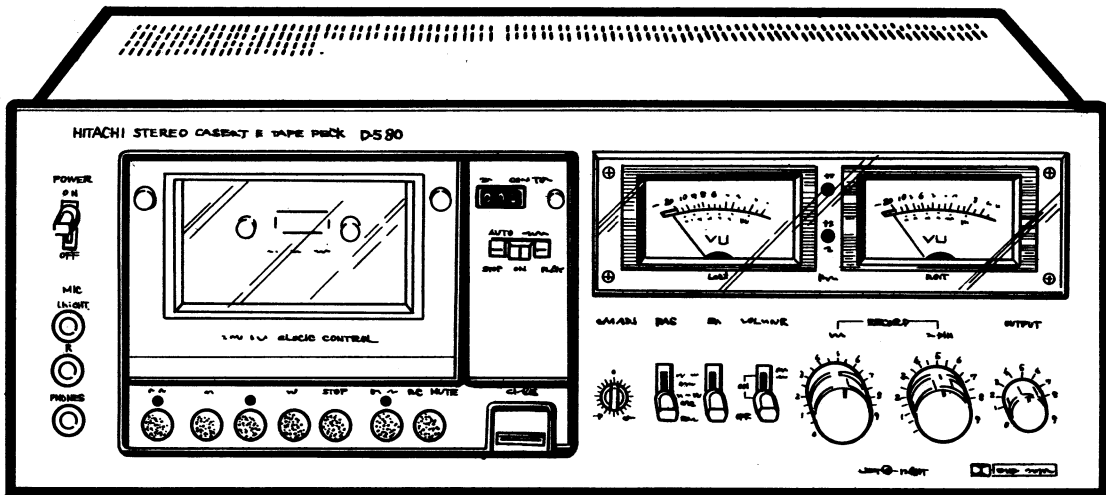




TECHNICAL INFORMATION

No. 1175



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STEREO CASSETTE TAPE DECK

Mar. 1979

DESCRIPTION OF NEW CIRCUIT

1. MODE CONTROL IC HA-12001

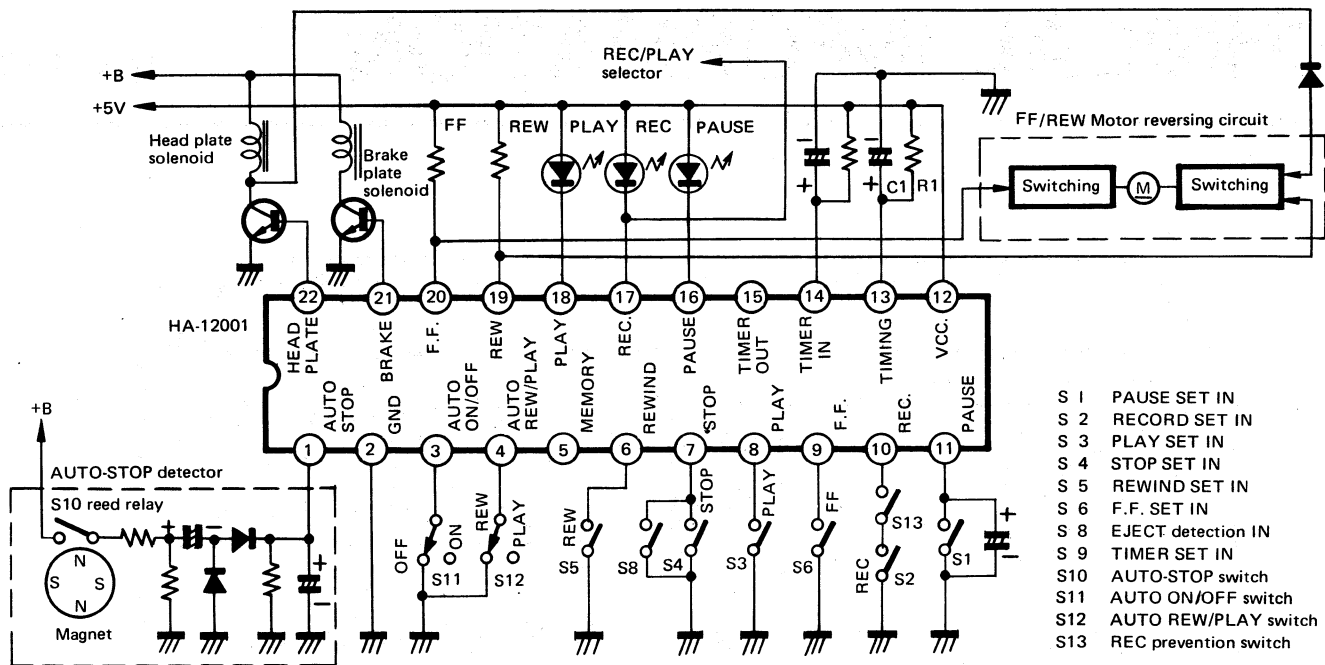


Fig. 1

This is an one-chip mode control IC developed for logic control cassette decks. Fig. 1 shows the peripheral circuit of this IC.

(1) AUTO-STOP DETECTION INPUT TERMINAL ①

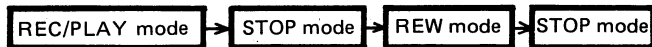
Terminal ① is the auto-stop detection signal input terminal. Rotation of the take-up reel disk is detected by the reed relay and the charging/discharging of C, R is performed by the ON/OFF operation of the reed relay. Terminal ① is kept at "High" level while the reel disc is rotating. The STOP mode is prevented by the IC's internal circuit in the PAUSE mode. When the tape is fully wound, the magnet stops rotating and the reed relay stops ON/OFF operation, so terminal ① is set to "Low" level.

(2) AUTO FUNCTION INPUT TERMINALS ③, ④

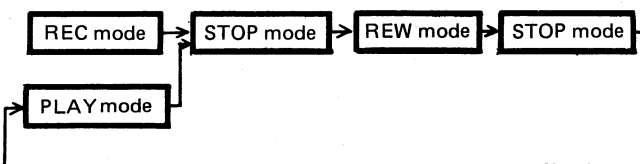
Terminals ③, ④ are the AUTO function input terminals. Set terminal ③ to "High" level to operate the AUTO function. Set terminal ④ to "Low" level to set to the AUTO-REWIND mode. Set terminal ④ to "High" level for set to the AUTO-REWIND PLAY mode.

The AUTO-REWIND mode is when the tape is fully wound during recording or playback, then the unit stops for approx. 0.5 to 1.0 sec. and rewinds automatically. After rewinding is complete, the unit enters the STOP mode. The AUTO-REWIND PLAY mode is when the tape is fully wound during playback or recording, the unit stops operation for approx. 0.5 to 1.0 sec. and then rewinds automatically. After rewinding is complete, the unit stops for approx. 0.5 to 1.0 sec., then enters the PLAY-BACK mode.

AUTO-REWIND MODE



AUTO-REWIND PLAY MODE



(When the tape is fully wound, the unit advances to the next mode after receiving the AUTO-STOP signal)

(3) MODE SELECTOR INPUT TERMINALS ⑥ to ⑪

Terminals ⑥ to ⑪ are input terminals for setting to the REW, STOP, PLAY, FF, REC and PAUSE modes. Set the designated terminal to "Low" level to enter the desired mode. The STOP mode is obtained by pressing the respective buttons simultaneously (excluding REC, PLAY). The PAUSE mode can be set from the REC or PLAY mode. Set any of the PLAY, FF, REW, STOP terminals to "Low" level to release the PAUSE mode. The electrolytic capacitor connected in parallel to PAUSE switch S1 functions to continue the PAUSE mode for several sec. (until the PLAY button is released) so that the PAUSE mode is not released prior to the PLAY button after both the PLAY button and PAUSE button have been pressed simultaneously. When S1 is turned ON, the electric charge

of this capacitor is discharged; next, when S1 is turned OFF, the voltage at terminal ⑪ is set to "Low" level until the charging of the capacitor is completed. The REC mode is held while terminal ⑩ is set to "Low" level (while the REC button is pressed) but when the REC button is released, the REC mode is not held. The REC mode can be held by setting terminal ⑧ to "Low" level while keeping terminal ⑩ at "Low" level. That is to say, press the REC button and PLAY button simultaneously or press the REC button before the PLAY button is pressed to set to the REC mode.

