HST-399
TC-119W2

Set using ISO screws

General Export Model

SONY®

SERVICE MANUAL

2955

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SECTION 1
TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the HST-399 are listed in Table 1.

Table 1. HST-399 TECHNICAL SPECIFICATIONS

Fm Tuner Section

Frequency range:	87.5 to 108 MHz
Intermediate frequency:	10.7 MHz
Sensitivity:	3.0 μV (S/N = 30 dB)
Signal-to-noise ratio:	60 dB
Selectivity:	20 dB, IHF
Image rejection:	20 dB
I-f rejection:	50 dB
Antenna:	300 ohms balanced with ac line antenna
Fm stereo separation:	Greater than 30 dB at 400 Hz
Harmonic distortion:	Mono 2.0% at 400 Hz 100% mod. Stereo 2.0% at 400 Hz 100% mod.
SCA suppression:	50 dB
19 kHz, 38 kHz suppression:	46 dB

A-m Tuner Section

Frequency range:	530 to 1,605 kHz
Intermediate frequency:	455 kHz
Sensitivity:	48 dB/m, built-in antenna
Signal-to-noise ratio:	50 dB
Image rejection:	38 dB at 1,400 kHz
I-f rejection:	20 dB at 1,000 kHz
Harmonic distortion:	2.0%

Audio Amplifier Section

Music power:	10W, both channels operating, 8 ohms 5% THD
Rated output:	2.6 W, per channel, both channels operating, 8 ohms
Power bandwidth:	45 Hz to 15 kHz, 8 ohms, IHF
Harmonic distortion:	Less than 5% at 1 kHz at rated output
Input sensitivity:	PHONO: 500 mV, 2.8 M ohms TAPE: 300 mV, 60 k ohms MIC: 0.8 mV REC/PB: 300 mV, 60 k ohms
Signal-to-noise ratio:	PHONO: greater than 55 dB TAPE: greater than 60 dB REC/PB (input): greater than 60 dB (weighting network "B")
Tone controls:	BASS: ±10 dB at 100 Hz TREBLE: ±8 dB at 10 kHz
REC out:	80 mV
REC/PB (output):	40 mV, 88 k ohms

Cassette Section

Tape speed:	4.8 cm/sec (1⅞ inch/sec)
Frequency response:	50 Hz to 10 kHz (−15 dB)
Recording bias frequency:	85 kHz
Flutter and wow:	less than 0.5%
Input:	MIC (0.8 mV)

General

Power consumption:	Approx. 20W
Power requirements:	100, 117, 220, 240V, 50/60 Hz
Dimensions:	21" (width) × 5" (height) × 11 7/16" (depth) 534 mm (width) × 126 mm (height) × 290 mm (depth)
Net weight:	13 lb 14 oz (6.3 kg)
Shipping weight:	17 lb (7.7 kg)

1-2. BLOCK DIAGRAM

A block diagram of the HST-399 is provided for your understanding of the overall operation.

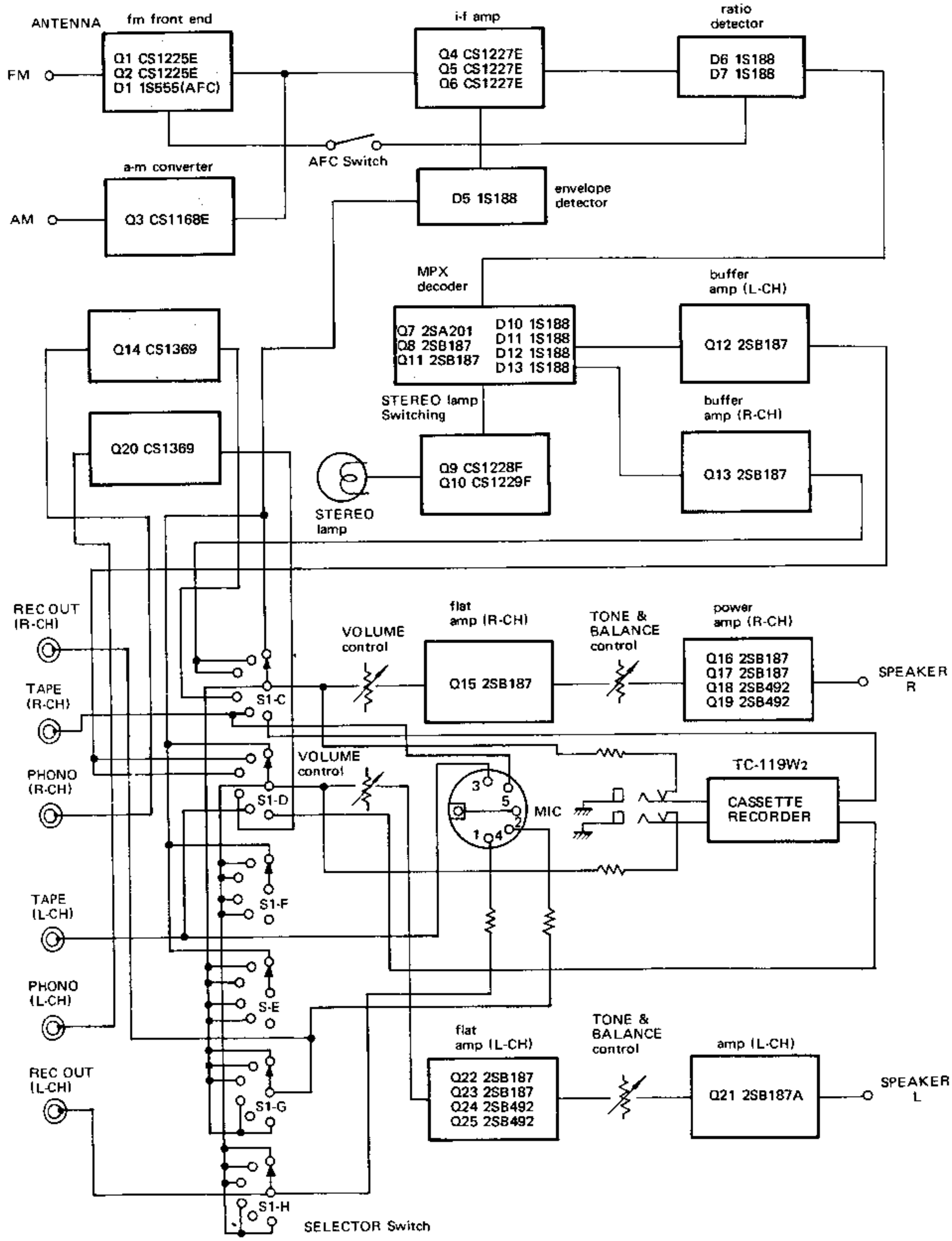


Fig. 1-1 Block diagram

1-3. CIRCUIT ANALYSIS

The following describes the functions of all stages and controls. The text sequence follows signal paths. Stages are listed by transistor reference designation at the left margin; major components are also listed in a similar manner. Refer to the block diagram on page 2 and the schematic diagram on page 35 and 36.

Fm Front End

Stage/Control	*Function*
ATT switch S4 (DX-LOCAL selector)	This selects the input network according to the signal strength for clear fm reception. In the DX position, input signals are directly fed to the fm front end. In the LOCAL position, excessively strong signals that may saturate the rf amplifier in the fm front end and cause distortion are attenuated in the resistive network.
Fm rf amplifier Q1	A common-base circuit is ideally suited for stable amplification. The output signals of this stage are developed across the tuned circuit at the collector of Q1, and fed to the subsequent converter stage through coupling capacitor C6.
Fm frequency converter Q2	This common-base configuration serves as both mixer and local-oscillator. The nonlinear base-emitter characteristic of Q2 is employed to function as a mixer. Transistor Q2 and the major components such as C8, C10, C11, CT-F2, CV-F2 and L3 form a modified Colpitts oscillator, that provides the injection voltage for heterodyne operation. Tuned transformer FM IFT-A develops the 10.7 MHz i-f output and provides low-impedance link coupling to the i-f amplifier chain.
Afc circuit D2	The afc circuit maintains a stable local-oscillator frequency. Frequency drift is detected as a dc voltage change at the discriminator and fed to variable capacitance diode D2 through AFC switch S2. The barrier capacitance of D2 changes according to the dc voltage applied across it. Since the series circuit composed of D2 and C12 is connected in parallel with the tank circuit of the local oscillator, it operates as a tuning capacitor, compensating for frequency drift. In the ON position of S2, relatively weak stations will not be received because strong adjacent stations will take over the afc.

I-f Amplifier Section

Stage/Control	*Function*
A-m frequency converter Q3	When the FUNCTION switch is set to AM, transistor Q3 operates as an a-m frequency converter to produce 455-kHz i-f output. This circuit employs a Hartley oscillator with feedback applied to the base of Q3 from the tap on a-m oscillator coil L2, through the antenna coil L1, to generate injection voltage for heterodyning with incoming a-m signals.
I-f transformer A-M IFT-F	I-f transformer A-M IFT-F develops the i-f signal and provides a path to ground through bypass capacitor C21 for the other heterodyne products.
Fm/a-m i-f amplifier Q4,5	The fm and a-m i-f strips use the same amplifier, tuned to both 10.7 MHz and 455 kHz. Switching is not necessary because of the wide difference in the intermediate frequencies.
A-m agc circuit	Two kinds of agc circuits are employed in this section, one is conventional reverse agc and the other is delayed agc. Reverse agc works as follows:

Stage/Control	Function
Reverse agc D5	The negative dc output voltage which is proportional to the input signal strength is picked off at the a-m detector (D5). It is filtered by R147, C29 and then fed back to the base of i-f amplifier Q4 through the secondary winding of A-M IFT-F and FM IFT-A. As a result, the bias current in Q4 decreases, reducing its gain.
Delayed agc D3, R12, R15	Delayed agc is also used to control the i-f amplifier's gain, especially when a relatively strong signal is received. The basic concept of this agc circuit is that the tuned amplifier's gain is greatly affected by the "Q" of the tank circuit. In this circuit, D3 acts as a shunting resistance which reduces effective "Q" of the tank circuit of A-M IFT-F to decrease amplifier's gain. Normally, voltage drops across R12 and R15 place a reverse bias on D3, so it presents a large value of resistance. When a strong signal is received, the collector current in Q4 is reduced by means of reverse bias agc. This in turn eliminates the reverse bias on D3, forcing it to conduct. As a result, the tank circuit of A-M IFT-F is shunted by the low forward resistance of D3. This drastically reduces the effective "Q" of the tank circuit.
Fm i-f amplifier Q6	Amplifies the 10.7-MHz signals to the level required to drive the ratio detector.
Ratio detector D6, D7 FM IFT-D FM IFT-E	Discriminator transformers FM IFT-D and FM IFT-E, and diodes D6 and D7 form a balanced ratio detector that transforms the frequency-modulated signal into an audio signal which appears across C36.
Envelope detector D5	Diode D5 acts as an envelope detector for a-m signals. A bypass capacitor (C30) removes the 455-kHz component in the detected signals. Audio output is, on the other hand, furnished to both audio amplifier chains.

Multiplex Decoder Section

Stage/Control	Function
SCA trap MT-D, C113	The composite stereo signal passes through the parallel trap consisting of MT-D and C113. This trap removes the unwanted SCA signals to provide a clean composite stereo signal.
Buffer amplifier Q7	This stage serves two functions. It extracts the 19-kHz pilot signal by means of a tuned circuit at its collector and provides a low-impedance source of composite stereo signal (without the pilot carrier) at its emitter. A parallel resonant circuit in the emitter circuit eliminates the 19-kHz pilot signal in the composite stereo signal.
19-kHz amplifier Q8	Amplifies the 19-kHz drive voltage for the frequency doubler (D8 and D9).
Frequency doubler D8, D9	Signals developed at the collector of Q8 are transformer-coupled to full-wave rectifier D8 and D9. The output of this rectifier is not filtered, resulting in two negative pulses for each input cycle. Thus the 19-kHz pilot-carrier frequency is effectively doubled by D8 and D9. However, the waveform is not sinusoidal at the base of Q11.
38-kHz amplifier Q11	The 38-kHz pulses produced by D8 and D9 are amplified by Q11. The tank circuit at the collector of Q11 is tuned to 38 kHz to restore these pulses to a sinusoidal switching signal. This signal is transformer-coupled to the bridge-type demodulator to supply the sampling drive.
STEREO lamp circuit Q9, Q10	The STEREO indicator lamp lights when an fm stereo signal is received. The output voltage of the frequency doubler is supplied to the base of Q9, which is normally cut off. The circuit operates as follows: When a composite stereo signal is

Stage/Control	*Function*
	applied to the multiplex decoder, the negative 38-kHz pulses produced by the frequency doubler force Q9 into conduction. This, in turn, makes Q10 conduct, thus lighting the STEREO lamp.
Multiplex, demodulator D10, D11, D12, D13	The demodulator circuit employs four diodes in a balanced-bridge arrangement. This system has the advantage of cancelling residual rf components (38-kHz signal, some 19-kHz signal, and higher-order harmonics of these frequencies). "L" and "R" components are developed at each side of the bridge as the result of demodulation, when the receiver is operated in the stereo mode. In the monaural mode, the emitter circuit of Q11 is opened, cutting off the 38 kHz carrier. Thus, only the composite stereo signal is applied to the demodulator. Diodes D10~D13 are forward biased to avoid nonlinear distortion.
De-emphasis C58, C62	These capacitors provide the roll-off at high-audio frequencies necessary to compensate for preemphasis at the transmitter.
38-kHz filter	This filter eliminates the 38-kHz carrier, thereby preventing carrier leak.
Buffer amplifier Q12, Q13	"L" and "R" audio signals are amplified to the level required to drive the following audio preamplifiers.
Channel separation adj. VR5	The network that connects the emitters of Q12 and Q13, provides a form of negative feedback between left and right channels. Any residual inverted "L" signals in the "R" channel are cancelled out by the "L" signal from the "L" channel. The same is true of residual "R" signals in the "L" channel. VR5 is therefore set for maximum channel separation.

Audio Amplifier Section

Since the audio amplifier section contains two identical amplifier chains, only the right channel will be described. Component reference designations for the left channel are given in parentheses.

Stage/Control	*Function*
Preamplifier Q14 (Q20)	This stage employs the common-collector configuration (emitter follower). This has the advantage of high-input impedance and low-output impedance.
VOLUME control VR1 Loudness circuit C100, C101, R132 (C103, C102, R133)	The signal level applied to the flat amplifier is determined by the setting of VR1. In addition, the loudness circuit compensates for the characteristics of the human ear, whose tonal response varies according to the loudness of the sound being heard. High- and low-frequency components are increased in inverse proportion to the VOLUME control setting.
Flat amplifiers Q15, Q16 (Q21, Q22)	These stages amplify the low-level signal provided by preamplifier Q14 and cassette recorder (or tape recorder connected to the TAPE or REC/PB jack) to the level required at the input of the power amplifier.
BASS control VR3	This control has a range of ±10 dB at 100 Hz.
TREBLE control VR4	This control has a range of ±8 dB at 10 kHz.
BALANCE control VR2	This control optimizes stereo reproduction by attenuating either channel's signal level.
Driver Q17 (Q23)	Transistor Q17 provides enough signal to drive the power transistors.
Driver transformer T1 (T2)	Transformer T1 provides equal but oppositely-phased output to drive the push-pull power-output stage.
Power amplifier Q18, Q19 (Q24, Q25)	These power transistors operate as emitter followers in the single-ended push-pull configuration, and deliver power to the speakers.

SECTION 2
DISASSEMBLY AND REPLACEMENT PROCEDURES

WARNING

Unplug the ac power cord before starting any disassembly or replacement procedures.

2-1. TOOLS REQUIRED

The following tools are required for performing disassembly and replacement procedures on the HST-399.

- Jacknut driver
- Screwdriver, Phillips head
- Diagonal cutters
- Contact cement
- Cement solvent
- Soldering iron, 40-150 watt
- Solder, rosin core
- Tape, electrical
- Tape, adhesive
- Wrench, 6-inch adjustable
- Pliers, long-nose
- Silicone grease

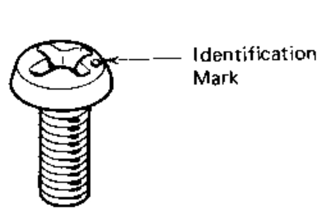


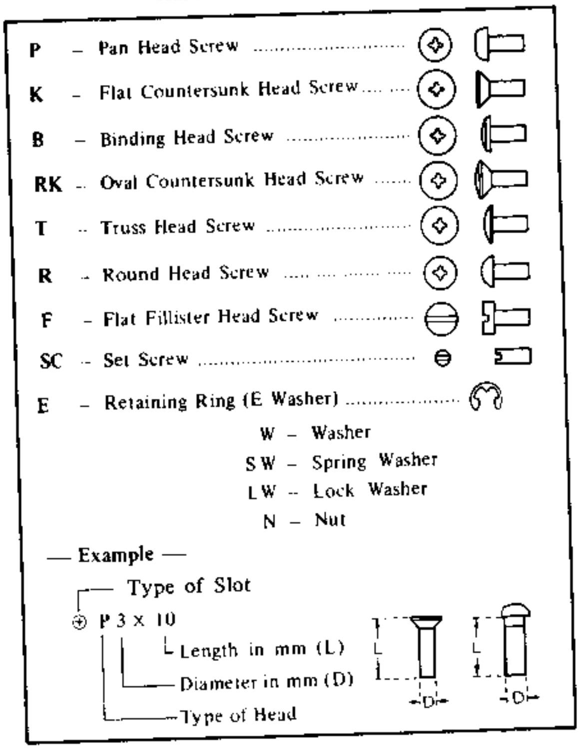
Fig. 2-1 ISO screw

2-2. HARDWARE IDENTIFICATION GUIDE

The following chart will help you to decipher the hardware codes given in this service manual.

NOTE: Some screws in the HST-399 are manufactured to the specifications of International Organization for Standardization (ISO). This means that the new and old screws are not interchangeable because ISO screws have a different number of threads per mm compared to the old ones. The ISO screws have an identification mark on their heads as shown in Fig. 2-1.

— Hardware Nomenclature —



2-3. RECEIVER UNIT REMOVAL

1. Remove all control knobs by pulling them off.
2. Remove the nut securing the HEADPHONE jack with a jacknut driver.
3. Remove the six screws at the rear hardboard; two of them (+P 2.6x6) secure the ATT switch, and the four others (wood screw +R 3.1x10) secure the hardboard to the wooden case. See Fig. 2-2.
4. Remove the seven screws (+P 3x20) at the bottom of the wooden case. See Fig. 2-2.
5. Disconnect 7 pin plug and two-pairs of Phono plug connecting between receiver unit and cassette deck.
6. Carefully draw the receiver unit out of the wooden case. Care should be taken so as not to damage the tuning-dial system.

2-4. FRONT-END BOARD REMOVAL

1. Remove the receiver unit as described in Procedure 2-3.
2. Turn the tuning shaft to place the dial-pointer in the center of the dial-scale back-plate. Then loosen one of the set screws on the tuning-capacitor drive-drum.
3. Turn the tuning shaft once more to set the pointer at the right side of the back-plate. Loosen the remaining set screw on the drive-drum.
4. Remove the tuning-capacitor drive-drum and lean it against the front sub-chassis, then fix it with adhesive tape as shown in Fig. 2-3.
5. Remove the nut and two screws (+K 2.6x4) that secure the front-end block to the chassis, and take out the front-end board. See Fig. 2-3.

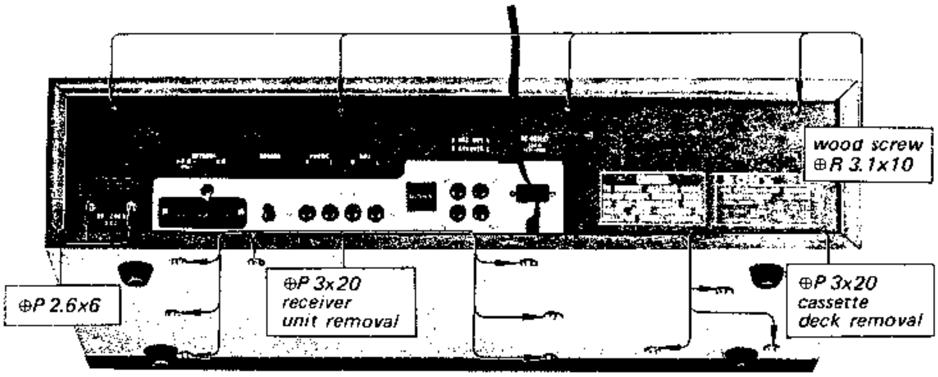


Fig. 2-2 Rear panel and bottom view

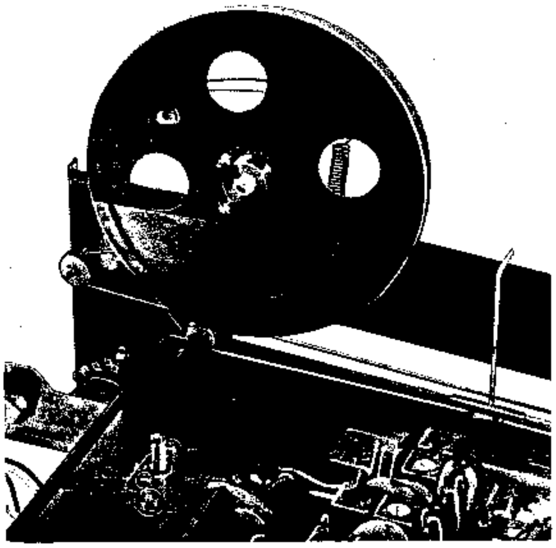


Fig. 2-3 Tuning-capacitor drive-drum removal

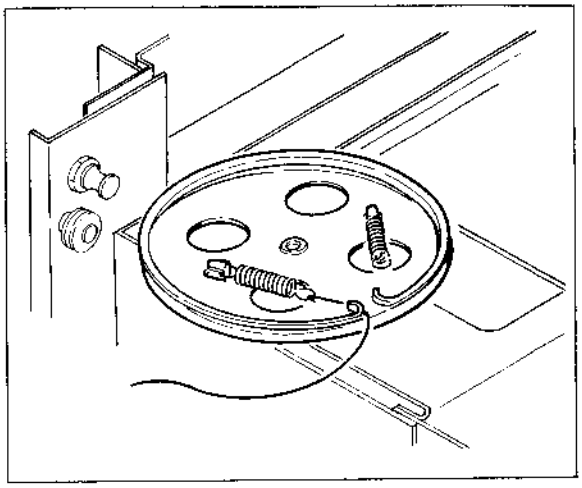


Fig. 2-4 Tuning-capacitor drive-drum installation

2-5. DIAL-CORD RESTRINGING

1. Cut a 45-inch (1,150mm) length of dial cord.
2. Rotate the tuning-capacitor shaft fully clockwise to set the tuning capacitor at its minimum capacitance position.
3. Install the tuning-capacitor drive-drum as illustrate in Fig. 2-4, then tighten the two set screws of the drive-drum.
4. Tie the end of the cord to a spring and hook it to the appropriate tab of the drum. Hook a spring to the other tab of the drum, as shown in Fig. 2-4.
5. Wrap the cord a half turn clockwise along the groove of the drum. See Fig. 2-5.
6. Run the cord over pulleys *A* and *B*, and wrap two turns counterclockwise around the tuning shaft. See Fig. 2-5.
7. Run the cord over pulley *C* and wrap a half turn clockwise around the drive-drum. See Fig. 2-5.
8. Hook the cord to the other end of the coil spring.

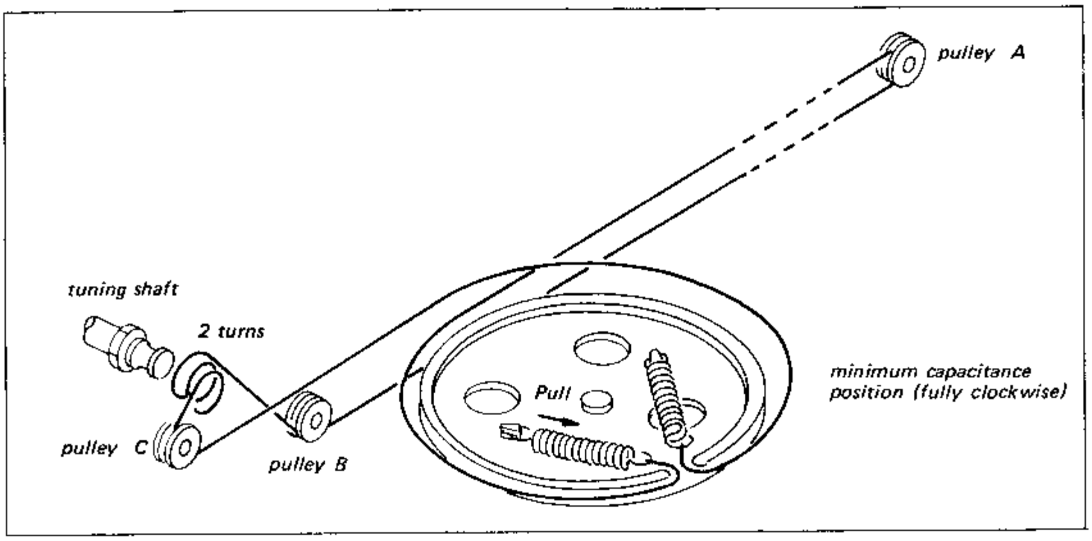


Fig. 2-5 Complete dial cord stringing

9. Pull the cord and tie it to the end of the spring to give it the proper tension while stretching the coil spring. See Fig. 2-5.
10. After completing the dial-cord stringing, make sure that the tuning system works properly.
11. Put the dial-pointer on the cord, and move it two-inches (50mm) away from the right end of the dial-scale back-plate at the minimum capacitance position of the tuning capacitor, as shown in Fig. 2-6.
12. Apply a drop of contact cement to the tabs of the dial-pointer and the knot on the coil spring.

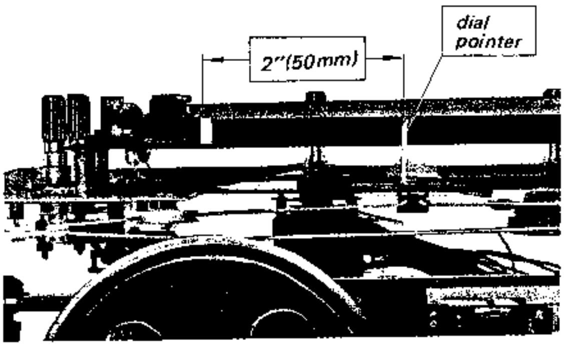


Fig. 2-6 Dial pointer position at minimum capacitance position

2-6. PILOT-LAMP REPLACEMENT

Dial Lamp

1. Remove the receiver unit as described in Procedure 2-3.
2. Pry out the defective lamp from the socket, and then install the replacement lamp.

Stereo Lamp

1. Remove the receiver unit as described in Procedure 2-3.
2. Mark on the dial-cord close to the tabs of the dial-pointer to facilitate reinstallation.
3. Apply a drop of paint-solvent to the tabs. After a few seconds, remove the pointer from the cord.
4. Remove the dial-scale back-plate by loosening four screws (+P 2.6x6).
5. Remove the adhesive tape that fixes the stereo lamp and its shade, then take out the lamp.
6. Cut the leads of the stereo lamp approximately in the middle, but about 3/4-inch different in length.
7. Solder the new lamp leads (also cut with a 3/4-inch difference in length) to the leads coming from the printed circuit board.
8. Wrap the connection point with insulating tape.
9. Install the new stereo lamp and reassemble the dial-tuning system.

2-7. CONTROL AND SWITCH REPLACEMENT

First, remove the receiver unit as described in Procedure 2-3, then perform the following procedures.

POWER/VOLUME Control

1. Remove the hex nut securing the POWER/VOLUME control.
2. Remove the control and unsolder the wires and leads connected to the control lugs.
3. Solder these leads to a new control, then install it on the chassis.

FUNCTION Switch

1. Unhook the dial pointer from the cord.
2. Remove the four screws (+P 2.6x6) securing front subchassis to the main chassis as shown in Fig. 2-7.
3. Pull the front subchassis out.
4. Remove the defective switch, and unsolder the leads from its lugs. Solder them to the new switch.
5. Install it to the front subchassis.

TONE and BALANCE Controls

1. Remove the hex nut that secures the defective control or switch to the front of the chassis.
2. Take out the control or switch, and replace it.

AFC Switch

1. Remove the two screws (+P 3 x 8) that secure the bar-antenna holders to the chassis.
2. Remove the screw (+P 3 x 8) securing the ground lug near the AFC switch.
3. Remove the hex nut that secures the AFC switch.
4. Move the bar antenna to permit removing the AFC switch, then take out the switch.

