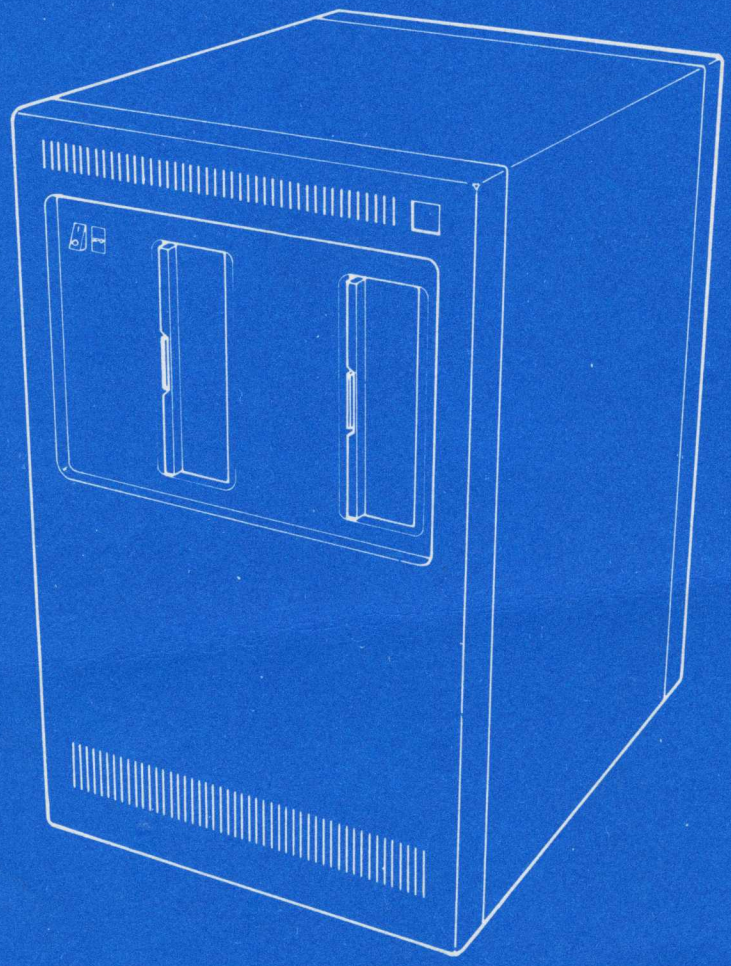
IBM

IBM 5114
Diskette Unit
Maintenance Information Manual



IBM 5114
Diskette Unit
Maintenance Information Manual

SY31-0551-1

Preface

This maintenance information manual is to be used for servicing the IBM 5114 diskette unit. Customer engineers using this manual are assumed to have completed the IBM 5114 education course.

The maintenance information manual (MIM) is in two major sections: maintenance and theory. The *Maintenance* section contains locations, service checks, adjustments, and removal and replacement procedures. The *Theory* section contains information about the operation of the IBM 5114.

The *Using the Maintenance Library* and *Diagnostic Aids* sections refer you to the appropriate sections of the *IBM 5110 Maintenance Information Manual,* SY31-0550.

Appendix A contains installation procedures and general information for the IBM 5114.

Appendix B contains definitions of terms, abbreviations, and acronyms that are used in the MIM.

Note: MIM pages 2-20, 2-21, 2-23, 2-25. 2-26, 2-32, 2-36, 2-37, 2-39, 2-42, 2-46, 2-49, 2-52 and 3-2 have DANGER and CAUTION notices. If desired, translate these notices and write your own words on the blank lines provided on these pages.

Related Publications

Related information can be found in the following manuals:

- *IBM 5110 Maintenance Information Manual,* SY31-0550
- *IBM 5110 System Logic Manual,* SY31-0552
- *IBM 5110 System Maintenance Analysis Procedures,* SY31-0553
- *IBM 5114 Parts Catalog,* SI31-0626

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Second Edition (January 1979)

This is a major revision of and obsoletes SY31-0551-0. Changes or additions to the text and illustrations are indicated by a vertical line to the left of the change or addition.

Changes are periodically made to the information herein: Changes will be reported in Technical Newsletters or in new editions of this publication.

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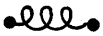
Resistor


Test Point

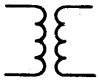

Coil


Phototransistor

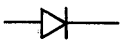

Light Emitting Diode


Capacitor


Fuse


Transformer


Ground


Diode


AC Line Cord Plug


Switch (N/O)


Switch (N/C)


Connector

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The IBM 5114 has the following specific DANGERs:

- Voltages are present on the connector terminals in the diskette drive when the drive motor is turning.
- The motor and solenoid cases become hot after continuous use.
- Voltage is present at the power cable socket when the power cable is disconnected and the immediate power off (IPO) switch is on.
- Some DC voltages are present in the 5114 when the IPO switch is off.

DANGER notices in this manual are personal safety precautions.

CAUTION notices in this manual are machine safety precautions.

CE SAFETY PRACTICES

All Customer Engineers are expected to take every safety precaution possible and observe the following safety practices while maintaining IBM equipment:

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you MUST work alone.
2. Remove all power, ac and dc, when removing or assembling major components, working in immediate areas of power supplies, performing mechanical inspection of power supplies, or installing changes in machine circuitry.
3. After turning off wall box power switch, lock it in the Off position or tag it with a "Do Not Operate" tag, Form 229-1266. Pull power supply cord whenever possible.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuitry anywhere in the machine, observe the following precautions:
   a. Another person familiar with power off controls must be in immediate vicinity.
   b. Do not wear rings, wrist watches, chains, bracelets, or metal cuff links.
   c. Use only insulated pliers and screwdrivers.
   d. Keep one hand in pocket.
   e. When using test instruments, be certain that controls are set correctly and that insulated probes of proper capacity are used.
   f. Avoid contacting ground potential (metal floor strips, machine frames, etc.). Use suitable rubber mats, purchased locally if necessary.
5. Wear safety glasses when:
   a. Using a hammer to drive pins, riveting, staking, etc.
   b. Power or hand drilling, reaming, grinding, etc.
   c. Using spring hooks, attaching springs.
   d. Soldering, wire cutting, removing steel bands.
   e. Cleaning parts with solvents, sprays, cleaners, chemicals, etc.
   f. Performing any other work that may be hazardous to your eyes. REMEMBER – THEY ARE YOUR EYES.
6. Follow special safety instructions when performing specialized tasks, such as handling cathode ray tubes and extremely high voltages. These instructions are outlined in CEMs and the safety portion of the maintenance manuals.
7. Do not use solvents, chemicals, greases, or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. Lift by standing or pushing up with stronger leg muscles – this takes strain off back muscles. Do not lift any equipment or parts weighing over 60 pounds.
11. After maintenance, restore all safety devices, such as guards, shields, signs, and grounding wires.
12. Each Customer Engineer is responsible to be certain that no action on his part renders products unsafe or exposes customer personnel to hazards.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. Ensure that all machine covers are in place before returning machine to customer.
15. Always place CE tool kit away from walk areas where no one can trip over it; for example, under desk or table.
16. Avoid touching moving mechanical parts when lubricating, checking for play, etc.
17. When using stroboscope, do not touch ANYTHING – it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before starting equipment, make certain fellow CEs and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machine while performing and after completing maintenance.

Knowing safety rules is not enough.
An unsafe act will inevitably lead to an accident.
Use good judgment - eliminate unsafe acts.

ARTIFICIAL RESPIRATION

General Considerations

1. Start Immediately – Seconds Count
   Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing, warm the victim, or apply stimulants.
2. Check Mouth for Obstructions
   Remove foreign objects. Pull tongue forward.
3. Loosen Clothing – Keep Victim Warm
   Take care of these items after victim is breathing by himself or when help is available.
4. Remain in Position
   After victim revives, be ready to resume respiration if necessary.
5. Call a Doctor
   Have someone summon medical aid.
6. Don't Give Up
   Continue without interruption until victim is breathing without help or is certainly dead.

Rescue Breathing for Adults

1. Place victim on his back immediately.
2. Clear throat of water, food, or foreign matter.
3. Tilt head back to open air passage.
4. Lift jaw up to keep tongue out of air passage.
5. Pinch nostrils to prevent air leakage when you blow.
6. Blow until you see chest rise.
7. Remove your lips and allow lungs to empty.
8. Listen for snoring and gurglings – signs of throat obstruction.
9. Repeat mouth to mouth breathing 10-20 times a minute. Continue rescue breathing until victim breathes for himself.

Thumb and finger positions

Final mouth-to-mouth position

Contents

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For information on the content and layout of the Maintenance Library, see Section 1 of the *IBM 5110 Maintenance Information Manual,* SY31-0550.

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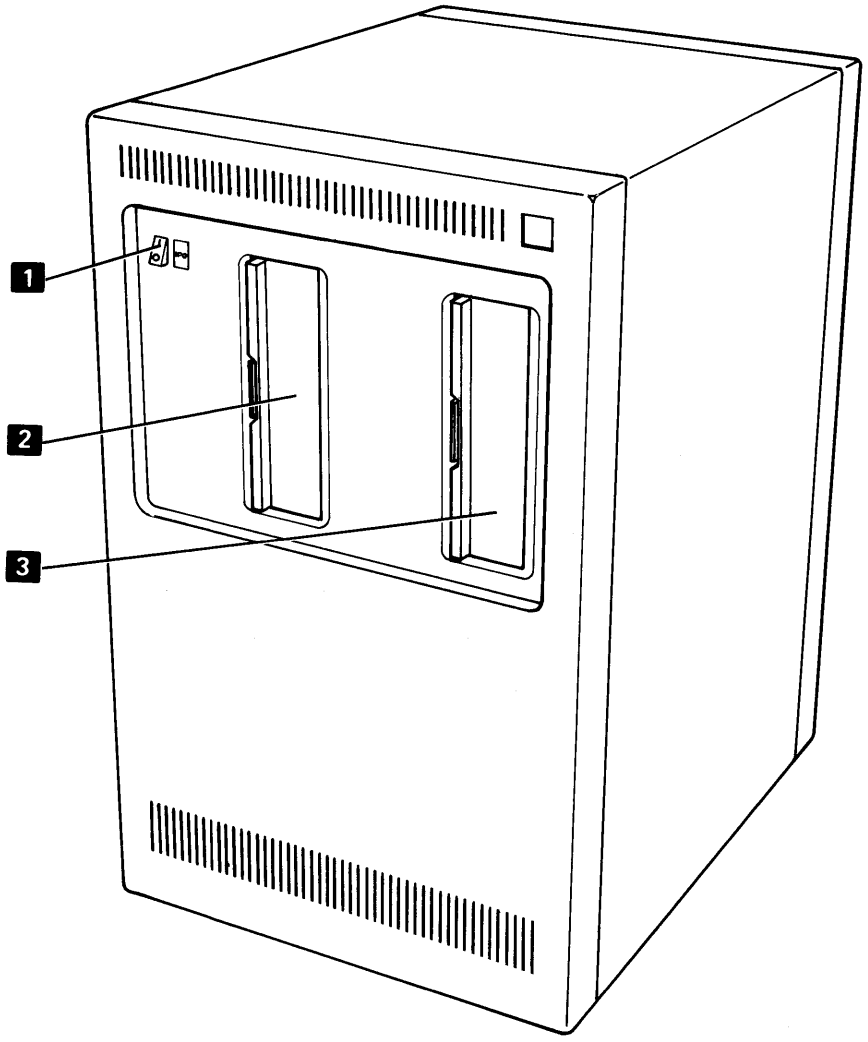
Contents

Locations

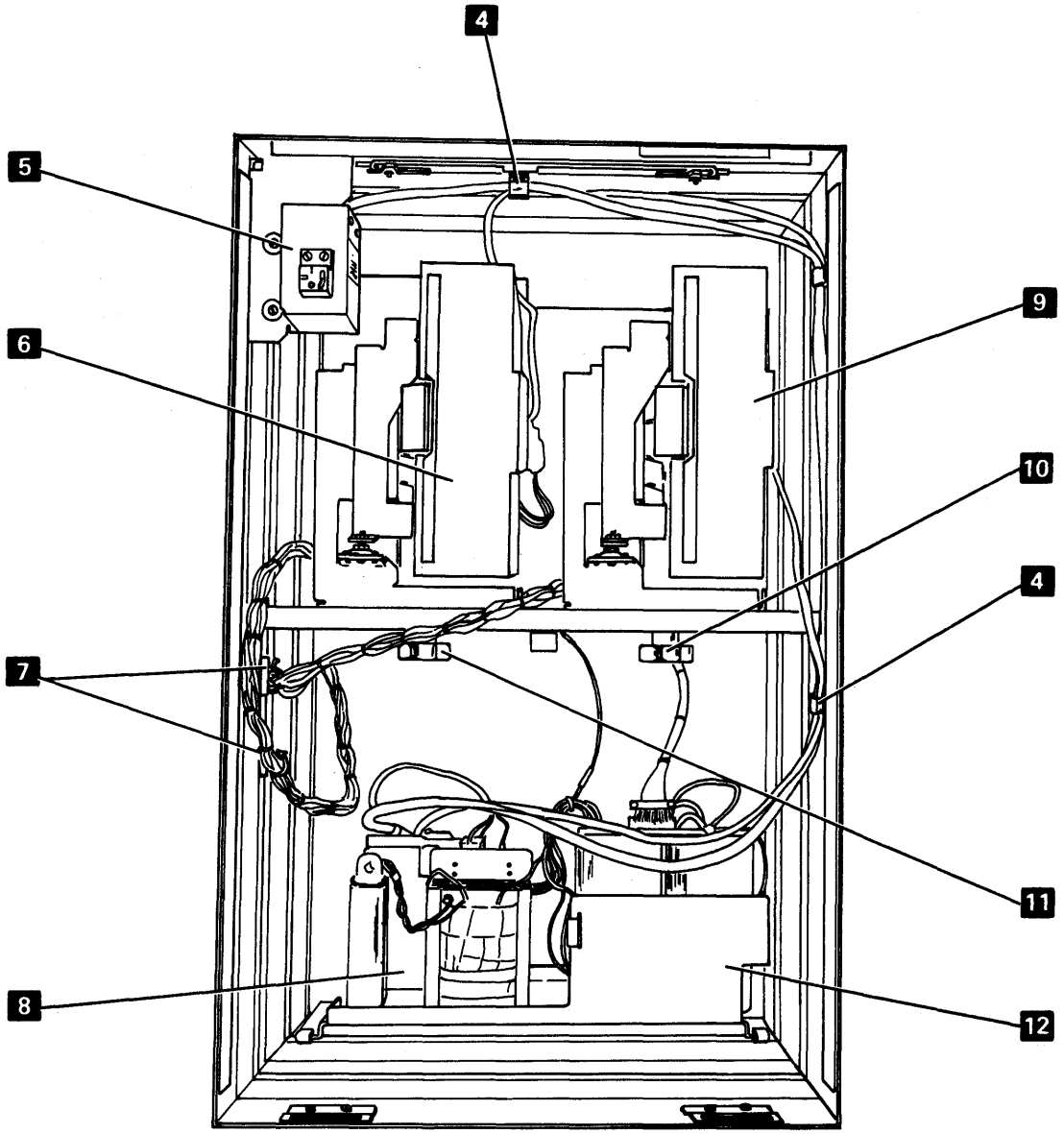
100 5114 DISKETTE UNIT (FRONT)

1. Immediate Power Off (IPO) Switch
2. Diskette Drive 1
3. Diskette Drive 2



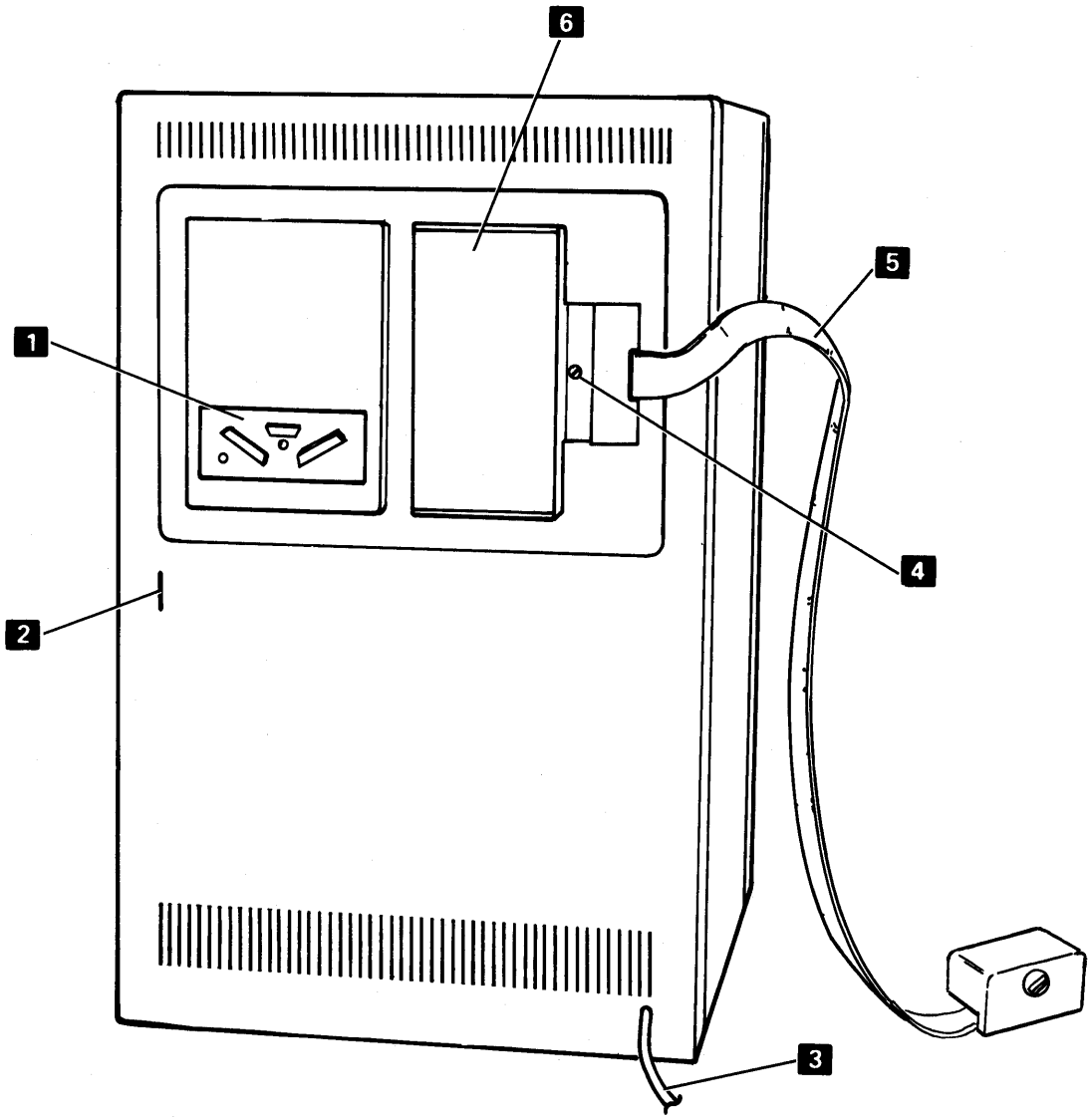
100 5114 DISKETTE UNIT (FRONT)

4 Power Cable Clamp
5 Immediate Power Off (IPO) Switch
6 Diskette Drive 1
7 Signal Cable Clamps
8 AC Box
9 Diskette Drive 2
10 Diskette Drive 2 Fastener Knob
11 Diskette Drive 1 Fastener Knob
12 Power Supply



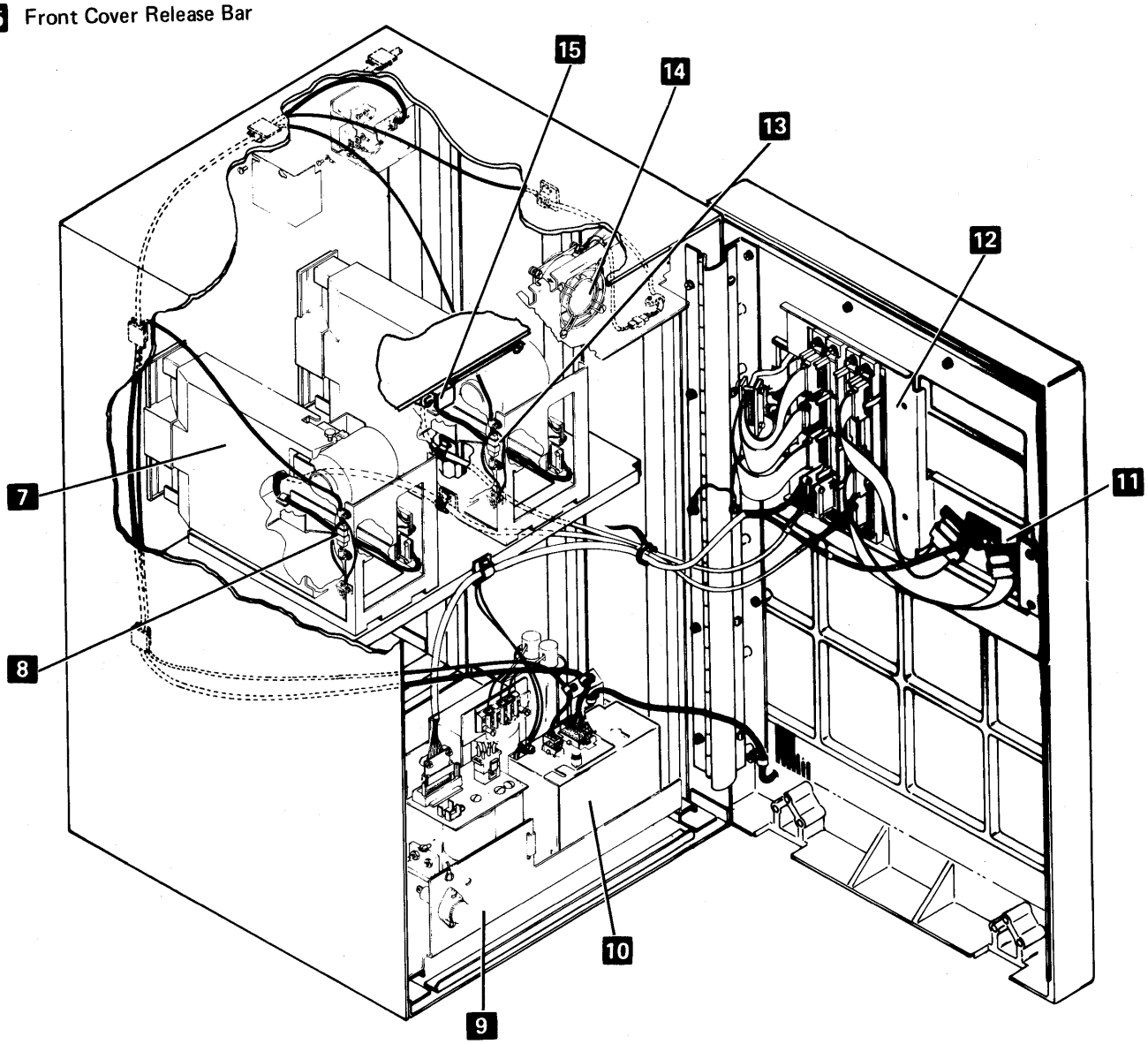
101 5114 DISKETTE UNIT (REAR)

1. I/O Interface Port
2. Rear Cover Fastener
3. AC Line Cord
4. A1 Board Pin Access Panel Screw
5. I/O Interface Cable
6. A1 Board Pin Access Panel



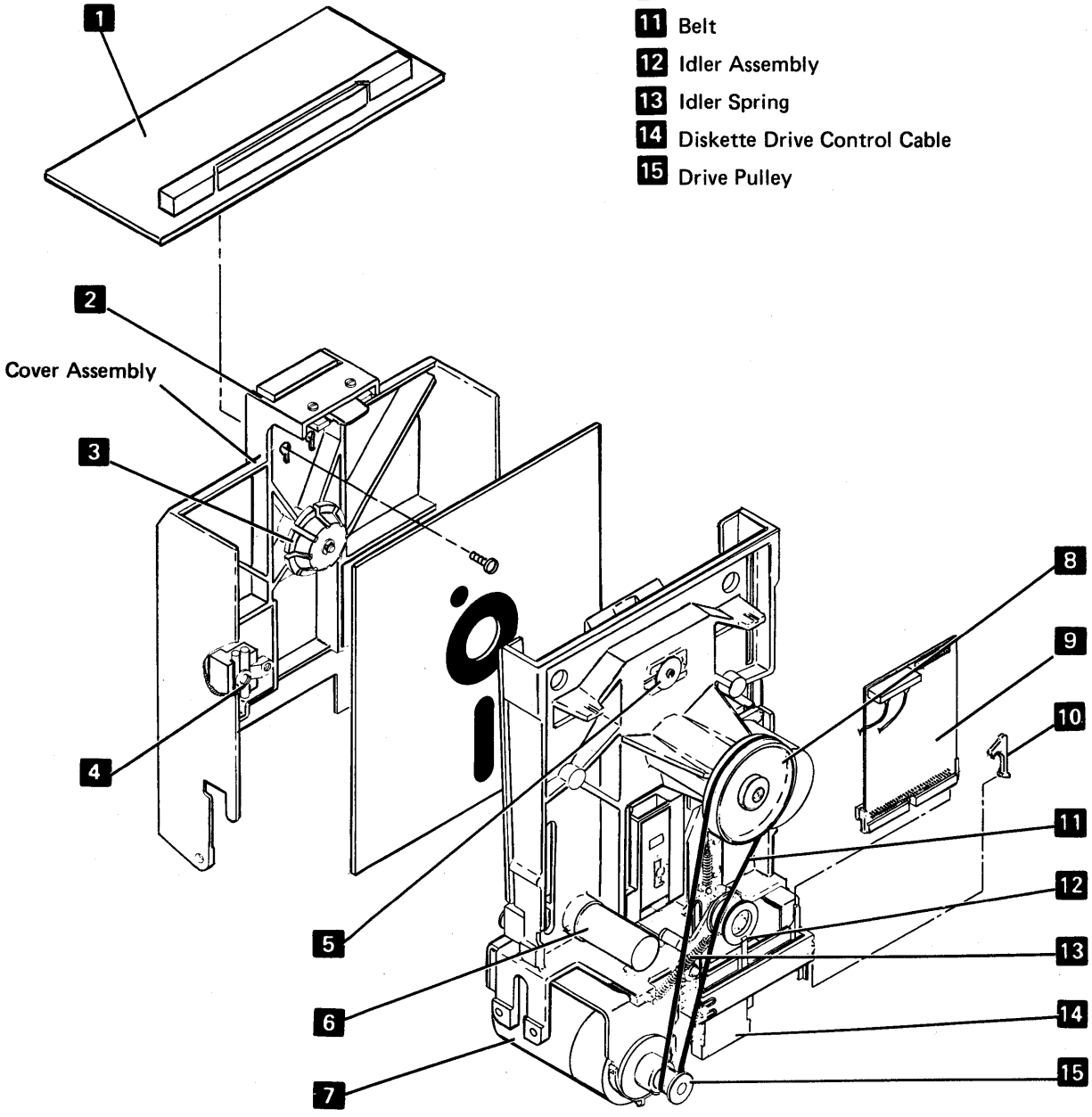
101 5114 DISKETTE UNIT (REAR)

7 Diskette Drive 2
8 Power Connector (J7)
9 DC Power Supply
10 AC Box
11 I/O Interface Port
12 A1 Board
13 Power Connector (J6)
14 Fan
15 Front Cover Release Bar



102 DISKETTE DRIVE

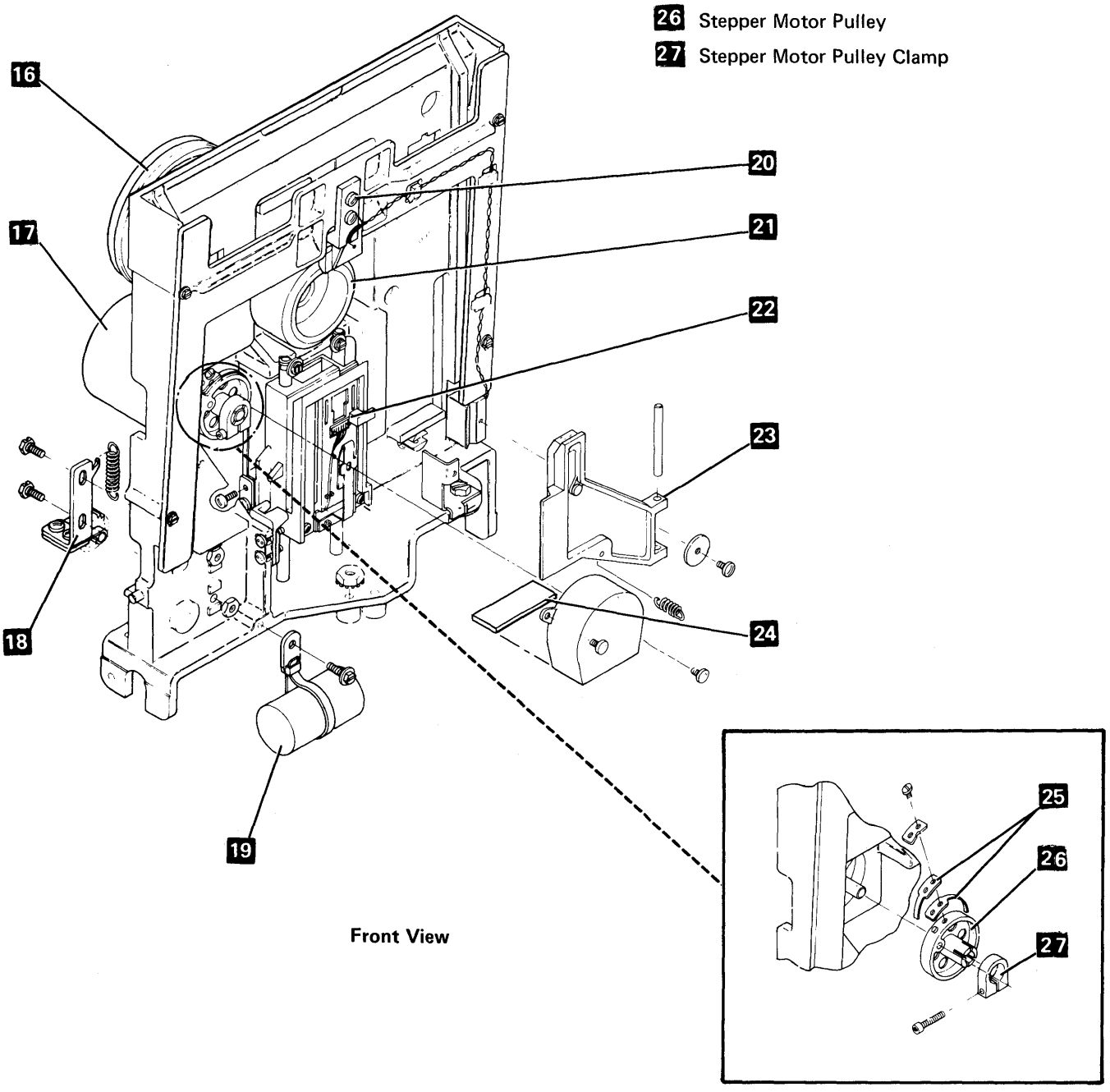
1. Diskette Drive Door
2. Latch Assembly
3. Collet
4. Timing Pins
5. PTX
6. Head Load Solenoid
7. Drive Motor
8. Spindle Pulley
9. Diskette Control Card
10. Card Retainer
11. Belt
12. Idler Assembly
13. Idler Spring
14. Diskette Drive Control Cable
15. Drive Pulley



Rear View

102 DISKETTE DRIVE

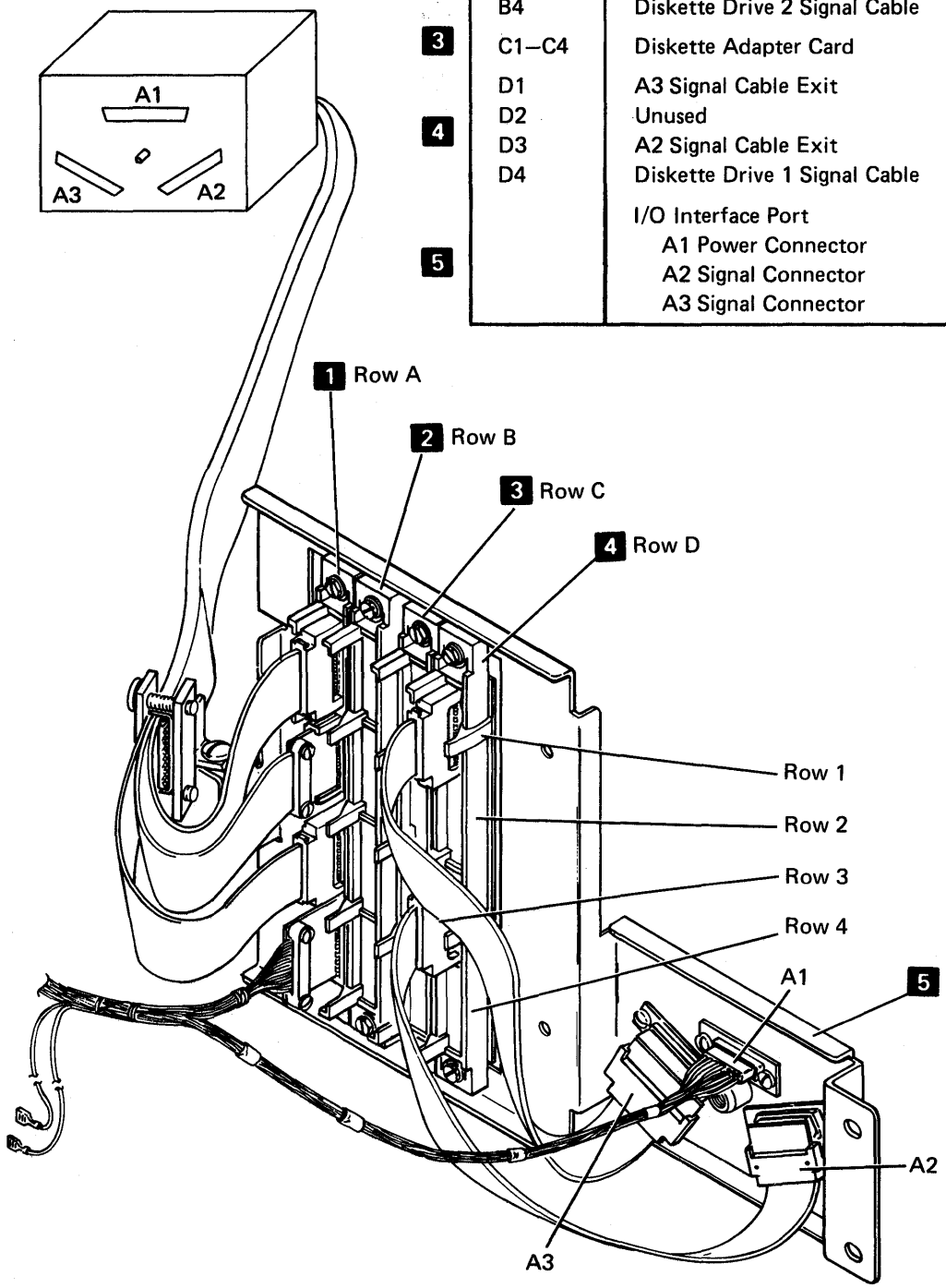
16 Spindle Pulley
17 Stepper Motor
18 Stepper Idler Assembly
19 Capacitor (not present on some drives)
20 LED
21 Spindle
22 Head and Carriage Assembly
23 Bail Head Load
24 Wiper
25 Stepper Drive Band
26 Stepper Motor Pulley
27 Stepper Motor Pulley Clamp



Front View

103 A1 BOARD

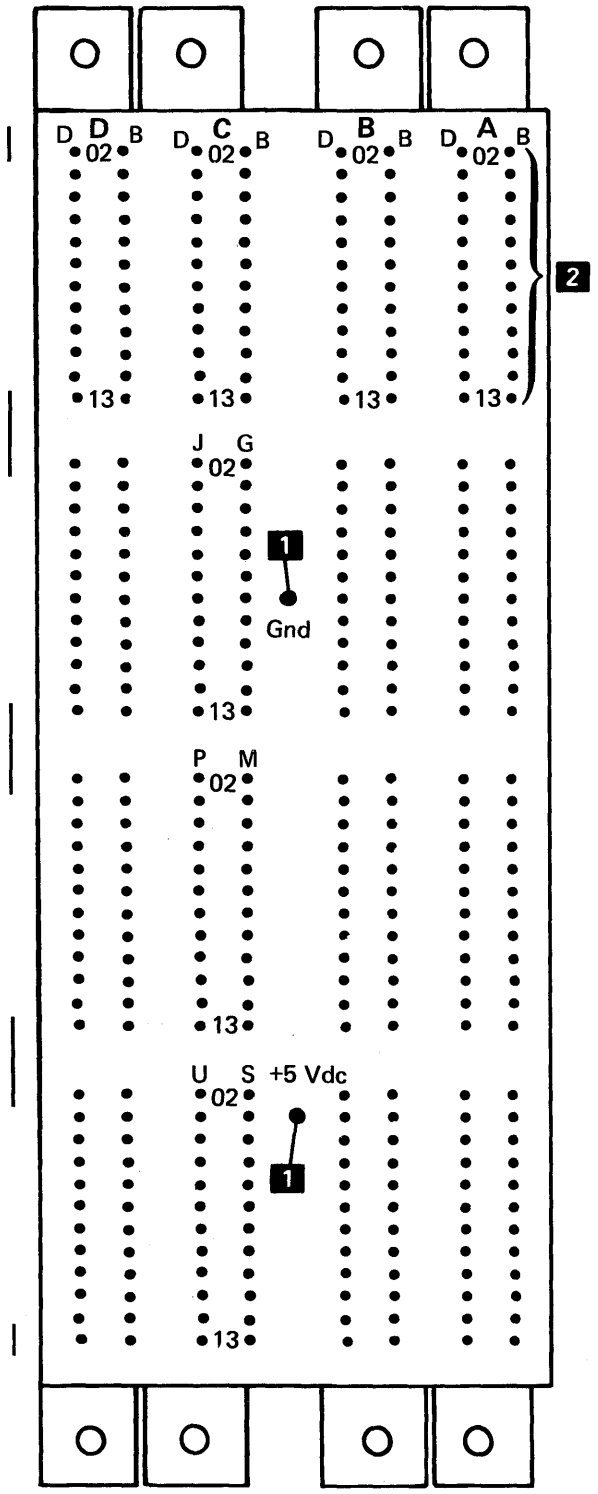
	Socket Location	Cable or Card
1	A1	A3 Signal Cable Entry
	A2	A1 Power Cable Entry
	A3	A2 Signal Cable Entry
	A4	DC Power Cable
2	B1, B2	VFO Card (not present on all machines. see MAP 050)
	B3	Unused
	B4	Diskette Drive 2 Signal Cable
3	C1–C4	Diskette Adapter Card
4	D1	A3 Signal Cable Exit
	D2	Unused
	D3	A2 Signal Cable Exit
	D4	Diskette Drive 1 Signal Cable
5		I/O Interface Port A1 Power Connector A2 Signal Connector A3 Signal Connector



