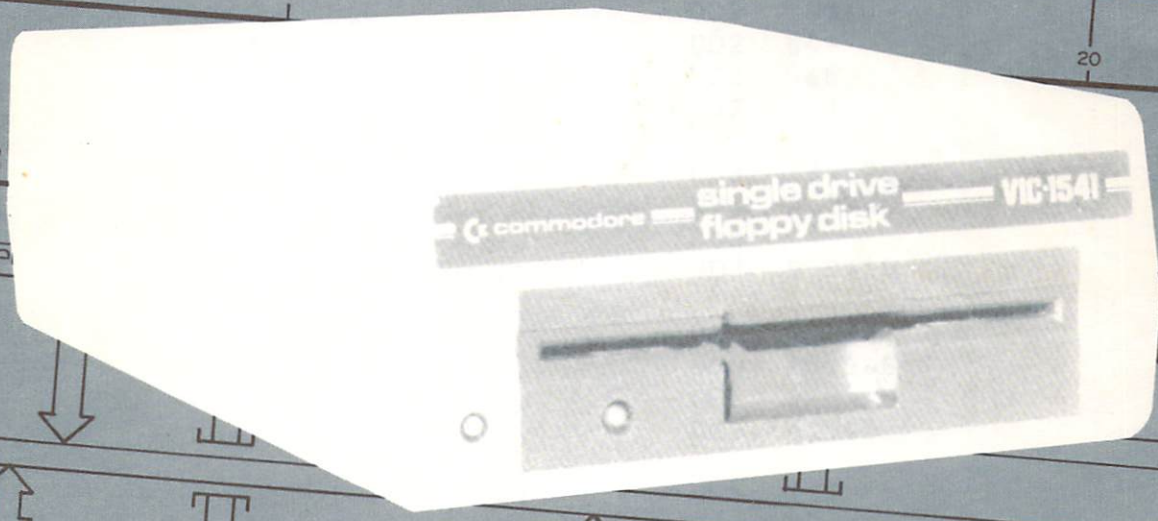
1541 Single Drive Floppy Disk
MAINTENANCE MANUAL

SUPPLEMENT



Michael G Peltier

COVER PAGE

The enclosed pages are revisions to the 1541 Single Drive Floppy Disk MAINTENANCE MANUAL. They include additional information for the 1541 Disk Drive and information on how to maintain the VIC-1541 (1540). At the time of the first printing, this information was not available. The author wanted all purchasers of this manual to have all available information so this supplement is being furnished to all persons who purchased the first printing. Simply insert the enclosed pages in the appropriate places in the manual. If any questions arise, the author may still be contacted at his address listed on the Acknowledgements page. Please note the alignment system discussed in the new Paragraph 5-5. Thank you for your business.

PREFACE

This manual contains information for the maintenance and repair of the VIC-1541 and 1541 Disk Drives. This manual can help you save on repair bills, reduce down time and improve the reliability of your VIC-1541/1541. A brief description of the information contained in this manual is given as follows:

Introduction-A narrative description of the use of this manual, as well as a brief description of the assemblies contained in the VIC-1541/1541.

Theory of Operation-A narrative description of electrical and mechanical theory of operation, including block diagrams and schematic excerpts.

Initial Configuration-Step by step procedures for verifying that the VIC-1541/1541 is operating properly.

Calibration-Step by step procedures for calibrating disk rpm's, head alignment and adjusting Track #1 stop.

Disassembly/Reassembly-Step by step procedures for the disassembly/reassembly of the VIC-1541/1541.

Preventive Maintenance-Step by step procedures for preventive maintenance, including cleaning and head care instructions.

Troubleshooting-Written in two parts: Part 1 gives step by step, fully illustrated, procedures for isolating a problem down to the PC Board or assembly level and is written with the novice in mind; Part 2 is written for the experienced technician and contains narrative instructions, backed up by 33 waveforms, to isolate a problem down to an integrated circuit or to a discrete component.

Schematics and Parts Layout-Complete schematics, interconnect diagram, sub-assembly identification and parts layout.

Appendices-Contain test equipment specifications, assembly instructions for test accessories, CMOS handling precautions, parts list and, in Appendix F, a narrative discussion of the differences between the VIC-1541 and the 1541, along with cross-reference tables.

All references in Sections 1 thru 9 of this manual refer to the VIC-1541 disk drive. Appendix F must be consulted for information concerning the 1541 disk drive.

Commodore Business Machines, Inc., and the author of this manual advise that any attempt to repair the VIC-1541 or the 1541 disk drives during the warranty period will void the factory warranty.

Section 4-PERFORMANCE TEST

Section 5-CALIBRATION

Section 6-DISASSEMBLY/REASSEMBLY

Section 7-PREVENTIVE MAINTENANCE

Section 8-TROUBLESHOOTING

Section 9-SCHEMATICS AND PARTS LAYOUT

APPENDICES

Section 2-THEORY OF OPERATION

2-1. Overall Theory

The VIC-1541 consists mainly of three sub-assemblies: disk controller PC Board, drive unit and frame.

The frame sub-assembly provides the power supply on the drive controller PC Board with +9 Vrms and +16 Vrms, which are derived from the 120 VAC power input. (Refer to Section 3 for selection of input power.)

The drive unit sub-assembly is capable of reading or writing to or from a floppy disk. The drive unit is also capable of rotating the floppy disk, changing read/write head location, detecting write protect status, and magnetically reading or writing data.

The disk controller PC Board sub-assembly includes the power supply, read/write circuitry, track select circuitry, timing circuitry, and a 6502-based computer. The computer operates the drive unit as well as managing the floppy disk. The program which this computer uses is called the DOS (Disk Operating System).

The floppy disk consists of a mylar disk with a magnetic coating inside a jacket (Refer to Figure 2-1). The jacket has several cutouts in it. The index cutout (Item 1) is not used in the VIC-1541 since sector information is written on each block. The slot (Item 2) allows the head to touch the magnetic coating. A similar slot is cut on the opposite side of the floppy disk. The write protect slot (Item 3) is provided as a means of protecting a disk against accidental erasure or overwriting. If the write protect slot is left uncovered, writing to the floppy disk is permitted. If the write protect slot is covered with opaque tape, writing is disabled.

The recording principles involved are identical to those of magnetic tape. The shape of the disc is more convenient than magnetic tape since each piece of information passes the vicinity of the head three hundred times per minute. This allows random access of the information on the disk. Data is physically stored in rings on the face of the disk. These rings are called tracks. There are 35 tracks on each disk. Each track is further divided into sectors. Each sector contains sync, ID, track, sector and checksum information along with 254 bytes of data. Track #18 is used for housekeeping purposes (i.e., the directory and the block availability map). Track #18 is automatically managed by the DOS. Any information to be written or read is received and transmitted by the disk controller to the VIC-20/COMMODORE 64 over the serial bus.

2-3. **Electrical Theory** (Refer to Figures 2-5 and 2-6)

2-3-1. **Frame Electrical Theory**

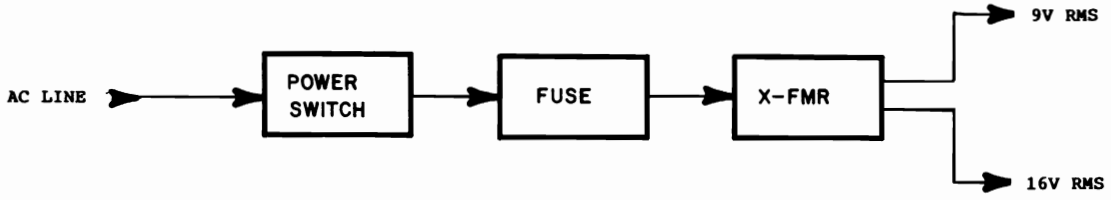
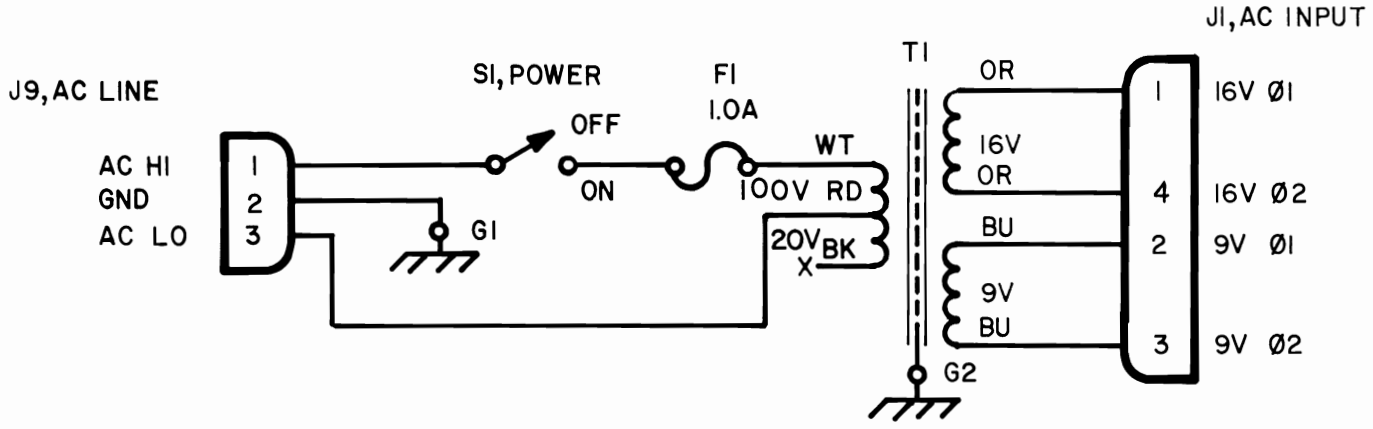


Figure 2-5. Frame Assembly, Block Diagram.