(4) MODE DELAY INPUT TERMINAL ⑬

Terminal ⑬ is the STOP time setting input terminal to delay the output for 0.5 to 1.0 sec. when shifting to another mode other than from the STOP mode. The moment the STOP mode is entered, the charging of C1 starts. Its charging time is determined by the time constant of C1, R1 connected to this terminal; it is set to 0.5 to 1.0 sec. in this unit.

(5) MODE OUTPUT TERMINALS ⑯ to ⑳

Terminals ⑯ to ⑳ are the output terminals for each mode. When the desired mode is entered, it is set to "Low" level. The lighting of LED diodes showing the respective modes and solenoid control are controlled from these terminals. With this unit, switching charges the polarity of the voltage applied to the motor during

the Fast-forward or Rewind mode.

Terminal ⑳ is the brake-operating solenoid output terminal. This terminal is set to "High" level in the FF or REW mode and "Low" level in other modes.

Terminal ㉑ is the output terminal for the head plate operating solenoid. This is set to "High" level in the PLAYBACK mode and "Low" level in the PAUSE mode.

Table 1 shows the output level at the respective terminals. Check output charges with the input terminals of each mode set to "Low" level to check this IC.

Mode	Output terminal level						
	16	17	18	19	20	21	22
STOP	1	1	1	1	1	0	0
PLAY	1	1	0	1	1	0	1
F. F.	1	1	1	1	0	1	0
REW	1	1	1	0	1	1	0
PAUSE	0	1	1	1	1	0	0
REC	1	0	1	1	1	0	0
PLAY/PAUSE	0	1	0	1	1	0	0
REC/PLAY	1	0	0	1	1	0	1
REC/PLAY/PAUSE	0	0	0	1	1	0	0

Table 1

- o Table 1 shows the output levels, when the input terminals for each mode are set to "Low" level.
- o 1 in the table shows "High" level, and 0, "Low" level.

2. MOTOR DRIVE CIRCUIT

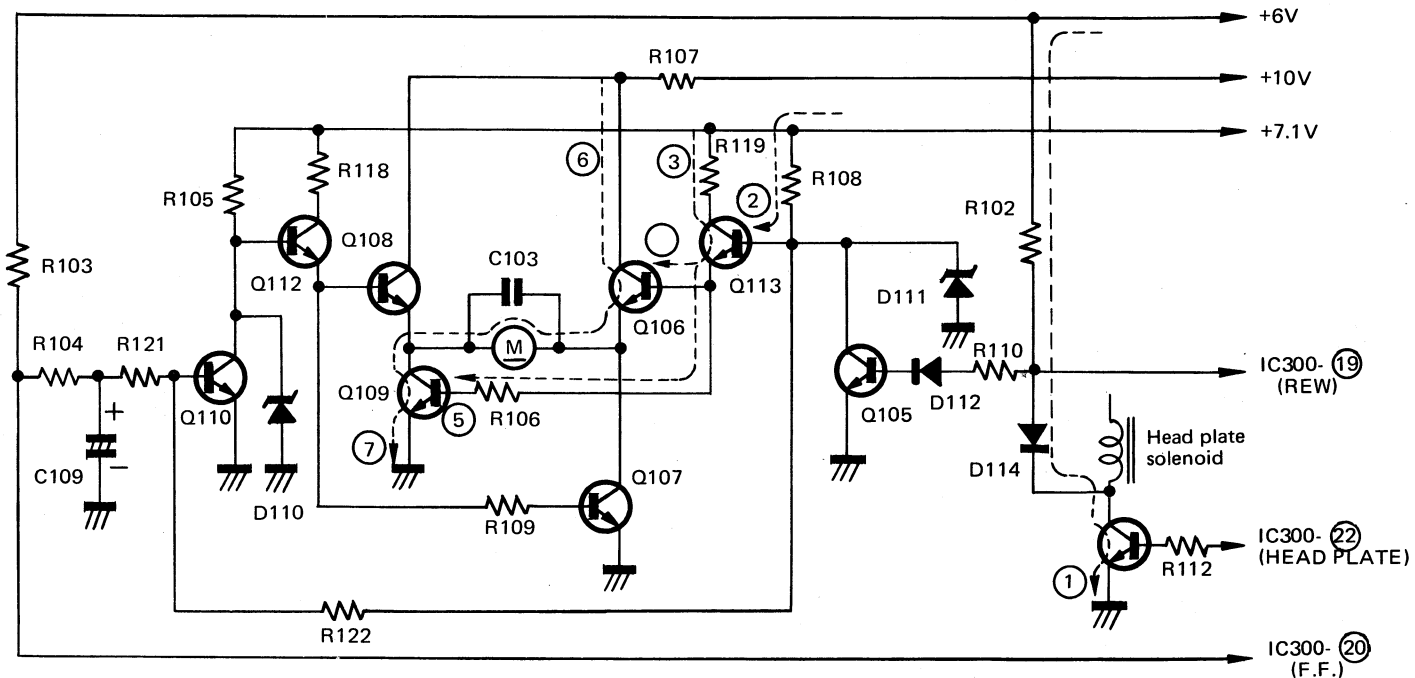


Fig. 2

This unit uses 2 DC motors a capstan drive motor (DC servo) and DC reel disc drive motor (with mechanical governor). The capstan drive motor rotates instantaneously when power is applied. The reel disc drive motor rotates when the polarity of the voltage applied to the motor is changed over by the mode control IC and power is applied. Accordingly, the direction of rotation of the motor during FF, and during REW and take-up are reversed.

(Note: The motor rotates in the same direction during PLAYBACK and REWIND because of its design. Refer to the service manual for UD[®] Type Chassis No. 1139 for details).

Fig. 2 shows the switching circuit for the reel disc drive motor. Q108 is the switching transistor supplying +B power to the motor during FF and Q106, during REW and take-up (REC/PB/FF). Q107 is the switching transistor grounding the motor during FF and Q109, during REW and take-up (REC/PB/FF). These transistors are OFF in the STOP mode. They are controlled by Q110, Q112 and the mode control IC during FF and by Q105, Q113 and the mode control IC during REW and take-up (REC/PB/FF). D110 and D111 make the bias current

flowing to the bases of Q112 and Q113 constant, regardless of power fluctuations, to limit the current applied to the reel disc drive motor.

In the take-up (REC/PB/FF) mode, terminal 22 of IC300 is set to "High" level, Q103 turns ON and the head plate solenoid operates when the PLAYBACK button is pressed. At the same time, since the collector of Q103 is set to "Low" level, the base bias of Q105 is grounded via D114 and cut off. (Dotted line 1). When Q105 is turned OFF, Q113 is biased by R108 (Dotted line 2) and turned ON. When Q113 is turned ON, Q106 and Q109 turn ON (Dotted lines 3, 4, 5), and the current flows to the motor as in the direction shown with dotted lines 6, 7 and the motor starts rotating.

Since terminal 19 of IC300 is set to "Low" level during REW, the base bias of Q105 is grounded and cut off, and Q113, Q106, Q109 operate in the same way as in the take-up mode.

Since terminal 20 of IC300 is set to "Low" level during FF, Q110 turns OFF, Q112, Q118, Q107 turn ON with the same operational principle as in the REW mode, and the current flows in the reverse direction to that during REW.

3. REC/PLAY AMP CHANGE-OVER IC (HA12005, HA12006)

Conventionally, a solenoid was excited to change over the slide switch changing over between REC and PLAY, but in this unit newly developed ICs (HA12005, HA12006) are used to change over between REC and PLAY elec-

tronically.

REC/PLAY change-over with this IC has the following facilities.

