SERVICE MANUAL
PARTS LIST

PRIDE IN QUALITY

AKAI STEREO TAPE DECK

MODEL GX-210D

STEREO TAPE DECK

MODEL GX-210D

SECTION 1

SERVICE MANUAL

TABLE OF CONTENTS

I. SPECIFICATIONS

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

TRACK SYSTEM		4-track 2-channel stereo system
TAPE SPEED		7-1/2 ips (19 cm/sec.) ±0.8% 3-3/4 ips (9.5 cm/sec.) ±1%
WOW AND FLUTTER		Less than 0.08% (*0.12%) RMS at 7-1/2 ips Less than 0.12% (*0.25%) RMS at 3-3/4 ips
TOTAL WOW AND FLUTTER		Less than 0.18% RMS at 7-1/2 ips (SCOTCH #175 tape, 3,000 Hz recording and playback)
FREQUENCY RESPONSE	S.R.T. TAPE	30 to 25,000 Hz ±3 dB at 7-1/2 ips 40 to 20,000 Hz ±3 dB at 3-3/4 ips
	REGULAR TAPE	30 to 23,000 Hz ±3 dB at 7-1/2 ips 40 to 18,000 Hz ±3 dB at 3-3/4 ips
TOTAL DISTORTION FACTOR		Less than 1.5% *Less than 2% at 1,000 Hz 0 VU recording *Less than 3% at 1,000 Hz 0 VU recording
OUTPUTS	LINE OUTPUT	1.228V (4 ±1 dB) at FWD mode, using a 250 Hz 0 VU pre-recorded tape 1.228V (4 ±1.5 dB) at REV mode, using a 250 Hz 0 VU pre-recorded tape
	DIN OUTPUT	610 mV (−2 dB), using a 250 Hz 0 VU pre-recorded tape
INPUTS	MIC INPUT	More than 0.3 mV
	LINE INPUT	More than 60 mV
	DIN INPUT	More than 5 mV (Low) More than 60 mV (High)
RECORDING/PLAYBACK LEVEL		1.228V (4 ±1.5 dB) at 7-1/2 ips 1,000 Hz 0 VU recording
S/N RATIO		Better than 50 dB *Better than 50 dB at 7-1/2 ips *Better than 47 dB at 3-3/4 ips
TOTAL S/N RATIO		Better than 47 dB at 7-1/2 ips
CROSS TALK		Better than 45 dB *Better than 40 dB at 1,000 Hz, 3 VU recording
ERASE RATIO		Better than 70 dB
RECORDING BIAS FREQUENCY		102 kHz ±5%
BIAS LEAK		Less than −30 VU
HIGH FREQUENCY DEVIATION		
	Between FWD channels	Within 3 dB
	Between REV channels	Within 4 dB
	Between FWD-REV	Within 3.5 dB
REVERSING TIME		2 to 3 seconds
RECORDING CAPACITY		45 min. stereo recording, using a 1,800 ft. tape at 7-1/2 ips
F.FWD AND RWD TIME		110/90 sec., using a 1,800 ft. tape at 50/60 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 motor Type: 24XO-MR Revolutions: 930/1,120 r.p.m. at 50/60 Hz
HEADS	COMBO RECORDING/ERASE HEAD	Type: RE4-6 GX Head Gap: 3.5 to 5.5 microns (REC) 0.2 mm W Gap (Erase) Impedance: 1,400Ω ±25% at 100 kHz (REC) 130Ω ±7% at 100 kHz (Erase) D.C. Resistance: 5.5Ω (REC) 2.3Ω (Erase)
	PLAYBACK HEAD	Type: P4-202 GX Head Gap: 1.2 to 2.2 microns Impedance: 1,400Ω at 1,000 Hz D.C. Resistance: 268Ω

TRANSISTORS	2SC711(D) (E) (F) . . . 14 2SD360(D) . . . 1	2SC1312(G) (H) . . . 14
DIODES	1N34A . . . 4 10D05 . . . 4 10D2 . . . 1	1S2473VE . . . 4 10D1 . . . 1 WG713 . . . 1
ZENER DIODES	WZ240 . . . 1	YZ088 . . . 2
POWER SUPPLY	100 to 240V A.C. 50/60 Hz for Universal and WG models 120V A.C. 60 Hz for CSA models 220V A.C. 50 Hz for CEE models	
POWER CONSUMPTION	100W max.	
DIMENSIONS	371(H) x 368(W) x 227(D) mm (14.6" x 14.5" x 8.9")	
WEIGHT	15.4 kg (33.9 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. 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

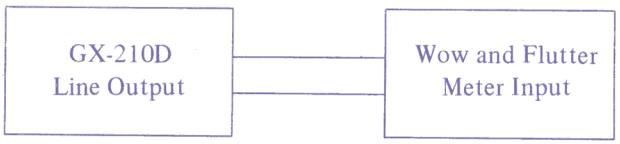


Fig. 2

Method A

As shown in Fig. 2, connect the Line output 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 signals. Measure wow and flutter with a Wow and Flutter Meter. (The wow and flutter value of Method B will be close to twice that of Method A.)

3. FREQUENCY RESPONSE

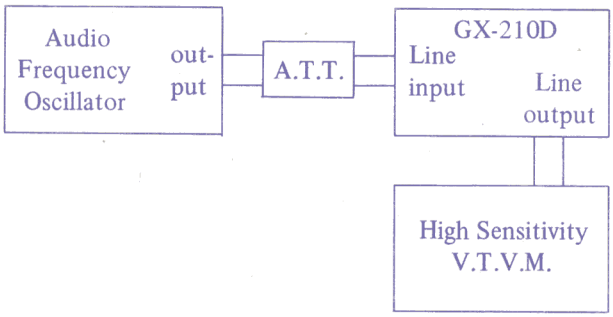


Fig. 3

For measuring frequency response, connect instruments as shown in Fig. 3 and proceed as follows:

1) Supply a 2,000 Hz sine wave signal to the Line input from an Audio Frequency Oscillator through an Attenuator.
2) Set tape deck to recording mode and turn recording level control volume to maximum. Adjust attenuator to obtain a +4 dB V.T.V.M. reading.
3) Under conditions described in 2) above, re-adjust attenuator so that the Line output is −16 dB, and record 30 to 23,000 Hz at 7-1/2 ips spot frequencies.
4) Rewind the 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

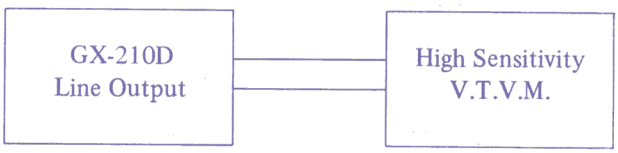


Fig. 4

As shown in Fig. 4, connect a High Sensitivity V.T.V.M. to the Line output. Playback a 250 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 FACTOR

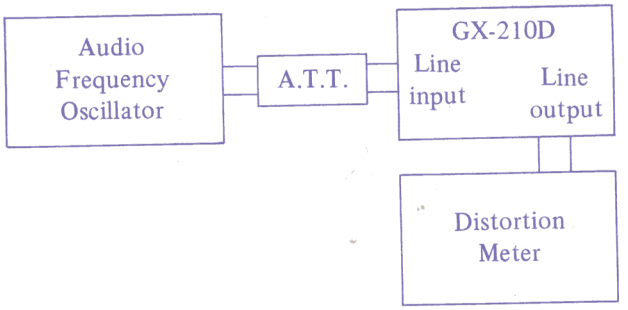


Fig. 5

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. Measure the noise level of the tape recorder without the tape. Connect the audio frequency oscillator directly to the distortion meter for measurement of the distortion factor of the oscillator. The required distortion factor can be obtained from the results of the above measurement by the following formula:

$$d_0 = d - d_1 - d_2$$

where, d_0 = Required distortion factor
d = Overall distortion factor
d_1 = Noise Level
d_2 = Distortion factor of the oscillator

NOTE: When measuring the distortion factor, new tape should be used.

6. CROSS TALK
(Cross talk between the channels)

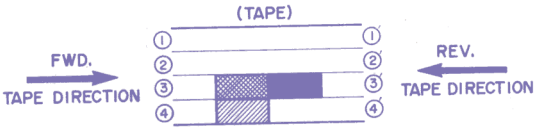


Fig. 6

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 Tracks No. 3 and 4 (reversed condition of tape) through the B.P.F. (band pass filter, Sensitivity ... 1:1) and obtain a ratio between the two from the following formula:

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

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

7. ERASE RATIO

As shown in Fig. 4, connect a High Sensitivity V.T.V.M. to the Line output. Playback a virgin tape and take a V.T.V.M. reading of the output level. Next, record a 1,000 Hz sine wave signal at +3 VU, then playback this recorded signal and take a V.T.V.M. reading of the output level. Next, using this pre-recorded tape, record under a non-input condition and take a reading of the noise level output of the erased signal and obtain a ratio between the two from the following formula:

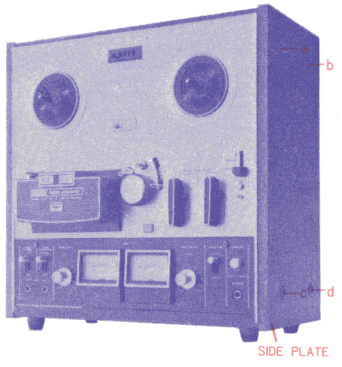
$$E_r = 20 \log \frac{E_0}{E_2 - E_1} \text{ (dB)}$$

where, E_r = Desired erase ratio (dB)
E_0 = 1,000 Hz signal output level
E_2 = Non-input signal recorded level
E_1 = Virgin tape noise output level

III. DISMANTLING OF UNIT

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

1



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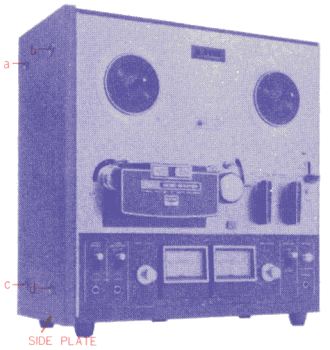

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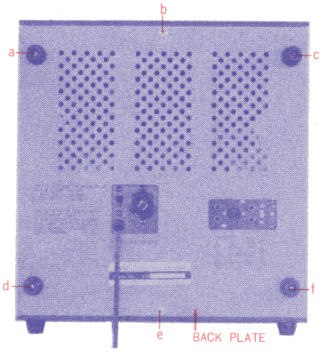

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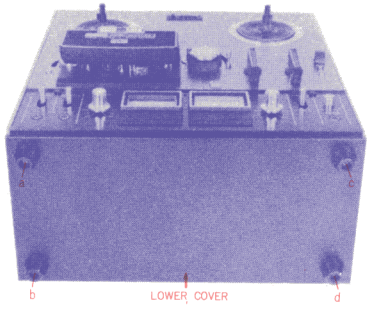

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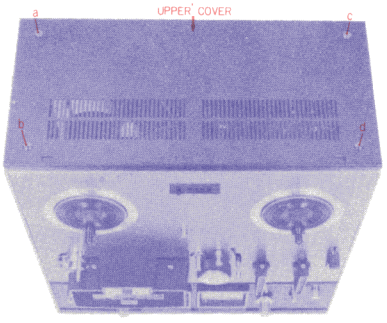

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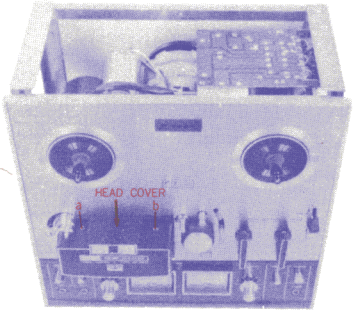

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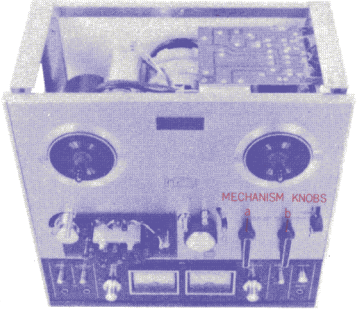

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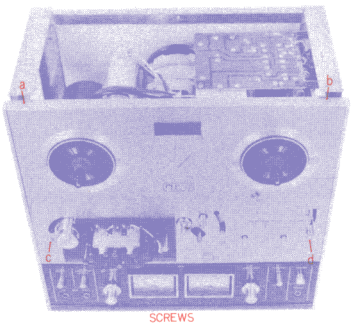

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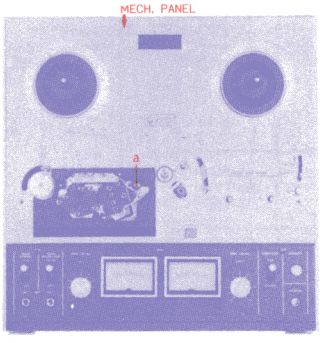

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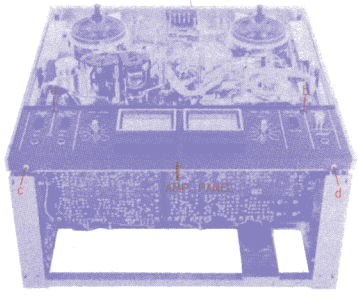

