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**MODEL 354-1,-2
PRINTER MECHANISM
TECHNICAL MANUAL**

37403445-9A00

REV. A

JUNE 1984

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9/84 Rev. H

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SECTION 1

GENERAL INFORMATION

1.1 SCOPE

This manual is one of three manuals composing the Model 354-1,-2 Technical Manual Package, part number 37403440-6001. The package includes the following manuals:

- Model 354-1,-2 General Technical Manual—Part Number 37403440-9XXX
- Model 354-1,-2 Printer Mechanism Technical Manual—Part Number 37403445-9XXX
- Model 354-1,-2 CPU/Print Controller Technical Manual—Part Number 37403446-9XXX

These manuals provide detailed information about the printer mechanism and electronic assemblies to enable qualified personnel to maintain and troubleshoot the printer.

This manual provides detailed adjustment and removal/replacement procedures for the basic Model 354-1,-2. In this manual the printer will be referred to as the Model 354 unless the subject discussed is unique to the Model 354-1 (110 Vac, 60 Hz version) or Model 354-2 (220 Vac, 50 Hz version).

1.2 PRINTER MECHANISM DESCRIPTION

The Model 354 printer mechanism, shown in Figure 1-1, contains the mechanical and electro-mechanical printer assemblies. This includes two major functional assemblies; the printing mechanism and the paper handling mechanism.

The printing mechanism consists of a 9-pin print-head assembly, carriage assembly, carriage drive components, and ribbon system. The carriage drive components include the carriage drive motor, drive belts, pulleys, and optics. These components drive the print head/carriage assembly back and forth across the platen and provides the video signals necessary for character generation.

The inking system consists of a disposable ribbon cassette, ribbon drive motor, and ribbon guide. The ribbon cassette contains a 70-yard long-life, black ribbon with a guide that attaches to the print head. The ribbon cassette snaps into place and rests on the drive system of the ribbon drive motor.

The paper handling mechanism consists of a stepper motor, pin-feed tractors, paper guides, and drive rollers. Fanfold forms enter through the rear of the printer and moved using the pin-feed tractors. Cut sheet forms enter through the top of the printer and moved by the paper-drive rollers.

The printer base cover supports the printer mechanism, power supply assembly, and printed circuit boards.

The printer mechanism and electronics are protected by four plastic covers that include a top cover, body cover, rear cover, and base cover. The body cover has an opening in the lower-right corner for the control panel.

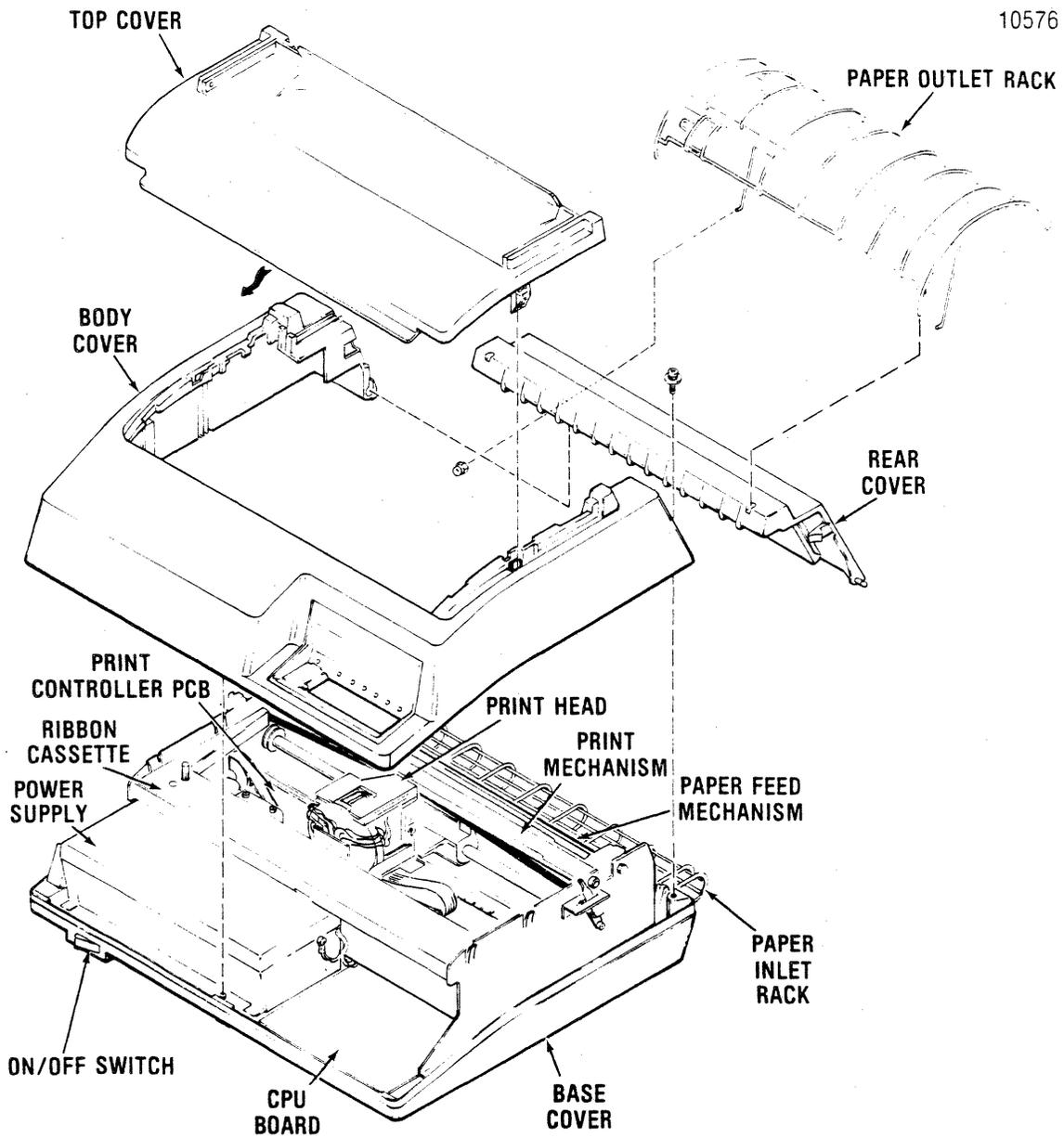


Figure 1-1 Model 354 Printer Mechanism

SECTION 2 ADJUSTMENTS

2.1 ADJUSTMENT SUMMARY

Adjustment procedures should be performed whenever an affected assembly is replaced or to correct an improper/marginal printer operation. Adjustment parameters should be checked before performing the procedure to ensure it is necessary. This section contains the following adjustment procedures.

- 2.2 Carriage Drive Belt
- 2.3 Carriage Drive Motor Belt
- 2.4 Tractor Gear Backlash
- 2.5 Paper Drive Belt
- 2.6 Paper Empty Switch
- 2.7 Optical Sensor and Encoder/Timing Disc
- 2.8 Horizontal Offset, CPU Board

After performing the adjustment procedure, a self-test printout should be generated to ensure proper printer operation. Refer to the 354 General Technical Manual.

NOTE

Removing the top cover enables the cover interlock switch and disables the printer. To operate the printer with the cover removed, place a small magnet against the interlock switch shown in Section 3, Figure 3-15. If the printer remains inoperative, reverse the polarity of the magnet against the switch.

2.2 CARRIAGE DRIVE BELT

The carriage drive belt tension is adjusted for smooth starts and stops of the carriage assembly. To adjust the belt refer to Figure 2-1 and perform the following steps:

1. Remove the printer covers as described in paragraph 3.2.
2. Position the print head/carriage assembly at the left margin.
3. Using a flat blade screwdriver, adjust the belt tension by turning clockwise (tighten) or counterclockwise (loosen) the two adjusting screws on the idle pulley assembly so the belt is taut and the carriage moves smoothly from side to side.

NOTE

Factory adjustment calls for the belt to deflect 8 mm (0.31 in) to 9 mm (0.35 in) when a 300 gram (11 oz) load is applied at the center of the belt.

4. Disable the cover interlock switch as described in paragraph 2.1 and generate a self-test printout to ensure proper printer operation.
5. Replace the printer covers.

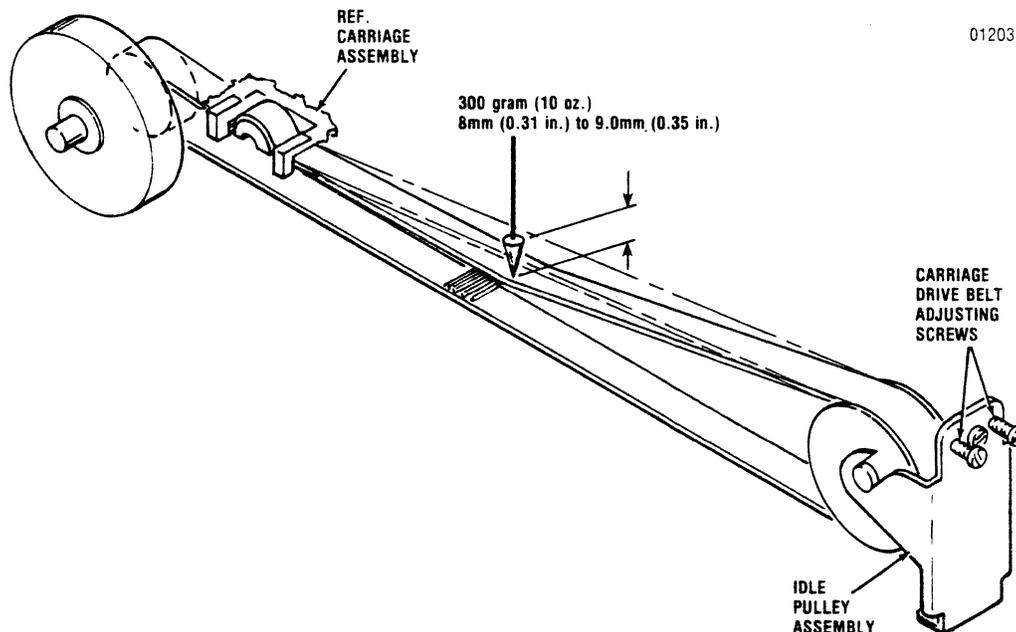


Figure 2-1 Carriage Drive Belt Adjustment

2.3 CARRIAGE DRIVE MOTOR BELT

The carriage drive motor belt tension is adjusted so the carriage starts and stops evenly as the carriage drive motor is turned on and off. To adjust the belt refer to Figure 2-2 and perform the following steps:

1. Remove the printer covers as described in paragraph 3.2.
2. Remove the ribbon cassette per steps 3 through 8 of paragraph 3.6.
3. Place the forms lever in the **SHEET** or **FORMS** position.
4. Move the print head/carriage assembly to the center of the printer.
5. Using a Phillips screwdriver, loosen the three screws mounting the carriage drive motor and move the motor left or right so the belt is taut

and tracks properly and the carriage moves smoothly from side to side.

NOTE

Factory adjustment calls for the belt to deflect 2.5 mm (0.09 in) to 4.5 mm (0.17 in) when a 300 gram (11 oz) load is applied at the center of the belt.

6. Tighten the three screws mounting the carriage drive motor.
7. Replace the ribbon cassette.
8. Disable the cover interlock switch and generate a self-test printout to ensure proper printer operation.
9. Check the self-test printout for horizontal offset of characters. If characters are offset, adjust per paragraph 2.8.
10. Replace the printer covers.

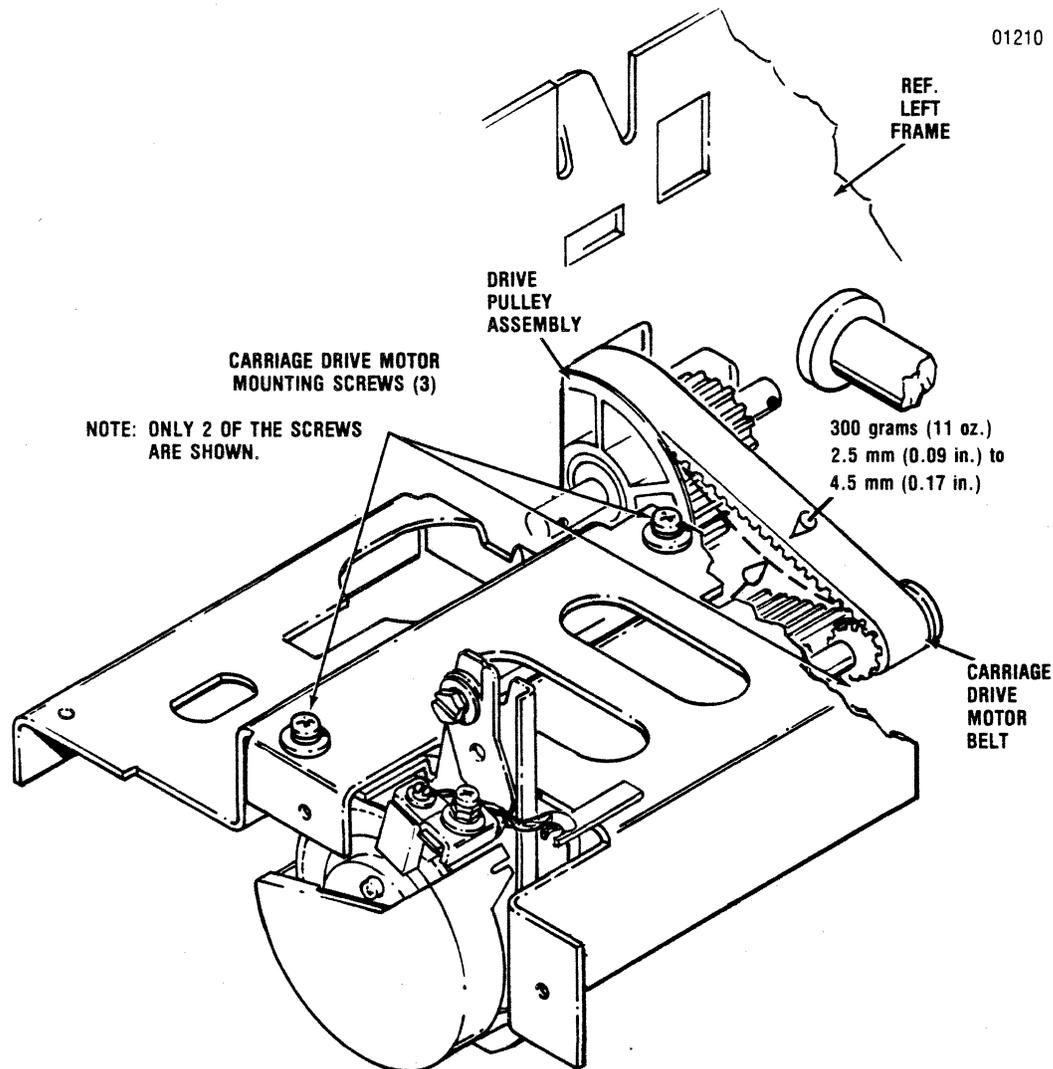


Figure 2-2 Carriage Drive Motor Belt Adjustment

2.4 TRACTOR GEAR BACKLASH

NOTE

After adjusting the tractor gear backlash (paragraph 2.4), the paper drive belt adjustment (paragraph 2.5) must be performed to ensure proper operation of the paper drive mechanism.

The backlash between the paper drive gear and tractor gear is adjusted to provide a positive drive between the paper drive stepper motor and tractor feed assembly. To adjust the backlash of the tractor gear, refer to Figure 2-3 and perform the following steps:

1. Remove the printer covers as described in paragraph 3.2.

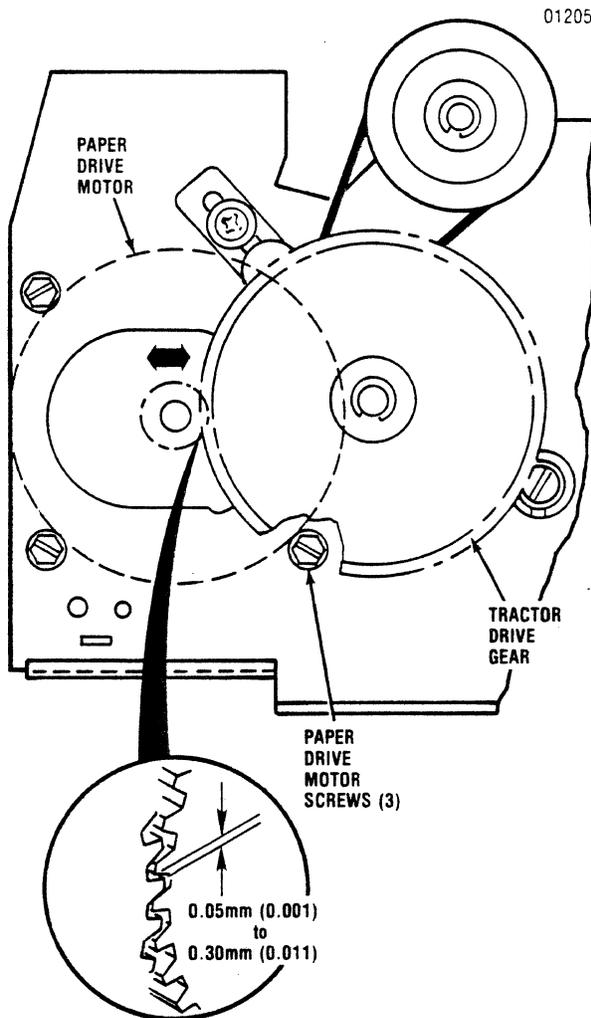


Figure 2-3 Tractor Gear Backlash Adjustment

2. Using a Phillips screwdriver, loosen the screw mounting the paper drive belt tension roller to the left frame.
3. Using a 7 mm wrench, loosen the three hex head screws mounting the paper drive stepper motor to the left frame.
4. Move the paper drive stepper motor to the front or back so there is a minimal backlash between the paper drive gear and tractor drive gear.

