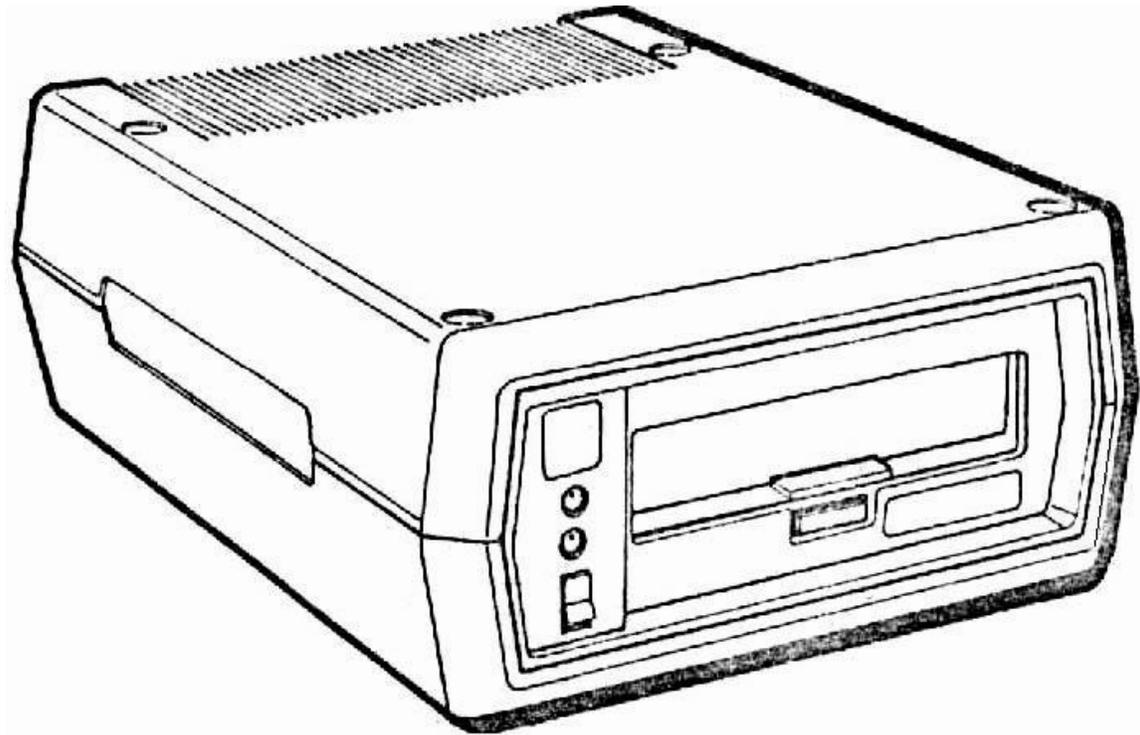


ATARI 810 DISK DRIVE



FIELD SERVICE MANUAL

□ JULY 1980
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REV.1

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SPECIFICATIONS

TECHNICAL SPECIFICATIONS

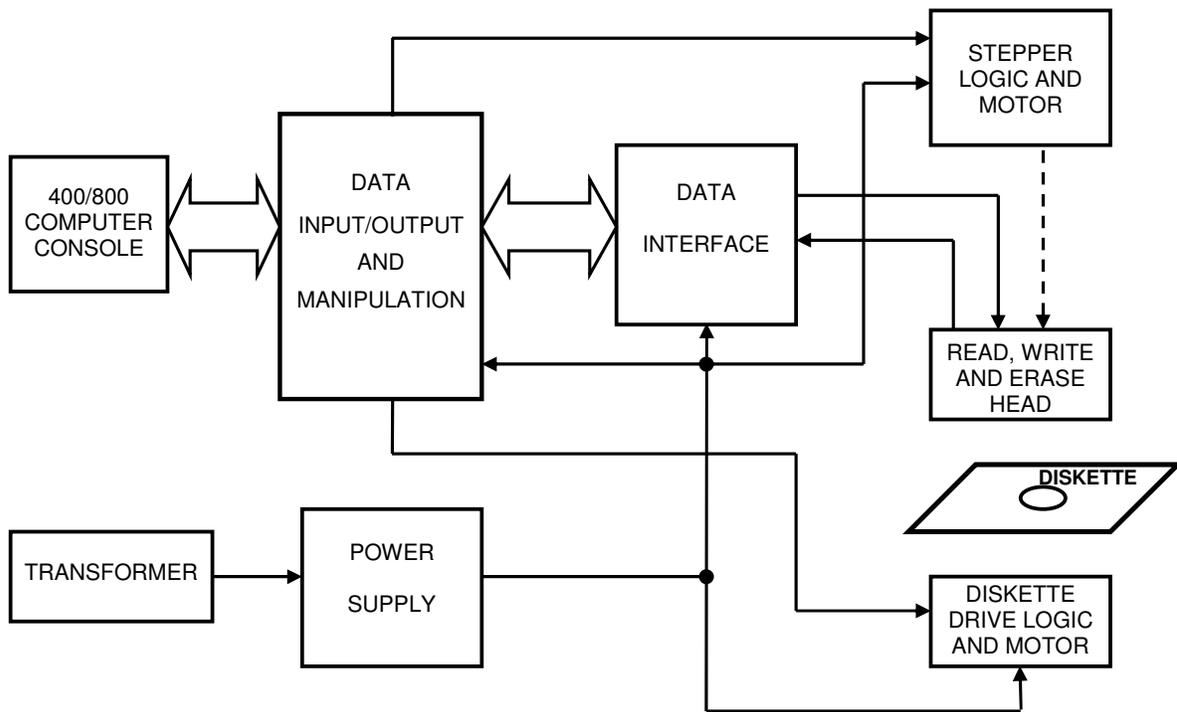
1. Uses ANSI standard 5¼ inch diskettes in a soft sectored format.
2. 40 tracks at 48 TPI track density.
3. Single density (FM), single sided recording.
4. Over 90K bytes storage per diskette.
5. 709 sectors of 128 bytes each.
6. Minimum data access time: 236 milliseconds.
7. Average data transfer rate: 6000 bits per second.
8. Automatic stand-by capability (built in microprocessor).
9. Up to four Drives can be daisy chained to a single 400/800 Computer Console (w/minimum 16K RAM) via select switches at the rear of the Drive.
10. Drives directly interface with the ATARI 400/800 Computer Console (16K RAM) or indirectly through the ATARI 850 Interface Module or 820 Printer.

THEORY OF OPERATION

THEORY OF OPERATION

The ATARI 400/800 Computer Console with 16K of RAM installed connects directly to the 810 Floppy Disk Drive. The Drive may also be daisy chained through the 820 Printer or the 850 Interface Module. Up to four Disk Drives can be connected to a single Console.

Refer to the Disk Drive Operators Manual for installation and operating instructions.

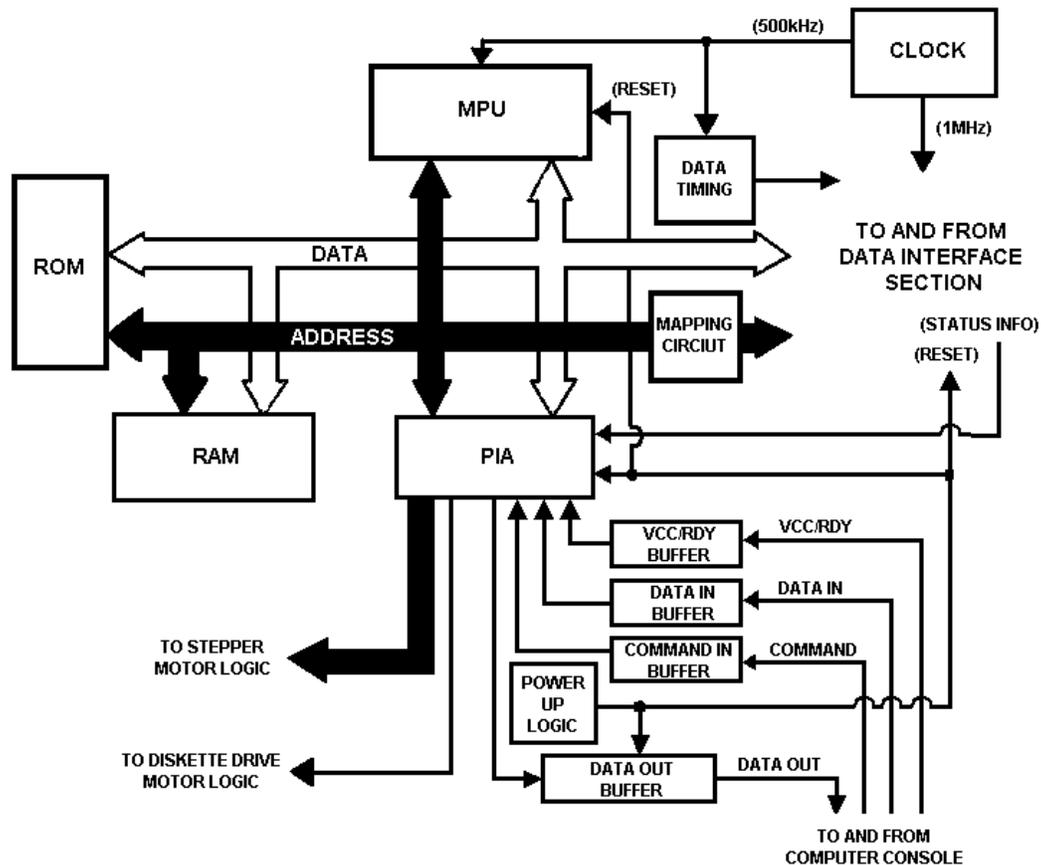


**ATARI 810 FLOPPY
DISK DRIVE**

The ATARI 810 Floppy Disk Drive consists of the following major sections:

- Data Input/Output and Manipulation
- Data Interface
- Read/Write and Erase Heads
- Stepper Motor and Logic
- Diskette Drive Motor and Logic
- Power supply

DATA INPUT/OUTPUT AND MANIPULATION SECTION



Data Input/Output and Manipulation Section

Data, control commands and a VCC/RDY signal from the Computer Console enter the Disk Drive through either of the two serial I/O connector jacks at the rear of the Drive chassis.

Each of the three main signal input lines are buffered for static protection and to reduce power consumption on the 800 I/O lines.

Data is sent by the Console in serial format, with checksums accompanying the data for validity verification.

The Drive's PIA is primarily a buffering and signal formatting device, with no decision making or computational capability. It is responsible for the following:

- Applying the Console's serial outputs to the Data 2nd Address Busses when requested by the Drive's Microprocessor Unit (NW).
- Assisting in the control of the Read/Write and Erase head position by buffering commands sent to the Stepper Motor Logic.
- Assisting in control of the Diskette Drive Motor Logic.
- Providing 128 bytes of RAM for temporary storage of status information and data sent by the Data Interface Section for application to the MPU.

The MPU provides the primary decision making and computational capabilities for the Disk Drive. The Drive's MPU is responsible for the following:

- Controlling data transfers, through its control over the Common Data and Address Busses.
- Interpreting and controlling the accomplishment of Console commands (temporarily stored in FLXM) and Disk Drive operating instructions (permanently stored in ROM).
- Controlling the Stepper, Disk Drive and Motor Logics, which are buffered by the PIA.

The Drive's ROM contains specific operating instructions used by the MPU to accomplish a variety of functions.

These functions include telling the Disk controller (WD1771-01) what task to perform.

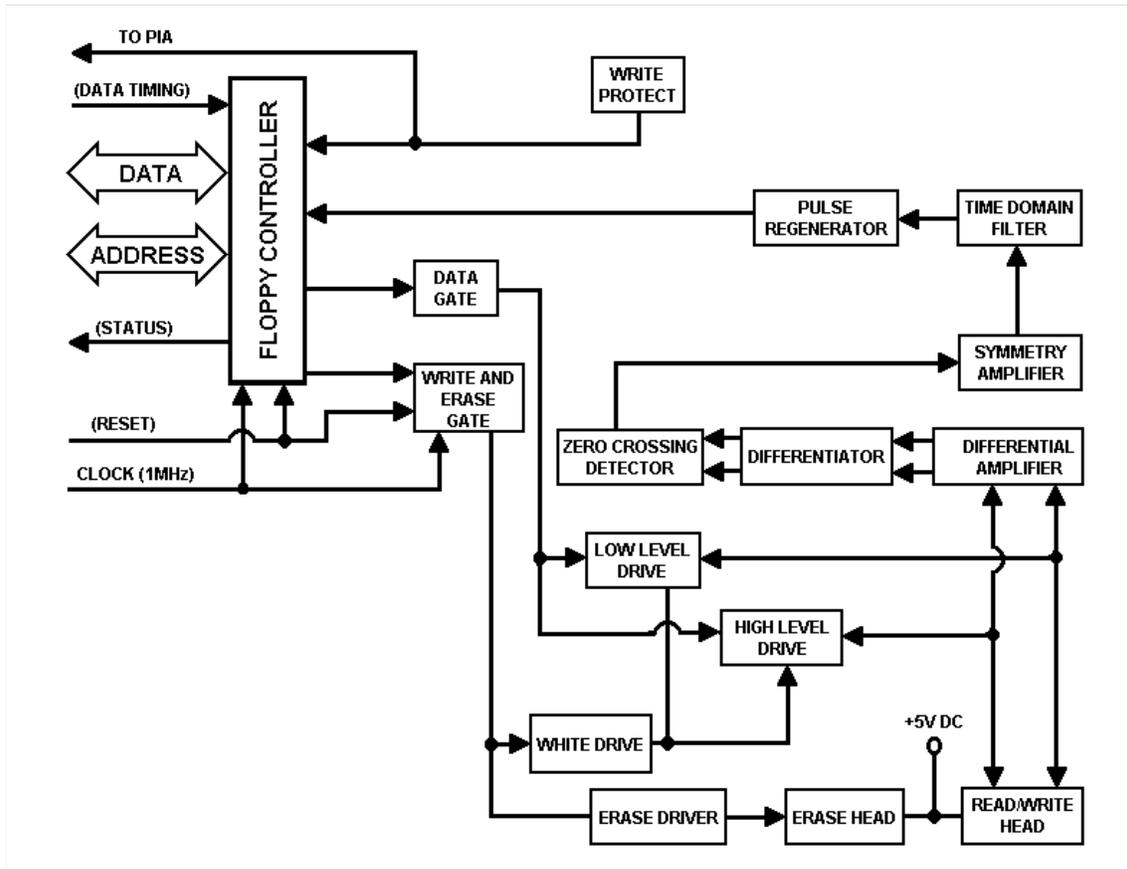
The Drive's RAM is used by the MPU for temporary storage of both data and system information.

The Drive's Data Output Buffer transfers the formatted data through the PIA to the Data Out line going to the Computer Console.

The Drive's Power Up Logic circuit resets the MPU, PIA and Data Interface Section whenever the Disk Drive is turned on. The RESET references the electrical circuits to their starting conditions. Additionally, the Power Up Logic circuit locks the Data Output Buffer off during a short period when the Drive is turned on. This prevents random pulses generated by the Drive's circuitry (during the initializing period) from being sent to the Console.

The Drive's Clock circuitry generates both a crystal controlled 1 MHz and a 500 kHz clock signal. The 1 MHz signal is used by the Data Interface Section. The 500 kHz signal is used both as a clock signal to the MPU, and to the data exiting from the Data Input/Output and Manipulation Section into the Data Interface Section.

DATA INTERFACE SECTION



Data Interface Section

The major element of the Data Interface Section is a Floppy Disk Controller (FDC). The FDC is a highly specialized microprocessor. It is responsible for the following activities:

- Combining data, timing and data validity pulses into the serial format to be recorded.
- Separating the above and providing the output data in parallel during a read operation.
- Controlling the Write and Erase Logic circuitry during a write operation.
- Generating the data validity codes (called Cyclic Redundancy Checks - or CRC's) during a write operation, and checking them during a read operation.

The Drive's Write and Erase Logic circuitry is controlled by, and receives its data from the FDC. Initially, the Data Gate converts the leading edge of each pulse (data, clock, etc.) into a single corresponding change of signed level. These levels then determine the polarity of the Drive's currents applied to the Read/Write Head through the High and Low level Drives, The Write Driver limits the write currents.



The FDC combines clock pulses with data to form a serial signal.



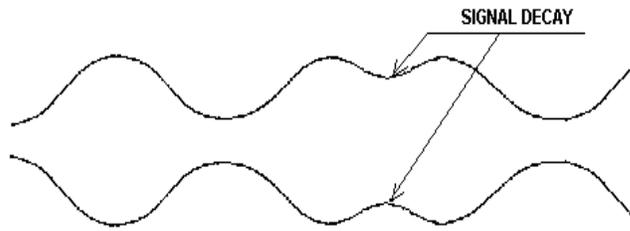
The Data Gate converts each pulse's rising edge into a logic level change, as shown.

Basically, this is the signal applied to the head during a write operation. The high levels out of the Data Gate turn on the High level Driver, and the low levels turn on the Low level Driver.

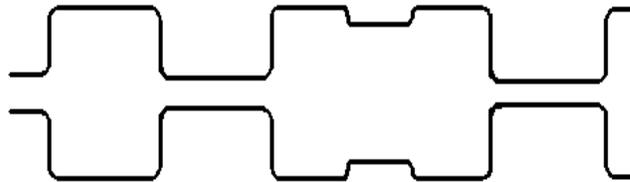
The Write and Erase Gate turns on both the Write and Erase Drivers during a write operation, and turns them off during a read operation. The Erase Driver drives the Erase Head during a write operation. See the Read/Write and Erase Head discussion for further information.

Major elements of the Drive's Read Data Conditioning circuitry are:

- Differential Amplifier - Initial amplification of Read/Write Head signals.
- Differentiator - Squaring up the two differential amplifier outputs.
- Zero Crossing Detector - The single output changes level whenever the two ,180° out-of-phase input signals cross their zero axis coincidentally (eliminates false pulses caused by



Two 180° out-of-phase signals are generated by head during a read operation and amplified by the Differential Amplifier.



The Differentiator squares the two out-of-phase signals.



The Zero Axis Crossing Detector provides a single output, further squared and now without any signal decay effects.



The Time Domain Filter provides a signal with very sharp leading and trailing edges.

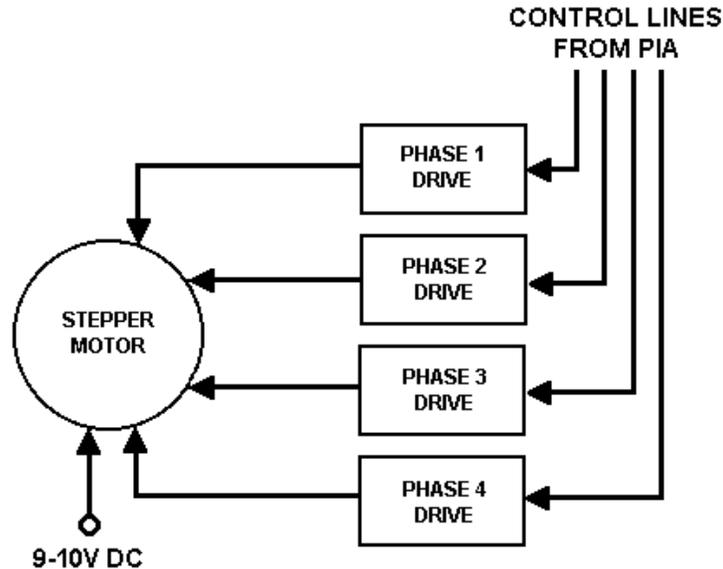


The Pulse Regenerator converts each logic level change into a single pulse, recreating the original signal produced by the FDC during the write operation.

The Drive's Write Protect circuit senses the presence or absence of a special notch in one side of the diskette casing. A write protected diskette's notch will be covered with an opaque tape. The circuit is basically an LED/photo transistor sensor, whose output is buffered before being applied to the FDC. With an unprotected diskette, the sensor signal allows the FDC to write data onto the diskette.

STEPPER MOTOR AND LOGIC

The Stepper Motor is a four phase motor with a 3.6° rotor rotation per step. The motor has a total of 100 poles, providing 100 rotor steps for the motor's full 360° rotation.



Stepper Motor and Logic

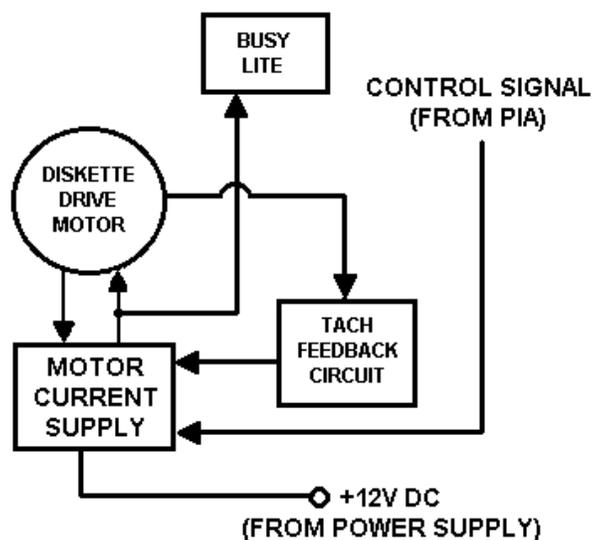
Each step change in the motor is translated through a steel band connection to a single track change for the Read/Write and Record Head assembly. The diskette is divided into 40 tracks, so the full range of the Stepper Motor is not used.

The Stepper Logic is controlled from the PIA. The four PIA signals are logic levels acting as the Stepper Motor's four phase inputs. These levels, in their various possible combinations, drive the Stepper Motor to reposition the head assembly from track to track.

The Stepper Motor is supplied with a nominal 3 to 10V DC from the Power Supply.

DISKETTE DRIVE MOTOR AND LOGIC

The Diskette Drive Motor is a DC motor that indirectly drives the diskette. The motor includes an internal tachometer, whose output is monitored in the Tach Feedback circuit. Variations in motor speed, as sensed by the Tach Feedback circuit, vary the current supplied to the motor. Diskette speed is set to 290 RPM \pm 1%.



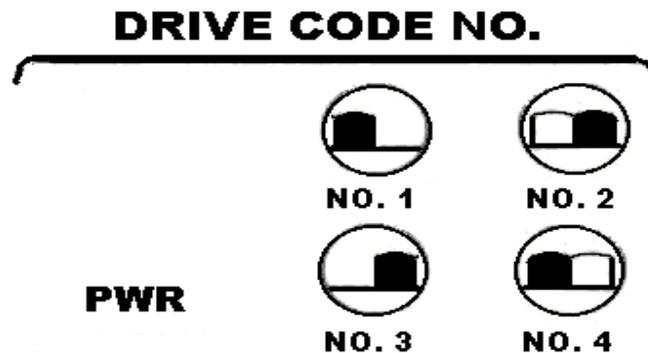
Diskette Drive Motor and Logic

Motor rotation is translated into diskette rotation via a pulley (attached to the motor shaft), a drive belt and a flywheel attached to a diskette drive spindle.

When a diskette has been inserted into the Disk Drive and the front door has been latched closed, the diskette is centered and clamped to the spindle by a clutching cone assembly.

Whenever the Diskette Drive Motor is supplied with power, the Drive's BUSY lite (LED) is turned on.

DISK DRIVE SELECT



A double "Single pole - Double throw" switch gives the Disk Drive operator the ability to assign a number to, and therefore a code for addressing, each of up to four Drives that could be daisy chained together.

The switch is accessible at the rear of the Drive chassis. The switch settings are read by the Drive's MPU through the PIA.

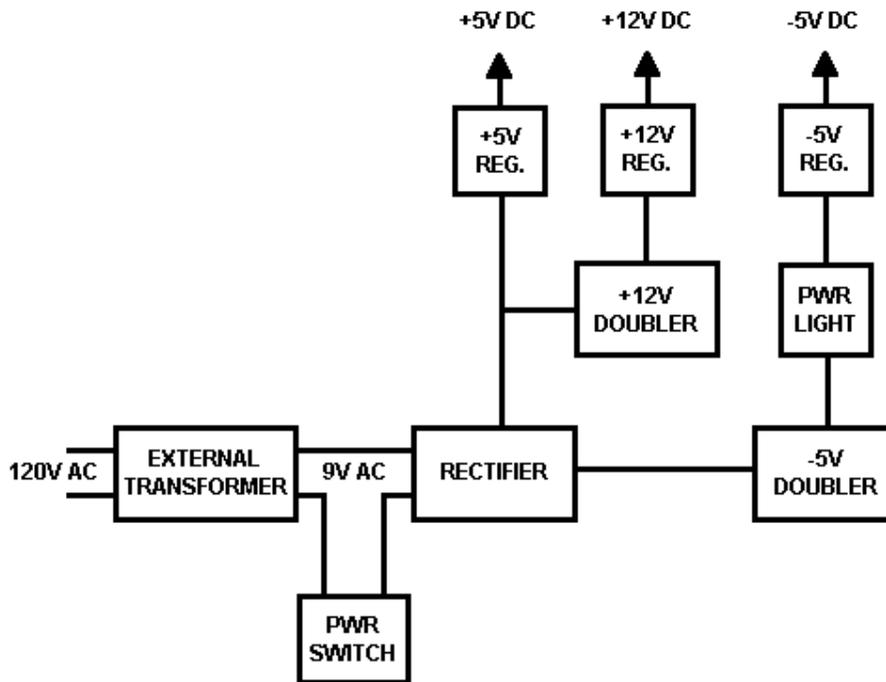
POWER SUPPLY

An external step-down transformer is supplied with each Drive. The 120V AC line Power is dropped to 9 VAC by the transformer. This 9V AC enters to the Drive through the "PWR" jack at the back of the chassis.

Turning the Drive's front panel "PWR" switch ON applies the 9 VAC to a full wave bridge rectifier.

The Power Supply provides the following:

- The unregulated 9-10V DC Diskette Drive Motor Supply.
- A regulated +5V DC.
- A regulated +12V DC (initially produced by a voltage doubler circuit).
- A zener regulated -5 VDC (also produced by a voltage doubler circuit).



A "PWR ON" lite (LED) is turned on through the -5 VDC section of the supply.

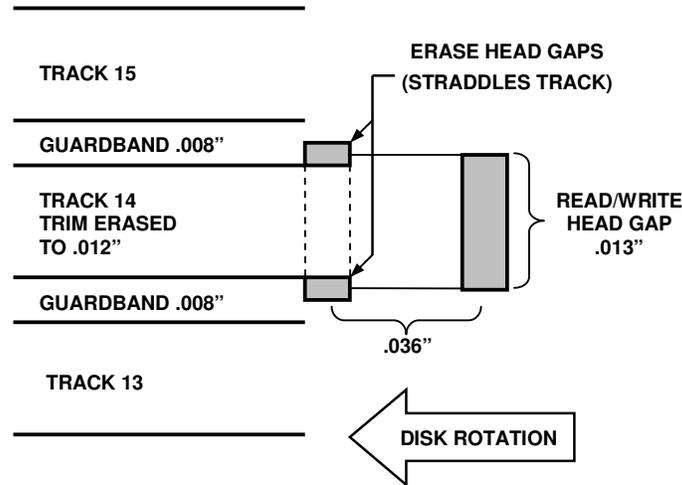
READ/WRITE AND ERASE HEADS

A magnetic head converts electrical currents into magnetic fields, and vice-versa. The Read/Write Head consists primarily of two ferrite core halves, wound with a centertapped coil. The centertap is connected to the regulated +5V DC from the Power Supply. One end of the coil is connected to the High level Driver and the other end to the Low level Driver.

WRITE OPERATION

Each logic level causes current to flow in one half of the coil, with a high in one direction and a low in the other. These currents set up corresponding magnetic fields in the core halves, with a high represented by a field in one direction, and a low by a field in the opposite direction.

When the ferric oxide coating on the diskette is in contact with the head, it completes the magnetic path between the core halves. In response to the change in direction of the magnetic field (logic level change) passing through the diskette's coating, the oxide particles realign themselves. Particle alignment in one direction represents a high level, and alignment in the other direction a low level.



During a write operation, the magnetic fields coupling through the diskette print a relatively wide (.013") path of aligned particles. In order to prevent one recorded track from interfering with either the next inner or next outer track, a blank space, called a guardband, is created between tracks. The Erase Head creates these guardbands. It straddles the Read/Write Head in such a way that just after (.036") the data is written onto the diskette, the Erase Head "tunnel" erases the track width down to .012", leaving .008" guardbands between tracks.

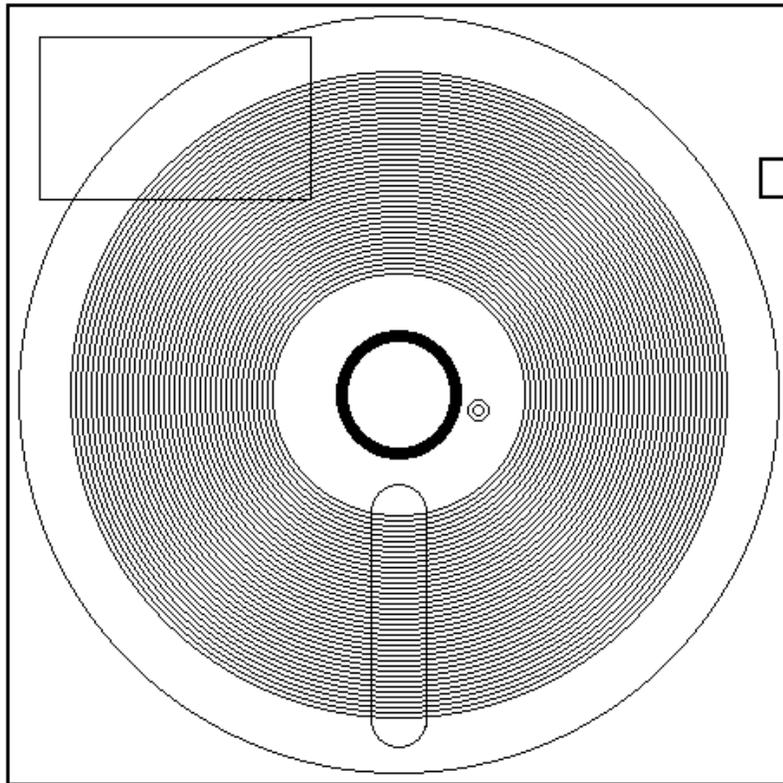
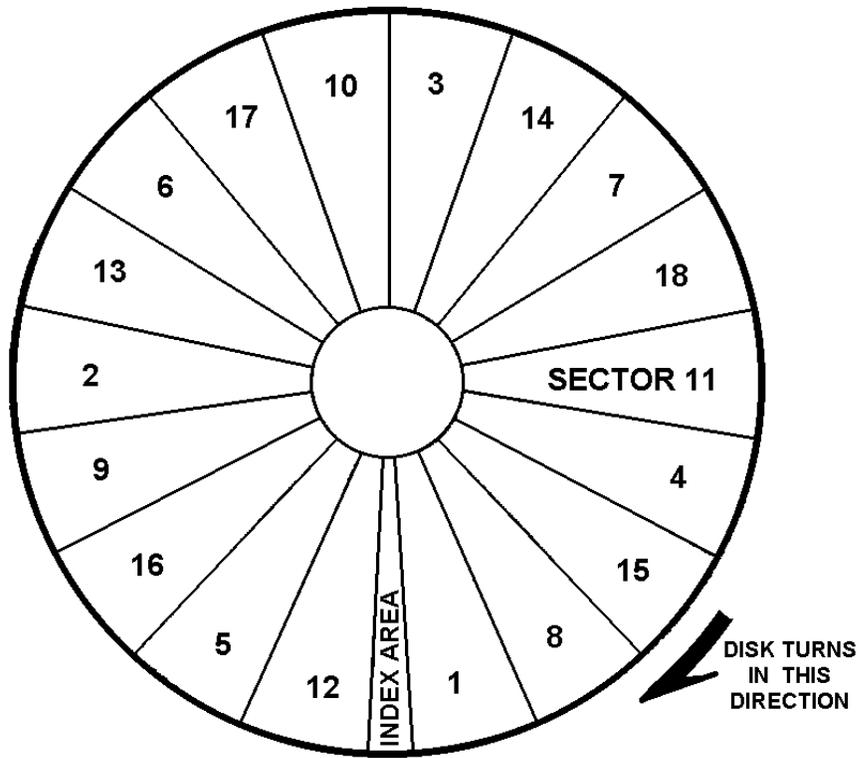
READ OPERATION

During a read operation, the very small fields existing due to particle alignment on the diskette couple through the head core halves. The diskette is rotating, causing the specific field being felt in the core halves to change for each change in particle alignment (i.e. change of recorded logic level). The changing fields in the core halves generate corresponding currents in the head coil windings. It is these very small signals that are applied to the differential amplifier.

