HITACHI

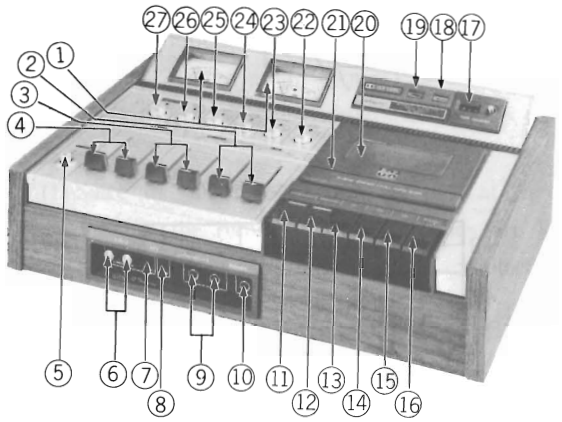
D-3500

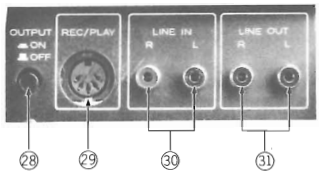
SERVICE MANUAL

GENERAL
USA
CANADA
AUSTRALIA

No. 764

NAME OF PARTS





1. Level meter
2. Line recording level control
3. Mic recording level control
4. Output level control
5. Power switch
6. Dolby calibration control
7. Test signal button
8. MPX filter switch
9. Mic jack
10. Headphone jack
11. Stop/Eject
12. Recording
13. Playback
14. Rewind
15. Fast forward
16. Pause
17. Tape counter
18. Playback indicator
19. Recording indicator
20. Cassette lid
21. Head cover
22. Meter selector switch
23. Memory counter switch
24. Tape selector switch
25. Dolby switch
26. Input selector switch
27. Monitor switch
28. Output switch
29. Din jack
30. Line in jack
31. Line out jack

FEATURES

1. R & P combination head
2. Low wow design with 4-pole hysteresis synchronous motor, large flywheel (100mm dial) and precision finished capstan (circular accuracy 0.1μ)
3. Peak level meter
4. Tape selector with chrome tape automatic changeover
5. Double Dolby noise reduction system
6. Dolby calibration control system
7. Full auto-stop
8. Independent controls for Mic and line in
9. MPX filter
10. Cassette tray enabling easier insertion of cassette
11. Tape-running stabilization mechanism (Tape shifter)
12. Open/close type head cover

SPECIFICATIONS

Power source
AC 120V 60 Hz (USA / Canada)
AC 100-110, 115-127, 200-220, 230-250V 50 Hz or 60 Hz (General / Australia)

Power consumption
20W

IC
15

Transistor
25 (including FET)

Diode
30

Thermister
2

Tape speed
4.75 cm/s

Cassette used
C-60, C-90

Recording system
4-track 2-channel AC bias system

Recording bias oscillation frequency
105 kHz

Erasing system
AC erasing system

Playback compensation time constant
NORMAL/UD : 120μs, CrO2 : 70μs

Head used
Recording head, Playback head } R & P combination (ferrite) head : 1
Erasing head (ferrite) head : 1

Motor used
4-pole hysteresis synchronous motor : 1

Frequency characteristics
Chrome tape 20–20,000 Hz
Normal tape 20–15,000 Hz

Wow & flutter
0.05% WRMS

S/N
Dolby "ON" 63 dB
Dolby "OFF" 55 dB

Distortion
2.0% (1 kHz, 0 dB)

Erasing
65 dB

Cross-talk
60 dB

Input sensitivity
Line input jack : 35 mV
Mic jack : 0.18 mV
Din jack : 0.18 mV

Input impedance
Line input jack : more than 100kΩ
Mic jack : 300Ω–20 kΩ (compatible impedance)
DIN jack : 2 kΩ

Output load impedance
Line output jack : more than 50 kΩ
Headphone jack : 8Ω–2 kΩ (General, Australia)
DIN jack : more than 50 kΩ : 8Ω (USA, Canada)

Output level
more than 0.5 V

Fast feed/rewind time
90 sec (C-60 used)

External dimensions
43.0(W)×14.0(H)×28.3(D)cm

Weight
7.0 kg

ACCESSORIES

AC plug adaptor (General)
DIN cord (General / Australia)
Patch cord (USA / Canada)
Motor pulley (60 Hz) (General / Australia) (fixed on chassis)

CONTENTS

STEREO CASSETTE TAPE DECK

May 1975

TECHNICAL EXPLANATION

1. Combined Recording/Playback head

The independent recording and playback heads are held in a single case ; this system has the following advantages.

1-1 Since there are independent recording and playback head, each with its own characteristics, low distortion, high sensitivity and good high frequency band characteristics can be obtained.

The object of the magnetic heads is for the recording head to record high level signals on the magnetic tape with minimum distortion so that a high level output can be obtained during playback ; the playback head must play the signals recorded on the tape back efficiently.

The reason why high quality open-reel tape decks have three heads (independent heads for erasing, recording and playback) is so that the performance of each head can be optimized.

Table 1 shows an example of the gap sections of the recording and playback heads of an open-reel tape deck.

It is desirable that the heads are designed with the gap of the recording head near the magnetic coating of the tape and the gap of the playback head approximately 1/3 of the wavelength of the highest frequency recorded.

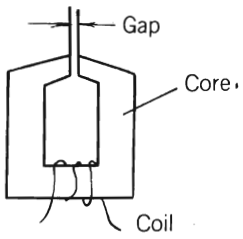


Fig. 1

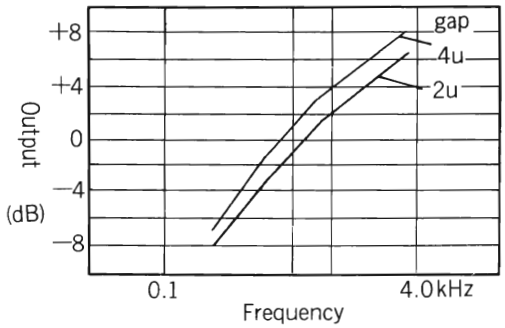


Fig. 2

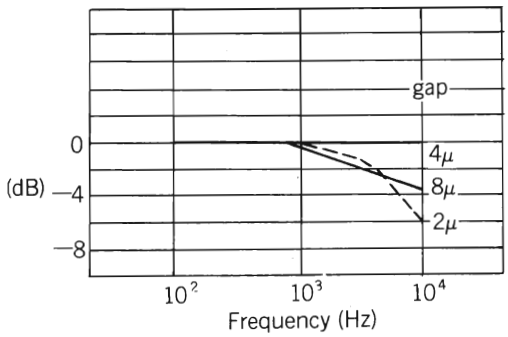


Fig. 3

	Recording head	Playback head
Gap	12.7μ	2.5μ

Table 1

In calculating the gap widths of the recording and playback heads of a cassette tape recorder from the standpoint of optimizing distortion/sensitivity and frequency characteristics, the following points must be taken into consideration. Fig. 2 shows freguency/sensitivity characteristics of recording heads with different gaps. For the same freguency, the playback output level of signals recorded with the 4μ gap head is 2 dB greater than those recorded with the 2μ gap head.

Fig. 3 shows the recording frequency/sensitivity characteristics of the recording heads. When compared with signals recorded with the 4μ gap head, the output at 10kHz is 4 dB down with a 8μ gap head and 6 dB down with a 2μ gap head, as can be seen from the diagram.

The gap width of the playback head determines the playback sensitivity and playback characteristics.

The wavelength of 10kHz signals recorded on cassette tape is 4.75μ so the gap width for optimum frequency characteristics is less than 1.5μ.

Distortion, sensitivity and frequency characteristics are optimized by making the gap of the recording head 1μ and that of the playback head 1.2μ, as described above.

1-2 Since both the recording and playback heads touch the cassette pad, wide frequency characteristics with small level fluctuations can be obtained.

The standards for the construction of cassettes specify 5 windows of different sizes and various combinations were considered. The system shown in Fig. 4 was adopted for the D-3500 to improve its characteristics as described below.

(1) Since the shield plate and pad are at the center window, the recording/playback heads are installed here to prevent induction and improve contact between the tape and head.

(2) The tape shifter is used to reduce level flucutations and minimize wow and flutter. Frequency characteristics are improved by making tape contact better.

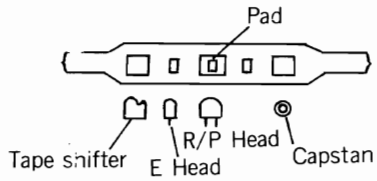


Fig. 4

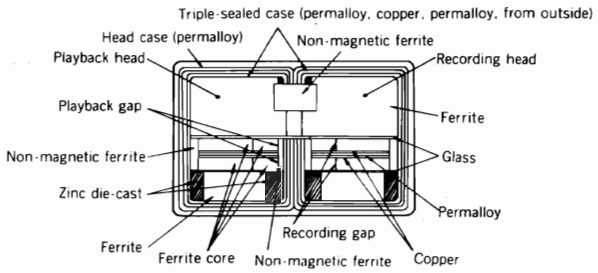


Fig. 5

1-3 Since ferrite cores are used, it is resistant to wear and good channel separation can be achieved.

The ferrite core has the following features :

(1) Resistance to wear is excellent and service life is long.

(2) High accuracy gaps can be manufactured, the playback head having a narrow 1.2μ glass gap.

(3) Since the head is a combination of recording/playback heads, the azimuth of the recording and playback heads cannot be adjusted independently, so the degree of parallel of the gaps and the accuracy of track width must be strictly controlled. By manufacturing heads with the gaps accurately parallel within 1μ/10mm, innacurate azimuth can be eliminated and channel separation improved.

1-4 By providing sufficient shielding, leakage of crossfeed signals from the recording to playback head can be reduced to less than the noise level.

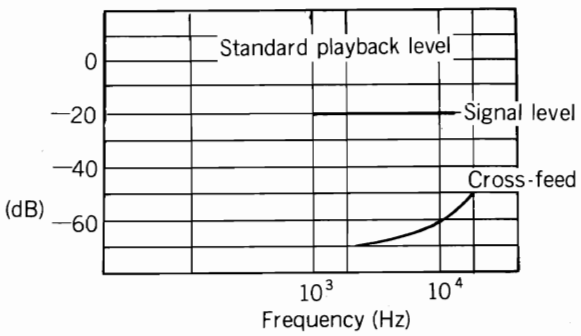


Fig. 6

Magnetic flux from the recording head not only passes through the tape but also leaks to the playback head. When this magnetic flux is at a high level, the signals picked up from the tape and magnetic flux leaking from the recording head are accumulated, so the output from the playback head is accompanied by noise.

This leakage of flux is called croos-feed and must be limited to 50 dB down, less than the noise level.

For this reason, the recording and playback heads are enclosed in the three layer shielding case — permalloy-copper-permalloy — shown in Fig. 5, so that playback output resulting from cross-feed is at the same or a lower level than noise.

2. TAPE SHIFTER AND TAPE GUIDE

With only the narrow pad built into the cassette providing uneven pressure, this is insufficient to obtain the constant and stable tape contact required by the combined recording/playback head. It is necessary to apply tension to the tape so that stable contact is made with the head surface. One method in which this is done is by providing the suppling turntable with back tension ; however, this causes the wow and fluuter to deteriorate in proportion to the tension applied as shown in Fig. 7. (A back tension of 20～25gr-cm is necessary in the D-3500.)

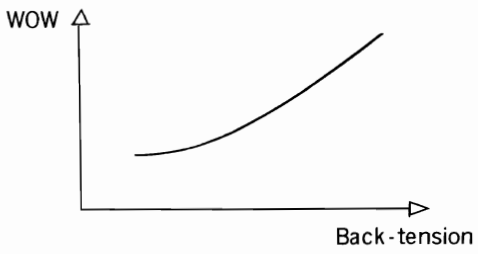


Fig. 7

Applying back-tension to the guide roller and the tape after the roller is sufficient to prevent the deterioration of the wow and flutter, lessening the influences of irregularities in the turn table, guide roller, etc.

To perform this, the newly developed Tape Shifter shown in Fig. 8 is used.

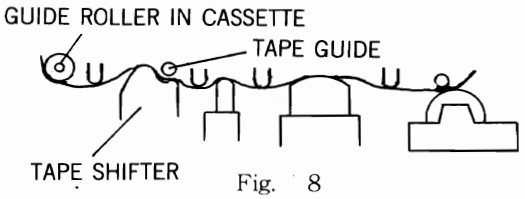


Fig. 8

As shown in Fig. 9, back-tension against the head is given by

$T=To\,e^{\Sigma\mu\theta}$

μ : Friction

θ : Azimuth of tape and tape guide

To : Tape tension before tape shifter

The back-tension of the cassette spool itself (1－2g-cm), is amplified to a tape tension of 20～25gr-cm against the head. In this way, the influence of cassette irregularities is eliminated and stable contact between the head surface and tape is achieved by the tesion of the roller. In addition, the groove in the Tape Guide absorbs irregularities in the tape running height, which is a result of the slight difference between cassettes. Thus, the contact between the tape and the erase and combination recording/playback heads is stable.