HEADPHONE Jack

1. Remove the hex nut securing the HEADPHONE jack.
2. Take out the jack.
3. Unsolder the leads from the jack, and resolder them to the replacement jack.
4. Install it to the front chassis.

2-8. POWER TRANSISTOR REPLACEMENT

1. Remove the four screws (+P 3x8) at each side of the chassis and two screws (+K 3x6) securing the power transformer bracket to the rear panel.
2. Push down the rear panel to allow applying a screwdriver to the heat-sink retaining screws (+P 3x16), as shown in Fig. 2-8.
3. Unscrew the screw while holding the nut on the transistor-mounting board with pliers, then remove the heat sink.
4. Unsolder and straighten the transistor leads to permit transistor removal. Cut the leads if necessary.
5. Remove the transistor from the chassis.
6. When reinstalling the power transistor, make

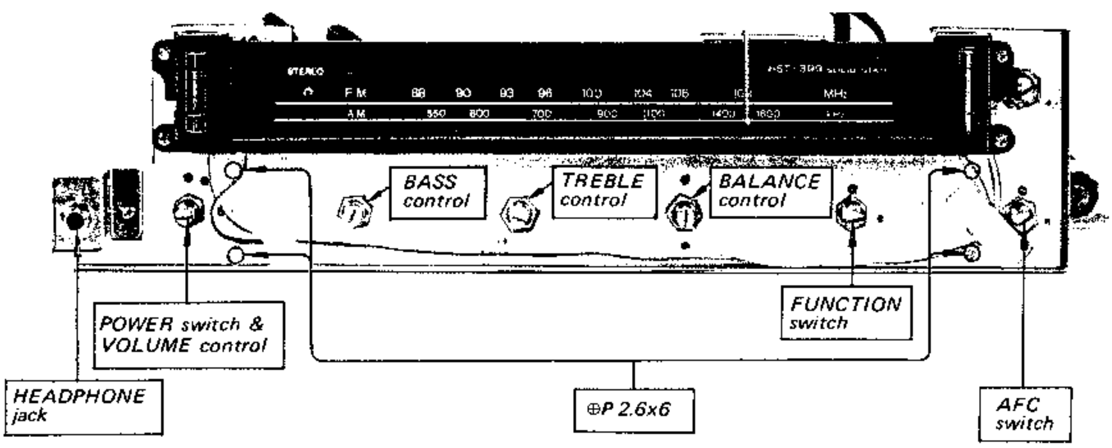


Fig. 2-7 Front subchassis removal

sure that the transistor leads are sleeved with insulating tubing.

7. Solder the transistor leads and install the heat sink with a coat of silicone grease inside the heat-sink depression in which the transistor is housed.

8. Secure the heat sink, then reassemble the rear chassis.

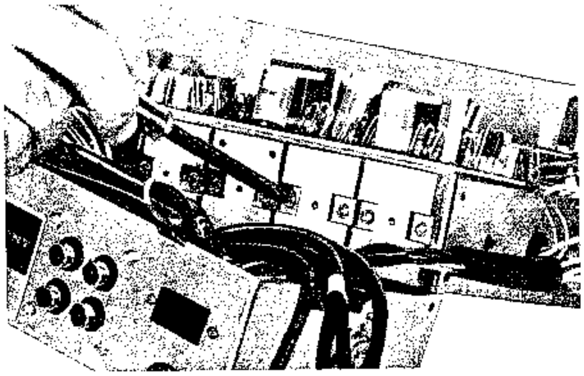
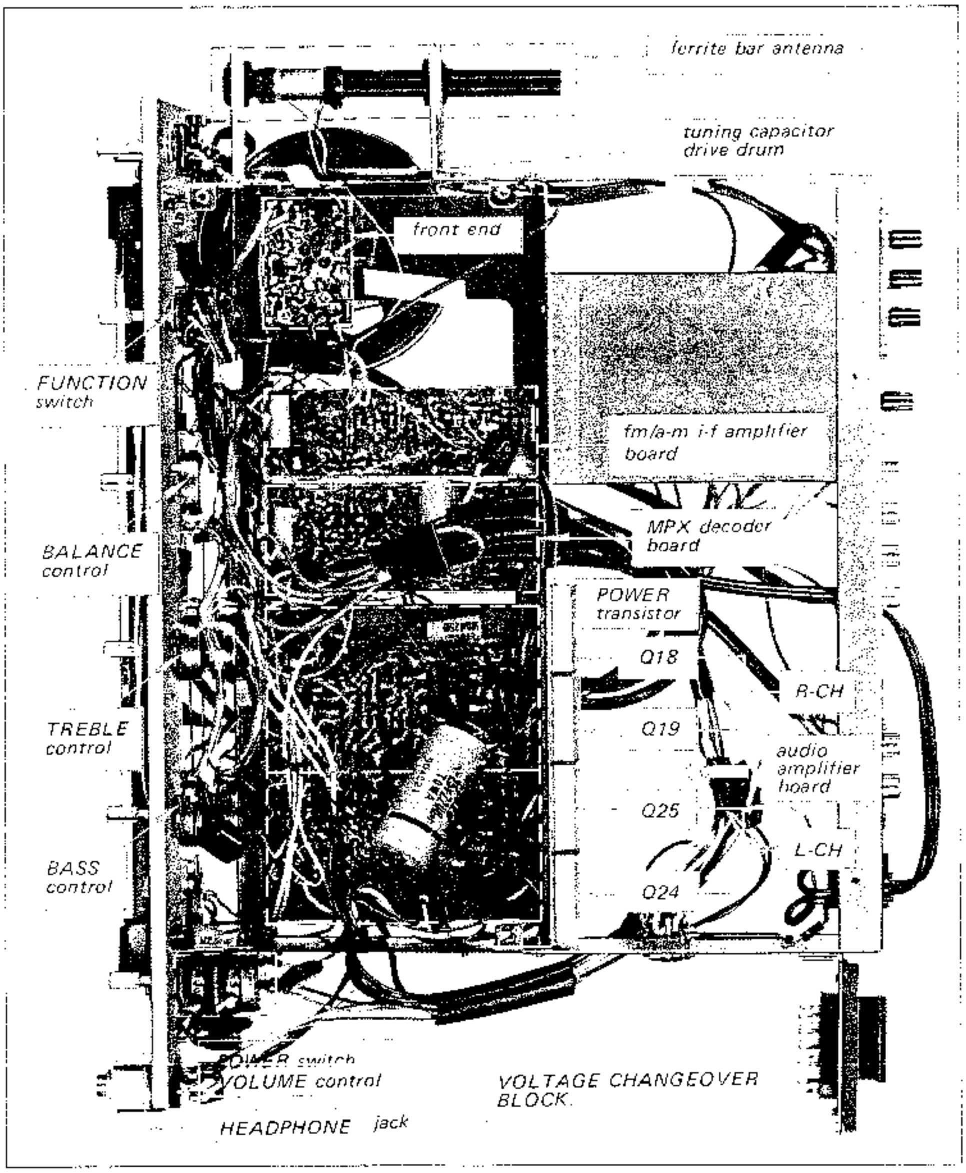


Fig. 2-8 Power transistor removal

2-9. CHASSIS LAYOUT



SECTION 3
ALIGNMENT AND ADJUSTMENT PROCEDURES

3-1. FM I-F STRIP ALIGNMENT

NOTE: There are two methods of fm i-f strip alignment. One is sweep generator alignment, and the other is signal generator alignment. You can use either of them.

Sweep Generator Alignment

Test Equipment Required

1. 10.7 MHz sweep generator
2. Oscilloscope
3. I-f probe (See Fig. 3-1.)
4. Alignment tools

Preparation

1. Remove the receiver unit as described in Procedure 2-3.

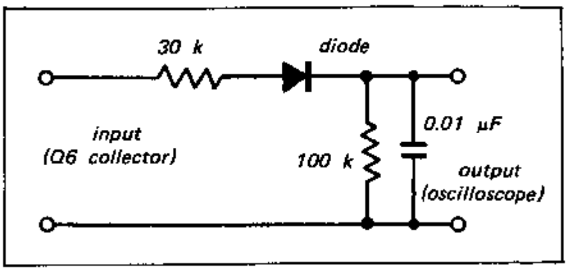


Fig. 3-1 I-f probe

2. Solder the input leads of the i-f probe to the collector of Q6 and ground on the i-f amplifier board (as shown in Fig. 3-2), and connect the output leads of the probe to the input cable of the oscilloscope.
3. Connect the output cable of the sweep generator across L3 on the front-end circuit board with alligator clips, as shown in Fig. 3-3.

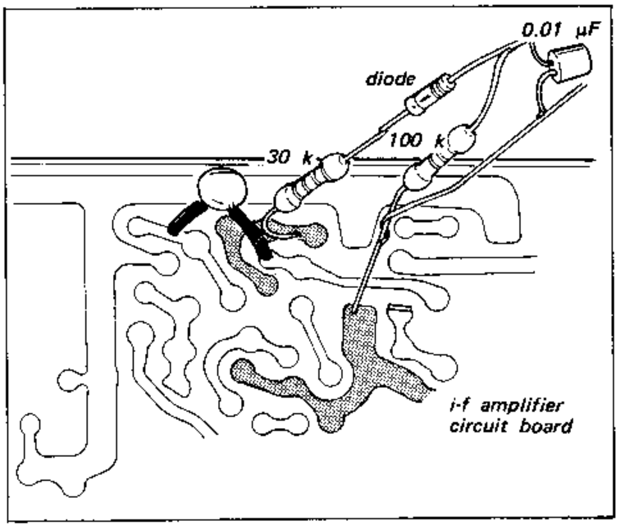


Fig. 3-2 I-f probe and oscilloscope connection

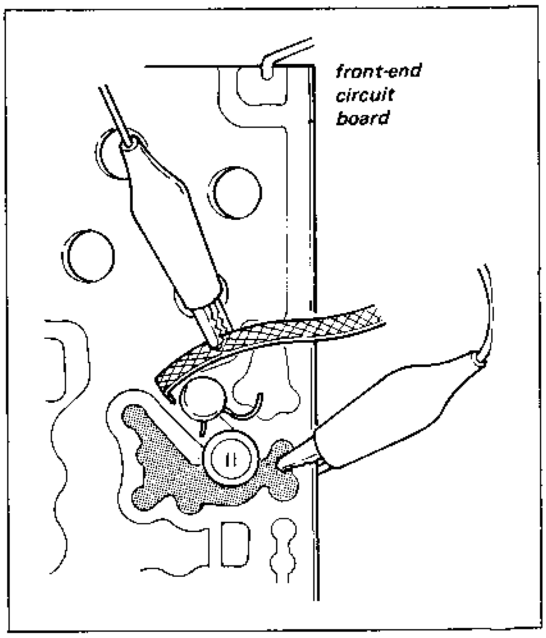


Fig. 3-3 Sweep generator connection

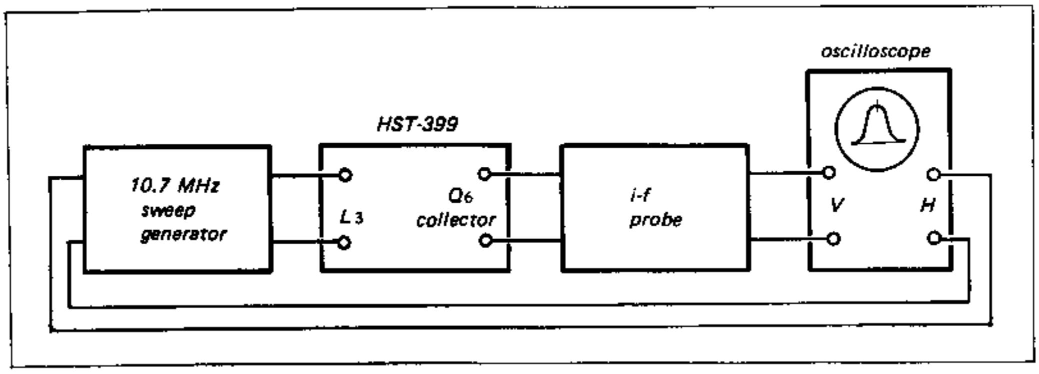


Fig. 3-4 Fm i-f strip alignment test setup, sweep generator alignment

Procedure

1. With the equipment connected as shown in Fig. 3-4, set the sweep generator's controls as follows:

   Center frequency .... 10.7 MHz
   Sweep width .... 1 MHz

   Set the receiver's controls as follows:

   VOLUME control .... Minimum
   FUNCTION switch .... FM
   AFC switch .... OFF

2. Adjust the oscilloscope controls to provide a visible indication.

3. Rotate the TUNING shaft to locate the hole of the tuning-capacitor drive-drum above transformer FM IFT-A on the front-end circuit board. This allows you to align transformer FM IFT-A with an alignment tool through the hole in the drum, as shown in Fig. 3-5.

4. Turn the cores of fm i-f transformers FM IFT-A (yellow), FM IFT-B (green), FM IFT-D (blue), to obtain a maximum and symmetrical response as shown in Fig. 3-6.

5. Repeat Step 4 until an optimum response is obtained.

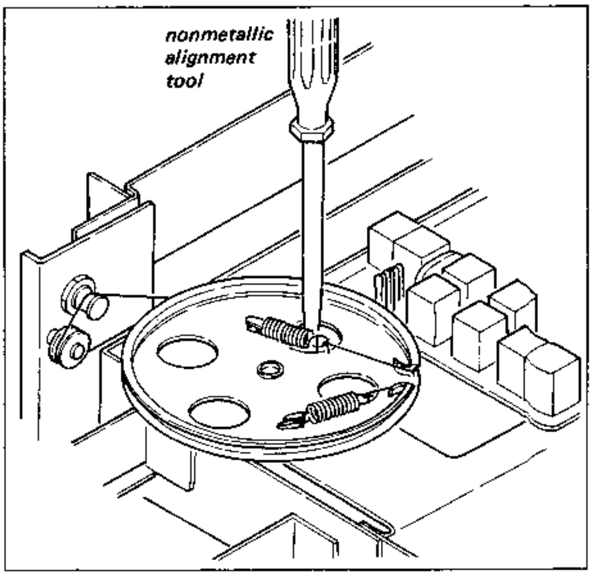


Fig. 3-5 Transformer FM IFT-A alignment

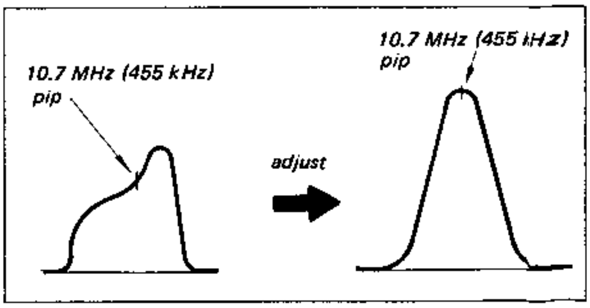


Fig. 3-6 Fm and a-m i-f alignment response cune

Signal Generator Alignment

Test Equipment Required

1. Standard fm signal generator

2. Ac VTVM

3. Alignment tools

Preparation

1. Remove the receiver unit as described in Procedure 2-3.

2. Connect the input cable of the ac VTVM across the VOLUME-control lugs, as shown in Fig. 3-7.

3. Connect the output cable of the signal generator to the lugs of the terminal strip located in back of the ANTENNA terminal, as shown in Fig. 3-8.

Procedure

1. With the equipment connected as shown in Fig. 3-9, set the signal generator's controls as follows.

Carrier frequency	98 MHz
Modulation	Fm, 400 Hz, 100%
Output level	60 μV (36 dB)

Set the receiver's controls as follows:

VOLUME control	Minimum
FUNCTION switch	FM
AFC switch	OFF

2. Tune the set to 98 MHz precisely.

3. Turn the cores of fm i-f transformers FM IFT-A (yellow), FM IFT-B (green), FM IFT-C (green), and FM IFT-D (blue), to obtain a maximum reading on the VTVM.

4. Repeat Step 3 until a maximum reading is obtained.

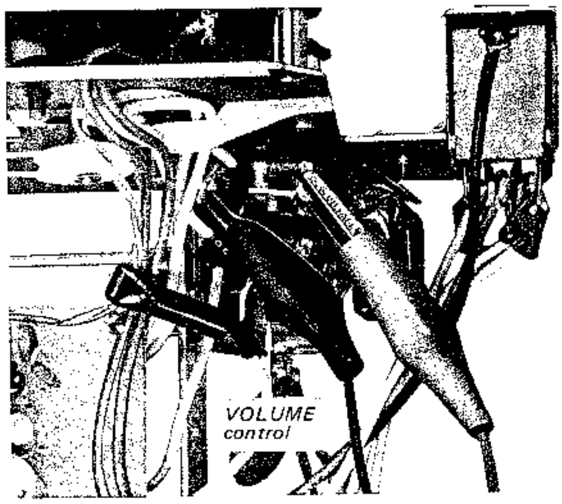


Fig. 3-7 VTVM connection

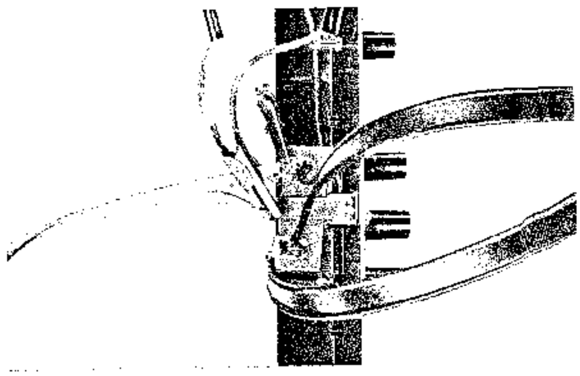


Fig. 3-8 Signal generator connection

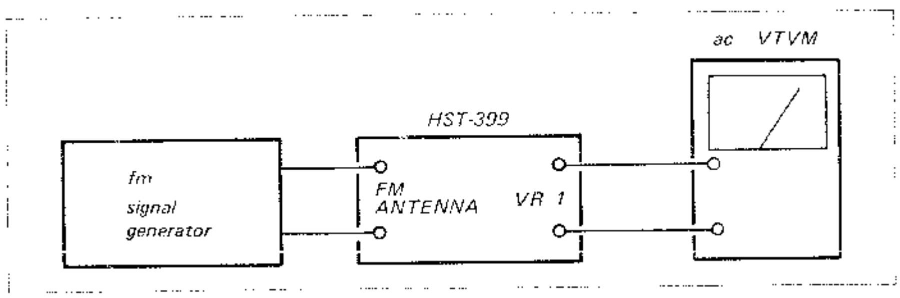


Fig. 3-9 Fm i-f strip alignment test setup, signal generator alignment

3-2. FM DISCRIMINATOR ALIGNMENT

NOTE: Two methods of discriminator alignment are available, sweep-generator alignment and signal generator alignment. You can use either of them.

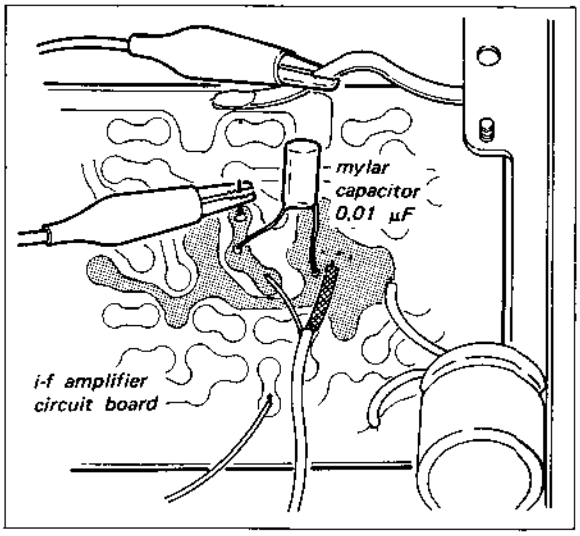


Fig. 3-10 Discriminator output connection

Sweep Generator Alignment

Test Equipment Required

1. 10.7 MHz sweep generator
2. Oscilloscope
3. Mylar capacitor, 0.01μF
4. Alignment tools

Preparation

1. Remove the receiver unit as described in Procedure 2-3.
2. Solder a 0.01-μF mylar capacitor across C36 on the i-f amplifier circuit board, as shown in Fig. 3-10.
3. Connect the input cable of the oscilloscope across the mylar capacitor with alligator clips, as shown in Fig. 3-10.
4. Connect the output cable of the sweep generator across L3 on the front-end circuit board with alligator clips, as shown in Fig. 3-3 on page 12.

Procedure

1. With the equipment connected as shown in Fig. 3-11, set the sweep generator's controls as follows:

   Center frequency .... 10.7 MHz
   Sweep width .... 1 MHz

   Set the receiver's controls as follows:

   VOLUME control .... Minimum
   FUNCTION switch .... FM
   AFC switch .... OFF

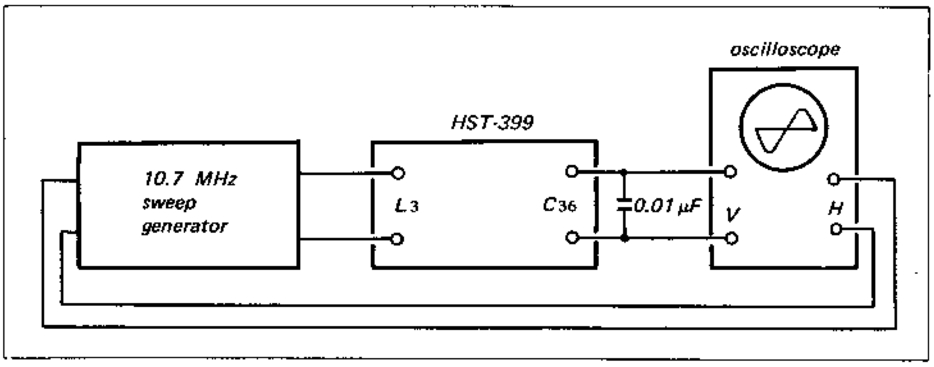


Fig. 3-11 Discriminator alignment test setup, sweep generator alignment

2. Adjust the controls of the oscilloscope to provide a visible indication.

   NOTE: Two or three traces will be observed on the oscilloscope as the center frequency of the sweep generator varies. The trace you are looking for has the largest amplitude. Once you get it, decrease the sweep-generator output as low as possible.

3. Turn the core of transformer FM IFT-E (pink) with an alignment tool to obtain the "S" curve response shown in Fig. 3-12.

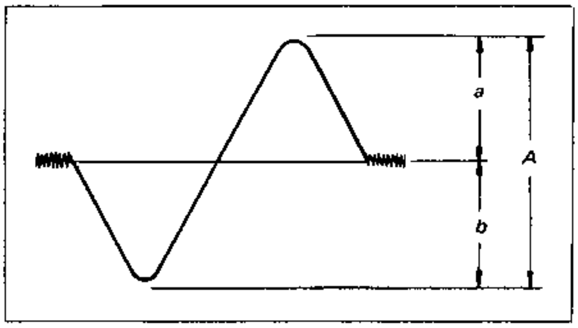


Fig. 3-12 "S" curve response

4. Turn the core of transformer FM IFT-D (blue) to obtain a maximum-amplitude indication on the oscilloscope.

5. Turn the core of FM IFT-E slightly to equalize the positive and negative peaks, as shown in Fig. 3-12.

$$\frac{A}{2} = a = b$$

6. Disconnect the sweep generator and make sure that the oscilloscope displays only noise.

Signal Generator Alignment

Test Equipment Required

1. Standard fm/a-m signal generator

2. Oscilloscope

3. Mylar capacitor 0.01 μF

4. Alignment tools

Preparation

1. Remove the receiver unit as described in Procedure 2-3.

2. Solder a 0.01-μF mylar capacitor across C36 on the i-f amplifier circuit board, as shown in Fig. 3-10 on page 15.

3. Connect the input cable of the oscilloscope across the mylar capacitor with alligator clips as shown in Fig. 3-10.

4. Connect the output cable of the sweep generator across L3 on the front-end circuit board with alligator clips, as shown in Fig. 3-3 on page 12.

Procedure

1. With the equipment connected as shown in Fig. 3-13 on page 17, set the signal generator's controls as follows:

   Carrier frequency .... 10.7 MHz
   Modulation .... A-m, 400 Hz, 30%
   Output level .... 1,000 μV (60 dB)

   Set the receiver's controls as follows:

   VOLUME control .... Minimum
   FUNCTION switch .... FM
   AFC switch .... OFF

2. Adjust the controls of the oscilloscope to provide a visible indication. A sine wave (400 Hz) should be observed on the oscilloscope.

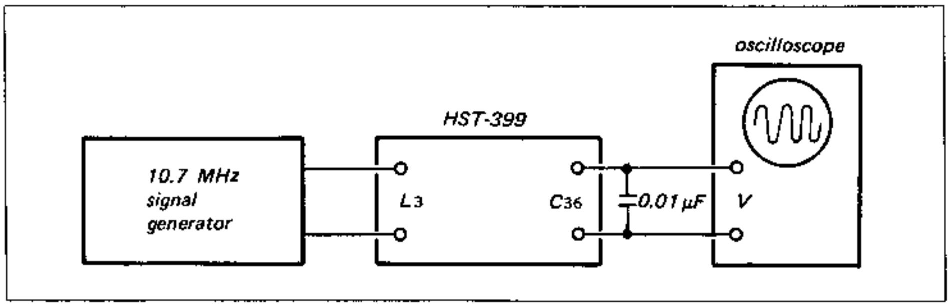


Fig. 3-13 Discriminator alignment test setup, signal generator alignment

3. Turn the core of transformer FM IFT-E (pink) to obtain minimum output, as shown in Fig. 3-14.

NOTE: At both extremes of core positions of FM IFT-E, decreased output will be observed. The real null point be obtained in the middle of the core thread length and maximum output occurs at each side of the true null point. Slowly and carefully turn the core to obtain minimum output.

3-3. FM FRONT-END ALIGNMENT

NOTE: Discriminator alignment should be performed first.

Test Equipment Required

1. Standard fm signal generator

   In case the generator is unavailable, off-the-air signals at end of the band will suffice.

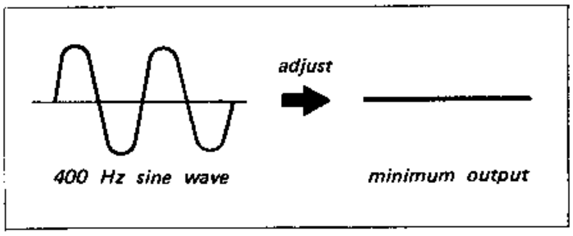


Fig. 3-14 Discriminator alignment output response

2. Ac VTVM
3. Alignment tools

Preparation

1. Remove the receiver unit as described in Procedure 2-3.
2. Connect the input cable of the ac VTVM across the VOLUME-control lugs, as shown in Fig. 3-7 on page 14.
3. Connect the output cable of the signal generator to the lugs of the terminal strip located in back of the ANTENNA terminal, as shown in Fig. 3-8 on page 14.
4. With the equipment connected as shown in Fig. 3-15, set the receiver's controls as follows:

   VOLUME control .... Minimum
   FUNCTION switch .... FM
   AFC switch .... OFF

Signal-Generator Alignment

1. Follow the procedures given in Tables 1 and 2.
2. Repeat these procedures two or three times until an optimum response is obtained.

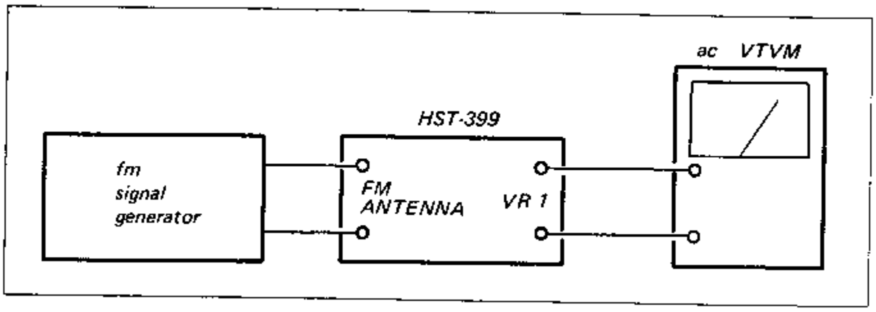


Fig. 3-15 Fm front-end alignment test setup

TABLE 1. Fm Frequency Coverage Alignment

Coupling Between Front End and SSG	SSG Frequency and Output Level	Tuning Capacitor	Ac VTVM Connection	Adjust	Indication
Direct	86 MHz 400 Hz, 100%, fm 60 μV (36 dB)	Maximum capacitance position	Across volume control lugs Fig. 3-7	OSC coil L3 Fig. 3-16	Maximum VTVM reading
Direct	109.5 MHz 400 Hz, 100%, fm 60 μV (36 dB)	Minimum capacitance position	Across volume control lugs Fig. 3-7	OSC trimmer CT-F2 Fig. 3-16	Maximum VTVM reading

TABLE 2. Fm Tracking Alignment

Coupling Between Fron End and SSG	SSG Frequency and Output Level	Tuning Capacitor	Ac VTVM Connection	Adjust	Indication
Direct	86 MHz 400 Hz, 100%, fm 60 μV (36 dB)	Maximum capacitance position	Across volume control lugs Fig. 3-7	RF coil L4 Fig. 3-16	Maximum VTVM reading
Direct	109.5 MHz 400 Hz, 100%, fm 60 μV (36 dB)	Minimum capacitance position	Across volume control lugs Fig. 3-7	RF trimmer CT-F1 Fig. 3-16	Maximum VTVM reading

Off-the-air Alignment

Accurate frequency coverage and tracking alignment can also be performed by utilizing off-the-air local fm signals. However, before performing the following procedure, be sure that the dial-pointer is correctly positioned, as described in Procedure 2-5 and AFC switch is set to OFF position.

