SERVICE MANUAL

AKAI TAPE RECORDER

MODEL X-V

TABLE OF CONTENT

I. SPECIFICATIONS

SPECIFICATIONS

STYLE : Portable
WEIGHT : 12.1 lbs (5.5 kg) without battery
Battery . . . 1.3 lbs (0.6 kg)
DIMENSIONS : 5-1/8"x 11" x 12" case closed
(130 x 280 x 300 mm)
POWER SUPPLY : AC 100 to 240 V 50/60 Hz
DC . . . Rechargeable Battery (6 V, 2.6 AH)
RECORDING SYSTEM
: In-line 4-track stereo, monaural recording with Cross-field Bias Head
PLAY BACK SYSTEM
: In-line 4-track stereo, monaural playback
TAPE SPEED : 4 speeds
7-1/2" (19 cm), 3-3/4" (9.5 cm),
1-7/8" (4.75 cm)
and 15/16" (2.375 cm)
TAPE SPEED DEVIATION
: Within ± 3%
WOW AND FLUTTER
(Play back only) : Less than 0.15% r.m.s. at 7-1/2"
Less than 0.17% r.m.s. at 3-3/4"
Less than 0.25% r.m.s. at 1-7/8"
Less than 0.35% r.m.s. at 15/16"
FREQUENCY RESPONSE
: 40 to 20,000 Hz ± 3 dB at 7-1/2"
40 to 17,000 Hz ± 3 dB at 3-3/4"
40 to 11,000 Hz ± 3 dB at 1-7/8"
40 to 5,500 Hz ± 3 dB at 15/16"
SIGNAL TO NOISE RATIO
: Better than 50 dB (DC)
Better than 45 dB (AC)
DISTORTION (Total Harmonics) : Within 5% at 20 dBm output power (each tape speed)
CROSS TALK Less than – 70 dB (Monaural)
Less than – 50 dB (Stereo)
ERASE RATIO : Less than – 70 dB
INSULATION RESISTANCE
: More than 50 M. Ohms
INSULATION DURABILITY
: 500 V AC for more than one minute duration
POWER OUTPUT
MAIN OUTPUT : 2 W maximum per each channel, total 4 W
Impedance . . . . . 8 Ohms
DIN OUTPUT : 0.5 V at Volume maximum
Impedance . . . . . 3.5 K. Ohms
INPUT LEVEL
LINE INPUT : 50 mV at 0 VU indication
Impedance . . . . . 220 K. Ohms
MIC. INPUT : 0.5 mV at 0 VU indication
Impedance . . . . . 3.9 K. Ohms
DIN INPUT : 20 mV at 0 VU indication
Impedance . . . . . 82 K. Ohms
FAST FORWARD AND
REWIND TIME : 145 seconds for 600 foot tape
MONITOR SYSTEM: Program being recorded can be monitored by using Stereo Headphone

MOTOR : DC brushless servo motor
Revolutions . . . . . 3,000 r.p.m.
Control circuit . . . 8 transistors and 4 diodes used.
HEADS
REC/PLAY HEAD
: In-line 4-track stereo/monaural
Gap . . . 2 micron
Impedance . . . 860 Ohms at 1,000 Hz
BIAS HEAD : In-line 4-track stereo
Gap . . . 0.2 mm
Impedance . . . 360 Ohms ± 30 Ohms at 50 KHz
ERASE HEAD : In-line 4-track stereo
Gap . . . 0.2 mm
Impedance . . . 360 Ohms ± 30 Ohms at 50 KHz
RECORDING LEVEL INDICATOR
: 2 VU meteres
TRANSISTORS : 4 2SC650A 4 2SC281B
1 2SC828R 2 2SB77B
6 2SB370B 2 2SB75B
2 2SC538 3 2SB346
3 2SB367
GERMANIUM DIODES
: 7 IN-34A
SILICON DIODES : 2 10D-1
BS-2, bridged silicon diode rectifier
SELENIUM RECTIFIER
: 16C-4, bridged selenium rectifier
ZENER DIODES : 1 10Z68
RD-6A
LOUD SPEAKER INCLUDED
: 3" round dynamic speaker
Impedance . . . . . 8 Ohms
REELS USED : 7", 5", 3" reels

II. MEASURING METHOD

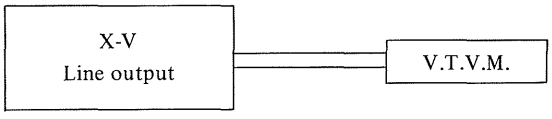
1. TAPE SPEED DEVIATION

1. Method involving use of pre-recorded tape.
   Playback on the tape recorder to be tested a tape pre-recorded at 1,000 Hz ± 0.1% for measuring tape speed deviation. Connect the appropriate output to a frequency counter meter in order to measure the tape speed deviation from the deviation of the measured frequency.
2. Method involving use of timing tape (designed for tape speed measurement).
   This method utilizes a timing tape marked at intervals of 7-1/2". The running time of the tape over 60 marked section is measured in order to calculate the deviation of the tape speed. In applying this method, however, it should be born in mind that should the timing tape stretch or contract, measurement error is inevitable, so that it is necessary to measure the total length of the tape in advance.

2. WOW AND FLUTTER

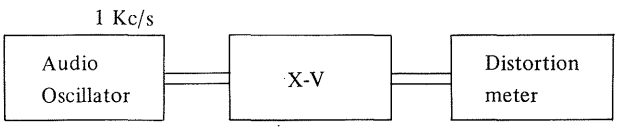
Playback the 3,000 Hz pre-recorded tape whose wow and flutter level is guaranteed to be smaller than 0.07% for measurement by means of a wow meter. It is also possible for a 3,000 Hz sine wave to be recorded and played for measurement by means of the wow meter. In this case, however, the wow meter indicates a value as twice the value given in the specification on the first page.

3. SIGNAL TO NOISE RATIO



Set the speed selector Switch on "7-1/2" ips position and playback a tape containing a 1,000 Hz sine wave recorded at "0" VU level on a standard recorder. Connect a V.T.V.M. to the line output jack of the recorder and measure its output.
Then remove the tape and measure the noise level under the same condition. Convert each of the measured values into decibels.

4. TOTAL HARMONIC DISTORTION FACTOR



Connect the measuring instrument as shown above, and record the 1,000 Hz sine wave at "0" VU. Playback the resultant signal and measure the overall distortion factor. Measure the noise level of the tape recorder with the tape removed ; connect the audio oscillator directly to the distortion meter for measurement of the distortion factor of the oscillator.
The required distortion factor may be obtained from the results of the above measurement by the following formula.

$$d_0 = d - d_1 - d_2$$

where, d_0=Requred
d=Overall distortion factor
d_1=Noise level
d_2=Distortion factor of the oscillator

(Note : New tape of particularly good quality should be used for measurement of the distortion factor.)

5. POWER OUTPUT

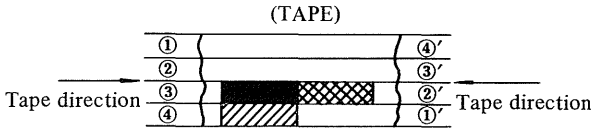
Playback the tape pre-recorded with a sine wave of 1,000 Hz at "0" VU, and connect an 8Ω load resistor to the output terminals of the tape recorder : measure the voltage across the resistor with the volume control set to maximum. Use the following formula to obtain the required output :

$$W = \frac{E^2}{R}$$

Where, W .....Output (watt)
E .....Output voltage
R .....Resistor (8 Ω)

(Note : The 8Ω resistor used in this measurement must be of high precision).

6. CROSS TALK
(Cross talk between the tracks)

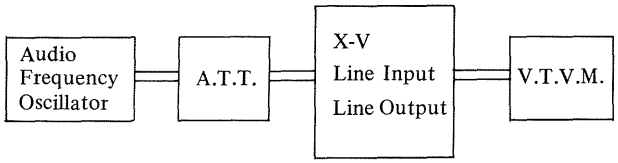


As shown in the figure, first record a 1,000 Hz sine wave on track No. 3 at + 3 VU level. Next, remove the 1,000 Hz input signal and record under a non-input condition.
Then playback the tape on track No. 3 and No. 1 (reversed condition of tape) through the 1,000 Hz B.P.F. (Band Pass Filter) and obtain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

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

C=Desired cross talk ratio (db)
E_0= 1,000 Hz signal output level
E_2= 1,000 Hz cross talk output level
E_1=No-input signal record level

7. FREQUENCY RESPONSE



Connect the measuring instrument as shown above diagram, and measure the frequency response in the following sequence :

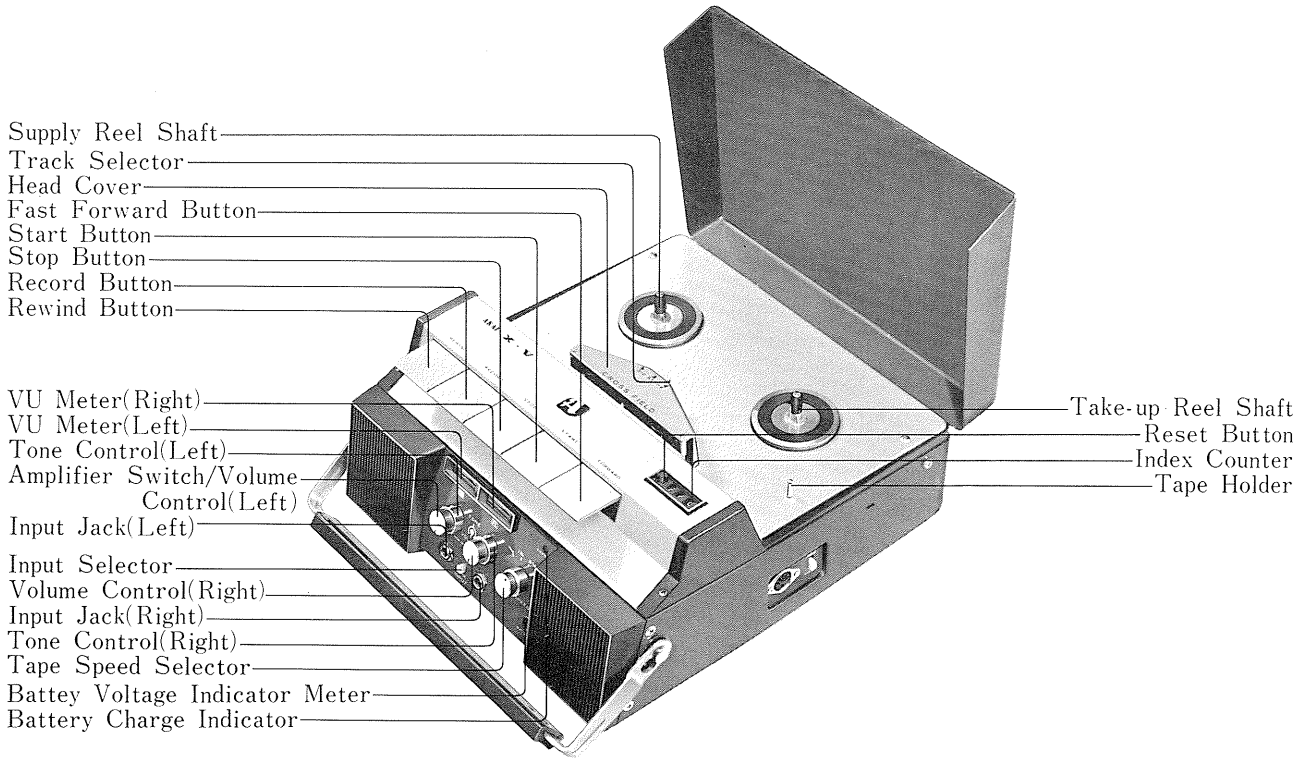
RECORD :

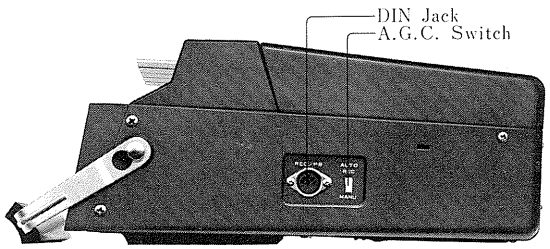
1) Give a sine wave of 1,000 Hz to the Line Input of the recorder to be tested, through an attenuator from an audio frequency generator.
2) Set the Start and Record Knob in to "Rec" position and adjust the line input volume so that the VU meter needle indicates "0" VU.
3) Under the condition described in (2), lower the input 10 db by means of the attenuator.
4) Record the spot frequency in the range of 30 Hz to 25,000 Hz from the audio frequency generator.

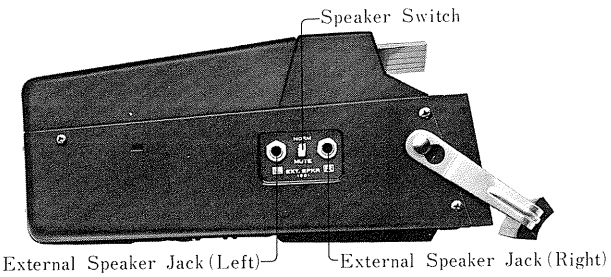
PLAYBACK :

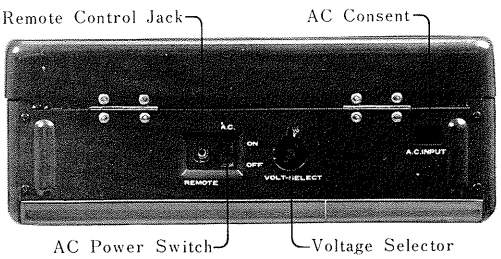
5) Set the Record/Playback Knob in to "Play" position.
6) Set the Speed Selector Switch on 7-1/2" or 3-3/4" position.
7) Connect a V.T.V.M. and 8Ω resistor across the speaker terminal.
8) Playback the tape previously recorded.
9) Adjust the output level to "0" dbm at 1,000 Hz as indicated on the V.T.V.M. by the range selector of a V.T.V.M.
10) conditions in (9) ; make a memo of output level and plot the value on a graph.

III. CONTROL LOCATIONS

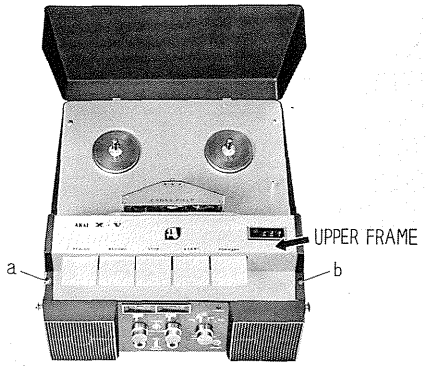




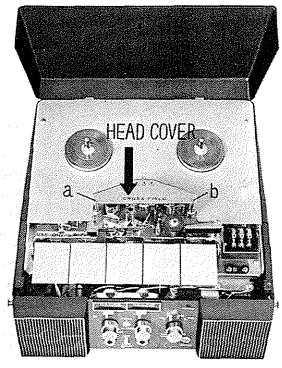




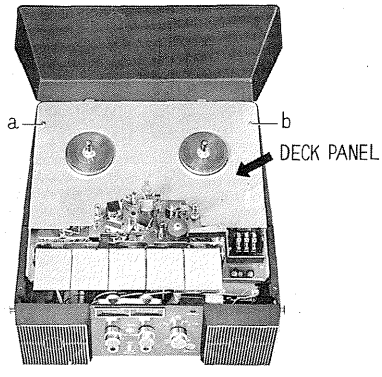
IV. DISMANTLING OF TRANSPORT UNIT & AMPLIFIERS



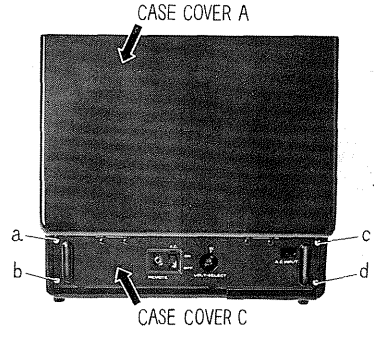
1) Remove RETAINING SCREWS (marked (a) and (b)) by using a Philips-head screw driver and remove UPPER FRAME.



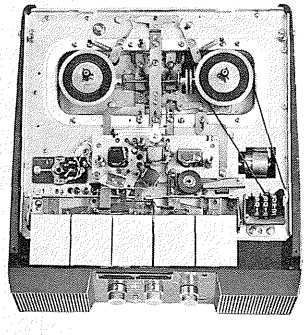
2) Remove RETAINING SCREWS (marked (a) and (b)) by using a Philips-head screw driver and remove HEAD COVER.



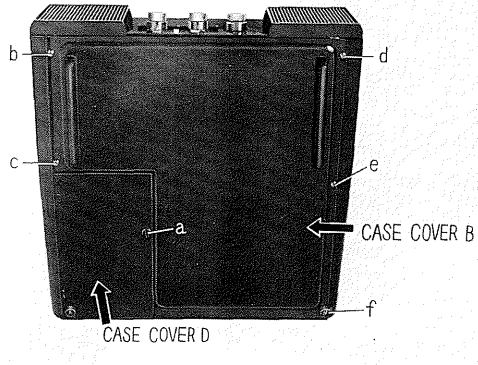
3) Remove RETAINING SCREWS (marked (a) and (b)) by using a Philips-head screw driver and remove DECK PANEL.



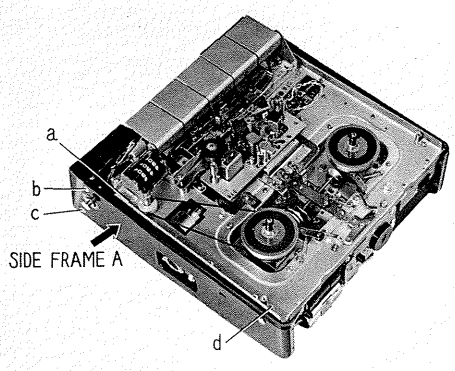
4) Remove RETAINING SCREWS (marked (a) to (d)) by using a Philips-head screw driver and remove CASE COVERS A & C.



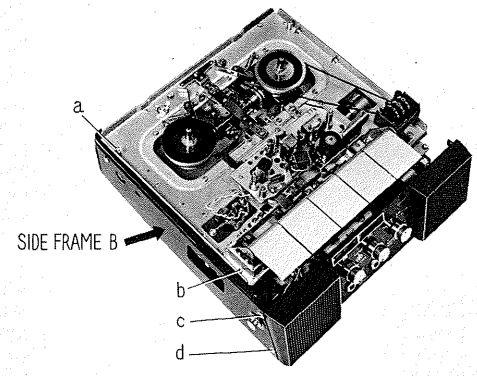
5) This picture shows all COVER PANELS removed making mechanism control adjustment accessible.



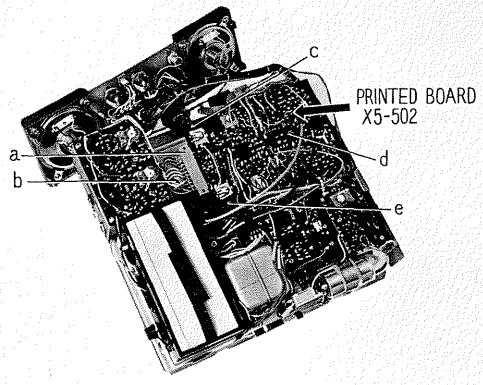
6) Loosen RETAINING SCREW (a) and remove CASE COVER D. Then remove RETAINING SCREWS (marked (b) to (f)) by using a Philips-head screw driver and remove CASE COVER B.



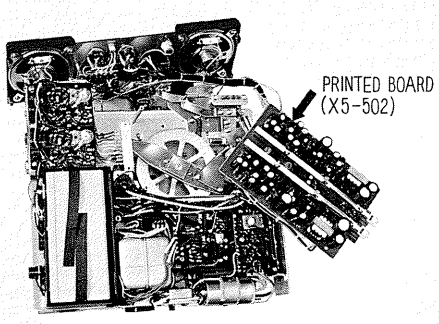
7) Remove RETAINING SCREWS (marked (a) to (d)) by using a Philips-head screw driver and remove SIDE FRAME A.



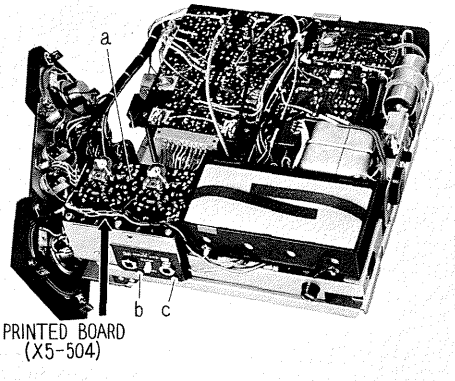
8) Remove RETAINING SCREWS (marked (a) to (d)) by using a Philips-head screw driver and remove SIDE FRAME B. FRONT PANEL with SPEAKERS may now be removed.