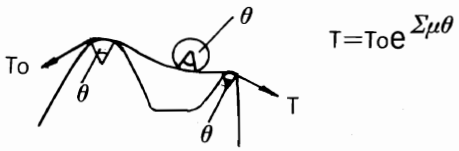


Fig. 9

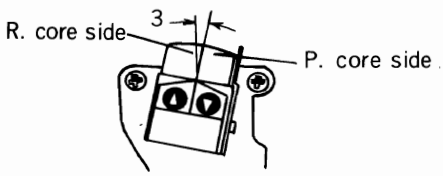


Fig. 10

Note : Some cassettes available have smaller pads. When such a cassette is used, if the R/P head is at right angles to the tape, the pad will be inclined to the play core and the tape pressure on the recording core will deteriorate.

To prevent this, the R/P head is installed inclined at 3° to the tape running direction, to ensure improved tape pressure against the recording core with all tapes available.

3. Full Auto-stop

The Auto-stop mechanism ensures that the stop mode is entered when the end of tape is reached in all modes-playback, recording, fast-forward and rewind.

(1) Pulley (1) which is the same unit as the worm gear rotated by the T-pulley, rotates and drives the cylindrical cam and its worm gear in the direction of the arrow. (a), (b), (c)

(2) Pulley (2) is driven by the belt from the take-up turntable. (d)

(3) The stopper is held at the lower part of pulley (2) by the weak force of the slip mechanism. The pin at the tip of the stopper is kept in the groove of the cylindrical cam, and as the cam rotates, it is turned in the groove.

(4) When the tape is running during recording, playback and fast-forward, pulley (2) rotates counterclockwise and the pin at the tip of the stopper also rotates counterclockwise with a slight force ; the pin moves along the surface inside the groove of the cylindrical cam. In the rewind mode, pulley (2) rotates counterclockwise and the stopper rotates clockwise. (e)

(5) When the tape stops in the condition described in (4), the rotation of the take-up turn table stops ; since a force causing the tip of the stopper to rotate is not applied, it is pushed straight forward (it does not deviate as the groove is narrow) and is caught by the projection in the groove, whereupon the rotation of the cylindrical cam stops. (f)

(6) Since the worm gear shaft continues to rotate, when the cylindrical cam and worm gear stop, the worm gear shaft drops in the direction of the arrow. (g)

(7) When the worm gear shaft drops it presses the eject lever in the direction of the arrow. (h)

(8) The eject lever rotates around its fulcrum in the direction of the arrow. (i)

(9) The revolution of the eject lever cause the lock slider and lock-off piece to move in the direction of the arrow. (j) (k)

(10) When the lock piece moves, it is kicked in the direction of the arrow by the projecting portion of the flywheel and the lock plate locking the button moves in the direction of the arrow, the button is unlocked and the machine enters the stop mode. (e) (m)

During the PAUSE and STOP modes, the cam is positioned so that the pin of the stopper does not come into contact with the projecting part of the cylindrical cam so that the auto-stop mechanism does not function.

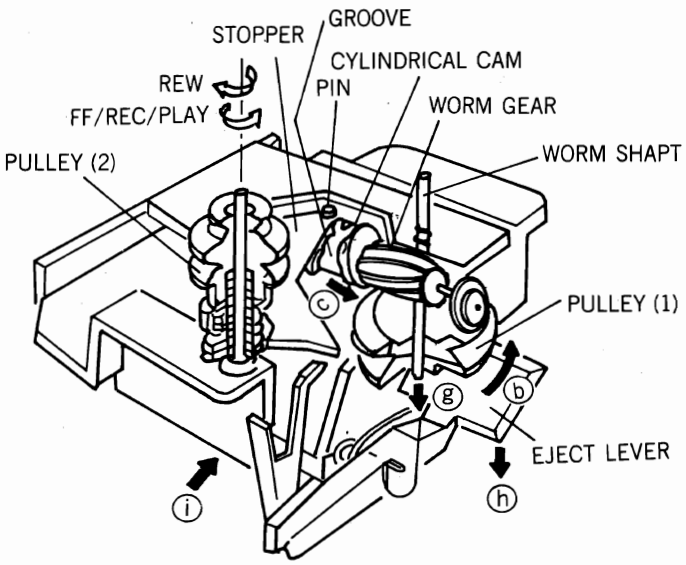


Fig. 11

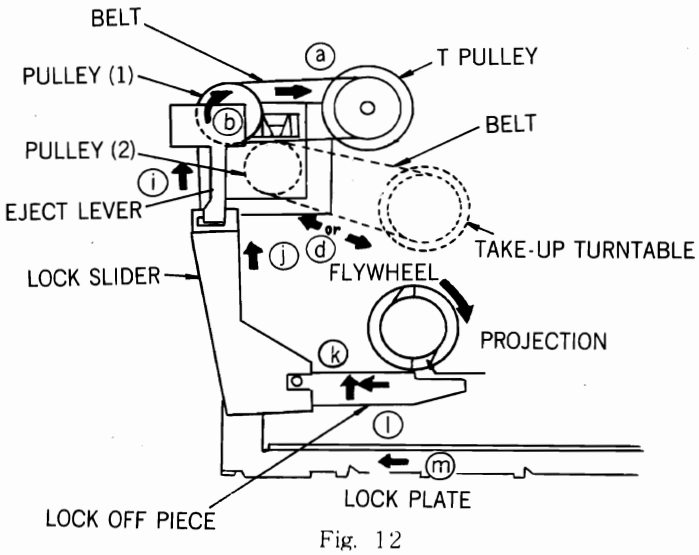


Fig. 12

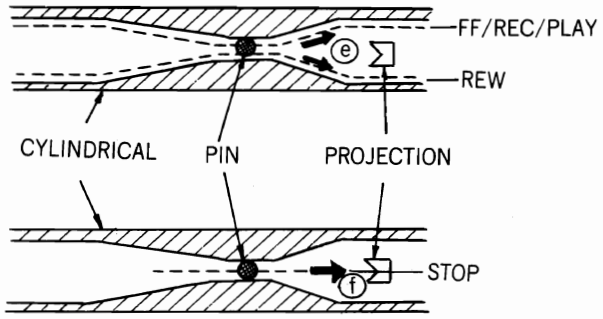


Fig. 13

4. Memory Counter

When the tape is rewound to the beginning of the recording with the memory counter switch (S10-1) set to ON and the tape counter having been reset to 000 before recording or playback, when 999 is indicated by the tape counter, switch S13 inside the counter turns ON, Q502 starts operation, current flows to the solenoid and the mechanism stops.

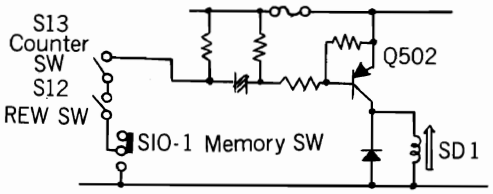


Fig. 14

5. CrO_2 cassette automatic changeover (S15)

Some cassettes containing chrome tape have CrO_2 detection holes as shown in Fig. 15. when this kind of cassette is loaded, micro-switch S15 is turned OFF, automatically switching on-line the recording/playback equalizer, recording bias and sensitivity for best use of chrome tape.

When a normal cassette is loaded, this hole is not detected and the switch is turned ON.

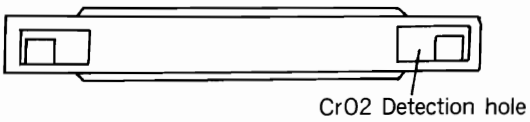


Fig. 15

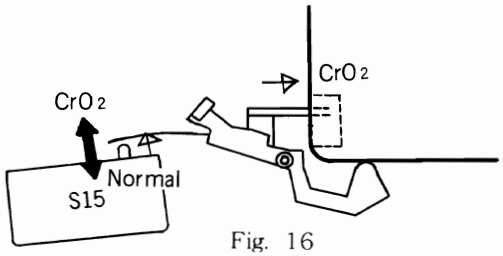


Fig. 16

Explanation of CrO_2 circuit

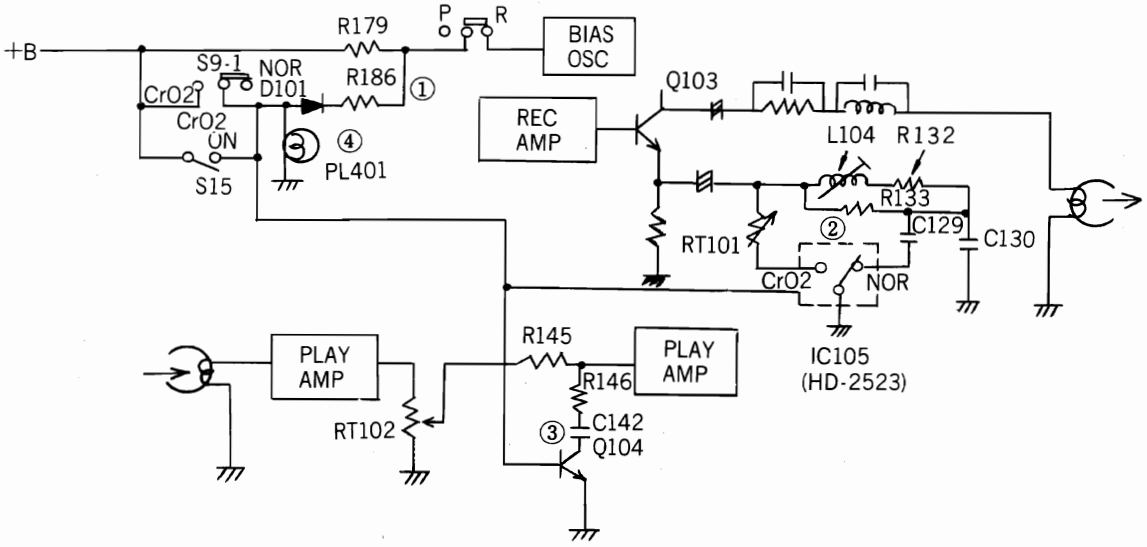


Fig. 17

(1) Bias current

To make the best use of chrome tape, a higher bias current is required than in the case of normal tape. Accordingly, R186 is inserted between +B and the bias circuit to increase the voltage supplied to the bias circuit when chrome tape is being used, thus increasing the bias current.

(2) Recording equalizer and sensitivity

When using chrome tape switched over to CrO_2, power is applied to the digital IC, changing over the recording equalizer and senitivity. In the CrO_2 position, RT101 is inserted to increase sensitivity.

(3) Playback equalizer

When chrome tape is used, Q104 operates to compensate for the changed time constants (Normal tape ; 120μs, chrome tape : 70μs) via R146 and C142.

6. Level meter circuit

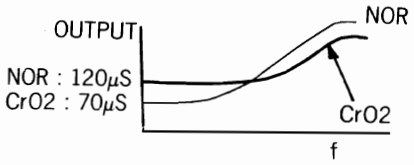
Fig. 18 shows a level meter which is not a peak level meter but which indicates Ia (average value). It is a combination of a variable coil ammeter and diodes.

With this type of meter, the level of the input signal which detends on the head, tape, etc. is determined by the circuit and it is clipped when the point at which it exceeds the satuaration level is shown. For pulse inputs with a wide dynamic range, the meter must show the peak value reached by the top section of the wave without clipping if the saturation level is not to be exceeded.

Fig. 20 shows a circuit which will indicate the peak value. Input ei is rectified and charges C. This discharges through the meter circuit with Ro and the current I_2. shown in Fig. 20, flows. When rectification is performed in this circuit with a time constant of Ri: C $\fallingdotseq$ 0, RoC $\gg$ meter response time, and the peak value of the input waveform shown in Fig. 19 is indicated. Fig. 22 shows the response time of the meter ; with a VU meter, the time required for a 90% indication is 300ms and the input current must be present for more than 300ms. However, the meter used in the D-3500 has a shorter response time, giving a 90% indication within 50ms.

(4) Indication lamp

PL401 is turned on when chrome tape is used. D101 is provided to prevent it lighting when normal tape is used.



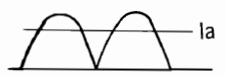


Fig. 18

Fig. 19

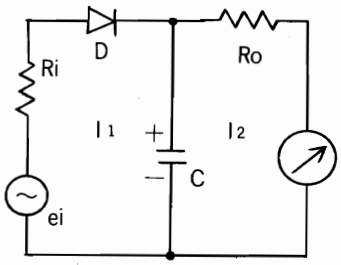


Fig. 20

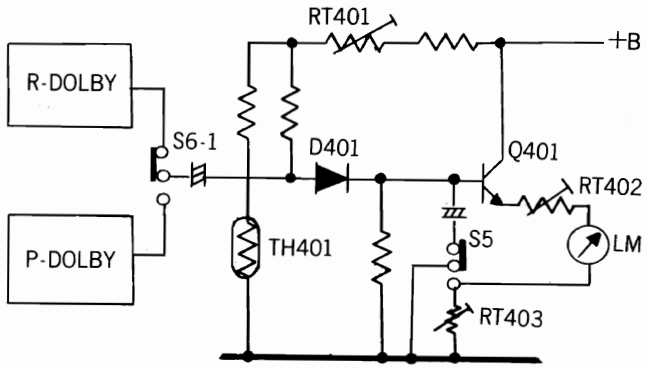


Fig. 21

Operation of each component shown in Fig. 21 is as follows.

1. Q401 is an emitter follower ; it increases the input the impedance and discharging time constant.
2. RT401 is a bias adjustment resistor, acting line on D401.
3. RT402 is a meter correction resistor when used as a VU meter.
4. RT403 is a meter correction resistor when used as a peak level meter.

