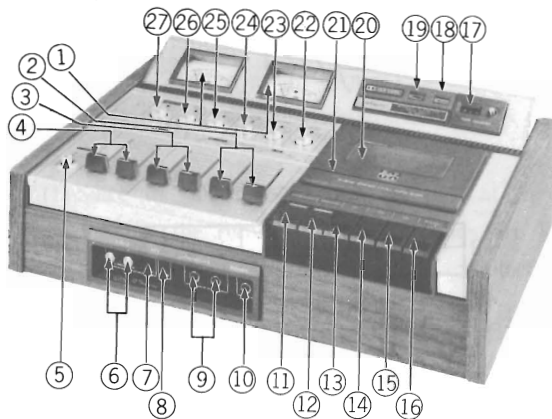


## SERVICE MANUAL

GENERAL  
USA  
CANADA  
AUSTRALIA

No. 764

### NAME OF PARTS



- |                                |                         |
|--------------------------------|-------------------------|
| ① Level meter                  | ⑭ Rewind                |
| ② Line recording level control | ⑮ Fast forward          |
| ③ Mic recording level control  | ⑯ Pause                 |
| ④ Output level control         | ⑰ Tape counter          |
| ⑤ Power switch                 | ⑱ Playback indicator    |
| ⑥ Dolby calibration control    | ⑲ Recording indicator   |
| ⑦ Test signal button           | ⑳ Cassette lid          |
| ⑧ MPX filter switch            | ㉑ Head cover            |
| ⑨ Mic jack                     | ㉒ Meter selector switch |
| ⑩ Headphone jack               | ㉓ Memory counter switch |
| ⑪ Stop/Eject                   | ㉔ Tape selector switch  |
| ⑫ Recording                    | ㉕ Dolby switch          |
| ⑬ Playback                     | 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   | 3. Peak level meter                                    | 7. Full auto-stop                                       | 11. Tape-running stabilization mechanism (Tape shifter) |
| 2. Low wow design with 4-pole hysteresis synchronous motor, large flywheel (100mm dial) and precision finished capstan (circular accuracy 0.1 $\mu$ ) | 4. Tape selector with chrome tape automatic changeover | 8. Independent controls for Mic and line in             | 12. Open/close type head cover                          |
|   | 5. Double Dolby noise reduction system                 | 9. MPX filter   |   |
|   | 6. Dolby calibration control system                    | 10. Cassette tray enabling easier insertion of cassette |   |

### SPECIFICATIONS

- Power source  
AC 120V 60 Hz (USA)  
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: 120 $\mu$ s, CrO2: 70 $\mu$ s
- Head used  
Recording head } R & P combination (ferrite) head : 1  
Playback head }  
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 100k $\Omega$   
Mic jack : 300 $\Omega$ -20 k $\Omega$  (compatible impedance)  
DIN jack : 2 k $\Omega$
- Output load impedance  
Line output jack : more than 50 k $\Omega$   
Headphone jack : 8 $\Omega$ -2 k $\Omega$  (General, Australia)  
DIN jack : more than 50 k $\Omega$  : 8 $\Omega$  (USA, Canada)
- Output level  
more than 0.5 V
- Fast feed/rewind time  
90 sec (C-60 used)
- External dimensions  
43.0(W) x 14.0(H) x 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) |

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# 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.

	Recording head	Playback head
Gap	12.7 $\mu$	2.5 $\mu$

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 frequency/sensitivity characteristics of recording heads with different gaps. For the same frequency, the playback output level of signals recorded with the 4 $\mu$  gap head is 2 dB greater than those recorded with the 2 $\mu$  gap head.

Fig. 3 shows the recording frequency/sensitivity characteristics of the recording heads. When compared with signals recorded with the 4 $\mu$  gap head, the output at 10kHz is

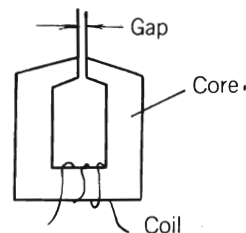


Fig. 1

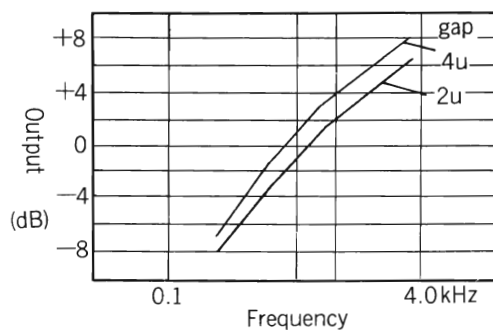


Fig. 2

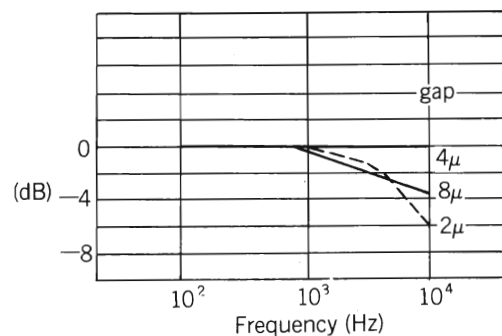


Fig. 3

4 dB down with a 8 $\mu$  gap head and 6 dB down with a 2 $\mu$  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 4.75 $\mu$  so the gap width for optimum frequency characteristics is less than 1.5 $\mu$ .

Distortion, sensitivity and frequency characteristics are optimized by making the gap of the recording head 4 $\mu$  and that of the playback head 1.2 $\mu$ , 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.

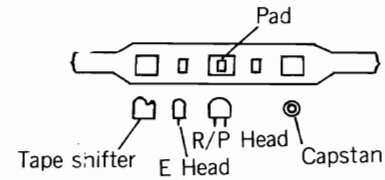


Fig. 4

(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 fluctuations and minimize wow and flutter. Frequency characteristics are improved by making tape contact better.

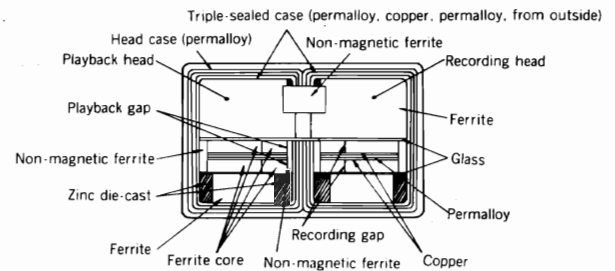


Fig. 5

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  $1.2\mu$  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  $1\mu/10\text{mm}$ , inaccurate 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.

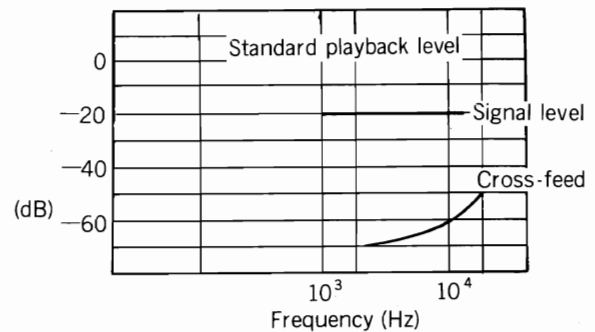


Fig. 6

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 cross-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 supplying turntable with back tension ; however, this causes the wow and flutter 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.)

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.

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

$$T = T_0 e^{\sum \mu \theta}$$

$\mu$  : Friction  
 $\theta$  : Azimuth of tape and tape guide  
 $T_0$  : 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 tension 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.

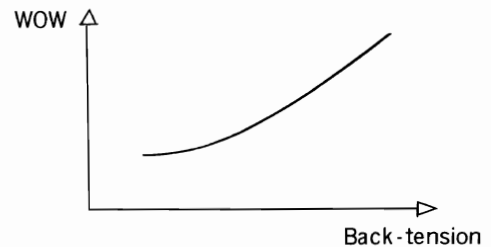


Fig. 7

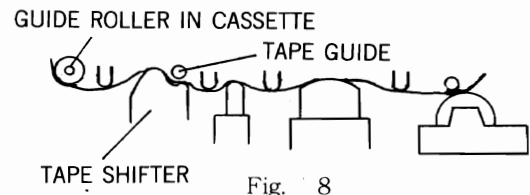


Fig. 8

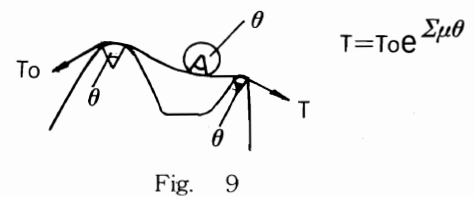


Fig. 9

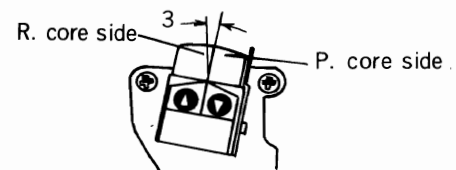


Fig. 10

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.

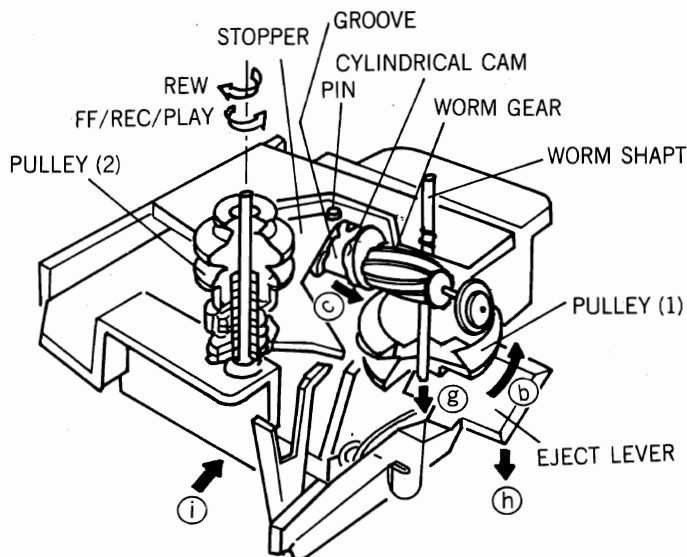


Fig. 11

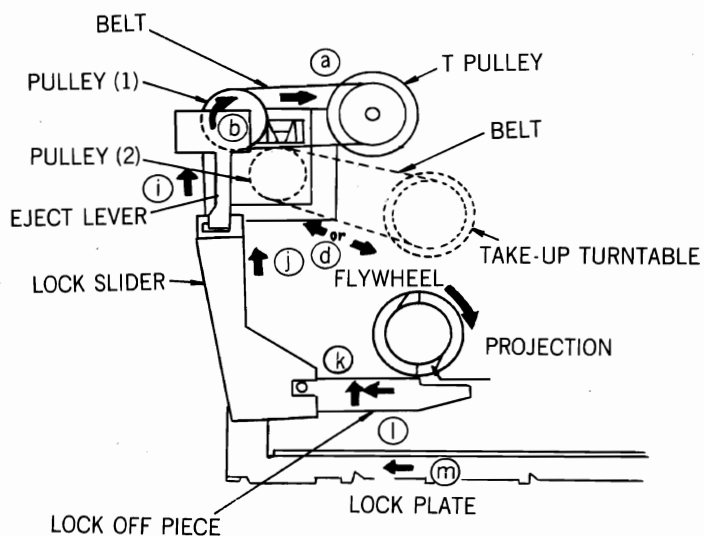


Fig. 12

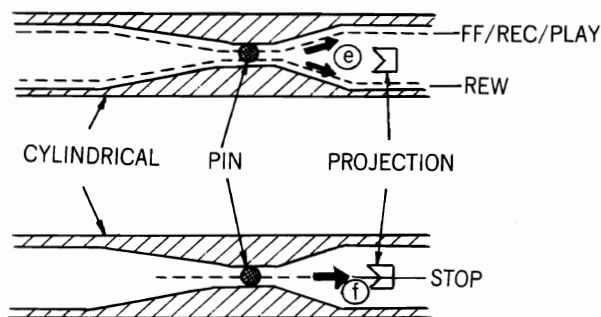


Fig. 13

#### 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.

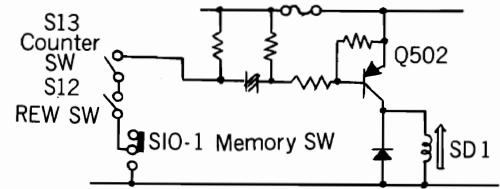


Fig. 14

#### 5. CrO<sub>2</sub> cassette automatic changeover (S15)

Some cassettes containing chrome tape have CrO<sub>2</sub> 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.