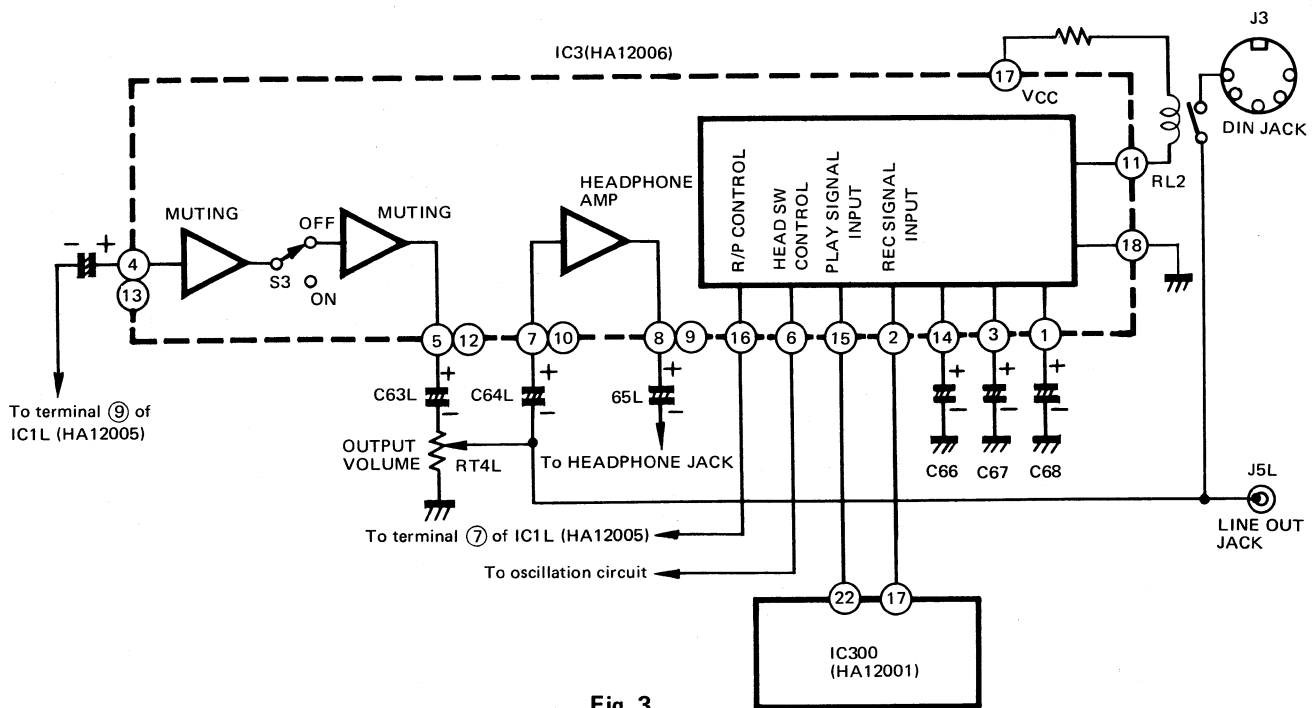


Fig. 3

- (1) Changing over the muting circuit
- (2) Changing over the PLAY amp/REC amp
- (3) Changing over the REC/PLAY head
- (4) Controlling the bias oscillation circuit

The above items are described simply in the following.

(1) CHANGING OVER THE MUTING CIRCUIT

ON/OFF change-over of the muting circuit is performed by IC3 (HA12006). The peripheral circuit of this IC (HA12006) is shown in Fig. 3.

The operation of each terminal of IC3 (HA12006) is shown in Table 2.

Terminal No.	Description
①	Delay input terminal which delays the output by means of C68 when shifting between REC and STOP modes.
②	Input terminal during REC mode ("Low" level in REC mode and "High" level in PLAY mode)
③	Delay input terminal which delays the output by means of C67 when shifting between PLAY and STOP modes.
④ ⑬	Muting amp input terminals (these mute noise generated when changing over between REC/PLAY and signal in the STOP/FF/REW modes)
⑤ ⑫	Muting amp output terminals (these mute noise generated when changing over between REC/PLAY and signal in the STOP/FF/REW modes)
⑥	Output terminal of the head change-over switch ("High" level in REC mode, and "Low" level in PLAY mode)
⑦ ⑩	Headphone amp input terminals
⑧ ⑨	Headphone amp output terminals
⑪	DIN mute output terminal
⑭	Reference voltage
⑮	Input terminal during PLAY mode ("High" level in PLAY mode, "Low" level in REC mode)
⑯	Output terminal during REC/PLAY ("Low" level in PLAY mode, "High" level in REC mode)
⑰	Vcc
⑱	GND

Table 2

IC3 (HA12006) consists of a muting circuit (gain = 0), headphone amp and REC/PLAY control circuit; this receives the head plate control signal output from terminal ⑫ of IC300 and the recording signal output from terminal ⑰ of IC300, and controls the muting amp using an internal logic circuit and performs REC/PLAY change-over control simultaneously. When the unit enters

the REC mode, terminals ⑩, ⑰ of IC300 are set to "Low" level to light up the "REC" indicator. When terminal ⑰ of IC300 is set to "Low" level, terminal ② of IC3 is set to "Low" level and terminals ⑥, ⑯ of IC3, to "High" level. When terminal ⑥ of IC3 is set to "High" level, the bias oscillation circuit starts oscillation. When terminal ⑯ of IC3 is set to "High" level, terminal ⑦ of IC1 is set to "High" level.

Next, when the unit is set to the PLAY mode, terminals ⑧, ⑱ of IC300 are set to "Low" level to light up the "PLAY" indicator. At the same time, terminal ⑫ of IC300 is set to "High" level and terminal ⑮ of IC3 to "High" level. When terminal ⑮ of IC3 is set to "High" level, terminal ⑯ of IC3 and terminal ⑦ of IC1 are set to "Low" level. Only when the REC signal or PLAY signal is input to terminals ④, ⑬ of IC3, equivalent switch S3 is turned OFF (ON except during REC/PLAY modes), and an output can be obtained from terminals ⑤, ⑫ of IC3.

The muting circuit interlocks with the operation button and operates as shown in the timing charts in Fig. 4 to 6.

a) When changed over as shown below.

STOP → REC → REC/PLAY → STOP mode ("0" in the figures shows "Low" level, and "1", "High" level.)

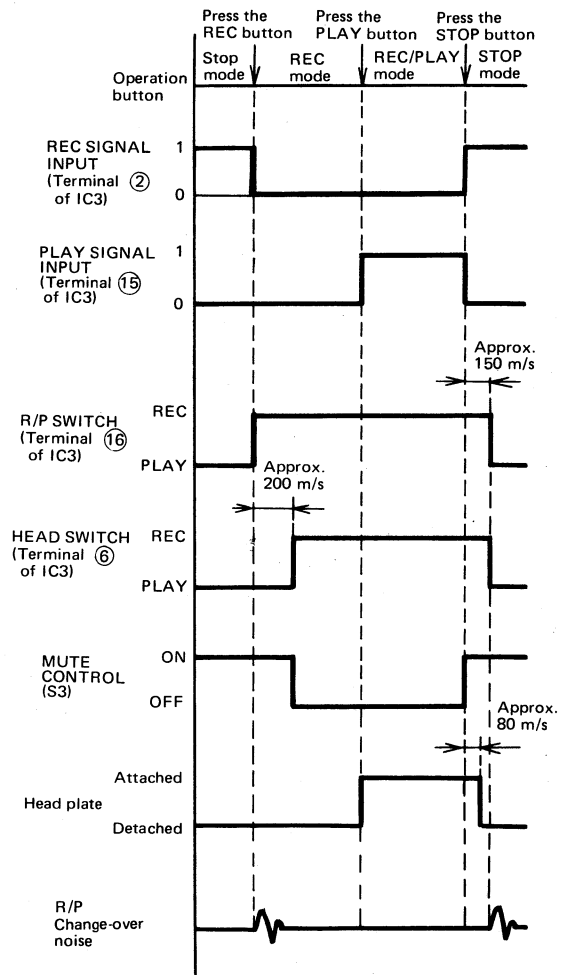


Fig. 4

b) When changed over from PLAY → REC mode.

