HEWLETT PACKARD

HARDWARE SUPPORT MANUAL

HP 7595/6
DRAFTING PLOTTERS

SERIAL NUMBERS

This manual applies directly to plotters with serial numbers prefixed 2949.

For additional important information about serial numbers, see SERIAL NUMBER INFORMATION in Chapter 1.

16399 W.BERNARDO DRIVE, SAN DIEGO, CALIFORNIA 92127-1899

MANUAL PART NO. 07595-90025

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CHAPTER 1
PRODUCT INFORMATION

1-1. INTRODUCTION

1-2. This Hardware Support Manual contains information necessary to test, adjust, and service the HP 7595B and 7596B Drafting Plotters, which are shown in Figure 1-1. The manual is divided into twelve chapters:

Chapter	1	Product Information
Chapter	2	Site Planning and Requirements
Chapter	3	Installation and Configuration
Chapter	4	Preventive Maintenance
Chapter	5	Functional Description
Chapter	6	Removal and Replacement
Chapter	7	Adjustments
Chapter	8	Troubleshooting and Diagnostics
Chapter	9	Replaceable Parts
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Chapter	11	Product History
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1-3. For ease of reading, the following references are used interchangeably: HP 7595/6 or plotter, for the HP 7595B and 7596B Drafting Plotters; and RS-232-C for the RS-232-C/CCITT V.24 Interface.

1-4. The HP-GL/2 Reference Guide (HP Part Number 5959–9733) contains information on interfacing, operating, and programming of the HP 7595/6. Supplied with the plotter is the User's Guide (HP Part Number 07595-90051) which contains additional pen and media information for the HP 7595/6.

1-5. DESCRIPTION

1-6. The HP 7595/6 is a microprocessor controlled plotter providing graphic displays of computer program output data. The HP 7595/6 operates with a number of HP computer systems and graphic terminals, using either HP-IB or RS-232-C external controllers.

1-7. The plotter can accommodate media sizes A4/A through A0/E. The left pinch wheel can be moved left or right in the raised position to adjust for the size of media being used. The HP 7596 has a roll-feed capability which allows long-axis plots to be produced.

1-8. The HP 7595/6 is equipped with such capabilities as point digitizing, labeling, axes generation, and automatic pen selection. Large format, multicolor plots of high resolution and quality are generated by the HP 7595/6. Applications include computer aided design (CAD), computer aided manufacturing (CAM), mapping, mechanical and architectural drawings, and general drafting.

1-9. The HP 7595/6 incorporates a low inertia variable reluctance (VR) servo motor drive system and optical position feedback for pen positioning and media transport. Internal diagnostic and calibration capabilities are provided as aids for adjustment and troubleshooting procedures.

1-10. Adjustable pen carousels for roller-ball, fiber-tip, transparency, and capillary drafting pens are supplied with each plotter. A carousel holds up to eight pens. An automatic pen return and capping feature is used in the plotter to increase pen life. When the carousel is configured for drafting pens, the pen in the pen holder is automatically returned to the carousel stable after 10 seconds if no plotting instructions are detected. When the carousel is configured for fiber-tip or roller-ball pens, the pen in the pen holder is returned after 65 seconds if no plotter instructions are detected. A grooved platen is used in the plotter for improved line quality and longer pen life. The carousel pen type is electronically sensed to establish default pen speed, force, and acceleration parameters. The plotter will draw on paper, vellum, or double-matte polyester film media. Media size is mechanically sensed to established plot limits. Default conditions are automatically established for all other plotting parameters. The default parameters can be overridden using front panel controls or HP-GL/2 programming instructions (HP-GL can also be used by setting a front panel option).

1-11. Plotter firmware contains 79 HP-GL/2 instructions for such features as pen control, arc and circle generation, labeling, rotation, absolute and relative vector plotting, point digitizing, and character sizing. A 1-Mbyte buffer stores incoming graphic plot instructions which can be invoked by a single instruction. Six resident character sets are provided in two style fonts for either segment or arc generated characters.

1-12. OPTIONS

1-13. The HP 7595/6 is capable of producing KANJI characters using the Processor PCA Option 010 Retrofit Kit, HP Part Number 17575A.

1-14. Power cord options are listed in Chapter 3 of this manual. The power cord configuration shipped with the plotter is dependent upon the country of destination for the plotter.

1-15. ACCESSORIES

1-16. Items listed in Table 1-1 are supplied with each plotter. Accessories available (not supplied with plotter) are listed in the HP Computer Users Catalog.

Table 1-1. Accessories Supplied

DESCRIPTION	HP PART NUMBER
HP 7595/6 User's Guide	07595-90051
Sales and Service Offices	5958-2682
Supplies Catalog	5957-3776
Survey Card	5958-2691
Disposable Drafting Pen Adapter (1 pkg. of 4)	5061-7578
Disposable Drafting Pens 0.35 mm (1 pkg. of 4)	5061-7566
Fiber-tip Pens 0.3 mm (2 pkgs. of 5)	17845P
Roller-ball Pens 0.3 mm (4)	5061-5037
Adjustable Pen Carousel (2)	5062-1576
Male-to-Male RS-232-C/ CCITT V.24 Cable	17355M
Power Cord	As Ordered
Grit Wheel Brush	5062-1515
Roll Paper (36 in. x 45 ft.) *	9280-0736
Paper Spool (36 in.) *	9300-1069
Roll-Feed Paper Cutter (5) *	07596-60008
D-Size Paper (5 Sheets)	9280-9050
* HP 7596B only	

1-17. PERFORMANCE SPECIFICATIONS

1-18. Plotter specifications are listed in Table 1-2. These specifications are the performance standards or limits against which the plotter is tested. Table 1-3 lists supplemental characteristics. Supplemental characteristics are not specifications but are typical characteristics included as additional information for the user.

Table 1-2. Specifications

RESOLUTION

Smallest Addressable Move:

0.025 mm (0.000984 in.)

Mechanical Resolution:

0.006 mm (0.00025 in.)

REPEATABILITY (for a given pen)

On paper, vellum or double-matte polyester film at 18-300C, level floor:

0.1 mm (0.004 in.)

Pen-to-Pen:

0.2 mm (0.008 in.)

ENDPOINT ACCURACY

On 0.075 mm (0.003 in.) double-matte polyester film at 18-300C, level floor:

0.09% of the move or 0.25 mm (0.00984) whichever is greater

Frame-to-Frame:

0.25 mm (0.01 in.)

NOTE

Specifications apply only when using HP authorized supplies.

Table 1-3. Supplemental Characteristics

PLOTTING AREA

Media Sizes: Accommodates media from 203 x 268 mm (8 x 10.5 in.) to 927 x 1219 mm (36.5 x 48 in.). Includes standard sizes A4/A through A0/E.

Maximum Plotting Area: Medium size less margins.

MARGIN SIZE

Expand Mode: Three margins of approximately 5 mm, fourth margin of approximately 29 mm (+0 mm, -5 mm)

Normal Mode: Three margins of approximately 16 mm, fourth margin of approximately 40 mm.

SPEED

Pen Down: Maximum; 110 cm/s (44 in./s) independent of vector direction
Programmable; 1 to 110 cm/s (0.4 to 44 in./s) in 1 cm/s increments
Front Panel Selectable; From 10 to 110 cm/s (4 to 44 in./s) in 5 cm/s increments

Pen Up: 110 cm/s (44 in./s) independent of vector direction

ACCELERATION

Maximum: 5.7 g, 55.6 m/s^2 (182.4 ft/s^2)
Programmable: 1 g to 4 g, 9.7 to 39 m/s^2 (32 to 128 ft/s^2)

FORCE

Pen Force: Programmable and front panel selectable (15 to 66 gram weights in 8 increments)

PENS

Number of Pens: 8 per carousel
Pen Types: Fiber-tip, roller-ball, tranparency, and long-body drafting (refillable or disposable)

MEDIA

Most standard paper, vellum, tracing bond, and double-matte polyester film from 0.05 mm (0.002 in.) to 0.1 mm (0.004 in.) thickness

BUFFER SIZE

1 Megabyte

1-19. SERIAL NUMBER INFORMATION

1-20. The serial number is located on the rear of the plotter. See Figure 1-2. Hewlett-Packard uses a two-part serial number consisting of a four-digit prefix and a five-digit suffix separated by a letter (0000J00000). The prefix is the same for all identical plotters and changes only when a modification is made that affects parts compatibility. The suffix is assigned sequentially and is different for each plotter. This manual applies directly to plotters with the serial prefix shown on the title page.

1-21. If the serial number prefix of your HP 7595/6 is higher than the one shown, one or more update packages of revised pages are supplied with the manual. Use these new pages to replace the original pages, and discard the old pages. If two or more update packages are supplied, insert them in order by revision letter; that is, Revision A first, then Revision B, etc. The title page will then show the latest serial prefix and the manual will apply directly to plotters with that prefix.

1-22. If the plotter at hand has a lower serial prefix than the one shown on the title page, information in the Product History chapter, Chapter 11, will adapt this manual to that plotter.

1-23. In addition to changes, revised pages may correct errors in the manual or include improved procedures.

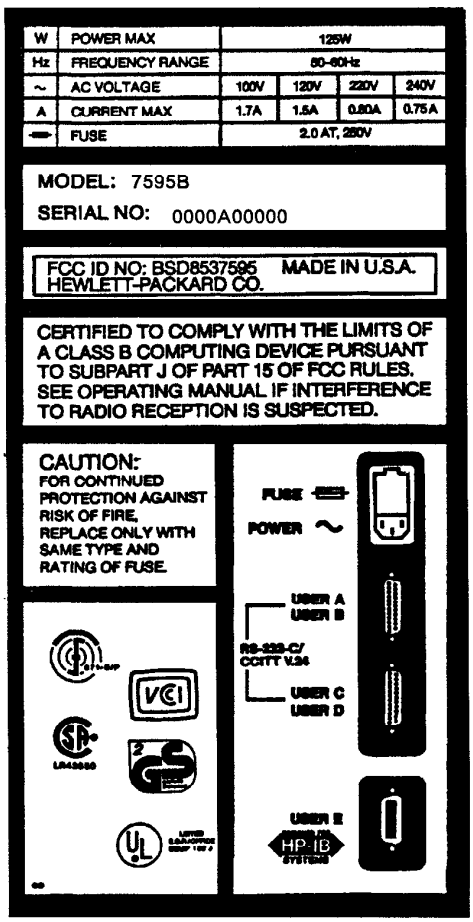


Figure 1-2. HP 7595/6 Identification

1-24. TOOLS AND TEST EQUIPMENT

1-25. Test equipment and special tools recommended to maintain the HP 7595/6 are listed at the end of this chapter in Table 1-4. Substitute equipment and tools must meet or exceed the specifications of the equipment and tools listed.

1-26. SUPPORT STRATEGY

1-27. Basic support strategy for the HP 7595/6 is on-site repair with assembly level replacement. The Processor PCA (A1) and the Analog PCA (A2) are on a factory exchange program.

Table 1-4. Test Equipment and Special Tools

EQUIPMENT/TOOLS	MODEL/SIZE
Oscilloscope	HP 182C or equivalent
Optical Comparator	Bausch and Lomb Measuring Magnifier #81-34-35
Torx Screwdrivers	T-8, T-10, T-15, and T-25
Hex Nut Drivers	7 mm, 8 mm, 3/16", 9/32", and 1/2"
Open End Wrench	10 mm
Allen Wrenches	1.5 mm, 2.0 mm, and 2.5 mm
Flat-blade Screwdrivers	Small and Medium
Grit Wheel Brush	HP (P/N 07595-20085)
Digital Multimeter	HP 3435A or equivalent
Controller	HP-85 or Portable Plus

CHAPTER 2

SITE PLANNING AND REQUIREMENTS

2-1. INTRODUCTION

2-2. This chapter contains information concerning the physical and electrical requirements for the proper installation of the HP 7595/6.

2-3. ELECTRICAL SPECIFICATIONS

WARNING

The ac power outlet (mains) must have a protective earth (ground) terminal. A serious shock hazard leading to death or injury may result if the plotter is not properly grounded.

2-4. POWER REQUIREMENTS

2-5. The HP 7595/6 can be moved easily from one area to another. The new area must have the proper power source available. Refer to Table 2-1 for power requirements.

Table 2-1. Power Requirements

SOURCE:	100V, 120V, 220V, 240V, (+5% to −10 %)
FREQUENCY:	48–66 HZ Single Phase
CONSUMPTION:	125 W

2-6. LINE CORD SET

2-7. The configuration of the ac line cord set required for use with the HP 7595/6 is determined by the destination of the plotter. Refer to Chapter 3 for the available ac line cord connectors.

2-8. ENVIRONMENTAL SPECIFICATIONS

2-9. The area in which the HP 7595/6 will be installed should have stable and level flooring. Other items such as adequate space for ventilation and media movement, plus stable environmental temperature and humidity should be considered for media stability. Refer to Table 2-2 for Environmental Range.

Table 2-2. Environmental Range

Operating Temperature	0°C to 55°C
Non-operating Temperature	−40°C to 75°C
Relative Humidity	5% to 95% (below 40°C)

2-10. PHYSICAL SPECIFICATIONS

2-11. The physical specifications of the HP 7595/6 are listed in Table 2-3.

Table 2-3. Size/Weight

Height	1200 mm (47 in.)
Width	1346 mm (53 in.)
Depth	508 mm (20 in.)
Net Weight	75 kg (164 lb.)
Shipping Weight	102 kg (225 lb.)

2-12. CABLE RESTRICTIONS

2-13. Cable restrictions for the HP 7595/6 are determined by the type of interface being used.

2-14. HP-IB INTERFACE

2-15. The HP-IB Interface allows up to 15 devices to be connected. However, the maximum cable length is restricted to 2 metres (6.6 ft.) per device up to 20 metres (65.8 ft.). The devices may be connected in a star or linear bus network.

2-16. RS-232-C INTERFACE

2-17. The use of short cables (each less than 15 metres or 50 feet) is recommended for the RS-232-C Interface. Longer cables are permissible, provided the load capacitance does not exceed 2500 picofarads.

CHAPTER 3

INSTALLATION AND CONFIGURATION

3-1. INTRODUCTION

3-2. This chapter contains information for incoming inspection, preparation for use, power requirements, installation, storage, and shipping of the HP 7595/6.

3-3. UNPACKING AND INSPECTION

3-4. Incoming inspection procedures are designed to detect any mechanical or electrical defects that may have occurred during transit.

3-5. MECHANICAL CHECKS

3-6. Visually inspect the plotter for damage, scratches, dents, or other mechanical defects. Also check the shipping containers for signs of damage which may have affected the plotter.

3-7. ELECTRICAL CHECKS

3-8. Electrical performance of the plotter can be checked by performing the Demonstration Plot described later in this chapter.

3-9. DAMAGE CLAIMS AND STORAGE

3-10. DAMAGE CLAIMS

3-11. If the plotter is damaged in transit, or fails upon receipt to meet the specifications given in Chapter 1 of this manual, notify the carrier and the nearest Hewlett-Packard Sales and Support Office. Retain the shipping containers and insulation material for the carrier's inspection. The field office will arrange for repair or replacement for your printer.

3-12. STORAGE

3-13. If the plotter is to be stored for an extended period of time, the following general procedures should be followed:

a. Remove the power cable and interface cable from the plotter.

b. Remove all pens from the carousel, and using a mild soap solution, clean any ink residue from the carousel.

c. Clean any ink residue or stains from the plotter.

d. Cover the plotter to protect it from dust.

3-14. INSTALLATION AND MOUNTING INSTRUCTIONS

3-15. LINE VOLTAGE AND FUSING

3-16. The HP 7595/6 can operate from a power source of 100, 120, 220, or 240 Vac +5-10%, 48 to 66 Hz, single phase. Power consumption is 125 W maximum. When shipped from the factory the line voltage selector is set, and an appropriate fuse is installed for operating in the country of destination.

CAUTION

Applying a line voltage of 220 V or 240 V to the printer while using a power transformer configured for use with 100 V or 120 V ac power may damage the power transformer, the plotter or both.

3-17. Line voltage identification, which is visible through the window of the fuse box, indicates the voltage setting. To match the plotter line input circuit to the applied line voltage, see Figure 3-1 and perform the following steps:

WARNING

The following service procedures should be performed only by service-trained personnel who are aware of the electrical shock hazards involved.

a. Set the plotter LINE switch to OFF and disconnect the ac power cord from the plotter

b. Line voltage selection is determined by the plastic insert in the fuse box directly above the ac power receptacle.

c. Use a small screwdriver to snap open the lid of the fuse box.

d. Remove the fuse holder and fuse from the fuse box. Note the orientation of the fuse holder before removal.

e. Remove the voltage selector block from the fuse box.

f. Note the orientation of the alignment pins on the ends of the block. One end is circular and the other end is a slightly larger hexagonal pin

g. Rotate the block until the desired voltage range is at the top.

h. Insert the block into the fuse box, making sure that the block does not turn during insertion.

i. Remove the fuse from the fuse holder. The black fuse holder is used for metric size fuses only.

j. Install a fuse with the correct amperage and voltage rating for the selected operating voltage. Refer to Table 3-1.

k. Insert the fuse holder into the far right side of the fuse box. Do not force the fuse holder. If properly aligned, the fuse holder will go in easily and the white arrows on the end of the fuse holder will always point to the right. The left side of the fuse box stores the unused fuse holder.

Table 3-1. Fuse Selection

VOLTAGE	FUSE RATING	HP P/N
100/120 V	2.0 A	2110-0792
220/240 V	2.0 A	2110-0792

l. Close the fuse box cover. Ensure that the desired voltage rating is visible through the small opening in the cover.

m. Install the correct ac line cord set for the selected voltage range. See Figure 3-2.

3-18. SWITCH AND JUMPER SETTINGS

3-19. There are no switch or jumper settings associated with the HP 7595/6. All modes are controlled through the front-panel keys.

3-20. INTERCONNECTION

3-21. CABLES. All cables used with the HP 7595/6 may be ordered through the HP Computer Users Catalog.

3-22. CONNECTORS. Connectors are provided on the rear panel for HP-IB and RS-232-C.

3-23. CONFIGURATION

3-24. The power cord configuration supplied with the plotter is dependent upon the country of destination. Power cord configurations are illustrated in Figure 3-2.

3-25. SELF-TEST PROCEDURES

3-26. The HP 7595/6 automatically performs a check on the RAM/ROM voltage and drive circuits upon initialization. The RAM/ROM voltage and drive circuits are then monitored by the voltage overload protection circuit. If a problem is detected, plotter operation is suspended and an error message is shown on the front panel display. The fault can then be isolated using the test procedures given in Chapter 8.

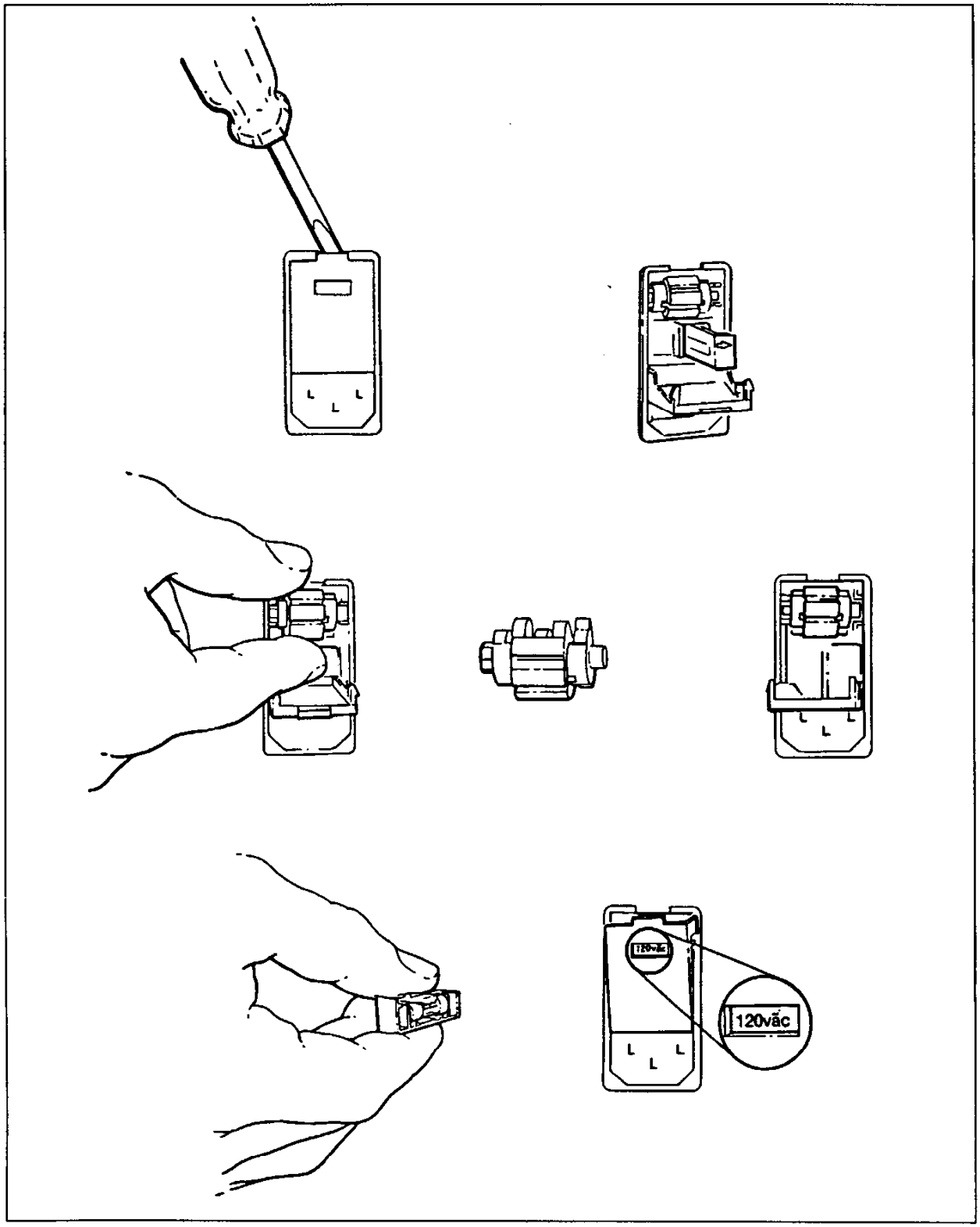
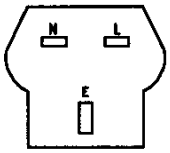
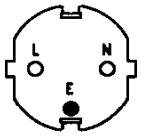
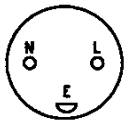
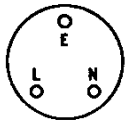


Figure 3-1. Fuse and Voltage Selector Block Setting

		Option No.
BS 1363A 	250 Vac, 13 A, Single Phase plug rating. For use in United Kingdom, Cypress, Nigeria, Zimbabwe, Singapore.	900
AS C112 	250 Vac, 10 A, Single Phase plug rating. For use in Australia, New Zealand.	901
CEE 7-VII 	250 Vac, 10/16 A, Single Phase plug rating. For use in East and West Europe, Egypt.	902
NEMA 5-15P 	125 Vac, 15 A, Single Phase plug rating. For use in Canada, Mexico, Philippines, Taiwan, Saudi Arabia, UL approved in the United States	903
NEMA 6-15P 	250 Vac, 15 A, Single Phase plug rating. For use in Canada, UL approved in the United States.	904
SEV 1011 	250 Vac, 10 A, Single Phase plug rating. For use in Switzerland.	906
DHCK-107 	250 Vac, 10 A, Single Phase plug rating. For use in Denmark.	912
SABS-164 	250 Vac, 10 A, Single Phase plug rating. For use in India, Republic of South Africa.	917
MITI 41-9692 	125 Vac, 12 A, Single Phase plug rating. For use in Japan.	918

NOTE: All plugs are viewed from the power outlet connector end.

L = Line or Active Conductor (also called "live" or "hot")
N = Neutral or Identified Conductor
E = Earth or Safety Ground

Figure 3-2. Power Cord Connector Configurations

3-27. USER INFORMATION AND OPERATION

3-28. FRONT PANEL CONTROLS AND INDICATORS

3-29. The front panel assembly contains 19 keys and a liquid crystal display (LCD) module. Alphanumeric representations of the front-panel functions and plotter activities are provided in the display. Figure 3-3 shows the plotter keys and the names of each. Figure 3-4 shows the hierarchy of functions accessible through the front-panel controls and is provided as an aid for accessing or exiting the functions. Error messages are also displayed in the LCD module.

3-30. PEN CAROUSEL LOADING

3-31. Each of the two adjustable pen carousels supplied with the HP 7595/6 is configured with a specific pen cap design for longer pen life. The pen type determines the default values for plotter speed, force, and acceleration. To assure plot quality, it is important to select the correct pen type to be used. Additional pen and carousel information is contained in the HP 7595/6 User's Guide.

3-32. To load pens into the carousel, proceed as follows:

a. Turn the carousel center column until the white tip of the pointer lines up with the symbol that corresponds to the pen type.

b. Uncap the pens.

c. Pull the carousel stable plunger down.

d. Slip the pen into the pen stable so that the pen collar is engaged between the stable pawl and the carousel top plate. See Figure 3-5. Make sure that the pen is firmly positioned in the stable.

e. Release the plunger.

f. Repeat steps c. and d. for each stable to be filled.

g. Raise the plotter carriage cover and insert the pen carousel into the plotter. The plotter default parameters will be set upon sensing of the carousel during plotter initialization

NOTE

If the pen is not installed correctly, an error message will appear in the front panel LCD.

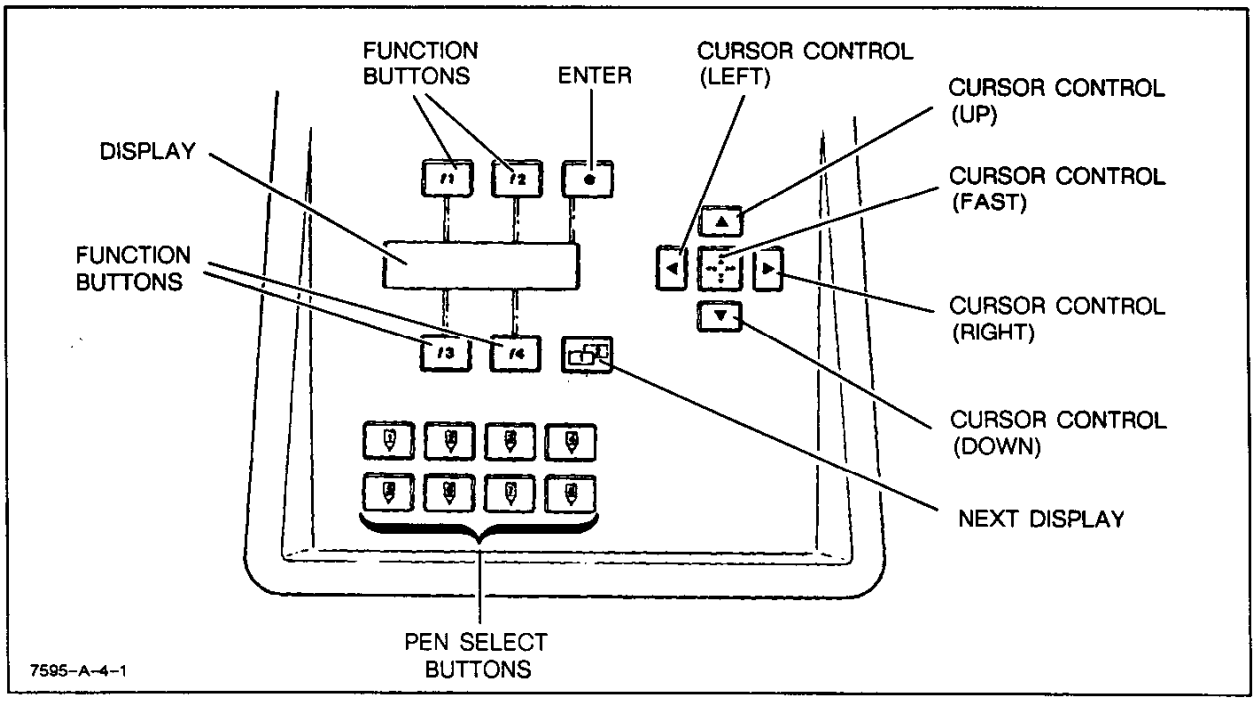


Figure 3-3. Front Panel Controls and Indicators

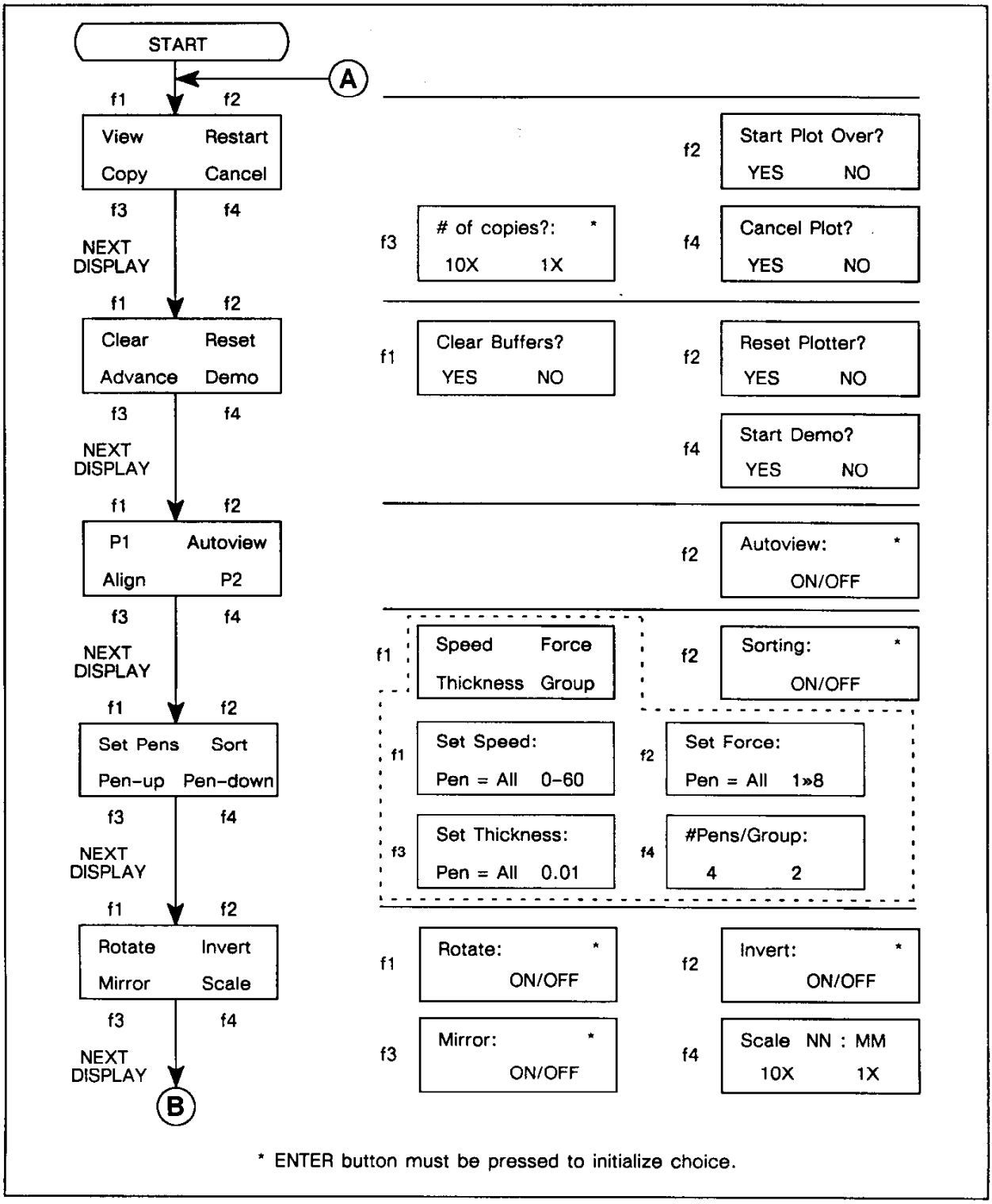


Figure 3-4. Front Panel Hierarchy

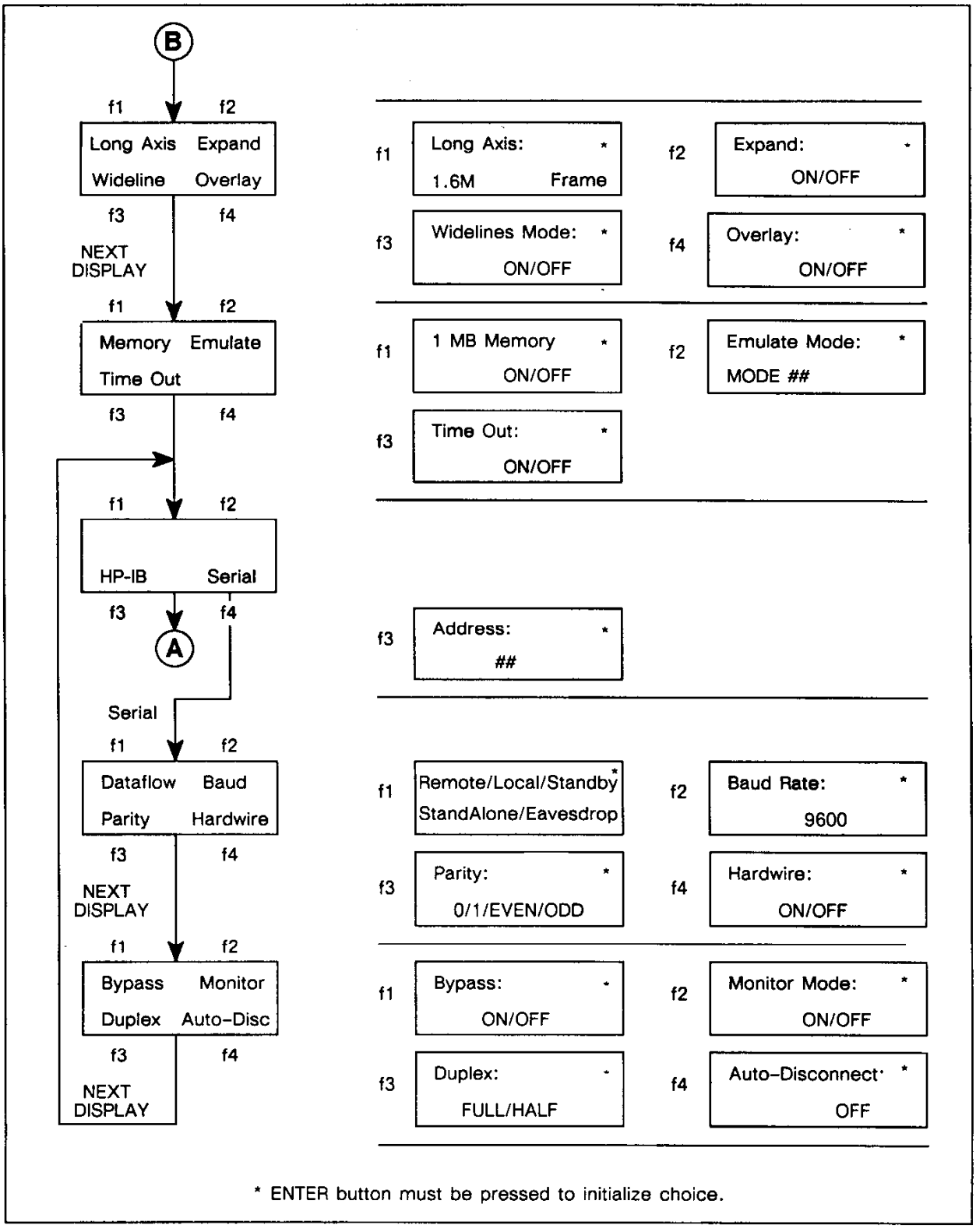


Figure 3-4. Front Panel Hierarchy (Continued)

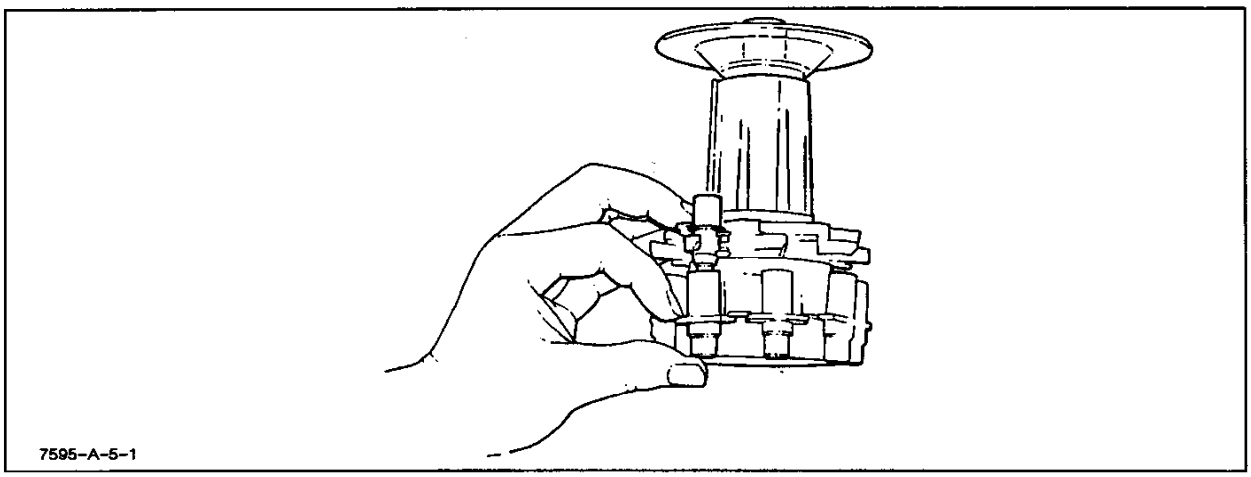


Figure 3-5. Pen Loading

3-33. PEN SPEED AND FORCE

3-34. Plotter pen speed and pen force default values are established upon sensing of the pen type. The pen type is sensed during plotter power-up initialization and whenever a carousel is inserted into the plotter. Default values for the pen types are listed in Table 3-2.

3-35. Pen speed and pen force values differing from the default values can be assigned to the pens in the carousel. The values selected will remain in effect until they are manually changed or the default values are reestablished. Altering the pen speed and pen force values from the default values or inserting different pen types into a carousel will affect plot quality. Refer to the HP 7595/6 User's Guide for pen speed and pen force values that will provide the best plot quality for the type of media and pens being used.

Table 3-2. Pen Carousel Default Values

PEN TYPE	FORCE (GRAMS)	SPEED (cm/s)
Fiber Tip	24	50
Roller Ball	54	60
Drafting	15	25
Transparency	24	10

3-36. To change the pen speed or pen force, perform the following procedure:

a. Press the NEXT DISPLAY button on the front panel until the pen SPEED and FORCE functions appear in the display module.

b. To enter the appropriate function, press the function key which is designated SPEED or FORCE by the display.

c. Press the function key which is designated PEN= in the display to assign the speed or force to either ALL of the pens, or continue to press the PEN= key until the desired pen stable number (1-8) appears in the display.

d. The pen SPEED may be incremented in steps of 5 cm/s from 10 to 60 cm/s. Press the f4 function key until the desired speed is displayed. Press the ENTER button to set the speed for the pen selected.

e. The pen FORCE can be incremented in 8 steps from 15 to 66 grams. A number (1-8) will appear in the display which represents the pen FORCE values shown below.

NUMBER DISPLAYED		FORCE (GRAMS)
1	→	15
2	→	24
3	→	30
4	→	36
5	→	45
6	→	51
7	→	57
8	→	66

f. Press the f4 function key until the number corresponding to the desired force is displayed. Press the ENTER button to set the force for the pen selected.

g. Repeat the above steps for each pen requiring a different SPEED or FORCE value.

3-37. LOADING SHEET PAPER

3-38. To load sheet paper into the plotter, perform the following procedure:

a. Turn the plotter LINE switch to Off (O).

b. Raise the plotter window to the standing position. See Figure 3-6.

c. Using the pinch arm lever, raise the pinch wheels.

d. Insert the paper, positioning it to the right and flush against the front and rear paper stops.

e. Move the left pinch-wheel arm to the right or to the left to accommodate the size of the paper being used. The white mark on the left pinch wheel should align with the left edge of the media.

f. Using the pinch arm lever, lower the pinch wheels.

g. Lower the plotter window and turn the LINE switch to ON (I).

3-39. LOADING ROLL PAPER

3-40. To load roll paper onto the plotter, perform the following procedure:

a. Grasp a roll feed spindle and remove the end cap.

b. Slide the spindle into a roll of paper as shown in Figure 3-7, Detail A.

c. Push the spindle until the paper core is flush against the core stop.

d. Firmly push the end cap onto the opposite end of the spool.

NOTE

Use the same procedure to load the cardboard core onto the second spindle. When a roll of plotting paper is used up, keep the cardboard core to use as a take-up spool.

e. Turn the plotter line switch to ON (I) and raise the carriage cover.

f. Using the pinch wheel lever, raise the pinch wheels and push the left pinch wheel toward the left end of the plotter.

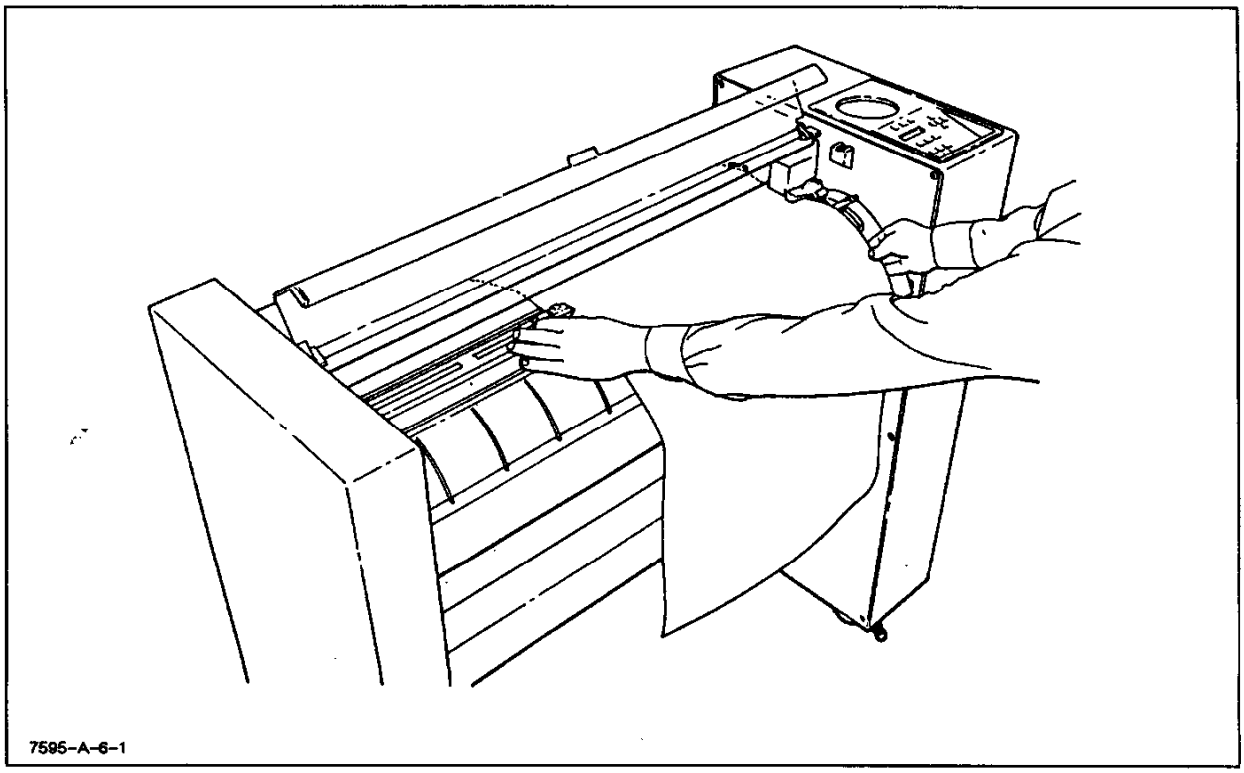


Figure 3-6. Loading Sheet Paper

g. Load the take-up spool into the front of the plotter, inserting its slotted end into the right module. See Figure 3-7, Detail B.

h. Load the spool of paper into the rear of the plotter, inserting its slotted end into the left module. See Figure 3-7, Detail C.

i. Pull the paper up from the rear of the plotter and thread it under the pinch wheels.Align the edge of the paper with both paper guides.

j. Pull the paper down the front of the plotter to the take-up spool and tape it to the edges and middle of the cardboard core.

k. Manually rotate the take-up spool two or three times to make sure the paper winds correctly.

l. Move the left pinch wheel so that it is aligned with the left edge of the paper.

m. Lower the pinch wheels.

n. Lower the carriage cover.

3-41. SYSTEM VERIFICATION

3-42. Proper operation of the HP 7595/6 is verified by the plotter successfully completing the Demonstration Plot.

3-43. DEMONSTRATION PLOT

3-44. To start the Demonstration Plot, shown in Figure 3-8, perform the following procedure:

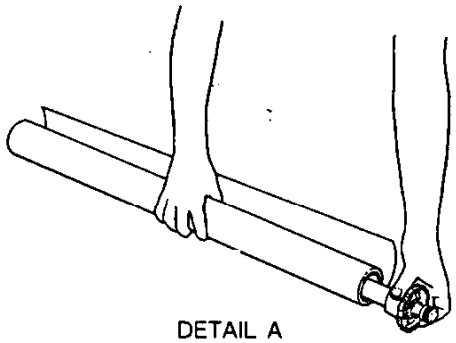
a. Connect the ac power cord to the plotter and wall outlet.

b. Load pens into the pen carousel.

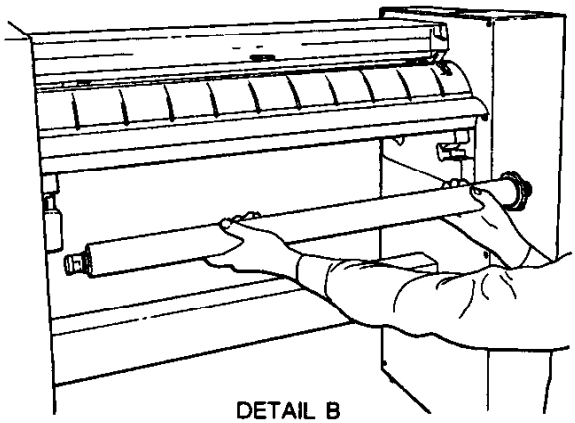
c. Load paper into the plotter.

d. Turn the plotter line switch to ON (I).

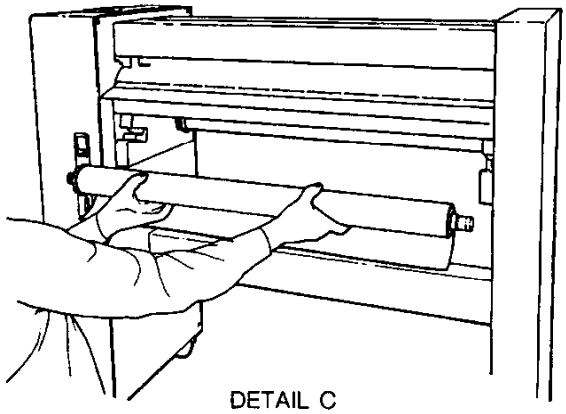
e. Press function key f2 to start the Demonstration Plot.



DETAIL A



DETAIL B



DETAIL C

7595-A-87-1

Figure 3-7. Loading Roll Paper

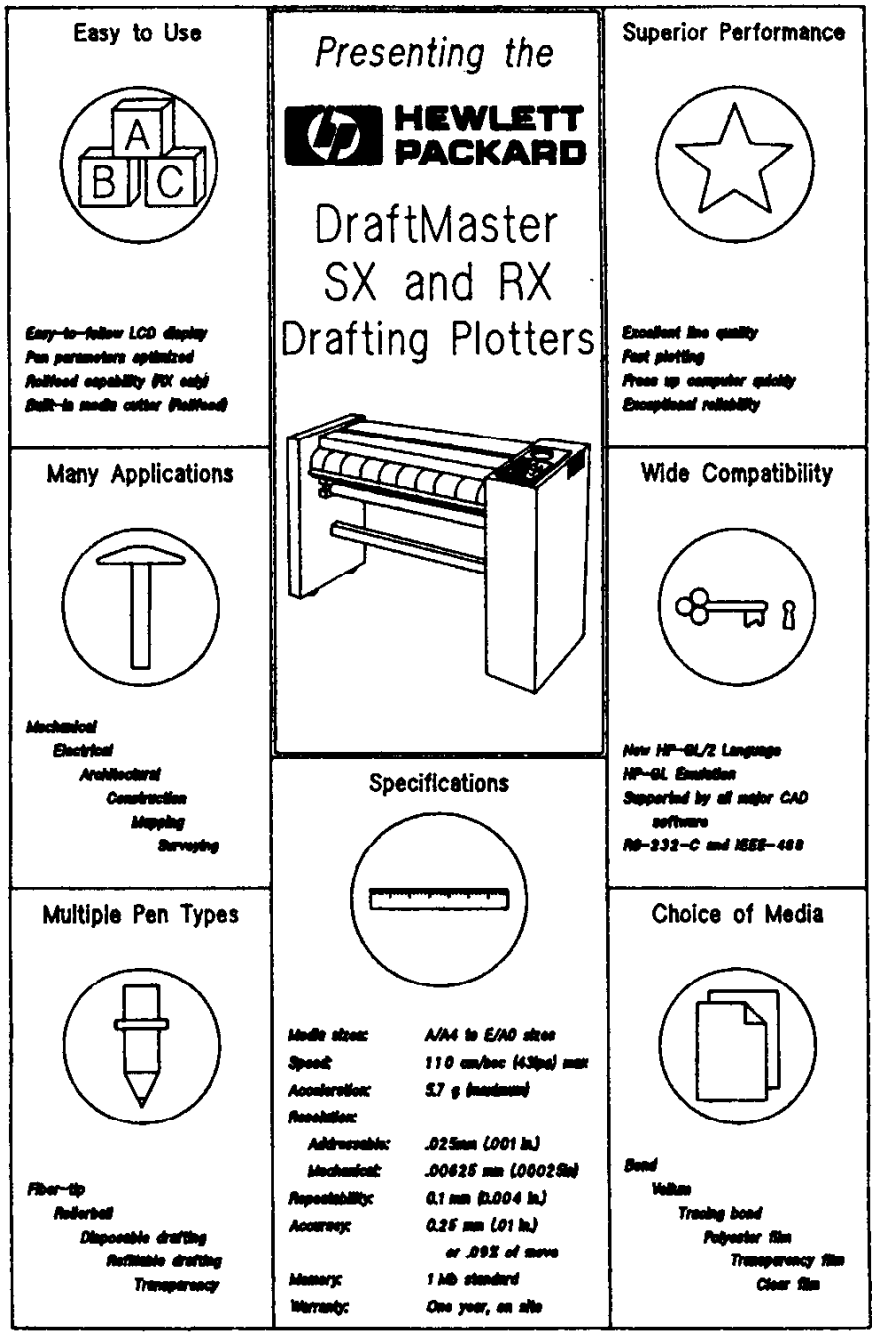


Figure 3-8. Demonstration Plot

CHAPTER 4

PREVENTIVE MAINTENANCE

4-1. INTRODUCTION

4-2. This chapter contains information on keeping the HP 7595/6 in the best operating condition. Included are instructions for operator maintenance and cleaning.

4-3. EFFECT ON PRODUCT RELIABILITY

4-4. To maintain the plotter in the best operating condition, keep the plotter free of dust accumulation, ink, and other contamination. The cleaning intervals are determined by the local conditions under which the plotter is operated and by the types of plotter supplies used. Although accumulations of dust or ink on the plotter will probably not degrade the performance, dust or lint on the grit wheels will affect plotter operation. A build-up of lint or paper fibers on the grit wheels will allow the media to slip and degrade the accuracy of the plot. As with any precision electronics equipment, proper maintenance will help to prolong the product life.

4-5. PREVENTIVE MAINTENANCE PROCEDURES

4-6. Perform the following preventive maintenance procedures to ensure the proper operation of the plotter.

WARNING

Disconnect the plotter from the power source before performing any maintenance. Do not allow water to run onto electrical components and circuits or through openings in the enclosure as it may create a shock hazard.

4-7. GENERAL CLEANING

4-8. Perform periodic and thorough cleaning of the plotter. The type of operations, local air contamination, and climatic conditions determine the cleaning intervals. Proper procedure should include the following:

a. Blow away dust accumulation with 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 the plotter dry after cleaning.

c. Using a damp sponge or cloth, wipe accumulated paper dust from the rubber pinch wheels. Do not use the grit wheel brush to clean the pinch wheels.

NOTE

Do not use abrasive cleaners on the plastic carriage cover. Clean the cover with a mild solution of soap and water and wipe it dry with a soft lint-free cloth to prevent scratching.

4-9. GRIT WHEEL CLEANING

4-10. Cleaning the micro-grip drive grit wheel is limited to the removal of the dust from between the particles of grit. To remove the dust, perform the following procedure:

a. Disconnect power from the plotter.

b. Raise the carriage cover to gain access to the grit wheel

CAUTION

To avoid damaging the grit on the grit wheel, use only the brush that is supplied with the plotter.

c. Manually rotate the grit wheel and brush dust from grit surface using the brush supplied with the plotter.

CHAPTER 5
FUNCTIONAL DESCRIPTION

5-1. INTRODUCTION

5-2. This chapter contains both a simplified and a functional level description of the HP 7595/6 circuits and options. The functional block diagram is located in Chapter 12.

5-3. SAFETY CONSIDERATIONS

5-4. The HP 7595/6 has been designed according to accepted safety standards. Safety Symbols used with Hewlett-Packard instruments are illustrated in the front matter of this manual. These symbols must be reviewed before service work is performed. Servicing should be performed only by qualified service personnel.

5-5. SIMPLIFIED THEORY OF OPERATION

5-6. This simplified theory of operation is provided as an introduction to the plotter system at a simplified block diagram level. See Figure 5-1.

5-7. The front panel assembly provides a means of manually entering X- and Y- position data, pen selection and control, and media load control data to the plotter circuitry for processing. Alphanumeric displays of the front panel functions and plotter activities are available on the front panel.

5-8. The General Purpose Interface Bus (GP-IB) and Dual Asynchronous Receiver/Transmitter (DART) circuits perform data transfer, interfacing, and any necessary data conversions for internal plotter use.

5-9. Data transfer is controlled by the microprocessor (μP) which generates the appropriate timing signals to properly sequence the processing of data and instructions on the processor bus.

5-10. Memory contains the operating system data for controlling plotter operations. The memory circuit consists of the Electrically Erasable Programmable Read Only Memory (EEPROM), Read Only Memory (ROM), and Dynamic Random Access Memory (DRAM). The EEPROM stores the user configuration data and mechanical calibration constants. The ROM stores the system instructions and data constants which the microprocessor accesses and interprets. DRAM is used for the temporary storage of microprocessor calculations and input/output data.

5-11. The Servo Integrated Circuit (IC) transfers position and velocity encoded information from the X- and Y-motors onto the data bus to the microprocessor for interpretation and provides PWM signals to the X- and Y-motor drive circuits which controls motor movement. Comparison and error detection signals received back from the microprocessor are used by the X- and Y-motors for compensation.

5-12. The Support Circuits further process data received from the microprocessor. The Support Circuits contain most of the logic that would otherwise be implemented in discrete Transistor-to-Transistor Logic (TTL) components.

5-13. Data on the plotter data bus are coupled through drive amplifiers and are used to step all drive motors for the plotter.

5-14. The photosensor assembly detects carousel presence, pen presence in the carousel stall, and the type of carousel being used in order for the plotter to determine default force and speed. It also senses if the plotter window is raised or lowered, and initializes the carousel so that the pen in pen stall #1 is positioned for a pen pick.

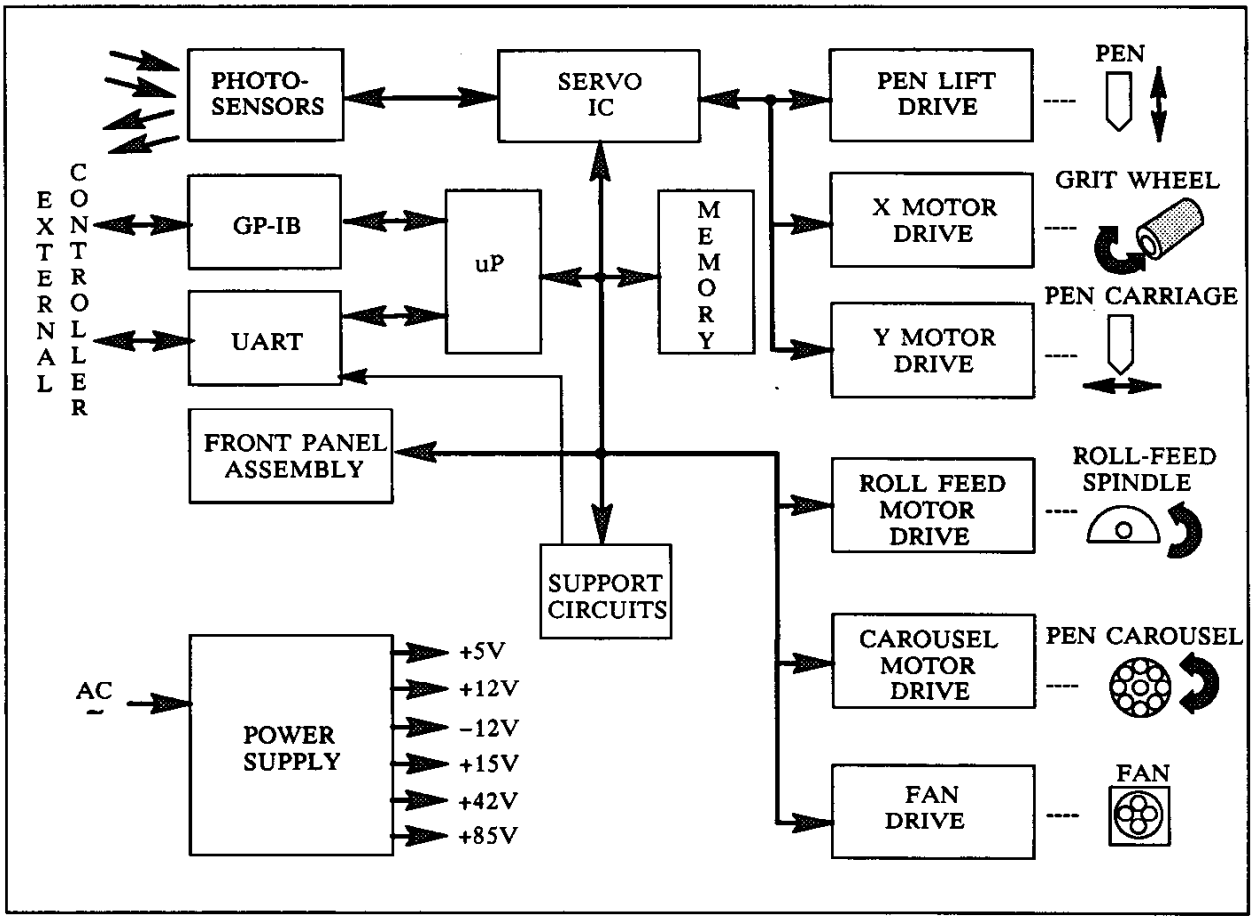


Figure 5-1. HP 7595/6 Simplified Block Diagram

5-15. FUNCTIONAL DESCRIPTION OF CIRCUITS

5-16. The functional theory of operation is a block diagram description (see Chapter 12) which presents an overview of the HP 7595/6 plotter operation. Simplified diagrams of major blocks are included to clarify descriptions.

5-17. FRONT-PANEL I/O CIRCUITS

5-18. A nineteen-button switch matrix on the front panel allows the operator to manually enter pen position data, pen selection and control data, media load information, plotter limits, and interface parameters. Four function keys, whose immediate functions are displayed in the display module on the front panel, allow the operator to set various plotter parameters and invoke the internal diagnostic routines.

5-19. The LCD (Liquid Crystal Display) module on the front panel assembly provides a 40-character (2 rows of 20 characters each) alphanumeric display of the plotter functions and activities as they are accessed through the front panel buttons.

5-20. The front panel, through microprocessor control, displays the names of the functions used to control the plotter. Every display has a ranking and the front panel has a functional hierarchy which is illustrated in Chapter 3 of this manual. Error displays have top ranking and will override other displays if an error occurs.

5-21. Signals from the front panel switch matrix are input through the bus drivers on the buffered data bus for processing. A signal from the Support ICs, which is decoded by the address information, enables the display module; and display data received from the microprocessor is latched through the keyboard latch register to the front panel display. Buffering of output signals to the switch matrix is provided by the Line Drivers. A simplified block diagram of the front panel and input/output circuits is shown in Figure 5-2.

5-22. Pressing any of the front panel buttons causes the corresponding matrix line to go low. This low is input to the Processor PCA and the information is put on the data bus for processing. A resistor network keeps the lines pulled high when not activated.

5-23. The microprocessor receives the keyboard information on data bus lines 0, 1, 2, and 3. Front panel status on the data bus is interpreted and processed by the microprocessor. Data from the microprocessor is used to drive the alphanumeric liquid crystal display module. Information displayed by the module is used for plotter status and troubleshooting purposes.

5-24. POWER SUPPLY CIRCUIT

5-25. Line voltage to the power supply is input through the ac input circuitry which includes the power cord receptacle, the line fuse and fuse holder, the LINE ON/OFF switch, and the power transformer. Voltage developed in the power transformer secondary is converted in the power supply to drive the plotter electronics, vacuum fan, and roll feed drive . The vacuum fan draws the medium down on the platen to eliminate pen drag on the medium. A simplified block diagram of the Power Supply circuit is shown in Figure 5-3.

5-26. Voltages of +5 V, +12 V, −12 V, +15 V, +42 V, and +85 V are produced in the power supply circuits to drive the motors and plotter electronics. The power supply is a switching type dc supply incorporating a pulse-width modulator (PWM).

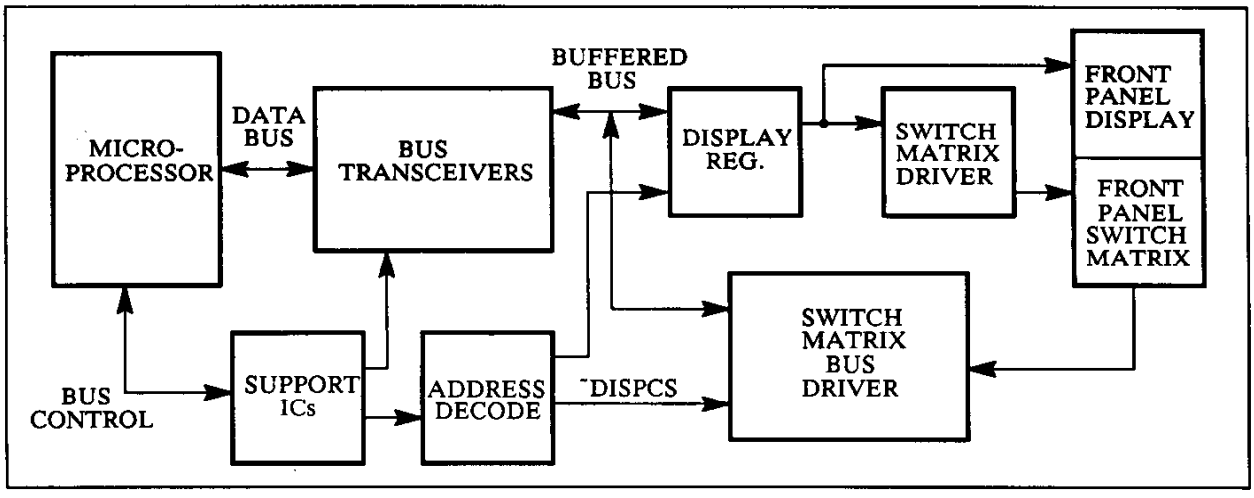


Figure 5-2. Front Panel I/O Circuit

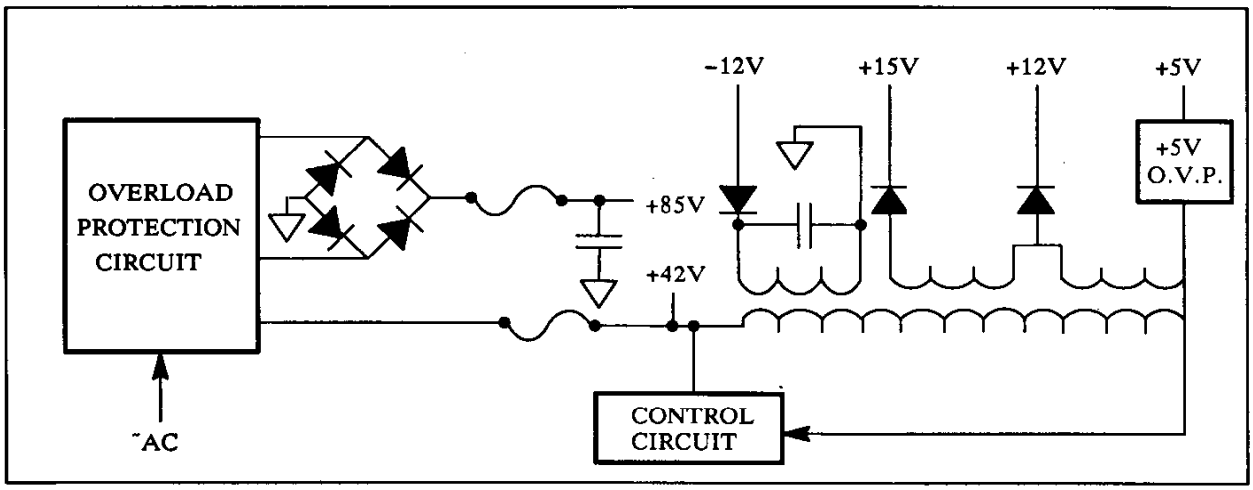


Figure 5-3. Power Supply

5-27. The ac power source is connected into the primary windings of the power transformer through the internal line fuse, the LINE ON/OFF switch, and the line voltage selector switch. The voltage selector switch can be configured for either 100 V, 120 V, 220 V, or 240 V ac operation.

5-28. The unregulated +85 V (motor drive) and +42 V (dc supply) are derived from the secondary of the center-tapped transformer. The ac voltage is passed through a full wave bridge where it is rectified and then filtered. An overload protection circuit protects the internal circuitry from over-voltage at the primary. If the input voltage exceeds the rated maximum, the overload protection circuit will be activated and the primary fuse will be blown.

5-29. HP-IB INTERFACE. Transfer of control data and information between the HP-IB external controller and the General Purpose Interface Bus (GP-IB) Talker/Listener is performed by two bidirectional bus transceivers. The Talker/Listener sets up the data transfer circuits when addressed and provides the interface to the plotter bus. The HP-IB address is front panel selectable and stored in memory. HP-IB addresses range from 0 to 30 and Listen Only. The factory default address is 5. When set to Listen Only, the plotter cannot be addressed to talk.