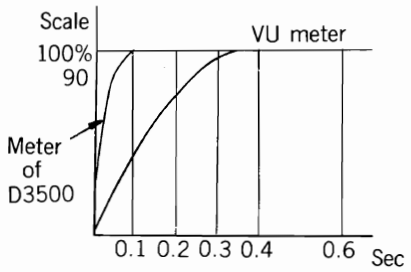


Fig. 22

7. Dolby Circuit

The Dolby noise reduction circuit can cut tape noise, improving the Signal-to-Noise ratio by up to about 10 dB without causing the frequency characteristics to deteriorate. Since the D-3500 is a 3-head deck, with independent recording and playback heads and amplifiers, two Dobly circuits are incorporated, for recording and playback. When monitoring during recording, monitoring of the signal after it has been processed by the Dolby circuit is possible.

Dolby operates by varying the gain at high frequencies, reducing noise and playing back Dolbyized tapes with a flat frequency response. However, since different kinds of tapes have different sensitivities, the flat frequency characteristic shown in Fig. 23 cannot normally be achieved. To prevent this unbalance, the sensitivity can be matched by using the built-in oscillator.

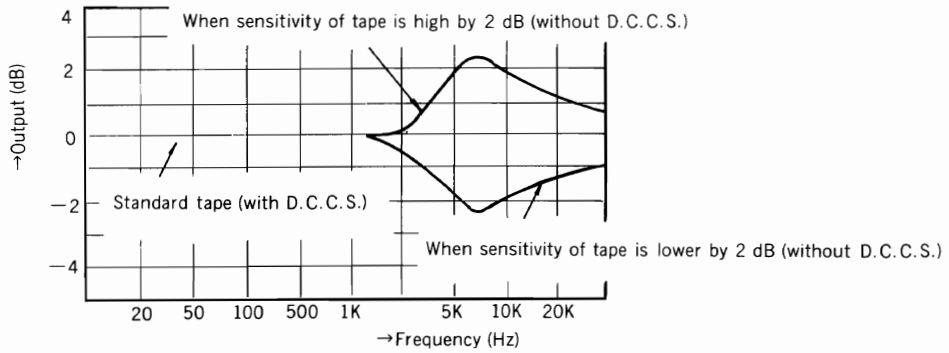


Fig. 23

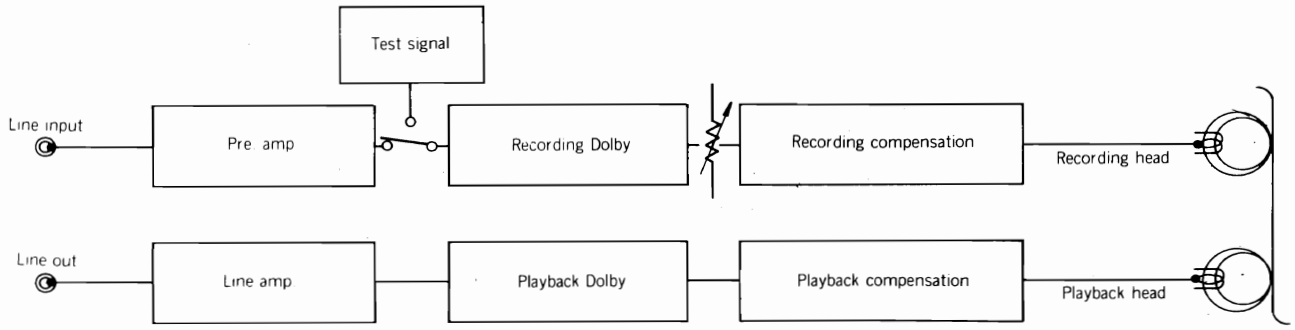


Fig. 24

8. TAPE/SOURCE Monitor (S6)

TAPE monitoring (monitoring the signal recorded on the tape) is possible as the D-3500 is a 3-head tape deck with independent recording, playback and erase heads.

NOTE :

Models for General and Australia have to be used with the PLAY and PAUSE buttons depressed, to monitor *source sound* prior to starting the tape. No sound willbe heard if monitoring is done in STOP mode.

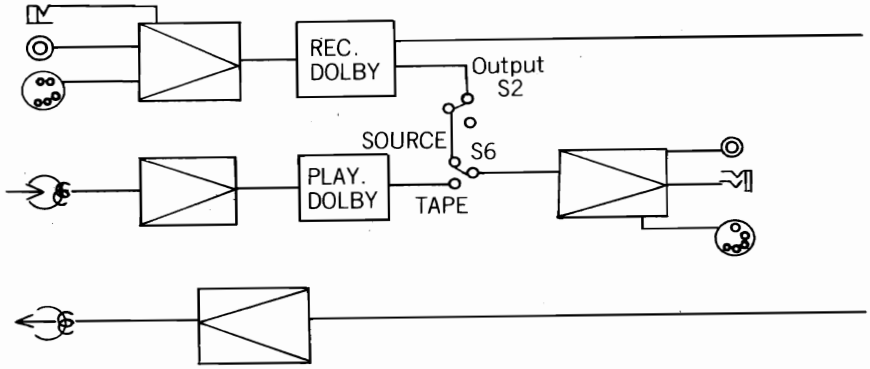


Fig. 25

9. Output switch (S2)

When connected to a stereo system using a DIN cord, oscillations may occur, so a switch is provided to turn off the output if this occurs. Abnormal oscillations occur during recording as a result of loops (1) and (2). shown in Fig. 26. To prevent this, output is cut by switch S2 when recording.

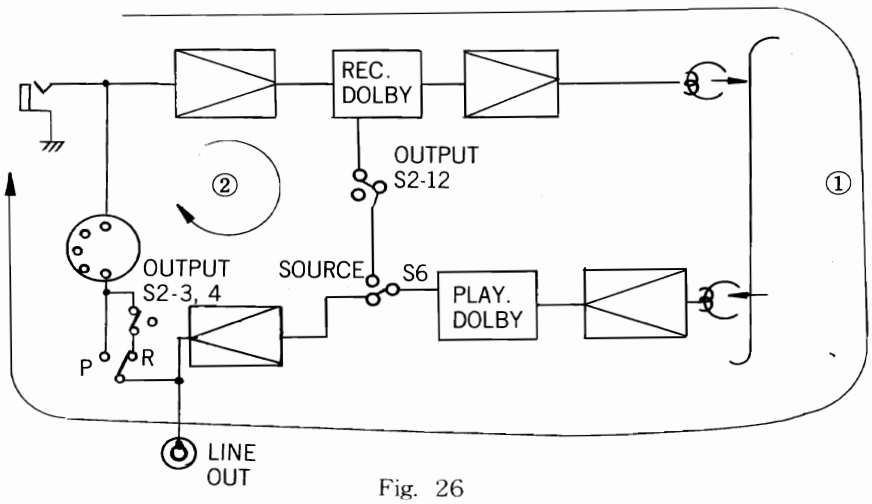


Fig. 26

10. Input selector (S7)

Select MIC and LINE inputs with S7.

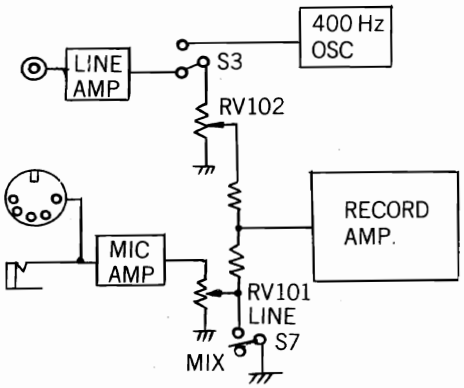


Fig. 27

11. MPX filter (S4)

The amount of compensation provided by the Dolby circuit varies with the input level. However, when the MPX separation signal leaks in FM stereo, correct compensation cannot be achieved.

To prevent this, it is necessary to provide an FM MPX filter to remove the 19kHz pilot signal and 38kHz subcarrier during Dolbyized recording.

Note : The filter is inserted when S4 is ON, so the frequency characteristic is no more than with the MPX filter switched OFF.

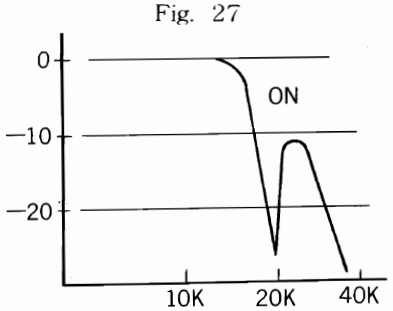


Fig. 28

DISASSEMBLY PROCEDURE FOR ALIGNMENT AND PART REPLACEMENT

Numerals in ◯ indicated on Fig. 29 and 30 show ones of Disassembly procedure.

