MICROPOLIS
MODEL 1015F/1016F
OEM FLOPPY DISK DRIVES

MAINTENANCE MANUAL

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MICROPOLIS CORPORATION, 21329 NORDHOFF STREET, CHATSWORTH, CALIFORNIA, 91311

LIMITED WARRANTY

Micropolis warrants hardware products of its manufacture to be free from defects in design, workmanship, and material under normal and proper use and service for a period of one hundred and twenty (120) days following delivery to the original Purchaser. Micropolis agrees to repair or replace at the place of manufacture, without charge, all parts of said products which are returned for inspection to its factory within the warranty period, provided such inspection discloses that the defects are as above specified and provided also that the equipment has not been altered or repaired other than with Micropolis' authorization and by its approved procedures, subjected to misuse, improper maintenance, negligence, or accident, damaged or had its serial number or any part thereof altered, defaced, or removed. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THOSE OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

OPTIONAL LIMITED WARRANTY

Same as above except that the warranty period is twelve (12) months, with no charge for parts and labor during the first two (2) months and a fixed fee repair charge of $45 per unit during the balance of the twelve months.

CHANGE RECORD

Revision Level	Date	Pages Changed	Brief Description
A	May, 1981		Initial Release (Preliminary)
B	Nov, 1981		Positioner description, Parts Lists, Assembly Drawings

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SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

This manual provides maintenance information for the Model 1015F and 1016F series of OEM Floppy Disk Drives, manufactured by Micropolis Corporation, Chatsworth, California. This manual provides data to aid in installing and maintaining the equipment.

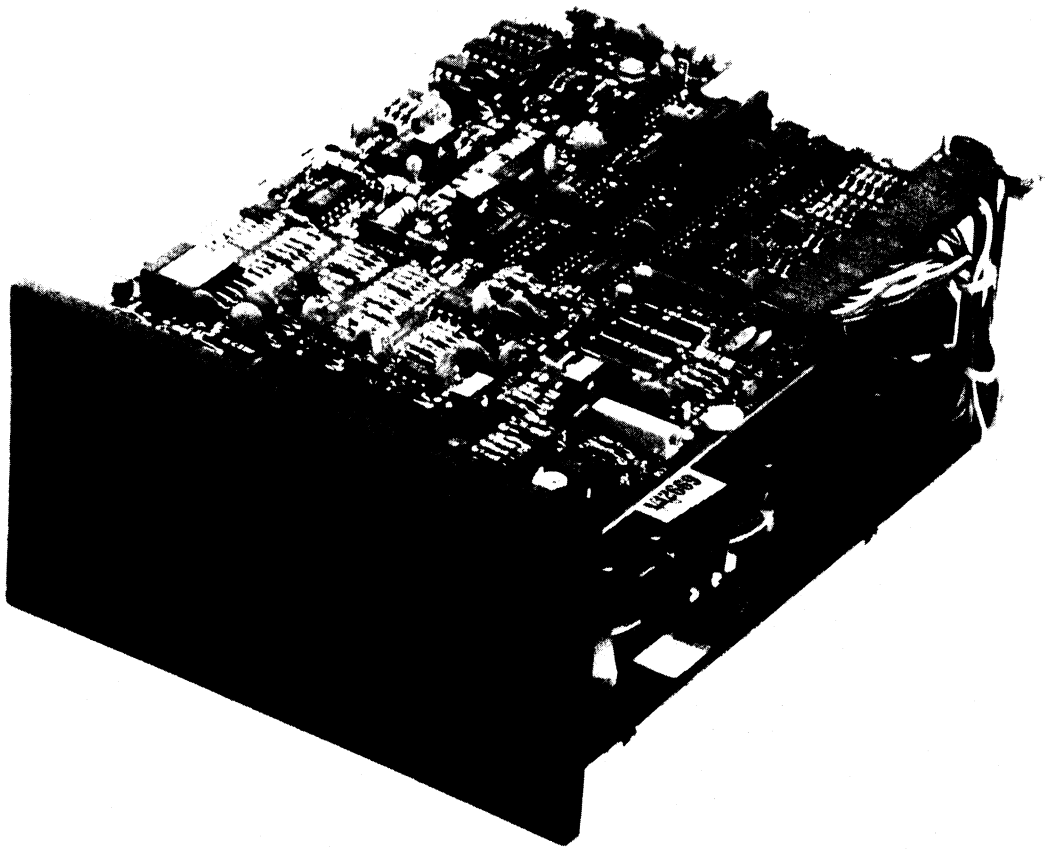


Figure 1-1. Micropolis 1015F/1016F OEM Floppy Disk Drive (Typical)

1.2 SCOPE OF MANUAL

This manual is primarily directed to service personnel, either field service engineers or repair technicians in an OEM repair depot. The manual consists of eight sections, as follows:

Section I, General Information, provides introductory information of a general nature. This includes a brief description of the drives, maintenance philosophy, operator troubleshooting and maintenance, test equipment and tools required, and spare parts ordering procedures.

Section II, Installation, provides procedures for unpacking the drive, installing the drive, configuring multi-drive systems, and supplying power.

Section III, Theory of Operation, provides a detailed description of the disk drive, covering the drive mechanism, the interface, and the drive electronics board.

Section IV, Tests and Adjustments, provides procedures to test and adjust all parameters of the disk drive.

Section V, Troubleshooting, provides information to assist in isolating a fault to a replaceable component or subassembly in a logical manner.

Section VI, Removal and Replacement Procedures, provides step-by-step instructions for replacing assemblies, subassemblies, or components of the disk drive.

Section VII, Parts Lists, provides a set of parts lists for the disk drive.

Section VIII, Assembly Drawings and Schematic Diagram, provides engineering assembly drawings for the drive, and an assembly drawing and schematic diagram for the Single C drive electronics board used in the 1015F/1016F OEM Floppy Disk Drives.

1.3 DESCRIPTION OF DRIVES

Each Micropolis 1015F/1016F OEM Floppy Disk Drive (see Figure 1-1) consists of a drive mechanism and a Single C Drive Electronics PCBA. A protective mounting sleeve, not shown in Figure 1-1, is optional. Since the drives are intended to be mounted within an OEM system and receive regulated DC power from the system, an enclosure and the regulated power supplies are not included. Also, since the system requirements determine the drive controller specifications, the controller is not supplied by Micropolis.

The following OEM Floppy Disk Drives are described in this manual:

a. Model 1015F MOD II (Single head, 100 TPI).

b. Model 1015F MOD IV (Dual head, 100 TPI).

c. Model 1015F MOD V (Single head, 96 TPI).

d. Model 1015F MOD VI (Dual head, 96 TPI).

e. Model 1016F MOD II (Single head, 100 TPI, GCR).

f. Model 1016F MOD IV (Dual head, 100 TPI, GCR).

MOD II and MOD IV drives have a track density of 100 tracks per inch (TPI), with 77 total tracks. MOD V and MOD VI drives have a track density of 96 TPI, with 80 total tracks. The difference in track density and total tracks results from using a different lead screw in the positioner, and different components and adjustments on the PCBA.

Table 1-1 summarizes the specifications of the 1015F/1016F OEM Floppy Disk Drives.

TABLE 1-1. SPECIFICATIONS

Physical (without sleeve)

Height	3 3/8 in (86 mm)
Width	5 7/8 in (149 mm)
Depth	8 1/2 in (216 mm)
Weight	3.9 lbs (1.77 kg)

Environmental

Operating temperature: 50°-113°F (10°-45°C)

Relative Humidity: 20%-80% (without condensation)

Power Dissipation

Standby	8 watts
Operating	16 watts

TABLE 1-1. SPECIFICATIONS (cont.)

Unformatted capacity (per drive)

1015F MOD II	
Single Density	240 Kbytes
Double Density	480 Kbytes
1015F MOD IV	
Single Density	480 Kbytes
Double Density	960 Kbytes
1015F MOD V	
Single Density	250 Kbytes
Double Density	500 Kbytes
1015F MOD VI	
Single Density	500 Kbytes
Double Density	1000 Kbytes
1016F MOD II	585 Kbytes
1016F MOD IV	1170 Kbytes

Drive Characteristics

Rotational speed	300 rpm
Rotational latency	100 milliseconds (average)
Drive motor start time	500 milliseconds
Head load time	75 milliseconds (with head load solenoid option)
Access time	
Track-to-track	10 milliseconds
Settling time	15 milliseconds
Average	256 milliseconds (MOD II, IV) 266 milliseconds (MOD V, VI)
Transfer rate	
1015F Single Density	125 Kbits/second
1015F Double Denstiy	250 Kbits/second
1016F	380 Kbits/second

TABLE 1-1. SPECIFICATIONS (cont.)

Drive Characteristics (cont.)

Recording density	
1015F MOD II Single Density	2624 bits per inch
1015F MOD II Double Density	5248 bits per inch
1015F MOD IV Single Density	2776 bits per inch
1015F MOD IV Double Density	5552 bits per inch
1015F MOD V Single Density	2790 bits per inch
1015F MOD IV Double Density	5580 bits per inch
1015F MOD VI Single Density	2962 bits per inch
1015F MOD IV Double Density	5923 bits per inch
1016F MOD II	6044-6380 bits per inch
1016F MOD IV	6395-6750 bits per inch
Track density	
MOD II, IV	100 tracks per inch
MOD V, VI	96 tracks per inch
Total tracks per surface	
MOD II, IV	77
MOD V, VI	80
Media size	5 1/4 inch (mini-floppy)

Reliability/Maintainability

MTBF	8500 hours
MTTR	0.5 hour
Media life	3×10^6 passes on single track
Insertions	30,000+
Head life	10,000 hours
Soft error rate	1 in 10^9
Hard error rate	1 in 10^{12}
Seek error rate	1 in 10^6

1.4 MAINTENANCE PHILOSOPHY

Micropolis Floppy Disk Drives are designed for trouble-free operation. Most maintenance operations require a high degree of technical sophistication, the proper training, and the proper equipment. Non-technical end users should NOT attempt to perform either preventive or corrective maintenance.

1.4.1 End User Maintenance

The isolation and correction of faults within the disk drive requires sophisticated test equipment and experience in the field of analog and digital troubleshooting. Unless you have been trained by Micropolis and have the necessary tools and equipment, you should make no attempt to perform tests, adjustments, or replacements. If the checks in Table 1-2 do not isolate or correct the fault, notify the appropriate service personnel.

TABLE 1-2. END USER TROUBLESHOOTING

Symptom	Probable Cause/Corrective Action
Motor does not turn and select indicator never lights.	No power to drive.
Select indicator never lights.	1. Interface cable not connected to drive or plugged into controller. 2. Controller not plugged into computer or computer not turned on. 3. Computer power supply voltages are incorrect.
Drive is always selected.	Interface cable is reversed at one end.
Program cannot be loaded (procedure in the system user's manual has been followed).	Inadequate memory - the memory requirements for the high data transfer rates associated with the Micropolis drives may exceed the capabilities of the computer's memory. Try substituting memory made by a different manufacturer.
Permanent I/O errors occur.	1. Inadequate memory (see above). 2. Computer timing problem - there have been many changes/improvements made to various brands of microcomputers to improve operation with disk memory systems. Check with Micropolis Product Support and/or the computer manufacturer to determine whether these changes have been incorporated in your system. 3. Drive fault - try using a known good drive. 4. Controller fault - try substituting a known good controller.
NOTE: This chart is intended only as a first-level diagnostic aid for system level troubleshooting. Section V contains a more thorough guide for qualified service personnel to troubleshoot the disk drive.	

1.4.2 Dealer Service Centers

Micropolis dealers and OEMs that have received formal training on the theory of operation and maintenance of Micropolis equipment, and that possess adequate test equipment and spare parts, are designated as Micropolis Service Centers. These Service Centers are best able to provide high quality and timely warranty and nonwarranty service on Micropolis products.

1.4.3 Micropolis Repair Depot

Micropolis maintains a fully equipped repair depot which provides warranty and nonwarranty repairs and emergency spares support. Contact Micropolis Customer Service to obtain a Return Goods Authorization (RGA) prior to returning any drive for repair.

1.5 MAINTENANCE EQUIPMENT REQUIRED

The following tools, test equipment, and special items are required for maintaining and/or servicing Micropolis OEM Floppy Disk Drives. Where a manufacturers part number is given, equivalent equipment may be used.

a. Tools:
   - 3/16-inch nut driver
   - 1/4-inch nut driver
   - Screwdriver, Phillips #1
   - Tweezers - Clause 231
   - 7/64-inch hex driver
   - 7/64-inch hex key, long handle
   - 3/32-inch hex key
   - Spring Hook Set - National Camera S1390
   - 1/4-inch combination wrench
   - 5/16-inch box end wrench
   - 3/8-inch box end wrench
   - Pot screwdriver - Bourns H90
   - Spring scale, 0-10 lbs
   - Cotton swabs

b. Test Equipment:
   - Oscilloscope - Tektronix 453
   - Digital multimeter - Simpson 461
   - Frequency counter, 0 to 10 MHz (optional)
   - Micropolis Flexible Disk Exerciser, Model 1099 (optional)

c. Special Items:
   - Freon TF or isopropyl alcohol
   - Maintenance standoff - Micropolis 100100-02-3
   - Lubricant, Saunders Magnalube - Micropolis 732-0001-6
   - Alignment Diskette (see paragraph 1.5.1)

1.5.1 Alignment Diskette

Specific alignment diskettes are used with each configuration of the drive. These are:

100 TPI - Single head - Micropolis Model No. 1081-03 (Dymec 501-5)
Dual head - Micropolis Model No. 1081-06 (Dymec 502-5)

96 TPI - Single head - Micropolis Model No. 1081-04 (Dymec 501-1D)
Dual head - Micropolis Model No. 1081-07 (Dymec 502-1D)

The proper tracks on the alignment diskette must be used, as follows:

	100 TPI	96 TPI
Radial Alignment Track	36	32
Circumferential Track	5	2
Azimuth Track	76	68

CAUTION

Care should be exercised not to erase the prerecorded alignment tracks. Do not defeat or override the write protect feature of the drive or diskette. Do not install the alignment diskette in a drive with a suspected write logic or write protect logic failure. NEVER unplug the drive's head connector with any diskette installed.

1.6 PREVENTIVE MAINTENANCE

Micropolis Floppy Disk Drives do not require preventive maintenance when used in the following environment:

a. Dustfree

b. 65^{o} to 80^{o}F ambient

c. Eight hours of operation per day (or less), with power applied, motor running, and a head load cycle of 25% or less.

If the operating conditions exceed these, the preventive maintenance operations specified in Table 1-3 should be performed.

TABLE 1-3. PREVENTIVE MAINTENANCE SCHEDULE

Operation	Frequency	Time Required (Hours)	Manual Paragraph Reference
Replace Head Load Pad	2000 hrs of diskette access	0.1	6.5
Clean Head	2000 hrs of diskette access	0.1	1.6.1
Lubricate Lead Screw	2000 hrs of diskette access	0.1	1.6.2
Replace Drive Motor	5000 hrs of motor operation	0.5	6.4
Lubricate Latch Mechanism	Every two years	0.1	1.6.3

NOTE: These maintenance operations are required only when operating conditions exceed normal.

1.6.1 Cleaning the Head

CAUTION

Rough or abrasive cloth must NOT be used to clean the head. Use only isopropyl alcohol or DuPont Freon TF; the use of other solvents, such as carbon tetrachloride, may damage the head lamination adhesive.

To gain access to the head, it will usually be necessary to first remove the drive from the system enclosure (see paragraph 6.2 for procedure).

Clean the magnetic head with a soft, lint-free cloth or cotton swab moistened with isopropyl alcohol or DuPont Freon TF. Wipe the head carefully to remove all accumulated oxide and dirt. Dry the head with a lint-free cloth.

NOTE

The head must be cleaned after head load pad replacement.

1.6.2 Lead Screw Lubrication

To gain access to the lead screw, first remove the drive from the system enclosure (see paragraph 6.2) and then temporarily move the PCBA out of the way (see paragraph 6.3, but do not cut the head cable tie wraps).

Prior to lubrication, the stepper motor lead screw should be cleaned. Wipe the lead screw with a lint-free cloth lightly moistened with isopropyl alcohol.

CAUTION

Do not contaminate the magnetic recording head or the head load pad with lubricant. Damage to the diskette's recording surface can be caused by lubricant deposited on the head or head load pad.

Lubricate the lead screw and the part of the head carriage that rides on the platen with a thick coat of Saunders Magnalube (Micropolis P/N 732-0001-6).

1.6.3 Latch Mechanism Lubrication

To gain access to the latch mechanism, it will usually be necessary to first remove the drive from the system enclosure (see paragraph 6.2 for procedure).

To ensure smooth, positive action of the door latch mechanism, apply a heavy coat of Saunders Magnalube (Micropolis P/N 732-0001-6) to the entire latch mechanism.

1.7 CORRECTIVE MAINTENANCE

Corrective maintenance consists of isolating a fault to a defective or misadjusted assembly or component, replacing or adjusting the assembly or component, and verifying that the repair has eliminated the fault. The following suggested sequence will help to make the most effective and efficient use of this manual:

a. Isolate the malfunction to the faulty assembly, subassembly, or component. See the Troubleshooting Chart in Section 5.

b. If a more thorough understanding of the operation of a circuit or mechanical or electrical component is desired, see the Theory o Operation in Section 3. The circuit descriptions reference th Assembly Drawings and Schematic Diagram in Section 8.

c. If necessary, test the suspected circuit or mechanical assembl See Section 4, Tests and Adjustments. Also using Section 4, it ma be possible to perform an adjustment to eliminate the fault.

d. Order a replacement component, subassembly, or assembly. See Section 7, Parts Lists.

e. Replace the component, subassembly, or assembly. See Section 6, Removal and Replacement Procedures.

f. Adjust and/or test the circuit or mechanism after replacing the part. See Section 4, Tests and Adjustments.

1.8 SPARE PARTS

Section 7 provides part numbers for the replaceable parts of the OEM Floppy Disk Drives. Information on recommended spares levels for field engineers and for repair depots can be obtained from Micropolis Customer Service. These levels should be maintained to reduce down-time.

Routine orders for spare parts should be placed through Order Entry, not Customer Service. Orders for routine spares are treated and scheduled in the same manner as orders for disk drives, accessories, etc.

Emergency spares will be shipped within two (2) working days and will not be discounted. Emergency spare orders should be placed with Customer Service.

An identification label is attached to the underside of the chassis, near the large pulley. It shows the model number, part number, and serial number of the drive. These numbers should be quoted in all correspondence. Drives shipped with the optional protective sleeve have the label attached to the back panel.

SECTION II

INSTALLATION

2.1 INTRODUCTION

This section provides information necessary for installing the drive. Included are instructions for unpacking the drive (and re-packing the drive for shipment if necessary), visually inspecting the drive, installing the drive, configuring multi-drive systems, and supplying power.

2.2 UNPACKING THE DRIVE

The drive is packed so as to minimize the possibility of damage during shipment. Use the following procedure to unpack the drive, and save ALL packing material in case it is necessary to re-pack the drive for shipping.

a. Place the shipping carton on a flat work surface.

b. Carefully cut the sealing tape on the carton top, open the top flaps.

c. Remove and SAVE the foam that covers the inner carton.

CAUTION

Use extreme care when handling the inner carton; the drive (inside it) is subject to damage if dropped.

d. Carefully remove the inner carton containing the drive and place it on the work surface.

CAUTION

When the carton is removed, the drive mechanism and circuit board will be exposed. Handle VERY carefully.

e. Remove the top and bottom sections of the inner carton from the drive.

f. SAVE both halves of the inner carton and the foam covers.

2.3 RE-PACKING THE DRIVE FOR SHIPMENT

If it is necessary to re-pack the drive for shipment, the following procedure must be used.

CAUTION

Do not attempt to ship the drive except in the original packing.

a. Put the drive in the bottom half of the inner carton; fold the sides of the carton carefully, and hold them in place.

b. Put the top of the inner carton on the drive, thus securing the sides of the bottom carton in place.

c. Place the bottom foam in the shipping carton.

d. Place the drive in the bottom foam.

e. Put the top foam on top of the drive.

f. Close the outer carton flaps and seal securely with tape.

2.4 UNPACKING/RE-PACKING DRIVES WITH SLEEVES

Drives with the optional sleeve are not shipped with the inner carton. The drive is enclosed in a large plastic bag and placed directly in the top and bottom foam.

2.5 VISUAL INSPECTION

When the drive is unpacked, inspect it for any damage. If shipping damage of any kind is evident, notify the carrier at once.

NOTE

Do not return the damaged drive until the shipping company inspector has reviewed the damage, since an insurance claim will be made.

2.6 INSTALLING THE DRIVE

2.6.1 General Guidelines

The following general guidelines should be adhered to when planning the installation:

a. Ambient temperature must be in the range of 50°-113° F (10°-45° C).

b. Do not install a drive close to sources of strong electromagnetic or electrostatic fields (i.e., large transformers, CRTs, motors, etc.).

c. Avoid dirty, dusty, or smoky areas.

d. Avoid static discharging to any part of the system (use anti-static spray on carpets).

e. Ensure that adequate regulated DC power (as specified in Section 2.8) is available.

f. For drives with the optional protective sleeve, ensure that the cooling slots are not obstructed.

2.6.2 Specific Mounting Requirements

Refer to Figure 2-1; ensure that the following mounting requirements are met:

a. The drive may be mounted in any orientation except upside down. If the drive is to be mounted with the bezel up, it should be ordered as such so the diskette ejector system can be suitably adjusted.

b. Use the recommended panel opening given in Figure 2-1, and insert the drive through the panel opening from the front.

c. On no account should the mounting scheme rely on the plastic bezel for support.

d. Use the two front and either one of the rear plastic mounting nuts on the chassis edges. For drives with the optional protective sleeve, use the outside two holes on either side, or the three holes on the sleeve bottom, or (preferred) the two front and either one of the rear holes that secure the sleeve to the drive chassis. See Figure 2-1 for details. Spacers against the sleeve should be at least 0.5 inch outside diameter.

e. Use care that mounting screws do not protrude more than 0.2 inch into the drive mechanism.

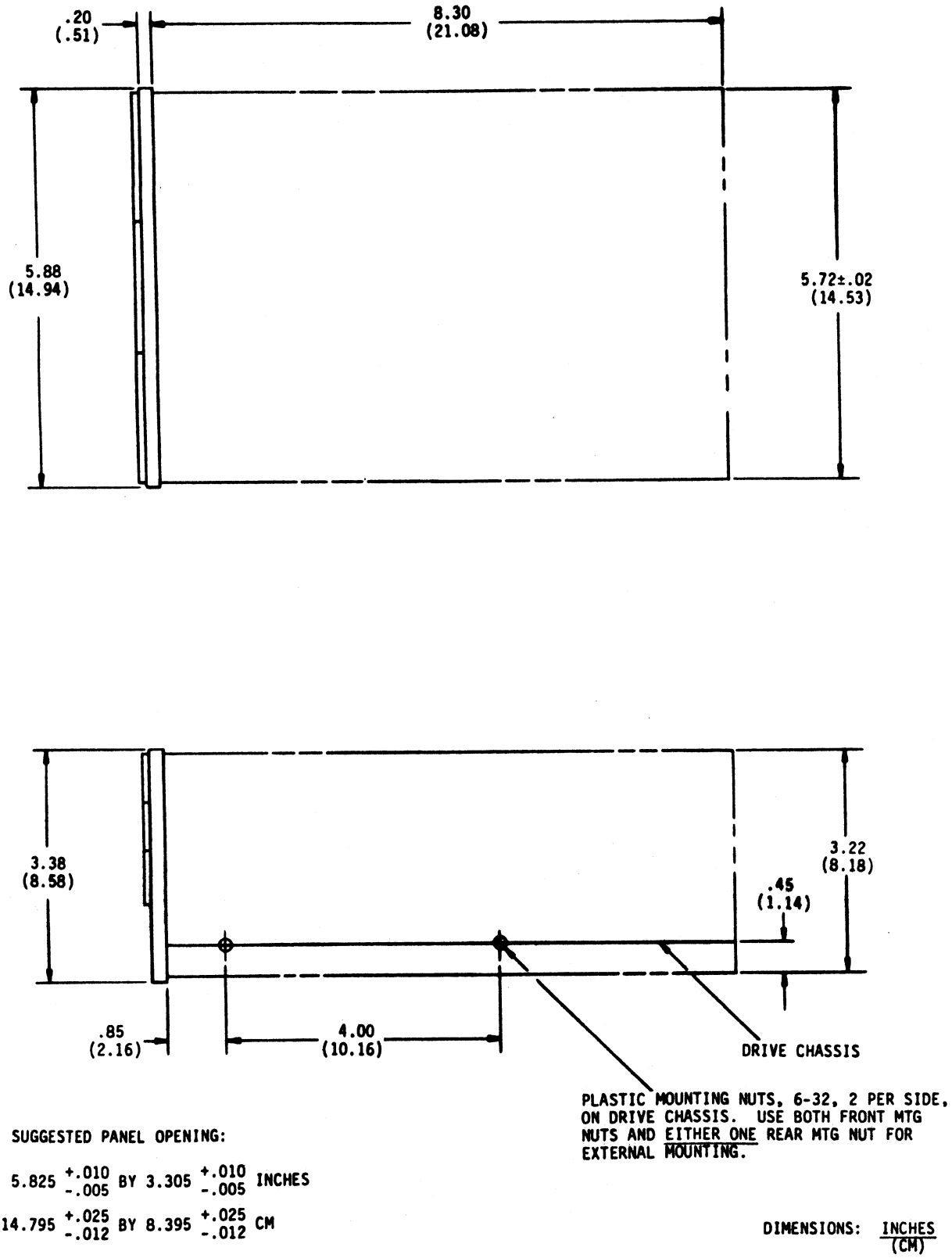


Figure 2-1. Drive Mounting Details

(Sh 1 of 2 - Without Optional Protective Sleeve)

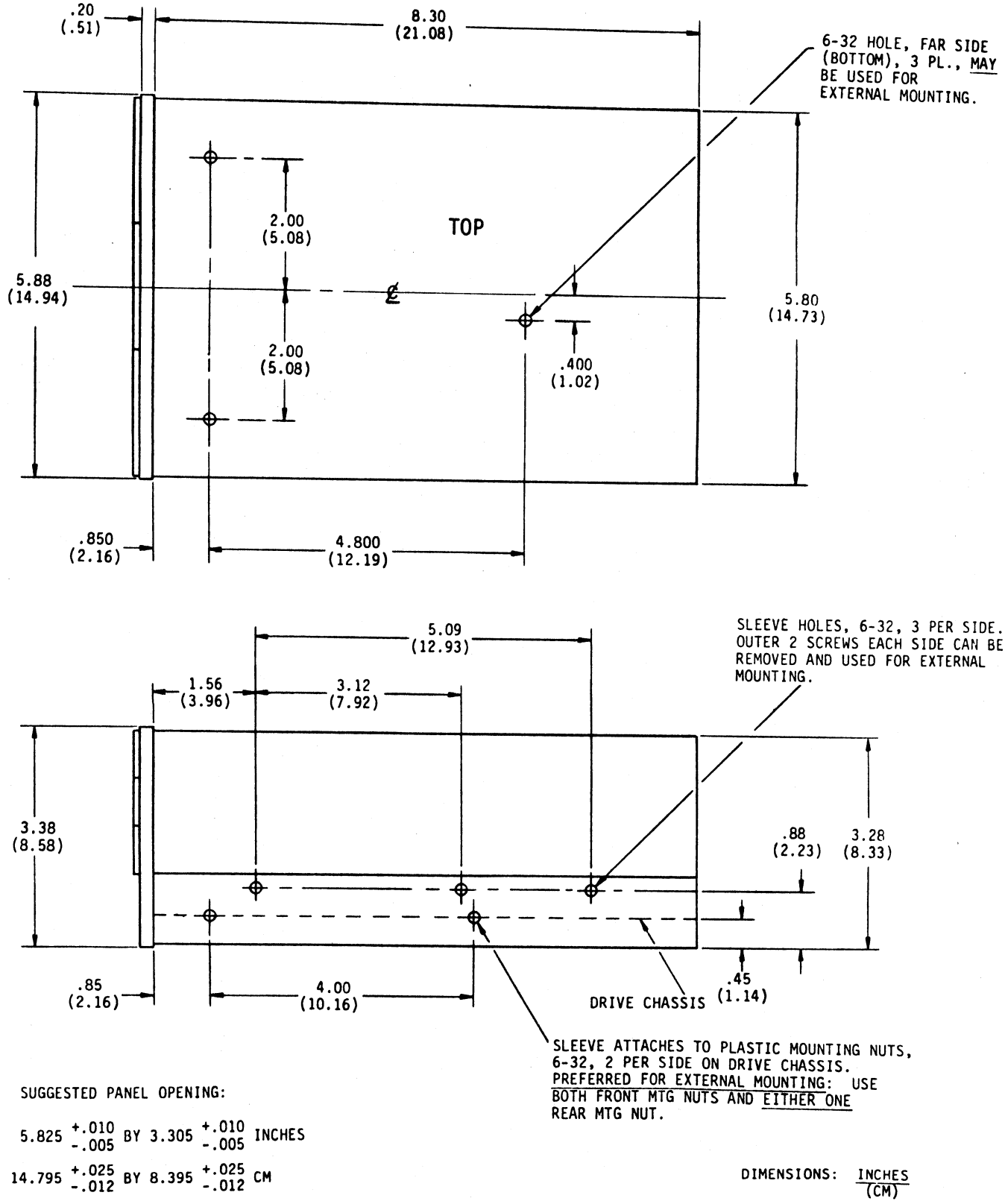


Figure 2-1. Drive Mounting Details

(Sh 2 of 2 - With Optional Protective Sleeve)

f. The holes in the base chassis to which the drive is to be mounted must have sufficient clearance to allow for tolerances and thermal expansion. This also precludes the use of flat-head screws.

g. Mounting brackets should be made of 0.060 inch thick (min) steel, attached to the base chassis, and with holes large enough that when all screws are tight, stress is not communicated to the drive.

2.7 MULTI-DRIVE DISK SYSTEMS

Micropolis 1015F/1016F drives can be configured into multi-drive systems, with up to four disk drives. This section provides the technical information necessary to implement a multi-drive system.

2.7.1 Daisy-Chaining Drives

A multi-drive system consists of two, three, or four drives, connected to the host controller with a "Daisy-Chain" interface cable. A typical multiple drive system is shown in Figure 2-2.

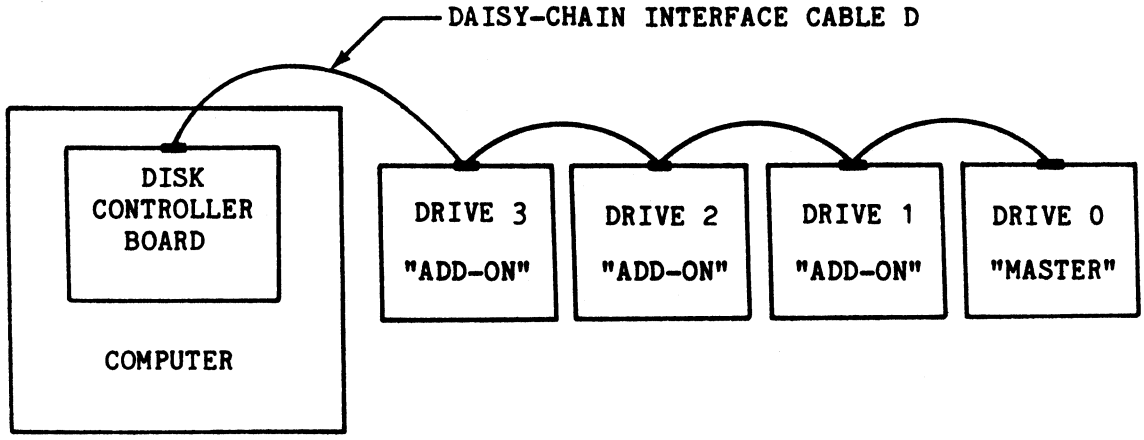


Figure 2-2. Typical Multiple Drive System

The interface cable consists of a set of common input/output lines and four disk select lines. All lines are supplied to all drives. Address comparison logic in each drive enables the drive to respond to one and only one disk select line. (Instructions for setting the address comparison logic are given in paragraph 2.7.3.) A single drive may be set to respond to address 0, 1, 2, or 3 (normally, if there is only one drive it will be set for address 0). In a multi-drive system, no two drives may be set to respond to the same disk select line.

In a multi-drive system a distinction is made between the "master" drive and the "add-on" drives. The master drive includes a resistor network for terminating the interface lines. An add-on unit does not include terminators. All 1015F/1016F drives are shipped as master drives; instructions for converting a master drive to an add-on drive are given in paragraph 2.7.2. The master/add-on distinction does not effect the address selection; any drive may have any address.

The following Daisy-Chain interface cables are available from Micropolis:

Name	Model No.	Usage
Interface Cable B	1083-02	Two drives
Interface Cable C	1083-03	Three drives
Interface Cable D	1083-04	Four drives

The Daisy-Chain interface cable is connected in place of the standard Interface Cable A. The Master drive (the one with the terminators) must be connected to the last connector on the cable (i.e., the furthest from the controller) to provide the proper termination.

2.7.2 Master to Add-On Conversion

To convert a master drive to an add-on, remove the terminators as follows:

a. Locate the terminator resistor pack (RN2 on the Single C PCBA).

b. With a small flat-blade screwdriver, carefully pry the resistor pack from its socket. The resistor pack should be saved in case it is desired to convert the drive back in the future.

2.7.3 Address Changing

To change the drive address, reconfigure the address comparison logic as follows:

a. Locate address jumper locations W1 through W4 on the PCBA. Model 1015F/1016F drives are shipped with W1 installed. Only ONE of the jumpers W1 through W4 may be installed on a PCBA.

b. Remove the jumper from the socket. Replace the jumper in the socket for the desired address, as follows:

Drive Address	Install Jumper	No Jumper
0	W1	W2,W3,W4
1	W2	W1,W3,W4
2	W3	W1,W2,W4
3	W4	W1,W2,W3

2.8 SUPPLYING DC POWER

The 1015F/1016F drives require user-supplied DC power. +5V and +12V regulated DC power is supplied to 10-pin connector J5 on the drive PCBA. The mating connector is Molex Part No. 22-01-2101. Pin assignments are:

Pin	Connection
1	Not used
2	Key
3	+12V return
4	+12V
5	Not used
6	+5V return
7	+5V
8	Not used
9	Not used
10	Not used

For MOD V and MOD VI drives, regulated DC power may alternatively be supplied to a 4-pin AMP Mate-n-Lok connector (P/N 350211-1) on the Drive PCBA (note that J5 is also present; either connector may be used). The mating connector is Amp P/N 480424-0, utilizing Amp P/N 61473-1 pins. In this case, pin assignments are:

Pin	Connection
1	+12V Regulated
2	+12V Return
3	+5V Return
4	+5V Regulated

For either connector, current requirements are as follows:

	Standby (Door Open)	Operating Average	Operating Peak
+12V ±5%	0.3A	1.0A	1.3A
+ 5V ±5%	0.5A	0.5A	0.5A

The +5V return and +12V return must be connected together at the power supply. The drive chassis must be connected to the computer chassis or directly to earth ground.

SECTION III

THEORY OF OPERATION

3.1 INTRODUCTION

This section describes the operation of the drive. First the drive mechanism is described, followed by the signal interface, and then the Single C drive electronics PCBA. Each of these components is described in sufficient detail to assist fault isolation and troubleshooting.

