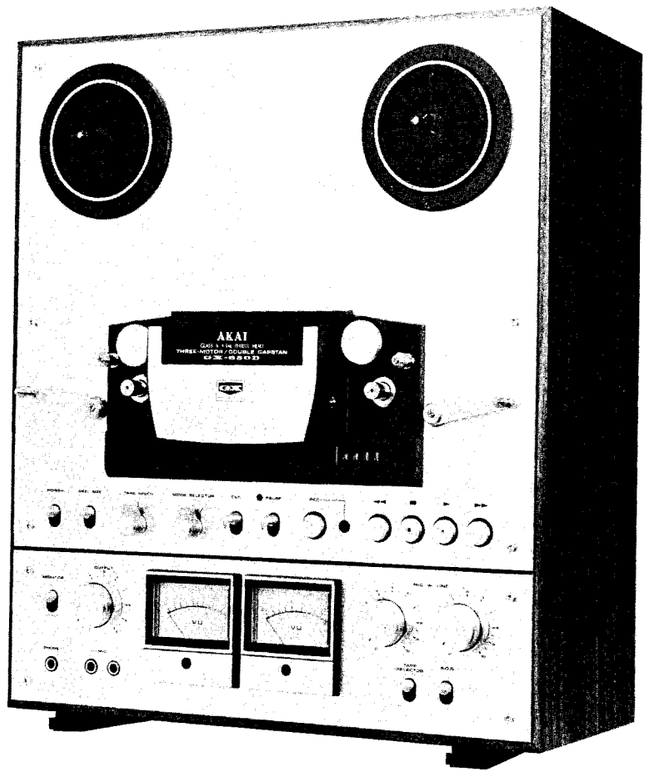
SERVICE MANUAL

PARTS LIST

MODEL GX-650D

AKAI



STEREO TAPE DECK

MODEL GX-650D

SECTION 1

SERVICE MANUAL

TABLE OF CONTENTS

For basic adjustments, measuring methods, and operating principles, refer to GENERAL OPERATING PRINCIPLES AND ADJUSTMENTS.

I. TECHNICAL DATA

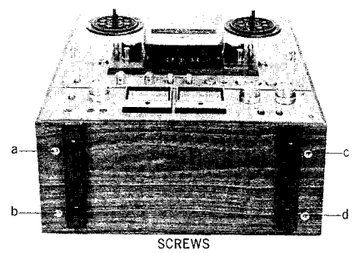
TRACK SYSTEM	4 track, 2 channel stereo/monaural system	
REEL CAPACITY	Up to 10-1/2" reel	
TAPE SPEED	15, 7-1/2 ips (±0.5%)	
WOW/FLUTTER	Less than 0.04% RMS at 15 ips Less than 0.055% RMS at 7-1/2 ips Less than 0.07% RMS at 3-3/4 ips	
FREQUENCY RESPONSE	30 to 30,000 Hz ±3 dB at 15 ips using Akai LN-150 tape 30 to 26,000 Hz ±3 dB at 7-1/2 ips using Akai LN-150 tape 30 to 20,000 Hz ±3 dB at 3-3/4 ips using Akai LN-150 tape	
DISTORTION	Less than 0.4% at 15 and 7-1/2 ips (1,000 Hz "0" VU) Less than 0.9% at 3-3/4 ips (1,000 Hz "0" VU)	
SIGNAL TO NOISE RATIO	Better than 58 dB (measured via tape with peak recording level of +6 VU)	
ERASE RATIO	Better than 70 dB	
BIAS FREQUENCY	150 kHz	
HEADS	(3): One GX Playback Head, one GX Recording Head and one Erase Head	
MOTORS	(3): One AC Servo Motor for capstan drive, and two Eddy Current Motors for reel drive	
FAST FORWARD AND REWIND TIME	120 sec using a 2,400 ft tape	
OUTPUT JACKS	Line (2): 0.775V (0VU) Required load impedance: More than 20 k ohms Phone (1): 30 mV/8 ohms	
INPUT JACKS	Microphone (2): 0.3 mV/ Required microphone impedance: 600 ohms Line (2): 80 mV/100 k ohms	
TRANSISTOR	2SA564(Q) (R) . . . 3 2SC458LG (C) (D) (P) . . . 14 2SC711(D2) . . . 1 2SC792 . . . 1 2SC945L (P) (Q) . . . 15 2SC1014 (C) (D) . . . . 1 2SD234 . . . 1	2SA640 (E) . . . 4 2SC711(D) (E) (F) . . . 12 2SC711 SPECIAL (E2) . . . 2 2SC945(P) (Q) (R) . . . 14 2SC971 . . . 1 2SC1247A (B) (V) . . . 3
DIODE	1N34A . . . 2 1S2473VE . . . 14 10D4 . . . 6 10DC2 (RED) . . . 1	1S2473 . . 20 10D1 . . . 7 10DC2 (BLK) . . . 1 RD7A (L) (N) . . . 3
POWER REQUIREMENTS	CSA, UL and LA Models: 120V 60 Hz only CEE Models: 220V 50 Hz only Other Models: 100 to 240V 50/60 Hz (Switchable)	
DIMENSIONS	524(H) x 442(W) x 258(D) mm (20.6" x 17.4" x 10")	
WEIGHT	26.2 kg (57.6 lbs)	

NOTES: 1. For improvement purposes, specifications and design are subject to change without notice.
2. Noise reduction circuit made under license from Dolby Laboratories Inc.
The word 'DOLBY' and the Double-D symbol are trademarks of Dolby Laboratories Inc.

II. DISMANTLING OF UNIT

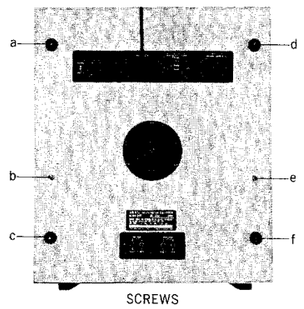
In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Reassemble in reverse order.

