



Set using ISO screws

TC-854-4

USA Model



SPECIFICATIONS

Power Requirements:	AC 120V, 60 Hz, 110W			Flutter and Wow:	0.03 % at 15 ips (38 cm/s) 0.04 % at 7½ ips (19 cm/s) 0.08 % at 3¾ ips (9.5 cm/s)
Track System:	4-track 4-channel stereo				
Reel Size:	10½" (267 mm) maximum			Inputs:	Eight MIC INPUTs Impedance: 600Ω Maximum sensitivity: 0.2 mV (– 72 dB)
Tape Speed:	15 ips (38 cm/s), 7½ ips (19 cm/s), 3¾ ips (9.5 cm/s)				Four LINE INPUTs Impedance: 100 kΩ Maximum sensitivity: 0.06 V (– 22 dB)
Recording Time	Tape speed	4-track 4-channel	4-track 2-channel		
with 2,400 ft tape:	15 ips (38 cm/s)	1 hour	2 hours		
with 1,800 ft tape:	7½ ips (19 cm/s)	45 minutes	1.5 hours	Output:	Four LINE OUTPUTs Impedance: 100 kΩ or more Output level: 0.775 V (0 dB)
with 1,800 ft tape:	3¾ ips (9.5 cm/s)	1.5 hours	3 hours		HEADPHONE output Load impedance: 8Ω
Frequency Response				Semiconductors:	101 transistors and 101 diodes
with SONY SLH tape:	20~30,000 Hz at 15 ips (38 cm/s) 20~30,000 Hz at 7½ ips (19 cm/s) 20~20,000 Hz at 3¾ ips (9.5 cm/s)			Dimensions:	17½/16 (W) x 22 (H) x 10" (D) (440 x 558.5 x 253 mm)
with standard tape:	20~28,000 Hz at 15 ips (38 cm/s) 20~25,000 Hz at 7½ ips (19 cm/s) 20~18,000 Hz at 3¾ ips (9.5 cm/s)			Weight:	61 lb 7 oz (28 kg)
Signal-to-Noise Ratio:	59 dB (with SONY SLH tape) 56 dB (with standard tape)				

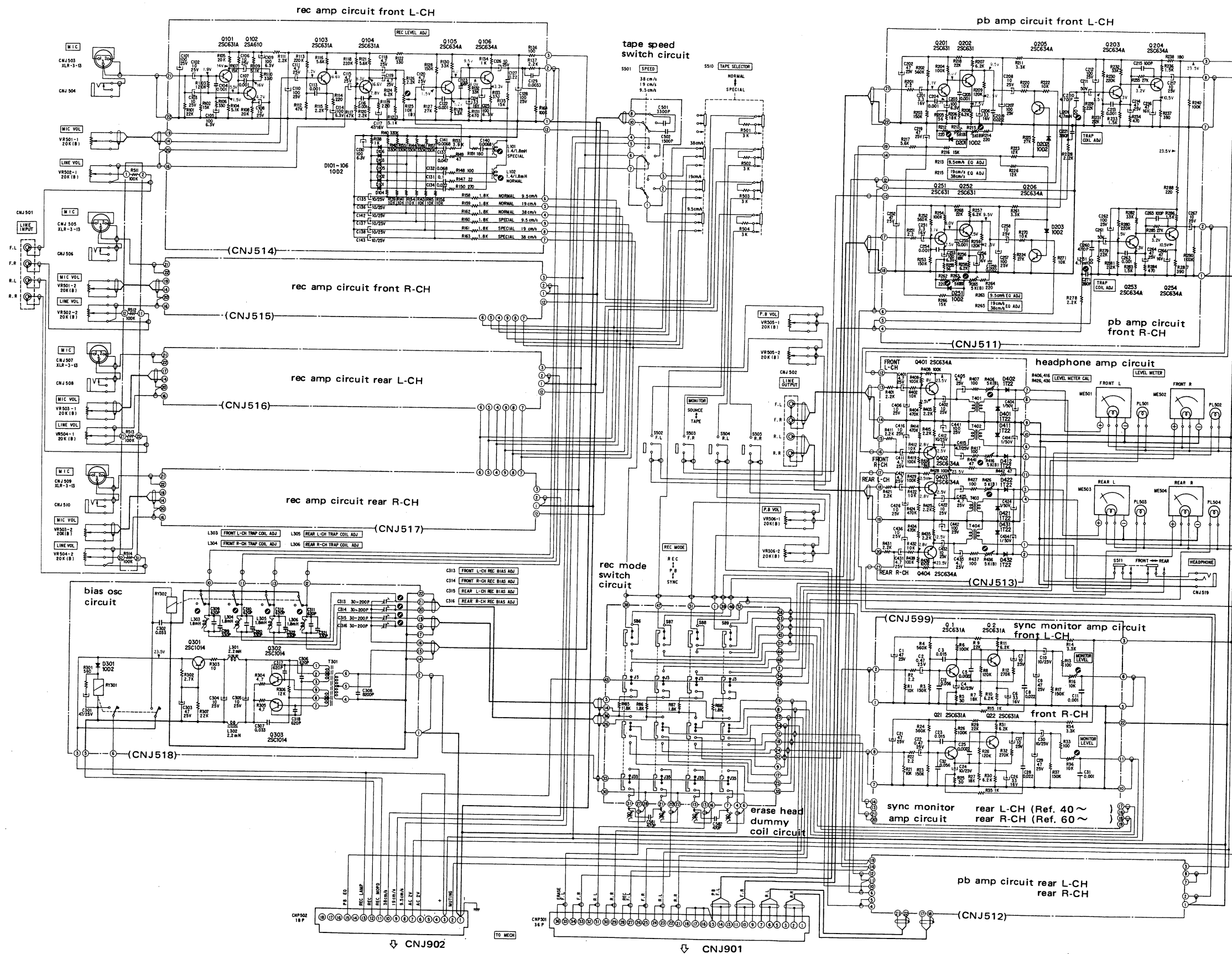
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SERVICE MANUAL

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SCHEMATIC DIAGRAM



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Ref.	Switch	Position
S501	TAPE SPEED switch	9.5 cm/s
S502	MONITOR switch (Front L-CH)	TAPE
S503	MONITOR switch (Front R-CH)	TAPE
S504	MONITOR switch (Rear L-CH)	TAPE
S505	MONITOR switch (Rear R-CH)	TAPE
S506	REC MODE switch (Front L-CH)	PB
S507	REC MODE switch (Front R-CH)	PB
S508	REC MODE switch (Rear L-CH)	PB
S509	REC MODE switch (Rear R-CH)	PB
S510	TAPE SELECTOR switch	NORMAL
S511	HEADPHONE switch	FRONT

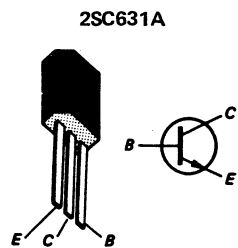
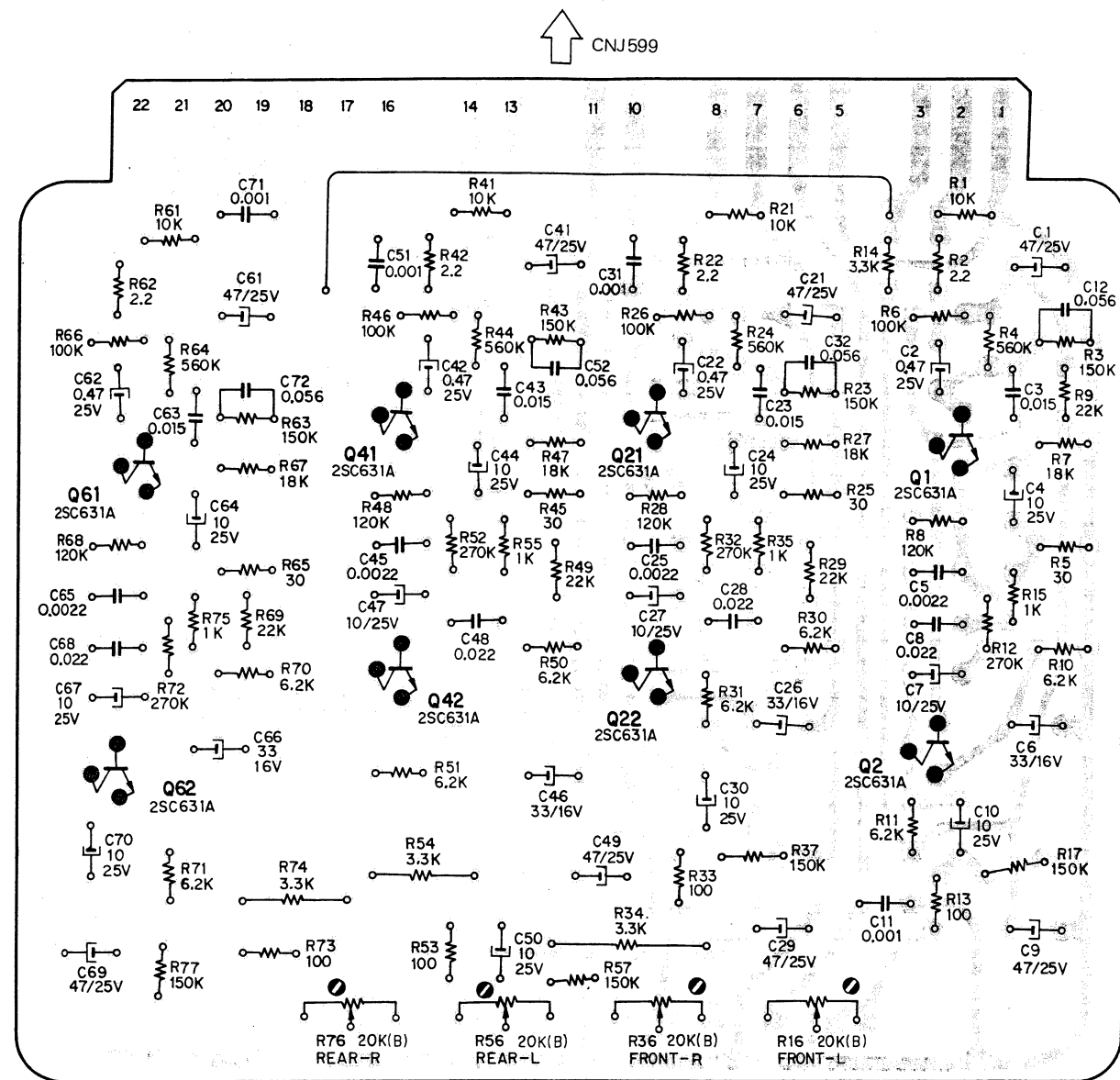
Note:

1. All resistors and capacitors are rated in Ω and μF , unless otherwise specified.
2. Voltages shown are measured to ground by using a voltmeter ($20\text{k}\Omega/\text{V}$) with no signal input in STOP mode. All voltages may vary slightly due to normal component tolerances, etc.

MOUNTING DIAGRAM

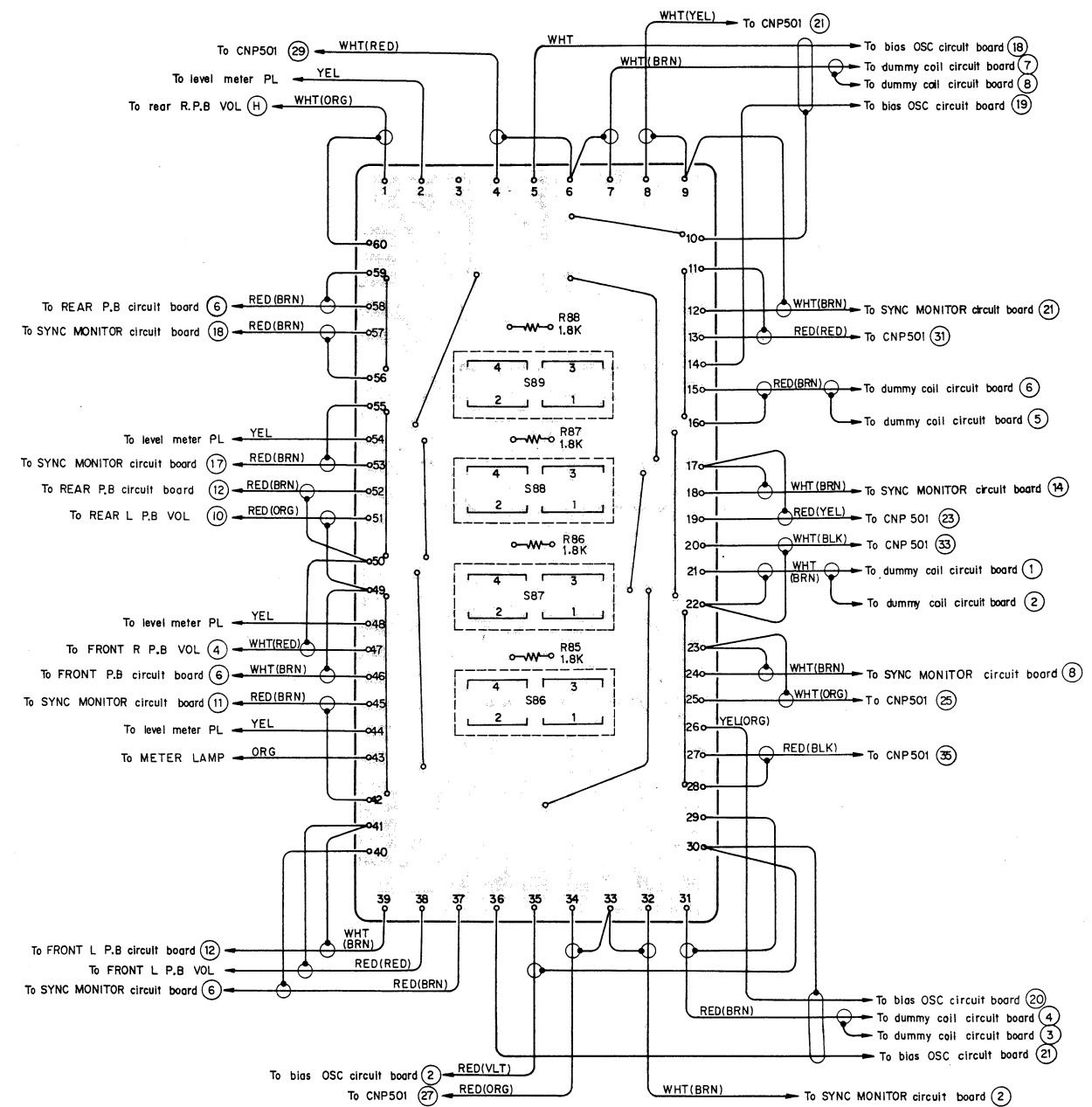
SYNC MONITOR Circuit Board

— Conductor Side —



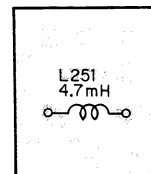
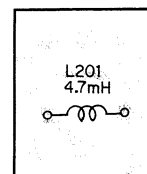
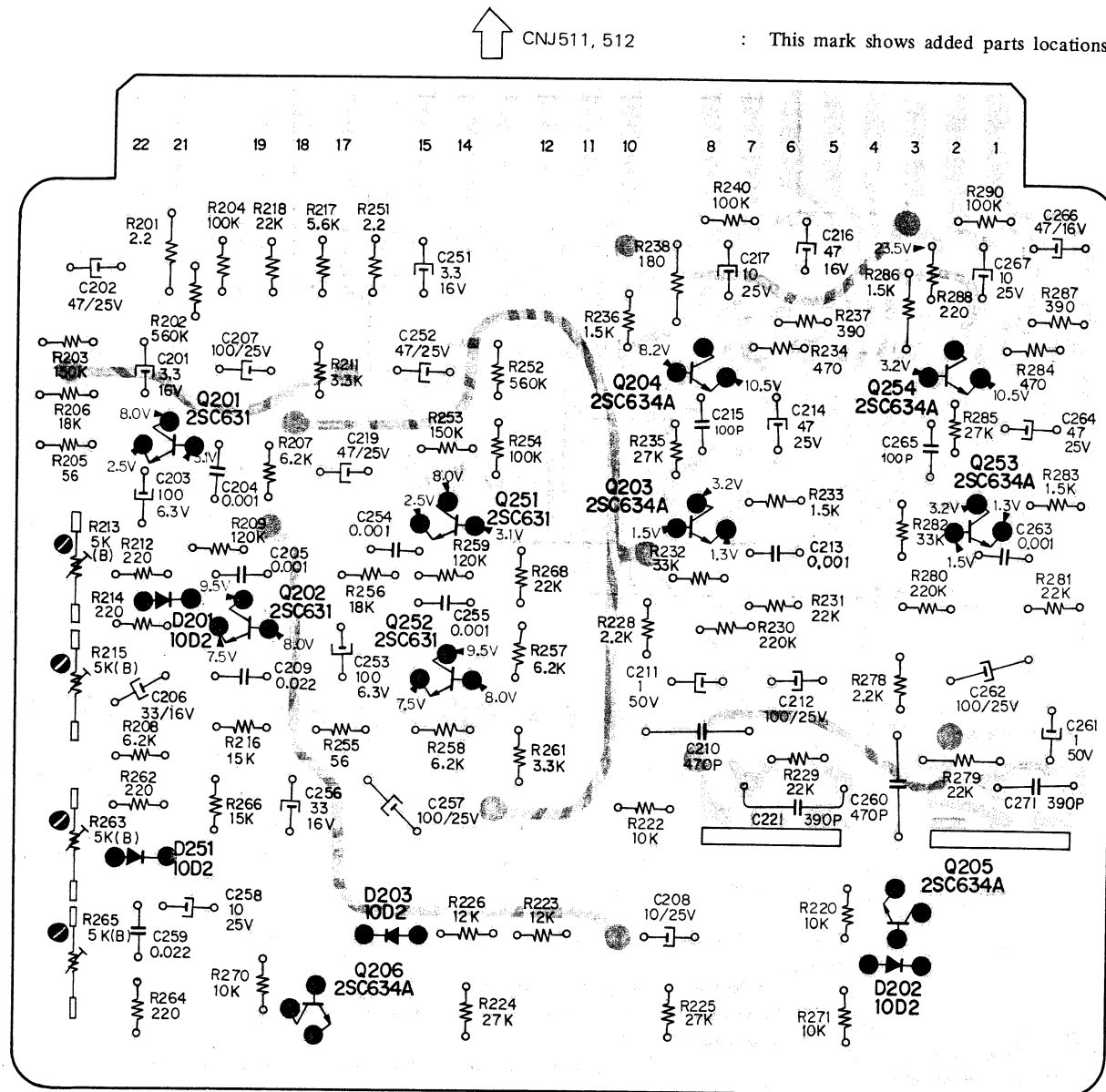
REC MODE Switch Circuit Board

– Conductor Side –



PB AMP Circuit Board

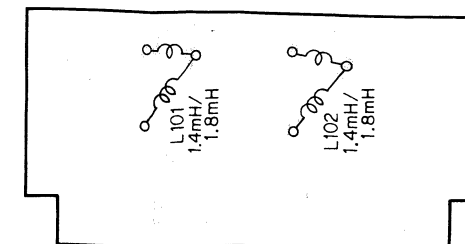
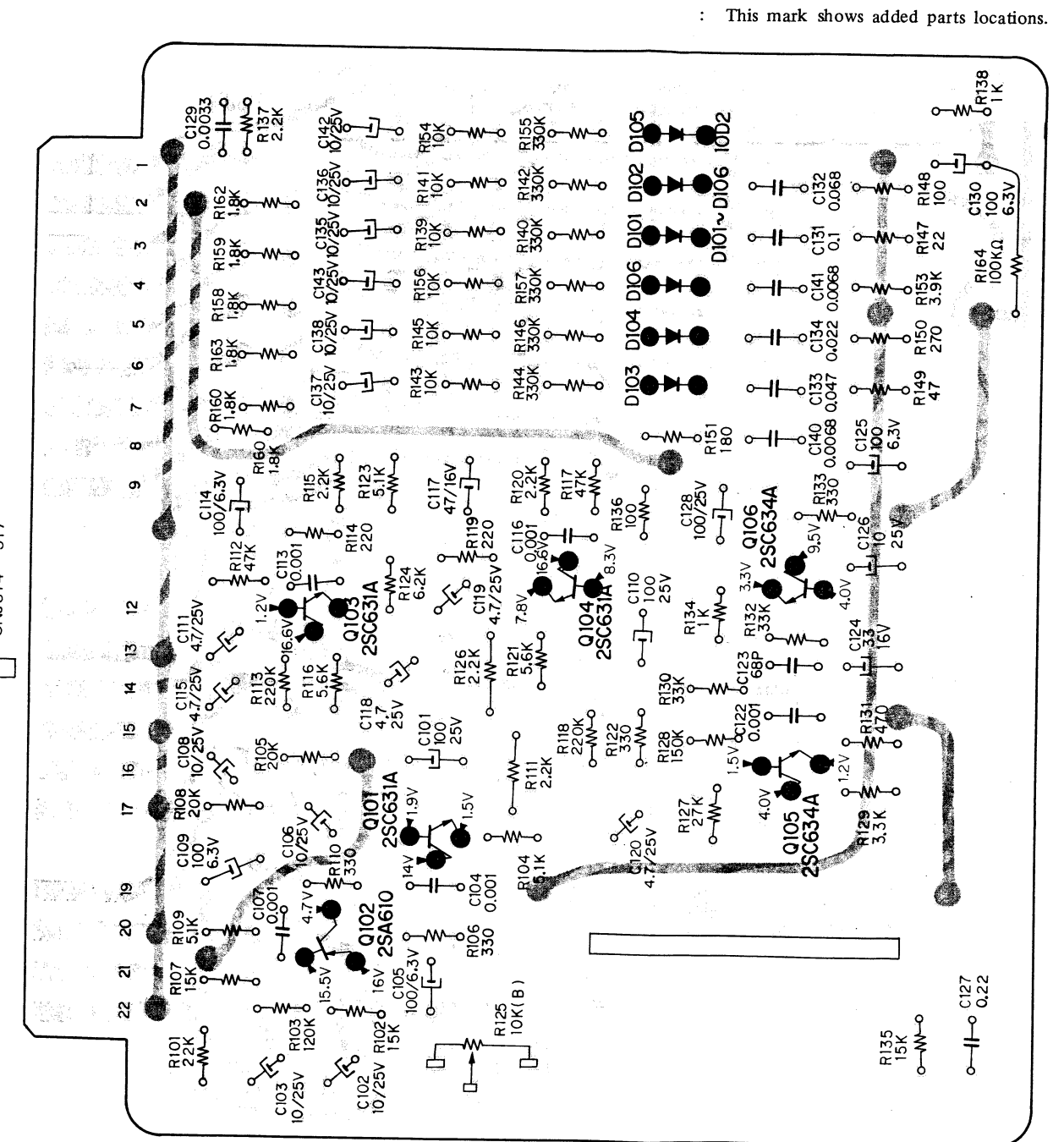
— Conductor Side —



— conductor side pattern
- - - component side pattern

REC AMP Circuit Board

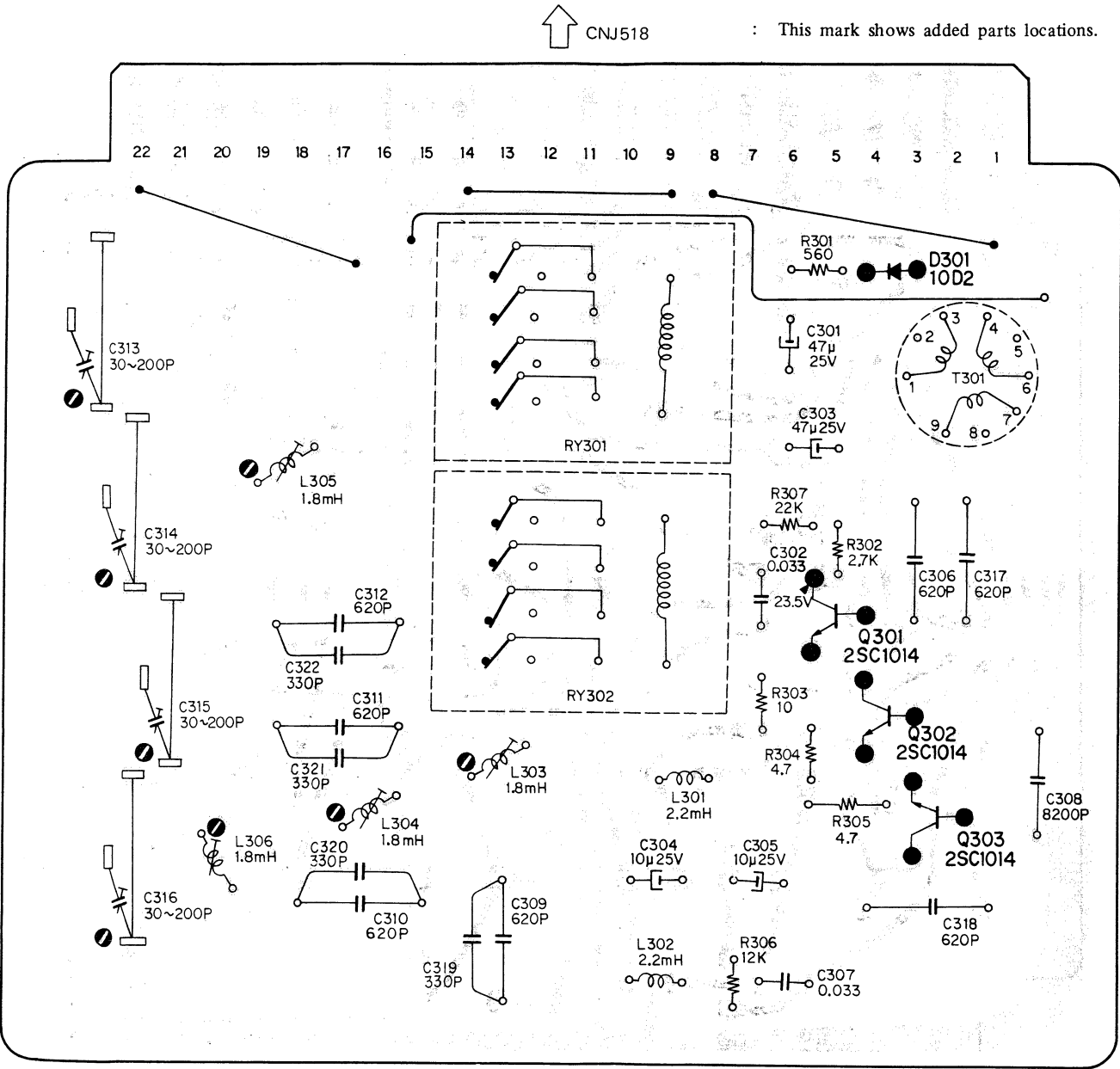
— Conductor Side —



— conductor side pattern
- - - component side pattern

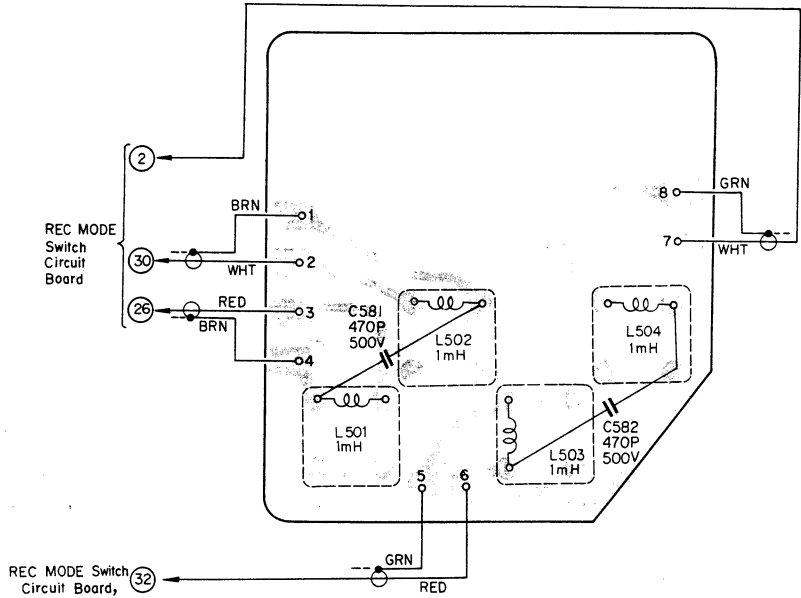
BIAS OSC Circuit Board

— Conductor Side —



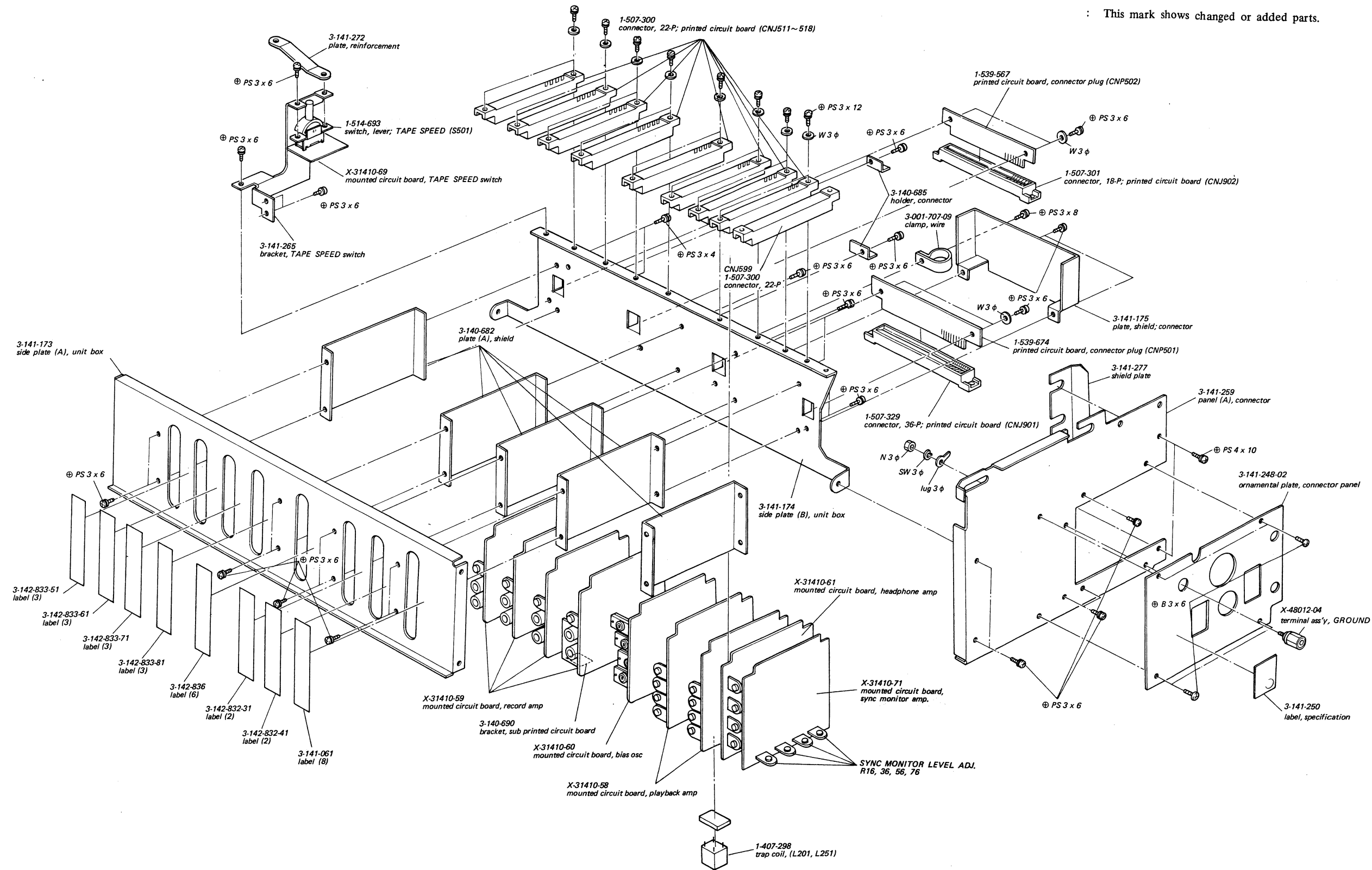
ERASE HEAD DUMMY Coil Circuit Board

— Conductor Side —



EXPLODED VIEW
AMP Circuit Board View

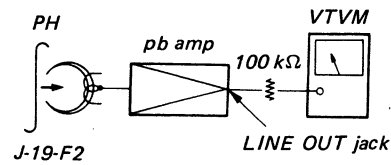
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ELECTRICAL ADJUSTMENTS/MEASUREMENTS

17. SYNC MONITOR Level Adjustment

Setup:



Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)

AUTO STOP switch: any

TAPE LIFT switch: ON

TAPE SPEED switch: 7½" (19 cm)

REEL SIZE switch: 7"

MONITOR switches: TAPE

REC MODE switches: SYNC MONITOR

TAPE SELECTOR switch: NORMAL

LINE REC VOLUME control: standard control-setting

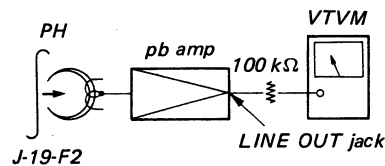
PB VOLUME control: * standard control setting

Procedure:

1. Play 1st tone (400 Hz) of the SONY alignment tape J-19-F2.
2. Adjust the semi-fixed resistors (R16, 36, 56, 76) (see page 12) for 0 dB (0.775 V) VTVM reading.

18. SYNC MONITOR Frequency Response Measurement

Setup:



Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)

AUTO STOP switch: any

TAPE LIFT switch: ON

TAPE SPEED switch: 7½" (19 cm)

REEL SIZE switch: 7"

MONITOR switches: TAPE

REC MODE switches: SYNC MONITOR

TAPE SELECTOR switch: NORMAL

LINE REC VOLUME control: standard control-setting

PB VOLUME control: * standard control setting

Procedure:

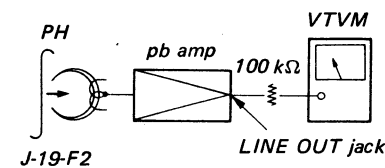
1. Play the SONY alignment tape J-19-F2.
2. Make sure that the level deviation of each frequency against 400 Hz signal is within the range specified.

Specification

freq.	200 Hz	400 Hz	1 kHz	3 kHz	5 kHz	7 kHz
(dB)	+2 -1	0	±1	+0 -4	+0 -5	+0 -8

19. SYNC MONITOR S/N Ratio Measurement

Setup:



Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)

AUTO STOP switch: any

TAPE LIFT switch: ON

TAPE SPEED switch: 7½" (19 cm)

REEL SIZE switch: 7"

MONITOR switches: TAPE

REC MODE switches: SYNC MONITOR

TAPE SELECTOR switch: NORMAL

LINE REC VOLUME control: standard control-setting

PB VOLUME control: * standard control setting

Procedure:

1. Play 1st tone (400 Hz) of the SONY alignment tape J-19-F2.
2. Note the VTVM reading.
3. Remove the alignment tape.
4. Hold the actuator with a rubber band so that the shut-off switch is activated.
5. Place the unit in playback mode and note VTVM reading.
6. Make sure that the level difference between Step 2 and 5 is more than 50 dB.

