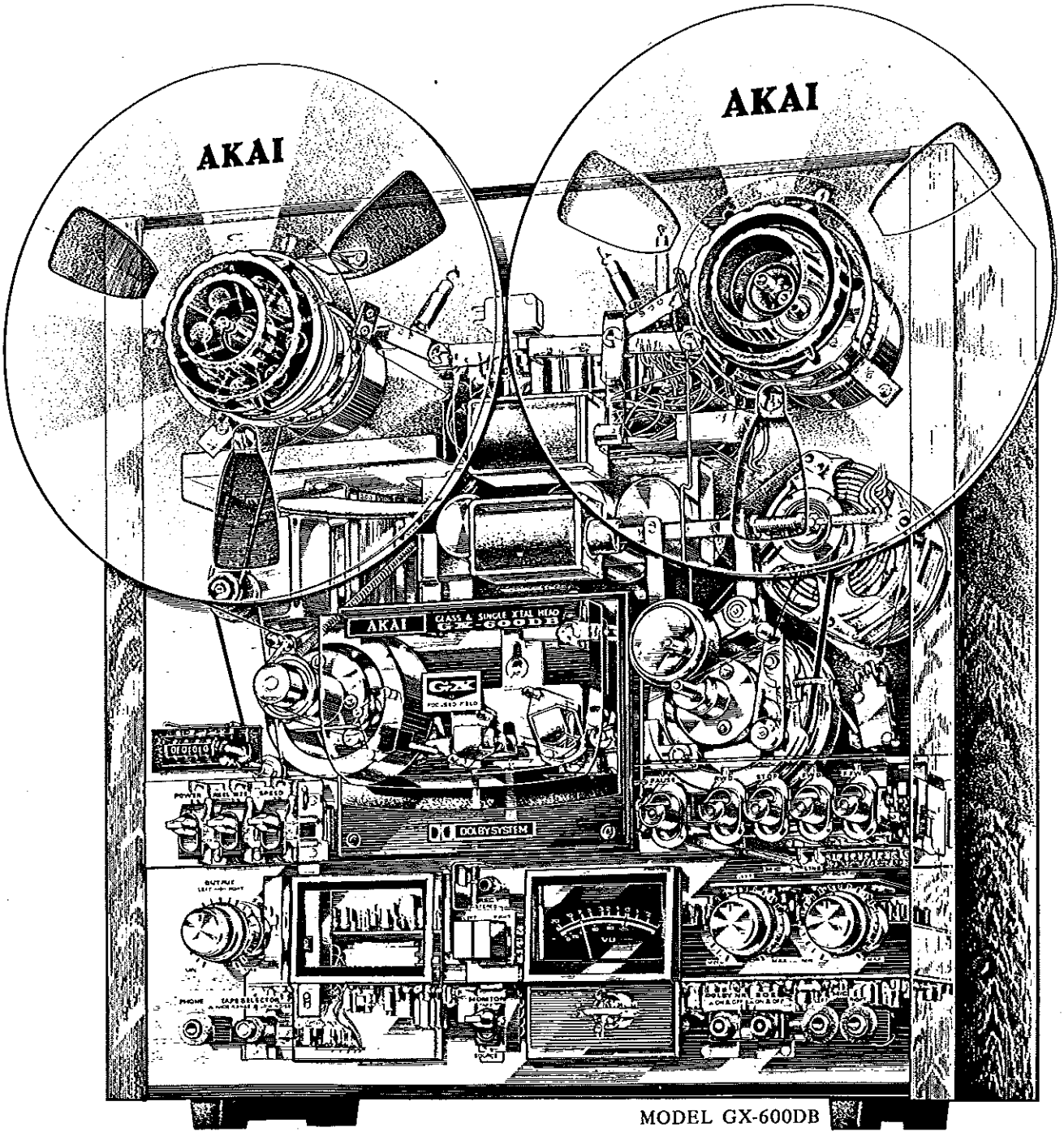

MODEL GX-600DB

STEREO TAPE DECK

MODEL GX-600D

ALSO APPLICABLE TO MODEL GX-600DB, GX-600D · PRO
STEREO TAPE DECK

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SECTION 1

SERVICE MANUAL

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I. SPECIFICATIONS

1. MODEL: GX-600D, GX-600DB

An asterisk next to a figure indicates the minimum guaranteed performance.

TRACK SYSTEM		4 track-2 channel stereo, monaural system
TAPE SPEED		7-1/2 ips. (19 cm/sec), 3-3/4 ips (9.5 cm/sec) ±0.8% ($*^{+1\%}_{-1.5\%}$)
WOW AND FLUTTER		Less than 0.07%(*0.1%) R.M.S. at 7-1/2 ips. Less than 0.10%(*0.17%) R.M.S. at 3-3/4 ips.
TOTAL WOW AND FLUTTER		Less than 0.13% R.M.S. at 7-1/2 ips. Less than 0.2% R.M.S. at 3-3/4 ips. (SCOTCH #150 tape, 3,000 Hz Recording/Playback)
FREQUENCY RESPONSE		30 to 23,000 Hz(*30 to 22,000 Hz)±3 dB at 7-1/2 ips. 30 to.19,000 Hz(*30 to 18,000 Hz)±3 dB at 3-3/4 ips. (SCOTCH #211 tape, low noise position, -20VU recording)
DISTORTION FACTOR		Less than 0.7% at 7-1/2 ips.
TOTAL DISTORTION FACTOR		*Less than 1.5% at 7-1/2 ips. *Less than 2.5% at 3-3/4 ips. (SCOTCH #211 tape, 1,000 Hz "0" VU Recording/Playback)
SIGNAL TO NOISE RATIO		Better than 56 dB(*50 dB)
TOTAL SIGNAL TO NOISE RATIO		*Better than 45 dB
OUTPUTS	LINE OUTPUT	0.775V(0±1 dB) Using a 700 Hz "0" VU pre-recorded tape, output vol. max.
	DIN OUTPUT	0.5V(-4±1 dB)
INPUTS	MIC INPUT	More than 0.3 mV
	LINE INPUT	More than 70 mV
	DIN INPUT	More than 3 mV
RECORDING PLAYBACK LEVEL		0.775V(0±1.5 dB) using a SCOTCH #211 tape
CROSS TALK		Better than 40 dB (stereo) Better than 60 dB (*55 dB) (Monaural) (1,000 Hz+3VU Recording)
ERASE RATIO		Better than 70 dB (1,000 Hz+3VU recording)
RECORDING BIAS FREQUENCY		150±10 kHz
BIAS LEAK		Less than -40VU
HIGH FREQUENCY DEVIATION		Within 3 dB 8,000 Hz 3-3/4 ips. tape at 7-1/2 ips.
RECORDING CAPACITY		180 min 2 channel stereo recording using a 3,600 ft. tape at 7-1/2 ips.
F.FWD AND RWD TIME		170 sec., using a 3,600 ft. tape at 50 Hz
MOTORS	CAPSTAN MOTOR	2 speed hysteresis synchronous motor Type: HM2-16MC(winterized) 4-8 pole Revolutions: 1,500/1,800 r.p.m. at 50/60 Hz 750/900 r.p.m. at 50/60 Hz
	REEL MOTOR	Two 6-pole eddy current outer rotor motors Type: 24XO-TD Revolutions: 930/1,120 r.p.m. at 50/60 Hz
HEADS	ERASE HEAD	Type: E4-260 GAP: W Gap Impedance: 210Ω ± 10% at 100 kHz D.C. Resistance: 2Ω
	RECORDING HEAD	Type: R4-200 Gap: 4 microns Impedance: 1,870Ω at 100 kHz D.C. Resistance: 8Ω
	PLAYBACK HEAD	Type: P4-202 Gap: 1.7±0.5 microns Impedance: 1,400Ω at 1 kHz D.C. Resistance: 268Ω
TRANSISTORS AND F.E.T		2SC458LG(C) . . . 16 2SC1211(D) . . . 2 2SC711(D) (E) . . . 6 2SD360(D) . . . 1 Dolby N.R. Circuit 2SA564(Q) . . . 4 2SC458(C) . . . 12 2SC458LG(C) . . . 12 2SK30A(GR) . . . 4

DIODES	1N34A . . . 2	10D4 . . . 7
	1S2473VE . . . 3	10D5 . . . 4
	Dolby N.R. Circuit	
	1N34A . . . 8	1S2473VE . . . 12
ZENER DIODES	WZ240 . . . 1	
	Dolby N.R. Circuit	
	WZ085 . . . 4	
POWER SUPPLY	100 to 240V A.C. 50/60 Hz universal models	
	120V A.C. 60 Hz U/L models	
	220V A.C. 50 Hz CEE models	
	100V A.C. 50/60 Hz JPN models	
POWER CONSUMPTION	130W/50 Hz, 100W/60 Hz	
DIMENSIONS	443(W) x 475(H) x 228(D)mm	
	(17.4" x 18.7" x 9")	
WEIGHT	GX-600D: 22.0 kg(48.4 lbs.)	
	GX-600DB: 22.3 kg(49.0 lbs.)	

NOTE: **Specifications subject to change without notice.**

2. MODEL: GX-600D · PRO

An asterisk next to a figure indicates the minimum guaranteed performance.

TRACK SYSTEM		2 track-2 channel stereo, monaural system
TAPE SPEED		15 ips. (38 cm/sec.), 7-1/2 ips. (19 cm/sec.) ±0.8% ($*^{+1\%}_{-1.5\%}$)
WOW AND FLUTTER		Less than 0.05%(*0.07%) R.M.S. at 15 ips. Less than 0.07%(*0.12%) R.M.S. at 7-1/2 ips.
TOTAL WOW AND FLUTTER		Less than 0.1% R.M.S. at 15 ips. Less than 0.15% R.M.S. at 7-1/2 ips. (SCOTCH #150 tape, 3,000 Hz Recording/Playback)
FREQUENCY RESPONSE		30 to 25,000 Hz(*30 to 24,000 Hz)±3 dB at 15 ips. 30 to 23,000 Hz(*30 to 22,000 Hz)±3 dB at 7-1/2 ips. (SCOTCH #211 tape, low noise position, -20VU recording)
DISTORTION FACTOR		Less than 0.7%
TOTAL DISTORTION FACTOR		Less than 1.5% (SCOTCH #211 tape, 1,000 Hz "0" VU Recording/Playback)
SIGNAL TO NOISE RATIO		Better than 59 dB(*50 dB)
TOTAL SIGNAL TO NOISE RATIO		Better than 45 dB
OUTPUTS	LINE OUTPUT	0.775V(0±1 dB) Using a 700 Hz "0" VU pre-recorded tape, output vol., max
	DIN OUTPUT	0.5V(-4±1 dB)
INPUTS	MIC INPUT	More than 0.3 mV
	LINE INPUT	More than 70 mV
	DIN INPUT	More than 3 mV
RECORDING PLAYBACK LEVEL		0.775V(0±1.5 dB) using a SCOTCH #211 tape.
CROSS TALK		Better than 40 dB(stereo) Better than 60 dB(*55 dB) (monaural) (1,000 Hz+3 VU recording)
ERASE RATIO		Better than 70 dB(1,000 Hz+3VU recording)
RECORDING BIAS FREQUENCY		150±10 kHz
BIAS LEAK		Less than -40VU
HIGH FREQUENCY DEVIATION		Within 3 dB 8,000 Hz 3-3/4 ips. tape at 7-1/2 ips.
RECORDING CAPACITY		45 min 2 channel stereo recording using a 3,600 ft. tape at 15 ips.
F.FWD AND RWD TIME		170 sec., using a 3,600 ft. tape at 50 Hz
MOTORS	CAPSTAN MOTOR	2 speed hysteresis synchronous motor Type: HM2-16MC (winterized) 4-8 pole Revolutions: 1,500/1,800 r.p.m. at 50/60 Hz 750/900 r.p.m. at 50/60 Hz
	REEL MOTOR	Two 6-pole eddy current outer rotor motors Type: 24XO-TD Revolutions: 930/1,120 r.p.m. at 50/60 Hz

HEADS	ERASE HEAD	Type: E2-100 Gap: W Gap Impedance: 280Ω at 100 kHz D.C. Resistance: 2.5Ω
	RECORDING HEAD	Type: R2-100 Gap: 4.5±1 microns Impedance: 3 kΩ±20% at 100 kHz D.C. Resistance: 8Ω
	PLAYBACK HEAD	Type: P2-100 Gap: 0.5 to 1 microns Impedance: 1.9 kΩ±20% at 1 kHz D.C. Resistance: 180Ω
TRANSISTORS		2SC458LG(C) . . . 6 2SC1211(D) . . . 2 2SC711(D) (E) . . . 6 2SD360(D) . . . 1
DIODES		1N34A . . . 2 10D4 . . . 7 1S2473VE . . . 3 10D5 . . . 4
ZENER DIODE		WZ240 . . . 1
POWER SUPPLY		100 to 240V A.C. 50/60 Hz universal models 120V A.C. 60Hz U/L models 220V A.C. 50Hz CEE models 100V A.C. 50/60 Hz JPN models
POWER CONSUMPTION		130W/50Hz, 100W/60 Hz
DIMENSIONS		443(W) x 475(H) x 228(D) mm (17.4" x 18.7" x 9")
WEIGHT		22.0 kg (48.4 lbs.)

NOTE: **Specifications subject to change without notice**

II. MEASURING METHOD

1. TAPE SPEED DEVIATION

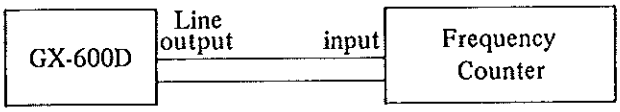


Fig. 1

As shown in Fig. 1, connect a Frequency Counter to the Line output of Model GX-600D. Playback a 1,000 Hz pre-recorded test tape. Take a Frequency Counter reading at the beginning, middle, and end of tape winding during playback. The maximum value of these respective readings will represent tape speed deviation.

2. WOW AND FLUTTER

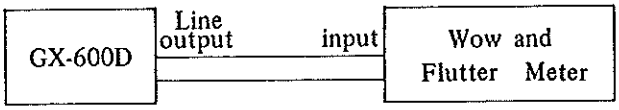


Fig. 2

METHOD A

As shown in Fig. 2, connect the Line output of Model GX-600D to the input of a Wow and Flutter Meter. Playback a 3,000 Hz pre-recorded test tape and take a Wow and Flutter Meter reading at the beginning, middle, and end of tape winding. The maximum value of these respective readings will represent the Wow and Flutter.

METHOD B

Supply a 3,000 Hz sine wave signal from an Audio Frequency Oscillator and make a recording on a blank tape at the beginning, middle, and end of tape winding. Rewind and playback the resultant signal. Measure Wow and Flutter with a Wow and Flutter Meter. (The Wow and Flutter value of Method B will be close to $\sqrt{2}$ times of value of Method A.)

3. FREQUENCY RESPONSE

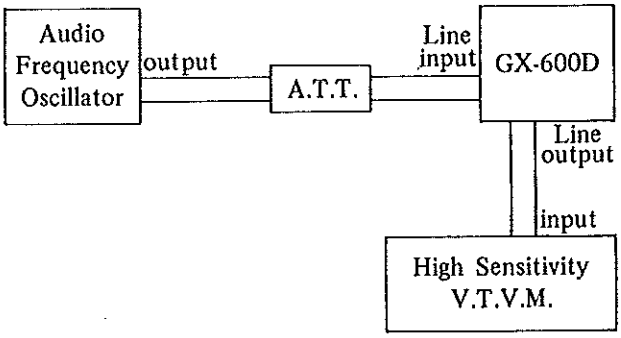


Fig. 3

For measuring Frequency Response, connect instruments as shown in Fig. 3 and proceed as follows:

1) Supply a 1,000 Hz sine wave signal to the Line input of Model GX-600D from an Audio Frequency Oscillator through an Attenuator.
2) Set recorder to recording mode and turn recording level control volume to maximum. Adjust Attenuator to obtain a 0 dB V.T.V.M. reading.
3) Under conditions described in 2) above, readjust Attenuator so that the Line output is -20 dB, and record 30 to 27,000 Hz spot frequencies.
4) Rewind tape and playback from the beginning. Take V.T.V.M. spot frequency readings and plot values on a graph.

NOTE: When measuring Frequency Response, new tape should be used.

