B Self Test Controls

5-11. MODEL C SELF TEST

5-12. A built-in Self Test provides a means to check the plotter performance and to isolate problems in the electronic circuits. The test is controlled by three switches located at the rear of the Main PCA. See the Model C illustrations for the Self Test.

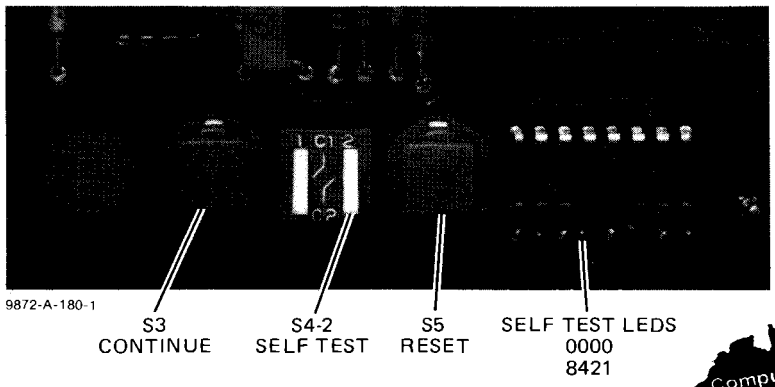
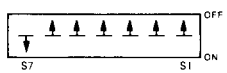


Figure 5-4. Model C Self Test Controls

TEST STEP	OPERATOR ACTION	SWITCH SETTING	TEST LEDS ON	TEST LEDS OFF	DETAILS
00	AUTOMATICALLY RUNS STEPS 00 THROUGH 15 1 SELF TEST switch S7 ON 2 Test switches S1-S6 OFF 3 Press RESET 4 Press STEP 5 LEDS flash 17_8		40 20 10	4 2 1	All LEDS ON indicates steps 00 through 15 PASS. LEDS indicate failed step. Proceed to that step for details.
01			40 20 10	4 2 1	PAGE 0 ROM FAILED REPLACE PCA A3
02			40 20 10	4 2 1	INTERFACE BUS FAILURE REPLACE PCA A3
03			40 20 10	4 2 1	ROM 4 DEFECTIVE REPLACE PCA A3
04			40 20 10	4 2 1	ROM FAILURE REPLACE PCA A4
05			40 20 10	4 2 1	ROM 40 FAILURE LSB REPLACE PCA A4
06			40 20 10	4 2 1	ROM 44 FAILURE LSB REPLACE PCA A4

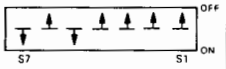
07			⑭ ⑳ ⑩ ❹ ❷ ❶	RAM 76 FAILURE REPLACE PCA A4
10			⑭ ⑳ ❿ ④ ② ①	INTERRUPT FAILURE REPLACE PCA A3 OR A4
13			⑭ ⑳ ❿ ④ ❷ ❶	UART FAILURE REPLACE PCA A1 OR A2
14			⑭ ⑳ ❿ ❹ ② ①	UART FAILURE REPLACE PCA A1 OR A2
15			⑭ ⑳ ❿ ❹ ② ❶	CONTROL LINE FAILURE REFER TO SERVICE MANUAL
20	Operator interactive test. Tests front panel controls and indicators. 1 Remove all pens 2 Test switches to 20 3 Press **RESET** 4 Press **STEP**		⑭ ❷⓪ ⑩ ④ ② ①	All front panel LEDS except **STBY** ON.* Failure to light indicates a defective LED. ***DATA SET** may be on or off
	Press **STEP**			**ERROR** LED ON

Figure 5-5. Model A/B Self Test

TEST STEP	OPERATOR ACTION	SWITCH SETTING	TEST LEDS ON	TEST LEDS OFF	DETAILS
20 cont'd	Press switches in order. 1 **CHART LOAD** 2 **P1 (LL)** 3 **P2 (UR)** 4 **FAST** 5 ←LEFT 6 →RIGHT 7 ↑UP 8 ↓DOWN 9 **PEN DOWN** 10 **PEN UP** 11 **CHART HOLD** 12 **ENTER** 13 X LIMIT 14 Y LIMIT 15 PEN SELECT **1** 16 PEN SELECT **2** 17 PEN SELECT **3** 18 PEN SELECT **4** 19 PEN STALL 4 20 PEN STALL 3 21 PEN STALL 2 22 PEN STALL 1 23 PEN IN ARM		㊾ ㉙ ⑩	❹ ❷ ❶	AS EACH SWITCH IS CLOSED THE FOLLOWING SEQUENCE WILL OCCUR. 1 **ERROR** LED OFF 2 **OUT OF LIMITS** LED ON MOMENTARILY. 3 **ERROR** LED ON. AFTER ALL 26 SWITCHES ARE TESTED, ALL SELF TEST LEDS ARE ON. IF THE SEQUENCE DOES NOT OCCUR, THE SWITCH CIRCUIT IS BAD.

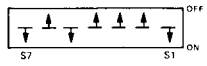
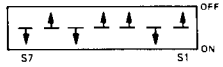
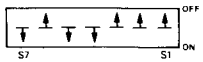
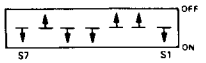
	24 **LOCAL** 25 **LINE** 26 **STBY**			
21	Operator interactive test of Rear Panel switches. 1 Test switches to 21 2 Press **RESET** 3 Press **STEP** 4 Close first switch 5 Press **STEP** 6 Open first switch 7 Press **STEP** 8 Follow this sequence for each switch a CONF TEST ON b PARITY ON c PARITY EVEN d DUPLEX HALF e HARDWIRE		● ● ● ○ ○ ○ ● ● ● ○ ○ ● ● ● ● ○ ● ○ ● ● ● ● ○ ○ ● ● ● ○ ○ ○ ● ● ● ○ ○ ○	Self Test LEDS indicate 40 LEDS indicate step a-e. Self Test LEDS indicate 40 LEDS indicate 41 LEDS indicate 42 LEDS indicate 44 LEDS indicate 50 LEDS indicate 60

Figure 5-5. Model A/B Self Test (Continued)

TEST STEP	OPERATOR ACTION	SWITCH SETTING	TEST LEDS ON OFF	DETAILS
22	OPTIONAL ROM TEST 1 Test switches to 22 2 Press **RESET** 3 Press **STEP**		⑩ ⑳ ㊵ ① ② ④ ㊵ ⑳ ⑩ ④ ❷ ① ㊵ ⑳ ⑩ ④ ❷ ❶ ㊵ ⑳ ⑩ ❹ ② ①	If LEDS indicate 1,2,3, or 4 Optional ROM error REPLACE PCA A5
MOTOR DRIVE TESTS These tests may also be used to make motor driver adjustments. Mute motors and move the pen carriage to the lower left-hand corner of the plate before performing steps 30 through 37.				
30	X Fundamental Test 1 Test switches to 30 2 Press **RESET** 3 Press **STEP** 4 To stop arm, press and hold **STEP.**		⑩ ⑳ ㊵ ① ② ④	LEDS indicate 30_8 plotter arm moves with pen up. Defect indicated by failure of LED display or movement.
31	X 2nd Harmonic Test 1 Test switches to 31 2 Press **RESET** 3 Press **STEP**		⑩ ⑳ ㊵ ① ② ④	LEDS indicate 31_8 and arm moves.

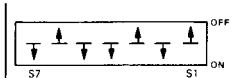
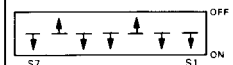
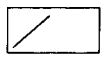
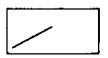
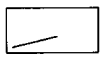
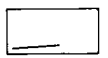
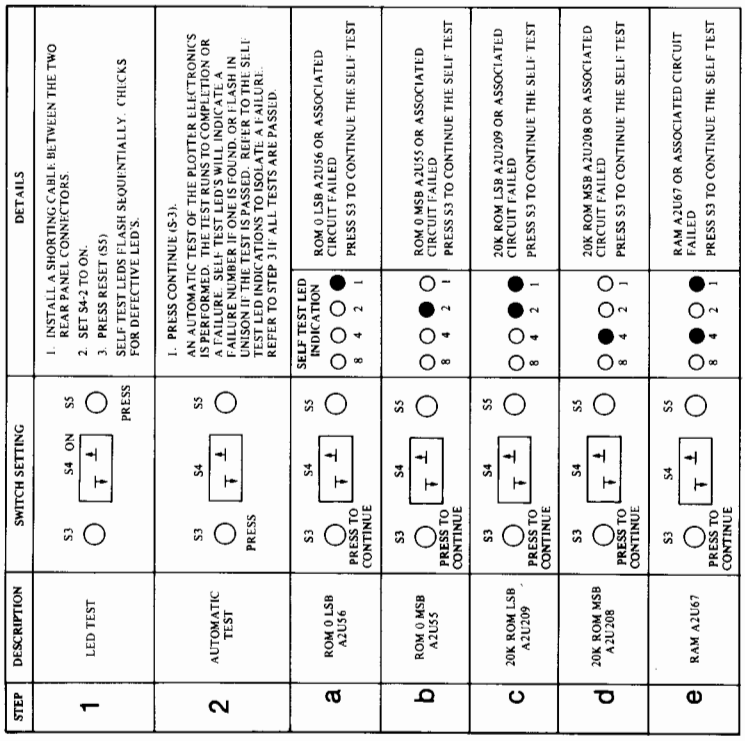
32	X 4th Harmonic Test 1 Test switches to 32 2 Press **RESET** 3 Press **STEP**		⑩ ⑳ ㊵ ① ② ④	LEDS indicate 32_8 and arm moves. 
33	45 Degree Test 1 Test switches to 33 2 Press **RESET** 3 Press **STEP**		❶ ❷ ④ ⑩ ⑳ ㊵	LEDS indicate 33_8 and arm moves. 
34	Y Fundamental Test 1 Test switches to 34 2 Press **RESET** 3 Press **STEP**		① ② ❹ ⑩ ⑳ ㊵	LEDS indicate 34_8 and arm moves. 
35	Y 2nd Harmonic Test 1 Test switches to 35 2 Press **RESET** 3 Press **STEP**		❶ ② ❹ ⑩ ⑳ ㊵	LEDS indicate 35_8 and arm moves. 
36	Y 4th Harmonic Test 1 Test switches to 36 2 Press **RESET** 3 Press **STEP**		① ❷ ❹ ⑩ ⑳ ㊵	LEDS indicate 36_8 and arm moves. 

Figure 5-5. Model A/B Self Test (Continued)

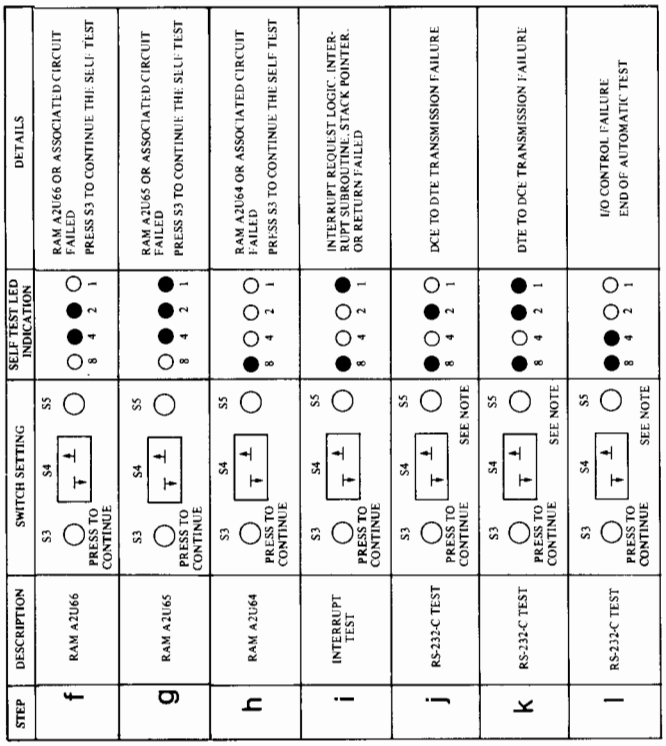
TEST STEP	OPERATOR ACTION	SWITCH SETTING	TEST LEDS ON	TEST LEDS OFF	DETAILS
37	Plot Test Plotter makes 7 pen-down moves. 1 Place pen in holder 2 Position holder in lower-left corner 3 Test switches to 37 4 Press **RESET** 5 Press **STEP**		⑳ ⑩	❹ ❷ ❶	LEDS indicate 37_8 and the plot is drawn.

Figure 5-5. Model A/B Self Test (Continued)



STEP	DESCRIPTION	SWITCH SETTING	DETAILS
1	LED TEST	S3 ○ S4 ON ┬┴ S5 ○ PRESS	1. INSTALL A SHORTING CABLE BETWEEN THE TWO REAR PANEL CONNECTORS. 2. SET S4-2 TO ON. 3. PRESS RESET (S5) SELF TEST LEDS FLASH SEQUENTIALLY. CHECKS FOR DEFECTIVE LED'S.
2	AUTOMATIC TEST	S3 ○ S4 ┬┴ S5 ○ PRESS	1. PRESS CONTINUE (S-3). AN AUTOMATIC TEST OF THE PLOTTER ELECTRONICS IS PERFORMED. THE TEST RUNS TO COMPLETION OR A FAILURE. SELF TEST LED'S WILL INDICATE A FAILURE NUMBER IF ONE IS FOUND, OR FLASH IN UNISON IF THE TEST IS PASSED. REFER TO THE SELF TEST LED INDICATIONS TO ISOLATE A FAILURE. REFER TO STEP 3 IF ALL TESTS ARE PASSED.
a	ROM 0 LSB A2U56	S3 ○ S4 ┬┴ S5 ○ PRESS TO CONTINUE	SELF TEST LED INDICATION ○○○● 8 4 2 1 ROM 0 LSB A2U56 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE THE SELF TEST
b	ROM 0 MSB A2U55	S3 ○ S4 ┬┴ S5 ○ PRESS TO CONTINUE	○○●○ 8 4 2 1 ROM 0 MSB A2U55 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE THE SELF TEST
c	20K ROM LSB A2U209	S3 ○ S4 ┬┴ S5 ○ PRESS TO CONTINUE	○○●● 8 4 2 1 20K ROM LSB A2U209 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE THE SELF TEST
d	20K ROM MSB A2U208	S3 ○ S4 ┬┴ S5 ○ PRESS TO CONTINUE	○●○○ 8 4 2 1 20K ROM MSB A2U208 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE THE SELF TEST
e	RAM A2U67	S3 ○ S4 ┬┴ S5 ○ PRESS TO CONTINUE	○●○● 8 4 2 1 RAM A2U67 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE THE SELF TEST