ELECTRICAL PARTS LIST

SYNC MONITOR AMP

Ref. No. Part No. Description

SEMICONDUCTORS

Q1, 2, 21, 22, 41, 42, 61, 62 transistor 2SC631A

RESISTORS

All resistors are ¼W and carbon type, unless otherwise indicated.

R1, 21, 41, 61	1-242-677	10 kΩ
R2, 22, 42, 62	1-242-609	2.2Ω
R3, 23, 43, 63	1-242-725	150 kΩ
R4, 24, 44, 64	1-242-739	560 kΩ
R5, 25, 45, 65	1-242-636	30Ω
R6, 26, 46, 66	1-242-721	100 kΩ
R7, 27, 47, 67	1-242-703	18 kΩ
R8, 28, 48, 68	1-242-723	120 kΩ
R9, 29, 49, 69	1-242-705	22 kΩ
R10, 30, 50, 70	1-242-692	6.2 kΩ
R11, 31, 51, 71	1-242-692	6.2 kΩ
R12, 32, 52, 72	1-242-731	270 kΩ
R13, 33, 53, 73	1-242-649	100Ω

Ref. No. Part No. Description

R14, 34, 54, 74	1-242-685	3.3 kΩ
R15, 35, 55, 75	1-242-673	1 kΩ
R16, 36, 56, 76	1-221-630	20 kΩ (B), semi-fixed
R17, 37, 57, 77	1-242-725	150 kΩ

CAPACITORS

All capacitors in microfarads, unless otherwise indicated. (elect = electrolytic)

C1, 21, 41, 61	1-121-410	47	25V	elect
C2, 22, 42, 62		0.47	25V	elect
C3, 23, 43, 63	1-105-675-12	0.015	50V	mylar
C4, 24, 44, 64	1-121-398	10	25V	elect
C5, 25, 45, 65	1-105-665-12	0.0022	50V	mylar
C6, 26, 46, 66	1-121-403	33	16V	elect
C7, 27, 47, 67	1-121-398	10	25V	elect
C8, 28, 48, 68	1-105-677-12	0.022	50V	mylar
C9, 29, 49, 69	1-121-410	47	25V	elect
C10, 30, 50, 70	1-121-398	10	25V	elect
C11, 31, 51, 71	1-105-661-12	0.001	50V	mylar

SONY CORPORATION

* See Service Manual TC-854-4 USA Page 19.

TC-854-4

USA Model

October 1971

SUPPLEMENT

SUBJECT: SYNC MONITOR AMP CIRCUIT ADDITION
APPLICABLE SERIAL NO.: 10,201 AND LATER

A new function is added to the usual operation using three heads; erase, record and playback. The unused tracks of a record head is used for playback purpose in record mode.

TC-854-4 can record and play back the sound on any selected tracks because of four-track four-channel system.

However, the record and playback heads are separately installed. When recording the new sounds on one track while playing back the other track's sounds, the newly recorded sounds are relatively delayed. Of course, the same occasions occur on

the conventional three-head units.

When recording the new materials on two tracks in addition to the other two tracks recorded already, you can make one master tape without delay using the new system as shown in Fig. A.

The newly recorded materials will synchronize to the pre-recorded materials.

SYNC MONITOR AMP (TC-854-4 Serial No. 10201 and later) is added to the conventional TC-854-4 and also SYNC position is added to the REC MODE switch. (See Fig. B.)

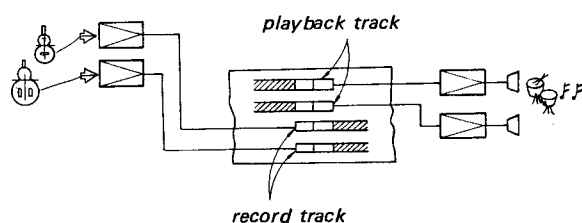


Fig. A.

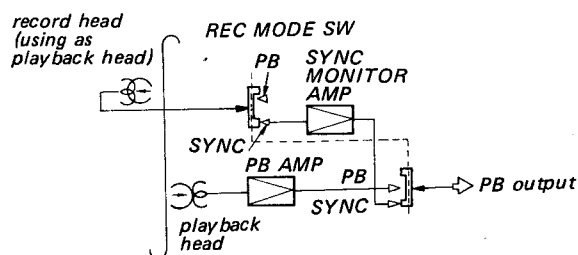


Fig. B.

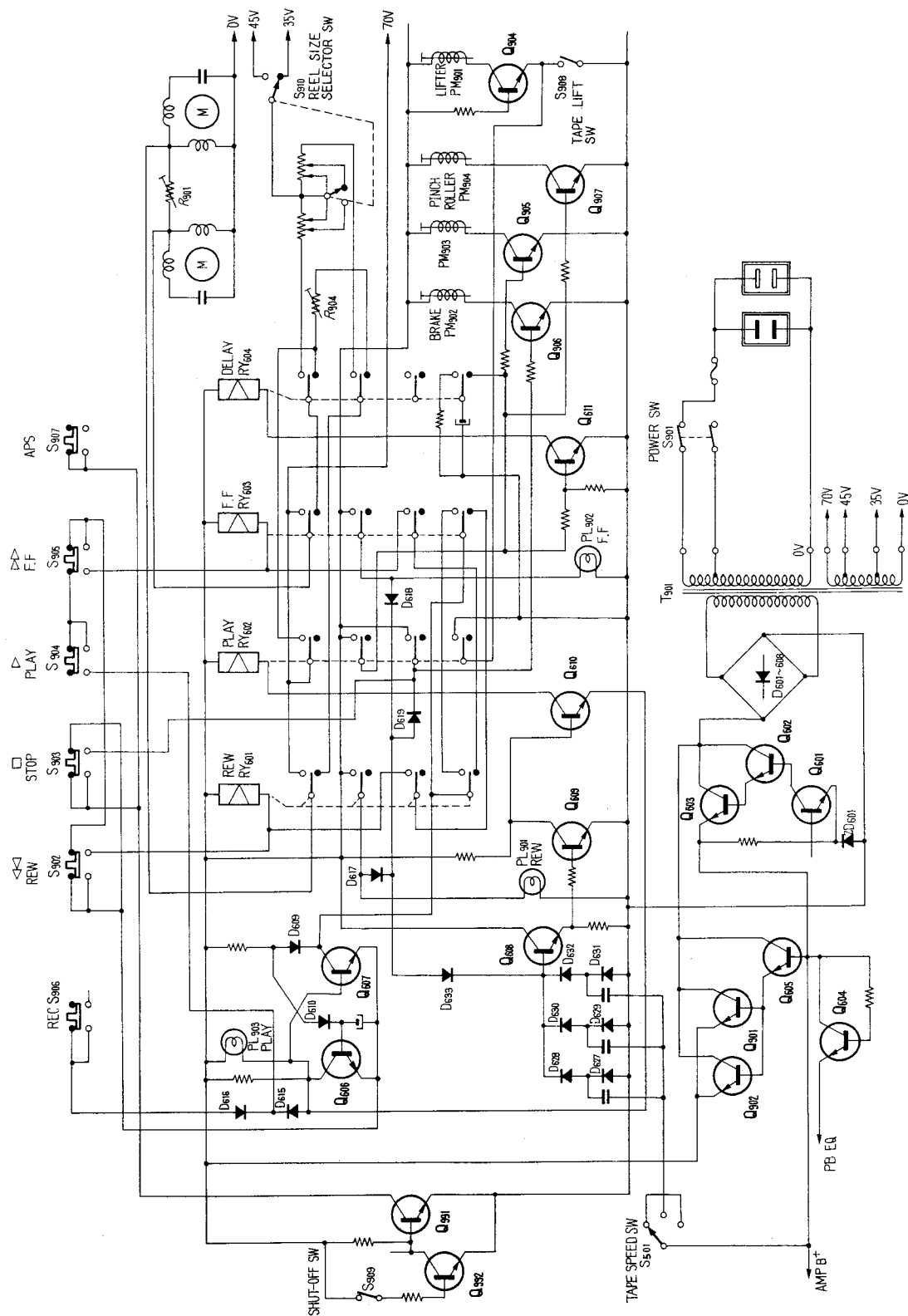
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	Location	Ref. No.	Part No.		Description
ADDED	PB AMP	C221, 271	1-107-242-11		capacitor, silvered mica; 390pF: 50V
	REC AMP	R164	1-242-721-12		resistor, carbon; 100 k Ω : $\frac{1}{4}$ W
	BIAS OSC	C319 ~ 322	1-107-006-11		capacitor, silvered mica; 330pF: 500V
	ERASE HEAD DUMMY COIL	C581, 582	1-107-016-11		capacitor, silvered mica; 470pF: 500V
	SYNC MONITOR AMP	CNJ599	X-31410-71 1-507-300		mounted circuit board, sync monitor (see page 14) connector, 22-P
DISCARDED	REC MODE Switch	R525 ~ 528	1-242-617-12		resistor, carbon; 4.7 Ω : $\frac{1}{4}$ W
CHANGED	PB AMP	C215, 265	<u>Former</u> 1-107-125-11	<u>New</u> 1-107-131-11	capacitor, silvered mica; 100pF: 50V
	HEADPHONE AMP	C441, 442	1-121-416-11	1-121-410-11	capacitor, electrolytic; 47 μ F: 50V
	REC MODE Switch		X-31410-65	X-31410-70	mounted circuit board, REC MODE switch
	(S506 ~ 509) → (S86 ~ 89)		1-514-769	1-514-693	switch, lever; REC MODE
	(R521 ~ 524) → (R85 ~ 88)		1-242-679-12		resistor, carbon; 1.8 k Ω : $\frac{1}{4}$ W
	APS & ATS	R712	1-242-709-12	1-242-705-12	resistor, carbon; 22 k Ω : $\frac{1}{4}$ W
	CABINET		3-141-254-02	3-141-254-21	ornamental panel, control
			3-142-837	3-141-061	label (7) → label (8)
			3-141-261	3-141-173	side plate (A), unit box
			3-141-262	3-141-174	side plate (B), unit box

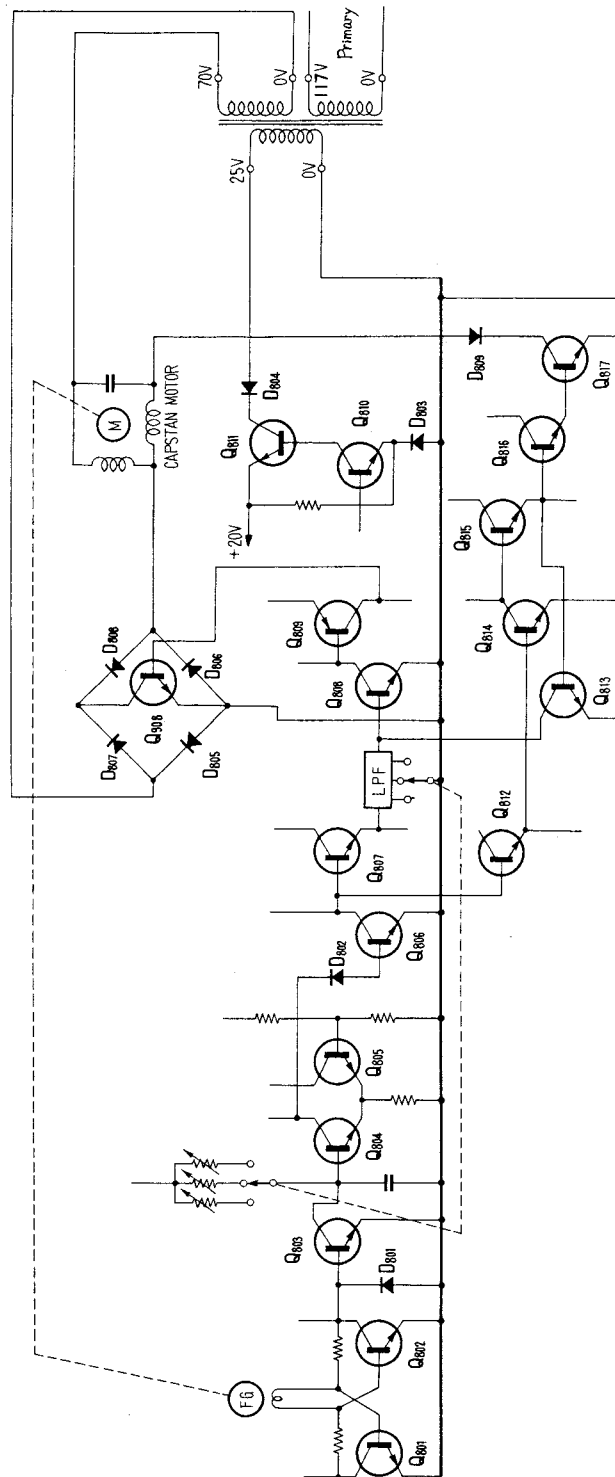
SECTION 1
OUTLINE

1-1. BLOCK DIAGRAM

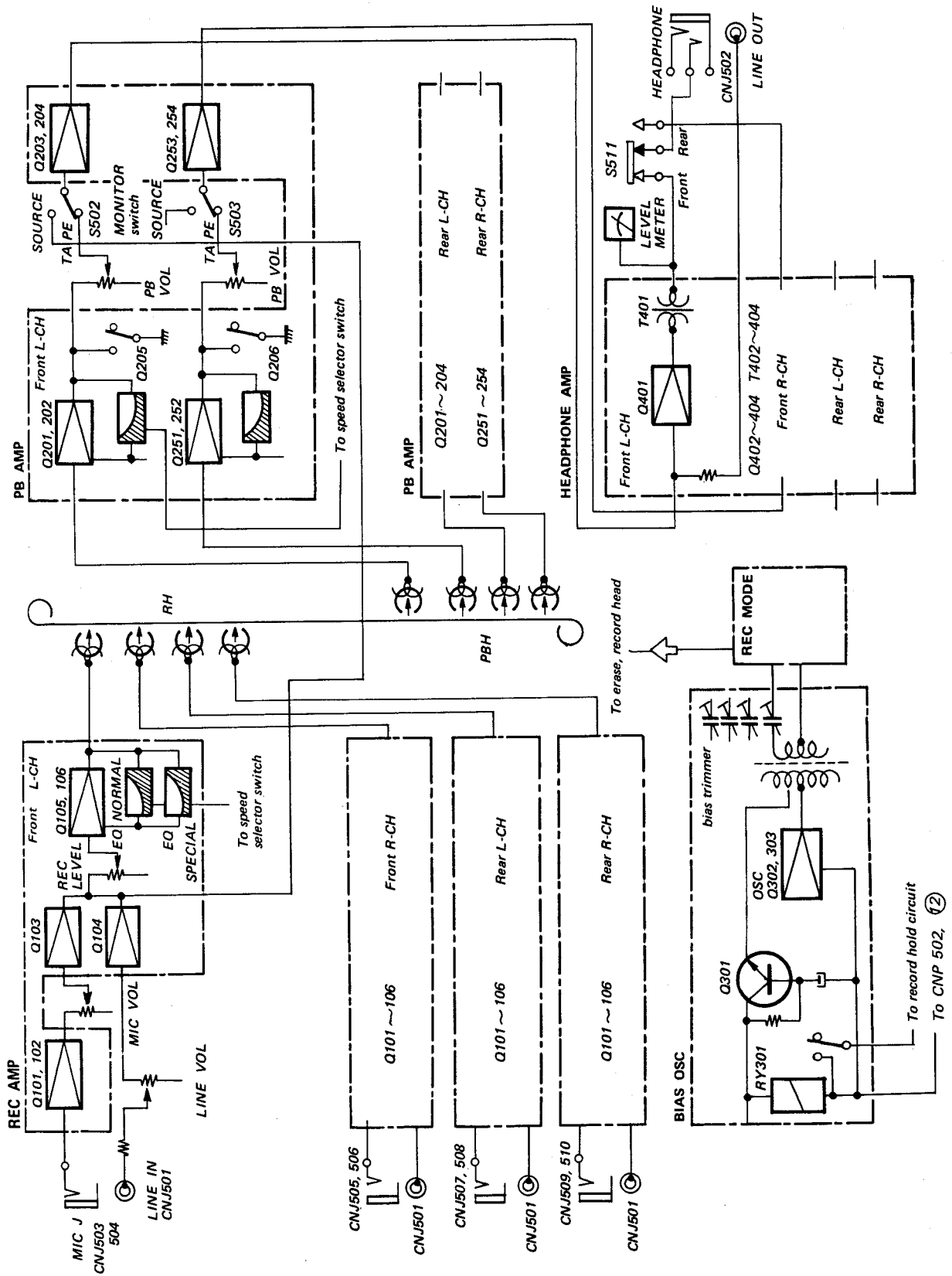
1-1-1. System Control Circuit



1-1-2. Capstan Servo Control Circuit



1-1-3. Audio Amp and Bias OSC Circuit



1-2. GENERAL

The SONY Model TC-854-4 which is a professional stereo tape recorder utilizing three motors and four heads is equipped with the following features:

- * An ac servo controlled capstan drive motor for perfect speed regulation and extremely low wow and flutter regardless of voltage and load fluctuations.
- * 10½" (267 mm) reel capacity and built-in reel locks.
- * Closed-loop dual capstan tape drive system which permits optimum tape tension and tape-to-head contact.
- * Both 2-channel and 4-channel stereo record and playback system are provided for maximum versatility and convenience.
- * APS (Automatic Program Scanner) and ATS (Automatic Tape Stop) systems to start and stop the tape transport at the desired position.

1-3. TECHNICAL FEATURES

System control of the TC-854-4 is accomplished by transistor logic, relays, and solenoids. Main functions are as follows:

1-3-1. System Control Circuit

Flip-Flop Circuit

The flip-flop (Fig. 1-3-1) comprises Q606, Q607, R611 through R616, D609, D610, and C621. The normal condition of Q606 is OFF and Q607 is ON. When PLAY pushbutton S904 is depressed, the collector voltage of Q606 and base voltage of Q607 go to 0 volts. This turns Q607 OFF and Q606 ON. The resulting positive voltage developed across R614,

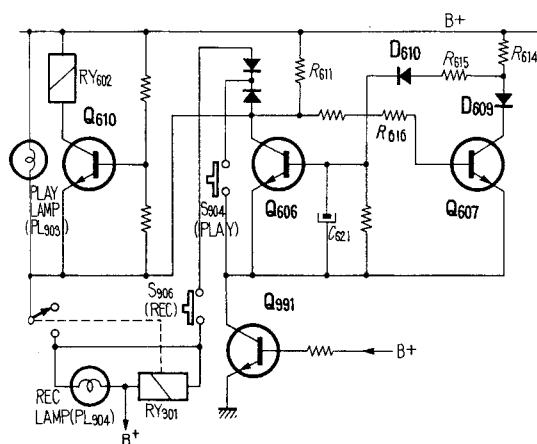


Fig. 1-3-1. Flip-flop circuit

R615, and D610 holds Q606 ON. The flip-flop remains in this condition until the automatic shut-off, STOP, FAST FORWARD, or REWIND switches are activated. These switches remove the ground from the emitters of Q606 and Q607, causing the flip-flop to reset.

The collector output of Q606 turns Q610 ON, which energizes PLAY relay RY602. The output also holds bias oscillator relay RY301 energized if RECORD MODE switch S506 and RECORD switch S906 have been activated.

Solenoid Operations

PINCH ROLLER solenoids PM903 and PM904 are energized by Q905 and Q907 respectively. Q905 and Q907 turn ON only when PLAY relay RY602 energizes. TAPE SHIFTER solenoid PM901 is energized by Q904. Q904 turns ON only when PLAY relay RY602 energizes or TAPE SHIFT switch S908 is actuated. BRAKE solenoid PM902 is energized by Q906. Q906 turns ON when the REWIND, PLAY, or FAST FORWARD relay energizes.

To avoid excessive heat built-up in the solenoids during extended operation, the following circuit is used (Fig. 1-3-2). Initially, +23 volts is applied across the solenoid. Also, +23 volts is applied to the network comprising R637 (R640, R634, R647), and C609 (C613, C608, C607). A high potential is instantaneously applied to the base of Q905 (Q907, Q906, Q904).

As the internal impedance of C609 (C613, C608, C607) approaches that of R638 (R641, R635, R648) the voltage at the base decreases. The voltage across the solenoid also decreases.

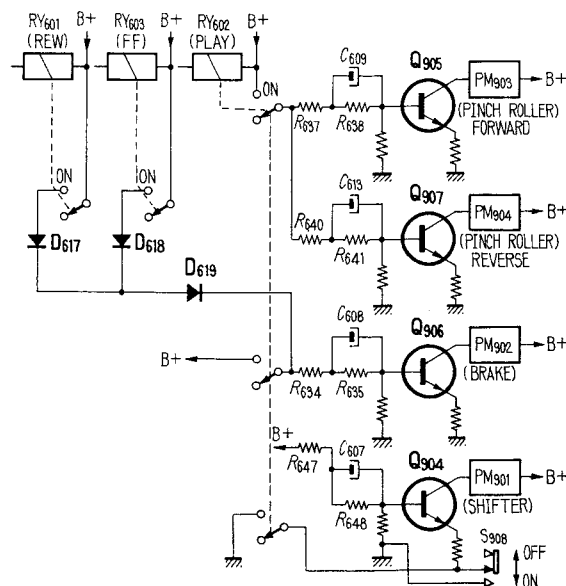


Fig. 1-3-2. Solenoid drive circuit

SHUT-OFF Stage

When a tape is threaded, the Automatic Shut-off (S909) becomes open, cutting off the positive potential applied to the base of transistor Q992 through the resistance network of R993, R994 and R995, turning Q992 OFF. This provides bias to transistor Q991 which then conducts heavily, reducing its collector voltage nearly to ground potential.

If a pulse is received at the base of transistor Q712 (supplied from the ATS circuit output), the collector of Q712 falls to ground potential. This brings the base of Q991 to ground, also, cutting off the operation of Q991 and stopping the transport.

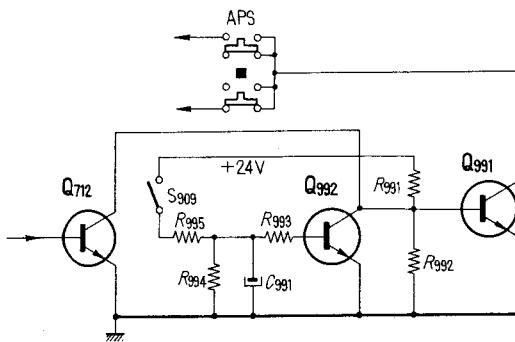


Fig. 1-3-3. SHUT-OFF circuit

1-3-2. APS-ATS Circuit

APS-ATS Oscillator Stage

A Colpitts oscillator circuit is used in the APS-ATS control circuit, operating at approximately 220 kHz. Regenerative feedback is derived from the tank circuit (consisting of the sensing head, C701 and C702 capacitors) and is applied to the emitter of Q701 through C702 and R704. Base bias for Q701 is developed across R701 and R702 while the emitter-swamping resistor is R703. This oscillator stage operates constantly. Capacitor C703 and inductor L701 form a series resonant circuit at the oscillator frequency which is coupled to the base of Q702, keeping it ON and maintaining the Q702 collector at emitter ground potential.

If a metallic object, such as the foil sensing tape, passes near the sensing head core, the inductance of

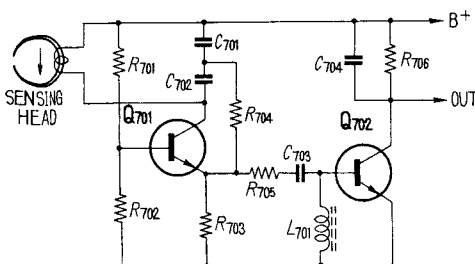


Fig. 1-3-4. APS and ATS oscillator circuit

the sensing head changes, also changing the oscillation intensity of the tank circuit. Inductor L701 then acts as a short to ground and Q702 is momentarily cut off, resulting in a sharp rise of voltage at the collector of Q702. This produces a positive pulse to the next stage.

ATS

When a positive pulse originates from transistor Q702, it is applied to the base of transistor Q703 (through R707 and D701). This turns Q703 ON and it conducts heavily, reducing its collector potential effectively to ground. The ground level of the Q703 collector drops the base of Q704 to ground potential, also, turning Q704 OFF momentarily. (Q704 is normally on.) With the collector of Q704 increasing its positive potential in its OFF condition (due increased impedance), the potential is applied to the base of Q712 which begins to conduct heavily, dropping its collector potential to ground. With the Q712 collector at ground potential, this activates the shut-off circuit as described in the shut-off stage for that function. Q711 and its associated base biasing circuit are to keep Q712 from functioning soon after the tape transport is turned from rewind to play in APS mode. When the mode changes from rewind to play, the foil which activated the change of mode passes again across the sensing head. This supplies positive pulse to base of Q712. However, potential charged in C710 keeps Q711 ON and grounds the pulse supplied from Q704 through R736 for approximately 15 seconds.

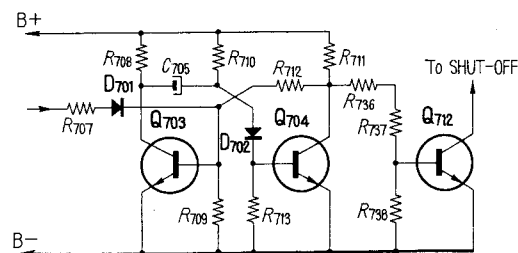


Fig. 1-3-5. ATS circuit

APS

When the APS switch is depressed (closed), the fast forward (FF) relay is activated through D703, putting the recorder in fast forward mode. At the same time, the collector of Q705 is momentarily grounded. This removes bias voltage at the base of Q706 (through R716) and Q706 turns OFF. The collector potential of Q706 rises, therefore, biasing (through R717) the base of Q705 and (through D711) the base of Q711. Both Q705 and Q711 begin to conduct heavily and their respective collectors fall to the emitter ground potential. Simultaneously,

the collector of Q607 is grounded through the FF relay contacts, which are closed as shown in the diagram. No bias is presented to the base of Q606, turning it OFF and turning Q607 ON. With Q607 conducting, the FF relay is self-locked as current flows from the B+ through the relay to ground through Q607. Positive voltage from the normally-off Q703 collector provides bias to the base of both Q707 and Q709. The collector voltage of both Q707 and Q709 is held at emitter ground potential, which in turn prevents bias from reaching the base of Q708 and the base of Q710. Q708 and Q710 are in an OFF condition which keeps the circuit from going into play or rewind modes.

TO REWIND:

When sensing foil crosses the sensing head, a pulse (from Q702) momentarily provides bias at the base of Q703, turning Q703 ON. Q703 conducts and momentarily stops supplying base bias to Q707, which turns OFF. With Q707 turned OFF, positive potential from the collector of Q707 biases the base of Q708 (through R727) and Q708 conducts with its collector dropping to emitter ground potential. This closes the REWIND relay as current flows from B+ through the relay and through Q708 to ground. At this time the self-locking contacts of the FF relay are opened and the self-locking contacts of the REWIND relay are closed. Switches are now op-

posite of the diagram positions. Once the REWIND relay is activated, it is self-locked in ON position through its contacts, fast forward relay contacts, and Q607.

TO STOP AND PLAY (from APS rewind mode):

When the sensing foil again crosses the sensing head (now in the APS rewind mode), Q703 again receives a momentary bias pulse (from Q702) and grounds the base of Q709, turning Q709 OFF. A positive potential is then allowed through ZD701, R722 and R733 from the FF relay coil. This potential biases Q710, which turns ON, and the collector of Q710 falls to emitter ground potential, removing bias from the base of Q607, turning it OFF. With Q607 OFF, the self-locking ground is open (remember, all switches are now opposite to the diagram positions) and the REWIND relay is released, stopping the rewind mechanism. Simultaneously, when Q710 is turned ON, its collector, now reduced to emitter ground potential, also applies this emitter ground potential to the collector of Q706 (through D709). The base of Q705 receives no bias, therefore. Q705 turns OFF and Q706 turns ON. With Q705 off, its positive collector voltage charges Q709 which delivers bias to the base of Q709 after a capacitive time-delay (through C709 and R728). This time delay is necessary to keep Q709 OFF for a short period right after Q710 is turned off.

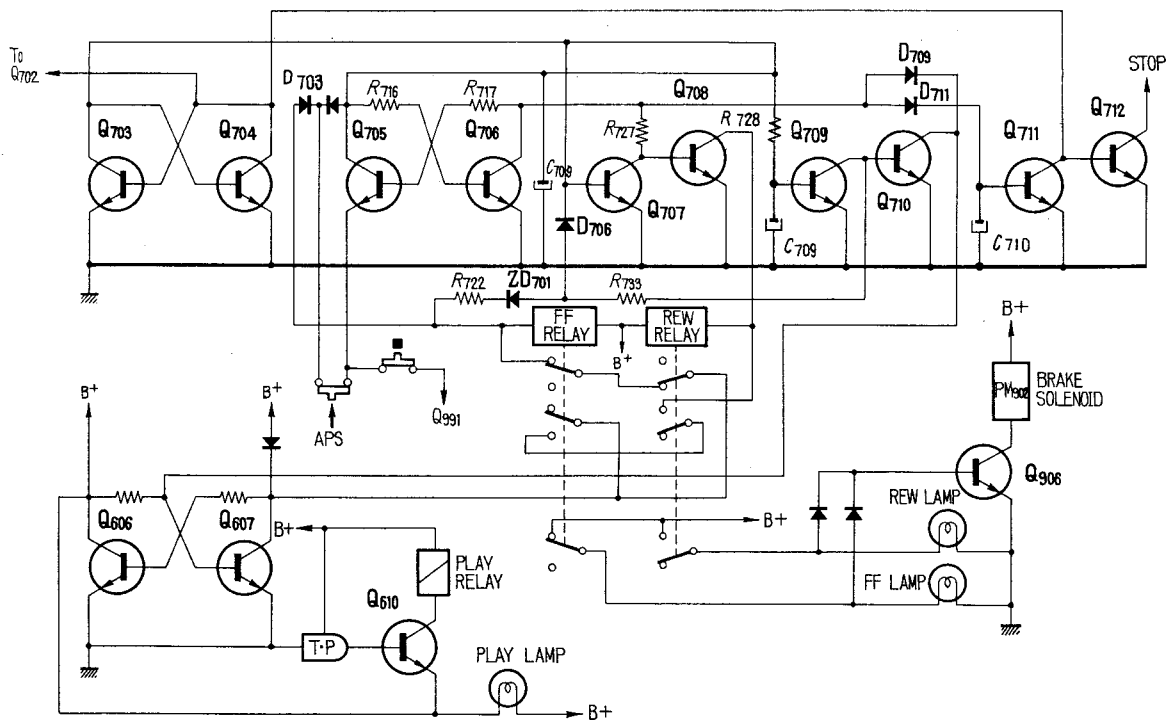


Fig. 1-3-6. APS and ATS circuit

	APS (To Fast Forward)	FOIL REACHES SENSING HEAD IN F.F. MODE (To Rewind)	FOIL REACHES SENSING HEAD IN REW. MODE (To STOP and PLAY)
Q703	OFF	ON (Momentarily)	ON (Momentarily)
Q704	ON	OFF (Momentarily)	OFF (Momentarily)
Q705	ON	ON	OFF
Q706	OFF	OFF	ON
Q707	ON	OFF	ON
Q708	OFF	ON	OFF
Q709	ON	ON	OFF
Q710	OFF	OFF	ON
Q711	ON	ON	ON
Q712	OFF	OFF	OFF

1-3-3. CAPSTAN SERVO-CONTROL Stage

Since it is a well-known fact that the capstan servo-control system brings many advantages over the conventional capstan motors driven directly by the AC power line, only technical function of the circuit is explained here, leaving the flowery words to advertising people.

The following is the basic block diagram of the capstan servo-control system used for the SONY Model TC-854-4.

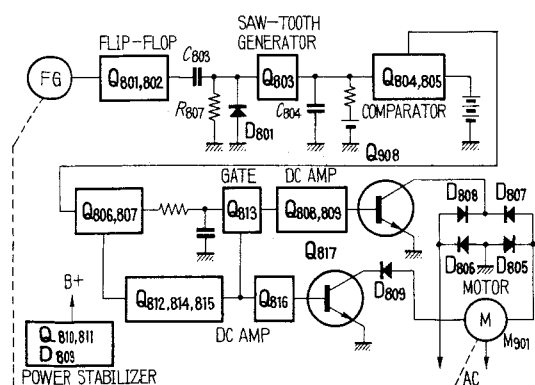


Fig. 1-3-7. Block diagram (Capstan servo-control circuit)

The motor used in this system is a type of AC torque motor, the speed and torque of which can be controlled by changing the supply voltage, with an AC frequency generator (FG) coupled coaxially to its shaft. The output of the FG is connected to the servo-control electronics to trigger the flip-flop (Q801 and Q802) which generates square wave output at the collector. This output is then differentiated and rectified by C803, R807 and D801 turning the wave form into positive pulses. These pulses trigger the saw-tooth generator (Q803). The saw-tooth output of Q803 is led to the comparator consisting of Q804 and Q805. Only for the period when the potential of saw-tooth wave becomes higher than the potential at the emitter of Q804 and Q805, Q804 becomes

conductive and supplies pulsating signal to Q806, which inverts the phase of the pulse signal. The signal then goes through a buffer stage (Q807) and passes through a low-pass filter for smoothing. The smoothed DC potential, which varies in direct proportion to the duration time of the pulse at emitter of Q807, controls the output of the DC amplifier consisting of Q808 and Q809. The output at the emitter of Q809 varies the impedance between collector and emitter of Q808, which is inserted in series with the capstan drive motor.

When, by a certain cause, the motor is rotating at a speed slower than the intended speed, the frequency of FG is also lower than the predetermined figure, which results in longer interval between the pulses for saw-tooth triggering. The longer interval between the pulses causes higher saw-tooth wave height, which in turn brings in a longer duration of "ON" period of Q804. Therefore, the output pulse at the emitter of Q807 becomes wider, which means higher positive biasing of Q808 resulting in less collector-emitter impedance of Q808 to increase the speed of the motor. When the motor is running too fast, operation of the servo system is vice versa. The equilibrium of the servo system is obtained where the highest potential of the saw-tooth wave becomes equal to the emitter potential of Q804 and Q805.

Tape speed selection is accomplished by changing the time constant of the saw-tooth generator Q803 and by selecting proper parameters in the smoothing low-pass filter.

