

The Harman Kardon Model CD401

Manual No. 39A

ULTRA WIDEBAND LINEAR PHASE CASSETTE DECK

Technical Manual



harman/kardon

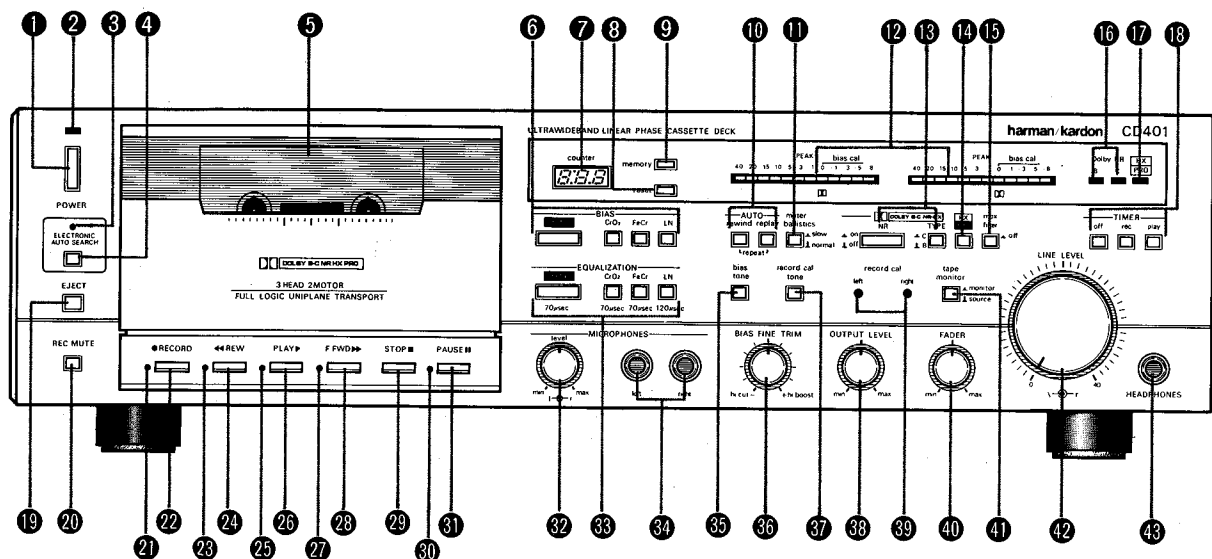
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COMPONENTS AND THEIR FUNCTIONS



1 POWER SWITCH (POWER)

For power turning on and off.
When this switch is pressed with the AC cord plugged to an AC outlet, the POWER INDICATOR illuminates.

2 POWER INDICATOR

For indication of power supply to this unit.

3 ELECTRONIC AUTO SEARCH INDICATOR

For indication of functioning of the electronic auto search system.

4 ELECTRONIC AUTO SEARCH SWITCH (ELECTRONIC AUTO SEARCH)

For quick cueing of the start of a music.
When this switch is depressed, the ELECTRONIC AUTO SEARCH INDICATOR illuminates and a start of each music is automatically searched so as to enable sequential playback of the musics recorded in a tape.

5 CASSETTE COMPARTMENT

6 BIAS SELECTORS (BIAS)

Press the button meeting the type of the tape for recording. If no button is pressed, the RECORD INDICATOR does not turn on and recording cannot be accomplished. These buttons are not effective in tape playback.

7 TAPE COUNTER (counter)

For digital display of the position in a cassette tape.
The figure changes as the tape runs. Cueing for the start of a melody is facilitated by making a note of the counter reading.

8 RESET BUTTON (reset)

For resetting the TAPE COUNTER to "000". Press this button to reset the counter to "000" when starting recording. This button is also used with the MEMORY button to stop tape rewinding automatically at the desired position.

9 MEMORY BUTTON (memory)

For automatic stopping of tape rewinding at a desired position in

combination with the RESET button.

Depress this button and push the RESET button during playback or recording to reset the TAPE COUNTER to "000".
When the tape is rewound in this state, tape running automatically stops at the position where the TAPE COUNTER indicates "000".

10 AUTOMATIC REPEAT BUTTONS (AUTO)

• AUTO REWIND BUTTON (rewind)

When this button is set in ON position (pressed), the tape is automatically rewound, after playback or recording to the tape end, either to the beginning of the tape or to "000" of the TAPE COUNTER indication when the MEMORY button is pressed on.

• AUTO REPLAY BUTTON (replay)

When this button is set in ON position (pressed), the tape playback automatically starts after rewind either from "000" position of the TAPE COUNTER indication when the MEMORY button is pressed on or from the beginning of the tape.

When these two buttons are set in ON position (pressed), the tape is automatically rewound from the tape end to the beginning of the tape or to "000" of the TAPE COUNTER indication when the MEMORY button is pressed ON and then playback starts automatically. Automatic rewind and playback are accomplished repeatedly.

11 METER BALLISTICS SELECTOR (meter ballistics)

For selection between normal and slow LED LEVEL DISPLAY recovery time.

12 LED LEVEL DISPLAY (PEAK)

For clear indication of the recording or playback level.

13 *DOLBY NR SYSTEM SELECTOR (DOLBY B-C NR)

• NR ON/OFF SELECTOR (NR)

For recording or playback using the Dolby NR system.
Press this selector to use the Dolby NR system. The green DOLBY NR INDICATOR (for B-type) or the yellow one (for C-type) illuminates according to the NR TYPE selector position. Press this selector again to invalidate the Dolby NR system.

• **NR TYPE SELECTOR (TYPE)**

For selection of Dolby B- or C-type NR system.
Depress this selector to select the Dolby C-type NR system.
Press it again and the B-type is selected.

14 HX-PRO SWITCH (HX-PRO)

Press the switch when recording in HX-PRO system.

15 MPX FILTER SWITCH (mpx filter)

For cutting the multiplex noise during recording of an FM stereo broadcasting program by using the Dolby NR system. Depress this switch to invalidate the MPX filter function.

16 DOLBY NR INDICATORS (Dolby NR B, C)

For indication of the validated Dolby NR system type.

17 HX-PRO INDICATOR (HX-PRO)

For indication that recording is in progress using HX-PRO system.

18 TIMER SWITCHES (TIMER)

These switches are used to automatically start recording or playback in combination with an audio timer.
REC Switch: For automatic recording.
PLAY Switch: For automatic tape playback.
OFF Switch: When audio timer is not used.

19 EJECT BUTTON (EJECT)

For opening the CASSETTE COMPARTMENT door.
The soft eject mechanism opens the door slowly when this button is pressed.

20 RECORD MUTE BUTTON (REC MUTE)

For providing a soundless interval during recording.
To cut off undesirable sound between melodies, keep this button pressed until the next melody starts. No sound is recorded as long as this button is kept pressed.

21 RECORD INDICATOR

For indication of recording state.

22 RECORD BUTTON (● RECORD)

For recording on a tape.
Press this button after pressing the PAUSE button to provide standby state for recording. The RECORD INDICATOR blinks and the PAUSE and PLAY INDICATORS illuminate. Recording starts when the PAUSE button is pressed again. The RECORD INDICATOR goes to continuous illumination and the PAUSE INDICATOR extinguishes.

23 REWIND INDICATOR

For indication of tape rewinding.

24 REWIND BUTTON (◀ REW)

For rewinding of a tape at a high speed.

25 PLAY INDICATOR

For indication of tape playback.

26 PLAY BUTTON (PLAY ▶)

For playback of a tape. Press this button to start playback.

27 FAST FORWARD INDICATOR

For indication of fast forwarding of a tape.

28 FAST FORWARD BUTTON (F. FWD ▶▶)

For fast forwarding of a tape.

29 STOP BUTTON (STOP ■)

For stopping each operation.
Pressing this button stops playback, recording, fast forwarding or rewinding of a tape. It also cancels standby state by PAUSE button operation.

30 PAUSE INDICATOR

For indication of pause state.

31 PAUSE BUTTON (PAUSE ■■)

For temporary stopping of playback or recording.
Also press this button to provide standby state for playback or recording.

32 MICROPHONE INPUT LEVEL CONTROLS (MICROPHONES-level)

For input level control during recording through microphones.
The front side knob is for the left channel and the rear one is for the right channel.
The knobs turn simultaneously when turned normally.

33 EQUALIZATION SELECTORS (EQUALIZATION)

Press the button meeting the type of the tape for playback.
These buttons are not effective in recording.

34 MICROPHONE JACKS (MICROPHONES)

For connection of recording microphones.
Use low-impedance microphones.

35 BIAS TONE BUTTON (bias tone)

For setting of optimal bias for each tape.
While this switch is kept pressed, 400Hz signal is recorded in the left channel, and 12.5 kHz in the right channel.

36 BIAS FINE TRIM KNOB (BIAS FINE TRIM)

For setting of the optimal bias for the tape to be used.

37 RECORD CALIBRATION TONE BUTTON (record cal tone)

For recording level calibration according to the type of the tape to be used.

When this switch is kept pressed, 400Hz signal is recorded on the tape. Make adjustment by operating the RECORD CALIBRATION controls during reproduction of this signal recorded on the tape so that the LED LEVEL DISPLAY may indicate 0 dB.

38 OUTPUT LEVEL CONTROL (OUTPUT LEVEL)

For control of the output level during playback or monitoring of the recorded sound. It also controls the volume of the sound monitored through headphones.

39 RECORD CALIBRATION CONTROLS (record cal)

Variable resistors to calibrate the recording level to 0 dB according to the type of the tape to be used. Make adjustment with a thin screw-driver through the hole.

40 FADER KNOB (FADER)

For fade-in and fade-out function to satisfy more variety in recording.
This makes it easy for you to start and/or end an item in recording, and to make the silent pauses.

41 TAPE MONITOR SWITCH (tape monitor)

When the MONITOR position is selected, signal being recorded (playback signal) can be heard. The button goes on indicating that the MONITOR position is selected.
When the SOURCE position is selected, signal before recording (recording input) can be heard.
Check the source sound and playback sound by pressing the switch while recording to check to be sure that source sound is correctly recorded. Be sure to place the switch in the MONITOR position while tape playback.

42 LINE INPUT LEVEL CONTROL (LINE LEVEL)

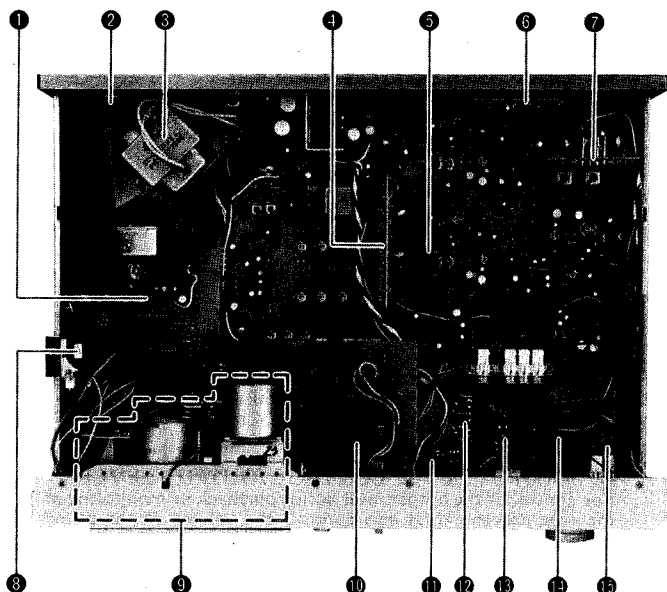
For input level control during recording from an external component.
The front side knob is for the left channel and the rear one is for the right channel. The knobs turn simultaneously when turned normally.

43 HEADPHONES JACK (HEADPHONES)

For connection of stereo headphones.
The sound volume can be adjusted by the OUTPUT LEVEL control.
For tape playback, be sure to set the TAPE MONITOR switch in the MONITOR position without fail.

* Noise reduction system manufactured under license from Dolby Laboratories Licensing Corporation. "Dolby" and the double-D symbols are trademarks of Dolby Laboratories Licensing Corporation.

INTERNAL VIEW



- ① LOGIC CONTROL P.C. BOARD (PCB-3)
- ② REMOTE CONTROL SOCKET P.C. BOARD (PCB-23)
- ③ POWER TRANSFORMER
- ④ HX-PRO P.C. BOARD (PCB-4)
- ⑤ MAIN P.C. BOARD (PCB-1)
- ⑥ INPUT AND OUTPUT JACKS P.C. BOARD (PCB-9)
- ⑦ PLAYBACK EQUALIZER AMP.P.C. BOARD (PCB-5)
- ⑧ POWER SWITCH
- ⑨ CASSETTE TAPE RECORDER MECHANICAL ASSEMBLY
- ⑩ ELECTRONIC COUNTER P.C. BOARD (PCB-8)
- ⑪ METER BALLISTICS AND AUTO PLAY SWITCHES P.C. BOARD (PCB-15)
- ⑫ BIAS AND RECORD CAL TONE P.C. BOARD (PCB-6)
- ⑬ TAPE MONITOR SWITCH P.C. BOARD (PCB-12)
- ⑭ MIC. AND LINE AMP. P.C. BOARD (PCB-2)
- ⑮ TIMER SWITCHES P.C. BOARD (PCB-14)

DISASSEMBLY PROCEDURES

[DISASSEMBLY OF CABINET]

① CABINET TOP REMOVAL

Remove the screws ① to ⑥ in Fig. 1 and then remove the cabinet top.

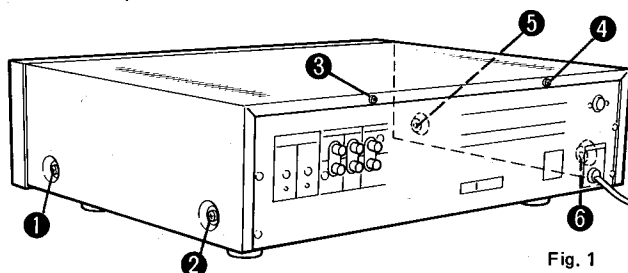


Fig. 1

② CABINET BOTTOM REMOVAL

Remove the screws ① to ⑫ in Fig. 2 and then remove the cabinet bottom.

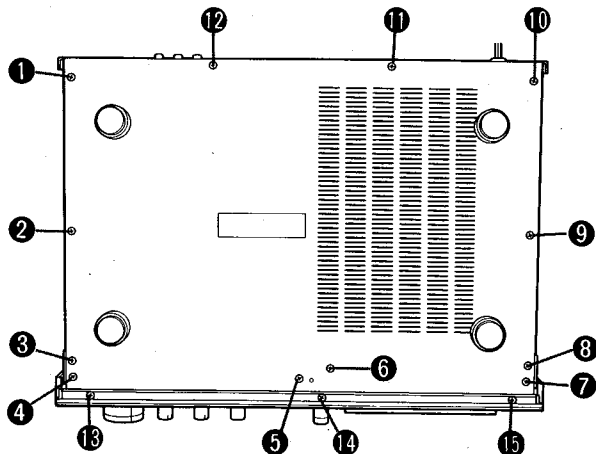


Fig. 2

③ FRONT PANEL ASSEMBLY REMOVAL

1. Remove the cabinet top. (Refer to step ①.)
2. Remove the cassette door assembly.
3. Remove the knobs.
4. Disconnect the connectors (J801, J802) from logic control P.C. board.
5. Remove the screws ⑬ to ⑮ in Fig. 2 and the screws ① to ③ in Fig. 3, and then pull out the front panel forward.
6. Remove the power indicator P.C. board and E.A.S. indicator P.C. board.

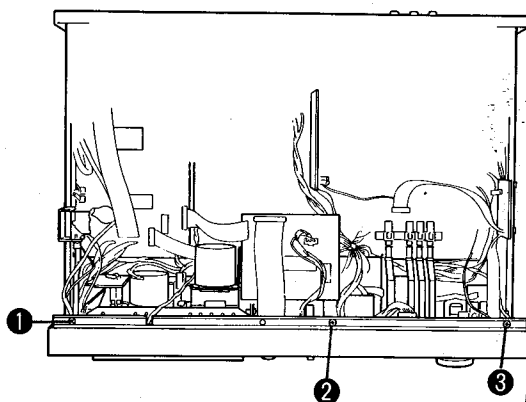


Fig. 3

[CASSETTE MECHANISM DISASSEMBLY AND PARTS REPLACEMENT]

① PINCH ROLLER REPLACEMENT

1. Remove the front panel assembly. (Refer to step ③ of DISASSEMBLY of CABINET.)
2. Remove the spring ② and E-stop ring ① in Fig. 4 and pull out the pinch roller forward.
3. Join the pinch roller with the lever as shown in Fig. 5 and install them to the shaft. At this time put the A section between B section and fix to the shaft with E-stop ring and attach the spring.

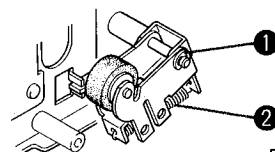


Fig. 4

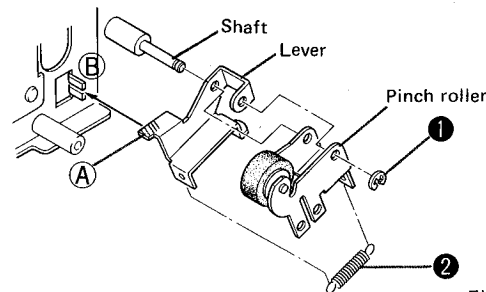


Fig. 5

2 HEAD REPLACEMENT (ERASE HEAD REPLACEMENT)

1. Unsolder the lead wire of the erase head. (When wiring, refer to Fig. 7)
2. Remove the screws 1 and 2 in Fig. 6 and then replace the erase head. Lock the screws 1 and 2 as not to loosen.

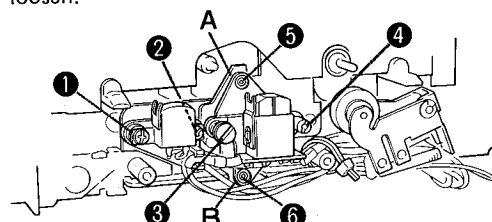


Fig. 6

(RECORD/PLAYBACK HEAD REPLACEMENT)

1. Unsolder the lead wire of the record/playback head. (When wiring, refer to Fig. 7)
2. Remove the screws 3 and 4 in Fig. 6 and then remove the record/playback head. A and B sections in Fig. 6 are locked with paint, so you can remove the head easily by coming it off.
3. Attach the record/playback head by turning the screws 3 and 4 in Fig. 6 provisionally. You may turn the screw 3 fully, but the screw 4 is for the azimuth adjustment and the screws 5 and 6 are for the positional adjustment. So you should refer to the mechanical adjustment step 1 to 3 and electrical adjustment step 2. And after completing the adjustment, apply screw lock paint.

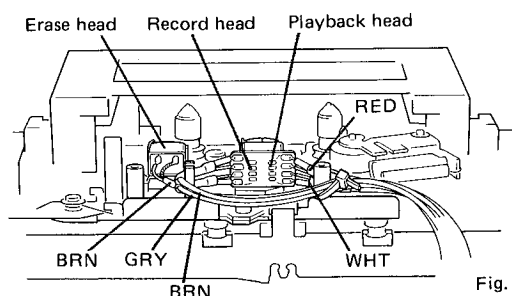


Fig. 7

(NOTE ON REPLACING THE HEAD)

*The head housing is very often moved up and down when recording and playing back. In addition to this the lead wires are thin and are easy to be torn off. Connect with the surplus lead wires.

*The lead wires of the inside of the head are very thin and easy to be broken down, so make sure to solder in a short time if possible.

(NOTE ON THE HEAD CHECK)

*Do not send a direct current to the head with a tester in purpose of finding out the coils disconnection of the inside of head. This cause to magnetize to the head and cause not to erase with a head eraser.

Make sure to use a AC/dB meter to find out the head disconnection.

*Apply 1 kHz, 50mV signal to the head with a low frequency oscillator and measure the voltage with a AC/dB meter or monitor with using a earphone, etc. to find out the disconnection.

3 DRESSING PLATE ASSEMBLY AND PLATE REMOVAL

Remove the screws 1 and 2 in Fig. 8 and then remove the dressing plate assembly and plate.

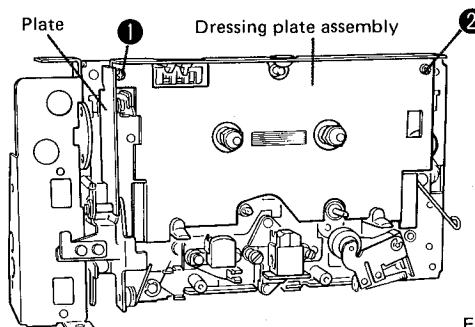


Fig. 8

4 CASSETTE MECHANISM UNIT REMOVAL (A) HOW TO REMOVE THE LED DISPLAY METER PLATE ASSEMBLY.

1. Disconnect the connector of the counter display P.C. board.
2. Disconnect the connector of the LED display meter.
3. Remove the screws 1 and 2 in Fig. 9 and then remove the dolby NR and HX-PRO indicator P.C. board.
4. Remove the screws 3 and 4 in Fig. 9 and then remove the lamp P.C. board.
5. Remove the screws 1 to 3 in Fig. 10 and then remove the LED display meter plate assembly.

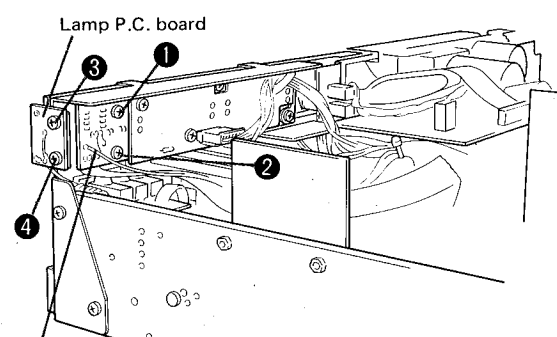


Fig. 9

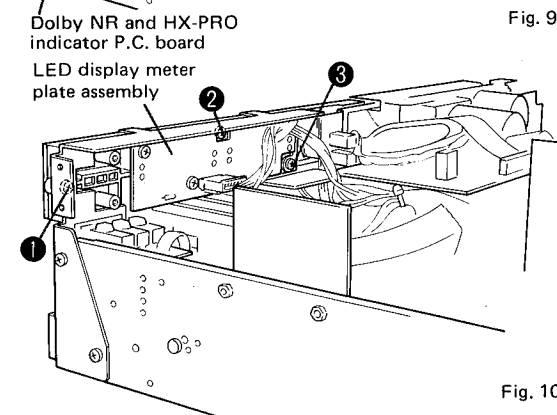


Fig. 10

(B) CASSETTE MECHANISM UNIT REMOVAL

1. Remove the screws 1 to 4 in Fig. 11 and then remove the bracket.
2. Disconnect the connector which are connected to the cassette mechanism.
3. Remove the push button assembly, power.
4. Remove the screws 1 and 2 in Fig. 12 and screws 1 to 4 in Fig. 13, and then remove the cassette mechanism unit.