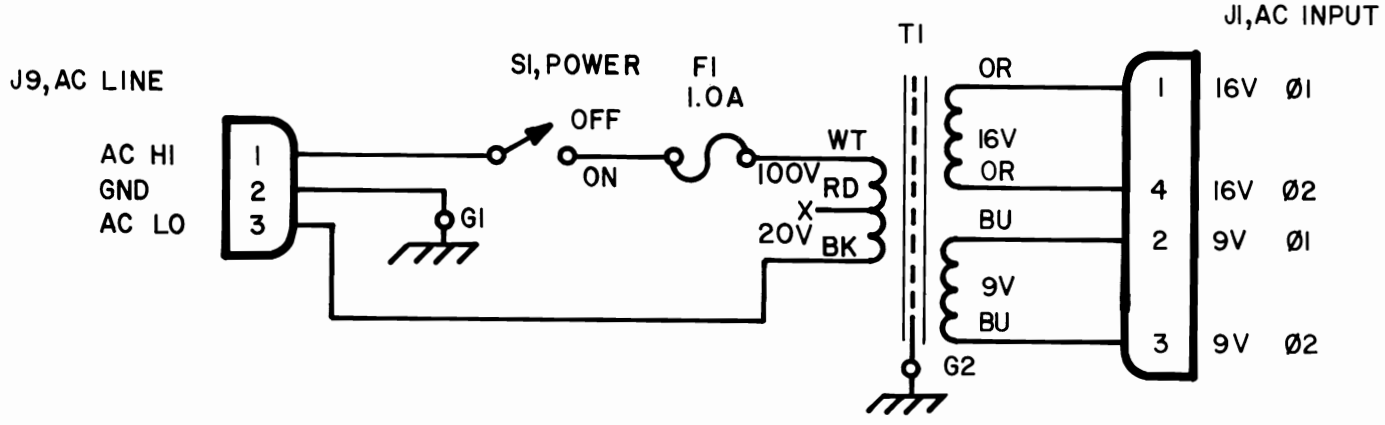
The electrical function of the frame assembly is to condition and convert the AC line voltage before applying it to the power supply on the disk controller PC Board.

The AC line voltage enters the disk drive at J9, which is both a connector and an RFI filter. After passing through the filter, the AC voltage is applied to the SPST power switch, S1. The output of the power switch is applied to F1, which provides over-current protection. F1 is a 1A, 250V Slow Blow fuse. The output of F1 is fed to the transformer, T1. T1 steps down the AC line voltage into +9 Vrms and +16 Vrms. Both of these outputs have their own secondary windings and are isolated from each other.

It should be noted that the AC return line for the primary of T1 may be connected to either tap on the primary winding. The black tap must be connected for use with Disk Controller P.C.Bd. 1540001-xx (long board version typical of VIC-1541(1540)). The red tap must be connected for use with Disk Controller P.C.Bd. 1540048-xx (short board version typical of 1541). Either Board may be used for replacement of the other provided the correct tap of T1 is used. See Section 3 for AC power configuration.



For use with P.C.Bd. 1540048-xx



For use with P.C.Bd. 1540001-xx

Figure 2-6. Frame Assembly, Schematic.

Section 3-INITIAL CONFIGURATION

3-1. General

This section provides step-by step procedures for setting the AC line voltage (selectable between 100 VAC and 120 VAC) and the device number (selectable between 8,9,10 or 11).

3-2. AC Power

When replacing the Disk Controller P.C. Bd., the AC input power may require changing. If Disk Controller P.C.Bd. 1540001-xx (long board version typical of VIC-1541 (1540)) is replaced with Disk Controller P.C.Bd. 1540048-xx (short board version typical of 1541), or vice versa, the input power will require re-configuration. To re-configure, perform the following steps:

1. Disconnect AC power cord from J9.

2. Disconnect serial bus cable(s) from J3 and/or J4.

3. Remove top cover. (Refer to Section 6-DISASSEMBLY/REASSEMBLY)

4. Remove RFI shield. (Refer to Section 6-DISASSEMBLY/REASSEMBLY)

5. Remove Disk Controller P.C. Board. (Refer to Section 6-DISASSEMBLY/REASSEMBLY)

6. Desolder wire from pin 1 of J9. (Refer to Figure 3-1)

7. Solder desired tap of T1 to pin 1 of J9:

   a. Solder black tap of T1 to pin 1 of J9 for 1540001-xx P.C.Bd. (long board version typical of VIC-1541(1540)). (Refer to Frame Schematic)

   b. Solder red tap of T1 to pin 1 of J9 for 1540048-xx P.C.Bd. (short board version typical of 1541). (Refer to Frame Schematic)

WARNING

- TO PREVENT A POSSIBLE SAFETY HAZARD, INSULATE PIN 1 OF T1 WITH HEAT SHRINK TUBING OR EQUIVALENT. USING HEAT SHRINK OR ELECTRICAL TAPE, INSULATE UNUSED TAP OF T1 AS SHOWN IN FIGURE 3-1.

5-5. **Head Alignment**

5-5-1. General

This procedure aligns the read/write head to the physical tracks on a floppy disk. A truly accurate alignment requires the use of an alignment reference disk and a test program disk. The procedure which follows allows the user to "get by" without such software. However, the degree of success achieved will depend on the accuracy of the disk which is used. Consequently, the alignment may cause compatibility problems when using software recorded on other drives or when using other drives to read disks recorded on a drive aligned with this procedure. This problem may be reduced by selecting a pre-recorded disk which has not been written to since it was recorded at the factory. Although this procedure is not 100% accurate, it will usually suffice for the home user. For an accurate alignment of the drive unit, one of the following alignment systems is recommended:

1. COMMODORE System

   This system is available from:
   Commodore Business Machines,Inc.
   Customer Service Dept.
   1200 Wilson Dr.
   Westchester, Pa. 19380

Alignment disk	970160-01	$130
Test program disk	970154-01	$ 26
Service manual	9900445	$ 25
	Total=	$181

   The above items, plus a dual trace oscilloscope, are required to align a disk drive using the COMMODORE system.

2. Peltier Industries System

   This system is available from:
   Peltier Industries,Inc.
   735 N. Doris
   Wichita, Ks. 67212

   Disk Alignment System (DAS-1541) $39.95
   The system includes:
   - Alignment reference disk
   - Control disk
   - Instruction manual
   - Video detector

   The above items, plus a 3 1/2 digit, 100 Kohm digital voltmeter, are required to accurately align a disk drive using the Peltier Industries System.

5-5-2. Equipment Required

1. Alignment standard-use a factory recorded disk which has not been written to since purchase, or a disk which has been formatted on a VIC-1541 which is known to be in proper alignment.

2. Digital Voltmeter

3. Video detector-see Appendix E

5-5-3. Preparation for Mechanical Alignment

1. Remove all external cables from VIC-1541

2. Remove upper cover (Refer to Section 6-DISASSEMBLY/REASSEMBLY).

3. Remove RFI Shield (Refer to Section 6-DISASSEMBLY/REASSEMBLY).

4. Remove Disk Controller PC Board (Refer to Section 6-DISASSEMBLY/REASSEMBLY).

5. Remove Drive Unit (Refer to Section 6-DISASSEMBLY/REASSEMBLY).

6. Reconnect J1 to P1, J2 to P2, J5 to P5, J6 to P6 and J7 to P7 in such a manner that access is still allowed to the stepping motor mount screws (See Figure 5-2).

CAUTION

- DO NOT ALLOW PATHWORK ON DISK CONTROLLER PC BOARD TO CONTACT THE FRAME OR DRIVE UNIT ASSEMBLIES. USE AN INSULATING RUBBER MAT, IF NECESSARY, TO INSULATE THE DISK CONTROLLER PC BOARD FROM THESE ASSEMBLIES.

7. Connect video detector between DVM and pins 7 and 8 of UH7.

8. Remove any Glyptol or other substance from stepping motor mount screws (See Figure 5-2).

5-5-4. Head Alignment

1. Connect VIC-20/COMMODORE 64 to video monitor or TV. (Refer to computer User's Guide for proper connection.)

2. Connect serial bus cable between P3 on VIC-1541 and serial bus connector on VIC-20/COMMODORE 64.

3. Connect AC power cord between J9 on VIC-1541 and AC outlet.

WARNING

- USE EXTREME CARE TO AVOID CONTACT WITH FRAME COMPONENTS. HIGH AC VOLTAGE POTENTIALS ARE PRESENT DURING CALIBRATION. THESE VOLTAGE POTENTIALS CAN CAUSE BODILY INJURY OR EVEN DEATH.