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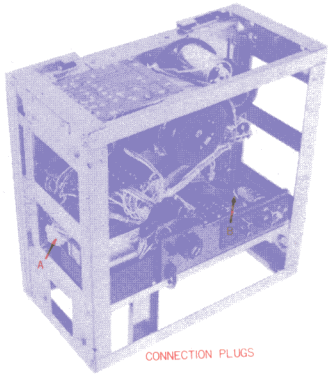

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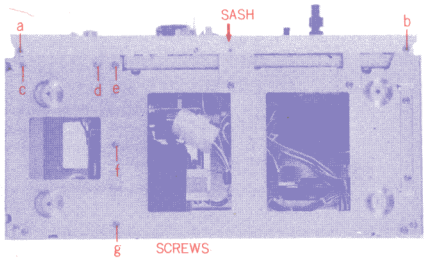

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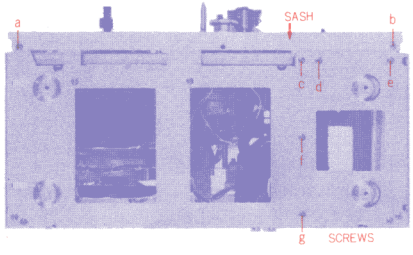

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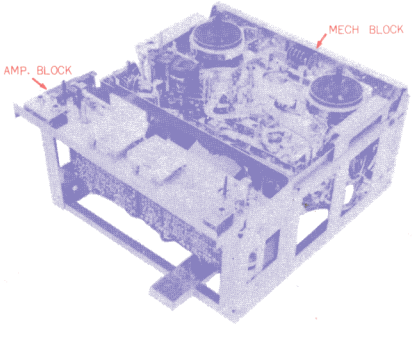
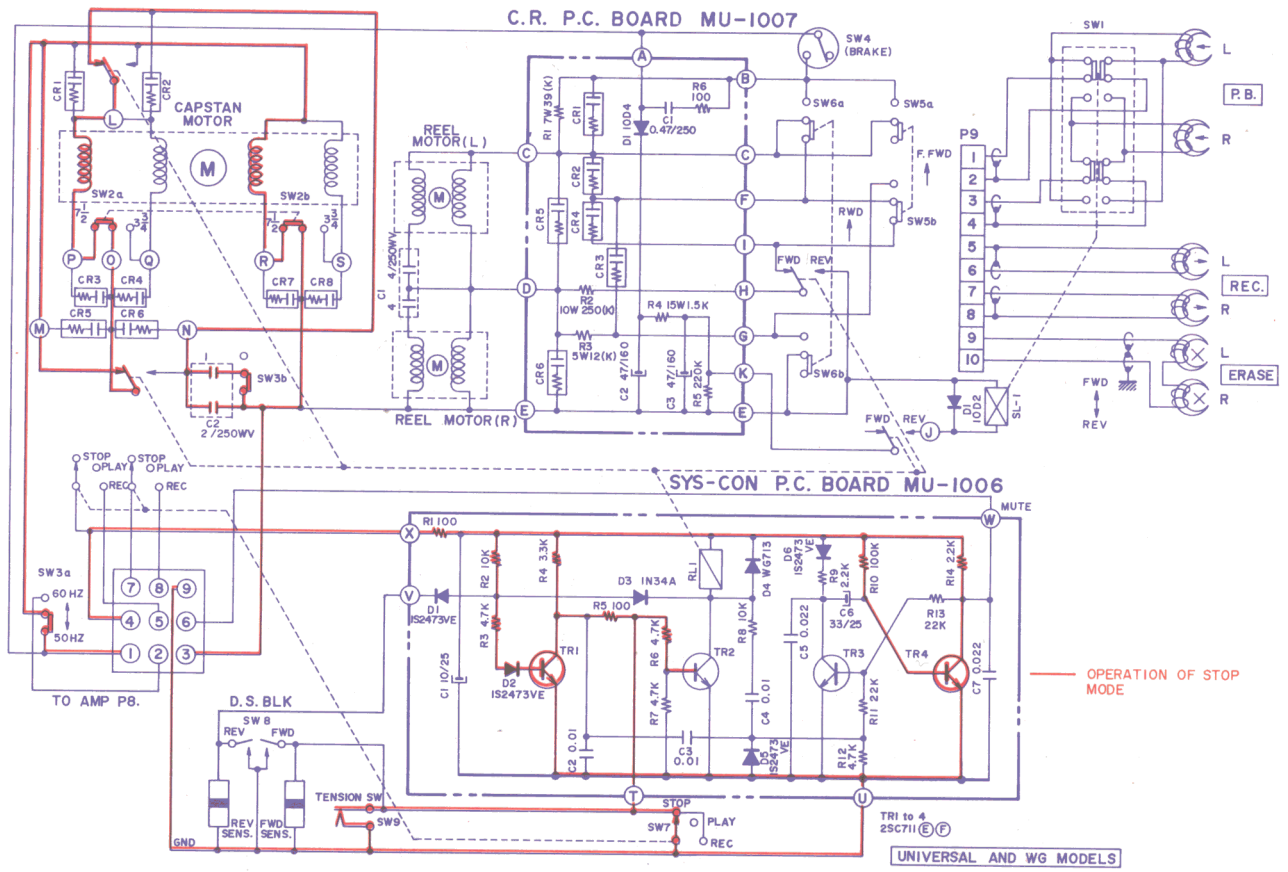
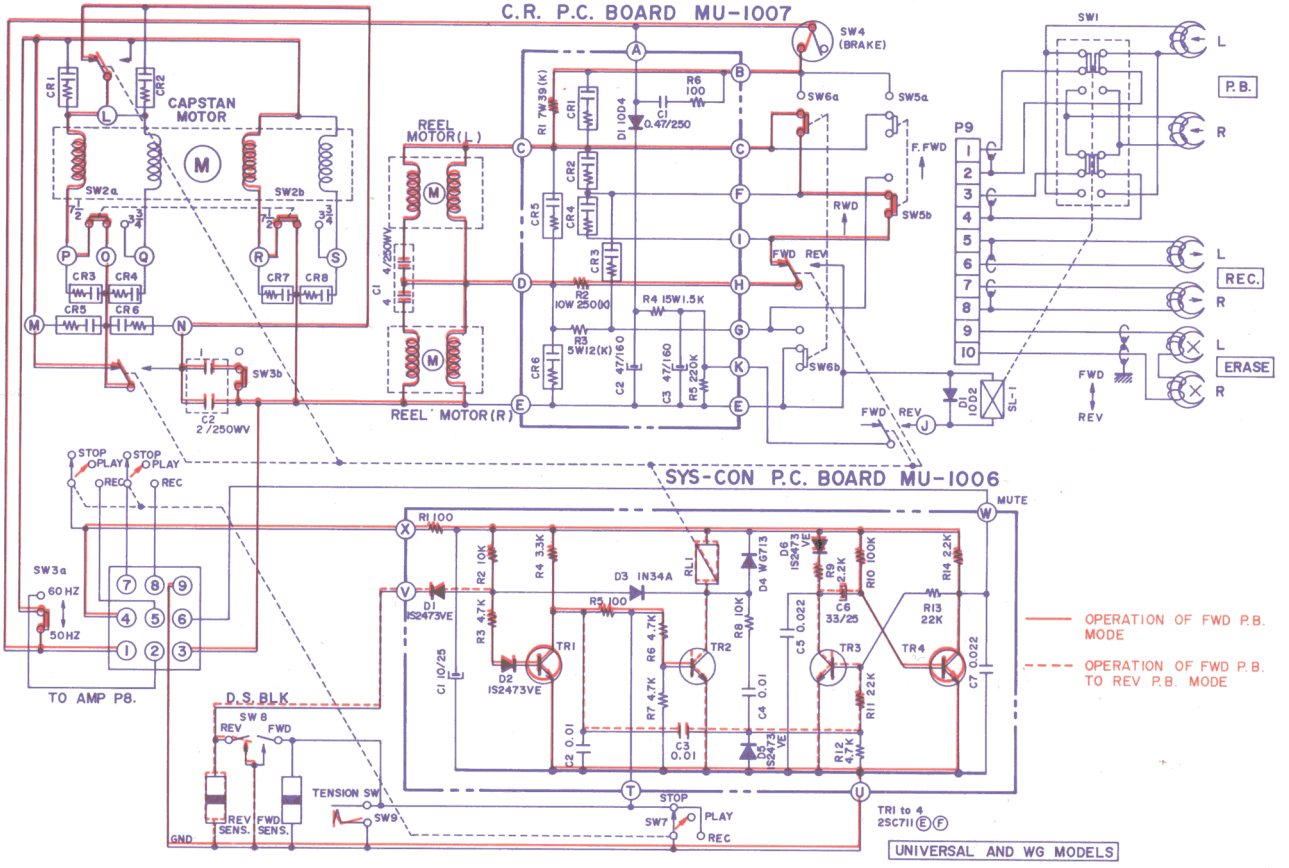