5-30. The Bus Transceiver is enabled when power is applied to the plotter and directed to transmit or receive in response to the HP-IB commands by the Talker/Listener. The T/R1 output of the Talker/Listener directs the bus transceivers into either the transmit or receive mode. All handshake requirements for the HP-IB are automatically handled by the Talker/Listener. When the plotter power is OFF, all inputs and outputs are high impedance and the plotter does not interfere with other HP-IB operations.

5-31. BUS LINE IDENTIFICATION. A 16 line bus is used to carry data and control information between the plotter and the HP-IB external controller. The bus line is divided into three sets of signal lines as follows:

a. Data bus - 8 signal lines - DIO1 through DIO8.

b. Data transfer control - 3 signal lines - (handshake).

c. Interface management - 5 signal lines.

5-32. The data bus carries 8-bit data or control words in bit parallel, byte serial form. These words are transmitted bidirectional and asynchronous.

5-33. The three data transfer control lines, or "handshake lines" are used to control the transfer of information on the data bus.

5-34. The five interface management lines are used to provide an orderly flow of information across the interface bus.

5-35. SIGNAL FUNCTIONS. Positive true logic is used within the plotter circuitry. Negative true logic is used on the HP-IB lines. A capital letter N in front of a mnemonic, such as NRFD, shows an inversion for that line.

5-36. LISTEN HANDSHAKE. When the controller is ready to transfer a control word on the data bus, it sends ATN true and EOI false. Control words are accepted by the plotter without microprocessor intervention. As soon as the plotter (acceptor) receives the above two signals it starts a "handshake" sequence.

5-37. TALK HANDSHAKE. Data is transferred from the plotter to the controller using an interlocked handshake sequence similar to the listen handshake.

5-38. RS-232-C INTERFACE. Line drivers and receivers in the RS-232-C circuitry transfer data and instructions between the RS-232-C external controllers and the Dual Asynchronous Receiver/Transmitter (DART). The DART converts the incoming serial data into parallel data for internal plotter use, and the outgoing data from parallel to serial data. Serial baud rate and handshaking configurations are front panel selectable and stored in nonvolatile memory. Specific information on the handshake definitions and configurations, as well as mode and parity settings, is contained in the HP 7595/6 Programmer's Reference.

5-39. Serial baud rate and handshaking configuration settings selected through the front panel are interfaced with the microprocessor bus by the Support Circuits. Figure 5-4 is a simplified block diagram of the baud rate generator circuit. Table 5-1 lists the baud rates and frequencies for the select codes.

5-40. RS-232-C WIRES/SIGNALS. A list of the EIA RS-232-C/CCITT V.24 signals used in the HP 7595/6 is given in Table 5-2.

5-41. MICROPROCESSOR AND MEMORY CIRCUITS

5-42. Data and instructions received through the interface or front-panel input/output circuits are input on the data bus for microprocessor interpretation. The microprocessor is used to convert incoming graphic instructions into plotter internal control instructions. The microprocessor input and output signals are grouped according to their function in Figure 5-5, and defined in Table 5-3.

5-43. The system memory is provided by eight 256k x 4 DRAM ICs, grouped in two banks of four ICs each. Each bank contains 256k memory words of 16 bits each that can be selected separately as bytes (high or low) or words.

5-44. The address bus is a 23-bit unidirectional, 3-state bus providing the signal path for bus address operations during all cycles except the interrupt cycles. During interrupt acknowledge cycles, address lines A1, A2, and A3 provide interrupt level service information while address lines A4 through A23 are set to a logic high.

5-45. The data bus is a 16-bit, bidirectional, 3-state bus providing the communication path for data between the Interface, Memory, Support Circuits, Servo IC, and microprocessor circuits. Data are transferred on the bus in either word or byte length. The direction of data flow on the bus is controlled by the READ/WRITE function of the microprocessor.

5-46. Function code outputs (FC0, FC1, and FC2) indicate the state of the microprocessor and the type of cycle currently being executed. The function code output information is valid whenever the Address Strobe (AS) is active (low). The function codes are also used for interrupt auto-vectoring.

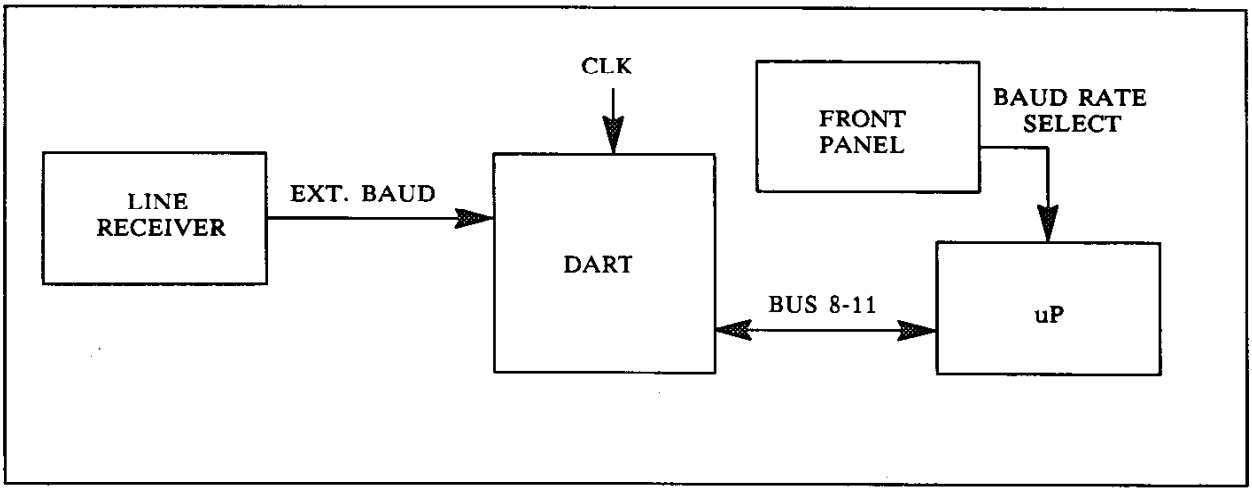


Figure 5-4. Baud Rate Generator Circuit

Table 5-1. Baud Rate Frequencies

SELECT CODE D C B A	BAUD RATE	FREQUENCY 16 X BAUD RATE ± 0.2%
0 0 0 0	75	1.20 kHz
0 0 0 1	110	1.76 kHz
0 0 1 1	150	2.40 kHz
0 1 0 0	300	4.80 kHz
0 1 0 1	600	9.60 kHz
0 1 1 0	1200	19.20 kHz
1 0 0 0	2400	38.40 kHz
1 0 0 1	4800	76.80 kHz
1 0 1 1	9600	153.60 kHz
1 1 0 0	19200	307.20 kHz

Table 5-2. EIA RS-232-C/CCITT V.24 Wires/Signals

WIRE/SIGNAL NAME	RS-232-C	CCITT V.24
Protective Ground	AA	101
Signal Common	AB	102
Transmitted Data	BA	103
Received Data	BB	104
Request to Send	CA	105
Clear to Send	CB	106
Data Set Ready	CC	107
Data Terminal Ready	CD	108.2
Received Line Signal Detector	CF	109
Data Signal Rate Selector	CH	111
Receiver Signal Element Timing	DD	115

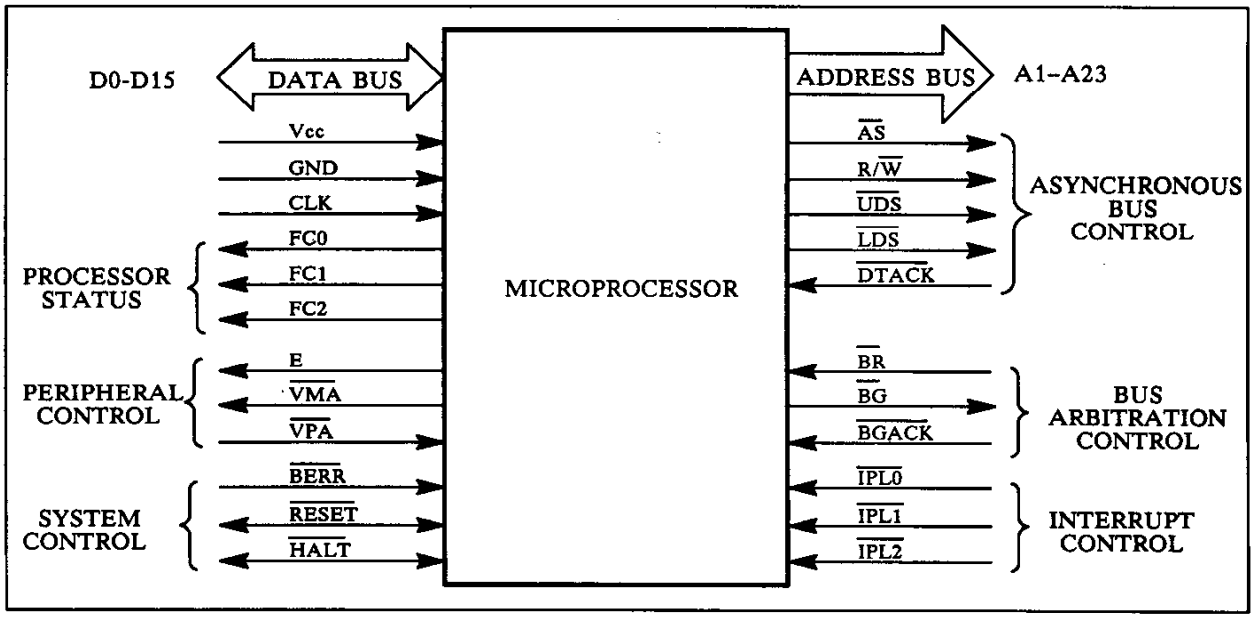


Figure 5-5. Microprocessor Groups

Table 5-3. Microprocessor Signal Summary

SIGNAL NAME	MNEMONIC	INPUT/ OUTPUT	ACTIVE STATE	PIN NUMBER
Address Bus	A1–A23	output	high	29–48, 50–52
Data Bus	D0–D15	input/output	high	1–5, 54–64
Address Strobe	~AS	output	low	6
Read/Write	R/~W	output	high/low	9
Upper and Lower Data Strobes	~UDS,~LDS	output	low	7, 8
Data Transfer Acknowledge	~DTACK	input	low	10
Bus Request	~BR	input	low	13
Bus Grant	~BG	output	low	11
Bus Grant Acknowledge	~BGACK	input	low	12
Interrupt Priority Level	~IPL0,~IPL1,~IPL2	input	low	23–25
Bus Error	~BERR	input	low	22
Reset	~RESET	input/output	low	18
Halt	~HALT	input/output	low	17
Enable	E	output	high	20
Valid Memory Address	~VMA	output	low	19
Valid Peripheral Address	~VPA	input	low	21
Function Code Output	FC0,FC1,FC2	output	high	26–28
Clock	CLK	input	high	15
Power Input	Vcc	input	--	14, 49
Ground	GND	input	--	16, 53

5-47. MICROPROCESSOR AND LOGIC CIRCUITS

5-48. Five subsystems provide the necessary support to allow the microprocessor to control all functions:

Oscillator
Chip Select Logic
Interrupt Priority Logic
Software-Controlled Interrupt Logic
~DTACK Generator Logic.

The interactions between these subsystems are shown in Figure 5-6.

5-49. OSCILLATOR. A 12MHz oscillator provides a clock input to the microprocessor, and is used to synchronize the microprocessor bus cycle. The output of the oscillator can be disabled for test purposes by pulling pin 1 low.

5-50. CHIP SELECT LOGIC. Plotter, ROM, RAM, UART and HP-IB information is mapped into separate areas of processor memory by the Chip Select Logic.

5-51. INTERRUPT PRIORITY LOGIC. A level 0 interrupt indicates no interrupt request. Levels 1 through 6 indicate interrupt requests of increasingly higher priority, each of which can be masked in software. A level 7 interrupt is the highest priority, and is nonmaskable. Table 5-4 lists the interrupt priority assignments

Table 5-4. Interrupt Priority

DEVICE	SIGNAL	PRIORITY
Plotter	~PINT	6
UART	~UINT	5
(Unused)	~FUTINT1	4
(Unused)	FUTINT2	3
HP-IB	~HINT	2
Soft	~INT1	1

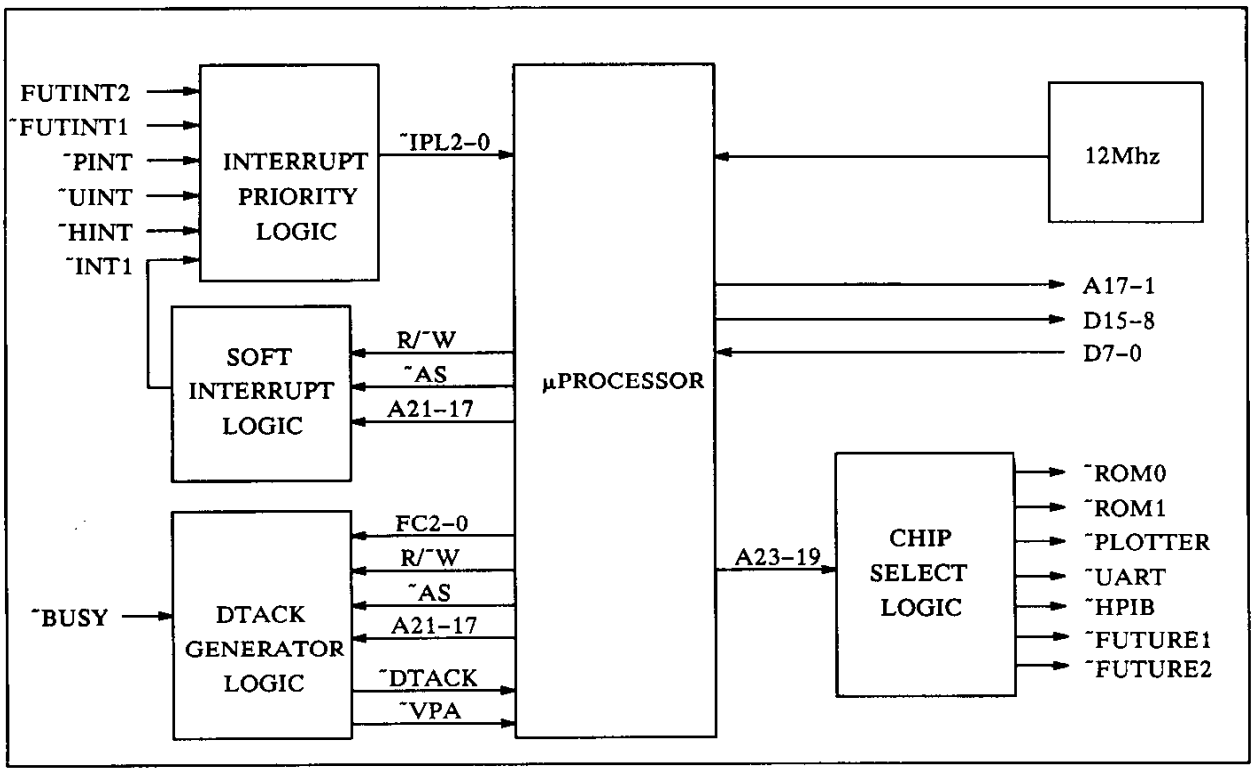


Figure 5-6. Microprocessor and Support Logic

5-52. SOFTWARE CONTROLLED INTERRUPT LOGIC. The Software Controlled Interrupt Logic is a latch which can be set and reset under software control. Setting the latch asserts the level 1 interrupt request ~INT1.

5-53. ~DTACK GENERATOR LOGIC. The ~DTACK Generator Logic serves to change the essentially asynchronous bus cycle of the microprocessor to an (almost) synchronous cycle. It operates in three modes; normal, interrupt, and refresh. The ~DTACK generator is in normal mode whenever the microprocessor is not responding to an interrupt request. The generator can only change modes when it is in the idle state. In the refresh mode, the bus cycle is asynchronous.

5-54. MOTOR SENSING AND DRIVE CIRCUITS

5-55. When first powered ON, the plotter performs an initialization sequence. During this initialization sequence, the pen carousel is rotated to determine the pen type, and then default parameters for pen speed and pen force are established. Pen type is sensed by a photosensor pair whose photo beam is interrupted by identification slots in the carousel body. A simplified diagram is shown in Figure 5-7. An enabling signal (LTEN) from the Servo IC is used by the Carousel Light Enable Driver to activate the carousel LED. Light beams passing through the carousel are sensed (LTSEN) by the carousel photosensor and input to the processor through the Switch Matrix Bus Driver for interpretation. Stepper Latch Register then allows microprocessor-generated carousel motor pulses on the data bus to pass through the Carousel Motor Driver and control the carousel motor.

5-56. Each pulse from the microprocessor causes the carousel motor to rotate one step. During each revolution, light sensed by the photosensor through the carousel identification slots creates a 576-bit memory map of the sensed photo beams. This memory map is unique to each type of carousel and is used by the microprocessor to identify the pen type and establish the appropriate pen speed and pen force default values.

5-57. Raising the carriage cover allows a spring-loaded mechanical shutter to block the carousel photo beam. This photo beam interrupt is sensed by the microprocessor which then issues signals to halt the plotter operation. The front-panel display will indicate LOWER COVER PRESS ENTER until the cover is lowered and the microprocessor resumes plotter operation.

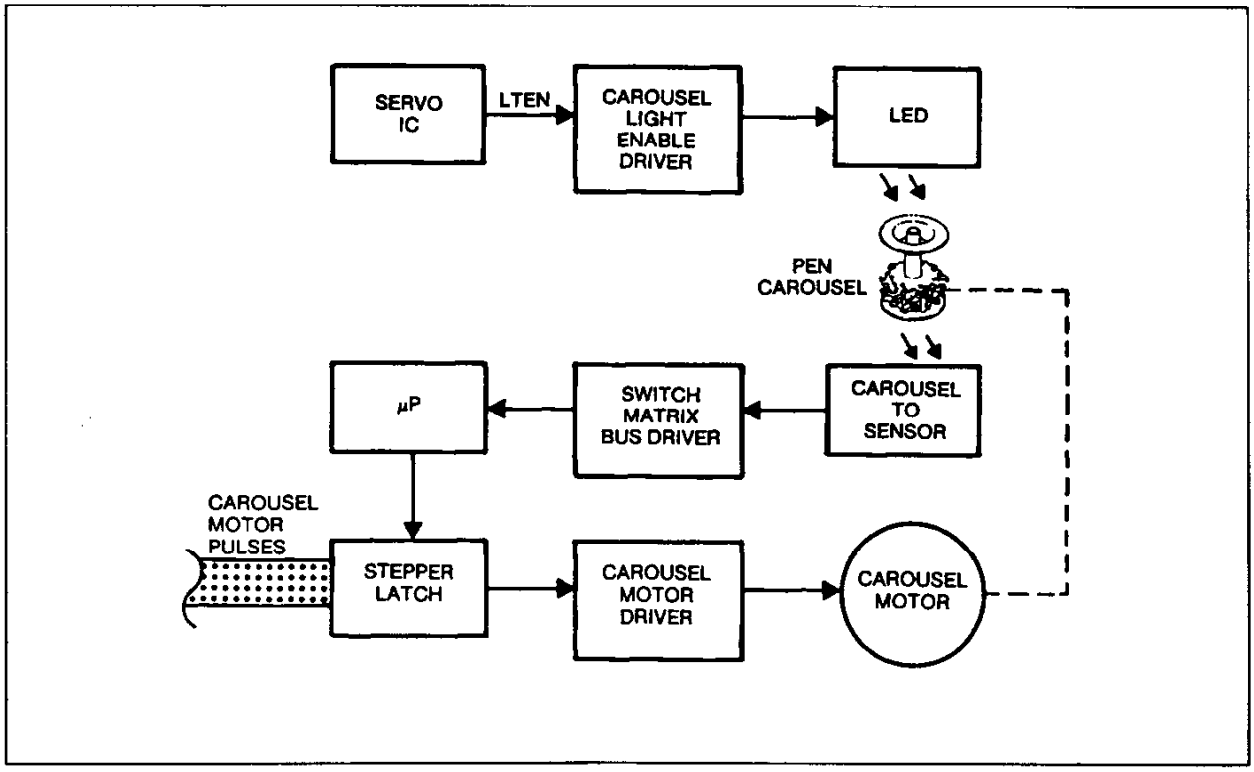


Figure 5-7. Motor Sensing and Drive Circuits

5-58. X- AND Y-MOTOR DRIVE CIRCUITS

5-59. The X- and Y-Motor Drives contain identical circuitry for phases A, B, and C. Only the X-Motor drive, phase A circuit will be discussed.

5-60. Two field-effect transistors are driven in a common source configuration. The N-channel gate drive is a pull down arrangement off the regulated +12 V supply. A series resistor is added to increase the discharge time of the gate capacitances for fall time control. The P-channel gate drive is considerably more complicated due to larger gate capacitances and its source being referenced to the +85 V unregulated supply.

5-61. A current source and gate-to-source voltage-setting resistor guarantees a fixed gate-to-source voltage independent of the value of the +85 V unregulated supply.

5-62. Two Field Effect Transistors are driven in tandem, either both on or both off. The FETs provide the current path during the "on" state, and fly-back diodes provide the path during the "off" state. This configuration provides the two quadrant controls by forcing the fly-back current to the supply through the forward biased diodes.

5-63. Current sensing is provided during both "on" and "off" states. These two currents are fed back through the Analog Multiplexer to the Operational Amplifier where they are summed, amplified, and filtered. Gain switching capability is provided to accommodate the two phase gain period of the motor operation. The current signal is then compared to the input signal. A resistor network provides hysteresis for the comparator and second stage filtering. The comparator provides an output with a duty cycle that is proportional to the difference between the current desired and the actual current.

5-64. The current reference signal is obtained by integrating the Pulse-Width Modulator (PWMX) signal to obtain a dc component proportional to the desired current, and an ac component that provides the proper switching frequency. Direction of motor rotation is accomplished by electronic commutation. Three identical drives, corresponding to three separate phases, are individually selected by the Servo IC to provide the needed commutation. A Low Gain signal is also provided when two phases are selected at once in order to maintain predictable torque characteristics.

5-65. PEN-LIFT DRIVE CIRCUIT

5-66. Using a sampled data control system during alternate servo interrupt cycles, the microprocessor compares the pen-lift position requested with the present pen position data and generates a number which represents the difference resulting from the comparison. This difference number is input to the pen-lift Pulse-Width Modulator (PWM) circuit in the Servo IC. See Figure 5-8 for a simplified block diagram of the pen-lift drive circuit.

5-67. Output pulses (PA, PC) from the pulse-width modulator circuit in the Servo IC are amplified by the pen-lift drive circuits to drive the pen-lift solenoid. The pen-lift solenoid raises and lowers the pen. Pen height information is maintained by an optical encoder in the pen-lift assembly. As the pen solenoid raises and lowers the pen, the pen encoder generates a series of quadrature pulses which are input to the Servo IC for decoding by the pen-lift position decoder register.

5-68. When the microprocessor receives a pen-lift position request, it reads an 8-bit number representing the present pen-lift position from the pen-lift decoder register in the Servo IC.

5-69. The pen-lift difference number calculated by the microprocessor controls the width of the pen-lift PWM pulses. As the pen-lift difference number increases, so does the width of the negative output pulses PA and PC. A zero value for the difference number will occur only when the pen solenoid is fully in the "up" position.

5-70. DIGITIZING CIRCUIT

5-71. The pen carriage contains an optical reflective sensor which is used for digitizing and calibrating the plotter. The output of the sensor is amplified and filtered. The signal is then summed and converted to a digital signal in the analog-to-digital converter. See Figure 5-9. The combination of the sensor, microprocessor, and pen-lift are used as a position control system to focus the infrared sensor. The sensor reads maximum amplitude when it is focused. The resulting height information is stored in the microprocessor memory.

5-72. ROLL-FEED DRIVE CIRCUIT

5-73. A separate motor and sensor switch is used for the roll feed feature. The sensor switch position data is input to the microprocessor through the Front-Panel Switch Matrix Receiver and the Buffered Data Bus Driver. The switch is used to sense when the roll feed spindle is in place. When a load or frame advance operation is requested and the spindle has been sensed, the roll feed motor will turn. See Figure 5-10.

5-74. In the frame advance mode, the length of the paper is determined by the hard-clip limits. In the load mode, the length of the paper is determined by the width of the roll. When loaded, the plotter locates the edges of the paper. The roll feed motor acts as a paper tensioner and will turn even though a loose sheet has been placed in the plotter. The actual paper movement is performed by the motor-driven grit wheels.

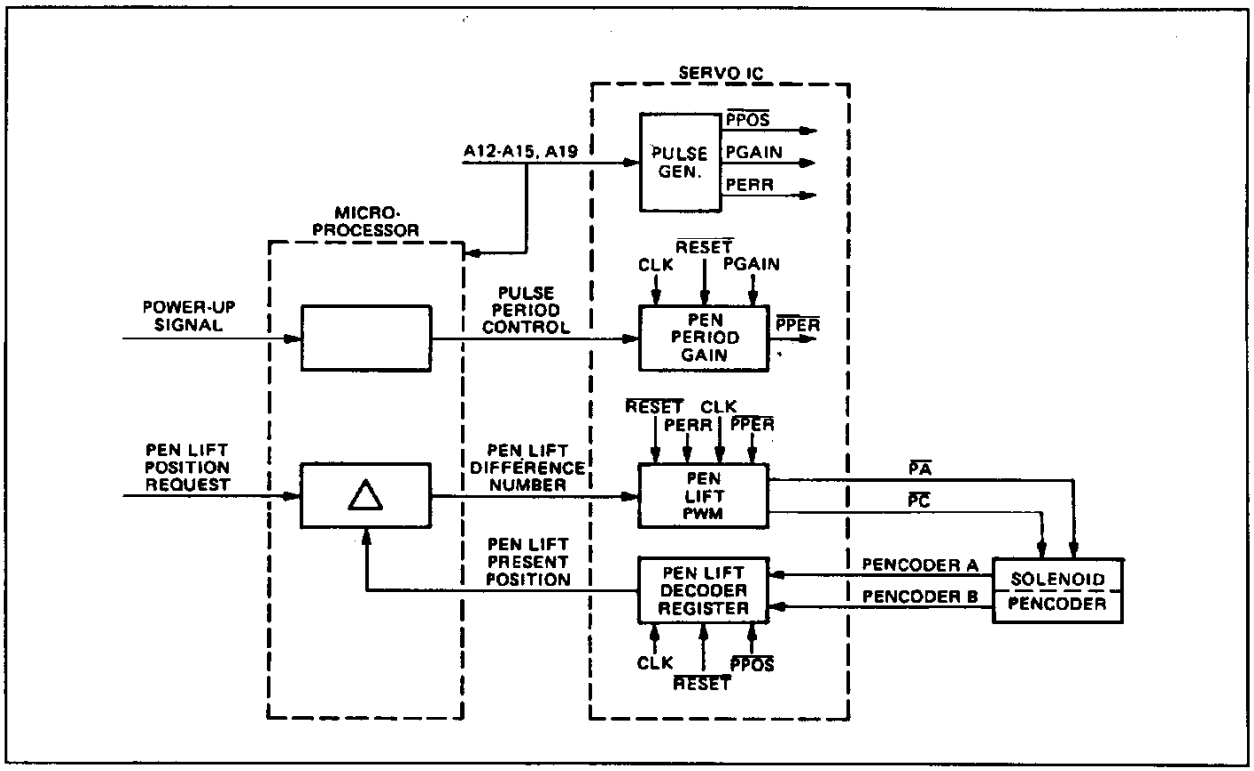


Figure 5-8. Pen Lift Drive

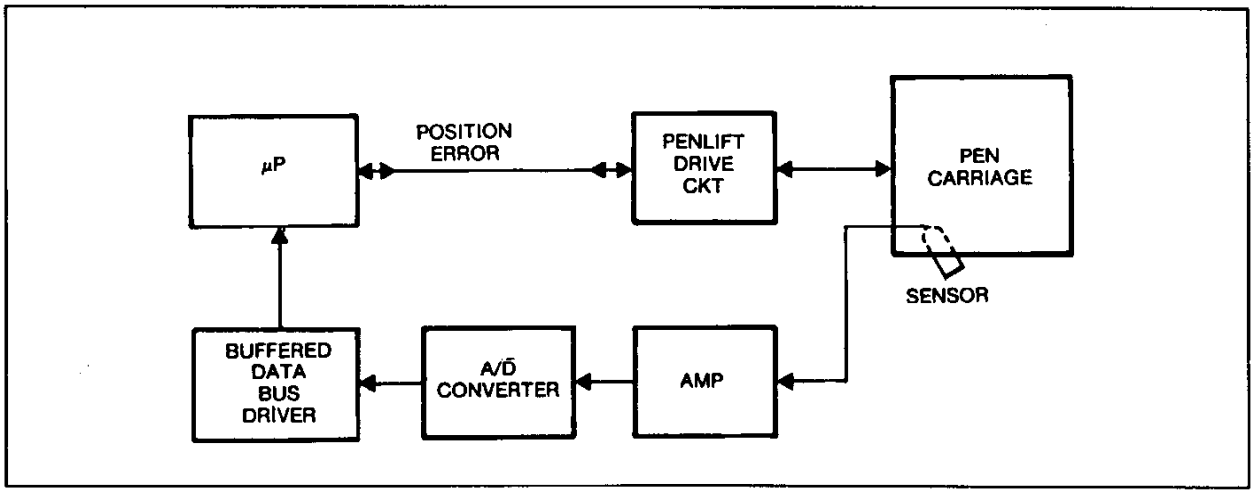


Figure 5-9. Digitizing Circuit

CHAPTER 6

REMOVAL AND REPLACEMENT

6-1. INTRODUCTION

6-2. This chapter contains procedures for the removal and replacement of the HP 7595/6 assemblies and mechanisms.

6-3. SAFETY CONSIDERATIONS

6-4. The Safety Symbols used with Hewlett-Packard instruments are illustrated in the front matter of this manual. WARNING and CAUTION symbols and instructions must be reviewed before service work is performed. These warnings and cautions must be followed for your protection and to avoid damage to the plotter.

WARNING

Disconnect the ac line cord and the interface cable before performing any disassembly or maintenance. Failure to do so can expose the service person to high voltage circuits and possible personal injury.

CAUTION

Some PCA connectors are capable of being plugged in upside down. When installing connectors, ensure the connector wires are above the connecotr for proper orientation.

6-5. ESD CONSIDERATIONS

6-6. Integrated circuits can be damaged by electrostatic discharge. To prevent damage to the plotter circuits from high voltage electrostatic discharge, perform the following procedure:

a. Do not wear clothing which is subject to static build-up.

b. Do not handle ICs in carpeted areas.

c. Do not remove an IC from its conductive foam pad until you are ready to install it.

d. Ground your body while disassembling and working on the plotter. Conductive wristbands (HP P/N 00970-67900) are available for this purpose.

e. After removing a cover from the plotter, attach a clip lead between the PCA common and earth ground. Touch all tools to earth ground to remove static charges before using them on the plotter.

6-7. REQUIRED TOOLS

6-8. The tools and equipment required to disassemble the HP 7595/6 are listed in Table 6-1.

Table 6-1. Required Tools and Equipment

TOOLS/EQUIPMENT	DESCRIPTION
Torx Screwdrivers	T-8, T-10, T-15, and T-25
Hex Nut Drivers	7 mm, 8 mm, 3/16 in., 9/32 in., and 1/2 in.
Open End Wrench	10 mm
Allen Wrenches	1.5 mm, 2.0 mm, and 2.5 mm
Flat-Blade Screwdrivers	Small and Medium

6-9. DISASSEMBLY AND REASSEMBLY PROCEDURES

6-10. The following procedures are given to facilitate repairs and parts replacement for various plotter mechanisms and assemblies. Unless otherwise stated in the procedures, reassembly of parts is performed in reverse order of disassembly.

WARNING

Disconnect the ac line cord and the interface cable before performing any disassembly or maintenance. Failure to do so may expose the service person to high voltage circuits and possible personal injury.

CAUTION

Some PCA connectors are capable of being plugged in upside down. When installing connectors, ensure the connector wires are above the connector for proper orientation.

6-11. ISOLATOR STRIP REMOVAL

6-12. To remove the isolator strip, perform the following procedure:

a. Grasp the left end of the mounting strip and carefully pull it away from the plotter until it is completely off. See Figure 6-1.

b. Remove the isolator strip.

6-13. WINDOW REMOVAL

6-14. To remove the window, perform the following procedure:

a. Remove the fourteen screws (Torx #25) that secure the left and right side covers and remove the covers. See Figure 6-2.

b. Loosen the two Y-arm cover mounting screws (Torx #15) at each end of the cover. See Figure 6-3.

c. While grasping the window, pull the left side panel away from the window pivot and carefully lift the window end out of the pivot hole.

CAUTION

Ensure that the stabilizing springs do not fall into the pinch wheel channel when removing the window.

d. Remove the window, two o-rings, and the stabilizing springs inside each pivot hole.

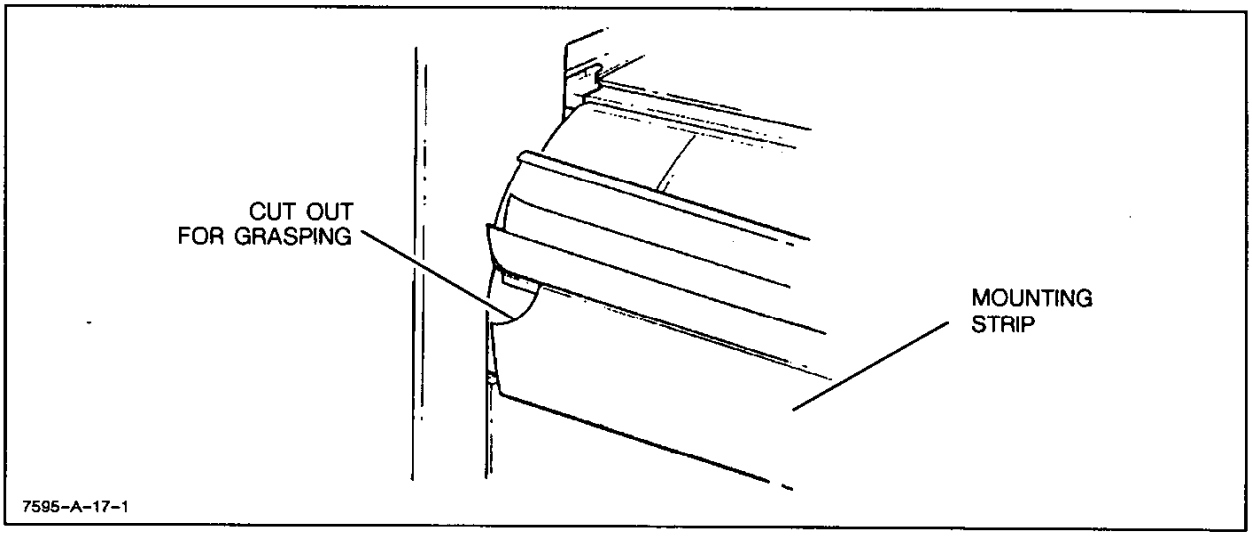


Figure 6-1. Isolator Strip Removal

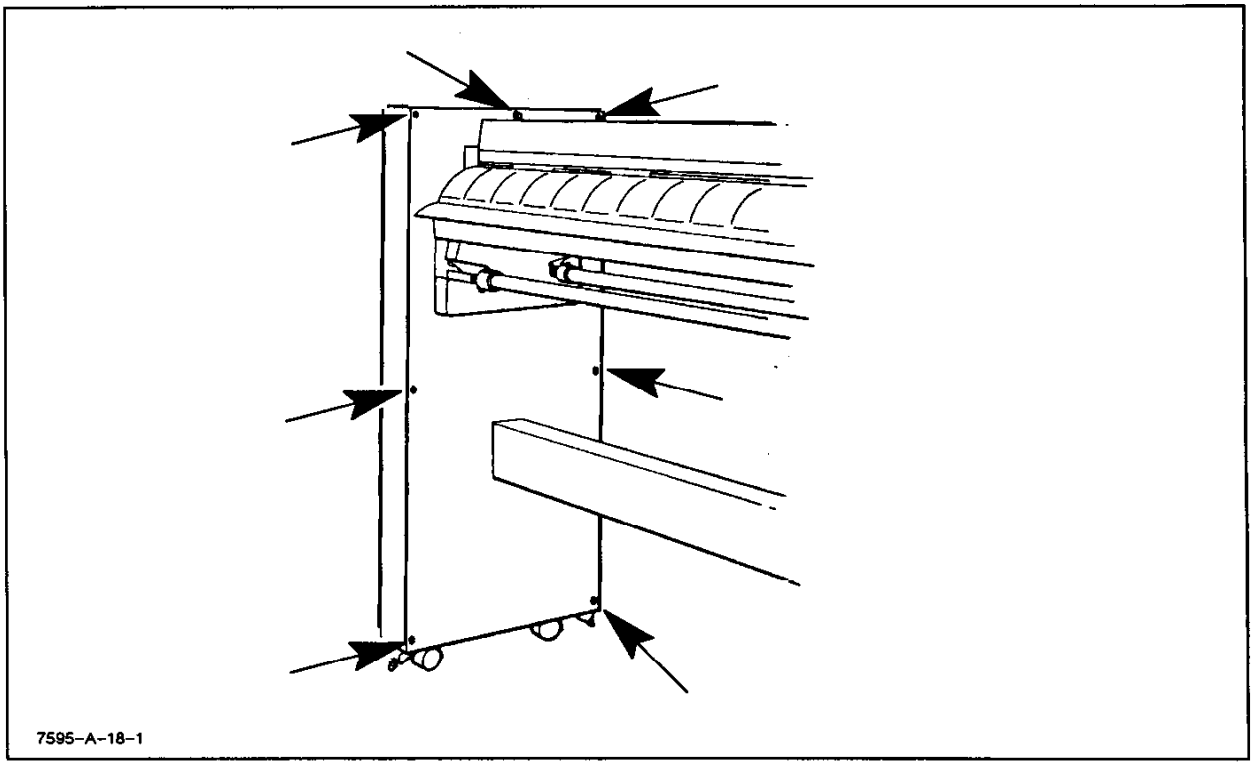


Figure 6-2. Side Cover Removal

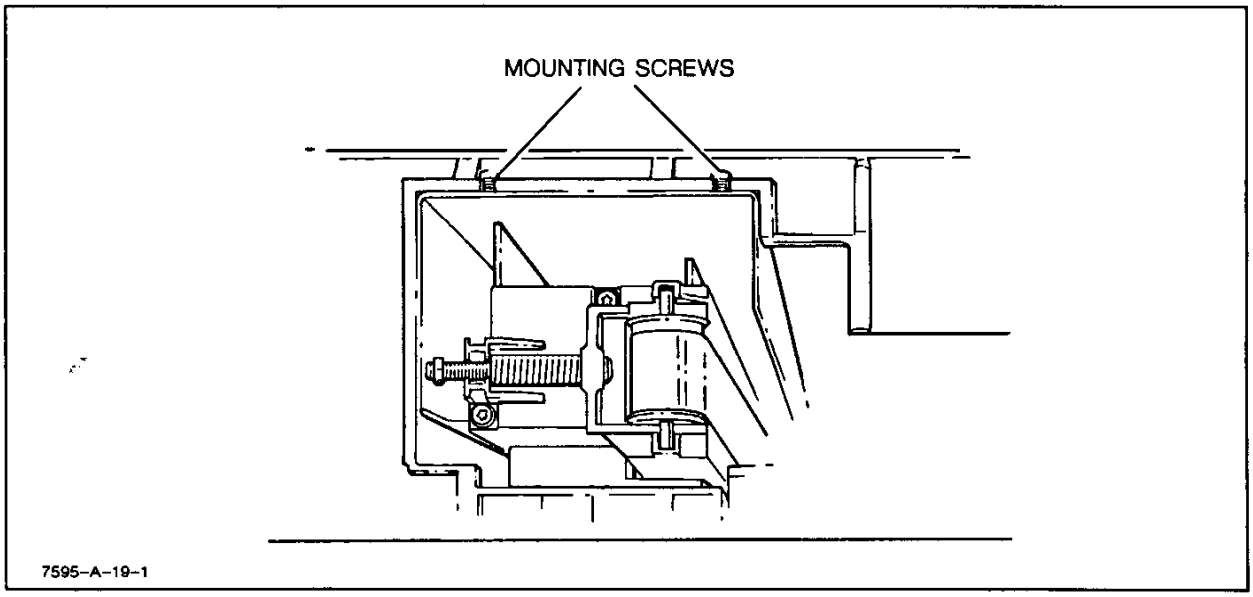


Figure 6-3. Window Removal

6-15. OPENING THE PLOTTER

6-16. To open the plotter, perform the following procedure:

a. Turn the plotter LINE switch to OFF (O) and remove the ac power cord.

CAUTION

The right side cover is connected to the right side panel by a ribbon cable. Improper handling of the right side panel may cause damage to the plotter.

b. Remove the seven mounting screws (Torx #25) from the right side cover. See Figure 6-4.

c. Remove the right side cover to expose the plotter mechanics.

d. Remove the twelve hex nuts (9/32) that secure the PCA cover and remove the cover. See Figure 6-5.

6-17. FRONT PANEL LCD REMOVAL

6-18. To remove the Front Panel Liquid Crystal Display (LCD), perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter. The PCA cover need not be removed.

c. Disconnect the LCD ribbon cable. See Figure 6-6.

d. Remove the LCD mounting screw (Torx #10).

e. Remove the LCD from the Front Panel.

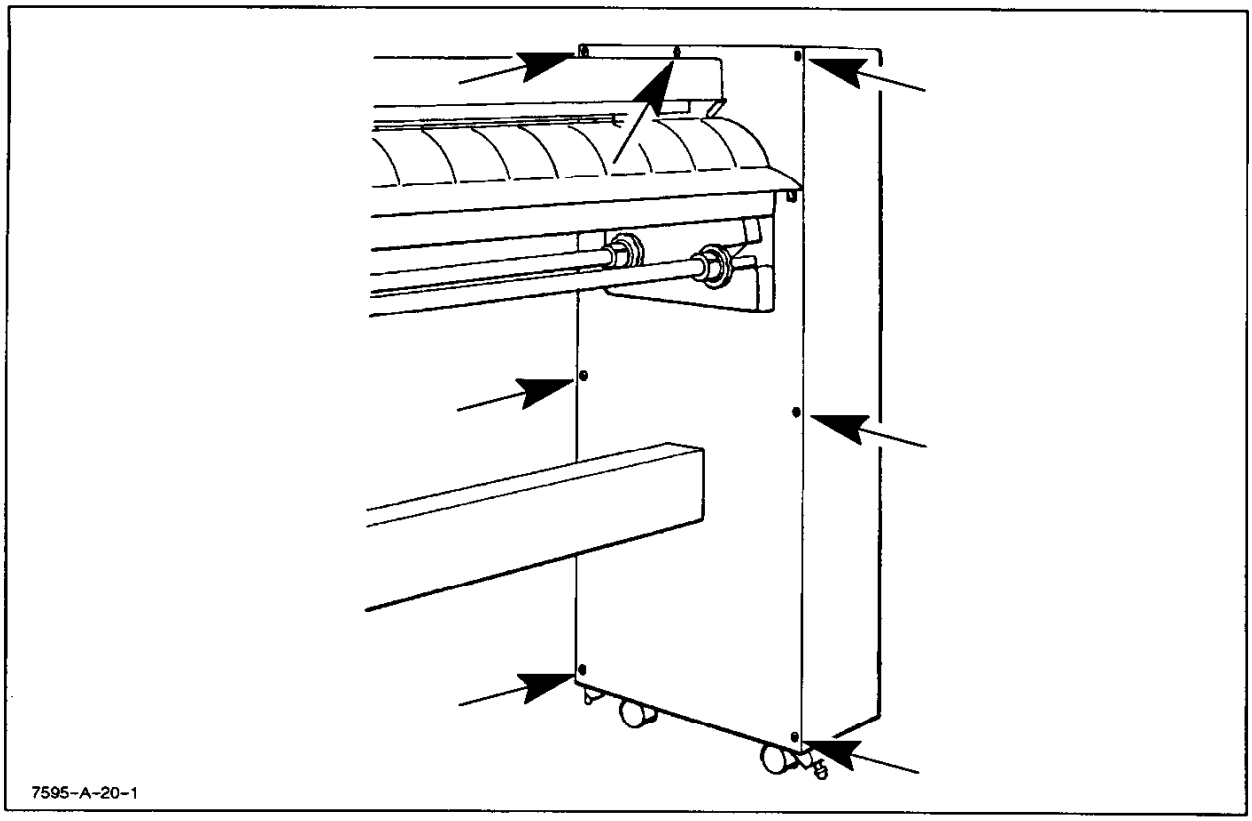


Figure 6-4. Opening the Plotter

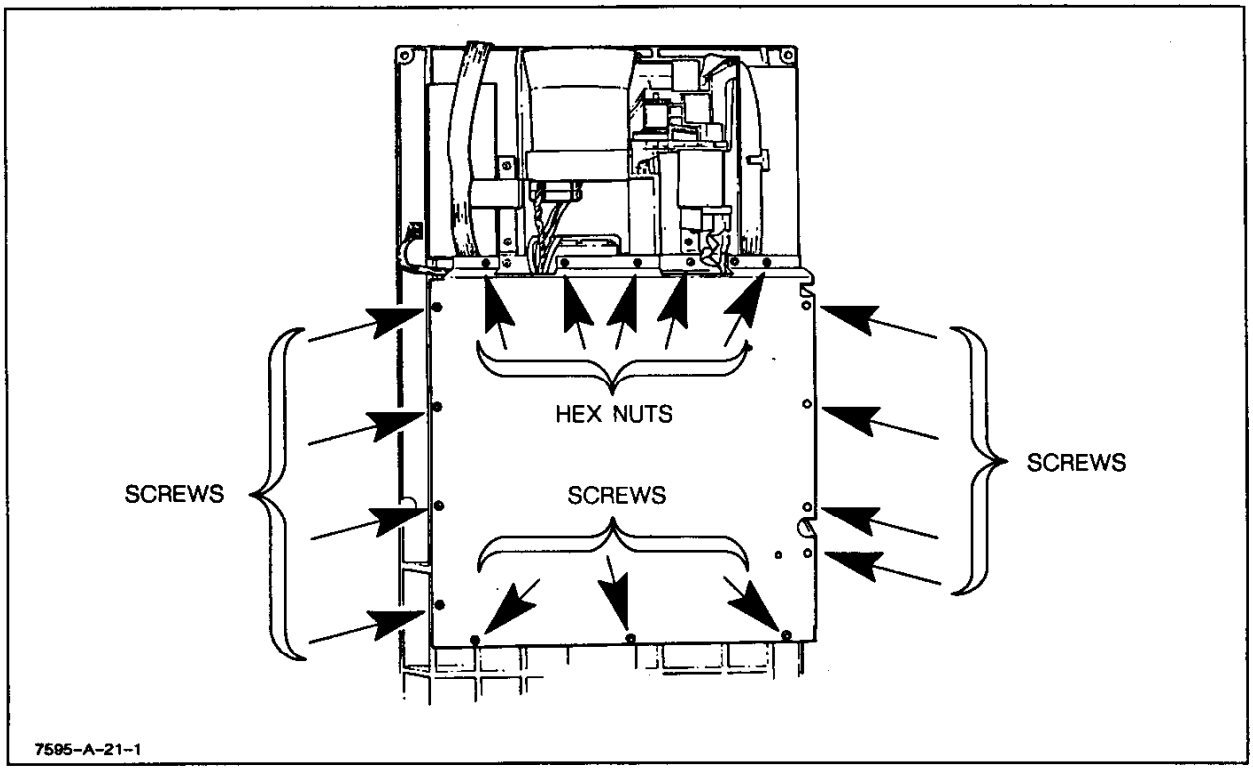


Figure 6-5. PCA Cover Removal

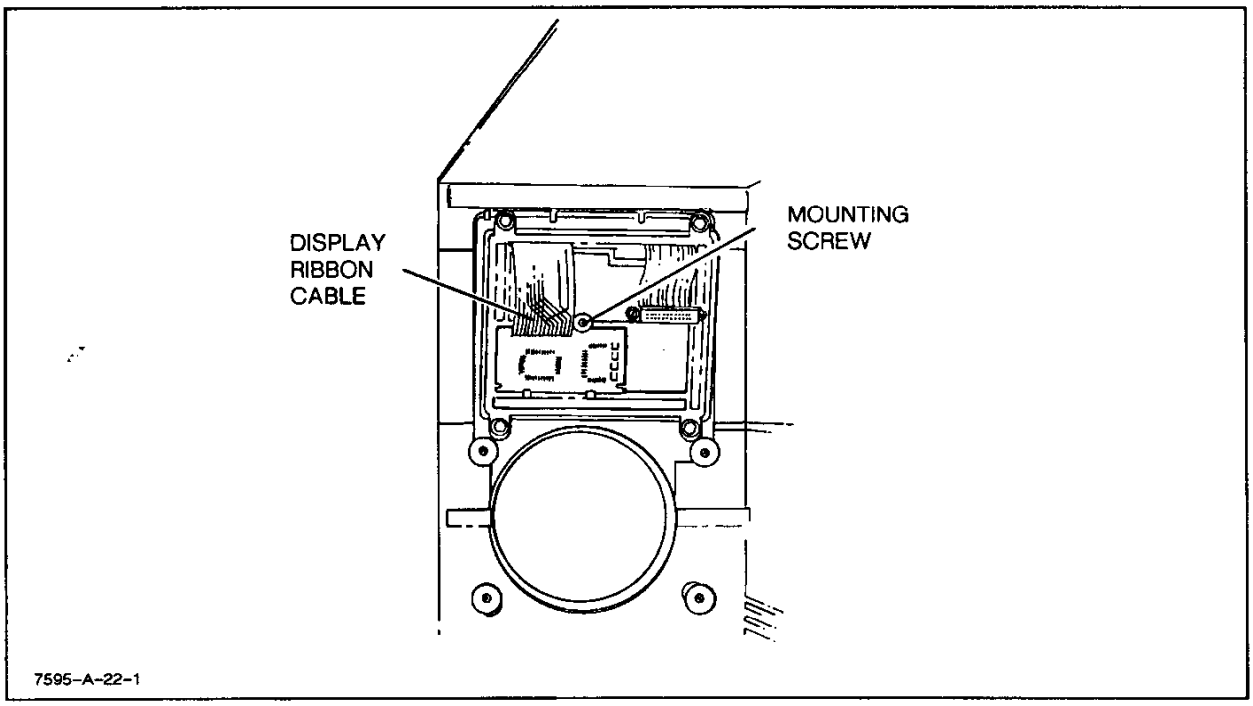


Figure 6-6. Front Panel Display Removal

6-19. FRONT PANEL REMOVAL

6-20. To remove the Front Panel, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter. The PCA cover does not need to be removed.

c. Disconnect the Front Panel cable. See Figure 6-7.

d. Remove the four screws (Torx #10) that secure the Front Panel to the right side cover and lift the Front Panel off.

6-21. PHOTOEMITTER/SENSOR REMOVAL

6-22. To remove the photoemitter and photosensor, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter. The PCA cover does not need to be removed.

c. To access the photoemitter, simultaneously squeeze and lift the photoemitter cap. Note the position of the node on the photoemitter for ease of reassembly. See Figure 6-8.

d. To access the photosensor, simultaneously squeeze and lift the photosensor cap. See Figure 6-8. Note the position of the flat side of the photosensor for ease of reassembly.

e. Unplug the sensors from the connectors. Use care not to bend the connector pins.

6-23. CAROUSEL MOTOR REMOVAL

6-24. To remove the carousel motor, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Disconnect the motor connector on J7 of the Processor PCA (A1). See Figure 6-9.

d. Remove the two carousel motor mounting screws (Torx #10).

e. Remove the carousel motor.

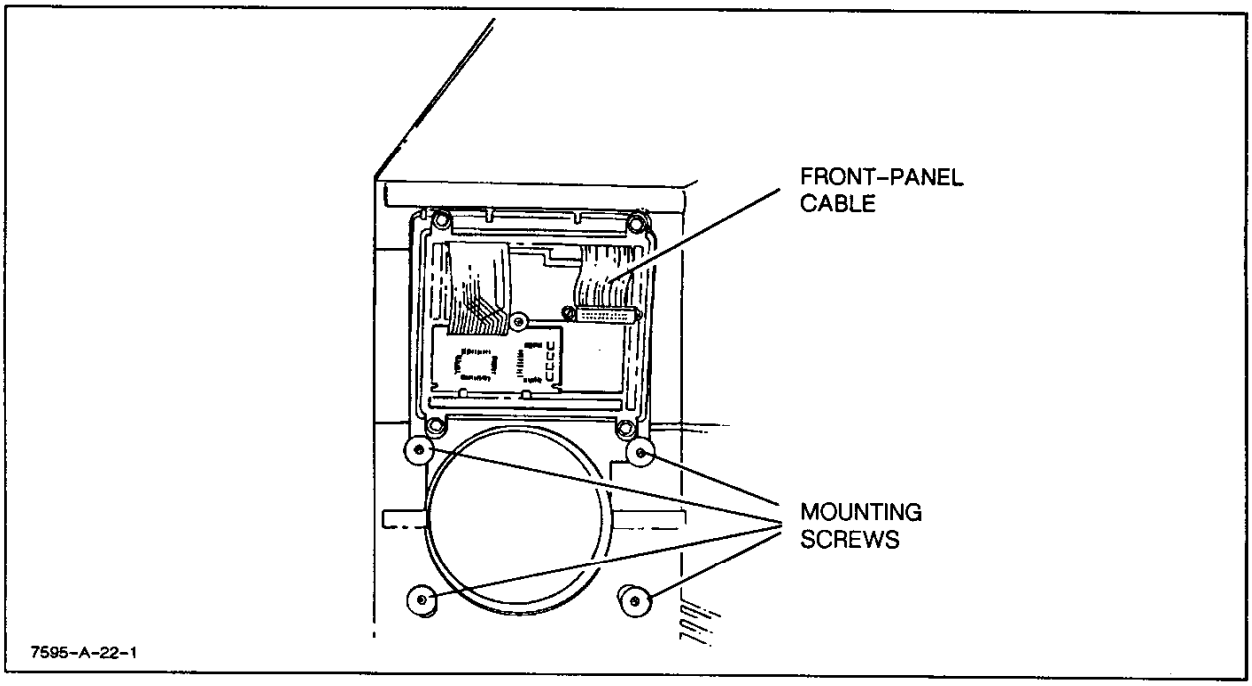


Figure 6-7. Front Panel Removal

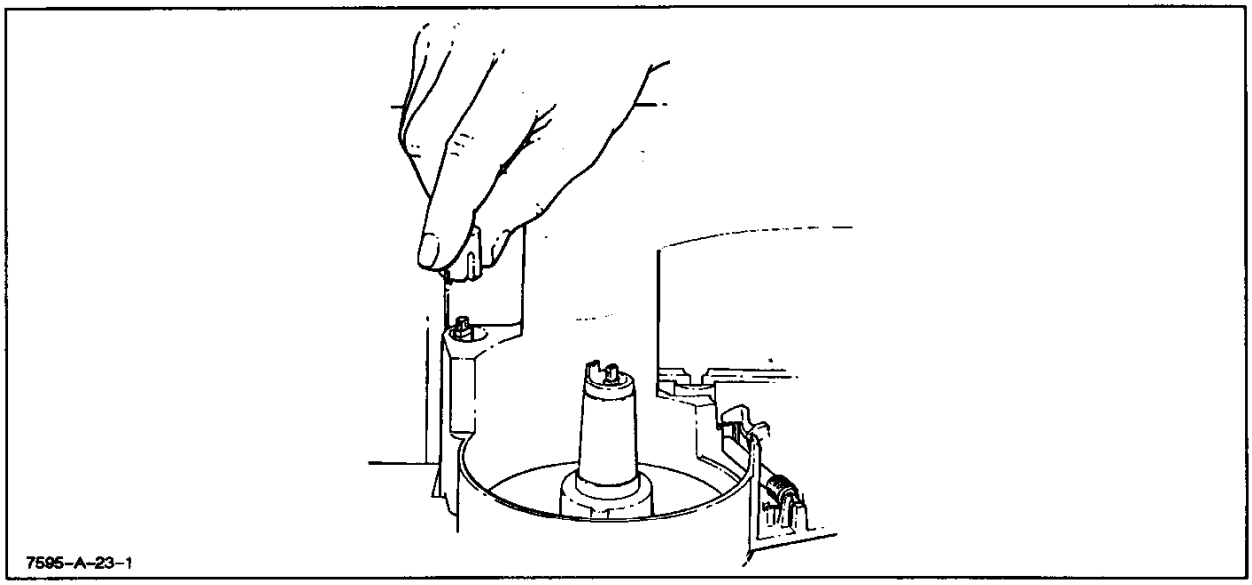


Figure 6-8. Photoemitter/Sensor Removal

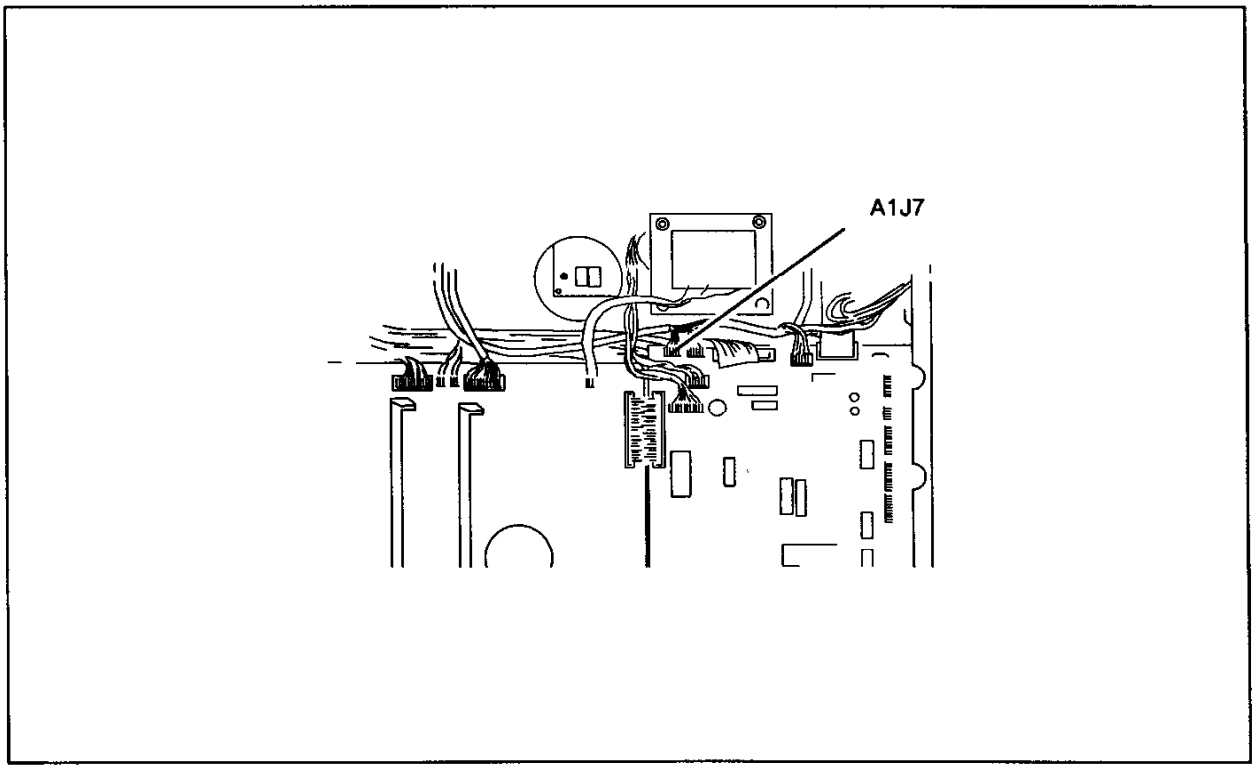


Figure 6-9. Carousel Motor Removal

6-25. CAROUSEL TUB REMOVAL

6-26. To remove the carousel tub, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter. The PCA cover does not need to be removed.

c. Remove the two carousel tub mounting screws (Torx #10). See Figure 6-10.

d. Lift and remove the tub.

6-27. PEN CAPPING MECHANISM REMOVAL

6-28. To remove the pen capping mechanism, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter. The PCA cover does not need to be removed.

c. Remove the carousel tub. Refer to the procedure for carousel tub removal.

d. Note that the pen capping mechanism is under spring tension. Remove the spring. Carefully pry the right end of the capping mechanism and gently lift it out. See Figure 6-11.

e. When installing the pen capping mechanism, make sure that the tension spring is fully seated in the groove of the carousel tub base. Snap the mechanism back into the carousel base and tension the spring to the tab of the capping mechanism.

6-29. CAROUSEL BASE ASSEMBLY REMOVAL

6-30. To remove the carousel base assembly, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Disconnect the carousel motor cable and the emitter/sensor cable from J4 and J6 of the Processor PCA A1.

d. Remove the hex nut (9/32 in.) located on the grounding plate of the electronics enclosure.

e. Remove the two base assembly mounting screws (Torx #25). See Figure 6-12.

f. Remove the carousel base assembly.

g. After replacing the carousel base assembly, perform the carousel base assembly adjustment procedure in Chapter 7.

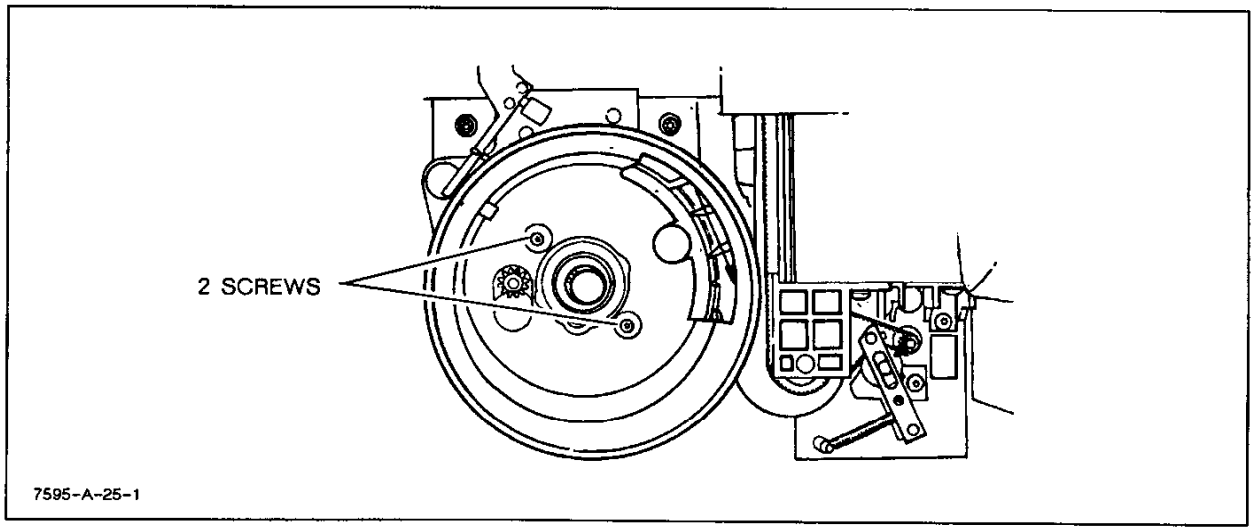


Figure 6-10. Carousel Tub Removal

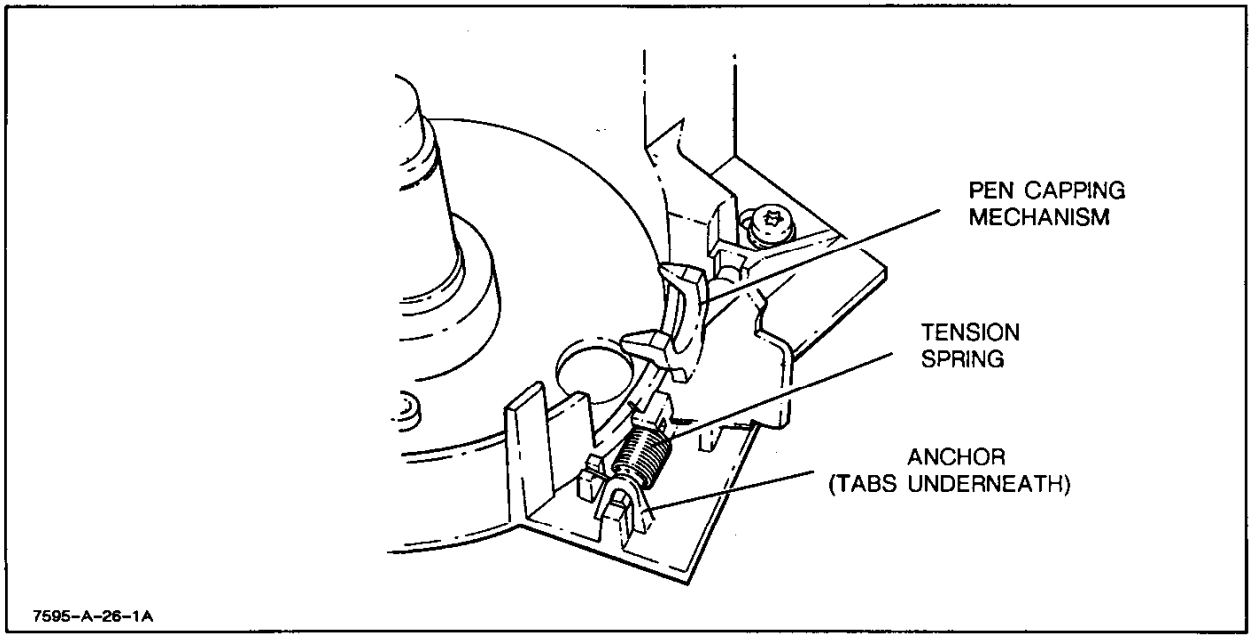


Figure 6-11. Pen Capping Mechanism Removal

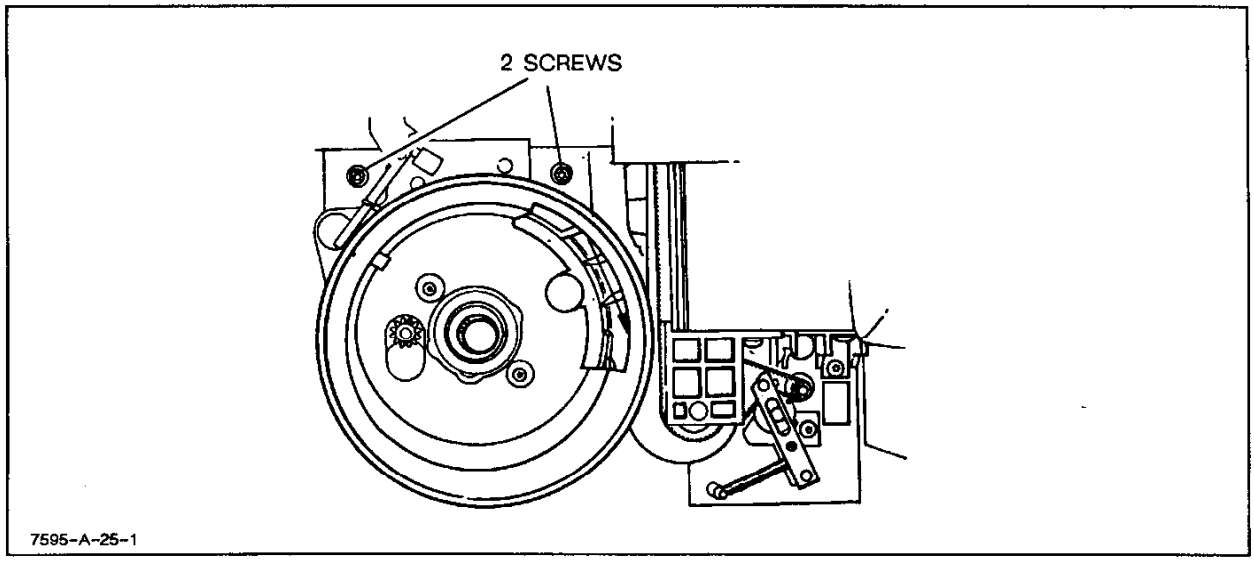


Figure 6-12. Carousel Base Assembly Removal

6-31. TRANSFORMER REMOVAL

6-32. To remove the transformer, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Disconnect the transformer cable and wiring. See Figure 6-13. When reconnecting, refer to the cabling diagram Figure 9-1.

d. Remove the transformer mounting bolts (Torx #25) and remove the transformer.