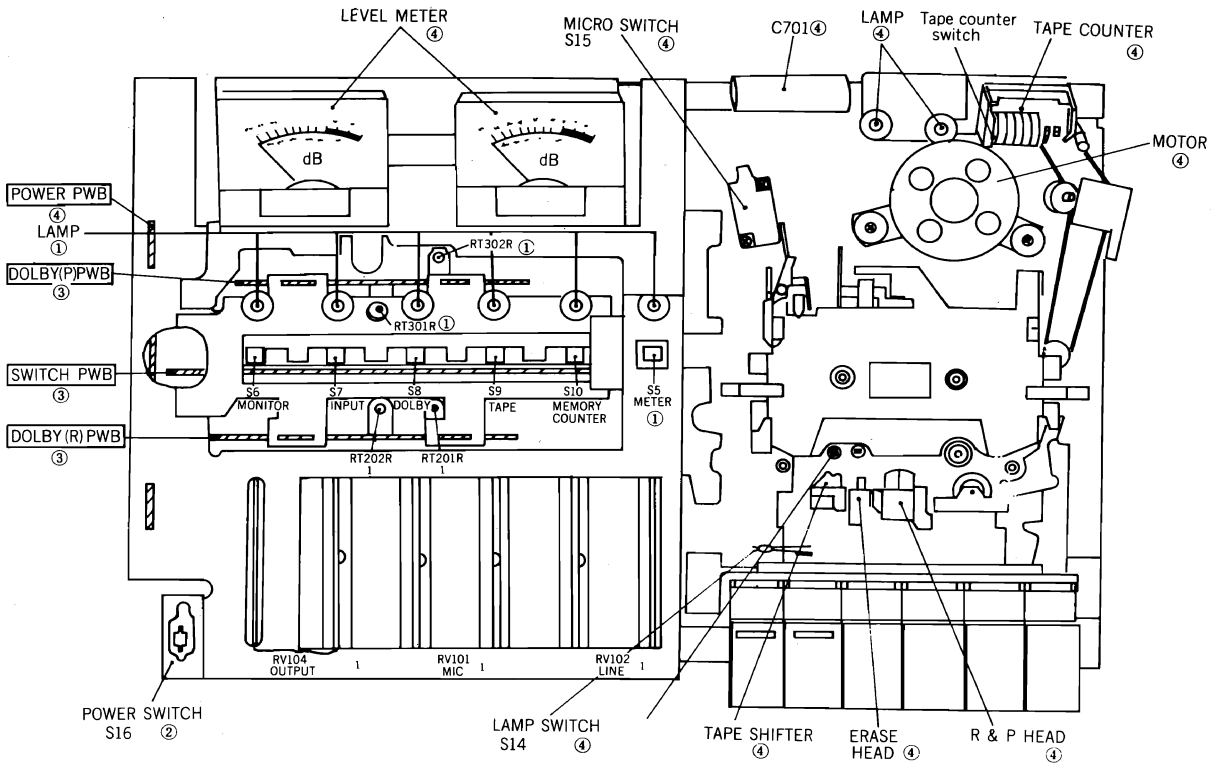


Fig. 29

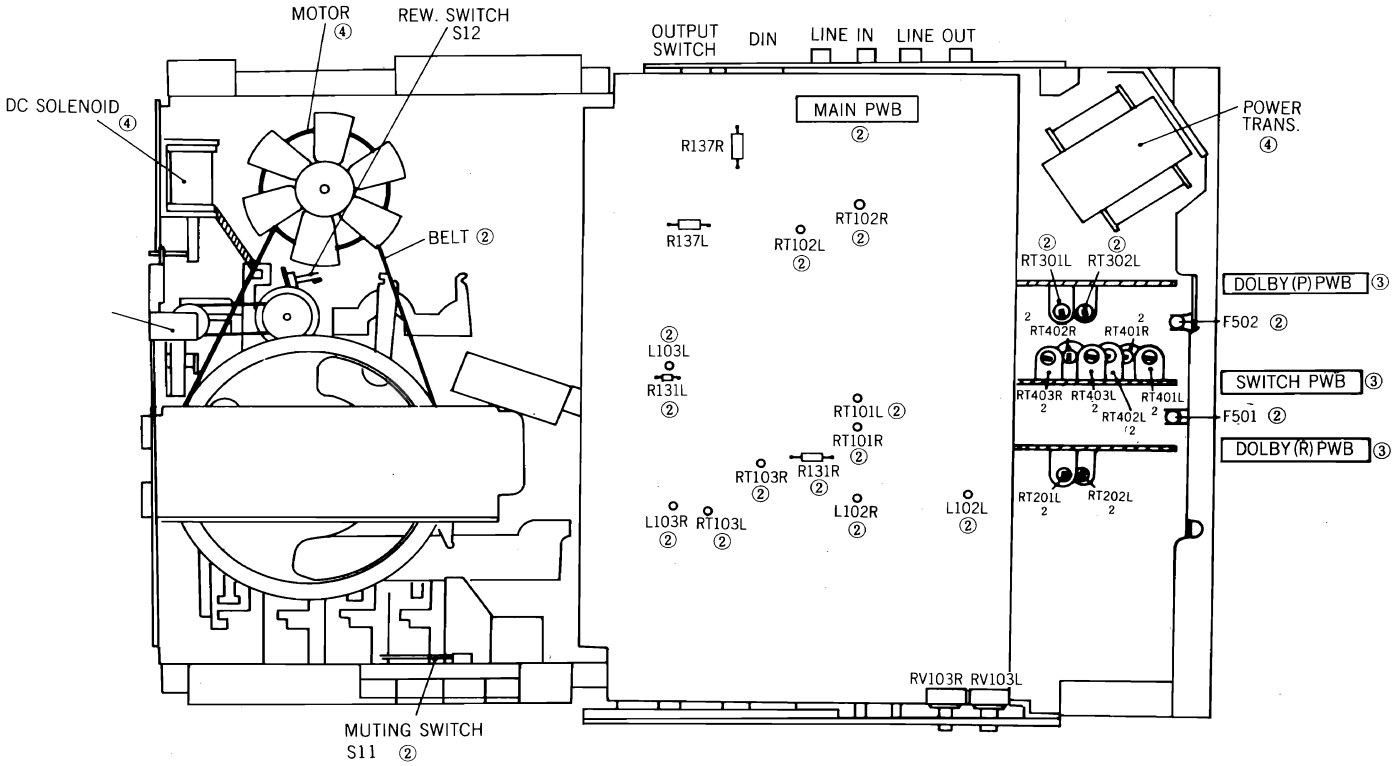
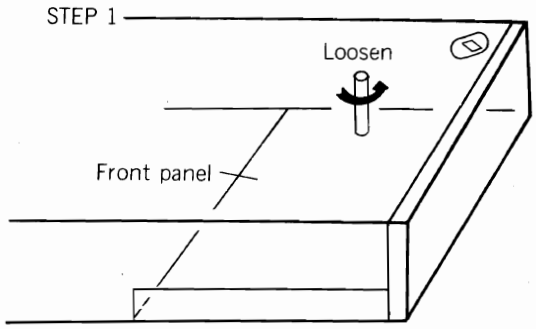
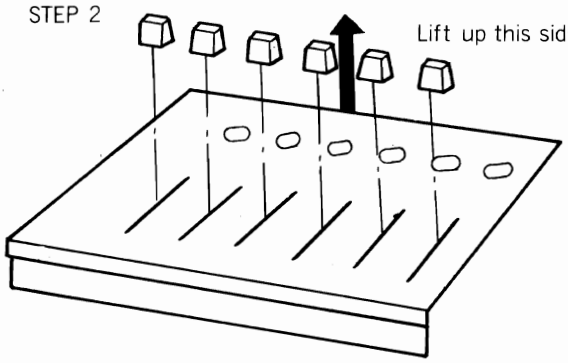


Fig. 30

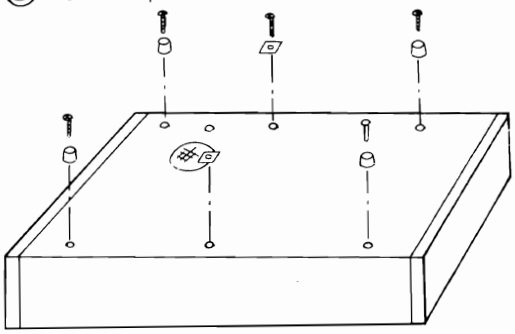
Disassembly procedure

① Front panel

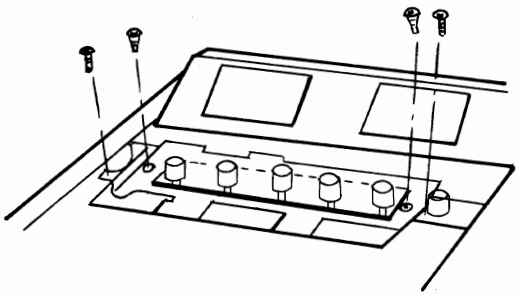




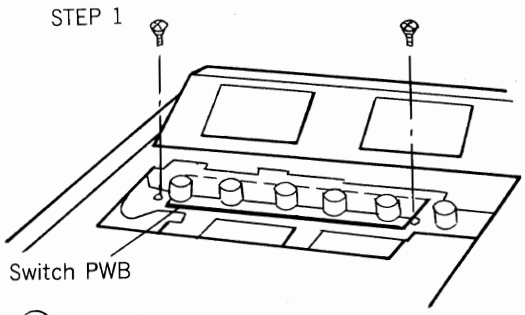
② Bottom plate

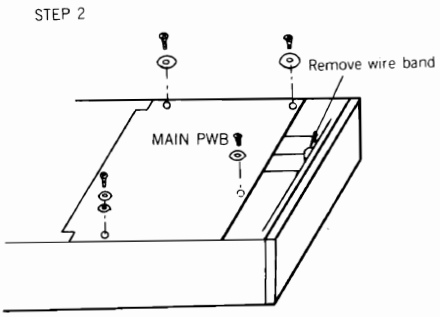


Lamp and Meter SW replacement

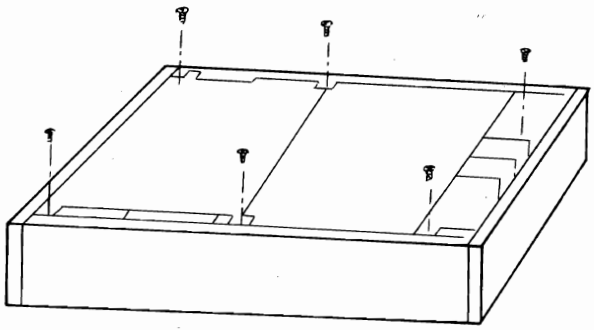


③ MAIN PWB with Dolby and Switch PWB

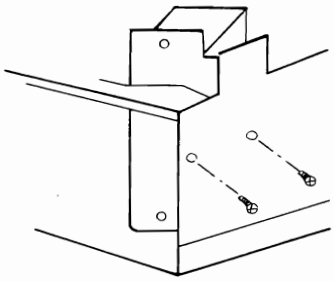




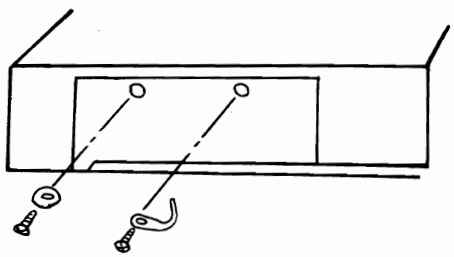
④ Chassis



Power Trans. replacement

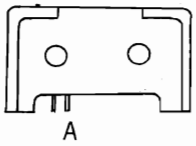


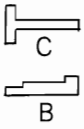
⑤ Power PWB

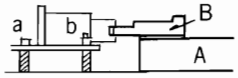
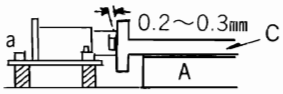
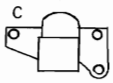
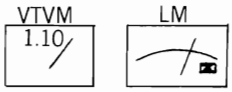
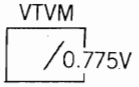
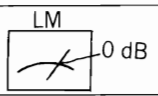
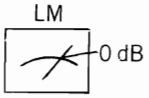


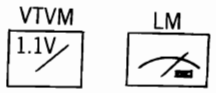
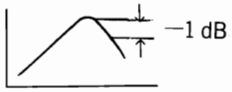
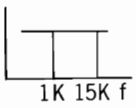
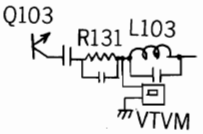
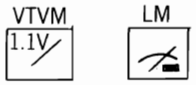
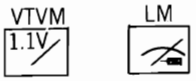
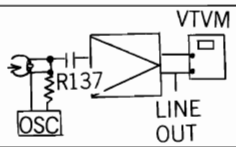
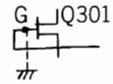
ELECTRICAL ADJUSTMENT

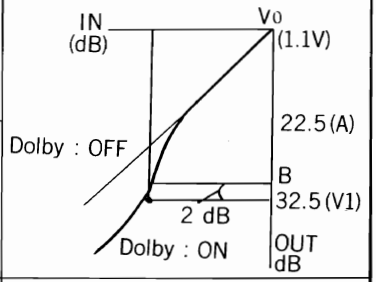
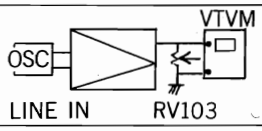
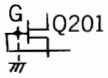
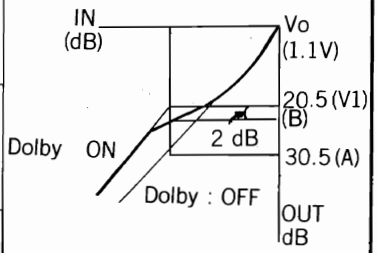
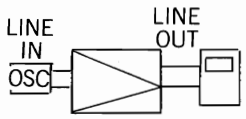
Special tools are necessary to perform the head adjustment shown in item 1. When adjustment is necessary, consult your nearest HITACHI. OFFICE



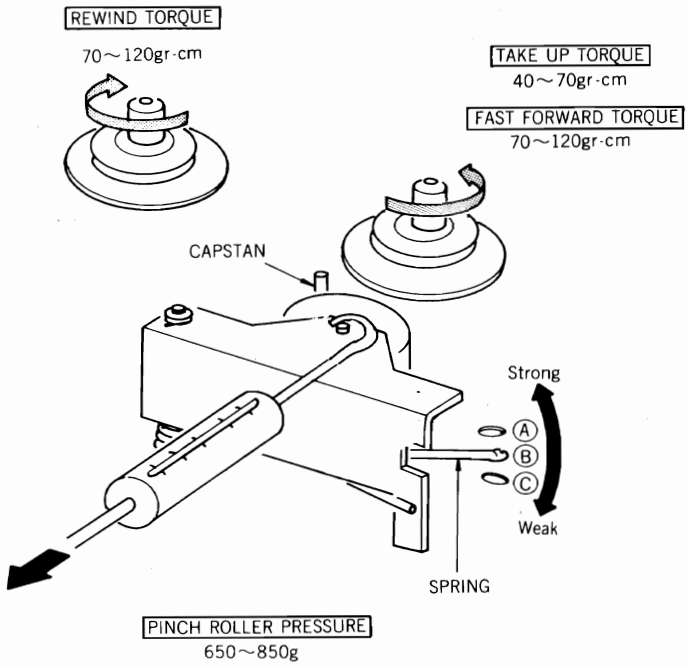


	Item	Instrument	Playback/ Recording	Switch pos'n	Adjust part	Method	Remarks
1.	R/P head						
	1-1 height	Tools A & B	Play	–	Screws a & b	Slide tools B to match head guide	
	1-2 gate	Tools A & C	Play	–	Screw a	Gap between tool C & upper surface of head 0.2–0.3㎜	
	1-3 azimuth	Azimuth standard tape	Play	NORMAL	Screw c	Maximize output	
2.	Playback amp. gain	Standard gain tape (Dolby tape 20m Maxwell) VTVM	Play	NORMAL	RT102	Output should be 1.1V	
3.	Level meter						
	3-1 Zero	–	–	–	RT401	Remove all inputs Adjust RT401 so pointer indicates zero	
	3-2 VU	–	–	Meter : VU Monitor : Source		Depress 400Hz Osc switch	
					RV102	LINE output must be 0.775V.	
					RT402	LM must be 0dB	
	3-3 Peak	–	–	Meter : Peak Monitor : Source	RT403	As 3-2	

	Item	Instrument	Playback/ Recording	Switch pos'n	Adjust part	Method	Remarks
4.	Bias current	CrO_2-Tape VTVM Oscillator	Rec	Tape : CrO_2		Apply to LINE IN 1kHz input which is 1.1V output(LM) at LINE OUT	
				Monitor : TAPE	RT103	Playback output −1 dB from peak	
					RT103	Reduce input signal by 20 dB ; adjust so 1kHz and 15 kHz are played back at same level(±4 dB)	
5.	Bias leak	VTVM	Rec	—	L103	Connect VTVM between R131 & L103. Adjust to minimize VTVM reading	
6.	Recording amp gain						
	6-1 NORMAL	Normal tape VTVM Oscillator	Rec	Monitor : Tape and Source Tape : NOR		Apply 1kHz to LINE IN for LINE OUT of 1.1V	
					RV103	LINE OUT at both TAPE & SOURCE must be the same	
	6-2 CrO_2	New CrO_2 tape VTVM Oscillator		Monitor : Tape & Source Tape : CrO_2	RT101	As 6-1	
7.	Dolby						
	7-1 Playback	Oscillator VTVM	Play	Monitor : Tape		Apply 5kHz to R137, connect VTVM to LINE OUT	
					RT302	Turn up to max.	
						Ground Q301 (Gate). Drop input by 22.5 dB from that which gives a line output of 1.1V(Vo)	

	Item	Instrument	Playback/ Recording	Switch pos'n	Adjust part	Method	Remarks
				Dolby : ON Monitor : TAPE	RT301	Output must be 32.5 dB (V1) lower than Vo.	
					RT302	Remove Q301 ground. Adjust to raise 2 dB from V1 (B)	
	7-2Recording	Oscillator VTVM	Rec	Dolby : OFF		Apply 5 kHz signal to LINE IN, connect VTVM to RV103.	
					RT202	Turn up to max.	
						Ground Q201 (gate). Apply input signal so that VTVM reading is 1.1V (Vo). Drop input 30.5 dB from Vo (A)	 
				Dolby : ON	RT201	Adjust to 20.5 dB below V0 (V1). Remove Q201 ground	
					RT202	Adjust to 2 dB down from V1 (B)	
8	MPX filter	Oscillator VTVM	Rec	MPX : ON	L102	Apply 19 kHz signal to LINE IN, connect VTVM to LINE OUT Minimum output	

MECHANICAL ADJUSTMENT



TURN TABLE TORQUE

1. Take up torque 40～70gr-cm (In PLAY mode)
2. Fast forward torque 70～120gr-cm (In F.F. mode)
3. Rewind torque 70～120gr-cm (In REW. mode)

PINCH ROLLER PRESSURE

Adjust by changing the hooking position of the spring so that spring scale reads 650～850gr when the pinch roller departs from the capstan.