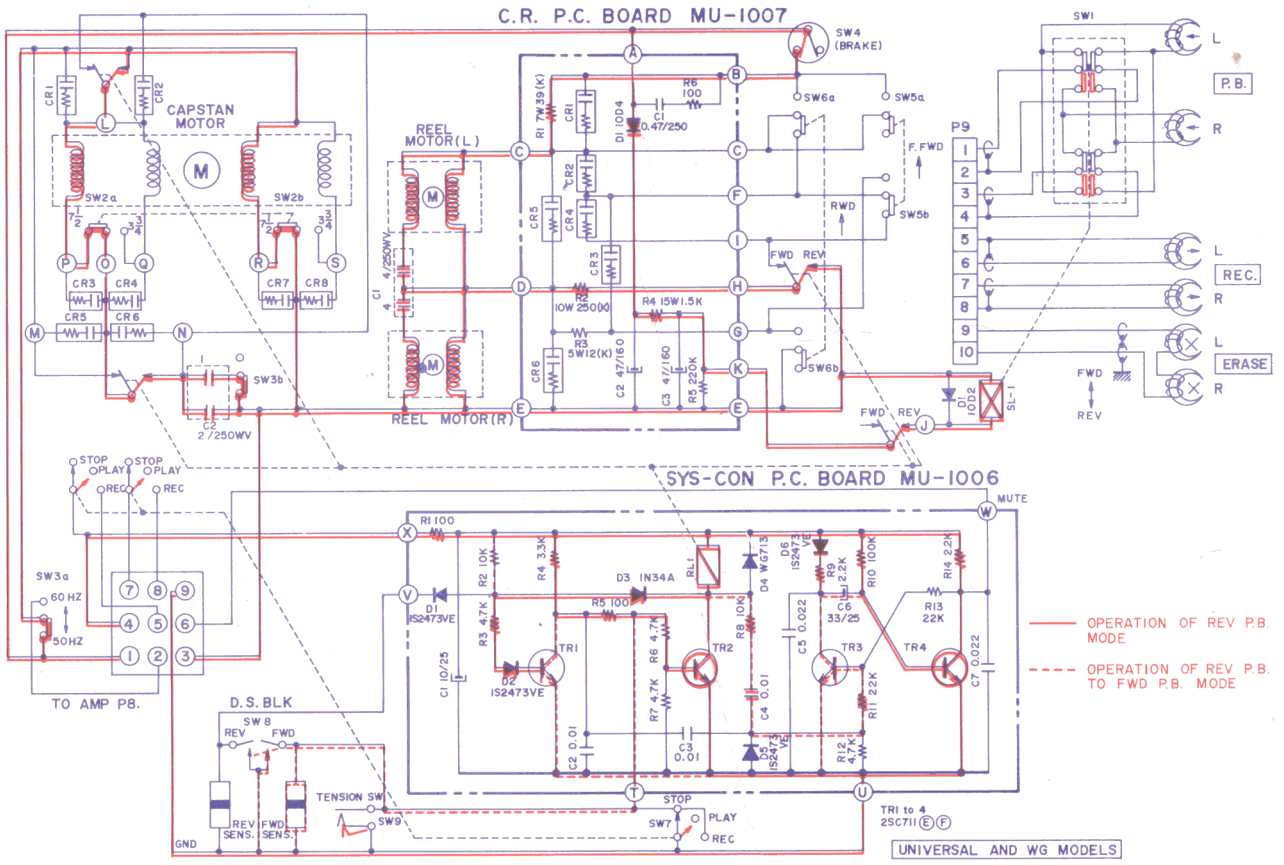
IV. SYSTEM CONTROL CIRCUIT OPERATION



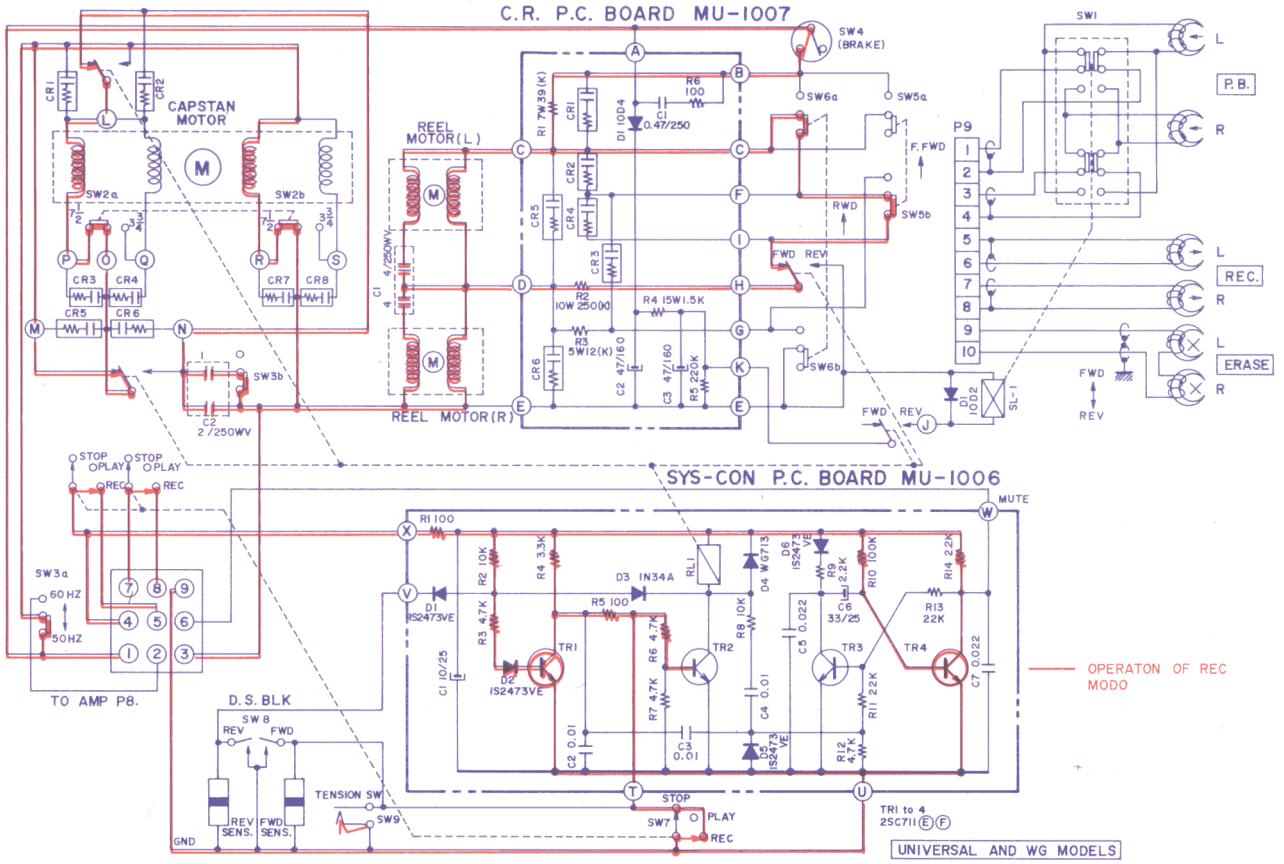
SCHEMATIC 1



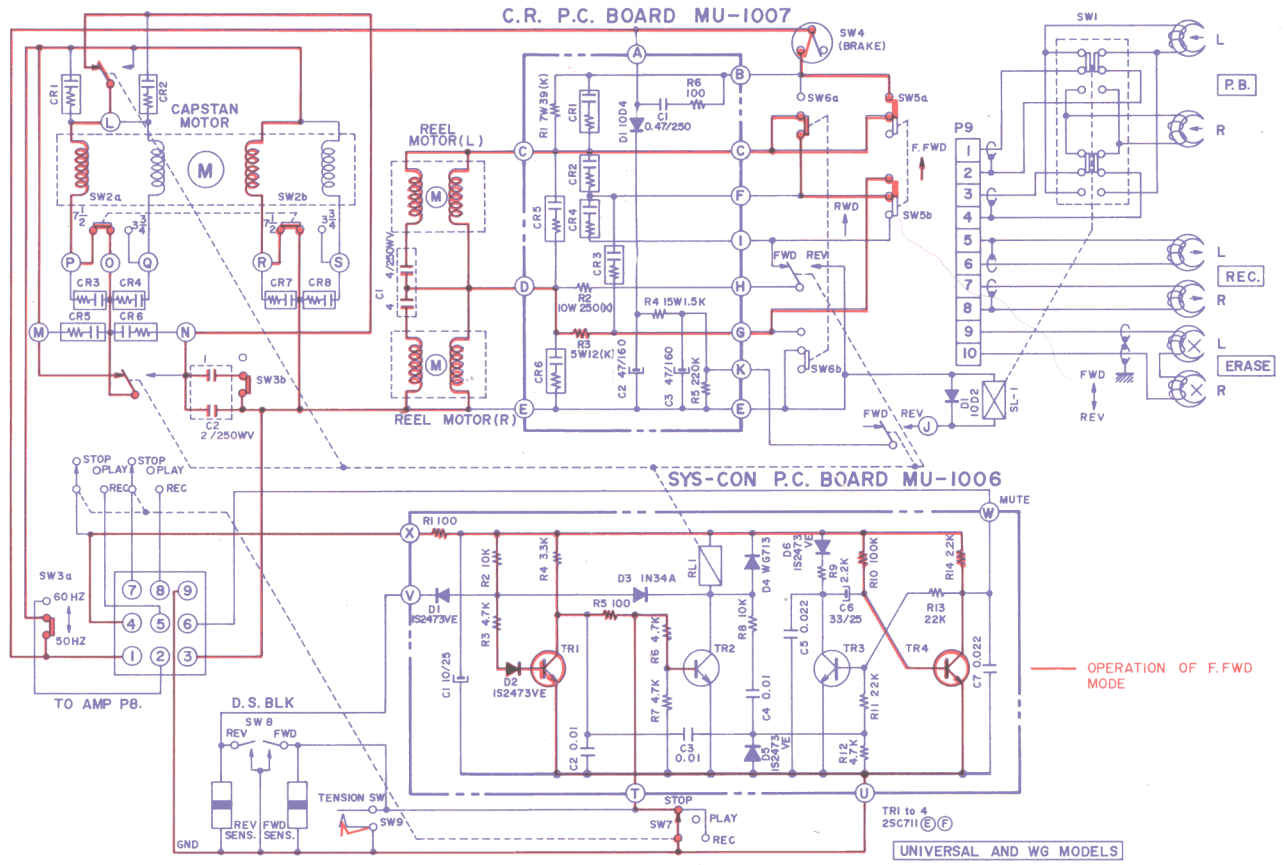
SCHEMATIC 2



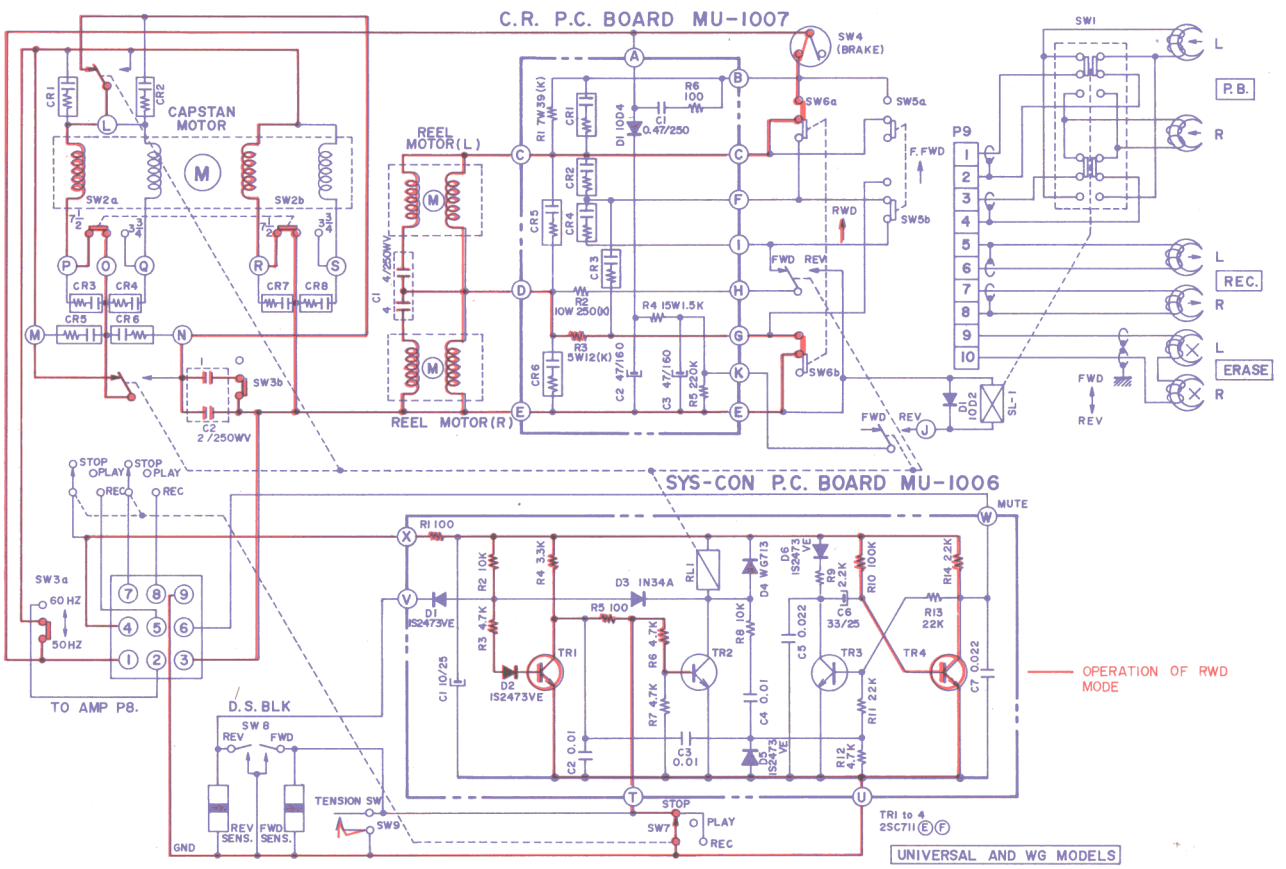
SCHEMATIC 3



SCHEMATIC 4



SCHEMATIC 5



SCHEMATIC 6

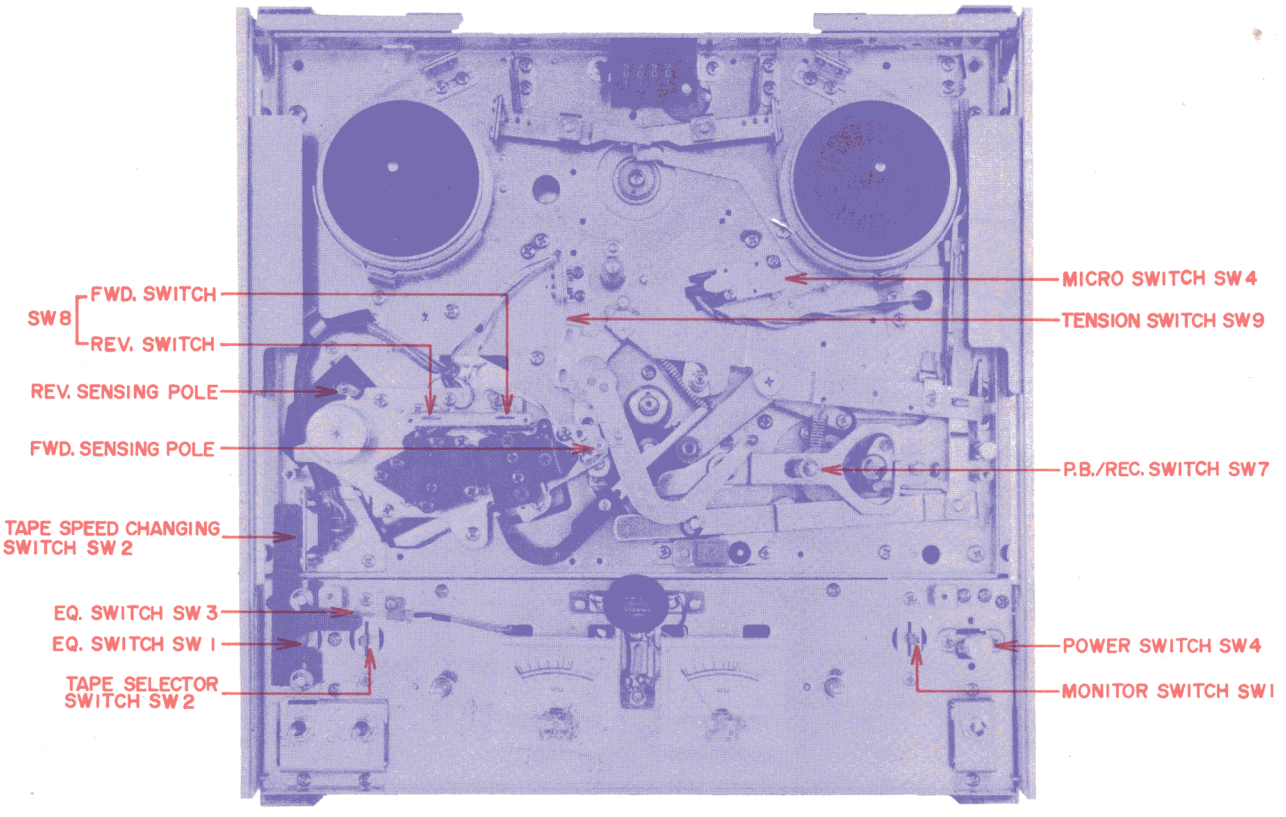


Fig. 7

1. STOP MODE (Refer to Schematic Diagram-1)

At Stop Mode, the various System Control (hereinafter referred to as SYSCON) transistors are maintained as follows: TR1(ON), TR2(OFF), TR3(OFF), and TR4(ON). Accordingly, the reverse relay connected to the collector of TR2 is OFF, and capstan motor revolutions are in forward direction. Also as TR4 is ON and TR4 collector voltage is roughly zero and thus Diode D1 (Playback Amp. P.C. Board) connected to the collector of TR4 is turned OFF, the playback Amp. Mute Circuit is also turned OFF. Both the supply and take-up reel motor are equipped with a Micro Switch SW4 which is activated to OFF and ON by the operation of the brake lever, and which at Stop Mode are turned OFF. Consequently, no voltage is supplied to either reel motor (both reel motors are connected in series).