3.2 DRIVE MECHANISM

The drive mechanism, shown in Figure 3-1, consists of the following elements:

a. Spindle Drive System
b. Head/Carriage Assembly
c. Positioner Control Mechanism
d. Electrical and Mechanical Interlocks
e. Index Sensor

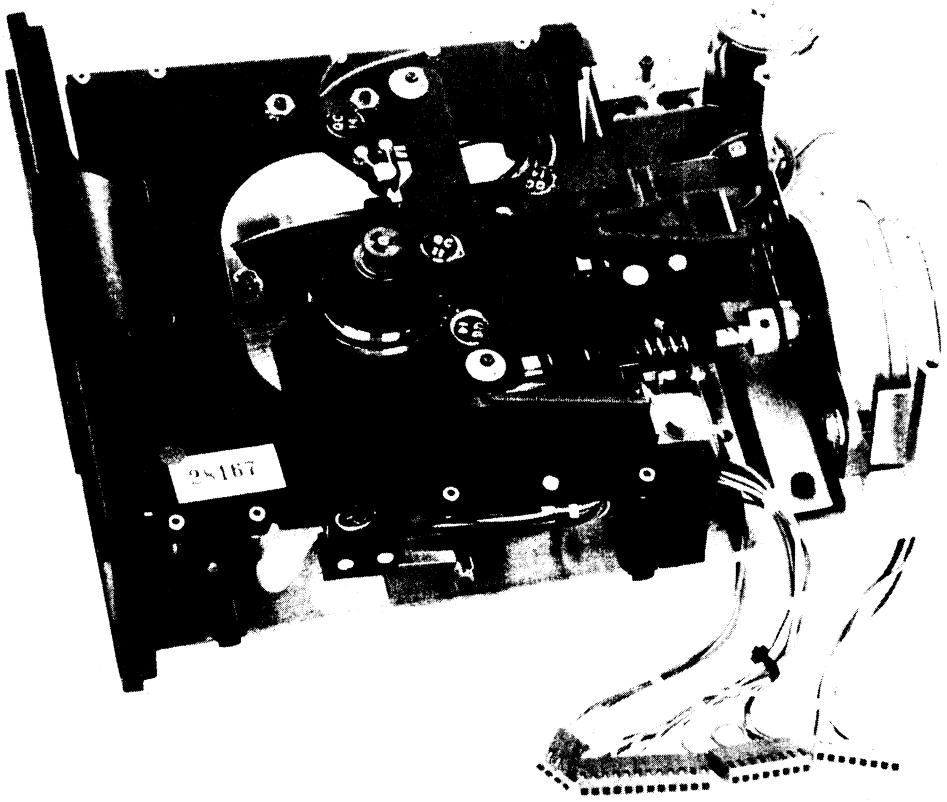


Figure 3-1. Typical Drive Mechanism

All drive mechanisms use the same mechanical elements except the lead screw has a pitch of 8.33 threads per inch for a 100TPI (MOD II or MOD IV) drive, or 8 threads per inch for a 96TPI (MOD V or MOD VI) drive.

3.2.1 Spindle Drive System

The spindle is driven by an integral DC motor/AC tachometer (which provides a closed-loop velocity servo action) via a belt which yields an 8-to-1 speed reduction from motor to spindle. When the drive door is closed, a spring-loaded clamp attached to the receiver assembly lowers and forces the diskette over a precision cone on the spindle assembly. The cone profile provides an interference fit that centers the diskette on the spindle. Centering is promoted by the rotation of the spindle during the diskette clamping process. The door switch is adjusted so the spindle begins to rotate before the diskette is clamped to the spindle.

3.2.2 Head/Carriage Assembly

The head consists of a ferrite read/write (R/W) element and two tunnel erase elements mounted in a barium titanate slider. The head is mounted in a carriage assembly which is both supported and driven by the lead screw via a steel follower and is also referenced to the platen. When the single head drive using the solenoid option load arm is selected, the head load solenoid is energized, allowing the head load arm and pressure pad to force the diskette into contact with the head. Drives with dual heads or single head drives using the mechanical load arm will load the head as long as the door is closed and clamped; opening of the door will unload the head. As long as the diskette access door is closed, the head is always loaded. A foam rubber pad on the solenoid arm or mechanical load arm ensures the diskette jacket is loaded against the platen surface. In this way an accurate relationship is established between the diskette and the head surface, yielding a controlled penetration. When the head load solenoid is deenergized, the diskette has little or no contact with the head.

3.2.3 Positioner Control Mechanism

The head/carriage assembly is positioned by a four-phase, permanent-magnet stepper motor, via a ground stainless steel follower. The positioner control and lead screw are preloaded against a bearing in the spindle housing by a flexure spring. This referencing technique substantially removes the base plate from the thermal expansion and mechanical stability loops.

The lead screw pitch is chosen so that four "ministeps" are taken to move one track. This reduces by a factor of four the effects of stepper motor inaccuracy and hysteresis effects caused by friction. Sequencing of the phases is organized by the control electronics (see paragraph 3.4.5). A track 0 switch is mounted on the chassis such that an extension of the head carriage activates the switch between tracks 0 and 1. A mechanical stop prevents the carriage from moving behind the track 0 position.

3.2.4 Interlocks

There are two electrical switch interlocks and a mechanical interlock.

The door open switch is an interlock that deenergizes the drive motor and causes loss of the Ready status when the door is open. The switch is adjusted to close as soon as the receiver assembly is lowered, so the motor is rotating before the diskette is actually clamped to the spindle.

The write protect switch senses the presence or absence of a notch in the diskette jacket for write protection. The normal write protect convention specifies that the diskette is write-protected if the write enable notch is covered by a write protect tab, thereby keeping the switch actuator from entering the notch.

The mechanical interlock is a mechanism associated with the diskette ejector, that prevents the door from closing if no diskette has been loaded into the drive receiver assembly. It also ejects the diskette when the door handle is lifted after the door is opened.

3.2.5 Index Sensor

Index and sector information is sensed by a combination of a light emitting diode (LED) mounted on the receiver assembly and an index transducer (photo transistor) mounted in the platen. Index-to-data adjustment is provided by moving the platen assembly.

3.3 INTERFACE

This section describes the interface signals and timing requirements from a general viewpoint. Specific circuit references are covered in the appropriate sections of the Single C PCBA description.

Interface connector J1 is located on the drive electronics PCBA. J1 provides the interface connection between the disk drive and the host controller. The interface consists of 11 input lines and 5 output lines. All interface lines are low true, with the following logic levels:

True = Logic Zero = 0 - +0.4V
False = Logic One = +2.5 - +5.25V

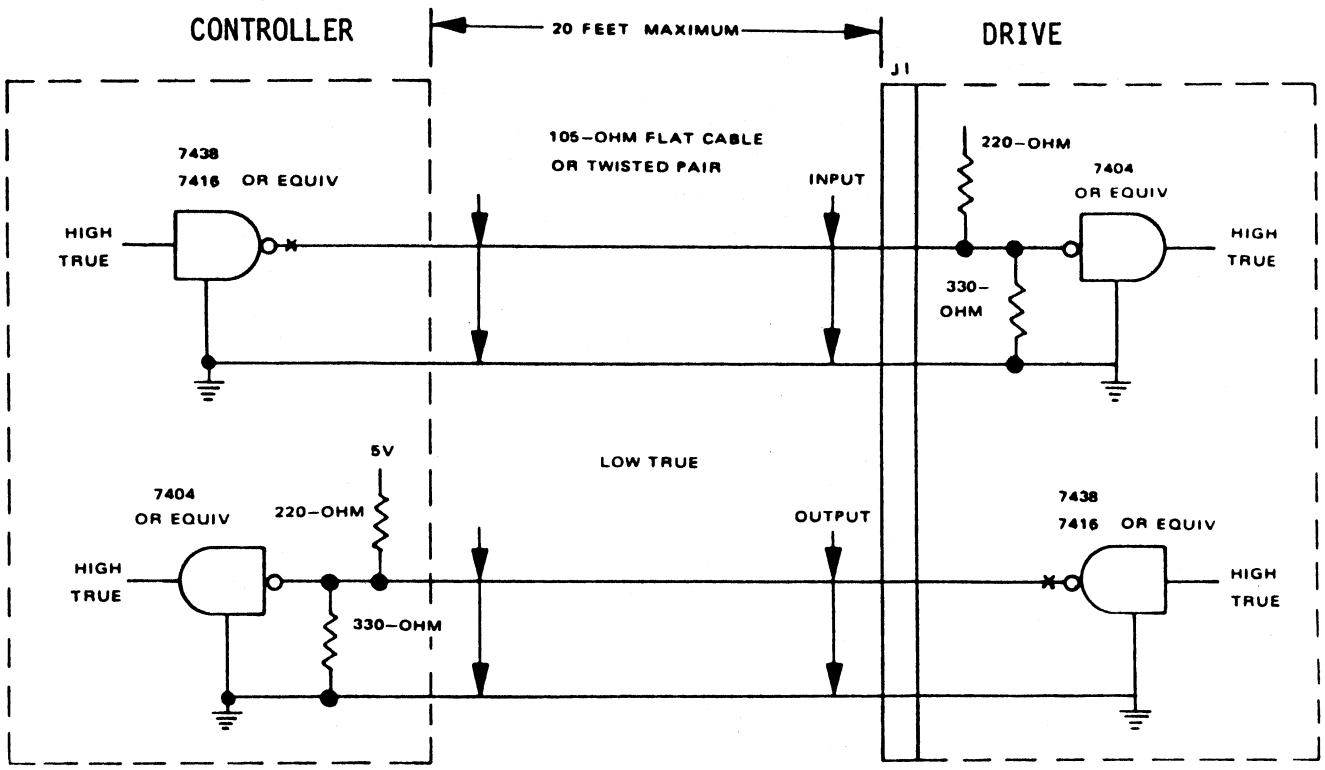
A maximum of four drives can be connected to one host controller with a daisy chain cable. Termination resistors for the input lines are provided on the drive electronics PCBA (for daisy chain connections, they are installed in the last drive only). Figure 3-2 shows the typical receiver/driver characteristics for the interface. Either flat cable or twisted pairs may be used, with a maximum total cable length of 20 feet.

Table 3-1 lists the interface signals. Detailed information about each signal is given in the Single C PCBA description. Figures 3-3, 3-4, and 3-5 show the general timing requirements.

TABLE 3-1. INTERFACE SIGNALS

J1 Connector Pin		Signal	Description	Source
Signal	Ground			
2	1	HDLD/	Head Load	Controller
4	3	---	Spare	---
6	5	RDY/	Ready	Drive
8	7	SECP/	Sector/Index Pulse	Drive
10	9	DS1/	Drive Select 1	Controller
12	11	DS2/	Drive Select 2	Controller
14	13	DS3/	Drive Select 3	Controller
16	15	MTRN/	Drive Motor On	Controller
18	17	DIRN/	Step Direction	Controller
20	19	STEP/	Step Command	Controller
22	21	WDA/	Write Data	Controller
24	23	WRT/	Write Gate	Controller
26	25	TRKØ/	Track Zero	Drive
28	27	WPT/	Write Protect	Drive
30	29	RDA/	Read Data	Drive
32	31	HSLT/	Head Select	Controller
34	33	DS4/	Drive Select 4	Controller

NOTE: J1 Mating Connector is Scotchflex P/N 3463-001 or equivalent.



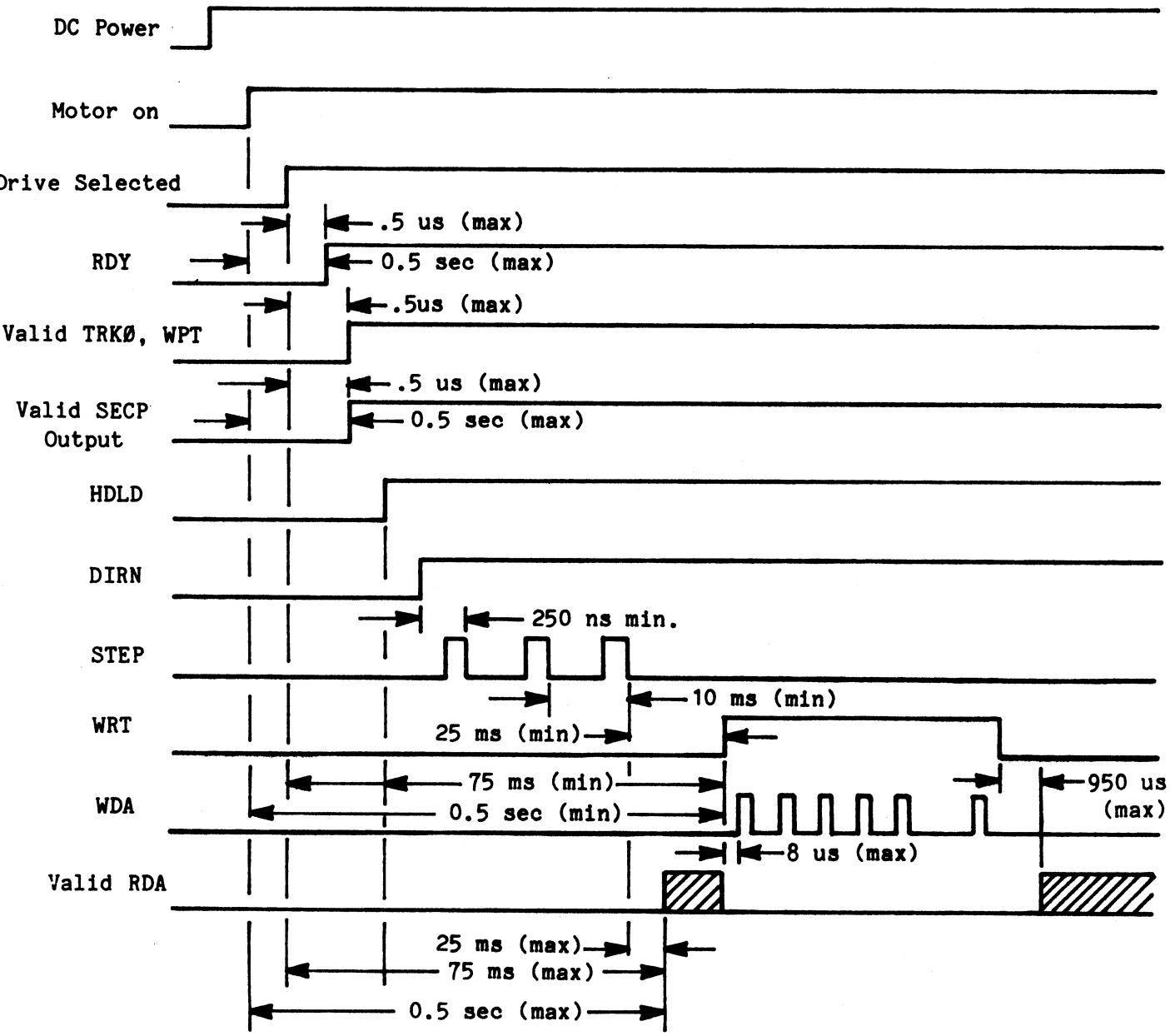
NOTES

Input Lines: TRUE = Logic Zero = 0 to 0.4V @ 25 ma max
FALSE = Logic One = 2.5 to 5.25V @ 0 ma (open)

Output Lines: TRUE = Logic Zero = 0 to 0.4V @ 48 ma max
FALSE = Logic One = 2.5 to 5.25V @ 250 ua max (open collector)

INPUT LINES ARE TERMINATED IN LAST DRIVE ONLY.
USER MAY USE 150 OHM TO +5V TERMINATION ON
OUTPUT LINES IF DESIRED.

Figure 3-2. Interface Characteristics



* Head Load Option Timing

All waveforms shown high true

Figure 3-3. Major Signal General Timing Requirements

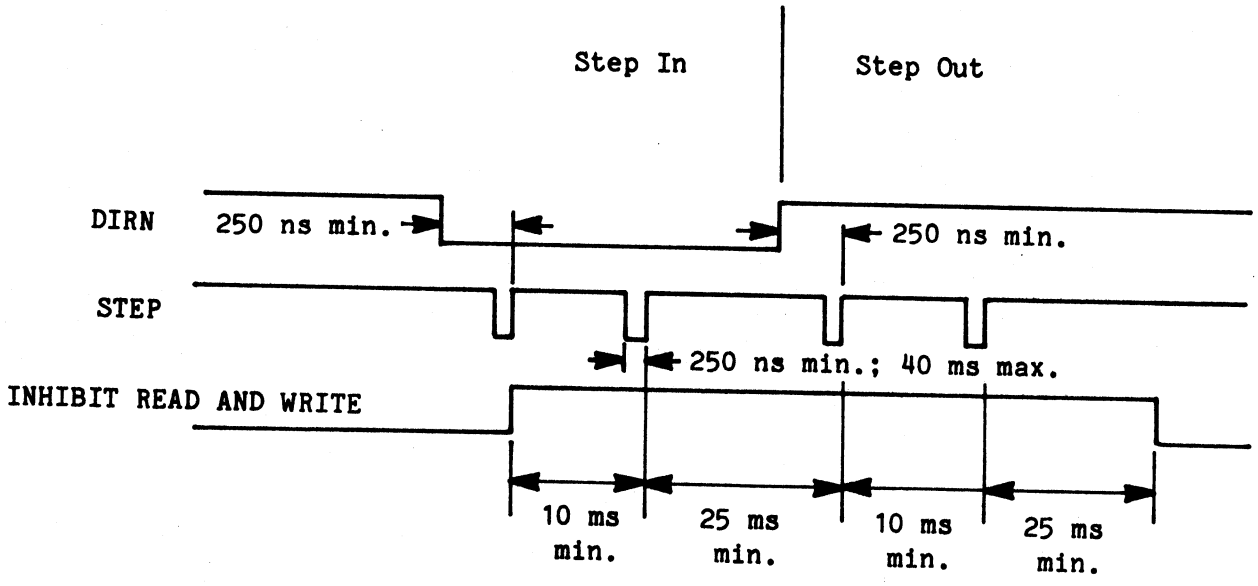


Figure 3-4. Positioner Control General Timing Requirements

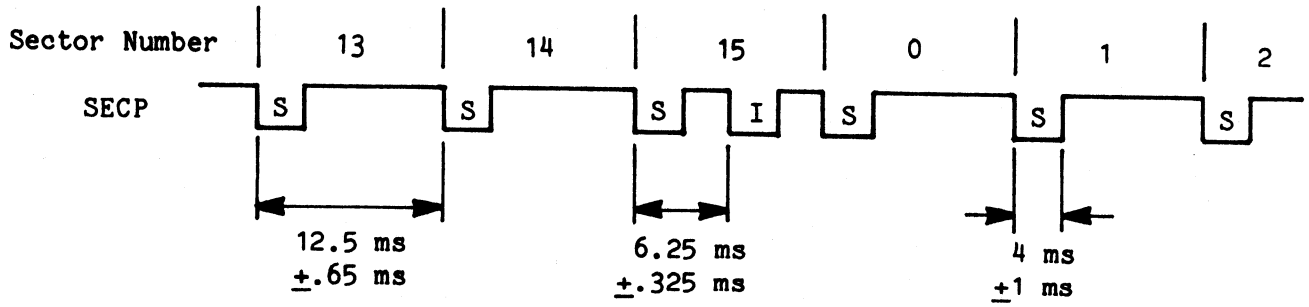


Figure 3-5. Index/Sector General Timing Requirements

3.4 SINGLE C DRIVE ELECTRONICS

The Single C Drive Electronics PCBA, P/N 102057, contains the control circuitry for the drive. The Single C PCBA controls the operation of the drive mechanism as well as reading and writing of data. The PCBA connects to the drive mechanism with a number of molex connectors; the interface connection to the host controller is discussed in Section 3.3.

The Single C PCBA consists of the following functional elements:

a. Interface Circuits
b. Motor Control Circuit
c. Read Circuitry
d. Write Circuitry
e. Positioner Control Circuit
f. Miscellaneous Control Circuits

These elements are shown in block diagram form in Figure 3-6. The paragraphs that follow provide a detailed explanation of each functional element; the schematic diagram is located in Section 8 of this manual (the schematic is referenced by drawing and sheet number to facilitate its use).

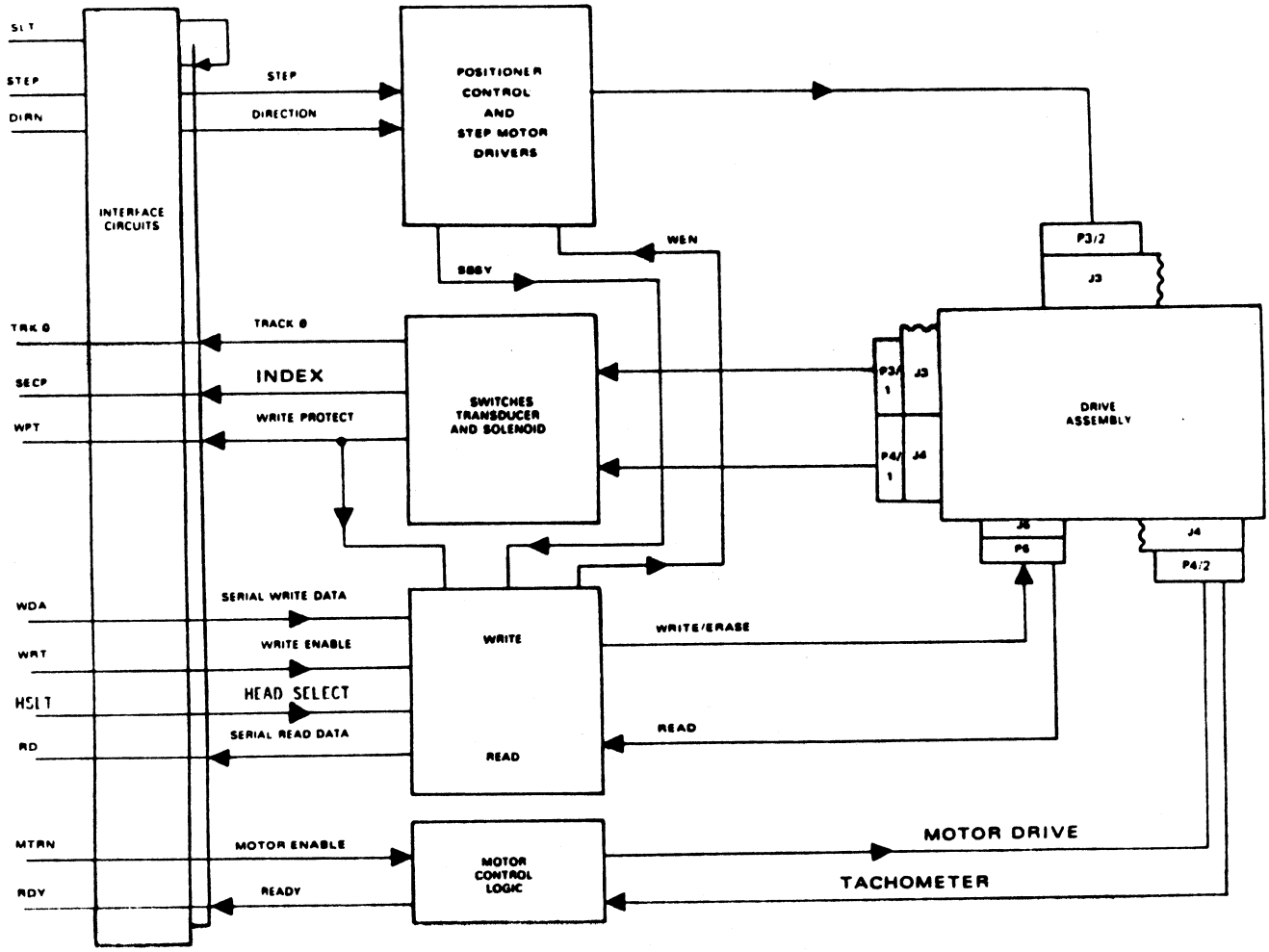


Figure 3-6. Single C Overall Block Diagram

3.4.1 Interface Circuits (Sh 3 of Dwg 102058)

The interface circuits consist of line receivers, input terminators, line drivers, and drive selection logic. Input signals are terminated by 220/330 ohm terminator pack RN2. (As discussed in paragraph 2.7.1, add-on drives have the terminator removed.)

A jumper in one of the positions W1, W2, W3, or W4 causes the drive selection logic to respond to the corresponding drive select input line DS1, DS2, DS3, or DS4. The appropriate select line is terminated by RN1 and received by U10-9. The select signal gates the output signals directly via drivers U1-5, U1-13, U1-11, U1-9, and U1-3, and indirectly via U11-10 (on Sh 8 of Dwg 102058) for the read data signal. The select signal also drives a LED panel indicator via driver U9-4, to indicate that the drive is selected.

The head select signal (HSLT) may also be energized through J1-34/33 if W13 is removed and W11 and W12 are installed. If this jumper option is employed, the Disk Select 4 (DS4) function is no longer available to the user.

The function of Disk Select 4 may be energized through J1-32/31 if W11 and W13 are removed and W12 is installed. DS4 control of any drive configured in this way is selected as usual by the W4 jumper on the jumper header.

3.4.2 Motor Control Circuit (Sh 9 of Dwg 102058)

The motor control circuit is a closed loop servo, which controls the spindle drive system. The spindle drive consists of a DC motor and AC tachometer mounted on a comman shaft. The DC motor shaft rotation is converted by the tachometer to an AC signal whose frequency is proportional to the speed of the motor. This feedback signal is converted and filtered by a charge pump to produce an equivalent DC signal. An operational amplifier compares the feedback signal with a reference level generated on the PCBA. The net output from the operational amplifier drives a power amplifier which in turn powers the DC motor. Figure 3-7 is a block diagram of this circuit.

a. LM2917 Charge Pump/Comparator. The AC signal enters the Single C PCBA at J4-14 and -15. Capacitor C2 filters out high frequency commutation noise, to keep it from entering the LM2917 (U7). The charge pump section of the LM2917 receives the tachometer signal through a squaring zero crossover detector. At each zero crossing of the tachometer signal, C3 is allowed to charge to an internally preset trigger voltage. The pulses thus generated are at twice the frequency of the incoming tachometer signal, since they occur at each zero crossing. The width of each pulse is determined by C3; the amplitude is internally fixed at 5V, and the pulse spacing is determined by the frequency of the tachometer signal zero crossings. For a given value of C3, each pulse has a constant width. As the speed of the motor increases, the spacing between pulses becomes smaller, and consequently the average DC value of the pulse train increases. This process is in effect a frequency to voltage converter and it forms the primary feedback to the speed control loop.

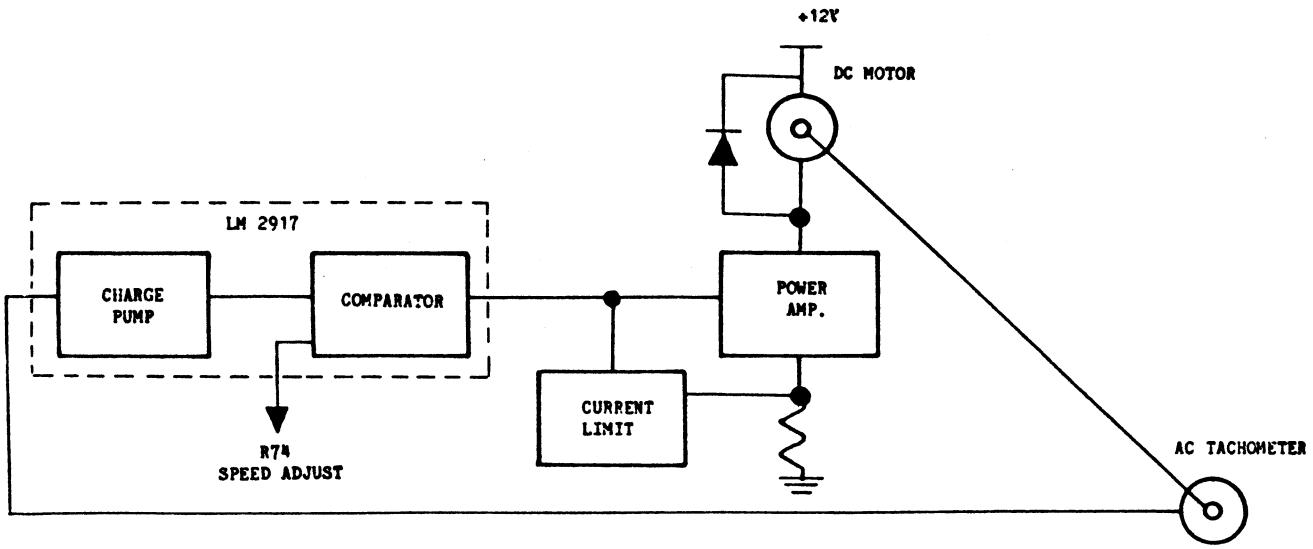


Figure 3-7. Single C Motor Control Circuit Block Diagram

The actual signal at R73 is a sawtooth waveform which has an average value that is proportional to the tachometer frequency, which in turn is proportional to the spindle motor speed. This signal is compared to an adjustable reference developed by a zener diode which is internal to U7, and the combination of R79 and speed adjustment potentiometer R74.

Capacitor C45 provides a feedback signal to filter the charge pump signal at the output transistor, and the combination of C44 and R76 provide frequency compensation of the servo loop to provide maximum speed stability.

The output of the LM2917 feeds the power amplifier drivers through the DC coupling and filtering network of R75, R82, R85, and C46.

b. Power Amplifier Circuits. The power amplifier circuits consist of Darlington pair transistor Q7, current limiter circuit Q6, and associated components. The operation of power amplifier driver Q7 is controlled by the state of the MOT signal. This signal is coupled into the base of Q7 by diode CR32 through R85.

When MOT is low, CR32 conducts, and the base of Q7 goes to 0.8V, cutting off Q7. When MOT goes high, CR32 is cut off, allowing the base of Q7 to attain its operational value (approximately 1.4V). Resistors R83, R81, and R84, and transistor Q6, form a feedback circuit that reduces the current surge caused by motor startup. When the motor-on command is received, transistor Q7 goes into saturation and collector current would normally rise to a larger value

since the motor is still stationary. However, the current feedback network consisting of Q6 and its associated components will limit this initial surge to a maximum of 1.0 amp. Resistor R81 provides a convenient point to monitor the motor current. Diode CR31 protects Q7 from inductive kickback caused by commutation. L6, C40, C41, C42, and C43 provide filtering to prevent high frequency transients generated by the motor from propagating into the drive electronics through the power supply.

3.4.3 Read Circuitry (Sh 8 of Dwg 102058)

The read circuitry processes the low-level information from the read head during the read cycle, reshaping it into a digital pulse stream. Figure 3-8 is a block diagram of the read circuitry. The +12V supplied to the elements in these circuits is filtered through L5 to provide additional noise isolation. Voltage divider R54, R55 and filter capacitor C24 develop a reference voltage (referred to as V1) of approximately 6V used in these circuits.

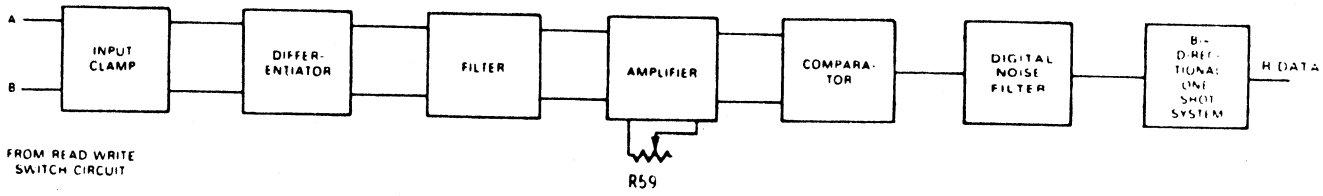


Figure 3-8. Single C Read Circuitry Block Diagram

a. Input Clamp. The low-level signal (approximately 1.5 mV pp) from the read head is fed to differentiator U28. Input diodes CR28 and CR29 constitute a clamp circuit that prevents transients generated by the write circuit from propagating through the read circuits. The junction of diodes CR28 and CR29 at V2 is held at approximately +6.7V. This voltage is generated in voltage divider R41, R42, R43 (refer to the discussion of PSEN generation in paragraph 3.4.4a).

b. Differentiator. The differentiator consists of U28 and its associated components. This element functions as a peak detector that generates the signal illustrated in the timing diagram of Figure 3-9, which shows the read waveforms for a sequence of "1's". Thus the output of U28 crosses the zero base-line each time a peak is detected on the input signal. Capacitor C25 yields the required 6 dB per octave rising characteristic of a differentiator. Resistor R56 terminates this characteristic at 250 kHz. This stage has an approximate gain of 40 at 125 kHz.

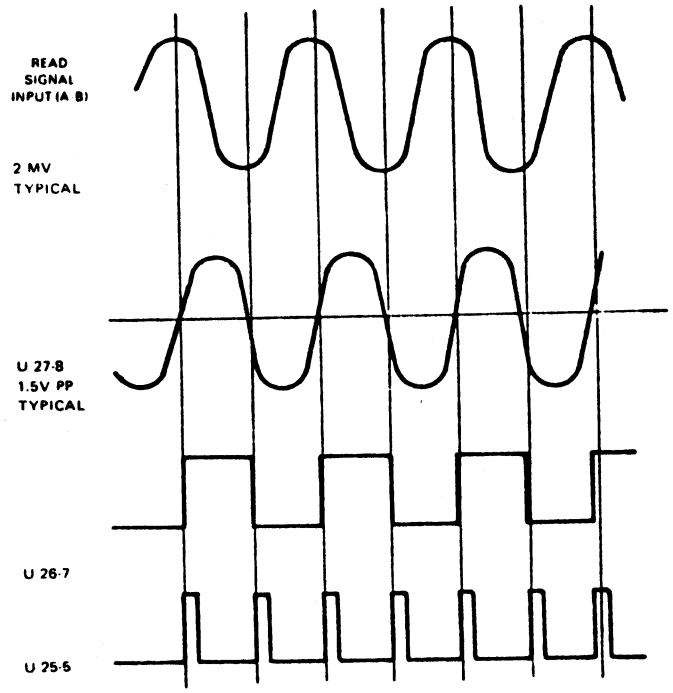


Figure 3-9. Single C Read Waveforms

c. Filter. The balanced output of U28 at pins 7 and 8 is applied to an LCR filter that provides a phase shift as a function of frequency. This is the linear function required for true data reproduction of the read data. R57 and R58, and V1, maintain the read signal at the center of U27's linear range.

d. Amplifier. The amplifier consists of U27 and resistors R59 and R60. The gain of this stage is approximately 50, and can be adjusted by R59. The balanced output of this amplifier is AC-coupled into a comparator by capacitors C32 and C33 and resistors R63 and R64. Resistors R61 and R62 center the output signal from U27 at the V1 reference potential.

e. Comparator. The output of the amplifier is processed by low-pass filter network R63, R64, C35, thus providing additional noise rejection for this stage. Comparator U26 converts the essentially sinusoidal wave shape input into a square wave. Figure 3-9 shows this waveform conversion and timing.

f. Digital Noise Filter. The output of comparator U26 is connected to one-shot U25-13 via exclusive "OR" gate U24-6, and to flip-flop U23-9. These three logic elements and their associated components form a digital noise filter that rejects short duration pulse-type noise. The filter will reject noise pulses of a duration of less than approximately 1.4 microseconds.

Since U24-6 is an exclusive "OR" gate, a short duration high-going pulse will be generated at U24-6 for every change in state of U26-7. This is due to the delay at U24 pin 5 created by R66 and C36. U25-13 will therefore fire for every transition. R67 and C37 determine the one-shot pulse width. U23 pin 11 will clock at the end of 1.4 microseconds; if the change in state which fired U25-13 is still present at U23 pin 12, then U23 pin 9 will assume the same state. U23 pin 12 will not change in less than 1.4 microseconds for normal data transition. U23-9 will not change state for a short duration noise pulse occurring at U26-7, since by the time the clock edge generated by the noise pulse is available at U23-11, the enable input at U23-12 is false.

g. Bidirectional One-Shot System. The operation of exclusive "OR" gate U24-8 is identical to that described for U24-6. Every change in state of U23-9 (every data transition) will cause a high-going pulse to be generated by U24-8. Element U25-5, a 0.9-microsecond one-shot, will fire for all transitions generating RDATA (see Figure 3-9). R69 and C39 determine the one-shot pulse width. U11 holds U25 reset whenever the drive is not selected or is in a write mode. This prevents noise from being transmitted to the interface.

3.4.4 Write Circuitry (Sh 7 of Dwg 102058)

The write circuitry consists of a power supply enable circuit, write control logic, write current drivers, an erase current driver, and the read/write switch. Figure 3-10 is a block diagram of the write circuitry.