NOTE

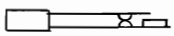
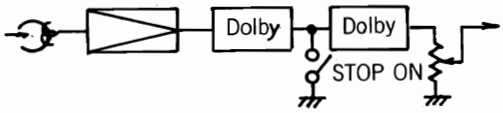
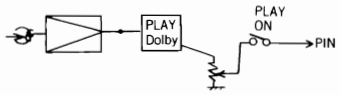
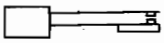
To increase the pressure : hook the spring in hole Ⓐ .
To reduce the pressure : hook the spring in hole Ⓒ .

LUBRICATION

Lubricate one or two drops of machine oil to rotating point or lubricate grease to sliding point.
Lubricate the respective parts listed below once every 1000 hours or once a year under normal conditions of use.
Avoid oiling then excessively, or rotation may become irregular because of oil splashes.

Lubrication point	Oil or grease
Motor shaft bearing	Oil
Capstan shaft bearing	Oil
Pinch roller shaft bearing	Oil

ADJUSTMENT OF SWITCHES

Name of switch	Action	Adjustment
Muting S11	This is interlocked with the head operating plate, preventing amp. sound except during recording and playback. 	For USA and Canada The contacts must be more than 0.5㎜ apart during recording and playback.  For General and Australia The contacts must be more than 0.5㎜ apart except during recording and playback. 
Rewind S12	Closed only during REWIND to operate Memory Counter	Contacts must be closed during rewinding and open at other times (bends by 1 to 3㎜) 
Lamp S14	This interlocks with head operating plate during recording & playback and lights PLAY indicator	The contacts must be closed only during recording & playback, and open at other times. (bends by 1-3㎜) 
CrO2 S15	This switch is used with CrO2 cassettes (refer to page.....)	When the cassette does not have a CrO2 detection hole, this must be turned ON. The gap between the switch & plate spring must be 0.2–0.6㎜. When a cassette with a CrO2 detection hole is used, it should be turned OFF.

VOLTAGE AND FREQUENCY CHANGING FOR GENERAL MODEL

General model is set for 230V, 50 Hz. When this unit is used in area with different power supply, change voltage and frequency as follows.

1. Voltage changing

This set can be used with mains voltage of 230–250V, 200–220V, 115–127 or 100–110V.

Turn the VOLTAGE selector to your desired mains voltage with a screw driver until click sound is heard.

2. Frequency changing

a motor pulley for 60 Hz is attatched to chassis beside a motor. Change the pulley after removing a bottom plate.

PRINCIPAL TROUBLE SHOOTING PROCEDURES

(Basic procedures are described in the Instruction Manual)

Malfunction	Possible cause	Solution
Large wow & flutter	Bad cassette	
	Back tension more than rated value, uneven back tension	Change cassette
	Tape deformed Misshapen  Center hollow 	Change cassette or cut out bad section of tape
	Improperly wound  Hub clamp Hub	Change cassette or do not use end of tape
	Wound unevenly 	Fast forward, then rewind
	Height of R/P head badly adjusted	Adjust
	Wear or faulty pinch roller pressure	Change or adjust
	Dirt in drive section (belt, pulley, flywheel, turn table, etc.)	Clean
	Dirt in tape path (tape shifter, pinch roller, capstan, head)	Clean
Overall frequency characteristics poor	Tape selector position does not match cassette being used.	Change position of switch
	Poor adjustment of R/P head gate	Adjust
	Poor adjustment of recording bias	Adjust
Poor playback frequency characteristics	Poor azimuth adjustment of R/P head	Adjust
	Tape selector position does not match cassette being used.	Change position of switch
	Select switch in NORMAL position when Dolbyized tape is being played.	
Distortion too great	Position of tape selector does not match cassette used	Change switch position
	Recording input too high	Reduce level of input
	Poor adjustment of recording bias	Adjust

Malfunction	Possible cause	Solution
Sound level fluctuates	Cassette faulty (see "Wow & flutter")	As described in "Wow & flutter"
	Dirt on R/P heads	Clean
	Poor adjustment of R/P head gate	Adjust
Auto-stop does not operate	Defective auto-stop detection mechanism	Repair
	Lock-off piece worn	Change
Memory counter does not operate	Faulty contacts at tape counter	Change or repair
	Solenoid faulty or badly positioned Faulty circuit	Change or repair Repair
Dolby does not operate correctly	Faulty or badly adjusted	Repair or adjust
	Dolby ciruit	
	Faulty MPX filter	Repair
	Poor DCCS adjustment	Adjust
Faulty CrO_2 auto-changeover	Defective detector	Repair
	Plate spring position incorrect	Adjust
	Faulty micro-switch	Replace
Level meter incorrect	Faulty meter	Replace
	Meter circuit defective	Repair
	Amp. gain incorrectly adjusted	Adjust
No output sound	Output switch at OFF	Set to ON
	DCCS adjusting volume set at minimum during recording	Adjust

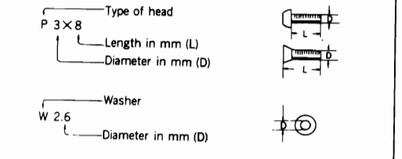
REPLACEMENT PARTS OF CAPACITORS, RESISTORS, SEMI-CONDUCTORS, TRASFORMERS AND COILS.

Symbol No.	Stock No.	Description	
CAPACITORS			
C 701	0256935	MP	1μF
RESISTORS			
RC 501	0219902	CR pack	
RT101L,R	0151884	Semi variable	2.2kΩ
RT102L,R	0151886	Semi variable	10kΩ
RT103L,R	0151889	Semi variable	100kΩ
RT201L,R	0151871	Semi variable	5kΩ
RT202L,R	0151871	Semi variable	5kΩ
RT301L,R	0151871	Semi variable	5kΩ
RT302L,R	0151871	Semi variable	5kΩ
RT401L,R	0151861	Semi variable	10kΩ
RT402L,R	0151121	Semi variable	2kΩ
RT403L,R	0151861	Semi variable	10kΩ
RV101L,R	5026003	Variable	10kΩ
RV102L,R	5026006	Variable	50kΩ
RV103L,R	5000151	Variable	20kΩ
RV104L,R	5026003	Variable	10kΩ
SEMI-CONDUCTOR			
Q101L,R	5320064	Transistor	2SC458D
Q102L,R	5320064	Transistor	2SC458D
Q103L,R	5320064	Transistor	2SC458D
Q104L,R	5320064	Transistor	2SC458D
Q105	5320613	Transistor	2SC1213C
Q106	5320613	Transistor	2SC1213C
Q107	5320064	Transistor	2SC458D
Q201L,R	5321221	Transistor	2SK40R-L
Q202L,R	5320592	Transistor	2SA673B
Q203L,R	5320064	Transistor	2SC458D
Q301L,R	5321221	Transistor	2SK40R-L
Q302L,R	5320592	Transistor	2SA673B
Q401L,R	5320064	Transistor	2SC458D
Q501	5320671	Transistor	2SC1061C
Q502	5320723	Transistor	2SA715C
IC101L,R	5350251	IC	HA-1406
IC102L,R	5350251	IC	HA-1406
IC103L,R	5356181	IC	TA-4015
IC104	5356021	IC	TA-4001
IC105	5359171	IC	HD-2523P
IC106	5068041	IC	RD-804
IC201L,R	5350273	IC	BA-301H-B
IC202L,R	5356071	IC	TA-4006
IC203L,R	5356191	IC	TA-4016
IC204L,R	5068031	IC	RD-803
IC302L,R	5356071	IC	TA-4006
IC304L,R	5068031	IC	RD-803
D101	5330341	Diode	WO6A
D201L,R	0575001	Diode	1N34A
D202L,R	5330572	Diode	1S2473HC
D203L,R	5330572	Diode	1S2473HC
D204L,R	0575001	Diode	1N34A
D205L,R	5330572	Diode	1S2473HC
D301L,R	0575001	Diode	1N34A
D302L,R	5330572	Diode	1S2473HC
D303L,R	5330572	Diode	1S2473HC
D304L,R	0575001	Diode	1N34A
D305L,R	5330572	Diode	1S2473HC
D402L,R	5330572	Diode	1S2473HC
D502	5330341	Diode	WO6A
D503	5330341	Diode	WO6A
D504	5330341	Diode	WO6A
ZD 501	5330059	Zenner diode	AWO1-22
TH401L,R	0576045	Thermistor	D-2B
TRANSFORMERS			
PT	5211731	Power trans (Australia, General)	
PT	5211665	Power trans (USA)	
PT	5211666	Power trans (Canada)	
T101	5260022	Oscillator trans	
T102L,R	5250944	Head phone trans	
COILS :			
L101LR	5120185	Trap coil	33mH
L102L,R	5270001	Choke coil	33mH
L103L,R	5270001	Choke coil	33mH
L104L,R	5120274	Trap coil	25mH
L105L,R	5270001	Choke coil	33mH

Hardware nomenclature

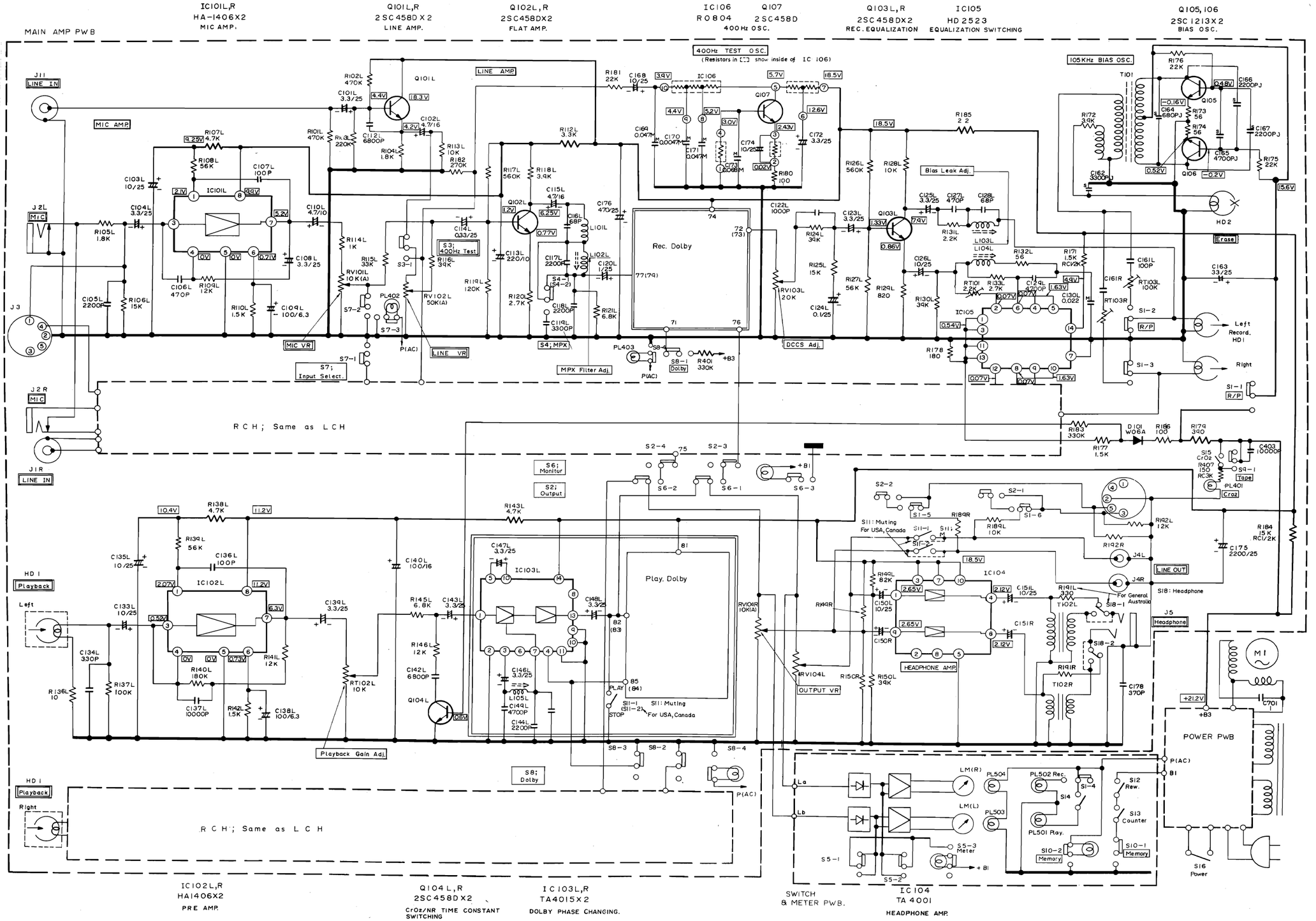
P	Pan head screw		BT	Binding head Tapping screw	
F	Flat countersunk head screw		BL	Bolt	
B	Binding head screw		W	Washer	
T	Round head tapping screw		E	"E" ring	

Example



when ordering hardware excluding stated on these lists, be sure to make your orders with type and size.