NOTE

Factory adjustment calls for 0.05 mm (0.001 in) to 0.30 mm (0.011 in) backlash for one rotation of the tractor drive gear. Check the backlash at three points, approximately 120° apart, for one rotation of the tractor gear.

5. Tighten the three hex head screws mounting the paper drive stepper motor to the left frame.
6. Perform the paper drive belt adjustment per paragraph 2.5.

2.5 PAPER DRIVE BELT

The paper drive belt tension is adjusted to provide a positive drive between the paper drive stepper motor and tractor feed assembly. To adjust the belt refer to Figure 2-4 and perform the following steps:

1. Remove the printer covers as described in paragraph 3.2.
2. Using a Phillips screwdriver, loosen the screw mounting the tension roller to the left frame.
3. At a point equidistant from the paper feed motor pulley and paper feed pulley adjust the belt tension by pushing down on the belt with the tension roller until the belt is taut.

NOTE

Factory adjustment calls for a 500 gram (17.5 oz) load to be applied at the center of the belt using the tension roller.

4. Tighten the Phillips head screw mounting the tension roller.
5. Disable the cover interlock switch and generate a self-test printout to ensure proper printer operation.
6. Replace the printer covers.

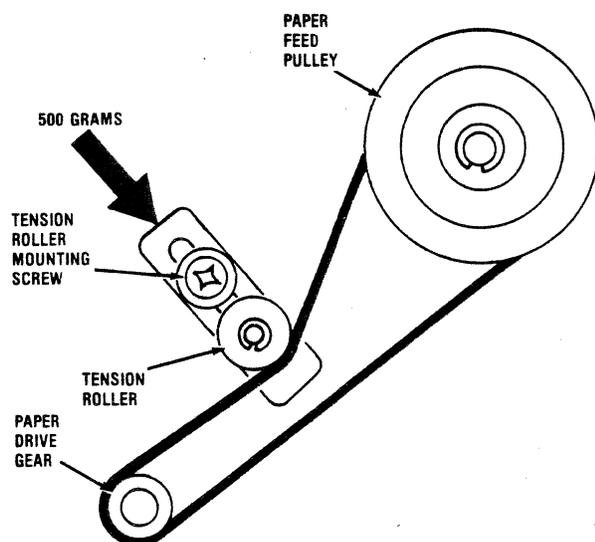


Figure 2-4 Paper Drive Belt Adjustment

2.6 OPTICAL SENSOR AND ENCODER/TIMING DISC

The optical sensor and encoder/timing disc are adjusted both mechanically and electrically to provide the correct video signals to the Print Controller pcb. To adjust the sensor and disc refer to Figure 2-6 and 2-7 and perform the following steps:

1. Tilt the printer mechanism as described in paragraph 3.10.1.
2. Remove the ribbon cassette as described in steps 3 through 8 of paragraph 3.6.
3. Disable the cover interlock switch by placing a small magnet against the switch. Refer to paragraph 3.2.1.
4. Refer to paragraphs 2.6.1 and 2.6.2 for the mechanical and electrical adjustment procedures.

2.6.1 MECHANICAL ADJUSTMENT

1. Place the forms lever in the **SHEET** or **FORMS** position and move the print head/carriage assembly to the extreme right side of the printer.
2. Using a Phillips screwdriver, loosen the screw mounting the optical sensor to the carriage drive motor.
3. Move the sensor left or right until the encoder/timing disc is centered in the middle of the sensor.

NOTE

Factory adjustment calls for a gap of 0.5 mm (0.020 in) between the sensor and disc.

4. Tighten the sensor mounting screw once sensor is adjusted.

2.6.2 ELECTRICAL ADJUSTMENT

1. Disable the cover interlock switch by placing a magnet against the switch.
2. Using a dual trace oscilloscope, connect the oscilloscope ground lead to test point TP4 on the Print Controller pcb.
3. Connect oscilloscope channel 1 probe to TP1 and oscilloscope channel 2 probe to TP2 on the Print Controller pcb.
4. Set the oscilloscope as follows:
 - Volts/Div. knobs at "2V/DIV"
 - Vert. Mode knob at "ALT"
 - Time/Div. knob at "50 us/DIV"
 - Internal Trigger on Channel 1.
5. Turn oscilloscope on.
6. Set dip switch S2, section 4, the "OPEN" position; turn on the printer, and then depress the **SELECT** switch.

NOTE

Printer will print the self-test pattern each time the **SELECT** switch is depressed.

7. Simultaneously monitor VIDEO 1 at TP1 and VIDEO 2 at TP2 on the Print Controller pcb while the print head is moving at a constant speed.
8. Check the phase relationships between VIDEO 1 and VIDEO 2 as the carriage moves in the forward and reverse direction. The phase difference between VIDEO 1 and VIDEO 2 should be a constant 90° over the entire travel of the carriage (i.e. width C equals 90° when it equals ¼ width D). If the phase adjustment is necessary, proceed to step 9.
9. Deselect the printer and slightly loosen the Optics Adjustment Screw (shown in Figure 2-6) securing the optics bracket to the carriage.
10. Press the **SELECT** switch and move the optics bracket right or left until the VIDEO 1 and

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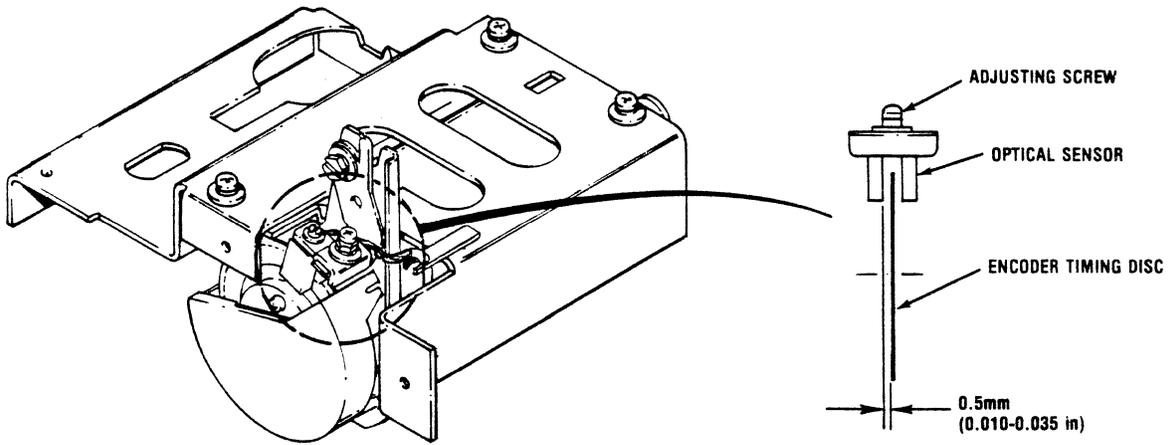


Figure 2-5 Mechanical Adjustment, Optical Sensor and Encoder/Timing Disc

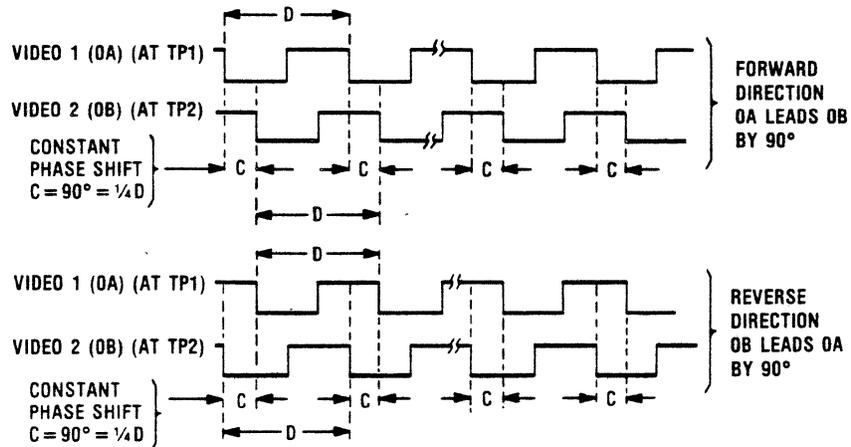
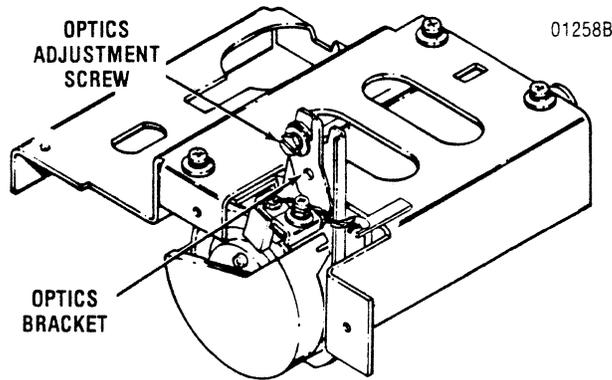


Figure 2-6 Electrical Adjustment, Optical Sensor and Encoder/Timing Disc

VIDEO 2 signals are adjusted as shown in Figure 2-6.

11. Deselect the printer and tighten the Optics Adjustment Screw.
12. Turn the printer and oscilloscope off.
13. Remove the oscilloscope probes and ground leads from the Print Controller pcb.
14. Lower the printer mechanism and reinstall the mounting hardware.
15. Reinstall the ribbon cassette assembly.
16. Replace the printer covers.

2.7 HORIZONTAL OFFSET

The CPU board uses 5 positions of dip switch S4 for the horizontal offset adjustment. This procedure adjusts the print position of the line printed in the reverse direction to the left or right so the printed character columns are vertically aligned. To adjust the horizontal offset, refer to Figures 2-7 and 2-8 and perform the following steps:

1. Remove the control panel bezel by gently pushing in on the center bottom-front edge of the bezel and lifting up and out. This is to gain access to switch S4.
2. Turn the printer power on, select the printer and print a dozen or so 132-column lines of the character H (octal 110).
3. Deselect the printer and compare the first and last columns of printed text to Figure 2-7.
4. If the printed text is offset as in condition A of Figure 2-7, close switch #5 of dip switch S4 on the CPU board (Figure 2-8) to move the print position to the left.

5. To adjust the offset for condition A follow the switch list below in Table 2-1 step-by-step until the characters are vertically aligned in the first and last columns.

Table 2-1
S4 Switch Selection (Condition A/B)

1	2	3	4	5
CLOSED	CLOSED	CLOSED	CLOSED	CLOSED/OPEN
OPEN	CLOSED	CLOSED	CLOSED	CLOSED/OPEN
CLOSED	OPEN	CLOSED	CLOSED	CLOSED/OPEN
OPEN	OPEN	CLOSED	CLOSED	CLOSED/OPEN
CLOSED	CLOSED	OPEN	CLOSED	CLOSED/OPEN
OPEN	CLOSED	OPEN	CLOSED	CLOSED/OPEN
CLOSED	OPEN	OPEN	CLOSED	CLOSED/OPEN
OPEN	OPEN	OPEN	CLOSED	CLOSED/OPEN
CLOSED	CLOSED	CLOSED	OPEN	CLOSED/OPEN
OPEN	CLOSED	CLOSED	OPEN	CLOSED/OPEN
CLOSED	OPEN	CLOSED	OPEN	CLOSED/OPEN
OPEN	OPEN	CLOSED	OPEN	CLOSED/OPEN
CLOSED	CLOSED	OPEN	OPEN	CLOSED/OPEN
OPEN	CLOSED	OPEN	OPEN	CLOSED/OPEN
CLOSED	OPEN	OPEN	OPEN	CLOSED/OPEN
OPEN	OPEN	OPEN	OPEN	CLOSED/OPEN

6. If printed text is offset as in condition B of Figure 2-7 open switch #5 of dip switch S4 on the CPU Board (Figure 2-8) to move the print position to the right.
7. To adjust the offset for condition B follow the switch list in Table 2-1 until the characters are vertically aligned in the first and last columns.
8. Reinstall the control panel bezel.
9. Generate a self-test printout to ensure the horizontal offset is properly adjusted.

SECTION 3

REMOVAL/REPLACEMENT

3.1 REMOVAL/REPLACEMENT, RECOMMENDED SPARES

This section describes the removal and replacement procedures for the recommended spare parts. The section is organized as shown in Table 3-1. The final paragraph of this section provides the part numbers of the recommended spares, which are listed according to figure and item number.

NOTE

The removal/replacement procedures contained in this section apply to the Model 354 printer without options. When options are installed, some procedures may be affected. Refer to the Model 354 Options Manual for the installation procedures of options.

Table 3-1 Recommended Spares and Associated Parts

(Items followed by an asterisk are associated parts; they are not recommended spares, but some must be removed/replaced when a spare is changed.)

PARAGRAPH	RECOMMENDED SPARE
3.2	Cover Assemblies*
3.3	Paper Inlet Rack*
3.4	Paper Outlet Rack Assembly*
3.5	Cover Interlock Magnet*
3.6	Ribbon Cassette and Guide
3.7	Print Head Assembly
3.8	Head Flex Cable
3.9	Head Adapter PCB*
3.10	Printer Mechanism*
3.11	Dust Cover*
3.12	Carriage Drive Motor Belt*
3.13	Carriage Drive Belt*
3.14	Optic Sensor Assembly
3.15	Carriage Drive Motor
3.16	Encoder/Timing Disc
3.17	Ribbon Drive Motor Bracket*
3.18	Ribbon Drive Motor*
3.19	Cover Interlock Switch
3.20	Paper Drive Belt*
3.21	Paper Drive Motor*
3.22	Paper Empty Switch
3.23	Sensor Arm Assemblies
3.24	Mounting Block Assemblies*
3.25	Tractor Assemblies, Left/Right
3.26	ON/OFF Switch
3.27	Main Fuse
3.28	Power Cord*
3.29	Cover Latch Springs*
3.30	Pico Fuses
3.31	Power Supply Assembly
3.32	CPU/Controller Cable
3.33	Print Controller PCB
3.34	CPU Board PCB
3.35	Recommended Spare Parts Listing

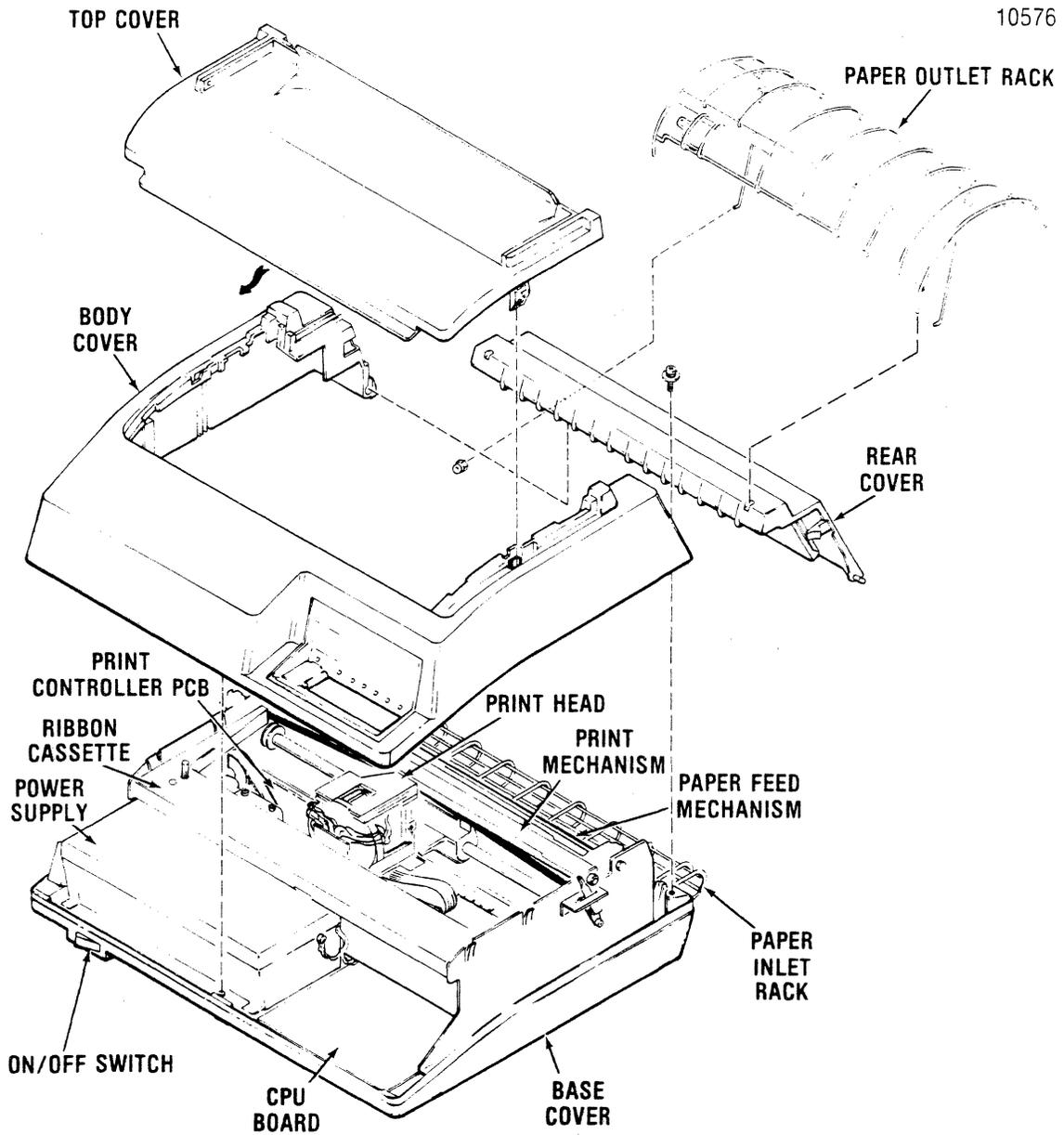


Figure 3-2 Removal/Replacement, Paper Outlet Rack Assy, Paper Inlet Rack, Cover Assemblies, and Cover Interlock Magnet

3.2.3 BODY COVER

1. Remove the top and rear covers, as explained in paragraphs 3.2.1 and 3.2.2.
2. Remove the two Phillips head screws at the rear of the printer, mounting the cover to the printer base.
3. Loosen the thumbscrew underneath the front of the printer, mounting the cover to the base.
4. Place the forms lever in the **LOAD** position.
5. Gently pull up on the rear of the cover, then guide the cover back while simultaneously lifting it off the printer.

