ORDER NO. MSD 851100502

Service Manual

Micro Floppy Disk Drive

JU-363/JU-323

Panasonic

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CONTENTS

1. GENERAL DESCRIPTION OF MAINTENANCE AND MAINTENANCE EQUIPMENT

1.1 Alignment Diskette

The 3.5-inch alignment diskette is used for head positioning and for index verification of JU-3X3.

Checks to be made are as follows:

1. Read/write head radial alignment check using track 40 (Sides 0, 1)
2. Index burst check using track 40 (Sides 0, 1)
3. Azimuth measurement and check using track 40 (Sides 0, 1)

Cautions: 1. When using an alignment diskette, be careful not to write on it. For this purpose, make sure that the write protect sensor is operating, using a work diskette that is normally used.
2. In this manual, JU-363/JU-323 is referred to as JU-3X3.

1.2 Exerciser

The exerciser permits any and all verifications and inspections required for the JU-3X3. The functions of the exerciser are as follows:

1. Seek — increment or alternate tracks
2. Read (no data compare)
3. Write 1F or 2F (All 0's or 1's)
4. Recalibration to track 00

The exerciser has switches and indicators for executing the designated functions.

1.3 Special Tools

Special tools such as shown below are used for the maintenance of the JU-3X3.

Tool	Part Number	Quantity
Alignment diskette (135TPI for JU-3X3) *1 DAD type	JU-01AA	1
Reference *2 (CE type)	*3 (RZ-W8-01 (Sony) checked by Matsushita Communications)	(1)
Work diskette	MF2-DD (Maxell)	1 to 3
Exerciser	FDD-EXT-5	1
CMOS/TTL conversion adaptor	YTFDD-CN35	1
Oscilloscope	50 MHz or over	1
Probe	10-to-1	3
Frequency counter		1
Test pin (Easily installable and removable)		
(Alignment meter for 3.5")	(JU-02A)	(1)
(Steel belt mounting jig)		(1)

*1 DAD: Dynamic Alignment Diskette *2 CE: Cat's Eye

*3: Never use any diskette that has not been checked by us. Even after being checked, it is not possible to measure index burst using the diskette.

2. DIAGNOSTIC PROCEDURES

2.1 Introduction

Errors by incorrect operating procedures, wrong programming, and damaged diskettes, or soft errors due to air contamination, random electrical noise, and other external causes are often attributed to drive failure or wrong adjustment. Unless an obvious fault in assembly, defect, or damaged part is detected by visual inspection of the drive, check that the error repeats with the original diskette, and then check the same using another diskette.

2.2 Soft Error Detection and Correction

Possible causes of soft errors are as follows:

1. Contaminants between the read/write heads and disk. These contaminants are usually removed by the liner in the diskette.
2. Random electrical noise usually less than a few microseconds.
3. Subtle track deviations that go undetected during write operation, and write timing deviations may cause soft errors during read.
4. Faulty grounding of the power supply for the drive or the host system may also cause soft errors.
5. Improper motor speed can also cause soft errors.

Observe the following procedure on the controller side to recover from the above mentioned soft errors.

1. Reread track ten times or until data is recovered.
2. If Step 1 fails to recover data, access the head to the adjacent track in the same direction as moved before. Then, return the head to the original track.
3. Repeat Step 1.
4. Any error that cannot be recovered by the above steps is not recoverable.

2.3 Write Error

If an error occurs during write, it will be detected during the next revolution by a read operation that is normally called a write check. To correct the error, write again, and repeat a write check operation. If ten write operations or more fail to product satisfactory results, attempt another read operation on another track to determine which, the media or drive, is faulty. If the error persists, replace the diskette, and repeat the above mentioned procedure. If the error still remains, the drive is considered defective. If the error disappears, consider the original diskette defective and dispose it.

2.4 Read Error

Most errors that occur are soft errors. If a read error occurs, perform the error recovery procedure described in paragraph 2.2 to recover the data.

2.5 Seek Error

Possible Causes;

1. Stepping motor or stepping motor drive circuit faulty
2. Carriage faulty

There are two ways of seek error recovery. One is to recalibrate to track 00 and then seek to the original track, and the other is to read the ID field, check the track on which the head is located, and move it from there.

2.6 Compatibility Error

Data that is written using one drive may not be able to be read by another drive. This is called a compatibility error. Most compatibility errors are caused by the following reasons, which should be checked as follows.

1. Head misalignment: Refer to 4.5.
2. Head amplitude too low: Refer to 4.3, and check both drives.
3. Motor speed difference: Refer to 4.1 and check both drives.
4. Check the format that it is as recommended.

3. TROUBLESHOOTING

First, to determine which – FDD, diskette, or controller – is defective, replace with a disk and an FDD that are known to be normal. If the trouble is assumed to be due to the FDD as a result, proceed as follows:

3.1 Troubleshooting Procedure

The following nine are possible JU-3X3 failures.

1. Index detection failure
2. Ready inoperative
3. Track 0 not detectable
4. Seek inoperative
5. Write inoperative
6. Read inoperative
7. Read error
8. IN USE LED Light inoperative LED
9. Write protect detection failure

Check for the above failures according to the troubleshooting flowcharts in 3.2 and 3.3.

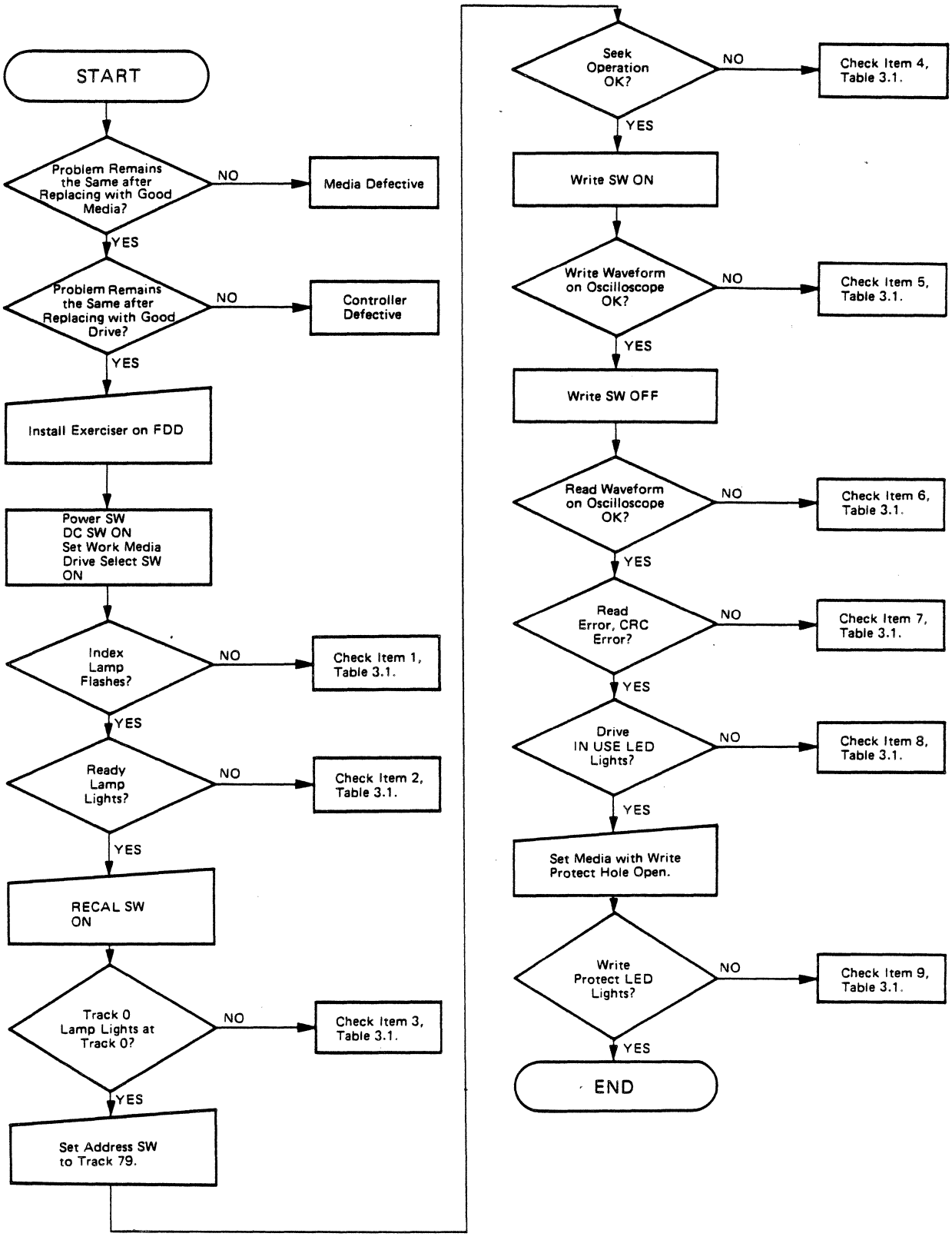
Caution: Be sure to switch power off before removing the disk drive from the system, or when removing the PCB.