SCHEMATIC DIAGRAM



NOTE

1. Voltage measured at base of chassis with minimum volume control and no signal.
2. Nomenclature of Rasistors and Capacitors.

RESISTORS

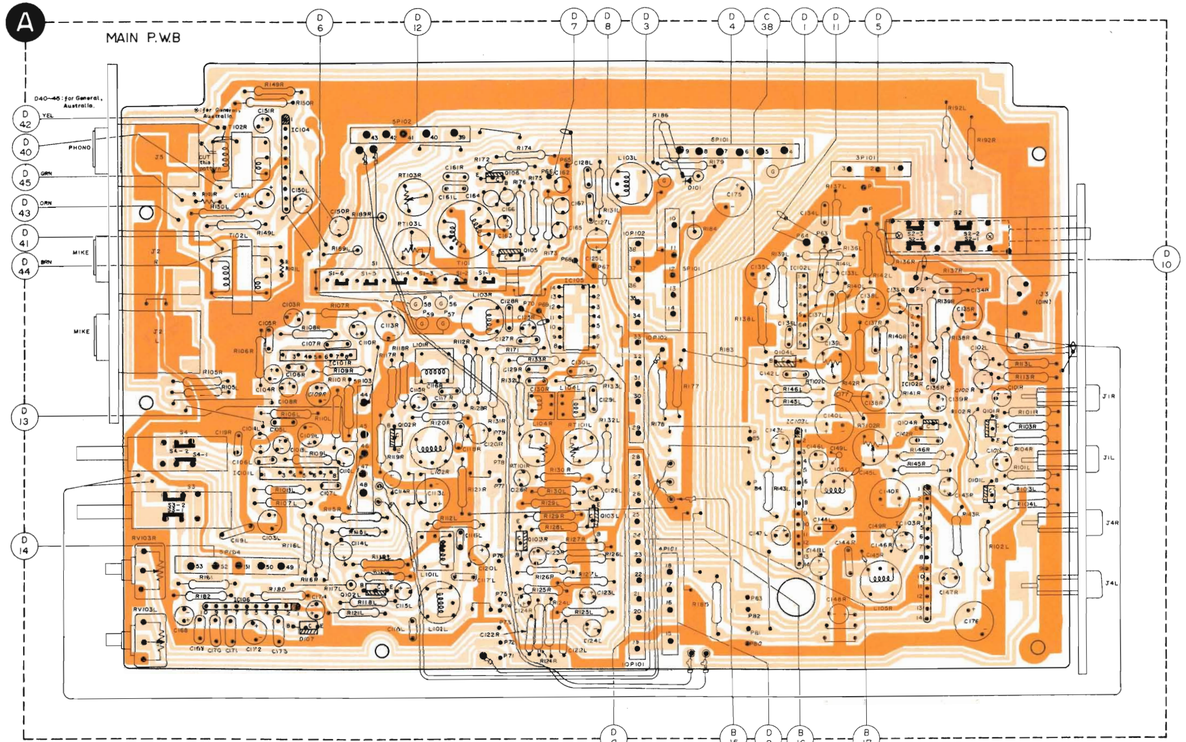
Value	No indicated : Ω K : 1000Ω
Wattage	No indicated : ¼W.
Tolerance	No indicated : ± 5% K : ±10%
Sort	No indicated : Carbon film RC : Composition RS : Metal oxide
Example	R101.....Circuit No. 150.....Value RS · 1 · K.....Sort · Wattage · Tolerance

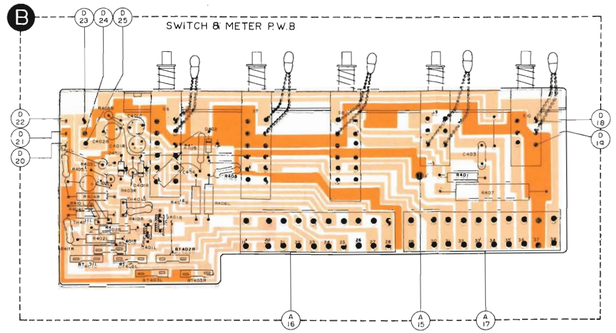
CAPACITORS.

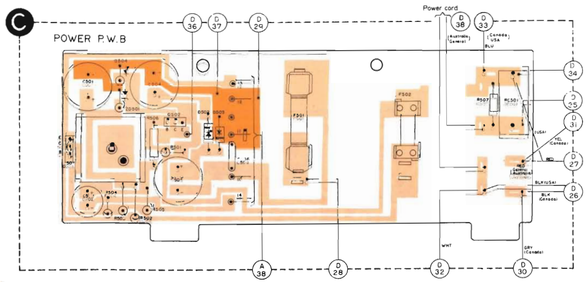
Value	No indicated : μF P : pF
Voltage	No indicated : 50WV
Tolerance	No indicated : ±10% J : ± 5% M : ±20% Z : +80 −20% D : ±0.5pF C : ±0.25pF
Sort	Ceramic Electrolitic Mylar
Example	C101.....Circuit No. 10/25.....Value/voltage .....Sort

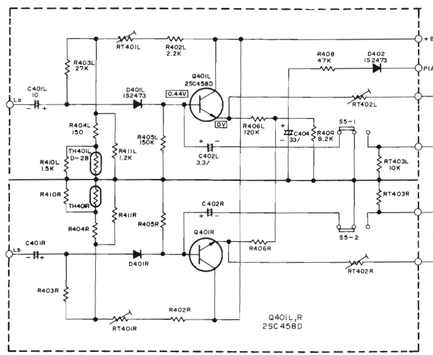
3. Be sure to make your orders of resistors and capacitors with value, Voltage, tolerance and sort.
4. When replacing capacitors marked with ※ , Use specified ones stated on parts list since required temperature characteristics.

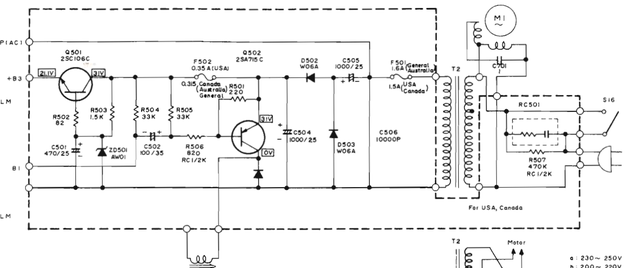
CIRCUIT BOARD DIAGRAM

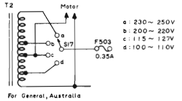


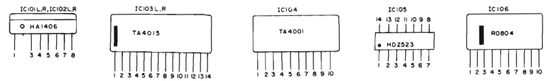


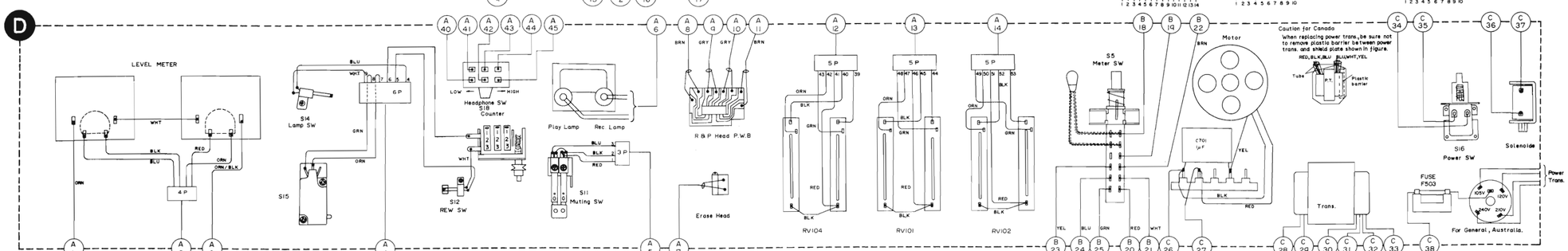












	Q101L,R	Q102L,R	Q103L,R	Q104L,R	Q105L,R	Q106L,R	Q107L,R	Q401L,R	Q501	Q502
E	4.2V	0.77V	0.86V	0V	−0.16V	0.52V	2.43V	0V	21.2V	31V
C	18.3V	6.25V	7.9V	—	15.6V	15.6V	5.7V	21.2V	31V	0V
B	4.4V	1.2V	1.33V	0.59V	0.48V	−0.2V	2.95V	0.44V	—	—

IC101L,R			
1	2.1V	5	0V
2	—	6	0.71V
3	0.6V	7	5.2V
4	0V	8	9.9V

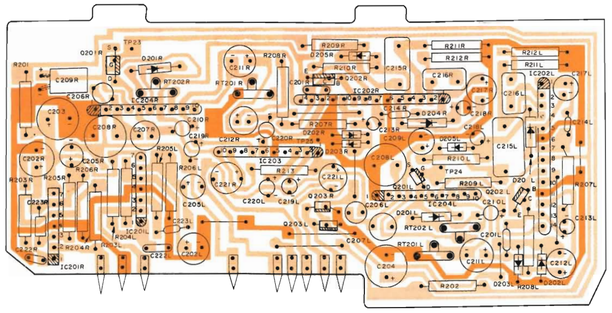
IC102L,R			
1	2.07V	5	0V
2	—	6	0.73V
3	0.52V	7	6.3V
4	0V	8	11.2V

IC103L,R			
1	2.35V	8	8.9V
2	0V	9	0V
3	0V	10	0.58V
4	0V	11	0V
5	0V	12	0V
6	2.42V	13	8.2V
7	8V	14	19.3V

IC104			
1	2.65V	6	21.2V
2	2.5V	7	18.5V
3	18.5V	8	2.65V
4	2.1V	9	2.65V
5	0V	10	18.5V

IC105			
1	0.54V	8	0.07V
2	0.07V	9	1.63V
3	0.54V	10	1.63V
4	1.63V	11	0.54V
5	1.63V	12	0.05V
6	0.07V	13	0.54V
7	0V	14	4.9V

IC106			
1	0V	6	12.6V
2	0.02V	7	18.5V
3	2.43V	8	5.2V
4	2.95V	9	4.4V
5	5.7V	10	3.9V



IC201L,R			
1	2.17V		
2	0.71V		
3	0.17V		
4	0V		
5	0.9V		
6	7.6V		
7	14.3V		

IC203			
1	6.6V	6	0.15V
2	0.1V	7	0.1V
3	0.15V	8	0.64V
4	0.63V	9	6.9V
5	0V	10	12.3V

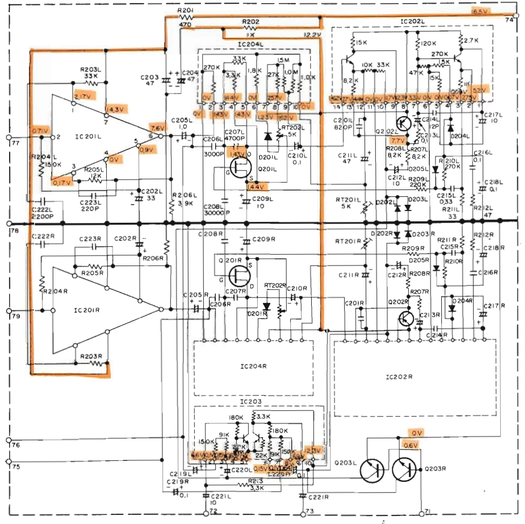
IC204L,R			
1	0V	6	0V
2	0V	7	12.3V
3	1.43V	8	2.75V
4	1.44V	9	1.62V
5	1.43V	10	0V

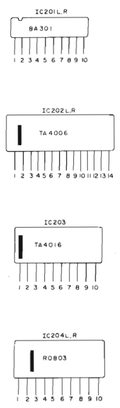
Q202L,R	Q203L,R
B 11.7V	——
C 7.7V	0.6V
E 12.3V	0V

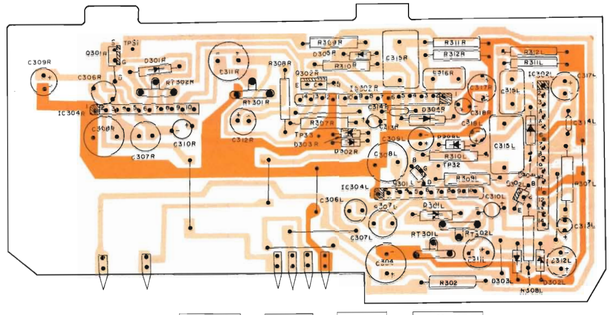
IC202L,R			
1	5.2V	8	12.3V
2	2.75V	9	11.7V
3	0.09V	10	0V
4	0.07V	11	0V
5	0V	12	4.4V
6	0V	13	7.7V
7	3.3V	14	1.62V