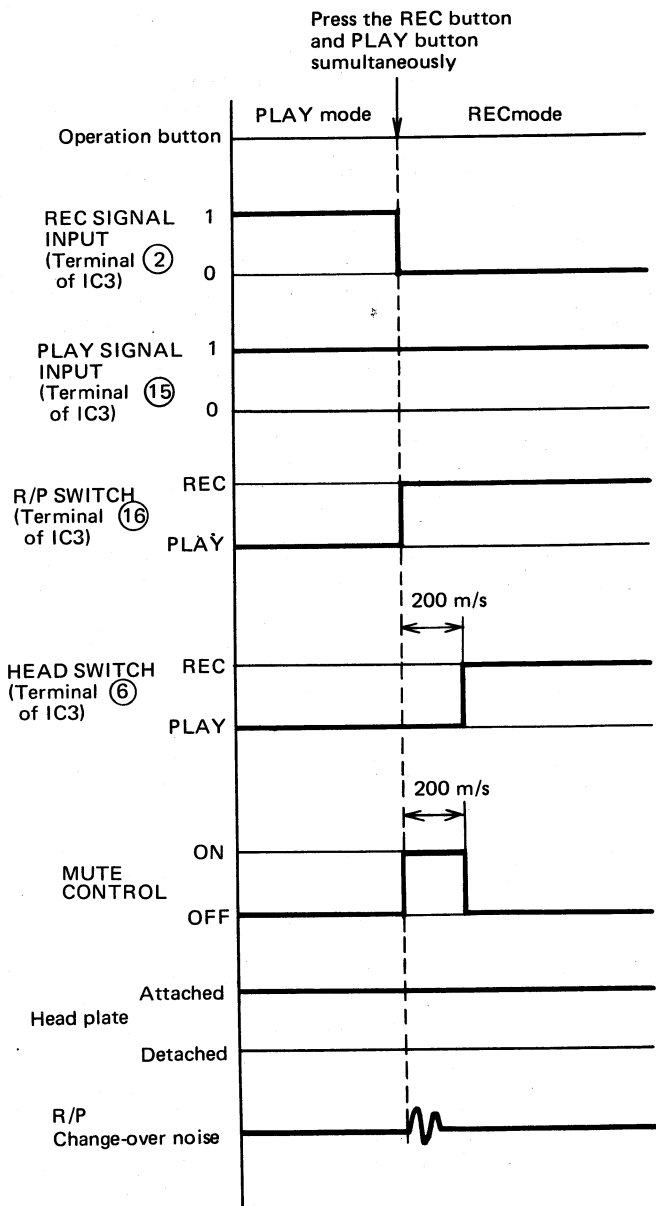


Fig. 5

c) When changed over as shown below.
STOP → PLAY → STOP mode

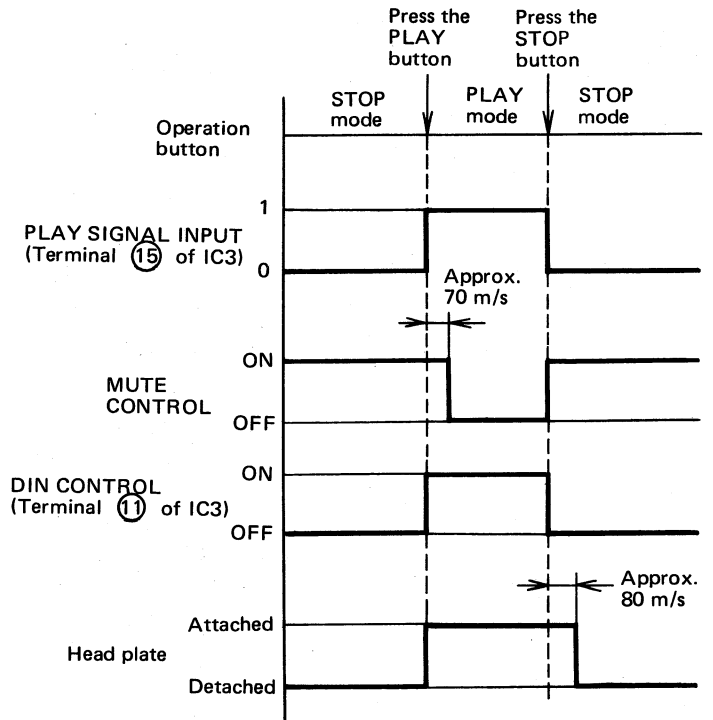


Fig. 6

(2) CHANGE-OVER OF PLAY AMP/REC AMP

Changing over the PLAY amp and REC amp is performed by IC (HA12005). Fig. 7 shows the peripheral circuit of IC (HA12005).

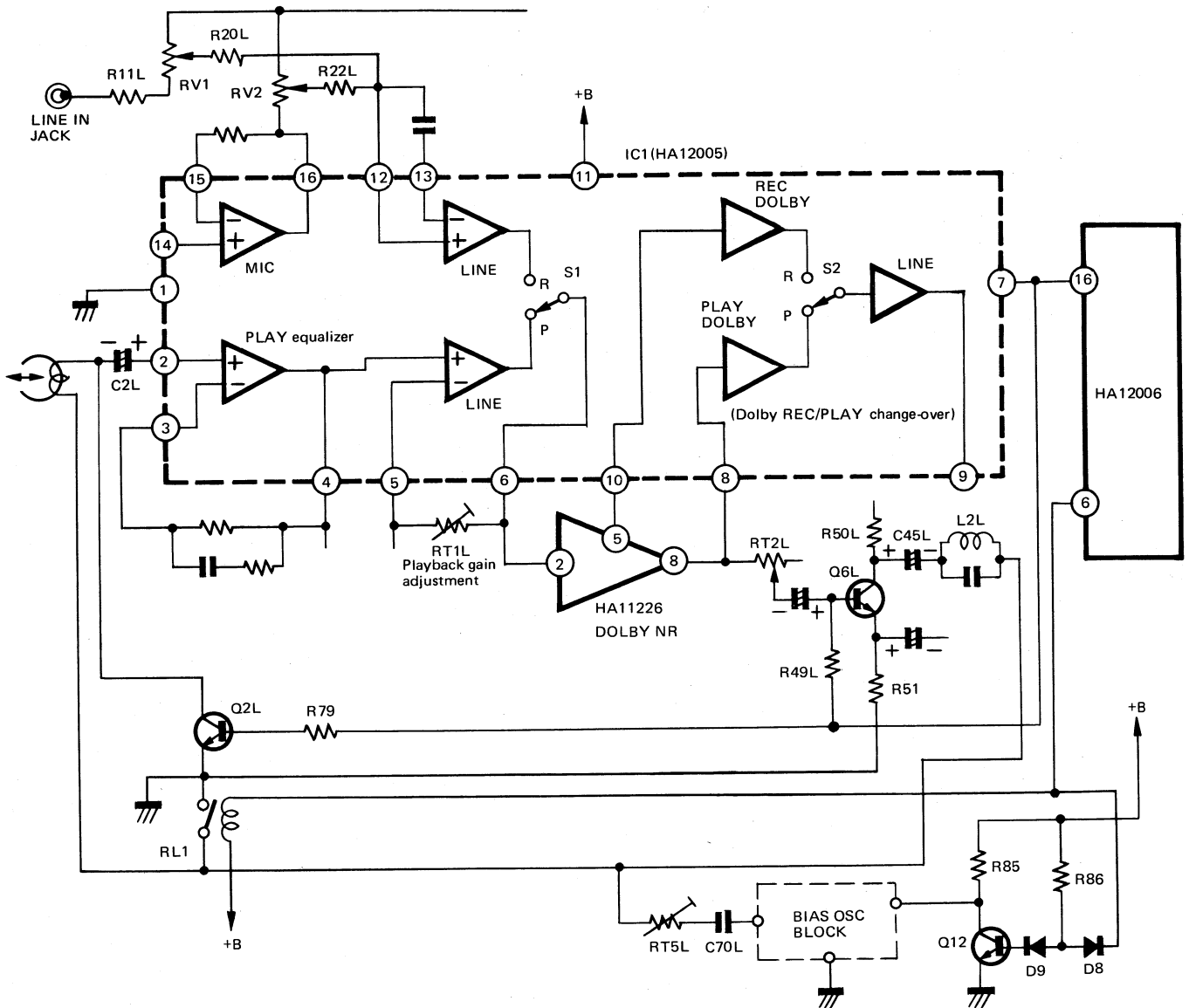


Fig. 7

Equivalent switch S1 which changes over the MIC amp and PLAY amp and equivalent switch S2 (gain = 0) which changes over the Dolby REC/PLAY amps are included in this IC (HA12005) and all internal amps are of OP amps.