3.2 Troubleshooting Table

Item	Trouble	No.	Possible Cause	Remedy
1	Index detection failure	1	Motor circuit board defective	Not field replaceable
		2	DD motor defective	Not field replaceable
		3	Index LED defective	Not field replaceable
		4	Index detector defective	Not field replaceable
		5	No. 3, 4 mounted improperly	Not field replaceable
		6	PCB motor ON circuit	Repair of PCB
		7	PCB index detecting circuit	Repair of PCB
2	Ready inoperative	1	Item 1	
		2	PCB ready circuit	Repair of PCB
3	Track 0 not detectable	1	Track 0 parts defective	Replace.
		2	PCB track 0 detecting circuit	Replace.
4	Seek inoperative	1	Stepping motor	Not field replaceable
		2	PCB step circuit	Replace.
5	Write inoperative	1	Item 1	
		2	Head wire disconnected	Not field replaceable
		3	Head shorted	Not field replaceable
		4	PCB write circuit	Replace.
6	Read inoperative	1	Item 1	
		2	Item 5	
		3	PCB read circuit	Replace.
7	Read error	1	Item 1	
		2	Item 6	
		3	Alignment adjustment	Adjust.
		4	Azimuth adjustment	Not field replaceable
		5	Burst adjustment	Not field replaceable
		6	Symmetry adjustment	Not field replaceable
		7	−1 track adjustment	Not field replaceable
		8	Flag 0 adjustment	Adjust.
		9	Index period	Not field replaceable
		10	PCB read circuit	Replace.
8	IN USE LED Light inoperative	1	LED	Replace.
		2	PCB IN USE circuit	Replace.
9	Write protect detection failure	1	Write protect	Replace.
		2	Detecting circuit	Replace.

Table 3.1 Troubleshooting Table

3.3 Troubleshooting Flow



4. ADJUSTMENTS AND CHECKS

4.1 Motor Speed Check

1. Insert a diskette, and check that the motor runs.
2. Connect a frequency counter to IX and GND.
3. Check that the frequency counter reads **200 ms ±3 ms.**

4.2 Write Protect Check

1. Insert a diskette whose write protect hole is closed, and check that the write protect lamp on the exerciser does not light.
2. Insert a diskette whose write protect hole is open, and check that the write protect lamp on the exerciser lights.
3. Repeat Steps 1 and 2 alternately a few times, and confirm.

4.3 Head Amplitude Check

This inspection is effective only in doing write and read checks such as mentioned below.
Do not use a long-used diskette for this inspection. Use a diskette which can disclose head defects.

1. Insert a good diskette.
2. Step to track 79.
3. Synchronize oscilloscope on IX (+ INDEX), and connect one probe to T1 on the printed circuit board and the other to T2 on the same. Also ground the probes to GND and AG.
   Invert one channel, and select the Add mode.
   Set vertical deflection to 5 mV/division, and horizontal deflection to 20 ms/division.
4. Write 2F (all 1's) on track 79 (on both sides 0 and 1 by SIDE SELECT).
5. Check that the average amplitude level is **160 mV or more.** (See **Fig. 4.1.**)

4.4 Modulation and Resolution Check

1. Insert a good work diskette.
2. Synchronize oscilloscope on IX (+ INDEX), connect one probe to T1 and the other probe to T2 on the printed circuit board. Ground the probes to GND and AG.
   Invert one channel, and select the Add mode.
   Set vertical deflection to 5 mV/division, and horizontal deflection to 20 ms/division.
3. Seek to track 0.
4. Write 1F from the exerciser, and measure the voltage level displayed on the oscilloscope. Similarly, write 2F, and measure the voltage level displayed on the oscilloscope. Do the same on both sides 0 and 1. (Minimum, maximum, and average values)
   (See **Fig. 4.1.**)
5. Then, seek to track 79.
6. Write 1F from the exerciser, and measure the voltage level displayed on the oscilloscope. Similarly, write 2F, and measure the voltage level displayed on the oscilloscope. Do the same on both sides on and 1. (Minimum, maximum, and average values)
7. Modulation: Track 0, track 79 $M = \frac{\text{Max.} - \text{Min.}}{\text{Max.} + \text{Min.}} \times 100$
   Check from the above equation that the measured value is **15% or less.**
8. Resolution: Track 79 $R = \frac{\text{2F average}}{\text{1F average}} \times 100$
   Check from the above equation that the measured value is **55% or more.**

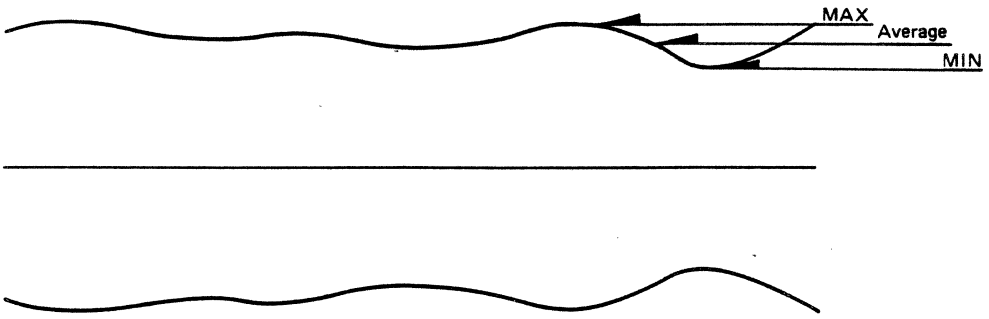


Fig. 4.1 Modulation

4.5 Radial Alignment

Normally, this adjustment is not necessary.

If the stepping motor mounting screws have loosened, or if parts have been damaged, or if a compatibility error has occurred, check and re-adjust as follows:

Steps 1 through 4 apply to both the CE and DAD types, except that alignment diskettes are different between them.

1. Insert an alignment diskette.

Caution: Be sure to leave the alignment diskette indoors for 20 minutes before starting radial alignment.

2. Step to track 40.
3. Synchronize oscilloscope on IX (— INDEX), and set time base to 20 ms/division. One revolution will be displayed.
4. Connect one probe to T1 and the other to T2. Ground the probes to GND and AG. Set inputs to AC, Add, and invert one channel. Set vertical deflection to 0.1 V/division (VARIABLE PULL) for the CE type, or to 2 mV/division for the DAD type.

* **Cat's Eye Type**

5. Check amplitude waveforms for Side 0 and Side 1. Waveforms such as shown in **Fig. 4.2** can be seen.
6. The amplitude ratio of the two waveforms should be **60% or more.** If it is not, adjust as follows:
7. Loosen the two stepping motor mounting screws.
8. Turn the stepping motor along the base by hand until the lobes of the two waveforms have approximately the same amplitude, and retighten the mounting screws. (See **Fig. 4.2.**)
9. Seek from track 0 to 40 and from track 79 to 40, and check that radial alignment is correct.
10. After radial adjustment, be sure to make track 00 sensor adjustment (4.8) and check carriage limiter (4.9).

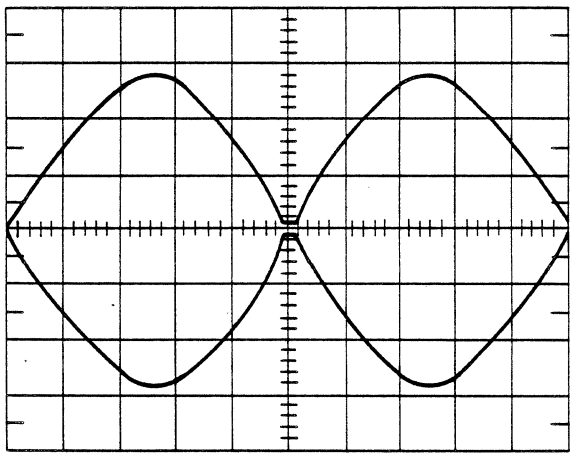


Fig. 4.2 Radial Alignment Waveforms (Cat's Eye)

Caution: Sides 0 and 1 are adjusted to agree at the factory, but if they differ from each other, readjust them to be **60% or more.**

- **DAD (Dynamic Alignment Diskette)**

1. Check amplitude waveforms for Side 0 and Side 1. Waveforms such as shown in **Fig. 4.3** can be seen.
2. Measure each of timing levels A_1 to A_4 and B_1 to B_4 (**Fig. 4.3**), and calculate the lobe ratio from the following formulas.

$$\Sigma A > \Sigma B : \frac{\Sigma B}{\Sigma A} \times 100\%$$

$$\Sigma A < \Sigma B : \frac{\Sigma A}{\Sigma B} \times 100\%$$

3. The lobe ratio calculated by the above formulas should be **50% or more**.
4. If it is not 60% or more, loosen the two stepping motor screws, and adjust.
5. Seek from track 0 to 40 and from track 79 to 40, and check that the specification is met. (Do not seek to track 0 by RECAL in this case.)
6. After radial adjustment, be sure to make track 00 sensor adjustment (4.8) and check carriage limiter (4.9).

For reference: If a 3.5-inch alignment meter is used, the lobe ratio is indicated by the meter so that easy and accurate adjustment can be made.