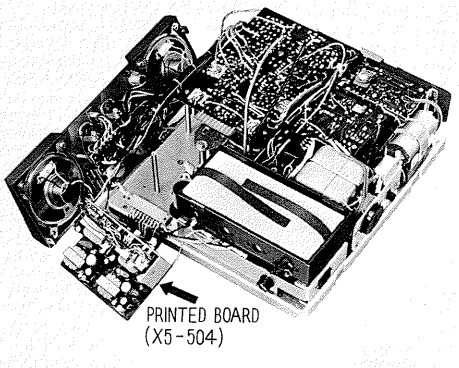
9) Disconnect MULTI JACK (a) and "U" RING (b), then, remove RETAINING SCREWS (marked (c) to (e)) by using a Philips-head screw driver. PRINTED BOARD (X5-502) can now be withdrawn. Adjustments or repairs on the front panel and speakers are possible.



10) This picture shows PRINTED BOARD (X5-502) removed from the case. Any adjustments and repairs are possible.

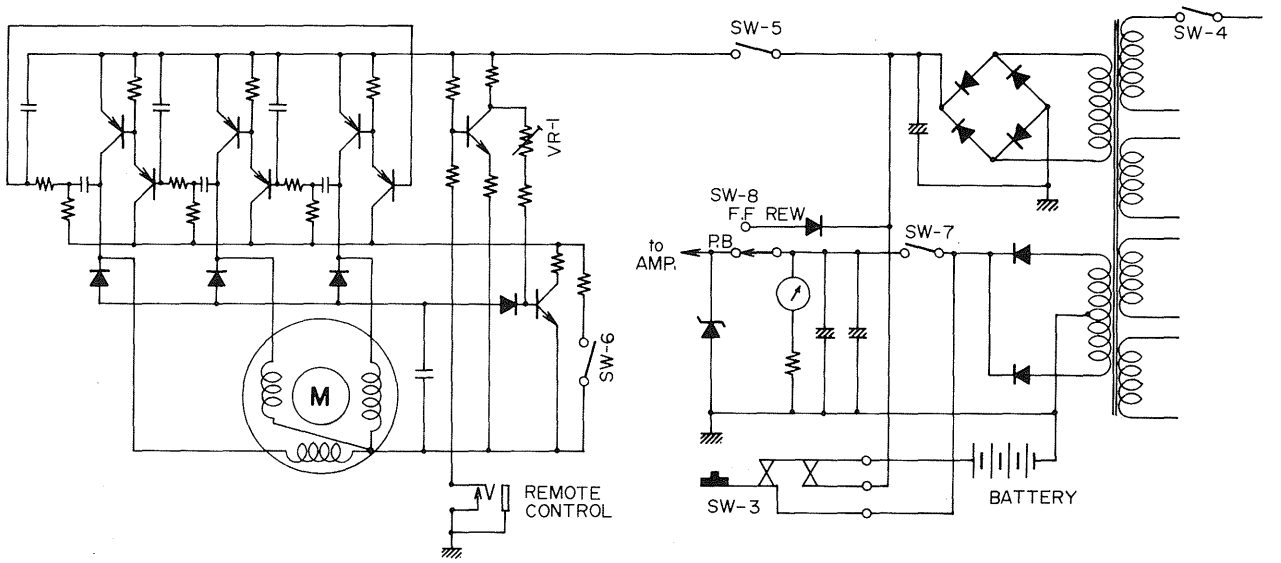


11) Remove RETAINING SCREWS (marked (a) to (c)) by using a Philips-head screw driver and remove PRINTED BOARD BLOCK (X5-504).



12) This picture shows accessibility for any adjustments and repairs on X5-504 PRINTED BOARD.

V. TAPE TRANSPORT MECHANISM



SW-3 : CONTAINED IN AC. PLUG
SW-4 : AC. SWITCH
SW-7 : CONTAINED IN VOLUME CONTROL
SW-8 : MICRO SWITCH

Fig. 1

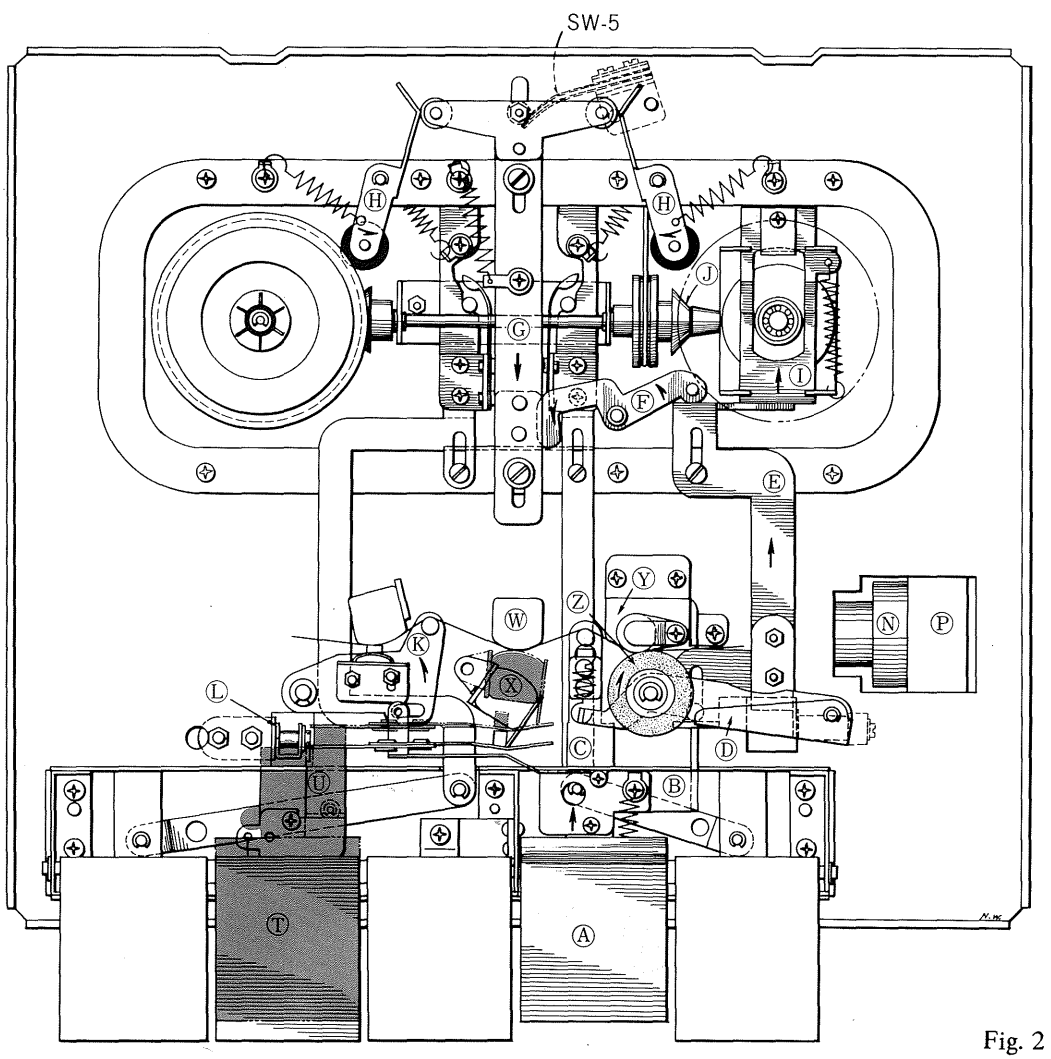


Fig. 2

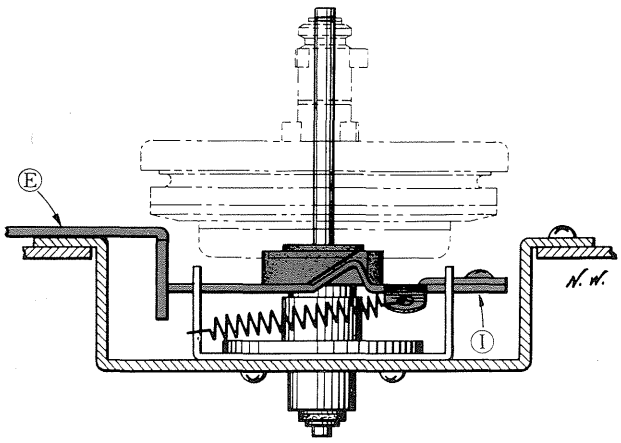


Fig. 2

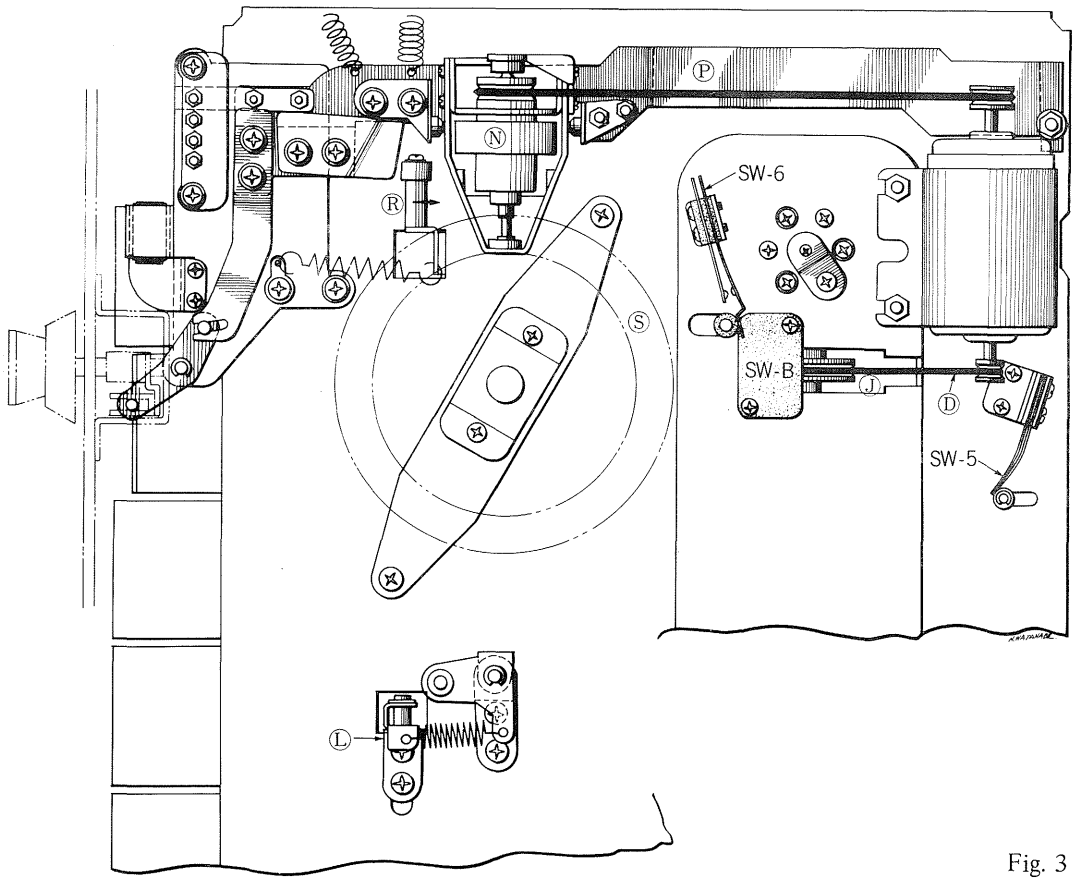


Fig. 3

1. START MODE (Playback)

As shown in Fig. 2, when Start Key (A) is pressed, all levers from (B) through (K), illustrated in yellow diagram, operate almost simultaneously. The Pin located on the tip of Lever (G) pushes SW-5 as shown in Fig. 3, causing the motor to rotate. Motor rotation is transfered to Pulley (J) by means of the Drive Belt. When Lever (I) of Take-up Reel Spindle is pushed in the arrow marked direction by Lever (E), it engages the Inner Wheel of Take-up Reel Spindle which is then pressed downward to contact Pulley (J). The Take-up Reel Spindle rotates counterclockwise to take up tape.

During other operation, the Pin on Lever (F) sets SW-6 to the "open" condition, as shown in Fig. 3, and pushes SW-8 (a microswitch). As this time, when switch SW-7, which is linked with Volume Control, is set to "ON", current flows to the amplifier through SW-7 & 8 from Battery or AC power source. When Lever (E) is operated as shown by the arrow marked direction in Fig. 2, Lever (R) operates as shown by the arrow mark in Fig. 3 so that Lever (P) is disengaged from "lock" position.

Lever (P) is moved by spring force so that the 5-step Pulley (B) comes in contact with Flywheel (S).
The 5-step Pulley is motor driven by means of a square type drive belt, transfering the rotation from the motor pulley to the flywheel, causing the flywheel to rotate. The shaft of the flywheel is directly connected to the capstan, so that the capstan (Y) begins to rotate simultaneously. Lever (D) is moved by spring force and Pinch Roller (Z) presses the tape against Capstan (Y) transporting tape at constant speed. The tape pressure pad which is installed on Lever (K), pushes the tape against Erase Head and creates hold back tension. Right and Left Brake Levers (H) are actuated by Lever (G) as shown by the arrows so that brakes are disengaged from reel plates.
In Fig. 1, each switch operates as follows : SW-3 mounted in the AC Socket, switches off battery current when the AC cord is connected. All current is supplied from Power Line (Alternating Current). When the AC cord is disconnected from the socket, SW-3 closes and current is supplied from the Battery to motor and amplifier. SW-4 installed on the back side of X-V case operates when Power Line are utilized. SW-5 is actuated by Lever (G), being in the "ON" condition during START, FAST FORWARD and REWIND MODE. SW-5 controls the current of the motor circuit and when SW-5 is "ON", the motor rotates. Adjust motor rotation during START MODE to 3,000 r.p.m. with potentiometer VR-1.
SW-7 which is linked with the volume control, controls power source of the amplifier.
A micro switch, SW-8, connects the amplifier during Start Mode, while during Fast Forward and Rewind Mode it connects the motor circuit through a Diode.
Since power consumption of the motor increases during Fast Forward and Rewind Mode, it is neccessary to increase the motor torque by connecting all power sources to the motor circuit.

2. RECORD MODE

As shown in Fig. 2, when Start Key (A) and Record Key (T) are depressed simultaneously, Levers which are illustrated in yellow and red on the diagrams are set to Record Mode.
Lever (U) pushes Bias Head (X) toward Recording Head (W), while Recording Lever (L) pushes the slide switch (SW-201) of Pre-amplifier into recording condition.
When SW-201 is set to Record Mode, voltage is supplied to the Bias Oscillator circuit and the Bias Oscillator begins to operate. Erase current then flows through Erase Head, and Bias current flows through Bias Head, establishing the recording condition.

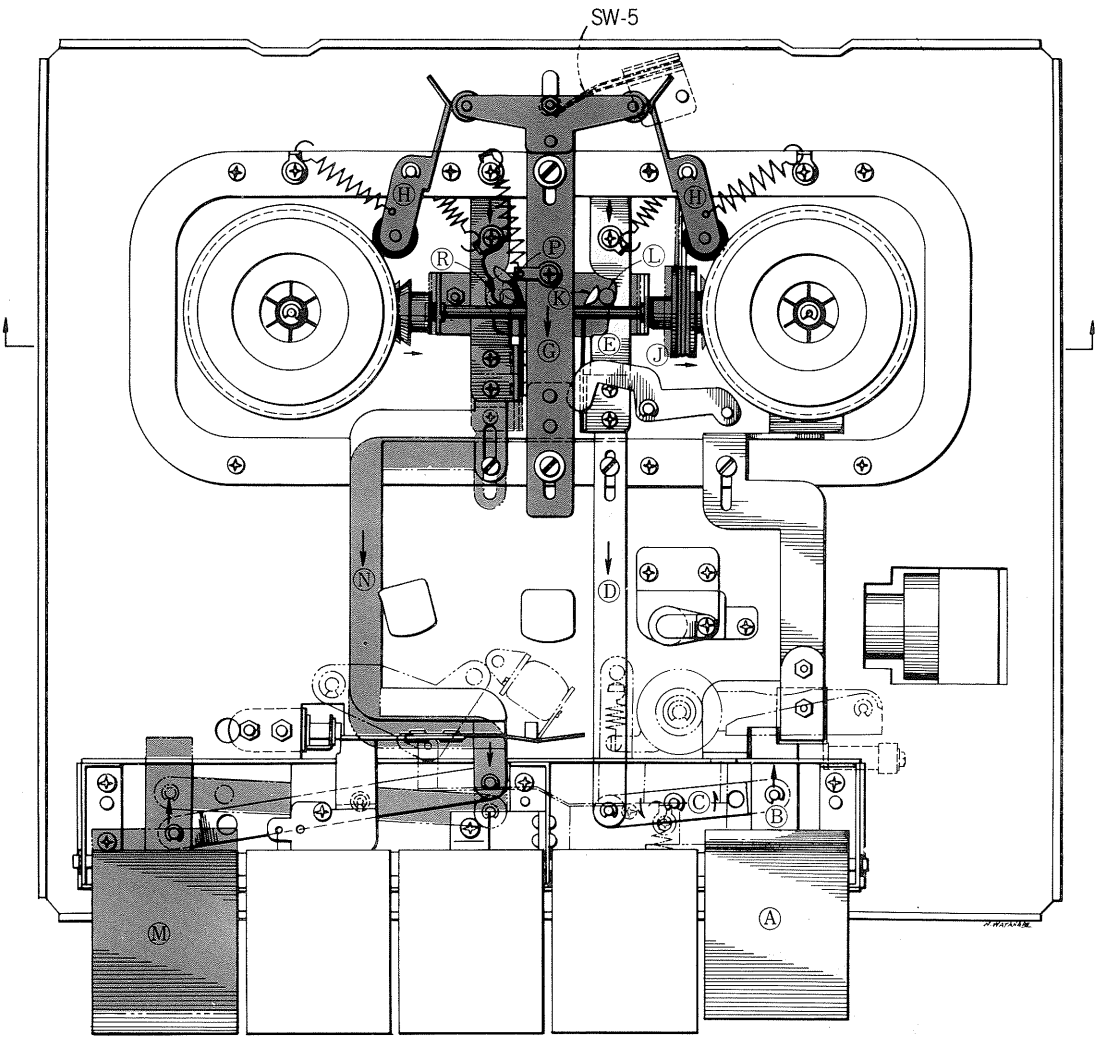


Fig. 4

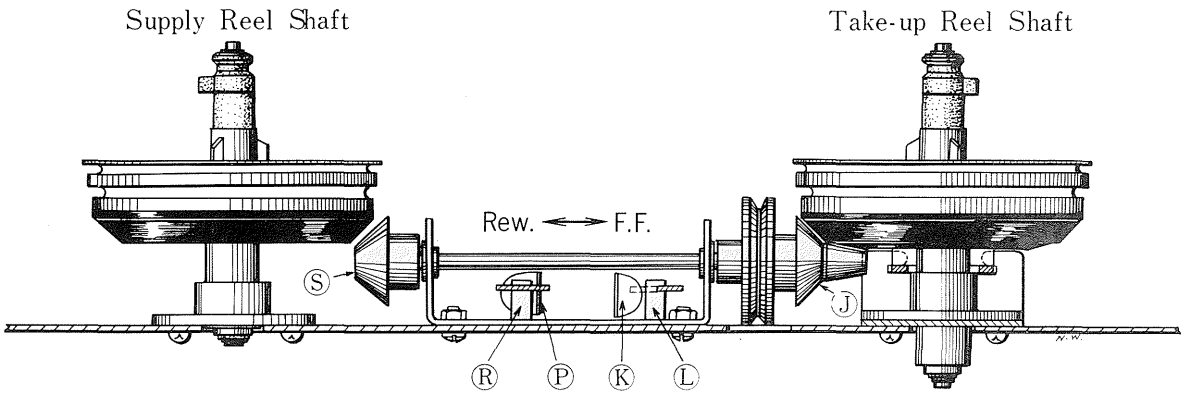


Fig. 5

3. FAST FORWARD AND REWIND FUNCTION MODE

a) FAST FORWARD MODE

As shown in Fig. 4 when the Fast Forward Key (A) is depressed, levers marked (B) to (G) operate simultaneously.

When Lever (G) moves in the direction of the arrow, SW-5 is set to the "ON" condition and the motor begins to rotate. At this time SW-6 contact points are closed and motor rotation reaches about 4,000 r.p.m.

Lever (G) actuates Brake Lever (H) and releases the brakes from right and left reel plates. Pulley (J) is driven by a round type drive belt, beginning to rotate simultaneously with the motor. Refer to the side view illustration of Fig. 5 for explanation of lever operations, located near by Reel Spindle.

When Lever (E) moves in the direction of the arrow, Bar Spring (K) pushes Pin (L) and the Pulley Shaft and Shaft Holder move toward Take-up Reel Shaft. Pulley (J) firmly contacts the rubber wheel of the Take-up Shaft, and Torque of the Pulley is transfered to the Take-up Reel Shaft, permitting Fast Forward operation.

