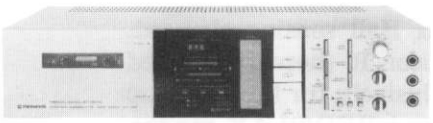
PIONEER®

Service Manual

CIRCUIT & MECHANISM DESCRIPTIONS



This photograph is CT-7R.

ORDER NO.
ARP-001-0

STEREO CASSETTE TAPE DECK

CT-7R
CT-6R

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1. MECHANICAL DESCRIPTIONS

1.1 Mechanism Operation

The various mechanical sections of the recorder are operated using the capstan motor to provide the driving force. The various modes are activated by solenoid L and R, and these are controlled by commands from CPU PD6006.

Both the capstan and reel-motor are direct-drive motors fitted with a Hall sensing element. Reel-motor L and reel-motor R (hereafter called RM L, RM R) are used exclusively for tape take-up in the FF, REW, PLAY, and REC/PLAY modes. The direction of rotation and rotational speed of these motors are controlled by commands from CPU PD6006.

The right side capstan motor is the DD type, and the left side capstan motor is belt-driven by the right side-motor. A sub-rotor acts as the actual capstan. (Refer to Fig. 1-1).

The mechanism forming the right and left-hand side of the unit is essentially symmetrical in configuration, and in forward and reverse (hereafter abbreviated FWD, REV) operations, each side acts together. This description covers the mechanical operations for FWD movement.

■ Basic Operations of the Mechanism

The mechanism assumes three different states: STOP, PAUSE, and PLAY. Consequently, since it can travel in the FWD and REV direction, there are a total of six states possible. There is also a direction operation for switching between FWD and REV travel. Transition between the FWD and REV state will be described using only one example.

When the mechanism, presently in the FWD-PLAY mode, is switched to the REV-PLAY mode, a direction operation is required, then the mechanism will make the transition following the steps listed below. (Refer to Fig. 1-2).

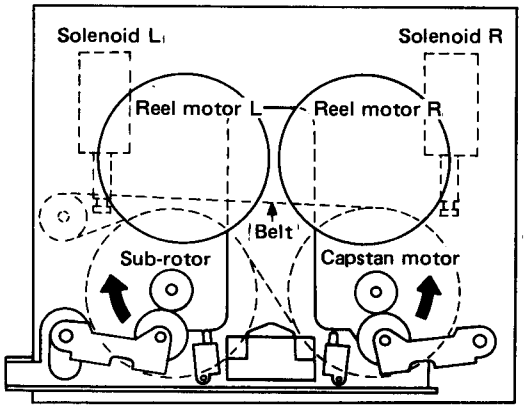


Fig. 1-1 Mechanical construction

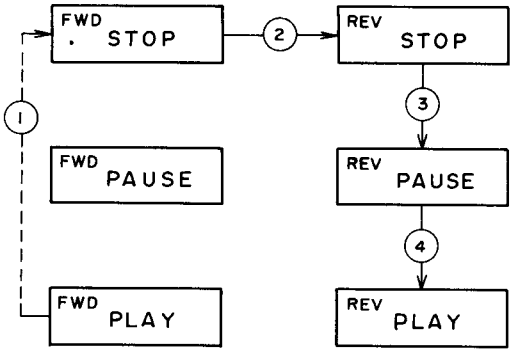


Fig. 1-2 Mechanism mode transition (example)

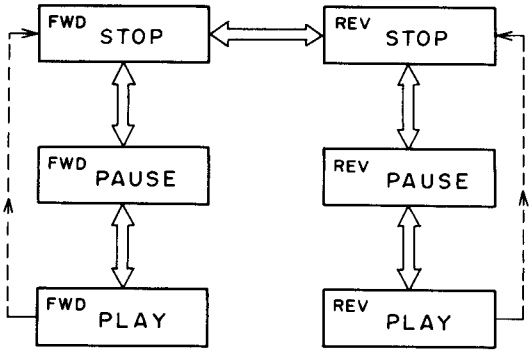
Mechanism Mode Transition Flow	State	Mode
	STOP state	STOP, DIRECTION (DIR)
	PAUSE state	PAUSE, PLAY/PAUSE, REC-PLAY/PAUSE, FF, REW.
	PLAY state	PLAY, REC/PLAY.

Fig. 1-3 Mechanism mode transition flow and modes

Direction switch ON

1. Instantaneous transit from FWD-PLAY to FWD-STOP.
2. Approx. 500msec after FWD-STOP entered, dirction operation effects REV-STOP.
3. Approx. 425msec after REV-STOP entered, REV-PAUSE entered.
4. Approx. 325msec after REV-PAUSE entered, REV-PLAY entered, thereby concluding the switching operation.

The above operational flow is also shown using interconnecting arrows in Fig. 1-3. This figure additionally shows other mechanism states possible with the various modes.

Next, the mechanism operation when switching between the various states (in the FWD direction) will be described.

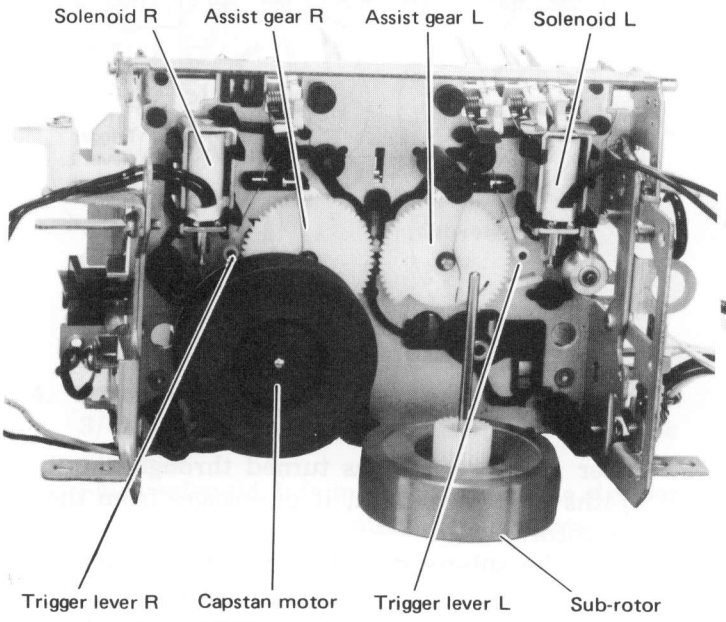


Fig. 1-4 Mechanical construction (Rear view)

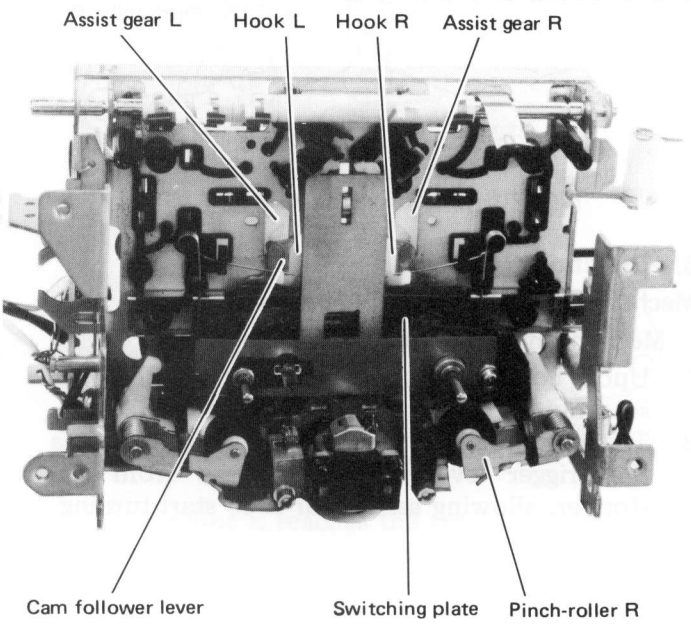


Fig. 1-5 Mechanical construction (Front view)

1. Mechanism Transition from STOP to PAUSE

Mechanism viewed from underneath

1. Upon command transmission from PD6006, solenoid R turns ON (plunger retracted). (Fig. 1-6).)
2. The movement of the solenoid plunger causes the trigger lever R to disengage from the stopper, allowing the assist gear R to turn.
3. Rotation of assist gear R is meshed with the capstan motor.

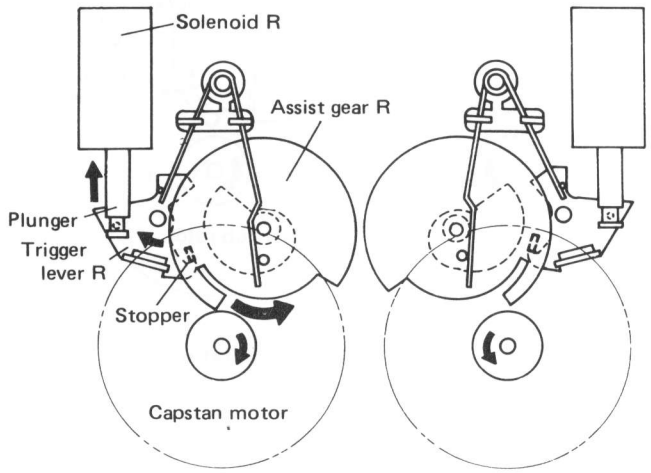


Fig. 1-6 STOP-PAUSE operation 1

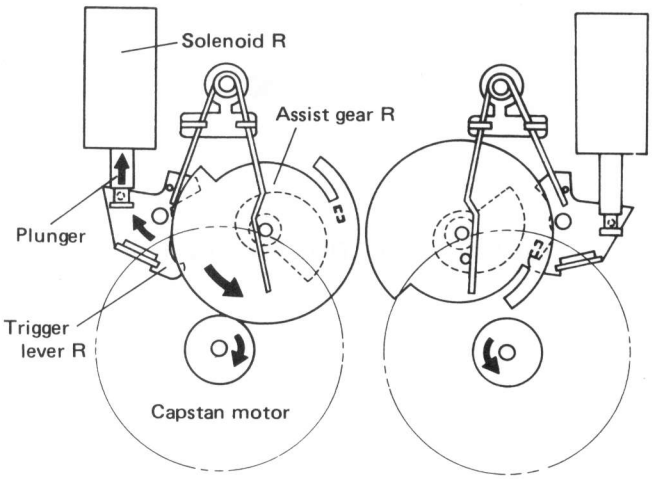


Fig. 1-7 STOP-PAUSE operation 2

4. After assist gear R has turned through about 3/4ths of a revolution, it disengages from the capstan motor.
5. Since solenoid R is in an ON state, the stopper on assist gear R contacts trigger lever R at point A, and stops. The above series of operations covers the events occurring on the backside of the mechanism. Next, the operations occurring simultaneous to the above, but as viewed from the top of the unit will be given.

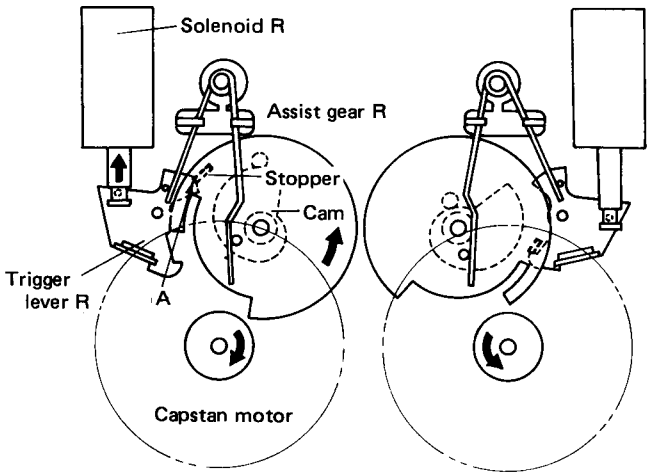


Fig. 1-8 STOP-PAUSE operation 3

Mechanism viewed from the top

1. As assist gear R rotates, its cam drives the B point of the cam follower lever in an upward direction.

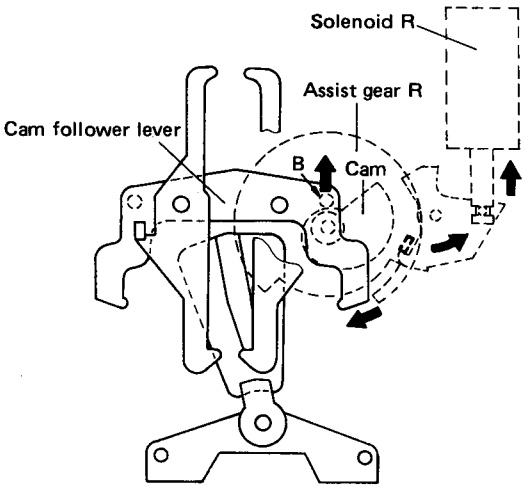


Fig. 1-9 STOP-PAUSE operation 4

2. As the B point is raised, hook R (coupled to B point) is also raised.
3. At point C, hook R catches the coupling plate and continues to rise, carrying the coupling plate and pinch-roller drive-plate with it.
4. The pinch-roller drive-plate continues to rise until the pinch-roller goes into a PAUSE status, then stops.