3.3 PAPER INLET RACK

The paper inlet rack, item 2 of Figure 3-2, attaches to the lower rear of the printer and guides the forms into the paper feed mechanism. To remove the inlet rack, refer to Figure 3-1 and perform the following steps:

1. Remove the two rack mounting tabs from the mounting holes on the inside of the left/right side frames.
2. Pull the inlet rack (2) straight out and then away from the printer.
3. To replace the rack, reverse steps 1 and 2.

3.4 PAPER OUTLET RACK ASSEMBLY

The paper outlet rack assembly, item 1 of Figure 3-2, attaches to the rear cover and guides the printed forms over the printer and into the paper basket. To remove the outlet rack assembly, refer to Figure 3-2 and perform the following steps:

1. Remove the rear cover per paragraph 3.2.2.
2. Remove the two nylon thumbnuts securing the rack mounting rails to the back of the rear cover.

NOTE

In some printers the rack mounting rails are secured to the cover by tabs instead of thumbnuts; tab mounted rails are removed by gently pulling on the rails until they are free from the cover.

3. Pull the outlet rack (1) out of the mounting holes on the top of the rear cover.
4. To replace the rack, reverse steps 1 through 3.

3.5 COVER INTERLOCK MAGNET

The cover interlock magnet, item 3 of Figure 3-2, is located in a slot on the underside of the clear cover. The purpose of the magnet is to disable the Hall effect interlock switch when the cover is closed, and to enable the switch when the cover is open. To replace the magnet, refer to Figure 3-2 and perform the following steps:

1. Place the clear cover in the open position, as shown in Figure 3-1.
2. Place the magnet (3) into the slot.
3. Using electrical tape, tape over and around the slot, temporarily securing the magnet in place.
4. Close the panel and place the forms lever in the **FORMS** (rear-most) position.
3. Move the print head to the right margin and power up the printer.
6. If the print head travels to the left margin and stops, the magnet is properly positioned in the slot; if the print head remains at the right, reverse the position of the magnet.
7. Open the panel and obtain an adhesive compound.
8. Carefully remove the tape and then the magnet, noting how it must be positioned when it is cemented in place.
9. Place a small amount of adhesive onto the side of the magnet (3).
10. Place the magnet into the slot and hold in place until the adhesive dries.

3.6 RIBBON CASSETTE AND GUIDE

The ribbon cassette, item 1 of Figure 3-3, is mounted to the left and right side frames. The ribbon guide is mounted over the front of the print head. No tools are required to remove the cassette or guide. To remove the cassette and guide, refer to Figure 3-3 and perform the following steps:

1. Remove the top cover per paragraph 3.2.1.
2. Unsnap the top of the rear cover and place in the open position.
3. Ensure the print head is at the extreme left margin.

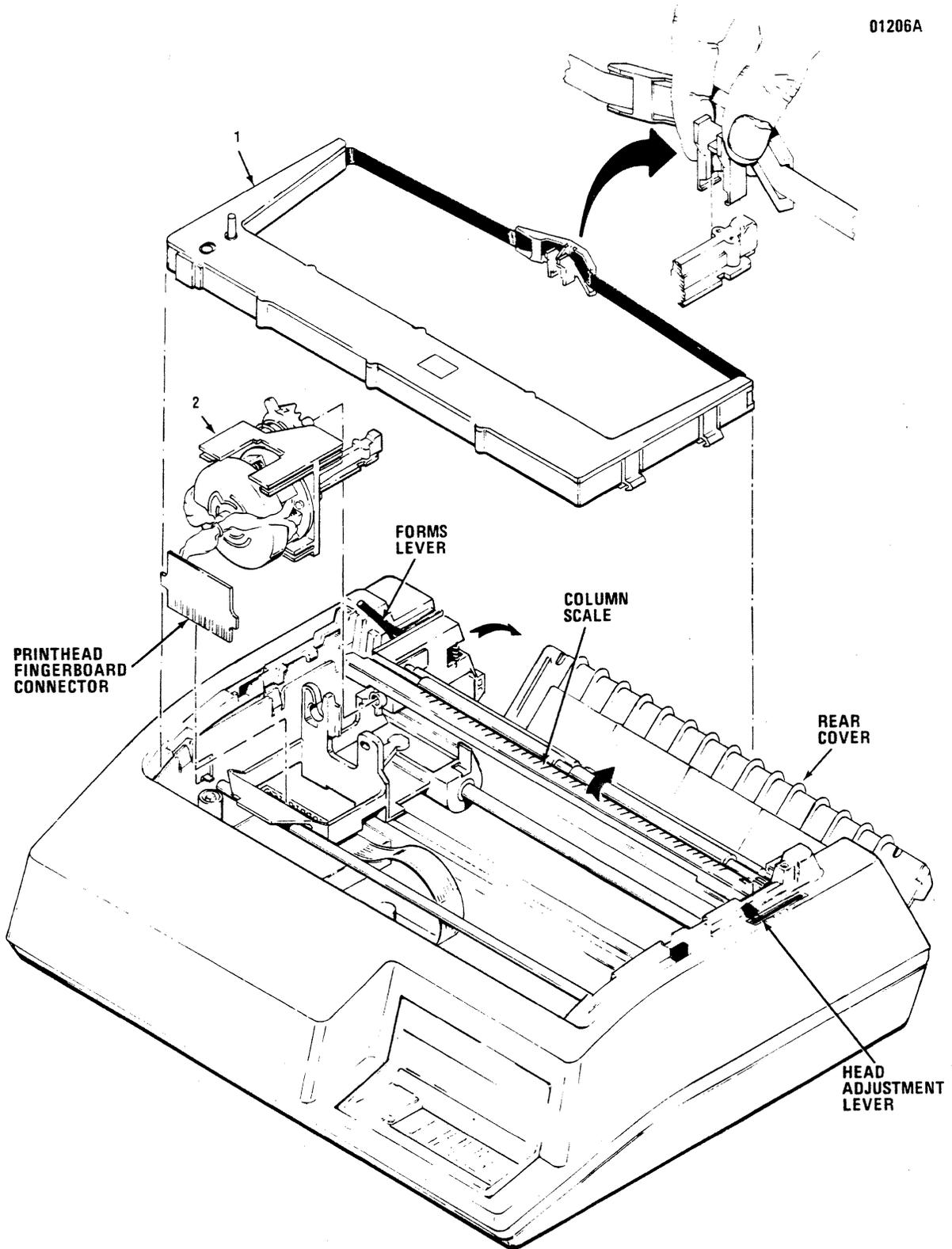


Figure 3-3 Removal/Replacement, Ribbon Cassette and Guide, Print Head Assembly

4. Place the forms lever in the **LOAD** position as shown in Figure 3-3.
5. Lift the column scale into the up position.
6. Pull the head adjustment lever to its maximum position, as shown in Figure 3-3.
7. Remove the ribbon guide from the front of the print head by squeezing together the two tabs at the top of the ribbon guide and lifting upward.
8. Lift the used ribbon cassette and guide (1) up and out of the printer.
9. To install the new ribbon cassette and guide, reverse steps 1 through 8.

3.7 PRINT HEAD ASSEMBLY

The print head assembly, item 2 in Figure 3-3, attaches to the carriage; no tools are required to remove the print head. To remove the print head, refer to Figure 3-3 and perform the following steps:

1. Remove the top cover per paragraph 3.2.1.
2. Unsnap the top of the rear cover and place in the open position.
3. Ensure the print head is at the extreme left margin.
4. Place the forms lever in the **LOAD** position, as shown in Figure 3-3, and lift the column scale into the up position.
5. Position the head adjustment lever in the maximum position, as shown in Figure 3-3.
6. Remove the ribbon guide from the front of the print head by squeezing together the two tabs at the top of the guide and lifting upward.
7. Remove the print head finger board connector P704 from the Head Adapter pcb connector J704 by lifting the connector upward.
8. To remove the print head (2) simultaneously pull the head toward the front of the printer and lift the head up and out of the printer.
9. To replace the print head assembly, reverse steps 1 through 8.

NOTE

Ensure the cam located on the front of the print head is in position "A" following replacement of the head.

3.8 HEAD FLEX CABLE

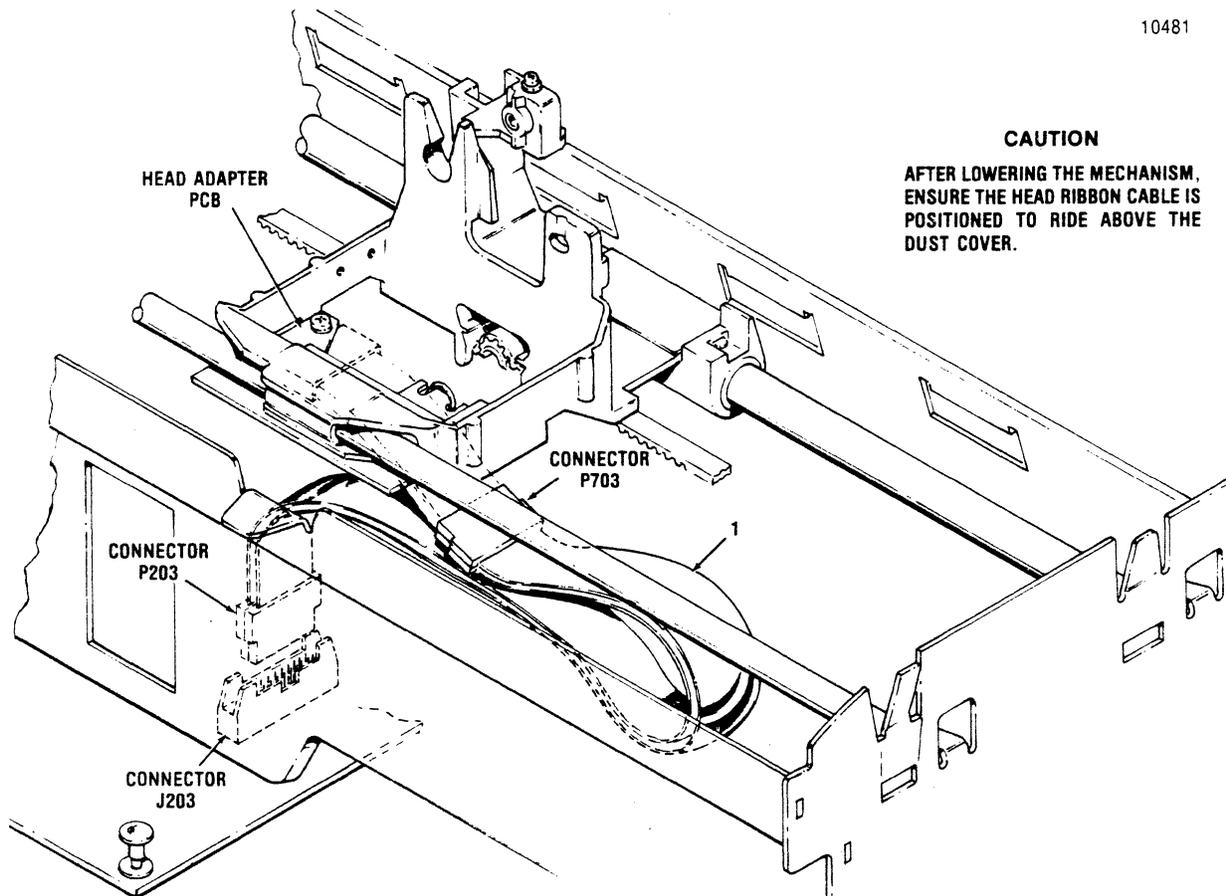
The head flex cable, item 1 of Figure 3-4, connects the print head assembly and the Print Controller pcb. To remove the head flex cable, refer to Figure 3-3 and perform the following steps:

1. Remove the top cover per paragraph 3.2.1.
2. Place the forms lever in **FORMS** (rear-most) position.
3. Move the print head about three quarters the length of the guide bar from the extreme left margin.
4. Remove the print head fingerboard connector P704 from the head adapter pcb connector J704 by lifting the connector upward (see Figure 3-3).
5. Remove the print head by simultaneously pulling the head toward the front of the printer and lifting the head up and out of the printer.
6. Unhook the rubber O-ring securing the head flex cable to the bracket on the Print Controller pcb.
7. Disconnect the head flex cable connector P203 from connector J203 on Print Controller pcb.
8. Unhook the rubber O-ring securing the cable to the underside of the carriage.
9. Disconnect the head flex cable (1) connector P703 from connector J703 on the Head Adapter pcb.
10. To replace the head flex cable, reverse steps 1 through 9.

3.9 HEAD ADAPTER PCB

The Head Adapter pcb (Figure 3-5) is attached to the carriage assembly and is removed using a Phillips screwdriver. To remove the Head Adapter pcb, refer to Figure 3-5 and perform the following steps:

1. Remove the top cover from the printer per paragraph 3.2.1.
2. Remove the ribbon cassette and guide per paragraph 3.6.



CAUTION
AFTER LOWERING THE MECHANISM, ENSURE THE HEAD RIBBON CABLE IS POSITIONED TO RIDE ABOVE THE DUST COVER.

Figure 3-4 Removal/Replacement, Head Flex Cable

- Remove the print head assembly per paragraph 3.7.

NOTE

Ensure the column scale is down and the forms lever is in the "SHEET" or "FORMS" position before performing step 4.

- Move the carriage approximately three quarters the length of the guide bar from the extreme left margin.
- Unhook the rubber O-ring securing the head flex cable to the underside of the carriage and disconnect the head flex connector P703 cable from connector J703 on the Head Adapter pcb.
- Remove the two screws mounting the Head Adapter pcb to the carriage and remove the pcb from the printer.
- To replace the Head Adapter pcb, reverse steps 1 through 6.

3.10 PRINTER MECHANISM

The printer mechanism, illustrated in Figures 3-6 and 3-7, contains the frame assemblies and most of the mechanical assemblies used in the printer.

Several removal/replacement procedures described in subsequent paragraphs cannot be performed unless the printer mechanism is detached from the printer base and repositioned for greater accessibility. The necessary accessibility can be gained by (1) placing the mechanism in a tilt position within the printer, or (2) removing the mechanism from the printer. The paragraphs below describe the procedure used to reposition the mechanism in either of these two ways.

NOTE

Tilting the mechanism is a simpler and less time consuming operation than removing it. Under normal circumstances, tilting is more efficient than removing the mechanism.

HEAD
ADAPTER
PCB

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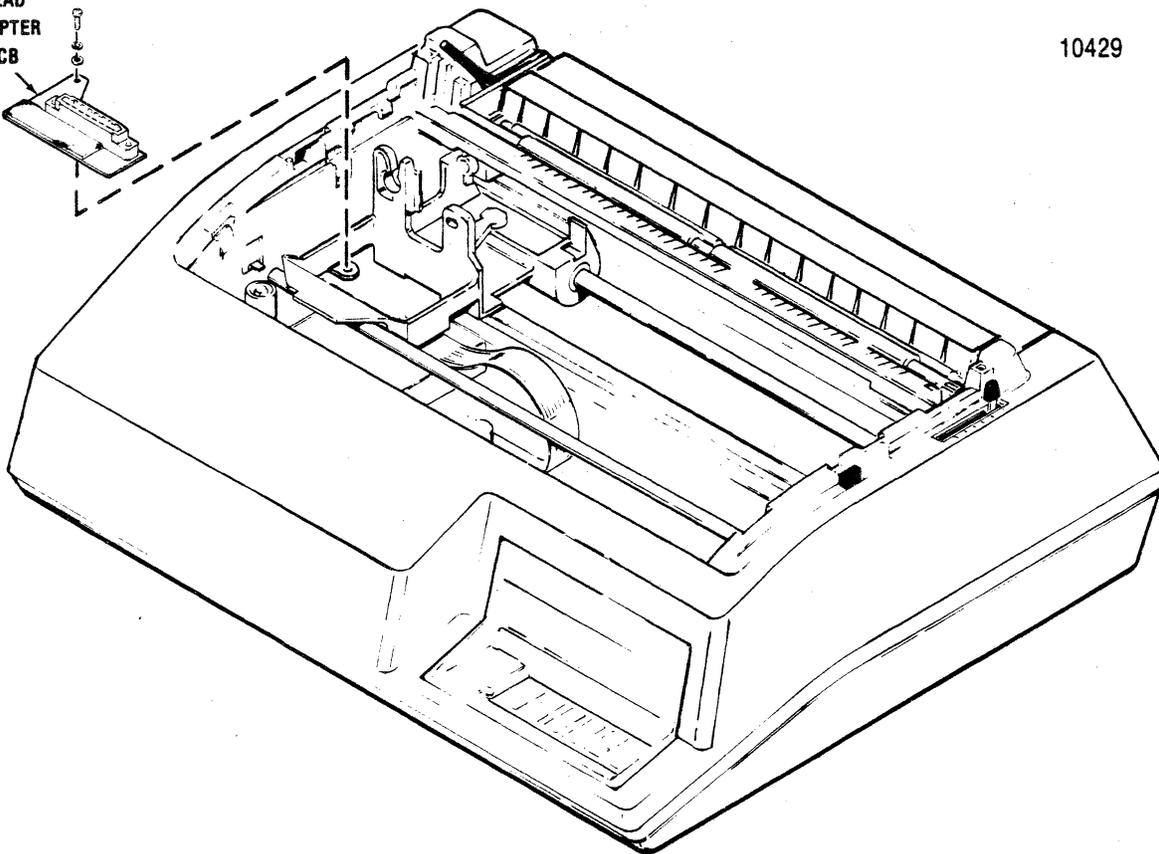


Figure 3-5 Removal/Replacement, Head Adapter PCB

3.10.1 TILTING PRINTER MECHANISM—To place the mechanism in tilt position, refer to Figure 3-6 and perform the following steps:

1. Remove the printer covers per paragraph 3.2.
2. Remove the four shoulder screws securing the printer mechanism to the base.
3. Unhook the rubber O-ring securing the head flex cable to the bracket on the Print Controller pcb.
4. Tilt the front of the mechanism upward about 45°.
5. Locate the support rod in the right side of the base. Raise the rod and position the top end into the opening provided in the front-right corner of the base.