4. SIGNAL TO NOISE RATIO

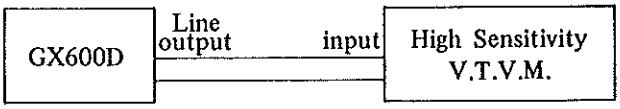


Fig. 4

As shown in Fig. 4, connect a High Sensitivity V.T.V.M. to the Line output of Model GX-600D. Playback a 700 Hz "0" VU pre-recorded test tape and measure the output. Then remove the tape and measure the noise level under the same condition. Convert each of the measured values into decibels.

5. TOTAL HARMONIC DISTORTION

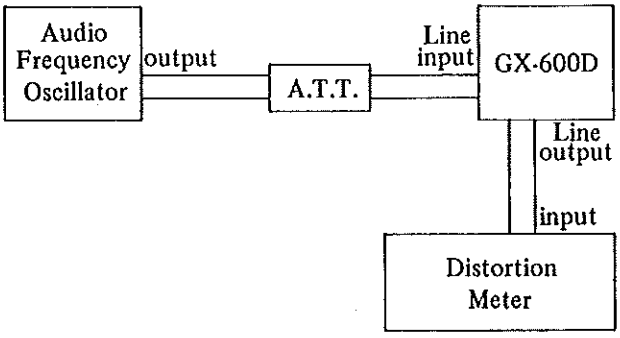


Fig. 5

Connect the measuring instruments as shown in Fig. 5 and record a 1,000 Hz sine wave signal at "0" VU. Playback the resultant signal and measure the overall distortion factor.

NOTE 1) At this time, Distortion of the Audio Frequency Oscillator for must be sufficiently small.

2) When measuring the distortion factor, new tape should be used.

6. CROSS TALK (Cross talk between the tracks)

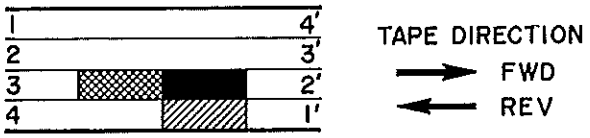


Fig. 6

As shown in Fig. 6, first record a 1,000 Hz sine wave signal on track No. 3 at +3 VU level. Next, record under a non-input condition. Then playback the tape on track No. 3 and 1 (reversed condition of tape) through the B.P.F. (1,000 Hz Band Pass Filter, sensitivity 1,000 Hz, ratio 1:1) and obtain the ratio from the following formula.

$$C = 20 \log \frac{E_0}{E_2 - E_1} \quad (dB)$$

where, C = Desired cross talk ratio (dB)
E_0 = 1,000 Hz signal output level (V)
E_2 = 1,000 Hz cross talk level (V)
E_1 = Non-input cross talk level (V)

7. ERASE RATIO

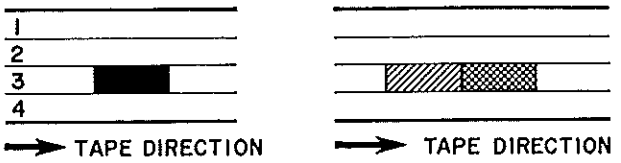


Fig. 7

As shown in Fig. 7, using a virgin tape first record a 1,000 Hz sine wave signal on track No. 3 at +3VU level, then playback this recorded signal and take a V.T.V.M. reading at the output level. Next, erase this recorded portion and playback the erased part through the B.P.F. (1,000 Hz sensitivity 1:1) and take readings of the erased signal. Obtain a ratio between the two from the following formula:

$$Er = 20 \log \frac{E_0}{E_2 - E_1} \quad (dB)$$

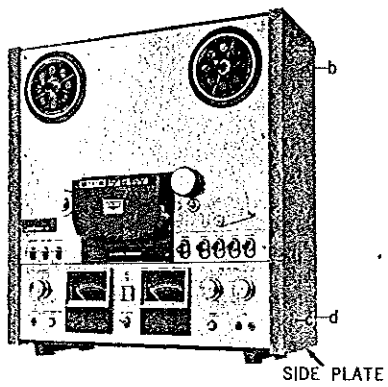
where,
Er = Desired erase ratio
E_0 = 1,000 Hz signal output level (V)
E_2 = Erased 1,000 Hz signal and noise level (V)
E_1 = Erased noise level (V)

NOTE: When measuring cross talk and erase ratio, virgin tape should be used.

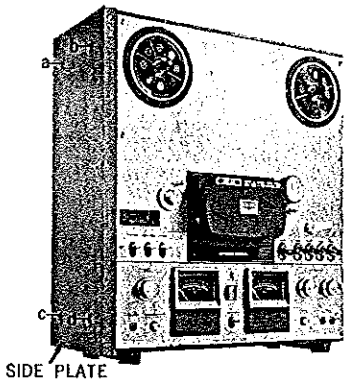
III. DISMANTLING OF UNIT

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

1



2



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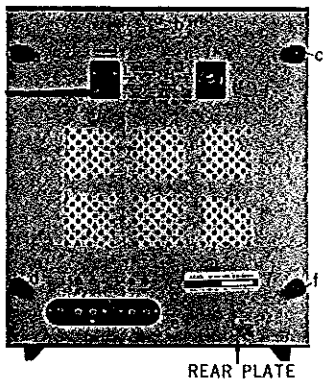

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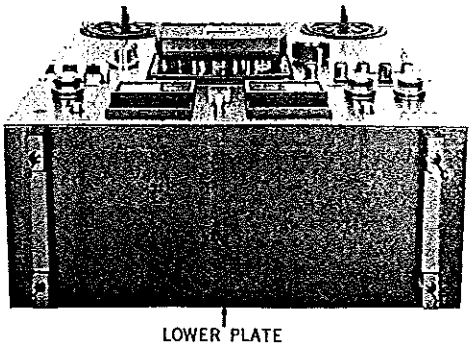

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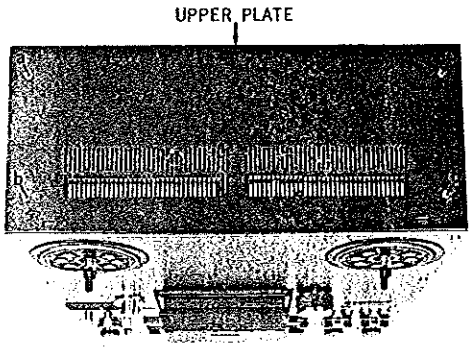
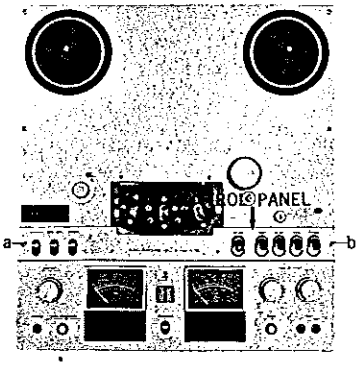


6

7

8



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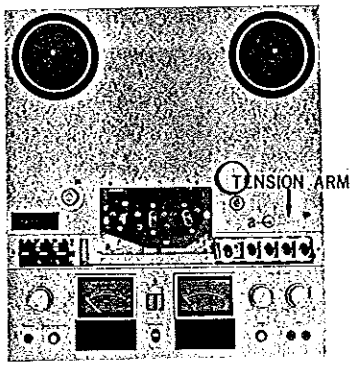

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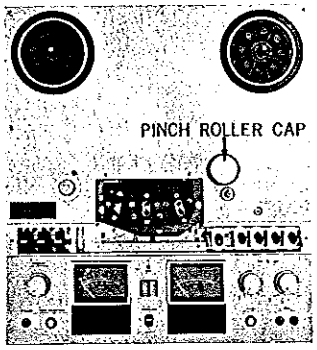

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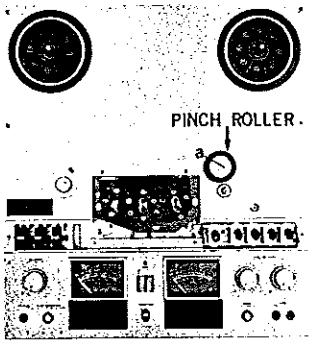

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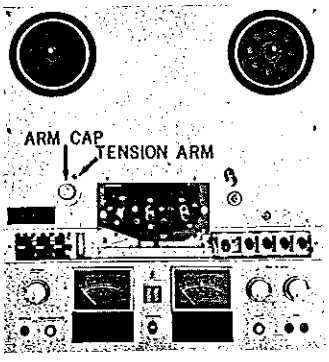
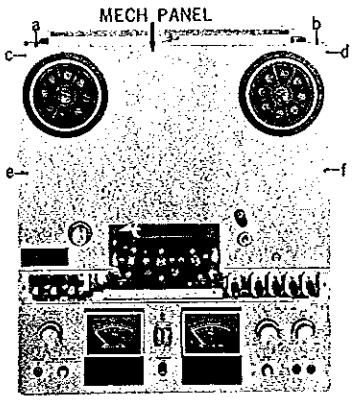


13



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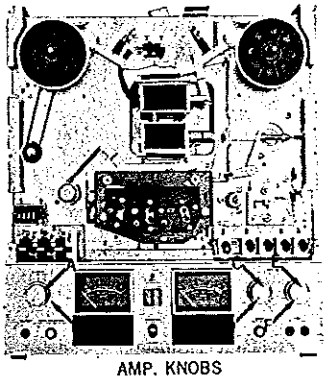

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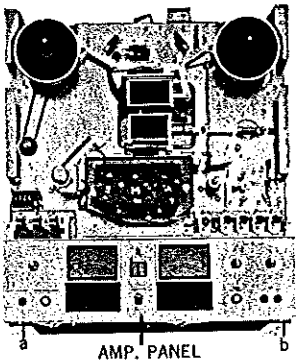
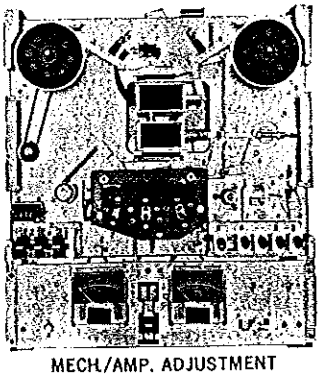


16



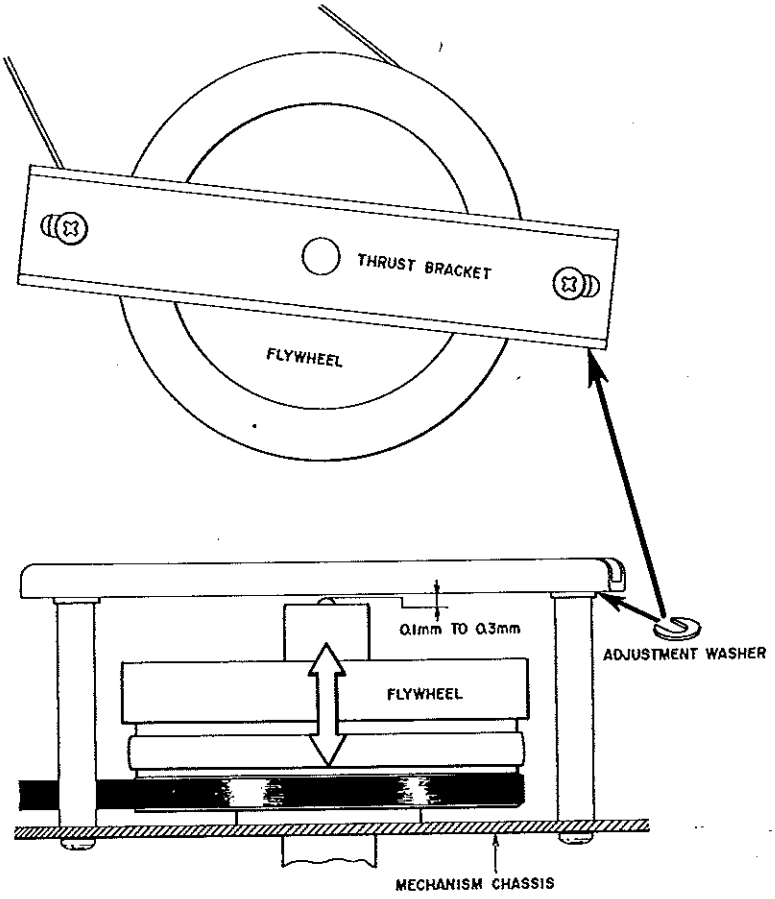

THRUST BRACKET
FLYWHEEL
0.1mm TO 0.3mm
FLYWHEEL
ADJUSTMENT WASHER
MECHANISM CHASSIS

Fig. 8

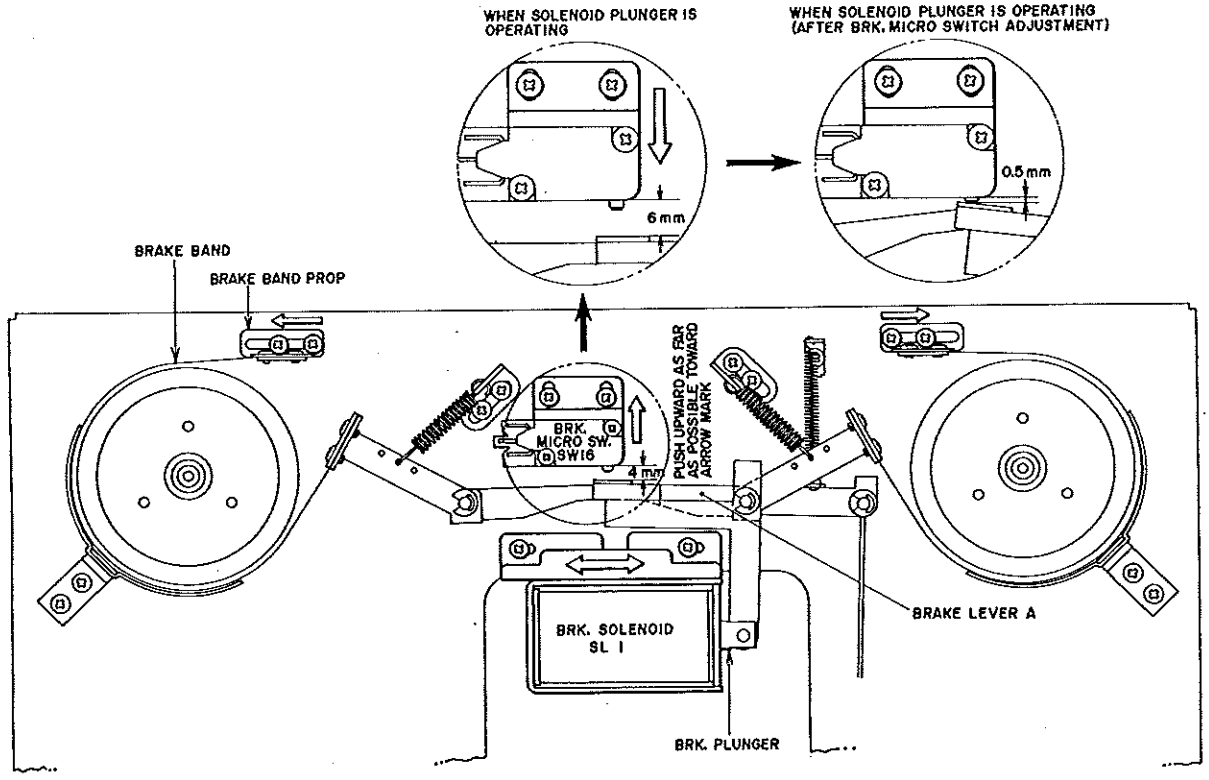

WHEN SOLENOID PLUNGER IS OPERATING
WHEN SOLENOID PLUNGER IS OPERATING (AFTER BRK. MICRO SWITCH ADJUSTMENT)
6mm
0.5mm
BRAKE BAND
BRAKE BAND PROP
BRK. MICRO SW. SW16
4mm
PUSH UPWARD AS FAR AS POSSIBLE TOWARD ARROW MARK
BRAKE LEVER A
BRK. SOLENOID SL 1
BRK. PLUNGER