103 A1 BOARD

1 CE Probe Connector Pins

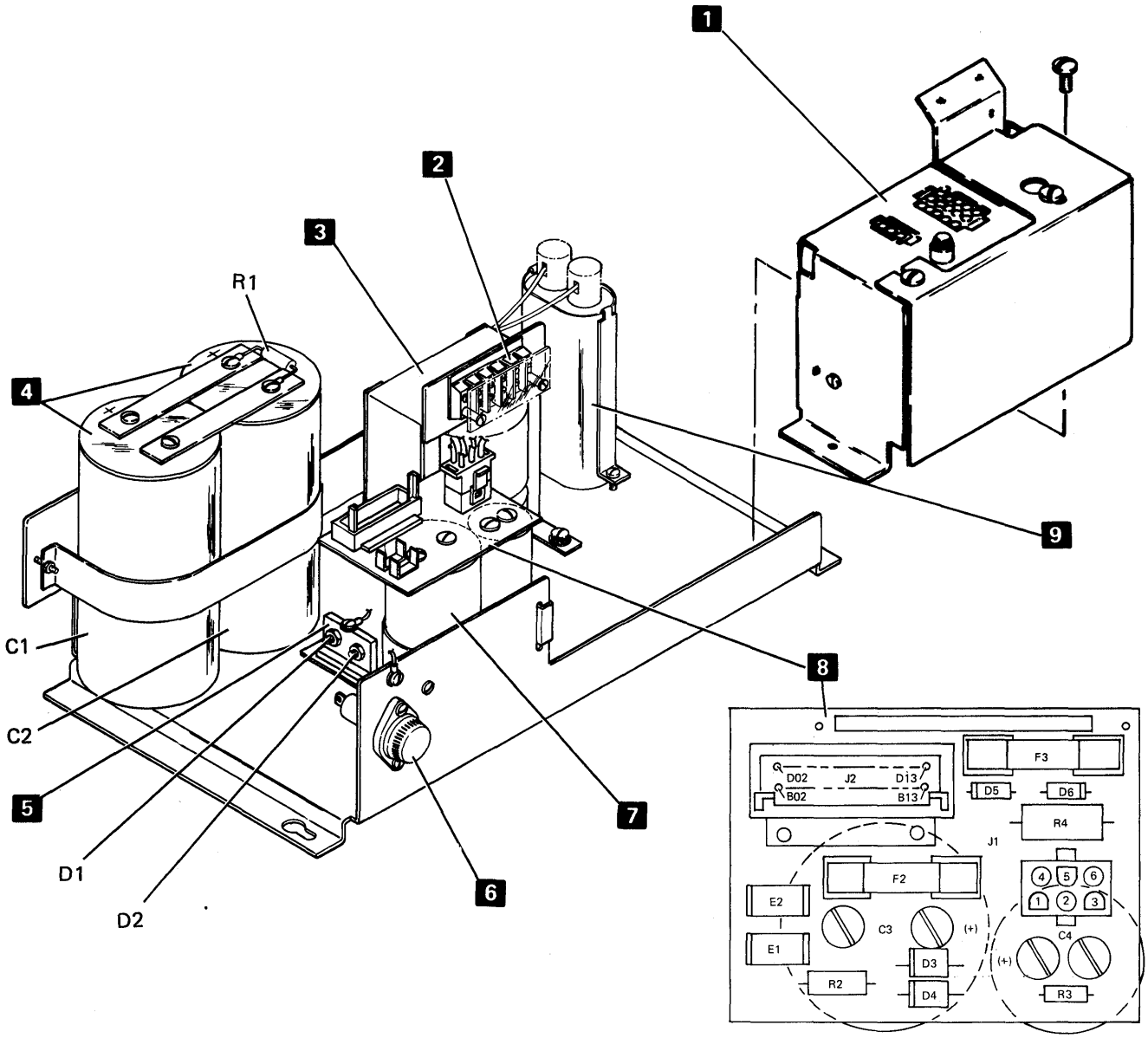
2 Pin Numbering



Pin Side of A1 Board

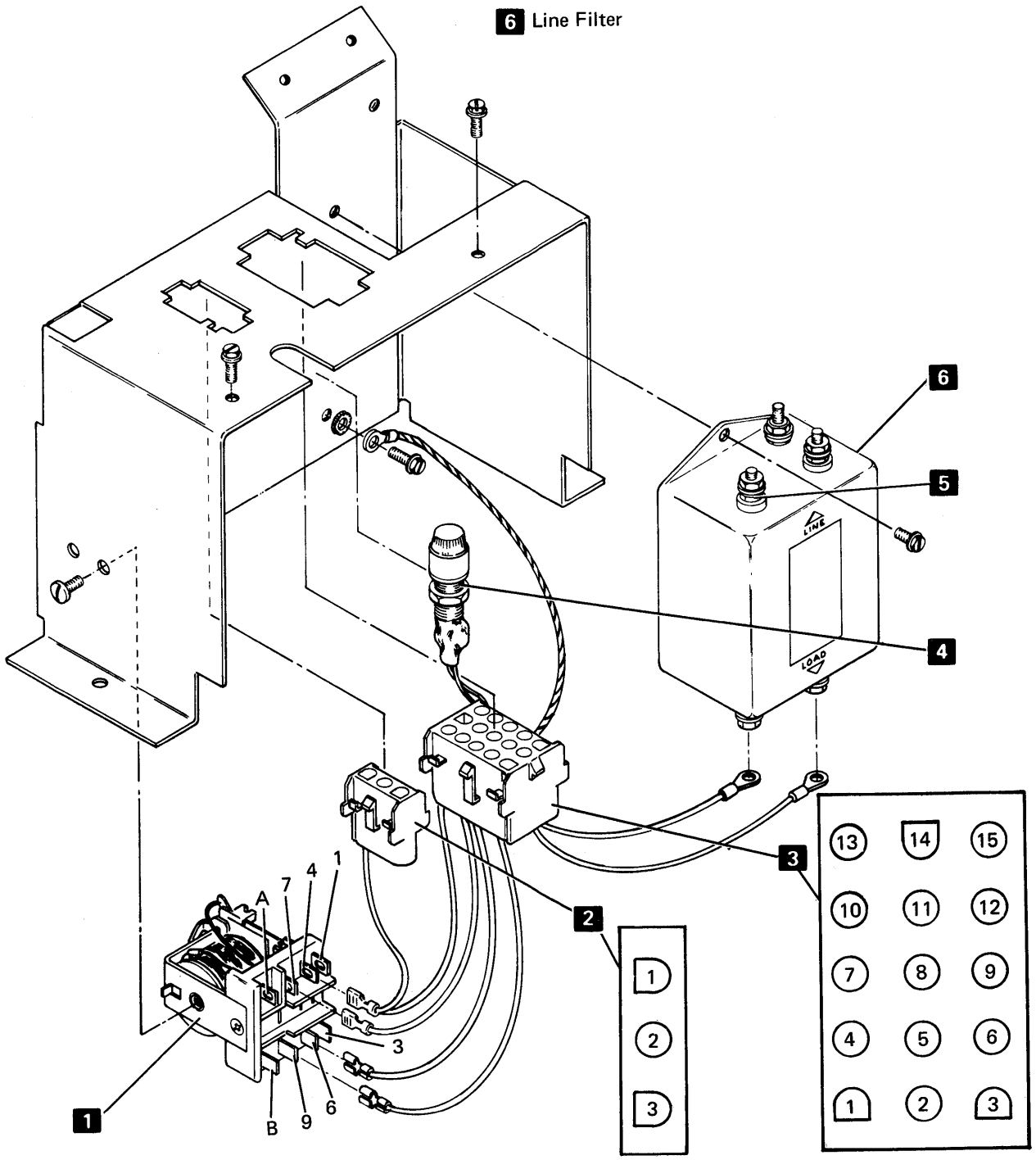
104 POWER SUPPLY

1. AC Box
2. Terminal Block (TB1)
3. Transformer (T1)
4. Capacitors (C1, C2 – C2 not present on some power supplies)
5. Rectifier Assemblies (D1, D2)
6. Fuse (F1)
7. Capacitors (C3, C4)
8. PC Board
9. Capacitor (C5)



105 AC BOX

1. Relay (R1)
2. Power Connector (J4)
3. Connector (J3)
4. Fuse (F4)
5. Line Filter Ground
6. Line Filter



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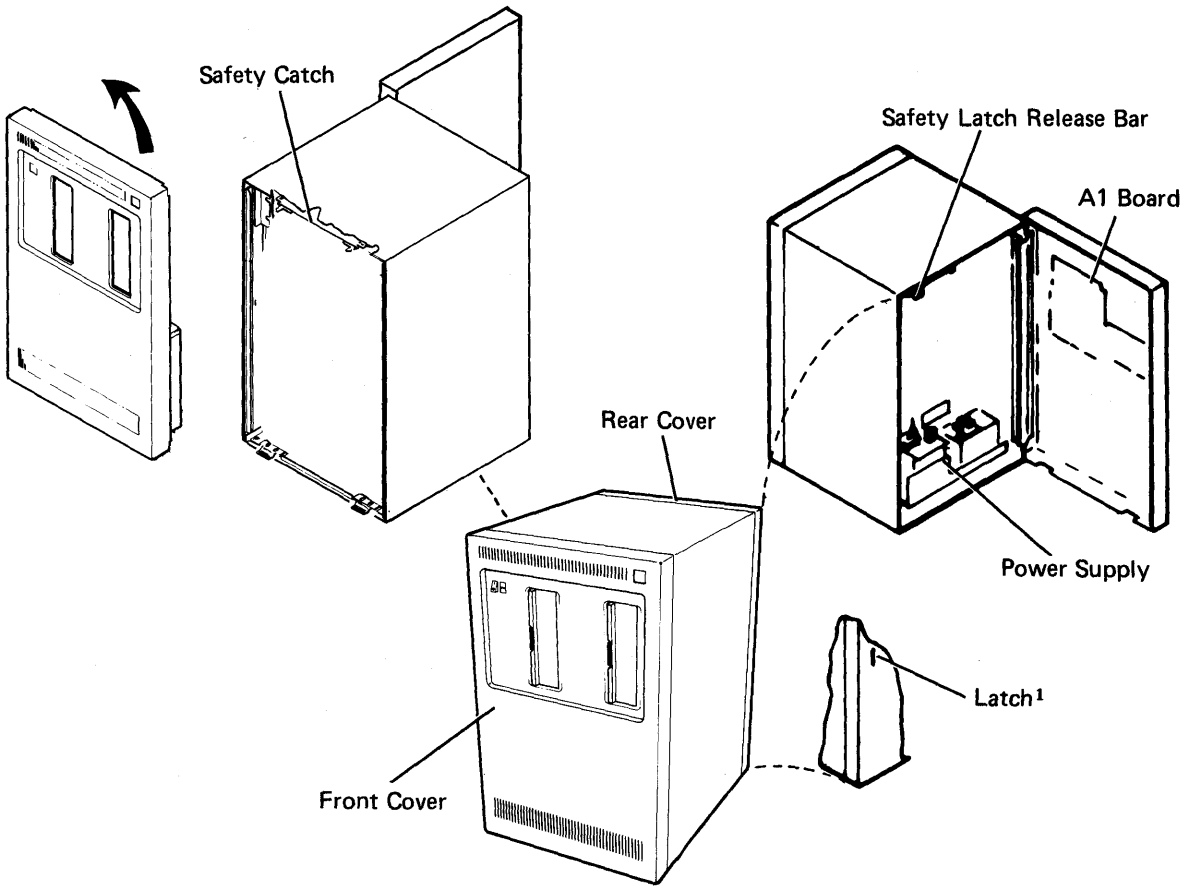
Covers and Diskette Drive

110 5114 COVERS



Rear Cover

To open the rear cover of the 5114, press[1] the latch located in a slot on the left of the cover. The cover is hinged on the right. Opening this cover provides access to the A1 board, the rear of the diskette drives, the power supply, and the front cover release bar.

Front Cover

To remove the front cover of the 5114, open the rear cover and press the release bar located at the top of the 5114. This allows the front cover to separate slightly from the 5114. To release the latch, located at the top front in the middle of the unit, lift it and pull the cover away from the 5114. Removing this cover allows access to the front of the diskette drives.

[1] More recent machines use a twist-lock instead of a push-latch.

111 DISKETTE DRIVE ASSEMBLY

Removal

1. Turn off the POWER switch on the 5110 and unplug the 5114 line cord.
2. Remove the front cover (110).
3. Remove the signal cable from the signal cable clamp 3.
4. Remove the power cable from the power cable clamp 1.
5. Loosen the diskette drive fastener knob 7 or 8.
6. Carefully slide the diskette drive, 5 or 6, toward the front of the 5114.
7. Lift up the diskette drive and remove it from the 5114.
8. Unplug the signal cable from the diskette drive control card socket 2.
9. Unplug the power cable from the diskette drive motor connector 4.

Replacement

1. Replace the diskette drive by reversing steps 3 through 9 of the removal procedure.

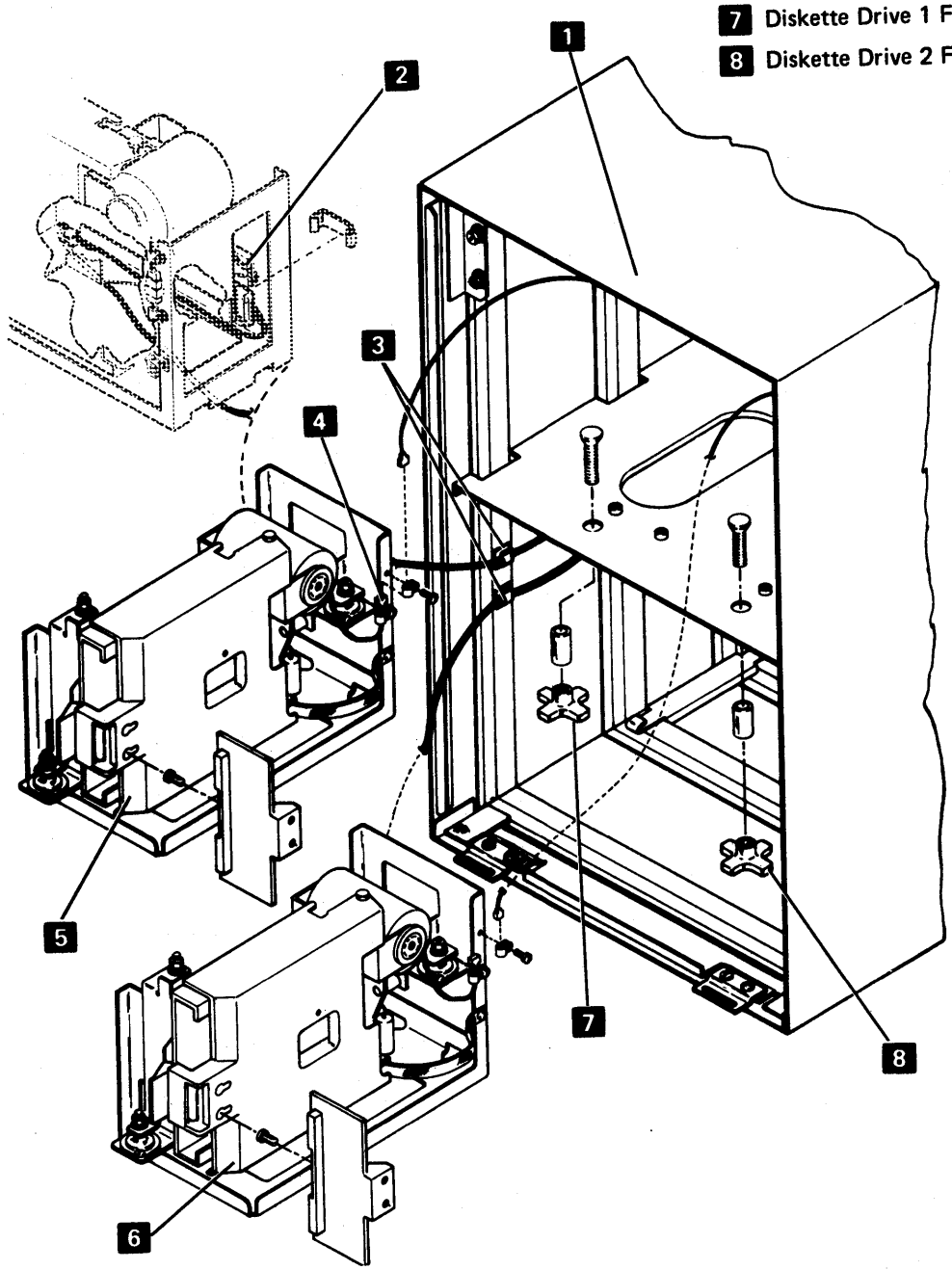
   CAUTION
   The cable routing must be the same as when the diskette drive was removed because of electrostatic noise.

   _____
   _____
   _____

2. Check the performance of the diskette drive using MAP 880.
3. Set the front cover in place to check the alignment of the diskette drives to the openings in the front cover. If the diskette drives line up with the openings, go to step 6. If the diskette drives do not line up with the openings, go to step 4.
4. Loosen the diskette drive fastener knob 7 or 8 and slide the diskette drive out to allow access to the diskette drive locator slot screws.
5. Loosen the diskette drive locator slot screws and position the diskette drive to fit correctly in the cover opening. Tighten the screws.
6. Replace the front cover (110).

111 DISKETTE DRIVE ASSEMBLY

1. Power Cable Clamp
2. Control Card Socket
3. Signal Cable Clamp
4. Power Cable Connector
5. Diskette Drive 1
6. Diskette Drive 2
7. Diskette Drive 1 Fastener Knob
8. Diskette Drive 2 Fastener Knob



112 DISKETTE DRIVE COVER ASSEMBLY

Removal

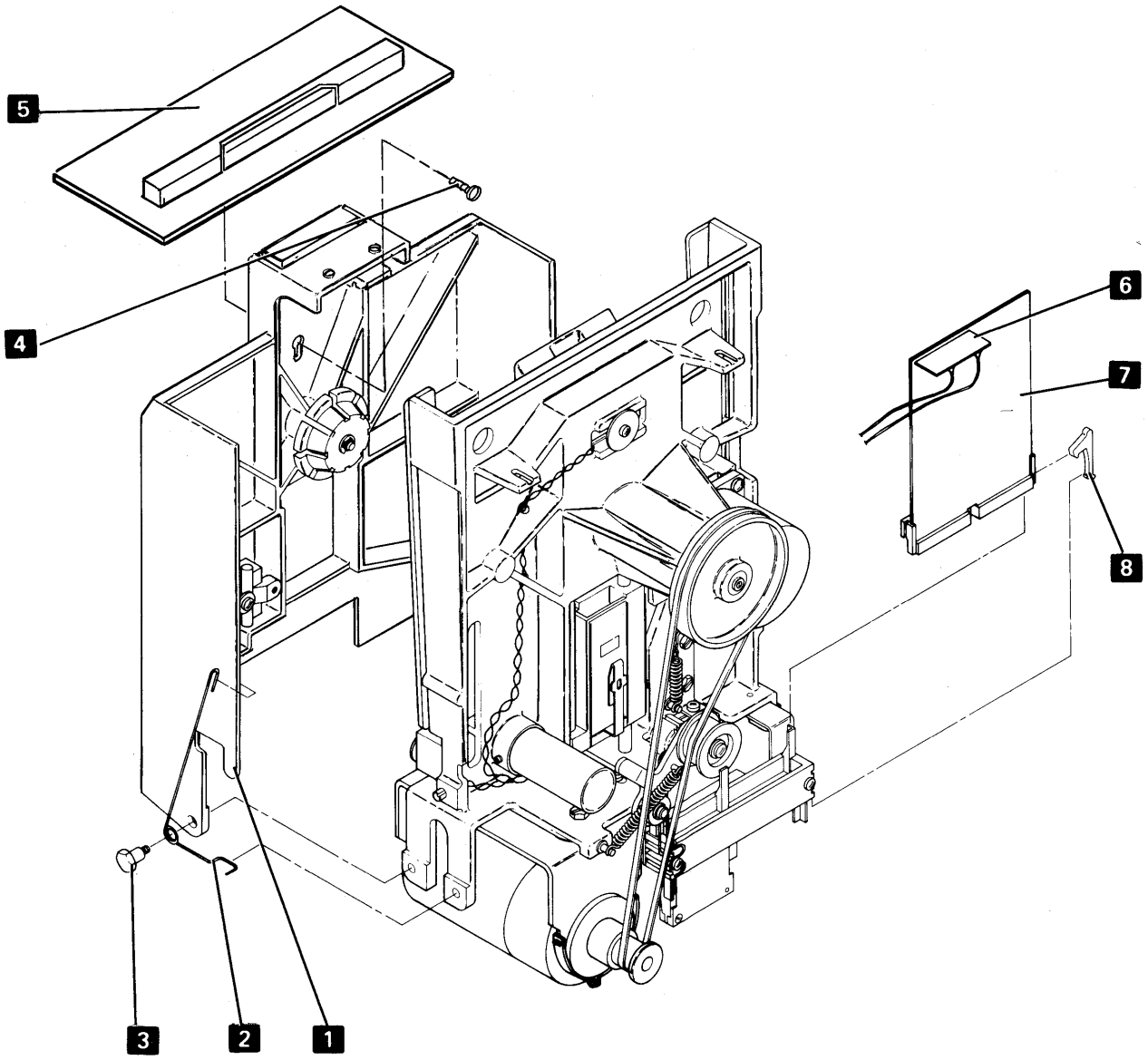
1. Open the diskette drive cover assembly 1.
2. Disconnect the spring 2 from the cover.
3. Loosen the two pivot screws 3 with a wrench.
4. While holding the cover assembly, remove the pivot screws.
5. Lift the cover from the diskette drive.

Replacement

1. Align the diskette drive cover assembly 1 with the mounting holes in the casting. Then reinstall the two pivot screws 3. (Ensure that the spring 2 is installed.)
2. Tighten the pivot screws with a wrench.
3. Connect the spring 2 to the cover.
4. Close the diskette drive cover assembly.

112 DISKETTE DRIVE COVER ASSEMBLY

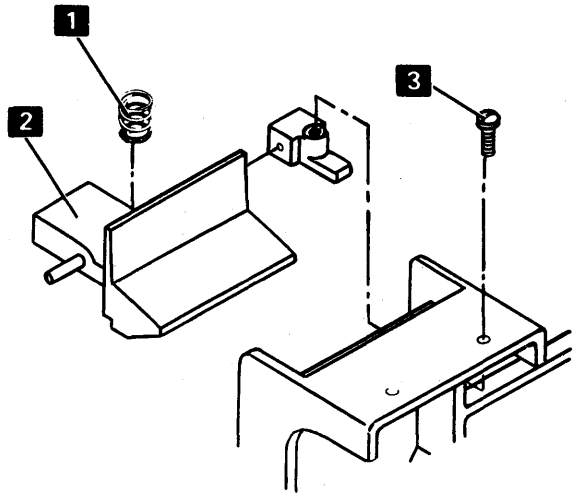
1. Cover
2. Spring
3. Pivot Screw
4. Mounting Screws
5. Diskette Drive Door
6. Head Cable
7. Diskette Control Card
8. Card Retainer



113 LATCH ASSEMBLY

Removal

1. Open the diskette drive cover assembly.
2. Remove the two latch mounting screws 3.
3. Carefully remove the latch 2 and the two pivots by pulling the latch toward the rear of the cover assembly. Do not lose the spring 1.



Replacement

1. Place the latch 2 in the cover assembly. Then position the two pivots. Reinstall the spring 2.
2. Reinstall the two latch mounting screws 3.
3. Close the diskette drive cover assembly.

114 COLLET

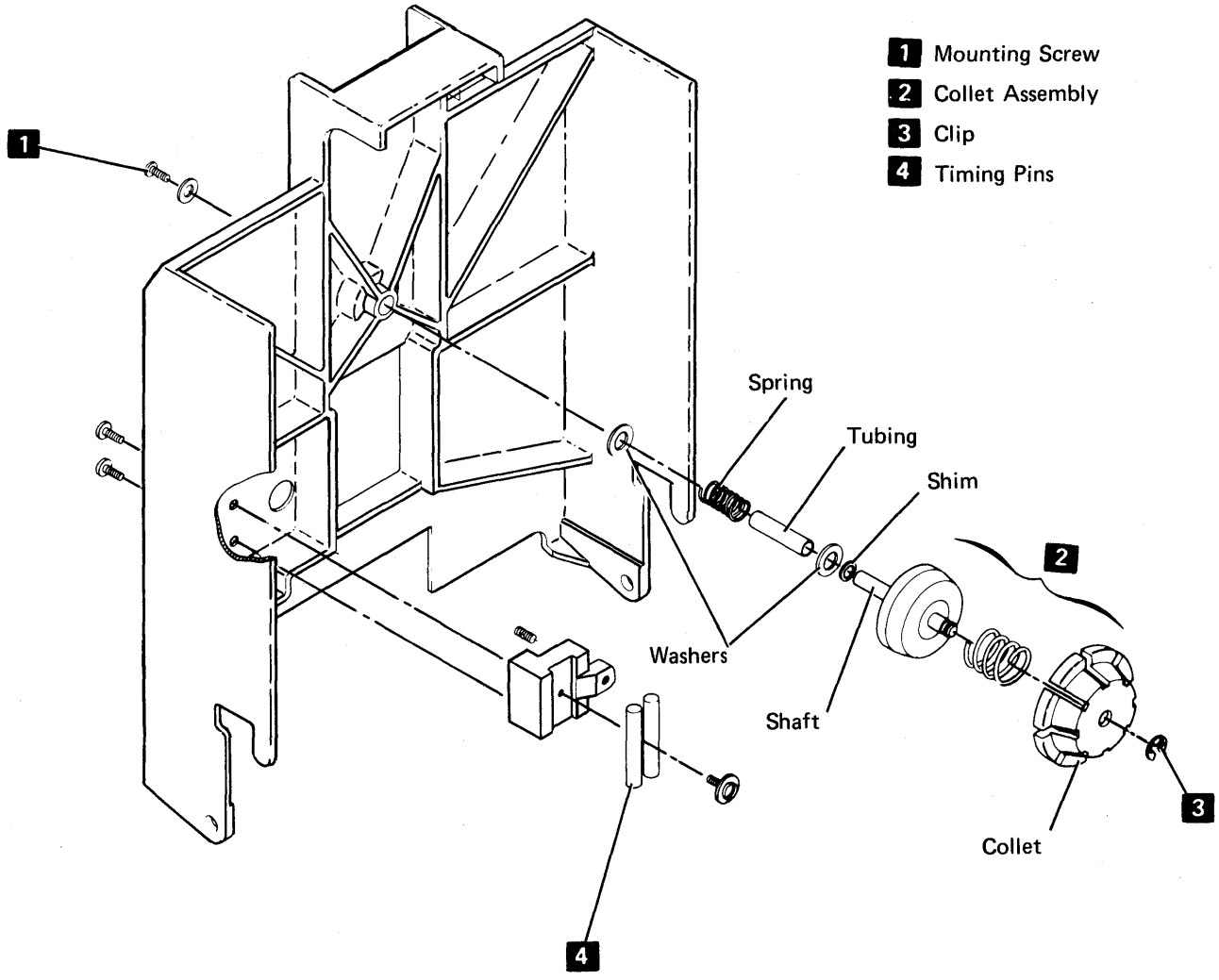
Removal

1. Remove the diskette drive cover assembly (112).
2. Remove the mounting screw 1
3. Remove the collet assembly 2 along with the parts on the collet assembly shaft.
4. Remove the clip 3 and the collet.
5. Inspect all parts for wear and install new parts as needed.

Replacement

1. Reinstall the collet and the clip 3.
2. Reinstall the remaining parts on the collet assembly shaft in the order shown.
3. Reinstall the collet assembly 2 and the mounting screw 1.
4. Reinstall the diskette drive cover assembly (112).

Maintenance



120 HEAD/CARRIAGE ASSEMBLY
(Page 1 of 5)

CAUTION
The head/carriage assembly was adjusted and tested at the factory. Adjust this assembly only as a unit. Do not attempt to repair or adjust any internal part of the assembly. The timing block is not adjustable in the field. If this block is loose, replace the diskette drive assembly.

Service Check

The drive band adjustment must be correct before this service check is performed (152).

When you perform the head/carriage service check, the diskette drive must be in approximately the same position as when installed or the indications can be wrong.

1. Prepare for the service check as follows:
   a. Turn off the IPO switch.
   b. Remove the 5114 covers (110).

   DANGER
   Voltage is present at the socket when the power cable is disconnected and the IPO switch is on.

   c. Remove the diskette drive assembly (111). (Disconnect the drive assembly motor power cable, but leave the signal cable connected.)
   d. Remove diskette adapter card A1C1 (103).
   e. Remove the diskette drive cover (112).
   f. Remove the wiper assembly 13.

2. Check the guide rods to ensure that they are seated correctly in the guide slots 18.

Steps 3, 4, and 5 are required to set up the correct torque required by the stepper motor before making the check in step 6. If these steps are not performed, the indications in step 6 will be unreliable.

3. Ensure that the head/carriage assembly is at track 40 as follows:
   a. Turn the stepper motor by hand until the timing slot in the casting and the timing hole in the stepper motor pulley are aligned 2.
   b. Turn on the IPO switch.

   CAUTION
   The PTX, LED, or drive card can be damaged if the incorrect test pins are jumped.

   c. Install a jumper from C (ground) to A (-align access 0).
   d. Insert a timing pin 5. (The pins are in the diskette drive cover.)
   e. The timing pin must pass freely through the stepper motor pulley timing hole into the timing slot in the casting.
   f. Remove the timing pin.

4. Electrically move the head/carriage assembly to track 39 as follows:

   a. Remove the jumper end from A (-align access 0) and install it on B (MC-3). The head/carriage assembly should move one track.
   b. Check for no gap between the timing pointer and the timing block 19.

   Note: The timing block is not adjustable in the field. If this block is loose, replace the diskette drive assembly.

5. Electrically move the head/carriage assembly to track 40 as follows:
   a. Remove the jumper end from B (MC-3) and install it on A (-align access 0).
   b. Visually check that the timing hole in the stepper motor pulley 2 and the timing slot in the casting are aligned. Do not use a timing pin.

120 HEAD/CARRIAGE ASSEMBLY
(Page 2 of 5)

6. Verify that the 0.020 inch (0.508 mm) gap 19 is correct as follows:

   Visually check that the head/carriage assembly does not move when a 0.0195 thickness gauge is inserted between the timing block and the timing pointer 19, but moves slightly when a 0.021 thickness gauge is inserted.

   Note: Due to the torque required by the stepper motor, the above step can be performed only once. If it is necessary to check this clearance again, go back to step 4.

7. If the gap 19 in step 6 is not correct, continue with step 1 of the adjustment procedure. If the gap 19 in step 6 is correct, continue with step 8 of the service check.

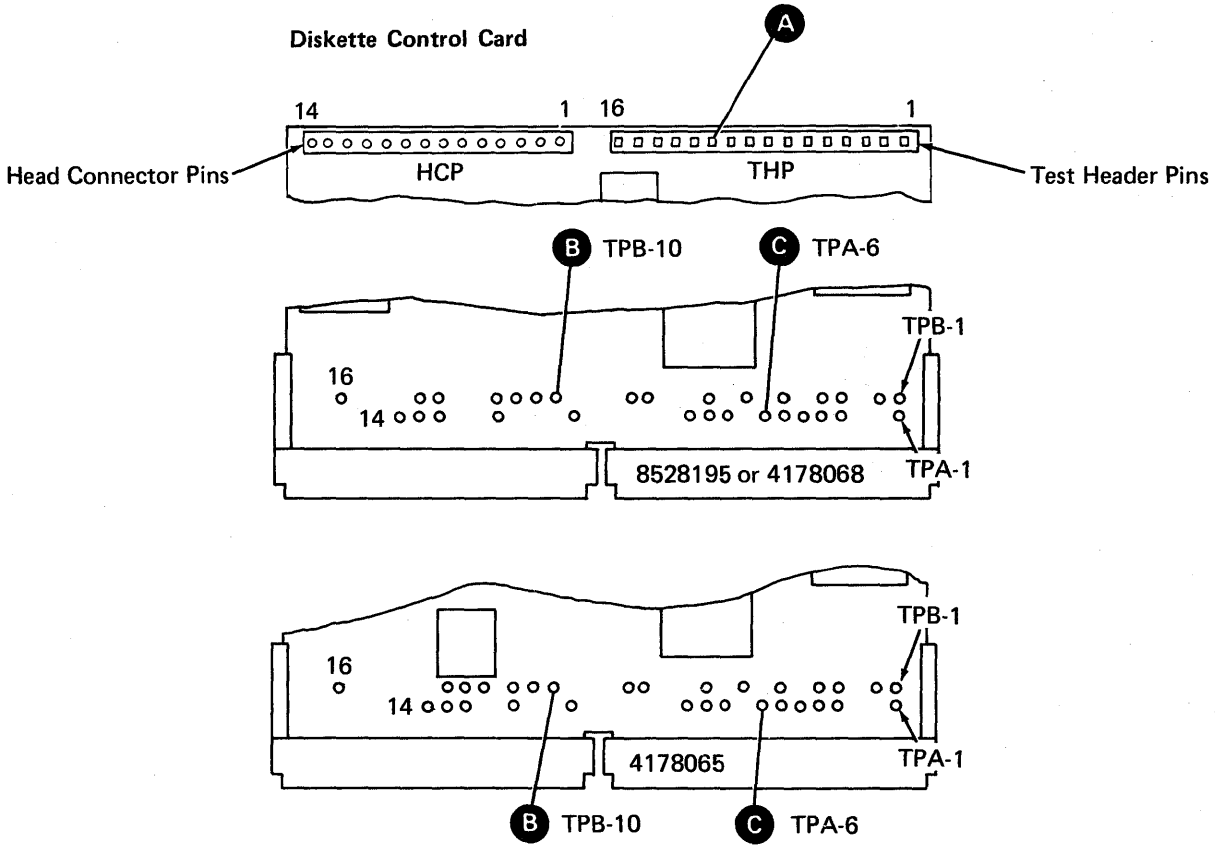
   Note: If the head/carriage assembly was replaced, perform the Head Load Solenoid and Bail Service Check (130).

8. Return the 5114 to operational status as follows:
   a. Remove the jumper.
   b. Turn off the IPO switch.
   c. Reinstall the wiper assembly 13.
   d. Reinstall the cover assembly.

   CAUTION
   The cable routing must be the same as when the diskette drive was removed because of electrostatic noise.

   _____
   _____
   _____
   _____

   e. Connect the drive motor power cable.
   f. Reinstall adapter card A1C1.
   g. Reinstall the diskette drive in the 5114.
   h. Turn on the IPO switch.



120 HEAD/CARRIAGE ASSEMBLY
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Adjustment

Perform the service check prior to performing the adjustment procedure.

1. Prepare for the adjustment as follows:
   a. Turn off the IPO switch.
   b. Set the diskette drive in a vertical position to allow access to the drive band screws.
   c. Measure and record the gap 4 between the stepper motor pulley and the casting.
   d. Loosen the clamp screw 3 to allow the stepper motor shaft to turn inside the pulley.
   e. Turn on the IPO switch.

2. Align the electrically locked stepper motor with the stepper pulley as follows:
   a. Install a jumper from C (ground) to A (-align access 0).
   b. Insert a timing pin 5. (The pins are in the diskette drive cover.)
   c. Adjust the gap 4 between the stepper motor pulley and the casting to the same size as recorded in step 1.
   d. Tighten the clamp screw 3.
   e. The timing pin must pass freely through the stepper motor pulley timing hole into the timing slot in the casting 5.
   f. Remove the timing pin 5.
   g. Loosen the two band clamping screws 1.

3. This step electrically locks the motor at track 39 and then at track 40 to ensure that the proper torque is set up for the adjustment of the drive band.
   a. Remove the jumper end from A (-align access 0) and install it on B (MC-3).
   b. Remove the jumper end from B (MC-3) and reinstall it on A (-align access 0).
   c. Visually check that the timing hole in the stepper motor pulley 2 and the timing slot in the casting are aligned. Do not use a timing pin.

Note: Be sure there is running clearance between the pulley and the side frame.

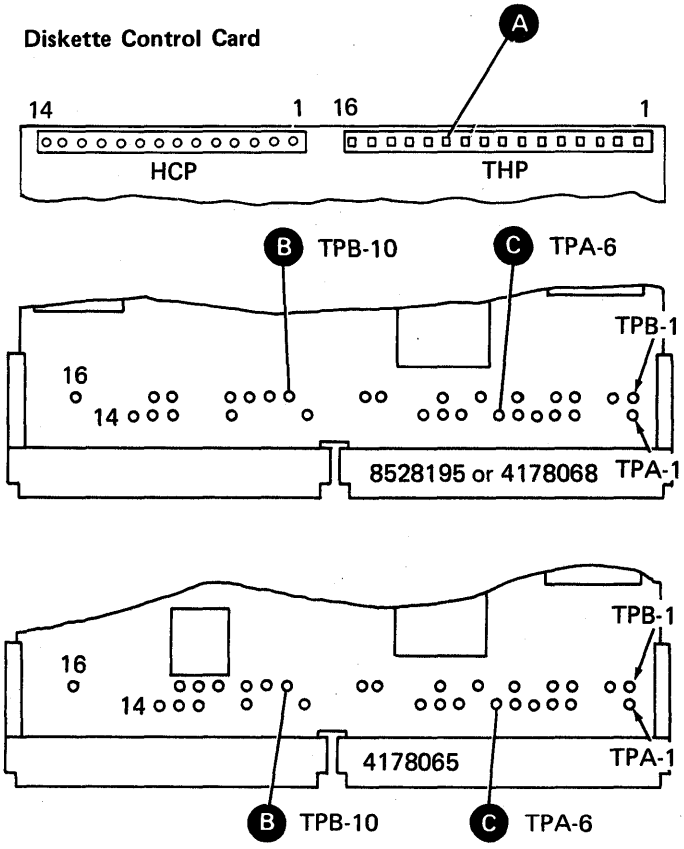
4. Perform the adjustment as follows:
   a. Insert a 0.019 thickness gauge between the timing pointer and the timing block 19.

      Note: The 0.019 thickness gauge provides the required 0.020 inch (0.508 mm) gap when the diskette drive is returned to its operational position.

   b. Lightly press the top of the carriage to hold the gauge in place.
   c. Ensure that the drive band is straight.
   d. Tighten the band clamping screws 1.

5. Perform the service check.

6. Check the performance of the diskette drive using MAP 880.



120 HEAD/CARRIAGE ASSEMBLY
(Page 4 of 5)

Removal

1. Turn off the IPO switch.
2. Remove the 5114 covers (110).
3. Remove the diskette drive from the 5114 (111).
4. Remove the diskette drive cover assembly (112).
5. Remove the wiper assembly 13.
6. Carefully remove the head cable from the diskette drive control card (172). (Remember the cable path for the replacement procedure.)
7. Place the diskette drive in a vertical position and remove the two band clamping screws 1 and the clamp.
8. Place the diskette drive in a horizontal position. Place the head/carriage assembly at the lower limit (track 00).
9. Loosen the screw 9 holding the lower guide rod. Remove the guide rod 11.
10. Carefully lift and turn the head/carriage assembly to remove it from the upper guide rod 14.

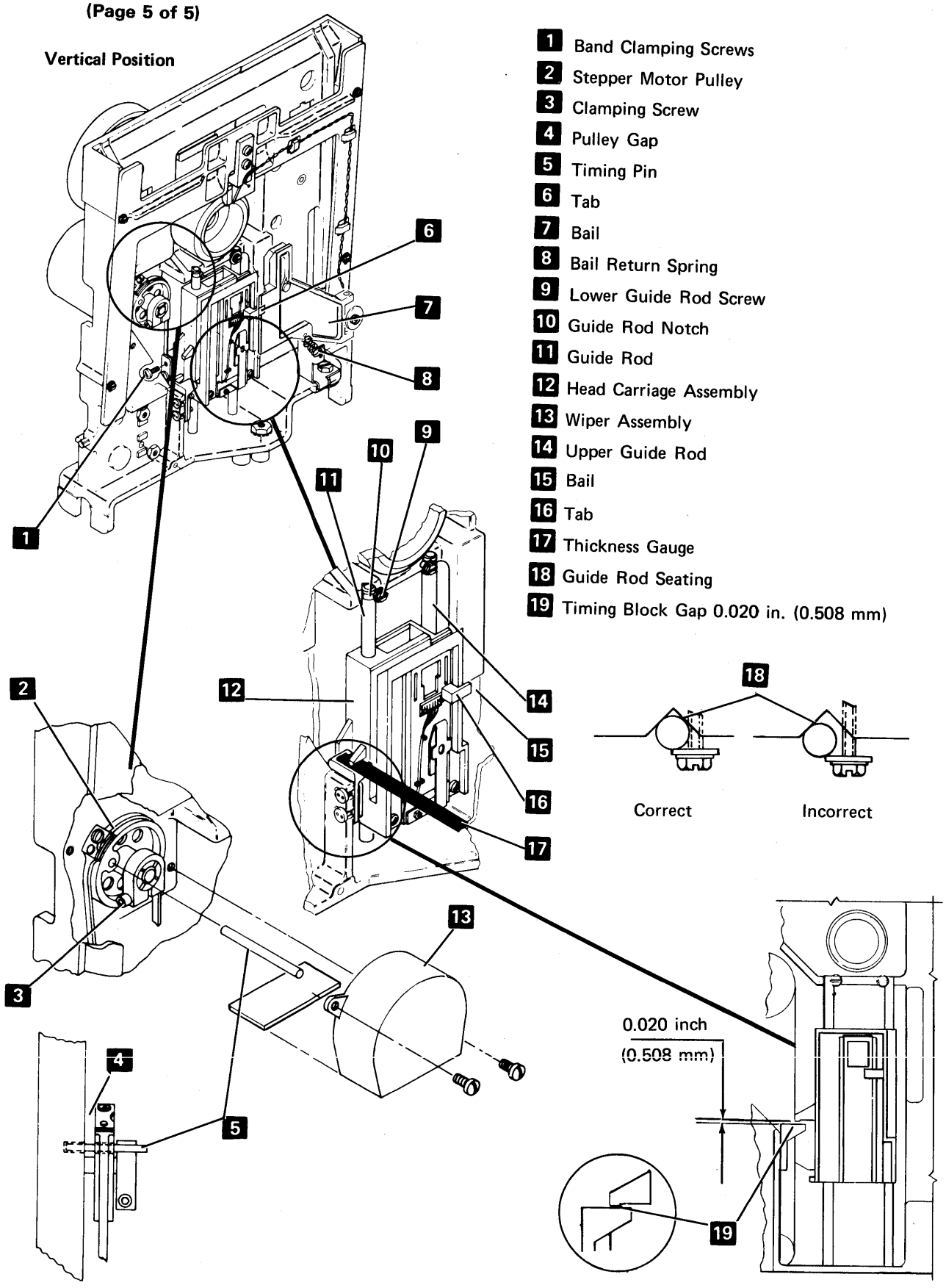
Replacement

CAUTION
When installing the head/carriage assembly, ensure that the bail 7 is under the tab 6 of the carriage arm. Ensure that the bail return spring 8 is properly installed. Place a strip of clean paper between the heads.