When at Stop Mode, switching by means of P.B./REC Switch SW-7 does not take place because the base of SYSCON TR2 is grounded and maintained at OFF condition.

That is to say, capstan motor revolutions will not reverse even when a REV Button is depressed. When the tension lever is raised, Tension Switch SW-9 is turned OFF. Thus, when no tape is loaded, this switch is ON.

Also, because Tension Switch SW-9 is installed in parallel with P.B./REC Switch SW-7, when SW-7 is at Stop Mode, if a tape is loaded, but not threaded through the Tension Lever and playback is effected, reverse mode cannot be effected when a Reverse Button is depressed. And, of course, reverse mode will not be effected when the sensing foil passes the sensing poles.

2. FORWARD PLAYBACK MODE (Refer to Schematic Diagram-2)

When the P.B./REC Switch is at PLAY position, the various SYSCON transistors are maintained as follows: TR1(ON), TR2(OFF), TR3(OFF), and TR4 (ON), i.e. functionally, the same as at stop mode. The difference is that the base of TR2 which was grounded by P.B./REC Switch SW-7 is now open. That is to say, when TR1 is turned OFF and TR1 collector voltage increases, bias is supplied to TR2, and TR2 is turned ON. Accordingly, while TR1 is (ON) and TR2(OFF) (FWD Playback Mode), capstan motor revolutions are in forward direction. Also Micro SW-4 is ON, and voltage is supplied to both reel motors.

At FWD Playback mode, an R2 (10W, 250Ω) resistor is in parallel with left reel motor winding. That is to say, the left reel motor resistance differs from the right reel motor resistance due to the R2 (10W, 250Ω) resistor which is parallel with the left reel motor as shown in Fig. 8.

In short, the voltage supplied to the left reel motor is low and FWD. Playback mode is maintained.

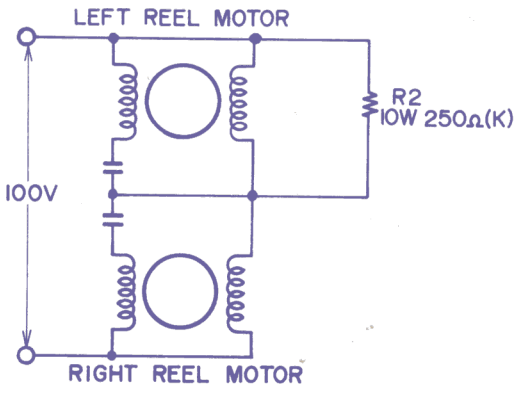


Fig. 8

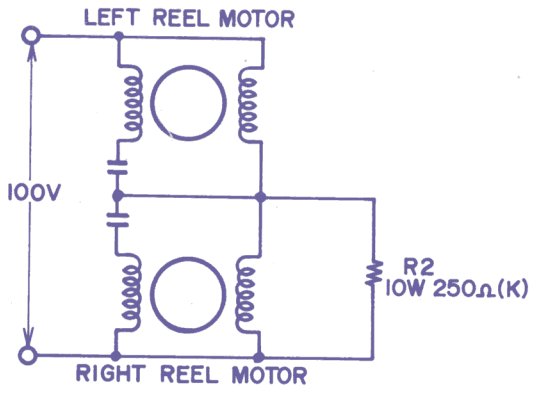


Fig. 9

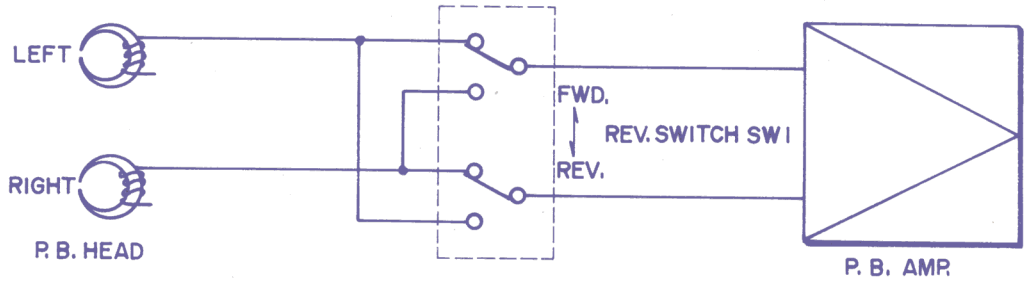


Fig. 10

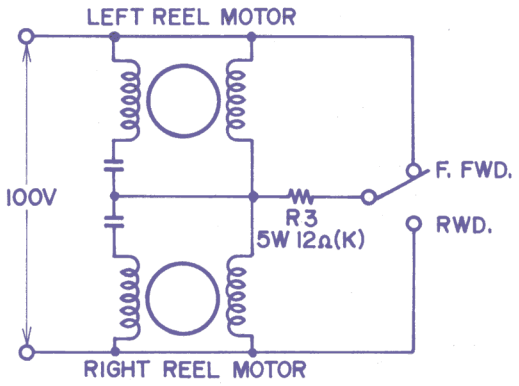
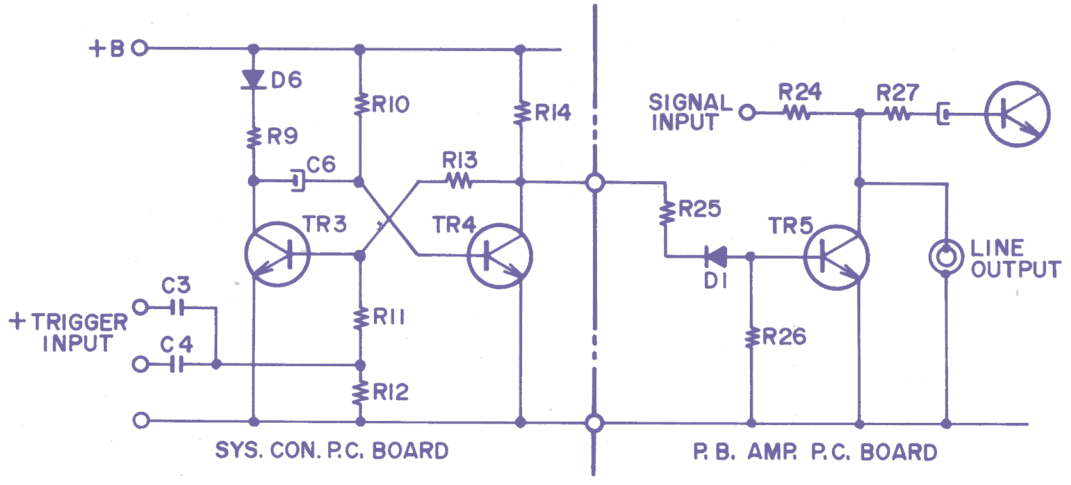


Fig. 11

3. FROM FWD TO REV PLAYBACK, AND REV PLAYBACK MODE (Refer to Schematic Diagrams-2, 3)

When the sensing tape passes the reverse sensing poles or when the Reverse Button is depressed, the base of TR1 is biased at zero electrical potential and TR1 is instantly turned OFF, TR1 collector voltage increases and bias is applied to the base of TR2, TR2 is turned ON, and Reverse Relay RL-1 is turned ON. In this TR1 and TR2 circuit, TR1 is maintained at OFF and TR2 at ON by means of Diode D3 (1N34A). (Refer to Schematic Diagram-3) By means of the reverse relay function, current flows from the reverse direction to the capstan motor sub coil, and reverse revolutions begin. Also, at FWD playback time, Resistor R2 (10W, 250Ω) connected in parallel with the left reel motor becomes parallel with the right reel motor. (Refer to Fig. 9)

At this condition, reverse playback begins and is maintained, and the capstan motor revolutions begin reversing from forward direction. For normalized and stable revolutions, flywheel inertia at time of forward revolutions and flywheel mass when reverse revolutions begin is applied so that stabilized tape speed is not immediate. For this reason, the signal output circuit must be muted until the capstan motor revolutions have been stabilized. (Refer to MUTING CIRCUIT OPERATION explanation)
Solenoid Plunger SL1 also functions to shift down Reverse Switch SW-1 and the P.B. Head. In other words, P.B. Head left and right channels are reversed by means of SW-1 as shown in Fig. 10.



SCHEMATIC 7

4. FROM REVERSE TO FORWARD PLAY-BACK (Refer to Schematic Diagram-3)

When the sensing tape passes the FWD sensing pole or when the FWD Button is depressed and the base of TR2 becomes biased at zero electrical potential, TR2 is instantly turned OFF, and reverse relay RL-1 is also turned OFF.

Diode D3 (1N34A) is also inverse biased, TR1 base current passes R2 (10 kΩ), R3 (4.7 kΩ), and D2 (1S2473VE) and is biased, and TR1 is turned ON and maintained.

Consequently, reverse relay RL1 returns to it's original condition (FWD P.B.) and FWD playback mode is effected.

Refer to MUTING CIRCUIT OPERATION for mute function during change from REV to FWD play-back.

5. RECORDING MODE

SYSCON operation at recording time is exactly the same as Stop mode.

6. FAST FORWARD AND REWIND MODE (Refer to Schematic Diagrams-5, 6)

In this case, SYSCON operation is also exactly the same as Stop mode. However, the voltage supply to both reel motors are as shown in Fig. 11.

7. MUTING CIRCUIT OPERATION (Refer to Schematic Diagrams 2, 3, and 7)

As shown in Schematic Diagram-7, the muting circuit is made up of an electronic switch from transistor TR5 and a one-shot multi-vibrator comprised of TR3 and TR4. When stabilization is attained, TR3 of the one-shot multi-vibrator is turned OFF, and TR4 turned ON. Accordingly, the electrical potential of TR4 collector is lowered, Zener Diode D1 is biased in reverse direction, and TR5 assumes an OFF condition. If Button SW-8 is now depressed for FWD to REV playback, or REV to FWD playback, a charge current flows to condenser C3 or C4. Thus the base of TR3 is biased (this becomes the trigger signal), the one-shot multi vibrator comprised of TR3 and TR4 is inverted, and after a certain period of time (2 to 3 seconds) again returns to it's stabilized condition.

Further, while this one-shot multi-vibrator is inverted, (while TR4 is OFF) because TR4 collector voltage is high, the voltage exceeding the zener point of Zener Diode D1 is applied to the cathode of D1 and D1 assumes a lead-through condition. Thus, electronic switch transistor TR5 is turned ON, and the signal is muted (the internal resistance TR5 at lead through time is extremely low).

