

**HP 9130K
Flexible Disc Drive
Service Documentation**

Table of Contents

Chapter 1: General Information

Introduction	1-1
General Description	1-1
Available Options	1-2
Environmental and Physical Specifications	1-2
Recording Specifications	1-2
Environmental Specifications	1-2
Physical Dimensions and Weight	1-3
Performance Specifications	1-3
Flexible Disc Media Use	1-4
Introduction	1-4
Operating Cleanliness	1-5
Handling Discs	1-5
Do	1-6
Don't	1-7
Write Protection	1-9

Chapter 2: Interface Information

Introduction	2-1
Interface	2-1
Primary Power Requirements	2-1
Signal Line Description	2-3
Input Control Lines	2-3
Output Status Lines	2-4
Typical Interface Drive/Receiver Circuit	2-8

Chapter 3: Theory of Operation

Introduction	3-1
Flexible Disc Recording Fundamentals	3-1
Index Pulse Shaping Network	3-3
Write Protect Sensor	3-3
Track 0 Switch	3-3
Spindle Motor Drive Control	3-3
Head Position Control	3-4
Power On Circuit	3-4
Data Circuitry	3-4
Writing Data	3-4
Reading Data	3-7

Chapter 4: Assembly Access

Introduction.....	4-1
-------------------	-----

Chapter 5: Maintenance

Introduction.....	5-1
Service Kit Contents.....	5-1
Drive Failure Analysis	5-2
Head Cleaning	5-3
Termination Resistor IC U2F.....	5-3
Shunt Block U1E	5-3
Alignment and Adjustments.....	5-3
Introduction	5-3
Spindle Motor Speed Adjustment.....	5-3
Spindle Drive Belt Adjustment	5-4
Radial Head Alignment	5-7
Head Azimuth Alignment.....	5-8
Track 0 Switch Adjustment	5-9
Index Emitter/Detector Adjustment	5-10
Write Protect Switch Adjustment	5-12
Read/Write Test	5-12
DSU Controls and Indicators	5-13
Disc Service Unit Operation	5-16
Packaging Instructions.....	5-17
Test Point Location and Waveforms.....	5-19

Chapter 6: Schematic Diagrams

Introduction.....	6-1
-------------------	-----

Chapter 7: Replaceable Parts

Introduction.....	7-1
-------------------	-----

Figures

1-1 Physical Dimensions	1-4
1-2 Head/Media Critical Requirements.....	1-6
1-3 Damaged Media	1-8
1-4 Loading the Disc	1-9
1-5 Write Protect Tab Installation	1-9
2-1 Connector J2 Pin Out	2-1
2-2 Connector J1 Pin Out (Circuit Side)	2-2
2-3 General Control and Data Requirements.....	2-5
2-4 Connector Location.....	2-6
2-5 Connector J4 Pin Out	2-6

2-6	Connector J3 Pin Out	2-7
2-7	Servo Electronics Board J1	2-8
2-8	Typical Interface Driver/Receiver Circuit	2-9
3-1	ID and Data Field Content	3-1
3-2	Media Sector and Track Structure	3-2
3-3	Head Positioning Assembly	3-3
3-4	9130K Functional Block Diagram	3-5
3-5	Write Timing Diagram	3-6
3-6	Read Timing Diagram	3-7
4-1	9130K Flexible Disc Drive Exploded View	4-2
4-2	Drive Board and Servo Board Removal	4-3
4-3	Front Panel and Latch Removal	4-4
5-1	Spindle Motor Speed Adjustment	5-4
5-2	Spindle Drive Belt Adjustment	5-5
5-3	9130K Test Setup	5-6
5-4	Radial Head Alignment Waveform	5-7
5-5	Head Assembly Retaining Screws	5-8
5-6	Head Azimuth Waveform	5-9
5-7	Track 0 Switch Retaining Screw	5-9
5-8	Track 0 Waveform	5-10
5-9	Index Detector Retaining Screw	5-11
5-10	Index to Burst Waveform	5-12
5-11	Write 1F Waveform	5-13
5-12	Write 2F Waveform	5-13
5-13	DSU Controls and Indicators	5-14
5-14	9130K/DSU Test Setup	5-16
5-15	Foam Latch Insert	5-17
5-16	Inner Box	5-18
5-17	Foam End Caps	5-18
5-18	Outer Box	5-19
5-19	Test Point Locations (09130-66501)	5-19
5-20	Test Point Locations (82901-66515)	5-20
6-1	Drive Electronics Board P/N 09130-66501 Schematic Diagram	6-3
6-2	Drive Electronics Board P/N 82901-66515 Schematic Diagram	6-5
6-3	Servo Electronics Board P/N 09130-66500 Schematic Diagram	6-9
6-4	Servo Electronics Board Component Locator	6-11
6-5	Drive Board P/N 82901-66515 Component Locator	6-12
6-6	Drive Board P/N 09130-66501 Component Locator	6-13

Chapter 1

General Information

Introduction

This service manual provides detailed information for servicing the 9130K disc drive.

Service Philosophy

The 9130K Flexible Disc Drive is comprised of three serviceable areas: the mechanical drive assembly, the drive electronics assembly and the servo electronics assembly. All assemblies are serviced on the exchange program with the exception of some parts on the mechanical assembly. The field replaceable parts are outlined in the maintenance and assembly access sections.

General Description

The HP 9130K mini double sided flexible disc drive is a semi-random access mass storage system employing a flexible magnetic medium. It consists of a mini disc drive, a servo electronics circuit board and a drive electronics circuit board.

Each drive module contains all the mechanical parts necessary for physically handling the disc. These include the drive spindle and motor, 2 heads each having read/write and erase capability, write protect sensor, track 0 sensor, index sensor, and activity LED on the front panel. Each drive module also contains a servo control board which controls the DC drive motor speed and a drive electronics board which interprets and generate control signals, controls movement of the read/write head to the correct position, and also reads and writes data.

The flexible magnetic medium used in the 9130K is called a flexible disc. The flexible disc measures 133.4 mm (5.25 inches) on a side and has a 3.8 cm (1.5 inch) hole for alignment on the disc drive spindle. The disc is enclosed in a protective polyvinylchloride (PVC) jacket with a slot for access to the recording surface. Both sides of the flexible disc are used for data storage.

The recording head in the drive module is positioned by a mechanism driven by a stepper motor and taut metal band. The head positioning mechanism operates in an open loop configuration, that is, there is no feedback to the drive electronics board to determine the actual position of the head.

The heads are mechanically coupled to the door mechanism so that closing of the door causes the heads to make contact with the media.

Available Options

The following options are available with the 9130K flexible disc drive:

Option #010

This option consists of drive board P/N 09130-66501.

Option #011

This option consists of drive board P/N 82901-60015 found in the 8290X series drives.

Option #050

This option consists of the mechanical drive assembly with servo board and front panel P/N 4040-1838 and latch P/N 4040-1836 and associated hardware.

Option #051

This option consists of the mechanical drive assembly with servo board and front panel P/N 4040-1915 and grey latch P/N 4040-1914 and associated hardware.

Option #052

This option consists of the mechanical drive assembly with servo board and front panel P/N 4040-1915 and brown latch P/N 4040-1913 and associated hardware.

Environmental and Physical Specifications

Recording Specifications

HP Physical Track Format

Recording Mode: Modified Frequency Modulated (MFM)

Rotational Speed: 300 RPM \pm 1.5% (\pm 4.5 RPM)

Bit Density: 5456 BPI Track 34

Tracks Per Inch: 48

Sides Per Disc: 2

Tracks Per Side: 35

Sectors Per Track: 16

Bytes Per Sector: 256 (362 including overhead bytes)

Bytes Per Disc: 286,720 (formatted) 420,000 (unformatted)

Transfer Rate

164,000 bits per second nominal burst rate.

Access Time

Track to Track Seek: 5 msec. max.

Head Settling Time: 15 msec. max.

Spindle Motor Start Time: 250 msec. max.

Environmental Specifications

Operating Limits

Temperature: +10°C to +44°C (50° F to 111.2° F)

Relative Humidity: 20% to 80% with maximum wet bulb temperature not to exceed 29.4°C (85° F)

Altitude: 0 to 4572M (0 to 15000 feet)

Storage Limits

Temperature: -41° C to 71° C (-40.5° F to 159.8° F)

Relative Humidity: 20% to 80% with maximum wet bulb temperature not to exceed 29.4° C (85° F)

Alignment Limits

Radial Alignment: 1.1 mils maximum of track center at track 16 measured at 20° C (68° F) and 50% humidity.

Azimuth: 18° maximum clockwise or counterclockwise on tracks 16 and 34.

Power Requirements: +12VDC \pm 0.6V @ 900ma nominal
+5VDC \pm 0.25V @ 600ma nominal

Media Life

Revolutions 2,500,000 revolutions on any track.

Head Life: More than 15,000 hours of operation with HP media.

Physical Dimensions and Weight

Figure 1-1 illustrates the physical dimensions.

Weight: 2.04Kg (4.5 lbs)

Height: 85.85mm (3.38 inches)

Width: 149.1mm (5.87 inches)

Length: 203.2mm (8 inches)

Performance Specifications

Soft Read Errors: 1 in 10⁹ bits read on inner most track

Seek Errors: 1 in 10⁶ seeks

See the 9130K Specification Document for further details.

“Hard Error” is defined as an error that cannot be recovered from using an HP approved retry scheme.

1-4 General Information

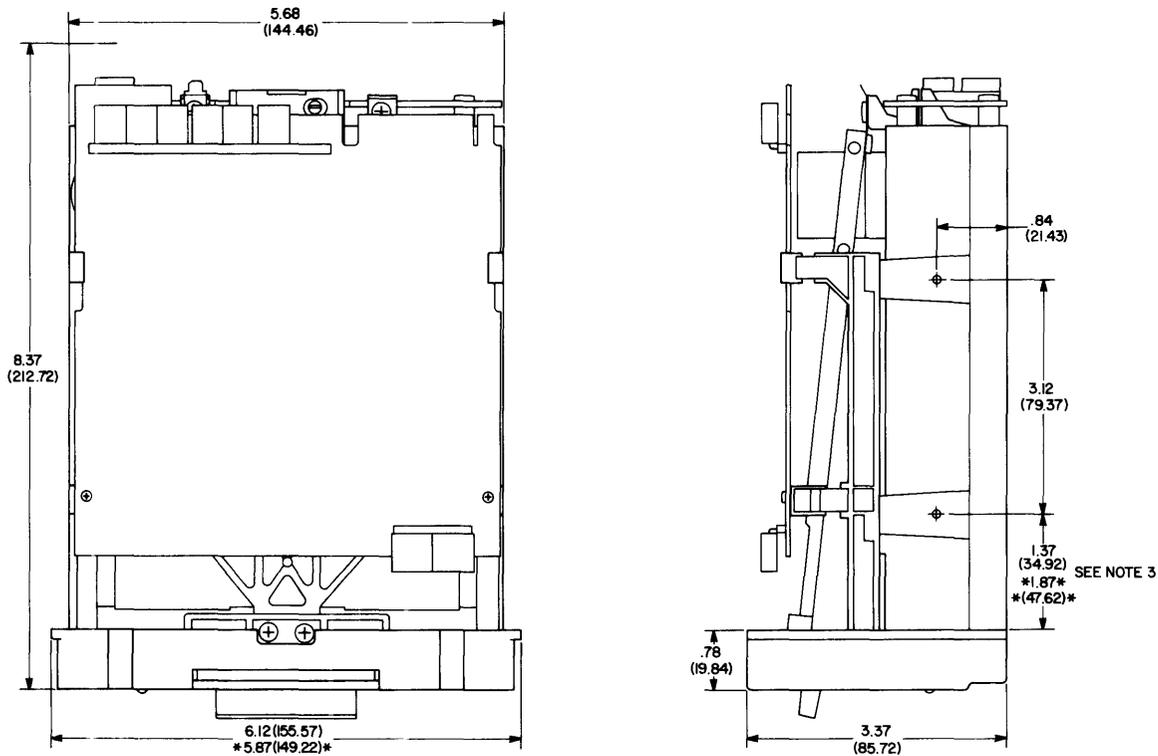


Figure 1-1: 9130K Physical Dimensions

Flexible Disc Media Use

Introduction

The storage medium used in the HP 9130K disc drive, is a flexible disc commonly called a floppy. The flexible disc measures 133.4 mm (5.25 inches) in diameter and has a 27.5 mm (1.125 inch) hole for alignment on the disc drive spindle. The disc is enclosed in a protective plastic jacket with a slot for head access to the recording surface. Both sides of the flexible disc are used for data storage.

By using flexible discs indentified as “double-sided”, up to .25 megabytes of data can be stored on each disc. Since some of the storage is used in subsystem overhead, the exact amount available for user storage depends upon the controller subsystem. Refer to the appropriate mainframe programming or reference manual for details. Double-sided flexible discs (HP part number 92190A, package of ten) are available from HP’s computer supplies catalog, by calling the toll free order number 800-538-8787.

Each flexible disc must be initialized before it can be used for data storage. The initialization procedure marks each disc track, checks for defective tracks, and may establish file directories. Refer to the mainframe programming or reference manual for correct procedures.

CAUTION

ONLY HP MEDIA IS APPROVED FOR USE IN THE 9130K FLEXIBLE DISC DRIVE. USE OF OTHER MEDIA MAY RESULT IN PREMATURE DISC FAILURE OR DAMAGE TO THE DRIVE. HP MEDIA WILL ALWAYS HAVE AN HP LABEL ON IT.

HP RIGOROUSLY TESTS EACH BATCH OF MEDIA FOR ERROR RATE AND WEAR PERFORMANCE IN ADDITION TO INITIAL VENDOR QUALIFICATION. ONLY IN THIS WAY CAN HP ASSURE RELIABLE MEDIA PERFORMANCE.

THE USE OF NON-HP MEDIA FOR SINGLE USE APPLICATIONS SUCH AS DATA INTERCHANGE WILL PROBABLY NOT DAMAGE THE DRIVE OR MEDIA BUT, IF EXTENDED USE IS ANTICIPATED, THE DATA MUST BE TRANSFERRED TO HP MEDIA.

EXTENDED USE OF NON-HP APPROVED MEDIA WILL VOID WARRANTY AND SERVICE CONTRACTS ON THE INSTRUMENTS.

Operating Cleanliness

To prevent potential damage or data loss, it is extremely important to maintain the cleanliness of the disc and air within the disc drive. The disc drive should not be operated in an environment in which dust, smoke, moisture, oil or chemical vapor or other foreign matter are present. Also, be sure to strictly follow the disc handling guidelines.

The critical elements involved in the read/write process are shown in Figure 1-2. The read/write heads must maintain contact with the media during the read and write operations. Also shown are various types of contaminants and their size relationships. A contaminant particle hard enough and of the right size may scratch either the oxide coating of the disc or the head surface. Even if the particle is not hard enough to scratch, it may be hard enough to lift the head from the disc surface and cause data errors.

Handling Discs

The flexible disc is basically maintenance free, but it is delicate and **MUST BE HANDLED CAREFULLY**. Remember, the disc contains your valuable data and programs and should be treated accordingly. A good rule of thumb is to treat the disc as you would a valuable record album. Here are some specific DO's and DON'Ts to avoid loss of data or damage to the discs.

EVEN A LITTLE CARELESSNESS IN DISC HANDLING CAN DRAMATICALLY REDUCE THE LIFE OF THE DISC.

1-6 General Information

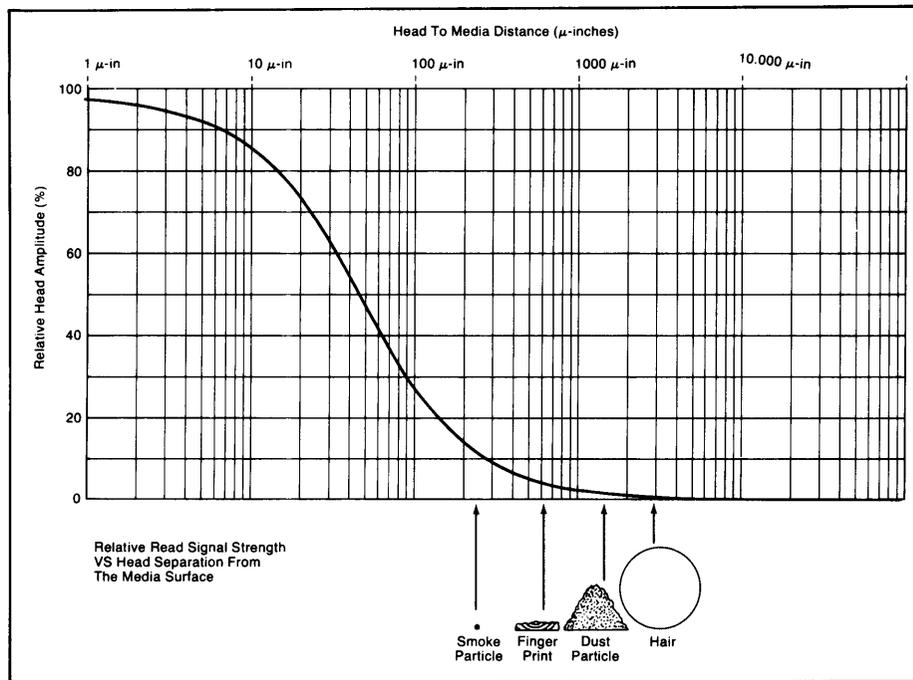


Figure 1-2: Head/Media Critical Requirements

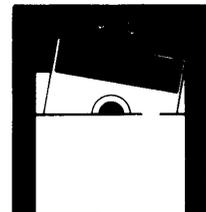
DO

Backup Disc Frequently

There is always a chance of losing data when mass storage devices are accessed. There are many causes in any computer system—a programming bug, operator error, power failure, or hardware failure. In the case of flexible discs, another mode is possible—media failure from contamination or wearout. **YOUR ONLY PROTECTION AGAINST DATA LOSS IS FREQUENT BACKUP OF DATA FILES.**

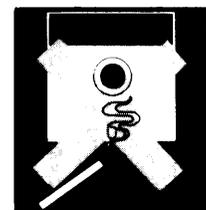
Return Disc to Storage Envelope when Not in Use

This is the single most important thing to remember about handling a disc because it prolongs disc life by protecting it from dust and scratches. Between uses discs should be stored upright in a dust free container. The box that the discs are shipped in, or a similar container, is a good choice.



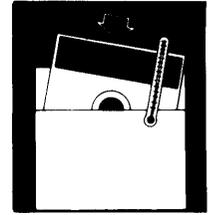
Operate in a Clean Environment

Airborne contaminants and particles accidentally dropped onto the disc will cause the disc to wear out prematurely and may cause unreliable data storage and retrieval operations. Some of the most common contaminants are **DUST, SMOKE, ASHES** and **ERASER PARTICLES**. Chemical vapors may also cause premature wearout.

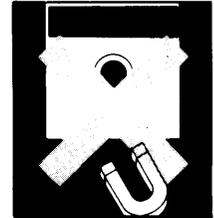


Maintain Proper Temperature and Environment

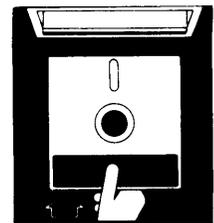
The proper operating range for the 9130K is 10 C (50° F) to 44 C (111° F) and 20% to 80% relative humidity. While temperature is usually easy to control, it may be necessary to make special provisions to keep the humidity in the proper range. Although the disc will continue to operate outside the normal recommended humidity range, it will wear out more quickly and will produce a higher error rate.

**Avoid Magnetic Fields**

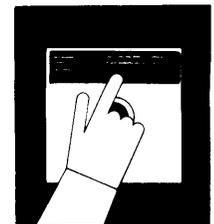
Since the data is stored as a pattern of magnetic fields on the disc, it can easily be erased by an external magnetic field. Avoid placing a disc near power transformers, magnets or large disc memories. Additionally, while HP goes to great lengths to confine the magnetic fields produced by CRT deflection shields, CRT's with magnetic deflection systems have been known to destroy data on discs, and it is a good idea to avoid placing discs on top of CRT's.

**Remove Disc from Drive when Not in Use**

Remove the disc completely from the drive when access is not needed for an extended period of time.

**Use a Felt Tip Pen to Label Discs**

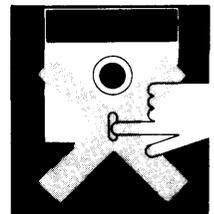
Use a soft felt tip pen to label the disc, and be careful to write only in the label area provided. Avoid the exposed media while labeling the disc. If possible, write on the large labels BEFORE applying them to the disc jacket.

**Replace Discs Frequently**

Although discs are designed to provide several million revolutions of useful life (approximately 2 to 4 months of use), they will eventually wear out. The life of a disc is VERY dependent upon how carefully it is handled and how much it is used. If there are ever visible signs of abrasions on the disc, do an immediate backup and discard the worn disc.

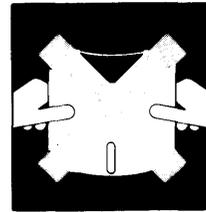
DON'T**Do Not Touch the Exposed Surface of the Disc**

The thickness of a fingerprint is enough to lift the head off the disc and cause errors (See Figure 1-2). The oils in a fingerprint will also collect dust which can cause a disc to wear out sooner than it normally would. Be especially careful when handling the disc as it is very easy to grasp the disc with a thumb directly over the exposed media.



Do Not Bend or Fold the Disc

The disc is flexible but will not operate if it is creased. Using ball point pens, rubber bands, paper clips, etc. can crease the disc.



Do Not Try to Clean a Disc

The inside surface of the disc jacket is covered with a special material that cleans the disc as it rotates. Any other method of cleaning may cause solvent damage to the media or scratch the disc, causing loss of data. If a disc becomes dirty or scratched, immediately copy the data to a new disc and dispose of the old disc.

CAUTION

IF MEDIA IS EVER DESTROYED (IF IT LOOKS ANYTHING LIKE THE PHOTO BELOW) IN YOUR 9130K DISC DRIVE, STOP USING THE DRIVE UNTIL IT CAN BE SERVICED. THIS IS EXCEPTIONALLY IMPORTANT, AS CONTINUED USE OF THE DRIVE WILL DESTROY MORE MEDIA. IMMEDIATELY CALL YOUR NEAREST HP SALES SERVICE OFFICE (SEE THE LIST IN THE BACK OF THIS MANUAL FOR THE NEAREST OFFICE).

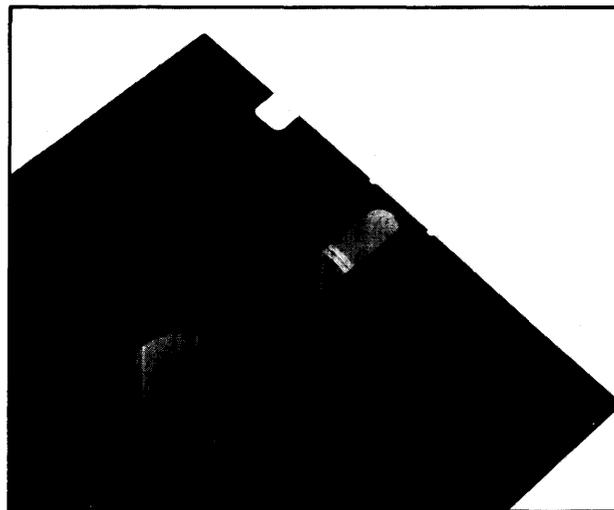


Figure 1-3: Damaged Media

Disc Loading

Insert the flexible disc into the drive as shown in Figure 1-4 (be sure that the label side faces up). Push the disc in until you feel it bottom out against the rear of the disc drive, then close the drive door latch. Never force the latch, as the media can be latched off center within the protective jacket.

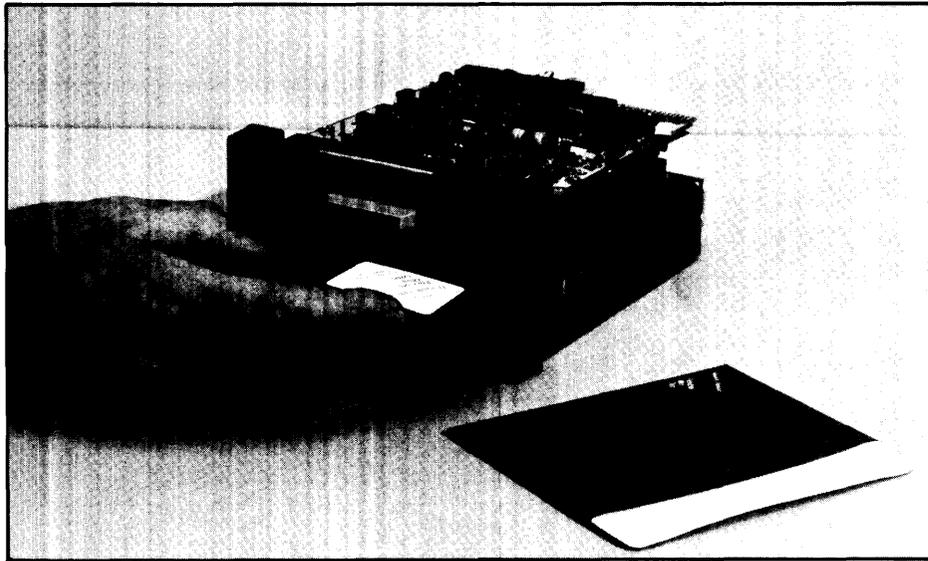


Figure 1-4: Loading the Disc

Write Protection

The disc has the capability of being write protected. This feature prevents the accidental erasure of data previously recorded on the disc. The write protect is enabled when the write protect notch on the jacket of the disc is covered (see Figure 1-4). When the notch is uncovered, data can be written on the disc.

The write protect notch may be covered by placing a tab over the notch on the top side of the disc jacket and then folding it over the edge to cover the notch on the bottom side. Installation of the tab is shown in Figure 1-5.