4. Place VIC-1541 power switch to ON.

5. Apply power to VIC-20/COMMODORE 64.

6. If a VIC-20 is the computer being used, enter the following command:

OPEN 15,8,15,"UI-":CLOSE 15<Return>

7. Insert disk which will be used as the alignment standard into the VIC-1541.

8. Enter the following program into the computer. This program will place the head on track 16 and will leave the drive motor running.

```
10  OPEN 15,8,15,"U+":OPEN 2,8,2,"#":OPEN 8,8,8,"#"
20  PRINT #15,"B-P:";8;0:PRINT #15,"UA:";2;0;16;1
30  FOR X=1 TO 9:READ Y
40  PRINT #8,Y;
50  NEXT X
60  PRINT #15,"M-E"+CHR$(0)+CHR$(5)
70  STOP
80  DATA 173,0,28,9,4,141,0,28,96
```

9. Type RUN<Return>.

10. Loosen two screws (Figure 5-2, Item 1) securing stepping motor housing to drive unit. Do not remove screws. Screws should be just loose enough to permit rotation of the stepping motor housing.

11. Rotate stepping motor housing while observing DVM display. Voltage reading on DVM will increase or decrease while rotating stepping motor housing. Correct position for stepping motor housing is the position which produces the largest voltage reading on DVM. Tighten the two screws when this position is reached.

12. Turn off DVM, disk drive and computer.

13.. Disconnect all cables and test accessories from disk

drive.

14. Apply small amount of Glyptol or fingernail polish to the two screws securing stepping motor housing to keep them from coming loose.

15. Reassemble the VIC-1541 (Refer to Section6-DISASSEMBLY/REASSEMBLY).

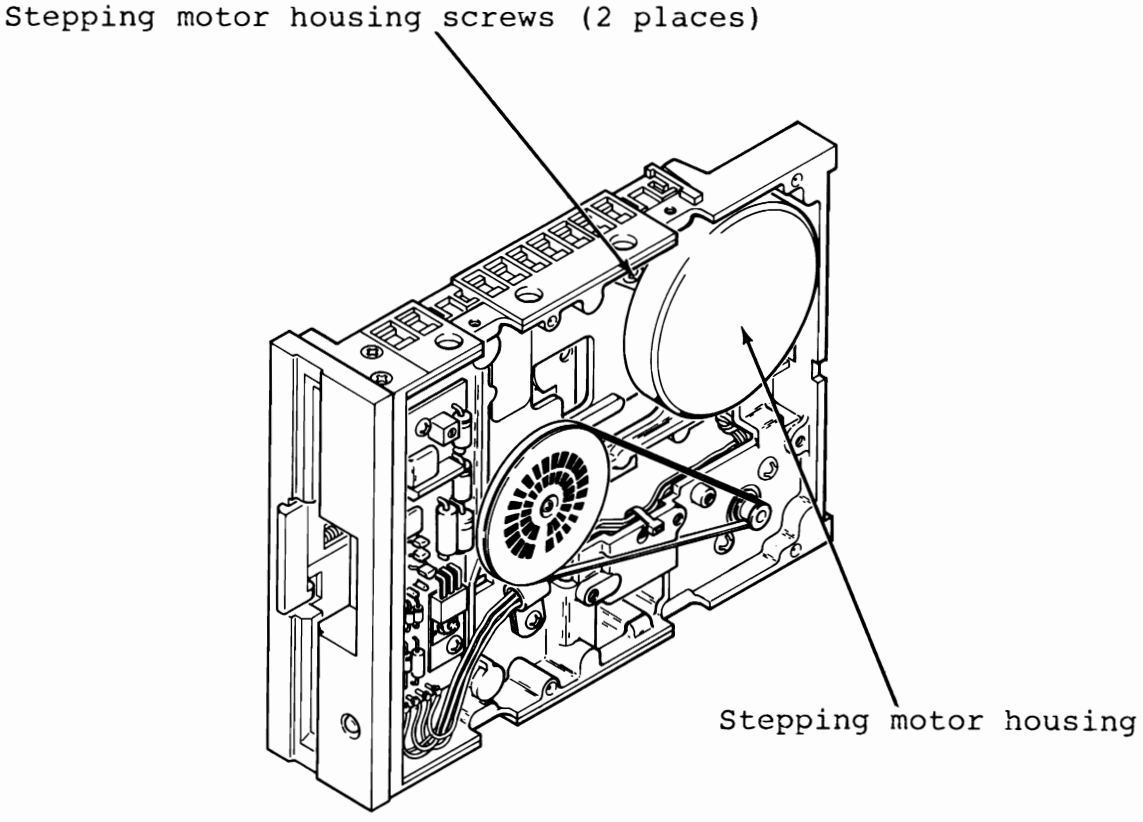


Figure 5-2. Head Alignment Adjustment

5-6. **Mechanical Alignment of Track #1 Stop**

5-6-1. General

This procedure adjusts the Track #1 Stop. The Track #1 Stop is used by the computer in the VIC-1541 for only two purposes:

1. Formatting a blank floppy disk ("New" command).

2. Soft error recovery.

The procedure that follows should only be used after carefully verifying that the rest of the VIC-1541 is properly operating, in accordance with the procedures given in Troubleshooting-Part 2.

5-6-2. Preparation for Mechanical Alignment.

1. Remove all external cables from VIC-1541.

2. Remove upper cover (Refer to Section 6-DISASSEMBLY/REASSEMBLY).

3. Remove RFI Shield (Refer to Section 6-DISASSEMBLY/REASSEMBLY).

4. Remove Disk Controller PC Board (Refer to Section 6-DISASSEMBLY/REASSEMBLY).

5. Remove Drive Unit (Refer to Section 6-DISASSEMBLY/REASSEMBLY).

6. Reconnect J1 to P1, J2 to P2, J5 to P5, J6 to P6 and J7 to P7 in such a manner that access is still allowed to the Track #1 Stop adjustment. (See Figure 5-3)

CAUTION

- DO NOT ALLOW PATHWORK ON DISK CONTROLLER PC BOARD TO CONTACT THE FRAME OR DRIVE UNIT ASSEMBLIES. USE AN INSULATING RUBBER MAT, IF NECESSARY, TO INSULATE THE DISK CONTROLLER PC BOARD FROM THESE ASSEMBLIES.

5-6-3. Mechanical Alignment

1. Connect serial bus cable between P3 and VIC-20/COMMODORE 64.

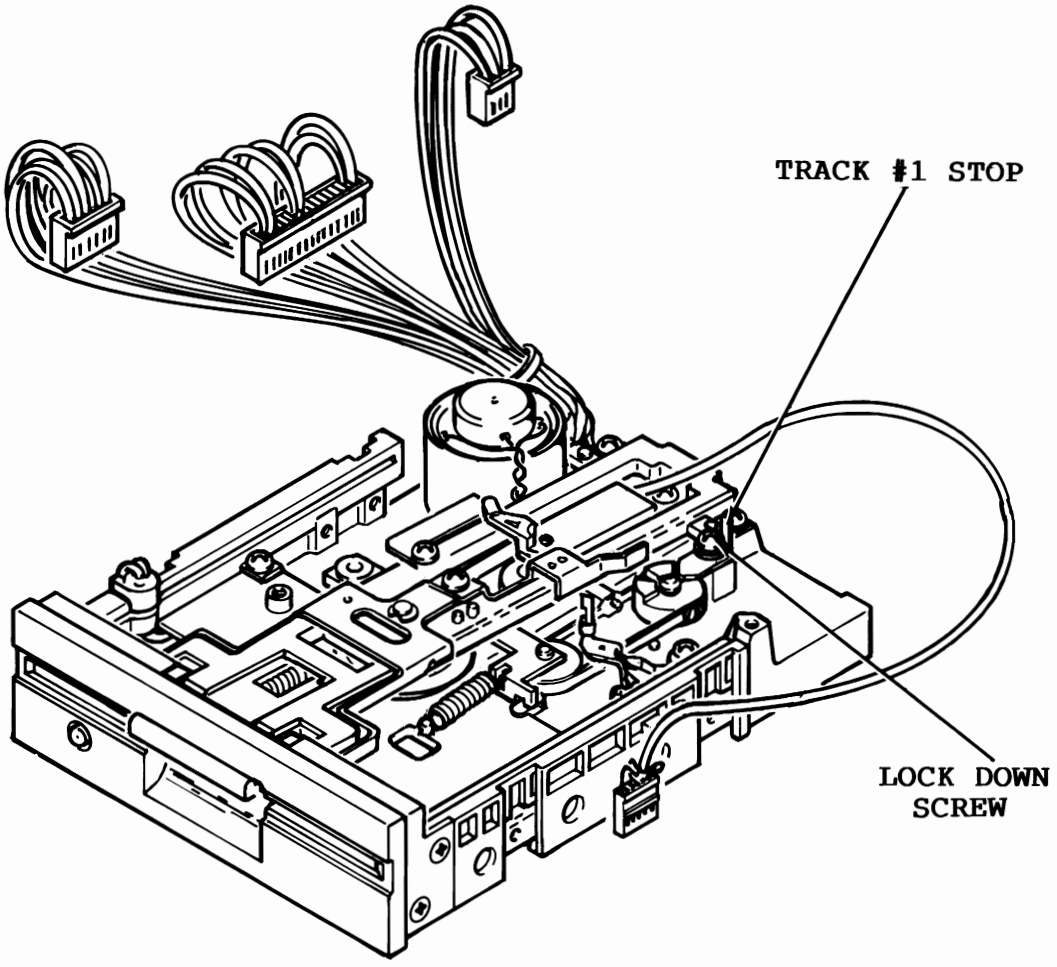


Figure 5-3. Track #1 Stop Adjustment.