Starting: The moment when the power switch of the recorder is turned on, the situation of the servo-control circuit and motor is as follows:

Q803	Q804	Q806	Q807	Q808	Q809	Q908	MOTOR
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF

This situation continues until the charged potential across C804 becomes higher than the potential

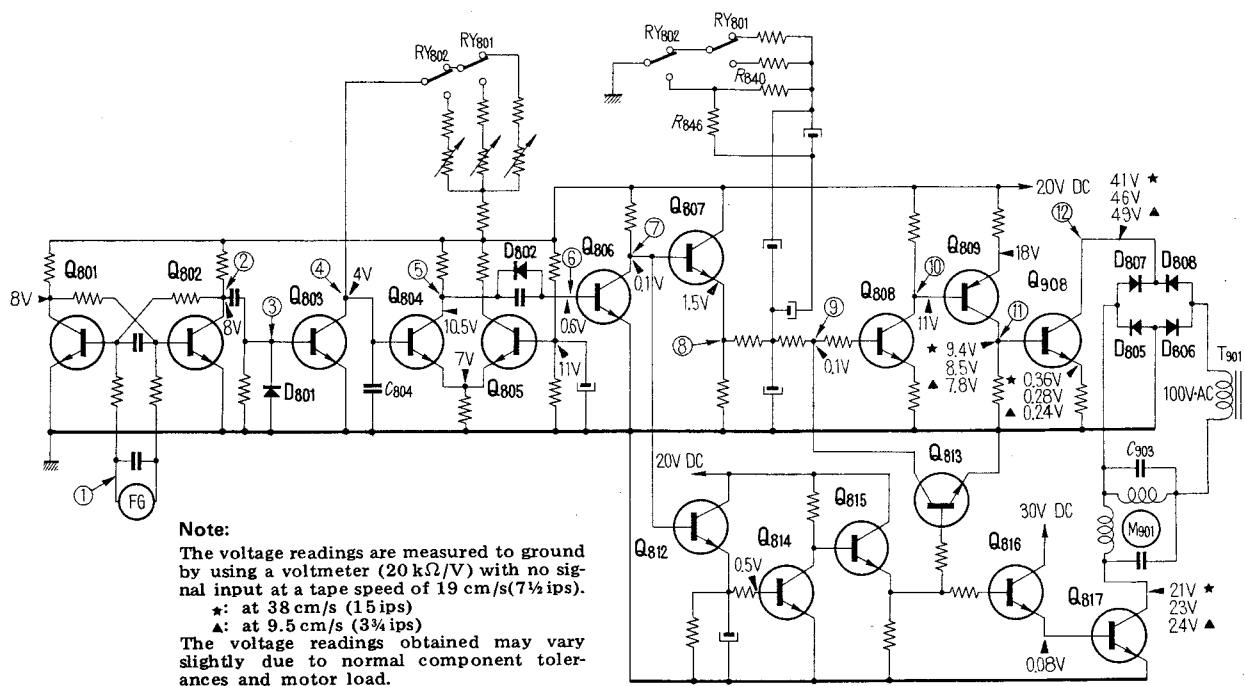
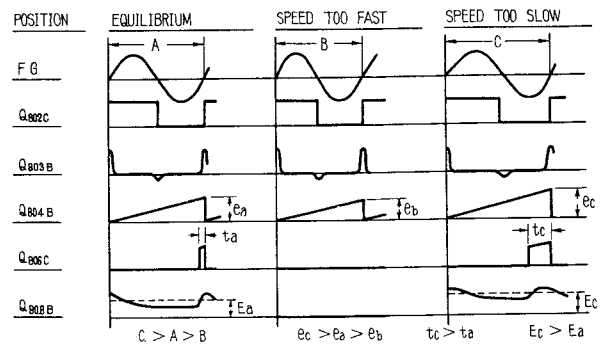
at the emitter of Q804 and Q805. When the potential across C804 becomes high enough to make Q804 conductive, the potential at collector of Q804 becomes lower than the zener voltage of D802, thus turning OFF Q806. The OFF situation of Q806 turns ON all the transistors Q807, Q808, Q809 and Q907, as well as the motor. Once the motor is started, its speed is controlled by the frequency generated by the coaxial generator as explained earlier.

Electromagnetic Braking: When changing tape speed to a slower position while the tape is in motion, it is necessary to force the speed down to make the change quick. This is accomplished by applying brake to the motor electromechanically. The change of speed selector switch to a slower position causes longer rise time of saw-tooth wave at the base of Q804 and induces base bias to Q806 to turn it ON. Then, the potential at the collector of Q806 becomes almost zero against the ground. This low potential turns OFF Q812 and, therefore, Q814. The OFF situation of Q814 turns ON Q815 generating higher potential at its emitter. This potential turns ON Q813, which shorts the servo-control signal to ground to inactivate the circuit. Meanwhile, the potential at the emitter of Q815 turns ON Q816 and Q817 to

induce braking current in the motor windings through D809, Q817 and D808. Once the frequency of FG becomes low enough to turn ON Q804 (and, therefore, to turn OFF Q806), the servo-control system takes over the motor speed control.

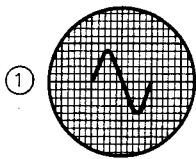
Stability: Since the supply potential to the servo-control circuit affects the tape speed, a voltage stabilizer consisting of Q810, Q811 and D803 is used for maximum stability of the supply potential. Also, the high stability of the circuit owes to the self-compensating comparator stage (Q804 and Q805) and use of silicon transistors throughout.

Wave Forms and Voltages: The wave forms at each stage and their relation and voltage are as follows:

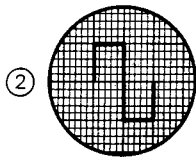


Note:
The voltage readings are measured to ground by using a voltmeter (20 k Ω /V) with no signal input at a tape speed of 19 cm/s (7 1/2 ips).
★: at 38 cm/s (15 ips)
▲: at 9.5 cm/s (3 3/4 ips)
The voltage readings obtained may vary slightly due to normal component tolerances and motor load.

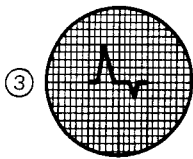
Fig. 1-3-8. Capstan servo-control circuit



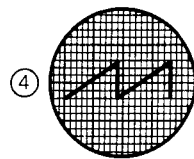
15 ips — 1,151 Hz, 7.6 Vp-p
7½ ips — 575 Hz, 3.2 Vp-p
3¾ ips — 288 Hz, 1.52 Vp-p



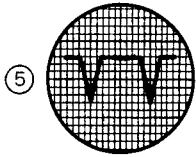
18 Vp-p



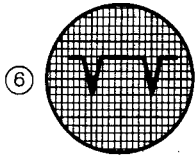
1.2 Vp-p



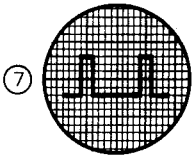
9 Vp-p



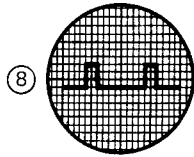
3 Vp-p



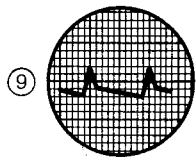
3 Vp-p



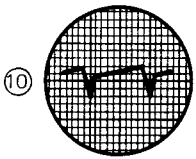
7.6 Vp-p



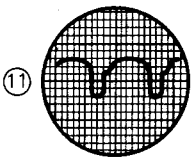
5.2 Vp-p



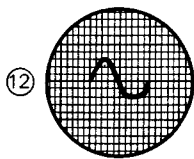
0.08 Vp-p



0.3 Vp-p



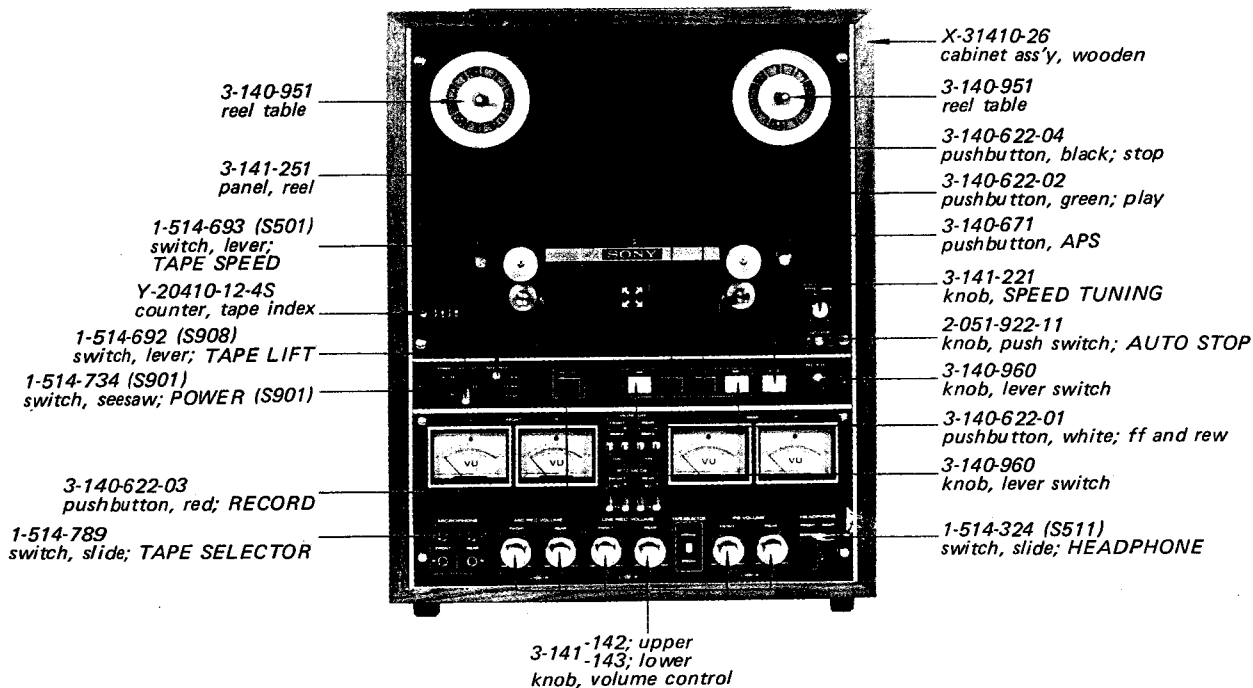
0.5 Vp-p



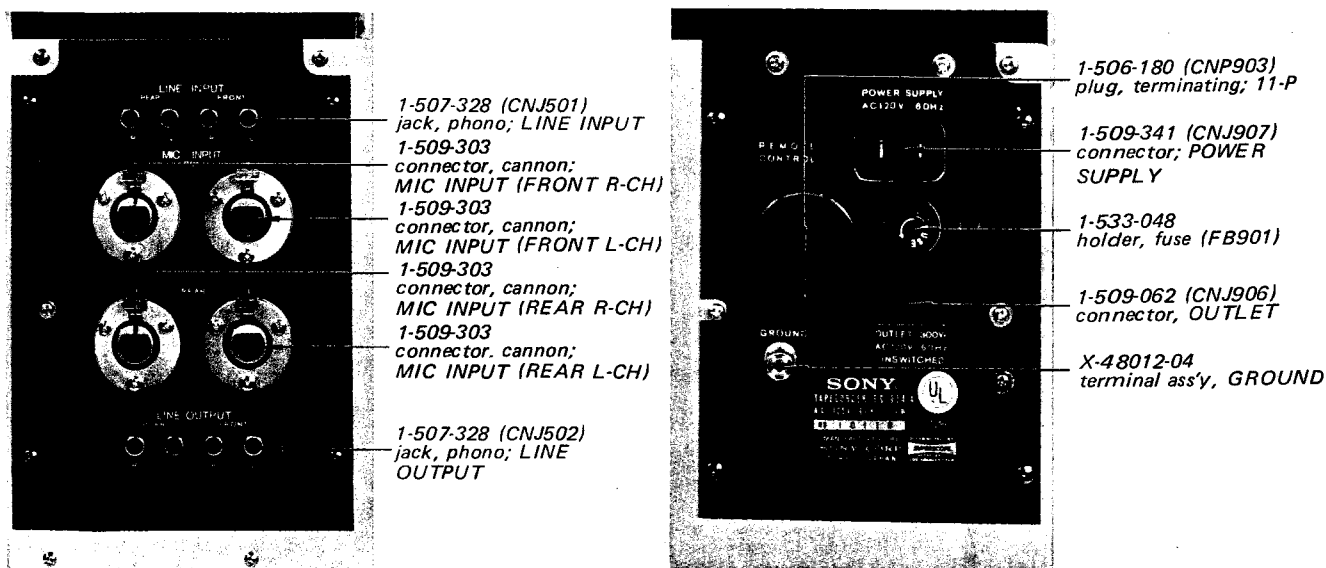
80 Vp-p

1-4. MAJOR PARTS LOCATIONS

— Cabinet front view —

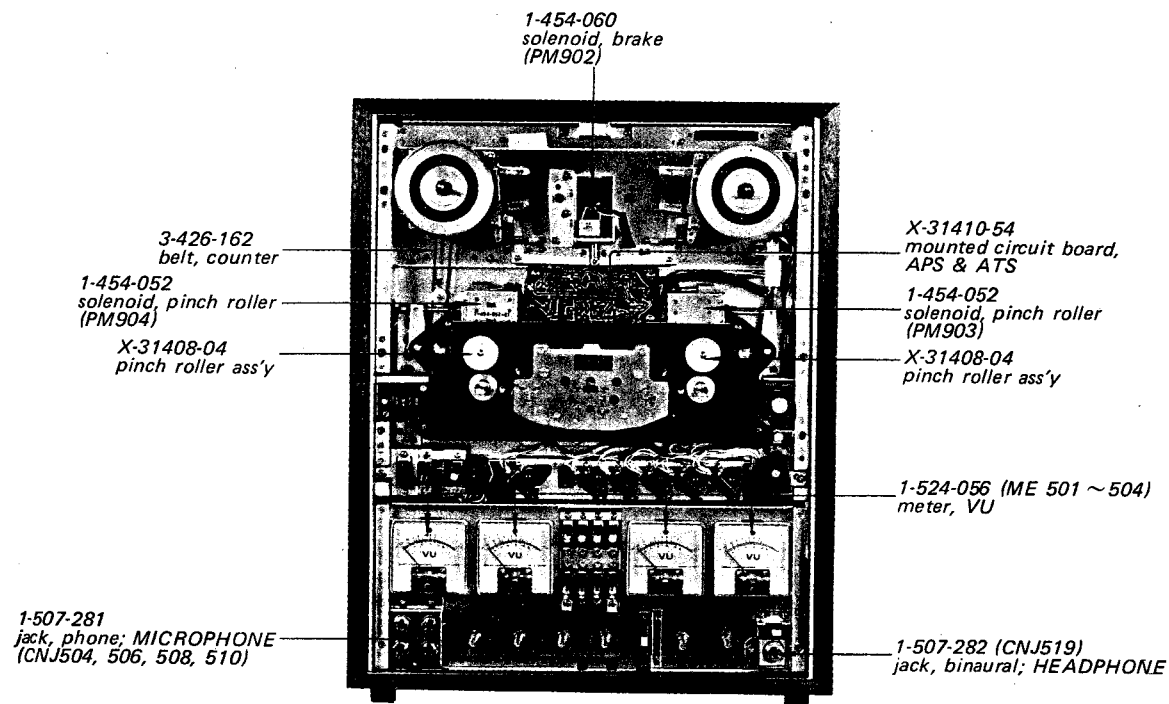


— Jack Panel —

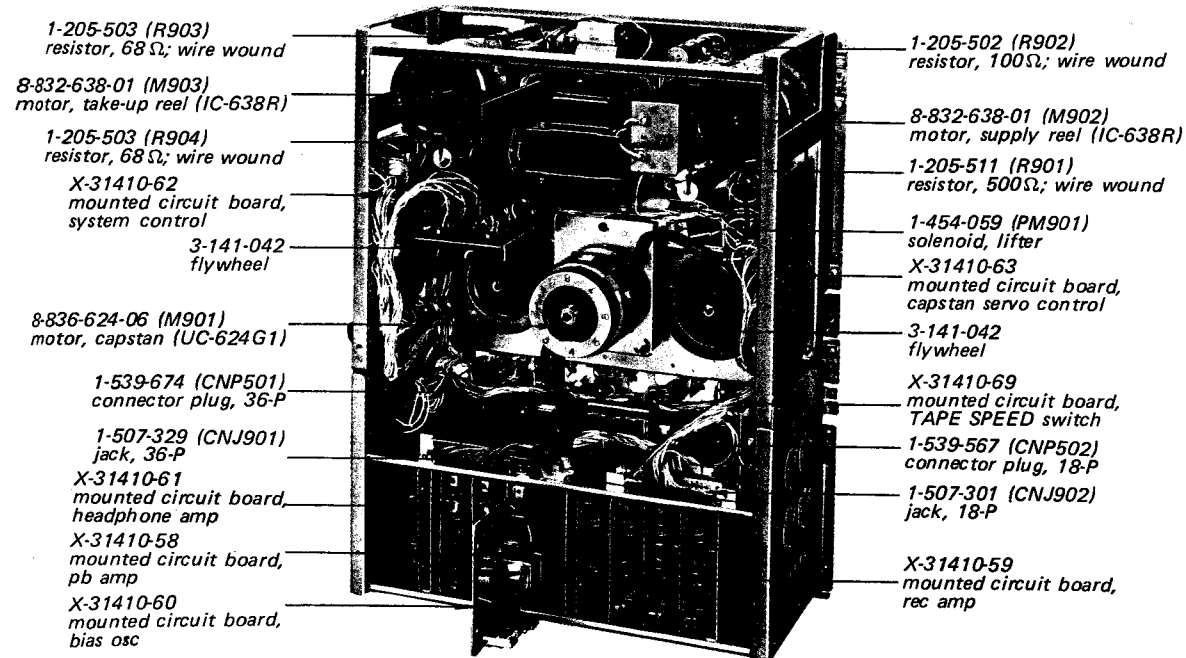


SECTION 2 DISASSEMBLY

— Chassis front view —



— Chassis back view —



2.1. REEL PANEL REMOVAL

Remove the four screws marked ☆ in Fig. 2-1.

2.2. AMP PANEL REMOVAL

- (1) Remove the control knob marked □ in Fig. 2-1 by loosening their set screws.
- (2) Remove the four screws marked △ in Fig. 2-1.

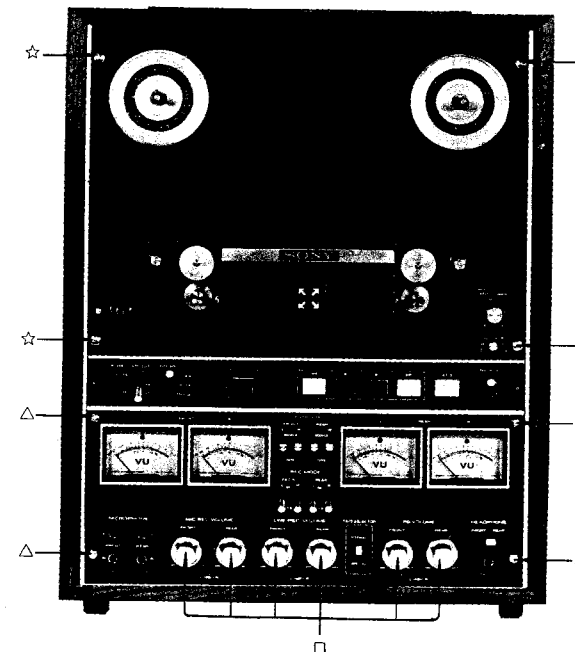


Fig. 2-1. Reel panel and amp panel removal

2.3. CABINET REMOVAL

- (1) Remove the six screws marked ● in Fig. 2-2.
- (2) Take out the chassis from the cabinet.

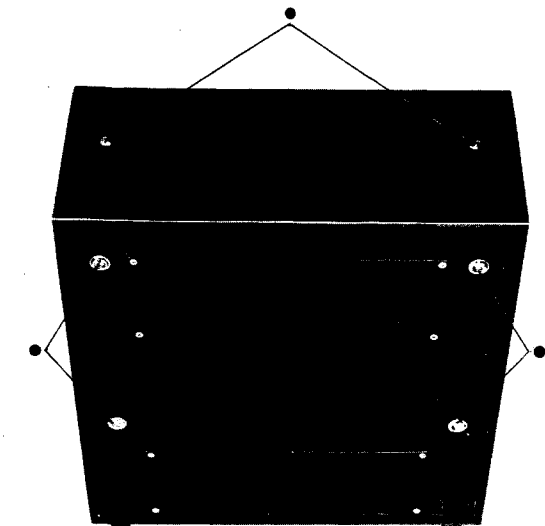
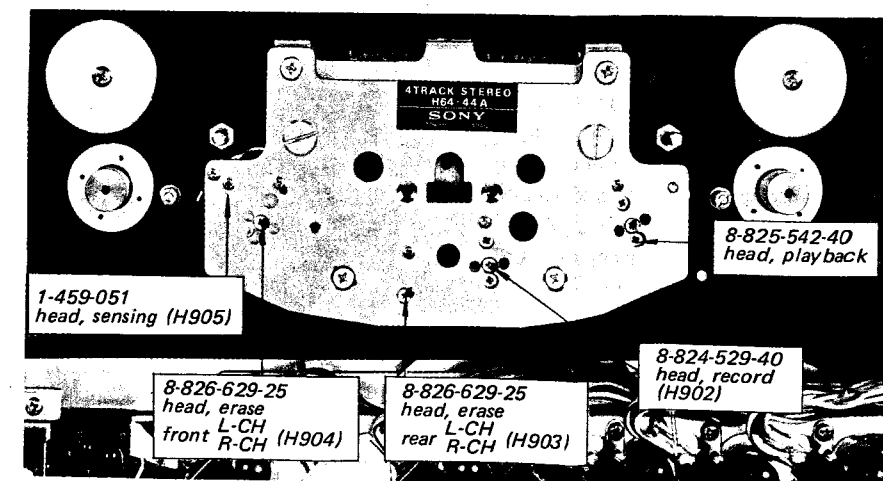


Fig. 2-2. Cabinet removal

MAJOR PARTS LOCATIONS — Continued —

— Head deck top view —



SECTION 3 ADJUSTMENT PROCEDURES

3-1. MECHANICAL ADJUSTMENTS

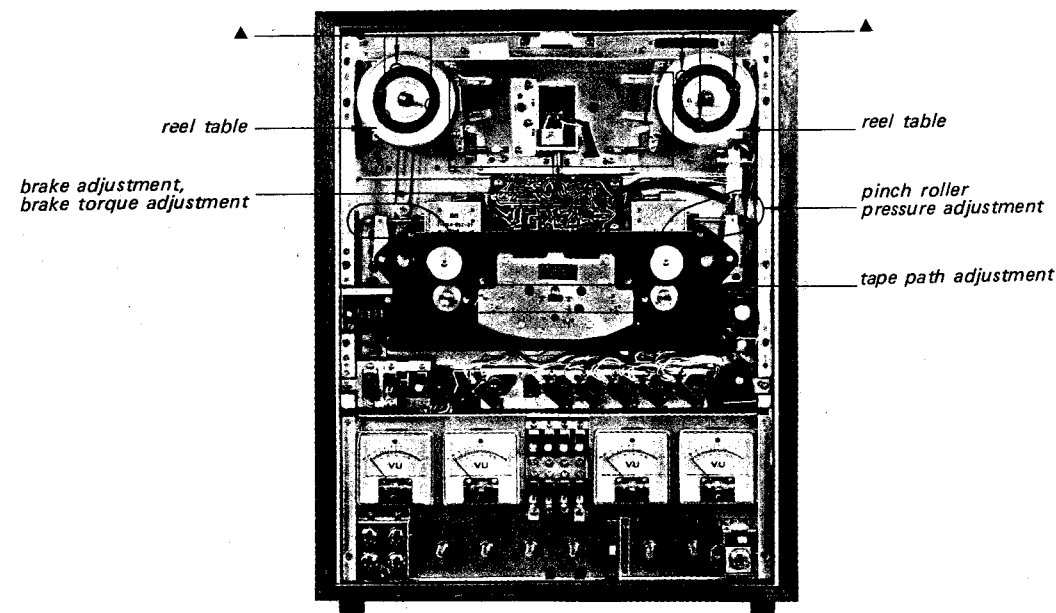


Fig. 3-1-1. Adjusting parts location

3-1-1. Brake Adjustment (See Fig. 3-1-2.)

Make the brake adjustment, if proper tape tensioning is not maintained in the STOP mode.

Steps:

- (1) Remove the reel panel, referring to "Reel Panel Removal" on page 14.
- (2) Remove the reel table by removing the six screws marked with ▲ in Fig. 3-1-1.
- (3) Place the unit in the STOP mode.
- (4) Loosen the two screws marked with ● at the take-up and the supply brake bands.
- (5) Temporarily tighten the screws marked with ● while pulling the brake band in the direction shown by the arrow as far as it will go.
- (6) When pushing the pole piece of solenoid slowly into its housing by the hand, the releasing plates of the take-up side and the supply side should touch the each brake lever at a time. If not, loosen the screw marked with ● of the part at which the releasing plate touches the brake lever faster than the other one and adjust the length of the brake band.
- (7) Place the unit in the PLAY mode.
- (8) Be sure that the brake solenoid is energized.
- (9) Loosen the three screws marked with ■ and adjust by positioning the brake solenoid holding plate so that the three screws are in the middle of the respective oval-shaped

holes of the brake solenoid holding plate.

- (10) There should be a clearance of approximately 0.5 mm ($\frac{1}{64}$ ") equally between the brake lining and the brake drum.

If not, loosen the screw marked with ● and adjust by positioning the brake band.

Note: If the 0.5 mm clearance is not obtained yet, loosen the three screws marked with ■ and adjust by positioning the brake solenoid holding plate.

- (11) Repeat the steps (6) through (10) until the satisfactory result is obtained.
- (12) Place the unit in the STOP mode..
- (13) Loosen the two screws marked with ▲ and adjust by positioning the stopper so that a clearance between the releasing plate and

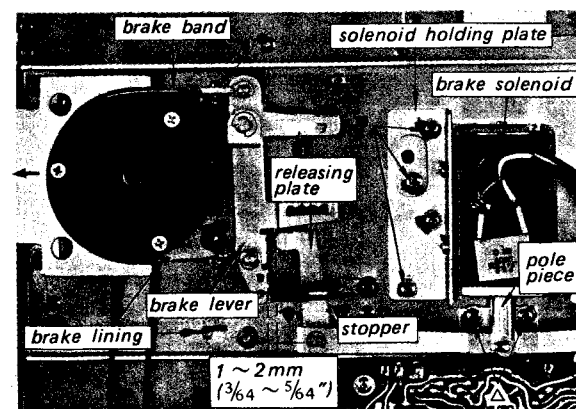


Fig. 3-1-2. Brake adjustment

the brake lever is 1 ~ 2 mm ($\frac{3}{64}$ ~ $\frac{5}{64}$ ") as shown in Fig. 3-1-2.

- (14) Be sure that the pole piece surely comes in contact with the stopper in the STOP mode.

3-1-2. Brake Torque Adjustment (See Fig. 3-1-3.)

This adjustment should be performed for both supply and take-up sides after the brake adjustment.

Note: Words in [] are applied to the take-up brake torque adjustment.

Steps:

- (1) Place the unit in the STOP mode.
- (2) Place a 7" reel with string wound several turns counterclockwise [clockwise] on the hub (44 mm) onto the reel table. Tie the string to a spring scale.
- (3) Pull the scale in the direction shown by the red arrow, making sure that the string does not touch either flange of the reel. The reel table will rotate counterclockwise [clockwise]. Take a reading only when the reel table is in steady motion.
- (4) Adjust the position of spring A so that a scale reading is between 1,800 g-cm and 2,200 g-cm (25.0 oz-inch and 30.6 oz-inch).
- (5) Rewind the string by turning the reel counterclockwise [clockwise].
- (6) Turn string several times clockwise [counterclockwise] on the hub (44 mm) onto the reel table.
- (7) Pull the scale in the direction shown by the black arrow, making sure that the string does not touch either flange of the reel.

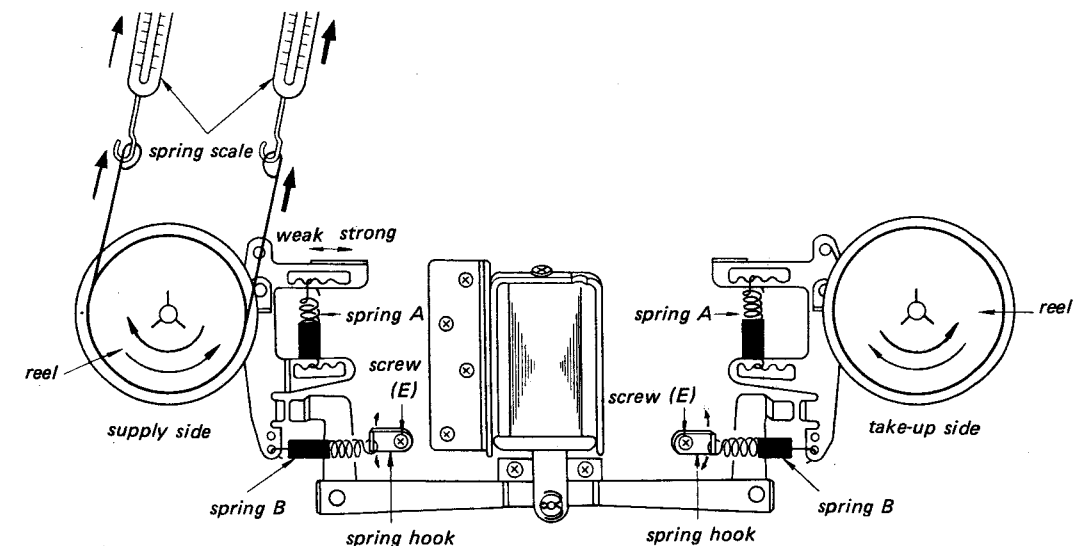


Fig. 3-1-3. Brake torque adjustment

The reel table will rotate clockwise [counterclockwise].

Take a reading only when the reel table is in steady motion.

- (8) Adjust the angle of the spring hook by loosening the screw (E) so that a scale reading is between 650 g-cm and 750 g-cm (8.95 oz-inch and 10.4 oz-inch).

SPECIFICATION:

Brake Torque of Supply Reel

in clockwise turning 650 ~ 750 g-cm
(8.95 ~ 10.4 oz-inch)
in counterclockwise turning
1,800 ~ 2,200 g-cm
(25.0 ~ 30.6 oz-inch)

Brake Torque of Take-up Reel

in clockwise turning
1,800 ~ 2,200 g-cm
(25.0 ~ 30.6 oz-inch)
in counterclockwise turning
650 ~ 750 g-cm
(8.95 ~ 10.4 oz-inch)

3-1-3. Take-up Tension and Back Tension Adjustment of Reel Table (See Fig. 3-1-4 and Fig. 3-1-5.)

Note: Set the TAPE SPEED switch to $7\frac{1}{2}$ ips (19 cm/s).

Hold the actuator so that the SHUT-OFF switch is activated (a rubber band or piece of masking tape will hold the actuator as though tape were threaded on the unit).

A Take-up Tension Adjustment

- (1) Set the reel size selector switch S910 to 10"

- (2) Place a 10" reel with string wound several turns clockwise on the hub (76 mm) onto the take-up reel table.
Tie the string to a spring scale.
- (3) Place the unit in the PLAY mode.
- (4) Pull a spring scale and then allow to take up the string on the reel while approaching the scale to the reel at the same speed of tape running [7 1/2 ips (19 cm/s)].
- (5) Adjust the upper side slider on resistor R903 so that a scale reading is between 430 g-cm and 470 g-cm (6.0 oz-inch and 6.5 oz-inch).
- (6) Place the unit in the STOP mode.
- (7) Set the reel size selector switch S910 to 7".
- (8) Place a 7" reel with string wound several turns clockwise on the hub (44 mm) onto the take-up reel table.
Tie the string to the spring scale.
- (9) Perform the steps (3) and (4) in order.
- (10) Adjust the lower side slider on resistor R903 so that a scale reading is between 280 g-cm and 320 g-cm (3.9 oz-inch and 4.5 oz-inch).

B Back Tension Adjustment

- (1) Set the reel size selector switch S910 to 10".
- (2) Place a 10" reel with string wound several turns counterclockwise on the hub (76 mm) onto the supply reel table.
Tie the string to the spring scale.
- (3) Place the unit in the PLAY mode.

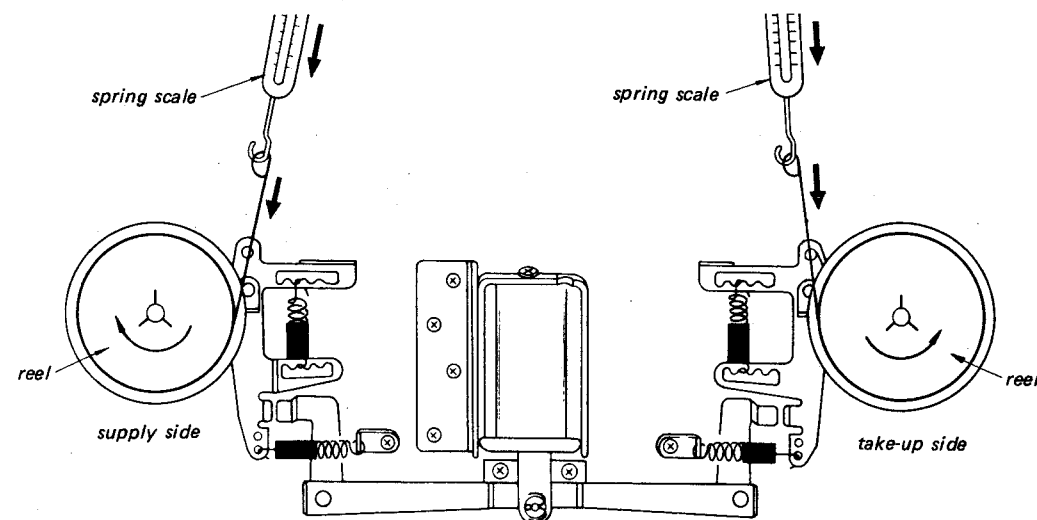


Fig. 3-1-5. Take-up tension and back-tension adjustment of reel table

- (4) Pull a spring scale and then allow to take up the string on the reel while approaching the scale to the reel at the same speed of tape running [7 1/2 ips (19 cm/s)].
- (5) Adjust the upper side slider on resistor R902 so that a scale reading is between 450 g-cm and 550 g-cm (6.3 oz-inch and 7.6 oz-inch).
- (6) Place the unit in the STOP mode.
- (7) Set the reel size selector switch S910 to 7".
- (8) Place a 7" reel with string wound several turns counterclockwise on the hub (44 mm) onto the supply reel table.
Tie the string to the spring scale.
- (9) Perform the steps (3) and (4) in order.
- (10) Adjust the lower side slider on resistor R902 so that a scale reading is between 180 g-cm and 220 g-cm (2.5 oz-inch and 3.1 oz-inch).

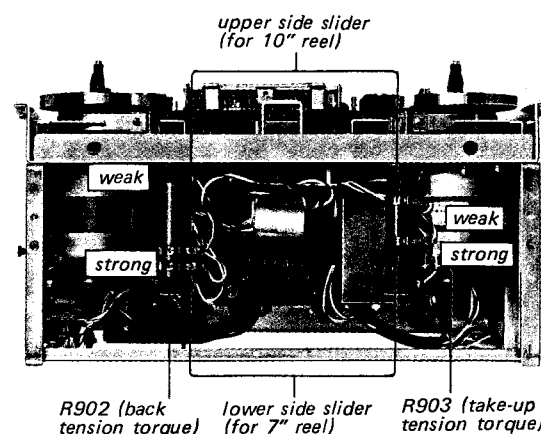


Fig. 3-1-4. Adjusting parts location

3-1-4. Pinch Roller Pressure Adjustment (See Fig. 3-1-6 and Fig. 3-1-7.)