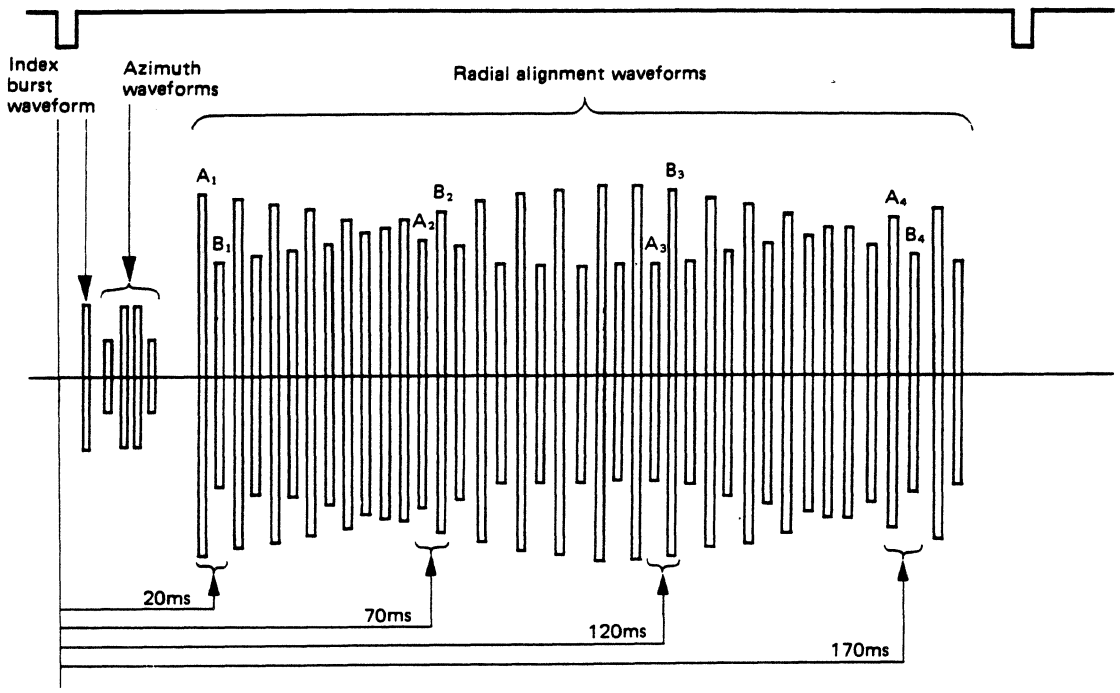
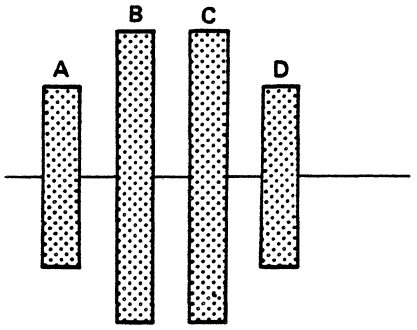


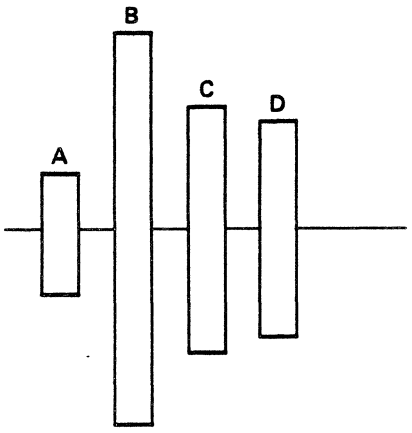
Fig. 4.3 Radial Alignment Waveform (DAD)

4.6 Azimuth Check

1. Insert an alignment diskette.
2. Step to track 40.
3. Synchronize oscilloscope on IX (– INDEX), and set time base to 20 ms/division (DAD) or to 0.5 ms/division (CE).
4. Connect one probe to T1 and the other to T2. Ground the probes to GND and AG. Set inputs to AC Add, and invert one channel. Set vertical deflection to 5 mV/division (DAD), or to 0.1 mV/division (CE).
5. Measure as shown in **Fig. 4.4.**
6. Check that the measured value is within ±**24 minutes.**



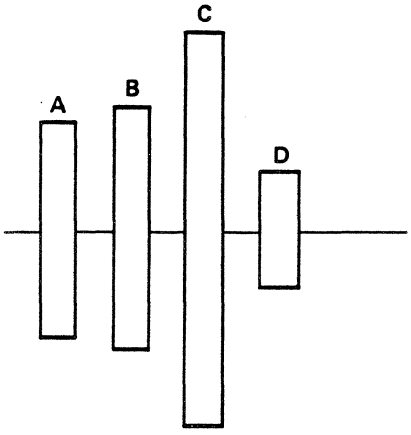
Azimuth 0 waveforms



If B > C

$$\text{Azimuth} = \frac{B - C}{B - D} \times \text{Ⓐ}$$

Ⓐ: 30′ (CE) 15′ (DAD)



If B < C

$$\text{Azimuth} = \frac{C - B}{C - A} \times \text{Ⓐ}$$

Ⓐ: 30′ (CE) 15′ (DAD)

Fig. 4.4 Azimuth Waveforms

4.7 Index Burst Check

1. Insert an alignment diskette.
2. Step to track 40.
3. Synchronize oscilloscope on IX (+ INDEX), and set time base to 20 ms/division (DAD).
4. Connect one probe to T1 and the other to T2. Ground the probes to GND and AG. Set inputs to AC Add, and invert one channel. Set vertical deflection to 2 mV/division (DAD).
5. Check that timing between oscilloscope start and first data pulse is **3 ± 1.7 ms (DAD).**

4.8 Track 00 Sensor Adjustment

1. Set time base of the oscilloscope to 20 ms/division.
2. Connect one probe to ZP. Ground the probes to GND and AG. Set vertical deflection to 0.2 V/division.
3. Set "0" in exerciser ADDRESS 1 and ADDRESS 2. (Single)
4. Set the exerciser to AUTO, and seek to track 0.
5. Check that the exerciser's track 00 LED lights.
6. When the track 00 LED is on, set "1" in the ADDRESS 1 switch and "2" in the ADDRESS 2 switch, and seek between tracks 1 and 2.
7. Loosen the track 0 sensor screw, and adjust until the waveform shown on the oscilloscope is as shown in **Fig. 4.5**.

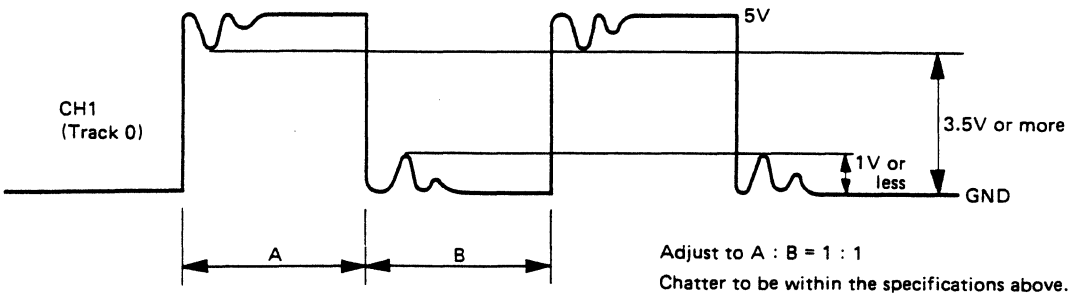


Fig. 4.5 Track 0 Waveforms

4.9 Limiter Adjustment

1. Seek until head position is on track 0.
2. Write 2F data on track 0, and measure read level.
3. Loosen the limiter mounting screw to free the limiter.
4. Bring the limiter to just touch the head carriage that is set to −1 track, and retighten the limiter mounting screw securely.
5. Check that, when power is switched on from off, the head returns to track 0 and that the 2F amplitude level is equal to the value measured in Item 2.

4.10 Asymmetry Check and Adjustment

1. Insert a work diskette.
2. Step to track 79.
3. Connect one of the oscilloscope probes to RD and the other probe to T2. Ground the probes to GND and AG. Set inputs to DC, AC, Add, and invert one channel. Set time base to 1 μs/division and vertical deflection to 0.2 V/division.
4. Write 1F.
5. A read waveform such as shown in **Fig. 4.6** is displayed on the oscilloscope.
6. Check that **T < 600 ns**.
7. If T is over the specified value, adjust it by turning the variable resistor VR1.

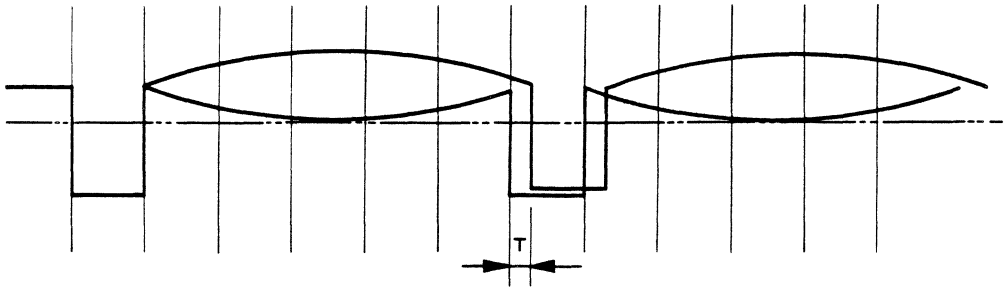
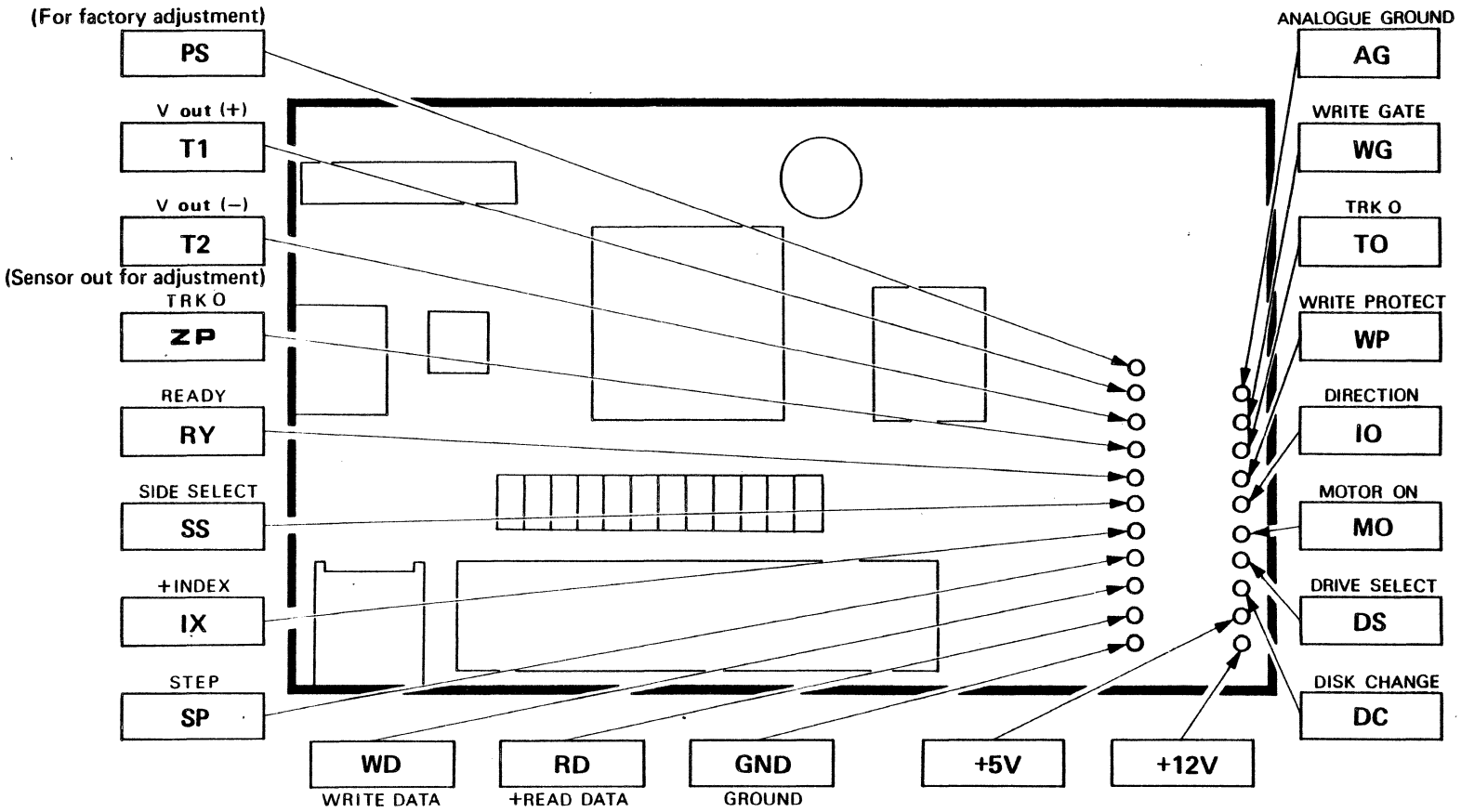