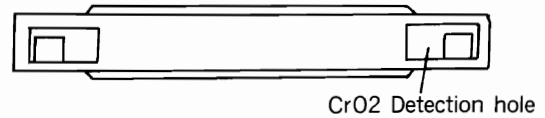


Fig. 15

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

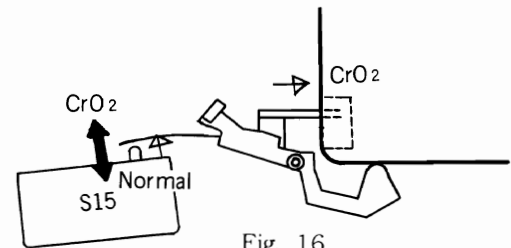


Fig. 16

#### Explanation of CrO<sub>2</sub> circuit

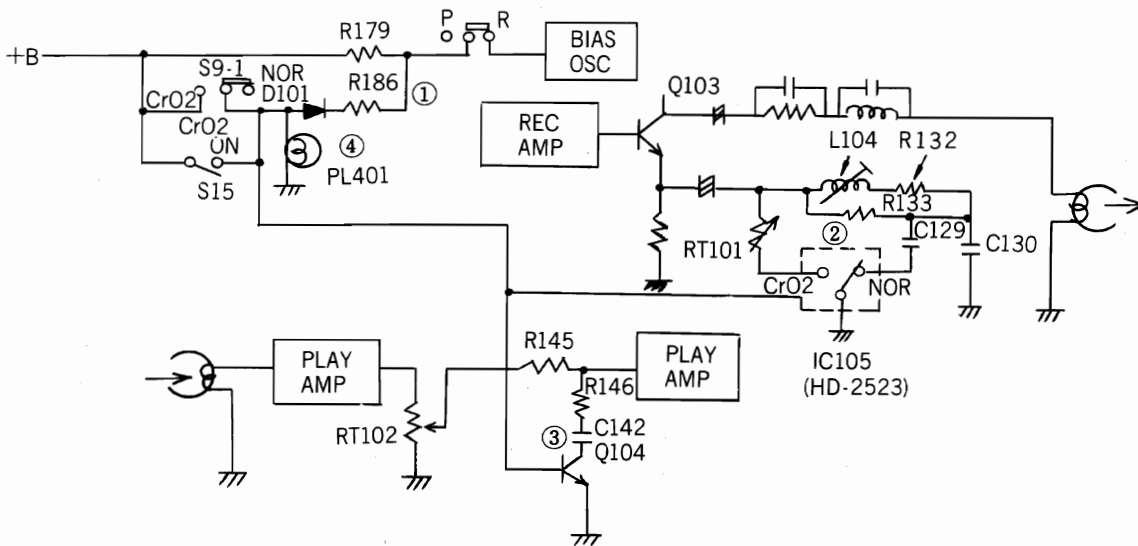


Fig. 17

(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<sub>2</sub>, power is applied to the digital IC, changing over the recording equalizer and sensitivity. In the CrO<sub>2</sub> 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.

(4) Indication lamp

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

6. Level meter circuit

Fig. 18 shows a level meter which is not a peak level meter but which indicates I<sub>a</sub> (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 depends on the head, tape, etc. is determined by the circuit and it is clipped when the point at which it exceeds the saturation 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 e<sub>i</sub> is rectified and charges C. This discharges through the meter circuit with R<sub>0</sub> and the current I<sub>2</sub>, shown in Fig. 20, flows. When rectification is performed in this circuit with a time constant of R<sub>i</sub>: C ≅ 0, R<sub>0</sub>C ≫ 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.

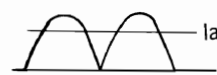
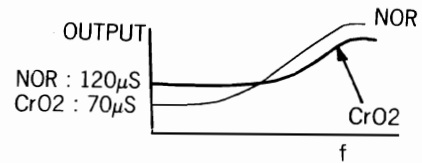


Fig. 18



Fig. 19

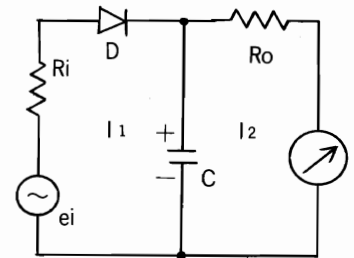


Fig. 20

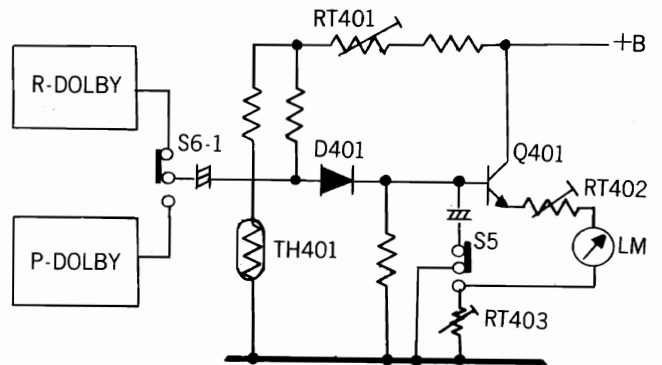


Fig. 21

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.

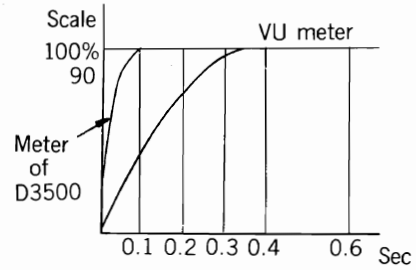


Fig. 22

### 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 Dolby 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.

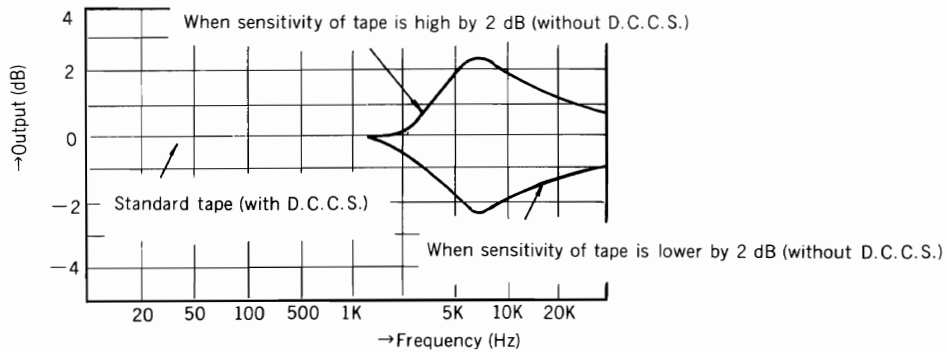


Fig. 23

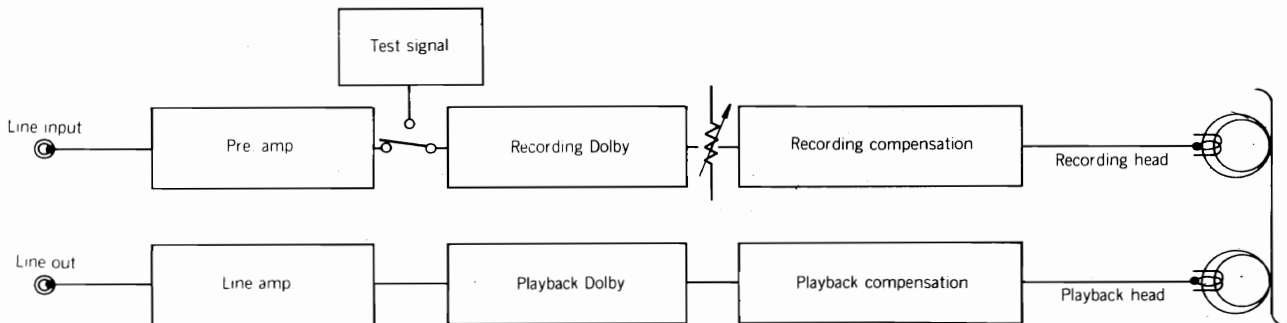


Fig. 24



**8. TAPE/SOURCE Monitor (S6)**

TAPE monitoring (monitoring the signal recorded on the tape)

**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 will be heard if monitoring is done in STOP mode.

is possible as the D-3500 is a 3-head tape deck with independent recording, playback and erase heads.

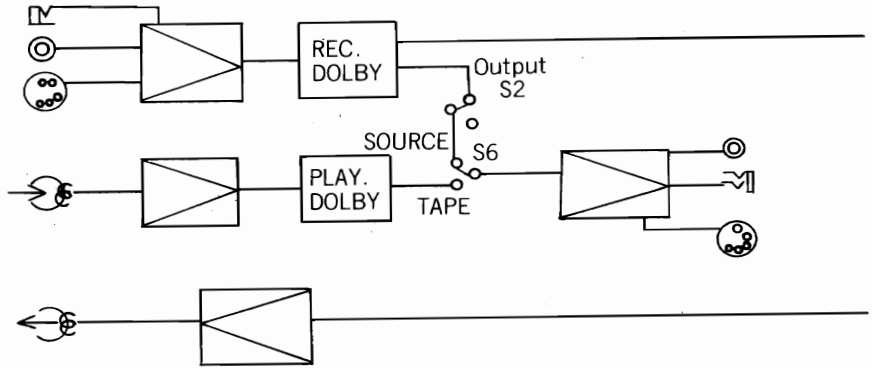


Fig. 25

**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.

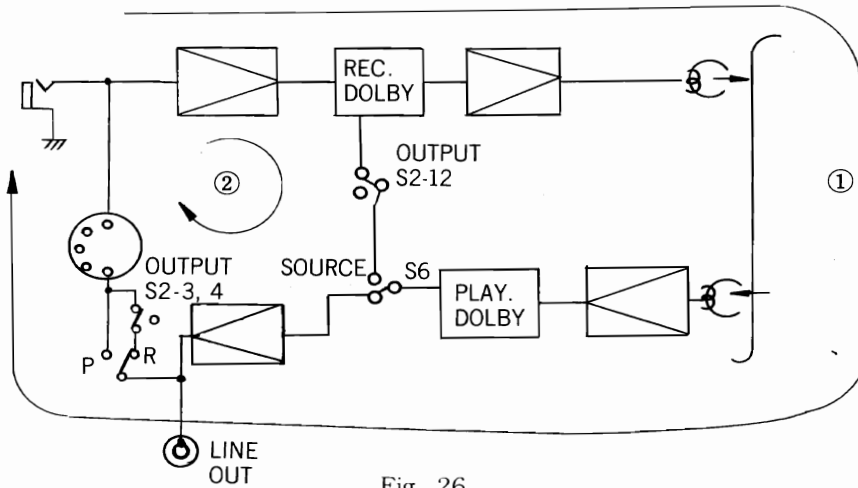


Fig. 26

**10. Input selector (S7)**

Select MIC and LINE inputs with S7.