REC/PLAY change-over in IC1 (HA12005) depends on whether terminal ⑦ of IC1 is set to "High" level or "Low" level. When terminal ⑦ of IC1 is set to "High" level, the unit enters the REC mode and when it is "Low" level, to the PLAY mode.

When the unit is set to the REC mode, terminal ⑯ of IC3 is set to "High" level and terminal ⑦ of IC1, to "High" level, so the equivalent switches are set to the REC side. When terminal ⑦ of IC1 is set to "High" level, base current flows to Q6L via R49L, Q6L is turned ON and the REC equalizer amp operates.

Next, when the unit is set to the PLAY mode, terminal ⑯ of IC3 is set to "Low" level and terminal ⑦ of IC1, to "Low" level, so the equivalent switches are set to the PLAY side.

When terminal ⑦ of IC1 is set to "Low" level, Q6L base is grounded, Q6L is turned OFF and the REC equalizer amp does not operate.

(3) CHANGE-OVER OF REC/PLAY HEAD

When the unit is set to the REC mode, terminal ⑦ of IC1 is set to "High" level and Q2L is turned ON. At the same time, terminal ⑥ of IC3 is set to "High" level to turn reed relay (RL1) OFF and the equivalent circuit

shown in Fig. 8 is obtained.

When the unit is set to the PLAY mode, terminal ⑦ of IC1 is set to "Low" level and Q2L is turned OFF. At the same time, terminal ⑥ of IC3 is set to "Low" level to turn reed relay (RL1) ON and the equivalent circuit shown in Fig. 9 is obtained.

The polarity of the head during playback and recording are reversed as shown in Fig. 8 and Fig. 9.

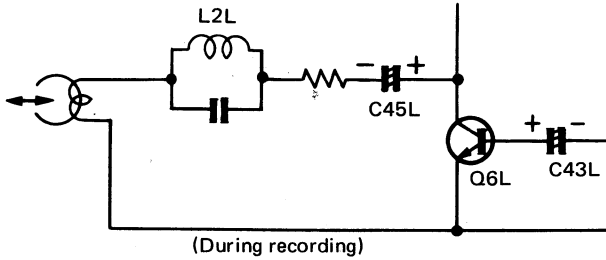


Fig. 8

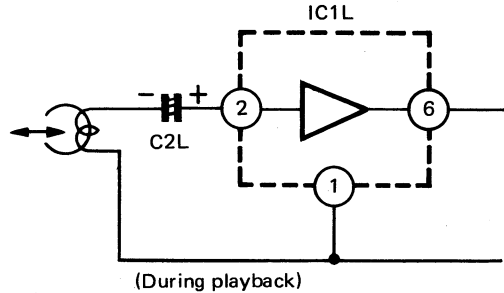


Fig. 9

(4) BIAS OSCILLATION CONTROL CIRCUIT

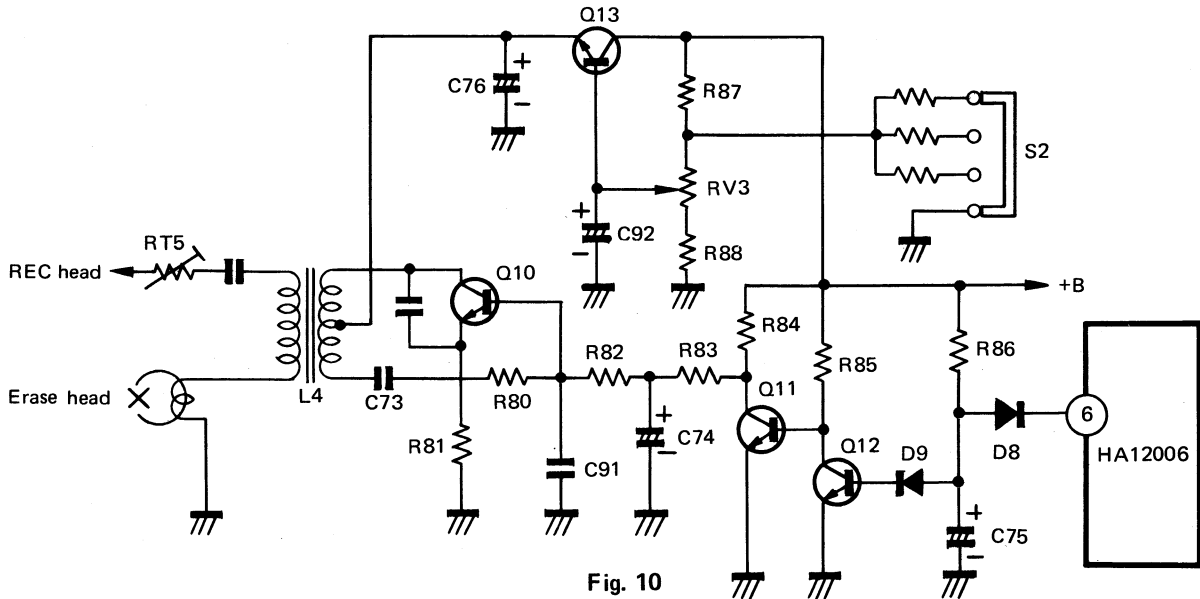


Fig. 10

Several different types of the tape have been recently come on the market and the matching of the deck and tape has become important.

Even with the same type of the tape; material, quantity of the magnetic material and the magnet pattern and finish, etc. differ, so sensitivity of the tape and frequency response also vary. With even the tape of the same type made by the same manufacturer, there is a certain difference in frequency response.

These differences are greater with tape from different manufacturers.

Conventionally, 2 or 3 stage bias, 1 equalizer change-over was provided to match the type of tape used. A single position for one type of tape, however, cannot compensate for differences in the characteristics of the

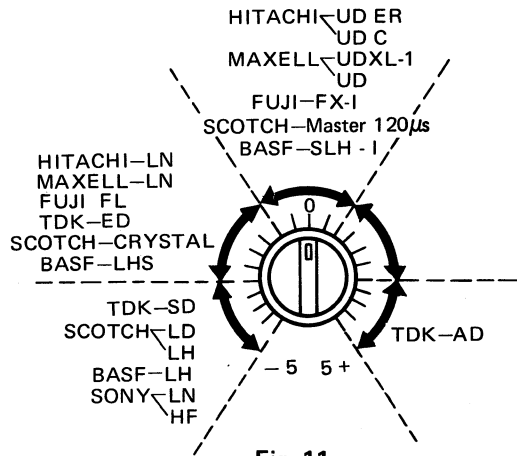


Fig. 11

tape because of the many types of tape. Especially, differences in the tape's frequency response at high frequencies. A bias current fine control function is provided in this unit to compensate the differences of various types of tape. It is adjusted so that optimum performance can be obtained with HITACHI UD-ER tape (tape selector switch set to UD-ER (Nor) position) at the center click position of the bias fine control knob. Perform bias fine control referring to Fig. 11 when using other tapes. This bias fine control can be varied in the UD-EX (CrO₂) and at FeCr positions, but difference of optimum bias of these tapes does not vary so much, so use these tapes setting the control to the center click point.