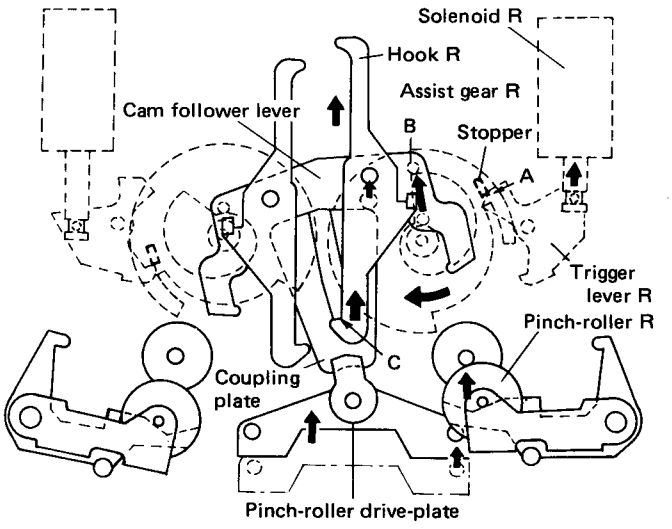


Fig. 1-10 STOP-PAUSE operation 5

2. Mechanism Transition from PAUSE to PLAY

Mechanism viewed from underneath

Solenoid R is presently ON, and the mechanism is in a PAUSE state.

1. Upon command transmission from PD6006, solenoid L turns ON (plunger retracted).
2. The movement of the solenoid plunger causes the trigger lever L to disengage from the stopper, allowing assist gear L to start turning.

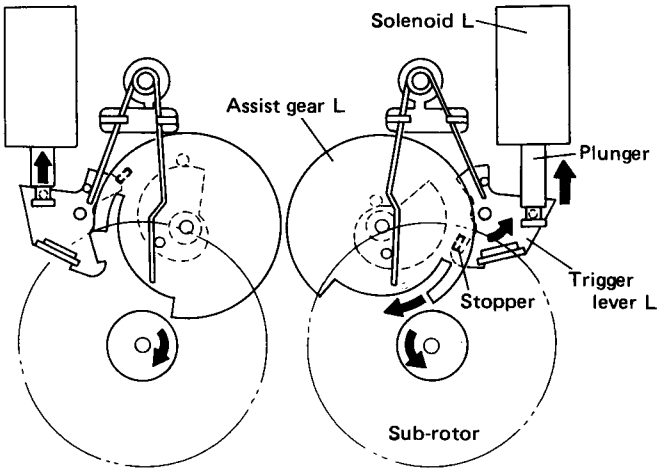


Fig. 1-11 PAUSE-PLAY operation 1

3. Rotation of assist gear L is meshed with the sub-rotor.

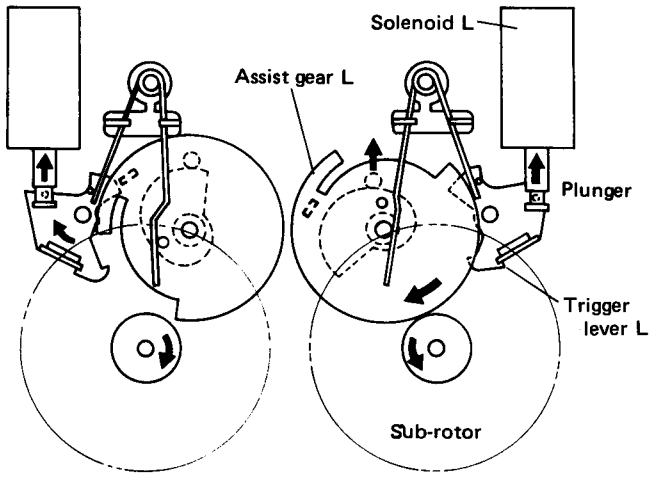


Fig. 1-12 PAUSE-PLAY operation 2

4. After assist gear L has turned through about 3/4ths of a revolution, it disengages from the sub-rotor.
5. Since solenoid L is in an ON state, the stopper on assist gear L contacts trigger lever L at point D, and stops.

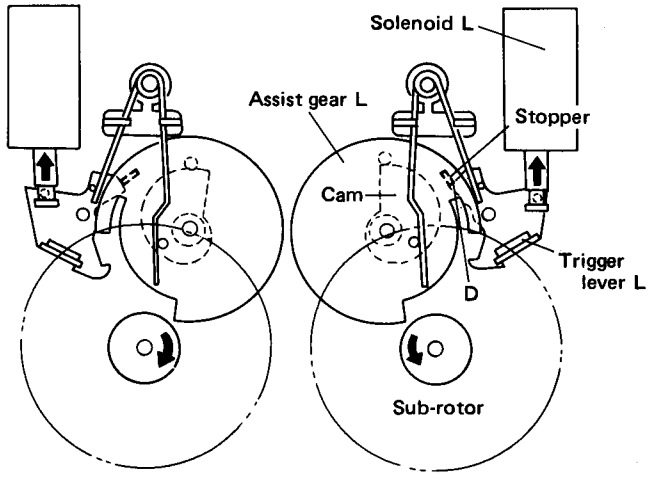


Fig. 1-13 PAUSE-PLAY operation 3

Mechanism viewed from the top

1. As assist gear L rotates, its cam drives the E point of the cam follower lever in an upward direction.
2. As the E point is raised, hook L (coupled to E point) is also raised.

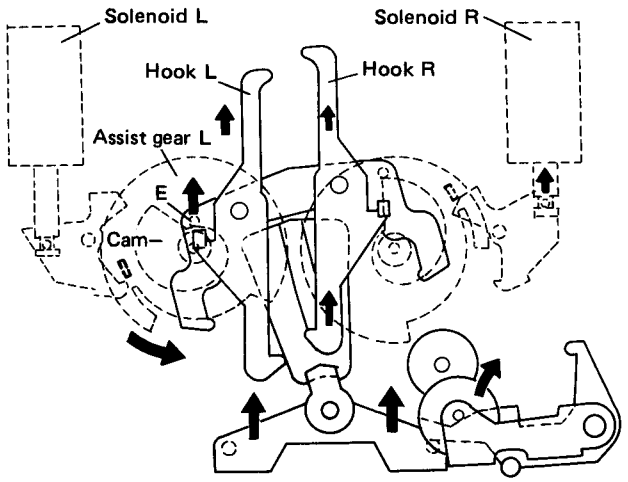


Fig. 1-14 PAUSE-PLAY operation 4

3. When point E reaches the same height as point B, it stops. The head and pinch-roller at this point is shown in Fig. 1-15. Here, since the E point has reached the same height as the B point, the X point rises higher than that of the PAUSE status. Consequently, the head makes contact with the tape, and the tape is pinched between pinch-roller R and the capstan shaft, completing PLAY mode entry.

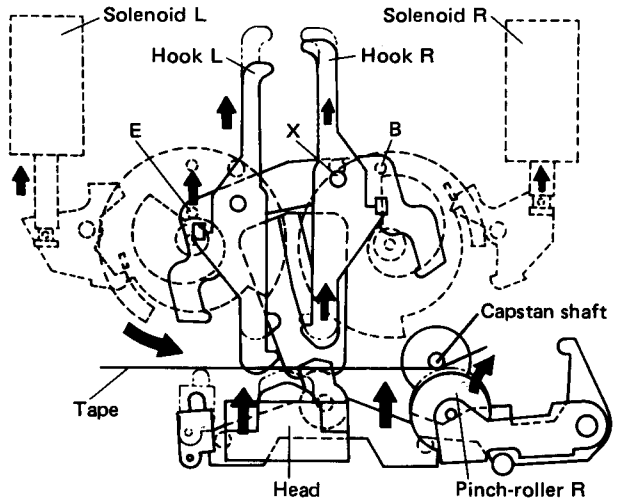


Fig. 1-15 PAUSE-PLAY operation 5

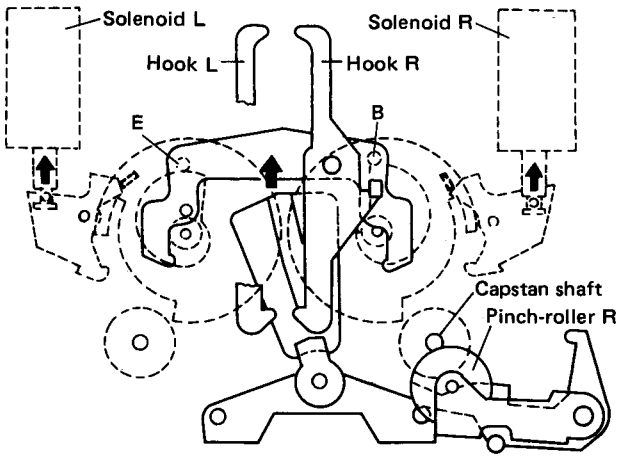


Fig. 1-16 PAUSE-PLAY operation 6

3. Direction Operation

Mechanism viewed from underneath

Mechanism is presently in STOP status

1. Upon command transmission from PD6006, solenoid L turns ON (plunger retracted).
2. The movement of the solenoid plunger causes the trigger lever L to disengage from the stopper, allowing assist gear L to start turning.

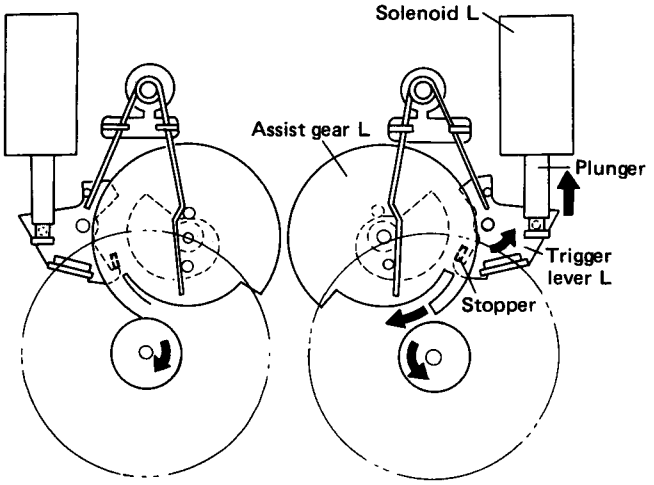


Fig. 1-17 DIRECTION operation 1

3. Solenoid L then goes OFF, returning trigger lever L to it's original position.
4. Rotation of assist gear L is meshed with the sub-rotor.

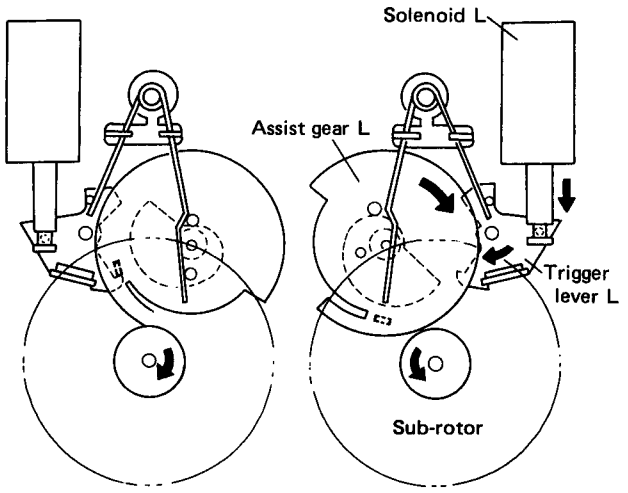


Fig. 1-18 DIRECTION operation 2

5. After assist gear L has turned through about 3/4ths of a revolution, it disengages from the sub-rotor.
6. When the sub-rotor and assist gear L become unmeshed, since the solenoid lever has already returned to its out position, spring tension is allowed to return the assist gear to its original position after making only one revolution. This completes the operation.

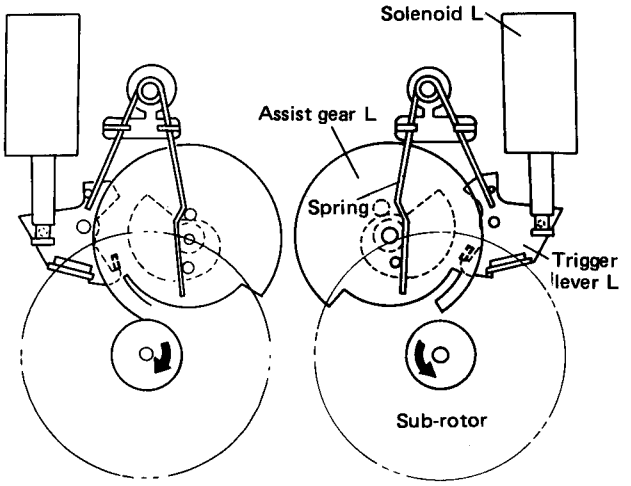


Fig. 1-19 DIRECTION operation 3

Mechanism viewed from the top

1. As assist gear L rotates, its cam drives the G point of the cam follower lever in an upward direction.
2. As the E point is driven upwards, point F on the right-hand side of the cam follower lever starts forcing the switching plate to the left.
3. As the switching plate is forced to the left, it carries the G point on the coupling plate to the left with it.

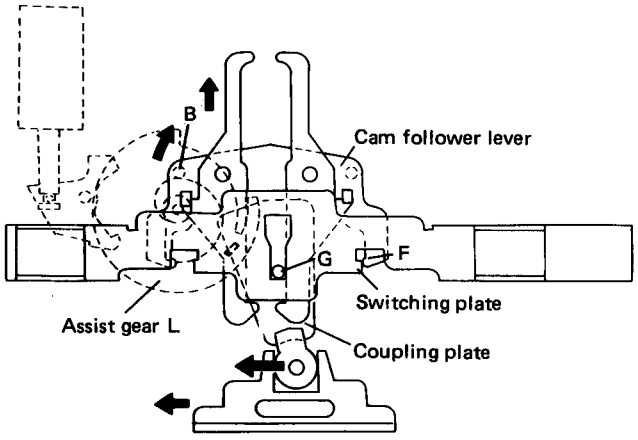


Fig. 1-20 DIRECTION operation 4

4. Since the H point on the coupling plate functions as a support point, as the G point is shifted to the left, the slide plate also moves to the left with the two plates above. This is shown in Fig. 1-21.