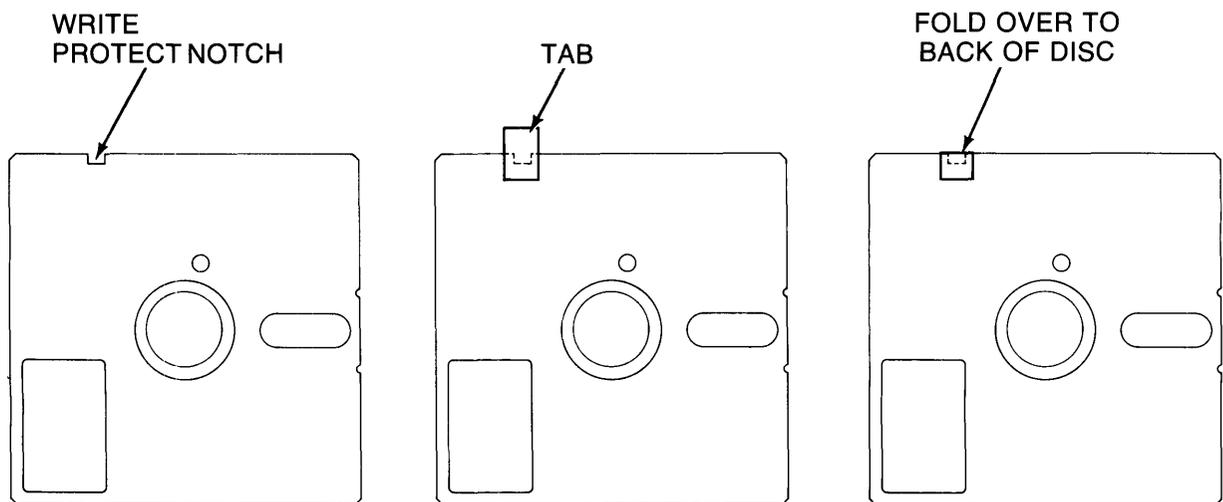


Figure 1-5. Write Protect Tab Installation

Chapter 2

Interface Information

Introduction

This chapter provides the interface information for the 9130K Flexible Disc Drive. The information provided in this chapter includes connector locations and pin-outs, signal line descriptions and typical interface driver and receiver circuits.

Interface

The flexible disc drive I/O connector (J1) is located on the rear edge of the drive electronics board. The 34 pin edge connector mates with the HP connector part number 1251-3916.

Primary Power Requirements

+12VDC \pm 0.6VDC @ 900MA (MAX)

+5VDC \pm 0.25VDC @ 600MA (MAX)

Maximum ripple 100 MV PP

DC power is supplied through a 4 pin connector (J2). The mating connector (not supplied) is HP part number 1251-4525. Four contacts P/N 1251-4615 are also required.

The connector (J2) pin out is shown in Figure 2-1.

Pin	Supply Voltage
1	+ 12VDC
2	+ 12V Return
3	+ 5V Return
4	+ 5VDC

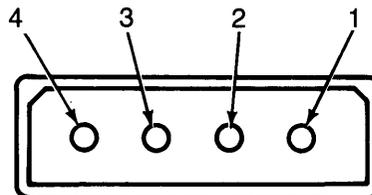


Figure 2-1: Connector J2 Pin Out

2-2 Interface Information

The pin-out for J2 is shown in Figure 2-2.

Input Control Lines			
GND	Pin	Signal	Description
	1	2	Connector Clamp
	3	4	(Spare)
	5	6	Drive Select 3
	9	10	Drive Select 0
	11	12	Drive Select 1
	13	14	Drive Select 2
	15	16	Motor On
	17	18	Direction Select
	19	20	Step
	21	22	Composite Write Data
	23	24	Write Gate
	31	32	Side One Select
Circuit Side		Component Side	

Output Status Lines			
GND	Pin	Signal	Description
	7	8	Index
	25	26	Track 0
	27	28	Write Protected
	29	30	Composite Read Data
	33	34	Connector Clamp
Circuit Side		Component Side	

NOTE

The drive electronics and bus lines use negative true logic.

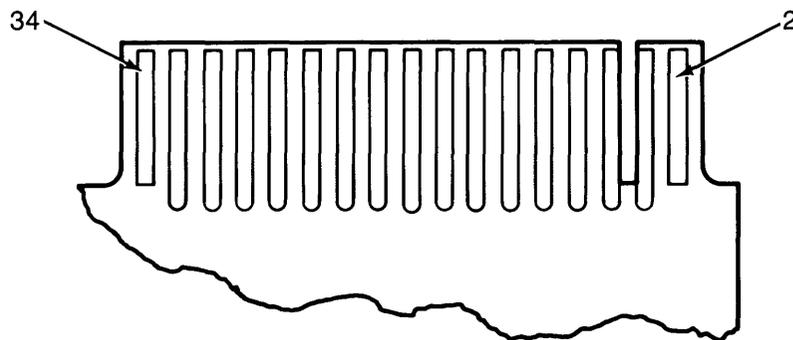


Figure 2-2: Connector J1 Pin Out (Circuit Side)

Signal Line Description

Input Control Lines

Drive Select Lines

There are four drive select lines which are used for selecting and de-selecting one of three disc drives attached to the controller.

When the logic level on the drive select line is low, the disc drive electronics are enabled and the drive will respond to step or Read/Write commands.

The drive select line must remain stable in the low state until the step or Read/Write command is completed.

When the logic level on the drive select lines are high, the input control lines and output status lines are disabled.

There is also a user installed option jumper available to utilize a fourth drive select line.

The disc drive address is determined by a select code shunt block located on the drive electronics circuit board. The drive select lines 1 through 3 provide a means of daisy chaining a maximum of three disc drives to a controller. An undefined operation may result if more than one drive is assigned the same select code or if more than one of the drive select lines are low simultaneously.

Motor On

A low logic level on this line causes the drive motor to accelerate and stabilize in less than 250 msec. When this line goes high, the drive motor decelerates to a stop.

Direction Select and Step Lines

When a disc drive is selected, a low pulse greater than 1 μ sec. but less than 2 msec. appearing on the step line initiates head assembly motion. The direction of this motion is determined by the logic level appearing on the direction select line when the step pulse is issued. A high logic level on the direction select line when the step pulse is issued the direction of motion is outward (step-out) away from the center of the disc. A logic low on the direction select line results in the inward direction (step in) of motion toward the disc center.

To ensure proper positioning, the direction select line should be stable 1 msec. minimum prior to the step pulse and remain stable until 1 μ sec. after the step pulse. The access motion is initiated on the trailing edge of the step pulse.

Consecutive trailing edges of step pulses should not be less than 5 msec. apart.

The drive electronics will ignore step pulses if any of the following conditions exist:

- The write gate line is low.
- The direction select is high and the head position is at track 0.
- The drive is not selected.

Composite Write Data

When the disc drive is selected, this line provides the bit serial composite write data pulses that control the switching of the write current in the selected head. The write electronics must be enabled by the write gate line.

Write Gate

When this line is low, the write electronics are enabled for writing data (read electronics are disabled). This line enables write current to flow in the selected read/write head.

Data is written under the control of the composite write data line and side one select line. Changes of state on the write gate line should occur before the first write data pulse. When the write gate line is high, all write electronics are disabled.

If a write protected disc is installed; the write electronics are disabled irrespective of the state of the write gate and side one select lines.

Side One Select

The Side One Select line defines which side of a two sided disc is used for information transfer.

A high logic level selects the side "0" read/write head and a low logic level selects the side 1 read/write head.

Output Status Lines

Index

An index pulse occurs once every revolution of the disc (200 msec. nominal) to indicate the beginning of a track.

The leading edge of this signal is used to insure data accuracy during format. The index line remains low for the duration of the index pulse.

Track 0

This line indicates to the controller that the read/write head is positioned on track 0. The track 0 signal remains low until the head is moved from track 0. This is accomplished by opening the track 0 switch and phase 0 of the stepper motor control.

Write Protected

This line goes low when the disc is write protected to disable the write electronics.

When the write protect line goes high, the write electronics are enabled and write operations may be performed. If the controller issues a write command when the disc is write protected an error condition will be reported to the host system.

Composite Read Data

Data and clock transitions are transmitted on this line when the disc drive is selected. Each flux transition detected by the head provides a logic low pulse of 1 μ sec. \pm .25 on this line.

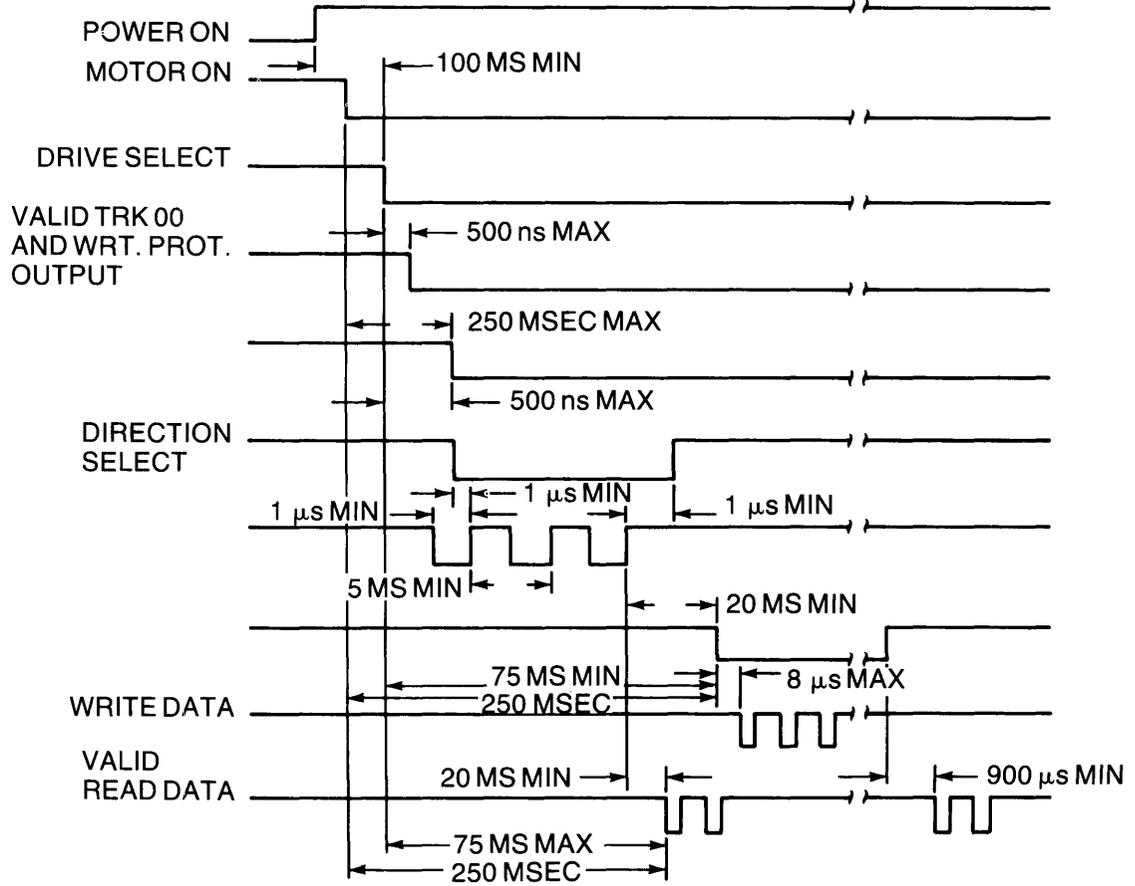


Figure 2-3: General Control and Data Timing Requirements

2-6 Interface Information

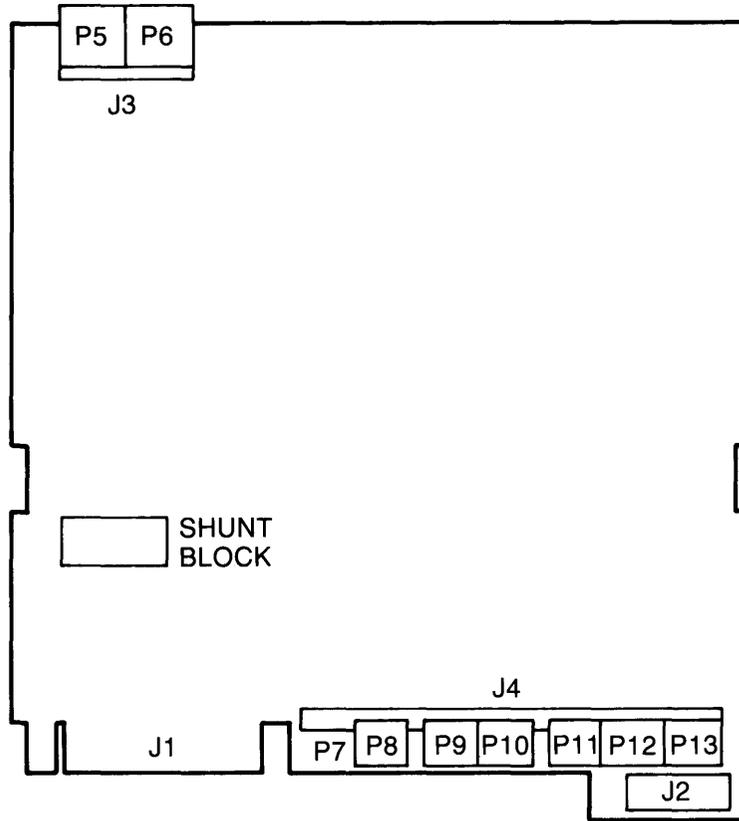


Figure 2-4: Connector Location

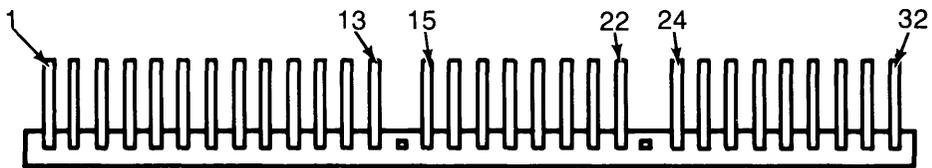


Figure 2-5: Connector J4 Pin Out

J4

Pin	Description
1	Not Used
2	Not Used
3	NC
4	NC
5	Wrt Protect Switch (Normally Closed)
6	Wrt Protect Switch Common
7	NC
8	NC
9	NC
10	Activity LED Signal Cathode
11	Activity LED +V Anode
12	NC
13	NC
14	Index +V LED Cathode
15	Index Signal Detector Emitter
16	Index Detector Collector
17	GND
18	NC
19	Not Used
20	Not Used
21	NC
22	GND
23	04
24	02
25	01
26	03
27	GND
28	N Motor On
29	NC
30	Motor GND
31	Motor Power

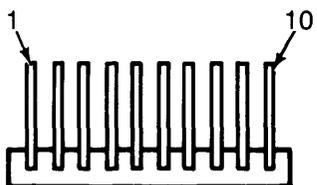


Figure 2-6: Connector J3 Pin Out

J3

Pin	Description
1	Head Shield
2	Wrt Head 1 (R/W Coil)
3	Center Tap
4	Wrt Head 1 (R/W Coil)
5	Erase Coil
6	Erase Coil
7	Wrt Head 2 (R/W Coil)
8	Center Tap
9	Wrt Head 2 (R/W Coil)
10	Shield

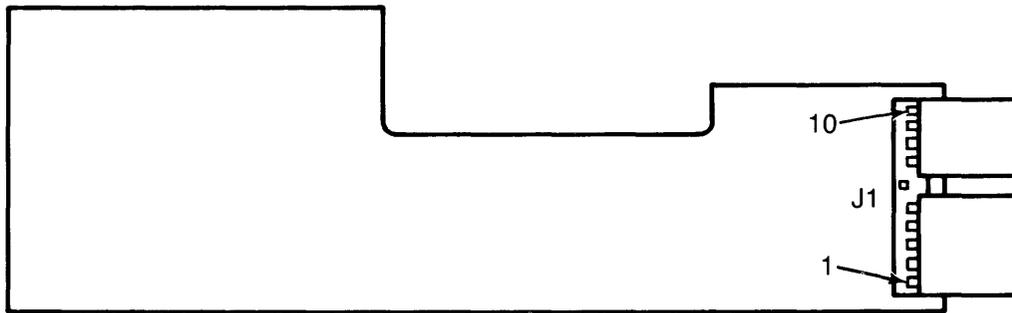


Figure 2-7: Servo Electronics Board J1

Pin	Description
1	+ Tach
2	- Tach
3	+ Motor Power
4	Motor Return
5	NC
6	NC
7	N Motor On
8	NC
9	GND
10	+ 12V

Typical Interface Drive/Receiver Circuits

The output control lines have the following electrical specifications:

True = Logical Zero = $V_{out} + 0.4V$ (max.) @ I_{out} 48ma (MAX)

False = Logical One = $V_{out} + 2.4V$ (min.) I_{out} 250ma (max.)

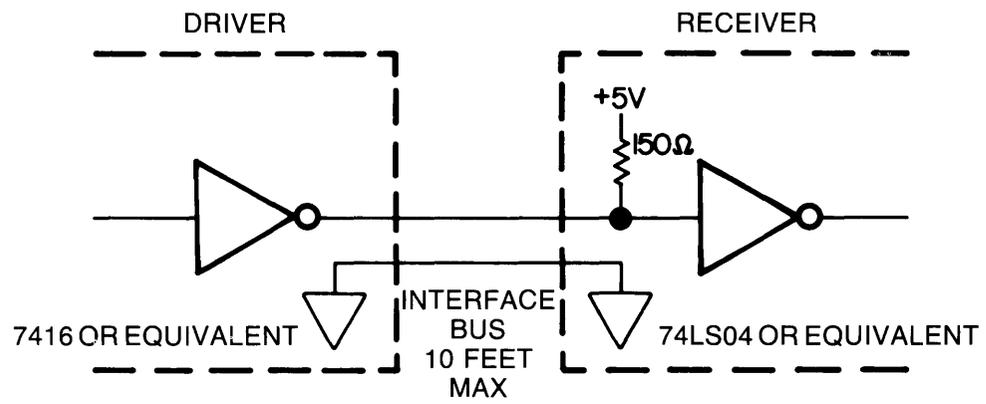


Figure 2-8: Typical Interface Driver/Receiver Circuit

Chapter 3

Theory of Operation

Introduction

This chapter describes the flexible disc recording fundamentals, and functional block diagram theory of operation. Refer to Figures 3-1 through 3-3 while reading the following description.

Flexible Disc Recording Fundamentals

To better understand the operation of the flexible disc drive, read this brief description of disc recording principles. Refer to Figure 3-1 and 3-2 while reading this section.

The flexible magnetic media used with the 9130K disc drive measures 5.25 inches in diameter. Both surfaces are coated with a ferromagnetic iron oxide. Both sides are used for data storage. Each side contains 35 circular tracks. Each track is divided into 16 pie slice shaped regions called sectors. Each sector can contain up to 256 bytes of data. Surface, track and sector information is used to reference data location on the disc. Data is encoded on the disc (ones and zeros) by changing the orientation of small magnetic dipoles in the magnetic coating on the disc. There is no correlation between the magnetic polarity of the dipoles and the ones and zeros. The ones and zeros are indicated by the location of the dipole polarity transitions.

The disc is soft sectoring, that is, there is no hardware indication of where each sector begins. In order to allow soft sectoring, each sector is divided into two fields. For each sector there is an ID field which contains information to identify the sector. Next there is a data field which contains the actual data. Thus, the ID field serves as a fixed marker for the beginning of each sector.

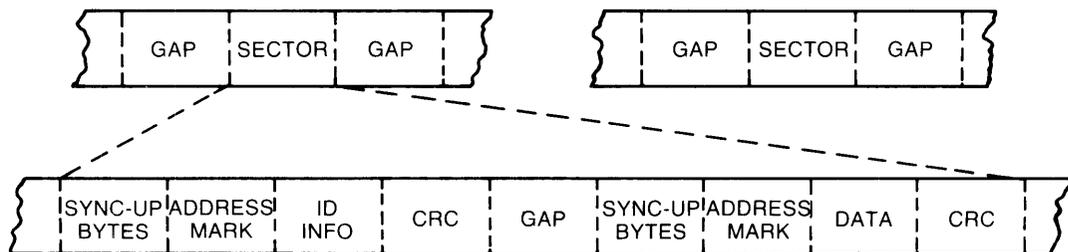


Figure 3-1: ID and Data Field Content

3-2 Theory of Operation

The makeup of the ID and DATA fields is similar. Both fields begin with a series of synchronization bytes. These bytes allow the decoder circuitry of the controller time to synchronize itself with the data on the disc. Following the synchronizing bytes, is the address mark byte which indicates that the beginning of an ID or DATA field has been located. The first bit of an address mark is the opposite polarity of the last bit of the previous synchronizing byte. This feature simplifies detection of address marks.

A series of information bytes follows the address mark. In an ID field, these bytes indicate the logical cylinder, head and sector address. In a DATA field, these bytes are the data being stored in the sector.

At the end of each field are two cyclic redundancy check (CRC) bytes. This check word (16 bits long) allows detection of most errors that occur in the data storage and recovery of information from a disc.

There are two gaps following each field on a track. The gaps allow for variations in disc rotational speed, index detector alignment variations and time for the hardware to prepare for the next field.

The logical sectors are numbered consecutively. However, the sectors (see Figure 3-2) may occur in any physical order around the track. This allows the sectors to be staggered to optimize system performance (interleaving).

The outermost track on the disc is track 0 and the innermost track is track 34. Each track has a physical address as described previously. There is also a logical track address associated with each good track. The logical track address is written in the ID field of each sector on the track. If a flexible disc has no bad tracks, the logical track has the same address as the physical track.

The recording head (see Figure 3-3) is moved in and out by a stepper motor assembly. Write current passes through the head coil to selectively magnetize the portions of the disc. To read back data, the magnetized material is passed under the head, thereby inducing read current into the head coil.

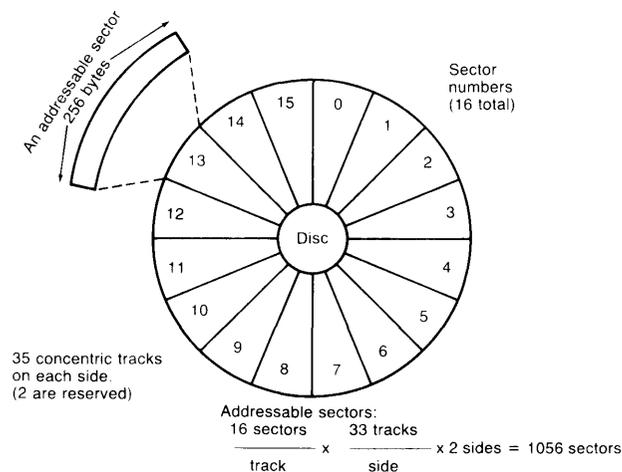


Figure 3-2: Media Sector and Track Structure

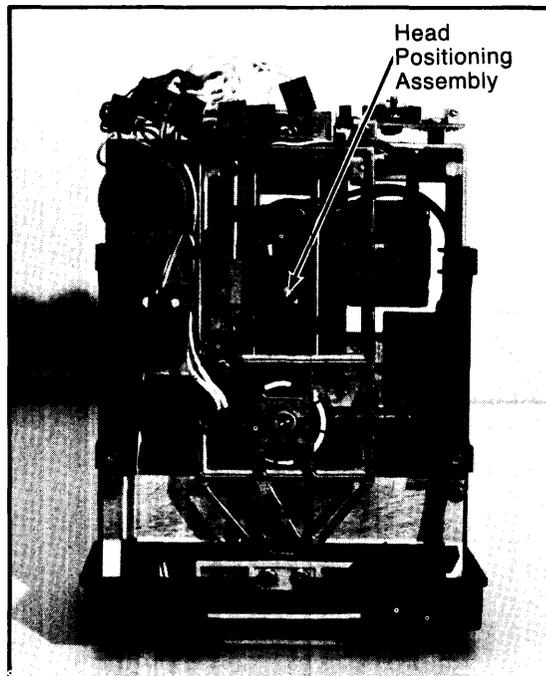


Figure 3-3: Head Positioning Assembly

Index Pulse Shaping Network

The index pulse circuitry consists of an index LED, photo transistor and pulse shaping network. The index hole in the flexible disc passes between the index LED and photo transistor, causing the photo transistor to conduct. The detected signal is then shaped and buffered and output on the Index Pulse interface line (J1-8). This signal although inverted may be observed at TP7 on the drive electronics board.

Write Protect Sensor

The write protect sensor consists of a switch which is opened when a write protected disc is inserted into the drive. This signal is delayed by an RF filter to eliminate transient noise from the switch. This will cause the write protect line (J1-28) to go low and TP9 to go high.

Track 0 Switch

The level on the Track 0 interface line is a function of the head assembly position. When the head assembly is positioned at track 0 and the stepper motor indicates phase 0, J4-19 is pulled low, causing TP8 and the Track 0 interface line to be pulled low.

Spindle Motor Drive Control

The spindle drive system consists of a spindle assembly driven by a DC motor-tachometer combination and the servo electronics board.

The servo electronics includes a current limiter and interface control line.

3-4 Theory of Operation

When the Drive Motor Enable line is low, the drive motor is allowed to come up to speed. This speed is adjustable by potentiometer R4 located on the servo electronics board.

A current sensing resistor, also located on the servo electronics board limits the motor current to 900ma. If this limit is exceeded, the motor is disabled.

Head Position Control

The head position Control consists of a four phase stepper motor drive which changes one phase for each track advancement of the head assembly. In addition to the logic for motion control, a gate is provided to inhibit repositioning during a write operation.

Power On Circuit

This circuit detects when the +5VDC and +12VDC are valid and prevents writing/reading/erasing/stepping until such time.

Data Circuitry

All signals required to control the data circuitry are provided by the host system and are shown in the functional block diagram of Figure 3-4. These signals are as follows:

- Drive Select
- Write Enable
- Write Data
- Side Select

There are 4 drive select lines connected to the data electronics. A shunt block determines the drive number. The drive number is established by clipping three of the jumpers on the shunt block or adding a shunt to an empty block. When the selected drive select line is pulled low, the data circuitry is enabled and the drive is conditioned to respond to step or read/write commands.