Fig. 4.6 Asymmetry Waveforms


(For factory adjustment)
PS
V out (+)
T1
V out (–)
T2
(Sensor out for adjustment)
TRK 0
ZP
READY
RY
SIDE SELECT
SS
+INDEX
IX
STEP
SP
WD
WRITE DATA
RD
+READ DATA
GND
GROUND
+5V
+12V
ANALOGUE GROUND
AG
WRITE GATE
WG
TRK 0
TO
WRITE PROTECT
WP
DIRECTION
IO
MOTOR ON
MO
DRIVE SELECT
DS
DISK CHANGE
DC

5. REMOVALS AND INSTALLATIONS

All installations should be performed by reversing the removal procedures.

5.1 Cover Removal and Installation (See EXPLODED VIEW-1.)

1. Remove the two cover mounting screws, and take off the cover.
2. When installing the cover back on, be careful not to let the motor leads be caught by the cover.

5.2 Mounting Bracket Removal and Installation (See EXPLODED VIEW-2.)

1. Remove the two mounting screws on the left mounting bracket, and remove the bracket.
2. Remove the right mounting bracket in the same way.

5.3 Front Panel and Eject Button Removal and Installation (See EXPLODED VIEW-1.)

1. Remove the cover as mentioned in Procedure 5.1.
2. Remove the two front panel mounting screws, take off the front panel and eject button.

5.4 Holder Assembly Removal and Installation (See EXPLODED VIEW-1.)

1. Remove the front panel as mentioned in Procedure 5.3.
2. Remove the holder mounting lever screw, and then the holder mounting lever.
3. Remove the auto shutter mounting lever screw, and then the auto shutter mounting lever.
4. Move the head all the way to the rear.
5. Place kim wipe between head sides 0 and 1. (Kim wipe: soft paper tissue)
6. Raise the trigger lever part of the holder assembly, exercising care not to let it be caught by the trigger lever shaft, and remove the holder assembly.
7. When installing the holder assembly back, be careful not to place the holder assembly on the head arm.

5.5 Write Protect Assembly Removal and Installation (See EXPLODED VIEW-1.)

1. Remove the holder assembly as mentioned in Procedure 5.4.
2. Remove the write protect assembly mounting screw, and take off the write protect assembly.

5.6 Head Stepper Motor Assembly Removal and Installation (See EXPLODED VIEW-1.)

1. Disconnect the stepper motor leads from the PCB connector.
2. Remove the holder assembly as mentioned in Procedure 5.4.
3. Unhook the FPC clamp tab, and take off the FPC clamp. (FPC: Flexible Printed Circuit)
4. Disconnect the head FPC from the connector on the control printed circuit board.
5. Remove the FPC retaining angle screw, and take off the FPC retaining angle, right clamp, and short shaft.
6. Remove the left clamp mounting screw and end clamp mounting screw, and take off the left clamp and end clamp.
7. Remove the two stepper motor mounting screws, and then the head stepper motor assembly.
8. After installing the head stepper motor assembly back, make radial adjustment as described in Procedure 4.5.

• Head Stepper Motor Assembly Handling Precautions

1. Be sure to hold the assembly by the motor.
2. Do not shake the motor.
3. Be sure to place kim wipe between head sides 0 and 1.

5.7 Head and Stepper Motor Removal and Installation (See Fig. 5.1.)

1. Remove the head stepper motor assembly as described in Procedure 5.6.
2. Remove the steel belt screw and then the head.
3. Remove the stepper motor pulley screw, and then the stepper motor and steel belt.

• Installation

① Steel belt mounting jig is necessary for assembling the head, stepper motor, and steel belt.
② Set the stepper motor on the jig.
③ Hook one end of the steel belt to the carriage tab.
④ Set the carriage on the jig in such a way that the screw hole in the pulley is in line with the screw hole in the steel belt.
⑤ Pull one end of the steel belt with a constant force, and fasten the pulley and carriage with screws at two points.
⑥ After screwing them, cut off the steel belt at the point where it is pulled.

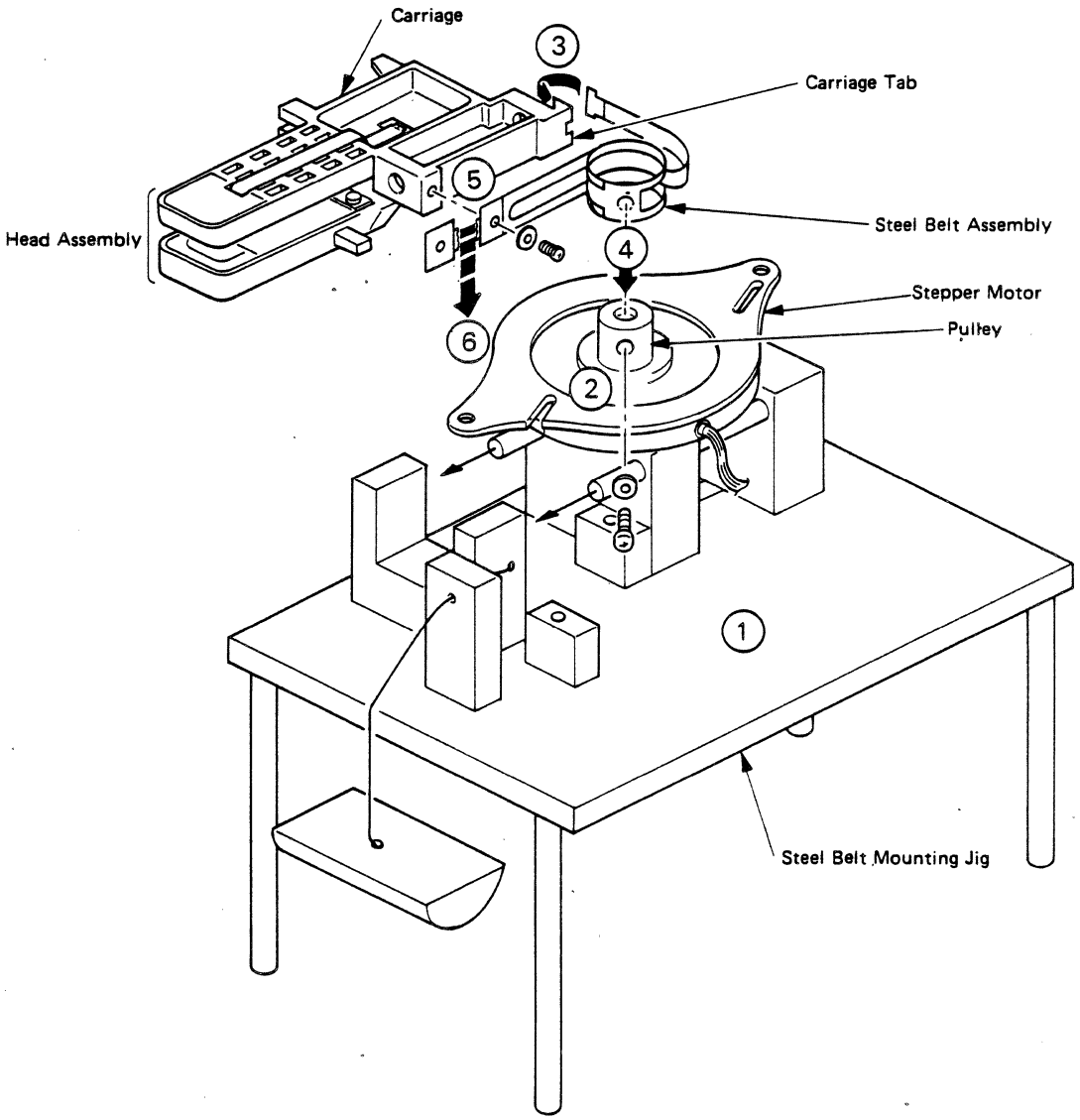


Fig. 5.1 Head and Stepper Motor Assembling

5.8 Eject Lever Removal and Installation (See EXPLODED VIEW-1.)

1. Remove the holder assembly as described in Procedure 5.4.
2. Remove the two eject lever springs.
3. Remove the trigger lever snap ring, trigger lever spring, and trigger lever.
4. Remove the three eject lever snap rings and the eject lever.