NOTE: Tune in weak stations or use an inefficient antenna to obtain signals as weak as possible for accurate fm front-end alignment.

1. Follow the procedures given in Tables 3 and 4.
2. Repeat these procedures two or three times until an optimum response is obtained.

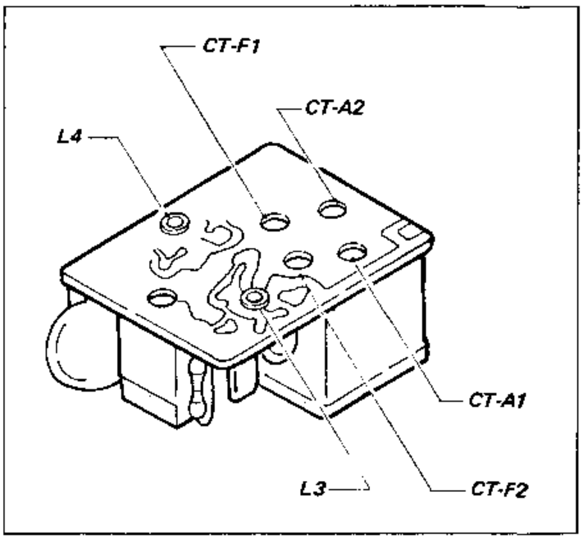


Fig. 3-16 Location of L3, L4, CT-F1, CT-F2, CT-A1 and CT-A2

TABLE 3. Fm Frequency Coverage Alignment

Receiver	Output Detector Connection	Adjust	Indication
Tune to the lowest-frequency station	Plug in headphone	OSC coil L3 Fig. 3-16	Maximum sound
Tune to the highest-frequency station	Plug in headphone	OSC trimmer CT-F2 Fig. 3-16	Maximum sound

TABLE 4. Fm Tracking Alignment

Receiver	Output Detector Connection	Adjust	Indication
Tune to the lowest-frequency station	Plug in headphone	RF coil L4 Fig. 3-16	Maximum sound
Tune to the highest-frequency station	Plug in headphone	RF trimmer CT-F1 Fig. 3-16	Maximum sound

3-4. SWITCHING TRANSFORMER ADJUSTMENT

Test Equipment Required

1. Standard fm signal generator
2. MPX stereo signal generator
3. Audio oscillator
4. Ac VTVM
5. Alignment tools

Preparation

1. Remove the receiver unit as described in Procedure 2-3.
2. Setup the equipment to produce fm stereo signals.
3. Connect the input cable of the distortion meter across the VOLUME-control lugs, as shown in Fig. 3-7.
4. Connect the output cable of the signal generator to the lugs of the terminal strip located in back of the GROUND terminal, as shown in Fig. 3-8.

Procedure

1. With the equipment connected as shown in Fig. 3-17, set the signal generator's controls as follows:

   Carrier frequency .... 98 MHz
   Modulation .... External mod.
   Output level .... 1,000μV (60 dB)

   The frequency modulation produced by the MPX stereo generator should be as follows:

   Main channel (400 Hz) ...... 45% (33.75 kHz)
   Sub channel (38 kHz) .... 45% (33.75 kHz)
   Pilot signal (19 kHz) .... 10% (7.5 kHz)

   The above mentioned modulation levels can be set as follows:

   (a) With the equipment connected as shown in Fig. 3-17, set the MPX stereo generator's controls as follows:

   MAIN CHANNEL .... OFF
   SUB CHANNEL .... OFF
   19 kHz (PILOT) .... ON

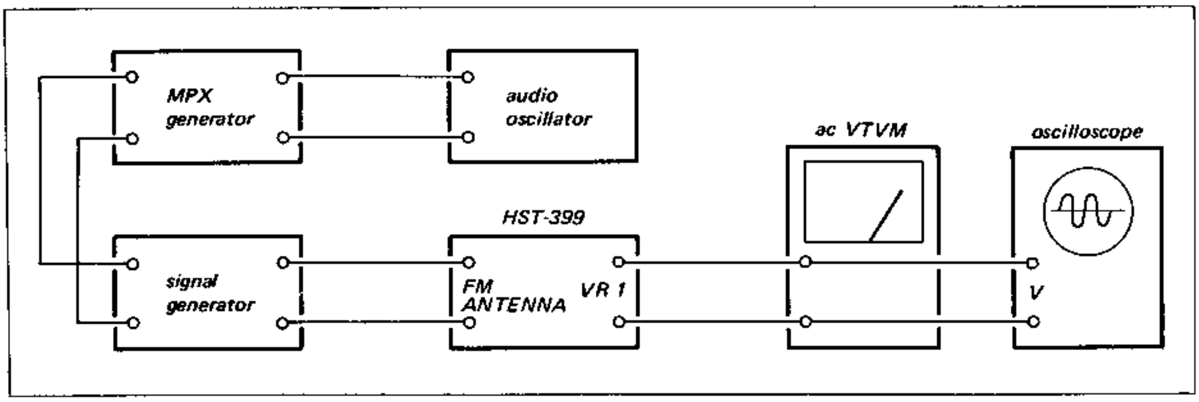


Fig. 3-17 Fm stereo distortion adjustment test setup

(b) Adjust the MPX stereo generator output level to obtain a 7.5-kHz deviation on the fm SSG modulation indicator.

(c) Reset the MPX stereo generator's controls as follows:

MAIN CHANNEL .... ON
SUB CHANNEL .... OFF
19 kHz (PILOT) .... OFF

(d) Adjust the audio oscillator output controls to obtain a 33.75-kHz deviation on the fm SSG modulation indicator.

(e) Set all controls to the ON position.

2. Set the receiver's controls as follows:

VOLUME control .... Minimum
FUNCTION switch .... FM AUTO STEREO
AFC switch .... OFF

3. Turn the core of switching transformer MT-B in the multiplex decoder board to obtain maximum output.

3-5. CHANNEL SEPARATION

Test Equipment Required

1. Standard fm signal generator
2. MPX stereo signal generator
3. Audio oscillator
4. Ac VTVM
5. Alignment tools

Preparation

1. Follow the preparation procedure described in 3-4, SWITCHING TRANSFORMER ADJUSTMENT.

Procedure

1. Follow the procedure described in Steps 1 and 2 of 3-4, SWITCHING TRANSFORMER ADJUSTMENT.
2. Record the output level of the left channel when the MPX generator input selector is set to the left channel.
3. Switch the input selector to the right, and read the residual signal level in the left channel.
4. The output-level to residual-level ratio represents the channel separation. Adjust separation adj. control VR5 (5k-B) on the multiplex decoder board for minimum residual level. Check the right channel for separation. Usually, some difference in channel separation exists. Readjust VR5 for minimum difference between left- and right-channel separation. While doing this, remember that the output level also changes according to the setting of VR5.

3-6. A-M I-F ALIGNMENT

NOTE: There are two methods of a-m i-f alignment. One is sweep generator alignment, and the other is signal generator alignment. You can use either of them.

Sweep Generator Alignment

Test Equipment Required

1. 455-kHz sweep generator
2. Oscilloscope
3. Alignment tools

Preparation

1. Remove the receiver unit as described in Procedure 2-3.
2. Shunt the local oscillator capacitor CV-A2 with a 0.02μF capacitor to kill the local oscillator's operation as shown in Fig. 3-18.
3. Connect the input cable of the oscilloscope across R148 on the i-f amplifier board, as shown in Fig. 3-19.
4. Connect the sweep generator's output cable to the AM external antenna terminal.

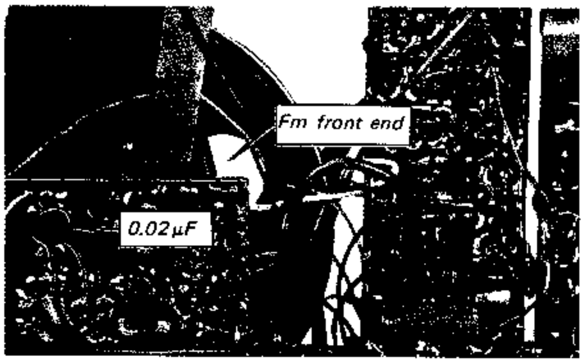


Fig. 3-18 Interruption of a-m local oscillator operation

Procedure

1. With the equipment connected as shown in Fig. 3-20, set the sweep generator's controls as follows:

   Center frequency .... 455 kHz
   Sweep width .... 25 kHz

   Set the receiver's controls as follows:

   VOLUME control .... Minimum
   FUNCTION switch .... AM

2. Adjust the oscilloscope controls to provide a visible indication.
3. Turn the cores of i-f transformer A-M IFT-F (yellow), A-M IFT-G (white) and A-M IFT-H (black) to obtain a maximum and symmetrical response as shown in Fig. 3-6 on page 13.
4. Repeat Step 3 above until an optimum response is obtained.

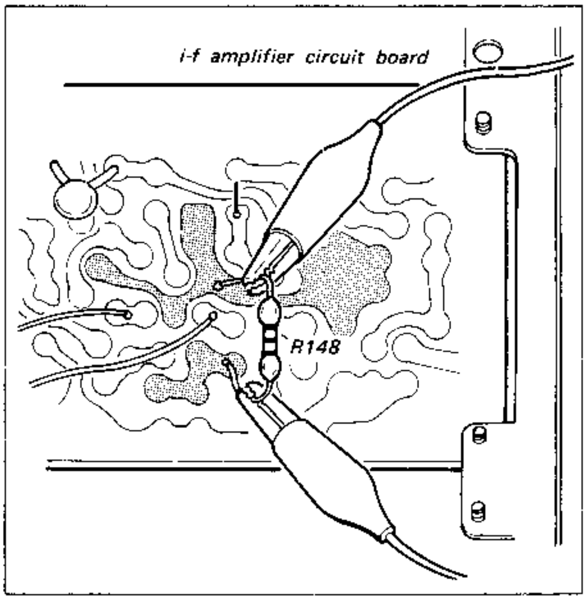


Fig. 3-19 A-m detector output connection

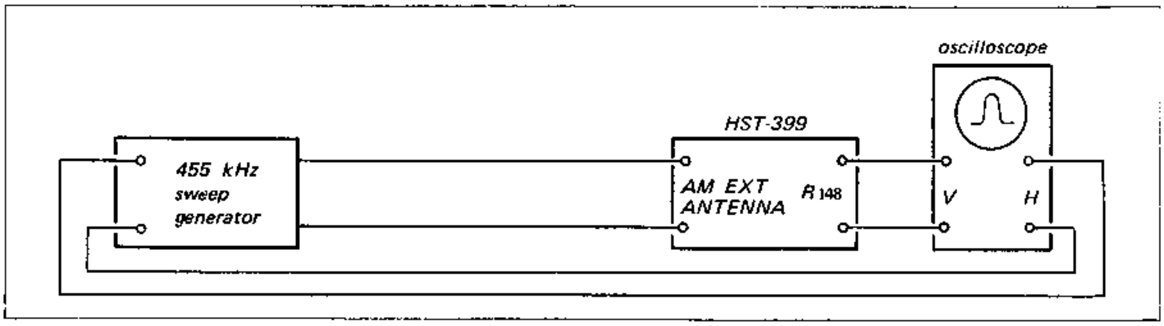


Fig. 3-20 A-m i-f alignment test setup, sweep generator alignment

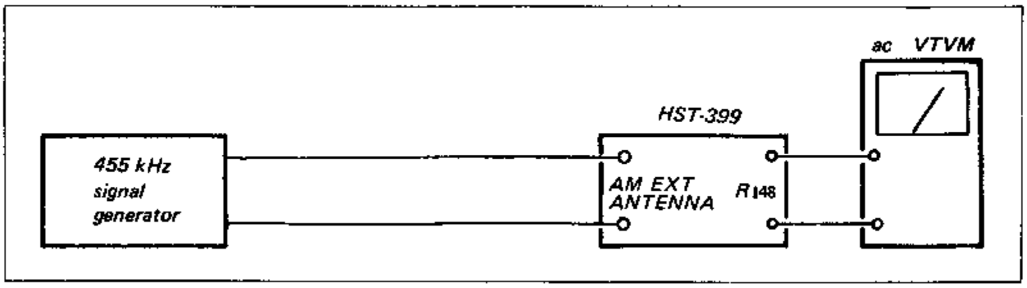


Fig. 3-21 A-m i-f alignment test setup, signal generator alignment

Signal Generator Alignment

Test Equipment Required

1. Standard a-m signal generator
2. Ac VTVM
3. Alignment tools

Preparation

Same as described in sweep generator alignment.

Procedure

1. With the equipment connected as shown in Fig. 3-21, set the signal generator's controls as follows:

   Carrier frequency .... 455 kHz
   Modulation .... A-m, 400Hz, 30%
   Output level .... 1,000μV (60 dB)

   Set the receiver's controls as follows:

   VOLUME control .... Minimum
   FUNCTION switch .... AM

2. Turn the cores of i-f transformers A-M IFT-F (yellow), A-M IFT-G (white), and A-M IFT-H (black), to obtain a maximum reading on the meter.

3. Repeat Step 2 until a maximum reading on the meter is obtained.

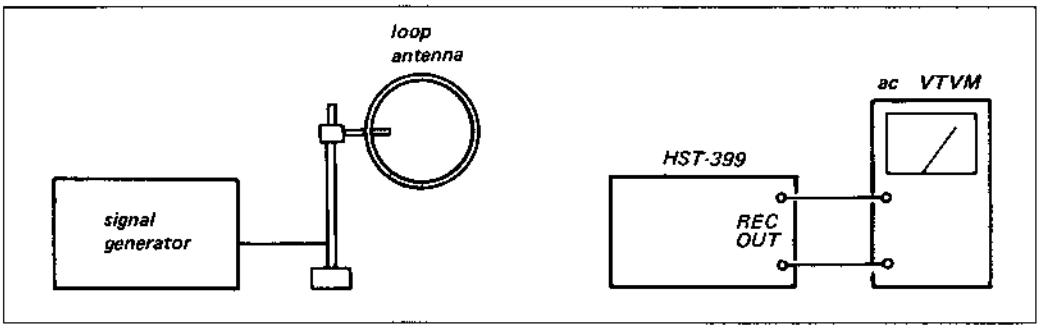


Fig. 3-22 A-m frequency coverage and tracking alignment test setup

3-7. A-M TUNER FREQUENCY COVERAGE AND TRACKING ALIGNMENT

Test Equipment Required.

1. Standard a-m signal generator

   In case the generator is unavailable, off-the-air signals at end of the band will suffice.

2. Loop antenna

3. Ac VTVM

4. Alignment tools

Preparation

1. Remove the receiver unit as described in Procedure 2-3.

2. Connect the input cable of the ac VTVM to the REC OUT terminal.

3. With the equipment connected as shown in Fig. 3-22, set the receiver's controls as follows:

   VOLUME control .... Minimum
   FUNCTION switch .... AM

Procedure

Signal Generator Alignment

1. Follow the procedures given in Tables 5 and 6.

2. Repeat these procedures two or three times until an optimum response is obtained.

TABLE 5. A-m Frequency Coverage Alignment

Coupling Between Receiver and SSG	SSG Frequency and Output Level	Tuning Capacitor	Ac VTVM Connector	Adjust	Indication
Loop or radiating antenna	520 kHz 400 Hz, 30%, a-m 1,000μV (60 dB)	Maximum capacitance position	REC OUT	OSC coil L2 Fig. 3-23	Maximum VTVM reading
Loop or radiating antenna	1,680 kHz 400 Hz, 30%, a-m 1,000μV (60 dB)	Minimum capacitance position	Same as above	OSC trimmer CT-A2 Fig. 3-16	Maximum VTVM reading

TABLE 6. A-m Tracking Alignment

Coupling Between Receiver and SSG	SSG Frequency and Output Level	Tuning Capacitor	Ac VTVM Connector	Adjust	Indication
Loop or radiating antenna	620 kHz 400 Hz, 30%, a-m 1,000μV (60 dB)	Tune to 620 kHz signal	REC OUT	Ant coil L1 Fig. 3-24	Maximum VTVM reading
Loop or radiating antenna	1,400 kHz 400 Hz, 30%, a-m 1,000μV (60 dB)	Tune to 1,400 kHz signal	Same as above	Ant trimmer CT-A1 Fig. 3-16	Maximum VTVM reading

Off-the-air Alignment

Accurate frequency coverage and tracking alignment can also be performed by utilizing off-the-air local a-m signals. However, before performing the following procedure, be sure that the dial-pointer is correctly positioned, as in Procedure 2-5.

NOTE: Tune in weak or long distance stations to obtain signals as low as possible for an accurate a-m tuner alignment.

1. Follow the procedures given in Tables 7 and 8.
2. Repeat these procedures two or three times until an optimum response is obtained.

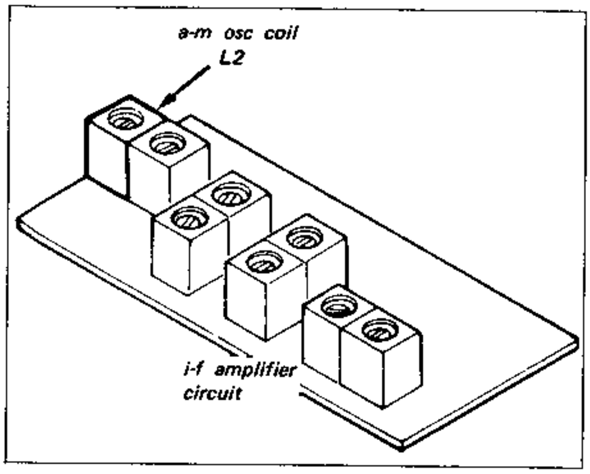


Fig. 3-23 Location of osc coil L2

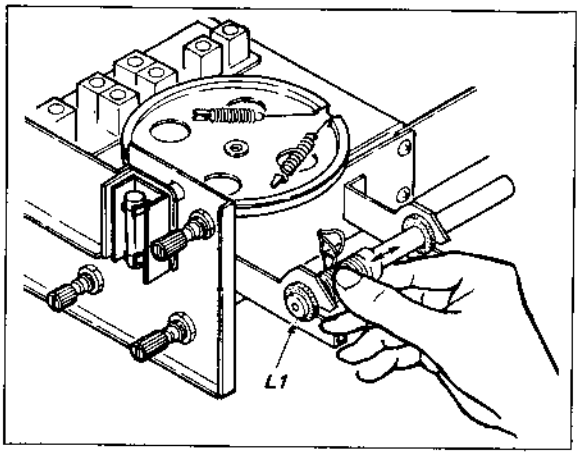


Fig. 3-24 Antenna coil L1 position adjustment

TABLE 7. A-m Frequency Coverage Alignment

Receiver	Output Detector Connection	Adjust	Indication
Tune in the lowest-frequency station	Plug-in headphone	OSC coil L2 Fig. 3-23	Maximum sound
Tune in the highest-frequency station	Plug-in headphone	OSC trimmer CT-A2 Fig. 3-16	Maximum sound

TABLE 8. A-m Tracking Alignment

Receiver	Output Detector Connection	Adjust	Indication
Tune in the station around 620 kHz	Plug-in headphone	Ant coil L1 Fig. 3-24	Maximum sound
Tune in the station around 1,400 kHz	Plug-in headphone	Antenna trimmer CT-A1 Fig. 3-16	Maximum sound

SECTION 4
REPACKING

The HST-399's original shipping carton and packing material are the ideal container for shipping the unit. However, to secure the maximum protection, the HST-399 must be repacked in these materials precisely as before. The proper repacking procedure is shown in Fig. 4-1.

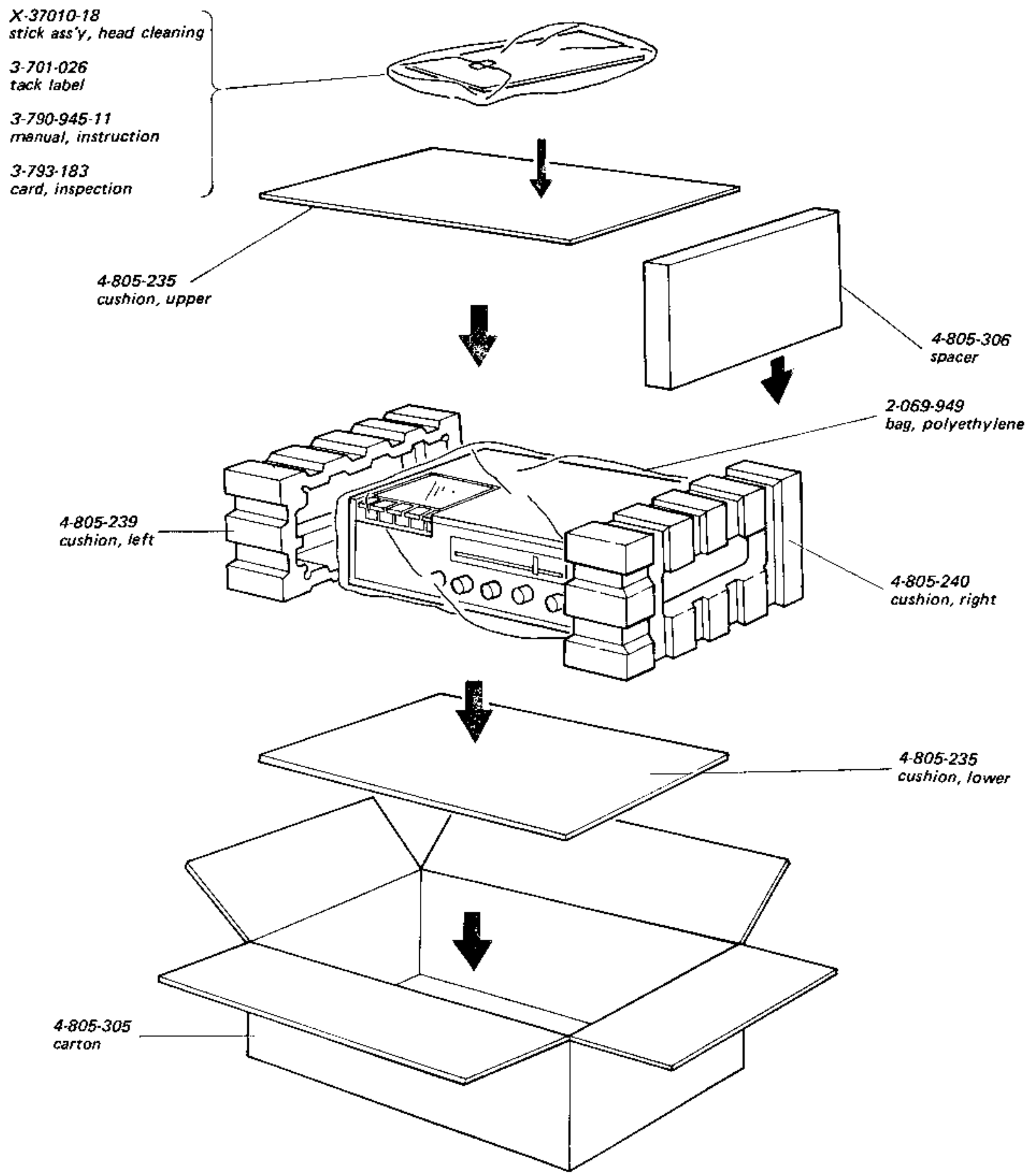
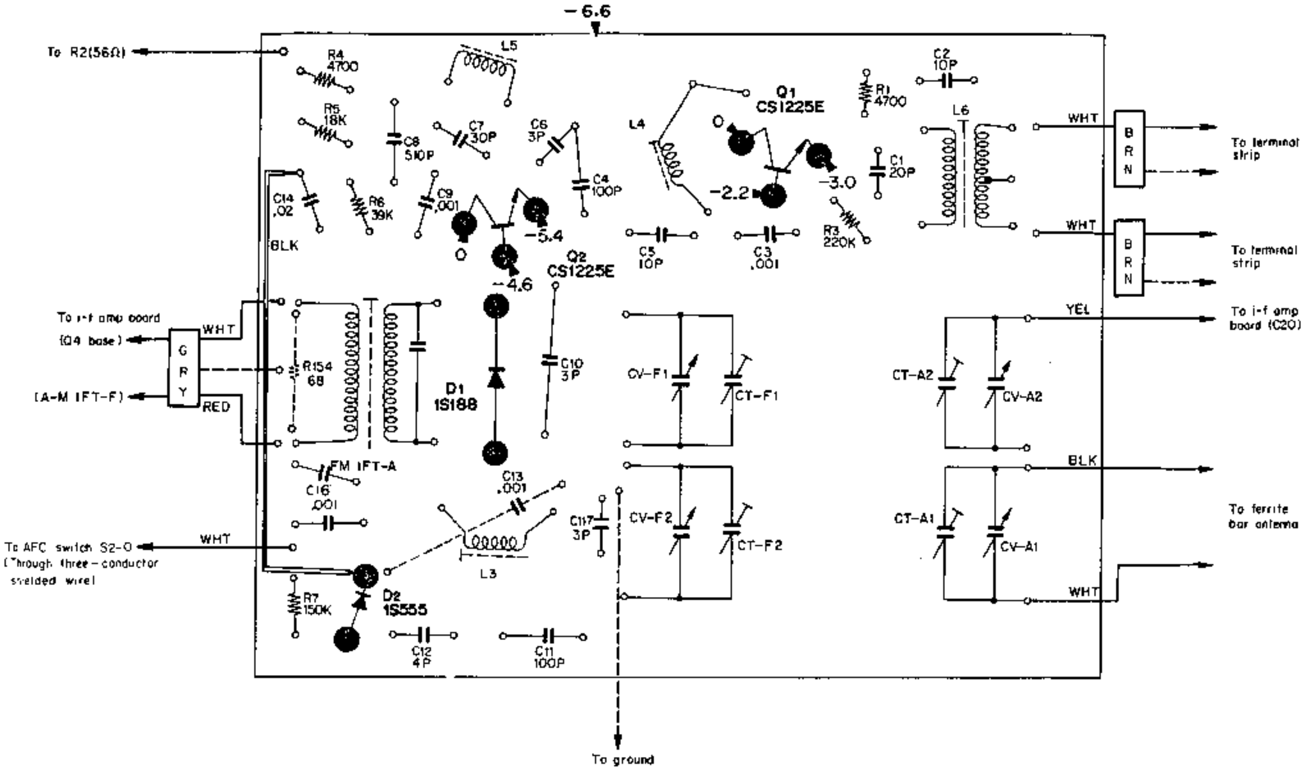