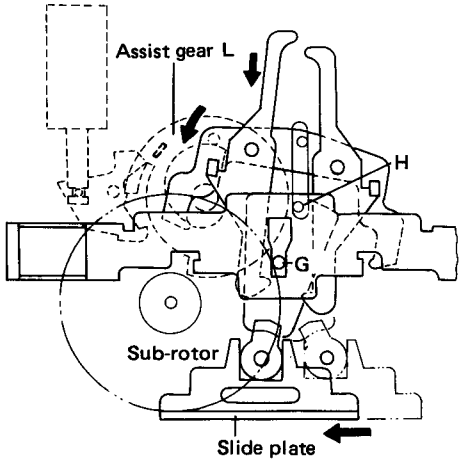


Fig. 1-21 DIRECTION operation 5

5. As the slide plate moves from right to left, the head rotates to the REV direction attitude. (Refer to Fig. 1-23)
6. After assist gear L has turned through about 3/4ths of a revolution, it disengages from the sub-rotor. Spring pressure forces it back to its original state, completing the direction operation, and switching the unit from REV to STOP.

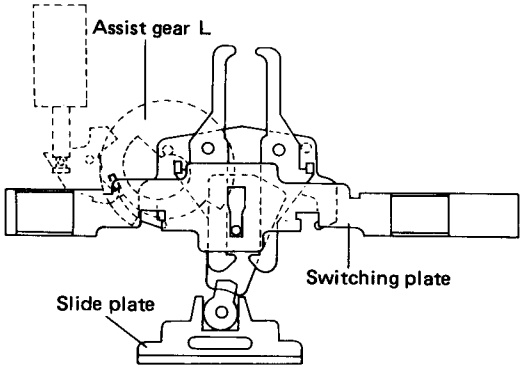


Fig. 1-22 DIRECTION operation 5

4. Head Rotation

As the slide plate moves from right to left in the direction operation (described above), the pin on the sector gear also is forced from right to left. This is shown in Fig. 1-23. As the sector gear pin goes past the center point, the force of the gear spring rotates the sector gear through approximately a 90° angle. This causes the head meshed to sector gear to rotate 180°, placing the unit in a REV state.

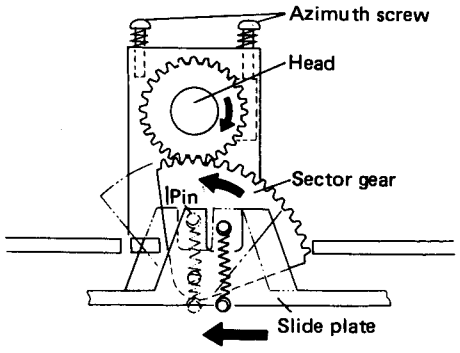


Fig. 1-23 Head rotation operation 1

2. CIRCUIT DESCRIPTIONS

2.1 PLAYBACK FLOW

This signal picked up by the playback head is amplified by the two-stage, direct-coupled amplifiers, Q501 and Q503. If the NORM position (EQ) is selected, the NF circuit between the collector of Q503 and the emitter of Q501 will set equalization bias to 120μs. Changing the selector position to METAL or CrO_2 turns Q505 ON, and EQ is switched from 120μs to 70μs, thus correcting frequency response for these tape formulations.

The output level from the EQ AMP is adjusted by a potentiometer and further amplified by the flat amp, Q507. Output from the flat amp is applied to pin 15 of the Dolby IC.

The Dolby circuit consists of IC601 (HA11226), and its output is taken from pin 8 of IC601. It then passes through the Dolby amp (IC302) and is applied to LINE OUTPUT.

2.2 RECORDING FLOW

Signals input to the MIC jack are amplified by the mic amp, Q801, then passed through the MIC/LINE selector switch and into the INPUT volume where the signal is adjusted to the proper level. This adjusted-level signal is then applied to flat amp Q803.

After amplification by the flat amp, the signal passes through the MPX filter and is input at pin 2 of the Dolby IC. Output is taken from pin 9.

The level of the output from the Dolby IC is adjusted by potentiometer, and passed through the REC AMP (IC501) where the signal is corrected for best compatibility with the tape being used. It is then fed to the recording head for use as the recording signal.

2.3 CONTROL CIRCUIT

The control circuitry of this unit is contained in CPU PD6006, expansion IC PM3001, and IC PA3010 used in the MS function. The key signals applied to PD6006 are transmitted to PM3001 as 16-bit serial data, and PM3001 then uses this data to control the various circuits.

When a mode key is activated, the 16-bit serial data transmission is output from pin 5 of PD6006. This is shown in Fig. 2-1. Also a clock pulse is output from pin 7. (Data and clock pulse transmission occurs once each time the key is activated.)

The 16-bit serial data is applied to pin 3 of the expansion IC, PM3001, and the leading edge of the clock pulse is read into the shift register of PM 3001 through pin 2.

After both read events are completed, a STB (strobe) pulse is applied to pin 1, and PM3001 then starts transmitting control signals from its various output pins in accordance with which key was activated. (Refer to Fig. 2-3.)

The following sections will describe the various circuit operations occurring when a mode key is activated. Operations will be described for the FWD direction of travel. (Except where otherwise specified, the pin nos. will be for PM3001.)

1. STOP Mode Key ON

Mechanism

The 16-bit serial data transmission from PD6006 will cause pin 7 and 8 of PM3001 to go high, turning SOL L and R OFF. The mechanism will thus be placed in a STOP status.

Motor

Pin 4 and 5 will be low, and the reel motor will be in a STOP status.

Signal path, and other circuits

When pin 6 goes low, the reed relay RY501 is activated. Consequently, point A of the REC/PLAY head is at ground potential, and the head is in the playback mode.

Pin 10 and 11 go high, turning Q306, Q302, and Q304 ON. This grounds the input of the REC AMP. LINE OUTPUT is also grounded, so no sound is output.

Pin 12 and 13 go low, turning Q310 and Q513 OFF. This causes the oscillation of the OSC circuit to stop. Also, since Q513 is OFF, signals picked up by the REC/PLAY head are input to the PB AMP.

2. PLAY Mode Key ON

Mechanism

Pin 7 and 8 of PM3001 go low, activating SOL L and R. (Refer to the timing chart in Fig. 2-19). This Places the mechanism in the PLAY mode.

Motor

Pin 4 goes to a low level, while pin 5 is held at a middle (M) level, causing RM R (reel-motor R) to start turning.

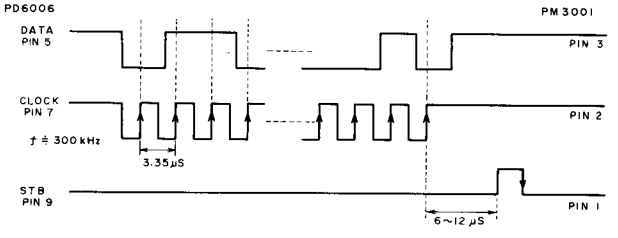


Fig. 2-1 PD6006 Data output

Signal Path

As pin 10 goes low, the Dolby amp muting transistor (Q302) and line muting transistor (Q304) are turned OFF. Thus, the signal is present at LINE OUTPUT.

3. FF Mode Key ON

Mechanism

Pin 7 goes high and pin 8 goes low. This turns SOL L OFF and SOL R ON, placing the mechanism in a PAUSE status.

Motor

Pi
L in

Signal

Sa

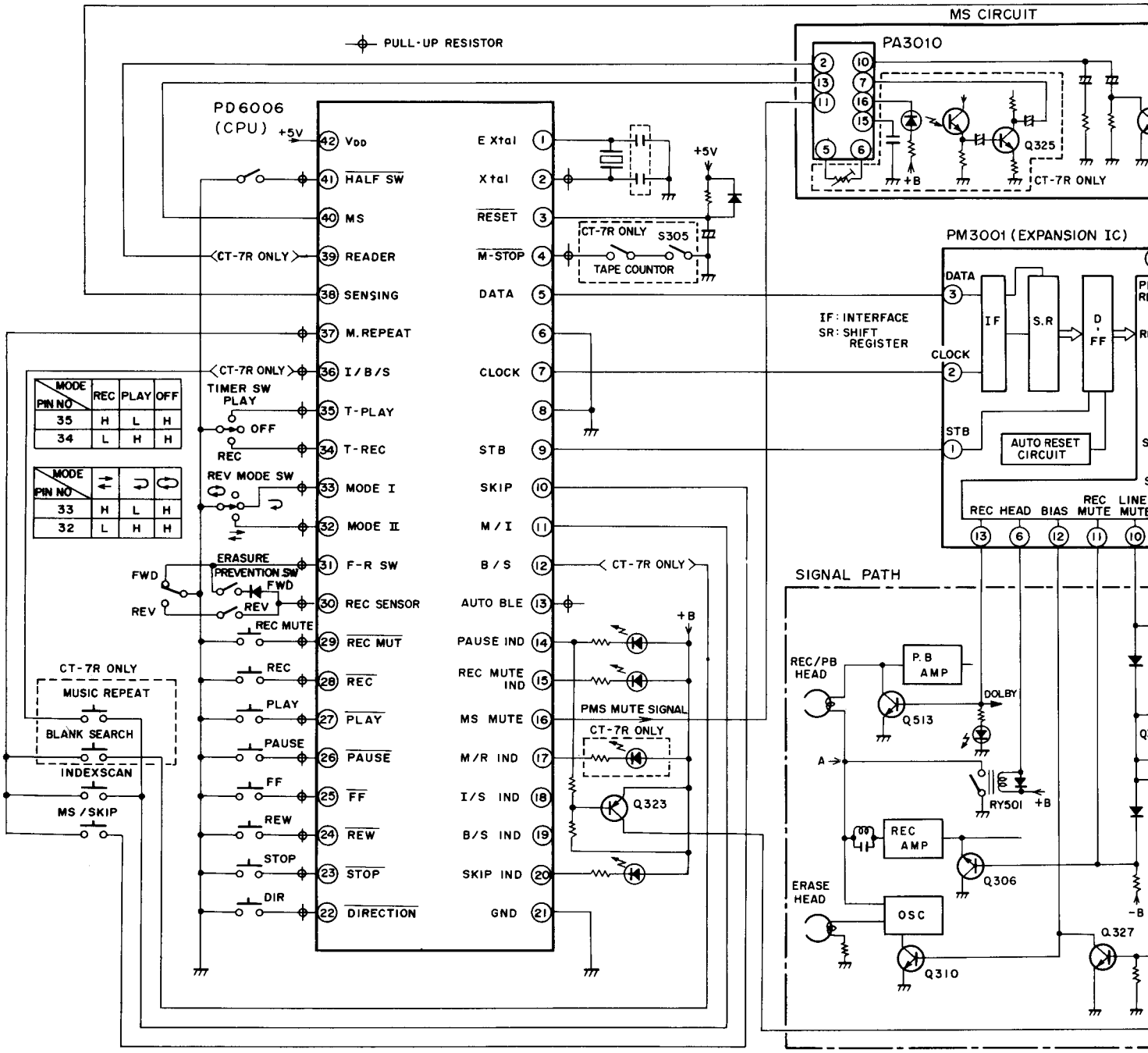


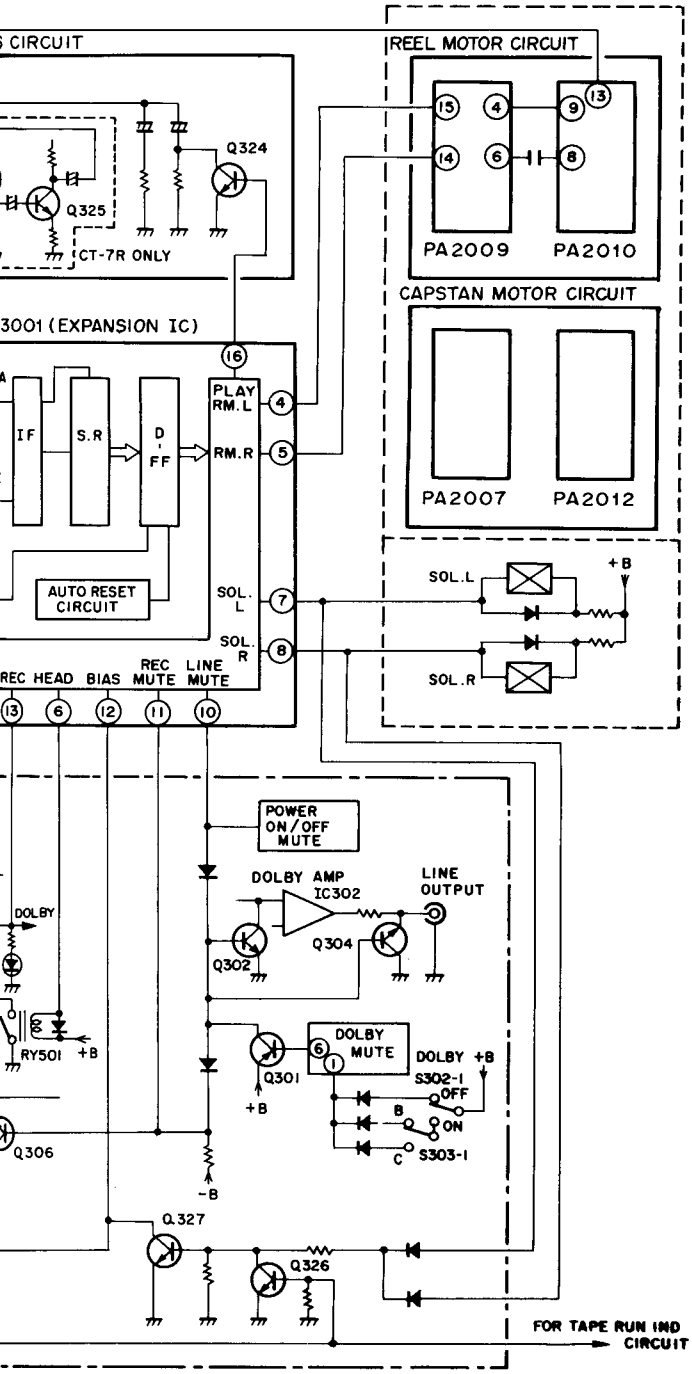
Fig. 2-2 Control system block diagram

Motor

Pin 4 goes low and pin 5 goes high, placing RM L in a STOP status and causing RM R to turn.