1. Carefully install the head/carriage assembly in the guide rod 14. Place the head/carrriage assembly at the lower limit (track 00).
2. Reinstall the guide rod 11 and tighten the screw 9.

   Note: Ensure that the guide rod notch 10 is aligned with the screw and is seated as shown 18. Access errors occur if this adjustment is not correct.
3. Reinstall the clamp and two band screws 1. (Do not tighten these two screws yet.)
4. Carefully place and connect the head cable to the diskette drive control card (172).
5. Remove the C1 adapter card.
6. Turn on the IPO switch.
7. Install a jumper from C (ground) to A (-align access 0).
8. Insert a timing pin through the hole in the motor pulley into the hole in the side frame.
9. The timing pin must pass freely through the holes. If it does not, loosen the motor pully clamp screw 3 and align the holes. Then tighten the motor pulley clamp screws but make sure there is clearance between the pulley and the side casting.
10. Go to *Head/Carriage Assembly* 120, step 2f of the adjustment section.

120 HEAD/CARRIAGE ASSEMBLY
(Page 5 of 5)



1 Band Clamping Screws
2 Stepper Motor Pulley
3 Clamping Screw
4 Pulley Gap
5 Timing Pin
6 Tab
7 Bail
8 Bail Return Spring
9 Lower Guide Rod Screw
10 Guide Rod Notch
11 Guide Rod
12 Head Carriage Assembly
13 Wiper Assembly
14 Upper Guide Rod
15 Bail
16 Tab
17 Thickness Gauge
18 Guide Rod Seating
19 Timing Block Gap 0.020 in. (0.508 mm)

130 HEAD LOAD SOLENOID AND BAIL
(Page 1 of 3)

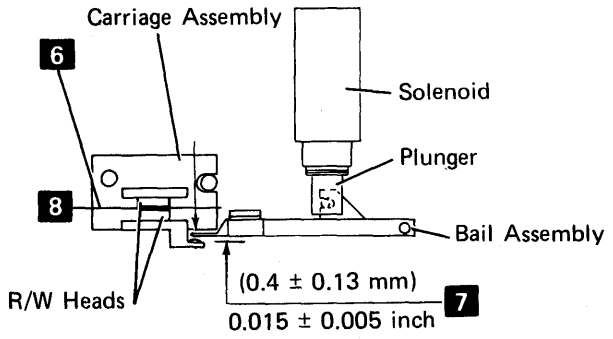
Service Check

1. Prepare for the service check as follows:
   a. Turn off the IPO switch.
   b. Remove the 5114covers (110).
   c. Remove the diskette drive assembly (111). (Disconnect the drive motor power cable but leave the signal cable connected.)
   d. Remove diskette adapter card A1C1 (103).
   e. Remove the diskette drive cover (112).

DANGER
Voltage is present at the socket when the power cable is disconnected and the IPO switch is on.

   f. Turn on the IPO switch. Verify that system power is turned on.

2. Check the bail and carriage arm gap as follows:
   a. Insert a clean strip of paper between the read/write heads 6.
   b. Check for tension on the head load spring.

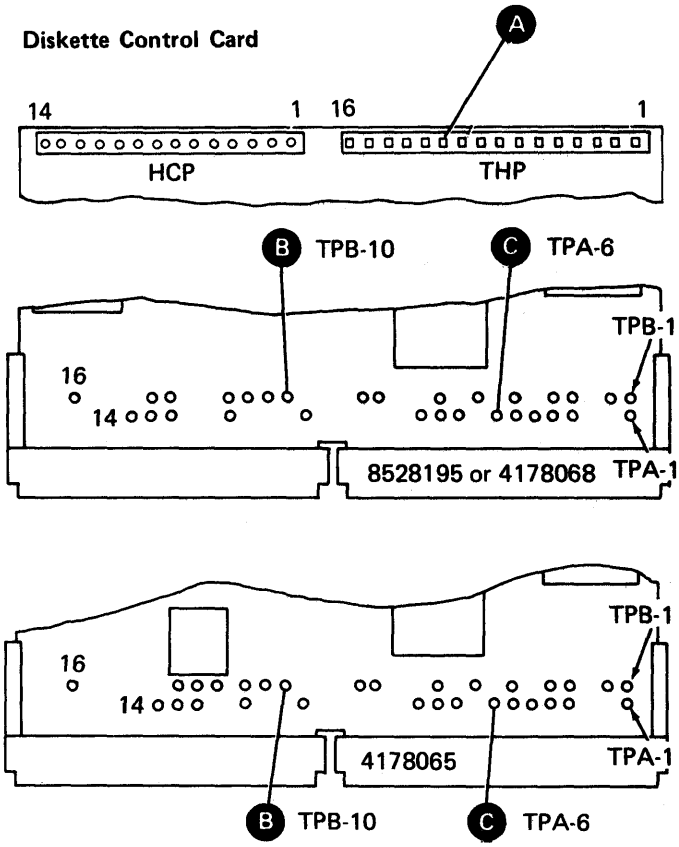


CAUTION
The PTX, LED, or drive card can be damaged if the incorrect test pins are jumped.

   c. Install a jumper from A (-head load) to B (ground) to activate the head load solenoid.

DANGER
The solenoid case becomes hot after continuous use.

Diskette Control Card



   d. Verify a 0.015 ± 0.005 inch (0.4 ± 0.13 mm) gap 7 between the bail and the carriage arm tab for full length of carriage travel (tracks 00 to 76).
   e. If the gap is correct, go to step 3. If the gap is not correct, go to step 1 of the adjustment procedure.

3. Check the gap between the head surfaces as follows:
   a. Remove the jumper.
   b. Remove the strip of paper from between the read/write heads.
   c. Visually check for a gap of approximately 1/8 inch (about 3 mm) between the head surfaces 8. (This gap cannot be measured.)
   d. If the gap is correct, go to step 4. If the gap is not correct, go to step 2 of the adjustment procedure.

130 HEAD LOAD SOLENOID AND BAIL
(Page 2 of 3)

4. Return the 5114 to operational status as follows:
   a. Turn off the IPO switch.
   b. Reinstall the diskette drive cover (112).

   CAUTION
   The cable routing must be the same as when the diskette drive was removed because of the electrostatic noise.

   _____
   _____
   _____
   _____
   _____

   c. Connect the drive motor power cable.
   d. Reinstall diskette adapter card A1C1.
   e. Reinstall the diskette drive in the 5114.
   f. Turn on the IPO switch.

Adjustment

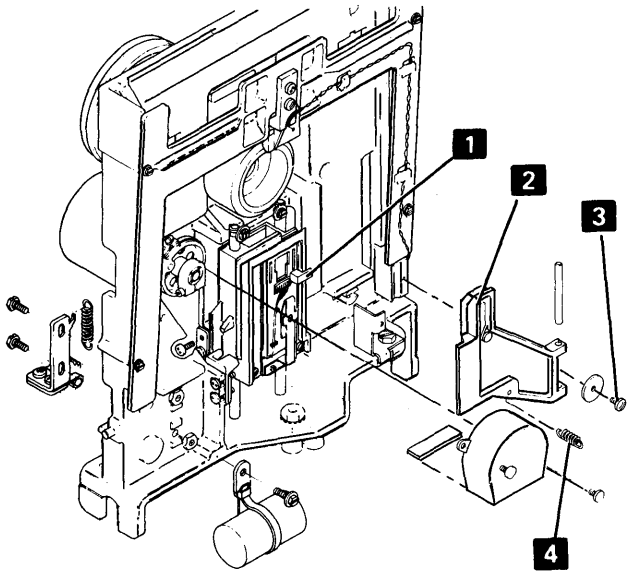
Perform the service check before performing the adjustment procedure.

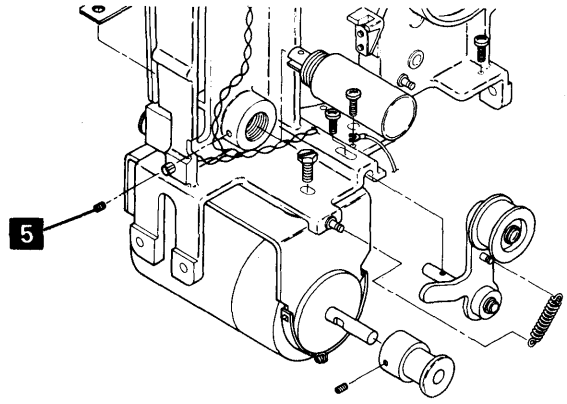
1. Adjust the bail and carriage arm gap as follows:
   a. Loosen the solenoid locking screw 5.
   b. Turn the solenoid in the casting for a 0.015 ± 0.005 inch (0.4 ± 0.13 mm) gap 7 between the bail 2 and the carriage arm tab 1. (A clockwise rotation of the solenoid decreases the gap.)
   c. Tighten the solenoid locking screw 5.
   d. Remove the jumper installed in step 2 of the service check.
   e. Reinstall the diskette drive cover assembly.
   f. If the head gap is to be adjusted, go to step 2. If the head gap is not to be adjusted, go to step 3 of the service check.

2. Adjust the gap between the heads as follows:

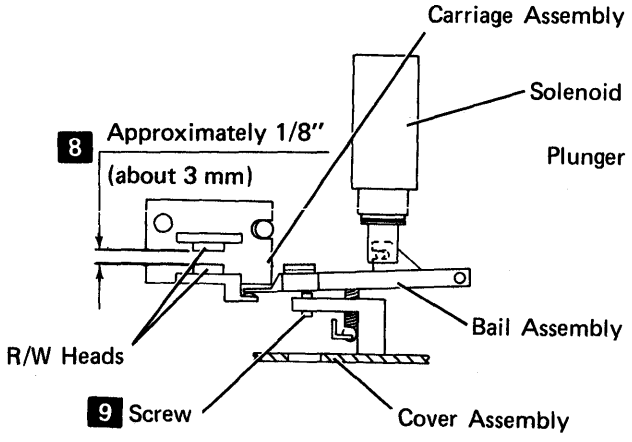
   Turn the bail stop screw 9 clockwise until the heads just touch; then turn the screw counterclockwise one turn.

3. Perform the service check.





1 Carriage Arm Tab
2 Bail
3 Bail Mounting Screw
4 Bail Return Spring
5 Solenoid Locking Screw

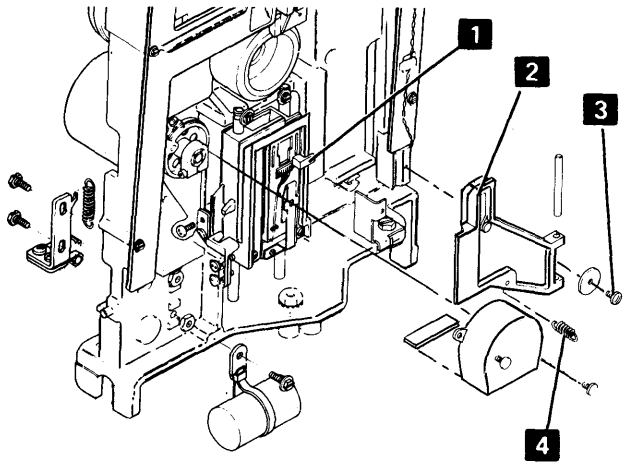


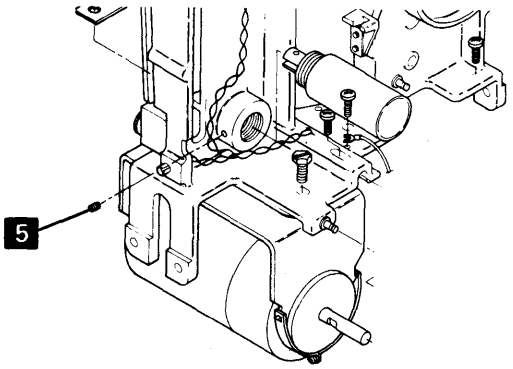
8 Read/Write Head Gap
9 Bail Stop Screw

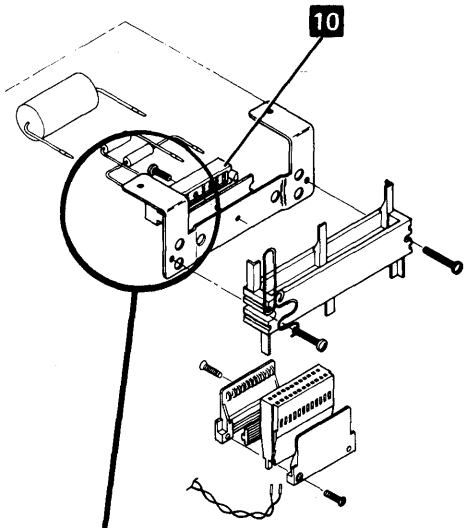
130 HEAD LOAD SOLENOID AND BAIL
(Page 3 of 3)

Removal

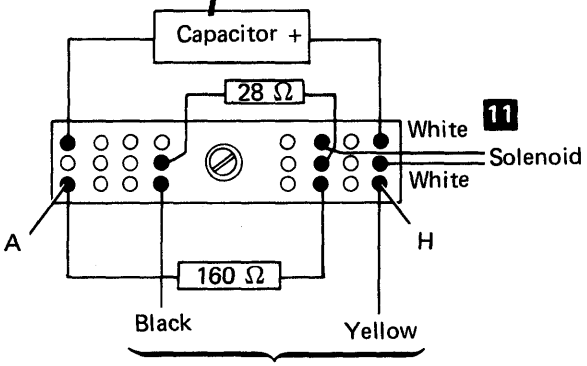
1. Turn off the IPO switch.
2. Remove the 5114 covers (110).
3. Remove the diskette drive from the 5114 (111).
4. Remove diskette adapter card A1C1 (103).
5. Remove the solenoid leads 11 from the taper pin terminal block 10. (Remember the cable path for the replacement procedure.) If there is no terminal block, remove the leads from the A2 connector.
6. Remove the bail return spring 4.
7. Remove the mounting screw 3 and the bail 2. (This pulls the solenoid plunger out of the solenoid. Be careful not to damage the plated surface of the plunger.)
8. Remove the plunger from the bail.
9. Loosen the solenoid locking screw 5 and remove the head load solenoid by turning it counterclockwise.







10 Taper Pin Terminal Block
11 Solenoid Leads



This illustrates machines without EC 836576. Machines with EC 836576 will not have this terminal block or associated components.

Replacement

1. Install the solenoid, turning it about four turns clockwise into the casting.
2. Install the plunger to the bail.
3. While inserting the plunger into the solenoid, reinstall the bail 2 and the mounting screw 3. (Be careful not to damage the plated surface on the plunger.) Ensure that the bail is under the tab 1 of the carriage arm.
4. Reinstall the bail return spring 4.
5. Carefully place and connect the solenoid 11 leads to the taper pin terminal block 10 or the A2 connector (see logic 440).
6. Perform the service check.

140 BELT TRACKING
(Page 1 of 2)

Service Check

1. With power on, check that the drive belt is centered on the hub pulley and the drive pulley.

2. If the drive belt is not centered, adjust the belt.

Adjustment

1. Turn off the IPO switch.

2. Loosen the idler locking screw 5 and the drive pulley setscrew 2.

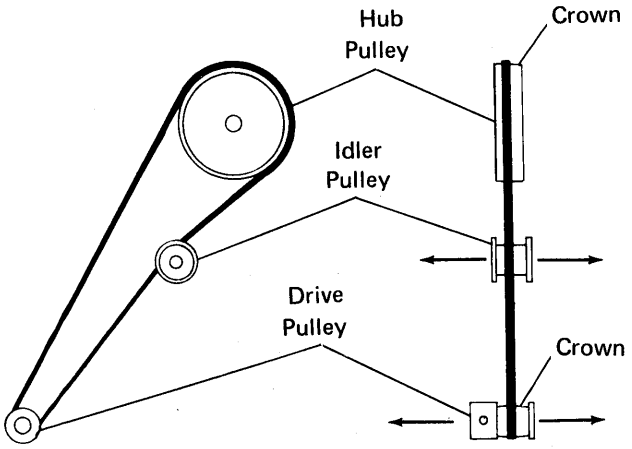
3. Slide the idler assembly 5 and the drive pulley 3 in or out so the belt is centered on the hub pulley 4 and the drive pulley when the drive pulley is turned counterclockwise.

4. Tighten the idler locking screw 5 and the drive pulley setscrew 2. Ensure that the drive pulley setscrew is aligned to the flat surface of the motor shaft.

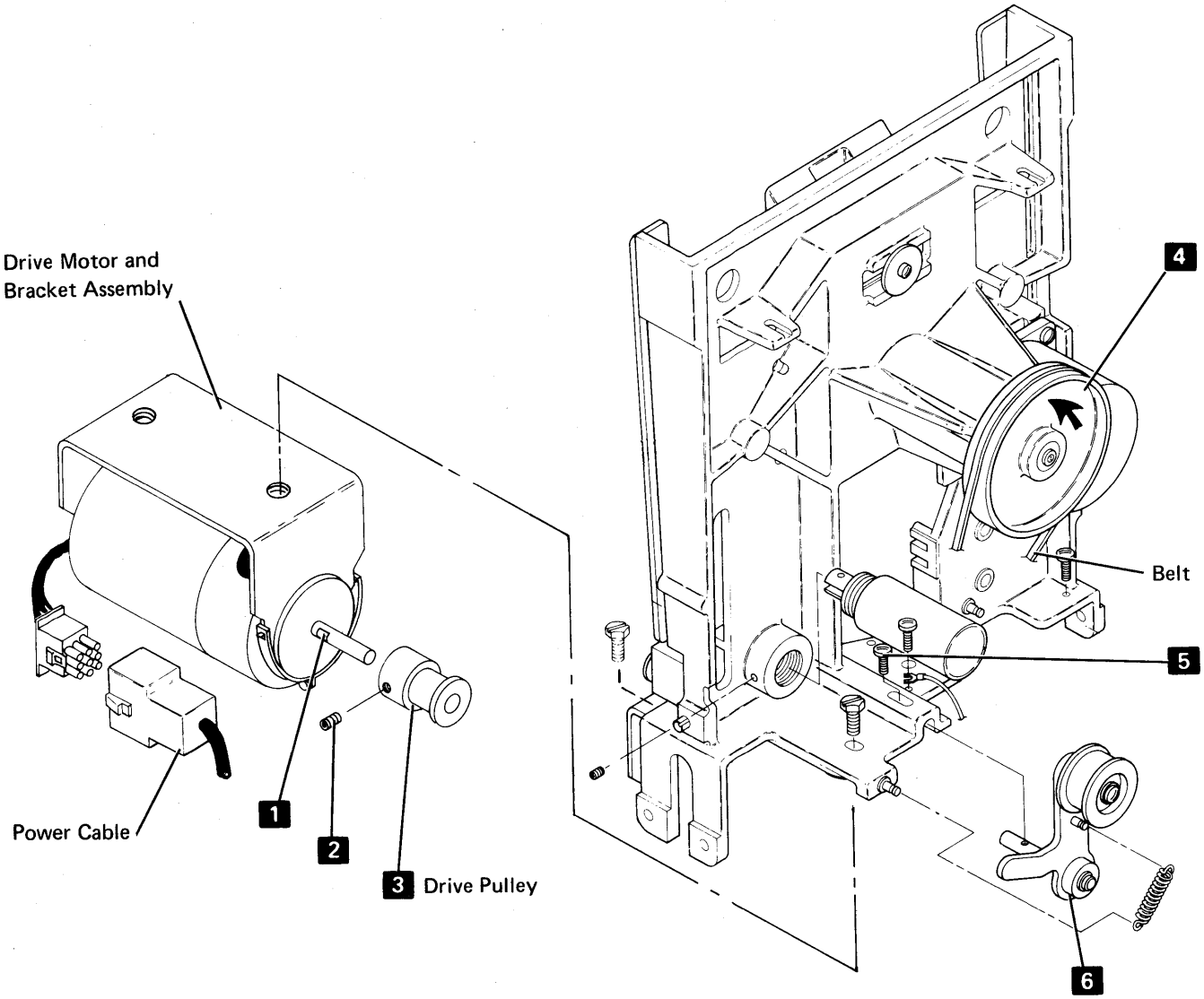
5. Turn on the IPO switch.

6. Perform the belt tracking service check.

140 BELT TRACKING
(Page 2 of 2)



1. Drive Motor Shaft Flat Surface
2. Drive Pulley Setscrew
3. Drive Pulley
4. Spindle Pulley
5. Idler Locking Screw
6. Idler Assembly



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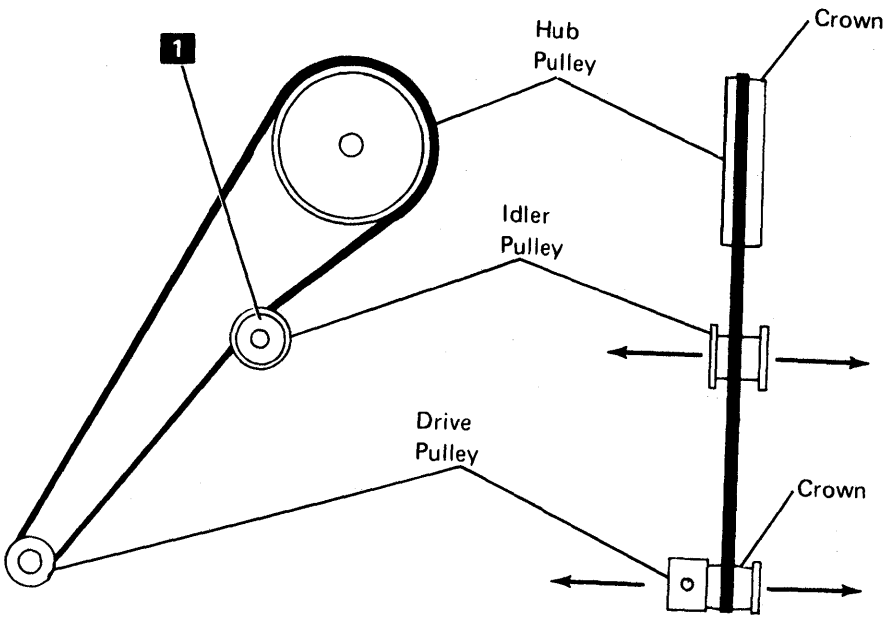
141 BELT

Removal

1. Turn off the IPO switch.
2. Release the idler tension by hand and remove the drive belt.

Replacement

1. Install the drive belt. Ensure that the idler is positioned as shown 1.
2. Turn on the IPO switch.
3. Perform the belt tracking service check (140).



142 DRIVE MOTOR
(Page 1 of 2)

Removal

1. Turn off the IPO switch.
2. Disconnect the drive motor power cable 1.
3. Remove the diskette drive cover assembly (112).
4. Remove the drive belt 7 (141).

> **DANGER**
> The motor case becomes hot after continuous use.
>
> _____
> _____

5. Remove the two motor bracket mounting screws 6 and remove the drive motor and the bracket as an assembly.
6. Loosen the setscrew 4; then remove the drive pulley.

Replacement

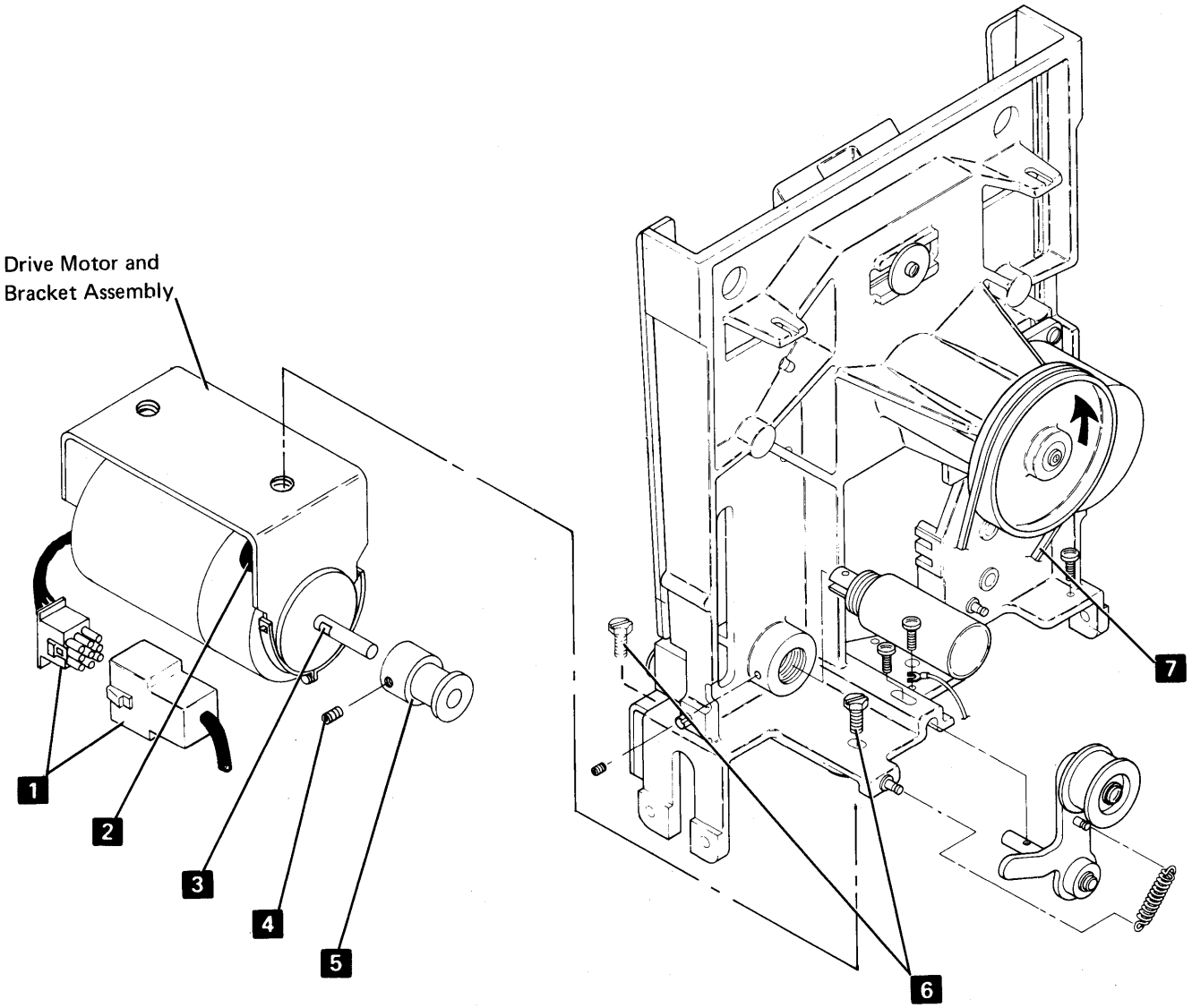
1. Reinstall the drive pulley 5 onto the new motor. Ensure that the setscrew 4 is aligned to the flat surface of the motor shaft 3.

> **DANGER**
> (60 Hz motors): To prevent personal injury, ensure that the two large holes 2 in the motor case are positioned up and under the bracket.
>
> _____
> _____
> _____
> _____
> _____

2. Install the drive motor and bracket assembly and the two screws 6.
3. Reinstall the diskette drive cover assembly (112).
4. Connect the drive motor power cable 1.
5. Replace the drive belt (141).
6. Perform the drive belt tracking service check (140).

142 DRIVE MOTOR
(Page 2 of 2)

1. Drive Motor Power Cable
2. Large Vent Hole
3. Motor Shaft Flat Surface
4. Drive Pulley Setscrew
5. Drive Pulley
6. Motor Bracket Mounting Screws
7. Drive Belt



143 DRIVE PULLEY

Removal

1. Turn off the IPO switch.
2. Remove the drive belt 4 (141).
3. Loosen the setscrew 2; then remove the drive pulley 3.

Replacement

1. Install the drive pulley 3 on the motor shaft with the setscrew 2 aligned to the flat surface of shaft 1.
2. Replace the drive belt (141).
3. Perform the drive belt tracking service check (140).

144 IDLER ASSEMBLY

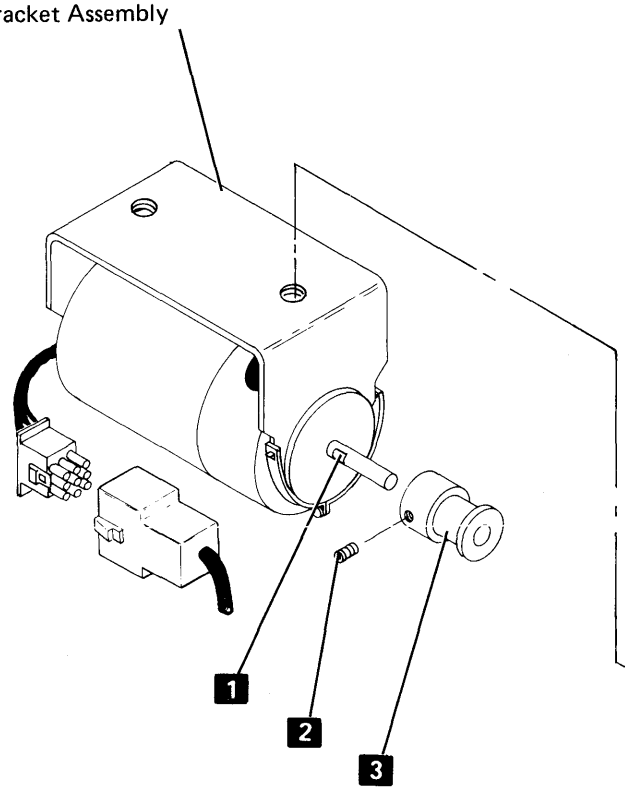
Removal

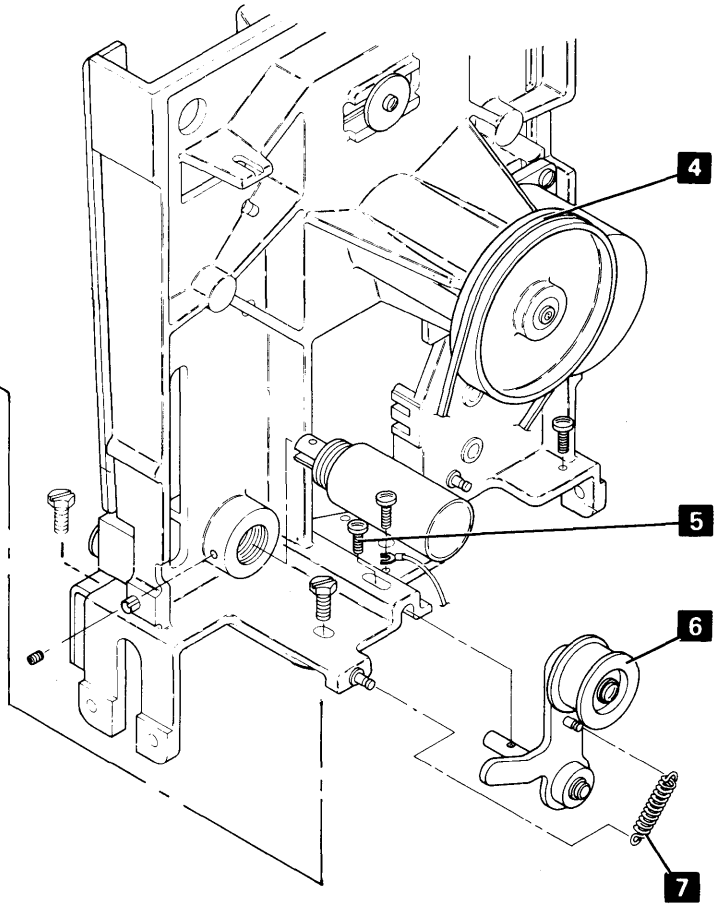
1. Turn off the IPO switch.
2. Remove the drive belt 4 (141).
3. Remove the idler spring 7.
4. Remove the locking screw 5 and the idler assembly 6.

Replacement

1. Install the idler assembly 6 and the locking screw 5
2. Reinstall the idler spring 7.
3. Replace the drive belt (141).
4. Perform the drive belt tracking service check (140).

Drive Motor and Bracket Assembly





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Stepper Drive Parts

150 STEPPER MOTOR
(Page 1 of 3)

Removal

1. Turn off the IPO switch.
2. Remove the diskette drive cover assembly (112).
3. Disconnect the head cable from the diskette drive control card (172).
4. Remove the card retainers and the diskette drive control card 9.
5. Disconnect the cable from position A2 10.
6. Remove the two screws 12 and the two connector covers.
7. Remove the five stepper motor leads 13 from the cable connector by pushing down on the terminal tabs 14 with a small screwdriver 11.
8. Remove the wiper assembly 8.
9. Loosen the two idler mounting screws 6. Push the idler assembly up against the spring tension; then tighten the screws.

CAUTION
While performing the following steps, be careful not to damage the drive band.

10. Remove the clamp screw 2 and the band clamp.
11. Carefully remove the drive band ends from the pulley pin.
12. Measure and record the gap 1 between the stepper motor pulley and the casting. This measurement will be used in the replacement procedure.
13. Loosen the clamp screw 3, then remove the stepper motor pulley.
14. Remove the three stepper motor mounting screws 5 then remove the motor.

Replacement

1. Install the stepper motor using the three mounting screws 5. (Position the motor cable toward the diskette drive control card.)
2. Insert the five stepper motor leads 13 into the cable connector. Ensure that the locking tabs 14 on the terminals lock in the connector slots.
3. Reinstall the connector covers and two screws 12.
4. Connect the cable to position A2 10.
5. Reinstall the stepper motor pulley. (Keep the clamp screw 3 loose so that the motor shaft can turn inside the pulley.) Be sure the pulley does not touch the side frame.
6. Carefully reinstall the drive band ends on the pulley pin as shown. Reinstall the band clamp (with the notch facing away from the stepper motor) and the screw 2. (Do not tighten the screw.)
7. Loosen the two mounting screws 6 and let the spring tension position the idler.
8. Tighten the mounting screw and center the drive band on the idler pulley 7. Ensure that the bracket is parallel to the casting.
9. Reinstall the diskette drive control card 9.
10. Reinstall the head cable on the diskette drive control card (172).
11. Turn the stepper motor pulley by hand until the timing slot in the casting and the timing hole in the stepper motor pulley are aligned, and insert a timing pin 4.
12. Disconnect the drive motor power cable.

DANGER
Voltage is present at the socket when the power cable is disconnected and power is on.

13. Remove diskette adapter card A1C1 (103).

150 STEPPER MOTOR
(Page 2 of 3)

14. Turn on the IPO switch.

CAUTION
The PTX, LED, or drive card can be damaged if the incorrect test pins are jumped.

15. Install a jumper from (B) (ground) to THP11 (-align access 0).

16. Make the gap 1 between the pulley and the casting the same size as the gap that was recorded in the removal procedure, step 12.

17. Tighten the clamp screw 3.

18. Remove the timing pin 4.

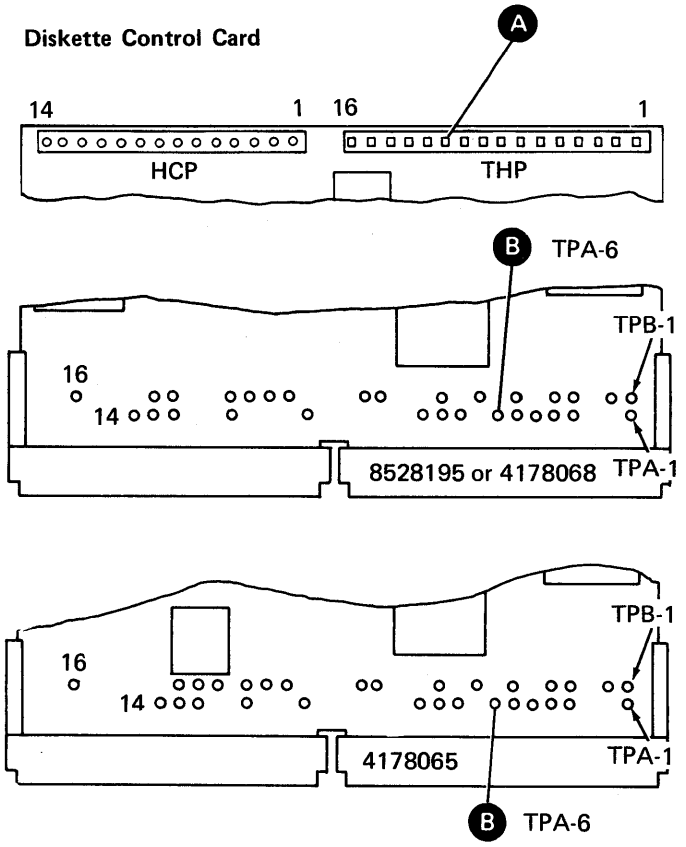
19. Remove the jumper.

20. Tighten the band clamp screw 2. (Ensure that the drive band is straight and the tension is present.)

21. Turn the stepper motor pulley by hand and check if the drive band is centered on the idler pulley 7 in all of the head/carriage assembly travel (tracks 00 to 76).

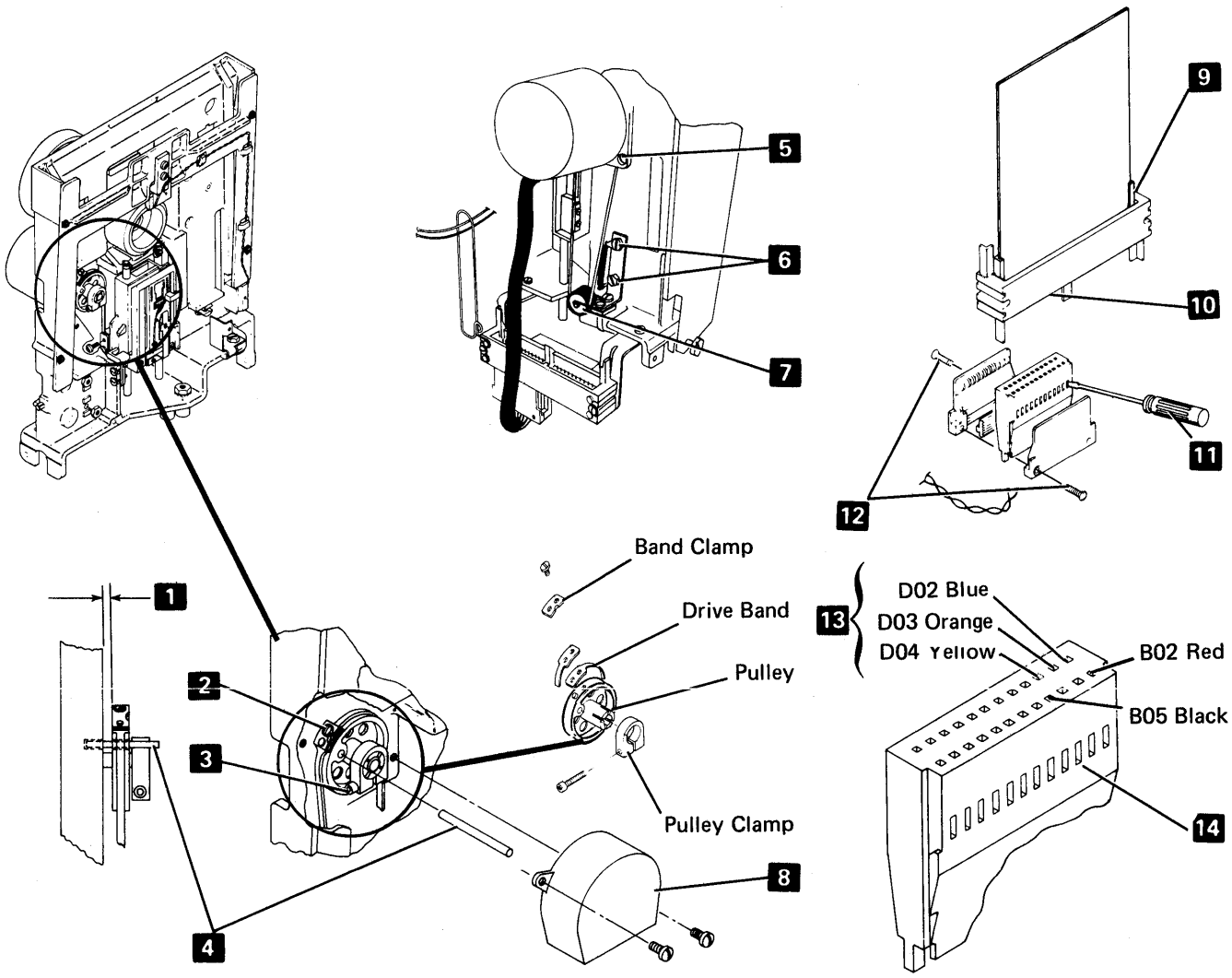
22. If the drive band is not centered or the tension is not present, adjust the drive band (152); start with step 4.