Writing Data

The write electronics consists of the following circuits:

- Write/erase current source
- Waveform generator
- Trim erase current source
- Head select logic
- Bias Source

The read/write winding on the head is center tapped. During a write operation, the current from the write current source flows in the alternate halves of the winding under the control of the write waveform generator.

Before recording can begin, certain conditions must be satisfied. The conditions required before writing (i.e., unit ready) must be established by the host system as follows:

1. Drive speed stabilization. This will exist 250ms after starting the drive motor.
2. Subsequent to any step operation, the positioner must be allowed to settle. This requires 20ms total after the last step pulse is initiated, i.e., 5ms for the step motion and 15ms for settling.

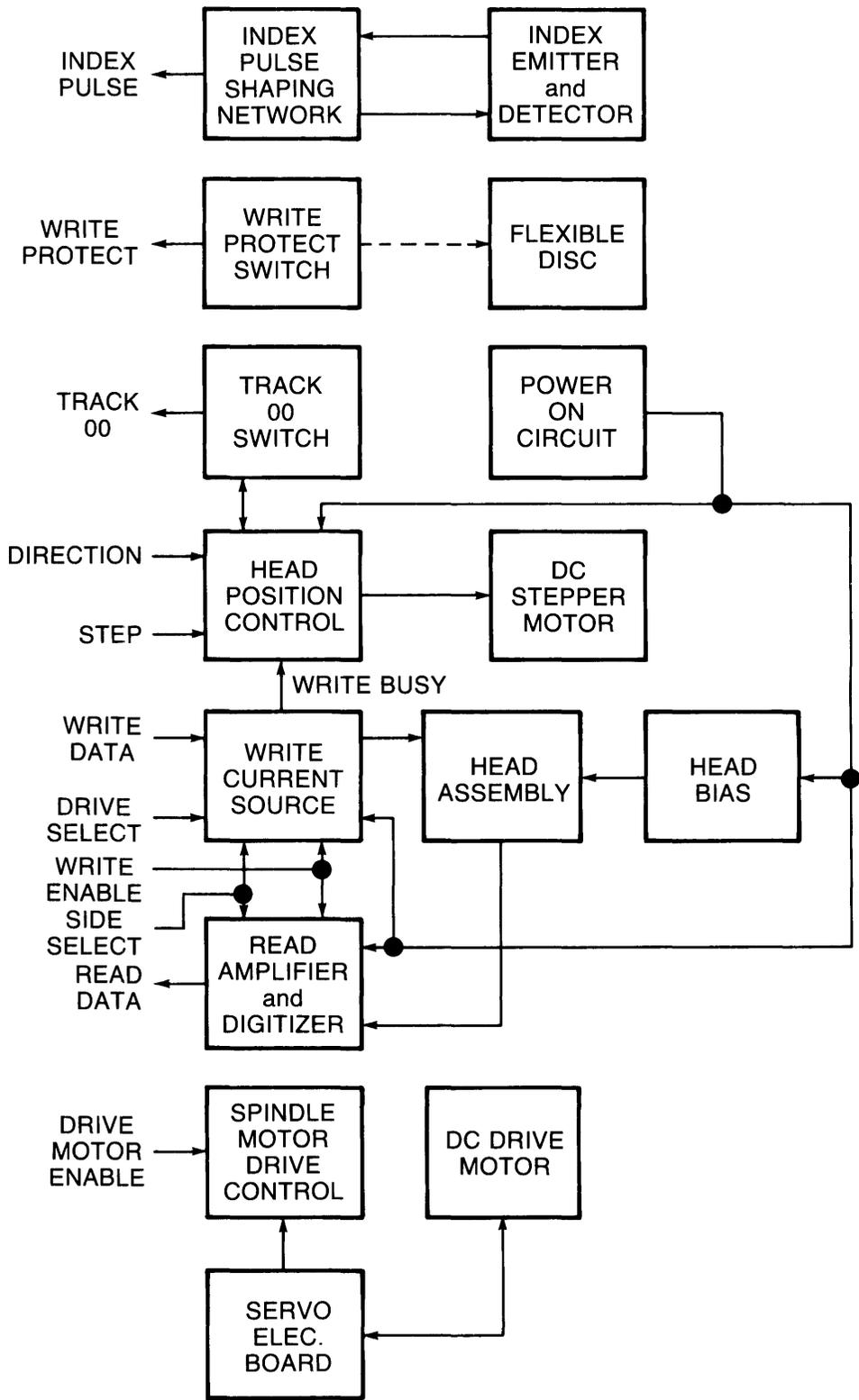


Figure 3-4: 9130K Functional Block Diagram

3-6 Theory of Operation

The following operations are performed when writing data. These operations may be overlapped if required.

Figure 3-5 shows the relevant timing diagram for a write operation. At $T = 0$ when the unit is ready, the write enable line goes low. This enables the write current source and bias circuitry.

Since the trim erase gaps are behind the read/write gap, the TRIM ERASE control goes true 390 μ sec. after the WRITE ENABLE interface line. It should be noted that this value is optimized between the requirements at Track 0 and Track 34 so that the effect of the trim erase gaps on previous information is minimized.

Figure 3-5 shows the information on the WRITE DATA interface line, and the output of the Write Waveform Generator which toggles on the leading edge of every WRITE DATA pulse.

At the end of recording, at least one additional pulse on the WRITE DATA line must be inserted after the last significant WRITE DATA pulse to avoid excessive peak shift effects.

The TRIM ERASE signal must remain true for 800 μ sec. after the termination of WRITE ENABLE to ensure that all recorded data are trim erased. This value is again optimized between the requirements at Tracks 0 and 34.

The duration of a write operation is from the true-going edge of WRITE ENABLE to the false-going edge of TRIM ERASE. This is indicated by the internal WRITE BUSY waveform shown.

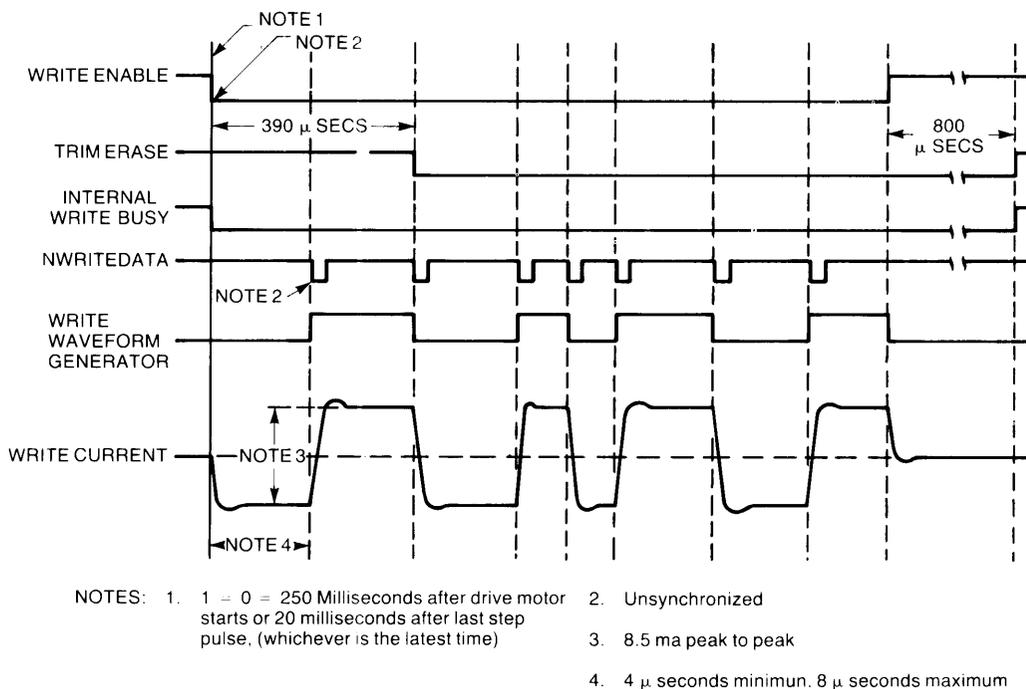


Figure 3-5: Write Timing Diagram

Reading Data

The read electronics consists of the following circuitry:

- Read switch/side select
- Read amplifier
- Filter
- Differentiator
- 0 Crossing detector

The read switch is used to isolate the read amplifier from the voltage excursion across the magnetic head during a write operation. The side select is used to enable one of the read/write/erase heads.

Before reading can begin, the Drive must be in a ready condition. As with the data recording operation, this ready condition must be established by the host system. In addition to the requirements established for data recording a 100 μ sec. delay must exist from the trailing edge of the TRIM ERASE signal to allow the read amplifier to settle after the transient caused by the read switch returning to the Read mode.

Referring to Figure 3-6, the output signal from the read/write head is amplified by a read amplifier and filtered to remove noise by a linear phase filter. The linear output from the filter is passed to the differentiator which generates a waveform whose zero crossovers correspond to the peaks of the read signal. This signal is then fed to the comparator and digitizer circuit.

The comparator and digitizer circuitry generates a 1 μ sec. READ DATA pulse corresponding to each peak of the read signal. This composite read data signal is then sent to the host system via the READ DATA interface line.

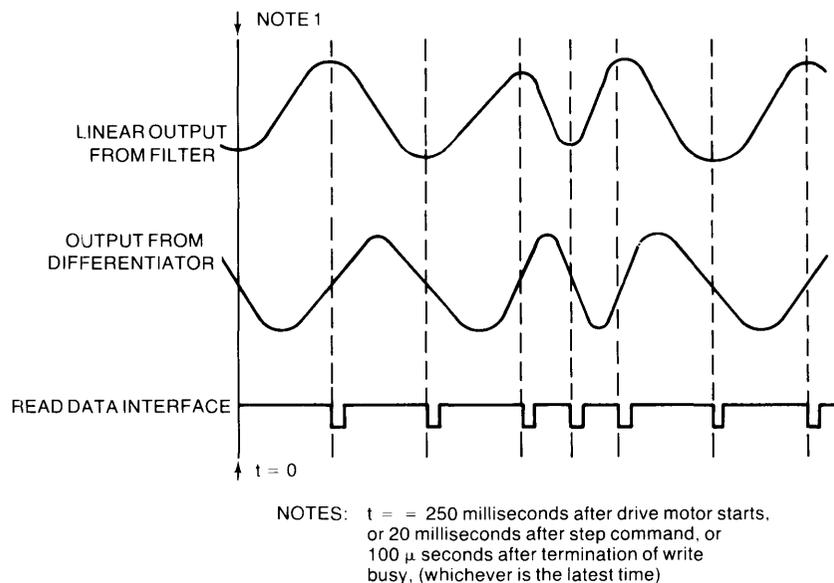


Figure 3-6: Read Timing Diagram

Chapter 4

Assembly Access

Introduction

This chapter provides assembly access procedures for the 9130K Flexible Disc Drive. An exploded view is included in this section with disassembly procedures. The disassembly procedures are provided for only those parts considered field replaceable. These parts are as follows:

- Drive Electronics Assembly
- Servo Electronics Assembly
- Latch and Front Panel Assembly
- Servo Motor
- Media Lift Inhibitor
- Drive Belt
- Activity LED
- Index Emitter/Detector Assembly

WARNING

REMOVE POWER TO THE DISC DRIVE BEFORE REMOVING ANY ASSEMBLY.

NOTE

Unless otherwise noted in the procedures, the disc drive assemblies are installed by reversing the procedures given for their removal.

The following tools are required to disassemble and reassemble the disc drive:

- #1 Posidriv Screwdriver
- #2 Posidriv Screwdriver
- Needlenose Pliers
- Small Flat Blade Screwdriver

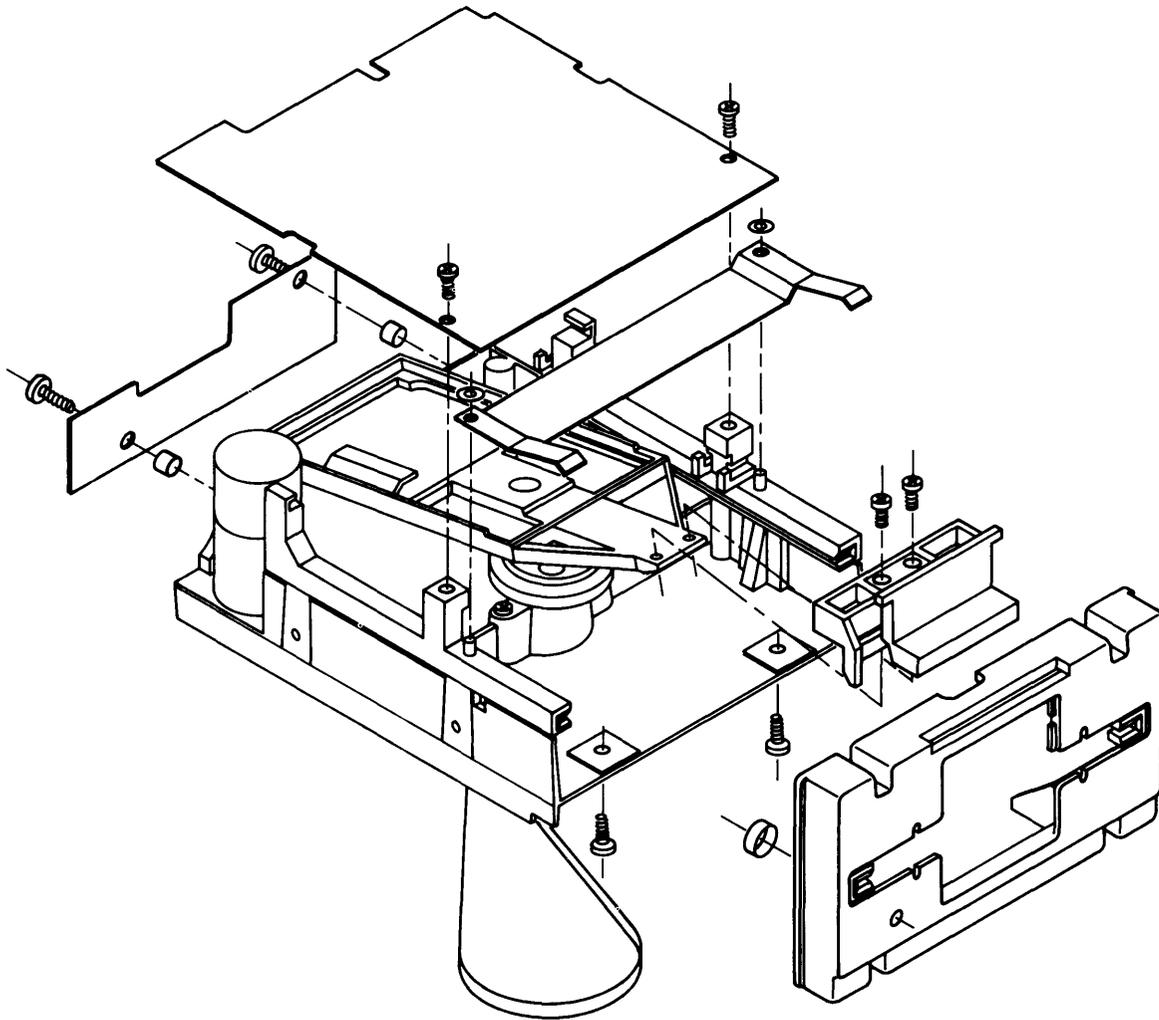


Figure 4-1: 9130K Flexible Disc Drive Exploded View

To access the internal assemblies, the drive electronics board A1 must first be removed. To do this, refer to Figure 4-2 and disconnect connectors P5, P6 and P8 through P13. Next remove the two screws (A) and slide the board toward the rear of the drive so that the notches in the sides of the board are centered about the two side retainers. Lift the board from the drive and place on a clean dry surface.

The servo electronics assembly (A2) is removed by disconnecting connectors P20 and P21 and then removing the two screws (B). Be careful not to lose the two fiber spacers (C) located behind the board when removing the retaining screws. Place the board on a clean dry surface.

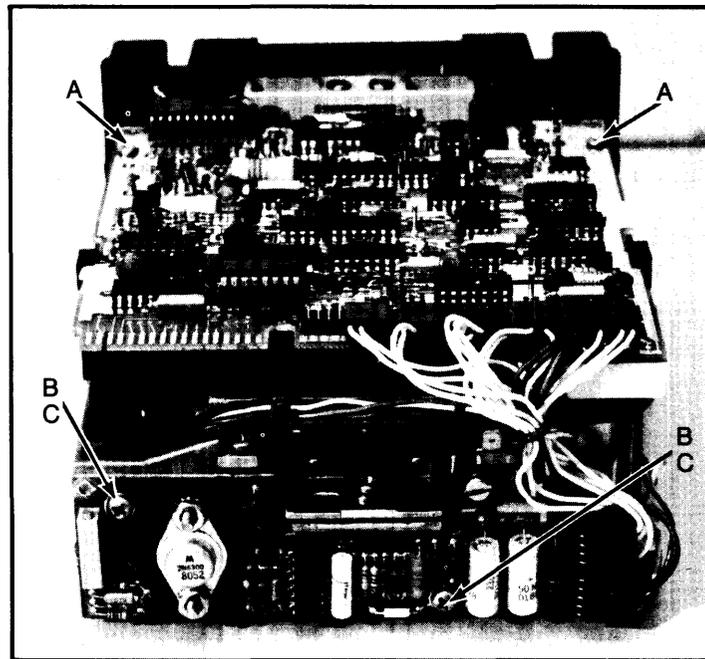


Figure 4-2: Drive Board and Servo Board Removal

The drive belt is removed by grasping it with the index finger and thumb and rotating the spindle pulley while gently pulling the belt from the bottom of the drive.

The spindle motor is removed by removing the two screws (D) from the bottom of the drive. Be careful not to lose the two nylon washers under the screws.

To remove and replace the front panel/latch follow these instructions carefully:

CAUTION

PRIOR TO REMOVING ANY ADDITIONAL HARDWARE, BE SURE TO PLACE A LARGE RUBBER BAND AROUND THE DRIVE UNIT AS SHOWN IN FIGURE 4-3 TO KEEP THE CONE ASSEMBLY IN PLACE. IF THIS IS NOT DONE, THE HEAD RETURN SPRING WILL BE DAMAGED.

Remove the two screws (E) and lift the latch out from behind the front panel.

Next slide the collar from around the activity LED toward the rear of the drive. Slide the LED out of its holder in the front panel. Place the drive on its side and remove the two screws (F) and pull the front panel from the drive unit.

To remove the media lift inhibitor, carefully pry the two retaining clips (G) from the plastic pins which are part of the side rails and lift the inhibitor off the unit.

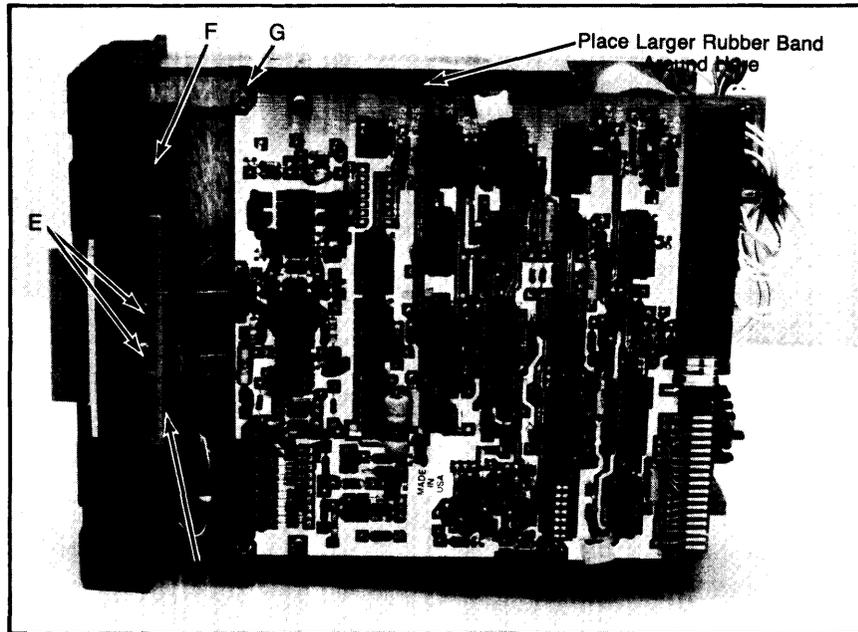


Figure 4-3: Front Panel and Latch Removal

Two screws hold the index emitter/detector in place. The emitter retaining screw (H) holds the emitter block in place on the cone assembly. The detector retaining screw (I) is located in the depression on the bottom of the drive casting.

Chapter 5

Maintenance

Introduction

This chapter provides maintenance information for servicing the 9130K flexible disc drive. This information includes failure analysis, alignment and adjustment procedures, required tools, DSU operating instructions and test point locations and waveforms for both the 09130-66501 and 82901-66515 drive boards.

Service Kit Contents

The host product has a two part service kit. Part 1 consists of the 9130K service kit, used to repair the disc drive(s), and part 2 is the product dependent service kit, used to repair the host system.

The contents of the 9130K service kit are as follows:

Part Number	Description	Quantity
09130-69600	Drive mechanical assembly with servo electronics, HP front panel and grey latch (same as 9130K Opt. 51).	1
09130-66501	Drive electronics board	1
09130-66500	Servo electronics board	1
4040-1636	HP latch, grey	2
4040-1856	HP latch, brown	2
4040-1635	HP front panel	1
1600-1137	Media lift inhibitor	1
0510-0042	Retaining clip	4
1400-0249	Cable ties	10
0950-0448	Drive belt	4
3140-0654	Spindle motor	2
7121-1451	Strobe label	10

The Product Support Package for all versions of the 9130K is as follows:

Part Number	Description	Quantity
9164-0151	Alignment disc	1
9164-0129	Blank disc	1
6040-0521	Molley cote grease (for latch lubrication)	1
8710-1305	Spindle motor adjustment tool	1

There is a 9130K video tape presentation available under HP part number 90362RZ. This tape contains theory of operation, product description and service information on the 9130K.

Drive Failure Analysis

The following possible drive failures and their symptoms are provided to simplify troubleshooting and repair of the disc drive at the customers site. Included are corrective actions which can be taken to remedy the problems.

NOTE

Upon entering a customer's site, carefully examine the conditions under which the flexible disc drive is operating. Also ask to see the customer's media. It is a good possibility that the customer is using non-HP media or the operating environment is too dirty to assure reliable operation. This is especially true when a customer experiences higher than normal soft errors. For these reasons you may have difficulty duplicating the customer's failure. When this occurs, ask the customer to duplicate the failure. If there is a high soft error rate problem, closely examine the customer's media for contamination and wear. Be sure to stress proper disc handling and use.

Another important point to be noted is that the 9130K disc drive is not a high duty cycle "Virtual Memory" type device. The 9130K reliability is not linear with its use.

Symptom	Possible Failure	Corrective Action
High read error rate	Media misuse and abuse	Teach customer proper media use/handling
	Servo board failure	Replace servo board
	Drive board failure	Replace drive board
	Contaminated heads	Clean heads
Drive buzzes or chatters or "bad disc" error	Heads misaligned	Align heads/swap drive
	Drive board failure	Replace drive board
"Missing Disc" errors	Track 0 switch failure	Replace drive assembly
	Index emitter/detector failure	Replace emitter/detector pair
"Seek" errors	Drive board failure	Replace drive board
	Drive belt failure	Replace and/or adjust drive belt
	Stepper motor failure	Replace drive
	Servo board failure	Replace servo board
	Drive motor failure	Replace drive motor
	Index emitter/detector misaligned	Align index emitter/detector pair
	Disc latched off center when inserted into drive	Replace drive

Head Cleaning

Periodically the read/write heads on the 9130K may require cleaning. This is especially true if media failure has been detected. The HP P/N for the head cleaning kit is 92193A.

A mainframe dependent clean program is required to effectively clean the heads and also to efficiently utilize the entire cleaning disc surface.

Termination Resistor IC U2F (09130-66501 only)

This resistor IC (150 Ω per resistor) is inserted into the last drive of a daisy chain. Remember to insert this resistor IC into the replacement drive when servicing the last drive on a daisy chain.

Shunt Block U1E (09130-66501 only)

The shunt block must be configured on a replacement drive as it is on the drive being removed.

Alignment and Adjustments

Introduction

This section provides the adjustment procedures for the 9130K flexible disc drive. The following recommended adjustments are relatively easy to perform and may be done at the customer's location. The "E" number following the "TP" number is for the 82901-66515 drive boards only.

- Spindle motor speed adjustment
- Spindle drive belt adjustment

Spindle Motor Speed Adjustment

The spindle motor speed should be re-adjusted whenever a new spindle motor or servo electronics board is installed. Refer to Figure 5-1 while making this adjustment.

Required Tools:

- Alignment tool or small insulated shank screwdriver
- HP 5314A or equivalent frequency counter (if primary power frequency is unknown or unstable or when adjusting motor speed under incandescent lighting).

Follow these instructions when primary power is a known 50 or 60 Hz and you are making this adjustment under fluorescent lighting.

1. Check the spindle pulley to see that it has a strobe label. If not, use one from your service kit.
2. Turn the spindle motor power on and observe the strobe pattern on the spindle pulley. For 50Hz primary power observe inner pattern. For 60Hz, observe the outer pattern.
3. Locate and adjust the potentiometer on the servo board until the proper pattern on the strobe label stabilizes.

If the primary power frequency is unstable or unknown, follow these instructions:

1. Connect the frequency counter input to TP7/E7 (index) and (TP6/E11 ground).
2. Turn the spindle motor on.
3. Locate and adjust the potentiometer on the servo board until a 200ms +/-1% period is observed on the counter display. This will assure a 300 RPM spindle speed.

CAUTION

USE AN INSULATED SHANK FLAT BLADE SCREWDRIVER OR ALIGNMENT TOOL TO AVOID SHORTING OF THE TRANSISTOR LEADS ON THE TANDON DESIGN SERVO BOARD.