Fig. 4-1 Repacking

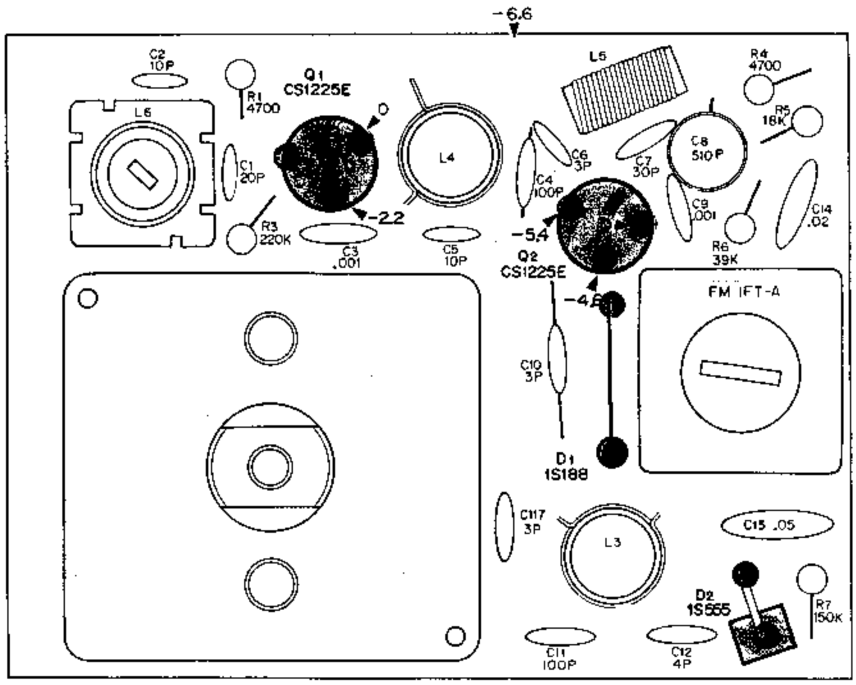
SECTIONS 5
DIAGRAMS

5-1. MOUNTING DIAGRAM – Fm Front-End Section –

– Conductor Side –

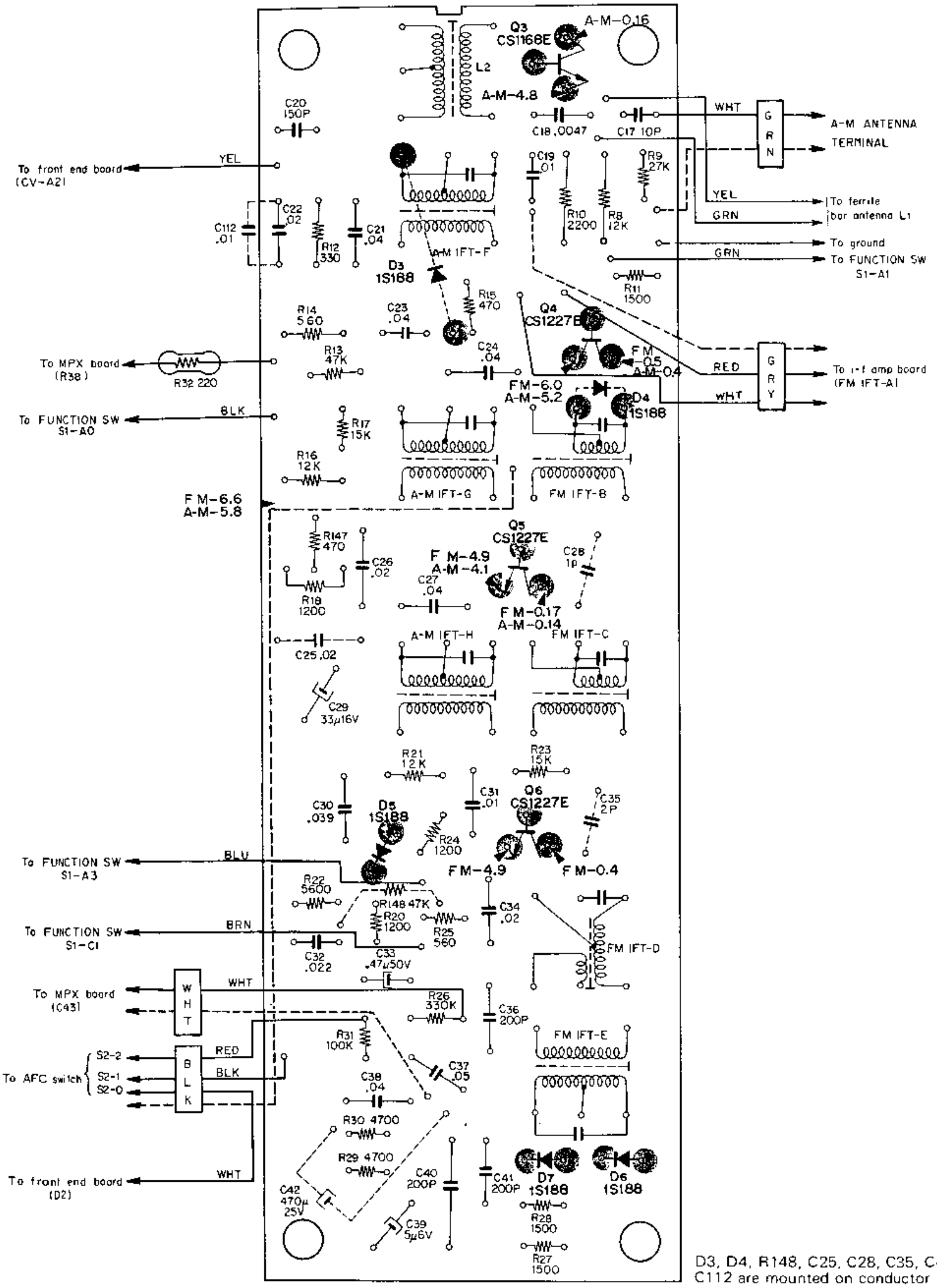


– Component Side –



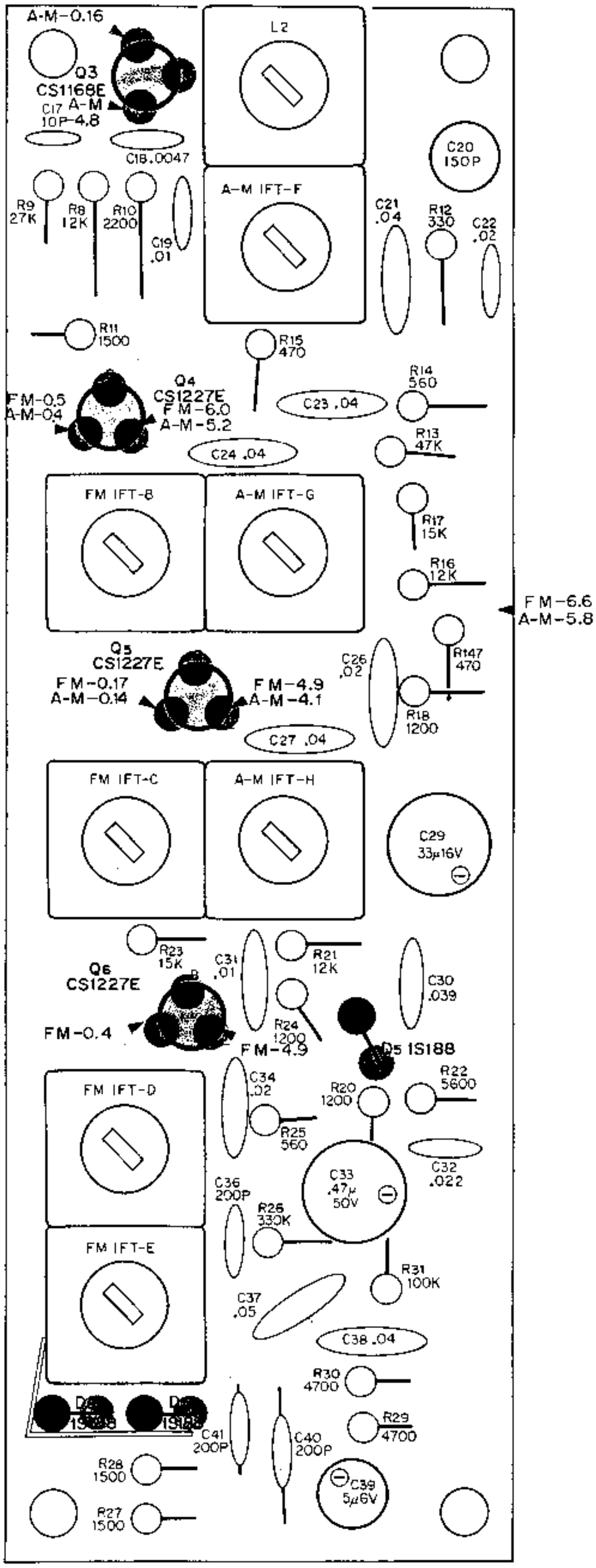
5-2. MOUNTING DIAGRAM — I-f Amplifier Section —

— Conductor Side —



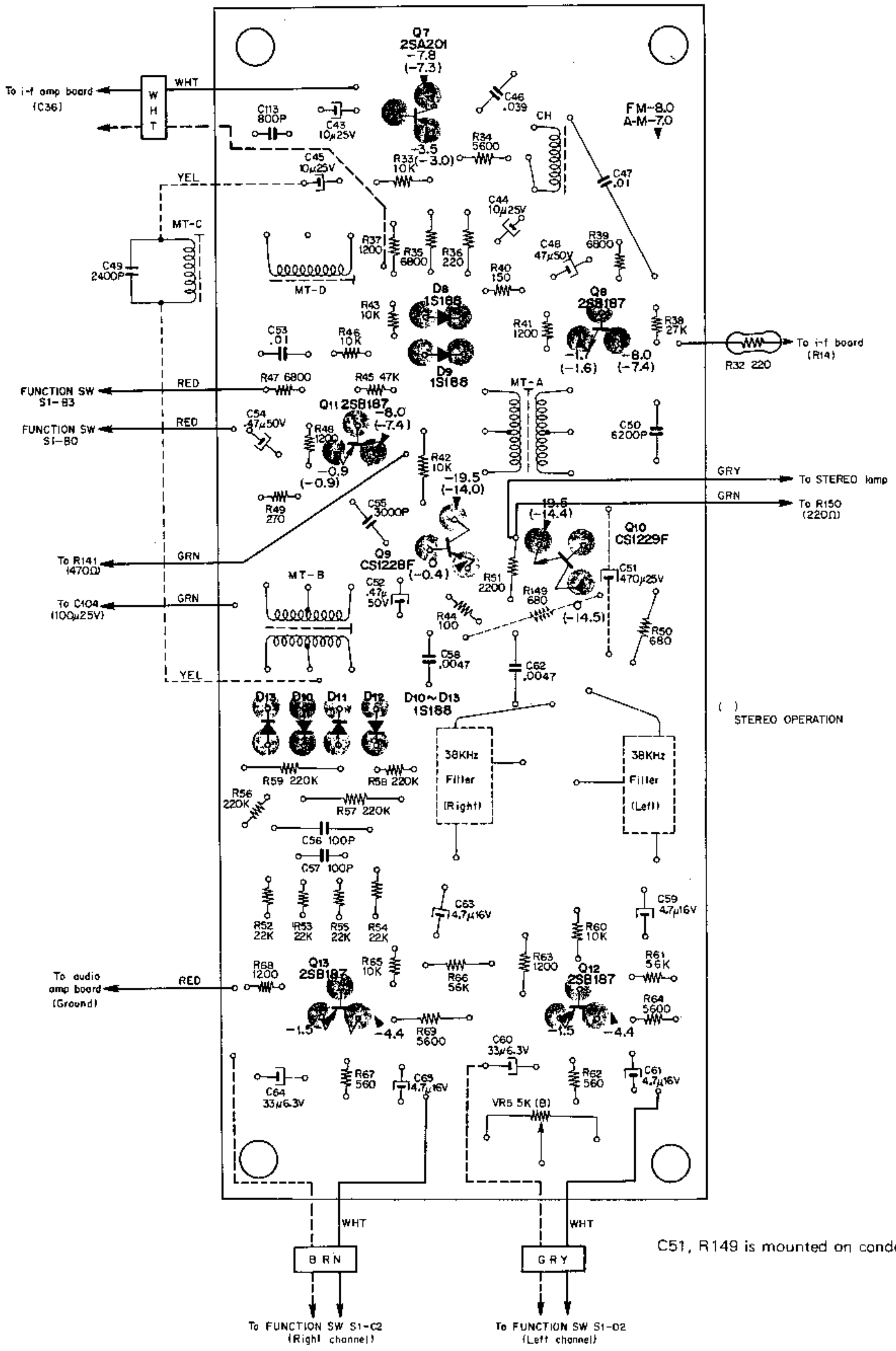
D3, D4, R148, C25, C28, C35, C42 and C112 are mounted on conductor side

– Component Side –



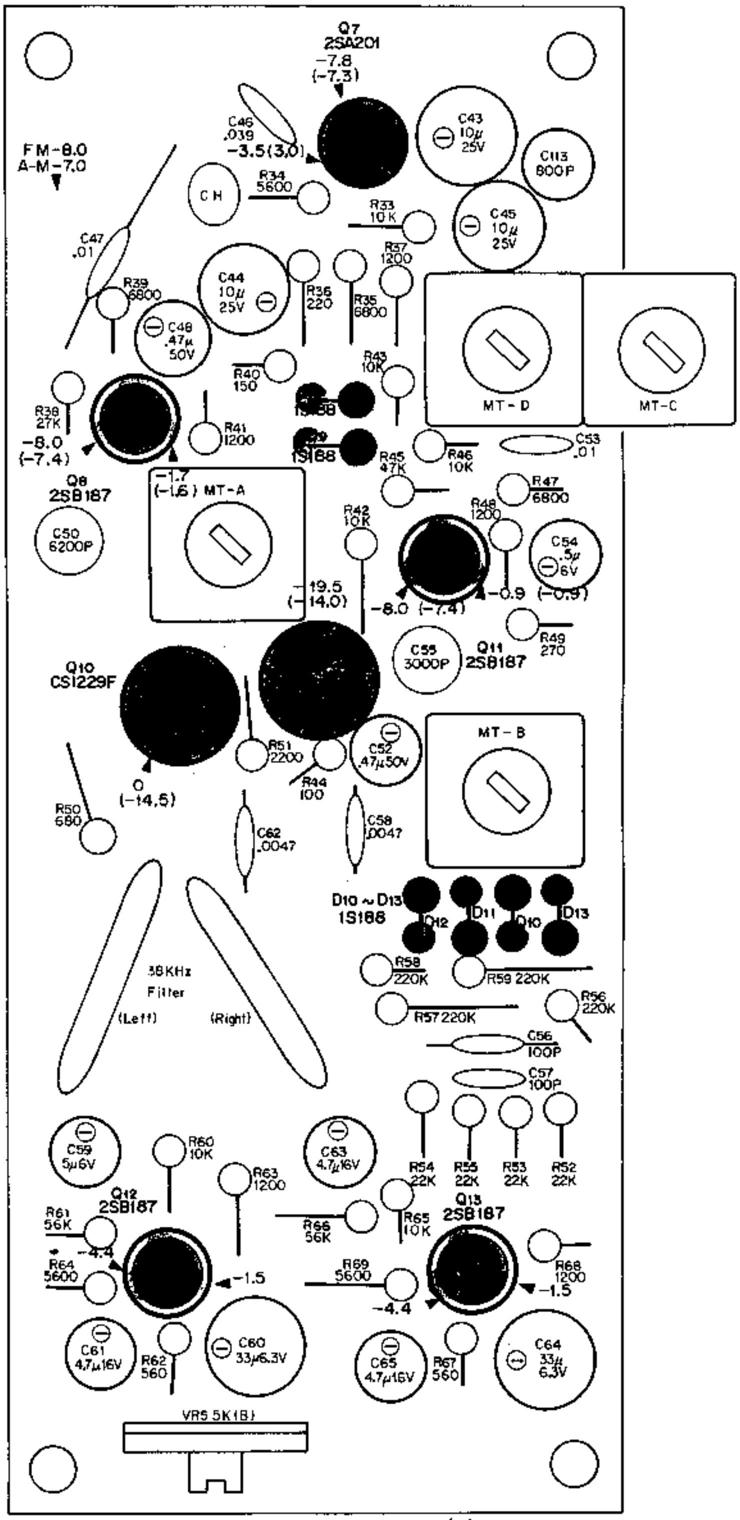
5-3. MOUNTING DIAGRAM – Multiplex Decoder Section –

– Conductor Side –



C51, R149 is mounted on conductor side

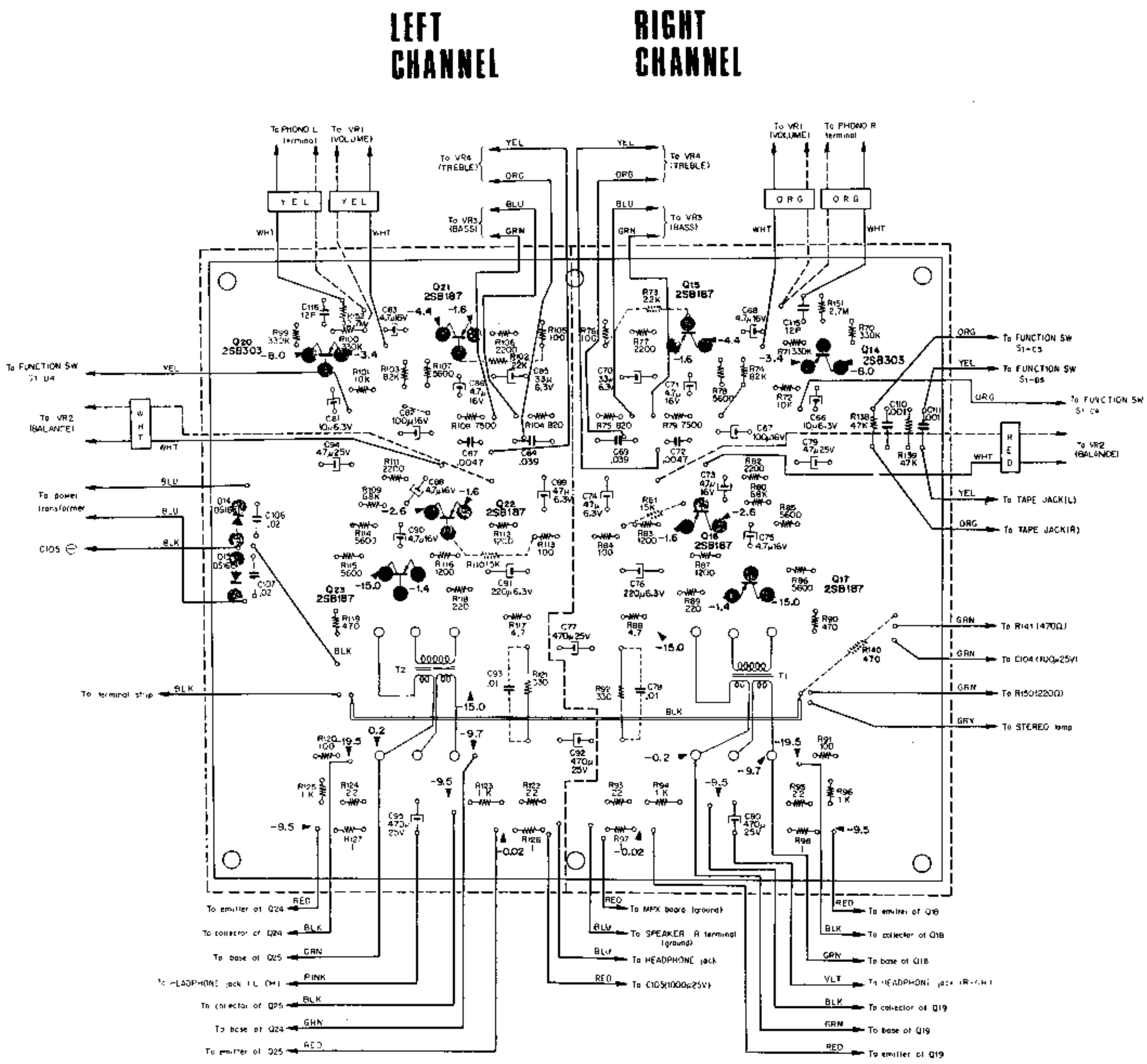
– Component Side –



( ) STEREO OPERATION

5-4. MOUNTING DIAGRAM – Audio Amplifier Section –

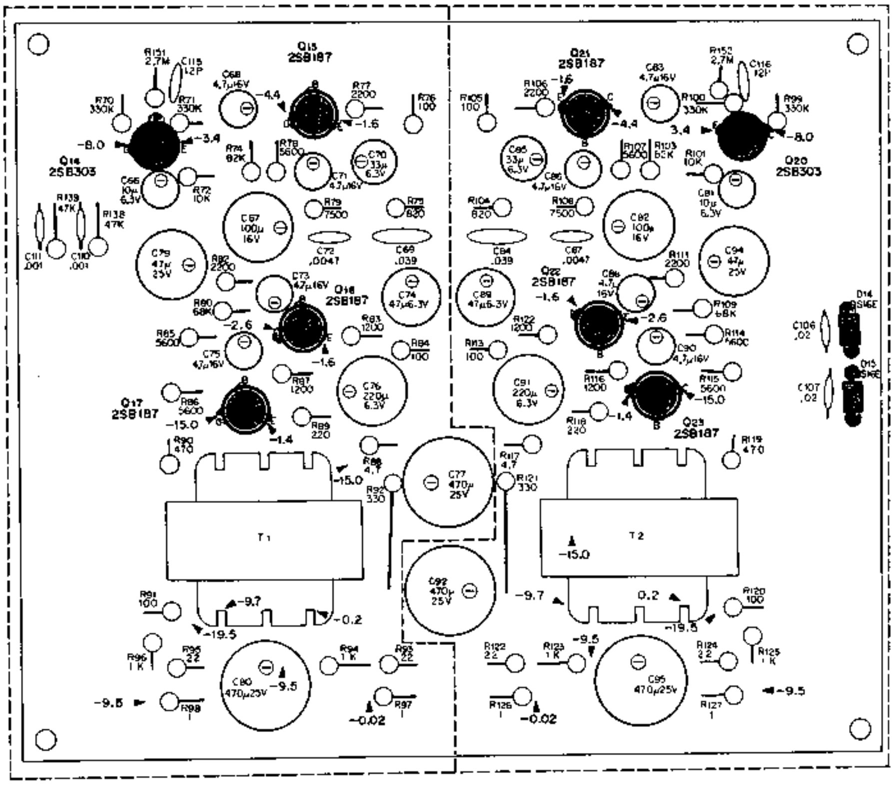
– Conductor Side –



R73,R81,R102,R110,R140,C78 and C93 are mounted on conductor side

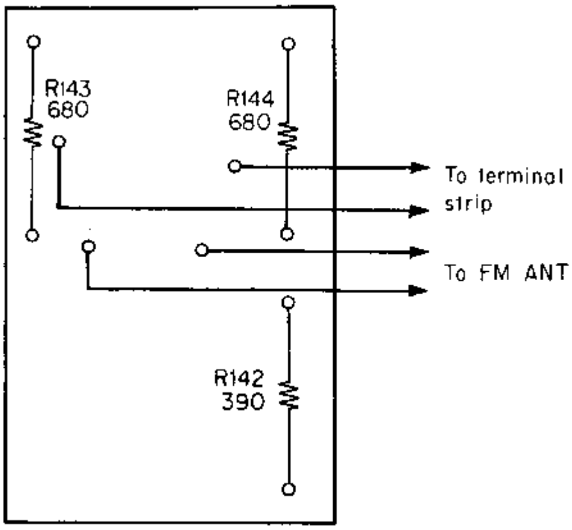
– Component Side –

RIGHT CHANNEL **LEFT CHANNEL**

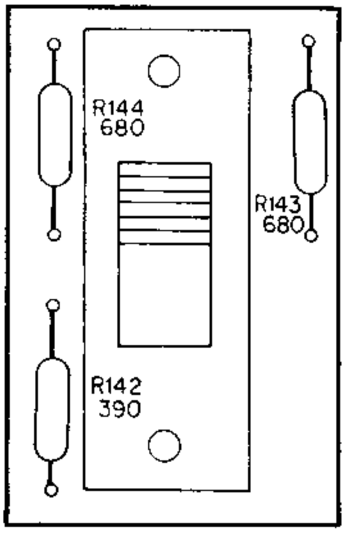


5-5. MOUNTING DIAGRAM – ATT Circuit Board –

– Conductor Side –

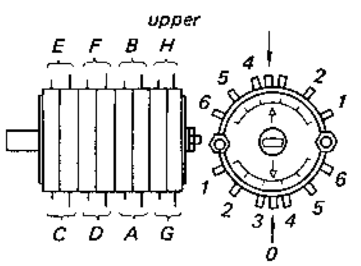
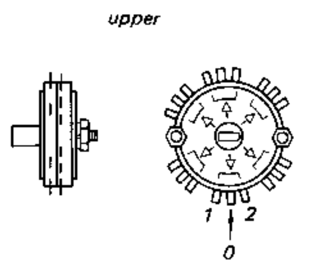


– Component Side –

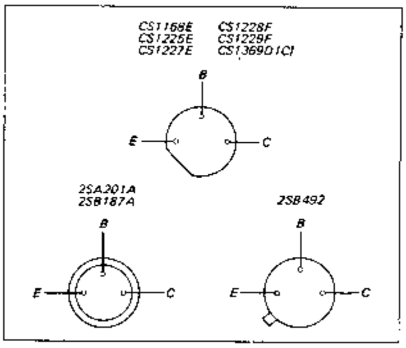


5-6. SCHEMATIC DIAGRAM NOTE

– Switch-lug Guide –

S1 FUNCTION switch	*S2 AFC switch*
	

– Transistor-lead Guide –



Switch Position –

Symbol	*Description*	*Position*
S1	*FUNCTION switch (AM-FM-FM AUTO STEREO-PHONO-TAPE-CASSETTE)*	*AM*
S2	*AFC switch*	*OFF*

Note:

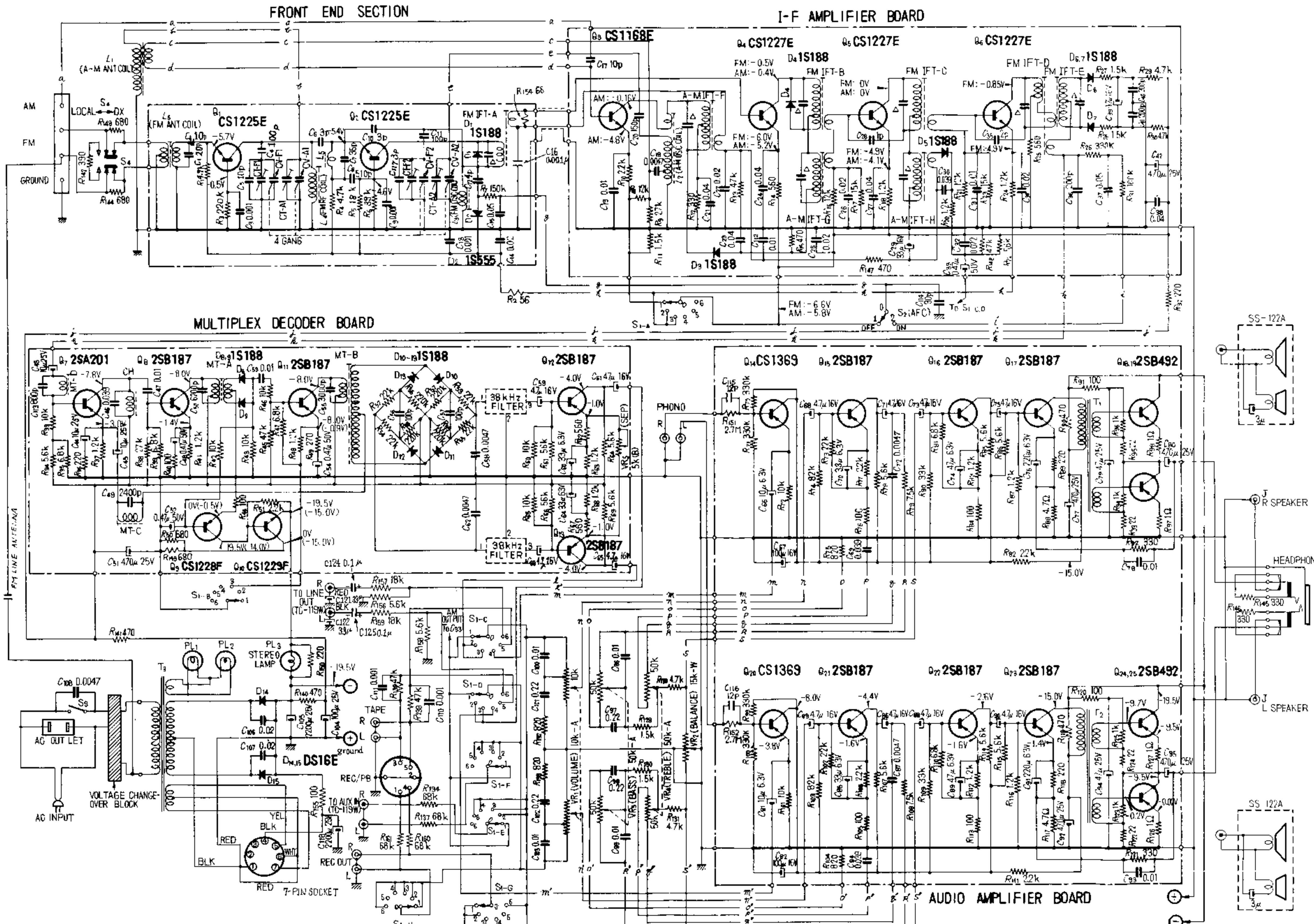
All resistance values are in ohms. k=1 000, M=1000 k

All capacitance values are in μF except as indicated with p, which means μμF.