Steps:

- (1) Remove the reel panel referring to "Panel Removal" on page 14.
- (2) Place the unit in the STOP mode.
- (3) Push the pole piece of the solenoid into its housing by the hand, and make sure that the clearance between the ring and the pinch roller lever is 0.5 ~ 1 mm (1/64 ~ 3/64").
- (4) Make a loop with a piece of string and attach the spring scale to the pinch roller shaft with the loop of string. See Fig. 3-1-6.
- (5) Hold the actuator so that the SHUT-OFF switch is activated (a rubber band or piece of masking tape will hold the actuator as though tape were threaded on the unit).
- (6) Place the unit in the PLAY mode.
- (7) Pull the scale horizontally in the direction shown by the arrow. The capstan shaft, pinch roller and the scale should be in a line.
- (8) Check a scale reading when the pinch roller just leaves the capstan shaft.
- (9) Adjust the adjusting nut so that a scale reading is between 1 kg and 1.4 kg (2.2 lb and 3.1 lb).
- (10) Make sure that the solenoid operates normally when a mode is changed from the PLAY to the STOP and vice versa several times. If the tape slips, readjust the above steps.
- (11) Lock the adjusting nut with the lock nut.
Note: Be careful not to move the adjusting nut.
- (12) Apply lock paint to the nuts.

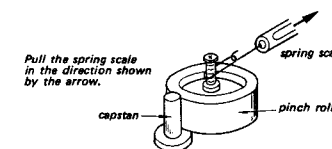


Fig. 3-1-6. Pinch roller pressure adjustment

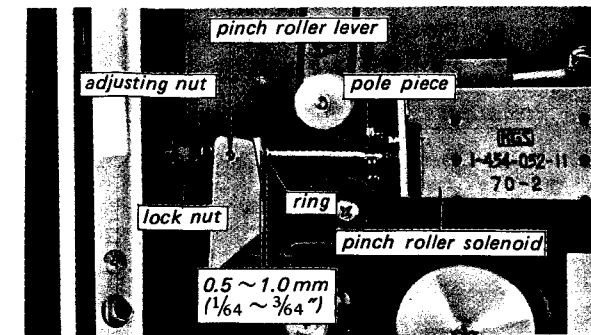


Fig. 3-1-7. Pinch roller pressure adjustment

3-1-5. Tape Path Adjustment (See Fig. 3-1-8.)

- Note:**
1. This adjustment should be performed in playback mode with a transparent tape threaded.
 2. Tape guides (A) and (D) should be adjusted for tape height difference caused by tape guide (B) and (C) adjustment.

After individual head replacement, make head height adjustment for the replaced head, referring to Fig. 3-1-8.

After head assembly replacement, check as follows:

- (1) Make sure that tape runs as shown in Fig. 3-1-8.
- (2) If not, adjust tape guides (B) and (C).

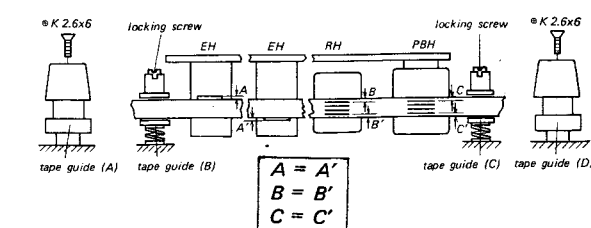


Fig. 3-1-8. Tape Path Adjustment

3-2. ELECTRICAL ADJUSTMENTS/ MEASUREMENTS

Precautions:

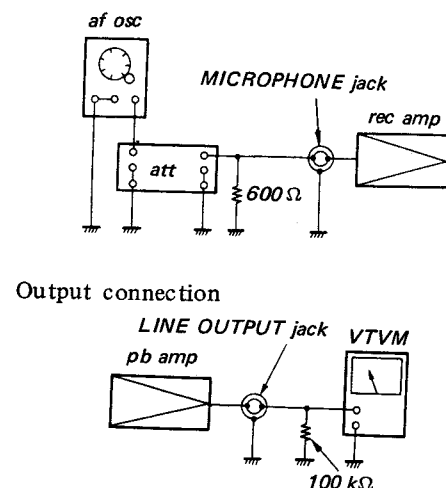
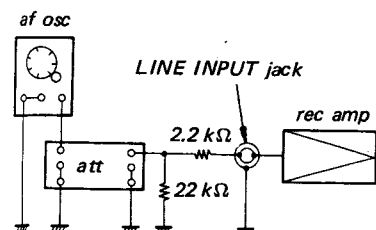
1. Clean the following parts with alcohol moistened swab:
record head
playback head
erase heads
capstans
pinch rollers
rubber belts
2. Demagnetize record and playback heads with a head demagnetizer.
3. Do not use magnetized screwdrivers for these adjustments.
4. Apply locking compound to the parts after these adjustments.
5. Follow the sequence in completing these adjustments.
6. Adjustments and measurements should be performed for each channel.

Equipment Required:

audio oscillator (af osc)
attenuator (att)
VTVM
1-kHz band-pass filter (BPF)
SONY alignment tapes
J-19-F2
J-9-F1
fixed resistors
100 k Ω 2.2 k Ω
600 Ω 22 k Ω

Equipment Connections:

Input connection



Standard Levels (unless otherwise specified):

Input		Impedance	Signal level
MIC		300 Ω	-60 dB (0.77 mV)
LINE INPUT		10 k Ω	-10 dB (0.25 V)
Output		Load resistor	Signal level
LINE OUTPUT		100 k Ω	0 dB (0.77 V)

Standard Control-Setting:

PB VOLUME Control:

1. Set MONITOR switch to TAPE position and TAPE SPEED switch to 7 1/2" (19 cm) position.
2. Play 1st tone (400 Hz) on SONY alignment tape J-19-F2.
3. Adjust PB VOLUME control for 0 dB (0.77 V) at LINE OUTPUT jack.

MIC REC VOLUME Control:

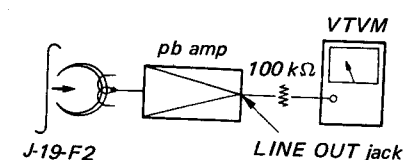
1. Set MONITOR switch to SOURCE position.
2. Deliver 1 kHz signal of -60 dB (0.77 mV) to MICROPHONE jack.
3. Adjust MIC REC VOLUME control for 0 dB (0.77 V) at LINE OUTPUT jack.

LINE REC VOLUME Control:

1. Set MONITOR switch to SOURCE position.
2. Deliver 1 kHz signal of -10 dB (0.25 V) to LINE INPUT jack.
3. Adjust LINE REC VOLUME control for 0 dB (0.77 V) at LINE OUTPUT jack.

1. Playback Head Azimuth Adjustment

Setup:



Switch/Control Setting:

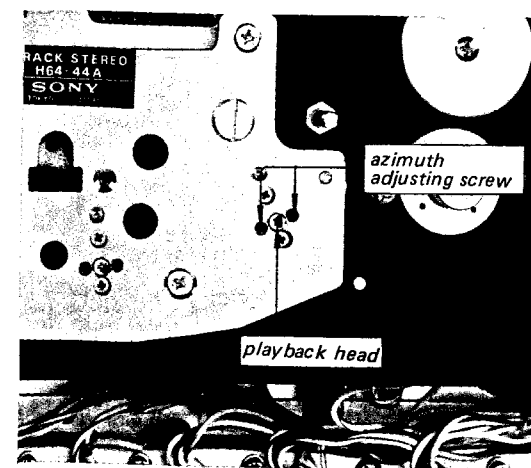
SPEED TUNING control: NORMAL (mechanical mid)
AUTO STOP switch: any
TAPE LIFT switch: ON
TAPE SPEED switch: 7 1/2" (19 cm)
REEL SIZE switch: 7"
MONITOR switches: TAPE
REC MODE switches: PB
TAPE SELECTOR switch: NORMAL
PB VOLUME control: proper position

Procedure:

1. Play 4th tone (12.5 kHz) on SONY alignment tape J-19-F2.
2. Adjust the adjusting screw for the biggest peak VTVM reading.

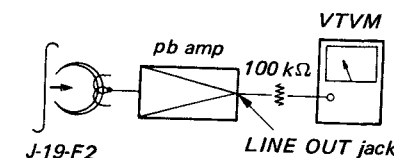
Note: If the biggest peak reading for all the channels cannot be obtained at the same screw position, take the mid between the both extreme positions of the screw.

Adjusting Parts Location:



2. Playback Equalizer Adjustment (7 1/2 ips, 19 cm/s)

Setup:



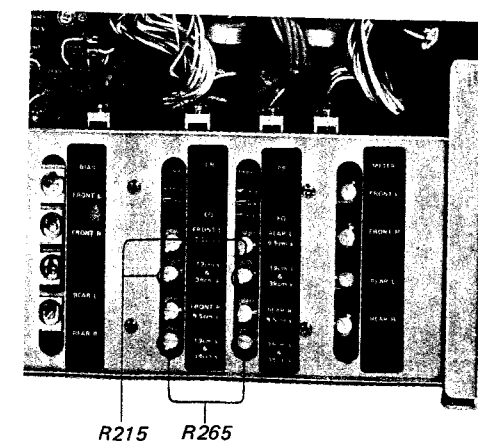
Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)
AUTO STOP switch: any
TAPE LIFT switch: ON
TAPE SPEED switch: 7 1/2" (19 cm)
REEL SIZE switch: 7"
MONITOR switches: TAPE
REC MODE switches: PB
TAPE SELECTOR switch: NORMAL

Procedure:

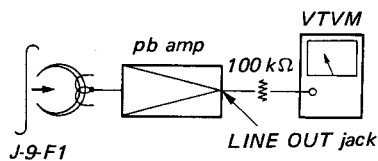
1. Play 2nd tone (400 Hz) on SONY alignment tape J-19-F2.
2. Adjust PB VOLUME control for 0 dB (0.77 V) VTVM reading.
3. Play 3rd tone (10 kHz) on the alignment tape.
4. Adjust the semi-fixed resistor for 0 dB (0.77 V) VTVM reading.

Adjusting Parts Location:



3. Playback Equalizer Adjustment (3¾ ips, 9.5 cm/s)

Setup:



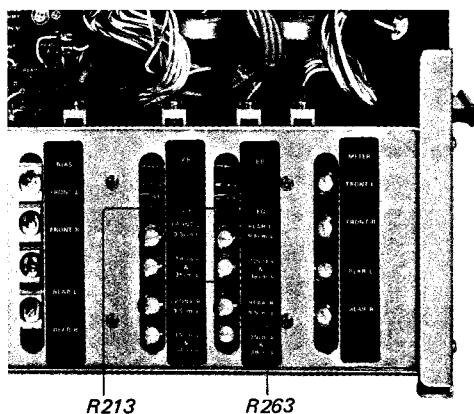
Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 3¾" (9.5 cm)
 REEL SIZE switch: 7"
 MONITOR switches: TAPE
 REC MODE switches: PB
 TAPE SELECTOR switch: NORMAL

Procedure:

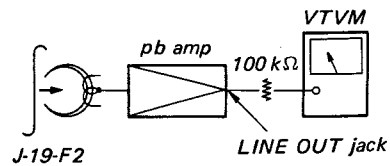
1. Play 3rd tone (400 Hz) on SONY alignment tape J-9-F1.
2. Adjust PB VOLUME control for 0 dB (0.77 V) VTVM reading.
3. Play 1st tone (5 kHz) on the alignment tape.
4. Adjust the semi-fixed resistor for 0 dB (0.77 V) VTVM reading.

Adjusting Parts Location:



4. Level Meter Calibration

Setup:



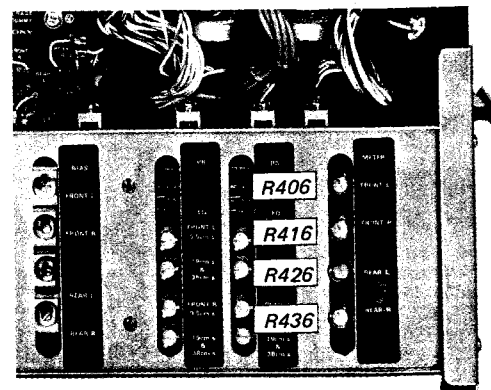
Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 7½" (19 cm)
 REEL SIZE switch: 7"
 MONITOR switches: TAPE
 REC MODE switches: PB
 TAPE SELECTOR switch: NORMAL

Procedure:

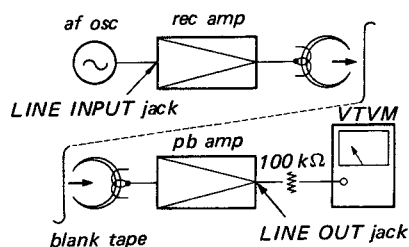
1. Play 1st tone (400 Hz) on SONY alignment tape J-19-F2.
2. Adjust PB VOLUME control for 0 dB (0.77 V) VTVM reading.
3. Adjust the semi-fixed resistor for 0 VU on the level meter.

Adjusting Parts Location:



5. Record Head Azimuth Adjustment

Setup:



Switch/Control Setting:

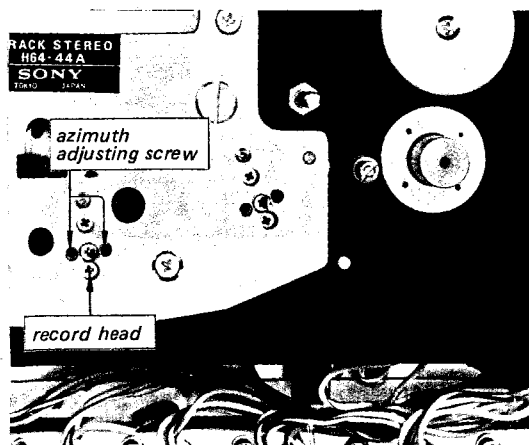
SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 3¾" (9.5 cm)
 REEL SIZE switch: 7"
 MONITOR switches: TAPE
 REC MODE switches: REC
 TAPE SELECTOR switch: NORMAL
 LINE REC VOLUME control: standard control-setting (Page 19)
 PB VOLUME control: proper position

Procedure:

1. Deliver 5 kHz signal of -20 dB (77 mV) to LINE INPUT jack.
2. Place the unit in record mode.
3. Adjust the adjusting screw for the biggest peak VTVM reading.

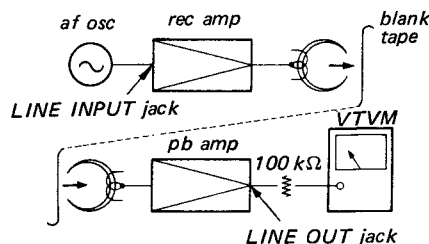
Note: If the biggest peak reading for all the channels cannot be obtained at the same screw position, take the mid between the both extreme positions of the screw.

Adjusting Parts Location:



6. Recording Bias Adjustment

Setup:



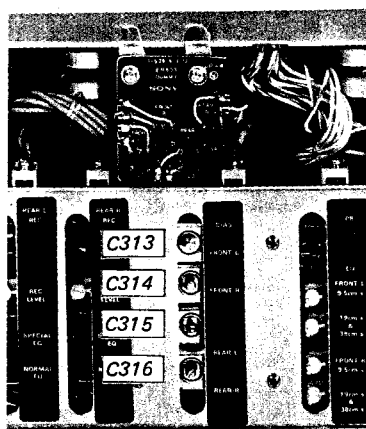
Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 15" (38 cm)
 REEL SIZE switch: 7"
 MONITOR switches: TAPE
 REC MODE switches: REC
 TAPE SELECTOR switch: NORMAL
 LINE REC VOLUME control: standard control-setting (Page 19)
 PB VOLUME control: proper position

Procedure:

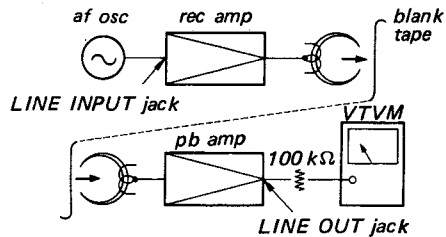
1. Deliver 1 kHz signal of -30 dB (24.5 mV) to LINE INPUT jack.
2. Place the unit in record mode.
3. Turn the trimmer capacitor counterclockwise three or four turns.
4. Slowly turn the trimmer capacitor clockwise for maximum VTVM reading.
5. Turn the trimmer capacitor clockwise for 0.5 dB below the maximum reading.

Adjusting Parts Location:



7. Erase Dummy Coil Adjustment

Setup:



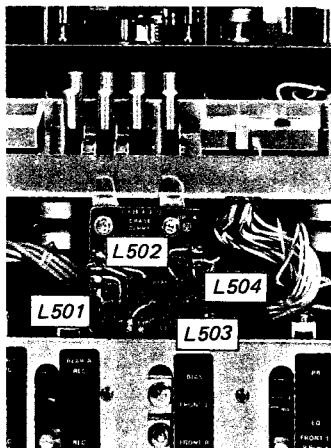
Switch/Control Setting:

- SPEED TUNING control: NORMAL (mechanical mid)
- AUTO STOP switch: any
- TAPE LIFT switch: ON
- TAPE SPEED switch: 7½" (19 cm)
- REEL SIZE switch: 7"
- MONITOR switches: TAPE
- REC MODE switches: REC
- TAPE SELECTOR switch: NORMAL
- LINE REC VOLUME control: standard control-setting (Page 19)
- PB VOLUME control: standard control-setting (Page 19)

Procedure:

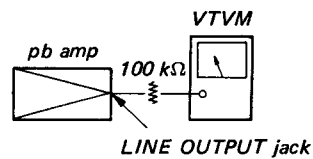
1. Deliver 10kHz signal of -30 dB (24.5 mV) to LINE INPUT jack.
2. Place the unit in record mode.
3. When setting a REC MODE switch to PB position, adjust the ERASE DUMMY coil for no change of the other channel LINE OUTPUT levels.

Adjusting Parts Location



8. Trap Coil Adjustment

Setup:



Switch/Control Setting:

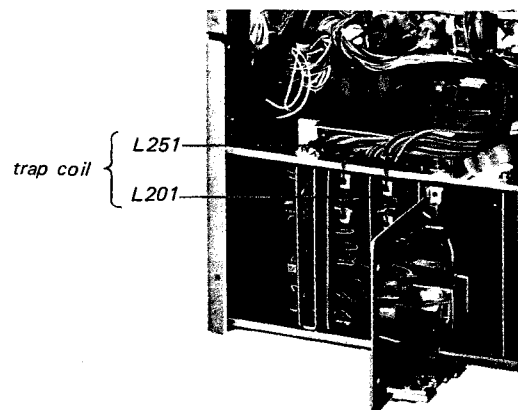
- TAPE LIFT switch: ON
- MONITOR switches: TAPE
- REC MODE switches: REC
- PB VOLUME control: standard control-setting (Page 19)

Procedure:

1. Place the unit in record mode without tape.
2. Adjust the trap coil for minimum VTVM reading.

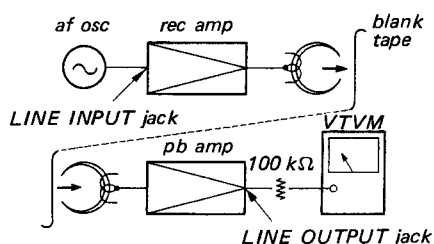
Note: The coil core can be adjusted by one turn only. Turn it no more than one turn.

Adjusting Parts Location:



9. Recording Level Adjustment

Setup:



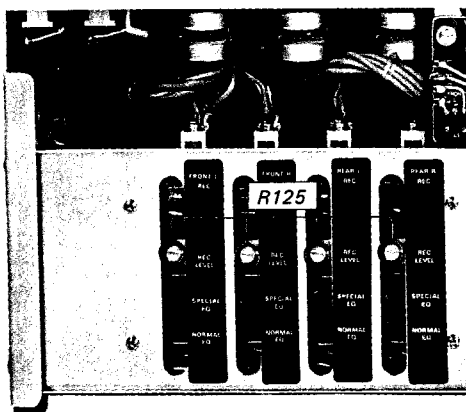
Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 7½" (19 cm)
 REEL SIZE switch: 7"
 MONITOR switches: SOURCE
 REC MODE switches: REC
 TAPE SELECTOR switch: NORMAL
 PB VOLUME control: standard control-setting (Page 19)

Procedure:

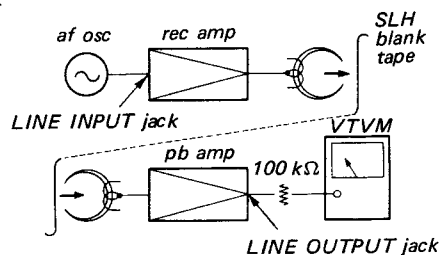
1. Deliver 1 kHz signal of -10 dB (0.25 V) to LINE INPUT jack.
2. Place the unit in record mode.
3. Adjust LINE REC VOLUME control for 0 dB (0.77 V) VTVM reading.
4. Set MONITOR switch to TAPE position.
5. Adjust the semi-fixed resistor for 0 dB (0.77 V) VTVM reading.

Adjusting Parts Location:



10. Record Equalizer (SPECIAL) Adjustment

Setup:



Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 7½" (19 cm)
 REEL SIZE switch: 7"
 MONITOR switches: TAPE
 REC MODE switches: REC
 TAPE SELECTOR switch: SPECIAL
 LINE REC VOLUME control: standard control-setting (Page 19)
 PB VOLUME control: standard control-setting (Page 19)

Procedure:

Note: Use SLH blank tape.

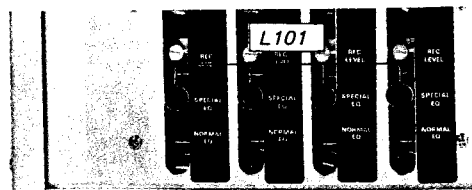
1. Deliver 1 kHz signal of -30 dB (24.5 mV) to LINE INPUT jack.
2. Place the unit in record mode.
3. Read the output level on VTVM.
4. Deliver 20 kHz signal of -30 dB (24.5 mV) to LINE INPUT jack.
5. Adjust SPECIAL EQ coil for 0.5 dB below the level in Step 3.

Note: 1. No adjustment is required for the other tape speeds.

2. Frequency response should be as follows:

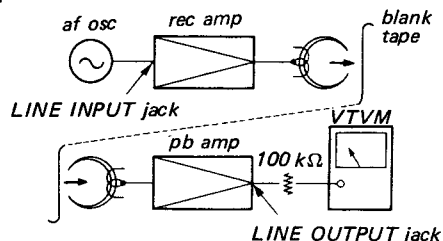
15 ips (38 cm/s): 30 to 25,000 Hz ±3 dB
 7½ ips (19 cm/s): 30 to 20,000 Hz ±3 dB
 3¾ ips (9.5 cm/s): 40 to 12,000 Hz ±3 dB

Adjusting Parts Location:



11. Record Equalizer (NORMAL) Adjustment

Setup:



Switch/Control Setting:

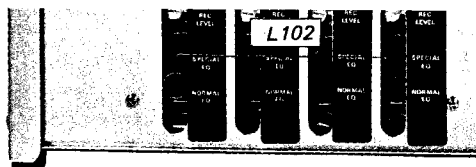
SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 3¾" (9.5 cm)
 REEL SIZE switch: 7"
 MONITOR switches: TAPE
 REC MODE switches: REC
 TAPE SELECTOR switch: NORMAL
 LINE REC VOLUME control: standard control-setting (Page 19)
 PB VOLUME control: standard control-setting (Page 19)

Procedure:

1. Deliver 1 kHz signal of -30 dB (24.5 mV) to LINE INPUT jack.
2. Place the unit in record mode.
3. Read the output level on VTVM.
4. Deliver 10 kHz signal of -30 dB (24.5 mV) to LINE INPUT jack.
5. Adjust NORMAL EQ coil for the same level as the level in Step 3.

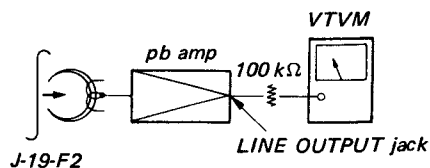
Note: 1. No adjustment is required for the other tape speeds.
 2. Frequency response should be as follows:
 15 ips (38 cm/s): 30 to 20,000Hz ± 3 dB
 7½ ips (19 cm/s): 30 to 15,000Hz ± 3 dB
 3¾ ips (9.5 cm/s): 40 to 10,000Hz ± 3 dB
 3. If the frequency response at 15 ips (38 cm/s) tape speed is not satisfied, perform the Record Equalizer (SPECIAL) Adjustment on Page 24.

Adjusting Parts Location:



12. Playback Signal-to-Noise Ratio Measurement

Setup:



Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 7½" (19 cm)
 REEL SIZE switch: 7"
 MONITOR switches: TAPE
 REC MODE switches: PB
 TAPE SELECTOR switch: NORMAL

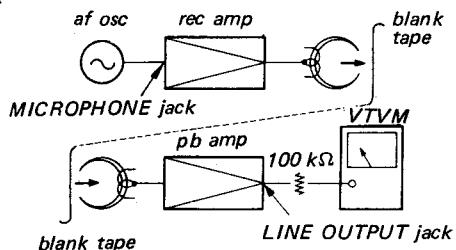
Procedure:

1. Play 1st tone (400 Hz) on SONY alignment tape J-19-F2.
2. Adjust PB VOLUME control for 0 dB (0.77 V) VTVM reading.
3. Remove the tape and place the unit in playback mode.
4. Measure the output level on VTVM.

Specification: less than -51 dB (2.2 mV)

13. Overall Signal-to-Noise Ratio Measurement

Setup:



Switch/Control Setting:

SPEED TUNING control:	NORMAL (mechanical mid)
AUTO STOP switch:	any
TAPE LIFT switch:	ON
TAPE SPEED switch:	7½" (19 cm)
REEL SIZE switch:	7"
MONITOR switches:	TAPE
REC MODE switches:	REC
TAPE SELECTOR switch:	NORMAL
MIC REC VOLUME control:	standard control-setting (Page 19)
PB VOLUME control:	standard control-setting (Page 19)

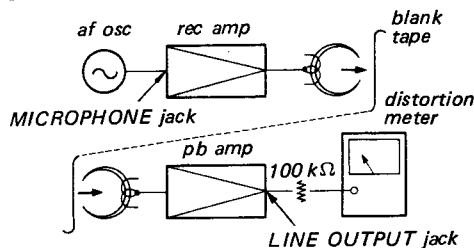
Procedure:

1. Deliver 1 kHz signal of -60 dB (0.77 mV) to MICROPHONE jack.
2. Place the unit in record mode.
3. After about one minute, remove the input connection and terminate MICROPHONE jack with 600Ω resistor. Continue recording.
4. Play back the 1 kHz signal recorded portion and no-signal recorded portion, and measure output level difference between the two portions.

Specification: greater than 47 dB

14. Overall Distortion Measurement

Setup:



Switch/Control Setting:

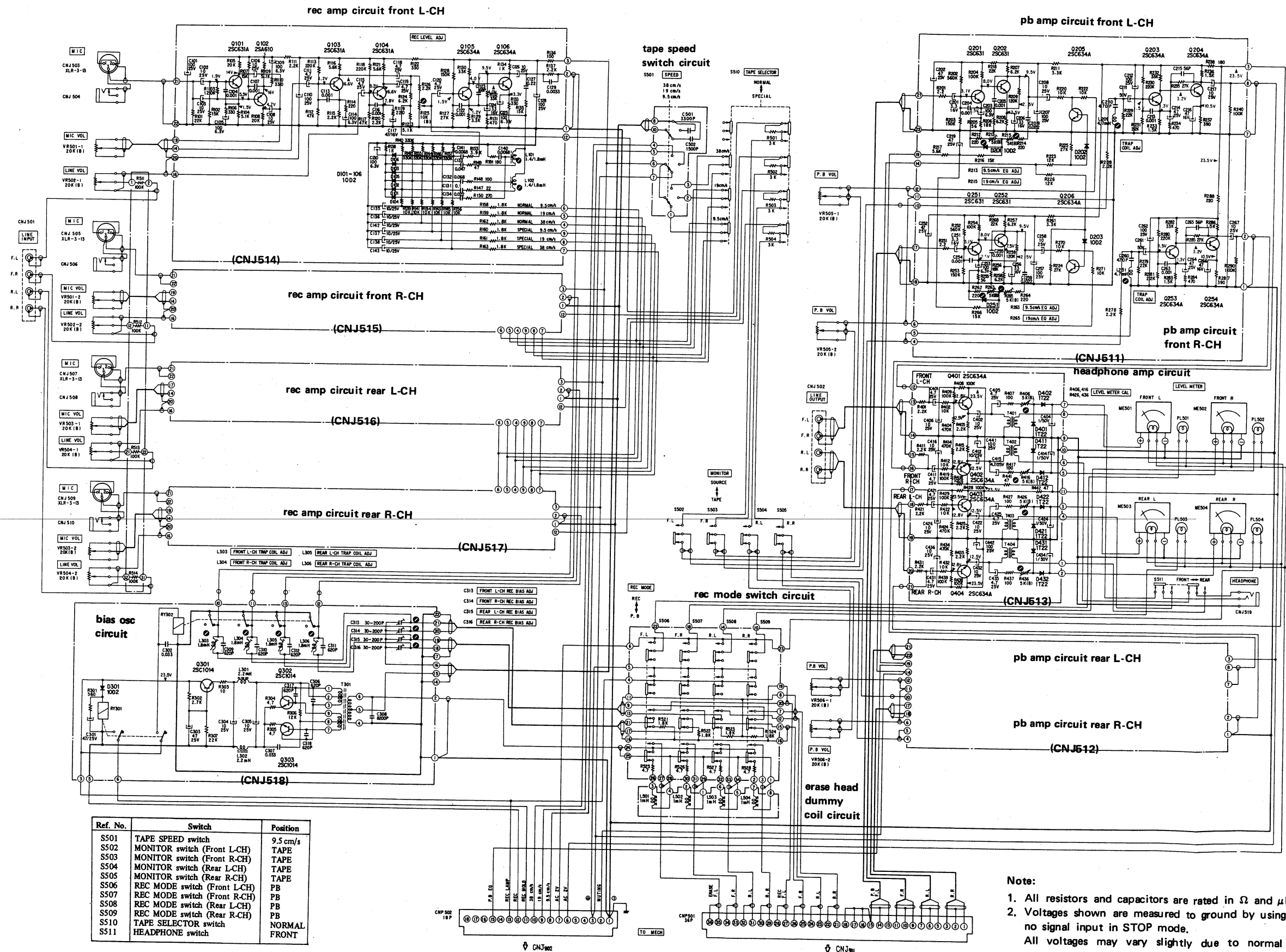
SPEED TUNING control:	NORMAL (mechanical mid)
AUTO STOP switch:	any
TAPE LIFT switch:	ON
TAPE SPEED switch:	7½" (19 cm)
REEL SIZE switch:	7"
MONITOR switches:	TAPE
REC MODE switches:	REC
TAPE SELECTOR switch:	NORMAL
MIC REC VOLUME control:	standard control-setting (Page 19)
PB VOLUME control:	standard control-setting (Page 19)

Procedure:

1. Deliver 1 kHz signal of -60 dB (0.77 mV) to MICROPHONE jack.
2. Place the unit in record mode.
3. Rewind the recorded portion.
4. Play back the signal and measure distortion.

Specification: less than 1.5%

4-2. SCHEMATIC DIAGRAM (AMPLIFIER)



Note:

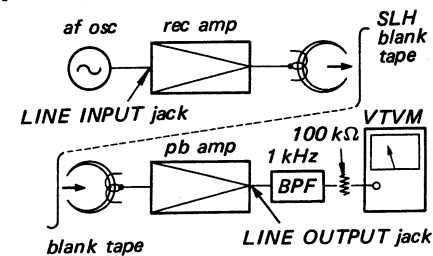
1. All resistors and capacitors are rated in Ω and μF , unless otherwise specified.
2. Voltages shown are measured to ground by using a voltmeter (20k Ω /V) with no signal input in STOP mode.

All voltages may vary slightly due to normal component tolerances, etc.

SECTION 4 DIAGRAMS

15. Erase Ratio Measurement

Setup:



Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 7½" (19 cm)
 REEL SIZE switch: 7"
 MONITOR switches: TAPE
 REC MODE switches: REC
 TAPE SELECTOR switch: SPECIAL
 LINE REC VOLUME control: standard control-setting (Page 19)
 PB VOLUME control: standard control-setting (Page 19)

Procedure:

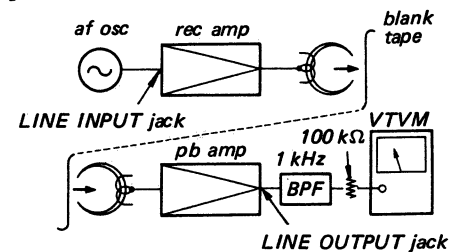
Note: Use SLH blank tape.

1. Deliver 1 kHz signal of +4 dB (1.2V) to LINE INPUT jack.
2. Place the unit in record mode.
3. Rewind a half of the recorded portion.
4. Remove the input connection and turn LINE REC VOLUME control and MIC REC VOLUME control to fully counterclockwise position.
5. Place the unit in record mode. (erase mode)
6. Rewind the tape up to the recording start position.
7. Play back the signal recorded portion and the erased portion, and measure the difference between the two portions.