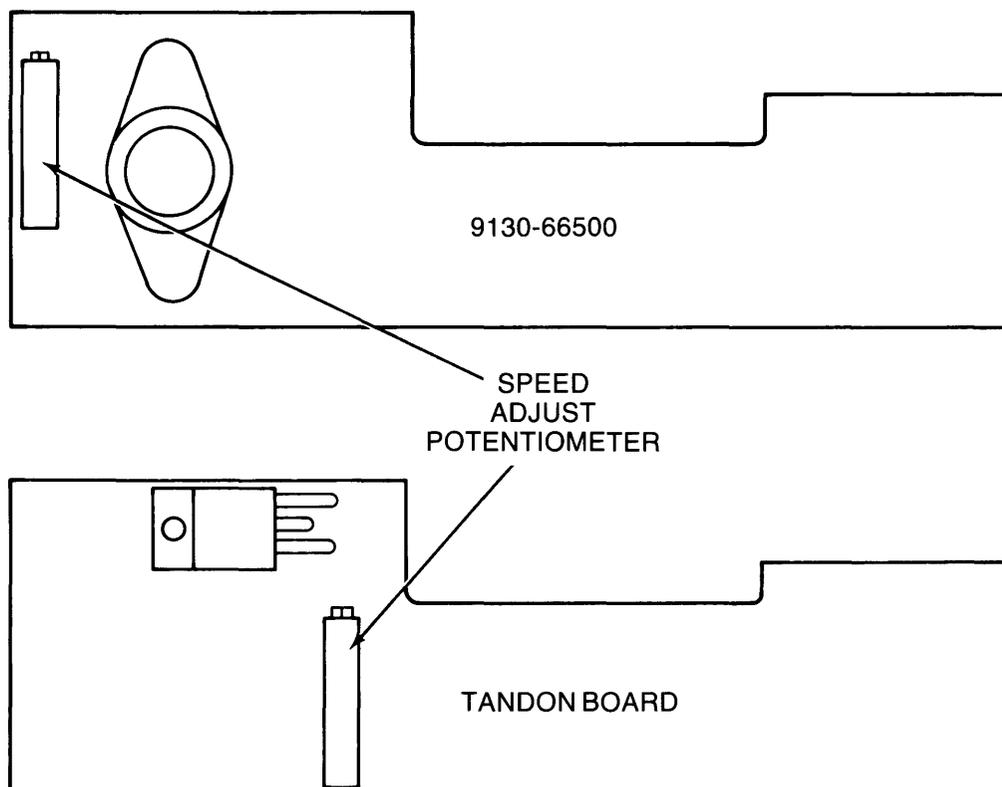


Figure 5-1: Spindle Motor Speed Adjustment

Spindle Drive Belt Adjustment

This adjustment is to ensure proper drive belt tension. This adjustment should be made whenever the drive belt or drive spindle motor is replaced.

Required Tools:

- #1 posidriv screwdriver
- Spindle motor adjustment tool P/N 8710-1385

Refer to Figure 5-2 while performing these steps:

1. Place the drive assembly on its side so that the bottom of the drive faces you.
2. Remove the drive belt.
3. Place the spindle motor adjustment tool on the bottom of the drive as shown in Figure 5-2 so that the small end of the adjustment tool rests against the motor pulley and the large end rests against the spindle pulley.
4. Slightly loosen the spindle motor retaining screws and move the motor until it rests firmly against the adjustment tool.
5. Re-tighten the spindle motor retaining screws and reinstall the drive belt.

NOTE

There is a good chance that the drive motor is not exactly perpendicular to the drive casting on which it is mounted. This will cause the drive belt to slip from the drive pulley when it is rotated. After a belt is installed, rotate the drive spindle approximately 10 revolutions to insure the belt will not slip from the drive pulley.

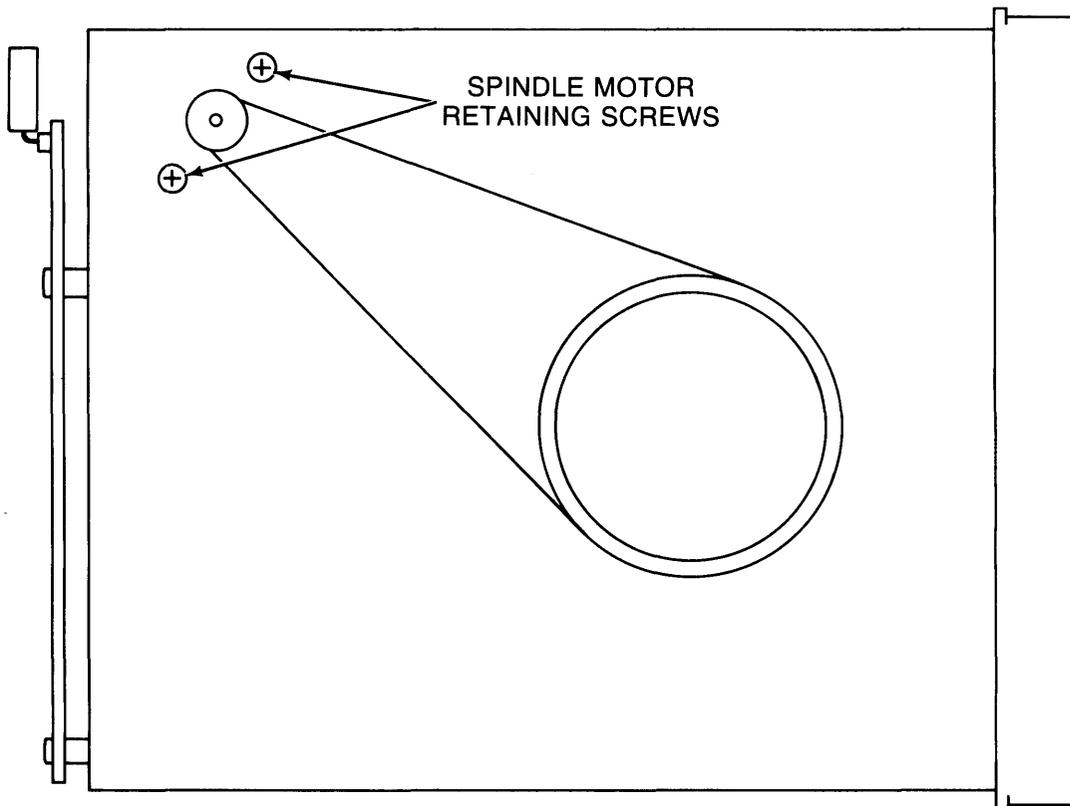


Figure 5-2: Spindle Drive Belt Adjustment

The following adjustments should not be performed except in emergency situations due to their delicate nature. These adjustments are never to be performed at the customers location.

The adjustments described in this section are:

- Radial Head Alignment
- Head Azimuth Adjustment
- Track 0 Switch Adjustment
- Index Emitter/Detector Adjustment
- Write Protect Switch Adjustment

Required Tools and Test Equipment

Oscilloscope	HP 1740A or equivalent
Dual Power Supply (+5VDC and +12VDC)	HP 6253A or equivalent
Disc Service Unit (DSU)	P/N 12748-60006 or equivalent
DSU Adapter Cable	P/N 09130-61606 or equivalent
Alignment Disc	P/N 9164-0151
Torque Driver	P/N 8710-0670
#1 Posidriv Screwdriver	P/N 8710-0899
#2 Posidriv Screwdriver	P/N 8710-0900
3/16 Thin Wall Nutdriver	P/N 8720-0001

The 9130K flexible disc drive must have power applied and the DSU and adapter connected to perform the following adjustments (refer to Figure 5-3). do not power the DSU with the host systems +5VDC supply or damage to the host system may result.

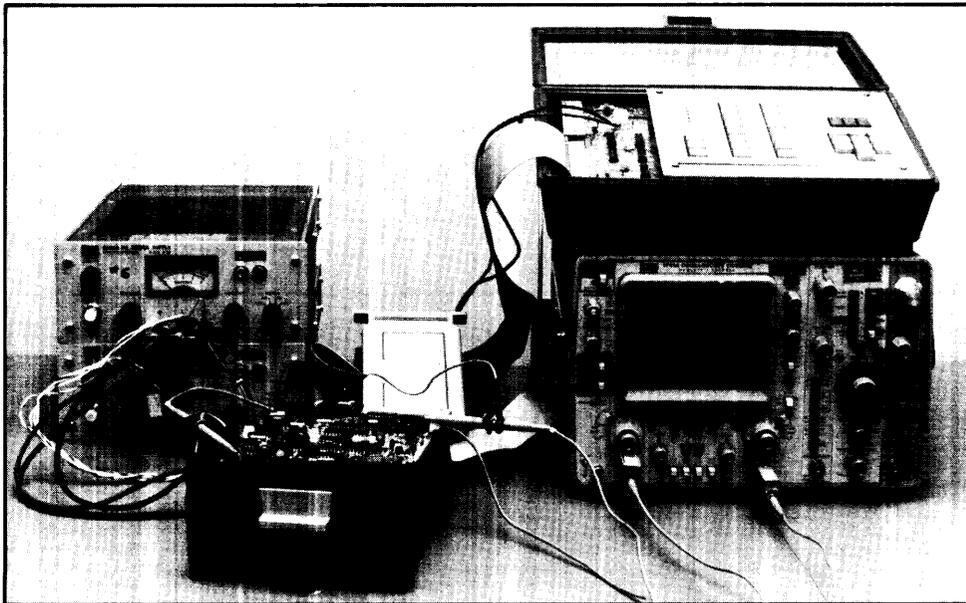


Figure 5-3: 9130K Test Setup

Radial Head Alignment

To properly align the read/write heads, perform the following steps in the order shown. Refer to the troubleshooting section for head misalignment symptoms.

1. Connect the equipment as shown in Figure 5-3 and apply power.
2. If the DSU display reads "bAd" or if TRK 0 LED indicator on the DSU is not lit, depress the SYSTEM RESET pushbutton on the DSU.
3. Insert Alignment disc P/N 9164-0151 into the drive and close the latch.
4. Connect and setup the scope as follows:
 Connect channel A to TP7/E7 (INDEX) and ground lead to TP6/E11.
 Connect channel B to TP4/E4 (READ DATA) and ground lead to TP6/E11.
 Trigger: Internal on channel A (POS)
 Display: Channel B
 Volts/DIV: .2V/DIV (using a 10:1 probe)
 Time/DIV: 20ms/DIV
5. With the scope connected, the pattern shown in Figure 5-4 should be observed.
6. Both lobes of the pattern should be equal in amplitude.

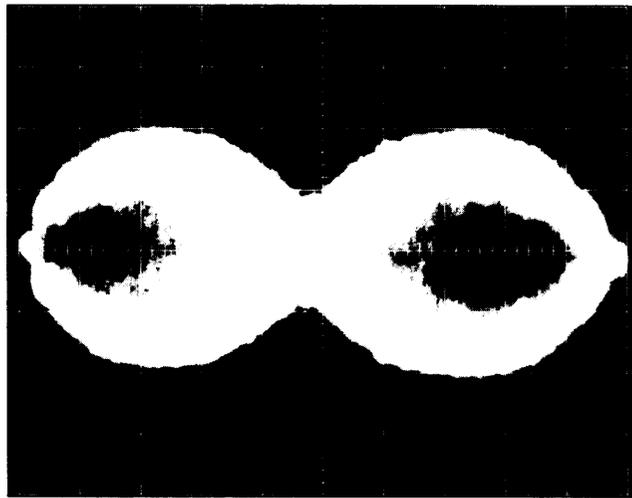


Figure 5-4: Radial Head Alignment Waveform

7. If the amplitude of one of the lobes of the waveform is less than 80% of the other, slightly loosen the three screws shown in Figure 5-5 and adjust the radial head alignment by gently turning the head alignment cam screw.

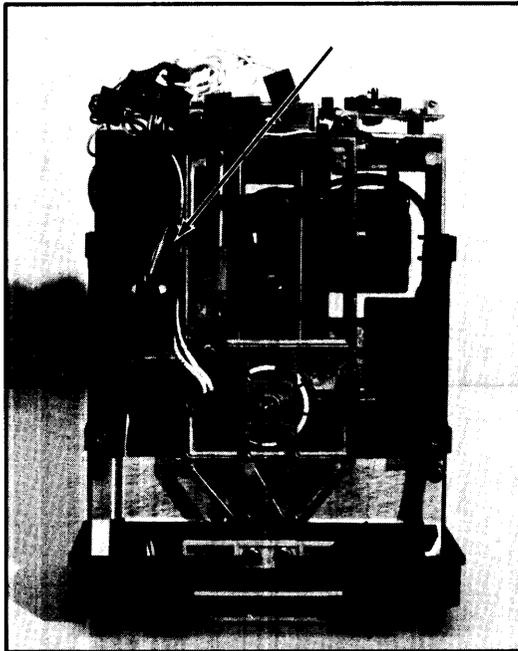


Figure 5-5: Head Assembly Retaining Screws

8. After the radial head alignment has been completed, re-tighten the three screws loosened in step 7 while observing the scope pattern. Tighten the retaining screws with the torque-driver set at 8 inch pounds.

Head Azimuth Alignment

The head azimuth is not field adjustable due to its very delicate nature. For this reason, the drive unit should be returned to CSD for azimuth alignment. To determine whether the head azimuth is out of limits, perform the following procedures:

Connect channel A of the scope to TP4/E4 and ground lead to TP10/E11.

Connect channel B to TP7/E7 and ground lead to TP6/E11.

Setup the scope as follows:

Trigger:	Internal on channel B (POS)
Display:	Channel A
Volts/DIV:	.02V/DIV
Time/DIV:	1ms/DIV

The waveform observed at TP4/E4 should look similar to that of Figure 5-6. Examine the waveform for heads 1 and 2. If lobe A is greater in amplitude than lobe B or if lobe D is greater in amplitude than lobe C, then the head azimuth is out of alignment and the drive assembly should be returned to CSD for adjustment.

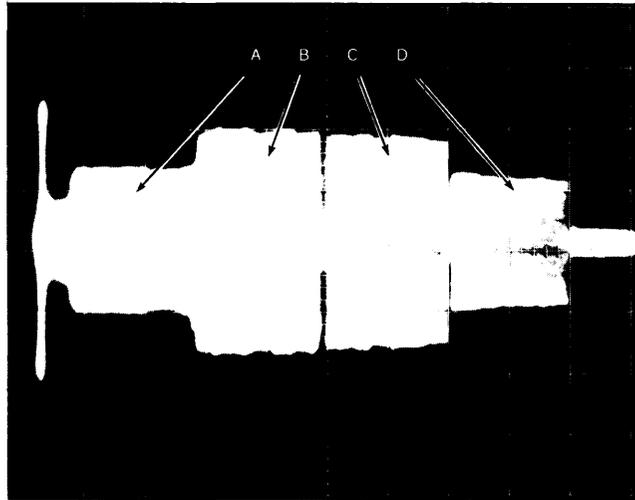


Figure 5-6: Head Azimuth Waveform

Track 0 Switch Adjustment (extremely difficult adjustment)

Track 0 switch adjustment should be performed whenever the radial head alignment is changed. To properly adjust the track 0 switch, follow these steps in the order shown:

1. Connect the equipment as shown in Figure 5-3.
2. Disconnect connectors P5 and P6 from the front of the drive board.
3. Remove the drive board retaining screws and carefully lift the drive board from the drive assembly.
4. Slightly loosen the track 0 switch retaining screw shown in Figure 5-7.

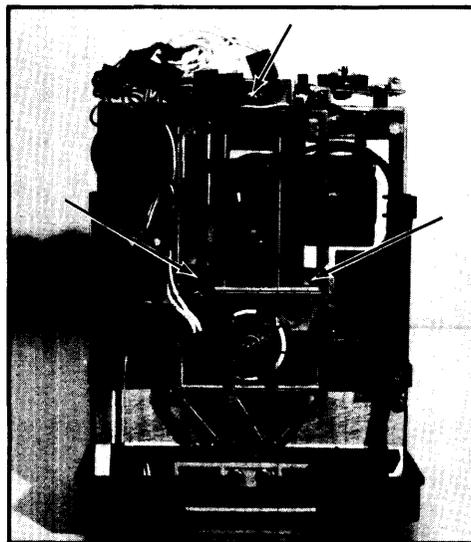


Figure 5-7: Track 0 Switch Retaining Screw

5. Rest the drive board on a piece of insulating material, such as cardboard, on top of the drive assembly.
6. Setup the DSU as follows:
MAX TRACK: 4
MIN TRACK: 0
STEP RATE: 5ms/track (Alternate Seek)
7. Connect and setup the oscilloscope as follows:
Connect channel A to TP12/U5-5 and (STEP) and ground lead to TP10/E11.
Connect channel B to U4F pin 11/U1 pin 11 and ground lead to TP6/E11.
Trigger: Internal on channel A (POS)
Display: Channel B
Volts/DIV: .02V/DIV (using a 10:1 probe)
Time/DIV: 1ms/DIV
8. With the scope connected and setup, the pattern should be similar to that of Figure 5-8. The duration of the pulse from T0 to T1 must be 15ms or less time T0 to T2 20ms or less.

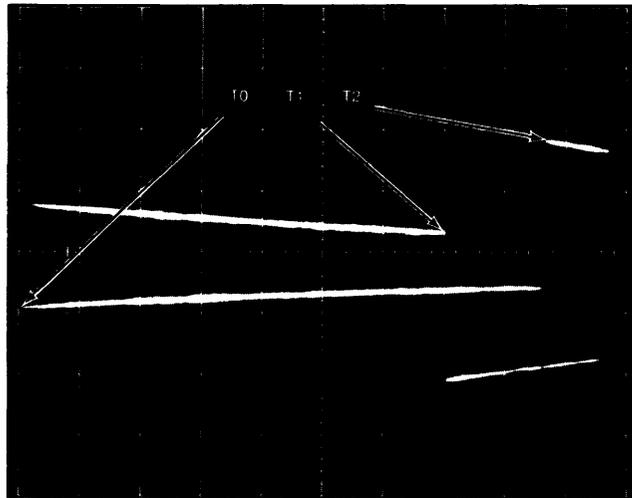


Figure 5-8: Track 0 Waveform

9. With the torque driver adjusted to 8 inch pounds, re-tighten the track 0 switch retaining screw while observing the oscilloscope pattern.
10. Reinstall the drive board and connectors P5 and P6. Tighten the board retaining screws with the torque driver set to 8 inch pounds.

Index Emitter/Detector Adjustment

This adjustment is required when the index emitter/detector assembly has been replaced.

Follow these steps in the order shown:

1. Place the drive assembly on its side with the bottom facing you.
2. Connect the equipment as shown in Figure 5-3.

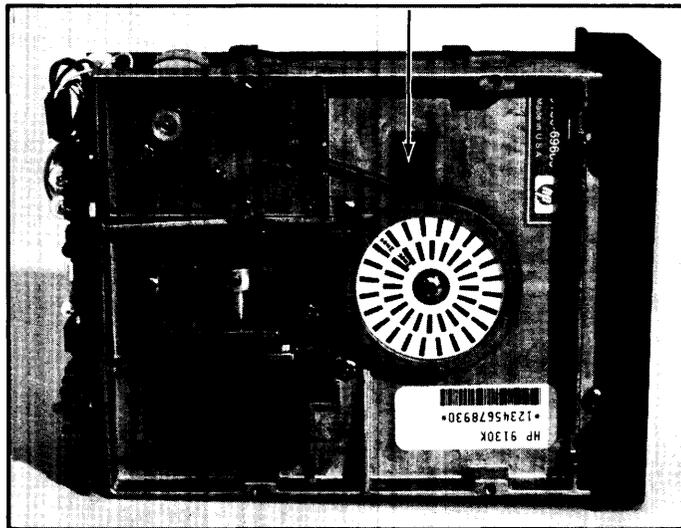


Figure 5-9: Index Detector Retaining Screw

4. Insert alignment disc into the drive and close the latch.
5. Seek to track 16, head 0.
6. Apply power and start the drive motor.
7. Connect and setup the oscilloscope as follows:
 - Connect channel A to TP7/E7 (INDEX) and ground lead to TP6/E11.
 - Connect channel B to TP1/E1 (READ DATA) and ground TP10/E11.
 - Trigger: Internal on channel A (POS)
 - Display: Channel B
 - Volts/DIV: .02V/DIV (using 10:1 probe)
 - Time/DIV: .1ms/DIV
8. The oscilloscope presentation should look like that of Figure 5-10.
9. Loosen the index detector retaining screw (Figure 5-9) and move the detector until the INDEX to DATA burst time is approximately $400 \mu\text{s} \pm 300 \mu\text{s}$ for head 0.
10. Re-tighten the index detector retaining screw using the torque driver set to 8 inch pounds while observing the scope.
11. Check the INDEX to DATA time for head 1 by depressing and releasing the SELECT HEAD 1 pushbutton switch on the DSU.
12. If the INDEX to DATA time is too far out, adjust the index emitter located on the top side of the drive assembly and then re-do steps 9 through 11.
13. Tighten the index emitter and detector retaining screws using the torque driver set to 8 inch pounds.
14. Reassemble the drive assembly.

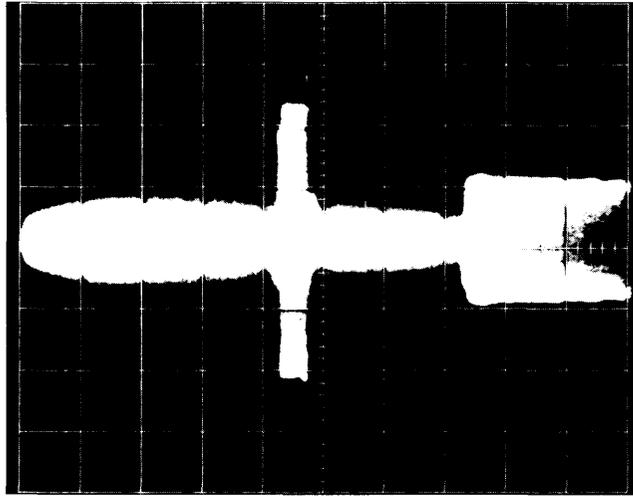


Figure 5-10. Index to Burst Waveform

Write Protect Switch Adjustment

The disc drive head assembly may be severely damaged while performing this adjustment. For this reason, replacement or adjustment of this switch is not to be done in the field.

Read/Write Test

A read/write test may be performed to verify proper operation of the read/write circuitry on the 9130K drive. Perform the following steps in the order shown:

1. Connect the equipment as shown in Figure 5-3.
2. Insert a test disc (not the alignment disc) into the drive and close the latch.
3. Connect and setup the oscilloscope as follows:
Connect channel A to TP4/E4 (READ DATA) and ground lead to TP6/E11.
Connect channel B to TP7/E7 (INDEX) and ground lead to TP10/E11.
Trigger: Internal on channel a (POS)
Display: Channel B
Volts/DIV: .05V/DIV (using 10:1 probe)
Time/DIV: 5 μ s/DIV
4. Apply power and depress and release the DRIVE VALIDATE, MOTOR ON and WRITE 1F & 2F WRITE ENABLE pushbuttons ON the DSU.
5. Depress and release the DWRITE 1F pushbutton and observe the oscilloscope display. The presentation should be like that of Figure 5-11. If the waveform is distorted or if point A and point B overlap, there is a problem in the read or write circuit.
6. Depress and release the WRITE 2F pushbutton and again observe the scope display. The presentation should be like that of Figure 5-12. Waveform distortion indicates read/write circuit failure.

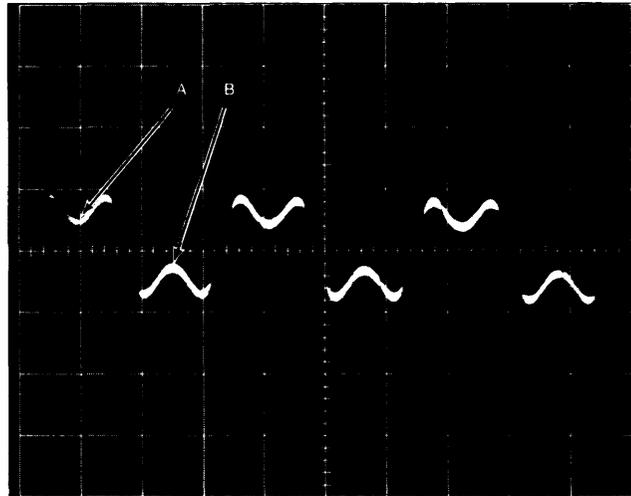


Figure 5-11: Write 1F Waveform

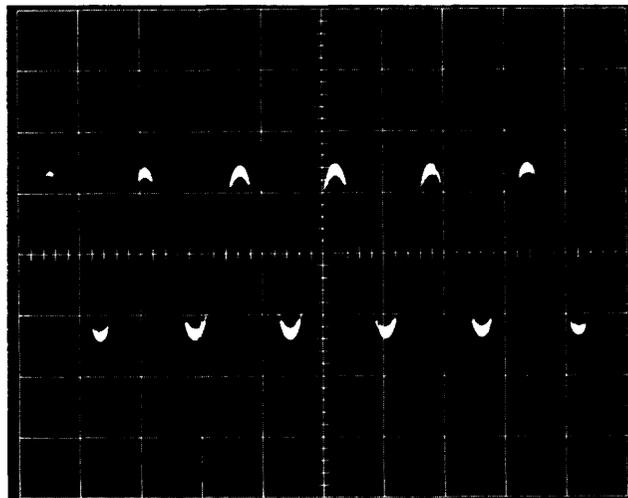


Figure 5-12: Write 2F Waveform

7. If the waveform appears normal, remove power and disconnect the test equipment. If not, replace the drive board.

DSU Controls and Indicators

This section describes the disc service unit (DSU) controls and indicators. A metal front panel overlay is supplied to allow you to exercise the 9130K flexible disc drive. A DSU adapter cable (P/N 09130-61606) is also required to convert the control signals from the

DSU to the 9130K. The Disc Service Unit and adapter cable both require a +5V supply. The 9130K also requires a +5V and +12V supply. Therefore a dual power supply (+5V and +12V) should be used. This information is for reference only. Most mainframes can function in place of DSU.