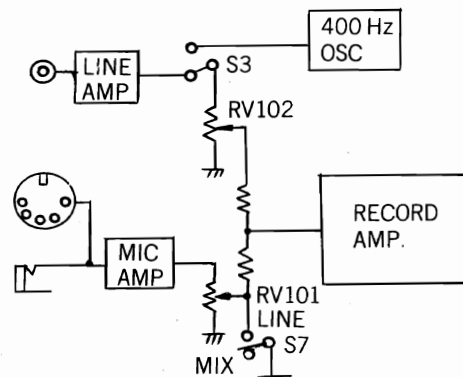


Fig. 27

**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.

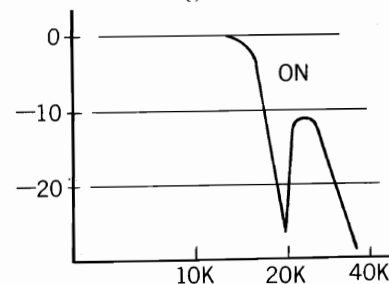



Fig. 28

# DISASSEMBLY PROCEDURE FOR ALIGNMENT AND PART REPLACEMENT

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

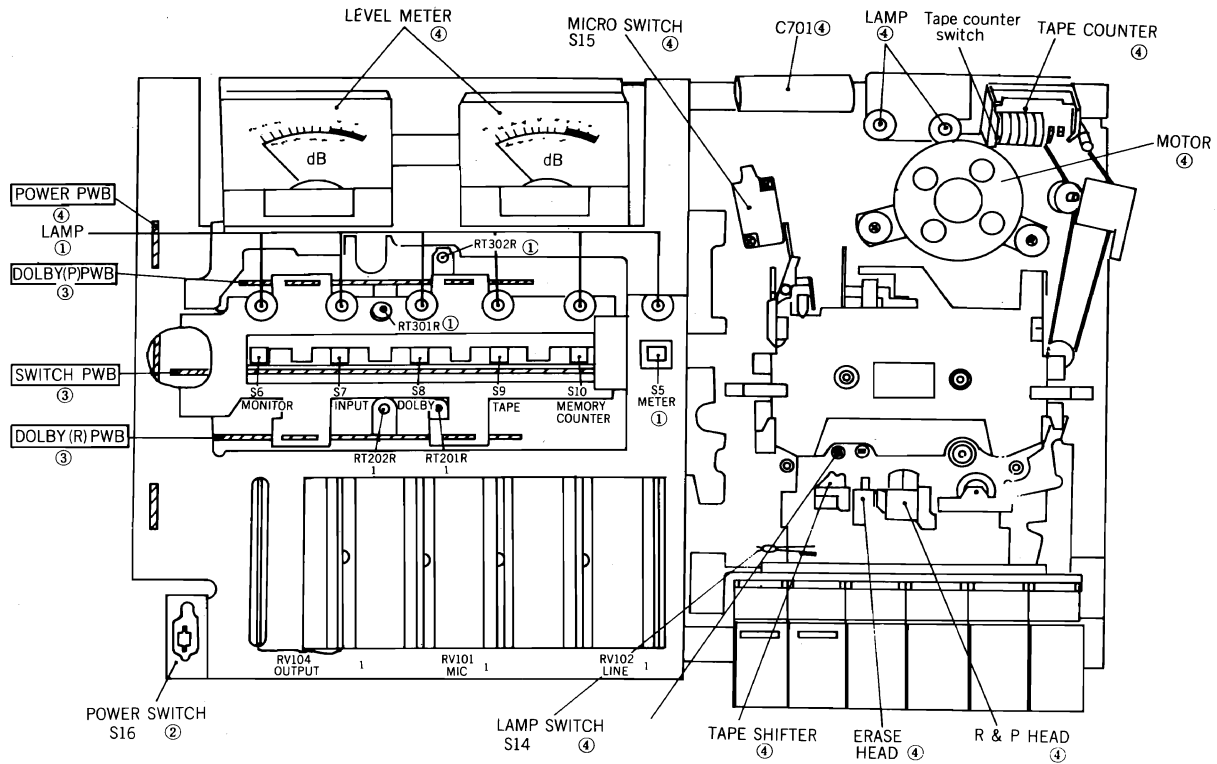


Fig. 29

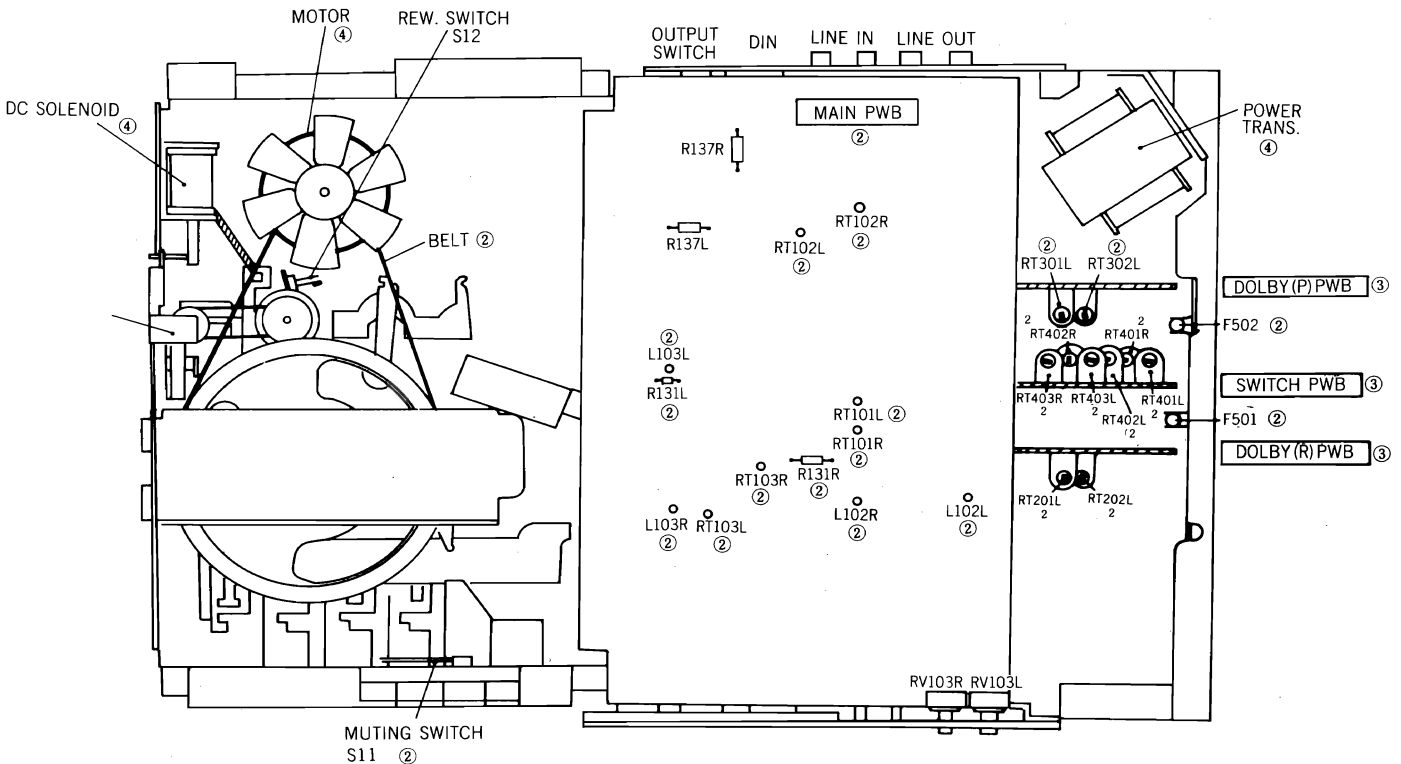
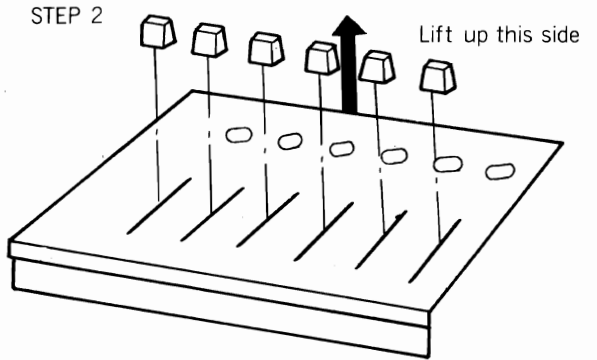
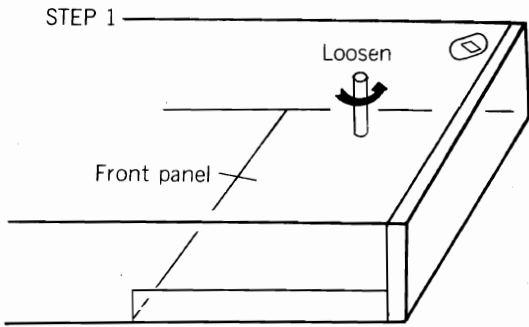


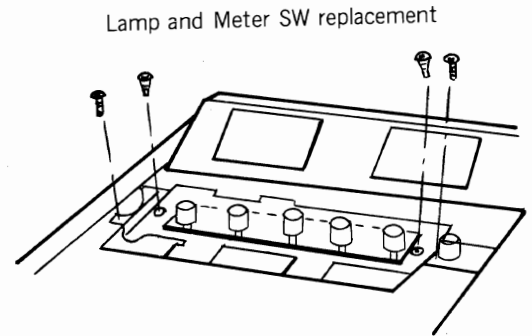
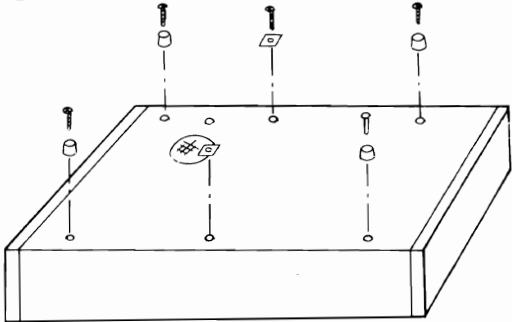
Fig. 30

**Disassembly procedure**

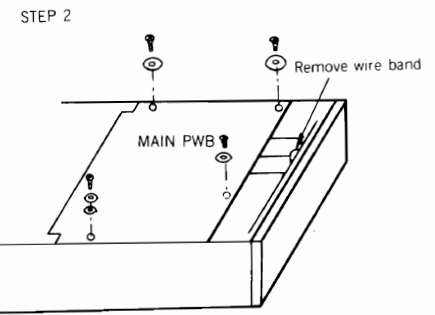
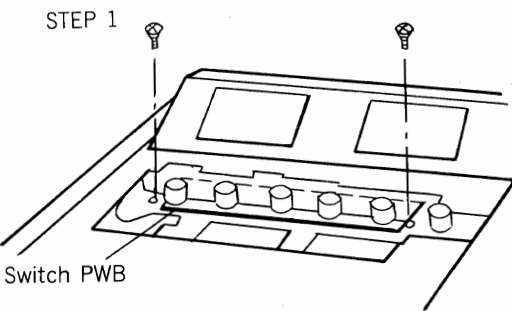
① Front panel



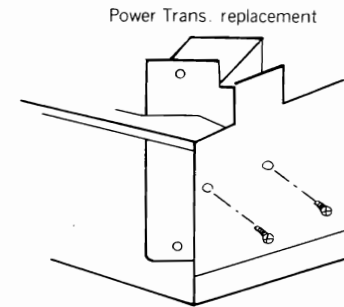
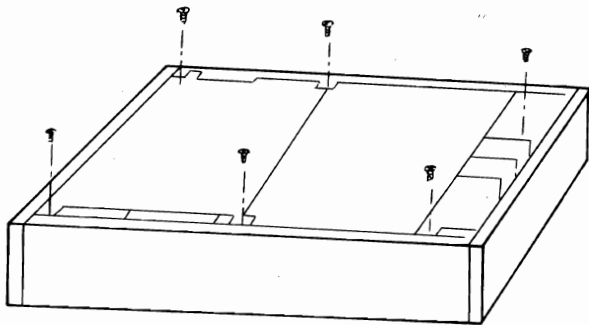
② Bottom plate



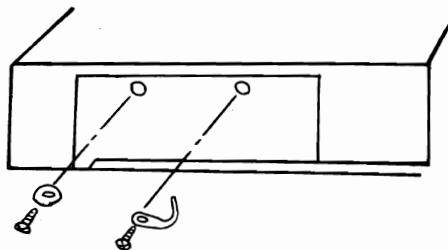
③ MAIN PWB with Dolby and Switch PWB



④ Chassis

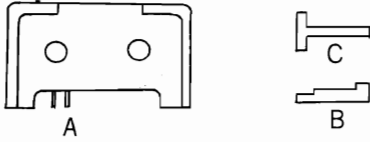


⑤ Power PWB

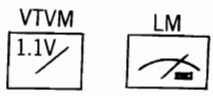
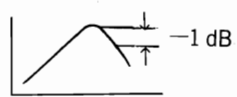
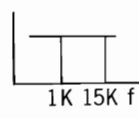
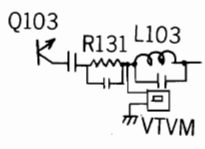

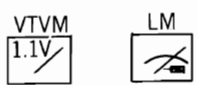
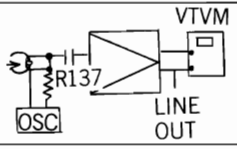
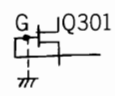


## ELECTRICAL ADJUSTMENT

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 0.2–0.3mm		
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		

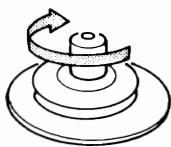
Item	Instrument	Playback/Recording	Switch pos'n	Adjust part	Method	Remarks	
4.	Bias current CrO <sub>2</sub> Tape VTVM Oscillator	Rec	Tape : CrO <sub>2</sub>		Apply to LINE IN 1kHz input which is 1.1V output(LM) at LINE OUT		
				Monitor : TAPE	RT103	Playback output -1 dB from peak	
				RT103	Reduce input signal by 20 dB ; adjust so 1 kHz 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 <sub>2</sub>	New CrO <sub>2</sub> tape VTVM Oscillator		Monitor : Tape & Source Tape : CrO <sub>2</sub>	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	
7-2Recording	Oscillator VTVM	Rec	Dolby : ON Monitor : TAPE	RT301	Output must be 32.5 dB (V1) lower than V0.		
				RT302	Remove Q301 ground. Adjust to raise 2 dB from V1 (B)		
			Dolby : OFF		Apply 5 kHz signal to LINE IN, connect VTVM to RV103.		
				RT202	Turn up to max.		
8	MPX filter	Rec	MPX : ON		Apply 5 kHz signal to LINE IN, connect VTVM to RV103.		
				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		Apply 19 kHz signal to LINE IN, connect VTVM to LINE OUT Minimum output		

## MECHANICAL ADJUSTMENT

### REWIND TORQUE

70~120gr·cm

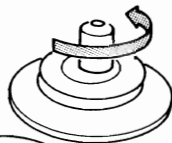


### TAKE UP TORQUE

40~70gr·cm

### FAST FORWARD TORQUE

70~120gr·cm



### 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)

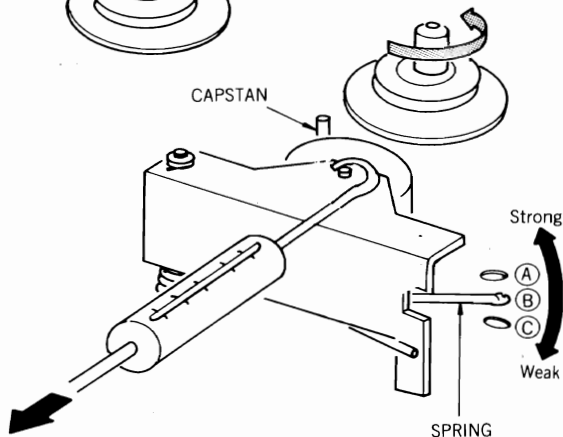
### PINCH ROLLER PRESSURE

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 (A)

To reduce the pressure : hook the spring in hole (C)



### PINCH ROLLER PRESSURE

650~850g

## LUBRICATION

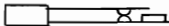
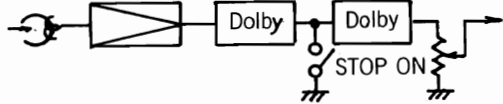
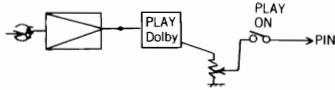

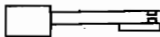
Lubricate one or two drops of machine oil to rotating point or lubricate grease to sliding point.