Figure 5-6. Model C Self Test



STEP	DESCRIPTION	SWITCH SETTING	SELF TEST LED INDICATION	DETAILS
f	RAM A2U66	S3 S4 S5 PRESS TO CONTINUE	8 4 2 1	RAM A2U66 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE THE SELF TEST
g	RAM A2U65	S3 S4 S5 PRESS TO CONTINUE	8 4 2 1	RAM A2U65 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE THE SELF TEST
h	RAM A2U64	S3 S4 S5 PRESS TO CONTINUE	8 4 2 1	RAM A2U64 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE THE SELF TEST
i	INTERRUPT TEST	S3 S4 S5 PRESS TO CONTINUE	8 4 2 1	INTERRUPT REQUEST LOGIC, INTERRUPT SUBROUTINE, STACK POINTER, OR RETURN FAILED
j	RS-232-C TEST	S3 S4 S5 PRESS TO CONTINUE SEE NOTE	8 4 2 1	DCE TO DTE TRANSMISSION FAILURE
k	RS-232-C TEST	S3 S4 S5 PRESS TO CONTINUE SEE NOTE	8 4 2 1	DTE TO DCE TRANSMISSION FAILURE
l	RS-232-C TEST	S3 S4 S5 PRESS TO CONTINUE SEE NOTE	8 4 2 1	I/O CONTROL FAILURE END OF AUTOMATIC TEST

STEP	DESCRIPTION	SWITCH SETTING	SELF TEST LED INDICATION	DETAILS
3	FRONT PANEL AND OPTIONAL RAM TEST	S3 S4 S5		1. REMOVE ALL PENS FROM THE PLOTTER 2. SET A2S1 (X MOTOR MUTE) TO OFF AND MOVE THE PLOTTER ARM TO THE LEFT END (NEAREST PEN STALL #1) OF THE PLATEN 3. SET A2S1 TO ON 4. PRESS PEN SELECT PUSHBUTTON #8 IF NO OPTIONAL RAM IS INSTALLED GO TO 3b
a	RAM TEST	S3 S4 S5	● ● ○ ● (8 4 2 1)	IF NO OPTIONAL RAM IS INSTALLED THE FOLLOWING FAILURE INDICATIONS MAY BE SEEN. IF TEST PASSES, LED'S INDICATE 13_2, GO TO 3c
	A2U215	S3 S4 S5 PRESS TO CONTINUE	○ ● ○ ● (8 4 2 1)	A2U215 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE TEST
	A2U214	S3 S4 S5 PRESS TO CONTINUE	○ ● ● ○ (8 4 2 1)	A2U214 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE TEST
	A2U213	S3 S4 S5 PRESS TO CONTINUE	○ ● ● ● (8 4 2 1)	A2U213 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE TEST
	A2U212	S3 S4 S5 PRESS TO CONTINUE	● ○ ○ ○ (8 4 2 1)	A2U212 OR ASSOCIATED CIRCUIT FAILED PRESS S3 TO CONTINUE TEST

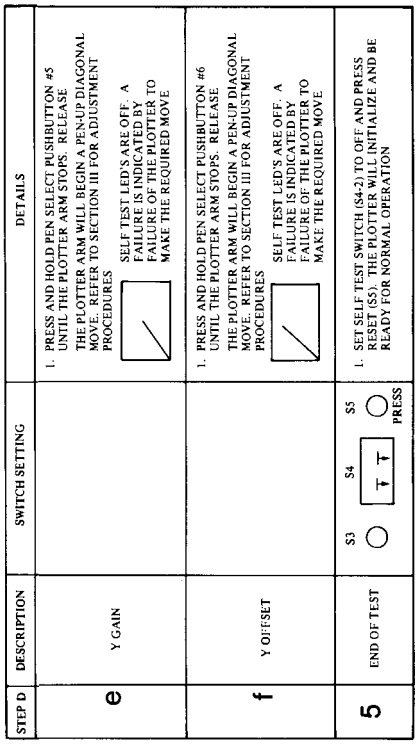
NOTE:
CERTAIN RS-232-C FAILURES MAY NOT ALLOW THE SELF TEST TO CONTINUE WHEN S3 IS PRESSED.

Figure 5-6. Model C Self-Test (Continued)

STEP	DESCRIPTION	SWITCH SETTING	SELF TEST LED INDICATION	DETAILS
b	FRONT PANEL INTERACTIVE TEST	S3 PRESS S4 S5	8 4 2 1	IF NO OPTIONAL RAM IS INSTALLED THE SELF TEST LED'S INDICATE 8_2 PRESS CONTINUE (S3). GO TO 3c.
c	FRONT PANEL TEST	S3 PRESS S4 S5	8 4 2 1	THE FRONT PANEL LED'S, EXCEPT STBY AND DATA SET, WILL BE ON PRESS CONTINUE (S3) FRONT PANEL ERROR LED IS ON CLOSE EACH FRONT PANEL SWITCH IN THE ORDER INDICATED. 1. CHART LOAD 18. SELECT PEN 4 2. LOWER LEFT (P1) 19. SELECT PEN 5 3. UPPER RIGHT (P2) 20. SELECT PEN 6 4. FAST 21. SELECT PEN 7 5. LEFT 22. SELECT PEN 8 6. RIGHT 23. PEN IN ARM 7. UP 24. PEN PRESENT 8 8. DOWN 25. PEN PRESENT 7 9. PEN DOWN 26. PEN PRESENT 6 10. PEN UP 27. PEN PRESENT 5 11. CHART HOLD 28. PEN PRESENT 4 12. ENTER 29. PEN PRESENT 3 13. "X" LIMIT 30. PEN PRESENT 2 14. "Y" INIT 31. PEN PRESENT 1 15. SELECT PEN 1 32. LOCAL 16. SELECT PEN 2 33. LINE 17. SELECT PEN 3 34. STANDBY AS EACH SWITCH IS CLOSED, THE ERROR LED WILL TURN OFF, AND THE OUT OF LIMIT LED WILL TURN ON MOMENTARILY. WHEN THE ERROR LED TURNS ON AGAIN, PRESS THE NEXT SWITCH. AFTER ALL 34 SWITCHES ARE TESTED THE SELF TEST LED'S WILL FLASH SEQUENTIALLY. A SWITCH FAILURE IS INDICATED IF THE OUT OF LIMIT LED DOES NOT TURN ON.

STEP D	DESCRIPTION	SWITCH SETTING	DETAILS
4	MOTOR DRIVER TEST	S3 ○ PRESS S4 [T 1] S5 ○	THE FOLLOWING STEPS TEST MOTOR DRIVER PERFORMANCE AND ARE ALSO USED TO PERFORM ALIGNMENTS 1. PRESS CONTINUE (S3)
a	X 3RD HARMONIC		1. PRESS AND HOLD PEN SELECT PUSHBUTTON #1 FOR APPROXIMATELY THREE SECONDS. RELEASE THE PLOTTER ARM WILL BEGIN A PEN-UP DIAGONAL MOVE. REFER TO SECTION III FOR ADJUSTMENT PROCEDURES SELF TEST LED'S ARE OFF: A FAILURE IS INDICATED BY FAILURE OF THE PLOTTER TO MAKE THE REQUIRED MOVE
b	X GAIN		1. PRESS AND HOLD PEN SELECT PUSHBUTTON #2 UNTIL THE PLOTTER ARM STOPS. RELEASE THE PLOTTER ARM WILL BEGIN A PEN-UP DIAGONAL MOVE. REFER TO SECTION III FOR ADJUSTMENT PROCEDURES SELF TEST LED'S ARE OFF: A FAILURE IS INDICATED BY FAILURE OF THE PLOTTER TO MAKE THE REQUIRED MOVE
c	X OFFSET		1. PRESS AND HOLD PEN SELECT PUSHBUTTON #3 UNTIL THE PLOTTER ARM STOPS. RELEASE THE PLOTTER ARM WILL BEGIN A PEN-UP DIAGONAL MOVE. REFER TO SECTION III FOR ADJUSTMENT PROCEDURES SELF TEST LED'S ARE OFF: A FAILURE IS INDICATED BY FAILURE OF THE PLOTTER TO MAKE THE REQUIRED MOVE
d	Y 3RD HARMONIC		1. PRESS AND HOLD PEN SELECT PUSHBUTTON #4 UNTIL THE PLOTTER ARM STOPS. RELEASE THE PLOTTER ARM WILL BEGIN A PEN-UP DIAGONAL MOVE. REFER TO SECTION III FOR ADJUSTMENT PROCEDURES SELF TEST LED'S ARE OFF: A FAILURE IS INDICATED BY FAILURE OF THE PLOTTER TO MAKE THE REQUIRED MOVE

Figure 5-6. Model C Self-Test (Continued)



STEP D	DESCRIPTION	SWITCH SETTING	DETAILS
e	Y GAIN		1. PRESS AND HOLD PEN SELECT PUSHBUTTON #5 UNTIL THE PLOTTER ARM STOPS. RELEASE THE PLOTTER ARM WILL BEGIN A PEN-UP DIAGONAL MOVE. REFER TO SECTION III FOR ADJUSTMENT PROCEDURES SELF TEST LED'S ARE OFF: A FAILURE IS INDICATED BY FAILURE OF THE PLOTTER TO MAKE THE REQUIRED MOVE
f	Y OFFSET		1. PRESS AND HOLD PEN SELECT PUSHBUTTON #6 UNTIL THE PLOTTER ARM STOPS. RELEASE THE PLOTTER ARM WILL BEGIN A PEN-UP DIAGONAL MOVE. REFER TO SECTION III FOR ADJUSTMENT PROCEDURES SELF TEST LED'S ARE OFF: A FAILURE IS INDICATED BY FAILURE OF THE PLOTTER TO MAKE THE REQUIRED MOVE
5	END OF TEST	S3 S4 S5 PRESS	1. SET SELF TEST SWITCH (S4-2) TO OFF AND PRESS RESET (S5). THE PLOTTER WILL INITIALIZE AND BE READY FOR NORMAL OPERATION

Figure 5-6. Model C Self Test (Continued)

NOTES

TABLE OF CONTENTS

TABLES

ILLUSTRATIONS

SECTION VI

ADJUSTMENTS

6-1. ELECTRICAL ADJUSTMENTS

NOTE

Section X includes a table listing the range or specification for each of the electrical adjustments.

6-2. MODELS A AND B

6-3. POWER SUPPLY ADJUSTMENTS

6-4. +5 V ADJUST. To adjust the +5 V(A), proceed as follows:

a. Remove the power supply cover.

b. Connect a DVM to the +5 V(A) test point on either the Memory PCA, A4, or the Power Supply Main PCA, A9.

c. Adjust A10R50 +5 V ADJUST to obtain a reading of +5.24 V on the meter. (This voltage will drop when the power supply is fully loaded.)

d. Replace the power supply cover.

6-5. +7 V ADJUST. To adjust the +7 V, proceed as follows:

a. Remove the power supply cover.

b. Connect the DVM to the +7 V test point located on the power supply Main PCA, A9.

c. Set the +7 V ADJUSTMENT potentiometer A9R29 to obtain a reading of 7.00 V on the meter.

6-6. INTERNAL I/O ADJUSTMENTS

6-7. To perform the I/O and motor driver adjustments, proceed as follows:

a. On the Internal I/O PCA, A5, set the X- and Y-3rd harmonic potentiometers, X R15 and Y R16, fully counterclockwise (CCW).

b. Connect a DVM common lead to the A5 analog common test point, and connect the (+) lead to the X-sine output J3 pin 6.

c. Set the switch A5S1 segment C to the ON position. All other segments remain OFF.

d. Adjust A5R4 DAC FULL SCALE for a reading of 4.5 ±0.01 V on the DVM.

e. Leaving A5S1 segment C ON, also set A5S1 segment A ON.

f. Adjust A5R8 DAC OFFSET to obtain a reading of −4.5 ±0.01 V on the DVM.

NOTE

Some interaction occurs between R4 and R8. Repeat steps c. through f. until both readings are correct.

g. Leaving switch A5S1 segment C ON, set A5S1 segment A OFF.

h. Adjust A5R15 X-3rd harmonic to obtain a reading of +6 ±0.1 V on the DVM.

i. Move the (+) lead of the DVM to A5J3 pin 8 Y-sine output.

j. Adjust A5R16 Y-3rd harmonic for a reading of +6 ±0.1 V on the DVM.

k. Remove the DVM leads from the test points, and set all segments of switch A5S1 to the OFF position.

l. This completes the Internal I/O adjustments

6-8. MOTOR DRIVER ADJUSTMENTS

6-9. The motor driver adjustment needs to be performed anytime the PCA is replaced or when the lines become wavy and irregular.

6-10. To perform the motor driver adjustments, proceed as follows:

a. On the Processor PCA, A3, set the self-test switches 7, 5, 4, and 2 to the ON position.

b. On the Motor Driver PCA, A8, set both the X- and Y-axis mute switches to the OFF position. Move the pen holder and arm to the lower-left corner of the platen.

c. Set the X-axis mute switch to the ON position, and press the STEP pushbutton on the Processor PCA.

d. On the Internal I/O PCA, adjust A5R15 X-3rd harmonic potentiometer for minimum vibration of the pen holder.

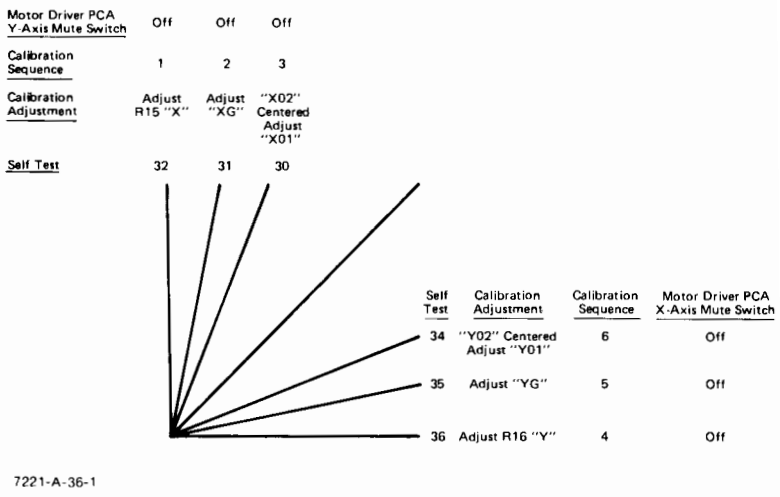


Figure 6-1. Models A and B Motor Driver Alignments

e. Hold down the STEP pushbutton until all pen motion stops. Set the self-test switches 5, 4, and 1 ON (31_8). Press the STEP pushbutton.

f. Adjust the X-gain XG potentiometer on the Motor Driver PCA for minimum vibration of the pen.

g. Repeat step e., except set self-test switches 5 and 4 ON (30_8).

h. On the Motor Driver PCA, center the XO2 X-OFFSET potentiometer and adjust the XO1 potentiometer for minimum vibration of the pen. Press the RESET pushbutton on the Processor PCA.

i. On the Motor Driver PCA, set the X-axis mute switch OFF and set the Y-axis mute switch to the ON position.

j. Set the self-test switches 5, 4, 3, and 2 ON, (36_8), and press the STEP pushbutton.

k. On the Internal I/O PCA, adjust A5R16 Y-3rd harmonic to obtain minimum vibration of the pen.

l. Repeat step e., except set self-test switches 5, 4, 3, and 1 ON (35_8).

m. On the Motor Driver PCA, adjust the Y-gain YG potentiometer for minimum vibration of the pen arm.

n. Repeat step e., except set self-test switches 5, 4, and 3 ON (34_8).

o. On the Motor Driver PCA, center YO2 Y-OFFSET, and adjust YO1 for minimum vibration of the pen arm.

p. Press the RESET pushbutton, and set all the self-test switches to the OFF position. On the Motor Driver PCA, set the Y-mute switch to the OFF position.

q. Move the plotter arm to a new position, but not more than 2 inches up or 6 inches over from the corner.

r. Repeat step e., except set self-test switches 5, 4, 3, 2, and 1 ON (37_8).

s. Load paper and place a pen in the pen holder. Set the X- and Y-axis mute switches to the ON position.

t. Press the STEP pushbutton. The test plot will be run.

u. Examine the test plot. If any lines are not straight, repeat the portion of the alignment required for that line.

v. Return all self-test switches to the OFF position, and press the RESET pushbutton. This completes the electrical alignment procedures.