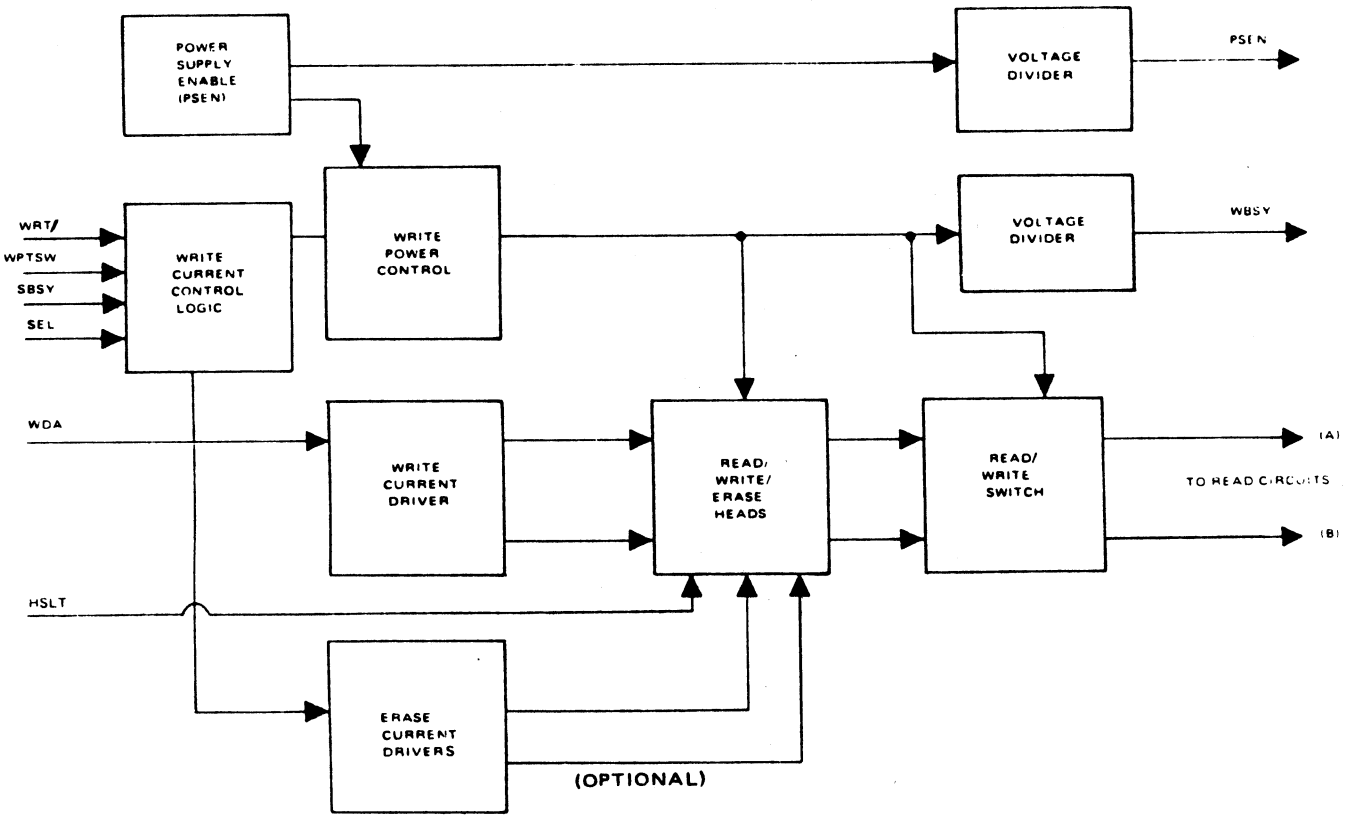


Figure 3-10. Single C Write Circuitry Block Diagram

a. Power Supply Enable Circuit. The power supply enable (PSEN) circuit allows the write current to flow only when the power supply voltages (+5V and +12V) are within operational tolerances. This prevents writing on the diskette during power-up or power-down sequences of the disk drive, or during accidental power loss. The PSEN circuit consists of transistors Q1 and Q2 and associated components. Initially, as the +5V power rises to operational level, transistor Q1 conducts as soon as the base voltage exceeds the zener voltage of CR8 plus the emitter base drop of Q1, or about 3.4V. When the collector current of Q1 is sufficient to drop 0.7V across R19, transistor Q2 conducts, providing +12V to the remaining circuits if the +12V power is present. At the same time, voltage divider R50, R51 generates a high status signal PSEN. The +12V is also divided by R41, R42, and R43. This divider produces about +6.7V, which is used in the input clamp of the read circuits (see paragraph 3.4.3a). The divider also develops approximately +6V. This voltage is applied to the center tap of the selected R/W head via Q4 or Q5, providing the correct bias for U28 in the read mode.

b. Head Select Circuit. The Single C PCBA is used in both single and double head drive mechanisms. Enclosed within the dotted line on sheet 7 are the write current supply (Q5), upper R/W/erase head (J8), and erase timer/current driver (U8) for the upper head. These components are absent on versions of the PCBA for use with single-sided (one head) drives.

The head selection levels HSLT and HSLT/, from Sh 3, are applied to U14-2 and U14-6 to enable respectively the lower or upper head erase drivers and to U22-6 and U22-8. If the lower (normal) head is selected, U22-6 will be low, turning on Q4. Q5 in turn will be turned off by HSLT/ being high. Write current from Q3 or read bias from R41, R42, and R43 will therefore be coupled to the correct head.

c. Write Control Logic. The write control logic provides the necessary signals to gate and control the write circuits. The write control logic consists of elements U18, U20, U22, and U19. This logic controls the operation of the write current driver, the erase current driver, and the write busy (WBSY) generator. The write control signal for these circuits is generated by four external logic signals gated by U18 and U20. When WRT/ is low (TRUE), write protect (WPTSW) is low (FALSE), and stepper busy (SBSY) is low (FALSE), U20-12 is high, enabling gate U18-13. If the drive is selected, SEL is high and U18-11 goes low. This condition is coupled to the base of Q3 via U22-6, generating the write busy (WBSY) signal.

As U18-11 goes low, Schmitt trigger inverter U19-6 goes high, releasing the set and clear direct inputs at pins 4 and 1 of U23. This condition enables U23 to respond to the state of the write data input, WDA. The low state of U18-11 also enables the erase current generator through U19-6, U14-3, and U14-5. Note that when U23 pins 4 and 1 were both held low, pins 5 and 6 of U23 were both in a high state.

d. Write Current Driver. When the write control logic removes the set and clear direct inputs to write flip-flop U23, write data (WDA) pulses from the interface can be processed by the write current driver circuit. (When both set and clear were low, both outputs were in a high state.) The flip-flop is connected in such a manner that each time a write pulse occurs, the flip-flop toggles on the trailing edge of that pulse. The two complementary outputs of U23 are coupled by power drivers into the read/write head through resistors R31 and R32. As the flip-flop toggles, power drivers U22-10 and U22-12 are energized sequentially, thus alternately driving a current through the two halves of the read/write head. Diodes CR14 and CR15 are used to isolate the write circuits from the head during the read operation, to increase noise immunity. Resistors R27 and R28 ensure that CR14 and CR15 are back biased when the write operation is concluded.

e. Erase Current Driver. Resistors R21 and R22, diode CR9, capacitor C10, and timer U15 combine the functions of an erase current driver with a delay generator that generates two different delays from the leading edge and the trailing edge of the input waveform. This causes the erase current to be switched on approx. 400 usec after the write control signal has been activated, and switched off 800 usec after the control signal is removed, to accomodate the delay between the write and erase gaps using a tunnel erase head. When the circuits are not in the write mode, U14-3 is low and the output of erase driver U15-3 is high. When the write operation is initiated, U14-3 goes high. The output of driver U15 does not follow the change of state until delay network R21, C10 times out (approx. 400 usec). At this time, U15 senses the high state of U14-3, and U15-3 goes low. This causes the erase current to flow from the center tap of the head through the erase winding and diode CR18. The amount of erase current is determined by the value of R35.

At the conclusion of the write operation, U14-3 goes low. As in the previous paragraph, the output of U15 does not follow this state until another delay circuit, consisting of R22 and C10, times out (approximately 800 microseconds). At the end of that period, U15-3 goes high, and the erase current stops flowing. Diode CR8 absorbs the inductive emf when the head winding current stops. The operation of U8 and its associated circuitry within the dashed lines is identical to that described above. This circuitry is only present for double head drives. Jumper W9 is required on single headed versions of the PCBA to prevent Q3 from switching to a read mode prior to the conclusion of the erase operation.

f. Read/Write Switch. The read/write switch consists of diodes CR16, CR17, CR19, CR20, and CR22 through CR27, and resistors R44, R45, R48, and R49. The function of this switch is to isolate the read circuit from the considerable voltage excursions which occur when a write operation is in effect, and to allow the read circuits to access the head when the read mode is selected.

When the write command occurs and Q3 conducts, the anodes of CR24 and CR25 go to about 11.5V. Thus all the cathode junctions of diodes CR22-27 are at about 11V. Since the anodes of diodes CR26 and CR27 cannot rise above the 6.7V clamp in the read circuits (paragraph 3.4.3), CR26 and CR27 are back biased and the read circuits are effectively isolated from the read/write head. When the read mode is selected, Q3 is cut off, since the WRT/ signal is high at U20-1. Under these conditions, the circuit stabilizes with CR24 and CR25 cut off and diodes CR22, CR23, CR26, and CR27 conducting. The anodes of CR22 and CR23 are at approximately +6V as established by the voltage dividers consisting of R41, R42, and R43, and Q4 and R37 or Q5 and R40. Approximately 0.25 ma is supplied through resistors R48 and R49, and diodes CR26 and CR27. About 0.5 ma is drawn through R44 and R45. Thus each of the four diodes have approximately 0.25 ma of current flowing through them. In this way, the diode bridge provides a low impedance path for the head signal to differentiator U28 (Sh 8 of Dwg 102058).

3.4.5 Positioner Control Circuit (Sh 4 of Dwg 102058)

The fast slew positioner control system, shown in block diagram form in Figure 3-11, employs a four-phase, permanent-magnet, stepper motor, a precision ground lead screw which is an integral part of the stepper motor shaft, and a four part control system. The four part control system supplies and controls the input power pulses to the stepper motor coils such that acceleration, decelleration, and steady-state rotational velocity are controlled without the use of extra sensors for position or velocity feedback or the use of extra circuitry or clamping devices.

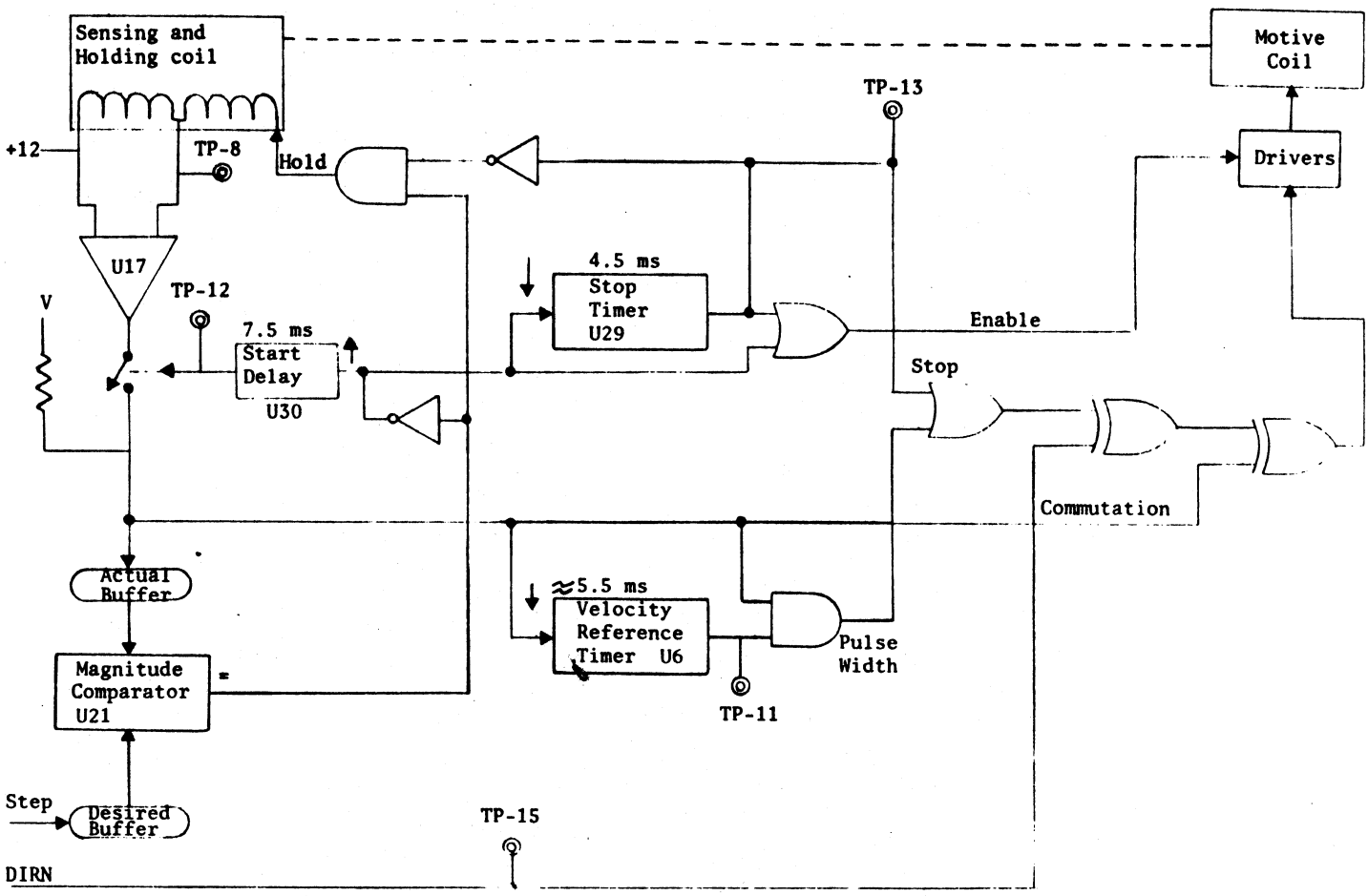


Figure 3-11. Fast Slew Positioner Control System

The control system employs the same stepper motor coils to operate the motor in four modes:

a. Controlled initial acceleration mode.

b. Controlled velocity mode.

c. Controlled decelleration mode.

d. Hold mode.

The mode selected by the control system is dependent upon the incoming step commands, the difference between the number of step commands received and the number of steps moved by the motor, and the stepper velocity.

a. Acceleration Mode. The acceleration mode is selected when the stepper motor is at rest and a new step command is received by the system. Thus, if the drive is selected (SEL/), is not performing a write operation (WEN), and a step command is issued (STEP/), then U20-8 pulses high causing the "desired position" buffer (U13) to increment. This causes the equality output of comparator U21 to go low (false). Inverter U19-12 goes high, releasing the start timer U30-3. At the same time, U3-5 is forced high, thus removing the system from the hold mode.

   Timer U30-3 produces an output pulse which disables amplifier U17-7 for 7.5 milliseconds. U17-7 is thereby forced high, which causes a power pulse to be applied to the motive coils. The polarity of the power pulse is determined by the direction (DIRN) command received by the system.

b. Controlled Velocity Mode. The completion of the acceleration phase is signaled when start timer U30 times out. The output of U30 goes low, thus enabling amplifier U17. The back EMF generated by the rotor motion is sensed at the de-energized holding coil, amplified and waveshaped by U17, and used as the motor commutation signal during the velocity mode. In this mode the stepper motor is operated as a two-phase brushless DC motor, and is permitted to accelerate to a velocity limit. The limit is determined by the velocity reference timer circuitry consisting of U6 and U18-3. The amplified and waveshaped commutation signal is applied to the trigger input (pin 2) of timer U6. The output of the timer, U6-3, is compared to the commutation signal by U18-3. When the motor velocity is less than the approximately 5.5 milliseconds reference, the output at U18-3 remains off or high. When the motor begins to exceed the desired velocity, the output at U18-3 goes low and acts as a gating signal for the power pulses, causing these pulses to be applied to the motive coil for a minimum time. The actual time varies, depending on the current velocity of the motor. This "minimum" pulse effect then applies a braking torque at the end of the power pulse, which results in slowing of the motor. Consequently, the motor is controlled at a velocity boundary which is held relatively constant.

c. Controlled Decelleration Mode. Since the rotor inertia and torque friction for the positioner system is known, as well as the velocity, it is possible to apply a fixed amount of stopping energy when the desired position has been reached. The amplified and shaped feedback signal from the motor is used to increment the actual track position buffer, U13, which then causes comparator U21-6 to return to the equality state. At this time, the change of the output at U21-6 causes the stop timer, U29-6, to fire for 4.5 milliseconds. This 4.5 millisecond pulse is applied to U18-10, which causes U18-8 to be forced high. Depending on the DIRN signal at U24-2, the output at U24-3 will change state after going either high or low. This change in state causes an immediate change of polarity to the motive coils via exclusive OR gate U24-11. This polarity reversal of the power pulses results in braking action of the motor.

d. Hold Mode. After the 4.5 millisecond stop timer signal is completed and no new step pulse has been received, comparator U21 is true, the output at U3-5 goes low and energizes the holding phase.

e. Fail Safe Logic. One-shot U29-4 monitors each step pulse received by the system and fires for 70 milliseconds upon receipt of a step pulse. If no step pulse has been received for 70 milliseconds, U29-4 times out and resets the actual and desired buffers, preventing the system from being stuck in a step mode in case of a mechanical malfunction. In addition, U20-6 examines the DIRN, Track Ø, and STEP signals. It will also cause U29-4 to reset the buffers if the system tries to step "behind" track Ø.

3.4.6 Miscellaneous Control Circuits

These circuits perform several functions:

a. Debounce the drive switch closures.

b. Reshape the pulses from the index transducer.

c. Control the head load solenoid.

d. Generate the drive ready (RDY) status signal.

e. Initialize the drive motor.

3.4.6.1 Switch Debouncers (Sh 6 of Dwg 102058)

The door open switch, track zero switch, and write protect switch closures are applied to latched gates U2-12, U2-4, and U2-10, respectively, to eliminate the effects of contact bounce.

3.4.6.2 Transducer Pulse Shaper (Sh 6 of Dwg 102058)

The index transducer (photo transistor) output is applied to Schmitt trigger U10. The output at U10-4 is the sector pulse SECP, which in turn is applied to interface driver U1-11. U10-10 provides positive feedback to produce hysteresis, thus preventing the circuit from responding to small discontinuities in the input signal.

3.4.6.3 Head Load Solenoid Driver (Sh 5 of Dwg 102058)

The head load solenoid is energized whenever the drive is selected or the HDLD signal is true. This latter mode allows the head to remain loaded even when the drive is deselected - for example, to avoid incurring a head load time in overlap operations such as drive-to-drive disk copying.

Whenever the SEL/ or HDLD/ signal is low, the output of U12-11 goes high. This energizes the head load solenoid driver U3-3 if the motor is enabled (MTRN/ low), PSEN is high, and the drive door is closed (DOOR/ is low), and W18 is installed and W17 is not installed.

The head load solenoid may be energized by the MTRN command alone (if PSEN is high and the door is closed) by installing W17 and removing W18. This option provides automatic head loading and unloading controlled solely by the assertion of MTRN.

3.4.6.4 Drive Ready Signal (Sh 5 of Dwg 102058)

When the MTRN, PSEN, and DOOR signals become true, a 1 1/2 second delay circuit consisting of U9-2, R14, C7, C8, and U10-6 is enabled. After the delay, the drive ready (RDY) signal is produced. This delay allows the drive motor to reach operating speed before proceeding.

3.4.6.5 Drive Motor Initialization (Sh 5 of Dwg 102058)

To ensure registration of the media whenever a diskette is inserted into the drive, the drive motor is automatically turned on for two seconds, independent of the state of MTRN. The delay circuit, consisting of U9-10, R11, R13, C5, C6, and U10-2, generates a high MOT signal for two seconds after DOOR/ goes low.

SECTION IV

TESTS AND ADJUSTMENTS

4.1 INTRODUCTION

This section provides information on testing a drive and (if necessary) adjusting the electrical and mechanical parameters. The tests and adjustments should be performed in an order dictated by the operating condition of the drive; this may or may not be the order in which they are presented in this section.

In general, the test requirements for the different drive configurations are the same. When the test requirements differ, the relevant paragraphs specify those differences. Figure 4-1 shows the location of PCBA-mounted components referenced in these procedures for the Single C PCBA. Tools and test equipment required are listed in Section 1.

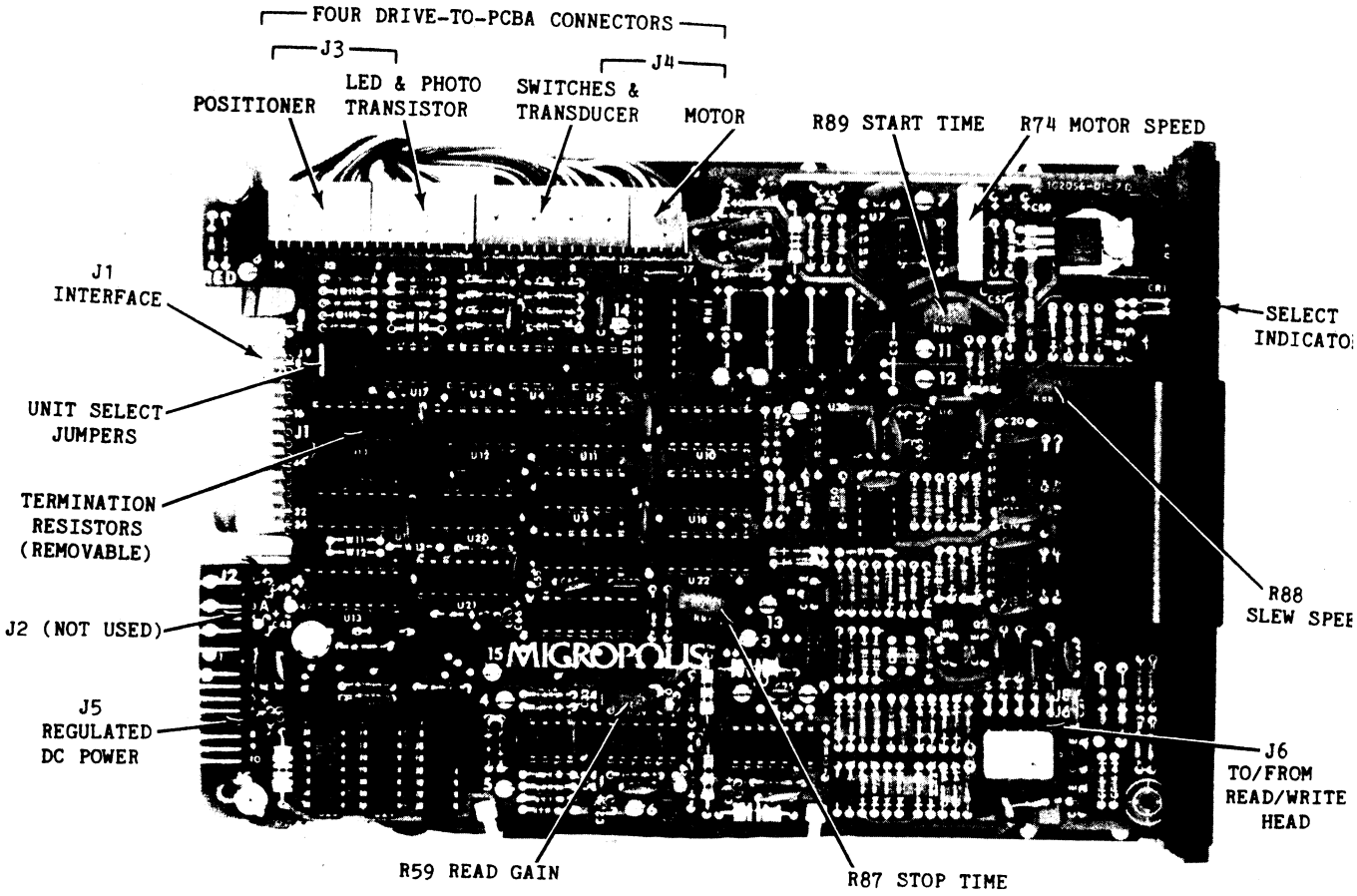


Figure 4-1. Single C PCBA-Mounted Components

4.2 ADJUSTMENT PHILOSOPHY

Acceptable limits are specified in each test and adjustment procedure, taking into account the assumed accuracy of the test equipment specified. If the measured value of any parameter is within the acceptable limits, NO ADJUSTMENT should be made. If the measured value is outside of the acceptable limits, the accompanying adjustment should be made.

4.3 DRIVE MOTOR SPEED

Drive motor speed should be checked whenever:

a. The motor or PCBA is replaced.

b. Any drive motor circuit components are replaced.

c. Diskette interchange compatibility problems are encountered.

Two methods are available for checking the drive motor speed. These are:

a. Using the strobe disk attached to the large pulley on the drive.

b. Measuring the period between index pulses using a counter.

4.3.1 Strobe Method

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert a work diskette in the drive and load it.

d. Apply interface signals that cause the drive to be selected and positioned at track zero. (The head should be loaded at this time.)

e. Illuminate the strobe disk with a fluorescent lamp.

f. Observe the outer strobe pattern for 60Hz lamp power (or the inner strobe pattern for 50Hz power) and time the pattern rotation speed. Ideally the pattern should be stationary; a maximum of 9 revolutions per minute clockwise or counterclockwise is acceptable.

g. If necessary, adjust potentiometer R74 on the Single C PCBA for a stationary strobe pattern.

4.3.2 Counter Method

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert a SINGLE HOLE (soft sectored) work diskette in the drive and load it.

d. Apply interface signals that cause the drive to be selected and positioned at track zero. (The head should be loaded at this time.)

e. Connect a counter/timer to the index/sector test point TP2 and TP6 (GND).

f. The index pulse period should be in the range of 194 to 206 ms. If not, adjust R74 on the Single C PCBA for a period of 200 ms.

4.4 INSTANTANEOUS SPEED VARIATION

Instantaneous speed variation (ISV) is the change of rotational speed over a short period of time. The period used in this test is approximately one and one-half revolutions of the large pulley. Factors that cause ISV include worn motor bearings, a defective motor, or a defective drive belt.

ISV should be checked whenever:

a. The drive motor or PCBA is replaced.

b. Any drive motor circuit components are changed.

c. The drive belt is replaced.

d. Diskette interchange compatibility problems are encountered.

4.4.1 Procedure

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert a work diskette in the drive and load it.

d. Apply interface signals that cause the drive to be selected and an all ones pattern to be written on track zero of the diskette.

e. Connect the oscilloscope to TP4 and TP6 (GND).

Set the vertical scale to 0.2V/cm and the time base to 0.5 usec/cm; then adjust the time base so that one cycle of the waveform fills the calibrated part of the screen.

f. ISV will appear as the width of the trace, as shown in Figure 4-2. The maximum allowable amount of ISV is eight percent of the overall width of one cycle of the waveform. If the ISV is greater than 8%, troubleshoot to the defective component; there is no adjustment.

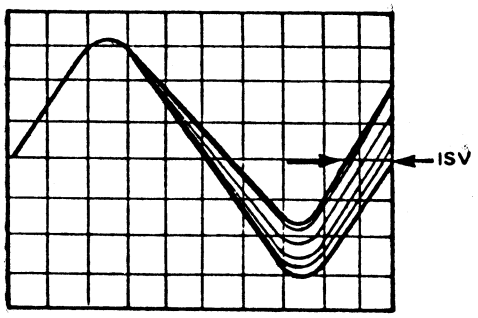


Figure 4-2. ISV Waveform

4.5 POSITIONER STEP TIMING

The positioner step timing should be checked whenever:

a. The PCBA is replaced.

b. Components in the positioner timing circuits are replaced.

c. There is any indication of incorrect positioning.

4.5.1 Procedure (Positioner Stop Time)

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert a work diskette in the drive and load it.

d. Apply interface signals that cause the drive to step between track 2 and 3 at a 30 msec step time and 15 msec step settle time.

e. Connect the oscilloscope to TP13 and TP6 (GND).

Set the vertical scale to 2V/cm and the time base to 1 ms/cm. Trigger internally negative.

f. The low level time, as shown in Figure 4-3a, should be within the range of 4.4 to 4.6 milliseconds.

g. If necessary, adjust R87 on the Single C PCBA for the proper limits.

4.5.2 Procedure (Positioner Start Time)

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert a work diskette in the drive and load it.

d. Apply interface signals that cause the drive to step between track 2 and 3 at a 30 msec step time and 15 msec step settle time.

e. Connect the oscilloscope to TP12 and TP6 (GND). Set the vertical scale to 2V/cm and the time base to 1 ms/cm. Trigger external negative on the DIRN signal at TP15. TRIGG PA R8 [U21:6]

f. The high level time, as shown in Figure 4-3b, should be within the range of 7.4 to 7.6 milliseconds. If necessary, adjust R89 on the Single C PCBA for the proper limits.

4.5.3 Procedure (Slew Speed Time)

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert a work diskette in the drive and load it.

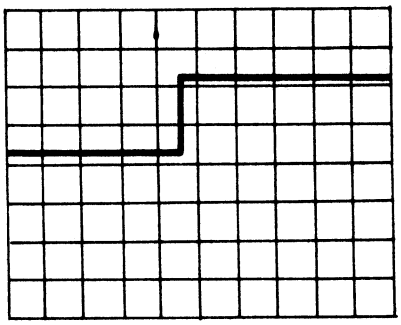
d. Apply interface signals that cause the drive to step between track 2 and 15 at a 8 msec step time, a 15 msec step settle time, and a 200 msec turnaround delay time.

e. Connect the oscilloscope to TP8 and TP6 (GND).

Set the vertical scale to 10V/cm and the time base to 20 ms/cm. Trigger internal positive ac.

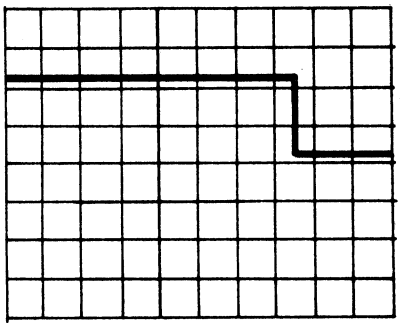
f. The time duration of the signal, as shown in Figure 4-3c, should be 128 milliseconds.

g. If necessary, adjust R88 on the Single C PCBA so the duration will be in the range of 126 to 130 milliseconds.



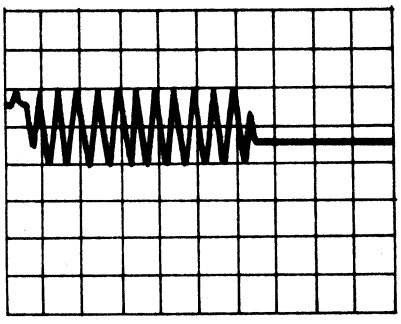
Channel A: TP 13
Internal Trigger

a. Stop Time



Channel A: TP 12
Trigger: TP 15

b. Start Time



Channel A: TP 8
Internal Trigger

c. Slew Speed Time

Figure 4-3. Positioner Step Timing Waveforms

JUSTERING AV STEGTIDER

Beroende på serienummer ska drivarna justeras enligt följande:

R89	7,3 - 7,7 ms	Start Time	Avsnitt 4.5.2
R87	4,3 - 4,7 ms	Stop Time	Avsnitt 4.5.1
R88	124 - 129,5 ms	Slew Time	Avsnitt 4.5.3

OBS!
Dessa tider gäller för drivar med serienummer 2041XXX eller lägre.

R89	7,8 - 8,2 ms	Start time	Avsnitt 4.5.2
R87	4,8 - 5,2 ms	Stop Time	Avsnitt 4.5.1
R88	124 - 129,5 ms	Slew Time	Avsnitt 4.5.3

OBS!
Dessa tider gäller för drivar med serienummer 2042XXX eller högre.

MOLOKIV MOTOR.

4.6 READ AMPLIFIER GAIN

The read amplifier gain control sets the signal level at the output of the amplifier chain. The adjustment should be checked whenever:

a. The head or PCBA is replaced.

b. Components in the R/W switch, differentiator, or amplifier circuits are replaced.

4.6.1 Procedure

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert a work diskette in the drive and load it.

d. Apply interface signals that cause the drive and lower head to be selected and an all ones pattern to be written on track zero of the diskette. For dual head models, apply interface signals to select the upper head and write an all ones pattern. Note that this adjustment must be performed at track zero. It is normal for the amplitude to decrease as the head moves in (toward the center of the diskette).

e. Connect the oscilloscope to TP4 and TP6 (GND).

   Set the vertical scale to 0.5V/cm and the time base to 10 us/cm. Trigger internally.

f. Measure the peak-to-peak amplitude of the read signal. The signal should be in the range of 1.0V to 2.0V peak-to-peak. For dual head models, the two amplitudes, when selecting first the lower head and then the upper head, should be centered about 1.5V nominal. If not, adjust potentiometer R59 on the Single C PCBA for a read signal amplitude of 1.5V peak-to-peak.

4.7 HEAD COMPLIANCE

The head compliance test checks for the presence of the correct contact between the head and the diskette. Good compliance is assured when the head load pad (on single head models or the two heads on dual head models) presses the diskette uniformly against the head(s). Compliance should be checked whenever:

a. Data errors are encountered.

b. It is suspected that the head load pad (single head models only) may have become worn or contaminated with oxide or dirt.

4.7.1 Procedure

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert a work diskette in the drive and load it.

d. Apply interface signals that cause the drive to be selected and an all ones pattern to be written on Track 76 of a 100TPI (MOD II or MOD IV) drive or Track 79 of a 96TPI (MOD V or MOD VI) drive.

   For dual head models, perform the same function for the upper head by applying interface signals to select the upper head.

e. Apply interface signals that cause the drive to be selected and positioned at the track indicated in step d.

f. Connect the oscilloscope to TP4 and TP6 (GND).

   Monitor the signal amplitude while applying a 10 gram load force on the head load arm. Note that the application of too much force will cause the diskette to slow down.

   For dual head models, repeat the same function by applying interface signals to select the upper head.

g. The maximum increase in signal amplitude should be 15%. If it increases more than 15%, replace the head load pad (see paragraph 6.5). For dual head models, contact Micropolis Technical Support for assistance.

4.8 CIRCUMFERENTIAL/AZIMUTH ALIGNMENT

The circumferential/azimuth alignment test checks that:

a. The relationship between the head and the index/sector phototransistor is correct.

b. The head moves along a line which passes through the center of the diskette (i.e., is a radius).

The circumferential/azimuth alignment should be checked whenever:

a. The head is replaced.

b. The positioner subassembly is replaced.

c. The platen assembly or photo transistor is replaced.

d. The LED assembly or the LED is replaced.

e. Diskette interchange compatibility problems are encountered.

4.8.1 Procedure

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert the appropriate alignment diskette (see paragraph 1.5.1) in the drive and load it.

d. Connect the oscilloscope to TP4 and TP6 (GND).

Set the vertical scale to 0.5V/cm and the time base to 50 usec/cm. Trigger external positive on the leading edge of the index/sector pulse at TP2.

e. Apply interface signals that cause the drive to be selected and positioned at Track 5 for a 100TPI (MOD II or MOD IV) drive or at Track 2 for a 96TPI (MOD V or MOD VI) drive.

f. Measure the time between the leading edge of the index pulse and the first peak of the index alignment burst (see Figure 4-4). The time should be in the range of 100 to 300 usec. Note the value and proceed to step g.

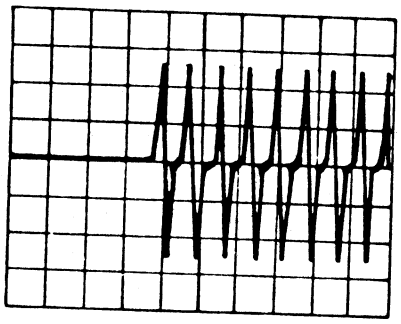


Figure 4-4. Circumferential/Azimuth Alignment Waveform

g. Apply interface signals that cause the drive to be selected and positioned at Track 76 for a 100TPI (MOD II or MOD IV) drive or at Track 68 for a 96TPI (MOD V or MOD VI) drive.

h. Again, measure the time between the leading edge of the index pulse and the first peak of the index alignment burst. This time and the time noted in step f should differ by no more than 100 usec.