DISKETTE FORMATTING

The specific arrangement of information recorded onto a diskette is called the diskette format. Unless a Master Diskette is to be used, the diskette must be initially formatted with a Disk Operating System (DOS) software program.

The DOS software divides the diskette into 19 pie-shaped slices, 18 of which are called sectors. These are not the same as the "709 FREE SECTORS" referred to when you list the directory of a disk. Because the diskette division is accomplished totally through software, this process is called "soft sectoring". The 18 sectors are equal in size, but the 19th (very narrow) slice acts as an index to define the start of each of the 40 tracks.



All 40 tracks receive the same formatting as follows:

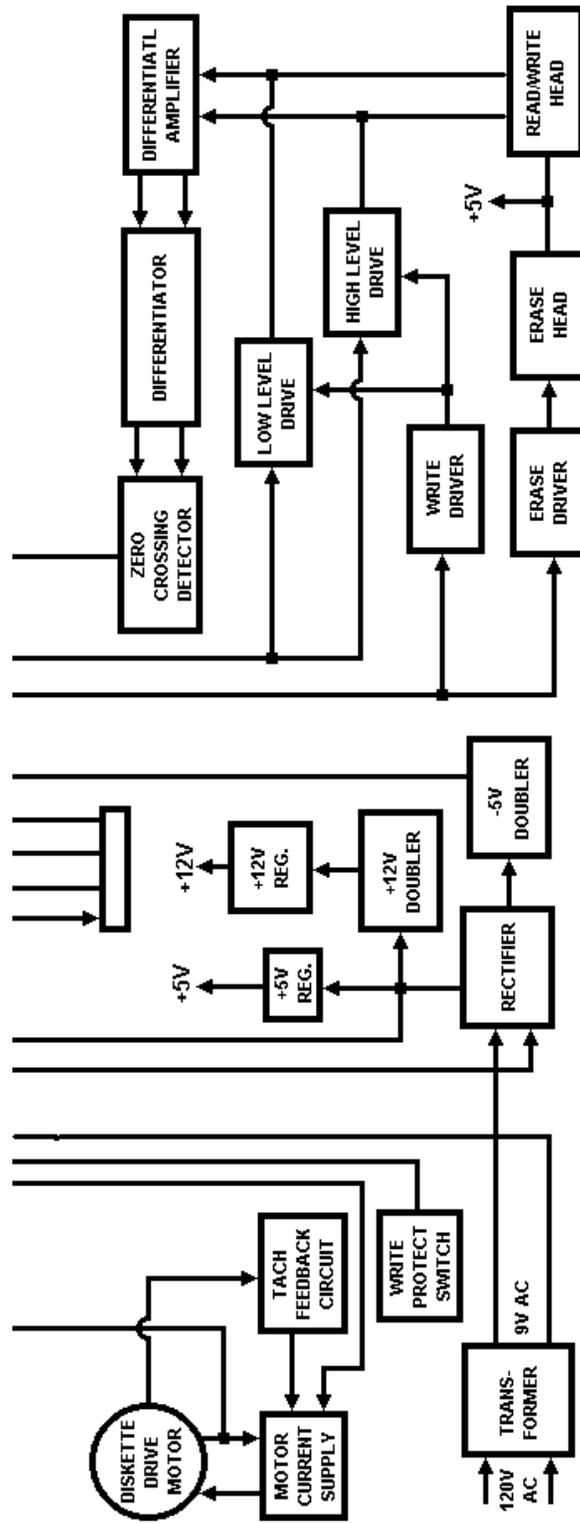
*	[256 bytes	00
		1 byte	FC (index mark)
		11 bytes	00 or FF
**	[6 bytes	00
		1 byte	FE
		1 byte	Track Number (00 thru 27 hex)
		1 byte	00
		1 byte	Sector Number (01 thru 12 hex)
		1 byte	00
		1 byte	CRC byte 2
		1 byte	CRC byte 1
		17 bytes	00 (or 11 bytes FF and 6 bytes 00)
		1 byte	FB (data address mark)
		128 bytes	Data (FF for blank fill)
		1 byte	CRC byte 2
		1 byte	CRC byte 1
		11 bytes	00 or FF

Cyclic Redundancy Checks (CRC's) are generated in the Drive's Floppy Disk Controller (FDC) during a write operation. The FDC uses the recorded CRC's during a read operation to verify the data. CRC's are similar in function to the checksums used between the Computer Console and the Disk Drive's MPU.

- * Appear only once per track for indexing.
- ** Repeated 18 times per track, producing the full 18 sectors.

BLOCK DIAGRAMS AND SCHEMATICS

On the following pages are block diagrams and schematics for the Disk Drive. Further understanding of the system's operation can be obtained by comparing these.



ATARI 810 REAR BOARD BLOCK DIAGRAM

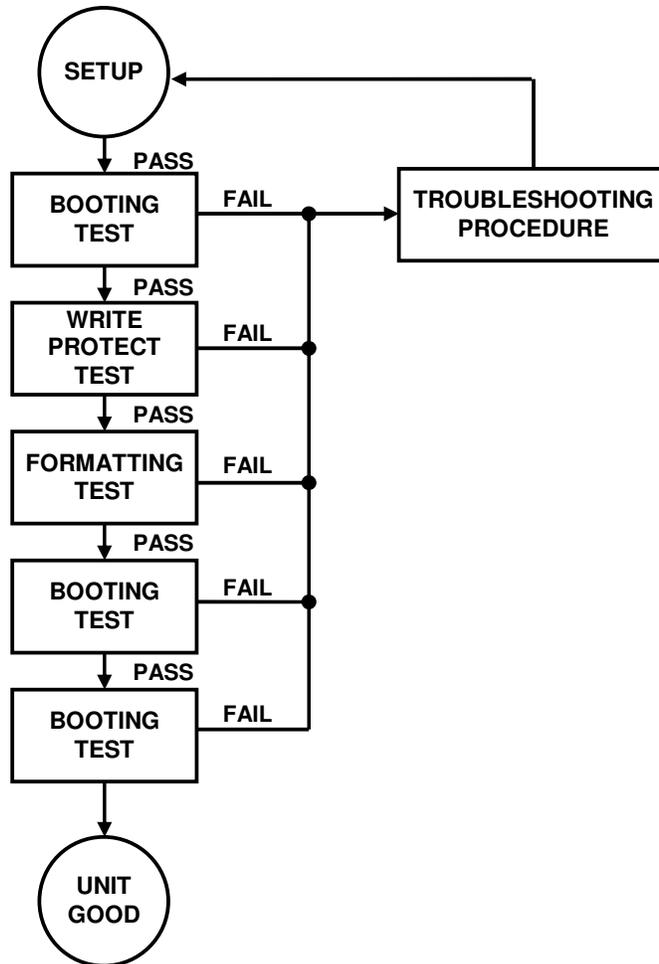
FLOPPY QUICKCHECK

This procedure should be completed both as a pre-service checkout and a final (post-service) checkout for the Disk Drive.

As a pre-service checkout, it will assist in identifying problems in the Drive.

As a final checkout, it will ensure that all repairs and alignments were successfully completed.

This procedure follows this flow chart:



All tests must be completed in the sequence shown.

The following are required to perform these procedures:

- A. Atari 400/800 Computer Console with a BASIC cartridge and minimum 16K RAM installed.
- B. I/O cables and Console/Drive power packs.
- C. TV.
- D. Master Disk File Manager diskette with writeprotect notch taped.
- E. Blank scratch diskette (not write-protected).
- F. Prerecorded sample diskette with DOS and sample programs recorded on a known "good" Disk Drive.

I

SETUP

1. Connect the Drive to the Console and connect both to power.
2. Turn the Drive ON and wait for the BUSY lite to go off. If BUSY lite does not come on and then go off, recheck connections then refer to the Troubleshooting Guide.

BOOTING TEST

1. Insert A Master Disk File Manager diskette into the Drive and close the Drive's door.
2. Turn the Console OFF, then ON. Verify that data is transferred from the diskette to the Console RAM (turn up the TV sound and listen for the "buzz. ..buzz...buzz...etc" , this should take about 10 seconds). When completed, the TV screen should display the word READY.
3. If the TV displays any ERRORS or does not show READY very shortly, repeat step 2. If the system still will not "BOOT UP", recheck your Console/Drive system and hookup for misconnections or gross equipment failures. If none are found and the system continues to ERROR, refer to the Troubleshooting Guide in this manual.
4. When the system has booted:
 - a. type DOS (Disk Operating System)
 - b. press the RETURN key

5. Verify that the DOS menu appears on the TV screen. Refer to the Troubleshooting Guide if you encounter an ERROR on the TV screen.

WRITE PROTECT TEST

This test must be completed with the write-protected Master diskette installed. The TV screen should be displaying the DOS menu from the Booting Test.

1. At the Console:
 - a. type I (capital letter)
 - b. press RETURN
 - c. type 1 (number one)
 - d. press RETURN
 - e. type y
 - f. press RETURN t
2. Verify that, the TV screen displays ERROR-144. If it does, the write protect circuit is operating correctly, go on to step 3. If it does not:
 - a. Repeat Step 1 again.
 - b. If the ERROR-144 still does not appear, refer to the Troubleshooting Guide.
3. Remove the Master diskette from the Drive.

FORMATTING TEST

CAUTION: The formatting operation erases the contents of a diskette.

This test must be completed with the DOS from the Master diskette still stored in the Console RAM.

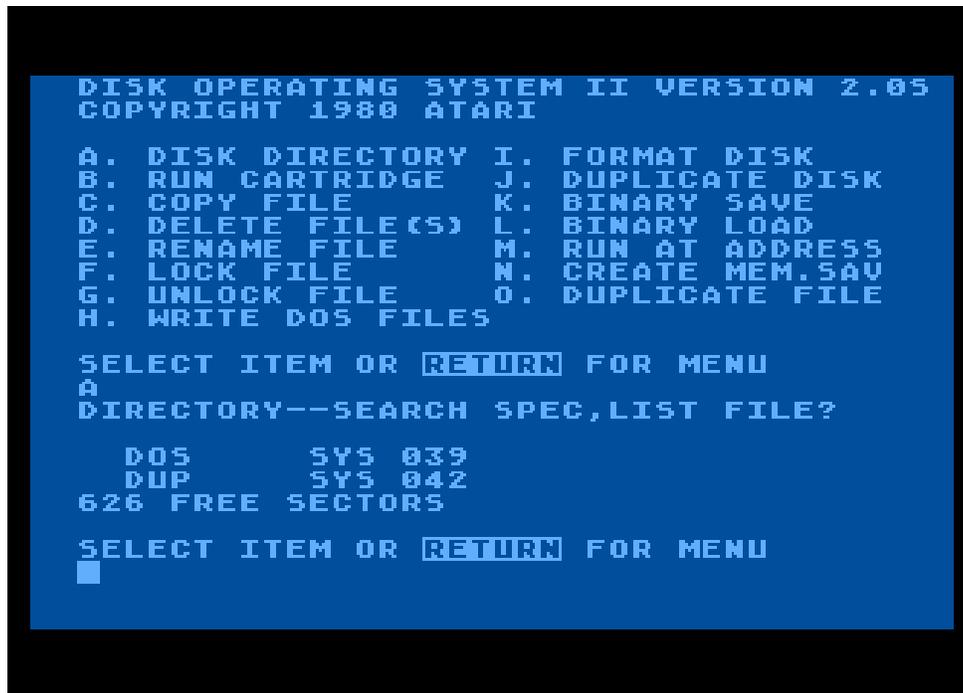
1. Insert a non-write-protected scratch diskette into the Drive and close the door.
2. At the Console:
 - a. press SYSTEM RESET
 - b. type DOS
 - c. press RETURN
 - d. type I (capital letter)
 - e. press RETURN
 - f. type 1 (number one)
 - g. press RETURN
 - h. type Y
 - i. press RETURN

3. Verify that after about 45 seconds OE formatting the Drive's BUSY lite turns OFF and no ERRORS have been displayed on the TV screen (refer to the Troubleshooting Guide for any ERRORS).
4. At the Console:
 - a. type A
 - b. press RETURN
 - c. press RETURN
 - d. Verify that "709" or "FREE SECTORS 709" is displayed at bottom of screen. If not, refer to the Troubleshooting Guide.
5. Press RETURN to get back to "MENU"

WRITE VERIFICATION

This test must immediately follow the FORMATTING TEST.

1. At the Console:
 - a. type I
 - b. press RETURN
 - c. type Y
 - d. press RETURN
2. Verify that the TV screen displays SELECT ITEM after a short period of time. If it does not, refer to the Troubleshooting Guide.
3. At the Console:
 - a. type A
 - b. press RETURN
 - c. press RETURN
4. Verify that the TV screen displays DOS.SYS and number of sectors used, followed by the number of sectors remaining. If it does not repeat the procedure. If the second attempt fails, refer to the Troubleshooting Guide.



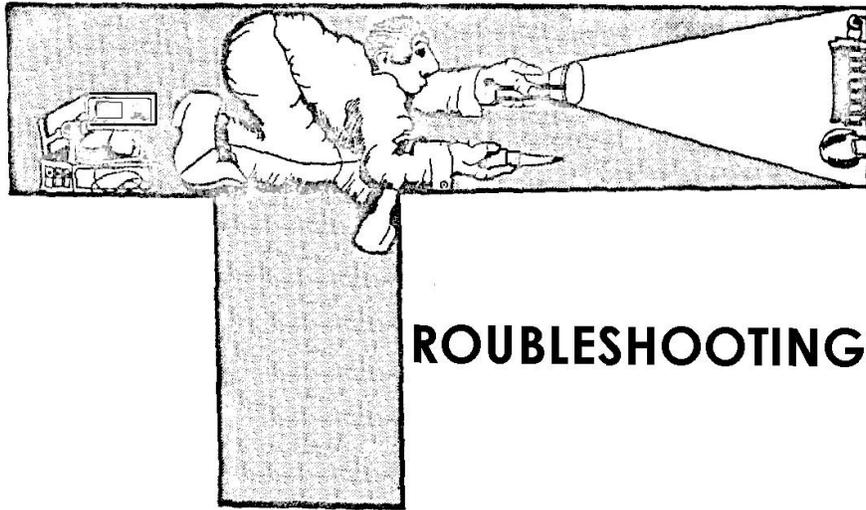
5. Delete the file as follows:
 - a. At the Console:
 1. press RETURN
 2. type D
 3. press RETURN
 4. type DOS.SYS
 5. press RETURN
 6. type y
 7. press RETURN
 - b. After a "SELECT ITEM" appears, at the Console:
 1. type A
 2. press RETURN
 3. press RETURN
 - c. Verify that the TV screen indicates that there are 709 free sectors remaining.
6. Remove the blank scratch diskette from the Drive.

COMPATIBILITY TEST

This test verifies that the Drive can read programs from a diskette recorded on a known "good" Drive.

1. Insert a sample diskette into the Drive.
2. Turn the Console OFF, then ON.
3. Verify that after about 10 seconds, the TV screen displays READY.
4. At the Console:
 - a. type DOS
 - b. press RETURN
5. Verify that the DOS menu appears on the TV screen, indicating that the diskette data was correctly loaded into the Console RAM. Refer to the Troubleshooting Guide in case of any ERRORS.
6. At the Console:
 - a. type A
 - b. press RETURN
 - c. press RETURN
7. Verify that the Drive's BUSY lite comes ON as the Drive loads its directory listing into the Console. The directory should appear on the TV screen.
8. Choose a program you wish to load.
At the Console:
 - a. press RETURN
 - b. type B
 - c. press RETURN
 - d. type LOAD "D:NAME OF PROGRAM"
 - e. press RETURN
9. Verify that the Drive's BUSY lite comes on as the Drive loads the selected program. After several seconds, the word READY should appear at the top of the screen. If not, refer to the Troubleshooting Guide.
10. At the Console:
 - a. type RUN
 - b. press RETURN

Verify that the selected program runs correctly. If it ERRORS, refer to the Troubleshooting Guide.

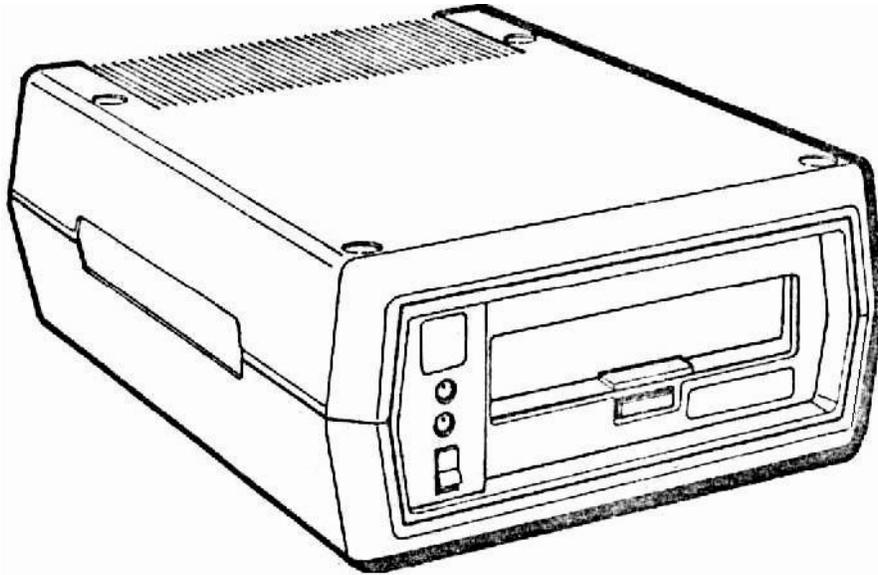


	SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
1	Drive will not turn ON.	A. Defective transformer. B. Electrical malfunction: Power Switch on Side PCB, Power Supply on Rear PCB.	A. Replace transformer. B. Replace and/or troubleshoot PCB(s).
2	Drive will not turn OFF.	A. Defective Side and/or Rear PCB	A. Replace or repair PCBs.
3	Diskette does not turn.	A. Drive Belt has fallen off Flywheel/Pullen or is broken. B. Drive Motor defective. C. Clutch Cone not clamping diskette. D. Electrical malfunction Drive Motor Circuit. Rear PCB.	A. Reposition or replace Drive Belt. B. Replace Drive Motor. C. Adjust or replace Clutch Cone assembly. D. Replace and/or troubleshoot PCB.
4	Diskette speed slow or varying.	A. Drive Motor Tach line out of place. B. Write Protect Circuit bad. C. Drive Belt incorrectly tensioned. D. Drive Belt stretched. E. Electrical malfunction Drive Motor circuit Rear PCB. F. Spindle Bearing freezing.	A. Connect green Motor Harness to center terminal of Write Protect Harness. B. Replace transport left Side Plate. C. Adjust Belt tension D. Replace Drive Belt. E. Replace and/or troubleshoot PCB. F. Replace Spindle Bearing.
5	Diskette won't eject when front door is opened.	A. Eject mechanism need adjusting or is broken. B. Clutch Cone-to-Spindle clearance (door open) too small.	A. Adjust or replace Eject Mechanism. B. Shim the Clutch Cone assembly.
6	Front door won't open	A. Door latching mechanism need adjustment or is broken.	A. Adjust or replace door latch.
7	Drive/Console System not boot-up	A. Drive Motor speed incorrect. B. Can't find Track 00. C. Electrical malfunction Side or Rear PCB(s). D. Stepper Motor malfunctioning. E. Radial track misalignment. F. Bad Head	A. Adjust Drive Motor speed. B. Adjust Track 00 stop setscrew. C. Replace and/or troubleshoot PCB(s). D. Replace Stepper Motor. E. Complete radial track alignment. F. Replace Head assembly.

Continue...

	SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
8	Occasional read errors all tracks.	A. Damaged diskette. B. Dirty or magnetized head. C. Worn or dirty head pressure pad. D. Overstressed pressure pad arm spring.	A. Replace diskette. B. Clean and demagnetize head. C. Replace head pressure pad. D. Replace spring or head assembly.
9	Occasional read errors inner tracks.	A. Drive Motor speed incorrect. B. Electrical malfunction in read circuit.	A. Adjust Drive Motor speed. B. Replace and/or troubleshoot Rear PCB, Side PCB or Head. (Check for slow Q102 or Z104 on Side PCB.
10	Occasional read errors outer tracks.	A. Drive Motor speed incorrect. B. Electrical malfunction in read circuit.	A. Check to ensure diskette is not write-protected. B. Replace Z105. C. Replace and/or troubleshoot PCB(s), transport.
11	Drive incompatibility	A. Drive Motor speed incorrect. B. Radial track misalignment.	A. Adjust Drive Motor Speed. B. Replace and/or troubleshoot Rear PCB, Side PCB or Head.
12	Various errors code during operation.	A. Eject mechanism need adjusting or is broken. B. Clutch Cone-to-Spindle clearance (door open too small.	A. Adjust or replace Eject Mechanism. B. Complete radial track alignment.
13	Drive writes onto write-protected diskettes.	A. Malfunctioning Write-Protect circuit.	A. Check write-protect LED/photo-transistor, wiring harness connections. Transport left sideplate.

DISSASSEMBLY / REASSEMBLY



DISASSEMBLY AND REASSEMBLY

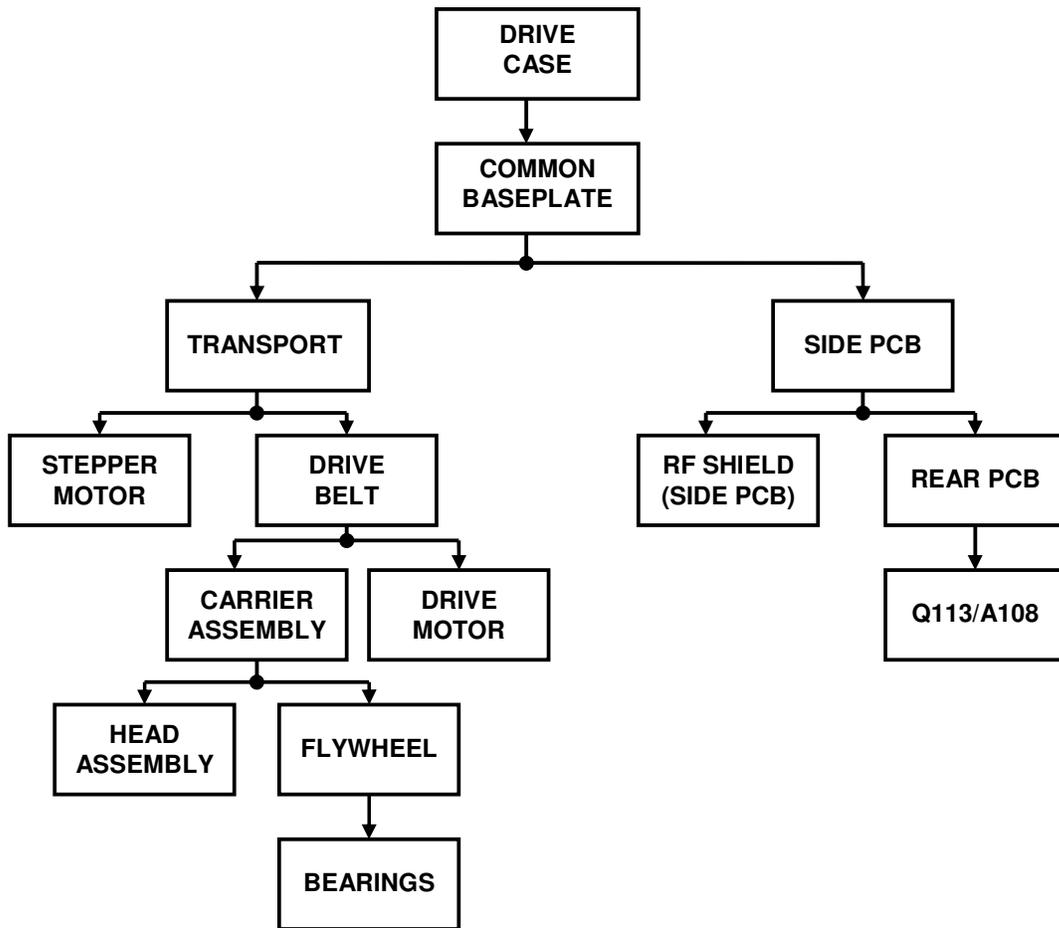
The level of Disk Drive disassembly will vary with the specific problem encountered. Some procedures list steps which are themselves procedures: i.e. "Disassemble the Drive case." When you encounter an underlined step, turn to that procedure first and follow it before proceeding.

SPECIAL NOTES

1. Refer to the Disk Drive and 400/800 Operators Manuals for proper Drive setup and operation.
2. Disk Drive circuitry includes static sensitive MOS devices. All Drive repairs should be performed at static protected work surfaces. Anyone handling Drive PCBs should wear a grounding strap.
3. To prevent thread damage, use only the specified screws.
4. Overtightening screws will strip the threads on plastic and aluminum parts. Do not exceed 6 inch pounds torque for plastic parts, or 10 inch pounds torque for aluminum parts.

5. Internal wiring connections are made with wiring harnesses terminated by nonpolarized pins and jacks. Be sure all pins and jacks are correctly installed before trying to operate the Disk Drive.
6. When reassembling the Drive, ensure that all wiring harnesses are routed in such a way as to prevent them from being pinched between reassembled parts.

DISASSEMBLY FLOW CHART



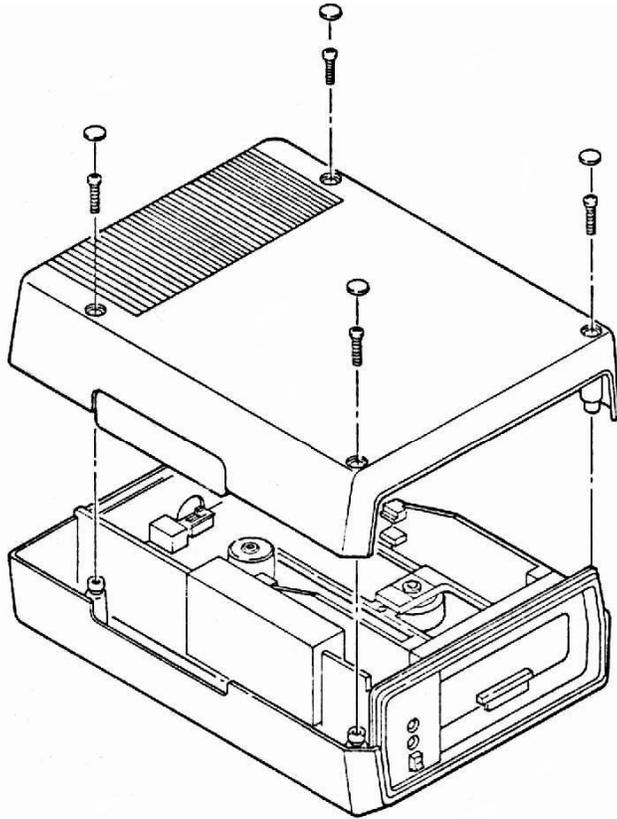
Identify the level of required and complete disassembly the sequence of steps indicated above.

DISSASSEMBLY

I

DISASSEMBLING THE DISK DRIVE CASE

WARNING: Unplug the Drive's AC transformer from AC power BEFORE opening the case.



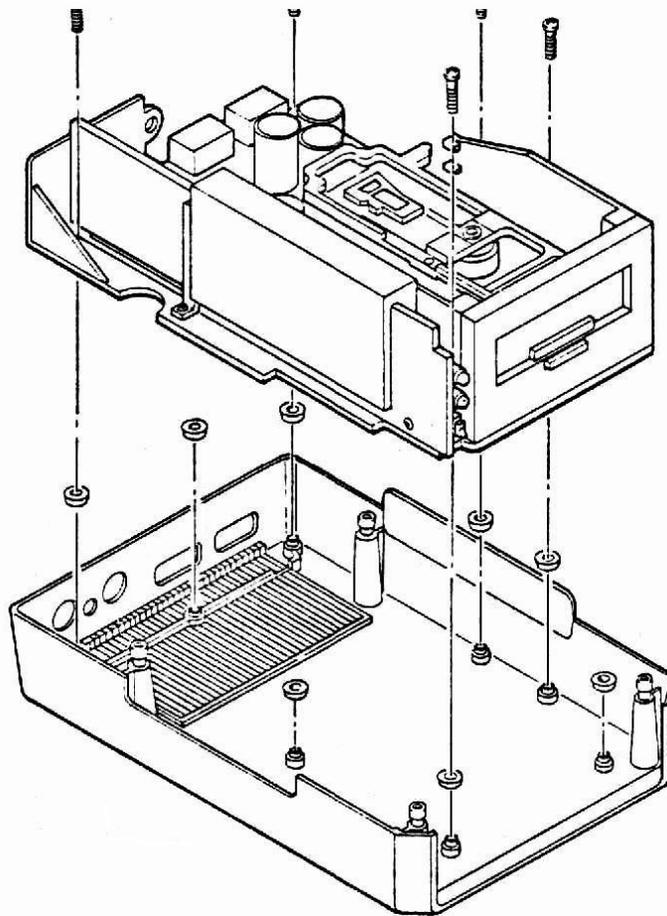
1. With the Disk Drive rightside up on a suitable work surface, locate and remove the four adhesive screw hole covers on the tophousing.
2. Locate and remove the four screws securing the tophousing to the base.
3. Lift the tophousing from the base, and set it aside.

CAUTION: The record/playback and erase head sub-assembly is extremely sensitive to magnetic fields. DO NOT use magnetized tools or articles when working inside the Drive case or near the Drive transport.

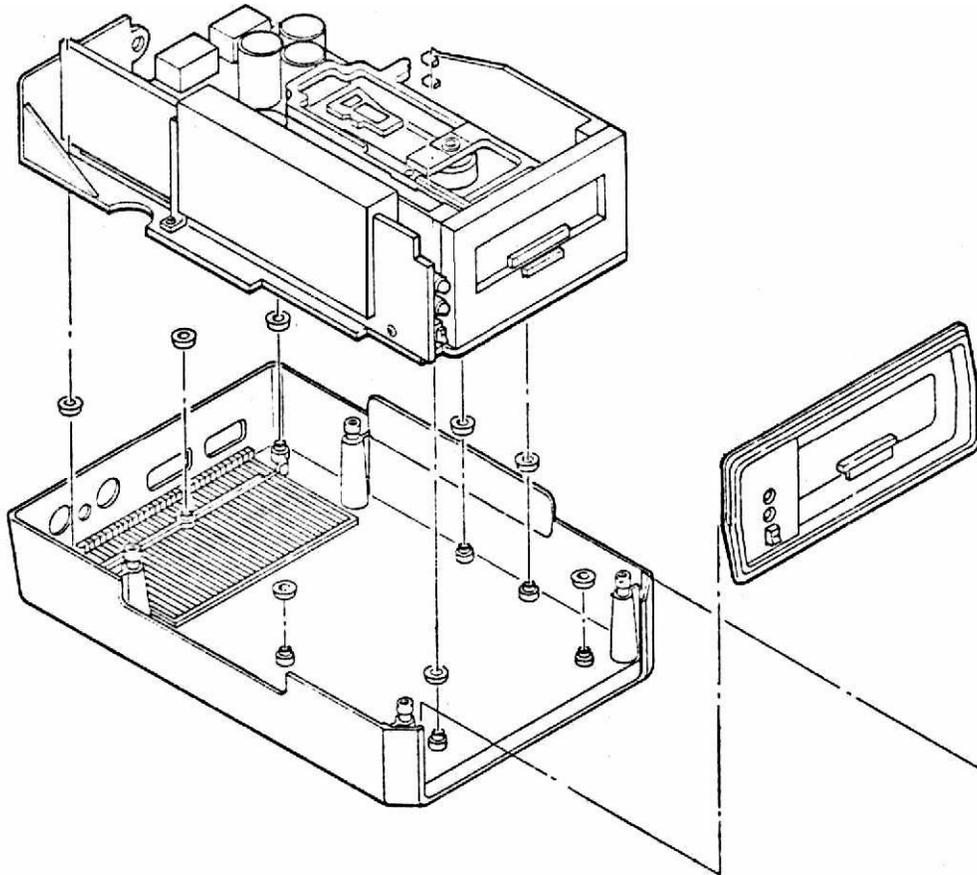
REMOVING THE COMMON BASEPLATE

NOTE : Removal of either the side PCB, rear PCB or Drive transport requires removal of their common baseplate from the Disk Drive base.