3.10.2 REMOVING PRINTER MECHANISM—The mechanism is removed using a Phillips screwdriver. To remove the printer mechanism, refer to Figure 3-7 and perform the following steps:

1. Remove the printer covers per paragraph 3.2.
2. Remove the four shoulder screws mounting the printer mechanism to the printer base.
3. Unhook the rubber O-ring securing the head flex cable to the bracket on the Print Controller pcb.
4. Tilt the front of the mechanism upward about 45°.
5. Position one end of the support rod into the opening provided in the front right corner of the base, then position the other end of the rod through the front right shoulder washer hole in the frame.
6. Note the connections of the seven printer mechanism cable assemblies to the Print Controller connectors J208, J209, J210, J212, J211, J214, and J215. Then disconnect the seven cable connectors from the Print Controller.
7. Remove the head flex cable per paragraph 3.8.

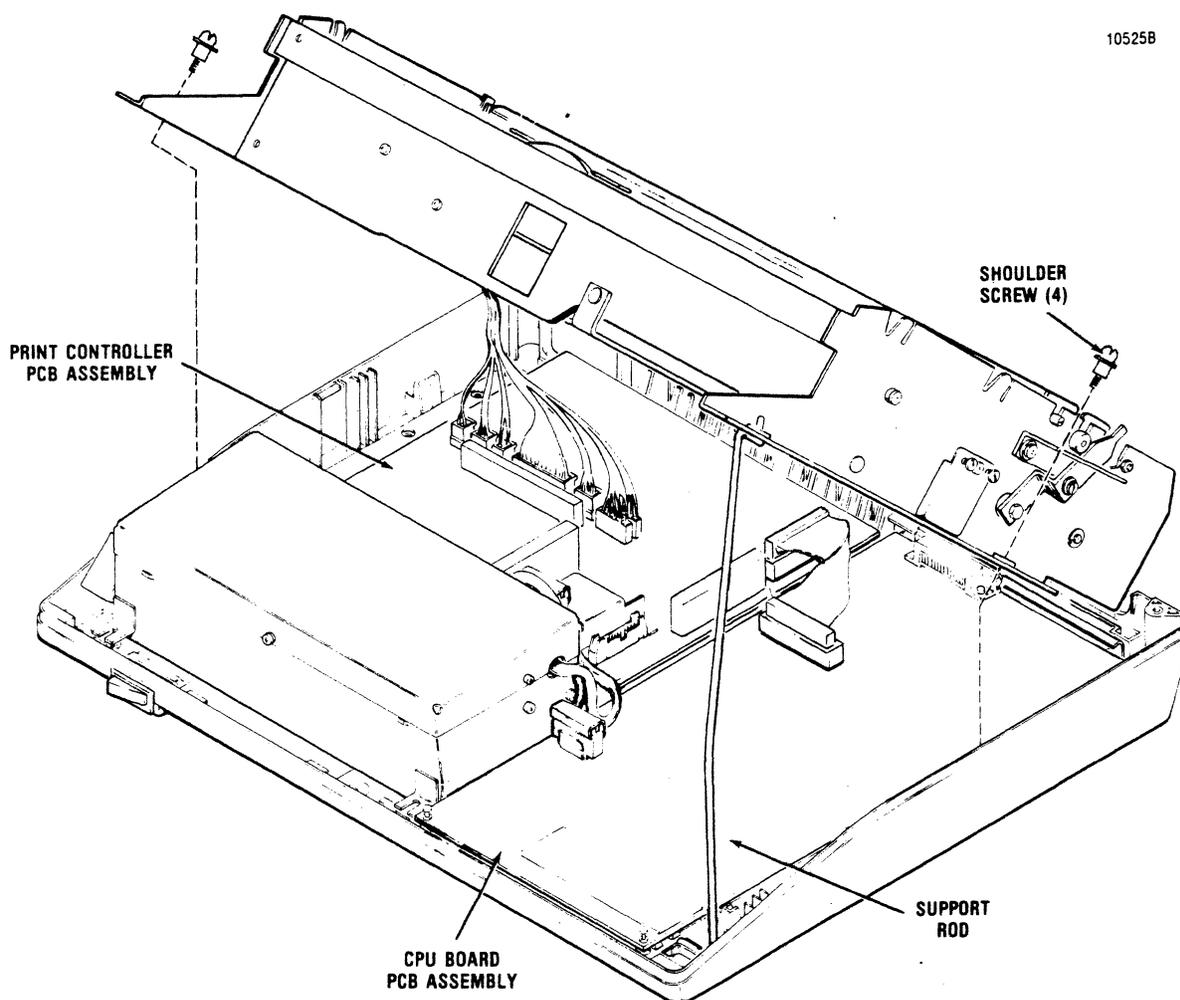


Figure 3-6 Tilting Printer Mechanism

8. Disconnect the green ground wire attached to the left rear of the mechanism.
9. Lift the printer mechanism up and out of the printer.
10. To replace the mechanism, reverse steps 1 through 9.

3.11 DUST COVER

The dust cover, item 1 of Figure 3-8, attaches to the bottom of the printer mechanism and protects the Print Controller and CPU pcb's. To remove the dust cover, refer to Figure 3-8 and perform the following steps:

1. Remove the ribbon cassette and guide per paragraph 3.6.

2. Tilt the printer mechanism per paragraph 3.10.1.
3. Disconnect the head flex cable connector P203 from the Print Controller pcb connector J203 (shown in Figure 3-4).
4. Push in (towards rear of printer) on the two locking tabs to release the dust cover from the mechanism. Then gently pull down on the front of the dust cover enough to clear the mechanism.
5. Pull the cover forward enough to clear the locating tabs from the slots in the mechanism and remove the dust cover from the printer.
6. To replace the dust cover, reverse steps 1 through 5.

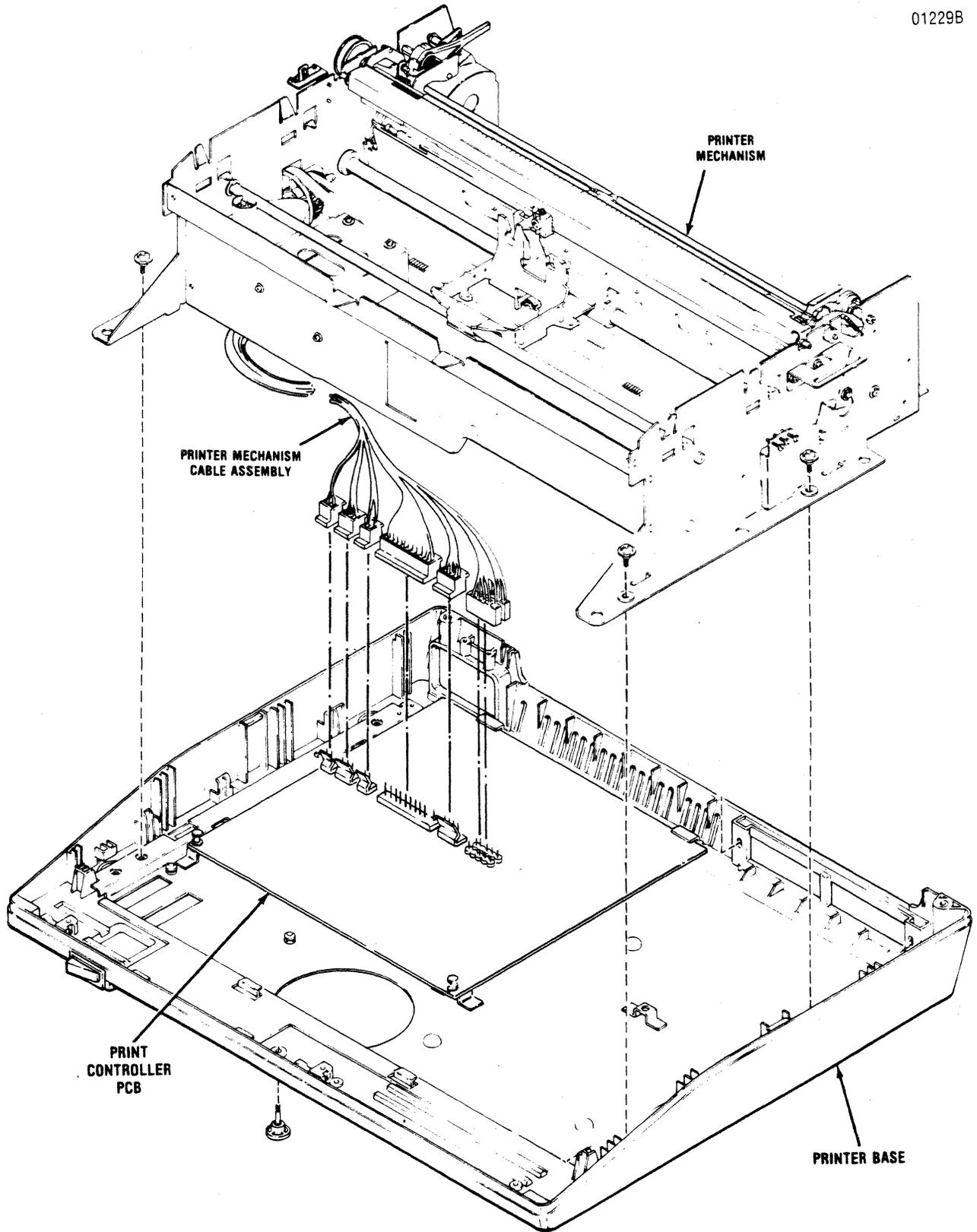


Figure 3-7 Removal/Replacement, Printer Mechanism

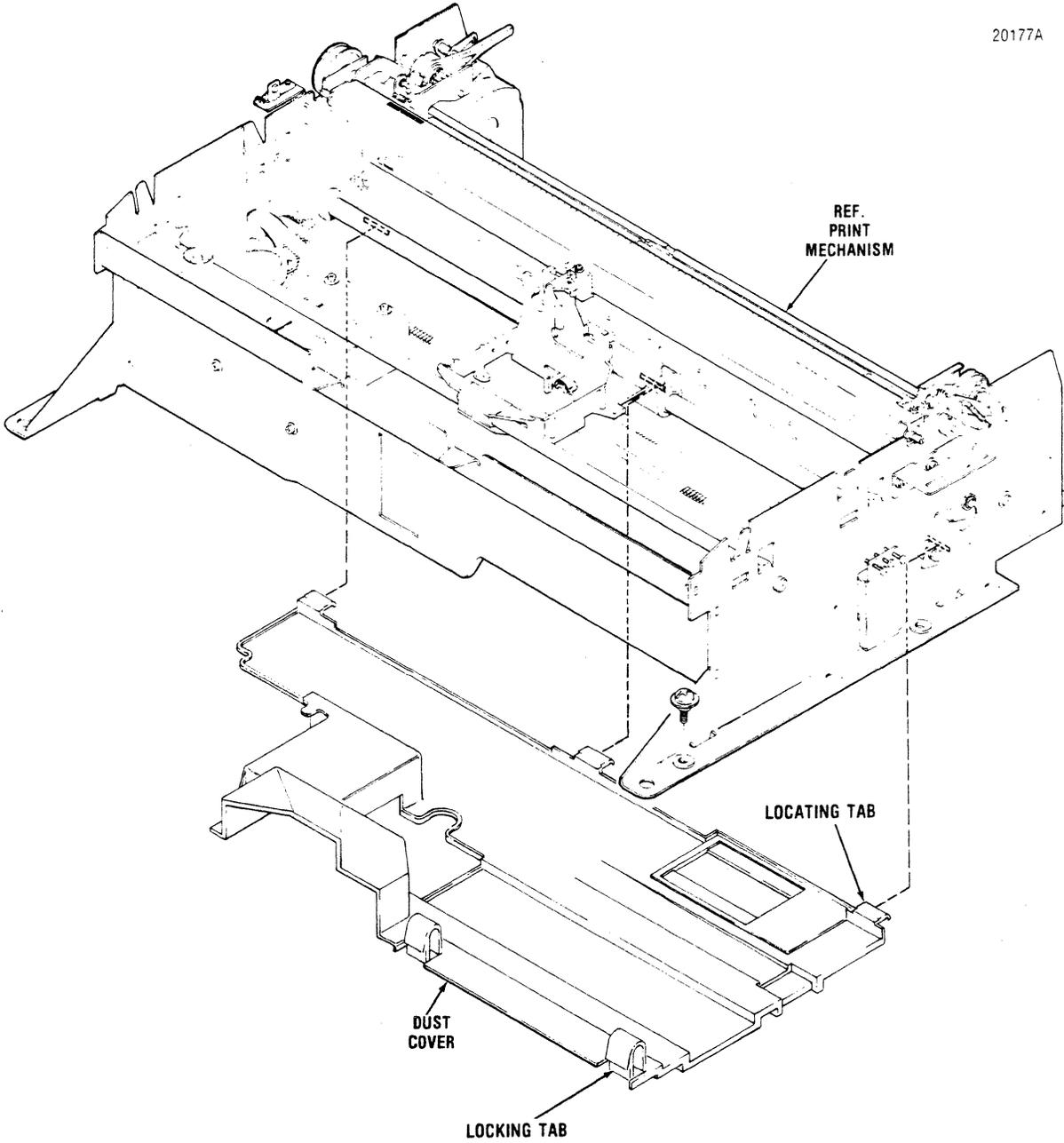


Figure 3-8 Removal/Replacement, Dust Cover

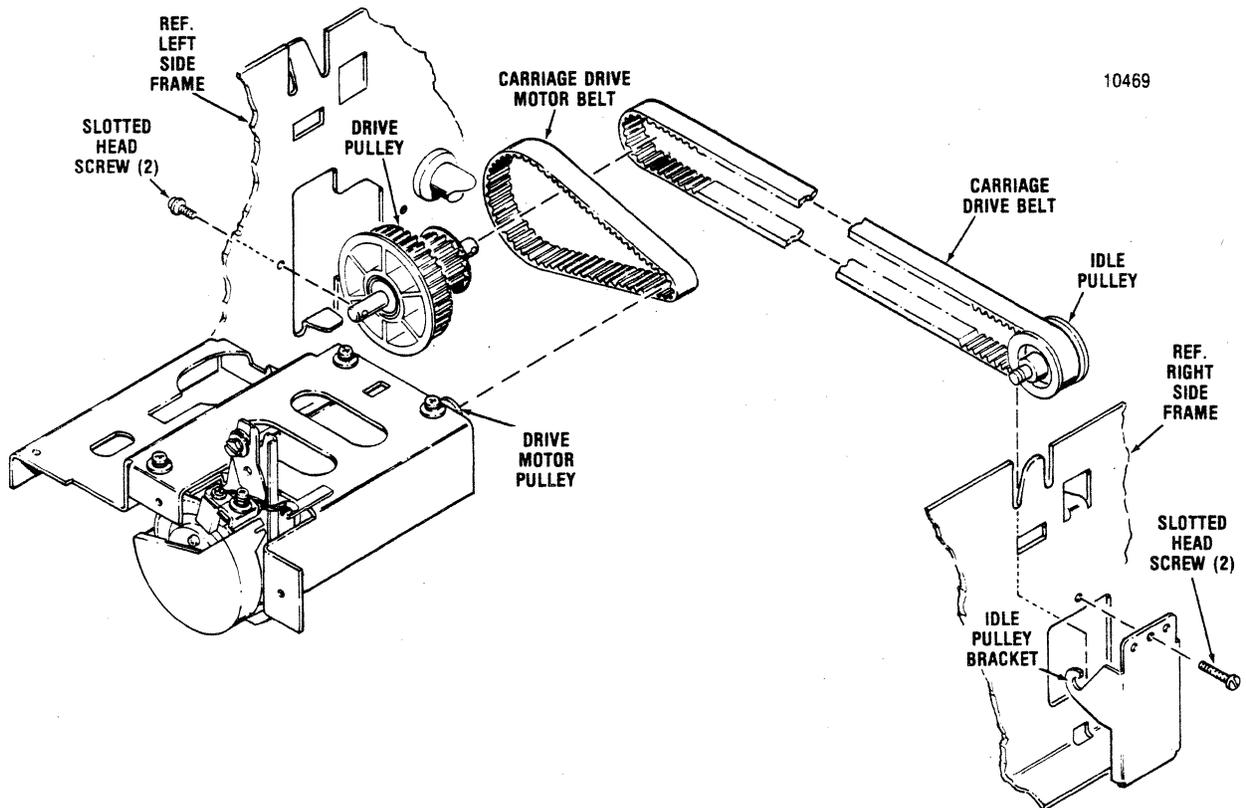


Figure 3-9 Removal/Replacement, Carriage Drive Motor Belt, Carriage Drive Belt

3.12 CARRIAGE DRIVE MOTOR BELT

The carriage drive motor belt (Figure 3-9) provides the drive from the carriage drive motor to the carriage drive belt, thus moving the carriage. The belt is removed using a flat blade screwdriver. To remove the belt, refer to Figure 3-9 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Release tension on the idler pulley by loosening the two, outside, slotted head screws on the idler pulley bracket.
3. Remove the two slotted head screws securing the drive pulley to the left frame.
4. Remove the carriage drive belt from the drive pulley.
5. Remove the carriage drive motor belt from the drive pulley.
6. To replace the belt, reverse steps 1 through 5 and refer to paragraph 2.2 for belt adjustment.