4. REWIND MODE

As shown in Fig. 4, when Rewind Key (M) is depressed, Levers (N) and (O) move in the direction of the arrow. In Fig. 5, Bar Spring (P) pushes Pin (R) and Pulley Shaft moves toward Supply Reel Shaft. Pulley (S) firmly contacts the rubber wheel of the Supply Reel Shaft, which begins to rotate clockwise, permitting Rewind operation.

VI. MECHANISM ADJUSTMENT

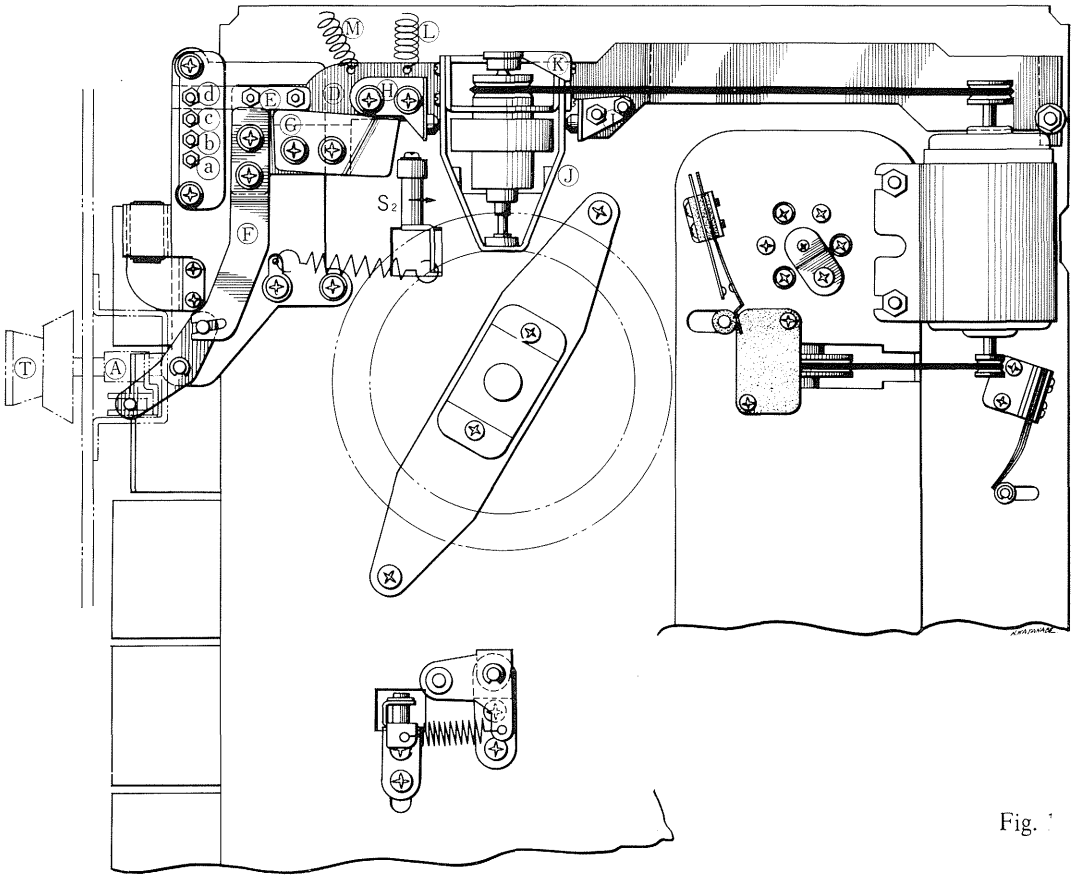


Fig. 1

1. ADJUSTMENT OF SPEED CHANGE MECHANISM (As shown in Fig. 1)

The adjustment of the speed change mechanism is performed in the following sequence :

1) Set the speed selector knob Ⓣ to the 3-3/4" position and adjust the fixing screws of the switch levers Ⓐ, Ⓔ, and Ⓕ, so that the cut portion of the switch lever Ⓔ fits smoothly into the lock pin ⓑ of the lock table.
2) At the 7-1/2" position of speed, adjust the switch lever Ⓔ to meet the lock pin ⓐ.
3) At the 15/16" position of speed, adjust the lock pin ⓓ to meet the left edge of the switch lever Ⓔ (as observed from the rear).
4) At the 1-7/8" position of speed, loosen the lock pin nuts Ⓒ and by moving the lock pin Ⓒ to the left and right, lock the switch lever Ⓔ. (the lock pin Ⓒ is movable over a distance of 0.8 mm)

2. ADJUSTMENT OF THE SWI[T]CH LEVER Ⓖ (As shown in Fig. 1)

At the 3-3/4" position of speed, adjust [s]crews of the lever (S2) and switch lever Ⓖ to se[t] the switch lever Ⓓ and the chassis by a distance [o]f 1 to 0.2 mm.

3. ADJUSTMENT OF THE 5-[S]TEP WHEEL ASSEMBLY (Fig. 1)

a) Adjust the positions of the whe[e]lder tables Ⓗ and Ⓘ, so that the clearance [b]ween the wheel holder tables (Ⓗ and Ⓘ) and t[h]wheel holders (Ⓙ and Ⓚ) is from 0.1 to 0.2 mm.
b) When the 5-step wheel spring [h]as been removed, the 5-step wheel should be f[r]y movable in the vertical direction.

4. The tension of the spri[n]g (M) of the switch lever (D) is to be 100 g ± 10 g, with the spring stretched to a le[n]gth of 43 mm.

5. ADJUSTMENT OF FLYWHEEL (RUBBER-WHEEL) GAP (Fig. 2)

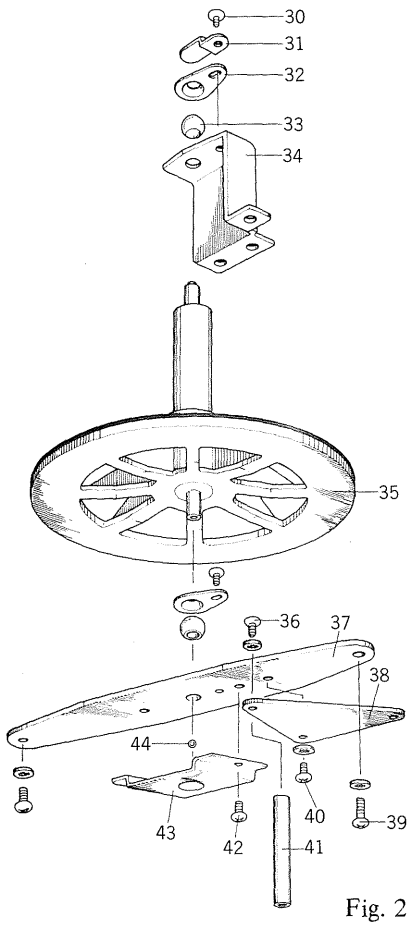


Fig. 2

Adj[illegible] flywheel shaft thrust plate Ⓐ at the upper sect[illegible] the chassis (at the side of the head), so that the [illegible]portion Ⓓ of the flywheel shaft does not come [illegible]contact with the upper main metal holder Ⓒ ; i[illegible] or decrease the number of nylon plates Ⓔ fitted [illegible] thrust plate Ⓑ underneath the chassis, so that the [illegible]cal play of the flywheel becomes from 0.1 to 0.5 m[illegible].

6. AD[illegible]TMENT OF BRAKE MECHANISM (Fig. [illegible])

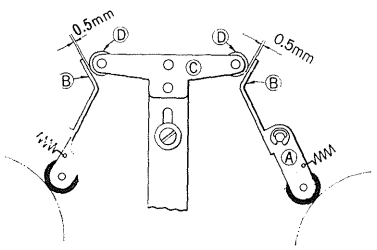


Fig. 3

In the stop conditi[illegible], adjust the brake tension so that the clearance becom[illegible] approximately 0.5 mm between the top portion Ⓑ o[illegible] the brake lever Ⓐ and the nylon rollers Ⓓ at both end[illegible] of the brake lever Ⓒ.

7. ADJUSTMENT OF THE TENSION OF SUPPLY AND TAKE-UP REEL SHAFT IN THE PLAYBACK AND RECORD CONDITIONS. (Fig. 4)

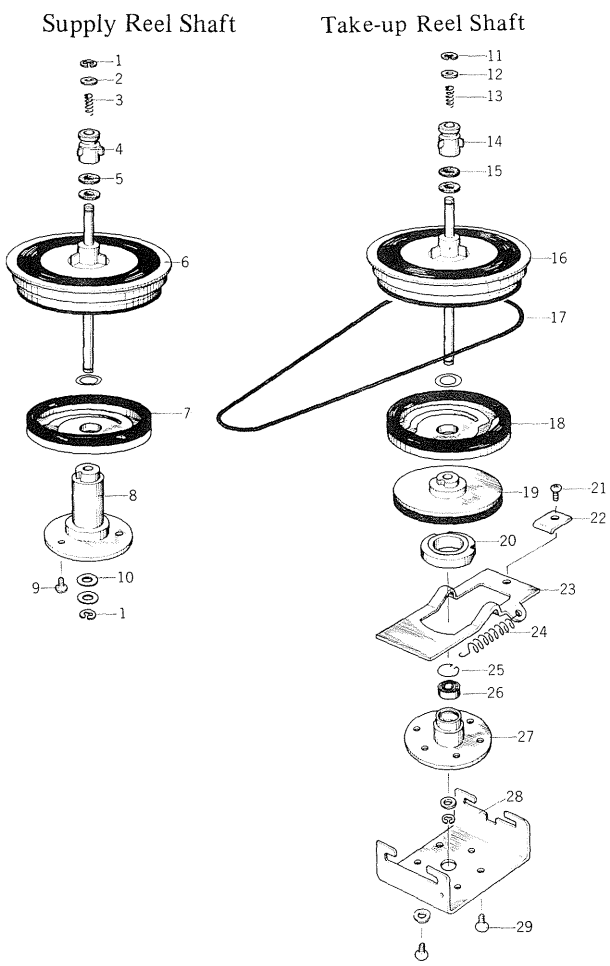


Fig. 4

a) Supply Reel Shaft
The tension of the supply reel shaft is 10 g standard as measured by a stick gauge, provided that the tape is wound around a 3" reel in the playback condition, to a thickness of 40 mm, with the end of the tape curled into a ring.
Adjust the tension by increasing or decreasing the tension of the mission spring ⓐ of the supply reel shaft.

b) Take-up Reel Shaft
The tension of the take-up reel shaft is 30 g standard, measured in an identical manner as the supply reel shaft.
Adjust the tension by increasing or decreasing the tension of the mission spring Ⓐ of the take-up reel shaft.
(However, counter belt should be removed for measurement)

8. ADJUSTMENT OF HEIGHT OF REEL SHAFT (Refer to Figs. 4 and 5)

a) Adjustment of height of supply reel shaft
Adjust the thickness of the height adjustment nylon washer ⓓ after removing the supply reel shaft, so that the height from the surface of the mechanism chassis to the top portion of the reel table plate is 32.3 mm in the rewinding condition.

b) Adjustment of height of take-up reel shaft
Remove the take-up reel shaft and adjust the thickness of the height adjustment nylon washer Ⓓ so that the height from the surface of the mechanism chassis to the top portion of the reel table plate is 32.3 mm. Correct vertical looseness of the reel shaft by tilting the thrust lever Ⓔ .

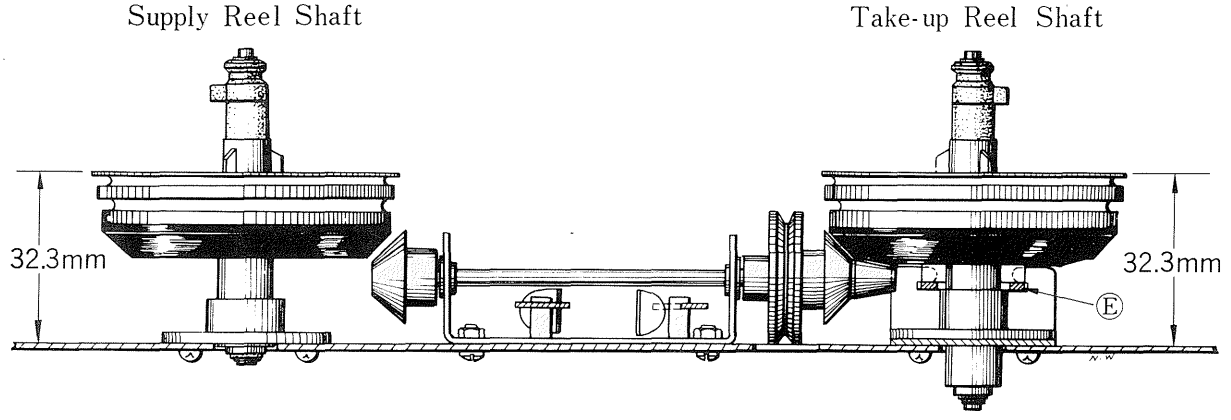


Fig. 5

VII. AMPLIFIER ADJUSTMENT

1. RECORDING BIAS VOLTAGE ADJUSTMENT

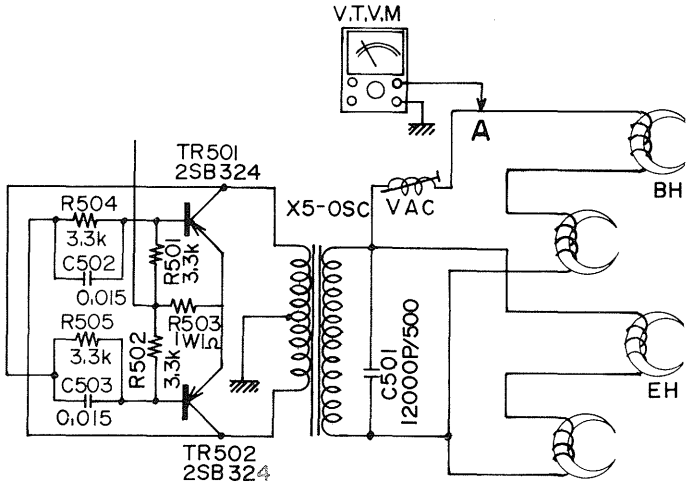


Fig. 1

Connect the V.T.V.M. to point (A) and adjust the recording bias voltage by turning the V.A.C. in the bias oscillator circuit until it reads the same voltage stamped on the back of the head assembly.

Note : There is no erase bias voltage adjustment. Correct bias voltage is between 40 and 50 V AC.

2. RECORDING LEVEL ADJUSTMENT

(Fig. 2)

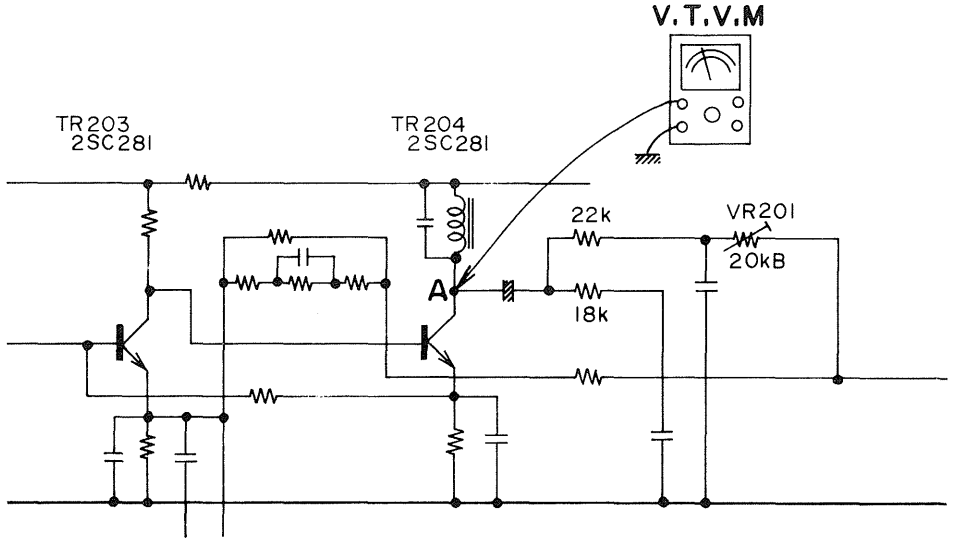


Fig. 2

a. Set the Automatic Recording Switch to Manual position.
b. Connect the V.T.V.M. to point (A).
c. Push the Record Button until it locks and set the Tape Speed Selector to 7-1/2".
d. Feed a 1,000 Hz sine wave signal (with 1.5 mV output level) from an Audio Frequency Oscillator to the Microphone Input of the X-V.
e. Turn the Volume Control VR-1a (10K-A) until the output level at point (A) reaches 0.9 V.
f. Turn the Volume VR-201 (20K-B) until the VU meter indicates "O" VU.

3. A.G.C. (AUTOMATIC GAIN CONTROL) ADJUSTMENT (Fig. 3)

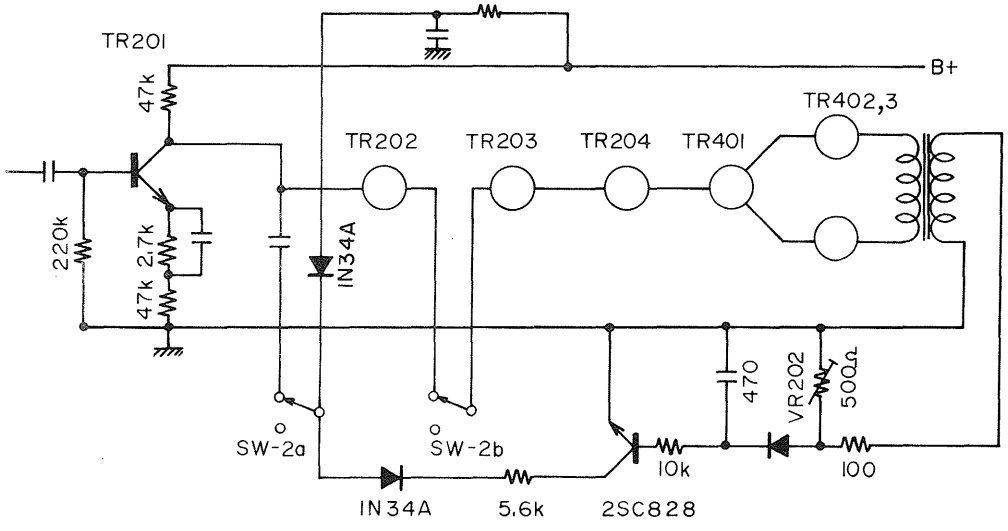


Fig. 3

a. After adjusting the Recording Level as indicated in step (2) above, feed a 1,000 Hz sine wave signal (with 1.5 mV output level) from an Audio Frequency Oscillator to the Microphone Input of the X-V.
b. Set the Automatic Recording Switch to the AUTO REC. position and turn the volume VR-202 (500 ohms) until the VU meter indicates "O" VU.

Caution :
(1) When A.G.C. Switch is set to Automatic Recording position, the adjustment should be done after 30 seconds while C226 (470 μF) completes the charging.
(2) When Automatic Recording switch is "ON", the power source is recommended to be "OFF".

4. MAIN AMPLIFIER ADJUSTMENT (Fig. 4) (Adjustment of D.C. Collector Current for Power Transistors 2SB-370 with no input signal)

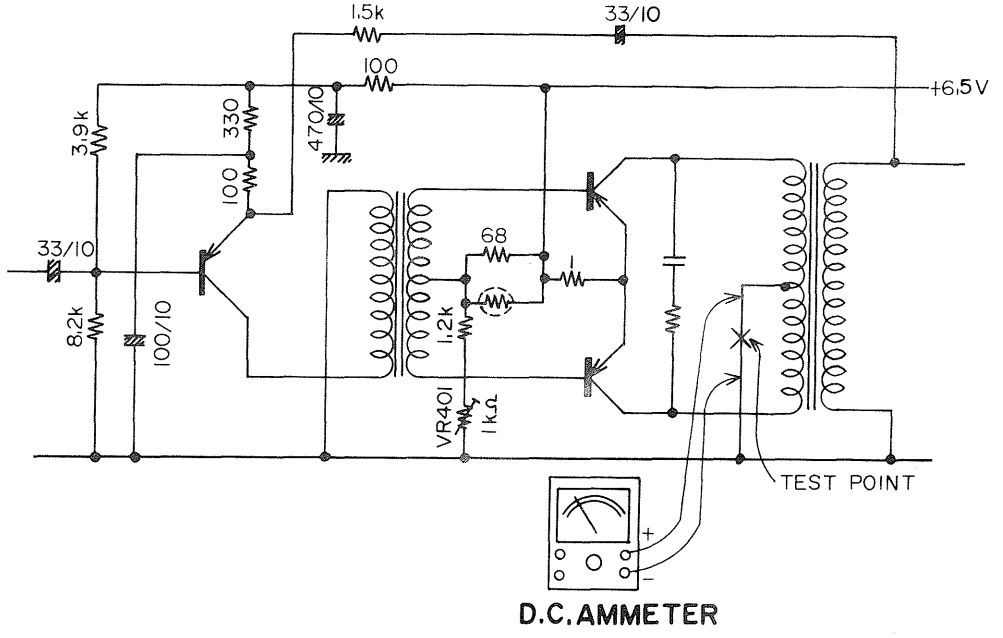


Fig. 4

a. Disconnect the wire between points (A) and (B) by using a soldering iron.
b. Connect the D.C. AmpMeter (use one with Milli-Amp Scale) to points (A) and (B).
c. Turn the Volume Control VR-1a back to the minimum position.
d. Turn the Volume VR-401 (1 K ohms) until the D.C. AmpMeter shows 6 mA.