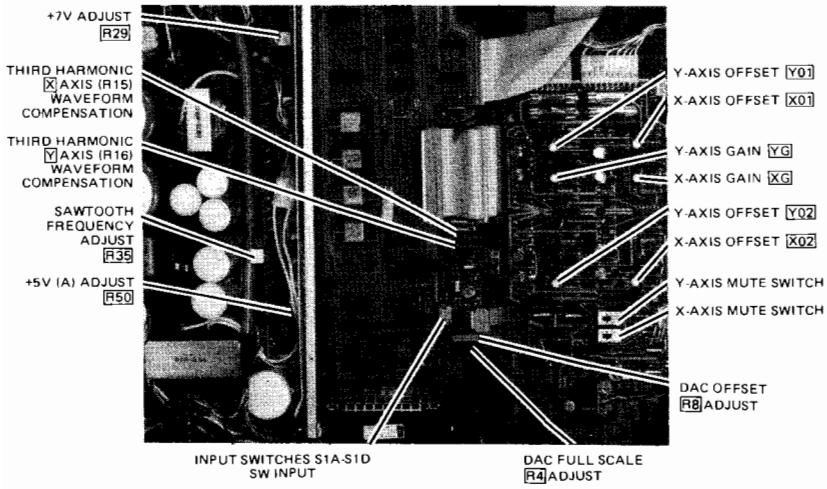


Figure 6-2. Models A and B Adjustment Locations

6-11. MODEL C

6-12. MOTOR DRIVER ADJUSTMENT

6-13. This procedure needs to be performed when the vectors drawn by the plotter are wavy or irregular, or after replacing the Main PCA, A2, or a stepper motor. To perform the X-axis adjustments, proceed as follows:

a. Open the plotter.

b. Place the self-test switch S4-2 in the ON position. Press RESET S5 and then CONTINUE S3.

c. Set the Y-mute S2 to the OFF position. See the adjustment location illustration.

d. Press and hold the #1 PEN SELECT pushbutton for approximately five seconds. Release.

e. Adjust the X-3rd potentiometer R38 for minimum vibration of the pen holder. See the adjustment illustration.

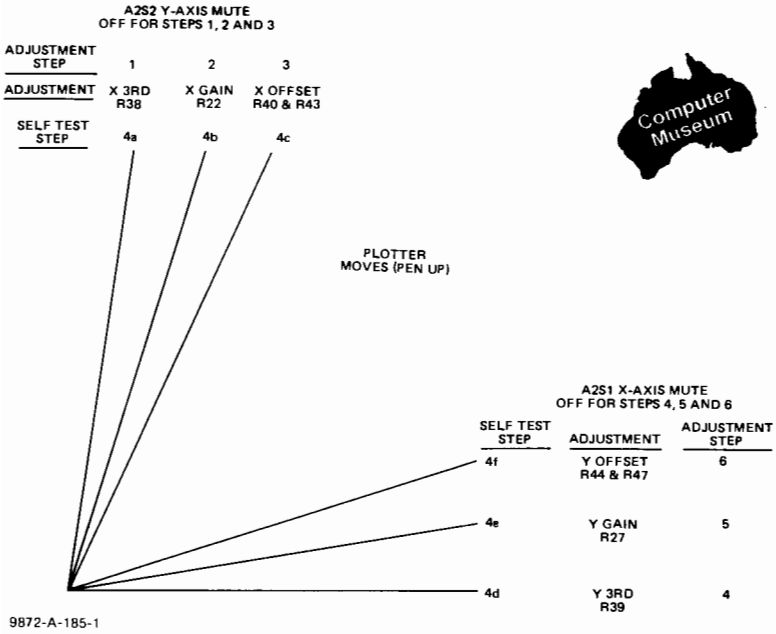


Figure 6-3. Model C Motor Driver Adjustments

f. Press and hold the #2 PEN SELECT pushbutton until the plotter arm stops. Release.

g. Adjust the X-gain potentiometer R22 for minimum vibration of the pen holder.

h. Press and hold the #3 PEN SELECT pushbutton until the plotter arm stops. Release.

i. Center the X-B offset potentiometer R40 and adjust the X-A R43 for minimum vibration of the pen holder.

j. Adjust the X-B offset potentiometer R40 for minimum vibration of the pen holder.

k. Return the Y-mute switch S2 to the ON position.

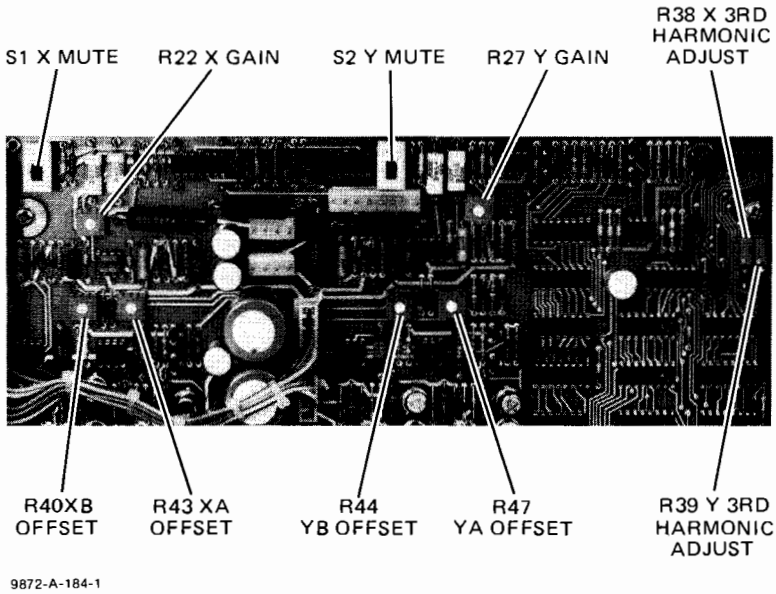


Figure 6-4. Model C Adjustment Locations

6-14. Y-AXIS MOTOR DRIVER ADJUSTMENTS

6-15. To perform the Y-axis adjustments, proceed as follows:

a. Open the plotter.

b. Place the self-test switch S4-2 in the ON position. Press RESET S5 and then CONTINUE S3.

c. Set the X-mute switch S1 to the OFF position.

d. Press and hold the #4 PEN SELECT pushbutton for approximately five seconds. Release.

e. Adjust the Y-3rd potentiometer R39 for minimum vibration of the pen holder.

f. Press and hold the #5 PEN SELECT pushbutton until the plotter arm stops. Release.

g. Adjust the Y-gain potentiometer R27 for minimum vibration of the pen holder.

h. Press and hold the #6 PEN SELECT pushbutton until the plotter arm stops. Release.

i. Center the Y-B offset potentiometer R44 and adjust the Y-A R47 for minimum vibration of the pen holder.

j. Adjust the Y-B offset potentiometer R44 for minimum vibration of the pen holder.

k. Return the X-mute switch S1 to the ON position. Also place the self-test switch S4-2 to the OFF position.

6-16. MECHANICAL ADJUSTMENTS

6-17. PEN SOLENOID TRAVEL ADJUSTMENT

NOTE

Pen adjustments are interactive. Perform in the order indicated.

6-18. To adjust the pen solenoid travel, proceed as follows:

a. Remove the pen cover with a Pozidrive screwdriver.

b. Using a common screwdriver, set the pen solenoid travel adjustment screw to obtain a travel of 1.9 mm (0.075 in.) for the 7221A or 3.4 mm (0.133 in.) for all other models. See the travel adjustment illustration.

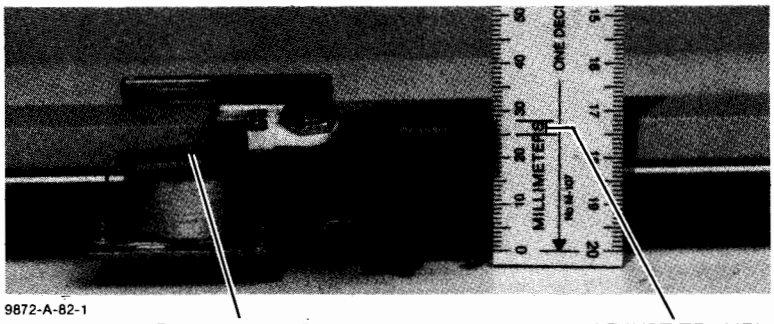


Figure 6-5. Pen Solenoid Travel Adjustment

6-19. PEN LIFT ADJUSTMENT

6-20. The pen lift adjustment is designed to obtain proper deflection of the pen solenoid armature. To adjust the pen lift, proceed as follows:

a. While holding the pen carriage assembly off the solenoid plate, use a 0–150 gram gauge to press down on the solenoid plate near the pen height adjustment screw.

b. The plate should start to deflect downward with a pressure of 51 ±2 grams on all models.

c. Adjustment is performed by bending the bottom pen solenoid plate spring tab either up or down to adjust as necessary.

6-21. PEN FORCE ADJUSTMENT

6-22. To adjust the pen force, proceed as follows:

a. Remove the pen cover.

b. Load a new pen into the holder, and position the holder at the lower-left corner of the platen.

c. Using a 0–150 gram gauge, adjust the pen force adjustment screw until a force of 23 ±3 grams is required to just lift the pen tip from the platen on all models. Refer to the figure for the adjustment location.

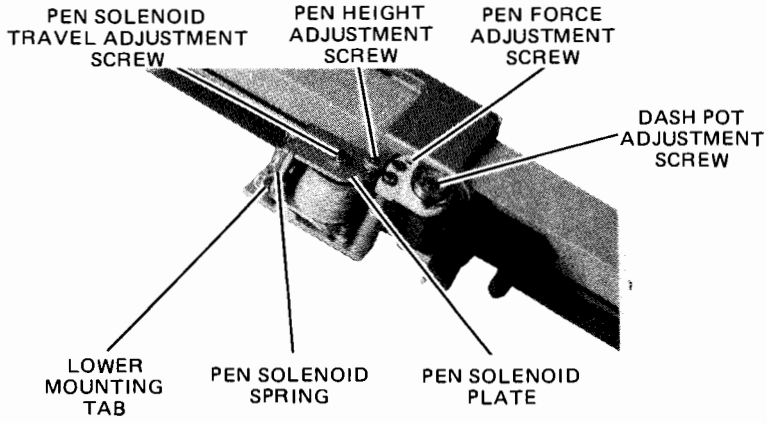


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Figure 6-6. Pen Holder Adjustments

6-23. PEN HEIGHT ADJUSTMENT

6-24. To adjust the pen height, proceed as follows:

a. Remove the pen cover.

b. Install a new pen in the pen holder, and move the holder to the lower-left corner of the platen.

c. Set the pen height adjustment screw until the pen tip is 0.8 mm (0.032 in.) above the platen on the 7221A or 2.3 mm (0.09 in.) above the platen on all other models. See the illustration for the adjustment location.

d. Check the pen height at the other three corners of the platen. If the pen is too low at any corner, reset at that location.

6-25. Y-AXIS TRACK ADJUSTMENT

6-26. If the pen height varies as the pen is moved in the Y-axis, but remains constant when moved in the X-axis, perform the following adjustment:

a. Remove the front panel and the rear hood.

b. Loosen the screws in each end of the Y-axis track.

c. Manuever the track so that the pen height remains constant as the pen is moved along the track.

d. Repeat the pen height adjustment.

e. Reassemble the plotter.

6-27. DASHPOT ADJUSTMENT

6-28. The dashpot adjustment must be checked under program control. The programs are contained on the HP 85 Test Tape and listed with the pen damping illustrations. Perform the dashpot adjustment as follows:

a. Load the plotter with a sheet of chart paper, and install a new pen in the holder.

b. Enter the applicable program into the HP 85 Personal Computer, or adapt the program to another suitable controller, and run the program.

c. Adjust the dashpot adjustment screw until the pen is overdamped. Refer to the illustration for an example of overdamping.

d. Turn the dashpot adjustment screw CCW until the correct damping is just reached, and then continue turning the adjustment 1/4 turn CCW.

Detail "A"

Not enough damping. Adjust Dashpot Screw clockwise.

Detail "B"

Too much damping. Adjust Dash Pot Screw clockwise to obtain this condition, then slowly adjust the Dash Pot Screw counterclockwise to obtain correct damping as shown in Detail "C". Adjust screw an additional ¼ turn counterclockwise.