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

### VOLTAGE AND FREQUENCY CHANGING FOR GENERAL MODEL

General model is set for 230V, 50Hz. 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 60Hz is attached 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	Change cassette or cut out bad section of tape
	Misshapen 	
	Center hollow 	
	Improperly wound 	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











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

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 circuit	
	Faulty MPX filter	Repair
	Poor DCCS adjustment	Adjust
Faulty CrO <sub>2</sub> 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

Symbol No.	Stock No.	Description		Symbol No.	Stock No.	Description	
<b>CAPACITORS</b>							
C 701	0256935	MP	1μF	IC105	5359171	IC	HD-2523P
<b>RESISTORS</b>							
RC 501	0219902	CR pack		IC106	5068041	IC	RD-804
RT101L,R	0151884	Semi variable	2.2kΩ	IC201L,R	5350273	IC	BA-301H-B
RT102L,R	0151886	Semi variable	10kΩ	IC202L,R	5356071	IC	TA-4006
RT103L,R	0151889	Semi variable	100kΩ	IC203L,R	5356191	IC	TA-4016
RT201L,R	0151871	Semi variable	5kΩ	IC204L,R	5068031	IC	RD-803
RT202L,R	0151871	Semi variable	5kΩ	IC302L,R	5356071	IC	TA-4006
RT301L,R	0151871	Semi variable	5kΩ	IC304L,R	5068031	IC	RD-803
RT302L,R	0151871	Semi variable	5kΩ	D101	5330341	Diode	WO6A
RT401L,R	0151861	Semi variable	10kΩ	D201L,R	0575001	Diode	1N34A
RT402L,R	0151121	Semi variable	2kΩ	D202L,R	5330572	Diode	1S2473HC
RT403L,R	0151861	Semi variable	10kΩ	D203L,R	5330572	Diode	1S2473HC
RV101L,R	5026003	Variable	10kΩ	D204L,R	0575001	Diode	1N34A
RV102L,R	5026006	Variable	50kΩ	D205L,R	5330572	Diode	1S2473HC
RV103L,R	5000151	Variable	20kΩ	D301L,R	0575001	Diode	1N34A
RV104L,R	5026003	Variable	10kΩ	D302L,R	5330572	Diode	1S2473HC
<b>SEMI-CONDUCTOR</b>							
Q101L,R	5320064	Transistor	2SC458D	D303L,R	5330572	Diode	1S2473HC
Q102L,R	5320064	Transistor	2SC458D	D304L,R	0575001	Diode	1N34A
Q103L,R	5320064	Transistor	2SC458D	D305L,R	5330572	Diode	1S2473HC
Q104L,R	5320064	Transistor	2SC458D	D402L,R	5330572	Diode	1S2473HC
Q105	5320613	Transistor	2SC1213C	D502	5330341	Diode	WO6A
Q106	5320613	Transistor	2SC1213C	D503	5330341	Diode	WO6A
Q107	5320064	Transistor	2SC458D	D504	5330341	Diode	WO6A
Q201L,R	5321221	Transistor	2SK40R-L	ZD 501	5330059	Zenner diode	AWO1-22
Q202L,R	5320592	Transistor	2SA673B	TH401L,R	0576045	Thermistor	D-2B
Q203L,R	5320064	Transistor	2SC458D	<b>TRANSFORMERS</b>			
Q301L,R	5321221	Transistor	2SK40R-L	PT	5211731	Power trans (Australia, General)	
Q302L,R	5320592	Transistor	2SA673B	PT	5211665	Power trans (USA)	
Q401L,R	5320064	Transistor	2SC458D	PT	5211666	Power trans (Canada)	
Q501	5320671	Transistor	2SC1061C	T101	5260022	Oscillator trans	
Q502	5320723	Transistor	2SA715C	T102L,R	5250944	Head phone trans	
IC101L,R	5350251	IC	HA-1406	<b>COILS :</b>			
IC102L,R	5350251	IC	HA-1406	L101LR	5120185	Trap coil	33mH
IC103L,R	5356181	IC	TA-4015	L102LR	5270001	Choke coil	33mH
IC104	5356021	IC	TA-4001	L103LR	5270001	Choke coil	33mH
				L104LR	5120274	Trap coil	25mH
				L105LR	5270001	Choke coil	33mH

Hardware nomenclature

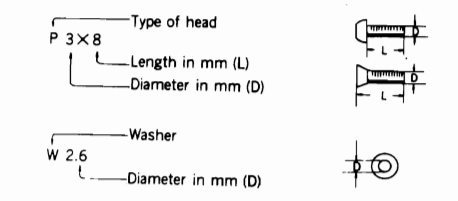
P	Pan head screw		BT	Binding head tapping screw	
F	Flat countersunk head screw		BL	Bolt	
B	Binding head screw		W	Washer	
T	Round head tapping screw		E	"E" ring	

Example

Type of head  
P 3 x 8

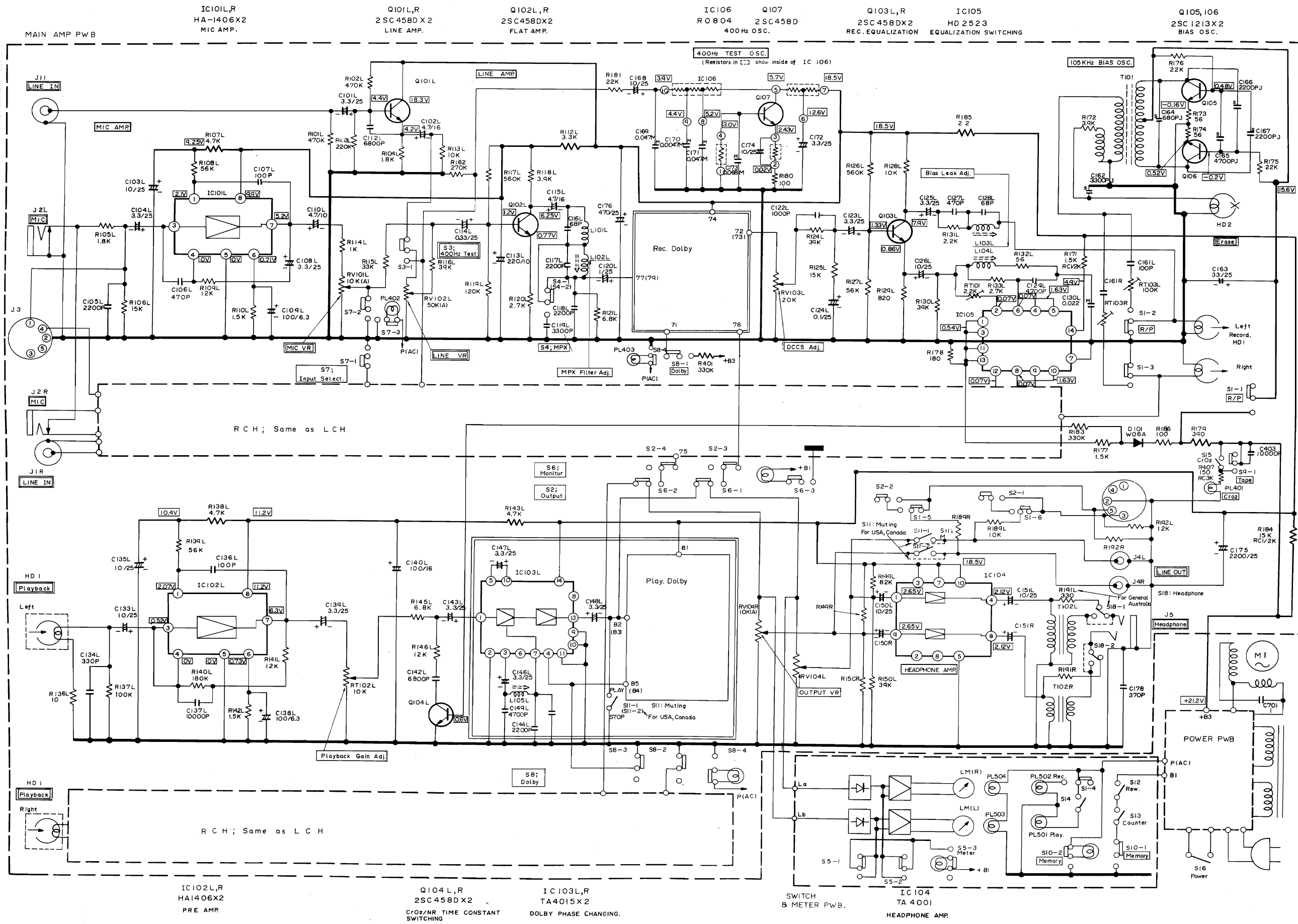
Length in mm (L)  
Diameter in mm (D)

Washer  
W 2.6  
Diameter in mm (D)



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 Resistors and Capacitors.

**RESISTORS**

Value	No indicated : $\Omega$ K : 1000 $\Omega$
Wattage	No indicated : 1/4W.
Tolerance	No indicated : $\pm 5\%$ K : $\pm 10\%$
Sort	No indicated : Carbon film RC : Composition RS : Metal oxide
Example	R101.....Circuit No. 150.....Value RS · 1 · K.....Sort · Wattage · Tolerance