For setting bias fine control with tapes other than those shown in Fig. 11, the following is a simple method:

Receive FM inter-station noise and record it at approx. -20dB recording level and playback the recorded tape. Adjust tone quality of the source monitor sound and the tape

monitor sound are approximately the same and the REC/PLAY output levels are the same. Slightly adjust to the (+) side when the tape REC/PLAY tone quality is harsh, and to the (-) side when it is soft.

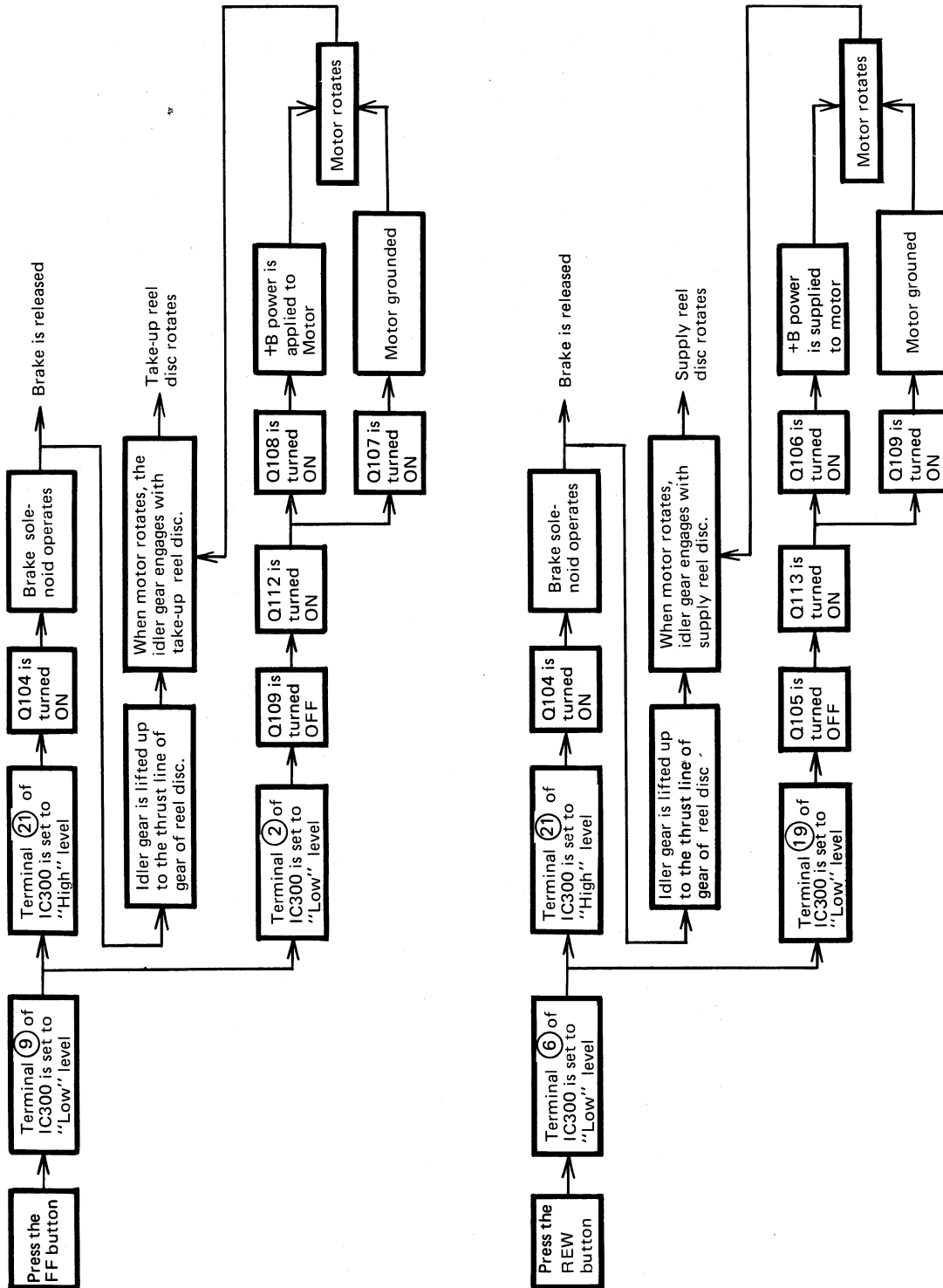
Fig. 10 shows the bias oscillation circuit of this unit. When the unit is set to the REC mode, terminal ⑥ of IC3 is set to "High" level, base current flows to Q12 and Q12 turns ON. As a result, the base potential of Q11 drops and Q11 turns OFF. When Q11 turns OFF, base current is applied to Q10 via R84, R83, R82, DC bias is applied to Q10 and the bias oscillation circuit starts oscillation. Q13 is the transistor which performs the current control in the bias oscillation circuit; it is controlled by the bias current setting resistor between its emitter and collector. RV3 is the variable resistor for REC bias current fine control; adjusting this resistor, varies the REC bias current by approx. $\pm 10\%$ from its value at the click position.

OPERATION DIAGRAM

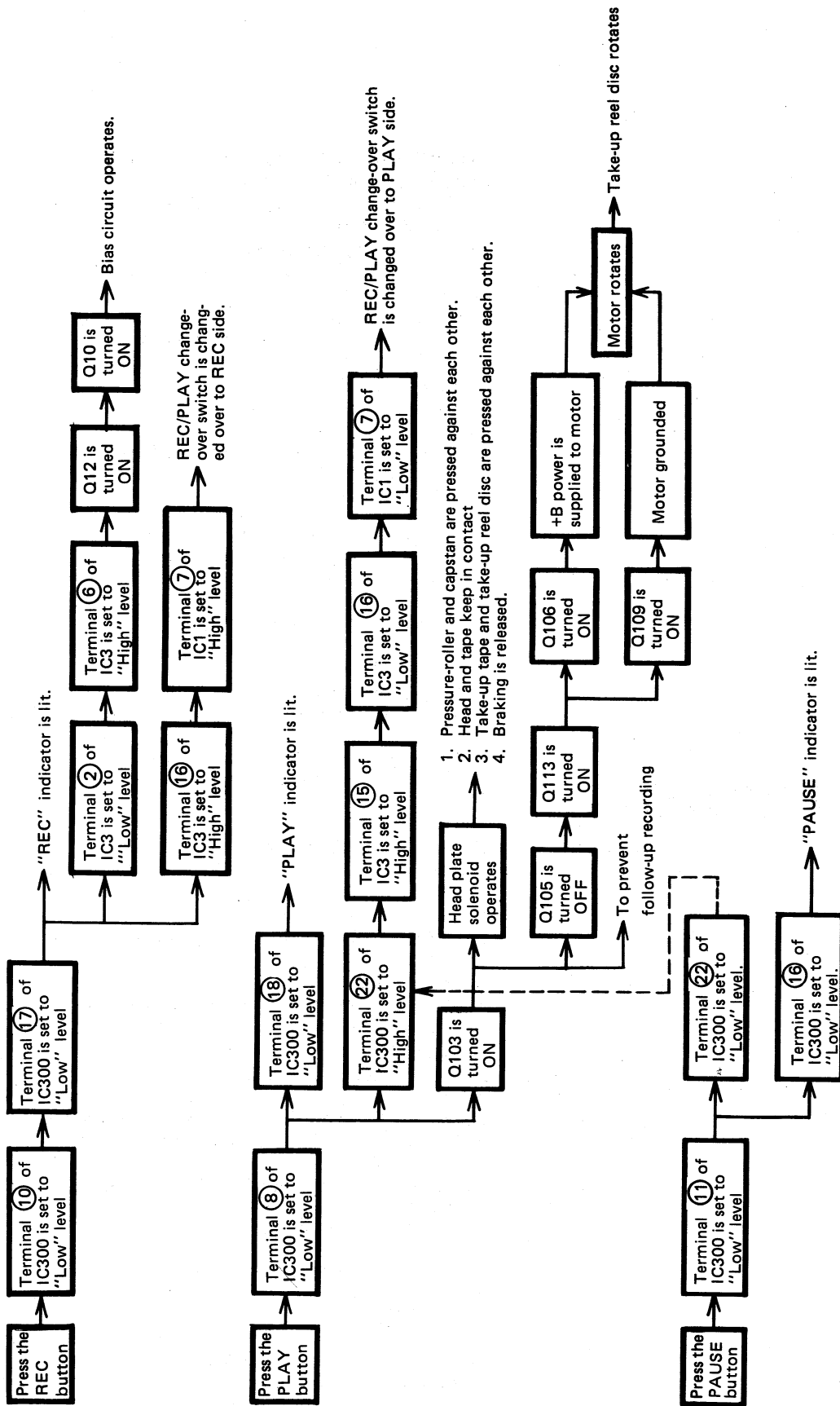
Since this unit has a logic control system, many switching transistors are used around the mode control IC(HA 12001). The diagrams hereafter show the condition of transistors in every mode and the chassis operation procedure.