2. Connect AC line cord between J9 and AC outlet.

WARNING

- DO NOT CONTACT THE FRAME ASSEMBLY OR WIRING. THE VOLTAGE POTENTIALS PRESENT ON THESE PARTS COULD CAUSE SEVERE INJURY OR DEATH.

3. Place VIC-1541 power switch to ON and place power switch on computer being used to ON.

NOTE

- If the VIC-20 is the computer in use, enter the following command: OPEN 15, 8, 15, "U-": CLOSE 15 <return>.

4. Load the Display T&S program into the computer. This program may be loaded from the Test Demo disk or it may be manually entered from the keyboard (The Display T&S program is listed in Appendix C of the VIC-1541 Single Drive Floppy Disk User's Manual.).

5. Place a factory recorded floppy disk into the VIC-1541.

6. Enter "RUN" <return> into the computer.

7. When the Display T&S program asks for a Track and Sector, enter Track 1, Sector 1.

8. After the head settles and the Display T&S program begins displaying Track information, adjust the Track #1 Stop adjustment in the following manner (See Figure 5-3):

a. Loosen the adjustment lock-down screw.

b. Place .006 inch feeler gauge between Stop and potrusion on the stepping motor hub. Carefully adjust the Stop until feeler gauge just touches the potrusion on the stepping motor hub and the Stop.

NOTE

- Do not disturb position of the stepping motor shaft.

c. Tighten the adjustment lock-down screw.

9. Place VIC-1541 and VIC-20/COMMODORE 64 power switches to OFF.

10. Reassemble the VIC-1541 (See Section 6-DISASSEMBLY/REASSEMBLY).

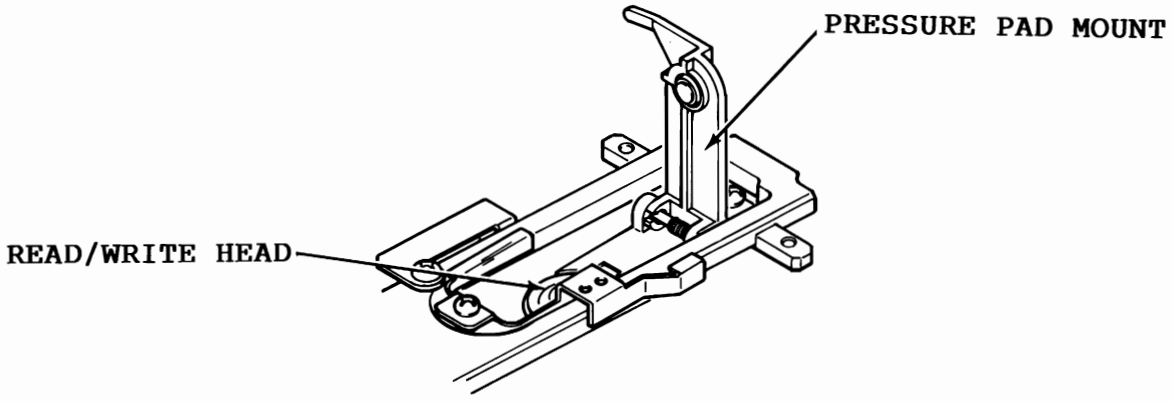


Figure 7-3. Access to read/write heads.

b. Inspect pressure pad on pressure pad mount for wear. Pad should be able to touch disk without allowing pressure pad mount to touch disk.

c. Inspect disk tension pads for excessive deformation or compression.

d. Perform Head Alignment (See paragraph 5-5) at least every six months.

7-5. Cleaning and Inspection

1. Clean and inspect drive unit as follows:

   a. Carefully remove drive unit from frame. (Refer to Section 6-DISASSEMBLY/REASSEMBLY)

2. Clean and inspect frame assembly as follows:

a. Remove dust using 15 psi of compressed air.

CAUTION

- NEVER EXCEED 15 PSI OF COMPRESSED AIR.

NOTE

- If compressed air is not available, a small clean brush may be used to remove dust.

b. Remove stubborn dirt with a damp lint-free cloth moistened with denatured alcohol.

CAUTION

- NEVER USE WATER OR DETERGENTS TO CLEAN FRAME ASSEMBLY.

c. Inspect F1 for proper size and rating. Fuse rating is 1A-250V Slow Blow.

d. Inspect insulation on unused tap of T1. The end of this wire should be insulated with electrical tape or heat shrink tubing as shown in Figure 7-4.

WARNING

- DO NOT CAP OFF WIRE AS SHOWN IN FIGURE 7-5. THIS METHOD MAY CREATE AN UNSAFE CONDITION WITH AGE.

e. Inspect remaining wires for frayed or faulty insulation.

f. Inspect wires for secure connections. All wires on frame assembly must be insulated with heat shrink tubing or equivalent.

g. Inspect frame for corrosion. Remove corrosion by gentle scraping, followed by cleaning with a lint-free cloth moistened with denatured alcohol.

h. Inspect connectors for cracked housings or loose pins.

Short pin 3 of P5 to ground. This will cause the motor to turn.

NOTE

- The read amplifiers may oscillate when not in use, but this is a normal occurrence.

Using the oscilloscope set-up described above and Figure 8-22, verify the input from the head is per Figure 8-21. The DC bias at pins 1 and 14 of UH7 is approximately 6 volts. Refer to Figure 8-23 for proper oscilloscope display at pins 7 and 8 of UH7. With oscilloscope connected to output of the first video amplifier, check mechanical alignment as follows:

NOTE

- Use a factory recorded disk or a disk which was formatted on a VIC-1541 that is known to be properly aligned.

Set oscilloscope to 100 mS/Div. Observe overall envelope of video and compare it with following general guidelines:

Flat, with constant amplitude-correct mechanical alignment.

Random changes in overall amplitude-incorrect tension or pressure on head.

Sinewave, 2 div/cycle-drive hub off center.

Sinewave with harmonics-gross misalignment of hub.

Low in amplitude-dirty head, incorrect track position, incorrect head pressure, incorrect tension, misalignment of disk seating plane or axial misalignment of the read/write head. Also check first video amplifier and the heads for proper electrical operation.

NOTE

- No provision is made on the VIC-1541 Drive Unit for head alignment, with the exception of Head Alignment. If a problem is clearly revealed as a head alignment problem, the Drive Unit must be replaced.

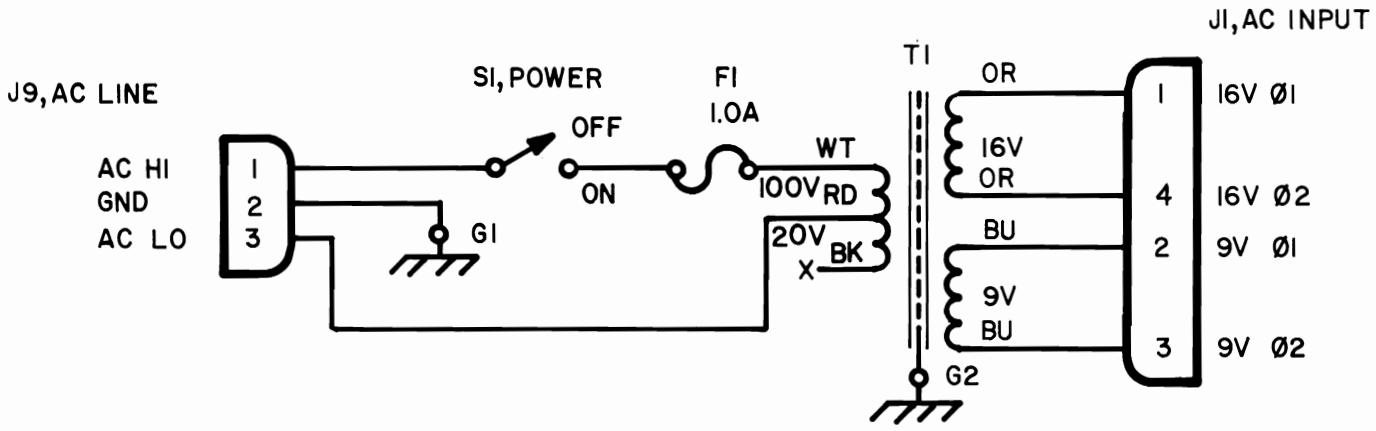


Figure 9-14. Frame Assy, Schematic (For use with P.C.Bd. 1540048-xx)

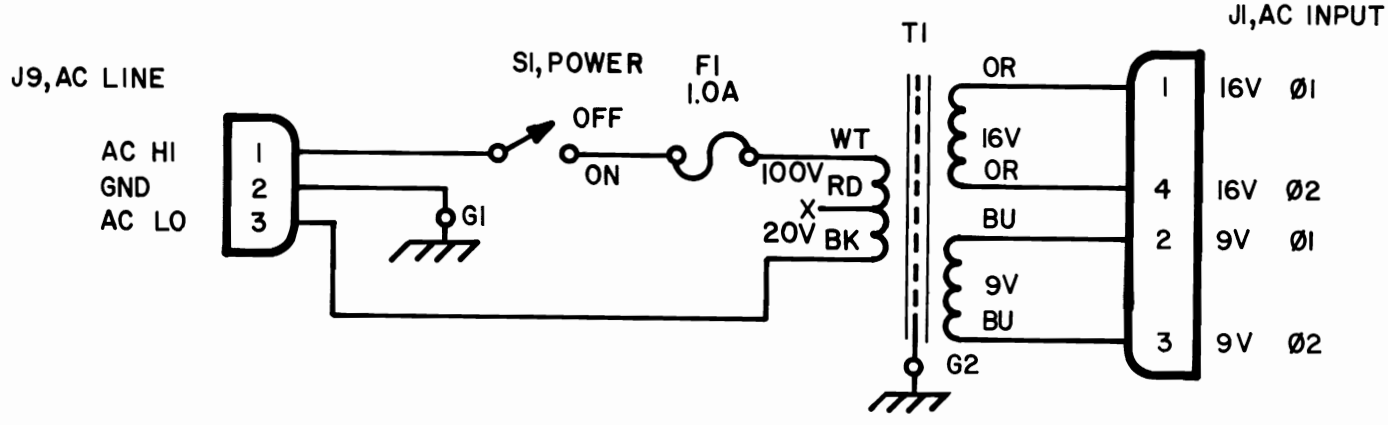


Figure 9-15. Frame Assy, Schematic (For use with P.C.Bd. 1540001-xx)

APPENDIX A

Test Equipment Specifications

This appendix contains the recommended specifications for test equipment used in servicing the VIC-1541.