Signal Path and other circuits

Same as in the STOP status.



4. REW Mode Key ON

Mechanism

Pin 7 goes high and pin 8 goes low. This turns SOL L OFF and SOL R ON, Placing the mechanism in a PAUSE status.

Motor

Pin 4 goes high and pin 5 goes low. This turns RM L on and places RM R in a STOP status.

Signal Path and other circuits

Same as in the STOP status.

5. REC/PLAY Mode Key ON

Mechanism

Same as PLAY Mode Key ON.

Motor

Same as PLAY Mode Key ON.

Signal Path and other circuits

When pin 6 goes high, the reed relay RY501 is turned OFF. Consequently, bias is applied to the REC/PLAY head by the output from the REC AMP and the OSC circuit.

As pin 10 and 11 go low, the Dolby amp muting transistor (Q302) and LINE MUTE transistor (Q304) are turned OFF and sound is output. Also, since Q306 is OFF, the input signal is applied to the REC AMP.

When pin 12 and 13 go high, Q310 and Q513 are turned ON, and the BIAS oscillator circuit is allowed to supply bias to the head. Turning Q513 ON also enables the head to go into a record-only status.

6. PAUSE Mode Key ON (in STOP status)

Mechanism

Pin 7 and 8 both go high, turning SOL L and R OFF and placing the mechanism in a STOP status.

Motor

Same as STOP status.

Signal Path and other circuits

Same as STOP status. (The PAUSE LED is illuminated however.)

7. PAUSE Mode Key ON (in PLAY status)

Mechanism

Pin 7 goes high, and pin 8 goes low. This turns SOL L OFF and SOL R ON, placing the mechanism in a PAUSE status.

Motor

Same as STOP status.

Signal Path

Same as STOP status. (PAUSE LED is illuminated however.)

8. REC/PLAY PAUSE Mode Key ON

Mechanism

Pin 7 goes high, and pin 8 goes low. This turns SOL L OFF and SOL R ON, placing the mechanism in a PAUSE status.

Motor

Same as STOP status.

Signal Path and other circuits

As pin 6 goes high it turns reed relay RY501 OFF.

This, bias is applied to the REC/PLAY head by the output of the REC AMP and the OSC circuit.

When pin 10 goes low, Q304 and Q302 go OFF and a signal is present at LINE OUTPUT.

Since pin 11 is high, Q306 is ON, and the input to the REC AMP is muted.

Pin 12 is at a low level, and Q310 turned OFF, stopping the OSC circuit.

Pin 12 is at a low level, and Q310 turned OFF, stopping the OSC circuit.

Pin 13 goes high turning Q513 ON, thereby allowing the head to function in the record-only mode.

Pin 14 of PD6006 goes low, causing the PAUSE LED to illuminate.

9. Direction Key ON (in STOP status)

Mechanism

Pin 7 goes low for a 275msec interval, and pin 8 goes high. This causes SOL L to turn on for only 275msec, and since SOL R is OFF, the mechanism goes through a direction operation from FWD-STOP to REV-STOP.

Motor

Same as STOP status.

Signal Path and other circuits

Same as STOP status.

PM3001 OUTPUT STATE BY MODE

Pin No.	MODE / FUNCTION	STOP		▷▷ FF		◁◁ REW		PLAY		REC/PLAY		STOP PAUSE		PLAY PAUSE		REC/PLAY PAUSE	
		FWD	REV	FWD	REV	FWD	REV	FWD	REV	FWD	REV	FWD	REV	FWD	REV	FWD	REV
4	RM. L	L (OFF)		L		H		L	M	L	M	L		L		L	
5	RM. R	L (OFF)		H		L		M	L	M	L	L		L		L	
6	HEAD SW	L (P.B MODE)		L		L		L		H		L		L		H	
7	SOL. L	H (OFF)		H	L	H	L	L		L		H		H	L	H	L
8	SOL. R	H (OFF)		L	H	L	H	L		L		H		L	H	L	H
9	P.B. MUTE	H (ON)		H		H		L		L		H		H		H	
10	LINE MUTE	H (ON)		H		H		L		L		H		H		L	
11	REC MUTE	H (ON)		H		H		H		L		H		H		H	
12	BIAS	L (OFF)		L		L		L		H		L		L		L	
13	REC	L (OFF)		L		L		L		H		L		L		H	
14	REW IND	L (OFF)		L		H		L		L		L		L		L	
15	FF IND	L (OFF)		H		L		L		L		L		L		L	
16	PLAY IND	L (OFF)		L		L		H		H		L		L		L	
PD 6006 14	PAUSE IND	H (OFF)		H		H		H		H		L		L		L	

Fig. 2-3 PM3001 Output state by mode

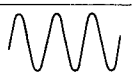
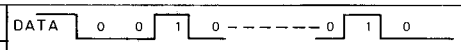
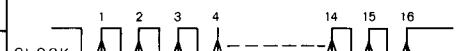
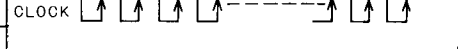
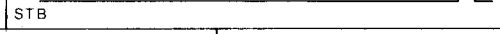
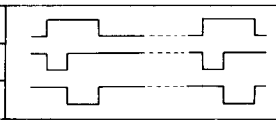
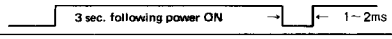
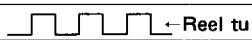
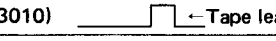
Pin No.	Symbol	I/O Status	Description		Applicable Model CT-7R	Applicable Model CT-6R
1	Extal	——	Used by internal quartz oscillator  Pin 2 – GND		O	O
2	Xtal	——	External circuit terminal f = 3.58MHz		O	O
3	RESET	IN	CPU reset input (effective low, normally high)		O	O
4	M-STOP	IN	Memory STOP input (effective low)		O	X
5	DATA	OUT	DATA output to PM3001 	Serial output to PM3001	O	O
6			NC 			
7	CLOCK	OUT	CLOCK output to PM3001 		O	O
8			NC 			
9	STB	OUT	STB output to PM3001 		O	O
10	SKIP	OUT	SKIP key scan output 	KEY SCAN output	O	O
11	M/I	OUT	MUSIC REPEAT, INDEX SCAN key scan output		O	O
12	B/S	OUT	BLANK SEARCH key scan output		O	X
13	AUTO BLE	OUT	AUTO BLE start output 		X	X
14	PAUSE IND	OUT	PAUSE indicator output (effective low)	Indicator output	O	O
15	REC MUTE IND	OUT	REC MUTE indicator output (effective low)		O	O
16	MS MUTE	OUT	MS MUTE output, PA3010 MS signal MUTE output (low level while reel motor turning during blank detector operation		O	O
17	M/R IND	OUT	MUSIC REPEAT indicator output (effective low)	Indicator output	O	X
18	I/S IND	OUT	INDEX SCAN indicator output (effective low)		X	X
19	B/S IND	OUT	BLANK SEARCH indicator output (effective low)		X	X
20	SKIP IND	OUT	SKIP indicator output (effective low)		O	O
21	GND		GND		O	O
22	DIRECTION	IN	DIR (direction) key input	Mode Key input	O	O
23	STOP	IN	STOP key input		O	O
24	REW	IN	REW key input		O	O
25	FF	IN	FF key input		O	O
26	PAUSE	IN	Pause key input		O	O
27	PLAY	IN	PLAY key input		O	O
28	REC	IN	REC/PLAY key input		O	O
29	REC MUT	IN	REC MUTE key input		O	O
30	REC Sensor	IN	REC sensor switch input (enabled low, disabled high)	Mechanism SW input	O	O
31	F-R SW	IN	FWD/REV sensor switch input (FWD: L; REV: H)		O	O
32	MODE I	IN	Mode selector switch input	Mode selector SW input	O	O
33	MODE II	IN			O	O
34	T-REC	IN	Timer REC switch input	Timer mode SW input	O	O
35	T-PLAY	IN	Timer PLAY switch input		O	O
36	I/B/S	IN	INDEX SCAN, BLANK SEARCH, SKIP key input	Key matrix input	O	O
37	M.REPEAT	IN	MUSIC REPEAT key input		O	X
38	SENSING	IN	Sensing pulse input (from PA2010 pin) 		O	O
39	LEADER	IN	Tape leader pulse detector input (from pin 2, PA3010) 		O	X
40	MS	IN	Blank signal input (H level between selection in PLAY, FF, REW; L level during selection; H level all other times)		O	O
41	HALF SW	IN	Cassette loading switch input (Loaded: L ; Unloaded: H)		O	O
42	VDD		+5V power source		O	O

Fig. 2-4 PD6006 Pin description

2.4 TAPE LEADER DETECTOR CIRCUIT

The tape leader detection circuit functions in the auto-reverse mode to detect the point of transition from the coated portion to the leader portion of the tape. It then directs the mechanism to reverse the direction of travel, or places the unit in a STOP status when this event occurs from the fast-forward (FF) or rewind (REW) mode.

The detector uses an optical system based on an infrared LED whose emission is picked up by a phototransistor. The circuit is activated by detecting a difference in the amount of light passed by the coated portion of tape, and the amount passed by the transparent leader.

The output from pin 16 of PA3010 is converted to light by the LED, and passes through the path shown in Fig. 2-5 to be picked up by the phototransistor. During tape travel, the amount of light received by the phototransistor is quite small, so the input level at pin 7 is held low. This causes the charge and voltage at pin 3 and 4 to also be held low, presenting a low logic input to the + and - terminals of comparator. This results in a low output from pin 2. But as the transparent leader passes into the light path, the amount of light picked up by the phototransistor suddenly increases the input to pin 7. This causes pin 3 to snap high, consequently applying a high input to the + terminal of the comparator. Output from pin 2 then goes high. As pin 3 goes high, the capacitor connected to pin 4 starts charging, raising the input level to the — terminal of the comparator. When the level of the — terminal reaches that of the + terminal, the output from the comparator snaps from high to low, and the output pulse taken from pin 2 appears as shown in Fig. 2-7.

CPU PD 6006 uses this output pulse to control the various mechanisms performing the mechanical functions of auto-reverse and automatic stop.

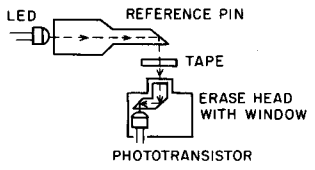


Fig. 2-5 Tape leader detector section

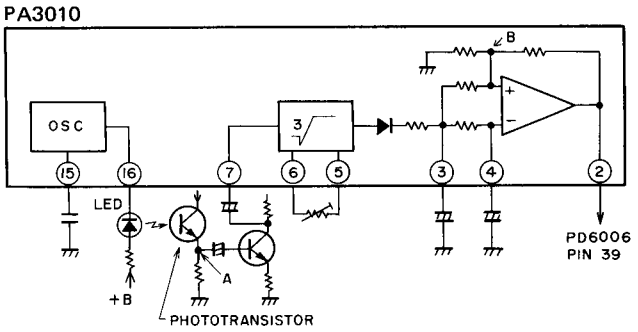


Fig. 2-6 Tape leader detector circuit

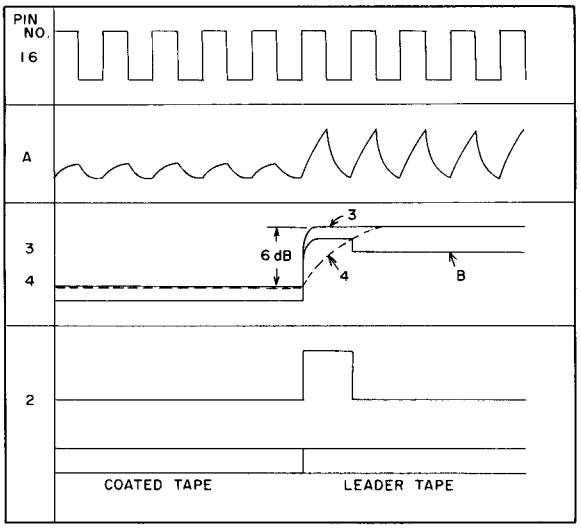


Fig. 2-7 Tape leader detector waves

2.5 END SENSOR CIRCUIT

- **CT-6R**

When the reel motor starts turning, a sensing pulse is transmitted from pin 13 of IC PA2010 (used to control the reel motor) to pin 38 of PD6006. (This pulse is taken from the Hall element and shaped into a square wave by PA2010.) When this pulse is maintained at either a low (L) or high (H) level for a period exceeding three seconds, PD6006 interprets that to mean the end of the tape and thus switches to the next mode of operation.

If the mechanism is in the fast-forward (FF), rewind (REW), or record-playback (REC/PLAY) mode, the next mode entered is STOP. If it is presently in the PLAY mode and the ⇄ reverse mode switch is selected, it also enters the STOP mode. But if ⇄ is selected, it first goes through a direction operation, then into a PLAY status.

- **CT-7R**

Since CT-7R is equipped with a tape leader detector circuit, it goes into a STOP status or goes through a direction operation before reaching the point where the end sensor circuit is activated, so normally the end sensor circuit will not operate.