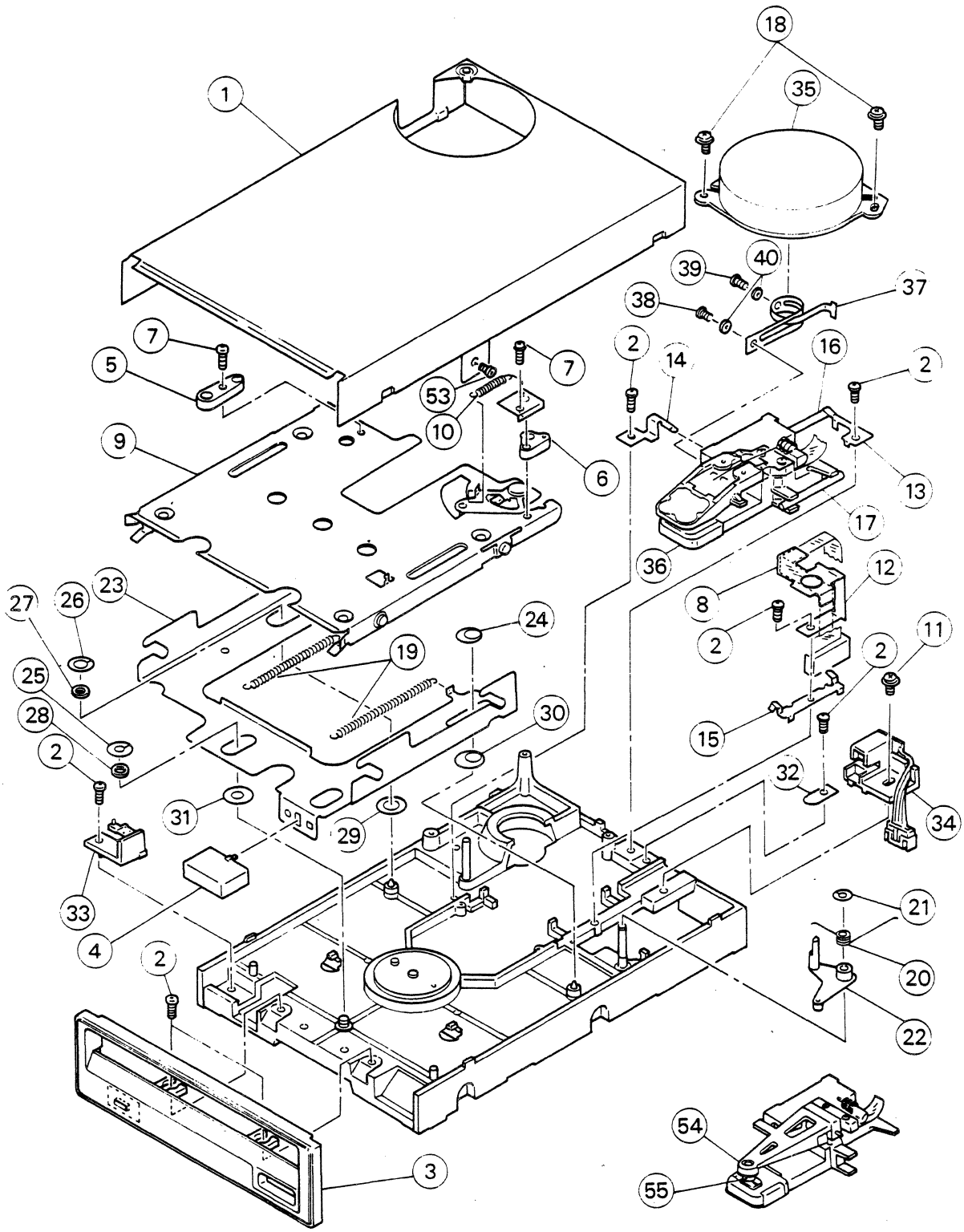
5.9 Control Printed Circuit Board Removal and Installation (See EXPLODED VIEW-2.)

1. Remove the cover as described in Procedure 5.1.
2. Disconnect the lead connector from the track 0 sensor.
3. Disengage the FPC clamp tab and remove the FPC clamp.
4. Disconnect the head FPC from the connector on the printed circuit board.
5. Remove the left and right mounting brackets as mentioned in Procedure 5.2.
6. Disconnect the lead connector from the drive motor printed circuit board.
7. Disconnect the lead connector from the stepper motor.
8. Remove the two control printed circuit board mounting screws and then the control printed circuit board.

5.10 Drive Motor Removal and Installation (See EXPLODED VIEW-2.)

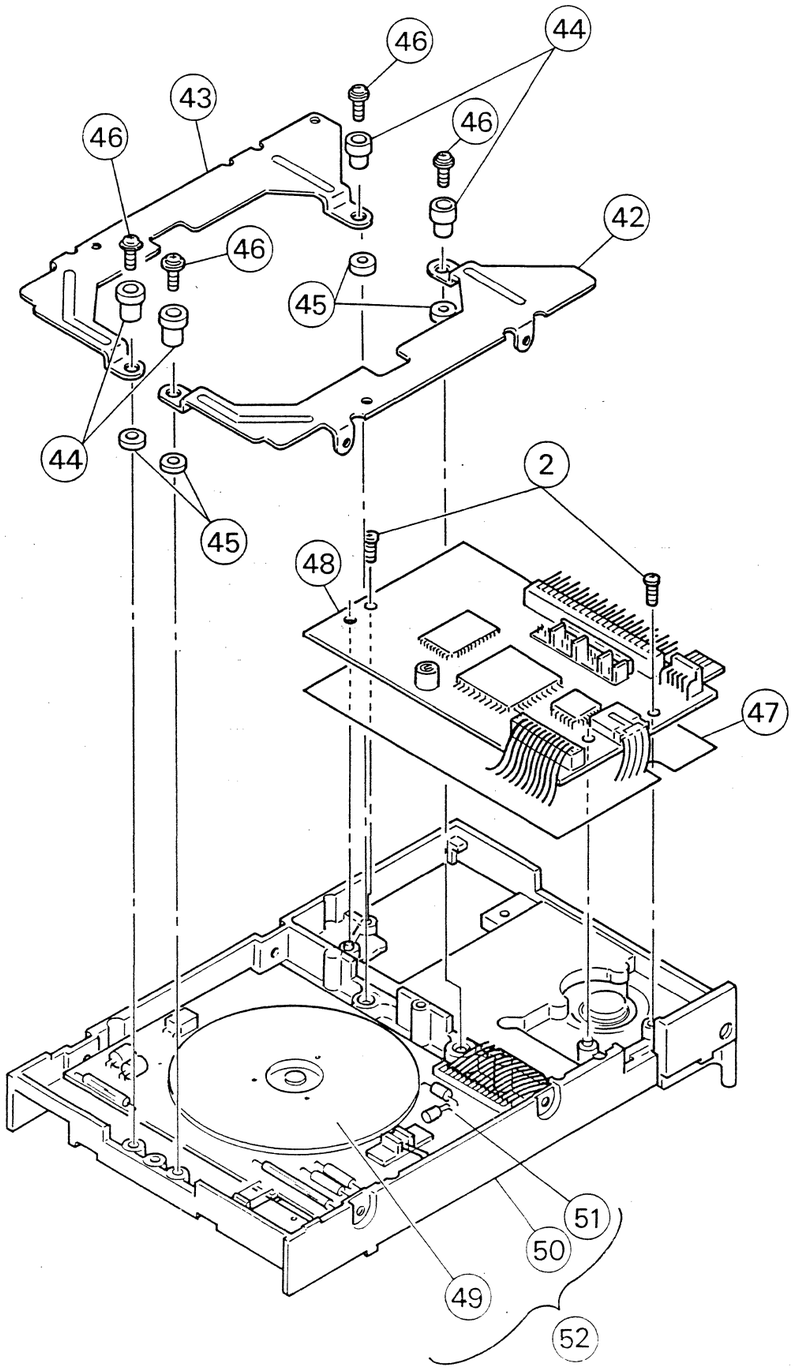
1. Remove the left and right mounting brackets as mentioned in Procedure 5.2.
2. Remove the D motor rotor mounting screw and then the rotor. Because the rotor is attracted by a magnet, it must be pulled hard to remove it.
3. Disconnect the relay cable from the control circuit board.
4. Remove the three motor circuit board mounting screws and then the motor circuit board.