All voltages represent an average value and should hold within ±20%.

All voltages are dc measured with a VOM (DC 20 k ohms/V) at no signal.

5-7. SCHEMATIC DIAGRAM



( ):STEREO OPERATION

SONY
HST-399
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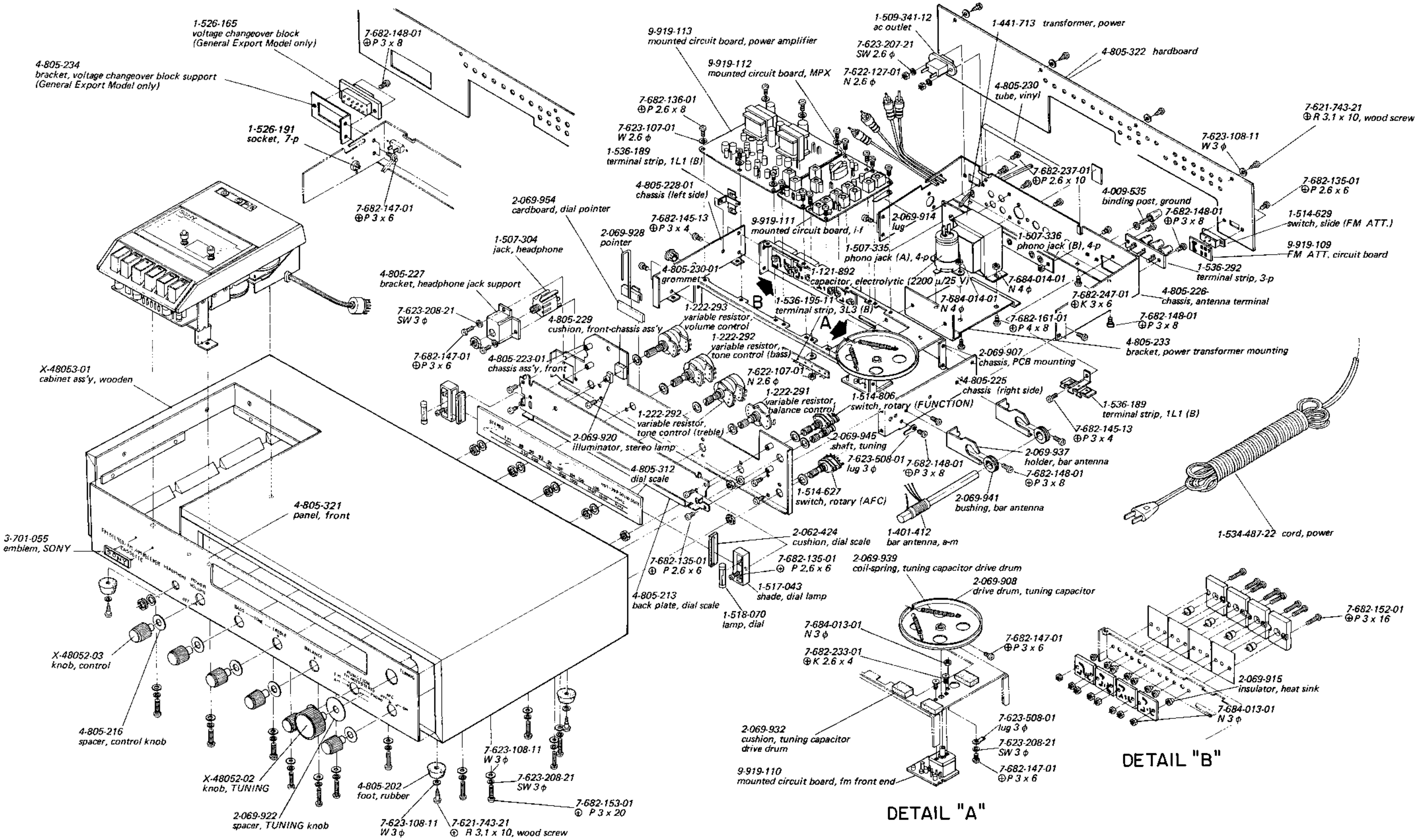
SECTION 6
EXPLODED VIEW



SECTION 7
ELECTRICAL PARTS LIST

Mounted Circuit Boards

Ref. No.	Part No.	Description
	9-919-110	fm front-end circuit board
	9-919-111	i-f circuit board
	9-919-112	MPX circuit board
	9-919-113	audio amplifier circuit board

Semiconductors

Ref. No.	Part No.	Description
D1		diode 1S188
D2		diode 1S555
D3		diode 1S188
D4		diode 1S188
D5		diode 1S188
D6		diode 1S188
D7		diode 1S188
D8		diode 1S188
D9		diode 1S188
D10		diode 1S188
D11		diode 1S188
D12		diode 1S188
D13		diode 1S188
D14		diode DS16E
D15		diode DS16E
Q1		transistor CS1225E
Q2		transistor CS1225E
Q3		transistor CS1168E
Q4		transistor CS1227E
Q5		transistor CS1227E
Q6		transistor CS1227E
Q7		transistor 2SA201A
Q8		transistor 2SB187A
Q9		transistor CS1228
Q10		transistor CS1229
Q11		transistor 2SB187A
Q12		transistor 2SB187A
Q13		transistor 2SB187A
Q14		transistor CS1369D(C)
Q15		transistor 2SB187A
Q16		transistor 2SB187A
Q17		transistor 2SB187A
Q18		transistor 2SB492
Q19		transistor 2SB492
Q20		transistor CS1369D(C)
Q21		transistor 2SB187A
Q22		transistor 2SB187A
Q23		transistor 2SB187A
Q24		transistor 2SB492
Q25		transistor 2SB492

Transformers, Coils and Inductors

Ref. No.	Part No.	Description
CH	1-407-416	coil, choke
IFT-A	1-403-558	IFT, 10.7 MHz
IFT-B	1-403-559	IFT, 10.7 MHz
IFT-C	1-403-559	IFT, 10.7 MHz
IFT-D	1-403-560	IFT, 10.7 MHz
IFT-E	1-403-561	IFT, 10.7 MHz
IFT-F	1-403-170	IFT, 455 kHz
IFT-G	1-403-169	IFT, 455 kHz
IFT-H	1-403-171	IFT, 455 kHz
L1	1-401-412	coil, a-m antenna
L2	1-405-416	coil, a-m osc
L3	1-405-415	coil, fm osc
L4	1-425-588	coil, fm rf
L5	1-409-182	coil, i-f trap
L6	1-401-411	coil, fm antenna
MT-A	1-425-590	MPX coil, 19 kHz
MT-B	1-425-589	MPX coil, 38 kHz
MT-C	1-409-183	MPX coil, 19 kHz
MT-D	1-425-591	MPX coil, 67 kHz
T1	1-425-146	transformer, input
T2	1-425-146	transformer, input
T3	1-441-713	transformer, power

Capacitors

All capacitance values are in μF except as indicated with p, which means μμF.

Ref. No.	Part No.	Description
C1	1-101-864	20 p ±5% 50V, ceramic
C2	1-101-959	10 p ±5% 50V, ceramic
C3	1-101-918	0.001 $\pm^{80}_{20}$% 25V, ceramic
C4	1-101-896	100 p ±5% 50V, ceramic
C5	1-101-959	10 p ±5% 50V, ceramic
C6	1-101-953	3 p ±0.5 pF 50V, ceramic
C7	1-101-871	30 p ±5% 50V, ceramic
C8	1-101-059	510 p ±5% 50V, ceramic
C9	1-101-918	0.001 $\pm^{80}_{20}$% 25V, ceramic
C10	1-101-953	3 p ±0.5 pF 50V, ceramic
C11	1-101-896	100 p ±5% 50V, ceramic
C12	1-101-954	4 p ±0.5 pF 50V, ceramic
C13	1-101-918	0.001 $\pm^{80}_{20}$% 25V, ceramic
C14	1-101-924	0.02 $\pm^{80}_{20}$% 25V, ceramic
C15	1-101-926	0.05 $\pm^{80}_{20}$% 25V, ceramic
C16	1-101-918	0.001 $\pm^{80}_{20}$% 25V, ceramic
C17	1-101-959	10 p ±5% 50V, ceramic
C18	1-105-669-12	0.0047 ±10% 50V, mylar
C19	1-105-673-12	0.01 ±10% 50V, mylar
C20	1-103-805	150 p ±5% 50V, styrol
C21	1-101-925	0.04 $\pm^{80}_{20}$% 25V, ceramic
C22	1-101-924	0.02 $\pm^{80}_{20}$% 25V, ceramic
C23	1-101-925	0.04 $\pm^{80}_{20}$% 25V, ceramic
C24	1-101-925	0.04 $\pm^{80}_{20}$% 25V, ceramic
C25	1-101-924	0.02 $\pm^{80}_{20}$% 25V, ceramic
C26	1-101-924	0.02 $\pm^{80}_{20}$% 25V, ceramic
C27	1-101-925	0.04 $\pm^{80}_{20}$% 25V, ceramic
C28	1-101-951	1 p ±0.5 pF 50V, ceramic
C29	1-121-485	33 $\pm^{100}_{10}$% 16V, electrolytic
C30	1-105-680-12	0.039 ±10% 50V, mylar
C31	1-101-924	0.02 $\pm^{80}_{20}$% 25V, ceramic
C32	1-105-677-12	0.022 ±10% 50V, mylar
C33	1-121-434	0.47 $\pm^{150}_{10}$% 50V, electrolytic
C34	1-101-924	0.02 $\pm^{80}_{20}$% 25V, ceramic
C35	1-101-952	2 p ±0.5 pF 50V, ceramic
C36	1-101-030	200 p ±5% 50V, ceramic
C37	1-101-926	0.05 $\pm^{80}_{20}$% 25V, ceramic
C38	1-101-925	0.04 $\pm^{80}_{20}$% 25V, ceramic
C39	1-121-464	4.7 $\pm^{150}_{10}$% 25V, electrolytic
C40	1-101-030	200 p ±5% 50V, ceramic
C41	1-101-030	200 p ±5% 50V, ceramic
C42	1-121-425	470 $\pm^{100}_{10}$% 10V, electrolytic
C43	1-121-471	10 $\pm^{100}_{10}$% 16V, electrolytic
C44	1-121-471	10 $\pm^{100}_{10}$% 16V, electrolytic
C45	1-121-471	10 $\pm^{100}_{10}$% 16V, electrolytic
C46	1-105-680-12	0.039 ±10% 50V, mylar
C47	1-105-673-12	0.01 ±10% 50V, mylar
C48	1-121-434	0.47 $\pm^{150}_{10}$% 50V, electrolytic
C49	1-103-834	2,400 p ±5% 50V, styrol
C50	1-103-844	6,200 p ±5% 50V, styrol
C51	1-121-425	470 $\pm^{100}_{10}$% 10V, electrolytic
C52	1-121-434	0.47 $\pm^{150}_{10}$% 50V, electrolytic
C53	1-105-673-12	0.01 ±10% 50V, mylar
C54	1-121-434	0.47 $\pm^{150}_{10}$% 50V, electrolytic
C55	1-103-836	3,000 p ±5% 50V, styrol
C56	1-101-896	100 p ±5% 50V, ceramic
C57	1-101-896	100 p ±5% 50V, ceramic
C58(C62)	1-105-669-12	0.0047 ±10% 50V, mylar
C59(C63)	1-121-464	4.7 $\pm^{150}_{10}$% 25V, electrolytic
C60(C64)	1-121-483	33 $\pm^{100}_{10}$% 10V, electrolytic
C61(C65)	1-121-464	4.7 $\pm^{150}_{10}$% 25V, electrolytic
C66(C81)	1-121-471	10 $\pm^{100}_{10}$% 16V, electrolytic
C67(C82)	1-121-377	100 $\pm^{150}_{10}$% 25V, electrolytic
C68(C83)	1-121-464	4.7 $\pm^{150}_{10}$% 25V, electrolytic
C69(C84)	1-105-680-12	0.039 ±10% 50V, mylar
C70(C85)	1-121-483	33 $\pm^{100}_{10}$% 10V, electrolytic
C71(C86)	1-121-464	4.7 $\pm^{150}_{10}$% 25V, electrolytic
C72(C87)	1-105-669-12	0.0047 ±10% 50V, mylar
C73(C88)	1-121-464	4.7 $\pm^{150}_{10}$% 25V, electrolytic
C74(C89)	1-121-487	47 $\pm^{100}_{10}$% 6.3V, electrolytic
C75(C90)	1-121-464	4.7 $\pm^{150}_{10}$% 25V, electrolytic
C76(C91)	1-121-420	220 $\pm^{100}_{10}$% 10V, electrolytic
C77(C92)	1-121-733	470 $\pm^{100}_{10}$% 25V, electrolytic
C78(C93)	1-105-673-12	0.01 ±10% 50V, mylar
C79(C94)	1-121-375	47 $\pm^{150}_{10}$% 25V, electrolytic
C80(C95)	1-121-733	470 $\pm^{100}_{10}$% 25V, electrolytic
C96(C99)	1-105-673-12	0.01 ±10% 50V, mylar
C97(C98)	1-105-689-12	0.22 ±10% 50V, mylar
C100(C103)	1-105-673-12	0.01 ±10% 50V, mylar
C101(C102)	1-105-689-12	0.22 ±10% 50V, mylar
C104	1-121-377	100 $\pm^{150}_{10}$% 25V, electrolytic
C105	1-121-892	2,200 $\pm^{100}_{10}$% 25V, electrolytic
C106(C107)	1-101-073	0.02 $\pm^{80}_{20}$% 50V, ceramic
C108	1-102-192	0.0047 ±10% 1,400V, ceramic
C110(C111)	1-105-661-12	0.001 ±10% 50V, mylar
C112	1-105-673-12	0.01 ±10% 50V, mylar
C113	1-103-823	820 p ±5% 50V, styrol
C114	1-101-871	30 p ±5% 50V, ceramic
C115(C116)	1-101-961	12 p ±5% 50V, ceramic
C117	1-101-953	3 p ±0.5 pF 50V, ceramic
C118	1-119-159	2,200 25V, electrolytic
C121	1-121-402	33 $\pm^{100}_{10}$% 10V, electrolytic
C122	1-121-402	33 $\pm^{100}_{10}$% 10V, electrolytic
C124	1-127-019	0.1 ±20% 10V, electrolytic (aluminum)
C125	1-127-019	0.1 ±20% 10V, electrolytic (aluminum)
CV	1-151-203	capacitor, tuning

Resistors

All resistance values are in ohms, ±5%, ¼ watts and carbon type unless otherwise indicated.

Ref. No.	Part No.	Description
R1	1-244-689	4.7 k
R2	1-244-643	56
R3	1-244-729	220 k
R4	1-244-689	4.7 k
R5	1-244-703	18 k
R6	1-244-711	39 k
R7	1-244-725	150 k
R8	1-244-699	12 k
R9	1-244-707	27 k
R10	1-244-681	2.2 k
R11	1-244-677	1.5 k
R12	1-244-661	330
R13	1-244-713	47 k
R14	1-244-667	560
R15	1-244-665	470
R16	1-244-699	12 k
R17	1-244-701	15 k
R18	1-244-675	1.2 k
R20	1-244-675	1.2 k
R21	1-244-699	12 k
R22	1-244-691	5.6 k
R23	1-244-701	15 k
R24	1-244-675	1.2 k
R25	1-244-667	560
R26	1-244-733	330 k
R27	1-244-677	1.5 k

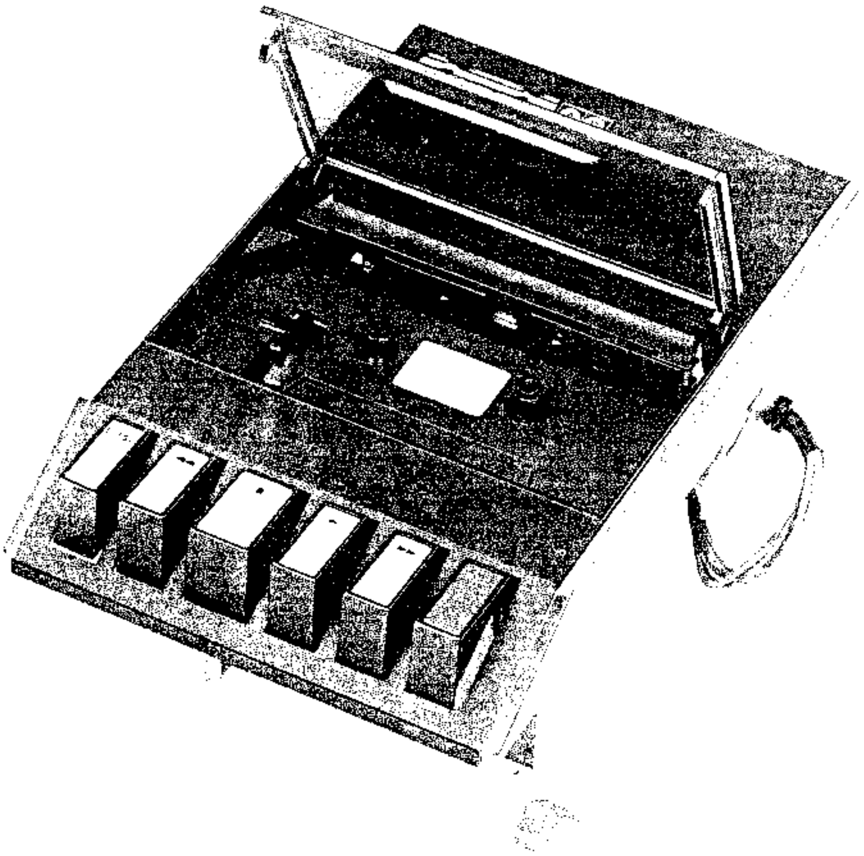
Ref. No.	Part No.	Description
R28	1-244-677	1.5 k
R29	1-244-689	4.7 k
R30	1-244-689	4.7 k
R31	1-244-721	100 k
R32	1-244-657	220
R33	1-244-697	10 k
R34	1-244-691	5.6 k
R35	1-244-693	6.8 k
R36	1-244-657	220
R37	1-244-675	1.2 k
R38	1-244-707	27 k
R39	1-244-693	6.8 k
R40	1-244-649	100
R41	1-244-675	1.2 k
R42	1-244-697	10 k
R43	1-244-697	10 k
R44	1-244-649	100
R45	1-244-713	47 k
R46	1-244-697	10 k
R47	1-244-693	6.8 k
R48	1-244-675	1.2 k
R49	1-244-659	270
R50	1-202-569	680 ±10% ½W, composition
R51	1-244-681	2.2 k
R52	1-244-705	22 k
R53	1-244-705	22 k
R54	1-244-705	22 k
R55	1-244-705	22 k
R56	1-244-729	220 k
R57	1-244-729	220 k
R58	1-244-729	220 k
R59	1-244-729	220 k
R60(R65)	1-244-697	10 k
R61(R66)	1-244-715	56 k
R62(R67)	1-244-667	560
R63(R68)	1-244-675	1.2 k
R64(R69)	1-244-691	5.6 k
R70(R99)	1-244-733	330 k
R71(R100)	1-244-733	330 k
R72 (R101)	1-244-697	10 k
R73(R102)	1-244-705	22 k
R74(R103)	1-244-719	82 k
R75(R104)	1-244-671	820
R76(R105)	1-244-649	100
R77(R106)	1-244-681	2.2 k
R78(R107)	1-244-691	5.6 k
R79 (R108)	1-244-694	7.5 k
R80(R109)	1-244-709	33 k
R81(R110)	1-244-693	6.8 k
R82(R111)	1-244-681	2.2 k
R83(R112)	1-244-675	1.2 k
R84(R113)	1-244-649	100
R85(R114)	1-244-691	5.6 k

Ref. No.	Part No.	Description
R86(R115)	1-244-691	5.6 k
R87(R116)	1-244-675	1.2 k
R88(R117)	1-244-617	4.7
R89(R118)	1-244-657	220
R90(R119)	1-244-665	470
R91(R120)	1-244-649	100
R92(R121)	1-244-661	330
R93(R122)	1-244-633	22
R94(R123)	1-244-673	1 k
R95(R124)	1-244-633	22
R96(R125)	1-244-673	1 k
R97(R126)	1-244-601	1
R98(R127)	1-244-601	1
R128(R131)	1-244-689	4.7 k
R129(R130)	1-244-677	1.5 k
R132(R133)	1-244-671	820
R134(R137)	1-244-717	68 k
R138(R139)	1-244-713	47 k
R140	1-244-665	470
R141	1-244-665	470
R142	1-244-663	390
R143	1-244-669	680
R144	1-244-669	680
R145(R146)	1-202-561	330 ±10% ½W, composition
R147	1-244-665	470
R148	1-244-713	47 k
R149	1-202-569	680 ±10% ½W, composition
R150	1-202-557	220 ±10% ½W, composition
R151(R152)	1-202-655	2.7 M ±10% ½W, composition
R154	1-244-645	68
R155	1-244-649	100
R156	1-244-691	5.6 k
R157	1-244-713	47 k
R158	1-244-691	5.6 k
R159	1-244-713	47 k
R160	1-244-717	68 k
R161	1-244-717	68 k
VR1	1-222-293	10 k variable (volume control)
VR2	1-222-291	15 k variable (balance control)
VR3	1-222-292	50 k variable (tone control, bass)
VR4	1-222-292	50 k variable (tone control, treble)
VR5	1-222-709	5 k semi-fixed
	Switches	
S1	1-514-806	switch, rotary (FUNCTION)
S2	1-514-627	switch, rotary (AFC)
S4	1-514-629	switch, slide (FM ATT)
	Filter	
	1-231-098	LPF, 38 kHz

Ref. No.	Part No.	Description
		Miscellaneous
	1-506-316-11	phono plug
	1-506-316-21	phono plug
	1-507-304	jack, headphone
	1-507-335	phono jack (A), 4-P (SPEAKER)
	1-507-336	phono jack (B), 4-P (PHONO, TAPE)
	1-509-029	REC/PB connector
	1-509-341	AC outlet
	1-517-043	socket, dial lamp
	1-518-070	lamp, dial

Ref. No.	Part No.	Description
	1-518-106	lamp, stereo
	1-526-165	voltage changeover block
	1-526-191	socket, 7-P
	1-534-487-22	cord, power
	1-534-666	cord, fm antenna
	1-536-189	terminal strip, 1L1 (B)
	1-536-292	terminal strip, 3-P
	9-919-109	printed circuit board, fm ATT

STEREO CASSETTE RECORDER
(TC-119W2)



Note: TC-119W2 is a stereo cassette deck installed in HST-399.

SONY

SERVICE MANUAL

TABLE OF CONTENTS

SECTION 1
TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the TC-119W2 stereo cassette tape deck are listed in Table 1.

Table 1. Technical Specifications

Tape speed	:	4.8 cm/sec (1 7/8 inch/sec)
Frequency response	:	50 Hz to 10 kHz (-15 dB)
Recording bias frequency	:	85 kHz
Flutter and wow	:	0.5 %

1-2. CIRCUIT ANALYSIS

The following text describes the function or operation of all stages and controls. The text sequence follows signal paths. Stages are listed by transistor reference designation at the left margin; major components are also listed in a similar manner. Refer to the block diagram on page 47 and the schematic diagram on page 59.

Since the REC/PB amplifier section contains two identical amplifier chains, only the left channel will be described. The right channel is identical except for reference symbol numbers.

Stage/Control	Function
Preamplifier Q101, Q102 Q103	This stage has two functions. It works as a flat amplifier for playback, but has an NAB equalizing characteristic for recording.
REC/PB change-over switch S1	In the record mode, input signal is fed to the base of Q101 through S1-2L, and is then amplified to the level required for driving the record amplifier by the three-stage direct-coupled preamplifier. Flat response and operation are obtained by the negative feedback loop consisting of R115, C108, R114, R104 and the impedance between collector and emitter of Q104. In the playback mode, the voltage induced in the playback head is applied to the preamplifier. Playback equalization is achieved by means of a negative feedback loop containing C107, R113, R112 and R111.

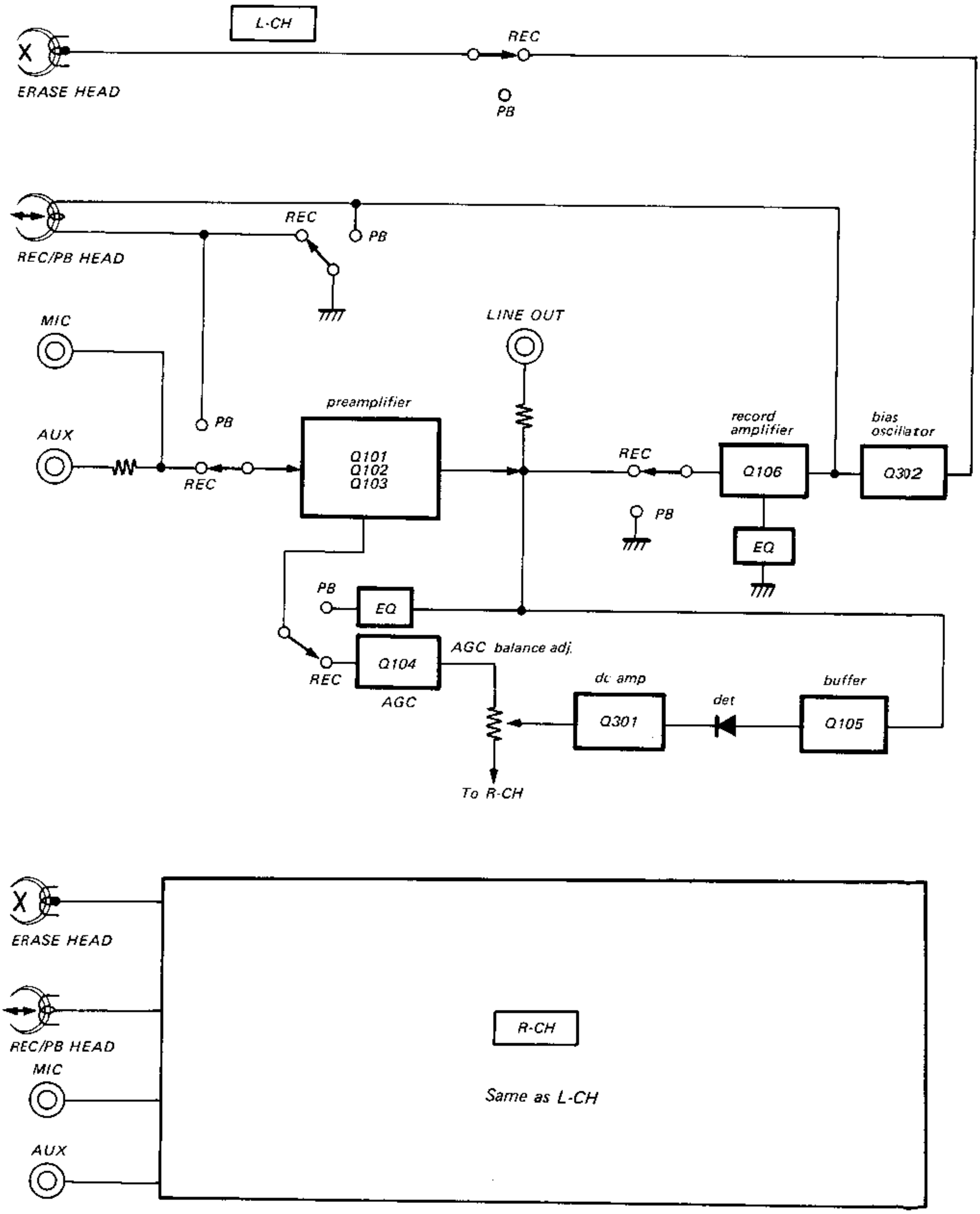
Stage/Control	Function
	The signal is now delivered to LINE OUT jack J103, through R117 and R301 (balance adj.). R301 is set to obtain the same output voltage at each LINE OUT jack. Input signals appear at J103 even in the recording and is available for monitoring.
AGC circuit Q104, Q105 Q301	The TC-119W2's automatic gain control circuit is essentially a compressor to prevent overmodulation in the recording system. Although agc restricts the volume range to some extent, it aids in flattening out excessive program peaks. Agc operation is achieved by changing the value of negative feedback voltage in the preamplifier by varying the impedance between collector and emitter of Q104. The agc circuit works as follows: In the record mode, output signal from the preamplifier is directly fed to emitter follower Q105. Since the emitter follower has a high input impedance, it works as a buffer amplifier and has no effect upon the preamplifier's operation.
D102	The signal is rectified by D102 and then supplied to the base of Q301 through S1-5R.
Q301	Q301 is a dc amplifier which amplifies the dc component of the rectified signal (which is proportional to the input signal level) to the level required to drive Q104. It responds to signal peaks also, since the agc circuit is required to control sudden variations in the program.
D101, Q104, R303	The dc output of Q301 is applied to the base of control transistor Q104 through R303 (agc balance adj.) and D101. The base current of Q104 determines the impedance between the collector and emitter of Q104, which in turn determines

Stage/Control	Function
	the amount of negative feedback and hence the preamplifier gain. D101 is employed to extend the agc response. R303 balances the agc response between "L" and "R" channels.
Record amplifier Q106	Amplifies the preamplifier output signal to the level required to drive the record head. In the emitter circuit of Q106. L101 and C114 (in series resonance) compensate for the high-frequency (11 kHz) loss that occurs in the record head and produce a flat frequency response during playback.
Bias current trap L102, C116	Prevents bias current leak in the record amplifier. This trap is a parallel-tuned circuit.
Bias current adj. C117 C118 C119	These coupling capacitors should be selected to obtain optimum bias current in the record head.