1. Disassemble the Disk Drive case.
2. Disconnect the AC transformer power cord from the PWR jack at the rear of the Drive chassis.
3. Disconnect any I/O cables from the I/O CONNECTORS at the rear of the Drive chassis.
4. Locate and remove the five screws securing the common baseplate to the base.



5. Carefully lift the baseplate from the base. Note that each of the bosses in the base is topped with a rubber washer.



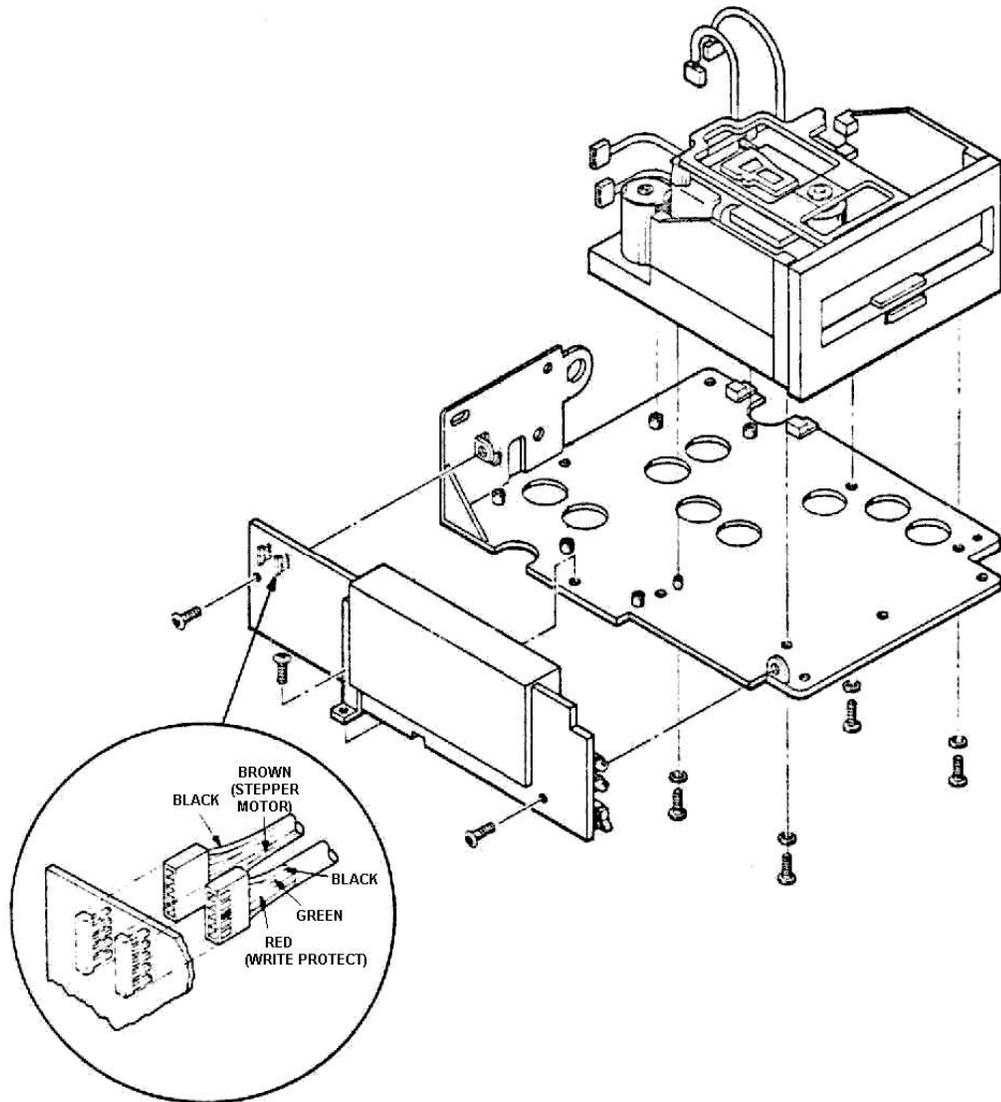
NOTE: As you lift the baseplate from the base, the front coverplate will lift out at the same time. Remove the coverplate from the baseplate and set it aside.

6. Place the baseplate on a suitable static protected work surface.

REMOVING THE SIDE PCB

1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Locate and disconnect the write protect wiring harness (nonpolarized - black, green, (blank), red, black) from the side PCB.
4. Locate and disconnect the stepper motor wiring harness (nonpolarized - black, white, red, green, brown) from the side PCB.

NOTE: See Appendix for alternate wiring harness arrangement.

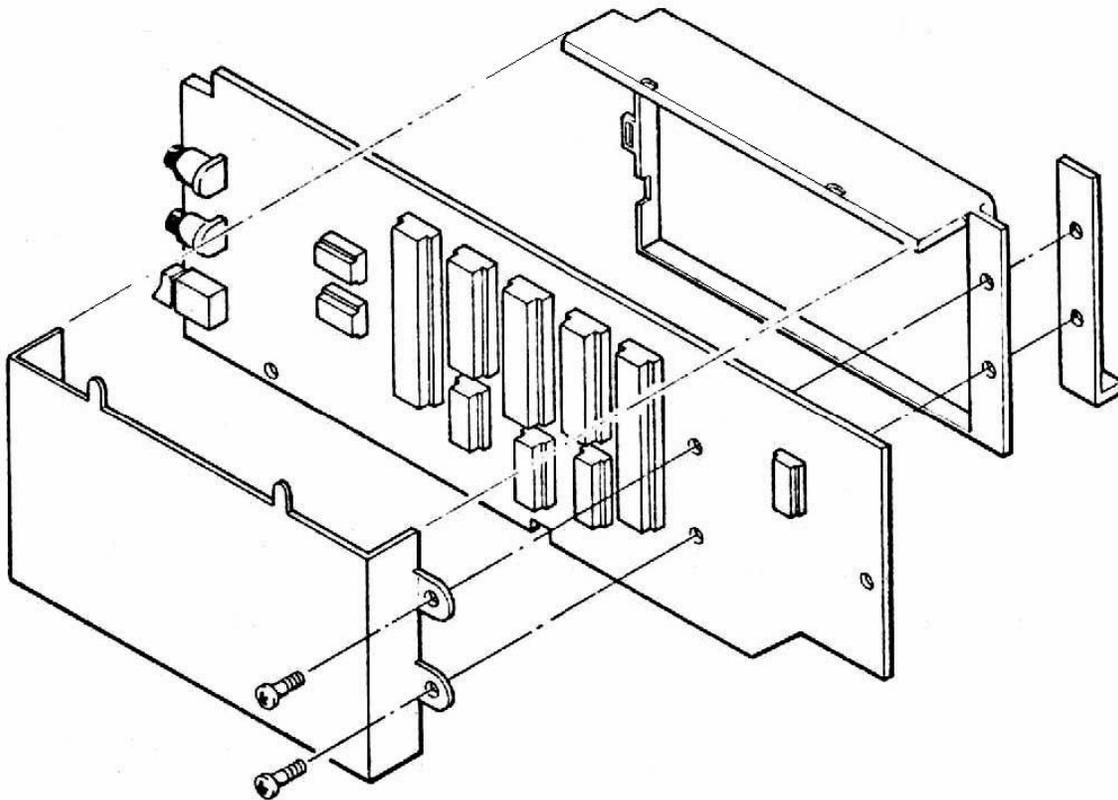


5. Locate and remove the three screws securing the side PCB and its center ground bracket to the common baseplate.
6. Grasp the side PCB at both its front edge and its upper rear corner. Lift the PCB straight up to disengage its rear jack from the row of pins
NOTE: You may have to rock the PCB slightly to overcome the jack-to-pin tension between the two PCBs.
7. Place the side PCB on a static protected work surface.

REMOVING THE RF SHIELD (SIDE PCB)

1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the side PCS from the common baseplate.
4. Locate and carefully straighten the three tabs securing the RF shield case halves together on the side P6B.

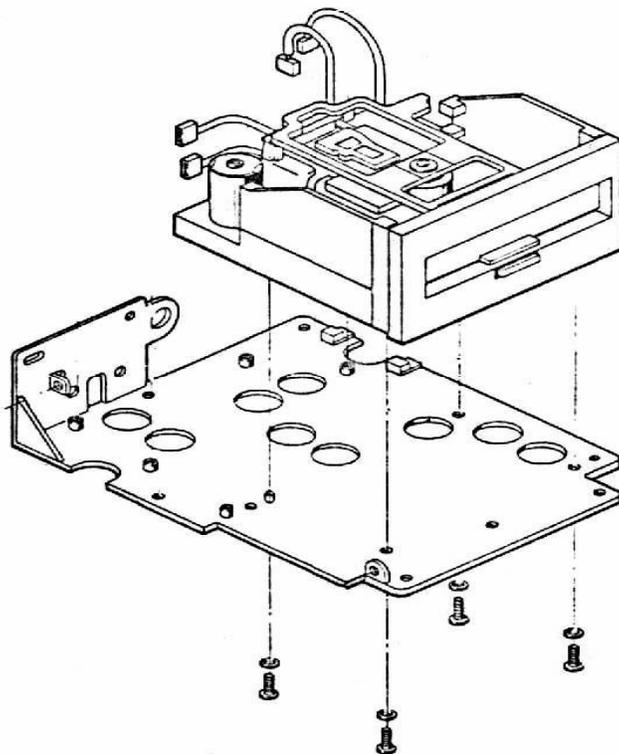
CAUTION: Excessive bending of the metal tabs will break them. DO NOT bend the tabs anymore than necessary.



5. Locate and remove the two screws securing the case halve to the ground bracket and PCB.
6. Carefully disengage the case halves from each other and the PCB. Set the case halves aside.

REMOVING THE DRIVE TRANSPORT

1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the side PCB.
4. Grass the transport securely, tip the assembly upside down, and place it on a suitable work surface.
5. Locate and remove the four screws that secure the transport to the baseplate. The screws are accessible only from the underside of the baseplate.

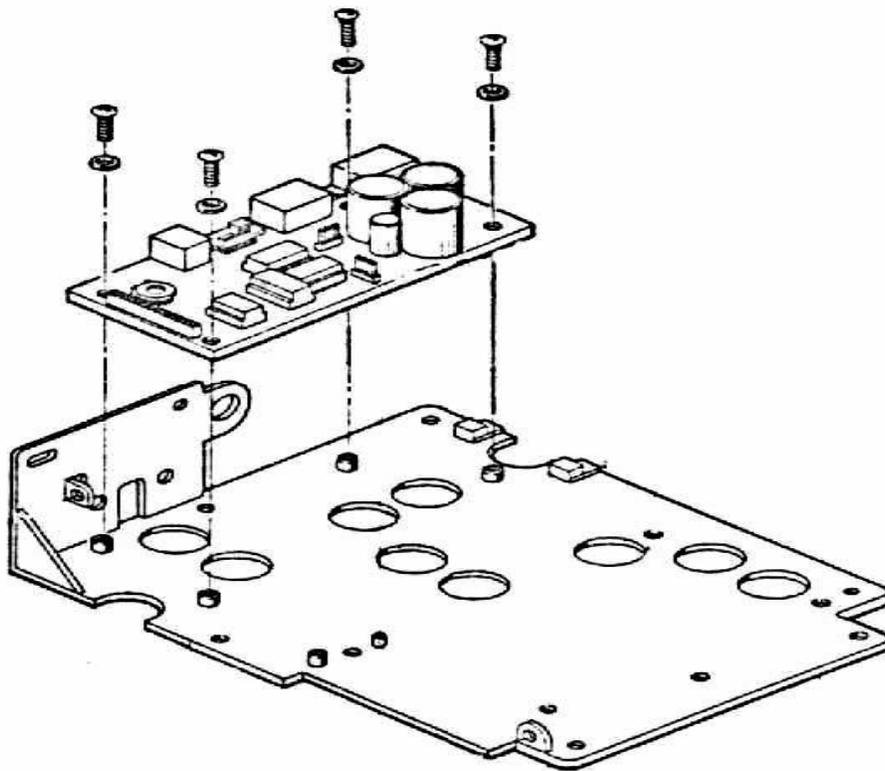


CAUTION: The transport provides critical mechanical alignments necessary for proper Disk Drive operation. Be very careful not to jar or damage the transport or any of its associated sub-assemblies and components.

6. Place the transport and baseplate on a suitable work surface.

REMOVING THE REAR PCB

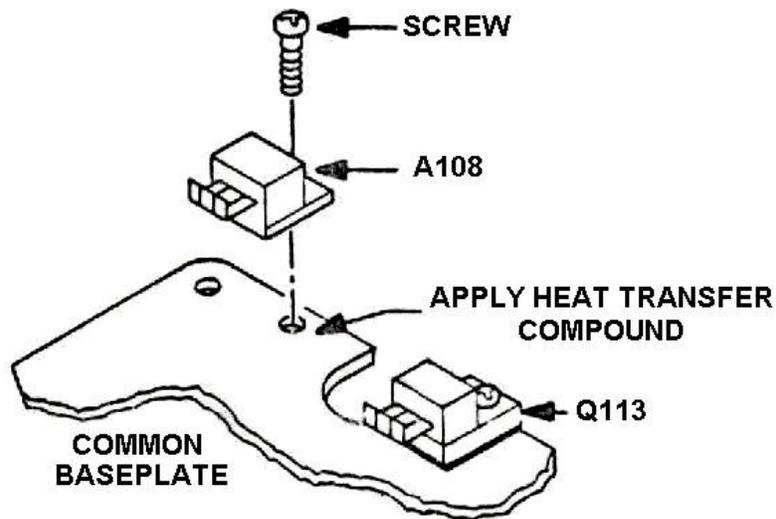
1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the side PC8 from the common baseplate.
4. Locate and remove the four screws securing the rear PCB to the common baseplate.
5. Grasp the rear PCB on both side edges. Carefully lift the board straight up far enough to disengage the board's two right side jacks from the six device pins.



- NOTE: You may have to rock the PCB slightly to overcome the jack-to-pin tension between the PCB and the pins attached to the common baseplate.
6. Lift the rear PCB away from the baseplate and place it on a suitable work surface.

REMOVING Q113 (TRANSISTOR)/A108 (VOLTAGE REGULATOR)

1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the side PCB from the common baseplate.
4. Remove the rear PCB from the common baseplate.
5. Locate and remove the single screw securing the device (either transistor Q113 or voltage regulator A108) to the common baseplate.

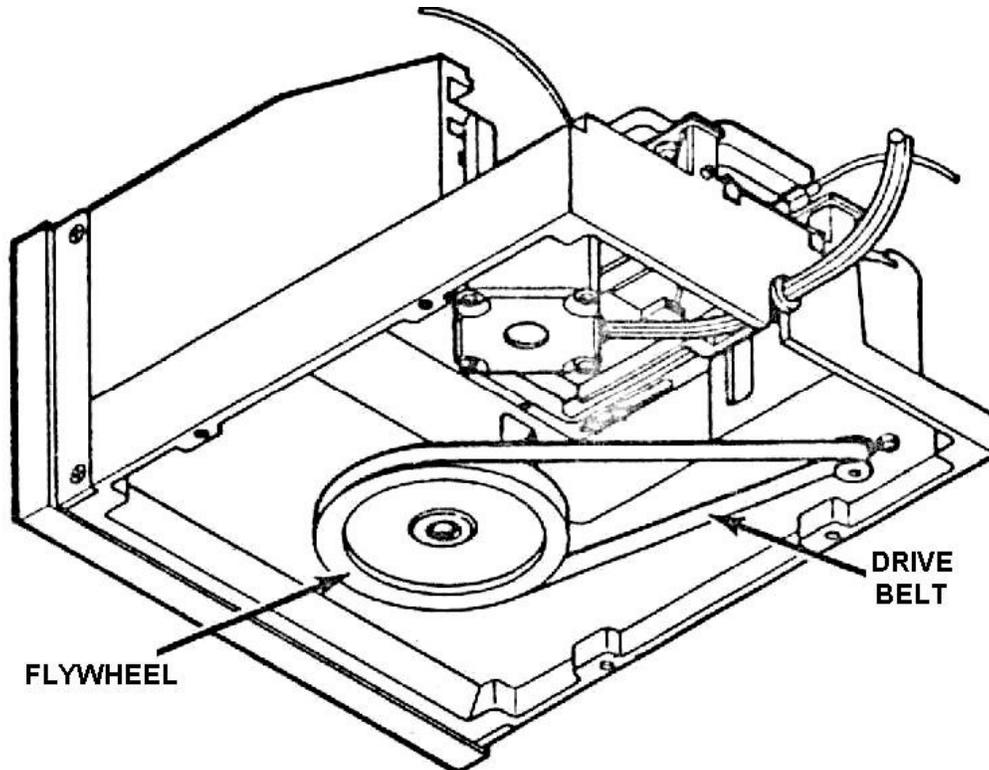


NOTE: If you are removing Q113 you should find an insulating plate between the back of the device and the common baseplate. Also, both Q113 and A108 use the common baseplate as a heatsink. Each device and Q113's insulating plate should be coated with heat transfer compound.

6. Lift the device (Q113 or A108) from the baseplate and set aside.

REMOVING THE TRANSPORT DRIVE BELT

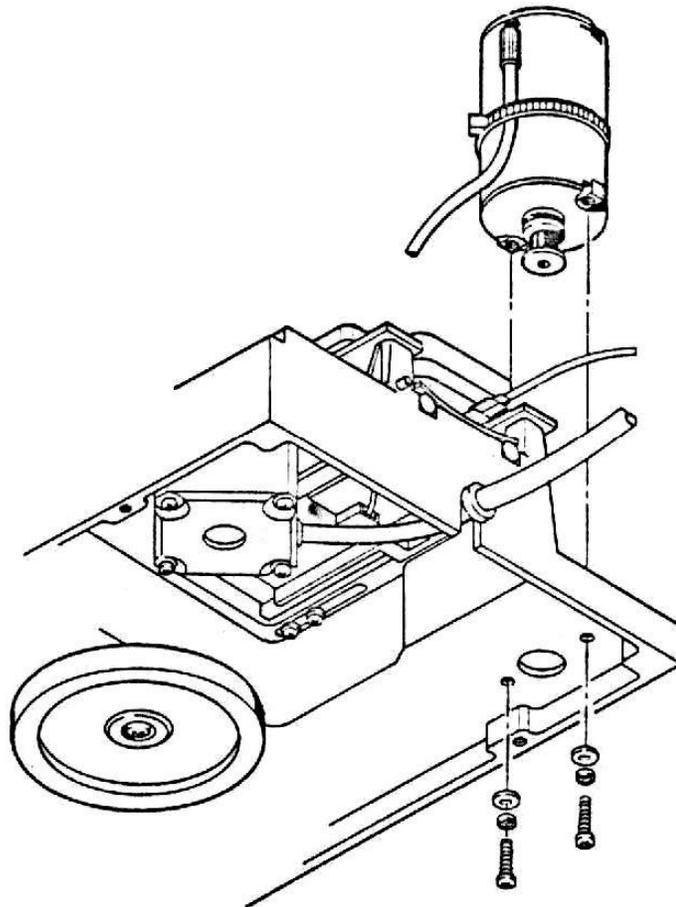
1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the Drive transport from the common baseplate.
4. Carefully lay the transport on its side.
5. Locate and remove the drive belt.



NOTE: TO remove the drive belt without stretching or damaging rotate the large flywheel (naked for strobe) while easing the belt off the outside edge of the flywheel.

REMOVING THE TRANSPORT DRIVE MOTOR

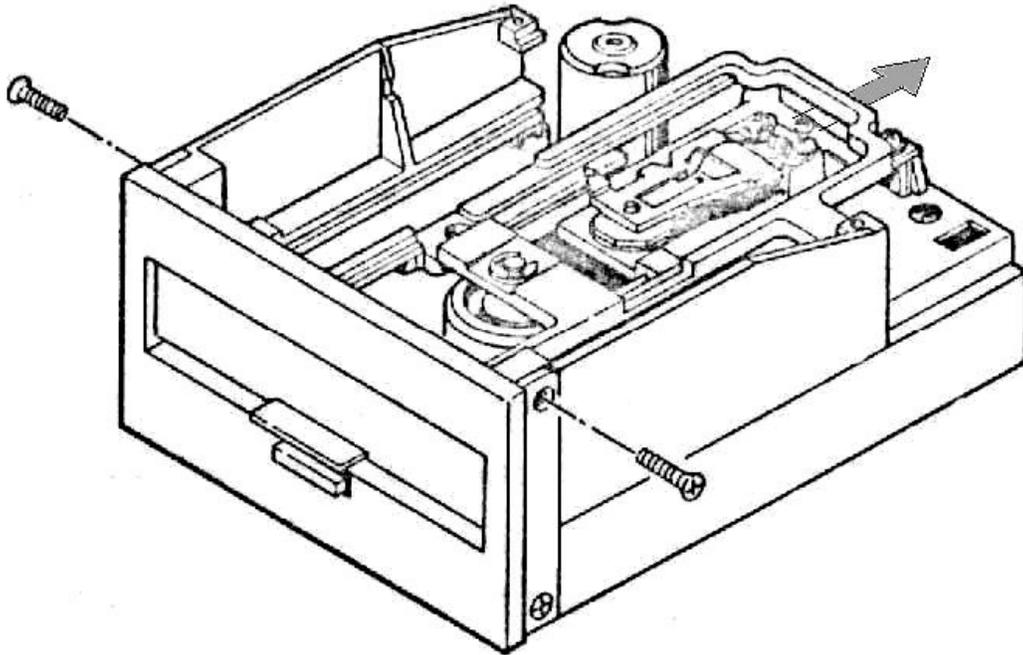
1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the Drive transport from the common baseplate
4. Remove the drive belt from the transport.
5. Locate and disconnect the single black ground lead coming from the drive motor wiring harness and going to the transport casting.



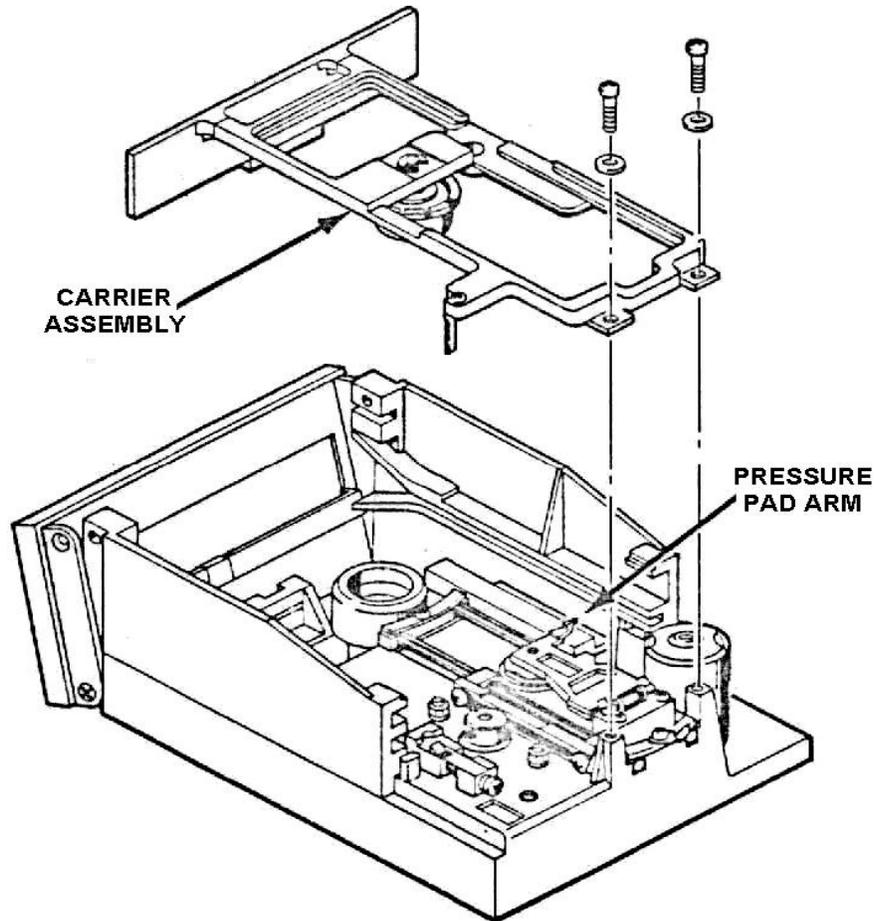
6. While supporting the drive motor with one hand, locate and remove the two screws securing the drive motor to the transport casting.
7. Separate the drive motor from the casting.

REMOVING THE CARRIER ASSEMBLY

1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the Drive transport from the common baseplate.
4. Locate the head assembly and slide the assembly all the way to the rear of its travel.



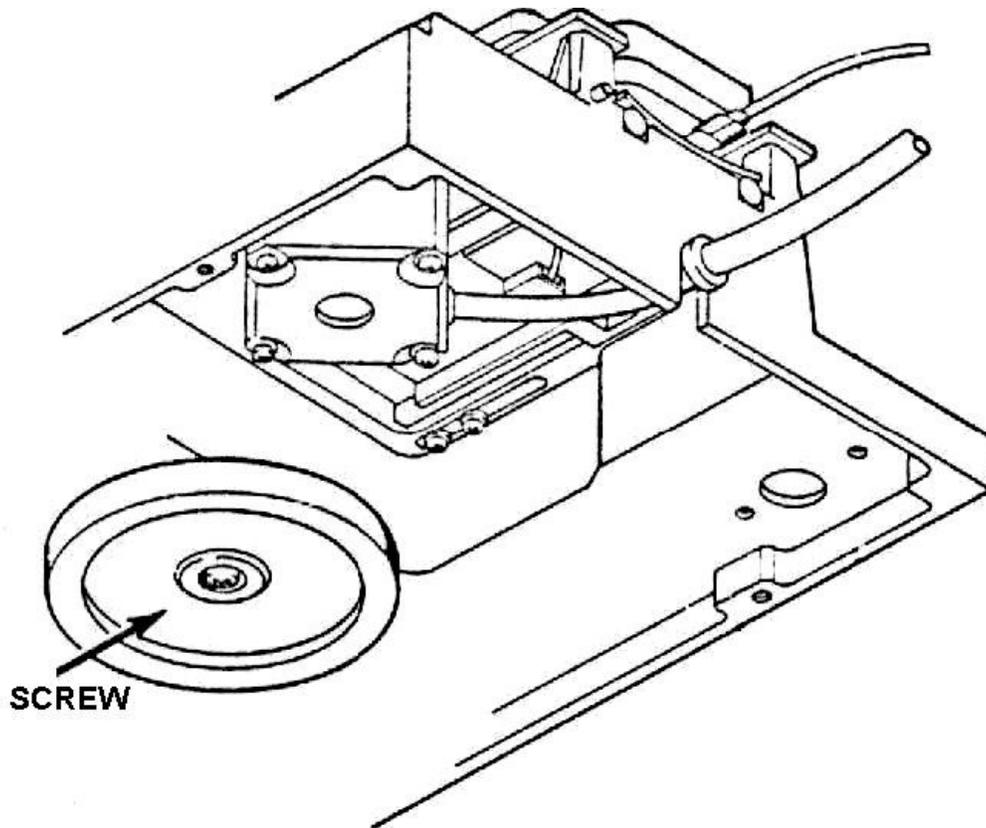
5. Locate and loosen approximately two full turns, but do not remove, the two screws securing the carrier assembly to the rear of the transport casting.
6. Locate the four screws securing the front panel bezel to the side guide assemblies and the transport casting.
7. Loosen (do not remove) the two bottom screws approximately four full turns.
8. Remove the two top screws.



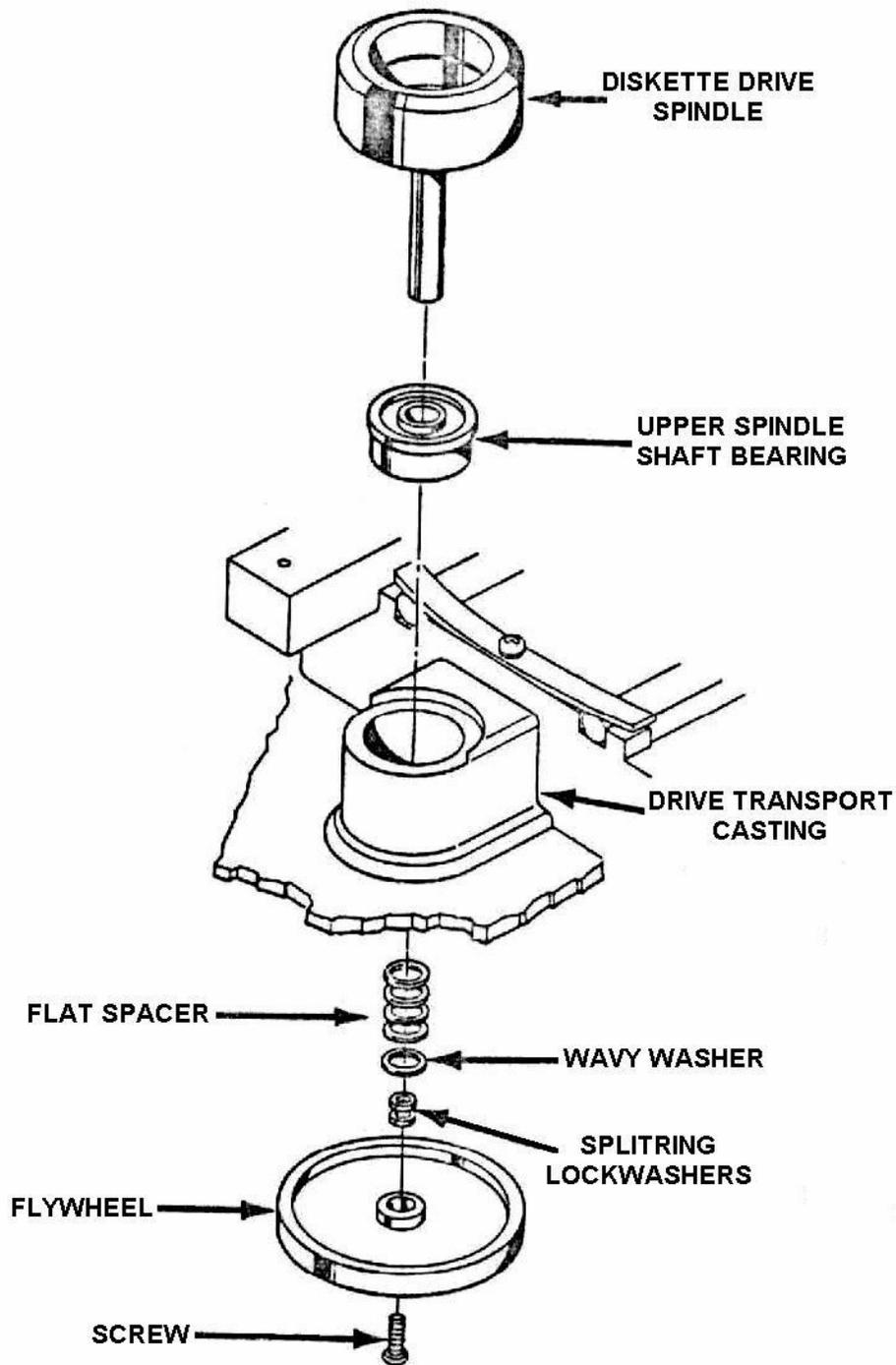
9. Push the door release button at the front of the transport to disengage the carrier assembly from the door latch. Lift the assembly far enough to clear the latch mechanism and release the button. Lower the door to a resting position.
 10. Now completely remove the two screws at the rear of the transport casting.
 11. Pull the top of the front panel bezel forward.
 12. Carefully, lift the carrier assembly out of the transport.
- CAUTION:** You will have to tilt the carrier assembly slightly to clear the head assembly's pressure pad arm. DO NOT lift the pressure pad arm higher than it would be lifted by the door arm during normal Drive operation. Lifting the pad arm too far will distort its pressure spring changing the pressure pad's loading effect on the head.