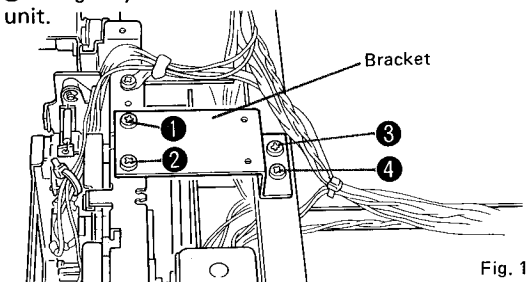


Fig. 11

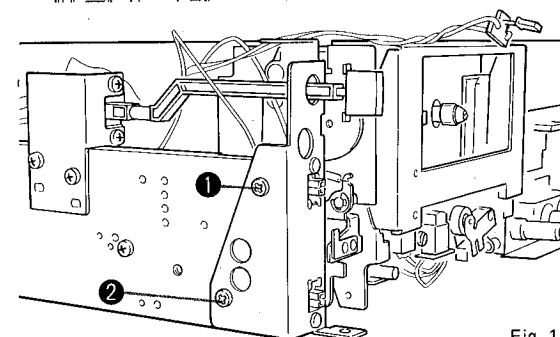


Fig. 12

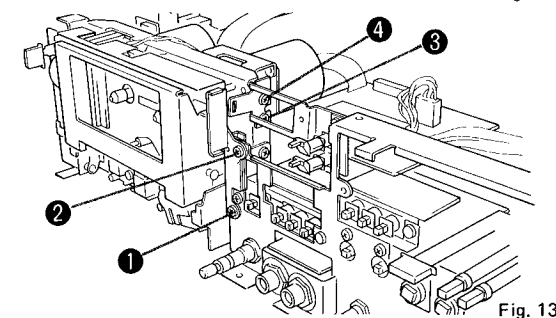


Fig. 13

5 REEL MOTOR AND CLUTCH REPLACEMENT

1. Remove the screws 1 and 2 in Fig. 14 and then remove the reel motor bracket assembly from the cassette mechanism.
2. Remove the sub belt.

(REEL MOTOR REPLACEMENT)

1. Remove two screws by which the motor is fixed and then remove the reel motor.
2. When assembling the reel motor, make sure to assemble it by moving in the direction of an arrows as shown in Fig. 15.

(Refer to Fig. 14 when wiring.)

(CLUTCH REPLACEMENT)

1. Remove the lock washer and then remove the clutch.

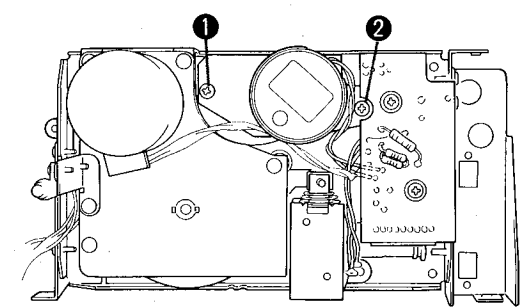


Fig. 14

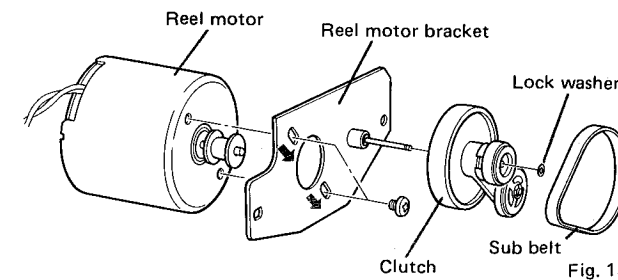


Fig. 15

6 CAPSTAN MOTOR, BELT AND FLYWHEEL REPLACEMENT

1. Remove the screw 1 in Fig. 16 and then remove the damper bracket.
2. Remove the screws 2 to 5 in Fig. 16 and remove the capstan motor bracket. At this time the main belt should have been removed from the capstan motor pulley.
3. Remove the screws 1 to 3 in Fig. 17 and then replace the capstan motor.
4. Remove the flywheel by pulling out toward to the backward as it is. When assembling the flywheel, be careful not to forget attaching the washer. (Refer to Fig. 18)

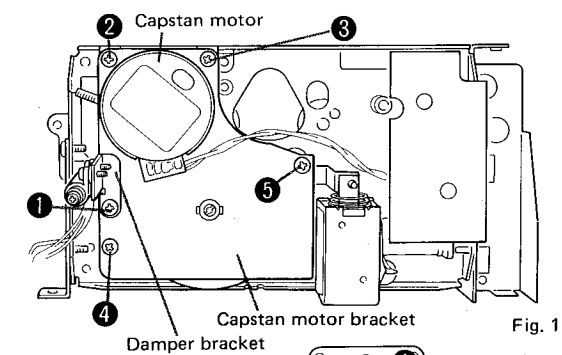


Fig. 16

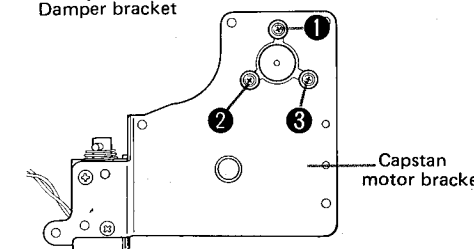


Fig. 17

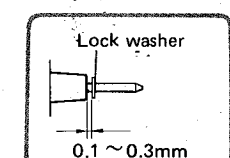


Fig. 18

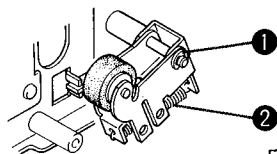


Fig. 4

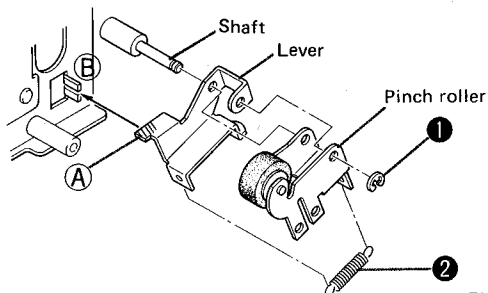


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2 HEAD REPLACEMENT (ERASE HEAD REPLACEMENT)

1. Unsolder the lead wire of the erase head. (When wiring, refer to Fig. 7)
2. Remove the screws 1 and 2 in Fig. 6 and then replace the erase head. Lock the screws 1 and 2 as not to loosen.

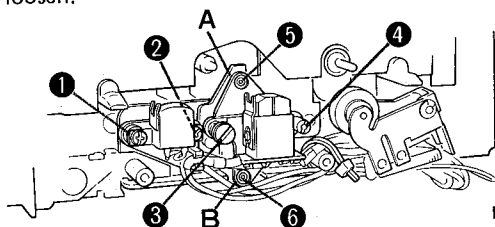


Fig. 6

(RECORD/PLAYBACK HEAD REPLACEMENT)

1. Unsolder the lead wire of the record/playback head. (When wiring, refer to Fig. 7)
2. Remove the screws 3 and 4 in Fig. 6 and then remove the record/playback head. A and B sections in Fig. 6 are locked with paint, so you can remove the head easily by coming it off.
3. Attach the record/playback head by turning the screws 3 and 4 in Fig. 6 provisionally. You may turn the screw 3 fully, but the screw 4 is for the azimuth adjustment and the screws 5 and 6 are for the positional adjustment. So you should refer to the mechanical adjustment step 1 to 3 and electrical adjustment step 2. And after completing the adjustment, apply screw lock paint.

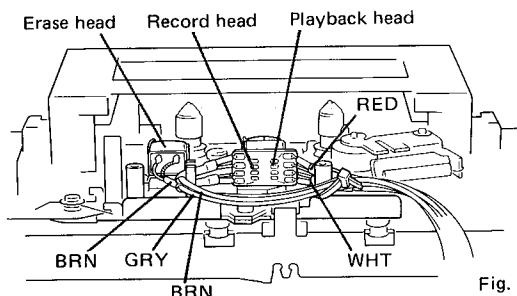


Fig. 7

(NOTE ON REPLACING THE HEAD)

- *The head housing is very often moved up and down when recording and playing back. In addition to this the lead wires are thin and are easy to be torn off. Connect with the surplus lead wires.
- *The lead wires of the inside of the head are very thin and easy to be broken down, so make sure to solder in a short time if possible.

(NOTE ON THE HEAD CHECK)

- *Do not send a direct current to the head with a tester in purpose of finding out the coils disconnection of the inside of head. This cause to magnetize to the head and cause not to erase with a head eraser.
- Make sure to use a AC/dB meter to find out the head disconnection.
- *Apply 1 kHz, 50mV signal to the head with a low frequency oscillator and measure the voltage with a AC/dB meter or monitor with using a earphone, etc. to find out the disconnection.

3 DRESSING PLATE ASSEMBLY AND PLATE REMOVAL

Remove the screws 1 and 2 in Fig. 8 and then remove the dressing plate assembly and plate.

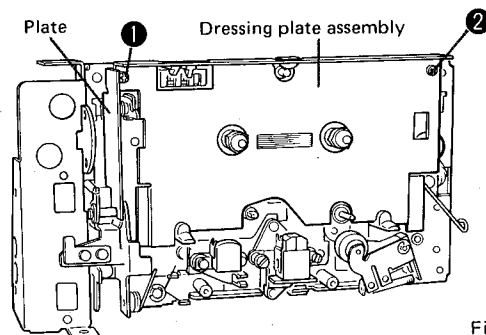


Fig. 8

4 CASSETTE MECHANISM UNIT REMOVAL

(A) HOW TO REMOVE THE LED DISPLAY METER PLATE ASSEMBLY.

1. Disconnect the connector of the counter display P.C. board.
2. Disconnect the connector of the LED display meter.
3. Remove the screws 1 and 2 in Fig. 9 and then remove the dolby NR and HX-PRO indicator P.C. board.
4. Remove the screws 3 and 4 in Fig. 9 and then remove the lamp P.C. board.
5. Remove the screws 1 to 3 in Fig. 10 and then remove the LED display meter plate assembly.

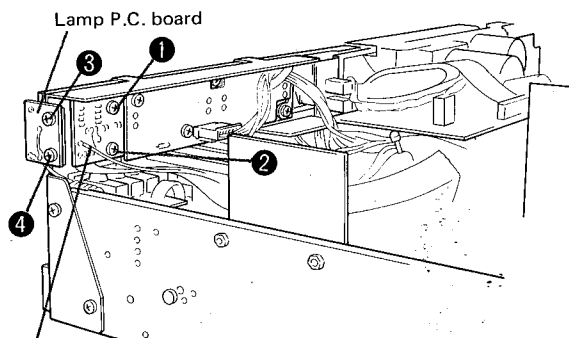


Fig. 9

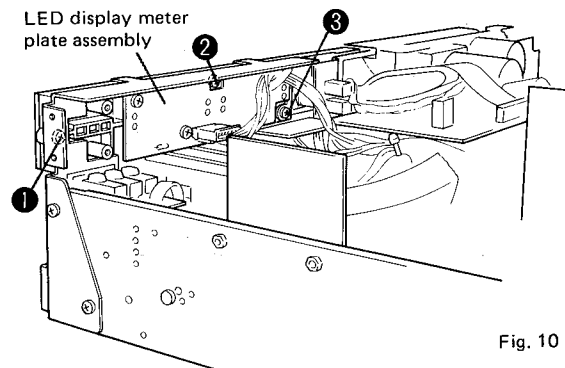


Fig. 10

(B) CASSETTE MECHANISM UNIT REMOVAL

1. Remove the screws ① to ④ in Fig. 11 and then remove the bracket.
2. Disconnect the connector which are connected to the cassette mechanism.
3. Remove the push button assembly, power.
4. Remove the screws ① and ② in Fig. 12 and screws ① to ④ in Fig. 13, and then remove the cassette mechanism unit.

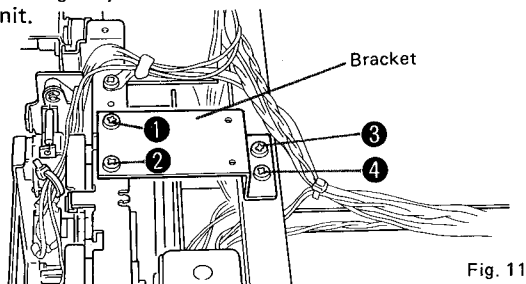


Fig. 11

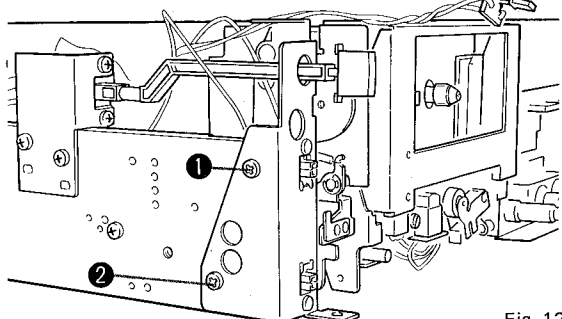


Fig. 12

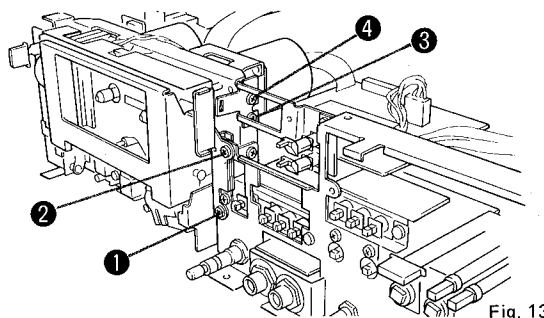


Fig. 13

(5) REEL MOTOR AND CLUTCH REPLACEMENT

1. Remove the screws ① and ② in Fig. 14 and then remove the reel motor bracket assembly from the cassette mechanism.
2. Remove the sub belt.

(REEL MOTOR REPLACEMENT)

1. Remove two screws by which the motor is fixed and then remove the reel motor.
2. When assembling the reel motor, make sure to assemble it by moving in the direction of an arrows as shown in Fig. 15.

(Refer to Fig. 14 when wiring.)

(CLUTCH REPLACEMENT)

1. Remove the lock washer and then remove the clutch.

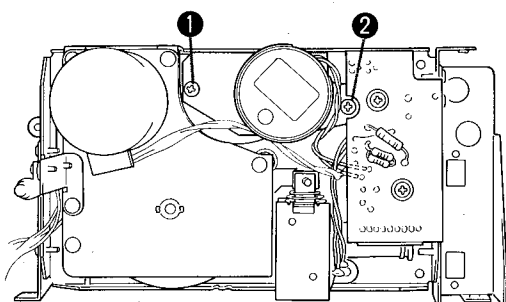


Fig. 14

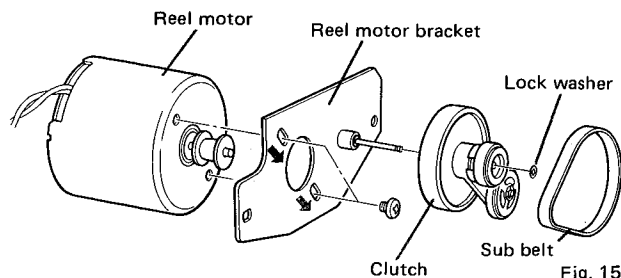


Fig. 15

(6) CAPSTAN MOTOR, BELT AND FLYWHEEL REPLACEMENT

1. Remove the screw ① in Fig. 16 and then remove the damper bracket.
2. Remove the screws ② to ⑤ in Fig. 16 and remove the capstan motor bracket. At this time the main belt should have been removed from the capstan motor pulley.
3. Remove the screws ① to ③ in Fig. 17 and then replace the capstan motor.
4. Remove the flywheel by pulling out toward to the backward as it is.

When assembling the flywheel, be careful not to forget attaching the washer.

(Refer to Fig. 18)

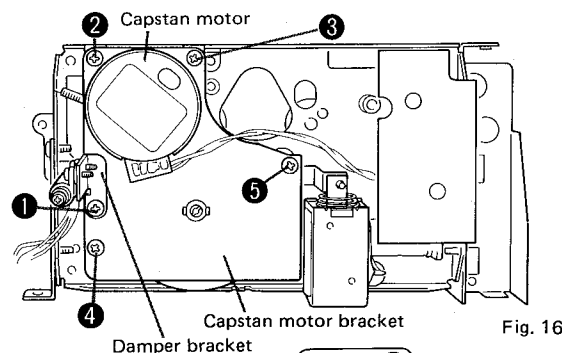


Fig. 16

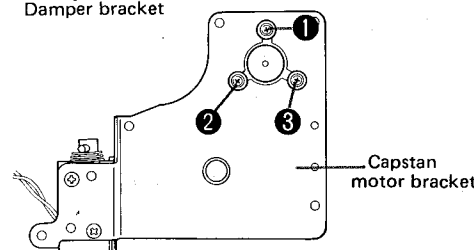


Fig. 17

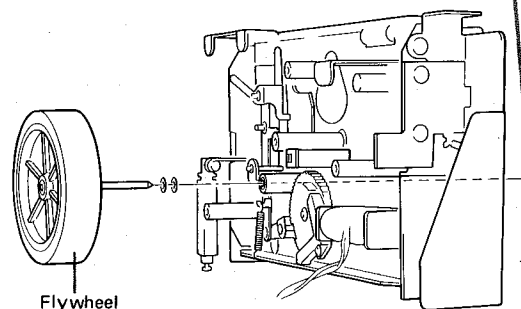
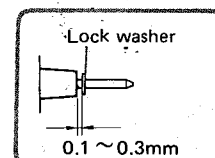


Fig. 18

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

Fig. 13

Fig. 14

Fig. 15

Fig. 16

Fig. 17

Fig. 18

Fig. 19

Fig. 20

Fig. 21

Fig. 22

Fig. 23

Fig. 24

Fig. 25

Fig. 26

Fig. 27

Fig. 28

Fig. 29

Fig. 30

Fig. 31

SPECIFICATIONS

Track Configuration 4-track 2 channel Stereo
Cassette Deck

● MECHANICAL SECTION

	Nominal	Limit
Tape Speed	4.75cm/sec.	±1%
Wow and Flutter	0.04%(NAB) ≤ 0.1%	
	0.06%(DIN)	

F.FWD/REW. Time for C-60 Cassette Motor 75sec. ≤ 85sec.

Motor 1 DC Servo motor (Capstan)
1 Flat Torque DC motor (Reel)

Take Up Torque 50gcm

F.FWD Torque 100gcm

REW. Torque 100gcm

● HEAD SECTION

Recording/Playback Fe-Al-Si Alloy Core

Erase Ferrite Core

● AMPLIFIER SECTION

Input Sensitivity	MIC	0.8mV	0.2(min) ~ 1.0(max)mV
LINE (Low)	70mV	60(min) ~ 150(max)mV	
LINE (High)	240mV	200(min) ~ 400(max)mV	

	Nominal	Limit
Input Impedance		
MIC	2.7kΩ	2(min) ~ 4(max)kΩ
LINE (Low)	16.5kΩ	10(min) ~ 20(max)kΩ
LINE (High)	33kΩ	20(min) ~ 40(max)kΩ

Signal-to-Noise Ratio (Dolby B to ON) at MIC input 52dB ≤ 46dB
(Input 1kHz, 1.5mV for normal tape)
at LINE (Low) input 61dB
(Input 1kHz, 100mV for normal tape)

Erase Ratio 71dB ≤ 60dB
(Input 80Hz for normal tape)

Channel Separation 43dB ≤ 35dB
(Input 1kHz)

Crosstalk 73dB ≤ 60dB
(Input 1kHz)

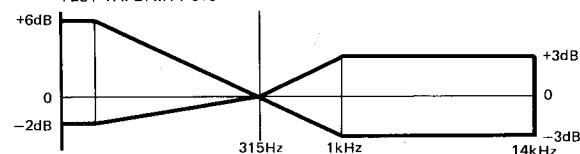
● DIMENSIONS (W x H x D) 17-7/16"x4-5/16"x12-5/8"
(443x110x320 mm)

● WEIGHT 16.1 lbs (7.3kg)

● POWER SUPPLY AC120V, 60Hz

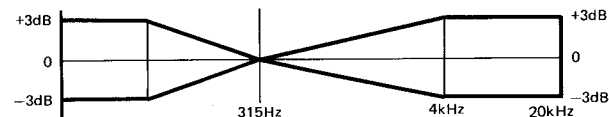
● POWER CONSUMPTION 40W

PLAYBACK FREQUENCY RESPONSE
TEST TAPE: MTT-316

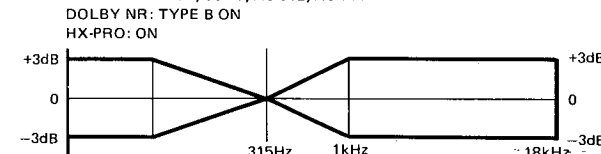


RECORD/PLAYBACK FREQUENCY RESPONSE

TEST TAPE: XL-1, CS-30, AC-512, AC-711
DOLBY NR: OFF
HX-PRO: ON

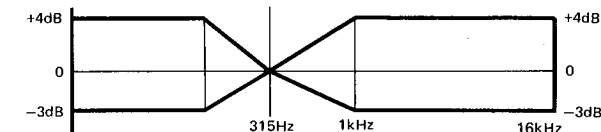


RECORD/PLAYBACK FREQUENCY RESPONSE
TEST TAPE: XL-1, CS-30, AC-512, AC-711
DOLBY NR: TYPE B ON
HX-PRO: ON



RECORD/PLAYBACK FREQUENCY RESPONSE

TEST TAPE: XL-1, CS-30, AC-512, AC-711
DOLBY NR: TYPE C ON
HX-PRO: ON



Specifications and components subject to change without notice.
Overall performance will be maintained or improved.