1



SCREWS

2



SCREWS

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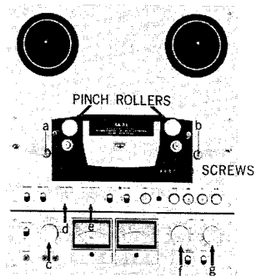

KNOBS

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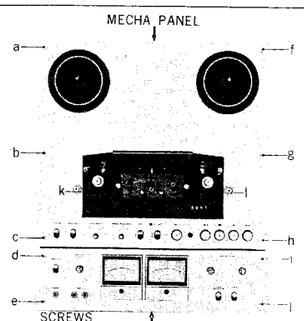

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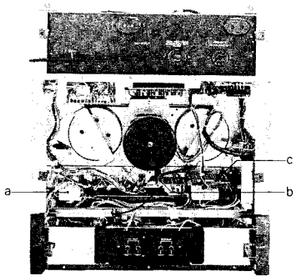
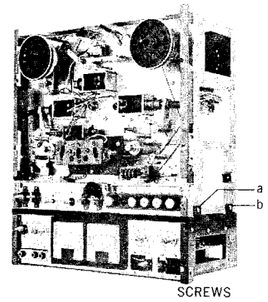


CONNECTORS

6



SCREWS

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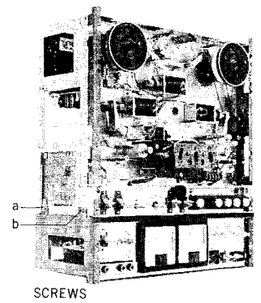

SCREWS

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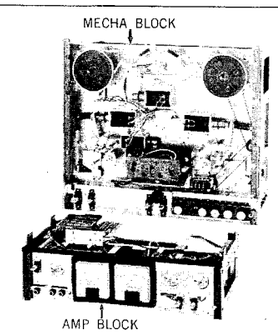