For dual head models, apply interface signals to select the upper head and repeat the procedure starting with step e.

i. If the 100 usec difference in step h is exceeded, perform the Azimuth Adjustment (para 4.8.2) and then the Circumferential Adjustment (para 4.8.3). If the difference in step h is 100 usec or less but the time noted in step f is outside the 100-300 usec range, perform the Circumferential Adjustment (para 4.8.3) only. If both steps f and h are satisfactory, no adjustment is necessary. If the bursts cannot be obtained, Radial Alignment (para 4.9) or the Track Zero Switch Adjustment (para 4.10) may be required.

4.8.2 Azimuth Adjustment

NOTE

As the positioner azimuth is adjusted, significant changes of burst amplitude will occur. In extreme cases, it may be necessary to readjust the radial alignment (see paragraph 4.9) to re-establish an on-track condition.

a. Temporarily install the maintenance standoff at the rear of the drive mechanism so the mechanism does not rest on the step motor.

b. Apply power to the drive.

c. Apply a low signal to the MTRN interface line (J1, pin 16).

d. Insert the appropriate alignment diskette (see paragraph 1.5.1) in the drive and load it.

e. Connect the oscilloscope as specified in paragraph 4.8.1, step d. Apply interface signals as specified in paragraph 4.8.1, step e.

NOTE

Step f below is performed to ensure that steps g through j can be achieved.

f. Loosen two platen assembly mounting screws (see Figure 4-5), and temporarily move the platen (use a screwdriver as a wedge between the tongue on the platen and slots in the chassis) until the index-to-burst time after reclamping the platen is 300 usec. Too much force can damage the polycarbonate platen material.

g. Loosen two positioner azimuth clamp screws (visible from below at the rear of the step motor, see Figures 4-5 and 4-7), that hold the positioner spring plate to the mounting block.

h. If the time measured in paragraph 4.8.1, step f (Track 5 or Track 2) exceeds that of 4.8.1 step h (Track 76 or Track 79), the positioner should be moved toward the step motor. This will decrease both of the times, but it will also tend to equalize them.

i. If the time measured in 4.8.1 step f is less than that of 4.8.1 step h, the positioner should be moved away from the drive motor.

j. After each movement in step h or i above, tighten the azimuth clamp screws and repeat steps a through h of paragraph 4.8.1 until the difference of times is approximately zero.

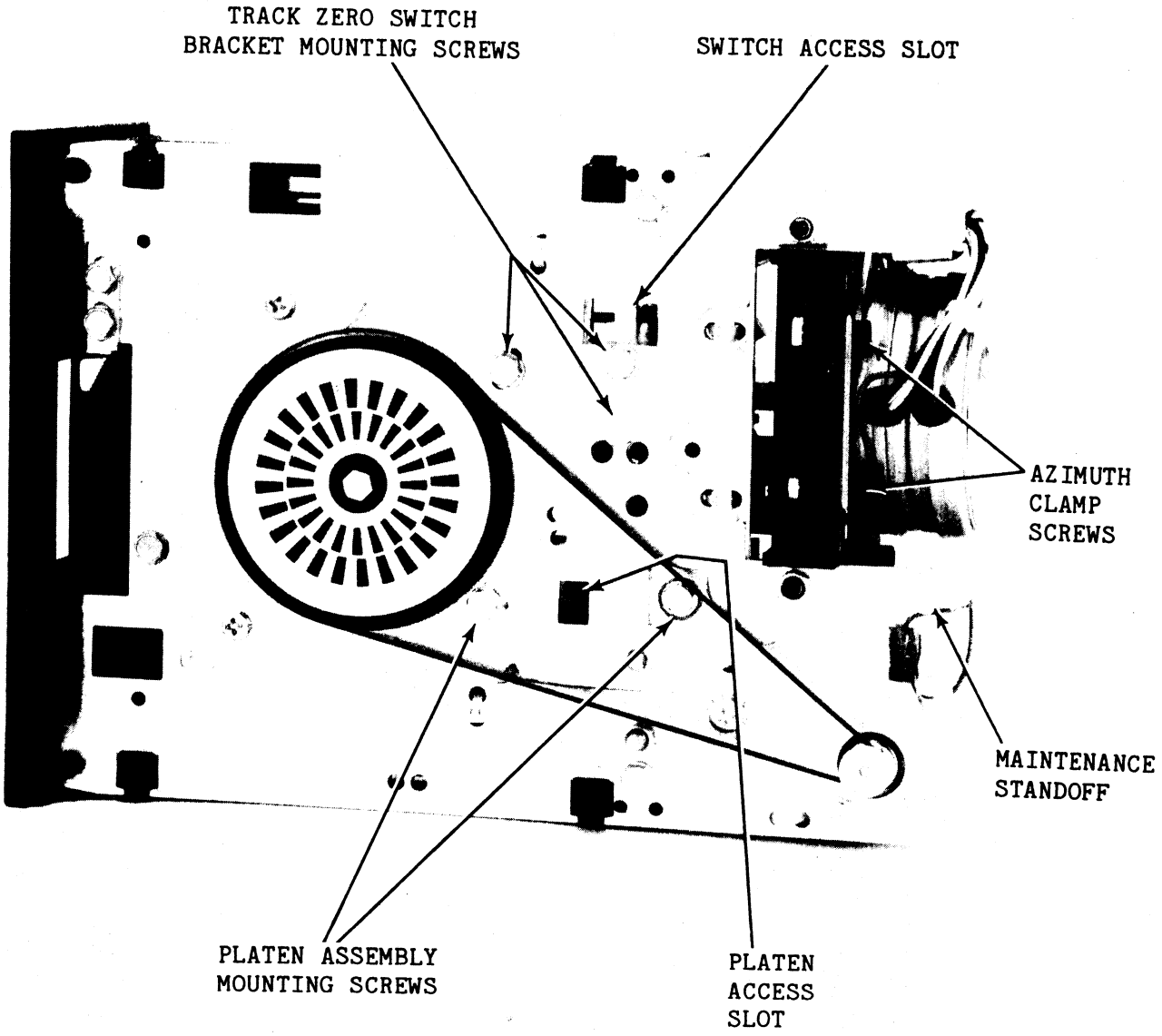


Figure 4-5. Drive Adjustment Access

NOTE

After adjusting the azimuth, the radial alignment (see Section 4.9) must be checked and adjusted if necessary. Also, after adjustment of the azimuth it is possible that mis-stepping will occur. This should be checked using steps a through e of paragraph 4.12.1.

k. Proceed to the Circumferential Adjustment, paragraph 4.8.3.

4.8.3 Circumferential Adjustment

NOTE

It is assumed that the conditions established by steps a through e of paragraph 4.8.2 are still in effect.

a. Turn the drive on its side. Loosen the two platen assembly mounting screws (see Figure 4-5) and move the platen (use a screwdriver as a wedge between the tongue on the platen and slots in the chassis) until the index-to-burst time is now the optimum 200±30 usec after reclamping the platen.

b. After the azimuth and circumferential adjustments are both satisfactory, remove the maintenance standoff.

4.9 RADIAL ALIGNMENT

Radial alignment ensures that the head is operating at the required radius for the particular track. The alignment utilizes a "cat's eye" pattern on the alignment diskette, centered on Track 36 for a 100TPI (MOD II or MOD IV) drive or Track 32 for a 96TPI (MOD V or MOD VI) drive.

Radial alignment should be checked whenever:

a. The head has been changed.

b. The positioner assembly has been replaced.

c. The positioner assembly has been adjusted for preload or azimuth.

d. Diskette interchange compatibility problems are encountered.

4.9.1 Procedure

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert the appropriate alignment diskette (see paragraph 1.5.1) in the drive and load it.

d. Connect the oscilloscope to TP4 and TP6 (GND).

Set the vertical scale to 0.2V/cm and the time base to 20 ms/cm. Trigger external positive on the leading edge of the index/sector pulse at TP2.

e. Apply interface signals that cause the drive to be selected and positioned at Track 36 for a 100TPI (MOD II or MOD IV) drive or at Track 32 for a 96TPI (MOD V or MOD VI) drive.

f. Observe the read signal (see Figure 4-6). Adjust the vertical scale so the peak amplitude of the larger lobe is five major divisions (cm) and note the amplitude of the smaller lobe.

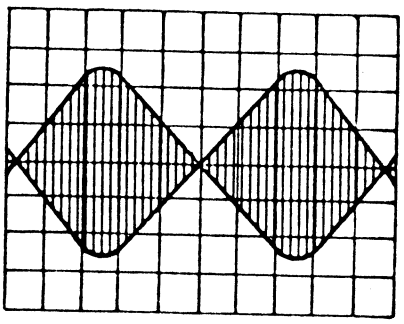


Figure 4-6. Cat's Eye Pattern for Radial Alignment

g. Apply interface signals that cause the positioner to move off track by at least two tracks and then return to the track in step e. Note the amplitude of the smaller lobe.

h. Apply interface signals that cause the positioner to move off track in the other direction and return. Again note the amplitude of the smaller lobe.

i. Acceptable track alignment is indicated if the peak-to-peak amplitude of the two lobes (in steps f, g, and h) are within one major division (1 cm) of being equal, when the larger lobe is set to five major divisions. If the track alignment is not acceptable, proceed to step j.

j. Loosen the two positioner flange mounting screws that clamp the positioner flange to the spring plate (see Figure 4-7).

k. Rotate the positioner body as required to equalize the lobes. Rotate CW if the first lobe is greater than the second, or CCW if the second lobe is greater.

NOTE

If the adjustment range is inadequate to equalize the lobes, the track zero switch must be moved one full track. See Section 4.10.

l. Retighten the positioner flange screws; torque to 18 inch-lbs.

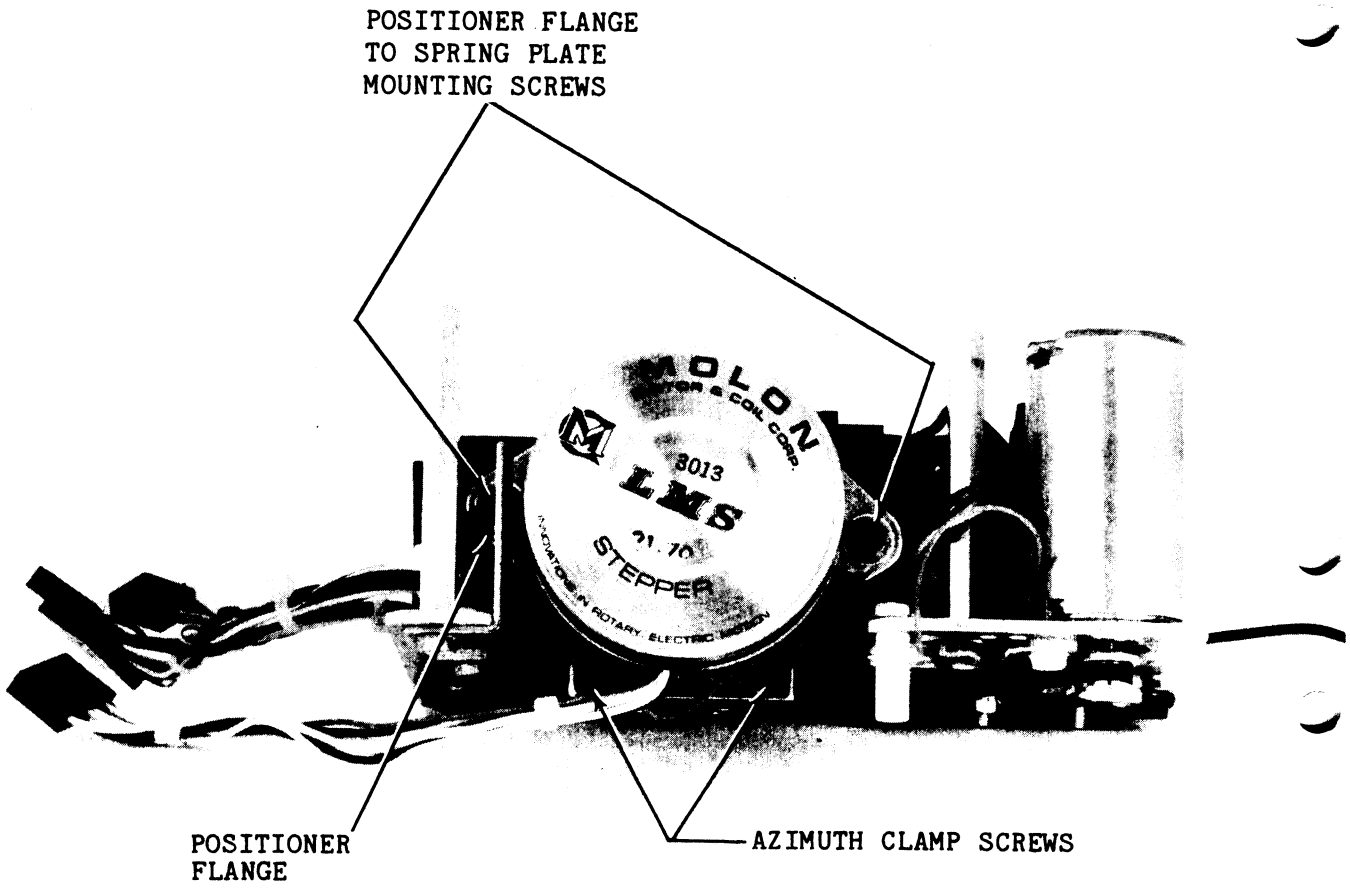


Figure 4-7. Positioner Adjustments

m. Repeat steps g and h, observing the read envelope. Repeat the adjustment as necessary to obtain equal amplitudes.

For dual head models, apply interface signals to select the upper head and repeat the procedure starting with step e.

NOTE

Sometimes the lobe amplitudes cannot be equalized for conditions of both steps g and h. In this case, adjust the radial amplitude so that the differential between lobes is equal and opposite for steps g and h. If under these conditions the limit of step i is still not met, check the Positioner Step Timing (Section 4.5) and the Positioner Mechanical Adjustment (Section 4.12).

4.10 TRACK ZERO SWITCH AND ZERO STOP FINJUSTERING

The track zero switch indicates to the controller that the head is at track zero. The zero stop is a mechanical stop on the lead screw that prevents the head from moving behind track zero.

The track zero switch and zero stop should be checked whenever: GROVJUSTERING NOT TRACK 2 TESTSKIVA.

a. The positioner has been replaced.

b. The head has been replaced.

c. The switch has been replaced.

d. Radial alignment has been performed or unsuccessfully attempted.

e. The head carriage is heard hitting against the mechanical stop.

4.10.1 Procedure

a. Apply power to the drive.

b. Apply a low signal to the MTRN interface line (J1, pin 16).

c. Insert a work diskette in the drive and load it.

d. Apply interface signals that cause the drive to be selected and alternately positioned to Track 0 and Track 1 with a turnaround time of approximately 200 ms.

e. Connect the oscilloscope channel 1 to TP 14 and channel 2 to U20-8.

Set the vertical scale for both channels to 2V/cm. Set the time base to 2 ms/cm. Trigger on the positive-going edge of the channel 2 input signal.

f. Observe the waveform on channel 2. Figure 4-8 shows alternate sweeps of the signal. The track 0 switch and stop settings are acceptable if the high-to-low and low-to-high transitions occur within two major divisions (4 ms) of each other on alternate sweeps. If so, skip step g and proceed directly to step h; if not, proceed with step g.

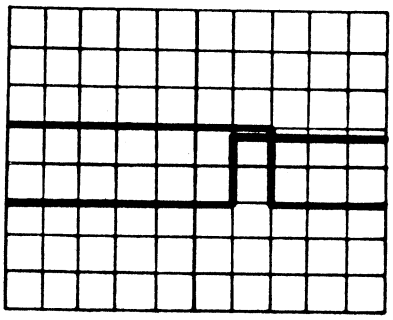


Figure 4-8. Track Zero Switch Test Waveform

g. Slightly loosen the three track zero switch mounting screws (see Figure 4-5). Use a screwdriver as a wedge through the track zero access slot to move the switch bracket backward or forward to line up the transitions referred to in step f above. Tighten the track zero switch mounting screws.

h. The track zero stop (see Figure 4-10) should be set so that when the head is positioned at track zero, the positioner cannot move more than one-third of a step behind track zero. If necessary, loosen the track zero stop set screw and reset the stop so that the drive screw can rotate 5^{o} to 10^{o} past track zero before the carriage hits the stop. The 5^{o} to 10^{o} free movement must be provided to prevent the head carriage from hitting the stop due to overshoot when positioning to track zero normally.

4.11 DOOR OPEN SWITCH

The door open switch (see Figure 4-9) is set to activate when the receiver assembly has been moved the minimum amount from its full open position as well as de-activate when the receiver is fully open. This adjustment will rotate the spindle to allow a proper and accurate media centering. The door open switch should be adjusted whenever:

a. The door open switch has been replaced.

b. The receiver assembly has been replaced.

c. There is evidence of diskette misclamping.

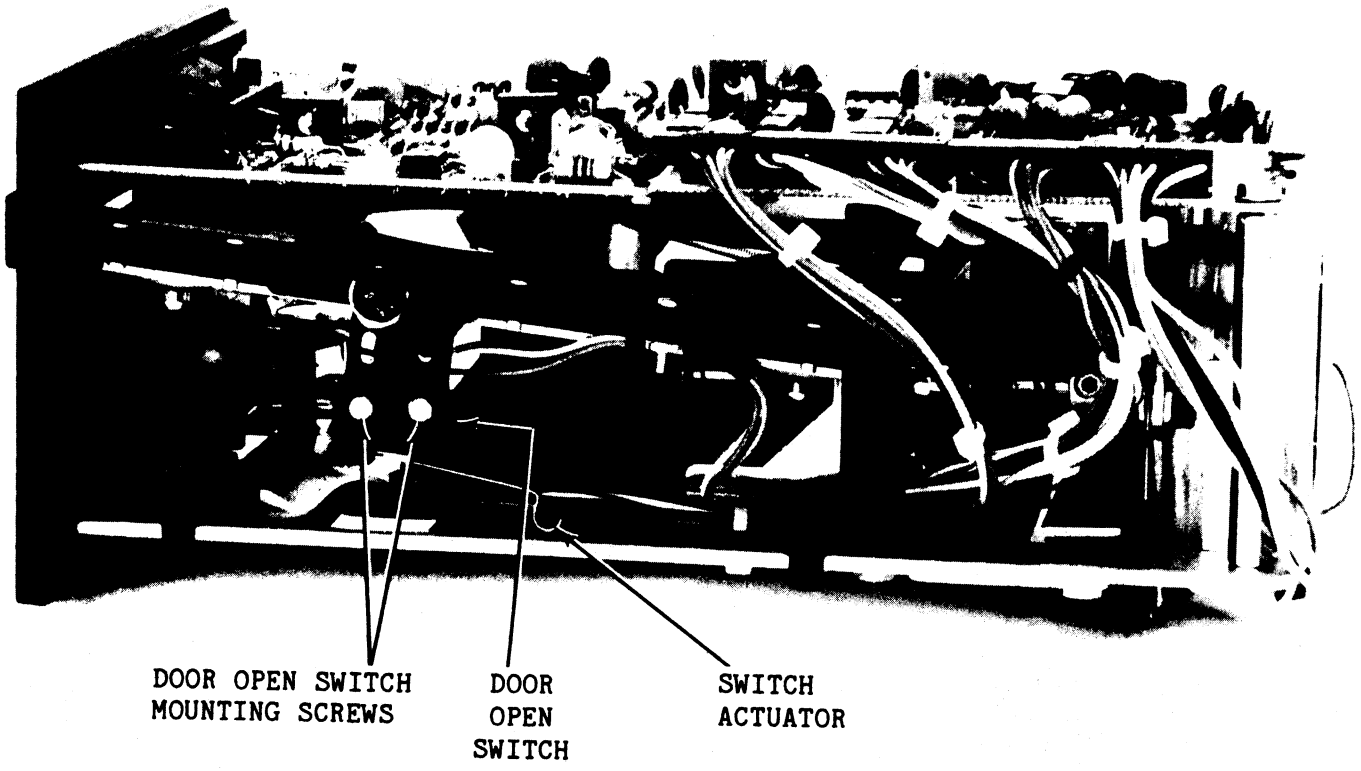


Figure 4-9. Door Open Switch and Mounting Location

4.11.1 Procedure

NOTE

This procedure can be performed on-line or off-line.

a. (On-line) Apply power to the drive. Apply a low signal to the MTRN interface line (J1, pin 16).

(Off-line) Connect an ohmmeter between the yellow and green wires in the 12-position Molex connector on the drive mechanism.

b. Press the receiver assembly until the motor turns (on-line) or the ohmmeter indicates continuity (off-line). The switch should activate before the top of the receiver is more than 1/8 inch (3.2 mm) below the front panel diskette access slot. If necessary, loosen the two switch mounting screws and move the switch as required.

4.12 POSITIONER MECHANICAL ADJUSTMENT

The positioner mounting block incorporates adjustments for the preload of the lead screw against the spindle housing and for azimuth alignment of the axis of travel of the headgap. The positioner mounting block adjustment is critical and complex, and should only be performed if:

a. The positioner is replaced or removed in order to install a new head.

b. The positioner shows evidence of mis-stepping even after the Step Timing (Section 4.5) has been adjusted.

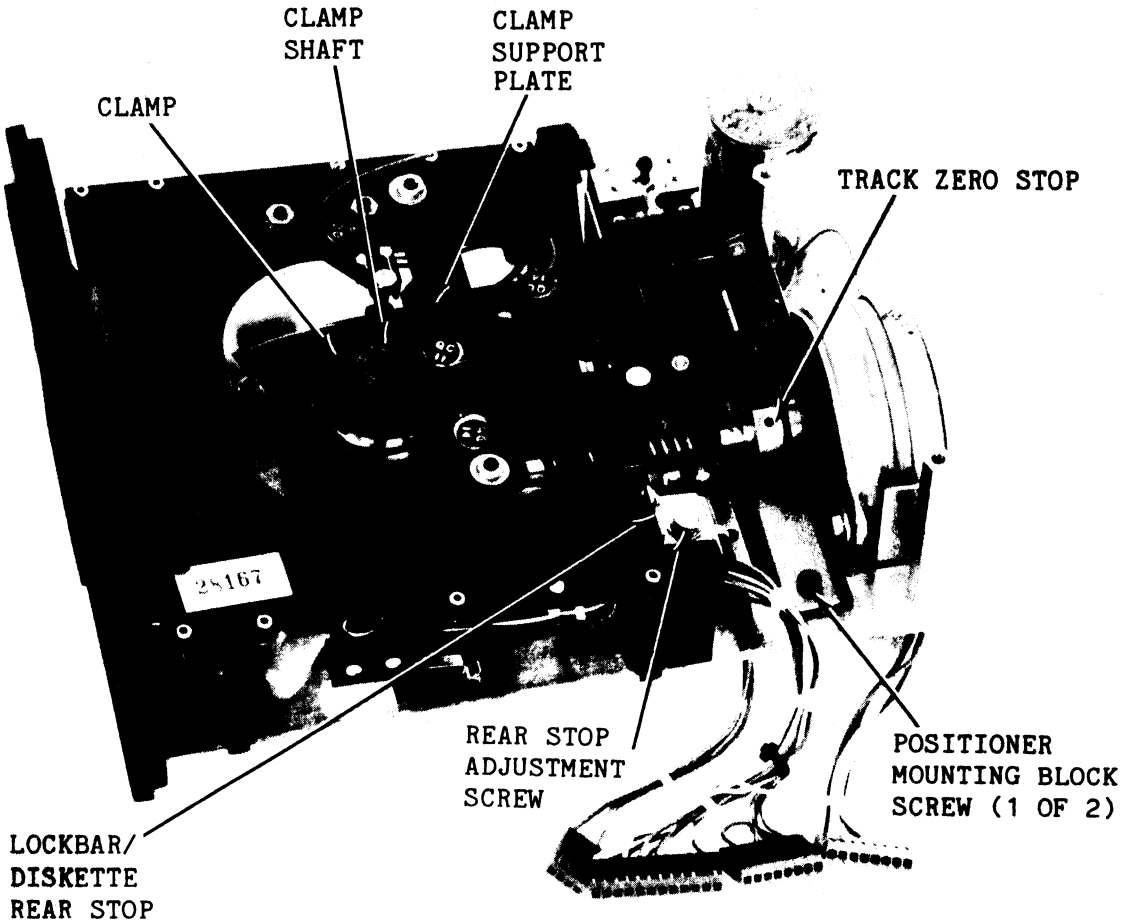


Figure 4-10. Drive Mechanism, Top Rear View

4.12.1 Procedure

a. Temporarily install the maintenance standoff at the rear of the drive mechanism so the mechanism does not rest on the step motor.

b. Apply power to the drive.

c. Insert a work diskette in the drive, and load and clamp the receiver.

d. Apply interface signals that cause the drive to be selected and that can cause the positioner to step inwards and then return to track zero. If mis-stepping occurs, proceed directly to the note before step f.

e. As the positioner steps, apply gentle pressure to the body of the step motor at the points indicated (1, 2, 3, and 4) in Figure 4-11, until mis-stepping occurs. Assess qualitatively the pressure required to cause mis-stepping. If the pressure is equal at all four points, and/or if a small region of free rocking exists in both axes, this is acceptable; proceed directly to step p.

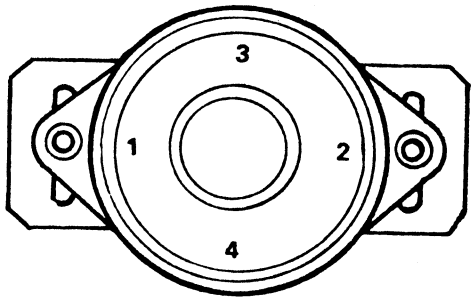


Figure 4-11. Pressure Points on Positioner

NOTE

Begin adjustment with step f if the positioner is being newly installed. If the positioner is already in place but requires adjustment, proceed directly to step m.

f. Loosen the positioner mounting block screws (see Figure 4-10) so the block can be moved.

g. Move one side of the block and then the other toward the spindle until the C-clip at the end of the lead screw just comes into contact with the bearing at the end of the lead screw.

h. Push the positioner mounting block forward on one side about 1/32 inch (.8 mm), and tighten the mounting screw on that side just enough to hold the block in place.

i. Push the other side of the block forward the same amount and tighten both of the mounting screws. The block should now be parallel to the slot in which the block sits. If it is not, readjust as necessary. The block must be parallel to the slot before continuing.

j. Use a force gauge to measure the force required to pull the positioner so that the C-clip just starts to leave the bearing in the spindle housing. This force should be between 2 1/2 and 3 1/2 pounds (1.1 - 1.6 Kg).

k. If the force in step j is too high, move the positioner mounting block away from the spindle; if the force is too low, move the block toward the spindle. Repeat steps j and k until the force is correct.

l. Repeat steps a through e. If mis-stepping still occurs or the limits of step e are not met, it is because the mounting block is not set exactly parallel to the slot; proceed to step m for fine adjustment. If the block is set correctly, preceed to step p.

NOTE

Steps m and n which follow can be interactive, so the fine adjustment process can be iterative.

m. Ability to apply more pressure at point 1 than point 2 (in step e) indicates that the "1" side of the mounting block should be moved toward the spindle, and vice-versa.

n. Ability to apply more pressure at point 4 than point 3 indicates that the block as a whole should be moved toward the spindle, and vice-versa. The block should only be moved approximately 1/64 inch (.4 mm) at a time.

o. Repeat steps d and e, and readjust per steps m and n, as necessary until mis-stepping is eliminated and the limits of step e are met.

p. When the block is correctly adjusted, remove the maintenance standoff.

4.13 WRITE PROTECT SWITCH

The write protect switch is mounted on a tab on the receiver (on the opposite side from the door open switch). It senses the presence of a slot or no slot (covered by a write protect tab to inhibit writing) on the diskette. The write protect switch should be adjusted whenever:

a. The switch is replaced.

b. False detection of either a write protected or a write enabled condition occurs.

4.13.1 Procedure

a. Connect an ohmmeter between the Black and White/Brown wires in the 12-position Molex connector on the drive mechanism.

b. Normally with no diskette inserted, the switch is open (no continuity indication).

c. Insert feeler gauges from the front of the drive on the left side of the receiver slot. Use feelers ranging from 0.020 inch to 0.050 inch (.5 - 1.3 mm), and observe the ohmmeter for a continuity indication. Use the following acceptance criteria:

> Continuity indication for gauge thicknesses in range 0.025 to 0.045 inch (.64 - 1.14 mm) is acceptable. Below 0.025 inch (.64 mm) no continuity is required. Above 0.045 inch (1.14 mm), continuity is unacceptable.

NOTE

> When adjusting the switch, use care not to break the mounting tab on the receiver.

d. To adjust the write protect switch, slightly loosen the two screws that hold the switch to the receiver tab. Rotate the switch so the first continuity indication occurs with a feeler gauge of 0.035 inch (.9 mm).

4.14 CLAMP SUPPORT PLATE

The clamp support plate (see Figure 4-12) provides the mounting surface for the clamp. The clamp shaft must be centered in the support plate hole such that the shaft does not touch the support plate, either on the side or via the C-clip which secures the clamp shaft, when the receiver assembly is in the loaded position.

This adjustment should be checked whenever:

a. The support plate is removed for any reason.

b. The spindle assembly is replaced.

c. There is evidence of severe diskette wear at the center of the clamp area.

4.14.1 Procedure

a. Remove the PCBA from the drive and reconnect it using extender cables as necessary.

b. Apply power to the drive.

c. Apply a low signal to the MTRN interface line (J1, pin 16).

d. Insert a diskette in the drive and load it.

e. Clearance should exist between the clamp shaft and the clearance hole in the clamp support plate (see Figure 4-12). If clearance does not exist, adjust per steps f and g.

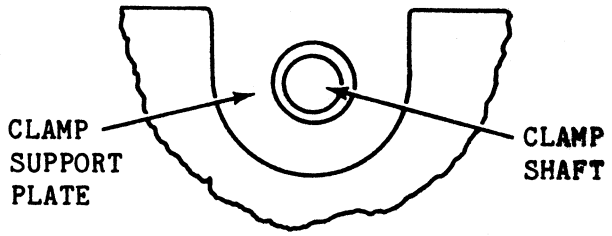


Figure 4-12. Clamp Support Plate Clearance

f. Loosen the clamp support plate mounting nuts.

g. Move the plate as required to center the clearance hole around the clamp shaft. Retighten the nuts.

h. With a diskette loaded, clearance should also exist between the clamp C-clip and the top of the support plate, to ensure that full clamp spring force exists. Otherwise, diskette slippage and wear will occur. If necessary, add or remove shim washers on the clamp support plate washers so clearance does exist. Maximum allowable clearance is .020 inch (.5 mm).

i. Unload and reload the diskette several times and check that clearance still exists.

4.15 DISKETTE REAR STOP

The diskette rear stop (see Figure 4-10) positions the diskette with respect to the spindle. The rear stop also serves to eject the diskette when it is being removed.

This adjustment should be checked whenever:

a. There is evidence of uneven wear on the diskette.

b. The diskette cannot be fully inserted in the drive or does not eject properly.

4.15.1 Procedure

a. Remove the PCBA from the drive and reconnect it using extender cables as necessary.

b. Apply power to the drive.

c. Apply a low signal to the MTRN interface line (J1, pin 16).

d. Insert a diskette in the drive. If it is close to its correct position, load it and proceed to step e. If it is significantly out of position, do not load it, but still proceed to step e.

e. Loosen the rear stop adjustment screw and slide the rear stop on the lock bar so that with the diskette jacket seated against the stop, the opening in the center of the jacket is centered around the clamp.

f. Tighten the rear stop adjustment screw.

g. Unload the diskette, then reload it and recheck the adjustment.

4.16 POSITIONER PROTECTION BRACKET

The positioner protection bracket (see Figure 6-6) prevents the lead screw from coming out of the spindle housing bearing during shipping. The bracket is removed during positioner removal and is re-installed after positioner replacement and radial alignment.

A gap of 1/16 inch (1.6 mm) should be allowed between the edge of the bracket and the positioner flange to the spring plate mounting screws (see Figure 4-7).

SECTION V

TROUBLESHOOTING

5.1 INTRODUCTION

This section provides a troubleshooting chart to aid in isolating a fault symptom to a specific circuit, component, or subassembly. In most cases, there is a paragraph reference for more information or a detailed procedure.

TABLE 5.1 TROUBLESHOOTING CHART

Symptom	Possible Cause	Action	Reference
Select indicator always lit.	Interface cable reversed at one end.	Reverse cable.	3.3
Drive motor does not rotate when diskette is inserted and door is latched down. (J1-16 low)	Drive controller not connected to drive.	Check interface cable.	3.3
	No power to drive.	Check for +5V at J5-7 and for +12V at J5-4 on the PCBA.	2.8
	Drive motor is defective.	Measure motor current (voltage across 1 ohm current limiting resistor R81). Nominal head loaded/motor turning current is 300 to 500 ma, rising to 700 ma with motor stalled. Replace motor if defective.	6.4
	Drive motor circuits on PCBA are defective.	Troubleshoot drive motor circuits or replace PCBA.	3.4.2; 6.3
	Door open switch is defective.	Check/replace switch.	6.14

TABLE 5.1 TROUBLESHOOTING CHART (cont.)

Symptom	Possible Cause	Action	Reference
Drive motor rotates much more rapidly than 300 rpm and cannot be adjusted.	Intermittent connector on drive motor.	Repair/replace connector.	
	Defective drive motor (open tachometer winding).	Replace drive motor.	6.4
	Failure in drive servo circuit or PCBA.	Troubleshoot servo circuit or replace PCBA.	3.4.2; 6.3
Head will not load. (Drives with head load solenoid option only.)	Head load solenoid open.	Replace solenoid.	6.8
	Failure in head load solenoid circuit on PCBA.	Troubleshoot solenoid logic and driver circuit or replace PCBA.	3.4.6; 6.3
Head will not unload. (Drives with head load solenoid option only.)	Solenoid driver shorted.	Troubleshoot driver circuit or replace PCBA.	3.4.6; 6.3
	Solenoid binding.	Remove obstruction to free movement.	
Positioner missteps, head ends up at wrong track.	Stepper motor defective.	Replace positioner.	6.6
	Positioner binding.	Readjust positioner.	4.7, 4.8, 4.9
	Failure in positioner circuits on PCBA.	Troubleshoot position-circuits or replace PCBA.	3.4.5; 6.3
Diskette slips after door is closed.	Insufficient clamping force. No gap between C-clip and top of support plate when door is closed.	Replace plate to ensure a minimum gap of 0.005" when door is shut and a diskette is in place.	6.9

TABLE 5.1 TROUBLESHOOTING CHART (cont.)

Symptom	Possible Cause	Action	Reference
Diskette jams or miscenters.	Clamp miscentered.	Adjust clamp support.	4.14
	Oxide on clamp or spindle.	Clean with alcohol.	
	Diskette rear stop out of position.	Adjust diskette rear stop.	4.15
	Clamp defective.	Replace clamp.	6.9
"Crunching" sound when closing drive door.	Not enough lubricant on the latch or on the bezel latch tabs.	Apply heavy coat of lubricant.	1.6.3
Door will not latch or unlatch.	Defective latch mechanism.	Replace latch mechanism.	6.17
Soft (non-permanent) read errors.	Degraded surface on diskette.	Change diskette.	
	Head dirty or contaminated with oxide.	Clean head.	1.6.1
	Head load pad is dirty or contaminated with oxide (single head models only).	Replace head load pad.	6.5
	Excessive instantaneous speed variation (ISV).	Check ISV. Check or replace drive belt and/or motor.	4.4, 6.4
	Excessive pulse-type noise in read signal (appears as spikes on read amplifier waveform).	May be internal (faulty drive motor, etc.) or external (high bus noise level, noisy cabling, radiating CRT, poor electrical ground). Isolate source and repair/replace.	
	Intermittent or marginal component in read circuit on PCBA.	Troubleshoot read circuits (including amplifiers, one-shots, and input select diodes) or replace PCBA.	3.4.3; 6.3

TABLE 5.1 TROUBLESHOOTING CHART (cont.)