EXPLODED VIEW-1



Basic Model Assembly-1

EXPLODED VIEW-2



Basic Model Assembly-2

REPLACEMENT PARTS LIST OF BASIC MODEL

Ref. No.	Part No.	Description	Per Set (pcs.)
1	YTF5E00561B3	Cover	1
2	XSB25+5FX	Screw (M2.5 x 5 Bind)	9
3	YTF7K02200B4	Front Panel	1
4	YTF6J00570B4	Button (For Eject)	1
5	YTF4H01600B4	Lever (For Holder Mounting)	1
6	YTF4H01610B4	Lever (for Auto Shutter)	1
7	XSN2+5FX	Screw (M2 x 5 Pan Head)	2
8	YTF2C03191B4	FPC Clamp	1
9	YTF7K01863B3	Holder Assembly	1
10	YTF4J01593B4	Spring (For Auto Shutter)	1
11	XYN25+5FX	Screw (M2.5 x 5 Sems)	1
12	YTF2C02770B4	Angle (For FPC Retaining)	1
13	YTF2C02780B4	Clamp (End)	1
14	YTF2C02790B4	Clamp (Left)	1
15	YTF2C02800B4	Clamp (Right)	1
16	YTF4H01470B4	Shaft (Long)	1
17	YTF4H01480B4	Shaft (Short)	1
18	YTF1E00410B4	Screw (For Stepper Motor Mounting)	2
19	YTF4J00861B4	Spring (For Eject Lever)	2
20	YTF4J01430B4	Spring (For Trigger Lever)	1
21	YTF1K00441B4	Stopper A	1
22	YTF7K01853B4	Lever Assembly (Trigger)	1
23	YTF2K02872B2	Lever (For Eject)	1
24	YTF1K00381B4	Stopper B	1
25	YTF1K00390B4	Stopper C	1
26	YTF1K00171B4	Stopper	1
27	YTF4S00800B4	Roller (For Eject)	1
28	YTF4S01680B4	Roller (For Eject)	1
29	YTF1K00121B4	Washer	1
30	YTF1K00361B4	Washer B	1
31	YTF1K00370B4	Washer C	1
32	YTF3D03030B4	Limiter (TRKϕ)	1
33	YTUFS363WP	Write Protect Assembly	1
34	YTUFS363T0	Sensor Assembly (For TRKϕ)	1
35**	YTFMD00652B4	Stepper Motor	1
36**	YTUF363HD	Head Assembly (For JU-363)	1
37**	YTF7K01843B3	Steel Belt Assembly	1
38**	YTF1E00421B4	Screw (For Steel Belt and Head Mounting)	1
39**	XYN2+4FX	Screw (For Steel Belt and Pulley Mounting)	1
40**	LPW2-0, 2	Washer (For Steel Belt and Pulley Mounting)	2
41*	YTUFS363HAC	Head S-Motor Assembly (For JU-363)	1
42	YTUFS363BK-R	Bracket Assembly (Right)	1
43	YTUFS363BK-L	Bracket Assembly (Left)	1
44	YTF2P03050B4	Collar (For Bracket)	4
45	YTF2P03060B4	Spacer (For Bracket)	4
46	XYN25+7FX	Screw (M2.5 x 7 Sems)	4
47	YTF2P03290A4	Insulating Paper	1
48	YTUF363PKCN	Control Circuit Board	1
49*	YTFMD00660B4	Drive Motor	1
50*	YTF7K01882B3	Base Assembly	1
51*	YTUF363PKMT	Motor Circuit Board	1
52	YTUF363DM	Base D-Motor Assembly	1
53	XSN25+4FX	Screw (M2.5 x 4 Pan Head)	2
54**	YTUF323HD	Head Assembly (For JU-323)	1
55	YTUFS322LP	Pad Assembly (For JU-323)	1

Note:
1. Those parts marked * and PCB parts are NOT FIELD REPLACEABLE.
2. PCBs are produced to order during the production period only.
3. When replacing the parts marked with **, steel belt assembly and steel belt fixing jigs are repuired.
4. When you order the aforementioned parts, be sure to specify "Part No." of the parts ordered.
5. Specify 35,36 for Ref. No. 41, and 52 for Ref. No. 49, 50 and 51.

REPLACEMENT PARTS LIST OF BASIC MODEL

MT Board (Parts Side)

Ref. No.	Part No.	Description	Per Set (pcs.)
R8	ERX1SJ2R2	Metal Film Resistor	1
C1	ECEA1VKS4R7	Electrolytic Capacitor	1
C6, 7, 8	RPE122F104Z	Ceramic Capacitor	3
C9, 10	ECEA1AKN100	Electrolytic Capacitor	2
C12	ECEA1HSNR47	Electrolytic Capacitor	1
C13	RPE122F104Z	Ceramic Capacitor	1
C15	ECEA1VKS4R7	Electrolytic Capacitor	1
C16	RPE122F104Z	Ceramic Capacitor	1
DS2	LN28RP	LED	1
IC	ON2160R, S	Photo Interruptor	1
L1	BL01RN1A62	Choke Coil	1
SW1, 2	YTFWY00020B4	Switch	2
X1	CSB614PB	Resonator	1
	F2S003010B4	Index Bracket Mounting Angle	1

MT Board (Conductor Side)

Ref. No.	Part No.	Description	Per Set (pcs.)
R1, 2	ERJ8GCJ122V	Chip Resistor	2
R3 ~ 5	ERJ8GCJ2R7V	Chip Resistor	3
R6	ERJ8GCJ123V	Chip Resistor	1
R7	ERJ8GCJ563V	Chip Resistor	1
R9	ERJ8GCJ331V	Chip Resistor	1
R10	ERJ8GCJ101V	Chip Resistor	1
R11	ERJ8GCJ271V	Chip Resistor	1
R12, 13	ERJ8GCJ122V	Chip Resistor	2
R14	ERJ8GCJ331V	Chip Resistor	1
C2 ~ 5	FCC00030B420	Chip Capacitor	4
C11	FCC00100B403	Chip Capacitor	1
C14	FCC00010B428	Chip Capacitor	1
J1 ~ 4	ERJ8GCOR00V	Chip Resistor	4
HA13432MP	HA13432MP	LSI	1
HU, HV, HW	OH003HR-TX	Hall Element	3

REPLACEMENT PARTS LIST OF BASIC MODEL

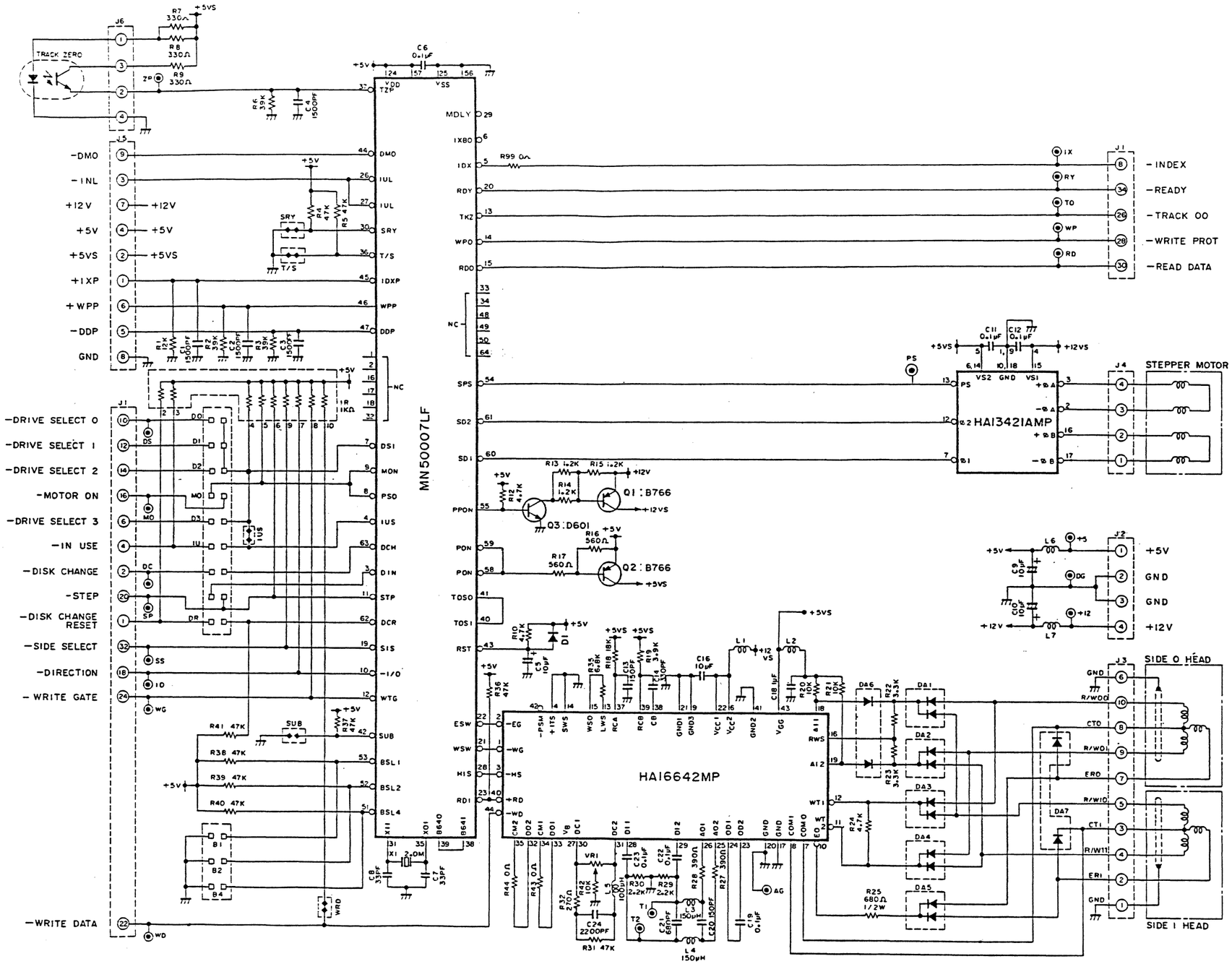
CNT Board (Parts Side)