Fig. 9

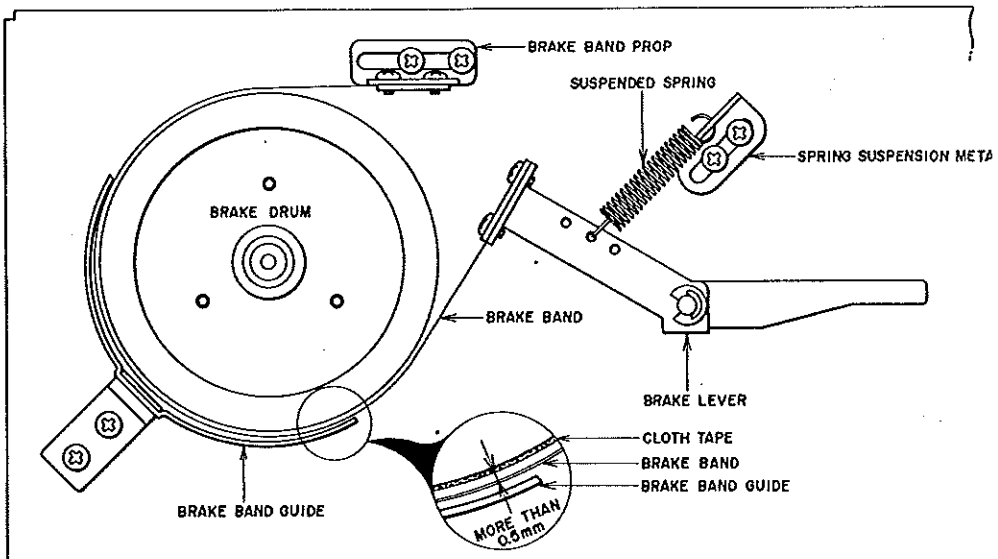


Fig. 10

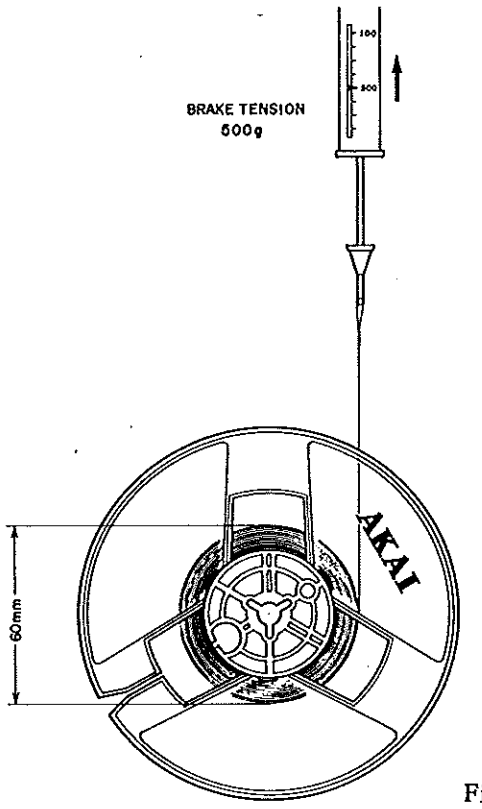


Fig. 11

1. FLYWHEEL LOOSE PLAY ADJUSTMENT

Adjust to obtain 0.1 to 0.3 mm loose play by the insertion of a horse shoe shaped washer as shown in Fig. 8.

2. BRAKE SOLENOID POSITION ADJUSTMENT (Refer to Fig. 9)

1) As shown in Fig. 9, push the Brake Micro as far as it will go toward the mechanical chassis and fix at that position.
2) Adjust brake band prop.
   Right hand brake band prop → fully to the right.
   Left hand brake band prop → fully to the left.
3) At the condition wherein the brake plunger has fully entered the solenoid, move the solenoid to left and right and fix the solenoid at place at which there is a .4 mm gap between brake lever A and the body of the brake micro switch.
4) At stop mode, lower brake micro switch and fix at position at which the space between brake lever A and the body of the brake micro switch is 6 mm.

NOTE: At playback mode (when the plunger operates), confirm that when brake lever A pushes the brake micro switch, it does not hit the body of the micro switch (Space between body of micro switch and brake lever A must be 0.5 mm).

3. BRAKE TENSION ADJUSTMENT (Refer to Fig.s 10, 11)

1) As shown in Fig. 11, for brake tension adjustment, use a 60 mm diameter of tape wound on an empty 5" reel, and measure with a spring scale. Correct brake tension is 500 gr.
2) In case brake tension is not within specifications, change the position of the suspended spring and adjust position of spring suspension metal.

NOTE: Left/right brake tension non-conformity must be within 50 gr.
After completing brake tension adjustment, confirm that at each mode (except stop mode), the brake band completely separates from the cloth tape on the brake drum. (free condition).

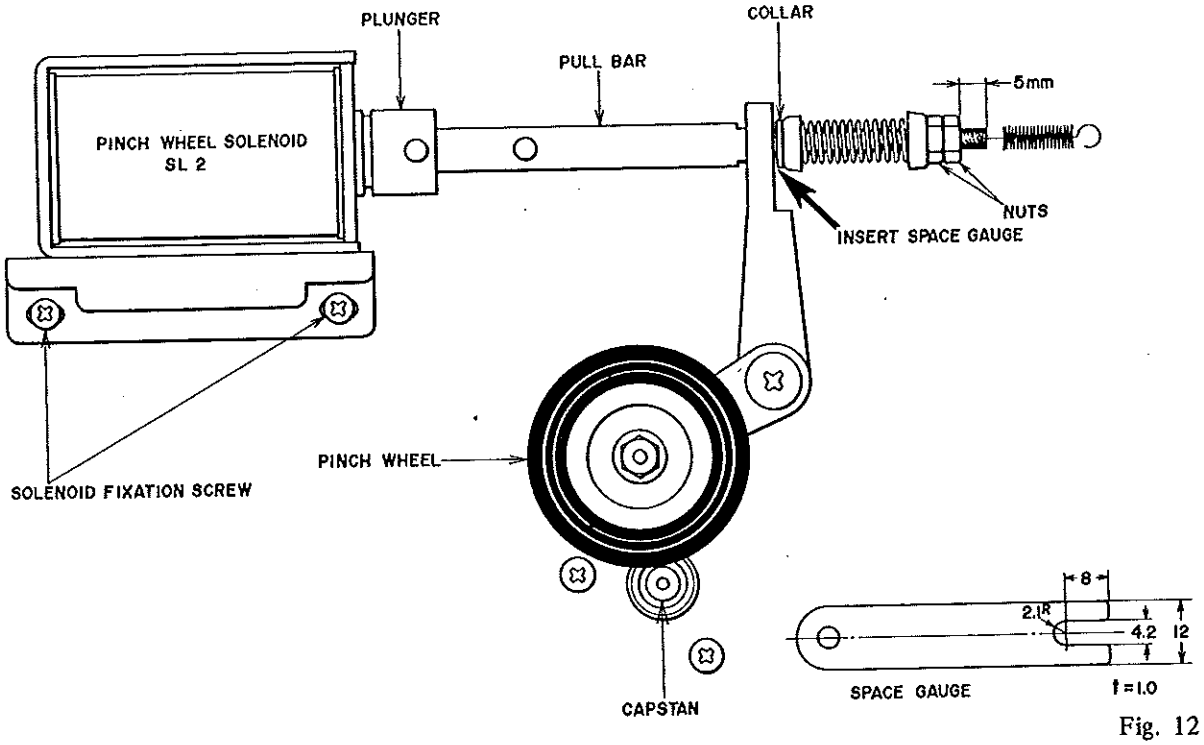

PLUNGER
PULL BAR
COLLAR
5mm
PINCH WHEEL SOLENOID
SL 2
NUTS
INSERT SPACE GAUGE
PINCH WHEEL
SOLENOID FIXATION SCREW
CAPSTAN
8
2.1R
4.2
12
SPACE GAUGE
t=1.0

Fig. 12

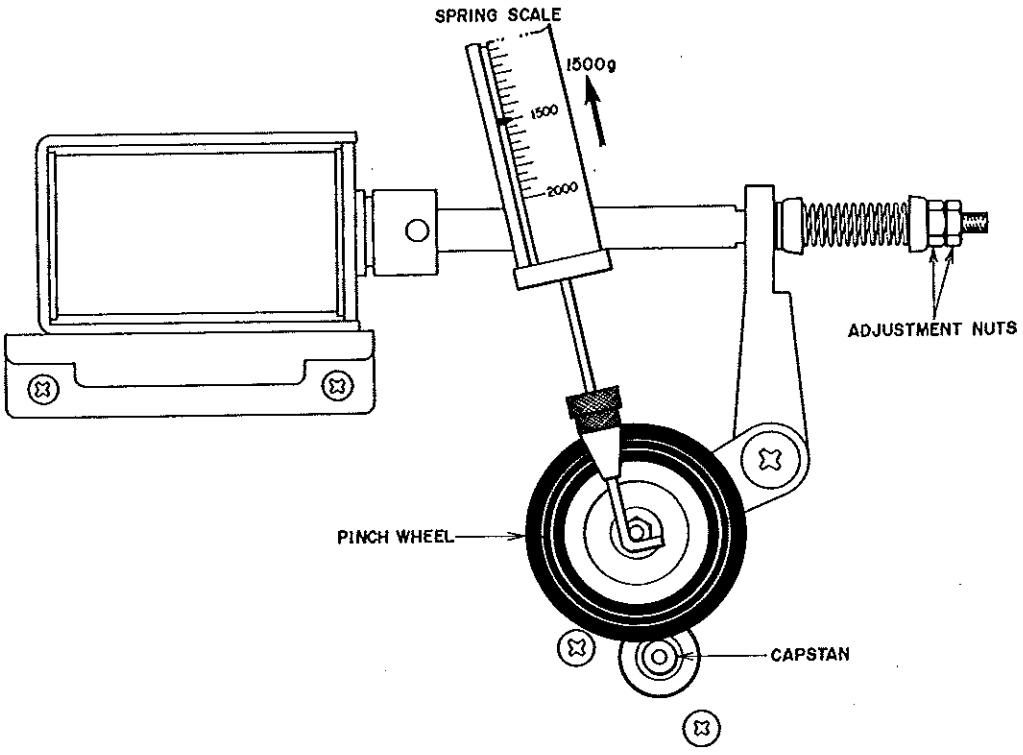

SPRING SCALE
1500g
1500
2000
ADJUSTMENT NUTS
PINCH WHEEL
CAPSTAN

Fig. 13

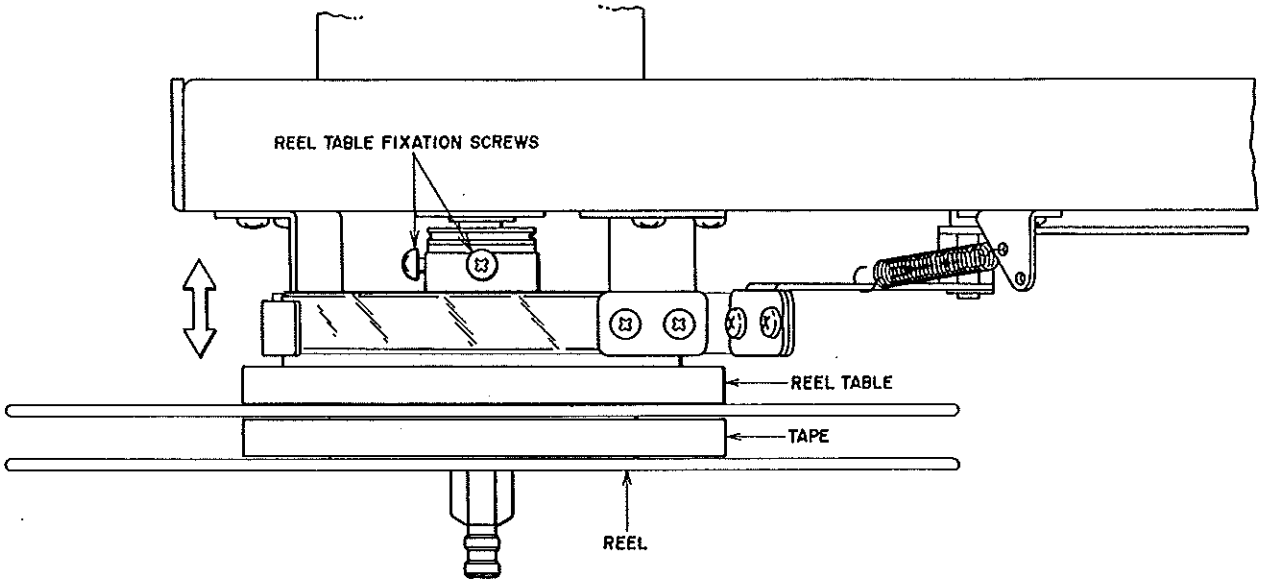


Fig. 14

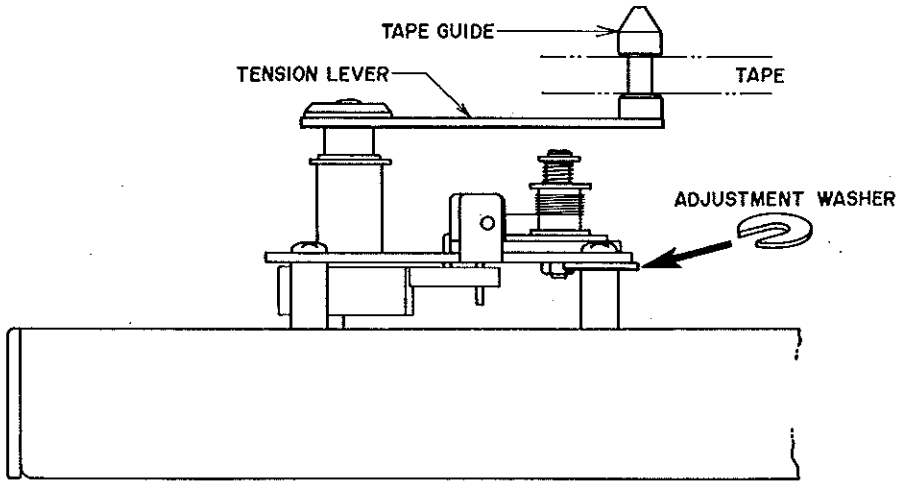


Fig. 15

4. PINCH WHEEL SOLENOID POSITION ADJUSTMENT (Refer to Fig. 12)

1) Set nut so that the screw part of the pull bar protrudes 5 mm from the nut.
2) Insert a space gauge between the collar and pull bar, and fix solenoid at position at which the pinch wheel touches the capstan.

5. PINCH WHEEL PRESSURE ADJUSTMENT (Refer to Fig. 13)

As shown in Fig. 13, pull out and return pinch wheel with a spring scale, reading the spring scale indication when the pinch wheel touches the capstan. Adjust pinch wheel pressure with adjustment nut to obtain a 1.5 kg. spring scale indication at pinch wheel and capstan contact.

6. REEL TABLE HEIGHT ADJUSTMENT (Refer to Fig. 14)

Properly load a tape, and adjust the reel table as indicated by the arrow mark in the figure so that the tape winds in the center of the reel at F.Fwd and Rwd modes. Fix at best position.
Also tape should wind in center of reel regardless of type of reel used.

7. TENSION LEVER HEIGHT ADJUSTMENT (Refer to Fig. 15)

Properly load a tape and set machine to Fwd mode. Adjust tension lever height with a horse-shoe washer so that the tape runs on the center of the tape guide.