REMOVING THE TRANSPORT FLYWHEEL/DRIVE SPINDLE

1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the Drive transport from the comma baseplate.
4. Remove the drive belt from the transport. .
5. Remove the carrier assembly from the transport.
6. Carefully lay the transport on its side.



7. Locate the single screw in the center of the flywheel. Holding the flywheel with one hand, remove the screw.
NOTE: See the following illustration of the flywheel/casting/spindle relationship. The specific number and placement of the washers is very important and helps to determine diskette speed during operation. DO NOT lose any of the washers you remove during this step.



8. Being very careful not to lose any washers, hold the drive spindle with one hand and carefully pull the flywheel away from the casting with the other hand.
9. Pull the spindle from the casting.

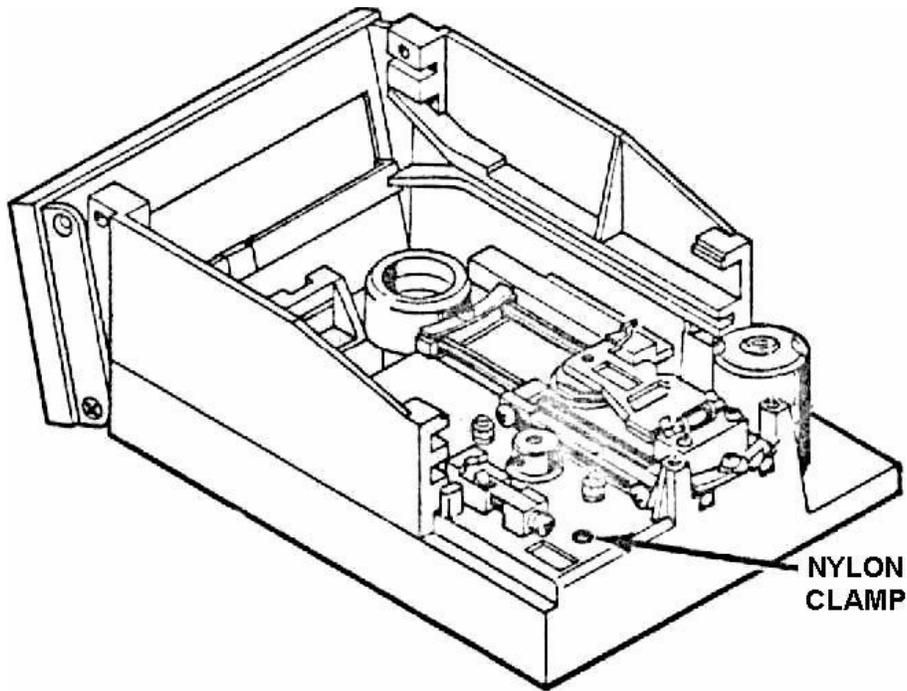
REMOVING THE TRANSPORT SPINDLE SHAFT BEARINGS

1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the Drive transport from the common baseplate.
4. Remove the Drive belt from the transport.
5. Remove the carrier assembly from the transport.
6. Remove the flywheel and drive spindle from the transport.

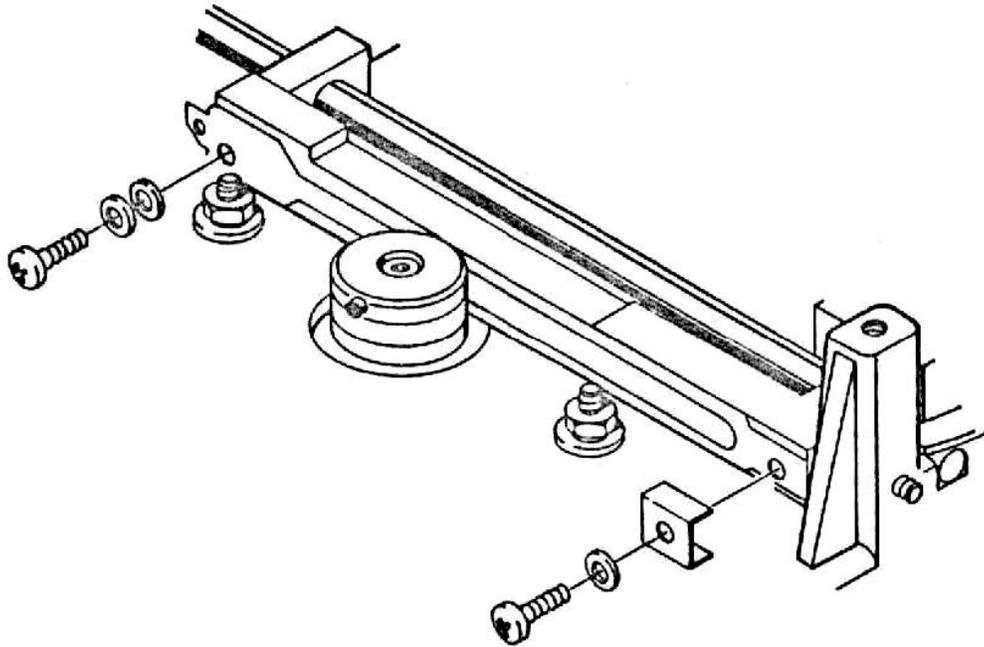
7. The top spindle shaft bearing may have lifted from the casting when you removed the drive spindle. If it did not, very carefully pry the bearing out of the casting.
8. Very carefully push the bottom bearing out of the casting (push from the top side of the casting, being very careful not to damage the casting bore).

REMOVING THE HEAD ASSEMBLY

1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive base.
3. Remove the Drive transport from the common baseplate.
4. Remove the Drive belt from the transport.



5. Locate the nylon clamp securing the record/playback and erase head I/O wiring harness to the right rear corner of the casting. Release the clamp from the casting.
6. Push the head assembly as far to the rear of the Drive as it will slide.
7. Locate and remove the ground lead (black wire from the drive motor wiring harness) faston from the rear of the casting.

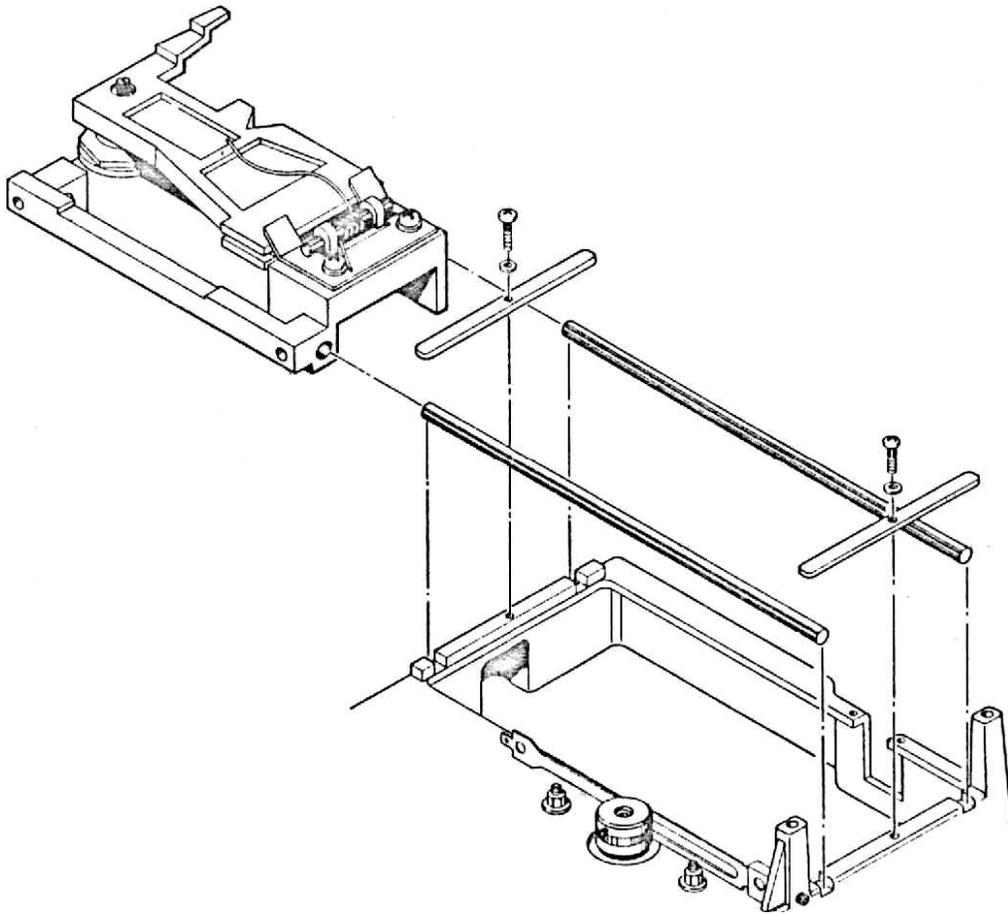


8. Locate the two screws securing the stepper motor positioning band to the right side of the head assembly.
 - a. Remove the rear screw, being very careful not to crimp or damage the band, and noting the screw and washer arrangement.
 - b. Slide the head assembly carriage forward enough to allow you to remove the front band screw. Remove the front screw, again noting the screw and washer arrangement.

NOTE: The stepper motor positioning band is very delicate and very important to the operation of the Drive. DO NOT kink or damage the band in any way.

9. Locate the two screws securing the carriage guiderod clamps to the drive casting.
10. Remove the two screws and lift the guiderod clamps away from the assembly.

11. Carefully pry the two guiderods up out of their locating notches in the drive casting.



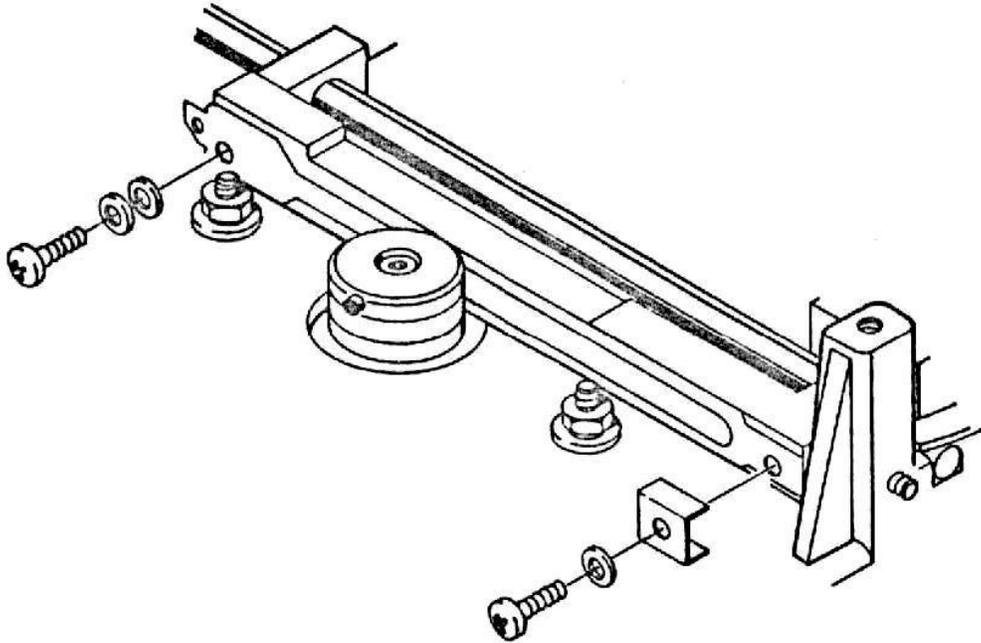
12. Gently lift the head assembly carriage and guiderods away from the casting. You will have to feed the head I/O cable through the casting at the same time.

CAUTION: The head is subject to external magnetic fields. DO NOT use magnetized tools or allow the head to get near any equipment producing strong magnetic fields.

13. Slide the guiderods out of the carriage.

REMOVING THE STEPPER MOTOR

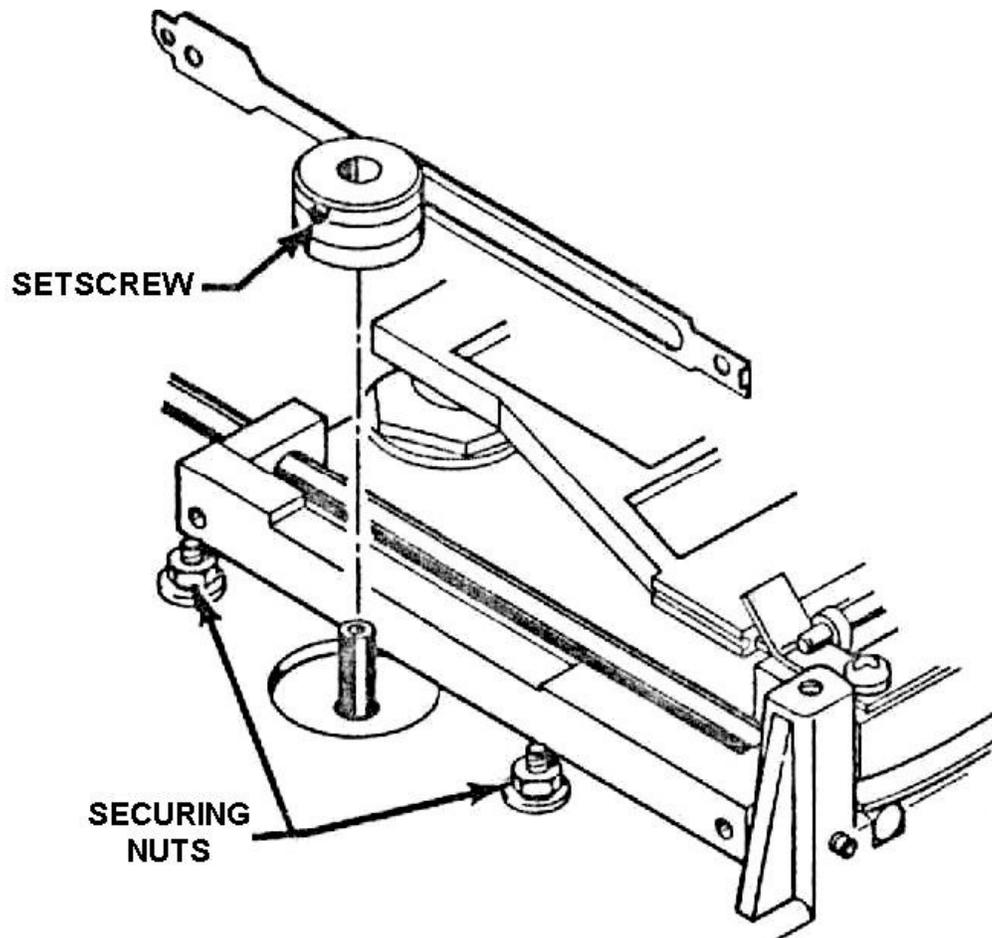
1. Disassemble the Disk Drive case.
2. Remove the common baseplate from the Drive case.
3. Remove the Drive transport from the common baseplate.



4. Locate the two screws securing the stepper motor positioning band to the right side of the head assembly.
 - a. Remove the rear screw, being very careful not to crimp or damage the band, and noting the screw and washer arrangement.
 - b. Slide the head assembly carriage forward enough to allow you to remove the front band screw. Remove the front screw, again noting the screw and washer arrangement.

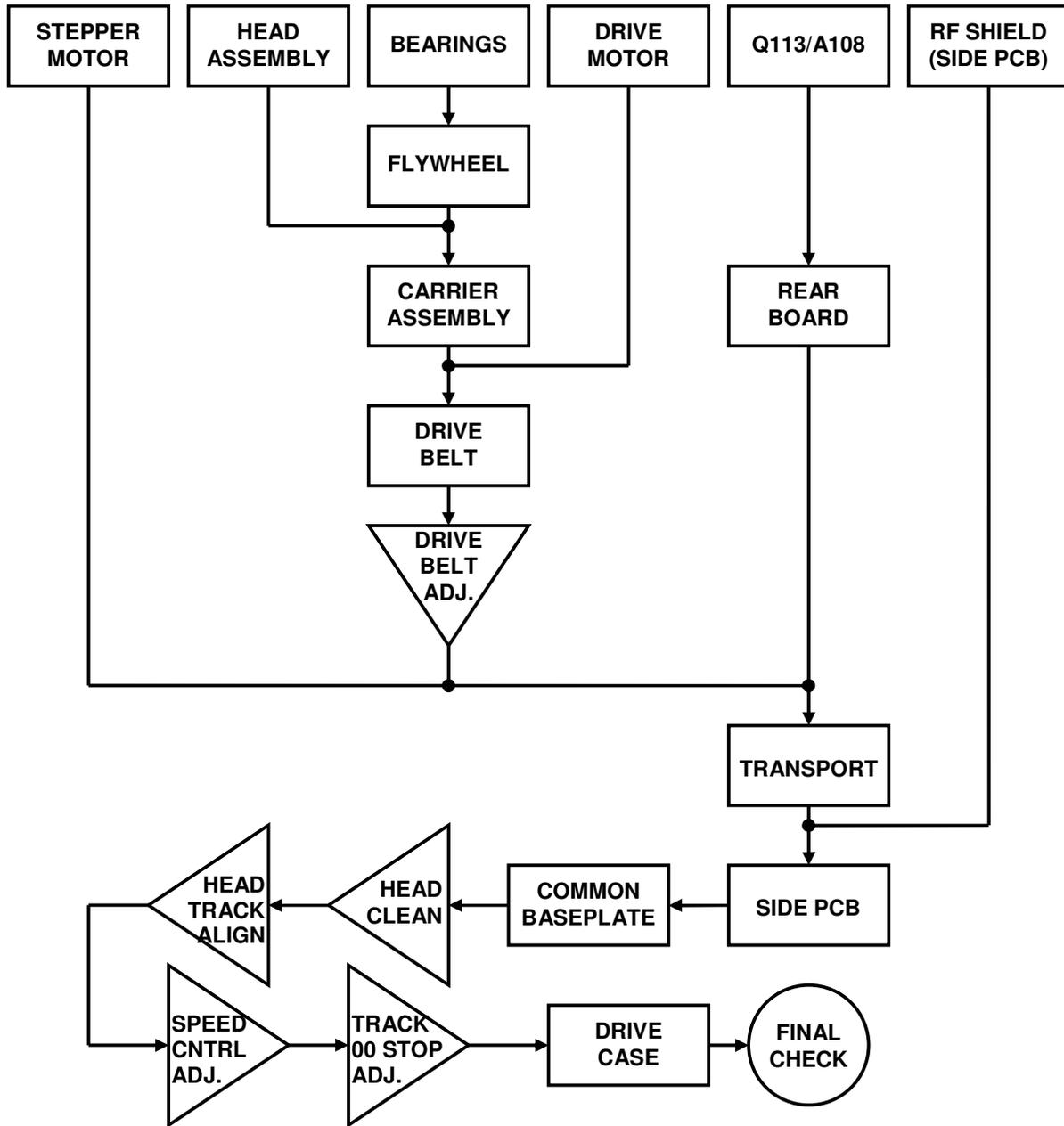
NOTE: The stepper motor positioning band is very delicate and very important to the operation of the Drive. DO NOT kink or damage the band in any way.

5. Locate the allen-head setscrew securing the head positioning strap pulley to the stepper motor drive shaft (topside of casting).
6. Back the setscrew out about 1 turn (counterclockwise).



7. Remove the band/pulley from the stepper motor shaft and set it aside.
8. Locate the two nuts securing the stepper motor to the casting.
9. Lay the casting on its left side.
10. While supporting the stepper motor with your right hand, remove the two securing nuts.
11. Carefully separate the motor from the chassis, while pulling the motor wiring harness out of its chassis slot.

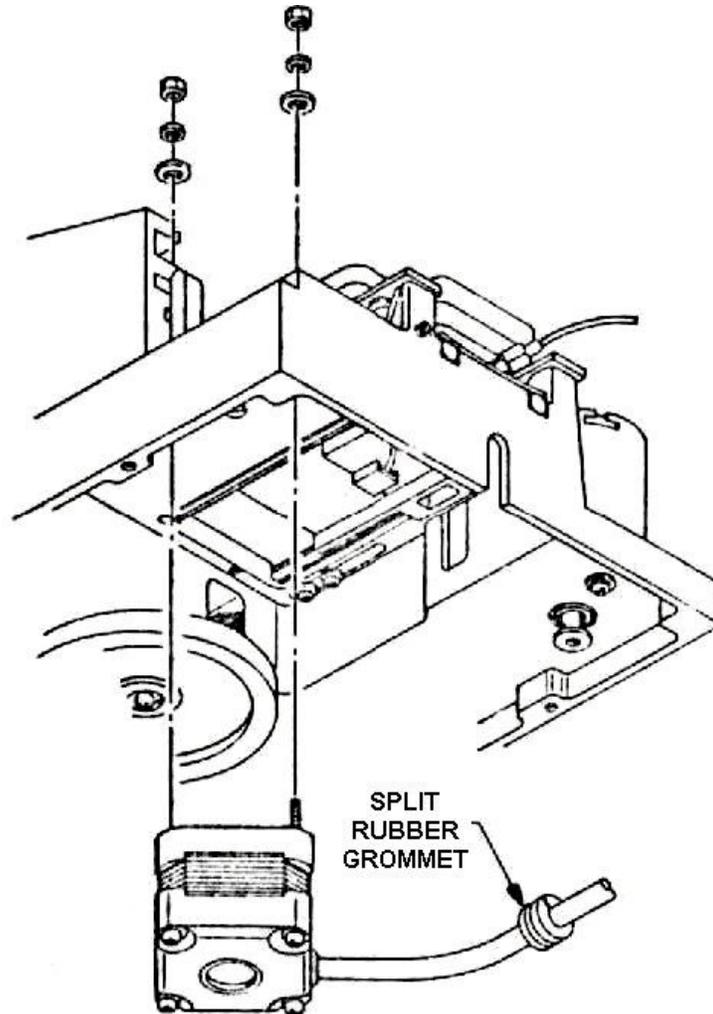
REASSEMBLY



Locate the beginning point of your reassembly, and follow the instructions called out in this flow chart in the order shown.

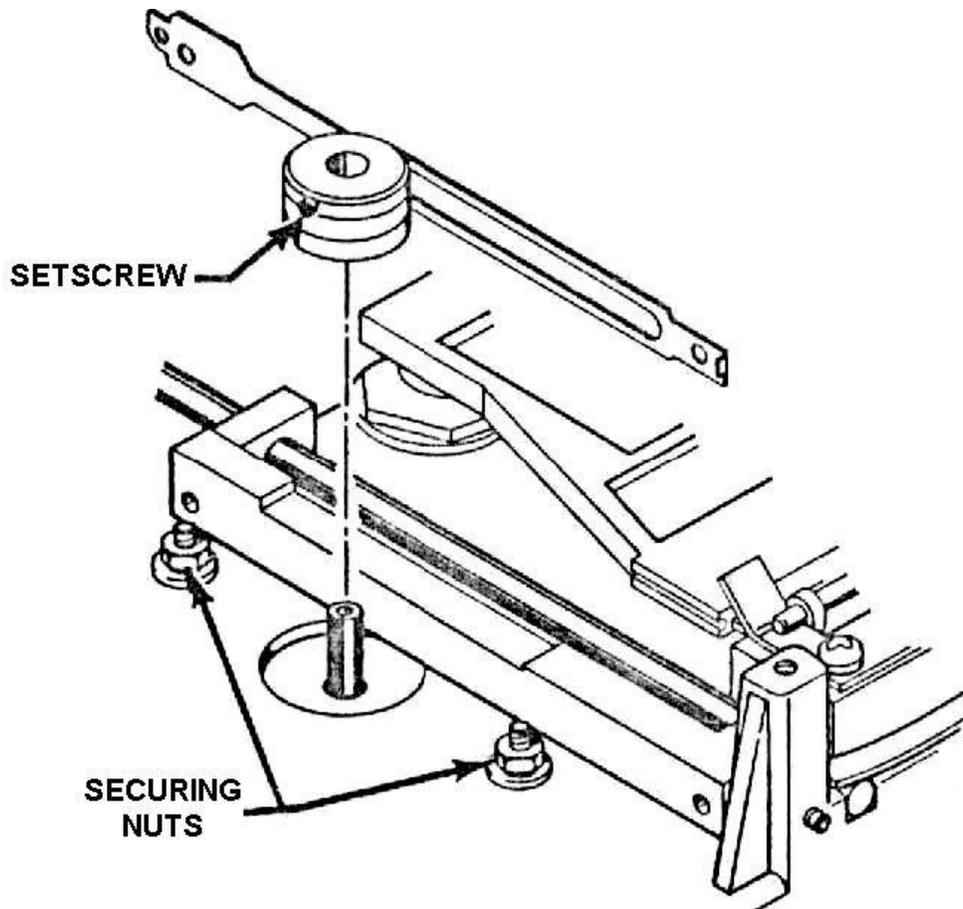
INSTALLING THE STEPPER MOTOR

1. Install a split rubber grommet on the stepper motor wiring harness.
2. Lay the transport on its left side.
3. Position the stepper motor to the underside of the transport casting. The motor's wiring harness should lie toward the rear center of the casting.



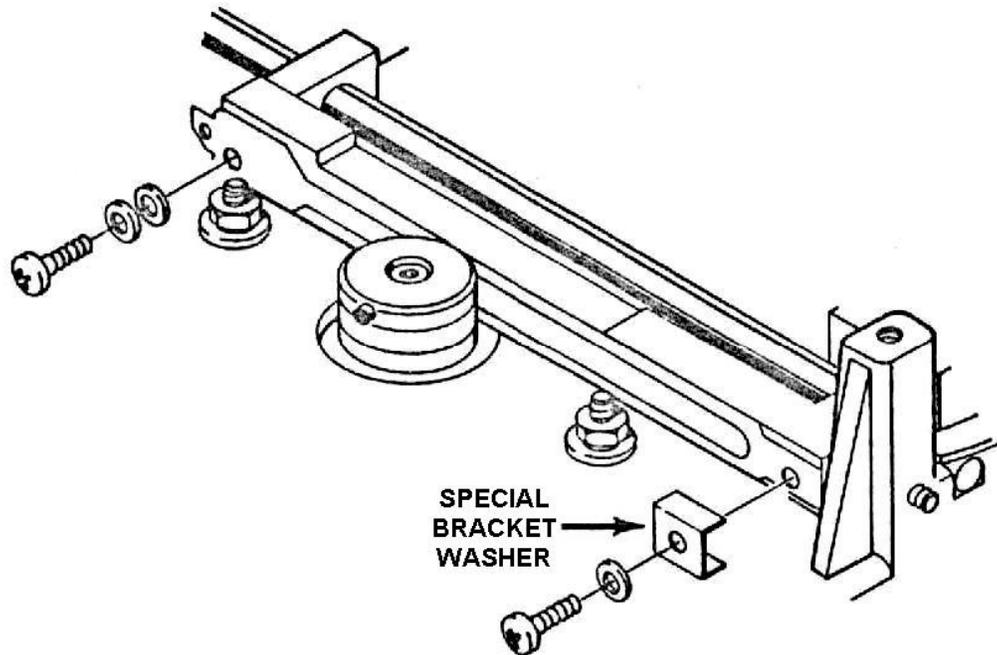
CAUTION: The head is subject to magnetization from external fields. DO NOT use magnetized tools or allow the head to get near any equipment producing strong magnetic fields.

4. Install a flatwasher, a splitting lockwasher, and a 1/4" hexnut onto each of the two stepper motor stud bolts projecting through the top of the casting. Lightly tighten the nuts.



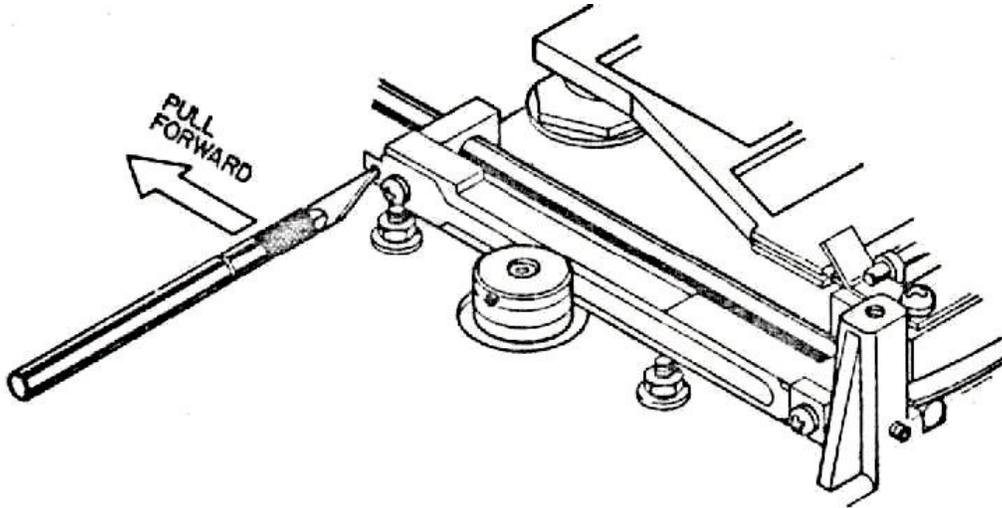
5. Carefully install the head positioning band pulley onto the stepper motor drive shaft (projecting through the top of the casting). If the pulley does not easily slip onto the motor shaft, back the pulley's allen-head setscrew a little farther out of the pulley. DO NOT tighten the setscrew at this time.

NOTE: The stepper motor positioning band is delicate and VERY important to the operation of the Drive. DO NOT kink or damage the band in any way.



6. Carefully position the head assembly, so that you can connect the positioning band to the assembly's right rear corner.
7. Install, but do not tighten, the rear screw, splitting lockwasher, and special bracket washer to hold the rear section of the positioning band to the head assembly.
8. Carefully pull the front section of the positioning hand forward until its screw hole is located over the matching screw hole on the front corner of the head assembly.
9. Install, but do not tighten, the screw, splitting lockwasher, and flatwasher to secure the band to the head assembly.
10. Gently slide the head assembly back and forth on its guiderods. This will center the band pulley on the stepper motor shaft.
11. Tighten the rear band retaining screw.

CAUTION: DO NOT exceed 6 inch lbs. torque when tightening screws into plastic parts.



12. Use a pointed tool (i.e. X-acto knife point etc.) to hook the small hole on the front end of the positioning band. Pull forward slightly on the band while tightening the front band retaining screw.
13. Slide the wiring harness, grommet up into the slot at the rear of the transport casting.
14. Attach the transport to the common baseplate.
15. Attach the common baseplate to the Drive base.