3.13 CARRIAGE DRIVE BELT

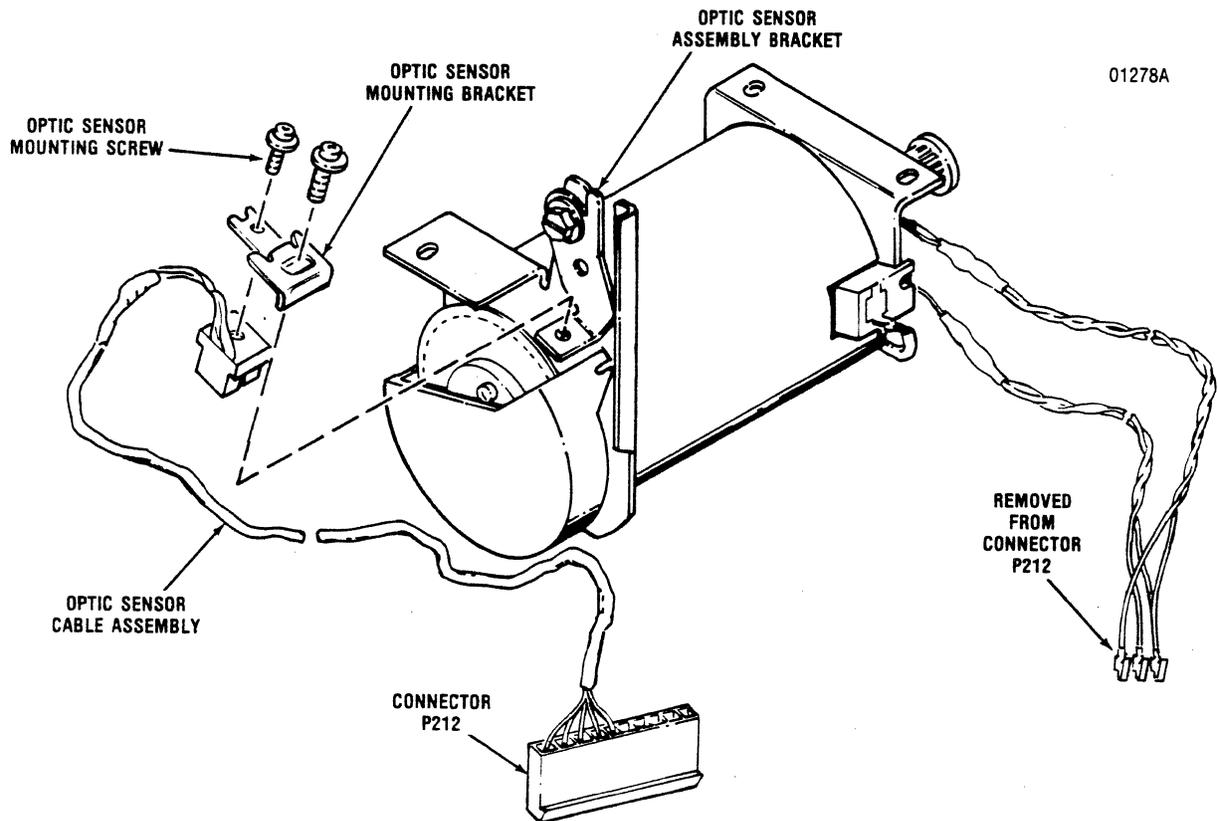
The carriage drive belt (Figure 3-9) attaches to the carriage and is driven by the carriage drive motor belt. The belt is removed using a flat blade screwdriver. To remove the belt, refer to Figure 3-9 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Remove the printer dust cover per paragraph 3.11.
3. Loosen the three slotted head screws mounting the idler pulley assembly to the right side frame and remove the pulley from the bracket.
4. Remove the two slotted head screws attaching the drive pulley to the left frame.

NOTE

Two small washers (one on either end of the pulley) are on the pulley shaft. Remove and retain these washers after detaching the pulley from the frame.

5. Remove the carriage drive belt from the idler



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Figure 3-10 Removal/Replacement, Optic Sensor Assembly

- pulley and the drive pulley, then remove the belt from the printer.
6. To replace the belt, reverse steps 1 through 5. Be sure to replace the small pulley washers during replacement.
 7. After replacement, refer to paragraph 2.3 for belt adjustment.
- 3.14 OPTIC SENSOR ASSEMBLY**
- The optic sensor assembly, item 1 of Figure 3-10, is attached to the carriage drive motor and is removed using a Phillips and a flatblade screwdriver. To remove the optic sensor assembly, refer to Figure 3-10 and perform the following steps:
1. Tilt the printer mechanism per paragraph 3.10.1.
 2. Remove the dust cover per paragraph 3.11.
 3. Remove the ribbon cassette and guide per paragraph 3.6.
 4. Remove the Phillips head screw mounting the sensor assembly to the assembly bracket.
 5. Remove the optic sensor cable from the clip on the drive motor mounting bracket.
 6. Remove the sensor cable from all clips on the mechanism frame.
 7. Cut the tie wraps that bind the optic cable.
 8. Remove connector P212 from the Print Controller pcb.
 9. Note the connections of the three carriage drive motor wires to connector P212. Then remove each of the three wire connectors from P212 by pressing their connector tab (use tip of small flat blade screwdriver) while gently lifting the wire from connector P212.
 10. Remove the optic sensor assembly from the printer.
 11. To replace the optic sensor assembly, reverse steps 1 through 10 and observe the wire connections to P212 noted in step 8.

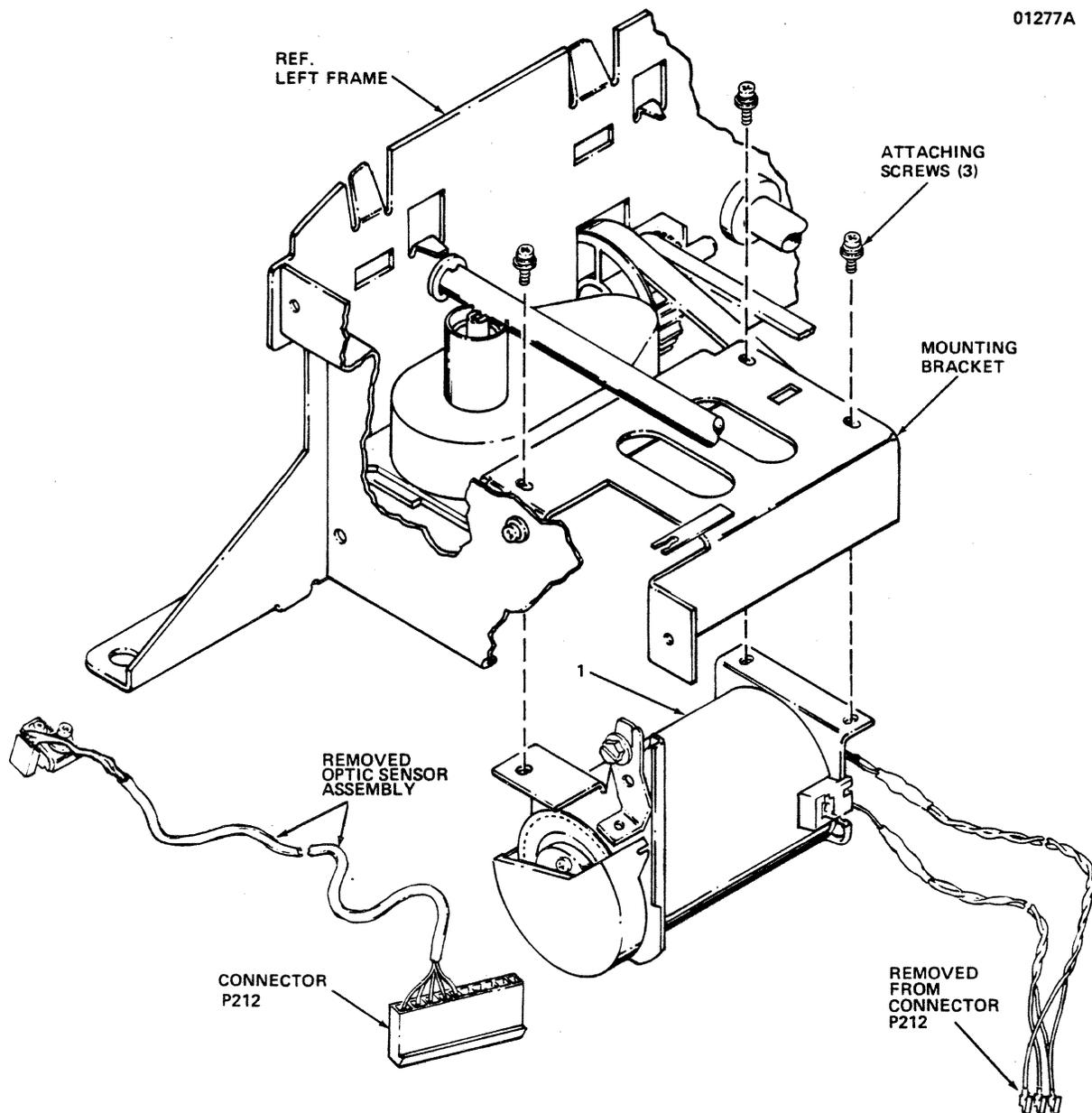


Figure 3-11 Removal/Replacement, Carriage Drive Motor

3.15 CARRIAGE DRIVE MOTOR

The carriage drive motor, item 1 of Figure 3-11, is attached to a motor mounting bracket and is removed using a Phillips screwdriver. To remove the carriage drive motor, refer to Figure 3-11 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Remove the dust cover per paragraph 3.11.
3. Remove the ribbon cassette and guide per paragraph 3.6.
4. Remove the drive motor cables from the harness clips on the frame.
5. Cut the tie wraps used to bind the drive motor cables.
6. Remove the Phillips head screw mounting the optic sensor assembly to the assembly bracket.
7. Note the connections of the three carriage drive motor wires to connector P212. Then remove each of the three wire connectors from P212 by pressing their connector tab while gently lifting the wire from the connector.
8. Remove the three Phillips head screws attaching the carriage drive motor to the motor mounting bracket.

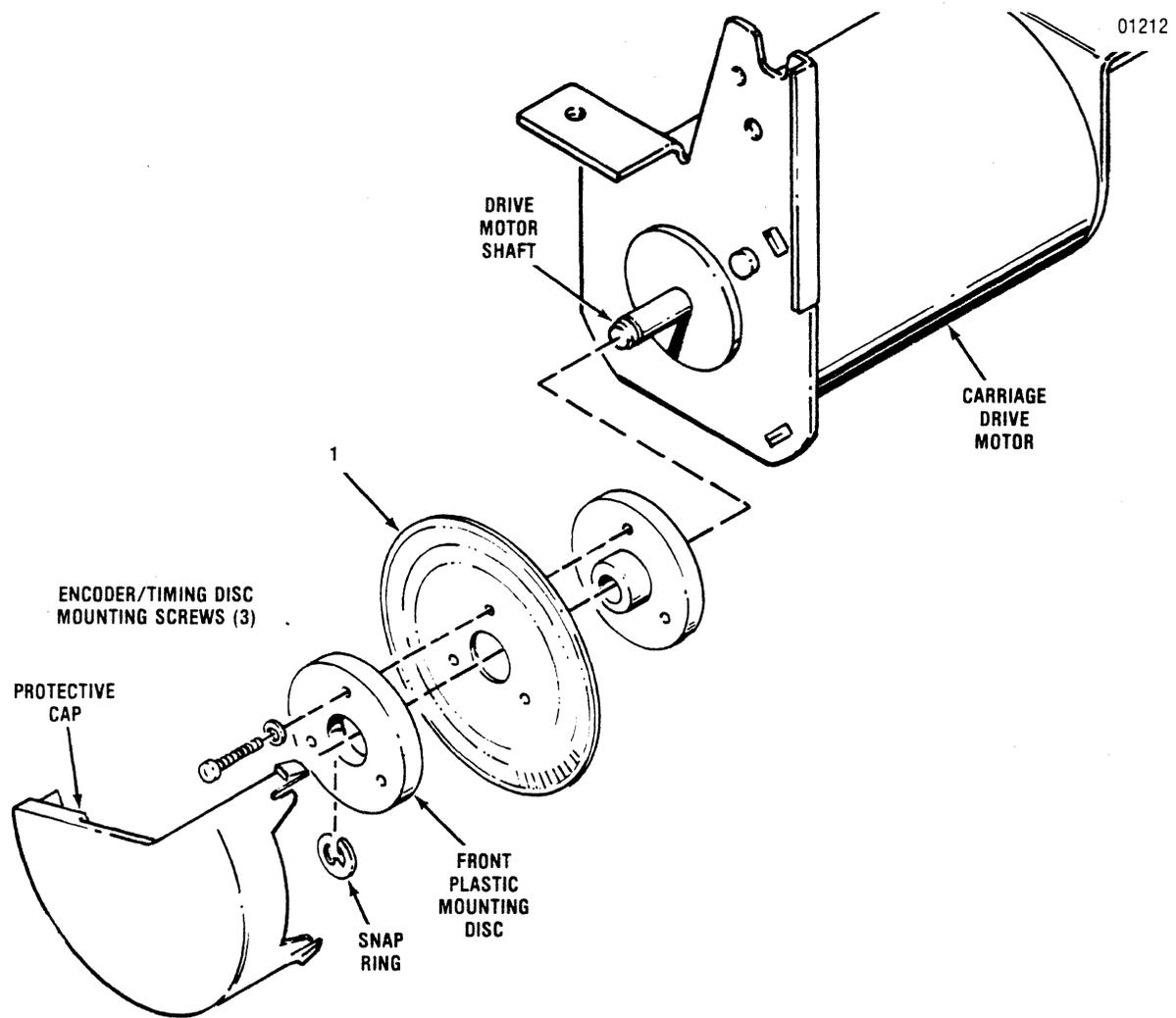


Figure 3-12 Removal/Replacement, Encoder/Timing Disc

CAUTION

Firmly grasp BOTH the motor and the front frame while removing the screws to prevent either from falling suddenly.

CAUTION

Always use care when working with the timing disc. It is extremely thin and can be bent or damaged if mishandled.

9. Remove the motor/cables from the printer.
10. To replace the motor, reverse steps 1 through 8 and observe the wire connections to P212 noted in step 6.
11. Perform the Optical Sensor Encoder/Timing Disc adjustment given in paragraph 2.6.

3.16 ENCODER/TIMING DISC

The encoder/timing disc, item 1 in Figure 3-12, is located at the end of the carriage drive motor shaft and is removed using a Phillips screwdriver. To remove the disc, refer to Figure 3-12 and perform the following steps:

1. Remove the carriage drive motor per paragraph 3.15.
2. Carefully unsnap the protective cap from the carriage drive motor.
3. Remove the snap ring securing the timing disc to the drive motor shaft.
4. Remove the three screws from the front plastic mounting disc.
5. Remove the front mounting disc and the encoder/timing disc (1) from the motor shaft.
6. To replace the disc, reverse steps 1 through 5.
7. Adjust timing disc per paragraph 2.6.

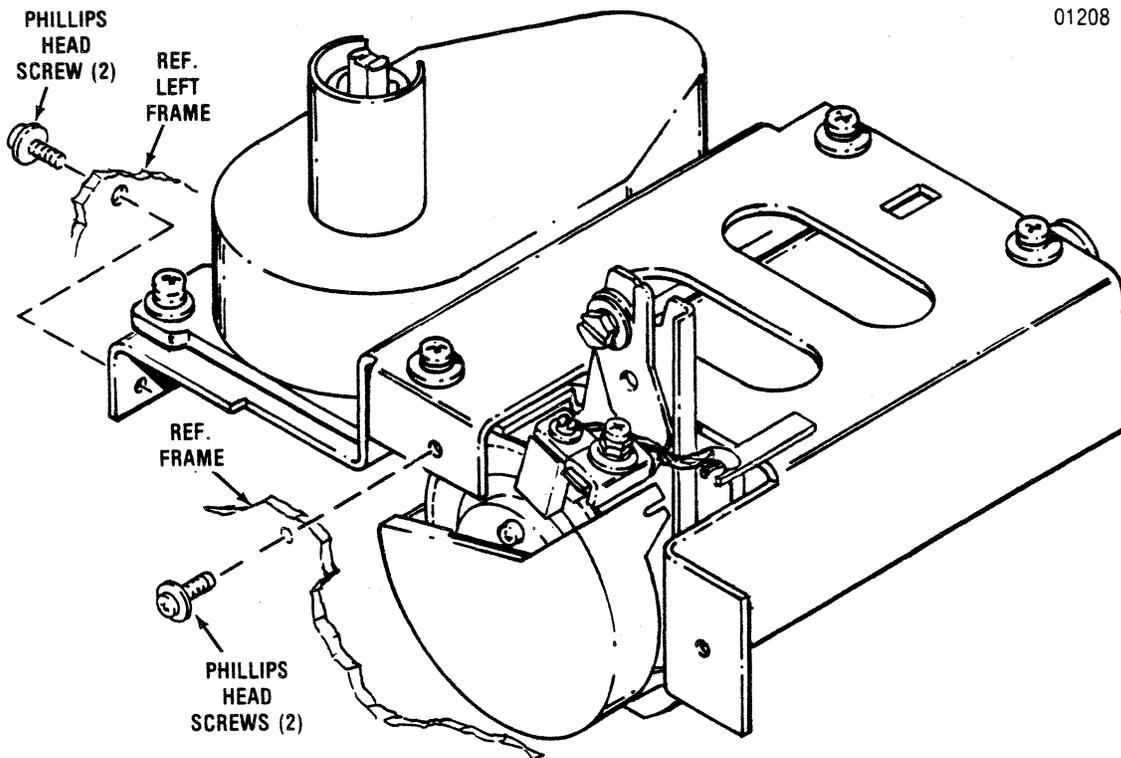


Figure 3-13 Removal/Replacement, Ribbon Drive Motor Mounting Bracket

3.17 RIBBON DRIVE MOTOR MOUNTING BRACKET

The ribbon drive motor mounting bracket supports both the ribbon drive and carriage drive motors. The bracket must be removed to remove/replace the ribbon drive motor. The bracket is secured to the left and front frames by four Phillips head screws. To remove the bracket, refer to Figure 3-13, and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Remove the dust cover per paragraph 3.11.
3. Remove the ribbon cassette and guide per paragraph 3.6.
4. Loosen the three Phillips head screws mounting the carriage drive motor to the mounting bracket and remove the carriage drive motor belt from carriage drive motor.
5. Locate and disconnect connectors J210 and J212 on the print controller pcb.
6. Remove the disconnected cables from all mounting clips and tie wraps.