Specification: greater than 65 dB

16. Cross-Talk Measurement

Setup:



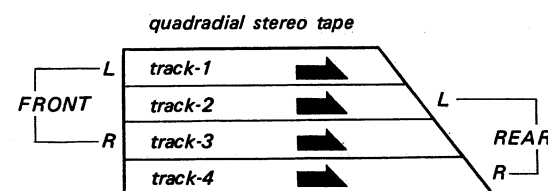
Switch/Control Setting:

SPEED TUNING control: NORMAL (mechanical mid)
 AUTO STOP switch: any
 TAPE LIFT switch: ON
 TAPE SPEED switch: 7½" (19 cm)
 REEL SIZE switch: 7"
 MONITOR switches: TAPE
 REC MODE switches: REC
 TAPE SELECTOR switch: NORMAL
 LINE REC VOLUME control: standard control-setting (Page 19)
 MIC REC VOLUME control: fully counterclockwise position
 PB VOLUME control: standard control-setting (Page 19)

Procedure:

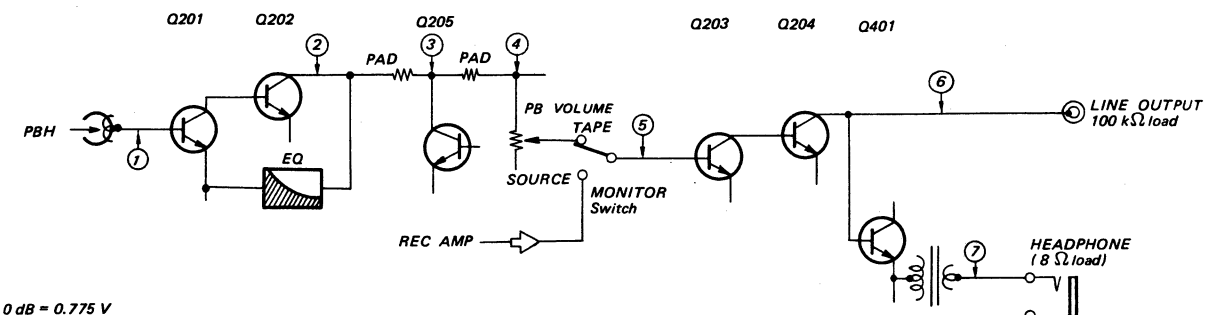
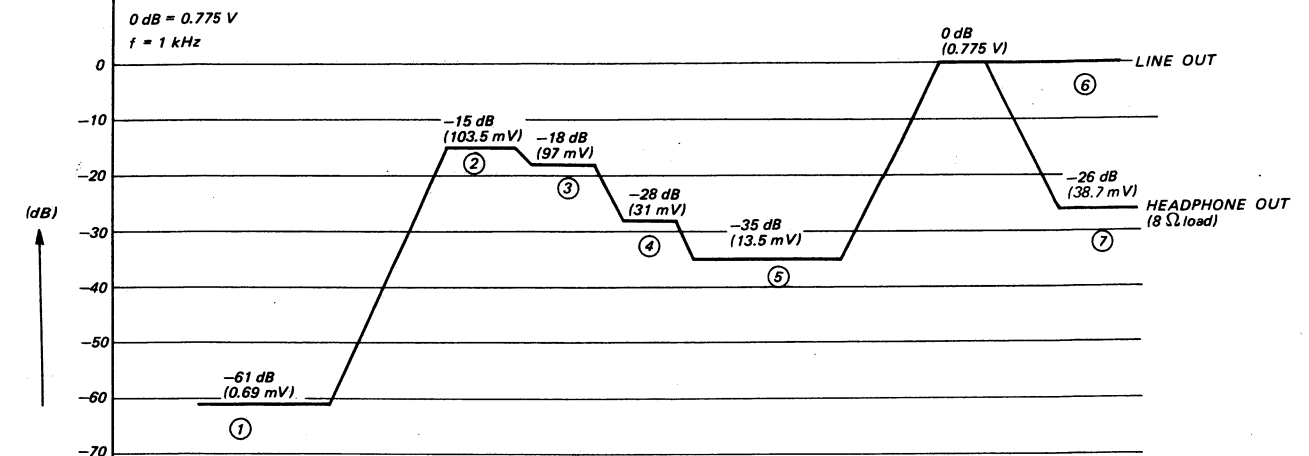
1. Deliver 1 kHz signal of +4 dB (1.2V) to LINE INPUT jacks of both FRONT-L and REAR-R channels.
2. Place the unit in record mode.
3. Rewind and play back the recorded portion.
4. Measure output level differences between FRONT-L and REAR-L channels, and between REAR-R and FRONT-R channels.
5. Record the signal to REAR-L and FRONT-R channels, and repeat Step 4.

Specification: greater than 50 dB

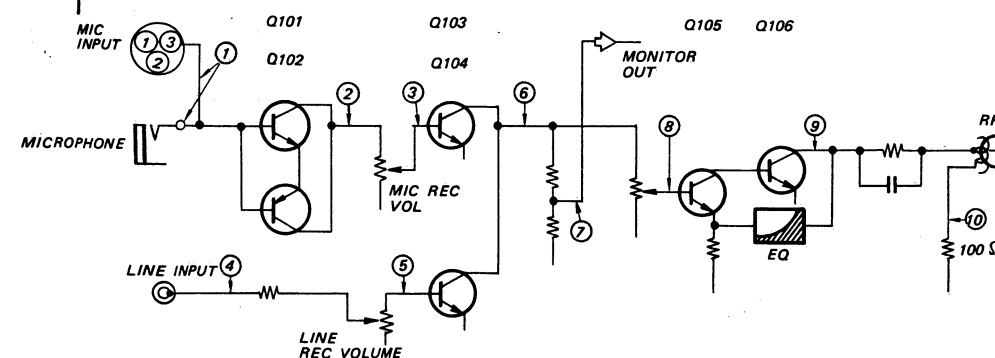
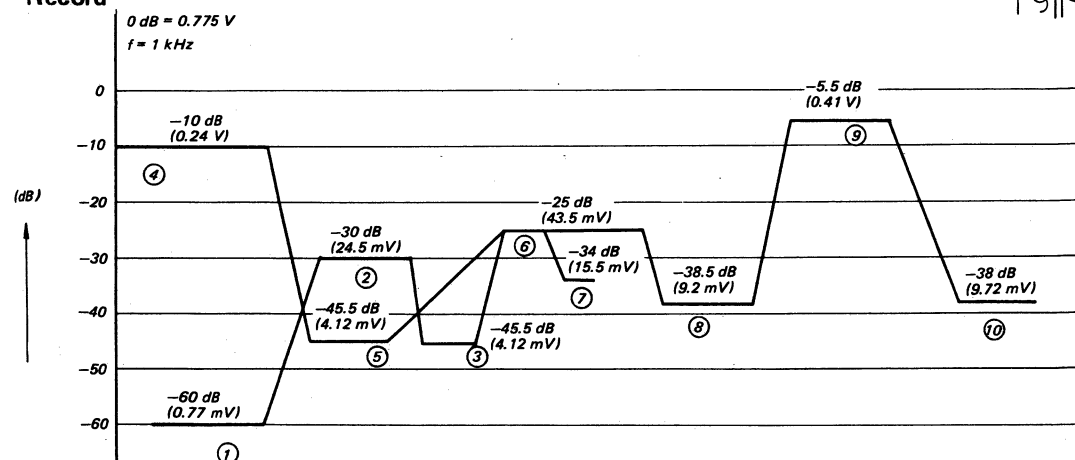


4-1. LEVEL DIAGRAMS

Playback

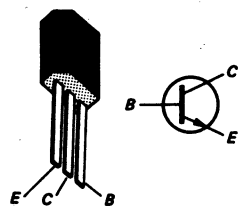
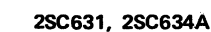
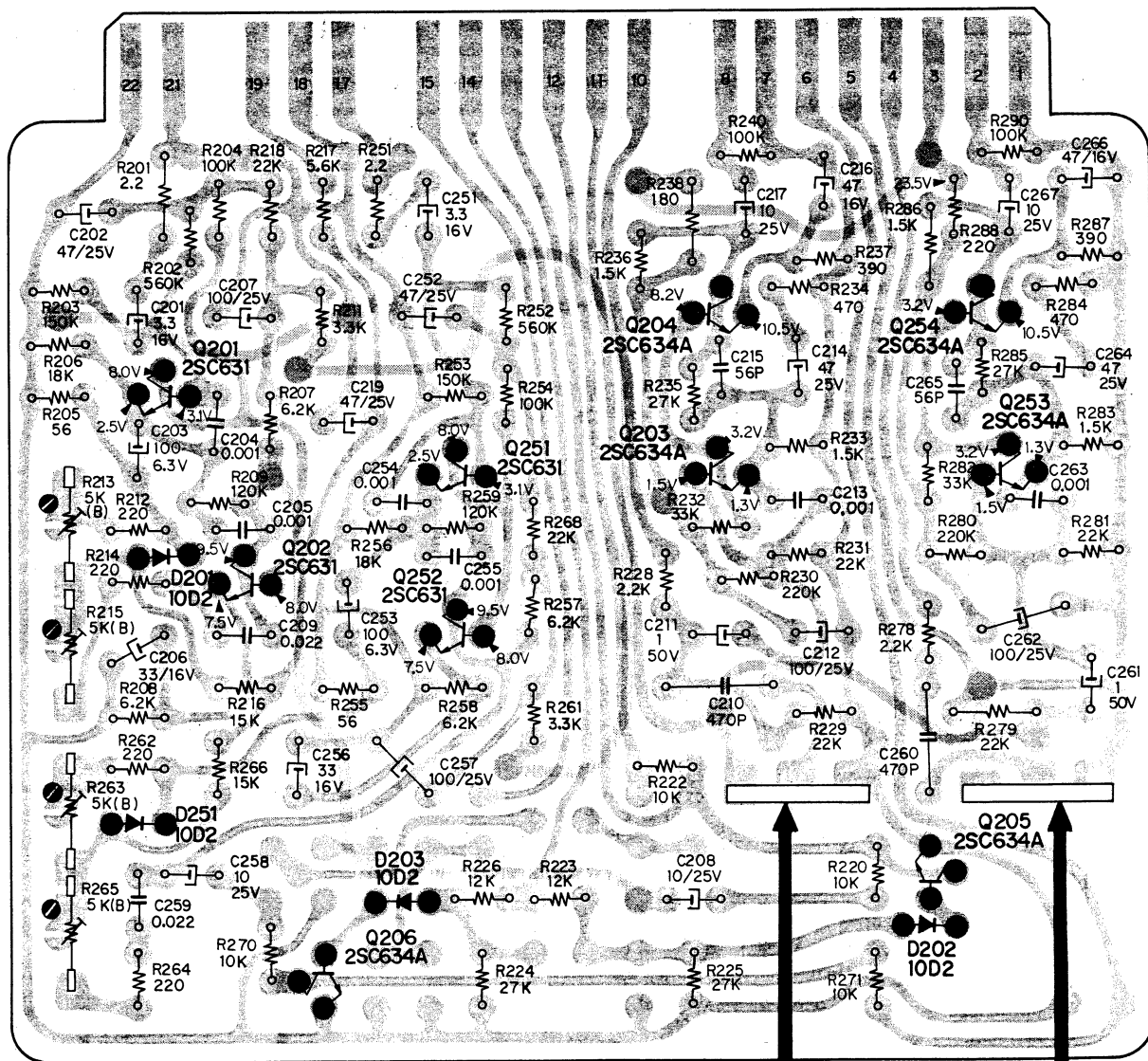
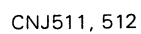


Record

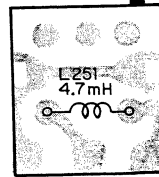
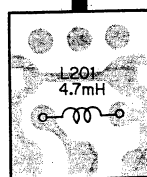
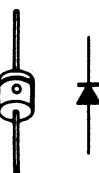


4-3. MOUNTING DIAGRAM (PB AMP)

— *Conductor Side* —

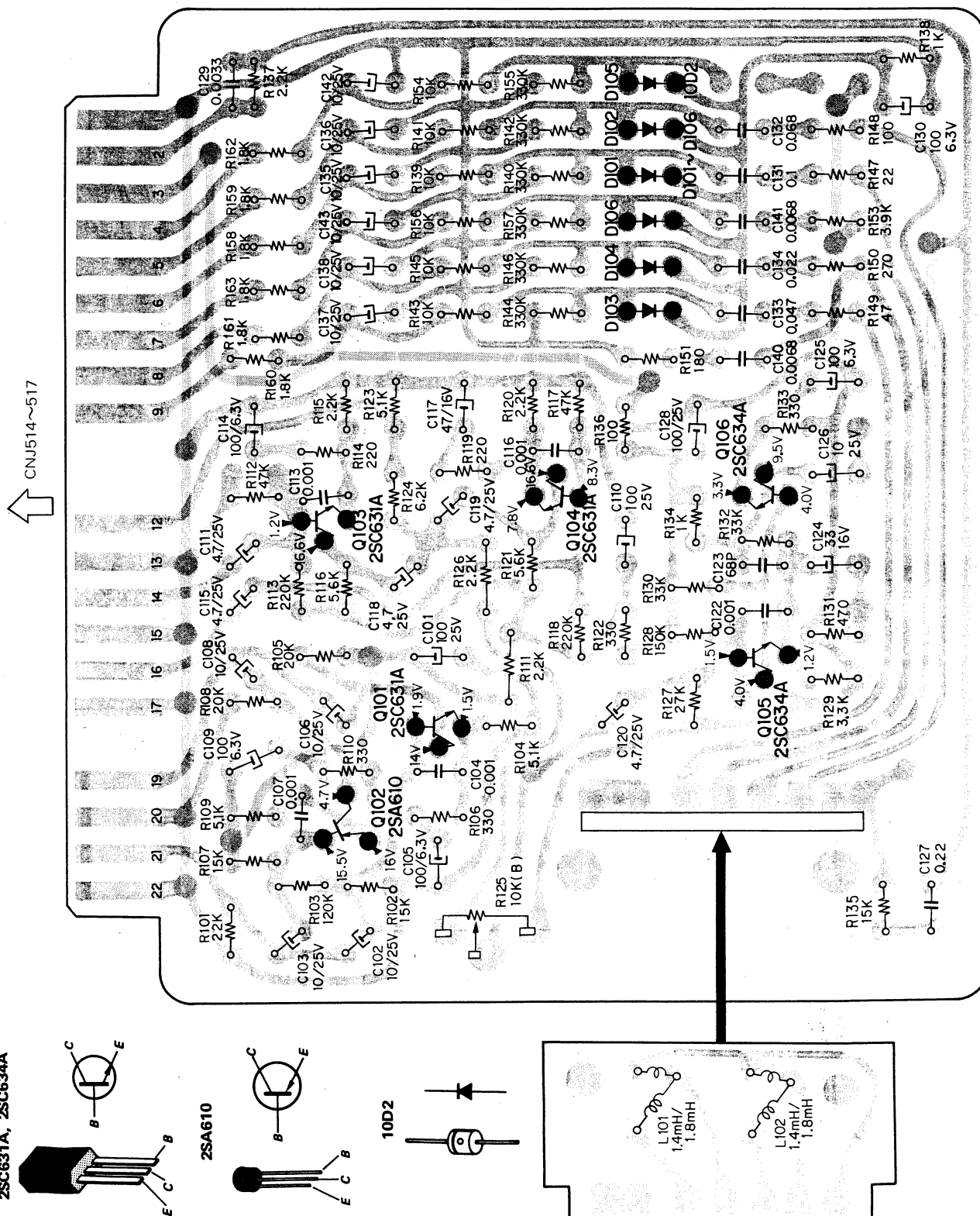


10D2



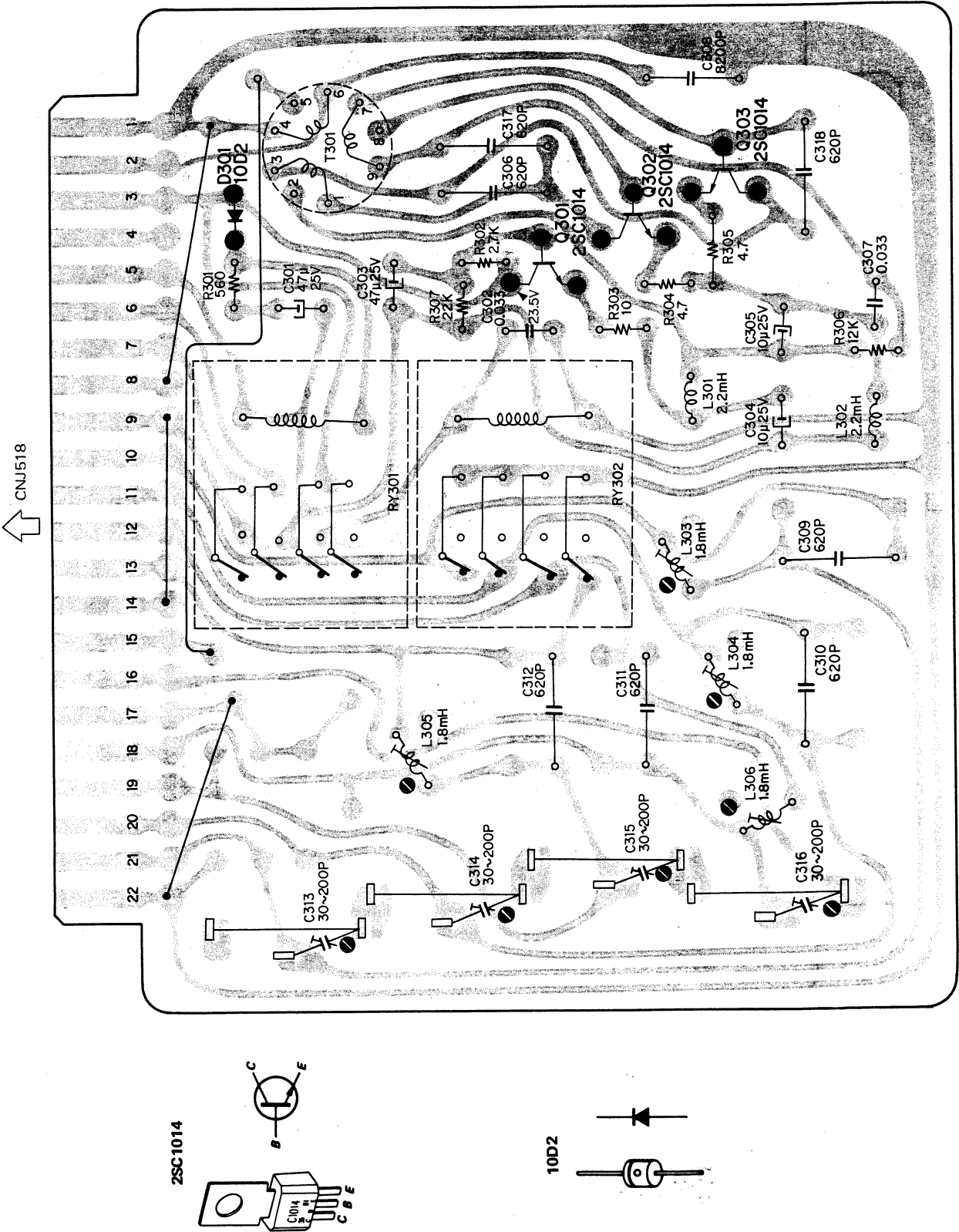
4-4. MOUNTING DIAGRAM (REC AMP)

— Conductor Side —



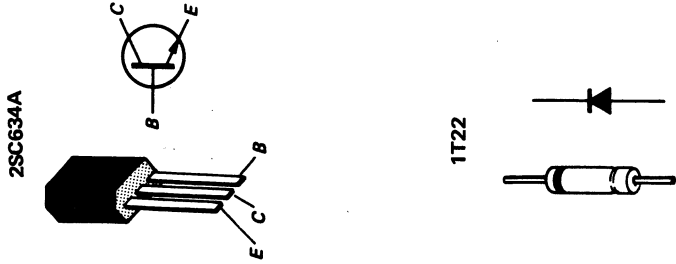
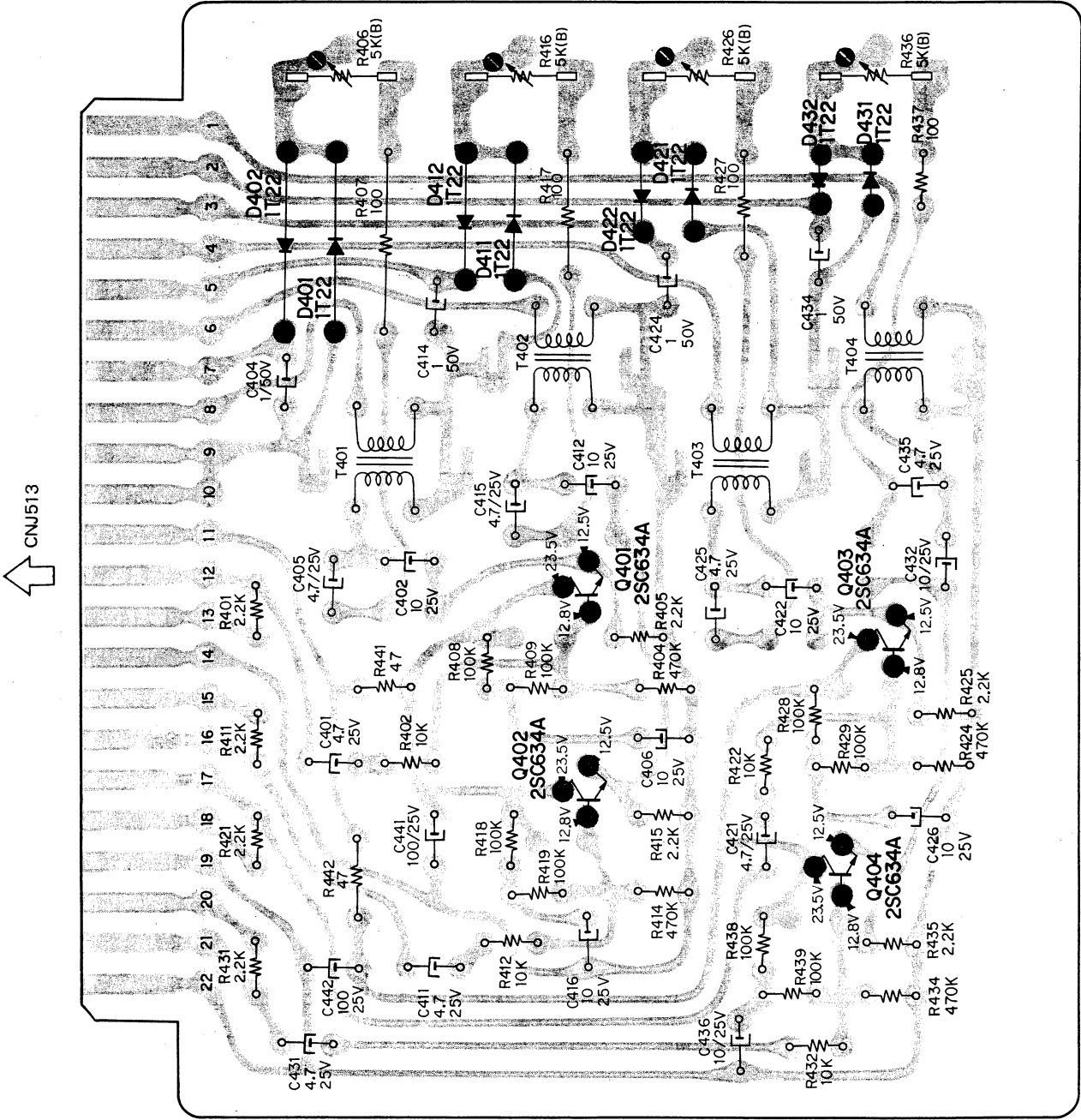
4.5. MOUNTING DIAGRAM (BIAS OSC)

- Conductor Side -



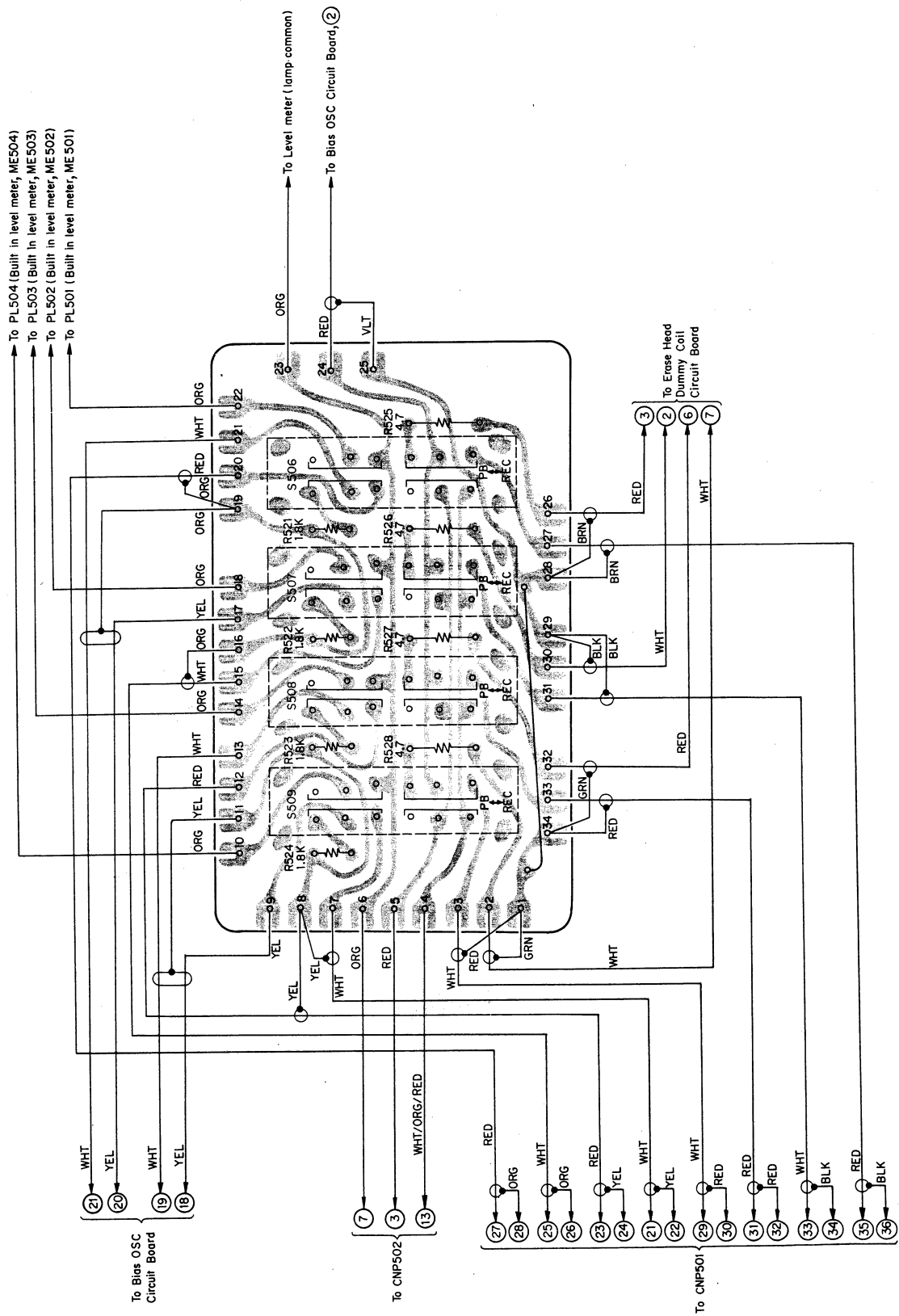
4-6. MOUNTING DIAGRAM (HEADPHONE AMP)

- Conductor Side -



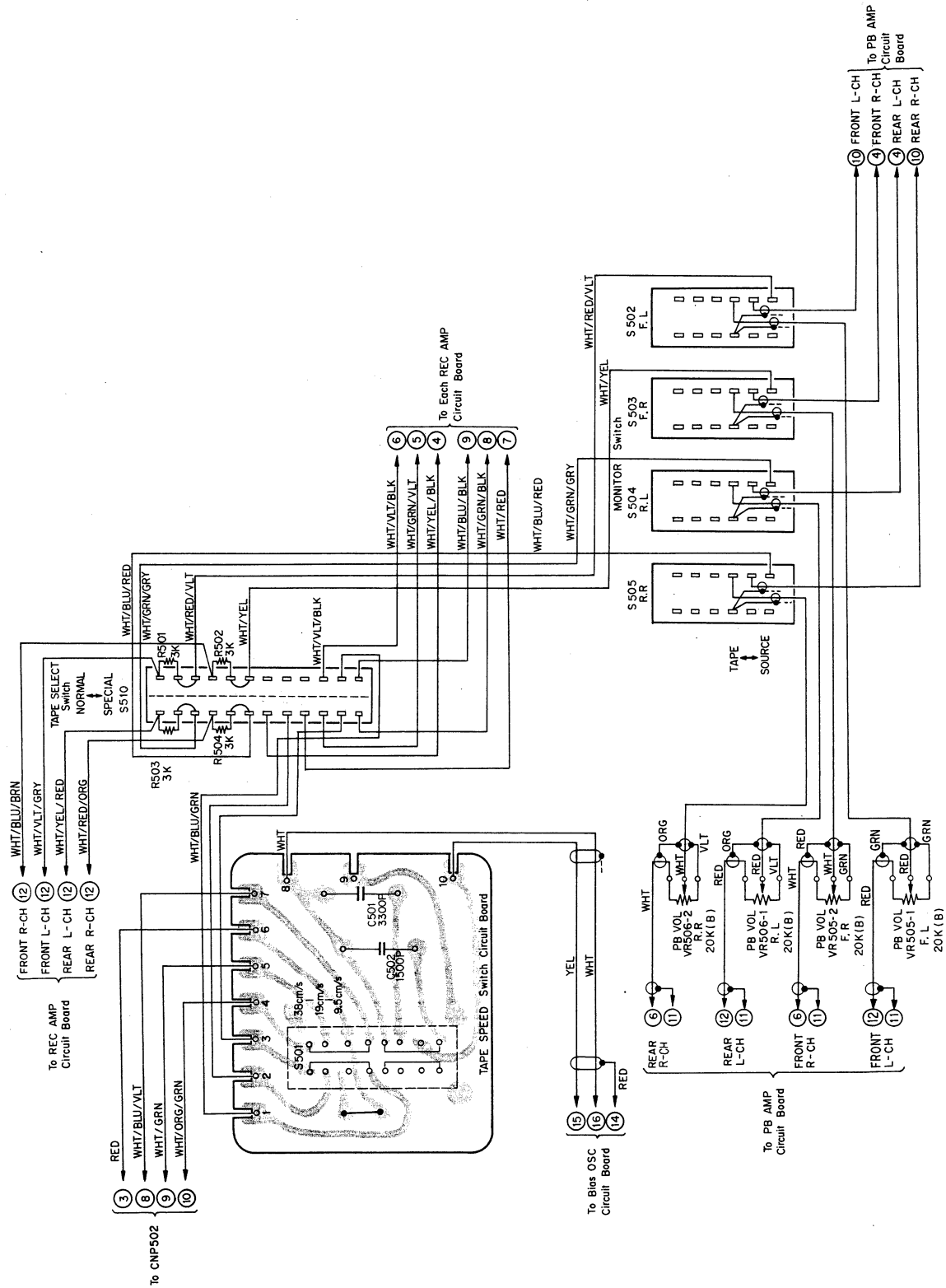
4-7. MOUNTING DIAGRAM (REC MODE SWITCH)

— Conductor Side —

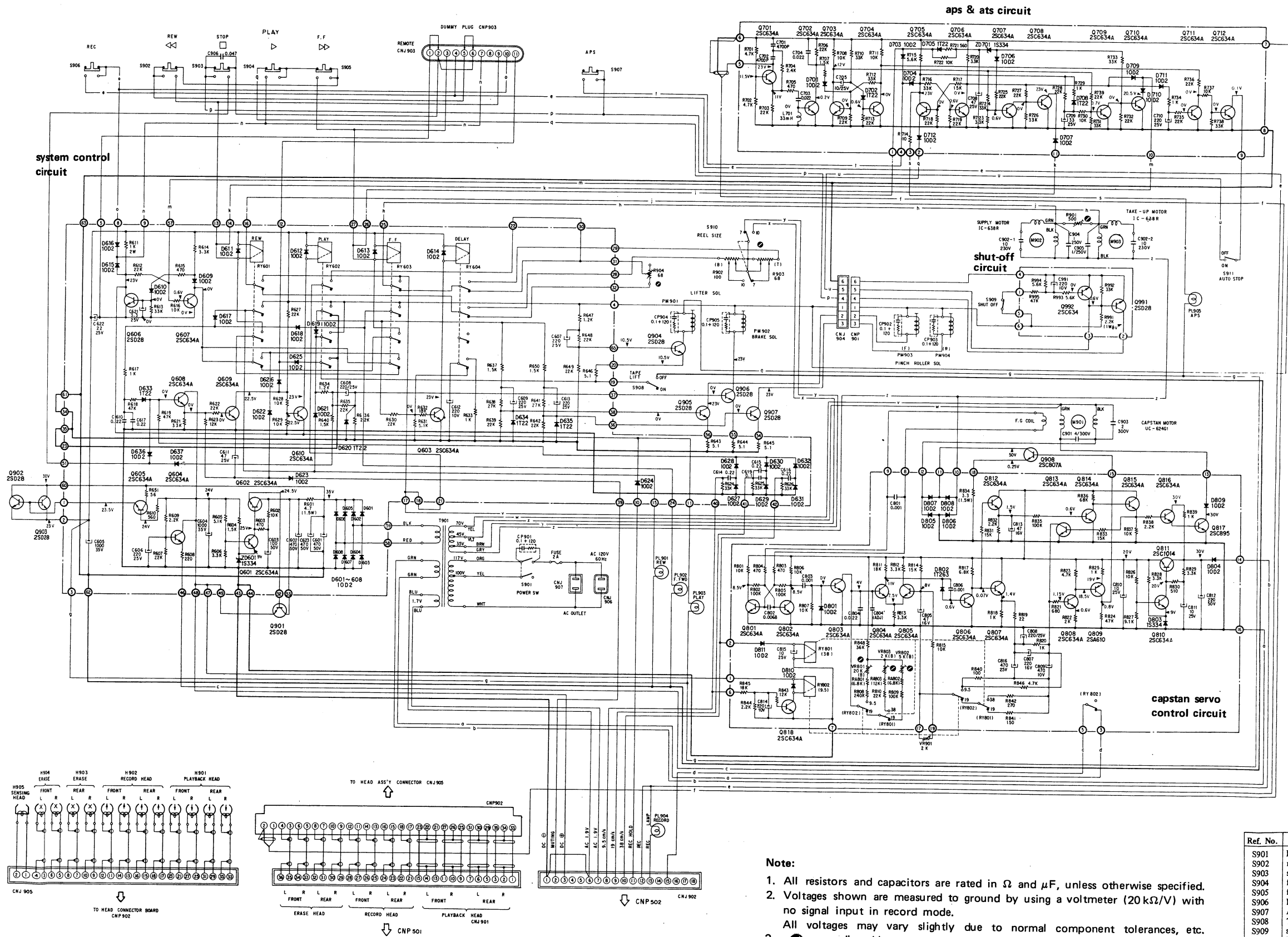


4-8. MOUNTING DIAGRAM (TAPE SPEED SWITCH)