However, where there is no leader on the cassette tape, or where there is an insufficient difference in the infrared transmission factor between the coated portion and leader portion of the tape, or in case the reel motor stops rotating before the tape leader is detected, the end sensor circuit is then activated, placing the unit in the STOP mode. However, in the REC/PLAY or PLAY mode, a direction operation may be called for depending on the position of the reverse mode switch.

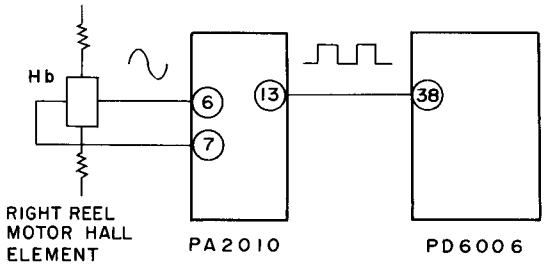


Fig. 2-8 End sensor diagram

2.6 BLANK DETECTOR IC PA3010 OPERATION

When the function key is placed ON, and the reel motor starts turning, pin 16 of PD6006 goes to a low level. When pin 16 goes low, pin 11 of the blank detector IC (PA3010) also goes low, lifting MS (Music Search) muting and commencing MS operations.

As MS MUTE is lifted, the signal is first amplified, then applied to pin 9, and its level is determined by the comparator in the next stage. Comparator output at point A is as shown in the accompanying table.

This output is used to turn Tr1 ON, and this in turn allows capacitor C connected to pin 12 to dump its charge through Tr1. Thus, pin 13 goes to a low level.

When there is no input signal present, Tr1 turns OFF, capacitor C starts recharging, and approximately 70msec later, a high level is output from pin 13.

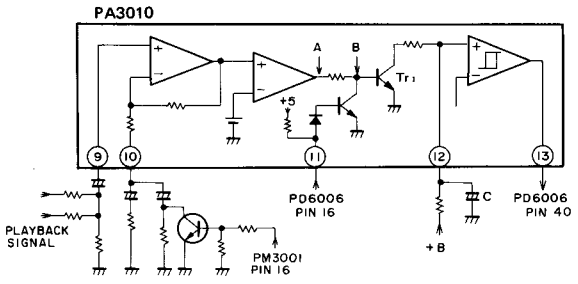


Fig. 2-9 Blank detector circuit

Consequently, when an input signal is present, pin 13 is at a low level, and no signal produces a high output. This output is used by each of the function operations (MS/SKIP, INDEX SCAN, BLANK SEARCH, MUSIC REPEAT).

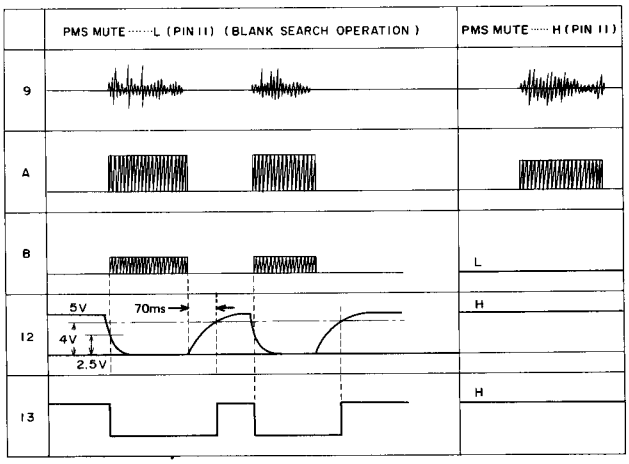


Fig. 2-10 Blank detector waves

2.7 FUNCTION KEY OPERATION

The various functions (MS/SKIP, INDEX SCAN, BLANK SEARCH, MUSIC REPEAT) are activated by placing the respective key to the ON position.

The timing chart for the pulses output from pins 10, 11, and 12 of CPU PD6006 are shown in Fig. 2-11. As a function key is placed in the ON position, a pulse train is input to either pin 36 or 37 of the CPU. The CPU then determines the timing of the pulse train, and starts operation of the selected mode accordingly. (CT-6R does not have BLANK SEARCH or MUSIC SEARCH capability.)

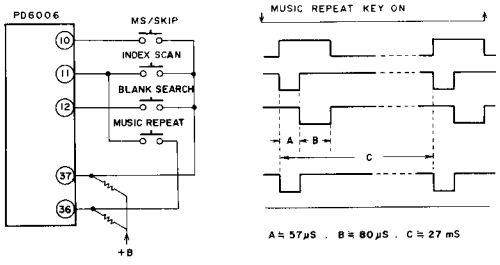


Fig. 2-11 Function key diagram

1. MS/SKIP Operation

When the MS/SKIP Key is placed ON, the FF (▷▷) key is activated, and when the beginning of a music selection is located, pin 13 of PA3010 drops from high to low. The trailing edge of the pulse effecting the level drop at the PD6006 pin sets the REWIND mode and rewinds the tape back to the beginning of the selection, and enters the PLAY mode.

At the end of the selection, if the unrecorded section of the tape (functioning to change the output from pin 13 from low to high) holds the level continuously high for over 8 seconds, PD6006 then selects the FF mode, continuing in that mode until the beginning of the next selection drops the level at pin 13 low. It then rewinds (◁◁) back out to the beginning of the selection, and enters the PLAY mode.

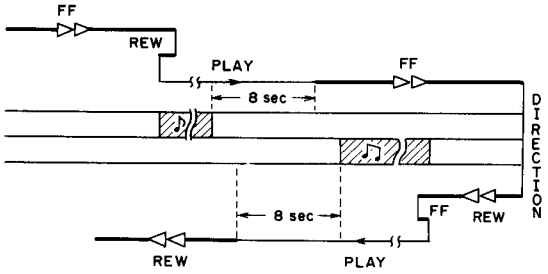


Fig. 2-12 MS/SKIP operation

2. INDEX SCAN Operation

When INDEX SCAN is activated, if the unit is operating in the FWD direction, the FF (▷▷) mode is entered; if in REV, REW (◁◁) is entered. The unit then cycles through a search operation to locate the beginning of a selection, then goes into the PLAY mode. Playback of the selection starts and continues for the 7 seconds that pin 13 of PA3010 is held low.

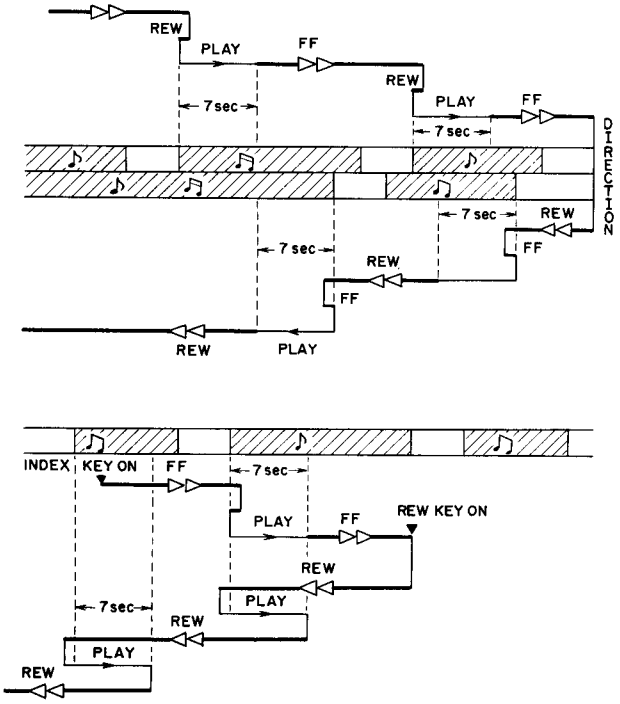


Fig. 2-13 INDEX SCAN operation

After this 7 seconds has elapsed, it once again returns to the FF or REW mode and cycles through another search operation until all selections on the tape are thus indexed.

If the tape should end while the unit is in FWD FF, or REV REW, either the STOP status would be entered, or a direction operation would allow search to continue, depending on the reverse mode switch setting.

When in INDEX SCAN operation, REW KEY (FF KEY in REV direction) is placed ON, INDEX SCAN is operated in REW mode as shown in Fig. 2-13.

3. BLANK SEARCH Operation

When the BLANK SEARCH key is placed ON, if the unit is operating in the FWD direction, the search is started in the FF (▷▷) mode; if operating in REV, it is started in the REW (◁◁) mode.

When input to the blank detector (output by pin 13 of PA3010) is held high for 8 seconds, or when the tape end sensor is detected, the present direction of travel is reversed, and the tape returns to the position where input to the blank detector snapped from high to low.

From this position, the unit reenters the PLAY mode until a point is reached where the input at the blank detector is maintained at a continuously high level for 4 seconds. It then goes into a STOP status, completing the operation.

As shown in Fig. 2-14(3), in case of the unrecorded tape, the tape returns to the tape end in REW mode after the search had been done for 8 seconds in FF mode.

When detecting the tape end, the tape travels the leader tape portion for 0.8 seconds in FF mode and then goes into a STOP.

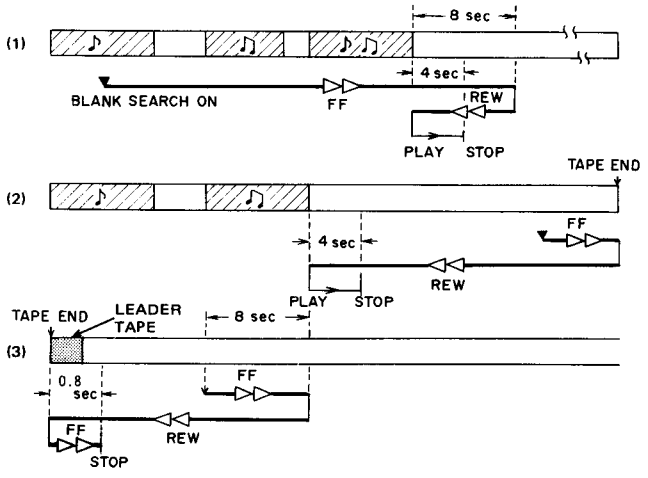


Fig. 2-14 BLANK SEARCH operation

4. MUSIC REPEAT Operation

When the MUSIC REPEAT key is placed ON while the unit is presently in the PLAY status, the present music selection (or the next if unrecorded tape selections) continues to completion, then the output from pin 13 of PA3010 goes from low to high. After the output of pin 13 has been held high for 2.5 seconds, the unit returns to the beginning of that selection and repeats playback.

This operation may be repeated for the same selection for up to 8 times, after which MUSIC REPEAT is cleared and a STOP status entered.

The STOP status will also be entered in case the end sensor is activated.

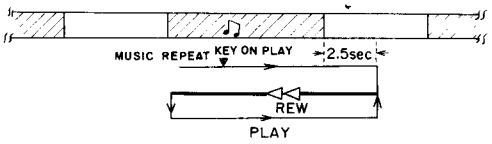


Fig. 2-15 MUSIC REPEAT operation

2.8 DOLBY NR PROCESSOR

The CT-7R and CT-6R both feature type B and type C Dolby NR processors.

The type C Dolby NR system enables noise to be reduced by up to 20dB at frequencies above 1kHz. The basic operating principles are the same as for the type B Dolby NR system, the major difference lying in the use of two separate processor stages (a high level stage and a low level stage connected in series). Switching to a type B Dolby NR processor also enables type B encoded tapes to be played. Block diagrams for encoding and decoding operations are outlined in Figs. 2-17 and 2-18 respectively. The corresponding input/output frequency response curves are shown in Fig. 2-16.

The REC signal is passed through a spectral skewing circuit (see Fig. 2-17) which is an LC resonator with an for at 20kHz, and designed to prevent low to mid-range decoding error (high level leakage) due to high level signals.

The REC signal is then applied to the 1st processor stage (high level stage) where it is divided into 2 signals, the main signal being passed directly to adder A, while the main signal is passed via SCF-1 (side chain filter), amplifier B and overshoot suppressor C before being applied to adder A where the main and sub signals are recombined.

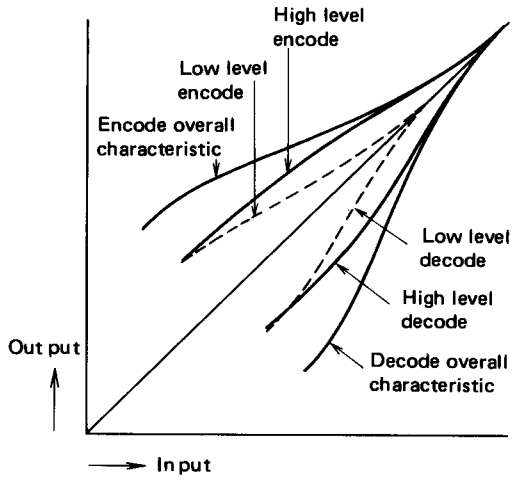


Fig. 2-16 Input/Output characteristic

In addition, the amplifier B output is applied to rectifier E (non-linear integrating type) via amplifier D, the rectified output being applied to VCR-1 (voltage control resistor) of SCF-1. This SCF is a variable high-pass filter where the frequency response is varied according to the VCR value. The VCR value is increased under low level conditions, and the SCF-1 turnover frequency is determined by C1/R1. The level of the adder A output will thus be 10dB higher than the main signal level (around 1.5kHz), and the dynamic range will be contracted. The VCR value will drop when the VCR control voltage exceeds the threshold value, and the SCF-1 turnover frequency will be increased by C2/C3/R2/VCR-1, thereby attenuating low to mid-range signals in the sub-signal. And since the sub to main signal ratio is lower at higher input signal frequencies, the degree of dynamic range contraction is smaller.