23. If the drive band is centered, perform the head/carriage check (120); start with step 3.



150 STEPPER MOTOR
(Page 3 of 3)

1. Pulley and Casting Gap
2. Band Clamp Screw
3. Pulley Clamp Screw
4. Timing Pin
5. Stepper Motor Mounting Screw
6. Idler Assembly Mounting Screw
7. Idler Pulley
8. Wiper Assembly
9. Diskette Drive Control Card
10. Position A2
11. Removal of Leads
12. Connector Cover Screws
13. Stepper Motor Leads
14. Terminal Tab



151 PULLEY CLAMP
(Page 1 of 3)

Removal

1. Turn off the IPO switch.
2. Remove the diskette drive cover assembly (112).
3. Remove the wiper assembly 8.
4. Disconnect the head cable from the diskette drive control card (172).
5. Remove the card retainers and the diskette drive control card 9 (172).
6. Loosen the two idler mounting screws 4. Push the idler assembly up against the spring tension; then tighten the screws.

CAUTION
While performing the following steps, be careful not to damage the drive band.

7. Remove the clamp screw 2 and the band clamp from the pulley.
8. Carefully remove the drive band ends from the pulley pin.
9. Measure and record the gap 1 between the stepper motor pulley and the casting. This measurement will be used in the replacement procedure.
10. Loosen the clamp screw 3; then remove the pulley and the clamp.

Replacement

1. Reinstall the pulley, the clamp, and the clamp screw 3. (Keep the screw loose so that the motor shaft can turn inside the pulley.) Be sure the pulley does not touch the side frame.
2. Carefully reinstall the drive band ends on the pulley pin. Then reinstall the band clamp (with the notch facing away from the stepper motor) and the screw 2. (Do not tighten the screw 2).
3. Loosen the two idler mounting screws 6 and let the spring tension put the idler in position. Hold the idler mounting bracket and tighten the mounting screws 6. Ensure that the bracket is parallel to the frame.
4. Turn the stepper motor pulley by hand a few times to center the drive band on the idler pulley 7.
5. Reinstall the diskette drive control card and the card retainers 9 (172).
6. Reinstall the head cable on the diskette drive control card (172).
7. Turn the stepper motor pulley by hand until the timing slot in the casting and the timing hole in the stepper motor pulley are aligned. Insert a timing pin 4.
8. Disconnect the drive motor power cable.

DANGER
Voltage is present at the socket when the power cable is disconnected and the IPO switch is on.

9. Remove diskette adapter card A1C1.
10. Turn on the IPO switch.

CAUTION
The PTX, LED, or drive card can be damaged if the incorrect test pins are jumpered.

151 PULLEY CLAMP
(Page 2 of 3)

11. Install a jumper from (B) (ground) to (A) (-align access 0).

12. Make the gap 1 between the pulley and the casting the same as the gap that was recorded in the removal procedure step 9.

13. Tighten the clamp screw 3.

14. Remove the timing pin 4.

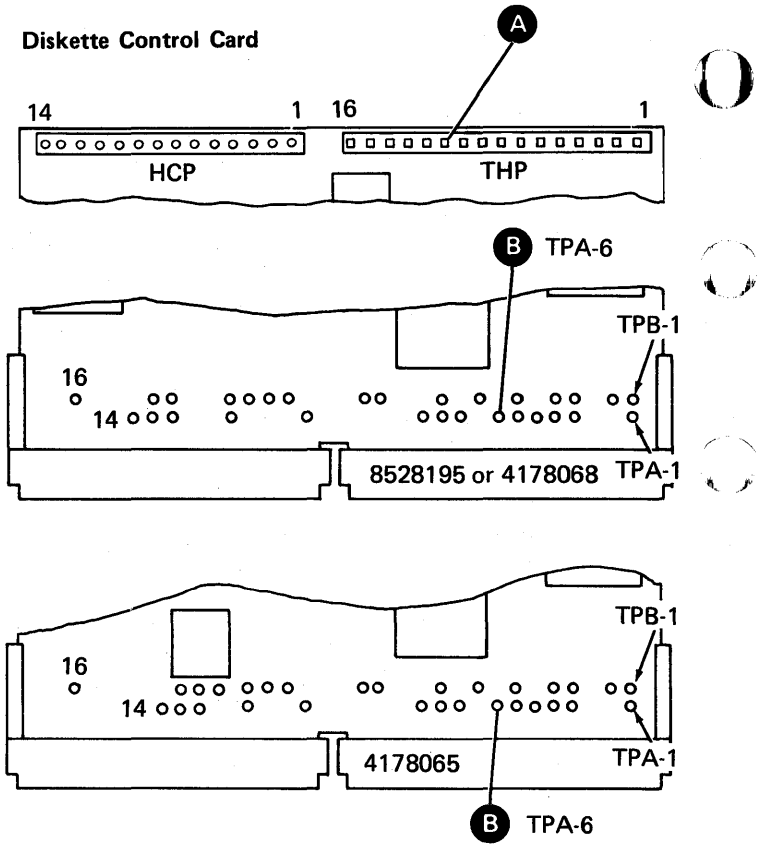
15. Remove the jumper.

16. Tighten the band clamp screw 2. (Ensure that the drive band is straight.)

17. Turn the stepper motor pulley by hand and check that the drive band is centered on the idler pulley 7 in all of the head/carriage assembly travel (tracks 00 to 76).

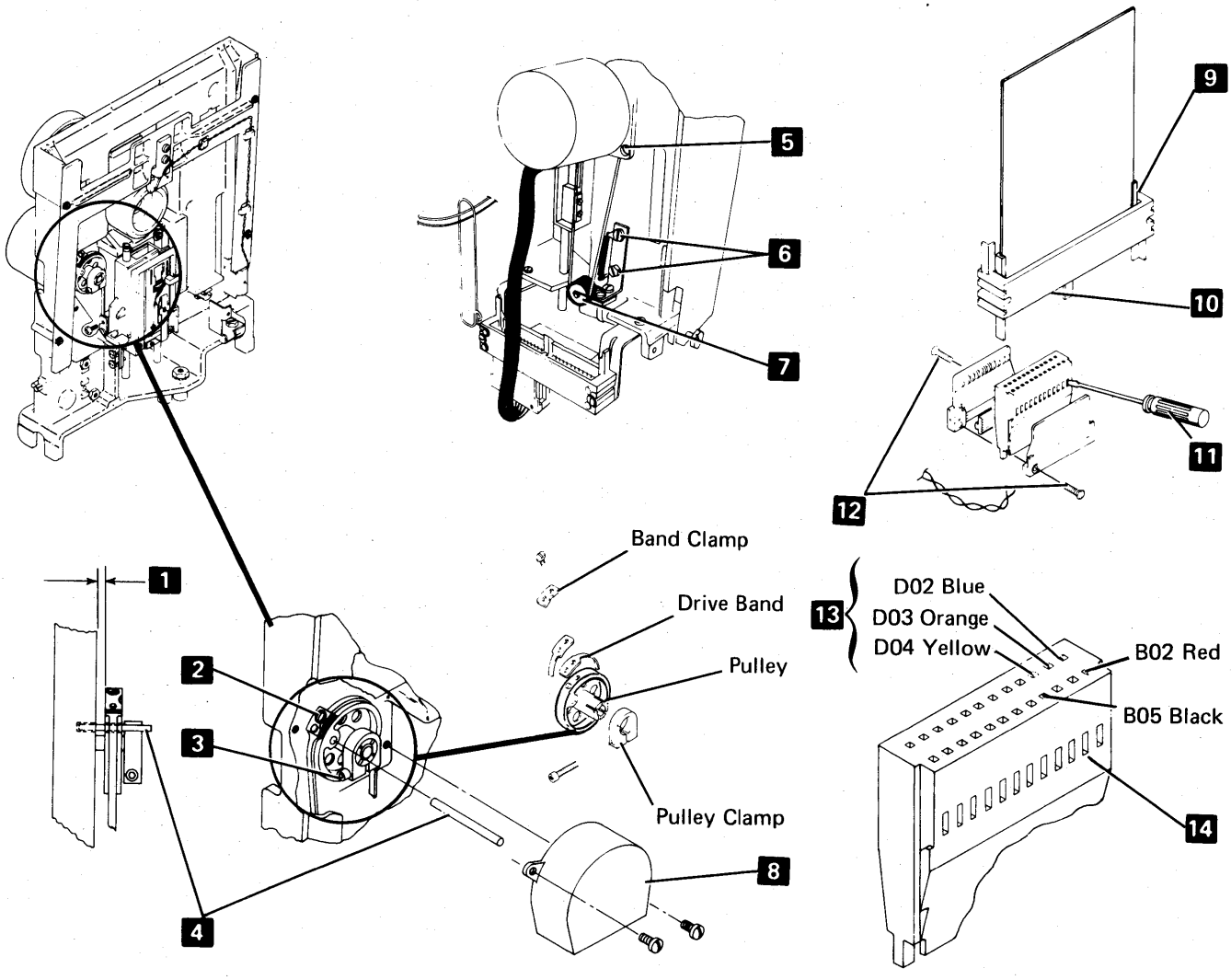
18. If the drive band is not centered, adjust the drive band (152); start with step 4 of the adjustment procedure.

19. If the drive band is centered, perform the head/carriage service check (120); start with step 3.



151 PULLEY CLAMP
(Page 3 of 3)

1. Pulley and Casting Gap
2. Band Clamp Screw
3. Pulley Clamp Screw
4. Timing Pin
5. Stepper Motor Mounting Screw
6. Idler Assembly Mounting Screw
7. Idler Pulley
8. Wiper Assembly
9. Diskette Drive Control Card
10. Position A2
11. Removal of Leads
12. Connector Cover Screws
13. Stepper Motor Leads
14. Terminal Tab



152 DRIVE BAND
(Page 1 of 3)

Service Check

1. Turn off the IPO switch.
2. Remove the diskette drive cover assembly (112).
3. Remove the wiper assembly 4.
4. Check for tension on the drive band.
5. Turn the stepper motor pulley by hand and check that the drive band is centered on idler pulley 8 in all of the head/carriage assembly travel (tracks 00 to 76).
6. If the drive band is not centered, perform the drive band adjustment; start with step 4. If the drive band is centered, go to step 6.
7. Reinstall the wiper assembly 4.
8. Reinstall the diskette drive cover assembly (112).

Adjustment

1. Turn off the IPO switch.
2. Disconnect the drive motor power cable (111).

DANGER
Voltage is present at the socket when the power cable is disconnected and the IPO switch is on.

3. Remove the diskette drive cover assembly (112).
4. Remove the wiper assembly 4.
5. Disconnect the head cable from the diskette drive control card (172).
6. Remove the card retainers and the diskette drive control card (172).
7. Place the head/carriage assembly to about the middle of its travel (track 40).
8. Remove the two band clamp screws 6 and the clamp 5.
9. Loosen the two idler mounting screws 7 and let the spring tension put the idler in position. Hold the idler mounting bracket and tighten the mounting screws. Ensure that the idler mounting bracket is parallel to the frame.
10. Turn the stepper motor pulley by hand a few times to center the drive band on the idler roller 8.
11. Place the head/carriage assembly to about track 40. Ensure that the band mounting slots are centered (left to right) over the mounting holes on the carriage pad 1.
12. Repeat step 10 with the head/carriage assembly at track 76 and track 00.
13. If the mounting slots are not centered, perform steps 13a through 13c. If the mounting slots are centered, go to step 14.
    a. Loosen the clamp screw 3.
    b. Loosen the band clamp screw 2.
    c. Position the stepper motor pulley to center the mounting slots and tighten the clamp screws 3 and 2.
14. Place the head/carriage assembly to about the middle of its travel (track 40).
15. Reinstall the clamp 5 and the two clamp screws 6. (Do not tighten.)
16. Move the head/carriage assembly from track 00 to track 76 and check for binds.
17. Reinstall the diskette drive control card and the card retainers (172).
18. Connect the head cable to the diskette drive control card (172).
19. Remove diskette adapter card A1C1 (103) and perform the head/carriage adjustment (120); start with step 3.

152 DRIVE BAND
(Page 2 of 3)

Removal

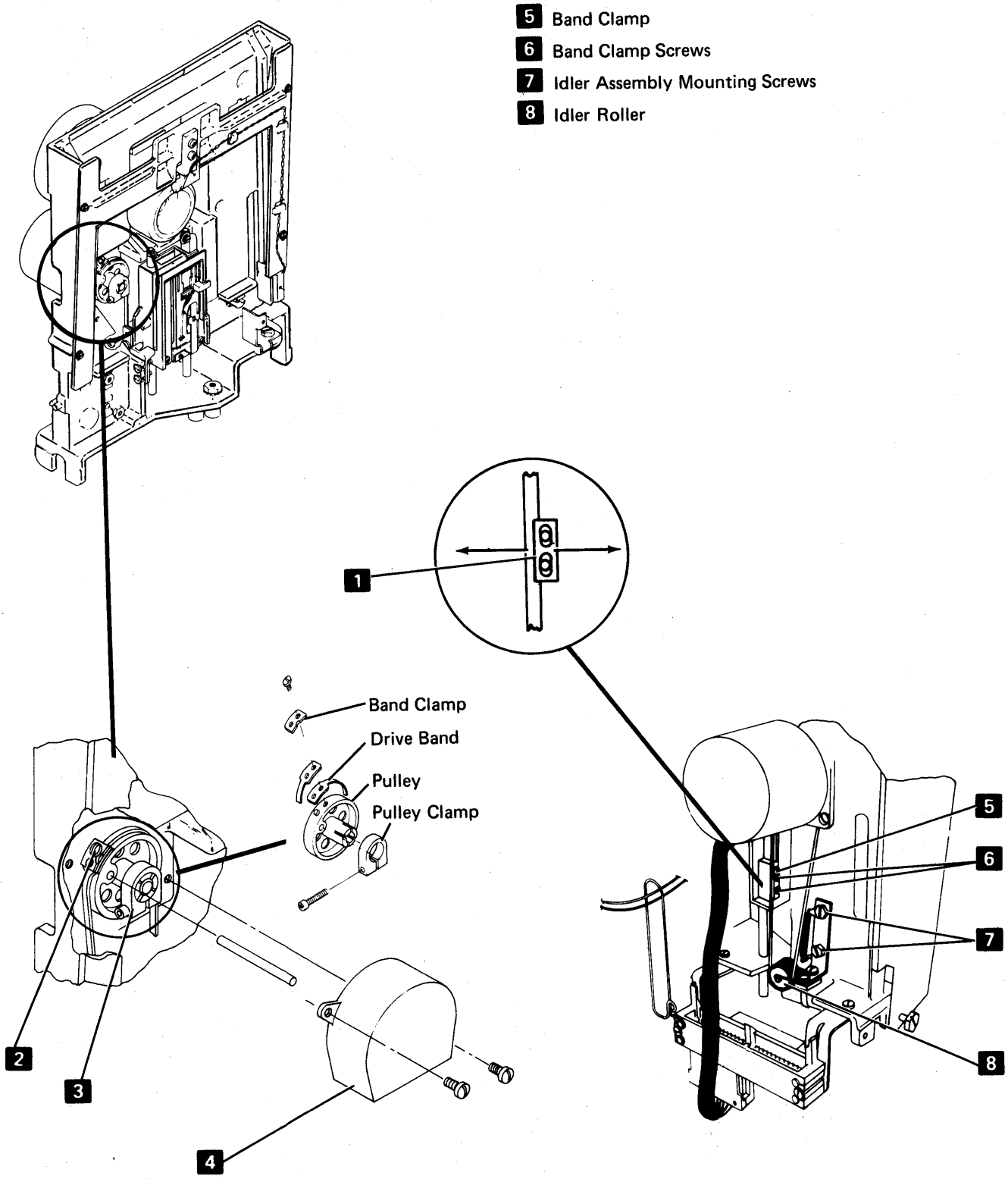
1. Turn off the IPO switch.
2. Remove the diskette drive cover assembly (112).
3. Remove the wiper assembly 4.
4. Disconnect the head cable from the diskette drive control card (172).
5. Remove the card retainers and the diskette drive control card (172).
6. Loosen the two idler mounting screws 7. Push the idler assembly against the spring tension and tighten the mounting screws.
7. Place the head/carriage assembly to about the middle of its travel (track 40).
8. Remove the two band clamp screws 6 and the clamp 5. Then place the head/carriage assembly at the lower limit (track 00).
9. Remove the clamp screw 2 and the clamp.
10. Remove the drive band ends from the pulley pin; then remove the band.

Replacement

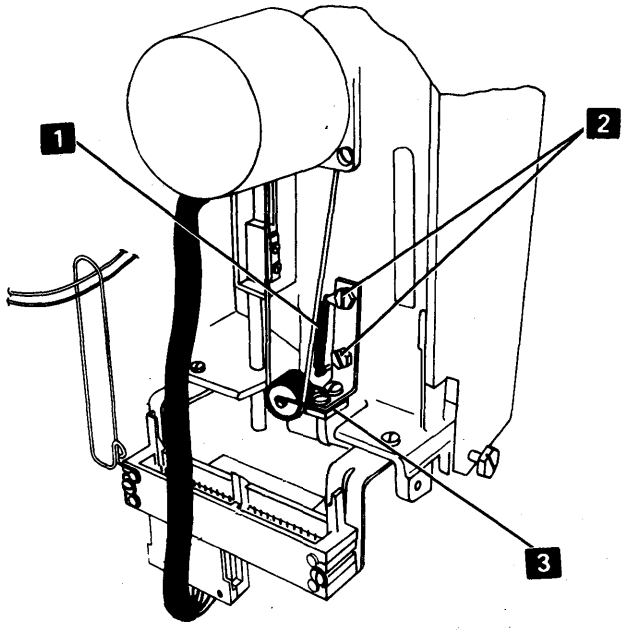
1. Place the drive band around the idler assembly 8.
2. Install the drive band ends on the pulley pin.
3. Reinstall the band clamp (with the notch facing away from the stepper motor) and the clamp screw 2. (Ensure that the drive band is straight.)
4. Adjust the drive band (152); start with step 8.

152 DRIVE BAND
(Page 3 of 3)

1. Carriage Pad Mounting Holes
2. Band Clamp
3. Pulley Clamp
4. Wiper Assembly
5. Band Clamp
6. Band Clamp Screws
7. Idler Assembly Mounting Screws
8. Idler Roller



153 STEPPER DRIVE IDLER ASSEMBLY



1 Idler Spring
2 Idler Mounting Screws
3 Idler Assembly

Removal

1. Remove the drive band (152).
2. Loosen the two mounting screws 2.
3. Remove the idler spring 1.
4. Remove the mounting screws 2 and the idler assembly 3.

Replacement

1. Reinstall the idler assembly 3 and the two mounting screws 2. (Do not tighten the screws.)
2. Replace the idler spring 1.
3. Push the idler assembly up against the spring tension; then tighten the mounting screws.
4. Replace the drive band (152).

LED And PTX Assemblies

160 DISKETTE SPEED

Service Check

1. Insert a diskette. (Ensure that the diskette drive cover assembly is closed.)

   CAUTION
   The PTX, LED, or drive card can be damaged if the incorrect test pins are jumpered.

   _____
   _____
   _____

2. Install a jumper from Ⓐ (-head load) to Ⓒ (ground) to activate the head load solenoid.

3. Use a Tektronix 453, 454, or a similar oscilloscope with x10 probes and set up an oscilloscope as follows:

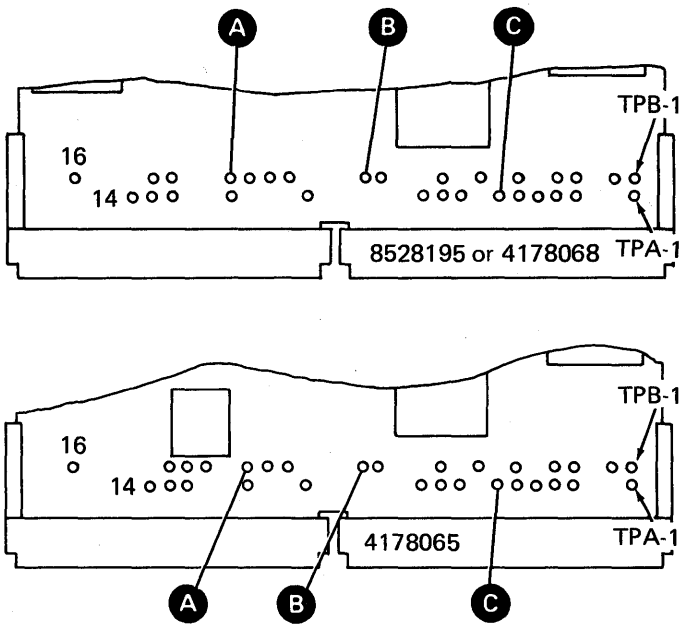
Switch	Setting
Channel A sweep mode	Normal
Channel A level	+
Channel A coupling	DC
Channel A slope	+
Channel A source	Internal
Trigger	Normal
Mode	Channel 1
Channel 1 volts/division	1.0 V/cm
Channel 1 input	DC
Times per division	20 ms/cm
Connect the channel 1 probe to Ⓑ (+index)	

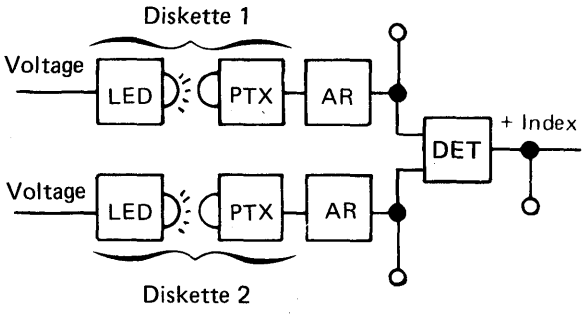
4. Observe an index pulse width of 1.5 to 3.0 ms Ⓕ occurring every 166.7 ± 4.2 ms Ⓓ. Pulse amplitude should be between 2.4 and 4.2 Vdc Ⓔ.

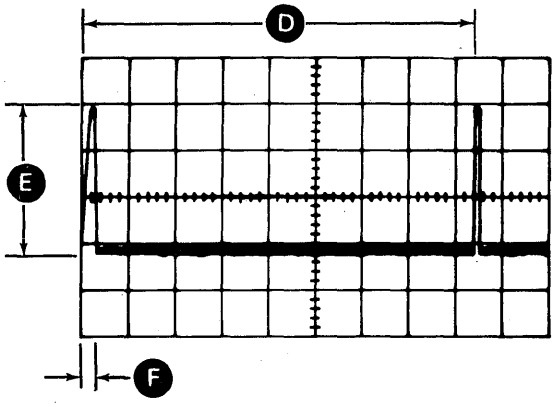
5. Remove the jumper.

6. Remove the diskette.

Diskette Control Card



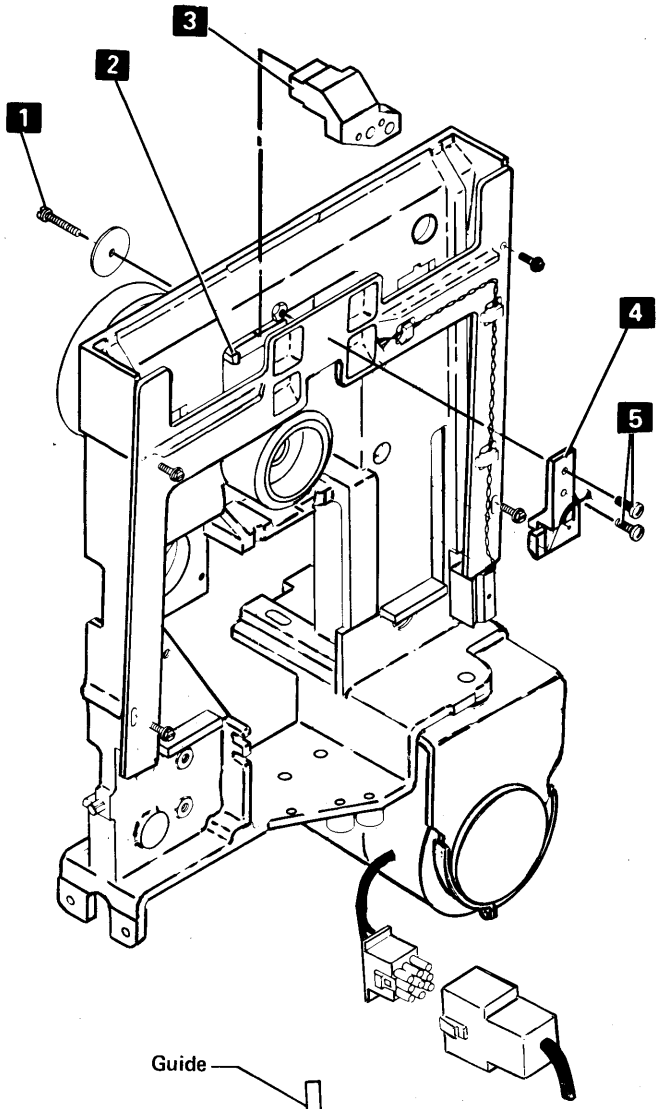


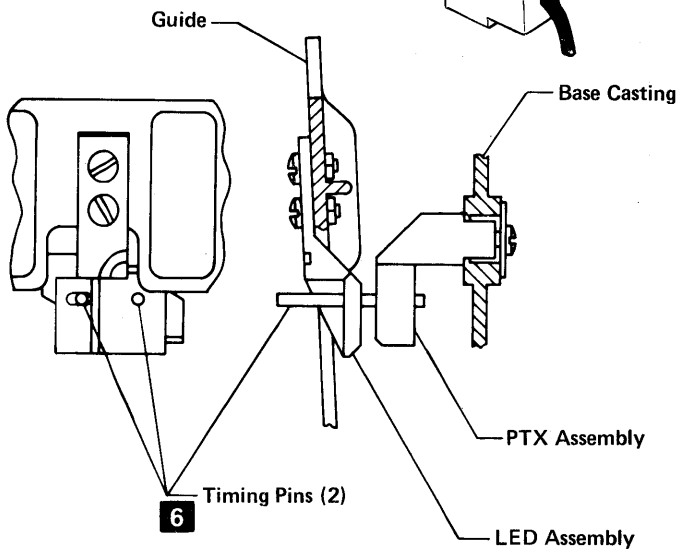


161 LED AND PTX ALIGNMENT

Alignment

1. Turn off the IPO switch.
2. Remove the diskette drive cover assembly (112).
3. Loosen the PTX mounting screw 1.
4. Place the PTX assembly 3 against the casting stop 2 (away from the leads); then tighten the mounting screw.
5. Loosen the two LED mounting screws 5.
6. Insert two timing pins 6 through the LED into the PTX assembly and tighten the LED mounting screws. The timing pins are stored in the diskette drive cover assembly (112).
7. Remove the timing pins.
8. Reinstall the diskette drive cover assembly (112).
9. Turn on the IPO switch.





1 PTX Mounting Screw
2 Base Casting Stop
3 PTX Assembly
4 LED Assembly
5 LED Mounting Screws
6 Timing Pins (2)

162 LED AND PTX SERVICE CHECKS

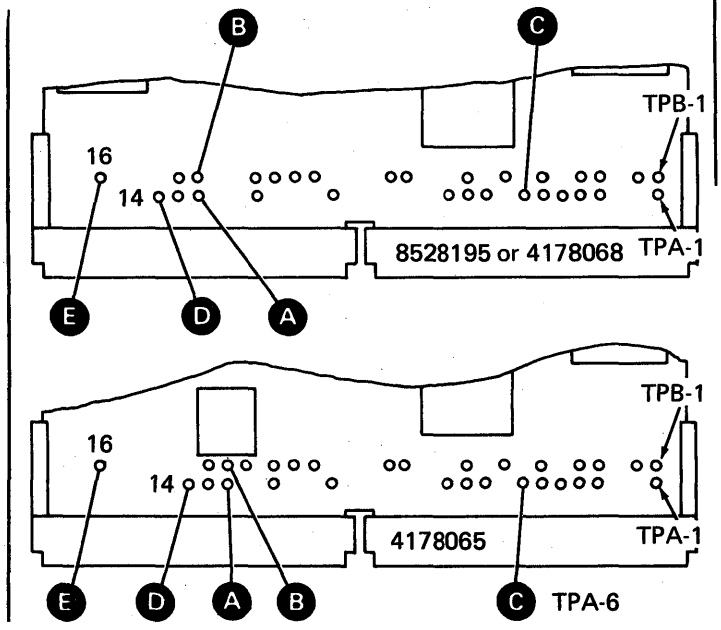
See Logic 440 for the circuit description.

Remove any diskette from the drive.

LED Service Check

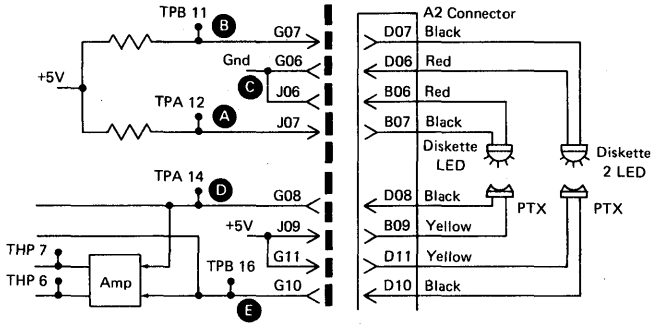
1. Connect the negative probe of a multimeter to C (ground) on the diskette drive control card.
2. Set the multimeter scale to 5 Vdc and connect the positive probe to A (diskette 1 LED voltage).
3. Check for a voltage level of 1 Vdc to 2 Vdc.
4. Move the positive probe to B (diskette 2 LED voltage).
5. Check for a voltage level of 1 Vdc to 2 Vdc.
6. Do PTX service check.

Diskette Control Card



PTX Service Check

1. Do LED service check first.
2. Set meter to the 15 Vdc scale.
3. Move the positive probe to D (diskette 1 PTX).
4. Check for a voltage level of 3 Vdc to 6 Vdc.
5. Move the positive probe to E (diskette 2 PTX).
6. Check for a voltage level of 3 Vdc to 6 Vdc.
7. Insert a diskette backwards.
8. Set the meter to the 5 Vdc scale.
9. Repeat steps 3 through 6 and check for a voltage level of less than 1 Vdc.



163 PTX AMPLIFIER SERVICE CHECK

Service Check

1. Remove any diskette from the drive.
2. Turn off the IPO switch.
3. Disconnect the drive motor power cable.

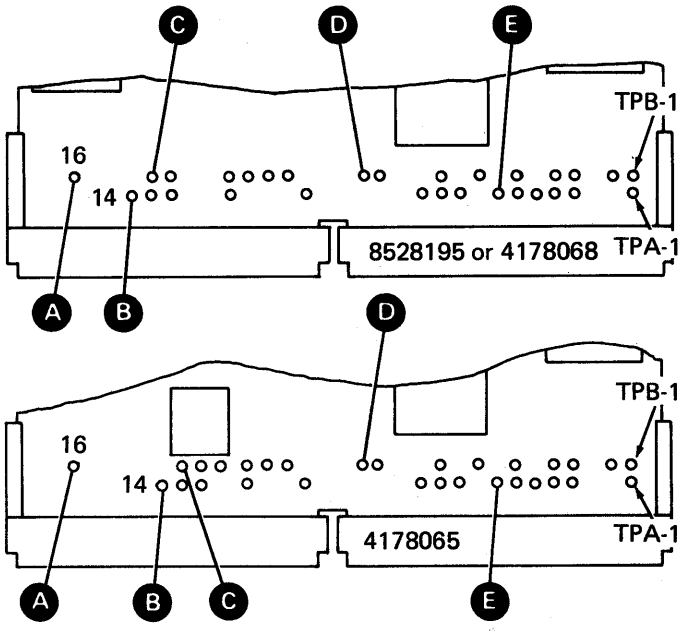
DANGER
Voltage is present at the socket when the power cable is disconnected and the IPO switch is on.

4. Turn on the IPO switch.
5. Insert a diskette backwards.
6. Set the meter to the 5 Vdc scale.
7. Connect the negative probe of the meter to E (ground).
8. Connect the positive probe to D (+ index).
9. Check for a reading of less than 1 Vdc.
10. Attach one end of a jumper to A (diskette 2 PTX).

CAUTION
The PTX, LED, or drive card can be damaged if the incorrect test pins are jumpered.

11. Watch the meter and touch the other end of the jumper to C (+5 Vdc) several times. The meter should give a reading of 2.5 Vdc or more after the first time the test pin was touched.
12. Move the jumper from A to B (diskette 1 PTX).
13. Repeat step 11.
14. Disconnect the jumper and remove it from the machine.
15. Remove the diskette.
16. Turn off the IPO switch.
17. Connect the drive motor power cable.
18. Turn on the IPO switch.

Diskette Control Card



164 LED REMOVAL AND REPLACEMENT

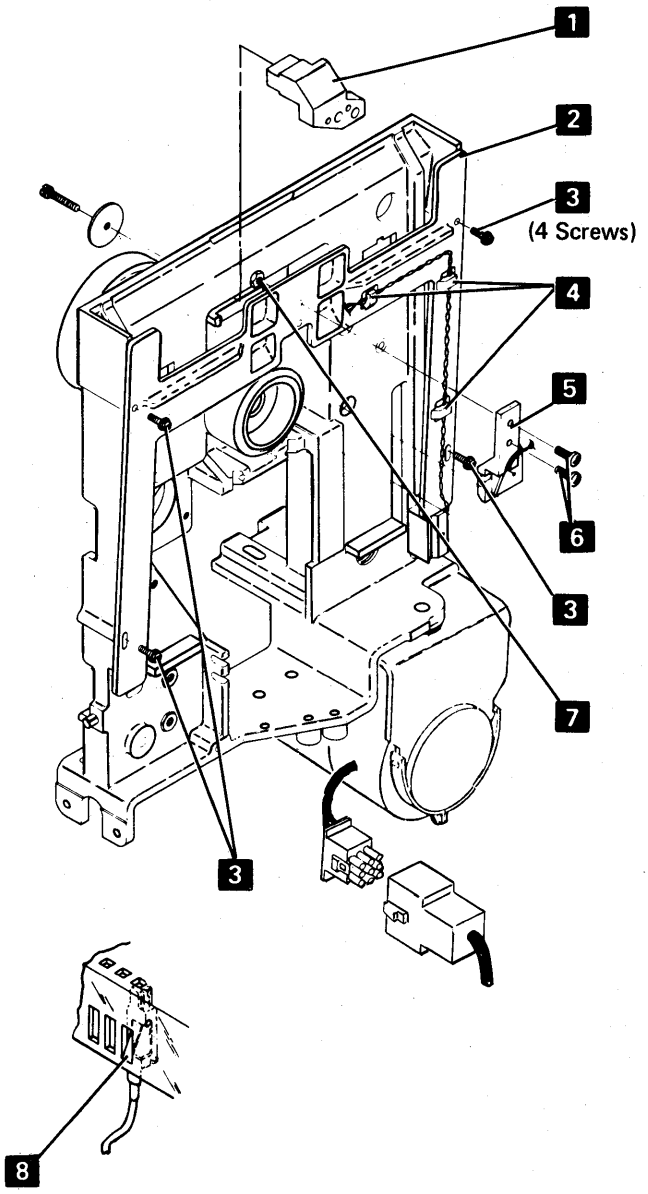
Removal

1. Turn off the IPO switch.
2. Remove the diskette drive cover assembly (112).
3. Disconnect the diskette drive control cable from position A2 9.
4. Remove the two screws 10 and the connector covers.
5. Remove the two diskette 1 LED leads 13 and the two diskette 2 LED leads 11 by pushing down on the tabs 8 with a small screwdriver 15.
6. Remove the LED cable from the three retainers 4.
7. Remove the four guide mounting screws 3 and the guide.
8. Remove the two LED mounting screws 6 and the nuts 7. Then remove the LED assembly 5.

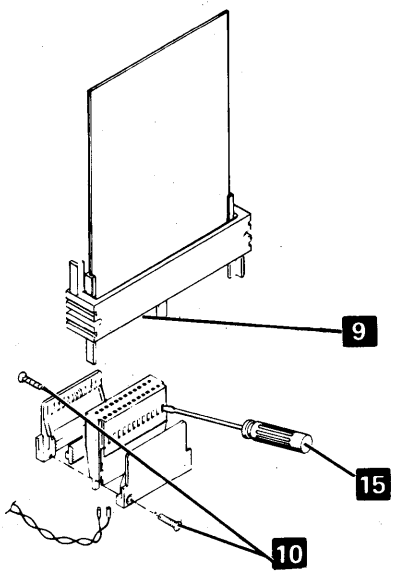
Replacement

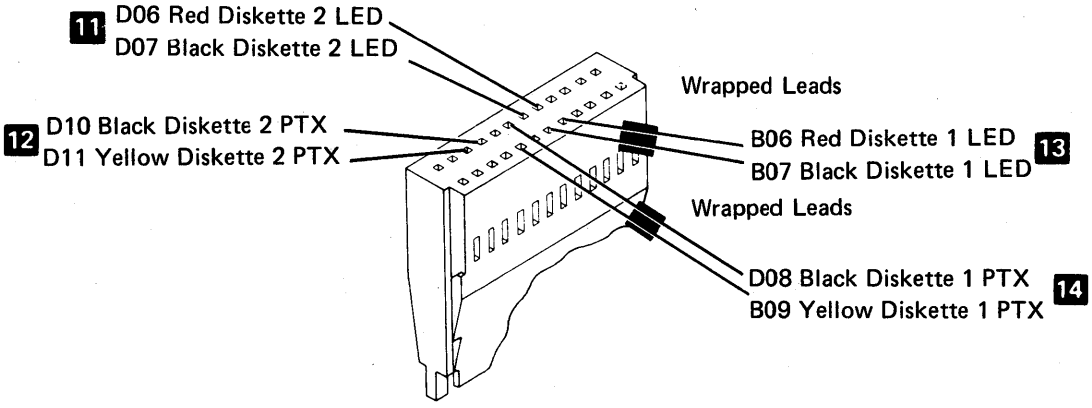
1. Install the LED assembly 5, the two mounting screws 6, and the nuts 7 onto the guide. (Do not tighten.)
2. Replace the guide and the four mounting screws 3.
3. Follow the cable path through three retainers 4 and insert the two diskette 1 leads (the wrapped pair of leads) 13 and the two diskette 2 leads 11 into the diskette drive control cable connector. Ensure that the locking tabs 8 on the terminals lock in the connector slots.
4. Replace the cable connector covers and the two screws 10.
5. Plug the cable into position A2 9 on the diskette drive control card socket.
6. Perform the LED and PTX alignment (161); start with step 3.

164 LED REMOVAL AND REPLACEMENT



1. PTX Assembly
2. Guide
3. Guide Mounting Screws (4)
4. Cable Retainers
5. LED Assembly
6. LED Mounting Screws
7. LED Mounting Nuts
8. Locking Tab
9. Position A2
10. Cable Connector Cover Screws
11. Diskette 2 LED Leads
12. Diskette 2 PTX Leads
13. Diskette 1 LED Leads
14. Diskette 1 PTX Leads
15. Screwdriver





165 PTX REMOVAL AND REPLACEMENT

Removal

1. Turn off the IPO switch.
2. Remove the diskette drive cover assembly (112).

   CAUTION
   While performing the following steps, be careful not to damage the LED leads.