The front panel of the DSU with the overlay installed, is shown in Figure 5-13.

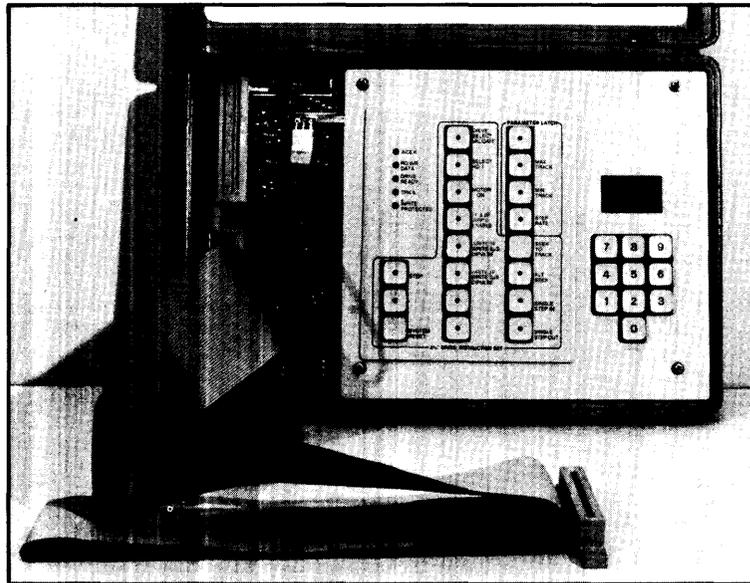


Figure 5-13: DSU Controls and Indicators

The DSU LED descriptions are as follows:

INDEX LED	Lights each time index hole in disc passes the disc drive index sensor.
RD/WR DATA	Lights when DSU is writing on or reading from a disc.
DRIVE READY	Lights when the disc drive is ready to be exercised.
TRK 0	Indicates when the read/write head is at track 0.
WRITE PROTECT	Indicates when the disc is write protected.

The DSU switch functions are follows:

KEYPAD	Used to establish parameter values for min and max track and step rate. Each time a key is pressed, that number is entered into least significant digit of 3-digit decimal display and other numbers shift up. The programmed number is entered when appropriate parameter pushbutton is pressed.
STOP	Stops DSU continuous operations (alternate seek, continuous write) and error signals. Pushbutton indicator lights when DSU is waiting for a command.

SYSTEM RESET	Resets the entire system and disc drive. DSU self test is initiated and the disc drive is recalibrated and initialized.
DRIVE SELECT VALIDATE	Validates drive number. Pushbutton indicator lights when drive number is valid.
SELECT HD 1	Selects read/write head. When indicator is on, head 1 is selected; when indicator is off, head 0 is selected. At DSU power-on and reset, head 0 is selected.
MOTOR ON	Turns spindle motor on and off. Indicator is lit when spindle motor is running.
1F & 2F WRITE ENABLE	Enables the DSU to write to the disc drive.
WRITE 1F	
WRITE 6 μ s DIPULSE	Writes 1's (125kHz) on disc. Pushbutton indicator lights when WRITE 1F is selected.
WRITE 2F	
WRITE 3 μ s DIPULSE	Writes 0's (250kHz) on disc. Pushbutton indicator lights when WRITE 2F is selected.

NOTE

If a write pushbutton is depressed and released in less than 1.5 seconds, the write operation lasts for one complete revolution of the disc. Holding the pushbutton depressed longer than 1.5 seconds produces a continuous write.

MAX TRACK	Enters keypad number selected for alternate seek maximum track number. Indicator flashes when number entered is less than the current alternate seek minimum track number. At power-on or system reset, the maximum track number is reset to 76.
MIN TRACK	Enters keypad number selected for alternate seek minimum track number. Indicator flashes when number entered is greater than the current alternate seek maximum track number. At power-on or system reset the minimum track number is reset to 0.
STEP RATE	Enters keypad number in milliseconds selected for track-to-track seek time. Pushbutton indicator flashes if number is less than 3. At power-on and reset the number is set to 3.
SEEK TO TRACK	Disc drive seeks to track number selected by keypad. If number selected is greater than 34, disc drive seeks to track 34. At power-on and reset, the drive seeks to track 0 automatically and the keypad is reset to 0.
ALT SEEK	Disc drive seeks between keypad selected minimum and maximum track numbers. Pushbutton indicator is lit during seek operation. At power-on and reset, alternate seek is set to occur between tracks 0 and 34.

SINGLE STEP IN	Head assembly steps inward one track. Pushbutton indicator is lit when heads are at inner most track.
SINGLE STEP OUT	Head assembly steps outward one track. Pushbutton indicator flashes if heads are at outer most track (0).

Disc Service Unit Operation

This section provides the operating instructions for the Disc Service Unit (DSU).

CAUTION

THE DSU WAS ORIGINALLY DESIGNED TO SERVICE AN 8 INCH FLEXIBLE DISC DRIVE, THEREFORE, CERTAIN PRECAUTIONS MUST BE TAKEN WHEN EXERCISING THE 9130K WITH THE DSU. AT POWER-ON AND SYSTEM RESET, THE DEFAULT MAX TRACK PARAMETER IS SET TO 76. THIS PARAMETER MUST BE MANUALLY RESET TO 34 TO PREVENT ACCIDENTAL DAMAGE TO THE HEAD POSITIONING ASSEMBLY. ALSO CAUTION MUST BE TAKEN WHEN SINGLE STEPPING THE HEAD ASSEMBLY SO AS NOT TO EXCEED THE INNER LIMIT OF THE DRIVE (34th TRACK).

Perform the following steps in the order shown to properly operate the 9130K flexible disc drive:

1. Remove all power prior to connecting the DSU, adapter cable and disc drive.
2. Connect the equipment as shown in Figure 5-14.

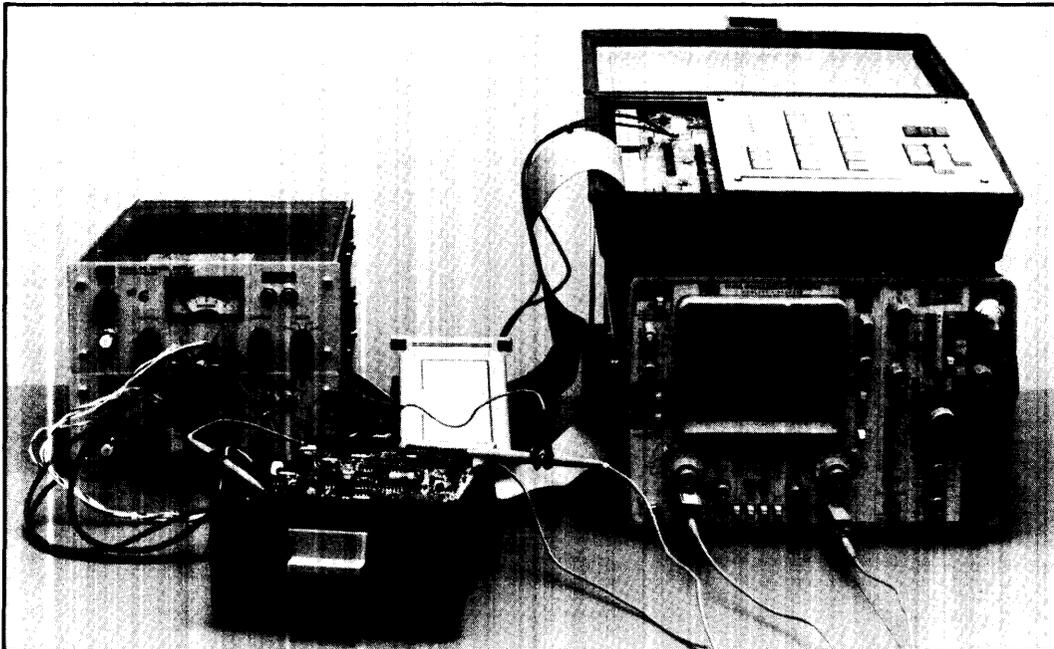


Figure 5-14: 9130K/DSU Test Setup

3. Apply power to the system. The DSU and adapter cable require +5VDC while the disc drive requires both +5VDC and +12VDC. A dual power supply capable of outputting +5VDC and +12VDC at 2ADC minimum is recommended.
4. Upon applying power, the DSU self test is initiated. This is evident by the three 8's seen on the DSU display. During the DSU self test, the drive motor will run. If the DSU self test fails, the DSU display will read "bAd". Re-initiate the self test by depressing the SYSTEM RESET pushbutton on the DSU. When the DSU has passed the self test, the DSU display will read "000" and the drive motor will stop. At this time the TRK 0, Drive Ready and RD/WR DATA LED's should be lit. If a write protected disc has been inserted into the drive, the WRITE PROTECTED LED will be lit.
5. Depress the DRIVE VALIDATE pushbutton (the drive is selected when the DRIVE VALIDATE pushbutton indicator is lit). The remaining DSU functions are now enabled by depressing the selected pushbuttons.

Packaging Instructions

The following instructions are provided to ensure proper packaging for safe shipment of the 9130K flexible disc drive assembly (less drive electronics board).

The following materials are required to package the drive assembly:

Description	HP Part Number
1—Outer Box	9211-3595
1—Inner Box	9211-3594
1—Foam Pac	4208-0368
1—Foam Latch Insert	9220-3448
2—Foam End Caps	9220-3450

To ensure damage free shipment of the 9130K drive assembly, follow these instructions:

1. Remove and retain the drive electronics board fastened to the top of the drive.
2. Open the front latch and insert the foam latch insert (P/N 9220-3448) as shown in Figure 5-15.

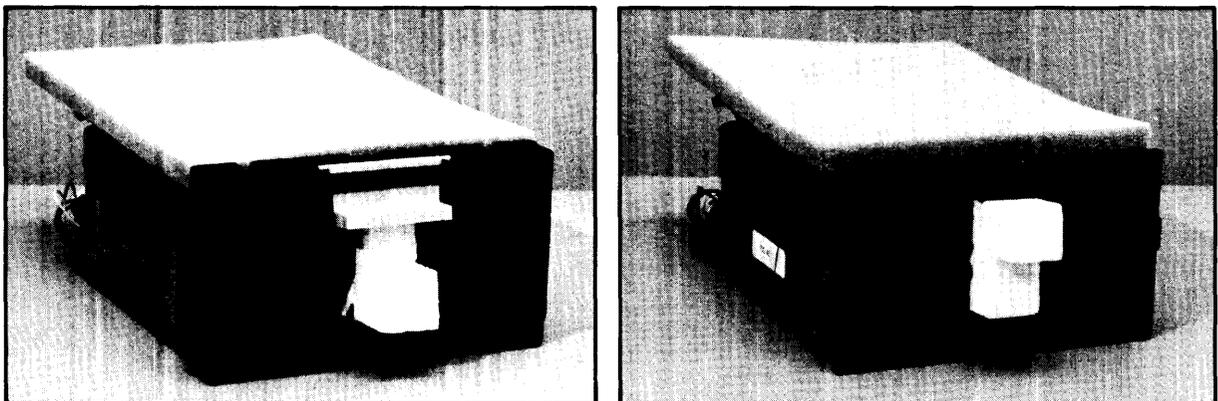


Figure 5-15: Foam Latch Insert

5-18 Maintenance

3. Place the foam pad (P/N 4208-0368) on top of the drive assembly and insert into the inner box (P/N 9211-3594) as shown in Figure 5-16.

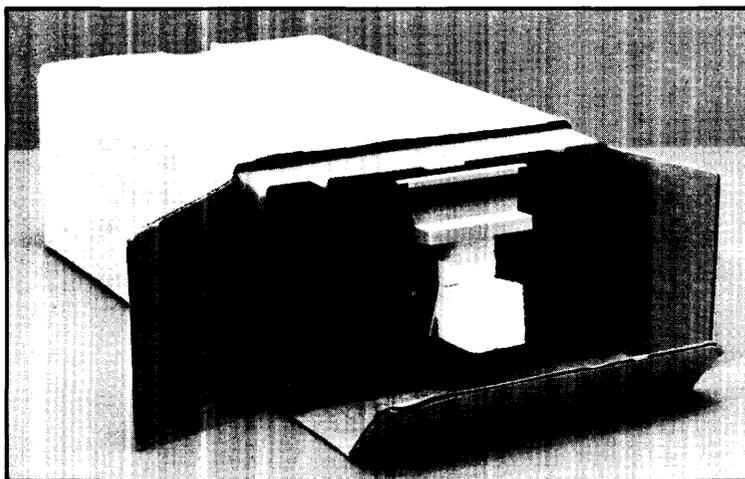


Figure 5-16: Inner Box

4. Refer to Figure 5-17 and close the inner box and insert into the two foam end caps (P/N 9220-3450).

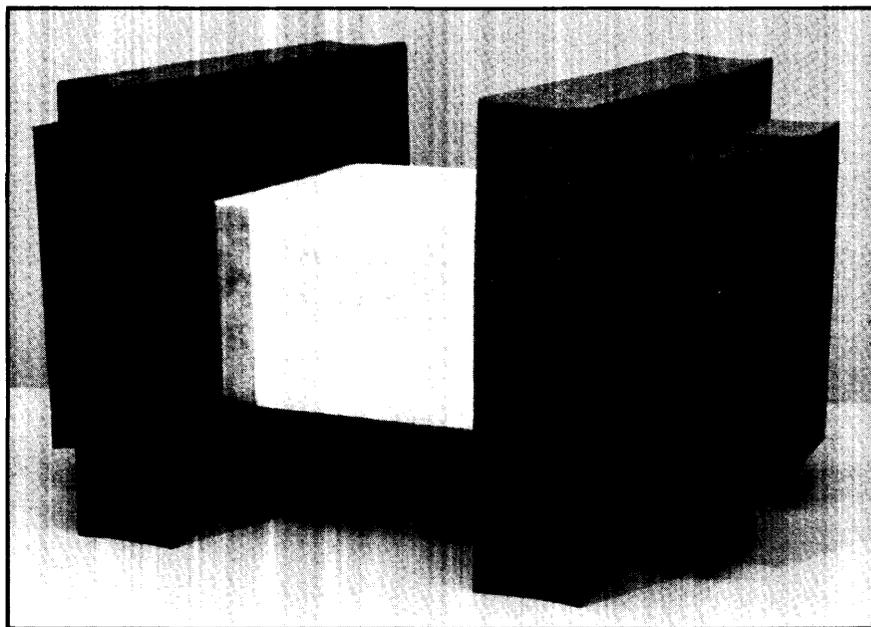


Figure 5-17: Foam End Caps

5. Now place the entire package into the large outer box (P/N 9211-3595) as shown in Figure 5-18 and seal with reinforced packaging tape.

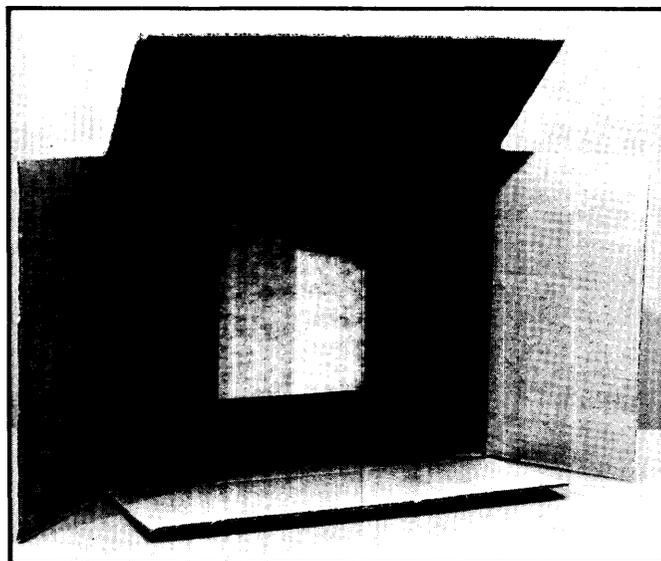


Figure 5-18: Outer Box

Test Point Location and Waveforms (P/N 09130-66501)

This section provides test point location and waveforms which can be observed at these points. To reproduce these waveforms, alignment disc P/N 9164-0151 must be used. The oscilloscope settings for each waveform is shown for each waveform.

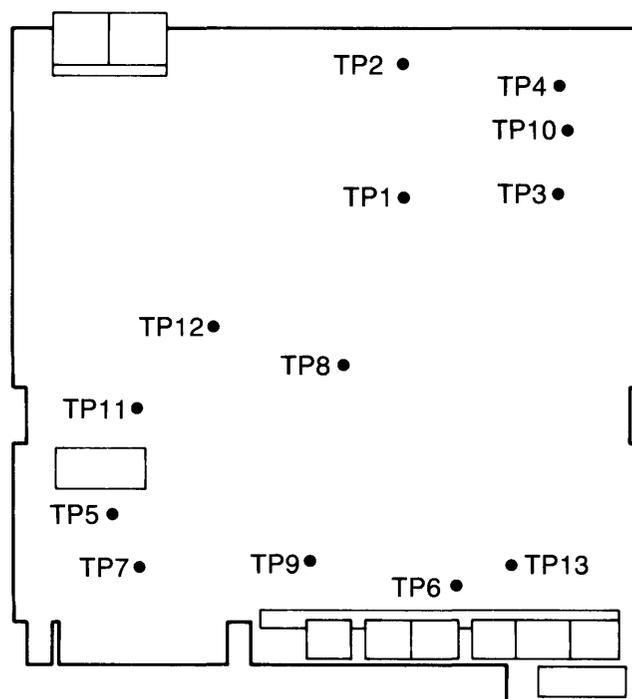


Figure 5-19: Test Point Locations (09130-66501)

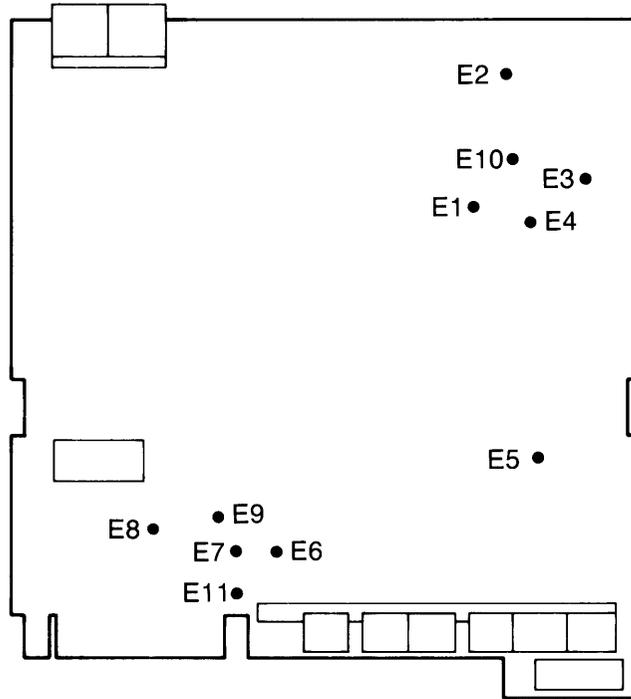
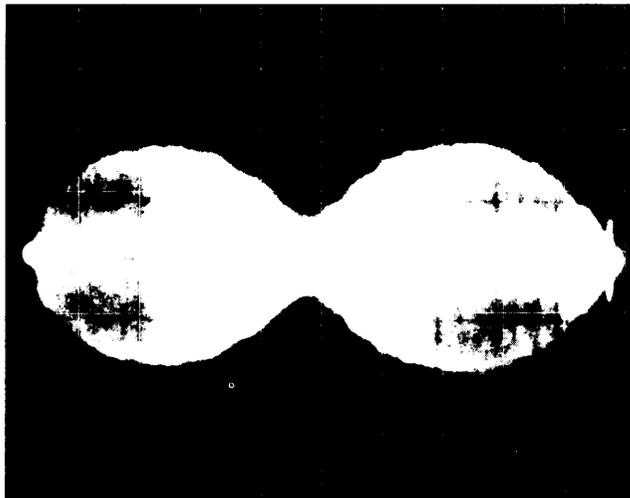
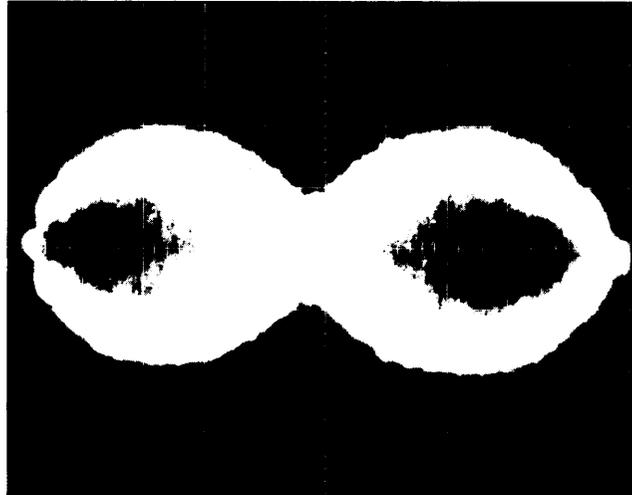


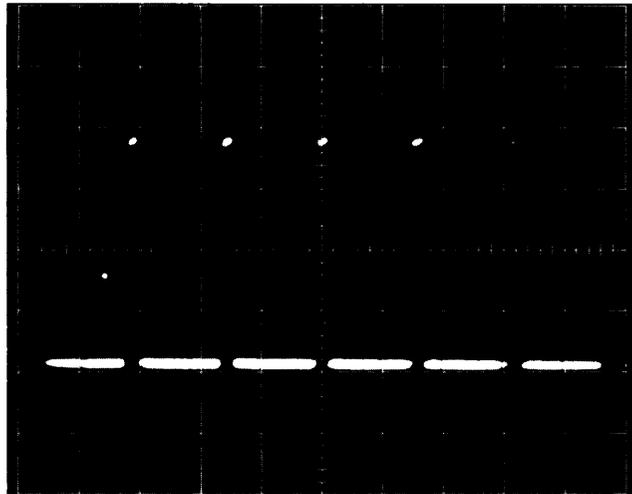
Figure 5-20: Test Point Locations (82901-66515)



TP1/TP2 (E1/E2) READ DATA (ANALOG)
Volts/DIV: .005V/DIV
Time/DIV: 10ms/DIV

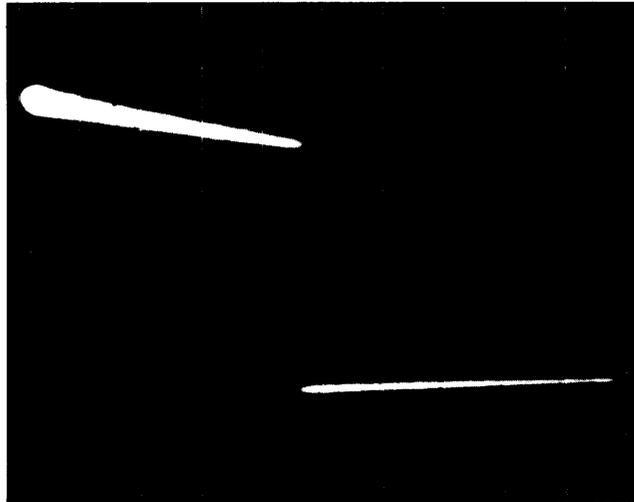


TP3/TP4 (E3/E4) DIFFERENTIATED READ DATA (ANALOG)
Volts/DIV: .01V/DIV
Time/DIV: 10ms/DIV

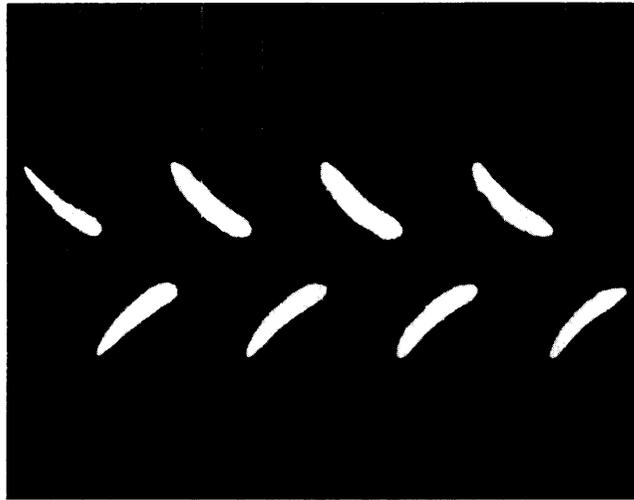


TP5 (E5) READ DATA (DIGITAL)
Volts/DIV: 1V/DIV
Time/DIV: 5us/DIV

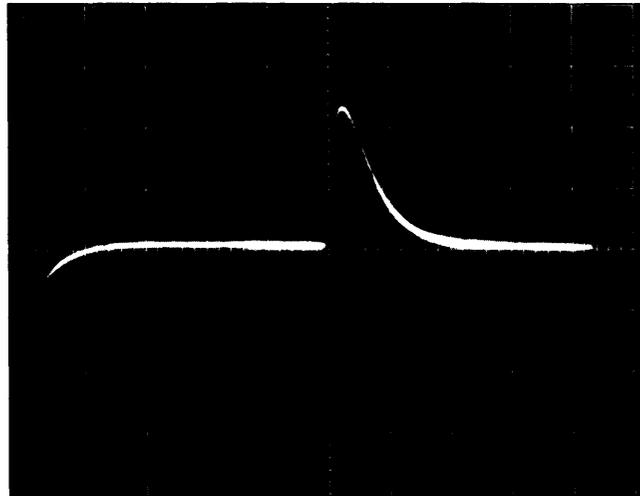
TP6 (E11) GROUND



TP7 (E7) INDEX
Volts/DIV: .1V/DIV
Time/DIV: 1ms/DIV



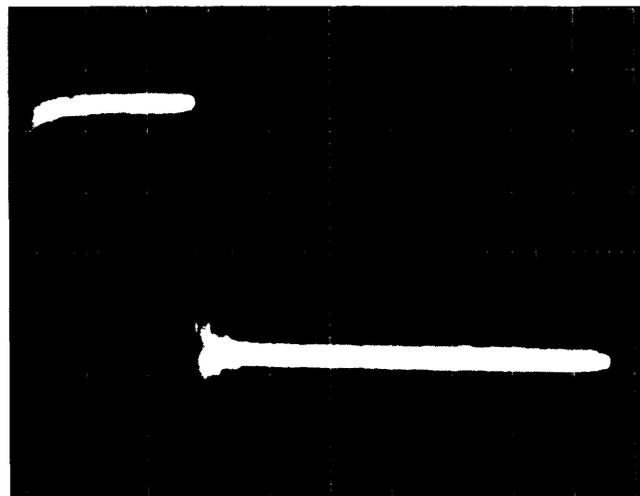
TP8 (E9) TRACK 0
Volts/DIV: 2V/DIV
Time/DIV: 10ms/DIV
Alternate seek track 0 and track 1
Step rate 10ms



TP9 (E8) WRITE PROTECT
Volts/DIV: 1V/DIV
Time/DIV: 10ms/DIV
Inserting disc gives positive transition
Removing disc gives negative transition

TP10 (E10) GROUND

TP11 DRIVE SELECT NO WAVEFORM



TP12 (U5-5) STEP
Volts/DIV: .2V/DIV
Time/DIV: 1us/DIV



TP13 MOTOR ON

Volts/DIV: .1V/DIV

Time/DIV: 10ms/DIV

Motor on gives negative transition

Motor off gives positive transition

NOTE

“E” numbers represent test points on the 82901-66515 drive board.