7. Remove the four screws attaching the mounting bracket to the front and left frames, and remove the bracket from the printer.

8. To replace the bracket, reverse steps 1 through 7.

3.18 RIBBON DRIVE MOTOR

The ribbon drive motor (Figure 3-14) is removed using a Phillips screwdriver and a flat blade screwdriver. To remove the motor, refer to Figure 3-14 and perform the following steps:

1. Remove the ribbon drive motor mounting bracket per paragraph 3.17.
2. Remove the two Phillips head screws mounting the ribbon drive motor cover and remove the cover from the mounting bracket.
3. Remove the two slotted head screws mounting the ribbon drive motor and remove the motor and attached cables from the bracket.
4. To replace the ribbon drive motor, reverse steps 1 through 3.

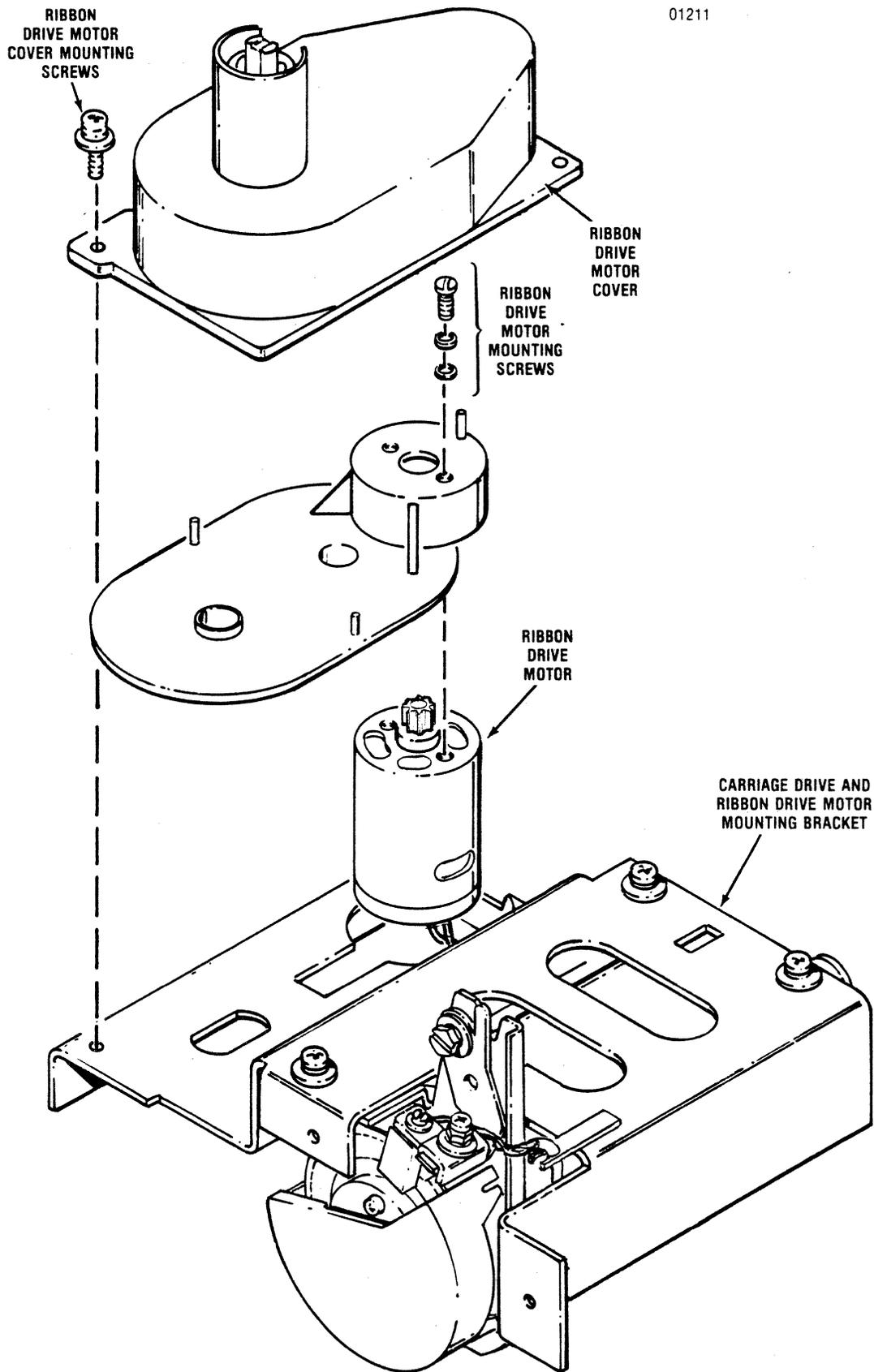


Figure 3-14 Removal/Replacement, Ribbon Drive Motor

3.19 COVER INTERLOCK SWITCH

The cover interlock switch, item 1 of Figure 3-15, is attached to the left frame and is removed using a Phillips screwdriver. To remove the cover interlock switch, refer to Figure 3-15 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Remove the cover interlock switch cable connector P209 from the Print Controller pcb and remove the cable from the wire harness mounting clips and tie wraps that secure the cable.
3. Remove the rubber grommet from the left frame which the cover interlock switch cable assembly is routed through.
4. Remove the Phillips head screw mounting the cable clamp to the left frame and remove the clamp from the printer.
5. Remove the two Phillips head screws mounting the cover interlock switch to the top of the left frame and remove the switch (1) and cable assembly from the printer.
6. To replace the switch, reverse steps 1 through 5.

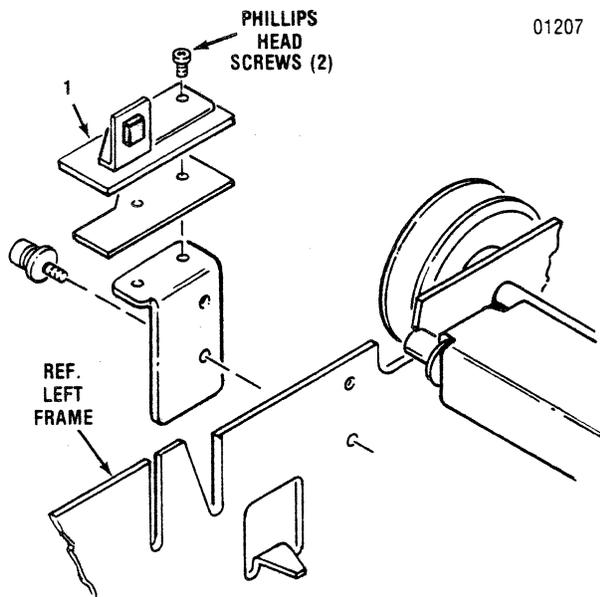


Figure 3-15 Removal/Replacement, Cover Interlock Switch

3.20 PAPER DRIVE BELT

The paper drive belt (Figure 3-16) provides the drive from the paper feed motor to the paper feed mechanism. The belt is removed using a snap ring remover and a Phillips screwdriver. To remove the belt, refer to Figure 3-16 and perform the following steps:

1. Remove the covers from the printer per paragraph 3.2.
2. Using a snap ring remover, remove the snap ring holding the tractor gear to the tractor drive shaft.
3. Gently pull the tractor gear off the tractor drive shaft.
4. Loosen the screw mounting the tensioner bracket to the left frame.
5. Remove the paper drive belt from the paper feed motor pulley and the paper drive pulley.
6. To replace the belt, reverse steps 1 through 5 and refer to paragraph 2.4 for belt adjustment procedures.

3.21 PAPER DRIVE MOTOR

The paper drive motor (Figure 3-17) is attached to the inside of the left frame and is removed using a Phillips screwdriver and a flat blade screwdriver. To remove the motor, refer to Figure 3-17 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Remove the paper drive belt per paragraph 3.20.
3. Unhook the small spring stretching from the motor shroud to the forms lever assembly.
4. Face the rear of the mechanism; note that one of the snap rings on the guide bar is against the inside of the side frame to your left.
5. Remove the snap ring on the inside of the frame and slide the guide bar to the left.

NOTE

After sliding the guide bar to the left, remove and retain the collar on the right end of the guide bar.

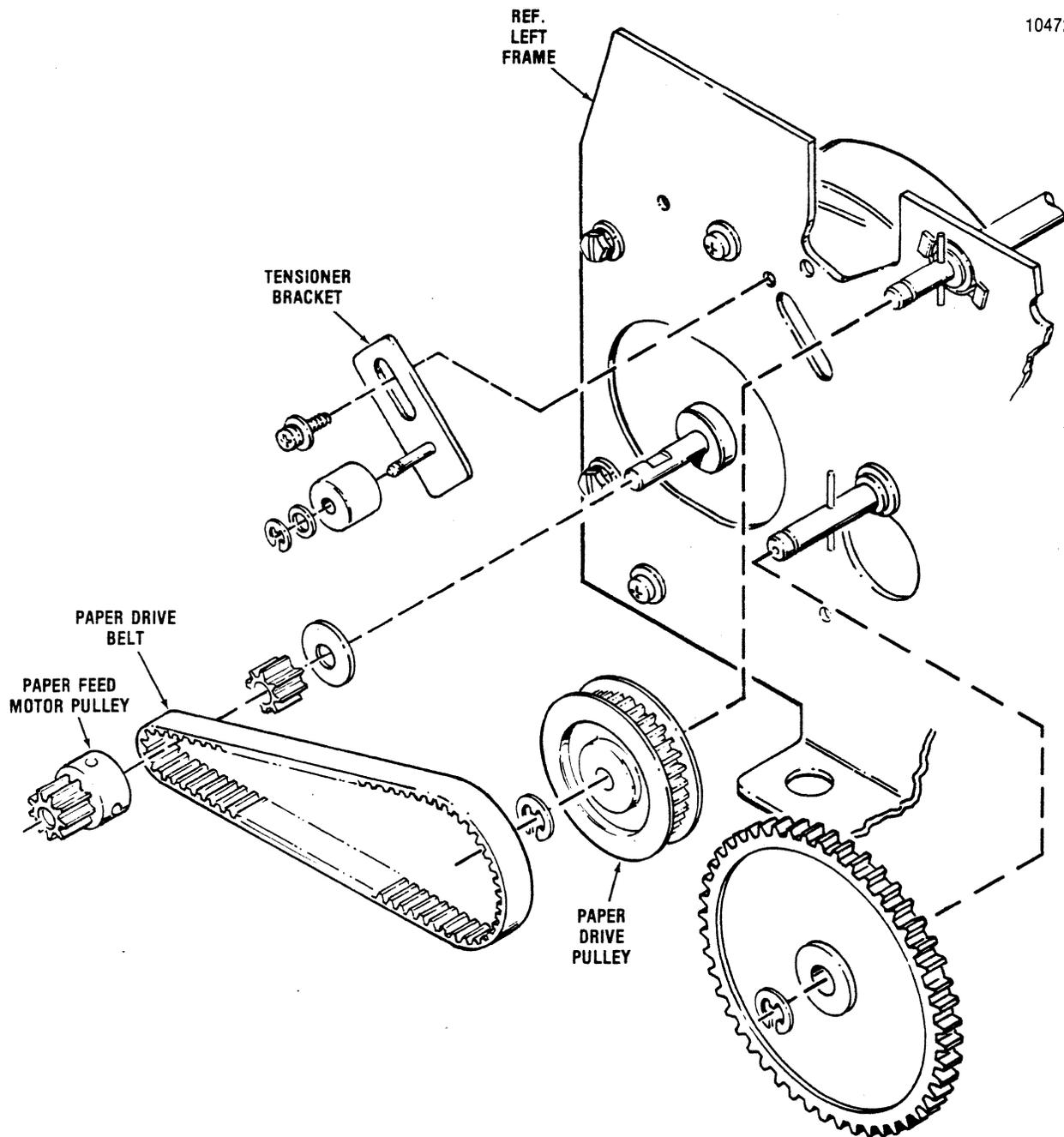


Figure 3-16 Removal/Replacement, Paper Drive Belt

6. Remove the three Phillips head screws mounting the motor shroud and remove the shroud from the printer.
7. Remove the paper drive motor cable from all clips and tie wraps holding the cable, then remove cable connector P211 from the Print Controller pcb.
8. Remove the three slotted head screws mounting the paper drive motor to the side frame and remove the motor and cable assembly from the printer.
9. To replace the motor, reverse steps 1 through 8.

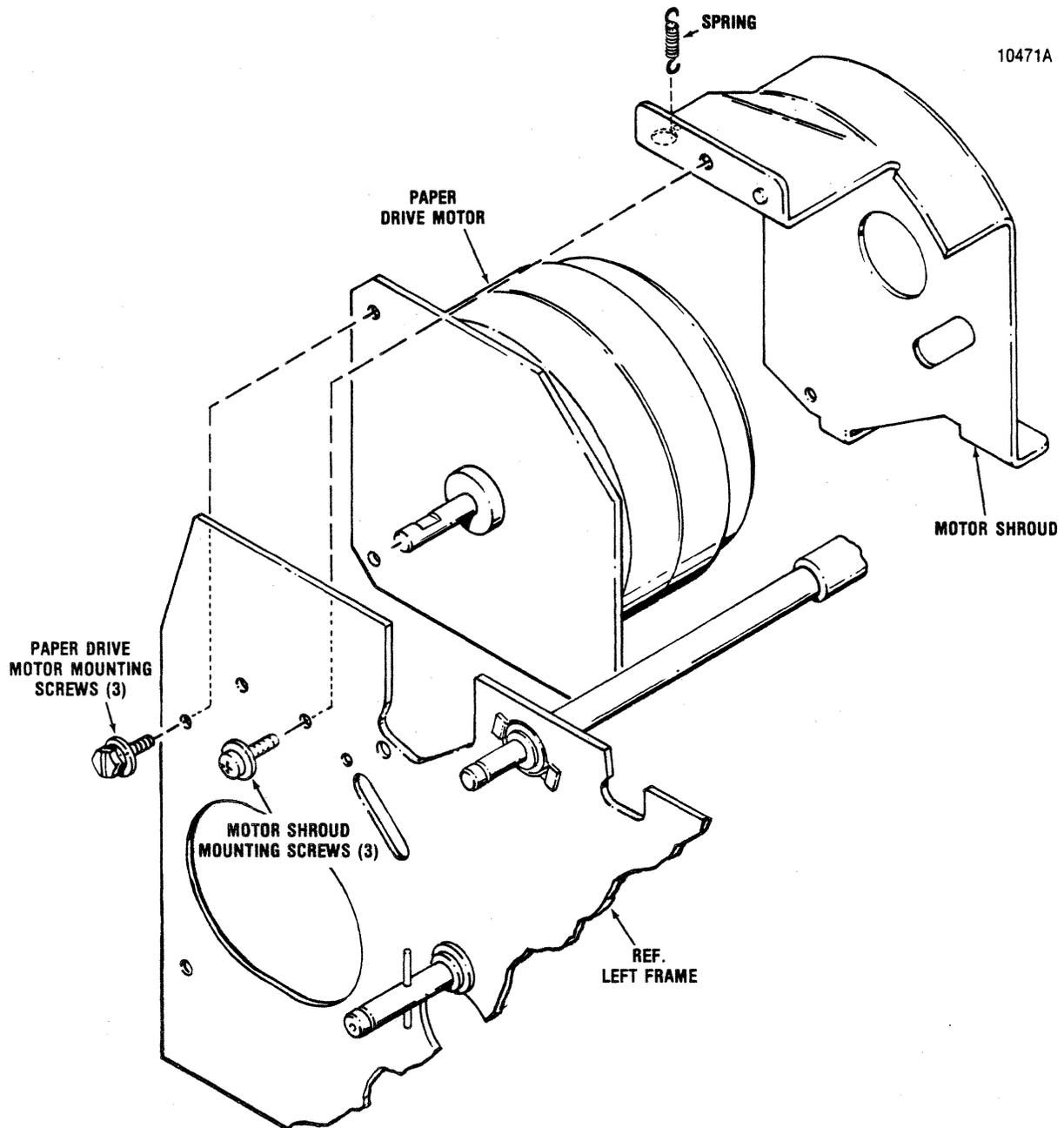


Figure 3-17 Removal/Replacement, Paper Drive Motor

3.22 PAPER EMPTY SWITCH

The paper empty switch, item 1 of Figure 3-18, is located on the right pin feed tractor and is removed using a Phillips screwdriver. To remove the paper empty switch, refer to Figure 3-18 and perform the following steps:

NOTE

Perform this procedure facing the rear of the printer.

1. Remove the printer covers per paragraph 3.2.
2. Tilt the printer mechanism per paragraph 3.10.1.
3. Remove the two pin connector P208 on the paper empty switch cable from connector J208 on the Print Controller pcb.
4. Remove the switch cable from any clips or tie wraps used to support the cable.