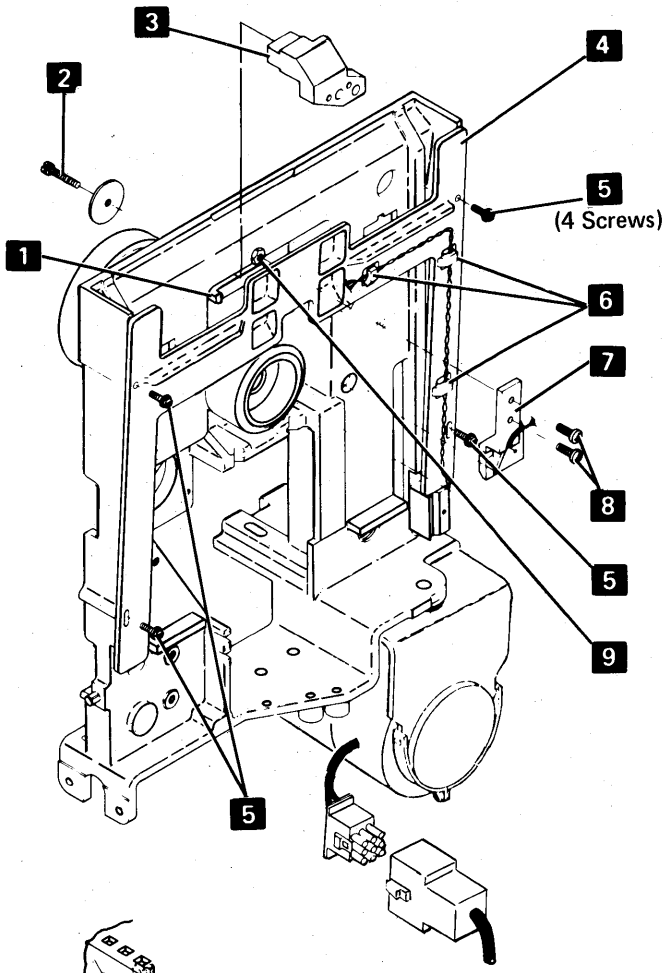
   _____
   _____
   _____

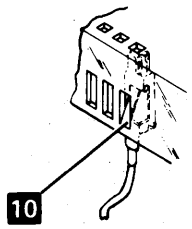
3. Remove the four guide mounting screws 5 and the guide.
4. Disconnect the diskette drive control cable from position A2 11.
5. Remove the two screws 12 and the two connector covers.
6. Remove the two diskette 1 PTX leads 17 and the two diskette 2 PTX leads 15 by pushing down on the tabs with a small screwdriver 13.
7. Remove the PTX mounting screw 2 and the washer.
8. Remove the PTX assembly 3. (Remember the cable path for the replacement procedure.)

Replacement

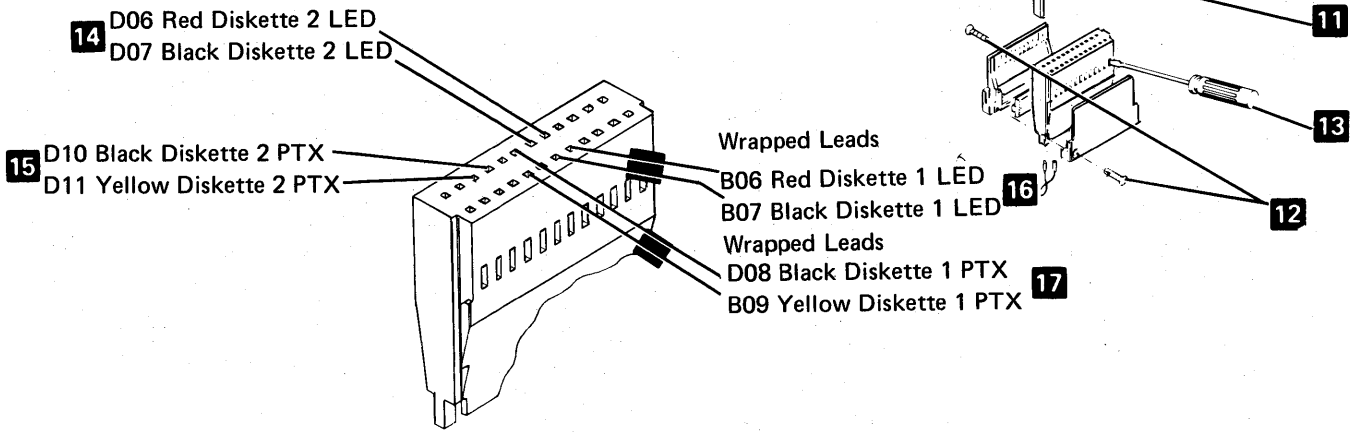
1. Install the PTX assembly 3 against the casting stop 1 (away from leads); then reinstall the mounting screw 2 and the washer.
2. Follow the cable path and insert the two diskette 1 PTX leads (the wrapped pair of leads) 17 and the two diskette 2 PTX leads 15 into the diskette drive control cable connector. Ensure that the locking tabs 10 on the terminals lock in the connector slots.
3. Reinstall the connector covers and the two screws 12.
4. Plug the connector into position A2 11 of the diskette drive control card socket.
5. Reinstall the guide 4 and the four mounting screws 5.
6. Perform the LED to PTX alignment (161); start with step 5.

165 PTX REMOVAL AND REPLACEMENT

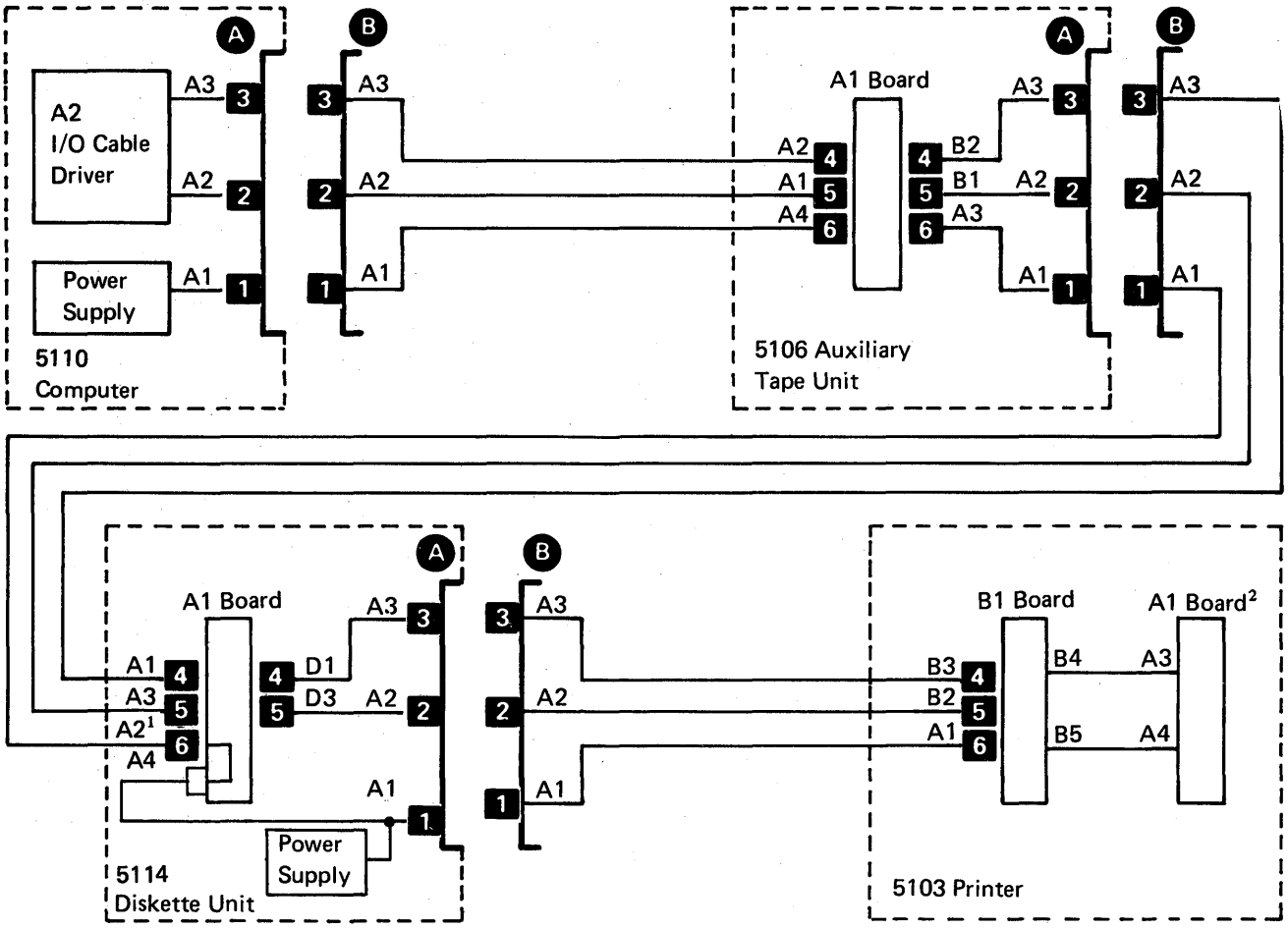




1. Base Casting Stop
2. PTX Mounting Screw
3. PTX Assembly
4. Guide
5. Guide Mounting Screws (4)
6. Cable Retainers
7. LED Assembly
8. LED Mounting Screws
9. LED Mounting Nuts
10. Locking Tab
11. Position A2
12. Cable Connector Cover Screws
13. Screwdriver
14. Diskette 2 LED Leads
15. Diskette 2 PTX Leads
16. Diskette 1 LED Leads
17. Diskette 1 PTX Leads



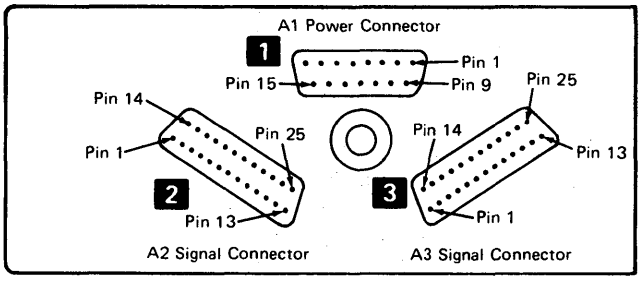
170 I/O INTERFACE CABLE PIN ASSIGNMENTS



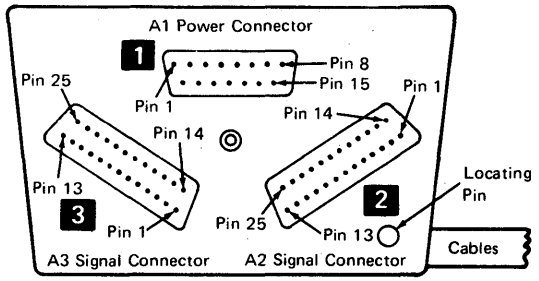
[1] The 5110 +5 Vdc stops here. The 5114 provides its own +5 Vdc and +5 Vdc for attaching devices.

[2] The cable terminator is permanently wired to the 5103 printer adapter card. If the printer is not in the system, a terminator must be installed on the last I/O device.

A Interface Connector (On Rear of Tape Unit)



B I/O Cable Assembly Connector



170 I/O INTERFACE CABLE PIN ASSIGNMENTS

1 POWER CONNECTOR

Pin	Line Name
1	+5 Vdc
2	+5 Vdc
3	+5 Vdc
4	+5 Vdc
5	+5 Vdc
6	Unused
7	Unused
8	Unused
9	Unused
10	Unused
11	Unused
12	+8.5 Vdc
13	+12 Vdc
14	-12 Vdc
15	-5 Vdc

4 SIGNAL CABLE

Pin	Line Name
B02	Unused
B03	-Bus Out 7
B04	-Bus Out 6
B05	-Bus Out 5
B06	-Bus Out 4
B07	-Bus Out 3
B08	-Bus Out 2
B09	-Bus Out 1
B10	-Bus Out 0
B11	+Bus Out P
B12	-Interrupt Req 2
B13	+Osc/4
D02	-Power On Reset (see note 2)
D03	Unused (see note 1)
D04	+Printer Clock
D05	+External Horz Drive
D06	-Machine Check
D07	+Start Execute Bit
D08	Ground
D09	Unused
D10	Unused
D11	Unused
D12	Unused
D13	Unused

Notes:

1. This line is grounded at the 5114 A1-D1 socket. A second 5114 uses this signal to recognize its subdevice address.
2. 5114 generates a power on reset for use by the 5103 Printer on second 5114.

2 SIGNAL CONNECTOR

Pin	Line Name
1	Ground
2	-Put Strobe
3	-Control Strobe
4	-Get Strobe
5	+DA Y3
6	+DA Y2
7	+DA Y1
8	+DA Y0
9	+DA X3
10	+DA X2
11	+DA X1
12	+DA X0
13	Unused
14	Ground
15	+Op Code E
16	+Bus in P
17	+Bus in 7
18	+Bus in 6
19	+Bus in 5
20	+Bus in 4
21	+Bus in 3
22	+Bus in 2
23	+Bus in 1
24	Unused
25	+Bus in 0

5 SIGNAL CABLE

Pin	Line Name
B02	Unused
B03	+DA X0
B04	+DA X1
B05	+DA X2
B06	+DA X3
B07	+DA Y0
B08	+DA Y1
B09	+DA Y2
B10	+DA Y3
B11	-Get Strobe
B12	-Control Strobe
B13	-Put Strobe
D02	+Bus In 0
D03	Unused
D04	+Bus In 1
D05	+Bus In 2
D06	+Bus In 3
D07	+Bus In 4
D08	Ground
D09	+Bus In 5
D10	+Bus In 6
D11	+Bus In 7
D12	+Bus In P
D13	+Op Code E

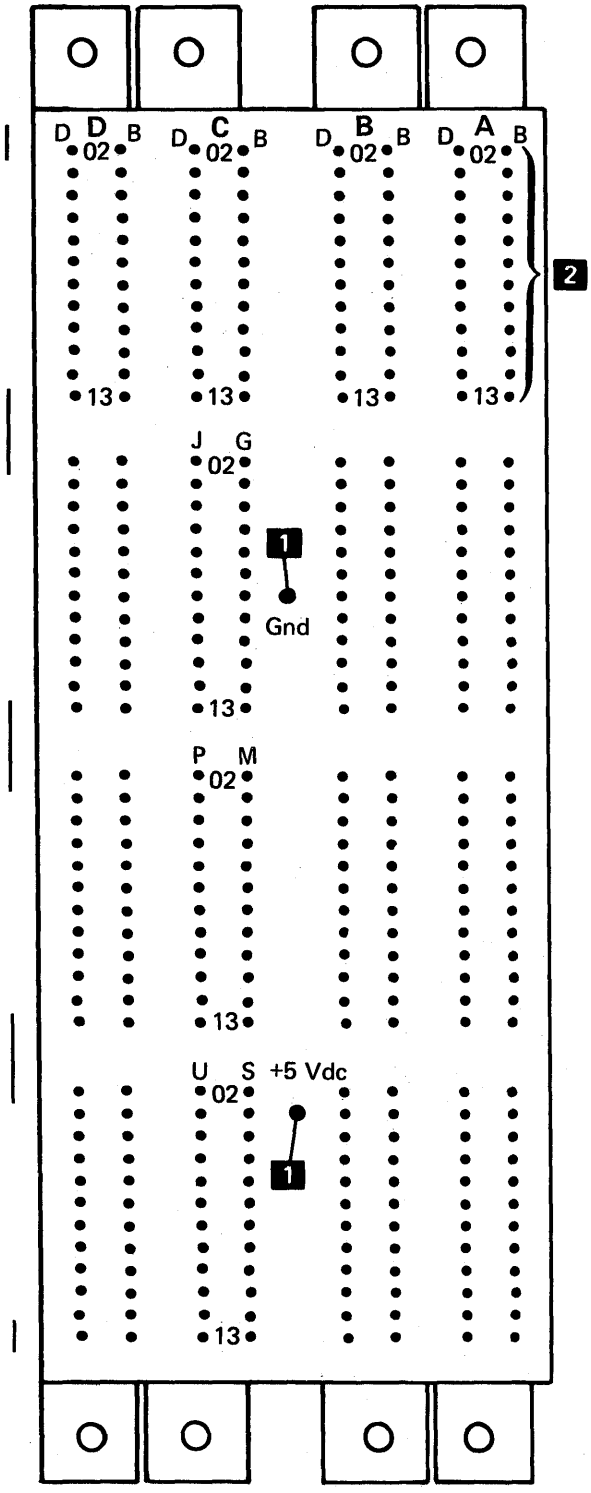
3 SIGNAL CONNECTOR

Pin	Line Name
1	Ground
2	+Osc/4
3	-Interrupt Req 2
4	+Bus Out P
5	-Bus Out 0
6	-Bus Out 1
7	-Bus Out 2
8	-Bus Out 3
9	-Bus Out 4
10	-Bus Out 5
11	-Bus Out 6
12	-Bus Out 7
13	Ground
14	Ground
15	Unused
16	Unused
17	Unused
18	Unused
19	Unused
20	+Start Execute
21	-Machine Check
22	+External Horz Drive
23	+Printer Clock
24	Unused
25	-Power On Reset (see note 2)

6 POWER CABLE

Pin	Line Name
B02	+5 Vdc
B03	+5 Vdc
B04	Unused
B05	Unused
B06	Unused
B07	Unused
B08	Unused
B09	Unused
B10	Unused
B11	+8.5 Vdc
B12	+12 Vdc
B13	Unused
D02	+5 Vdc
D03	+5 Vdc
D04	+5 Vdc
D05	Unused
D06	Unused
D07	Unused
D08	Unused
D09	Unused
D10	Unused
D11	-5 Vdc
D12	-12 Vdc
D13	Unused

171 A1 BOARD SOCKET AND PIN ASSIGNMENTS (Page 1 of 4)



1 Pin Side of A1 Board
CE Probe Connector Pins
2 Pin Numbering

171 A1 BOARD SOCKET AND PIN ASSIGNMENTS (Page 2 of 4)

Socket	Card/Cable
A1	A3 Signal Cable
A2	A1 Power Cable
A3	A2 Signal Cable
A4	Power Cable (internal)
B1	VFO Card } Not present on
B2	VFO Card } all machines, see
B3	Spare MAP 050
B4	Drive 2 Signal Cable
C1	Adapter Card
C2	Adapter Card
C3	Adapter Card
C4	Adapter Card
D1	A3 Signal Cable
D2	Spare
D3	A2 Signal Cable
D4	Drive 1 Signal Cable

Pin	Line Name or Voltage
A1B02	Spare
A1B03	-Bus Out Bit 7
A1B04	-Bus Out Bit 6
A1B05	-Bus Out Bit 5
A1B06	-Bus Out Bit 4
A1B07	-Bus Out Bit 3
A1B08	-Bus Out Bit 2
A1B09	-Bus Out Bit 1
A1B10	-Bus Out Bit 0
A1B11	+Bus Out Bit P
A1B12	-Interrupt Request 2
A1B13	+Oscillator/4
A1D02	-Power on Reset
A1D03	-Drives 3 and 4 (spare on first 5114)
A1D04	+Printer Clock
A1D05	+External Horizontal Drive
A1D06	-Machine Check
A1D07	+Start Execute
A1D08	Ground
A1D09	Spare
A1D10	Spare
A1D11	Spare
A1D12	Spare
A1D13	Spare

Pin	Line Name or Voltage
A2B02	+5 Vdc } (from 5110[1])
A2B03	+5 Vdc }
A2B04	Spare
A2B05	Spare
A2B06	Spare
A2B07	Spare
A2B08	Spare
A2B09	Spare
A2B10	Spare
A2B11	+8.5 Vdc
A2B12	+12 Vdc
A2B13	Spare
A2D02	+5 Vdc }
A2D03	+5 Vdc } (from 5110[1])
A2D04	+5 Vdc }
A2D05	Spare
A2D06	Spare
A2D07	Spare
A2D08	Ground
A2D09	Spare
A2D10	Spare
A2D11	-5 Vdc (from 5110[1])
A2D12	-12 Vdc
A2D13	Spare
A3B02	Spare
A3B03	+Device Address X0
A3B04	+Device Address X1
A3B05	+Device Address X2
A3B06	+Device Address X3
A3B07	+Device Address Y0
A3B08	+Device Address Y1
A3B09	+Device Address Y2
A3B10	+Device Address Y3
A3B11	-Get Strobe
A3B12	-Control Strobe
A3B13	-Put Strobe
A3D02	+Bus In Bit 0
A3D03	Spare
A3D04	+Bus In Bit 1
A3D05	+Bus In Bit 2
A3D06	+Bus In Bit 3
A3D07	+Bus In Bit 4
A3D08	Ground
A3D09	+Bus In Bit 5
A3D10	+Bus In Bit 6
A3D11	+Bus In Bit 7
A3D12	+Bus In Bit P
A3D13	+Op Code E

Pin	Line Name or Voltage
A4B02	+5 Vdc } (from 5114)
A4B03	+5 Vdc }
A4B04	+5 Vdc }
A4B05	Spare
A4B06	Ground
A4B07	Ground
A4B08	Ground
A4B09	Ground
A4B10	-5 Vdc (from 5114)
A4B11	+8.5 Vdc
A4B12	+12 Vdc
A4B13	+12 Vdc
A4D02	+5 Vdc }
A4D03	+5 Vdc } (from 5114)
A4D04	+5 Vdc }
A4D05	Spare
A4D06	Ground
A4D07	Ground
A4D08	Ground
A4D09	Ground
A4D10	+24 Vdc (from 5114)
A4D11	-5 Vdc
A4D12	-12 Vdc
A4D13	-12 Vdc
B1B02	+Standard Clock
B1B03	+4F Clock Phase 1
B1B04	+Standard Data
B1B05	Spare
B1B06	Spare
B1B07	Spare
B1B08	Spare
B1B09	Ground
B1B10	+VFO Sync
B1B11	Spare
B1B12	+File data 1
B1B13	Spare
B1D02	Spare
B1D03	+5 Vdc
B1D04	Spare
B1D05	Spare
B1D06	-5 Vdc (from 5114)
B1D07	+MFM
B1D08	Ground
B1D09	Spare
B1D10	Spare
B1D11	Spare
B1D12	Spare
B1D13	Spare

[1] The +5 Vdc is not used on this board and is not forwarded from these pins.
[2] These pins apply to drive 1.

171 A1 BOARD SOCKET AND PIN ASSIGNMENTS (Page 3 of 4)

Pin	Line Name or Voltage		Pin	Line Name or Voltage	Pin	Line Name or Voltage
B1G02	Spare		B4B02	+Access 0	C1G02	+Start Execute
B1G03	Spare		B4B03	+Access 1	C1G03	+Device Address X0
B1G04	Spare		B4B04	+Access 2	C1G04	+Device Address X1
B1G05	Spare		B4B05	+Access 3	C1G05	+Device Address X2
B1G06	Spare		B4B06	Spare	C1G06	+Deivce Address X3
B1G07	+TPY		B4B07	+File Data	C1G07	+Device Address Y0
B1G08	+TPY		B4B08	+Diskette Sense	C1G08	+Device Address Y1
B1G09	Spare		B4B09	-Diskette Drive Sense	C1G09	+Device Address Y2
B1G10	Spare		B4B10	+Head Engaged	C1G10	-Power On Reset Out
B1G11	Spare		B4B11	Spare	C1G11	Ground
B1G12	Spare		B4B12	+Inner Track Select	C1G12	-Control Strobe
B1G13	Spare	Drive 2 Signal Cable Socket	B4B13	+Index	C1G13	-Put Strobe
B1J02	Spare		B4D02	+Write Data	C1J02	+Bus In Bit 0
B1J03	+5 Vdc		B4D03	+5 Vdc	C1J03	+5 Vdc
B1J04	Spare		B4D04	+Erase Gate	C1J04	+Bus In Bit 1
B1J05	Spare		B4D05	+Write Gate	C1J05	+Bus In Bit 2
B1J06	Spare		B4D06	+Inner Tracks	C1J06	+Bus In Bit 3
B1J07	Spare		B4D07	+Select Head 1	C1J07	+Oscillator Out
B1J08	Ground		B4D08	Ground	C1J08	Ground
B1J09	Spare		B4D09	+Erase Current Sense	C1J09	+Bus In Bit 5
B1J10	Spare		B4D10	+24 Vdc	C1J10	+Bus In Bit 6
B1J11	Spare		B4D11	-5 Vdc (from 5114)	C1J11	+Bus In Bit 7
B1J12	Spare		B4D12	Spare	C1J12	+Bus in Bit P
B1J13	+Data Window		B4D13	Spare	C1J13	-Power On Reset
B3B02	Spare		C1B02	+Oscillator In	C1M02	+Standard Clock
B3B03	Spare		C1B03	-Bus Out Bit 7	C1M03	+4F Clock Phase 1
B3B04	Spare		C1B04	-Bus Out Bit 6	C1M04	+Standard Data
B3B05	Spare		C1B05	-Bus Out Bit 5	C1M05	Ground
B3B06	Spare		C1B06	-Bus Out Bit 4	C1M06	Gound
B3B07	Spare		C1B07	-Bus Out Bit 3	C1M07	-Power On Reset Out
B3B08	Spare		C1B08	-Bus Out Bit 2	C1M08	+MFM
B3B09	Spare		C1B09	-Bus Out Bit 1	C1M09	Ground
B3B10	Spare		C1B10	+Device Address Y3	C1M10	+VFO Sync
B3B11	Spare		C1B11	+Bus Out Bit P	C1M11	-Power On Reset In
B3B12	Spare		C1B12	-Interrupt Request 2	C1M12	+File Data 1
B3B13	Spare		C1B13	-Machine Check	C1M13	+Data Window
B3D02	Spare		C1D02	Ground	C1P02	+Access 0 (drive 2)
B3D03	Spare		C1D03	+5 Vdc	C1P03	+5 Vdc
B3D04	Spare		C1D04	Gound	C1P04	+Access 1 (drive 2)
B3D05	Spare		C1D05	-Get Strobe	C1P05	+Access 2 (drive 2)
B3D06	Spare		C1D06	-5 Vdc (from 5114)	C1P06	+Access 3 (drive 2)
B3D07	Spare		C1D07	Ground	C1P07	+File Data (drive 2)
B3D08	Spare		C1D08	Ground	C1P08	Spare
B3D09	Spare		C1D09	-Bus Out Bit 0	C1P09	+Access 0 (drive 1)
B3D10	Spare		C1D10	+Bus Out Parity Error	C1P10	+Access 1 (drive 1)
B3D11	Spare		C1D11	+Device Address Parity Error	C1P11	+Access 2 (drive 1)
B3D12	Spare		C1D12	+Bus In Bit 4	C1P12	+Access 3 (drive 1)
B3D13	Spare		C1D13	+Op Code E	C1P13	+File Data (drive 1)

[1]The +5 Vdc is not used on this board and is not forwarded from these pins.
[2]These pins apply to drive 1.

171 A1 BOARD SOCKET AND PIN ASSIGNMENTS (Page 4 of 4)

Pin	Line Name or Voltage	Pin	Line Name or Voltage	Pin	Line Name or Voltage
C1S02	+Write Data (drive 2)	D2B02	Spare	D4B02	+Access 0[2]
C1S03	-Drives 3 and 4	D2B03	Spare	D4B03	+Access 1[2]
C1S04	+Erase Gate (drive 2)	D2B04	Spare	D4B04	+Access 2[2]
C1S05	+Write Gate (drive 2)	D2B05	Spare	D4B05	+Access 3[2]
C1S06	+Inner Tracks (drive 2)	D2B06	Spare	D4B06	Spare
C1S07	+Select Head 1 (drive 2)	D2B07	Spare	D4B07	+File Data[2]
C1S08	-Diskette Drive Sense (drive 2)	D2B08	Spare	D4B08	+Diskette Sense[2]
C1S09	+Erase Current Sense (drive 2)	D2B09	Spare	D4B09	Spare
C1S10	+Diskette 2 Sense (drive 2)	D2B10	Spare	D4B10	+Head Engage[2]
C1S11	+Head Engage (drive 2)	D2B11	Spare	D4B11	Spare
C1S12	+Inner Track Select (drive 2)	D2B12	Spare	D4B12	+Inner Track Select[2]
C1S13	+Index (drive 2)	D2B13	Spare	D4B13	+Index[2]
C1U02	+Write Data (drive 1)	D2D02	Spare	D4D02	+Write Data[2]
C1U03	+5 Vdc	D2D03	Spare	D4D03	+5 Vdc
C1U04	+Erase Gate (drive 1)	D2D04	Spare	D4D04	+Erase Gate[2]
C1U05	+Write Gate (drive 1)	D2D05	Spare	D4D05	+Write Gate
C1U06	+Inner Tracks (drive 1)	D2D06	Spare	D4D06	+Inner Tracks[2]
C1U07	+Select Head 1 (drive 1)	D2D07	Spare	D4D07	+Select Head 1[2]
C1U08	Ground	D2D08	Spare	D4D08	Ground
C1U09	+Erase Current Sense (drive 1)	D2D09	Spare	D4D09	+Erase Current Sense[2]
C1U10	+Diskette 2 Sense (drive 1)	D2D10	Spare	D4D10	+24 Vdc
C1U11	+Head Engage (drive 1)	D2D11	Spare	D4D11	-5 Vdc
C1U12	+Inner Track Select (drive 1)	D2D12	Spare	D4D12	Spare
C1U13	+Index (drive 1)	D2D13	Spare	D4D13	Spare
D1B02	Spare	D3B02	Spare		
D1B03	-Bus Out Bit 7	D3B03	+Device Address XO		
D1B04	-Bus Out Bit 6	D3B04	+Device Address X1		
D1B05	-Bus Out Bit 5	D3B05	+Device Address X2		
D1B06	-Bus Out Bit 4	D3B06	+Device Address X3		
D1B07	-Bus Out Bit 3	D3B07	+Device Address Y0		
D1B08	-Bus Out Bit 2	D3B08	+Device Address Y1		
D1B09	-Bus Out Bit 1	D3B09	+Device Address Y2		
D1B10	-Bus Out Bit 0	D3B10	+Device Address Y3		
D1B11	+Bus Out Bit P	D3B11	-Get Strobe		
D1B12	-Interrupt Request 2	D3B12	-Control Strobe		
D1B13	+Oscillator/4	D3B13	-Put Strobe		
D1D02	-Power On Reset Out	D3D02	+Bus In Bit 0		
D1D03	Ground	D3D03	Spare		
D1D04	+Printer Clock	D3D04	+Bus In Bit 1		
D1D05	+External Horizontal Drive	D3D05	+Bus In Bit 2		
D1D06	-Machine Check	D3D06	+Bus In Bit 3		
D1D07	+Start Execute	D3D07	+Bus In Bit 4		
D1D08	Ground	D3D08	Ground		
D1D09	Spare	D3D09	+Bus In Bit 5		
D1D10	Spare	D3D10	+Bus In Bit 6		
D1D11	Spare	D3D11	+Bus In Bit 7		
D1D12	Spare	D3D12	+Bus In Bit P		
D1D13	Spare	D3D13	+Op Code E		

[1] The +5 Vdc is not used on this board and is not forwarded from these pins.
[2] These pins apply to drive 1.

Diskette Drive Control Card

172 CONTROL CARD

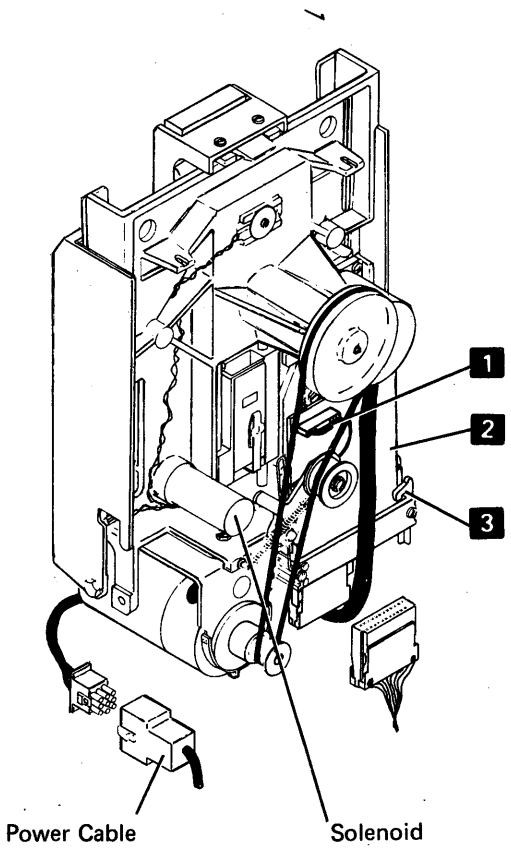
Removal

1. Turn off the IPO switch.
2. Disconnect the head cable 1 from the diskette drive control card 2.
3. Remove the card retainers 3.
4. Remove the diskette drive control card.

Replacement

1. Reinstall the diskette drive control card 2. Ensure that the card is seated in the socket.
2. Reinstall the card retainers 3.
3. Connect the head cable 1 to the diskette drive control card.
4. Turn on the IPO switch.

1 Head Cable
2 Control Card
3 Control Card Retainer



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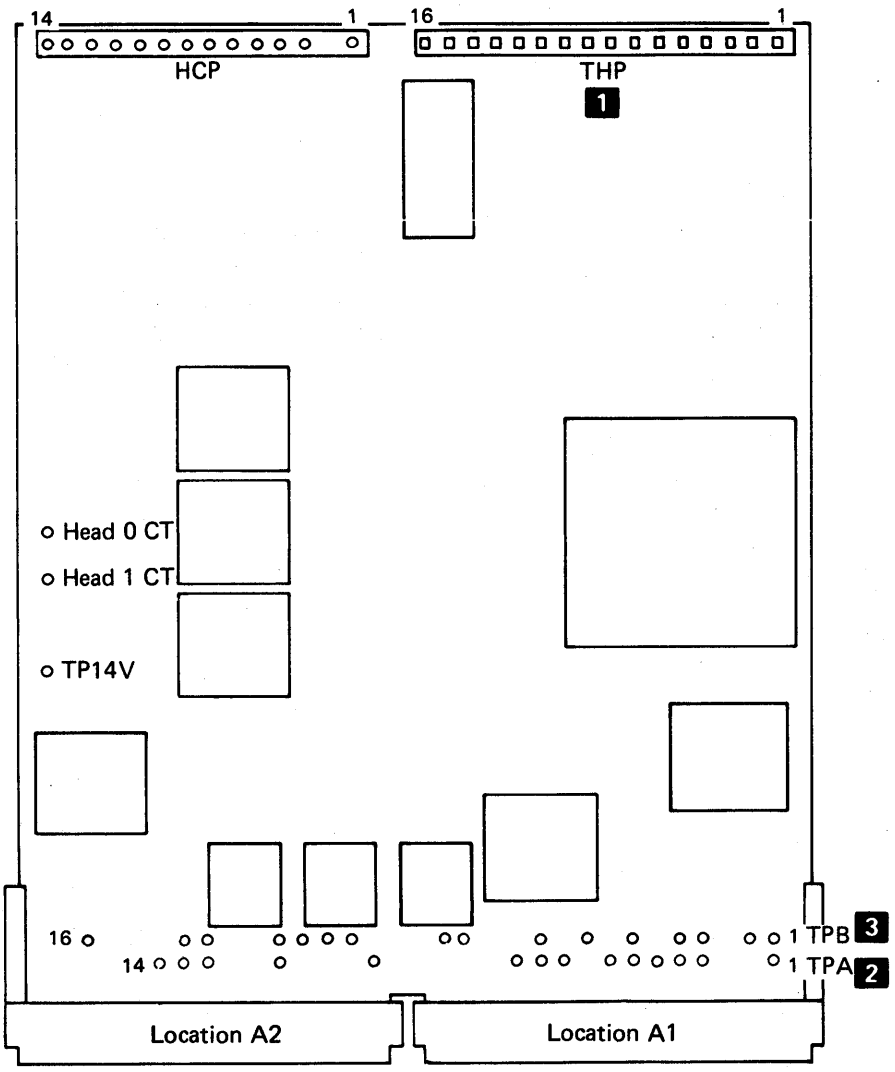
173 DISKETTE CONTROL CARD TEST PINS (PART 8528195 or 4178068)



1

THP1	+Diskette Loaded
THP2	+Predrive MC-3
THP3	+Predrive MC-2
THP4	+Predrive MC-1
THP5	+Predrive MC-0
THP6	Diskette 2 Index
THP7	Diskette 1 Index
THP8	Diff Read A
THP9	Diff Read B
THP10	–High Gain
THP11	–Align Access 0
THP12	-High Current
THP13	Preamp TP1
THP14	Preamp TP2
THP15	–High Gain A
THP16	–High Gain B

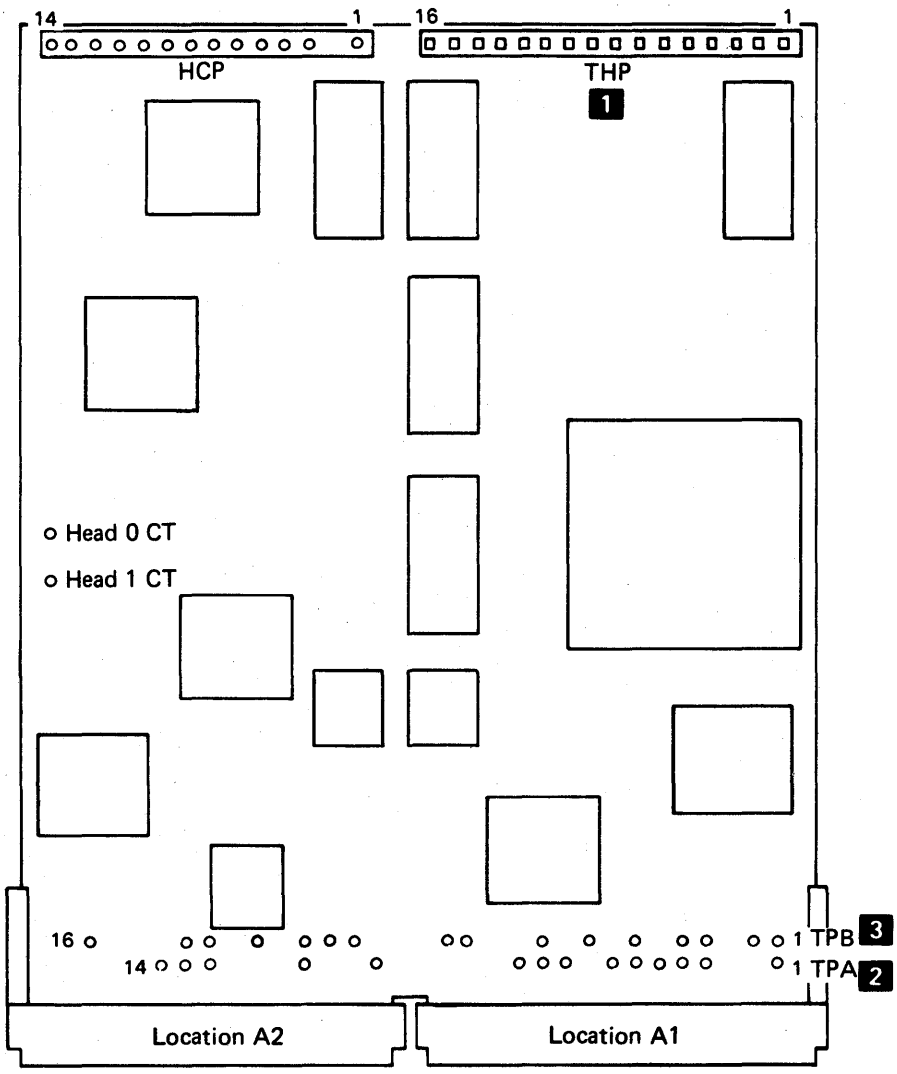
2

TPA1	+Write Data
TPA2	+Erase Gate
TPA3	+Write Gate
TPA4	+Inner Tracks
TPA5	+Select Head 1
TPA6	Ground
TPA7	+Erase Current Sense
TPA8	+24 Vdc
TPA9	–5Vdc
TPA10	MC-1
TPA11	MC Common
TPA12	Diskette 1 LED Voltage
TPA13	Ground
TPA14	Diskette 1 PTX

3

TPB1	+Access 0
TPB2	+Access 1
TPB3	+Access 2
TPB4	+Access 3
TPB5	+File Data
TPB6	+Diskette 2 Sense
TPB7	+Head Engage
TPB8	+Inner Track Select
TPB9	+Index
TPB10	MC-3
TPB11	MC-0
TPB12	MC-2
TPB13	–Head Load
TPB14	Diskette 2 LED Voltage
TPB15	+5 Vdc
TPB16	Diskette 2 PTX

DISKETTE CONTROL CARD TEST PINS (PART 4178065)



1

THP1	+Diskette Inserted
THP2	–Hd Ld Osc
THP3	+14 Vdc
THP4	Ground
THP5	Ground
THP6	Diskette 2 Index
THP7	Diskette 1 Index
THP8	Diff Read A
THP9	Diff Read B
THP10	–High Gain
THP11	–Align Access 0
THP12	–High Current
THP13	Preamp TP1
THP14	Preamp TP2
THP15	–High Gain A
THP16	–High Gain B