The adder A output is applied to the 2nd processor stage (low level stage) where the signal whose dynamic range was compressed in the 1st compressor stage is added. In order to further compress the dynamic range in this 2nd processor stage, the threshold level of the 2nd processor VCR-2 control voltage is set below the corresponding level of the 1st processor stage. The 2nd processor stage also includes an anti-saturation circuit R. The purpose of this circuit is to effect the same improvements as the spectral skewing circuit.

During playback (see Fig. 2-18), the same basic circuitry is used as in recording mode, but with the 1st and 2nd processor stages in the reverse order. Since the circuit starts from the output of the inverter (sub-signal output), a negative feedback loop is formed with the sub-signal being subtracted

from the main signal in adder A'. And since the sub-signal path operation is exactly the same as during recording mode, the decoding and encoding characteristics complement each other. Furthermore, the anti-saturation P and spectral de-skewing characteristics during decoding are the exact opposite of the corresponding characteristics during encoding. Consequently, a flat frequency response is maintained at all levels after all phases of the encoding and decoding opperations are completed.

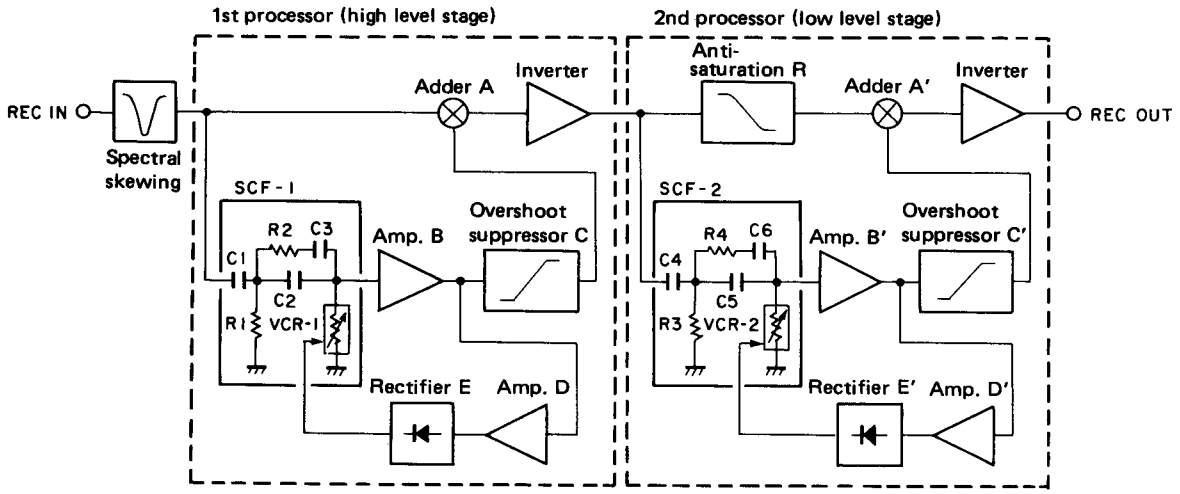


Fig. 2-17 Block diagram for encoding operation

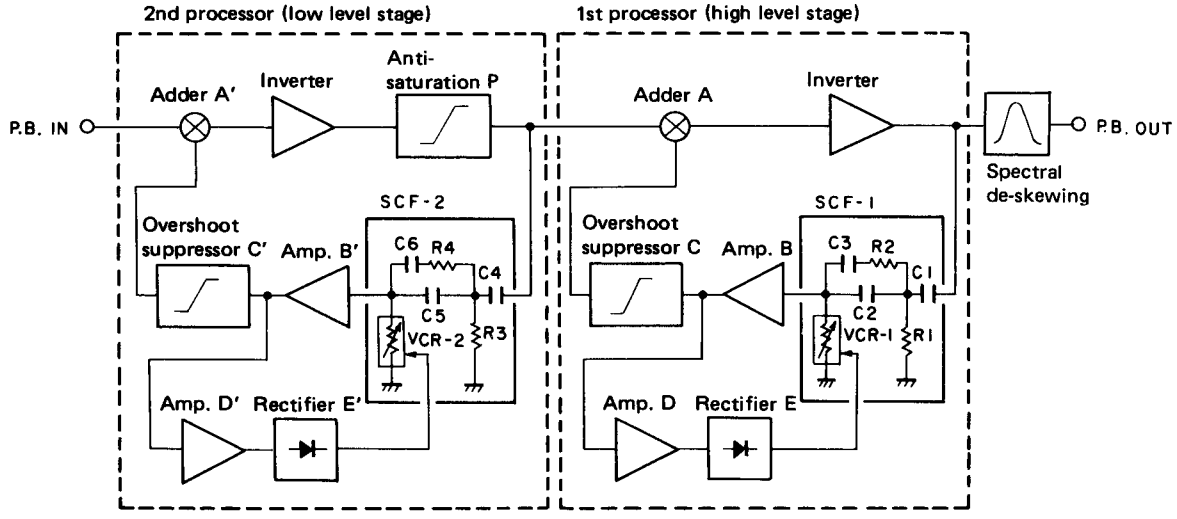


Fig. 2-18 Block diagram for decoding operation

Timing chart 1

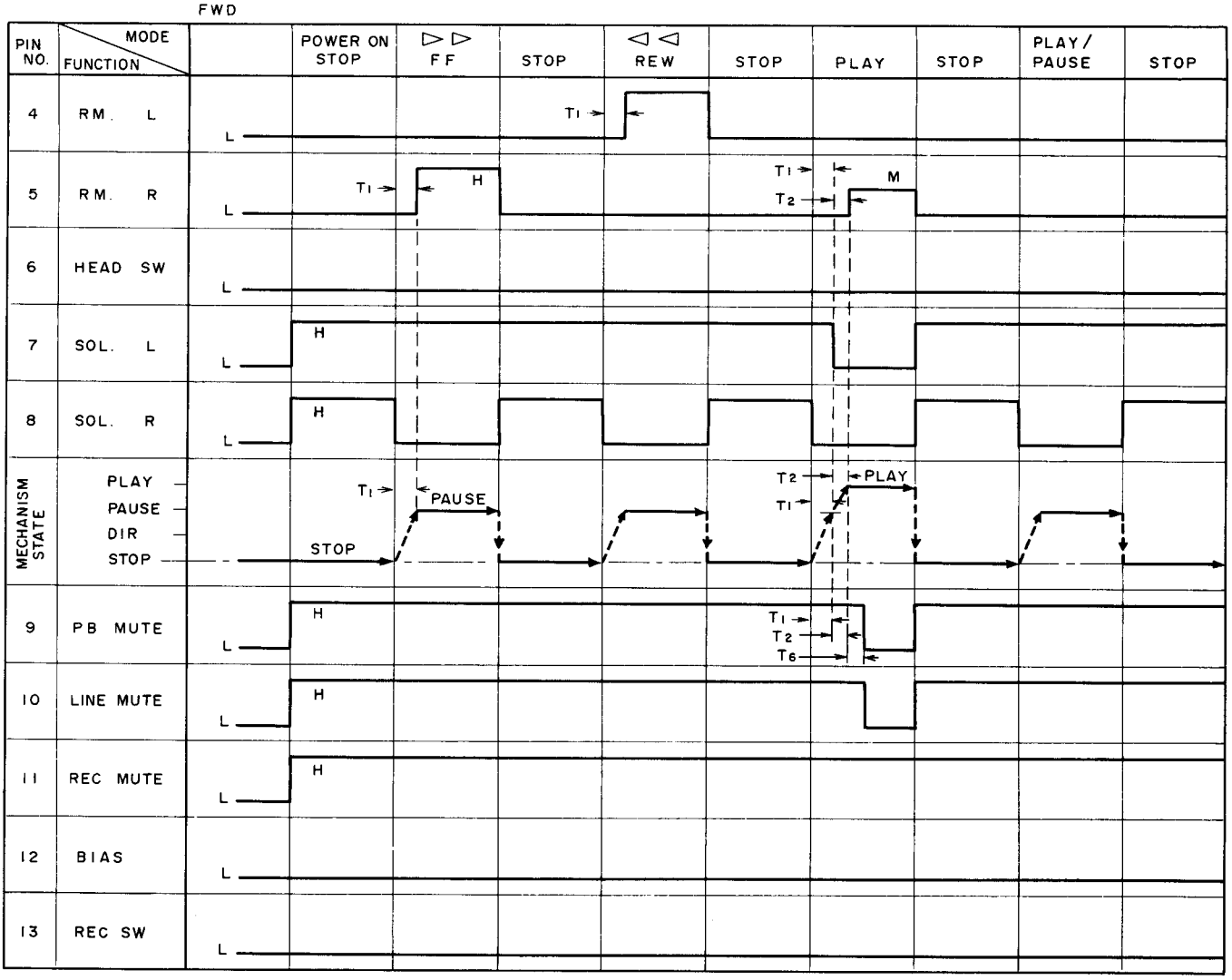


Fig. 2-19 Timing chart of PM3001, 1

Timing chart 2

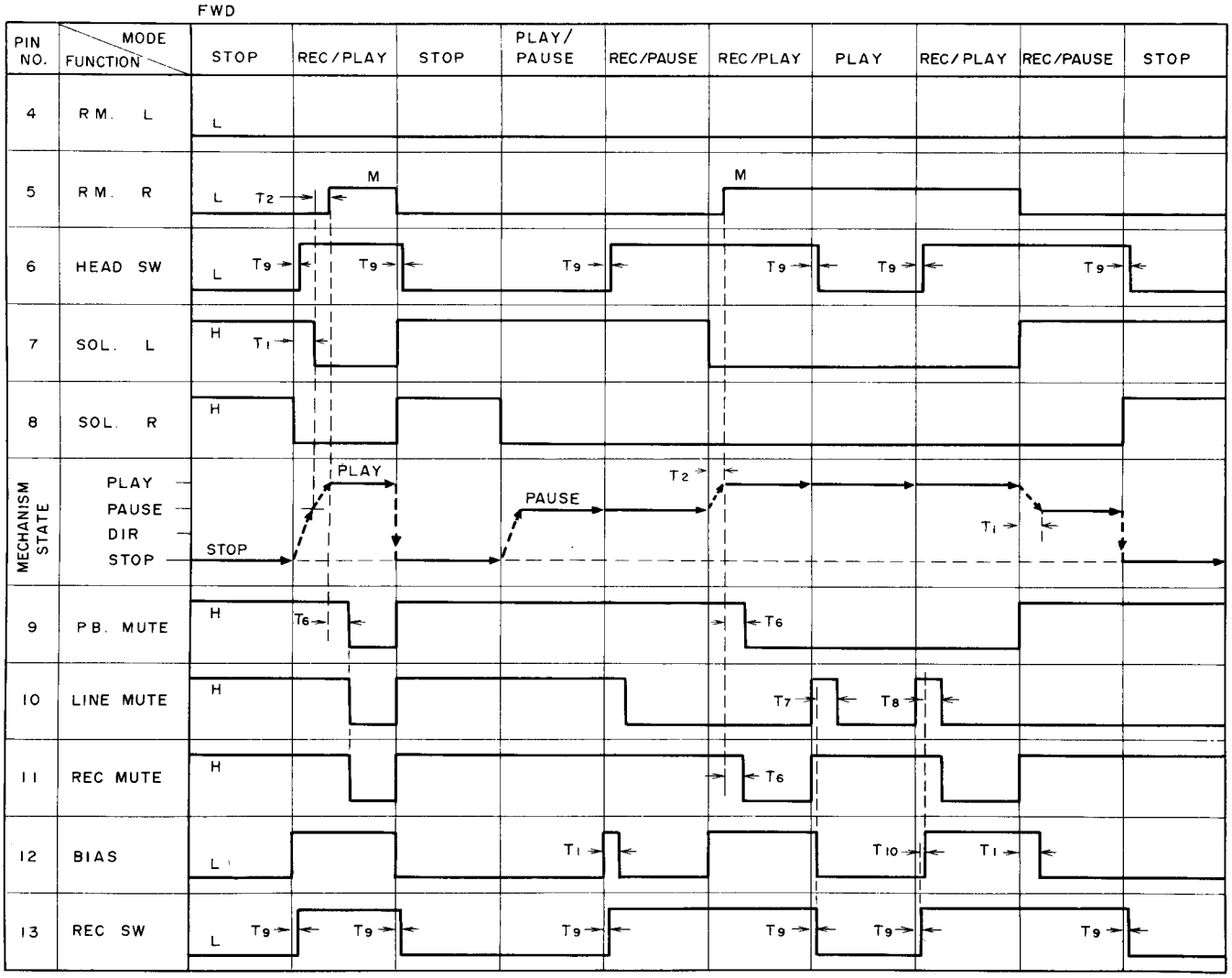


Fig. 2-20 Timing chart of PM3001, 2

Timing chart 3

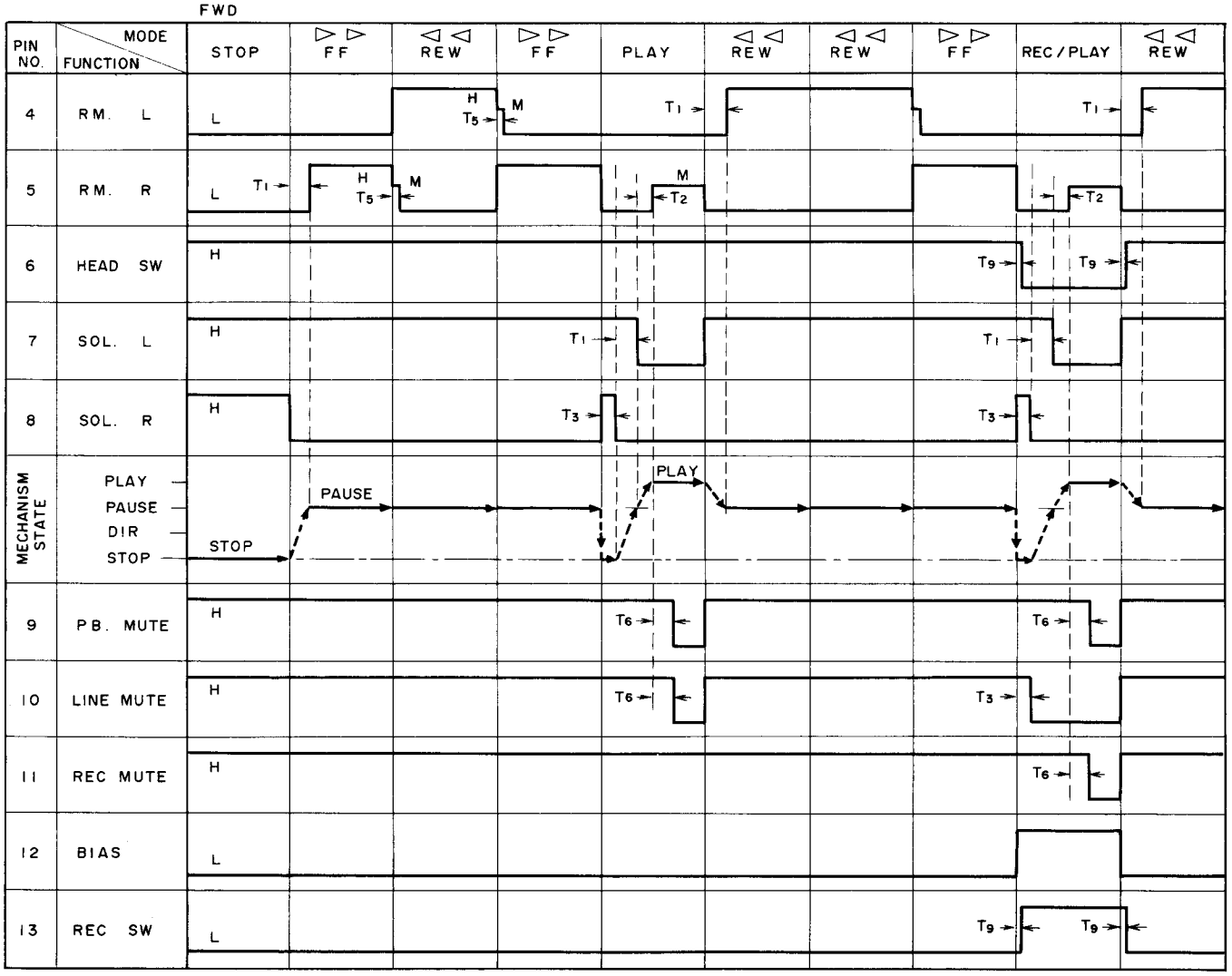


Fig. 2-21 Timing chart of PM3001, 3

Timing chart 4

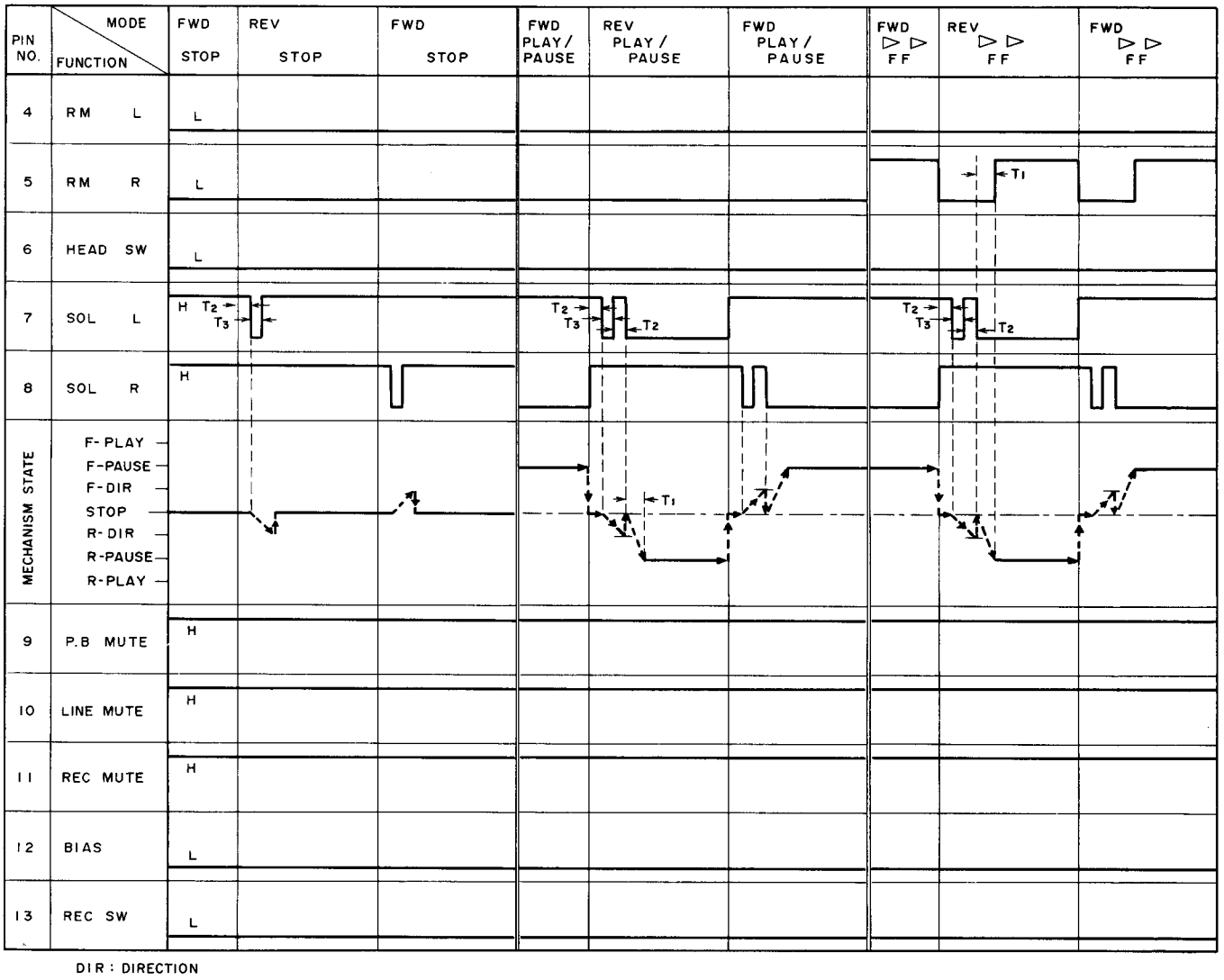


Fig. 2-22 Timing chart of PM3001, 4

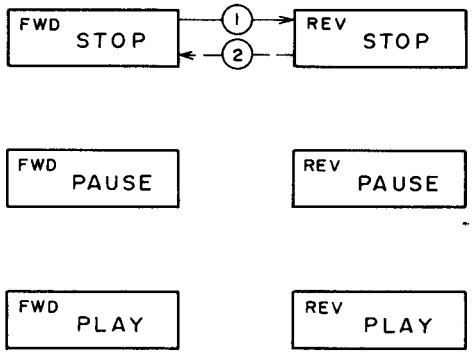


Fig. 2-23 Direction operation (in STOP status)

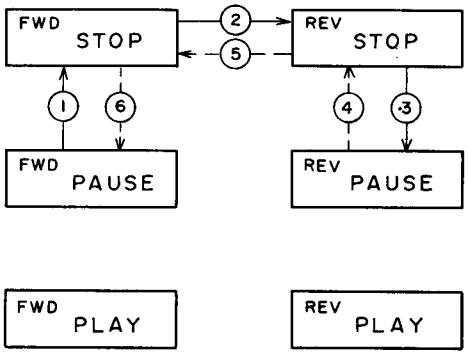


Fig. 2-24 Direction operation (in PAUSE, FF and status)