Chapter 6

Schematic Diagrams

Introduction

This chapter provides detailed schematic diagrams of the 9130K Flexible Disc Drive.

The assemblies for which the schematic diagrams are provided are as follows:

Drive Electronic Boards

09130-66501

82901-66515 (used on 82901X and 82902X drives)

Tandon Design (used on older 82901X and 82902X drives)

Servo Electronics Board

09130-66500

Tandon Design (used on older 82901X and 82902X drives)

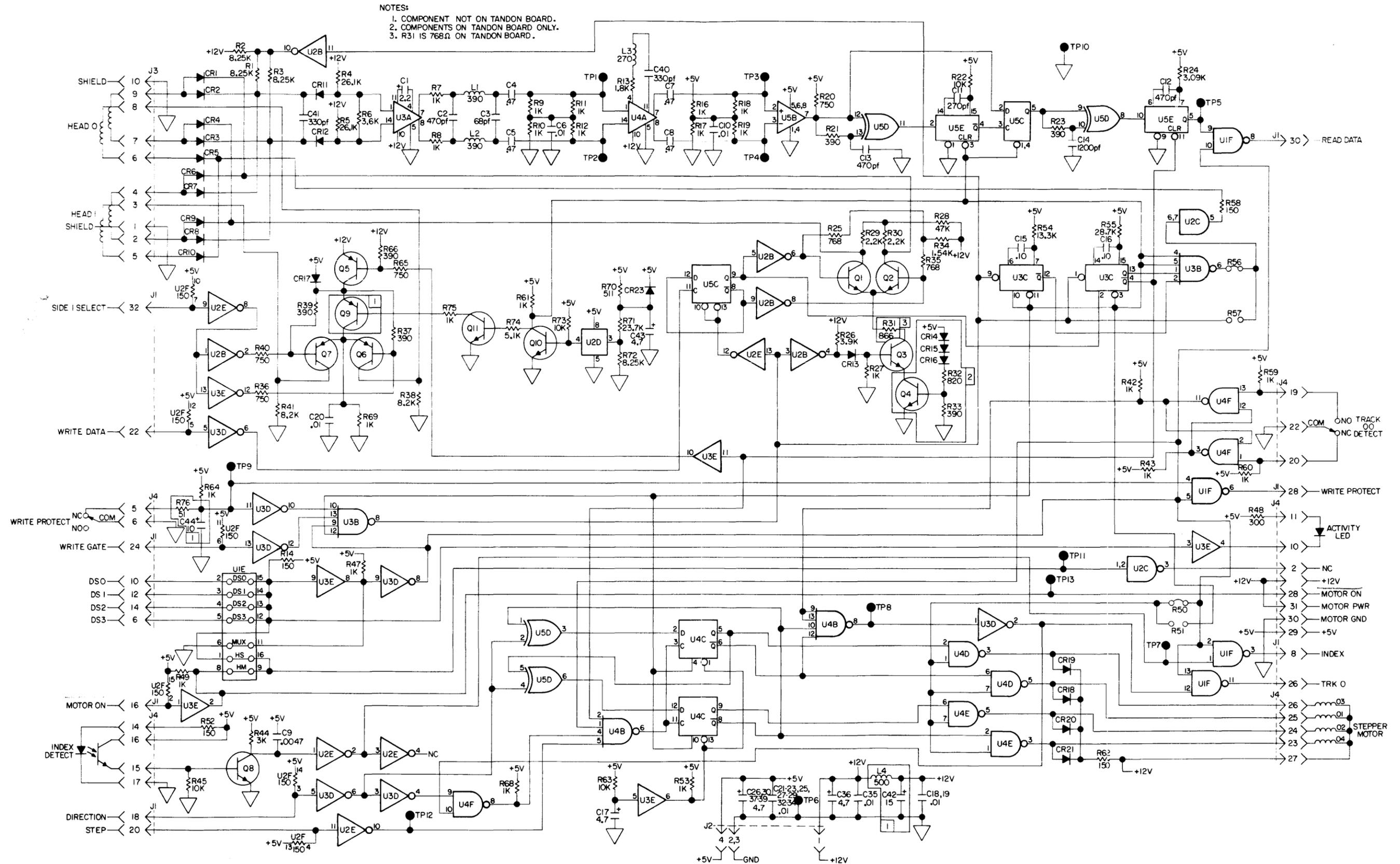
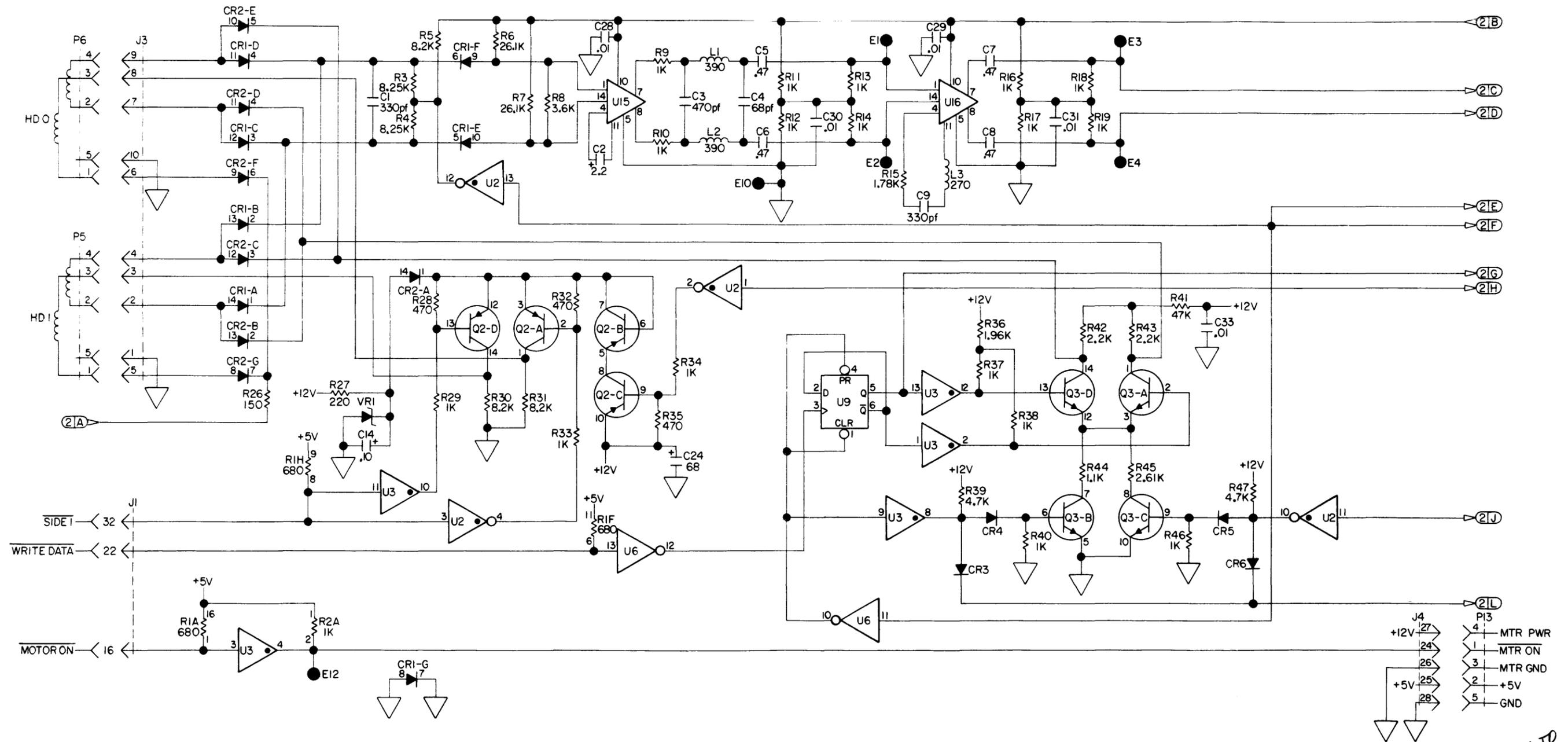


Figure 6-1: Drive Electronics Board P/N 09130-66501 Including Tandon Variations



J4 - ADD 4 TO PIN # TO MATCH 9130-66501 #

Figure 6-2: Drive Electronics Board P/N 82901-66515

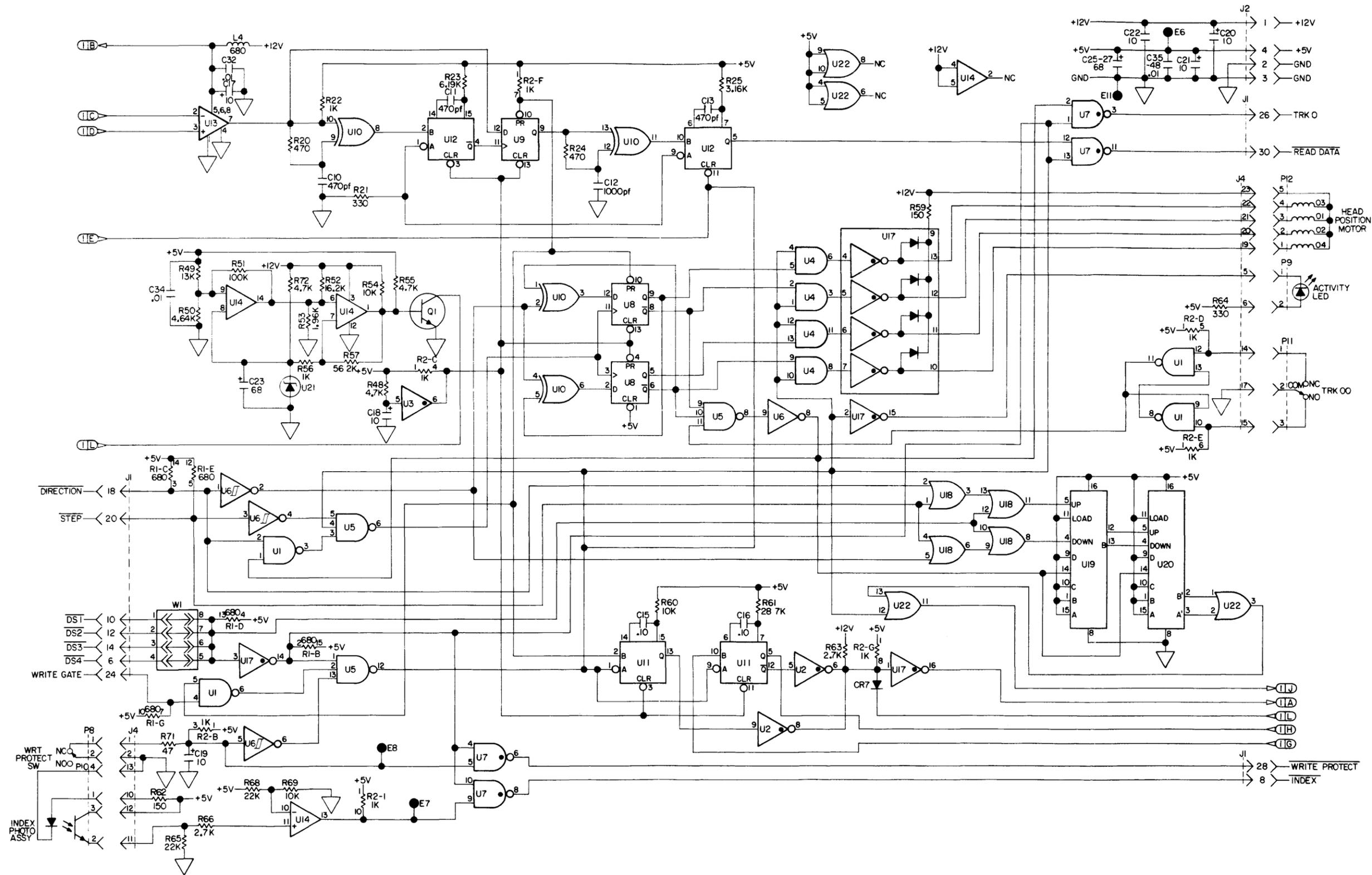


Figure 6-2: Drive Electronics P/N 82901-66515 (Continued)

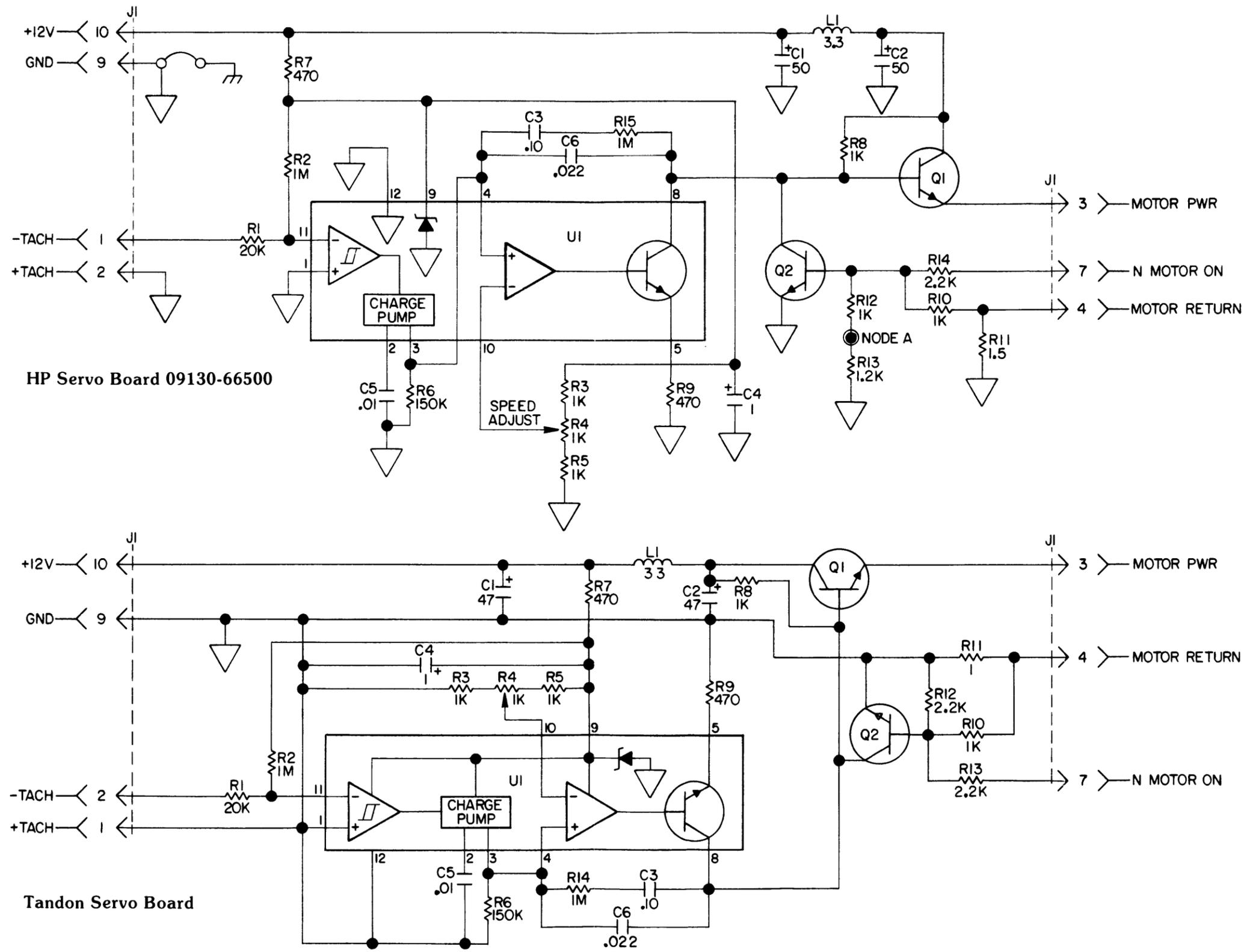


Figure 6-3: Servo Electronics Board P/N 09130-66500 Including Tandon Variations

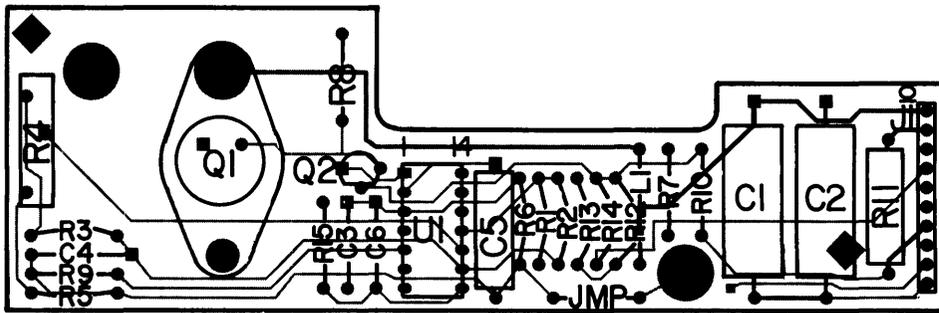


Figure 6-4. Servo Electronics Board Component Locator

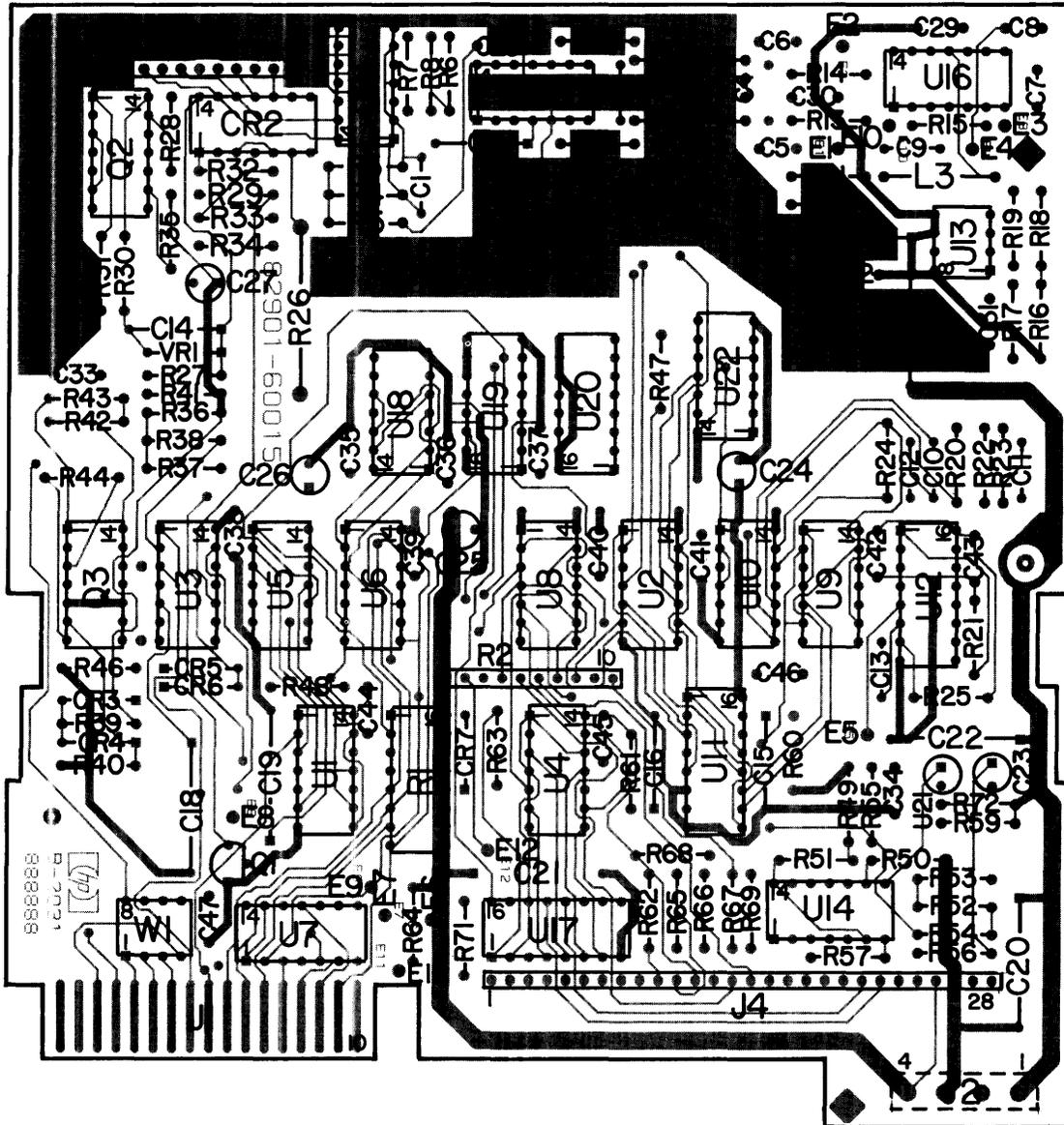


Figure 6-5. Drive Board P/N 82901-60015 Component Locator

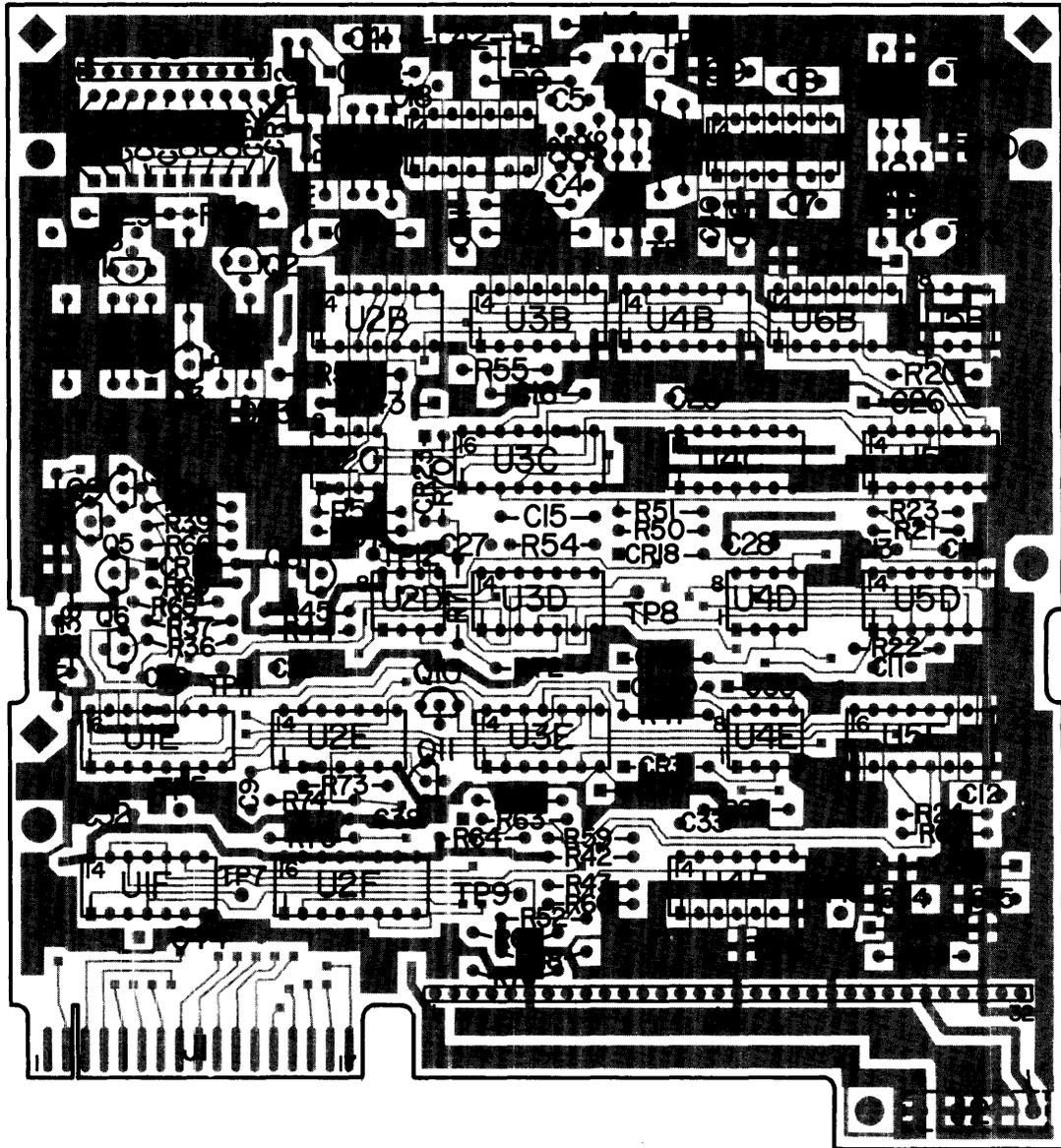


Figure 6-6. Drive Board P/N 09130-66501 Component Locator

Chapter 7

Replaceable Parts

Introduction

This chapter contains the complete replaceable parts list for the 9130K flexible disc drive. The parts list for the drive mechanical assembly is shown in disassembly order.