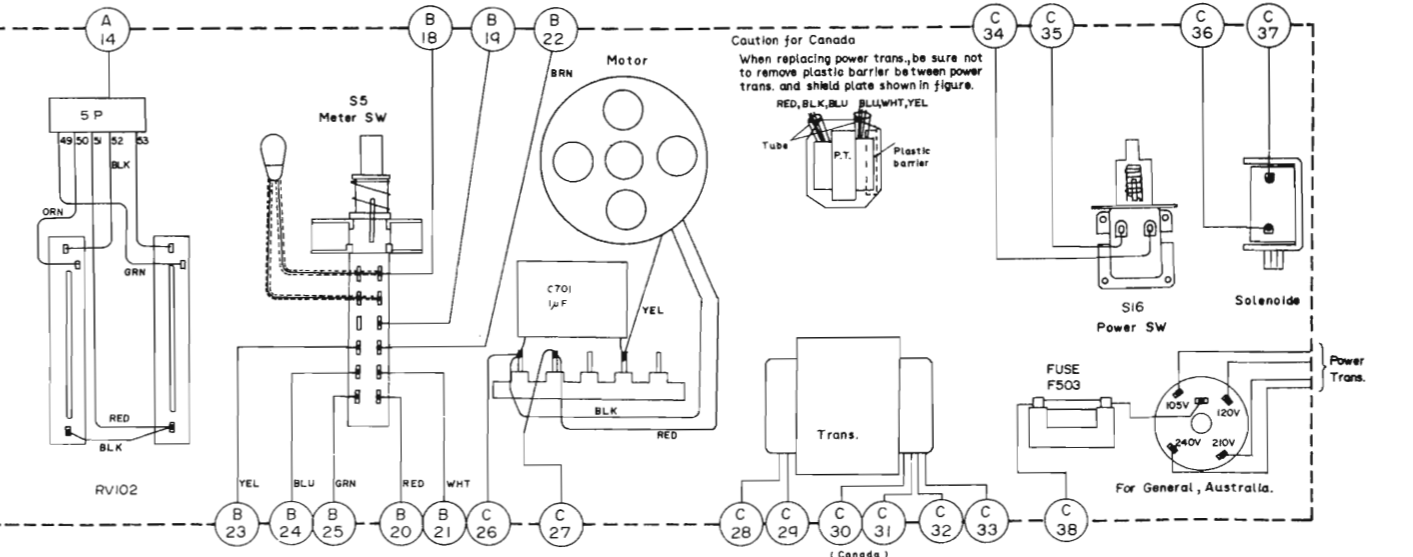
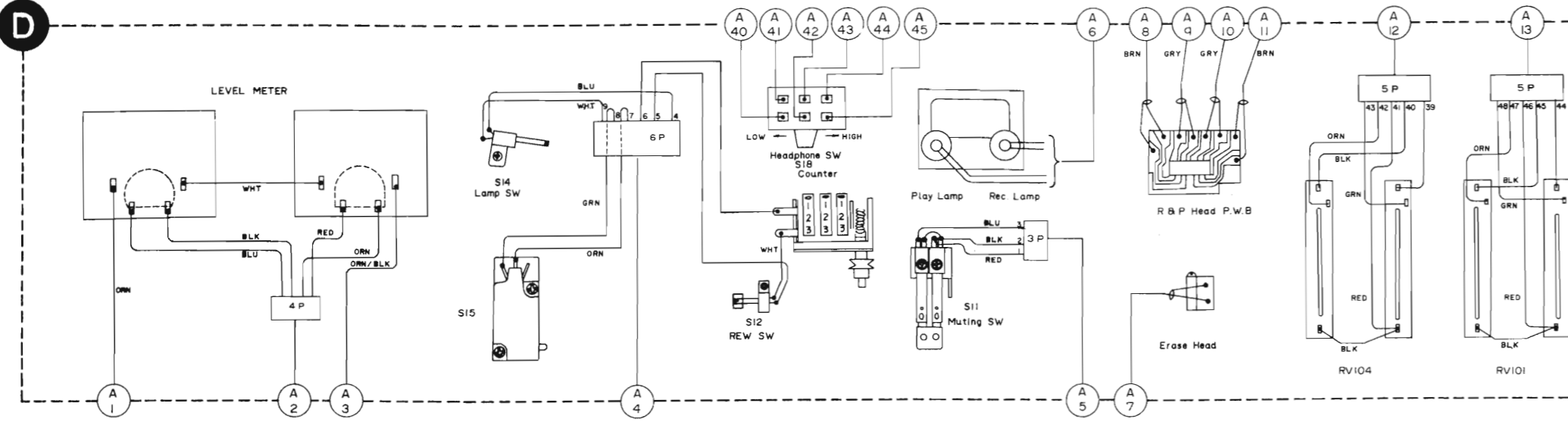
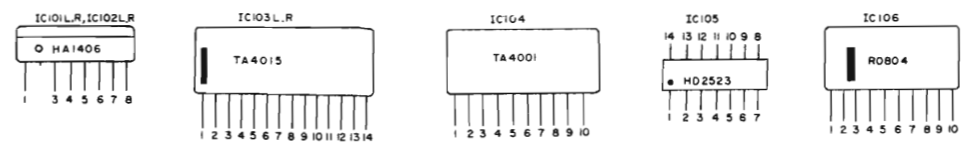
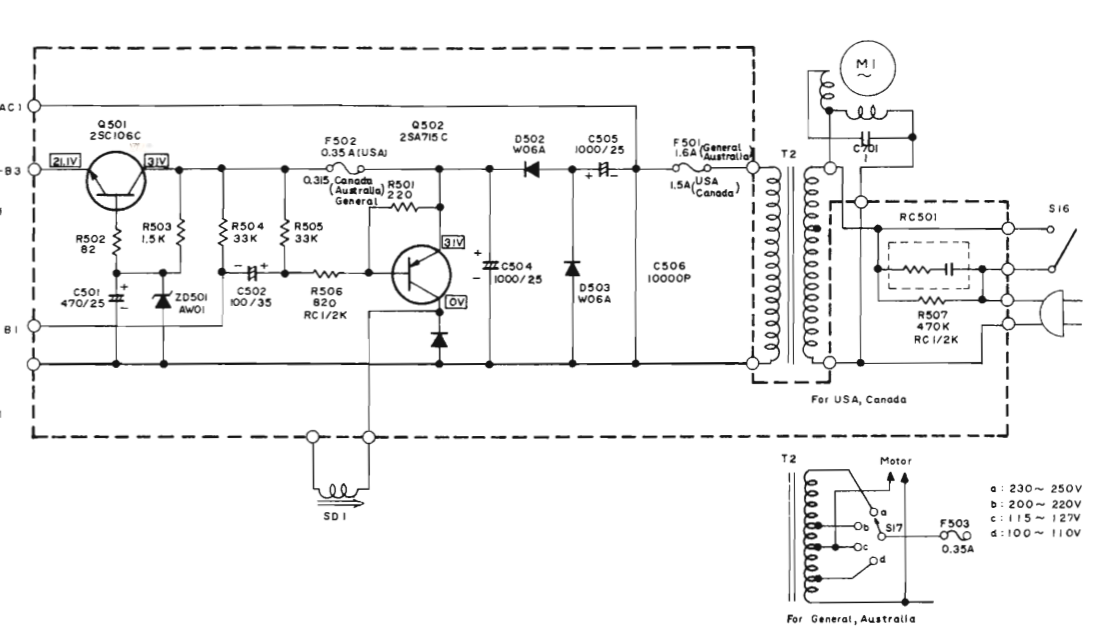
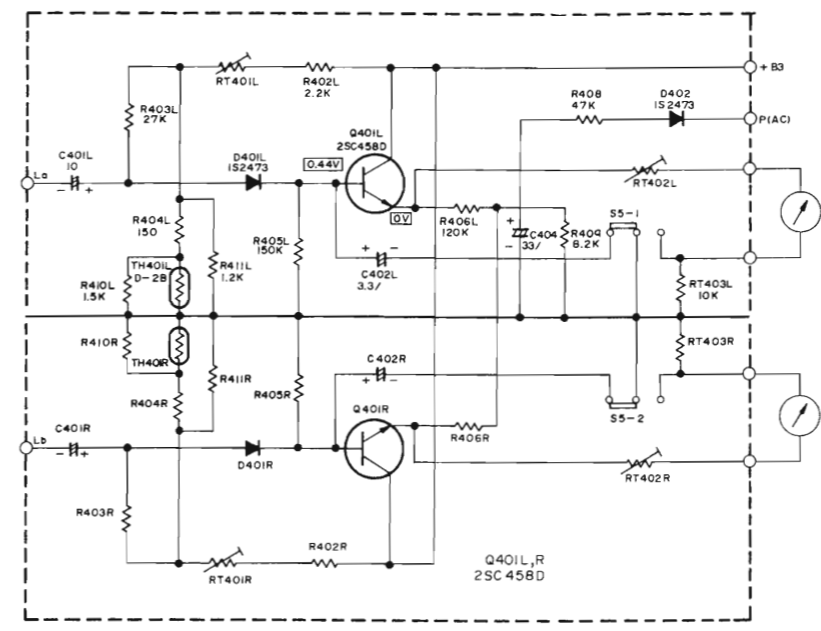
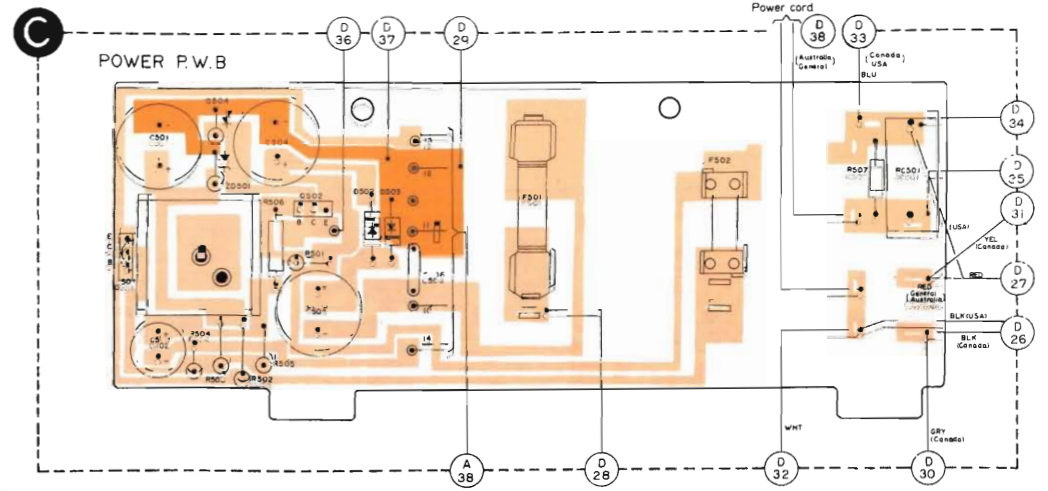
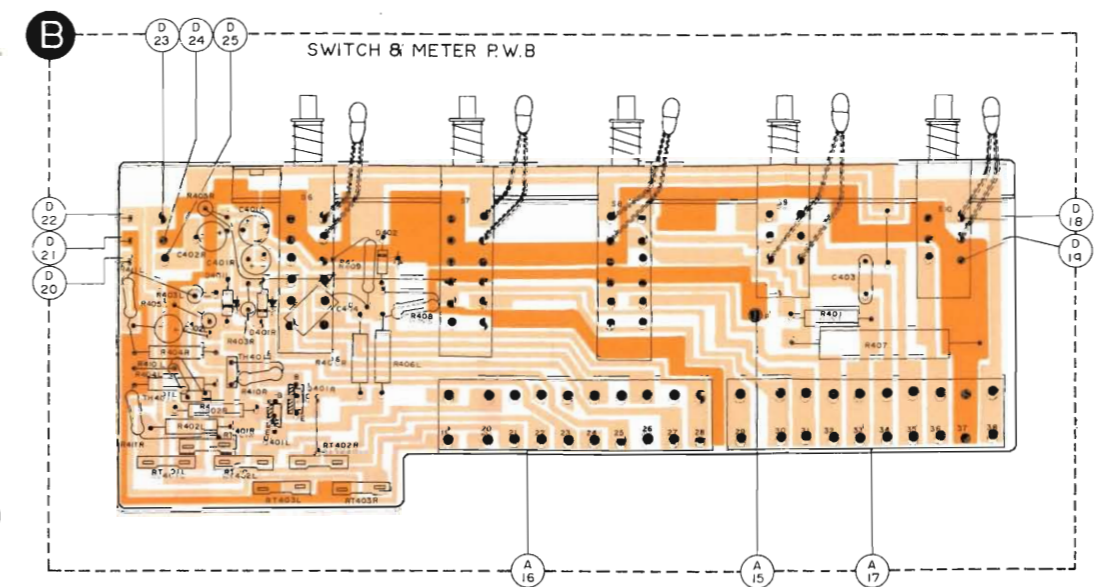
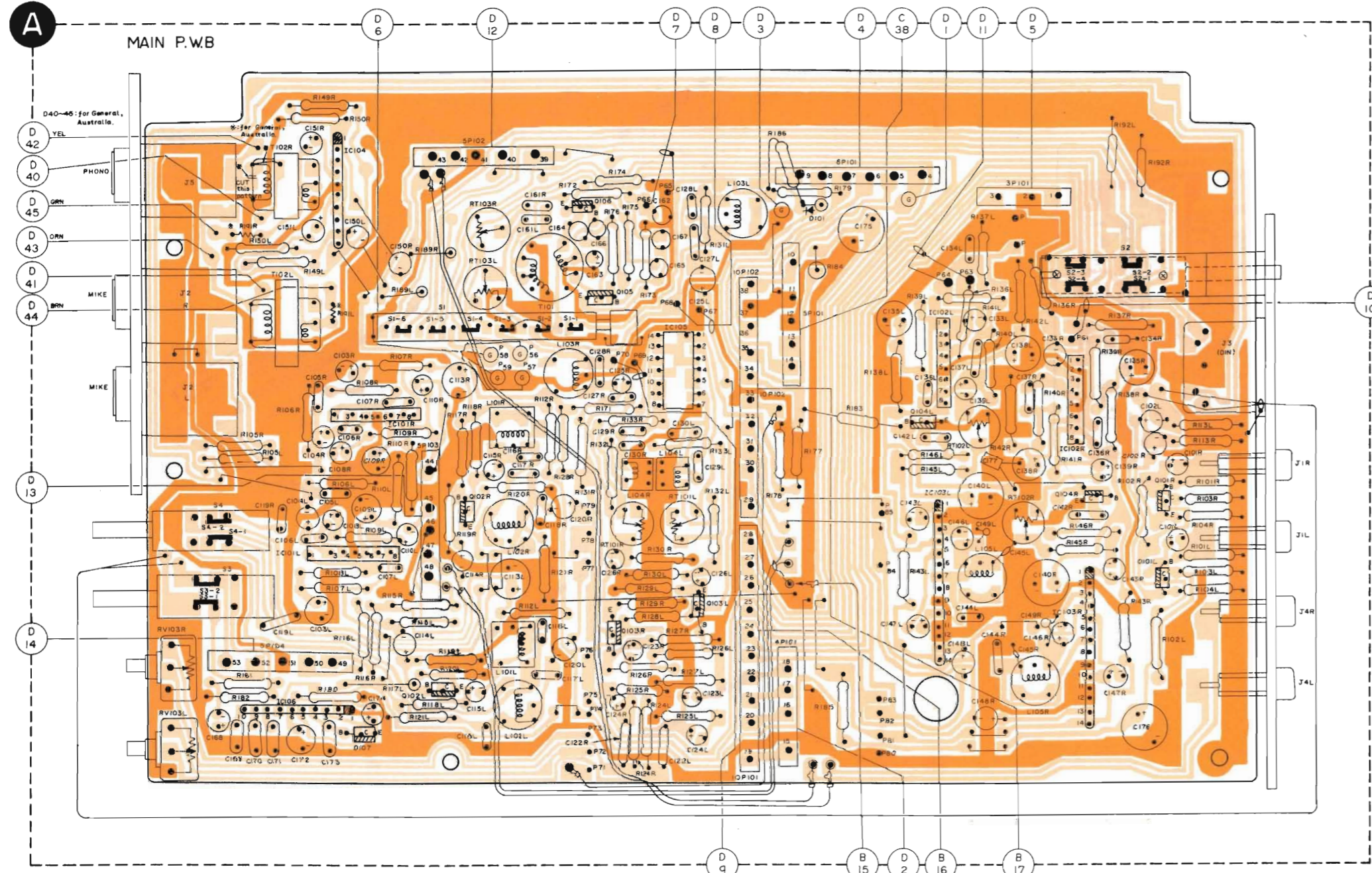
**CAPACITORS**