ALIGNMENT PROCEDURES

■ ELECTRICAL ADJUSTMENT

1. BEFORE ADJUSTMENT

- Make sure that primary supply voltage comes within 120V ± 2V.
- After the power switch is pushed on, wait for 10 minutes before measuring to be sure of the most stable operation.
- Since head magnetization, dust accumulations, etc. are likely to introduce error in the various characteristics, it is very important that the heads are properly demagnetized and cleaned before commencing any adjustment, particularly frequency response and head azimuth adjustment.
- Proceed with the recording section adjustment after having finished the playback section adjustment. Should the recording section adjustment be carried out without having completed the playback section adjustment perfectly, the recorded tape may not be played back properly with the other tape deck and the adjustment itself may become impossible.

2. INSTRUMENTS REQUIRED

- Low frequency oscillator
- AC VTVM or dual channel AC VTVM
- Oscilloscope
- Wow/flutter meter

3. TEST TAPE

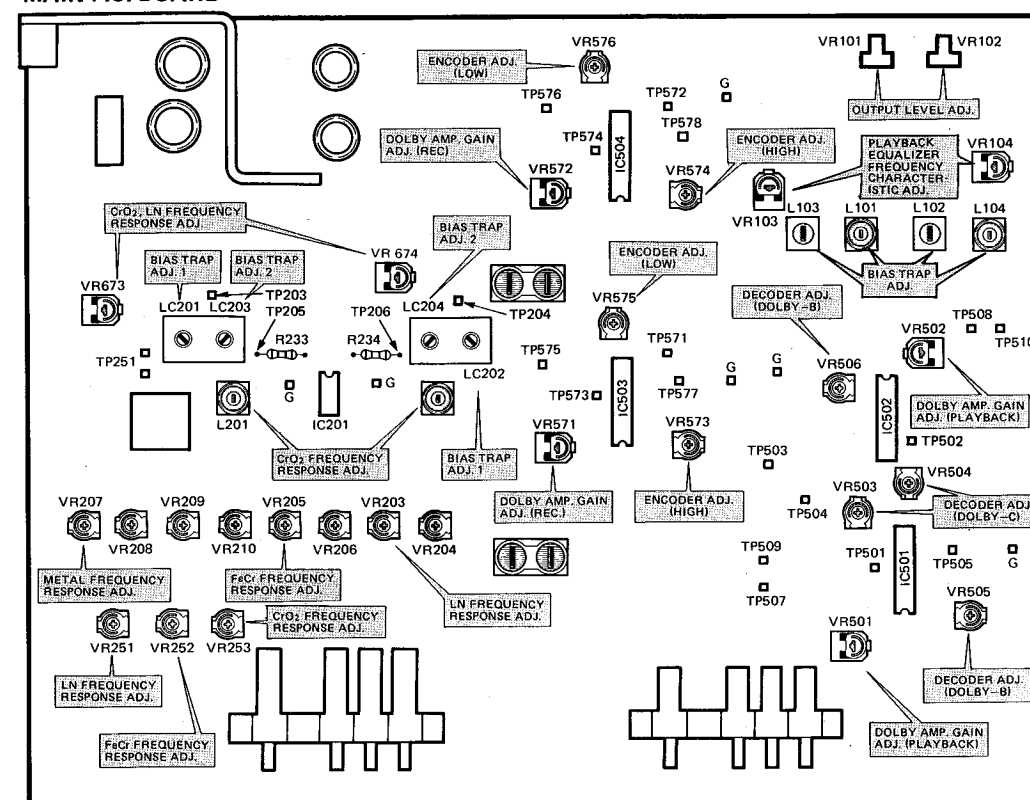
- Azimuth adjustment MTT-114
- Tape speed adjustment MTT-111
- Output level (Playback mode) MTT-150
- Metal bias temporary adjustment AC-711
- Metal record level temporary adjustment AC-711
- Frequency response adjustment
 - LN XL-1
 - FeCr CS-30
 - CrO₂ AC-512
 - Metal AC-711

- Record level adjustment AC-512

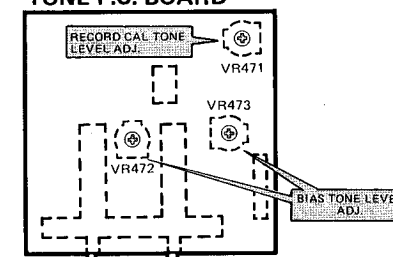
*C-90 differs with C-60 in the thickness and bias is unequal, so adjust with the tape whose bias is of specified value.

■ ADJUSTMENT AND TEST POINTS

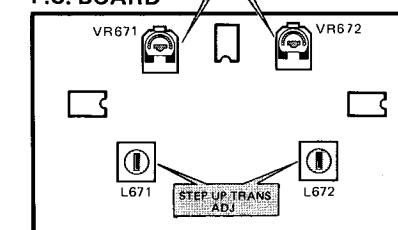
MAIN P.C. BOARD



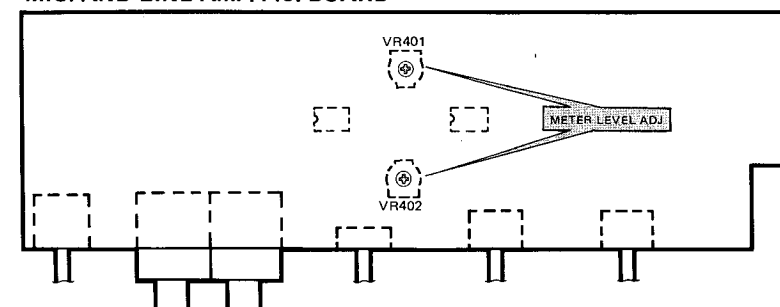
BIAS AND RECORD CAL TONE P.C. BOARD



HX-PRO P.C. BOARD



MIC. AND LINE AMP. P.C. BOARD



SPECIFICATIONS

Track Configuration 4-track 2 channel Stereo
Cassette Deck

● MECHANICAL SECTION

	Nominal	Limit
Tape Speed	4.75cm/sec.	±1%
Wow and Flutter	0.04%(NAB) ≤ 0.1%	
	0.06%(DIN)	
F.FWD/REW. Time for C-60 Cassette Motor	75sec. ≤ 85sec.	
	1 DC Servo motor (Capstan)	
	1 Flat Torque DC motor (Reel)	

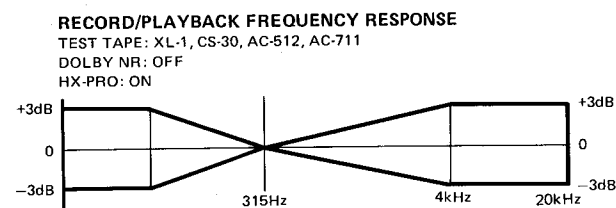
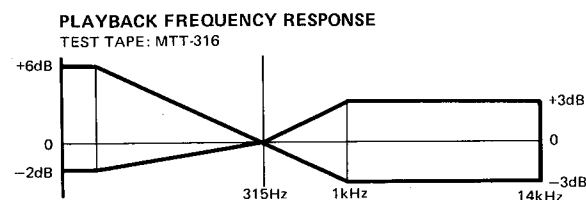
Take Up Torque	50gcm
F.FWD Torque	100gcm
REW. Torque	100gcm

● HEAD SECTION

Recording/Playback	Fe-Al-Si Alloy Core
Erase	Ferrite Core

● AMPLIFIER SECTION

Input Sensitivity	
MIC	0.8mV 0.2(min) ~ 1.0(max)mV
LINE (Low)	70mV 60(min) ~ 150(max)mV
LINE (High)	240mV 200(min) ~ 400(max)mV



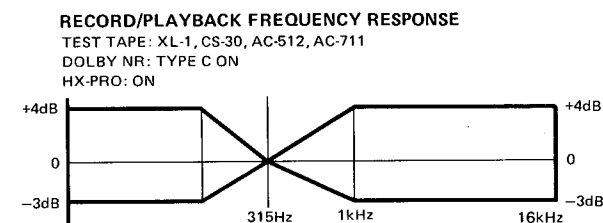
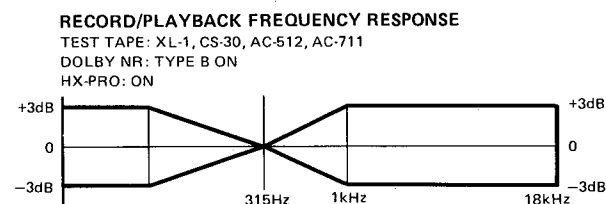
	Nominal	Limit
Input Impedance		
MIC	2.7kΩ	2(min) ~ 4(max)kΩ
LINE (Low)	16.5kΩ	10(min) ~ 20(max)kΩ
LINE (High)	33kΩ	20(min) ~ 40(max)kΩ

Signal-to-Noise Ratio (Dolby B to ON) at MIC input	52dB ≤ 46dB
	(Input 1kHz, 1.5mV for normal tape)
at LINE (Low) input	61dB
	(Input 1kHz, 100mV for normal tape)
Erase Ratio	71dB ≤ 60dB
	(Input 80Hz for normal tape)

Channel Separation	43dB ≤ 35dB
	(Input 1kHz)
Crosstalk	73dB ≤ 60dB
	(Input 1kHz)

● DIMENSIONS (W x H x D)	17-7/16"x4-5/16"x12-5/8"
	(443x110x320 mm)

● WEIGHT	16.1 lbs (7.3kg)
● POWER SUPPLY	AC120V, 60Hz
● POWER CONSUMPTION	40W



Specifications and components subject to change without notice.
Overall performance will be maintained or improved.

ALIGNMENT PROCEDURES

■ ELECTRICAL ADJUSTMENT

1. BEFORE ADJUSTMENT

- Make sure that primary supply voltage comes within 120V ± 2V.
- After the power switch is pushed on, wait for 10 minutes before measuring to be sure of the most stable operation.
- Since head magnetization, dust accumulations, etc. are likely to introduce error in the various characteristics, it is very important that the heads are properly demagnetized and cleaned before commencing any adjustment, particularly frequency response and head azimuth adjustment.
- Proceed with the recording section adjustment after having finished the playback section adjustment. Should the recording section adjustment be carried out without having completed the playback section adjustment perfectly, the recorded tape may not be played back properly with the other tape deck and the adjustment itself may become impossible.

2. INSTRUMENTS REQUIRED

- Low frequency oscillator
- AC VTVM or dual channel AC VTVM
- Oscilloscope
- Wow/flutter meter

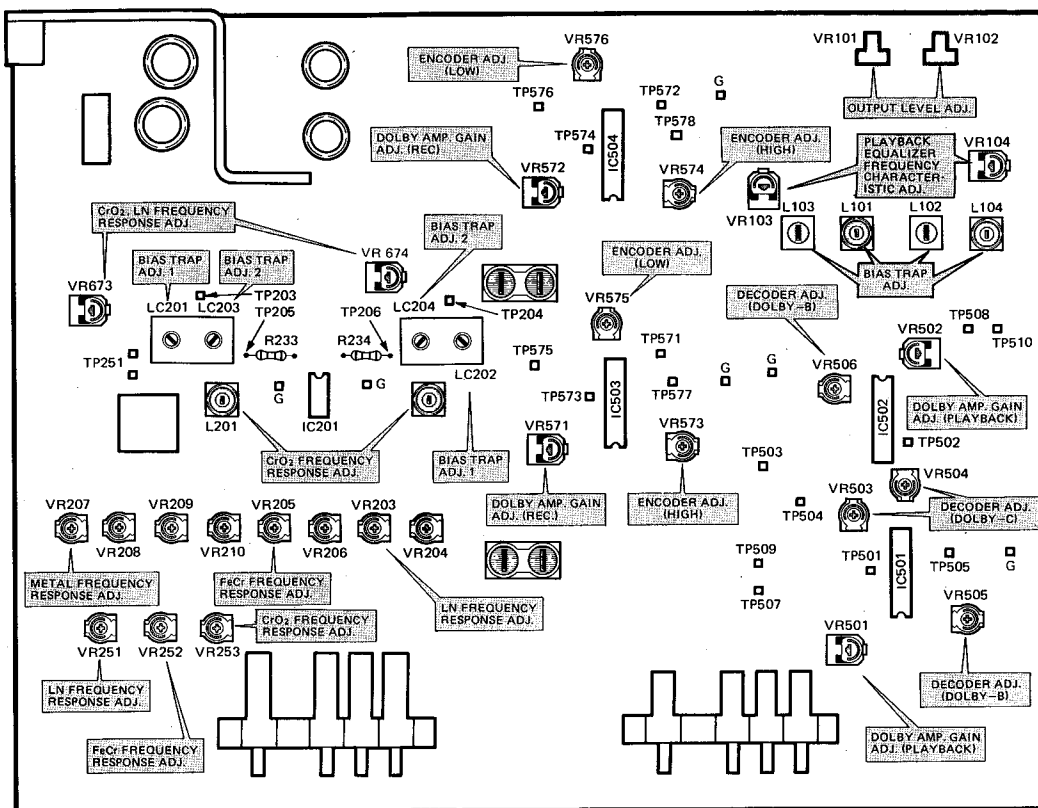
3. TEST TAPE

- Azimuth adjustment MTT-114
- Tape speed adjustment MTT-111
- Output level (Playback mode) MTT-150
- Metal bias temporary adjustment AC-711
- Metal record level temporary adjustment AC-711
- Frequency response adjustment
 - LN XL-1
 - FeCr CS-30
 - CrO₂ AC-512
 - Metal AC-711
- Record level adjustment AC-512

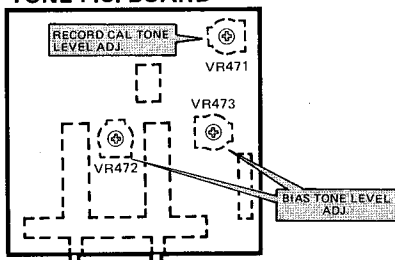
* C-90 differs with C-60 in the thickness and bias is unequal, so adjust with the tape whose bias is of specified value.

■ ADJUSTMENT AND TEST POINTS

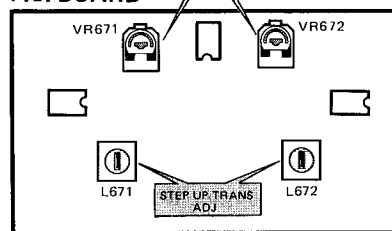
MAIN P.C. BOARD



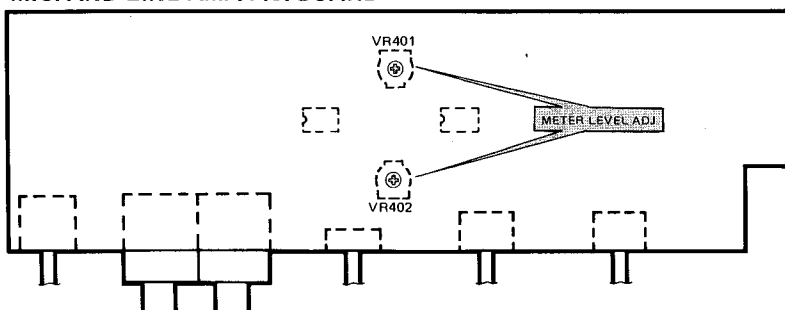
BIAS AND RECORD CAL TONE P.C. BOARD



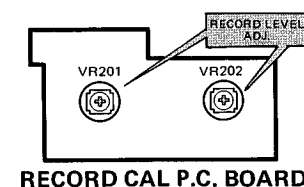
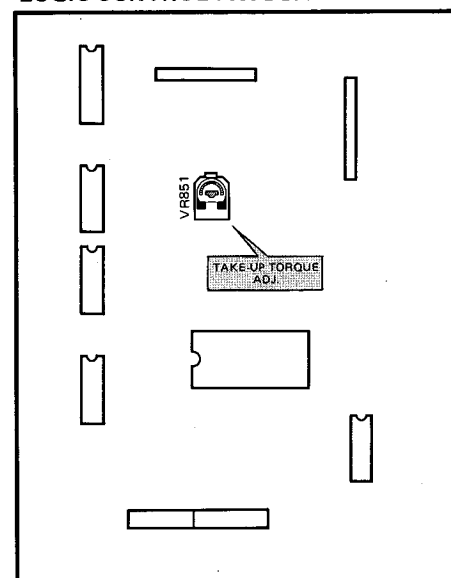
HX-PRO P.C. BOARD



MIC. AND LINE AMP. P.C. BOARD



LOGIC CONTROL P.C. BOARD



General conditions (unless otherwise noted).

CONTROLS AND SWITCHES	SETTINGS
Dolby NR	off
MPX Filter	off
Microphones Level	min
Bias Fine Trim	center
Output Level	max
Line Input Level	max
HX-PRO	off

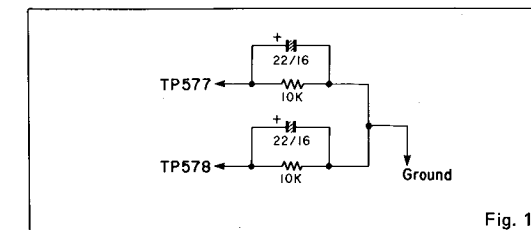


Fig. 1

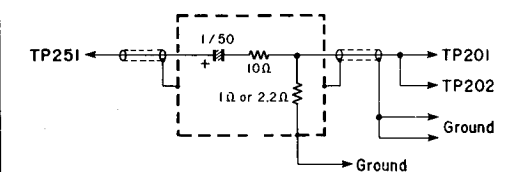


Fig. 3

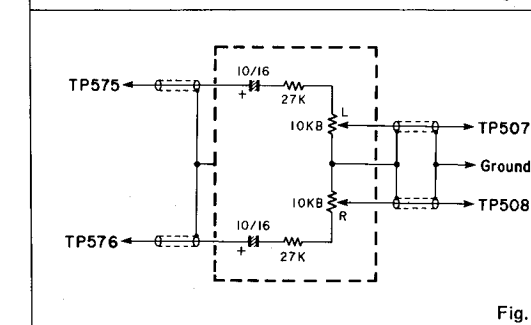
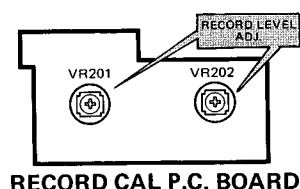
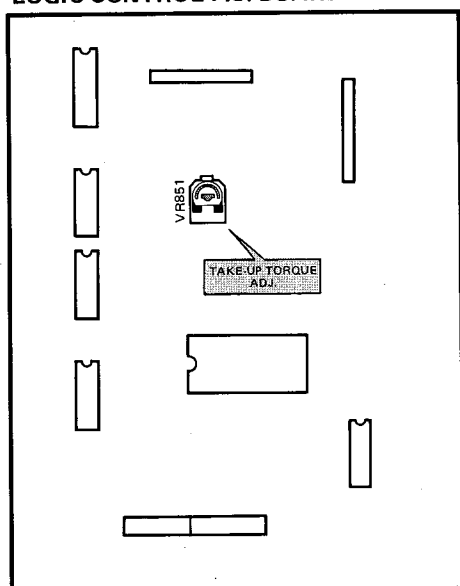


Fig. 2

■ELECTRICAL ADJUSTMENT

STEP	ADJUSTMENT ITEM	INSTRUMENT REQUIRED	MODE	INPUT SIGNAL	POINT TO BE CONNECTED	ADJUST POINT	RATING	REMARKS
1	Take up torque	Cassette tape torque meter (TW-2111)	PB			VR851	50gcm	
2	Azimuth & playback equalizer frequency characteristic	VTVM Test tape (TCC-288H)	PB		TP501 or TP502	Azimuth screw	Maximum output	• Short the TP507 and TP509, TP508 and TP510. • Adjust with 20kHz test tone signal.
					TP501 TP502	VR103 VR104	With the 20kHz test tone, the output becomes +2dB more than that with 1kHz test tone.	
3	Tape speed	Frequency counter Test tape (MTT-111)	PB		TP501 or TP502	VR built in motor	3kHz $\pm$ 10Hz	• Short the TP507 and TP509, TP508 and TP510. • Make the adjustment at about the half way point in the tape.
4	Playback Dolby amp. gain	VTVM	PB	Apply 700Hz signal to TP507(L), TP508(R) and ground. Set audio generator so that TP501 and TP502 voltage is 775mV.	TP503 TP504	VR501 VR502	775mV	
5	Playback amp. level	VTVM Test tape (MTT-150)	PB		TP501 TP502	VR101 VR102	775mV	• Short the TP507 and TP509, TP508 and TP510.
6	Record Dolby amp. gain	VTVM	REC-PAUSE	Apply 700Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP571 and TP572 voltage is 775mV.	TP573 TP574	VR571 VR572	775mV	
7	Dolby encoder	VTVM	REC-PAUSE	Apply 700Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 23.5mV when REC-PAUSE mode.	TP575 TP576	VR575 VR576	So that a +6.5dB boost is obtained when dolby is switched from off to dolby-C.	• Attach the jig shown in Fig. 1 and adjust.
					TP575 TP576	VR573 VR574	So that a +11dB $\pm$ 0.25dB boost is obtained when dolby is switched from off to dolby-C.	• Repeat the high level stage and low level stage adjustments 2-3 times.
8	Dolby decoder	VTVM	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 44mV. Adjust the output of TP501 and TP502 to 44mV with the L and R potentiometers on the jig (Fig. 2). Then, adjust with a 20Hz to 30kHz sweep signal.	TAPE OUT	VR505 VR506	So that frequency response is flat.	• Attach the jig shown in Fig. 2 and adjust. • Dolby B is on.
					TAPE OUT	VR503 VR504	So that frequency response is flat.	• Dolby C is on. • Make this adjustment for dolby-B first, then recheck dolby-B after adjusting dolby-C.
9	Bias trap	VTVM	REC/PB		TP203 TP204	LC201 LC202	Maximum output	• Bias fine trim control is hi cut. • Bias selector is metal position. • Turn the VR671 maximum clockwise and VR672 maximum counter-clockwise position. • Repeat adjustments 1 and 2, then do them again after completing adjustment 3.
					TP203 TP204	L671 L672	Maximum output	
					TP205 TP206	LC203 LC204	Minimum output	
10	Play bias trap	VTVM	REC/PB		TP501 TP502	L101 L103 L102 L104	Minimum output	• Bias selector is metal position. • Short the TP507 and TP509, TP508 and TP510. • Attach the jig shown in Fig. 3 and adjust. • Adjust L101/L102 and L103/L104 in alternation.

LOGIC CONTROL P.C. BOARD



RECORD CAL P.C. BOARD

General conditions (unless otherwise noted).