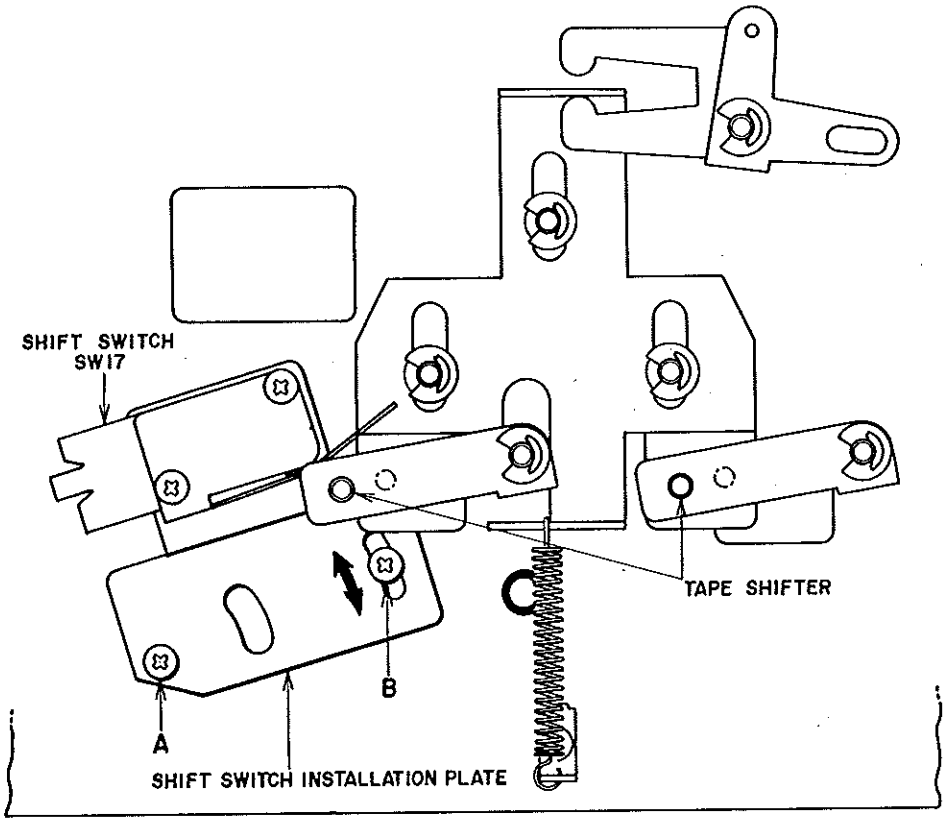


Fig. 16

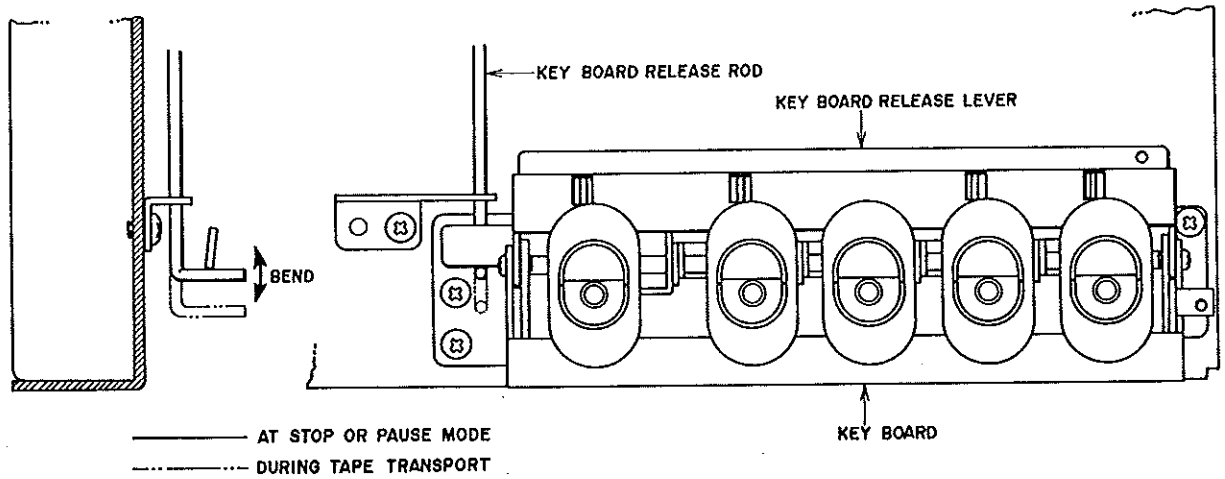


Fig. 17

8. SHIFT SWITCH POSITION ADJUSTMENT (Refer to Fig. 16)

As shown in Fig. 16, adjust by moving shift switch installation plate as shown by the arrow mark in figure so that when the machine is set to pause mode, the shift switch is not turned off.
(Shift switch installation plate can be moved after loosening screws A, B)

9. KEYBOARD RELEASE ROD ADJUSTMENT (Refer to Fig. 17)

With the power switch turned off, adjust by bending release rod so that the keys do not lock at any mode.

V. HEAD ADJUSTMENT

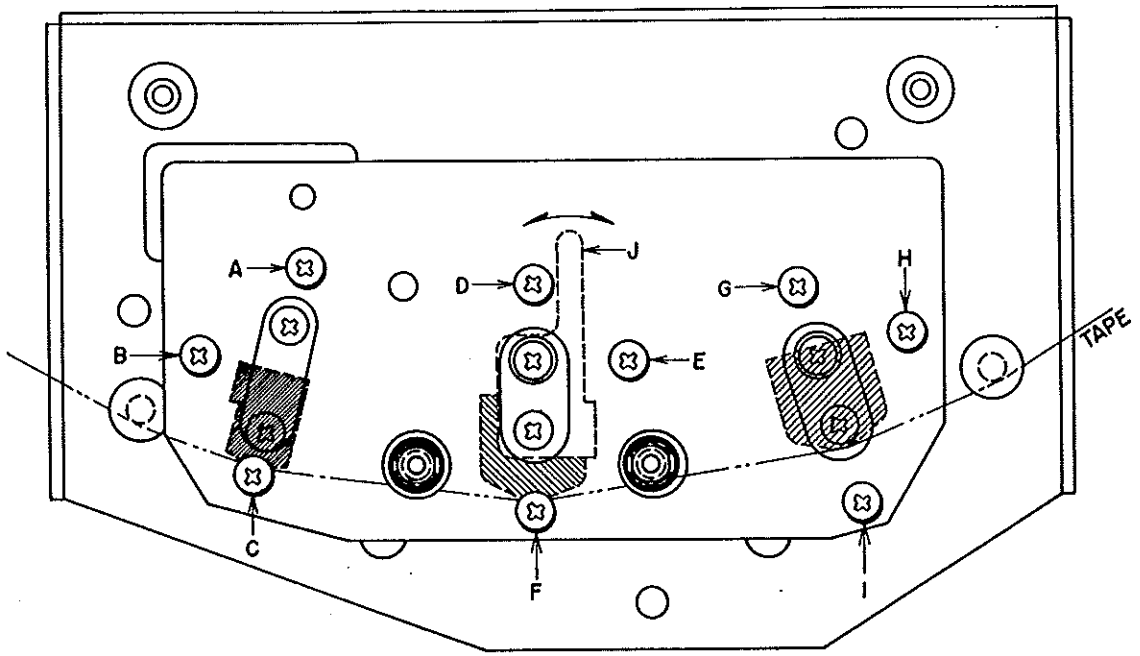


Fig. 18

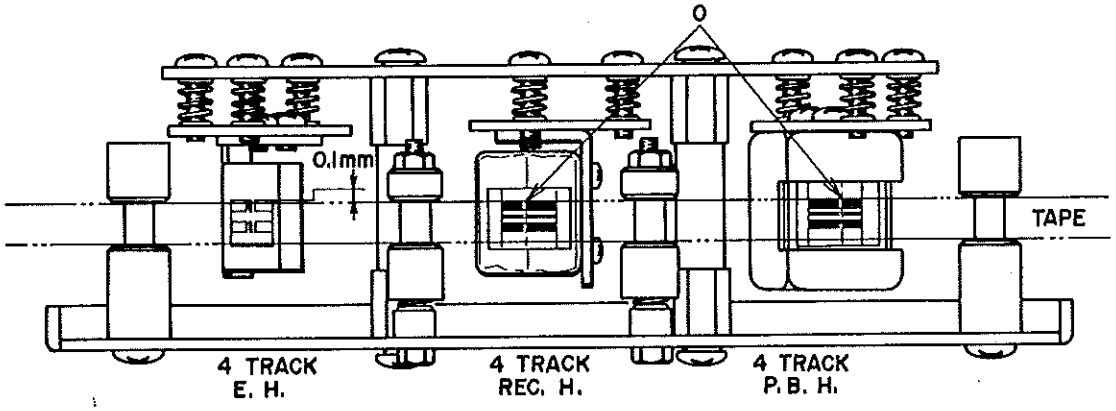


Fig. 19

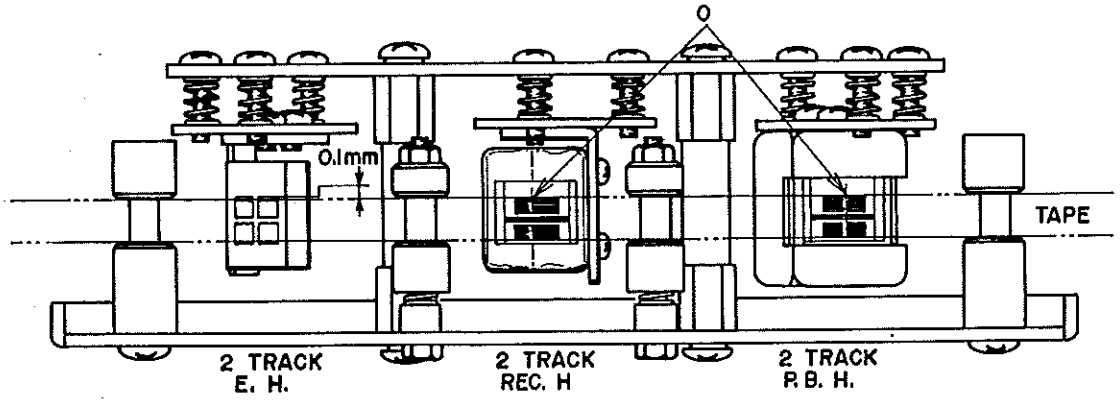


Fig. 20

1. MODELS: GX-600D, GX-600DB

(Refer to Figs. 18, 19)

Adjustment Item	Test Tape, Supply Signal	Measuring Instrument and connection point	Mode	Tape Speed	Adjustment Screw	Remarks
ERASE HEAD HEIGHT	Optional		FWD	Optional	(A)(B)(C)	Upper edge of Ch. 1 head core 0.1 mm higher than upper edge of tape.
RECORDING HEAD HEIGHT	Optional		FWD	Optional	(D)(E)(F)	Upper edge of Ch. 1 head core same height as upper edge of tape
PLAYBACK HEAD HEIGHT	Optional		FWD	Optional	(G)(H) (I)	Upper edge of Ch. 1 head core same height as upper edge of tape
PLAYBACK HEAD AZIMUTH ALIGNMENT	8,000 Hz. 3-3/4 ips.	High Sensitivity V.T.V.M. to Line output	FWD	7-1/2 ips. (19 cm/sec)	(H)	Maximum output on both channels
RECORDING HEAD AZIMUTH ALIGNMENT	15,000 Hz. -20 dBm	Audio Frequency Oscillator to Line input, High Sensitivity V.T.V.M. to Line output	REC	7-1/2 ips. (19 cm/sec)	(E)	Maximum output on both channels.
RECORDING HEAD TAPE CONTACT	15,000 Hz. -20 dBm	Audio Frequency Oscillator to Line input, High Sensitivity V.T.V.M. to Line output	REC	7-1/2 pis. (19 cm/sec)	(J)	No change in output when tension is applied to supply reel side

Chart 1

2. MODEL: GX-600D · PRO

(Refer to Figs. 18, 20)

Adjustment Item	Test Tape, Supply Signal	Measuring Instrument and connection point	Mode	Tape Speed	Adjustment Screw	Remarks
ERASE HEAD HEIGHT	Optional		FWD	Optional	(A)(B)(C)	Protruding Top & Bottom Edges of Head core Equidistant (Tape runs on exact center of Head core)
RECORDING HEAD HEIGHT	Optional		FWD	Optional	(D)(E)(F)	Upper edge of Ch. 1 head core same height as upper edge of tape
PLAYBACK HEAD HEIGHT	Optional		FWD	Optional	(G)(H)(I)	Upper edge of Ch. 1 head core same height as upper edge of tape
PLAYBACK HEAD AZIMUTH ALIGNEMENT	8,000 Hz. 3-3/4 ips.	High Sensitivity V.T.V.M to Line output	FWD	7-1/2 ips. (19 cm/sec)	(H)	Maximum output on both channels
RECORDING HEAD AZIMUTH ALIGNMENT	15,000 Hz. -20 dBm	Audio Frequency Oscillator to Line input, High Sensitivity V.T.V.M. to Line output	REC	7-1/2 ips. (19 cm/sec)	(E)	Maximum output on both channels
RECORDING HEAD TAPE CONTACT	15,000 Hz. -20 dBm	Audio Frequency Oscillator to Line input, High Sensitivity V.T.V.M. to Line output	REC	7-1/2 ips. (19 cm/sec)	(J)	No change in output when tension is applied to supply reel side.

Chart 2

VI. AMPLIFIER SYSTEM ADJUSTMENT

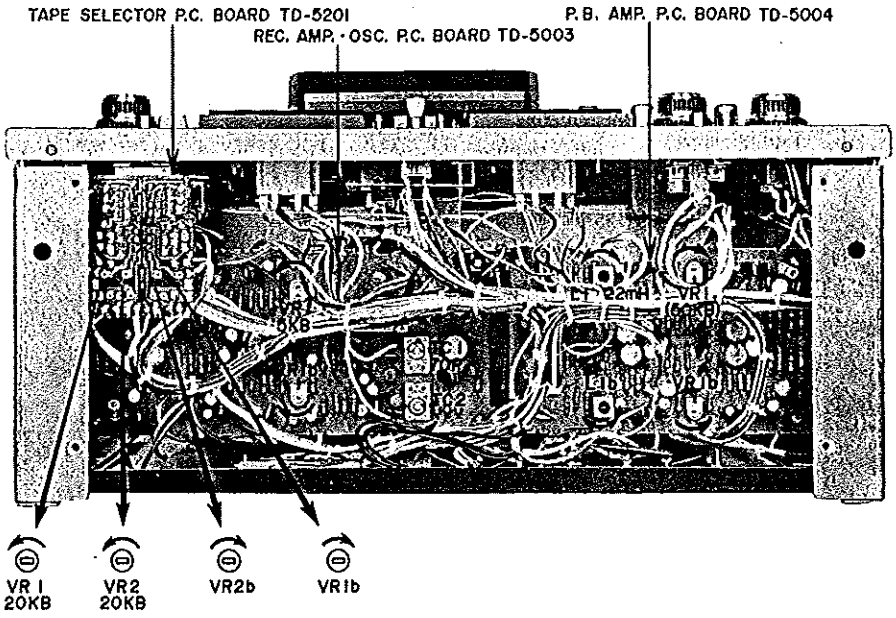


Fig. 21

1. PLAYBACK LEVEL ADJUSTMENT

1) Set Speed Selector to 7-1/2 ips. (19 cm/sec)
2) Set Monitor Switch to TAPE position and output volumes to maximum.
3) Playback a 7-1/2 ips. 700 Hz "0" VU recorded test tape.
4) Adjust semi-fixed resistors VR1 50 kB (left ch.) and VR1b 50 kB (right ch.) of P.B. Amp. P.C. Board (Fig. 21) to obtain a 0 dBm ("0"VU) line output level on both channels.

2. HIGH RANGE DEVIATION CHECK

Check to confirm that the difference in output level between left and right channel is within 3 dB when a 3-3/4 ips. 8,000 Hz ampex alignment test tape is played back at 7-1/2 ips.
If high range deviation exceeds 3 dB make head azimuth alignment adjustments again.

3. RECORDING LEVEL ADJUSTMENT (Models GX-600D, GX-600D · PRO only)

1) Set Speed Selector to 7-1/2 ips. (19 cm/sec)
2) Set Monitor Switch to TAPE position and output volumes to maximum.
3) Set Tape Selector to LOW NOISE position and load a Scotch #211 blank tape.
4) Set tape deck to recording mode and supply a 1,000 Hz sine wave signal to the line input from an Audio frequency oscillator.
5) Adjust line recording level volumes or input attenuator so that the line output level of both channels is 0 dBm ("0" VU).
6) Set Monitor Switch to SOURCE position.
7) Adjust semi-fixed resistors VR1 5 kB (left ch.) and VR1b 5 kB (right ch.) of Recording Amp. OSC., P.C. Board (Fig. 21) to obtain a 0 dBm ("0" VU) line output level on both channels.

4. RECORDING LEVEL ADJUSTMENT (Model GX-600DB only)

1) Set Speed Selector to 7-1/2 ips. (19 cm/sec)
2) Set Monitor Switch to SOURCE position and set output volumes to maximum.
3) Set Tape Selector to LOW NOISE position and load a Scotch #211 blank tape.
4) Supply a 1,000 Hz sine wave signal to the line input from an Audio frequency oscillator.
5) Adjust line recording level volume or input attenuator to obtain a 0 dBm ("0" VU) line output level on both channels.
6) Set Monitor Switch to TAPE position and set tape deck to recording mode.
7) Adjust semi-fixed resistors VR1 20 kB (left channel) and VR1b 20 kB (right channel) of tape selector P.C. Board (Fig. 21) to obtain a 0 dBm ("0" VU) line output level on both channels.

NOTE: 1) In the case of wide range tape, set Tape Selector to WIDE RANGE position and use AKAI S.R.T. tape and adjust semi-fixed resistors VR2 20 kB (left ch) and VR2b 20 kB (right ch) of tape selector P.C. Board (Fig. 21) in the same way as outlined in article 4.

2) In the case of Model GX-600D or GX-600D · PRO, the recording level adjustment semi-fixed resistors are on the Recording Amp. P.C. Board, and in the case of GX-600DB, the recording level adjustment semi-fixed resistors are on the tape selector P.C. Board.