Value	No indicated : $\mu F$ P : pF
Voltage	No indicated : 50WV
Tolerance	No indicated : $\pm 10\%$ J : $\pm 5\%$ M : $\pm 20\%$ Z : $+80 - 20\%$ D : $\pm 0.5 pF$ C : $\pm 0.25 pF$
Sort	Ceramic Electrolytic 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

D-3500

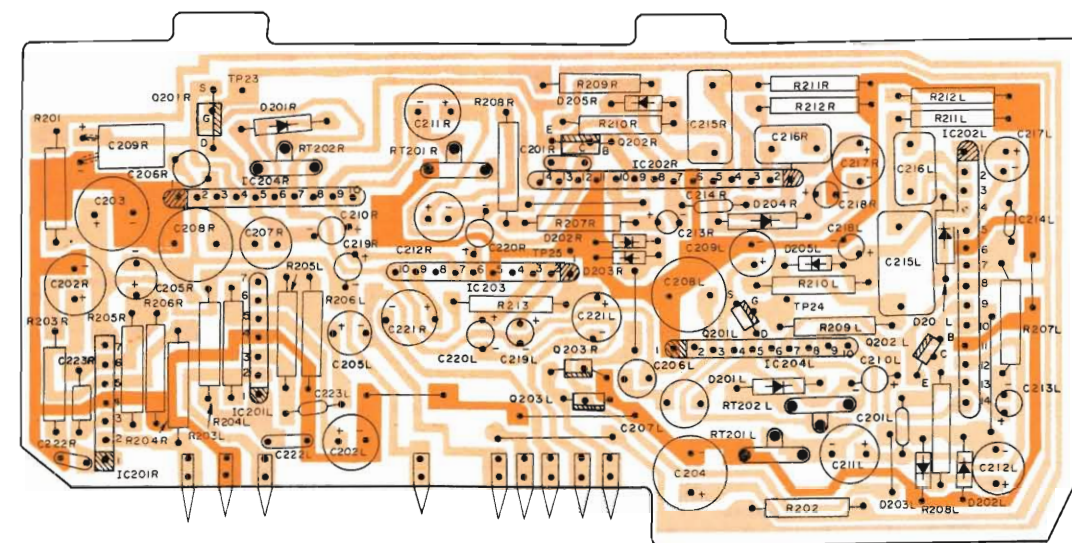


	Q101L,R	Q102L,R	Q103L,R	Q104L,R	Q105L,R	Q106L,R	Q107L,R	Q401L,R	Q501	Q502
E	4.2V	0.77V	0.86V	0V	-0.16V	0.52V	2.43V	0V	21.2V	31V
C	18.3V	6.25V	7.9V	—	15.6V	15.6V	5.7V	21.2V	31V	0V
B	4.4V	1.2V	1.33V	0.59V	0.48V	-0.2V	2.95V	0.44V	—	—

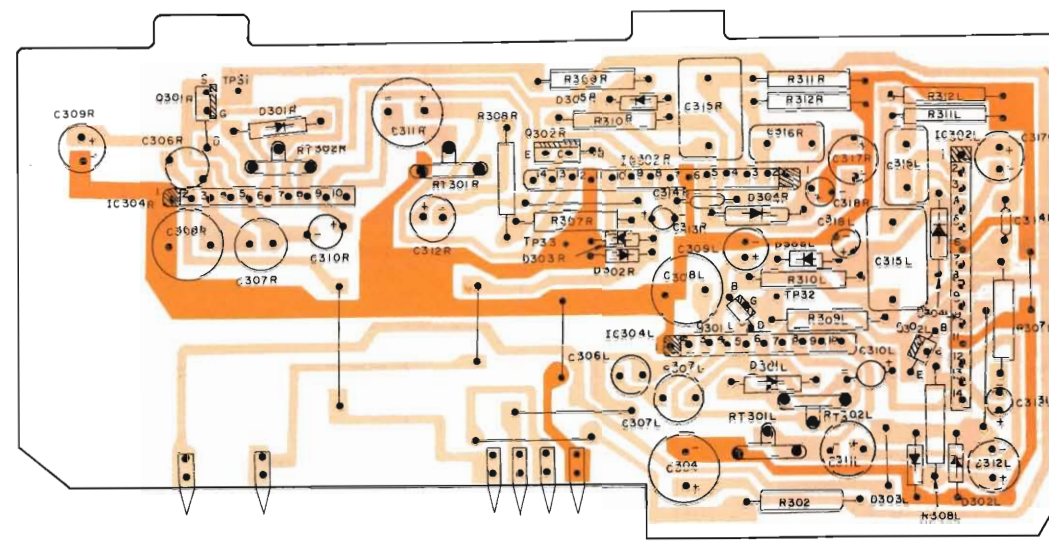
IC101L,R			IC102L,R			IC103L,R					
1	2.1V	5	0V	1	2.07V	5	0V	1	2.35V	8	8.9V
2	—	6	0.71V	2	—	6	0.73V	2	0V	9	0V
3	0.6V	7	5.2V	3	0.52V	7	6.3V	3	0V	10	0.58V
4	0V	8	9.9V	4	0V	8	11.2V	4	0V	11	0V
								5	0V	12	0V
								6	2.42V	13	8.2V
								7	8V	14	19.3V

IC104			IC105			IC106					
1	2.65V	6	21.2V	1	0.54V	8	0.07V	1	0V	6	12.6V
2	2.5V	7	18.5V	2	0.07V	9	1.63V	2	0.02V	7	18.5V
3	1.85V	8	2.65V	3	0.54V	10	1.63V	3	2.43V	8	5.2V
4	2.1V	9	2.65V	4	1.63V	11	0.54V	4	2.95V	9	4.4V
5	1.63V	10	18.5V	5	1.63V	12	0.05V	5	5.7V	10	3.9V
				6	0.07V	13	0.54V				
				7	0V	14	4.9V				

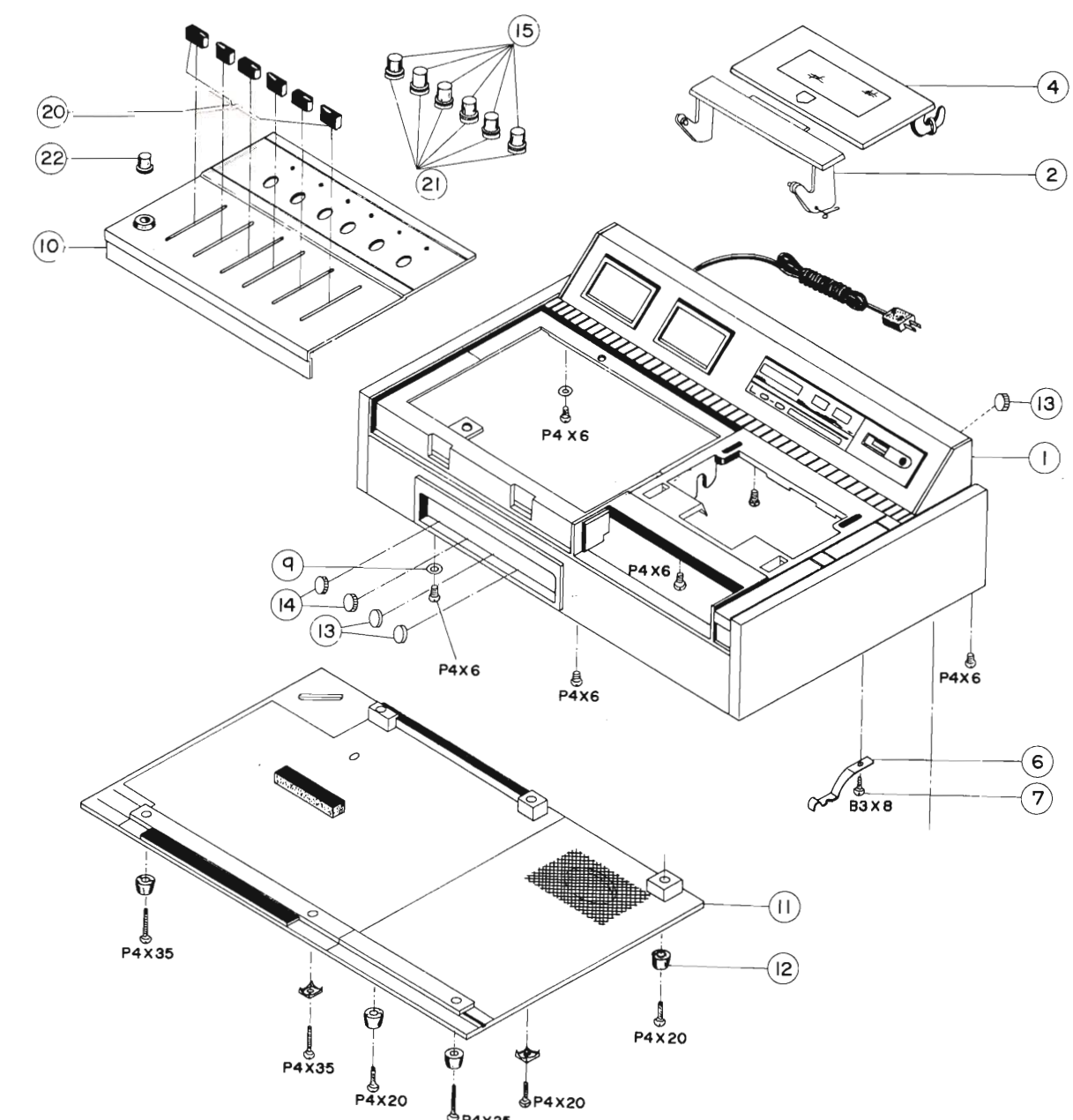
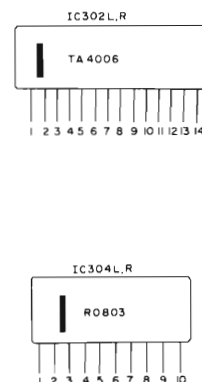
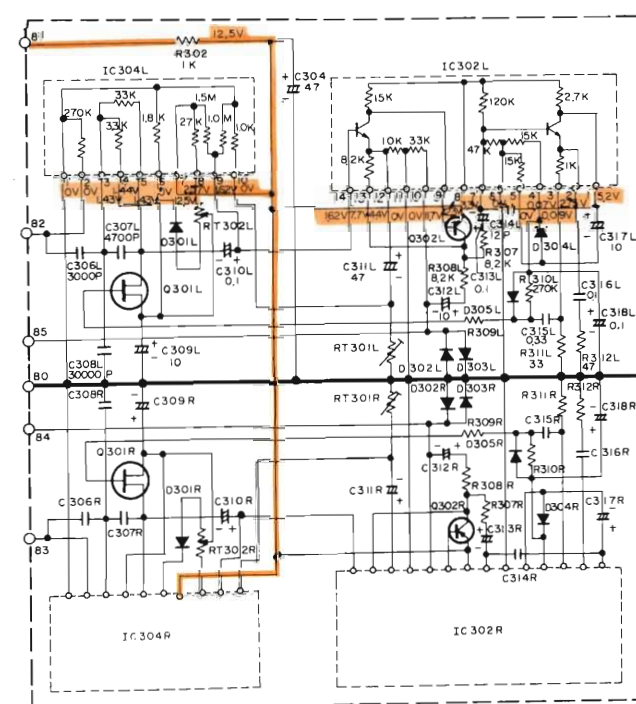
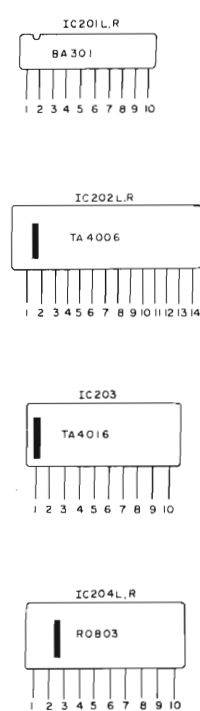
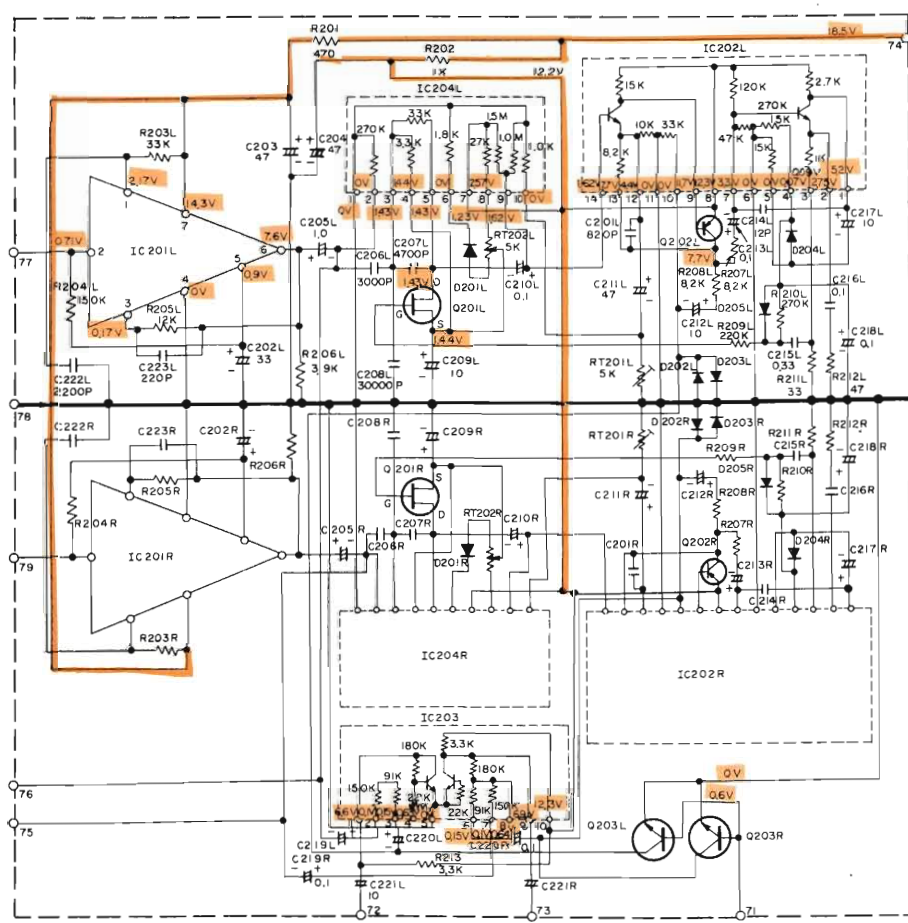
EXPLODED VIEW OF CABINET