Digital Multi-Meter	Display-3 1/2 digit Accuracy-2 per cent full scale Sensitivity- 100 KOhm/Volt Ranges DC Volts-9 to +30 V AC Volts-0 to 250 Vrms Ohms-0 ohms to infinity Resolution DC Volts-0.01 V AC Volts-1.0 V Ohms-1.0 Ohms
Oscilloscope	Display-Dual trace Input impedance-1 Mohm,15pF Vert sens-to 5 V/Div Input coupling-AC 6 DC Vert Bandwidth-DC to 30 MHz(50 MHz preferred) Time base-100nS/Div to 10mS/Div Trigger sources-CH B & Line Trigger modes-(+) trigger & (-) trigger
Frequency Counter	Accuracy-2% Range-39 KHz to 16 MHz Resolution-10 Hz
Timing Strobe	See Appendix B
Feeler Gauge	.006 inch thick
Video Detector	See Appendix E

APPENDIX E

Fabrication of Video Detector

Materials Required:

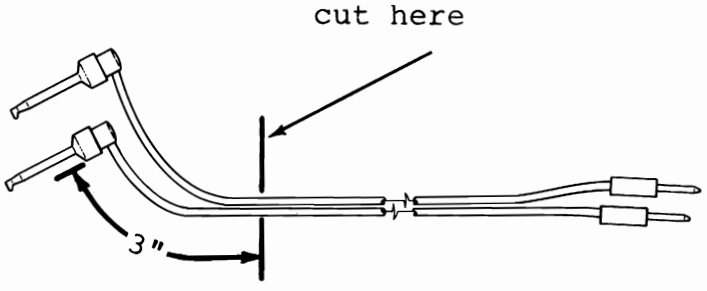
One set of meter leads	
One capacitor	.o1uF,50V
One resistor	1K,10%,1/4 W
One diode	1N4148 or equivalent

Equipment and Supplies:

- Knife
- Soldering iron
- Wire cutters
- Needle nose pliers
- Heat shrink tubing, 1/2 inch
- Heat shrink tubing, 3/16 inch
- Solder, 60/40 resin core
- Scale (ruler)
- Ohmmeter
- String or two wire ties

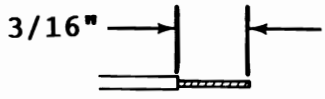
Preparation:

1. Cut meter leads as shown below:

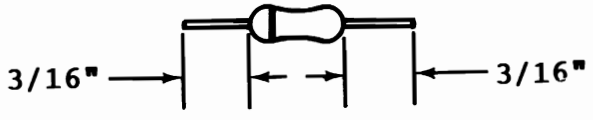


NOTE

Strip off insulation 3/16" from both sides of cut.



2. Prepare diode as shown below:

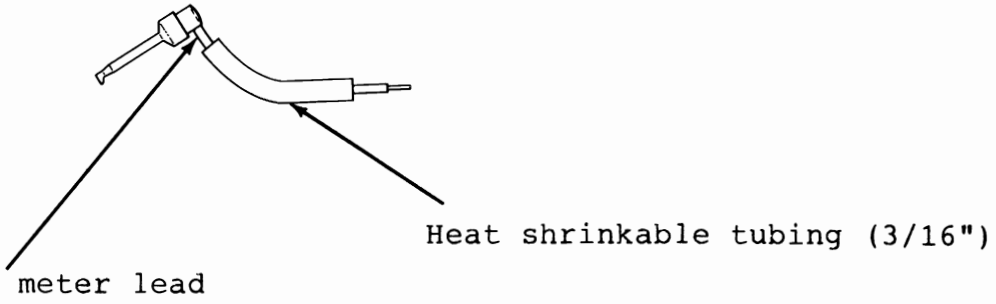


3. Prepare resistor as shown below:

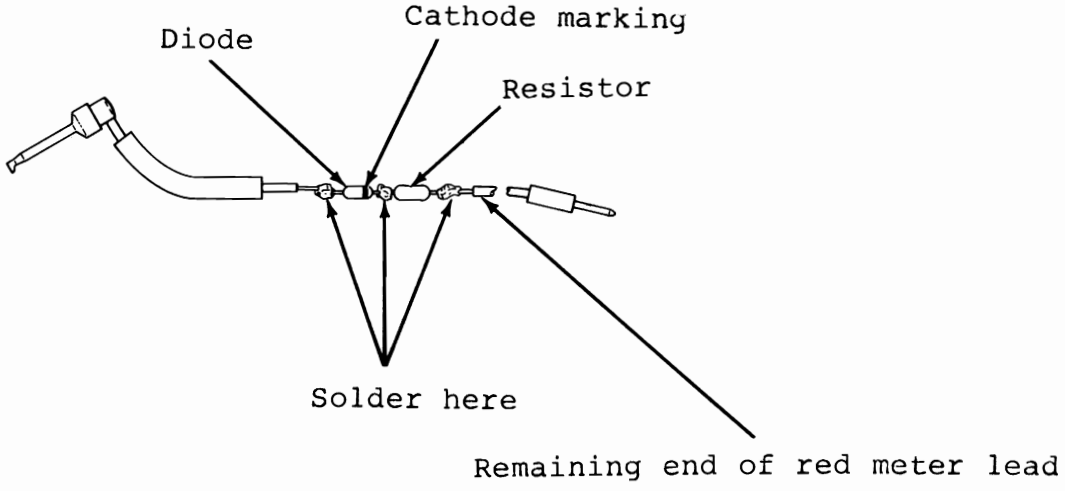
4. Tin all leads on resistor, diode and meter leads

Assembly:

1. Slide 1 1/2 inch length of 1/8 inch heat shrink tubing onto red meter lead as shown below. Do not shrink the tubing at this time.

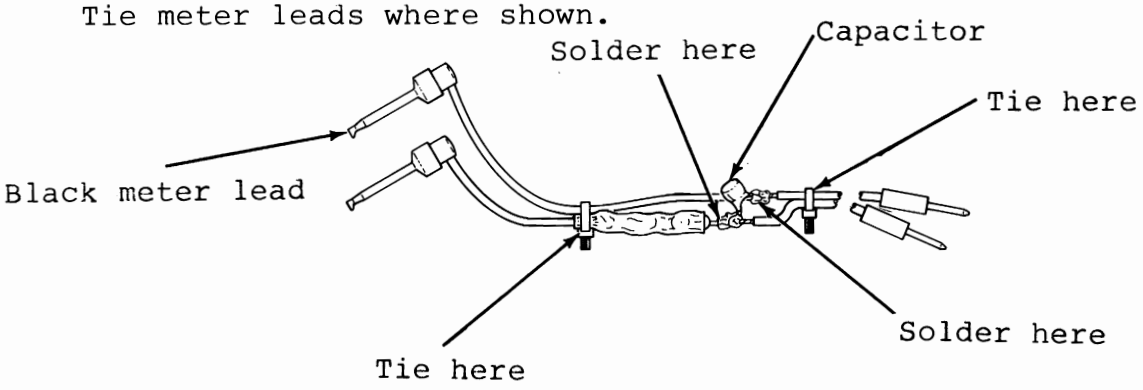


2. Solder diode, resistor and remaining end of meter lead together as shown below. Note proper polarity of diode.

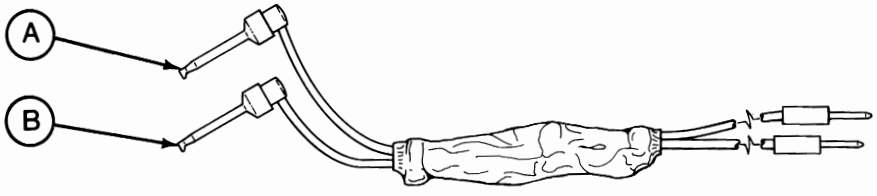


3. Slide heat shrink tubing over diode and resistor, leaving one lead of resistor exposed, and then shrink the tubing.

4. Solder capacitor and black meter leads as shown below. Tie meter leads where shown.



5. Slide a 2 inch length of 1/2 inch heat shrink tubing over capacitor and then shrink the tubing.



CAUTION

- USING OHMMETER, VERIFY RESISTANCE BETWEEN POINTS A AND B IS INFINITY.