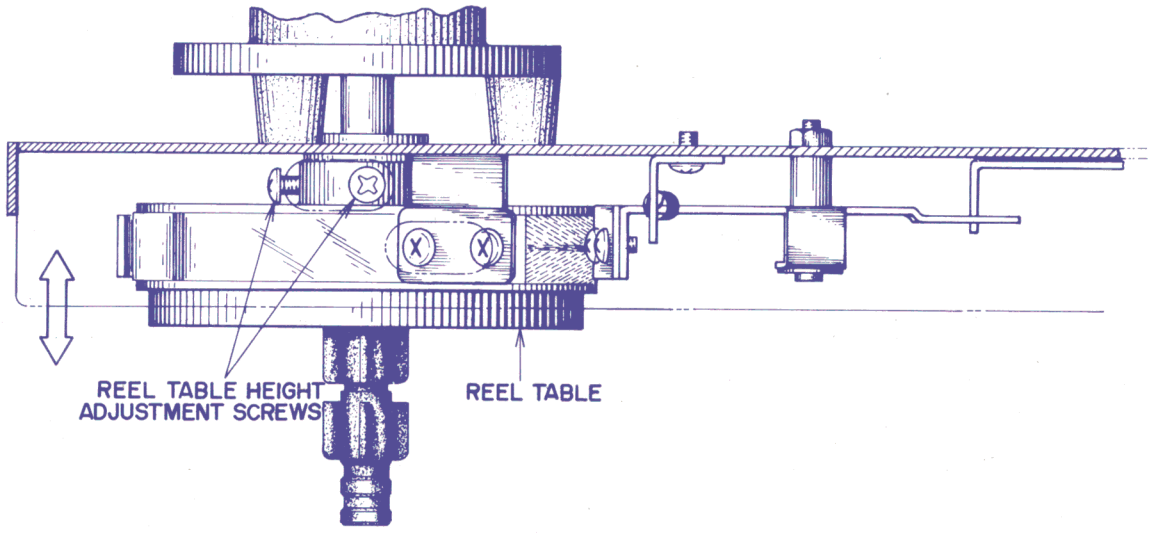


Fig. 12

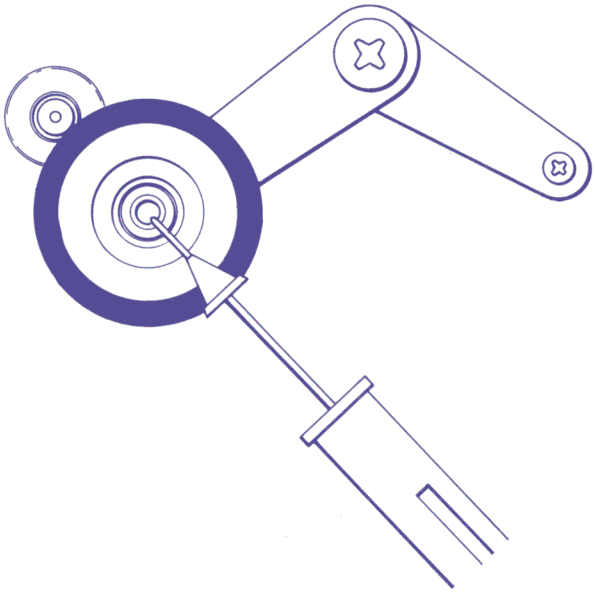


Fig. 13

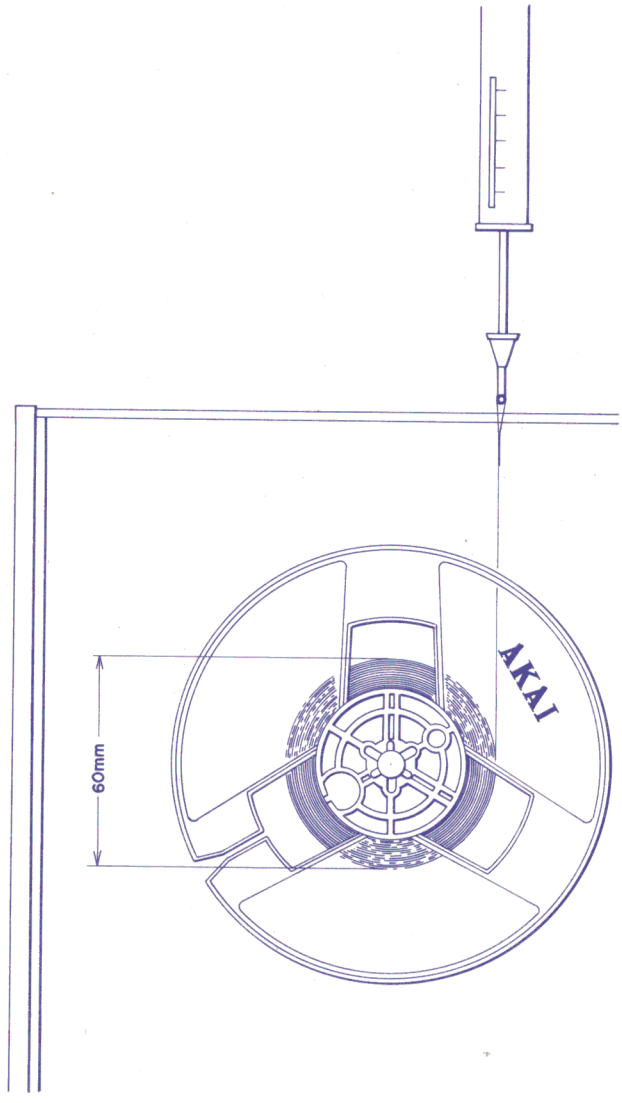


Fig. 14

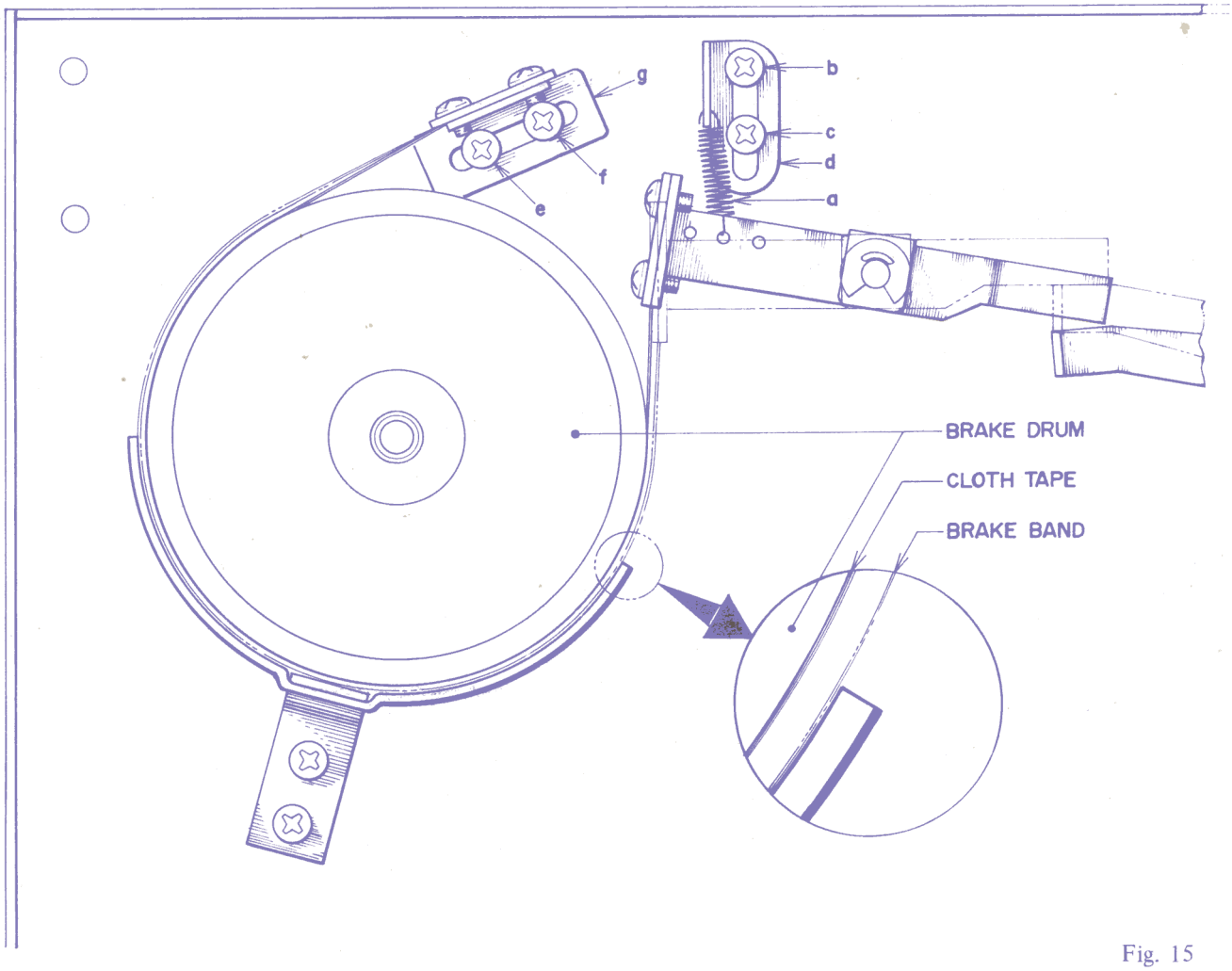


Fig. 15

1. REEL TABLE HEIGHT ADJUSTMENT

As shown in Fig. 12, loosen reel table height adjustment screws, and adjust reel table height by moving table in direction of arrow and positioning so that the tape winds in the center of the reel.

2. PINCH WHEEL PRESSURE MEASURING METHOD

Measure pinch wheel pressure with a tension gauge as shown in Fig. 13. Read the value on the tension gauge as soon as the pinch wheel separates from the tape and tape travel stops. Ideal pinch wheel pressure is 1.8 kg.

3. BRAKE TENSION ADJUSTMENT

1) As shown in Fig. 14, use a 60 mm diameter tape wound on a 5″ reel and measure the brake tension with a tension gauge. Ideal brake tension is from 300 to 370 grams.
2) Brake tension adjustment can be made as follows: (Refer to Fig. 15)
   a) Change position of suspended spring (a).
   b) Loosen screws (b) and (c) and adjust the vertical position of spring suspension metal (d).
   c) Loosen screws (e) and (f) and adjust the horizontal position of brake band suspension metal (g).
   d) Only the left side is shown in Fig. 15, but the right side must be adjusted in the same way.

NOTE: In making brake tension adjustment, at all modes except stop mode, confirm that the brake band completely separates from the cloth tape on the brake drum. (Refer to Fig. 15)

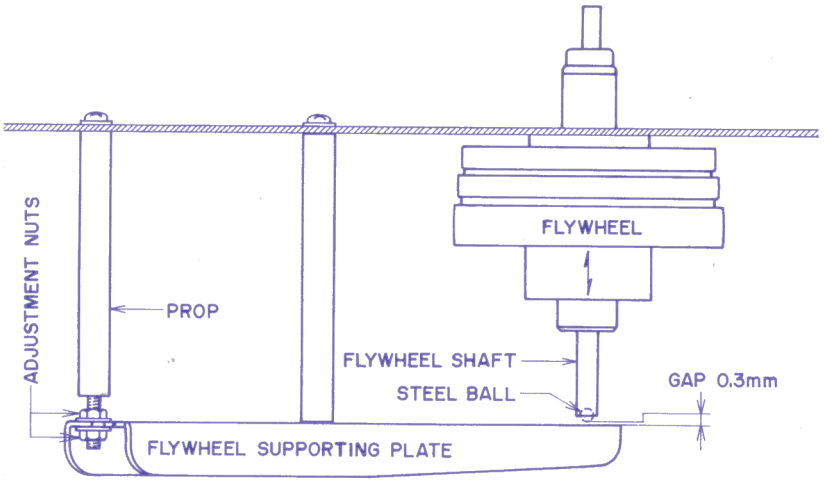


Fig. 16

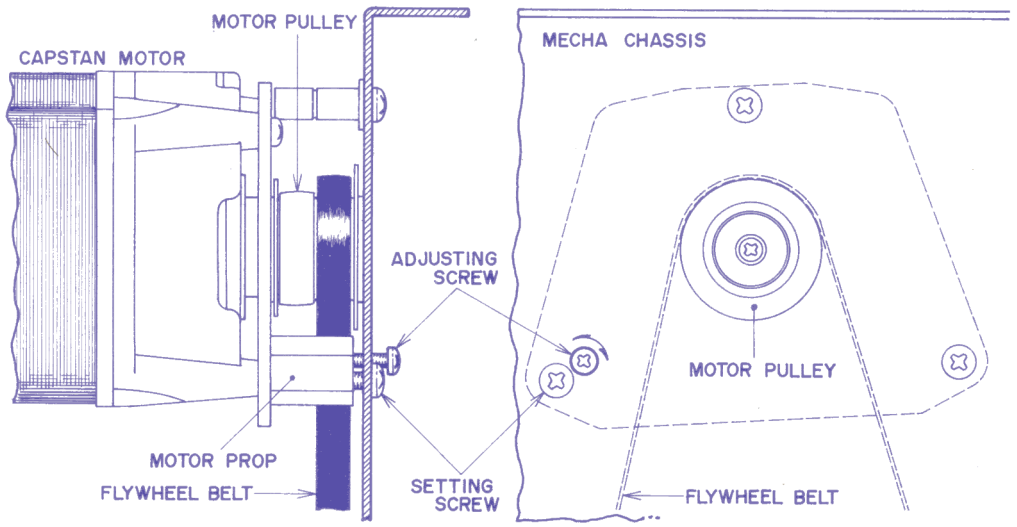


Fig. 17

4. LEFT AND RIGHT REEL MOTOR TENSION AT VARIOUS OPERATING MODES

Mode \ Reel Motor	Left Reel Motor	Right Reel Motor
FWD P.B.	60g	180g
REV P.B.	180g	60g
F.FWD	10g	450g
RWD	450g	10g

Chart 1

5. FLYWHEEL LOOSE PLAY ADJUSTMENT

Turn the adjustment nuts to obtain a 0.3 mm gap between the steel ball and flywheel supporting plate when the flywheel is moved in the direction of the arrow as shown in Fig. 16.

6. FLYWHEEL BELT POSITION ADJUSTMENT

1) With capstan motor revolutions operating at Rev. mode, loosen setting screw and turn flywheel belt position adjustment screw until the flywheel belt comes to the center of the motor pulley. (Refer to Fig. 17)
2) Tighten setting screw to maintain center positioning of flywheel belt at Rev. mode.
3) Confirm that the flywheel belt runs on the center of the motor pulley at Fwd. mode also.