6-33. ANALOG PCA REMOVAL

6-34. To remove the Analog PCA, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Note the orientation of the connectors and then disconnect all cables from the PCA. Refer to the cabling diagram, Figure 9-2, when installing the new PCA.

d. Remove the nine hex nuts (9/32 in.) that secure the PCA. See Figure 6-14.

e. Remove the Analog PCA.

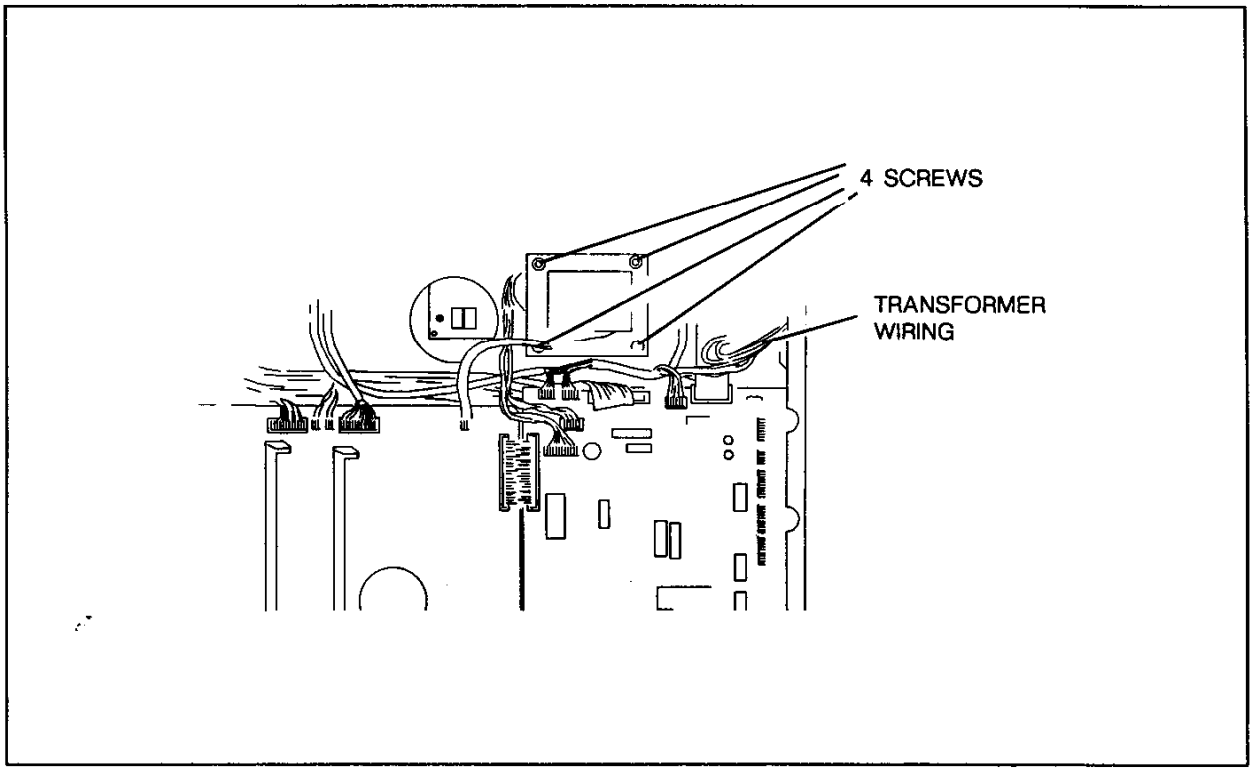


Figure 6-13. Transformer Removal

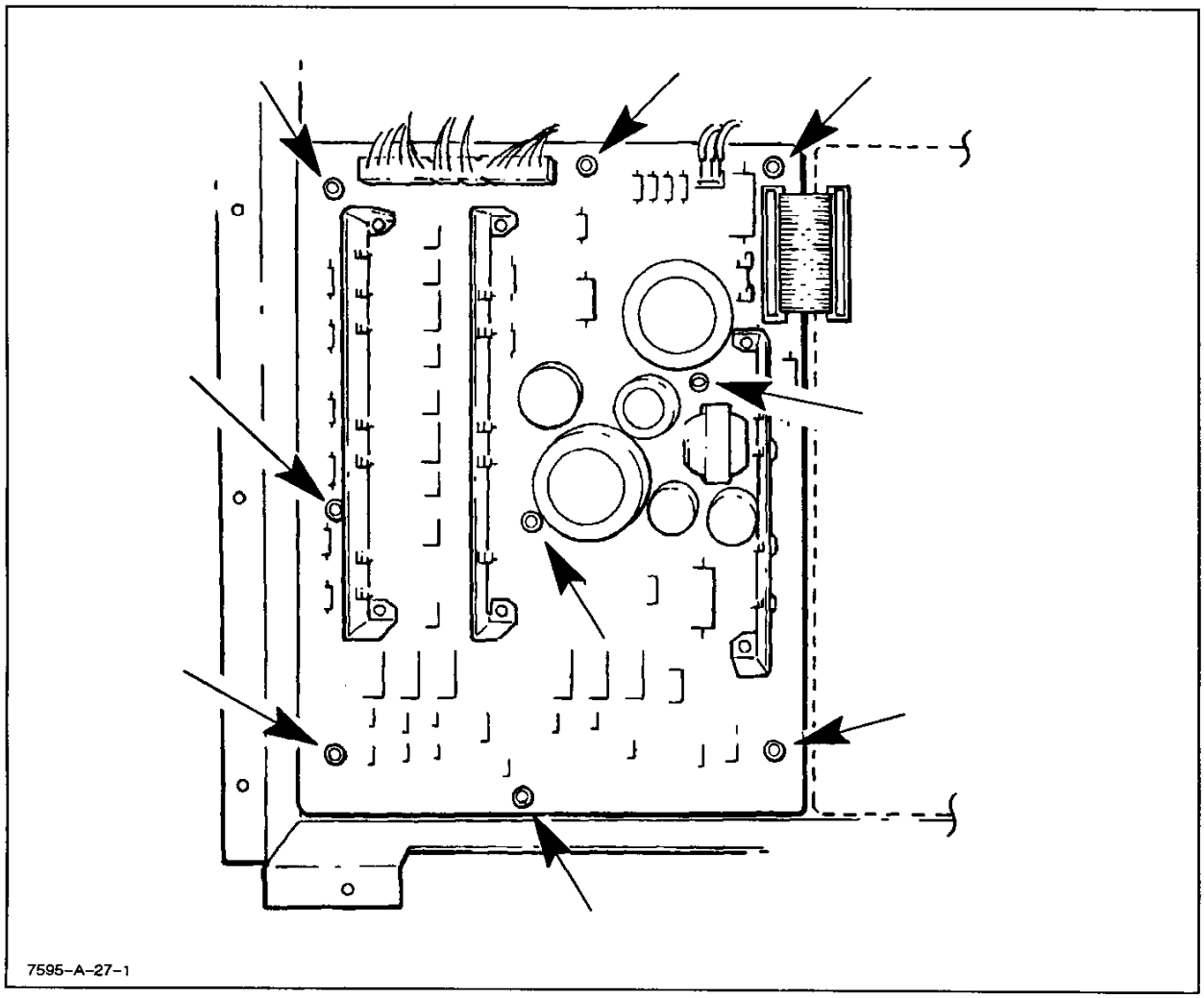


Figure 6-14. Analog PCA Removal

6-35. PROCESSOR PCA REMOVAL

6-36. To remove the Processor PCA, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Note the orientation of the connectors and then disconnect all cables from the PCA. Refer to the cabling diagram, Figure 9-2, when installing the new PCA.

d. Remove the hex nuts (3/16 in. and 9/32 in.) that mount the I/O to the back panel. See Figure 6-15.

e. Remove the eleven hex nuts (9/32 in.) used to mount the PCA. See Figure 6-16.

f. Remove the Processor PCA. Be sure to swap the EEPROMs when replacing the old PCA.

6-37. PEN CARRIAGE DRIVE MOTOR/ENCODER REMOVAL

6-38. To remove the pen carriage drive motor/encoder, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Disconnect the motor/encoder cables.

d. Remove the motor belt tensioning spring. See Figure 6-17.

e. Hold the motor/encoder firmly with one hand while removing its three mounting screws (Torx #15).

f. Remove the motor/encoder.

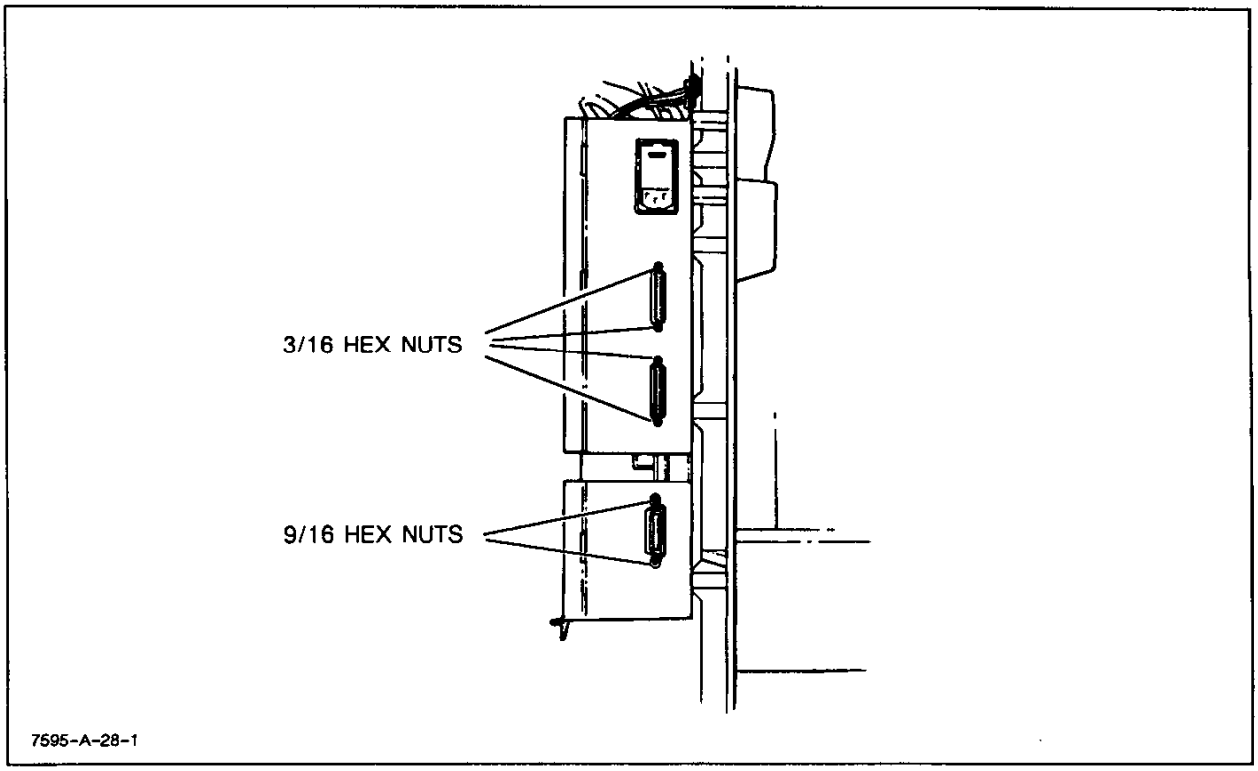


Figure 6-15. I/O Connectors

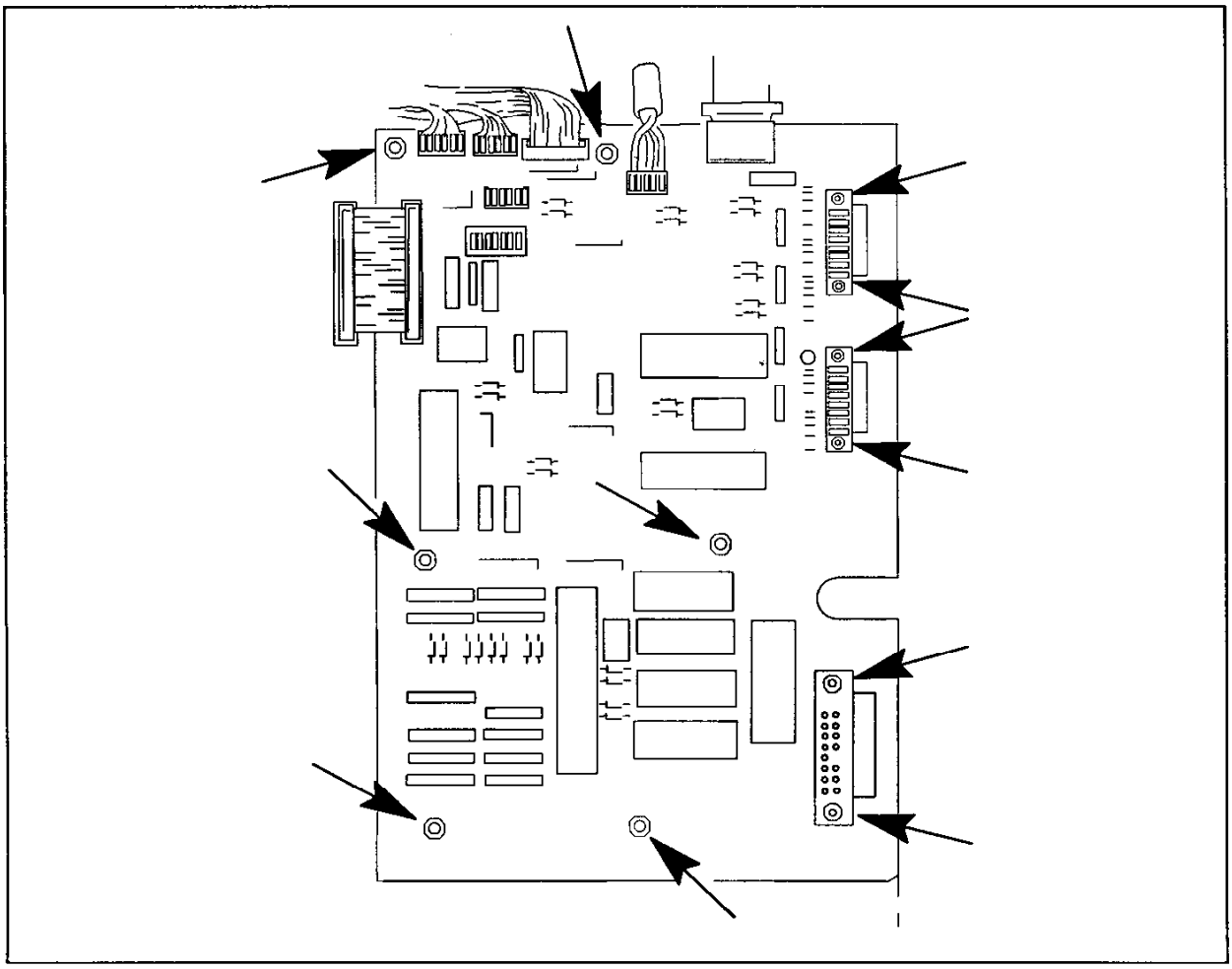


Figure 6-16. Processor PCA Removal

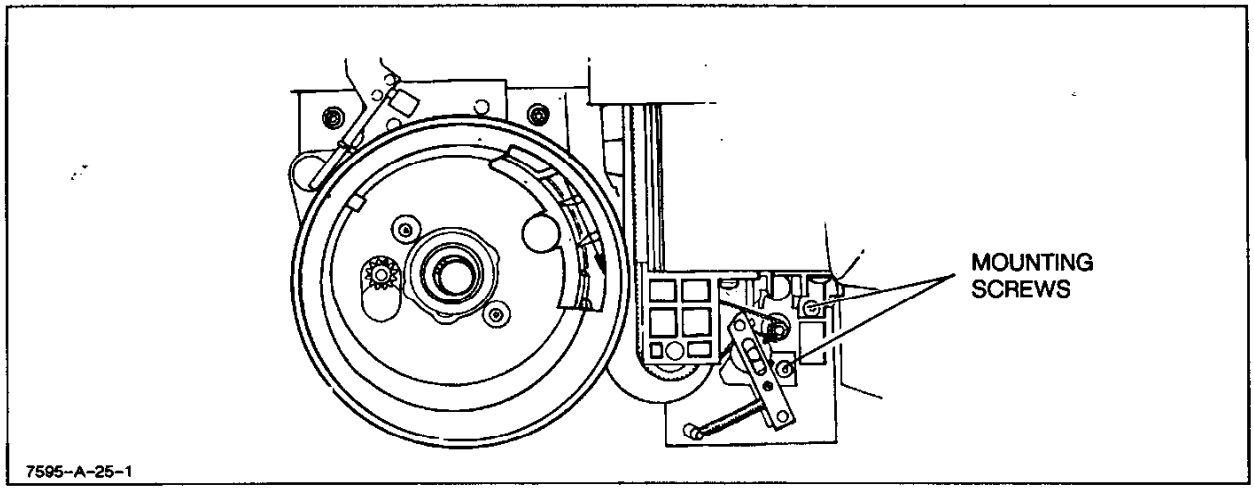


Figure 6-17. Pen Carriage Drive Motor/Encoder Removal

6-39. PEN CARRIAGE MOTOR BELT TENSIONER ASSEMBLY REMOVAL

6-40. To remove the pen carriage motor belt tensioner assembly, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter. The PCA cover does not need to be removed.

c. Note the position of all parts for future assembly. See Figure 6-18.

d. Remove the motor belt tensioning spring.

e. Remove the motor belt tensioner assembly by first pressing the tabs in with a small screwdriver and then lifting the assembly off. See Figure 6-19.

f. To disassemble the pen carriage motor belt tensioner, remove the pulley assembly from the mounting frame and then remove the axle from its bearing.

g. When reassembling, make sure that the slot in the axle faces the tensioning wedge, and that the belt is placed between the front post and the pulley.

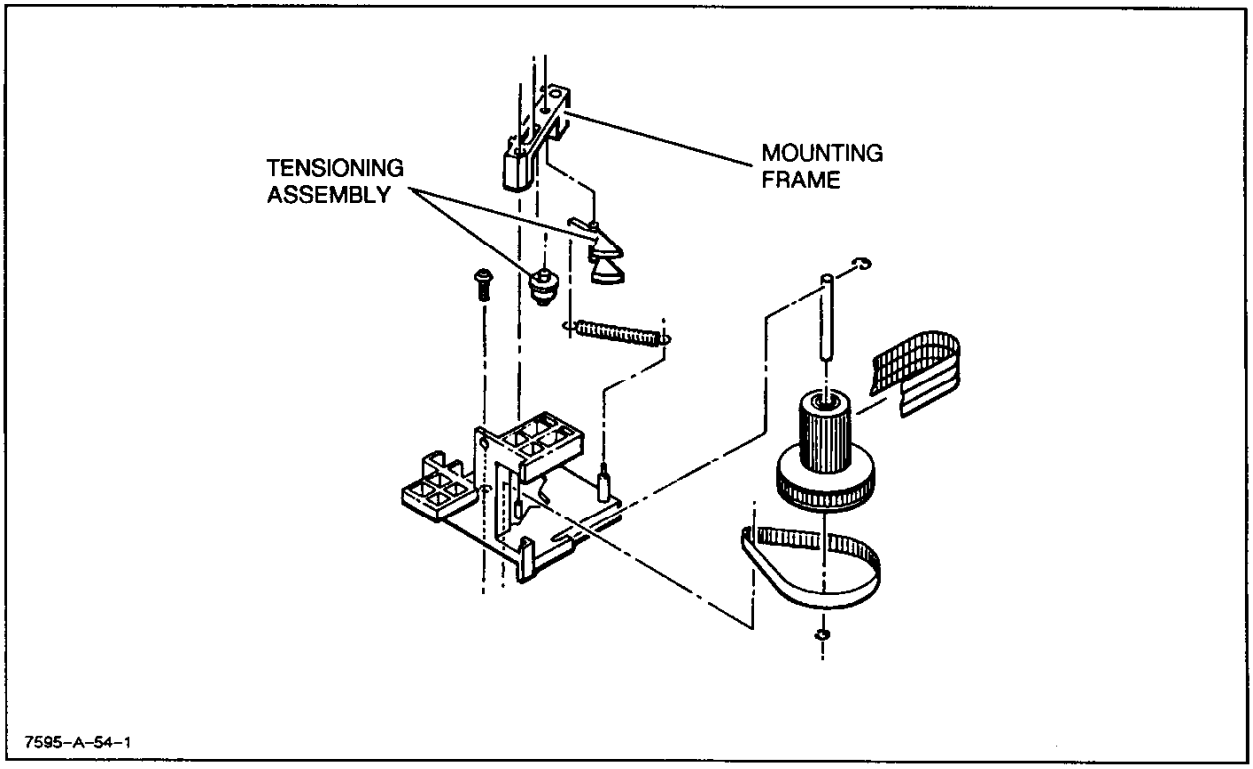


Figure 6-18. Tensioner Assembly Exploded View

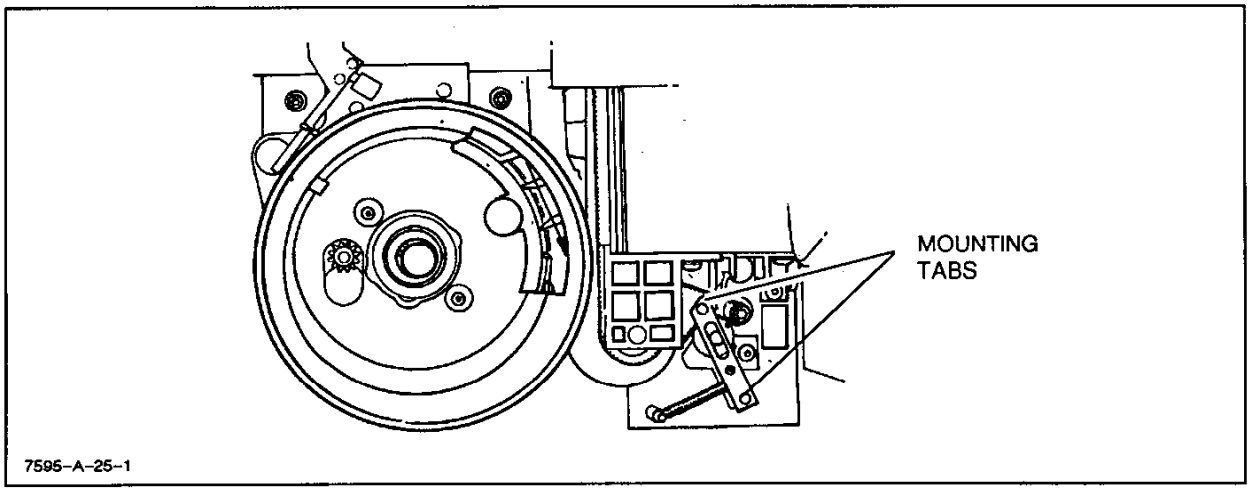


Figure 6-19. Motor Belt Tensioner Assembly Removal

6-41. GRIT WHEEL DRIVE BELT REMOVAL

6-42. To remove the grit wheel drive belt, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Remove the seven mounting screws (Torx #25) from the left side cover and remove the cover. See Figure 6-20.

c. Remove the tensioning spring. See Figure 6-21.

d. Loosen, but do not remove, the two motor mounting screws (Torx #15).

e. Loosen the hex nut (10 mm) on the belt tensioning bolt.

f. Remove the grit wheel drive belt.

g. For reassembly, install the drive belt and attach the tensioning spring before tightening the motor mounting screws.

6-43. TRAILING CABLE REMOVAL

6-44. To remove the trailing cable, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Remove the seven screws (Torx #25) that secure the left side cover and remove the cover.

d. Remove the screws (Torx #15) located at the ends of the Y-arm cover and remove the cover.

e. Remove the window. If necessary, refer to the procedure for removing the window given in this chapter.

f. Remove the three screws (Torx #10) that secure the pen carriage cover and remove the cover.

g. Grasp the back of the trailing cable clip. Pull back and lift the top of the clip from the cover. See Figure 6-22.

h. Pull the left end of the cover out and release the two bottom hooks from the cover.

i. Pull back and lift the top of the clip from the cover.

j. Remove the screw (Torx #15) holding the trailing cable mounting bracket and remove the bracket.

k. Disconnect the cable at A1J5 and remove the cable.

NOTE

When installing the trailing cable clip, plug the trailing cable into the pen carriage and attach the clip hooks to the pen carriage cover. Grasp the back of the pen carriage cover and push the clip until both upper tabs snap in place. See Figure 6-22. Install the cover screws.

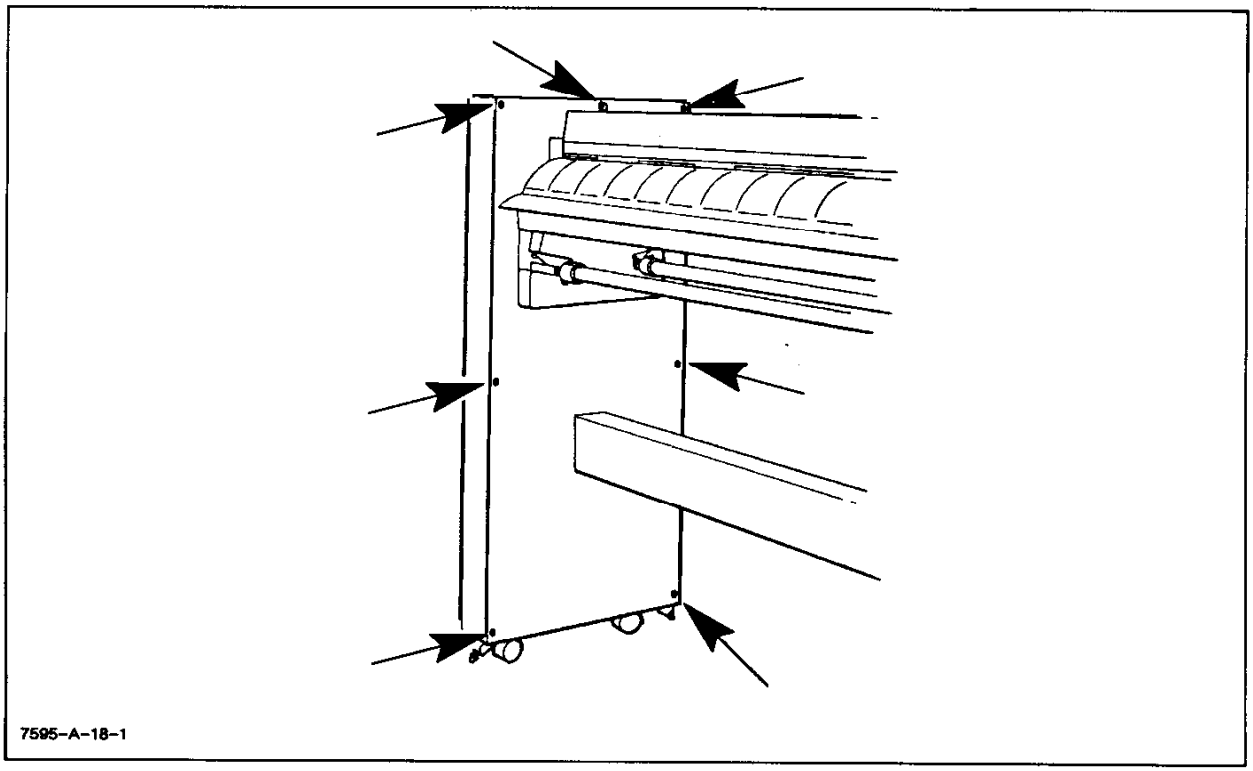


Figure 6-20. Left Side Cover Removal

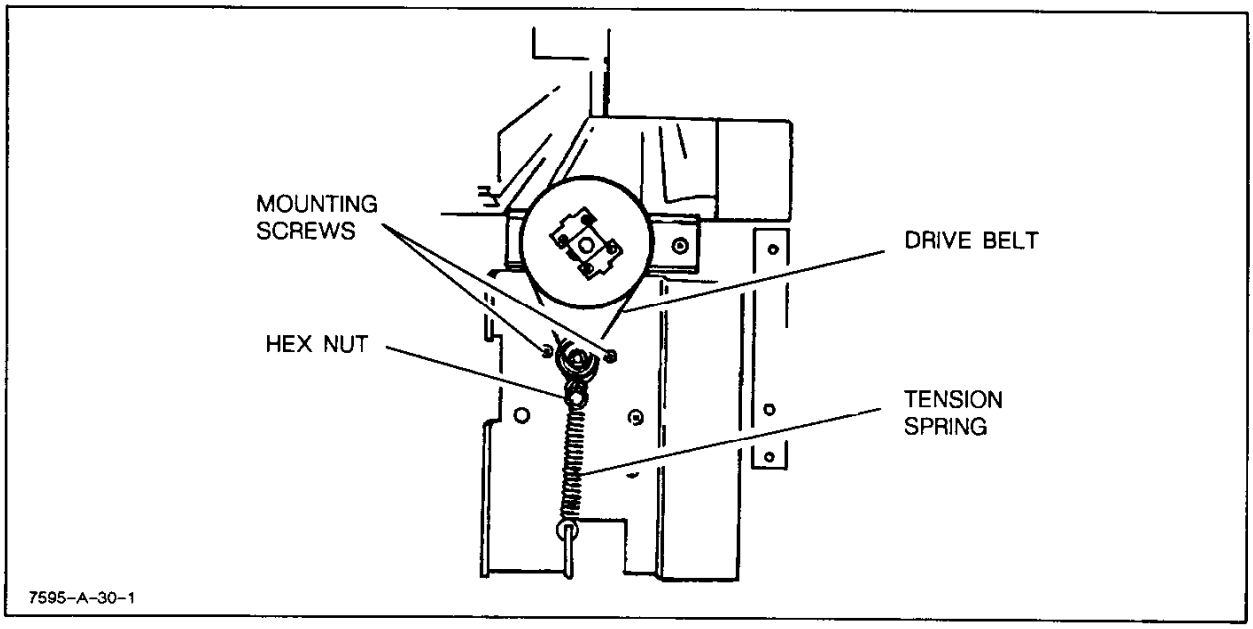


Figure 6-21. Grit Wheel Drive Belt Removal

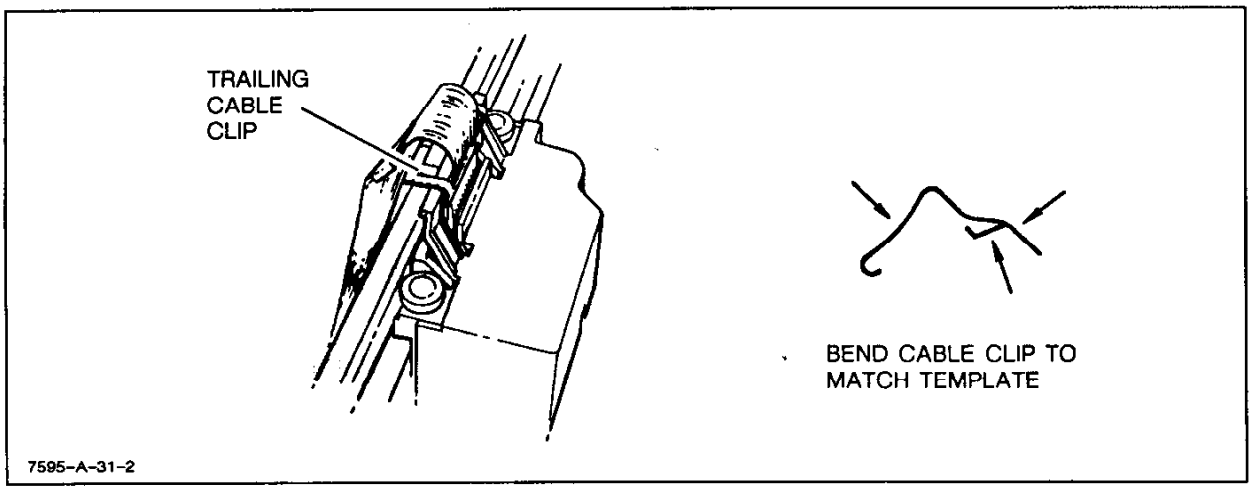


Figure 6-22. Trailing Cable Removal

CAUTION

The trailing cable clip tabs must fully contact the carriage cover for Electrostatic Discharge (ESD) protection. To ensure full contact, use the template in Figure 6-22 for proper clip angle.

6-45. PEN CLAW REMOVAL

6-46. To remove the pen claw, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter. The PCA cover does not need to be removed.

c. Remove the carousel base assembly. If necessary, refer to the procedure for carousel base assembly removal given in this chapter.

d. Loosen the screws (Torx #15) located at each end of the Y-arm cover and remove the cover.

e. Remove the pen carriage cover.

f. Slide the pen carriage to the extreme right end of the Y-arm.

g. Remove the pen claw tensioning spring from the bottom of the pen carriage by compressing the spring at the end closest to the pen claw with a small flat-blade screwdriver. See Figure 6-23.

h. Open the pen claw and slide it down and out to remove it.

6-47. To install the pen claw perform the following procedure:

a. Install the claw into the pen carriage.

b. Place one end of the tensioning spring on a small flat-blade screwdriver.

c. Place the free end of the spring onto the support post.

d. Place the other end of the spring onto the pen claw.

6-48. PEN CARRIAGE DRIVE BELT TENSIONER ASSEMBLY REMOVAL

6-49. To remove the pen carriage drive belt tensioner assembly, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Remove the seven mounting screws (Torx #25) that secure the left side cover and remove the cover.

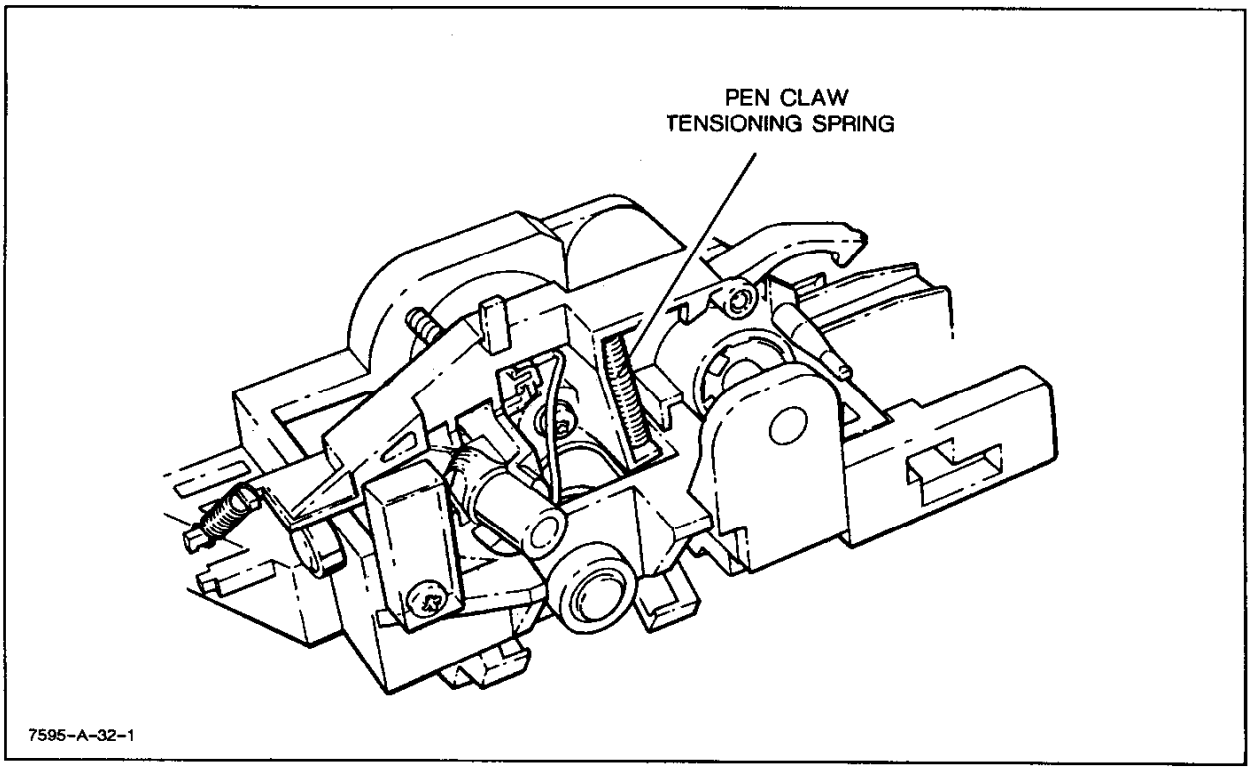


Figure 6-23. Pen Claw Removal

WARNING

Failure to tighten the hex nut against the mounting plate may cause the tensioning spring to slip and cause personal injury.

d. Tighten the hex nut on the tensioning bolt until all tension is released from the pen carriage drive belt. See Figure 6-24.

e. Remove the two screws (Torx #15) that secure the mounting plate to the Y-arm.

f. Remove the pen carriage drive belt tensioner assembly

NOTE

During reassembly, the hex nut should be backed out to the end of the tensioning bolt. This allows for temperature related size changes in the pen carriage drive belt.

6-50. PEN CARRIAGE DRIVE ASSEMBLY REMOVAL

6-51. To remove the pen carriage drive assembly, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Remove the seven mounting screws (Torx #25) that secure the left side cover and remove the cover.

d. Remove the motor/encoder connectors from J5 on the Processor PCA and J3 on the Analog PCA. See Figure 6-25.

e. Release the tension on the pen carriage drive belt tensioner assembly by tightening the hex nut (9/32 in.) on the tensioner.

f. Remove the Y-motor drive tensioning spring.

g. Remove the pen carriage motor belt from the motor pinion.

h. Remove the right side drive belt pulley. See Figure 6-26.

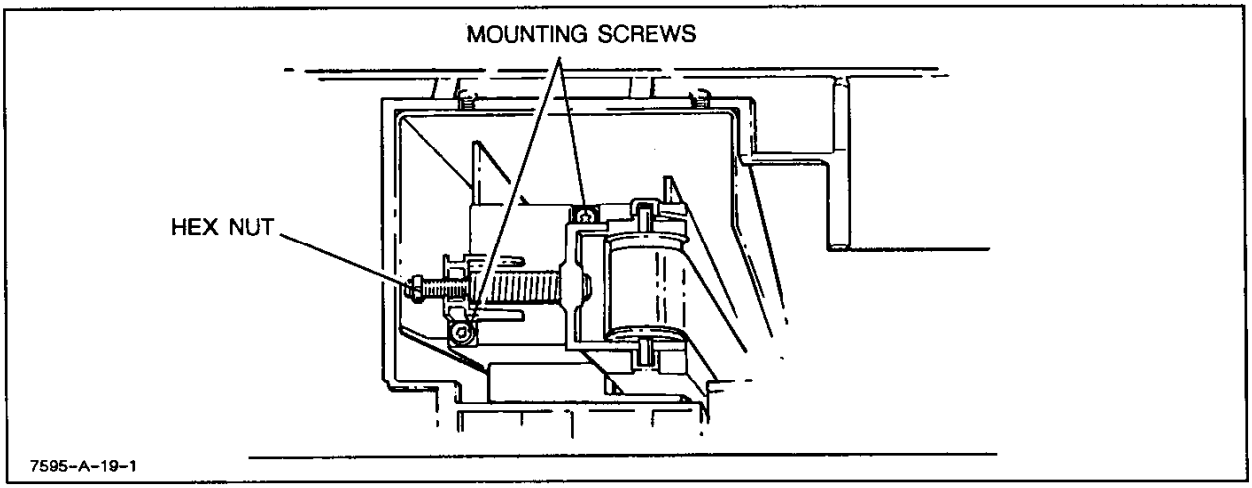


Figure 6-24. Pen Carriage Drive Belt Tensioner Assembly Removal

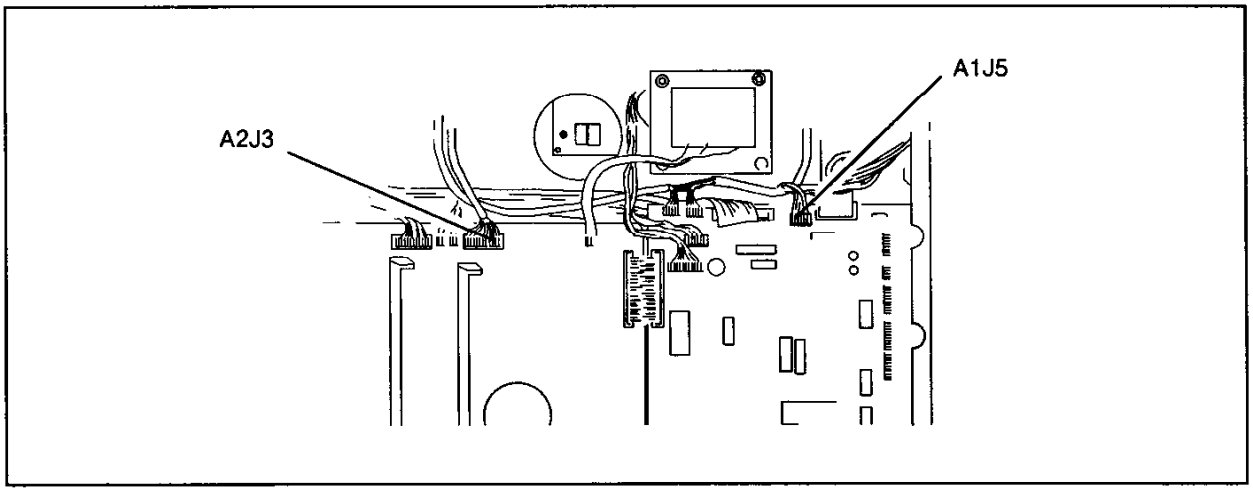


Figure 6-25. Motor/Encoder Connectors

i. Remove the two screws (Torx #15) that secure the pen carriage drive assembly and remove the assembly.

6-52. PEN CARRIAGE REMOVAL

6-53. To remove the pen carriage, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter. The PCA cover does not have to be removed.

c. Remove the seven screws (Torx #25) that secure the left side cover and remove the cover.

d. Remove the eight Y-arm cover mounting screws (Torx #15) and slide the Y-arm cover out the left side of the plotter. See Figure 6-27.

e. Remove the window. If necessary, refer to the procedure for removing the window given in this chapter.

f. Remove the trailing cable and clip from the pen carriage. If necessary, refer to the procedure for removing the trailing cable given in this chapter.

g. Remove the pen carriage cover by gently pulling the left side of the cover out and pushing down on the support arm until it releases from the tab of the pen carriage.

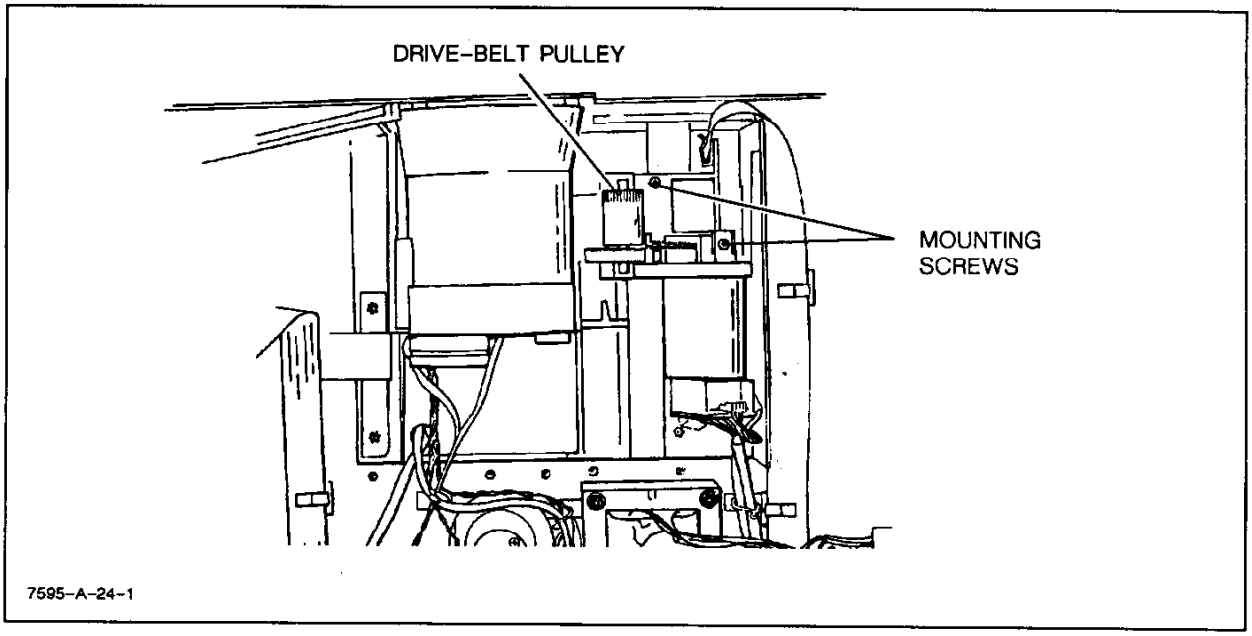


Figure 6-26. Pen Carriage Drive Assembly Removal

h. Remove the grit wheel drive belt. If necessary, refer to the procedure for removing the grit wheel drive belt given in this chapter.

i. Loosen the grit wheel drive pulley retaining screw (Torx #10) and remove the pulley.

j. Remove the pen carriage motor belt tensioner assembly. If necessary, refer to the procedure for removing the tensioner assembly given in this chapter.

k. Remove the Y-motor belt tensioning spring.

l. Remove the Y-motor belt from the Y-motor pinion.

m. Remove the right side reduction pulley.

n. Carefully slide the pen carriage out of the left end of the Y-arm.

o. Place your thumbs under the swing arm and lift it off of the carriage. See Figure 6-27.

p. Remove the two pen carriage motor belt mounting screws (2 mm Allen) and remove the belt from the pen carriage.

6-54. When reinstalling the pen carriage, notice that each of the three drive belts have double notches engraved on the smooth side. Align the three belts so that the notches form a "V", then attach the belts to the pen carriage. Once the pen carriage is installed on the y-arm and the belt assembly is tensioned, loosen the pen carriage belt screws so that the belts will adjust to the tensioning, then retighten the pen carriage belt screws.

6-55. When reinstalled properly, the pen carriage will slide smoothly along the Y-arm.

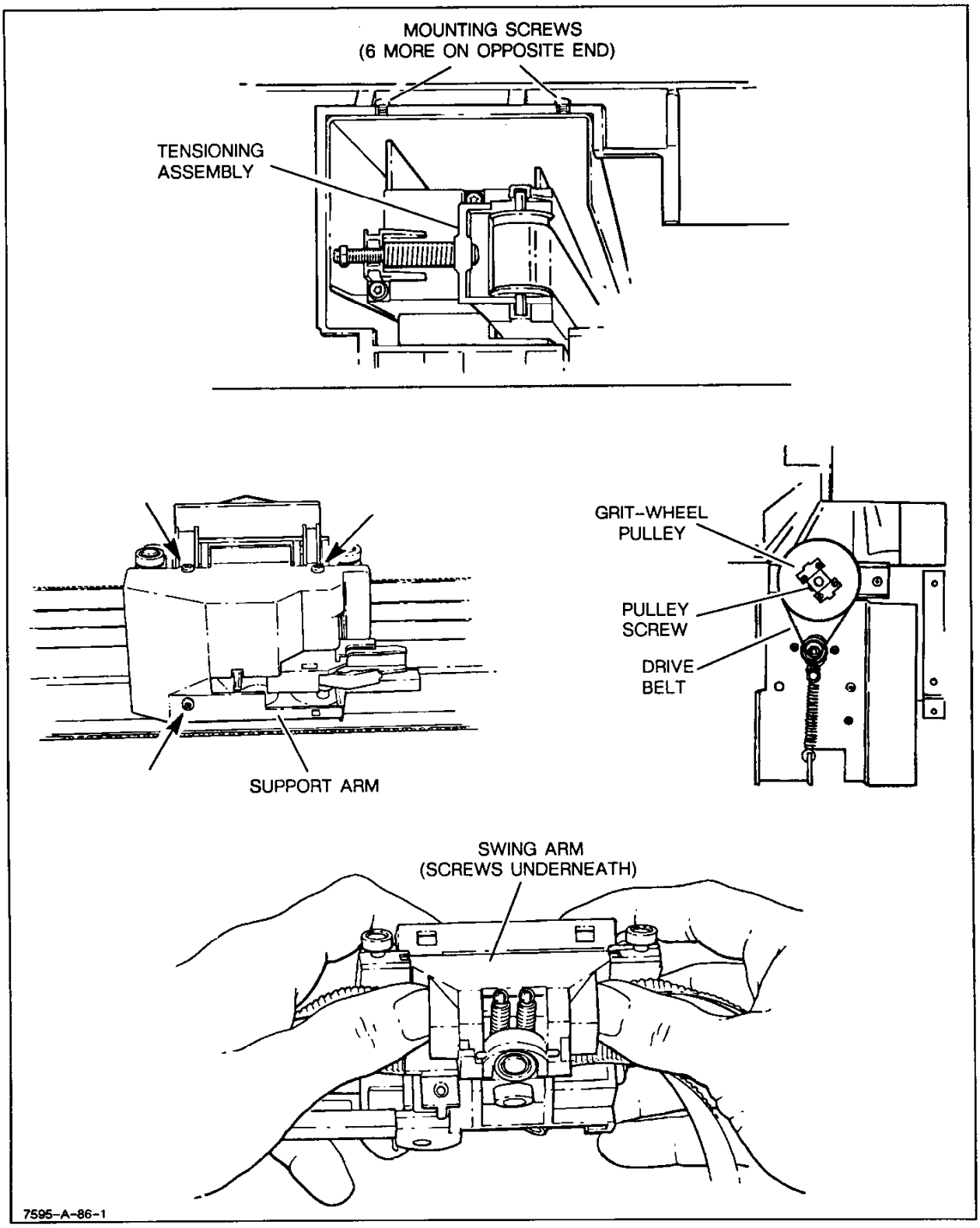


Figure 6-27. Pen Carriage Removal

6-56. Y-ARM REMOVAL

6-57. To remove the Y-Arm, perform the following procedures:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Remove the pen carriage assembly. If necessary, refer to the procedure for removing the pen carriage assembly given in this chapter.

d. Loosen the four set screws (2.0 mm Allen in the front and 1.5 mm Allen in the rear) on the Y-arm. See Figure 6-28 and Figure 6-29 .

e. Remove the four mounting screws (Torx #25) that secure the Y-arm to the platen and remove the Y-arm.

NOTE

While reinstalling the Y-arm, refer to the Y-arm adjustment procedure given in Chapter 7.

6-58. PINCH WHEEL REMOVAL

6-59. To remove the pinch wheel, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Raise the window and use the pinch wheel lever to raise the pinch wheels to the up position.

c. Insert a small flat-blade screwdriver in the access hole and push the center shaft out. See Figure 6-30.

d. Remove the pinch wheel.

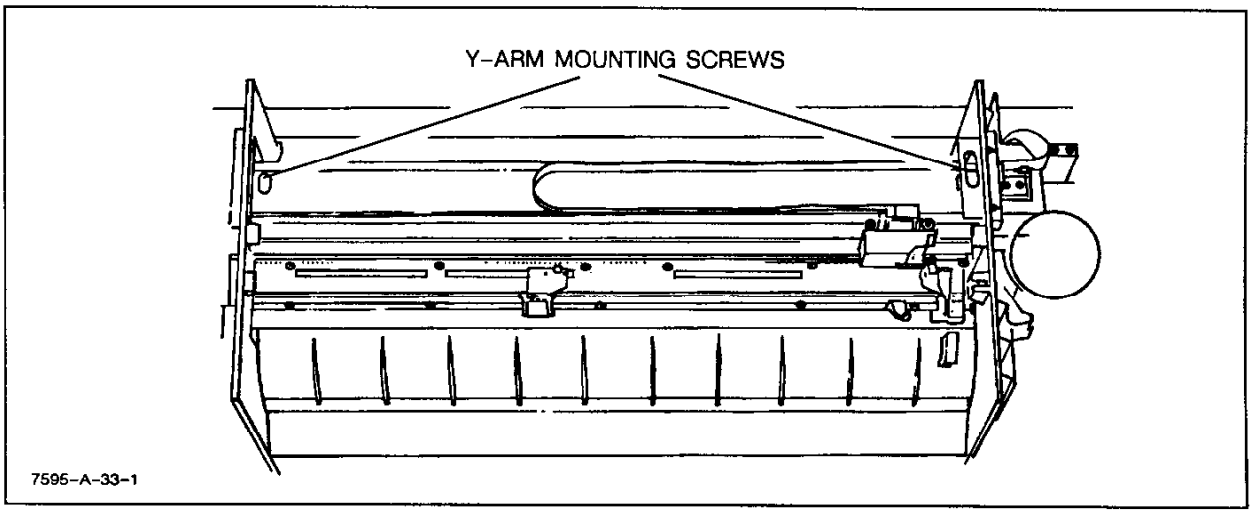


Figure 6-28. Y-Arm Set Screws

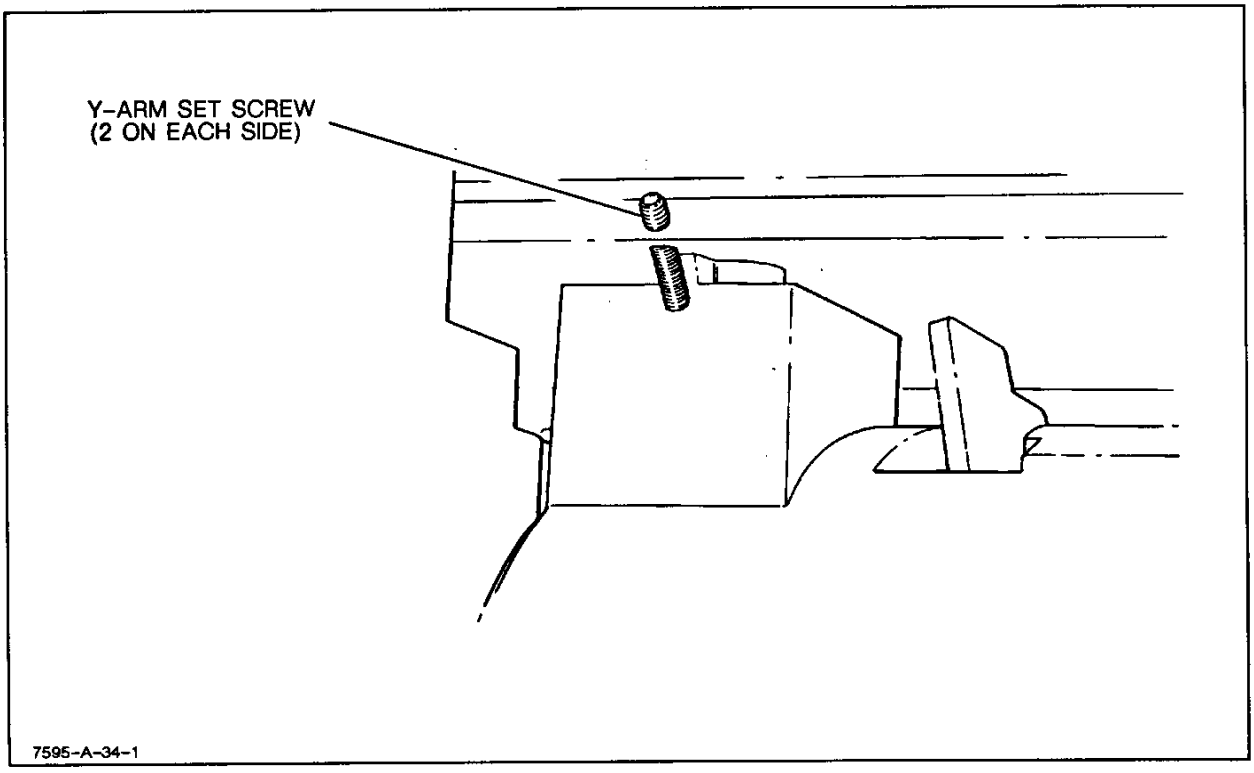


Figure 6-29. Y-Arm Removal

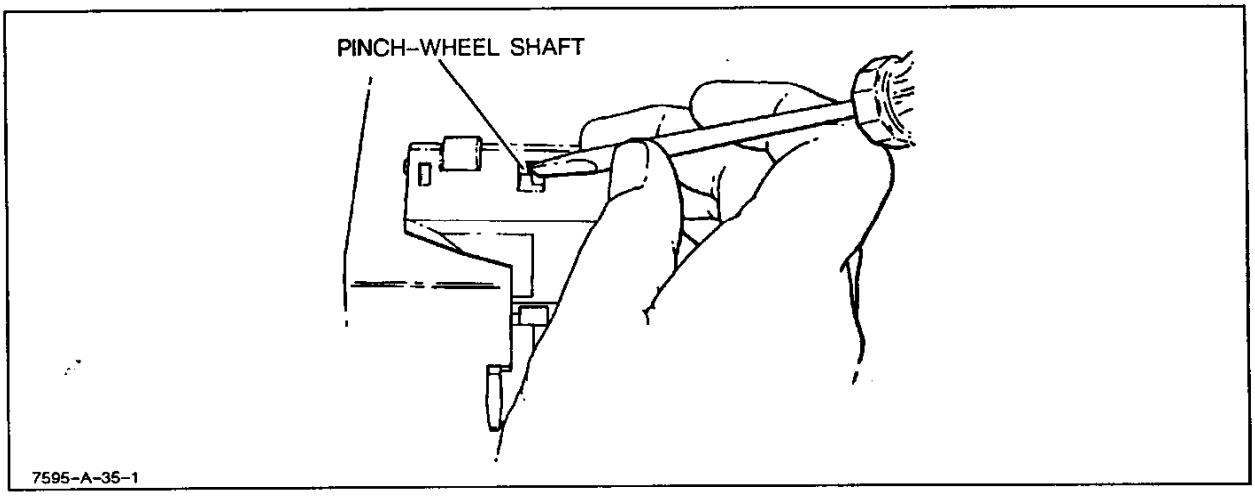


Figure 6-30. Pinch Wheel Removal

6-60. PINCH WHEEL BRIDGE ASSEMBLY REMOVAL

6-61. To remove the pinch wheel bridge assembly, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Remove the seven screws (Torx #25) that secure the left side cover and remove the cover.

c. Remove the two pinch wheel channel cover mounting screws (Torx #10) and remove the cover. See Figure 6-31.

d. Remove the five bridge mounting screws (Torx #15). SeeFigure 6-32.

e. Gently lift the right side up and slide the right pinch wheel subassembly inward. Carefully lift the pinch wheel bridge assembly out of the plotter. See Figure 6-32.

f. The right lift arm assembly can now slide off of the pinch wheel bridge assembly. See Figure 6-33.

NOTE

The lift arm assemblies should be replaced as a whole unit.

g. Remove the left cover mount and slide the left lift arm assembly out.

h. Slide the media deflector out of either end of the pinch wheel bridge assembly.

6-62. To reinstall the pinch wheel bridge assembly, perform the following procedure:

a. Pull back the pinch wheel lever so that when installed, the pinch wheels are in the up position.

b. Move the paper stop slide bar so that the gear is positioned in the middle of the pinch wheel channel.

c. Slide the right lift arm assembly to the left to simplify installation.

d. Before the pinch wheel bridge assembly is totally in the channel, slide the right lift arm assembly back to the right. The assembly should be positioned to the right of the chassis block so that the lever gear is connected with the slide bar gear. Ensure that the pinch wheel bridge assembly is flush against the chassis.

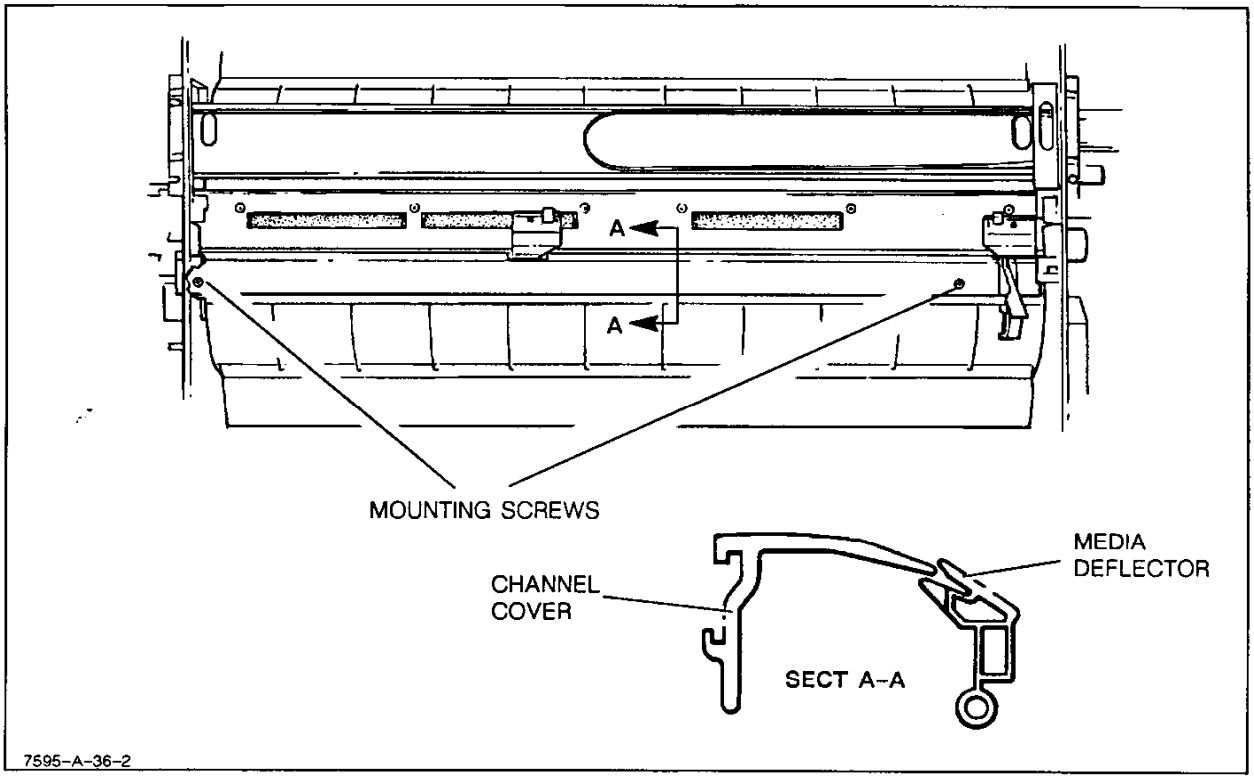


Figure 6-31. Pinch Wheel Channel Cover Removal

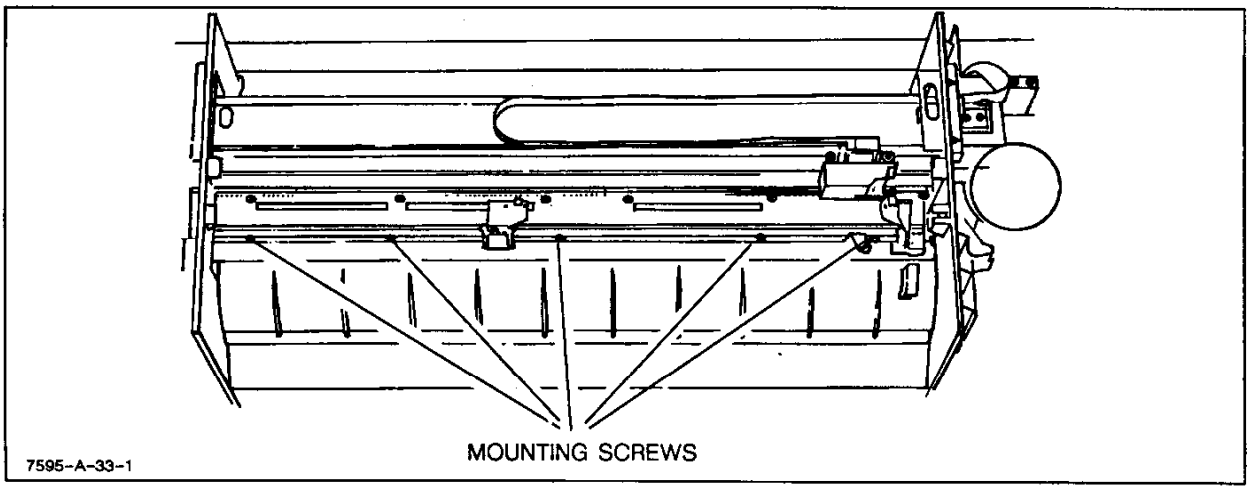


Figure 6-32. Pinch Wheel Bridge Assembly Removal

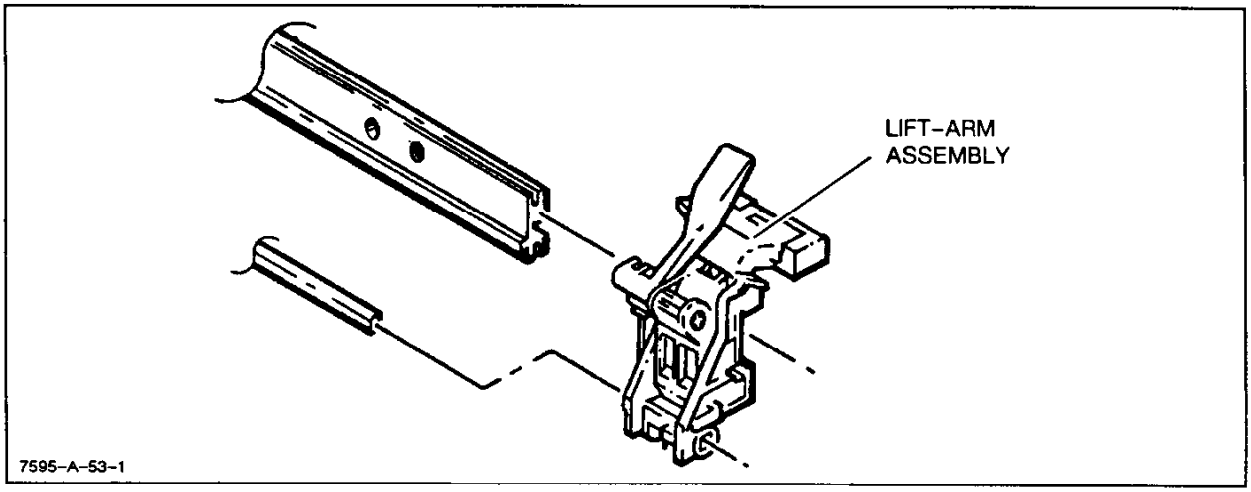


Figure 6-33. Lift Arm Removal

e. For proper tightening, make sure that the pinch wheel bridge screws enter the screw holes at a 45 degree angle. Ensure the paper stops actuate properly before installing the pinch wheel channel cover.

f. Install the pinch wheel channel cover. Slide the adjustable pinch wheel to the right, compressing the media deflector. Place the channel cover between the upper and lower tabs of each section of the media deflector. See Figure 6-31.