CONTROLS AND SWITCHES	SETTINGS
Dolby NR	off
MPX Filter	off
Microphones Level	min
Bias Fine Trim	center
Output Level	max
Line Input Level	max
HX-PRO	off

ELECTRICAL ADJUSTMENT

STEP	ADJUSTMENT ITEM	INSTRUMENT REQUIRED	MODE	INPUT SIGNAL	POINT TO BE CONNECTED	
1	Take up torque	Cassette tape torque meter (TW-2111)	PB			V
2	Azimuth & playback equalizer frequency characteristic	VTVM Test tape (TCC-288H)	PB		TP501 or TP502	A so
					TP501 TP502	V V
3	Tape speed	Frequency counter Test tape (MTT-111)	PB		TP501 or TP502	V in
4	Playback Dolby amp. gain	VTVM	PB	Apply 700Hz signal to TP507(L), TP508(R) and ground. Set audio generator so that TP501 and TP502 voltage is 775mV.	TP503 TP504	V V
5	Playback amp. level	VTVM Test tape (MTT-150)	PB		TP501 TP502	V V
6	Record Dolby amp. gain	VTVM	REC-PAUSE	Apply 700Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP571 and TP572 voltage is 775mV.	TP573 TP574	V V
7	Dolby encoder	VTVM	REC-PAUSE	Apply 700Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 23.5mV when REC-PAUSE mode.	TP575 TP576	V V
					TP575 TP576	V V
8	Dolby decoder	VTVM	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 44mV. Adjust the output of TP501 and TP502 to 44mV with the L and R potentiometers on the jig (Fig. 2). Then, adjust with a 20Hz to 30kHz sweep signal.	TAPE OUT	V V
					TAPE OUT	V V
9	Bias trap	VTVM	REC/PB		TP203 TP204	L L
					TP203 TP204	L L
					TP205 TP206	L L
10	Play bias trap	VTVM	REC/PB		TP501 TP502	L L

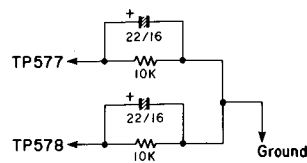


Fig. 1

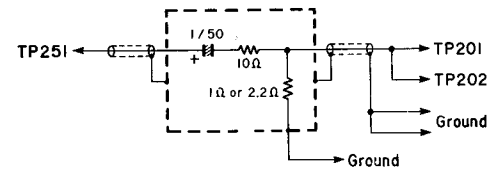


Fig. 3

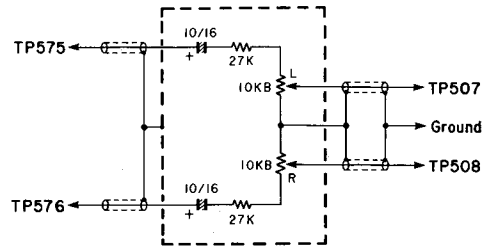


Fig. 2

SETTINGS

off
off
min
center
max
max
off

	POINT TO BE CONNECTED	ADJUST POINT	RATING	REMARKS
		VR851	50gcm	
	TP501 or TP502	Azimuth screw	Maximum output	- Short the TP507 and TP509, TP508 and TP510. - Adjust with 20kHz test tone signal.
	TP501 TP502	VR103 VR104	With the 20kHz test tone, the output becomes +2dB more than that with 1kHz test tone.	
	TP501 or TP502	VR built in motor	3kHz $\pm$ 10Hz	- Short the TP507 and TP509, TP508 and TP510. - Make the adjustment at about the half way point in the tape.
and	TP503 TP504	VR501 VR502	775mV	
	TP501 TP502	VR101 VR102	775mV	Short the TP507 and TP509, TP508 and TP510.
Set 2	TP573 TP574	VR571 VR572	775mV	
Set 4	TP575 TP576	VR575 VR576	So that a +6.5dB boost is obtained when dolby is switched from off to dolby-C.	Attach the jig shown in Fig. 1 and adjust.
Set 4	TP575 TP576	VR573 VR574	So that a +11dB $\pm$ 0.25dB boost is obtained when dolby is switched from off to dolby-C.	Repeat the high level stage and low level stage adjustments 2-3 times.
Set 4	TAPE OUT	VR505 VR506	So that frequency response is flat.	- Attach the jig shown in Fig. 2 and adjust. - Dolby B is on.
Set 4	TAPE OUT	VR503 VR504	So that frequency response is flat.	- Dolby C is on. - Make this adjustment for dolby-B first, then recheck dolby-B after adjusting dolby-C.
	TP203 TP204	LC201 LC202	Maximum output	- Bias fine trim control is hi cut. - Bias selector is metal position. - Turn the VR671 maximum clockwise and VR672 maximum counter-clockwise position. - Repeat adjustments 1 and 2, then do them again after completing adjustment 3.
	TP203 TP204	L671 L672	Maximum output	
	TP205 TP206	LC203 LC204	Minimum output	
	TP501 TP502	L101 L103 L102 L104	Minimum output	- Bias selector is metal position. - Short the TP507 and TP509, TP508 and TP510. - Attach the jig shown in Fig. 3 and adjust. - Adjust L101/L102 and L103/L104 in alternation.

STEP	ADJUSTMENT ITEM	INSTRUMENT REQUIRED	MODE	INPUT SIGNAL	POINT TO BE CONNECTED	ADJUST POINT	RATING	REMARKS
11	Peaking coil (Pre-adjustment)	VTVM	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP203 and TP204 voltage is 1mV. Then, adjust with 25kHz signal.	TP203 TP204	L201 L202	Maximum output	Short the TP251 to ground.
12	Record equalizer (Pre-adjustment)	VTVM	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP203 and TP204 voltage is 1mV (at each position of bias selector). Then, adjust with a 8kHz signal.	TP203 TP204	VR207 VR208	2.3mV	• Bias and equalization selectors are metal position.
					TP203 TP204	VR209 VR210	1.95mV	• Bias and equalization selectors are CrO ₂ position.
					TP203 TP204	VR205 VR206	2.25mV	• Bias and equalization selectors are FeCr position.
					TP203 TP204	VR203 VR204	1.45mV	• Bias and equalization selectors are LN position.
13	Bias level (Pre-adjustment)	VTVM Blank tape (AC-711)	REC/PB	Apply 1kHz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode.	TP501 TP502	VR671 VR672	Maximum output	• HX-PRO switch is on position. • Bias and equalization selectors are metal position.
14	Record level (Pre-adjustment)	VTVM Blank tape (AC-711)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode.	TP501 TP502	VR201 VR202	775mV -25dB	• HX-PRO switch is on position. • Bias and equalization selectors are metal position.
15	Record/playback equalizer frequency characteristic (Pre-adjustment)	VTVM Blank tape (AC-711)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal.	TAPE OUT	VR671 VR672 L201 L202	So that the record/playback frequency response is flat. (※)	• HX-PRO switch is on position. • Bias and equalization selectors are metal position.
16	Record/playback equalizer frequency characteristic	VTVM Blank tape (LN XL-1 FeCr CS-30 CrO ₂ AC-512 metal AC-711)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal.	TAPE OUT	VR253 L202 VR671 L201	So that the record/playback frequency response is flat. (※)	• HX-PRO switch is on position. • Bias and equalization selectors are CrO ₂ position.
					TAPE OUT		• Confirm record/playback frequency response. • If the frequency response is not flat do the adjustment over starting with step 15.(※)	• HX-PRO switch is on position. • Bias and equalization selectors are metal position.
						VR207	So that the record/playback frequency response is flat. (※)	
					TAPE OUT	VR252 VR205	So that the record/playback frequency response is flat. (※)	• HX-PRO switch is on position. • Bias and equalization selectors are FeCr position.
					TAPE OUT	VR251 VR203	So that the record/playback frequency response is flat. (※)	• HX-PRO switch is on position. • Bias and equalization selectors are LN position.
					TAPE OUT	VR673 VR674	So that the record/playback frequency response is flat. (※)	• Bias and equalization selectors are CrO ₂ position.
					TAPE OUT		• Confirm record/playback frequency response. • If frequency response is not the same as for step 16-9, adjust while watching the balance of the two.	• Bias and equalization selectors are LN position.
17	Record level	VTVM Blank tape (AC-512)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV when REC-PAUSE mode.	TP501 TP502	VR201 VR202	775mV	• Bias and equalization selectors are CrO ₂ position.
18	Record/playback equalizer frequency characteristic confirmation	VTVM Blank tape (LN XL-1 FeCr CS-30 CrO ₂ AC-512 metal AC-711)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal.	TAPE OUT		• Confirm record/playback frequency response is within specifications. • If specification are not met, redo the adjustments on steps from 11 to 16.	• This confirmation should be done at each bias and equalization positions under each of the following conditions Dolby B, Dolby C, Dolby B and HX-PRO ON, Dolby C and HX-PRO ON.
19	Record calibration tone level	VTVM	REC-PAUSE		TP573 TP574	VR471	775mV	• Keep pressing the RECORD CAL TONE button. • Adjust balance if there is a difference in output between the R and L channels.
20	Bias tone	VTVM	REC-PAUSE		TP573 TP574	VR472 VR473	775mV -25dB	• Keep the BIAS TONE button pressed.
21	Meter level	VTVM	REC-PAUSE	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -0.5dB when REC-PAUSE mode.		VR401 VR402	Adjust to the point where the O VU LED of the LED display lights dimly.	• Output level control at center. • Connect a 10k Ω load resistor to TAPE OUT.

(※) Measurement is satisfactory if it is within the record/playback frequency response range specified for dolby off. But adjust it as close to flat as possible.

STEP	ADJUSTMENT ITEM	INSTRUMENT REQUIRED	MODE	INPUT SIGNAL	POINT TO BE CONNECTED	ADJUST POINT
11	Peaking coil (Pre-adjustment)	VTVM	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP203 and TP204 voltage is 1mV. Then, adjust with 25kHz signal.	TP203 TP204	L201 L202
12	Record equalizer (Pre-adjustment)	VTVM	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP203 and TP204 voltage is 1mV (at each position of bias selector). Then, adjust with a 8kHz signal.	TP203 TP204	VR207 VR208
					TP203 TP204	VR209 VR210
					TP203 TP204	VR205 VR206
					TP203 TP204	VR203 VR204
13	Bias level (Pre-adjustment)	VTVM Blank tape (AC-711)	REC/PB	Apply 1kHz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode.	TP501 TP502	VR671 VR672
14	Record level (Pre-adjustment)	VTVM Blank tape (AC-711)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode.	TP501 TP502	VR201 VR202
15	Record/playback equalizer frequency characteristic (Pre-adjustment)	VTVM Blank tape (AC-711)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal.	TAPE OUT	VR671 VR672 L201 L202
16	Record/playback equalizer frequency characteristic	VTVM Blank tape (LN XL-I FeCr CS-30 CrO ₂ AC-512 metal AC-711)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal.	TAPE OUT	VR253 L202 VR671 L201
					TAPE OUT	VR207
					TAPE OUT	VR252 VR205
					TAPE OUT	VR251 VR203
					TAPE OUT	VR673 VR674
					TAPE OUT	
					TAPE OUT	
					TAPE OUT	
					TAPE OUT	
					TAPE OUT	
17	Record level	VTVM Blank tape (AC-512)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV when REC-PAUSE mode.	TP501 TP502	VR201 VR202
18	Record/playback equalizer frequency characteristic confirmation	VTVM Blank tape (LN XL-I FrCr CS-30 CrO ₂ AC-512 metal AC-711)	REC/PB	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal.	TAPE OUT	
19	Record calibration tone level	VTVM	REC-PAUSE		TP573 TP574	VR471
20	Bias tone	VTVM	REC-PAUSE		TP573 TP574	VR472 VR473
21	Meter level	VTVM	REC-PAUSE	Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV -0.5dB when REC-PAUSE mode.		VR401 VR402

POINT TO BE CONNECTED	ADJUST POINT	RATING	REMARKS	
TP203 TP204	L201 L202	Maximum output	Short the TP251 to ground.	
TP203 TP204	VR207 VR208	2.3mV	• Bias and equalization selectors are metal position.	• Short the TP251 and ground.
TP203 TP204	VR209 VR210	1.95mV	• Bias and equalization selectors are CrO ₂ position.	
TP203 TP204	VR205 VR206	2.25mV	• Bias and equalization selectors are FeCr position.	
TP203 TP204	VR203 VR204	1.45mV	• Bias and equalization selectors are LN position.	
TP501 TP502	VR671 VR672	Maximum output	• HX-PRO switch is on position. • Bias and equalization selectors are metal position.	
TP501 TP502	VR201 VR202	775mV –25dB	• HX-PRO switch is on position. • Bias and equalization selectors are metal position.	
TAPE OUT	VR671 VR672 L201 L202	So that the record/play-back frequency response is flat. (※)	• HX-PRO switch is on position. • Bias and equalization selectors are metal position.	
TAPE OUT	VR253 L202 VR671 L201	So that the record/play-back frequency response is flat. (※)	• HX-PRO switch is on position. • Bias and equalization selectors are CrO ₂ position.	
TAPE OUT		• Confirm record/play-back frequency response. • If the frequency response is not flat do the adjustment over starting with step 15.(※)	• HX-PRO switch is on position. • Bias and equalization selectors are metal position.	
	VR207	So that the record/play-back frequency response is flat. (※)		
TAPE OUT	VR252	So that the record/play-back frequency response is flat. (※)	• HX-PRO switch is on position. • Bias and equalization selectors are FeCr position.	
	VR205			
TAPE OUT	VR251	So that the record/play-back frequency response is flat. (※)	• HX-PRO switch is on position. • Bias and equalization selectors are LN position.	
	VR203			
TAPE OUT	VR673 VR674	So that the record/play-back frequency response is flat. (※)	• Bias and equalization selectors are CrO ₂ position.	
		• Confirm record/play-back frequency response. • If frequency response is not the same as for step 16-9, adjust while watching the balance of the two.	• Bias and equalization selectors are LN position.	
TP501 TP502	VR201 VR202	775mV	• Bias and equalization selectors are CrO ₂ position.	
TAPE OUT		• Confirm record/playback frequency response is within specifications. • If specification are not met, redo the adjustments on steps from 11 to 16.	• This confirmation should be done at each bias and equalization positions under each of the following conditions Dolby B, Dolby C,Dolby B and HX-PRO ON, Dolby C and HX-PRO ON.	
TP573 TP574	VR471	775mV	• Keep pressing the RECORD CAL TONE button. • Adjust balance if there is a difference in output between the R and L channels.	
TP573 TP574	VR472 VR473	775mV –25dB	• Keep the BIAS TONE button pressed.	
	VR401 VR402	Adjust to the point where the O VU LED of the LED display lights dimly.	• Output level control at center. • Connect a 10kΩ load resistor to TAPE OUT.	

(※) Measurement is satisfactory if it is within the record/playback frequency response range specified for dolby off. But adjust it as close to flat as possible.

■ MECHANISM ADJUSTMENT AND CONFIRMATION

ITEM	TOOLS USED	ADJUSTMENT POINT	STANDARD	REMARKS
Head height position adjustment	Head gauge MAZ-0057 (chip MAZ-0181(C)) M-300 (chip MAZ-0180(D))	Adjustment screws A, B, C and D (Fig. 1)	Confirm alignment with head gauge. (Fig. 1)	Adjustment washer Thickness Part No. 0.1mm 2410-5017 0.2mm 2410-5018 0.3mm 2410-5019
Head position adjustment (PLAY)	Head gauge MAZ-0057/ M-300	Adjustment screw C, D, E and F (Fig. 2)	Record/playback head, 0-MAX; erase head, MIN-0	
Head position adjustment (AUTO SCAN)	Head gauge MAZ-0057 (chip MAZ-0181(A)) /M-300 (chip MAZ-0181(B))	Adjustment screws E and F (Fig. 4)	Record/playback head, 0-MAX (as close to 0 as possible)	Repeat steps 2 and 3
Pinch roller pressure adjustment	Dial tension gauge (1,000g.)	Lever (Fig. 6)	350g	
Back tension adjustment	Cassette torque meter (TW-2111)	Back tension lever	5.5gcm	
Take-up torque confirmation	Cassette torque meter (TW-2111)		50gcm	Replace clutch if torque is not within limits as per VR851.
FF, REW torque confirmation	Dial torque gauge (300gcm)		130gcm	
Brake torque confirmation	Dial torque gauge (90gcm)		120gcm	Measure in clockwise direction for take-up reel, in counter-clockwise direction for supply reel.
Capstan spindle back clearance confirmation				Fig. 9
Tape travel confirmation	Mirror cassette (MTT-902)		Confirm that the tape, erase and Record/playback heads, pinch roller, and capstan are properly positioned.	

■ HEAD HEIGHT ADJUSTMENT

● PURPOSE

The tape guides not only determine the route of tape travel, but act to limit up/down movement of the tape. Therefore, they must be carefully adjusted to avoid damage to the tape edges or abnormal travel.

● INSPECTION PROCEDURE

1. Insert the head gauge and place the unit in the PLAY state.
2. Make sure that the adjustment chip is not in contact with the tape guides of both heads.

● ADJUSTMENT PROCEDURE

Adjust as follows if either of the adjustment chips catch on the tape guides.

*In case of record/playback head, adjust by turning adjustment screws A or B. Both adjustment screws should be turned in the same direction.

In case of erase head, loosen the adjustment screw C and D and insert an adjusting washer under the head.

[NOTES]

1. Ensure that the head gauge is firmly set in place.

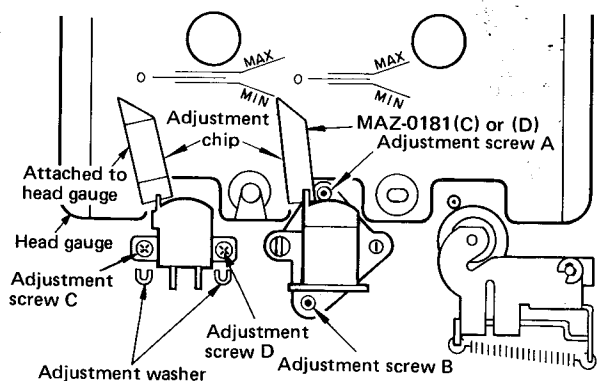


Fig. 1

■ HEAD ADJUSTMENT (PLAY state)

●PURPOSE

The heads must move when the unit is switched from STOP to PLAY or REC.. The position of the heads with relation to the cassette at such time is determined according to the cassette standards. Lack of proper contact with the tape will result if the heads are moved too far or not far enough; therefore, head positioning must be adjusted very carefully.

●INSPECTION PROCEDURE

1. Insert the head gauge and place the unit in the PLAY state.
2. The heads are properly positioned if the ends of the adjustment chips are within the specified range when they are perpendicular to and in light contact with the centers of the heads.

Record/Playback head: 0—MAX

Erase head: MIN—0

●ADJUSTMENT PROCEDURE

Loosen adjustment screws C—F to adjust head positioning.

(Be careful to ensure that the heads are not tilted.)

[NOTES]

Confirm that the head gauge is pressed in the direction indicated by the arrow (↓) when it is inserted.

●FOR REFERENCE

Relationship between head position and MAX—MIN on the head gauge.

The position in which the heads are installed is specified as shown in Figure 3 above. Use the head gauge to ensure that the heads are positioned within the indicated ranges when they are installed.

Relationship between specified ranges and MAX—0—MIN on the head gauge.

RECORD/PLAYBACK HEAD

MAX position: 3.1 (−0.25 of tolerance)

0 position: 3.35 (center)

MIN position: 3.8 (+0.45 of tolerance)

ERASE HEAD

MAX position: 3.3 (−0.2 of tolerance)

0 position: 3.5 (center)

MIN position: 4.0 (+0.5 of tolerance)

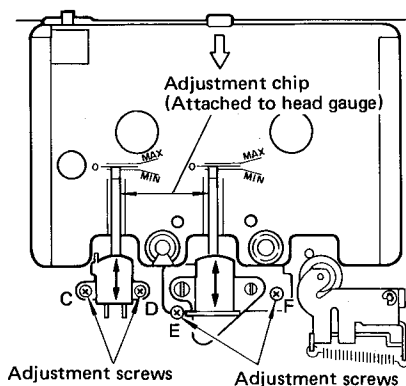


Fig. 2

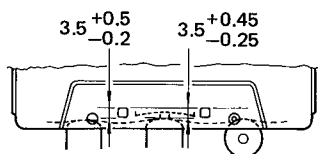


Fig. 3

■ HEAD ADJUSTMENT (AUTO-SCAN)

●PURPOSE

The head position must be adjusted to ensure that the tape signal is correctly detected during auto scan operation. If the Record/playback head moves out too far the tape will not be taken up properly, while if it does not move out far enough the tape signal will not be detected.

●INSPECTION PROCEDURE

1. Insert the head gauge and place the unit in the AUTO-SCAN state.
2. Ensure that the end of the adjustment chip is within the specified range when it is perpendicular to and in light contact with the center of the Record/playback head.

Record/playback head: 0—MAX

●ADJUSTMENT PROCEDURE

1. Loosen the adjustment screws and adjust the head position in the same manner as for PLAY. However, be sure to recheck the PLAY position of the head after doing this.
2. If specifications cannot be satisfied for both the PLAY and SCAN states, make fine adjustments by bending the lever shown in Fig. 5 at the point marked※.

[NOTES]

1. Ensure that the head gauge is securely inserted.
2. Although the adjustment range is given as 0—MAX, the adjustment should be as close to 0 as possible. However, it must not be less than 0.

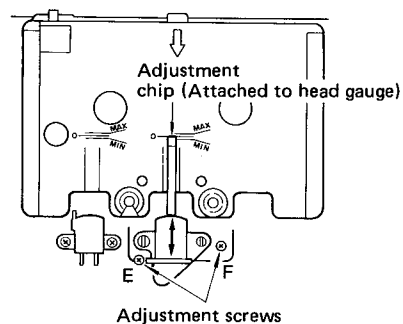


Fig. 4

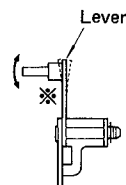


Fig. 5

■ PINCH ROLLER ADJUSTMENT

●PURPOSE

High tape tension is obtained when the pinch roller pressure is high. However, an excessive load is exerted on the spindle bearings of the capstan and the pinch roller if the pressure is too high. This can result in destructive side pressure which will shorten the life of the spindle bearings and cause wow and flutter. Further, the rubber contact surface of the pinch roller is excessively deformed in such cases, and the resulting variations in hardness can also produce wow and flutter and hasten deterioration of the rubber.