5. BATTERY CHARGING CIRCUIT ADJUSTMENT

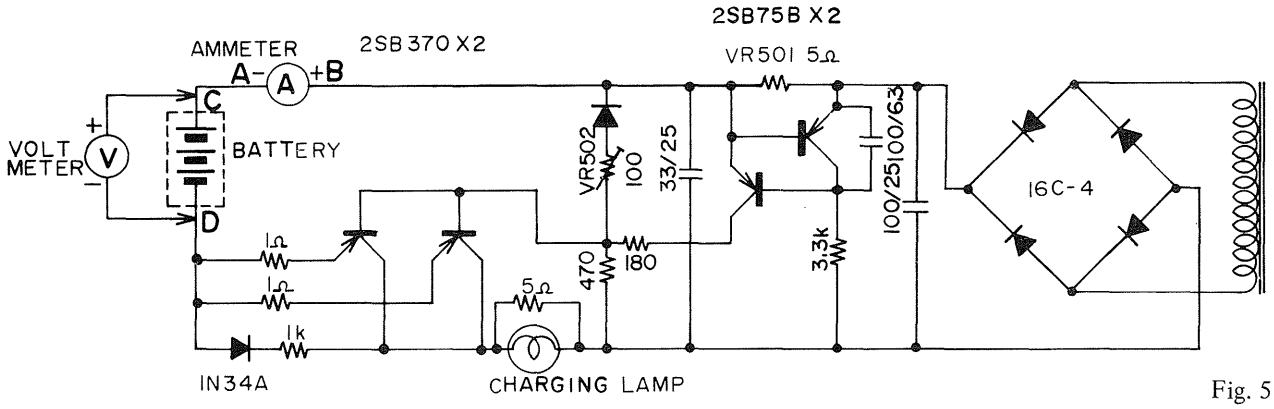


Fig. 5

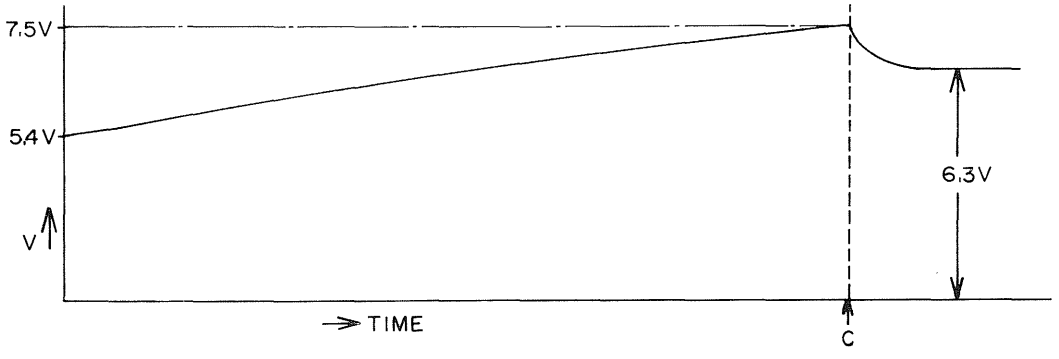


Fig. 6

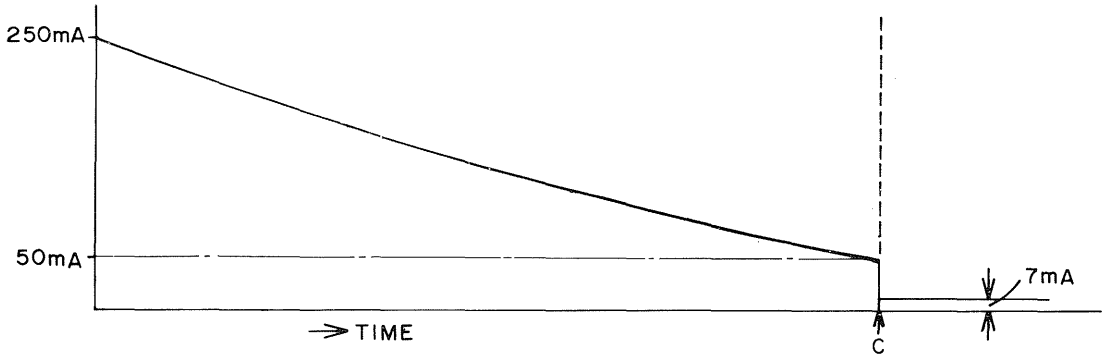


Fig. 7

a. Use a fully charged battery.
b. Connect the D,C. AmpMeter (use one with Milli-Amp Scale) to between points (a) and (b).
c. Connect the D.C. Volt Meter to points (c) and (d).
d. Turn the Volume VR-501 (5 ohms) to the middle position.
e. Turn the Volume VR-502 so that the charging circuit closes (5 ~ 7 mA) indicated on the AmpMeter) as soon as the VoltMeter shows 7.5V.

6. TAPE SPEED ADJUSTMENT

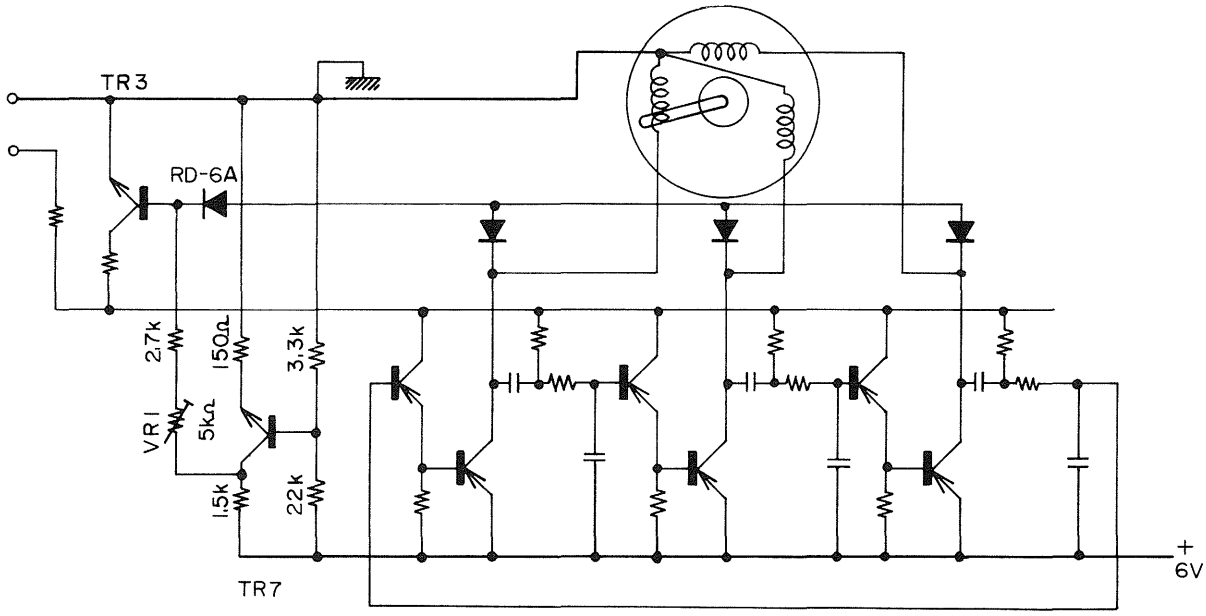


Fig. 8

a. Connect the Frequency Counter to the Speaker Output Jack.
b. Playback the test tape (1,000 Hz "O" VU recorded) at 7-1/2" tape speed and adjust the tape speed by turning the Volume VR-1 (5K ohm) until the Frequency Counter indicates 1,000 Hz.

VIII. HEADS ADJUSTMENT

1. HEIGHT ADJUSTMENT (Fig. 1)

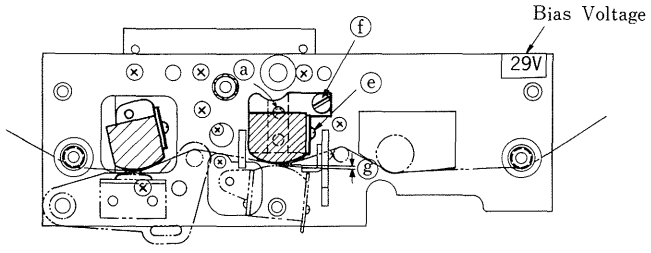


Fig. 1

Adjust Recording and Playback Head Height so that the upper edge of the left channel core is parallel with the upper edge of the tape, by turning the 2 set screws, as shown in Fig. 1 (a).
Adjust Erase and Bias Head Height so that the upper edge of the upper Erase Head's core is 0.125 mm higher than the upper edge of the tape, by loosening screw (b), and adjusting the cam up or down as shown in Fig. 1. Bias Head Height Adjustment is automatically completed with Erase Head Adjustment.

2. AZIMUTH ALIGNMENT

Set the tape speed to 7-1/2 ips. Connect a V.T.V.M. to pre-amplifier output. Playback a 16 KHz recorded tape and adjust screw (f) of Fig. 2 so that V.T.V.M. indicator reads maximum.

3. ADJUSTMENT OF BIAS HEAD AND BIAS VOLTAGES (Fig. 2)

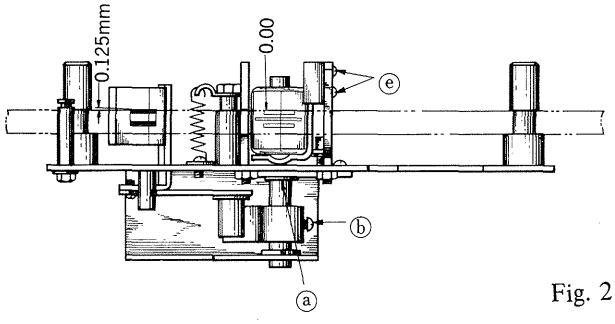


Fig. 2

As Model X-V utilizes a Cross-field Recording System, each machine has its own optimum Bias Voltage. The optimum Bias Voltage is indicated by a mark stamped on the right edge of the head assembly. Bias Voltage should be measured with a V.T.V.M. When the head assembly is replaced, adjustment of Bias Voltage to the same previous value will ensure a optimum recording condition.
When replacing the Recording/Playback Head, adjust the space between the Bias and Recording Head to 0.3 mm by loosening screw (e) and adjusting the Bias Head stopper, as shown in Fig. 2.
The space between Bias and Recording Head, and Bias Voltage should be adjusted to ensure a "FLAT" frequency response when the Recording/Playback Distortion Level reads within 3% at 1 KHz.

IX. MAINTENANCE PROCEDURE

LUBRICATION

a. Parts to be lubricated

1) Upper and Lower Bearings of Flywheel Shaft	1 drop
2) Pinch Roller Shaft	2 drops
3) Fast Forward or Rewind Pulley Shaft	1 drop
4) Supply & Take-up Reel Shaft	1 drop
5) 5-step Pulley Shaft	1 drop
6) Bearing of Erase Head & Bias Head Holder Prop	2 drops

b. Parts to be greased.
All levers except the lubricated parts listed above.

X. TROUBLE SHOOTING CHART

SECTION "A" AMPLIFIER TROUBLES

A. Playback System Problems (Playback Mode)

1. Power Supply fuse blows
   - Short-circuited power transformer → Replace transformer.
   - Zener Diode 10Z68 defective → Replace Zener Diode 10Z68

2. No. sound from speaker
   - Sound from pre-amplifier output (5P Jack, J3)
     - Check main amplifier voltages.
     - Check transistors Tr-401, Tr-402, Tr-403.
   - No sound from pre-amplifier output → Check pre-amplifier voltages

3. Faint sound from speaker
   - Dust deposit on Playback Head. → Check transistors Tr-201, Tr-202, Tr-203, Tr-204. Clean the head with benzine or alcohol immersed gauze.
   - Sound from pre-amplifier output. → Check main amplifier for correct voltage reading and related parts.
   - Faint sound from pre-amplifier-output
     - Check pre-amplifier for correct voltage reading.
     - Check transistors Tr-201, Tr-202, Tr-203, Tr-204.
     - Tape reversed. → Check and correct tape.
     - Playback Head worn out. → Replace Playback Head.

4. Distorted sound
   - Distorted sound internal speaker only. → Check internal speaker and/or replace.
   - Distorted sound both internal and external speakers. → Check main amplifier and voltages.

5. Disturbing noise from speaker
   - Noise level varies with volume control
     - Defective transistor Tr-201 or Tr-202
     - Resistor R202, R205 develops noise – Replace resistor.
   - Turning the volume control produces noise. → Replace VR-1 (10KΩA)
   - Noise Level is irrelative to volume control → Check Tr-203, Tr-204 of pre-amplifier.

B. Recording System Problems (Recording Mode)

1. Recording not possible
   - VU meter needle fails to move.
     - Recording lever not operate the slide switch of pre-amplifier → Disassemble pre-amplifier and reset recording lever.
     - Loose switch (SW-1) contact or input Jack (JI). → Replace SW-1 or Jack (J1).
   - VU meter indicates normal but no recording
     - Dust deposit on Recording Head. → Clean the recording head.
     - Defective recording head. → Check recording head and/or replace.

2. Distorted sound
   - VU meter functions normally, recording monitor through earphone also normal. → Faulty bias oscillator circuit.
     - Measure recording bias voltage.
     - Check oscillator circuit.
   - VU meter functions normally but recording monitor through earphone distorted.
     - Excessive recording input signal. → Reduce input signal level.
     - VU meter has lost sensitivity. → Replace VU meter.
     - Bias Head not functioning properly. → Check Bias Head location.

3. Erase Problems
   - Unit does not erase.
     - Defective Erase Head. → Check Erase Head.
     - Broken lead wire in erasing circuit. → Check lead wire and repair.
   - Incomplete erasure. → Dust deposit on Erase Head. → Clean Erase Head.

4. Recorded sound is not clear.
- Dust on Recording Head. → Clean Recording Head.
- Recording bias out of adjustment → Check Bias voltage with V.T.V.M. and readjust.
- Worn out Recording Head. → Replace Recording Head.

SECTION "B" TROUBLE WITH TAPE TRANSPORT MECHANISM

1. Tape does not move with start button depressed.

Battery indicator pointer indicates in red aread.
- Battery voltage too low. → Recharge battery.

Battery indicator pointer indicates green area.
- Motor does not rotate.
  - No voltage in the motor control circuit. → Loose contact of the remote control jack (J5)
  - Motor jerking.
    - Check motor control circuit voltage
    - Check transistor Tr-1 ~ Tr-6
  - Worn out Motor. → Replace Motor.
  - Loose contact of the remote control jack (J5) → Repair or Replace Jack (J5)
- Motor rotates but tape does not move. — 5-step Wheel Drive Belt stretched. → Replace Belt.
- Motor rotates only when using AC cord. — Loose SW-3 or SW-5 contact → Clean the switch contact point

2. Slow Tape Speed

Battery indicator indicates in red area.
- Battery voltage is too low → Recharge Battery.

Battery indicator indicates in green area.
- 5-step wheel drive belt streched. → Replace belt.
- Motor speed controller out of adjustment → Readjust motor speed.

3. Fast Forward and Rewind not possible.

Motor rotates.
- Round type dirve belt stretches and slips. → Replace Drive Belt.
- Pulley slips at Take-up or Supply Spindle. → Check mechanism and spring tension.
- Brake shoe is contacting reel spindle. → Check Brake Lever.

Motor does not rotate
- Battery voltage too low → Recharge Battery.
- Loose contact of SW-6. → Clean switch contact points.

4. Speed changing not possible.

Speed change knob fails to turn.
- Switch Lever (B) is out of sequent. → Check the location of the Lever (B).

5-step wheel is stuck to Flywheel
- 5-step wheel is offset from holder. → Repair holder.
- Switch Lever (D) is bent. → Repair Lever (D).

Speed change knob turns.
- Switch Lever (E) is stuck to lock pin → Adjust switch lever (E).

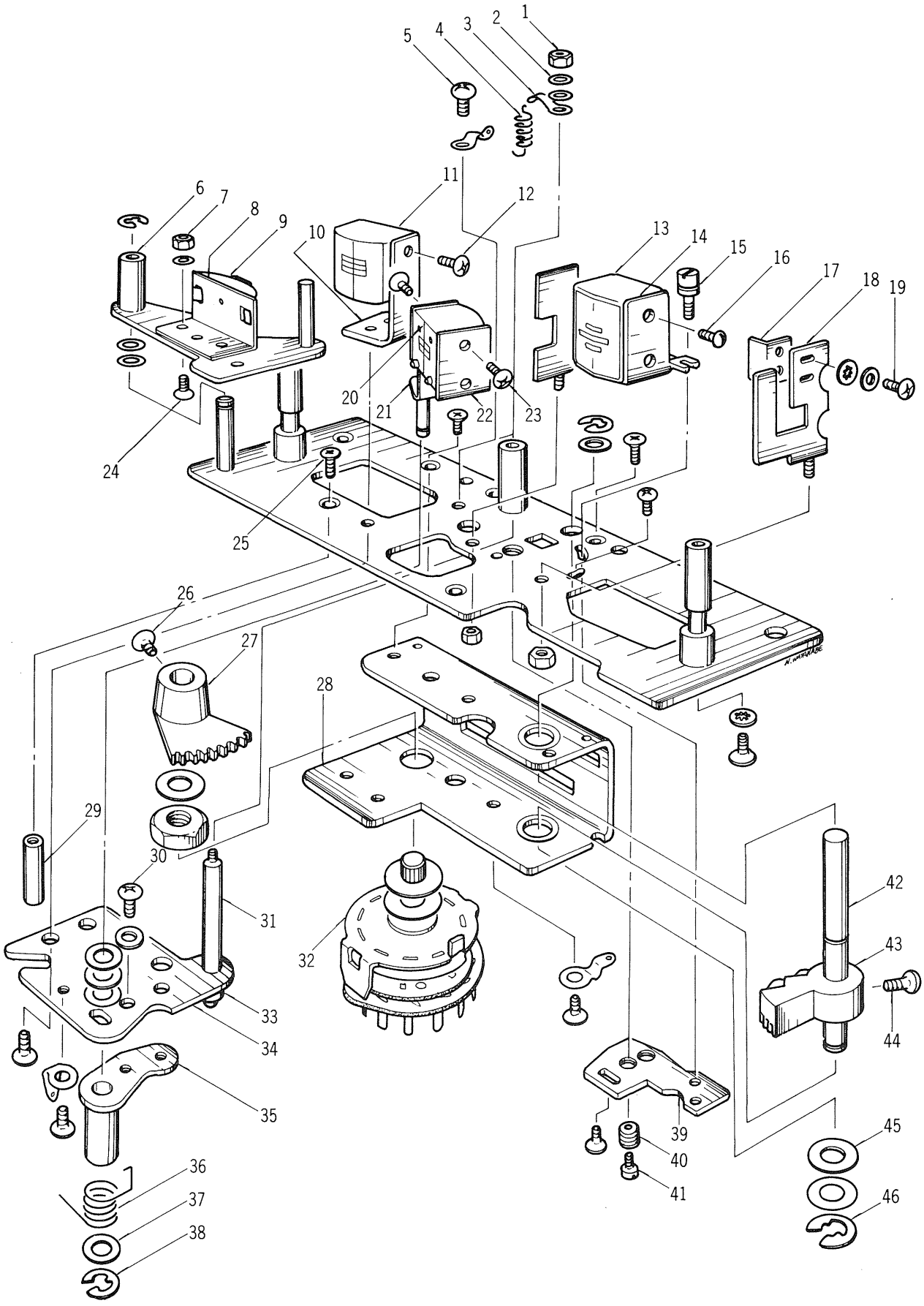
5. Tape sags during playback
- Take-up tension too weak. → Adjust spring tension of Take-up Spindle.
- Tape counter is sticking. → Replace tape counter.

6. Vibrating sound during playback (Wow and Flutter)
- 5-step wheel is unbalanced. → Replace 5-step wheel
- 5-step wheel drive belt is uneven. → Replace drive belt.