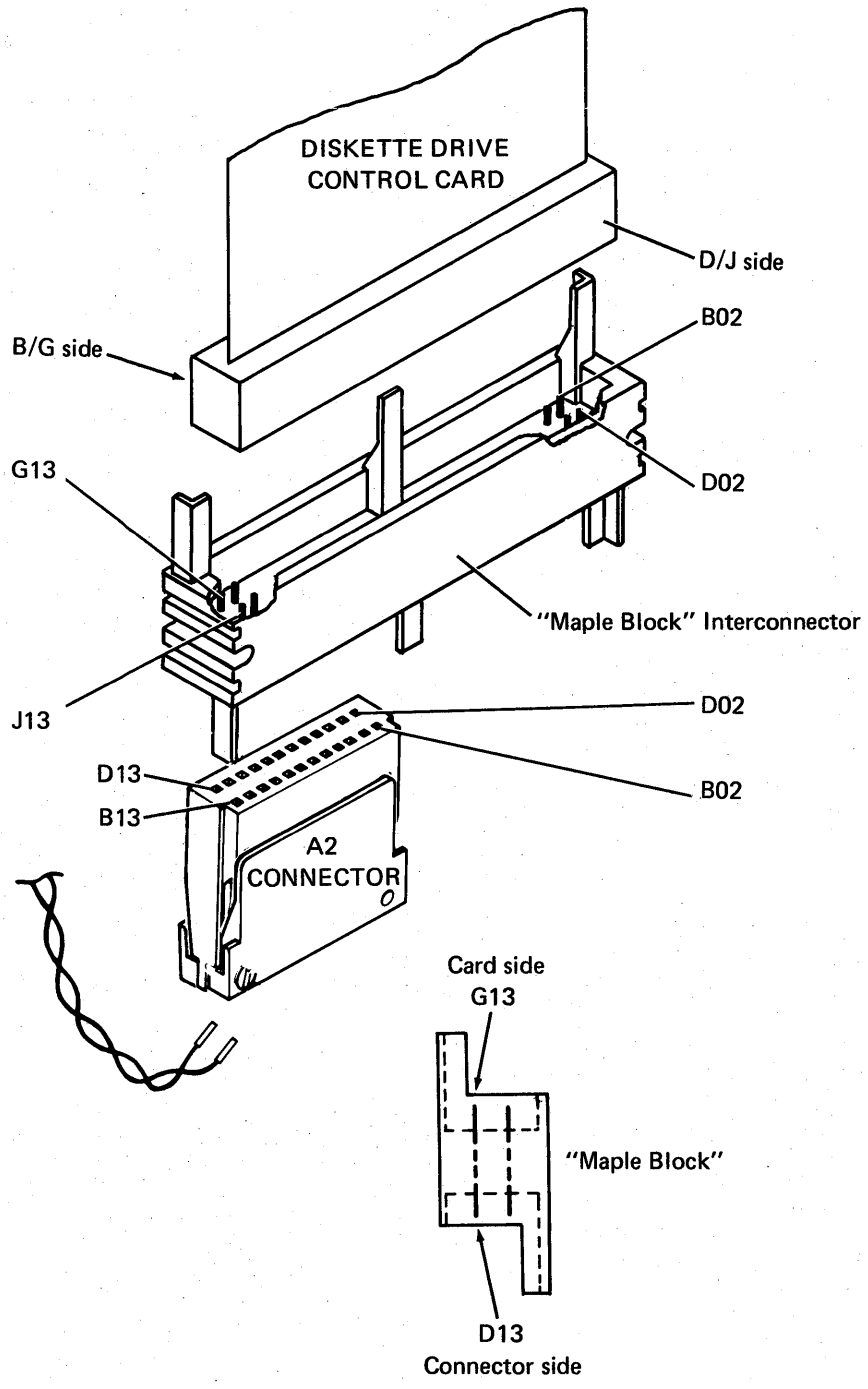
2

TPA1	+Write Data
TPA2	+Erase Gate
TPA3	+Write Gate
TPA4	+Inner Tracks
TPA5	+Select Head 1
TPA6	Ground
TPA7	+Current Enabled
TPA8	+24 Vdc
TPA9	–5Vdc
TPA10	MC-1
TPA11	+Hd Load Solenoid
TPA12	Diskette 1 LED Voltage
TPA13	Ground
TPA14	Diskette 1 PTX

3

TPB1	+Access 0
TPB2	+Access 1
TPB3	+Access 2
TPB4	+Access 3
TPB5	+File Data
TPB6	+Diskette 2 Sense
TPB7	+Head Engage
TPB8	+Inner Track Select
TPB9	+Index
TPB10	MC-3
TPB11	MC-0
TPB12	MC-2
TPB13	–Head Load
TPB14	Diskette 2 LED Voltage
TPB15	+5 Vdc
TPB16	Diskette 2 PTX

175 DISKETTE CONTROL CARD SOCKET AND CONNECTOR PINS



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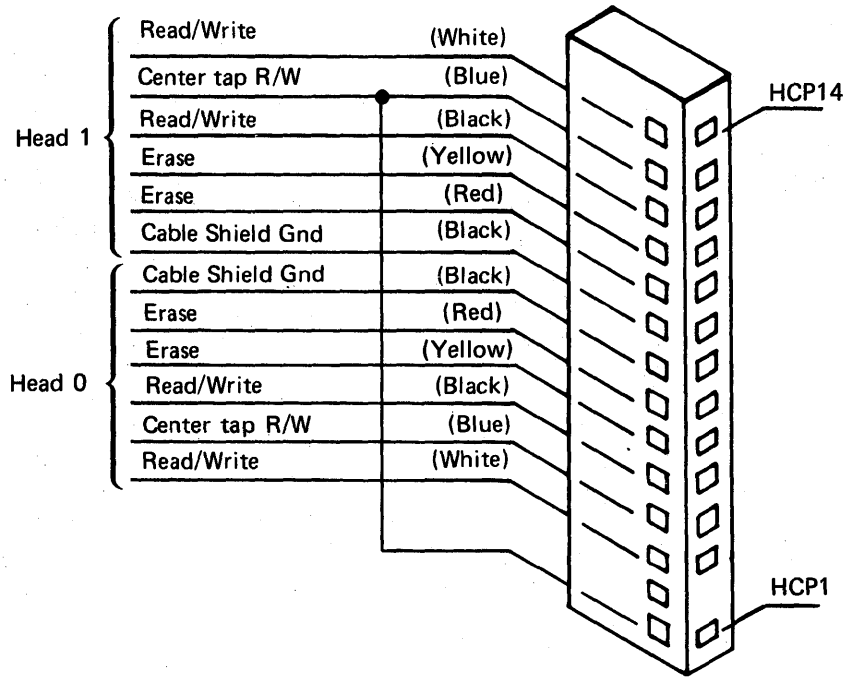
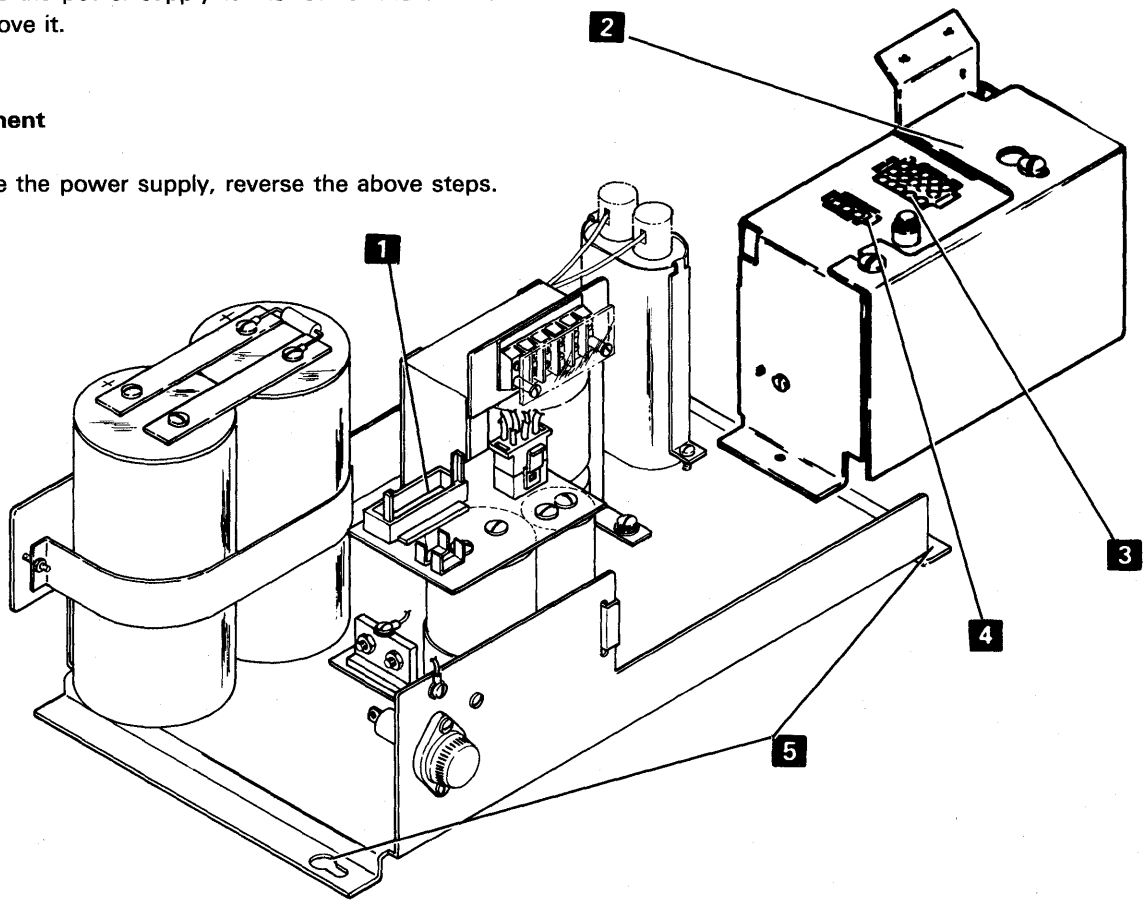
177 DISKETTE CONTROL CARD HEAD CABLE PINS



180 POWER SUPPLY

Removal

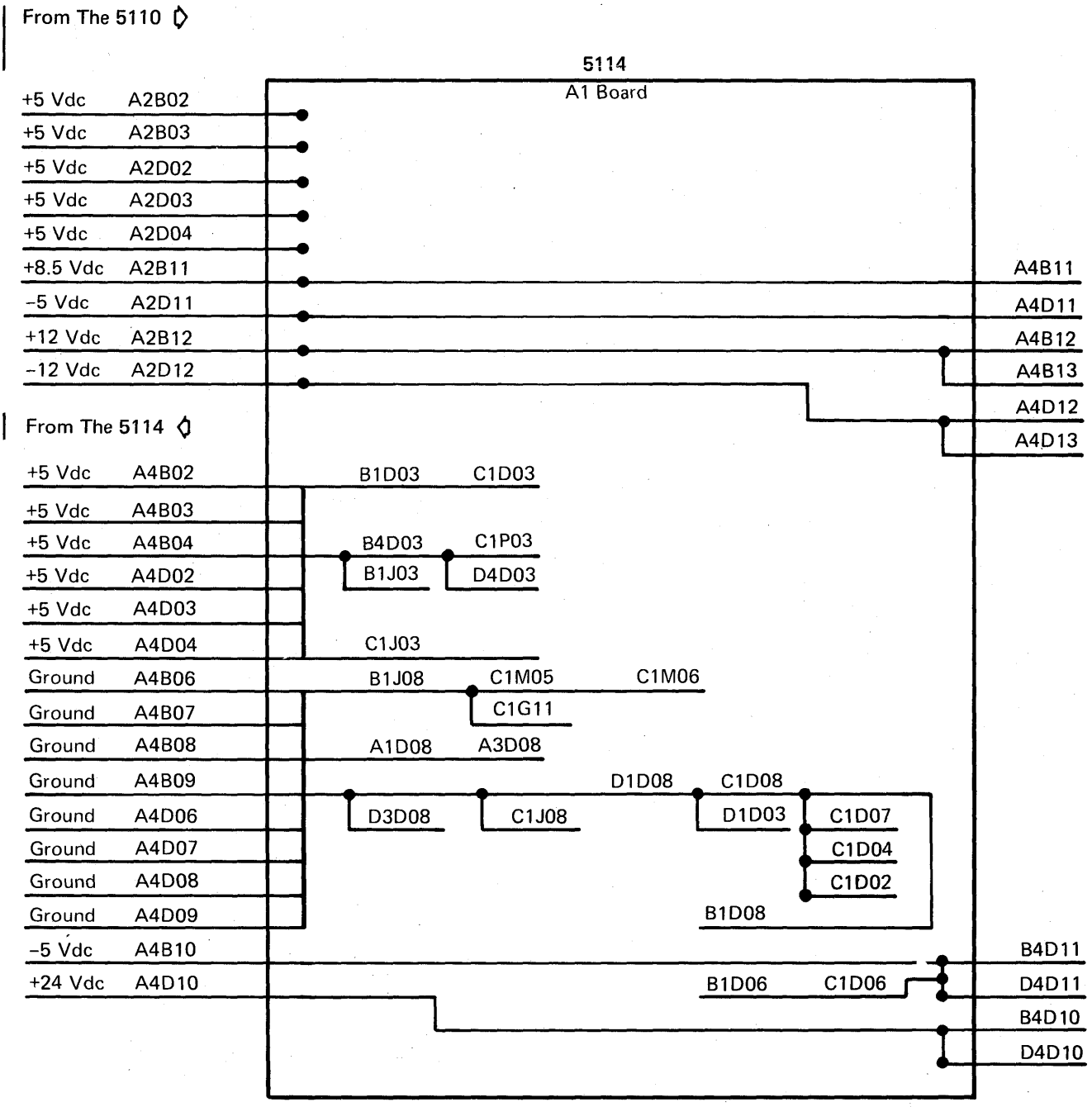
1. Turn off the POWER switch on the 5110.
2. Turn off the IPO switch.
3. Unplug the 5114 from the wall socket.
4. Remove the AC box cover 2.
5. Remove the Line Cord from the AC box.
6. Remove the J4 4 and J3 3 connectors on the AC box.
7. Remove the J2 1 connector.
8. Loosen the two base screws 5.
9. Slide the power supply to the rear of the 5114 and remove it.



Replacement

To replace the power supply, reverse the above steps.

183 DC VOLTAGE DISTRIBUTION



Introduction

The 5114 Diskette Unit is an input/output (I/O) device that attaches to a system via an I/O interface cable. The 5114 stores and retrieves data by writing data on diskettes for later use and by reading data from diskettes for immediate use. The data rate in a write operation is 24k bytes per second. The data rate in a read operation is 48k bytes per second. The write operation is only half the speed of the read operation because of the verify read that occurs on the write operation. The data capacity of each diskette is a maximum of 1.2 megabytes.

The commands and controls for operating the 5114 are provided by the system. The I/O interface cable carries these commands and controls between the system and the 5114.

The 5114 uses three types of diskettes: diskette 1, diskette 2 and diskette 2d. The 5114 can write on and read from all three types of diskettes.

The 5114 contains one or two diskette drives, a logic board, an I/O interface port, and its own DC power supply.

The diskette drive uses both the frequency modulated (FM) and the modified frequency modulated (MFM) method of recording data on the diskette. Drive 1 on a 5114 is standard and drive 2 is optional. On a 5114 with two diskette drives, drive 1 is nearest to the immediate power off (IPO) switch (100).

The logic board contains the diskette drive signal cables, a DC power cable, the variable frequency oscillator (VFO) circuitry, and a diskette adapter logic card. The VFO circuitry can be located either on the diskette adapter card or on a separate VFO card. The logic board is mounted on the back cover of the 5114.

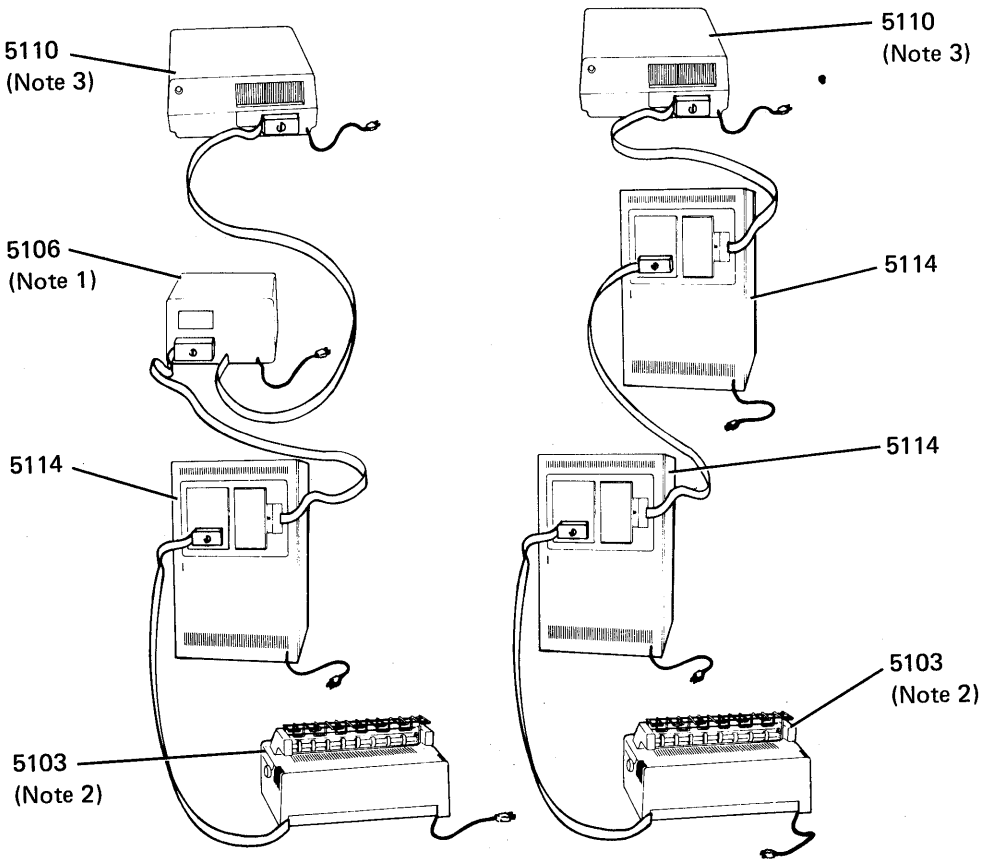
An I/O interface cable allows the 5114 to attach a system or another I/O device. In addition, another device can attach to the system via the 5114.

The illustration on the facing page shows the two possible maximum system configurations.

The 5114 power supply provides DC power to the diskette drives and also provides +5 Vdc to any I/O device attached to the 5114. A relay in the 5114 power supply allows the system to control the 5114 power. This means that the 5114 power goes on and off with the system power. The 5114 power can also be turned off with the IPO switch. This switch controls the distribution of the AC and DC power in the 5114.

DANGER
Some DC voltage from the 5110 is still present in the 5114 when the IPO switch is in the OFF position.

Typical System Cabling

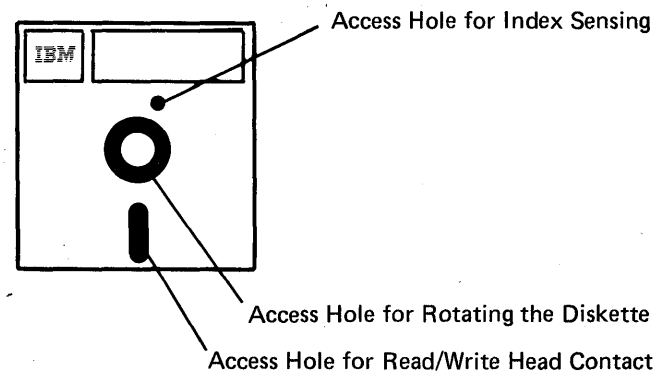


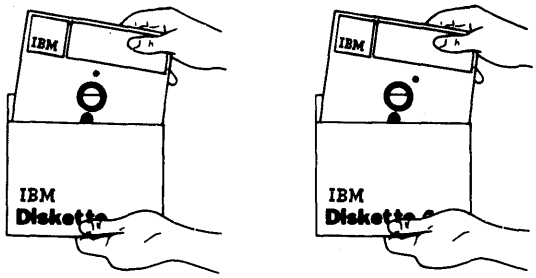
Notes:

1. When a 5106 Auxiliary Tape Unit is attached, it must be attached directly to the 5110.
2. When a printer is attached, it must be the last I/O unit in the string.
3. No more than three I/O devices can be attached to the 5110. However, a 5106 Auxiliary Tape Unit and two 5114 units cannot be attached to the same 5110.
4. A 5106 Auxiliary Tape Unit cannot be attached to a 5110 Model X2X.

Diskette Description

The IBM diskette is a thin, flexible disk housed in a protective envelope. Information is stored magnetically on the diskette surface, which is coated with magnetic oxide. The diskette is free to rotate inside the envelope. As the diskette rotates, the inner surface of the envelope cleans the diskette. The envelope has access holes for rotating the diskette, for read/write (R/W) head contact, and for index hole sensing. There are two arrangements for recording data on a diskette. Diskette 1 permits the recording of data on only one aide of the diskette; diskette 2 and diskette 2D permit the recording of data on both sides of the diskette.





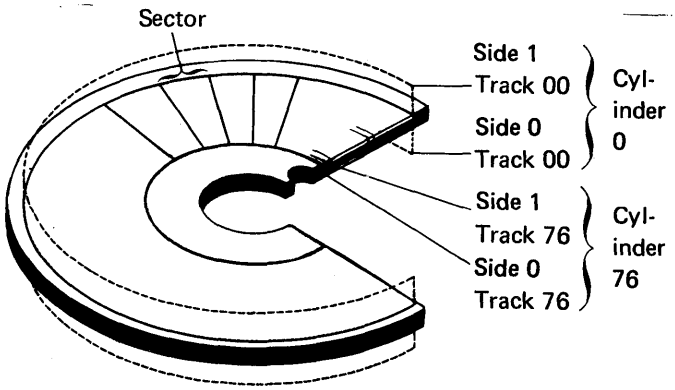
Diskette 1 Diskette 2

The location of the access hole for index sensing on diskette 1 differs from that on diskette 2 and diskette 2D. When a diskette 1 is inserted in the diskette drive, index sensing circuits sense that a diskette 1 is being used, and the use of the blank side is prevented.

Information is written on the diskette in tracks. A track is a circular path on the diskette surface. A sector is a division of each track of the diskette that was determined during diskette initialization. Each sector is used to write one record. Information is magnetically written to or read from a track by a read/write head as the diskette rotates.

There are 77 tracks on each side of a diskette. Track 00, which is the outside track, is reserved as a label track and can not be used for data. Tracks 75 and 76, which are the two innermost tracks, are reserved as replacement tracks and can only be used for data if another track becomes damaged.

Diskette 1 has 74 tracks available for recording data. Diskette 2 or diskette 2D has 74 tracks available on each side of the diskette, resulting in a total of 148 tracks of data. When data is recorded on only one side of a diskette, it is practical to refer to each addressed circle of data as a track. When data is recorded on both sides of a diskette, however, each pair of tracks (one upper and one lower) is referred to as a cylinder. For example, cylinder 0, the outside cylinder, is made up of upper and lower track 00.



When one-sided diskettes (diskette 1's) are used, the most data that can be read or written on a track without moving the R/W head is that track over which the R/W head is positioned. When two-sided diskettes (diskette 2's or 2D's) are used, the most data that can be read or written on 2 tracks (one on each side of the diskette), without moving the R/W head assembly is the 2 tracks over which the R/W head is positioned. When 2 tracks are used, the total amount of area that can be accessed is referred to as a cylinder.

Diskette Safety

LONG TERM STORAGE

Place diskettes in their envelopes and store them in the following environment:

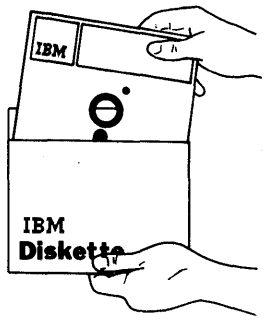
- Temperature 50° F to 125° F (10.0° to 51.5° C)
- Relative humidity 8% to 80%
- Maximum wet bulb 185° F (29.4° C)

If a diskette has been exposed to temperatures outside the indicated range, allow 5 minutes acclimation time before use. You should remove the diskette from its plastic shipping container during this time.

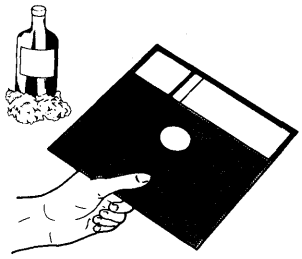
SHIPPING AND RECEIVING

Use only shipping cartons to ship diskettes. Additional shipping cartons are available at IBM branch offices. With the diskette in place, the package weighs 10 ounces (280 grams). Be sure to label the package: DO NOT EXPOSE TO HEAT OR SUNLIGHT. Save the carton for diskette storage and/or for later shipment.

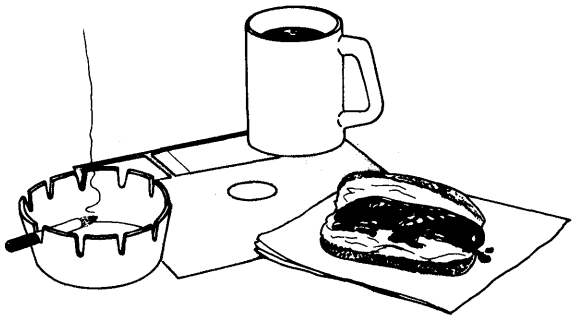
Return a diskette to its envelope whenever it is removed from the diskette drive.



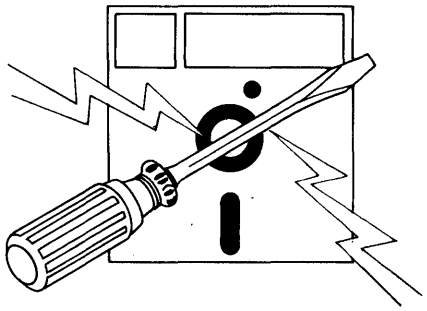
Do not touch or attempt to clean diskette surfaces. Contaminated diskettes must be discarded.



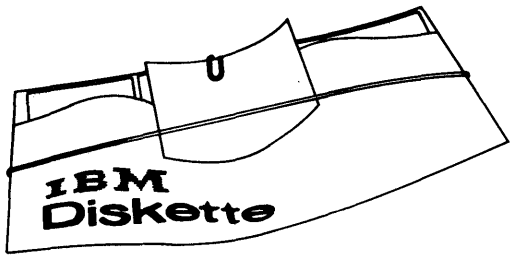
Do not lay diskettes near food, drink, or ashtrays.



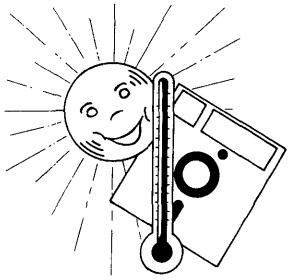
Do not place diskettes near materials that might be magnetized. Data can be lost from a diskette exposed to a magnetic field.



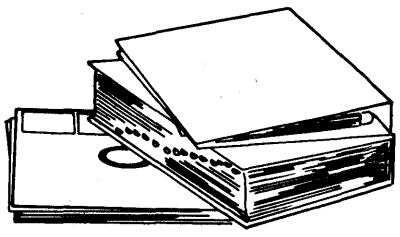
Do not use clips or rubber bands on a diskette.



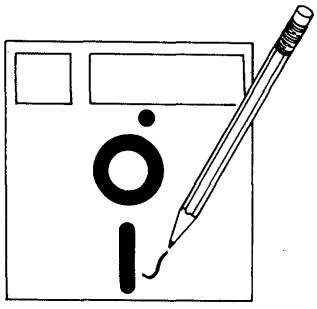
Do not expose diskettes to heat greater than 51.5° C (125° F) or direct sunlight.



Do not place heavy objects on diskettes. The weight can cause serious damage.



Do not write on diskettes outside label area.



Diskette Handling

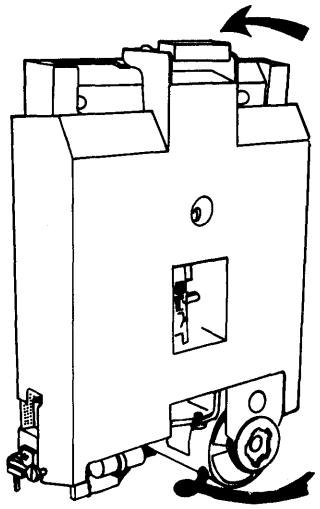
DISKETTE INSERTION

1. Open the diskette drive cover assembly.
2. Remove the diskette from its protective envelope.
3. Place the diskette squarely into the diskette drive (with the label facing the cover).
4. Close the diskette drive cover assembly.

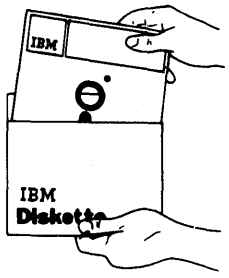
DISKETTE REMOVAL

1. Open the diskette drive cover assembly.
2. Remove the diskette.
3. Insert the diskette into a protective envelope.
4. Close the diskette drive cover assembly.

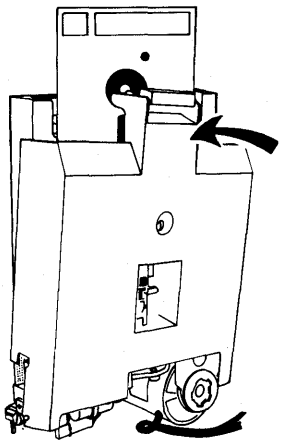
Open diskette drive cover.



Remove diskette from envelope.



Place diskette squarely into diskette drive (with label facing cover) and close cover.



To remove diskette, reverse above steps.

Stepper Motor

Stepper Motor Description

The dc stepper motor consists of a permanent magnet rotor (armature) and pairs of two-phase stator windings. The motor is a sealed unit having no gears or commutators and requiring no maintanance.

Notes:

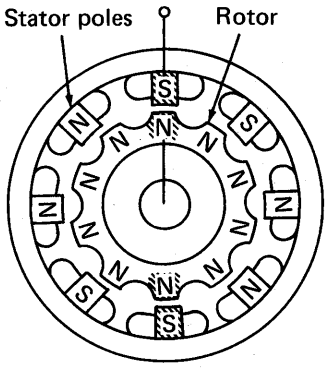
1. The rotor is magnetized after assembly at the plant of motor manufacture. Disassembly of the motor reduces the magnetic flux of the rotor. This causes a reduction in the torque produced by the motor. For this reason, you should not disassemble the motor.

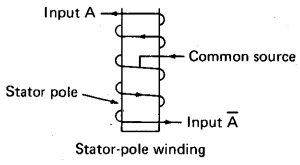
   When current flows through a pair of stator windings, a magnetic field set up in the stator poles acts on the rotor to provide torque to the rotor shaft. This torque turns the rotor shaft only a part of a revolution; then it holds the shaft in an electrically detented position. The electrical detent is due to the direct current in the stator windings acting on the permanent magnet rotor. Shaft rotation is not continuous unless the stepper motor is continually pulsed.
2. The rotor cannot be easily turned by hand with the power on. When power is off, any residual detenting is felt as a drag or roughness, and it may cause a clicking sound as the shaft is turned.

Stepper Motor Operation

For ease of understanding, the motor used in this example turns 9° per step; the actual motor turns 1.8° per step.

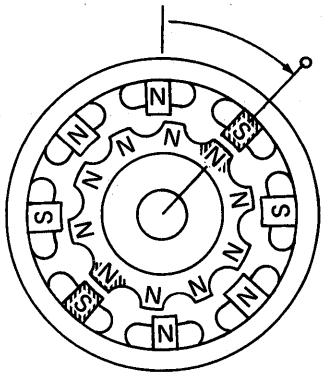
This simplified stepper motor consists of eight coil wound stator poles and a ten-pole permanent magnet rotor.





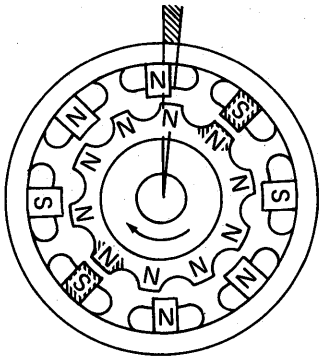
Stator-pole winding

If you could rotate the stator in either direction, the rotor would maintain its detented position and follow the stator as shown. Both the stator poles and the rotor are shown rotated 45° clockwise.

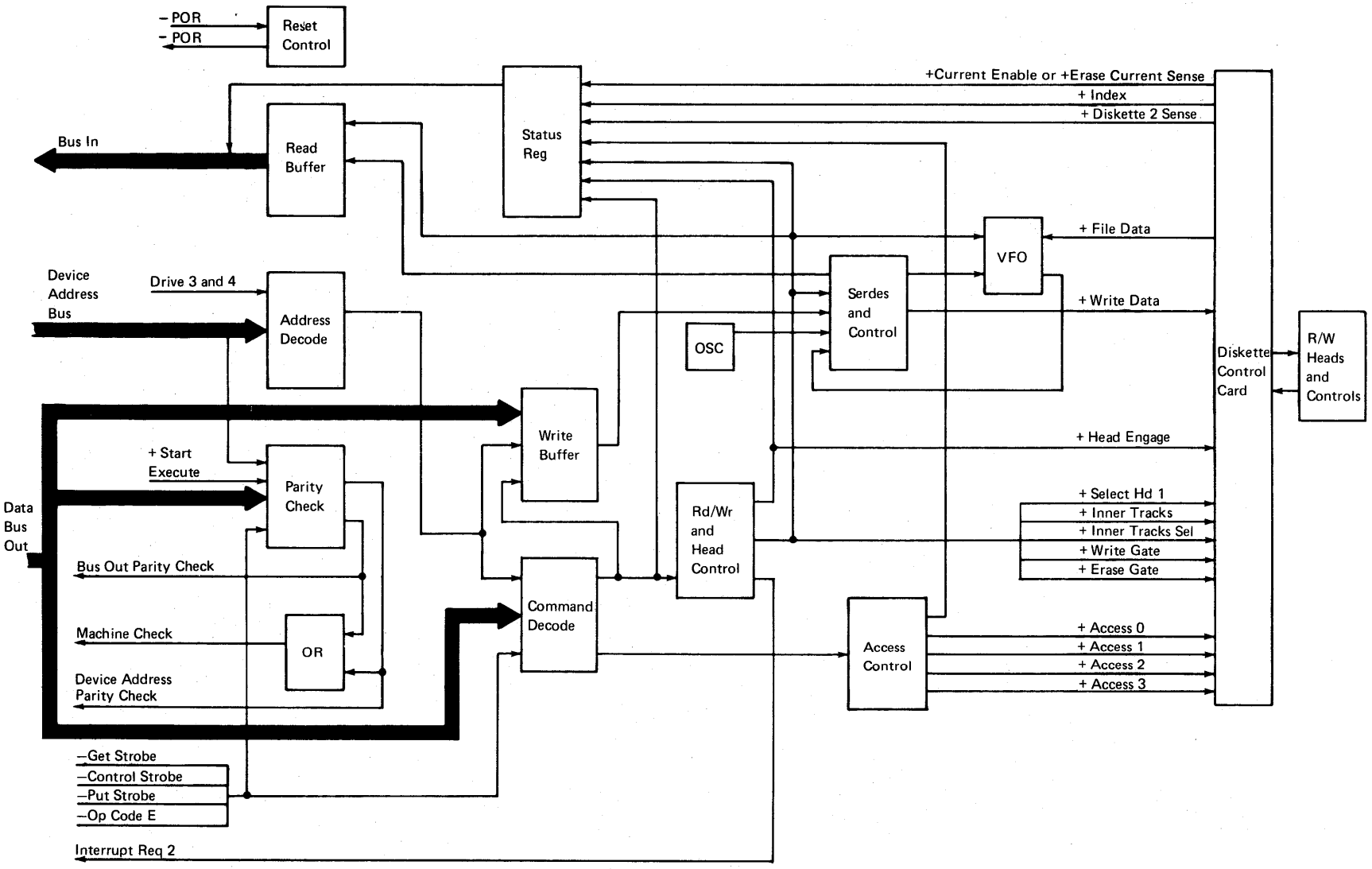


Note: Current flows only in one-half of the winding at a time. Polarity of the stator poles is determined by which half of the winding has the current flow.

If, instead of physically rotating the stator, you electrically rotate its magnetic field by switching the current to the next stator winding, the rotor turns until the closest opposite-polarity magnetic poles are attracted into alignment. Note that the polarity of the poles has rotated one position clockwise from that shown in the first illustration. The sequence of the phase pulses from the logic circuits determines the direction of rotation.



In the diskette unit, the stepper motor drive band is attached to the head/carriage assembly. As the motor turns, the band moves the assembly. A 90° rotation of the motor moves the assembly across the diskette the distance of one track. A clockwise movement of the rotor moves the assmebly toward the hub of the diskette. The stepper motor moves the assembly one track in 5 milliseconds. It requires 35 milliseconds to stop the moving assembly. Total seek time is 5 milliseconds times the number of tracks traveled plus 35 milliseconds.


-POR
-POR
Reset Control
+Current Enable or +Erase Current Sense
+ Index
+ Diskette 2 Sense
Status Reg
Bus In
Read Buffer
+ File Data
VFO
Device Address Bus
Drive 3 and 4
Address Decode
Serdes and Control
+ Write Data
OSC
Diskette Control Card
R/W Heads and Controls
Write Buffer
+ Head Engage
+ Start Execute
Parity Check
+ Select Hd 1
+ Inner Tracks
+ Inner Tracks Sel
+ Write Gate
+ Erase Gate
Data Bus Out
Rd/Wr and Head Control
Bus Out Parity Check
Command Decode
Machine Check
OR
Access Control
+ Access 0
+ Access 1
+ Access 2
+ Access 3
Device Address Parity Check
-Get Strobe
-Control Strobe
-Put Strobe
-Op Code E
Interrupt Req 2

FM (Frequency Modulated) Format Principles

FM format is a method of recording data on a diskette surface. The frequency of pulses in changed (modulated) to represent data.

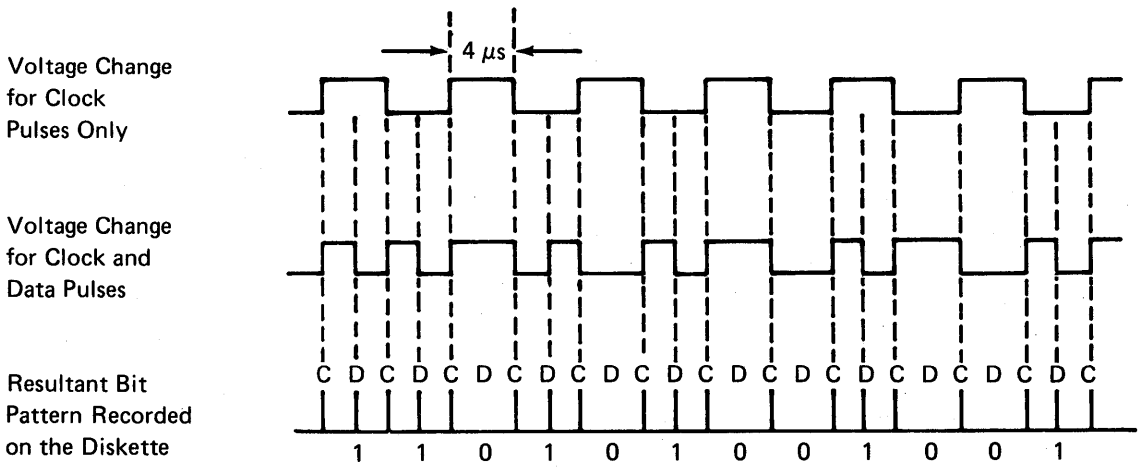
When no data is present (all 0 bits), only clock pulses are present. These pulses occur at a frequency of every 4 μs.

When data is present, the pulse frequency changes. Each 1 bit pulse is inserted halfway between adjacent clock pulses so there is double the pulse frequency. If a 0 bit is recorded, no pulse is between the clock pulses, so the pulse frequency is not changed.

The raw data rate in FM format is 250,000 bits (31,250 bytes) per second.

READ DATA

Each clock pulse or 1 bit pulse is recorded on the diskette surface as a change in magnetic direction (flux) from the bit immediately preceding it. As this change in flux passes the read/write heads, it causes the current in the read/write heads to change direction. This change in current direction is recognized by the adapter as either a clock pulse or a 1 bit pulse. If there is no change in the direction of the current between two adjacent clock pulses, the adapter recognizes that a 0 bit is present.

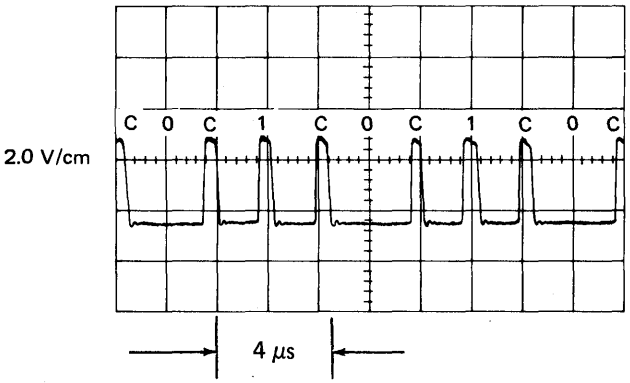


The C and D above the line show the clock and data bit times.