If the amount of pressure is too small, wow and flutter can result due to slipping; therefore, the pressure must be adjusted to within the range which will give stable tape speed.

●INSPECTION PROCEDURE

1. Place the unit in the PLAY state and confirm that the gap between the pinch roller and the level is $0.3 \text{ mm} \pm 0.1 \text{ mm}$.

2. With the unit in the PLAY state, apply the dial tension gauge to the pinch roller spindle and exert pressure in the direction indicated by the arrow (↖) for a distance of about 0.2mm (to the point where the pinch roller stops turning). Then, gradually return the gauge in the opposite direction (↗) and confirm that the pinch roller starts turning when the tension gauge reads 350g. ± 30 g.

●ADJUSTMENT PROCEDURE

Inspection item 1... Adjust by moving the  section of the lever to the right or left (↔).

Inspection item 2... Adjust by bending the  section of the lever in the direction indicated by the arrow (↷).

Pressure is increased if this section of the lever is bent to the left (↶), and reduced if it is bent to the right (↷).

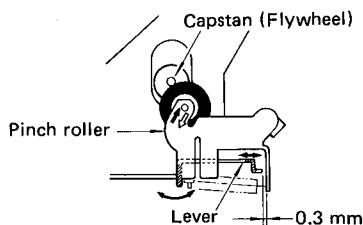


Fig. 6

■ BACK TENSION ADJUSTMENT

●PURPOSE

Back tension is applied during PLAY to improve contact between the tape and the head. If back tension is insufficient, the tape is jerked when the unit is switched to PLAY and tape speed will be uneven while the resulting slack is taken up. If back tension is too great, the tape is subjected to excessive tension which can stretch it or cause the capstan drive to slip (resulting in wow just before slippage occurs). If back tension on the supply reel spindle is not even, wow becomes particularly pronounced as the end of the tape is neared because the relative amount of back tension is increased.

●INSPECTION PROCEDURE

1. Clean the reel spindles (both supply and take up) with freon.
2. Use a jig (MAZ-0192) to age the mechanism (place the unit in the PLAY state for approximately 5 seconds).
3. Insert the cassette torque meter in the mechanism and place it in the PLAY state.
4. Confirm that the torque meter reads 5.5gcm ± 1 gcm. at this time.

●CHECK ITEMS

Check the following when the torque meter reading is not as specified.

1. Visually confirm that gap (a) in Fig. 7 is approximately 0.4mm while the unit is in the PLAY state.
2. Visually confirm that gap (b) in Fig. 7 is approximately 0.4mm while the unit is in the CUE state.

●ADJUSTMENT PROCEDURE

1. When gap (a) is not as specified while the unit is in the PLAY state, adjust by bending the  section of the back tension lever in the direction indicated by the arrow (↷).
2. When gap (b) is not as specified while the unit is in the CUE state, adjust it by bending the  section of the back tension lever in the direction indicated by the arrow (↶).

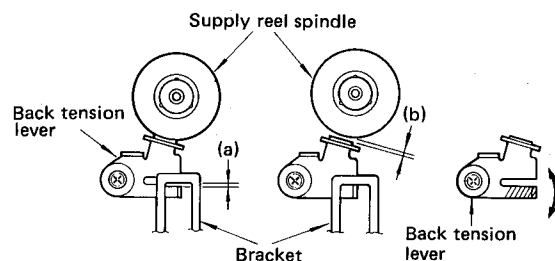


Fig. 7

■ TAKE-UP TORQUE CONFIRMATION

●PURPOSE

Take-up torque must be applied to the reel spindle to ensure that the tape is taken up at a constant speed. If the take-up torque is too high, the tape will be subjected to excessive tension and become stretched or curled, or the tape travel position will change, resulting in wrinkling or damage to the edge of the tape. However, if the take-up torque is too low the tape will become loose and may not be wound up evenly.

●INSPECTION PROCEDURE

Replace the clutch if no slippage occurs and the take-up torque is not within specifications as per VR851.

[NOTES]

Check whether the torque meter reading on the take-up side varies by more than ± 5 g-cm as the reel spindle goes through one revolution. If so, the drive section is dirty and should be cleaned with freon or the like. Repeat the check after cleaning.

■ F. FWD AND REW. TORQUE CONFIRMATION

●PURPOSE

To confirm that the tape is taken up correctly.

●INSPECTION PROCEDURE

1. Place the unit in the FF and REW states.
2. Slip the dial torque gauge vertically onto the reel spindle, holding the gauge with the fingers so that "0" marks are aligned.
3. After slipping the gauge onto the reel spindle, gradually move your finger away from the rotating part at the bottom (the part marked * in Fig. 8).
4. Confirm that dial torque gauge reads 130gcm ± 20 gcm.

[NOTES]

1. Hold the dial gauge so that there is a gap between it and the reel spindle as shown in the figure.
2. Attach a cassette hub to the tip of the gauge (to its center).
3. Usually, low FF or REW torque readings are due to grease or dirt on the drive section; therefore, this section should be cleaned with freon or the like before taking the readings.

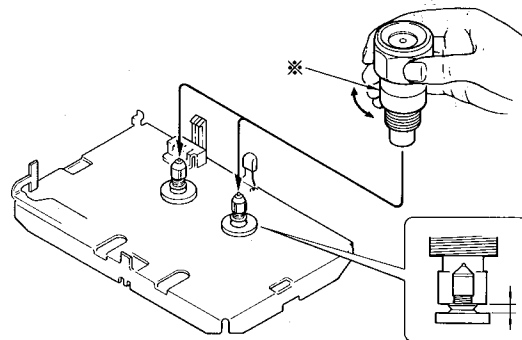


Fig. 8

■ BRAKE TORQUE CONFIRMATION

●PURPOSE

The function of the brake is to stop the tape as quickly and surely as possible without subjecting it to excessive tension or allowing it to become slack when switching from FF, REW, or PLAY to STOP. However, in order to protect the tape, the brake must not be applied until after the drive force has been removed. Further, greater braking force must be applied to the reel spindle on the supply side than to that on the take-up side in order to prevent the tape from overrunning.

●INSPECTION PROCEDURE

- 1 With the mechanism in the STOP state, slip the dial torque gauge vertically onto the reel spindle.
- 2 Slowly rotate the top of the dial gauge (in the clockwise direction for the take-up reel and in the counter-clockwise direction for the supply reel) and confirm that it reads $120\text{gcm} \pm 50\text{gcm}$ when the reel spindle starts turning.

[NOTES]

1. Usually, low brake torque readings are due to grease or dirt on the brake shoes or reel spindles; therefore, these sections should be cleaned with freon or the like before taking the readings.
2. If the brakes do not operate smoothly because they have become deformed, they must be repaired or replaced.

■ CAPSTAN BACK END CLEARANCE CONFIRMATION

●PURPOSE

The capstan is provided with a small amount of clearance at its back end (and the smaller, the better). When the unit is used vertically, the capstan becomes horizontal and vibrates in its own axial direction. This causes wow flutter level variation. To prevent such a situation, a spring is inserted so that the capstan is stabilized with light pressure applied in the axial direction. Without any clearance, friction causes burning. Therefore, the purpose of this inspection is to confirm that a proper clearance is obtained at the back end of the capstan to allow the spring to take effect.

●INSPECTION PROCEDURE

- 1 Pull the capstan in the direction of arrow $\downarrow$ and confirm that the clearance (a) is more than 0.1mm.
- 2 Push the capstan in the direction of arrow $\uparrow$ and confirm that the clearance (b) is within 0.8mm.

[NOTES]

1. When the clearance (a) is made 0 (by pushing the bearing in the direction of the arrow $\leftarrow$ lightly), the flywheel (capstan) must be free from play.
2. When the unit is placed vertically and is set in the play mode, the flywheel pushed by the bearing must maintain smooth and constant revolution at the fixed position.

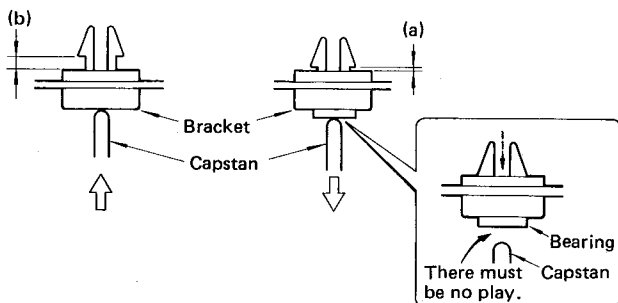


Fig. 9

■ TAPE TRAVEL CONFIRMATION

●PURPOSE

If the edges of the tape are in constant contact with the tape guides during tape travel, the tape will be subjected to excessive wear and will not be in proper contact with the head; this will result in increased variations in level. Therefore, proper tape travel must be confirmed using the mirror cassette.

●INSPECTION PROCEDURE

1. Set the mirror cassette in the mechanism.
2. Place the mechanism in the PLAY state.
3. Confirm that tape travel is as shown in Fig. 11; the tape should not be in contact with the tape guides and should be centered on the pinch roller.
4. Pay particular attention to the splice between the tape leader and the magnetic tape.

●ADJUSTMENT PROCEDURE

There is a problem with one of the following if the tape is in contact with the tape guides as shown in Fig. 12 or 13.

- Pinch roller perpendicularity
 - Record/playback head height
 - Record/playback head angle
 - Erase head height
- a) The pinch roller is at fault if the tape is as shown in Fig. 12.
 - b) Head height is the problem in the case of Fig. 13.

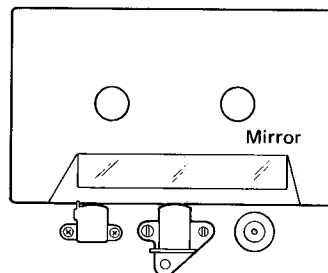
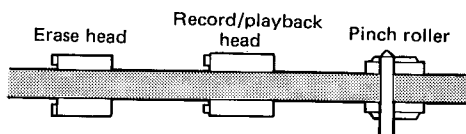
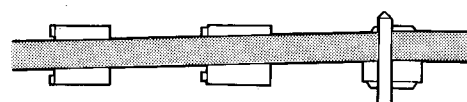


Fig. 10



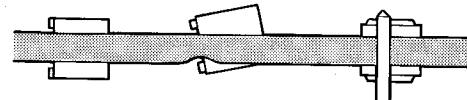
Normal

Fig. 11



Defective pinch roller

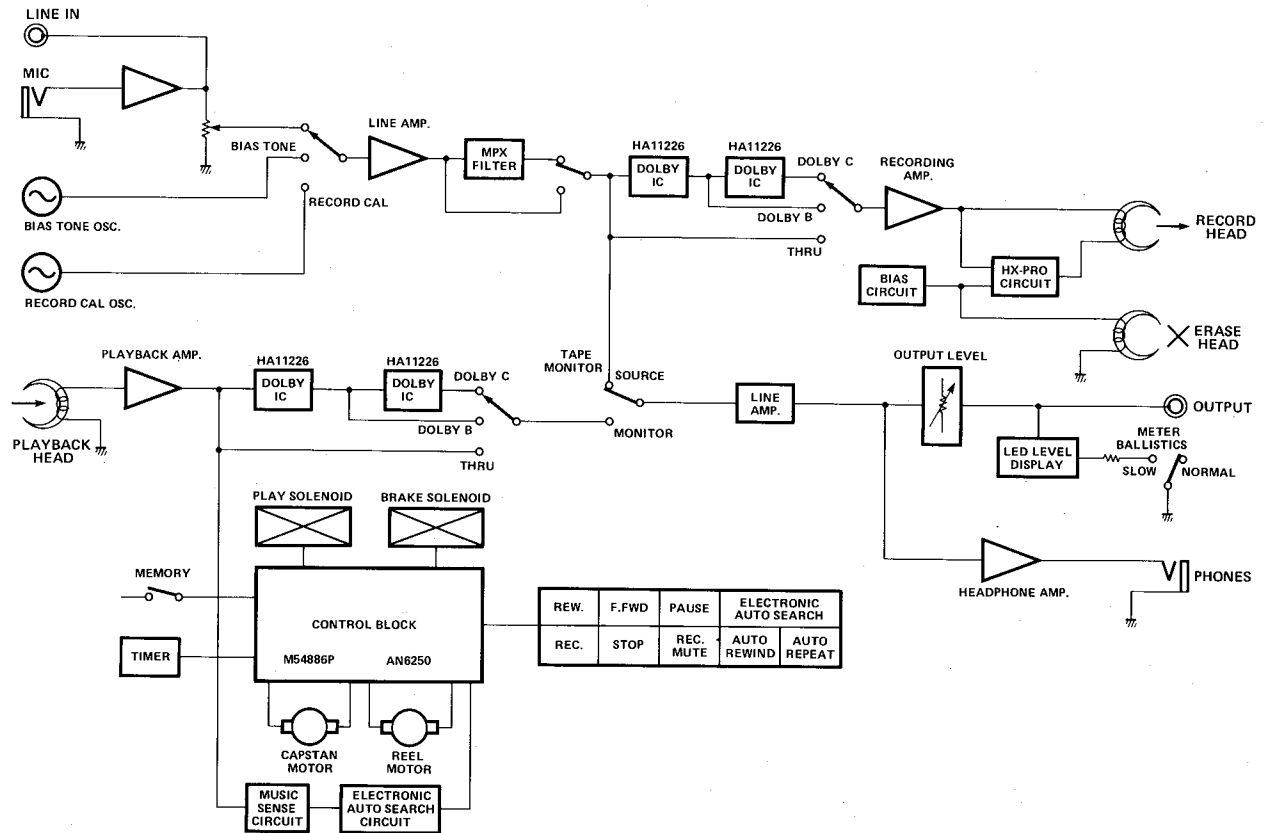
Fig. 12



Incorrect head positioning

Fig. 13

BLOCK DIAGRAM



CIRCUIT DESCRIPTION

●PLAYBACK MODE (Rch)

The output of playback head is fed to base of playback amp. (Q 102) and amplified. The output of playback amp. (Q 112) is fed to 15 pin of the dolby IC (IC 502). At Dolby-B mode, the noise reduction is done with one channel of dolby IC (IC 502).

At Dolby-C mode, further the other channel is used.

After noise reduction, the signal is amplified in the line amp. (Q 302, 304, 306, 308) and through output variable resistor (VR302), line out signal is gained.

●RECORDING MODE (Lch)

Mic. input is fed to the base of mic amp. (Q 151). The output of mic amp. (Q 153) and line input through the line amp. (Q 571, 573) and MPX filter. The output of MPX filter is fed to 2 pin of dolby IC (IC 503). After noise reduction, signal is fed to the recording amp. (IC 201). The output of recording amp. (IC 201) is added to the bias current bias osc. block through HX-PRO circuit and fed to the record head.

●MUTING

At playback and recording mode the muting control voltage is taken out from 15 pin (at playback or recording mode) and 16 pin (at recording mode) of the tape deck controller (IC 801) and mutes at "low" level.

Q 751 becomes on and Q 757 (Lch) and Q 758 (Rch) become on and mute the output of the line amp. Q 301, 303, 305, 307 (Lch) and Q 302, 304, 306, 308 (Rch). And also Q 753 (Lch) and Q (754) become on and mute the output of playback amp.

To mute recording signal, Q 53, Q 51 and Q 52 become on and Q 759 (Lch) and Q 760(Rch) become on.

●HX-PRO System

By varying the bias level to compensate for the different characteristics of the input signal, Active Bias is kept constant, so that this allows natural-sounding recordings of the low frequency region. Also, much higher levels of high frequencies can be recorded.

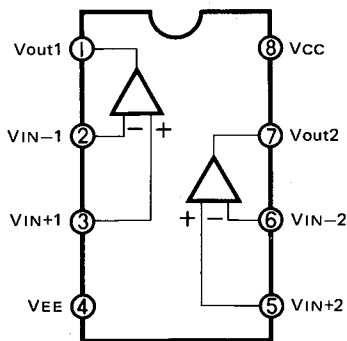
If we consider specific sectors of the frequency range, then, if a signal source only contains high frequency components, the HX-PRO will detect this and reduce the bias from the oscillator to the optimum bias for the signal. On the other hand, no changes in bias level will be made for signal sources that contains only low frequency sounds. However, when low frequency signals contain occasional admixtures of high frequency signals, the HX-PRO will reduce the bias, changing only high frequency bias levels while keeping lower frequency bias level constant. The new system, therefore, not only offers an improvement at high frequencies, but also ensures the optimum bias at low frequencies, too.

Advantages of the HX-PRO

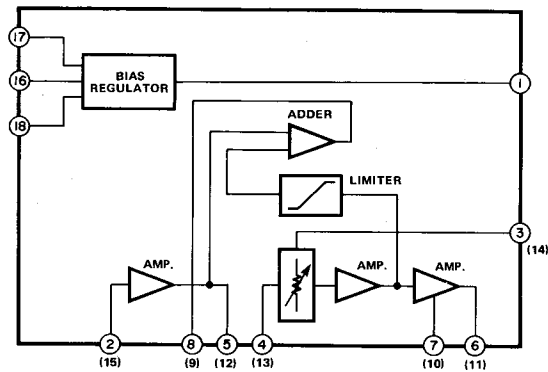
1. Gives performance almost equal to metal tape for normal tape.
2. Outstanding treble dynamic range.
3. Adjustment to left and right channels can be made independently.
4. All kinds of tape from normal through metal are suitable.

IC FUNCTIONAL BLOCK DIAGRAM

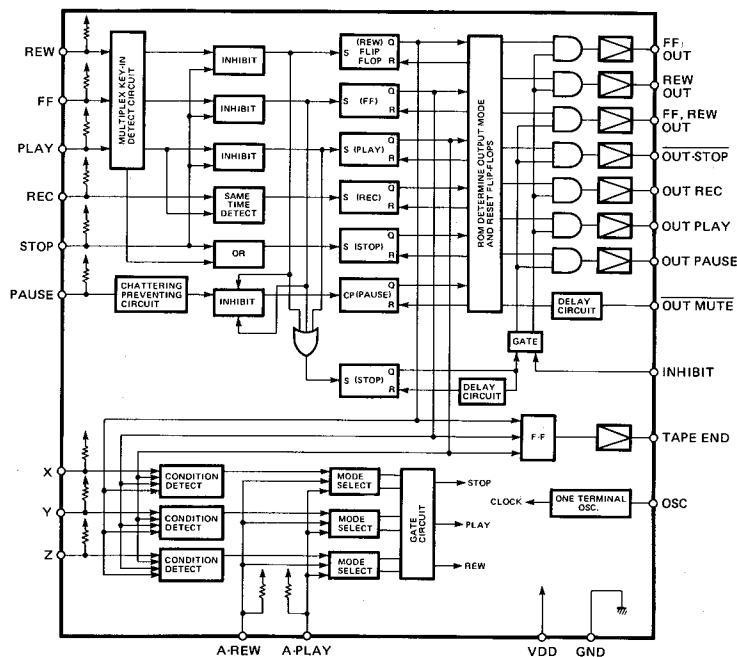
IC351: NJM 4556D
 IC421: LA 6458
 IC471: μ PC 4558C
 IC671, 672: HA 17082PS
 IC673: NJM 4559D



IC501, 502, 503, 504: HA 1126

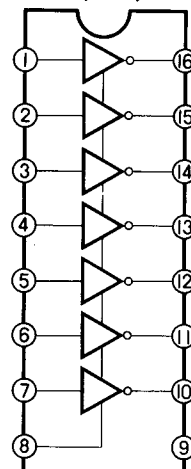


IC801: TC 9121P

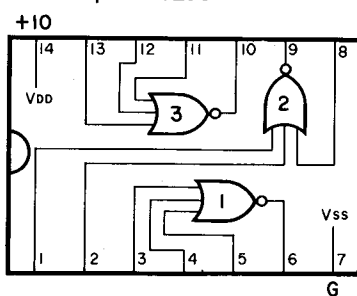


X: Input terminal which orders "stop" or Y: Input terminal which orders "stop" or Z: Orders the operation at tape end while "play" while rewinding. (Set at auto "rewind" while playing or recording. auto rewind or auto play. play mode.) (Set at auto rewind mode.)