Symptom	Possible Cause	Action	Reference
Hard (permanent) read errors.	Failure of read circuit component on PCBA.	Check for read data at interface pin 30. Check for read signal at read test point. Check for read signal at output of first read amplifier.	3.4.3
Write errors.	Head is dirty or contaminated with oxide.	Clean head.	1.6.1
	Head load pad dirty or comtaminated with oxide (single head models only).	Replace head load pad.	6.5
	Intermittent write protect switch or circuit.	Check switch for noisy contacts. Troubleshoot write protect circuit.	3.4.4
	Intermittent diode(s) in read/write head switch circuit.	Troubleshoot head switch diodes.	3.4.4f
	Erase current driver in write circuitry has incorrect delays.	Troubleshoot or replace PCBA.	3.4.4e; 6.3
	Failure in write circuitry on PCBA.	Troubleshoot or replace PCBA.	3.4.4; 6.3
	Defective head.	If replacing the PCBA does not correct the problem, replace the head.	6.7
Drive is always or never write protected.	Write protect switch failure.	Check/adjust/replace switch.	4.13, 6.13
	Failure in write protect circuitry on PCBA.	Troubleshoot or replace PCBA.	3.4.4; 6.3

TABLE 5.1 TROUBLESHOOTING CHART (cont.)

Symptom	Possible Cause	Action	Reference
Diskette incompatibility between drives.	Drive motor speed incorrect.	Check/adjust motor speed.	4.3
	Excessive instantaneous speed variation (ISV).	Check ISV. Check or replace drive belt and/or motor.	4.4, 6.4
	Circumferential/Azimuth alignment out of adjustment.	Check/adjust circumferential/azimuth alignment.	4.8
	Radial alignment out of adjustment.	Check/adjust radial alignment.	4.9
	Marginal head or marginal read/write circuits.	Troubleshoot read/write circuits or replace PCBA. If problem persists, replace head.	6.3, 6.7

SECTION VI

REMOVAL AND REPLACEMENT PROCEDURES

6.1 INTRODUCTION

This section provides detailed procedures for replacing subassemblies and parts of the drive. Components are replaced at their spared level; i.e., a subassembly is replaced as a unit. Tests and adjustments in Section 4 are referenced as applicable for each replacement procedure. Tools required for these procedures are listed in Section 1. All procedures assume that the sleeve, if present, has been removed.

6.2 DISK DRIVE REPLACEMENT

Use this procedure to replace the entire disk drive, consisting of the drive mechanism and the drive electronics PCBA.

a. Disconnect DC power at J5 and the interface cable to the controller at J1 on the PCBA.

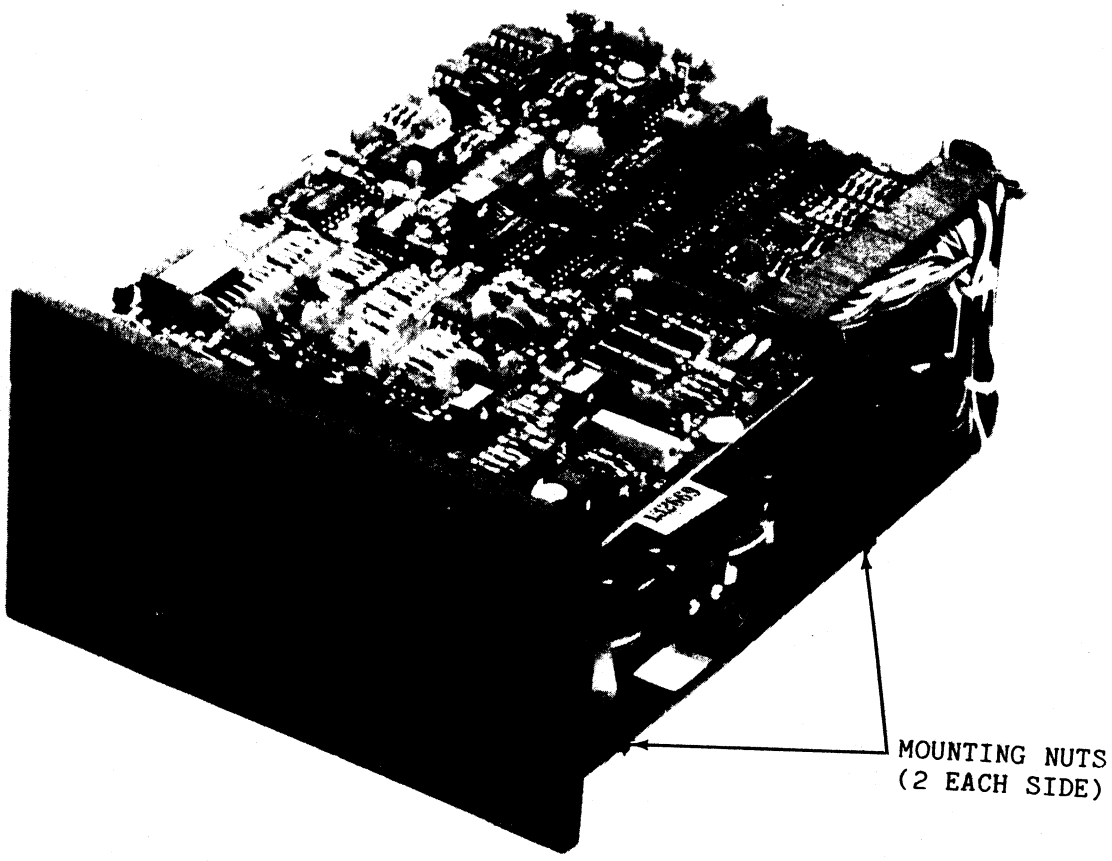


Figure 6-1. Mounting Nut Location

b. Remove the screws that attach the disk drive to the base chassis or brackets. Remove the disk drive through the panel opening.

c. Insert the replacement drive through the panel opening from the front.

d. Reattach the drive to the base chassis or mounting brackets. (See Section 2.6 for more information, if needed.)

e. Reconnect the interface cable at J1 and the DC power at J5.

6.3 SINGLE C DRIVE ELECTRONICS PCBA

The drive electronics PCBA is mounted on top of the drive mechanism.

a. Note the location and orientation of the four drive-to-PCBA connectors at J3 and J4 on the PCBA, then disconnect the four connectors.

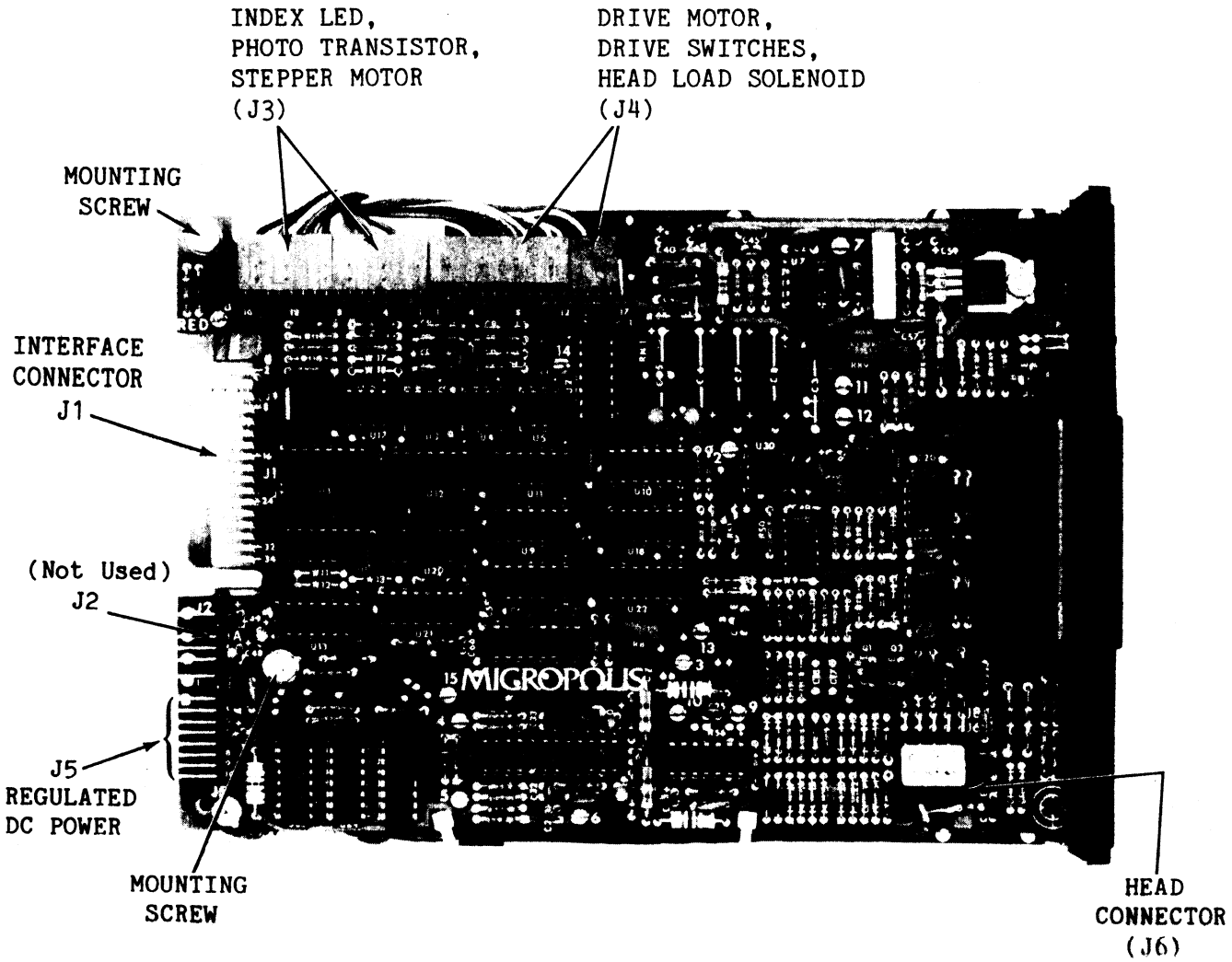


Figure 6-2. PCBA Mounting Details

CAUTION

During the next two steps, handle the head cable and cable connector very carefully because they are fragile and irreparable.

b. Note the location of the tie wraps securing the head cable to the PCBA, then cut the tie wraps.

c. Disconnect the head cable at PCBA connector J6.

d. Remove two PCBA mounting screws, then lift the PCBA off the drive mechanism.

e. Position the replacement PCBA so that it is supported between the fingers on the bezel.

f. Install the two PCBA mounting screws.

CAUTION

During the next two steps, handle the head cable very carefully.

g. Mate the head cable connector with J6 on the PCBA.

CAUTION

During the following step, loosely install the tie wraps to prevent crushing the head cable.

h. Install tie wraps to secure the head cable, locating them as noted in step b.

i. Mate the four drive-to-PCBA connectors with the PCBA, orienting them as noted in step a.

j. Perform the following tests and adjustments in the order listed:

Procedure	Paragraph
Drive Motor Speed	4.3
Positioner Step Timing	4.5
Read Amplifier Gain	4.6

6.4 DRIVE MOTOR OR DRIVE BELT

Depending on how the disk drive is mounted, the drive motor and/or drive belt may be accessible without first removing the drive. If it is necessary to remove the drive, use the procedure given in Section 6.2.

CAUTION

If the drive belt is to be reused, do not stretch or kink it during removal. If this happens the drive belt must be replaced.

a. Slip the drive belt off the large pulley (with the strobe disk) and remove it from the drive motor pulley (see Figure 6-3). Retain the belt if it is acceptable for reuse. Note which surface of the belt is in contact with the pulleys. If the drive belt is to be replaced and the existing drive motor is acceptable, proceed directly to step i.

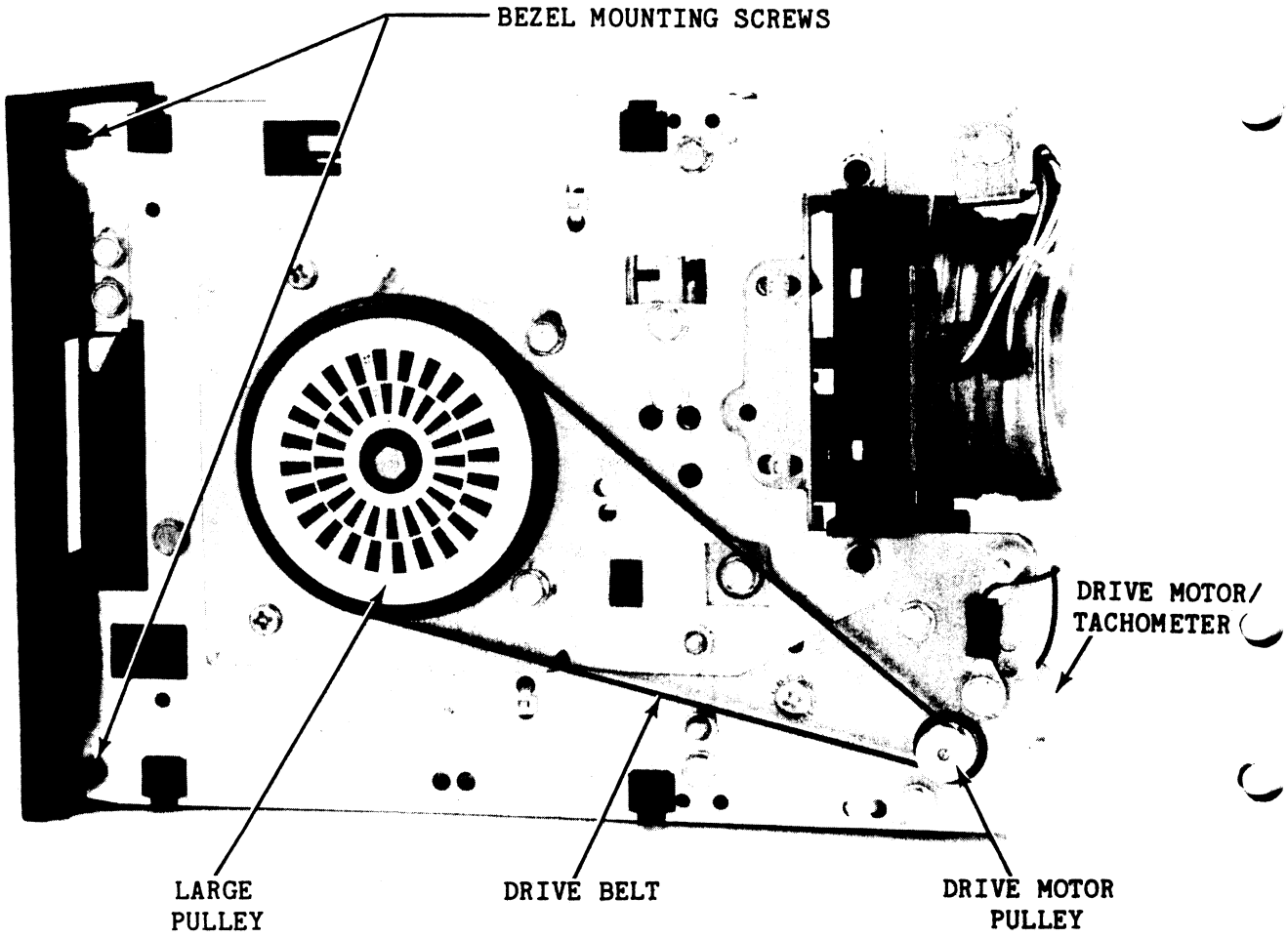


Figure 6-3. Drive Motor and Belt Details

b. Disconnect the cable from the drive motor at J4 on the PCBA. Clip the tie wraps on the cable.

c. Two mounting screws secure the drive motor to the chassis. The one toward the rear secures a ground lug. The motor is insulated from the chassis by a plastic disk and two insulating shoulder washers.

d. While holding the drive motor, remove the two drive motor mounting screws. Retain the plastic disk and shoulder washers. Remove the drive motor from the chassis.

e. Hold the replacement drive motor (and plastic insulator disk) against the chassis.

f. Install the right side motor mounting screw (and shoulder washer).

g. If the drive motor ground lug is secured by the left side motor mounting screw, run the screw through the ground lug and shoulder washer, and install (see Figure 6-4).

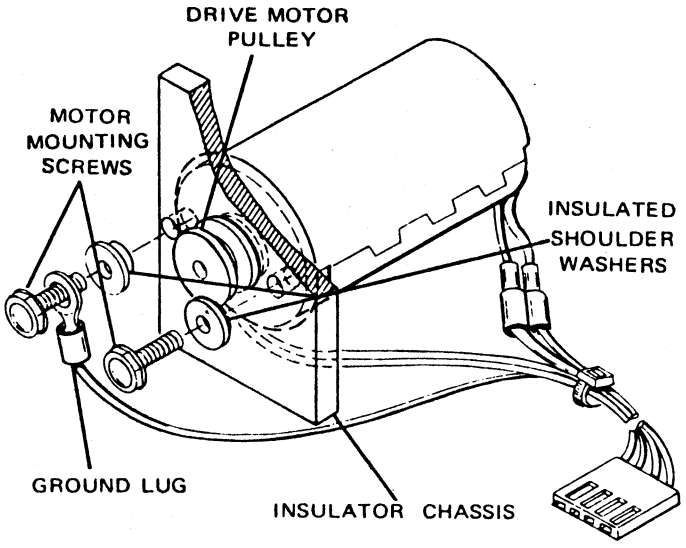


Figure 6-4. Drive Motor Ground Lug

h. Connect the cable from the drive motor to J4 on the PCBA. Secure the cable with tie wraps.

i. Place the original or replacement drive belt over the drive motor pulley, then rotate the large pulley while slipping the belt over it. Ensure that the correct surface of the belt is in contact with the pulleys (see step a).

j. Perform the Drive Motor Speed test and adjustment (paragraph 4.3) and the Instantaneous Speed Variation test (paragraph 4.4).

6.5 HEAD LOAD PAD (Single Head Models only)

The head load pad seats into a recess in the head load arm, and is held in place with adhesive. The head load pad and arm are accessible when the PCBA is removed from the drive.

a. Position the head carriage assembly to the middle of its stroke.

b. Pivot the head load arm up until it is vertical and hold it in this position, using care to keep the spring and pins in place (see Figure 6-5).

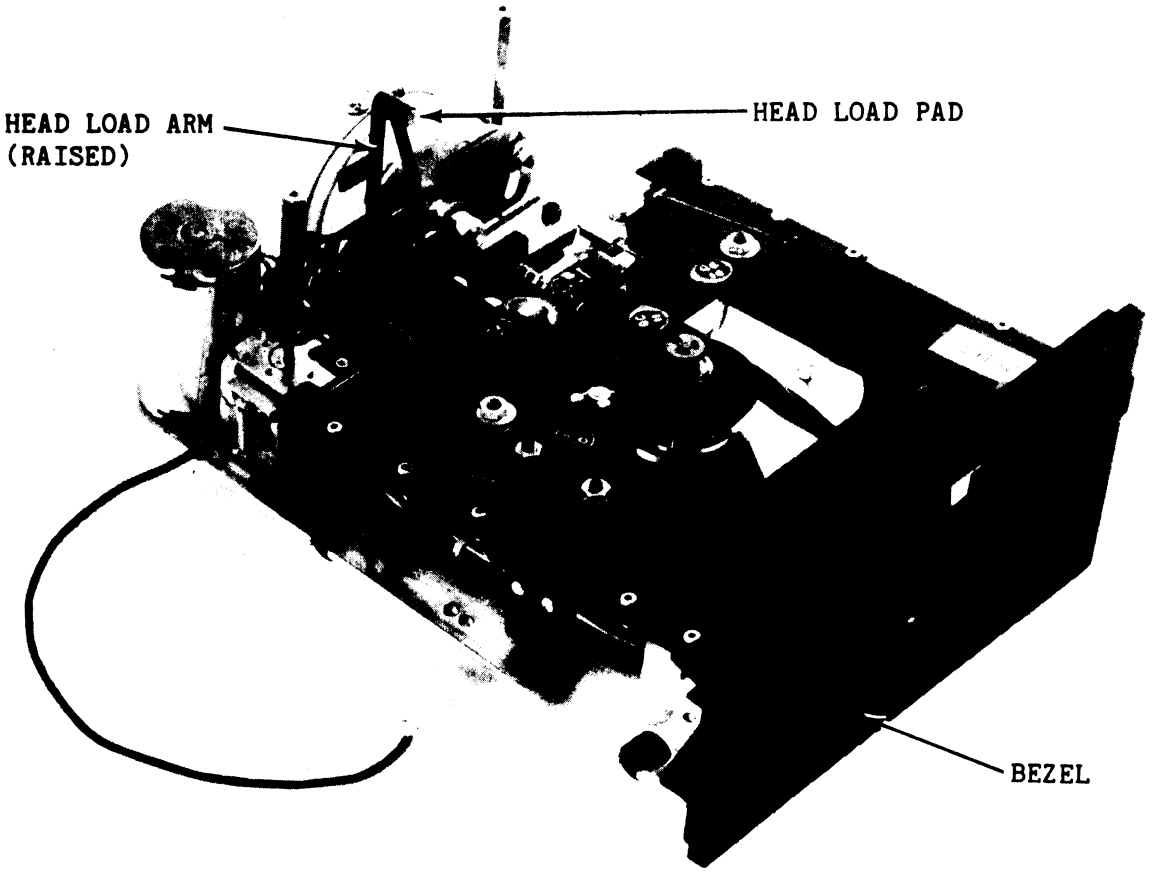


Figure 6-5. Head Load Arm and Pad

c. Using tweezers, carefully remove the old Head load pad from the arm. Adhesive will usually remain stuck in the recess in the head load arm. Using caution to avoid damaging the head load arm, remove all bits of residual adhesive.

d. Being careful not to touch the adhesive surface, peel the protective strip from the back of the replacement head load pad.

CAUTION

During the following step, make sure that the head load pad is flat. An off-center and/or off-level head load pad will cause data errors.

e. Position the head load pad in the head load arm recess, then use a flat tool to press it into place.

f. Lower the head load arm to the head load solenoid plate.

g. Perform the Read Amplifier Gain test and adjustment (paragraph 4.6) and the Head Compliance test (paragraph 4.7).

6.6 POSITIONER

The positioner, consisting of the stepper motor and lead screw, is replaced as a unit. The positioner should not be removed until the PCBA is removed, since the head carriage is removed along with the positioner.

CAUTION

During the next step, handle the head cable very carefully.

a. Note the routing of the head cable, then cut the tie wraps and free the cable from the drive mechanism.

b. Rotate the lead screw until the head carriage is fully forward (away from the stepper motor).

c. Loosen the screw securing the positioner protection bracket (see Figure 6-6) and turn the bracket out of the way so the positioner can be removed.

d. Remove the two positioner mounting screws that attach the positioner mounting block to the chassis.

e. Move the positioner (with the head carriage) away from the spindle housing until the lead screw clears the spindle housing bearing.

CAUTION

For dual head models, the upper and lower heads must not come into direct contact with each other. During the removal and replacement procedure, use a small piece of paper to separate the two heads.

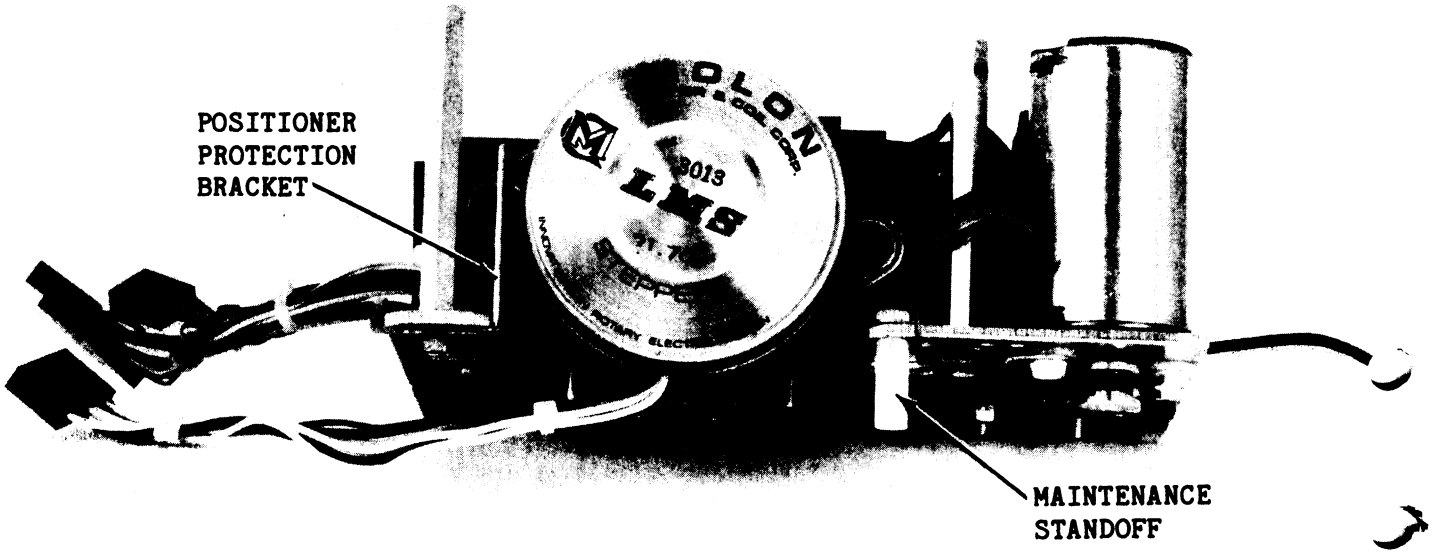


Figure 6-6. Positioner Mounting Screws and Protection Bracket

CAUTION

If the original head is going to be installed on the replacement positioner, be careful to avoid touching the head face.

For dual head models, ensure that the upper and lower heads do not come into direct contact by using a small piece of paper to separate them.

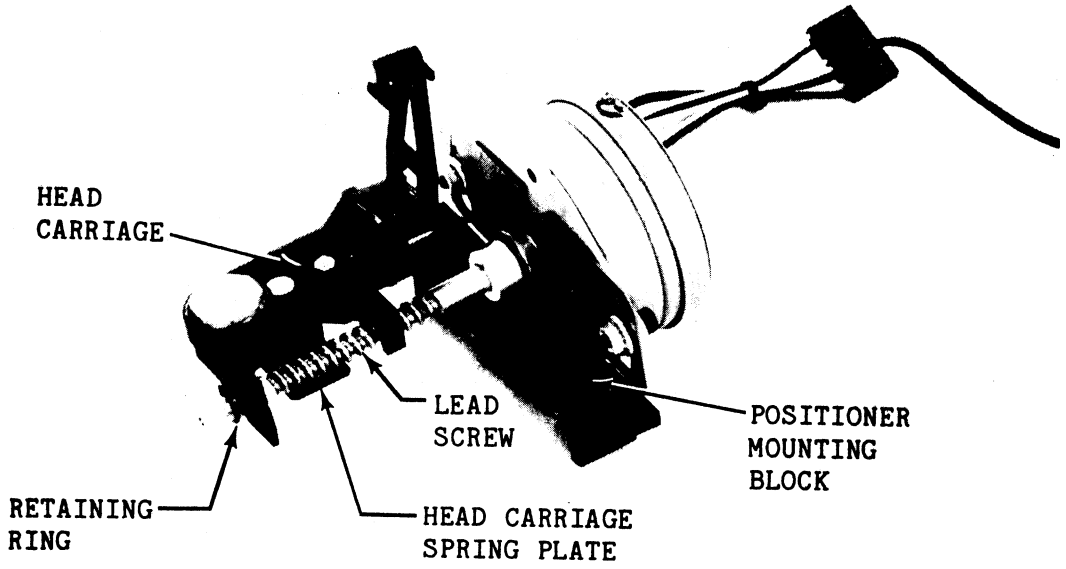
f. Carefully remove the positioner and head carriage from the drive mechanism.

g. Remove the three screws that hold the head carriage spring plate against the lead screw (see Figure 6-7). Remove the spring plate and the head carriage from the positioner.

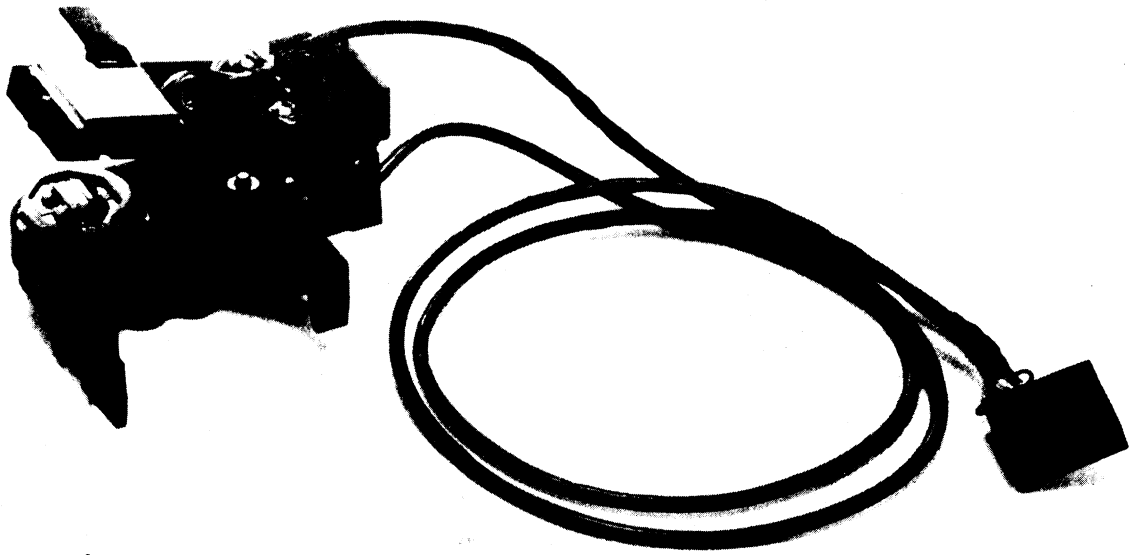
NOTE

For the following step, use the replacement head carriage and/or replacement positioner.

h. Install three screws that hold the spring plate against the lead screw and attach the spring plate to the head carriage. If using a replacement head carriage, use the attaching hardware that comes with it. Check that the spring plate is perpendicular to the head carriage and to the lead screw, and adjust if necessary.



a. Single Head



b. Dual Head (Removed from positioner for clarity)

Figure 6-7. Head Carriage Mounting Details

i. Place the positioner (with head carriage) on the chassis near its installed position, but without inserting the lead screw in the spindle housing bearing.

CAUTION

During the next step, handle the head cable very carefully.

j. Route the head cable as noted in step a. Install tie wraps over cable sleeving, but leave them loose to avoid crushing the cable. Make sure a service loop is left at the head end.

k. Rotate the lead screw until the head carriage is just inside the retaining ring at the far end (the spindle housing end) of the lead screw.

CAUTION

During the following step, force is NOT needed. If the lead screw does not slip into position easily, it is not correctly aligned with the spindle housing bearing. Using force will damage the drive mechanism.

l. Make sure the projection on the head load arm tab will be above the actuator arm, then gently insert the lead screw into the spindle housing bearing.

m. Loosely install the two positioner mounting screws through the spacer plate and positioner mounting block.

n. Adjust the positioner to obtain as accurate a side-to-side centering as possible, then tighten the mounting screws to 18 inch-lbs (4 Nm).

o. Apply a coat of grease (Micropolis P/N 732-0001) to the lead screw.

p. Manually rotate the lead screw. The head carriage should move smoothly on the lead screw but not be so loose that the spring plate does not hold the carriage against the lead screw.

q. Perform the following tests and adjustments in the order listed:

Procedure	Paragraph
Positioner Mechanical Adjustment	4.12
Radial Alignment	4.9
Circumferential/Azimuth Alignment	4.8
Track Zero Switch and Zero Stop	4.10
Radial Alignment (second time)	4.9
Read Amplifier Gain	4.6
Head Compliance	4.7

r. Loosen the screw securing the positioner protection bracket, turn the bracket to its normal position (where it will prevent the lead screw from coming out of the spindle housing bearing, as described in paragraph 4.16), then tighten the screw.

6.7 HEAD CARRIAGE

The head is supplied permanently mounted in the head carriage. Since the head carriage is removed and installed along with the positioner, follow the procedure given in paragraph 6.6 to replace the head carriage.

6.8 HEAD LOAD SOLENOID (Optional - Single Head Models Only)

The head load solenoid is accessible when the drive is removed.

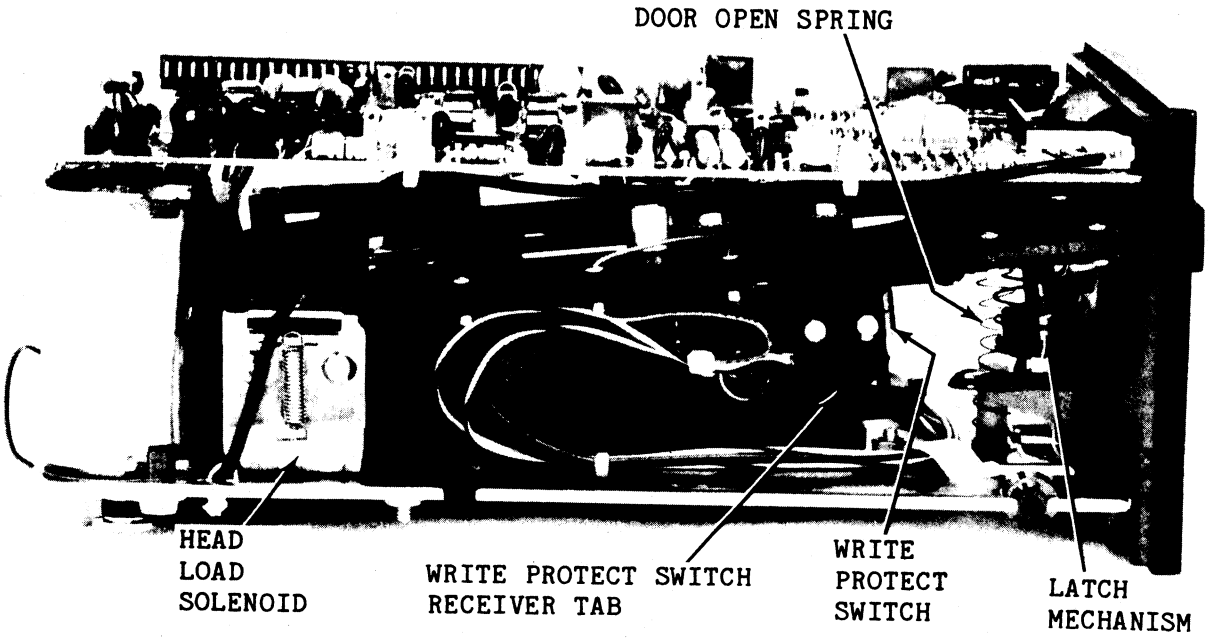


Figure 6-8. Head Load Solenoid, Write Protect Switch, and Latch Mechanism

a. Remove the head load solenoid mounting screw, then slide the head load solenoid out of the drive mechanism far enough to disconnect the wires from the solenoid terminals. Then remove the head load solenoid. It may be necessary to clip the tie wrap holding the head cable to the chassis to perform this step.

b. Connect wires to the replacement solenoid.

c. Lift the head load arm and slide the head load solenoid into position on the chassis.

d. Align the solenoid mounting hole and key with respective holes in the chassis, then install the mounting screw and lockwasher.

e. Check freedom of solenoid action by manually operating the solenoid plate.

f. If the tie wrap was cut in step a, replace it loosely to avoid crushing the head cable.

6.9 CLAMP ASSEMBLY

The clamp assembly consists of the clamp and clamp support plate. The clamp assembly is accessible when the PCBA is removed.

For dual head models only, use a small piece of paper to separate the upper and lower heads before removing the lift spring. Never allow the two heads to come into direct contact, as this may damage the heads.