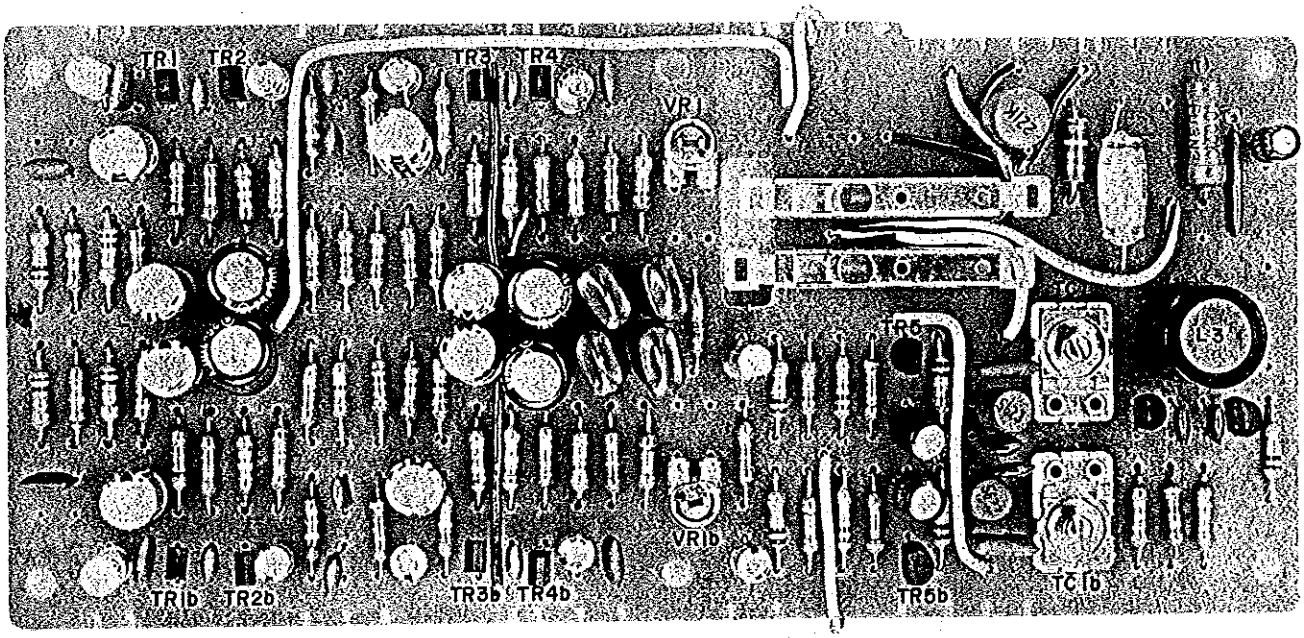


Fig. 22 REC. AMP./OSC. P.C. BOARD TD-5003 (Front Side)

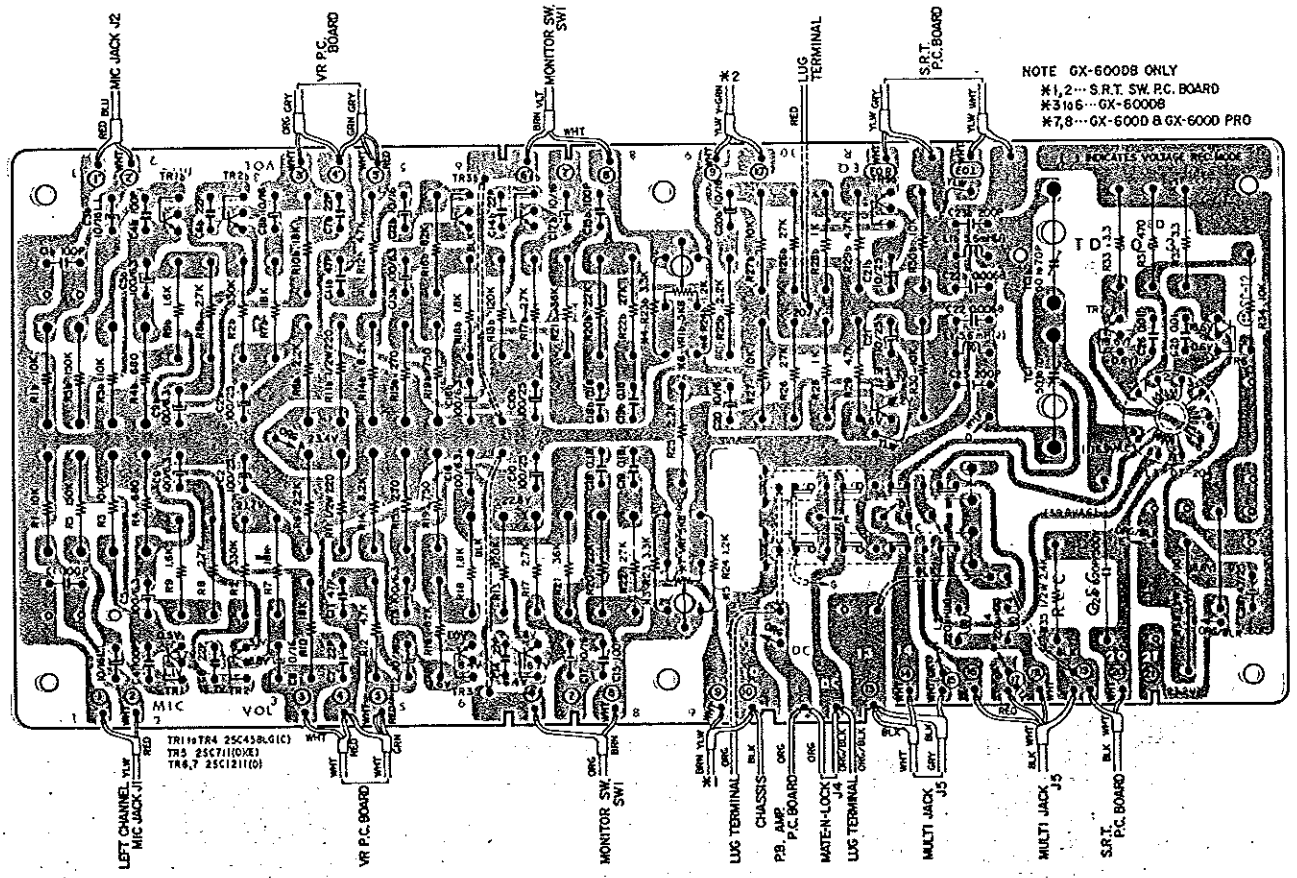


Fig. 23 REC. AMP./OSC. P.C. BOARD TD-5003 (Reverse Side)

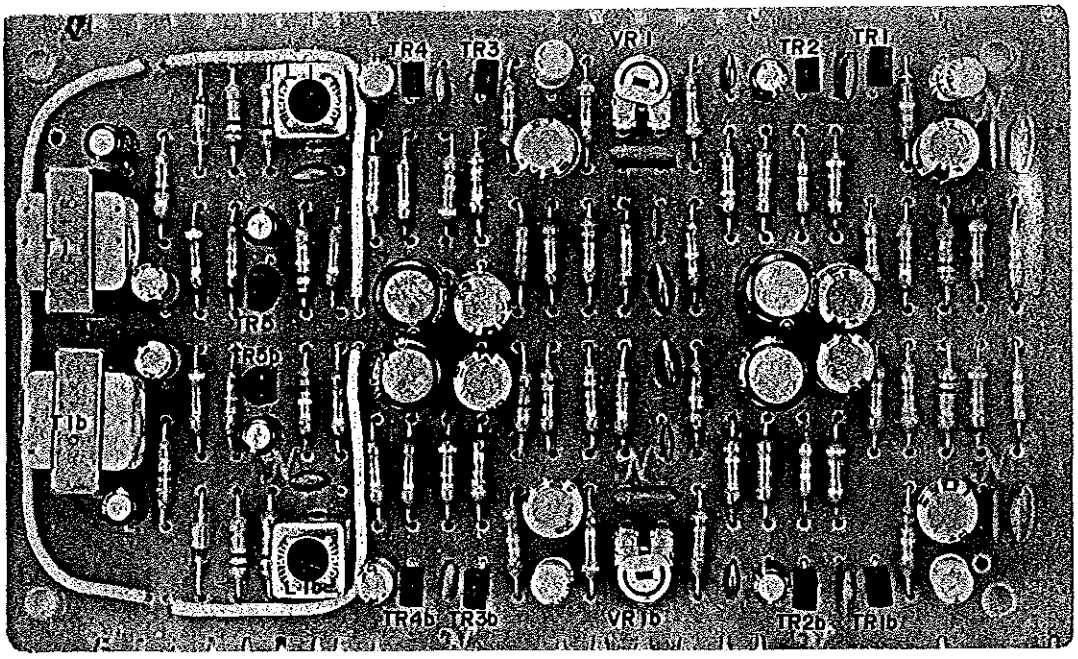


Fig. 24 PB. AMP. P.C. BOARD TD-5004 (Front Side)

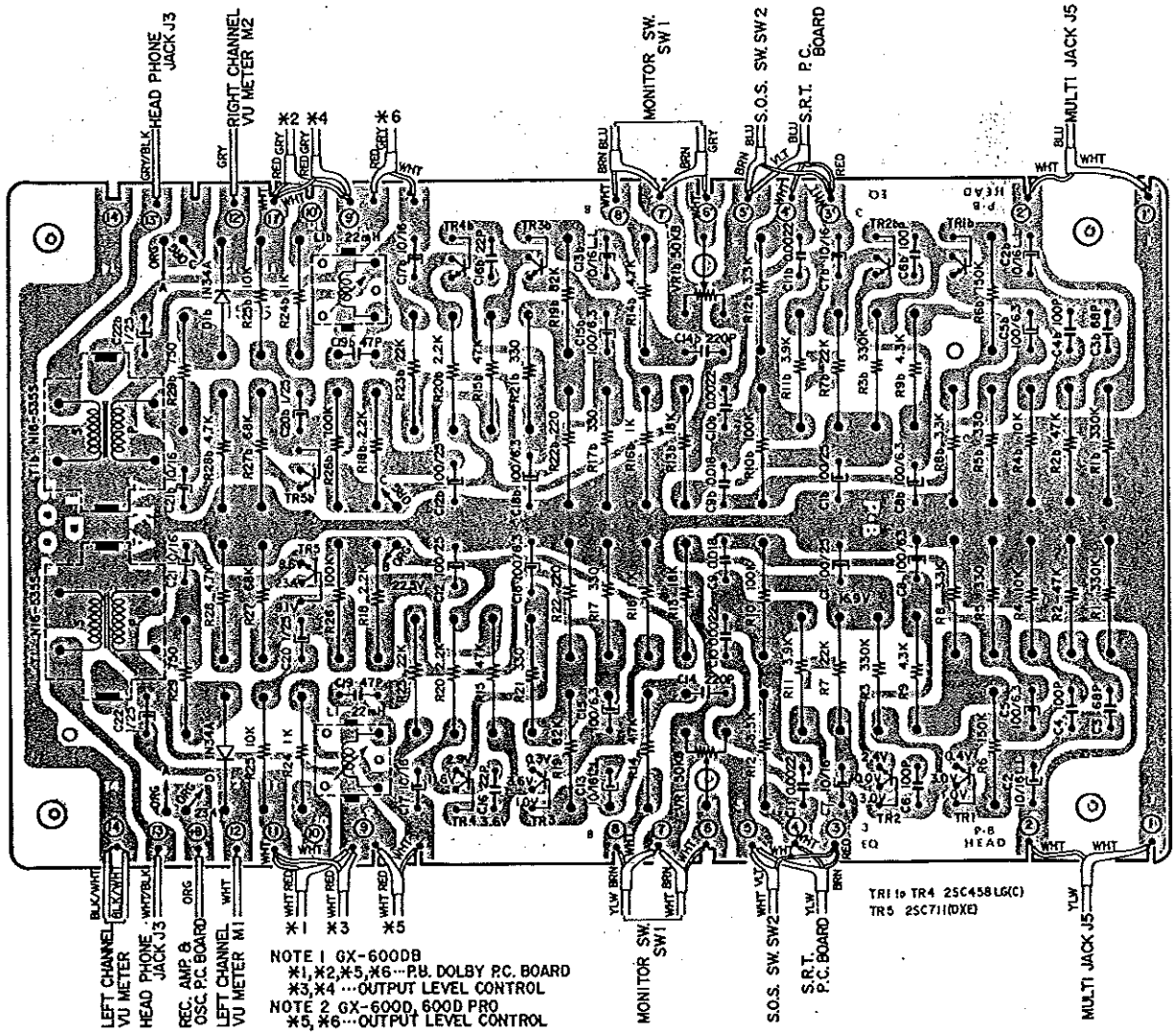


Fig. 25 PB. AMP. P.C. BOARD TD-5004 (Reverse Side)

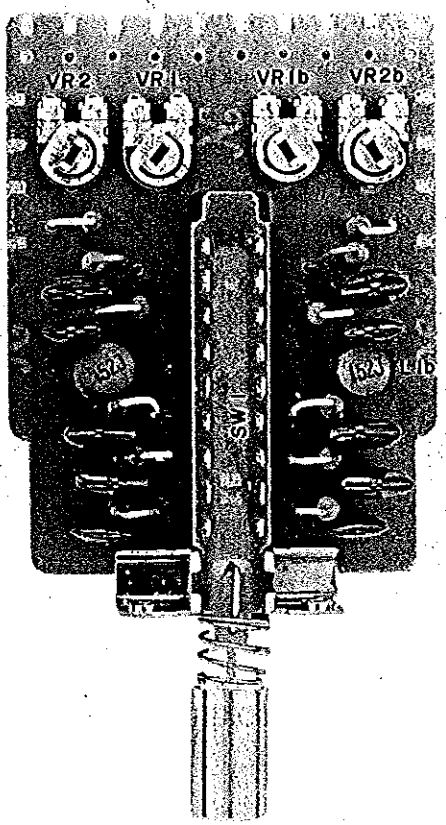


Fig. 26 TAPE SELECTOR P.C. BOARD
TD-5201 (Front Side)

5. FREQUENCY RESPONSE ADJUSTMENT
(Recording Bias Voltage Adjustment)

1) Set Speed Selector to 3-3/4 ips. (9.5 cm/sec.).
2) Set Monitor Switch to TAPE and set output volumes to maximum.
3) Set Tape Selector to LOW NOISE position and load a scotch #211 blank tape.
4) Set tape deck to recording mode and supply a 1,000 Hz sine wave signal to the line input from an audio frequency oscillator and adjust input attenuator to obtain a -20 dBm (-20 VU) line output level.
5) Switch the oscillation frequency of the audio frequency oscillator to 10,000 Hz from the condition outlined in item 5-4)
6) Adjust trimmer condensers TC1 70P (left ch) and TC2 70P (right ch) of Recording Amp. OSC., P.C. Board (Fig. 21) to obtain the same level on both channels at both of the two frequencies mentioned in items 5-4) and 5-5).