APPENDIX F

VIC-1541(1540) vs. 1541 DISK DRIVES

General
This appendix lists the differences between the VIC-1541 (also known as the 1540) and the 1541 Disk Drives. If you are maintaining a 1541, read this appendix in its entirety before attempting any procedure in this manual. Basically, COMMODORE combined certain discrete components which were present on the VIC-1541 Disk Controller PC Board and combined them in custom IC's. When they did this, they renamed the disk drive the 1541 and changed the reference designators. Functionally, there is very little difference between the two versions.

Reference Designators
When servicing a 1541, always cross reference all reference designators using the table in this appendix. The designators in Sections 2 thru 9 apply to the VIC-1541 only and must be converted to their equivalent 1541 designator before attempting any maintenance procedure. In addition,when a procedure references a pin number, use the cross references given in this appendix. If confusion arises, compare the VIC-1541 Disk Controller schematic with that of the 1541.

CAUTION

- FAILURE TO CROSS REFERENCE DESIGNATORS OR PIN NUMBERS MAY RESULT IN DAMAGE TO YOUR 1541.

Theory of Operation
Functionally, there is very little difference between the VIC-1541 and the 1541 disk drives. Listed below are the differences as they apply to Theory of Operation:

1. Timing Circuit
UC9,Y1,C10,R1 and R2 on the VIC-1541 are replaced by Y1 on the 1541. Extra bypass capacitors have also been installed. Y1 on the 1541 produces a 16 MHz square wave. The remainder of the circuit is the same.

2. Computer Circuit
UA2,UA3,UB2 and UB3 have been replaced by UB2 on the 1541. To accomodate this change, UC6D and UC5E have been added to the Address Decoder circuit. These gates functionally OR the Low RAM (pin 1) and the High RAM (pin 2) outputs of UC7. This causes UB2 to be selected when addresses $0000_{(H)}$ thru $07FF_{(H)}$ are present on the address bus. Since A13 and A14 are not decoded, images of this RAM appear at three other address ranges: 2000-27FF, 400-47FF and 600-67FF. In addition, a minor change to the Reset circuit was made. UD1D and UD1E on the VIC-1541 is replaced by UD3B on the 1541.

The remaining Computer circuits operate the same on both versions.

3. Encoder/Decoder Circuit
The entire Encoder/Decoder circuit on the VIC-1541 has been replaced by UC1 on the 1541. Internally, UC1 performs the same functions as the following IC's did on the VIC-1541: UE3,UF4,UE5A,UE5B,UF3,UC1B,UF5B,UF5A,UC2,UD2,UC3,UE4,UD3 and UF6B.

4. Read Circuit
UF6A on the VIC-1541 has been replaced by pins 23,24 and 25 of UC1 on the 1541. The remainder of the Read circuit operates the same on both versions.

5. Write Circuit
UC1D,Uf5D,UF5C and UG2C on the VIC-1541 have been replaced by pins 2,40 and 6 of UC1 on the 1541. The remainder of the Write circuit operates the same on both versions.

6.Track Select Circuit
UE2 and UF2D on the VIC-1541 have been replaced by pins 5,15,16,17 and 18 of UC1 on the 1541. The remainder of the Track Select circuit operates the same on both versions.

7. Power Supply Circuit
Other than differences in capacitor values and in the number of bypass capacitors, there are no changes in the operation of the Power Supply circuit. The 1541 requires fewer bypass capacitors than the VIC-1541 because it has fewer IC's to bypass.

8. Optics Circuit
There are no differences in operation of the Optics circuit between the two versions.

9. Drive Motor System
There are no differences in operation of the Drive Motor System between the two versions.

Initial Configuration
On the 1541, the device number programming pads are located near the front of the Disk Controller PC Board. Refer to Figure B-2.

Performance Test-no change.

Calibration-no change.

Disassembly/Reassembly-no change.

Preventive Maintenance-no change.

Troubleshooting-Part 1
The procedures apply to both the VIC-1541 and the 1541. The locations of P4 and P8 have changed and the reference designators have changed. Some gates of IC's have also changed. If you are troubleshooting the 1541, be sure to cross reference the designators and pin numbers given with those in the table in this appendix. For example, Step 9 of Troubleshooting instructs the user to short pin 10 of P6 to pin 10 of UF2E. After converting the designators, the user would short pin 1 of P6 to pin 12 of UB1.

CAUTION

- FAILURE TO CROSS REFERENCE DESIGNATORS AND PIN NUMBERS MAY RESULT IN DAMAGE TO YOUR 1541.

Troubleshooting-Part2
The procedures apply to both the VIC-1541 and the 1541 and may be used by converting the reference designators and pin numbers. Also note the changes described under Theory of Operation. Many of the test points on the VIC-1541 are not available on the 1541 because they are inside UC1. Disregard these test points and any reference to them.

REFERENCE DESIGNATOR CROSS REFERENCE

VIC-1541 to 1541

Disk Controller PC Board

Designator	Description	Value/Part number
C1-C1	Capacitor	1uF,50V
C2-C2	Capacitor	47uF,16V
C3-C3	Capacitor	0.1uF
C4-C4	Capacitor	1uF,50V
C5-C5	Capacitor	47uF,16V
C6-C6	Capacitor	0.1uF
C7-C7	Capacitor	0.1uF
C8-C8	Capacitor	0.1uF
C9-C9	Capacitor	0.1uF
C10-none		
C11-C10	Capacitor	0.1uF
C12-C15	Capacitor	10uF,25V
C13-C48	Capacitor	0.1uF
C14-C47	Capacitor	0.1uF
C15-C37	Capacitor	0.47uF,35V
C16-C45	Capacitor	680pF
C17-C22	Capacitor	0.1uF
C18-C27	Capacitor	0.1uF
C19-C28	Capacitor	0.1uF
C20-C29	Capacitor	0.1uF
C21-C30	Capacitor	0.1uF
C22-none		
C23-C44	Capacitor	3.3uF,25V
C24-C38	Capacitor	0.47uF,35V
C25-C40	Capacitor	0.1uF
C26-C14	Capacitor	1000pF
C27-C34	Capacitor	680pF
C28-C36	Capacitor	330pF
C29-none		
C30-none		
C31-none		
C32-none		
C33-C31	Capacitor	150pF
C34-C35	Capacitor	0.1uF
C35-none		
C36-none		
C37-none		
C38-none		
C39-none		
C40-none		
C41-none		
C42-none		
C43-none		
C44-none		
C45-none		

Designator	Description	Value/Part number
C46-none		
C47-none		
C48-none		
C49-C32	Capacitor	330pF
C50-C33	Capacitor	680pF
C51-C17	Capacitor	6800uF,25V
C52-C16	Capacitor	47,000uF,16V
C53-none		
C54-none		
C55-none		
C56-C46	Capacitor	100uF,15V
C57-C43	Capacitor	0.1uF
C58-C42	Capacitor	.022uF
C59-C39	Capacitor	.022uF
C60-none		
C61-C13	Capacitor	0.1uF-220uF
C62-C21	Capacitor	4.7uF
C63-C14	Capacitor	1.0uF
C64-none		
C65-none		
CR1-CR1	Bridge Rectifier	8241
CR2-CR2	Diode	1N4002
CR3-CR3	Bridge Rectifier	8240
CR4-CR4	Diode	1N4002
CR5-CR5	Zener Diode	3.3V
CR6-CR15	Diode	1N4148
CR7-CR16	Diode	1N4148
CR8-CR12	Diode	1N4148
CR9-CR14	Diode	1N4148
CR10-CR17	Diode	1N4148
CR11-CR18	Diode	1N4148
CR12-CR13	Diode	------
CR13-CR8	Diode	1N4002
CR14-CR9	Diode	1N4002
CR15-CR10	Diode	1N4002
CR16-CR11	Diode	1N4002
CR17-CR7	Diode	1N4002
CR18-CR6	Diode	1N4148
L1-L1	Inductor	2.2uH
L2-L2	Inductor	
L3-L3	Inductor	
L4-L5	Inductor	
L5-L6	Inductor	
L6-L7	Inductor	
L7-L8	Inductor	100uH
L8-L9	Inductor	
L9-L11	Inductor	
L10-L12	Inductor	