— Conductor Side —



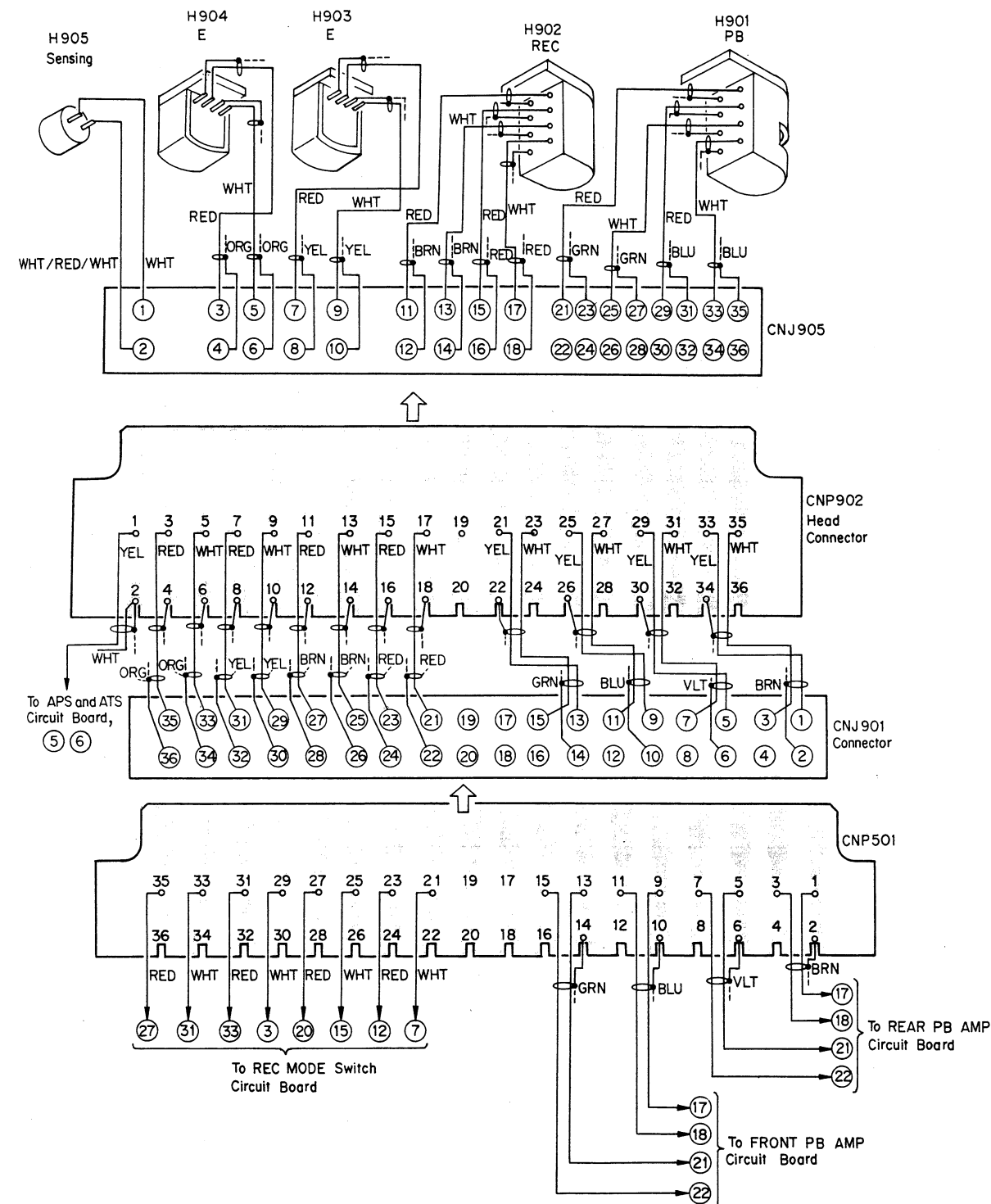
4-12. SCHEMATIC DIAGRAM (MECHANICAL CHASSIS)



Ref. No.	Switch	Position
S901	POWER switch	OFF
S902	rewind function switch	not push
S903	stop function switch	not push
S904	forward function switch	not push
S905	fast forward function switch	not push
S906	RECORD function switch	not push
S907	APS function switch	not push
S908	TAPE LIFT switch	ON
S909	shut-off switch	ON
S910	REEL SIZE switch	7
S911	AUTO STOP	OFF

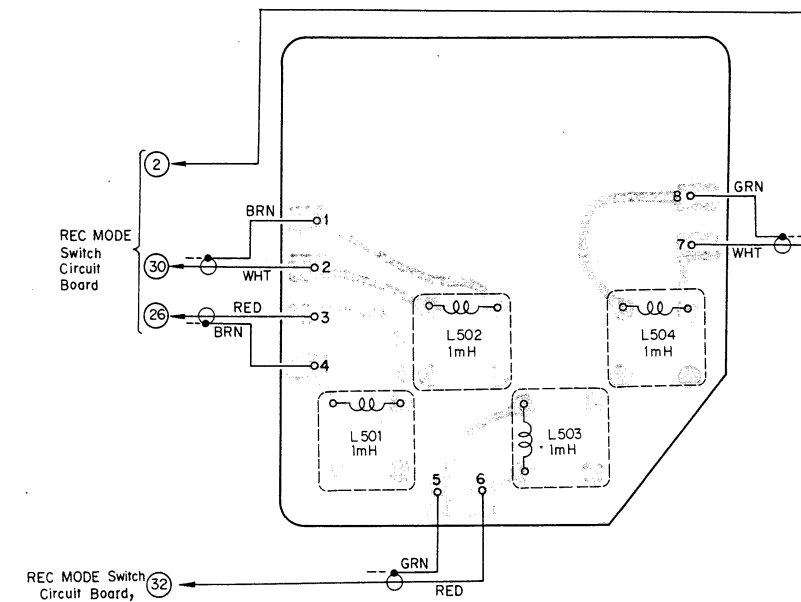
4-9. MOUNTING DIAGRAM (HEAD CONNECTOR)

— Conductor Side —



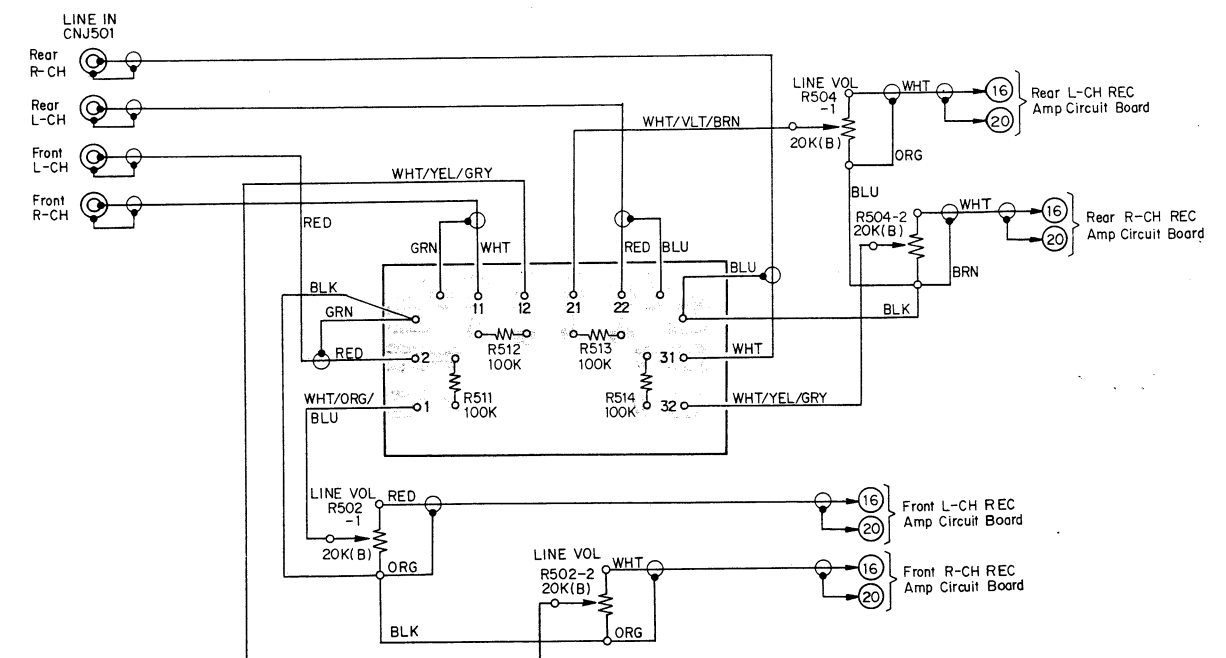
4-10. MOUNTING DIAGRAM (ERASE HEAD DUMMY COIL)

— Conductor Side —



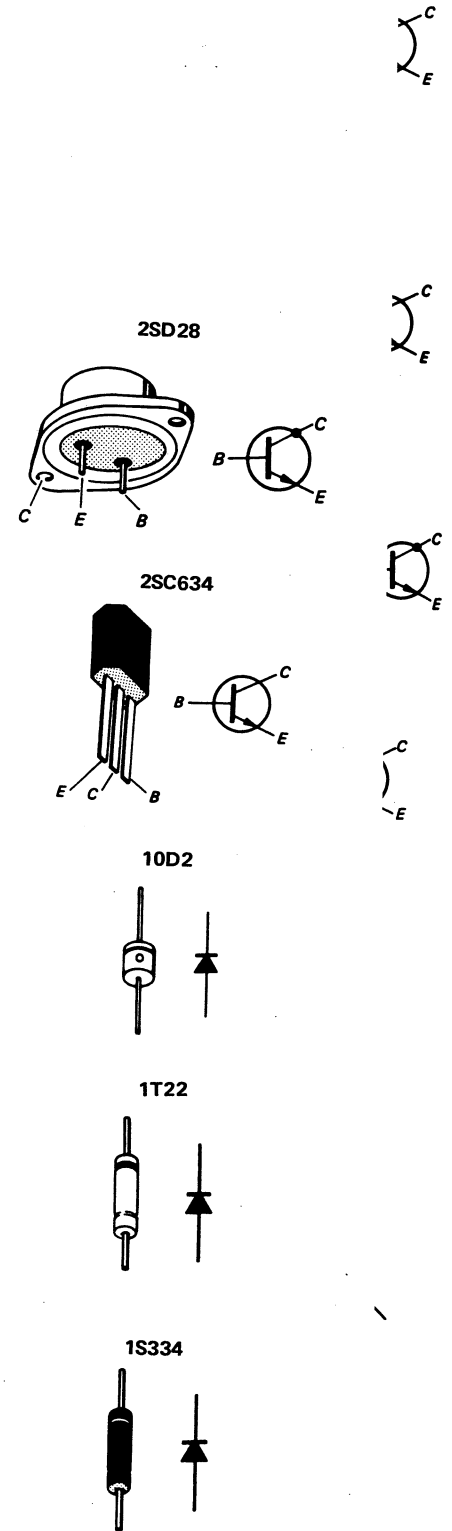
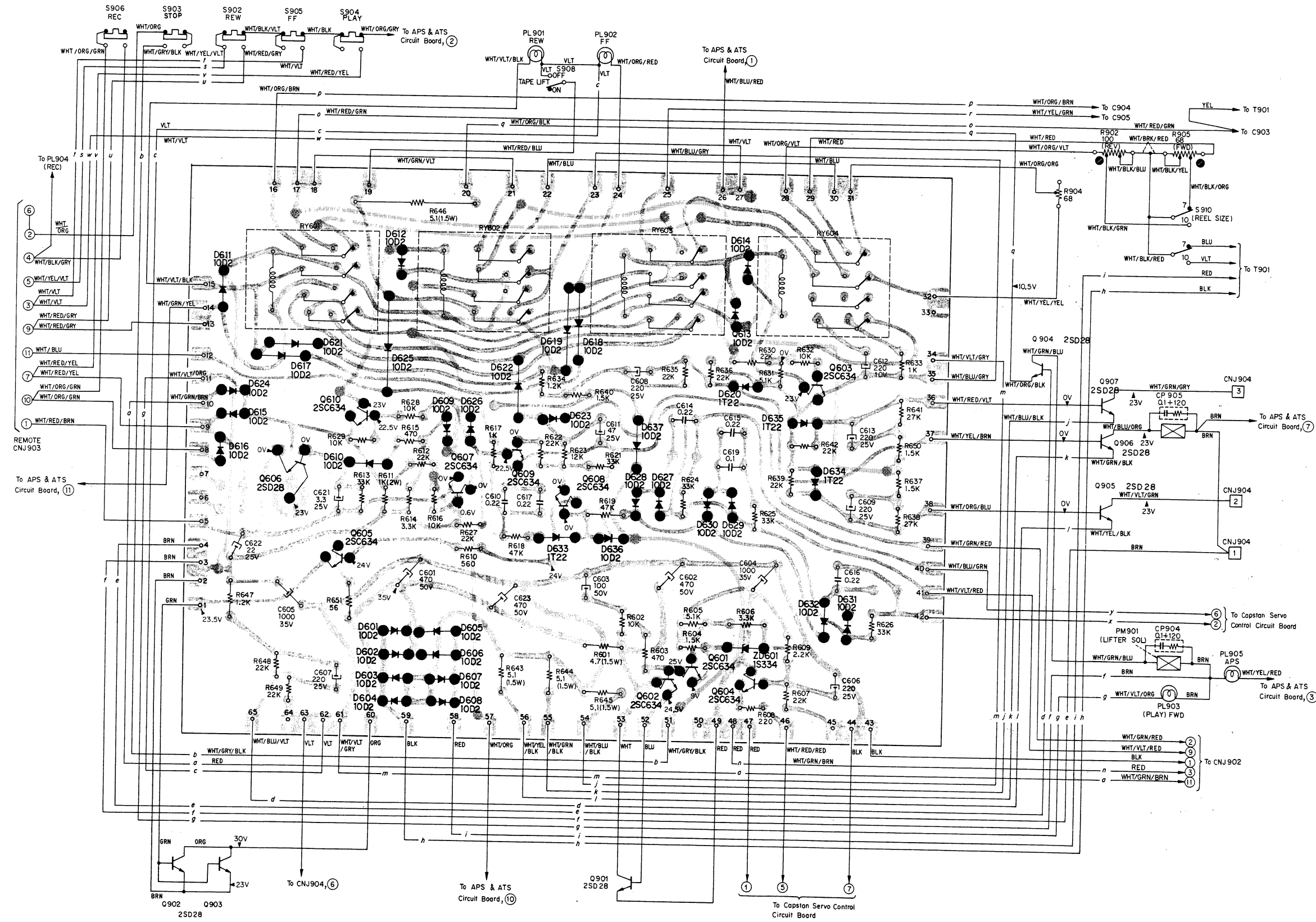
4-11. MOUNTING DIAGRAM (RESISTOR TERMINAL)

— Conductor Side —

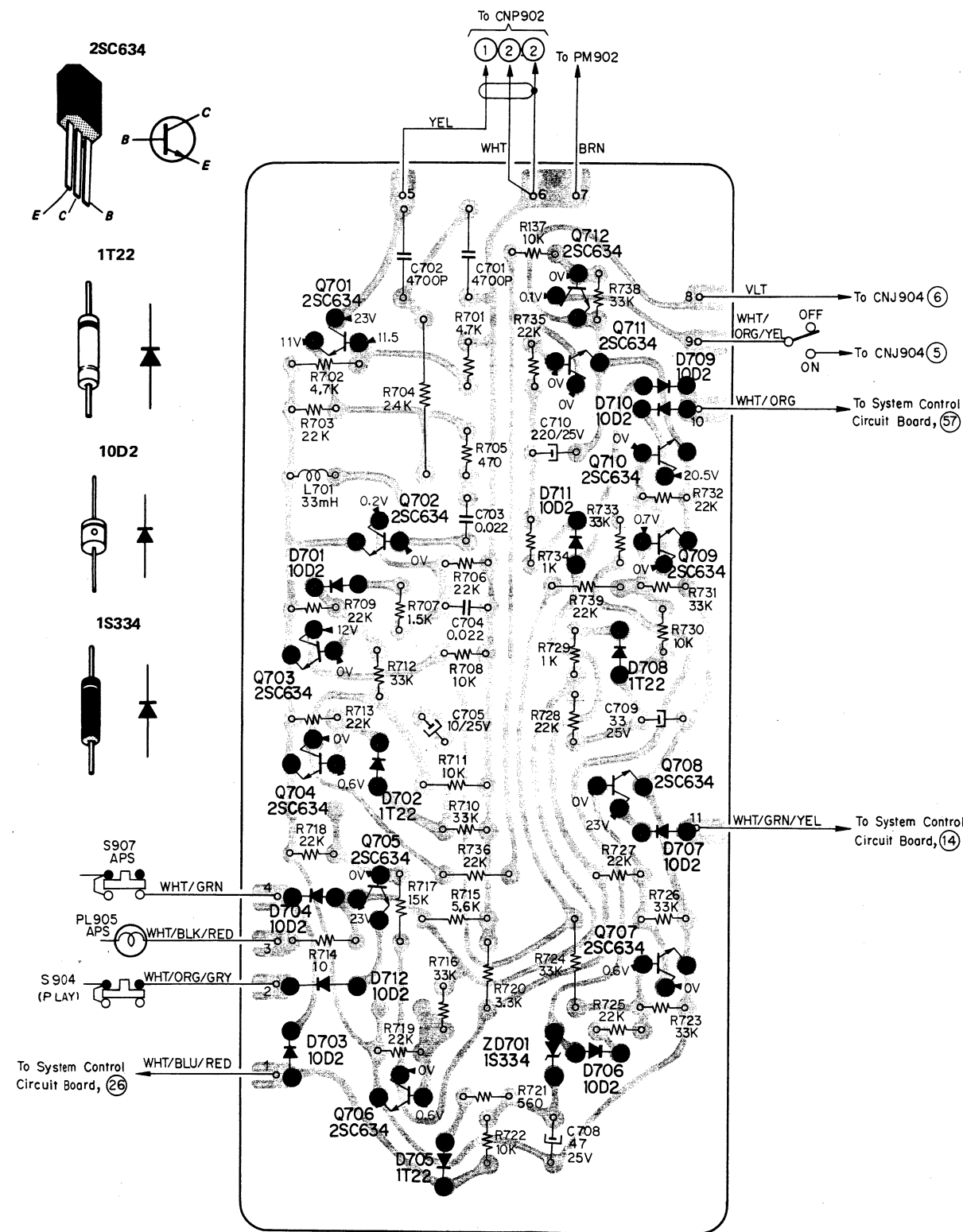


4-13. MOUNTING DIAGRAM (SYSTEM CONTROL)

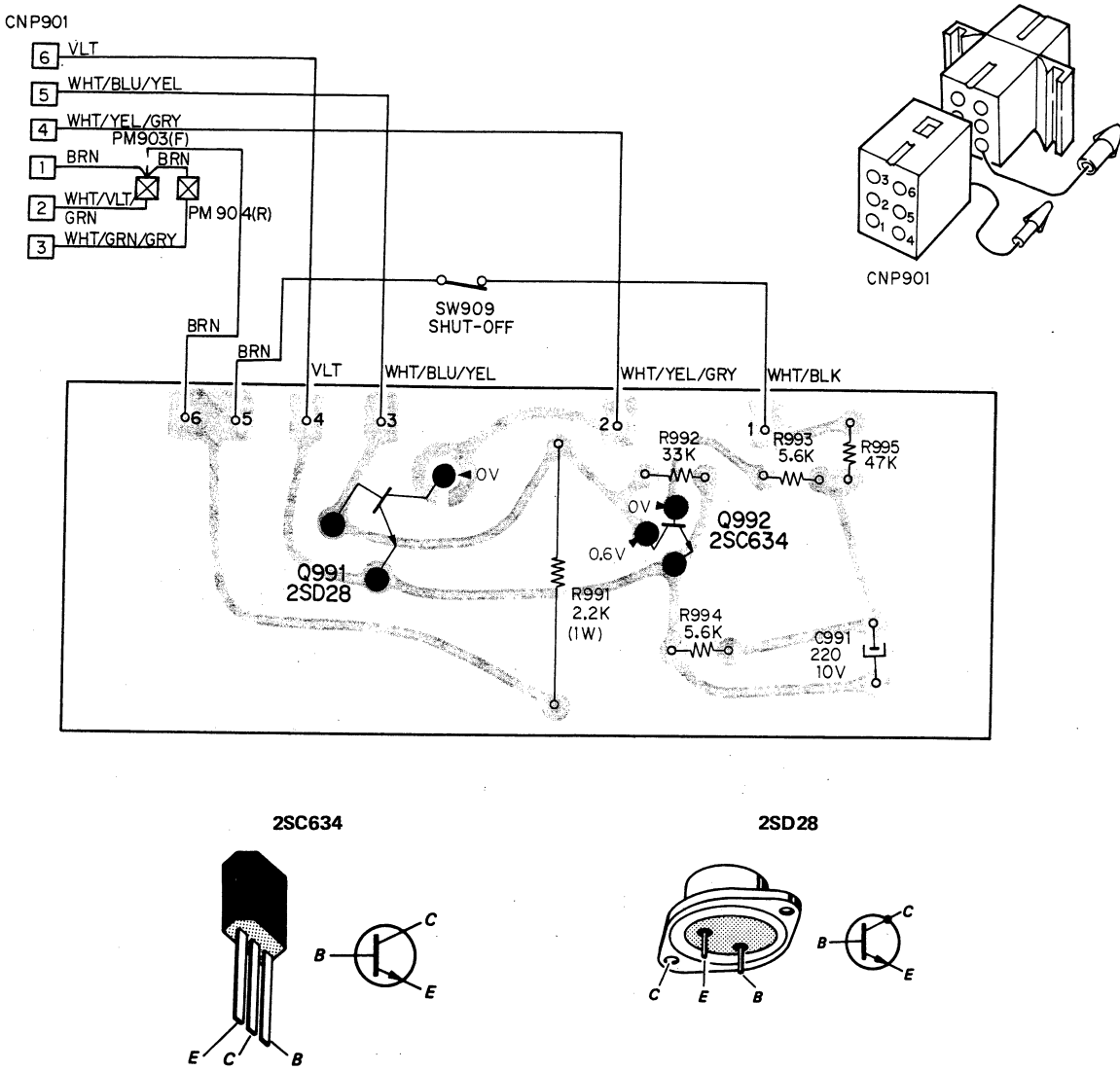
– Conductor Side –



4-14. MOUNTING DIAGRAM (APS & ATS)
— Conductor Side —



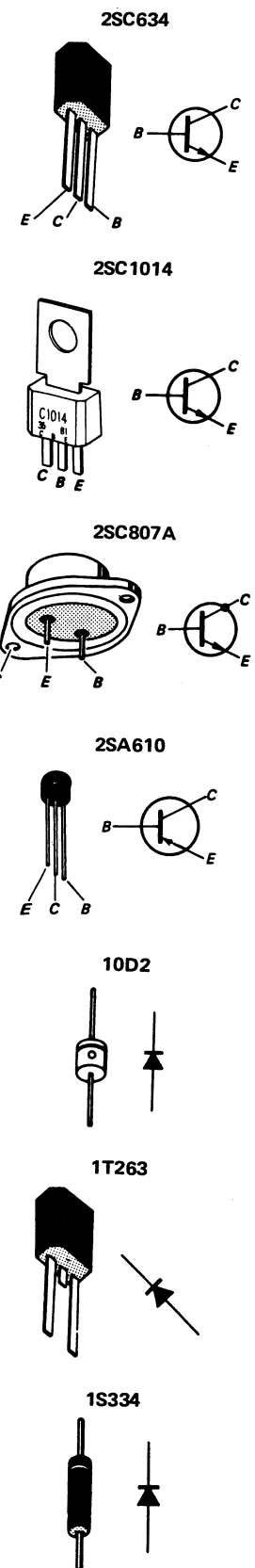
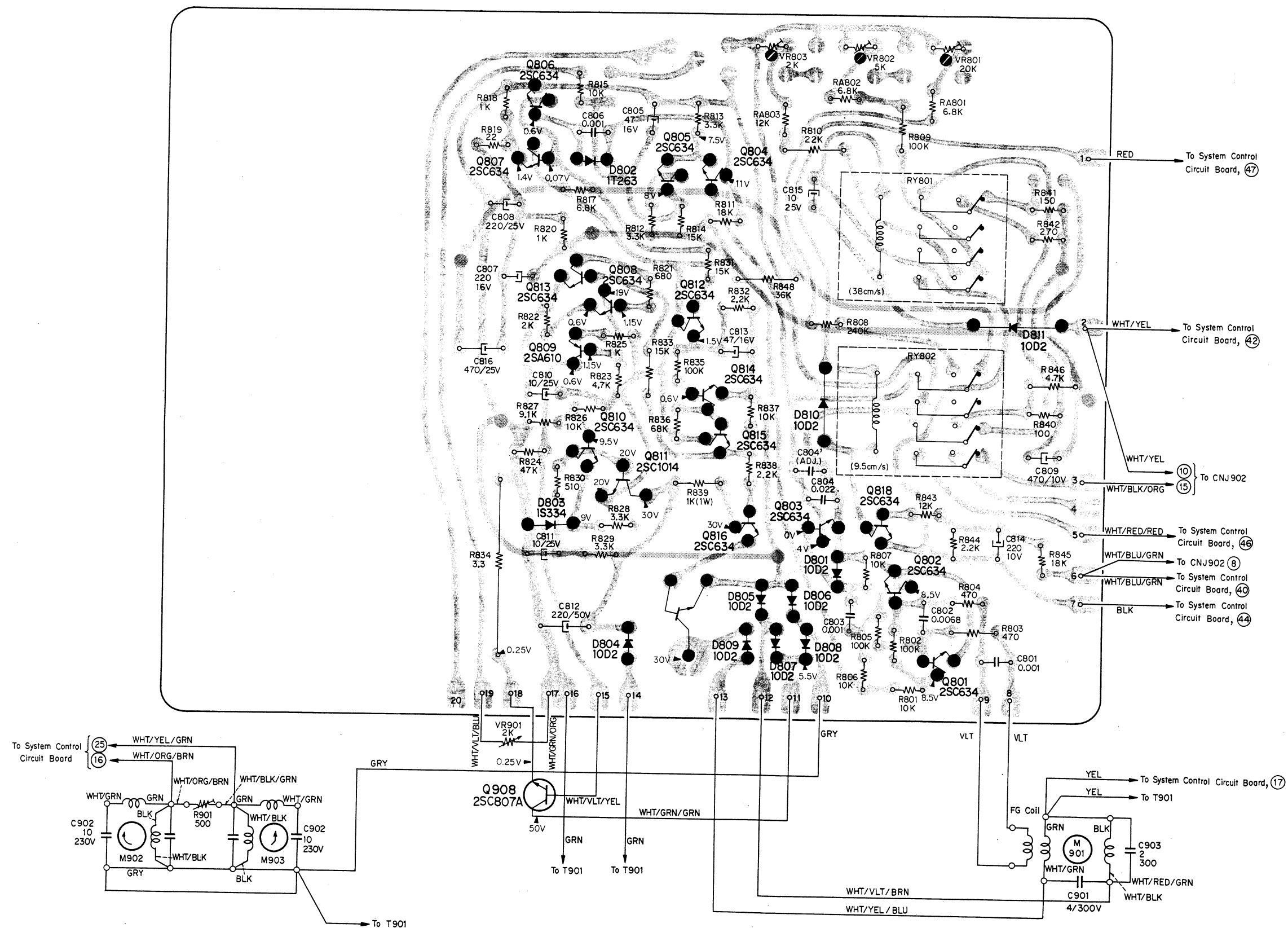
4-15. MOUNTING DIAGRAM (SHUT-OFF)
— Conductor Side —

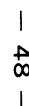


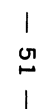
TC-854-4 TC-854-4

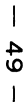
4-16. MOUNTING DIAGRAM (CAPSTAN SERVO CONTROL)