Detail "C"

Correct damping adjustment.

```
 10 ! "PD7220"-PEN DAMPING
 20 CLEAR
 30 ! INTERFACE SETUP
 40 CONTROL 10,1 ; 17
 50 CONTROL 10,2 ; 5
 60 CONTROL 10,3 ; 11
 70 CONTROL 10,4 ; 3
 80 CONTROL 10,9 ; 129
 90 OUTPUT 10 ;"E.M100;;;10;13:"
100 OUTPUT 10 ;"E.(IN;"
110 WAIT 5000
120 ! INIT AND SELECT PEN 1
130 OUTPUT 10 USING "#,K" ; "SP1
    ;SI.5,.8;"
140 ! A=COLUMNS
150 FOR A=100 TO 15100 STEP 1000
160 OUTPUT 10 USING "#,K" ; "PA"
    &VAL$(A)&",10000;"
170 ! B=ROWS
180 FOR B=1 TO 10
190 OUTPUT 10 USING "K" ; "LBH"
200 OUTPUT 10 USING "#,B" ; 3
210 NEXT B
220 ! SETUP DISPLAY SCREEN
230 DISP "     TO STOP"
240 DISP "Press Function Key#1"
250 FOR L=1 TO 3
260 DISP
270 NEXT L
280 DISP "To Adjust Damping:"
290 DISP "  1)Adjust with Allen
    wrench"
300 DISP "  2)PRESS Function Key
    #2"
310 ON KEY# 1 GOTO 360
320 ON KEY# 2 GOTO 340
330 GOTO 310
340 CLEAR
350 NEXT A
360 CLEAR
370 OUTPUT 10 ;"SP0;PA16000,1140
    0;E.)"
380 END
```

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Figure 6-7. Dashpot Adjustment

```
 10 ! "PO7221" - PEN DAMPING
 20 CLEAR
 30 ! INTERFACE SETUP
 40 CONTROL 10,1 ; 17
 50 CONTROL 10,2 ; 5
 60 CONTROL 10,3 ; 11
 70 CONTROL 10,4 ; 3
 80 CONTROL 10,9 ; 129
 90 OUTPUT 10 ;"E.M100;;;10;13;"
100 OUTPUT 10 ;"E.("
110 ! INIT AND SELECT PEN 1
120 OUTPUT 10 USING "B,B" ; 126,
    95
130 OUTPUT 10 USING "B,B" ; 118,
    65
140 OUTPUT 10 USING "5(B)" ; 126
    ,37,100,66,64
150 ! A= COLUMNS
160 FOR A=36 TO 111
170 GOSUB 260
180 OUTPUT 10 USING "#,5(B)" ; 1
    12,A,63,60,64
190 ! B= ROWS
200 FOR B=1 TO 10
210 OUTPUT 10 USING "#,6(B)" ; 1
    26,39,72,13,10,3
220 WAIT 2000
230 NEXT B
240 NEXT A
250 ! SET UP DISPLAY SCREEN
260 DISP
270 DISP "       TO STOP"
280 DISP "  PRESS function key #
    1."
290 FOR L=1 TO 3
300 DISP
310 NEXT L
320 DISP "To Adjust Damping:"
330 DISP "  1) Adjust with Allen
     wrench"
340 DISP "  2) PRESS function ke
    y #2"
350 BEEP
360 ON KEY# 1 GOTO 410
370 ON KEY# 2 GOTO 390
380 GOTO 360
390 CLEAR
400 RETURN
410 CLEAR
420 OUTPUT 10 ;"E.)"
430 END
```

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Figure 6-7. Dashpot Adjustment (Continued)

6-29. X- AND Y-DRIVE CABLE TENSION ADJUSTMENT

6-30. To adjust the drive cable tension, proceed as follows:

a. Open the plotter.

b. Move the pen arm to the extreme right edge of the platen, and move the pen carriage to the top of the arm, as viewed from the front of the plotter.

c. Locate the midpoint between pulleys on the cable.

CAUTION

Wrap a piece of masking tape around the tip of the gauge to prevent damage to the plotter cable.

d. Using a 0–700 gram gauge, press against the cable at the midpoint until the cable just touches the rear track edge. The correct reading for either of the cables is 325 ±25 grams.

e. For the X-axis cable, rotate the cable tension adjustment nut to obtain a reading of 325 ±25 grams on the gauge (clockwise increases tension).

f. For the Y-axis cable, loosen the socket-head cap screw, and rotate the cable tensioner with a 3/8 in. open-end wrench to obtain a reading of 325 ±25 grams on the gauge. Securely tighten the cap screw.

NOTE

On plotters with a serial prefix below 2148, the Y-axis cable tension is adjusted at the rocker arm with a hex wrench.

g. After each adjustment, manually move the arm or carriage through its range of travel several times and recheck the tension.

6-31. PEN ARM ADJUSTMENT

6-32. To set the plotter arm perpendicular to the X-axis, proceed as follows:

a. Load the plotter with lined chart paper and a new pen.

b. Draw one line in the Y-axis on a chart grid line.

c. Check this drawn line for any offset from the grid line.

d. Any offset can be corrected by resetting the pen arm adjustment nut. See the X-axis stringing diagram for the adjustment location.

6-33. X- AND Y-LIMIT SWITCH ADJUSTMENT

6-34. To adjust the X- and Y-limit switches, proceed as follows:

NOTE

Perform these adjustments very carefully. Done incorrectly, these can lead to pen pick failures and pen crashes.

a. Open the plotter.

b. Move the plotter arm assembly to the extreme right end of its travel, viewed from the front of the plotter.

c. Position the pen claw so that it just touches the right end of the pen capper assembly of the last pen stall. Refer to the illustration.

d. Loosen the adjusting screw on the switch bracket, and move the X-limit switch bracket until the switch just closes against the plotter arm assembly. This can be detected either by the sound of the switch closing, or by placing an ohmmeter, HP 427 or equivalent, across the X-limit switch connector and observing the meter for continuity.

NOTE

The 7221A is adjusted with an Allen wrench at the hex-head screw.

e. Tighten the adjustment screw, and recheck the setting.

f. The Y-limit switch is adjusted by placing a pen in the holder and moving the holder into the Y-limit switch stall.

g. Listen for the sound of the pen-in-arm switch and then the Y-limit switch. If this sequence is not detected, adjust the X-limit switch.

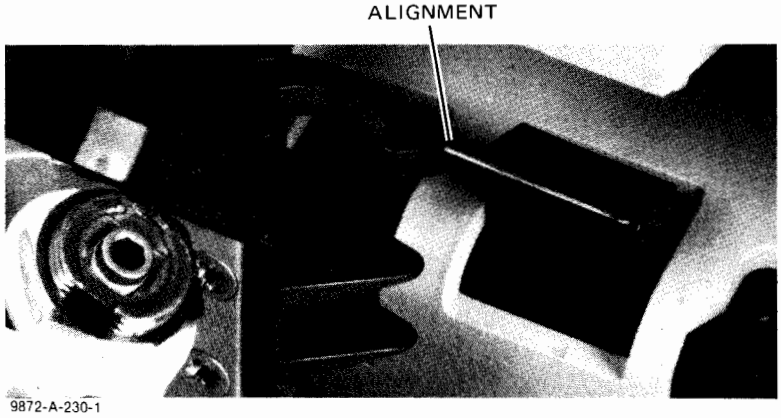

Figure 6-8. Pen Holder Position for Switch Alignment

6-35. NONHORIZONTAL MOUNTING ADJUSTMENT PROCEDURE

6-36. The plotter may be mounted in a nonhorizontal position and function normally with only an adjustment of the pen force to compensate for gravity. To perform this adjustment, proceed as follows:

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

b. Remove the pen cover.

c. Reset the pen force adjustment screw according to the table or compute the adjustment from the following formula.

$$\text{No. of turns CW} = 5.75(1 - \cos\theta)$$

θ = angle from horizontal

d. To return the plotter to a horizontal position or to a lower angle, reverse the process.

Table 6-1. Pen Force Adjustment

PLATEN INCLINATION	NO. OF TURNS CW OF PEN FORCE ADJUSTMENT SCREW FROM FACTORY SETTING
0–15° (Horiz)	No readjustment necessary
30°	3/4
45°	1-3/4
60°	3
75°	4-1/4
90°	5-3/4

6-37. PEN ARM ROLLER ADJUSTMENT

6-38. The following procedures adjust the gap between the plotter arm block rollers and the platen edge. Adjustment may be indicated if excessive X-liner bearing noise is heard during short X-axis moves. To perform the adjustments, proceed as follows:

a. Switch the plotter OFF (O), remove the power cord set, unplug the interface cable, and open the plotter.

NOTE

Some newer plotters (Models C/T) have an opening cut in the trailing cable tray at the rear of the plotter. This hole allows access to the screw in the end of the Y-arm without having to remove the front panel. After removing the rear hood, check for this opening. If this opening is present, skip steps b. and c.

b. Unplug the front panel connectors, and remove the screws securing the front panel.

c. Remove the front panel to allow access to the screw located in the end of the Y-axis slider rod.

NOTE

The Model C plotters are also equipped with setscrews which are used to adjust the rollers. Refer to the illustration for setscrew location.

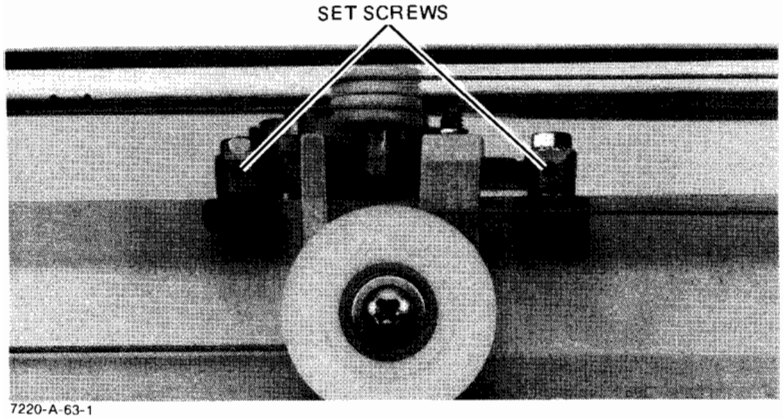

Figure 6-9. Setscrews for Roller Adjustment

d. Loosen the nuts securing the lower rollers to the rear block.

e. Place a 0.6 mm (0.024 in.) shim between the upper-right roller and the platen edge.

f. Loosen the screw in the end of the Y-axis slider rod, pressing down firmly on the casting so that both upper wheels are firmly in contact with either the platen edge or shim. Securely tighten the screw in the end of the Y-axis slider rod.

g. Remove the shim, and verify that the 0.6 mm space exists.

h. Place a 0.05 mm (0.002 in.) shim between both of the upper rollers and platen edge.

i. Squeeze each wheel pair to press the wheels tight against the platen edge. Tighten the nuts on each wheel pair. On plotters with setscrews, tighten the screw to force each wheel pair (upper and lower) together against the platen edge and tighten the nut securely on each pair.

j. Remove the shim, and verify that the upper-right and lower-left rollers turn freely.

k. Reassemble the plotter, and verify smooth operation.

NOTE

If precision shims are not available, the 0.6 mm shim may be approximated by six layers of HP chart paper (9270-1004, or equivalent). The 0.05 mm shim may be approximated by one layer of lightweight note paper.

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PERIPHERALS

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SECTION VIII

REPLACEMENT PARTS

7221A PCAs AND ASSEMBLIES		REBUILT	NEW
I/O CONN	PCA A1		07221-60152
RS-232-C	PCA A2	07221-66153	07221-60153
PROCESSOR	PCA A3	07221-66131	07221-60131
MEMORY	PCA A4	07221-66146	07221-60146
MEMORY OPT 01	PCA A4	07221-66147	07221-60147
INTERNAL I/O	PCA A5	09872-66210	09872-60210
FRONT PANEL	PCA A6		07221-60100
PEN STABLE	PCA A7		09872-60110
MOTOR DR	PCA A8	09872-66120	09872-60120
POWER SUP	ASSY	09872-66192	09872-60192
POWER SUP VDE	ASSY	09872-66292	09872-60292
SOLENOID	ASSY		09872-60010
I/O PANEL	ASSY		09872-00035

7221B/S PCAs AND ASSEMBLIES		REBUILT	NEW
I/O CONN	PCA A1		07221-60165
RS-232-C	PCA A2	07221-66163	07221-60163
PROCESSOR	PCA A3	07221-66133	07221-60133
MEMORY	PCA A4	07221-66146	09872-60146
MEMORY OPT 01	PCA A4	07221-66147	07221-60147
INTERNAL I/O	PCA A5	09872-66209	09872-60209
FRONT PANEL	PCA A6		07221-60100
PEN STABLE	PCA A7		09872-60110
MOTOR DR	PCA A8	09872-66123	09872-60123
POWER SUP	ASSY	09872-66192	09872-60192
POWER SUP VDE	ASSY	09872-66292	09872-60292
SOLENOID	ASSY		09872-60092
I/O PANEL	ASSY		09872-00037

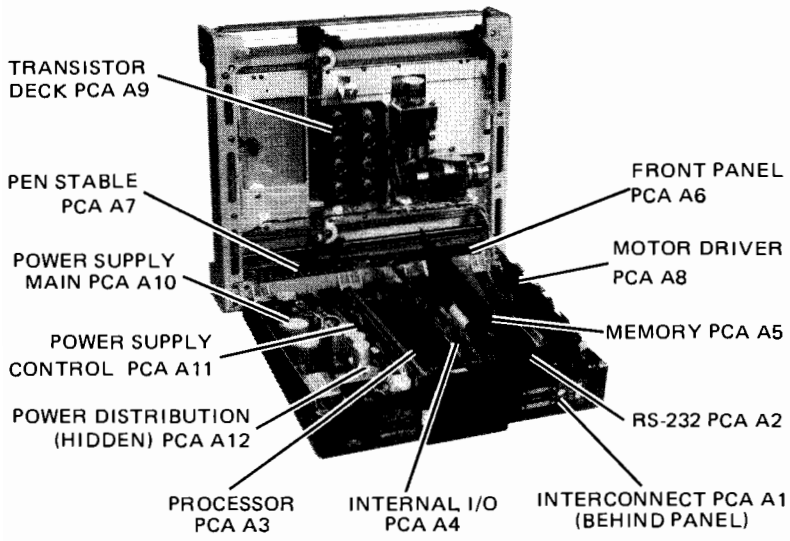

Figure 8-1. Models A and B Printed Circuit Assemblies

7221C/T PCAs AND ASSEMBLIES		REBUILT	NEW
INTERCONNECT	PCA A1		07221-60506
MAIN	PCA A2	07221-66520	07221-60520
FRONT PANEL	PCA A3		09872-60530
FRONT PANEL	ASSY	09872-66540	09872-60540
POWER SUPPLY	PCA A4		09872-60500
PRIMARY	PCA A5		09872-60505
CHART HOLD	PCA A6		09872-60580
POWER SUPPLY	ASSY	09872-66508	09872-60508

7220A/S PCAs AND ASSEMBLIES		REBUILT	NEW
I/O CONN	PCA A1		07220-60165
RS-232-C	PCA A2	07221-66163	07221-60163
PROCESSOR	PCA A3	07220-66131	07220-60131
MEMORY	PCA A4	07220-66146	07220-60146
MEMORY OPT 01	PCA A4	07220-66147	07220-60147
INTERNAL I/O	PCA A5	09872-66209	09872-60209