5. Remove the two screws mounting the paper empty switch to the right tractor assembly.
6. Remove the grommet shown in the figure by pressing it out from the inside of the chassis.
7. Remove the switch, grommet, and cable/connector from the printer.
8. To replace the switch, reverse steps 1 through 7.

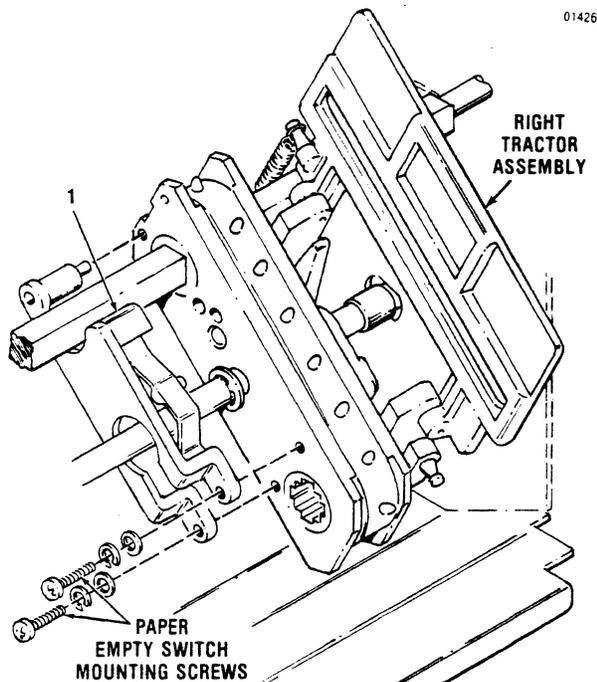


Figure 3-18 Removal/Replacement, Paper Empty Switch

3.23 SENSOR ARM ASSEMBLIES

The left-hand and right-hand sensor arm assemblies (items 1 and 2 respectively of Figure 3-19) are located on the platen assembly and are positioned to face the rectangular cut-outs on the upper paper guide assembly. To remove the sensor arm assemblies, refer to Figure 3-19 and perform the following steps:

1. Remove the printer covers per paragraph 3.2.
2. Tilt the printer mechanism per paragraph 3.10.1.
3. Remove the five-pin connectors P214 and/or P215 on the sensor assemblies from connectors J214 and/or J215 on the Print Controller pcb.
4. Remove the assembly cables from any clips or tie wraps used to support the cables.
5. Carefully pull the cable(s) of the sensor arm assembly(ies) up through the mechanism assembly opening near the paper-feed motor.
6. Remove the M3 x 6 attaching hardware for the sensor(s).
7. Remove the sensor arm assembly(ies) and cable/connectors from the printer.
8. To replace the sensor arm assembly(ies), reverse steps 1 through 7 and observe the following note.

NOTE

Ensure that the sensor arm assembly(ies) is pushed up against the upper paper guide before tightening the attaching hardware. Otherwise, there may be false paper-out indications by the printer when operating in the cut sheet mode.

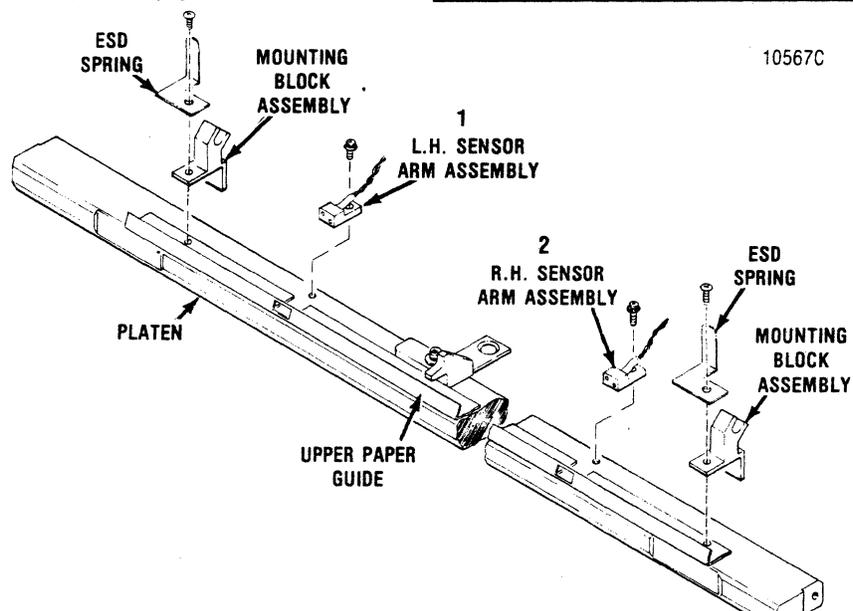


Figure 3-19 Removal/Replacement, Sensor Arm and Mounting Block Assemblies

3.24 MOUNTING BLOCK ASSEMBLIES

The mounting block assemblies are used to properly position the optional three-bin sheet feeder. The mounting block assemblies, item 3 of Figure 3-19 are located on the upper paper guide and are removed using a Phillips screwdriver. To remove these assemblies, refer to Figure 3-19 and perform the following steps:

1. Remove the printer covers per paragraph 3.2.
2. Remove the Truss Head screw securing each of the mounting blocks and ESD springs to the upper guide rails.
3. To replace the blocks, place a drop of adhesive on the threaded portion of the screw and reverse steps 1 and 2 above.

3.25 TRACTOR ASSEMBLIES, LEFT/RIGHT

The left and right tractor assemblies, items 1 and 2 of Figure 3-20, are located on the tractor drive shaft and the tractor guide bar. The tractors are removed using a snap ring tool. To remove the

tractors, refer to Figure 3-20 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Remove the paper drive pulley per paragraph 3.20.
3. Remove the paper empty switch per paragraph 3.22.
4. Facing the rear of the printer, remove the three snap rings securing the guide bar and slide the bar to the left and through the tractor assemblies.
5. Remove the tractor drive shaft snap ring and washer from the left end of the shaft (ring/washer are labeled in Figure 3-20).
6. Slide the bearing labeled in Figure 3-20 to the left, causing the drive shaft to drop to the side-frame access hole below.
7. Move the drive shaft to the left enough to lower right side of the shaft into the side-frame access hole below.

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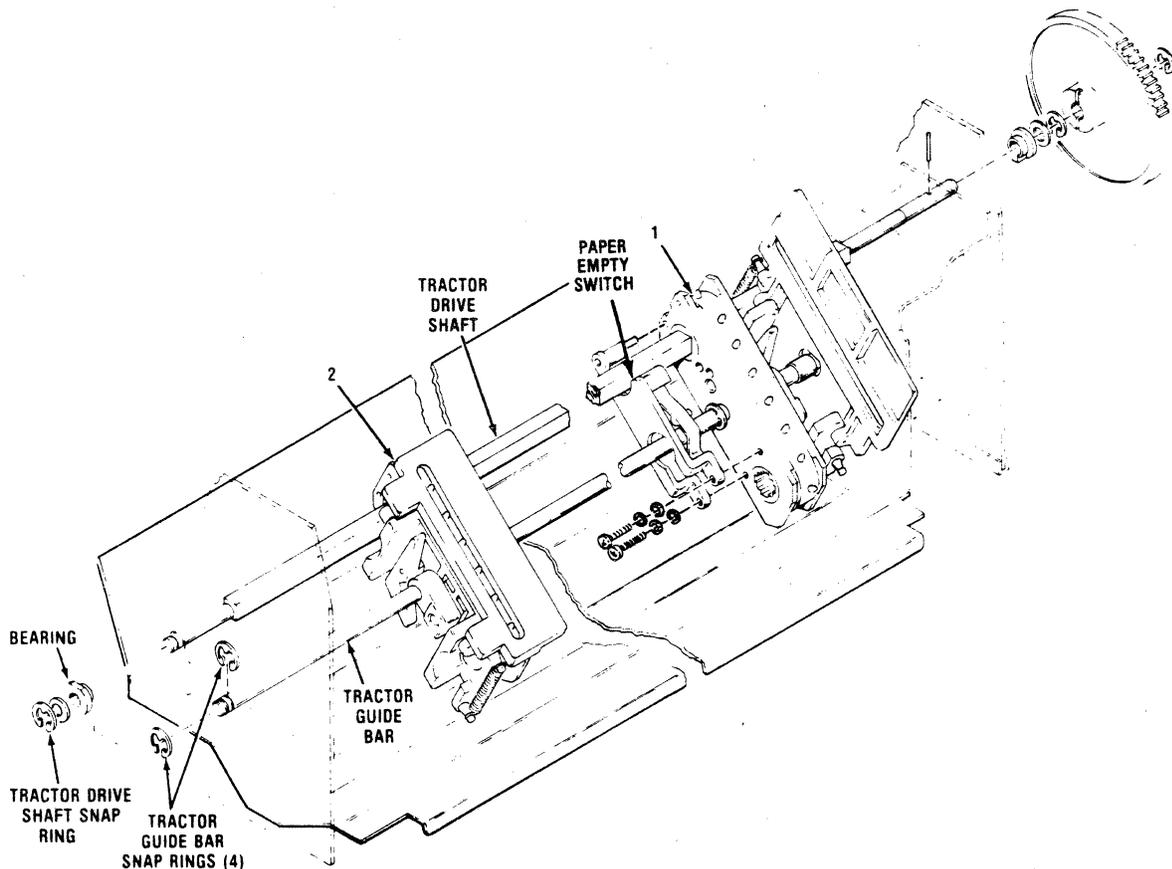


Figure 3-20 Removal/Replacement, Tractor Drive Assemblies

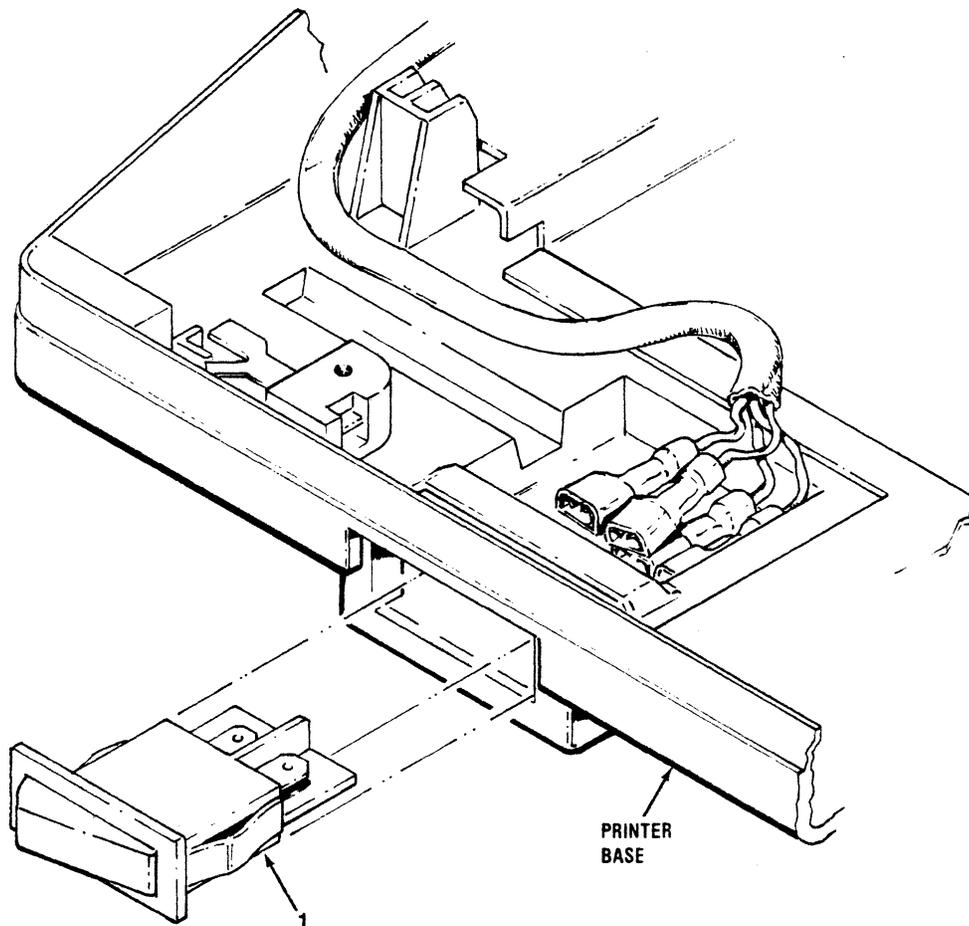


Figure 3-21 Removal/Replacement, On/Off Switch

8. Push the tractor shaft to the right, through the access hole and tractor assemblies, and remove the tractors from the printer.
9. To replace the tractor assemblies, reverse steps 1 through 8.

NOTE

Verify tractor pin alignment when replacing tractors on guide shaft.

3.26 ON/OFF SWITCH

The ON/OFF switch, item 1 of Figure 3-21, is located on the left front of the printer base and no tools are required to remove the switch. To remove the ON/OFF switch, refer to Figure 3-21 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Remove the power supply assembly per paragraph 3.31.
3. Note the wire connections to the switch and then remove the four connectors from the switch.
4. Push the switch forward through the opening in the printer base and remove the switch (1) from the printer.
5. To replace the switch, reverse steps 1 through 4.

NOTE

When replacing the switch, ensure the wires are connected properly as noted in step 3.

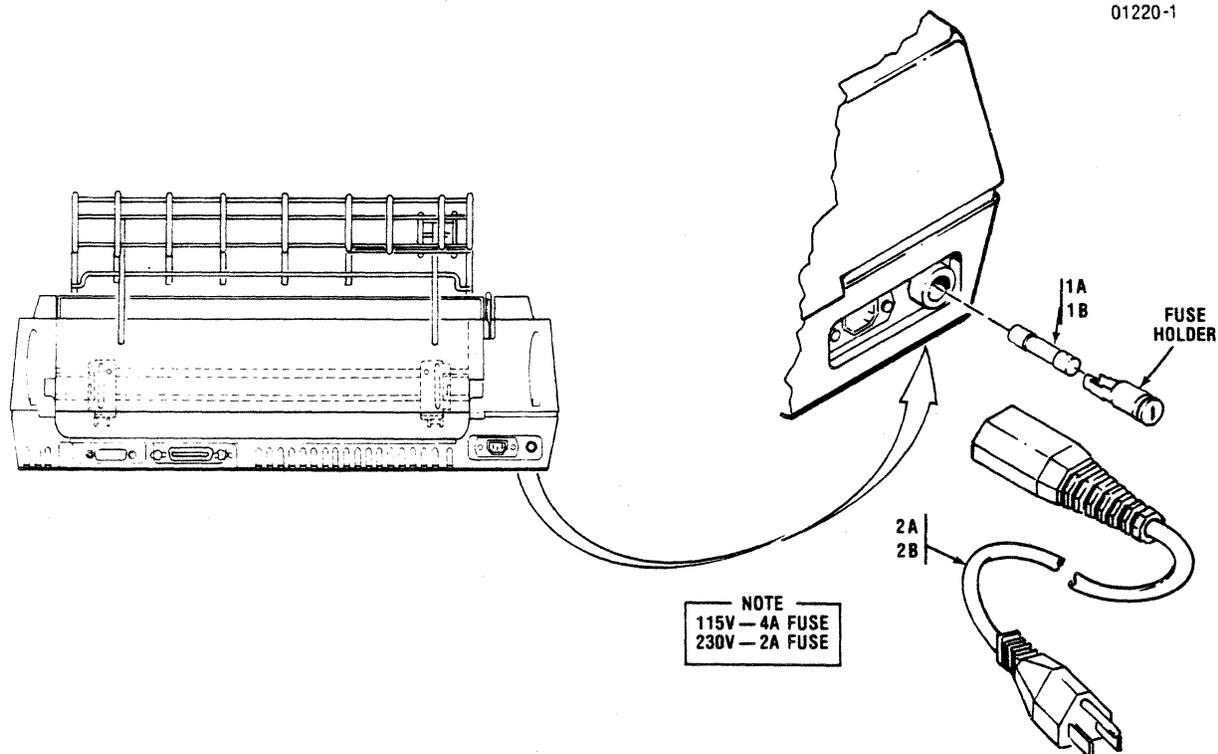


Figure 3-22 Removal/Replacement, Main Fuse and Power Cord

3.27 MAIN FUSE

The main fuse, item 1A or 1B of Figure 3-22, is located in the rear of the printer and is removed using a flat blade screwdriver. To remove the fuse, refer to Figure 3-22 and perform the following steps:

1. Remove the power cord from the wall socket.
2. Using a flat blade screwdriver, turn the fuse holder one quarter of a full turn, counterclockwise.
3. Remove the defective fuse (1A or 1B) from the fuse holder.
4. Install the new fuse into the fuse holder and replace the fuse holder back into the printer base.

NOTE

Ensure the same type rated fuse is installed when replacing the fuse. Refer to Figure 3-22.

3.28 POWER CORD

The 8 foot power cord, item 2A or 2B of Figure 3-22, is terminated on one end with a 3-prong grounded plug and terminated on the other end

with a 3-prong receptacle. The cord is removed from the printer by removing the plug end from the external power source, then the receptacle end from the printer. Refer to Figure 3-22.

3.29 COVER LATCH SPRINGS

Four small springs (Figure 3-23) are located on the inside of the body cover to help secure the top and rear covers to the body cover. To remove any of the four springs, refer to Figure 3-23 and perform the following steps:

1. Remove the body cover per paragraph 3.2.3.
2. Turn cover over to expose the inside, then stretch the spring enough to free one end of the spring from its catch.
3. Slide the other end of the spring off the other catch, and remove.
4. To replace spring, attach one end of spring to cover catch, stretch spring, and slide other end of the spring over the other catch.
5. Replace the body cover by reversing steps 1 through 6 of paragraph 3.2.3.