Reference designations are used in lieu of item numbers on printed circuit assemblies and the total quantity of each part is shown only once in the "TQ" column.

The check digit shown in the "CD" column is required when ordering a part from HP. Please include this number with your order.

The Tandon drive and servo electronics boards are not supported by HP. The replaceable parts lists for these boards are not supplied.

7-2 Replaceable Parts

9130K Flexible Disc Drive Replaceable Parts List

Level	Item Number	Ref Des	Part Number	CD	TQ	Description
1	1	A1	9130K 09130-66500	4 4	1	DISC DRIVE,FLEXIBLE SERVO ELECTRONICS BOARD
			ATTACHING PARTS			
2			2360-0454	4	2	SCREW,6-32X.5
2			0380-0340	7	2	SPACER,ROUND,.25 IN
2			2190-0007	2	1	WASHER,#6,LOCK

1	2	A2	09130-67900	0	1	DISC DRIVE ASSY
2	2		0950-0448	5	1	BELT,DRIVE
2	3		09130-67920	4	1	MOTOR ASSY,SERVO
3	4		1401-0180	0	1	CAP,MOTOR END
3	5		1600-1024	5	1	SHIELD,MOTOR
3	6		1251-3476	4	34	CONTACT,FEMALE
3	7	P21	1251-4273	1	1	CONNECTOR,5 PIN,FEMALE
3	8	M1	3140-0654	1	1	MOTOR,SPINDLE DRIVE
			ATTACHING PARTS			
2	9		3050-1056	8	2	WASHER,SHOULDER
2	10		2360-0332	7	2	SCREW,MACHINE,6-32

2	9		09130-67923	7	1	INDEX ASSY
			ATTACHING PARTS			
			2360-0331	6	1	SCREW,MACHINE,6-32
			2360-0117	6	1	SCREW,LOCKING,#6
			3050-0635	7	1	WASHER,FLAT

3	10	CR1	1990-0443	5	1	LED,INFRARED
3	11		4040-1852	2	1	HOLDER,EMITTER
3	12	P10	1251-3965	6	1	CONNECTOR,4 PIN,FEMALE
3	13	Q1	1990-0792	7	1	TRANSISTOR,PHOTO
3	14		4040-1851	1	1	HOLDER,DETECTOR
2			09130-67921	5	1	LEVER ASSY,CONE
			ATTACHING PARTS			
2			2360-0331	6	2	SCREW,MACHINE,6-32

3	15		4040-1945	4	1	CONE,CENTERING
			ATTACHING PARTS			
3			1531-0214	6	1	SHAFT,CONE
1	3		0510-0045	6	1	E-RING

3	16		09130-67921	5	1	CONE LEVER ASSY
3	17		1460-1918	8	1	SPRING,CONE RELEASE
3	18		4040-1947	6	1	EXPANDER,CONE

Level	Item Number	Ref Des	Part Number	CD	TQ	Description
3	19		1410-1130	1	1	BEARING, UPPER
3	20		3050-1040	0	1	WASHER, STEP
3	21		1460-1876	7	1	SPRING, CONE
3	22		3050-1069	3	1	WASHER, SHOULDER
3	23		3050-1045	5	1	WASHER, FLAT, SPECIAL
3	24		4208-0350	9	1	PAD, FOAM
3	25		0050-2049	8	2	LEVER, CONE
2	26		1600-1060	9	2	SPRING, CONE LEVER
			ATTACHING PARTS			
2			2360-0331	6		SCREW, MACHINE, 6-32
2			2190-0007	2	1	WASHER, LOCK
2			0360-1938	9	1	LUG, SOLDER

02	27		1500-0605	4	1	PULLEY, SPINDLE
			ATTACHING PARTS			
2			2510-0205	2	1	SCREW, MACHINE, 8-32
2			3050-0159	0		WASHER, FLAT, #8

2	28		1410-1131	2	1	BEARING, LOWER
2	29		1460-1877	8	1	SPRING, PRELOAD
2	30		1531-0187	2	1	SPACER, BEARING
2	31		1531-0189	4	1	SHAFT, HUB
2	32		1410-1132	3	1	BEARING, UPPER
			ATTACHING PARTS			
2			2360-0331	6	2	SCREW, MACHINE, 6-32
2			1600-1023	4	1	RETAINER, BEARING

2	33		4040-1843	1	1	GUIDE, LEFT
2	34		4040-1844	2	1	GUIDE, RIGHT
2	35		1531-0195	2	1	SCREW, CAM ADJUSTMENT
2	36		09130-67922	6	1	HEAD MODULE ASSY
			ATTACHING PARTS			
			2360-0332	6	3	SCREW, MACHINE, 6-32
			3050-0066	8	1	WASHER, FLAT, #6

3	37		4114-0917	5	1	COVER, MODULE
			ATTACHING PARTS			
3			2630-0331	6	2	SCREW, MACHINE, 6-32

3	38	P12	1251-4273	1	1	CONNECTOR, 4 PIN, FEMALE
3	39	M2	3140-0653	0	1	MOTOR, STEPPER
			ATTACHING PARTS			
3			0590-0199	9	2	NUT, HEX, W/LOCK WASHER

7-4 Replaceable Parts

Level	Item Number	Ref Des	Part Number	CD	TQ	Description

3	40		3030-0199	6	1	SET SCREW,4-40X9/16
3	41		4040-1853	3	1	BLOCK,TRACK 0
			ATTACHING PARTS			
3			2200-0591	2	2	SCREW,4-40X9/16

3	42		1400-1096	7	2	CLAMP,SHAFT
			ATTACHING PARTS			
3			2200-0592	3	1	SCREW,4-40X3/6

3	43	P5,P6	1531-0184	9	2	SHAFT,CARRIAGE
3	44		1251-4273	1	2	CONNECTOR,5 PIN,FEMALE
3	45		1600-1058	5	1	SPRING,BAND
			ATTACHING PARTS			
3			0610-0001	6	1	NUT,HEX
3			0520-0155	0	3	SCREW,MACHINE,2-56

3	46		3030-0189	4	1	SCREW,SOCKET,4-40
3	47		1500-0607	6	1	COLLAR,CLAMPING
3	48		1531-0200	0	1	PULEY,STEPPER
3	49		09130-88887	6	1	CARRIAGE/HEAD ASSY
2	50		0570-1180	8	1	SCREW,TRACK 0 ADJUST
2	51		0510-0261	8	2	E-RING
2	52		09130-67916	8	1	SWITCH ASSY.WRITE PROTECT
			ATTACHING PARTS			
2			2360-0331	6	1	SCREW,MACHINE,6-32

3	53	P8	1251-3965	6	1	CONNECTOR,4 PIN,FEMALE
3	54		1400-1094	5	1	BRACKET,SWITCH
			ATTACHING PARTS			
			0520-0131	2	2	SCREW,MACHINE,2-56
			3050-0098	6	2	WASHER,FLAT
			0590-1311	9	1	NUTPLATE,2-56

3	55	S1	3101-2437	0	1	SWITCH.WRITE PROTECT
2	56		09130-67917	9	1	SWITCH ASSY,TRACK 0 1
			ATTACHING PARTS			
			2360-0331	6	1	SCREW,MACHINE,6-32

3	57	P11	1251-3965	6	1	CONNECTOR,4 PIN,FEMALE
3	58		1600-1025	6	1	BRACKET,SWITCH

Level	Item Number	Ref Des	Part Number	CD	TQ	Description
			ATTACHING PARTS			
			2200-0149	6	2	SCREW,MACHINE,4-40
			3050-0222	8	2	WASHER,FLAT
			0590-1312	0	1	NUTPLATE,4-40

3	59	S2	3101-2438	1	1	SWITCH,TRACK 0
2	60		1600-1059	6	2	SPRING,MODULE
2	61		4040-1847	5	1	HOLDER,SPRING
			ATTACHING PARTS			
			2360-0370	3	2	SCREW,MACHINE,6-32

2	62		09130-61604	9	1	LED ASSY,FRONT PANEL
3	63	P9	1251-3965	6	1	CONNECTOR,4 PIN,FEMALE
3	64	CR3	1990-0794	9	1	DIODE,LED,RED
2	65		1450-0610	4	1	BUSHING/COLLAR,LED
2	66		09130-61602	7	1	JUMPER CABLE,SERVO
3	67	P13,P20	1251-3965	6	2	CONNECTOR,4 PIN,FEMALE
2	68		7101-0585	9	1	CHASSIS

Servo Board Parts List

REFERENCE DESIGNATOR	CHECK DIGIT	HP PART NUMBER	TOTAL QUANT.	DESCRIPTION
A2	4	09130-66500		BOARD:SERVO ELECTRONICS
C1	0	0180-0058	2	C-F:50UF:25V
C2	0	0180-0058		C-F:50UF:25V
C3	0	0160-4557	1	C-F:1UF:50V
C4	3	0180-0291	1	C-F:1UF:35V
C5	3	0160-5334	1	C-F:01UF:100V
C6	5	0160-4833	1	C-F:022UF:100V
J1	3	1251-4051	1	CONNECTOR:10 PIN
L1	0	9140-0607	1	COIL:3.3UF:10
Q1	4	1854-0648	1	TRANSISTOR:2N6300
Q2	1	1854-0215	1	TRANSISTOR:2N3904
R1	3	0683-2035	1	R-F:20K OHM:5:25W
R2	5	0683-1055	2	R-F:1M OHM:5:25W
R3	3	0757-0280	2	R-F:1K OHM:1:125W
R4	7	2100-3154	1	R-F:THERMISTOR:1K OHM:10
R5	3	0757-0280		R-F:1K OHM:1:125W
R6	0	0757-0469	1	R-F:150K OHM:1:125W
R7	0	0683-4715	2	R-F:470 OHM:5:25W
R8	9	0683-1025	3	R-F:1K OHM:5:25W
R9	0	0683-4715		R-F:470 OHM:5:25W
R10	9	0683-1025		R-F:1K OHM:5:25W
R11	9	0811-1668	1	R-F:1.5 OHM:5:2W
R12	9	0683-1025		R-F:1K OHM:5:25W
R13	1	0683-1225	1	R-F:1.2K OHM:5:25W
R14	3	0683-2225	1	R-F:2.2K OHM:5:25W
U1	1	1826-0842	1	IC:LM2917
	5	1205-0438	1	HEAT SINK
	5	2420-001	1	NUT:#6
	2	2360-0121	1	SCREW:#6X.5

09130-66501 Parts List

REFERENCE DESIGNATOR	CHECK DIGIT	HP PART NUMBER	TOTAL QUANT.	DESCRIPTION
A1	5	09130-66501		BOARD:DRIVE ELECTRONICS
C1	8	0180-0197	1	C-F:2.2UF:20V
C2	7	0160-5205	3	C-F:470PF:200V
C3	8	0160-5206	1	C-F:68PF:200V
C4	1	0160-4441	4	C-F:47UF:50V
C5	1	0160-4441		C-F:47UF:50V
C6	9	0160-2055	16	C-F:01UF:100V
C7	1	0160-4441		C-F:47UF:50V
C8	1	0160-4441		C-F:47UF:50V
C9	3	0160-5219		C-F:4700PF:100V
C10	9	0160-2055		C-F:01UF:100V
C11	0	0160-5208	1	C-F:270UF:100V
C12	7	0160-5205		C-F:470PF:200V
C13	7	0160-5205		C-F:470PF:200V
C14	9	0160-5207	1	C-F:1200PF:100V
C15	7	0160-4835	2	C-F:1UF:50V
C16	7	0160-4835		C-F:1UF:50V
C17	3	0180-0100	8	C-F:4.7UF:35V
C18	9	0160-2055		C-F:01UF:100V
C19	9	0160-2055		C-F:01UF:100V
C20	9	0160-2055		C-F:01UF:100V
C21	9	0160-2055		C-F:01UF:100V
C22	9	0160-2055		C-F:01UF:100V
C23	9	0160-2055		C-F:01UF:100V
C25	9	0160-2055		C-F:01UF:100V
C26	3	0180-0100		C-F:4.7UF:35V
C27	9	0160-2055		C-F:01UF:100V
C28	9	0160-2055		C-F:01UF:100V
C29	9	0160-2055		C-F:01UF:100V
C30	3	0180-0100		C-F:4.7UF:35V
C32	9	0160-2055		C-F:01UF:100V
C33	9	0160-2055		C-F:01UF:100V
C34	9	0160-2055		C-F:01UF:100V
C35	9	0160-2055		C-F:01UF:100V
C36	3	0180-0100		C-F:4.7UF:35V
C37	3	0180-0100		C-F:4.7UF:35V
C38	3	0180-0100		C-F:4.7UF:35V
C39	3	0180-0100		C-F:4.7UF:35V
C40	1	0160-5209	2	C-F:330PF:200V
C41	1	0160-5209		C-F:330PF:200V
C42	5	0180-1746	1	C-F:15UF:20V
C43	3	0180-0100		C-F:4.7UF:35V
C44	3	0180-0374		C-F:10UF:20V
CR1	3	1901-0050		DIODE:SWITCHING
CR2	3	1901-0050		DIODE:SWITCHING
CR3	3	1901-0050		DIODE:SWITCHING
CR4	3	1901-0050		DIODE:SWITCHING
CR5	3	1901-0050		DIODE:SWITCHING
CR6	3	1901-0050		DIODE:SWITCHING
CR7	3	1901-0050		DIODE:SWITCHING
CR8	3	1901-0050		DIODE:SWITCHING
CR9	3	1901-0050		DIODE:SWITCHING
CR10	3	1901-0050		DIODE:SWITCHING
CR11	3	1901-0050		DIODE:SWITCHING
CR12	3	1901-0050		DIODE:SWITCHING
CR13	3	1901-0050		DIODE:SWITCHING

REFERENCE DESIGNATOR	CHECK DIGIT	HP PART NUMBER	TOTAL QUANT.	DESCRIPTION
CR17	3	1901-0050		DIODE:SWITCHING
CR18	3	1901-0050		DIODE:SWITCHING
CR19	3	1901-0050		DIODE:SWITCHING
CR20	3	1901-0050		DIODE:SWITCHING
CR21	3	1901-0050		DIODE:SWITCHING
CR23	4	1901-0704	1	DIODE:1N4002
J2	7	1251-4617	1	CONNECTOR:4 PIN
J3	3	1251-4051	1	CONNECTOR:10 PIN
J4	7	1251-5855	2	CONNECTOR:16 PIN (2 REQUIRED)
L1	8	9100-2283	2	COIL:3900UH:10
L2	8	9100-2283		COIL:3900UH:10
L3	6	9100-2281	1	COIL:270UF:10
L4	8	9140-0118	1	COIL:500UH:5
Q1	1	1854-0215	6	TRANSISTOR:2N3904
Q2	1	1854-0215		TRANSISTOR:2N3904
Q3	1	1854-0215		TRANSISTOR:2N3904
Q5	2	1853-0036	4	TRANSISTOR:2N3906
Q6	2	1853-0036		TRANSISTOR:2N3906
Q7	2	1853-0036		TRANSISTOR:2N3906
Q8	1	1854-0215		TRANSISTOR:2N3904
Q9	2	1853-0036		TRANSISTOR:2N3906
Q10	1	1854-0215		TRANSISTOR:2N3904
Q11	1	1854-0215		TRANSISTOR:2N3904
R1	8	0757-0441	4	R-F:8.25K OHM:1: .125W
R2	8	0757-0441		R-F:8.25K OHM:1: .125W
R3	8	0757-0441		R-F:8.25K OHM:1: .125W
R4	5	0698-3159	2	R-F:26.1K OHM:1: .125W
R5	5	0698-3159		R-F:26.1K OHM:1: .125W
R6	9	0683-3625	1	R-F:3.6K OHM:5: .25W
R7	9	0683-1025	23	R-F:1K OHM:5: .25W
R8	9	0683-1025		R-F:1K OHM:5: .25W
R9	9	0683-1025		R-F:1K OHM:5: .25W
R10	9	0683-1025		R-F:1K OHM:5: .25W
R11	9	0683-1025		R-F:1K OHM:5: .25W
R12	9	0683-1025		R-F:1K OHM:5: .25W
R13	7	0683-1825	1	R-F:1.8K OHM:5: .25W
R14	2	0683-1515	3	R-F:150 OHM:5: .25W
R16	9	0683-1025		R-F:1K OHM:5: .25W
R17	9	0683-1025		R-F:1K OHM:5: .25W
R18	9	0683-1025		R-F:1K OHM:5: .25W
R19	9	0683-1025		R-F:1K OHM:5: .25W
R20	4	0683-7515	4	R-F:750 OHM:5: .25W
R21	0	0683-3915	5	R-F:390 OHM:5: .25W
R22	1	0683-1035	4	R-F:10K OHM:5: .25W
R23	0	0683-3915		R-F:390 OHM:5: .25W
R24	5	0698-4438	1	R-F:3.09K OHM:1: .125W
R25	5	0698-4462	2	R-F:768 OHM:1: .125W
R26	2	0683-3925	1	R-F:3.9K OHM:5: .25W
R27	9	0683-1025		R-F:1K OHM:5: .25W
R28	4	0683-4735	1	R-F:47K OHM:5: .25W
R29	3	0683-2225	2	R-F:2.2K OHM:5: .25W
R30	3	0683-2225		R-F:2.2K OHM:5: .25W
R31	2	0698-3495	1	R-F:866 OHM:1: .125W
R34	0	0698-4425	1	R-F:1.54K OHM:1: .125W
R35	5	0698-4462		R-F:768 OHM:1: .125W
R36	4	0683-7515		R-F:750 OHM:5: .25W
R37	0	0683-3915		R-F:390 OHM:5: .25W
R38	5	0683-8225	2	R-F:8.2K OHM:5: .25W
R39	0	0683-3915		R-F:390 OHM:5: .25W

7-8 Replaceable Parts

REFERENCE DESIGNATOR	CHECK DIGIT	HP PART NUMBER	TOTAL QUANT.	DESCRIPTION
R40	4	0683-7515		R-F:750 OHM;5;.25W
R41	5	0683-8225		R-F:8.2K OHM;5;.25W
R42	9	0683-1025		R-F:1K OHM;5;.25W
R43	9	0683-1025		R-F:1K OHM;5;.25W
R44	3	0683-3025	1	R-F:3K OHM;5;.25W
R45	1	0683-1035		R-F:10K OHM;5;.25W
R47	9	0683-1025		R-F:1K OHM;5;.25W
R48	1	0683-3015	1	R-F:300 OHM;5;.25W
R49	9	0683-1025		R-F:1K OHM;5;.25W
R52	2	0683-1515		R-F:150 OHM;5;.25W
R53	9	0683-1025		R-F:1K OHM;5;.25W
R54	2	0757-0289	1	R-F:13.3K OHM;1;.125W
R55	6	0698-3449	1	R-F:28.7K OHM;1;.125W
R58	9	0698-3624	1	R-F:150 OHM;1;.125W
R59	9	0683-1025		R-F:1K OHM;5;.25W
R60	9	0683-1025	1	R-F:1K OHM;5;.25W
R61	9	0683-1025		R-F:1K OHM;5;.25W
R62	2	0683-1515		R-F:150 OHM;5;.25W
R63	1	0683-1035		R-F:10K OHM;5;.25W
R64	9	0683-1025		R-F:1K OHM;5;.25W
R65	4	0683-7515		R-F:750 OHM;5;.25W
R66	0	0683-3915		R-F:390 OHM;5;.25W
R68	9	0683-1025		R-F:1K OHM;5;.25W
R69	9	0683-1025		R-F:1K OHM;5;.25W
R70	7	0757-0416	1	R-F:511 OHM;1;.125W
R71	4	0698-3158	1	R-F:23.7K OHM;1;.125W
R72	8	0757-0441		R-F:8.25K OHM;1;.125W
R73	1	0683-1035		R-F:10K OHM;5;.25W
R74	8	0683-5125	1	R-F:5.1K OHM;5;.25W
R75	9	0683-1025		R-F:1K OHM;5;.25W
R76	4	0683-5105	1	R-F:51 OHM;5;.25W
U1E	4	1251-4292	1	SHUNT BLOCK
U1F	2	1820-0621	1	IC:7438N
U2B	0	1820-0471	1	IC:SN7406N
U2C	4	1820-2520	1	IC:SN75463N
U2D	5	1826-0408	1	IC:ICL8212
U2E	5	1820-1416	1	IC:74LS14
U2F	2	1810-0325	1	IC:RESISTOR PACK
U3A	9	1826-0064	1	IC:733
U3B	9	1820-1204	2	IC:74LS20
U3C	2	1820-0621	1	IC:7438N
U3D	0	1820-0174	1	IC:SN7404N
U3E	7	1820-0668	1	IC:SN7407
U4A	6	1826-0194	1	IC:NE592
U4B	9	1820-1204		IC:74LS20
U4C	8	1820-1112	2	IC:74LS74
U4D	5	1820-2208	2	IC:SN75462P
U4E	5	1820-2208		IC:SN75462P
U4F	2	1820-0621	1	IC:7438N
U5B	0	1826-0065	1	IC:LM311N
U5C	8	1820-1112		IC:74LS74
U5D	8	1820-1211	1	IC:74LS86
U5E	7	1820-1260		IC:SN74221N
XU1E	8	1200-0853	2	SOCKET:IC:16 PIN
XU2F	8	1200-0853		SOCKET:IC:16 PIN
	8	0380-1331	2	SPACER
	4	4040-1854	1	SHIELD

82901-66515 Parts List

REFERENCE DESIGNATOR	CHECK DIGIT	HP PART NUMBER	TOTAL QUANT.	DESCRIPTION
A1	8	82901-66515		BOARD:DRIVE ELECTRONICS
C1	8	0160-4810	2	C-F:330PF;100V
C2	7	0180-2514	1	C-F:2.2UF;35V
C3	0	0160-3335	4	C-F:470PF;100V
C4	1	0160-4350	1	C-F:68PF;200V
C5	1	0160-4441	4	C-F:47UF;50V
C6	1	0160-4441		C-F:47UF;50V
C7	1	0160-4441		C-F:47UF;50V
C8	1	0160-4441		C-F:47UF;50V
C9	8	0160-4810		C-F:330PF;100V
C10	0	0160-3335		C-F:470PF;100V
C11	0	0160-3335		C-F:470PF;100V
C12	1	0160-4574	1	C-F:1000PF;100V
C13	0	0160-3335		C-F:470PF;100V
C14	2	0180-1743	3	C-F:1UF;35V
C15	2	0180-1743		C-F:1UF;35V
C16	2	0180-1743		C-F:1UF;35V
C17	3	0180-0374	6	C-F:10UF;20V
C18	3	0180-0374		C-F:10UF;20V
C19	3	0180-0374		C-F:10UF;20V
C20	3	0180-0374		C-F:10UF;20V
C21	3	0180-0374		C-F:10UF;20V
C22	3	0180-0374		C-F:10UF;20V
C23	1	0180-2617	5	C-F:68UF;35V
C24	1	0180-2617		C-F:68UF;35V
C25	1	0180-2617		C-F:68UF;35V
C26	1	0180-2617		C-F:68UF;35V
C27	1	0180-2617		C-F:68UF;35V
C28	9	0160-2055	20	C-F:01UF;100V
C29	9	0160-2055		C-F:01UF;100V
C30	9	0160-2055		C-F:01UF;100V
C31	9	0160-2055		C-F:01UF;100V
C32	9	0160-2055		C-F:01UF;100V
C33	9	0160-2055		C-F:01UF;100V
C34	9	0160-2055		C-F:01UF;100V
C35	9	0160-2055		C-F:01UF;100V
C36	9	0160-2055		C-F:01UF;100V
C37	9	0160-2055		C-F:01UF;100V
C38	9	0160-2055		C-F:01UF;100V
C39	9	0160-2055		C-F:01UF;100V
C40	9	0160-2055		C-F:01UF;100V
C41	9	0160-2055		C-F:01UF;100V
C42	9	0160-2055		C-F:01UF;100V
C43	9	0160-2055		C-F:01UF;100V
C44	9	0160-2055		C-F:01UF;100V
C45	9	0160-2055		C-F:01UF;100V
C46	9	0160-2055		C-F:01UF;100V
C47	9	0160-2055		C-F:01UF;100V
CR1	1	1906-0248	1	DIODE:PACK
CR3	1	1901-1098	5	DIODE:1N4150
CR4	1	1901-1098		DIODE:1N4150
CR5	1	1901-1098		DIODE:1N4150
CR6	1	1901-1098		DIODE:1N4150
CR7	1	1901-1098		DIODE:1N4150
J2	7	1251-4617	1	CONNECTOR:4 PIN