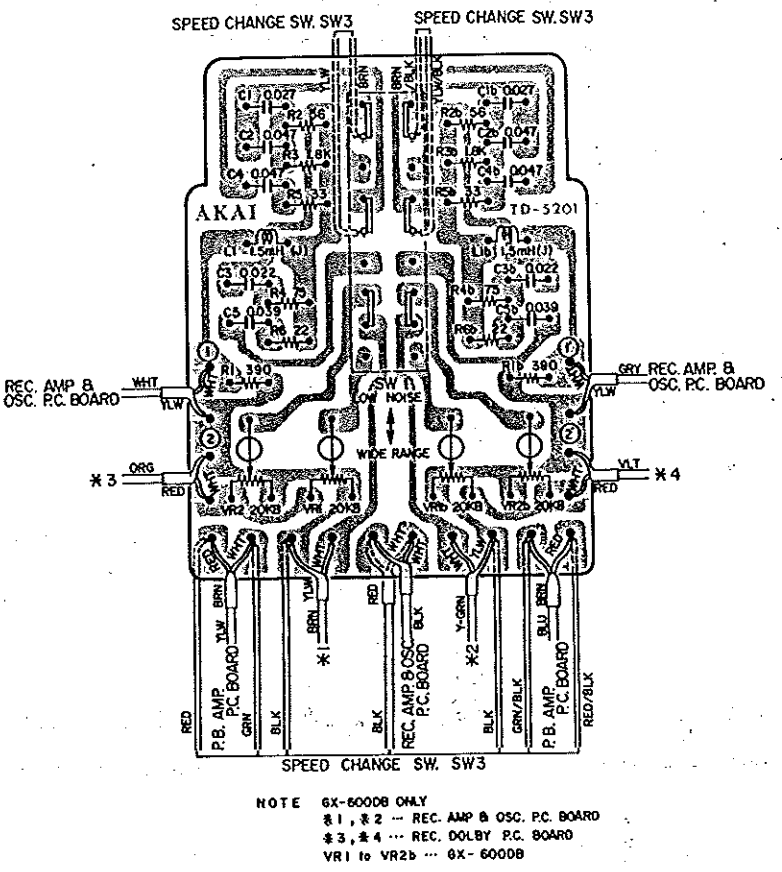


Fig. 27 TAPE SELECTOR P.C. BOARD TD-5201 (Reverse Side)

6. DOLBY N.R. AMP. P.C. BOARD ADJUSTMENT (Model GX-600DB only)

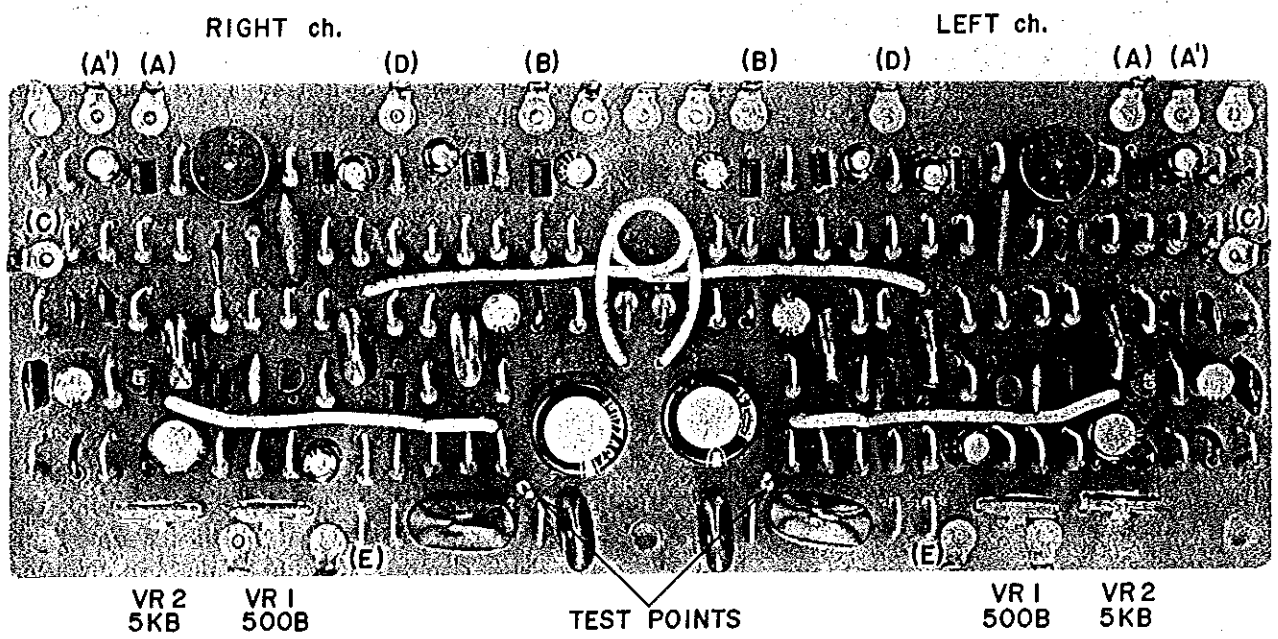


Fig. 28 DOLBY N.R. P.C. BOARD TD-5301 (Front Side)

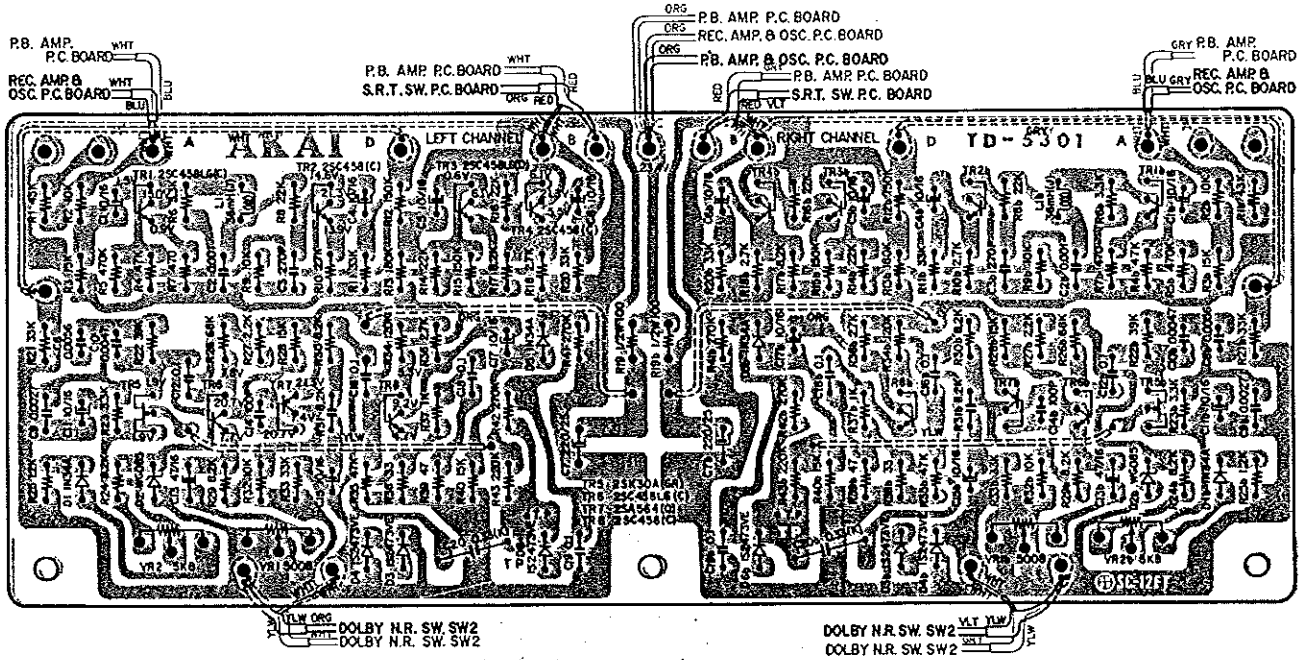


Fig. 29 DOLBY N.R. P.C. BOARD TD-5301 (Reverse Side)

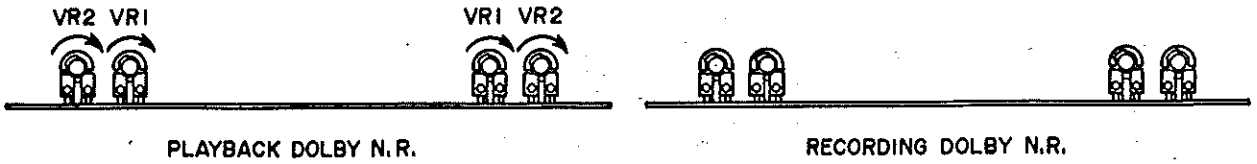


Fig. 30

NOTE: The same P.C. Boards are utilized for Recording Dolby NR and Playback Dolby NR. The Recording Dolby NR Amp. P.C. Board is located on the Recording Amp. OSC., P.C. Board, and the Playback Dolby NR Amp. P.C. Board is located on the Playback Amp. P.C. Board. Adjust left and right channels respectively.

(1) RECORDING DOLBY NR CIRCUIT ADJUSTMENT

Disconnect the wire connected to Dolby circuit input/output terminals (A) and (B). Connect an Audio frequency oscillator to terminal (A) and connect a high sensitivity V.T.V.M. to terminal (B).

1) Turn semi-fixed resistors VR1 500B and VR2 5 kB fully clockwise (Fig. 30).
2) Ground test points (Fig. 28).
3) Set Dolby Switch to OFF position.
4) Supply a 5 kHz, -10 dBm signal which has been verified with a frequency counter from the audio frequency oscillator and confirm that at this time the indication of the high sensitivity V.T.V.M. connected to terminal (B) is 0 dBm.
5) Next, reduce the output of the audio frequency oscillator by -30.5 dB from the condition outlined in item 1-4) (5 kHz -40.5 dB) and at this time confirm that the indication of the high sensitivity V.T.V.M. connected to terminal (B) is -30.5 dB.
6) Set the Dolby Switch to ON position and adjust semi-fixed resistor VR1 500B to obtain a -20.5 dB indication on the high sensitivity V.T.V.M. connected to terminal (B).
7) Next, disconnect ground wire from test points (grounded in item 1-2) and at this time adjust semi-fixed resistor VR2 5 kB to obtain a -22.5 dB indication on the high sensitivity V.T.V.M. connected to terminal (B).

(2) PLAYBACK DOLBY NR CIRCUIT ADJUSTMENT

This adjustment is carried out in essentially the same way as the Recording Dolby Circuit adjustment. Disconnect the wire connected to input/output terminals (A) and (B), connect an audio frequency oscillator to terminal (A), and connect a high sensitivity V.T.V.M. to terminal (B). Turn semi-fixed resistors VR1 500 B and VR2 5 kB fully clockwise, and ground test points.

1) Set Dolby Switch to OFF position and supply a 5 kHz, -10 dBm signal which has been verified with a frequency counter from the Audio frequency oscillator. Confirm that the high sensitivity V.T.V.M. indication at this time is 0 dBm. Next, lower the oscillator output by -22.5 dB and confirm that the high sensitivity V.T.V.M. indication is -22.5 dB.
2) Set Dolby Switch to ON position and at this time adjust semi-fixed resistor VR1 500B to obtain a -32.5 dB high sensitivity V.T.V.M. indication. Next, disconnect ground wire from test points and adjust semi-fixed resistor VR2 5 kB to obtain a -30.5 dB indication.

VII. OPERATING PRINCIPALS OF DOLBY NR CIRCUIT

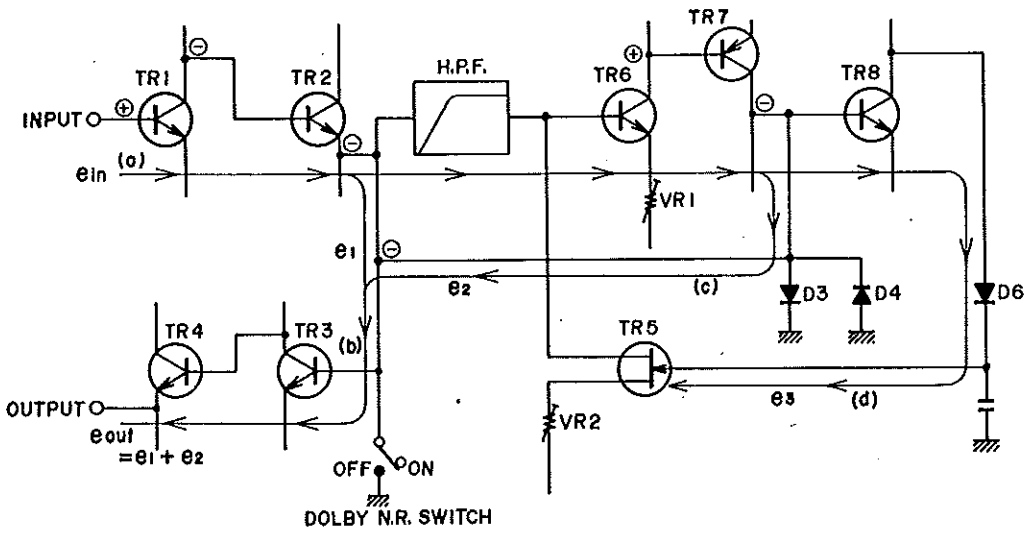


Fig. 31 Recording Dolby NR diagram

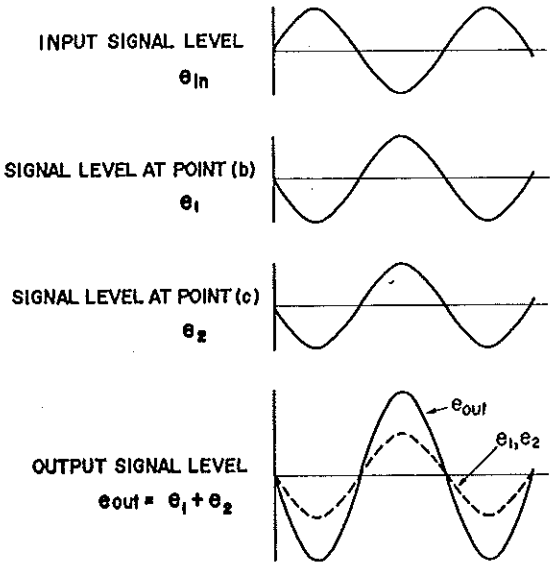


Fig. 32 Level and Phase of each point at individual frequency.

1. RECORDING DOLBY NR (Figs. 31, 32)

In figure 31, the Input Signal e in passes TR1 ~ TR4 and becomes the output signal. The signal from TR2 passes the High Pass Filter (H.P.F.) and is amplified at TR6, TR7. At this time, TR6 signal is controlled by FET (field effect transistor) TR5 gate D.C. bias and the signal from TR7 is varied by means of Diodes D3, D4 characteristics and is emitted as e_2. This output signal e_2 is inphased with TR2 output signal and TR4 output becomes the dolbyized output signal e out.

Accordingly if input signal level e in is small, because FET TR5 becomes an electronic attenuator with a certain impedance value, the output signal e_2 from (C) point is attenuated by H.P.F. and TR5 and becomes e/k. Then it is amplified at TR6, TR7. With A representing this amplification, e_2 becomes as shown in formula (1) below.

$$e_2 = e/k \cdot A \cdot 1 \ldots\ldots (1)$$

Where 1 is the determined attenuated volume by means of Diode D3, D4 characteristics, if

A.K · 1 = m, formula (1) becomes as shown in formula (2) below:

$$e_2 = m_e \ldots\ldots (2)$$

Because e_2 of formula (2) and TR2 output signal e_1 is composited, this output signal e out becomes as shown in formula (3) below:

$$e \text{ out} = e_1 + e_2 = e_1 + m_e \ldots\ldots (3)$$

In formula (3) above, the relation of e_1 and m_e with regards to the Dolby NR System, is the relation between e out and e_1, i.e., the value of e out is 10 dB higher than e_1. For this reason, at a level of -30 dB lower than the Dolby level, the output signal is 10 dB higher than the more than 400 Hz input signal e in.

Also, if the input signal e in level is high, it is amplified at TR6, current modified at diode D5, and the D.C. voltage at (d) point is also large in proportion to input.

Accordingly, if e_3 becomes large, FET TR5 impedance is reduced and (c) point signal level e^2 gradually becomes smaller. Thus at a level higher than the Dolby level, formula (4) below is applicable:

$$E \text{ out} = e_1 + m_e = e \ldots\ldots (4)$$

$$\because e \gg m_e$$

Consequently, the input and output levels display linear characteristics.

NOTE: H.P.F. (high pass filter)
This filter attenuates an under 400 Hz signal at 18 dB octave.