7220A/S PCAs AND ASSEMBLIES (Continued)		REBUILT	NEW
FRONT PANEL	PCA A6		07221-60100
PEN STABLE	PCA A7		09872-60110
MOTOR DR	PCA A8	09872-66123	09872-60123
POWER SUP	ASSY	09872-66192	09872-60192
POWER SUP VDE	ASSY	09872-66292	09872-60292
SOLENOID	ASSY		09872-60092
I/O PANEL	ASSY		09872-00037

7220C/T PCAs AND ASSEMBLIES		REBUILT	NEW
INTERCONNECT	PCA A1		07221-60506
MAIN	PCA A2	07220-66520	07220-60520
FRONT PANEL	PCA A3		07221-60530
FRONT PANEL	ASSY	09872-66540	09872-60540
POWER SUPPLY	PCA A4		09872-60500
PRIMARY	PCA A5		09872-60505
CHART HOLD	PCA A6		09872-60580
POWER SUPPLY	ASSY	09872-66508	09872-60508

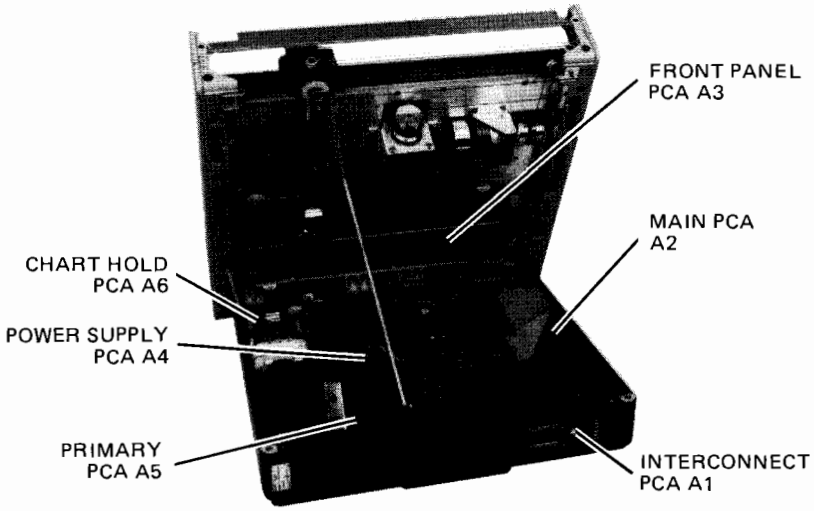

Figure 8-2. Model C Printed Circuit Assemblies

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SECTION IX

DIAGRAMS

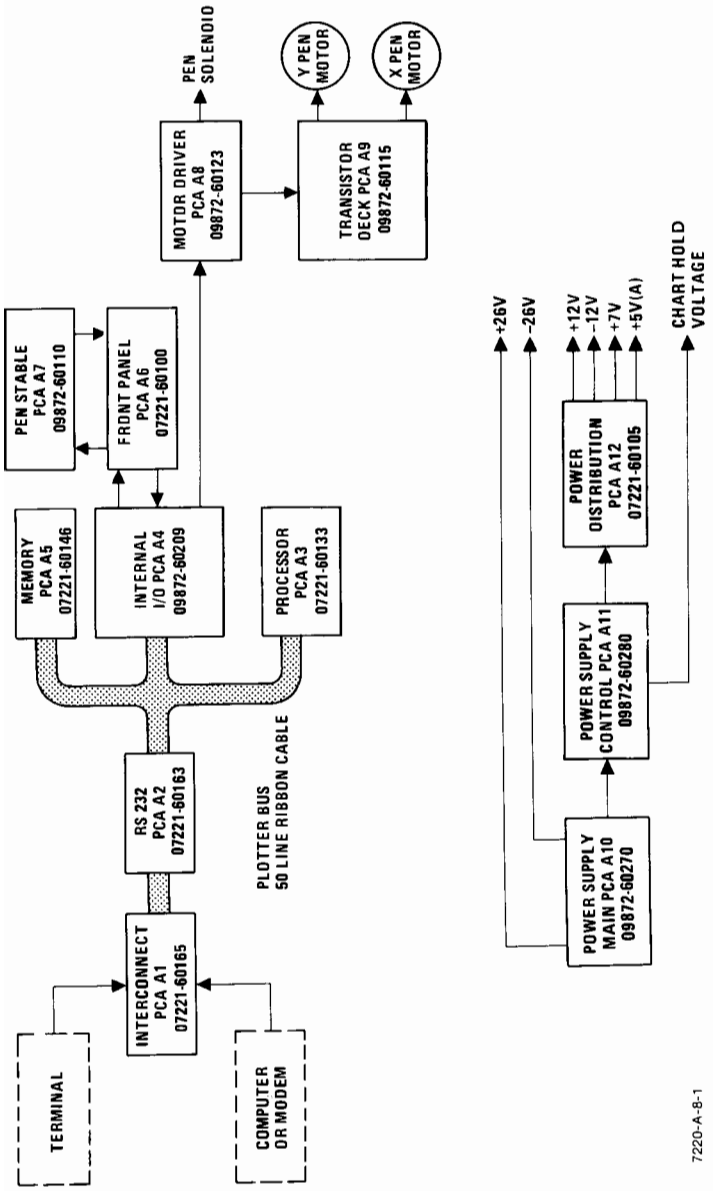

Figure 9-1. Models A and B Simplified Block Diagram

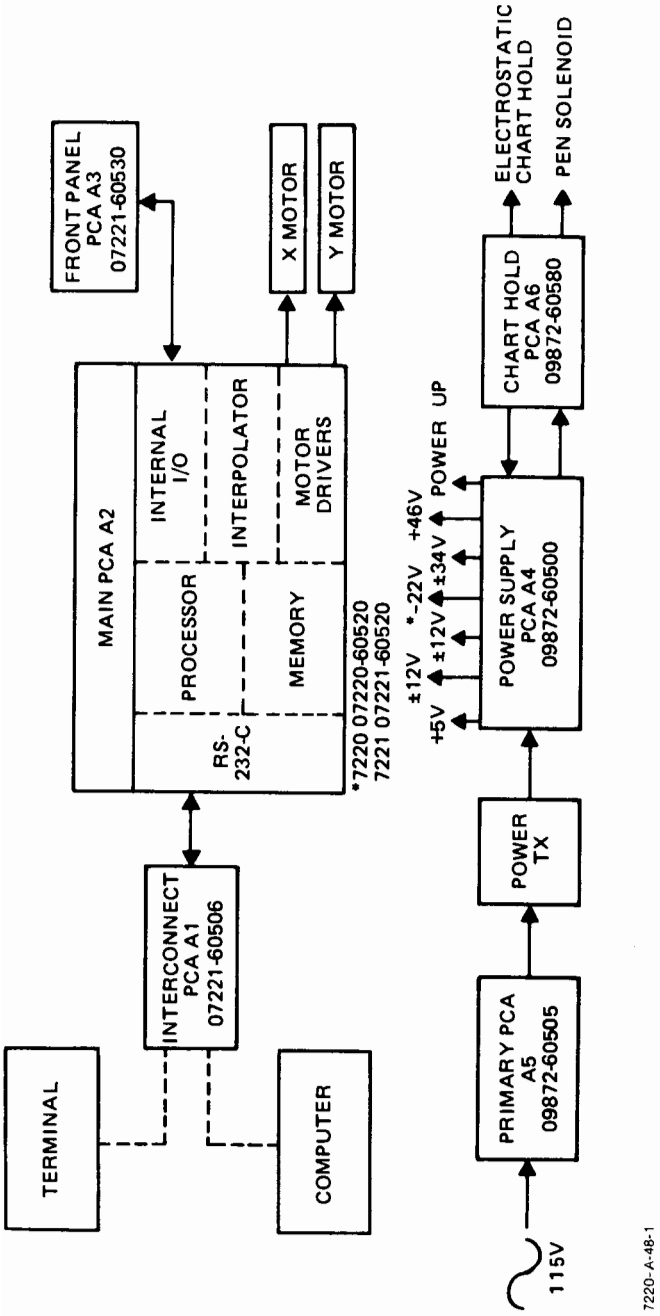

Figure 9-2. Model C Simplified Block Diagram

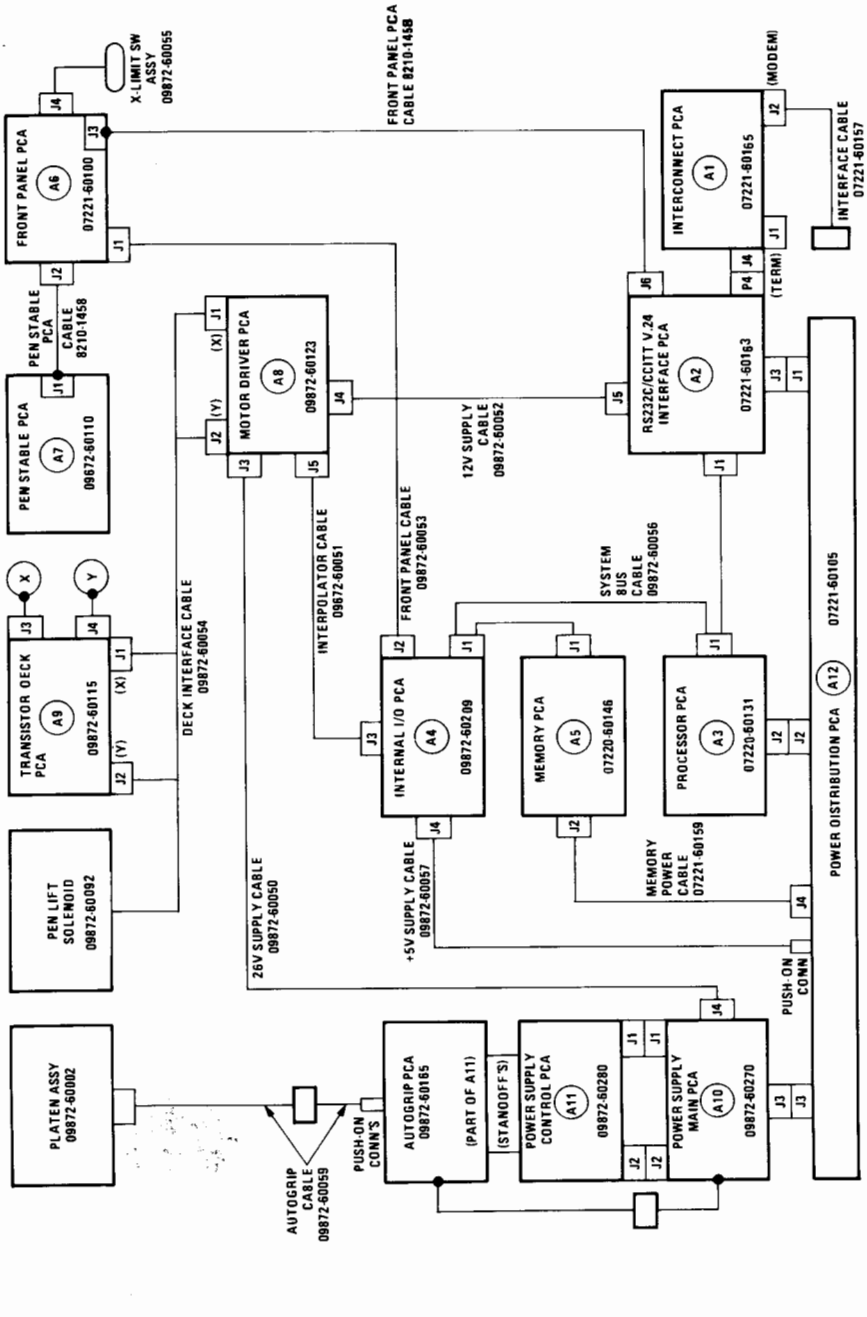

Figure 9-3. Models A and B Interconnecting Cable Diagram

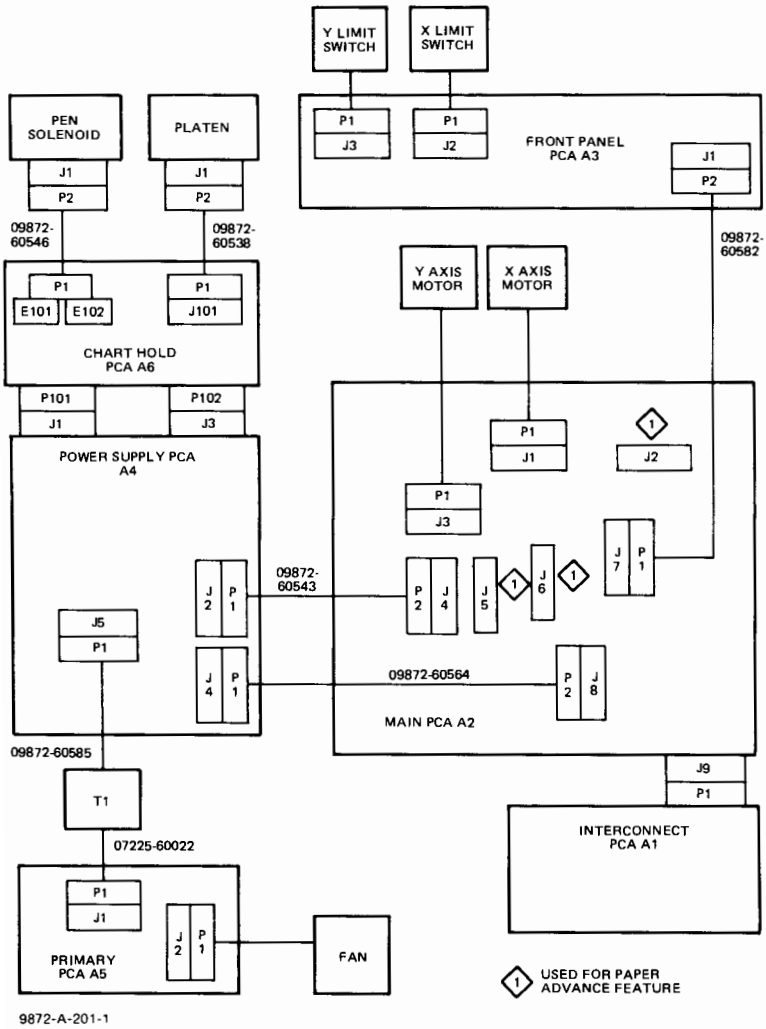

Figure 9-4. Model C Interconnecting Cable Diagram

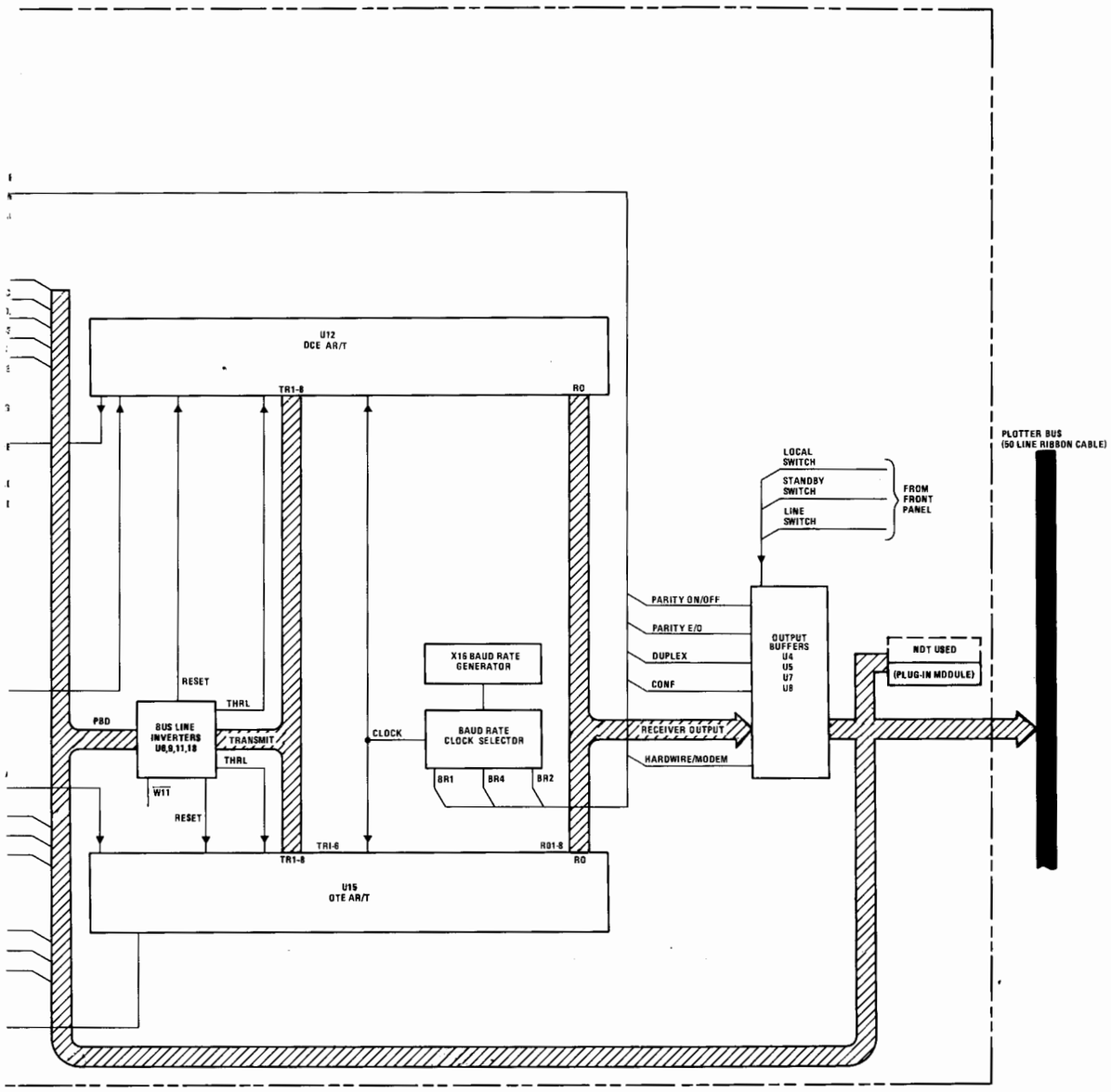

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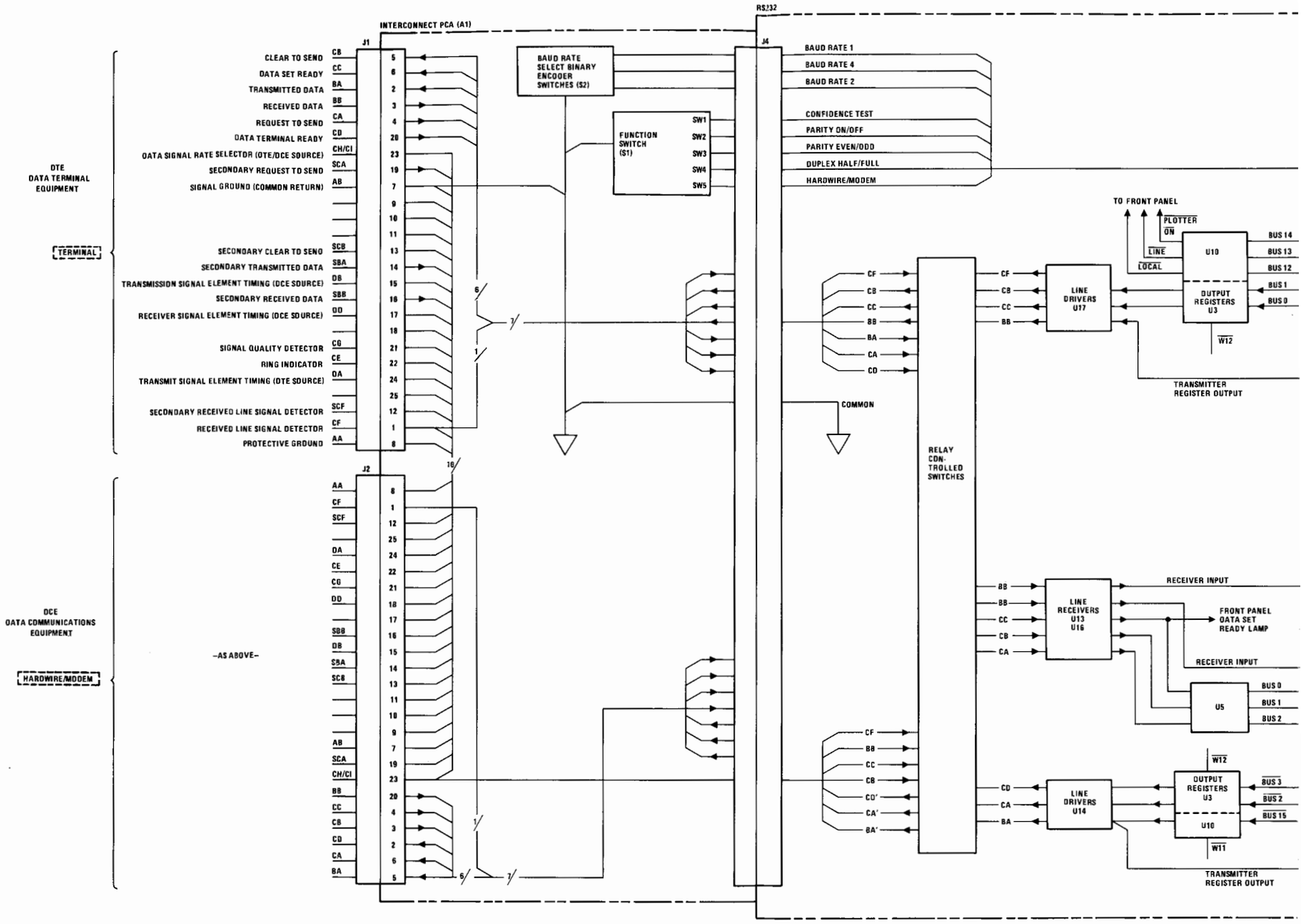