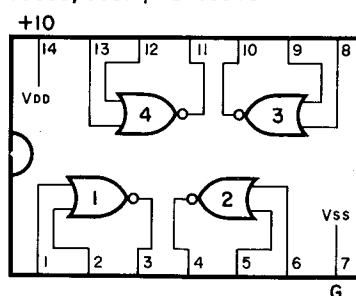
IC902, 903, 904: IR 2403



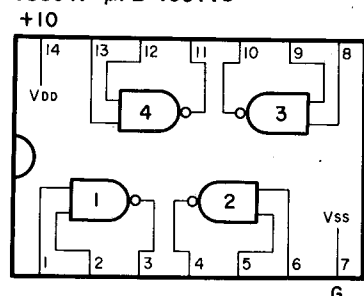
IC802: μ PD 4023C

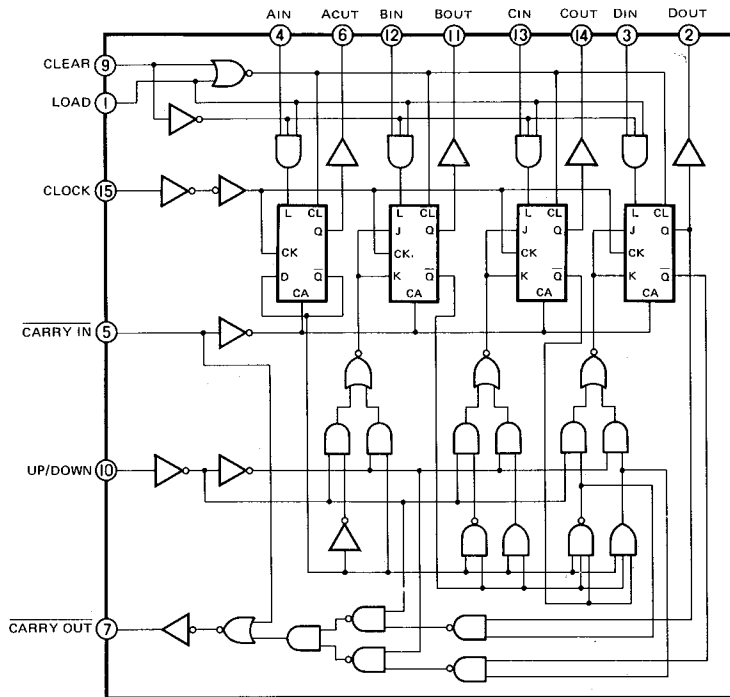


IC803, 806: μ PD 4001C

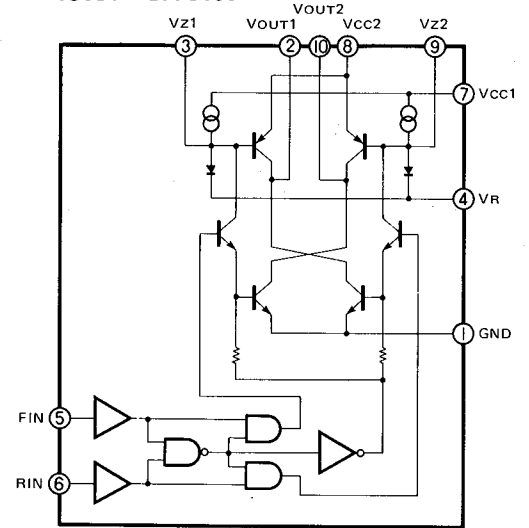


IC804: μ PD 40011C

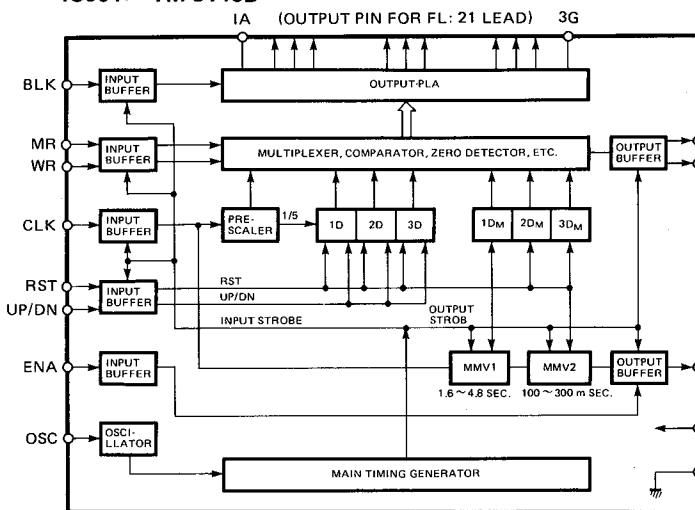


IC805: μ PD 4516C

IC851: BA 6109



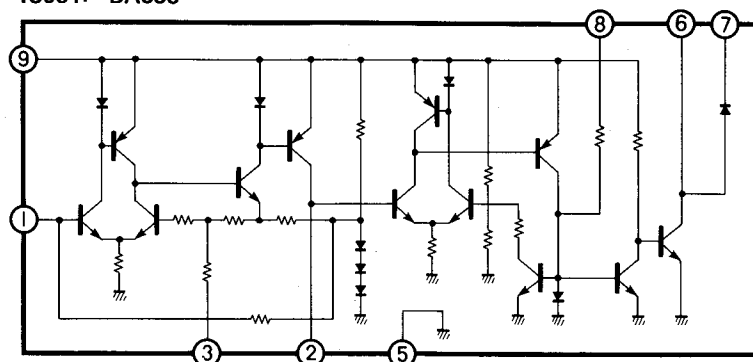
IC901: TM 3140B



TM3140B

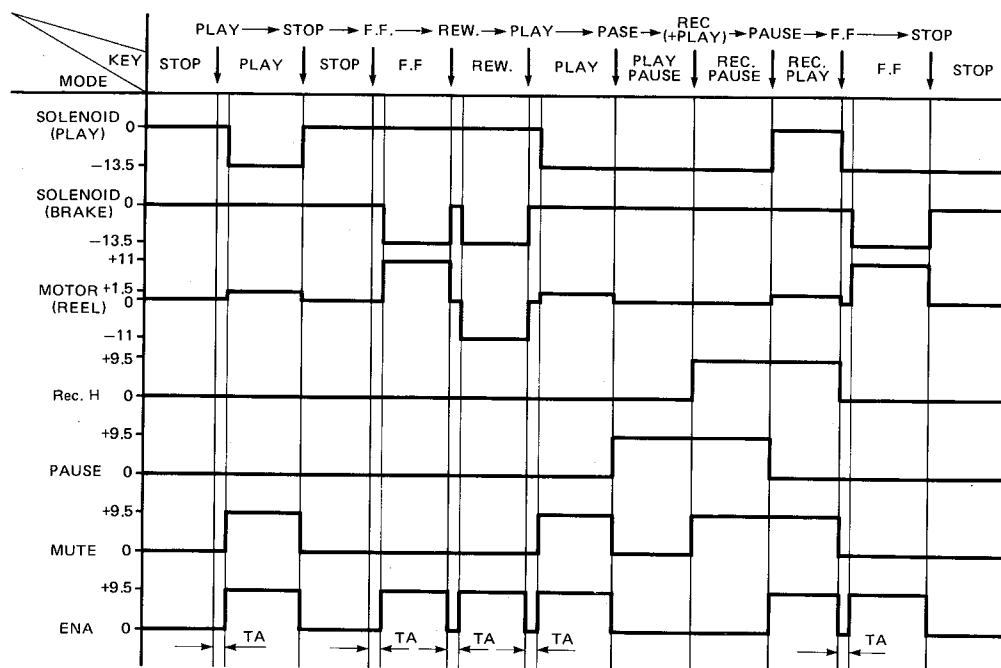
- (3) OSC (OSCILLATOR-IN)
Input terminal to generate the internal clock.
- (4) RST (RESET-IN)
Input terminal to reset the 3 figures counter and the content of memory.
- (5) MR (MEMORY READ-IN)
Input terminal to appoint displaying the content of memory.
- (6) WR (MEMORY WRITE-IN)
Input terminal to save the content of counter into memory.
- (7) CLK (CLOCK PULSE-IN)
Input terminal for the clock pulse of counter.
- (8) UP/DN (UP/DOWN-IN)
Input terminal to appoint the add and subtract mode of counter.
- (9) ZD (ZERO DETECT-OUT)
Output terminal to send one-shot signal when counter is in subtract mode and all zero.
- (10) MD (MEMORY DETECT OUT)
Output terminal to send the one-shot signal when the content of counter equals that of memory.
- (11) TEO (TAPE END-OUT)
Output terminal to detect the tape-end.
- (12) 1A ~ 3G (SEGMENT-OUT)
Output terminal to drive segments of 3-figures, 7-segments fluorescent display tube.
- (13) BLK (BLANKING-IN)
Input terminal to inhibit the 3-figures output of counter.
- (14) ENA (TEO ENABLE-IN)
Input terminal to control TEO output.

IC951: BA335



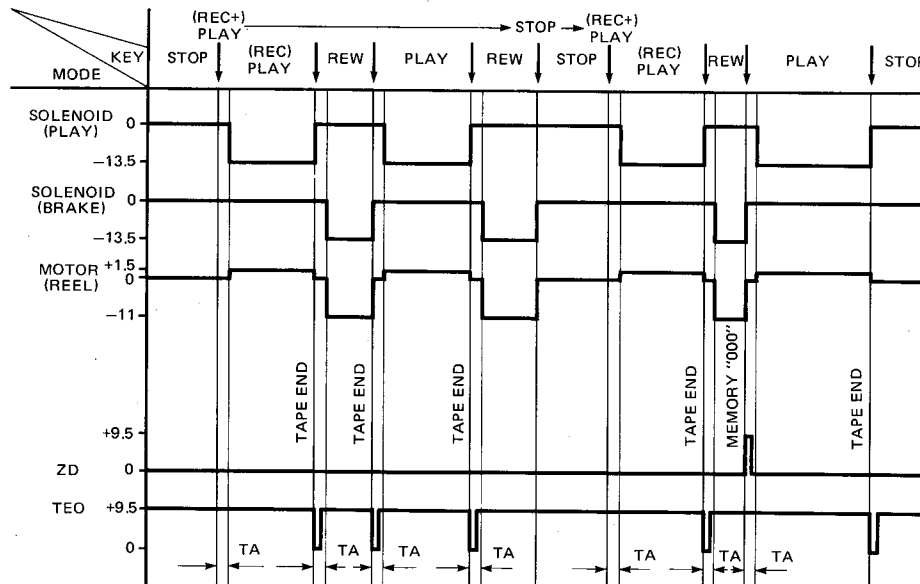
TIMING CHART

No. 1 KEY OPERATION MODE



TA = 0.3 sec.

No. 2 AUTO REPEAT

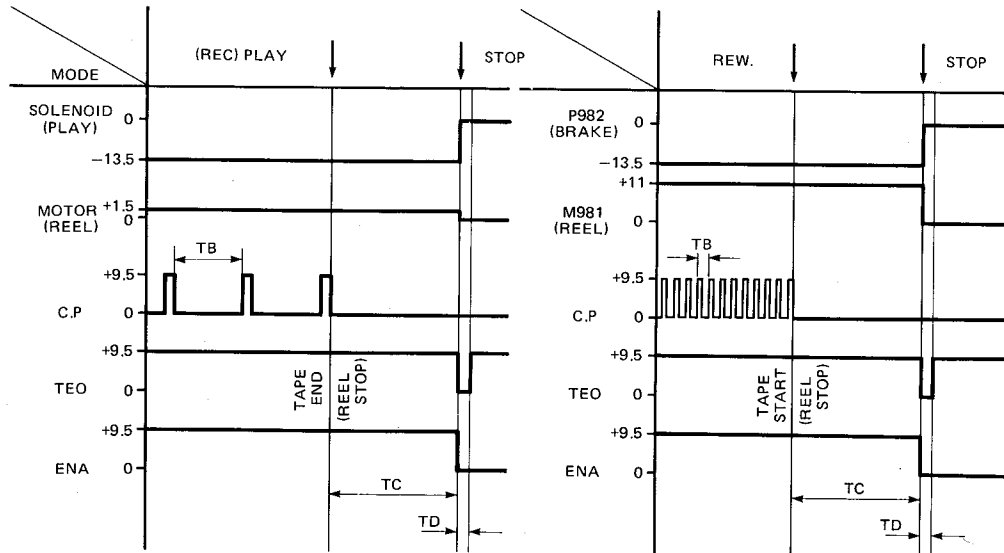


• AUTO PLAY REW. ON
• MEMORY OFF

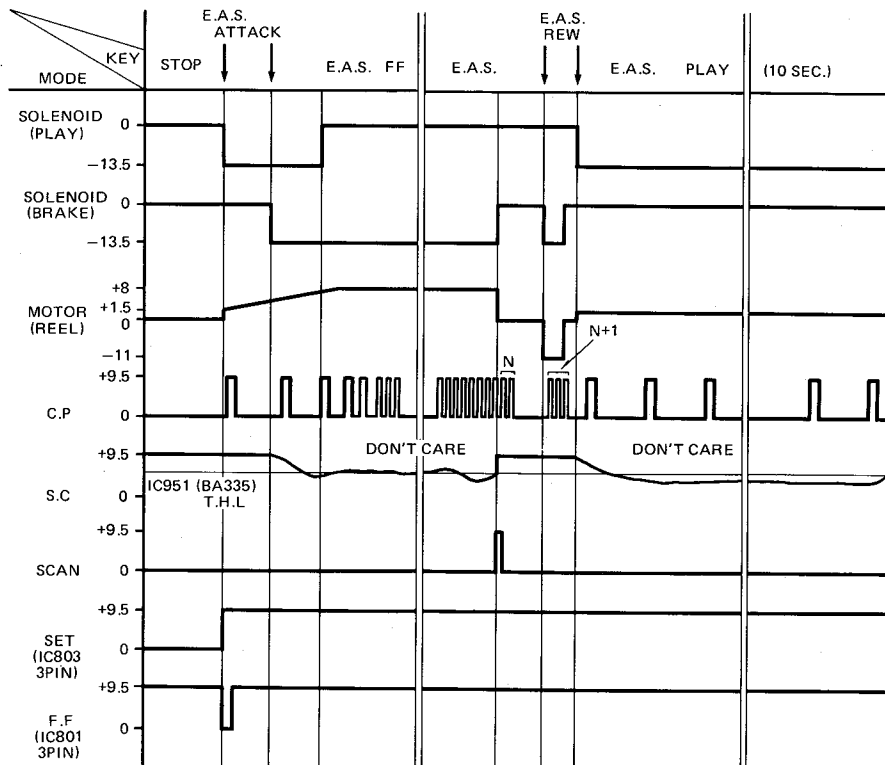
• AUTO PLAY REW. ON
• MEMORY ON

• AUTO PLAY REW. OFF
• MEMORY ON or OFF

No. 3 AUTO STOP

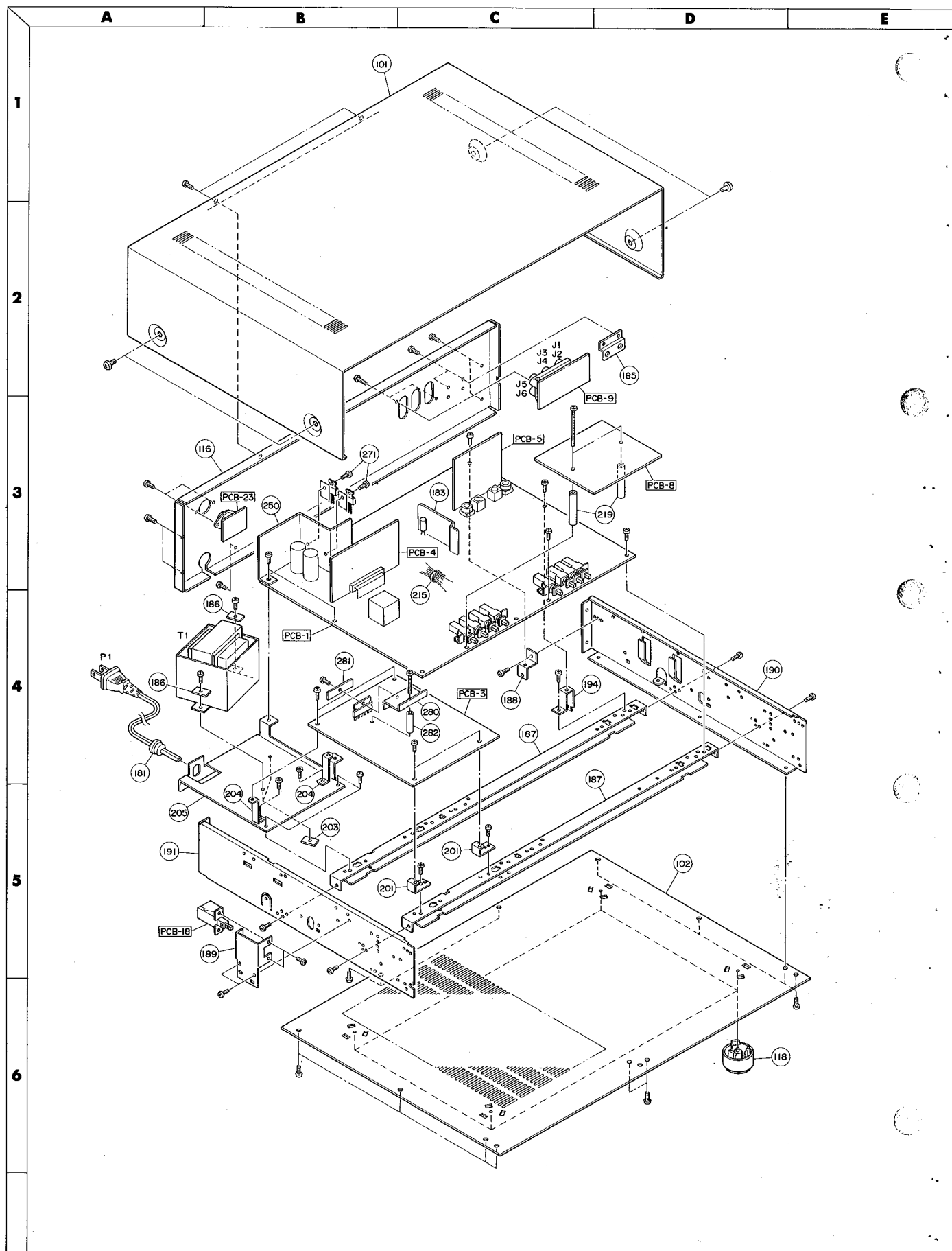


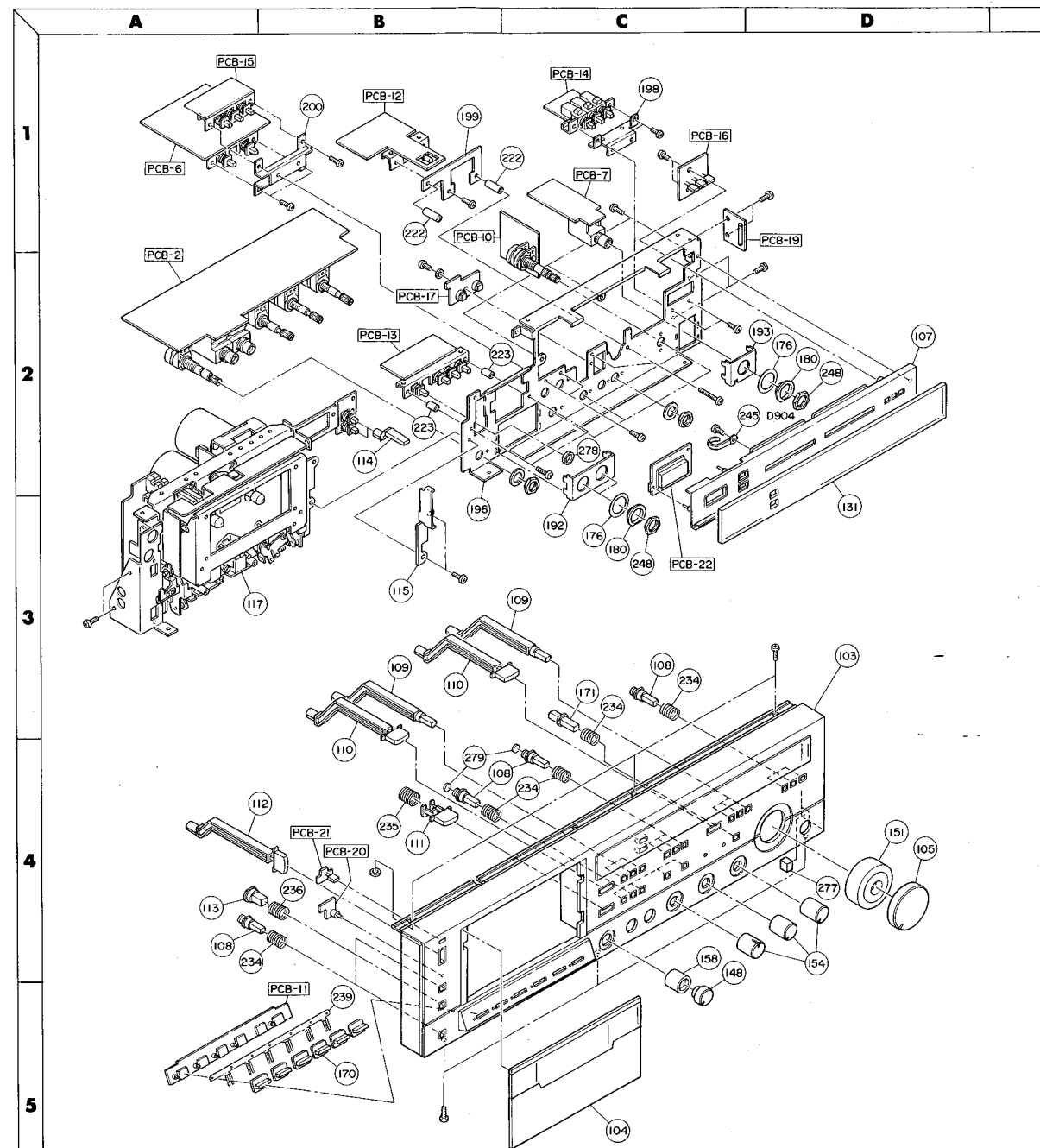
No. 4 E.A.S.



	PLAY	F. F	REW.
TA		0.3 sec.	
TB	450 ~ 1200 m sec.	29 ~ 44 m sec.	17 ~ 65 m sec.
TC		2.2 ~ 6.7 sec.	
TD		0.15 ~ 0.45 sec.	