III. ARRANGEMENT OF PRINCIPAL PARTS

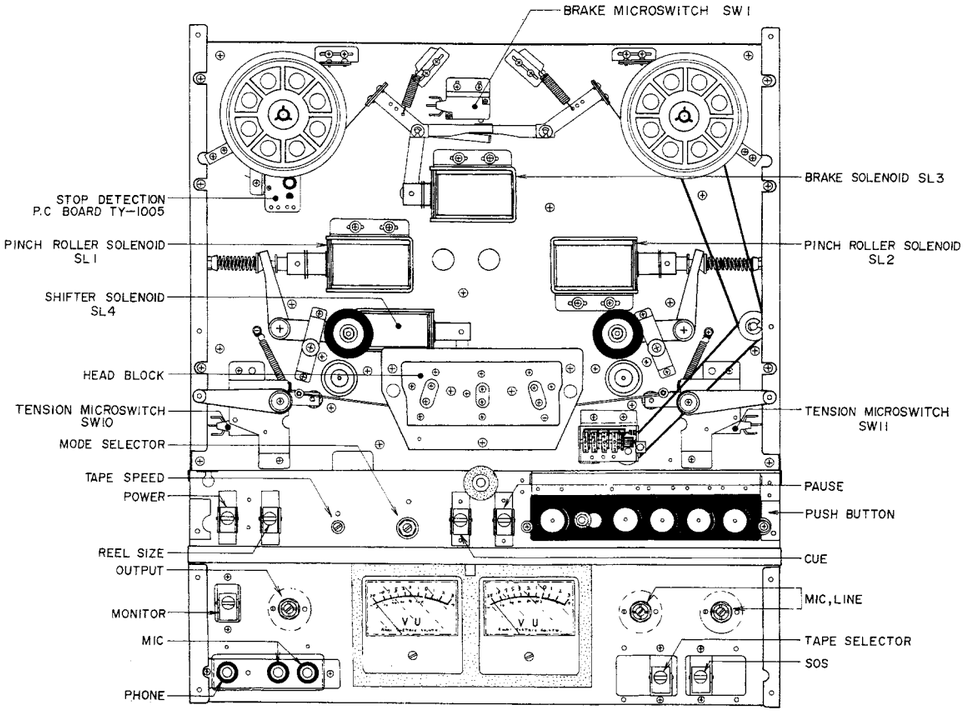


Fig. 1 Front View

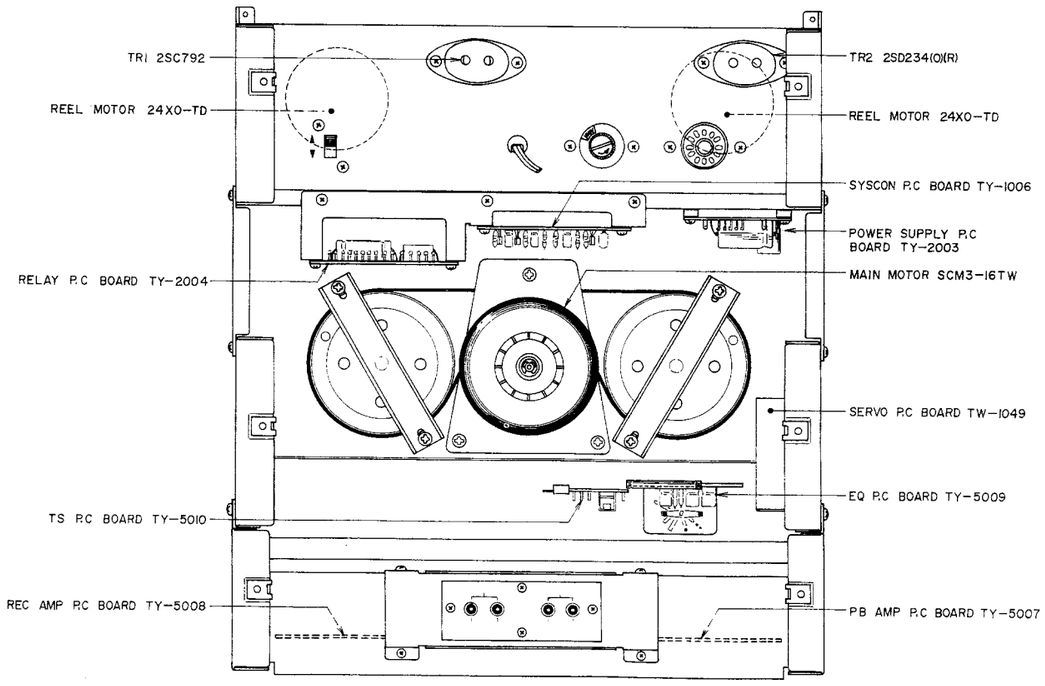


Fig. 2 Rear View

IV. MECHANISM ADJUSTMENT

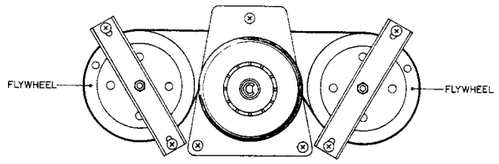


Fig. 3

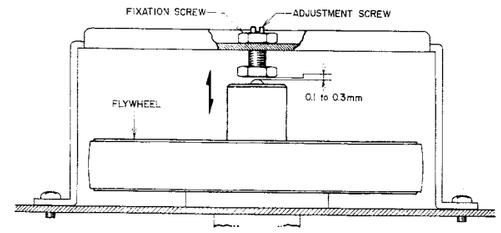


Fig. 4

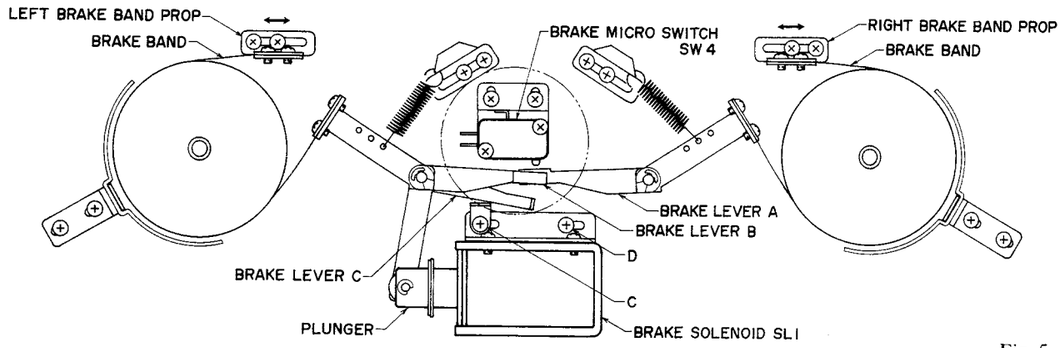


Fig. 5

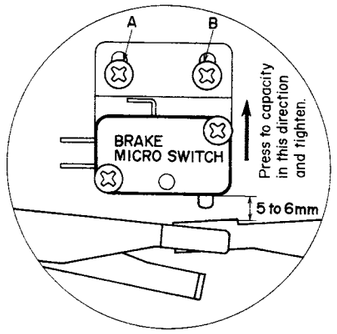


Fig. 6

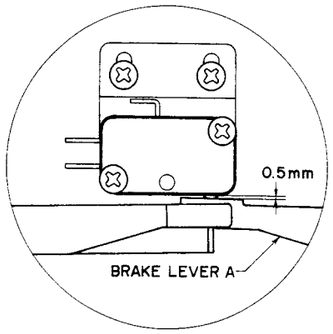


Fig. 7

1. CAPSTAN SHAFT LOOSE PLAY ADJUSTMENT (Refer to Figs. 3 and 4)

Adjust by turning Adjustment Screw to obtain a 0.1 to 0.3 mm degree of loose play when the capstan shaft is moved as indicated by the arrow mark. · Tighten fixation nut to maintain optimum adjusted condition.

NOTE: When replacing a flywheel, replace with same rank flywheel as previously installed.

2. BRAKE SOLENOID POSITION ADJUSTMENT

1) As shown in Fig. 6, press brake micro switch as far as it will go toward the top of the mechanical frame, and tighten screws A and B.
2) Move the Right Brake And Prop shown in Fig. 5 so that the gap between Brake Lever A and the body of Brake Micro Switch is 5 to 6mm (See Fig. 6).
3) Move the Left Brake Band Prop shown in Fig. 5 so that Brake Lever B and Brake Lever A are simultaneously operated by Brake Lever C.
4) As shown in Fig. 7, when the plunger is pulled, tighten Brake Solenoid Screws C and D at position at which the gap between Brake Lever A and the body of Brake Micro Switch is 0.5 mm at the narrowest place.

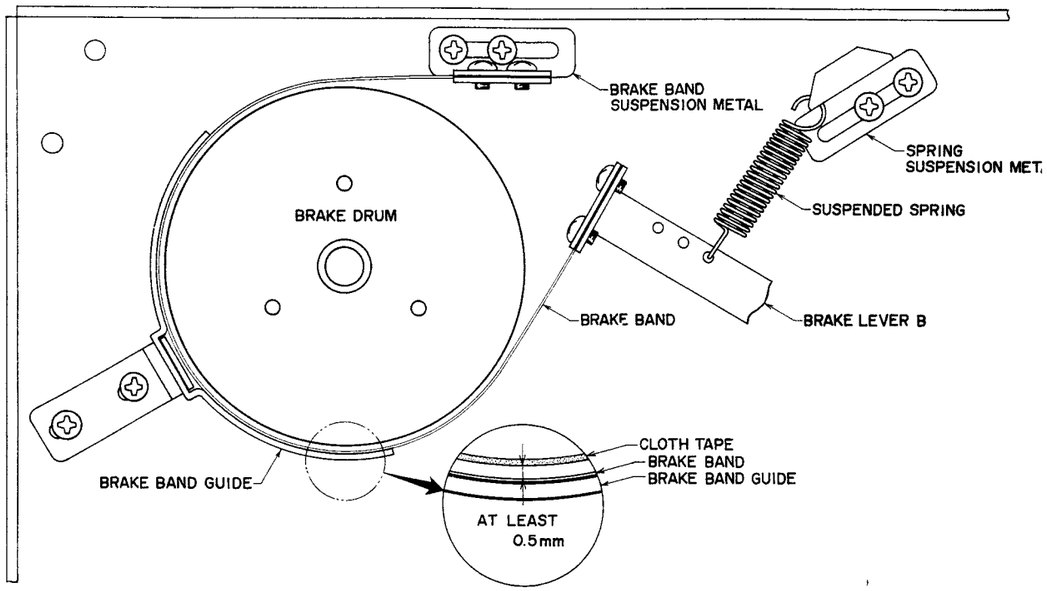


Fig. 8

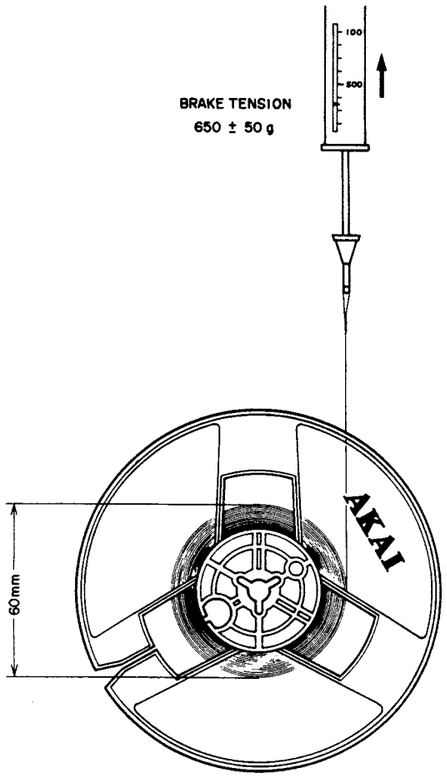


Fig. 9

3. BRAKE TENSION ADJUSTMENT

1) As shown in Fig. 9, brake tension is measured with a spring gauge using a 60 mm diameter tape wound on a 5″ reel. Ideal brake tension is 650 ±50 gr. and left/right deviation allowance should be within 50 gr.
2) Methods for brake tension adjustment are as follows: (See Fig. 8)
   Method A: Change position of suspended spring.
   Method B: Adjust position of spring suspension metal.