Stage/Control	Function
Bias oscillator Q302 T301	This oscillator supplies bias current to the record head through T301 and coupling capacitor C118. The circuit is a Hartley oscillator with the feedback applied to the base from the collector circuit.
Erase head	C303, C314, and the inductance of the erase head form a resonant circuit at the bias frequency to make the bias current flow in the erase head more efficiently.
Power Supply CD-2	Diode D303 (a double diode) forms a full-wave rectifier to supply dc operating voltage to the drive motor. Ac current for this rectifier is supplied through connector CNP1 from the power transformer in the receiver section.

Note: The well filtered and stabilized dc voltage for amplifiers is supplied from receiver section through connector CNP1.

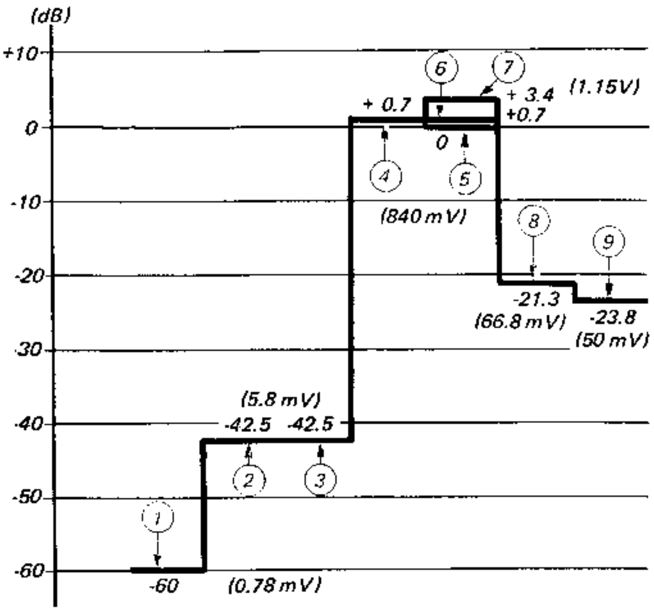
1-3. BLOOK DIAGRAM



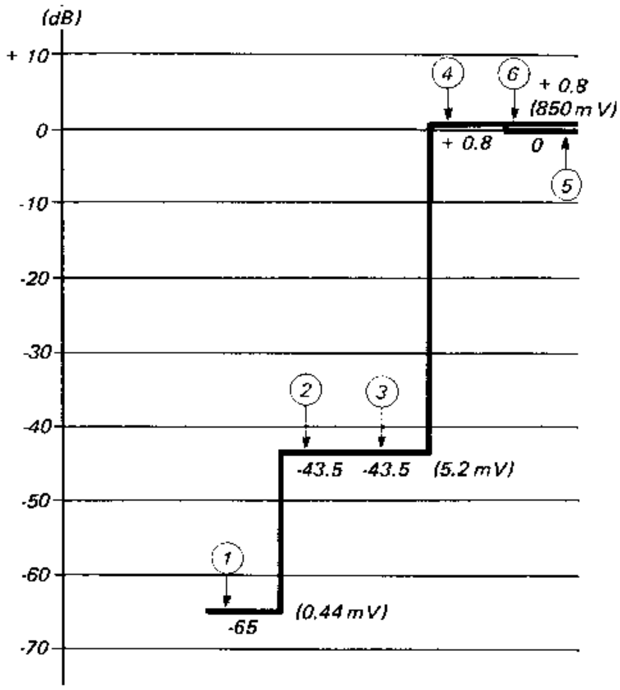
1-4. LEVEL DIAGRAM

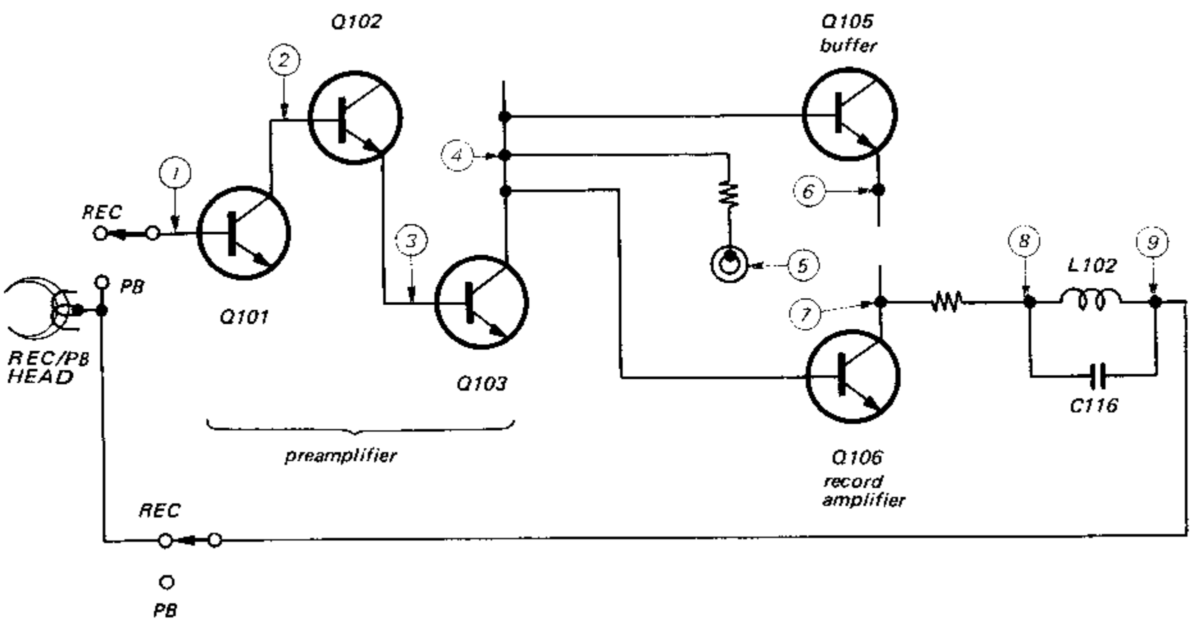
Note: Signal voltages are measured with ac VTVM and expressed in dB referred to 0.775V, 1 kHz.

RECORD MODE



REPRODUCE MODE





SECTION 2
DISASSEMBLY AND REPLACEMENT PROCEDURES

WARNING

Unplug the ac power cord before starting any disassembly or replacement procedures.

2-1. TOOLS REQUIRED

The tools required to perform the following disassembly and replacement procedures on the TC-119W2 are listed below.

Screwdrive, Philips-head
Pliers, long-nose

2-2. HARDWARE IDENTIFICATION GUIDE

The following chart will help you to decipher the hardware codes given in this service manual.

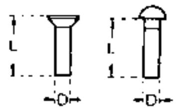
— Hardware Nomenclature —

- **P** – Pan Head Screw
- **PS** – Pan Head Screw with Spring Washer
- **K** – Flat Countersunk Head Screw
- **B** – Binding Head Screw
- **RK** – Oval Countersunk Head Screw
- **T** – Truss Head Screw
- **R** – Round Head Screw
- **F** – Flat Fillister Head Screw
- **SC** – Set Screw
- **E** – Retaining Ring (E Washer)

W – Washer
SW – Spring Washer
LW – Lock Washer
N – Nut

– Example –

⊕ P 3x10
- Type of Slot
- Length in mm (L)
- Diameter in mm (D)
- Type of Head



Note: All screws in the TC-119W2 are manufactured to the specifications of the International Organization for Standardization (ISO). This means that the new and old screws are not interchangeable because ISO screws have a different number of threads per mm compared to the old ones. The ISO screws have an identification mark on their heads as shown in Fig. 2-1.

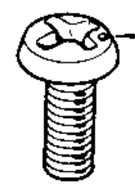


Fig. 2-1 ISO screw

2-3. CASSETTE DECK REMOVAL

1. Remove the six screws at the rear hardboard, two of them (⊕P 2.6 x 6) secure the ATT switch, and the four others (wood screw ⊕R 3.1 x 10) secure the hardboard to the wooden case as shown in Fig. 2-2.
2. Remove the three screws (⊕P 3 x 20) securing the cassette deck from the bottom as shown in Fig. 2-2. This frees the cassette deck.
3. Disconnect 7 pin plug and two-pairs of phono plug connecting between the cassette deck and the receiver unit.

2-4. TOP COVER REMOVAL

1. Remove the two screws (⊕ PS 3x6, ⊕ P 2.6x6) from the bottom of the chassis. See Fig. 2-3.

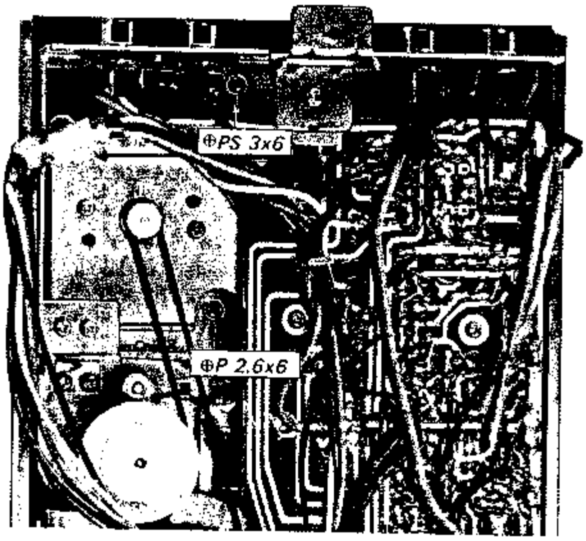


Fig. 2-3 Top cover removal (1)

2. Remove the two nuts securing the microphone jack to the top cover, and the two screws (⊕ P 2.6x4, ⊕ P 2.6x8) securing the top cover to the chassis. See Fig. 2-4.

3. Lift the top cover straight up.

2-5. PRINTED-CIRCUIT BOARD REMOVAL

1. Remove the recorder from the wooden case as described in Procedure 2-3.

2. Remove the three screws (⊕ PS 3x6, ⊕ P 2.6x4) securing the brackets to the chassis as shown in Fig. 2-5 and Fig. 2-6.

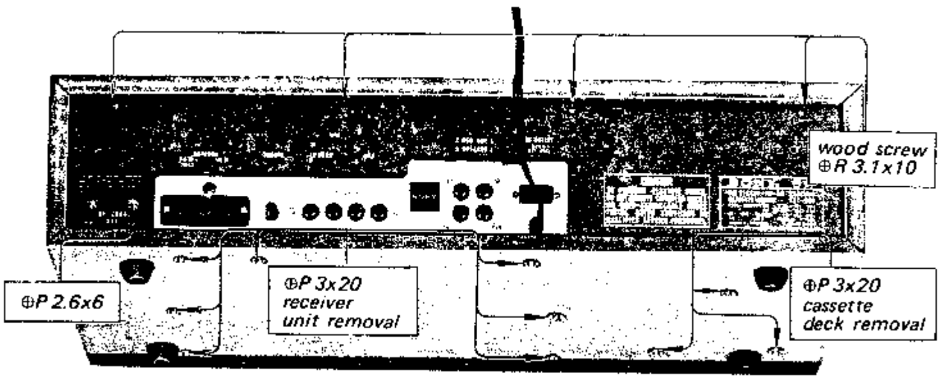


Fig. 2-2 Cassette deck removal

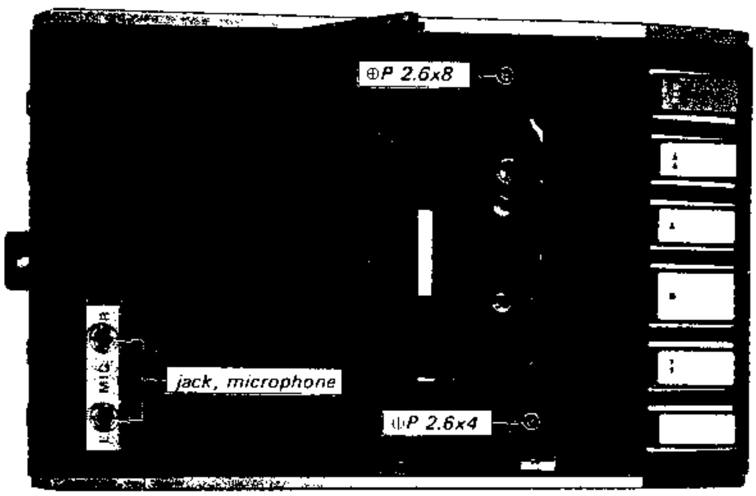


Fig. 2-4 Top cover removal (2)

3. Remove the four screws(⊕ P 2.6x4) securing the printed circuit board to the chassis as shown in Fig. 2-7.

4. Now the printed circuit board can be removed for servicing.

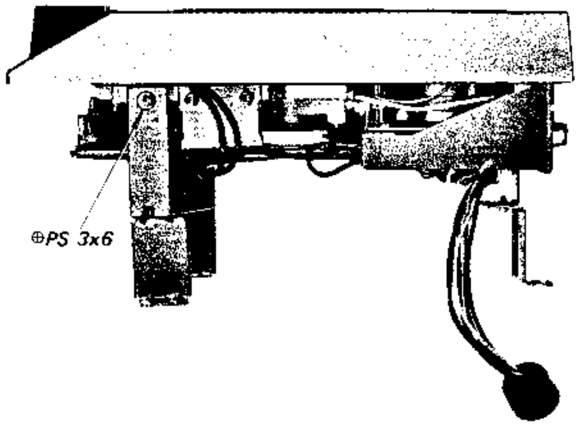


Fig. 2-5 Chassis bracket removal (1)

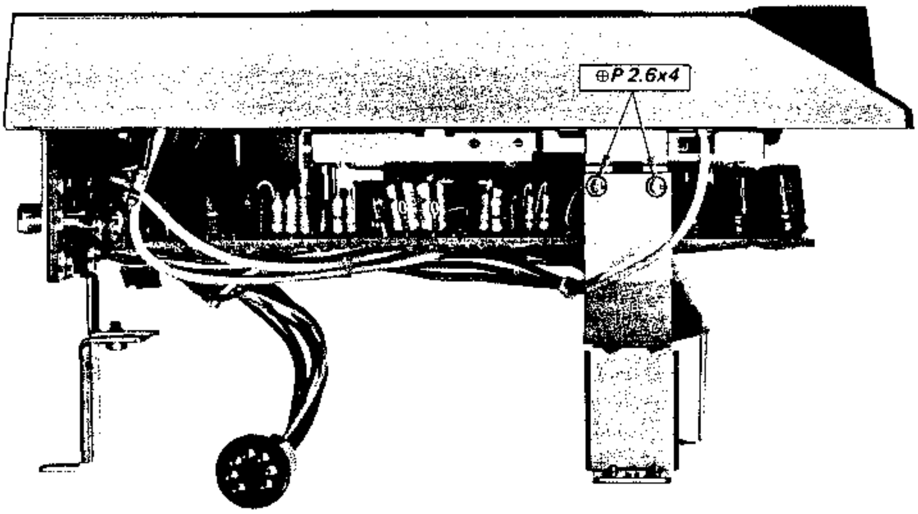


Fig. 2-6 Chassis bracket removal (2)

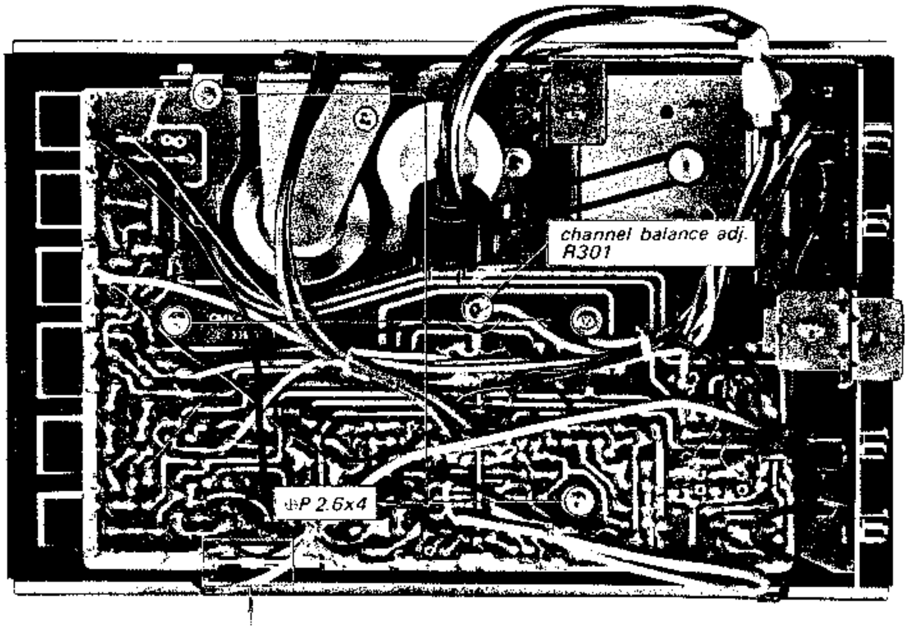


Fig. 2-7 PCB removal

SECTION 3
MECHANICAL ADJUSTMENT PROCEDURES

Note: The mechanical assembly is shipped from the factory with all adjustments set for correct performance. It should be unnecessary to change any adjustment before putting the equipment into service, unless shipping damage has occurred. In the course of normal service, or in the event of component failure and replacement of parts, some readjustment may be necessary.

3-1. TOOLS REQUIRED

The following tools are required to perform mechanical adjustment procedures on the TC-119W_2.

Screwdriver, Phillips-head
Screwdriver, 3 mm blade
Pliers, long-nose
Contact cement

3-2. PUSH-BUTTON HEIGHT ADJUSTMENT

1. Check that the top surfaces of all push buttons line up in the STOP mode.
2. Push-button height can be adjusted by bending the tab on the push-button mechanism with a screwdriver. See Fig. 3-1.

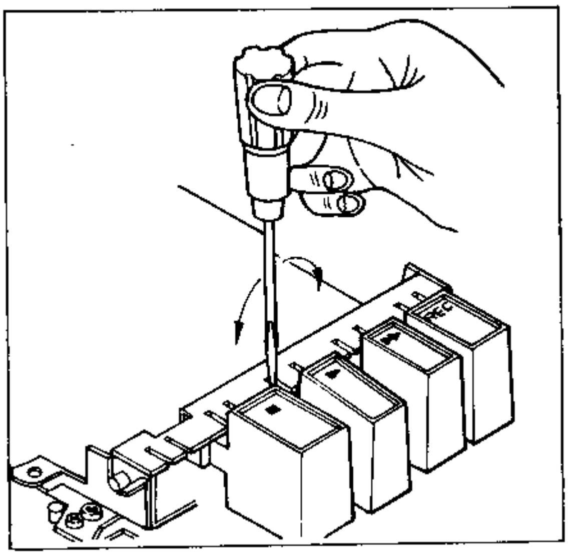


Fig. 3-1 Push-button height adjustment

3-3. CLEARANCE ADJUSTMENT BETWEEN PULLEY "C" AND REEL TABLES

1. With the equipment in the STOP mode, make sure that pulley "C" does not touch the reel tables. At the same time the clearance (b) between pulley "C" and the take-up reel table should be larger than the clearance (a) between pulley "C" and the supply-reel table as shown in Fig. 3-2.
2. The clearance can be changed by bending the Rewind/Fast Forward spring in the back of the chassis with pliers as shown in Fig. 3-3.

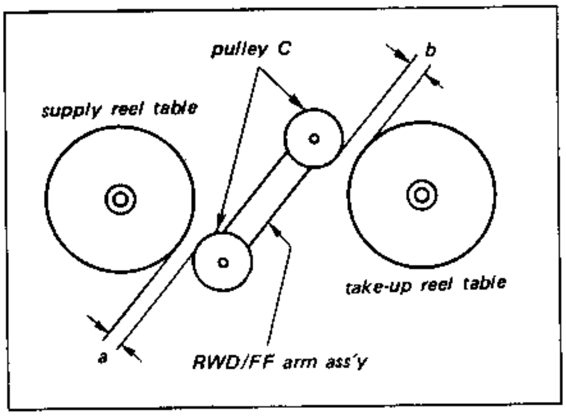


Fig. 3-2 Clearance between pulley "C" and reel tables

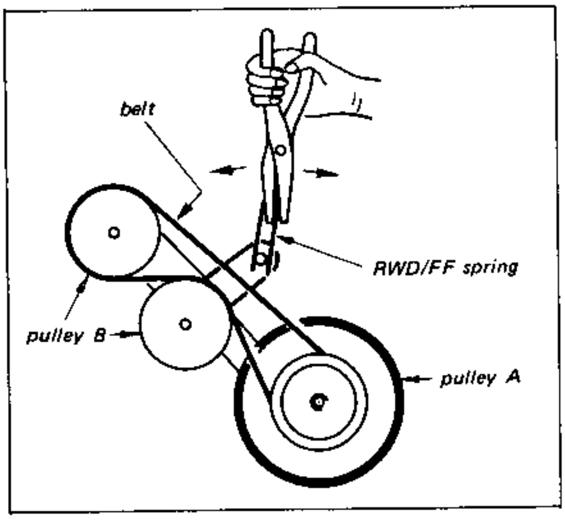


Fig. 3-3 Spring adjustment for pulley "C" clearance

3-4. PULLEY "C" HEIGHT ADJUSTMENT

1. In the Fast Forward or Rewind mode, the reel tables should run in the center of pulley "C" as shown in Fig. 3-4.

2. To adjust the pulley height, bend the tab of the Fast Forward/Rewind spring to obtain proper operation as shown in Fig. 3-5.

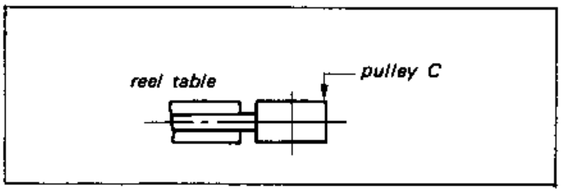


Fig. 3-4 Pulley "C" height adjustment

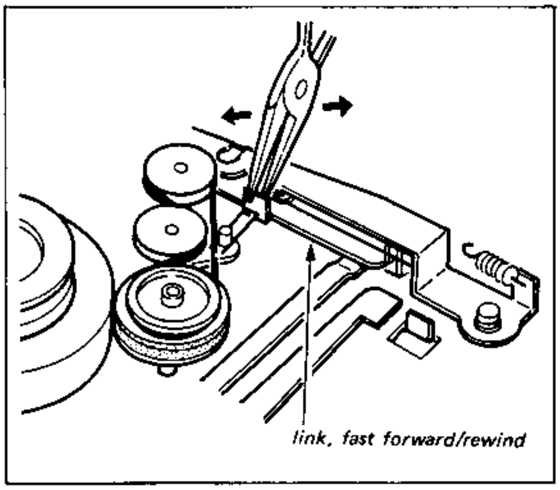


Fig. 3-5 Tab adjustment for pulley "C" height

3-5. FLYWHEEL END-PLAY ADJUSTMENT

1. In the STOP mode, check the end play of the flywheel. There should be 0.2 mm to 0.5 mm end play between the flywheel and its housing as shown in Fig. 3-6.

2. End play can be changed by turning the screw marked ▲ in Fig. 3-6.

3. After completing the adjustment, apply a drop of contact cement to the screw.

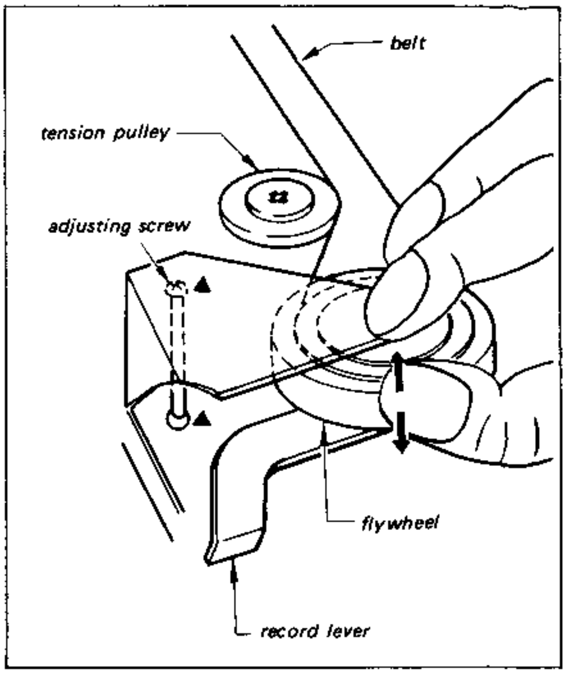


Fig. 3-6 Flywheel end-play adjustment

3-6. TAKE-UP TENSION CHECKOUT

Serious malfunctions such as tape sticking in the pinch roller will result if the take-up tension is not sufficient.

Take-up tension is checked by measuring the take-up reel table's torque in the playback mode with the special torque driver (or equivalent) as follows:

Equipment Required

* Torque driver (See Fig. 3-7.) or equivalent.

Procedure

1. Press the EJECT button to open the lid.

2. Turn the power switch "ON" and press the playback button to allow the counterclockwise motion of the take-up reel table.

3. Release the torque driver clamp first, and then place it slowly onto the take-up-reel table's shaft as shown in Fig. 3-7.
   Be certain that the torque driver clutches the shaft properly. See Fig. 3-8.

4. Observe the readings on the scale. It should be between 40 and 60 gram-cm as shown in Fig. 3-9.

Note: If the proper reading is not obtained, all mechanisms related to take-up motion such as the friction pulley assembly, capstan drive belt, drive-motor and take-up-reel table assembly, should be checked and replaced.

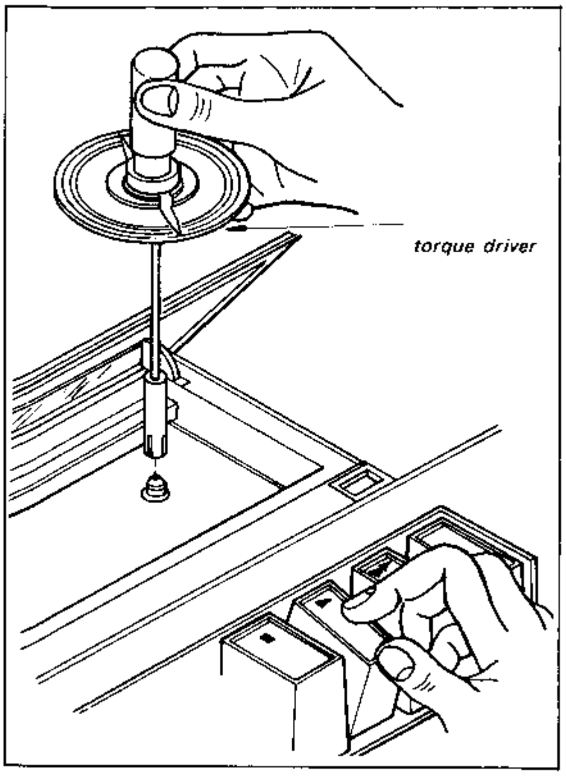


Fig. 3-7 Tack-up tension checkout

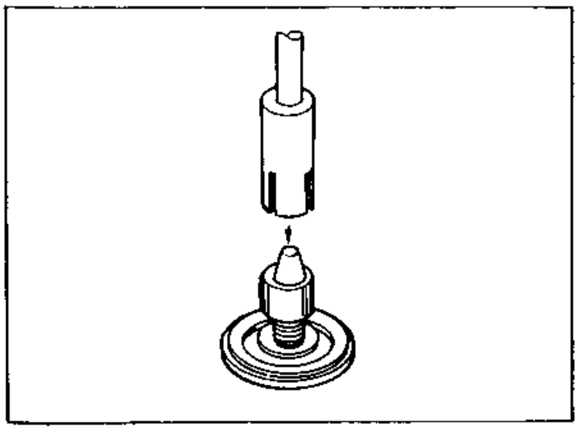


Fig. 3-8 Torque driver installation

(a) Friction pulley assembly replacement
1. Remove the top cover as described in Procedure 2-4.
2. Remove the take-up reel table drive pulley by loosening the set screw as shown in Fig. 3-10.
3. Pull the defective friction pulley assembly out from the bottom and then install the replacement friction pulley assembly.