7-10 Replaceable Parts

REFERENCE DESIGNATOR	CHECK DIGIT	HP PART NUMBER	TOTAL QUANT.	DESCRIPTION
J3	3	1251-4051	1	CONNECTOR:10 PIN
J4	1	1251-6849	1	CONNECTOR:28 PIN
J5	8	1200-0796	1	SOCKET:IC:8 PIN
L1	4	9100-1645	2	COIL:390UH:5
L2	4	9100-1645		COIL:390UH:5
L3	1	9100-1642	1	COIL:270UH:5
L4	1	9100-1650	1	COIL:680UH:5
Q1	1	1854-0215	1	TRANSISTOR:2N3904
Q2	2	1858-0052	1	TRANSISTOR:Q2T2905
Q3	3	1858-0053	1	TRANSISTOR:Q2T2222
R1	9	1810-0265	1 680	IC:RESISTOR PACK
R2	1	1810-0275	1 1K	IC:RESISTOR PACK
R3	8	0757-0441	2	R-F:8.25K OHM:1.:125W
R4	8	0757-0441		R-F:8.25K OHM:1.:125W
R5	5	0683-8225	3	R-F:8.2K OHM:5.:25W
R6	5	0698-3159	2	R-F:26.1K OHM:1.:125W
R7	5	0698-3159		R-F:26.1K OHM:1.:125W
R8	9	0683-3625	1	9 R-F:3.6K OHM:5.:25W
R9	9	0683-1025	16	R-F:1K OHM:5.:25W
R10	9	0683-1025		R-F:1K OHM:5.:25W
R11	9	0683-1025		R-F:1K OHM:5.:25W
R12	9	0683-1025		R-F:1K OHM:5.:25W
R13	9	0683-1025		R-F:1K OHM:5.:25W
R14	9	0683-1025		R-F:1K OHM:5.:25W
R15	9	0757-0278	1	R-F:1.78K OHM:1.:125W
R16	9	0683-1025		R-F:1K OHM:5.:25W
R17	9	0683-1025		R-F:1K OHM:5.:25W
R18	9	0683-1025		R-F:1K OHM:5.:25W
R19	9	0683-1025		R-F:1K OHM:5.:25W
R20	0	0683-4715	5	R-F:470 OHM:5.:25W
R21	4	0683-3315	2	R-F:330 OHM:5.:25W
R22	9	0683-1025		R-F:1K OHM:5.:25W
R23	5	0757-0290	1	5 R-F:6.19K OHM:1.:125W
R24	0	0683-4715		R-F:470 OHM:5.:25W
R25	0	0757-0279	1	R-F:3.16K OHM:1.:125W
R26	9	0698-3624	1	R-F:150 OHM:5.:125W
R28	0	0683-4715		R-F:470 OHM:5.:25W
R29	9	0683-1025		R-F:1K OHM:5.:25W
R30	5	0683-8225		R-F:8.2K OHM:5.:25W
R31	5	0683-8225		R-F:8.2K OHM:5.:25W
R32	0	0683-4715		R-F:470 OHM:5.:25W
R33	9	0683-1025		R-F:1K OHM:5.:25W
R34	9	0683-1025		R-F:1K OHM:5.:25W
R35	0	0683-4715		R-F:470 OHM:5.:25W
R36	8	0698-0083	2	R-F:1.96K OHM:1.:125W
R37	3	0757-0280	3	R-F:1K OHM:1.:125W
R38	3	0757-0280		R-F:1K OHM:1.:125W
R39	2	0683-4725	5	R-F:4.7K OHM:5.:25W
R40	9	0683-1025		R-F:1K OHM:5.:25W
R41	4	0683-4735	1	R-F:47K OHM:5.:25W
R42	3	0683-2225	2	R-F:2.2K OHM:5.:25W
R43	3	0683-2225		R-F:2.2K OHM:5.:25W
R44	7	0757-0424	1	R-F:1.1K OHM:1.:125W
R45	0	0698-0085	1	R-F:2.61K OHM:1.:125W
R46	9	0683-1025		R-F:1K OHM:5.:25W
R47	2	0683-4725		R-F:4.7K OHM:5.:25W
R48	2	0683-4725		R-F:4.7K OHM:5.:25W
R49	2	0757-0445	1	R-F:13K OHM:1.:125W
R50	1	0698-3155	1	R-F:4.64K OHM:1.:125W

REFERENCE DESIGNATOR	CHECK DIGIT	HP PART NUMBER	TOTAL QUANT.	DESCRIPTION
R51	6	0757-0465	1	R-F:100K OHM;1;.125W
R52	4	0757-0447	1	R-F:16.2K OHM;1;.125W
R53	8	0698-0083		R-F:1.96K OHM;1;.125W
R54	1	0683-1035	2	R-F:10K OHM;5;.25W
R55	2	0683-4725		R-F:4.7K OHM;5;.25W
R56	3	0757-0280		R-F:1K OHM;1;.125W
R57	8	0757-0459	1	R-F:56.2K OHM;1;.125W
R59	2	0683-1515	2	R-F:150 OHM;5;.25W
R60	9	0757-0442	1	R-F:10K OHM;1;.125W
R61	6	0698-3449	1	R-F:28.7K OHM;1;.125W
R62	2	0683-1515		R-F:150 OHM;5;.25W
R63	8	0683-2725	2	R-F:2.7K OHM;5;.25W
R64	4	0683-3315	2	R-F:330 OHM;5;.25W
R65	5	0683-2235	2	R-F:22K OHM;5;.25W
R66	8	0683-2725		R-F:2.7K OHM;5;.25W
R68	5	0683-2235		R-F:22K OHM;5;.25W
R69	1	0683-1035		R-F:10K OHM;5;.25W
R71	8	0683-4705	1	R-F:47 OHM;5;.25W
R72	2	0683-4725		R-F:4.7K OHM;5;.25W
U1	9	1820-1197	1	IC:74LS00
U3	7	1820-0668	1	IC:SN7407
U4	9	1820-1204	1	IC:74LS20
U5	7	1820-1202	1	IC:74LS10
U6	5	1820-1416	1	IC:74LS14
U7	4	1820-1209	1	IC:74LS38
U8	8	1820-1112	2	IC:74LS74
U9	8	1820-1112		IC:74LS74
U10	8	1820-1211	1	IC:74LS86
U11	4	1820-1423	1	IC:74LS123
U12	0	1820-1437	1	IC:74LS221
U13	0	1826-0065	1	IC:LM311
U14	8	1826-0138	1	IC:LM339
U15	6	1826-0194	2	IC:NE592
U16	6	1826-0194		IC:NE592
U17	2	1858-0573	1	IC:TRANSISTOR ARRAY
U18	3	1820-1208	2	IC:74LS32
U19	6	1820-1194	2	IC:74LS193
U20	6	1820-1194		IC:74LS193
U21	5	1826-0573	1	IC:ICL8069DCQ
U22	3	1820-1208		IC:74LS32
VR1	8	1902-0954	1	DIODE:ZENER:6.8V
	9	0340-0883		INSUL:XISTOR



**HEWLETT
PACKARD**

Change Sheet

**9130K Flexible Disc Drive
9130K Flexible Disc Drive Service Manual**

(For Manual P/N 09130-90030 Dated July 1, 1981)

Page 3-8:

Add:

Disc Drive Jumper Configurations

Each 9130K Flexible Disc Drive is shipped with a jumper block installed on the drive electronics board. The specific configuration of the jumper block installed depends on the board part number and the particular installation.

The jumper configurations described here are found on the 82901-60015, 09130-66501 and the Tandon design drive electronics boards.

The jumpers on the 09130-66501 and the Tandon design drive electronics boards are located in a 16 pin DIP socket designated U1E. The drives are shipped with all the jumpers on the block intact. Selected jumpers must be cut to set the drives select number etc.

Consult the following configuration matrix to determine when the jumpers should be in place.

The jumpers and their functions are listed in the following table

Jumper Name	U1E Pin Numbers	Function
HS	1 and 16	The head load solenoid is activated when the drive is selected if this jumper is left intact. Since the 9130K drive does not have a head load solenoid, this jumper is a don't care.
DS0	2 and 15	When this jumper is intact, the drive responds to drive address 0.
DS1	3 and 14	When this jumper is intact, the drive responds to drive address 1.
DS2	4 and 13	When this jumper is intact, the drive responds to drive address 2.
DS3	5 and 12	When this jumper is intact, the drive responds to drive address 3.
MUX	6 and 11	When this jumper is intact, the drive is always selected.

June 11, 1982

Supplement to 09130-90030

NOT USED	7 and 10	This jumper is not used.
HM	8 and 9	When this jumper is intact, the head load solenoid is activated when the motor is turned on. If both the HS and HM jumpers are left intact, the motor will come on when the drive is selected. The 9130K and Tandon drives are shipped with 7 jumpers in the jumper block (the HM jumper is left open).

An 8 pin DIP socket, designated W1, is used on the 82901-60015 drive board for drive address selection. To set a drive to a selected address, a jumper is installed in the jumper block. The drive boards are shipped from the factory with a jumper installed in the DS0 slot. The jumpers and their functions are as follows:

Jumper Name	W1 Pin Numbers	Function
DS0	1 and 8	When this jumper is installed, the drive will respond to drive address 0.
DS1	2 and 7	When this jumper is installed, the drive will respond to drive address 1.
DS2	3 and 6	When this jumper is installed, the drive will respond to drive address 2.
DS3	4 and 5	When this jumper is installed, the drive will respond to drive address 3.

Termination Resistor Packages

Drive electronics boards P/N 82901-60015 each have a termination resistor package soldered in place. The purpose of the resistor pack is to terminate the bus on multiple drive installations.

On drive electronics board P/N 09130-66501, the 16 pin DIP socket designated U2F is for insertion of the termination resistor package.

Consult the configuration matrix to determine what type of resistor package to insert into this socket.

9130K Configuration Matrix

Product	Drive Electronics	Drive Select Jumpers	Resistor Pack	Servo PCA Ground Strap	Latch	Bezel
82901M	82901-60015	Drive 0 : p1 - p8 Drive 1 : p2 - p7	1810-0265	Intact	09130-67918	4040-1838
	09130-66501	Drive 0 : p2 - p15 Drive 1 : p3 - p14	1810-0402	Intact	09130-67918	4040-1838
82902M	82901-60015	Drive 0 : p1 - p8	1810-0265	Intact	09130-67918	4040-1838
	09130-66501	Drive 0 : p2 - p15	1810-0402	Intact	09130-67918	4040-1838
82901S	82901-60015	Drive 2 : p3 - p6 Drive 3 : p4 - p5	1810-0265	Intact	09130-67918	4040-1838
	09130-66501	Drive 2 : p4 - p13 Drive 3 : p5 - p12	1810-0265	Intact	09130-67918	4040-1838
82902S	82901-60015	Drive 2 : p3 - p6	1810-0265	Intact	09130-67918	4040-1838
	09130-66501	Drive 2 : p4 - p13	1810-0265	Intact	09130-67918	4040-1838
9130A	09130-66501	Either Drive: p2 - p15	1810-0402	Intact	4040-1914	4040-1915
9135A	09130-66501	p2 - p15	1810-0325	Intact	09130-67918	4040-1838
9826/9836	09130-66501	p6 - p11 or all positions	1810-0325	Intact	4040-1914	4040-1915
13272A	13270-60002	N/A	N/A	Intact	4040-1914	4040-1915
64100B/ 64110A	09130-66501	p6 - p11 or all positions	1810-0325	Cut	4040-1913	4040-1915

I N T E R - O F F I C E S E R V I C E M E M O

Date: 3/14/81

TO: Technical Support & Customer Engineers, U.S., Canada,
 Europe and ICON

FROM: Mitch Stein, Service Engineer, Greeley Division

SUBJECT: 9130K Support Plan

1.0 PRODUCT DESCRIPTION

The 9130K Minifloppy Disc Drive provides random access mass storage for HP products. Each removable 133mm (5.25") disc has approximately 270K bytes of formatted data storage.

This high volume product is being concurrently produced by both HP's Greeley Division and Tandon Magnetics Corp. of Chatsworth, California. Over the next few years HP will ramp up to assume the large majority of production, while Tandon will remain a second source.

The product is intended to be sold as an ICOEM device, to be integrated into the using division's products.

The 9130K makes several contributions to HP products:

1. A high performance alternative to the DC100 cartridge tape.
2. The ability to transfer data to and from other HP products with minifloppies using the HP logical interchange format.
3. A fast and simple to use offline mass storage device.
4. Provides an efficient means of distributing and loading software.

1.1.0 PHYSICAL DESCRIPTION

The 9130K drive can be mounted in either a vertical or horizontal plane.

The spindle is belt driven by a DC motor with an integral tachometer. The correct spindle speed is maintained by a



servo control circuit. The double-sided read/write head assembly is positioned by a stepper motor, pulley and split band assembly.

The read/write/erase head assembly is a glass-bonded ferrite/ceramic structure with a life expectancy of approximately 20,000 hours.

Operator access for disc loading is provided via a slot located at the front of the unit.

The electronic components of the drive are mounted on two PCA's one of which (spindle motor servo) is located on the back of the drive and the other (drive electronics) is mounted on the top. Power and signal connectors plug directly into the drive electronics PCA.

There are currently four different drive electronics PCA's in use within the corporation which differ slightly in form and features, although all are based on the same Tandon circuit. This is due to the independent development of products at different divisions, previous to the decision to adopt the Tandon minifloppy as the corporate standard.

1.1.1 FUNCTIONAL DESCRIPTION

The 9130K consists of three basic systems: Spindle drive, head positioning and read/write/erase systems.

When the front latch is opened, access is provided for the insertion of a disc. The disc is located by plastic side rails and the front latch. In/out location is ensured if the disc is inserted until a back stop is encountered.

There are presently two different front panel/latch systems being manufactured: the original Tandon front panel/latch (Opt 50) as seen on the HP model 82901 M/S flexible disc drive system, and the HP sub-front panel/latch (Opt 51) as seen on the HP model 2642A terminal. In addition there will be two different colored latches used with the HP front panel, which are easily interchangeable.

Closing the front latch activates the cone/clamp system resulting in centering of the disc and clamping of the disc to the drive hub. The drive hub is driven at a constant speed of 300 rpm by a servo controlled dc motor. In operation, the magnetic heads are loaded into contact with the media whenever the front latch is closed.

The heads are positioned over the desired track by means of

a four-phase stepper motor/band assembly and its associated electronics. This positioner employs a one-step rotation to cause a one-track linear movement.

When performing a write operation, a 0.33mm (0.013 inch) (nominal) data track is recorded. This track is then tunnel erased to 0.30mm (0.012 inch) (nominal).

Data recovery electronics include a low-level read amplifier, differentiator, zero-crossing detector and digitizing circuits.

No data encoding/decoding facilities are presently provided on the drive.

The drive is also supplied with the following sensor systems: a track 0 switch which senses when the head/carriage assembly is positioned at track 0; an index sensor, which consists of a photoemitter/detector pair, and is positioned such that the index hole on the disc is detected; a write protect sensor which disables the drive's write electronics when a write protect tab is placed on the left side notch of the disc.

The 9130K uses an HP 133.4mm (5.25 inch) double-sided, double density disc which is soft-sectored, p/n 92190A (box of 10).

1.1.2 MECHANICAL SPECIFICATIONS

Dimensions

(to bezel surfaces)	Tandon Bezel	HP Bezel (Approx)
Height	85.8mm (3.38 in)	86.0mm (3.39 in)
Width	149.1mm (5.87 in)	156.0mm (6.14 in)
Mounting Depth	210.5mm (8.29 in)	211.0mm (8.31 in)
Weight	1.5 Kg (3.3 lbs)	

Disc Speed 300 rpm + 1.5% (long term)
Speed Variation $\pm 1.5\%$ @ any frequency

Start Time 250 msec max

Seek Time 5 msec track to track

Head Setting Time 20 msec max (includes final step time of 5 msec)

Head Life 20,000 hrs typ, using HP media

Media	Industry compat 5.25" disc
Tracks/Inch	48
Recording Surfaces	2/disc
Tracks/Side	35
Sectors/Track	16
Bytes/Sector	256
Total Capacity	286,720 bytes formatted
Temp Limits (operating)	10 to 50 deg C (50 to 125 deg F)
Relative Humidity (op)	8-80% (non condensing)
Life (min)	138 hours rotation (2.5 Mrevs) @20 deg C & 50% R.H.

Note: Only HP media is approved for use in the 9130 flexible disc drive. Use of other media can result in premature disc failure or damage to the drive. HP media will always have an HP label on it.

HP rigorously tests each batch of media for error rate and wear performance in addition to initial vendor qualification. Only in this way can we assure proper error rate and wear test performance.

Using non-HP media for single use applications such as data interchange will probably not damage the drive or media but if extended use is anticipated, the data must be transferred to HP media.

Extended use of non-HP media may void warranty and service contracts on the product.

1.1.3 PERFORMANCE SPECIFICATIONS

Maximum error rates with interchange using HP qualified media and HP approved controller

- a) soft read errors - 1 in 10^9 bits read
- b) seek errors - 1 in 10^6 seeks

"Soft error" is defined as an error that can be recovered from using an HP approved retry scheme.

1.1.4 ELECTRICAL SPECIFICATIONS

Power Consumption	+12 Vdc + 0.6V @ 900 ma Avg +5 Vdc + 0.25 V @ 600 ma Avg
Recording Mode	MFM (modified Freq Modulation)
Transfer Rate	164 bits/sec burst nominal (Interleave 1), Data dependent

1.1.5 ENVIRONMENTAL SPECIFICATIONS

Ambient Temperature

Operating	10 to 44 deg C (50 to 111 deg F)
Non-Operating	-40 to 71 deg C (-40 to 160 deg F)
Relative Humidity	20% to 80%, with max wet bulb
Operating	temp not to exceed 29.4 deg C (84.9 deg F)
Non-Operating	20% to 80% (non-condensing)
Vibration (operating)	3 axis, 5-55-5 Hz, 15 min., .38mm amplitude

Particulate Matter	
Maximum Particle Size	
Maximum Particle Hardness	Currently No Spec
Maximum Particle Density	
EMC	
Perform to specs w/	
Magnetic Field Suscep.	1Gauss p-p 47.5 - 198 Hz
Mag Field Interference	5.25mGauss @ 4.6m from surface
Radiated Susceptibility	10V/m 14kHz - 1GHz
Conducted Susceptibility	100mV. ripple on 12 & 5V lines DC - 400MHz
Heat Dissipation	15W max, 8.4W typ.
Altitude	
Operating	0 to 400m (0 to 15,000 ft)
Non-Operating	-300 to 15,200m (-1000 to 50,000 ft)
Caustic Environment	
Tolerance	Currently No Spec

1.2 FAILURE RATE

The 9130K has an expected long term annual failure rate of 9%, at a 10% duty cycle.

These failure rate predictions do not take into account any external factors, such as harsh environments, customer misuse of mechanism and media, vendor quality problems, etc.

Note: The heads are loaded any time the latch is closed, but the spindle motor only turns when the drive is selected.

1.3 CONFIGURATION

The 9130K is an ANSI standard 5.25" minifloppy drive that can be configured in a system of one to four drives per controller using either horizontal or vertical orientation.

2.0 SUPPORT STRATEGY

The 9130K support strategy will be used in conjunction with that of the host product.

The host product will have a two part service kit. Part 1 will be the 9130K service kit, used to repair the disc drive(s), and Part 2 will be the product dependent service kit, used to repair the rest of the product.

Having a single support strategy for all 9130K's regardless of their host insures a consistent, efficient, unambiguous approach to service.

2.1 INSTALLATION PLAN

The installation plan of the 9130K will be strictly dependent on that of its host product.

2.2.0 REPAIR METHODS

Because the 9130K will be used in many different products, crossing all product types, it is important to provide repair methods for all potential situations.

2.2.1 ON-SITE

On-site service will essentially be an assembly interchange situation. Because of the different color latches used, it may be necessary to change latches on the exchange assembly.

Drive electronics and drive mechanisms will be freely interchangeable with no adjustments required for proper drive function.

Replacement assemblies are as follows:

- Drive Board
- Spindle Motor
- Servo Board
- Belt
- Latch
- Bezel

There is one type of exchange assembly; a drive mechanism with servo electronics and without drive board. There are two different configurations of this exchange assembly, one using the Tandon bezel, and one using the HP bezel.

The following adjustments may be done on-site:

- Motor Speed
- Spindle Motor Replacement
- Servo Board Replacement
- Spindle Belt Replacement
- Drive Board Replacement
- Latch Replacement
- Latch Alignment & Lubrication
- Index Timing *
- Track 0 Switch *
- Radial Alignment *
- Azimuth (Head 1) *

*Although it is possible to perform these adjustments on site with the proper tools, they are not recommended, due to their delicate nature.

2.2.2 BENCH REPAIR

All of the above mentioned on-site repairs may be done on the bench in addition to component repair of most of the sub assemblies, at the CE's discretion.

2.2.3.0 SUPPORT PACKAGE

The 9130K will have a standard support package that will be used regardless of host product, with one exception. The 8290X service kit will substitute an exchange drive with a Tandon front panel for the one with an HP front panel.

This approach allows the field office to only order 9130K service kits as needed instead of duplicating them for every using product service kit, thus optimizing their inventory.

2.2.3.1 FSI

Part Number 09130-67197*

This FSI will include the exchange assembly only until March 1982.

CK DGT	PART NUMBER	R/X	DESCRIPTION	QTY	TOT LIST PRICE	EXCH PRICE
7	09130-69600	X	Drive Mech w/Servo Elect, HP pnl, Grey Latch (same as 9130K Opt 051)	1	650.00	350.00
5	09130-66501	R	Drive Elec PCA	1	235.00	
4	09130-66500	R	Servo Elec PCA	1	62.50	
7	4040-1914	R	HP Latch Grey	2	8.20	
6	4040-1913	R	HP Latch, Brown	2	8.20	
8	4040-1915	R	HP Front Panel	1	9.75	
1	1600-1137	R	Media Lift Inhib.	1	4.10	
3	0510-0042	R	Retaining Clip	4	.40	
0	1400-0249	R	Cable Tie	10	1.00	
5	0950-0448	R	Drive Belt	4	56.00	
4	09130-67920	R	Spindle Motor	2	92.00	
2	7121-1451	R	Strobe Label	10	5.00	

*The 9130K service kit for the 8290X will use optional FSI part number 09130-67198 which will be identical with the exception of substituting exchange assembly 09130-69601 (same as 9130K Opt 050, Tandon front panel) for 09130-69600 (HP panel/grey latch).

The exchange drives will be packed in exchange assy box # 09130-67910.

2.2.3.2 PSP

The PSP for all versions of the 9130K is as follows:
Part Number 09130-67100

CK DGT	PART NUMBER	R/X	DESCRIPTION	QTY	HP COST	TOT LIST PRICE
9	9164-0151	PSP	Alignment Disc	1	55.00	205.00
1	9164-0129	PSP	Blank Disc (10 Pack)	1	16.50	75.00
2	6040-0521	PSP	Molley Cote Grease	1	4.60	24.00
1	8710-1385	PSP	Spindle Motor Adj Tool	1	.75	4.90

2.2.3.3 SERVICE KIT PRICING

The prices for service kits are as follows:

FSI:	09130-67197	\$832.15
	09130-67198	\$832.15
PSP:	09130-67100	
	HP Service only	\$ 76.85
	List Price	\$308.90

2.2.4 PARTS

Every 9130K part will be set up at CPC & PCE. In addition to component parts, the following service only assemblies will be set up under 913K Opt. SRV:

CK DGT	HP P/N	DESCRIPTION
9	09130- 61602	Servo Jumper
8	09130- 61604	Bezel LED
7	09130-67923	Index
6	09130-67922	Head/Stepper Module
5	09130-67921	Cone Lever
4	09130-67920	Spindle Motor
0	09130-67918	Tandon Latch
9	09130-67917	Track 0 Switch
8	09130-67916	Write Protect Switch
7	09130-67915	Stepper Motor

2.2.5 TOOLS

The following is a list of recommended tools for on-site use:

HP P/N	DESCRIPTION
8710-0899	#1 Pozi-driver
8710-0900	#2 Pozi-driver
8710-0059	Straight screwdriver
8710-0033	Insulated shank pot-adjustment screwdriver
8710-0006	Diagonal cutters, 5"
8710-1065	Long nose pliers
8710-1385	Spindle motor adjustment tool
Optional	
1740A	O-scope-----
6253A	Power supply, dual output 5-12Vdc --- or equiv.
12748-60008	Disc Service Unit (DSU)
09130-61606	9130K DSU adapter
8720-0001	Nut driver, 3/16" thinwall

2.2.6 DIAGNOSTICS & SELF TEST

The 9130K has no onboard diagnostics or self test, all must be provided by the host product. (These include alignment, hysteresis, motor speed, read/write, etc.)

2.3 SERVICE CONTRACTS

Although service contracts will be written for host products, and not specifically for the 9130K, service pricing will still be calculated and approved by CSD. These prices will be used as an incremental factor in computing a product's overall pricing.

SMMC	BMMC	PMMC	FMMC
\$8	\$7	\$6	\$4

2.4 CUSTOMER SELF SUPPORT PLAN

There are presently several products under development that are integrating the 9130K in such a way as to make it customer replaceable. This is accomplished by making the drive easily removable (such as a snap off cosmetic front panel, giving access to a slide mounted drive) and keeping it shielded from hazardous voltages and currents.

In the customer replacement mode, the user would first run the

mainframe diagnostics that would, to an acceptable confidence level, isolate the problem to the drive itself. The customer would then remove the drive and replace it with his spare and retest, and/or send the drive to his nearest regional repair center for participation in the exchange program.

2.5 TECHNICAL SUPPORT CAPABILITIES

There will be a wide base of technical competence on the 9130K. In addition to the expertise at Greeley Division there will be one or more experts at every using division, including the service engineer for the using product(s). In addition the TSO will be well versed in the support of the 9130K as will the CEO due to the sheer numbers that they will see.

3.0 TRAINING

Training will be broken down into two levels:

- 1) Basic -- assembly swap
- 2) Advanced -- exchange assembly and component repair

The basic training, intended for CE's and customers wishing to service their own equipment will be provided on video tape in conjunction with the service manual. The tape, p/n 9036RZ, is available for \$35 from corporate video.

Advanced training is intended for TSE's and CSD personnel in addition to service and production engineers from using divisions. This training may also be provided on video tape and will include detailed theory of operation and troubleshooting techniques suitable for component repair of the drives. This will also include the use of advanced diagnostic equipment intended for factory and CSD use.

4.0 DOCUMENTATION

Service documentation will be provided in the form of an insert for the using products service manual, as well as a separate manual p/n 09130-90030.

The 9130K service manual will be as complete as possible, including: in-depth theory of operation, complete schematics, exploded drawings of all assemblies, complete parts lists (including every screw and resistor), recommended troubleshooting procedures for both assembly swap and component repairs, descriptions and instructions for use of all available test equipment, etc.

5.0 WARRANTY

Administration of warranty policies for the 9130K, e.g. on-site vs return to HP, and 90-day vs 1 year, will be determined by the host product.