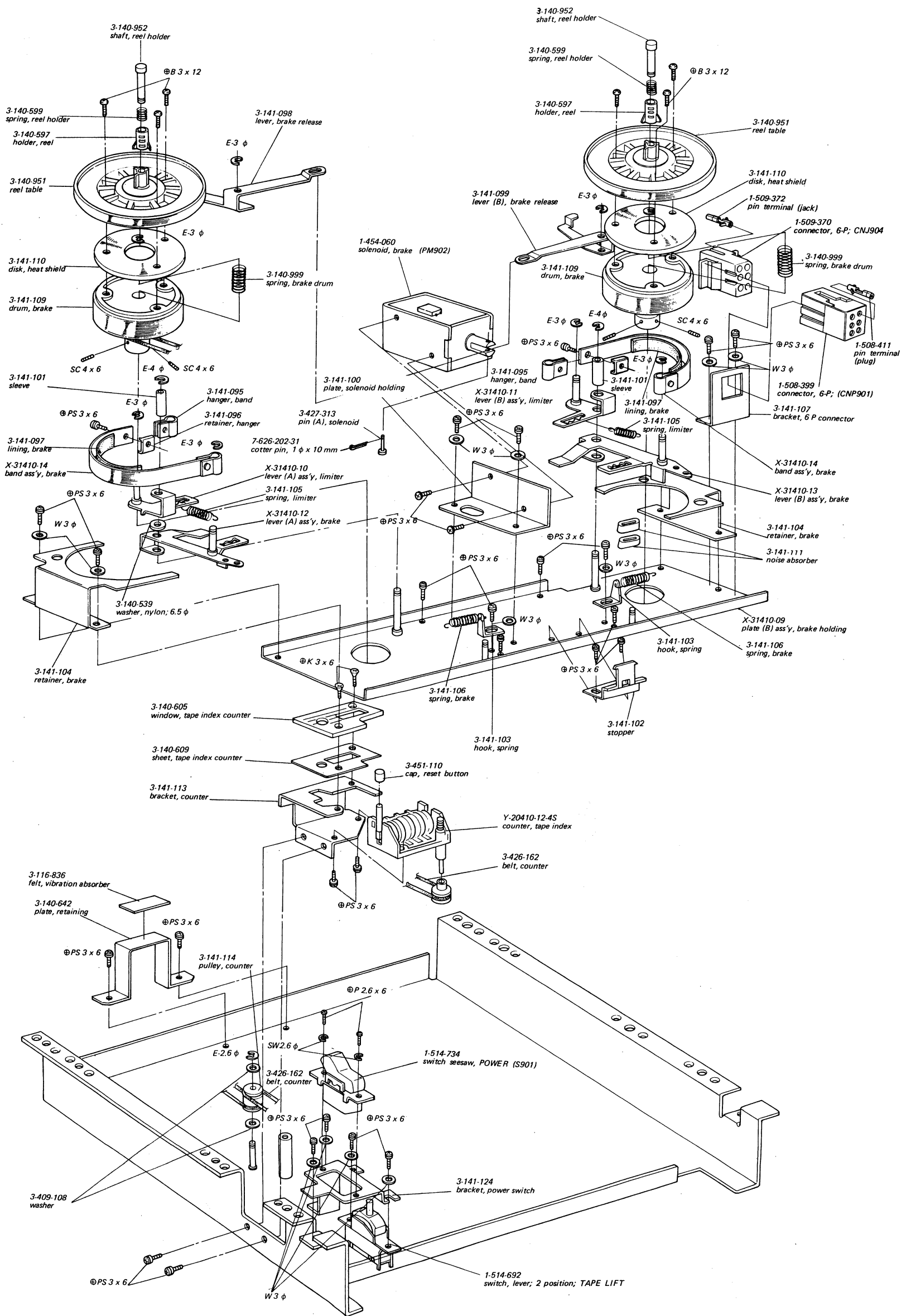
— Conductor Side —



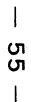




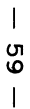


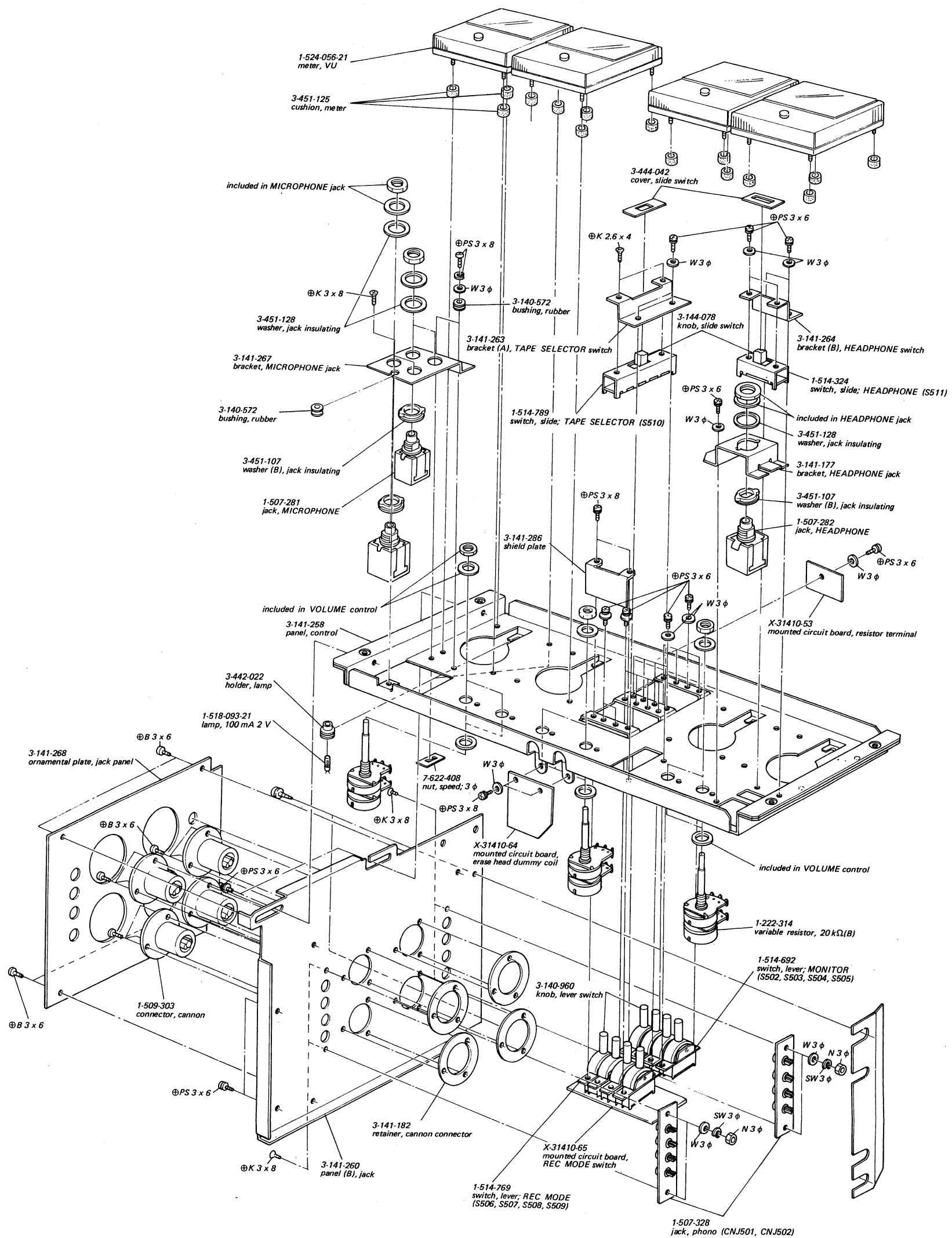


TC-854-4 TC-854-4



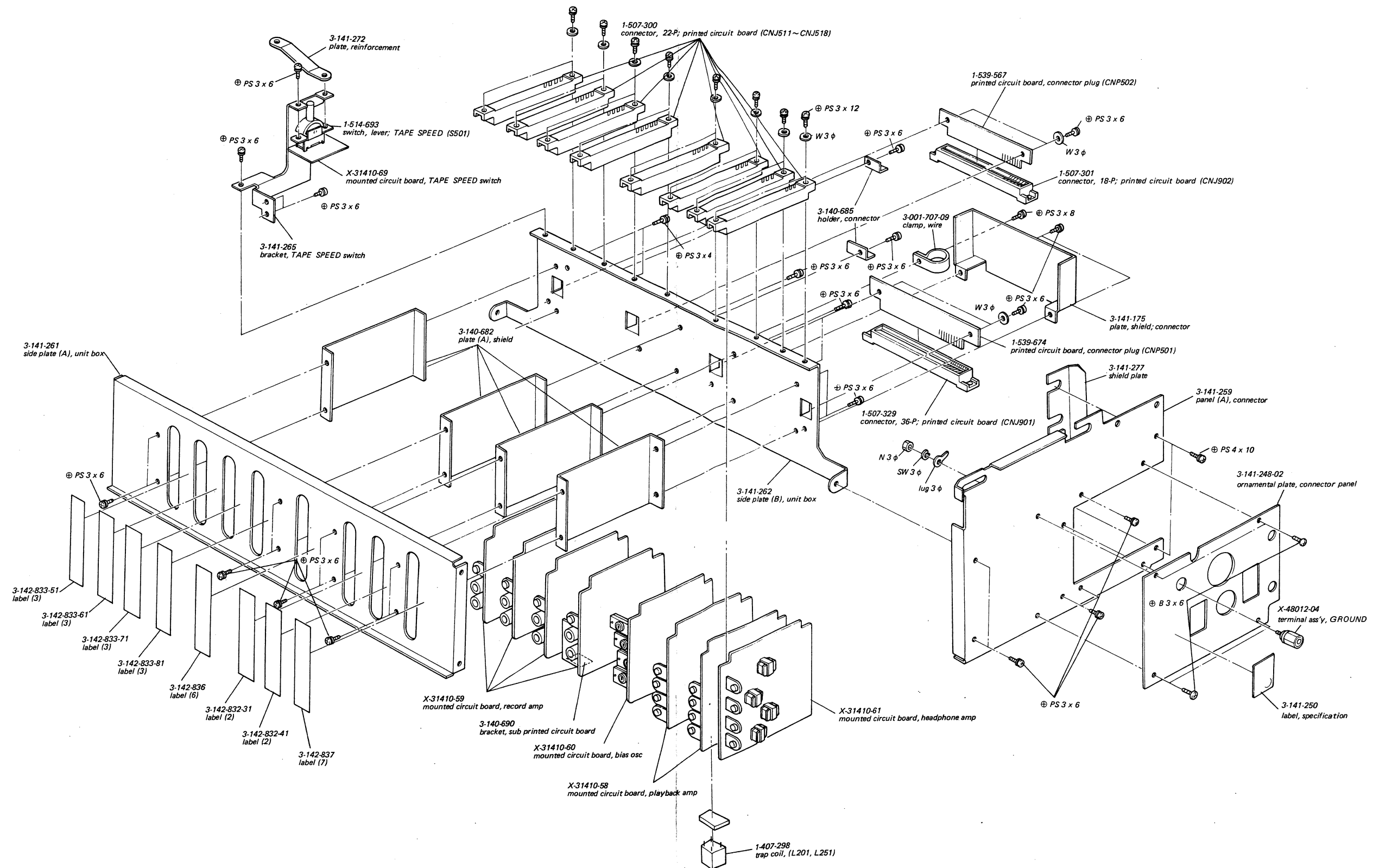




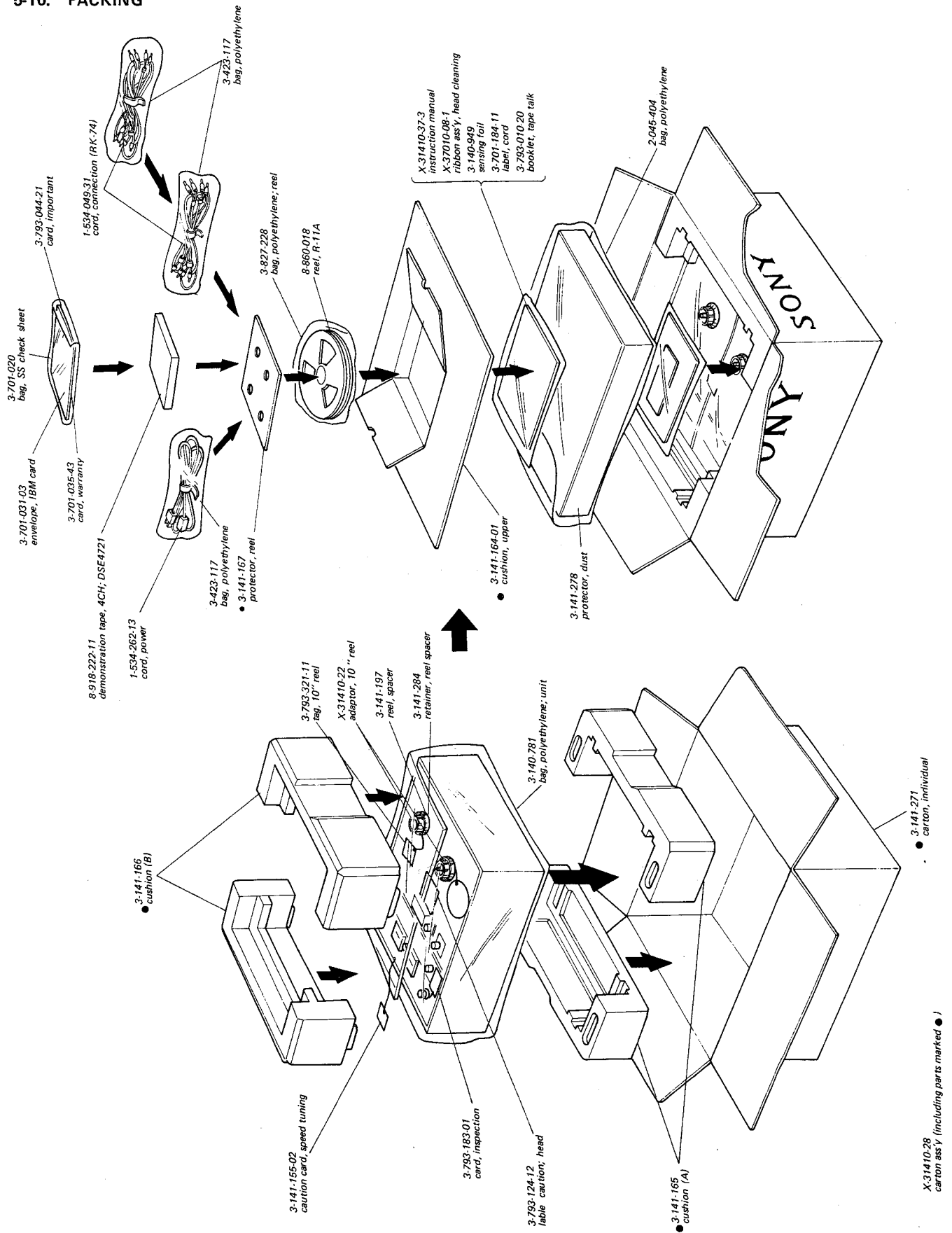


TC-854-4 TC-854-4

5-9. AMP CIRCUIT BOARD VIEW



5-10. PACKING



SECTION 6

ELECTRICAL PARTS LIST

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
MOUNTED CIRCUIT BOARDS					
	X-31410-53	resistor terminal	D202		diode 10D2
	X-31410-54	APS & ATS	D203		diode 10D2
	X-31410-56	shut-off	D251		diode 10D2
	X-31410-58	pb amp	D301		diode 10D2
	X-31410-59	rec amp	D401		diode 1T22
	X-31410-60	bias osc	D402		diode 1T22
	X-31410-61	headphone amp	D411		diode 1T22
	X-31410-62	system control	D412		diode 1T22
	X-31410-63	capstan servo control	D421		diode 1T22
	X-31410-64	erase head dummy coil	D422		diode 1T22
	X-31410-65	REC MODE switch	D431		diode 1T22
	X-31410-69	TAPE SPEED switch	D432		diode 1T22
SEMICONDUCTORS			D601~619		diode 10D2
Q101		transistor 2SC631A	D620		diode 1T22
Q102		transistor 2SA610	D621~632		diode 10D2
Q103		transistor 2SC631A	D633~637		diode 1T22
Q104		transistor 2SC631A	ZD601		diode, zener 1S334
Q105		transistor 2SC634A	D701		diode 10D2
Q106		transistor 2SC634A	D702		diode 1T22
Q201, 251		transistor 2SC631A	D703		diode 10D2
Q202, 252		transistor 2SC631A	D704		diode 10D2
Q203, 253		transistor 2SC634A	D705		diode 1T22
Q204, 254		transistor 2SC634A	D706		diode 10D2
Q205		transistor 2SC634A	D707		diode 10D2
Q206		transistor 2SC634A	D708		diode 1T22
Q301		transistor 2SC1014	D709		diode 10D2
Q302		transistor 2SC1014	D710		diode 10D2
Q303		transistor 2SC1014	D711		diode 10D2
Q401~404		transistor 2SC634A	D712		diode 10D2
Q601		transistor 2SC634A	ZD701		diode, zener 1S334
Q602		transistor 2SC634A	D801		diode 10D2
Q603		transistor 2SC634A	D802		diode 1T263
Q604		transistor 2SC634A	D803		diode 1S334
Q605		transistor 2SC634A	D804~811		diode 10D2
Q606		transistor 2SD28	COILS & TRANSFORMERS		
Q607~611		transistor 2SC634A	L101	1-231-069	equalizer, 1.4/1.8 mH
Q701~712		transistor 2SC634A	L102	1-231-069	equalizer, 1.4/1.8 mH
Q801~808		transistor 2SC634A	L201	1-407-298	bias trap (TRAP COIL ADJ.)
Q809		transistor 2SA610	L251	1-407-298	bias trap (TRAP COIL ADJ.)
Q810		transistor 2SC634A	L301	1-407-198-21	micro inductor, 2.2 mH
Q811		transistor 2SC1014	L302	1-407-198-21	micro inductor, 2.2 mH
Q812~816		transistor 2SC634A	L303	1-231-069	equalizer, 1.8 mH; FRONT L-CH
Q817		transistor 2SC895			TRAP COIL ADJ.
Q818		transistor 2SC634A	L304	1-231-069	equalizer, 1.8 mH; FRONT R-CH
Q901~907		transistor 2SD28			TRAP COIL ADJ.
Q908		transistor 2SC807A	L305	1-231-069	equalizer, 1.8 mH; REAR L-CH
Q991		transistor 2SD28			TRAP COIL ADJ.
Q992		transistor 2SC634	L306	1-231-069	equalizer, 1.8 mH; REAR R-CH
					TRAP COIL ADJ.
D101~106		diode 10D2	L501~504	1-409-038	dummy, 1 mH
D201		diode 10D2	L701	1-407-212	micro inductor, 33 mH
			T301	1-433-148	bias osc

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		
T401~404	1-427-284	headphone		
T901	1-441-628	power		
CAPACITORS				
C101	1-121-416	100 μ F	25 V	electrolytic
C102	1-121-398	10 μ F	25 V	electrolytic
C103	1-121-398	10 μ F	25 V	electrolytic
C104	1-105-661-12	0.001 μ F	50 V	mylar
C105	1-121-413	100 μ F	6.3 V	electrolytic
C106	1-121-398	10 μ F	25 V	electrolytic
C107	1-105-661-12	0.001 μ F	50 V	mylar
C108	1-121-398	10 μ F	25 V	electrolytic
C109	1-121-413	100 μ F	6.3 V	electrolytic
C110	1-121-416	100 μ F	25 V	electrolytic
C111	1-121-395	4.7 μ F	25 V	electrolytic
C112				
C113	1-105-661-12	0.001 μ F	50 V	mylar
C114	1-121-413	100 μ F	6.3 V	electrolytic
C115	1-121-395	4.7 μ F	25 V	electrolytic
C116	1-105-661-12	0.001 μ F	50 V	mylar
C117	1-121-409	47 μ F	16 V	electrolytic
C118	1-121-395	4.7 μ F	25 V	electrolytic
C119	1-121-395	4.7 μ F	25 V	electrolytic
C120	1-121-395	4.7 μ F	25 V	electrolytic
C121				
C122	1-105-661-12	0.001 μ F	50 V	mylar
C123	1-107-127	68pF	50 V	silvered mica
C124	1-121-403	33 μ F	16 V	electrolytic
C125	1-121-413	100 μ F	6.3 V	electrolytic
C126	1-121-398	10 μ F	25 V	electrolytic
C127	1-105-689-12	0.22 μ F	50 V	mylar
C128	1-121-416	100 μ F	25 V	electrolytic
C129	1-105-679-12	0.0033 μ F	50 V	mylar
C130	1-121-413	100 μ F	6.3 V	electrolytic
C131	1-105-685-12	0.1 μ F	50 V	mylar
C132	1-105-683-12	0.068 μ F	50 V	mylar
C133	1-105-681-12	0.047 μ F	50 V	mylar
C134	1-105-677-12	0.022 μ F	50 V	mylar
C135	1-121-398	10 μ F	25 V	electrolytic
C136	1-121-398	10 μ F	25 V	electrolytic
C137	1-121-398	10 μ F	25 V	electrolytic
C138	1-121-398	10 μ F	25 V	electrolytic
C139				
C140	1-105-671-12	0.0068 μ F	50 V	mylar
C141	1-105-671-12	0.0068 μ F	50 V	mylar
C142	1-121-398	10 μ F	25 V	electrolytic
C143	1-121-398	10 μ F	25 V	electrolytic
C201, 251	1-127-304	3.3 μ F	16 V	electrolytic
C202, 252	1-121-410	47 μ F	25 V	electrolytic
C203, 253	1-121-413	100 μ F	6.3 V	electrolytic
C204, 254	1-105-661-12	0.001 μ F	50 V	mylar
C205, 255	1-105-661-12	0.001 μ F	50 V	mylar
C206, 256	1-121-403	33 μ F	16 V	electrolytic

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		
C207, 257	1-121-416	100 μ F	25 V	electrolytic
C208, 258	1-121-398	10 μ F	25 V	electrolytic
C209, 259	1-105-677-12	0.022 μ F	50 V	mylar
C210, 260	1-107-244	470pF	50 V	silvered mica
C211, 261	1-121-391	1 μ F	50 V	electrolytic
C212, 262	1-121-416	100 μ F	25 V	electrolytic
C213, 263	1-105-661-12	0.001 μ F	50 V	mylar
C214, 264	1-121-410	47 μ F	25 V	electrolytic
C215, 265	1-107-125	56pF	50 V	silvered mica
C216, 266	1-121-409	47 μ F	16 V	electrolytic
C217, 267	1-121-398	10 μ F	25 V	electrolytic
C218				
C219	1-121-410	47 μ F	25 V	electrolytic
C301	1-121-410	47 μ F	25 V	electrolytic
C302	1-105-679-12	0.033 μ F	50 V	mylar
C303	1-121-410	47 μ F	25 V	electrolytic
C304	1-121-398	10 μ F	25 V	electrolytic
C305	1-121-398	10 μ F	25 V	electrolytic
C306	1-107-188	620pF	500 V	silvered mica
C307	1-105-679-12	0.033 μ F	50 V	mylar
C308	1-109-523	8,200pF	500 V	silvered mica
C309	1-107-188	620pF	500 V	silvered mica
C310	1-107-188	620pF	500 V	silvered mica
C311	1-107-188	620pF	500 V	silvered mica
C312	1-107-188	620pF	500 V	silvered mica
C313~316	1-141-076	30~200pF		trimmer
C317	1-107-188	620pF	500 V	silvered mica
C318	1-107-188	620pF	500 V	silvered mica
C401, 411	1-121-395	4.7 μ F	25 V	electrolytic
C421, 431				
C402, 412	1-121-398	10 μ F	25 V	electrolytic
C422, 432				
C403, 413	1-121-391	1 μ F	50 V	electrolytic
C423, 433				
C404, 414	1-121-395	4.7 μ F	25 V	electrolytic
C424, 434				
C405, 415	1-121-398	10 μ F	25 V	electrolytic
C425, 435				
C406, 416	1-121-398	10 μ F	25 V	electrolytic
C426, 436				
C441	1-121-416	100 μ F	25 V	electrolytic
C442	1-121-416	100 μ F	25 V	electrolytic
C501	1-109-506	3,300pF	500 V	silvered mica
C502	1-109-503	1,500pF	500 V	silvered mica
C601	1-121-810	470 μ F	50 V	electrolytic
C602	1-121-810	470 μ F	50 V	electrolytic
C603	1-121-417	100 μ F	50 V	electrolytic
C604	1-121-388	1,000 μ F	35 V	electrolytic
C605	1-121-388	1,000 μ F	35 V	electrolytic
C606	1-121-422	220 μ F	25 V	electrolytic

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		
C607	1-121-422	220 μ F	25 V	electrolytic
C608	1-121-422	220 μ F	25 V	electrolytic
C609	1-121-422	220 μ F	25 V	electrolytic
C610	1-105-689-12	0.22 μ F	50 V	mylar
C611	1-121-410	47 μ F	25 V	electrolytic
C612	1-121-420	220 μ F	10 V	electrolytic
C613	1-121-422	220 μ F	25 V	electrolytic
C614	1-105-689-12	0.22 μ F	50 V	mylar
C615	1-105-689-12	0.22 μ F	50 V	mylar
C616	1-105-689-12	0.22 μ F	50 V	mylar
C617	1-105-687-12	0.22 μ F	50 V	mylar
C618				
C619	1-105-685-12	0.1 μ F	50 V	mylar
C620				
C621	1-121-392	3.3 μ F	25 V	electrolytic
C622	1-121-480	22 μ F	25 V	electrolytic
C623	1-121-810	470 μ F	50 V	electrolytic
C701	1-103-891	4,700pF	50 V	polystyrol
C702	1-103-891	4,700pF	50 V	polystyrol
C703	1-105-677-12	0.022 μ F	50 V	mylar
C704	1-105-677-12	0.022 μ F	50 V	mylar
C705	1-121-398	10 μ F	25 V	electrolytic
C706				
C707				
C708	1-121-410	47 μ F	25 V	electrolytic
C709	1-121-404	33 μ F	25 V	electrolytic
C710	1-121-422	220 μ F	25 V	electrolytic
C801	1-105-661-12	0.001 μ F	50 V	mylar
C802	1-105-671-12	0.0068 μ F	50 V	mylar
C803	1-105-661-12	0.001 μ F	50 V	mylar
C804	1-105-677-12	0.022 μ F	50 V	mylar
C805	1-121-409	47 μ F	16 V	electrolytic
C806	1-105-611-12	0.001 μ F	50 V	mylar
C807	1-121-421	220 μ F	16 V	electrolytic
C808	1-121-422	220 μ F	25 V	electrolytic
C809	1-121-425	470 μ F	10 V	electrolytic
C810	1-121-398	10 μ F	25 V	electrolytic
C811	1-121-398	10 μ F	25 V	electrolytic
C812	1-121-423	220 μ F	50 V	electrolytic
C813	1-121-409	47 μ F	16 V	electrolytic
C814	1-121-420	220 μ F	10 V	electrolytic
C815	1-121-398	10 μ F	25 V	electrolytic
C816	1-121-733	470 μ F	25 V	electrolytic
C901	1-117-082	4 μ F	300 V	metalized paper
C902-1~2	1-113-071	10 μ F	230 V	(block type) metalized paper
C903	1-117-040	0.5 + 2 μ F	300 V	(block type) metalized paper
C904	1-113-072	1 μ F	250 V	metalized paper
C905	1-113-072	1 μ F	250 V	metalized paper
C906	1-105-681-12	0.047 μ F	50 V	mylar

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		
C991	1-121-420	220 μ F	10 V	electrolytic

RESISTORS

All resistors are $\frac{1}{4}$ W and carbon type, unless otherwise indicated.

R101	1-242-705	22 k Ω
R102	1-242-701	15 k Ω
R103	1-242-723	120 k Ω
R104	1-242-690	5.1 k Ω
R105	1-242-704	20 k Ω
R106	1-242-661	330 Ω
R107	1-242-701	15 k Ω
R108	1-242-704	20 k Ω
R109	1-242-690	5.1 k Ω
R110	1-242-661	330 Ω
R111	1-242-681	2.2 k Ω
R112	1-242-713	47 k Ω
R113	1-242-729	220 k Ω
R114	1-242-657	220 Ω
R115	1-242-681	2.2 k Ω
R116	1-242-691	5.6 k Ω
R117	1-242-713	47 k Ω
R118	1-242-729	220 k Ω
R119	1-242-657	220 Ω
R120	1-242-681	2.2 k Ω
R121	1-242-691	5.6 k Ω
R122	1-242-661	330 Ω
R123	1-242-690	5.1 k Ω
R124	1-242-692	6.2 k Ω
R125	1-221-383	10 k Ω (B) semi-fixed (REC LEVEL ADJ.)
R126	1-242-681	2.2 k Ω
R127	1-242-707	27 k Ω
R128	1-242-725	150 k Ω
R129	1-242-685	3.3 k Ω
R130	1-242-709	33 k Ω
R131	1-242-665	470 Ω
R132	1-242-709	33 k Ω
R133	1-242-661	330 Ω
R134	1-242-673	1 k Ω
R135	1-242-701	15 k Ω
R136	1-242-649	100 Ω
R137	1-242-681	2.2 k Ω
R138	1-242-673	1 k Ω
R139	1-242-697	10 k Ω
R140	1-242-733	330 k Ω
R141	1-242-697	10 k Ω
R142	1-242-733	330 k Ω
R143	1-242-697	10 k Ω
R144	1-242-733	330 k Ω
R145	1-242-697	10 k Ω
R146	1-242-733	330 k Ω
R147	1-242-633	22 Ω

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R148	1-242-649	100Ω
R149	1-242-641	47Ω
R150	1-242-659	270Ω
R151	1-242-655	180Ω
R152		
R153	1-242-687	3.9 kΩ
R154	1-242-697	10 kΩ
R155	1-242-733	330 kΩ
R156	1-242-697	10 kΩ
R157	1-242-733	330 kΩ
R158~163	1-242-679	1.8 kΩ
R201, 251	1-242-609	2.2Ω
R202, 252	1-242-739	560 kΩ
R203, 253	1-242-725	150 kΩ
R204, 254	1-242-721	100 kΩ
R205, 255	1-242-643	56Ω
R206, 256	1-242-703	18 kΩ
R207, 257	1-242-692	6.2 kΩ
R208, 258	1-242-692	6.2 kΩ
R209, 259	1-242-723	120 kΩ
R211, 261	1-242-685	3.3 kΩ
R212, 262	1-242-657	220Ω
R213, 263	1-221-311	5 kΩ (B) (9.5 cm/s EQ ADJ.)
R214, 264	1-242-657	220Ω
R215, 265	1-221-311	5 kΩ (B) (9.5 cm/s EQ ADJ.)
R216, 266	1-242-701	15 kΩ
R217	1-242-691	5.6 kΩ
R218, 268	1-242-705	22 kΩ
R220, 270	1-242-697	10 kΩ
R222, 271	1-242-697	10 kΩ
R223	1-242-699	12 kΩ
R224	1-242-707	27 kΩ
R225	1-242-707	27 kΩ
R226	1-242-699	12 kΩ
R228, 278	1-242-681	2.2 kΩ
R229, 279	1-242-705	22 kΩ
R230, 280	1-242-729	220 kΩ
R231, 281	1-242-705	22 kΩ
R232, 282	1-242-709	33 kΩ
R233, 283	1-242-677	1.5 kΩ
R234, 284	1-242-665	470Ω
R235, 285	1-242-707	27 kΩ
R236, 286	1-242-677	1.5 kΩ
R237, 287	1-242-663	390Ω
R238	1-242-655	180Ω
R240, 290	1-242-721	100 kΩ
R288	1-242-657	220Ω
R301	1-242-667	560Ω
R302	1-242-683	2.7 kΩ
R303	1-242-625	10Ω
R304	1-242-617	4.7Ω

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R305	1-242-617	4.7Ω
R306	1-242-699	12 kΩ
R307	1-242-705	22 kΩ
R401, 411	1-242-681	2.2 kΩ
R421, 431		
R402, 412	1-242-697	10 kΩ
R422, 432		
R403, 413		
R423, 433		
R404, 414	1-242-737	470 kΩ
R424, 434		
R405, 415	1-242-681	2.2 kΩ
R425, 435		
R406	1-221-311	5 kΩ (B) semi-fixed LEVEL METER CAL (FRONT L-CH) CAL (FRONT R-CH)
R416		
R426	1-221-311	5 kΩ (B) semi-fixed LEVEL METER CAL (FRONT L-CH) CAL (FRONT R-CH)
R436		
R407, 417	1-242-649	100Ω
R427, 437		
R408, 418	1-242-721	100 kΩ
R428, 438		
R409, 419	1-242-721	100 kΩ
R429, 439		
R441	1-242-641	47Ω
R442	1-242-641	47Ω
VR501-1	1-222-314	20 kΩ (B) variable MIC VOL (FRONT L-CH)
VR501-2	1-222-314	20 kΩ (B) variable MIC VOL (FRONT R-CH)
VR502-1	1-222-314	20 kΩ (B) variable LINE VOL (FRONT L-CH)
VR502-2	1-222-314	20 kΩ (B) variable LINE VOL (FRONT R-CH)
VR503-1	1-222-314	20 kΩ (B) variable MIC VOL (REAR L-CH)
VR503-2	1-222-314	20 kΩ (B) variable MIC VOL (REAR R-CH)
VR504-1	1-222-314	20 kΩ (B) variable LINE VOL (REAR L-CH)
VR504-2	1-222-314	20 kΩ (B) variable LINE VOL (REAR R-CH)
VR505-1	1-222-314	20 kΩ (B) variable PB VOL (FRONT L-CH)
VR505-2	1-222-314	20 kΩ (B) variable PB VOL (FRONT R-CH)
VR506-1	1-222-314	20 kΩ (B) variable PB VOL (REAR L-CH)
VR506-2	1-222-314	20 kΩ (B) variable PB VOL (REAR R-CH)

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>			<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R501~504	1-242-684	3 k Ω			R650	1-242-677	1.5 k Ω
R511~514	1-242-721	100 k Ω			R651	1-242-643	56 Ω
R521~524	1-242-679	1.8 k Ω					
R525~528	1-242-617	4.7 Ω			R701	1-242-689	4.7 k Ω
					R702	1-242-689	4.7 k Ω
R601	1-207-272	4.7 Ω	1.5 W	wire wound	R703	1-242-705	22 k Ω
R602	1-242-697	10 k Ω			R704	1-244-682	2.4 k Ω
R603	1-242-665	470 Ω			R705	1-242-665	470 Ω
R604	1-242-677	1.5 k Ω			R706	1-242-705	22 k Ω
R605	1-242-690	5.1 k Ω			R707	1-242-677	1.5 k Ω
R606	1-242-685	3.3 k Ω			R708	1-242-697	10 k Ω
R607	1-242-705	22 k Ω			R709	1-242-705	22 k Ω
R608	1-242-657	220 Ω			R710	1-242-709	33 k Ω
R609	1-242-681	2.2 k Ω			R711	1-242-697	10 k Ω
R610	1-242-667	560 Ω			R712	1-242-709	33 k Ω
R611	1-206-016	1 k Ω	2 W	metal oxide film	R713	1-242-705	22 k Ω
R612	1-242-705	22 k Ω			R714	1-242-625	10 Ω
R613	1-242-709	33 k Ω			R715	1-242-691	5.6 k Ω
R614	1-242-685	3.3 k Ω			R716	1-242-709	33 k Ω
R615	1-242-665	470 Ω			R717	1-242-701	15 k Ω
R616	1-242-697	10 k Ω			R718	1-242-705	22 k Ω
R617	1-242-673	1 k Ω			R719	1-242-705	22 k Ω
R618	1-242-713	47 k Ω			R720	1-242-685	3.3 k Ω
R619	1-242-713	47 k Ω			R721	1-242-667	560 Ω
R620					R722	1-242-697	10 k Ω
R621	1-242-709	33 k Ω			R723	1-242-709	33 k Ω
R622	1-242-705	22 k Ω			R724	1-242-709	33 k Ω
R623	1-242-699	12 k Ω			R725	1-242-705	22 k Ω
R624	1-242-709	33 k Ω			R726	1-242-709	33 k Ω
R625	1-242-709	33 k Ω			R727	1-242-705	22 k Ω
R626	1-242-709	33 k Ω			R728	1-242-705	22 k Ω
R627	1-242-705	22 k Ω			R729	1-242-673	1 k Ω
R628	1-242-697	10 k Ω			R730	1-242-697	10 k Ω
R629	1-242-697	10 k Ω			R731	1-242-709	33 k Ω
R630	1-242-705	22 k Ω			R732	1-242-705	22 k Ω
R631	1-242-690	5.1 k Ω			R733	1-242-709	33 k Ω
R632	1-242-697	10 k Ω			R734	1-242-673	1 k Ω
R633	1-242-673	1 k Ω			R735	1-242-705	22 k Ω
R634	1-242-675	1.2 k Ω			R736	1-242-705	22 k Ω
R635	1-242-705	22 k Ω			R737	1-242-697	10 k Ω
R636	1-242-705	22 k Ω			R738	1-242-709	33 k Ω
R637	1-242-677	1.5 k Ω			R739	1-242-705	22 k Ω
R638	1-242-707	27 k Ω					
R639	1-242-705	22 k Ω			R801	1-242-697	10 k Ω
R640	1-242-677	1.5 k Ω			R802	1-242-721	100 k Ω
R641	1-242-707	27 k Ω			R803	1-242-665	470 Ω
R642	1-242-705	22 k Ω			R804	1-242-665	470 Ω
R643	1-207-273	5.1 Ω	1.5 W	wire wound	R805	1-242-721	100 k Ω
R644	1-207-273	5.1 Ω	1.5 W	wire wound	R806	1-242-697	10 k Ω
R645	1-207-273	5.1 Ω	1.5 W	wire wound	R807	1-242-697	10 k Ω
R646	1-207-273	5.1 Ω	1.5 W	wire wound	R808	1-242-730	240 k Ω
R647	1-242-675	1.2 k Ω			R809	1-242-721	100 k Ω
R648	1-242-705	22 k Ω			R810	1-242-705	22 k Ω
R649	1-242-705	22 k Ω			R811	1-242-703	18 k Ω

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		
R812	1-242-685	3.3 kΩ		
R813	1-242-685	3.3 kΩ		
R814	1-242-701	15 kΩ		
R815	1-242-697	10 kΩ		
R816				
R817	1-242-693	6.8 kΩ		
R818	1-242-673	1 kΩ		
R819	1-242-633	22Ω		
R820	1-242-673	1 kΩ		
R821	1-242-669	680Ω		
R822	1-242-680	2 kΩ		
R823	1-242-689	4.7 kΩ		
R824	1-242-713	47 kΩ		
R825	1-242-673	1 kΩ		
R826	1-242-697	10 kΩ		
R827	1-242-696	9.1 kΩ		
R828	1-242-685	3.3 kΩ		
R829	1-242-685	3.3 kΩ		
R830	1-242-666	510Ω		
R831	1-242-701	15 kΩ		
R832	1-242-681	2.2 kΩ		
R833	1-242-701	15 kΩ		
R834	1-207-268	3.3 Ω	1.5 W	metal oxide film
R835	1-242-721	100 kΩ		
R836	1-242-717	68 kΩ		
R837	1-242-697	10 kΩ		
R838	1-242-681	2.2 kΩ		
R839	1-206-093	1 kΩ	1 W	metal oxide film
R840	1-242-649	100Ω		
R841	1-242-653	150 kΩ		
R842	1-242-659	270Ω		
R843	1-242-699	12 kΩ		
R844	1-242-681	2.2 kΩ		
R845	1-242-703	18 kΩ		
R846	1-242-689	4.7 kΩ		
R847				
R848	1-242-710	36 kΩ		
RA801	1-242-693	6.8 kΩ		
RA802	1-242-693	6.8 kΩ		
RA803	1-242-699	12 kΩ		
VR801	1-221-175	20 kΩ (B), semi-fixed		
VR802	1-221-173	5 kΩ (B), semi-fixed		
VR803	1-221-172	2 kΩ (B), semi-fixed		
VR901	1-222-353	2 kΩ, semi-fixed		
R901	1-205-511	500Ω	40H	wire wound
R902	1-205-502	100Ω	40H	wire wound
R903	1-205-503	68Ω	40H	wire wound
R904	1-205-503	68Ω	40H	wire wound
R991	1-206-097	2.2 kΩ	1 W	metal oxide film
R992	1-242-709	33 kΩ	¼W	

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		
R993	1-242-691	5.6 kΩ	¼W	
R994	1-242-691	5.6 kΩ	¼W	
R995	1-242-713	47 kΩ	¼W	
SWITCHES				
S501	1-514-693	lever, 3 position; TAPE SPEED		
S502	1-514-692	lever, 2 position; MONITOR (FRONT L-CH)		
S503	1-514-692	lever, 2 position; MONITOR (FRONT R-CH)		
S504	1-514-692	lever, 2 position; MONITOR (REAR L-CH)		
S505	1-514-692	lever, 2 position; MONITOR (REAR R-CH)		
S506~509	1-514-769	lever, 2 position; REC MODE		
S510	1-514-789	slide, TAPE SELECTOR		
S511	1-514-324	slide, HEADPHONE		
S901	1-514-734	seesaw; POWER		
S902~906	1-514-057-10	micro; REW, STOP, PLAY, FF, REC		
S907	1-514-057-10	micro; APS		
S908	1-514-692	lever; 2 position; TAPE LIFT		
S909	1-514-530-21	micro; SHUT OFF		
S910	1-514-735	reel selector; REEL SIZE		
S911	1-513-149	push; AUTO STOP		
JACKS/CONNECTORS/PLUGS				
CNJ501	1-507-328	phono; LINE INPUT		
CNJ502	1-507-328	phono; LINE OUTPUT		
CNJ503	1-509-303	cannon; MIC INPUT FRONT L-CH		
CNJ504	1-507-281	phone; MICROPHONE FRONT L-CH		
CNJ505	1-509-303	cannon; MIC INPUT FRONT R-CH		
CNJ506	1-507-281	phone; MICROPHONE FRONT R-CH		
CNJ507	1-509-303	cannon; MIC INPUT REAR L-CH		
CNJ508	1-507-281	phone; MICROPHONE REAR L-CH		
CNJ509	1-509-303	cannon; MIC INPUT REAR R-CH		
CNJ510	1-507-281	phone; MICROPHONE REAR R-CH		
CNJ511~518	1-507-300	connector, 22-P		
CNJ5194	1-507-282	binaural, HEADPHONE		
CNP501	1-539-674	connector plug, 36-P		
CNP502	1-539-567	connector plug, 18-P		
CNJ901	1-507-329	36-P		
CNJ902	1-507-301	18-P		
CNJ903	1-507-255	11-P		
CNJ904	1-509-370	6-P		
CNJ905	1-507-329	36-P		
CNJ906	1-509-062	OUTLET		
CNJ907	1-509-341	POWER SUPPLY		
CNP901	1-508-399	6-P		
CNP902	1-539-672	printed circuit board 36-P; head		
CNP903	1-506-180	terminating; 11-P		