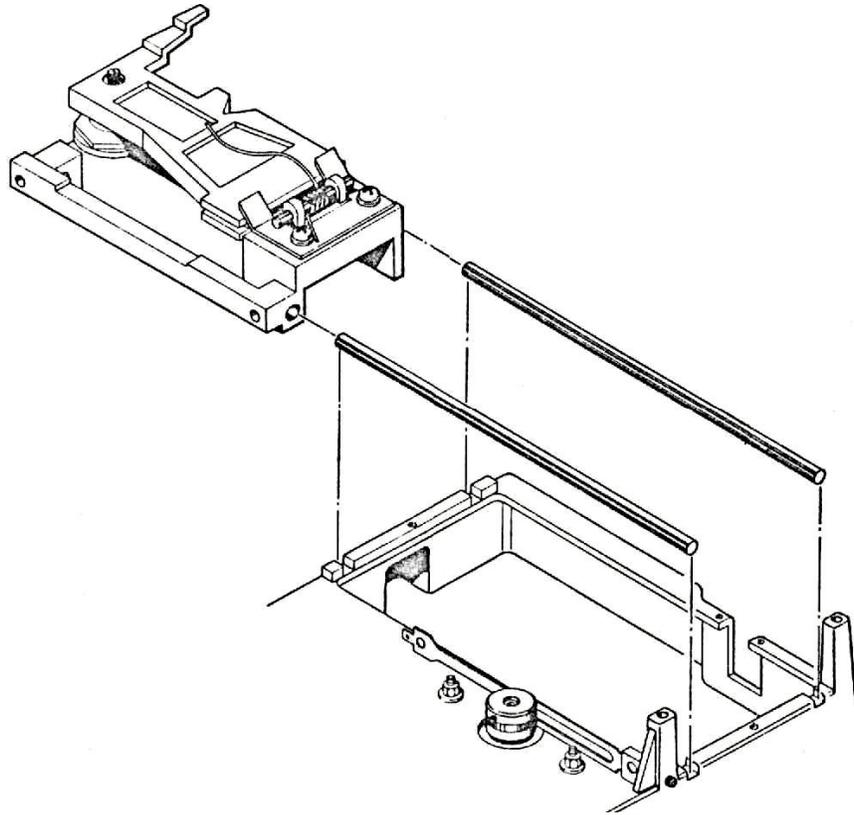
INSTALLING THE HEAD ASSEMBLY

CAUTIONS: The head is subject to magnetization from external fields. DO NOT use magnetized tools or allow the head to get near any equipment producing strong magnetic fields. The head is also damaged by dirt and oils.

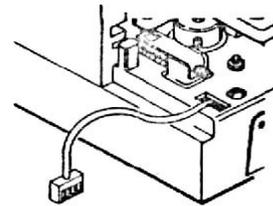
DO NOT touch either the head or the pressure pad with your fingers.

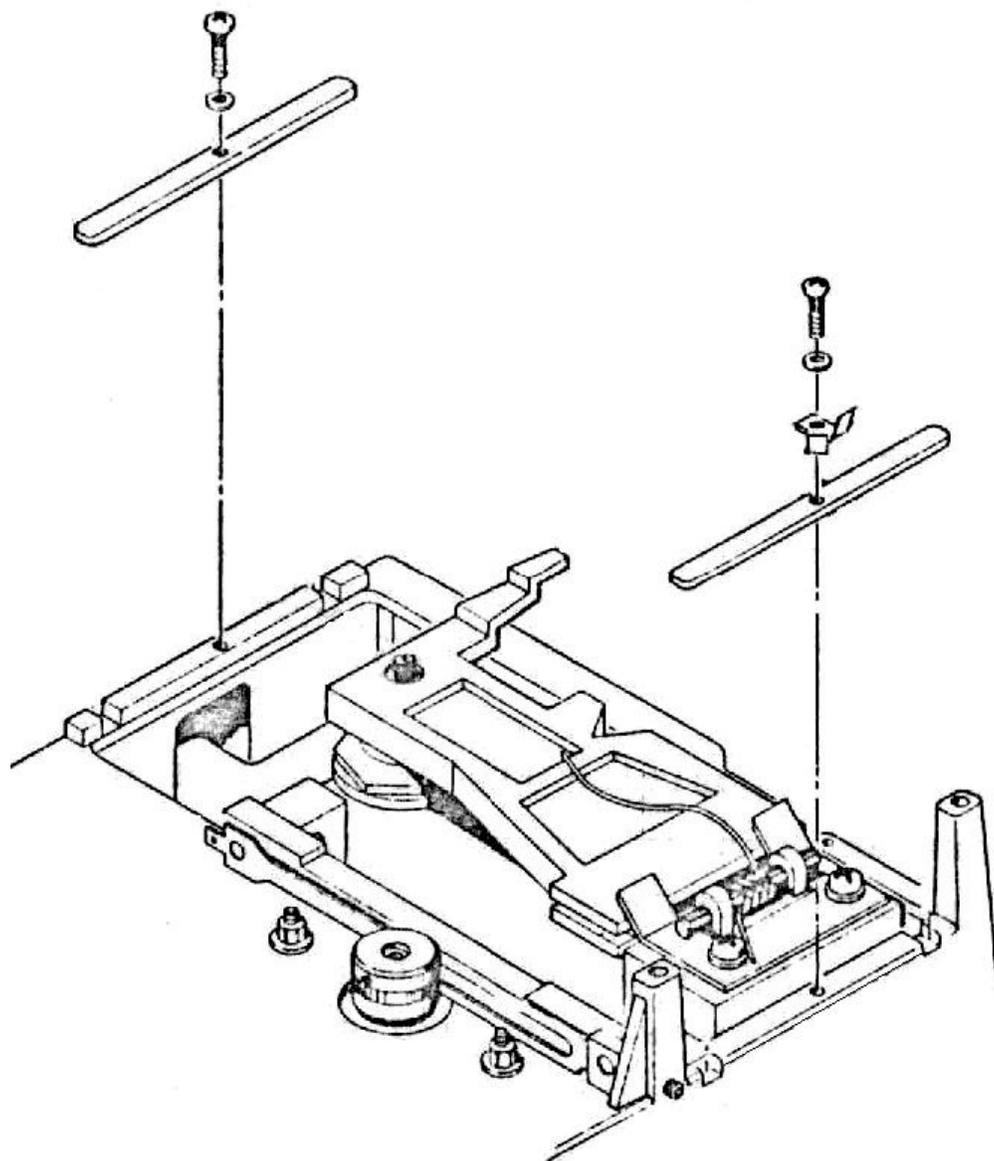
DO NOT lift the pressure pad arm farther from the head carriage than the arm would be lifted during normal Disk Drive operations. Lifting the arm too far will distort its pressure spring, changing the arm's loading effect on the head during operation.

The stepper motor positioning band is delicate and very important to the operation of the Drive. DO NOT kink or damage the band in any way.

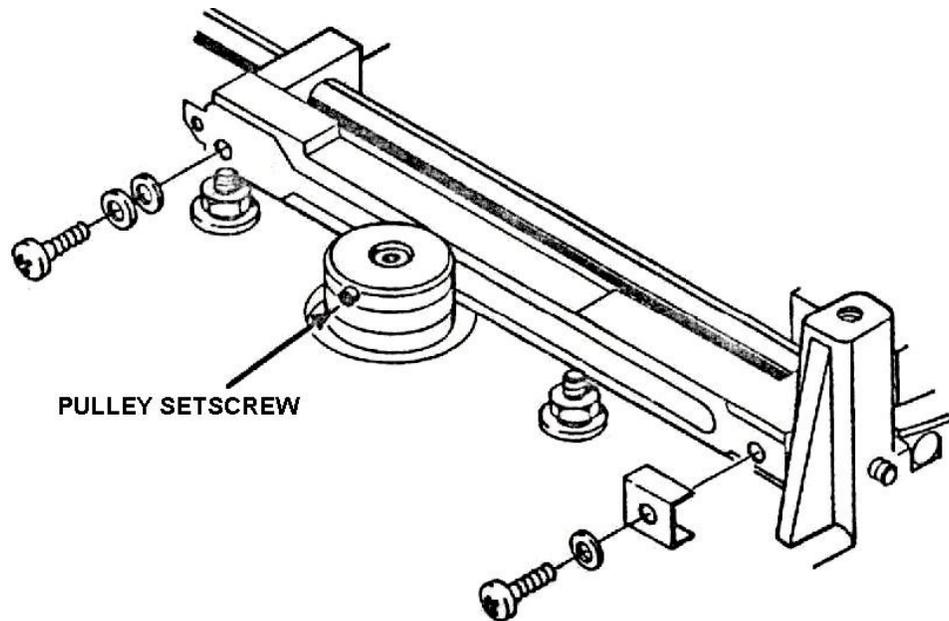


1. Slide the two guiderods into the sides of the head assembly carriage.
2. Carefully lower the carriage/guiderods assembly into position in the transport casting. Ensure that the head wiring harness lies down in the underside of the transport.
3. Wrap a small piece of masking tape around the head assembly's wiring harness, about 3" from the head. Install the nylon cable clamp over the tape and snap the clamp into the hole provided at the back of the casting.
4. Feed the wiring harness up through the rectangular hole at the right rear corner of the transport casting.
5. Center (front-to-back) the two head assembly guiderods in their transport casting slots.

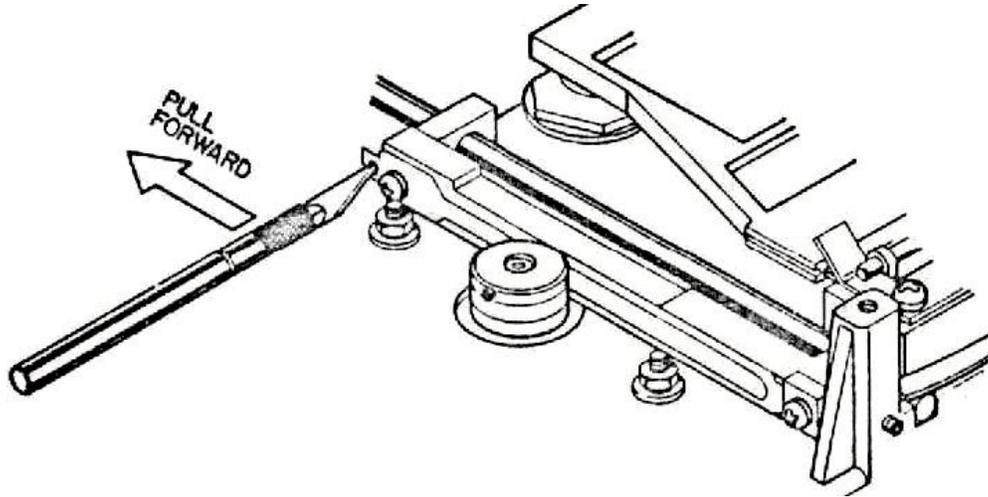




6. Position the two guiderod clamps onto the casting, over the ends of the guiderods.
7. Install, but do not tighten, the front clamp screw including a splitting lockwasher.
8. Install, but do not tighten, the rear clamp screw including two male faston terminals and a splitting lockwasher.
9. Tighten the two clamp screws to 10 inch lbs. torque



10. Carefully position the head assembly so that you can connect the positioning band to the assembly right rear corner.
 11. Install, but do not tighten, the rear screw, splitting lockwasher, and special bracket washer to hold the rear section of the positioning band to the head assembly.
 12. Carefully pull the front section of the positioning band forward until its screw hole is located over the matching screw hole on the front corner of the head assembly.
 13. Install, but do not tighten, the screw, splitting lockwasher, and flatwasher to secure the band to the head assembly.
 14. Locate the allen-head setscrew securing the positioning band pulley to the stepper motor driveshaft. Back the setscrew out (counterclockwise) about 1/4 turn.
 15. Gently slide the head assembly back and forth on its guiderods. This will center the band pulley on the stepper motor shaft.
 16. Tighten the rear band retaining screw.
- CAUTION: Do not exceed 6 inch lbs. torque when tightening screws into plastic parts.

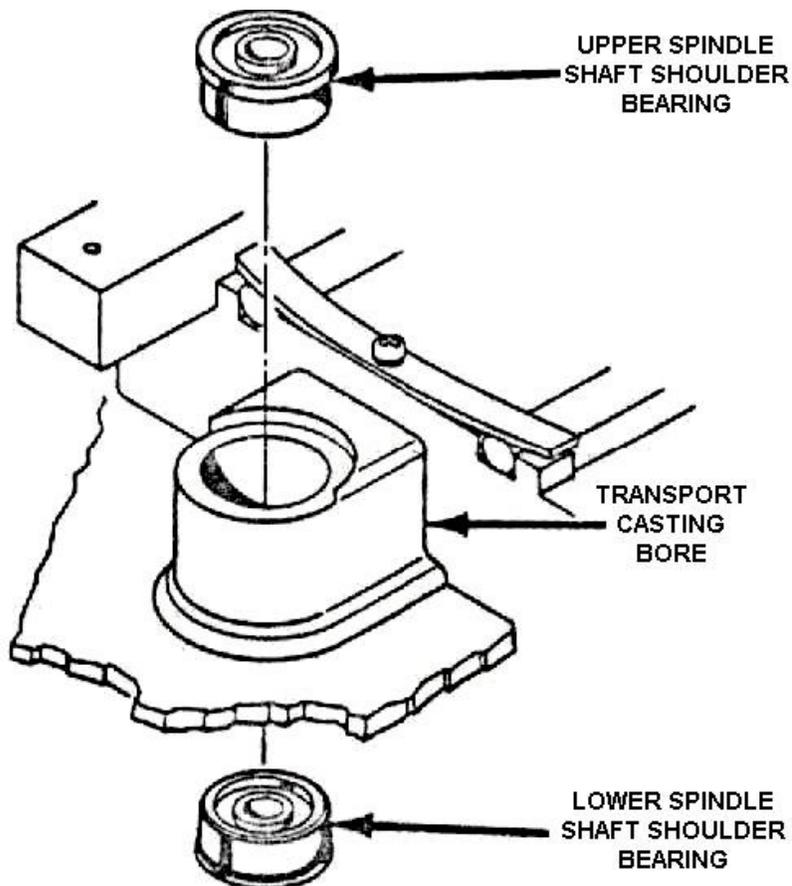


17. Use a pointed tool (i.e. X-acto knife point, etc.) to hook the small hole on the front end of the positioning band. Pull forward slightly on the band while tightening the front band retaining screw.
18. Attach the black ground lead (drive motor wiring harness) to one of the faston lugs at the rear of the transport.
19. Attach the carrier assembly to the transport.

INSTALLING THE TRANSPORT SPINDLE SHAFT BEARINGS

1. Gently insert either the top or bottom (or both) shoulder bearings into the casting bore. There should be a slight friction fit.

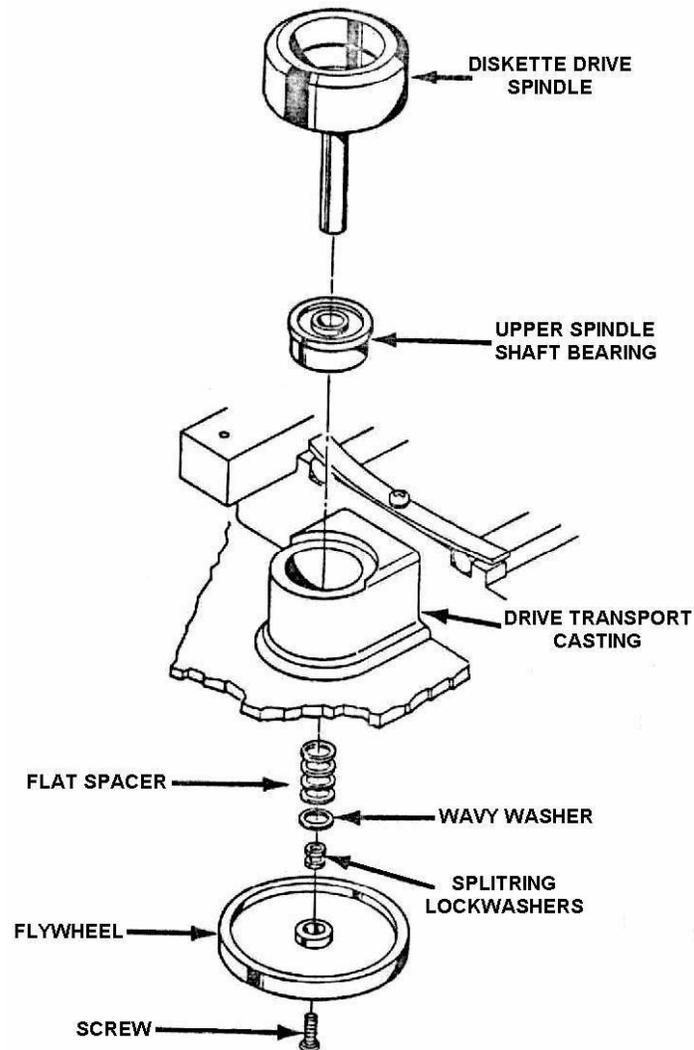
NOTE: If excessive force is required, you probably have incorrectly identified the bearing. Obtain the correct bearing before proceeding.



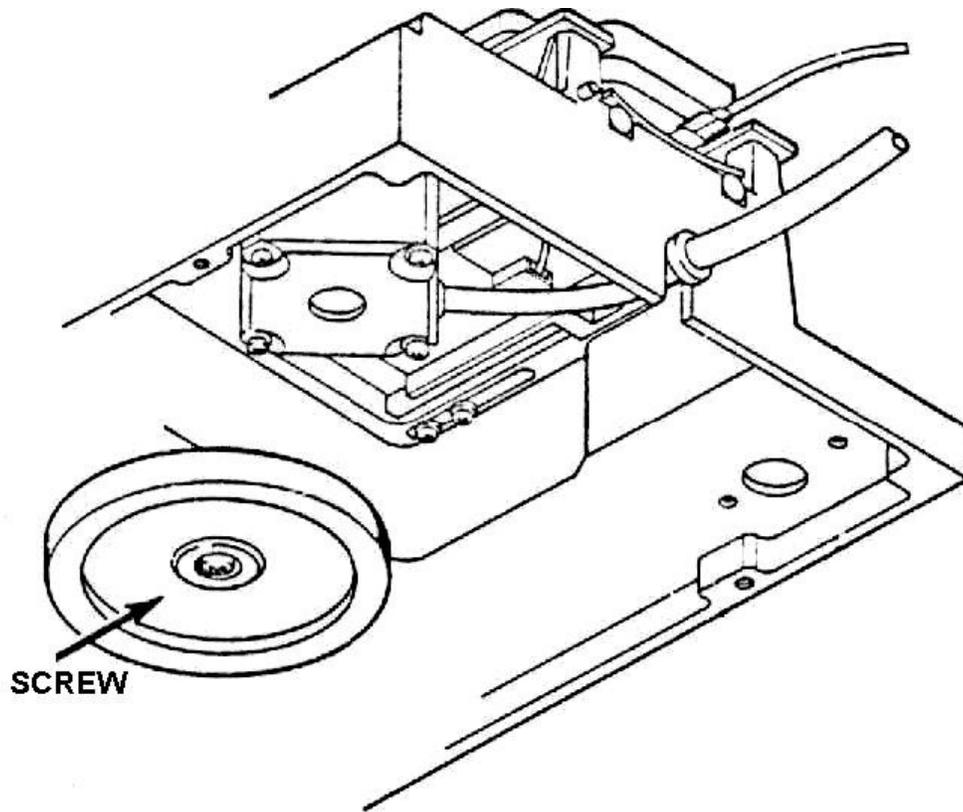
2. Ensure that the shoulder of the bearing is firmly seated flat against the casting.
3. Attach the flywheel and drive spindle to the transport.

INSTALLING THE TRANSPORT FLYWHEEL / DRIVE SPINDLE

1. Lay the transport casting on its side.



2. From the top side of the casting, insert the diskette drive spindle into the shoulder bearings.
3. Assemble the necessary combination of washers along with the flywheel and screw. See the illustration for the flywheel/casting/spindle relationship. The specific number and placement of the washers is very important and helps to determine diskette speed during operation.

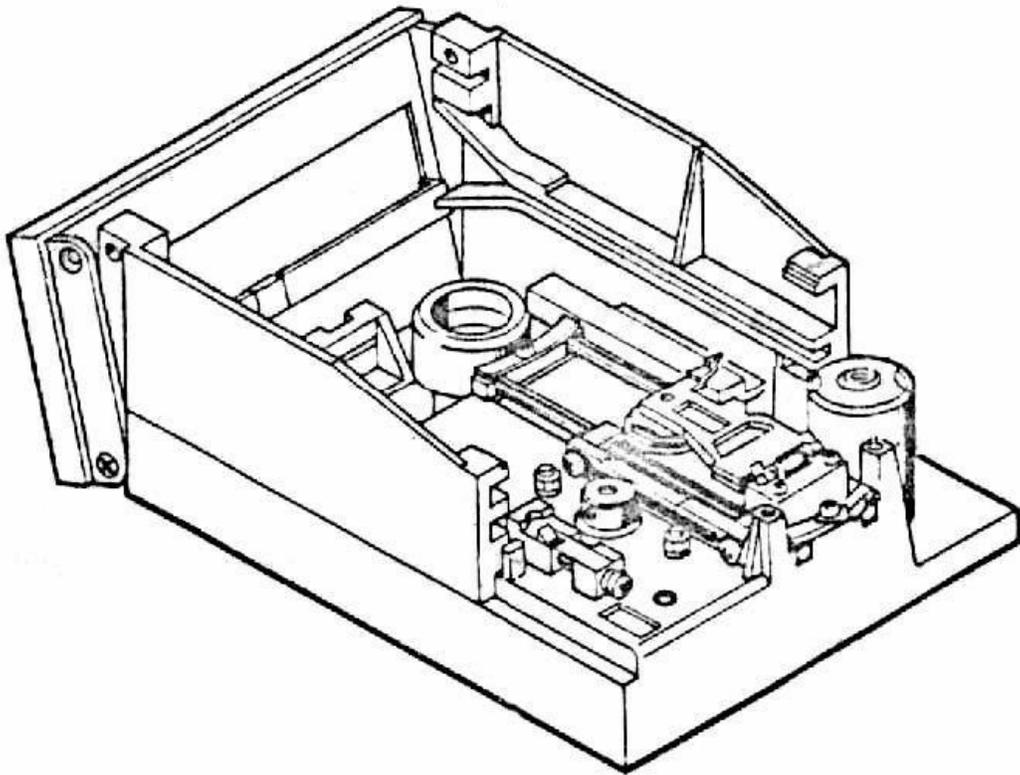


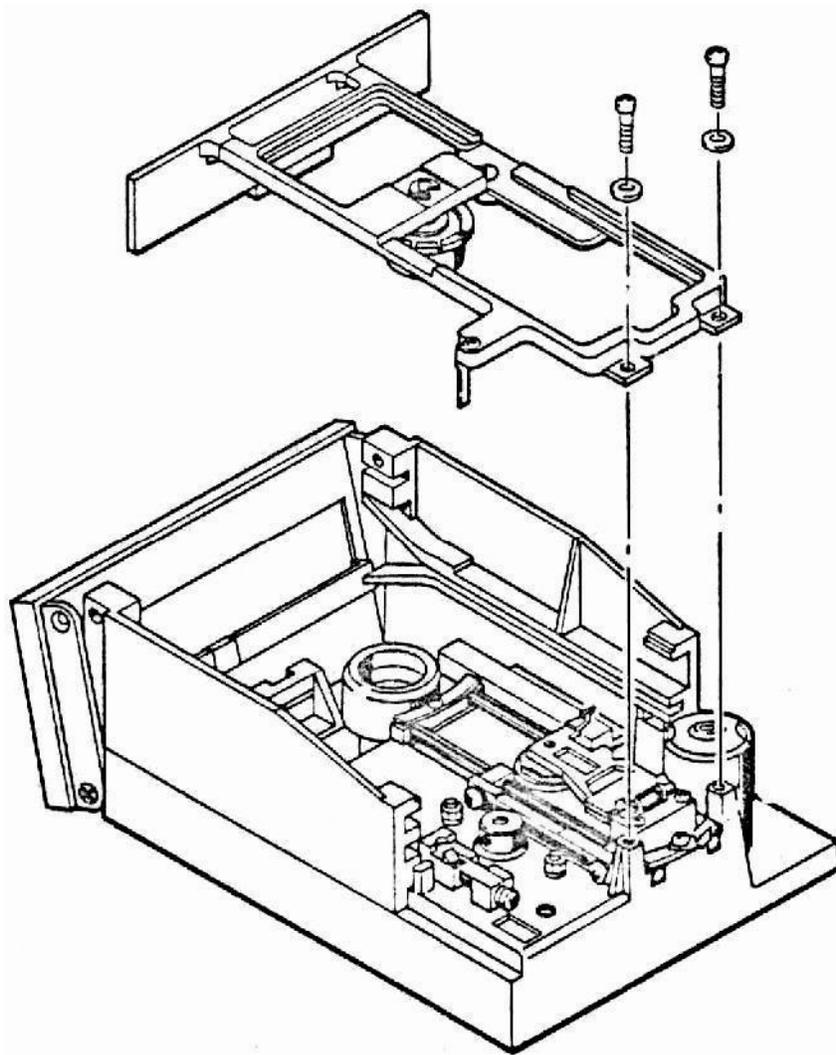
4. From the bottom side of the casting, position the flywheel, screw and washer combination over the bottom of the spindle shaft. Screw the assembly together. Torque the screw to 6 inch lbs.
5. Rotate the flywheel and check for wobble, runout or binding of either the flywheel or drive spindle. Adjust the assembly as necessary.
6. Attach the carrier assembly to the transport.

INSTALLING THE CARRIER ASSEMBLY

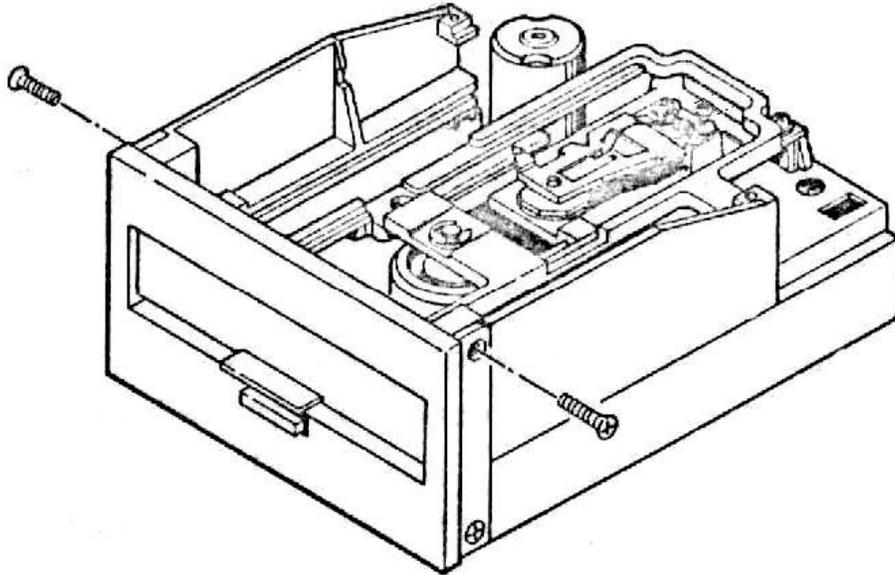
CAUTIONS: This procedure requires that you lift the head assembly pressure pad arm in order to position its lift arm onto the carrier assembly. DO NOT lift the pressure pad higher than it would be lifted by the carrier assembly during normal operations. Lifting the pad arm too far will distort its pressure spring, changing the pad's loading effect on the head. The head is subject to magnetization from external fields. DO NOT use magnetized tools or allow the head to get near any equipment producing strong magnetic fields.

1. Ensure that the transport front panel bezel is tilted forward from both guide assemblies for extra clearance at the top.

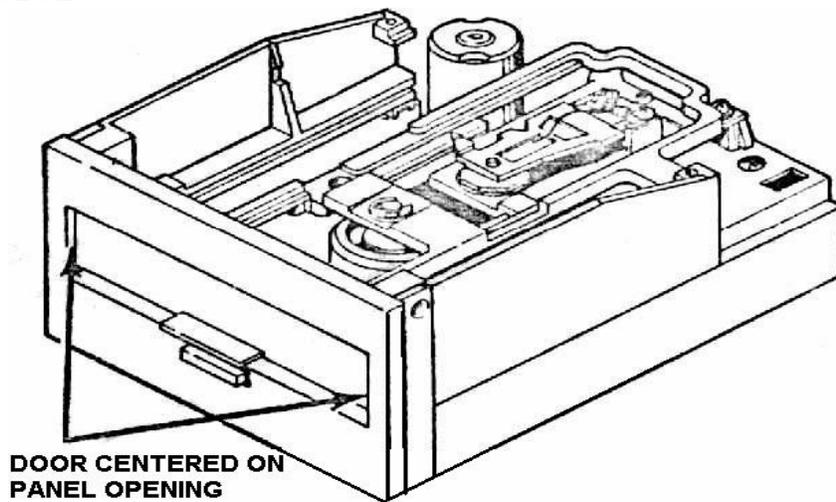




2. Carefully lower the carrier assembly into position over the transport casting. Lift the head assembly's pressure pad arm just enough to position it onto its carrier assembly slide area.
3. Install and slightly tighten the two screws, splitting lockwashers, and flatwashers at the rear corners of the carrier assembly.
4. Push the bezel back to its normal position and install the two top screws.



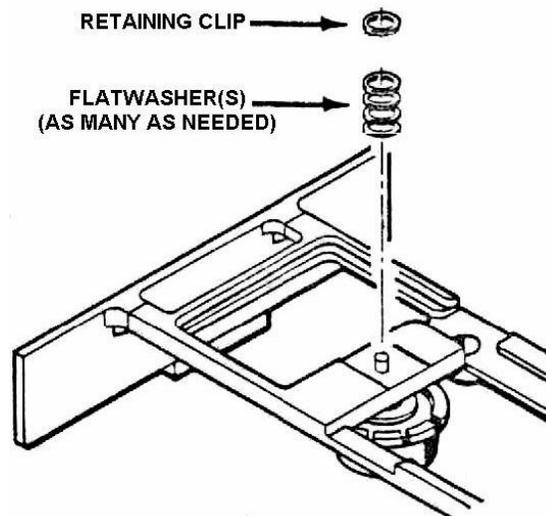
5. Tighten the four screws securing the bezel to the transport.
6. Latch the carrier assembly closed (down) at the bezel.



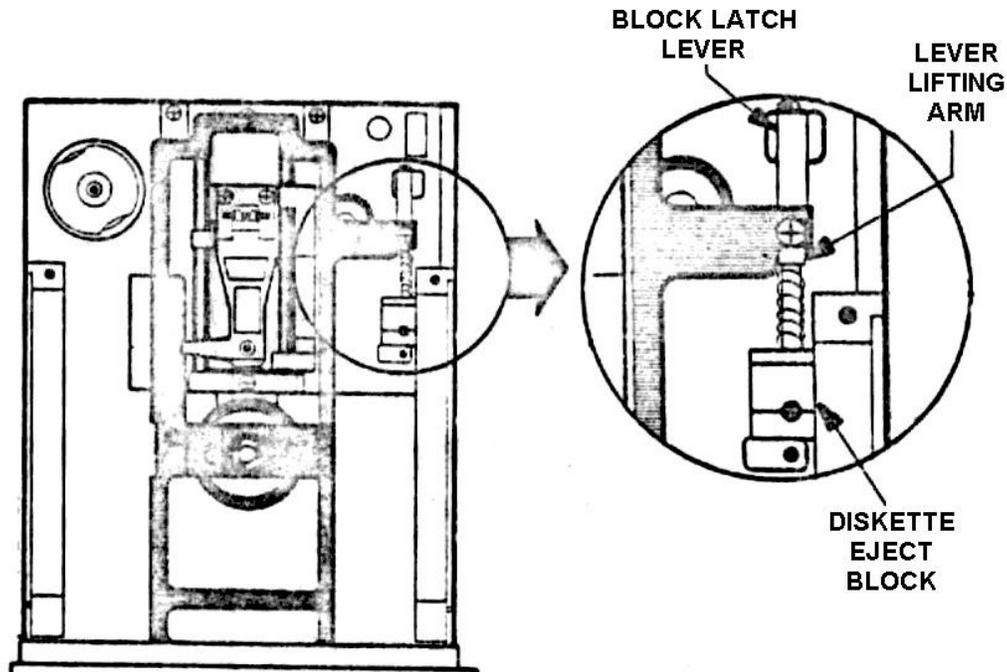
7. Horizontally center the door in the door opening of the bezel.