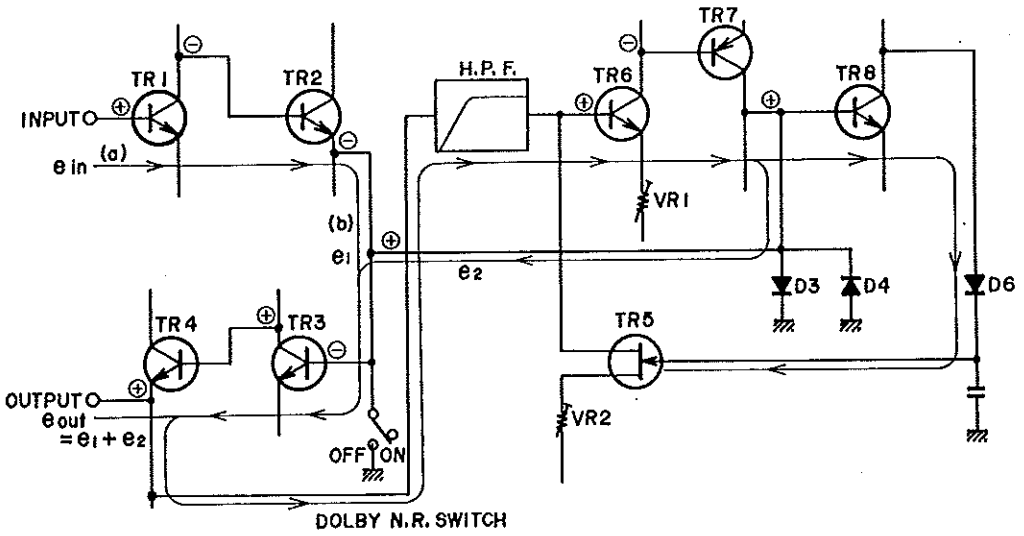


Fig. 33 Playback Dolby NR Diagram

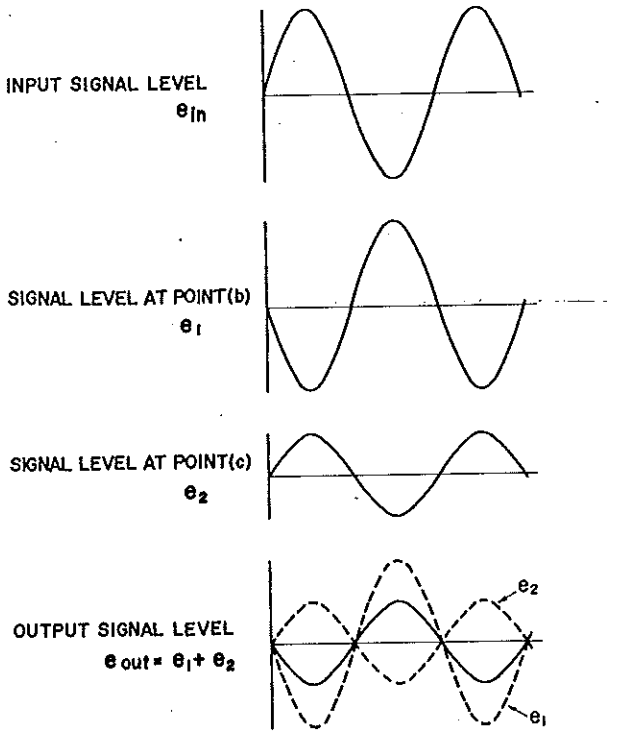


Fig. 34 Level and phase of each point at individual frequency

2. PLAYBACK DOLBY NR (Figs. 33, 34)

In Fig. 33, input signal e in passes TR1 ~ TR4 and becomes the output signal. The signal from TR4 passes H.P.F. and is amplified at TR6, TR7. At this time TR5 signal is controlled by the gate D.C. bias of FET TR5, and TR7 signal is variated by the characteristics of diodes D3, D4 and is emitted as e_2, This output signal e_2 is added as the reverse phase of TR2 output signal and the Dolbylized output signal e out is emitted.

Therefore, the procedure is the same as Recording Dolby NR except that the signal is reverse phased (formula (3))

$$e_o = e + (-e_2) = e + (-m_e)$$

and thus, becomes the exact opposite of Recording Dolby NR.

VIII. DC RESISTANCE OF VARIOUS COILS

The values shown in this chart are average D.C. resistance values.

Designation	Type	D.C. Resistance
CAPSTAN MOTOR	HM2-16MC	Between PNK-RED 130Ω Between PNK-BRN 180Ω Between GRN-GRY 360Ω Between GRN-YLW 370Ω
REEL MOTOR	24XD-TD	Between RED-BLU 72Ω Between YLW-GRN 160Ω
BRAKE SOLENOID	SDC1064 PHT 48V	300Ω
PINCH WHEEL SOLENOID	1660 THT 3	685Ω
QUICK TENSION RELAY	MY-4-0-US-AD4 D.C.24V	650Ω
HEADPHONE OUTPUT TRANSFORMER	N16-535S	Primary 565Ω±15% Secondary 0.95Ω±15%
OSCILLATOR COIL	OT-204	Between 1 ~ 3 0.3Ω Between 4 ~ 6 0.7Ω Between 7 ~ 9 8.2Ω
4 TRACK ERASE HEAD	E4-260	2.0Ω
FULL TRACK ERASE HEAD	E2-100	2.5Ω
4 TRACK RECORDING HEAD	R4-200	8Ω
2 TRACK RECORDING HEAD	R2-100	8Ω
4 TRACK PLAYBACK HEAD	P4-202	268Ω
2 TRACK PLAYBACK HEAD	P2-100	250Ω

Chart 3

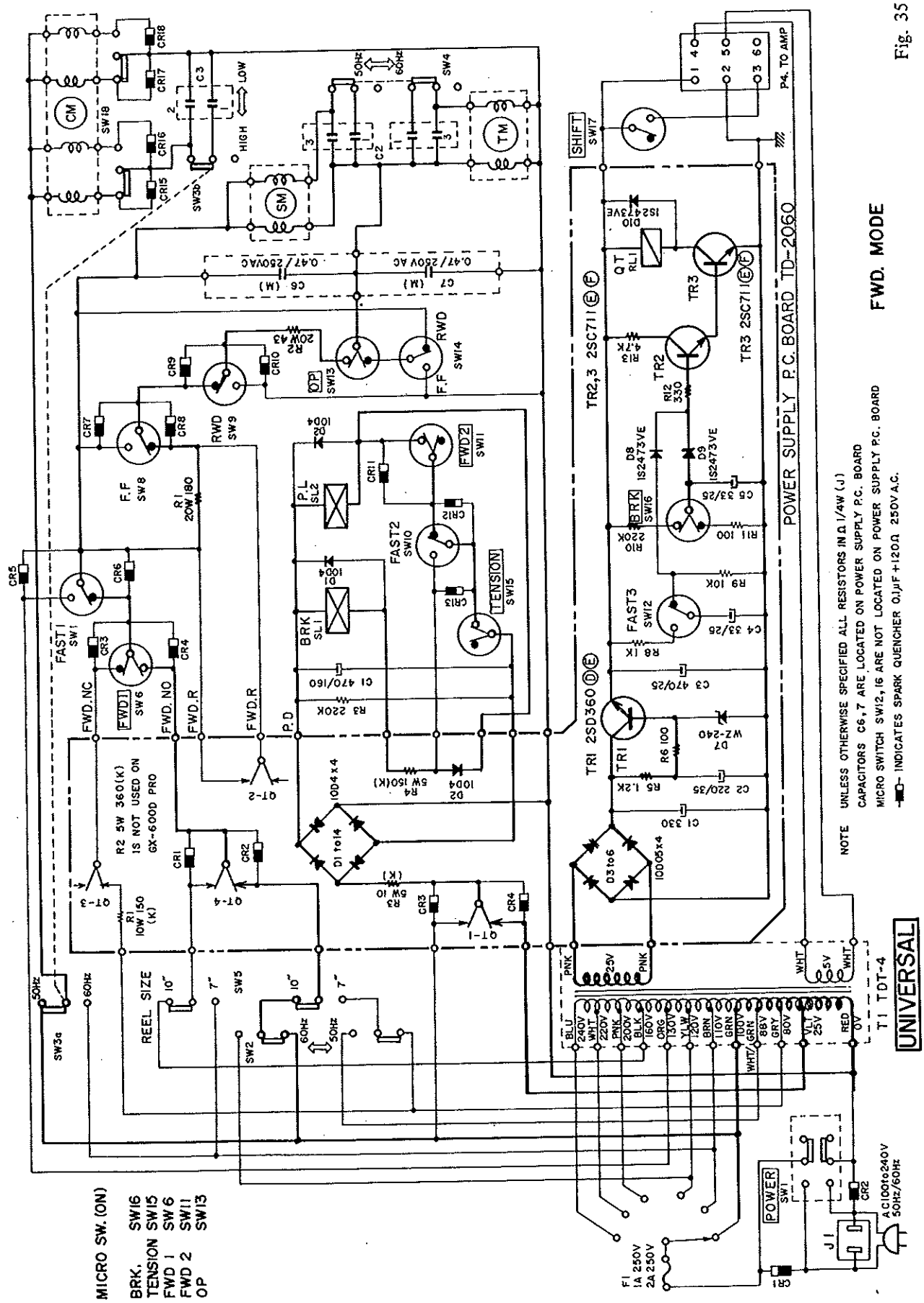

FWD. MODE
POWER SUPPLY P.C. BOARD TD-2060
UNIVERSAL
T1 TDT-4
MICRO SW. (ON)
BRK. SW16
TENSION SW15
FWD 1 SW 6
FWD 2 SW11
OP SW13
NOTE UNLESS OTHERWISE SPECIFIED ALL RESISTORS IN Ω 1/4W (J)
CAPACITORS C6,7 ARE LOCATED ON POWER SUPPLY P.C. BOARD
MICRO SWITCH SW12,16 ARE NOT LOCATED ON POWER SUPPLY P.C. BOARD
INDICATES SPARK QUENCHER 0.1μF+120Ω 250V A.C.
R2 5W 360(K) IS NOT USED ON GX-600D PRO
REEL SIZE
AC100to240V 50Hz/60Hz

Fig. 35

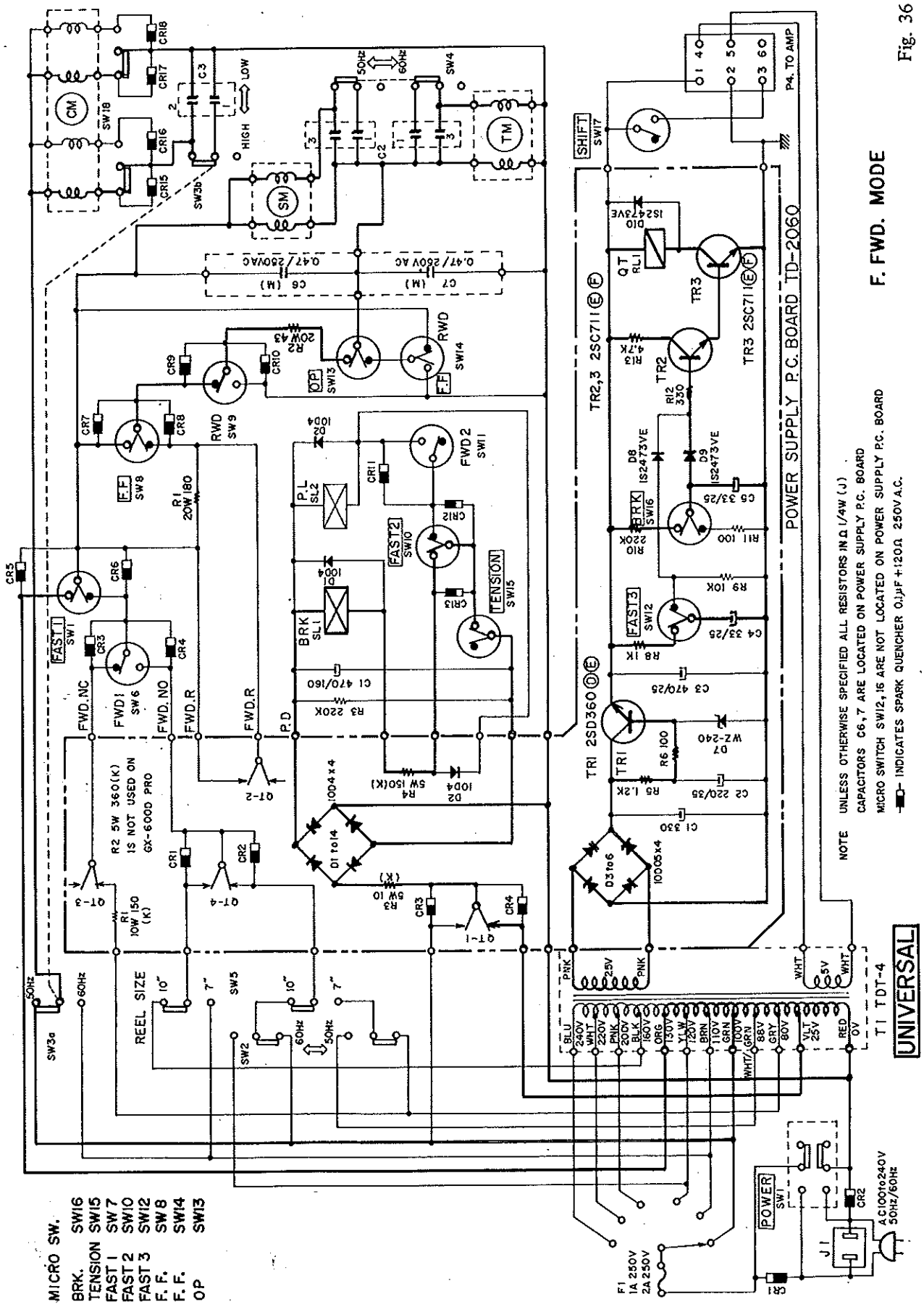

F. FWD. MODE
POWER SUPPLY P.C. BOARD TD-2060
TR1 2SD360
TR2,3 2SC711
TR3 2SC711
P4. TO AMP
NOTE UNLESS OTHERWISE SPECIFIED ALL RESISTORS IN Ω 1/4W (J)
CAPACITORS C6,7 ARE LOCATED ON POWER SUPPLY P.C. BOARD
MICRO SWITCH SW12,16 ARE NOT LOCATED ON POWER SUPPLY P.C. BOARD
INDICATES SPARK QUENCHER 0.1μF+120Ω 250V A.C.
MICRO SW.
BRK. SW16
TENSION SW15
FAST 1 SW7
FAST 2 SW10
FAST 3 SW12
F. F. SW8
F. F. SW14
OP SW13
REEL SIZE
R2 5W 360(K) IS NOT USED ON GX-6000 PRO
T1 TDT-4
UNIVERSAL
AC100to240V 50Hz/60Hz