IC201L,R		IC203		IC204L,R		Q202L,R Q203L,R		IC202L,R		Q201L,R	
1	2.17V	1	6.6V	6	0.5V	B	11.7V	1	5.2V	8	12.3V
2	0.71V	2	0.1V	7	0.1V	C	7.7V	2	0V	7	12.5V
3	0.17V	3	0.5V	8	0.64V	D	12.3V	3	0.09V	10	0V
4	0V	4	0.63V	9	6.9V	E	12.3V	4	0.07V	11	0V
5	0.9V	5	0V	10	12.3V	F	12.3V	5	0V	12	4.4V
6	7.6V					G		6	0V	13	7.7V
7	14.3V							7	3.3V	14	1.62V

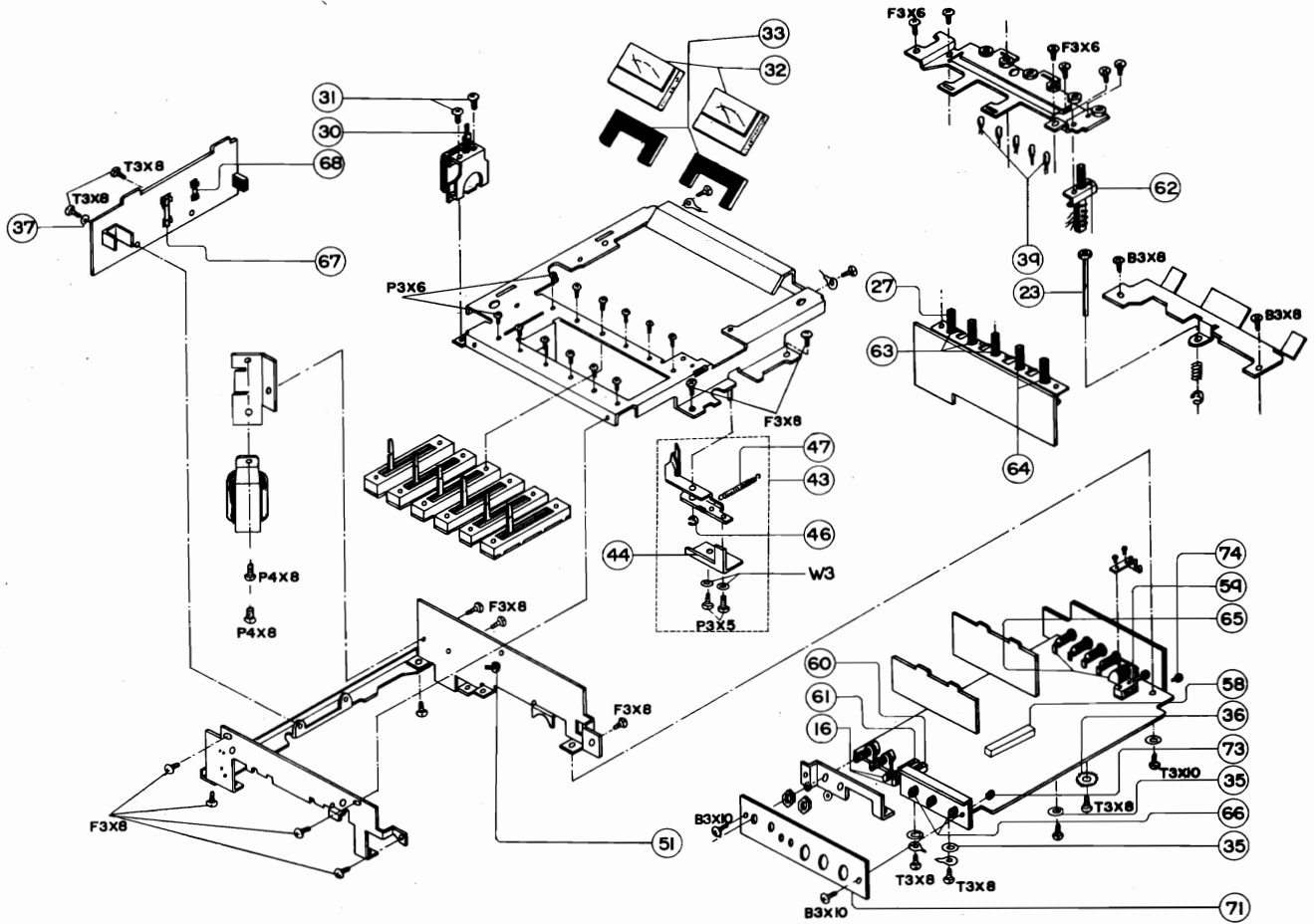


IC304L,R		Q301L,R		Q302		IC302L,R	
1	0V	D	1.43V	B	11.7V	1	5.2V
2	0V	E	1.44V	C	7.7V	2	2.75V
3	1.43V	F	1.44V	D	12.3V	3	1.43V
4	1.44V	G		E	12.3V	4	0.07V
5	1.43V			F	12.3V	5	0V
				G		6	0V
						7	3.3V



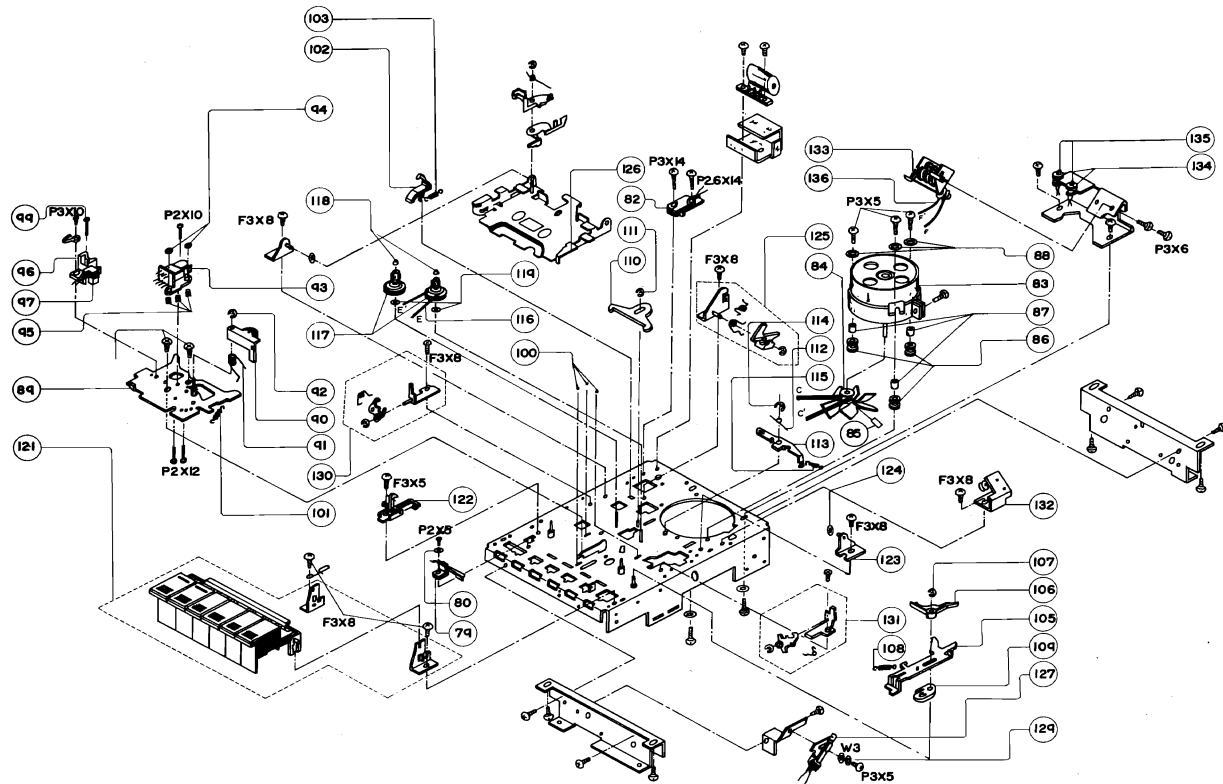
Index No.	Stock No.	Description	Index No.	Stock No.	Description
1	6134402	Front case assembly	20	6295131	Volume knob
	6218992	Counter board assembly	21	7717705	Special washer (6 req'd) for switch button
2	6095081	Head cover	22	6272468	Push button for power switch
4	6090405	Cassette lid	<b>Accessory</b>		
6	6580082	Ring for upper cover	5662021	5662021	E socket adaptor (General)
9	7717704	Special washer (2 req'd) for front case mounting	5744842	5744842	DIN cord (Australia)
10	6670501	Amp panel assembly	5746141	5746141	Patch cord (U.S.A., Canada)
11	6154629	Bottom plate assembly (Australia)	6346742	6346742	Motor pulley (60Hz) with fan (Australia)
	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)			