(b) Take-up or supply reel table assembly replacement
1. Open the lid of the top cover and then pry out the cap on the shaft with a jeweler's screw driver.

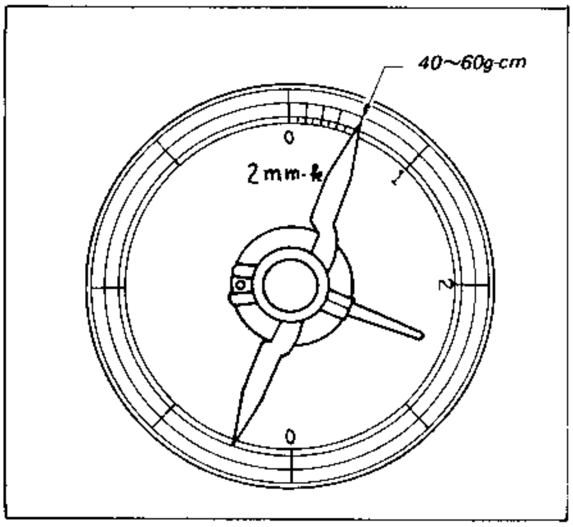


Fig. 3-9 Torque driver indication

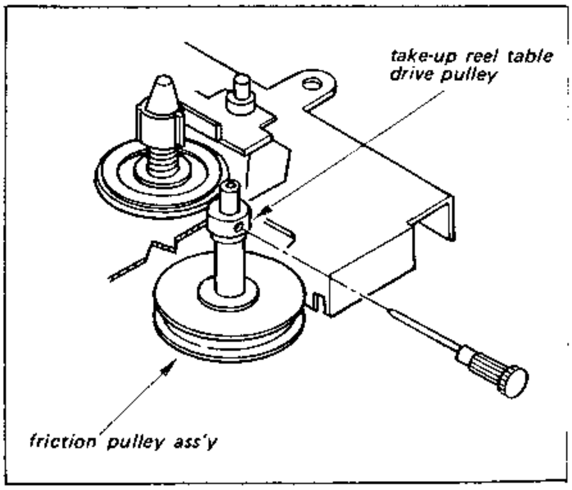


Fig. 3-10 Friction pulley removal

2. Remove the defective reel table and then install the replacement.

3-7. PINCH ROLLER PRESSURE CHECKOUT

The pinch roller is forced against the capstan by the action of pressure spring.
Insufficient pressure may cause slippage on the capstan while excessive pressure throws an unnecessary load on the capstan bearing causing speed reduction.
Pinch roller pressure should be maintained within the recommended value.

Equipment Required

* Special spring scale as shown in Fig. 3-11 or equivalent.

Procedure

1. Press the EJECT button to open the lid.
2. Press the playback button.
3. Check the pressure applied to the pinch roller by using a special spring scale as shown in Fig. 3-11 and 3-12.

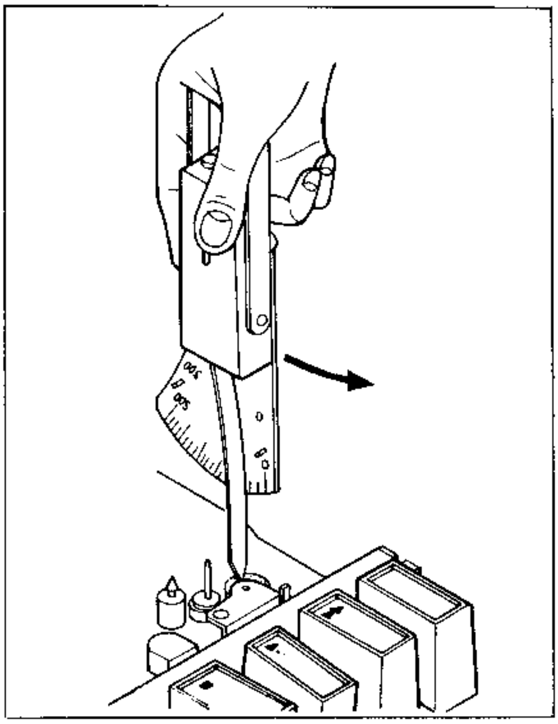


Fig. 3-11 Pinch roller pressure checkout

4. Take a reading only when the pinch roller is pulled backward by the spring scale and then slowly returned toward the capstan. The force required to overcome the static friction will produce an excessively high initial reading; this technique eliminates this source of error.
5. The readings should be between 280 and 400 grams as shown in Fig. 3-13.

Note: If the proper reading is not obtained, replace the pressure spring.

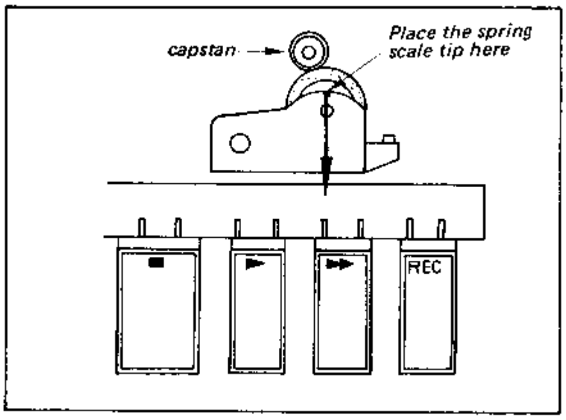


Fig. 3-12 Detail of measuring point

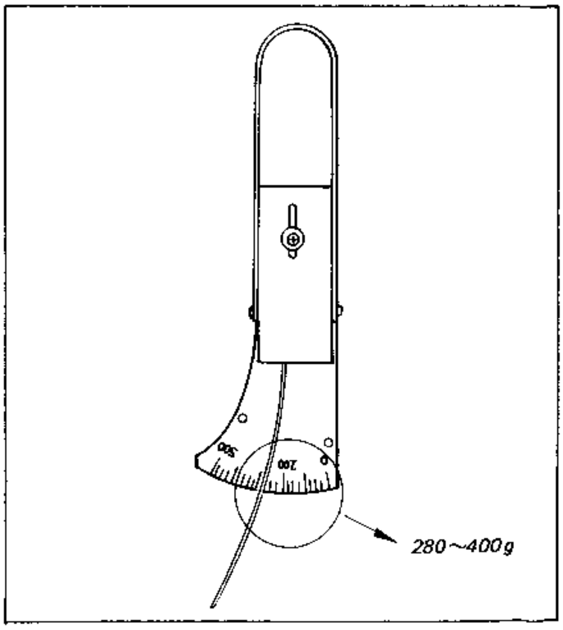


Fig. 3-13 Spring scale reading

SECTION 4
MAINTENANCE AND ADJUSTMENT

4-1. HEAD CLEANING

Most tape manufacturers lubricate their tapes to reduce head and tape wear. Unfortunately deposits of this lubricant will gradually build up on the heads. These deposits cause loss of high frequencies, therefore the heads should be cleaned before adjustment. To clean the heads, use a solvent specially manufactured for tape head cleaning.
Do not use any metallic cleaning tool or other device which will scratch the heads.

4-2. DEMAGNETIZING

The record/playback head may occasionally acquire a degree of permanent magnetization. This results in an increase in noise, distortion of any recorded signal, and a gradual erasure of high frequencies on any recorded tape which passes over it.
Head demagnetizing is easily accomplished by using the head eraser.
To demagnetize the head, proceed as follows:

Procedure

1. Make certain that all controls are in their OFF position.
2. Connect the head eraser to a source of ac power.
3. Bring the tips of the head eraser in close proximity to; but not in contact with, the record/playback head so that the tips straddle the gap in the center of the head. Run the tips up and down over the head several times, and then slowly withdraw the head eraser. The slow withdrawal is essential to proper demagnetization.
4. Repeat Step 3 at the erase head and tape guides.

4-3. SPEED ADJUSTMENT

Note: This adjustment should be performed only if precise tape speed is required.

Test Equipment Required

1. SONY SPC-4 test tape or equivalent
2. Frequency counter
3. Connecting cord ...... SONY RK-46
4. Three kinds of motor pulley. See Fig. 4-2.
5. Screwdriver, 3 mm

Procedure

1. With the equipment connected as shown in Fig. 4-1, set the counter's gate control to 1 second.
2. Reproduce the test tape. Wait 10 seconds then note the counter's indication.
3. The indication should be within the limit of 1,000±30 Hz. If not, replace the pulley.
4. Three kinds of motor pulley are available for precise speed adjustment as shown in Fig. 4-2.

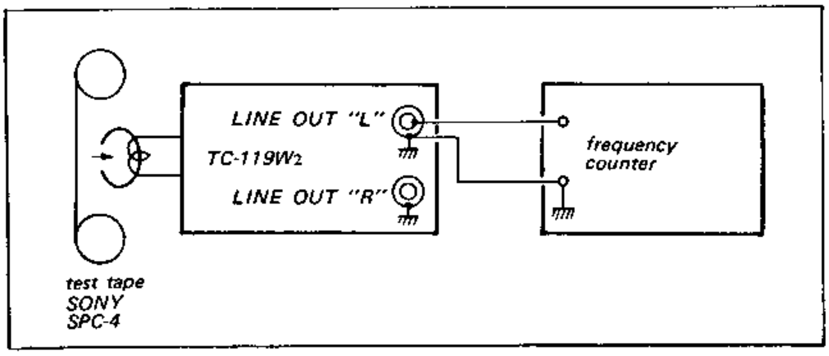
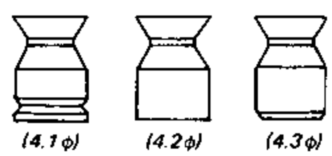


Fig. 4-1 Speed adjustment test setup



Part No.	Diameter (mm)
3-434-106	4.1
3-434-107	4.2
3-434-108	4.3

Fig. 4-2 Motor pulleys

4-4. RECORD/PLAYBACK HEAD AZIMUTH ADJUSTMENT

CAUTION

The test tape used in the following procedure may be partially erased. If the head is permanently magnetized, demagnetize the heads as described in Procedure 4-2 before starting this procedure.

Test Equipment Required

1. SONY P-4-A81 test tape
2. Ac VTVM
3. Oscilloscope
4. Connecting cord RK-46 2
5. Screwdriver 3 mm

Note: Head azimuth adjustment, bias adjustment (4-5), and channel balance adjustment (4-6) should be performed only after replacing the record/playback head.

Procedure

1. With the equipment connected as shown in Fig. 4-4, play the 6 kHz signal recorded on the test tape.
2. Adjust the azimuth adjusting screw (See Fig. 4-3) on the record/playback head for maximum output on the VTVM, and an in-phase indication on the oscilloscope as shown in Fig. 4-4.

Note:

(1) The in-phase condition may not coincide with maximum output. It is permissible that the in-phase condition be obtained while the output level is within 1 dB below maximum output.

(2) If the head azimuth is far out of alignment, minor peaks may observed on both sides of maximum peak. The proper setting is higher than these peaks.

4-5. BIAS ADJUSTMENT

Note: Bias adjustment should be performed only after replacing the record/playback head and azimuth adjustment.

Test Equipment Required

1. Blank cassette tape
2. Ac VTVM
3. 600Ω unbalanced attenuator
4. Connecting cord ....SONY RK-46 (2)
5. Aduio oscillator
6. Solder and soldering iron, 40 to 50W.
7. 600Ω resistor, ¼W, ±5%

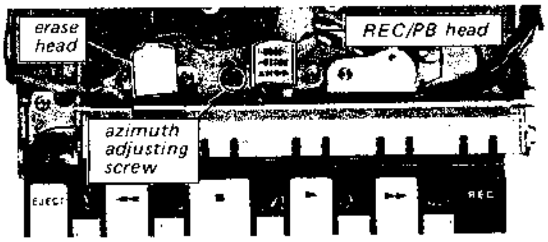


Fig. 4-3 Azimuth adjusting screw

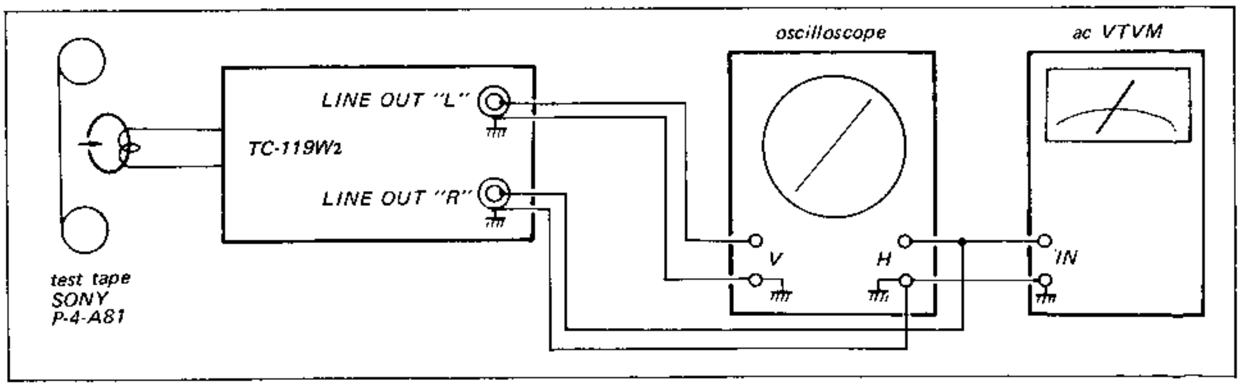


Fig. 4-4 Head azimuth and phase adjustment test setup

Procedure

1. With the equipment connected as shown in Fig. 4-4, record the signals as follows:

Frequency	Level
1,000 Hz	-90 dB
150 Hz	-90 dB
6,000 Hz	-90 dB

* 0 dB = 0.775 V

2. Playback the recorded signals and measure the output levels of the 1,000 Hz, 150 Hz, and 6,000 Hz test tones. The 150 Hz and 6,000 Hz output levels should be within ±3 dB of the 1,000 Hz output level.

3. Proper frequency response will achieved by changing the bias current as follows:
   (a) If the output at 150 and 6,000 Hz is too high, connect 27 pF capacitor C117 (C217) instead of 22 pF capacitor C118 (C218). See Fig. 4-6.

   (b) If the output at 150 and 6,000 Hz is too low, connect 18 pF capacitor C119 (C219) instead of C118 (C218). See Fig. 4-6.

4-6. CHANNEL BALANCE AND AGC BALANCE

Note: These adjustments should be performed after replacing the record/playback head.

Test Equipment Required

1. Blank cassette tape
2. Ac VTVM
3. Connecting cord ...SONY RK-46 or equivalent
4. 600 Ω unbalanced attenuator
5. Audio oscillator
6. Screwdriver, 3 mm
7. 600 Ω resistor, ¼W, ±5%

Channel Balance

Procedure

1. With the equipment connected as shown in Fig. 4-5, record a 1,000 Hz, -60 dB signal and then play it back.

2. Adjust semifixed resistor R301 (See Fig. 2-7) to obtain the same output voltage from each channel.

AGC Balance

Procedure

1. With the equipment connected as shown in Fig. 4-5, record a 1,000 Hz, -50 dB signal. Play it back. Adjust semifixed resistor R303 (see Fig. 2-7) to obtain the same output voltage from each channel while recording.

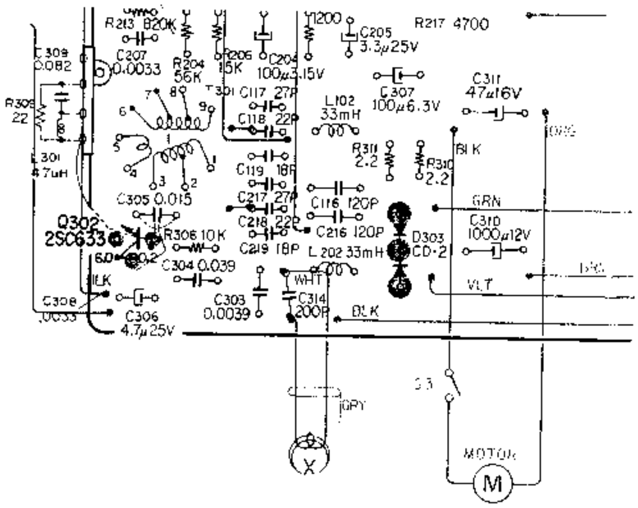


Fig. 4-6 Bias current adjustment

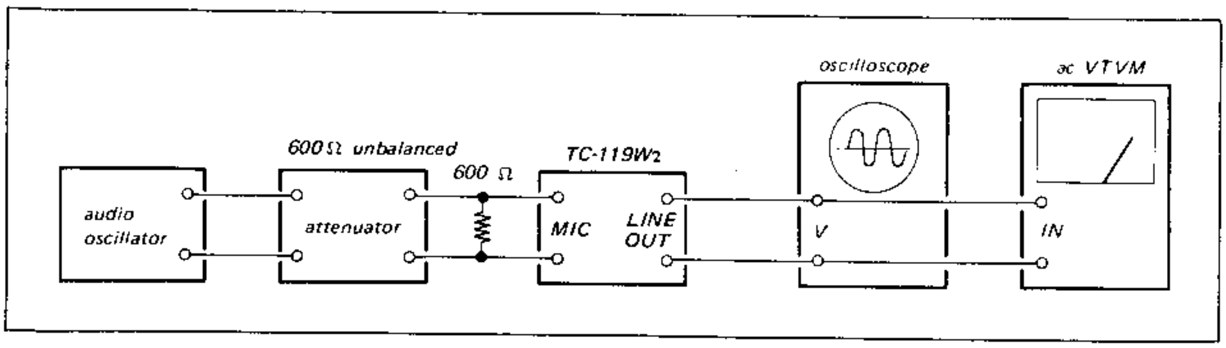
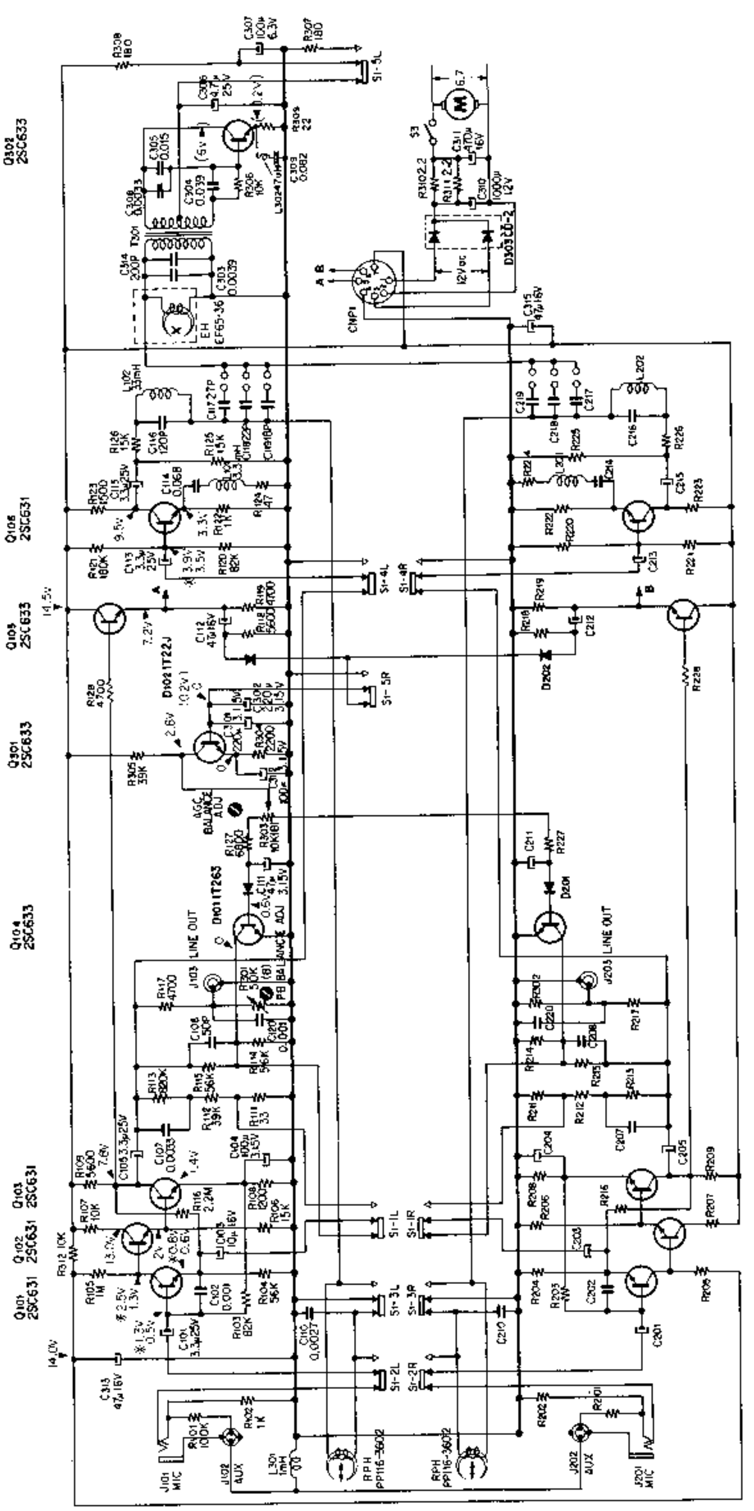


Fig. 4-5 Cassette recorder adjustment test setup

SECTIONS 5
DIAGRAMS

SCHEMATIC DIAGRAM

REC/PB Amplifier Board



LEFT

RIGHT

SONY
TC-119W2

Note:

All resistance values are in Ω k=1000, M=1000 k

All capacitance values are in μF except as indicated with p, which means μμF.

All voltages represent an average value and should hold within ±20%.

All voltages are dc measured with a VOM which has an input impedance of 20 kΩ/V. No signal in.

Voltages are measured with dc VTVM

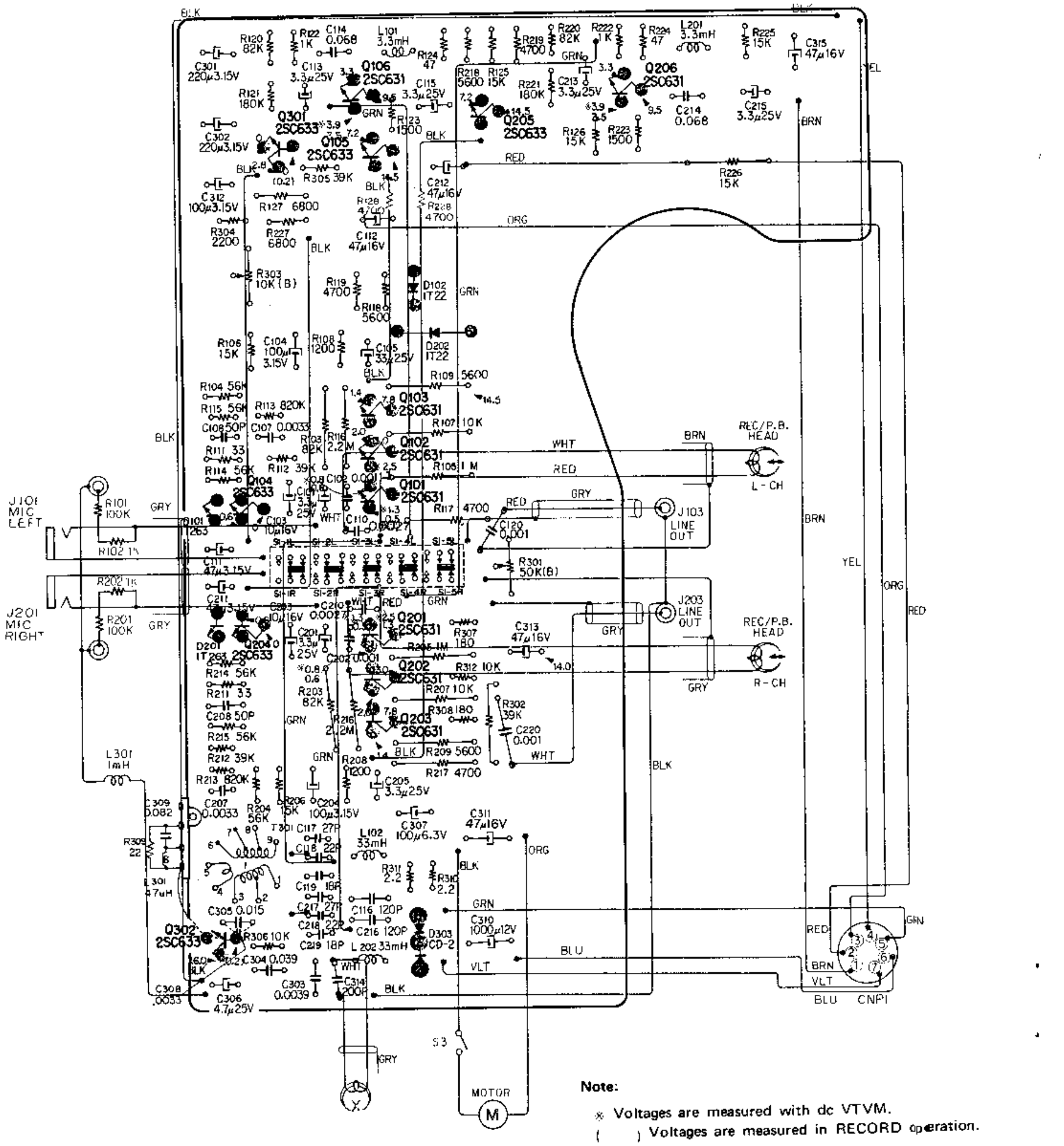
Voltages are measured in RECORD operation.

2SC631
633
E C B

MOUNTING DIAGRAM

REC/PB Amplifier Board

– Conductor side –



Note:

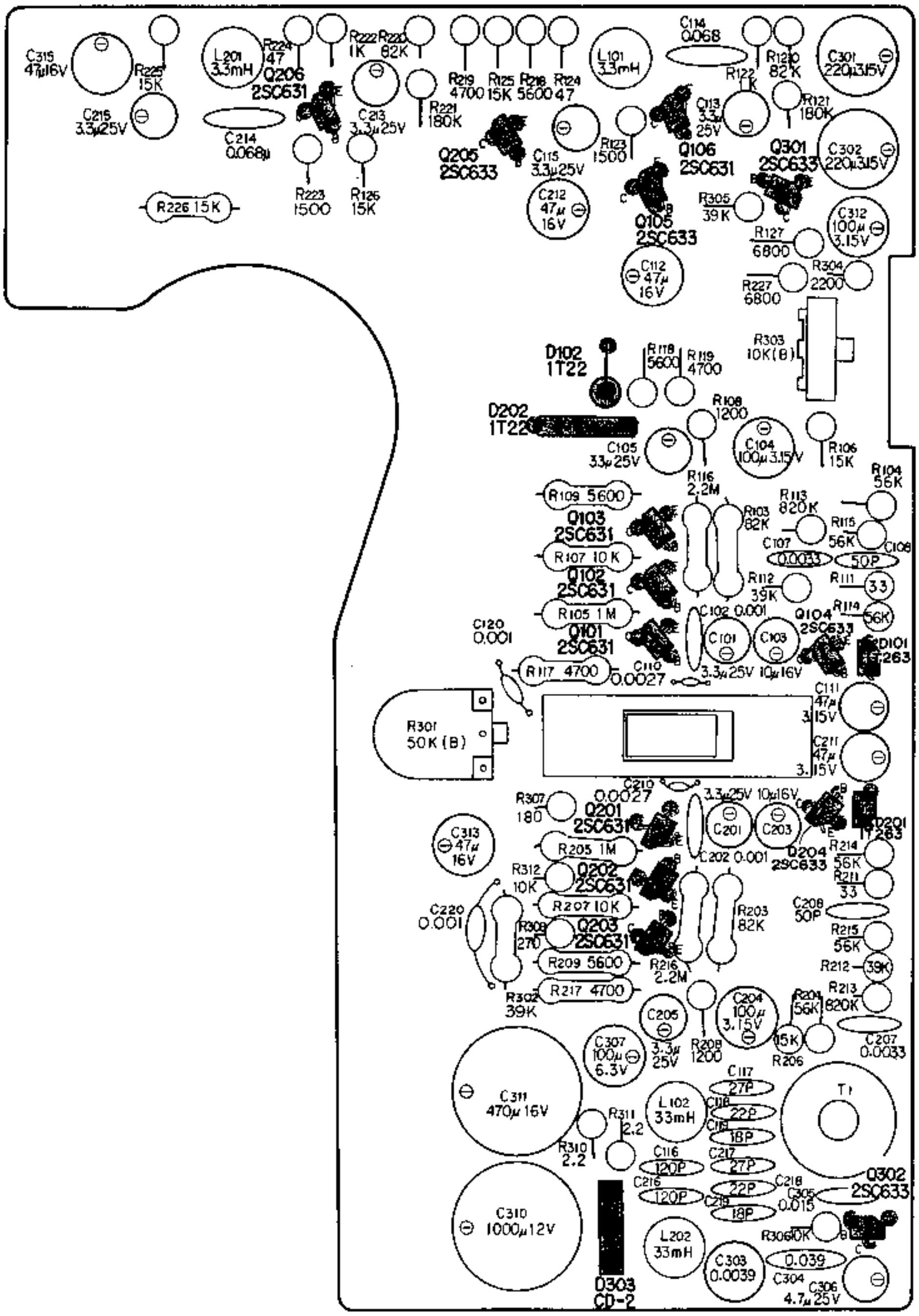
※ Voltages are measured with dc VTVM.