For all dual head models and single head models using the mechanical lift arm (i.e., without the head load solenoid option), carefully remove the lift spring attached to the side of the base plate of the mechanical load arm assembly.

a. Remove the two clamp support plate retaining nuts and washers (see Figure 6-9).

b. Disconnect the ejection spring from the clamp support plate, then remove the clamp support plate and clamp from the drive mechanism.

c. Install the replacement clamp support plate (with clamp) and secure with nuts and flat washers.

d. Reattach the ejection spring to the clamp support plate.

e. Perform the Clamp Support Plate test and adjustment (paragraph 4.14).

f. For all dual head models and single head models using the mechanical lift arm (i.e., without the head load solenoid option), remount the lift spring to the side of the base plate of the mechanical load arm assembly.

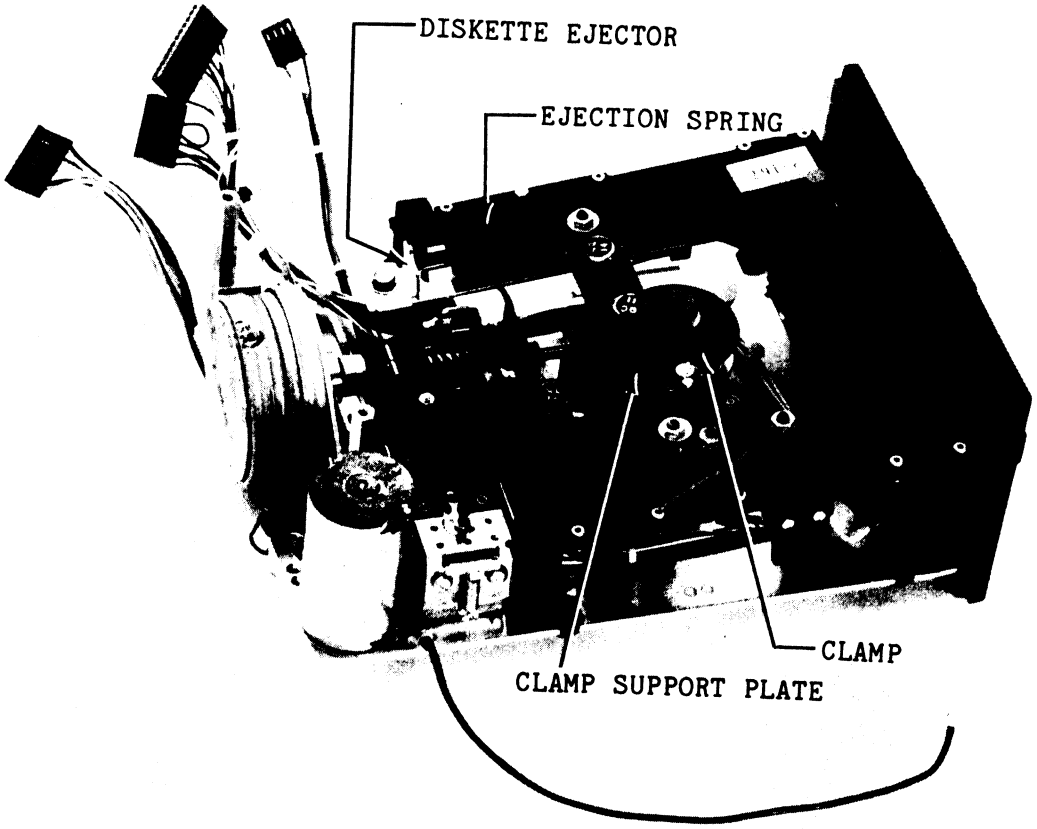


Figure 6-9. Clamp and Clamp Support Plate

6.10 SPINDLE ASSEMBLY

The spindle assembly consists of the spindle and spindle housing, the large drive pulley and strobe disk, and the spindle and lead screw bearings. The spindle assembly is accessible when the drive is removed and the PCBA and clamp assembly are removed.

a. Remove the drive belt (see paragraph 6.4 for procedure).

b. While holding the large pulley with one hand, remove the retaining screw, then remove the large pulley.

c. Remove the clamp assembly (see paragraph 6.9 for procedure).

d. Remove the three spindle housing mounting screws and remove the spindle housing (and spindle) from the drive mechanism by raising the housing from the chassis and sliding it toward the bezel (toward the front of the drive) until the lead screw is free of the bearing in the housing. See Figure 6-10.

e. Slide the replacement spindle housing (with replacement spindle) over the end of the lead screw. Align the spindle housing mounting holes and key with the respective holes in the chassis.

f. Install the spindle housing mounting screws and tighten them securely.

g. Replace the clamp assembly (see paragraph 6.9).

h. Place the large pulley (with strobe disk) against the spindle and install the retaining screw.

i. Replace the drive belt (see paragraph 6.4).

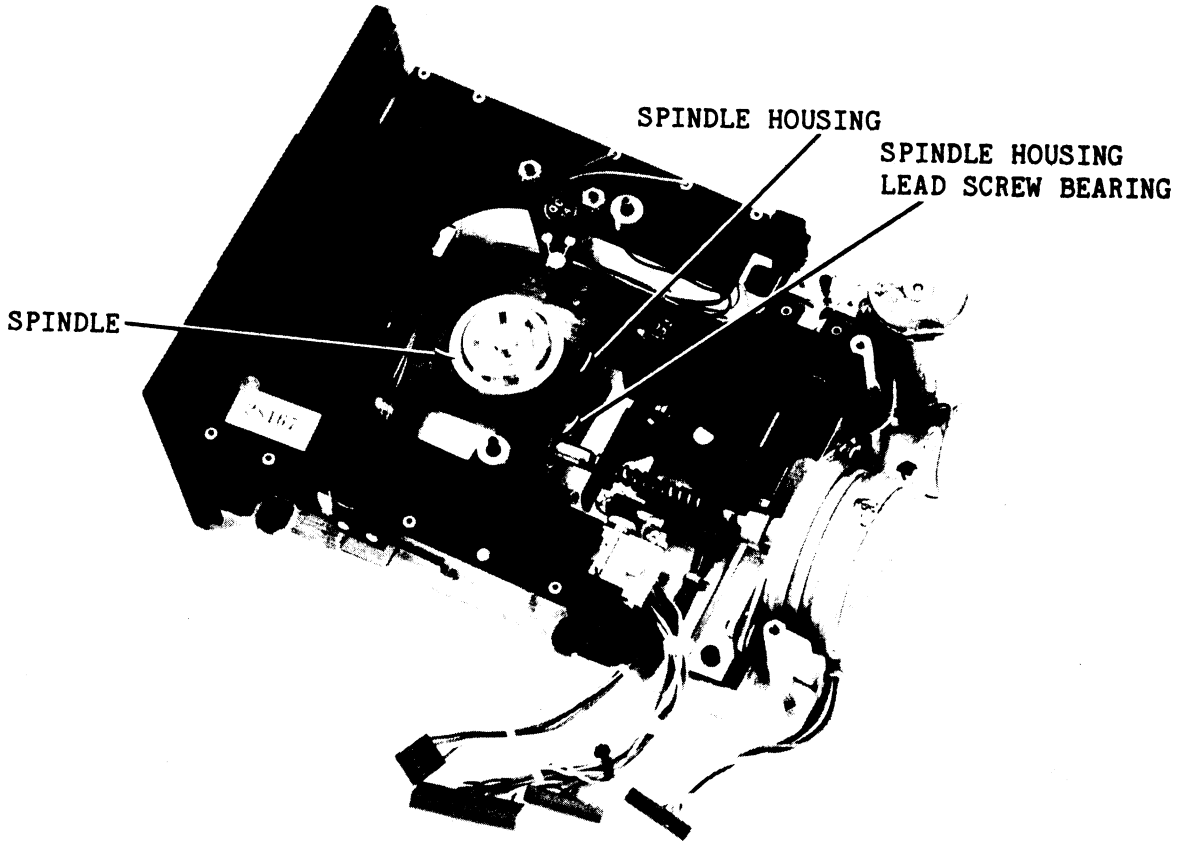


Figure 6-10. Spindle Housing Details

j. Perform the following tests and adjustments in the order listed:

Procedure	Paragraph
Clamp Support Plate	4.14
Circumferential/Azimuth Alignment	4.8
Radial Alignment	4.9
Track Zero Switch and Zero Stop	4.10

6.11 INDEX/SECTOR ASSEMBLY

The Index/Sector LED Assembly consists of a light emitting diode (LED) on a bracket. It is accessible when the PCBA is removed.

a. Remove the two LED Assembly retaining nuts and washers (see Figure 6-11).

b. Turn the LED Assembly on end to gain access to the two terminals. Note the wire color coding for each terminal, then unsolder the wires and remove the LED Assembly.

c. Solder the wires to the feed-through terminals on the replacement LED Assembly, ensuring that the color coding is as noted in step b.

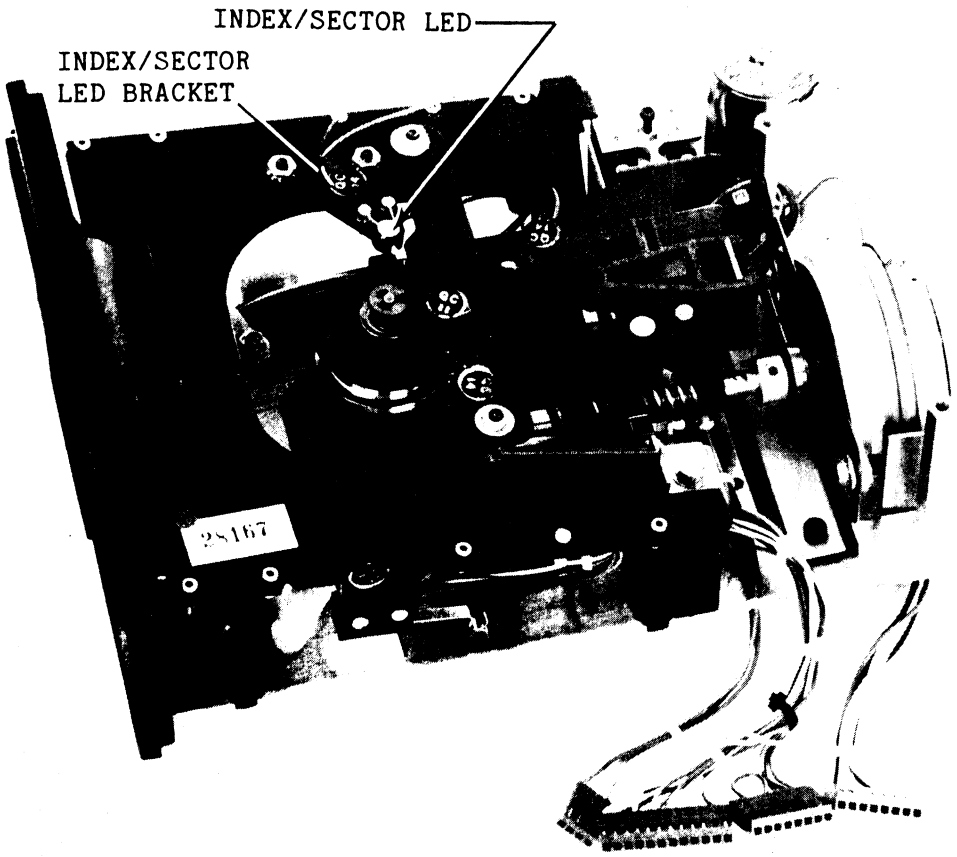


Figure 6-11. Index/Sector LED Assembly Details

d. Route the wires through the notch on the underside of the bracket, then install the bracket over the studs and secure with two washers and nuts.

e. Perform the Circumferential/Azimuth Alignment (paragraph 4.8).

6.12 INDEX/SECTOR PHOTO TRANSISTOR

The Index/Sector Photo Transistor is part of the Platen Assembly. The Platen Assembly is accessible when the drive is removed.

a. While holding the platen (see Figure 6-12) in place, remove two platen mounting screws.

b. For all dual head models, use a small piece of paper to separate the upper and lower heads. The two heads must not come in direct contact with each other.

   Slide the platen toward the side of the chassis until it is freed from the head carriage and spring plate.

CAUTION

Perform the next step carefully, since the photo transistor wires will still be attached.

c. Tilt the platen and slide it out between the receiver and the chassis.

d. Note the wire color coding for the two terminals on the platen, then unsolder the two wires and remove the platen.

e. Solder the wires to the terminals on the replacement platen, ensuring that the color coding is as noted in step d. Ensure that the blue wire is at the terminal that will be nearer the spindle housing.

f. Lubricate both sides of the platen lip with Magnalube grease (Micropolis P/N 732-0001).

g. Tilt the platen and slide it into approximate position on the chassis.

h. Position the platen so the photo transistor is toward the front of the drive mechanism, the spring plate on the head carriage assembly is below the platen lip and the head carriage is above it, and the platen mounting holes are aligned over the holes in the chassis.

i. Verify that the head cable is <u>not</u> underneath the platen, then install the platen mounting screws.

j. Perform the Circumferential/Azimuth Alignment (paragraph 4.8).

6.13 WRITE PROTECT SWITCH

The write protect switch is attached to a tab on the drive motor side of the receiver. It is accessible when the drive is removed.

CAUTION

When performing this procedure, do not apply stress to the fragile tab to which the switch is mounted. If the tab is damaged, the entire receiver must be replaced (paragraph 6.15).

a. While holding the receiver tab and the write protect switch, remove the two switch mounting screws (see Figure 6-8). When the second screw is removed, the nut plate (on the inward side of the switch) will be freed.

b. Note the color coding of the wires at the three switch terminals, then unsolder the wires and remove the switch.

c. Observing the color coding noted in step b, solder the three wires to the replacement switch.

d. Hold the switch in place and insert two mounting screws through the receiver tab and through the switch. Hold the nut plate against the screws, and loosely run the screws into the nut plate. Ensure the switch actuator is in the receiver notch.

e. Perform the Write Protect Switch adjustment (paragraph 4.13).

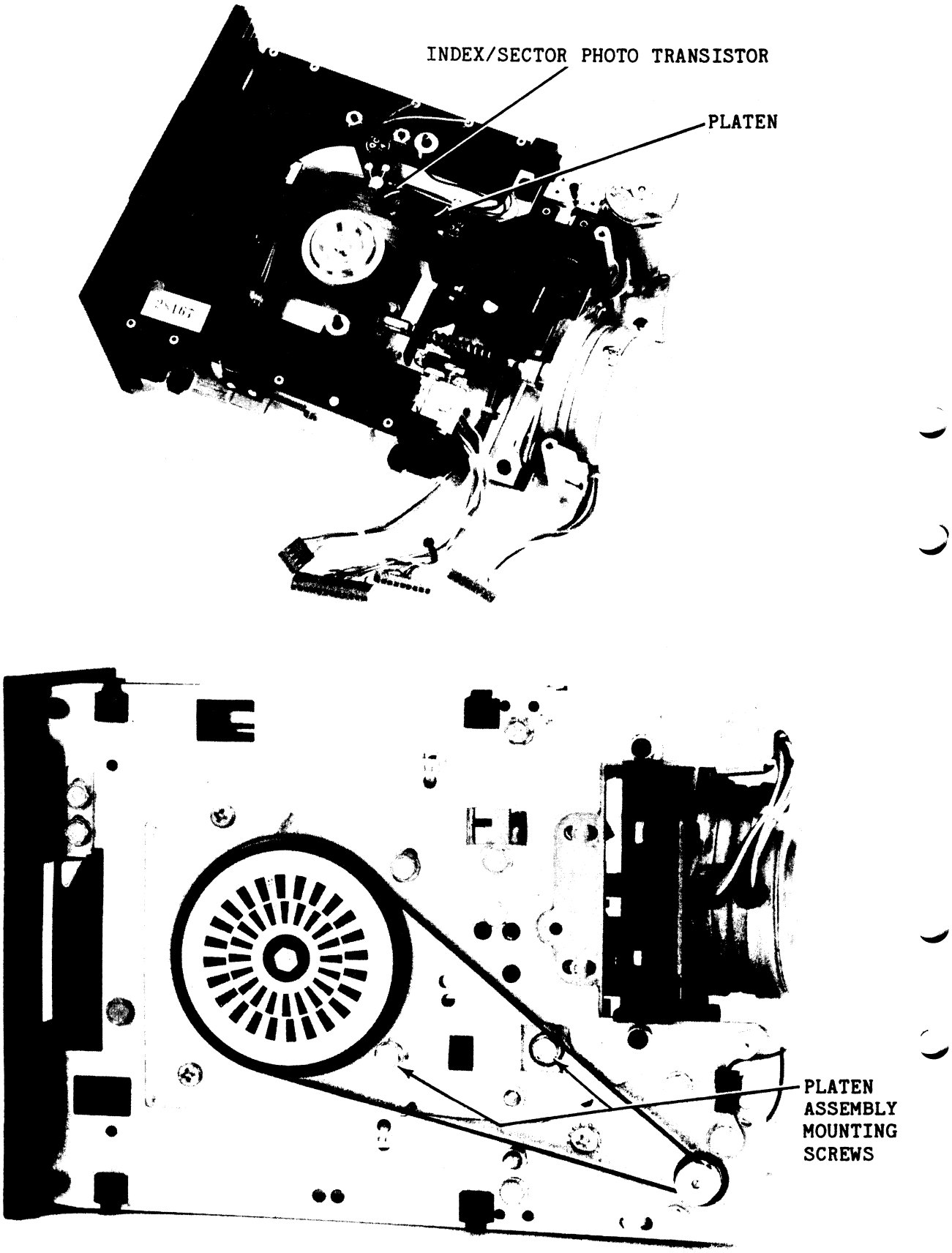


Figure 6-12. Platen Details

6.14 DOOR OPEN SWITCH

The door open switch is attached to a tab on the diskette ejector side of the receiver. It is accessible when the drive is removed.

CAUTION

When performing this procedure, do not apply stress to the fragile tab to which the switch is mounted. If the tab is damaged, the entire receiver must be replaced (paragraph 6.15).

a. While holding the receiver tab and the door open switch, remove the two switch mounting screws. When the second screw is removed, the nut plate (on the inward side of the switch) will be freed.

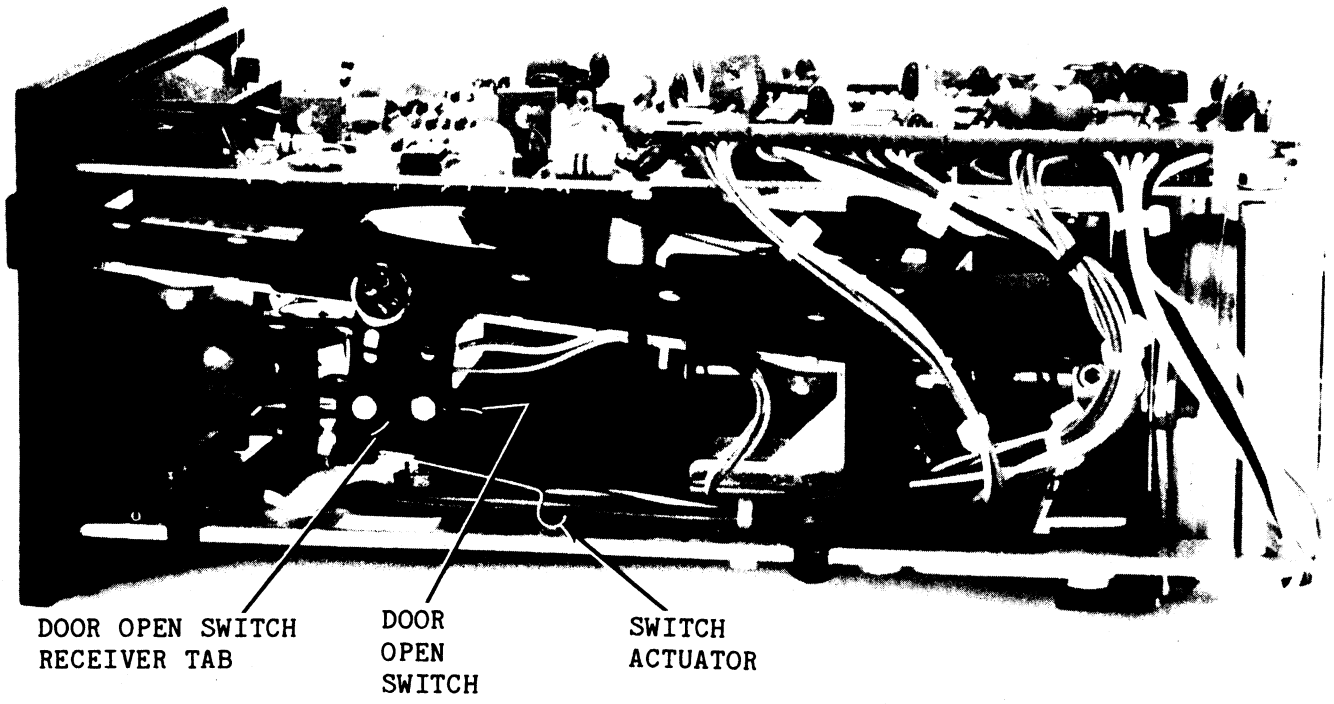


Figure 6-13. Door Open Switch Details

b. Note the color coding of the wires at the three switch terminals, then unsolder the wires and remove the switch.

c. Observing the color coding noted in step b, solder the three wires to the replacement switch.

d. Hold the switch in place and insert two mounting screws through the receiver tab and through the switch. Hold the nut plate against the screws, and loosely run the screws into the nut plate. The switch actuator should be positioned down and toward the rear of the drive.

e. Perform the Door Open Switch adjustment (paragraph 4.11).

6.15 RECEIVER

The Receiver Assembly includes the receiver, write protect switch, door open switch, index/sector LED, and diskette ejector mechanism; it does not include the clamp assembly. The Receiver Assembly is accessible when the drive is removed and the PCBA is removed from the drive.

a. Loosen the two bezel mounting screws (see Figure 6-3).

   For dual head models only, use a small piece of paper to separate the upper and lower heads before removing the lift spring. Never allow the two heads to come into direct contact, as this may damage the heads.

   For all dual head models and single head models using the mechanical lift arm (i.e., without the head load solenoid option), carefully remove the lift spring attached to the side of the base plate of the mechanical load arm assembly.

b. Slide the diskette ejector rearward until it latches.

c. Move the bezel forward and upward until it clears the door handle, then remove the bezel.

d. Loosen the left hand pivot post mounting screw, then separate the receiver from the left hand pivot (see Figure 6-14).

e. Rotate the receiver on the right hand pivot post, while moving the receiver to the left, until the receiver is free of the right hand pivot. Retain door open spring.

f. Note the location of the tie wraps securing the receiver wires to the chassis, then cut the tie wraps.

g. Separate the receiver wires from the remainder of the drive mechanism wires.

h. With the original receiver assembly still attached to the drive mechanism by wires, position the replacement receiver assembly so that its wires can be routed in the same manner as the original's.

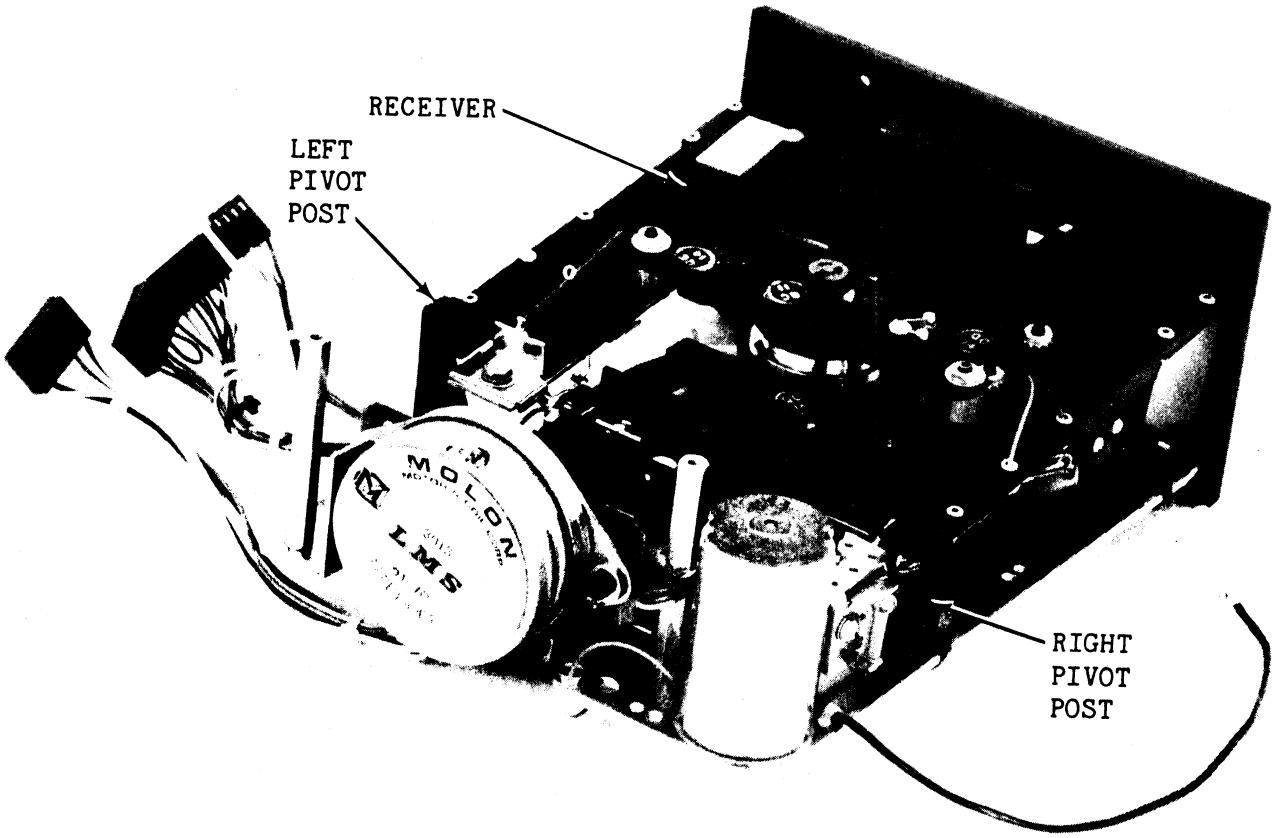


Figure 6-14. Receiver Details

i. Select a wire from the original receiver and trace it to the PCBA connector.

j. Insert a pointed tool (such as a scribe) into the connector window adjacent to the selected wire and press the metal tab that locks the contact in the connector body.

k. Slide the contact toward the wire end of the connector, then gently pull on the wire while using the scribe to push the contact out of the connector body.

l. Select the corresponding wire from the replacement receiver, align its contact with the connector body socket (metal tab toward window), and push the contact into the connector until seated.

m. Repeat steps i through l for all remaining receiver wires.

n. Ensure the door open spring is in place, then position the replacement receiver in the right pivot with the left side up.

o. Install the left pivot post in place over the receiver pivot. Install the left pivot post mounting screw; do not overtighten.

p. Slide the diskette ejector rearward until it latches.

q. Slide the bezel over the door handle, then move the bezel down and rearward until it can be attached to the chassis with two screws and nuts.

r. Install tie wraps at locations noted in step f.

s. Lift the door handle to release the diskette ejector.

t. Remove the clamp assembly from the original receiver and reinstall it on the replacement receiver (see paragraph 6.9).

For all dual head models and single head models using the mechanical lift arm (i.e., without the head load solenoid option), remount the lift spring to the side of the base plate of the mechanical load arm assembly.

u. Perform the following tests and adjustments in the order listed:

Procedure	Paragraph
Door Open Switch	4.11
Write Protect Switch	4.13
Clamp Support Plate	4.14
Diskette Rear Stop	4.15

6.16 TRACK ZERO SWITCH

The track zero switch and its bracket are replaced as an assembly. The track zero switch assembly is accessible after the drive is removed and the PCBA is removed from the drive.

a. Remove the three mounting screws securing the switch bracket to the chassis (see Figure 6-15).

b. Tilt the switch bracket for better access to the switch terminals, then note the color coding of the wires at the three switch terminals. Unsolder the wires. The switch and bracket can now be removed between the lead screw and the diskette ejector.

c. Position the replacement track zero switch assembly approximately in place. Observing the color coding noted in step b, solder the three wires to the switch.

d. Loosely install the three mounting screws.

e. Perform the Track Zero Switch and Zero Stop adjustment (para 4.10).

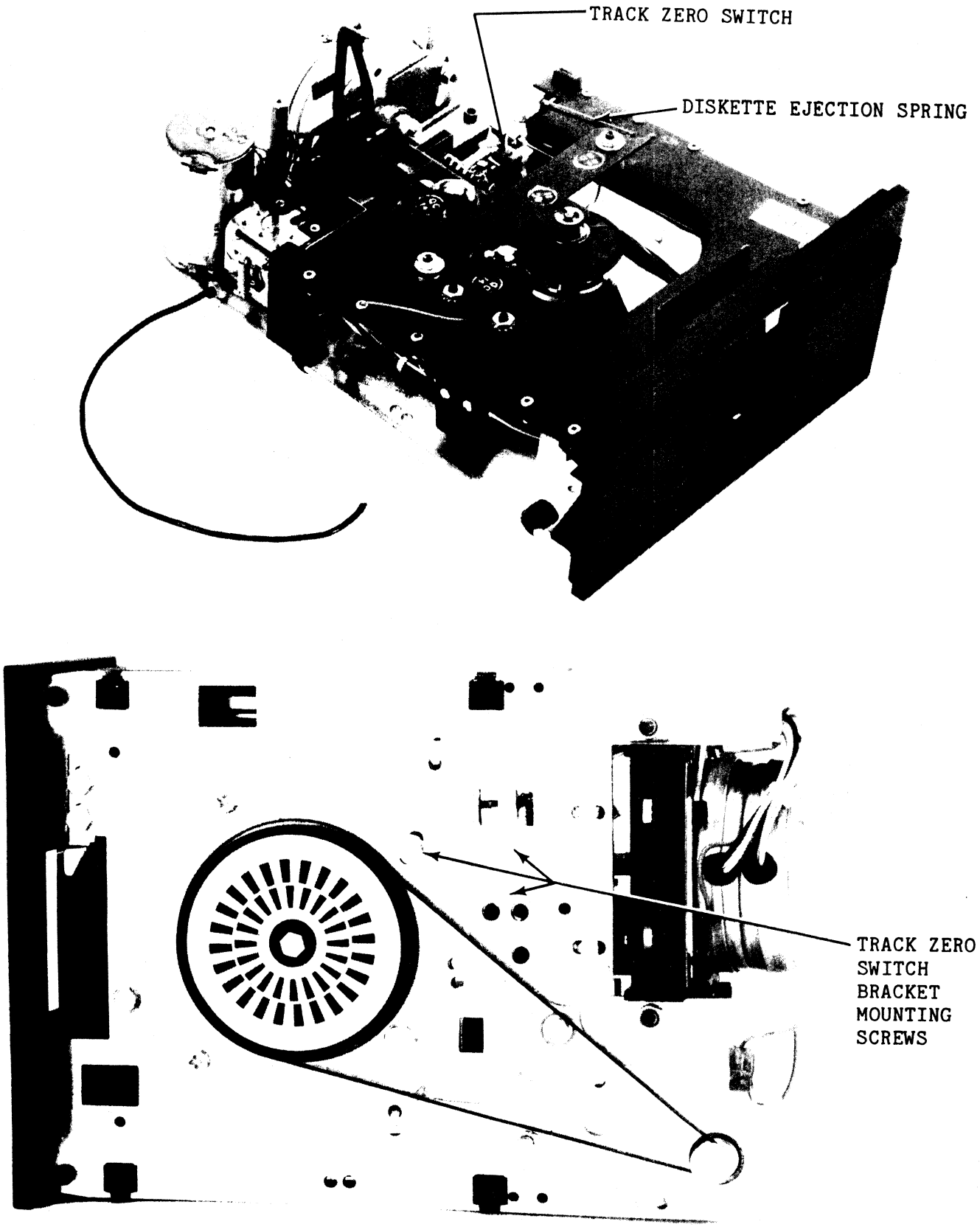


Figure 6-15. Track Zero Switch Details

6.17 LATCH MECHANISM

The latch mechanism is part of the Receiver Assembly. The latch mechanism should be replaced whenever the door cannot be latched or unlatched without difficulty (i.e., if it is binding, not latching or releasing properly, etc.). The latch mechanism is accessible when the drive is removed and the PCBA is removed from the drive.

a. Loosen the two bezel mounting screws.

b. Slide the diskette ejector rearward until it latches.

c. Move the bezel forward and upward until it clears the door handle, then remove the bezel.

d. The receiver may now be tilted upward to gain access to the two nuts securing the latch mechanism to the receiver (see Figure 6-8). Remove the two nuts, and remove the latch mechanism. Retain the spacer plate.

e. Place the spacer plate and the replacement latch mechanism on the two mounting studs.

f. Install and tighten the two mounting nuts.

g. Apply a heavy coat of grease (Micropolis P/N 732-0001) to the entire latch mechanism.

h. Lower the receiver to its normal position.

i. Slide the bezel over the door handle, then move the bezel down and rearward until it can be attached to the chassis with two screws and nuts.

SECTION VII

PARTS LISTS

7.1 INTRODUCTION

This section provides a set of parts lists for the 1015F/1016F OEM Floppy Disk Drive. Item numbers are keyed to the drawings in Section 8 of this manual.

TABLE 7-1. BASE ASSEMBLY

Item	Qty	Micropolis Part Number	Description	Remarks
1	1	102011-01-2	Base Chassis	
2	1	100012-01-2	Motor Tach Assy	
3	2	100014-01-8	Pivot	
4	1	100015-04-9	Receiver Assy	See Table 7-3
5	1	100028-01-8	Bezel	
6	1	100029-01-6	Platen Assy	
7	1	100064-02-1 100064-01-3 100037-02-7 100037-01-9	Carriage Assy	See Table 7-2 Dual Head GCR Dual Head MFM Single Head GCR Single Head MFM
8	1	100007-01-2	Pulley	
9	1	100536-01-5	Motor Mount PLate	
10	1	100040-01-3	Tilt Lock Clip	
11	1	100076-04-1 100076-05-8	Step Motor Assy	See Table 7-2 100 TPI 96 TPI
12	1	100077-01-5	Spindle Assy	
13	1	100081-01-7	Track Zero Switch Assembly	

TABLE 7-1. BASE ASSEMBLY (cont.)

Item	Qty	Micropolis Part Number	Description	Remarks
14	1	100100-02-3	Stand-Off	
15	1	100115-01-3	Insulating Washer	
16	1	100136-01-9	Strobe Disk	
17	1	100137-01-3	Shoulder Washer	
18	1	100167-01-4	Motor Stop	"L" Stop
19	2	100100-05-6	Standoff	PCBA
20	1	 102010-02-2 102010-01-4	Head Lifter Assy Dual Head Single Head	(Mechanical)
21	1	100079-01-1	Solenoid Assy	Solenoid Head Load Only.
22	1	100166-01-6	Solenoid Shield	Solenoid Head Load Only
23	1	102015-01-3	Lift Spring	
24	10	703-0605-5	Screw, #6 x 5/16 Taptite	
25	5	703-0606-3	Screw, #6 x 3/8 Taptite	Motor Tach, Track Ø Switch
26	1	715-1002-8	Door Spring	
27	2	704-0606-1	Screw, #6 x 3/8 Socket Head	Bezel
28	1	700-0806-5	Screw, 8-32 x 3/8 Pan Head, Phillips	Solenoid
29	2	706-0610-8	Screw, 6B x 5/8	Platen
30	2	710-0602-7	Nut, #6	Step Motor, Clamps
31	2	710-0604-3	Nut, #6, Square	Bezel

TABLE 7-1. BASE ASSEMBLY (cont.)