VI. HEAD ADJUSTMENTS

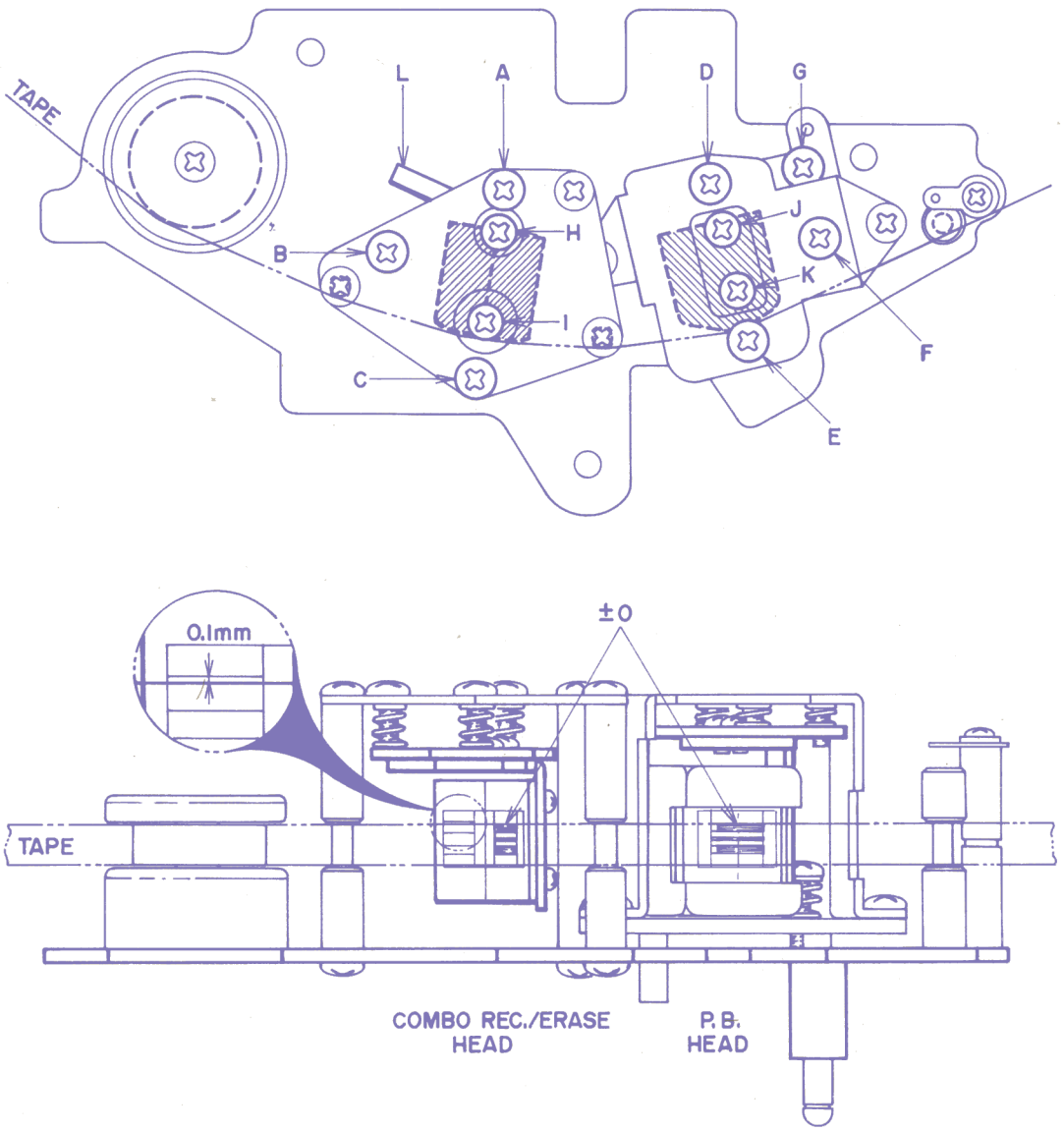


Fig. 18

1. HEAD HEIGHT ADJUSTMENT

1) COMBO Head

At Playback mode adjust COMBO head height by turning screws (A) (B) and (C) shown in Fig. 18 to left and right until the upper edge of the tape is the same height as the upper edge of the left channel recording head core.

2) Playback Head

a) At Forward Playback mode, adjust playback head height by turning screws (D) (E) and (F) shown in Fig. 18 to left and right until the upper edge of the tape is the same height as the upper edge of the left channel playback head core.

b) At Reverse Playback mode, adjust playback head height by turning screw (G) shown in Fig. 18 to left and right until the lower edge of the tape is the same height as the lower edge of the right channel playback head core.

2. HEAD AZIMUTH ALIGNMENT ADJUSTMENT

1) Playback Head

a) Connect a high sensitivity V.T.V.M. to the line output terminals.

b) Set the Tape Speed Switch to 7-1/2 ips. (19 cm/sec.), and set the Monitor Switch to TAPE position.

c) Playback an 8,000 Hz 3-3/4 ips. recorded Ampex Alignment test tape.

d) At Forward Playback mode, turn Azimuth Alignment Screw (F) shown in Fig. 18 to obtain maximum line output level on both channels.

e) After the adjustment in Item d) above has been completed, loosen screws (J) and (K) shown in Fig. 18 and move the head gap side of the playback head to left and right. When tension is applied to the supply reel side and

the line output level of both channels do not fluctuate, (maximum allowable fluctuation within +0.5/−0 dB) fix screws (J) and (K) to maintain this condition.

f) At reverse playback mode, make the same adjustment as outlined above until the line output level of both channels do not fluctuate.

2) COMBO Head

a) Connect an audio frequency oscillator to the line input terminals, and connect a high sensitivity V.T.V.M. to the line output terminals and load a blank tape.

b) Set the Tape Speed Switch to 7-1/2 ips. (19 cm/sec.) and set the monitor switch to TAPE position.

c) Record a 16,000 Hz audio frequency at −10 dB recording level.

d) At recording mode, turn Azimuth Alignment Adjustment Screw (B) shown in Fig. 18 to left and right until the line output level of both channels is maximum and does not fluctuate.

e) After completing adjustment in Item d) above, adjust gap side of recording head by moving installation angle (L) shown in Fig. 18 to left and right until the line output level of both channels do not fluctuate (maximum allowable fluctuation within +0.5/−0 dB) when tension is applied to the supply reel side.

3. To obtain best results, repeat adjustments outlined in paragraphs 1 and 2 above 2 or 3 times. New blank tape should be used when making these adjustments.

VII. AMPLIFIER ADJUSTMENTS

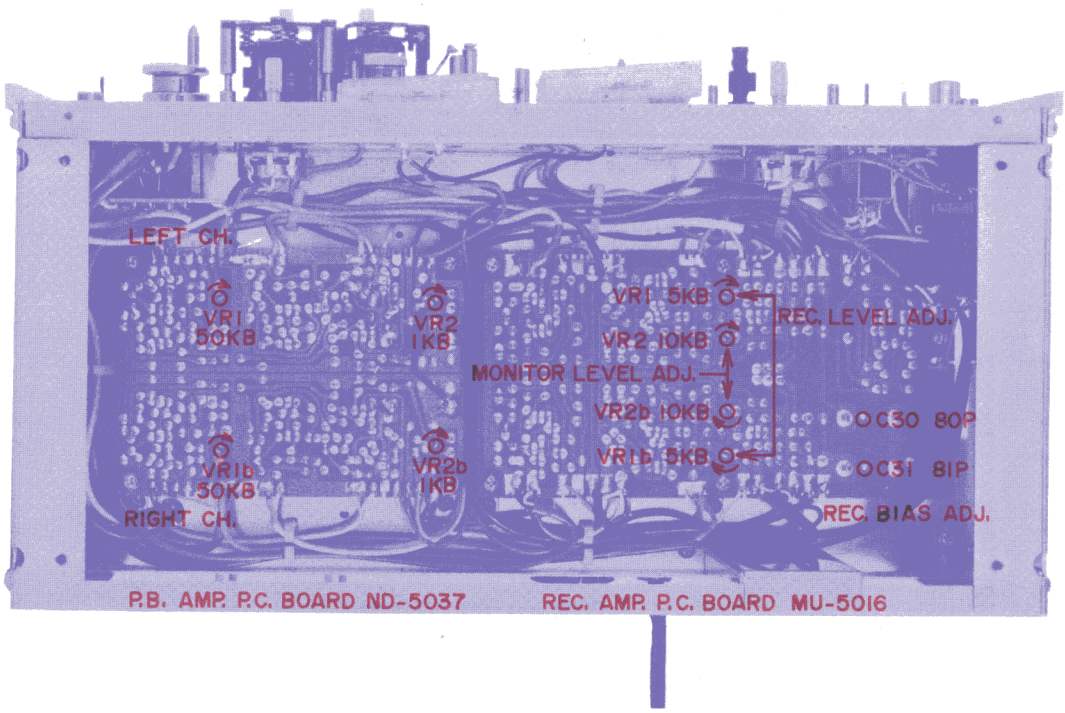


Fig. 19

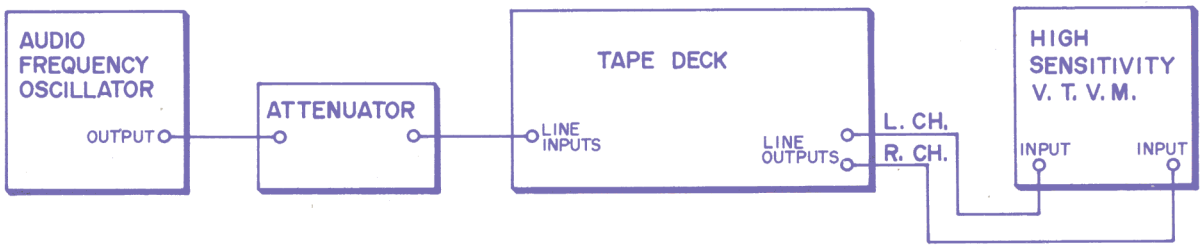
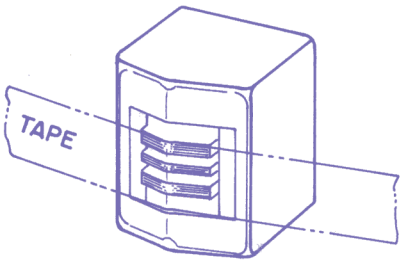
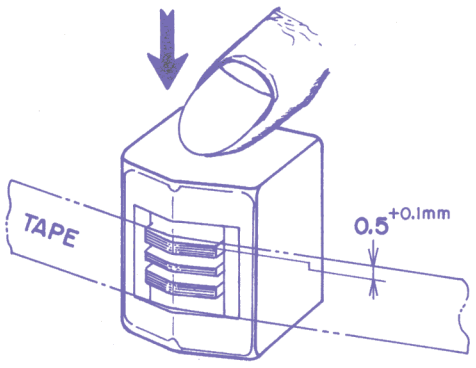


Fig. 20



RIGHT CH. P.B. LEVEL ADJUSTMENT



LELT CH. P.B. LEVEL ADJUSTMENT

Fig. 21

Connect the various measuring instruments as shown in Fig. 20.

1. PLAYBACK LEVEL ADJUSTMENTS

1) Set Tape Speed Selector to 7-1/2 ips.
2) Set Monitor Switch to TAPE position.
3) Playback a 250 Hz recorded test tape at 7-1/2 ips.
4) Adjust Playback Amp. P.C. Board semi-fixed resistors VR1 50 kB (left ch.), and VR1b 50 kB (right ch.) shown in Fig. 19 to obtain a high sensitivity V.T.V.M. indication of 4 dB (1.228V) line output level on both channels.
5) When making the left channel line output level adjustment, press playback head slightly downward with one finger and regulate to 4 dB.