EXPLODED VIEW OF MAIN CHASSIS



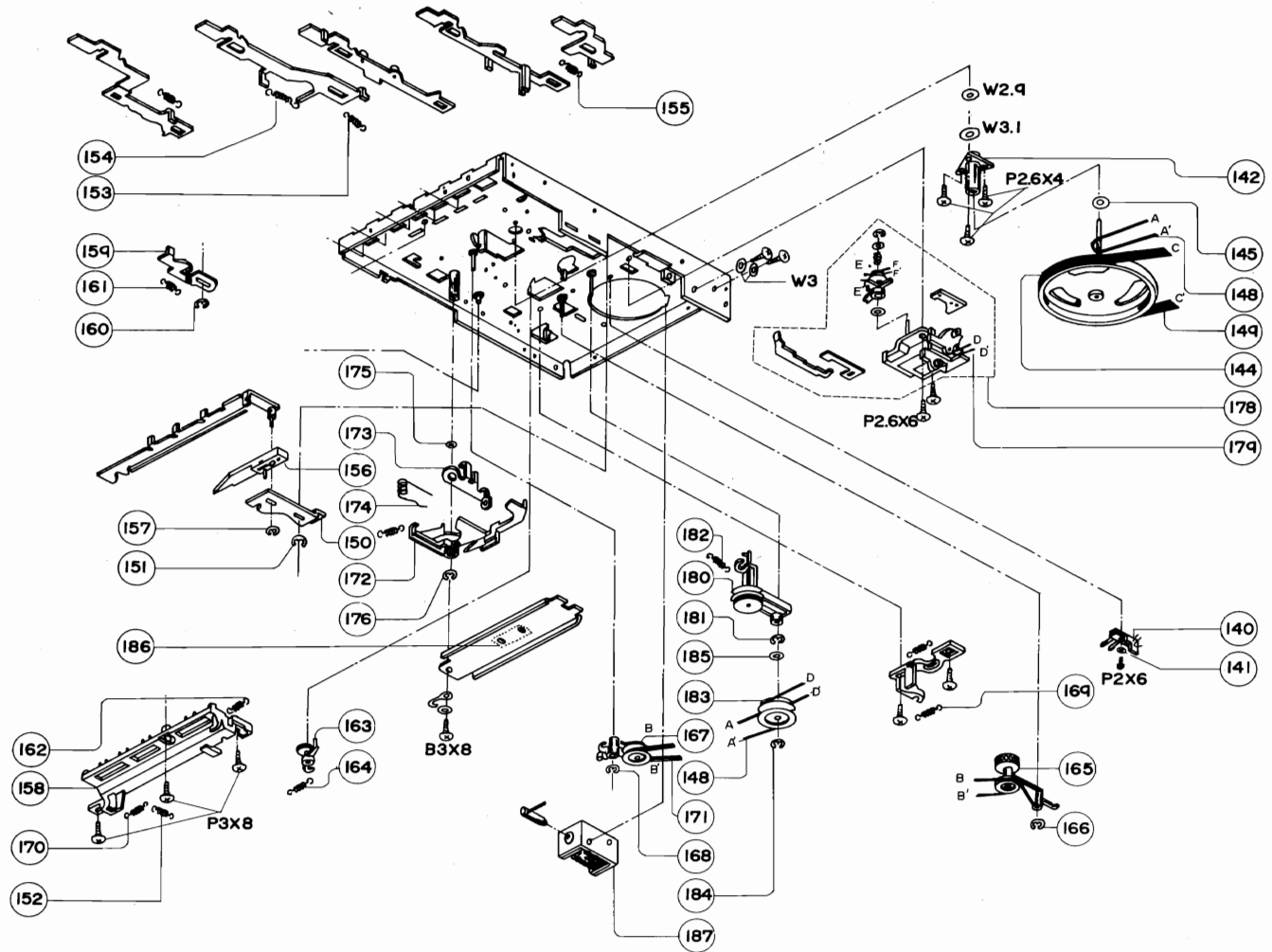
Index No.	Stock No.	Description	Index No.	Stock No.	Description	
23	7538192	Stud	PL502	5762171	Lamp	
25	7230904	*E* ring-5mmφ	PL501	5762171	Lamp	
27	6258881	Button base for switch button		6354181	Counter belt	
S 16 30	5633021	Push switch for power switch		5639023	Rotary switch (Australia General)	
31	7777618	Specail screw (2 req'd) for power switch mounting	S 1	58	5632112	Slide switch (R/P)
32	7677152	Level meter cushion	S 2	59	5630903	Push switch (Output)
33	5554101	Level meter	S 3	60	5633164	Push switch (400Hz)
35	7711854	Fiber washer (3 req'd) for amp printed mounting	S 4	61	5633161	Push switch (MPX)
36	8815114	Lock washer-3mmφ for amp printed mounting	S 5	62	5637039	Push switch (Meter)
37	7778012	Fiber washer (2 req'd) for amp printed and AC printed mounting	S 6	63	5637036	Push switch (Monitor)
38	7667833	Lamp rubber cushion (6 req'd)	S 7	63	5637036	Push switch (Input)
39	5762141	Lamp	S 8	63	5637036	Push switch (Dolby)
43	7271688	R lever assembly	S 9	64	5637036	Push switch (Tape)
44	7271702	R lever (2)	S 10	64	5637036	Push switch (Memory)
46	7230903	*E* ring-4mmφ for R lever mounting	J 1L, R	65	5676092	Pin jack
47	6324451	Spring for R lever	4L, R			
51	0043793	Bushing (power cord) (U.S.A. Canada General)	J 2L, R	66	5679181	Jack for Mic & Phone
	6794011	Bushing (Australia)	5L, R			
	5559041	Memory counter Assembly	F501	67	0591188	Fuse (1.6A) (Australia General)
	7667833	Motor rubber cushion (2 req'd)	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



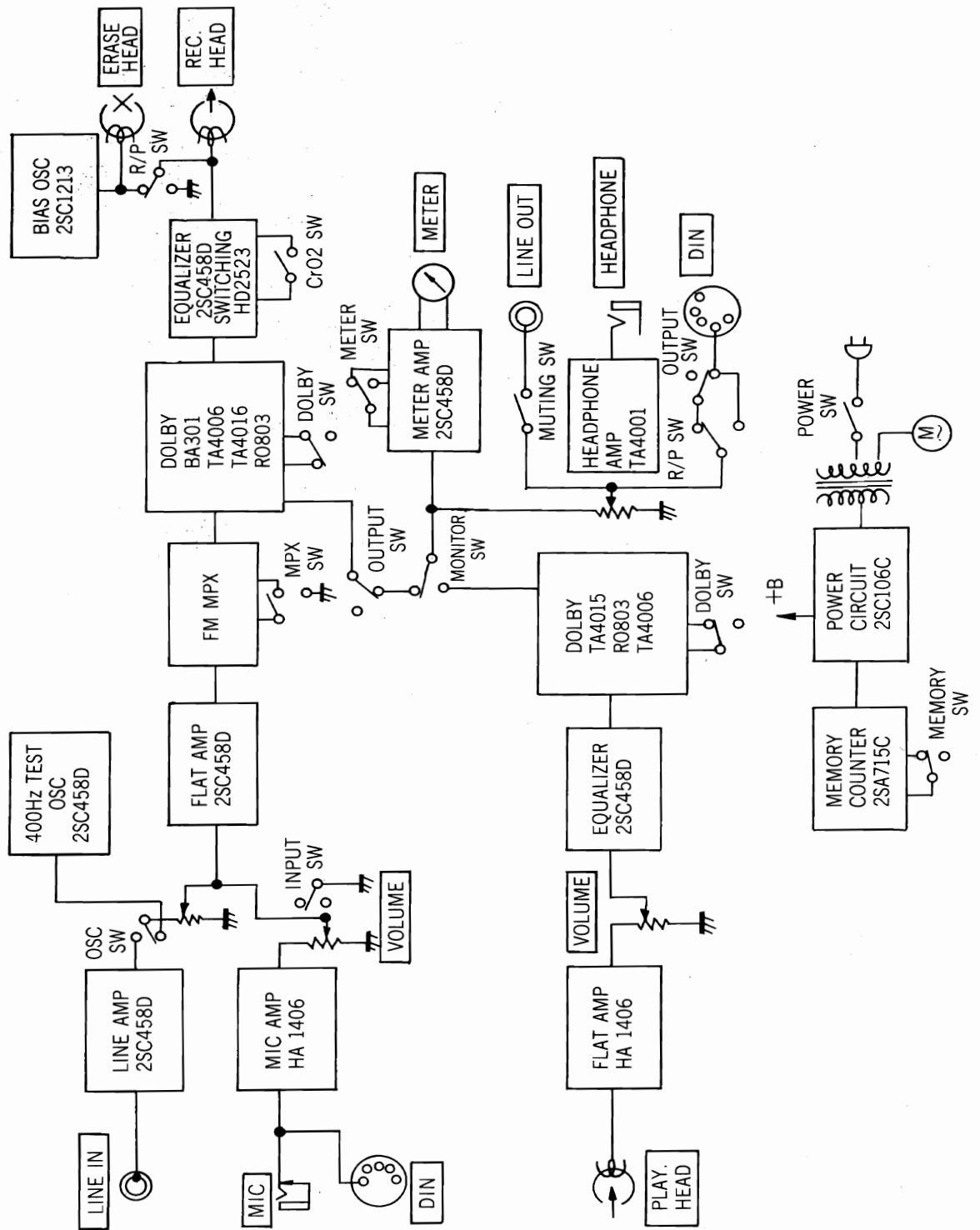
Index No.	Stock No.	Description	Index No.	Stock No.	Description	
76	5526271	Leaf switch with switch P.W.B assembly	107	7230902	E-ring-3mm φ for pause slider & pause lever	
78	8815111	Lock washer-2mm φ for switch printed wire board assembly mounting	108	6322801	Return spring	
79	5630562	<b>Leaf switch</b>	109	6725701	Pause lock piece	
80	8815111	Lock washer-2mm φ for leaf switch mounting	110	6733991	Brake plate	
82	5631821	<b>Micro switch</b> for tape selector	111	7230902	*E <sup>φ</sup> ring-3mm φ for brake plate mounting	
83	5571202	Motor (Canada, Australia, General)	112	6307162	Spring	
	5571201	Motor (USA)	113	7275261	Lever moving with brake plate	
84	6346741	Motor pulley with fan (Australia) (General) (50 Hz)	114	7230903	*E <sup>φ</sup> ring-4mm φ	
	6346742	Motor pulley with fan (U.S.A.) (Canada) (60 Hz)	115	6321281	Spring	
85	7773083	Screw for motor pulley mounting	116	6354151	Turn table belt	
86	6576161	Motor cushion (3 req'd)	117	6411701	<b>Turn table assembly</b>	
87	7574403	Coller (3 req'd)	118	0930002	Cap	
88	0645587	Special washer (3 req'd) for motor holder mounting	119	0948831	Polyester washer for turn table	
89	7270533	Head plate assembly	121	6255182	Button assembly	
90	7252992	Pinch roller assembly	122	6733913	Eject assembly	
91	6306921	Spring for pinch roller	123	7270552	Tray holder assembly	
92	7230901	*E <sup>φ</sup> ring-2mm φ for pressure roller assembly mounting	124	0948727	Nylon washer	
93	5444132	R & P Head	125	7274271	Tray arm assembly	
94	8821231	Nut-2mm φ (2 req'd) for head mounting	126	7271051	<b>Cassette tray assembly</b>	
95	6303951	Spring for head	127	5632173	<b>Plate switch</b>	
96	6736381	Tape shifter Assembly	129	8813114	Spring washer-3mm φ for plate switch mounting	
97	5445011	<b>Erase head</b>	130	7274261	Side arm assembly (Supplying side)	
98	7275982	Plate for erase head	131	7274262	Side arm assembly (Take-up side)	
99	7780824	Special screw	132	7465271	Roller holder assembly	
100	0948492	Ball-2mm φ	133	5559041	<b>Memory counter assembly</b>	
101	6300351	Spring for head plate	134	7667833	Rubber cushion (2 req'd)	
102	6733922	Recording prevention plate	PL501, 502	135	5762171	<b>Lamp</b>
103	6321661	Spring for recording prevention plate	136	6354181	<b>Counter belt</b>	
105	7270634	Pause slider assembly				
106	6733932	Pause lever				

EXPLODED VIEW OF CHASSIS—BOTTOM



Index No.	Stock No.	Description	Index No.	Stock No.	Description
140	5526271	<b>Leaf switch with P.W.B</b>	166	7230901	*E <sup>o</sup> ring-2mm $\phi$
131	8815111	Lock washer-2mm $\phi$	167	6411623	for fast forward arm mounting
142	7592581	for switch P.W.B	168	7230901	F arm assembly
144	6372283	Metal holder assembly	169	6320071	*E <sup>o</sup> ring-2mm $\phi$
145	7771761	Flywheel assembly	170	6322051	for F arm mounting
148	6354161	Polyester washer (2 req'd)	171	6354171	T spring
149	6357054	for flywheel	172	6733981	Spring for t function
150	7270571	<b>Belt for take-up</b>	173	7273091	*E <sup>o</sup> ring-4mm $\phi$
151	7230901	<b>Belt for flywheel</b>	174	6307043	for FR lever mounting
152	6300142	Lock off slider	175	7778433	Spring for head plate
153	6322051	*E <sup>o</sup> ring-2mm $\phi$	176	7230903	<b>Auto stop block assembly</b>
154	6323801	Spring for recording slider	178	6300351	<b>Block belt</b>
155	7538471	Spring for rewinding slider	179	6411693	Take-up arm assembly
156	6733891	Spring for fast forward slider	180	6411633	E-ring-1.5mm $\phi$
157	7230901	Play pin	181	7778394	for take-up arm assembly
158	6733952	Spring for stop slider	182	6300171	Spring
159	7270444	Lock off piece	183	6349032	T pulley assembly
160	7230902	*E <sup>o</sup> ring-2mm $\phi$	184	7778394	E-ring-1.5mm $\phi$
161	6300142	Holder plate	185	0948832	for T pulley assembly
162	6323063	Eject plate	186	6733941	Polyester washer
163	6733501	*E <sup>o</sup> ring-3mm $\phi$	187	5642082	for T pulley assembly
164	6325853	for eject plate mounting			Capstan holder
165	6733182	Spring			DC solenoid
		Rewinding idler assembly			
		Spring for rewinding idler			
		Fast forward arm assembly			

# BLOCK DIAGRAM



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 Cable Address : HITACHY TOKYO  
 Codes : All Codes Used

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 '75 (Y)



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October 22, 1976

TO: All Audio Component Authorized Service Facilities  
FROM: Curtis L. Sidles - National Service Manager  
SUBJ: D-3500 "CrO<sub>2</sub>/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<sub>2</sub> circuit" (figure 17) and "CrO<sub>2</sub> 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.

CLS/pak 

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