Item	Qty	Micropolis Part Number	Description	Remarks
32	2	710-0605-0	Nut, #6, Sheet Edge	
33	2	703-1607-0	Screw, 6-32 x 7/16 Pan Head, Phillips	Solenoid Shield
34	1	712-1401-9	Shim, Nylon	
35	1	704-0610-3	Screw, 6-32 x 5/8, Socket Head	Step Mounting Block
36	1	725-1201-5	Belt	
37	1	711-0803-9	Lock Washer, #8 External	Star Washer, Solenoid
38	2	706-0610-8	Screw, 6-32 x 5/8 Hex Head	Wire Clamp
39	2	669-3002-5	Tension Clamp	

TABLE 7-2. POSITIONER/HEAD ASSEMBLY

Item	Qty	Micropolis Part Number	Description	Remarks
1	1		Stepper Motor Assembly	
		100076-04-1		100 TPI
		100076-05-8		96 TPI
2	1		Head Carriage Assembly	
		100064-02-1		Dual Head, GCR
		100064-01-3		Dual Head, MFM
		100037-02-7		Single Head, GCR
		100037-01-9		Single Head, MFM
3	1	100039-02-3	Stud Spring	
4	1	100002-01-3	Mounting Block	Stepper
5	1		Spring, Motor Mounting	
		100003-02-9		Use with Molon Motor
		100003-01-1		Use with North American Phillips Motor
6	1	100004-01-9	Support Plate	
7	3	704-0403-3	Screw, #4 x 3/16 Socket Head	Stud Spring
8	2	704-0610-3	Screw, #6 x 5/8 Socket Head	Motor Spring
9	2	704-0608-7	Screw, #6 x 1/2 Socket Head	Motor Mount
10	6	711-0602-2	Washer	Motor Mount
11	4	710-0602-7	Star Nut	
12	1	707-2501-5	Retaining Ring	
13	1	100046-01-0	Stop Cam	Track Zero Collar

TABLE 7-3. RECEIVER ASSEMBLY
DWG No. 100015

Item	Qty	Micropolis Part Number	Description	Remarks
1	1	100016-01-3	Top Plate	For assembly, use mandrel (Avdel) No. 1 oversize, Catalog No. 7150-6103 (Must be .076 Dia.)
2	1	100017-01-1	Bottom Plate	
3	2	100018-01-9	Guide	
4	1	100019-01-7	Door Handle	
5	1	100021-01-3	Lock Bar	
6	1	100022-01-1	Stop	
7	1	100023-01-9	LED Assy	
8	1	100026-01-2	Support	
9	1	100027-01-0	Clamp	
10	1	100047-01-8	Bearing Retainer	
11	4	100098-01-9	Shoulder Washer	
12	2	100100-01-5	Standoff	
13			---	
14	1	100321-01-7	Latch Support	
15	2	100322-01-5	Nut Plate	Write Protect and Door Open Switches
16	1	102048-01-4	Write Protect Switch Assy	
17	1	102047-01-6	Door Open Switch Assy	
18	A/R	669-1001-9	Tie Wrap	
19	6	681-0002-3	Molex Pin	
20	2	681-0003-1	Molex Pin	Loose
21	5	700-0207-6	Screw, #2 x 7/16	Switches, Cable Clamp

TABLE 7-3. RECEIVER ASSEMBLY (cont.)

Item	Qty	Micropolis Part Number	Description	Remarks
22	2	703-0605-5	Screw, #6 x 5/16 Taptite	Stop, Handle
23	1	707-1101-5	E Ring	
24	1	707-2501-5	Retaining Ring	
25	9	708-0901-7	Rivet	
26	1	709-0001-4	Latch	
27	3	710-0201-8	Nut, #2	Latch, Cable Clamp
28	2	710-0601-9	Nut, #6	Clamp
29	2	710-0602-7	Nut, #6	LED Assy
30	2	710-0603-5	Nut, Locking, #6	Lock Bar
31	A/R	711-0601-7	Washer, #6	Support, Stop
32	1	715-1001-0	Spring	
33	1	715-2001-9	Spring	
34	1	716-2501-6	Bearing, 1/4" ID	
35	1	717-1201-2	Groove Pin, Steel, Type 4, .125 x .625	Groove Pin Corp. (Alt. Type D BRG Eng.'s)
36	1	717-1202-0	Groove Pin, Steel, Type 24, .125 x 1.50	Groove Pin Corp.
38	A/R	711-0201-6	Washer, #2	Latch (2 Maximum)
39	1	669-3001-7	Cable Clamp	Door Switch Cable

TABLE 7-4. SINGLE C PCBA

NOTE: Quantities and Reference Designators shown in parentheses are for boards used in dual-head drives only.

Item	Qty	Micropolis Part Number	Description	Remarks
1	Ref	102055	Master Layout	
2	Ref	102057	Assembly	
3	Ref	102058	Schematic	
4	Ref	102059	Specification	
5	1	102056-01-7	Process Board	
6			---	
7	2	400-0000-2	I.C., 74LS00	U12,U18
8	1	400-0002-8	I.C., 74LS02	U11
9	3	400-0014-3	I.C., 74LS14	U10,U16,U19
10	1	400-0027-5	I.C., 74LS27	U20
11	1	400-0074-7	I.C., 74LS74	U23
12	1	400-0085-3	I.C., 74LS85	U21
13	1	400-0086-1	I.C., 74LS86	U24
14	2	400-0123-2	I.C., 74LS123	U25,U29
15	1	400-0393-1	I.C., 74LS393	U13
16			---	
17	2	401-0016-6	I.C., 7416	U2,U9
18	1	401-0017-4	I.C., 7417	U22
19	1	401-0368-1	I.C., 74368	U1
20			---	
21	1	406-0451-4	I.C., 75451	U14

TABLE 7-4. SINGLE C PCBA (cont.)

Item	Qty	Micropolis Part Number	Description	Remarks
22	3	406-0452-2	I.C., 75452	U3,U4,U5
23			---	
24	2	410-0311-2	I.C., LM311	U17,U26
25	3 (4)	410-0555-4	I.C., LM555	U6,(U8),U15,U30
26	2	410-0592-7	I.C., NE592	U27,U28
27	1	410-2917-4	I.C., LM2917	U7
28			---	
29	19 (24)	200-4446-7	Diode, 1N4446	CR9,(CR10),CR11,CR12,(CR13), CR14 thru CR18,(CR19, CR20,CR21),CR22 thru CR29,CR32,CR33,CR34
30			---	
31	1	210-5223-8	Diode, 1N5223	CR8
32	1	210-5244-4	Diode, 1N5244	CR30
33			---	
34	8	220-4002-6	Diode, 1N4002	CR2 thru CR7,CR31,CR35
35		---		
36	1	622-0001-9	LED, FLV160	CR1
37			---	
38	2	300-4400-2	Transistor, 2N4400	Q1,Q6
39	3 (4)	300-4402-8	Transistor, 2N4402	Q2,Q3,Q4,(Q5)
40			---	
41	1	340-0110-7	Transistor, TIP110	Q7
42			---	

TABLE 7-4. SINGLE C PCBA (cont.)

Item	Qty	Micropolis Part Number	Description	Remarks
43	7 (8)	100-0000-8	Resistor, 0 ohm	Single: R42,R52,R53,W5, W7,W9,W10 (Dual: R42,R52,R53,W5, W6,W7,W8,W10)
44	1	100-0470-3	Resistor, 47 ohm, 5%, 1/4W	R72
45	6	100-1000-7	Resistor, 100 ohm, 5%, 1/4W	R8,R15,R51,R85,R91 [and R56 GCR Only]
46	3	100-1500-6	Resistor, 150 ohm, 5%, 1/4W	R1,R57,R58
47	1	100-1800-0	Resistor, 180 ohm, 5%, 1/4W	R19
48	5	00-2200-2	Resistor, 220 ohm, 5%, 1/4W	R13,R14,R54,R55,R60
49	4	100-3300-9	Resistor, 330 ohm, 5%, 1/4W	R20,R50,R66,R68
50	6	100-4700-9	Resistor, 470 ohm, 5%, 1/4W	R63,R64,R65,R70,R71,R83
51	1	100-5600-0	Resistor, 560 ohm, 5%, 1/4W	R41
52	1	100-6800-5	Resistor, 680 ohm, 5%, 1/4W	R47
53	10 (11)	100-1001-5	Resistor, 1K, 5%, 1/4W	R5,R7,R9,R10,R18,R25,R34, (R39),R75,R82,R84
54			---	
55	3	100-1501-4	Resistor, 1.5K, 5%, 1/4W	R26,R33,R38
56	1	100-1801-8	Resistor, 1.8K, 5%, 1/4W	R46
57	3	100-2201-0	Resistor, 2.2K, 5%, 1/4W	R43,R61,R62

TABLE 7-4. SINGLE C PCBA (cont.)

Item	Qty	Micropolis Part Number	Description	Remarks
58	6 (8)	100-1202-9	Resistor, 12K, 5%, 1/4W	R29,(R30),R37,(R40),R44 R45,R69,R77
59	1	100-1502-2	Resistor, 15K, 5%, 1/4W	R86
60	5	100-2202-8	Resistor, 22K, 5%, 1/4W	R6,R27,R28,R78,R92
61	2	100-2702-7	Resistor, 27K, 5%, 1/4W	R48,R49
62	4	100-4702-5	Resistor, 47K, 5%, 1/4W	R11,R12,R17,R90
63	2	100-1003-1	Resistor, 100K, 5%, 1/4W	R16,R79
64	1	100-4703-3	Resistor, 470K, 5%, 1/4W	R76
65			---	
66	1	101-0010-5	Resistor, 1 ohm, 5%, 1/2W	R81
67	1 (2)	101-3900-4	Resistor, 390 ohm, 5%, 1/2W	R35,(R36)
68			---	
69	2	105-2801-6	Resistor, 2.80K, 1%, 1/8W	R31,R32
70	1	105-5901-1	Resistor, 5.9K, 1%, 1/8W	R67
71	1 (2)	105-6191-8	Resistor, 6.91K, 1%, 1/8W	R21,(R23)
72	2	105-1002-2	Resistor, 10K, 1%, 1/8W	R2,R4
73	1 (2)	105-1962-7	Resistor, 19.6K, 1%, 1/8W	R22,(R24)

TABLE 7-4. SINGLE C PCBA (cont.)

Item	Qty	Micropolis Part Number	Description	Remarks
74	2	105-3572-2	Resistor, 35.7K, 1%, 1/8W	R3,R80
75	1	105-1503-9	Resistor, 150K, 1%, 1/8W	R73
76			---	
77	1	130-2001-1	Resistor, Variable, 2K, 10%	R59
78	3	130-2002-9	Resistor, Variable, 20K, 10%	R87,R88,R89
79			---	
80	1	131-1003-6	Resistor, Variable, Multi-Turn, 100K, 10%	R74
81			---	
82	1	116-0002-0	Resistor, SIP, 150 ohm	RN1
83	1	116-0011-1	Resistor, SIP, 220/330 ohm	RN2
84			---	
85	3	160-1000-1	Capacitor, 100 pF, 5%	C4,C14,C39
86	1	160-3300-3	Capacitor, 330 pF, 5%	C35
87	2	160-4700-3	Capacitor, 470 pF, 5%	C9,C37
88	2	160-7500-4	Capacitor, 750 pF, 5%	C36,C38
89			---	
90	1	161-1501-6	Capacitor, 1500 pF, 10%	C28
91	1	161-4701-9	Capacitor, 4700 pF, 10%	C25

TABLE 7-4. SINGLE C PCBA (cont.)

Item	Qty	Micropolis Part Number	Description	Remarks
92	3	161-2202-0	Capacitor, .022 uF, 10%	C32,C33,C45
93			---	
94	1 (2)	162-4702-5	Capacitor, .047 uF, 10%	C10,(C11)
95	1	162-1003-6	Capacitor, 1 uF	C44
96	3	162-4703-3	Capacitor, 47 uF, 10%	C57,C63,C72
97			---	
98	2	163-2203-4	Capacitor, 22 uF, 10%	C64,C65
99	4	163-4703-1	Capacitor, .47 uF, 10%	C29,C30,C47,C48
100	9	163-3304-9	Capacitor, 3.3 uF, 10%	C24,C26,C40,C42,C49,C51, C58,C59,C66
101	2	163-1006-2	Capacitor, 100 uF, 10%	C5,C6
102			---	
103	27 (29)	165-1002-6	Capacitor, .01 uF, 5%	C1,C2,C12,(C13),C15,(C16), C21,C22,C23,C27,C31,C34, C41,C43,C46,C50,C52,C53, C54,C56,C60,C61,C62,C67, C68,C69,C70,C71
104			---	
105	1	177-0001-4	Capacitor, .01 uF, 10%, Ceramic	C3
106			---	
107	2	190-0240-1	Inductor, 24 UH, 5%	L3,L4
108	3	190-1000-8	Inductor, 100 UH, 5%	L1,L2,L5

TABLE 7-4. SINGLE C PCBA (cont.)

Item	Qty	Micropolis Part Number	Description	Remarks
109			---	
110	1	191-0100-5	Inductor, 10 UH, 10%	L6
111	1	680-0401-9	Header, 4 Pin	J2B
112	1	680-0503-2	Header, 5 Pin, .1"	J2A
113	1	680-1001-6	Header, 10 Pin, .1"	J5
114	1	680-1601-3	Header, 16 Pin, .1"	J3
115	1	680-1701-1	Header, 17 Pin, .1"	J4
116	1	680-0804-4	8 Pin DIP Socket	
117	1	680-0506-5	Header, 5 Pin	J6
118	1	680-0505-7	Header, 5 Pin	J8
119	1	680-1007-3	10 Pin SIP Socket	J7
120	1	684-0001-9	8 Pin DIP Header	
121	15	684-0008-4	Post, Test	TP1 thru TP15
122			---	
123	1	650-0001-0	Heatsink	
124	A/R	650-0003-6	Grease, Heat Conducting	
125	1	700-0605-1	Screw	
126	1	710-0602-7	Nut	

SECTION VIII

ASSEMBLY DRAWINGS AND SCHEMATIC DIAGRAMS

8.1 INTRODUCTION

This section consists of assembly drawings (corresponding to the Parts Lists of Section VII) for the 1015F/1016F OEM Floppy Disk Drives, and engineering documentation for the circuit board used. Figures include:

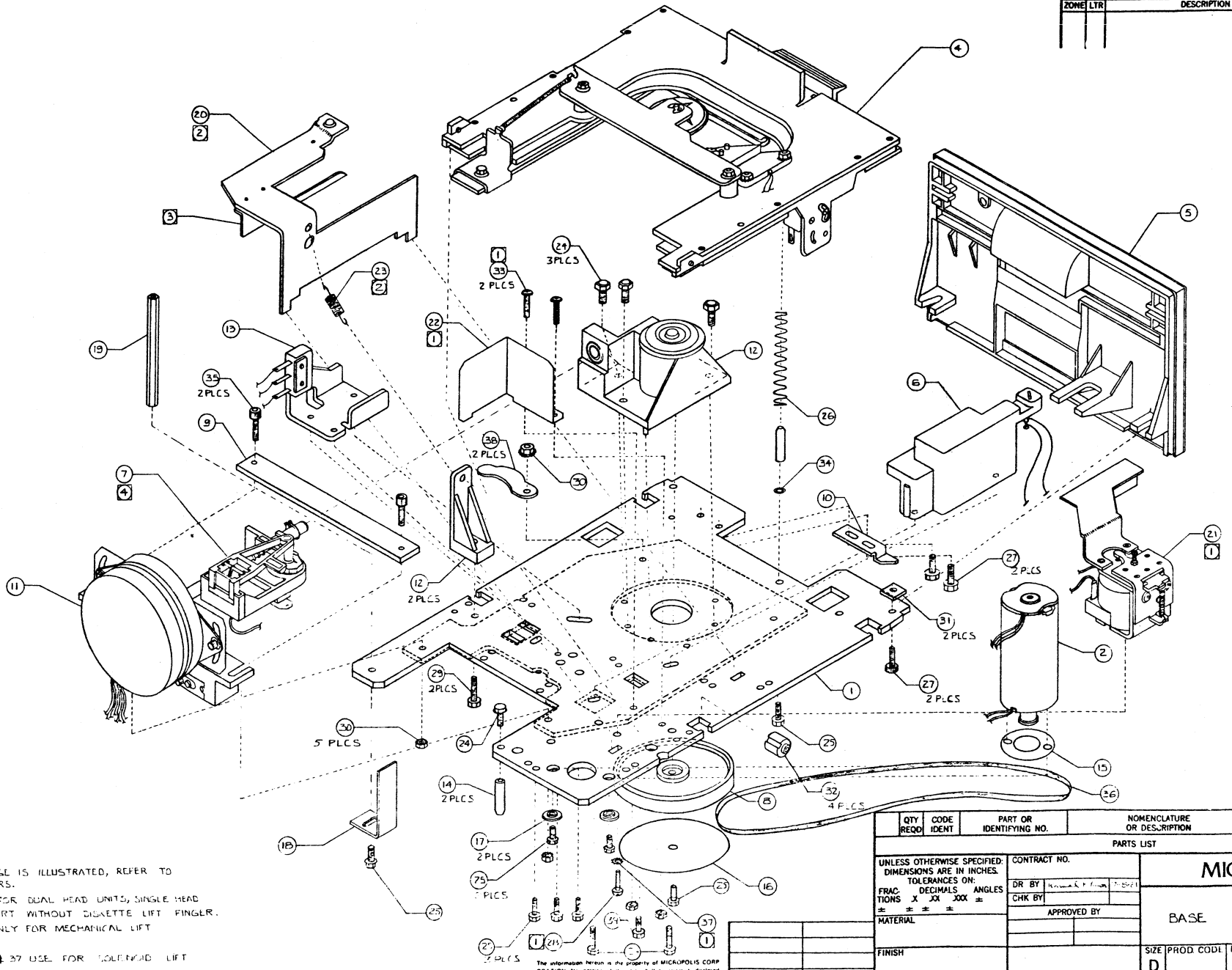
a. Drive (Base) Assembly Drawing.

b. Positioner/Head Assembly Drawing

c. Receiver Assembly Drawing, 100015

d. Single C PCBA Assembly Drawing, 102057.

e. Single C PCBA Schematic Diagram, 102058.



4 A SINGLE HEAD CARRIAGE IS ILLUSTRATED, REFER TO PARTS LIST FOR OTHERS.

3 ITEM 20 IS AS SHOWN FOR DUAL HEAD UNITS, SINGLE HEAD UNITS USE SIMILAR PART WITHOUT DISKETTE LIFT FINGER.

2 ITEMS 20 & 23, USE ONLY FOR MECHANICAL LIFT ARM DRIVES.

1 ITEMS 21, 22, 28, 33 & 37 USE FOR SOLENOID LIFT ARM DRIVES ONLY.

NOTE. UNLESS OTHERWISE SPECIFIED

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION		ZONE
			PARTS LIST		

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON: FRACTIONS X .XX .XXX ± ± ± ± ± DECIMALS ANGLES

MATERIAL

FINISH

NEXT ASSY | USED ON

APPLICATION

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CONTRACT NO.

DR BY

CHK BY

APPROVED BY

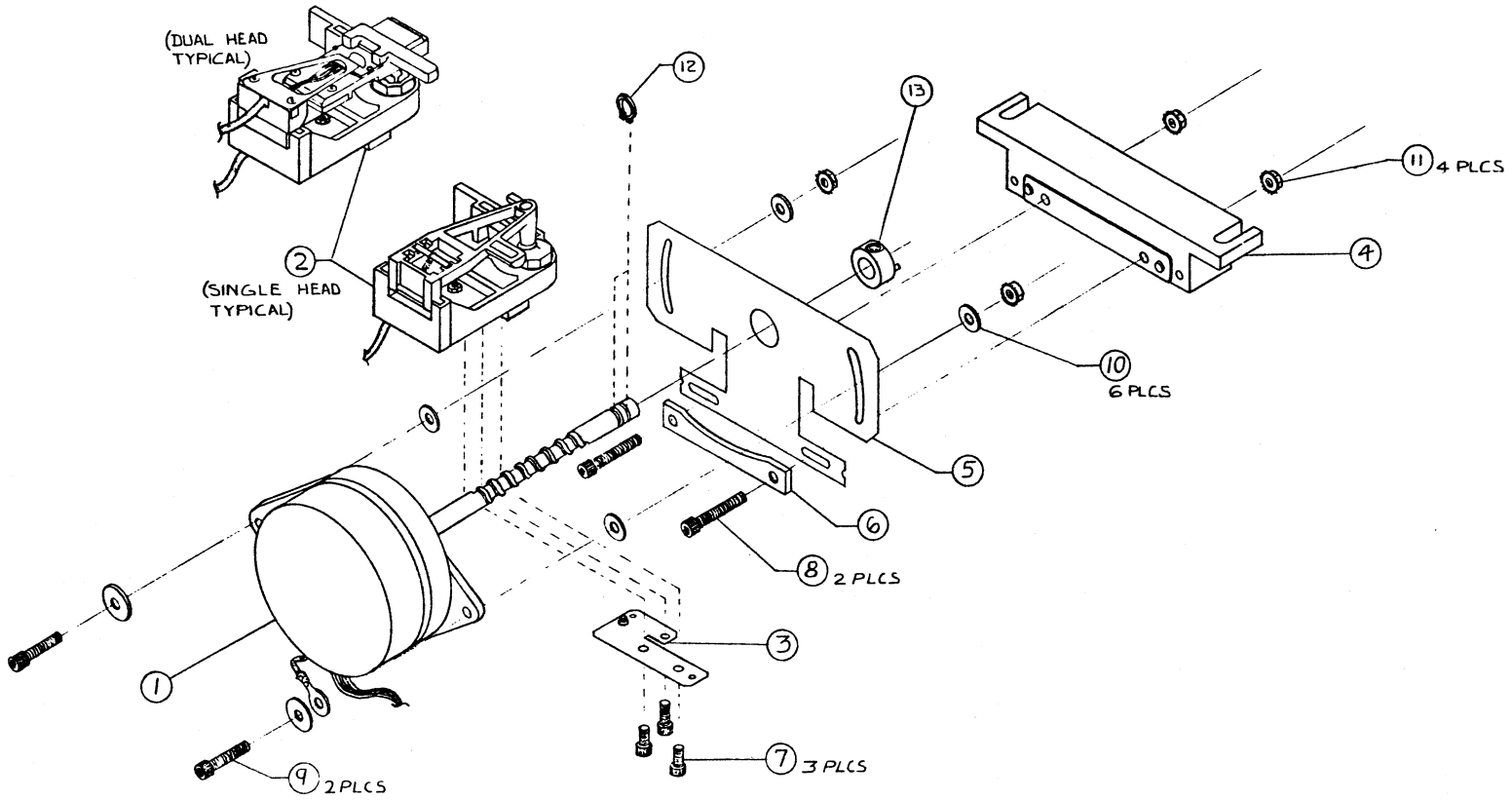
MICROPOLIS™

BASE ASSEMBLY

SIZE D | PROD CODE | DWG NO. | REV

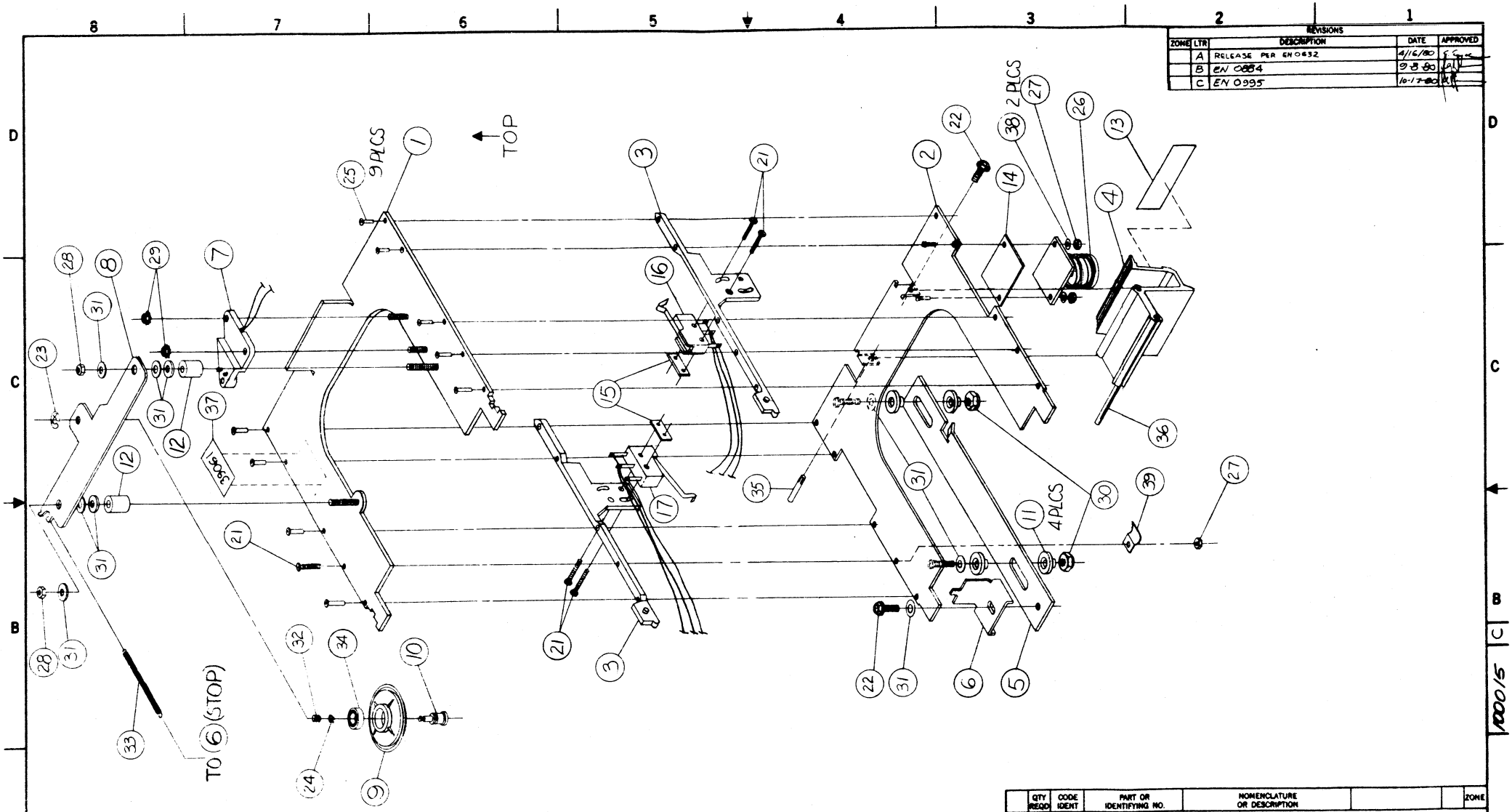
SCALE | SHEET OF

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



NOTE UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON: FRAC ± DECIMALS .XX ± .XXX ± ANGLES ±	CONTRACT NO.	MICROPOLIS™	
MATERIAL	DR BY Kamal R. Lalji 7/11/84	POSITIONER/HEAD ASSY	
FINISH	CHK BY	SIZE C	PRODUCT CODE F/D
NEXT ASSY / USED ON	APPROVED BY	DWG NO	REV
APPLICATION	DO NOT SCALE DRAWING	SCALE	SHEET 1 OF 1



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASE PER EN 0632	4/16/80	
	B	EN 0884	9-3-80	
	C	EN 0995	10-17-80	

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION		ZONE
PARTS LIST					

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON: FRACTIONS ± DECIMALS .X ± .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

NEXT ASSY | USED ON

APPLICATION

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CONTRACT NO.

DR BY P Hawley 2/24/80

CHK BY

APPROVED BY

F.S.J. 4/4/80

MICROPOLIS™

RECIEVER ASSY

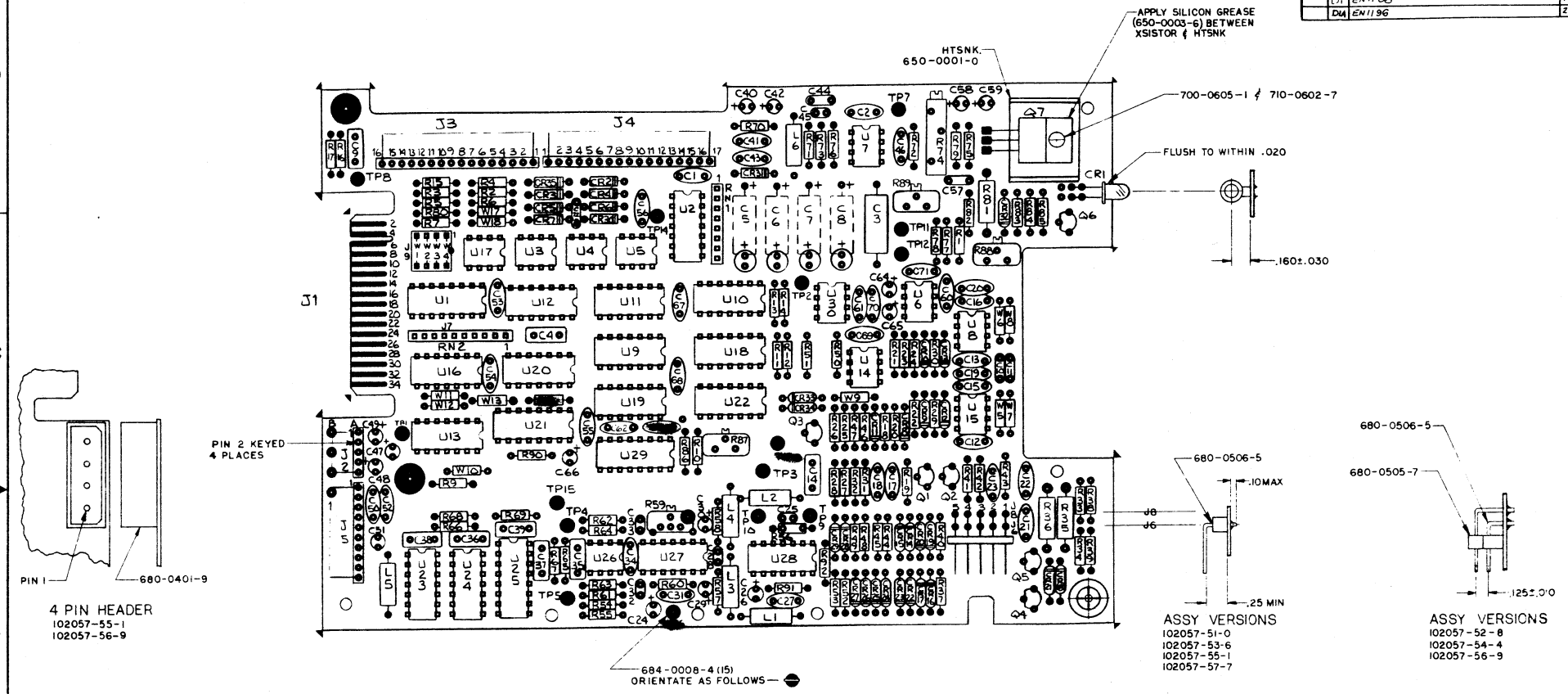
SIZE D | CODE IDENT NO. F/D | DWG NO. 100015 | REV. C

SCALE: FULL | SHEET 1 OF 1

100015

NOTE: UNLESS OTHERWISE SPECIFIED

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	B1	EN1048 PROD RELEASE	12-11-80	
	D1	EN1108	1-6-81	
	DIA	EN1196	2-27-81	



COMPONENT SIDE SHOWN

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION		ZONE
PARTS LIST					

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON: FRACTIONS .X .XX .XXX ANGLES ± ± ±.02 ±.010 ±1/2°

MATERIAL (1.)

FINISH (3.)

DO NOT SCALE DRAWING

CONTRACT NO.

DR BY

CHK BY

APPROVED BY

MICROPOLIS

PCBA - F.D.
SINGLE C

SIZE	CODE IDENT NO	DWG NO.	REV
D	F/D	102057	DIA

SCALE

SHEET 1 OF 1

102058	SCHEMATIC
NEXT ASSY	USED ON
APPLICATION	

102057 DIA

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	B1	EN1048 PROD RELEASE	12-11-80	
	D1	EN1108	1-6-81	

[4] TABLE I

PART NO.	REF. DESIGNATION
100-0000-8	R42,52,53, W5,7,10
100-0470-3	R72
100-1000-7	R8,15,51,85,91
100-1001-5	R5,7,9,10,18,25,34,75,82,84
100-1003-1	R16,79
100-1202-9	R29,37,44,45,69,77
100-1500-6	R1,57,58
100-1501-4	R26,33
100-1502-2	R86
100-1800-0	R19
100-1801-8	R46
100-2200-2	R13,14,54,55,60
100-2201-0	R43,61,62
100-2202-8	R27,28,78,6
100-2702-7	R48,49
100-3300-9	R20,50,66,68
100-4700-9	R63,64,65,70,71,83
100-4702-5	R11,12,17,90
100-4703-3	R76
100-5600-0	R41
100-6800-6	R47
101-0010-5	R81
105-1002-2	R2,4
105-1503-9	R73
105-1962-7	R22
105-3572-2	R3,80
105-5801-1	R67
105-6191-8	R21
116-0011-1	RN2
116-0002-0	RN1
130-2001-1	R59
130-2002-9	R87, 88,89
131-1003-6	R74
160-1000-1	C4,14,39
160-3300-3	C35
160-4700-3	C9,37
160-7500-4	C36,38
161-1501-6	C28
161-2202-0	C32,33,45
161-4701-9	C25
162-1003-1	C44
162-4702-5	C10
162-4703-3	C57,C72,63
163-1006-2	C5,6
163-2203-4	C69,65
163-3304-9	C24,26,40,42,49,51,58,59,66
163-4703-1	C29,30,47,48

[4] TABLE I (CONT.)

PART NO	REF DESIGNATION
165-1002-6	C1,2,12, 15, 62, 21, 22,23,27,31,34,41,43,46,50,52, 53,54,55,56,60,61,67,68,69,70, 71
177-0001-4	C3
190-0240-1	L3,4
190-1000-8	L1,2,5
191-0100-5	L6
200-4446-7	CR9, 11,12, 14,15,16,17,18, 22,23,24,25,26,27,28,29, 32,33,34
210-5223-8	CR6
210-5244-4	CR30
220-4002-6	CR2,3,4,5,6,7,31,35
300-4400-2	Q1,6
300-4402-8	Q2,3,4
340-0110-7	Q7
400-0000-2	U12,18
400-0002-8	U11
400-0014-3	U10,16,19
400-0027-5	U20
400-0074-7	U23
400-0085-3	U21
400-0086-1	U24
400-0123-2	U25,29
400-0393-1	U13
401-0016-6	U2,9
401-0017-4	U22
401-0368-1	U1
406-0451-4	U14
406-0452-2	U3,4,5
410-0311-2	U26,17
410-0555-4	U6,15,30
410-0592-7	U27,28
410-2917-4	U7
622-0001-9	CR1
680-0503-2	J2A
680 1007 3	J7
680-0804-4	J9
680-1001-6	J5
680-1601-3	J3
680-1701-1	J4
684-0001-9	W1
684-0008-4	TP1 THRU 15

[6] TABLE III

LAST USED	NOT USED	DELETED
R92		
C72	C17,18,19,20	
U30		
CR36		
Q7		
L6		
J9		
W18		
TP15		
RN2		

REFERENCE DOCUMENTS

MASTER LAYOUT	102055
PROCESS BOARD	102056
P. C. B. A	102057

[7] FOR NO HEAD-LOAD-SOLENOID ("X") OPTION, THE SOLENOID IS OMITED AND C7 AND C8 ARE 33μF. ALL OTHER VERSIONS C7 AND C8 ARE 100μF.

[6] FOR LAST USED, NOT USED, AND DELETED SEE TABLE III.

[5] FOR COMPONENTS AFFECTED BY VERSION SEE TABLE II.

[4] FOR PART NO OF COMPONENTS NOT AFFECTED BY VERSION SEE TABLE I.

3. FOR PCBA SEE DWG. NO. 102057.

2. ALL CAPACITOR VALUES ARE IN MICROFARADS.

1. ALL RESISTOR VALUES ARE IN OHMS.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	ZONE
PARTS LIST				

102057	PCBA
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON: FRACTIONS ± DECIMALS .X ± .XX ± .XXX ± ANGLES ±

CONTRACT NO.