Figure 9-5. Models A and B Functional Block Diagram (Sheet 1 of 4)


RS232
INTERCONNECT PCA (A1)
J1
J2
J4
DTE
DATA TERMINAL
EQUIPMENT
TERMINAL
DCE
DATA COMMUNICATIONS
EQUIPMENT
HARDWIRE/MODEM
CLEAR TO SEND
DATA SET READY
TRANSMITTED DATA
RECEIVED DATA
REQUEST TO SEND
DATA TERMINAL READY
DATA SIGNAL RATE SELECTOR (DTE/DCE SOURCE)
SECONDARY REQUEST TO SEND
SIGNAL GROUND (COMMON RETURN)
SECONDARY CLEAR TO SEND
SECONDARY TRANSMITTED DATA
TRANSMISSION SIGNAL ELEMENT TIMING (DCE SOURCE)
SECONDARY RECEIVED DATA
RECEIVER SIGNAL ELEMENT TIMING (DCE SOURCE)
SIGNAL QUALITY DETECTOR
RING INDICATOR
TRANSMIT SIGNAL ELEMENT TIMING (DTE SOURCE)
SECONDARY RECEIVED LINE SIGNAL DETECTOR
RECEIVED LINE SIGNAL DETECTOR
PROTECTIVE GROUND
–AS ABOVE–
BAUD RATE SELECT BINARY ENCODER SWITCHES (S2)
FUNCTION SWITCH (S1)
SW1
SW2
SW3
SW4
SW5
BAUD RATE 1
BAUD RATE 4
BAUD RATE 2
CONFIDENCE TEST
PARITY ON/OFF
PARITY EVEN/ODD
DUPLEX HALF/FULL
HARDWIRE/MODEM
COMMON
RELAY CON-TROLLED SWITCHES
TO FRONT PANEL
PLOTTER ON
LINE
LOCAL
LINE DRIVERS U17
OUTPUT REGISTERS U3
U10
W12
TRANSMITTER REGISTER OUTPUT
LINE RECEIVERS U13 U16
RECEIVER INPUT
FRONT PANEL DATA SET READY LAMP
U5
LINE DRIVERS U14
W11
BUS 0
BUS 1
BUS 2
BUS 3
BUS 12
BUS 13
BUS 14
BUS 15