The numbers under the line show whether a 1 bit or a 0 bit is recorded.

See logic 440 in the *5110 System Logic Manual* for circuit description and test points.

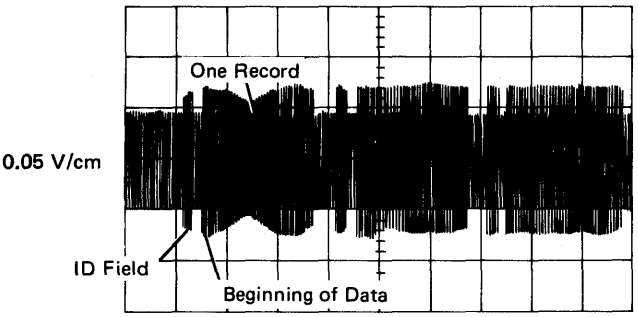
File Data
Example: 01010



Note: Use Tektronix 453, 454, or similar oscilloscope with x10 probes.

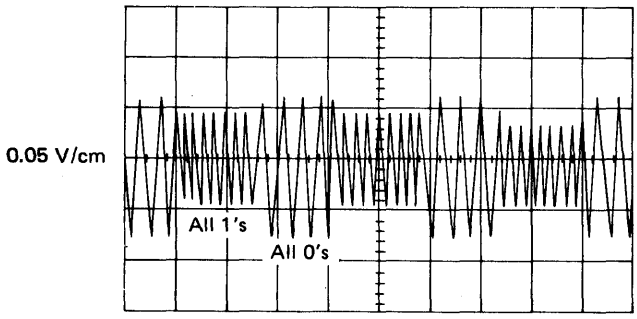
Channel A sweep mode	Normal
Channel A level	+
Channel A coupling	DC
Channel A slope	+
Channel A source	External
Trigger	Normal
Mode	Channel 1
Channel 1 volts/division	2.0 V/cm
Channel 1 input	DC
Times per division	2μs/cm
Connect channel 1 to	+File data
Connect trigger to	+Index test pin
Observe:	Clock pulses every 4 μs. Pulse duration should be between 100 and 500 ns. Pulse amplitude should be between 2.4 and 4.2 volts.

Read Head Signal at TP1 and TP2



Note: Use Tektronix 453, 454, or similar oscilloscope with x10 probes.

Channel A sweep mode	Normal
Channel A level	+
Channel A coupling	DC
Channel A slope	+
Channel A source	External
Trigger	Normal
Mode	Add
Channel 1 volts/ division	0.05 mV/cm
Channel 2 volts/division	0.05 mV/cm
Channel 1 input	AC
Channel 2 input	AC
Invert	Pull out
Times per division	2ms/cm
Connect channel 1 to	Preamp TP1
Connect channel 2 to	Preamp TP2
Connect trigger to	+Index test pin
Observe:	The amplitude of the read signal should be between 6.5 to 560 mV.



MFM (Modified Frequency Modulated) Format Principles

MFM format is a method of recording data on a diskette surface. The frequency of pulses is changed (modulated) to represent data.

With no data present (all 0 bits) the only pulses present are clock pulses. These pulses occur at a frequency of every 2 μs.

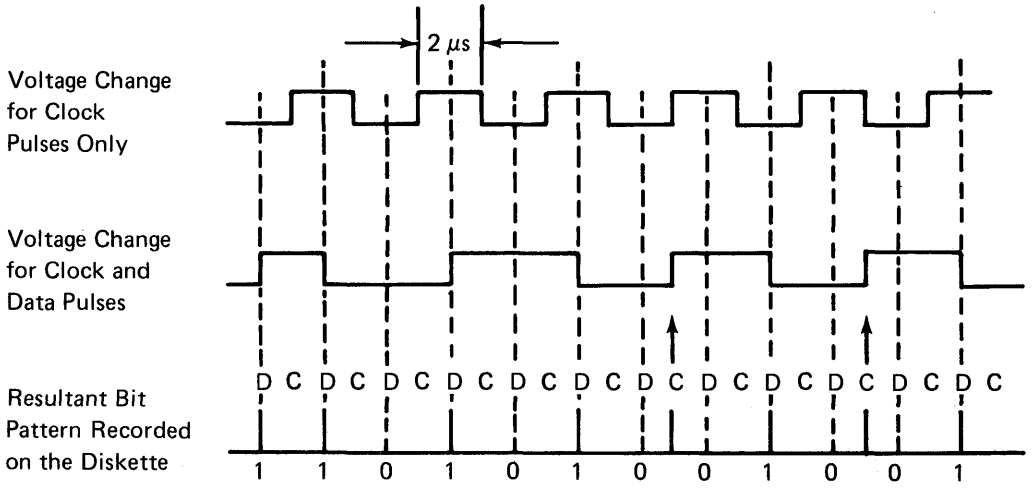
When data is present, the pulse frequency changes. Each 1 bit pulse is inserted halfway between adjacent clock times. The clock pulses are suppressed however, so the frequency remains the same. All clock pulses will be suppressed unless two 0 bits (no pulse) occur next to each other. When this happens, the clock pulse that would normally occur at the clock time between the 0 bits is not suppressed. Therefore, for that particular time, the pulse frequency changes.

Therefore, a pulse appears *between* any consecutive 0 bits (the clock pulses) and *for* each 1 bit.

READ DATA

Each clock pulse or 1 bit is recorded on the diskette surface as a change in magnetic direction (flux) from the bit immediately preceding it. As this change in flux passes the read/write heads, it causes the current in the read/write heads to change direction. This change in current direction is recognized by the adapter as either a clock pulse or a 1 bit pulse. If there is no change in the direction of current at data time, the adapter recognizes that a 0 bit is present.

MFM format, when compared to FM format, can record twice the amount of data on a diskette surface.

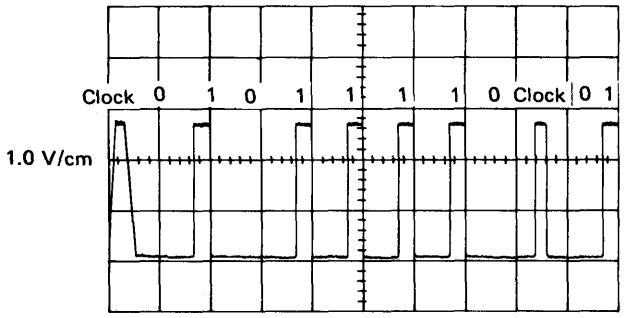


The C and D above the line show the clock and data bit times.

The numbers under the line show whether a 1 bit or a 0 bit is recorded.

See Logic 440 in the *5110 System Logic Manual* for circuit description and test points.

File Data
Bit Pattern: Hex 'E5E5'
Example: 0101111001

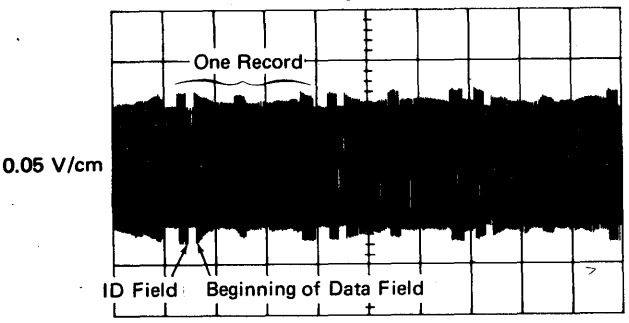


Note: Use Tektronix 453, 454, or similar oscilloscope with x10 probes.

Channel A sweep mode	Normal
Channel A level	+
Channel A coupling	DC
Channel A slope	+
Channel A source	External
Trigger	Normal
Mode	Channel 1
Channel 1 volts/division	1.0 V/cm
Channel 1 input	DC
Times per division	2 µs/cm
Connect channel 1 to	+File data
Connect trigger to	+Index test pin
Observe:	Clock or data pulses every 2 to 4 µs. Pulse duration should be between 100 and 500 ns. Pulse amplitude should be between 2.4 and 4.2 volts.

Theory

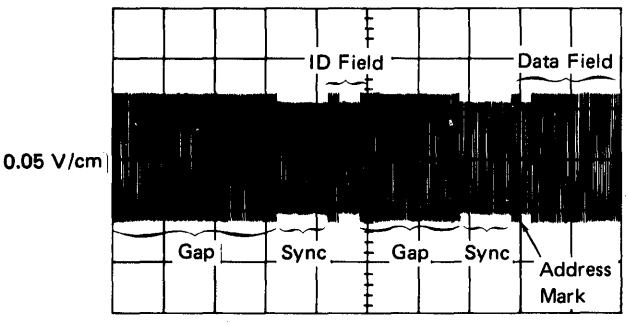
Read Head Signal at TP1 and TP2



Note: Use Tektronix 453, 454, or similar oscilloscope with x10 probes.

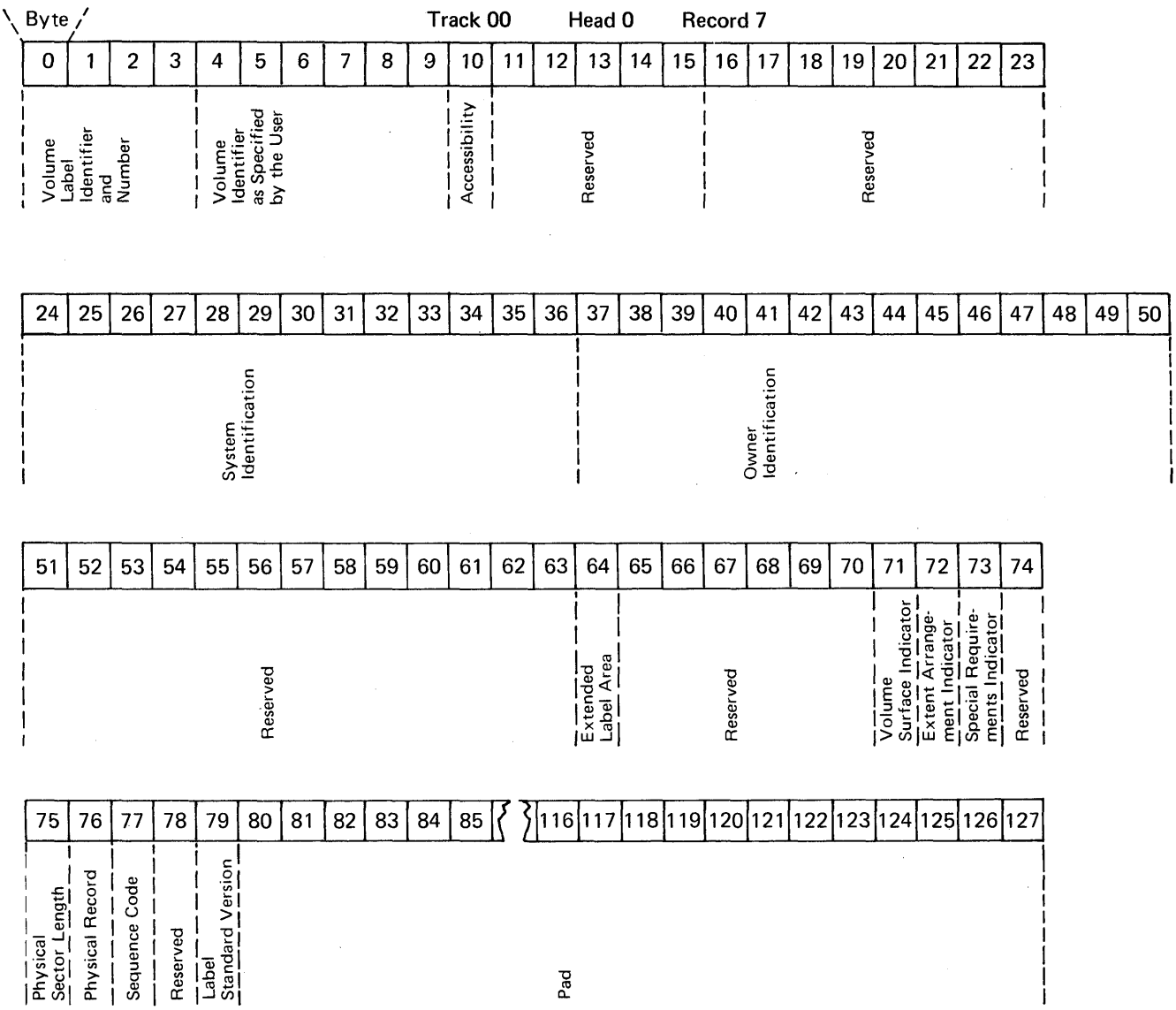
Channel A sweep mode	Normal
Channel A level	+
Channel A coupling	DC
Channel A slope	+
Channel A source	External
Trigger	Normal
Mode	Add
Channel 1 volts/ division	0.05 V/cm
Channel 2 volts/division	0.05 V/cm
Channel 1 input	AC
Channel 2 input	AC
Invert	Pull out
Times per division	2ms/cm
Connect channel 1 to	Preamp TP1
Connect channel 2 to	Preamp TP2
Connect trigger to	+Index test pin
Observe:	The amplitude of the read signal should be between 6.5 and 560 mV.

One Record



Volume Label

VOLUME LABEL LAYOUT



VOLUME LABEL FORMAT

The volume label is located at track 00 head 0 record 7 on all diskettes. It identifies the diskette and indicates to the adapter how the information on the diskette is arranged. The volume label is encoded on the diskette every time the diskette is initialized using the initialization utility program. The volume label is always encoded in FM format. This label is read and verified each time a sense command is issued to the diskette drive.

Volume Label Fields

Volume Label Identifier and Number (0-3): Identifies this particular portion of the diskette as a volume label (for example: VOL1).

Volume Identifier As Specified By User (4-9): Identifies this diskette. This identifier contains up to 6 alphameric characters. The identifier is specified during diskette initialization.

Accessibility (10): Indicates if the diskette can be read from or written to. If this bit is on, the diskette cannot be read from or written to. This bit can be turned on or off using the)VOLID command in APL or the UTIL command in BASIC.

System Identification (24-36): Identifies the system or system group on which the diskette was initialized (for example: IBM 5100).

Owner Identification (37-50): This field contains 14 alphameric characters. Identifies the owner of the diskette or the owner of the information written on the diskette.

Extended Label Area (64): Indicates how many, if any, additional tracks have been allocated as header label tracks. Up to 9 additional tracks on each side of a diskette 2d can be set aside for header labels (for example: 0 = no additional tracks, 1 = one additional track).

track 00, side 0 = 19 labels
track 00, side 1 = 52 labels (2 labels per sector)
9 additional tracks, both sides = 936 labels

Volume Surface Indicator (71): Identifies the diskette as a diskette 1 diskette 2 or a diskette 2d. Set to space for a diskette 1, 2 for a diskette 2, or M for a diskette 2d.

Extent Arrangement Indicator (72): Not used on 5114 diskette drive. Must be set to space.

Special Requirements Indicator (73): Not used on 5114 diskette drive. Must be set to space.

Physical Sector Length (75): Specifies the sector length as 128 bytes, 256 bytes or 512 bytes. Set to space for 128 bytes, 1 for 256 bytes, 2 for 512 bytes, or 3 for 1024 bytes.

Physical Record Sequence Code (76-77): Specifies a sector sequencing other than sequential.

26 Sectors Per Track

When this field contains:	**Blank**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**
The sequencing will be:	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2	2	3	4	5	6	7	8	9	10	11	12	13	14
	3	3	5	7	9	11	13	15	17	19	21	23	25	2
	4	4	7	10	13	16	19	22	25	2	2	2	2	15
	5	5	9	13	17	21	25	2	2	11	12	13	14	3
	6	6	11	16	21	26	2	9	10	20	22	24	26	16
	7	7	13	19	25	2	8	16	18	3	3	3	3	4
	8	8	15	22	2	7	14	23	26	12	13	14	15	17
	9	9	17	25	6	12	20	3	3	21	23	25	4	5
	10	10	19	2	10	17	26	10	11	4	4	4	16	18
	11	11	21	5	14	22	3	17	19	13	14	15	5	6
	12	12	23	8	18	3	9	24	4	22	24	26	17	19
	13	13	25	11	22	8	15	4	12	5	5	5	6	7
	14	14	2	14	26	13	21	11	20	14	15	16	18	20
	15	15	4	17	3	18	4	18	5	23	25	6	7	8
	16	16	6	20	7	23	10	25	13	6	6	17	19	21
	17	17	8	23	11	4	16	5	21	15	16	7	8	9
	18	18	10	26	15	9	22	12	6	24	26	18	20	22
	19	19	12	3	19	14	5	19	14	7	7	8	9	10
	20	20	14	6	23	19	11	26	22	16	17	19	21	23
	21	21	16	9	4	24	17	6	7	25	8	9	10	11
	22	22	18	12	8	5	23	13	15	8	18	20	22	24
	23	23	20	15	12	10	6	20	23	17	9	10	11	12
	24	24	22	18	16	15	12	7	8	26	19	21	23	25
	25	25	24	21	20	20	18	14	16	9	10	11	12	13
	26	26	26	24	24	25	24	21	24	18	20	22	24	26

15 Sectors Per Track

When this field contains:	Blank	01	02	03	04	05	06	07
The sequencing will be:	1	1	1	1	1	1	1	1
	2	2	3	4	5	6	7	8
	3	3	5	7	9	11	13	15
	4	4	7	10	13	2	4	7
	5	5	9	13	2	7	10	14
	6	6	11	2	6	12	2	6
	7	7	13	5	10	3	8	13
	8	8	15	8	14	8	14	5
	9	9	2	11	3	13	5	12
	10	10	4	14	7	4	11	4
	11	11	6	3	11	9	3	11
	12	12	8	6	15	14	9	3
	13	13	10	9	4	5	15	10
	14	14	12	12	8	10	6	2
	15	15	14	15	12	15	12	9

8 Sectors Per Track

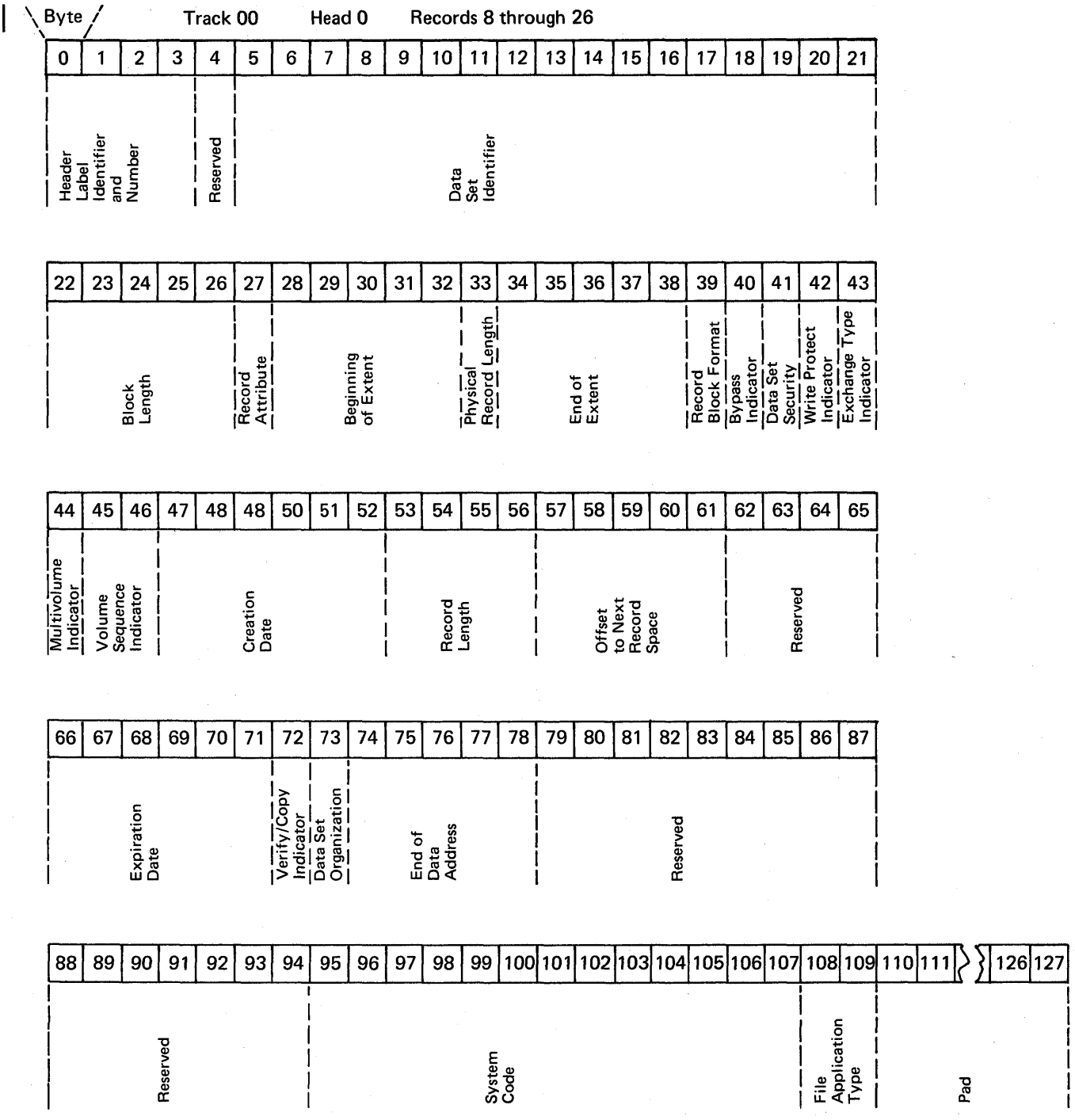
When this field contains:	Blank	01	02	03	04
The sequencing will be:	1	1	1	1	1
	2	2	3	4	5
	3	3	5	7	2
	4	4	7	2	6
	5	5	2	5	3
	6	6	4	8	7
	7	7	6	3	4
	8	8	8	6	8

Label Standard Version (79): Not used on the 5114. Must contain a W.

Pad (80-127): Extends to the end of the sector. Each position of this field contains hex FF.

Header Label

HEADER LABEL LAYOUT



HEADER LABEL FORMAT

The header labels are located on track 00, head 0, records 8 through 26 on all diskettes. In addition, on a diskette 2 or diskette 2d, the header labels are also located at track 00, head 1, records 8 through 26. On a diskette 2d, additional header labels can be set aside for all record lengths. Up to 9 additional tracks on each side of the diskette 2d can be allocated for header labels. The header labels are used to reserve a block of record space for a particular use. They also contain controls, status information, and the record name for that block of records.

Header Label Fields

Header label identifier and number (0-3): Identifies this particular record as a header and denotes which header it is (for example: HDR1).

Data Set Identifier (5-21): Establishes a name for this particular block of records. This field is user optional.

Block Length (22-26): Assigns the logical record length to this block of records (for example: BB128 = record length of 128 bytes and B = blank).

Record Attribute (27): Must be set to space.

Beginning of Extent (28-32): Identifies the address of the first record of a data set.

Physical Record Length (33): Determines the size of the physical record. If blank, the record length is 128 bytes; if 1, the record length is 256 bytes; if 2, the record length is 512 bytes. The physical record length indicator must be identical to the physical sector length indicated by the volume label.

End of Extent (34-38): Identifies the address of the last record space reserved for this data set.

Record Block Format (39): Indicates whether the data set is recorded in FM or MFM.

Bypass Indicator (40): Not used on the 5114. Must be set to space.

Data Set Security (41): Must be a space. The data set is protected by use of the accessiblity bit in the volume label.

Write Protect Indicator (42): Indicates whether the record space can be written on. If blank, the record space can be written on. If P, the record space is protected and cannot be written on.

Exchange Type Indicator (43): Specifies the type of record blocking.

Multivolume Data Set Indicator (44): Not used by the 5114.

Volume Sequence Indicator (45-46): Not used by the 5114.

Creation Date (47-52): Not used by the 5114.

Record Length (53-56): Determines record size for record input. It is set to logical record length for record files. It is set to maximum record length for stream files.

Offset To Next Record Space (57-61): Not used on the 5114. Must be set to space.

Expiration Date (66-71): Not used on the 5114.

Verify/Copy Indicator (72): Not used on the 5114.

Data Set Organization (73): Indicates how the data set is organized. If SEQ is specified, the field is set to D, otherwise, it is set to space.

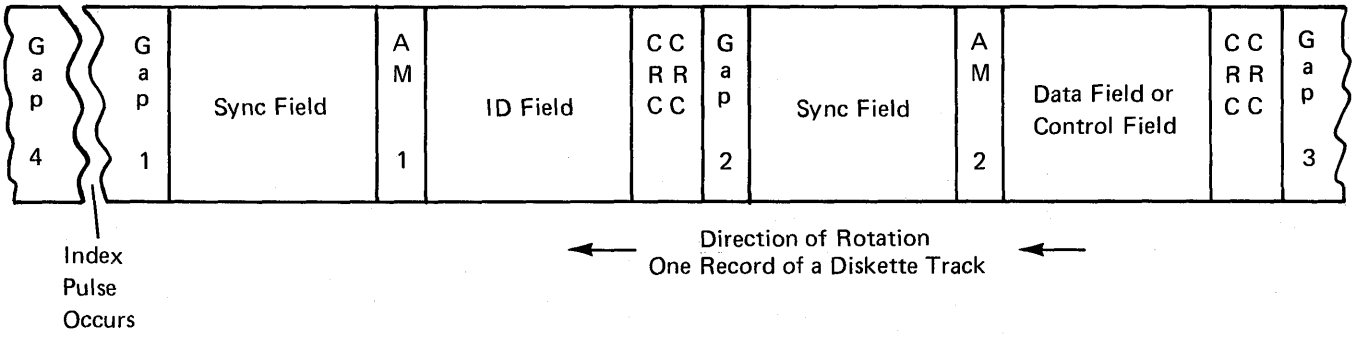
End of Data Address (74-78): Identifies the address of the next unused record space.

System Code (95-107): Identifies the system or system group during creation of application files.

File Application Type (108-109): Used with the system code to identify an application file.

Pad (110-127): Extends to the end of the sector. Each position of this field contains hex FF.

Data Recording Format



GAP 1

This gap separates the index pulse from the sync field of the first record. Gap 1 consists of 73 bytes of Hex FF in FM mode and 146 bytes of hex 4E in MFM mode.

Sync Field

This field is required to synchronize the adapter circuitry to the information being read from the diskette. Each sync field contains a set number of bytes of hex 00. In FM format, the sync field contains 6 bytes. In MFM format, the sync field contains 12 bytes.

AM 1

AM 1 is the address mark that identifies the following field as an ID field. In FM format, this field contains 1 byte that is always hex FE. In MFM format, this field contains 4 bytes that are always hex A1A1A1FE.

ID Field

The ID (identification) field is made up of the track address, record address, head address, and record length.

The *track address* contains a hex number from hex 00 through hex 4A (hex 00 = track 00, hex 01 = track 01, hex 02 = track 02, and so on).

The *record address* contains a hex number from hex 01 through hex 1A (hex 01 = sector 1, hex 02 = sector 2, and so on).

The *head address* for a diskette 1 is always hex 00. For a diskette 2 and diskette 2d, the head address contains either hex 00 or hex 01 depending on which side of the diskette is being read or written.

The *record length* contains a number from 0 through 3, depending on the number of sectors the track is divided into.

Number	Record Format	Sectors Per Track	Record Length
0	FM	26	128 bytes
1	FM	15	256 bytes
2	FM	8	512 bytes
1	MFM	26	256 bytes
2	MFM	15	512 bytes
3	MFM	8	1024 bytes

Note: All records on a track will have hex FF recorded as record length if any record on that track is damaged.

Theory

CRC

Two CRC (cyclic redundancy check) bytes are generated in the CRC register during a write operation for an ID field or a data field. The bit structure of the CRC bytes is determined by an algebraic formula applied to the bit structure of the field being written. These 2 CRC bytes are written on the diskette immediately following the field. The data written on the diskette during a write operation is retained in a buffer for use during the verify read operation. During the verify read operation, the data is compared bit for bit with the data in the buffer, as it is read from the diskette. If any bit read from the diskette does not compare with the corresponding bit in the buffer, a data check error occurs. Also, as the data is read from the diskette, 2 CRC bytres are built in the CRC register. When the 2 CRC bytes (written on the diskette during the write operation) are read, they are subtracted from the 2 CRC bytes that were built in the CRC register during the verify read operation. The CRC register is then tested for a content of 0. If the CRC register equals 0, the field was written correctly. If the CRC register does not equal 0, a CRC error occurs.

During a read operation, 2 CRC bytes are again generated in the CRC register for ID fields and data fields. The bit structure of the CRC bytes is determined by an algebraic formula applied to the bit structure of the field being read. After the complete field is read, the 2 CRC bytes on the diskette are read and compared to the 2 CRC bytes from the CRC register. If the CRC bytes are exactly the same, the field has been read correctly. If they are not exacly the same, a CRC error occurs.

GAP 2

This Gap is used to separate the ID field from the data field. Gap 2 consists of 11 bytes of hex FF in FM format and 22 bytes of hex FF in MFM format.

AM 2

AM 2 is the address mark that identifies the following field as either a data field or a control field. If the following field is a data field, AM 2 (in FM format) contains hex FB. In MFM format, it contains hex A1A1A1FB. If the following field is a control field, AM 2 (in FM format) contains hex F8. In MFM format, it contains hex A1A1A1F8.

Data Field

The data field contains the data record.

Control Field

The control field contains data to control the reading of that particular record.

GAP 3

Gap 3 separates one sector from another. This gap contains hex FF in FM format. In MFM format, it contains hex 4E.

Record Format	Gap Size	Record Length
FM	27 bytes	128 bytes
FM	42 bytes	256 bytes
FM	58 bytes	512 bytes
MFM	54 bytes	256 bytes
MFM	84 bytes	512 bytes
MFM	116 bytes	1024 bytes

GAP 4

Gap 4 occurs after the last record of the last sector of a track and separates that record from the index pulse. This gap contains a variable number of bytes of hex FF in FM format and a variable number of bytes of hex 4E in MFM format. The actual number of bytes depends on the speed of the diskette. The length is variable to allow interchangeability of diskettes between diskette drives.

Index

An index pulse occurs each time the index hole in the diskette passes the light emitting diode/phototransistor (LED/PTX) of the diskette drive. The index pulse indicates to the adapter that sector 1 of that particular track will be the next sector to reach the read/write heads.

Typical Operation

Operating the 5114 is simply a matter of inserting a diskette into the diskette drive and closing the diskette drive cover. With the system power on, the following occurs: (*See Typical Timing Sequence.*)

1. The diskette starts turning. It takes approximately 10 seconds for the diskette to reach operating speed (360 rpm).

2. Index pulses are sensed every revolution (166.7 ms) by the LED/PTX. The type of diskette inserted is identified on the diskette sense line. An UP level on the diskette sense line indicates a diskette 2 or a diskette 2d is inserted.

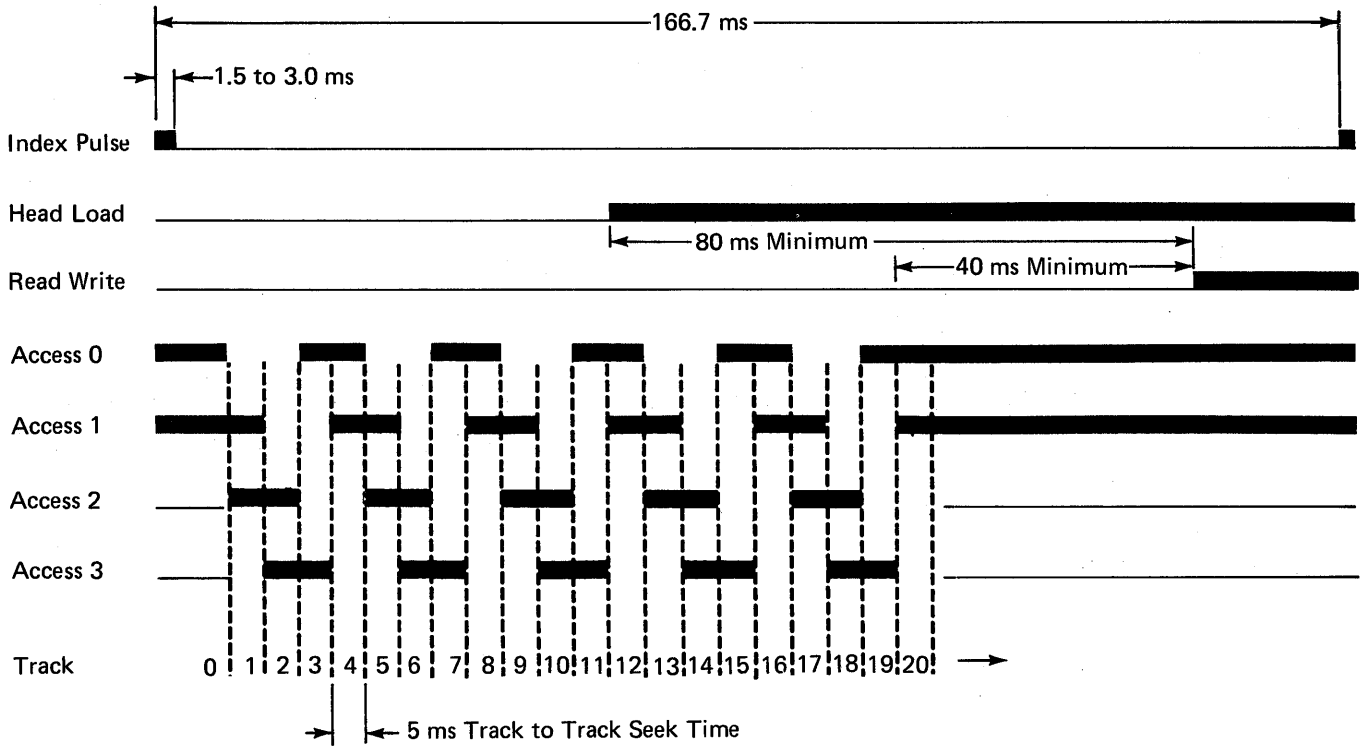
3. Seeking to the selected track is done by sequentially activating two of the four stepper motor access lines. This turns the stepper motor which moves the read/write heads a distance equal to 1 track. The two access lines which are activated at the time the read/write heads reach the desired track, remain activated as long as the heads remain at that track. It takes 40 ms for the heads to settle to a complete stop after a seek operation. Because of this, data is not valid for a minimum of 40 ms after a seek operation.

4. A head load command can be issued before or during a seek operation to activate the head load solenoid. Because of head settling time, data is not valid for 80 ms after a head load operation.

5. In order to reduce the wear to the diskette and the read/write heads, the heads are unloaded after the read/write operation if another command is not issued by the system within two revolutions of the diskette.

Typical Timing Sequence

This timing sequence shows a seek operation from track 00 to track 20. Track 20 is the track that is to be read from or written to.



Note: Seeking and head loading are not timed to the index.

Diskette Adapter Card

DISKETTE ADAPTER

The diskette adapter is packaged on one card. This card plugs into socket A1C1. The adpater card is used on more than one type of diskette drive unit. There are jumper pins on the card to select the type of unit you are using. (See 210 in the *5110 Maintenance Information Manual*, SY31-0550.)

The diskette adapter provides an interface between the system and the diskette drive. The adapter accepts access, read, and write commands from the system and activates the proper control lines to the diskette drive. The adapter assembles the sense information and data and passes them back to the system.

The adapter function is divided into four modes of operation. These modes are: initialization, access, read, and write.

Initialization mode is a type of power on reset for the diskette drive. Initialization mode occurs each time the system is powered on or the diskette drive cover is opened and then closed while the power is on. In this mode, the adapter controls are reset, the 'new media' latch is set, and commands from the system are monitored for a diskette drive address. This reset condition can also be caused by an I/O reset command; however, the 'new media' latch is not set.

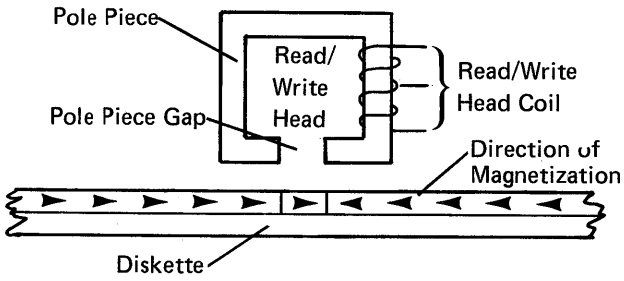
Access mode is determined by the absence of read or write mode with a diskette drive selected. Access mode is the mode of operation in which the heads can be moved to the selected track, the heads can be loaded or unloaded, and the proper head can be selected.

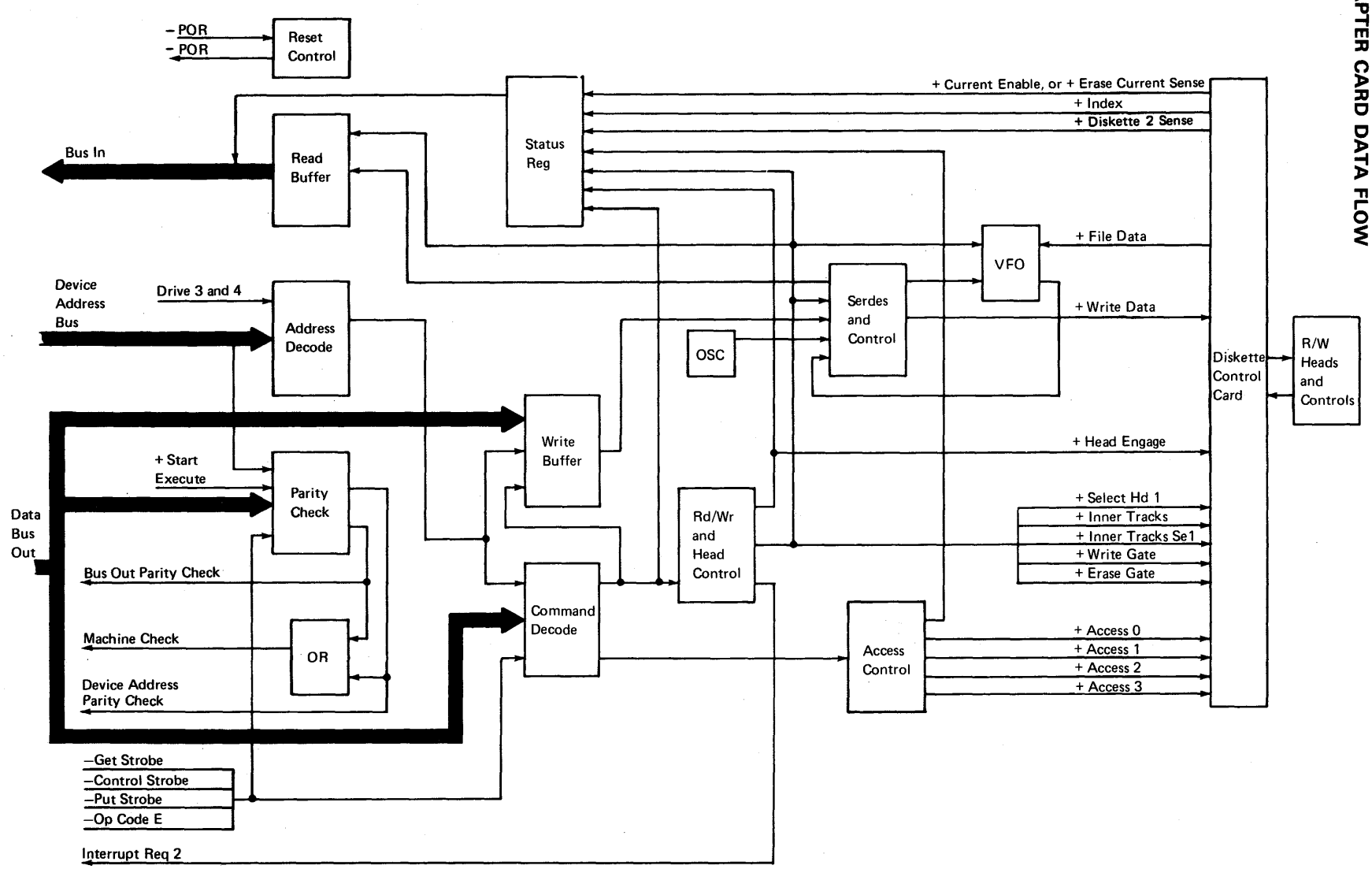
Read mode is determined by issuing the START READ command. The VFO circuitry, in read mode, receives data the system diskette and passes it through the adapter to the system.

During a read operation, with the recording surface of the diskette magnetized in one horizontal direction, constant flux flows and the coil registers no output voltage. However, when a recorded bit (180 degrees horizontal flux reversal) passes the pole piece gap, the flux flowing through the ring and coil also reverses and produces a voltage output pulse. This output pulse represents a clock pulse or 1 bit.