DR BY J. Hanley

CHK BY

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MATERIAL

FINISH

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MICROPOLIS™

SCHEMATIC

F. D. SINGLE C

SIZE	PROD. CODE	DWG NO.	REV
D	F/D	102058	D1

SCALE

SHEET 1 OF 10

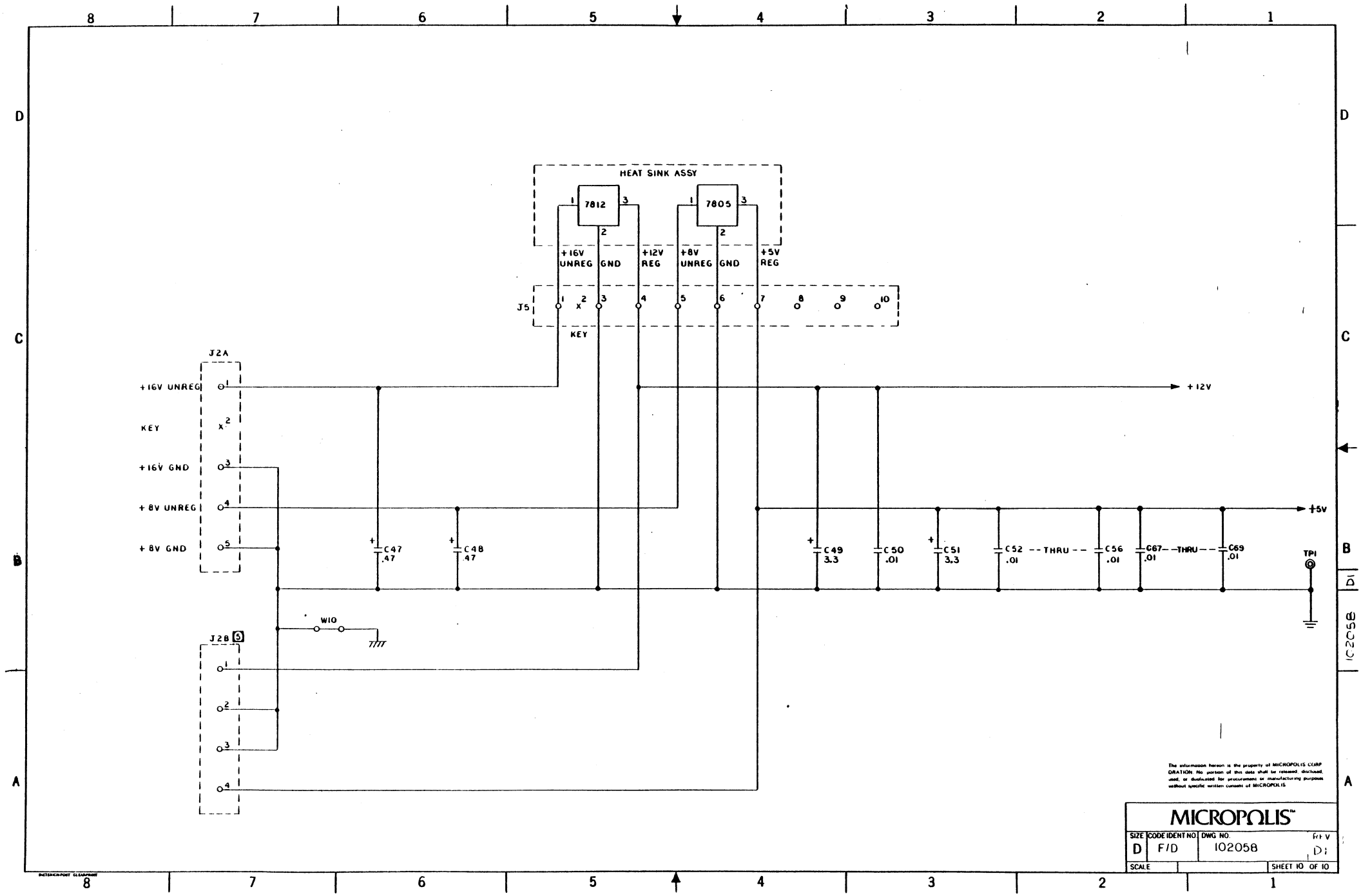
102058 D1

(5) TABLE II

ASSEMBLY 102057 VERSION	VERSION CHARACTERISTIC	U8	Q5	CR10, CR13, CR19, CR20, CR21	J6	J8	W6 W8	W9	W11 W13	W12	W17	W18	R23	R24	R30 R40			R36	R38	R39	R56	J28		C11	C13 C16			
-51-0	96/100 TPI, MFM SINGLE HEAD				HEADER 680-0505-7			IN	IN			IN																
-52-8	96 100 TPI, MFM DUAL HEAD	NE555 410-0555-4	2N4402 300-4402-8	IN4446 200-4446-7	HEADER 680-0506-5	HEADER 680-0505-7	IN		IN			IN	6.19K, 1%	19.6K, 1%	12K			390Ω, ½W	1.5K	1K				.047μF	.01μF			
-53-6	100TPI, GCR SINGLE HEAD				HEADER 680-0505-7			IN	IN			IN									100Ω							
-54-4	100TPI, GCR DUAL HEAD	NE555 410-0555-4	2N4402 300-4402-8	IN4446 200-4446-7	HEADER 680-0506-5	HEADER 680-0505-7	IN		IN			IN	6.19K, 1%	19.6K, 1%	12K			390Ω, ½W	1.5K	1K	100Ω			.047μF	.01μF			
-55-1	96/100 TPI, MFM SINGLE HEAD POWER CONNECTOR				HEADER 680-0505-7			IN	IN			IN										HEADER 680-0401-9						
-56-9	96/100TPI, MFM DUAL HEAD POWER CONNECTOR	NE555 410-0555-4	2N4402 300-4402-8	IN4446 200-4446-7	HEADER 680-0506-5	HEADER 680-0505-7	IN		IN			IN	6.19K, 1%	19.6K, 1%	12K			390Ω, ½W	1.5K	1K		HEADER 680-0401-9		.047μF	.01μF			
-57-7	96/100TPI, MFM SINGLE HEAD (TANDY)				HEADER 680-0505-7			IN		IN		IN																

MICROPOLIS™

SIZE	PROD. CODE	DWG NO	REV
D	F/D	102056	-1
SCALE		SHEET 2	OF 10



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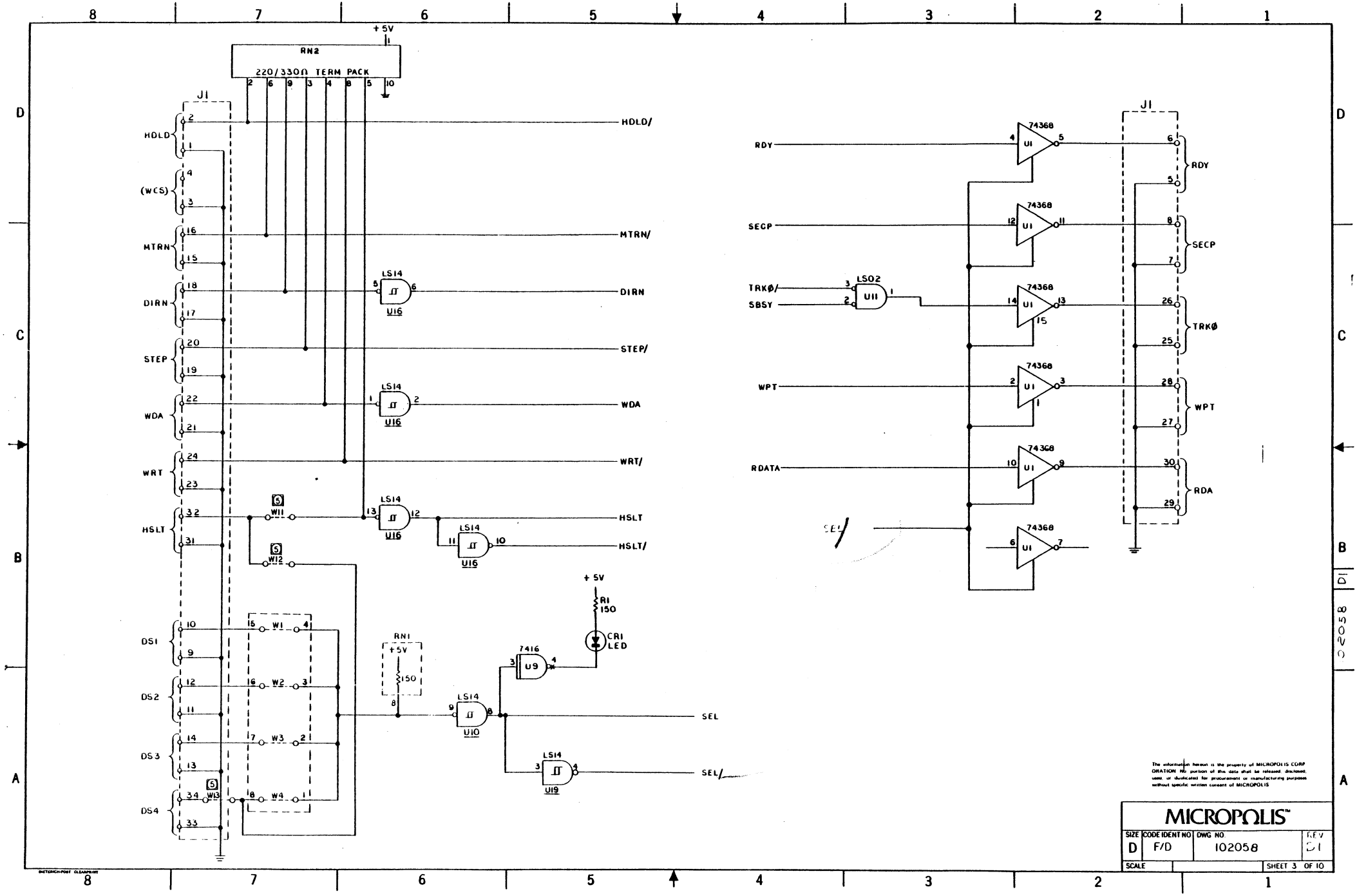
SIZE	CODE IDENT NO.	DWG NO.	REV
D	F/D	102058	D1
SCALE			SHEET 10 OF 10

D1
102058


+5V
RN2
220/330Ω TERM PACK
J1
HDLD
(WCS)
MTRN
DIRN
STEP
WDA
WRT
HSLT
HDLD/
MTRN/
DIRN
STEP/
WDA
WRT/
HSLT
HSLT/
LS14
U16
W11
W12
W1
W2
W3
W4
DS1
DS2
DS3
DS4
RN1
150
7416
U9
R1
150
CR1
LED
LS14
U10
SEL
SEL/
LS14
U19
RDY
SECP
TRKØ/
SBSY
WPT
RDATA
LS02
U11
74368
U1
RDY
SECP
TRKØ
WPT
RDA
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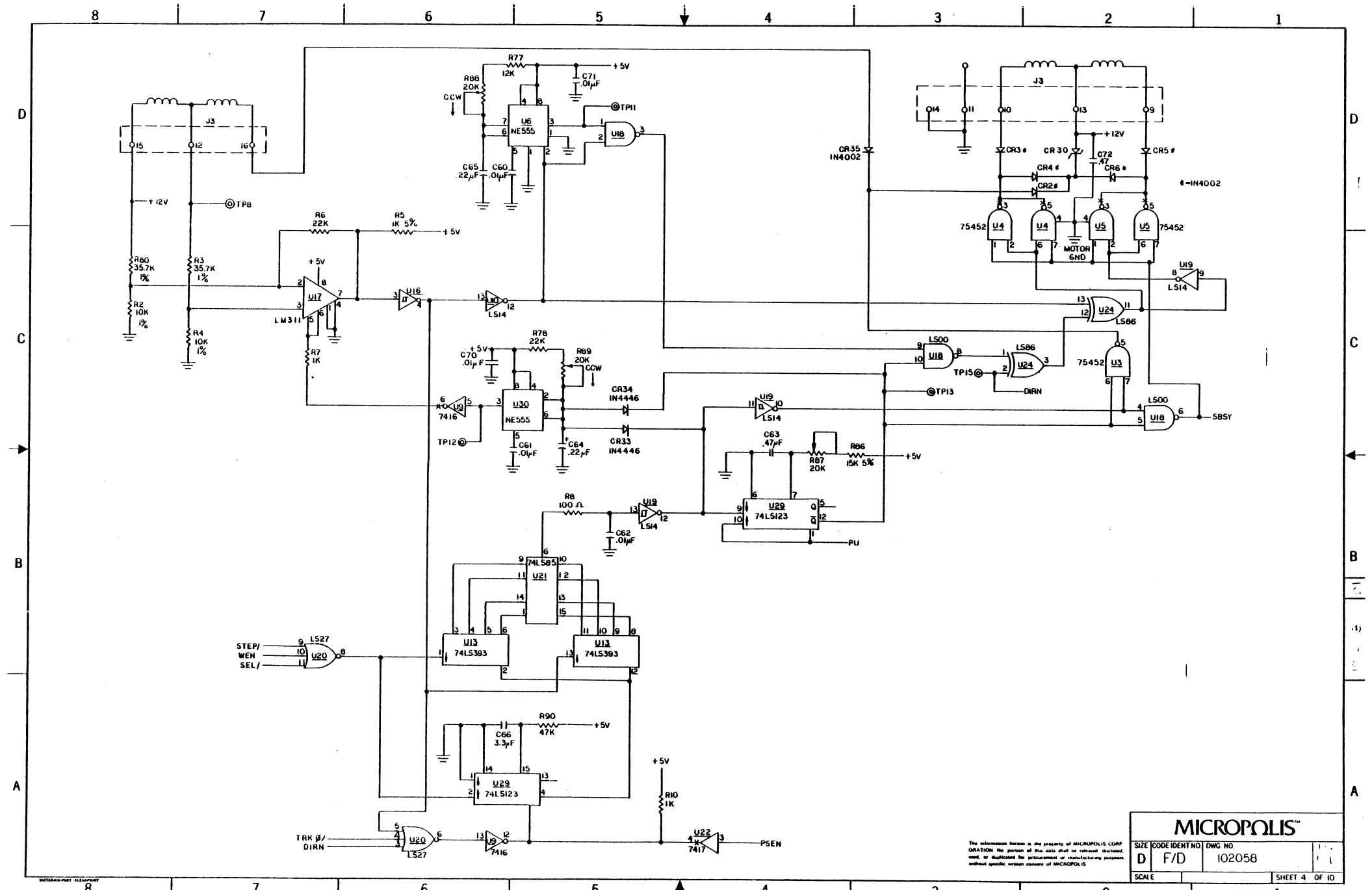
MICROPOLIS™
SIZE D
CODE IDENT NO F/D
DWG NO 102058
REV D1
SCALE
SHEET 3 OF 10



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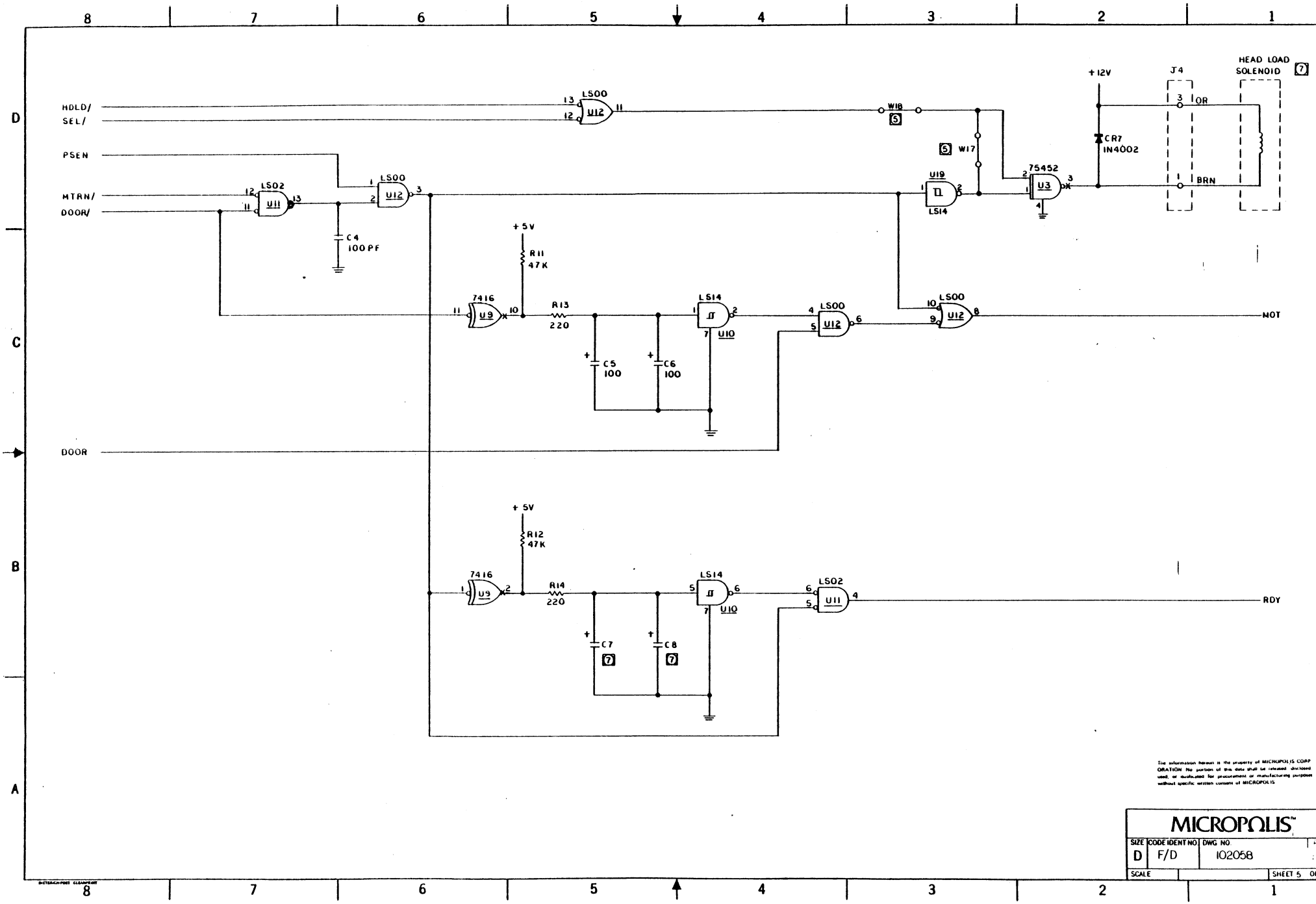
SIZE	CODE IDENT NO	DWG NO.	
D	F/D	102058	
SCALE			SHEET 4 OF 10



MICROPOLIS™

SIZE	CODE IDENT NO.	DWG NO.	REV
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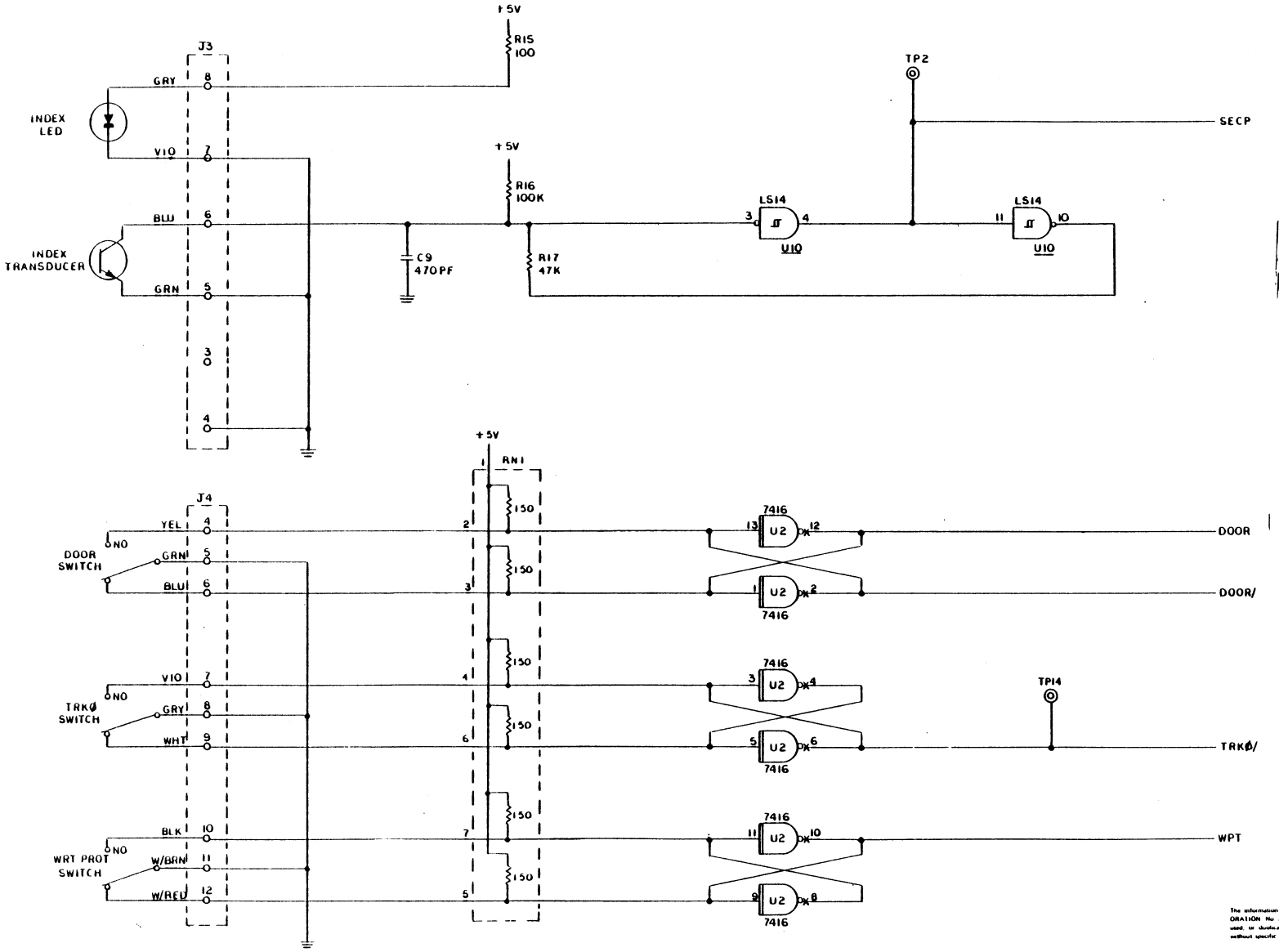
SCALE		SHEET 5 OF 10	

102058



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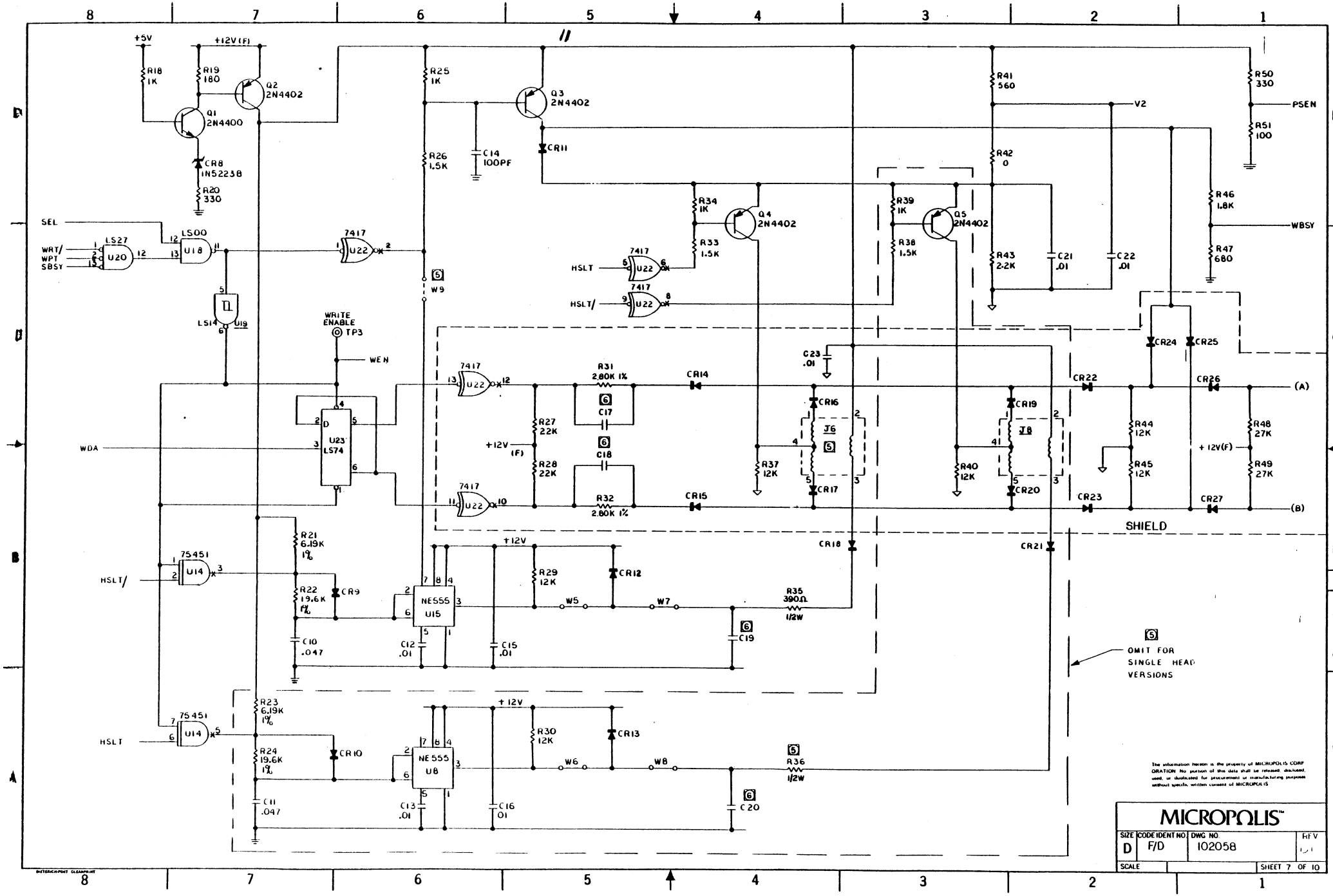
SIZE	CODE IDENT NO.	DWG NO.	REV
D	F/D	102058	D11
SCALE		SHEET 6 OF 10	


+5V
+12V(F)
R18 1K
R19 180
Q2 2N4402
Q1 2N4400
CR8 1N5223B
R20 330
R25 1K
Q3 2N4402
CR11
R26 1.5K
C14 100PF
R34 1K
Q4 2N4402
R33 1.5K
R39 1K
Q5 2N4402
R38 1.5K
R41 560
R42 0
R43 2.2K
C21 .01
C22 .01
R50 330
PSEN
R51 100
R46 1.8K
WBSY
R47 680
V2
SEL
WRT/
WPT
SBSY
LS27 U20
LS00 U18
7417 U22
W9
LS14 U19
WRITE ENABLE
TP3
WEN
WDA
U23 LS74
HSLT
HSLT/
75451 U14
R21 6.19K 1%
R22 19.6K 1%
CR9
C10 .047
NE555 U15
C12 .01
C15 .01
R29 12K
CR12
W5
W7
R35 390Ω 1/2W
C19
R23 6.19K 1%
R24 19.6K 1%
CR10
C11 .047
NE555 U8
C13 .01
C16 .01
R30 12K
CR13
W6
W8
R36 1/2W
C20
R31 2.80K 1%
C17
R27 22K
R28 22K
C18
R32 2.80K 1%
CR14
CR15
C23 .01
CR16
CR17
J6
R37 12K
CR18
CR19
CR20
J8
R40 12K
CR21
CR22
CR23
CR24
CR25
CR26
CR27
R44 12K
R45 12K
R48 27K
R49 27K
+12V(F)
(A)
(B)
SHIELD
OMIT FOR SINGLE HEAD VERSIONS
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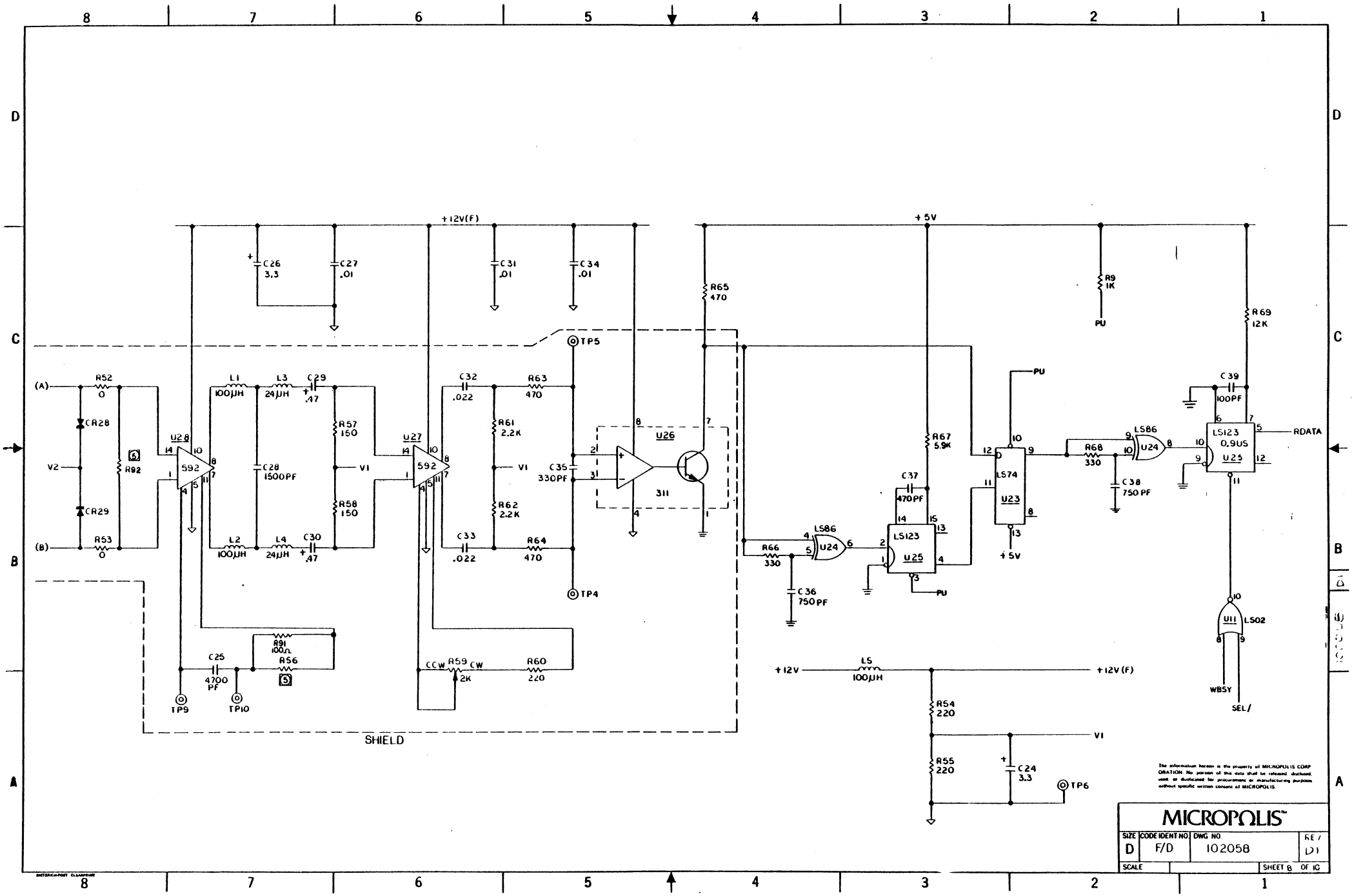
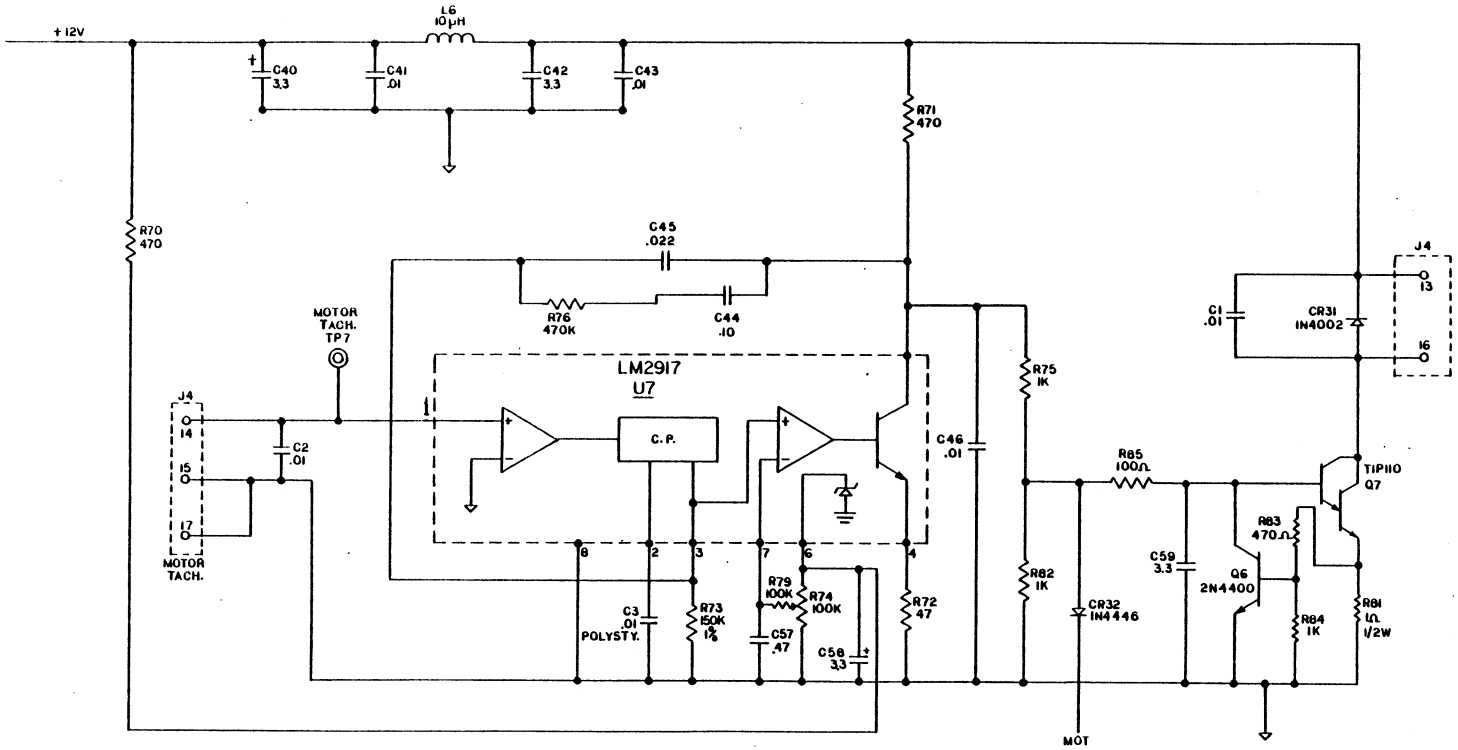
SIZE D
CODE IDENT NO. F/D
DWG NO. 102058
REV
SCALE
SHEET 7 OF 10


+12V(F)
+5V
C26 3.3
C27 .01
C31 .01
C34 .01
R65 470
R9 1K
PU
R69 12K
TP5
TP4
(A)
(B)
R52 0
R53 0
CR28
CR29
V2
R82
U28
592
L1 100µH
L2 100µH
L3 24µH
L4 24µH
C29 .47
C30 .47
C28 1500PF
R57 150
R58 150
V1
U27
592
C32 .022
C33 .022
R63 470
R64 470
R61 2.2K
R62 2.2K
C35 330PF
U26
311
C39 100PF
LS123 0.9US U25
RDATA
LS86 U24
R68 330
C38 750 PF
R67 5.9K
C37 470PF
LS123 U25
LS74 U23
R66 330
C36 750PF
U11 LS02
WBSY
SEL/
R91 100Ω
R56
C25 4700 PF
TP9
TP10
CCW R59 CW 2K
R60 220
SHIELD
+12V
L5 100µH
+12V(F)
R54 220
R55 220
C24 3.3
TP6
MICROPOLIS
SIZE D
CODE IDENT NO. F/D
DWG NO. 102058
REV D1
SCALE
SHEET 8 OF 10



MICROPOLIS™

SIZE	CODE IDENT NO.	DWG NO.	REV
D	F/D	102058	F

SCALE | SHEET 9 OF 10