6-63. GRIT WHEEL REMOVAL

6-64. To remove the grit wheel, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Remove the window. If necessary, refer to the procedure for removing the window given in this chapter.

c. Remove the seven screws (Torx #25) that secure the left side cover and remove the cover.

d. Remove the grit wheel drive belt tensioning spring. See Figure 6-34.

e. Ease the tension on the drive belt by loosening the hex nut (10 mm) and two grit wheel motor mounting screws (Torx #15).

f. Remove the drive belt.

g. Loosen the screw (Torx #10) that secures the grit wheel pulley and remove the pulley.

h. Remove the two screws (Torx #15) that secure the grit wheel mounting plate and remove the plate along with the attached bearing.

i. Remove the pinch wheel bridge assembly. If necessary, refer to the pinch wheel bridge assembly removal procedure given in this chapter.

j. Remove the carousel from the carousel tub.

k. Move the pen carriage to the extreme right end of the Y-arm.

l. Remove the six screws (Torx #8) that secure the center platen and carefully remove the platen. See Figure 6-35.

CAUTION

Excessive torque on the center platen screws can cause stripping in the bearing blocks. Ensure both bearing block plugs are firmly pressed into the bearing blocks to prevent loss of vacuum.

m. Remove the grit wheel mounting screws (Torx #15), and starting from right to left, lift the grit wheel out of the plotter. See Figure 6-36.

CAUTION

Do not press down on the end of the shaft during installation or damage to the plotter may occur.

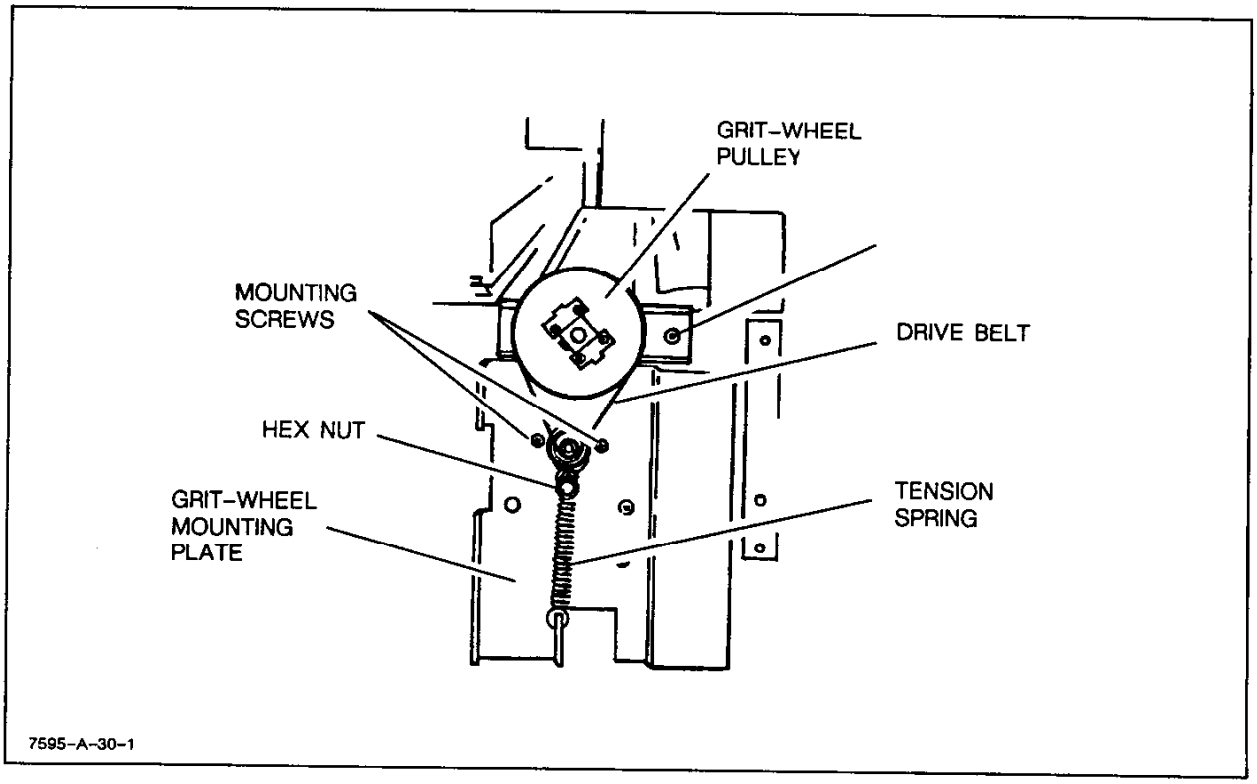


Figure 6-34. Grit Wheel Drive Assembly

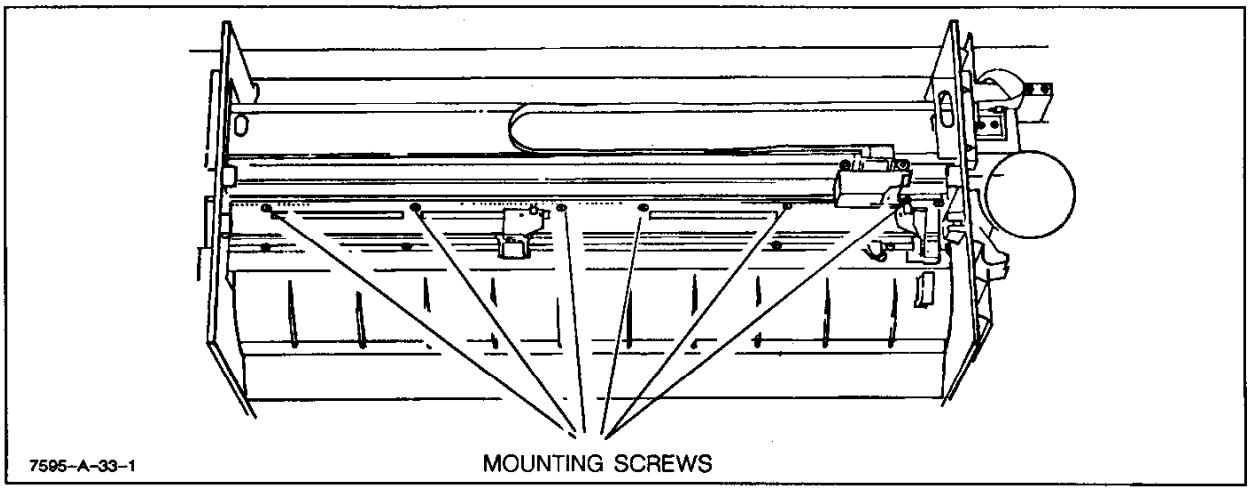


Figure 6-35. Center Platen Removal

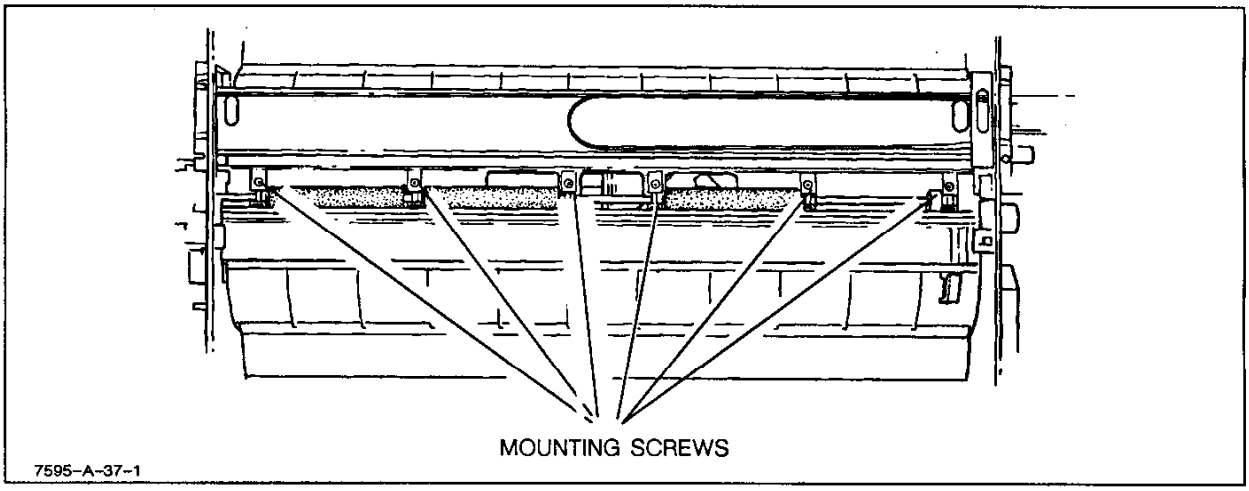


Figure 6-36. Grit Wheel Removal

NOTE

When reinstalling the grit wheel, rotate the bearing blocks so that they rest against the front edge of the grit wheel channel. While keeping the left end slightly raised, rotate the bearing blocks back one at a time, right to left, while inserting the grit wheel. This will simplify the reinstallation of the grit wheel.

Insert the outer bearing to the end of the grit wheel shaft, then attach the grit wheel mounting plate and slide it forward until the slanted side touches the bearing. This will allow the grit wheel to adjust to varying pressures.

6-65. ROLL-FEED MODULE REMOVAL AND DISASSEMBLY

6-66. To remove the left side and right side roll-feed modules, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Open the plotter. If necessary, refer to the procedure for opening the plotter given in this chapter.

c. Disconnect the roll-feed motor cable and microswitch cable connectors. See Figure 6-37.

d. Remove the two roll-feed module mounting screws (Torx #15). See Figure 6-38.

e. Grasp the bottom of the right side module and press in on the two bottom locking tabs. Simul-

taneously lift and pull the drive module to release the locking tabs. See Figure 6-38. Repeat steps d and e to remove the left side module.

f. Remove the support arm springs.

g. To disassemble the right side module, remove the retaining screws (Torx #15) from the gear cover. See Figure 6-39.

h. Remove the gear cover with the take-up motor attached. All interior parts of the drive module are now accessible. See Figure 6-40 for proper placement of parts.

6-67. When reassembling the drive module, check that the microswitch standoff engages the hole in the gear cover and that the microswitch actuator is facing the microswitch plunger. Tension the take-up motor belt by performing the following:

a. Remove the motor belt tensioning spring. See Figure 6-39.

b. Loosen the plate adjusting screws.

c. Place the drive belt around the motor pinion.

d. Replace the tension spring.

e. Tighten the plate adjusting screws.

CAUTION

When installing either roll feed module, ensure the module snaps in firmly to prevent misalignment of the media during operation.

6-68. GRIT WHEEL DRIVE MOTOR REMOVAL

6-69. To remove the grit wheel drive motor, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Remove the seven screws (Torx #25) that secure the left side cover and remove the cover.

c. Remove the grit wheel drive belt tensioning spring. See Figure 6-41.

d. Loosen the hex nut (10 mm) on the tensioning bolt and the two motor screws (Torx #15).

e. Remove the drive belt.

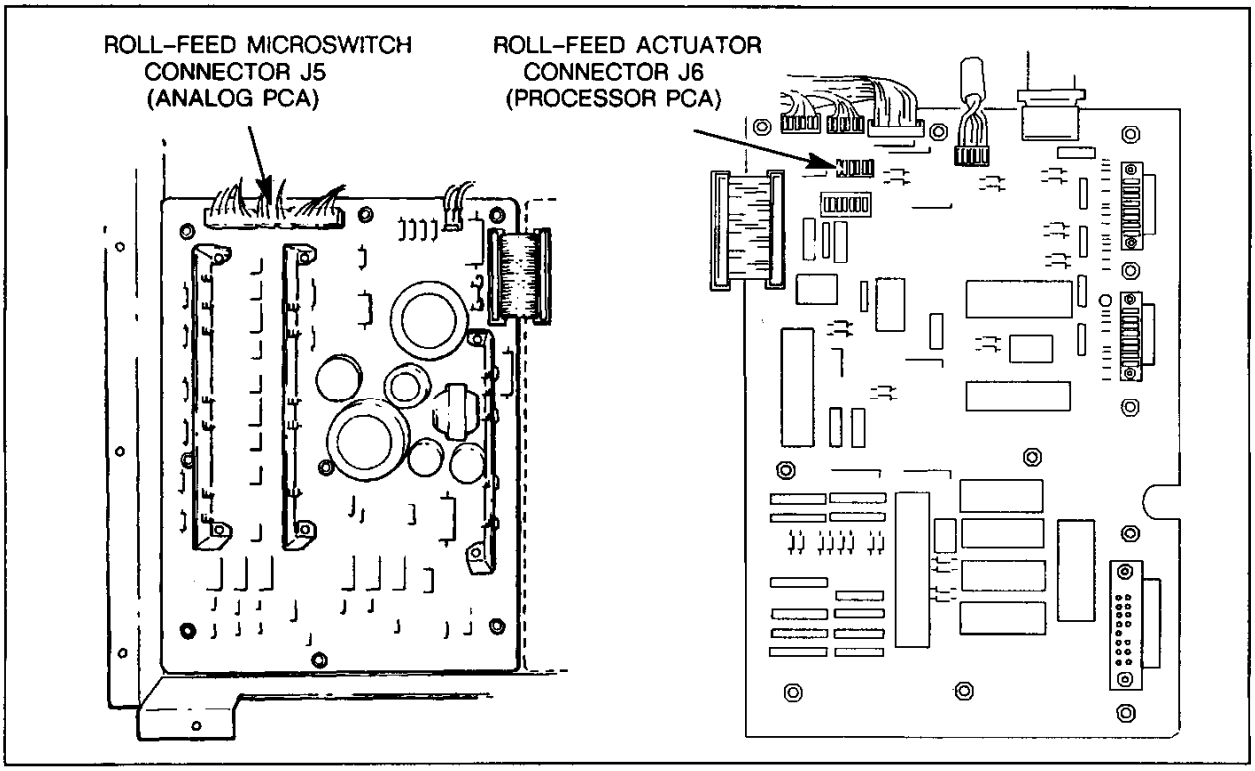


Figure 6-37. Roll-Feed Module Cable Connectors

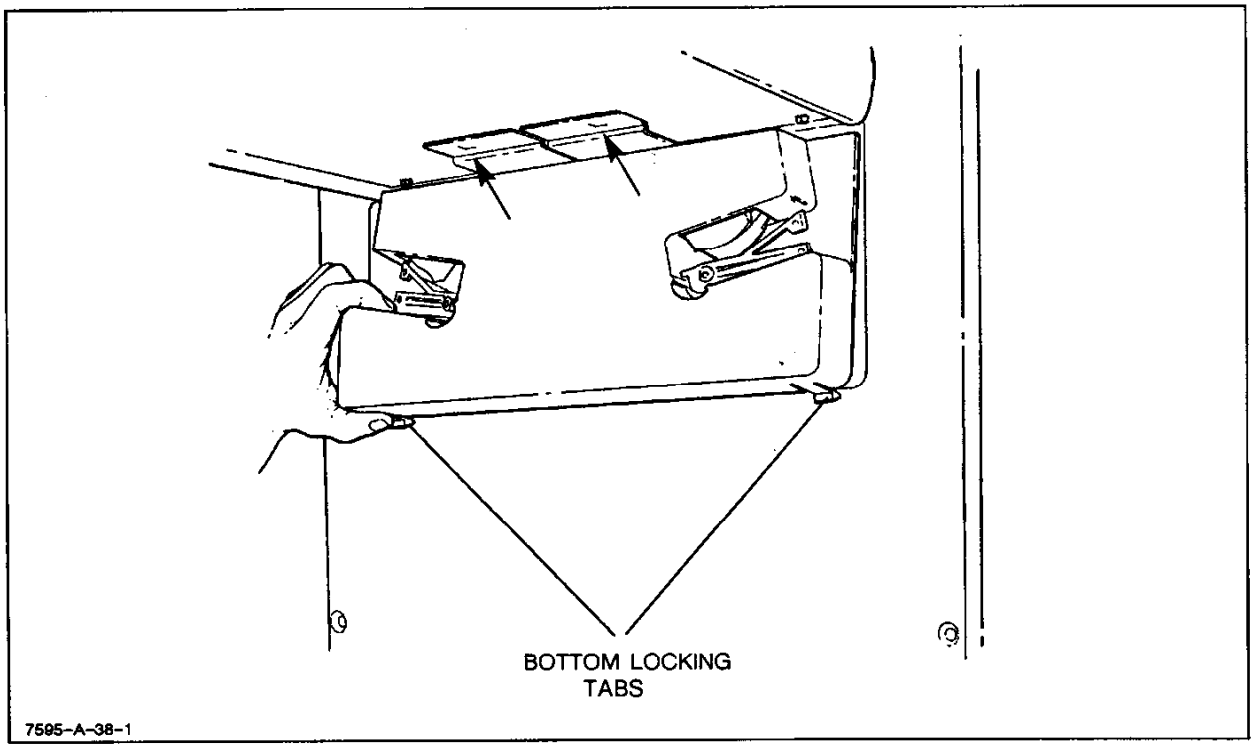


Figure 6-38. Roll-Feed Module Removal

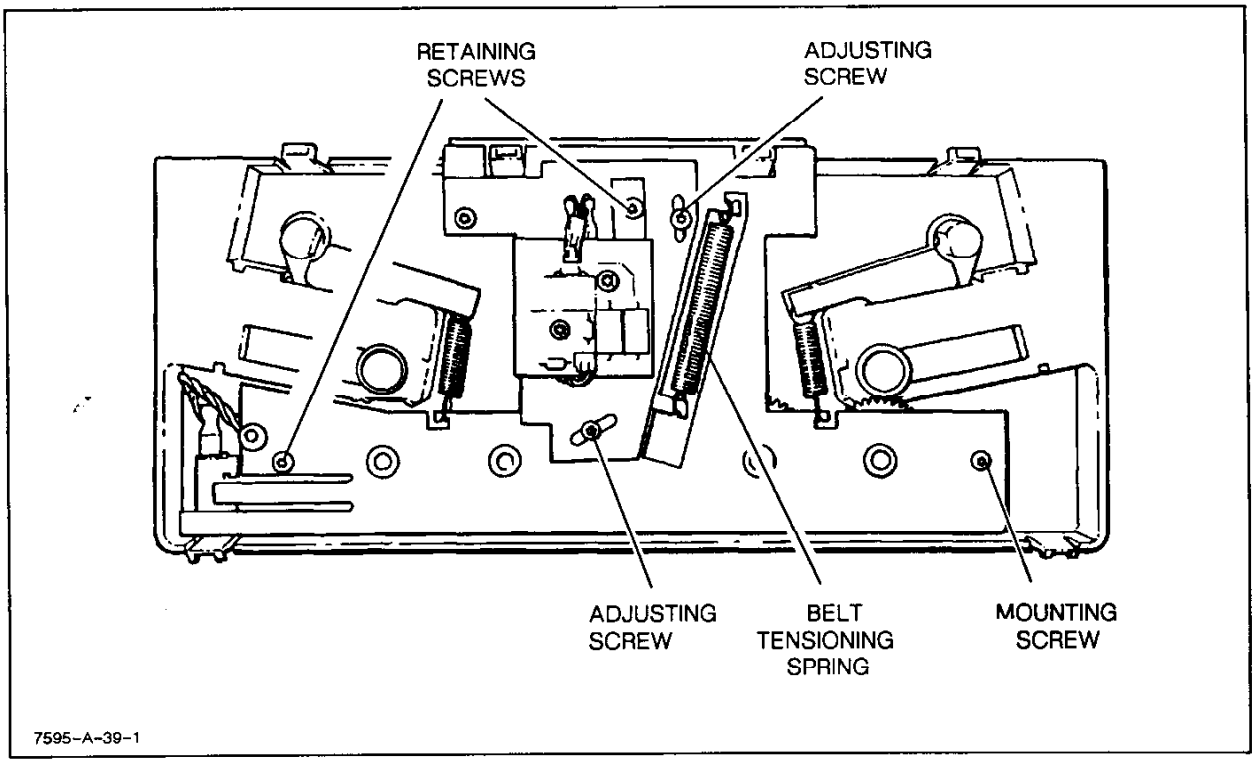


Figure 6-39. Roll-Feed Module Retaining Screws

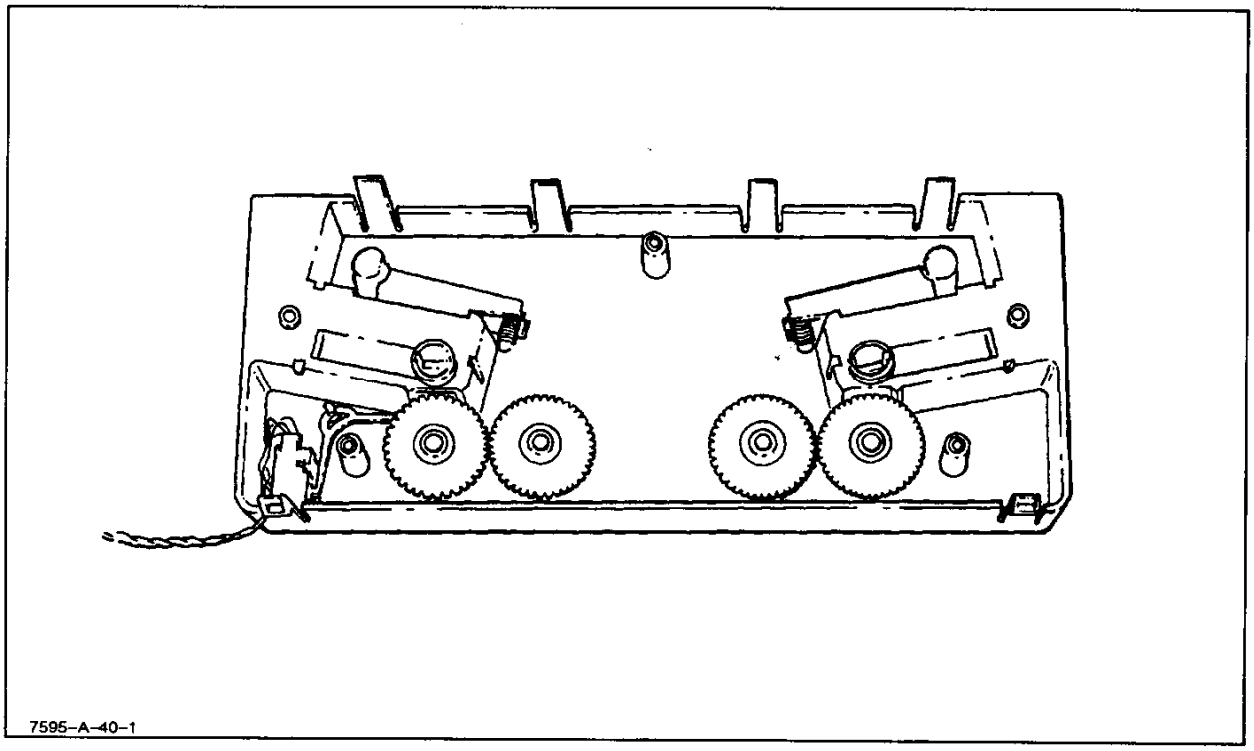


Figure 6-40. Drive Module Disassembly

f. Loosen the grit wheel pulley mounting screw (Torx #10) and remove the pulley.

g. Remove the three mounting plate screws (Torx #15) and the ground strap screw (Torx #15).

h. Carefully remove the motor from the access hole and disconnect the motor cables. See Figure 6-42.

NOTE

When installing the grit wheel drive motor, tension the drive belt by attaching the drive belt to the motor pinion and attach the tensioning spring before tightening the motor screws and hex nut.

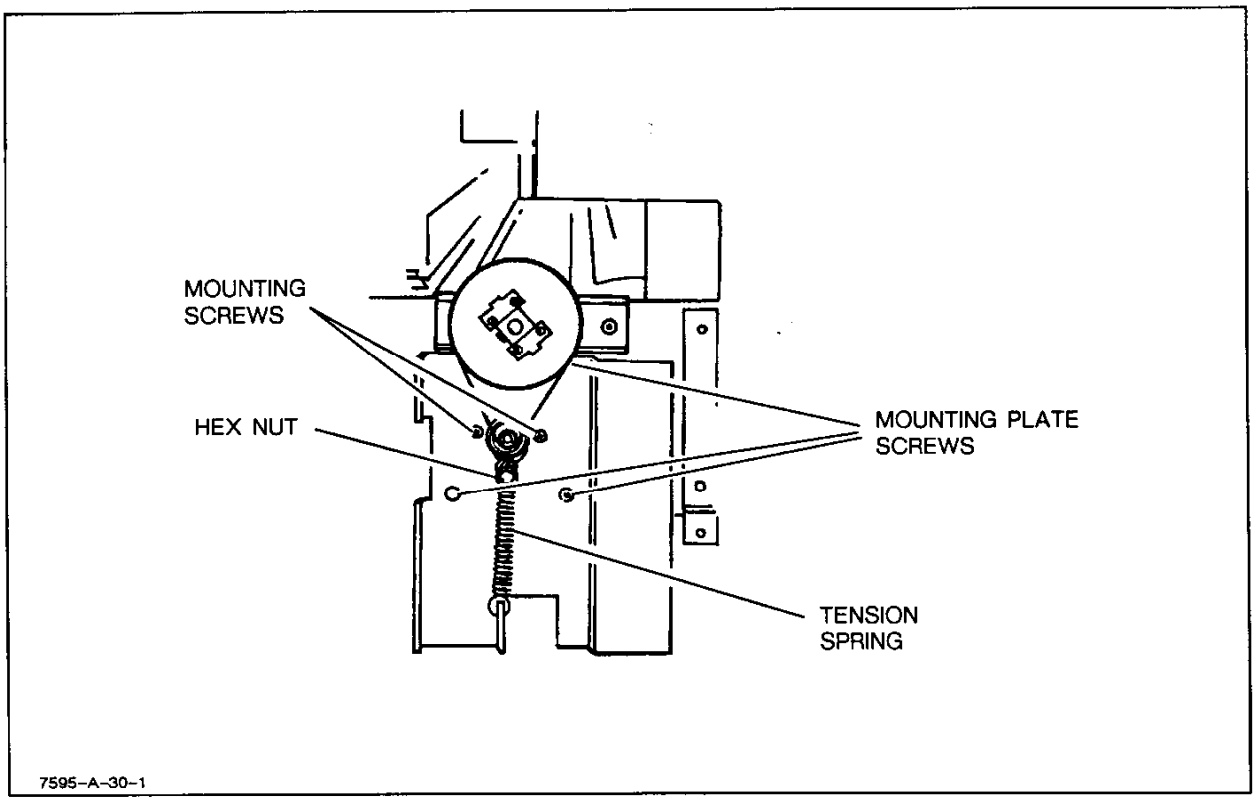


Figure 6-41. Grit Wheel Drive Motor Removal

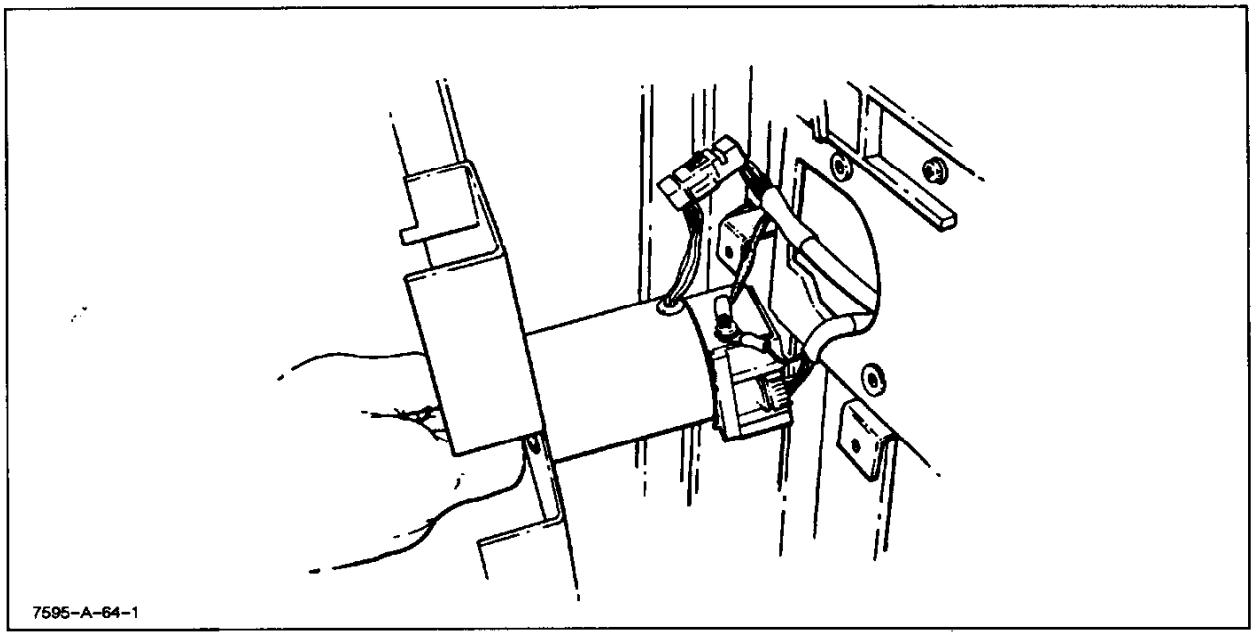


Figure 6-42. Grit Wheel Drive Motor Cable Connectors

6-70. FAN ASSEMBLY REMOVAL

6-71. To remove the fan assembly, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Remove the roll feed modules. If necessary, refer to the roll feed module removal procedure given in this chapter.

c. Remove the ten hex nuts (9/32 in.) and four screws (Torx #15) that secure the bottom cover. Carefully remove the cover so that the side panel does not get scratched. See Figure 6-43.

d. Disconnect the fan wires. See Figure 6-44.

e. Remove the four screws (2.5 mm Allen) that secure the fan to the mounting plate and remove the fan.

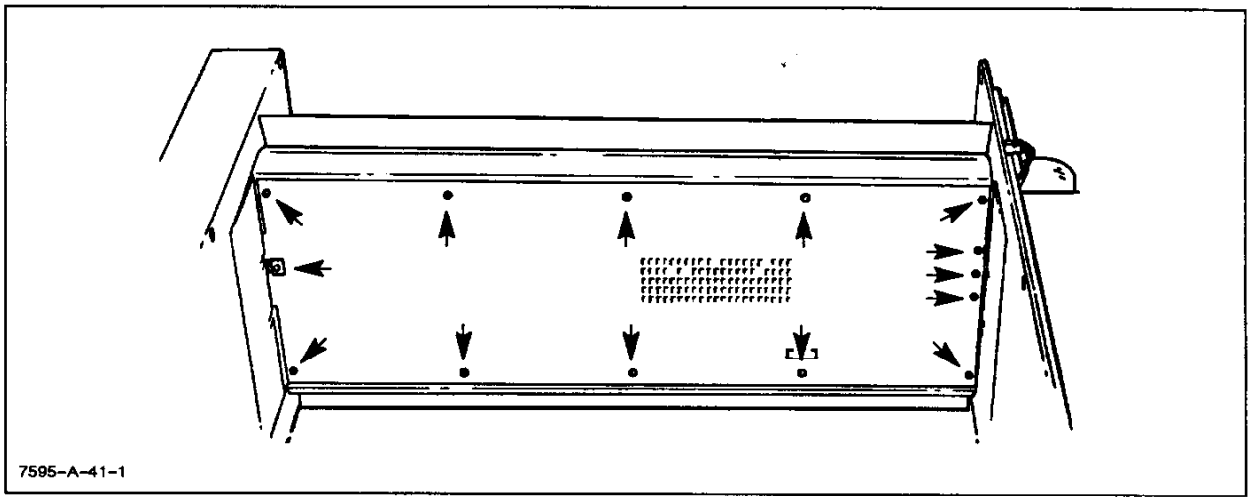


Figure 6-43. Bottom Cover Removal

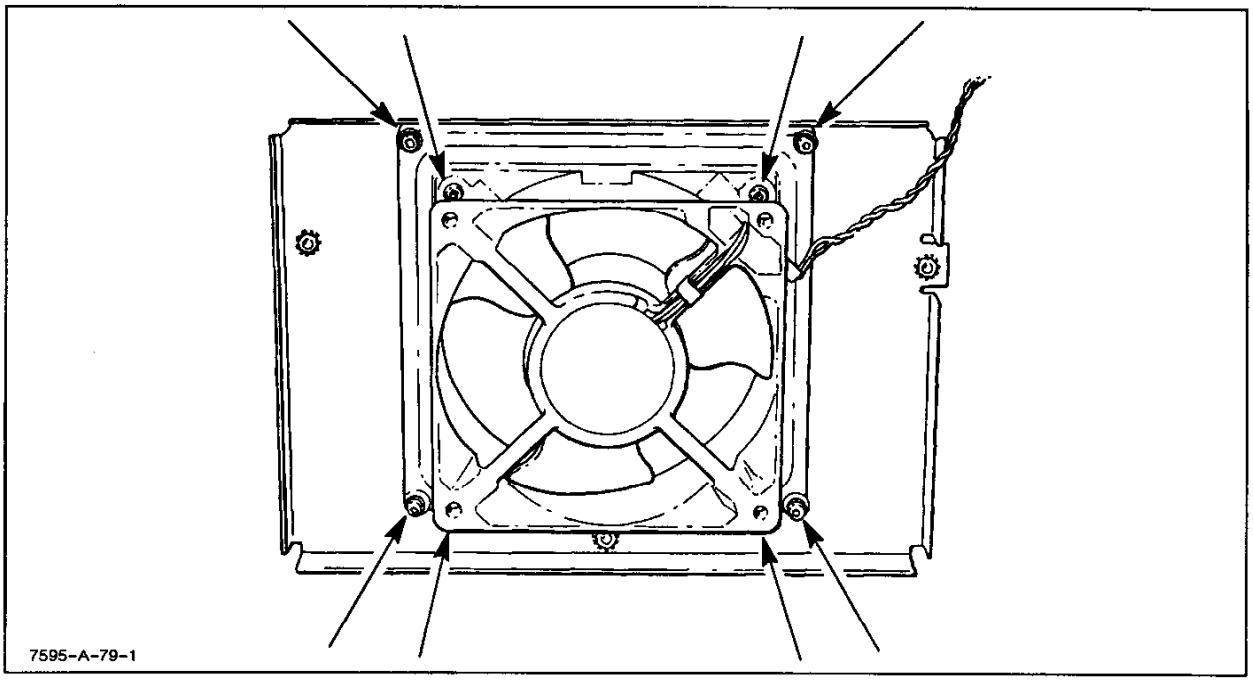


Figure 6-44. Fan Assembly Removal

6-72. PAPER STOP ASSEMBLY REMOVAL

6-73. To remove the paper stop assembly, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Pull the pinch wheel lever back so that the pinch wheels are in the up position.

c. Remove the pinch wheel bridge assembly. If necessary, refer to the procedure for removing the pinch wheel bridge assembly given in this chapter.

d. If the plotter has the roll feed option, remove the roll feed modules. If necessary, refer to the roll feed module assembly removal procedure given in this chapter.

e. Remove the paper stop rack spring.

f. Remove the ten hex nuts (9/32 in.) and four screws (Torx #15) that secure the bottom cover and remove the cover.

g. Unhook the two paper stop tension spring ends that are closest to the center of the plotter. See Figure 6-45.

h. Remove the back end of the slide lever by turning it counterclockwise (as viewed from the front of the plotter) until the retaining tab clears the upper ledge of the holding block. Repeat for the front end of the slide lever. See Figure 6-46 and Figure 6-47.

i. Gently pull the slide lever down until it releases and remove the slide lever.

j. To remove the front paper stop, remove the two holding block mounting screws.

k. Repeat step j for the rear paper stop.

6-74. To install the paper stop assembly, perform the following procedure:

a. Attach the paper stops to the holding blocks.

b. Install the two tension springs onto the paper stops.

c. Attach the holding blocks to the platen.

NOTE

The slide lever gear teeth must mesh with the pinch wheel gear teeth to ensure proper operation of the pinch wheel assembly and paper stop assembly.

d. Attach the slide lever by inserting it between the paper stops and the holding blocks. See Figure 6-46.

e. Push both ends of the slide lever up and to the front of the plotter until the front and rear tab slots lock in place over the holding block tabs.

f. Attach the paper stop springs.

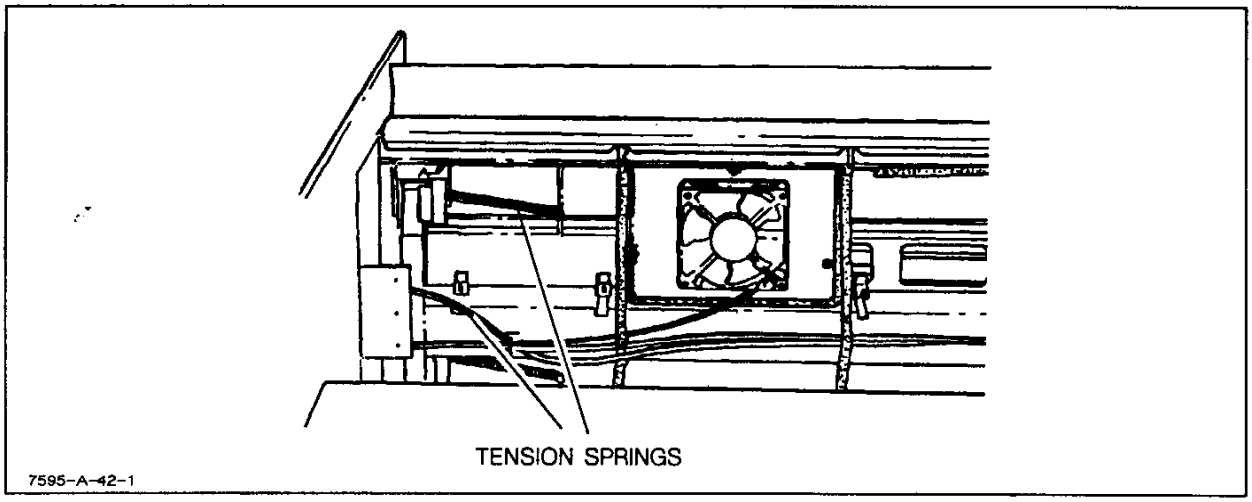


Figure 6-45. Paper Stop Assembly Removal

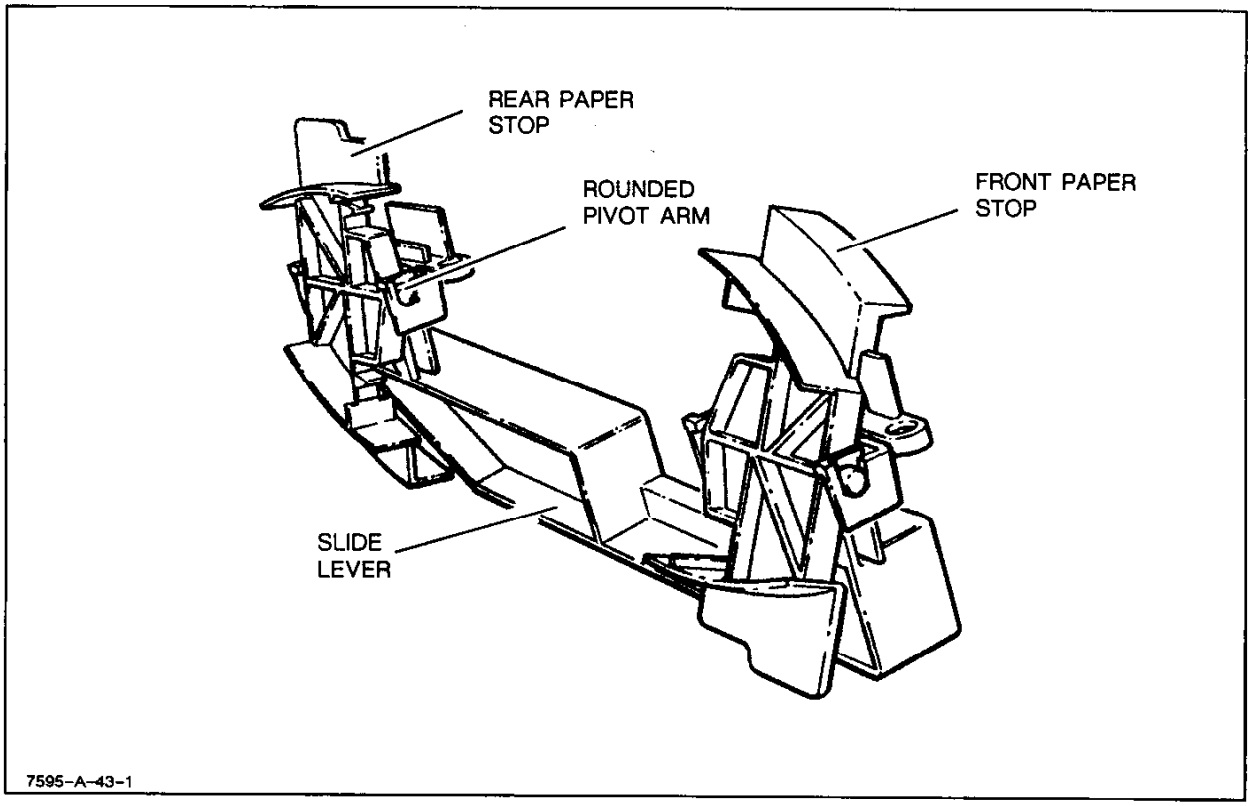


Figure 6-46. Paper Stop Removal

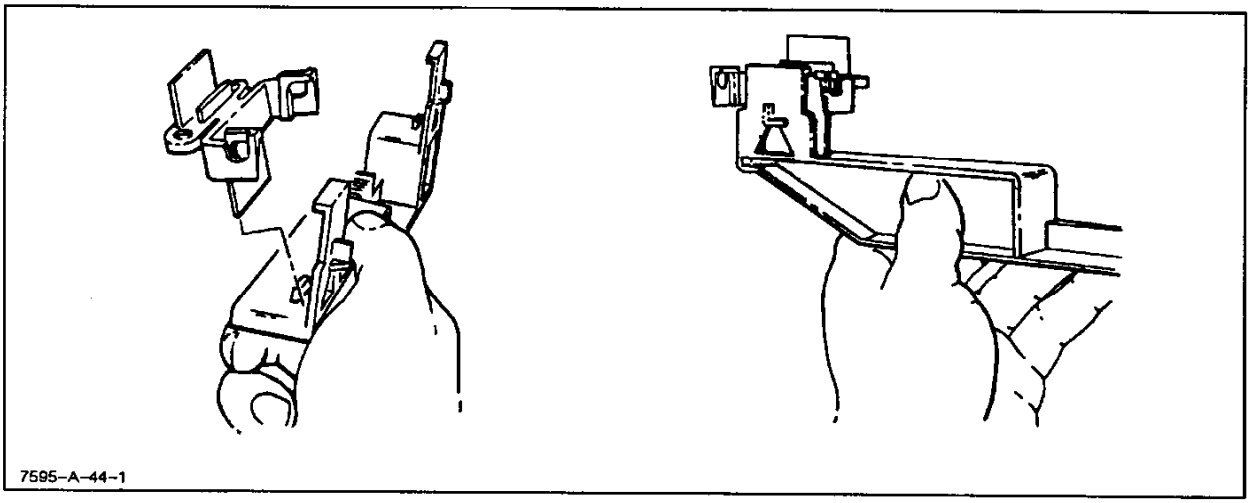


Figure 6-47. Slide Lever Removal

CHAPTER 7
ADJUSTMENTS

7-1. INTRODUCTION

7-2. This chapter describes adjustments used to maintain the HP 7595/6 plotter, or to return the plotter to proper operating condition after repairs have been made.

7-3. SAFETY CONSIDERATIONS

7-4. The HP 7595/6 has been designed in accordance with accepted safety standards. Safety symbols used with Hewlett-Packard instruments are contained in the front matter of this manual. These symbols must be reviewed before service work is performed. Also, refer to Chapter 6 for ESD considerations.

WARNING

To avoid personal injury, turn the plotter line switch to OFF (O) and disconnect the ac power cord before attempting any adjustments given in this chapter.

7-5. RECOMMENDED TOOLS

7-6. The tools recommended for plotter adjustments are listed in Table 7-1.

7-7. ADJUSTMENT PROCEDURES

7-8. The mechanical adjustments are described in the following paragraphs.

7-9. MECHANICAL ADJUSTMENTS

7-10. Two mechanical adjustments are required for the HP 7595/6. The carousel base adjustment must be performed whenever the carousel base is loosened or replaced. The Y-arm adjustment must be performed whenever the Y-arm is removed or replaced.

Table 7-1. Required Tools and Equipment

TOOLS/EQUIPMENT	MODEL/SIZE
Torx Screwdrivers	T-8, T-10, T-15, and T-25
Hex Nut Drivers	7mm, 8mm, 3/16", 9/32", and 1/2"
Open End Wrench	10 mm
Allen Wrenches	1.5 mm, 2.0 mm, and 2.5 mm
Flat-blade Screwdrivers	Small and Medium

7-11. CAROUSEL BASE ADJUSTMENT. To adjust the carousel base, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. Remove the carousel from the carousel tub and the pen from the pen carriage.

c. Loosen the two carousel base mounting screws.

CAUTION

If the carousel base is not placed flat against the support base, it could ride on top of the chassis stops and damage the plotter.

d. Ensure the carousel base is flat against the support base and chassis stops on the X-Y chassis. See Figure 7-1.

e. Manually move the pen carriage to the right until the decapper foot touches the pen carriage drive pulley. See Figure 7-2.

f. Slide the carousel base (side to side) to a position where the actuator foot first contacts the alignment tab on the carousel base. See Figure 7-2.

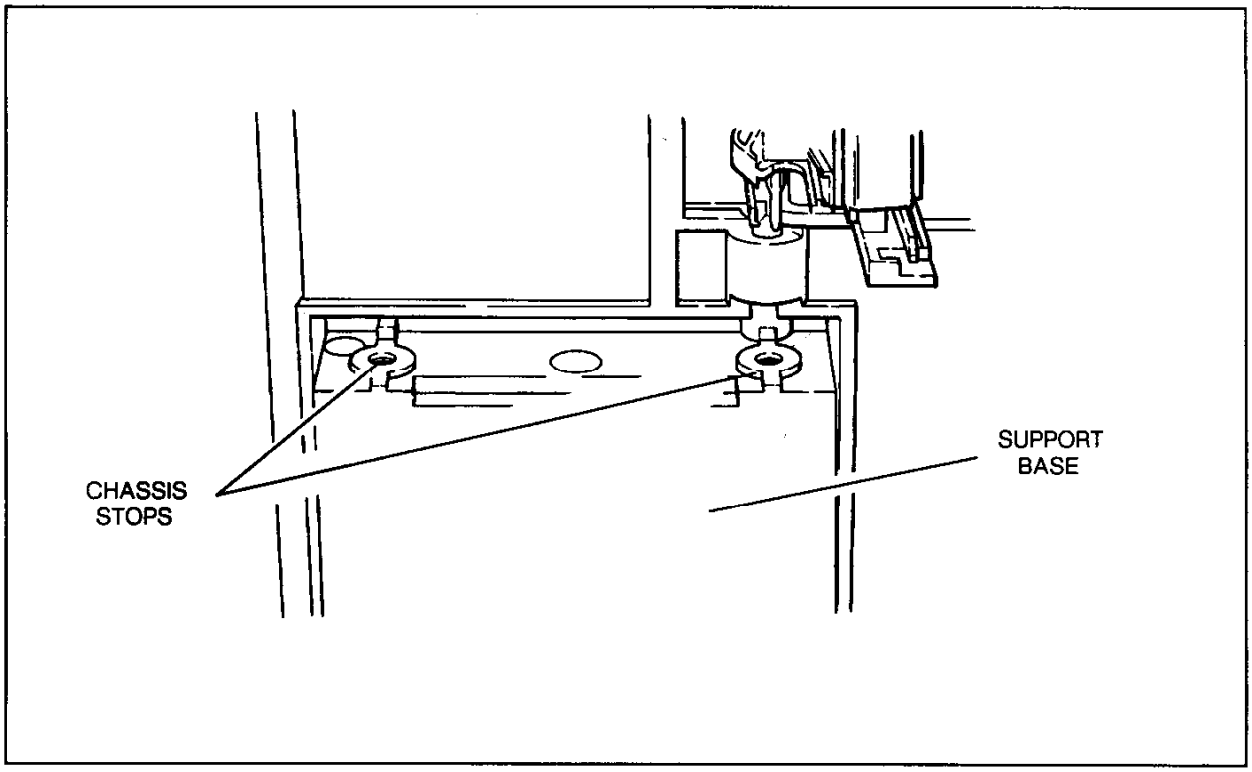


Figure 7-1. Carousel Support Base

NOTE

Alignment is obtained by three points of contact. The carousel base touches two stops on the X-Y chassis and the actuator foot touches the alignment tab.

g. Tighten both carousel base mounting screws

7-12. Y-ARM ADJUSTMENT. To adjust the Y-arm, perform the following procedure:

a. Turn the plotter line switch to OFF (O) and disconnect the ac power cord.

b. With the Y-arm loosely mounted, adjust the front and rear set screws on each end of the Y-arm so that the pen carriage crutch rides along the middle of the groove in the center platen. SeeFigure 7-3.

c. When the pen carriage crutch is centered along the entire length of the groove, tighten the two mounting screws on each end of the Y-arm.

7-13. ELECTRICAL ADJUSTMENTS

7-14. There are no electrical adjustments for the HP 7595/6.

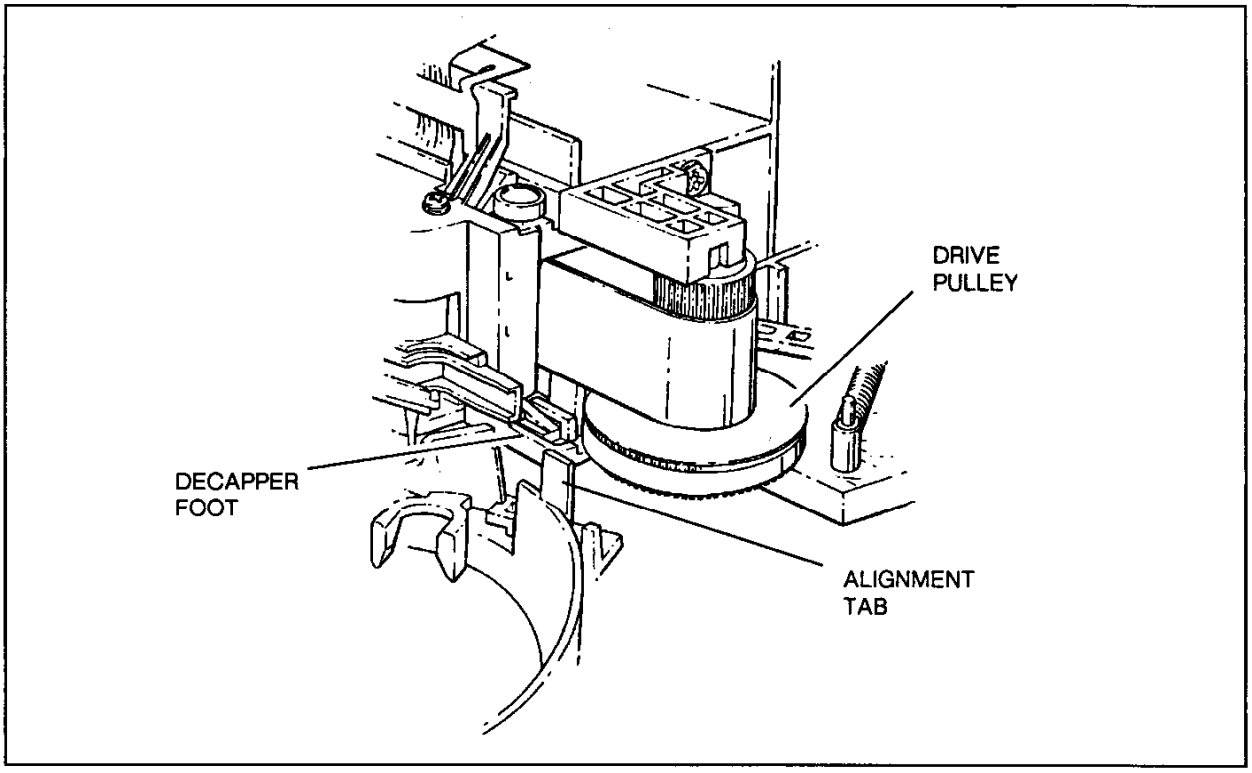


Figure 7-2. Carousel Base Adjustment

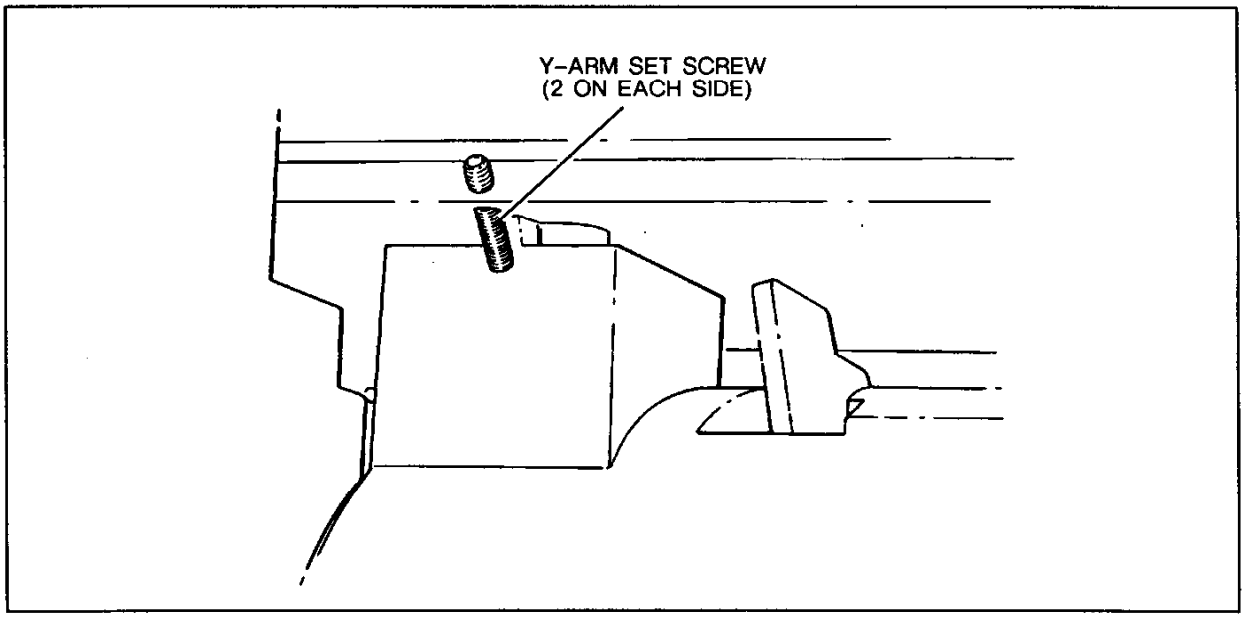


Figure 7-3. Y-Arm Adjustment

CHAPTER 8

TROUBLESHOOTING AND DIAGNOSTICS

8-1. INTRODUCTION

8-2. This chapter contains Error Codes and Messages, Test Failure Tables, diagnostic instructions, and troubleshooting information for use as an aid in solving plotter symptoms and failures.

8-3. SAFETY CONSIDERATIONS

8-4. The HP 7595/6 Drafting Plotter has been designed in accordance with accepted safety standards. Safety symbols used with Hewlett-Packard instruments are contained in the front matter of this manual. These symbols must be reviewed before service work is performed. Servicing must be performed only by qualified service personnel.

8-5. DIAGNOSTICS

8-6. Table 8-1 contains Error Codes and Messages that are displayed on the Front Panel. This table identifies the Error Code and the associated message that may be displayed because of a plotter symptom or failure. Error messages that may be unclear are explained in the following paragraph. Table 8-2, Table 8-3, and Table 8-4 provide tests, displays, and results of various plotter tests. The buttons column shows which buttons to press to initiate the function desired. The FUNCTION column shows which function or test is selected when the associated buttons are pressed. Tests are initiated by pressing the appropriate buttons while powering up the plotter.

NOTE

The tests in Table 8-4 require paper to be loaded before power is applied. A 0.30 mm or 0.35 mm wide black pen must be installed in pen stall 8. Pens must be installed in pen stalls 1, 2, 3, 4, and 8 for the Service Demonstration Plot. Do not use a roller-ball pen in pen stall 8 whenever the digitizer is used.

8-7. Error message 6, POSITION OVERFLOW, indicates that an overflow occurred after an internal calculation was performed. Error message 7, BUFFER OVERFLOW, indicates a graphics buffer overflow (ie. downloadable, polygon, etc.). Error message 15, ERROR IN I/O TRANSMISSION, indicates a baud rate mismatch or framing error. Other indications include the following:

17: TRANSMIT UNDERRUN

Baud rate mismatch during eavesdrop between data coming to the plotter from the main frame and data retransmitted from the plotter to the terminal.

100: SEE SERVICE MANUAL

Processor exception, normally caused when the instruction pointer has become lost, an illegal opcode has been received, or an illegal memory location is accessed (typically fixed by replacing the Processor PCA).

200: SEE SERVICE MANUAL

Indicates that the mechanical calibration must be performed. Pressing the FAST button will begin the calibration while this message is displayed.

300: SEE SERVICE MANUAL

Indicates that the accuracy calibration must be performed. The message is displayed approximately 10 seconds and is then cleared. It will reappear whenever the plotter is powered on until the accuracy calibration is performed. This error condition will not interfere with plotter operation. However, the plotter may not perform to specifications.

LOAD PAPER TO PLOT

The "LOAD PAPER TO PLOT" message will be accompanied by a numerical code, located in the lower right corner of the LCD, to provide more detail as to the cause of the message. Table 8-11 at the end of this chapter describes the numerical code.

8-8. Other messages are displayed in the front panel display without an error code. They are listed below:

PUT IN CAROUSEL

PEN PUT FAILED

LOWER COVER PRESS *

CHECK CAROUSEL PRESS *

CUT PAPER PRESS *

DIGITIZE POINT * (Pen Up/Pen Down)

X-AXIS FAILURE

A failure has been detected in the media axis. Possible causes include:

a. Paper jam or other mechanical binding of the grit wheel drive.

b. Defective X-motor/encoder.

c. Defective Analog and/or Processor PCA. Refer to the Axis Failure Troubleshooting Flowchart in this chapter.

Y-AXIS FAILURE

A failure has been detected in the pen axis. Possible causes include:

a. Mechanical binding of the pen axis drive mechanics.

b. Defective Y-motor/encoder.

c. Defective Analog and/or Processor PCA. Refer to the Axis Failure Troubleshooting Flowchart in this chapter.

Z-AXIS FAILURE

A failure has been detected during initialization. Possible causes include:

a. Metal-tipped pen carriage probe is too close to the media surface during a pen-down operation (pen installed). This can occur if the pen adapter is not screwed tightly to the drafting pen body or if the pen tip has been excessively worn down. This failure can also occur if the plotter performs a pen-down operation without a pen installed in the pen carriage.

b. Defective pen carriage.

c. Defective trailing cable.

d. Defective Analog and/or Processor PCA. Refer to the Axis Failure Troubleshooting Flowchart in this chapter.

CHECK PEN AND PAPER

A Z-Axis failure has occurred while plotting. Possible causes are:

a. Excessive wear of pen tip.

b. Drafting pen adapter not screwed on.

c. Pen fell out of pen claw.

d. Torn media.

e. Plotter needs mechanical calibration.

8-9. DRAM/ROM TEST

8-10. This test is designed to assure correct data patterns in the DRAM (Dynamic Random Access Memory) and the ROM (Read Only Memory). The DRAM is tested for stuck data bits, shorted adjacent data lines, and stuck or shorted address lines. The ROM is tested for stuck or shorted data and address lines.

8-11. To invoke the DRAM/ROM TEST, perform the following steps:

a. Turn the plotter LINE switch to OFF (0)

b. While pressing the front panel ENTER and PEN SELECT 1 buttons down, turn the plotter LINE switch to ON (1). Release the buttons.

8-12. An 8 bit pattern summarizing the test results will be displayed in the display module. Refer to Table 8-5 for test results listings.

NOTE

The plotter display will indicate when the test is complete, wait 9 seconds, and automatically repeat the test until manually stopped.

8-13. If the first four bytes of the optional 80000H pair does not equal 5555AAAA Hex, then the pair is assumed not to be present. In this case, the code 11010011 is displayed for 4 seconds.

8-14. In the case of multiple component errors, the lower number error code is displayed. All interrupts are disabled during this error. The firmware for the entire test is contained in the 00000 ROM pair.

Table 8-1. Error Codes

ERROR CODE	MESSAGE
1	COMMAND NOT RECOGNIZED
2	WRONG NUMBER OF PARAMETERS
3	BAD PARAMETER
5	UNKNOWN CHARACTER SET
6	POSITION OVERFLOW
7	BUFFER OVERFLOW
10	INVALID I/O OUTPUT REQUEST
11	INVALID BYTE FOLLOWING ESC.
12	INVALID BYTE IN I/O PARAMETER
13	OUT OF RANGE I/O PARAMETER
14	TOO MANY I/O PARAMETERS
15	ERROR IN I/O TRANSMISSION
16	I/O BUFFER OVERFLOW
17	TRANSMIT UNDERRUN
100, 200, 300	SEE SERVICE MANUAL
	FILE TOO BIG, NO COPIES
	FILE TOO BIG, NO FRAMES

Table 8-2. Front Panel User Function

BUTTONS	FUNCTION
FAST	Default all user EEPROM parameters and internal flags
1	Select front panel language to be English
2	Select front panel language to be French
3	Select front panel language to be German
4	Select front panel language to be Spanish
5	Select front panel language to be Italian
6	Select front panel language to be Japanese
8	User accuracy calibration

Table 8-3. Internal Functions

BUTTONS	FUNCTION
ENTER, 1	DRAM/ROM Test
ENTER, 2	Motor/Sensor Test
ENTER, 3	I/O Test
ENTER, 4	Servo Calibration
ENTER, 5	Servo/Support Chip Test
ENTER, 6	Model Number and Company Name Test
ENTER, 7	EEPROM Test
ENTER, f3	Reset All EEPROM Variables
ENTER, UP	Pen Pick Test

Table 8-4. Paper Tests

BUTTONS	FUNCTION
NEXT, 1	Calibrate Pen-to-Sensor Offsets
NEXT, 2	Service Demonstration Plot
NEXT, 3	Endpoint Accuracy Plot
NEXT, 4	Deadband Test Plot

8-15. If a test failure occurs, refer to Table 8-5 for error code interpretation.

8-16. To stop the DRAM/ROM TEST, turn the plotter LINE switch to OFF (0).

8-17. SENSOR AND MOTOR TEST

8-18. This test checks the operation of the media feed and carousel sensors and exercises all of the plotter's motors. With the servo control system active, the X- and Y-axis motors are slowly rotated back and forth while the carousel and media feed motors are continuously half-stepped and the roll feed motor runs continuously.

8-19. To invoke the SENSOR AND MOTOR TEST, perform the following steps:

a. Turn the plotter LINE switch to OFF (0).

b. While pressing the front panel ENTER and PEN SELECT 2 buttons down, turn the plotter LINE switch to ON (1). Release the buttons.

8-20. A summary of the test results will be displayed in the display module. The following letter designations cross-reference the positions of the displayed results to the items tested:

DISPLAY

A B CC DD EE

FF GGGGGG H

Table 8-5. DRAM/ROM Test Results

RESULTS	MEMORY COMPONENT
10000011	Test in Progress
00000011	Test Complete
00100011	Error in DRAM 400000 bits 3–0
00100111	Error in DRAM 400000 bits 7–4
00101011	Error in DRAM 400000 bits 11–8
00101111	Error in DRAM 400000 bits 15–12
00110011	Error in DRAM 480000 bits 3–0
00110111	Error in DRAM 480000 bits 7–4
00111011	Error in DRAM 480000 bits 11–8
00111111	Error in DRAM 480000 bits 15–12
	Note: 8 DRAM ICs 256K x 4 bits each
01000011	Error in ROM 000000 LS byte FF
01000111	Error in ROM 000000 MS byte 7F
01010011	Error in ROM 400000 LS byte 0F
01010111	Error in ROM 400000 MS byte 07
	Note: 512-kilobyte ROMs

8-21. The items tested and the test results will indicate the following:

A: Carousel Sensor (0-2):
Display 0; light sensed after LED enabled.
Display 1; light not sensed after LED enabled.
Display 2; light sensed before LED enabled (sensor defective).

B: Roll Feed Sensor; 4-bit hex display

CC: Pen Lift Encoder; 8-bit hex display

DD: X-Axis Encoder; 8-bit hex display

EE: Y-Axis Encoder; 8-bit hex display

FF: Digitizing Sensor; 8-bit hex display

GGGGGG: Front Panel button map; 24-bit hex display

H: "X"; X-Axis servo shutdown
"Y"; Y-Axis servo shutdown
"*"; Servo shutdown algorithm momentarily deactivated
" "; Both X- and Y-Axis servos operating properly

8-22. The X- and Y-axis VR motors are slowly moved back and forth with the servo control system active. The plotter's servo shutdown algorithm can be momentarily deactivated by holding down the f3 and NEXT DISPLAY buttons. An asterisk will then be displayed in the lower right corner. This deactivation will permit the motor cables to be disconnected without interrupting servo operation.

WARNING

Do not disconnect the encoder cables. Doing so may cause the motor to run in an uncontrolled state and may result in personal injury.

8-23. The carousel motor is half-stepped continuously and the roll feed motor is full-stepped continuously. If the ENTER and NEXT DISPLAY buttons are simultaneously pressed during the Sensor and Motor Test, the pen lift voice coil is driven with a sawtooth signal at approximately 104 Hz. This is too fast for the voice coil to respond and permits output measurement with an oscilloscope.

8-24. The motor activity can be stopped by simultaneously pressing ENTER and f1 buttons during the Sensor and Motor Test. The X- and Y-axis servo operation continues while the information is displayed. Only the 570 ms interrupt is enabled during this test.