   NOTE: Following Brake Tension Adjustment, confirm that when the machine is set to each of the various modes (except stop mode), the brake band separates from the cloth tape on the brake drum by at least 0.5 mm. (See Fig. 8)

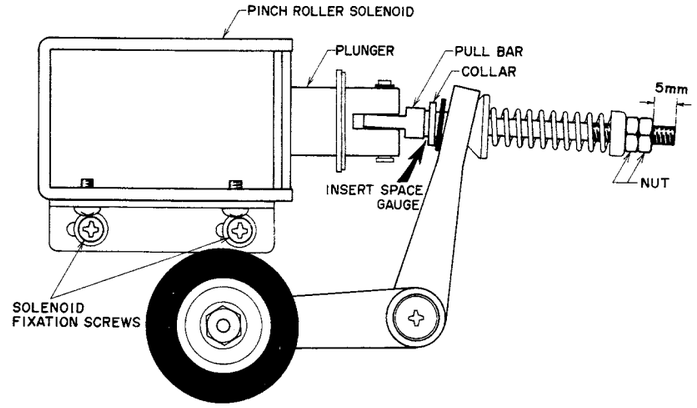
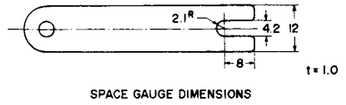


Fig. 10



SPACE GAUGE DIMENSIONS

Fig. 11

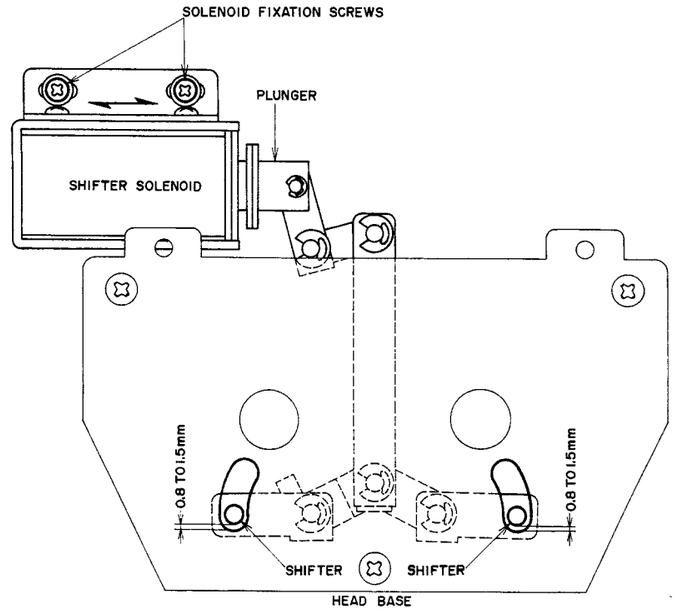


Fig. 12

4. PINCH ROLLER SOLENOID POSITION ADJUSTMENT

Set nut so that the screw part of the pull bar extends 5 mm further than the nut, and insert a space gauge of which the dimensions are the same as shown in Fig. 11 between the collar and pull bar shown in Fig. 10, and fix at position at which the pinch roller rests against the capstan. Set left and right to same degree.

5. SHIFTER SOLENOID POSITION ADJUSTMENT

As shown in Fig. 12, adjust the position of the Shifter Solenoid so that when the plunger is pulled, the gap of the shifter and oblong hole of the head base is 0.8 to 1.5 mm.

NOTE: The tape must definitely not touch the head.

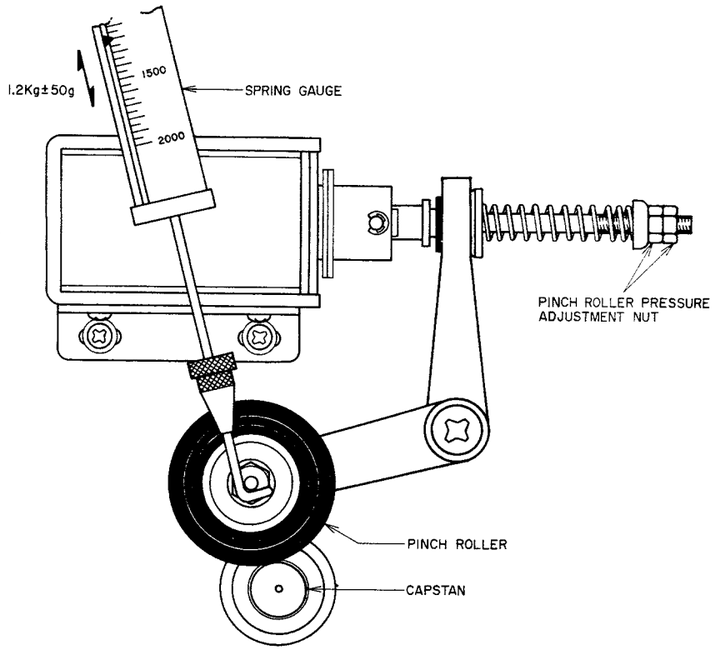


Fig. 13

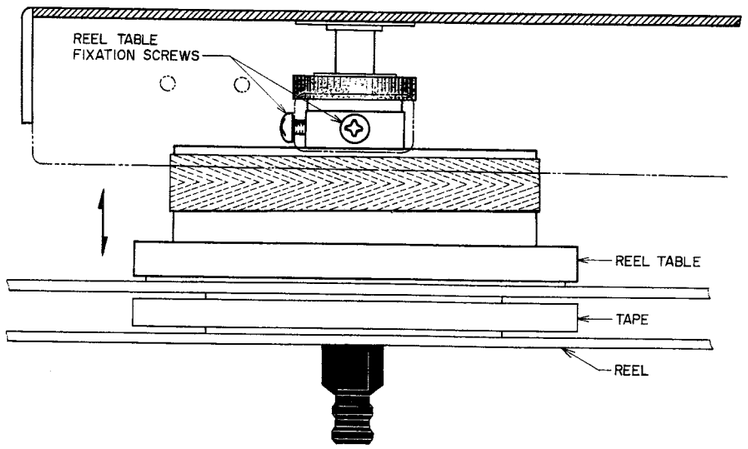


Fig. 14

7. REEL TABLE HEIGHT ADJUSTMENT (See Fig. 14)

Load a tape (left and right reel tables), but do not thread tape through left/right tape guides and tension levers. Set to F.Fwd and Rwd mode and adjust the position of reel tables in direction of arrow mark so that the tape winds in the center of the reels. Tighten reel table fixation screws at most ideal position.

NOTE: Tape should wind in center of reel regardless of type of reel used.

6. PINCH ROLLER PRESSURE ADJUSTMENT

As shown in Fig. 13, pull back the Pinch Roller with a spring gauge, and then return. Take a reading of the spring gauge indication at the time the pinch roller touches the capstan. Adjust Pinch Roller Pressure Adjustment nut to obtain a 1.2 kg ±50 gr spring scale indication at this time.