8. Tighten (10 inch lbs.) the two screws securing the rear corners of the carrier assembly to the rear of the transport casting.
9. Press the front door release button. Ensure that the door opens and the carrier assembly lifts the head assembly pressure pad arm.
10. With the door open, observe the gap between the top edge of the diskette drive spindle and the bottom edge of the clutch cone assembly. Be sure a diskette can move in and out without being scratched or pinched.

NOTE: The spindle/cone clearance is critical to ensure that the diskette is ejected when opening the front door. Too little clearance may cause the back edge of the cone to catch the edge of the diskette hub hole, preventing the diskette from being ejected. Test the ejection process using a standard diskette.

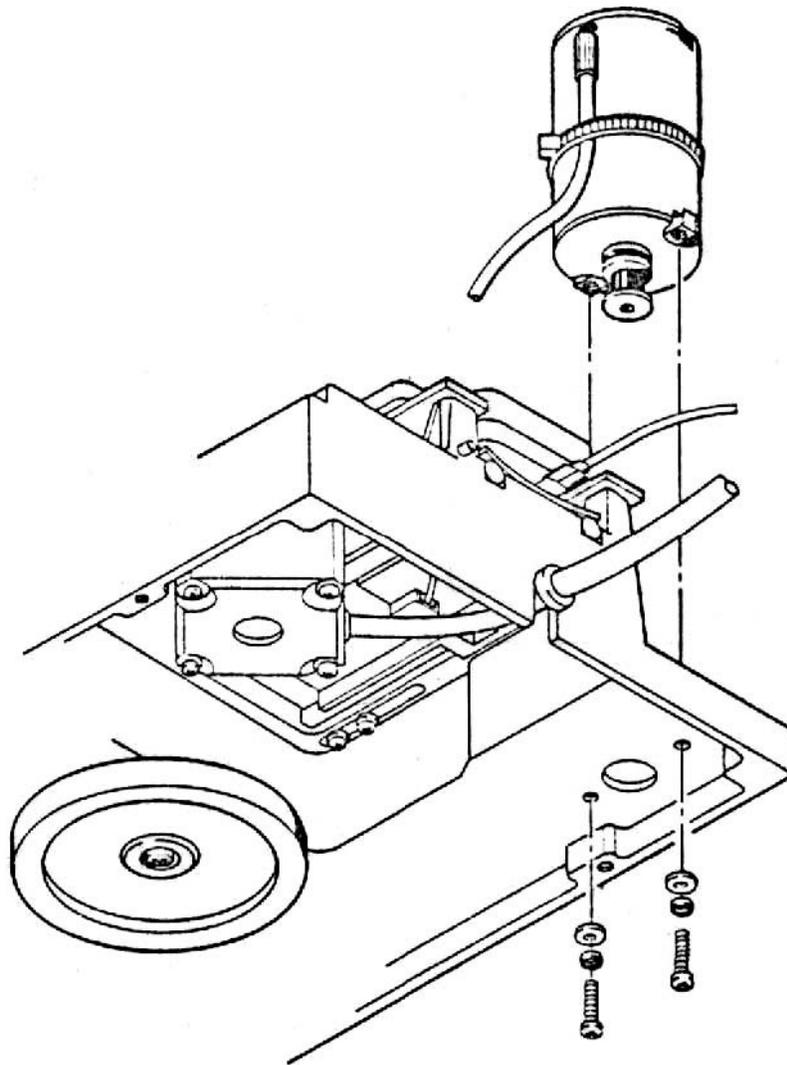


11. To adjust the clearance, compress the clutch cone into the door arm, forcing the clutch cone shaft up out of the top of the carrier assembly.
12. Locate and remove the retaining clip from the shaft.
13. Place another flatwasher over the shaft and replace the retaining clip.
14. Release the clutch cone and return to step 10.



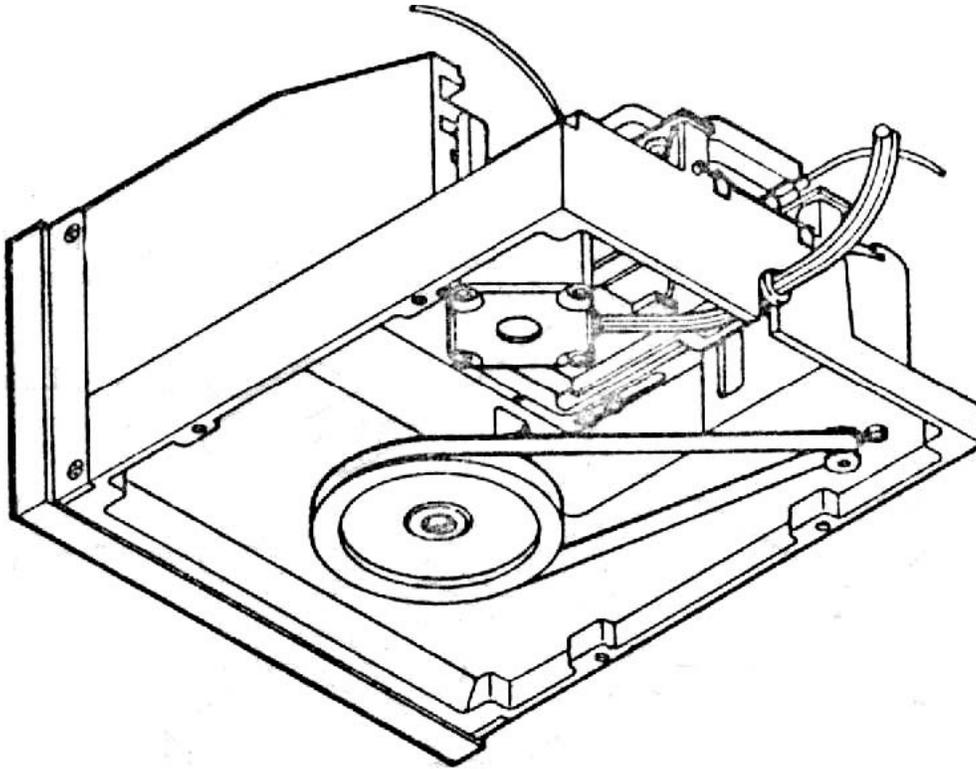
15. With the carrier assembly open, push the diskette eject block (right rear corner) until it latches into its rear position under the latch lever.
16. Close the carrier assembly and then press the release button to reopen the door.
17. Check to see that the diskette eject block freely returned to its forward position when the carrier assembly opened.
18. If the block did not return, bend either the latching lever or the lever lifting arm to adjust the mechanism.
19. Repeat steps 15 thru 18 until the diskette eject mechanism works as indicated.
20. If necessary, install the drive belt.
21. Attach the transport to the common baseplate.

INSTALLING THE DRIVE MOTOR



1. Lay the Drive transport on its side.
2. Position the drive motor onto the top side of the casting. The motor's wiring harness should exit the motor toward the center rear of the transport.
3. While supporting the motor with one hand, install the two screws, splitting lockwashers, and flatwashers to secure the motor to the transport.
4. Torque the two screws to 10 inch lbs.
5. Attach the drive belt to the transport.

INSTALLING THE TRANSPORT DRIVE BELT

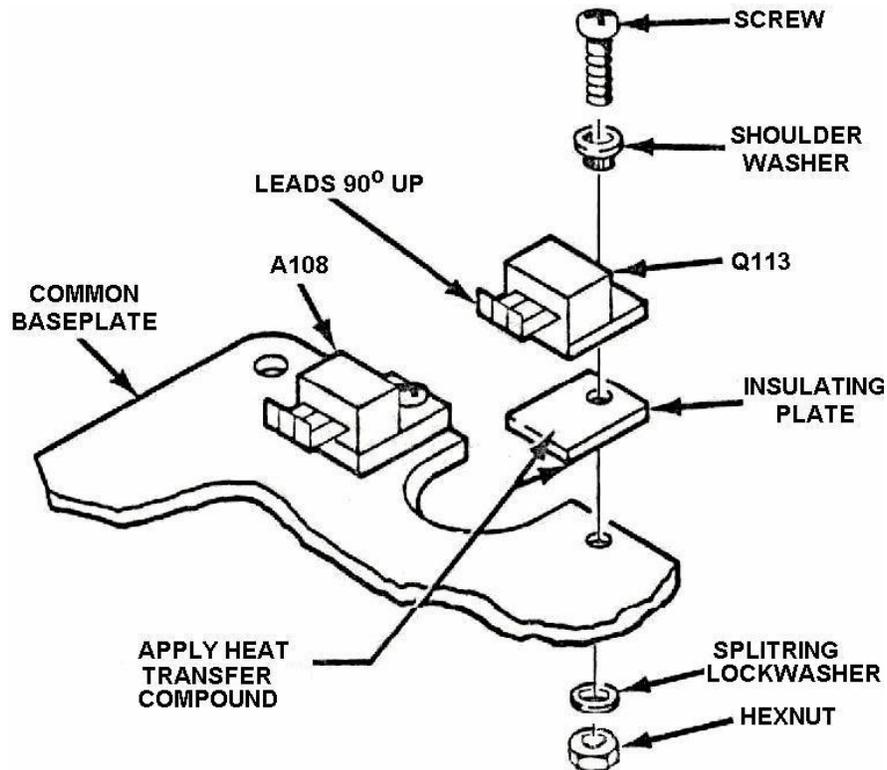


1. Lay the transport on its side.
2. Loop the drive belt over the drive motor drive hub. Carefully ease the belt onto the flywheel while rotating the flywheel.

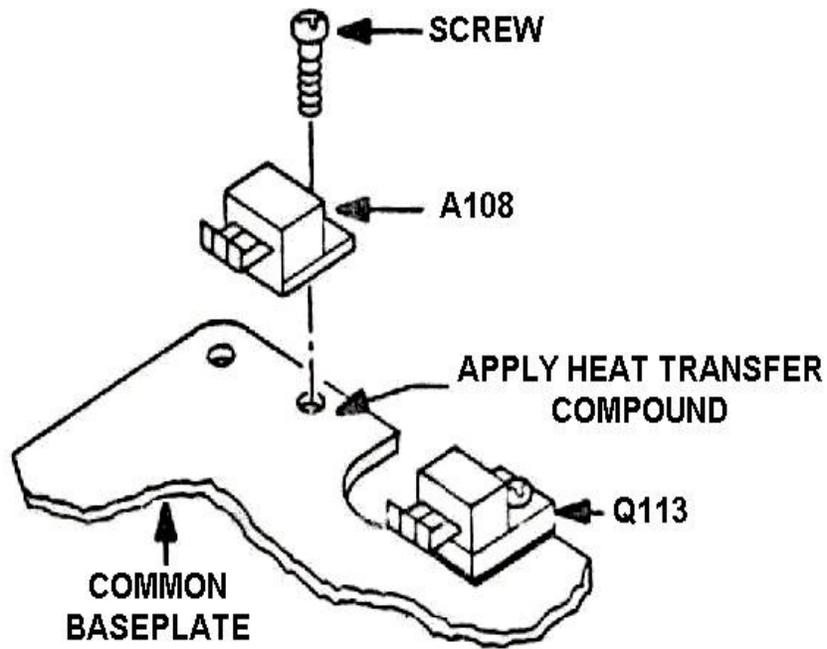
NOTE: DO NOT stretch or damage the drive belt. It is primarily responsible for diskette speed and any variations in diskette speed caused by a stretched or damaged drive belt can cause errors during read and write operations.

3. Refer to the adjustments section of this manual and complete the drive belt adjustment.
4. Attach the transport to the common baseplate.

INSTALLING Q113 (TRANSISTOR)/A108 (VOLTAGE REGULATOR)



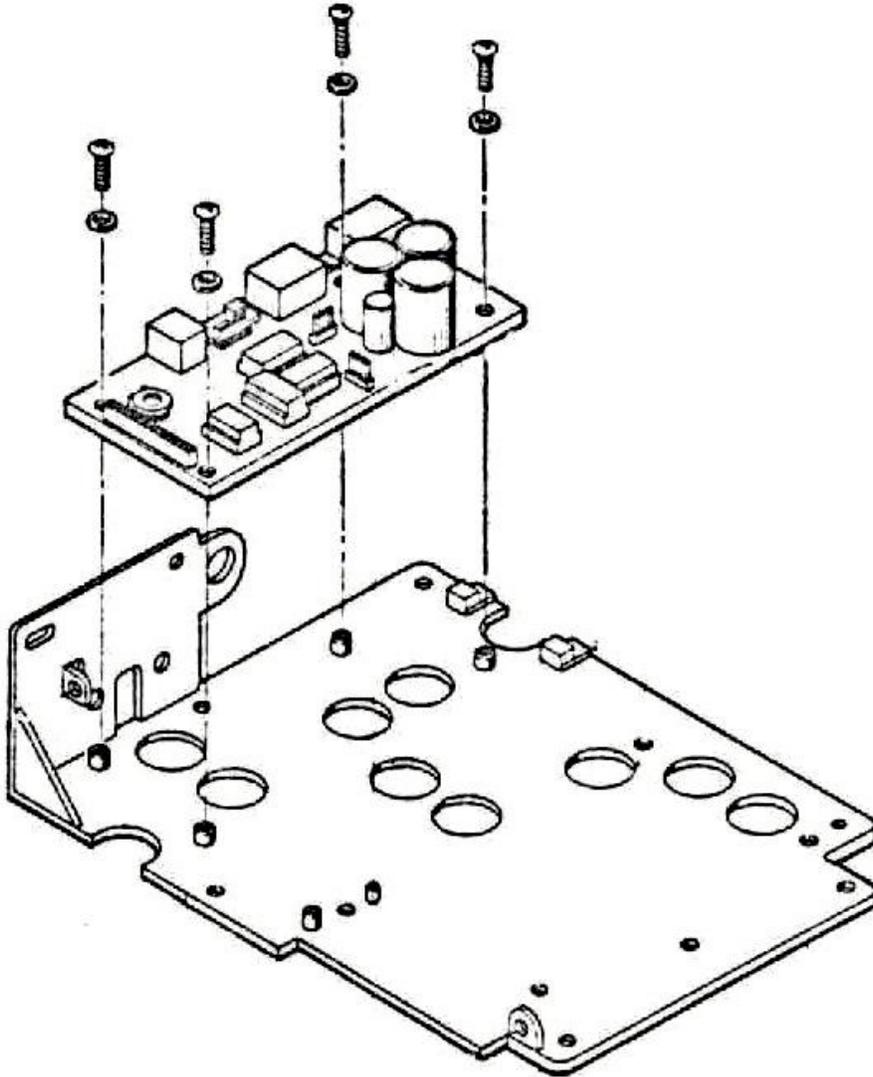
1. Bend the leads of the device you are about to install as shown above.
2. If you are installing Q113 (transistor):
 - a. Apply heat transfer compound to both sides of the mica insulating plate.
 - b. Place the insulating plate into location on the common baseplate.
 - c. Place the transistor into position on top of the insulating plate.
 - d. Secure the transistor/insulating plate combination to the common baseplate with a #4-40 x 3/8" PHIL HD. SCREW, shoulder washer, #4 splitring lockwasher, and a #4 ST2 hexnut.



3. If you are installing A108 (voltage regulator):
 - a. Apply heat transfer compound to the back of the voltage regulator. :
 - b. Position the regulator onto the common baseplate.
 - c. Secure the device to the baseplate with a #4 x 1/4 THD F PHIL HD. screw.
4. Attach the rear PCB to the common baseplate.

INSTALLING THE REAR PCB

1. Carefully lower the rear PCB into position on the common baseplate. Ensure that the six device legs at the right side of the baseplate are correctly seated into the two three-pin sockets on the PCB.

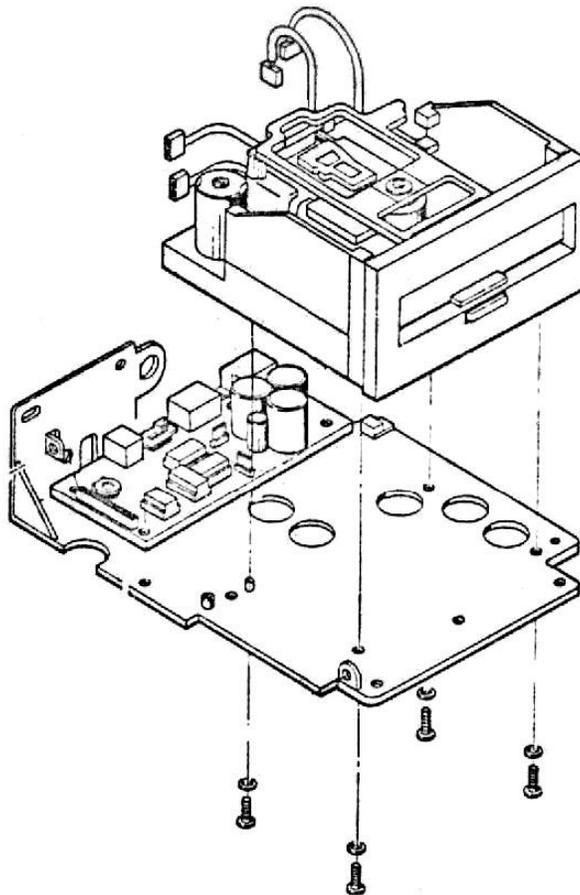


2. Install and tighten the four screws (#6-32 x 1/4" PHIL HD.) and lockwashers (#6 splitting) to secure the PCB to the baseplate.
3. Connect the transport to the common baseplate.

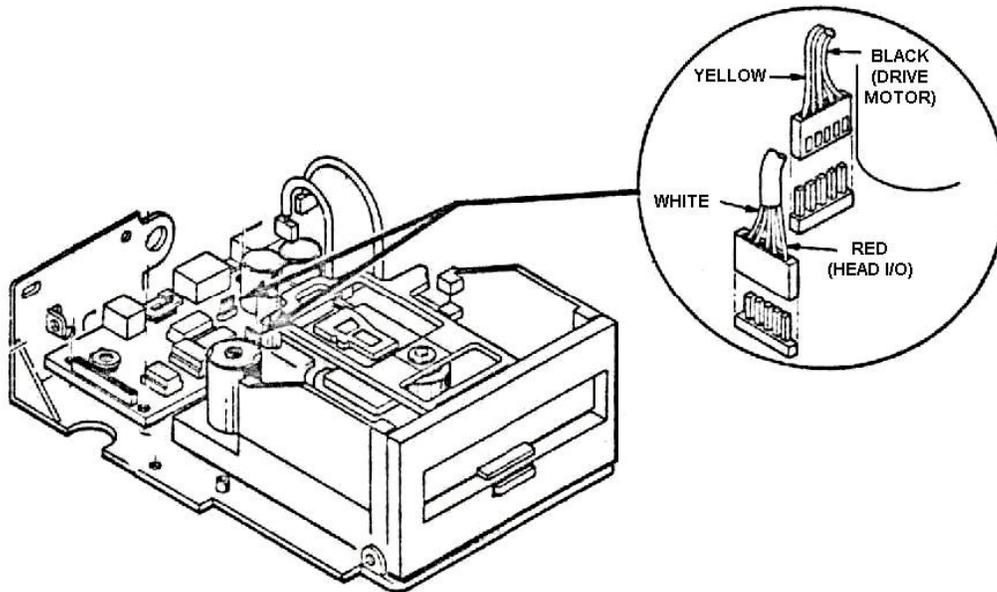
INSTALLING THE DRIVE TRANSPORT

CAUTION: The transport provides critical mechanical alignments necessary for proper Disk Drive operation. Be very careful not to jar or damage the transport or any of its associated subassemblies and components.

1. Carefully set the transport upside down on a suitable work surface.
2. Gently set the transport (upside down) on top of the transport.



3. Install and tighten the four screws (t6-32 x 1/4" PHIL HD.) and lockwashers (#6 splitting) to secure the transport to the baseplate.
4. Set the assembly rightside up on the work surface.

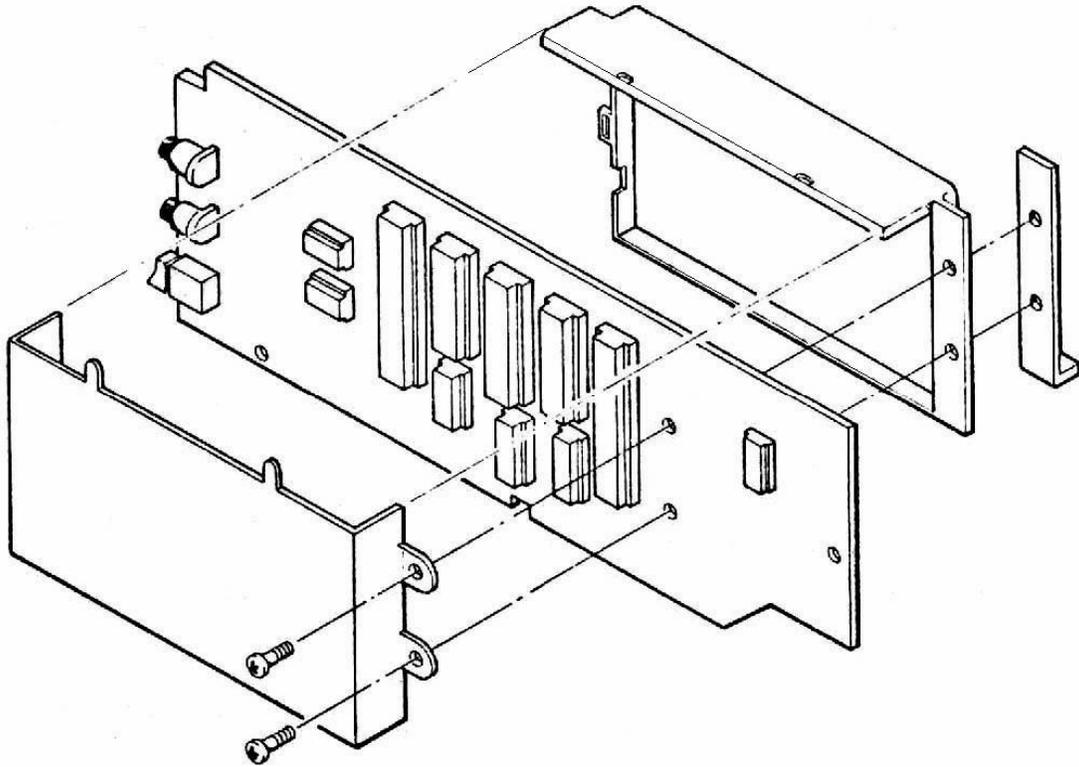


5. Locate and connect the record/playback and erase head I/O wiring harness (shielded red, (blank), blue and either white, black or black, white) to the rear PCB (nonpolarized, X4).
6. Locate and connect the drive motor/ground wiring harness (yellow, green, blue, red, black) to the rear PCB (nonpolarized, #3).
7. If you removed the side PCB, follow the procedures to attach the PCB to the common baseplate.
8. If you did not remove the side PCB during disassembly:
 - a. Locate and connect the stepper motor wiring harness (black, white, red, green, brown) to the side PCB (nonpolarized, #2).
 - b. Locate and connect the write protect wiring harness (black, green, (blank), red, black) to the side PCB (nonpolarized, #1).
9. Go on to step 10.
10. Attach the common baseplate to the Drive base.

NOTE: See Appendix for alternate wiring harness arrangement.

INSTALLING THE RF SHIELD (SIDE PCB)

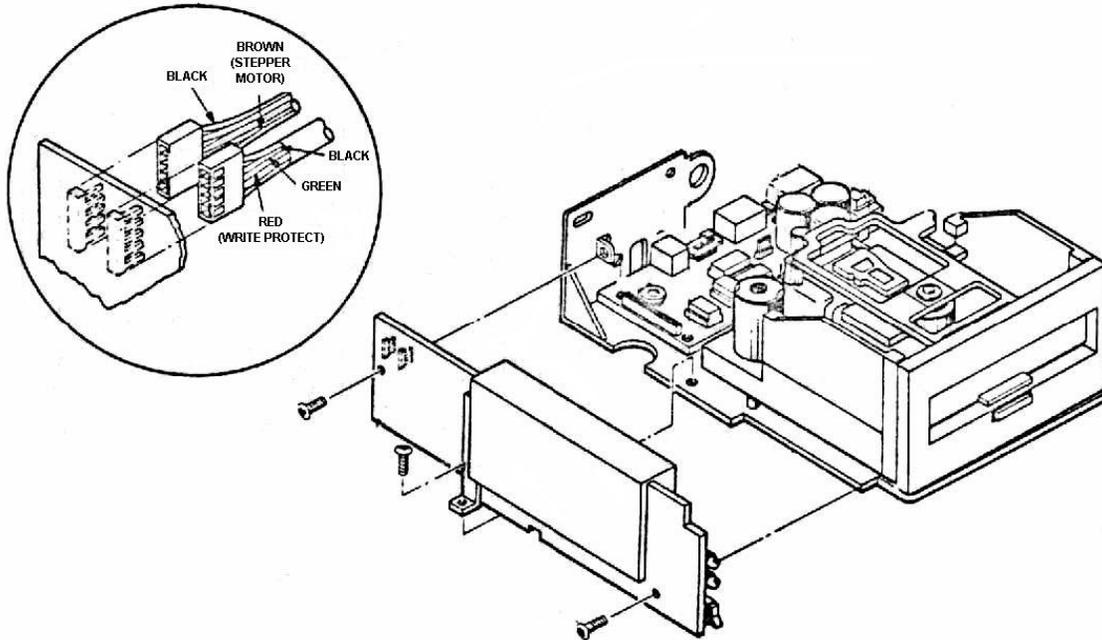
CAUTION: Excessive handling of the locating tabs on the shield case will break them. DO NOT bend the tabs anymore than absolutely necessary.



1. Carefully position the case halves on the side PCB.
2. Position the ground bracket onto the side PCB.
3. Install and tighten the two screws (186-32 x 5/16" TRD F, PHIL HD.) to secure the ground bracket to the PCB and case halves.
4. Locate and bend the three tabs securing the RF shield case halves together.
5. Connect the side PCB to the common baseplate.

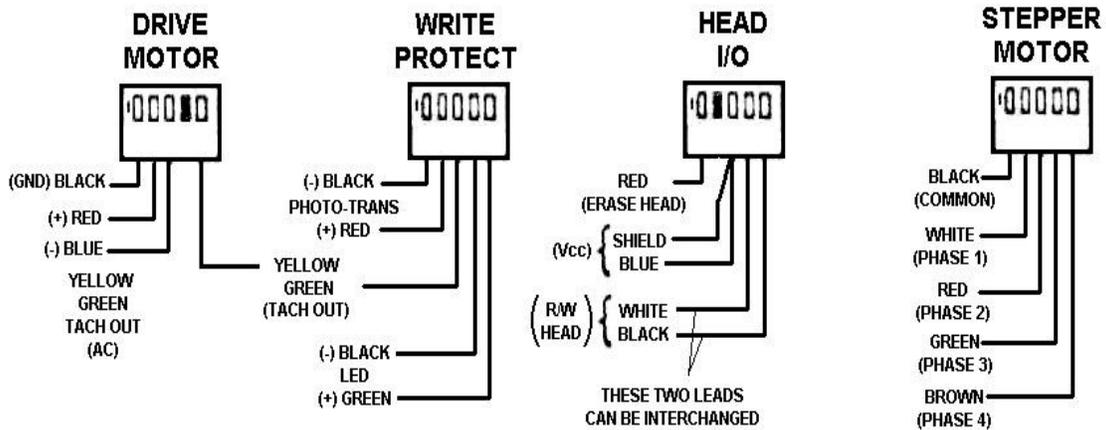
INSTALLING THE SIDE PCB

1. Position the side PCB on the common baseplate (with rear PCB installed).



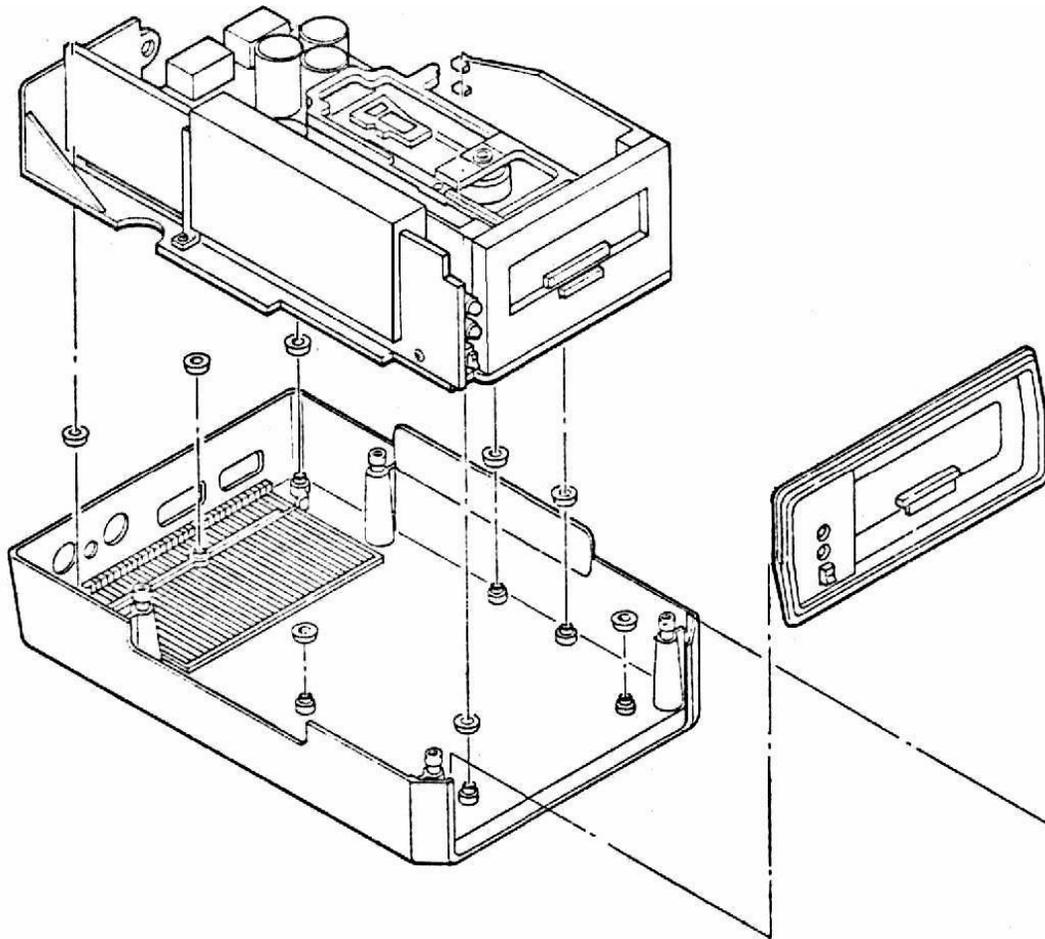
2. Gently seat the multipin socket at the rear lower edge of the side PCB down onto the pins protruding from the rear PCB.
3. Install and tighten the three screws (116-32 x 5/16" THD F, PHIL HD.) that secure the side PCB and its ground bracket to the common baseplate.

4. Locate and connect the stepper motor wiring harness (black, white, red, green, brown) from the Drive transport to the side PCB (nonpolarized, 'P2).
5. Locate and connect the write protect wiring harness (black, green, (blank), red, black) to the side PCB (nonpolarized, #1).
6. Attach the common baseplate to the Drive base.