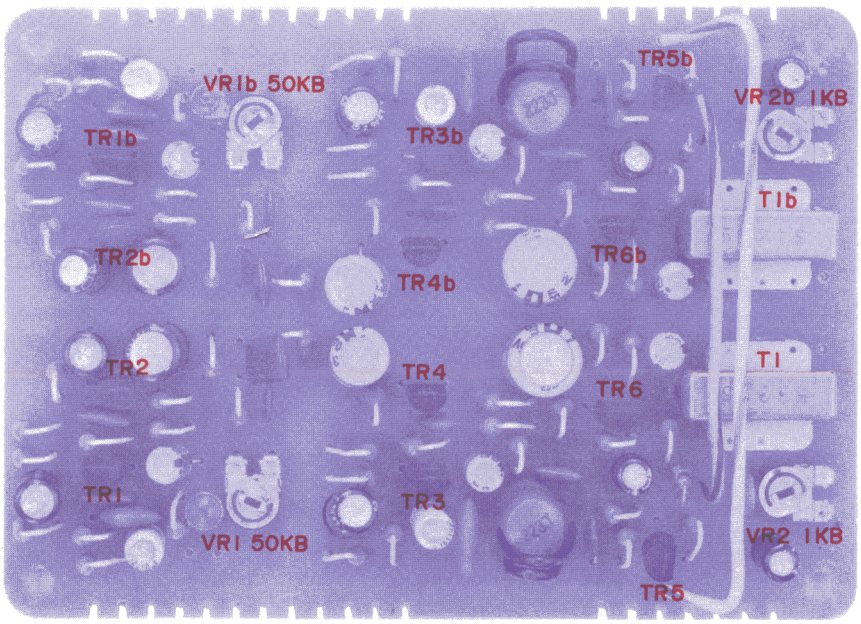


Fig. 22 PLAYBACK AMP. P.C. BOARD ND-5037

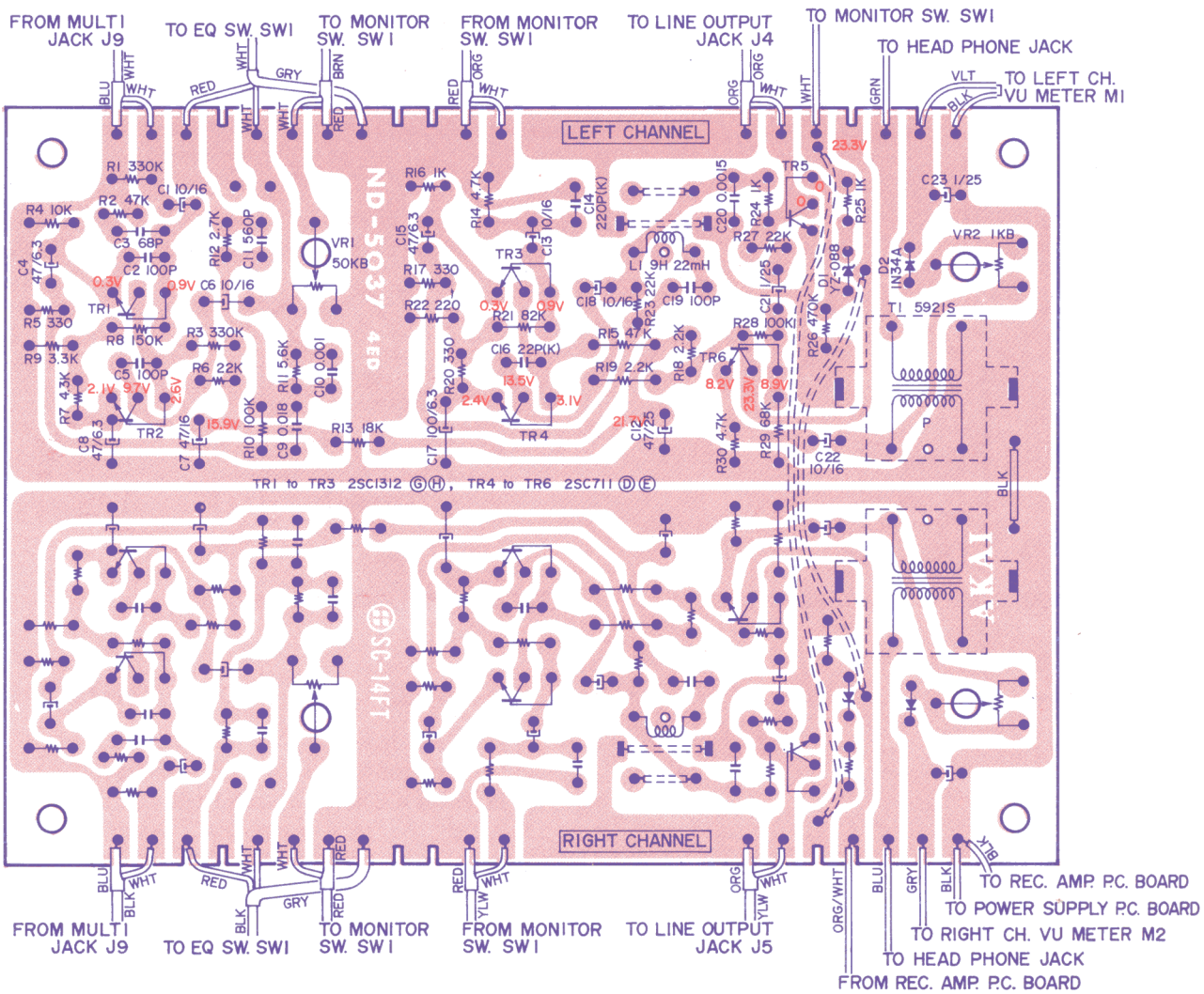


Fig. 23 PLAYBACK AMP. P.C. BOARD ND-5037 (Reverse Side)

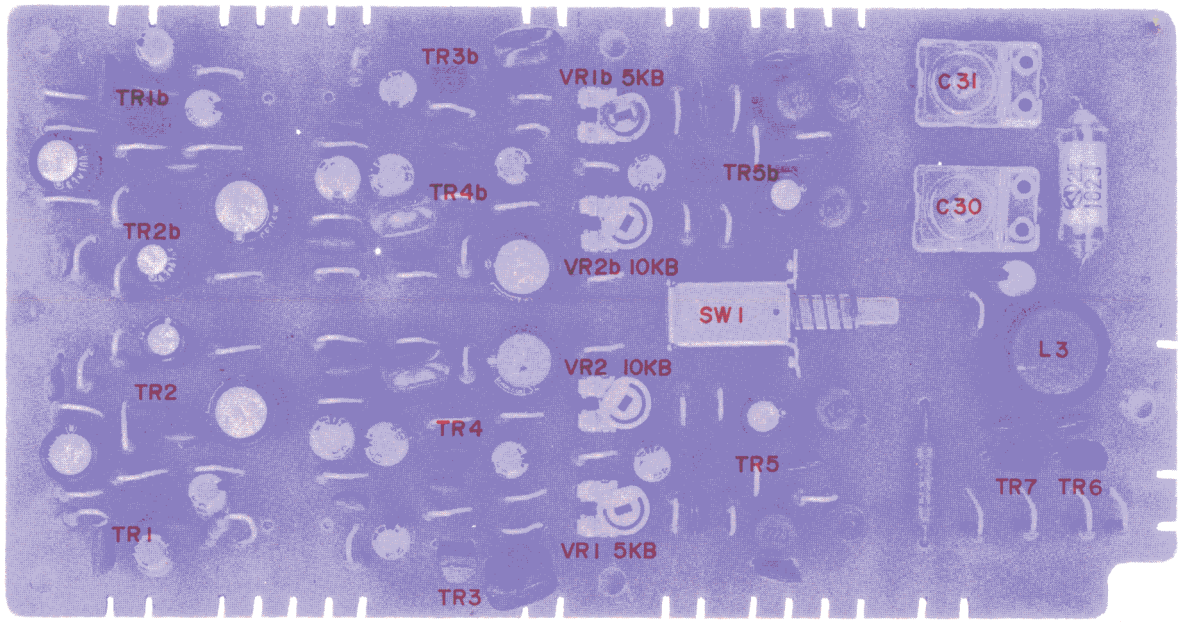


Fig. 24 RECORDING AMP. P.C. BOARD MU-5016

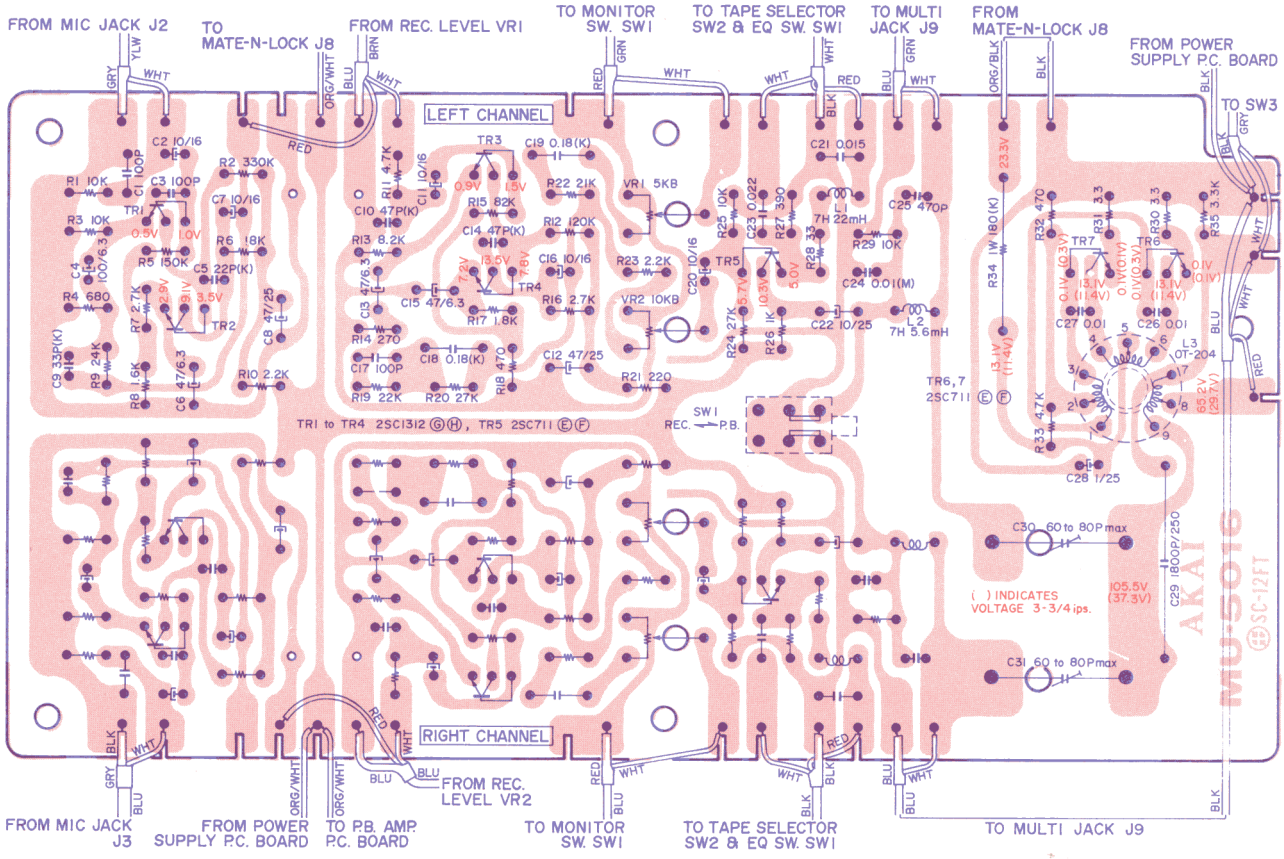


Fig. 25 RECORDING AMP. P.C. BOARD MU-5016 (Reverse Side)

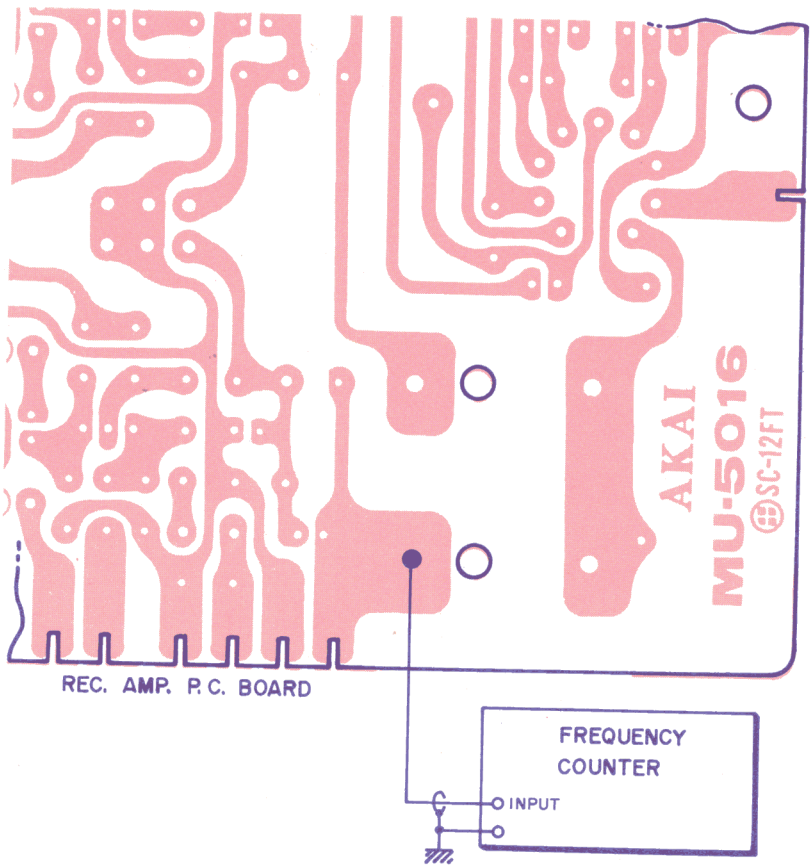


Fig. 26

2. VU METER SENSITIVITY ADJUSTMENT

After playback level adjustments has been completed, with the playback level of both channels at 4 dB, adjust P.B. Amp. P.C. Board semi-fixed resistors VR2 1 kB (left ch.) and VR2b 1 kB (right ch.) shown in Fig. 19 to obtain a left/right VU meter indication of 0 VU.

3. HIGH RANGE FREQUENCY DEVIATION CHECK

1) Between Channels

When an 8,000 Hz 3-3/4 ips. Ampex Alignment Test Tape is played back at 7-1/2 ips, check to confirm that the difference in high range output between left and right channel is within 3 dB at FWD mode and within 4 dB at REV mode.

2) Between FWD and REV Playback

When an 8,000 Hz 3-3/4 ips. Ampex Alignment Test Tape is played back at 7-1/2 ips, check to confirm that the difference in high range output between FWD and REV playback is within 3.5 dB.