NOTE: Because this model employs a dual capstan system, adjust so that the difference in pinch roller pressure between left and right is within 50 gr.

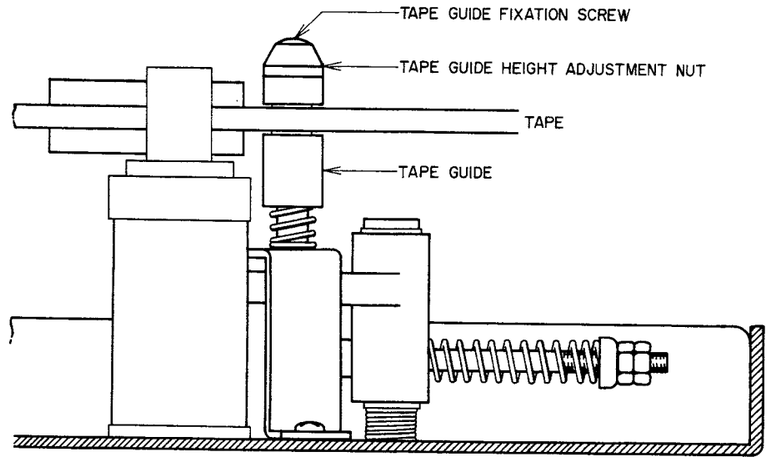


Fig. 15

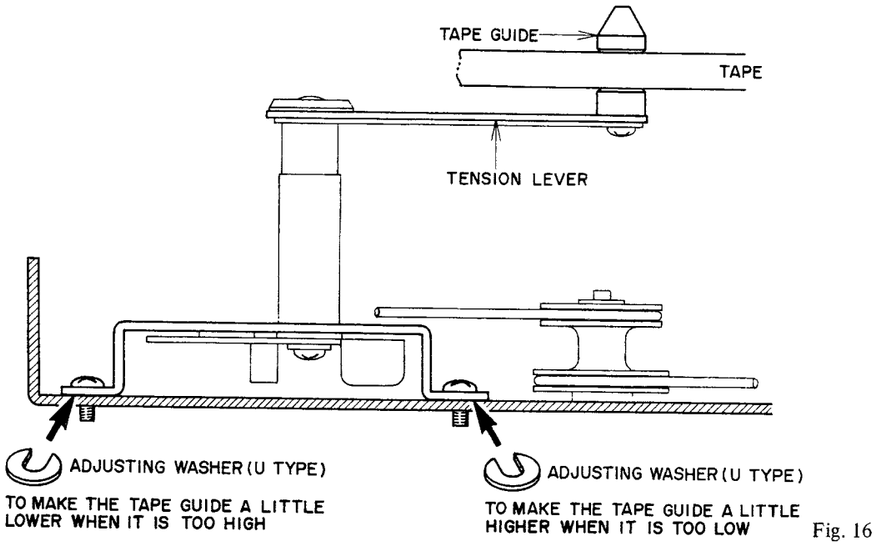


Fig. 16

8. TAPE GUIDE HEIGHT ADJUSTMENT (See Fig. 15)

Thread tape over left and right tape guides, but do not thread over left and right tension levers. Loosen tape guide fixation screws and adjust left and right tape guide heigh adjustment nuts so that at Fwd mode, the tape runs on the center of the tape guides. Tighten tape guide fixation screws to maintain this condition.

9. TENSION LEVER HEIGHT ADJUSTMENT

Thread tape over left and right tension levers and over the left and right tape guides properly. Adjust tension lever height by inserting an Adjusting washer (U type) as shown in Fig. 16 so that at Fwd mode, the tape travels on the center of the tape guide.

NOTE: The right hand side tape guide is shown in Fig. 16, but when making the left hand side tension lever height adjustment, the screw on the left is used to make the tape guide higher, and the screw on the right is used to make the tape guide lower.

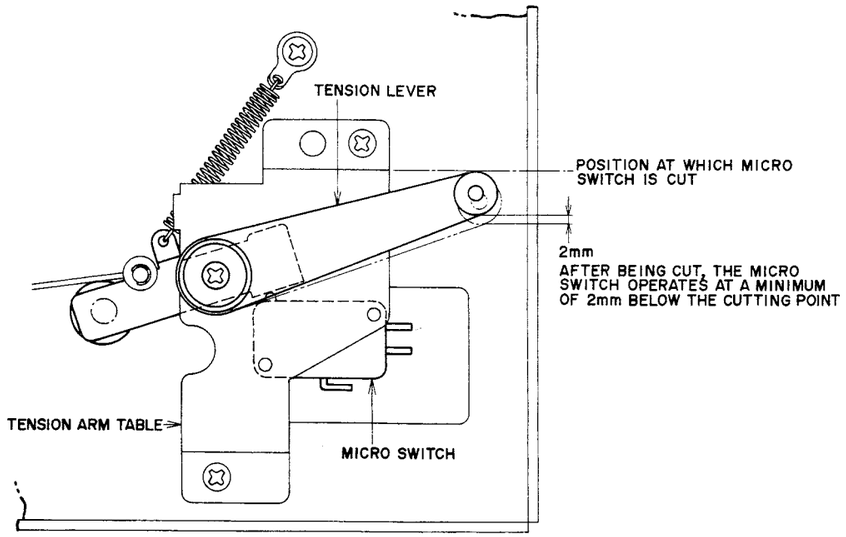


Fig. 17

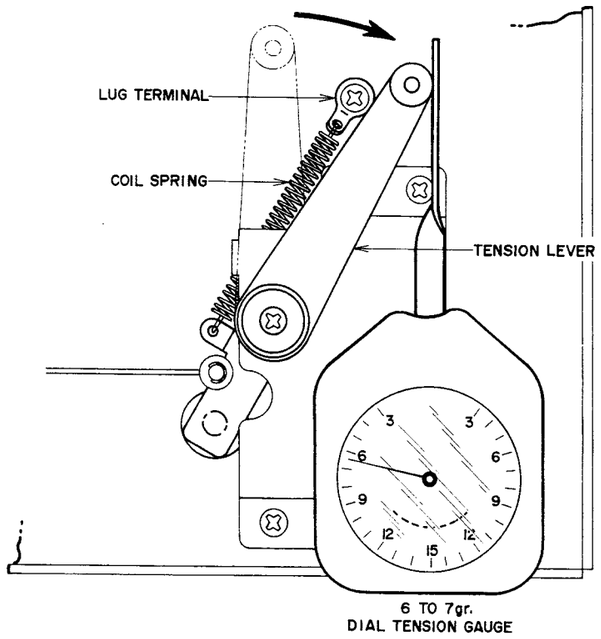


Fig. 18

10. CONFIRMATION OF POINT AT WHICH LEFT AND RIGHT TENSION ARMS OPERATE

Confirm that the left and right micro switches operate at the positions indicated in Fig. 17.