8-25. VR MOTOR TEST. The VR Motor Test is activated by holding down ENTER and FAST buttons during the Sensor and Motor Test. This is a step mode that activates 6 different motor phase positions (A, AB, B, BC, C, CA) plus a commutation mode. The information will be formatted on the display as shown below:

DISPLAY

X PH aa POS bbb

Y PH cc POS ddd

aa -- X-Axis phase (only a, ab, b, bc, c, and ca are valid) 0/1 = inactive/active

bbb -- X-Axis encoder position (relative to X position at the end of the last servo initialization)

cc -- Y-Axis phase

ddd -- Y-Axis encoder position

8-26. Pressing the NEXT DISPLAY button will step through phases A, AB, B, BC, C, and CA, and initiate the commutation mode. The commutation mode applies a very small amount of power to the drive motor in one direction. The motor is not able to move the axis. Turn the motor by moving the axis manually. The front panel will display the changing commutation bits as the axis is moved. This test is most effective in troubleshooting motor drive problems.

8-27. In step mode, a constant 10H/7FH is written to the X-Y PWMs. In commutation mode, a constant 08H/7FH is written to the X-Y PWMs.

8-28. In the step-mode part of the test, the firmware reads the encoders and phase/low-gain lines, but only so that they can be displayed on the front-panel LCD. The firmware does not use the feedback for anything else.

8-29. In the commutation part of the test, the firmware still reads the encoders and phase/low-gain lines. This is only for the front-panel display, as it was in the step modes. The firmware does not care what feedback it observes. However, the servo chip must use the encoder feedback in order to commutate.

8-30. I/O TEST

8-31. The I/O TEST routine checks the HP-IB and RS-232-C Interface circuits in the HP 7595/6. Entering the I/O TEST accesses five tests which may be run individually or simultaneously. The four tests are described as follows:

SERIAL IC TEST
Tests the communication path between the serial I/O and the microprocessor.

HP-IB IC TEST
Tests the communication path between the HP-IB interface TALKER/LISTENER and the microprocessor.

SERIAL LOOPBACK
Tests the communication path from the microprocessor to the serial I/O, through an external cable connected to the I/O connectors, and back to the microprocessor.

HP-IB ECHO TEST
Tests the basic operation of the HP-IB by returning transmitted characters back to the controller. Tests all control lines except REN (Remote Enable), IFC (Interface Clear), SRQ (Service Request), and EOI (End Or Identification).

HP-IB FULL TEST
Similar to HP-IB echo test, but tests all control lines. This will require a more complicated controller program.

8-32. To invoke the I/O TEST routine, perform the following steps:

a. Turn the plotter LINE switch to OFF (0).

b. If the SERIAL LOOPBACK test is to be performed, connect a Male-to-Male RS-232-C cable between the MODEM and TERMINAL connectors at the back of the plotter. RS-232-C cable (HP P/N 17355M) may be used.

c. If the full HP-IB ECHO TEST is to be performed, connect the HP-IB connector at the back of the plotter to the HP-85 controller. HP-IB cables (HP P/N 10833A, 10833B, or equivalent) may be used.

d. While pressing the front panel ENTER and Pen Select 3 buttons down, turn the plotter LINE switch to ON (1). Release the buttons

e. The plotter will enter the I/O TEST routine as displayed on the front panel display module.

f. To access the four individual tests, press the function button designated START in the display module. Pressing the function button designated END will exit the test routine and the display will return to the first level of front panel functions.

g. After pressing the function button designated START, the plotter will access the SERIAL IC TEST as shown in the display module.

h. To perform the SERIAL IC TEST, press the function button designated YES in the display module. To bypass this test, press the function button designated NO.

i. After pressing the desired function button for the SERIAL IC TEST, the plotter will access the HP-IB IC TEST as shown in the display module.

j. To perform the HP-IB IC TEST, press the function button designated YES in the display module. To bypass this test, press the function button designated NO.

k. After pressing the desired function button for the HP-IB IC TEST, the plotter will access the SERIAL LOOPBACK TEST as shown in the display module.

l. To perform the SERIAL LOOPBACK TEST, press the function button designated YES in the display module. To bypass this test, press the function button designated NO.

m. After pressing the desired function button for the SERIAL LOOPBACK TEST, the plotter will access the HP-IB ECHO TEST as shown in the display module.

n. To perform the HP-IB ECHO TEST, refer to the HP 7595/6 HP-IB ECHO TEST procedure given in this section. To bypass this test, press the function button designated NO.

8-33. Upon the successful completion of each test, the I/O TEST routine will advance to the next test requested. The I/O TEST routine will continuously loop through the test areas selected until suspended by the operator or until a test failure occurs. A test failure will suspend the I/O TEST routine and the failed test area will be displayed in the display module. If a test failure occurs, refer to the troubleshooting information given in Chapter 8 of this manual.

8-34. To exit the I/O TEST routine, press the function button designated END in the display module. The HP 7595/6 will initialize and normal operation may be resumed.

8-35. HP 7595/6 HP-IB ECHO TEST

8-36. This test is designed to check the basic operation of the HP-IB data, management, and handshake lines by echoing transmitted characters back to the HP-IB controller. The ECHO TEST is a function of the I/O TEST routine given earlier in this chapter.

8-37. Using an HP-85 controller connected to the HP-IB connector on the plotter, input the HP 7595/6 ECHO TEST program. The program may be entered either through the HP-85 Plotter Service Tape (HP P/N 5010-2585/2412), or manually using the program listed in Figure 8-1. Note that lines beginning with an exclamation point (!) are only commentary and do not imply an action in the program.

8-38. The ECHO TEST program provides three levels of functional checks as follows:

Level 1 : Tests the Data Input/Output (DIO) lines by receiving and echoing ASCII characters in groups of three, (32,33,34 through 124,125, 126). A display "LEVEL 1 PASSED" on the HP-85 indicates that all ASCII characters were received and echoed with proper recognition of the ATTENTION (ATN) management line, and the DATA VALID (DAV), NOT READY FOR DATA (NRFD), and NOT DATA ACCEPTED (NDAC) handshake lines.

Level 2 : Tests the DIO lines for shorts and opens by receiving and echoing characters in a sequence emulating "marching ones" (1,2,4,..128), and "marching zeroes" (254,253,251,..127). A display "LEVEL 2 PASSED" on the HP-85 indicates that there are no shorts or opens on the DIO lines.

Level 3 : Tests the presence of a SERVICE REQUEST (SRQ) or END OR IDENTIFY (EOI) when required and the acknowledgment of an INTERFACE CLEAR (IFC). A display "LEVEL 3 PASSED" on the HP-85 indicates recognition and proper operation of the SRQ, EOI, and IFC management lines.

8-39. If a test failure occurs, refer to the troubleshooting information given later in this chapter.

8-40. To repeat the HP-IB ECHO TEST if the program was manually entered, press the RUN button on the HP-85 when indicated by the controller. To repeat the test if the program was entered through the HP-85 Plotter Service Tape, press the plotter function buttons designated END then START in the plotter display, and then press the HP-85 REPEAT function button. To exit the HP-IB ECHO TEST, press the function button designated END in the plotter display module.

```
10        COM P9
20        P9=2
30        CLEAR @ DISP "HP-IB ECHO TEST"
40        DISP "(4/15/86)"
50        DISP
60        DISP "POWER ON WHILE PRESSING"
70        DISP <ENTER> <3> buttons."
80        DISP
90        DISP "ANSWER PLOTTER QUESTIONS:"
100       DISP "I/O SELF TEST"          PRESS "START"
110       DISP "SERIAL IC TEST?"        PRESS "NO"
120       DISP "HPIB IC TEST?"          PRESS "NO"
130       DISP "SERIAL LOOPBACK?"       PRESS "NO"
140       DISP "HPIB ECHO TEST?"        PRESS "YES"
150       DISP
160       DISP "PRESS 'CONT' ON 85 TO CONTINUE."
170       PAUSE
180       CLEAR
190       DIM S$[4], T$[4]
200       M=7 !      I/F ADDRESS
210       N=705 !    I/F & 7595 ADDRESS
220       ON TIMEOUT 7 GO TO 1170
230       SET TIMEOUT M;10 !    SETUP 10ms TIMEOUT
240       ! **********************************
250       ! LEVEL 1 TEST (ASCII I/O)
260       ! PARTIALLY TEST DIO1-DIO8
270       !TEST DAV, NRFD, NDAC, AND ATN
280       ! **********************************
290       L=1
300       FOR I=32 TO 124
310       T$=CHR$(I)&CHR$(I+1)&CHR$(I+2)
320       GOSUB 1070
330       CLEAR @ DISP "TEST IN PROGRESS"
340       NEXT I
350       DISP " " @ DISP "LEVEL 1 PASSED" @ DISP
360       ! **********************************
370       ! LEVEL 2 TEST (MARCHING 1's AND 0's)
380       ! FULLY TEST DIO1-DIO8
390       ! TEST DAV, NRFD, NDAC, AND ATN
400       ! **********************************
410       L=2
420       T$=CHR$(1)&CHR$(2)&CHR$(4)
430       GOSUB 1070
440       T$=CHR$(8)&CHR$(16)&CHR$(32)
450       GOSUB 1070
460       T$=CHR$(64)&CHR$(128)&CHR$(254
470       GOSUB 1070
```

Figure 8-1. HP-IB Echo Test Program

```
480     T$=CHR$(253)&CHR$(251)&CHR$(247)
490     GOSUB 1070
500     T$=CHR$(239)&CHR$(223)&CHR$(191)
510     GOSUB 1070
520     T$=CHR$(127)&CHR$(85)&CHR$(170)
530     GOSUB 1070
540     DISP "LEVEL 2 PASSED" @ DISP " "
550     ! ********************************
560     ! LEVEL 3 TEST
570     ! TEST SRQ, EOI, AND IFC LINES
580     ! ********************************
590     L=3
600     OFF INTR M !
        CANCELS EOL BRANCH ON INT.
610     CONTROL M,1 ; 0 !
        DISABLES INTERRUPT CONTROL REGISTER
620     Q=0
630     A= -1
640     ON INTR M GOSUB 980 !
        ENABLE EOL BRANCH ON SRQ
650     T$=CHR$(153)&CHR$(51)&CHR$102)
660     OUTPUT N USING "#,K" ; T$&CHR$(10) !
        ADDRESSES 7595 TO BE A LISTENER
670     TRIGGER M ! I/F PUTS A "GET" ON HP-IB
680     Q=1
690     ENABLE INTR M;8 ! I/F ENABLED FOR SRQ ASSERTED
700     WAIT .01 ! TIME FOR I/F TO CONFIRM SRQ
710     IF A<>68 THEN GO TO 1190 ! TEST IS SRQ ASSERTED
720     A= -1
730     ENTER N USING "%,%K" ; S$ !
        I/F SET UP TO ACKNOWLEDGE EOI
740     IF S$<>T$[1,1] THEN GO TO 1200 !
        TESTS IF EOI ASSERTED WITH CHR$(153)
750     ENTER N USING "%,%K" ; S$ !
        TESTS IF 7595 SENT CHR$(51),(102) & (10)
760     IF S$<>T$[2,3] THEN GO TO 1210 !
        S$ SHOULD CONTAIN ONLY CHR$(51) & (102)
770     OUTPUT N USING "#,K" ; T$&CHR$(10) !
        ADDRESSES 7595 TO BE A LISTENER
780     ABORTIO M ! I/F ASSERTS IFC UNADDRESSING 7595
790     TRIGGER M ! I/F PUTS A "GET" ON HP-IB
800     WAIT .01 ! TIME FOR I/F TO CONFIRM SRQ
810     IF A<>-1 THEN GO TO 1220 !
        TEST IF 7595 DID NOT ASSERT SRQ
820     ENTER N USING "K" ; S$
830     IF S$<>T$ THEN GO TO 1230 !
        TEST IF 7595 ECHOED T$ CORRECTLY
```

Figure 8-1. HP-IB Echo Test Program (Continued)

```
840     DISP "LEVEL 3 PASSED"
850     DISP
860     DISP TAB (6);"button";TAB(14);"DECISION"
870     DISP TAB (7);"1";TAB(15);"P-MENU"
880     DISP TAB (7);"2";TAB(15);"REPEAT" @ DISP
890     DISP "Select with FUNCTION button"
900     ON button# 1,"P-MENU" GO TO 950
910     ON button# 2,"REPEAT" GO TO 940
920     button LABEL
930     GO TO 900
940     CLEAR @ GO TO 30
950     CHAIN "EH7595/6"
960     END
970     ! ********************************
980     ! INTERRUPT SERVICE ROUTINE
990     ! ********************************
1000    STATUS M,1 ; B
1010    IF Q<>1 THEN GO TO 1240 !
        TESTS IF SRQ ASSERTED WITHOUT TRIGGER
1020    A=SPOLL(N) ! SERIAL POLL RESP. IS 68
1030    Q=2
1040    ENABLE INTR M;8 ! I/F REENABLED TO ACK. SRQ
1050    RETURN
1060    ! ********************************
1070    ! HP-IB OUTPUT AND ECHO CHECK
1080    ! ********************************
1090    OUTPUT N USING "#,K" ; T$&CHR$(10)
1100    ENTER N USING "%,%K" ; S$
1110    IF S$<>T$ THEN GO TO 1180 !
        TESTS IF 7595/6 ECHOED T$ CORRECTLY 1120 RETURN
1130    ! ********************************
1140    ! ERROR DISPLAY ROUTINE
1150    ! ********************************
1160    BEEP
1170    DISP "LEVEL #";L;
        "TIMEOUT FAILURE" @ GO TO 850
1180    DISP"LEVEL #";L;
        "FAILED WHEN T$=";T$[1,3] @ DISP @ GO TO 850
1190    DISP "LEVEL #3 FAILED AS SRQ WAS NOT ASSERTED" @ GO TO 850
1200    DISP "LEVEL #3 FAILED AS EOI WAS NOT ASSERTED" @ GO TO 850
1210    DISP "LEVEL #3 FAILED AS EOI WAS ASSERTED" @ GO TO 850
1220    DISP "LEVEL #3 FAILED AS IFC WAS NOT ACKNOWLEDGED" @ GO TO 85
1230    DISP "LEVEL #3 FAILED WHEN T$ = ";T$[1,3] @ GO TO 850
1240    DISP "LEVEL #3 FAILED AS 85'S SRQ ACKNOWLEDGE WAS ENABLED"
        @ GO TO 850
```

Figure 8-1. HP-IB Echo Test Program (Continued)

8-41. MECHANICAL CALIBRATION

NOTE

If any parts are changed that affect the pen pick distance, pen height from the platen, pinch wheel height from the grit wheel, or pen down force, the mechanical calibration test must be performed.

8-42. In this series of calibrations, the plotter will measure the pen pick distance, calibrate the pen height in relation to the platen, measure the pinch wheel height, and calibrate the pen lift offset force which varies between plotters due to the spring used to lift the pen holder while power is off.. It will use these measurements to determine if the pinch wheels are lowered or not and calibrate the pen down force. The Mechanical Calibration must be performed whenever the EEPROM, y-arm, carousel tub, paper stops pinch wheel assembly, or pen carriage is removed or replaced during a repair.

8-43. To initiate the mechanical calibration, perform the following procedure:

a. Turn the plotter LINE switch to OFF (0).

b. Load media into the plotter.

c. Set the pinch wheels to the down position.

d. Remove the pen from the pen carriage if one is installed.

e. Put a pen in pen stall #1 of the carousel. Ensure the pen type matches the carousel pen selection-type. The letter stamped on top of the pen body should match the letter selected on the carousel.

f. While pressing the front panel ENTER and PEN SELECT 4 buttons down, turn the plotter LINE switch to ON (1).

8-44. The "200: See Manual" error message will appear in the front panel LCD. Press the FAST button to initiate the calibration. When the plotter has completed the initialization sequence, pick pen #1 and do a "pen down" using the front panel. Then press the ENTER and PEN SELECT 1 buttons to put the pen away. The test is sucessfully completed if the "200: See Manual" message does not appear on the LCD during power-on.

8-45. SERVO IC TEST

8-46. This test uses the microprocessor to exercise the Servo IC. The results of the test are displayed on the front panel display as SERVO CHP (PASS or FAIL). If a failure occurs, replace the Processor PCA. To start the test, simultaneously press the ENTER and PEN SELECT 5 buttons while turning the plotter line switch to ON.

8-47. OUTPUT IDENTITY (O/I) CONFIGURATION

8-48. This test displays the current model number and company name that is stored in the EEPROM. It also allows the selection of a new number and name to be burned into the EEPROM. The currently installed firmware version is displayed, separated by a comma. Table 8-6 lists the index number, name, and model number in the Non-Emulate mode. Table 8-7 lists the index number, name, and model number in the Emulate mode. Choosing these selections will cause the model number to be plotted during the Demonstration Plot rather than the model name. The Output Identity (O/I) Configuration must be performed upon replacement of the EEPROM. Revision Level 1023 is the current Firmware Revision Number.

8-49. To initiate the Output Identity (O/I) Configuration, perform the following procedure:

a. While pressing the front panel ENTER and PEN SELECT 6 buttons down, turn the plotter line switch to ON (1).

b. Choose the appropriate number from the INDEX column in Table 8-6 and press the corresponding PEN SELECT button on the front panel.

c. Press the ENTER button to apply the selection.

d. Press the ENTER button again to confirm the selection and configure the EEPROM.

Table 8-6. O/I Configuration, Non-Emulate Mode

INDEX	COMPANY NAME	MODEL NUMBER
1	Reserved	4444A (sheet)
2	Reserved	5555A (roll)
3	Hewlett-Packard	7595B (sheet)
4	Hewlett-Packard	7596B (roll)
5	Reserved	6187 (sheet)
6	Reserved	6187 (roll)
7	Hewlett-Packard	7595B (sheet)
8	Hewlett-Packard	7596B (roll)

Table 8-7. O/I Configuration, Emulate Mode

INDEX	COMPANY NAME	MODEL NUMBER
1	Reserved	2222A (sheet)
2	Reserved	3333A (roll)
3	Hewlett-Packard	7585B (sheet)
4	Hewlett-Packard	7586B (roll)
5	Reserved	6187 (sheet)
6	Reserved	6187 (roll)
7	Hewlett-Packard	7585B (sheet)
8	Hewlett-Packard	7586B (roll)

8-50. EEPROM TEST

8-51. This test is designed to check the validity code of the Electrically Erasable Programmable Read Only Memory (EEPROM). When correctly set, the code indicates that the EEPROM has been initialized with valid data.

8-52. To invoke the EEPROM TEST, perform the following steps:

CAUTION

The EEPROM constants will be lost if the plotter is turned off before the test is complete.

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

b. While pressing the front panel ENTER, PEN SELECT 7, and UP buttons down, turn the plotter LINE switch to ON (1). Release the buttons.

c. Approximately 20 seconds after the start of the test, an 8-bit pattern summarizing the test results will be displayed in the display module. The results will indicate the following:

DISPLAY	RESULTS
10000011	Test in progress
00000011	Test complete (15 seconds after start)
01000011	Error in the EEPROM

d. To stop the EEPROM TEST, turn the plotter LINE switch to OFF (0).

8-53. If a test failure occurs, replace the EEPROM and perform the Servo Calibration, O/I Configuration, and Accuracy Calibration.

8-54. During normal plotter operation, the EEPROM is used to store certain parameter values which are remembered when the power is removed. The first four bytes of the EEPROM contain two validity codes which when correctly set, indicate that the EEPROM has been initialized with valid data. If the validity code is incorrect then an attempt is made to initialize the EEPROM with a set of default Parameter values obtained from ROM. The initialization process can be forced by holding down the FAST button during power-on in order to reset the external parameters.

8-55. The EEPROM is also used to store internal plotter parameters which the user never sees, in addition to user EEPROM variables and internal flags. These parameters, variables, and flags can be defaulted or initialized by simultaneously pressing the ENTER and f3 buttons during power-on.

8-56. PEN PICK TEST

8-57. This is an infinite pen pick test. Initially, the pen picks are random. An 8-digit counter on the front-panel display keeps track of the number of logical pen picks. If the carousel does not have eight pens, then the counter will not agree with the number of physical pen picks (the counter is incremented, but no physical pen pick is done if a pen stall is empty).

8-58. To start the Pen Pick Test, simultaneously press ENTER and UP while turning the plotter line switch to ON (1). Pressing NEXT DISPLAY causes the pen pick mode to change from random to sequence. In the sequence mode, pens 1 through 8 are picked in sequence continuously. Pressing NEXT DISPLAY again changes the pen pick mode to single. In single mode, a single pen is alternately picked and put away continuously. Pressing NEXT DISPLAY again returns the plotter back to the random mode.

8-59. PEN-TO-SENSOR OFFSET CALIBRATION

8-60. To perform the Pen-To-Sensor Offset Calibration, proceed as follows:

a. Turn the plotter line switch to OFF (0).

b. Load media into the plotter.

c. Load a 0.30 mm or 0.35 mm black pen into pen stall #8 of the carousel (non-roller ball).

d. Simultaneously press NEXT DISPLAY and PEN SELECT 1 buttons while turning the plotter line switch to ON (1).

8-61. During calibration, the plotter will draw a large cross on coordinates 0, 3000 and 0, -3000; digitize each cross four times, and enter the new offset calibration into the EEPROM. If any digitizing attempt fails, the calibration must be aborted by turning the plotter line switch to OFF (0). Once aborted, the new calibration will not be entered into the EEPROM. A successful calibration will display the offset values on the front panel display.

NOTE

The Pen-To-Sensor Offset Calibration must be performed upon replacement of the pen carriage or EEPROM.

8-62. Pressing any button after the offset calibration is completed will start the Digitizer Calibration Test. The test will alternate between digitizing the left and right crosses. If the LEFT button is pressed, the test will digitize the left cross only. If the RIGHT button is pressed, the test will digitize the right cross only. Counts for the number of good and bad digitizes of the left and right crosses are displayed on the display.

8-63. SERVICE DEMONSTRATION PLOT

8-64. The Service Demonstration Plot adds stars in the corners of the User Demonstration Plot to check for repeatability. See Figure 8-2. The Service Demonstration Plot may be done on single sheet or long-axis. The long-axis plot is similar to the single sheet plot, but P1 and P2 are shifted in the X direction by half a frame length. This centers the plot across a frame boundary.

To start the Service Demonstration Plot, perform the following procedure:

a. Turn the plotter line switch to OFF (0).

b. Load paper into the plotter.

NOTE

When performing a long-axis plot, do not use a roller-ball pen in pen stall 8. The digitizer cannot see roller-ball ink. A "+" will be drawn over the alignment mark if the digitizer fails to find the alignment mark.

c. Load pens in pen stalls 1 through 4. For long-axis plots, add a 0.30 mm or 0.70 mm black pen in pen stall 8.

d. Simultaneously press NEXT DISPLAY and PEN SELECT 2 buttons while turning the plotter line switch to ON (1). Afterwards, pressing ENTER (asterisk is on) will cause the plot to be continuously drawn.

8-65. ENDPOINT ACCURACY PLOT

8-66. The Endpoint Accuracy Plot checks the accuracy of the plotter to draw lines from one point to another. See Figure 8-3. To start the Endpoint Accuracy Plot, perform the following procedure:

a. Turn the plotter line switch to OFF (0).

b. Load a sheet of double-matte polyester film (3 mil) into the plotter.

c. Install a pen in pen stall 8 of the carousel.

d. Simultaneously press NEXT DISPLAY and PEN SELECT 3 buttons while turning the plotter line switch to ON (1).

NOTE

A circle will be drawn at the ends of complete lines. Measure from one end of a line to the other, and subtract the pen width to get the actual line length.

8-67. DEADBAND TEST PLOT

8-68. The Deadband Test Plot is another check for dynamic repeatability. Two deadband verniers are drawn. One vernier is for the X-axis and the other is for the Y-axis. See Figure 8-4. Each number represents an increase in thousandths of an inch from zero. Ideally, the lines should match on zero and progressively offset as the number gets greater. The specification is +4 to −4. If +5 or −5 line up, then the plotter is out of specification. To Start the Deadband Test Plot, perform the following procedure:

a. Turn the plotter line switch to OFF (0).

b. Load paper into the plotter.

c. Install a pen into pen stall 8 of the carousel (a fine-tipped pen is recommended for this test plot).

d. Simultaneously press the NEXT DISPLAY and PEN SELECT 4 buttons while turning the plotter line switch to ON (1).

8-69. ACCURACY CALIBRATION

8-70. In the Accuracy Calibration, the pen-to-sensor offsets are calibrated and the platen plugs are digitized. This provides the distance standard. To start the Accuracy Calibration, perform the following procedure:

a. Turn the plotter line switch to OFF (0).

b. Load a sheet of mylar into the plotter.

NOTE

Do not use a roller-ball pen for this calibration. The digitizer cannot recognize the roller-ball ink.

c. Install a 0.30 mm or 3.5 mm black drafting pen in pen stall 8 of the carousel.

d. Press the PEN SELECT 8 button while turning the plotter line switch to ON (1).

8-71. During calibration, a large square is drawn on the paper. The plotter will draw an outline and position the paper so that the front edge can be cut off with the built-in paper cutter. Cut and unload the paper. Rotate the paper 90 degrees clockwise (uncut edge against the paper stops) and reload the paper into the plotter. The plotter will digitize the sides of the square and calculate the new accuracy constants. The new accuracy constants are stored in the non-volatile memory and a message indicating successful completion of the calibration procedure will be displayed on the front panel display. Failure of the accuracy calibration procedure will be indicated by an error message on the front panel display and the EEPROM accuracy constants will not be changed.

8-72. TROUBLESHOOTING

8-73. The tables and figures provided in this chapter are to be used as an aid in troubleshooting plotter failures. Table 8-8 provides symptoms and solutions for writing and plot quality difficulties. Figure 8-5 is used in conjunction with Table 8-9 and Table 8-10 for axis failure troubleshooting. Figures 8-5 through 8-7 provide flowcharts for easier troubleshooting.

Figure 8-2. Service Demonstration Plot

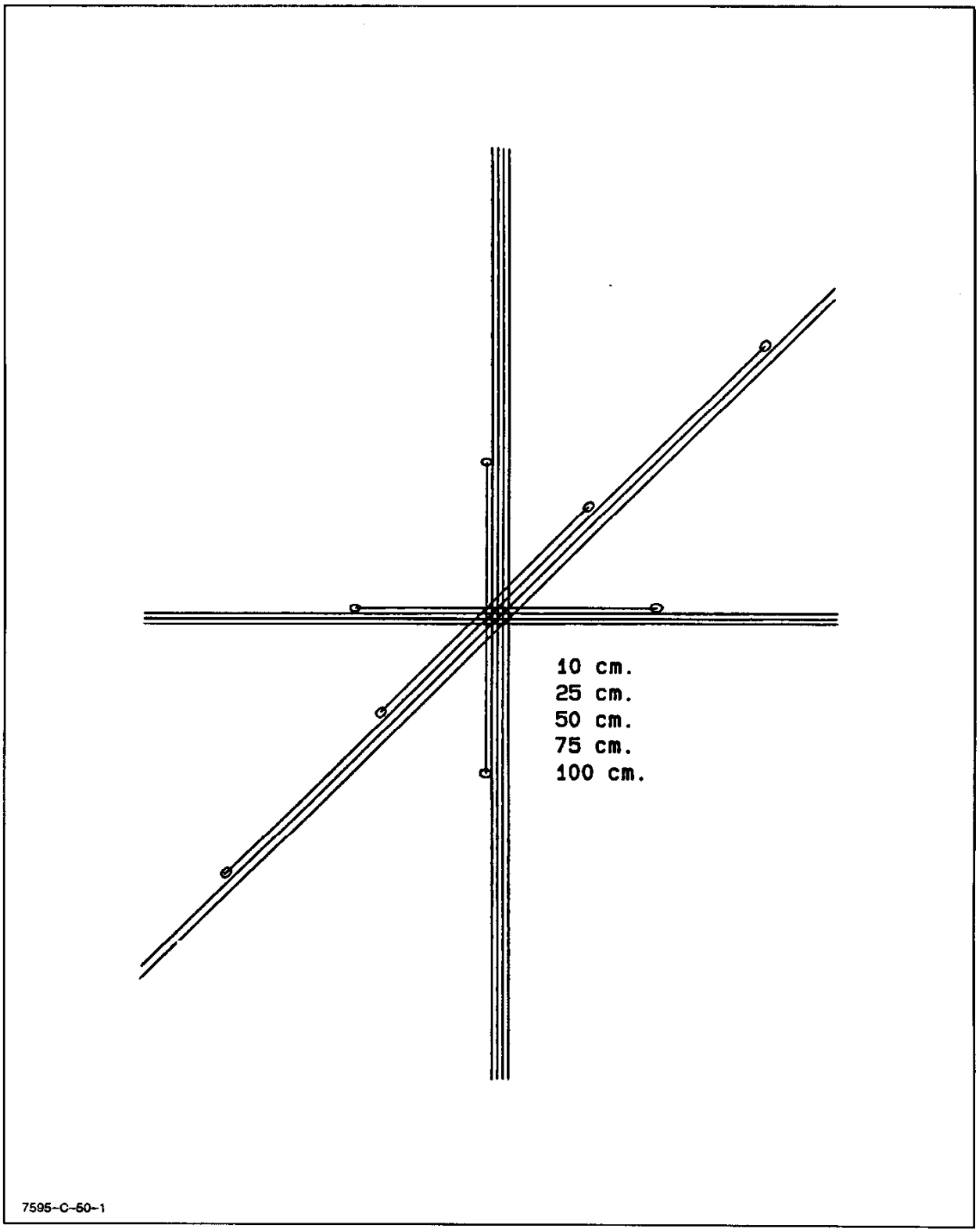


Figure 8-3. Endpoint Accuracy Plot

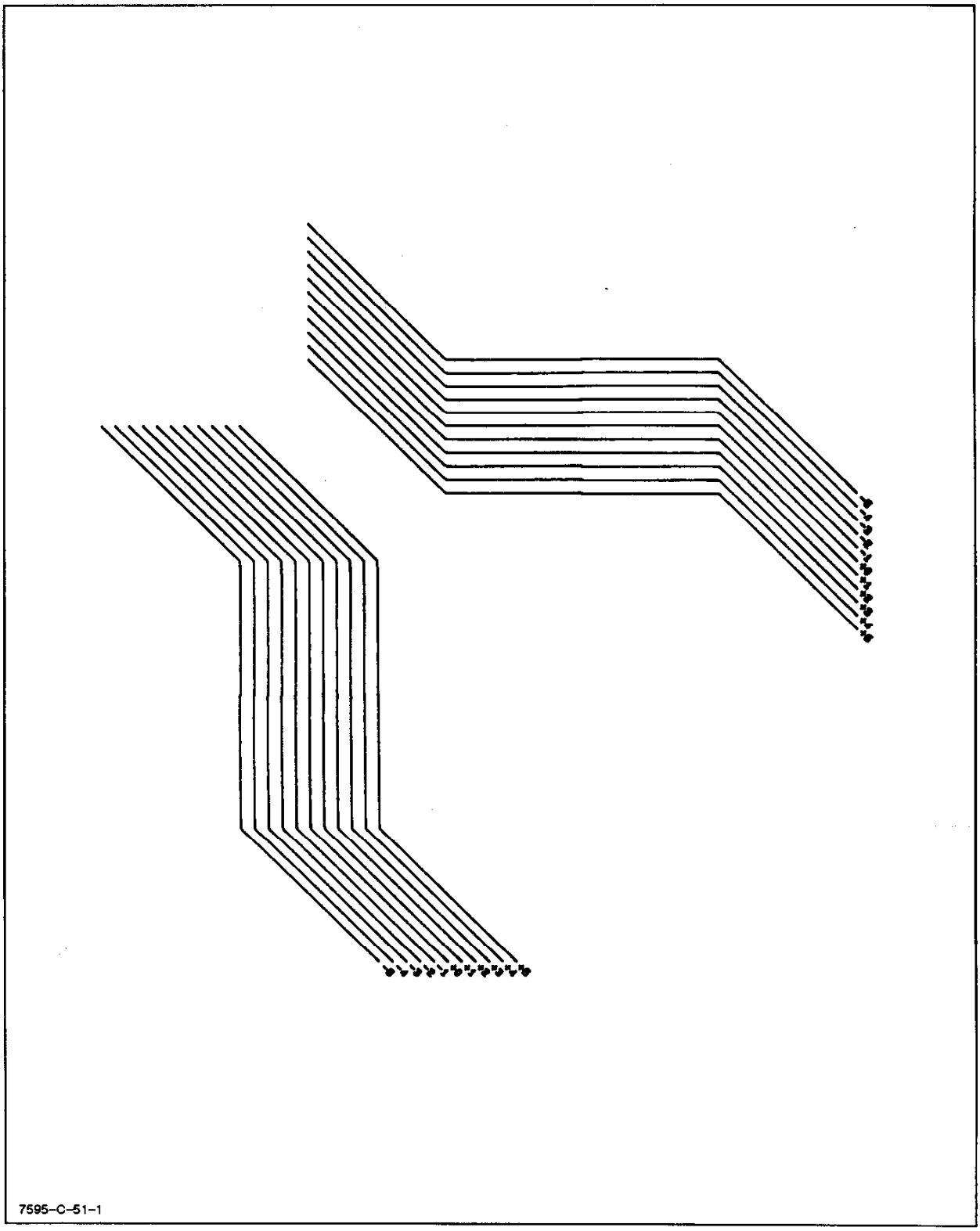


Figure 8-4. Deadband Test Plot

Table 8-8. Writing and Plot Quality Difficulties

SYMPTOMS	SOLUTIONS
Pen does not write.	Pen tip is dried out -- prime pen tip or replace pen. Refill ink reservoir (drafting pens). Pen is out of ink -- replace the pen.
Beginning of line does not show.	Pen tip is partially dried out -- prime the pen tip or replace the pen.
Pen skips or drags.	Pen tip is worn or damaged -- replace the pen. Pen speed or force is incorrect for type of pen -- select proper value. Plotting medium surface is watermarked, oily, bubbled, the wrong weight or thickness -- replace medium. Pen lift mechanism is sticky or the pen height is incorrect -- repair the plotter.
Line width is not uniform or too narrow/wide.	Pen tip is worn or damaged -- replace the pen. Pen speed is too fast -- select a lower speed value. Wrong pen tip width -- select correct width.
Ink blobs or flows unevenly.	Pen force is too high -- select a lower force value. Wrong pen/media combination -- select correct type of pen for media used. Pen tip is dirty -- clean the pen tip.
Wiggly lines.	Pen tip is worn or damaged -- replace the pen. Media surface is dirty or bubbled -- replace the media. Pen holder mechanism is damaged -- repair the plotter.
Plot misregistration or drift.	Plotter has been subjected to hard vibration or jarred -- eliminate interference. Dirty grit wheel or pinch wheels -- clean as recommended. Medium unstable due to climatic or environmental change -- stabilize environment if possible. Unsuitable media used -- use only media as recommended by Hewlett-Packard.

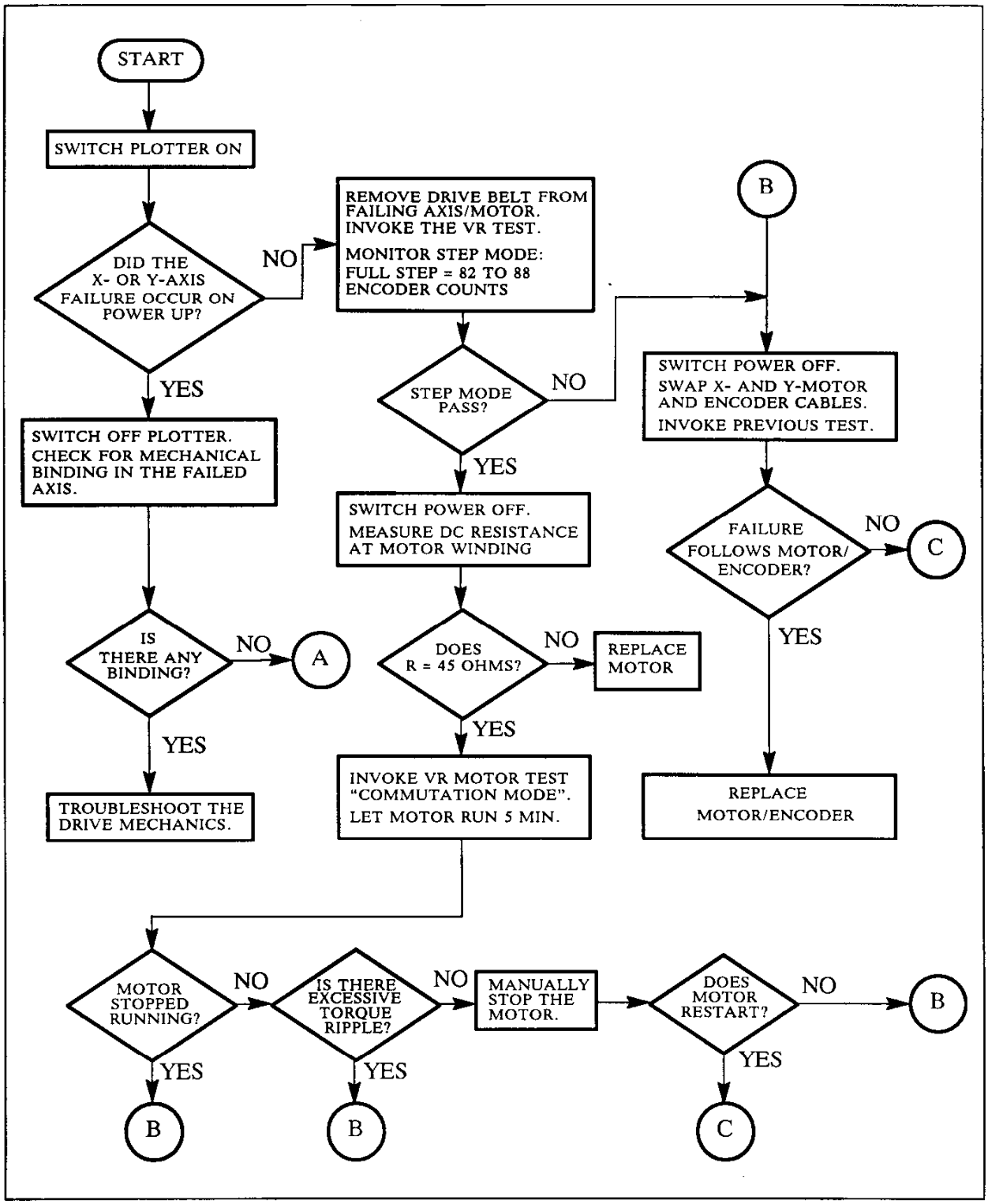


Figure 8-5. Axis Failures (Sheet 1 of 2)

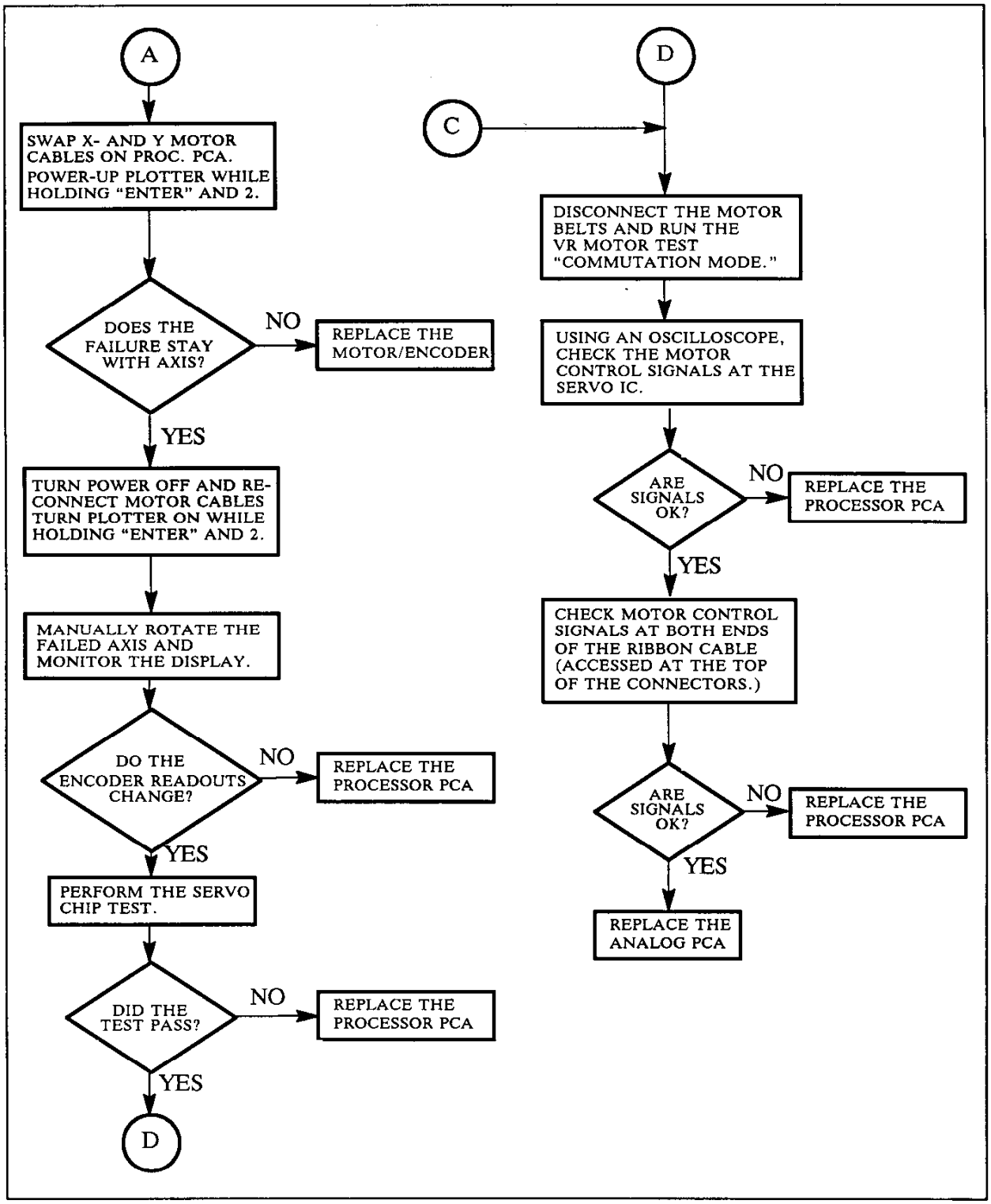


Figure 8-5. Axis Failures (Sheet 2 of 2)

Table 8-9. Control Signals

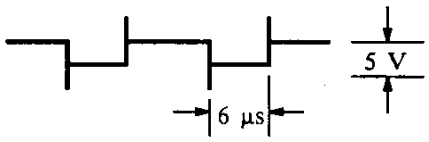
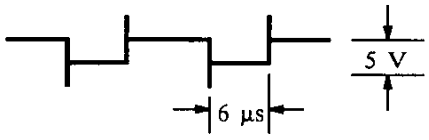
IC PIN NUMBER AND DESCRIPTION	J1 PIN	SCOPE SETTING	WAVEFORM
		Y-AXIS MOTOR	
27 PWM INPUT	36	5 V/Div. 10 µs/Div.	
29 LOW GAIN FLAG	31	5 V/Div. 0.2 ms/Div.	Asserted low for 2-PHASES selected
30 PHASE C SELECT	30	5 V/Div. 0.2 ms/Div.	Asserted low when PHASE C selected
31 PHASE B SELECT	29	5 V/Div. 0.2 ms/Div.	Asserted low when PHASE B selected
32 PHASE A SELECT	26	5 V/Div. 0.2 ms/Div.	Asserted low when PHASE A selected
		X-AXIS MOTOR	
28 PWM INPUT	32	5 V/Div. 10 µs/Div.	
35 LOW GAIN FLAG	22	5 V/Div. 0.2 ms/Div.	Asserted low for 2-PHASES selected
36 PHASE C SELECT	20	5 V/Div. 0.2 ms/Div.	Asserted low when PHASE C selected
37 PHASE B SELECT	19	5 V/Div. 0.2 ms/Div.	Asserted low when PHASE B selected
38 PHASE A SELECT	18	5 V/Div. 0.2 ms/Div.	Asserted low when PHASE A selected
		PEN COIL	
24 PWM FOR PEN DRIVE	37	5 V/Div. 50 µs/Div.	
26 PWM FOR PEN DRIVE	38	5 V/Div. 50 µs/Div.	

Table 8-10. Encoder Signals

IC PIN NUMBER AND DESCRIPTION	SCOPE SETTING	WAVEFORM
44 Y-MOTOR/ENCODER RETURN	5 V/Div. 10 µs/Div.	
45 Y-MOTOR/ENCODER RETURN	5 V/Div. 10 µs/Div.	
46 X-MOTOR/ENCODER RETURN	5 V/Div. 10 µs/Div.	
47 X-MOTOR/ENCODER RETURN	5 V/Div. 10 µs/Div.	
41 Z-AXIS ENCODER RETURN	5 V/Div. 2 ms/Div.	
43 Z-AXIS ENCODER RETURN	5 V/Div. 2 ms/Div.	

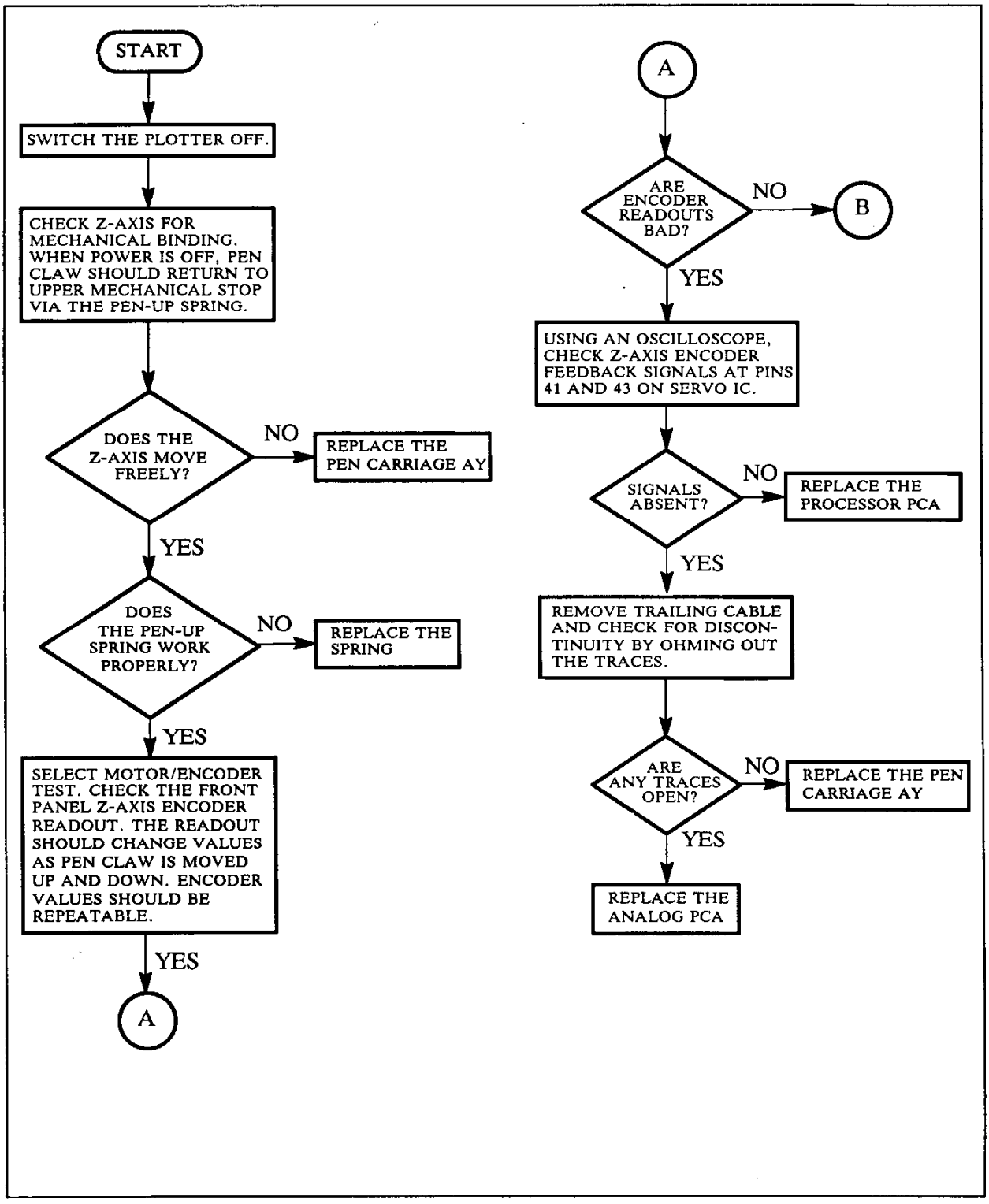


Figure 8-6. Pen Drive Troubleshooting Flowchart

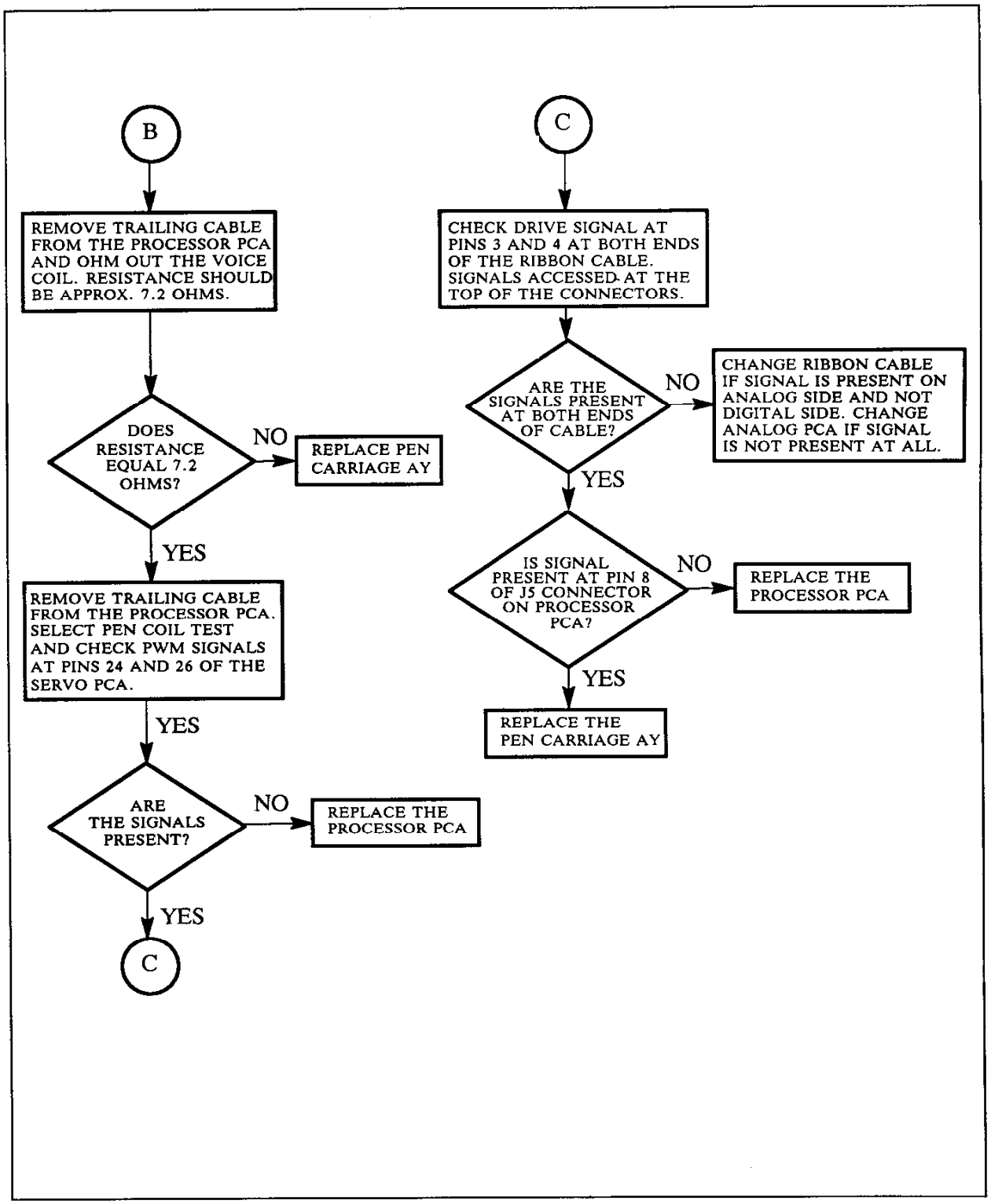


Figure 8-6. Pen Drive Troubleshooting Flowchart (Continued)

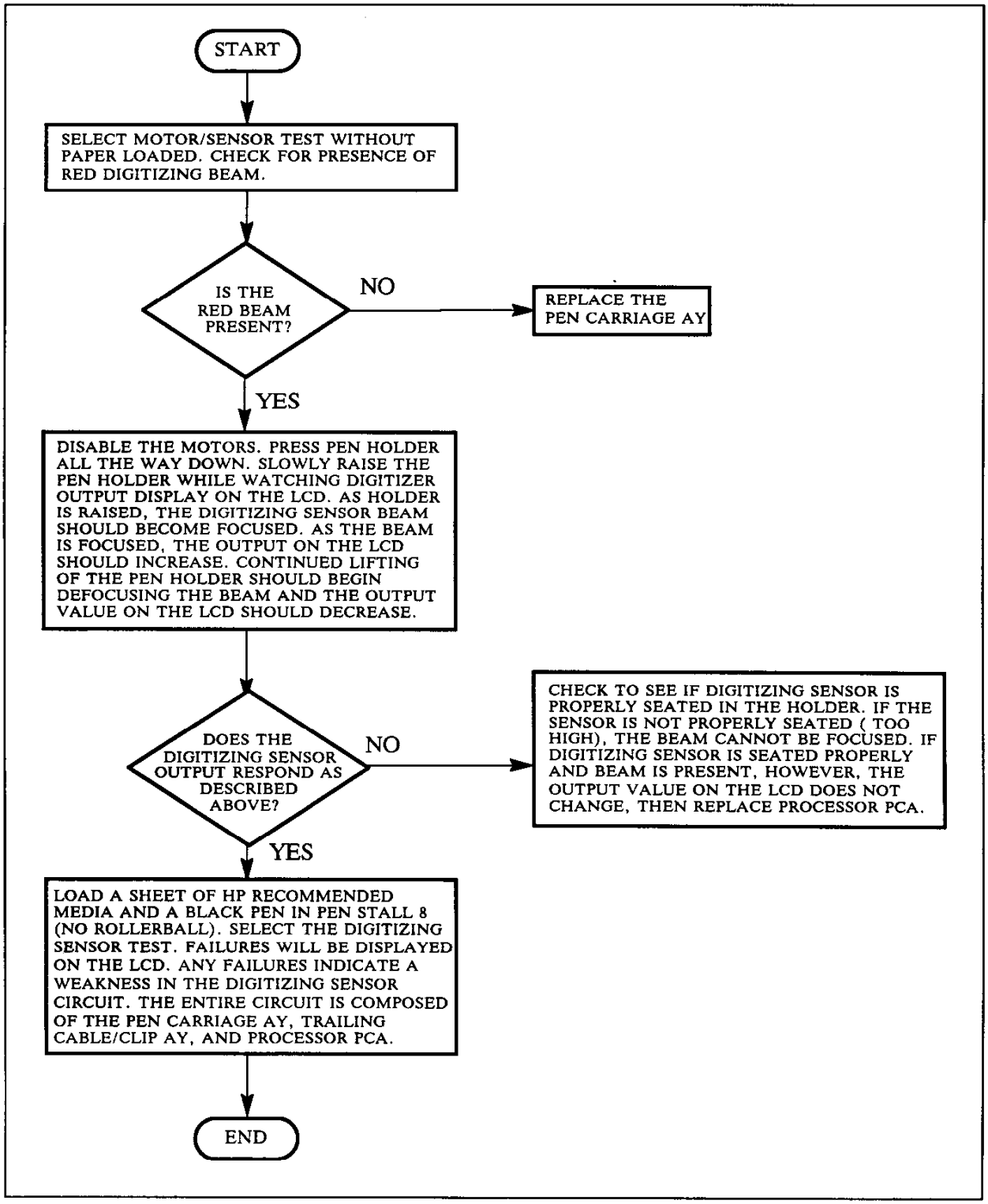


Figure 8-7. Digitizing Sensor Troubleshooting Flowchart

8-74. FRAME-TO-FRAME MISALIGNMENT

8-75. If a plot has frame-to-frame misalignment, use the following recommendations to correct the problem:

a. Use Hewlett-Packard recommended media. The ability of the sensor to work properly depends a great deal on the reflectivity of the media.

b. Use a concentric pen. A non-concentric pen used to draw the alignment marks can result in misalignment of the frames. Drafting pen bodies which have been used a great deal can actually change shape. This will cause the pen to be non-concentric.

c. Do not draw lines near the alignment marks. Lines drawn near the alignment marks can fool the digitizing sensor.

d. If the white tape on the platen is missing or dirty, it can affect the ability of the sensor to see the alignment marks. Clean or replace the tape.

e. Be sure there is a black pen in pen stall 8 when doing frame-to-frame plotting.

f. Do not use a roller-ball pen to draw alignment marks.

8-76. REPEATABILITY TROUBLESHOOTING GUIDE

8-77. The repeatability specification refers to the ability of the plotter pen to return to a previously defined point within a given tolerance (0.004 in.). If the plotter fails to meet the repeatability specification, perform the following:

a. What kind of media is being used?

1. HP 3 mm, double-matte polyester film -- go to step b.

2. HP paper, vellum or tracing bond -- go to step d.

3. Non-HP media -- go to step e.

b. Polyester film typically has the poorest tracking margin of all media. If the plotter is unable to properly hang on to the media as it is moved back and forth, a repeatability error will occur. The best way to troubleshoot misregistration is to look at the grit tracks left on the media by the grit wheel. Look at the grit tracks imprinted on the media with a 10X magnifier. A black background behind the media helps locate the tracks. Good tracks will show a random set of small indentations. Bad tracks will show rows of small indentations (shown below). Counting the number of indentations that make up a row will indicate how many times the media slipped.

GOOD TRACKS BAD TRACKS

(one slip)

c. Do the tracks show signs of slippage?

1. YES -- go to step f

2. NO -- go to step g.

d. Run the plot on HP 3 mm double-matte polyester film. Does the plot still show a repeatability problem when drawn on polyester film?

1. YES -- go to step b.

2. NO -- go to step i.

e. HP drafting plotters will work with many types of media. However, Hewlett-Packard can only support media which have been tested and approved. Variables such as thickness, weight, texture, opacity, and overall quality can affect the quality of the plot and specifically repeatability. Run the plot on some comparable HP recommended media. Does the plot show a repeatability problem using HP recommended media?

1. YES -- go to step d.

2. NO -- Refer the customer to the Preferred Media Guide for HP Drafting Plotters. The customer assumes responsibility for plot quality when using non-recommended media.

f. The following is a list of items, in order of probable occurrence, which may be responsible for media slippage.

1. Pinch wheels. Look for flat spots caused by the pinch wheels being dragged across the grit wheel while in the down position. Also look for delamination of the outer rubber on the wheel.

2. Grit wheel. A clean grit wheel is vital for proper registration. Use the cleaning brush supplied with the plotter to clean the grit wheel. Also, worn bearings and aluminum oxide grit particles can cause misregistration.

3. Obstructions. Be sure the media path is not obstructed as the media is moved by the grit drive system during a plot. Standing waves can form in the media after striking an object which can cause the media to slip.

4. Static. Static can cause the media to cling to various plotter chassis parts, causing slippage. Beware of polyester film which does not feature double-matte protection. This texture, in conjunction with special conductive coatings used on various plotter parts, helps prevent static.

5. Mechanics. Check for the pinch-wheel arms and pinch-wheel yokes for cracks which could result in a decreased pinch wheel down force. Also check the springs for proper seating and spring force.

g. The following are items which can cause repeatability problems not associated with misregistration (slip):

1. Motor/Encoder. If the repeatability problem occurs only in one axis, troubleshoot either the motor/encoder assembly or the associated drive mechanics.

2. Software. Perform the Service Demonstration plot first. If no errors are found, run the customer's plot several times. Software induced repeatability errors will be consistent from plot to plot.

3. Pen offsets. The repeatability specification of 0.1 mm (0.004 in.) applies to one pen only. Picking a pen can introduce a repeatability error up to +/- 0.15 mm (0.006 in.). Trying to match points drawn with two pens increases the error to +/- 0.25 mm (0.01 in.). As with media, only HP pens should be used for testing.

4. Mechanics. Faulty mechanics to troubleshoot would be the pen claw, belts and cables, tensioning systems, and bearings.

h. Media such as paper, vellum, and tracing bond, is made of fibers which are bonded together in various ways. These fibers will expand or contract according to changes in temperature and humidity. Fibers tend to change more in diameter than in length. Tearing the media will determine the grain direction. If the tear is jagged, this would be against the grain and would be the direction of greatest expansion or contraction. Is the room environment, where the plot takes place, stable during the plot?

1. YES -- go to step i.

2. NO -- Educate the customer as to the need for a stable plotting environment. Keep the plotter away from open doors and vents. If the environment cannot be controlled, a more stable media, such as polyester film, should be recommended.

i. Drape a sheet of media over the plotter for approximately 15 to 30 minutes prior to plotting. Media, stored in the original package or in an area other than the plotting area, needs to be conditioned. Educate the customer as to the need for media conditioning to obtain plot quality. Refer to Plotter Notes #8 P/N 5953-4163 for further information. Ideally the media should be stored loosely in a drawer in the same room as the plotter.

8-78. BORDER CALIBRATION

8-79. The border calibration allows the hard-clip limits to be recalibrated. The hard-clip limit defines the physical plotting limit of the plotter. The limits are set at the factory to 16 mm for the left, right, and top borders and 40 mm for the bottom border. The borders can be calibrated between 15 mm and 18 mm for the left, right, and top borders and between 39 mm and 45 mm for the bottom border. If the borders are calibrated smaller, media load failures can result.

8-80. If media cannot be loaded, due to hard-clip limits, press the ENTER button and f3 button simultaneously while powering on the plotter. This will default all constants in the EEPROM. The front panel LCD will show ":200 SEE MANUAL" which indicates the mechanical calibration must be performed. After the mechanical calibration is done, the border calibration program can be run.

8-81. Before running the border calibration, record the RS-232-C and HP-IB configurations that are presently set up by the customer. These configurations are set to default values during the program and may not work for the customer's application. Reconfigure the plotter after the calibration has been performed.

NOTE

After pressing ENTER and f3 buttons during power ON, the accuracy calibration must also be performed to clear the ":300 SEE MANUAL" display. This calibration may be performed after the border calibration.

When entering border values into the HP-85, do not follow the number with "mm".

The "Esc" character can be generated on the HP-85 by pressing <Shift> <CTRL> and <[> (left bracket) simultaneously.