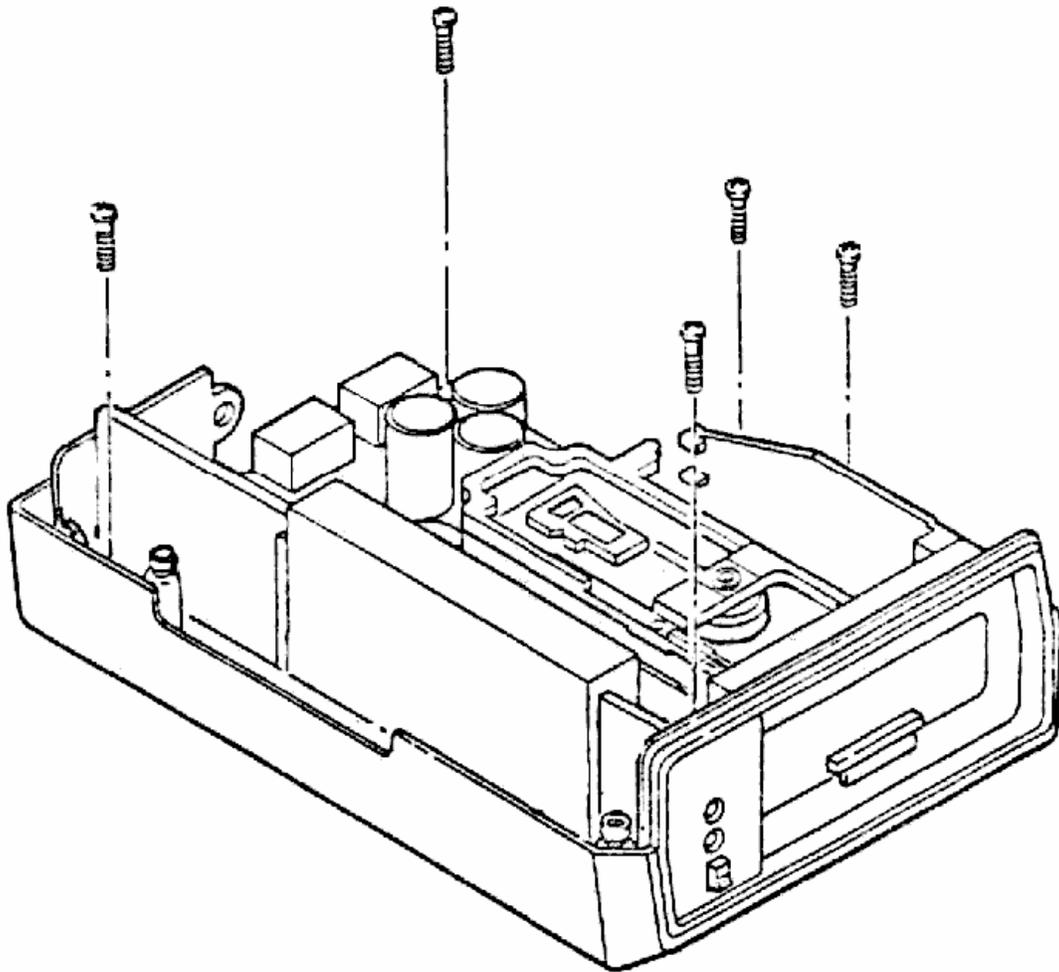


NOTE: You may also have this wiring harness arrangement.

INSTALLING THE COMMON BASEPLATE



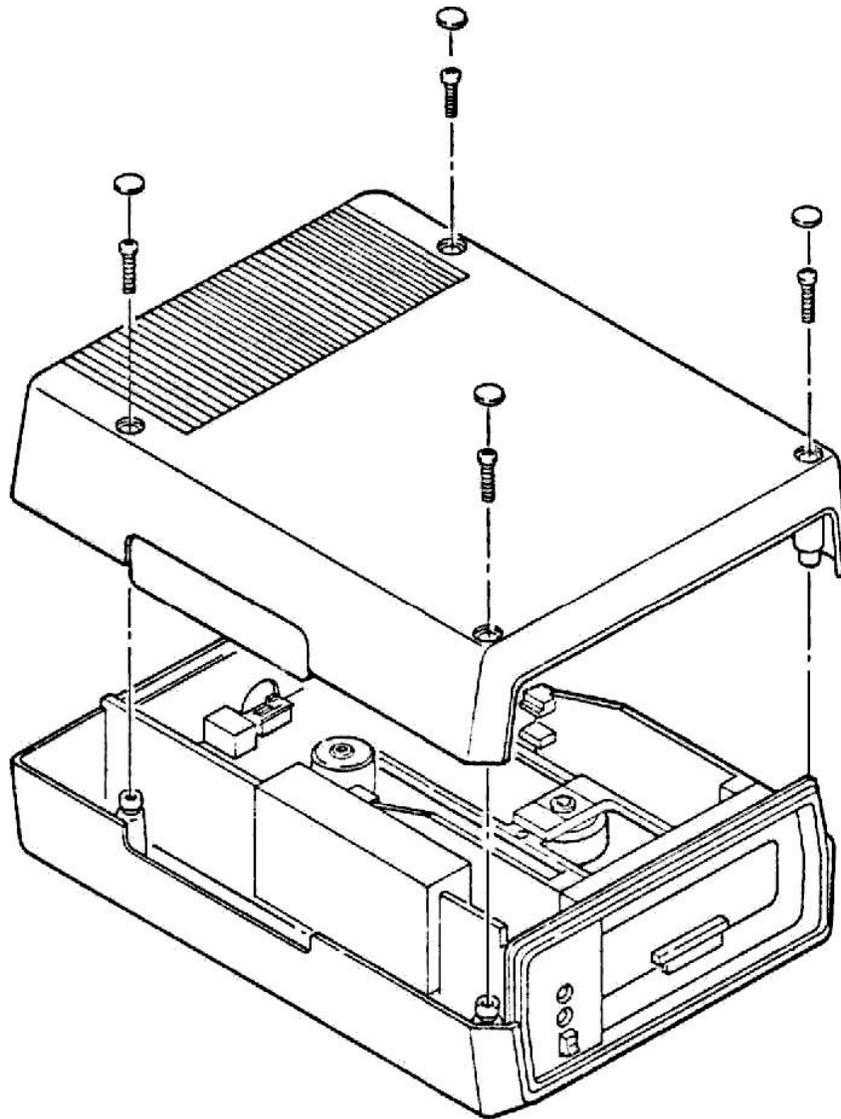
1. Ensure that every boss in the base (even those not used to secure the baseplate is topped with a rubber isolation washer.
2. Position the front coverplate onto the baseplate/transport/PCB assembly.
3. Carefully lower the baseplate into position in the Drive base, ensuring that the cover-plate is also correctly positioned in the base.
4. Install and tighten the five screws (6 - 1/2" BT. PHIL HD.) securing the common baseplate to the drive base.



5. Refer to the adjustments section of this manual and complete the head cleaning and demagnetization procedure.
6. Refer to the adjustments section of this manual and complete the radial track alignment, speed control adjustment, and track 00 end stop adjustment.
7. Assemble the Drive case.

ASSEMBLING THE DRIVE CASE

1. Carefully position the tophousing onto the base and coverplate.



2. Install and tighten the four screws (#6-3/4" SHTMTL, PHIL HD.) securing the tophousing to the coverplate. Install the screw hole covers.
3. Refer to the final checkout section of this manual and complete the full checkout procedure for the Drive.

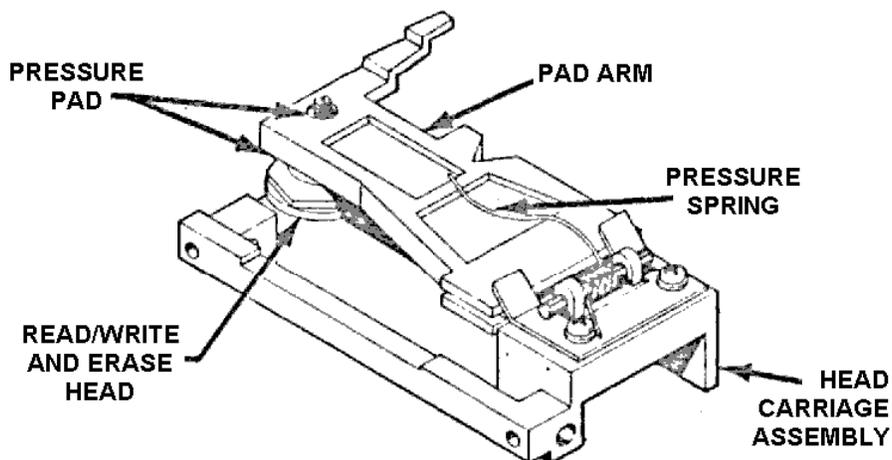
ADJUSTMENTS

READ/WRITE & ERASE HEAD CLEANING & DEMAGNETIZATION

Both the head and the pressure pad will accumulate dirt and oxide particles during use. Periodic cleaning and inspection is necessary for proper Disk Drive operation.

CAUTIONS: The head is subject to magnetization from external fields. DO NOT use magnetized tools or allow the head to get near any equipment producing strong magnetic fields.

DO NOT lift the pressure pad arm farther from the head carriage than the arm would be lifted during normal Disk Drive operations (i.e. front door open).



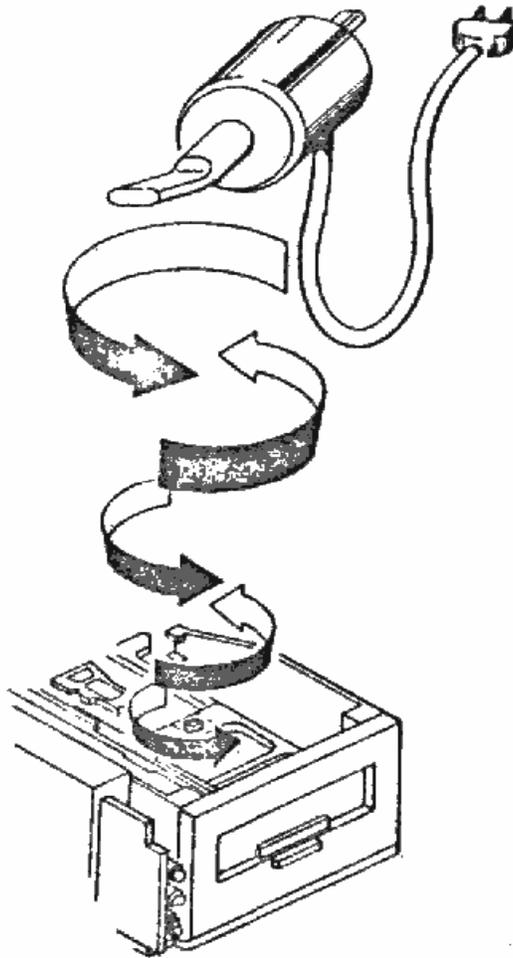
1. Use a small mirror to inspect the pressure pad for excessive buildup of oxides and dirt, or for excessive wear. Replace the head if it is worn or damaged.
2. Otherwise, clean the head.

NOTE: Use either a cotton swab (preferred) or a lint-free cloth (if. chamois) moistened with either methyl or high quality 31% isopropyl alcohol.

Wipe the head carefully to remove all accumulated oxide and dirt. Dry the head.

CAUTION: DO NOT use carbon tetrachloride as a cleaning solution for the head.

3. To demagnetize the head, hold the energized demagnetizing tool about 6 inches above the head. Slowly lower the tool toward the head in a spiraling motion. DO NOT allow the tool to come into contact with the head.



4. Reverse the procedure as you lift the tool away from the head. DO NOT turn the tool off until it is at least 6 inches away from the head.

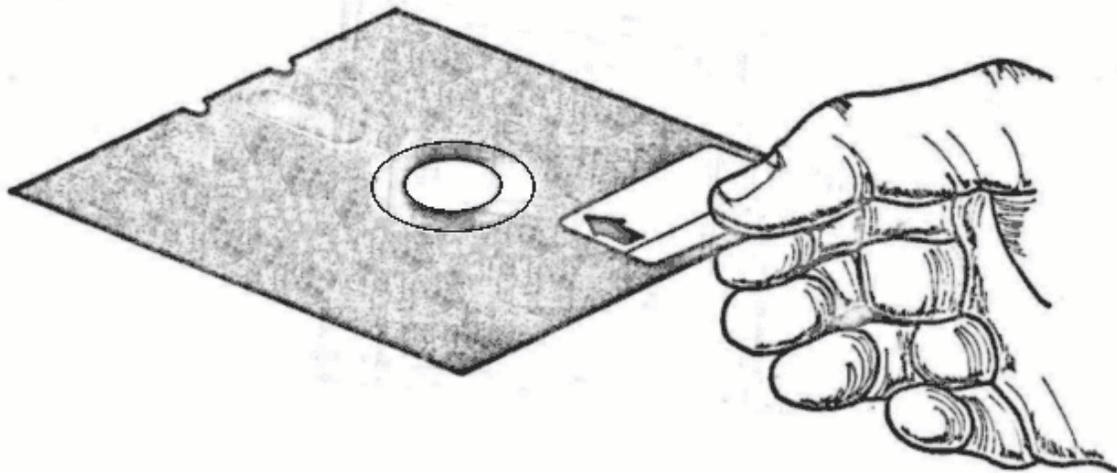
RADIAL TRACK ALIGNMENT & SPEED ADJUSTMENT

Radial track alignment and speed adjustment is necessary to provide optimum diskette compatibility between Drives.

The following are required to perform this procedure:

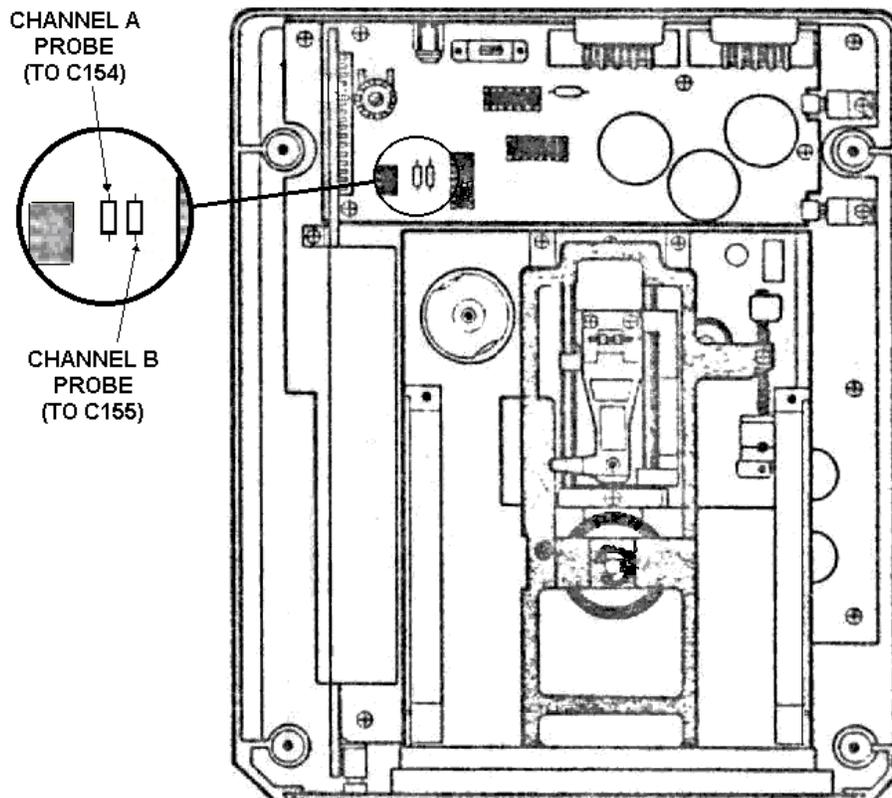
- A. Oscilloscope, dual trace with A+B function, and B invert function, with two probes.
- B. Atari 400/800 Computer Console with minimum 16K RAM installed.
- C. I/O cables and Console/Drive power packs.
- D. Disk Alignment Cartridge or Program.
- E. Master Alignment Diskette.
- F. 0.050 hex setscrew driver.
- G. Non-conductive common blade tuning wand.

CAUTIONS: Take extreme care when handling and storing the master alignment diskette.

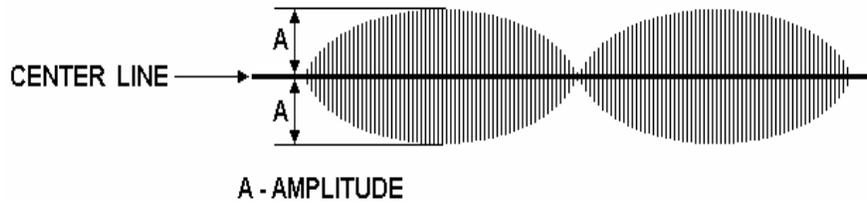


The Disk Drive PWR ON lite should be ON and the BUSY lite should be OFF whenever you are inserting or removing a diskette from the unit. DO NOT open the Drive door or turn Drive power off when the BUSY lite is on.

1. Connect the Drive to the Computer Console.
2. Turn the Drive on and wait for the BUSY lite to go off. Insert the master alignment diskette.
3. Either insert the disk alignment cartridge or load the disk alignment program into the Console.
4. Via the Console, command the Drive to read track #16.
5. Set the oscilloscope controls as follows:
DISPLAY: A + B, B inverted
TIME/DIV: 20msec./DIV
VOLTS/DIV: 20mV/DIV
6. Compensate your scope probes.
7. Connect a ground probe from the scope to the faston lug ground at the rear of the transport.
8. Attach the channel A probe to the rear lead of CR154.

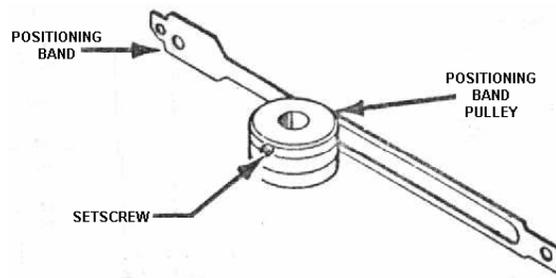


9. Attach the channel B probe to the rear lead of C155.

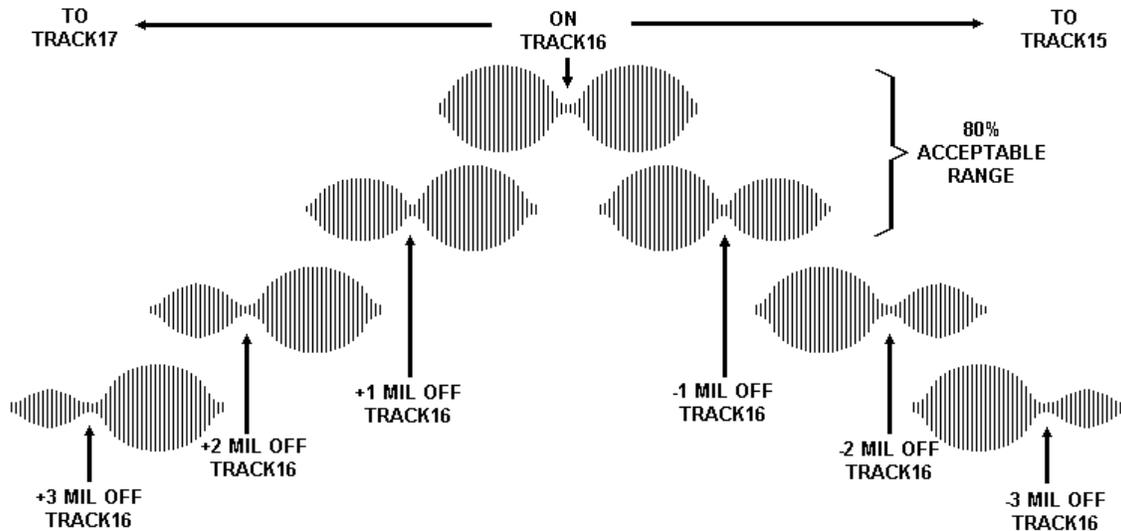


CAT'S-EYE PATTERN

10. The 'scope should be displaying a repeating cat's-eye lobe pattern as shown above.
 - a. If the lobes are of equal amplitude, go on to step 11.
 - b. If the lobes are of unequal amplitudes, proceed as follows:
 1. Locate the setscrew securing the stepper motor positioning band pulley to the stepper motor shaft.



2. With the Drive still reading track 16, back the setscrew out (counterclockwise) of the pulley about 1/4 turn. Leave the setscrew driver in the pulley.
3. Slightly rotate the pulley either clockwise or counterclockwise until the 'scope shows equal amplitude cat's-eye lobes.
4. Tighten the setscrew and remove the setscrew driver.
5. Verify that the lobes are still within 80% amplitude of each other. If they are not, return to step 2.
6. Via the Console, command the Drive to step back to track 00 and return to read track 16.

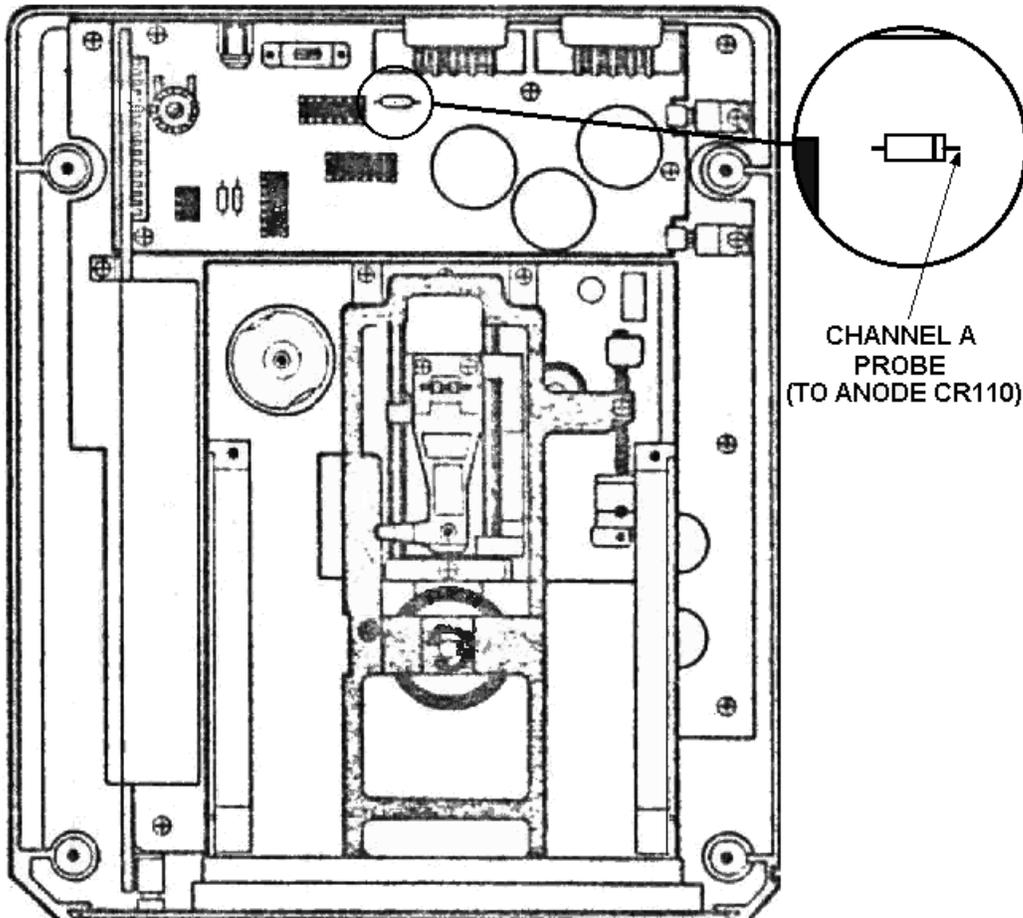


"CAT'S EYES" DISPLAY AS A FUNCTION OF READ HEAD TO TRACK 16 POSITION

7. Verify that the lobes are still within 80% amplitude of each other. If they are not, return to step 2.
8. Via the Console, command the Drive to step out to track 32 and return to read track 16.
9. Verify that the lobes are still within 80% amplitude of each other. If they are not, return to step 2.

NOTE: Steps 6 thru 3 check the hysteresis within the head positioning system. If you are unable to achieve the results indicated, suspect: 1) a broken or damaged setscrew; 2) a binding and misaligned positioning band; 3) binding of head assembly to guiderods; or 4) a bad stepper motor.

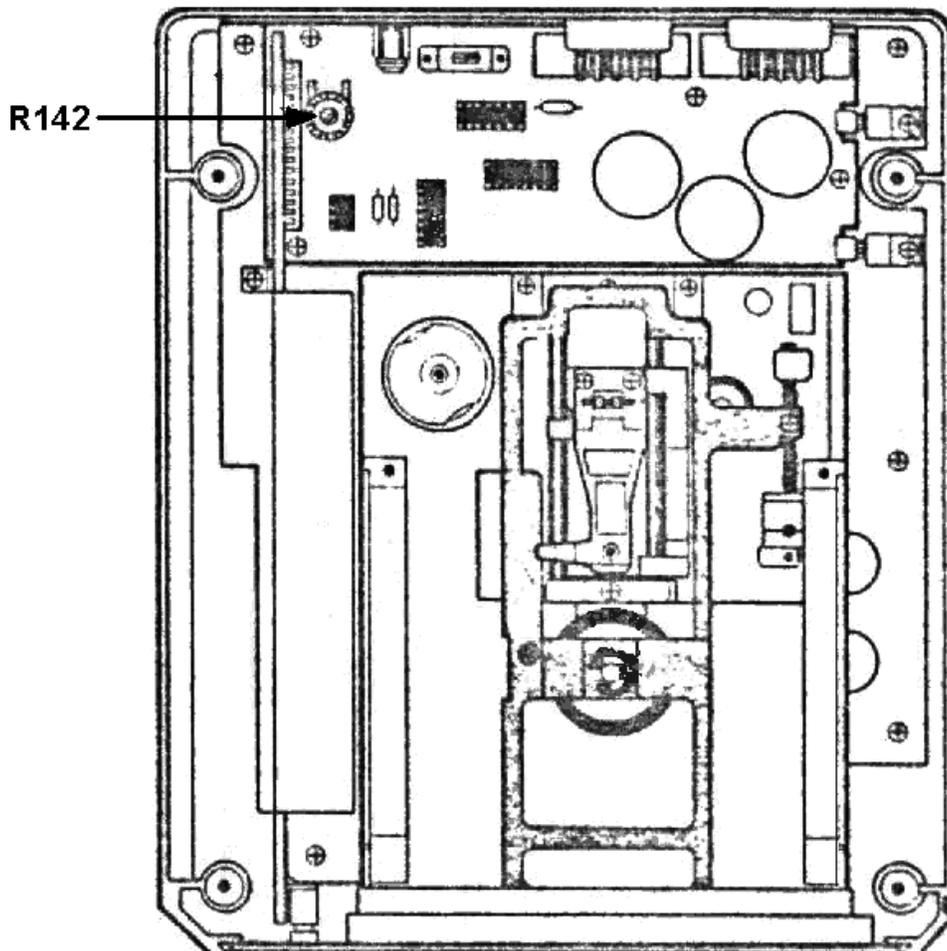
11. Disconnect the 'scope probes (except for the ground lead) from the drive circuit.
12. Reset the 'scope DISPLAY to channel A only.
13. Attach the A channel probe to ANODE side of CR110 (tachometer output).



14. Command the Drive to read any track.
15. Refer to the following guide for correct tachometer frequencies. If the tested frequency is not correct, adjust R142.

SPEED ADJUSTMENT GUIDE

DRIVE BELT	DRIVE MOTOR PULLEY DIAMETER	TACH FREQUENCY	ONE CYCLE TIME	DRIVE MOTOR PART NO.
Mylar (yellow)	.250"	390 Hz	2.564 msec	3-35003-002
Mylar (yellow)	.300"	320 Hz	3.125 msec	3-35003-001
Neoprene (black)	.300"	305 Hz	3,279 msec	3-35003-001

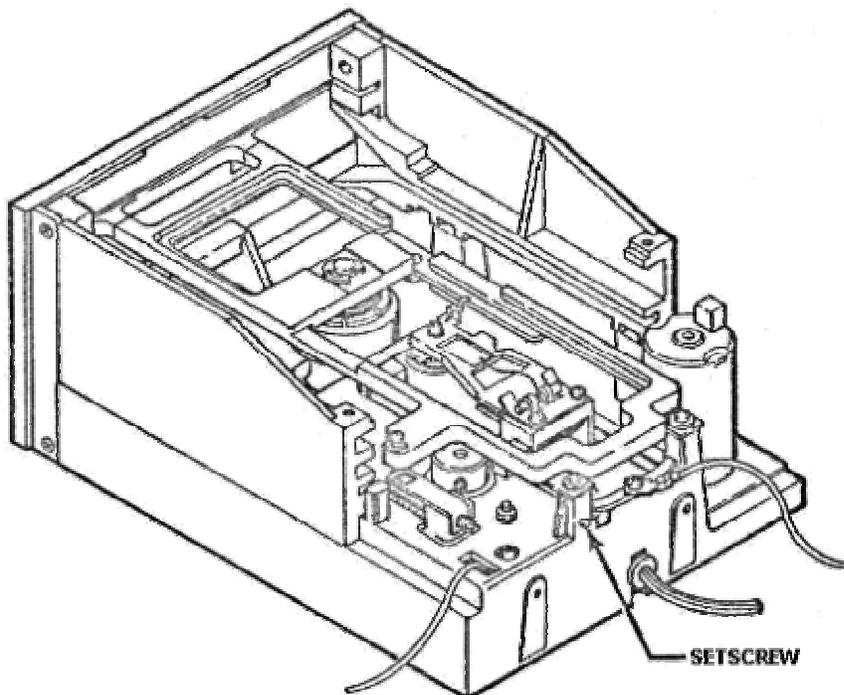


TRACK 00 STOP ADJUSTMENT

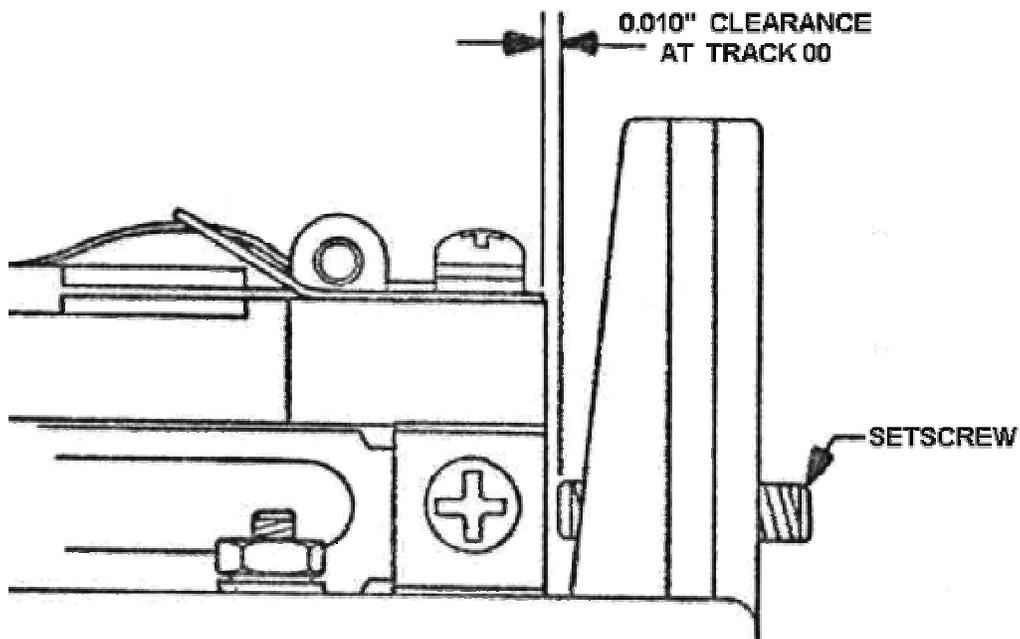
The following are required to perform this procedure:

- A. Atari 400/800 Computer Console with minimum 16K RAM installed.
- B. I/O cables and Console/Drive power packs.
- C. Disk Alignment Cartridge (Console) or Disk Alignment Program.
- D. Master Alignment Diskette.
- E. 0.050 hex setscrew driver.
- F. 0.010 inch flat or round feeler gage.