11. TENSION ARM RETURN TENSION ADJUSTMENT

Bend the oval shaped lug terminal and adjust the strength of coil spring so that as shown in Fig. 18, when the tension arm returns in the direction of the arrow, the tension registered with a tension gauge is 6 to 7 gr.

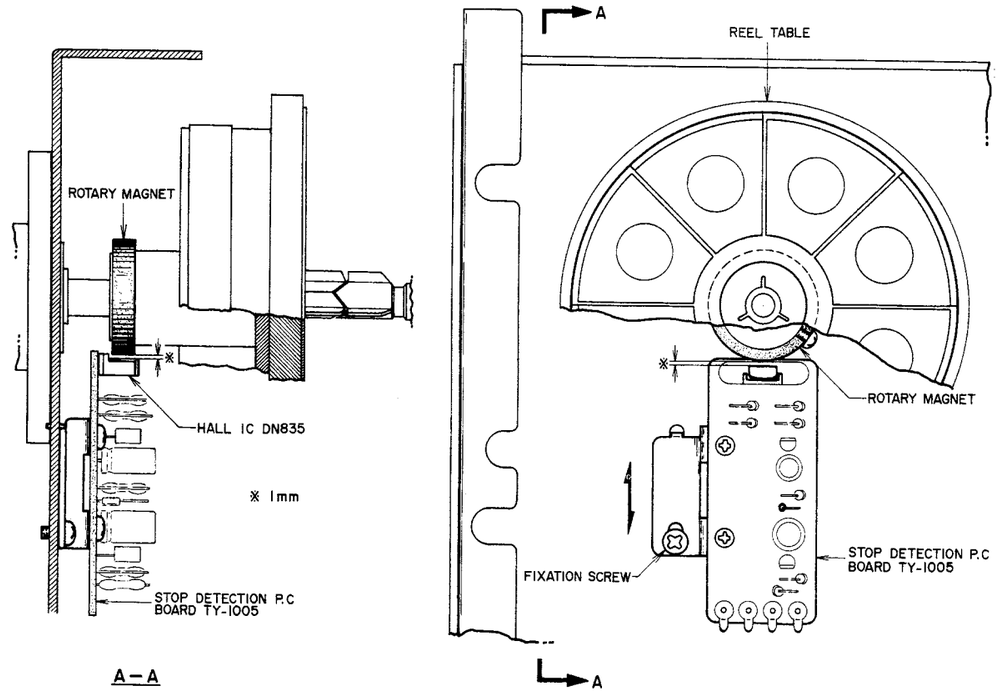
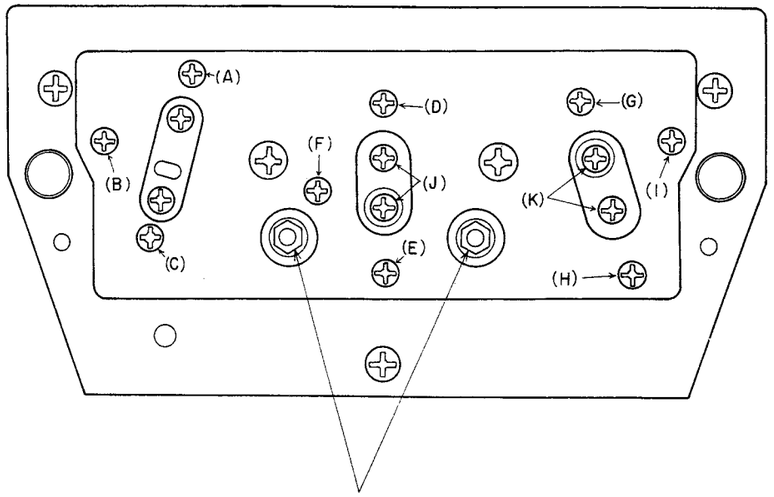


Fig. 19

12. HALL IC (DN835) AND ROTARY MAGNET CLEARANCE ADJUSTMENT

Adjust the Stop Detection P.C Board in the directions indicated by the arrow mark so that the gap between the Hall IC and the rotary magnet is 1 mm as shown in the Fig. 19.

V. HEAD ADJUSTMENT



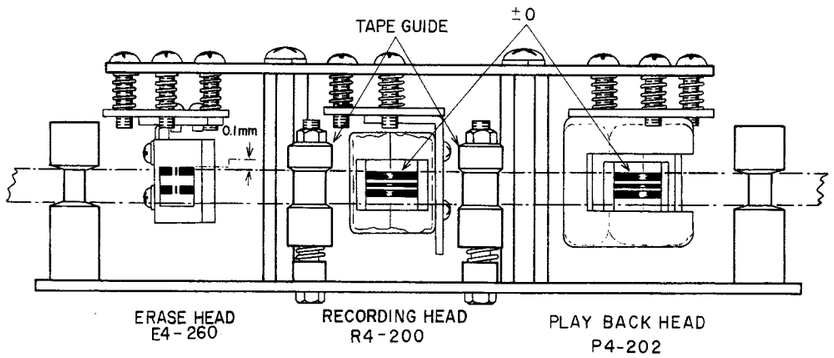


Fig. 20

Step	Adjustment Item	Test Tape & Supply Signal	MODE	Adjustment Item	Remarks
1	Tape Guide Height Adjustment	Optional	PLAY	Tape Guide Height Adjustment Nut	Adjust so that tape does not twist between tape guide on head base
2	Erase Head Height Adjustment	Optional	PLAY	(A)(B)(C)	Upper edge of channel-1 head core is 0.1 mm higher than upper edge of tape
3	Recording Head Height Adjustment	Optional	PLAY	(D)(E)(F)	Even upper edge of channel-1 head core and upper edge of tape
4	Playback Head Height Adjustment	Optional	PLAY	(G)(H)(I)	Same as Step-3 above
5	Playback Head Azimuth Alignment Adjustment	8,000 Hz 3-3/4 ips test tape	PLAY	(I)	Maximum output on both channels
6	Playback Head Gap Alignment Adjustment	8,000 Hz 3-3/4 ips test tape	PLAY	(K)	Adjust head gap surface so that there is no change in output level when tension is applied to the supply reel side
7	Recording Head Azimuth Alignment Adjustment	SCOTCH #211 tape, 15,000 Hz −20 dBm	REC	(F)	Same as Step-5 above
8	Recording Head Gap Alignment Adjustment	SCOTCH #211 Tape, 15,000 Hz −20 dBm	REC	(J)	Same as Step-6 above

Chart 1

NOTES:
1. Demagnetize heads with head demagnetizer before and after head adjustments.
2. Set Tape speed to 7-1/2 ips and Tape Selector to Low Noise.
3. Set Output Control to maximum position.
4. Refer to Fig. 20.