GENERAL UNIT EXPLODED VIEW

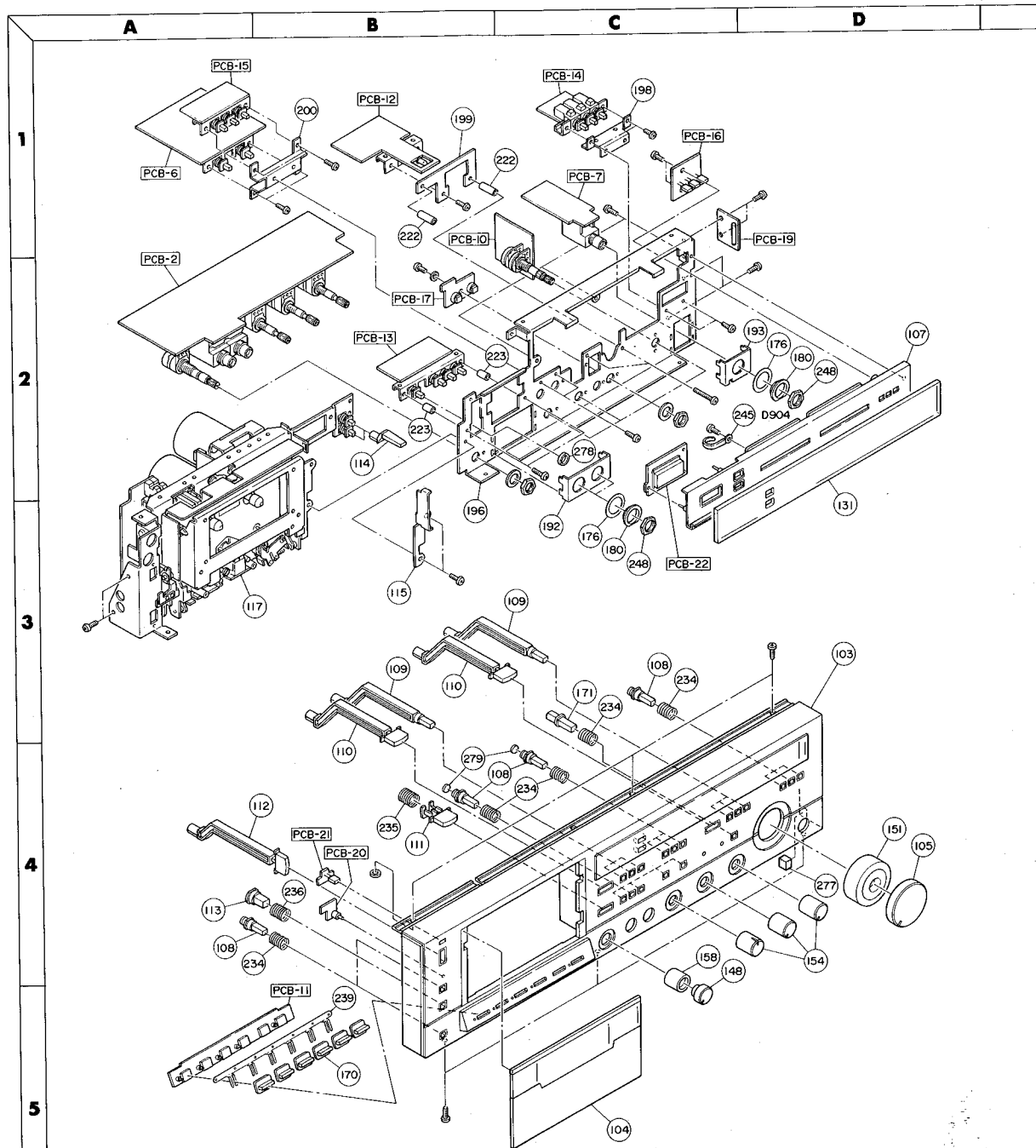




GENERAL UNIT PARTS LIST

Ref. No.	Part No.	Description
101	A414-CD401A	Cabinet Top Assembly
102	A423-CD401A	Cabinet Bottom Assembly
103	A443-CD401A	Front Panel Assembly
104	A452-CD401A	Door Assembly
105	A634-CD401A	Knob Assembly, Line Level (L)
107	A514-CD401A	Plate Assembly, LED Display Meter
108	A662-CD401A	Push Button Assembly, Electronic Auto Search, Rec. Mute, Equalization (CrO ₂ , FeCr, LN), Auto Rewind, Auto replay Meter Ballistics, Bias Tone, Record Cal. Tone, Timer

Ref. No.	Part No.	Description
109	A662-CD401B	Push Button Assembly, Bias (CrO ₂ , FeCr, LN), Dolby NR Type Selector, HX-PRO, MPX Filter
110	A662-CD401C	Push Button Assembly, Bias (Metal), Dolby NR System Selector
111	A662-CD401D	Push Button Assembly, Equalization (Metal)
112	A662-CD401E	Push Button Assembly, Power
113	A662-CD401F	Push Button Assembly, Eject
114	A662-CD401G	Push Button Assembly, Memory, Reset
115	B219-CD401A	Bracket Assembly
116	B424-CD401A	Cabinet Back Assembly
117	MR064HF(C)	Cassette Tape Recorder Mechanical Assembly (Basic Assembly Only)
118	1319-0139	Foot
131	1441-00302	Clear Panel
148	1630-02001	Knob, Microphone Level (L)
151	1630-01801	Knob, Line Level (R)
154	1630-01901	Knob, Bias Fine Trim, Output Level, Fader
158	1634-03301	Knob, Microphone Level (R)
170	1662-05901VN	Push Button, Record, Rew., Play, F.FWD, Stop, Pause
171	1662-08301	Push Button, Tape Monitor
176	2111-1356	Felt, Microphones Jack, Headphones Jack
180	2114-72167	Bushing, Microphones Jack, Headphones Jack
181	2114-415027	Bushing, AC Line Cord
183	2216-7127	Shield Plate
185	2219-7737	Bracket
186	2219-7093	Bracket
187	2219-7754	Bracket
188	2219-7651	Bracket
189	2219-7653	Bracket
190	2219-7654	Bracket
191	2219-7655	Bracket
192	2219-7656	Bracket
193	2219-7657	Bracket
194	2219-7661	Bracket
196	2219-7668	Bracket
198	2219-7746	Bracket
199	2219-7797	Bracket
200	2219-7798	Bracket
201	2219-7800	Bracket
203	2219-7091	Bracket
204	2219-7799	Bracket
205	2219-7801	Bracket
215	2240-7120	Holder
219	2363-501716	Bushing
222	2132-301521	Spacer
223	2132-3008021	Spacer
224	2132-01702	Spacer
234	2651-210188	Spring
235	2651-210190	Spring
236	2651-210189	Spring
239	2652-00253	Leaf Spring
245	2218-7001	Holding Bracket
248	2440-61	Special Nut
250	2222-7131	Heat Sink
271	2320-7004	Special Screw (+)
277	2112-11248	Sponge
278	2114-01224	Bushing
279	2111-1442	Felt
280	2222-5039	Heat Sink
281	2222-5040	Heat Sink
282	2132-01703	Spacer



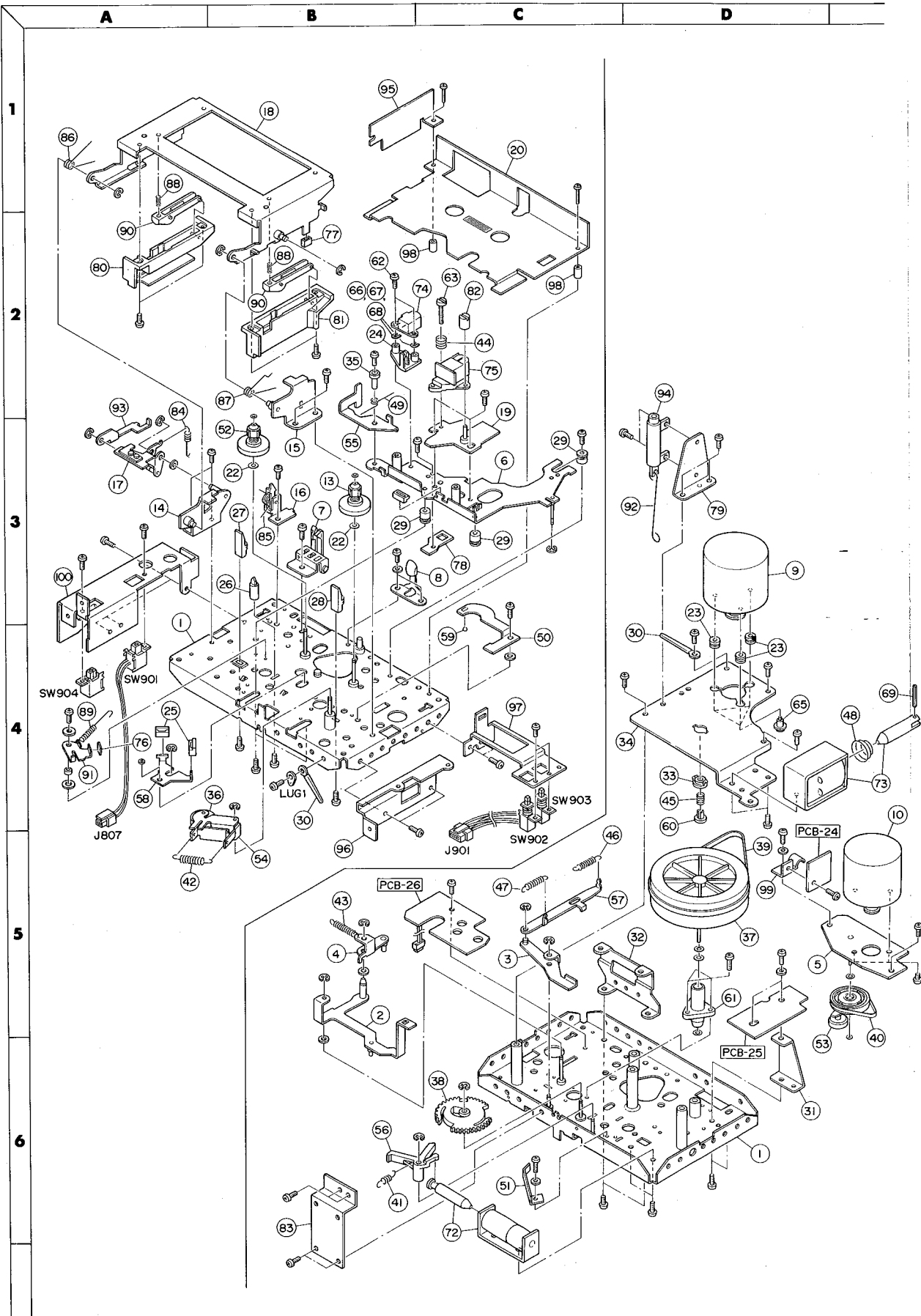
GENERAL UNIT PARTS LIST

Ref. No.	Part No.	Description
101	A414-CD401A	Cabinet Top Assembly
102	A423-CD401A	Cabinet Bottom Assembly
103	A443-CD401A	Front Panel Assembly
104	A452-CD401A	Door Assembly
105	A634-CD401A	Knob Assembly, Line Level (L)
107	A514-CD401A	Plate Assembly, LED Display Meter
108	A662-CD401A	Push Button Assembly, Electronic Auto Search, Rec. Mute, Equalization (CrO ₂ , FeCr, LN), Auto Rewind, Auto replay Meter Ballistics, Bias Tone, Record Cal. Tone, Timer

Ref. No.	Part No.	Description
109	A662-CD401B	Push Button Assembly, Bias (CrO ₂ , FeCr, LN), Dolby NR Type Selector, HX-PRO, MPX Filter
110	A662-CD401C	Push Button Assembly, Bias (Metal), Dolby NR System Selector
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112	A662-CD401E	Push Button Assembly, Power
113	A662-CD401F	Push Button Assembly, Eject
114	A662-CD401G	Push Button Assembly, Memory, Reset
115	B219-CD401A	Bracket Assembly
116	B424-CD401A	Cabinet Back Assembly
117	MR064HF(C)	Cassette Tape Recorder Mechanical Assembly (Basic Assembly Only)
118	1319-0139	Foot
131	1441-00302	Clear Panel
148	1630-02001	Knob, Microphone Level (L)
151	1630-01801	Knob, Line Level (R)
154	1630-01901	Knob, Bias Fine Trim, Output Level, Fader
158	1634-03301	Knob, Microphone Level (R)
170	1662-05901VN	Push Button, Record, Rew., Play, F.FWD, Stop, Pause
171	1662-08301	Push Button, Tape Monitor
176	2111-1356	Felt, Microphones Jack, Headphones Jack
180	2114-72167	Bushing, Microphones Jack, Headphones Jack
181	2114-415027	Bushing, AC Line Cord
183	2216-7127	Shield Plate
185	2219-7737	Bracket
186	2219-7093	Bracket
187	2219-7754	Bracket
188	2219-7651	Bracket
189	2219-7653	Bracket
190	2219-7654	Bracket
191	2219-7655	Bracket
192	2219-7656	Bracket
193	2219-7657	Bracket
194	2219-7661	Bracket
196	2219-7668	Bracket
198	2219-7746	Bracket
199	2219-7797	Bracket
200	2219-7798	Bracket
201	2219-7800	Bracket
203	2219-7091	Bracket
204	2219-7799	Bracket
205	2219-7801	Bracket
215	2240-7120	Holder
219	2363-501716	Bushing
222	2132-301521	Spacer
223	2132-3008021	Spacer
224	2132-01702	Spacer
234	2651-210188	Spring
235	2651-210190	Spring
236	2651-210189	Spring
239	2652-00253	Leaf Spring
245	2218-7001	Holding Bracket
248	2440-61	Special Nut
250	2222-7131	Heat Sink
271	2320-7004	Special Screw (+)
277	2112-11248	Sponge
278	2114-01224	Bushing
279	2111-1442	Felt
280	2222-5039	Heat Sink
281	2222-5040	Heat Sink
282	2132-01703	Spacer

h, Rec. Mute,
d, Auto replay
e, Timer

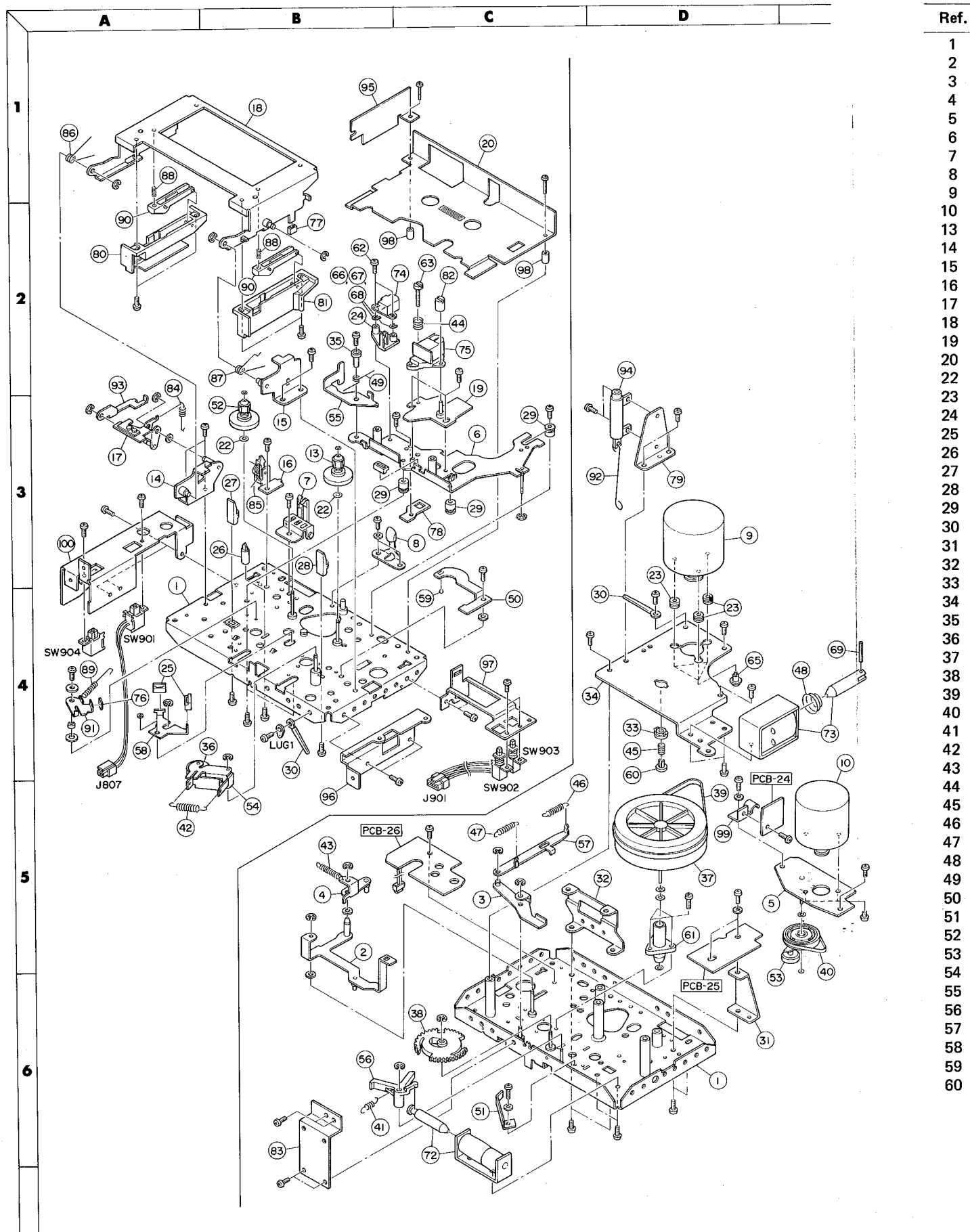
CASSETTE MECHANISM EXPLODED VIEW



CASSETTE MECHANISM PARTS LIST

Ref. No.	Part No.	Description
1	B211-MR064HFA	Chassis Assembly
2	B672-MR064HFA	Lever Assembly, Brake
3	B672-MR064HFB	Lever Assembly, Play Main
4	B672-MR064HFC	Lever Assembly, Cue
5	B251-MR064HFA	Bracket Assembly, Motor
6	B674-MR064HFB	Slider Assembly, sub chassis
7	B219-MR064HFA	Bracket Assembly, Switches
8	B652-MR064HFA	Leaf Spring Assembly, Cassette Positioning
9	D311-MR064HFA	DC Motor Assembly, Main
10	D311-MR064HFB	DC Motor Assembly, Sub
13	B661-MR064HFA	Take-Up Reel Spindle Assembly
14	B219-MR064HFB	Bracket Assembly, Lid Left
15	B219-MR064HFC	Bracket Assembly, Lid Right
16	B219-MR064HFD	Bracket Assembly, Lid Lock Lever
17	B672-MR064HFD	Lever Assembly, Eject
18	A614-MR064HFA	Lid Assembly
19	B219-MR064HFE	Bracket Assembly, Head Base
20	A514-CD401MA	Dressing Plate Assembly (Includes: Lamp)
22	2111-1357	Felt
23	2114-18	Bushing
24	2132-5092	Spacer
25	2135-5004	Brake Shoe
26	2142-5005	Guide
27	2142-5006	Guide
28	2142-5011	Guide
29	2142-5013	Guide
30	2218-7001	Holding Bracket
31	2218-5017	Holding Bracket
32	2219-5614	Bracket
33	2240-5090	Holder
34	2251-5046	Bracket, Motor
35	2363-55150	Boss
36	2614-5030	Pinch Roller
37	2617-5163	Flywheel
38	2622-5036	Gear
39	2642-02418	Belt, Main
40	2642-02415	Belt, Sub
41	2651-1103452	Spring
42	2651-1103453	Spring
43	2651-1103411	Spring
44	2651-2101413	Spring
45	2651-210164	Spring
46	2651-1103455	Spring
47	2651-1103454	Spring
48	2651-222010	Spring
49	2651-5169	Spring
50	2652-5165	Leaf Spring
51	2652-5163	Leaf Spring
52	2661-415032	Supply Reel Spindle
53	2662-5020	Clutch
54	2672-5305	Lever
55	2672-5350	Lever
56	2672-5352	Lever
57	2674-5271	Slider
58	2677-5007	Brake
59	2711-002021	Steel Ball
60	2712-5020	Bearing

CASSETTE MECHANISM EXPLODED VIEW



CASSETTE MECHANISM PARTS LIST

Ref. No.	Part No.	Description
1	B211-MR064HFA	Chassis Assembly
2	B672-MR064HFA	Lever Assembly, Brake
3	B672-MR064HFB	Lever Assembly, Play Main
4	B672-MR064HFC	Lever Assembly, Cue
5	B251-MR064HFA	Bracket Assembly, Motor
6	B674-MR064HFB	Slider Assembly, sub chassis
7	B219-MR064HFA	Bracket Assembly, Switches
8	B652-MR064HFA	Leaf Spring Assembly, Cassette Positioning
9	D311-MR064HFA	DC Motor Assembly, Main
10	D311-MR064HFB	DC Motor Assembly, Sub
13	B661-MR064HFA	Take-Up Reel Spindle Assembly
14	B219-MR064HFB	Bracket Assembly, Lid Left
15	B219-MR064HFC	Bracket Assembly, Lid Right
16	B219-MR064HFD	Bracket Assembly, Lid Lock Lever
17	B672-MR064HFD	Lever Assembly, Eject
18	A614-MR064HFA	Lid Assembly
19	B219-MR064HFE	Bracket Assembly, Head Base
20	A514-CD401MA	Dressing Plate Assembly (Includes: Lamp)
22	2111-1357	Felt
23	2114-18	Bushing
24	2132-5092	Spacer
25	2135-5004	Brake Shoe
26	2142-5005	Guide
27	2142-5006	Guide
28	2142-5011	Guide
29	2142-5013	Guide
30	2218-7001	Holding Bracket
31	2218-5017	Holding Bracket
32	2219-5614	Bracket
33	2240-5090	Holder
34	2251-5046	Bracket, Motor
35	2363-55150	Boss
36	2614-5030	Pinch Roller
37	2617-5163	Flywheel
38	2622-5036	Gear
39	2642-02418	Belt, Main
40	2642-02415	Belt, Sub
41	2651-1103452	Spring
42	2651-1103453	Spring
43	2651-1103411	Spring
44	2651-2101413	Spring
45	2651-210164	Spring
46	2651-1103455	Spring
47	2651-1103454	Spring
48	2651-222010	Spring
49	2651-5169	Spring
50	2652-5165	Leaf Spring
51	2652-5163	Leaf Spring
52	2661-415032	Supply Reel Spindle
53	2662-5020	Clutch
54	2672-5305	Lever
55	2672-5350	Lever
56	2672-5352	Lever
57	2674-5271	Slider
58	2677-5007	Brake
59	2711-002021	Steel Ball
60	2712-5020	Bearing

Ref. No.	Part No.	Description
61	2712-5026	Bearing
62	2310-5009	Special Screw (—)
63	2310-5017	Special Screw (—)
65	2310-5019	Special Screw (—)
66	2410-5017	Special Washer
67	2410-5018	Special Washer
68	2410-5019	Special Washer
69	2425-3016722	Spring Pin
72	4333-40216	DC Solenoid, Play
73	4333-40514	DC Solenoid, Brake
74	5873-1217	Erase Head
75	5874-1322	Record/Playback Head
76	2111-11464	Felt
77	2114-415090	Bushing
78	2219-5648	Bracket
79	2219-5672	Bracket
80	2240-5139	Holder
81	2240-5140	Holder
82	2440-5004	Special Nut
83	2219-7802	Bracket
84	2651-1101409	Spring
85	2651-5147	Spring
86	2651-5155	Spring
87	2651-5157	Spring
88	2651-2101411	Spring
89	2651-1101405	Spring
90	2672-5311	Lever
91	2672-5312	Lever
92	2673-5028	Link
93	2674-5190	Slider
94	2692-3	Damper
95	1514-05601	Plate
96	2219-7667	Bracket
97	2219-7704	Bracket
98	2362-961409	Boss
99	2222-7133	Heat Sink
100	2219-7662	Bracket