(   ) Voltages are measured in RECORD operation.

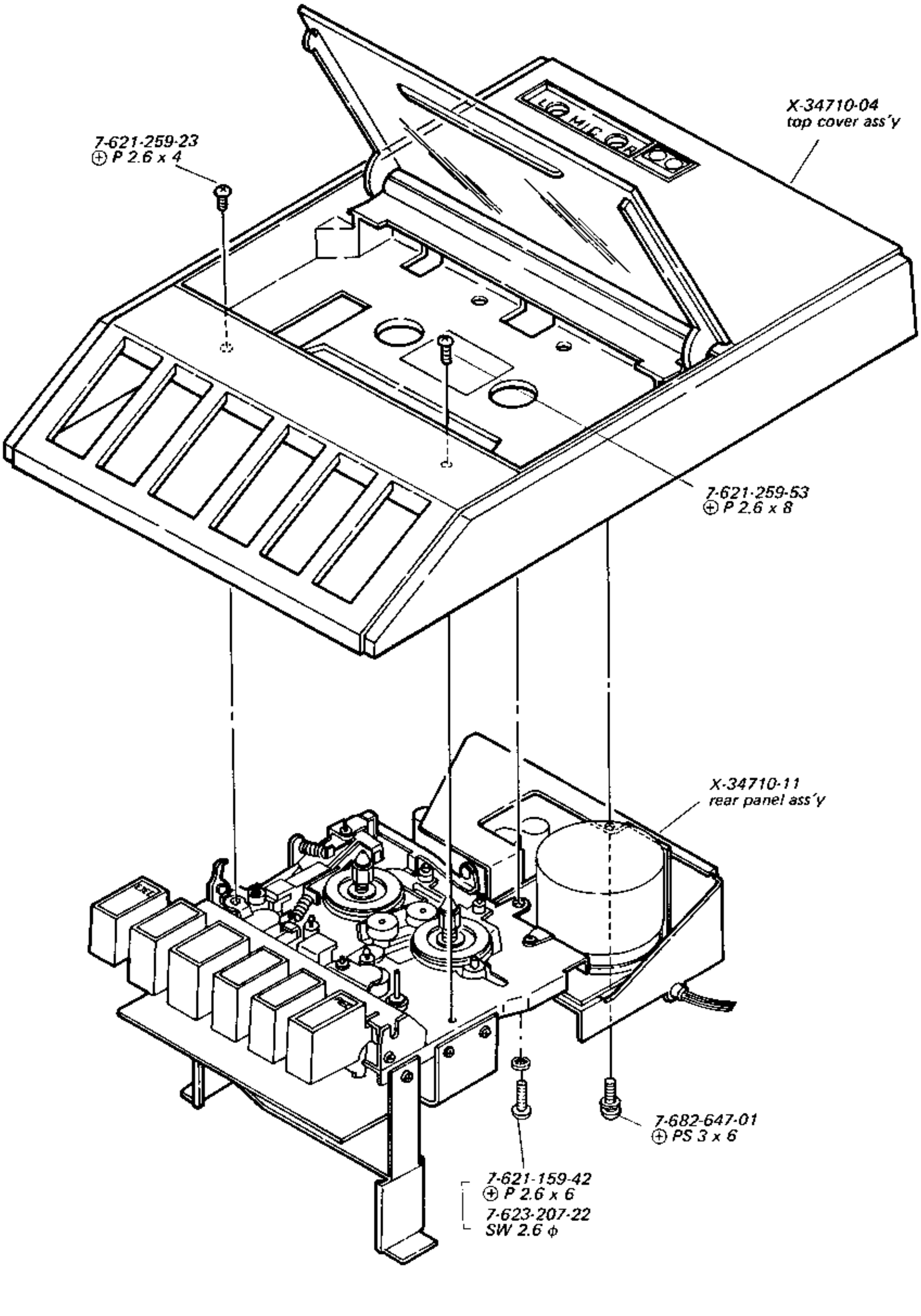
MOUNTING DIAGRAM

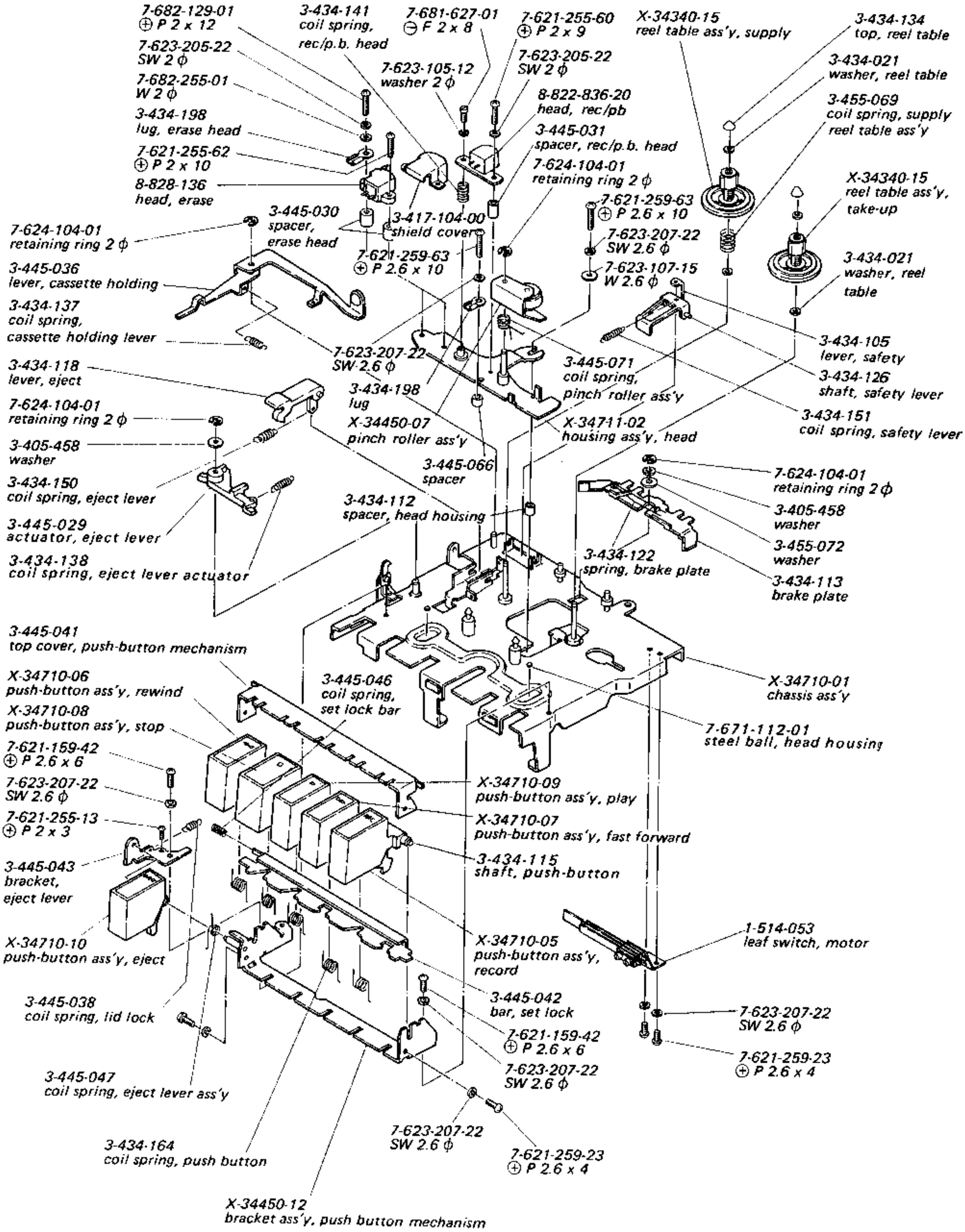
REC/PB Amplifier Board

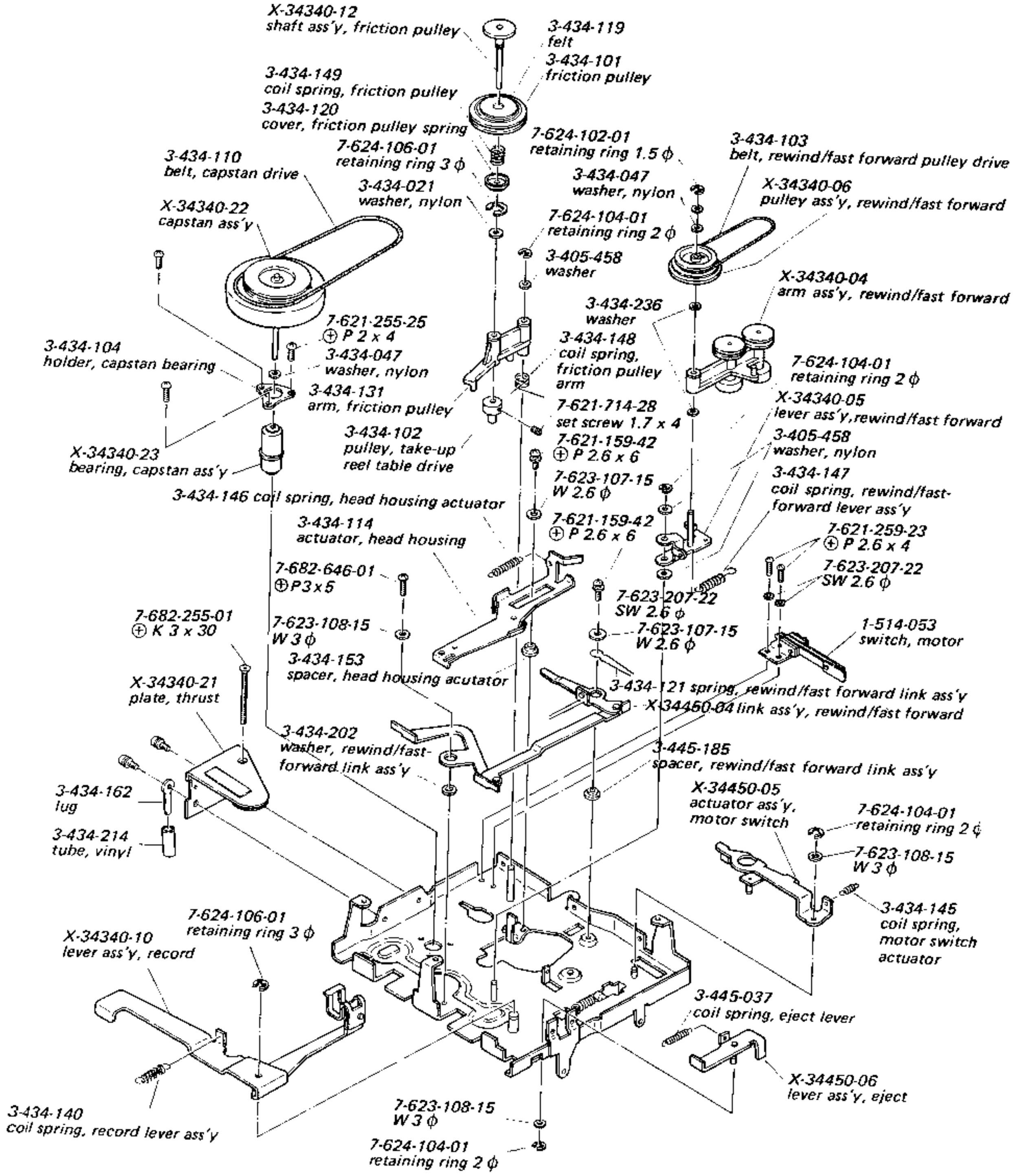
– Component side –

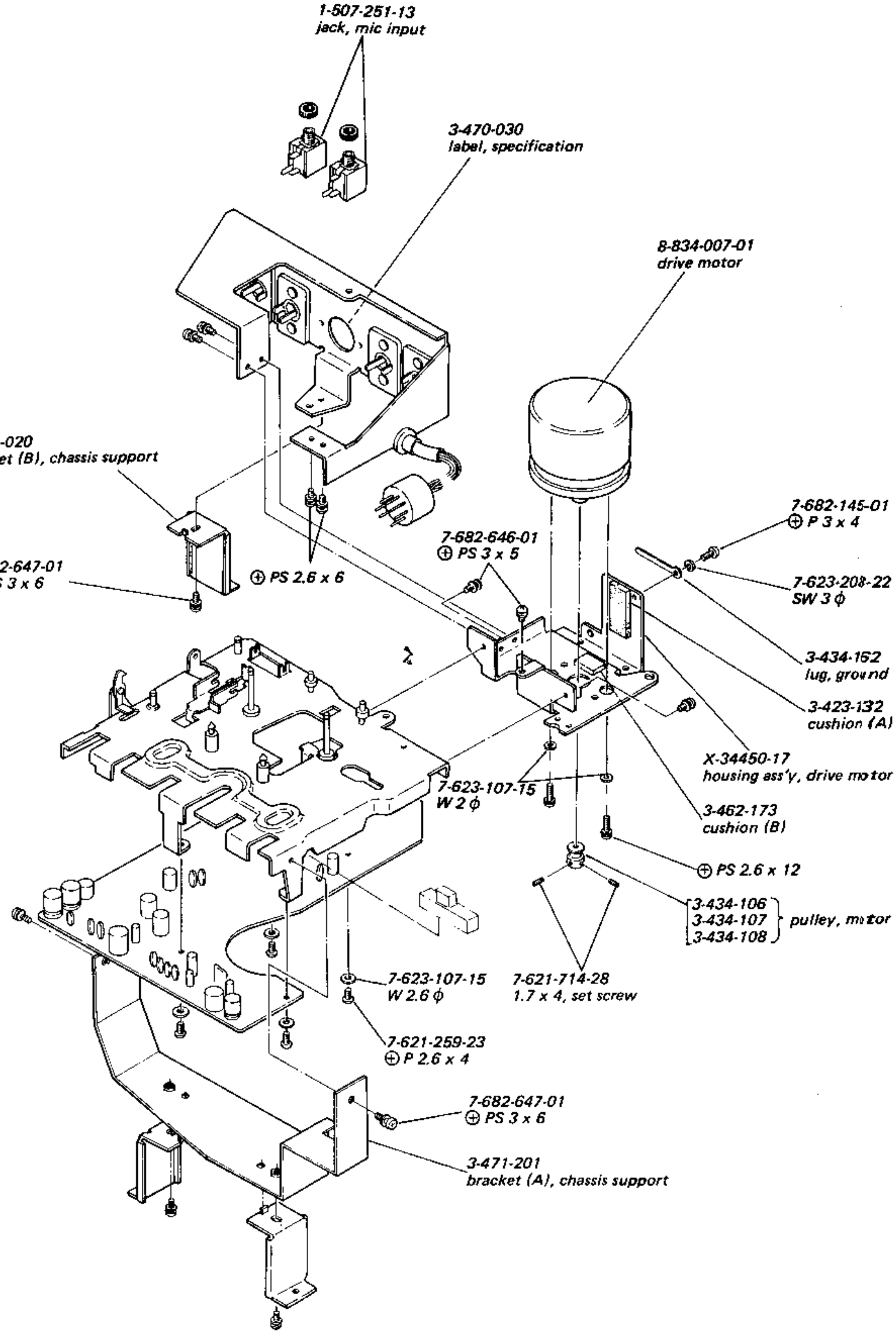


SECTION 6
EXPLODED VIEW




7-682-129-01
⊕ P 2 x 12
7-623-205-22
SW 2 ϕ
7-682-255-01
W 2 ϕ
3-434-198
lug, erase head
7-621-255-62
⊕ P 2 x 10
8-828-136
head, erase
3-434-141
coil spring, rec/p.b. head
7-681-627-01
⊖ F 2 x 8
7-623-105-12
washer 2 ϕ
7-621-255-60
⊕ P 2 x 9
7-623-205-22
SW 2 ϕ
8-822-836-20
head, rec/pb
3-445-031
spacer, rec/p.b. head
7-624-104-01
retaining ring 2 ϕ
X-34340-15
reel table ass'y, supply
3-434-134
top, reel table
3-434-021
washer, reel table
3-455-069
coil spring, supply reel table ass'y
X-34340-15
reel table ass'y, take-up
3-434-021
washer, reel table
7-621-259-63
⊕ P 2.6 x 10
7-623-207-22
SW 2.6 ϕ
7-623-107-15
W 2.6 ϕ
3-445-030
spacer, erase head
3-417-104-00
shield cover
7-621-259-63
⊕ P 2.6 x 10
7-624-104-01
retaining ring 2 ϕ
3-445-036
lever, cassette holding
3-434-137
coil spring, cassette holding lever
7-623-207-22
SW 2.6 ϕ
3-434-198
lug
X-34450-07
pinch roller ass'y
3-445-071
coil spring, pinch roller ass'y
X-34711-02
housing ass'y, head
3-434-105
lever, safety
3-434-126
shaft, safety lever
3-434-151
coil spring, safety lever
3-434-118
lever, eject
7-624-104-01
retaining ring 2 ϕ
3-405-458
washer
3-434-150
coil spring, eject lever
3-445-029
actuator, eject lever
3-434-138
coil spring, eject lever actuator
3-445-066
spacer
3-434-112
spacer, head housing
7-624-104-01
retaining ring 2 ϕ
3-405-458
washer
3-455-072
washer
3-434-122
spring, brake plate
3-434-113
brake plate
3-445-041
top cover, push-button mechanism
X-34710-06
push-button ass'y, rewind
X-34710-08
push-button ass'y, stop
3-445-046
coil spring, set lock bar
X-34710-01
chassis ass'y
7-671-112-01
steel ball, head housing
7-621-159-42
⊕ P 2.6 x 6
7-623-207-22
SW 2.6 ϕ
7-621-255-13
⊕ P 2 x 3
3-445-043
bracket, eject lever
X-34710-09
push-button ass'y, play
X-34710-07
push-button ass'y, fast forward
3-434-115
shaft, push-button
X-34710-10
push-button ass'y, eject
X-34710-05
push-button ass'y, record
1-514-053
leaf switch, motor
3-445-038
coil spring, lid lock
3-445-042
bar, set lock
7-621-159-42
⊕ P 2.6 x 6
7-623-207-22
SW 2.6 ϕ
7-623-207-22
SW 2.6 ϕ
7-621-259-23
⊕ P 2.6 x 4
3-445-047
coil spring, eject lever ass'y
3-434-164
coil spring, push button
7-623-207-22
SW 2.6 ϕ
7-621-259-23
⊕ P 2.6 x 4
X-34450-12
bracket ass'y, push button mechanism


X-34340-12
shaft ass'y, friction pulley
3-434-119
felt
3-434-101
friction pulley
3-434-149
coil spring, friction pulley
3-434-120
cover, friction pulley spring
7-624-102-01
retaining ring 1.5 φ
3-434-103
belt, rewind/fast forward pulley drive
3-434-110
belt, capstan drive
7-624-106-01
retaining ring 3 φ
3-434-047
washer, nylon
X-34340-06
pulley ass'y, rewind/fast forward
3-434-021
washer, nylon
X-34340-22
capstan ass'y
7-624-104-01
retaining ring 2 φ
3-405-458
washer
X-34340-04
arm ass'y, rewind/fast forward
3-434-236
washer
7-621-255-25
⊕ P 2 x 4
3-434-148
coil spring, friction pulley arm
3-434-104
holder, capstan bearing
3-434-047
washer, nylon
7-624-104-01
retaining ring 2 φ
3-434-131
arm, friction pulley
7-621-714-28
set screw 1.7 x 4
X-34340-05
lever ass'y, rewind/fast forward
3-434-102
pulley, take-up reel table drive
7-621-159-42
⊕ P 2.6 x 6
3-405-458
washer, nylon
X-34340-23
bearing, capstan ass'y
7-623-107-15
W 2.6 φ
3-434-147
coil spring, rewind/fast-forward lever ass'y
3-434-146 coil spring, head housing actuator
3-434-114
actuator, head housing
7-621-159-42
⊕ P 2.6 x 6
7-621-259-23
⊕ P 2.6 x 4
7-682-646-01
⊕P3x5
7-623-207-22
SW 2.6 φ
7-623-207-22
SW 2.6 φ
7-682-255-01
⊕ K 3 x 30
7-623-108-15
W 3 φ
7-623-107-15
W 2.6 φ
1-514-053
switch, motor
3-434-153
spacer, head housing acutator
X-34340-21
plate, thrust
3-434-121 spring, rewind/fast forward link ass'y
X-34450-04 link ass'y, rewind/fast forward
3-434-202
washer, rewind/fast-forward link ass'y
3-445-185
spacer, rewind/fast forward link ass'y
3-434-162
lug
X-34450-05
actuator ass'y, motor switch
7-624-104-01
retaining ring 2 φ
3-434-214
tube, vinyl
7-623-108-15
W 3 φ
3-434-145
coil spring, motor switch actuator
7-624-106-01
retaining ring 3 φ
X-34340-10
lever ass'y, record
3-445-037
coil spring, eject lever
X-34450-06
lever ass'y, eject
3-434-140
coil spring, record lever ass'y
7-623-108-15
W 3 φ
7-624-104-01
retaining ring 2 φ


1-507-251-13
jack, mic input
3-470-030
label, specification
8-834-007-01
drive motor
3-471-020
bracket (B), chassis support
7-682-145-01
⊕ P 3 x 4
7-682-646-01
⊕ PS 3 x 5
7-682-647-01
⊕ PS 3 x 6
⊕ PS 2.6 x 6
7-623-208-22
SW 3 ϕ
3-434-162
lug, ground
3-423-132
cushion (A)
X-34450-17
housing ass'y, drive motor
7-623-107-15
W 2 ϕ
3-462-173
cushion (B)
⊕ PS 2.6 x 12
3-434-106
3-434-107
3-434-108
pulley, motor
7-623-107-15
W 2.6 ϕ
7-621-714-28
1.7 x 4, set screw
7-621-259-23
⊕ P 2.6 x 4
7-682-647-01
⊕ PS 3 x 6
3-471-201
bracket (A), chassis support

SECTION 7
ELECTRICAL PARTS LIST

MOUNTED CIRCUIT BOARD

Ref. No.	Part No.	Description
	X-34710-21	REC/P.B amplifier circuit board

SEMICONDUCTORS

Ref. No.	Description	
D101(D201)	diode	1T263
D102(D202)	diode	1T22J
D303	diode	CD2
Q101(Q201)	transistor	2SC631
Q102(Q202)	transistor	2SC631
Q103(Q203)	transistor	2SC631
Q104(Q204)	transistor	2SC633
Q105(Q205)	transistor	2SC633
Q106(Q206)	transistor	2SC631
Q301	transistor	2SC633
Q302	transistor	2SC633

TRANSFORMER AND INDUCTORS

Ref. No.	Part No.	Description
L101(L201)	1-407-200	inductor, micro 3.3 mH
L102(L202)	1-407-212	inductor, micro 33 mH
L301	1-407-195	inductor, micro 1 mH
L302	1-407-165	inductor, micro 47 μH
T301	1-433-132-22	transformer, osc

CAPACITORS

All capacitance values are in μF except as indicated with p, which means μμF.

Ref. No.	Part No.	Value	Tolerance	Description
C101(C201)	1-121-344	3.3	$\pm^{150}_{10}$%	25V, electrolytic
C102(C202)	1-105-661-12	0.001	±10%	50V, mylar
C103(C203)	1-121-398	10	$\pm^{100}_{10}$%	25V, electrolytic
C104(C204)	1-121-290	100	$\pm^{100}_{10}$%	3.15V, electrolytic
C105(C205)	1-121-344	3.3	$\pm^{150}_{10}$%	25V, electrolytic
C107(C207)	1-105-667-12	0.0033	±10%	50V, mylar
C108(C208)	1-107-002	50p	±10%	500V, silvered mica
C110(C210)	1-105-666-12	0.0027	±10%	50V, mylar
C111(C211)	1-121-406	47	$\pm^{100}_{10}$%	3.15V, electrolytic
C112(C212)	1-121-409	47	$\pm^{100}_{10}$%	16V, electrolytic
C113(C213)	1-121-344	3.3	$\pm^{150}_{10}$%	25V, electrolytic
C114(C214)	1-105-683-12	0.068	±10%	50V, mylar
C115(C215)	1-121-344	3.3	$\pm^{150}_{10}$%	25V, electrolytic
C116(C216)	1-107-058	120p	±10%	500V, silvered mica
C117(C217)	1-107-053	27p	±10%	500V, silvered mica
C118(C218)	1-107-052	22p	±10%	500V, silvered mica
C119(C219)	1-107-001	18p	±10%	500V, silvered mica
C120(C220)	1-105-661-12	0.001	±10%	50V, mylar
C301	1-121-419	220	$\pm^{100}_{10}$%	6.3V, electrolytic
C302	1-121-419	220	$\pm^{100}_{10}$%	6.3V, electrolytic
C303	1-129-709	0.0039	±10%	630V, polypropylene
C304	1-105-680-12	0.039	±10%	50V, mylar
C305	1-105-675-12	0.015	±10%	50V, mylar
C306	1-121-396	4.7	$\pm^{100}_{10}$%	50V, electrolytic
C307	1-121-413	100	$\pm^{100}_{10}$%	6.3V, electrolytic
C308	1-105-667-12	0.0033	±10%	50V, mylar
C309	1-105-684-12	0.082		50V, mylar
C310	1-121-530	1000	$\pm^{100}_{10}$%	12V, electrolytic
C311	1-121-426	470	$\pm^{100}_{10}$%	16V, electrolytic
C312	1-121-290	100	$\pm^{100}_{10}$%	3.15V, electrolytic
C313	1-121-409	47	$\pm^{100}_{10}$%	16V, electrolytic
C314	1-107-024	200p	±10%	500V, silvered mica
C315	1-121-409	47	$\pm^{100}_{10}$%	16V, electrolytic

RESISTORS

All resistance values are in Ω, ±5%, ¼W and carbon type unless otherwise indicated.

Ref. No.	Part No.	Description
R101(R201)	1-244-721	100 k
R102(R202)	1-242-673	1 k
R103(R203)	1-244-719	82 k
R104(R204)	1-242-715	56 k
R105(R205)	1-244-745	1 M
R106(R206)	1-242-701	15 k
R107(R207)	1-244-697	10 k
R108(R208)	1-242-675	1.2 k
R109(R209)	1-244-691	5.6 k
R111(R211)	1-242-637	33
R112(R212)	1-242-771	39 k
R113(R213)	1-242-743	820 k
R114(R214)	1-242-715	56 k
R115(R215)	1-242-715	56 k
R116(R216)	1-244-753	2.2 M
R117(R217)	1-244-689	4.7 k
R118(R218)	1-242-691	5.6 k
R119(R219)	1-242-689	4.7 k
R120(R220)	1-242-719	82 k
R121(R221)	1-242-727	180 k
R122(R222)	1-242-673	1 k
R123(R223)	1-242-677	1.5 k
R124(R224)	1-242-641	47
R125(R225)	1-242-701	15 k
R126	1-244-701	15 k
R226	1-242-701	15 k
R127(R227)	1-242-693	6.8 k
R128(R228)	1-244-689	4.7 k
R301	1-221-953	50 k, semi-fixed
R302	1-244-711	39 k
R303	1-221-401	10 k, semi-fixed
R304	1-242-681	2.2 k
R305	1-242-771	39 k
R306	1-242-697	10 k
R307	1-202-555	180 ±10% ½W, composition
R308	1-202-555	180 ±10% ½W, composition
R309	1-244-633	22
R310	1-242-609	2.2
R311	1-242-609	2.2
R312	1-242-697	10 k

SWITCHES

Ref. No.	Part No.	Description
S1	1-514-254	switch, slide (REC/P.B.)
S3	1-514-053	switch, leaf (MOTOR)

MISCELLANEOUS

Part No.	Description
1-506-133	7-P plug
1-507-176-12	phono jack
1-507-251-13	jack, microphone
1-536-181	terminal strip, 2L1
8-822-836-20	REC/P.B. head
8-828-136-00	erase head
8-834-007-01	motor, D-007G

Sony Corporation

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