VI. AMPLIFIER SYSTEM ADJUSTMENT

1. DC POWER SUPPLY VOLTAGE ADJUSTMENT (Refer to Fig. 21)

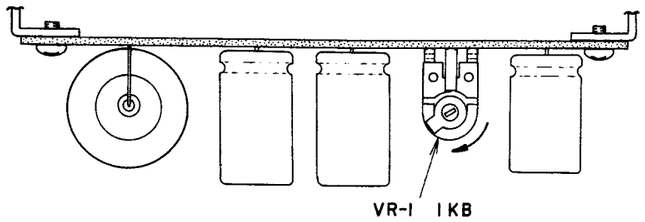


Fig. 21 Power Supply P.C Board TY-2003

2. TAPE SPEED ADJUSTMENT (Refer to Fig. 22)

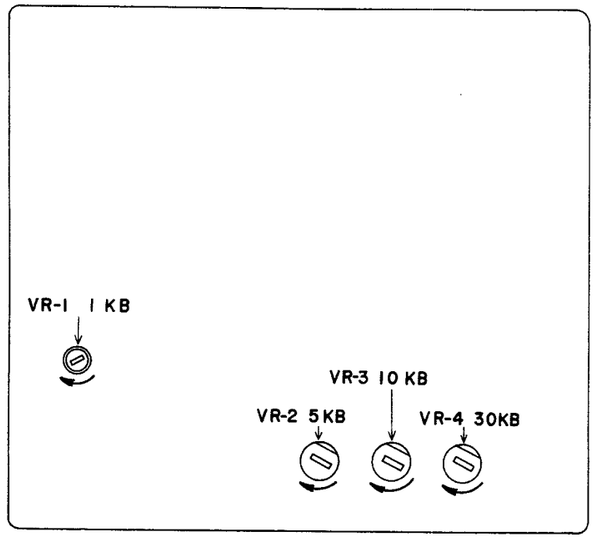


Fig. 22 Servo P.C Board TW-1049 5ED

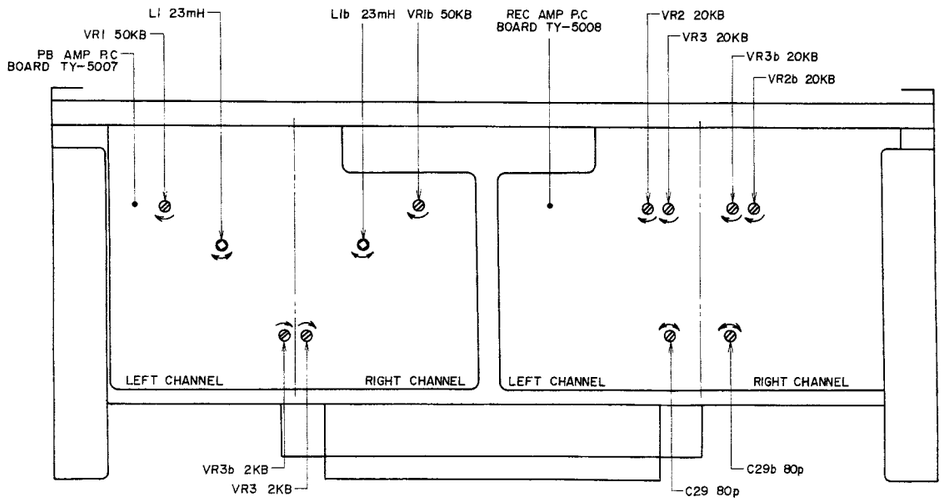


Fig. 23 Bottom View

Step	Adjustment Item	Test Tape or Supply Signal	MODE	Adjustment Point	Result	Remarks
1	DC Power Supply Voltage Adjustment	None	STOP	VR1 1 kB (TY-2003) See Fig. 21	DC24V	Measure at terminal "DC" of Power Supply P.C Board
2	DC Power Supply Voltage Adjustment	None	STOP	VR1 1 kB (TW-1049) See Fig. 22	DC21V	Measure at TR1 Emitter of Servo P.C Board
3	Tape Speed Adjustment 15 ips	1,000 Hz 7-1/2 ips Test Tape	PLAY	VR2 5 kB (TW-1049) See Fig. 22	2,000 Hz ± 0.5%	Tape Speed to 15 ips
4	Tape Speed Adjustment 7-1/2 ips	1,000 Hz 7-1/2 ips Test Tape	PLAY	VR3 10 kB (TW-1049) See Fig. 22	1,000 Hz ±0.5%	Tape Speed to 7-1/2 ips
5	Tape Speed Adjustment 3-3/4 ips	1,000 Hz 7-1/2 ips Test Tape	PLAY	VR4 30 kB (TW-1049) See Fig. 22	500 Hz ±0.5%	Tape Speed to 3-3/4 ips
6	Playback Level Adjustment	700 Hz 7-1/2 ips 0 VU Tape	PLAY	VR1 50 kB (TY-5007) See Fig. 23	0 ±0.5 dB (0.775V)	
7	VU Meter Sensitivity Adjustment	700 Hz 7-1/2 ips 0 VU Tape	PLAY	VR3 2 kB (TY-5007) See Fig. 23	0 VU	
8	Recording Level Adjustment (Low Noise)	SCOTCH #211 Tape 1,000 Hz 0 VU recording	REC	VR2 20 kB (TY-5008) See Fig. 23	0 ±0.5 dB (0.775V)	Tape Selector to Low Noise
9	Recording Level Adjustment (Wide Range)	Akai LN-150 Tape 1,000 Hz 0 VU recording	REC	VR3 20 kB (TY-5008) See Fig. 23	0 ±0.5 dB (0.775V)	Tape Selector to Wide Range
10	Frequency Response Adjustment	SCOTCH #211 Tape 1,000 Hz & 10,000 Hz 0 VU recording	REC	C29 80P (TY-5008) See Fig. 23	1,000 Hz to 10,000 Hz flat	Tape Selector to Low Noise. Recheck recording level
11	Bias Leak Adjustment	None	REC	L1 23 mH (TY-5007) See Fig. 23	Less than −30 VU	

Chart 2

NOTE: 1. Set Monitor Switch to "TAPE", and Output Control to Maximum.
2. The letter "b" following an adjustment part number indicates "right" channel.