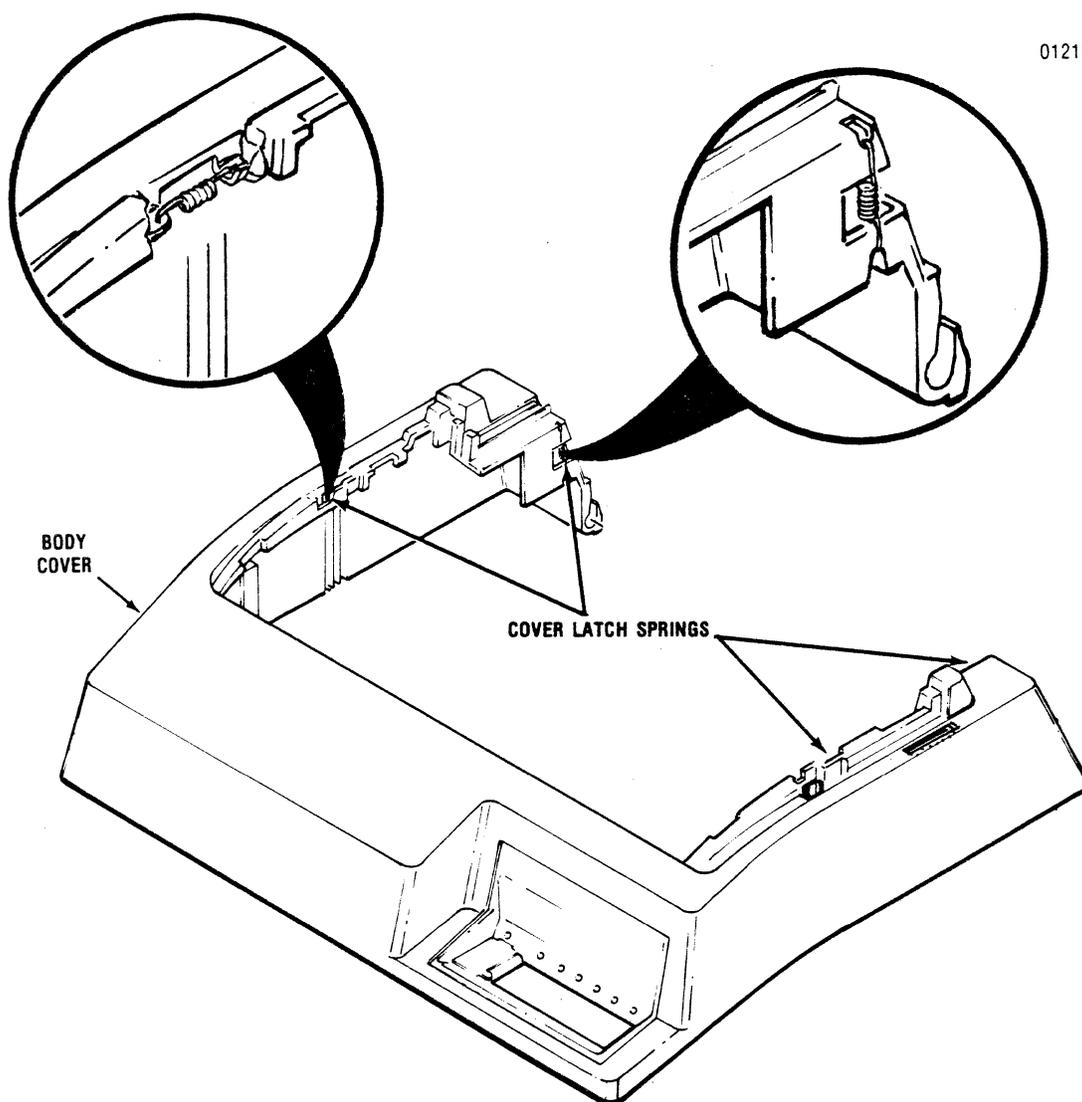


Figure 3-23 Removal/Replacement, Cover Latch Springs

3.30 PICO FUSE

The pico fuses, items F1 through F12 of Figure 3-24 are located on the Print Controller pcb and are removed using needle-nose pliers. To remove the pico fuses, refer to Figure 3-24 and perform the following steps:

1. Remove the Print Controller pcb per paragraph 3.33.

NOTE

Refer to Figure 3-24 for the locations (F1 through F12) of the pico fuses and to Appendix A for pico fuse color coding information.

2. Remove the defective fuse from the Print Controller pcb.
3. Install new pico fuse by pushing fuse into place.

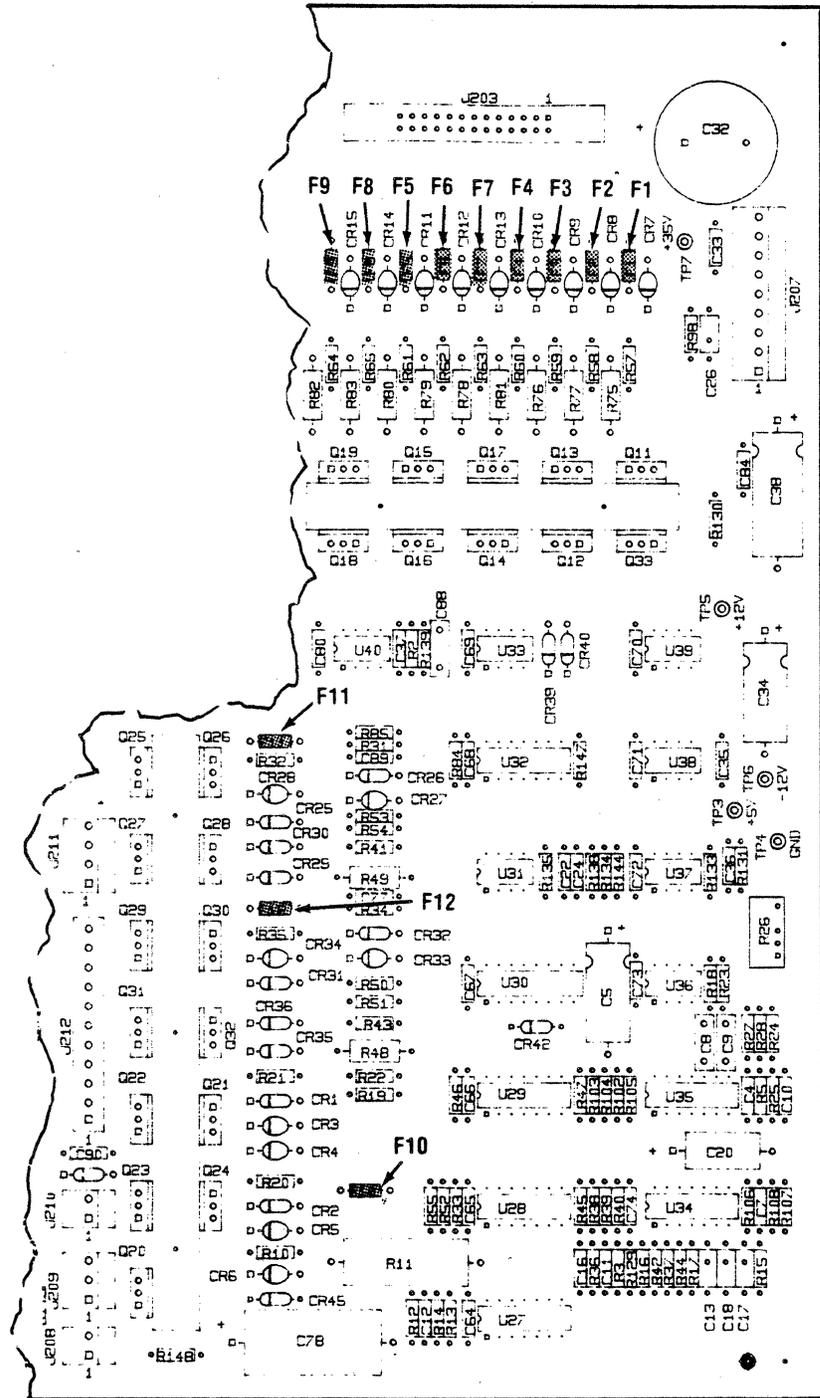


Figure 3-24 Removal/Replacement, Pico Fuses

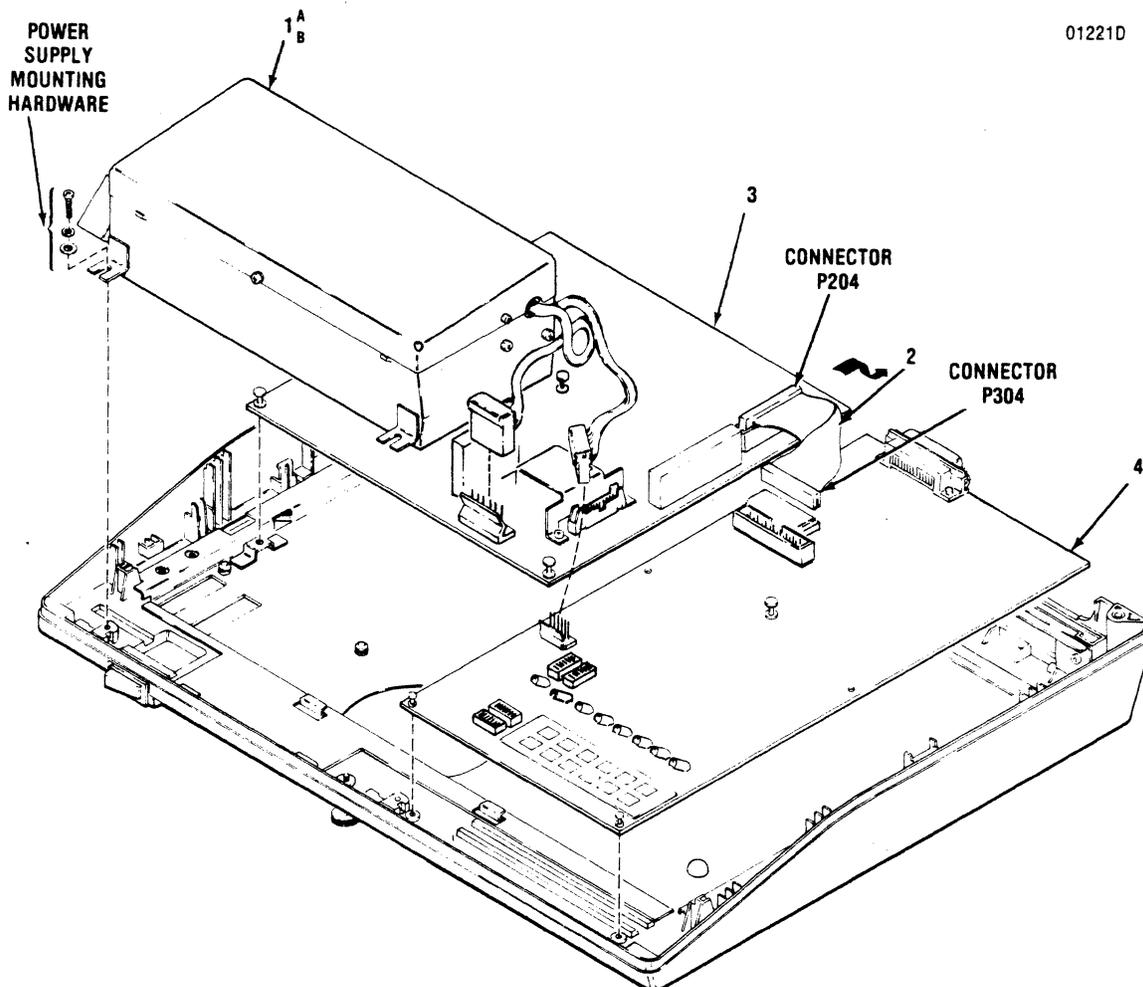


Figure 3-25 Removal/Replacement, Power Supply Assembly, CPU/Controller Cable, Print Controller PCB and CPU Board PCB

3.31 POWER SUPPLY ASSEMBLY

The power supply assembly, item 1A or 1B of Figure 3-25, is mounted to the printer base and is removed using a Phillips screwdriver. To remove the power supply, refer to Figure 3-25 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Disconnect the two cable assembly connectors P304 and P204 from the CPU Board pcb and Print Controller pcb.
3. Remove the two Phillips head screws mounting the front of the power supply to the printer base.
4. Disconnect the three connectors from the bottom of the line filter assembly which is attached to the left side of the power supply.

5. Pull the power supply forward, off the two mounting tabs, and remove the power supply assembly (1A or 1B) from the printer.

6. To replace the power supply assembly, reverse steps 1 through 5.

3.32 CPU/CONTROLLER CABLE

The CPU/Controller cable, item 2 of Figure 3-25, connects the Print Controller pcb and CPU Board pcb. To remove the cable, refer to Figure 3-25 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Snap back the two mounting tabs securing one end of the cable to the CPU Board pcb and remove the cable connector P304 from connector J001 on the pcb.

NOTE

Some pcbs do not have mounting tabs.

3. Remove the other connector P204 of the CPU/Controller cable from the Print Controller pcb connector J201 and remove the cable (2) from the printer.
4. To replace the CPU/Controller cable, reverse steps 1 through 3.

3.33 PRINT CONTROLLER PCB

The Print Controller pcb, item 3 of Figure 3-25, is mounted to the printer base by quick release fasteners. No tools are required to remove the pcb. To remove the Print Controller pcb, refer to Figure 3-25 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Remove the CPU/Controller cable from the Print Controller pcb.
3. Disconnect the power supply cable from the Print Controller pcb.
4. Detach all cable connectors from the Print Controller pcb.
5. Lift up on the three quick release fasteners securing the pcb to the printer base.
6. Pull the pcb forward and lift the Print Controller pcb up and out of the printer.
7. To replace the Print Controller pcb, reverse steps 1 through 6.

3.34 CPU BOARD PCB

The CPU Board pcb, item 4 of Figure 3-25, is mounted to the printer base by quick release fasteners. No tools are required to remove the pcb. To remove the CPU Board, refer to Figure 3-25 and perform the following steps:

1. Tilt the printer mechanism per paragraph 3.10.1.
2. Note the switch settings for the Horizontal Offset (Switch S4, positions 1 through 5) on the CPU Board.
3. Remove the CPU/Controller cable from the CPU Board.
4. Disconnect the power supply cable from the CPU Board.
5. Lift up on the three quick release fasteners securing the pcb to the printer base.
6. Pull the CPU Board (4) forward and lift up and out of the printer.
7. To replace the CPU Board, reverse steps 1 through 6.
8. Set the Horizontal Offset as noted in step 2. Run a test printout of H's to check for horizontal offset described in paragraph 2.7. If there is an offset, perform the adjustment described in paragraph 2.7.

3.35 RECOMMENDED SPARE PARTS LISTING

The following table lists the recommended spares according to Figure and item number, and provides a description of the recommended spare and its part number. An example is shown below:

3-3	1	64000520-6001	Ribbon Cassette (4 pack)
Figure in which recommended spare is shown.	Item number used in figure to identify spare.	Recommended spare part number.	Description of recommended spare part.

Table 3-2 Recommended Spare Part Listing

FIGURE	ITEM	PART NUMBER	DESCRIPTION
3-3	1	64000520-6001	Ribbon Cassette (4 pack)
	2	63180315-5102 or 5002	Print Head Assembly
3-4	1	63180285-4001	Head Flex Cable (2 each)
3-10	1	39099012-1001	Optic Sensor Assembly
3-11	1	U20187001	Carriage Drive Motor
3-12	1	64000992-2001	Encoder/Timing Disc
3-15	1	U20242001	Cover Interlock Switch
3-18	1	U21014001	Paper Empty Switch
3-19	1	64002072-2001	Sensor Assembly, Left
	2	64002072-2002	Sensor Assembly, Right
3-20	1	U20073001	Tractor Assembly, Left
	2	U20074001	Tractor Assembly, Right
3-21	1	39098122-1001	ON/OFF Switch
3-22	1A	39030033-1027	Main Fuse, 4 Amp (115V)
	1B	36100736-1007	Main Fuse, 2 Amp (230V)
3-24	F1, F2	39030030-1004	Pico Fuse, 2 Amp
	F3	39030030-1006	Pico Fuse, 3 Amp
	F4-F12	39030030-1009	Pico Fuse, 5 Amp
3-25	1A	64000399-5002	Power Supply Assembly, 50 Hz
	1B	64000399-5001	Power Supply Assembly, 60 Hz
	2	63180300-4001	CPU/Controller Cable
	3	64001180-4001	Print Controller PCB
	4	64003372-4001	CPU Board PCB

APPENDIX A

PICO FUSE COLOR CODE

A.1 GENERAL INFORMATION

Some pico fuse manufacturers mark the outer covering of their fuses with four colored bands. The first three bands are of the same width and indicate the current rating of the fuse. The fourth

band is wider than the other three and indicates the time-current characteristics of the fuse.

Table A-1 shows the pico fuse color code for fuses with "normal blo" time characteristics.

**Table A-1. Pico Fuse Color Code
(I.E.C. Standards, Publication 127)**

RATED CURRENT MA	FIRST BAND	SECOND BAND	THIRD BAND	FOURTH BAND
62	Blue	Red	Black	Red
100	Brown	Black	Brown	Red
125	Brown	Red	Brown	Red
250	Red	Green	Brown	Red
375	Orange	Violet	Brown	Red
500	Green	Black	Brown	Red
750	Violet	Green	Brown	Red
1000	Brown	Black	Red	Red
1500	Brown	Green	Red	Red
2000	Red	Black	Red	Red
2500	Red	Green	Red	Red
3000	Orange	Black	Red	Red
3500	Orange	Green	Red	Red
4000	Yellow	Black	Red	Red
5000	Green	Black	Red	Red
7000	Violet	Black	Red	Red
10000	Brown	Black	Orange	Red
12000	Brown	Red	Orange	Red
15000	Brown	Green	Orange	Red

READERS COMMENTS

Publications Title Model 354-1,-2 Printer Mechanism Technical Manual

Publications No. 37403445-9A00 Revision A Date June 1984

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