X. REPLACEMENT PARTS TABLE

X5 PARTS LIST

Note : * mark shows more than 10 pieces.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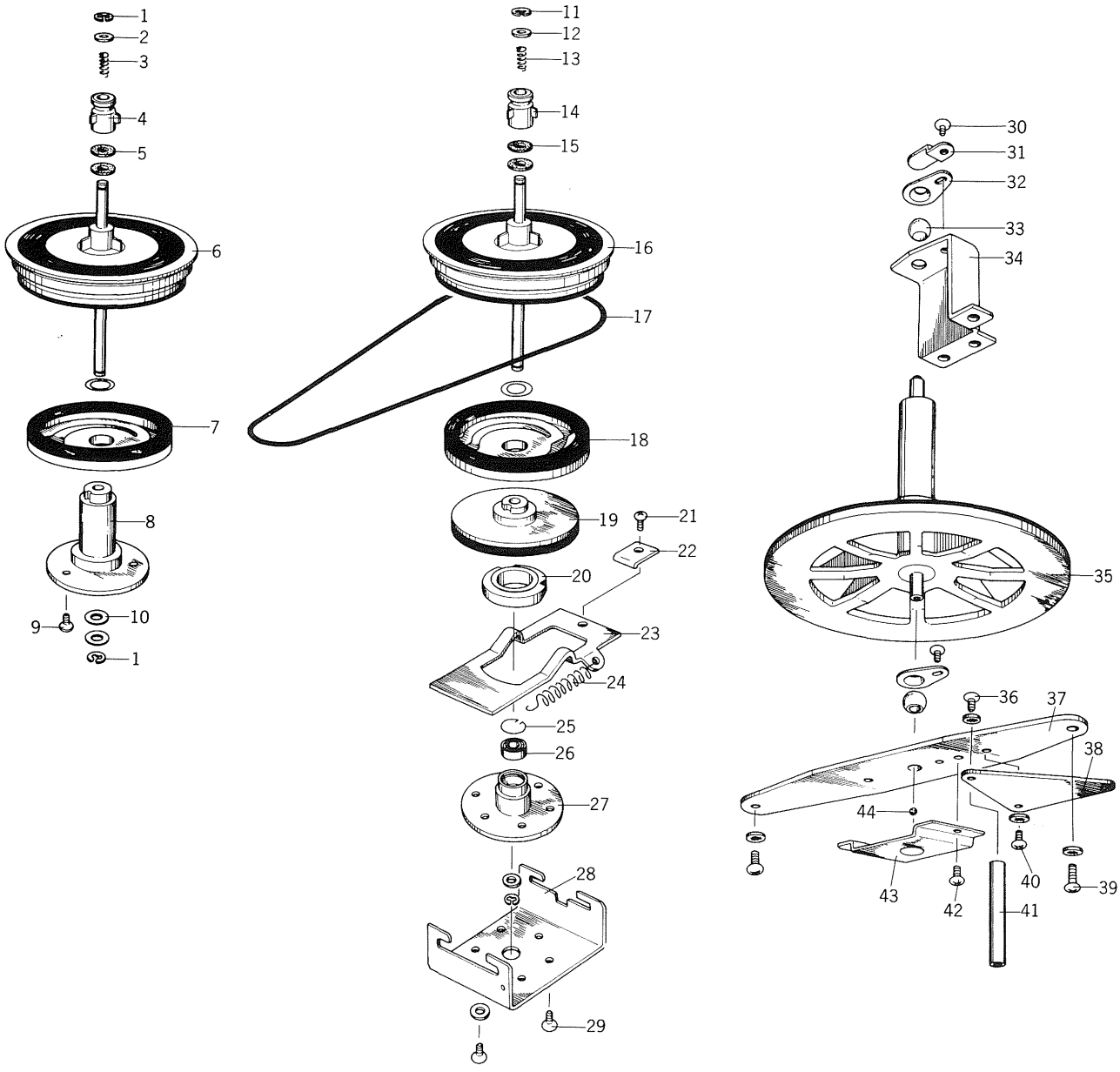
HEAD BLOCK X5-1100

Ref. No.	Parts No.	Nomenclature	Qu'ty
0	X5-1100	Head Assembly Complete	1
1	X5-1109	Nut 3 mm	1
2	X5-1106	Washer 3 mm	2
3	X5-1131	Lug Plate 4 mm	2
4	X5-1147	Tension Spring	1
5	X5-1132	Set Screw 3 x 6 mm	1
6	X5-1170	Plate, felt-pad mounting	1
7	X5-1178	Nut 2 mm	2
8	X5-1171	Bracket, felt-pad mounting	1
9	X5-1174	Plate Spring, felt-pad hold	1
10	X5-1134	Angle, Erase Head Mounting	1
11	X5-1136	Erase Head	1
12	X5-1137	Set Screw 2 x 3 mm	2
13	X5-1118	Recording/Playback Head	1
14	X5-1115	Angle, R/P.B. Head Mounting	1
15	X5-1117	Screw (Angle Adjusting)	1
16	X5-1122	Set Screw 2 x 3 mm	2
17	X5-1127	Bias Head Stopper	1
18	X5-1125	Tape Guide No. 7	1
19	X5-1130	Set Screw 2 x 4 mm	2
20	X5-1149	Bias Head	1
21	X5-1148	Angle with Shaft (Bias Head mounting)	1
22	X5-1151	Side Plate (for Bias Head)	1
23	X5-1150	Set Screw 2 x 3 mm	4
24	X5-1172	Set Screw 2 x 5 mm (special)	2
25	X5-1111	Set Screw 2.3 x 5 mm	1
26	X5-1160	Set Screw 3 x 5 mm	1
27	X5-1159	Gear, Rotary Switch	1
28	X5-1157	Switch Table	1
29	X5-1110	Guide Prop, Heads hold-down	1
30	X5-1111	Set Screw 2.3 x 5 mm	2
31	X5-1143	Shaft, Heads hold-down	1
32	X5-1158	Rotary Switch 25RS-1,3,4,	1
33	X5-1109	Nut 3 mm	1
34	X5-1133	Plate, Heads hold-down	1
35	X5-1140	Metal Plate for Bias Head	1
36	X5-1153	Spring, Bias Head hold-down	1
37	X5-1154	Washer 4 mm	1
38	X5-1155	"E" Ring 3 mm	1
39	X5-1112	Plate, Angle Adjusting	1
40	X5-1114	Angle Adjusting Screw	1
41	X5-1116	Set Screw (special)	1
42	X5-1162	Shaft, Track Selector	1
43	X5-1165	Gear/Cam, Track Selector Shaft	1
44	X5-1160	Set Screw 3 x 5 mm	1
45	X5-1164	Washer 5.2 mm	1
46	X5-1163	"U" Ring	1

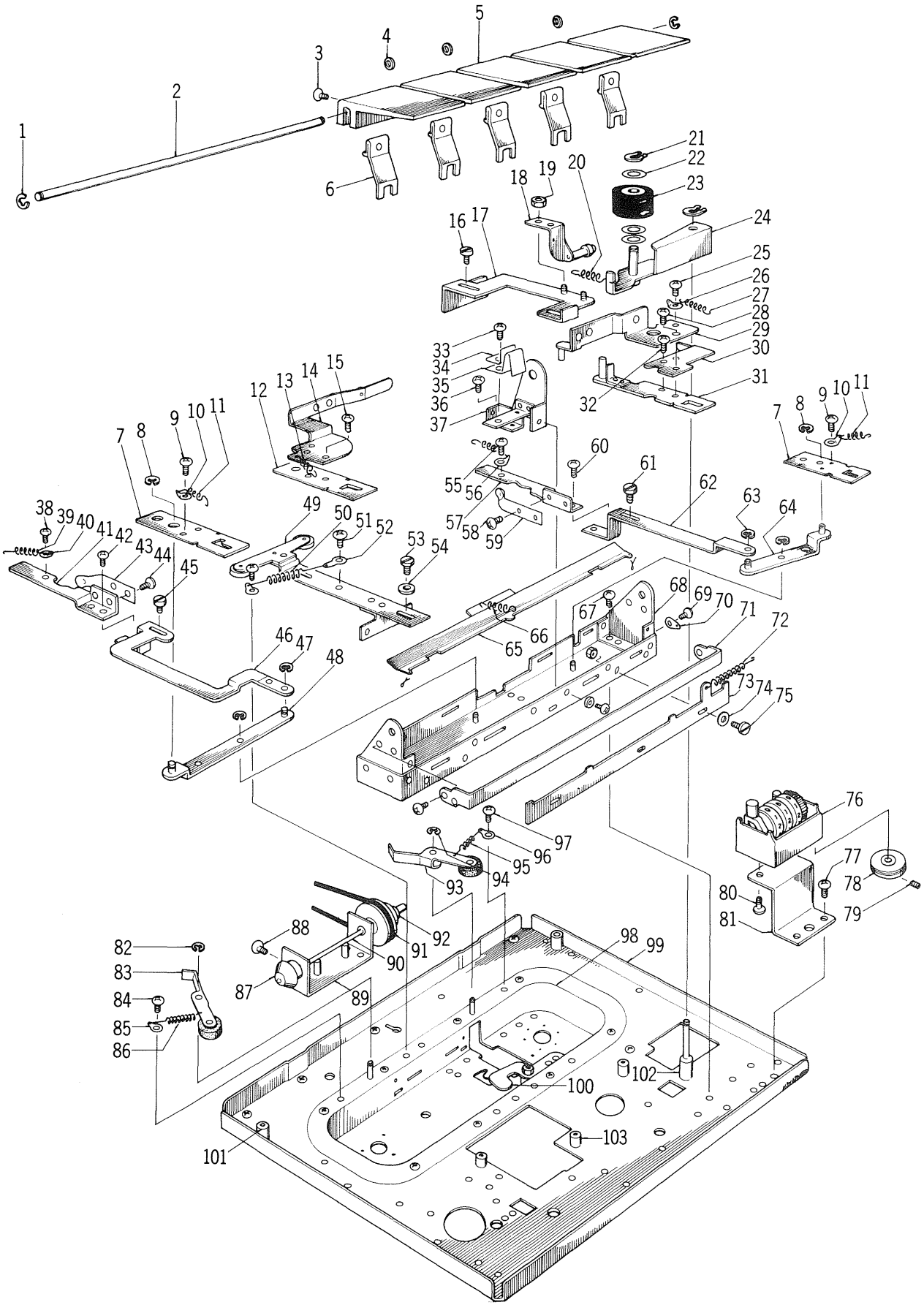
REEL ASSEMBLY BLOCK (X5-1200 & X5-1300)



REEL ASSEMBLY BLOCK(X5-1200 & X5-1300)

Ref. No.	Parts No.	Nomenclature	Qu'ty
0	X5-1200	Supply Reel Assembly Complete	1
1	X5-1207	"E" Ring 1.9 mm	2
2	X5-1206	Washer 2.7 mm	2
3	X5-1205	Spring, Reel Holder Tension	1
4	X5-1204	Reel Holder	1
5	X5-1203	Rubber Washer	1
6	X5-1201	Reel Table with Shaft	1
7	X5-1210	Reel Mission Spring with Felt Ring (left)	1
8	X5-1212	Bearing Plate, Supply Reel Mounting	1
9	X5-1215	Screw, binding head 2.3 x 5 mm	3
10	X5-1213	Nylon Washer 3.1 mm	2
0	X5-1300	Take-up Reel Assembly Complete	1
11	X5-1307	"E" Ring 1.9 mm	2
12	X5-1306	Washer 2.7 mm	2
13	X5-1305	Spring, Reel Holder Tension	1
14	X5-1304	Reel Holder	1
15	X5-1303	Rubber Washer	2
16	X5-1301	Reel Table with Shaft	1
17	X5-3309	Belt, Counter (118ϕ)	1
18	X5-1310	Reel Mission Spring with Felt Ring (right)	1
19	X5-1312	Disk with Rubber	1
20	X5-1321	Thrust Metal	1
21	X5-1320	Set Screw 2.3 x 3 mm	1
22	X5-1319	Stopper, Thrust Leber	1
23	X5-1318	Thrust Lever	1
24	X5-1325	Spring, Thrust Lever Tension	1
25	X5-1315	Ring Spring	1
26	X5-1314	Miniature Bearing (B-3-7)	1
27	X5-1313	Bearing Plate only (without Miniature Bearing)	1
28	X5-1316	Bracket, Thrust Lever	1
29	X5-1317	Screw, binding head 2.3 x 4 mm	3
30	X5-2232	Screw, binding head 2.3 x 4 mm	1
31	X5-2231	Thrust Plate A	1
32	X5-2230	Holder, Ball Bearing	2
33	X5-2229	3ϕ sphere Metal Bearing	2
34	X5-2228	Main Metal Holder	1
35	X5-2234	Flywheel with Shaft	1
36	X5-2246	Screw, binding head 3 x 5 mm	1
37	X5-2236	Metal Plate	1
38	X5-2243	Supporting Plate, Printed Board	1
39	X5-2247	Screw, round head 3 x 8 mm	2
40	X5-2244	Screw, binding head 3 x 5 mm	1
41	X5-2245	Prop D, Amplifier Card	1
42	X5-2242	Screw, binding head 2.3 x 4 mm	2
43	X5-2240	Thrust Plate B	1
44	X5-2235	1.6ϕ Steel Ball	2