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
CHASSIS MISCELLANEOUS		
P1	4161-0487	AC Line Cord
T1	5584-701369	Power Transformer
PL2	5731-1407123	Lamp, Cassette Illumination
CO1	4443-712	Connector, AC Line Cord
D904	5623-LT1043	LED Display, Peak Level Meter
SW901, 904	4431-01027195	Push Switch, Electronic Auto Search, Rec. Mute
SW902	4431-01027269	Push Switch, Reset
SW903	4431-01027169	Push Switch, Memory
J101	4163-74853	Connector with Lead Wire, 2-Pin
J171	4163-73853	Connector with Lead Wire, 3-Pin
J181	4163-74953	Connector with Lead Wire, 3-Pin
J182	4163-73753	Connector with Lead Wire, 3-Pin
J201	4163-74453	Connector with Lead Wire, 3-Pin
J202	4163-70353	Connector with Lead Wire, 3-Pin
J251	4163-73453	Connector with Lead Wire, 3-Pin
J301, 473	4163-73553	Connector with Lead Wire, 3-Pin
J401	4163-74653	Connector with Lead Wire, 3-Pin
J441	4163-74753	Connector with Lead Wire, 4-Pin
J471	4163-71053	Connector with Lead Wire, 2-Pin
J472	4163-74253	Connector with Lead Wire, 6-Pin
J551	4163-74553	Connector with Lead Wire, 3-Pin
J552	4163-74353	Connector with Lead Wire, 3-Pin
J601	4163-71853	Connector with Lead Wire, 3-Pin
J701	4163-042501	Connector with Lead Wire, 4-Pin
J751	4163-101301	Connector with Lead Wire, 10-Pin
J801	4163-73953	Connector with Lead Wire, 6-Pin
J802	4163-74053	Connector with Lead Wire, 7-Pin
J803	4163-062501	Connector with Lead Wire, 6-Pin
J804	4163-70353	Connector with Lead Wire, 3-Pin
J805	4163-080901	Connector with Lead Wire, 8-Pin
J806	4163-70453	Connector with Lead Wire, 2-Pin
J807	4163-70553	Connector with Lead Wire, 2-Pin
J808	4163-70453	Connector with Lead Wire, 2-Pin
J809	4163-70181	Connector with Lead Wire, 9-Pin
J901	4163-71653	Connector with Lead Wire, 4-Pin
J902, 903	4163-111301	Connector with Lead Wire, 11-Pin
J904	4163-70665	Connector with Lead Wire, 7-Pin
JM301	4242-030012	Jumper Lead, 3-Wire
JM401	4242-032002	Jumper Lead, 3-Wire
JM801	4242-082702	Jumper Lead, 8-Wire
LUG1	4211-4	Lug Terminal

PCB-1 MAIN P.C. BOARD

RESISTORS		
R14	5102-4R75713	4.7 Ω , $\pm$ 5%, 1/4W, Fuse
R235, 236	5102-2714715	270 Ω , $\pm$ 2%, 1/4W, Fuse
R256	5102-4R75715	4.7 Ω , $\pm$ 5%, 1/4W, Fuse
R441	5102-2204713	22 Ω , $\pm$ 2%, 1/4W, Fuse
R442	5102-8204713	82 Ω , $\pm$ 2%, 1/4W, Fuse
R507, 508	5174-162381	1.6k Ω , $\pm$ 1%, 1/4W, Metal
R511, 512, 547, 548, 601, 602, 641, 642	5174-133381	10k Ω , $\pm$ 2%, 1/4W, Fuse
R533, 534, 661, 662	5174-112381	1.1k Ω , $\pm$ 1%, 1/4W, Metal
R555, 556, 607, 608	5174-512381	5.1k Ω , $\pm$ 1%, 1/4W, Metal
R739, 740	5102-1004715	10 k Ω , $\pm$ 2%, 1/4W, Fuse
CONTROLS		
VR101, 102	5101-2238575	22k Ω B
VR103, 104	5101-10271920	1k Ω B
VR203, 204, 205, 206, 207, 208, 209, 210, 503, 504, 505, 506, 573, 574, 575, 576	5101-10371920	10k Ω B
VR251, 252, 253	5101-20371920	20k Ω B
VR501, 502, 571, 572	5101-20271913	2k Ω B

Ref. No.	Part No.	Description
VR673, 674	5101-5037189	50kΩB
CAPACITORS		
C4, 5	5345-228D041	2200μF, ±20%, 25V, Electrolytic
C6, 7, 10, 555, 556, 721, 722, 637, 638, 753	5345-226C041	22μF, ±20%, 16V, Electrolytic
C8, 9	5345-108C041	1000μF, ±20%, 16V, Electrolytic
C51	5345-475-50	4.7μF, +75% -10%, 50V, Electrolytic
C52	5345-226D0211	22μF, ±20%, 25V, Electrolytic
C53	5345-227D041	220μF, ±20%, 25V, Electrolytic
C54, 503, 504, 571, 572, 581, 582	5345-227C041	220μF, ±20%, 16V, Electrolytic
C117, 118, 119, 120, 207 208, 215, 216, 233, 234, 551, 552, 579, 580, 589, 590, 635, 636	5345-106C0951	10μF, ±20%, 16V, Electrolytic
C125, 209, 210, 251	5345-476C041	47μF, ±20%, 16V, Electrolytic
C213, 214	5352-684571	0.68μF, ±5%, 63V, Metal
C219, 220	5345-107C041	100μF, ±20%, 16V, Electrolytic
C501, 502, 573, 574, 513, 514, 531, 532, 535, 536, 595, 596, 599, 600, 619, 620	5345-105F0951	1μF, ±20%, 50V, Electrolytic
C519, 520, 525, 526, 539, 540, 549, 550, 575, 576, 603, 604, 613, 614, 627, 628, 633, 634, 702, 959	5345-106-16	10μF, +50% -10%, 16V, Electrolytic
C505, 506, 583, 584	5345-477C041	470μF, ±20%, 16V, Electrolytic
C553, 554	5345-476B041	47μF, ±20%, 10V, Electrolytic
C509, 510, 515, 516, 527, 528, 533, 534, 591, 592, 597, 598, 615, 616, 621, 622	5359-153771	0.015μF, ±2%, 50V, Polypropylene
C751	5345-225-50	2.2μF, +75% -10%, 50V, Electrolytic
C752	5345-104F0211	0.1μF, ±20%, 50V, Electrolytic
C953	5345-104F0212	0.1μF, ±20%, 50V, Electrolytic
C958	5345-224F0212	0.22μF, ±20%, 50V, Electrolytic
C960	5345-105-50	1μF, +75% -10%, 50V, Electrolytic
INTEGRATED CIRCUIT		
IC201	5652-μPC4558C	μPC4558C
IC501, 502, 503, 504	5652-HA11226	HA11226
IC951	5652-BA335	BA335
TRANSISTORS		
Q1	5612-855(C)	2SB855(C)
Q2, 675, 676	5613-2603(F)	2SC2603(F)
Q3,	5611-1115(F)	2SA1115(F)
Q4	5613-1419(C)	2SC1419(C)
Q5	5613-2236(Y)	2SD2236(Y)
Q51, 52, 503, 504, 575, 576, 591, 592, 703, 751	5611-1115(F) or (E)	2SA1115(F) or 2SA1115(E)
Q53, 252, 501, 502, 505 506, 507, 508, 509, 510, 511, 512, 513, 514, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 701, 752, 753, 754, 759, 760, 951	5613-2603(F) or (E)	2SC2603(F) or 2SC2603(E)
Q111, 112, 573, 574	5613-2320L(F)	2SC2320L(F)
Q251	5614-667(C)	2SD667(C)
Q571, 572	5611-999L(F)	2SA999L(F)
Q673, 674	5616-2SK163(M)	2SK163(M)
Q702	5612-647(C)	2SB647(C)
Q755, 756	5613-2878(B)	2SC2878(B)
DIODES		
D1	5685-1F	Bridge Silicon, S1WB10

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Ref. No.	Part No.	Description
D2, 5, 51, 52, 53, 54, 55, 56, 57, 251, 252, 253, 254, 503, 504 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 573, 574, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 591, 675, 701, 751, 756, 757, 758, 951, 952, 953	5631-1S2473	1S2473
D3, 4	5635-RD9R1EB2	Zener, RD9.1EB2
D501, 502, 505, 506, 519, 520, 571, 572, 575, 576, 589, 590	5631-1K34A	1K34A
COILS		
L101, 102	5933-70314	27mH
L103, 104	5933-70416	4.7mH
L201, 202	5933-70116	3.3mH
L252	5995-101325	100μH
L571, 572	5995-363156	36mH
LC201, 202	5932-70116	
LC203, 204	5932-70115	
LC571, 572	5214-28	
MISCELLANEOUS		
OS101	6171-0406	Complex, Osc.
SW251, 252, 253, 254	4431-04167957	Push Switch, Bias Selectors (LN, FeCr, CrO ₂ , Metal)
SW501, 502, 503, 504	4431-04087657	Push Switch, Dolby NR, NR Type, HX-PRO, MPX Filter
P201, 202, 551, 552, 601	4443-030158	Connector, 3 Pin
P701	4443-040177	Connector, 4 Pin
P751	4443-100177	Connector, 10 Pin
JM201	4242-030802	Jumper Lead, 3-Wire
	2132-5049	Spacer
PCB-2 MIC. AND LINE AMP. P.C. BOARD		
RESISTORS		
R169, 170	5102-1014715	100Ω, ±2%, 1/4W, Fuse
R435, 436	5102-1214715	120Ω, ±2%, 1/4W, Fuse
CONTROLS		
VR151, 152	5113-5037182	50kΩA, Microphones Level
VR155, 156	5113-50374122	50kΩB, Fader Control
VR254	5113-2027821	2kΩB, Bias Fine Trim
VR301, 302	5113-5027F40	5kΩA, Output Level
VR401, 402	5101-50371920	50kΩB
CAPACITORS		
C151, 152	5345-106C0212	10μF, ±20%, 16V, Electrolytic
C155, 156	5345-107B041	100μF, ±20%, 10V, Electrolytic
C159, 160	5345-105F0212	1μF, ±20%, 50V, Electrolytic
C161, 162	5345-476C041	47μF, ±20%, 16V, Electrolytic
C307, 308	5342-226C0951	22μF, ±20%, 16V, Electrolytic
C361, 409, 410	5345-226C041	22μF, ±20%, 16V, Electrolytic
C401, 402	5345-105-50	1μF, +75% -10%, 50V, Electrolytic
C403, 404	5345-475-25	4.7μF, +75% -10%, 25V, Electrolytic
C407, 408	5345-225F0211	4.7μF, +75% -10%, 25V, Electrolytic
C421, 422	5345-224F0212	0.22μF, ±20%, 50V, Electrolytic

Ref. No.	Part No.	Description
C423, 424	5345-106-16	10 μ F, +50% -10%, 16V, Electrolytic
INTEGRATED CIRCUITS		
IC401, 421	5652-LA6458	LA6458
TRANSISTORS		
Q151, 152	5613-2320L(F)	2SC2320L(F)
Q153, 154	5611-999L(F)	2SA999L(F)
Q301, 302	5616-170 (GR)	F.E.T., 2SK170(GR)
Q303, 304	5615-74(GR)	F.E.T., 2SJ74(GR)
Q305, 306	5611-984(F)	2SA984(F)
Q307, 308	5613-2274(F)	2SC2274(F)
Q309, 310	5613-2603(F) or (E)	2SC2603(F) or 2SC2603(E)
Q351	5613-2603(F)	2SC2603(F)
Q421, 422, 423, 424	5613-2320(D) or (E)	2SC2320(D) or 2SC2320(E)
Q757, 758	5613-2878(B)	2SC2878(B)
DIODES		
D401, 402	5631-1K34A	1K34A
D421, 422, 753, 754	5631-1S2473	1S2473
COILS		
L301, 302	5995-363156	36mH
MISCELLANEOUS		
J151, 152	4451-00106	Jack, Microphones
P251, 301	4443-030158	Connector, 3-Pin
PCB-3 LOGIC CONTROL P.C. BOARD		
RESISTORS		
R816, 859	5102-1004713	10 Ω , $\pm$ 2%, 1/4W, Fuse
R860	5102-1004715	10 Ω , $\pm$ 2%, 1/4W, Fuse
CONTROL		
VR851	5101-50171920	500 Ω
CAPACITORS		
C808	5345-684F0212	0.68 μ F, $\pm$ 20%, 50V, Electrolytic
C809	5345-106-16	10 μ F, +50% -10%, 16V, Electrolytic
C811	5345-476C0212	47 μ F, $\pm$ 20%, 16V, Electrolytic
C812	5345-107C041	100 μ F, $\pm$ 20%, 16V, Electrolytic
C813, 815	5345-226-16	22 μ F, +50% -10%, 16V, Electrolytic
C817	5342-226C0951	22 μ F, $\pm$ 20%, 16V, Electrolytic
C818	5345-474-50	0.47 μ F, +75% -10%, 50V, Electrolytic
C831, 887	5345-335-25	3.3 μ F, +75% -10%, 25V, Electrolytic
INTEGRATED CIRCUITS		
IC801	5654-TC9121P	TC9121P
IC802	5654- μ PD4023C	μ PD4023C
IC803, 806	5654- μ PD4001C	μ PD4001C
IC804	5654- μ PD4011C	μ PD4011C
IC805	5654- μ PD4516C	μ PD4516C
IC851	5653-BA6109	BA6109
TRANSISTORS		
Q801, 856, 859	5613-2236(Y)	2SC2236(Y)
Q803, 805, 808, 855, 858	5611-1115(E) or (F)	2SA1115(E) or 2SA1115(F)
Q804, 806, 807, 852, 853, 854, 857	5613-2603(E) or (F)	2SC2603(E) or 2SC2603(F)

Ref. No.	Part No.	Description
DIODES		
D801, 802, 803, 804, 805 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837	5631-1S2473	1S2473
D851, 852	5635-RD10EB2	Zener, RD10EB2
MISCELLANEOUS		
P801	4443-060158	Connector, 6-Pin
P802	4443-070158	Connector, 7-Pin
P803	4443-060177	Connector, 6-Pin
P804	4443-030158	Connector, 3-Pin
P805	4443-080177	Connector, 8-Pin
P806, 807, 808	4443-020158	Connector, 2-Pin
P809	4443-090177	Connector, 9-Pin
PCB-4 HX-PRO P.C. BOARD		
RESISTORS		
R687, 688	5102-1004715	10 Ω , $\pm$ 2%, 1/4W, Fuse
CONTROLS		
VR671, 672	5101-20371920	20k Ω B
CAPACITORS		
C685, 686	5345-476C041	47 μ F, +50% -10%, 16V, Electrolytic
INTEGRATED CIRCUITS		
IC671, 672	5652-HA17082PS	HA17082PS
IC673	5652-NJM4559D	NJM4559D
TRANSISTORS		
Q671, 672	5614-667(C)	2SD667(C)
DIODES		
D671, 672, 673, 674	5631-1S2473	1S2473
COILS		
L671, 672	5933-70123	
MISCELLANEOUS		
P651	4443-117167	Connector, 11-Pin
PCB-5 PLAYBACK EQUALIZER AMP. P.C. BOARD		
RESISTORS		
R111, 112, 117, 118	5174-562381	5.6k Ω , $\pm$ 1%, 1/4 W, Metal
R113, 114	5174-183381	18k Ω , $\pm$ 1%, 1/4W, Metal
CAPACITORS		
C103, 104	5345-226C0226	22 μ F, $\pm$ 20%, 16V, Electrolytic
C105, 106	5345-227A0951	220 μ F, $\pm$ 20%, 6.3V, Electrolytic
C107, 108, 109, 110	5359-222771	2200pF, $\pm$ 2%, 50V, Polypropylene
C111, 112	5345-106C0951	10 μ F, $\pm$ 20%, 16V, Electrolytic
C113, 114	5345-107C041	100 μ F, $\pm$ 20%, 16V, Electrolytic

Ref. No.	Part No.	Description
TRANSISTORS		
Q101, 102	5611-1190(E) or (D)	2SA1190(E) or 2SA1190(D)
Q103, 104	5613-2855(E) or (D)	2SC2855(E) or 2SC2855(D)
Q105, 106	5613-2320L(F)	2SC2320L(F)
Q107, 108	5611-999(F)	2SA999(F)
Q109, 110	5613-2603(F) or (E)	2SC2603(F) or 2SC2603(E)
DIODES		
D101, 102	5641-MV11	Varistor, MV11
MISCELLANEOUS		
P101	4443-067167	Connector, 6-Pin
PCB-6 BIAS AND RECORD CAL TONE P.C. BOARD		
RESISTORS		
R486, 487	5102-1014713	100 Ω , $\pm 2\%$, 1/4W, Fuse
CONTROLS		
VR471	5101-10271920	1k Ω B
VR472, 473	5101-50371920	50k Ω B
CAPACITORS		
C475, 476	5345-105-50	1 μ F, +75% -10%, 50V, Electrolytic
C477, 478	5345-226C041	22 μ F, $\pm 20\%$, 16V, Electrolytic
INTEGRATED CIRCUIT		
IC471	5652- μ PC4558C	μ PC4558C
DIODES		
D471, 472, 473, 474	5635-RD5R1EB2	Zener, RD5.1EB2
MISCELLANEOUS		
SW471, 472	4431-02127559	Push Switch, Rec. Cal Tone, Bias Tone
P471	4443-020158	Connector, 2-Pin
P472	4443-060158	Connector, 6-Pin
P473	4443-030171	Connector, 3-Pin
PCB-7 HEADPHONE JACK P.C. BOARD		
RESISTORS		
R363, 364	5102-1014715	100 Ω , $\pm 2\%$, 1/4W, Fuse
CAPACITORS		
C351, 352	5345-106-16	10 μ F, +50% -10%, 16V, Electrolytic
C355, 356	5345-474-50	0.47 μ F, +75% -10%, 50V, Electrolytic
C359, 360	5345-476C041	47 μ F, $\pm 20\%$, 16V, Electrolytic
INTEGRATED CIRCUIT		
IC351	5652-NJM4556D	NJM4556D
MISCELLANEOUS		
J351	4451-00107	Jack, Headphones
PCB-8 ELECTRONIC COUNTER P.C. BOARD		
CAPACITOR		
C902	5345-335F0212	3.3 μ F, $\pm 20\%$, 50V, Electrolytic
INTEGRATED CIRCUITS		
IC901	5654-TM3140B	TM3140B
IC902, 903, 904	5654-IR2403	IR2403

Ref. No.	Part No.	Description
Q901	TRANSISTOR 5613-2603(E) or (F)	2SC2603(E) or 2SC2603(F)
D901, 902	DIODES 5631-1S2473	1S2473
P901 P902, 903	MISCELLANEOUS 4443-040158 4443-110177	Connector, 4-Pin Connector, 11-Pin
PCB-9 INPUT AND OUTPUT JACKS P.C. BOARD		
J1, 2, 3, 4, 5, 6 P181, 182	4486-8 4443-030171	6-Pin Jack, Line Input (Low, High), Line Output Connector, 3-Pin
PCB-10 LINE INPUT LEVEL CONTROL P.C. BOARD		
VR153, 154	CONTROLS 5113-5037182	50k Ω A, Line Level
P171	MISCELLANEOUS 4443-030171	Connector, 3-Pin
PCB-11 KEY SWITCHES P.C. BOARD		
D841 D842, 843, 844 D845	DIODES 5637-TLR226 5637-TLG226 5637-TLY226	L.E.D., TLR226, Red, Record L.E.D., TLG226, Green, Rew., Play, F. FWD L.E.D., TLY226, Yellow, Pause
SW801, 802, 803, 804, 805, 806	MISCELLANEOUS 4431-01017193	Push Switch, Record, Rew., Play, F. FWD, Stop, Pause
PCB-12 TAPE MONITOR SWITCH P.C. BOARD		
SW401 PL3 P441	4431-01047894 5731-0607142 4443-040158	Push Switch, Tape Monitor Lamp, Green Connector, 4-Pin
PCB-13 TAPE SELECTORS P.C. BOARD		
SW101, 102, 103, 104 P101	4431-04087557 4443-020171	Push Switch, LN, FeCr, CrO ₂ , METAL Connector, 2-Pin
PCB-14 TIMER SWITCHES P.C. BOARD		
SW810, 811, 812	4431-03067550	Push Switch, Timer off/rec./play
PCB-15 METER BALLISTICS AND AUTO PLAY SWITCHES P.C. BOARD		
C405, 406	CAPACITORS 5345-225F0211	2.2 μ F, $\pm$ 20%, 50V, Electrolytic
SW807, 808, 809 P401	MISCELLANEOUS 4431-03068150 4443-030171	Push Switch, Meter ballistics, Auto Rewind/Replay Connector, 3-Pin
PCB-16 DOLBY NR AND HX-PRO INDICATORS P.C. BOARD		
D433 D434 D435	5637-GL9NG2 5637-GL9HY2 5637-GL9PR20	L.E.D., GL9NG2, Green, Dolby NR B L.E.D., GL9HY2, Yellow, Dolby NR C L.E.D., GL9PR20, Red, HX-PRO
PCB-17 REC. CAL P.C. BOARD		
VR201, 202	5101-1027274	Control, 1k Ω B, Record Cal.

Ref. No.	Part No.	Description
PCB-18 POWER SWITCH P.C. BOARD		
C1	5361-1030419	Capacitor, 0.01 μ F, +100% -0%, AC125V, Ceramic
SW1	4431-A01026	Push Switch, Power
PCB-19 LAMP P.C. BOARD		
PL1	5731-1507245	Lamp, Clear
PCB-20 E.A.S. INDICATOR P.C. BOARD		
D432	5637-TLG206	L.E.D., TLG206, Green, Electronic Auto Search
PCB-21 POWER INDICATOR P.C. BOARD		
D431	5637-GL9PR20	L.E.D., GL9PR20, Red, Power
PCB-22 COUNTER DISPLAY P.C. BOARD		
D903	5623-SL2495	LED Display, Counter
PCB-23 REMOTE CONTROL SOCKET P.C. BOARD		
SO2	4474-159	DIN Jack
PCB-24 TORQUE CONTROL P.C. BOARD		
Q891	5613-2320(E) or (F)	Transistor, 2SC2320(E) or 2SC2320(F)
PCB-25 MECH. TERMINAL P.C. BOARD		
CAPACITORS		
C951	5342-226C0951	22 μ F, $\pm$ 20%, 16V, Electrolytic
DIODES		
D981, 982	5632-1SR35-10	1SR35-100
MISCELLANEOUS		
SW981, 982	4463-48	Spring Switch, Erase Protect, Cassette Det.
PCB-26 ROTATION SENSOR P.C. BOARD		
PH981	5624-GP2S02(A) or (B)	Photo-Interrupter

PACKAGE