Designator	Description	Value/Part number
L11-L10	Inductor	
L12-L16	Inductor	
L13-L13	Inductor	
L14-L15	Inductor	
L15-L14	Inductor	
L16-L4	Inductor	
Q1-Q1	Transistor	A952
Q2-Q2	Transistor	C945
Q3-Q7	Transistor	25C945
Q4-Q8	Transistor	25C2001
Q5-Q9	Transistor	25C2001
Q6-Q10	Transistor	25C2001
Q7-Q11	Transistor	25C2001
Q8-Q5	Transistor	25A1015
Q9-Q3	Transistor	25A1015
Q10-Q6	Transistor	25A1015
Q11-Q4	Transistor	25A1015
R1-none		
R2-none		
R3-R1	Resistor,1/4W	47
R4-R4	Not Used	
R5-R3	Resistor,1/4W	330
R6-R2	Resistor,1/4W	1.0K
R7-R39	Resistor,1/4W	22K
R8-R51	Resistor,1/4W	91,1%
R9-R42	Resistor,1/4W	680
R10-R35	Resistor,1/4W	22K
R11-R43	Resistor,1/4W	1.0K
R12-R53	Resistor,1/4W	9.10K
R13-R54	Resistor,1/4W	9.10K
R14-R19	Resistor,1/4W	2.2K
R15-R21	Resistor,1/4W	2.2K
R16-R36	Resistor,1/4W	220
R17-R16	Resistor,1/4W	200
R18-R17	Resistor,1/4W	150
R19-R18	Resistor,1/4W	150
R20-R23	Resistor,1/4W	330
R21-R26	Resistor,1/4W	3.0
R22-R10	Resistor,1/4W	3.0
R23-R9	Resistor,1/4W	3.0
R24-R27	Resistor,1/4W	510
R25-R14	Resistor,1/4W	360
R26-R11	Resistor,1/4W	2.2K
R27-R22	Resistor,1/4W	470
R28-R20	Resistor,1/4W	470
R29-R12	Resistor,1/4W	22K
R30-R24	Resistor,1/4W	360
R31-R6	Resistor,1/4W	1.0K

Designator	Description	Value/Part number
R32-R7	Resistor,1/4W	1.0K
R33-R5	Resistor,1/4W	1.0K
R34-R8	Resistor,1/4W	1.0K
R35-R46	Resistor,1/4W	150
R36-R45	Resistor,1/4W	150
R37-R31	Resistor,1/4W	330
R38-none		
R39-R47	Resistor,1/4W	680
R40-R48	Resistor,1/4W	680
R41-R49	Resistor,1/4W	680
R42-R50	Resistor,1/4W	680
R43-R25	Resistor,1/4W	1.0K
R44-none		
R45-R55	Resistor,1/4W	220
R46-R44	Not Used	
R47-R41	Resistor,1/4W	470
R48-R40	Resistor,1/4W	1.5K
R49-R28	Resistor,1/4W	100
R50-R30	Resistor,1/4W	470
R51-R33	Resistor,1/4W	2.2K
R52-R34	Resistor,1/4W	2.2K
R53-R52	Resistor,1/4W	22K
R54-R29	Resistor,1/4W	150
R55-R37	Resistor,1/4W	470
R56-R32	Resistor,1/4W	2.2K
R57-R38	Resistor,1/4W	470
R58-none		
UA2-none		
UA3-none		
UAB1-UC3	Versatile Interface Adapter	6522
UAB4-UB3	8K x 8 ROM	235302-01
UAB5-UB4	8K x 8 ROM	981229-01
UB2-none		
UB3-none		
UB6-UC5	Hex Inverter	74LS04
UB7-UC6	Quad 2 input pos. NAND Gate	74LS00
UB8-UC7	BCD-to-Decimal Decoder	74LS42
UC1-UA1	Hex Schmitt-Trigger Inverter	74LS14
UC2-none		
UC3-none		
UC6-UD5	Binary Presettable Counter/Latch	74LS197
UC7-none		
UCD4-UC2	Versatile Interface Adapter	6522
UCD5-UC4	8-Bit Microprocessor	6502
UD1-UB1	Hex Inverter Buffer/Driver	7406
UD2-none		
UD3-none		
UE2-none		
UE3-none		

Designator	Description	Value/Part number
UE4-none		
UE5-none		
UE7-UE6	Binary w/Clear Synchronous Up/Down Dual Clock Counter	74LS193
UF2-UD1	Hex Inverter Buffer/Driver	7406
UF3-none		
UF4-UD2	Binary w/Clear Synchronous Up/Down Dual Clock Counter	74LS193
UF5-none		
UF6-none		
UG2-UD3	Quad 2 input EXCLUSIVE-OR Gate	74LS86
UG3-UD4	Dual Retriggerable Resettable Monostable Multivibrator	9602
UG4-none		
UH4-UE4	Comparator w/Open Collector Output	LM311
UH5-UF4	Differential Video Amplifier	NE592N
UH7-UF3	Differential Video Amplifier	NE592N
none-UB2	2K x 8 RAM	2016
none-UC1	Logic Array	325572-01
Y1-Y1	Crystal	16 MHz

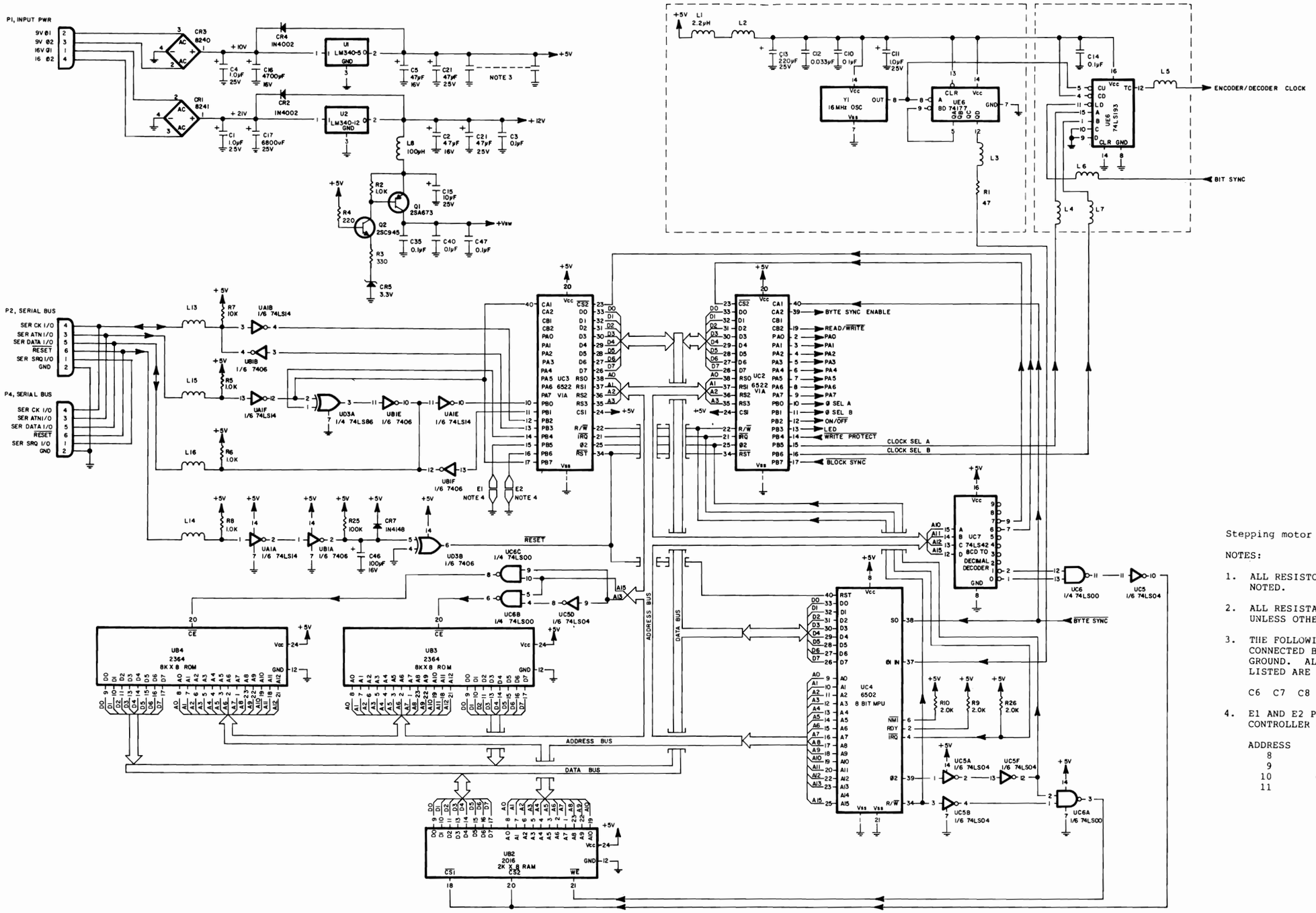
Drive Motor/Servo Circuit-no change

Jack/Plug Numbers

VIC-1541	1541
J1/P1	J1/P1
J2/P2	J8/P8
J3/P3	J2/P2
J4/P4	J3/P3
J5/P5	J5/P5
J6/P6	J6/P6
J7/P7	J7/P7
J8/P8	J4/P4
J9	J9

PIN NUMBER CROSS REFERENCE

VIC-1541		to	1541	
UC1	1&2		UA1	11&10
UC1	3&4		UA1	13&12
UC1	5&6		none	
UC1	9&8		UA1	5&6
UC1	11&10		UA1	1&2
UC1	13&12		UA1	3&4
UD1	1&2		UB1	13&12
UD1	3&4		UB1	11&10
UD1	5&6		UB1	3&4
UD1	8&9		none	
UD1	10&11		none	
UD1	13&12		UB1	1&2
UF2	1&2		UD1	11&10
UF2	3&4		UD1	5&6
UF2	5&6		UD1	3&4
UF2	9&8		none	
UF2	10&11		UD1	13&12
UF2	12&13		UD1	8&9
UF4	1&2		UD2	13&12
UF4	3&4		UD2	11&10
UF4	5&6		UD2	1&2
UF4	8&9		UD2	8&9
UF4	11&10		UD2	5&6
UF4	13&12		UD2	3&4
UG2	1,2&3		UD3	13,12&11
UG2	4,5&6		UD3	1,2&3
UG2	8,9&10		none	
UG2	11,12&13		UD3	8,9&10
UB7	1,2&3		UC6	1,2&3
UB7	4,5&6		UC6	10,9&8
UB7	9&8		UC5	9&8
UB7	13,12&11		UC6	4,5&6
UB6	1&2		UC5	1&2
UB6	3&4		UC5	13&12
UB6	5&6		UC5	3&4
UB6	9&8		none	
UB6	11&10		none	
UB6	13&12		none	



Stepping motor housing

NOTES:

1. ALL RESISTORS ARE 10%, 1/4W UNLESS NOTED.
2. ALL RESISTANCE IS EXPRESSED IN OHMS UNLESS OTHERWISE NOTED.
3. THE FOLLOWING BYPASS CAPACITORS ARE CONNECTED BETWEEN THE +5V LINE AND GROUND. ALL THESE CAPACITORS LISTED ARE 0.1 UF, CERAMIC.