8-82. To calibrate the HP 7595/6 borders, perform the following procedure:

a. Connect a HP-85 to the plotter.

b. Load the program located in Figure 8-8 into the HP-85.

c. Initialize the program and follow all instructions on the HP-85 screen.

```
10      ! 7595/6 BORDER CALIBRATION
20      ! REVISION A 11/18/86 CL
30      ON button# 1, "HPIB" GO TO 1620
40      ON button# 4, "RS232" GO TO 1530
50      CLEAR
60      DISP USING "/,X,K" ; "THIS PROGRAM WILL ALLOW THE"
70      DISP USING "X,K" ; "THE HARDCLIP LIMIT BORDER TO BE"
80      DISP USING "X,K" ; "CALIBRATED."
90      DISP USING "3/,X,K" ; "PRESS THE SPECIAL FUNCTION button"
100     DISP USING "X,K" ; "CORRESPONDING TO THE INTERFACE"
110     DISP USING "X,K" ; "BEING USED"
120     button LABEL
130     GO TO 130
140     CLEAR
150     DISP "POWER OFF THE PLOTTER. LOAD AN"
160     DISP "E/A0-SIZE SHEET OF MEDIA INTO"
170     DISP "THE PLOTTER AND A PEN INTO"
180     DISP "PEN STALL #1."
190     DISP USING "/,K" ; "NOW POWER UP THE PLOTTER"
200     DISP USING "K" ; "WHILE HOLDING DOWN THE <FAST>"
210     DISP USING "K" ; "BUTTON (CENTER CURSOR) ON THE"
220     DISP USING "K" ; "PLOTTER'S FRONT PANEL."
230     DISP USING "/,K" ; "PRESS 'CONT' WHEN READY"
240     PAUSE
250     CLEAR
260     OUTPUT O ; "Esc.M;;;13;10:"
270     OUTPUT O ; "OH;"
280     DISP USING "5/,X,K" ; "INITIALIZING...PLEASE WAIT"
290     ENTER O ; R(1),R(2),R(3),R(4)
300     OUTPUT O ;"SP1;"
310     OUTPUT O ;"PUPA" ,R(1),R(2)
320     OUTPUT O ;"PD" ,R(3),R(2),R(3),R(4),R(1),R(4),R(1),R(2)
330     OUTPUT O ;"DI1,0"
```

(Continued)

Figure 8-8. Border Calibration Program

```
340     OUTPUT O ;"SI.25,.3SP1"
350     OUTPUT O ;"PUPA-375,",R(2)+63
360     OUTPUT O USING "#,K" ; "LB"
370     OUTPUT O USING "K" ; "LEFT"
380     OUTPUT O ;CHR$(3)
390     OUTPUT O ;"DI-1,0"
400     OUTPUT O ;"PU375," ,R(4)-63
410     OUTPUT O USING "#,K" ; "LB"
420     OUTPUT O USING "K" ; "RIGHT"
430     OUTPUT O ;CHR$(3)
440     OUTPUT O ;"DI0,-1"
450     OUTPUT O ;"PU",R(3)-188,",375"
460     OUTPUT O USING "#,K" ; "LB"
470     OUTPUT O USING "K" ; "BOTTOM"
480     OUTPUT O ;CHR$(3)
490     OUTPUT O ;"DI0,1"
500     OUTPUT O ;"PU",R(1)+188,",-375"
510     OUTPUT O USING "#,K" ; "LB"
520     OUTPUT O USING "K" ; "TOP"
530     OUTPUT O ;CHR$ (3)
540     OUTPUT O ;"SP0;"
550     CLEAR
560     DISP "WHEN THE PLOT IS COMPLETE,"
570     DISP "REMOVE THE MEDIA FROM THE"
580     DISP "PLOTTER. LEAVE THE PINCH WHEELS"
590     DISP "IN THE UP POSITION AND THE"
600     DISP "SAFETY COVER DOWN."
610     BEEP
620     DISP USING "3/,K" ; "PRESS 'CONT' WHEN READY"
630     PAUSE
640     CLEAR
650     DISP "MEASURE, TO THE NEAREST mm,"
660     DISP "FROM THE EDGE OF THE MEDIA"
670     DISP "TO THE DRAWN BORDER FOR EACH"
680     DISP "SIDE."
690     DISP USING "/,K" ; "PRESS 'CONT' WHEN READY"
700     PAUSE
710     FOR I=1 TO 4
720     CLEAR
730     IF I=1 THEN DISP USING "6/,K" ; "CURRENT LEFT BORDER WIDTH"
740     IF I=2 THEN DISP USING "6/,K" ; "CURRENT RIGHT BORDER WIDTH"
750     IF I=3 THEN DISP USING "6/,K" ; "CURRENT TOP BORDER WIDTH"
760     IF I=4 THEN DISP USING "6/,K" ; "CURRENT BOTTOM BORDER WIDTH"
770     BEEP
780     INPUT B1(I)
790     NEXT I
800     FOR I=5 TO 8
810     CLEAR
```

Figure 8-8. Border Calibration Program (Continued)

```
820     IF I=5 THEN DISP USING "6/,K" ; "DESIRED LEFT BORDER" @ GOTO 920
830     IF I=6 THEN DISP USING "6/,K" ; "DESIRED RIGHT BORDER" @ GOTO 920
840     IF I=7 THEN DISP USING "6/,K" ; "DESIRED TOP BORDER" @ GOTO 920
850     IF I=8 THEN DISP USING "6/,K" ; "DESIRED BOTTOM BORDER"
860     BEEP
870     INPUT B1(I)
880     PRINT B1(I)
890     IF B1(I)<39 THEN GOTO 1410
900     IF B1(I)>45 THEN GOTO 1410
910     GO TO 970
920     BEEP
930     INPUT B1(I)
940     PRINT B1(I)
950     IF B1(I)<15 THEN GO TO 1410
960     IF B1(I)>18 THEN GO TO 1410
970     NEXT I
980     B(1)=B1(5)-B1(1)
990     B(2)=B1(6)-B1(2)
1000    B(3)=B1(7)-B1(3)
1010    B(4)=B1(8)-B1(4)
1020    FOR I=1 TO 4
1030    B(I)=B(I)*40
1040    NEXT I
1050    CLEAR
1060    DISP USING "6/,K" ; "CALIBRATING..."
1070    OUTPUT O ;"Esc.M;;;13;10:"
1080    OUTPUT O ;"Esc.Q100:"
1090    OUTPUT O ;"EM1122;R4354;"
1100    ENTER O ; A
1110    A=A+64
1120    PRINT "CURRENT EEPROM CONSTANTS"
1130    PRINT ""
1140    PRINT "ADDRESS VALUE"
1150    PRINT ""
1160    FOR I=1 TO 4
1170    C=I*2
1180    OUTPUT O USING "2A,8D" : "R2":A+C;":"
1190    ENTER O ; T(I)
1200    PRINT A+C;"=";T(I)
1210    NEXT I
1220    OUTPUT O ;"EM1122;R4354;"
1230    ENTER O ; A 1
1240    A=A+64
1250    PRINT ""
1260    PRINT "NEW EEPROM CONSTANTS"
1270    PRINT ""
1280    PRINT "ADDRESS VALUE"
1290    PRINT ""
```

Figure 8-8. Border Calibration Program (Continued)

```
1300    FOR I=1 TO 4
1310    C=I*2
1320    OUTPUT O USING "2A,8D" ; "W2";A+C;",";B(I)+T(I)
1330    OUTPUT O ;"EX330;"
1340    PRINT A+C;"=";B(I)+T(I)
1350    NEXT I
1360    CLEAR
1370    DISP USING "6/,5X,K" ; "CALIBRATION COMPLETE"
1380    DISP USING "/,K" ; "TURN POWER OFF TO THE PLOTTER"
1390    BEEP @ BEEP @ BEEP
1400    END
1410    CLEAR
1420    DISP "YOU HAVE SELECTED TOO SMALL"
1430    DISP "OR TOO LARGE A VALUE AND MEDIA"
1440    DISP "LOAD FAILURES COULD OCCUR."
1450    DISP "TOP, RIGHT AND LEFT BORDERS"
1460    DISP "SHOULD BE BETWEEN 15 AND 18."
1470    DISP "THE BOTTOM BORDER SHOULD BE"
1480    DISP "BETWEEN 39 AND 45."
1490    DISP USING "/,K" ; "PLEASE RESELECT."
1500    DISP USING "/,K" ; "PRESS 'CONT' TO CONTINUE"
1510    PAUSE
1520    GO TO 800
1530    CLEAR
1540    DISP USING "3/,K" ; "RS232 INTERFACE SELECT CODE?"
1550    DISP USING "/,K" ; "(ie. 10)"
1560    INPUT O
1570    CONTROL O,1 ; 16
1580    CONTROL O,2 ; 5
1590    CONTROL O,3 ; 15
1600    CONTROL O,4 ; 3
1610    GO TO 140
1620    CLEAR
1630    DISP USING "3/,K" ; "HPIB INTERFACE SELECT CODE?"
1640    DISP USING "/,K" ; "(ie. 705)"
1650    INPUT O
1660    GO TO 140
1670    END
```

Figure 8-8. Border Calibration Program (Continued)

Table 8-11. Code Descriptions

CODE	DESCRIPTION
00	Paper unloaded with a "PG;" command or pinch wheels raised at power-on (normal operation).
10	Right edge sense failure. Main cause is intermittent stiction in Z-axis. Fix by replacing the pen carriage.
11	Right edge sense failure. Main cause is stiction in Z-axis. Fix by replacing the pen carriage.
12,13	Right edge was found, however, media skew was detected. Probable cause would be misloaded media or excessive error in the Y-axis.
20	Same as code 10 except this code refers to the left edge (fast scan).
21	Same as code 11 except this code refers to the left edge (fast scan).
22	Left edge found during the second scan at an unexpected location. Could be caused by a tear in the media which the plotter incorrectly interpreted as an edge.
23	Same as code 20 except this code refers to the slow scan.
24	Same as code 21 except this code refers to the slow scan.
25,26 27,28	These four codes indicate the left edge was found in a non-grit wheel area.
30	Same as code 20 except this code refers to the front edge.
31	Same as code 23 except this code refers to the front edge.
32	Same as code 24 except this code refers to the front edge.
33	Checked the right edge after finding the front edge and determined there was excess skew. Typically caused by not properly aligning the right edge of the media with the front and rear paper stops.
40	Same as code 30 except this code refers to the rear edge.
41	No media present.
42	Same as code 31 except this code refers to the rear edge.
43	Same as code 32 except this code refers to the rear edge.
44	Roll feed supply roll out of media.

CHAPTER 9

REPLACEABLE PARTS

9-1. INTRODUCTION

9-2. This chapter contains parts information for the HP 7595/6 Drafting Plotter. Included is a listing of assemblies, replacement parts, and ordering information.

9-3. ORDERING INFORMATION

9-4. To obtain replacement parts or assemblies, address an order or inquiry to the nearest Hewlett-Packard Sales and Support Office. The order must include the part or assembly number, its description and location, and the plotter model and serial number.

9-5. ABBREVIATION LIST AND REFERENCE DESIGNATIONS

9-6. Table 9-1 lists abbreviations and reference designations used throughout this manual. Abbreviations in the parts lists are always capital letters. In other parts of the manual, both upper and lower cases abbreviations are used.

9-7. EXCHANGE PCAs

9-8. Factory rebuilt assemblies that can be exchanged are listed in Table 9-2. Exchange, factory repaired and tested, assemblies are available only on a trade-in basis; therefore, the defective assemblies must be returned for credit.

9-9. FIELD REPLACEABLE PARTS LISTS

9-10. Mechanical parts are listed in order by number-keyed designations corresponding to the illustrated parts breakdown diagrams in this section. The information given for each part consists of the Hewlett-Packard part number, the quantity used in the plotter, the part description, and the manufacturer's code number. The total quantity for each part is given only once, at the first appearance of the part number in the list.

9-11. PRINTED CIRCUIT ASSEMBLIES

9-12. PCA part numbers are listed in Table 9-3. Parts located on printed circuit assemblies PCAs are illustrated in Chapter 12, Figures 12-13 and 12-14.

9-13. CABLE ASSEMBLIES

9-14. Figure 9-1 contains a cable and wiring diagram for the primary transformer. Interconnecting cable assemblies with their respective part numbers are illustrated in Figure 9-2. Use the part number and assembly name when ordering the cable assemblies.

9-15. MECHANICAL ASSEMBLIES

9-16. Mechanical assemblies and frame mounted parts are listed in Tables 9-4 through 9-15 and illustrated in Chapter 12, Figures 12-1 through 12-12. Match the appropriate parts list and illustrated parts breakdown diagram for part identification.

9-17. CODED LIST OF MANUFACTURERS

9-18. Table 9-16 lists the five-digit code numbers assigned to the manufacturers of parts used in the HP 7595/6 Drafting Plotter. These code numbers appear with the parts in the Replacement parts Lists in this section as an aid for ordering replacement parts directly from the manufacturer.

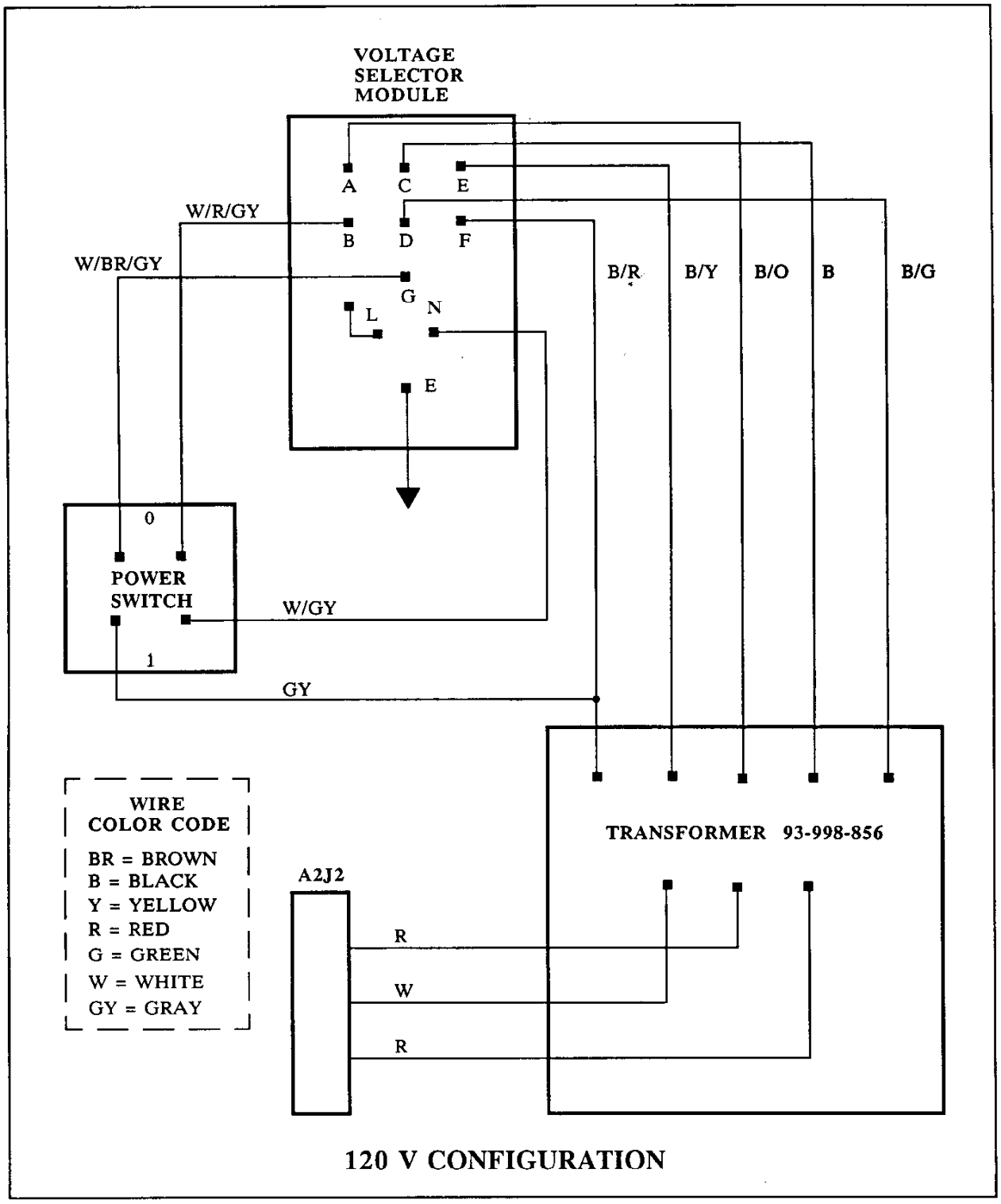


Figure 9-1. Primary Transformer Wiring Diagram

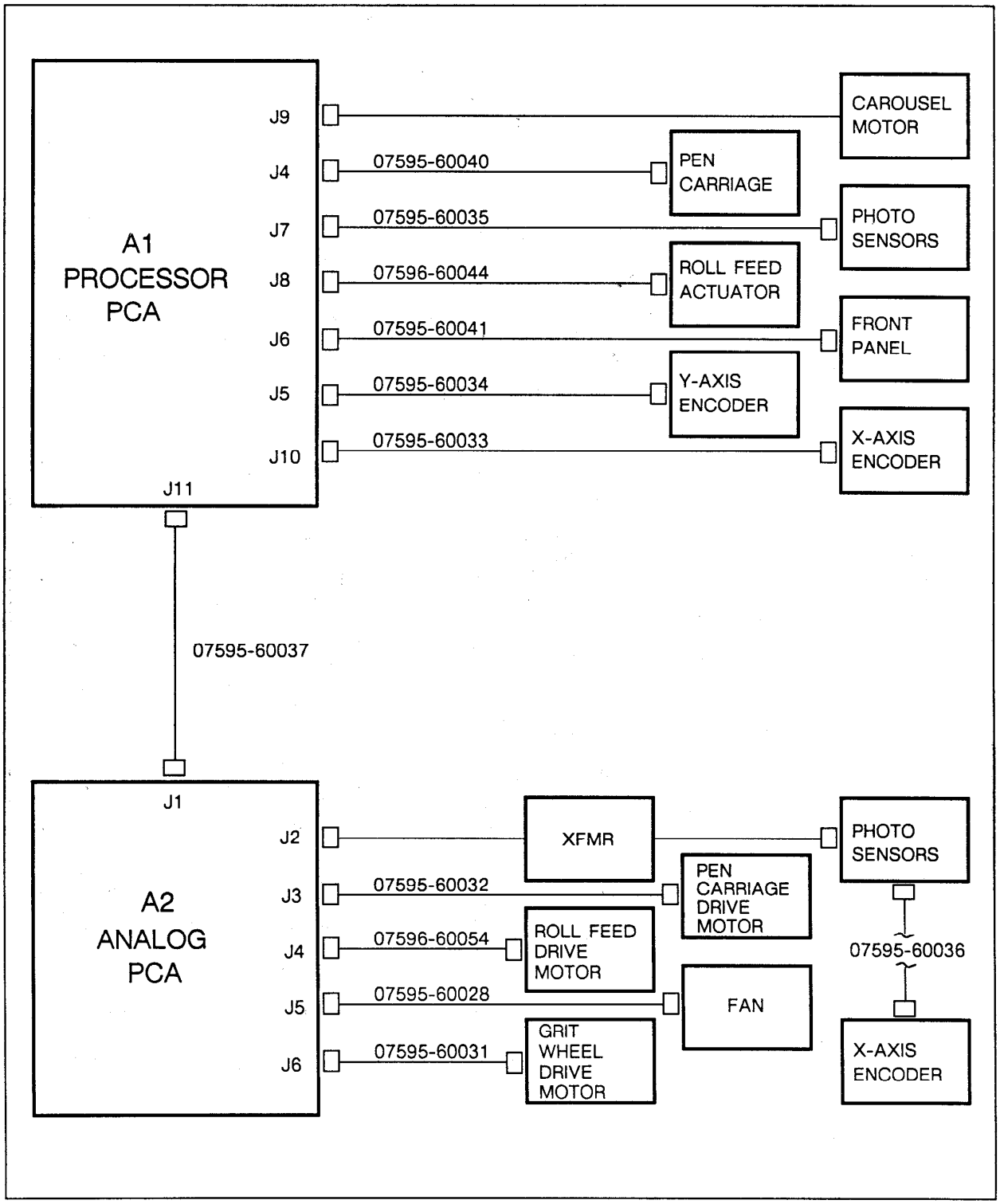


Figure 9-2. HP 7595/6 Cabling Diagram

Table 9-1. Reference Designations and Abbreviations

REFERENCE DESIGNATIONS

A ..... assembly
AT ..... attenuator; isolator; termination
B ..... fan; motor
BT ..... battery
C ..... capacitor
CR ..... diode; diode thyristor; varactor
DS ..... annunciator; signaling device (audible or visual); lamp; LED
E ..... miscellaneous electrical part
F ..... fuse
FL ..... filter
H ..... hardware
J ..... electrical connector (stationary portion); jack
K ..... relay
L ..... coil; inductor
M ..... meter
MP ..... miscellaneous mechanical part
P ..... electrical connector (movable portion); plug
Q ..... transistor; SCR; thyristor
R ..... resistor
RN ..... resistor network
RT ..... thermistor
S ..... switch
T ..... transformer
TP ..... test point
U ..... intergrated circuit; microcircuit
VR ..... voltage regulator; breakdown diode
W ..... cable; transmission path; wire
X ..... socket
Y ..... crystal unit (piezo-electric or quartz)
Z ..... tuned cavity; tuned circuit

ABBREVIATIONS

A ..... ampere
ac ..... alternating current
ADJ ..... adjustment
A/D ..... analog-to-digital
AMPL ..... amplifier
ASSY ..... assembly
AWG ..... American wire gauge
BCD ..... binary coded decimal
BKDN ..... breakdown
CAL ..... calibrate
ccw ..... counter-clockwise
CER ..... ceramic
CHAN ..... channel
cm. ..... centimetre
COAX ..... coaxial
COEF ..... coefficient
COM ..... common
COMP ..... composition
CONN ..... connector
CTL ..... complementary transistor logic
cw ..... clockwise
D/A ..... digital-to-analog
dB ..... decibel
dBm ..... decibel referred to 1 mW
dc ..... direct current
deg ..... degree (temperature interval or difference)
° ..... degree (plane angle)
°C ..... degree Celsius
°F ..... degree Fahrenheit
°K ..... degree Kelvin
diam ..... diameter
DIA ..... diameter
DIFF AMPL ..... differential amplifier
DPDT ..... double-pole, double-throw
DTL ..... diode transistor logic
DVM ..... digital voltmeter
ECL ..... emitter coupled logic
EMF ..... electromotive force
EDP ..... electronic data processing
ELECT ..... electrolytic
EAROM ..... electrically alterable read only memory
EPROM ..... electrically programmable read only memory
EEPROM ..... electrically eraseable programmable read only memory
EXT ..... external
F ..... farad
FET ..... field-effect transistor
F/F ..... flip flop
FH ..... flat head
FM ..... frequency modulation
FP ..... front panel
FP ..... flame proof
FREQ ..... frequency
FXD ..... fixed
g ..... gram
GE ..... germanium
GHz ..... gigahertz
GL ..... glass
GND ..... ground(ed)
H ..... henry
h ..... hour
HEX ..... hexagonal
HD ..... head
HDW ..... hardware
HG ..... mercury
HI ..... high
HP ..... Hewlett-Packard
HPF ..... high pass filter
HR ..... hour
HV ..... high voltage
Hz ..... Hertz
IC ..... intergrated circuit
ID ..... inside diameter
in ..... inch
INCD ..... incandescent
INCL ..... include(s)
INP ..... input
INS ..... insulation
INT ..... internal
kg ..... kilogram
kHz ..... kilohertz
kΩ ..... kilohm
kV ..... kilovolt
lb ..... pound
LC ..... inductance-capacitance
LED ..... light-emitting diode
LF ..... low frequency
LG ..... long
LH ..... left hand
Lim ..... Limit
LIN ..... linear taper (used in parts list)
lin ..... linear
LKWASH ..... lock washer
LO ..... low; local oscillator
LOG ..... logarithmic taper
log ..... logarithm(ic)
LPF ..... low pass filter
LV ..... low voltage
m ..... metre (distance)
mA ..... milliampere
MAX ..... maximum
MΩ ..... megohm
MEG ..... meg (106) (used in parts list)
MET FLM ..... metal film
MET OX ..... metallic oxide
MF ..... medium frequency; microfarad
MFR ..... manufacturer
mg ..... milligram
MHz ..... megahertz
mH ..... millihenry
mho ..... mho
MIN ..... minimum
min ..... minute (time) minute (plane angle)
mm ..... millimetre
MOD ..... modulator
MOM ..... momentary
MOS ..... metal-oxide semiconductor
ms ..... millisecond
MTG ..... mounting
MTR ..... meter (indicating device)

NOTE

All Abbreviations in the parts list will be in upper case

Table 9-1. Reference Designations and Abbreviations (Continued)

mV ..... millivolt
mVac ..... millivolt,ac
mVdc ..... millivolt,dc
mVpk ..... millivolt, peak
mVp-p ..... millivolt, peak-to-peak
mVrms ..... millivolt, rms
mW ..... milliwatt
MUX ..... multiplex
MY ..... mylar
µA ..... microampere
µF ..... microfarad
µH ..... microhenry
µs ..... microsecond
µV ..... microvolt
µVac ..... microvolt,ac
µVdc ..... microvolt,dc
µVpk ..... microvolt, peak
µVp-p ..... mircovolt, peak-to-peak
µVrms ..... microvolt, rms
µW ..... microwatt
nA ..... nanoampere
N/C ..... normally closed
NEG ..... negative
NI PL ..... nickel plate
N/O ..... normally open
NOM ..... nominal
NORM ..... normal
NPN ..... negative-positive-negative
ns ..... nanosecond
nW ..... nanowatt
OBD ..... order by description
OD ..... outside diameter
OPAMPL ..... operational amplifier
OPT ..... option
OSC ..... oscillator
OX ..... oxide
oz ..... ounce
Ω ..... ohm
P ..... peak
PC ..... printed circuit
pF ..... picofarad
PIV ..... peak inverse voltage
pk ..... peak
PNP ..... positive-negative-positive
P/O ..... part of
POLY ..... polystyrene
PORC ..... porcelain
POS ..... positive; position(s)
POSN ..... position
POT ..... potentiometer
p-p ..... peak-to-peak (used in parts list)
PPM ..... parts per million
PREAMPL ..... preamplifier
PRF ..... pulse-repetition frequency
PRR ..... pulse repetition rate
ps ..... picosecond
PT ..... point
PWV ..... peak working voltage
RAM ..... random access memory
RC ..... resistance-capacitance
RECT ..... rectifier
REF ..... reference
REG ..... regulated
REPL ..... replaceable
RF ..... radio frequency
RFI ..... radio frequency interference
RH ..... round head; right hand
RLC ..... resistance-inductance-capacitance
rms ..... root-mean-square
RND ..... round
ROM ..... read only memory
s ..... second (time)
" ..... second (plane angle)
S-B ..... slow-blow fuse
SCR ..... silicon controlled rectifier; screw
SE ..... selenium
SECT ..... sections
SEMICON ..... semiconductor
SI ..... silicon
SIL ..... silver
SL ..... slide
SNR ..... signal-to-noise ratio
SPDT ..... single-pole, double-throw
SPG ..... spring
SR ..... split ring
SPST ..... single-pole, single-throw
SST ..... stainless steel
STL ..... steel
SQ ..... square
SYNC ..... synchronize
T ..... timed (slow-blow fuse)
TA ..... tantalum
TC ..... temperature coefficient
TD ..... time delay
TERM ..... terminal
TGL ..... toggle
THD ..... thread
THRU ..... through
TI ..... titanium
TOL ..... tolerance
TRIM ..... trimmer
TSTR ..... transistor
TTL ..... transistor-transistor logic
µ ..... micro (10-^) (used in parts list)
UNREG ..... unregulated
V ..... volt
VA ..... voltampere
Vac ..... volts,ac
VAR ..... variable
Vdc ..... volts,dc
VDCW ..... volts,dc, working
Vpk ..... volts,peak
Vp-p ..... volts, peak-to-peak
Vrms ..... volts,rms
VTVM ..... vacuum-tube voltmeter
W ..... watt
WIV ..... working invervse voltage
WW ..... wirewound
W/O ..... without

NOTE

All Abbreviations in the parts list will be in upper case

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
u	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

Table 9-2. Parts List, Exchange Assemblies

REF. DES.	HP PART NUMBER	CD	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
A1	07595-69200	8	1	PCA, PROCESSOR, REBUILT	28480	07595-69200
A2	07595-66121	0	1	PCA, ANALOG, REBUILT	28480	07595-66121
				NOTE REBUILT ASSEMBLY PART NUMBERS HAVE A -66XXX OR -69XXX SUFFIX. NEW ASSEMBLIES HAVE A -60XXX OR -68XXX SUFFIX.		

Table 9-3. Parts List, Printed Circuit Assemblies

REF. DES.	HP PART NUMBER	CD	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
A1	07595-68200	6	1	PCA-PROCESSOR (DATE CODE 2949-11)	28480	07595-68200
A2	07595-60121	6	1	PCA-ANALOG (DATE CODE 2846-11)	28480	07595-60121
				PLUG-IN ICs FOR PROCESSOR PCA (2949-11)		
U16	07595-18039	0	1	IC-EPROM 4L	28480	07595-18039
U17	07595-18040	3	1	IC-EPROM 6L	28480	07595-18040
U18	07595-18041	4	1	IC-EPROM 4U	28480	07595-18041
U19	07595-18042	5	1	IC-EPROM 6U	28480	07595-18042

Table 9-5. Parts List, Right Side Exploded View

REF. DES.	HP PART NUMBER	C D	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				RIGHT SIDE EXPLODED VIEW		
1	07595-40131	0	1	CHASSIS	28480	07595-40131
2	07595-00020	2	4	PLATE-STUD	28480	07595-00020
3	07595-40033	1	2	PAPER STOP	28480	07595-40033
4	07595-40035	3	2	RETAINER-PAPER STOP	28480	07595-40035
5	07595-40036	4	1	PAPER STOP RACK	28480	07595-40036
6	07595-40140	1	1	PANEL R.H. MKD	28480	07595-40140
7	07595-40129	6	1	INTERLOCK LEVER	28480	07595-40129
8	1460-2159	1	1	SPRING-EXT 2.4-MM-OD 54.4-MM-OA-LG	28480	1460-2159
9	07550-40063	4	2	CAP-PHOTO	28480	07550-40063
10	07595-00013	3	4	PLATE-WASHER	28480	07595-00013
11	0535-0043	6	14	NUT-HEX W/LKWR M4 X 0.7 3.2MM-THK	28480	0535-0043
12	07595-00141	8	1	MOUNT CHASSIS I/O	28480	07595-00141
13	9135-0317	8	1	LINE MODULE-UNFILTERED VOLTAGE:100 TO	28480	9135-0317
14	9100-4595	9	1	TRANSFORMER	28480	9100-4595
15	0515-1736	4	12	SCREW-MACHINE ASSEMBLY M5 X 0.8	28480	0515-1736
16	07595-68200	6	1	PCA-PROCESSOR	28480	07595-68200
17	07595-60121	8	1	PCA-ANALOG	28480	07595-60121
18	07595-60037	7	1	CABLE-BUS	28480	07595-60037
19	07595-00140	7	1	COVER-MOUNT CHASSIS I/O	28480	07595-00140
20	3101-2901	3	1	SWITCH-POWER LINE	28480	3101-2901
				MISCELLANEOUS		
	07595-60036	6	1	CABLE ASSEMBLY-POWER (SHOWN ON FIGURE 12-2 AS "A-A")	28480	07595-60036

Table 9-4. Parts List, Stand Assembly

REF. DES.	HP PART NUMBER	C D	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				STAND ASSEMBLY		
1	07595-40135	4	1	COVER-SIDE (L.H.) MKD	28480	07595-40135
2	0515-0465	4	7	SCREW-SKT-HD-CAP M2 X 0.4 3MM-LG	28480	0515-0465
3	07595-60029	7	1	MOTOR AY-GRIT WHEEL DRIVE	28480	07595-60029
4	0515-0380	2	7	SCREW-MACHINE ASSEMBLY M4 X 0.7 10MM-LG	00000	ORDER BY DESCRIPTION
5	07595-60007	1	1	STRAP, X-MOTOR GROUND	28480	07595-60007
6	07595-00013	3	4	PLATE-WASHER	28480	07595-00013
7	0535-0077	6	8	NUT-HEX W/EXT-T-LKWR M5 X 0.8 5.1MM-THK	00000	ORDER BY DESCRIPTION
8	0515-1736	4	12	SCREW-MACHINE ASSEMBLY M5 X 0.8 58MM-LG	28480	0515-1736
9	07595-40139	8	1	PANEL (L.H.) MKD	28480	07595-40139
10	0535-0043	6	17	NUT-HEX W/LKWR M4 X 0.7 3.2MM-THK	28480	0535-0043
11	0515-1733	1	12	SCREW-METRIC SPECIALTY M5 X 0.8 THD; 10	28480	0515-1733
12	07595-40124	1	1	COVER, Y-CARRIAGE	28480	07595-40124
13	0515-1820	7	2	SCREW	28480	0515-1820
14	07595-60064	4	1	Y-CARRIAGE (INCLUDES ITEM 12)	28480	07595-60064
15	1460-2157	9	2	SPRING-CPRSN 6.1-MM-OD 19.05-MM-OA-LG	28480	1460-2157
16	07595-40056	8	1	WINDOW	28480	07595-40056
17	07595-00103	2	1	COVER, Y-ARM MKD	28480	07595-00103
18	07595-20002	2	1	Y-ARM	28480	07595-20002
19	0515-0440	5	4	SCREW-MACHINE ASSEMBLY M5 X 0.8 20MM-LG	00000	ORDER BY DESCRIPTION
20	07595-40131	0	1	CHASSIS	28480	07595-40131
21	07595-00020	2	4	PLATE-STUD	28480	07595-00020
22	07595-00012	2	1	PLATE-BOTTOM	28480	07595-00012
23	07595-20125	0	1	CROSS BRACE MKD	28480	07595-20125
24	07595-60150	5	1	CONTROL PANEL ASSEMBLY	28480	07595-60150
25	07595-80012	0	1	LIQUID CRYSTAL DISPLAY (LCD)	28480	07595-80012
26	07595-60041	3	1	CABLE-FRONT PANEL	28480	07595-60041
27	3050-1099	9	2	WASHER-FL MTLC NO. 6 .14-IN-ID .75-IN-OD	73734	1418ZP
28	0624-0681	7	2	SCREW-TPG 4-20 .25-IN-LG PAN-HD-TORX T10	93907	225-05813-890BE112TXPNP
29	07595-40137	6	1	COVER-SIDE (R.H.) MKD	28480	07595-40137
30	07595-40140	1	1	PANEL (R.H.) MKD	28480	07595-40140
31	07595-20017	9	2	SUPPORT-CASTER	28480	07595-20017
32	07595-20145	4	4	MOUNT-LEVELING MKD	28480	07595-20145
33	07595-60048	0	4	SCREW-LEVELING	28480	07595-60048
34	2190-0038	9	4	WASHER-LK HLCL 5/16 IN .319-IN-ID	28480	2190-0038
35	1492-0114	1	4	STEM-CASTER M8 X 1.25 THD; 9.5 MM LG	28480	1492-0114
36	1492-0106	1	4	CASTER-SWVL STEM 50-MM-WHL-DIA	28480	1492-0106
37	07595-60154	9	1	TRAILING CABLE AND CLIP	28480	07595-60154
38	07595-80007	3	1	SPRING-COMPRESSION	28480	07595-80007
39	07595-40087	5	1	PEN PAWL	28480	07595-40087
40	07595-40126	3	1	DECAPPER FOOT	28480	07595-40126
41	0515-0383	5	4	SCREW-MACH AY M4 X 0.7 16MM-LG	28480	0515-0383
42	3050-1267	3	4	WASHER-FL MTLC NO.8 .172-IN-ID .5-IN-OD	28480	3050-1267
43	3050-1277	4	2	WASHER-FLAT	28480	3050-1277
44	07595-00059	7	1	LABEL, DRAFTMASTER I	28480	07595-00059
	07596-00059	8	1	LABEL, DRAFTMASTER II	28480	07596-00059
45	07595-00064	4	1	LABEL, LANGUAGE	28480	07595-00064
46	07595-00066	6	1	LABEL, TIP WARNING	28480	07595-00066
47	07595-00062	2	1	LABEL, SERIAL	28480	07595-00062
48	07595-60149	2	1	FENDER BEARING ASSEMBLY	28480	07595-60149
49	0515-1751	3	2	SCREW-SET M3 X 0.5 16MM LG	00000	ORDER BY DESCRIPTION
50	0515-1842	3	2	SCREW-SET M4 X 0.7 10MM LG	00000	ORDER BY DESCRIPTION

Table 9-6. Parts List, Platen Assembly

REF. DES.	HP PART NUMBER	CD	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				PLATEN ASSEMBLY		
1	07595-60047	9	1	PLATE-FINISHED	28480	07595-60047
2	0624-0680	6	6	SCREW-TPG 3-24 .375-IN-LG PAN-HD-TORX	28480	0624-0680
3	07595-60020	8	1	SHAFT AY-GRIT WHEEL	28480	07595-60020
4	0515-0383	5	6	SCREW-MACHINE ASSEMBLY M4 X 0.7	00000	ORDER BY DESCRIPTION
5	0515-1732	0	2	SCREW-MACH M3 X 0.5 10MM-LG	28480	0515-1732
6	07595-20001	1	1	COVER-LIFT ARM	28480	07595-20001
7	07595-60071	9	1	GUIDE BLADE ASSEMBLY	28480	07595-60071
8	07595-20075	9	1	BRIDGE-PINCH WHEEL	28480	07595-20075
9	07595-60153	8	1	LIFT ARM ASSEMBLY (L.H.)	28480	07595-60153
10	1401-0228	7	1	CAP/PLUG-PROT TPR FLG .396-ID YEL	28480	1401-0228
11	0515-1739	7	2	SCREW-MACHINE M6 X 1.0 26MM-LG PAN-HD	28480	0515-1739
12	07595-40089	7	2	MOUNT-COVER	28480	07595-40089
13	07595-20029	3	1	BAR-SLIDER	28480	07595-20029
14	0624-0682	8	5	SCREW-TPG 6-20 1.5-IN-LG PAN-HD-TORX	28480	0624-0682
15	07595-60170	9	1	PINCH WHEEL AY (R.H.)	28480	07595-60170
16	07595-40131	0	1	CHASSIS	28480	07595-40131
17	07595-00020	2	4	PLATE-STUD	28480	07595-00020
18	07595-20057	7	2	CLAMP-ISOLATOR-M	28480	07595-20057
19	07595-20056	6	2	CAP-ISOLATOR-MAC	28480	07595-20056
20	07595-00091	7	2	ISOLATOR	28480	07595-00091
21	0515-1742	2	4	SCREW-SKT-HD-CAP M3 X 0.5 12MM-LG	28480	0515-1742
22	07595-00014	4	1	MOUNT-FAN	28480	07595-00014
23	0535-0043	6	17	NUT-HEX W/LKWR M4 X 0.7 3.2MM-THK	28480	0535-0043
24	3160-0506	4	1	FAN	28480	3160-0506
25	07595-00092	8	1	ISOLATOR STRIP	28480	07595-00092
26	07595-00093	9	1	ISOLATOR STRIP	28480	07595-00093
27	07595-00023	5	5	NUT-SPRING	28480	07595-00023

Table 9-7. Parts List, Carousel Base Assembly

REF. DES.	HP PART NUMBER	CD	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				CAROUSEL BASE ASSEMBLY		
1	0624-0314	3	5	SCREW-TPG 4-20 .375-IN-LG PAN-HD-TORX	00000	ORDER BY DESCRIPTION
2	07595-40182	1	1	TUB-CAROUSEL	28480	07595-40182
3	0515-0440	5	2	SCREW-MACHINE ASSEMBLY M5 X 0.8	00000	ORDER BY DESCRIPTION
4	07595-40129	6	1	INTERLOCK LEVER	28480	07595-40129
5	1460-2159	1	1	SPRING-EXT 2.4-MM-OD 54.4-MM-OA-LG	28480	1460-2159
6	07595-40240	0	1	BASE-CAROUSEL	28480	07595-40240
7	07550-40063	4	2	CAP-PHOTO	28480	07550-40063
8	1990-0965	6	1	PHOTOSWITCH IF=50MA-MAX	13606	ULN3330Y(SEL)
9	1990-1113	8	1	LED-INFRARED IF=50MA-MAX ID=100UA-MAX	28480	1990-1113
10	07595-40097	7	1	CAM-CAPPER	28480	07595-40097
11	1460-2062	5	1	SPRING-TRSN 9.5-MM-OD 12-MM-OA-LG SST	28480	1460-2062
12	07595-60035	5	1	CABLE-CAROUSEL SENSOR	28480	07595-60035
13	07595-00029	1	1	STRAP-CAROUSEL GROUND	28480	07595-00029
14	3140-0807	6	1	MOTOR STEPPER	28480	3140-0807

Table 9-8. Parts List, Pen Carriage Drive Assembly

REF. DES.	HP PART NUMBER	CD	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				PEN CARRIAGE DRIVE ASSEMBLY		
1	07550-40105	5	1	BRACKET-IDLER MOUNT	28480	07550-40105
2	0515-0380	2	5	SCREW-MACHINE ASSEMBLY M4 X 0.7	00000	ORDER BY DESCRIPTION
3	07570-60112	2	1	IDLER ASSEMBLY	28480	07570-60112
4	07550-40104	4	1	CAM-TENSIONER	28480	07550-40104
5	1460-2144	4	1	SPRING-EXT 12.7-MM-OD 44.45-MM-OA-LG	28480	1460-2144
6	0510-0997	7	2	RETAINER-RING CRSNT EXT .25-IN-DIA STL	28480	0510-0997
7	07595-20008	7	1	SHAFT-REDUCTION PULLEY	28480	07595-20008
8	07595-60334	7	1	DRIVE PULLEY-REDUCTION AY	28480	07595-60334
9	1500-0687	2	1	BELT-GEAR .25-IN-WD 105-IN-T POLYU*	28480	1500-0687
10	07595-40014	8	1	MOUNT, Y-MOTOR	28480	07595-40014
11	07595-00090	6	1	STRAP, Y-MOTOR GROUND	28480	07595-00090
12	07595-60030	0	1	Y-MOTOR ASSEMBLY	28480	07595-60030
13	07595-60032	2	1	CABLE, Y-MOTOR	28480	07595-60032
14	07595-60034	4	1	CABLE, Y-ENCODER	28480	07595-60034
15	1500-0688	2	1	MAIN BELT	28480	1500-0688

Table 9-9. Parts List, Lift Arm Assembly (R.H.)

REF. DES.	HP PART NUMBER	CD	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
	07595-60170			LIFT ARM ASSEMBLY (R.H.)		07595-60170
1	07595-40029	5	1	ACTUATOR ARM	28480	07595-40029
2	0905-1092	2	1	O-RING .07-IN-ID .07-IN-XSECT-DIA NTRL	83259	2-004N103-70
3	07595-20049	7	1	AXLE-PINCH WHEEL	28480	07595-20049
4	07580-60099	4	1	PINCH WHEEL ASSEMBLY	28480	07580-60099
5	07595-40026	2	1	LIFT ARM-PINCH WHEEL (R.H.)	28480	07595-40026
6	07595-20074	1	1	SENSOR ACTUATOR	28480	07595-40017
7	07595-20048	6	1	PIN-SENSOR HINGE	28480	07595-20048
8	0510-0015	0	2	RETAINER-RING E-R EXT .125-IN-DIA STL	28480	0510-0015
9	07595-40027	3	1	YOKE-PINCH WHEEL	28480	07595-40027
10	1460-2167	1	2	SPRING-COMPRESSION	28480	1460-2167
11	07595-20028	2	1	AXLE-LIFT ARM	28480	07595-20028
12	07595-40120	7	1	LINK ACTUATOR	28480	07595-40120
13	07595-40028	4	1	CAM-PINCH WHEEL	28480	07595-40028
14	07595-40102	5	1	ROLLER-PINCH WHEEL CAM	28480	07595-40102
				MISCELLANEOUS		
	0510-1302	2	1	STUD-RECEIVER	28480	0510-1302
	07595-00097	7	1	SPRING-YOKE	28480	07595-00097

Table 9-10. Parts List, Lift Arm Assembly (L.H.)

REF. DES.	HP PART NUMBER	CD	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
	07595-60153			LIFT ARM ASSEMBLY (L.H.)		07595-60153
1	07595-40025	1	1	LIFT ARM-PINCH WHEEL (LEFT)	28480	07595-40025
2	07580-60099	4	1	PINCH WHEEL ASSEMBLY	28480	07580-60099
3	07595-20049	7	1	AXLE-PINCHWHEEL	28480	07595-20049
4	0905-1092	2	1	O-RING .07-IN-ID .07-IN-XSECT-DIA NTRL	83259	2-004N103-70
5	0510-0015	0	2	RETAINER-RING E-R EXT .125-IN-DIA STL	28480	0510-0015
6	07595-40027	3	1	YOKE-PINCH WHEEL	28480	07595-40027
7	07595-20028	2	1	AXLE-LIFT ARM	28480	07595-20028
8	1460-2167	1	2	SPRING-COMPRESSION	28480	1460-2167
9	07595-40028	4	1	CAM-PINCH WHEEL	28480	07595-40028
10	07595-40102	5	1	ROLLER-PINCH WHEEL	28480	07595-40102
				MISCELLANEOUS		
	0510-1302	2	1	STUD-RECEIVER	28480	0510-1302
	07595-00097	7	1	SPRING-YOKE	28480	07595-00097

Table 9-11. Parts List, Grit Wheel Drive Assembly

REF. DES.	HP PART NUMBER	CD	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				GRIT WHEEL DRIVE ASSEMBLY		
1	07595-60155	0	1	MAIN IDLER ASSEMBLY	28480	07595-60155
2	07595-60068	4	1	WEDGE ASSEMBLY	28480	07595-60068
3	1460-2163	7	1	SPRING-COMPRESSION	28480	1460-2163
4	0535-0101	7	1	NUT-HEX PLSTC-LKG M6 X 1.0 6MM-THK	39428	90576A115
5	0515-0383	5	13	SCREW-MACHINE ASSEMBLY M4 X 0.7	00000	ORDER BY DESCRIPTION
6	07595-40018	2	1	MOUNT-TENSIONER	28480	07595-40018
7	07595-40061	5	1	PULLEY, X-DRIVEN	28480	07595-40061
8	1500-0689	4	1	BELT-DR .375-IN-WD 145-IN-T .08-IN-P	28480	1500-0689
9	0515-0456	3	2	SCREW-MACHINE ASSEMBLY M4 X 0.7	00000	ORDER BY DESCRIPTION
10	3050-1267	3	6	WASHER .172 ID	28480	3050-1267
11	07595-40105	8	1	SNUBBER	28480	07595-40105
12	1410-1234	6	1	BEARING-RDL BA .375-IN-ID .875-IN-OD	83086	RI-1438HHRA1 P58LG39
13	1460-2144	4	1	SPRING-EXT 12.7-MM-OD 44.45-MM-OA-LG	28480	1460-2144
14	0515-0380	2	3	SCREW-MACHINE ASSEMBLY M4 X 0.7	00000	ORDER BY DESCRIPTION
15	07595-00019	9	1	MOUNT-MOTOR, X-AXIS	28480	07595-00019
16	0590-1742	0	3	THREADED INSERT-MOLD-IN M4 X 0.7	00613	B832 METRIC
17	07595-60029	7	1	MOTOR/ENCODER ASSEMBLY	28480	07595-60029
18	07595-60007	1	1	STRAP, X-MOTOR GROUND	28480	07595-60007
19	0515-0604	9	3	SCREW-MACH AY M3 X 0.5 12MM-LG	28480	0515-0604
20	07595-20065	7	1	CLAMP	28480	07595-20065
21	3050-1265	1	2	WASHER-FL MTLC NO.4 .125-IN-ID	28480	3050-1265
22	07595-20042	0	1	BOLT-TENSIONER	28480	07595-20042
23	0535-0089	0	1	NUT-HEX METRIC	00000	ORDER BY DESCRIPTION

Table 9-12. Parts List, Roll Feed Assembly

REF. DES.	HP PART NUMBER	C D	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				ROLL FEED ASSEMBLY		
1	07596-40077	4	2	SPACER-SPINDLE	28480	07596-40077
2	07596-60059	1	2	SPINDLE ASSEMBLY	28480	07596-60059
3	07596-40076	3	2	FLANGE-SPINDLE	28480	07596-40076
4	3050-0476	4	4	WASHER-FL MTLC NO.12 .204-IN-ID	28480	3050-0476
5	0515-0380	2	4	SCREW-MACH AY M4 X 0.7 10MM-LG	28480	0515-0380

Table 9-13. Parts List, Roll Feed Module Assembly (R.H.)

REF. DES.	HP PART NUMBER	C D	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				ROLL FEED MODULE ASSEMBLY (R.H.)		
1	07596-40049	0	2	SUPPORT ARM-SHAFT	28480	07596-40049
2	1460-2160	4	2	SPRING-EXT 9.5-MM-OD 30-MM-OA-LG	28480	1460-2160
3	07596-40098	9	1	SIDE PLATE (OPT. 151)	28480	07596-40098
4	07596-00011	2	1	COVER-GEAR	28480	07596-00011
5	07596-40051	4	1	GEAR-SPUR	28480	07596-40051
6	07596-60002	7	1	CLUTCH-SUPPLY	28480	07596-60002
7	07596-60003	8	1	CLUTCH, TAKE-UP	28480	07596-60003
8	07596-60044	7	1	CABLE, MICROSWITCH	28480	07596-60044
9	3101-2893	2	1	SWITCH-SENS STD .005A 24VDC	91929	VX-10
10	07596-40050	3	1	ACTUATOR-MICROSWITCH	28480	07596-40050
11	1500-0690	7	1	BELT-DR .25-IN-WD 42-IN-T 2-IN-P	28480	1500-0690
12	0515-0380	2	9	SCREW-MACHINE ASSEMBLY M4 X 0.7	00000	ORDER BY DESCRIPTION
13	1400-1261	8	3	CABLE CLAMP-HFCL .138-WD NYL	28480	1400-1261
14	0515-1748	8	2	SCREW-MACH M5 X 0.8 8MM-LG PAN-HD	28480	0515-1748
15	07596-00008	7	1	PLATE-MOTOR MOUNT	28480	07596-00008
16	1460-2153	5	1	SPRING-EXT 9.5-MM-OD 57-MM-OA-LG	28480	1460-2153
17	07596-60043	6	1	CABLE, TAKE-UP	28480	07596-60043
18	3140-0815	6	1	MOTOR	28480	3140-0815
19	07596-60105	0	1	PCA-FILTER	28480	07596-60105
20	2360-0115	4	2	SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
21	07596-60054	9	1	CABLE ASSEMBLY-FILTER	28480	07596-60054

Table 9-14. Parts List, Roll Feed Module Assembly (L.H.)

REF. DES.	HP PART NUMBER	C D	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				ROLL FEED MODULE ASSEMBLY (L.H.)		
1	0515-0380	2	3	SCREW-MACHINE ASSEMBLY M4 X 0.7	00000	ORDER BY DESCRIPTION
2	07596-00011	2	1	COVER-GEAR	28480	07596-00011
3	07596-40049	0	2	ARM-SUPPORT SHAFT	28480	07596-40049
4	1460-2160	4	2	SPRING-EXT 9.5-MM-OD 30-MM-OA-LG	28480	1460-2160
5	07596-40098	9	1	PLATE-SIDE, ROLL FEED	28480	07596-40098
6	1460-2158	0	2	SPRINT-CPRSN 12.2-MM-OD 58.6-MM-OA-LG	28480	1460-2158
7	07596-40086	5	2	ARM-BIAS	28480	07596-40086

Table 9-15. Parts List, Pen Carousel Assembly

REF. DES.	HP PART NUMBER	C D	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
				PEN CAROUSEL ASSEMBLY		
1	5081-5099	8	1	LABEL, CAROUSEL	28480	5081-5099
2	0624-0314	3	4	SCREW-TPG 4-20 .375-IN-LG PAN-HD-POZI	28480	0624-0314
3	07580-40041	4	1	TOP PLATE-CAROUSEL	28480	07580-40041
4	07595-40128	5	1	TURRET-ADJUSTABLE	28480	07595-40128
5	07550-40051	0	1	CAROUSEL TOP	28480	07550-40051
6	07550-40058	7	1	CAROUSEL PAWL	28480	07550-40058
7	1460-1870	1	1	SPRING, STABLE PAWL RETAINER	28480	1460-1870
8	07550-40065	6	8	BOOT, STABLE	28480	07550-40065
9	07550-40066	7	8	SEAL, STABLE	28480	07550-40066
10	07550-40059	8	8	PLUNGER, STABLE	28480	07550-40059
11	1460-2052	3	8	SPRING-CPRSN .3-IN-OD 1.5-IN-OA-LG	28480	1460-2052
12	07550-40055	4	1	CAROUSEL BODY	28480	07550-40055
13	05795-00045	1	1	LABEL-HAT	28480	07595-00045
14	1460-2173	9	1	SPRING-COMPRESSION	28480	1460-2173

Table 9-16. Code List of Manufacturers

MFR. CODE	MANUFACTURER NAME	ADDRESS	ZIP CODE
D5243	ROEDERSTEIN GMBH	LANDSHUT, GM	8300
S4013	HITACHI AMERICA LTD	SUNNYVALE, CA	94086
00000	ANY SATISFACTORY SUPPLIER		
00613	USM CORP MOLLY FASTENER DIV	TEMPLE, PA	19560
00779	AMP INC	HARRISBURG, PA	17111
00853	SANGAMO CAPACITOR DIV	PICKENS, SC	29671
01121	ALLEN-BRADLEY CO INC	EL PASO, TX	79935
01295	TEXAS INSTRUMENTS INC	DALLAS, TX	75265
03888	KDI PYROFILM CORP	WHIPPANY, NJ	07981
04713	MOTOROLA INC SEMI-COND PROD	PHOENIX, AZ	85008
13606	SPRAGUE ELECTRIC SEMICON DIV	CONCORD, NH	03301
14936	GENERAL INSTR CORP (DIODE)	HICKSVILLE, NY	11802
18324	SIGNETICS CORP	SUNNYVALE, CA	94086
19701	MEPCO/CENTRALAB INC	W. PALM BEACH, FL	33407
24546	CORNING ELECTRONICS	SANTA CLARA, CA	95050
27014	NAT'L SEMICONDUCTOR CORP	SANTA CLARA, CA	95052
28480	HEWLETT-PACKARD CO HQ	PALO ALTO, CA	94304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE, NJ	
3L680	BEMAN MFG INC	ETTERS, PA	17319
32997	BOURNS INC	RIVERSIDE, CA	92507
39428	MCMASTER CARR SUPPLY	SANTA FE SPGS, CA	90670
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS, MA	01247
72136	ELECTRO MOTIVE CORP	FLORENCE, SC	06226
73734	FEDERAL SCREW PRODUCTS CO	CHICAGO, IL	60618
83086	PARKER SEAL CO	PETERBOROUGH, NH	03458
83259	INTL RECTIFIER CORP	LEXINGTON, KY	90231
9M011	UNITRODE CORP	EL SEGUNDO, CA	90245
9N171	DALE ELECTRONICS INC	LEXINGTON, MA	02173
91637	HONEYWELL INC MICRO SW DIV	EL PASO, TX	79936
91929	CAMCAR SCREW & MFG CO	FREEPORT, IL	61032
93907	NEW HAMPSHIRE BALL BRG INC	ROCKFORD, IL	61101

CHAPTER 10
REFERENCE

10-1. INTRODUCTION

10-2. This chapter contains reference information necessary to maintain the proper support of the HP 7595/6.

10-3. OTHER MANUALS AND REFERENCES

10-4. Information on interfacing and operating the HP 7595/6 is contained in the Hewlett-Packard publications shown in Table 10-1.

10-5. CODE LISTINGS

10-6. The HP 7595/6 uses the Hewlett-Packard Graphics Language (HP-GL) instructions listed in Table 10-2 and HP-GL/2 instructions listed in Table 10-3.The instructions are programmed into the plotter through an external controller.

10-7. MNEMONICS

10-8. Table 10-4 contains a list of mnemonics used in the theory of operation in Chapter 5. Table 10-5 contains a list of abbreviations of organizations that contribute to the electronics publications standards used in this manual.

Table 10-1. HP Publications

PUBLICATION TITLE	HP PART NUMBER
HP-GL/2 Reference Guide	5959-9733
User's Guide	07595-90051

Table 10-2. HP-GL Instructions

INSTRUCTION	DEFINITION
AA x,y,arc angle(,chord)	Arc Absolute
AF	Advance Full Page
AH	Advance Half Page
AP n	Automatic Pen op
AR x,y,arc angle(,chord)	Arc Relative
AS pen acc(,pen number)	Select Pen Accel.
BF	Buffer Plot
BL c...c<ETX>	Buffer Label
CA set	Alternate Char set
CC chord angle	Char Chord mode
CI radius(,chord tol)	Circle
CM switch mode(,fallback)	Char Select mode
CP spaces,lines	Character Plot
CS set	Standard Char set
CT n	Chord Tol. mode
CV n(,input delay)	Curved Line Gen
DC	Digitize Clear
DF	Set Default values
DI run,rise	Abs label direct
DL char number(,pen cont),x,y(,...)	Downloadable char
DP	Digitize point
DR run,rise	Rel label direct
DS slot,set	Designate Char set
DT label terminator	Define label term
EA x,y	Edge rect abs
EC (n)	Enable Cutter
EP	Edge Polygon
ER x,y	Edge Rect Relative
ES spaces(,lines)	Extra Spacing
EW radius,start angle,sweep angle(,chord)	Edge wedge-circle
FP	Fill Polygon
FR	Advance Frame
FS pen force(,pen number)	Select Pen Force
FT type(,spacing(,angle))	Fill Type
GC count number	Set count number
GM (polygon buffer) (,DL char buffer) (,replot buffer) (,vector buffer)	Graphics Memory
GP (group num(,pen num(,num-pens(length)))	Designate Group
IC c	Input char
IM e(,s(,p))	Set e,s, & p masks
IN	Initialize plotter
IP Plx,Ply(,P2x,P2y)	Input P1 and P2
IV slot(,left)	Invoke slot
IW xl,yl,x1,y2	Input Window
KY key(,function)	Assign funct key
LB c...c<ETX>	Label string
LO position number	Set label Origin
LT pat num(,pat length)	Line type
NR	Not Ready

Table 10-2. HP-GL Instructions (Continued)

INSTRUCTION	DEFINITION
OA	Output Actual pos
OB	Output Box dimen
OC	Output Command pos
OD	Output Digit. Pt
OE	Output Error
OF	Output Factors
OG	Output count num
OH	Output Hard-clip limit
OI	Output ID
OK	Output funct key
OL	Output Length
OO	Output Options
OP	Output P1 & P2
OS	Output Status
OT	Output Carousel
OW	Output Window
PA x,y(,x,y(,...))	Plot Absolute
PB	Plot Buffer label
PD (x,y(,...))	Pen Down
PG n	Advance page
PM n	Enable polygon
PR x,y(,x,y(,...))	Plot relative
PT thickness	Select pen thick
PU (x,y(,...))	Pen Up
RA x,y	Fill Rect Abs
RL n	Front-panel lock
RO n	Rotate coord sys
RP n	Replots buffer
RR x,y	Fill Rect rel
SA	Select Alt set
SC Xmin,Xmax,Ymin,Ymax	User-unit scaling
SG group number	Select pen group
SI width,height	Abs char size
SL tan(angle)	Character Slant
SM c	Symbol Mode
SP pen number	Select Pen
SR width,height	Relative char size
SS	Select Std Set
TL tp(,tn)	Set tick length
UC (pen control,)x,y(,pen control)(,...)	User-def char
UF gap1(,gap2,...gap20)	User-def fill type
VA	Adaptive Velocity
VN	Normal Velocity
VS pen velocity(,pen num)	Set Velocity
WD c...c<ETX>	Write to Display
WG radius,start angle,sweep angle(,chord)	Fill wedge-circle
XT	Draw X-axis tick
YT	Draw Y-Axis tick

Table 10-3. HP-GL/2 Instructions

MNEMONIC AND PARAMETERS	DEFINITION
AA x_center,y_center,sweep_angle(,chord)	Arc Absolute
AC (x_coordinate,y;_coordinate)	Anchor Corner
AD (kind, value...(,kind, value));	Alternate Font Definition
AR x_incr,y_incr,sweep_angle(,chord)	Arc Relative
AT x_inter,y_inter,x_end,y_end(chord_angle)	Absolute Arc Three Point
BJ	Begin Job
BP	Begin Picture
CF (fill_mode(,edge_pen));	Character Fill Mode
CI radius (,chord_angle);	Circle
CP spaces,lines	Character Plot
CT n	Chord Tolerance Mode
DC	Digitize Clear
DF	Default Values
DI run,rise	Abs label direct
DL char number(,pen cont),x,y(,...)	Downloadable char
DP	Digitize point
DR run,rise	Rel label direct
DT (lbterm (,mode));	Define label terminator
DV (path (,line));	Define Variable Text Path
EA x_coordinate,y_coordinate;	Edge rectangle absolute
EC (n)	Enable Cutter
EJ	End Job
EP	Edge Polygon
ER x_increment,y_increment;	Edge Rectangle Relative
ES (width,height);	Extra Space
EW radius,start_angle,sweep_angle(,chord)	Edge Wedge
FP	Fill Polygon
FR	Advance Frame
FT (fill_type(,option1(,option2)))	Fill Type
IN (n);	Initialize
IP (p1x,p1y(,lp2x,lp2y));	Input P1 and P2
IR (p1x,p1y(,lp2x,lp2y));	Input Relative P1 and P2
IW (xLL,yLL,xUR,yUR);	Input Window
LA (kind, value...(,kind, value));	Line Attributes
LB (char...(char))lbterm	Label
LO (position);	Label Origin
LT (line_type(,pattern_length(,mode)))	Line type
MC	Merge Control
MG	Message
MT	Media Type
NR	Not Ready

Table 10-2. HP-GL/2 Instructions (Continued)

MNEMONIC AND PARAMETERS	DEFINITION
OD	Output Dig. Pt. and Pen Status
OE	Output Error
OH	Output Hard-clip limit
OI	Output ID
OP	Output P1 & P2
OS	Output Status
PA (x,y...(,x,y));	Plot Absolute
PB	Plot Buffer label
PD (x,y(,...))	Pen Down
PE (flag(val)|coord_pair...(flag(val)|coord_pair));	Polyline Encoded
PF	Plot Fitting
PG (n);	Advance Full Page
PM polygon_definition;	Polygon Mode
PR (x,y...(,x,y));	Plot Relative
PS	Plot Size
PT thickness	Select pen thick
PU (x,y...(,x,y));	Pen Up
PW (width,(,pen));	Pen Width
RA (x_coordinate,y;_coordinate);	Fill Rectangel Absolute
RF (index(,width,height,pen_nbr...pen_nbr));	Raster Fill Definition
RO (angle);	Rotate coordinate system
RP (n);	Replot
RR x_increment,y_increment;	Fill Rectangle relative
RT x_incr_inter,y_incr_inter, x_incr_end,y_incr_end(,chord_angle);	Relative Arc Three Point
SA	Select Alternate Font
SC (x1,x2,y1,y2(,type(,left,bottom))); or (x1,xfactor,y1,yfactor,2);	Scale
SD (kind,value...(,kind,value))	Standard Font Definition
SI (width,height);	Absolute Character Size
SL (tangent_of_angle);	Character Slant
SM (char);	Symbol Mode
SP (pen);	Select Pen
SR (width,height);	Relative Character Size
SS	Select Standard Font
ST	Sort
TD (mode);	Transparent Data
UL (index(,gap1...gapn));	User-defined Line Type
WG radius,start_angle,sweep_angle(,chord_angle);	Fill Wedge
WU (type);	Pen Width Unit Selection

Table 10-4. Mnemonics

MNEMONIC	DEFINITION
ALE	ADDRESS LATCH ENABLE
APE	AUTOMATIC POLL ENABLE
ATN	ATTENTION
CA	CONTROLLER ACTIVE
CLK	CLOCK
COMPEN	COMPARATOR ENABLE
COMPX	COMPARATOR X FEEDBACK SIGNAL
COMPY	COMPARATOR Y FEEDBACK SIGNAL
CS	CHIP SELECT
CTS	CLEAR TO SEND
DAC	DATA ACCEPTED
DAV	DATA AVAILABLE
DIO	DATA INPUT/OUTPUT
DMAACK	DIRECT MEMORY ACCESS ACKNOWLEDGE
DMAREQ	DIRECT MEMORY ACCESS REQUEST
DSA	DIGITAL SIGNATURE ANALYSIS
DSR	DATA SET READY
DTR	DATA TERMINAL READY
EA	EXTERNAL ADDRESS
EOI	END OR IDENTIFY
EXT	EXTERNAL
FP	FRONT PANEL
GEC	GRAPHIC ENHANCEMENT CARTRIDGE
HP-GL	HEWLETT-PACKARD GRAPHICS LANGUAGE
HP-IB	HEWLETT-PACKARD INTERFACE BUS
IFC	INTERFACE CLEAR
INT	INTERRUPT
MOTXA	MOTOR X-AXIS A DRIVE SIGNAL
MOTXB	MOTOR X-AXIS B DRIVE SIGNAL
MOTYA	MOTOR Y-AXIS A DRIVE SIGNAL
MOTYB	MOTOR Y-AXIS B DRIVE SIGNAL
NDAC	NOT DATA ACCEPTED
NMOS	N-CHANNEL METAL OXIDE SEMICONDUCTOR
NRFD	NOT READY FOR DATA

Table 10-4. Mnemonics (Continued)

MNEMONIC	DEFINITION
PCA	PRINTED CIRCUIT ASSEMBLY
PPL	PARALLEL POLL LATCH
PPWM	POWER SUPPLY PULSE WIDTH
PS	MODULATOR
PS	POWER SUPPLY
COMP	POWER SUPPLY COMPARATOR
PWM	PULSE WIDTH MODULATOR
RD	READ
REN	READ ENABLE
RFD	READY FOR DATA
RLS	RECEIVED LINE SIGNAL
RLSD	RECEIVED LINE SIGNAL DETECTOR
RPNL	REAR PANEL
RS	REGISTER SELECT
RST	RESET
RXD	RECEIVED DATA
SC	SYSTEM CONTROLLER
SRQ	SERVICE REQUEST
TAD	TRACKING ANALOG TO DIGITAL
TE	TALKER ENABLE
T/R	TRANSMIT/RECEIVE
TXD	TRANSMITTED DATA
VLSI	VERY LARGE SCALE INTEGRATION
WE	WRITE ENABLE
WR	WRITE
XTAL	CRYSTAL

Table 10-5. Organizational Abbreviations

ABBREVIATION	FULL NAME
ANSI	American National Standards Institute
CCITT	International Telegraph and Telephone Consultative Committee
EIA	Electronics Industries Association
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization

10-9. GLOSSARY

10-10. The following is a list of terms with associated definitions. These terms are used throughout this manual.

Accumulator: One or more registers associated with the ALU which temporarily store sums and other arithmetical and logical results of the ALU.

ALU (Arithmetic Logic Unit): The ALU performs various forms of addition and subtraction. The logic mode performs such logic operations as ANDing the contents of two registers or masking the contents of a register.

Asynchronous: Operation of a switching network by a free-running signal which signals successive instructions; the completion of one instruction triggering the next. There is no fixed time per cycle.

Baud Rate: A measure of data flow. The number of signal elements per second based on the duration of the shortest element.

Bidirectional: A term applied to a port or bus line that can be used to transfer data in either direction.

Buffer: A circuit inserted between other circuit elements to prevent interactions, match impedances, supply additional drive capability, or delay rate of information flow. Buffers may be inverting or non-inverting.

Bus Driver: An integrated circuit which is added to the data bus system to facilitate proper drive to the CPU when several memories are tied to the data bus line. These are necessary because of capacitive loading which slows down the data rate and prevents proper time sequencing of microprocessor operation.

Byte: Indicates a predetermined number of consecutive bits treated as an entity.

Clock: A generator of pulses which controls the timing of switching circuits in a microprocessor.

Control Block: This is the circuitry which performs the control functions of the CPU. It is responsible for decoding microprogrammed instructions and generating the internal control signals that perform the operations requested.

CPU (Central Processing Unit): The processing circuitry of the microprocessor which is made up of storage elements called registers, computational circuits in the ALU, the Control Block, and I/O.

DART (Dual Asynchronous Receiver Transmitter): A dual channel serial to parallel, parallel to serial converter/controller used in the asynchronous mode. It also provides modem control for both channels.

Data Bus: The microprocessor communicates internally and externally by means of the data bus. It is bidirectional and can transfer data to and from the CPU, memory storage, and peripheral devices.

Decrement: A programming instruction which decreases the contents of a storage location.

Dedicated: To set apart for some special use. For example, a ROM is a dedicated memory.

DMA (Direct Memory Access): A method of gaining direct access to main storage to achieve data transfer without involving the CPU.

EEPROM (Electrically Erasable Programmable ROM): Manufactured with a transparent quartz lid covering the silicon die to facilitate erasure with an ultraviolet irradiation instrument. Programming will not degrade after exposure to other light sources.

Execution Time: The time expressed in clock cycles, necessary to carry out an instruction.

Firmware: Software instructions which have been permanently frozen into a ROM.

Flag Bit: An information bit which indicates some form of demarcation has been reached such as overflow or carry. Also an indicator of special conditions such as interrupts.

Flow Chart or Flow Diagram: A graphic representation for the definition, analysis, or solution of a problem, in which symbols are used to represent operations, data, flow, and equipment.

Hardware: Any piece of data processing equipment or the individual components of a circuit, both passive and active.

Hardwired Logic: The interconnection of numerous integrated circuits representing the logic elements.

Instruction Set: Constitutes the total list of instructions that can be executed by a given microprocessor and provides the basic information necessary to assemble a program.

Interface: A common boundary between adjacent components, circuits, or systems. The interface enables the devices to yield and acquire information from one another.

Interrupt: An interrupt involves the suspension of the normal programming routine of a microprocessor in order to handle a sudden request for service.

Interrupt Mask: Prevents the CPU from responding to further interrupt requests until cleared by execution of programmed instructions.

I/O (Input/Output): Package pins which are tied directly to the internal bus network to enable I/O to interface the microprocessor with external elements.

Memory: The part of a system into which information can be inserted and held for future use.

Microprocessor: The semiconductor CPU is one of the principal components of the microcomputer. The elements of the microprocessor are frequently contained on a single chip but can be distributed over several separate chips.

Mnemonic Code: Groups of letters or symbols that suggest the definition of an instruction or the name of a signal.

MOS (Metal-Oxide Semiconductor): In MOS technology, amplification or switching is accomplished by applying a signal voltage to a gate electrode. The resulting electrostatic field creates a conduction channel between the two defused regions in the silicon crystal structure called the source and the drain.

Multiplexing: A process of transmitting more than one signal at a time over a single link, route, or channel.

Parallel Operation: Processing all the digits of a word or byte simultaneously by transmitting each digit on a separate channel or bus line.

Polling: The method used to identify the source of interrupt requests.

Port: Device terminals that provide electrical access to a system or circuit.

Program: A procedure for solving a problem and frequently referred to as software.

Program Counter: One of the registers in the CPU which holds addresses necessary to step the machine through the program.

RAM (Random Access Memory): Provides rapid access to any storage location point in the memory immediately by means of vertical and horizontal coordinates. Information may be "written" in or "read" out in the same way.

Register: A register is a memory on a smaller scale. The words stored in it may involve arithmetical, logical, or transferral operations.

ROM (Read-Only Memory): Information is stored permanently and is read out, but not altered in operation.