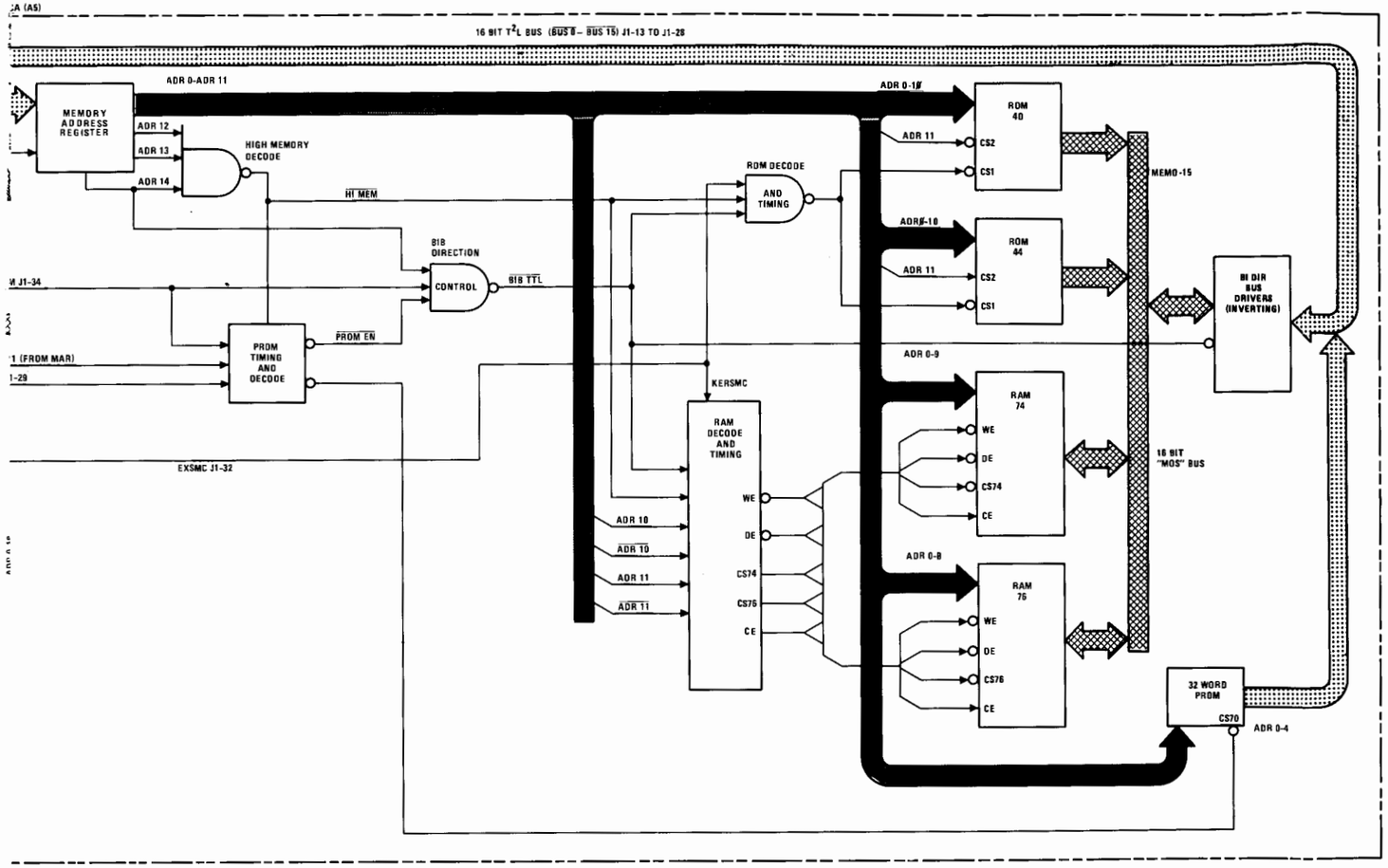


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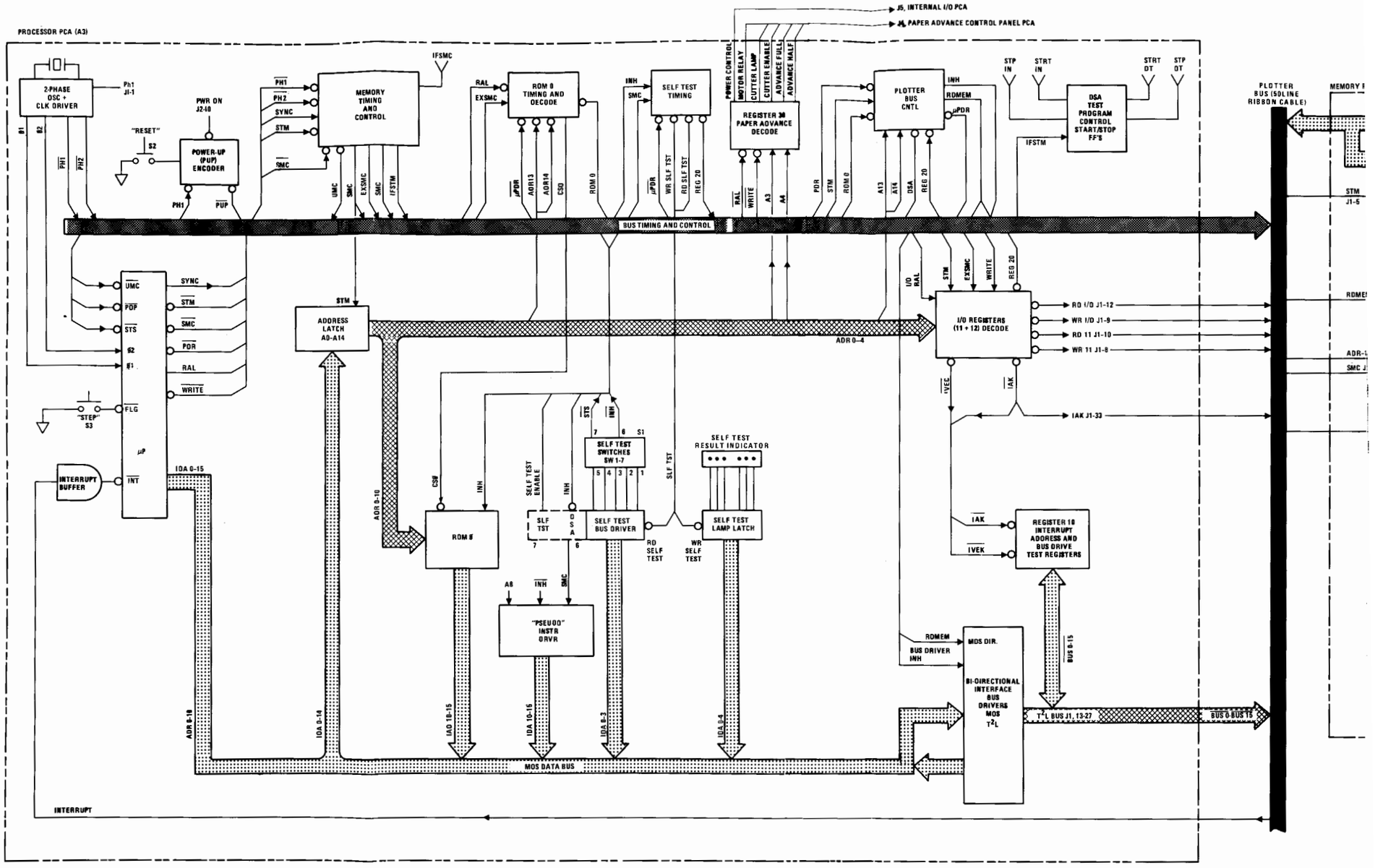
Figure 9-5. Models A and B Functional Block Diagram (Sheet 2 of 4)


PROCESSOR PCA (A3)
J5, INTERNAL I/O PCA
J6, PAPER ADVANCE CONTROL PANEL PCA
2-PHASE OSC + CLK DRIVER
Ph1 J1-1
PWR ON J2-10
"RESET"
S2
POWER-UP (PUP) ENCODER
MEMORY TIMING AND CONTROL
IFSMC
ROM 8 TIMING AND DECODE
SELF TEST TIMING
REGISTER 30 PAPER ADVANCE DECODE
POWER CONTROL
MOTOR RELAY
CUTTER LAMP
CUTTER ENABLE
ADVANCE FULL
ADVANCE HALF
PLOTTER BUS CNTL
DSA TEST PROGRAM CONTROL START/STOP FF'S
STP IN
STRT IN
STRT OT
STP OT
IFSTM
BUS TIMING AND CONTROL
PLOTTER BUS (50 LINE RIBBON CABLE)
MEMORY
STM J1-5
RDMEM
ADR-L
SMC J
ADDRESS LATCH A0-A14
ADR 0-4
I/O REGISTERS (11 + 12) DECODE
RD I/O J1-12
WR I/O J1-9
RD 11 J1-10
WR 11 J1-8
IAK J1-33
SELF TEST RESULT INDICATOR
SELF TEST SWITCHES SW 1-7
"STEP" S3
INTERRUPT BUFFER
IOA 0-15
ROM 8
SELF TEST ENABLE
SLF TST
SELF TEST BUS DRIVER
SELF TEST LAMP LATCH
RD SELF TEST
WR SELF TEST
"PSEUDO" INSTR DRVR
REGISTER 10 INTERRUPT ADDRESS AND BUS DRIVE TEST REGISTERS
BUS DRIVER INH
MOS DIR.
BI-DIRECTIONAL INTERFACE BUS DRIVERS MOS T²L
T²L BUS J1, 13-27
BUS 0-BUS 15
MOS DATA BUS
INTERRUPT

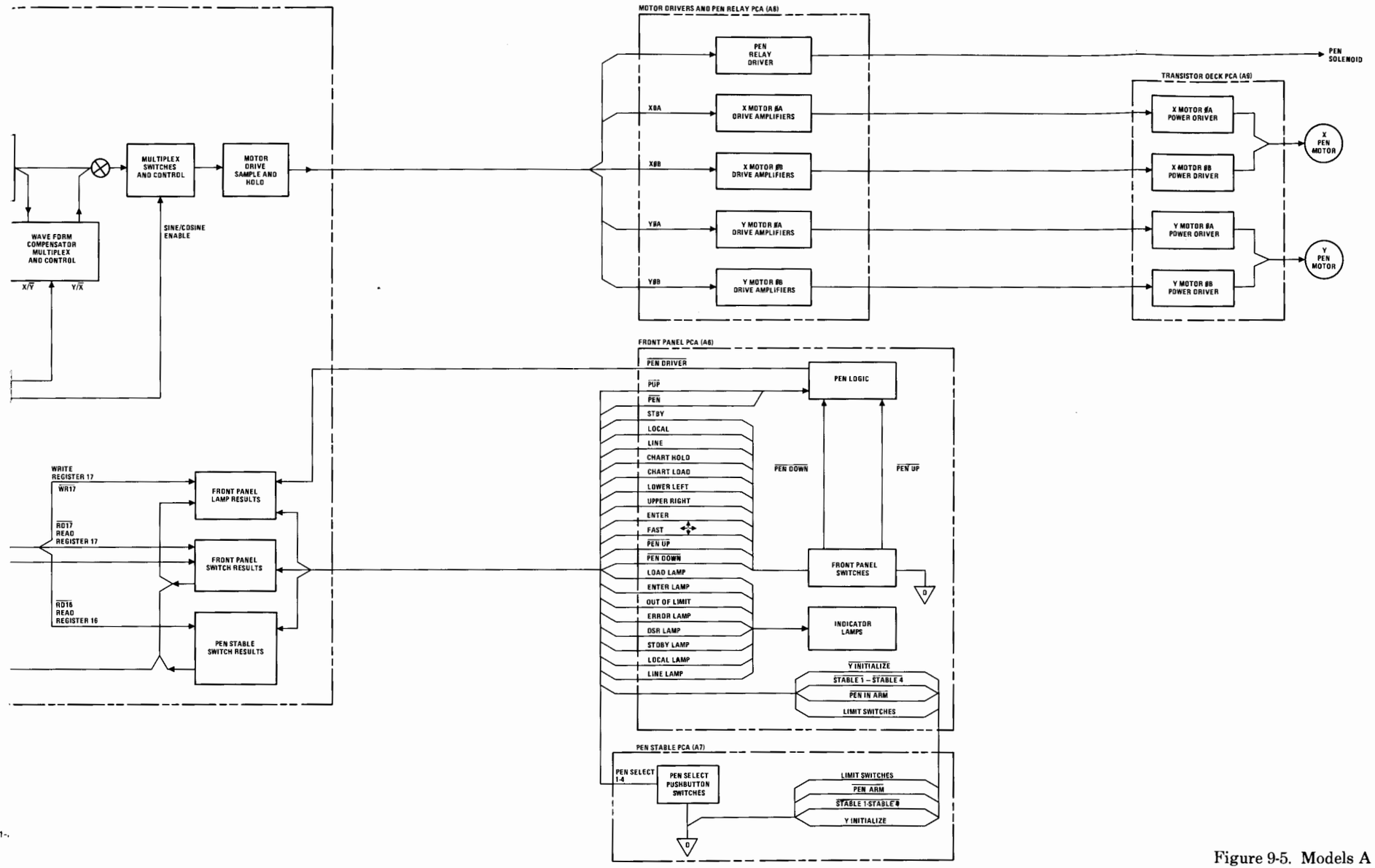
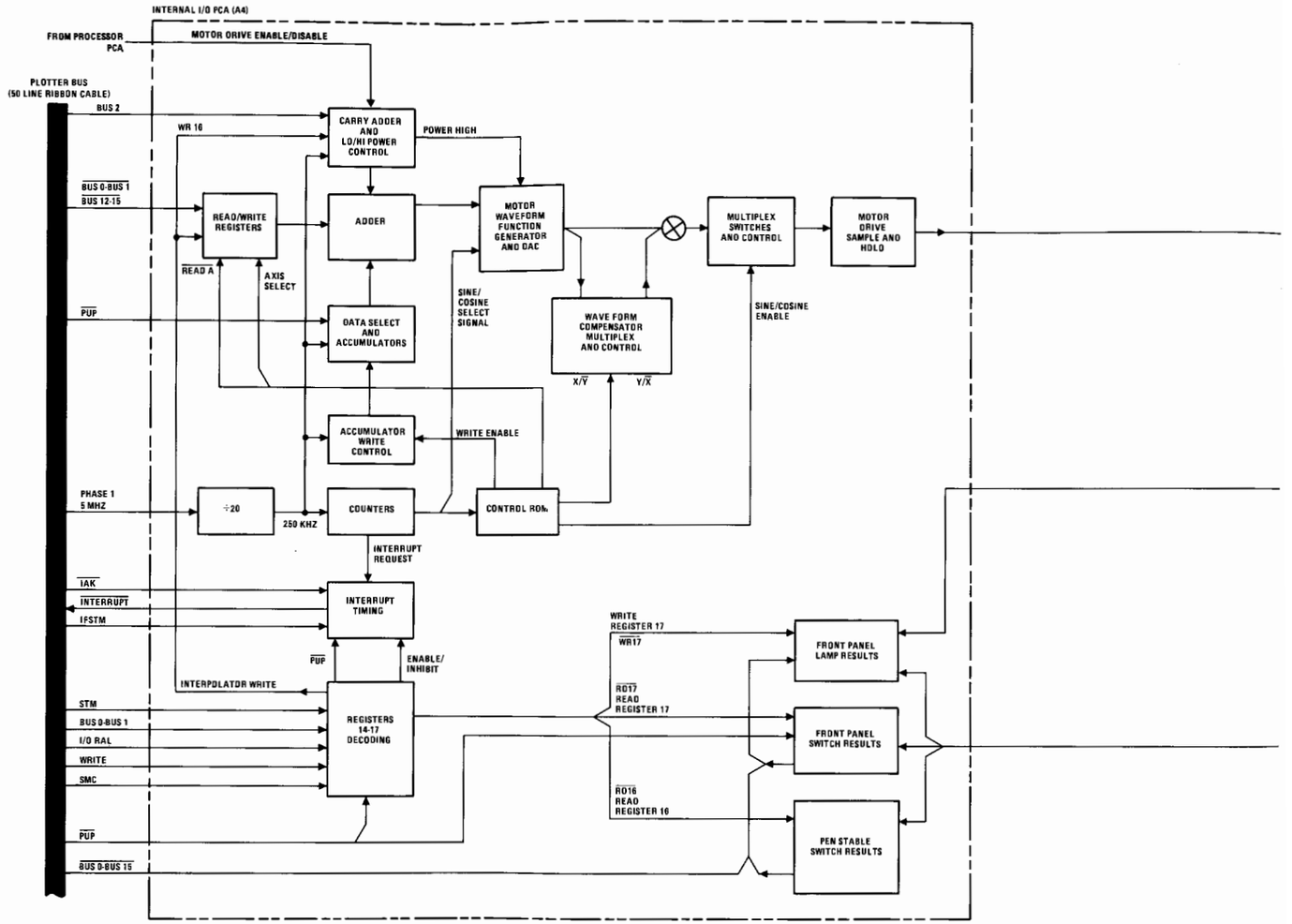


Figure 9-5. Models A and B Functional Block Diagram (Sheet 3 of 4)


INTERNAL I/O PCA (A4)
FROM PROCESSOR PCA
MOTOR DRIVE ENABLE/DISABLE
PLOTTER BUS (50 LINE RIBBON CABLE)
BUS 2
WR 16
CARRY ADDER AND LO/HI POWER CONTROL
POWER HIGH
BUS 0-BUS 1
BUS 12-15
READ/WRITE REGISTERS
ADDER
MOTOR WAVEFORM FUNCTION GENERATOR AND DAC
MULTIPLEX SWITCHES AND CONTROL
MOTOR DRIVE SAMPLE AND HOLD
READ A
AXIS SELECT
SINE/ COSINE SELECT SIGNAL
WAVE FORM COMPENSATOR MULTIPLEX AND CONTROL
SINE/COSINE ENABLE
PUP
DATA SELECT AND ACCUMULATORS
X/Y
Y/X
ACCUMULATOR WRITE CONTROL
WRITE ENABLE
PHASE 1 5 MHZ
÷20
250 KHZ
COUNTERS
CONTROL ROM
INTERRUPT REQUEST
IAK
INTERRUPT
IFSTM
INTERRUPT TIMING
WRITE REGISTER 17
WR17
FRONT PANEL LAMP RESULTS
PUP
ENABLE/ INHIBIT
INTERPOLATOR WRITE
RD17 READ REGISTER 17
STM
BUS 0-BUS 1
I/O RAL
WRITE
SMC
REGISTERS 14-17 DECODING
FRONT PANEL SWITCH RESULTS
RD16 READ REGISTER 16
PUP
PEN STABLE SWITCH RESULTS
BUS 0-BUS 15