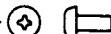
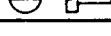
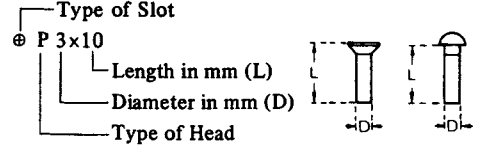
<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
SOLENOIDS		
PM901	1-454-059	lifter
PM902	1-454-060	brake
PM903	1-454-052	pinch roller (forward)
PM904	1-454-052	pinch roller (reverse)
LAMPS		
PL501~504	1-518-093-21	100 mA, 2V (included in METER ME501 ~ 504)
PL901~905	1-518-053-00	40 mA, 28V (REW, FF, PLAY, REC, APS)
ENCAPSULATED COMPONENTS C-R		
CP901	1-101-534	0.1 + 120 Ω 500 V
CP902~905	1-101-528	0.1 + 120 Ω 250 V
MOTORS		
M901	8-836-624-06	capstan (UC-624G1)
M902	8-832-638-01	supply reel (IC-638R)
M903	8-832-638-01	take-up reel (IC-638R)

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		
METERS				
ME501~504	1-524-056	VU, with PL 501 ~504		
RELAYS				
RY301	1-515-127-11	650 Ω	24 V	
RY601~604	1-515-127-41	650 Ω	24 V	
RY801, 802	1-515-127-41	650 Ω	24 V	
HEADS				
H901	8-825-542-40	playback (PP77-4204)		
H902	8-824-529-40	record (RP77-2904)		
H903	8-826-629-25	erase (EF18-2902A) (REAR)		
H904	8-826-629-25	erase (EF18-2902A) (FRONT)		
H905	1-459-051	sensing		
MISCELLANEOUS				
FB901	1-533-048	holder, fuse		
	1-536-213	lug plate, 5-P		
	1-508-411	pin terminal (plug)		
	1-517-018	socket, lamp; swan type		
	1-509-372	pin terminal (jack)		

SECTION 7 HARDWARE

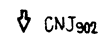
<i>Part No.</i>	<i>Description</i>	<i>Part No.</i>	<i>Description</i>
SCREWS			
0-503-222-00	⊕ P 3 × 8	7-683-273-31	3 × 3, lock w/ hexagon socket
7-621-255-24	⊕ P 2 × 4	7-683-238-01	3 × 4, lock w/ hexagon socket
7-621-255-34	⊕ P 2 × 5	7-683-240-31	3 × 6, lock w/ hexagon socket
7-621-255-44	⊕ P 2 × 6	7-683-247-31	4 × 6, lock w/ hexagon socket
7-621-255-54	⊕ P 2 × 8		2 × 4, lock w/ hexagon socket
7-621-255-74	⊕ P 2 × 12	NUTS	
7-621-259-44	⊕ P 2.6 × 6	7-622-107-04	2.6φ, hexagon socket
7-621-259-54	⊕ P 2.6 × 8	7-684-013-02	3φ, hexagon socket
7-621-259-64	⊕ P 2.6 × 10	7-684-014-02	4φ, hexagon socket
7-621-555-34	⊕ K 2 × 5	WASHERS	
7-621-555-44	⊕ K 2 × 6	7-623-105-14	2φ (middle)
7-621-559-24	⊕ K 2.6 × 4	7-623-107-14	2.6φ (middle)
7-621-559-44	⊕ K 2.6 × 6	7-623-108-14	3φ (middle)
7-621-712-22	⊖ SC 2.6 × 3	7-623-110-14	4φ (middle)
7-621-770-34	⊕ B 2 × 5	7-623-205-21	2φ, spring
7-682-146-02	⊕ P 3 × 5	7-623-207-21	2.6φ, spring
7-682-147-15	⊕ P 3 × 6	7-623-208-21	3φ, spring
7-682-150-02	⊕ P 3 × 12	7-623-210-21	4φ, spring
7-682-166-02	⊕ P 4 × 20	RETAINING RINGS	
7-682-247-02	⊕ K 3 × 6	7-624-104-01	E-2
7-682-248-02	⊕ K 3 × 8	7-624-105-01	E-2.3
7-682-348-14	⊕ RK 3 × 8	7-624-106-01	E-3
7-682-367-14	⊕ RK 4 × 25	7-624-108-01	E-4
7-682-547-15	⊕ B 3 × 6	7-624-109-01	E-5
7-682-548-15	⊕ B 3 × 8	LUG PLATE	
7-682-647-02	⊕ PS 3 × 6	7-623-508-01	3φ
7-682-648-02	⊕ PS 3 × 8	COTTER PIN	
7-682-649-02	⊕ PS 3 × 10	7-626-202-31	1φ × 10
7-682-651-02	⊕ PS 3 × 14		
7-682-661-02	⊕ PS 4 × 8		
7-682-662-02	⊕ PS 4 × 10		

— Hardware Nomenclature —

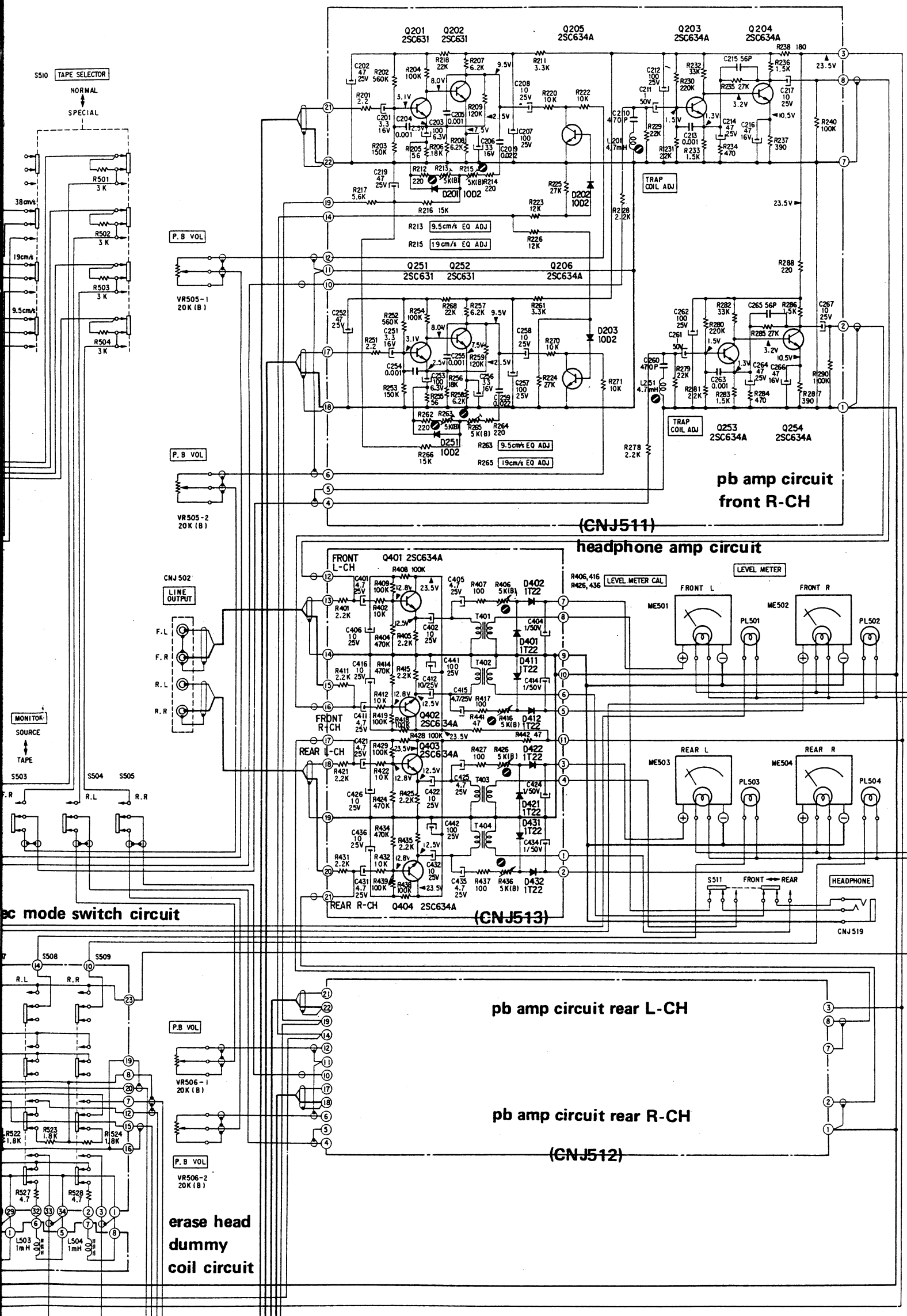
P — Pan Head Screw		SC — Set Screw	
PS — Pan Head Screw with Spring Washer		E — Retaining Ring (E Washer)	
K — Flat Countersunk Head Screw		W — Washer	
B — Binding Head Screw		SW — Spring Washer	
RK — Oval Countersunk Head Screw		LW — Lock Washer	
T — Truss Head Screw		N — Nut	
R — Round Head Screw		— Example —	
F — Flat Fillister Head Screw			

SONY CORPORATION

SCHEMATIC DIAGRAM – Amplifier –



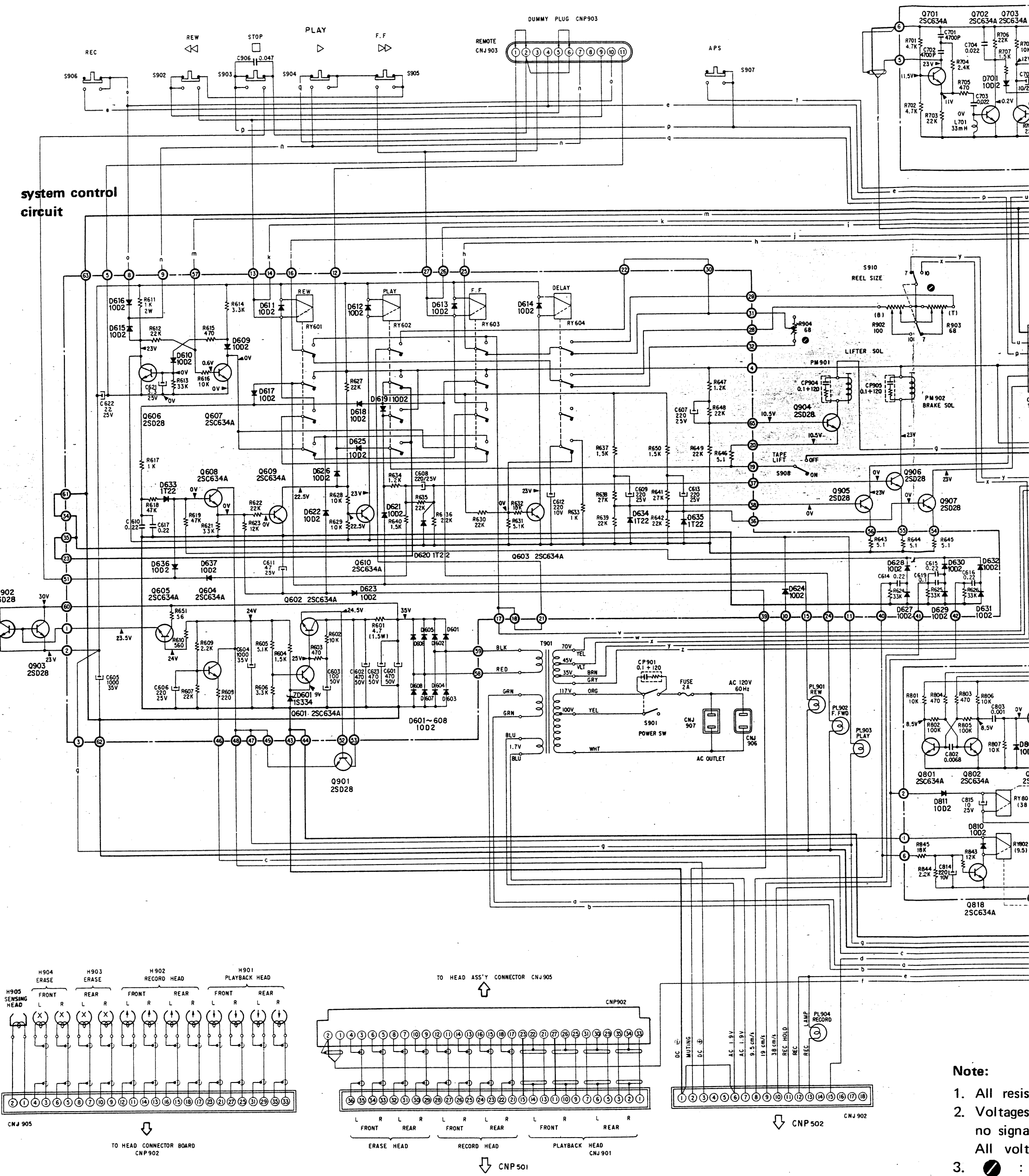
pb amp circuit front L-CH



Note:

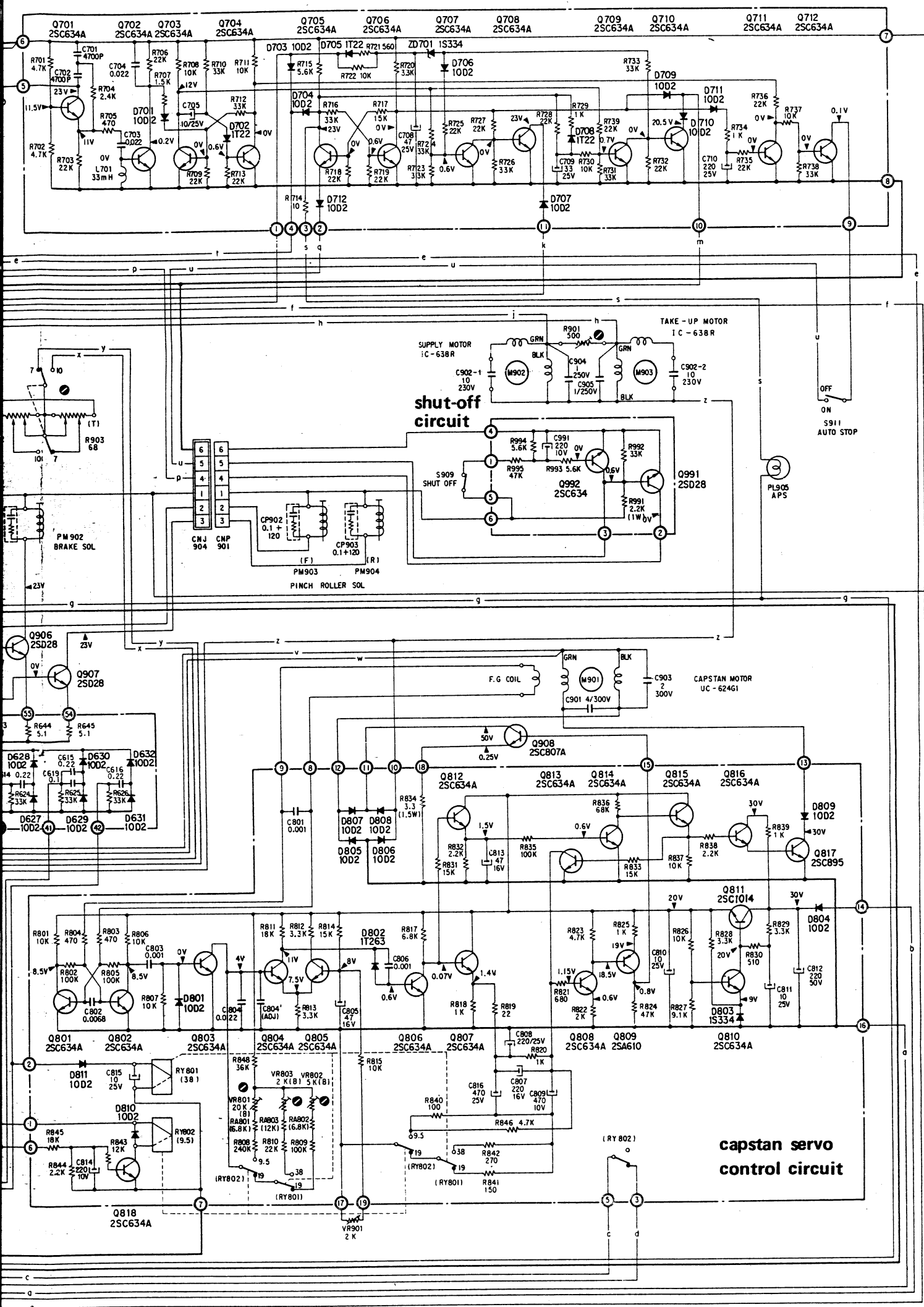
1. All resistors and capacitors are rated in Ω and μF , unless otherwise specified.
 2. Voltages shown are measured to ground by using a voltmeter (20 k Ω /V) with no signal input in STOP mode.
- All voltages may vary slightly due to normal component tolerances, etc.

TC-854-4
SCHEMATIC DIAGRAM — Mechanical Chassis —



Note:
1. All resistors are in ohms unless otherwise specified.
2. Voltages are nominal values.
3. All voltages are measured with no signal applied.

aps & ats circuit

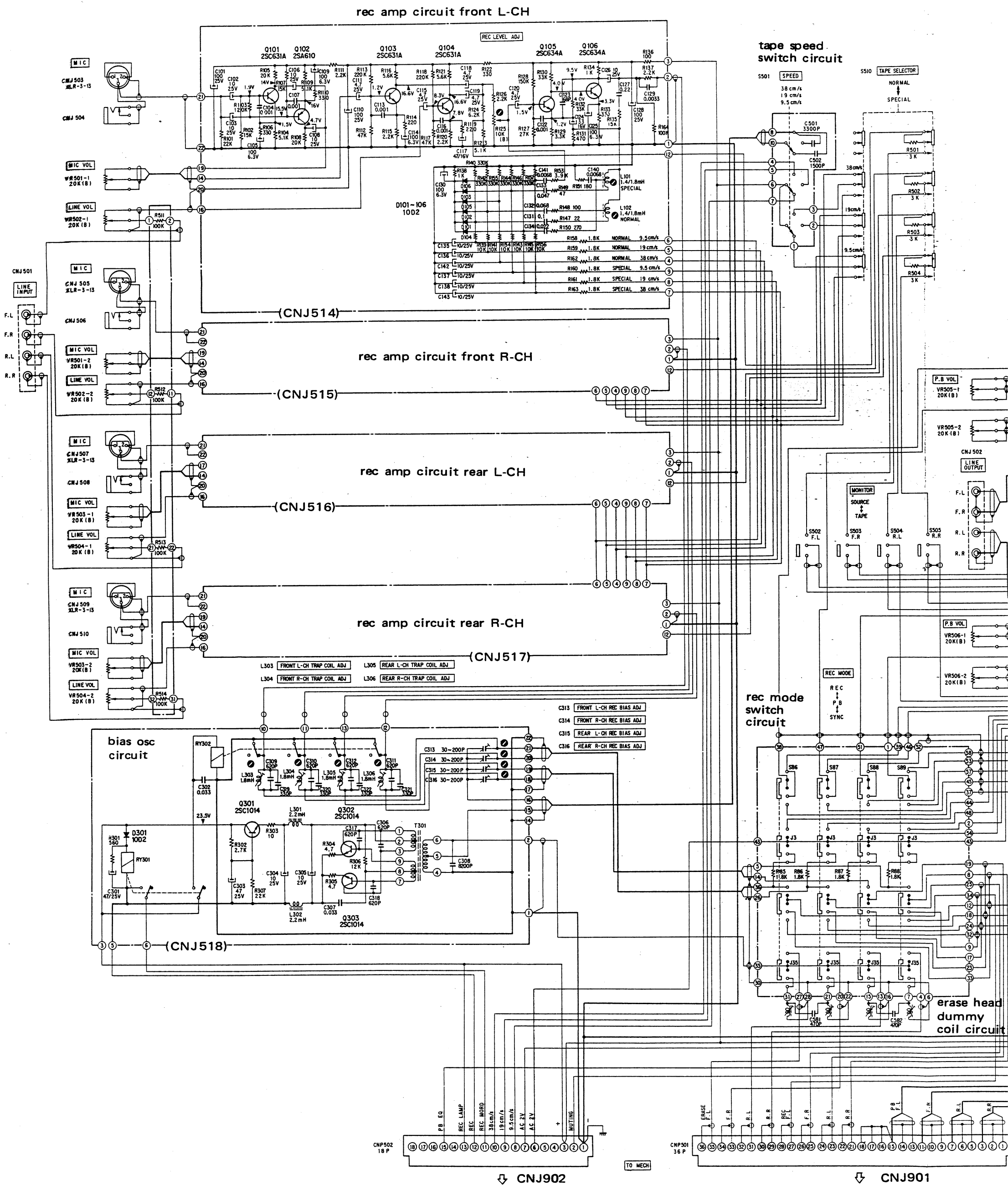


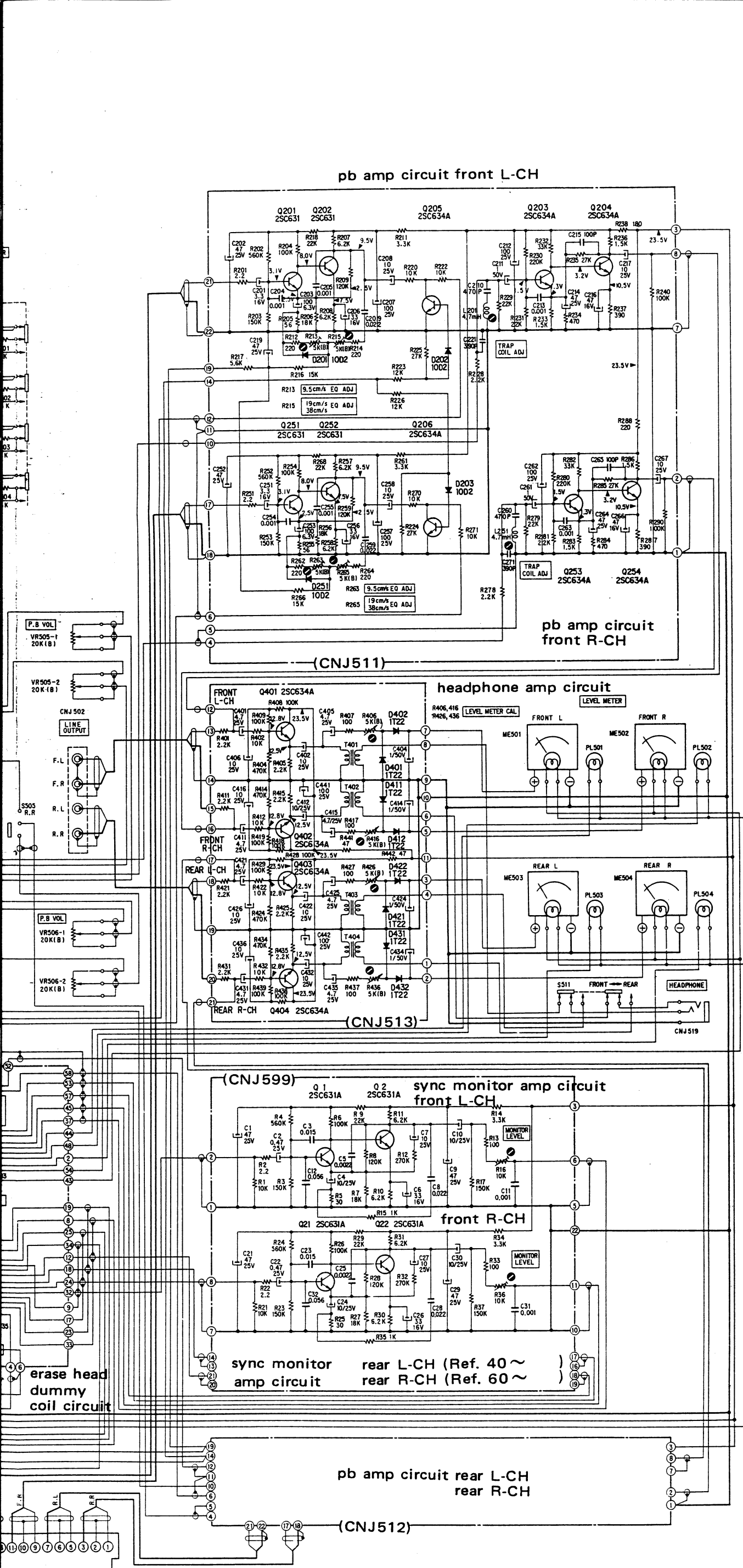
Note:

1. All resistors and capacitors are rated in Ω and μF , unless otherwise specified.
2. Voltages shown are measured to ground by using a voltmeter (20 k Ω /V) with no signal input in record mode.
All voltages may vary slightly due to normal component tolerances, etc.
3.  : adjustable.

Ref. No.	Switch	Position
S901	POWER switch	OFF
S902	rewind function switch	not push
S903	stop function switch	not push
S904	forward function switch	not push
S905	fast forward function switch	not push
S906	RECORD function switch	not push
S907	APS function switch	not push
S908	TAPE LIFT switch	ON
S909	shut-off switch	ON
S910	REEL SIZE switch	7
S911	AUTO STOP	OFF

TC-854-4
SCHEMATIC DIAGRAM — Applicable Serial No.: 10,201 and Later —





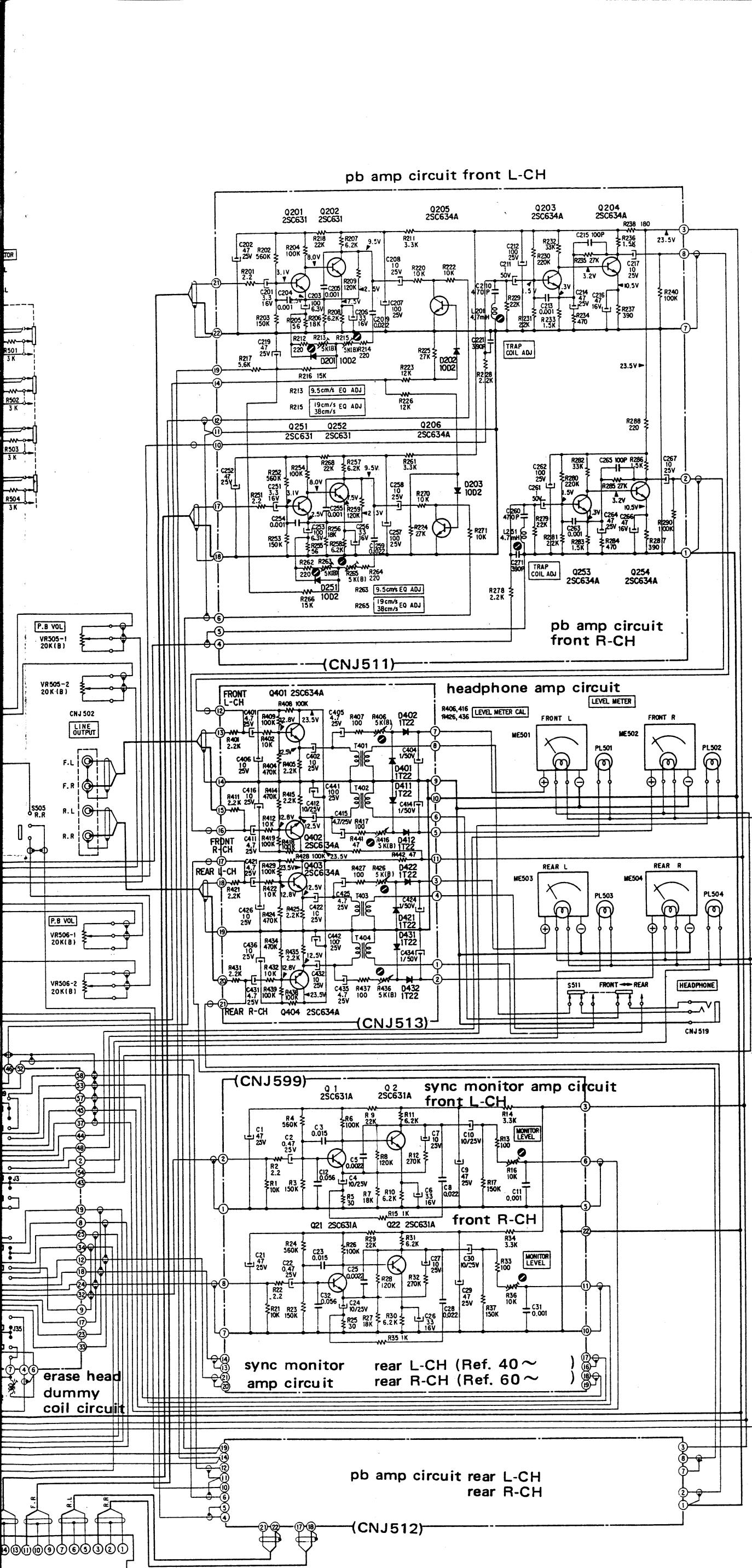
Ref.	Switch	Position
S501	TAPE SPEED switch	9.5 cm/s
S502	MONITOR switch (Front L-CH)	TAPE
S503	MONITOR switch (Front R-CH)	TAPE
S504	MONITOR switch (Rear L-CH)	TAPE
S505	MONITOR switch (Rear R-CH)	TAPE
S506	REC MODE switch (Front L-CH)	PB
S507	REC MODE switch (Front R-CH)	PB
S508	REC MODE switch (Rear L-CH)	PB
S509	REC MODE switch (Rear R-CH)	PB
S510	TAPE SELECTOR switch	NORMAL
S511	HEADPHONE switch	FRONT

Note:

1. All resistors and capacitors are rated in Ω and μF , unless otherwise specified.
2. Voltages shown are measured to ground by using a voltmeter (20k Ω/V) with no signal input in STOP mode. All voltages may vary slightly due to normal component tolerances, etc.

SCHEMATIC DIAGRAM – Applicable Serial No.: 10,201 and Later –





Ref.	Switch	Position
S501	TAPE SPEED switch	9.5 cm/s
S502	MONITOR switch (Front L-CH)	TAPE
S503	MONITOR switch (Front R-CH)	TAPE
S504	MONITOR switch (Rear L-CH)	TAPE
S505	MONITOR switch (Rear R-CH)	TAPE
S506	REC MODE switch (Front L-CH)	PB
S507	REC MODE switch (Front R-CH)	PB
S508	REC MODE switch (Rear L-CH)	PB
S509	REC MODE switch (Rear R-CH)	PB
S510	TAPE SELECTOR switch	NORMAL
S511	HEADPHONE switch	FRONT

Note:

1. All resistors and capacitors are rated in Ω and μF , unless otherwise specified.
2. Voltages shown are measured to ground by using a voltmeter (20k Ω /V) with no signal input in STOP mode. All voltages may vary slightly due to normal component tolerances, etc.

■ Parts List (A Mechanism)

Item	Part Number	Part Name	Q'ty	Description	Area
1	188801501T	CHASSIS BASE	1		
2	18800102T	PACK SPRING	1		
3	SPST2004Z	SCREW	2		
4	18650250AT	TAPE GUIDE	2		
5	18650252T	SCREW	2		
6	18650254T	GUIDE SPRING	2		
7	188802307T	HEAD BASE ASSY	1		
8	18880202T	HEAD PANEL (A)	1		
9	18800204T	RC SPRING	1		
10	188802501T	HEAD PANEL (B) ASSY	1		
11	18800206T	CHP LEVER	1		
12	18800405T	PINCH ROLLER SPRING	1		
13	18650228T	CHP LEVER COLLAR	2		
14	9C0117301T	SCREW	2		
15	62020722T	HEAD	1		
16	9F1316482T	SCREW	2		
17	9P1520063T	SCREW	2		
18	9P0220051T	SCREW	2		
19	18650961T	SPACER	1		
20	18650234T	RELAY BOARD	1		
21	18650249T	WIRE CLAMP	1		
22	9P1220051T	SCREW	1		
23	18880204T	HEAD PANEL SPRING	1		
24	188807307T	RF. CLUTCH ASSY	1		
25	18880709T	RF. PULLER ARM SPRING	1		
26	18880707T	RF BELT	1		
27	11140302T	CORD CLAMP	1		
28	18880212T	SHIELD PLATE	1		
29	188805301T	T. REEL ASSY (F)	1		
30	188805302T	T. REEL ASSY (R)	1		
31	18880515T	B. T. SPRING	2		
32	18880508T	FF. GEAR	1		
33	18880509T	RF. TRIGGER ARM	1		
34	18880216T	PANEL COLLAR	1		
35	9C2520503T	SCREW	1		
36	9W0640030T	HL. WASHER CUT	2		
37	MMI-6H2LWK	DC MOTOR	1		
38	18881210T	MOTOR PULLEY (U)	1		
39	18881202T	MOTOR BRACKET	1		
40	19211202T	SCREW	2		
41	SPST2005Z	SCREW	5		
42	18880925T	M. BELT	1		
43	9W0640040T	HL. WASHER CUT	2		
44	18882109T	TRIGGER ARM SPRING	1		
45	18802105T	PLUNGER	2		
46	18802106T	PLUNGER HOLDER	2		
47	18882108T	SOLENOID	2		
48	18882104T	P. KICK LEVER	1		
49	18802111T	P. K. LEVER SPRING	1		
50	18882101T	CH. SLIDE LEVER	1		
51	18882102T	M. GEAR	1		
52	18882103T	M. TRIGGER ARM	1		
53	18882110T	RF. CAM GEAR	1		
54	REE2000X	E. RING	1		
55	9W0650040T	HL. WASHER CUT	1		

Item	Part Number	Part Name	Q'ty	Description	Area
56	18885306T	P. BASE	1		
57	18885303T	IC PROTECTOR	1		
58	640101193T	LEAF SWITCH	2		
59	640101194T	LEAF SWITCH	1		
60	640101195T	LEAF SWITCH	1		
61	68040604T	HALL IC	1		
62	68150206T	CONNECTOR	1		
63	18885304T	P. BASE STAND	2		
64	SPST2004Z	SCREW	1		
65	188805501T	T. GEAR ARM (F) ASSY	1		
66	18880507T	T. GEAR	2		
67	188805502T	T. GEAR ARM (R) ASSY	1		
68	18880513T	T. G. ARM (F) SPRING	1		
69	18880514T	T. G. ARM (R) SPRING	1		
70	188804301T	PINCH ROLLER ARM (F) ASSY	1		
71	18800403T	P. ARM (F) SPRING	1		
72	188804302T	PINCH ROLLER ARM (R) ASSY	1		
73	18800404T	P. ARM (R) SPRING	1		
74	188809301T	FL METAL (F) ASSY	1		
75	188809302T	FL METAL (R) ASSY	1		
76	9W0650050T	HL. WASHER CUT	1		
77	188809311T	FLYWHEEL (F) ASSY	1		
78	9W0650080T	HL. WASHER CUT	1		
79	188809312T	FLYWHEEL (R) ASSY	1		
80	9W0520030T	HL. WASHER	2		
81	18881309T	EJECT STOPPER	1		
82	18881302T	EJECT STOPPER	1		
83	99991404T	SCREW	1		
84	18801320T	SPRING	1		
85	18801305T	E. STOPPER COLLAR	1		

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