Write mode is determined by issuing the START WRITE command. The adapter, in write mode, receives data from the system, writes it onto the diskette, and erases the edges of the data track just written. This erasing process prevents crosstalk between tracks during later read operations (tunnel erase).

During a write operation, a clock pulse or 1 bit is recorded by reversing the direction of the current in the read/write head coil. This reverses the flux direction in the pole piece and the pole piece gap. When the flux in the pole piece gap reverses, either a clock pulse or a 1 bit pulse is recorded on the diskette surface. Each reversal represents a clock pulse or 1 bit pulse.




-POR
-POR
Reset Control
Bus In
Read Buffer
Status Reg
+ Current Enable, or + Erase Current Sense
+ Index
+ Diskette 2 Sense
+ File Data
VFO
Device Address Bus
Drive 3 and 4
Address Decode
Serdes and Control
+ Write Data
OSC
Diskette Control Card
R/W Heads and Controls
Write Buffer
+ Head Engage
+ Start Execute
Parity Check
Data Bus Out
Rd/Wr and Head Control
+ Select Hd 1
+ Inner Tracks
+ Inner Tracks Se1
+ Write Gate
+ Erase Gate
Bus Out Parity Check
Command Decode
Machine Check
OR
Access Control
+ Access 0
+ Access 1
+ Access 2
+ Access 3
Device Address Parity Check
-Get Strobe
-Control Strobe
-Put Strobe
-Op Code E
Interrupt Req 2

DATA FLOW FUNCTIONAL COMPONENTS

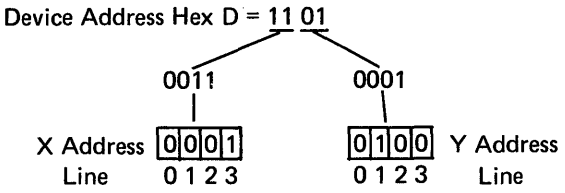
Parity Check

This block is used in all modes of operation. It checks for odd parity on the 'data bus out' line. The parity bits are generated in the system. If an odd parity exists, the bytes are passed to the appropriate circuits. If an even parity exists, the 'machine check' line to the system is activated, and the remaining bytes coming in are ignored. This block also checks the X and Y device address lines. Only one X line and only one Y line must be active. If any other condition exists, the 'machine check' line is activated.

Address Decode

This block reads all address bytes coming to the adapter for hex D. Hex D is the address byte for a diskette drive. Any other address will be ignored. When an address of hex D is decoded, the commands that follow the address are passed to the appropriate circuits.

The hex D is converted to a binary number to activate the X and Y device address lines.



Diskette Control Card Controls

This block is used in all modes of operation. There are several lines to this block that perform the tasks necessary to read, write, and load the heads. These lines are as follows:

+Write Data: For each change of the write data signal, the current switches in the read/write head. This process records the data on the diskette surfaces. (See Logic 440.)

+Select Head 1: When active, this line selects head 1. (See Logic 440.)

+Inner Tracks: On a write operation, this line is used to reduce the amount of recording current beyond the middle cylinders. On a read operation, this line is used to compensate for bit shifting beyond the middle cylinders.

+Write Gate: Write gate activates the write circuits and deactivates the read circuits for a write operation. (See Logic 440.)

+Erase Gate: Erase gate activates the erase circuits for a write operation. (See Logic 440.)

+Inner Track Select: This line is used with the inner tracks line to further compensate for bit shifting beyond cylinder 60 for MFM encoding. This line is not used on a write operation.

+Erase Current Sense[1]: When this line is active, the erase circuits are working OK.

+File Data: File data is a series of clock and data pulses that represent the data read from the diskette surface.

Note: On card Pn 4178065, this line is called '+ current enabled'.

+Index: This line indicates the beginning of a track. This 1.5 to 3.0 ms pulse occurs every 166.7 ms.

+Diskette 2 Sense: When active, this line indicates that a diskette 2 or 2D is being used. This line is not activated by a diskette 1.

+Head Engage: When active, this line loads the read/write heads.

-Diskette Drive Sense: This line is used by the adapter card to sense if a second drive is installed.

+Access Lines 0 through 3: Two of the four access pulses move the read/write heads from one cylinder to the next cylinder. Notice in the chart that the same pair of access pulses are repeated every four cylinders.

[1] On card P/N 4178065, this line is called '+current enabled'.

Cylinder	In ⟶								⟵ Out		
Location	0	1	2	3	4	5	-- 40 --		74	75	76
Access 0	1	0	0	1	1	0	1		0	1	1
Access 1	1	1	0	0	1	1	1		0	0	1
Access 2	0	1	1	0	0	1	0		1	0	0
Access 3	0	0	1	1	0	0	0		1	1	0

The four access pulses are sequenced to move the heads in (toward the drive hub) or out (away from the drive hub).

Status Register

This block provides sense information to the system. It senses the condition of the latches and several lines in the adapter. This block turns on associated bits in the diskette sense and the access sense bytes of the 'bus in' line.

Latch	Bit
Write Mode	Diskette Sense Bit 0
Read Mode	Diskette Sense Bit 1
Diag 1 or 2	Diskette Sense Bit 2
Index	Diskette Sense Bit 3
Erase Gate	Diskette Sense Bit 4
Diskette 1 or Diskette 2	Diskette Sense Bit 5
CRC Error	Diskette Sense Bit 6
Read/Writen Overrun	Diskette Sense Bit 7
New Media	Access Sense Bit 0
MFM	Access Sense Bit 1
Inner Track Select (filter control)	Access Sense Bit 2
Inner Tracks	Access Sense Bit 3
Head Engage	Access Sense Bit 4
Head Selected	Access Sense Bit 5
Access Lines	Access Sense Bits 6 and 7

Read and Write Data Buffers

These buffers provide a temporary storage for data as it travels to and from the adapter.

Access Control (Register)

This register takes the output of the access control byte, bits 6 and 7, to activate two of the four access lines. The access lines cause the stepper motor to rotate moving the read/write heads across the recording surface of the diskette. (See *Stepper Motor* in this section.)

R/W & Head

This register controls the condition of the write gate. When the 'write gate' line is active, the read circuitry is degated. When the 'write gate' line is inactive, the read circuitry is active.

Serdes and Control

This block is made up of the write serializer, the read deserializer, and the controls necessary to count the bits.

On a write operation, this block receives bytes of data and sends them to the write circuitry serially bit by bit. On a read opertaion, this block receives data from the diskette serially bit by bit, builds bytes of data, and sends the data to the system byte by byte.

Oscillator

The oscillator is only used in a write operation. It is used to insert clock bits in the write data at the correct times. These clock bits are used on a read operation for sychronization in the VFO circuitry. The VFO circuitry deletes the clock bits from the data before sending the data to the Serdes register.

VFO

This block is physically a part of the VFO circuitry. It is only used in a read operation. This block provides clocking for the raw data and subdevice selection.

Operations

INITIALIZATION

Diskette drive initialization, which is a type of power on reset, occurs each time the diskette drive is turned on, or a new diskette is inserted in the drive. During the initialization phase of operation, all controls on the adapter are reset, and system commands are monitored for a diskette drive address.

After the diskette drive is selected, the system looks at the sense byte of the 'bus in' line to determine the condition of the drive. If the sense byte indicates that the 'new media' latch is set, the diskette drive is forced to access mode and the access sense lines are sensed to determine their condition. The correct number of reverse seek commands are issued to move the read/write heads to track 00.

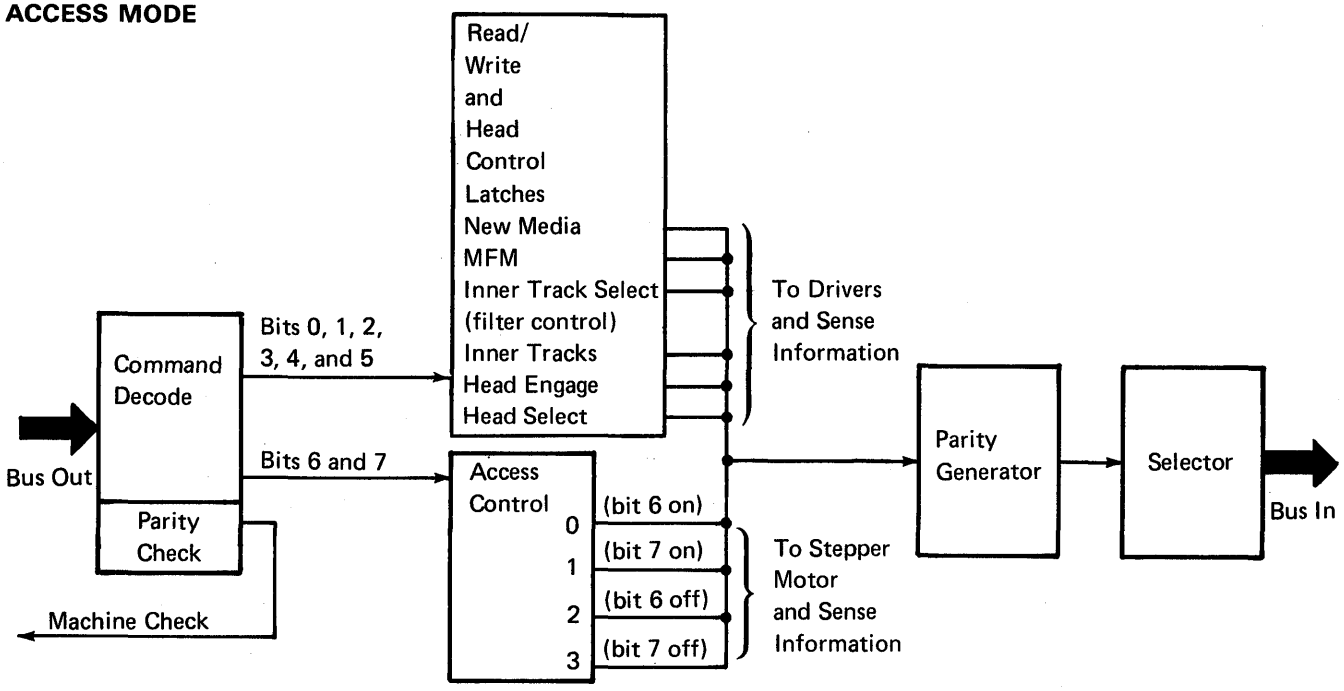
If the 'access 0' and 'access 1' lines are active, 76 reverse seek commands are issued.

If the 'access 1' and 'access 2' lines are active, 77 reverse seek commands are issued.

If the 'access 2' and 'access 3' lines are active, 78 reverse seek commands are issued.

If the 'access 3' and 'access 0' lines are active, 79 reverse seek commands are issued.

ACCESS MODE



In access mode, the system can check the status of the drive and diskette, move the heads, select the correct side and current, and load or unload the heads. The adapter is in access mode when no read, write, or diagnostic operation is in progress, and a diskette drive has been selected.

After an initialization sequence, the adapter is set to access mode.

The commands for the adapter in access mode are sent by the system over the 'bus out' line, access control byte. As the access control byte enters the adapter, it is checked for odd parity. This parity is generated by the system. If an even parity is detected, the machine check line is activated and the commands are ignored.

Bit 0 of the 'bus out' line is turned on to reset the 'new media' latch in case it has been set. The 'new media' latch is set anytime an index pulse is not sensed for 200 ms or the index pulse duration exceeds 16 ms. If a diskette is not inserted in the drive, the diskette drive cover is open, or the diskette has stopped turning or slowed down with the index sensing mechanism covered, the index pulse sensing time will exceed 200 ms. If the diskette has stopped turning or slowed down with the index hole over the index sensing mechanism, the index pulse duration will exceed 16 ms.

The 'MFM control' latch is set or reset depending on the format to be used in the operation following the access operation. If the following operation is in the MFM format, bit 1 of the 'bus out' line is set on and the 'MFM control' latch set. If the following operation is to be in the FM format, bit 1 of the 'but out' is turned off and the 'MFM control' latch is reset.

As the read/write heads move toward track 76 of the diskette, the density of the recorded information increases. This happens because the physical length of the track is smaller on the inside tracks. Since the same amount of information is recorded on each track, the information on the inner tracks is more compact than the information on the outer tracks. When the heads reach track 60 accessing toward track 76, bit 2 of the 'bus out' line is turned on. This sets the inner track select (filter control) latch which filters out the clock pulses. When the heads are accessing toward the track 00 and the head location is between track 00 and track 59, this bit is turned off and the inner track select (filter control) latch is reset.

A lower current is required at the inner tracks for write operations. The inner tracks latch is used to provide a lower current at the inner tracks. Any time the heads are located at track 42 or greater, bit 3 of the 'bus out' line is turned on. This sets the inner tracks latch. Bit 3 of the 'bus out' line is turned off, and the inner tracks latch is reset any time the head location is track 41 or less.

The loading (lowering) or unloading (raising) of the read/write heads is controlled by bit 4 of the 'bus out' line. When this bit turns on, the heads are loaded. In the loaded position, the heads can read or write information on the diskette surface. If two index pulses are detected and a command was not issued to the adapter, this bit is turned off and the heads are unloaded.

There are two read/write heads on the diskette drive. In order to read or write the correct side of the diskette, one and only one head must be selected. Bit 5 of the 'bus out' line determines which head is used in the read or write operation. If this bit is off, head 0 is selected. If this bit is on, head 1 is selected.

Four access lines are used to move the heads from track to track. When the adapter first entered access mode, the heads were located at track 00. This was accomplished in the initialization phase of the operation. In track 00, bits 6 and 7 of the 'bus out' line are both on. With these bits on, access lines 0 and 1 are active. These access lines remain active as long as the heads stay at track 00 and no access command is issued by the system to change the status of bits 6 and 7. Access commands move the read/write heads sequentially from track to track in both forward and reverse directions.

	Track									
	00	01	02	03	04	05	06	07	08	09
Bus Out Bit 6	1	0	0	1	1	0	0	1	1	0
Bus Out Bit 7	1	1	0	0	1	1	0	0	1	1
Access Line 0	1	0	0	1	1	0	0	1	1	0
Access Line 1	1	1	0	0	1	1	0	0	1	1
Access Line 2	0	1	1	0	0	1	1	0	0	1
Access Line 3	0	0	1	1	0	0	1	1	0	0

To move the heads from track 00 to track 01, bit 6 of the 'bus out' line turns off and bit 7 remains on. This pulses the stepper motor and turns it just enough to move the heads to track 01. Bit 6 turning off with bit 7 remaining on deactivates the 'access 0' line and activates the 'access 2' line. The 'access 1' line remains active. These two access lines (1 and 2) remain active as long as the heads are located at track 01 and no access commands have changed the status of bits 6 and 7. To move the heads from track 01 to track 00, bit 6 is turned on and bit 7 remains on. This turns off the 'access 2' line and turns on the 'access 0' line. The 'access 1' line remains active. The stepper motor now turns in a reverse direction to move the heads back to track 00.

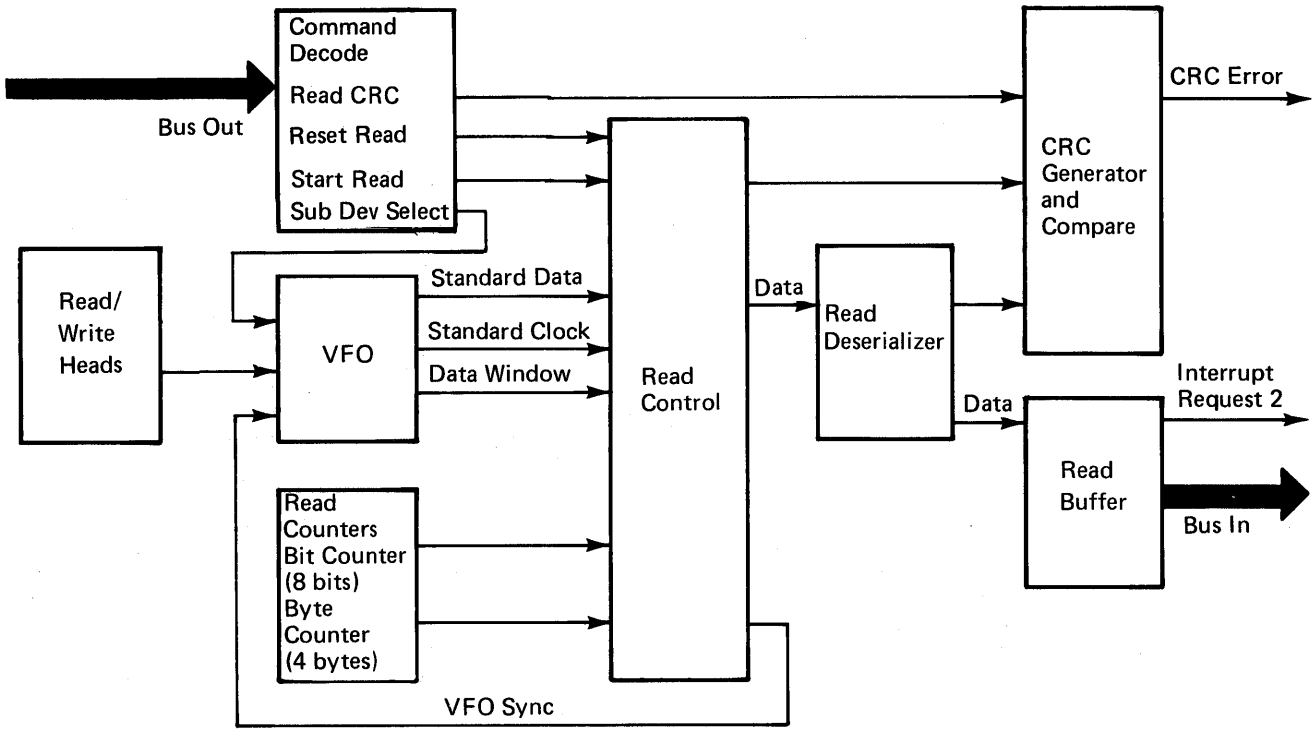
ACCESS MODE SENSING

In access mode, sense information is sent to the system by the adapter. This information is in the access sense byte of the 'bus in' line. The bits in the access sense byte represent the condition of the different control latches in the adapter. Bits 6 and 7 are set according to the condition of the access lines.

This byte of information tells the system the operational state of the diskette drive. (See *Access Sense*, under *Adapter Commands* in this section.)

The system has sent commands to the adapter over the 'bus out' line. After these commands were sent, the system sensed the condition of the adapter by analyzing the access sense byte of the 'bus in' line to ensure that all of the commands were operated on and the diskette drive is in the exact operational status as demanded by the commands.

READ MODE



The correct drive, head, and track for a read operation is selected during access mode. A read operation senses data that has been recorded on a diskette and sends this data to the system. The data rate for read operation is 48k bytes/seconds.

The read operation starts when the system sends the START READ command to the adapter. This command comes on the 'bus out' line, diskette control byte, bit 1. When the adapter senses that this bit is turned on, it sends a signal to the read control block to raise the 'VFO Sync' line. The 'VFO Sync' line causes the VFO to sync on all data transitions. The VFO syncs on the raw data coming from the VFO control block.

The adapter now starts looking for a sync field of all 0's (6 in FM, 12 in MFM). Once the correct number of 0's have been detected, the adapter drops the 'VFO sync' line.

The presence of a bit after the sync field signals the start of an address mark. The read control block checks for the correct clock pattern of the address mark and passes the data portion through the read deserializer block to the buffer and on to the system. The data portion of the address mark is also sent to the CRC generator. The address mark has clock pulses 2, 3, and 4 suppressed to ensure its validity and to ensure that it is not mistaken for data. In FM, 1 byte is needed for for the address mark. In MFM, 4 bytes are required. A byte counter frames these bytes and keeps track of how many bytes have been processed.

In MFM, the first 3 bytes of the address mark are checked for correct clock and data. The 4th byte is passed back to the system.

If the address mark is correct, the read operation continues. If the address mark is not correct, a resync is issued by the system. A resync command consists of two separate commands. First the system sends the RESET READ command over the 'bus out' line, diskette control byte, bit 7. Then it sends the START READ command over the 'bus out' line, diskette control byte, bit 1. This causes the adapter to start looking for a sync field again.

The presence of a 1 bit after the sync field starts a bit and byte counter and the CRC generator.

The bit counter counts to 8 and is used to frame the data into bytes. The data is blocked into bytes in the read deserializer. As soon as 8 bits have been counted, they are passed to the buffer. When the buffer receives a byte of data, the 'interrupt request 2' line is raised. When the system receives this interrupt request, it takes the data from the buffer over the 'bus in' line and resets the interrupt request. This transfer of data to the buffer and interrupt sequence is repeated every 8 bits. (32 microseconds in FM; 16 microseconds in MFM). This sequence continues until reset by the system.

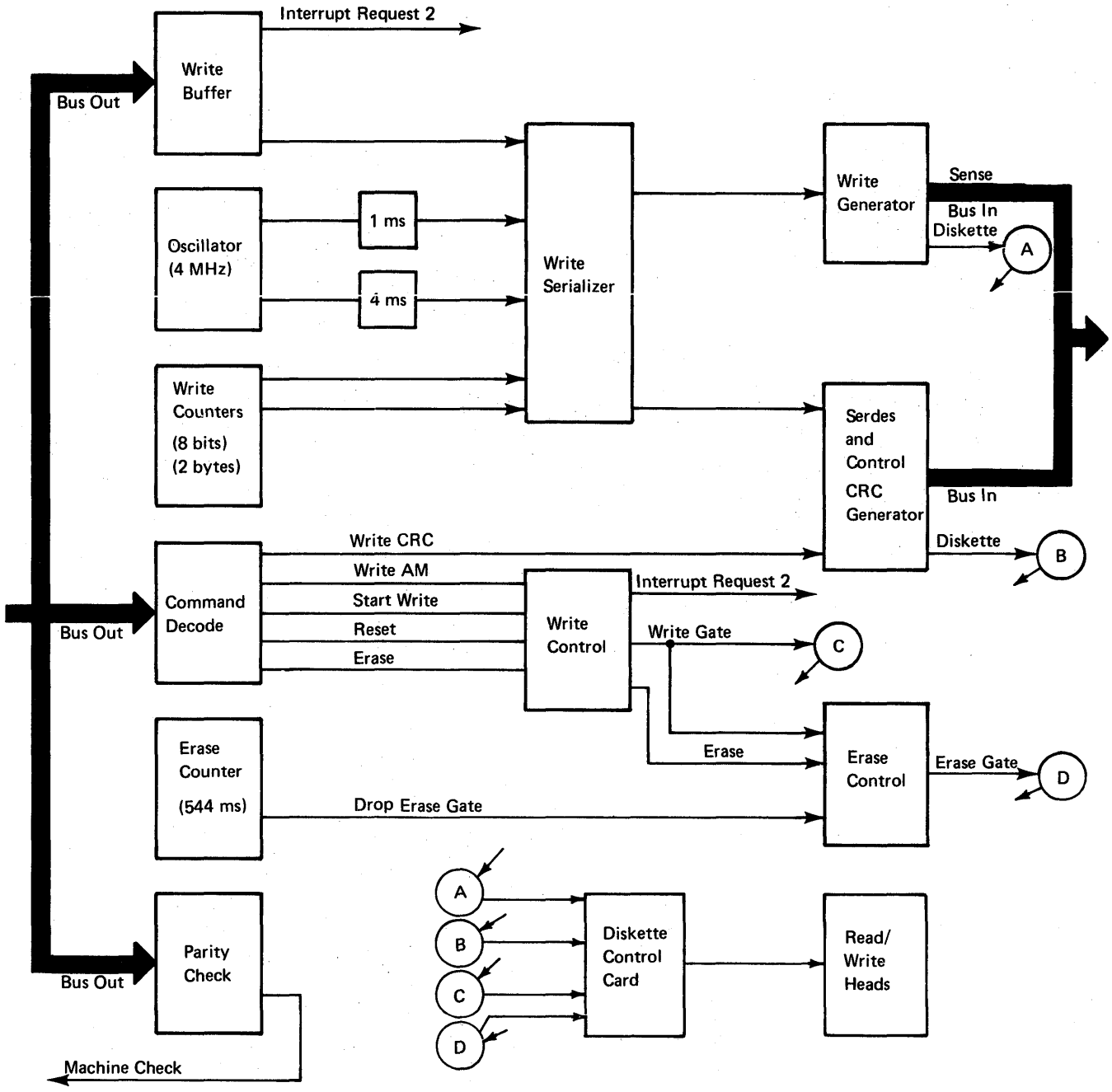
The data bits that are sent to the buffer are also sent to the CRC generator. This generator builds 2 bytes of CRC information. The command to read the CRC information comes from the system over the 'bus out' line, diskette control byte, bit 5. For a read operation, this command causes the adapter to compare the CRC generated during the read operation with the CRC read from the diskette.

The read operation is terminated when the system sends the RESET READ command over the 'bus out' line, diskette control byte, bit 7.

READ MODE SENSING

During a read operation, the system is sensing the condition of the adapter over the 'bus in' line by sampling the diskette sense byte. For an explanation of the different bits of the diskette sense byte. (See *Diskette Sense* under *Adapter Commands* in this section.)

WRITE MODE


Interrupt Request 2
Write Buffer
Bus Out
Oscillator (4 MHz)
1 ms
4 ms
Write Serializer
Write Generator
Sense
Bus In Diskette
A
Write Counters (8 bits) (2 bytes)
Serdes and Control CRC Generator
Bus In
Diskette
B
Write CRC
Write AM
Start Write
Reset
Erase
Command Decode
Bus Out
Write Control
Interrupt Request 2
Write Gate
C
Erase
Erase Counter (544 ms)
Drop Erase Gate
Erase Control
Erase Gate
D
A
B
C
D
Diskette Control Card
Read/ Write Heads
Parity Check
Bus Out
Machine Check

The data rate in a write operation is 24K bytes/second.

The write operation starts when the system sends the START WRITE command to the adapter. This command comes on the 'bus out' line, diskette control byte, bit 0. When the adapter senses that this bit is turned on, it sends a signal to the write control block. This block raises the 'interrupt request 2' line. This causes the system to send the first byte of data to the buffer and reset the interrupt request.

Now the buffer transfers the byte of data to the write serializer and raises the 'interrupt request 2' line to obtain the next byte of data.

The first bytes (6 in FM, 12 in MFM) are all 0's. This is the sync field. After the sync field is written, the system sends the WRITE AM command on the 'bus out' line, diskette control byte, bit 6. This sets the 'write AM' the latch in the write control block which brings up the 'write gate' line and turns on the 'erase gate' latch. Turning on the 'erase gate' with the WRITE AM command provides the necessary delay at the beginning of the write operation before the tunnel erase operation begins (544 microseconds). The oscillator provides the correct clock pulses for the address mark and the data.

When the address mark is written, the system resets the 'write AM' latch and starts sending data. The write serializer takes a byte of data and sends it to the write generator a bit at a time. It also sends the data a bit at a time to the CRC generator.

After all the data is written, the system issues, a WRITE CRC command over the 'bus out' line, diskette control byte, bit 5. This command is decoded and the 'write CRC' line causes the 2 CRC bytes to be written serially from the CRC generator to the diskette.

While writing the CRC, the adapter still interrupts the system. The system has to service these interrupts by sending dummy data.

When the CRC information is written, the system issues a RESET WRITE command over the 'bus out' line, diskette control byte, bit 7. This stops the write operation.

Because the erase heads are physically located behind the read/write heads, the tunnel erase operation has not been completed at this time. An erase counter provides a drop out delay to the erase heads of 544 microseconds after the RESET WRITE command has been received.

The system now issues a START READ command over the 'bus out' line, diskette control byte, bit 1. This puts the adapter in read mode. The adapter now reads and sends all of the data just written to the system. The data is compared bit for bit in the system for validity. This is the verify read operation.

WRITE MODE SENSING

During a write operation, the system is sensing the condition of the adapter over the 'bus in' line by sampling the diskette sense byte. The bits of the diskette sense byte are used to inform the system of the condition of several latches during the write operation. (See *Diskette Sense* under *Adapter Commands* in this section.)

Adapter Commands

DISKETTE CONTROL

Bus Out Bit 0 – Start Write

Start write causes the adapter to raise the 'interrupt request 2' line and set the 'write mode' latch. The adapter starts writing data to the diskette and interrupts the system after each byte has been written.

Bus Out Bit 1 – Start Read

Start read causes the adapter to search for a sync field and detect an address mark. As soon as the 8-bit address mark has been shifted into the serdes, the adapter raises the 'interrupt request 2' line for the system to read the data. The adapter keeps interrupting every 8 bits until the RESET READ command is given.

Bus Out Bits 2 and 3 – Diag 1 and Diag 2

The combination of these 2 bits determines the diagnostic state of the adapter.

Bit 2	Bit 3	Diagnostic Mode
0	0	Normal read or write operation
1	0	Loop write read with VFO and read CRC
0	1	Loop write read without VFO and read CRC
1	1	Loop write read without VFO and write CRC

Bus Out Bit 4 – Erase Gate

This bit controls the turn on and turn off of the 'erase gate' latch. This bit is turned on when the 'write AM' latch is set.

Bus Out Bit 5 – Read/Write CRC

When writing to the diskette, this bit turning on causes the contents of the CRC register to be written on the diskette. During a read operation, this bit causes the adapter to compare the CRC read from the diskette with the contents of the CRC register.

Bus Out Bit 6 – Write AM

This bit causes the adapter to write an address mark by dropping clock pulses 2, 3, and 4. It also turns on bit 4 of the 'bus out' line.

Bus Out Bit 7 – Reset Read/Write/Diagnostic

When the system has completed reading, writing, or diagnostics, this bit causes the system to issue the RESET command, which sets the adapter into access mode.

DISKETTE SENSE

Bus In Bit 0 – Write Mode

This bit is turned on when the 'write' latch is set.

Bus In Bit 1 – Read Mode

This bit is turned on when the 'read' latch is set.

Bus In Bit 2 – Diag 1 or Diag 2

This bit is turned on when either the 'diag 1' or the 'diag 2' latch is set.

Bus In Bit 3 – Index

This bit is turned on when the index hole in the diskette passes by the index phototransistor.

Bus In Bit 4 – Erase Gate Sense

This bit indicates the status of the 'erase gate' latch.

Bus In Bit 5 – Diskette 1, Diskette 2

This bit is turned off when a diskette 1 is located in the diskette drive. This bit is turned on when a diskette 2 is located in the diskette drive. This bit must be tested after the index pulse has been checked.

Bus In Bit 6 – CRC Error

This bit is turned on when the CRC read from the diskette does not agree with the generated CRC.

Bus In Bit 7 – Read/Write Overrun

This bit is turned on when the system does not service an interrupt before the next interrupt occurs. Detection of an overrun causes the adapter to reset to access mode.

ACCESS CONTROL

Bus Out Bit 0 – Reset New Media

This bit resets the 'new media' latch. The latch is set when the diskette drive cover is opened.

Bus Out Bit 1 – MFM

This bit sets the adapter to the desired recording mode. If the bit is off, the adapter is in FM mode. If the bit is on, the adapter is in MFM mode.

Bus Out Bit 2 – Inner Track Select (filter control)

This bit sets the inner track select (filter control) latch. The bit is turned on and the inner track select (filter control) latch is set when the read/write head location is equal to or greater than track 60. This bit is turned off, and the inner track select (filter control) latch is reset when the read/write head location is less than track 60.

Bus Out Bit 3 – Inner Tracks

This bit sets the inner tracks latch. This bit is turned on and the inner tracks latch is set when the read/write head location is equal to or greater than track 42. This bit is turned off, and the Inner tracks latch is reset when the read/write head location is less than track 42.

Bus Out Bit 4 – Engage Head

This bit controls the loading and unloading of the read/write heads. This bit is turned on to load the heads. This bit is turned off to unload the heads. If two index pulses are detected and no commands have been issued to the adapter, the heads are unloaded.

Bus Out Bit 5 – Head Select

This bit selects the appropriate head for the read/write operation. This bit is turned on to select head 1. This bit is turned off to select head 0.

Bus Out Bits 6 and 7 – Access lines

These 2 bits together control the movement of the heads from track to track.

	Tracks				
	00	01	02	03	04
Bus out Bit 6	1	0	0	1	1
Bus out Bit 7	1	1	0	0	1
Access Line 0	1	0	0	1	1
Access Line 1	1	1	0	0	1
Access Line 2	0	1	1	0	0
Access Line 3	0	0	1	1	0

Setting in track 00, both bits 6 and 7 are on. This makes access lines 0 and 1 active and access lines 2 and 3 inactive. To move the read/write heads to track 01, bit 6 must be turned off. This deactivates access line 0 and activate accesss line 2 while leaving access line 1 active. With these two access lines active, the stepper motor moves the read/write heads to track 01.

ACCESS SENSE

Bus In Bit 0 – New Media

If no index pulse is sensed for 200 ms or an index pulse duration exceeded 16 ms, this bit turns on indicating the 'new media' latch is set.

Bus In Bit 1 – MFM

If this bit is on the diskette adapter is in MFM mode. If this bit is off the diskette adapter is in FM mode.

Bus In Bit 2 – Inner Track Select (filter control)

This bit indicates the status of the inner track select (filter control) latch.

Bus In Bit 3 – Inner Tracks

This bit indicates the status of the inner tracks latch.

Bus In Bit 4 – Head Engage

This bit indicates whether the heads are loaded or unloaded.

Bus In Bit 5 – Head Selected

This bit indicates which side of the diskette is being used.

Bus In Bits 6 and 7 – Access Lines

These bits indicate the status of the access lines.

Power

AC POWER BOX

The 5114 operates with any of five single phase AC power sources (see *Appendix A*). AC power enters the 5114 via a line cord that attaches to the line filter in the AC power box. The AC power box also contains a fuse holder. An IPO switch controls distribution of AC power to the cooling fan and the DC power supply. The AC power box components are:

Line Cord	Supplies AC line input voltage to the AC power box.
Line Filter	Filters line noise to frame ground.
Fuse Holder	Holds the fuse that protects the internal AC wiring and components.

POWER SUPPLY

The 5114 uses a ferroresonant power supply that develops three DC voltages:

+5 Vdc	A1 board and the I/O interface port (The +5 Vdc from 5110 is not used in 5114)
-5 Vdc	A1 board
+24 Vdc	Diskette control card

These output voltages can vary within the following range before they affect the function of the machine:

Voltage	Range
+5 Vdc	+4.6 Vdc to 5.5 Vdc
-5 Vdc	-4.6 Vdc to -5.5 Vdc
+24 Vdc	+21.6 Vdc to 26.8 Vdc

The input voltages can vary ± 10% before they affect the operation of the machine.

The peak to peak ripple voltage should not exceed 0.16V on the + 5 Vdc and -5 Vdc or 0.8V on the +24 Vdc.

Input frequency variation should not exceed ± 1/2 cycle (0.5 Hz).

The power supply, which includes the AC input and DC output cables, is a field-replaceable unit and requires no adjustments. If the supply fails, replace the entire unit.

POWER SUPPLY PROTECTION

The power supply has a fuse to protect it from an overcurrent condition. When the current is excessive, caused by overloaded or short circuited output voltages, the fuse opens and the power supply shuts down.

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Diagnostic Aids

For information on diagnostic aids, see Section 4 of the *IBM 5110 Maintenance Information Manual*, SY31-0550.

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Appendix A. Installation Procedures

PREPOWER CHECK

Check with the customer to verify that the AC voltage outlet is grounded and the correct voltage is available.

CABLE INSTALLATION

1. Turn off the POWER switch on the 5110.
2. Attach the line terminator to the I/O port on the back of the 5114 unit if the 5114 is the last or only I/O unit.
3. Attach the external I/O interface cable assembly to the back of the 5110.

POWER ON CHECK

1. Turn off the IPO switch on the 5114.
2. Turn off the POWER switch on the 5110.
3. Connect the power cord to the AC power outlet.
4. Turn on the IPO switch on the 5114.
5. Observe the 5114 for signs of overheating or smoke. If any abnormal conditions are noted, turn off the IPO switch immediately.
6. Turn on the POWER switch on the 5110.
7. Observe both the 5110 and the 5114 for signs of overheating or smoke. If any abnormal conditions are noted, turn off the POWER switch on the 5110 and the IPO switch on the 5114 immediately.
8. Check that the 5114 fan is turning.
9. Use 5114 MAP 880 to check the 5114 operation and performance.
10. Replace all covers.

The 5114 serial number is on a tag on the frame behind the front cover.

GENERAL INFORMATION

Cover Cleaning

Use a mild soap or isopropyl alcohol (part 2200200). Do not use IBM cleaning fluid.

Safety

Remove all electrical power from the 5114 unit turning off the POWER switch on the 5110 and unplugging the 5114 line cord from the AC outlet.

Specifications

Dimensions:

	Width	Depth	Height
Inches	17.75	22.25	29.0
Millimeters	450.85	565.15	736.60

Weight: 130 lbs (58.97 Kg)

Heat output/hr: 648 Btu

Power Requirements:

AC Voltage	Phase	Hz	kVA
100 Vac	1	50	0.4
100 Vac	1	60	0.4
115 Vac	1	60	0.4
220 Vac	1	50	0.4
235 Vac	1	50	0.4

Power Cord Specifications:

Cable PD	0.4 ± 0.015 inch (10.16 ± 0.38 mm)
Shields	None
Conductor size	16 Awg (1.3 mm)
Length	6 feet (1.83 meters)

Operating Environment:

Temperature	60° F to 90° F (15.6° C to 32.2° C)
Relative humidity	8% to 80%
Maximum wet bulb	73° F (22.8° C)

Appendix B. Glossary

µs: Microsecond.

A: Both the logic block symbol for the AND function and the abbreviation for ampere.

AC: Alternating current.

access lines: The pulses on these lines turn the stepper motor.

AM: Address mark.

amplifier: An electronic circuit that increases the amplitude of a signal signal for distribution.

AR: Amplifier.

AR-DIF: See *differeniator-amplifier*.

backstop screw: An adjustable screw in the cover assembly that stops the backward movement of the bail assembly.

bail assembly: A mechanical arm that operates under control of the head load solenoid to load or unload the read/write heads.

band: See *drive band*.

basic data exchange: A format for exchanging data on diskettes between systems or devices that use a diskette 1.

block: A collection of records recorded as a unit.

blocking: Combining two or more records into one block.

C: Celsius.

carriage: The part that carries the two read/write heads under control of the stepper motor.

CE: See *customer engineer*.

characteristics: Electrical, physical, or functional features of a machine which are not specifications.

clamp: A part used to lock another part.

collet: The part of the cover assembly that centers and holds the diskette to the drive hub.

crosstalk: Data bits detected from one track while reading another track.

customer engineer (CE): A person who services IBM products in the field.

DC: Direct current.

DET: See *detector*.

detector (DET): An electronic circuit that detects a carried signal and converts it to a signal pulse.

differentiator-amplifier (AR-DIF): An electronic circuit whose output signal is a function of the time rate of change in the input signal.

diskette 1: A diskette used for storing data on only one surface.

diskette 2: A diskette used for storing data on both surfaces.

diskette 2d: A diskette used for storing data on both surfaces with twice the bit density used on a diskette 2.

DR: See *driver*.

drive band: A metal band connected to the stepper motor pulley and the head/carriage assembly.

drive hub: A continously running part that turns the diskette at 360 rpm.

driver (DR): An electronic circuit that increases the energy of a signal to a sufficient level to drive a predetermined load.

environmental: Pertaining to the environment.

F: Fahrenheit.

flux: The flow of magnetic force around an object when that object is magnetized or has electric current flowing through it.

FM (frequency modulation): See *modulation*.

head/carriage assembly: Two read/write heads mounted on common carriage.

hub: See *drive hub.*

Hz: Hertz.

IAD: Installation activity document.

Kg: Kilogram.

KHz: Kilohertz.

LED (light emitting diode): An electronic part used as a source of light.

logical record: A collection of related items. Portions of a logical record can be located in different physical records.

MAP: Maintenance analysis procedures.

MFM (modified frequency modulation): See *modulation.*

MIM: Maintenance information manual.

mm: Millimeter.

modulation: The process of varying the amplitude and frequency of the read and write signals.

ms: Millisecond.

mV: Millivolt.

ns: Nanosecond.

physical record: One or more records written one sector on a track.

PTX (phototransistor): An electronic part used to sense the light of an LED.

R/W: See *read/write.*

read/write (R/W): Refers to the function of reading data from and writing data to a diskette.

record: A collection of related items of data, treated as a unit.

rpm: Revolutions per minute.

solenoid: An electromechanical part that operates the bail assembly to load and unload the read/write heads.

spanned record: A logical record stored in more than one block.

stream files: Records of varying length that must be read sequentially.

V: Volt.

Vac: Volts alternating current.

Vdc: Volts direct current.

VFO (variable frequency oscillator): An electronic circuit used to synchronize the read and write circuits with diskette rotation in FM and MFM recording.

wiper assembly: A small plastic cover with a foam wiper that protects and cleans the drive band.

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