Fig. 36

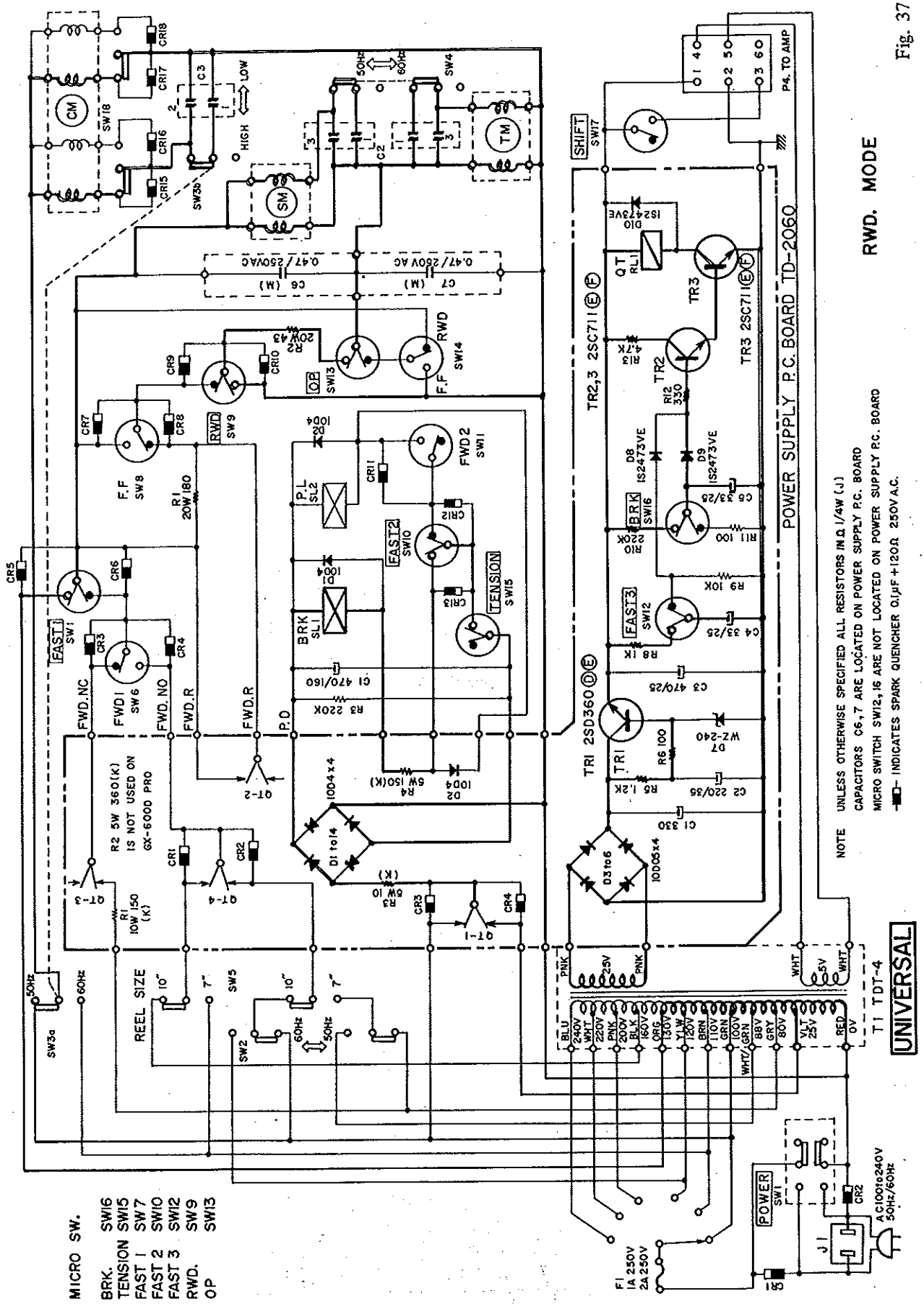
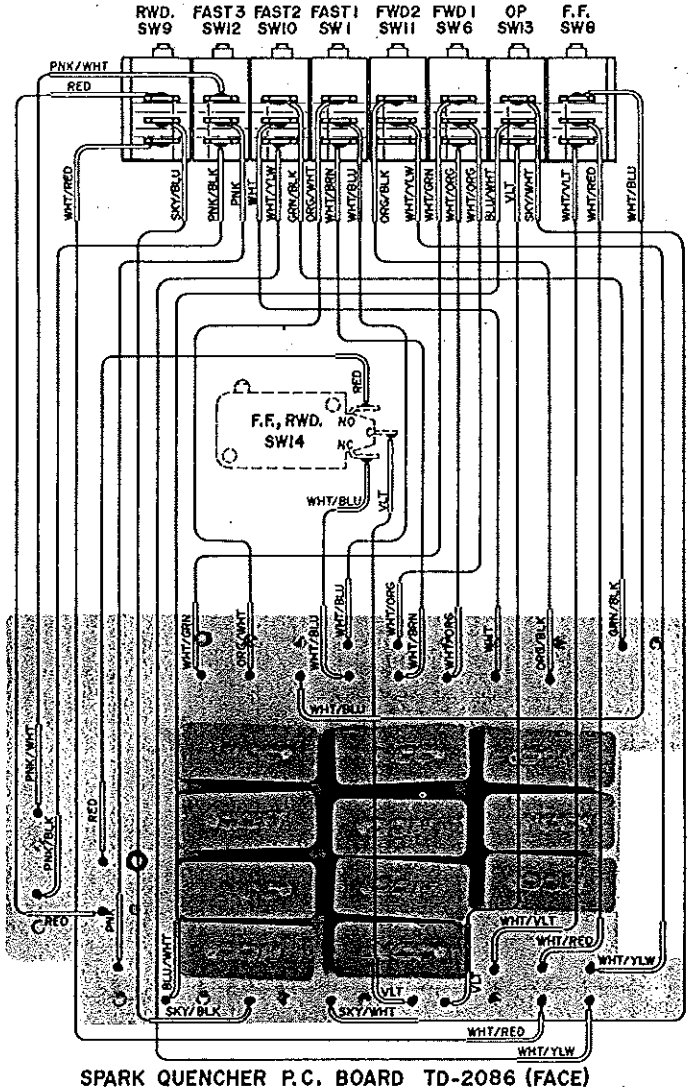

RWD. MODE
POWER SUPPLY P.C. BOARD TD-2060
UNIVERSAL
T1 TDT-4
NOTE UNLESS OTHERWISE SPECIFIED ALL RESISTORS IN Ω 1/4W (J)
CAPACITORS ©6,7 ARE LOCATED ON POWER SUPPLY P.C. BOARD
MICRO SWITCH SW12,16 ARE NOT LOCATED ON POWER SUPPLY P.C. BOARD
INDICATES SPARK QUENCHER 0.1μF+120Ω 250V A.C.
MICRO SW.
BRK. SW16
TENSION SW15
FAST 1 SW7
FAST 2 SW10
FAST 3 SW12
RWD. SW9
OP SW13
AC100 to 240V 50Hz/60Hz
F1 1A 250V 2A 250V
POWER SW1
REEL SIZE
FWD.NC
FWD1 SW6
FWD.NO
FWD.R
P.D
BRK SL1
P.L SL2
FWD 2 SW1
FAST2 SW10
TENSION SW15
FAST3 SW12
SHIFT SW17
TR1 2SD360 (D)(E)
TR2,3 2SC711 (E)(F)
TR3 2SC711 (E)(F)
D1 to 4 1004x4
D3 to 6 1008x4
P4. TO AMP

Fig. 37

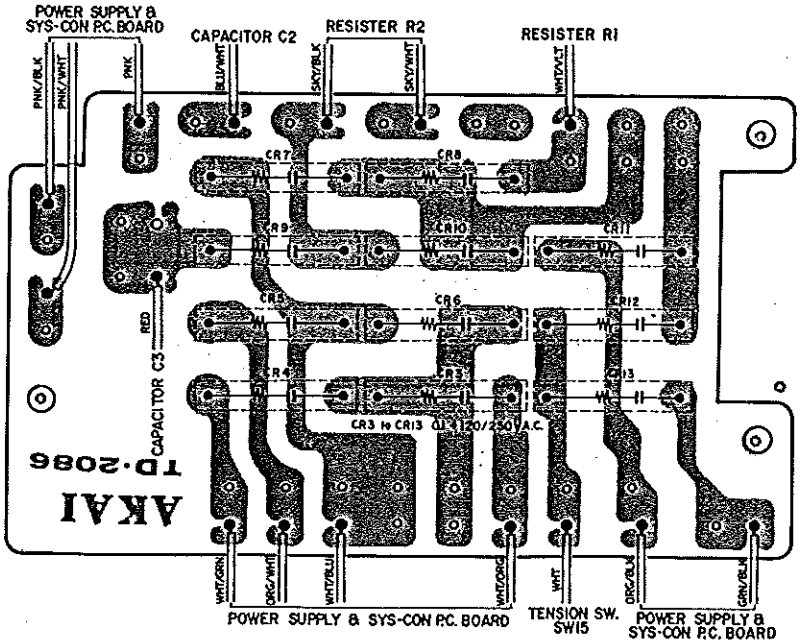
X. COMPOSITE VIEWS OF COMPONENTS

1. SPARK QUENCHER P.C. BOARD (A) TD-2086 (Front Side)

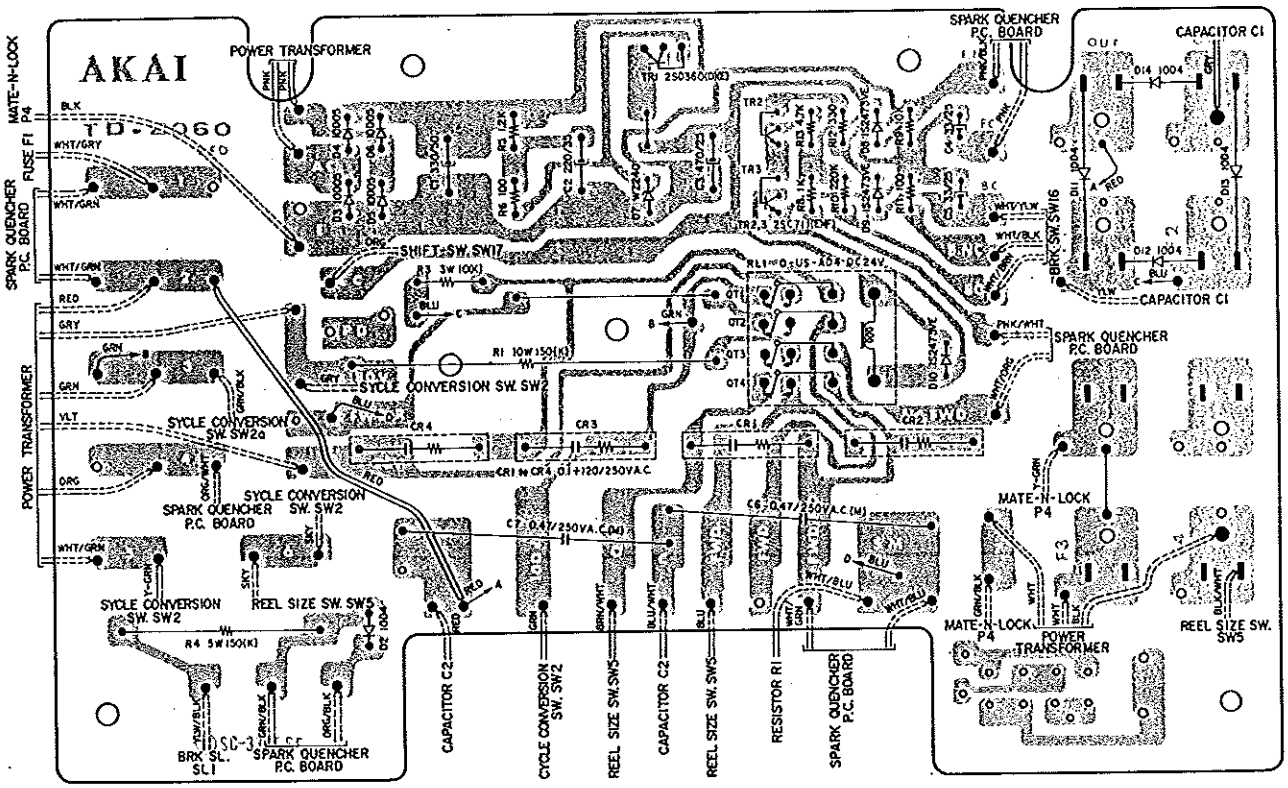


SPARK QUENCHER P.C. BOARD TD-2086 (FACE)

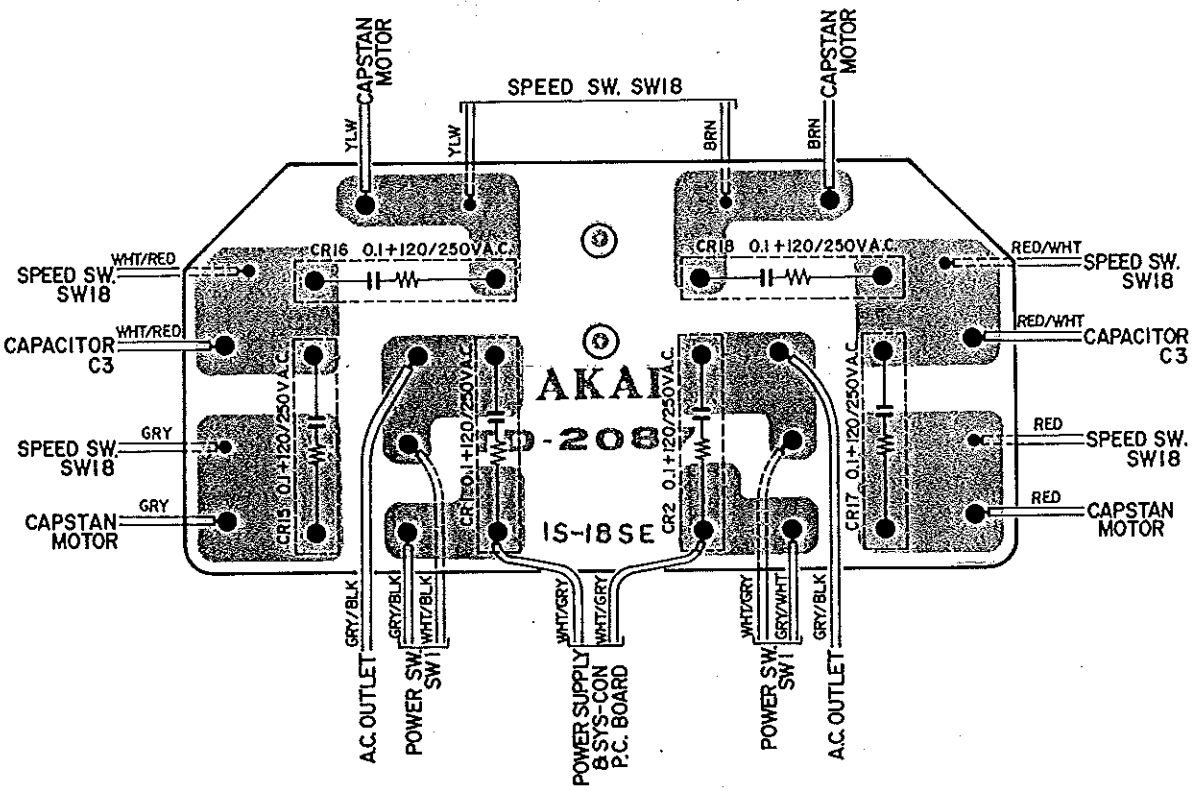
2. SPARK QUENCHER P.C. BOARD (A) TD-2086 (Reverse Side)



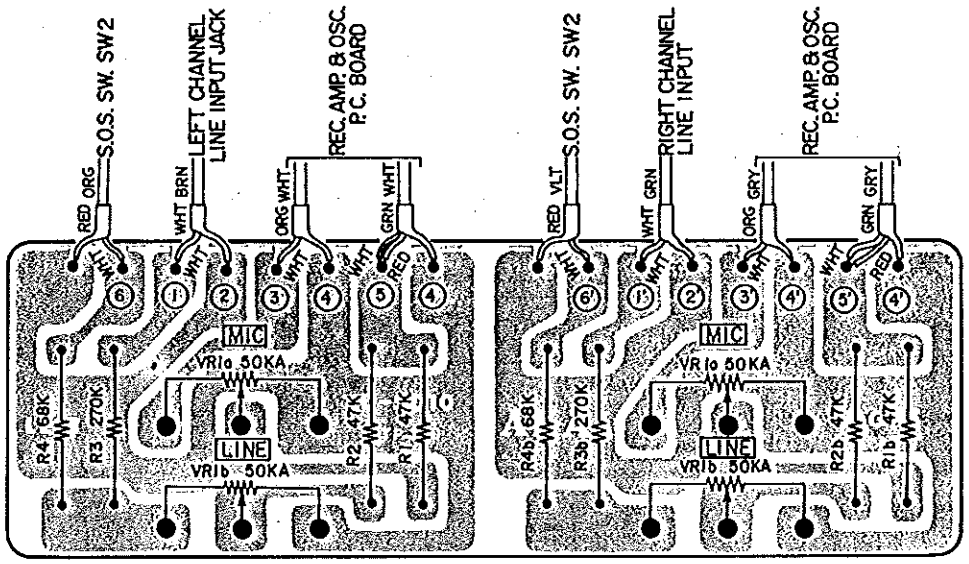
3. POWER SUPPLY & SYS. CON. P.C. BOARD TD-2060



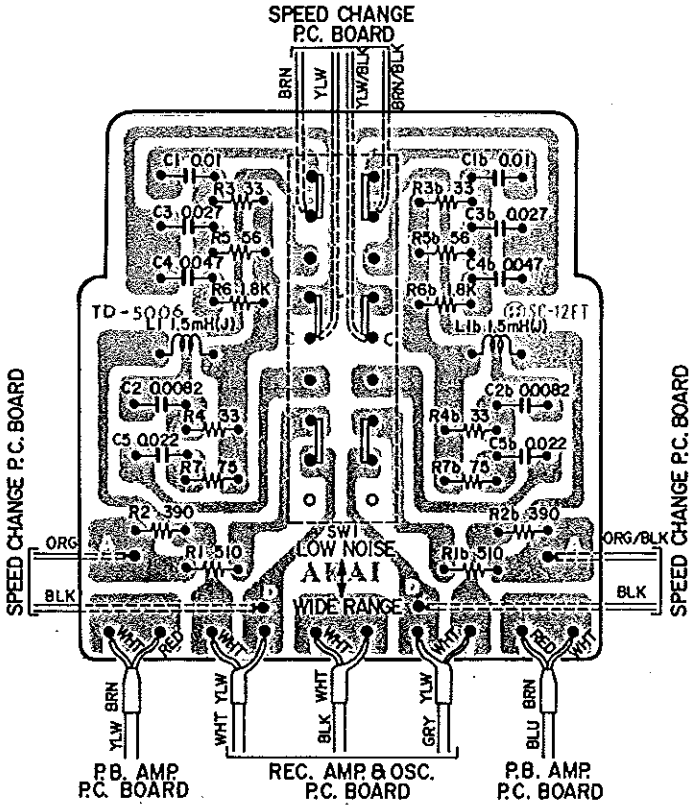
4. SPARK QUENCHER P.C. BOARD (B) TD-2087



5. VOLUME P.C. BOARD TD-5010



6. SRT SW. P.C. BOARD TD-5006



7. SPEED CHANGE P.C. BOARD TD-5005