Ref. No.	Part No.	Description	Per Set (pcs.)
R9	ERJ8GCJ331V	Chip Resistor	1
R20, 21	ERJ8GCG103V	Chip Resistor	2
R22, 23	ERJ8GCG332V	Chip Resistor	2
R24	ERJ8GCJ472V	Chip Resistor	1
R25	ERD50TJ681	Carbon Resistor	1
R35	ERJ8GCG682V	Chip Resistor	1
R41	ERJ8GCJ473V	Chip Resistor	1
C5	ECEA1CKS100	Electrolytic Capacitor	1
C6	RPE122F104Z	Ceramic Capacitor	1
C9, 10	ECEA1CKS100	Electrolytic Capacitor	2
C11, 12	RPE122F104Z	Ceramic Capacitor	2
C16	ECSZ35HS10	Tantalum Capacitor	1
C18	FCJ00080B400	Ceramic Capacitor	1
C19	FCC00020B401	Chip Capacitor	1
J1	34PA-2.5DS3	Connector	1
J2	171826-4	Power Connector	1
J4	4PS2L225EFK	Connector	1
J5	B09-DR-S	Connector	1
L1	ELEBD330KA	Choke Coil	1
L2	ELEBD681KA	Choke Coil	1
L3, 4	FNC00030B426	Low Frequency Coil	2
L5	FNC00030B424	Low Frequency Coil	1
L6, 7	BL01RN1A62	Choke Coil	2
D6, 7	MA159-TW	Diode	2
IR1	EXBF10E102J	Block Resistor	1
ID3	DAN202KT-97	Diode Array	1
X1	YJCSA2.0OMK	Resonator	1
VR1	EVMQ0G01KB24	Variable Resistor	1
421	HA13421AMP	LSI	1
HA16642	HA16642MP	IC	1
MN50007LF	MN50007LFC	LSI	1
P	FJH00130B4-1	Plug	4
P	FJH00130B4-2	Plug	1
P	FJH00160B4-1	Plug	3
P	FJH00160B4-2	Plug	1

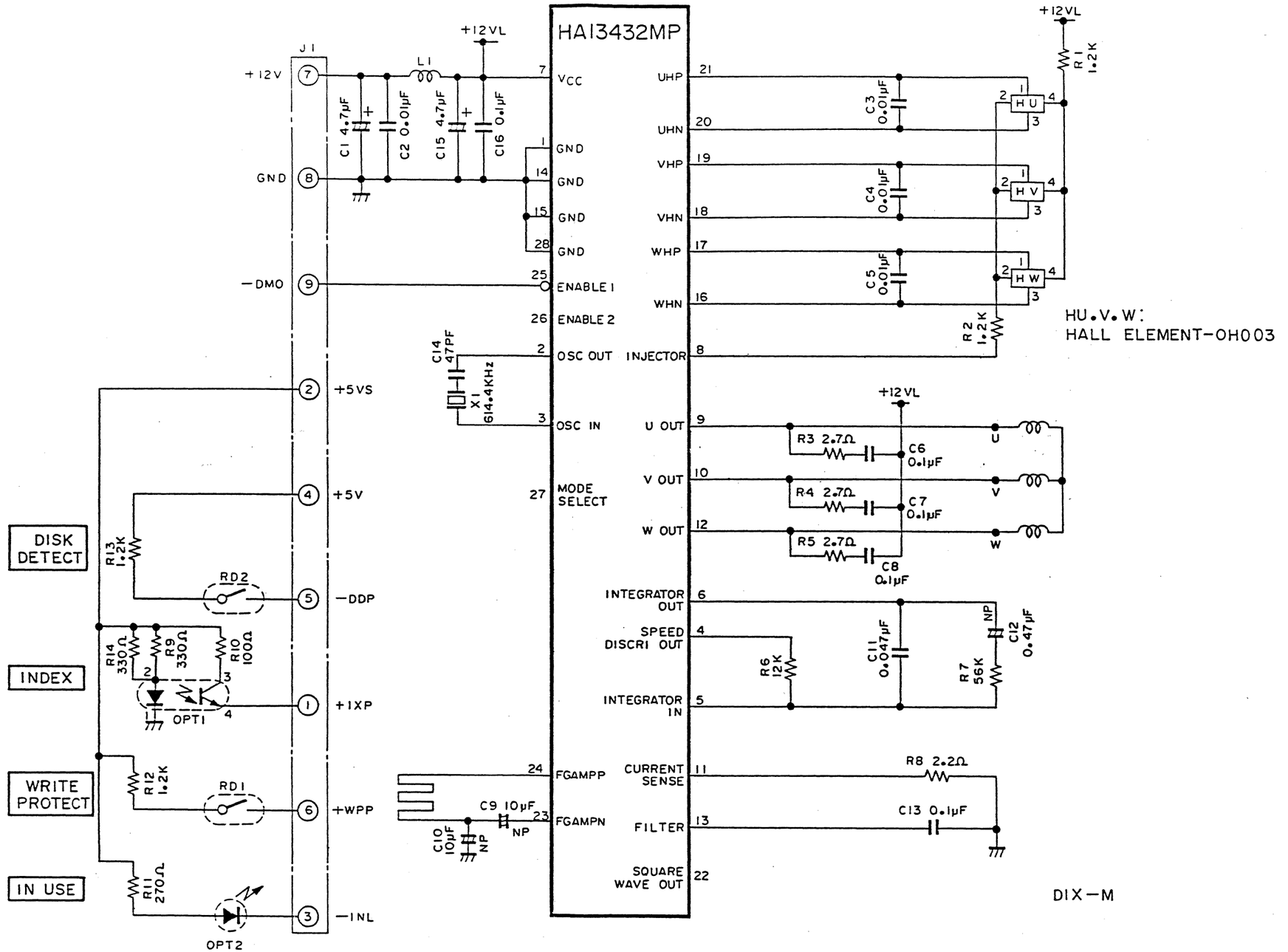
CNT Board (Conductor Side)

Ref. No.	Part No.	Description	Per Set (pcs.)
R1	ERJ8GCJ123V	Chip Resistor	1
R2, 3	ERJ8GCJ393V	Chip Resistor	2
R4, 5	ERJ8GCJ473V	Chip Resistor	2
R6	ERJ8GCJ393V	Chip Resistor	1
R7, 8	ERJ8GCJ331V	Chip Resistor	2
R10	ERJ8GCJ472V	Chip Resistor	1
R12	ERJ8GCJ472V	Chip Resistor	1
R13 ~ 15	ERJ8GCJ122V	Chip Resistor	3
R16, 17	ERJ8GCJ561V	Chip Resistor	2
R18	ERJ8GCG183V	Chip Resistor	1
R19	ERJ8GCG392V	Chip Resistor	1
R27, 28	ERJ8GCJ391V	Chip Resistor	2
R29, 30	ERJ8GCG222V	Chip Resistor	2
R31	ERJ8GCJ473V	Chip Resistor	1
R32	ERJ8GCJ271V	Chip Resistor	1
R36 ~ 40	ERJ8GCJ473V	Chip Resistor	4
R42	ERJ8GCJ103V	Chip Resistor	1
R43, 44	ERJ8GCOR00V	Chip Resistor	2
R99	ERJ8GCOR00V	Chip Resistor	1
C1 ~ 4	ECUV1H152KBM	Chip Capacitor	4
C7, 8	FCC00010B424	Chip Capacitor	2
C13	FCC00010B440	Chip Capacitor	1
C14	FCC00010B448	Chip Capacitor	1
C20	FCC00010B440	Chip Capacitor	1
C21	FCC00010B456	Chip Capacitor	1
C22, 23	FCC00020B401	Chip Capacitor	2
C24	FCC00030B412	Chip Capacitor	1
C99	ECUV1H102KBM	Chip Capacitor	1
J3	FJC00150B4	Connector	1
J6	ILS4PS2T2EF	Connector	1
D1	MA151K-TX	Diode	1
ID1, 2	DAN202KT-96	Diode Array	2
ID4, 5	DAN202KT-96	Diode Array	2
Q1, 2	2SB766-TX	Transistor	2
Q3	2SD601-TX	Transistor	1