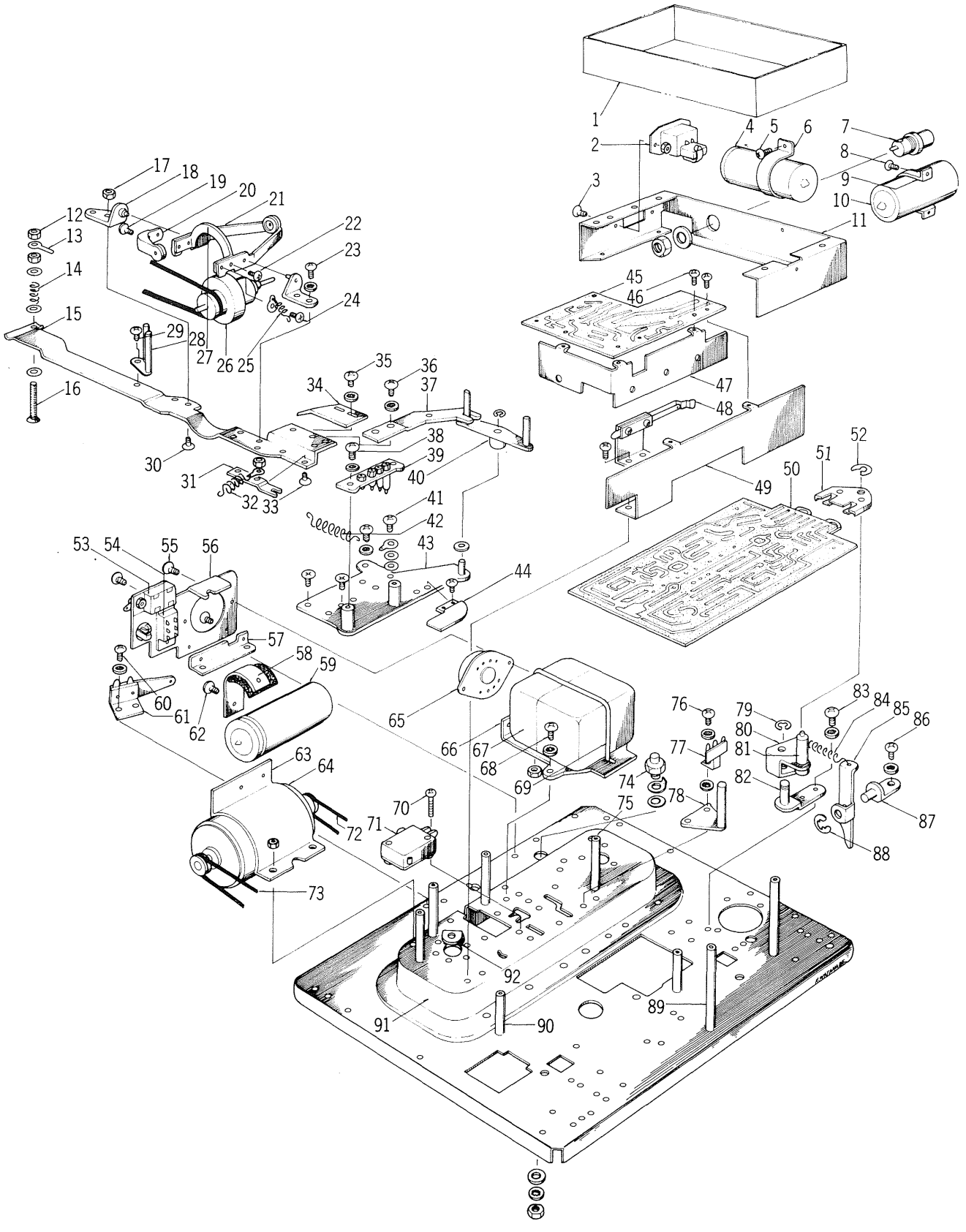
MECHANISM FRAME FRONT BLOCK



MECHANISM FRAME FRONT BLOCK

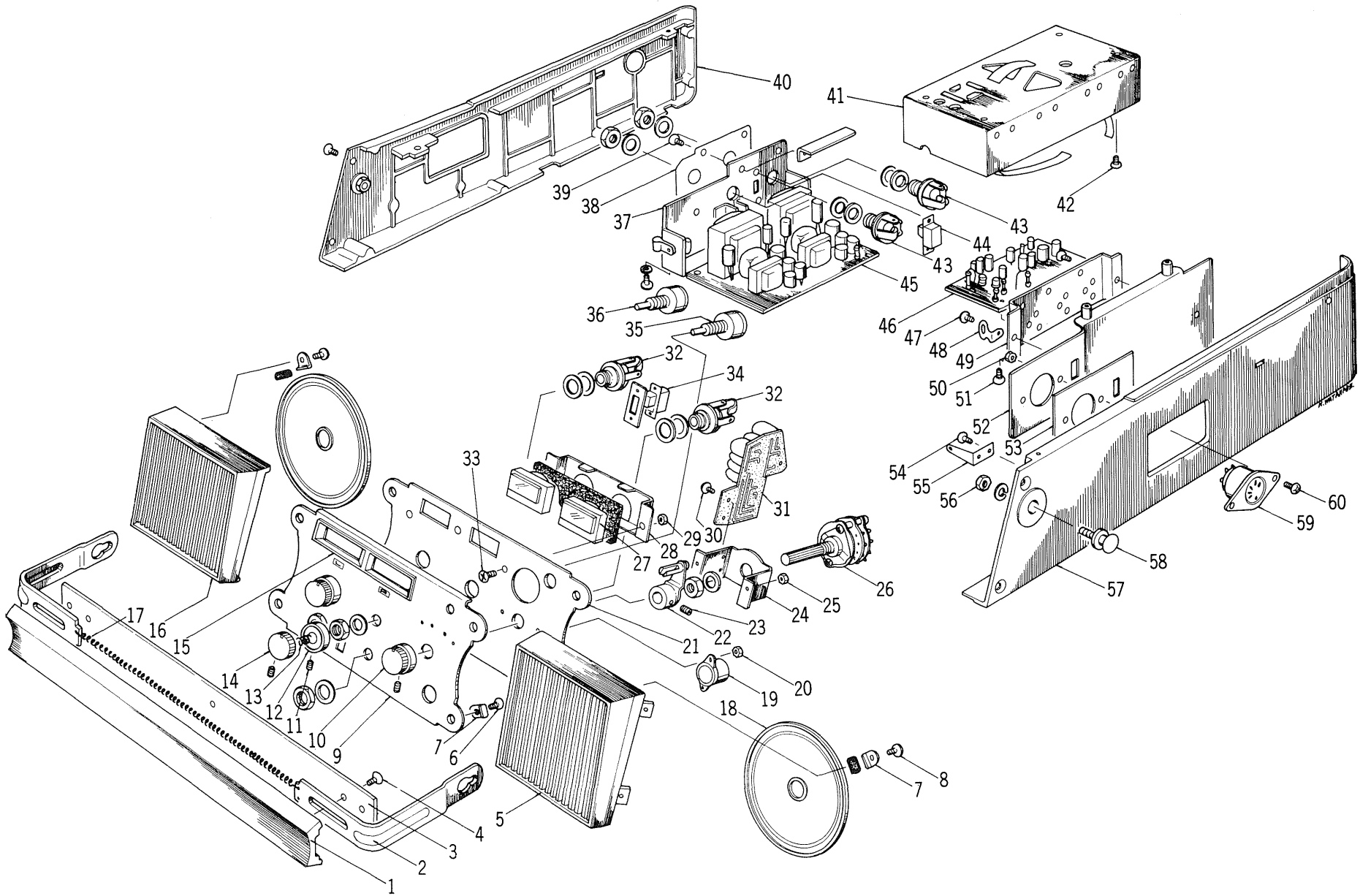
Ref. No.	Parts No.	Nomenclature	Qu'ty
1	X5-1442	"E" Ring 1.9 mm	2
2	X5-1439	Shaft, Keyboard	1
3	X5-1438	Set Screw, flat head 3 x 8 mm	5
4	X5-1440	Washer 4.2 mm	3
5	X5-1436	Keyboard	5
6	X5-1437	Lever A, Keyboard	5
7	X5-1416	Lever B, Keyboard	2
8	X5-1421	"E" Ring 1.9 mm	2
9	X5-1418	Set Screw 2.3 x 3 mm	2
10	X5-1417	Lug Plate 2.3 mm	2
11	X5-1419	Tension Spring, Keyboard	2
12	X5-1431	Lever C, Keyboard	1
13	X5-1419	Tension Spring, Keyboard	1
14	X5-2325	Lever C-2, Keyboard	1
15	X5-2326	Screw, binding head 2.3 x 3 mm	2
16	X5-1538	Screw, flat head 2.3 mm (special)	2
17	X5-2218	Lever B	1
18	X5-2219	Lever S-2	1
19	X5-2221	Nut 3 mm	2
20	X5-2332	Spring, Pinch Roller	1
21	X5-2205	Retaining Washer 2.9 mm	2
22	X5-2328	Washer 3.1 mm	3
23	X5-2329	Pinch Roller No.7	1
24	X5-2327	Lever, Pinch Roller	1
25	X5-2323	Screw, pan head 2.3 x 5 mm	1
26	X5-2324	Lug Plate 4 mm	1
27	X5-1435	Tension Spring	2
28	X5-2323	Screw, pan head 2.3 x 5 mm	1
29	X5-2322	Lever D-4, Keyboard	1
30	X5-1433	Lever D-3, Keyboard	1
31	X5-1432	Lever D with Shaft, Keyboard	1
32	X5-1434	Set Screw 2.3 x 5 mm	1
33	X5-1413	Set Screw 2.3 x 3 mm	2
34	X5-1412	Supporting Plate, Plate Spring	1
35	X5-1411	Plate Spring	1
36	X5-1413	Set Screw, 2.3 x 3 mm	1
37	X5-1409	Side Plate (small)	1
38	X5-1547	Screw, binding head 2.3 x 3 mm	1
39	X5-1419	Tension Spring, Keyboard	1
40	X5-1546	Lug Plate 2.3 mm	1
41	X5-1544	Lever A (left)	1
42	X5-1547	Screw, binding head 2.3 x 3 mm	2
43	X5-1545	Plate Spring (R)	1
44	X5-1547	Screw, binding head 2.3 x 3 mm	2
45	X5-1538	Screw, flat head 2.3 mm (special)	1
46	X5-1549	3-step Lever B	1
47	X5-1442	"E" Ring 1.9 mm	2
48	X5-1427	Replacing Lever (large)	1
49	X5-1531	Brake Lever B, C	1
50	X5-1543	Spring, Brake Lever	1
51	X5-1542	Screw, binding head 2.3 x 4 mm	1
52	X5-1541	Lug Plate 2.3 mm	1
53	X5-1538	Screw, flat head 2.3 mm (special)	2
54	X5-1539	Washer 3.4 mm	1
55	X5-1523	Screw, binding head 2.3 x 3 mm	1
56	X5-1522	Lug Plate 2.3 mm	1
57	X5-1519	Lever A (right)	1
58	X5-1521	Screw, binding head 2.3 x 3 mm	2
59	X5-1520	Plate Spring (R)	1
60	X5-1525	Screw, binding head 2.3 x 3 mm	2
61	X5-1538	Screw, flat head 2.3 mm (special)	1
62	X5-1524	3-Step Lever C	1
63	X5-1429	"E" Ring 1.9 mm	2
64	X5-1420	Replacing Lever (small)	1
65	X5-1406	Lever E, Keyboard	1
66	X5-1408	Spring E, Keyboard Lever	1
67	X5-1449	Screw, binding head 2.3 x 4 mm	4
68	X5-1401	Frame with Side Plate, Keyboard	1
69	X5-1449	Screw, binding head 2.3 x 4 mm	5
70	X5-1448	Lug Plate 2.3 mm	1
71	X5-1450	Name Plate, Keyboard	1
72	X5-1447	Spring, Safety Lever	1
73	X5-1443	Safety Lever	1
74	X5-1445	Washer 3.4 mm	2
75	X5-1444	Screw, flat head (special)	2
76	X5-2100	3-digit Tape Counter Complete	1
77	X5-2130	Screw, round head 3 x 5 mm	2
78	X5-2127	Counter Pulley C	1
79	X5-2128	Screw, without head 3 x 3 mm	1
80	X5-2119	Screw, round head 2.3 x 4 mm	2
81	X5-2129	Angle, Tape Counter	1
82	X-5 1528	"E" Ring 1.9 mm	1
83	X5-1570	Brake Lever A (left)	1
84	X5-1578	Screw, binding head 2.3 x 3 mm	1
85	X5-1577	Lug Plate 2.3 mm	1
86	X5-1579	Spring, Brake Lever	1
87	X5-1560	Pulley B	1
88	X5-1561	Screw, round head 3 x 5 mm	1
89	X5-1502	Holder B, Pulley	1
90	X5-1551	Shaft, Pulley	1
91	X5-1562	Belt, Pulley (40 mm)	1
92	X5-1552	Pulley A	1
93	X5-1572	Brake Lever A (right)	1
94	X5-1528	"E" Ring 1.9 mm	1
95	X5-1579	Spring, Brake Lever	1
96	X5-1577	Lug Plate 2.3 mm	1
97	X5-1578	Screw, binding head 2.3 x 3 mm	1
98	X5-1501	Frame, Reel	1
99	X5-2201	Mechanism Frame	1
100	X5-1526	Brake Lever E with Metal	1
101	X5-2202	Prop, Mechanism Panel	2
102	X5-2204	Prop, Pinch Roller	1
103	X5-2206	Prop, Head Assembly Mounting	1
	X5-2299	Voltage Adjusting Coil Assy. Comp. (X5-506)	1
	X5-2300	Screw, binding head 3 x 5 mm	1
	X5-2301	Voltage Adjusting Coil	1

MECHANISM FRAME REAR BLOCK



MECHANISM FRAME REAR BLOCK

Ref. No.	Parts No.	Nomenclature	Qu'ty
1	X5-2411	Battery Box Assembly	1
2	X5-2408	Socket with 3-wire changing switch	1
3	X5-2409	Screw, flat head 3 x 8 mm	2
4	X5-2402	Electrolytic Condenser, Tublar Type CETX 2200μ x 16 WV	1
5	X5-2404	Screw, pan head 2.3 x 4 mm	1
6	X5-2403	Holder A, Condenser	1
7	X5-2405	Fuse Post (T3P)	1
8	X5-2404	Screw, pan head 2.3 x 4 mm	1
9	X5-2403	Holder A, Condenser	1
10	X5-2402	Electrolytic Condenser, Tublar Type CETX 2200μ x 16 WV	1
11	X5-2401	Bracket, Battery Holder Mounting	1
12	X5-2307	Nut 3 mm	1
13	X5-2306	Lug Plate 3 mm 20L	1
14	X5-2304	Spring	1
15	X5-1702	Lever D, 5-steps wheel	1
16	X5-2302	Screw, round head 3 x 20 mm	1
17	X5-1717	Nut 2.3 mm	1
18	X5-1714	Angle, 5-step Wheel	1
19	X5-1818	Screw, pan head 2.3 x 5 mm	2
20	X5-1813	Holder B, 5-step Wheel	1
21	X5-1803	Holder A, 5-step Wheel	1
22	X5-1810	Screw, flat head 2.3 x 5 mm	1
23	X5-1713	Screw, binding head 3 x 5 mm	2
24	X5-1811	Screw, pan head 2.3 x 5 mm	2
25	X5-1718	Spring, 3-step Lever	1
26	X5-1801	5-step Wheel	1
27	X5-1809	Holder C, 5-step Wheel	1
28	X5-1715	Guide, Belt	1
29	X5-1713	Screw, binding head 3 x 5 mm	1
30	X5-1716	Screw, flat head 2.3 x 6 mm	2
31	X5-1702	Switch Lever E	1
32	X5-1706	Spring, Switch Lever	1
33	X5-1703	Screw, flat head 2.3 x 5 mm	2
34	X5-1707	Switch Lever G	1
35	X5-1708	Screw, binding head 3 x 5 mm	2
36	X5-1708	Screw, binding head 3 x 5 mm	2
37	X5-1709	Switch Lever F	1
38	X5-1614	Screw, binding head 3 x 6 mm	2
39	X5-1607	Plate, Speed Change Locking with Pin A, B, C, D	1
40	X5-1602	Switch Lever B	1
41	X5-2254	Screw, binding head 3 x 5 mm	2
42	X5-2225	Spring, Lever S-2	1
43	X5-1601	Switch Lever C	1
44	X5-1615	Holder, Lamp	1
45	X5-3100	O.S.C. Recharging Circuit Printed Board Assy. Comp.	1
46	X5-3128	Screw, binding head 2.3 x 6 mm	3
47	X5-3127	Heat Sink Plate C	1
48	X5-2273	Short Switch with Angle C	1
49	X5-2269	Shield Plate	1
50	X5-3200	Pre-amp. Printed Board Assy. Comp. (X5-502)	1
51	X5-3304	Recording Lever A	1
52	X5-3305	"U" Ring 2.85 mm	1
53	X5-2509	Diode 16C-4 (D-1)	1
54	X5-2512	6P Slide Switch 11A-1053A (SW-4) AC ON/OFF	1
55	X5-2510	Screw, binding head 3 x 8 mm	2
56	X5-2508	Plate, Power Source Selector	1
57	X5-2212	Holder, Main Amplifier	1
58	X5-2311	Holder, Condenser	1
59	X5-2310	Electrolytic Condenser, Tublar Type CETX 3300μ x 12.5 WV (C-1)	1
60	X5-2268	Screw, binding head 3 x 8 mm	2
61	X5-2262	Short Switch with Angle	1
62	X5-2312	Screw, binding head 2.3 x 6 mm	1
63	X5-2308	Holder, Micro Motor	1
64	X5-1900	Brushless Motor Assembly	1
65	X5-2507	Rotary Switch, Voltage Selector	1
66	X5-2506	Table, Transformer	1
67	X5-2501	Power, Transformer T-1	1
68	X5-2510	Screw, binding head 3 x 8 mm	2
69	X5-2504	Holder, Transformer	1
70	X5-1506	Screw, binding head 2.3 x 18 mm	2
71	X5-1504	Micro Switch M8-3 (SW-8)	1
72	X5-1562	Belt, Pulley (40 mm)	1
73	X5-2314	Square Belt (large, 86 mm)	1
74	X5-2214	Zener Diode (10Z68)	1
75	X5-1509	Prop, Case Cover D Mounting	1
76	X5-2259	Screw, binding head 3 x 5 mm	2
77	X5-2261	Lug Terminal KP-2L-1	1
78	X5-2256	Pre-amplifier Prop Plate with Prop C	1
79	X5-2288	"U" Ring 2.85 mm	1
80	X5-2292	Recording Lever B	1
81	X5-2294	Prop A, Recording Lever	1
82	X5-2291	Plate, Shaft	1
83	X5-2298	Screw, binding head 3 x 5 mm	2
84	X5-2293	Spring, Recording Lever	1
85	X5-2287	Recording Lever C	1
86	X5-2289	Screw, binding head 3 x 8 mm	2
87	X5-2286	Angle, Recording Lever	1
88	X5-2288	"U" Ring 2.85 mm	1
89	X5-2208	Prop A, Amplifier Card	2
90	X5-2210	Prop 27 mm	2
91	X5-1501	Frame, Reel	1
92	X5-1565	Adjusting Plate, Reel Table	1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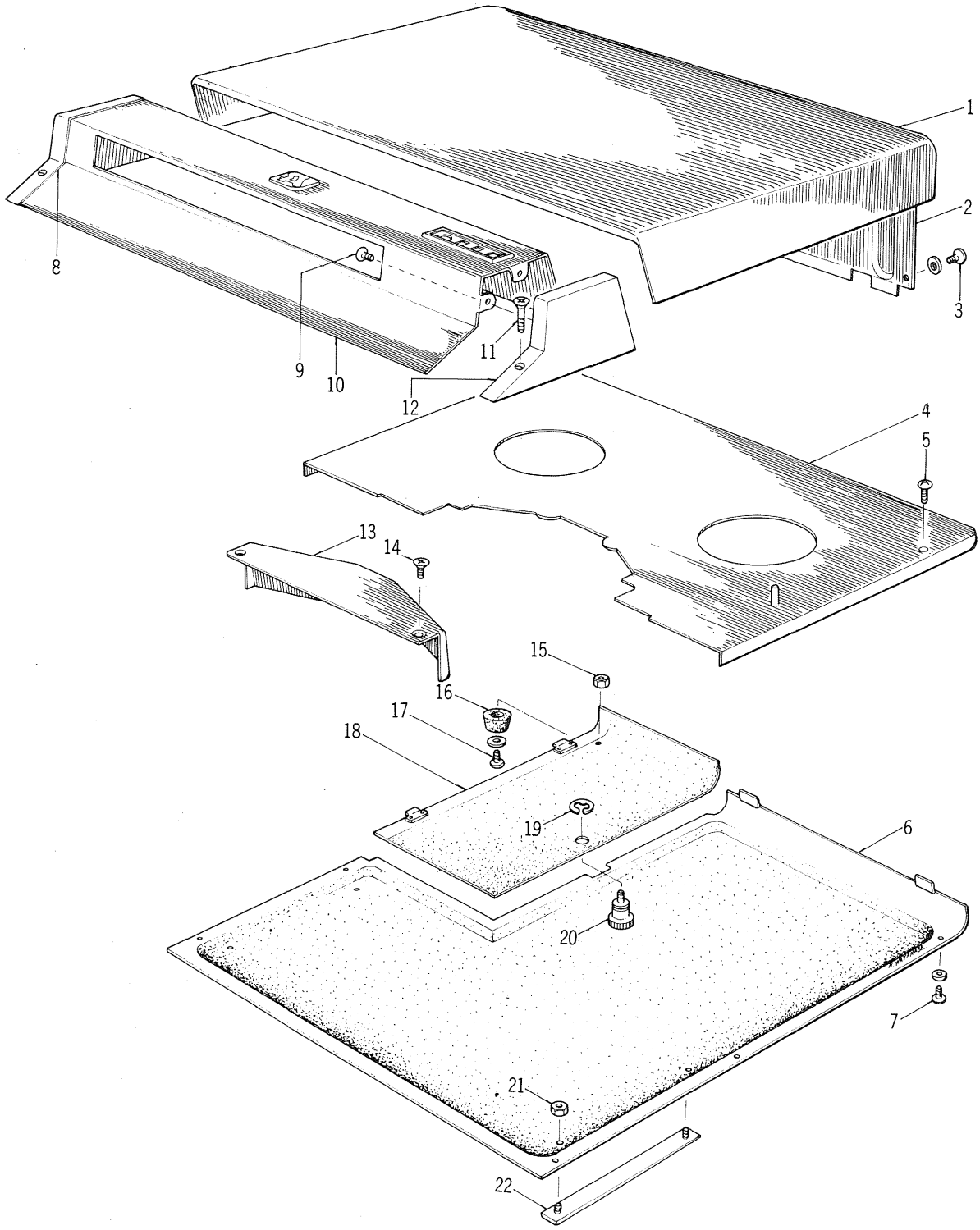
FRONT & SIDE PANEL BLOCK

Ref. No.	Parts No.	Nomenclature	Qu'ty
0	X5-3300	Handle Assembly	1
1	X5-3348	Handle	1
2	X5-3349	Metal Part, Handle	2
3	X5-3352	Metal Part C, Handle	1
4	X5-3353	Screw, round head counter sunk 3 x 8 mm	5
5	X5-2733	Speaker Escutcheon (right)	1
6	X5-2736	Screw, binding head 3 x 8 mm	4
7	X5-2735	Retainer, Speaker Mounting	8
8	X5-2737	Screw, binding head 3 x 6 mm	4
9	X5-2725	Control Panel	1
10	X5-2742	Knob, Speed Changing	1
11	X5-2739	Screw, without head 3 x 5 mm	4
12	X5-2738	Knob A, Tone Control	2
13	X5-2744	Spring, Volume Control	2
14	X5-2740	Knob B, Volume Control	2
15	X5-2702	Escutcheon, Meter	1
16	X5-2732	Speaker Escutcheon (left)	1
17	X5-3351	Spring, Handle	1
18	X5-2734	Speaker (8P-65S)	2
19	X5-2708	Checker with Holder, Battery KL-248A-1 (M-3)	1
20	X5-2712	Nut 2.3 mm	1
21	X5-2701	Control Chassis	1
22	X5-2713	Switch Lever A	1
23	X5-2714	Screw, without head 4 x 4.5 mm	2
24	X5-2802	Bracket, Switch Mounting	1
25	X5-2719	Nut 2.3 mm	2
26	X5-2801	Rotary Switch F-244-2	1
27	X5-2704	VU Meter A-81 (M-1)	2
28	X5-2705	Holder, Meter	1
29	X5-2707	Nut 2.3 mm	2
30	X5-2803	Screw, binding head 2.3 x 5 mm	2
31	X5-2800	Equalizer Printed Board Assembly Complete	1
32	X5-2726	2-pole Mic. Jack E (J1 – 2)	2
33	X5-2706	Screw, flat head 2.3 x 5 mm	2
34	X5-2720	Slide Switch FS-201NH (SW-1) Mic/Line	1
35	X5-2730	Tone & Volume Control V162DS (SG) (VR-2a – b)	2
36	X5-2731	Tone/Volume Control with Switch VI62DN (VI-1a-b) (SW-4)	1
37	X5-2621	Holder with Transistor Cooler, Main Amplifier	2
38	X5-2628	Name Plate, Speaker Jack	1
39	X5-2627	Screw, flat head 2 x 5 mm	2
40	X5-2335	Side Frame (left)	1
41	X5-2411	Battery Box	1
42	X5-2412	Screw, flat head 2.3 x 5 mm	4
43	X5-2629	2-pole Speaker Jack E	2
44	X5-2626	Slide Switch FS-201NH	1
45	X5-2600	Main Amplifier Printed Board Assembly Complete	1
46	X5-2000	Motor Printed Board Assembly Complete	1
47	X5-3003	Screw, binding head 3 x 5 mm	2
48	X5-3008	Lug Plate 20L	1
49	X5-2002	Heat Sink Plate	1
50	X5-3010	Nut 2.3 mm	1
51	X5-3013	Screw, binding head 2.3 x 5 mm	2
52	X5-3001	Plate, DIN Jack Mounting	1
53	X5-3006	Name Plate, DIN Jack	1
54	X5-2345	Screw, round head 3 x 6 mm	2
55	X5-2337	Holder, Pre-amplifier	1
56	X5-2340	Nut 4 mm	2
57	X5-2336	Side Frame (right)	1
58	X5-2339	Screw for Handle 4 x 12 mm	2
59	X5-3007	5P DIN Jack	1
60	X5-3009	Screw, truss head 2.3 x 8 mm	2

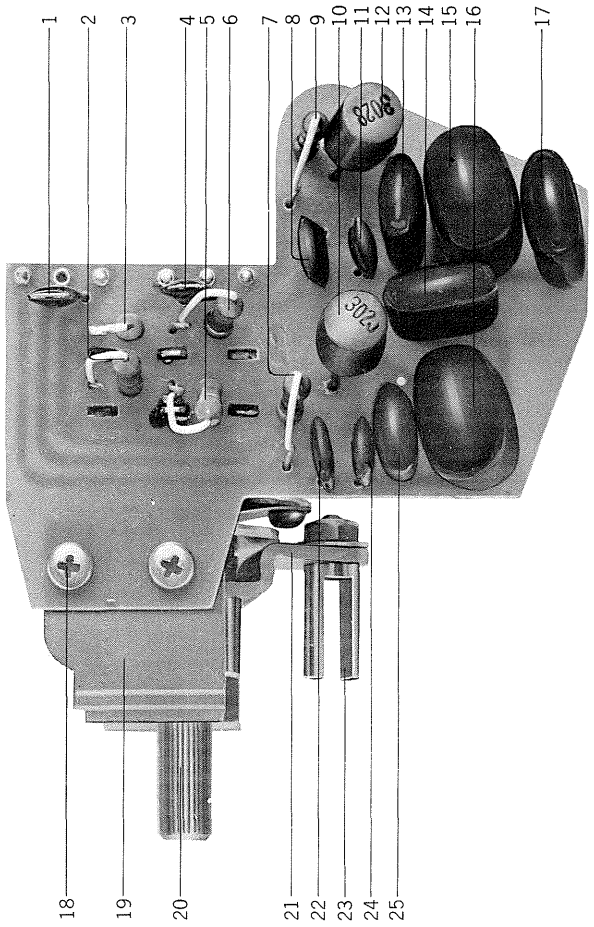
Ref. No.	Parts No.	Nomenclature	Qu'ty
	X5-3004	Slide Switch SL-242B-4F	1
	X5-3005	Screw, flat head 2.6 x 5 mm	2