   C6 C7 C8 C22 C27 C28 C29 C30

4. E1 AND E2 PROGRAM THE DISK CONTROLLER ADDRESS.

ADDRESS	E1	E2
8	CLOSED	CLOSED
9	OPEN	CLOSED
10	CLOSED	OPEN
11	OPEN	OPEN

Figure F-1. Disk Controller P.C.Bd. Schematic
(Sheet 1 of 2)

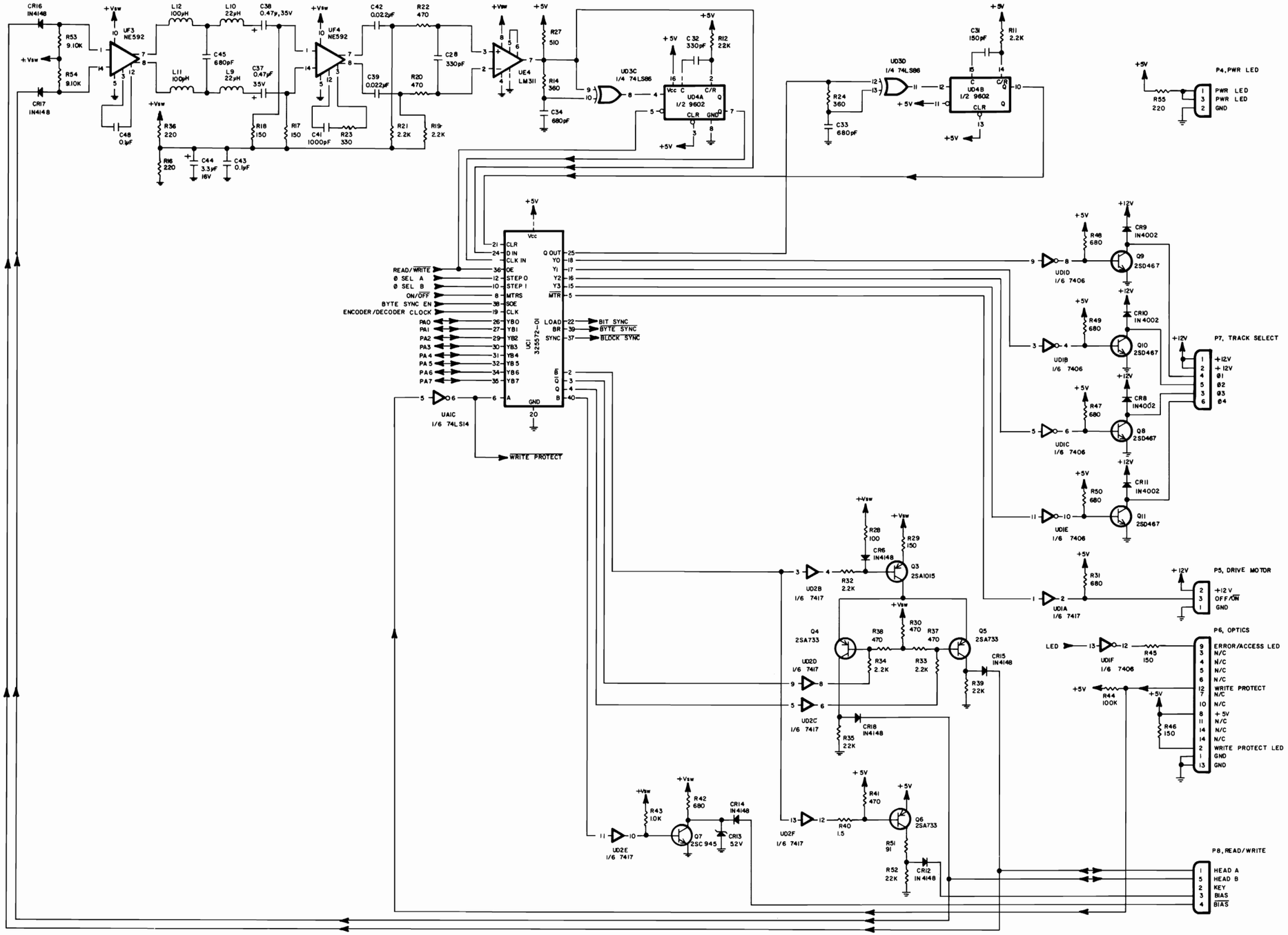


Figure F-2. Disk Controller P.C.Bd. Schematic (Sheet 2 of2)

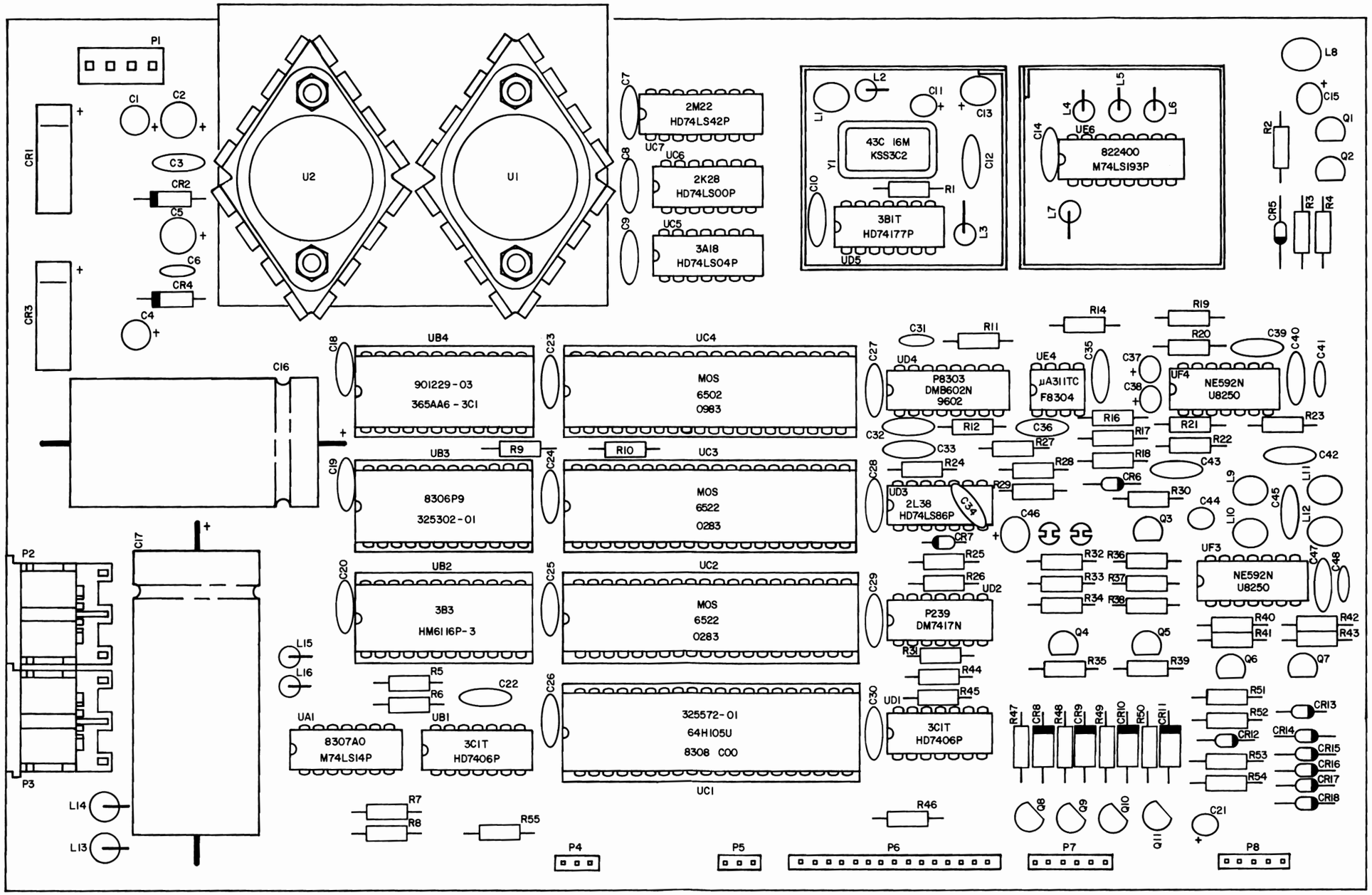


Figure F-3. Disk Controller P.C.Bd. Parts Layout