SCHEMATIC DIAGRAM OF CONTROL BOARD



SCHEMATIC DIAGRAM OF DRIVE MOTOR

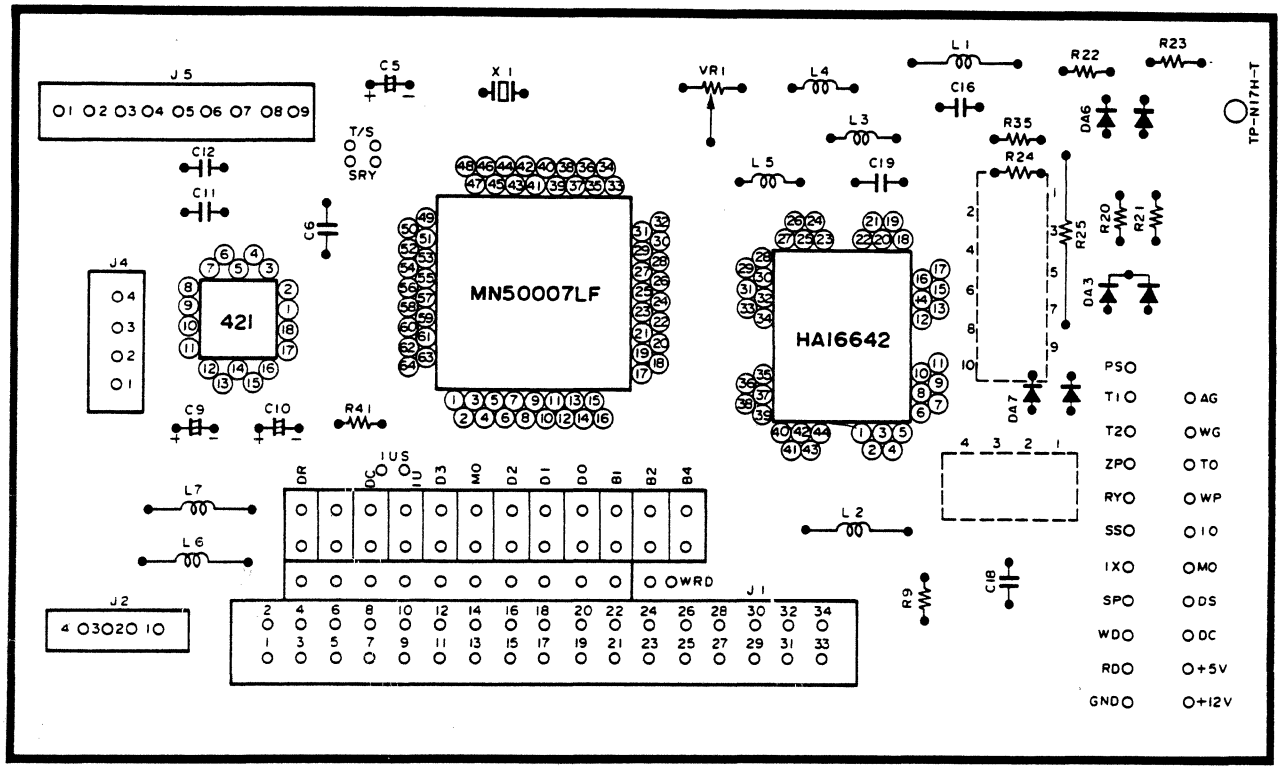


HU.V.W:
HALL ELEMENT-OH003

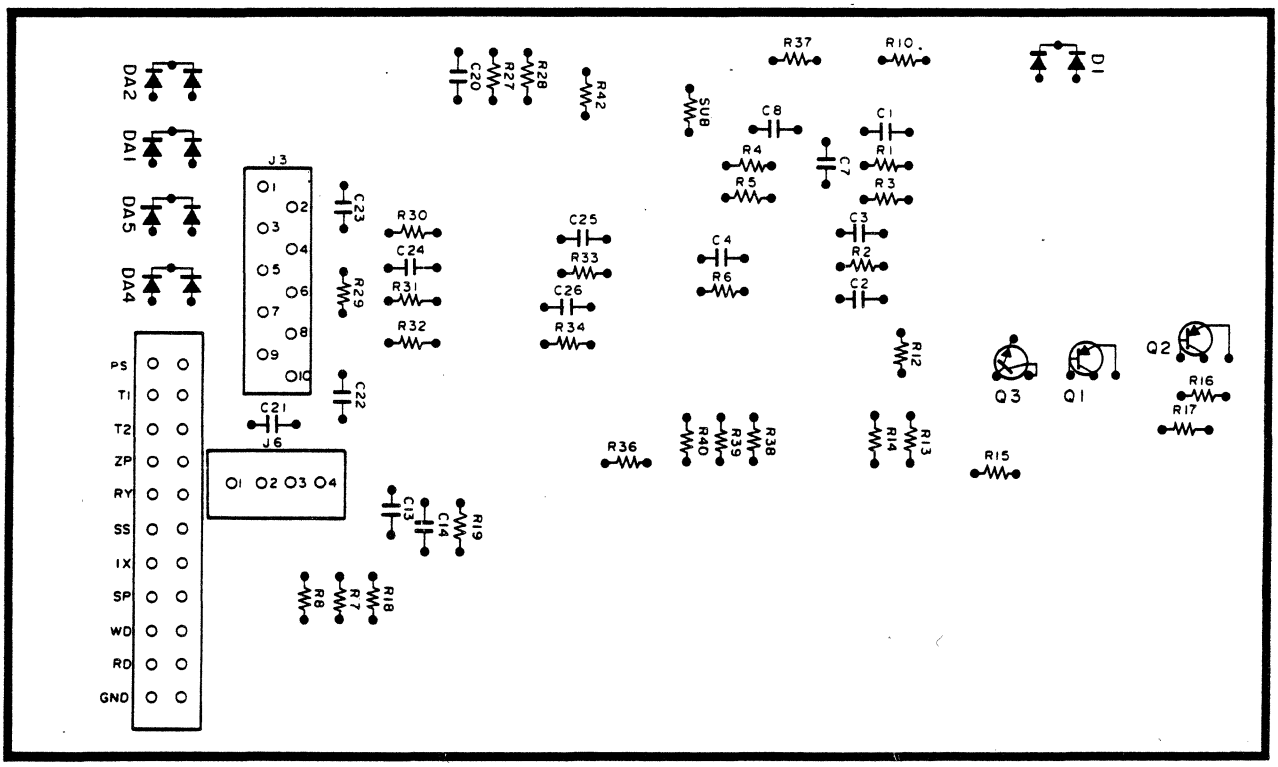
DIX-M

CIRCUIT BOARD OF CONTROL BOARD

Parts side.

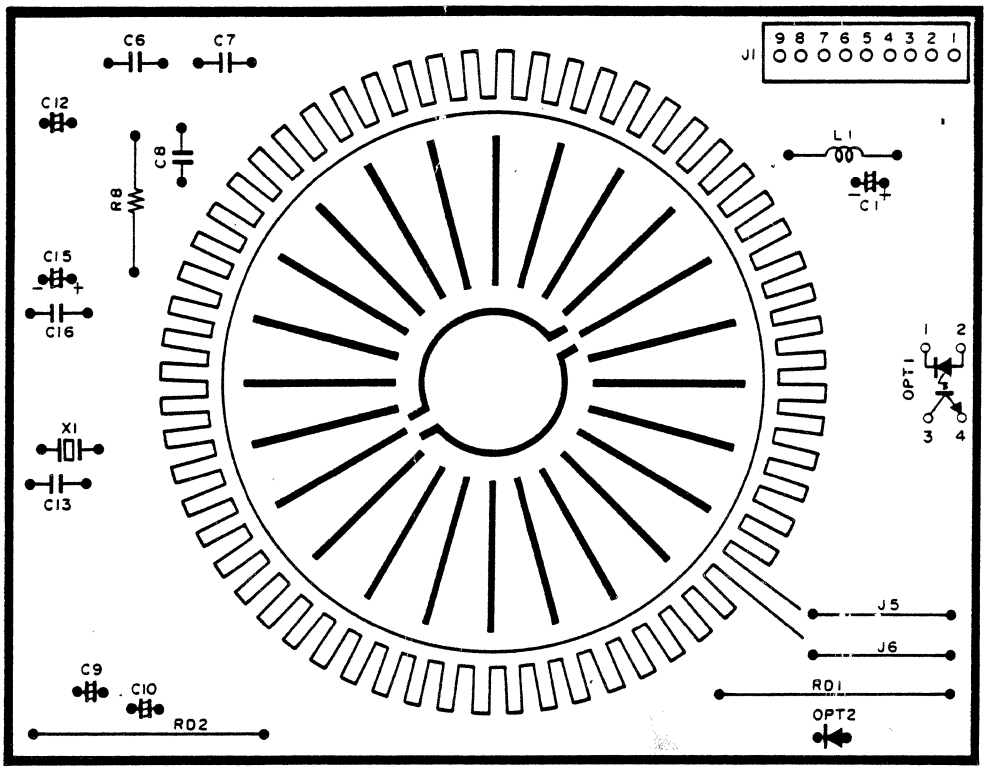


Conductor side.

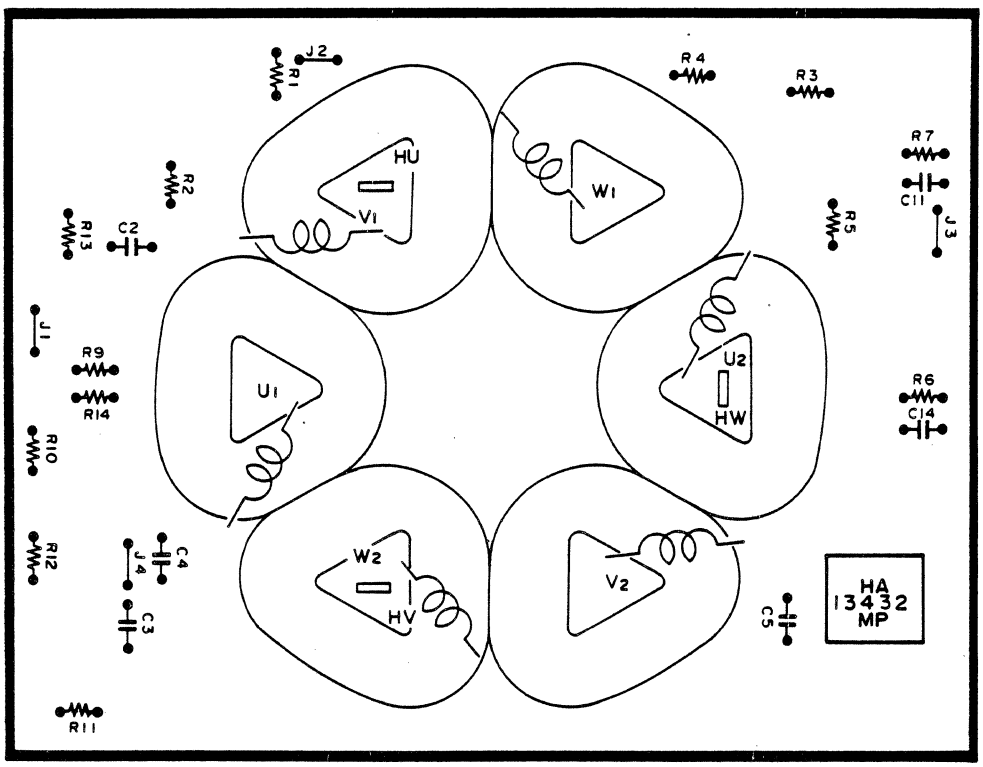


CIRCUIT BOARD OF DRIVE MOTOR

Parts side.



Conductor side.



Note:

Printed in Japan