Scratch pad: This term is applied to information that the processing unit stores or holds temporarily. It is a memory containing subtotals for various unknowns which are needed for final results.

Software: The programs, routines, and languages used by a programmer to communicate with the computer.

Storage: The word storage is used interchangeably with memory.

Subroutine: Part of a master routine which may be used at will in a variety of master routines.

Throughput: The speed with which problems or segments of problems are performed.

CHAPTER 11

PRODUCT HISTORY

11-1. INTRODUCTION

11-2. This chapter describes the differences between earlier models of the HP 7595/6 and the latest version documented in this manual. These earlier models are identified by their serial number prefix, and the date codes on their printed-circuit assemblies (PCAs). For ease of reference this chapter is divided into two major topics; History of Serial Number Prefix and History of Printed Circuit Assemblies.

11-3. HISTORY OF ASSEMBLIES BY SERIAL NUMBER PREFIX

11-4. Table 11-1 is a quick-reference table that lists, by plotter serial number prefix, the assemblies that differ from those documented in this manual. Also referenced are Item Numbers under which these differences are described in this chapter.

11-5. Table 11-2 lists the assemblies that are described under each Item.

11-6. Knowing the serial number prefix of the plotter, the user can see in Table 11-1 which assemblies are documented in this chapter. In Table 11-2 the user can see if more than one change has been made to the assembly in question and which Items in this chapter to refer to.

11-7. HISTORY OF PRINTED-CIRCUIT ASSEMBLIES

11-8. Hewlett-Packard's printed-circuit assemblies have three major identification features:

a. Part Number. PCAs having the same part number are directly interchangeable. If a PCA is revised in any way that makes it non-interchangeable with previously issued PCAs of the same part number, a new part number is assigned to the revised PCA.

b. Revision Letter. This letter identifies the most recent revision to the etched circuit pattern. The original issue is identified with the letter A. If the master artwork for a printed circuit board is revised in order to alter performance or manufacture, the revision letter is changed to the next letter in the alphabetical sequence.

c. Assembly Date Code. The date code on the PCA is a four-digit number which identifies the assembly level by date code. The PCA date code is changed when a component or component part number is changed which alters the performance of the PCA. The first two digits represent the last two digits of the current year and are derived by subtracting 60 from the current year; the last two digits represent the week in that year, ie: 2702 = second week in 1987. Any digits following a hyphen in the date code represent the division that manufactured the PCA.

11-9. Table 11-3 is a quick-reference table that lists PCAs by part number and date code. Listed next to the part number and date code of the PCAs are the Items located in this section that describe the differences between the PCA in question and the level of that PCA described in the main body of this manual.

Table 11-1. Assembly Reference by Serial Number Prefix

SERIAL NUMBER PREFIX	ASSEMBLIES	ITEMS

NOTE: Assemblies designated with an asterisk (*) denote changes made during the plotter production cycle.

Table 11-2. Item Description

ITEM	ASSEMBLIES

Table 11-3. PCA Reference by Date Code

PCA PART NUMBER	PCA DATE CODE	REVISION LETTER	ITEM

CHAPTER 12
DIAGRAMS

12-1. INTRODUCTION

12-2. This chapter contains a test point table, engineering diagrams, mechanical drawings, and electrical drawings. These items should be used as an aid in troubleshooting and localizing plotter failures.

12-3. TEST POINTS

12-4. Table 12-1 lists all test points, their associated outputs, and their location.

Table 12-1. Analog Test Points

TEST POINT	LOCATION
+5V	A1C40
+12V	A1C15
-12V	A1CR2
+15V	A1CR3
+42V	A1R21
+85V	A1R21
ANALOG GROUND	A1C2

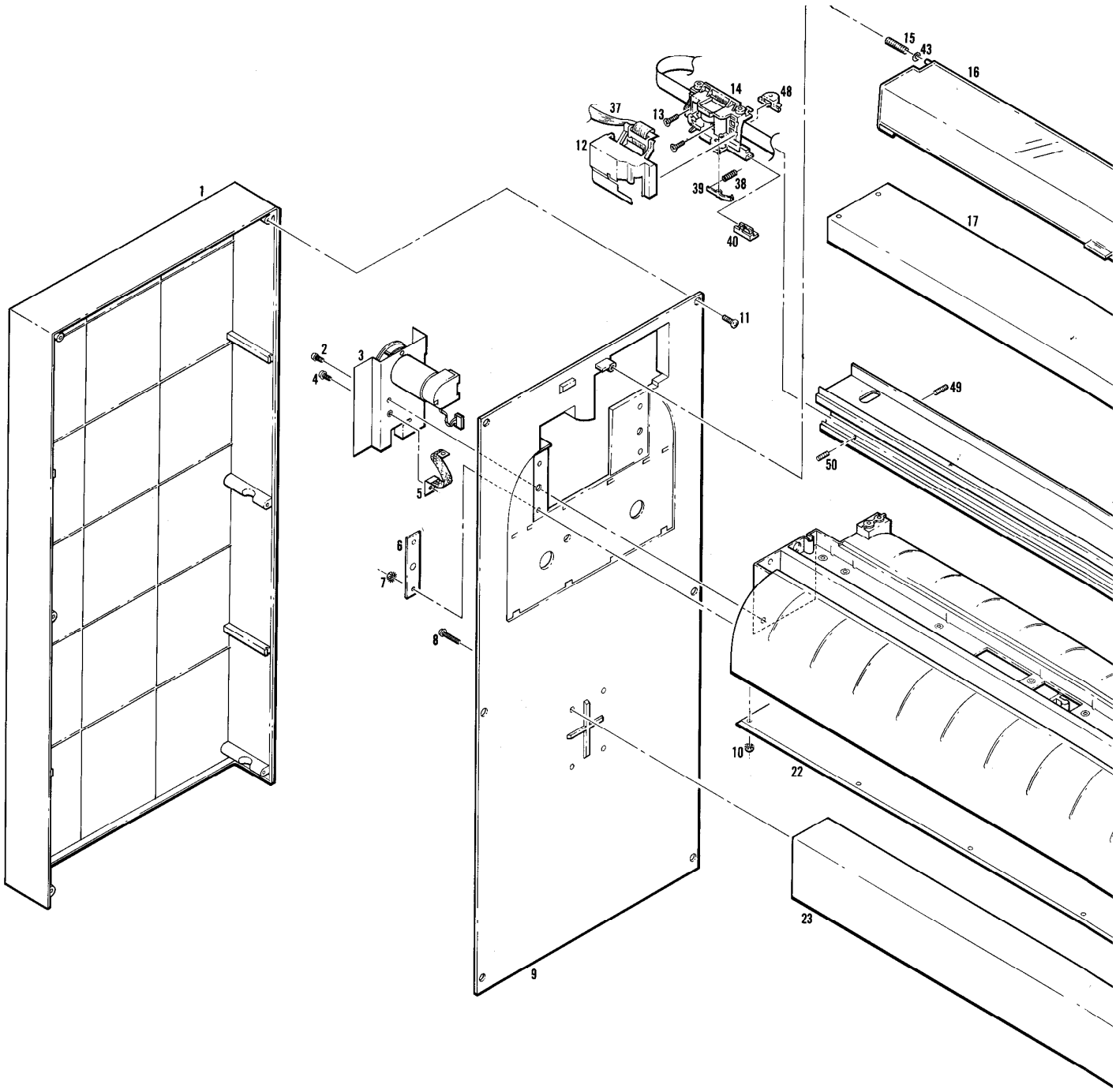
12-5. ENGINEERING DIAGRAMS

12-6. MECHANICAL DIAGRAMS

12-7. Figures 12-1 through 12-12 contain the Illustrated Parts Breakdown (IPB) for each major mechanical assembly of the HP 7595/6.

12-8. ELECTRICAL DIAGRAMS

12-9. Component Location Diagrams for the Processor PCA and the Analog PCA are contained in Figures 12-13 and 12-14. The functional block diagram is shown in Figure 12-15.


1
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50

NOTE:
REFER TO THE PARTS LIST ON PAGE 9-7.

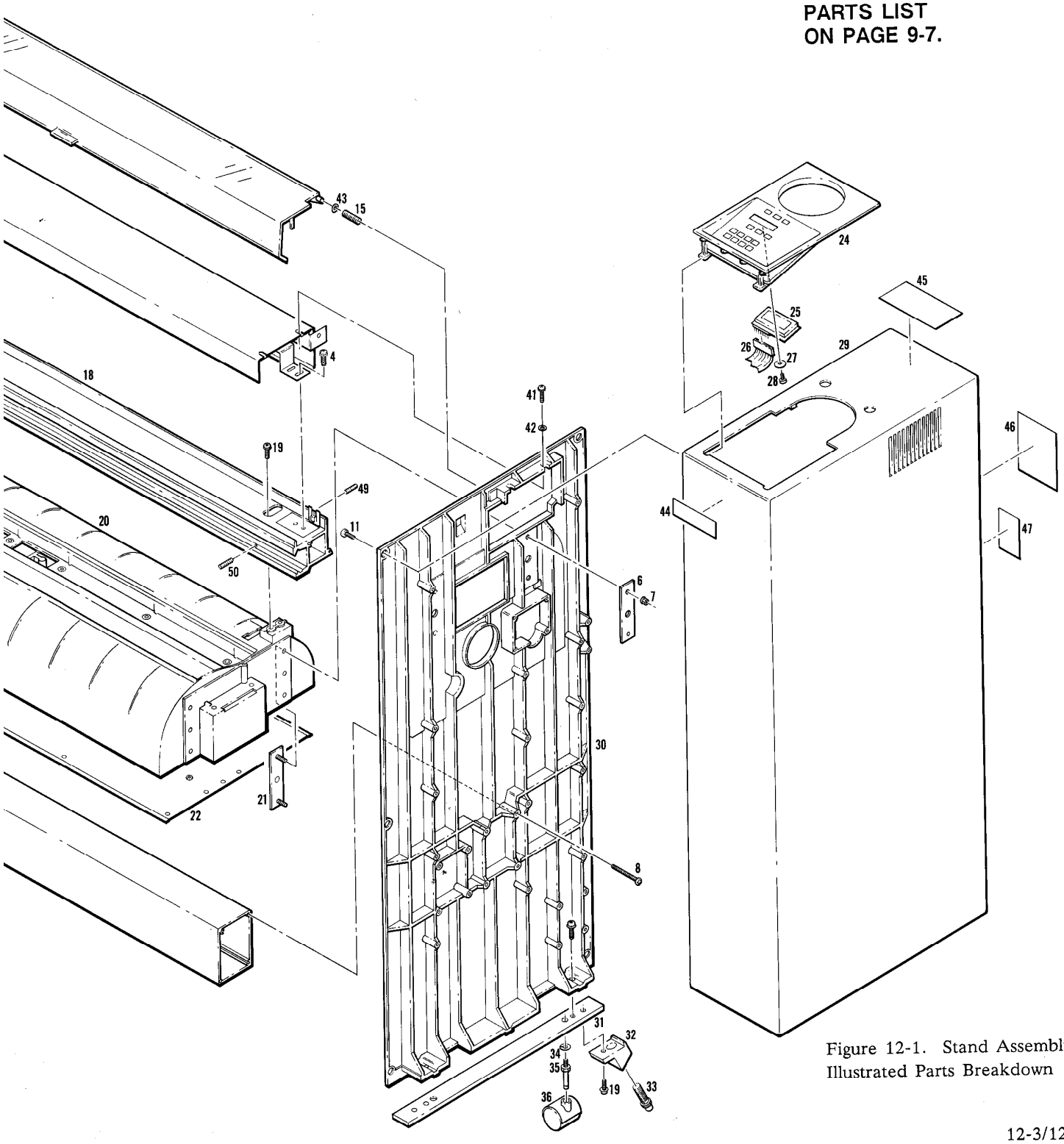
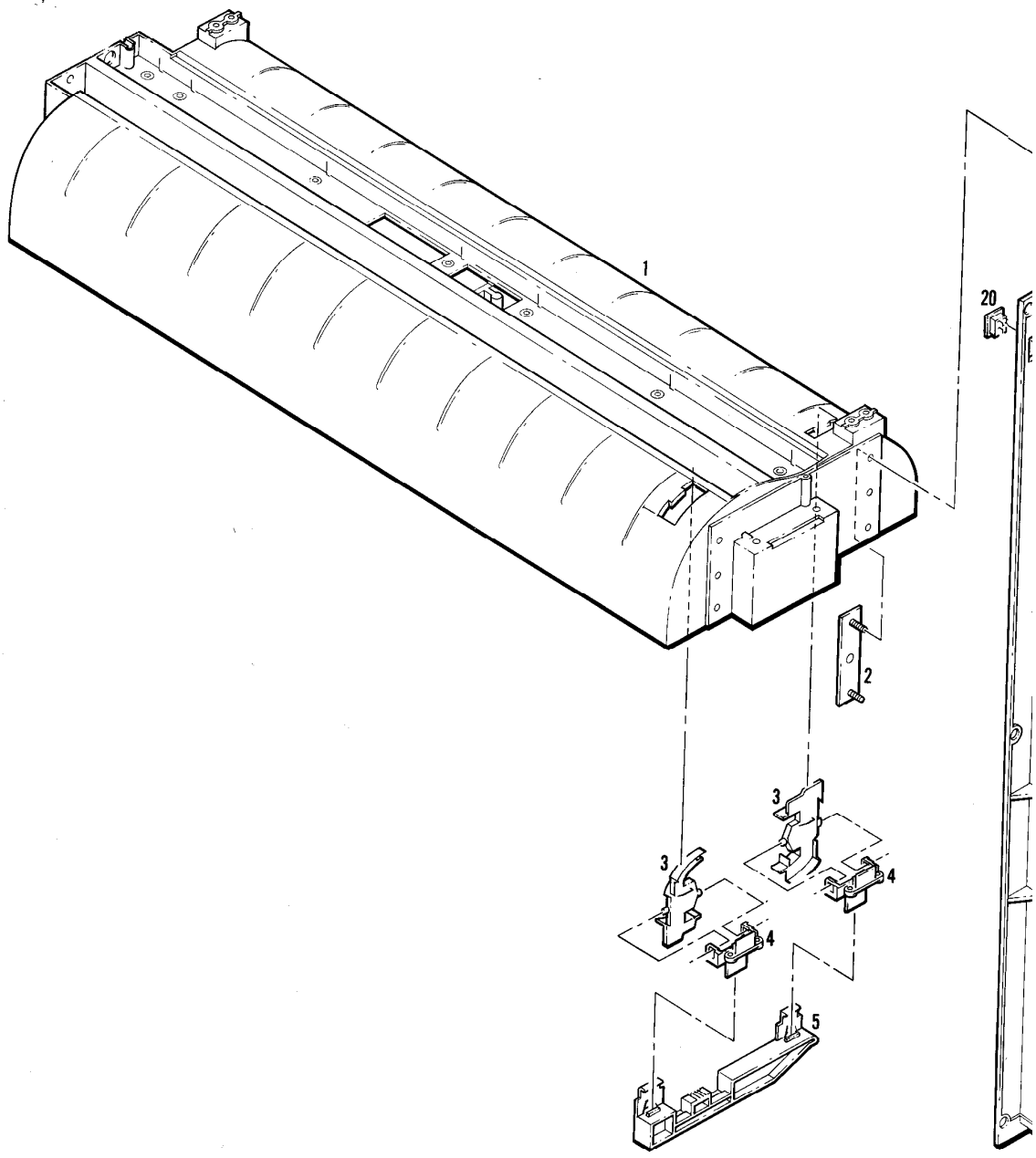
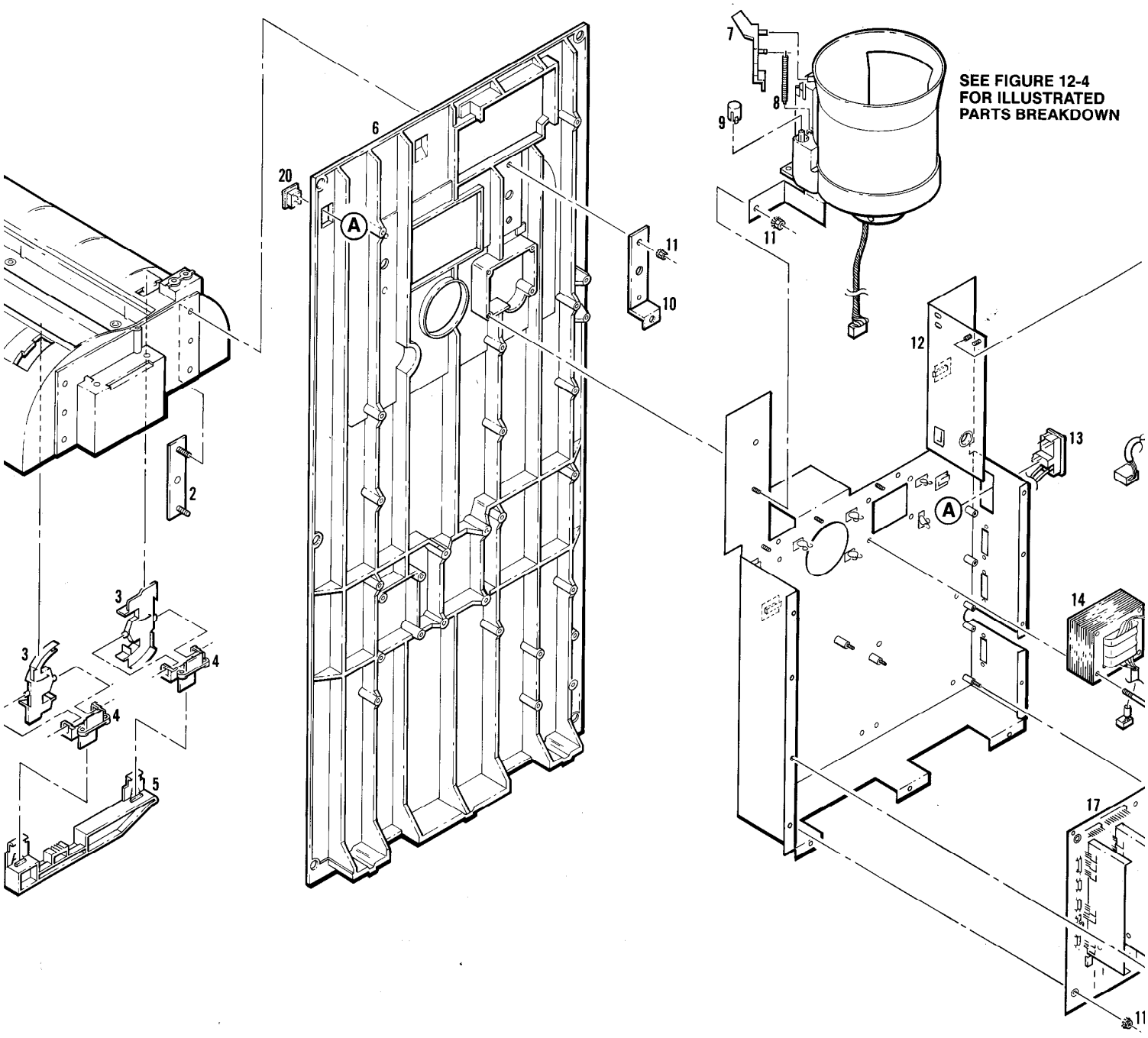
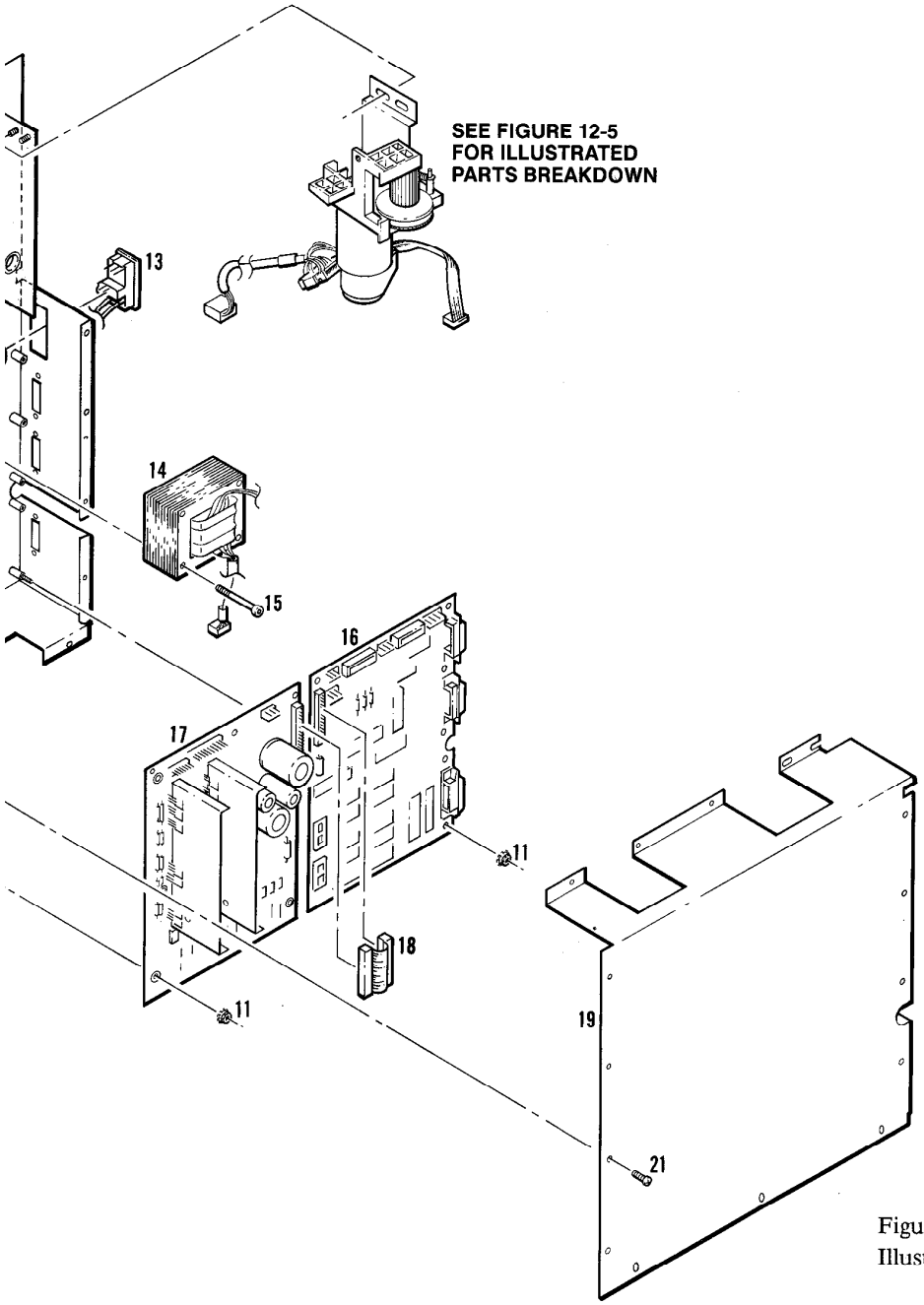


Figure 12-1. Stand Assembly, Illustrated Parts Breakdown


1
2
3
3
4
4
5
20

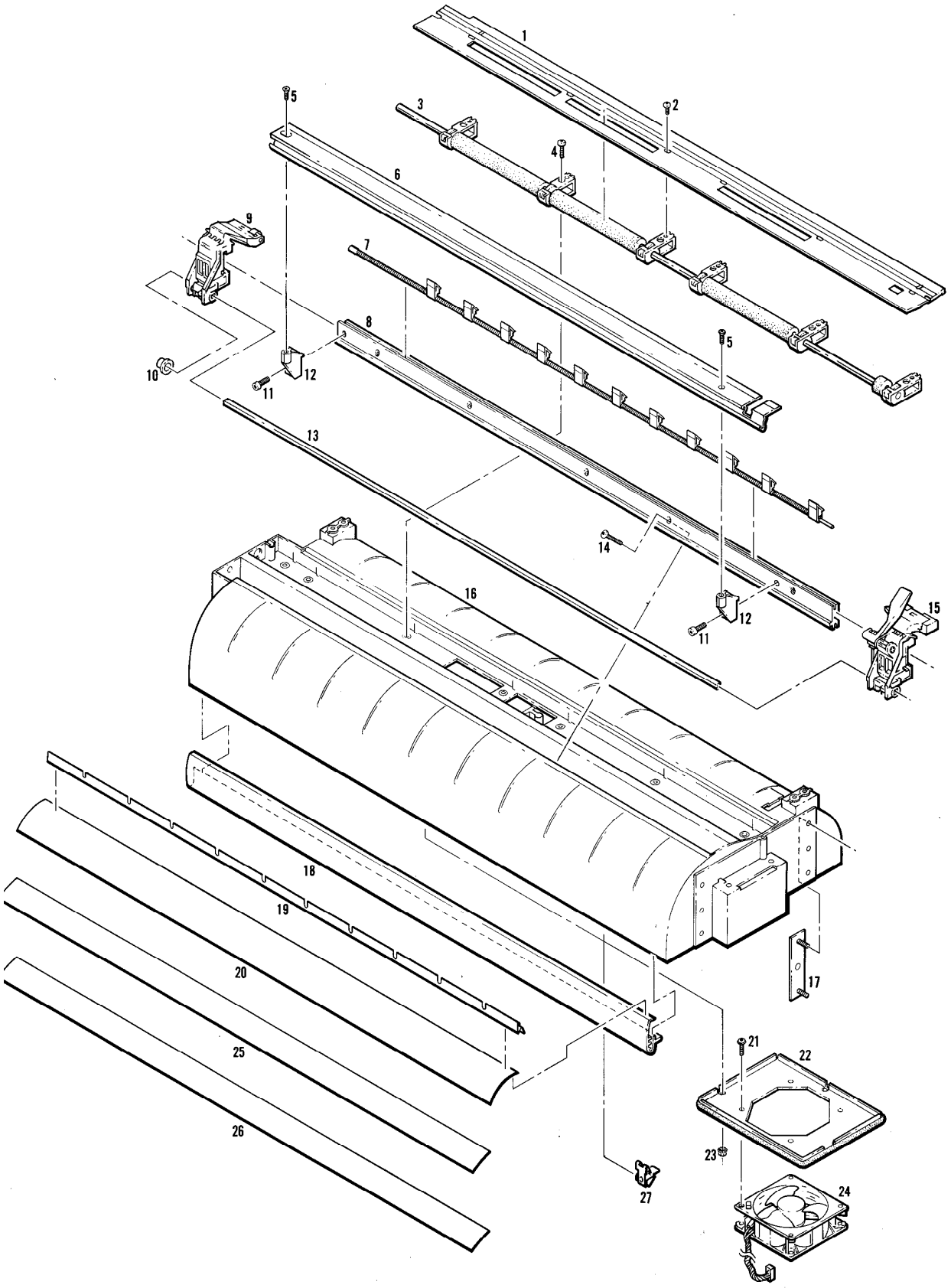

SEE FIGURE 12-4
FOR ILLUSTRATED
PARTS BREAKDOWN
20
6
7
8
9
11
10
12
13
2
3
4
5
14
17
A

SEE FIGURE 12-4
FOR ILLUSTRATED
PARTS BREAKDOWN



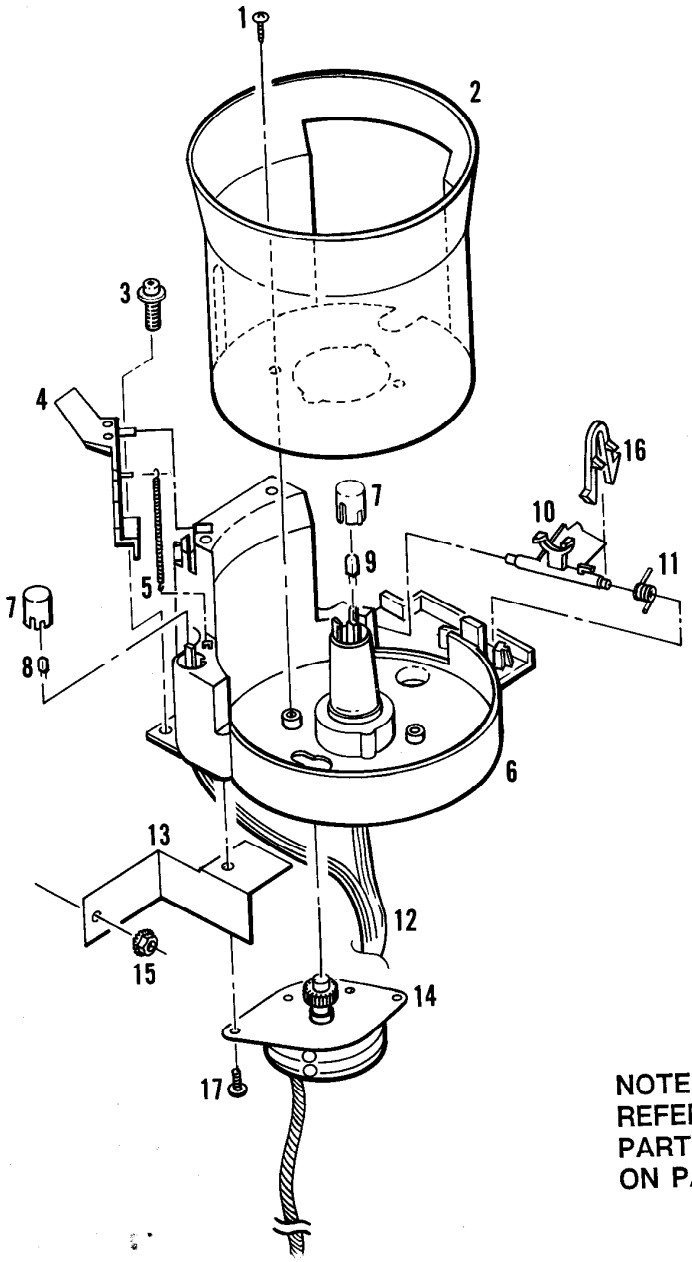
NOTE:
REFER TO THE
PARTS LIST
ON PAGE 9-8.

Figure 12-2. Right Side Exploded View, Illustrated Parts Breakdown



NOTE:
REFER TO T
PARTS LIST
ON PAGE 9-

Figure 12-3. I
Illustrated Part



NOTE:
REFER TO THE
PARTS LIST
ON PAGE 9-10.

Figure 12-4. Carousel Base Assembly, Illustrated Parts Breakdown

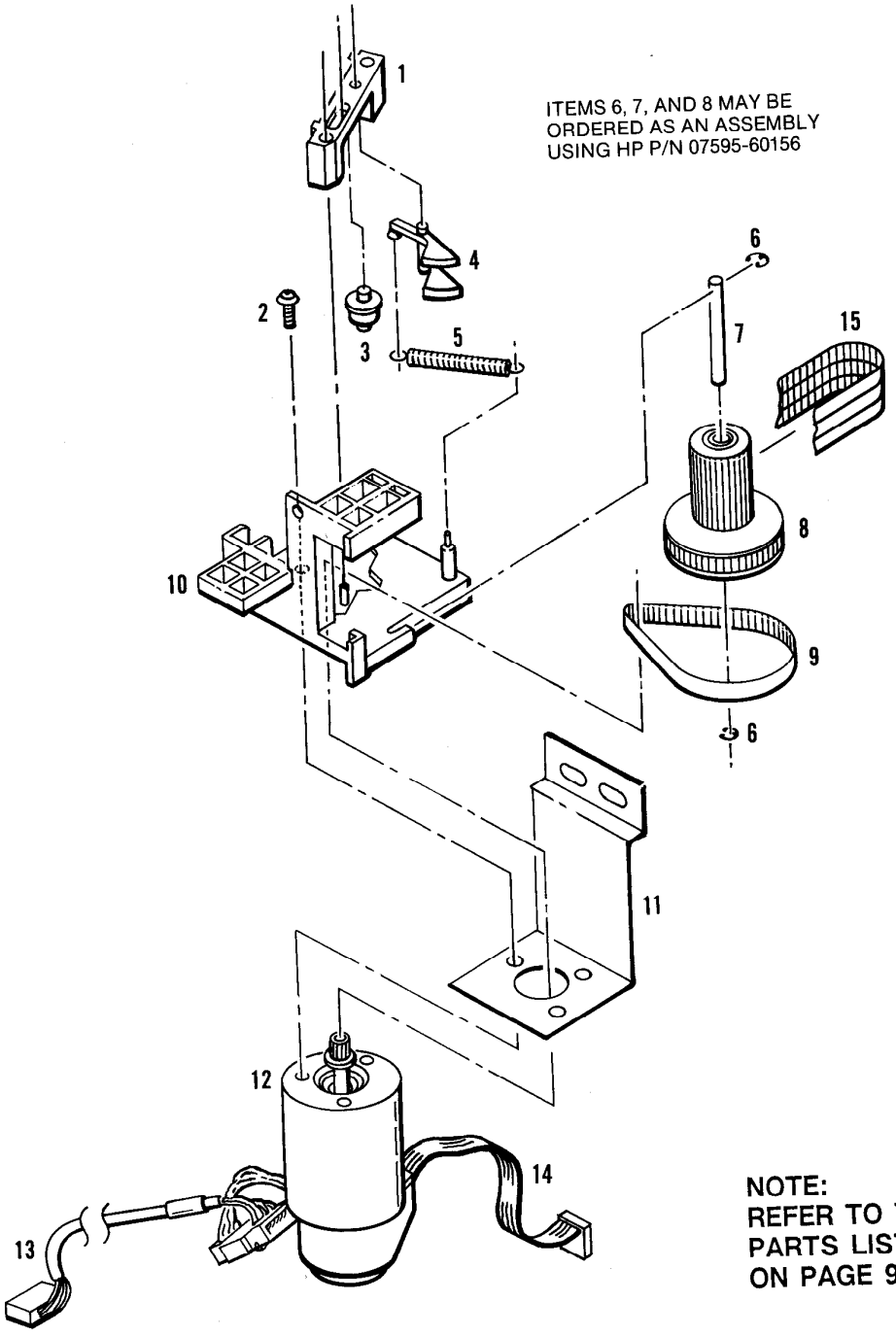


Figure 12-5. Pen Carriage Drive Assembly, Illustrated Parts Breakdown

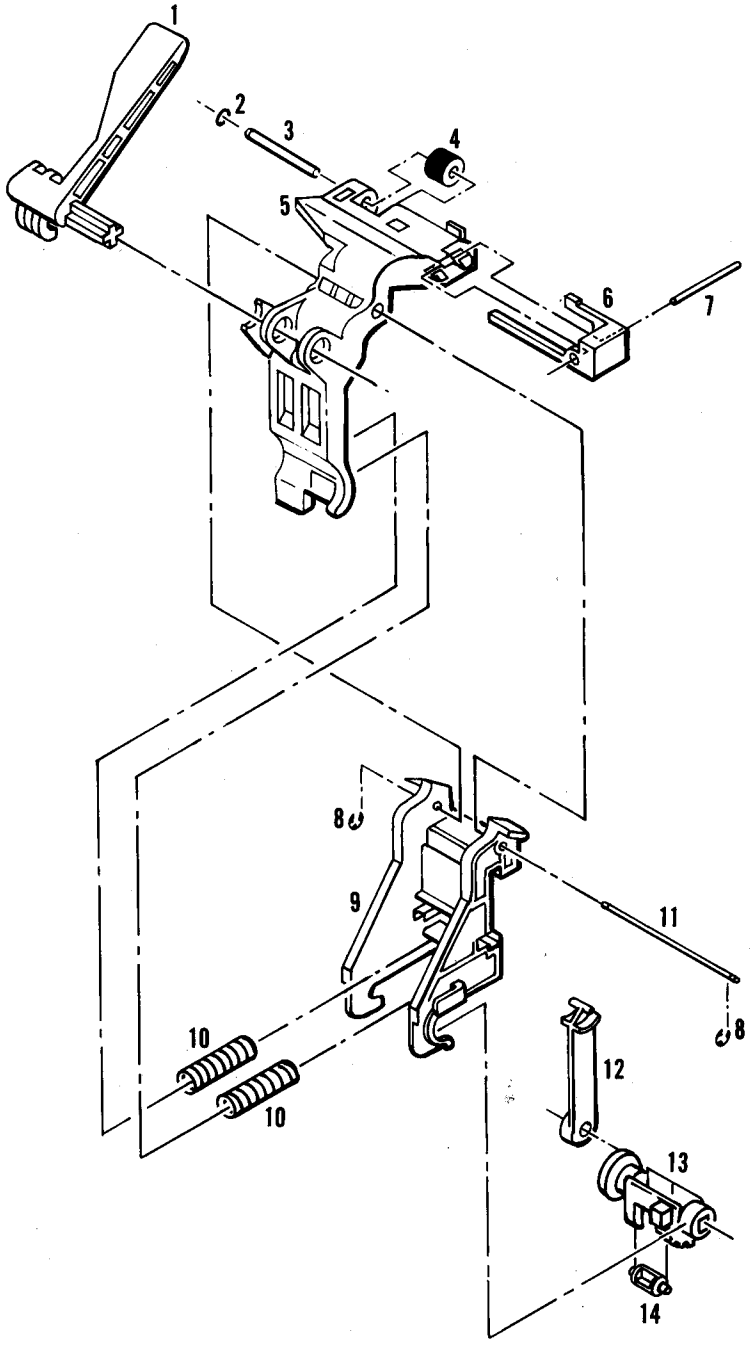
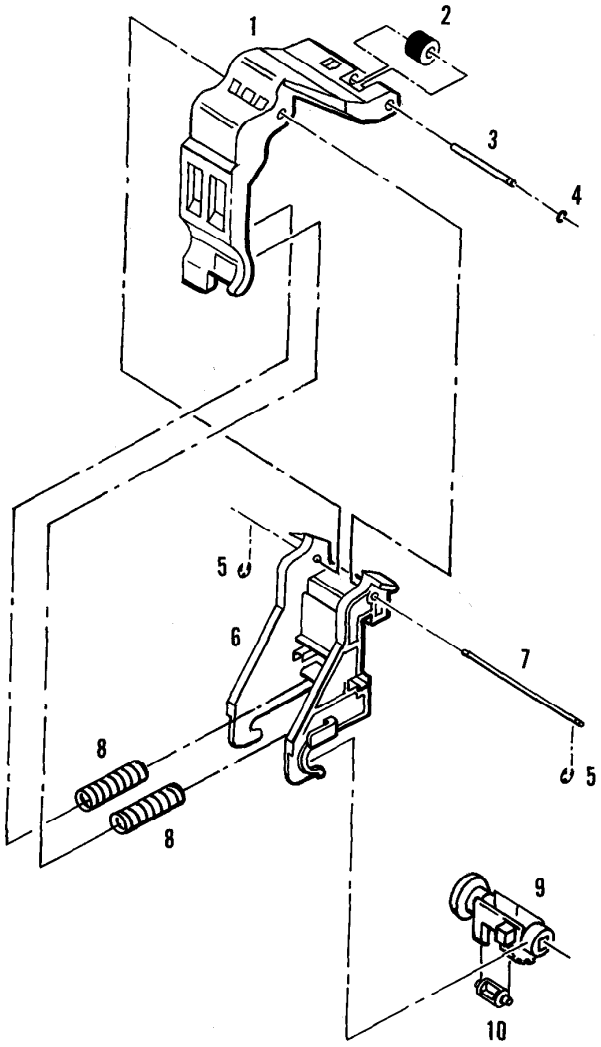


Figure 12-6. Lift Arm Assembly (RH), Illustrated Parts Breakdown



NOTE:
REFER TO THE PARTS LIST ON PAGE 9-12.

Figure 12-7. Lift Arm Assembly (LH), Illustrated Parts Breakdown

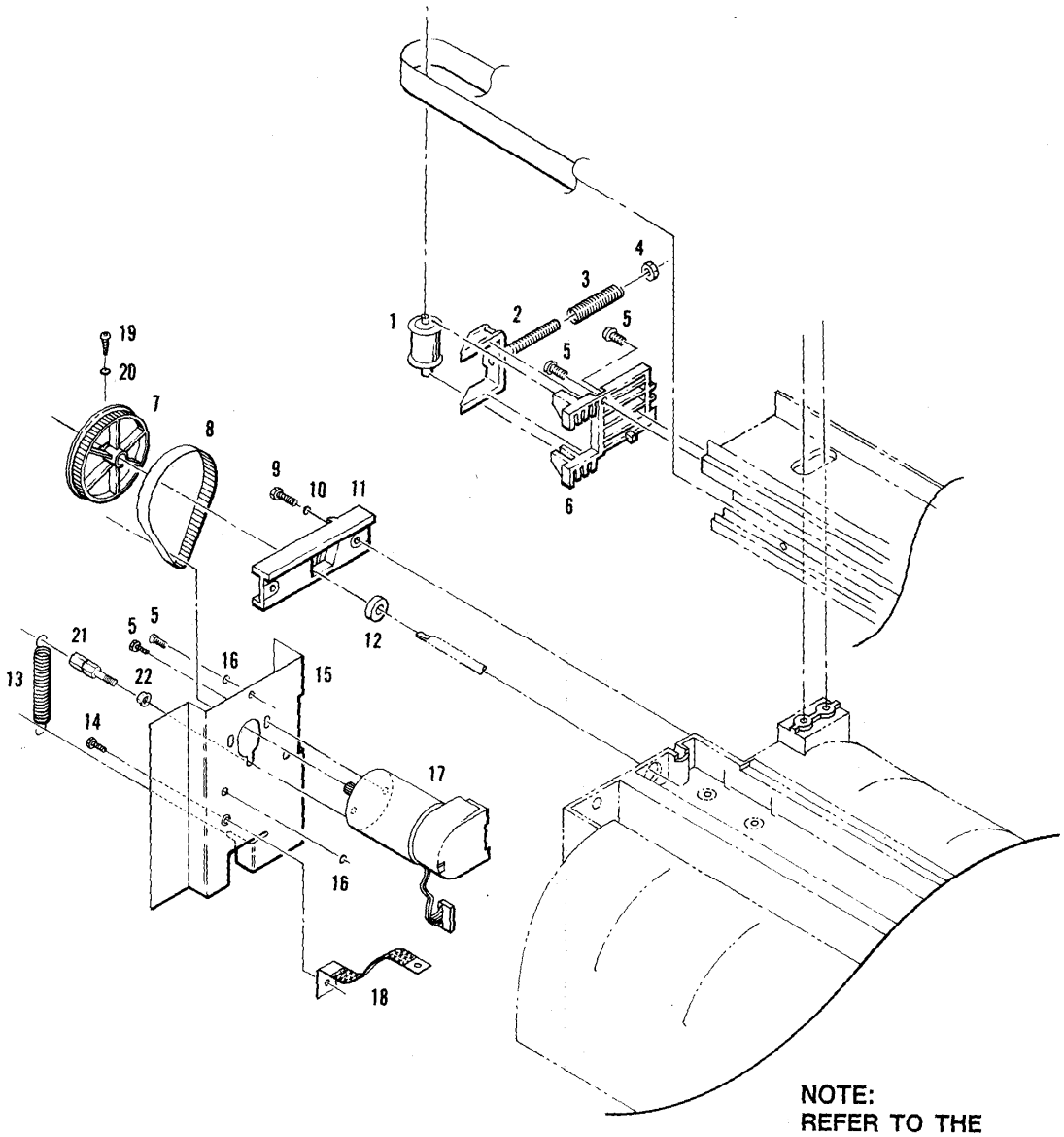
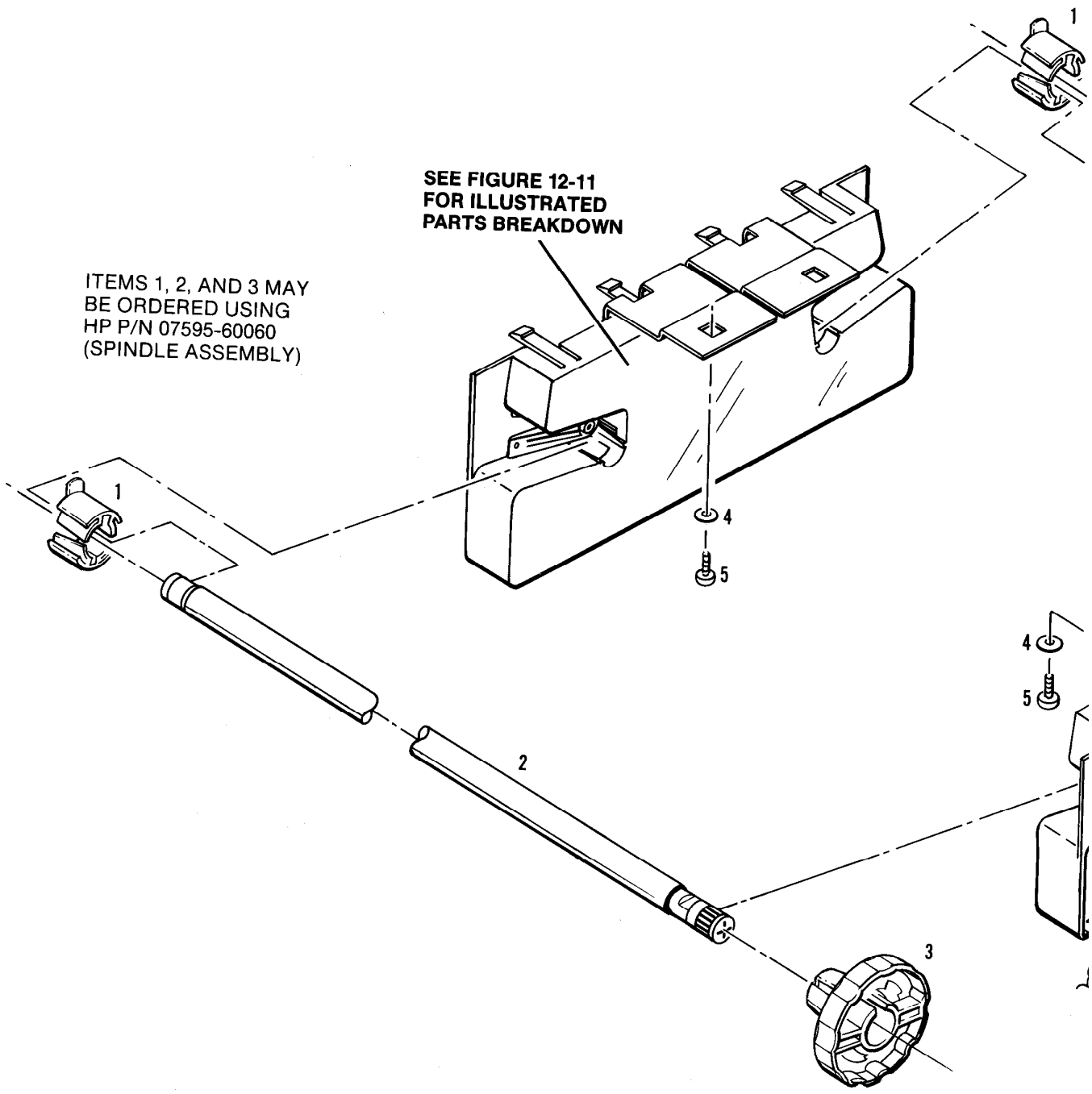


Figure 12-8. Grit Wheel Drive Assembly, Illustrated Parts Breakdown


SEE FIGURE 12-11
FOR ILLUSTRATED
PARTS BREAKDOWN
ITEMS 1, 2, AND 3 MAY
BE ORDERED USING
HP P/N 07595-60060
(SPINDLE ASSEMBLY)
1
1
2
3
4
5
4
5

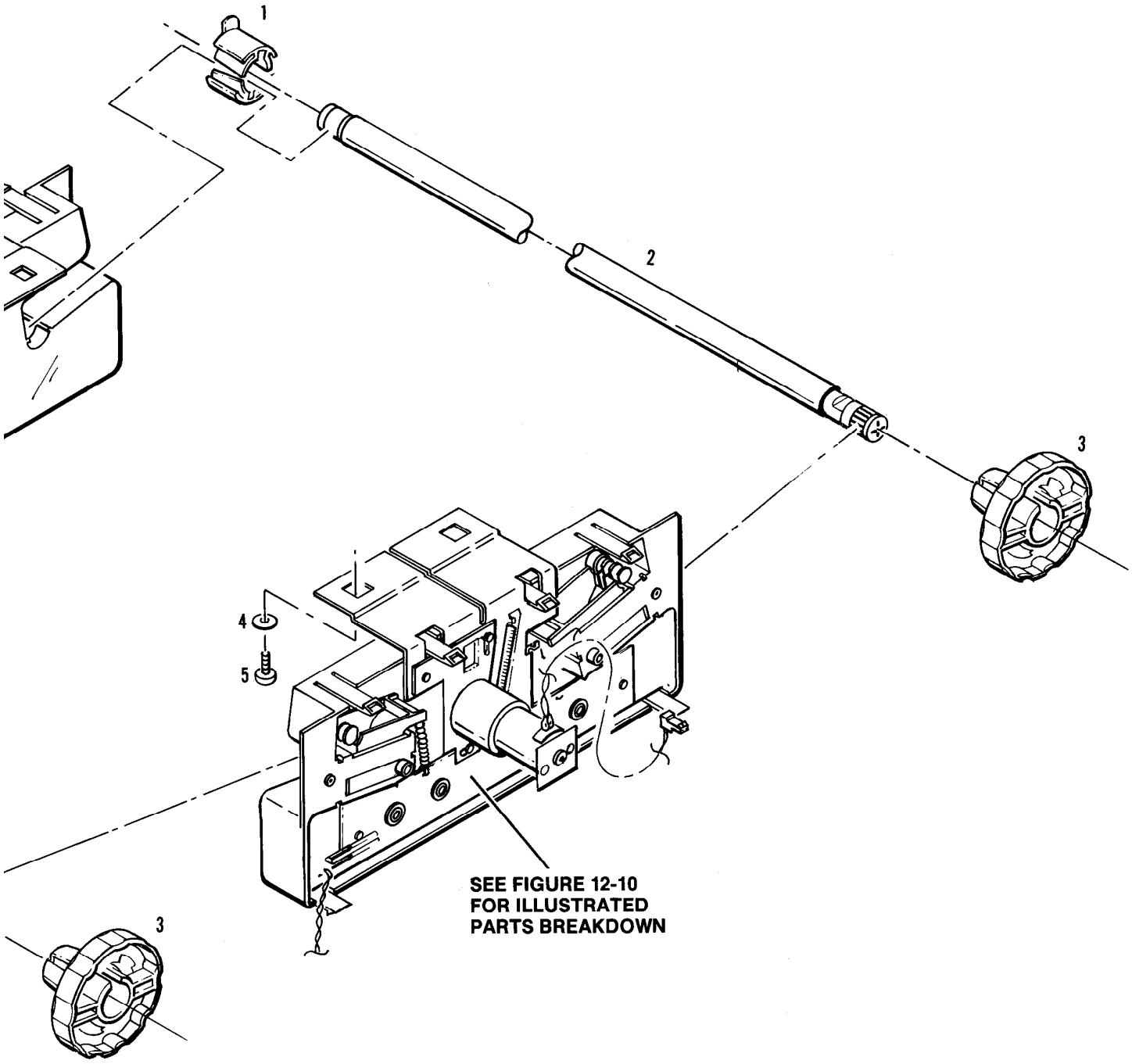
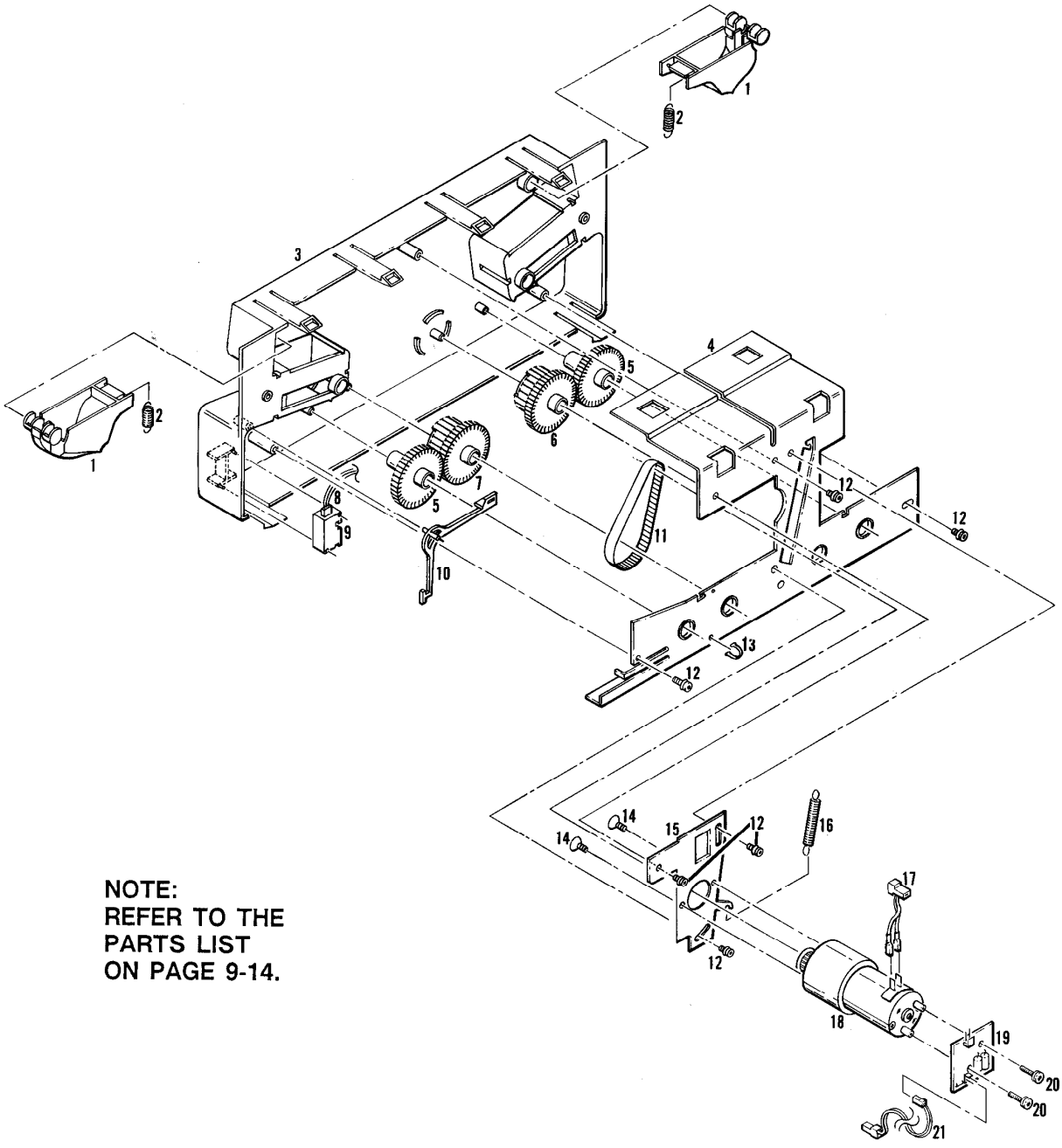


Figure 12-9. Roll Feed Assembly, Illustrated Parts Breakdown



NOTE:
REFER TO THE PARTS LIST ON PAGE 9-14.

Figure 12-10. Roll Feed Module Assembly (RH), Illustrated Parts Breakdown

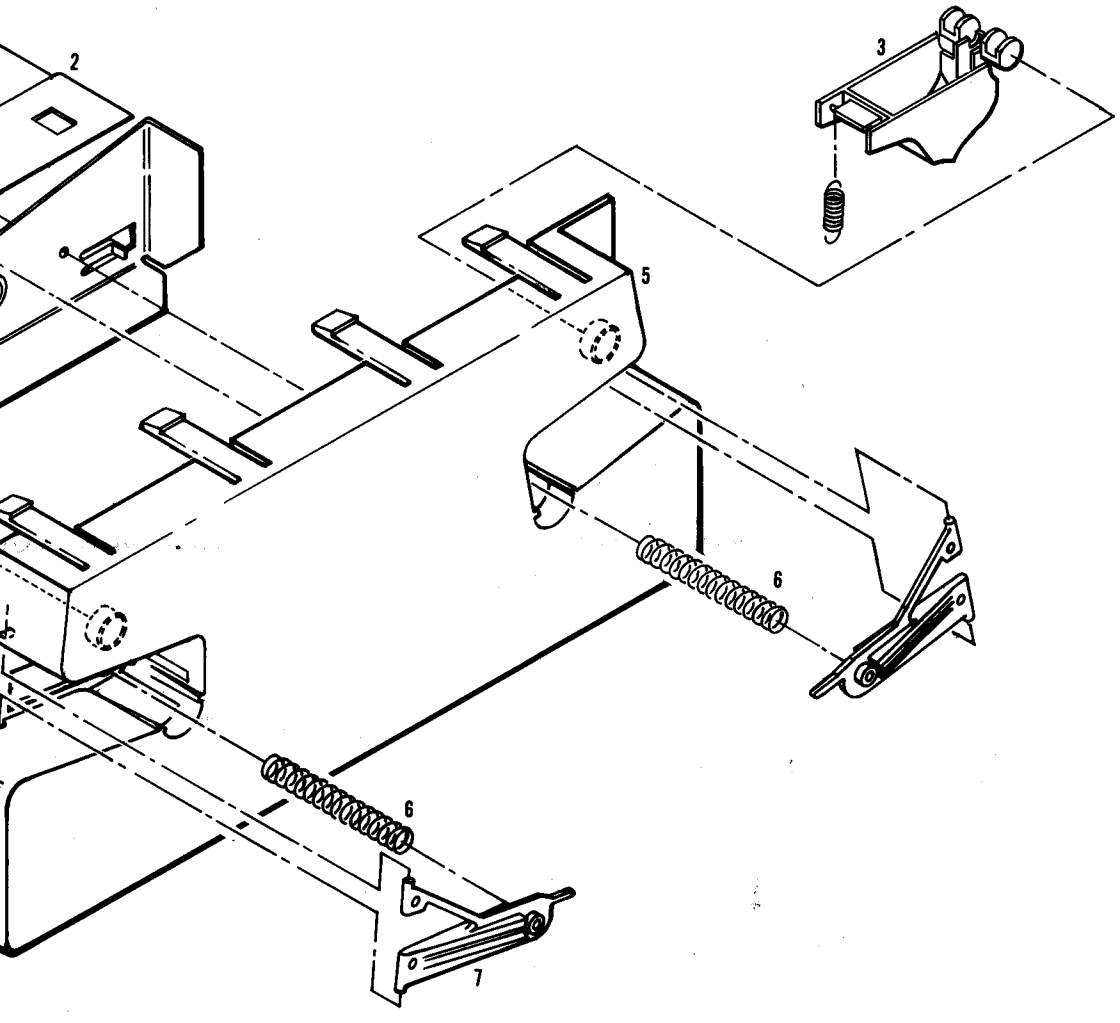


Figure 12-11. Roll Feed Module Assembly (LH), Illustrated Parts Breakdown

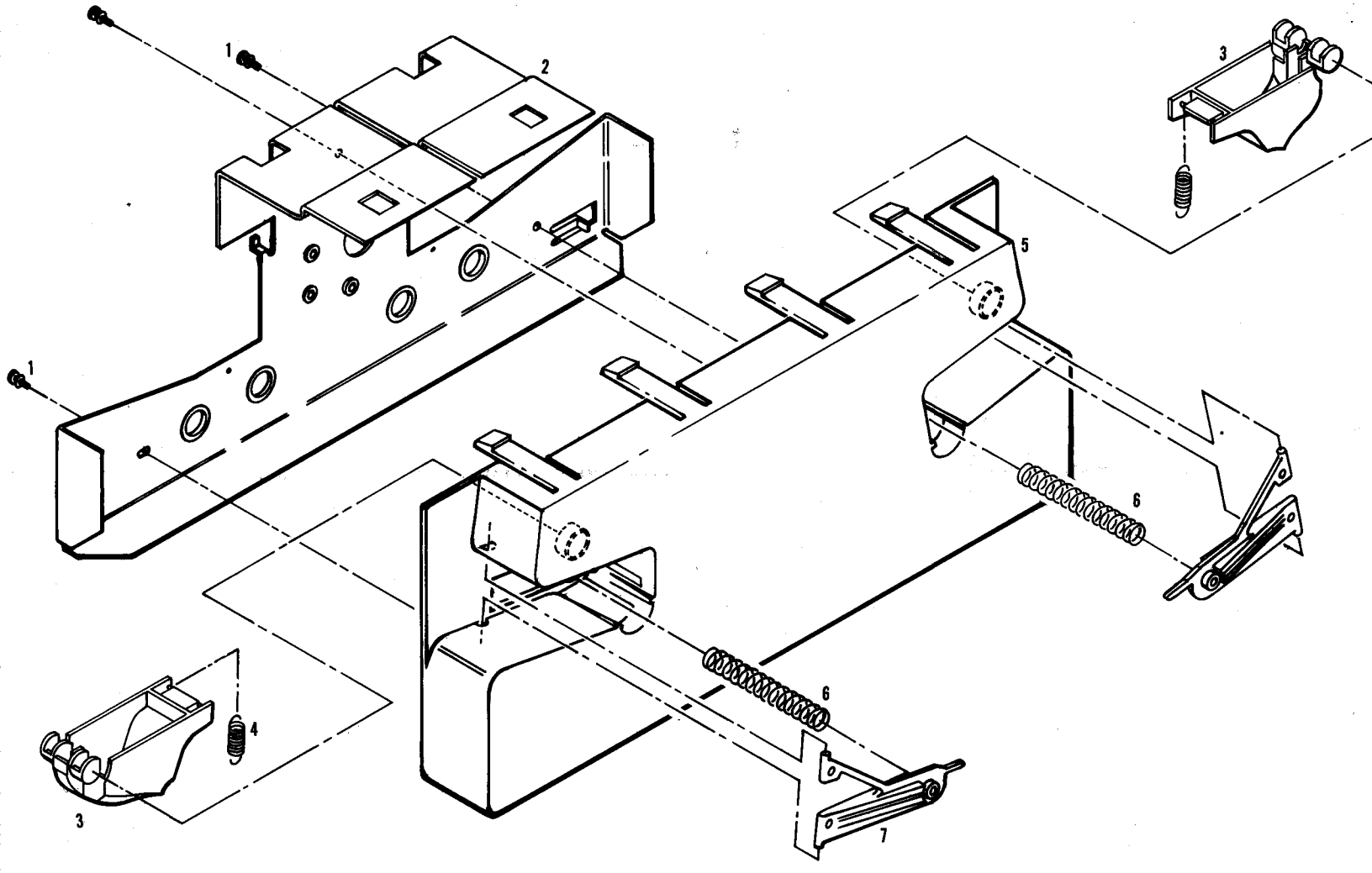


Figure 12-1

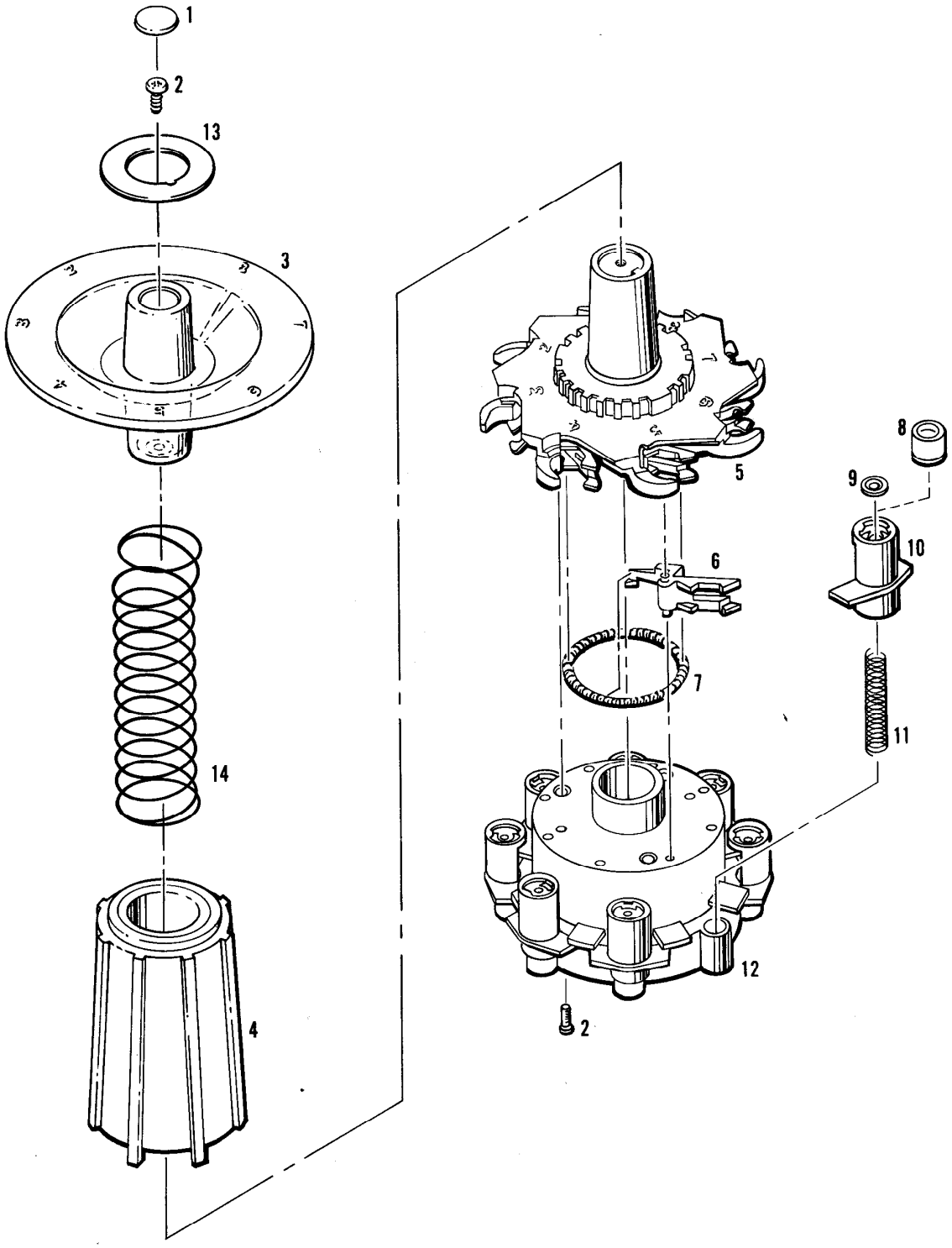
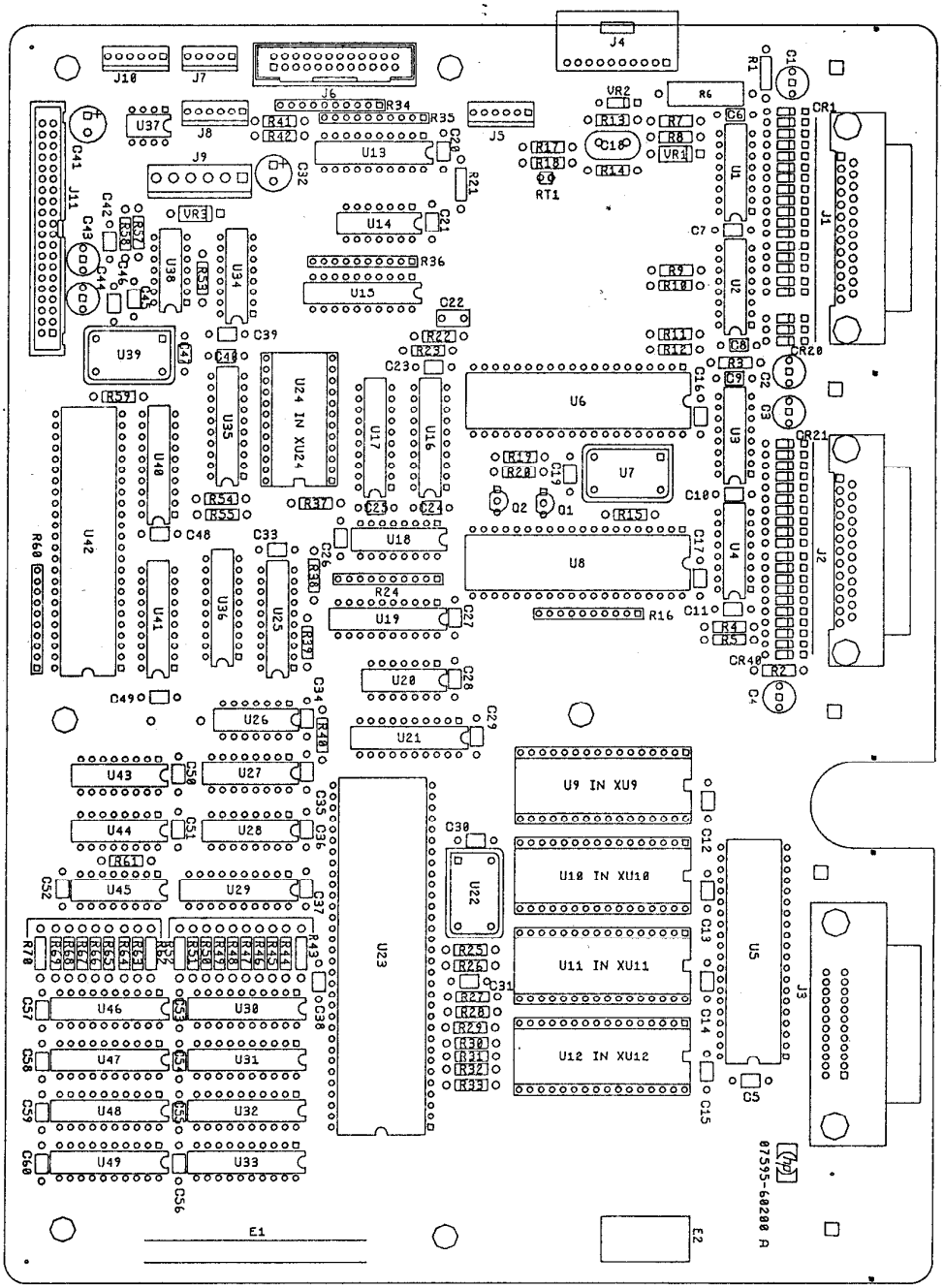