7221-J-13-1

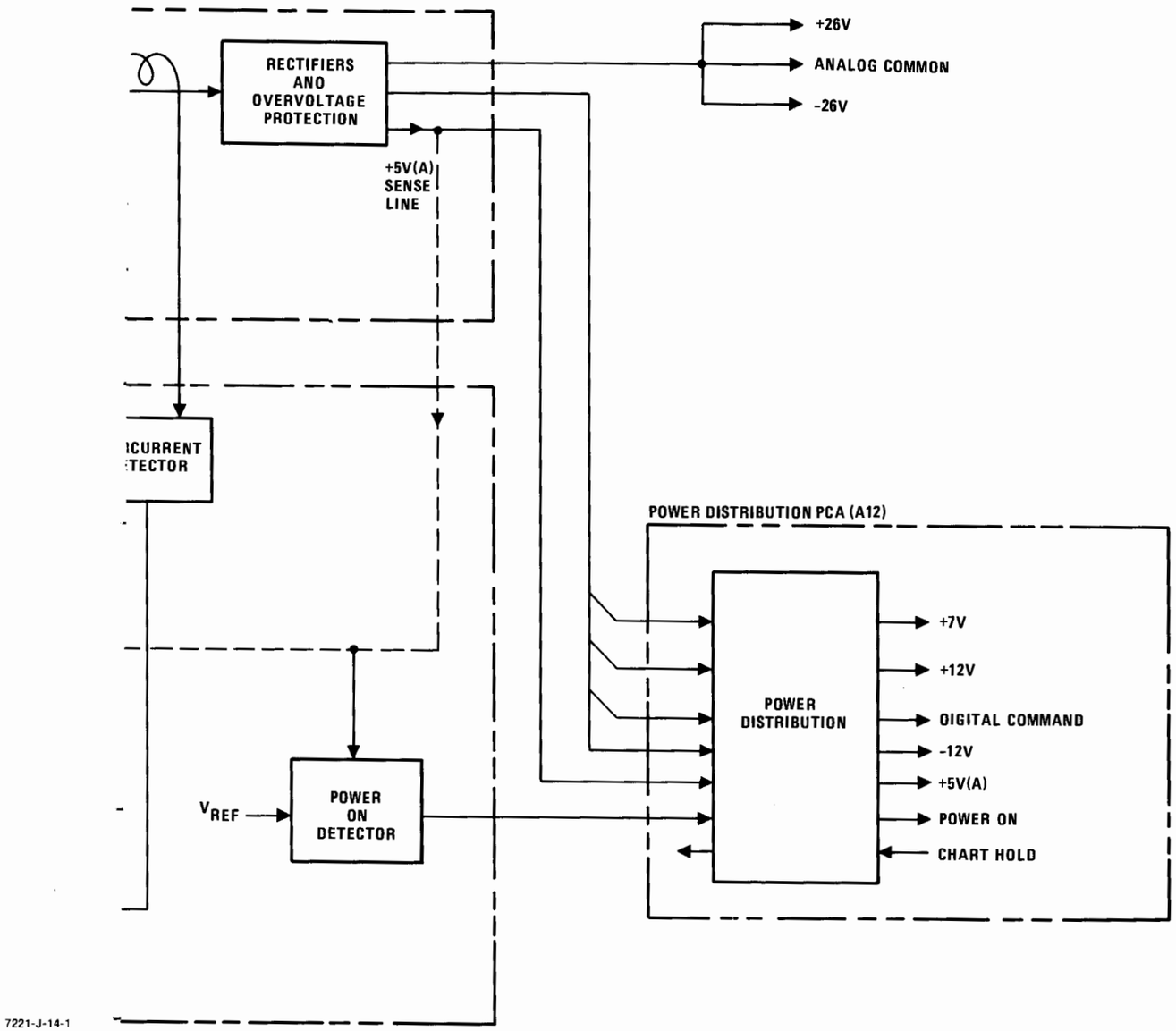
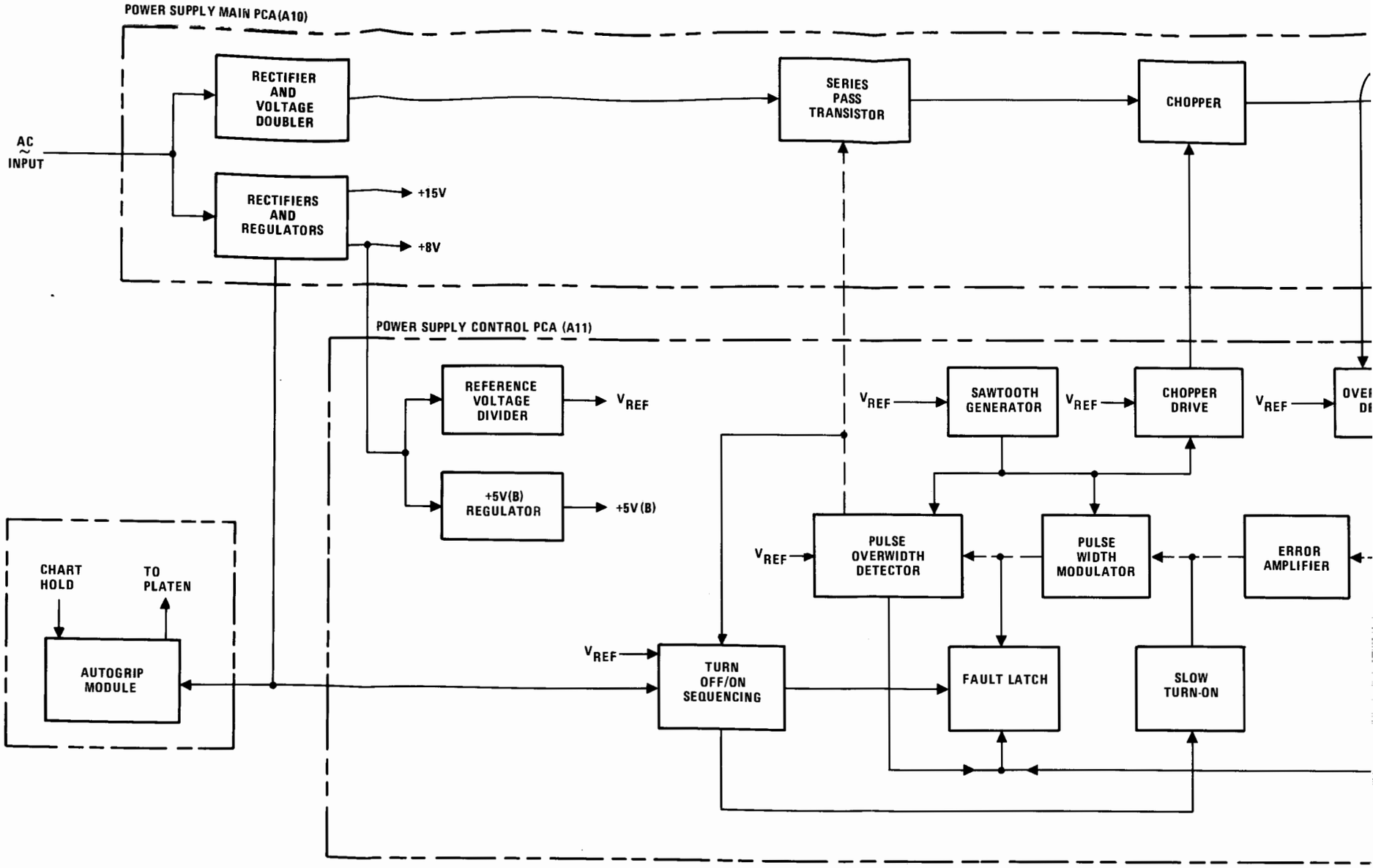


Figure 9-5. Models A and B Functional Block Diagram (Sheet 4 of 4)


POWER SUPPLY MAIN PCA(A10)
AC ~ INPUT
RECTIFIER AND VOLTAGE DOUBLER
RECTIFIERS AND REGULATORS
+15V
+8V
SERIES PASS TRANSISTOR
CHOPPER
POWER SUPPLY CONTROL PCA (A11)
REFERENCE VOLTAGE DIVIDER
V_{REF}
+5V(B) REGULATOR
+5V(B)
V_{REF}
SAWTOOTH GENERATOR
V_{REF}
CHOPPER DRIVE
V_{REF}
V_{REF}
PULSE OVERWIDTH DETECTOR
PULSE WIDTH MODULATOR
ERROR AMPLIFIER
V_{REF}
TURN OFF/ON SEQUENCING
FAULT LATCH
SLOW TURN-ON
CHART HOLD
TO PLATEN
AUTOGRIP MODULE

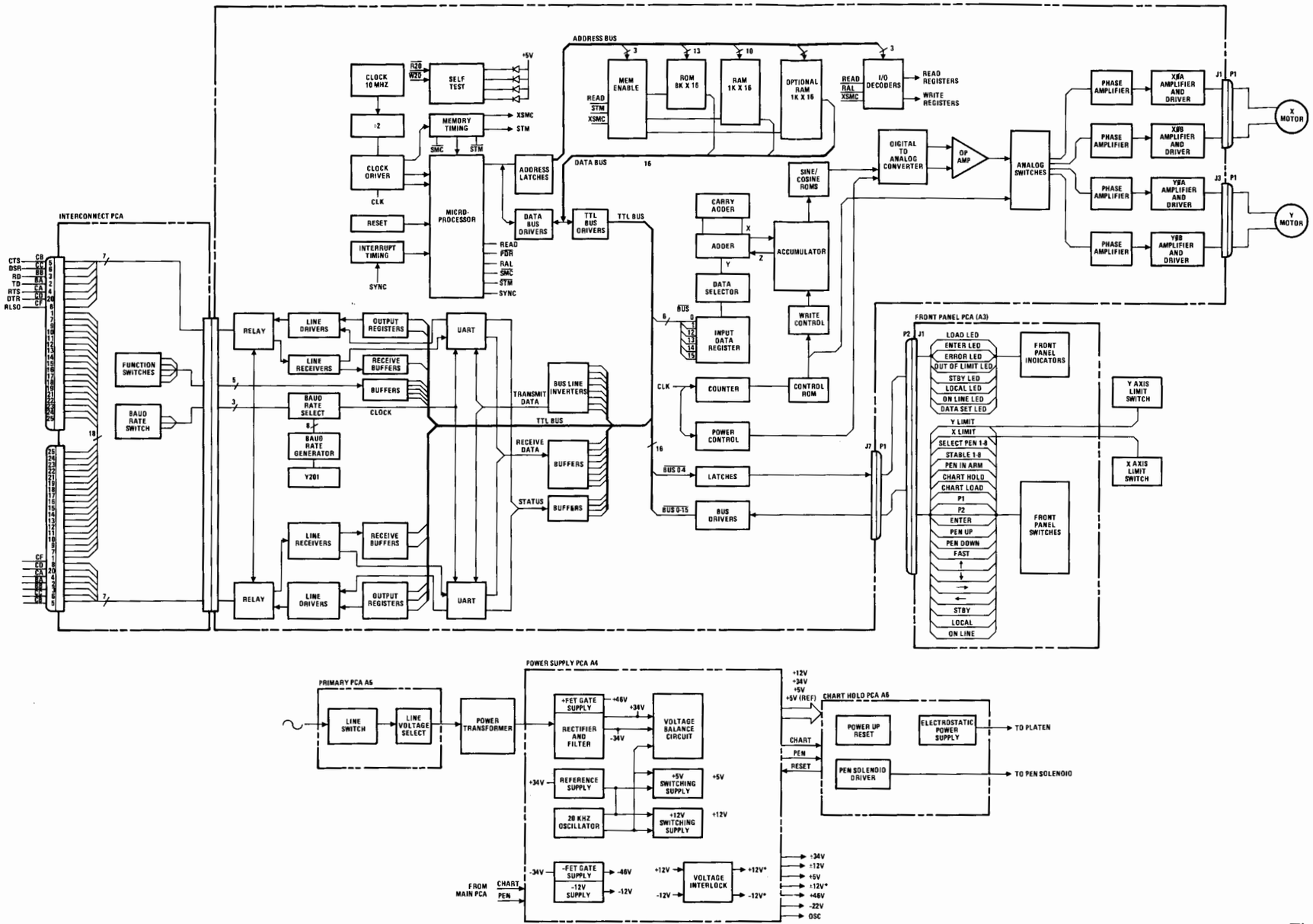


Figure 9-6. Model C Functional Block Diagram

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TABLES

SECTION X

REFERENCE

10-1. TABLES OF ELECTRICAL ADJUSTMENTS

Table 10-1. Models A and B Power Supply Adjustments

SUPPLY	POTENTIOMETER	A	B
+5 V ADJUST	A10R50	5.24 V	5.24 V
+7 V ADJUST	A9R29	7.00 V	7.00 V

Table 10-2. Models A and B Internal I/O Adjustment

STEP	POTENTIOMETER				SWITCH A5S1				DVM READING		NOTE
					SEGMENT						
	A5R15 X	A5R16 Y	A5R4 FULL SCALE	A5R8 OFFSET	A	B	C	D	J3 PIN 6	J3 PIN 8	
1	CCW	CCW	ADJUST	ADJUST	OFF	OFF	ON	OFF	+4.5 ±0.01 V	+6.0 ±0.1 V	Repeat steps 1 & 2 to minimize interaction.
2	CCW	CCW			ON	OFF	ON	OFF	−4.5 ±0.01 V		
3	ADJUST				OFF	OFF	ON	OFF	+6.0 ±0.1 V		
4		ADJUST			OFF	OFF	ON	OFF			

Table 10-3. Models A and B Motor Driver Adjustments

STEP	SELF TEST NUMBER	MOTOR DRIVER MUTE		PRESS BUTTON	ADJUSTMENT		PRESS BUTTON
		X	Y				
1	Self-Test switch ON 32 Octal	ON	OFF	RESET & STEP	A5R15 X	INT I/O	STEP
2	31 Octal	ON	OFF	RESET & STEP	XG	MOTOR DR	STEP
3	30 Octal	ON	OFF	RESET & STEP	CENTER XO2	ADJUST XO1	STEP
4	36 Octal	OFF	ON	RESET & STEP	A5R16 Y	INT I/O	STEP
5	35 Octal	OFF	ON	RESET & STEP	YG	MOTOR DR	STEP
6	34 Octal	OFF	ON	RESET & STEP	CENTER YO2	ADJUST YO1	STEP
7	37 Octal	ON	ON	RESET & STEP	Observe plot for irregularities.		
8	00 Octal Self-Test switch OFF	ON	ON	RESET	Returns plotter to normal operation.		

Table 10-4. Model C Motor Driver Adjustments

STEP	SWITCH SETTING	MOTOR MUTE		ADJUST FOR MINIMUM VIBRATION AT THE PEN HOLDER
		X	Y	
1	S4-2 ON (Self Test) Press a. RESET b. CONT. c. PEN SELECT #1	ON	OFF	R38 X 3RD
2	#2	ON	OFF	R22 X GAIN
3	#3	ON	OFF	CENTER R40 XB OFFSET ADJUST R43 XA OFFSET ADJUST R40 XB OFFSET
4	#4	OFF	ON	R39 Y 3RD
5	#5	OFF	ON	R27 Y GAIN
6	#6	OFF	ON	CENTER R44 YB OFFSET ADJUST R47 YA OFFSET ADJUST R44 YB OFFSET
7	S4-2 OFF Press RESET	ON	ON	Returns the plotter to the normal operating state.

Table 10-5. Model C Table of Mechanical Adjustments

ADJUSTMENT	7221A	ALL OTHERS
Solenoid Travel	1.9 mm (0.075 in.)	3.4 mm (0.133 in.)
Pen Height	0.8 mm (0.032 in.)	2.3 mm (0.09 in.)
Pen Force	23 ±3 grams	
Pen Lift	51 ±2 grams	
Dashpot	program controlled (USE HP 85 SERVICE TAPE)	
Cable Tension	325 ±25 grams for all cables	

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