Check the respective switching transistors and the chassis referring to these block diagrams when the logic control malfunctions. Refer to the service manual, UD-2 Mechanism (No. 1139), for the chassis.

1. FF/REW mode



2. REC/PLAY/PAUSE mode





HITACHI SALES CORPORATION OF AMERICA
Eastern Regional Office
1200 Wall Street West, Lyndhurst, New Jersey 07071
Tel. 201-935-8980

Mid-Western Regional Office
1400 Morse Ave., Elk Grove Village, Ill. 60007
Tel. 312-593-1550

Southern Regional Office
510 Plaza Drive College Park, Georgia 30349
Tel. 404-763-0360

Western Regional Office
401 West Artesia Boulevard, Compton, California 90220
Tel. 213-537-8383

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743-G Waiakamilo Rd., Honolulu, Hawaii 96817
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3300 Trans Canada Highway Pointe Claire, Quebec, H9R1B1, Canada
Tel. 514-697-9150

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2 Hamburg 54, Kleine Bahnstraße 8, West Germany
Tel. 850 60 71-75

HITACHI SALES (U.K.) Ltd.
Hitachi House, Station Road, Hayes, Middlesex UB3 4DR, England
Tel. 01-848-8787 (Service Centre : 01-848-3551)

HITACHI SALES SCANDINAVIA AB
Rissneleden 8, Sundbyberg, Box 7138, S-172-07 Sundbyberg 7,
Sweden
Tel. 08-98 52 80

HITACHI SALES NORWAY A/S
Oerebekk 1620 Gressvik P.O. Box 46 N-1601 Fredrikstad, Norway
Tel. 032-28050

SUOMEN HITACHI OY
Box 151, SF-15100 Lahti 10, Finland
Tel. Lahti 44 241

HITACHI SALES A/S
Kudysen 13, DK-2630 Taastrup, Denmark
Tel. 02-999200

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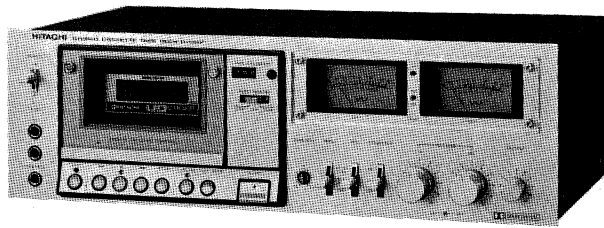
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Tel. 201-25-00

HITACHI SALES WARENHANDELS GMBH
A-1180/Wien, Kreuzgasse 27
Tel. (0043222) 439367/8

HITACHI SALES AUSTRALIA Pty Ltd.
153 Keys Road, Moorabbin, Victoria 3189 Australia
Tel. 95-8722

HITACHI Ltd. TOKYO JAPAN
Head Office: 5-1, 1-chome, Marunouchi, Chiyoda-ku, Tokyo
Tel. Tokyo (212)1111 (80 lines)
Cable Address: "HITACHY" TOKYO
Codes: All Codes Used

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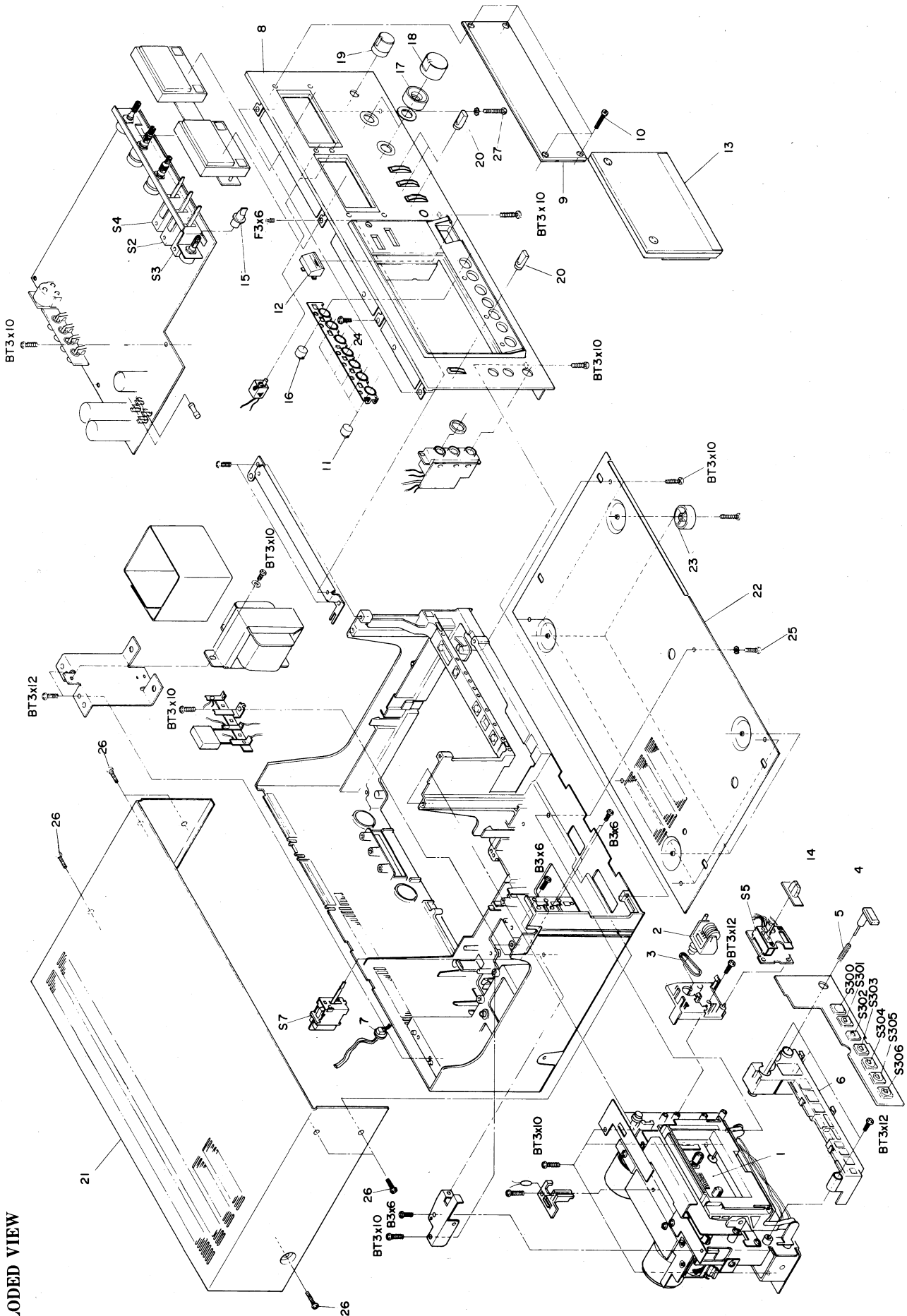
STEREO CASSETTE TAPE DECK

Model D-580 (FS,AU,BS,RW,W)