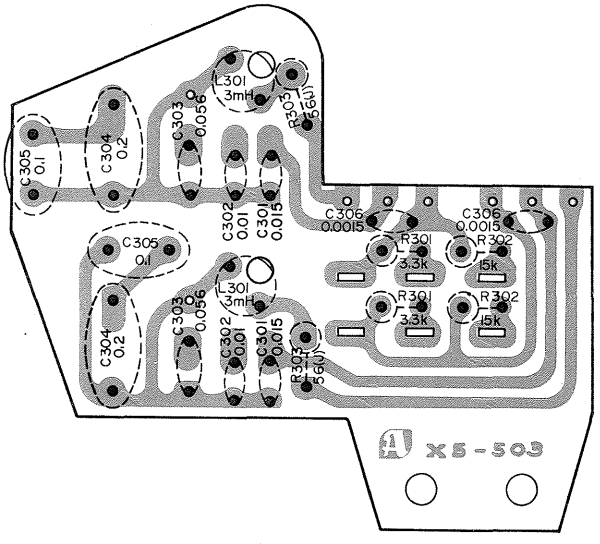
CASE BLOCK (X5-3300)



CASE BLOCK (X5-3300)

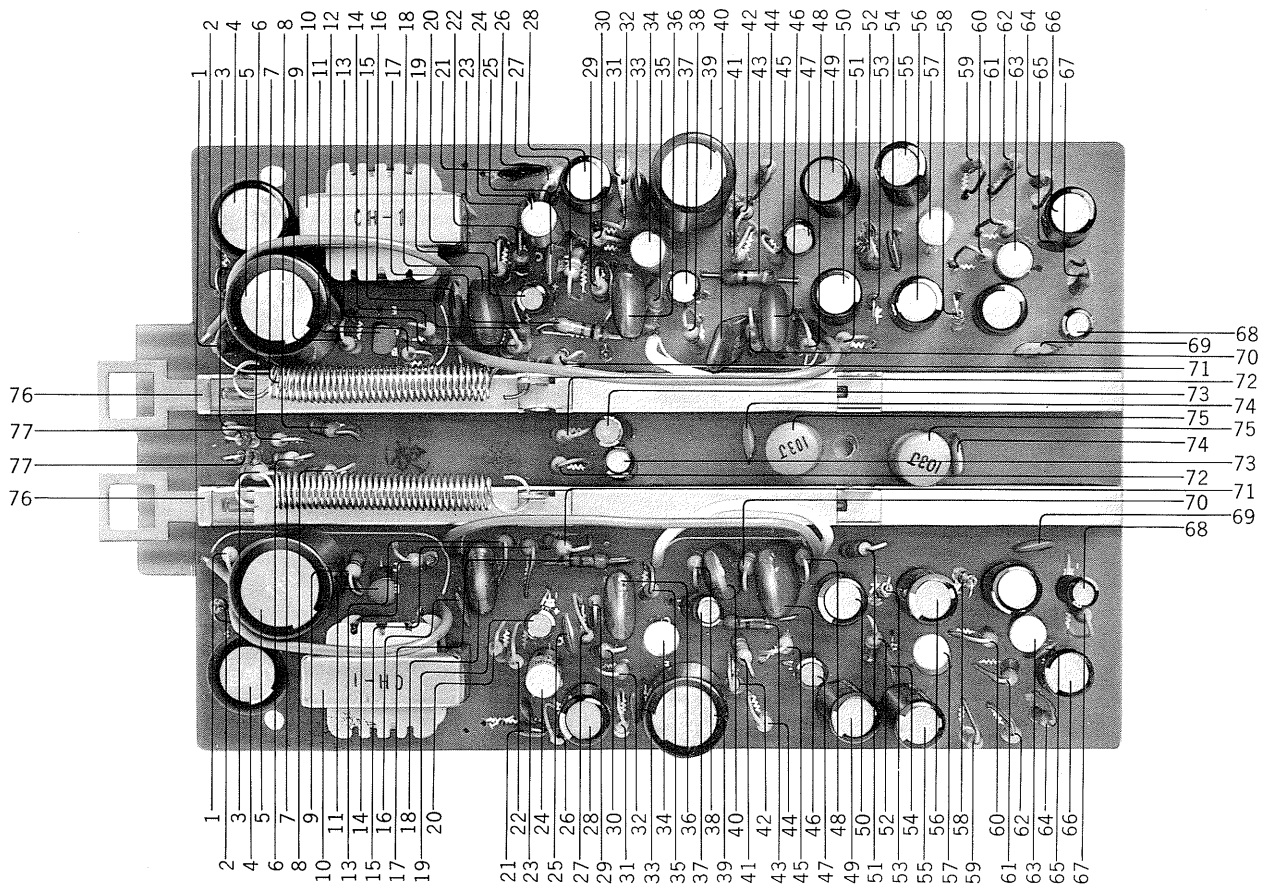
Ref. No.	Parts No.	Nomenclature	Qu'ty
1	X5-3311	Case Cover A	1
2	X5-3310	Case Cover C-2	1
3	X5-3315	Screw, truss head 2.3 x 8 mm	4
4	X5-3316	Mechanism Panel	1
5	X5-3322	Screw, truss head 3 x 6 mm	2
6	X5-3338	Case Cover B	1
7	X5-3341	Screw, truss head 2.3 x 6 mm	4
8	X5-3330	Upper Frame (left)	1
9	X5-3331	Screw, binding head 2.3 x 3 mm	6
10	X5-3332	Upper Panel	1
11	X5-3336	Screw, round head counter sunk 3 x 15 mm	2
12	X5-3329	Upper Frame (right)	1
13	X5-3324	Head Cover	1
14	X5-3325	Screw, flat head 3 x 5 mm	2
15	X5-3360	Nut 2.3 mm	1
16	X5-3355	Rubber Foot	2
17	X5-3356	Screw, truss head 2.3 x 8 mm	2
18	X5-3342	Case Cover D	1
19	X5-3346	"E" Ring	1
20	X5-3345	Set Screw, Case Cover D	1
21	X5-3340	Nut 2.3 mm	4
22	X5-3339	Oblong Plastic Foot	2

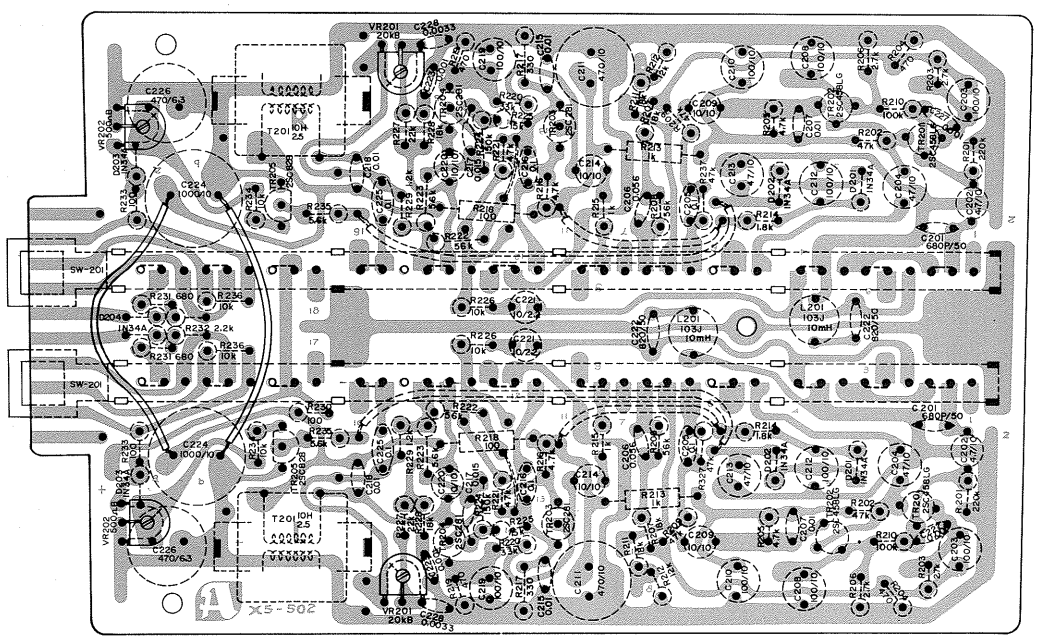




EQUALIZATION BLOCK ASSEMBLY (X5-503)

Ref. No.	Parts No.	Nomenclature	Qu'ty
0	X5-503 (X5-2800)	Equalization Block Assembly	1
1	X5-C306	Mylar Condenser 0.0015μ 50 V	1
2	X5-R302	Carbon Resistor with stopper 15K 1/4 watt	1
3	X5-R302	Carbon Resistor with stopper 15K 1/4 watt	1
4	X5-C306	Mylar Condenser 0.0015μ 50 V	1
5	X5-R301	Carbon Resistor with stopper 3.3K 1/4 watt	1
6	X5-R301	Carbon Resistor with stopper 3.3K 1/4 watt	1
7	X5-R303	Carbon Resistor with stopper 56Ω 1/4 watt	1
8	X5-C301	Mylar Condenser, vertical mounting type 0.015μ 50 V	1
9	X5-R303	Carbon Resistor with stopper 56Ω 1/4 watt	1
10	X5-L301	Inductive Coil FL7H 302	1
11	X5-C302	Mylar Condenser, vertical mounting type 0.01μ 50 V	1
12	X5-L301	Inductive Coil FL7H 302	1
13	X5-C303	Mylar Condenser, vertical mounting type 0.056μ 50 V	1
14	X5-C305	Mylar Condenser, vertical mounting type 0.1μ 50 V	1
15	X5-C304	Mylar Condenser, vertical mounting type 0.2μ 50 V	1
16	X5-C304	Mylar Condenser, vertical mounting type 0.2μ 50 V	1
17	X5-C305	Mylar Condenser, vertical mounting type 0.1μ 50 V	1
18	X5-2803	Screw, binding head 2.3 x 5 mm	2
19	X5-2802	Bracket, Switch Mounting	1
20	X5-2801	Rotary Switch F-244-2	1
21	X5-2713	Switch Lever A	1
22	X5-C301	Mylar Condener, vertical mounting type 0.015μ 50 V	1
23	X5-2715	Grooved Shaft, for Tape Speed Change	1
24	X5-C302	Mylar Condenser, vertical mounting type 0.01μ 50 V	1
25	X5-C303	Mylar Condenser, vertical mounting type 0.056μ 50 V	1



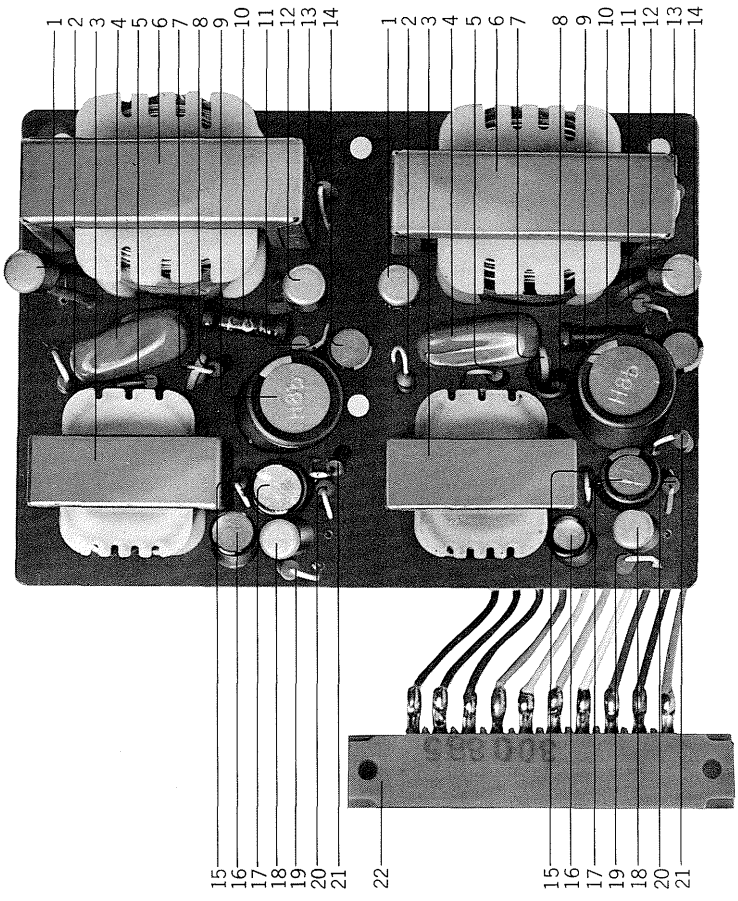


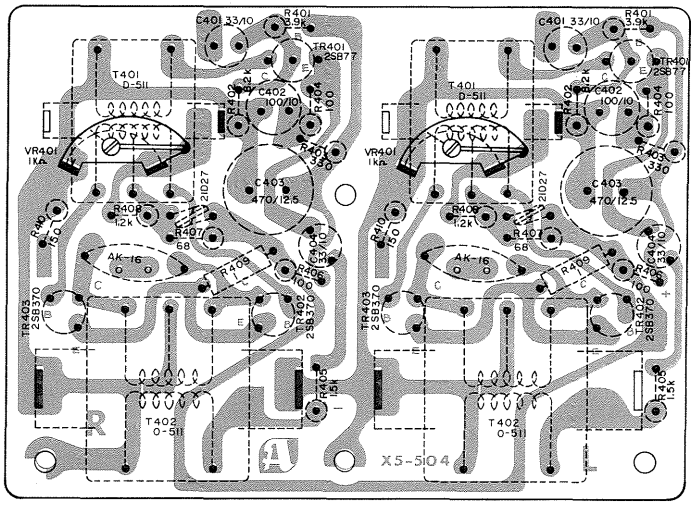
PRE-AMPLIFIER BLOCK ASSEMBLY (X5-502)

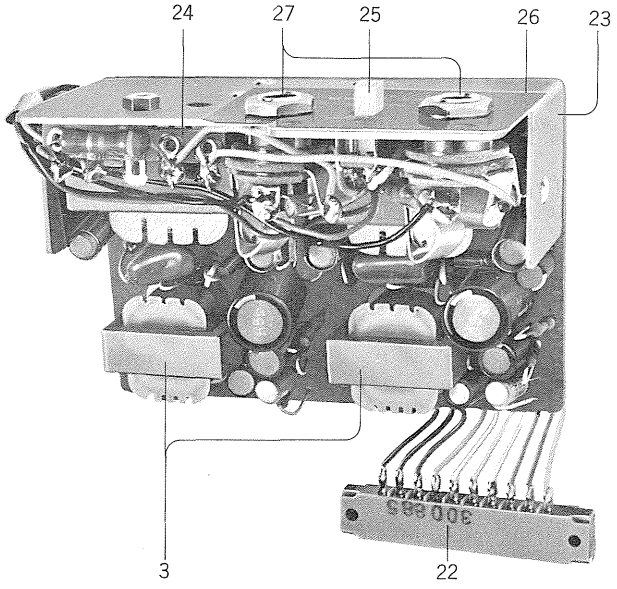
Ref. No.	Parts No.	Nomenclature	Qu'ty
0	X5-502 (X5-3200)	Pre-amplifier Block Assembly	1
1	X5-R233	Carbon Resistor with stopper 100Ω 1/4 watt	2
2	X5-D203	Germanium Diode IN34A	1
3	X5-R231	Carbon Resistor with stopper 680Ω 1/4 watt	2
4	X5-C226	Electrolytic Condenser, vertical mounting type 470μ 6.3 V	2
5	X5-C224	Electrolytic Condenser, vertical mounting type 1000μ 10 V	2

Ref. No.	Parts No.	Nomenclature	Qu'ty
6	X5-R232	Carbon Resistor with stopper 2.2K 1/4 watt	2
7	X5-S201	Spring, switch lever tension	2
8	X5-R236	Carbon Resistor with stopper 10K 1/4 watt	2
9	X5-R234	Carbon Resistor with stopper 10K 1/4 watt	2
10	X5-T201	Transformer CH-1	2
11	X5-TR205	Transistor, 2SC-828 R	2
12	X5-R230	Carbon Resistor with stopper 100Ω 1/4 watt	1
13	X5-R229	Carbon Resistor with stopper 1.2K 1/4 watt	2
14	X5-R235	Carbon Resistor with stopper 5.6K 1/4 watt	1
15	X5-R223	Carbon Resistor with stopper 5.6K 1/4 watt	2
16	X5-C218	Mylar Condenser, vertical mounting type 0.01μ 50 V	2
17	X5-R218	Carbon Resistor 100Ω 1/4 watt	2
18	X5-C225	Mylar Condenser, vertical mounting type 0.1μ 50 V	2
19	X5-C220	Electrolytic Consender, vertical mounting type 10μ 10 V	2
20	X5-R227	Carbon Resistor with stopper 33K 1/4 watt	2
21	X5-C228	Mylar Condenser, vertical mounting type 0.0033μ	2
22	X5-R228	Carbon Resistor with stopper 18K 1/4 watt	2
23	X5-C223	Mylar Condenser, vertical mounting type 0.001μ 50 V	2
24	X5-TR204	Transistor, 2SC-281 B	2
25	X5-C217	Mylar Condenser, vertical mounting type 0.015μ 50 V	2
26	X5-R219	Electrolytic Condenser, vertical mounting type 100μ 10 V	2
27	X5-R224	Carbon Resistor with stopper 150K 1/4 watt	2
28	X5-C219	Electrolytic Condenser, vertical mounting type 100μ 10 V	2
29	X5-R221	Carbon Resistor with stopper 47K 1/4 watt	2
30	X5-R225	Carbon Resistor with stopper 15K 1/4 watt	2
31	X5-R217	Carbon Resistor with stopper 330Ω 1/4 watt	2
32	X5-R220	Carbon Resistor with stopper 33K 1/4 watt	2
33	X5-C215	Mylar Condenser, vertical mounting type 0.01μ 50 V	2
34	X5-TR203	Transistor, 2SC-281 B	2
35	X5-R216	Carbon Resistor with stopper 4.7K 1/4 watt	2
36	X5-C216	Mylar Condenser, vertical mounting type 0.1μ 50 V	2
37	X5-C214	Electrolytic Condenser, vertical mounting type 10μ 10 V	2
38	X5-R215	Carbon Resistor with stopper 1K 1/4 watt	2
39	X5-C211	Electrolytic Condenser, vertical mounting type 470μ 10 V	2
40	X5-C206	Mylar Condenser, vertical mounting type 0.056μ 50 V	2
41	X5-R207	Carbon Resistor with stopper 18K 1/4 watt	2
42	X5-R211	Carbon Resistor with stopper 18K 1/4 watt	2
43	X5-R213	Carbon Resistor 1K 1/4 watt	2
44	X5-R212	Carbon Resistor with stopper 12K 1/4 watt	2
45	X5-R209	Carbon Resistor with stopper 47K 1/4 watt	2
46	X5-C205	Mylar Condenser, vertical mounting type 0.1μ 50 V	2
47	X5-C209	Electrolytic, Condenser vertical mounting type 10μ 10 V	2
48	X5-R237	Carbon Resistor with stopper 47K 1/4 watt	2
49	X5-C210	Electrolytic Condenser, vertical mounting type 100μ 10 V	2
50	X5-C213	Electrolytic Condenser, vertical mounting type 470μ 10 V	2
51	X5-R214	Carbon Resistor with stopper 1.8K 1/4 watt	2
52	X5-R205	Carbon Resistor with stopper 4.7K 1/4 watt	2
53	X5-D202	Germanium Diode IN 34A	2
54	X5-C207	Mylar Condenser, vertical mounting type 0.01μ 50 V	2
55	X5-C208	Electrolytic, Condenser, vertical mounting type 100μ 10 V	2
56	X5-C212	Electrolytic Condenser, vertical mounting type 100μ 10 V	2
57	X5-TR202	Transistor, 2SC-650A	2
58	X5-D201	Germanium Diode IN34A	2
59	X5-R206	Carbon Resistor with stopper 2.7K 1/4 watt	2
60	X5-R202	Carbon Resistor with stopper 47K 1/4 watt	2
61	X5-R210	Carbon Resistor with stopper 100K 1/4 watt	2
62	X5-R204	Carbon Resistor with stopper 470Ω 1/4 watt	2
63	X5-TR201	Transistor 2SC-650A	2
64	X5-R203	Carbon Resistor with stopper 2.7K 1/4 watt	2
65	X5-C227	Mylar condenser, vertical mounting type 0.001μ 50 V	2
66	X5-C203	Electrolytic Condenser, vertical mounting type 100μ 10 V	2
67	X5-R201	Carbon Resistor with stopper 220K 1/4 watt	2
68	X5-C202	Electrolytic Condenser, vertical mounting type 4.7μ 10 V	2
69	X5-C201	Ceramic Condenser, vertical mounting type 680P 50 V	2
70	X5-R208	Carbon Resistor with stopper 56K 1/4 watt	2
71	X5-R222	Carbon Resistor with stopper 56K 1/4 watt	2
72	X5-R226	Carbon Resistor with stopper 10K 1/4 watt	2
73	X5-C221	Electrolytic Condenser, vertical mounting type 2.2μ 10 V	2
74	X5-C222	Ceramic Condenser, vertical mounting type 820P 50 V	2
75	X5-L201	Inductive Coil FL9H 103	2
76	X5-S201	Slide Switch CLB-1122B-35	2
77	X5-D204	Germanium Diode IN34A	2
	X5-VR202	Variable Resistor, 500Ω type B	2
	X5-VR201	Variable Resistor, 20K type B	2