1. Connect the Drive to the Computer Console.
2. Turn the Drive on and wait for the BUSY lite to go off. Insert the master alignment diskette.
3. Either insert the disk alignment cartridge or load the disk alignment program into the Console.
4. Via the console, command the Drive to read track 00.



5. Locate the track 00 stop setscrew at the rear of the Drive transport.



6. Check and adjust as needed for a 0.010 inch clearance between the setscrew and the rear corner of the head carriage plastic molding.
7. Command the Drive to step out to any track above 30 and then return to track 00.
8. Verify that upon returning to and reading track00, the carriage does not butt against the setscrew.

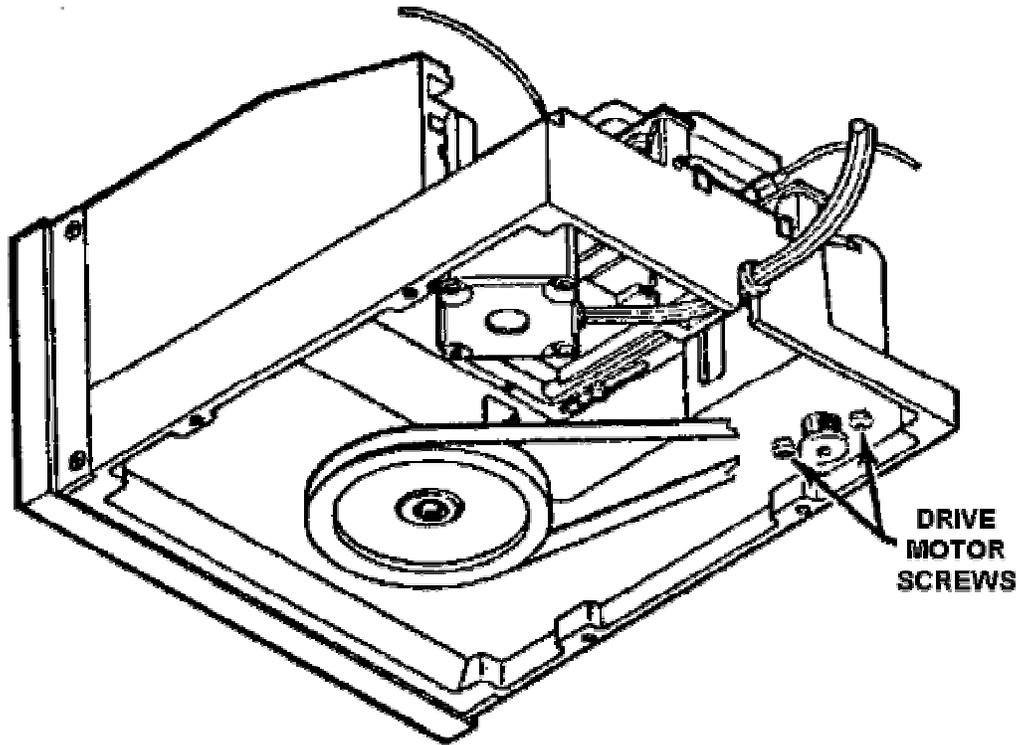
DRIVE BELT ADJUSTMENTS

Drive belt adjustments are completed with No power applied to the unit.

The transport will have either the older (yellow) mylar drive belt or the newer (black) neoprene drive belt. Proper adjustment of the mylar belt requires the USC of a tensiometer or suitable substitute capable of measuring 17 + 1 grams.

MYLAR (YELLOW) DRIVE BELT

1. Loosen but do not remove the two screws securing the drive motor to the transport casting.



(In this point of part "Adjustments" source has ended)

PARTS LISTS

No.	PART NUMBER	DESCRIPTION	QTY
1	CO14757	PRODUCT CARTON	1
2	CO14758-02	END CAP	1
3	CO14758-01	END CAP	1
4	CO15200	DOS/FILE MGR.	1
5	CO14763	INSERT	1
6	CA014748	POWER ADAPTER (PACKAGED)	1
7	CA014862-01	DISK PROGRAM CX8101	1
8	CO14760	INSTRUCTION MANUAL	1
9	CO15554	DOOR CLOSE WARNING SHEET	1
10	CO16065	INSERT SHEET	1
11	CO14759	POLY BAG	1
12	CA014156	FINAL ASSEMBLY	1
13	CA014157	UPPER ASSEMBLY	1
14	CO14105	PANEL LABEL COVER	1
15	CO12972	COMMON BASE	1
16	CO14106	HOLE COVER LABEL	4
17	88-1010	MOUNTING PAD	5
18	CA014158	LOWER ASSEMBLY	1
19	CA014318	FASTENER-BASE ASSEMBLY	1
20	CO14324	FASTENER	4
21	CO12972	COMMON BASE	1
22	CO14086	CONNECTOR LABEL	1
23	ES-1004	RUBBER FEET	1
24	CO14085	SERIALIZATION LABEL	1
25	CA014159	PANEL ASSEMBLY	1
26	CO14039	LOGO LABEL	1
27	CO14082	NAMEPLATE LABEL	1
28	CO12976	DISC PANEL, PRIMARY	1
29	CO14026	ALTERNATE FOR ITEM 31	1
30	CA014160	MOUNTING PLATE ASSEMBLY	1
31	75-046	LOCKWASHER	8
32	CA014072	DISK DRIVE	1
33	72-1604S	SCREW #6-32X1/4 PHIL.HD.	4
34	72-1406S	SCREW #4-40X3/8 PHIL.HD.	1
35	72-CL404	SCREW #4X1/4 THD. FRM. PHIL. HD.	1
36	CO14814	WASHER SHOULDER	1
37	CO14811	INSULATOR	1
38	75-044	LOCKWASHER	1
39	75-914C	NUT #4	1
40	CA014833	PCB ASSEMBLY (REAR)	1
41	CA014161	PCB SUB-ASSEMBLY (REAR)	1
42	CO14025	PCB FAB	1
43	72-CL605	SCREW #6X5/16 THD.F.PHIL.HD.	3

810 COVER

CONTINUE

No.	PART NUMBER	DESCRIPTION	QTY	
44	72-16046	SCREW #32X1/4 PHIL. HD.	4	
45	CA014834	PCB ASSEMBLY (SIDE)	1	
46	CA014162	PCB SUB-ASSEMBLY (SIDE)	1	
47	CO14024	PCB FAB	1	
48	72-CL605	SCREW	2	
49	CO14138	GROUND BRACKET	1	
50	CO14136	RF SHIELD (INSIDE/COMPONENT)	1	
51	CO14137	RF SHIELD (OUTSIDE/TRACE)	1	
52	CO12977	MOUNTING PLATE	1	
53	75-AL612	SCREW #6-3/4 SHEETM.P.H:PHIL.	4	
54	82-AL608	SCREW #6-1/2 B.T.PHIL.HD.	5	
55	CA014122	CABLE ASSEMBLY (13 PIN)	1	
56	CA014121	CABLE SUB-ASSEMBLY	1	
57	CO11506	SHIPPING LABEL	1	
58	CO14845	WARRANTY CARD	1	
59	CA015303	POLY ENVELOPE ASSEMBLY	1	
60	CO15304	RETAILER WARRANTY CARD	1	
61	CO15305	POLY ENVELOPE	1	
62	CO15936	PUBLICATIONS QUESTIONNAIRE	1	
63	CA015598-XX	SERVICE CENTER LIST PACKET	1	

810 COVER

No.	PART NUMBER	QTY	DESCRIPTION
1	CO14179-03	1	Cap, CER, AXIAL: 10pF, 20%, COG, C122
2	CO14179-04	1	Cap, CER, AXIAL: 33pF, 5%, COG, C141
3	CO14179-02	4	Cap, CER, AXIAL: 47pF, 10%, COG, c101,103,131, 119
4	CO14179-07	1	Cap, CER, AXIAL: 62pF, L0%, COG, C105
5	CO14180-03	4	Cap, CER, AXIAL: 100pF, 20%, X7R, C110,130, 139, 140
6	CO14180-10	1	Cap, CER, AXIAL: 390pF, 5%, X7R, C111
7	CO14180-07	1	Cap, CER, AXIAL: 470pF, 20%, X7R, C106
8	CO14181-01	16	Cap, CER, AXIAL:
9	CO14181-03	8	Cap, CER, AXIAL: .001uF, +80-20%, Z5U, C113,116-118, C123-129, C134-138
10	CO14369	1	ELECTROLYTIC, RADIAL: 4.7uF, 35V, +75-10%, C132
11	14-51R1	1	RESISTOR: 1.1Ω, 1/4W, 5%, R125
12	14-5151	1	RESISTOR: 150Ω, 1/4W, SZ, R117
13	14-5221	1	RESISTOR: 220Ω, 1/4W, x, R103,
14	14-5271	2	RESISTOR: 270Ω, 1/4W, 5%, R120, 126
15	14-5331	1	RESISTOR: 330Ω, 1/4W, 5%, R132
16	14-5471	1	RESISTOR: 470Ω, 1/4W, 5%. R106
17	14-5102.	6	RESISTOR: 1K, 1/4W, 5%, PJ18,121-124, 129
18	14-5152	1	RESISTOR: 1.5K, 1/4W, 5%. R114
19	14-5332	1	RESISTOR: 3.3K, 1/4W, 5%, R115
20	14-5472	4	RESISTOR: 4.7K, 1/4W, 5%, R110,116,128,133
21	14-5562	2	RESISTOR: 5.6K, 1/4W, 5%, R101,102
22	14-5103	4	RESISTOR: 10K, 1/4W, 5%, R105,109,113,134
23	14-5153	2	RESISTOR: 15K, 1/4w, 5%, R112,108
24	14-5273	1	RESISTOR: 27K, 1/4W, 5%, R131
25	14-5333	1	RESISTOR: 33K, 1/4W, 5%, R111
26	14-5393	1	RESISTOR: 39K, 1/4W, 5X, R104
27	14-5473	2	RESISTOR: 47K, 1/4W, 5%, R119,130
28	14-5104	2	RESISTOR: 100K: 1/4W, 5%, R135, 136
29	14-5224	1	RESISTOR: 220K 1/4W, 5%, R127
30	14-5750	1	RESISTOR: 75 Ω, 1/4W, 5%, R175
31	CO14702	1	INDUCTOR: 470uH, L101
32	CO14384	2	FERRITE BEAD, L102,103
33	31-1N914		DIODE: 1N914, CR120, CR121, CR122

810 SIDE BOARD

CONTINUE

No.	PART NUMBER	QTY	DESCRIPTION
34	31-1N4001	5	DIODE: 1N4001, CR101-104 ,106
35	CO14808-01	1	DIODE, ZENER: 1n5231B, 5.1V, 5%, CR107
36	CO14394	4	TRANSISTOR: MPSA06, Q106-109
37	33-2N3906	3	TRANSISTOR: 2N3906, Q101,103,104
38	34-2N3904	4	TRANSISTOR: 2N3904, Q102,105,110,111
39	CO14316	1	CRYSTAL: 1.000 MHz, X101
40	CO14386-07	2	SOCKET, IC: 24 PIN
41	CO143%-08	1	SOCKET, IC: 28 PIN
42	COLL3S6-09	2	SOCKET, IC: 40 PIN
43	CO14356-02	6	SOCKET, IC: 14 PIN
44	CO14717-01	1	CONECTOR: 23 PIN. P101
45	CO14719-02	2	CONECTOR: 5 TIN. J101,102
46	CO14397-xx	1	SWITCH, POWER, S102
47	CO14024	1	PCB
48	CO14379	1	RESISTOR NETWORK 9X4.7K, SIP, R176
49	CA015325	2	LED & STANDOFF ASSEMBLY
50	CA011624	1	PCB ASSEMBLY
51	CO11299	1	IC: CUSTOM - ROM, A1.02
52	CO14329	1	IC: FLOPPY CONTROLLER - 1771, A105
53	CO10745	1	IC: CPU - 6507, A101
54	CO10750	1	IC: RIOT - 6532, A104
55	CO14328	1	IC: SRAM - 6810, A103
56	CO14334	2	IC: CD4013, Z101, Z105
57	CO10447	1	IC: CD4077, Z104
58	CO14333	1	IC: CD4011, Z102
59	CO11465-XX	1	IC: CD4069, Z103
60	CO10174-XX	1	IC: CA3086, A106
61	CO14136	1	INSIDE COMPONENT R.F. SHIELD
62	CO14137	1	OUTSIDE TRACE R.F. SHIELD
63	72-CL605	2	SCREW, #6X5/16" THD. F. PHIL. HD.
64	CO14138	1	GROUND BRACKET
65	CO14641-10	1	PCB SERIAL NO. LABEL (SEE MFG. PROCEDURE)

810 SIDE BOARD

No.	PART NUMBER	QTY	DESCRIPTION
1	CO14179-08	1	CAP, CER, AXIAL: 82pF, 10%, COG, C159
2	21-101474	1	CAP, MYLAR FILM .47uF, 100V,10%, C152
3	CO14180-05	1	CAP, CER, AXIAL: 220pF, 10%, COG, C153
4	CO14181-01	4	CAP, CER, AXIAL: .001uF, +80-20%, Z5U, C154-256, 120
5	CO14180-08	1	CAP, CER, AXIAL: .0047uF,20%, X7R, C157
6	CO14181-02	1	CAP, CER, AXIAL: .01uF, +80-20%, Z5U, C147
7	CO14181-03	3	CAP, CER, AXIAL: .1uF, +80-20%, Z5U, C161,163,144
8	CO10394	2	CAP, MYLAR FILM .22uF,10%, C145, 158
9	CO14181-05	-	CAP, CER, AXIAL: .22uF, ALTERNATE FOR ITEM 8
10	CO14392	2	CAP, ELECTROLYTIC: 10uF,16V,+50-10%, RADIAL, C143, 160
11	CO14368	2	CAP, ELECTROLYTIC: 470uF,16V,+50-10%, RADIAL, C150, 151
12	CO14780	3	CAP, ELECTROLYTIC: 4700uF,25V,+50-10%, RADIAL, C146, 148, 149
13	14-51R1	1	RESISTOR: 1.1 Ω , 1/4W, 5%, R139
14	14-5220	1	RESISTOR: 22 Ω 1/4W, 5%. R173
15	14-5101	5	RESISTOR: 100 Ω , 1/4W, 5%, R138,147,174, 162,163
16	14-5241	1	RESISTOR: 240 Ω , 1/4W, 5%, R148
17	14-5331	1	RESISTOR: 330 Ω , 1/4W, 5%, R146
18	14-5221	1	RESISTOR: 220 Ω , 1/4W, 5%, R141
19	14-5751	1	RESISTOR: 750 Ω , 1/4W, 5%, R170
20	14-5821	1	RESISTOR: 820 Ω , 1/4W, 5%, R167
21	14-5102	5	RESISTOR: 1K, 1/4W, 5%, R137,149,151, 154,156
22	14-5332	1	RESISTOR: 3.3K, 1/4W, 5%, R155
23	14-5202	1	RESISTOR: 2K, 1/4W, 5%, R150
24	14-5222	4	RESISTOR: 2.2K, 1/4W, 5%, R159,160,171, 145
25	14-5392	1	RESISTOR: 3.9K, 1/4W, 5%, R161
26	14-5472	2	RESISTOR: 4.7K, 1/4W, 5%, R164,168
27	14-5752	1	RESISTOR: 7.5K, 1/4W, 5%, R169
28	14-5103	8	RESISTOR: 10K, 1/4W, 5%, R140,143,152, 153,157,158,165,166
29	14-5105	1	RESISTOR: 1M, 1/4W, 5%, R144
30	15-5360	1	RESISTOR: 36 Ω , 1/2W, 5%, R172
31	I9-411504	1	RESISTOR: VARIABLE 500K, R142
32	CO14703	1	INDUCTOR: 680uH, 1103
33	31-1N914	2	DIODE: 1N914, CR110,119

810 REAR BOARD

CONTINUE

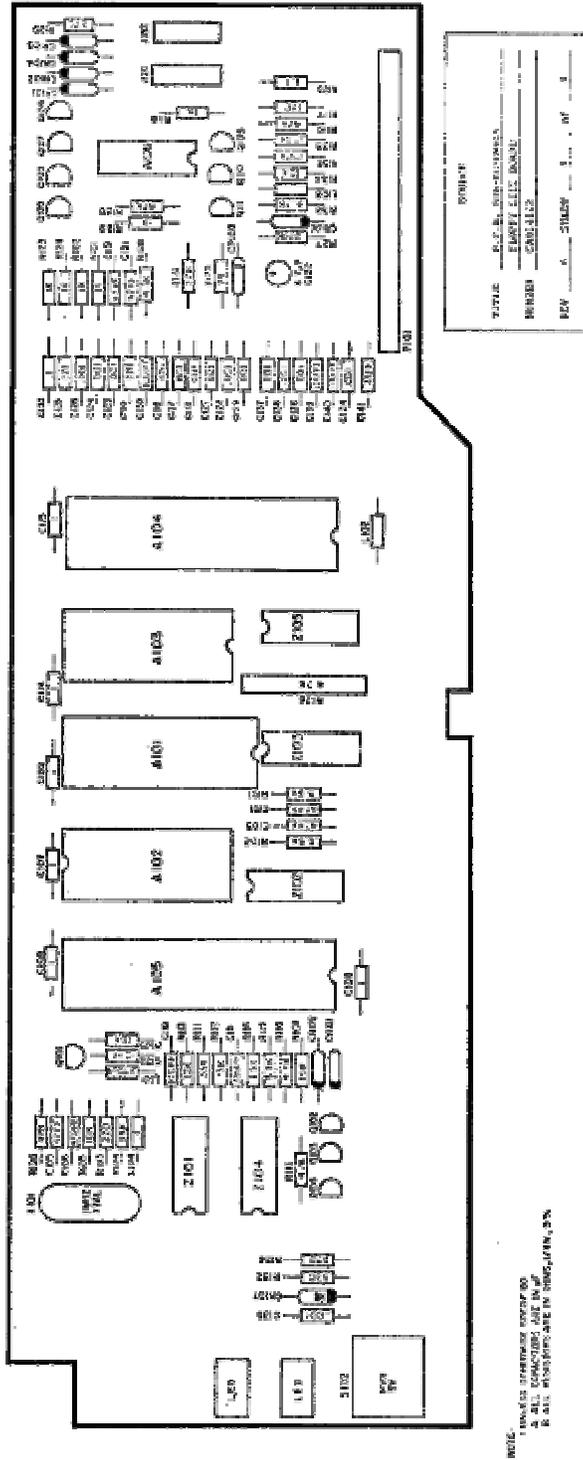
No.	PART NUMBER	QTY	DESCRIPTION
34	31-1N4001	5	DIODE: 1N4001, CR109,115-118
35	CO14308	4	DIODE: MR501, CR111-115
36	34-2N3904	2	TRANSISTOR: 2N3904, Q116,117
37	CO14394	2	TRANSISTOR: MPSA06, Q114,115
38	Ca015326	1	TRANSISTOR & HEATSINK ASSEMBLY
39	CO15505	1	CAP, ELECTROLYTIC, RADIAL, 47uF,16V
40	CO14386-01	1	IC SOCKET: 8PIN
41	CO14386-02	3	IC SOCKET: 14PIN
42	CO14725	1	SWITCH, LOGIC, S101
43	CO14715	1	CONNECTOR: POWER JACK, J110
44	CO12995	2	CONNECTOR: 13PIN, RIGHT ANGLE, J107,108
45	CO14719-03	1	CONNECTOR: 23PIN, J106
46	CO14716-03	2	CONNECTOR: 3PIN, J104,105
47	CO14719-02	2	CONNECTOR: 5PIN, J103,109
48	CO14796	4	LATCHING FASTENER
49	CO14025	1	PCB
50	CO14641-11		PCB SERIAL NO. LABEL (SEE MFG. PROCEDURE)
51	CA014161	1	PCB SUB-ASSEMBLY
52	CO14332	1	IC: LM311, A109
53	CO10174-XX	3	TRANSISTOR ARRAY, A107,110,111
54	CO14348	1	VOLTAGE REGULATOR, 7805, A108

810 REAR BOARD

APPENDIX

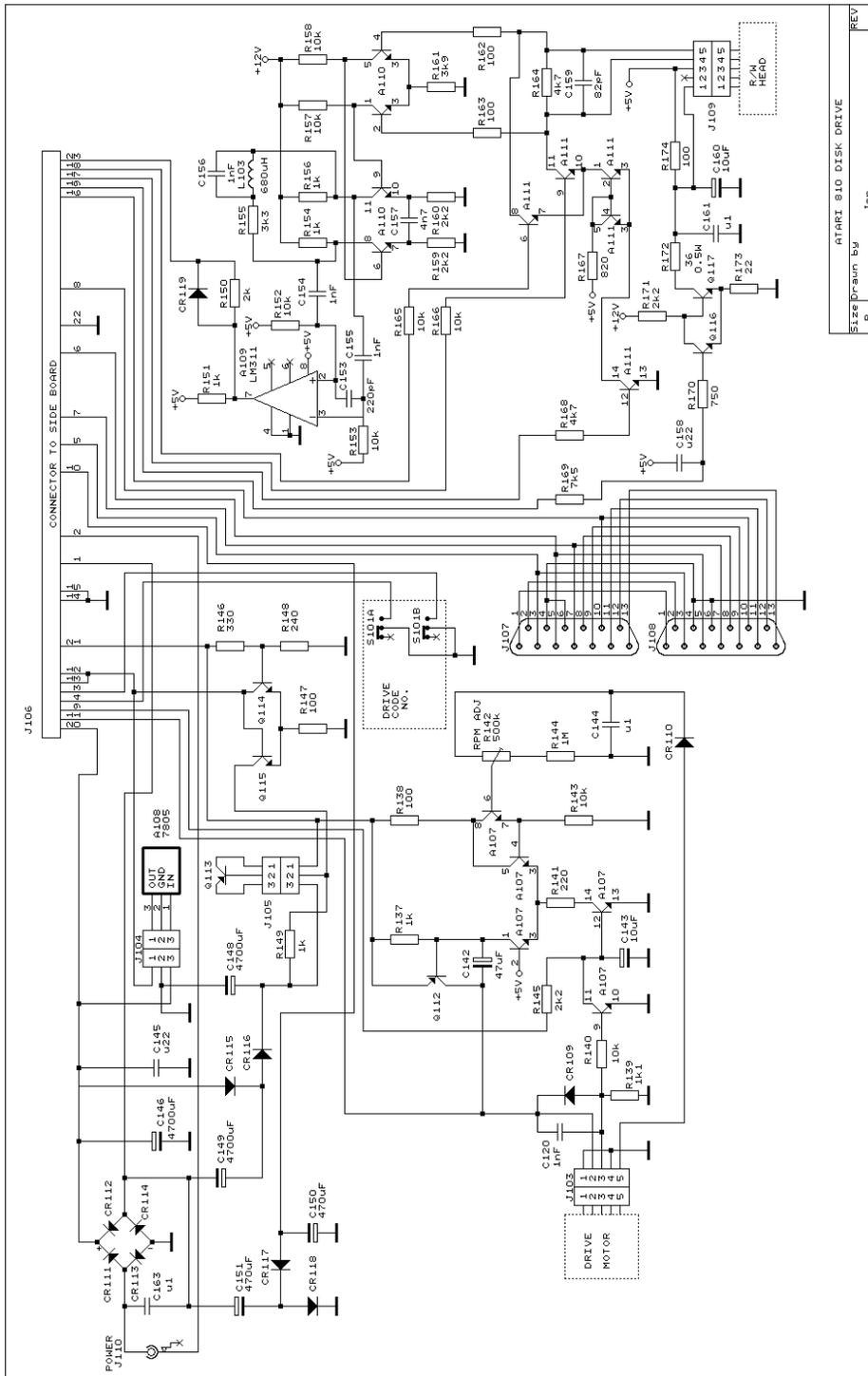
Appendix A ATARI 810 Block Diagram
Appendix B 810 Side Board Schematic
Appendix C 810 Side Board Silkscreen
Appendix D Rear Board Schematic
Appendix E 810 Rear Board Silkscreen
Appendix F 810 Wiring Harness Diagram (Alternate)
Appendix G ERROR Code Listing

C



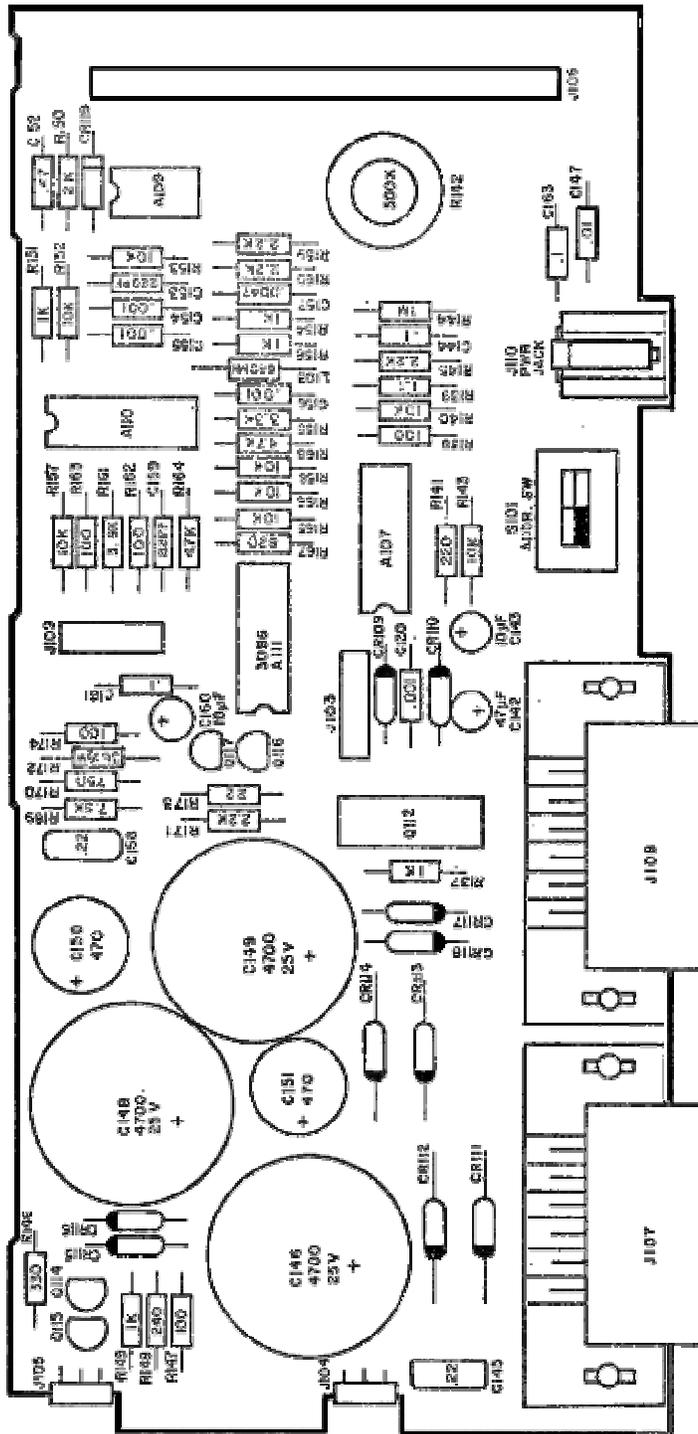
ATARI 810 SIDE BOARD SILKSCREEN

D



ATARI 810 REAR BOARD SCHEMATIC DIAGRAM

Size Drawn by Jer
REV B



SOURCE

TITLE P.C.B. SUB-ASSEMBLY

PROJECT REAR BOARD

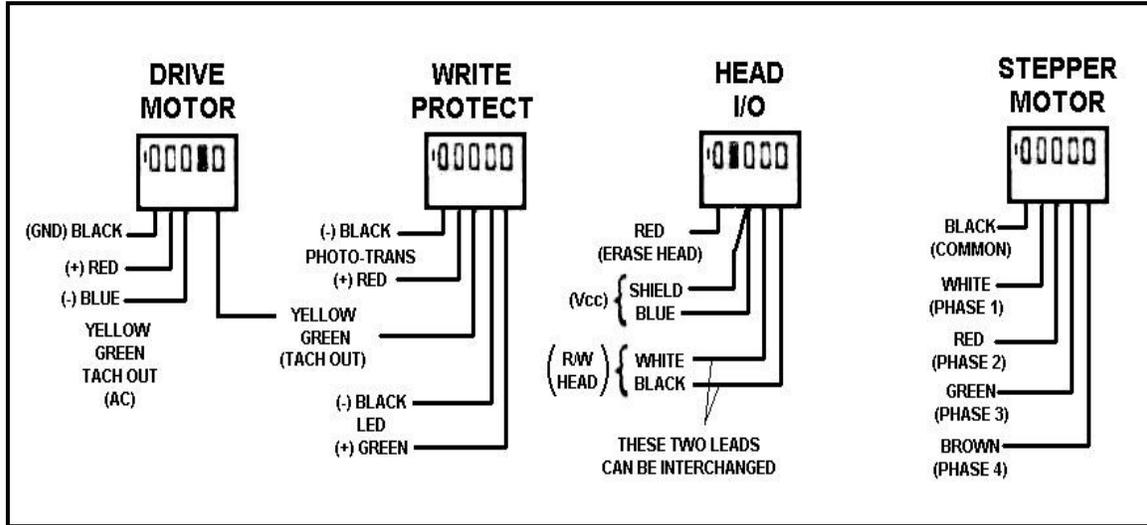
DRAWING NO. 014161

REV 8 SHEET 4 of 4

- NOTES:
1. UNLESS OTHERWISE SPECIFIED
 - A. ALL CAPACITORS ARE IN pF
 - B. ALL RESISTORS ARE IN OHMS, 1/4W, 5%
 2. BLACK SWITCH MUST BE TOWARD REAR OF BOARD

ATARI 810 REAR BOARD SILKSCREEN

F



ALTERNATE WIRING HARNESS ARRANGEMENT

G

ERROR CODES

Error Code	Error Code Message
2	Memory Insufficient
3	Value Error
4	Too Many Variables
5	String Length Error
6	Out of Data Error
7	Number Greater than 32767
8	INPUT Statement Error
9	Array of String DIM Error
10	Argument Stack Overflow
11	Floating Point Overflow/Underflow Error
12	Line Not Found
13	No Matching FOR Statement
14	Line Too Long Error
15	GOSUB or FOR Line Deleted
16	RETURN Error
17	Garbage Error
18	Invalid String Character
142	Serial Bus Data time Overrun
143	Serial Bus Data Frame Checksum Error
144	Device Done Error
145	Read After Write Compare Error
146	Function not Implemented
147	Insufficient RAM
160	Drive Number Error
161	Too Many OPEN Files
162	Disk Full
163	Unrecoverable System Data I/O Error
164	File Number Mismatch
165	File Name Error
166	POINT Data Length Error
167	File Locked
168	Command Invalid
169	Directory Full
170	File Not Found
171	POINT Invalid

NOTE: The following are INPUT/OUTPUT errors that result during the use of disk drives, printers, or other accessory devices. Further information is provided with the auxiliary hardware.

Error Code	Error Code Message
19	LOAD Program Too Long
20	Device Number Larger
21	LOAD File Error
128	BREAK Abort
129	IOCB
130	Nonexistent Device
131	IOCB Write Only
132	Invalid Command
133	Device or File not Open
134	BAD IOCB Number
135	IOCB Read Only Error
136	End Of File
137	Truncated Record
138	Device Timeout
139	Device NAK
140	Serial Bus
141	Cursor Out of Range

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