VII. DC RESISTANCE OF VARIOUS COILS

Part	Designation	DC Resistance
Main Motor	SCM-3-16TW	Between RED–BLU 19 ohms Between YLW-GRN 90 ohms
Reel Motor	240XO-TD	Between RED-BLU 30 ohms Between YLW-GRN 157 ohms
Pinch Roller Solenoid	1660PHT2	750 ohms
Brake Solenoid	1660THT2	700 ohms
Shifter Solenoid	1254THT	620 ohms
Pick-up Coil	Built into Main Motor	3,700 ohms
Relay	MY4-O-US DC24V	650 ohms
Relay	LC1-C-JT DC24V	1,150 ohms
Relay	MTS-2	980 ohms
Headphone Output Transformer	N16-535S	Primary 565 ohms ±15% Secondary 0.95 ohms ±15%
Oscillator Coil	OT-204	Between 1-3 0.3 ohms Between 4-6 0.7 ohms Between 7-9 8.2 ohms
Erase Head	E4-260	2.0 ohms
Recording Head	R4-200	8.0 ohms
Playback Head	P4-202	268 ohms

Chart 3

Note: The resistance values shown in this chart are average values.

VIII. CLASSIFICATION OF VARIOUS P. C BOARD

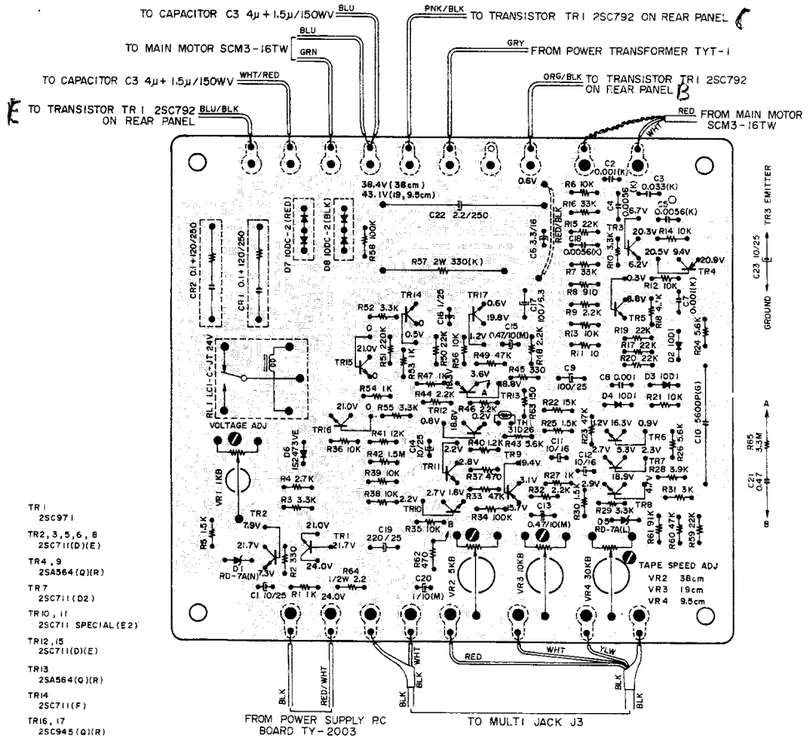
1. RELATION OF P.C BOARD TITLE AND NUMBER

P.C Board Title	P.C Board Number
Servo Control P.C Board	TW-1049 5ED
System Control P.C Board	TY-1006
Power Supply P.C Board	TY-2003
Relay P.C Board	TY-2004
PB Amplifier P.C Board	TY-5007
Rec Amplifier P.C Board	TY-5008
TS P.C Board	TY-5010
Equalizer P.C Board	TY-5009
Stop Detection P.C Board	TY-1005

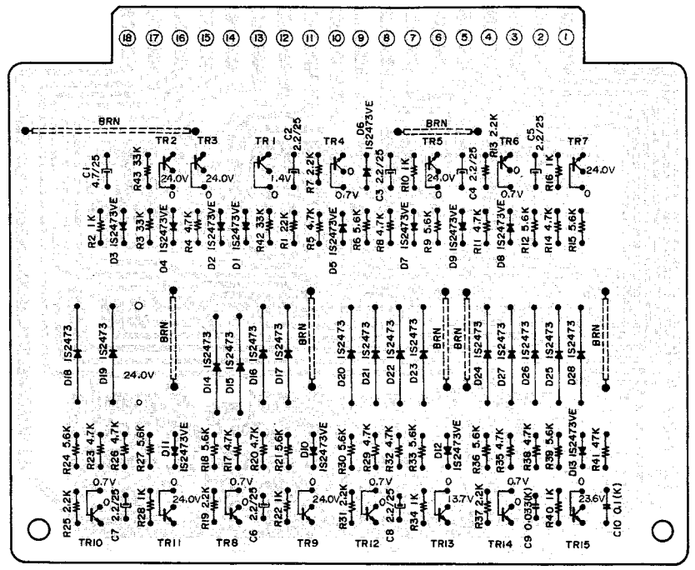
Chart 4

2. COMPOSITION OF VARIOUS P.C BOARDS

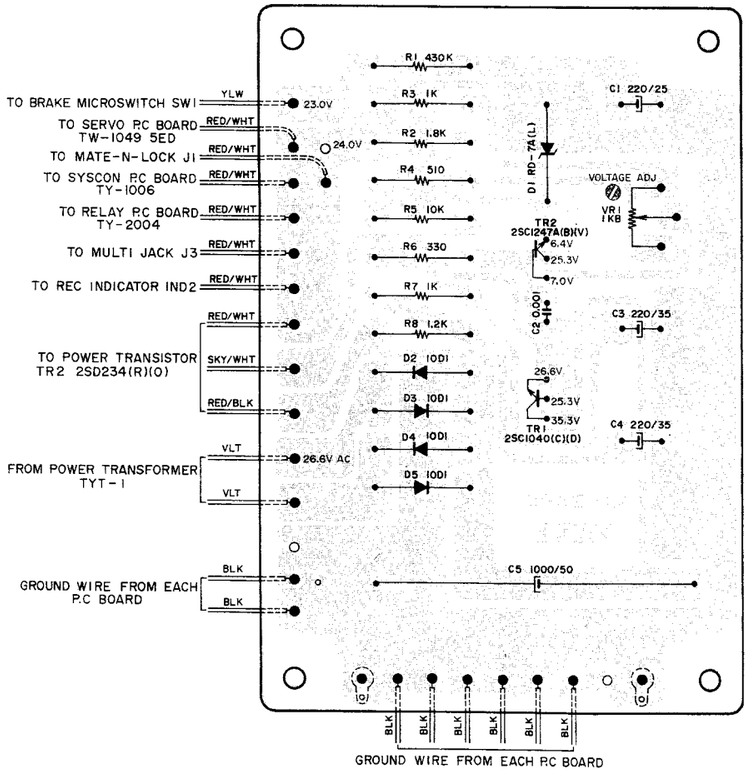
1) SERVO CONTROL P.C BOARD TW-1049 5ED



2) SYSTEM CONTROL P.C BOARD TY-1006



3) POWER SUPPLY P.C BOARD TY-2003



4) RELAY P.C BOARD TY-2004