3) If in Items 3-1) and 3-2) above, the difference is not within specifications, repeat Head Azimuth Alignment adjustment.

4. RECORDING LEVEL ADJUSTMENT

1) Set Tape Speed Selector to 7-1/2 ips.
2) Set Monitor Switch to TAPE position.
3) Set Left and Right ch. recording level to maximum (turn fully clockwise) and load a blank tape.
4) Set tape deck to recording mode and supply a 1,000 Hz, −70 dB (0.25 mV) sine wave signal to the Mic Inputs from the audio frequency oscillator.
5) Adjust Recording Amp. P.C. Board semi-fixed resistors VR2 10 kB (left ch.) and VR2b 10 kB (right ch.) shown in Fig. 19 to obtain a high sensitivity V.T.V.M. indication of 4 dB (1.228V) line output level on both channels.
6) Set Monitor Switch to SOURCE position.
7) Adjust Recording Amp. P.C. Board semi-fixed resistors VR1 5 kB (left ch.) and VR1b 5 kB (right ch.) shown in Fig. 19 to obtain a high sensitivity V.T.V.M. indication of 4 dB (1.228V) line output level on both channels.

NOTE: In Item 4) above if sine wave is supplied to Line Input, set audio frequency oscillator output to −24.5 dB (46 mV).

5. FREQUENCY RESPONSE ADJUSTMENT

1) Set Tape Speed Selector to 7-1/2 ips.
2) Set Monitor Switch to TAPE position.
3) Set Left and Right ch. recording level to maximum (turn fully clockwise) and load a blank tape.
4) Set tape deck to recording mode and supply a 2,000 Hz sine wave signal to the Mic or Line Inputs. Adjust attenuator to obtain a high sensitivity V.T.V.M. indication of −16 dB (120 mV) line output level.
5) Switch the oscillation frequency of the audio frequency oscillator from the condition described in Item 5-4) above to 20,000 Hz.
6) Adjust Recording Amp. P.C. Board Trimmer Condenser C30 80p max (left ch.) and C31 80p max (right ch.) shown in Fig. 19 until the same high sensitivity V.T.V.M. indication level is obtained on both the left and right channel at the two frequencies described in Items 5-4) and 5-5) above.

6. RECORDING BIAS FREQUENCY MEASURING METHOD

As shown in Fig. 26, connect a Frequency Counter to the output side of the trimmer condenser. Set tape deck to recording mode, and take a frequency counter reading. Specifications are 102 kHz±5%.

VIII. D.C. RESISTANCE OF VARIOUS COIL

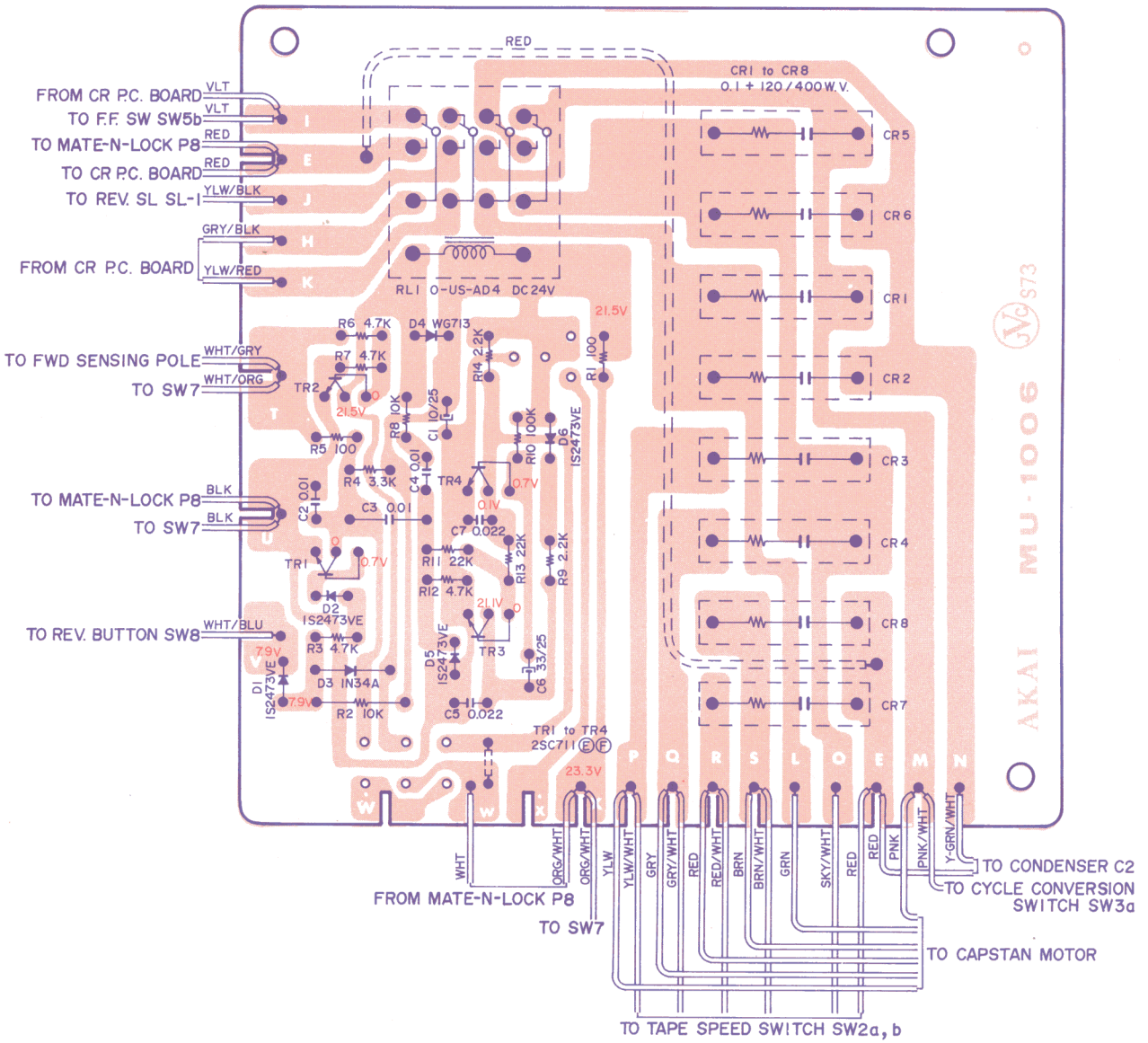
D.C. Resistance shown in chart are average values.

Parts	Designation	D.C. Resistance
CAPSTAN MOTOR	HM-12-16MC	Between PNK-RED 130Ω Between PNK-BRN 180Ω Between GRN-GRY 360Ω Between GRN-YLW 370Ω
REEL MOTOR	24XO-MR	Between RED-BLU 74Ω Between GRN-YLW 166Ω
HEAD REVERSE SOLENOID	RGA-10143	630Ω
REVERSE RELAY	MY4-0-US-AD4 DC24V	650Ω
HEADPHONE OUTPUT TRANSFORMER	5921S	Primary 230Ω Secondary 0.9Ω
OSCILLATOR COIL	OT-204	Between 1-3 0.3Ω Between 4-6 0.7Ω Between 7-9 8.2Ω
COMBO HEAD	RE4-6	5.5Ω (REC) 2.3Ω (ERASE)
PLAYBACK HEAD	P4-202	268Ω

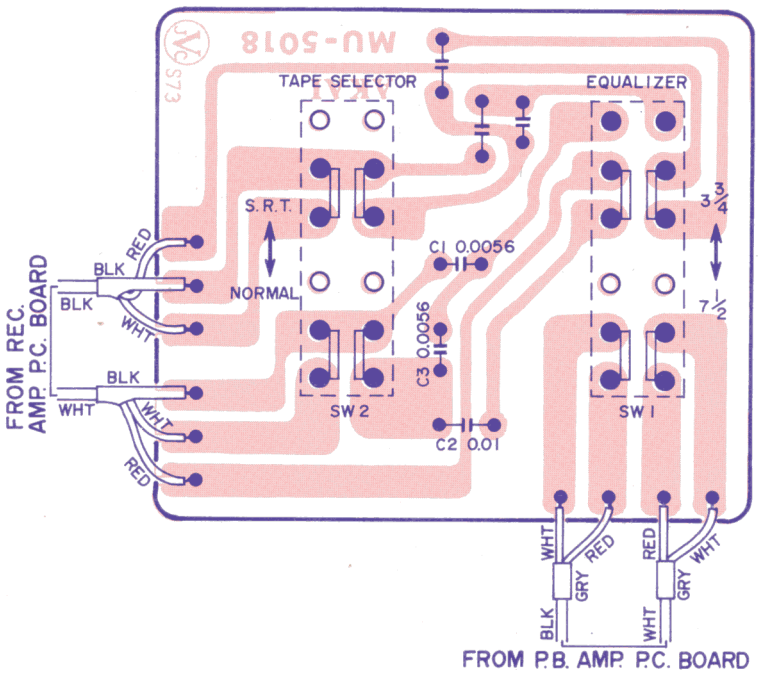
Chart 2

IX. COMPOSITE VIEWS OF COMPONENTS

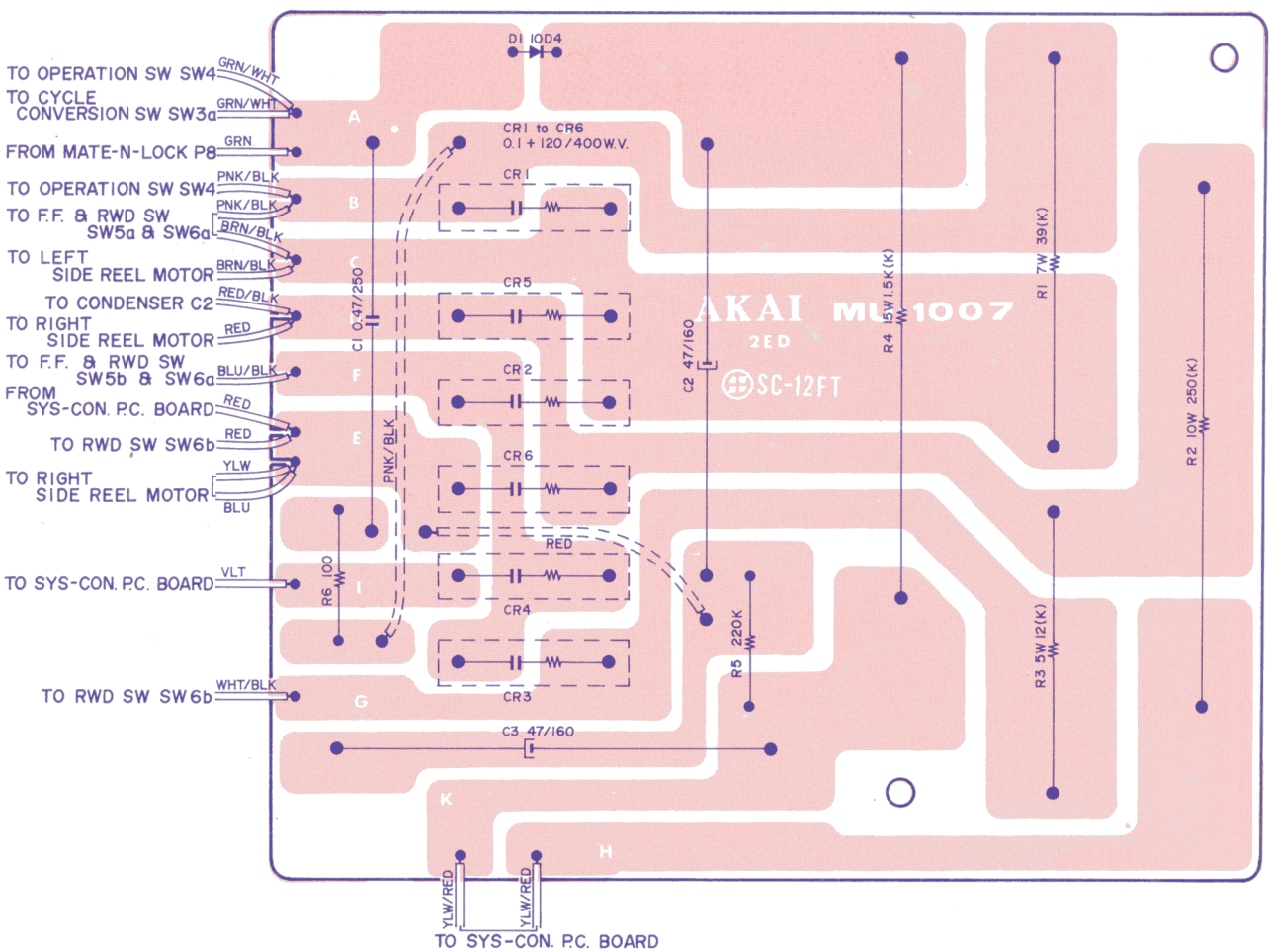
1. SYSTEM CONTROL P.C. BOARD MU-1005



2. EQ. P.C. BOARD MU-5018



3. CR. P.C. BOARD MU-1007



4. POWER SUPPLY P.C. BOARD MU-5017