Q201L,R	
D	1.43V
S	1.44V
G	——

D-3500





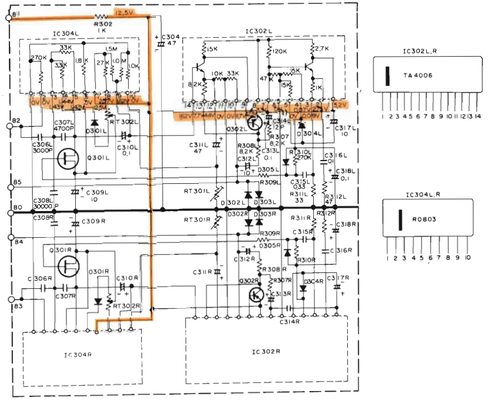


IC304L,R			
1	0V	6	0V
2	0V	7	12.5V
3	1.43V	8	2.57V
4	1.44V	9	1.62V
5	1.43V	10	0V

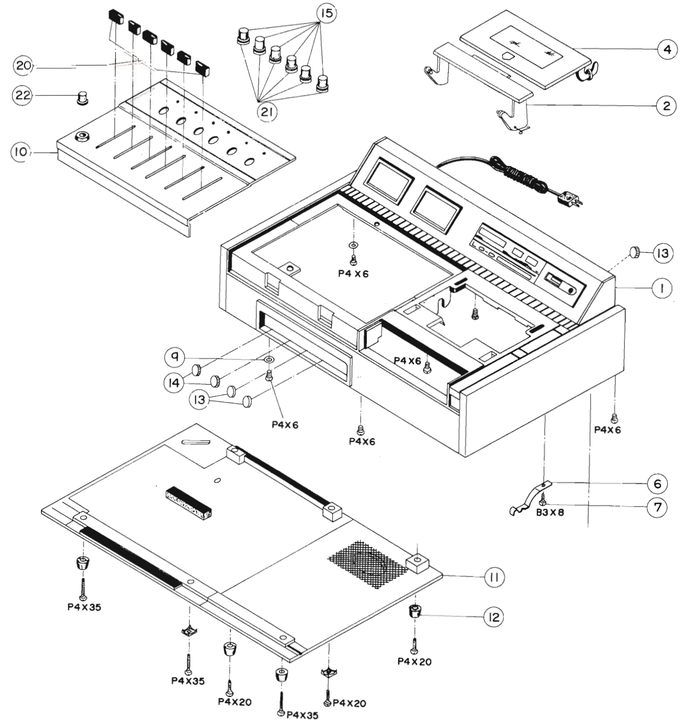
Q301L,R	
D	1.43V
S	1.44V
G	——

Q302	
B	11.7V
C	7.7V
E	12.3V

IC302L,R			
1	5.2V	8	12.3V
2	2.75V	9	11.7V
3	0.09V	10	0V
4	0.07V	11	0V
5	0V	12	4.4V
6	0V	13	7.7V
7	3.3V	14	1.62V



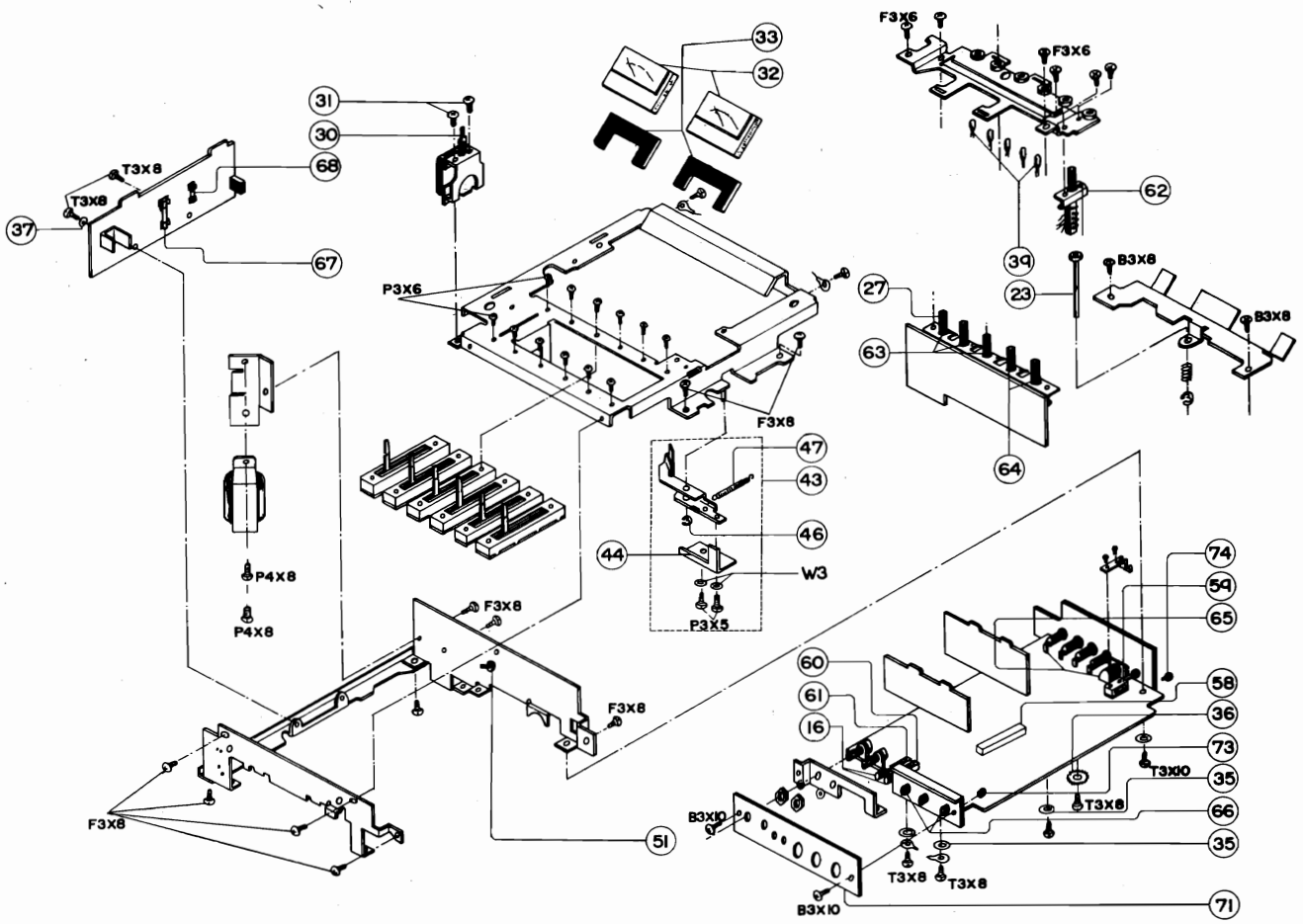
EXPLODED VIEW OF CABINET



Index No.	Stock No.	Description
1	6134402	Front case assembly
	6218992	Counter board assembly
2	6095081	Head cover
4	6090405	Cassette lid
6	6580082	Ring for upper cover
9	7717704	Special washer (2 req'd) for front case mounting
10	6670501	Amp panel assembly
11	6154629	Bottom plate assembly (Australia, General)
	6154628	Bottom plate assembly (Canada)
	6154626	Bottom plate assembly (U.S.A.)
12	6573011	Rubber base (4 req'd)
13	6262182	**Knob** (3 req'd) for MPX SW. DOLBY TEST SW & output
14	6734501	Screw Knob for D.C.C.S
15	6258982	Switch button assembly
17	5746301	**Power cord** (USA. Canada)

Index No.	Stock No.	Description
	5746154	**Power cord** (General)
	5746052	**Power cord** (Australia)
20	6295131	**Volume knob**
21	7717705	Special washer (6 req'd) for switch button
22	6272468	Push button for power switch
		Accessory
	5662021	E socket adoptor (General)
	5744842	DIN cord (Australia, General)
	5746141	Patch cord (U.S.A., Canada)
	6346742	Motor pulley (60Hz) (General, Australia) with fan (fixed on chassis)

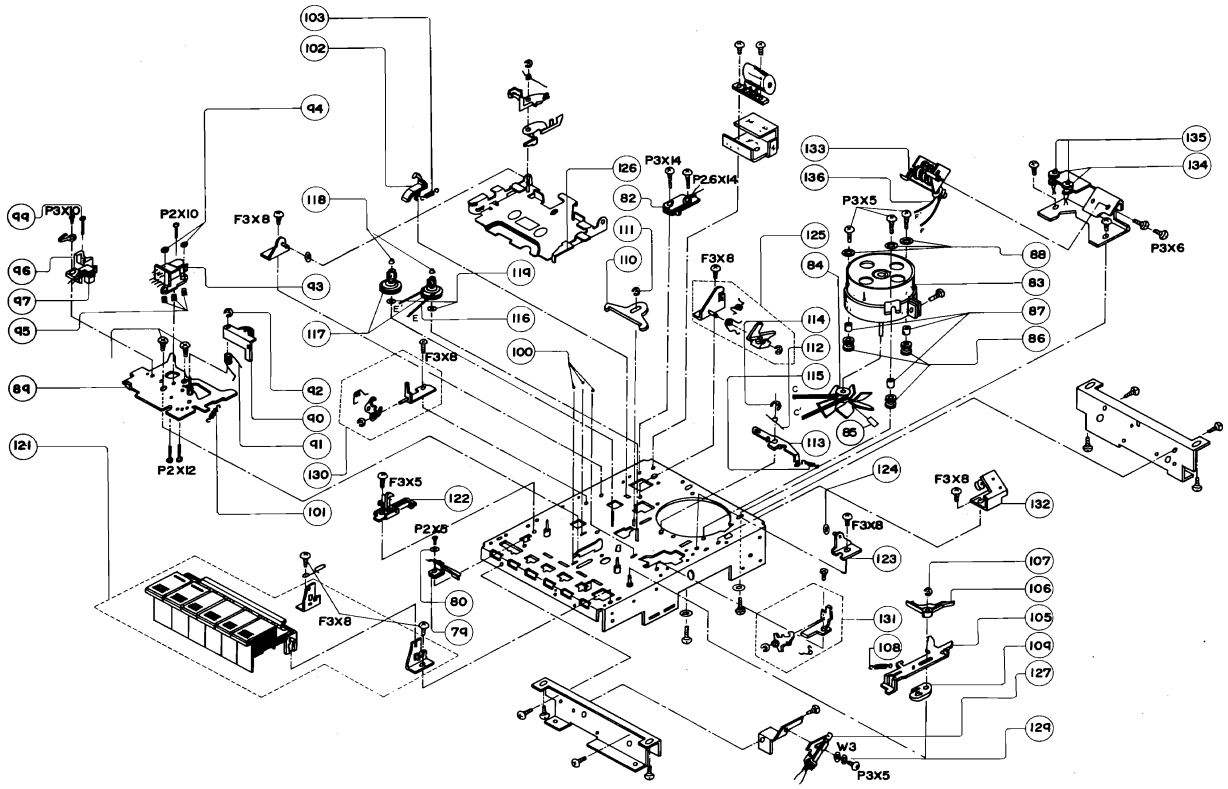
EXPLODED VIEW OF MAIN CHASSIS



Index No.	Stock No.	Description
23	7538192	Stud
25	7230904	"E" ring-5mmφ
27	6258881	Button base for switch button
S 16 30	5633021	**Push switch** for power switch
31	7777618	Specail screw (2 req'd) for power switch mounting
32	7677152	Level meter cushion
33	5554101	**Level meter**
35	7711854	Fiber washer (3 req'd) for amp printed mounting
36	8815114	Lock washer-3mmφ for amp printed mounting
37	7778012	Fiber washer (2 req'd) for amp printed and AC printed mounting
38	7667833	Lamp rubber cushion (6 req'd)
39	5762141	**Lamp**
43	7271688	R lever assembly
44	7271702	R lever (2)
46	7230903	"E" ring-4mmφ for R lever mounting
47	6324451	Spring for R lever
51	0043793	Bushing (power cord) (U.S.A. Canada / General)
	6794011	Bushing (Australia)
	5559041	Memory counter Assembly
	7667833	Motor rubber cushion (2 req'd)

Index No.	Stock No.	Description
PL502	5762171	**Lamp**
PL501	5762171	**Lamp**
	6354181	**Counter belt**
	5639023	**Rotary switch** (Australia / General)
S 1 58	5632112	**Slide switch** (R/P)
S 2 59	5630903	**Push switch** (Output)
S 3 60	5633164	**Push switch** (400Hz)
S 4 61	5633161	**Push switch** (MPX)
S 5 62	5637039	**Push switch** (Meter)
S 6 63	5637036	**Push switch** (Moniter)
S 7 63	5637036	**Push switch** (Input)
S 8 63	5637036	**Push switch** (Dolby)
S 9 64	5637036	**Push switch** (Tape)
S 10 64	5637036	**Push switch** (Memory)
J 1L, R 4L, R 65	5676092	**Pin jack**
J 2L, R 5L, R 66	5679181	**Jack** for Mic & Phone
F501 67	0591188	**Fuse** (1.6A) (Australia / General)
F501	5720088	**Fuse** (1.5A) (USA / Canada)
F502 68	5720171	**Fuse** (315mA) (Australia / General)
F502	5720086	**Fuse** (0.35A) (USA / Canada)
F503	5720171	**Fuse** (0.35A) (Australia / General)
71	6734111	Jack plate F
73	8821114	Nut-3mmφ for jack plate F mounting