MAIN AMPLIFIER BLOCK ASSEMBLY (X5-504)

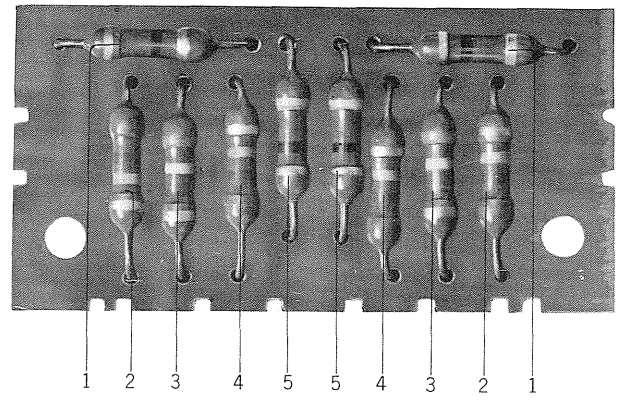


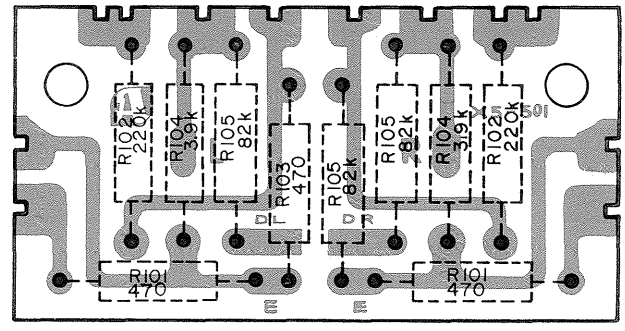




MAIN AMPLIFIER BLOCK ASSEMBLY(X5-504)

Ref. No.	Parts No.	Nomenclature	Qu'ty
0	X5-504 (X5-2600)	Main Amplifier Block Assembly	1
1	X5-TR403	Transistor 2SB370 B	2
2	X5-R410	Carbon Resistor with stopper 150Ω 1/4 watt	2
3	X5-T401	Driver Transformer N-24B-6254A	2
4	X5-AK16	C.R. Compound	2
5	X5-R408	Carbon Resistor with stopper 1.2K 1/4 watt	2
6	X5-T402	Output Transformer N35-5918B	2
7	X5-TH407	Thermister 21D27	2
8	X5-R407	Carbon Resistor with stopper 68Ω 1/4 watt	2
9	X5-C403	Electrolytic Condenser, vertical mounting type 470μ 10 V	2
10	X5-R409	Wire wound Resistor, type L, 1Ω 1/4 watt	2
11	X5-R406	Carbon Resistor with stopper 100Ω 1/4 watt	2
12	X5-TR402	Transistor 2SB370 B	2
13	X5-R405	Carbon Resistor with stopper 1.5K 1/4 watt	2
14	X5-C404	Electrolytic Condenser, vertical mounting type 33μ 10 V	2
15	X5-R402	Carbon Resistor with stopper 8.2K 1/4 watt	2
16	X5-C401	Electrolytic Condenser, vertical mounting type 33μ 10 V	2
17	X5-C402	Electrolytic Condenser, vertical mounting type 100μ 10 V	2
18	X5-TR401	Transistor, 2SB77 B	2
19	X5-R401	Carbon Resistor with stopper 3.9K 1/4 watt	2
20	X5-R404	Carbon Resistor with stopper 100Ω 1/4 watt	2
21	X5-R403	Carbon Resistor with stopper 330Ω 1/4 watt	2
22	X5-J401	Multi Jack 10P	1
23	X5-2621	Holder with Transistor Cooler	1
24	X5-LP301	Lug Plate VB2L2	1
25	X5-2626	Slide Switch, FS-201NH for MUTE/NORM	1
26	X5-2628	Name Plate, Ext. Spkr. jack	1
27	X5-2629	Speaker Jack (2-conductor) E-type	2
	X5-VR401	Variable Resistor 1KΩ B V17K-2-1	2

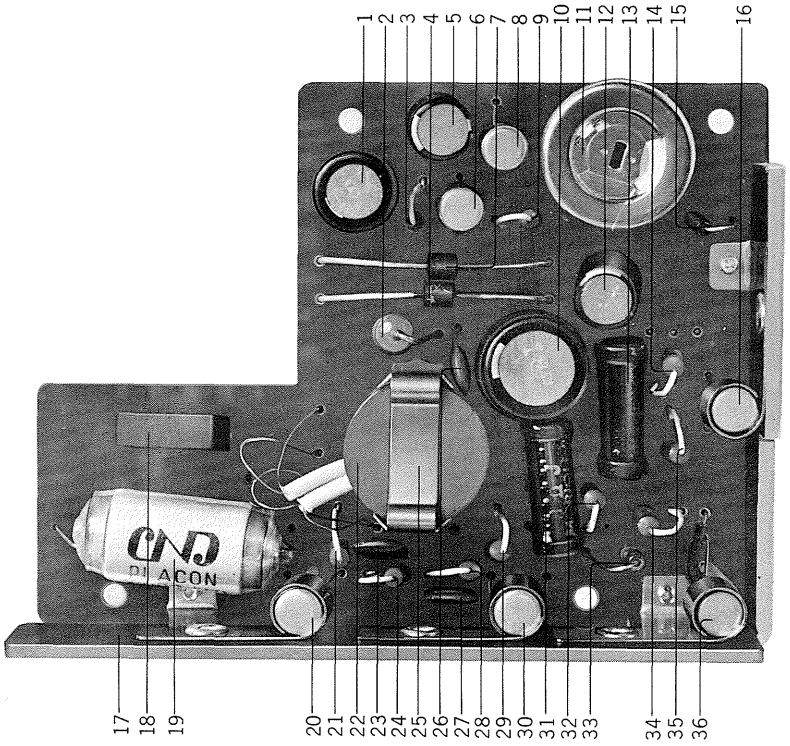


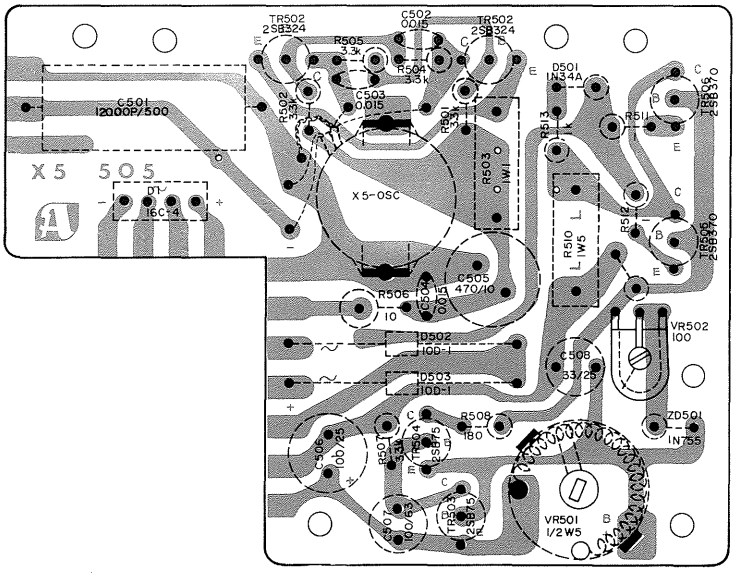


ATTENUATOR BLOCK ASSEMBLY (X5-501)

Ref. No.	Parts No.	Nomenclature	Qu'ty
0	X5-501	Attenuator Block Assembly	1
		Carbon Resistor	
1	X5-R101	470Ω 1/4 watt	2
2	X5-R102	220K 1/4 watt	2
3	X5-R104	3.9K 1/4 watt	2
4	X5-R105	82K 1/4 watt	2
5	X5-R103	470Ω 1/4 watt	2

OSCILLATOR/CHARGER BLOCK (X5-505)

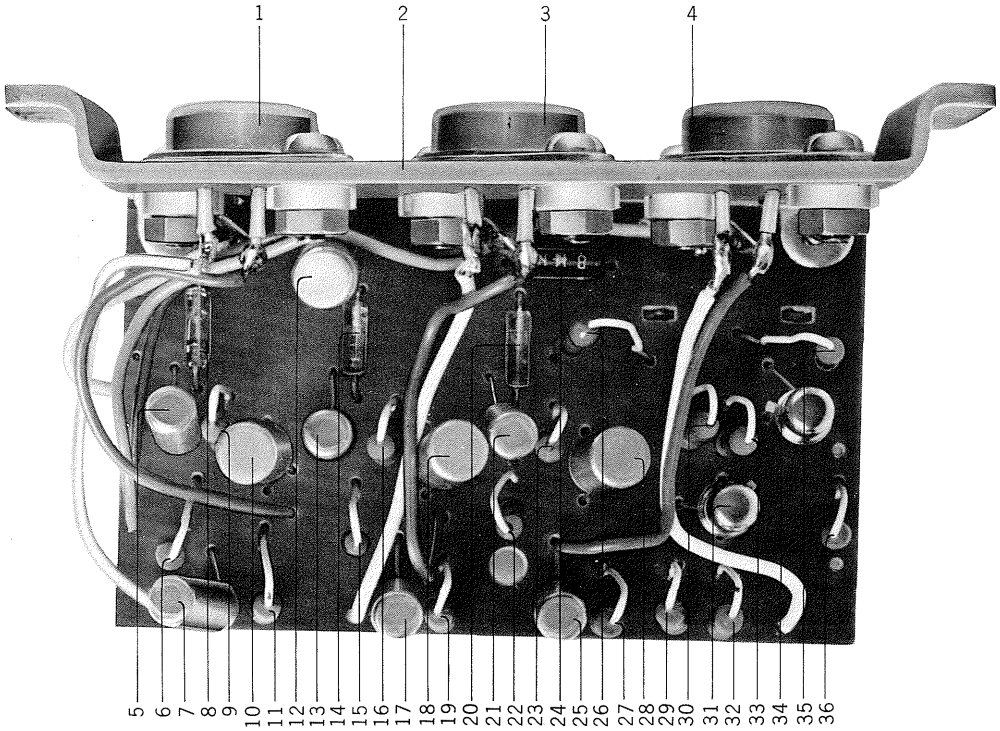


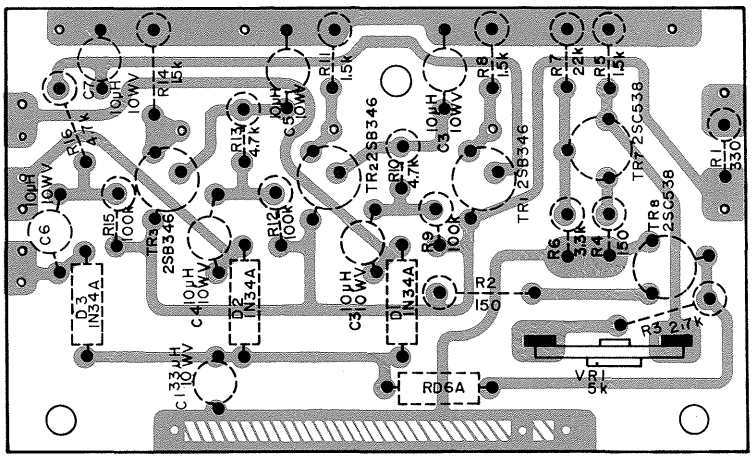


OSCILLATOR/CHARGER BLOCK (X5-505)

Ref. No.	Parts No.	Nomenclature	Qu'ty
0	X5-505 (X5-3100)	Oscillator/Charger Block Complete	1
1	X5-C506	Electrolytic Condenser, vertical mounting type	
2	X5-R506	Carbon Resistor 10Ω 1/2 watt	1
3	X5-R507	Carbon Resistor with stopper 3.3K 1/4 watt	1
4	X5-D502	Silicon Diode 10D-1	1
5	X5-C507	Electrolytic Condenser, vertical mounting type 100μ 6.3 V	1
6	X5-TR504	Transistor, 2SB75 B	1
7	X5-D503	Silicon Diode 10D-1	1
8	X5-TR503	Transistor, 2SB75 B	1
9	X5-R508	Carbon Resistor with stopper 180Ω 1/4 watt	1
10	X5-C505	Electrolytic Condenser, vertical mounting type 470μ 10 V	1
11	X5-VR501	Wirewound Variable Resistor WR181K	1
12	X5-C508	Electrolytic Condenser, vertical mounting type 33μ 25 V	1
13	X5-R510	Wirewound Resistor 5Ω 1 watt	1
14	X5-R509	Carbon Resistor with stopper 470Ω 1/4 watt	
15	X5-ZD501	Zener Diode IN755	1
16	X5-TR505	Transistor, 2SB370 B	1
17	X5-3127	Heat Sink Plate C	1
18	X5-D505	Rectifier 16C-4 D1	1
19	X5-C501	Plastic Condenser, tublar type 1200P 500 V	1
20	X5-TR502	Transistor, 2SB324	1
21	X5-R502	Carbon Resistor with stopper 3.3K 1/4 watt	1
22	X5-OSC1	Oscillator Coil	1
23	X5-C503	Mylar Condenser, vertical mounting type 0.015μ 50 V	1
24	X5-R505	Carbon Resistor with stopper 3.3K 1/4 watt	1
25	X5-HOSC1	Holder, Oscillator Coil	2
26	X5-C504	Mylar Condenser, vertical mounting type 0.015μ 50 V	1
27	X5-C502	Mylar Condenser, vertical mounting type 0.015μ 50 V	1
28	X5-R504	Carbon Resistor with stopper 3.3K 1/4 watt	1
29	X5-R501	Carbon Resistor with stopper 3.3K 1/4 watt	1
30	X5-TR502	Transistor, 2SB324	1
31	X5-R503	Wirewound Resistor L-type 1Ω 1W	
32	X5-R513	Carbon Resistor with stopper 1K 1/4 watt	1
33	X5-D501	Germanium Diode IN34A	1
34	X5-R511	Carbon Resistor with stopper 1Ω 1/4 watt	1
35	X5-R512	Carbon Resistor with stopper 1Ω 1/4 watt	1
36	X5-TR506	Transistor, 2SB370 B	1
	X5-VR502	Variable Resistor 100Ω B	1

MOTOR PRINTED CIRCUIT ASSEMBLY (X5-2000)





MOTOR PRINTED CIRCUIT ASSEMBLY (X5-2000)

Ref. No.	Parts No.	Nomenclature	Qu'ty
0	X5-2000	Motor Printed Circuit Assembly	1
1	X5-TR06	Transistor, 2SB367 (B)	1
2	X5-2002	Heat Sink Plate	1
3	X5-TR05	Transistor, 2SB367 (B)	1
4	X5-TR04	Transistor, 2SB367 (B)	1
5	X5-C06	Tantalum Electrolytic Capacitor, vertical mounting type	1
6	X5-R016	Carbon Resistor with stopper 4.7K 1/4 watt	1
7	X5-C07	Tantalum Electrolytic Capacitor, vertical mounting type	1
8	X5-D03	Germanium Diode IN34A	1
9	X5-R015	Carbon Resistor with stopper 100K 1/4 watt	1
10	X5-TR03	Transistor, 2SB-346	1
11	X5-R014	Carbon Resistor with stopprt 1.5K 1/4 watt	1
12	X5-C01	Tantalum Electrolytic Capacitor, vertical mounting type 33μ 10 V	1
13	X5-C04	Tantalum Electrolytic Capacitor, vertical mounting type 10μ 10 V	1
14	X5-D02	Germanium Diode IN34 A	1
15	X5-R013	Carbon Resistor with stopper 4.7K 1/4 watt	1
16	X5-R012	Carbon Resistor with stopper 100K 1/4 watt	1
17	X5-C05	Tantalum Electrolytic Capacitor, vertical mounting type 10μ 10 V	1
18	X5-TR02	Transistor, 2SB-346	1
19	X5-R011	Carbon Resistor, with stopper 1.5K 1/4 watt	1
20	X5-D01	Germanium Diode IN34A	1
21	X5-C03	Tantalum Electrolytic Capacitor, vertical mounting type 16μ 10 V	1
22	X5-R010	Carbon Resistor with stopper 4.7K 1/4 watt	1
23	X5-R09	Carbon Resistor with stopper 100K 1/4 watt	1
24	X5-ZD01	Zener Diode RD-6A	1
25	X5-C03	Tantalum Electrolytic Capacitor, vertical mounting type 10μ 10 V	1
26	X5-R02	Carbon Resistor with stopper 150Ω 1/4 watt	1
27	X5-R08	Carbon Resistor with stopper 1.5K 1/4 watt	1
28	X5-TR01	Transistor, 2SB-346	1
29	X5-R07	Carbon Resistor with stopper 22K 1/4 watt	1
30	X5-R06	Carbon Resistor with stopper 3.3K 1/4 watt	1
31	X5-TR07	Transistor, 2SC538	1
32	X5-R05	Carbon Resistor with stopper 1.5K 1/4 watt	1
33	X5-R04	Carbon Resistor with stopper 150Ω 1/4 watt	1
34	X5-TR08	Transistor, 2SC-538	1
35	X5-R03	Carbon Resistor with stopper 680Ω 1/4 watt	1
36	X5-R01	Carbon Resistor with stopper 330Ω 1/4 watt	1
	X5-VR01	Variable Resistor 10K B	1

X-5

TR201 2SC458LG(B) TR202 2SC458LG(B) TR203 2SC281(B) TR204 2SC281(B) TR401 2SB77(B) TR402~3 2SB370(B)

MIC LINE LEFT RIGHT LINE MIC.

PLAY 0.3~0.5V Y
REC MONI 50mA X
20mV -32db
DIN J3

CH1 CH2 A BH B EH C

TR8 2SC538(S)(T) TR1 2SB346 TR7 2SC538(S)(T) TR2 2SB346 TR3 2SB346 TR4 2SB367(B) TR5 2SB367(B) TR6 2SB367(B)

TR205 2SC828(R)

TR501~2 2SB324(E) X5-OSC

TR505~6 2SB370(B)

TR503~4 2SB75(B)

D202 IN34A D203 IN34A D204 IN34A D501 IN34A D1 IN34A D2 IN34A D3 IN34A

A.G.C.

SW-2a SW-2b SW-301 SW201-1 SW201-2 SW201-3 SW201-4 SW201-5 SW201-6 SW201-7 SW201-8 SW201-9 SW201-10 SW201-11 SW201-12 SW-3 SW-4 SW-5 SW-6

VU METER

TEST POINT 6 mA

LEFT EXTERNAL SPEAKERS

RIGHT EXTERNAL SPEAKERS

S.P

REMOTE CONT

VOLTAGE SELECTOR

4-TRACK CROSS FIELD HEAD ASSEMBLY NO.10

SW201-1~12 REC/PB. CHANGE SWITCH (CLB1122B35)
(SHOWING RECORD OPERATION)
SW301 EQUALIZATION SELECTOR (CONTROLED BY SPEED SELECTOR SWITCH (F-244-2)
(SHOWING 7-½ IPS OPERATION)
SW401 MUTE SWITCH (FS201NH)
(SHOWING NORMAL OPERATION)

SW-1 INPUT SELECTOR SW. (MIC./LINE) (FS-201NH)
(SHOWING MIC. INPUT OPERATION)
SW-2 A.G.C. ON/OFF SW. (SL-242B4F)
(SHOWING A.G.C. "ON" CONDITION)
SW-3 AC/DC CHANGE SW. (BELONGS TO J4)
(INDICATES BATTERY VOLTAGE)

SW-4 AC POWER SW. (11A-1053A)
(SHOWING AC "OFF" CONDITION
SW-5 MOTOR SW. (LINKING WITH FWD., RWD. AND START LEVERS)
(SHOWING START CONDITION)

SW-6 IS "ON" AT FWD. OR RWD. OPERATION } LINKING WITH
SW-8 IS "ON" AT START PLAY OPERATION } START LEVER
SW-7 AMP. SW. (ATTACHED TO VR1 SW.)
(SHOWING AMP. "ON" CONDITION)

X-5 SCHEMATIC 13606246

N.W.