SYMBOL-NO	P-NO	DESCRIPTION	SYMBOL-NO	P-NO	DESCRIPTION
RESISTORS					
RT1LR	0151887	VARIABLE 22K OHM B	IC 1LR	5350881	IC HA12005
RT2LR	0151886	VARIABLE 10K OHM B	IC 2	5350561	IC HA 11226
RT3LR	0151885	VARIABLE 4.7K OHM B	IC 3	5350891	IC HA12006
RT4	0151886	VARIABLE 10K OHM B	IC300	5350851	IC HA12001
RT5LR	0151889	SEMI VARIABLE 100K OHMB	LED 1	5380241	LED GL 3PR1
RV1	5000551	VARIABLE 20K OHM(A)	LED 2	5380241	LED GL 3PR1
RV2	5000551	VARIABLE 20K OHM(A)	LED300	5380242	LED GL 3PG1
RV3	5000435	VARIABLE 5K OHM(B)	LED301	5380241	LED GL 3PR1
RV4	5000145	VARIABLE 10K OHM(B)	LED302	5380242	LED GL 3PG1
SEMI-CONDUCTORS					
D 1	5330572	DIODE SILICON 1S2473HC 100M	Q 1LR	5321295	TRANSISTOR 2SC1740E
D 2LR	5330572	DIODE SILICON 1S2473HC 100M	Q 2LR	5321295	TRANSISTOR 2SC1740E
D 3LR	5330721	DIODE GERMANIUM 1N34A 10MHZ 50MW	Q 5LR	5321194	TRANSISTOR 2SD467BC
D 4LR	5330721	DIODE GERMANIUM 1N34A 10MHZ 50MW	Q 6LR	5321295	TRANSISTOR 2SC1740E
D 5LR	5330721	DIODE GERMANIUM 1N34A 10MHZ 50MW	Q 7	5321295	TRANSISTOR 2SC1740E
D 6LR	5330721	DIODE GERMANIUM 1N34A 10MHZ 50MW	Q 8	5321295	TRANSISTOR 2SC1740E
D 7LR	5330721	DIODE GERMANIUM 1N34A 10MHZ 50MW	Q 9	5321295	TRANSISTOR 2SC1740E
D 8	5330572	DIODE SILICON 1S2473HC 100M	Q 10	5320613	TRANSISTOR SILICON 2SC1213C 80M
D 9	5330572	DIODE SILICON 1S2473HC 100M	Q 11	5321295	TRANSISTOR 2SC1740E
D 13	5330341	DIODE SILICON W0-6A 60M	Q 12	5321295	TRANSISTOR 2SC1740E
D 14	5330341	DIODE SILICON W0-6A 60M	Q 13	5321295	TRANSISTOR 2SC1740E
D 15	5330541	ZENER DIODE HZ-15	Q 14	5320671	TRANSISTOR SILICON 2SC1061B 5M
D100	5330572	DIODE SILICON 1S2473HC 100M	Q102	5320643	TRANSISTOR SILICON 2SC1162 150M
D101	5330101	DIODE SILICON V06C 15K	Q103	5320643	TRANSISTOR SILICON 2SC1162 150M
D102	5330101	DIODE SILICON V06C 15K	Q104	5320643	TRANSISTOR SILICON 2SC1162 150M
D103	5330101	DIODE SILICON V06C 15K	Q105	5321295	TRANSISTOR 2SC1740E
D104	5330101	DIODE SILICON V06C 15K	Q106	5320643	TRANSISTOR SILICON 2SC1162 150M
D105	5330101	DIODE SILICON V06C 15K	Q107	5321213	TRANSISTOR 2SD468C 190MHZ 0.9MW
D110	5330482	DIODE SILICON AW01-7 DC	Q108	5321213	TRANSISTOR 2SD468C 190MHZ 0.9MW
D111	5330482	DIODE SILICON AW01-7 DC	Q109	5321213	TRANSISTOR 2SD468C 190MHZ 0.9MW
D112	5330571	DIODE 1S2473VE	Q110	5321295	TRANSISTOR 2SC1740E
D114	5330572	DIODE SILICON 1S2473HC 100M	Q112	5321295	TRANSISTOR 2SC1740E
D118	5330483	ZENER DIODE AW01-7	Q113	5321295	TRANSISTOR 2SC1740E
D200	5330572	DIODE SILICON 1S2473HC 100M	TRANSFORMERS		
D201	5330572	DIODE SILICON 1S2473HC 100M	△ PT	5212324	POWER (For FS)
D300	5330572	DIODE SILICON 1S2473HC 100M	△ PT	5212325	POWER (For BS,AU)
			△ PT	5212326	POWER (For W,RW)
			COILS		
			L1LR	5120274	CHOKE
			L2LR	5120561	BIAS TRAP
			L3LR	5161661	DOLBY FILTER
			L4	5260093	OSCILLATOR BLOCK
			L5	5152125	CHOKE 47MICRO H
			L6	5152125	CHOKE 47MICRO H

SYMBOL-NO	P-NO	DESCRIPTION	SYMBOL-NO	P-NO	DESCRIPTION
MISCELLANEOUS					
	5658062	LED SOCKET	4	6748611	EJECT BODY
	5679402	MIC JAC ASSEMBLY	5	6303054	SPRING
Δ	5746154	POWER CORD (For FS,W,RW)	6	6748891	FUNCTION HOLDER
Δ	5746291	POWER CORD ASS'Y (For BS)	Δ 7	6794161	BUSHING (For BS)
Δ	5746431	POWER CORD (For AU)	Δ	6711351	BUSHING (For AU)
F1	5720179	FUSE T1A	Δ	6794141	BUSHING (For FS,W,RW)
F2	5720179	FUSE T1A	MISCELLANEOUS		
F3	5720174	FUSE 630MA	8	6671305	FRONT PANEL ASSEMBLY
Δ F5	5720171	FUSE (For BS,W,RW)	9	6201791	METER PANEL
J3	5651141	5P DIN SOCKET	10	7781393	SPECIAL BOLT
J4LR	5676082	PIN JACK	11	6050692	PUSH BUTTON (STOP, F.F., REC, PAUSE, REW, PLAY)
J5LR	5676082	PIN JACK	12	6257241	EJECT BUTTON
LM	5554651	LEVEL METER	13	6091554	CASSETTE DOOR ASSEMBLY
PL	5762036	PILOT LAMP	14	6296491	KNOB (AUTO REWIND)
RL1	5641141	LEAD RELAY	15	6287361	KNOB (BIAS FINE)
RL2	5641141	LEAD RELAY	16	6051112	PUSH BUTTON (REC MUTE)
S 2	5604211	LEVER SWITCH (Equalizer)	17	6289101	KNOB ASSEMBLY-24HMD
S 3	5604224	LEVER SWITCH (Bias)	18	6287341	KNOB ASSEMBLY-22HMD
S 4	5604211	LEVER SWITCH (Dolby)	19	6287321	KNOB ASSEMBLY-15HMD
S 5	5620852	SWITCH-SLIDE (Auto stop)	20	6296531	FUNCTION KNOB
S 7	5604321	LEVER SWITCH (Power)	21	6149682	UPPER COVER (For RW)
S 10	5605081	ROTARY SWITCH (Voltage select (For W, RW)		6149681	UPPER COVER (For BS,FS,W,AU)
S300	5633371	PUSH SWITCH (Edit)	22	6149435	BOTTOM COVER (For BS,FS,AU)
S301-306	5633351	PUSH SWITCH (Rec, Rew, Play, F.F, Stop, Pause)		6149437	BOTTOM COVER (For W,RW)
FOR CASSETTE DECK ASSEMBLY (B)			23	6739721	RUBBER LEG
1	6630991	CASSETTE METAL ASSEMBLY	24	8724406	FLAT SCREW-3MMDX6MM
2	5550178	COUNTER WITH PULLEY	25	8699410	BT BIND HEAD SCREW-3MMDX10MM (BLACK)
3	6354631	COUNTER BELT	26	8699610	BT BIND SCREW-4MMDX10MM
			27	8745425	BINDING SCREW-3MMDX25MM

EXPLODED VIEW



SCHEMATIC DIAGRAM