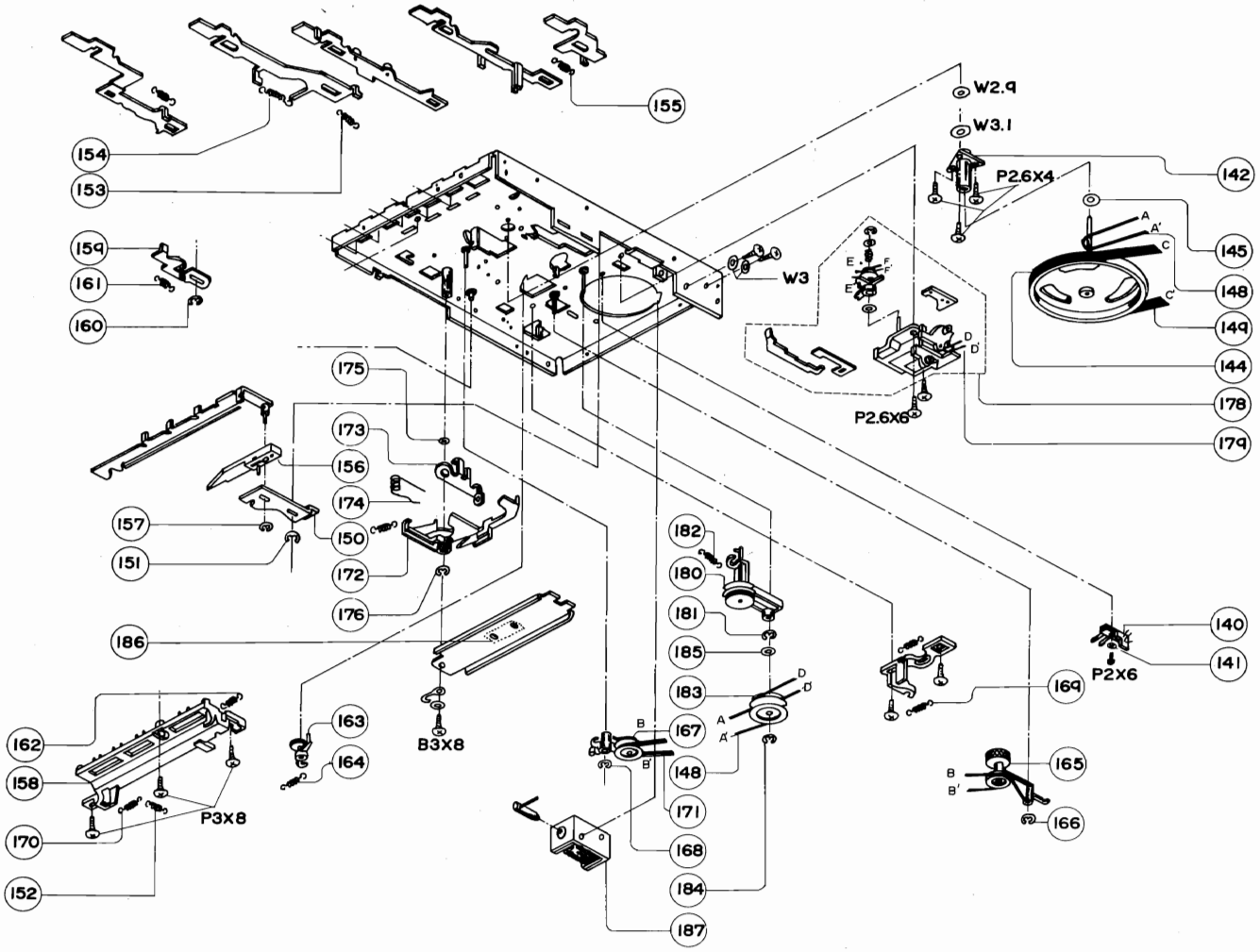
EXPLODED VIEW OF CHASSIS—TOP



Index No.	Stock No.	Description
76	5526271	Leaf switch with switch P.W.B assembly
78	8815111	Lock washer-2mmφ for switch printed wire board assembly mounting
79	5630562	**Leaf switch**
80	8815111	Lock washer-2mmφ for leaf switch mounting
82	5631821	**Micro switch**
83		for tape selecter
	5571202	Motor (Canada, Australia, General)
	5571201	Motor (USA)
84	6346741	Motor pulley with fan (Australia, General) (50 Hz)
	6346742	Motor pulley with fan (U.S.A., Canada) (60Hz)
85	7773083	Screw for motor pulley mounting
86	6576161	Motor cushion (3 req'd)
87	7574403	Coller (3 req'd)
88	0645587	Special washer (3 req'd) for motor holder mounting
89	7270533	Head plate assembly
90	7252992	Pinch roller assembly
91	6306921	Spring for pinch roller
92	7230901	'E' ring-2mmφ for pressure roller assembly mounting
93	5444132	R & P Head
94	8821231	Nut-2mmφ (2 req'd) for head mounting
95	6303951	Spring for head
96	6736381	Tape shifter Assembly
97	5445011	**Erase head**
98	7275982	Plate for erase head
99	7780824	Special screw
100	0948492	Ball-2mmφ
101	6300351	Spring for head plate
102	6733922	Recording prevention plate
103	6321661	Spring for recording prevention plate
105	7270634	Pause slider assembly
106	6733932	Pause lever

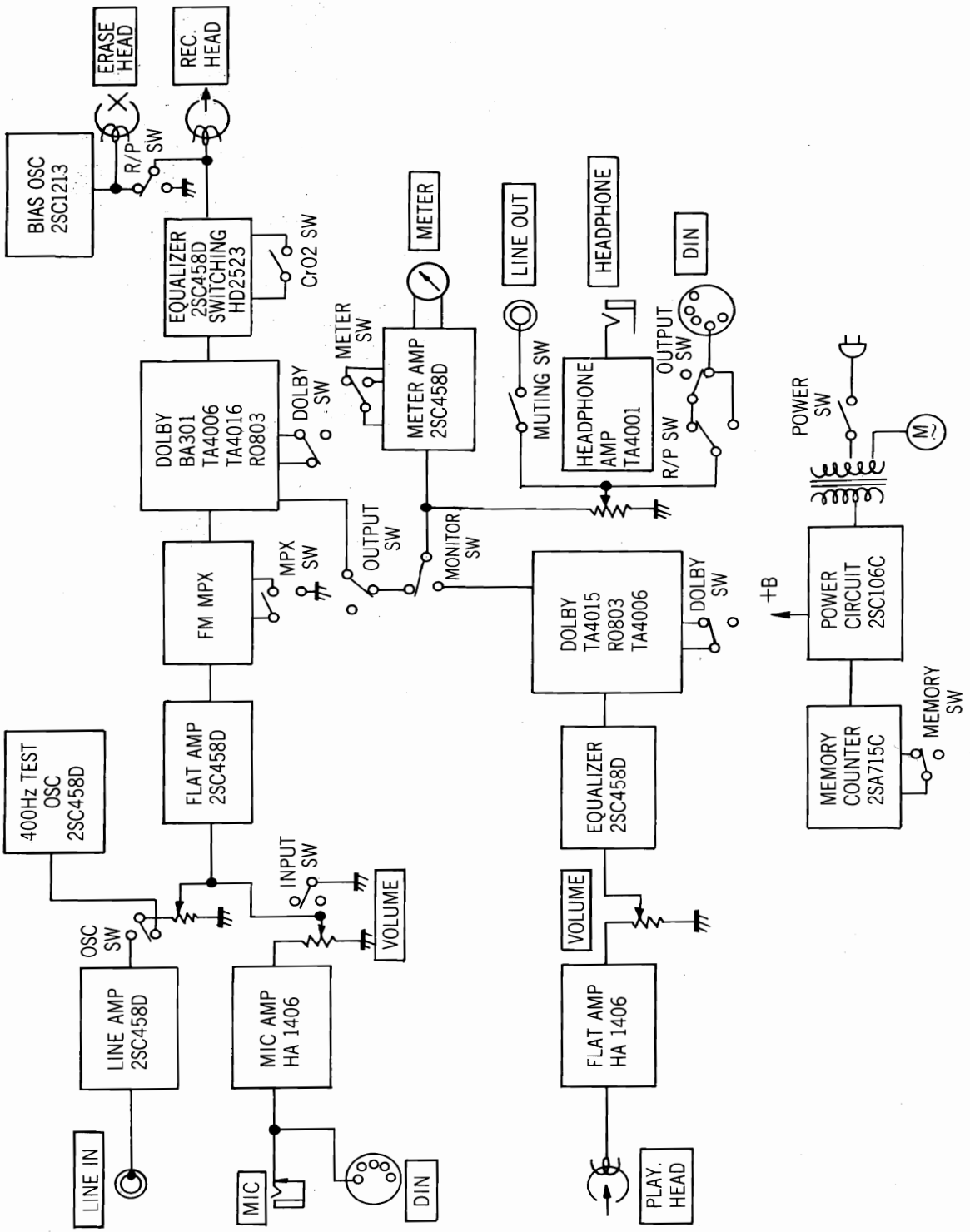
Index No.	Stock No.	Description
107	7230902	E-ring-3mmφ for pause slider & pause lever
108	6322801	Return spring
109	6725701	Pause lock piece
110	6733991	Brake plate
111	7230902	'E' ring-3mmφ for brake plate mounting
112	6307162	Spring
113	7275261	Lever moving with brake plate
114	7230903	'E' ring-4mmφ
115	6321281	Spring
116	6354151	Turn table belt
117	6411701	**Turn table assembly**
118	0930002	Cap
119	0948831	Polyester washer for turn table
121	6255182	Button assembly
122	6733913	Eject assembly
123	7270552	Tray holder assembly
124	0948727	Nylon washer
125	7274271	Tray arm assembly
126	7271051	**Cassette tray assembly**
127	5632173	**Plate switch**
129	8813114	Spring washer-3mmφ for plate switch mounting
130	7274261	Side arm assembly (Supplying side)
131	7274262	Side arm assembly (Take-up side)
132	7465271	Roller holder assembly
133	5559041	**Memory counter assembly**
134	7667833	Rubber cushion (2 req'd)
PL501, 502 135	5762171	**Lamp**
136	6354181	**Counter belt**

EXPLODED VIEW OF CHASSIS—BOTTOM



Index No.	Stock No.	Description	Index No.	Stock No.	Description
140	5526271	**Leaf switch with P.W.B**	166	7230901	"E" ring-2mmϕ for fast forward arm mounting
131	8815111	Lock washer-2mmϕ for switch P.W.B	167	6411623	F arm assembly
142	7592581	Metal holder assembly	168	7230901	"E" ring-2mmϕ for F arm mounting
144	6372283	Flywheel assembly	169	6320071	T spring
145	7771761	Polyester washer (2 req'd) for flywheel	170	6322051	Spring for t function
148	6354161	**Belt for take-up**	171	6354171	**FR belt**
149	6357054	**Belt for flywheel**	172	6733981	FR lever
150	7270571	Lock off slider	173	7273091	Recording stopper
151	7230901	"E" ring-2mmϕ	174	6307043	Spring for stoper
152	6300142	Spring for recording slider	175	7778433	Polyester washer for recording stopper
153	6322051	Spring for rewinding slider	176	7230903	"E" ring-4mmϕ for FR lever mounting
154	6323801	Spring for fast forward slider		6300351	Spring for head plate
	7538471	Play pin	178	6411693	**Auto stop block** assembly
155	6321661	Spring for stop slider	179	6354121	**Block belt**
156	6733891	Lock off piece	180	6411633	Take-up arm assembly
157	7230901	"E" ring-2mmϕ	181	7778394	E-ring-1.5mmϕ for take-up arm assembly
158	6733952	Holder plate	182	6300171	Spring
159	7270444	Eject plate	183	6349032	T pulley assembly
160	7230902	"E" ring-3mmϕ for eject plate mounting	184	7778394	E-ring-1.5mmϕ for T pulley assembly
161	6300142	Spring	185	0948832	Polyester washer for T pulley assembly
162	6323063	Spring	186	6733941	Capstan holder
163	6733501	Rewinding idler assembly	187	5642082	DC solenoid
164	6325853	Spring for rewlnding idler			
165	6733482	Fast forward arm assembly			

BLOCK DIAGRAM



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ASF-2034

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TO: All Audio Component Authorized Service Facilities

FROM: Curtis L. Sidles - National Service Manager

SUBJ: D-3500 "CrO_2/Normal" Switching

The D-3500 Service Manual (number 764) has an error in the page 20 chromium-dioxide/normal switching circuit diagram.

This circuit is correctly described on pages 6 and 7 in the "explanation of CrO_2 circuit" (figure 17) and "CrO_2 cassette automatic changeover" (Technical Explanation number 5). Do not hesitate to contact the Regional Service Manager at your nearest HITACHI Regional Office should any questions arise.

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