Figure 12-12. Pen Carousel Assembly, Illustrated Parts Breakdown



7595-A-103-1

Figure 12-13. Processor PCA A1, Component Location Diagram

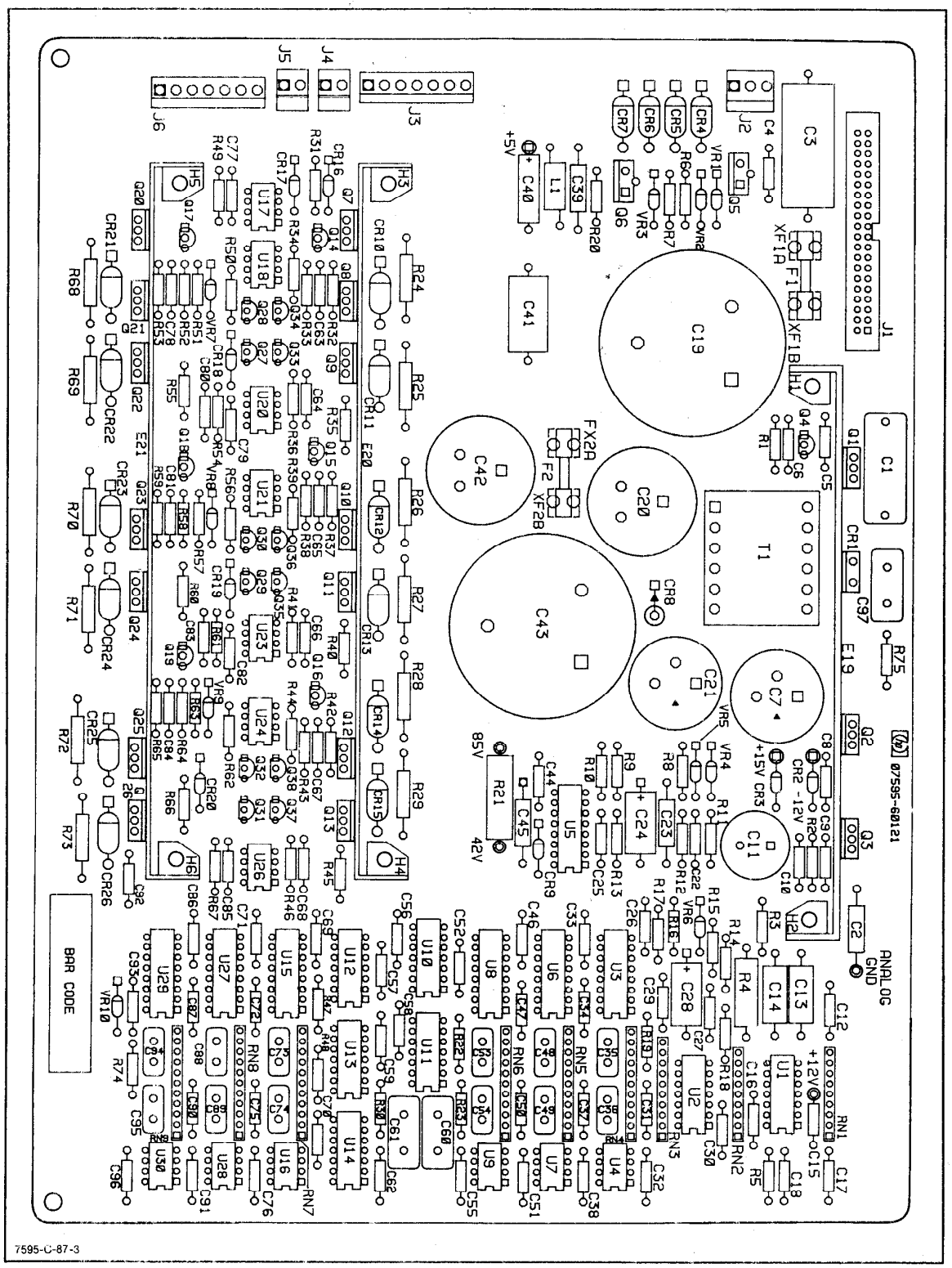
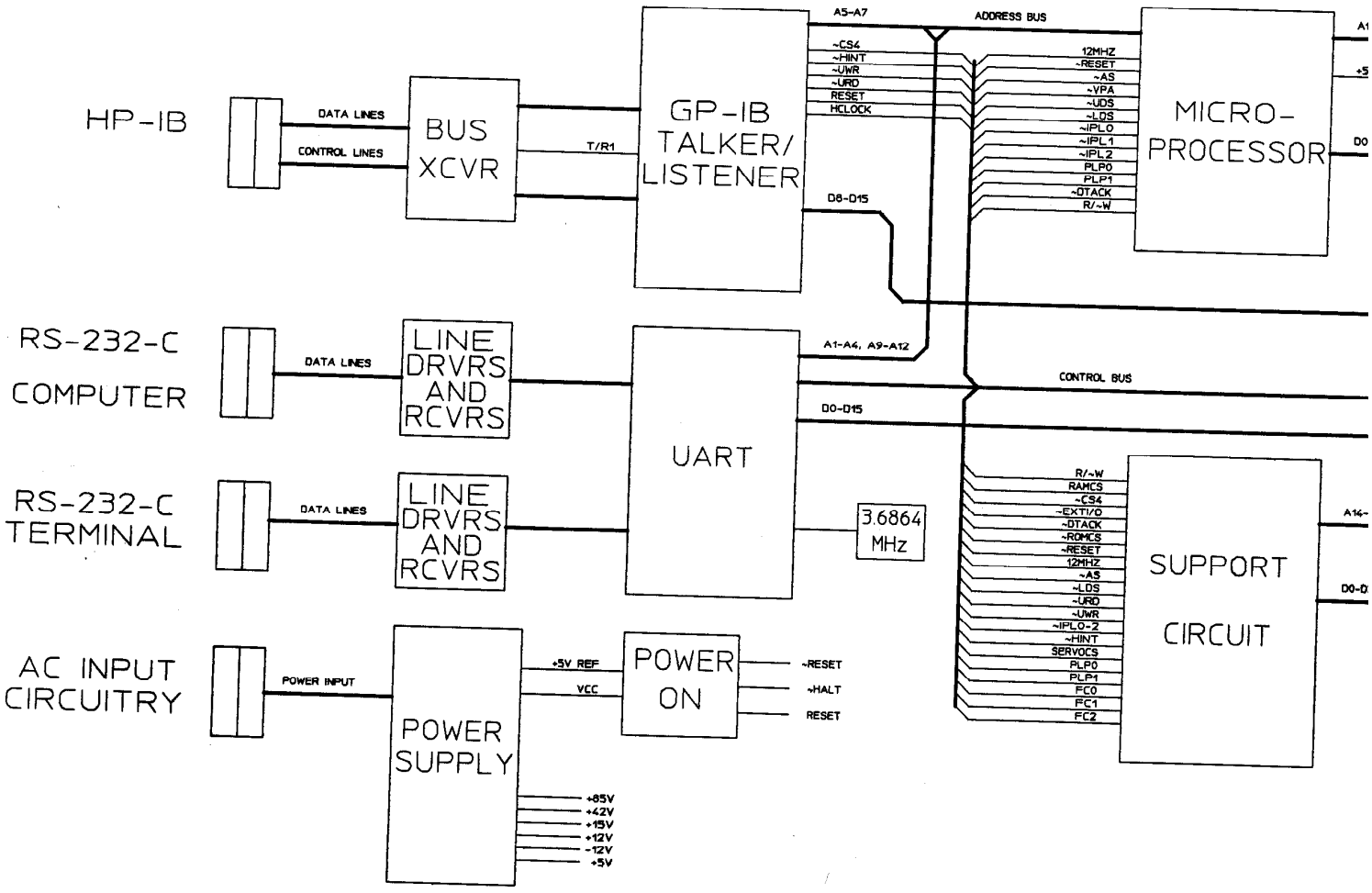
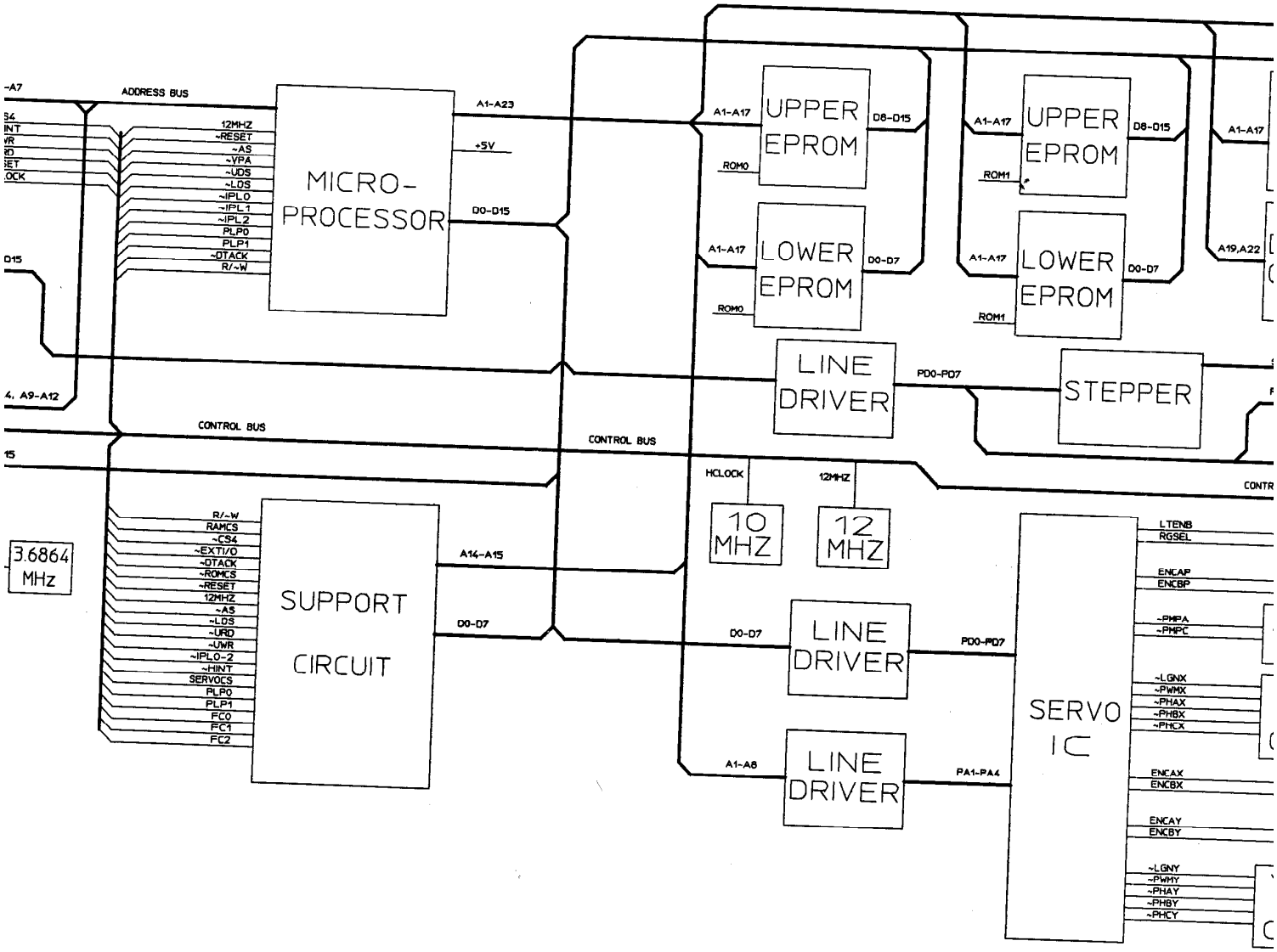
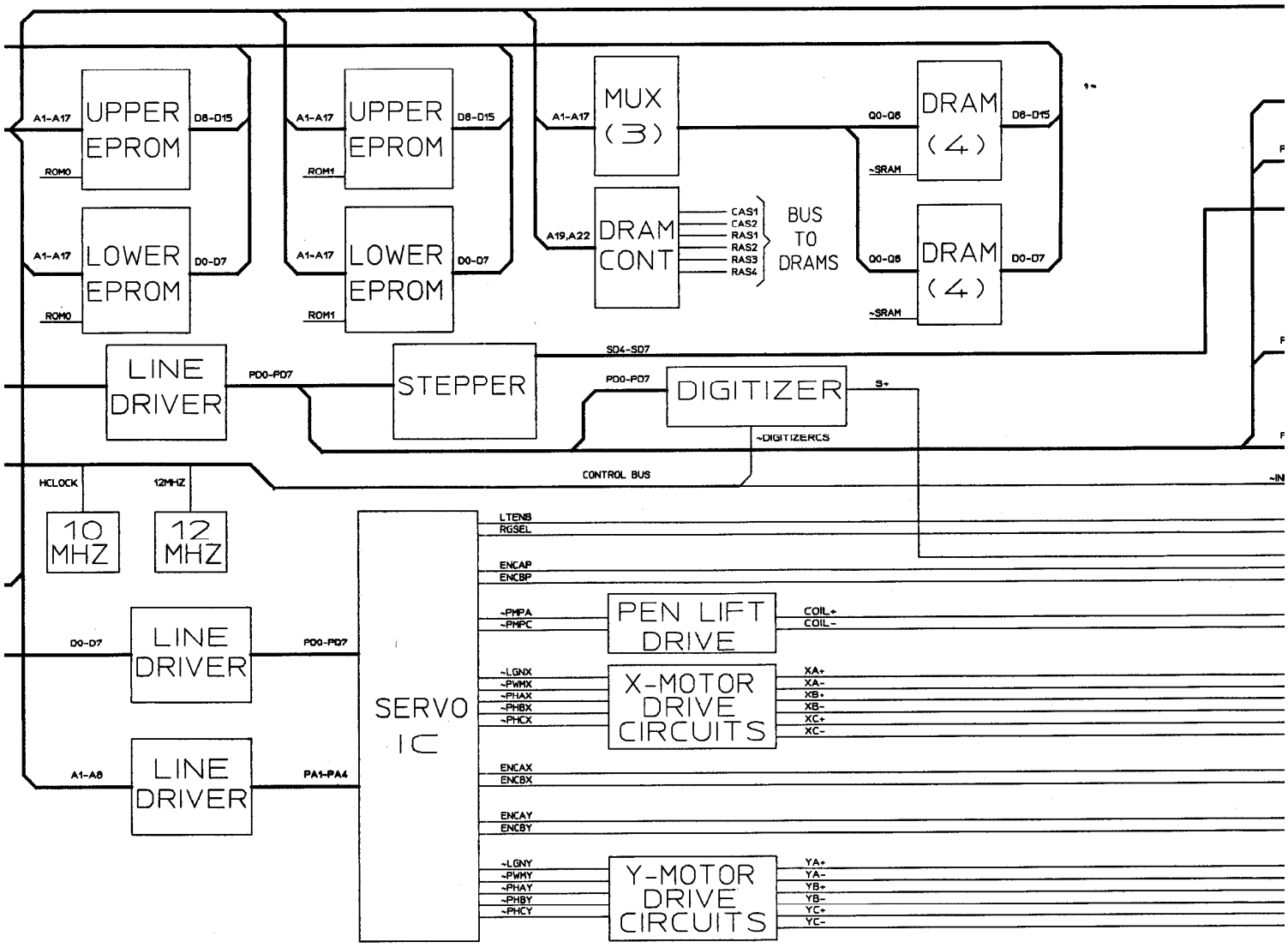


Figure 12-14. Analog PCA A2, Component Location Diagram


HP-IB
DATA LINES
CONTROL LINES
BUS XCVR
T/R1
GP-IB TALKER/ LISTENER
A5-A7
ADDRESS BUS
~CS4
~HINT
~UWR
~URD
RESET
HCLOCK
12MHZ
~RESET
~AS
~VPA
~UDS
~LDS
~IPL0
~IPL1
~IPL2
PLP0
PLP1
~DTACK
R/~W
D8-D15
MICRO-PROCESSOR
RS-232-C COMPUTER
DATA LINES
LINE DRVRS AND RCVRS
A1-A4, A9-A12
CONTROL BUS
D0-D15
UART
RS-232-C TERMINAL
DATA LINES
LINE DRVRS AND RCVRS
3.6864 MHz
R/~W
RAMCS
~CS4
~EXTI/O
~DTACK
~ROMCS
~RESET
12MHZ
~AS
~LDS
~URD
~UWR
~IPL0-2
~HINT
SERVOCS
PLP0
PLP1
FC0
FC1
FC2
SUPPORT CIRCUIT
AC INPUT CIRCUITRY
POWER INPUT
POWER SUPPLY
+5V REF
VCC
POWER ON
~RESET
~HALT
RESET
+85V
+42V
+15V
+12V
-12V
+5V


ADDRESS BUS
CONTROL BUS
CONTROL BUS
MICRO-
PROCESSOR
SUPPORT
CIRCUIT
3.6864
MHz
12MHZ
~RESET
~AS
~VPA
~UDS
~LDS
~IPL0
~IPL1
~IPL2
PLP0
PLP1
~DTACK
R/~W
R/~W
RAMCS
~CS4
~EXTI/O
~DTACK
~ROMCS
~RESET
12MHZ
~AS
~LDS
~URD
~UWR
~IPL0-2
~HINT
SERVOCS
PLP0
PLP1
FC0
FC1
FC2
A1-A23
+5V
D0-D15
A14-A15
D0-D7
A1-A17
UPPER
EPROM
ROM0
D8-D15
A1-A17
LOWER
EPROM
ROM0
D0-D7
A1-A17
UPPER
EPROM
ROM1
D8-D15
A1-A17
LOWER
EPROM
ROM1
D0-D7
A19,A22
LINE
DRIVER
PD0-PD7
STEPPER
HCLOCK
12MHZ
10
MHZ
12
MHZ
D0-D7
LINE
DRIVER
PD0-PD7
A1-A8
LINE
DRIVER
PA1-PA4
SERVO
IC
LTENB
RGSEL
ENCAP
ENCBP
~PMPA
~PMPC
~LGNX
~PWMX
~PHAX
~PHBX
~PHCX
ENCAX
ENCBX
ENCAY
ENCBY
~LGNY
~PWMY
~PHAY
~PHBY
~PHCY


A1-A17
UPPER EPROM
D8-D15
ROM0
A1-A17
LOWER EPROM
D0-D7
ROM0
A1-A17
UPPER EPROM
D8-D15
ROM1
A1-A17
LOWER EPROM
D0-D7
ROM1
A1-A17
MUX (3)
A19,A22
DRAM CONT
CAS1
CAS2
RAS1
RAS2
RAS3
RAS4
BUS TO DRAMS
Q0-Q8
DRAM (4)
D8-D15
~SRAM
Q0-Q8
DRAM (4)
D0-D7
~SRAM
LINE DRIVER
PD0-PD7
STEPPER
SD4-SD7
PD0-PD7
DIGITIZER
S+
~DIGITIZERCS
CONTROL BUS
HCLOCK
12MHZ
10 MHZ
12 MHZ
D0-D7
LINE DRIVER
PD0-PD7
A1-A8
LINE DRIVER
PA1-PA4
SERVO IC
LTENB
RGSEL
ENCAP
ENCBP
~PMPA
~PMPC
PEN LIFT DRIVE
COIL+
COIL-
~LGNX
~PWMX
~PHAX
~PHBX
~PHCX
X-MOTOR DRIVE CIRCUITS
XA+
XA-
XB+
XB-
XC+
XC-
ENCAX
ENCBX
ENCAY
ENCBY
~LGNY
~PWMY
~PHAY
~PHBY
~PHCY
Y-MOTOR DRIVE CIRCUITS
YA+
YA-
YB+
YB-
YC+
YC-

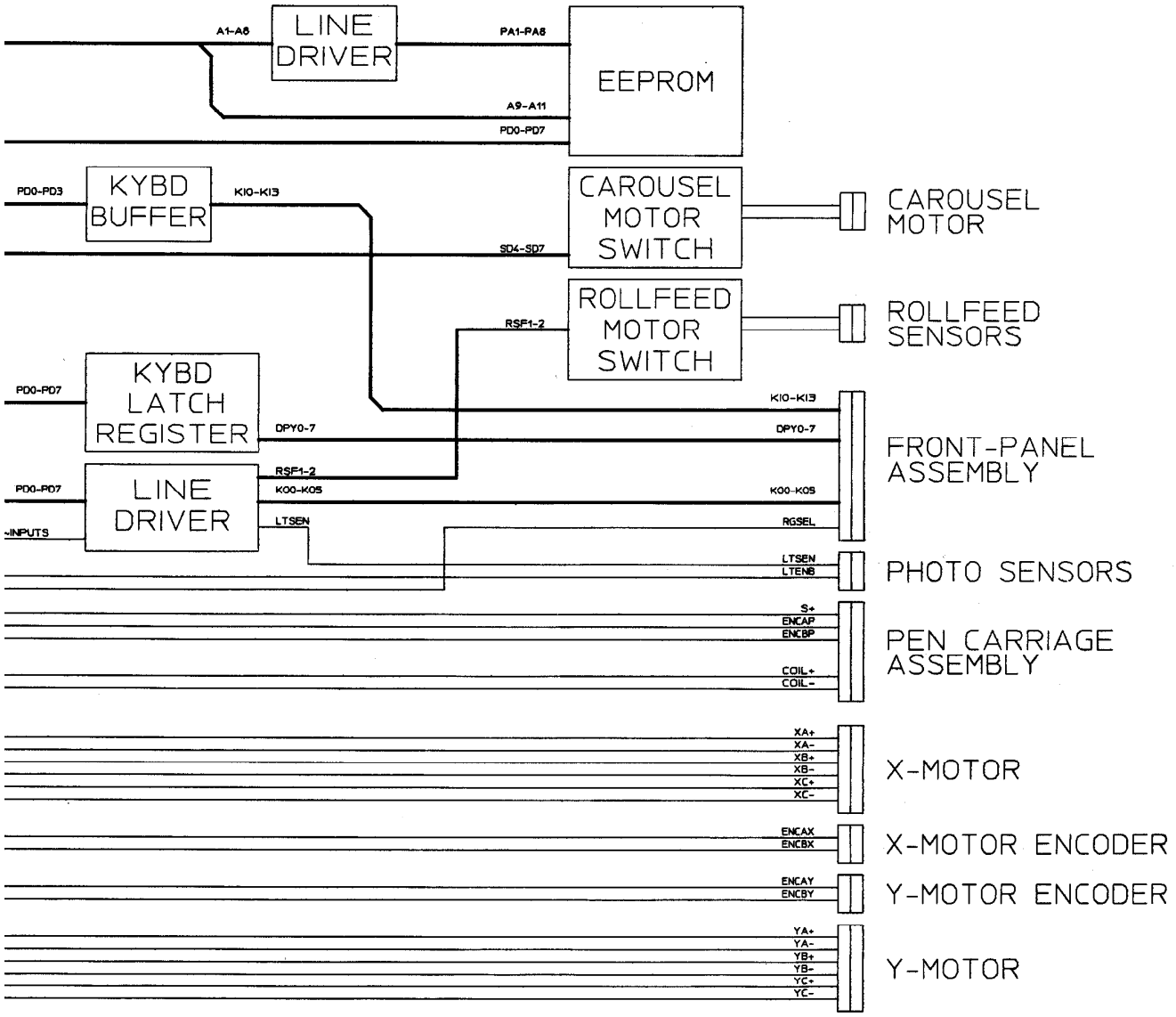


Figure 12-15. HP 7595/6
Functional Block Diagram

PART OF PROCESSOR PCA A1 (Ø7595-6Ø141)

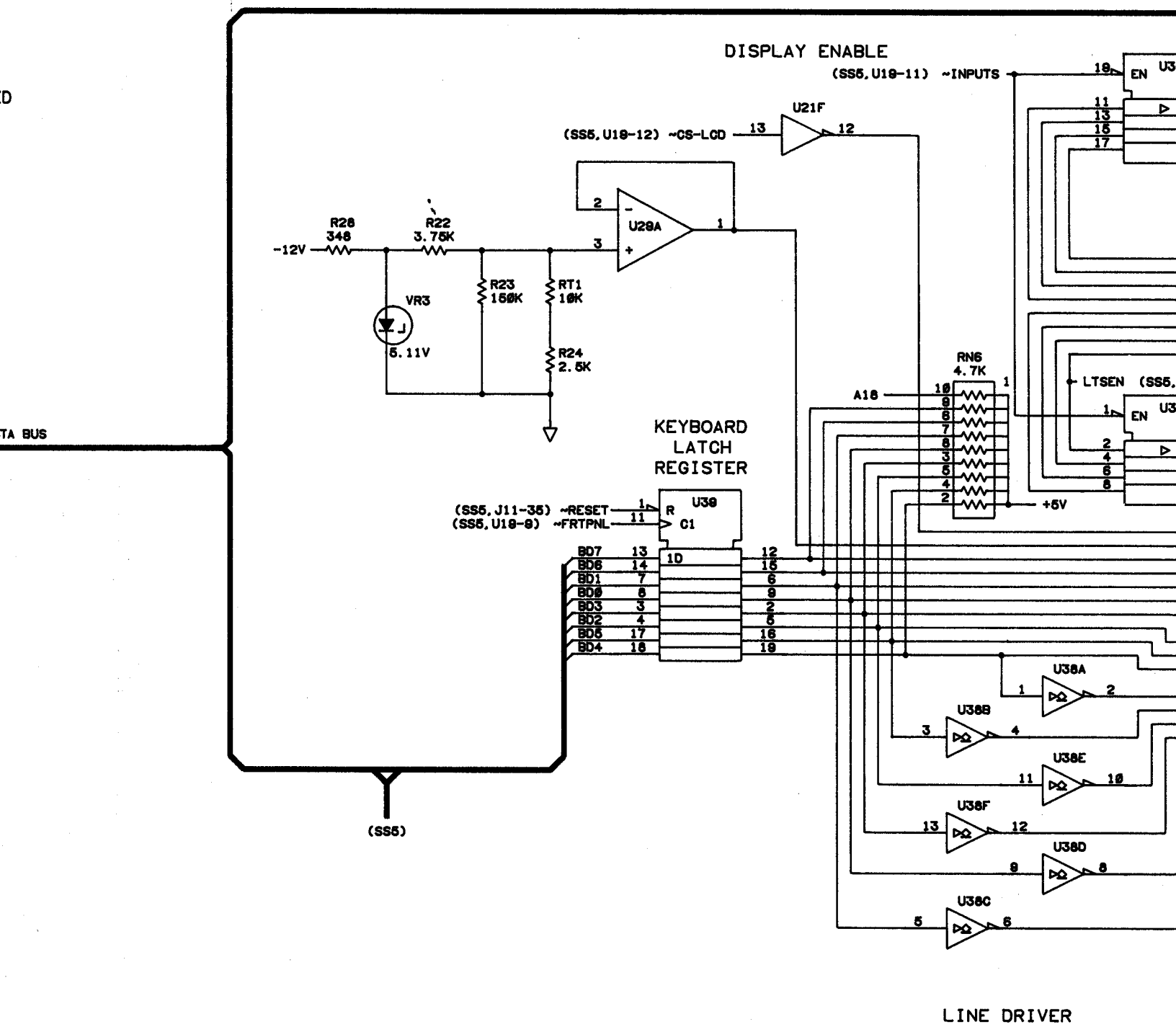
NOTE:
SS = SERVICE SHEET

BYPASS CAPACITORS, UNUSED GATES, AND PWR/GND NETS ARE LOCATED ON SS6.

FROM SS3

B DATA BUS

KEYBO
BUFF


DISPLAY ENABLE
(SS5,U19-11) ~INPUTS
U21F
(SS5,U19-12) ~CS-LCD
U29A
R28
348
R22
3.75K
-12V
R23
150K
RT1
10K
VR3
5.11V
R24
2.5K
RN6
4.7K
A18
+5V
LTSEN (SS5,
KEYBOARD
LATCH
REGISTER
U39
(SS5,J11-35) ~RESET
(SS5,U18-9) ~FRTPNL
BD7
BD6
BD1
BD0
BD3
BD2
BD5
BD4
U38A
U38B
U38E
U38F
U38D
U38C
TA BUS
(SS5)
LINE DRIVER

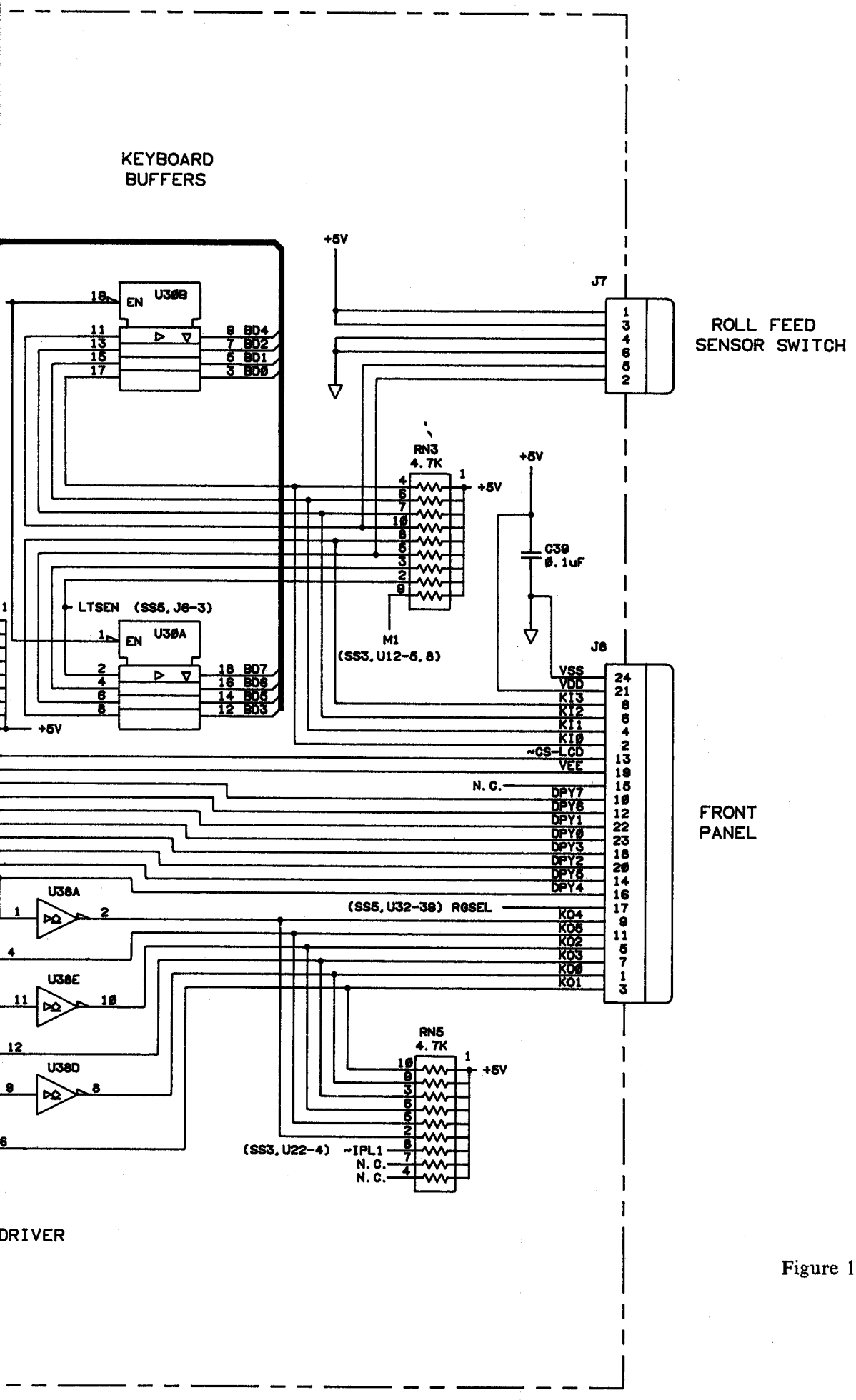


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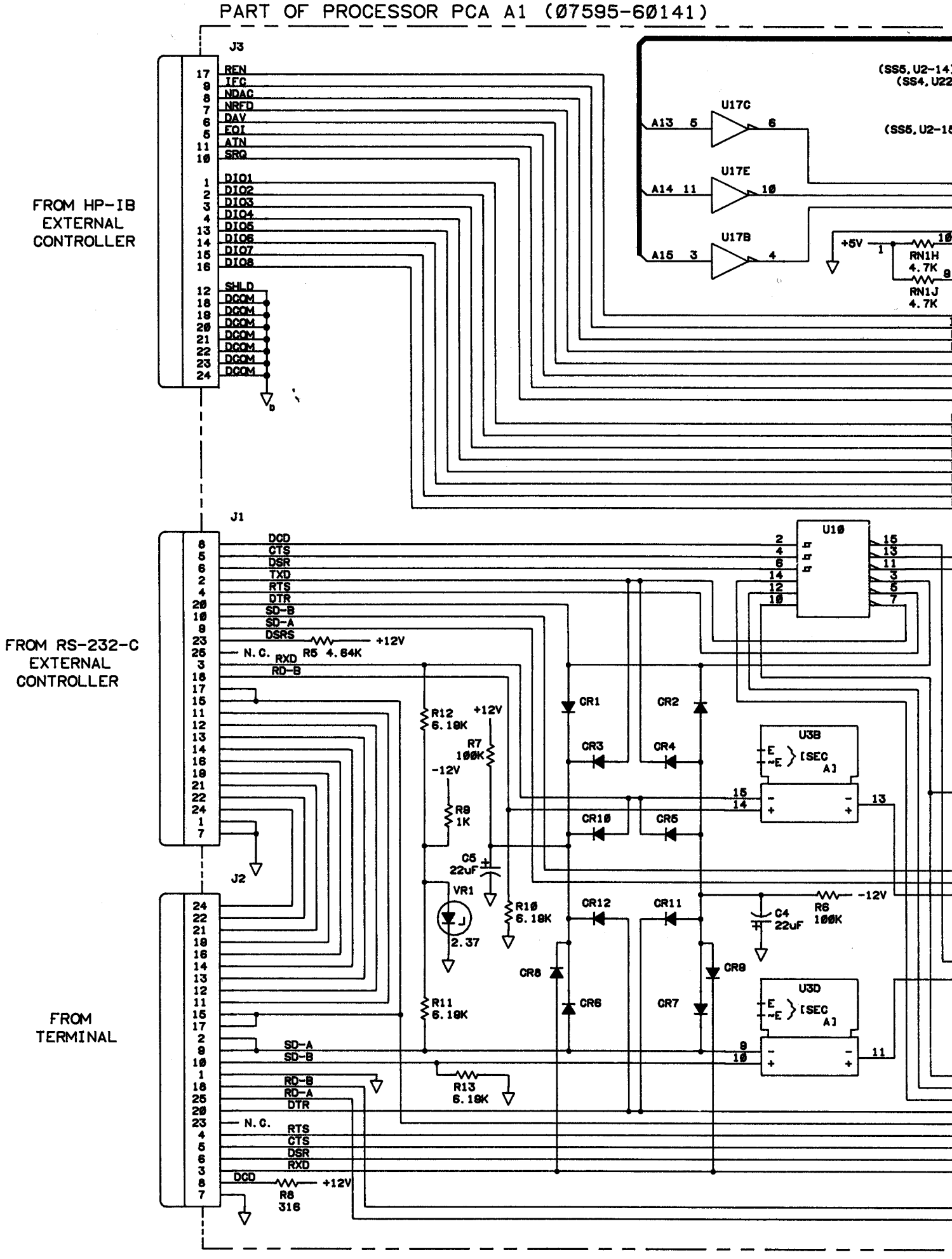
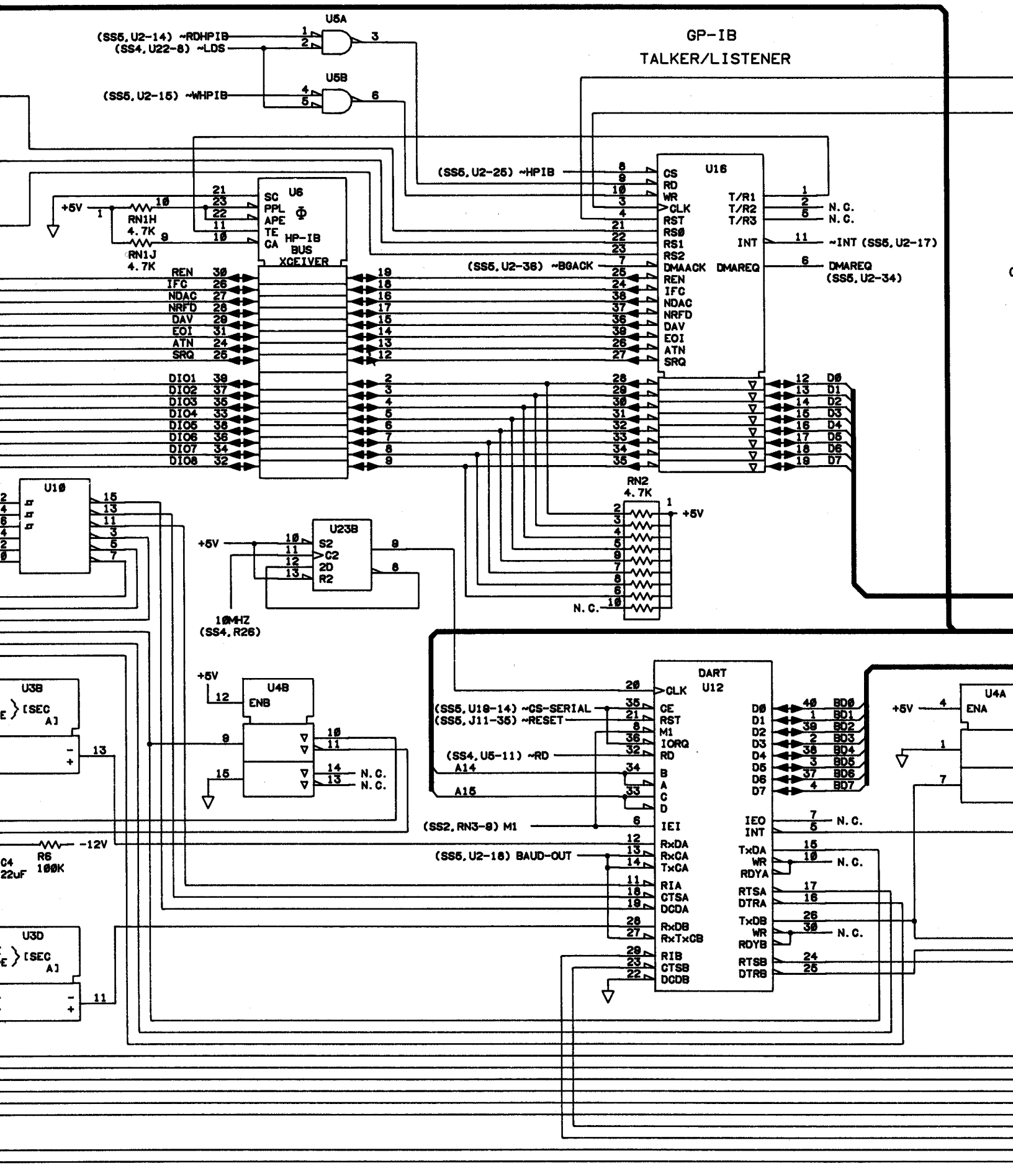
Figure 12-16. Input/Output Circuits, Schematic Diagram


PART OF PROCESSOR PCA A1 (Ø7595-6Ø141)
FROM HP-IB EXTERNAL CONTROLLER
FROM RS-232-C EXTERNAL CONTROLLER
FROM TERMINAL
J3
REN
IFC
NDAC
NRFD
DAV
EOI
ATN
SRQ
DIO1
DIO2
DIO3
DIO4
DIO5
DIO6
DIO7
DIO8
SHLD
DCOM
U17C
U17E
U17B
A13
A14
A15
+5V
RN1H 4.7K
RN1J 4.7K
J1
DCD
CTS
DSR
TXD
RTS
DTR
SD-B
SD-A
DSRS
N.C.
RXD
RD-B
R5 4.64K
+12V
U1Ø
R12 6.19K
R7 1ØØK
-12V
R9 1K
C5 22uF
VR1
2.37
R1Ø 6.19K
R11 6.19K
R13 6.19K
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR1Ø
CR11
CR12
U3B
U3D
[SEC A]
C4 22uF
R6 1ØØK
J2
RD-A
R8 316


GP-IB
TALKER/LISTENER
U5A
(SS5, U2-14) ~RDHPIB
(SS4, U22-8) ~LDS
U5B
(SS5, U2-15) ~WHPIB
U6
SC
PPL
APE
TE
CA
HP-IB BUS XCEIVER
+5V
RN1H 4.7K
RN1J 4.7K
REN
IFC
NDAC
NRFD
DAV
EOI
ATN
SRQ
DIO1
DIO2
DIO3
DIO4
DIO5
DIO6
DIO7
DIO8
U16
(SS5, U2-25) ~HPIB
CS
RD
WR
CLK
RST
RS0
RS1
RS2
DMAACK
(SS5, U2-38) ~BGACK
T/R1
T/R2
T/R3
INT
DMAREQ
N.C.
N.C.
~INT (SS5, U2-17)
DMAREQ (SS5, U2-34)
D0
D1
D2
D3
D4
D5
D6
D7
RN2 4.7K
N.C.
U10
U23B
S2
C2
2D
R2
10MHZ (SS4, R26)
U3B
U3D
U4B
ENB
U4A
ENA
-12V
R6 100K
C4 22uF
DART U12
CLK
(SS5, U18-14) ~CS-SERIAL
(SS5, J11-35) ~RESET
CE
RST
M1
IORQ
RD
(SS4, U5-11) ~RD
A14
A15
B
A
C
D
(SS2, RN3-8) M1
IEI
IEO
INT
RxDA
RxCA
TxCA
(SS5, U2-18) BAUD-OUT
TxDA
WR
RDYA
RIA
CTSA
DCDA
RTSA
DTRA
RxDB
RxTxCB
TxDB
WR
RDYB
RIB
CTSB
DCDB
RTSB
DTRB
BD0
BD1
BD2
BD3
BD4
BD5
BD6
BD7

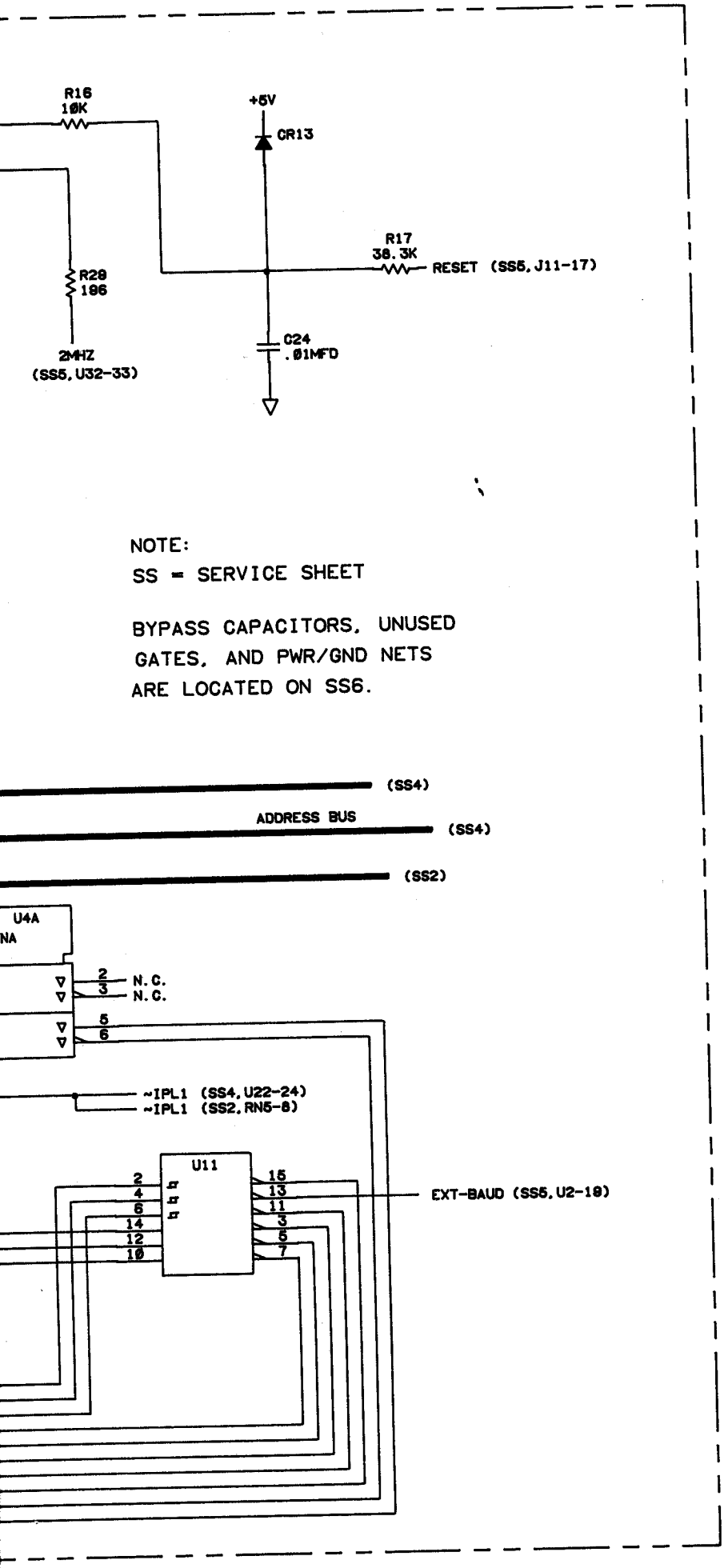


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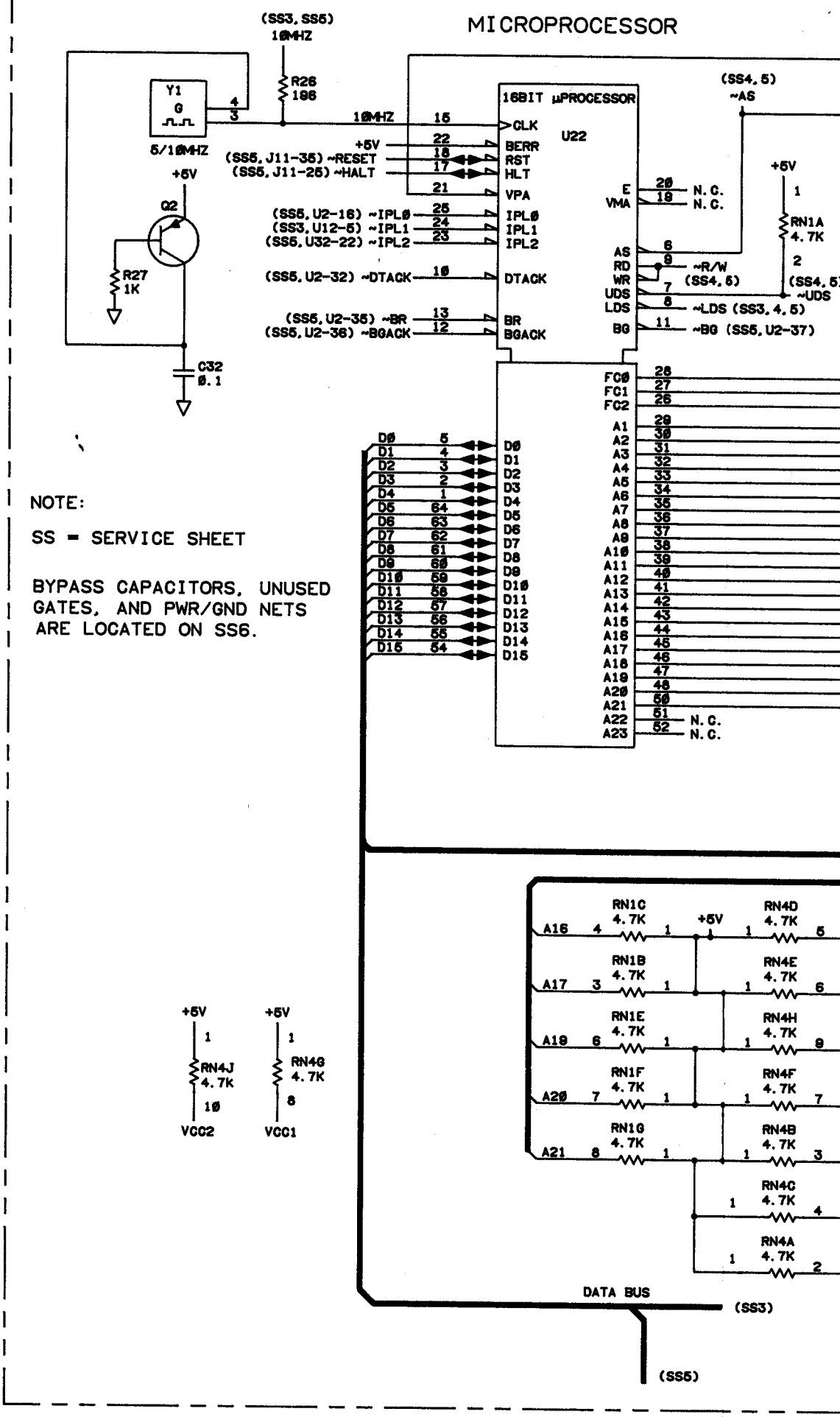
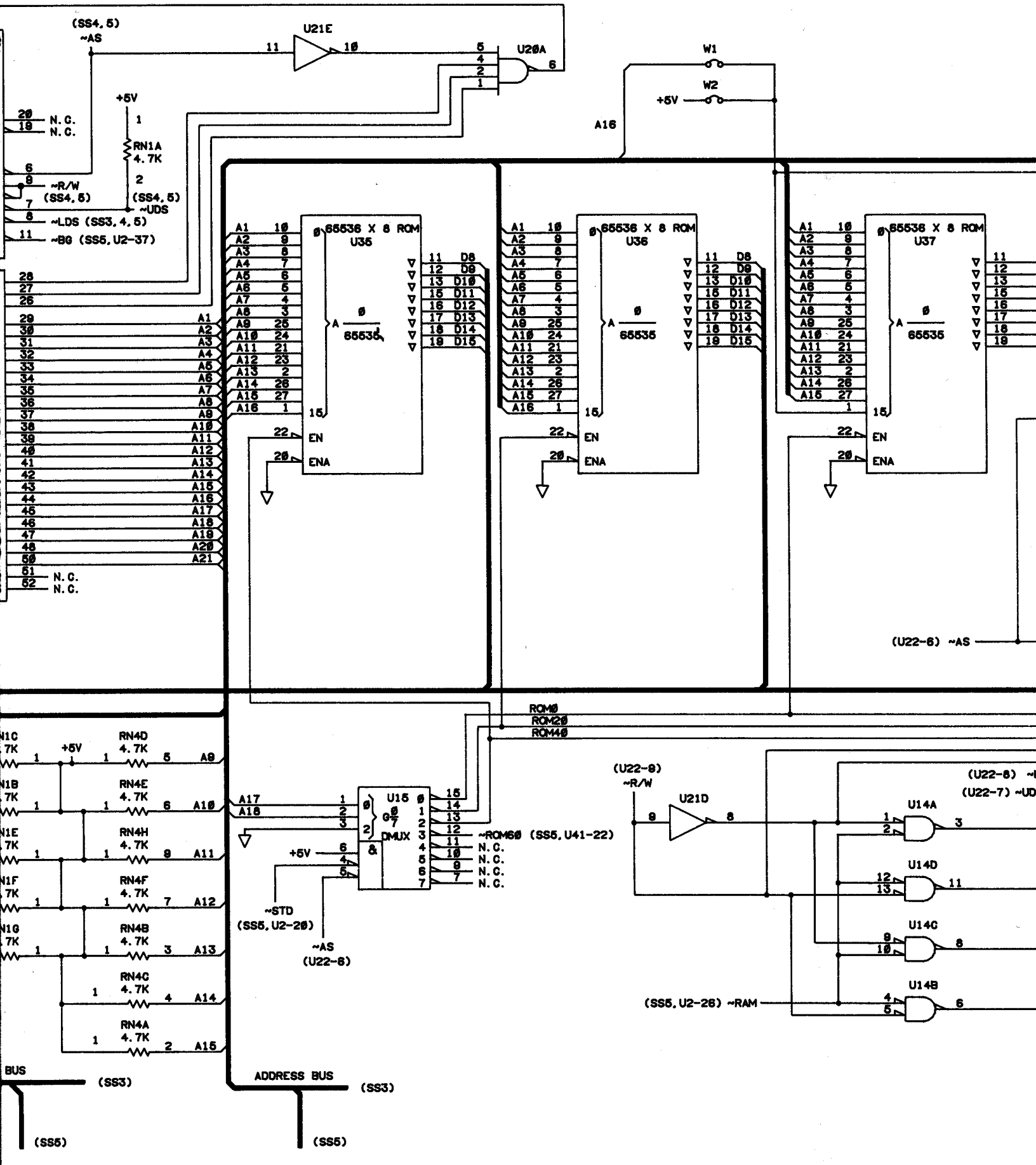
Figure 12-17. HP-IB/RS-232-C Interface Circuits, Schematic Diagram

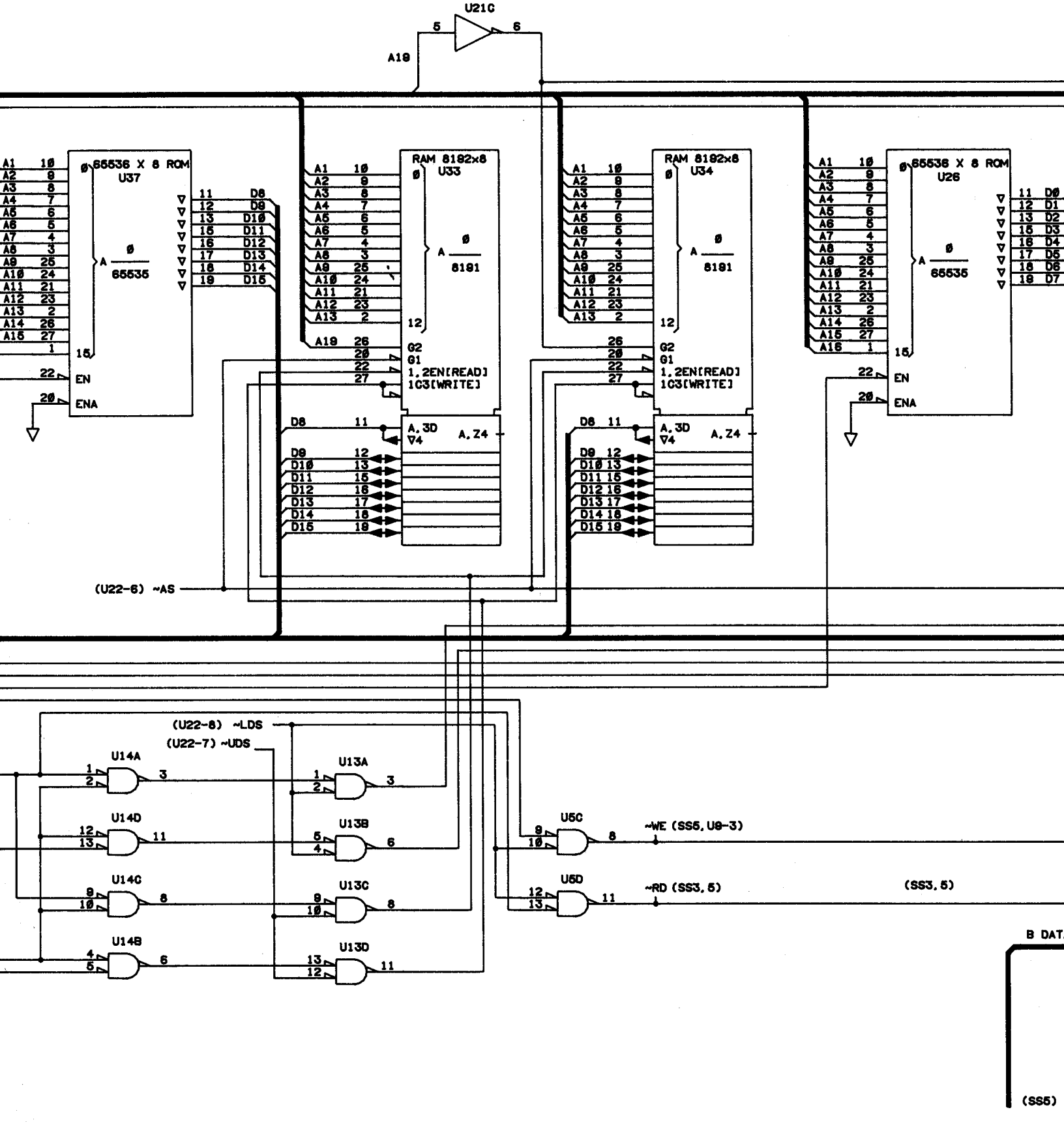
PART OF PROCESSOR PCA A1 (Ø7595-6Ø141)



READ ONLY MEMORY

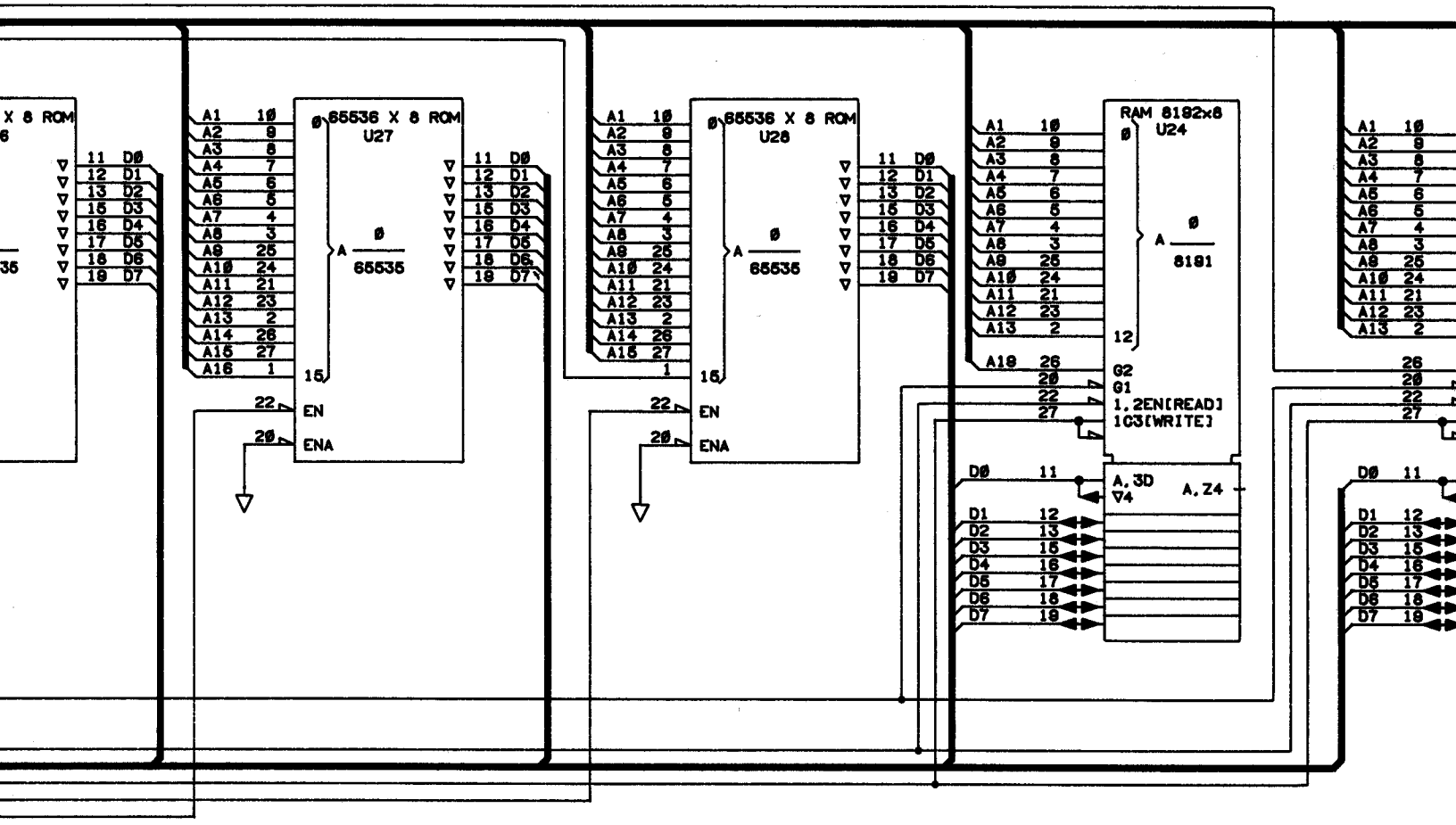


RANDOM ACCESS MEMORY



READ ONLY MEMORY

RANDOM ACCESS M



B DATA BUS

(SS5)

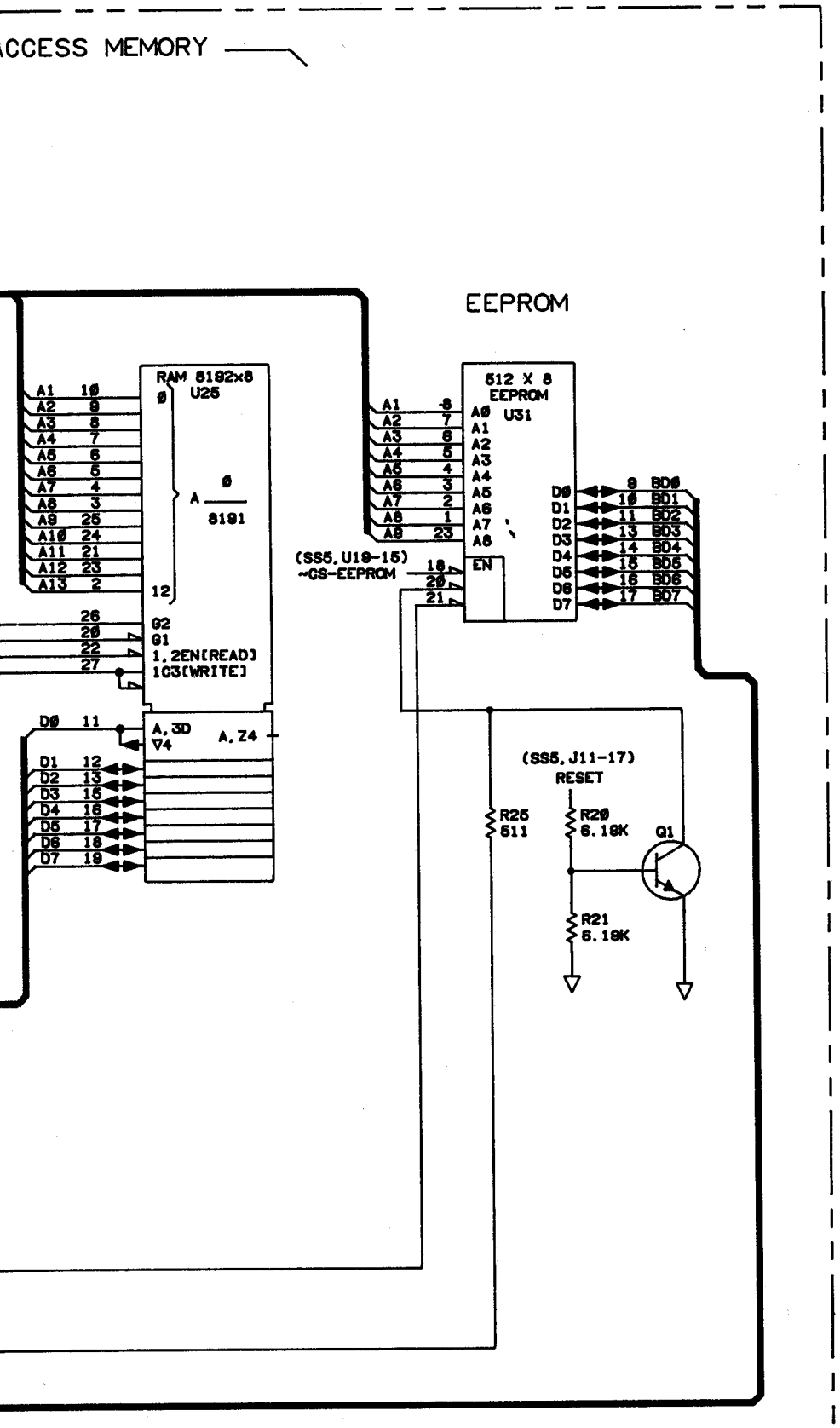


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Figure 12-18. Processor and Memory Circuits, Schematic Diagram