Timing chart 5

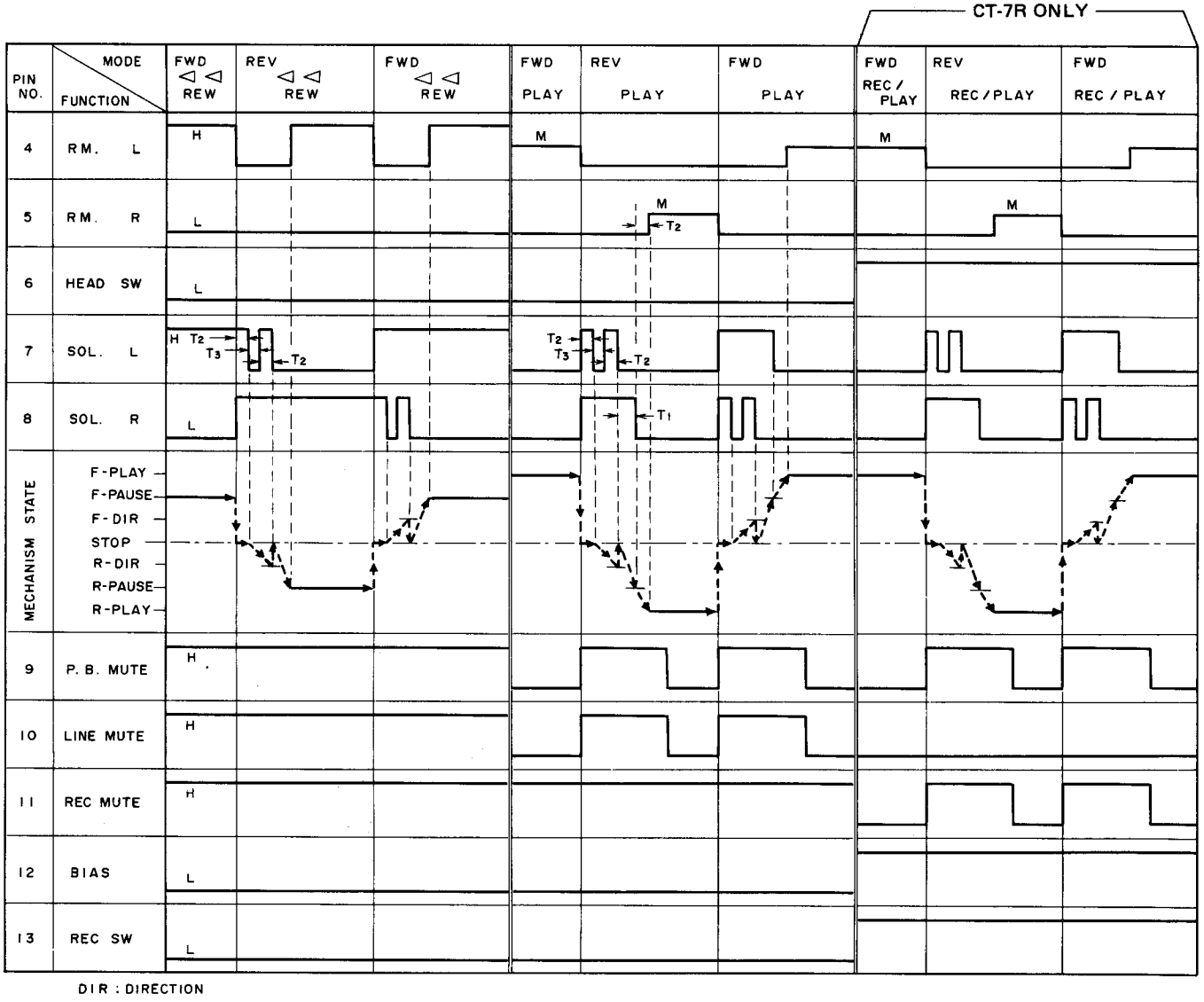


Fig. 2-25 Timing chart of PM3001, 5

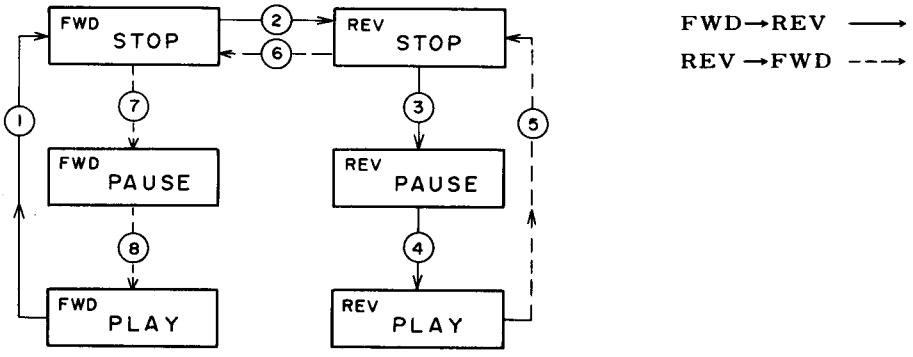
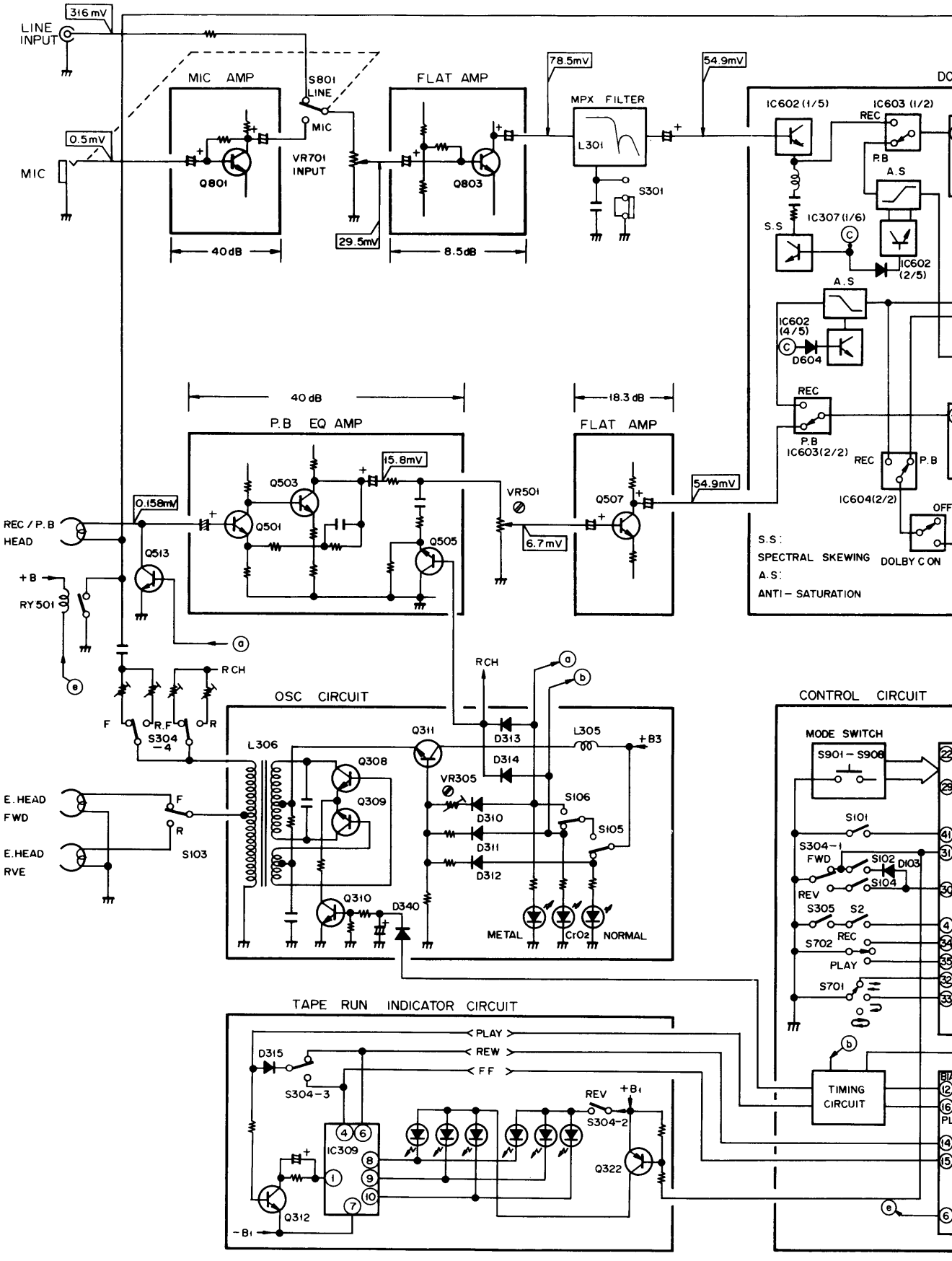
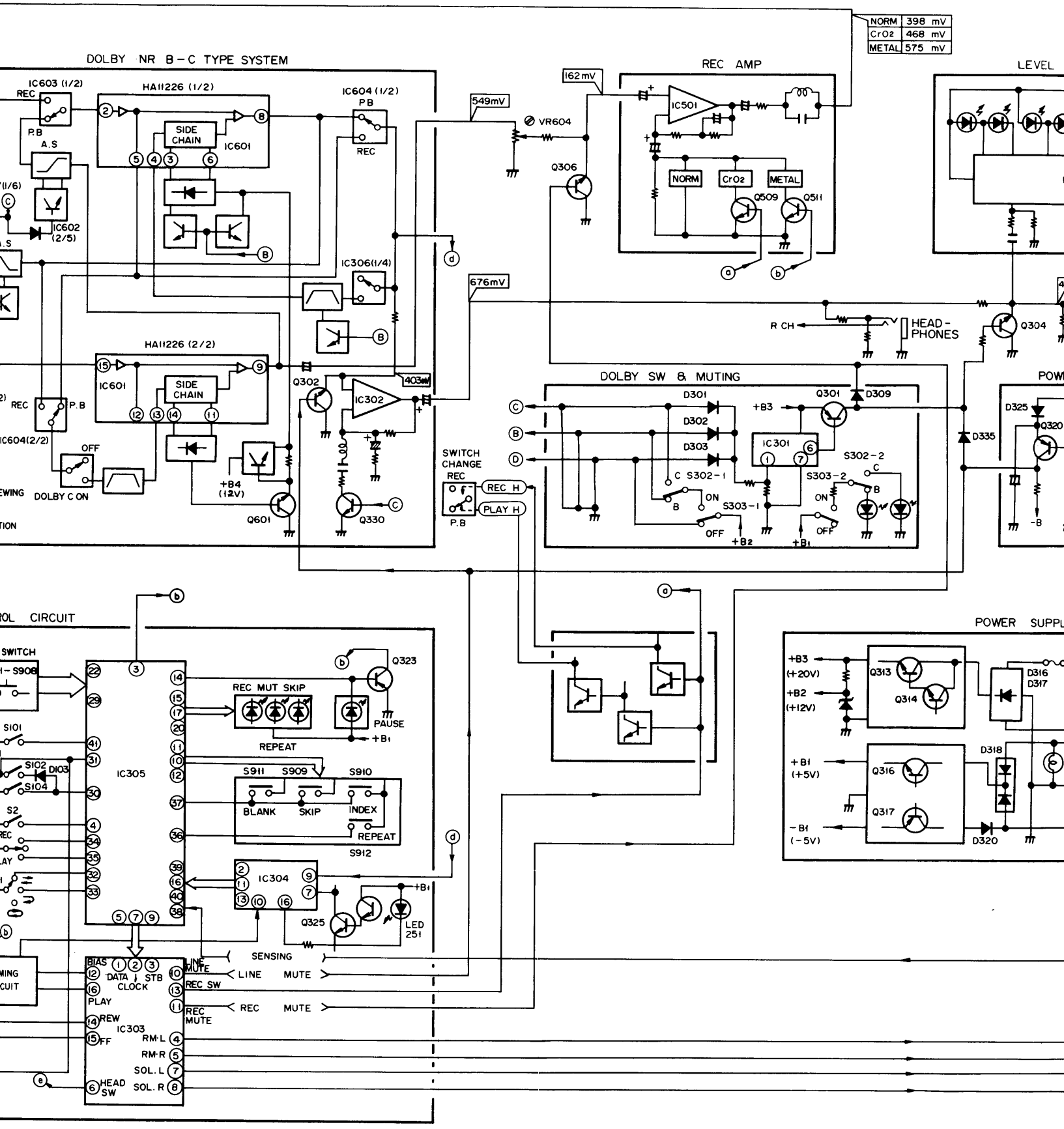


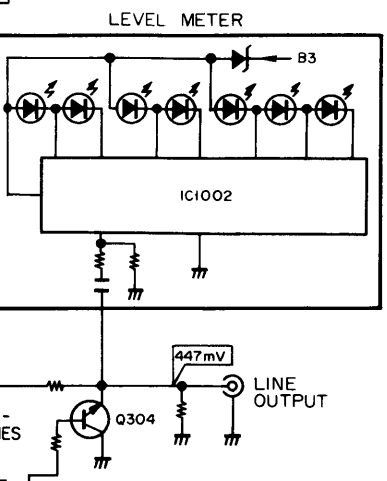
Fig. 2-26 Direction operation (in PLAY and REC/PLAY status)

3. BLOCK DIAGRAM

■ **CT-7R**



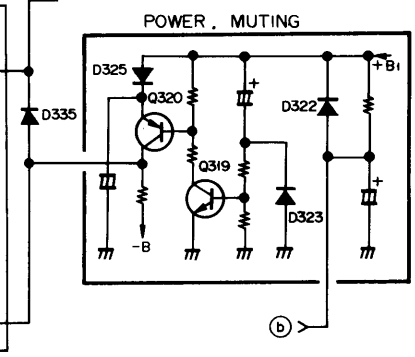

NORM 398 mV
CrO2 468 mV
METAL 575 mV
DOLBY NR B-C TYPE SYSTEM
REC AMP
LEVEL
IC603 (1/2)
REC
P.B
A.S
HA11226 (1/2)
SIDE CHAIN
IC601
IC604 (1/2)
P.B
REC
IC602 (2/5)
IC306(1/4)
HA11226 (2/2)
IC604(2/2)
OFF
DOLBY C ON
+B4 (12V)
Q601
Q302
IC302
Q330
403mV
549mV
VR604
Q306
162mV
IC501
NORM
CrO2
METAL
Q509
Q511
676mV
R CH
HEAD-PHONES
Q304
DOLBY SW & MUTING
D301
D302
D303
C S302-1
ON
OFF
+B2
IC301
Q301
+B3
D309
S302-2
S303-2
S303-1
+B1
SWITCH CHANGE
REC
REC H
PLAY H
P.B
D335
D325
Q320
POWER SUPPL
CIRCUIT
SWITCH
S101
S102
D103
S104
S2
IC305
Q323
REC MUT SKIP
PAUSE
REPEAT
+B1
S911
S909
S910
BLANK
SKIP
INDEX
REPEAT
S912
IC304
Q325
LED 251
SENSING
BIAS
DATA
CLOCK
STB
LINE MUTE
REC SW
REC MUTE
PLAY
REW
FF
IC303
RM-L
RM-R
SOL. L
SOL. R
HEAD SW
LINE MUTE
REC MUTE
+B3 (+20V)
+B2 (+12V)
+B1 (+5V)
-B1 (-5V)
Q313
Q314
D316
D317
Q316
Q317
D318
D320

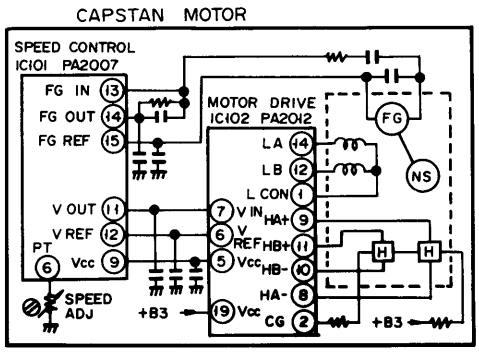


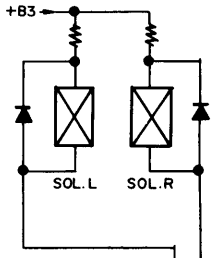
SWITCHES :

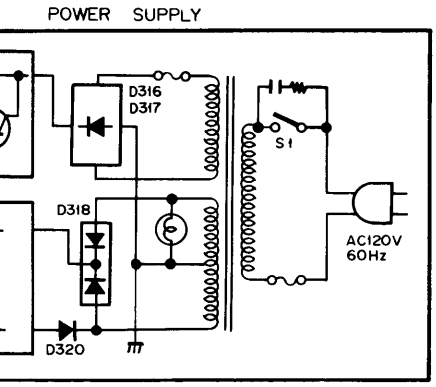
S1	POWER	ON – OFF	S901	REC MUTE	ON – OFF
S2	TAPE COUNTER	ON – OFF	S902	REC	ON – OFF
S301	MPX FILTER	ON – OFF	S903	PLAY	ON – OFF
S302	DOLBY NR	TYPE B – TYPE C	S904	PAUSE	ON – OFF
S303	DOLBY NR	ON – OFF	S905	FF	ON – OFF
S304	FWD/REV SELECTOR	FWD – REV	S906	REW	ON – OFF
S305	MEMORY	ON – OFF	S907	STOP	ON – OFF
S701	MODE	⇄ – ⇉ – ↻	S908	DIRECTION	ON – OFF
S702	TIMER	REC – OFF – PLAY	S909	SKIP	ON – OFF
S801	INPUT SELECTOR	LINE – MIC	S910	INDEX SCAN	ON – OFF
			S911	BLANK SEARCH	ON – OFF
			S912	MUSIC REPEAT	ON – OFF

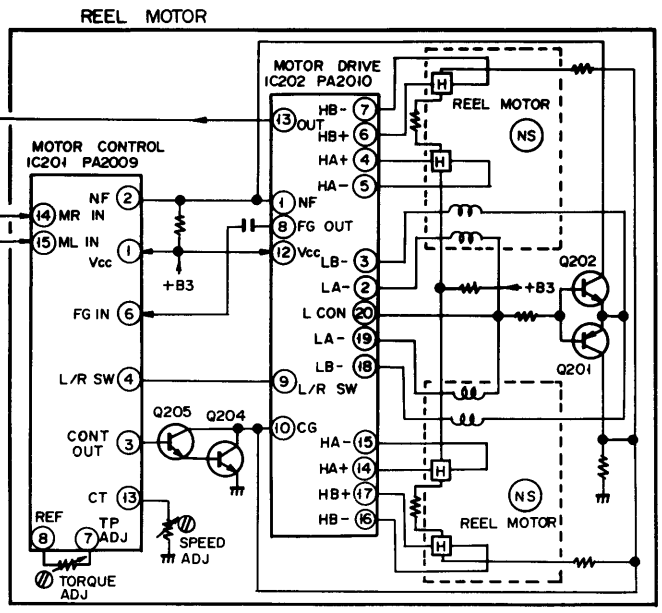
The underlined indicates the switch position.



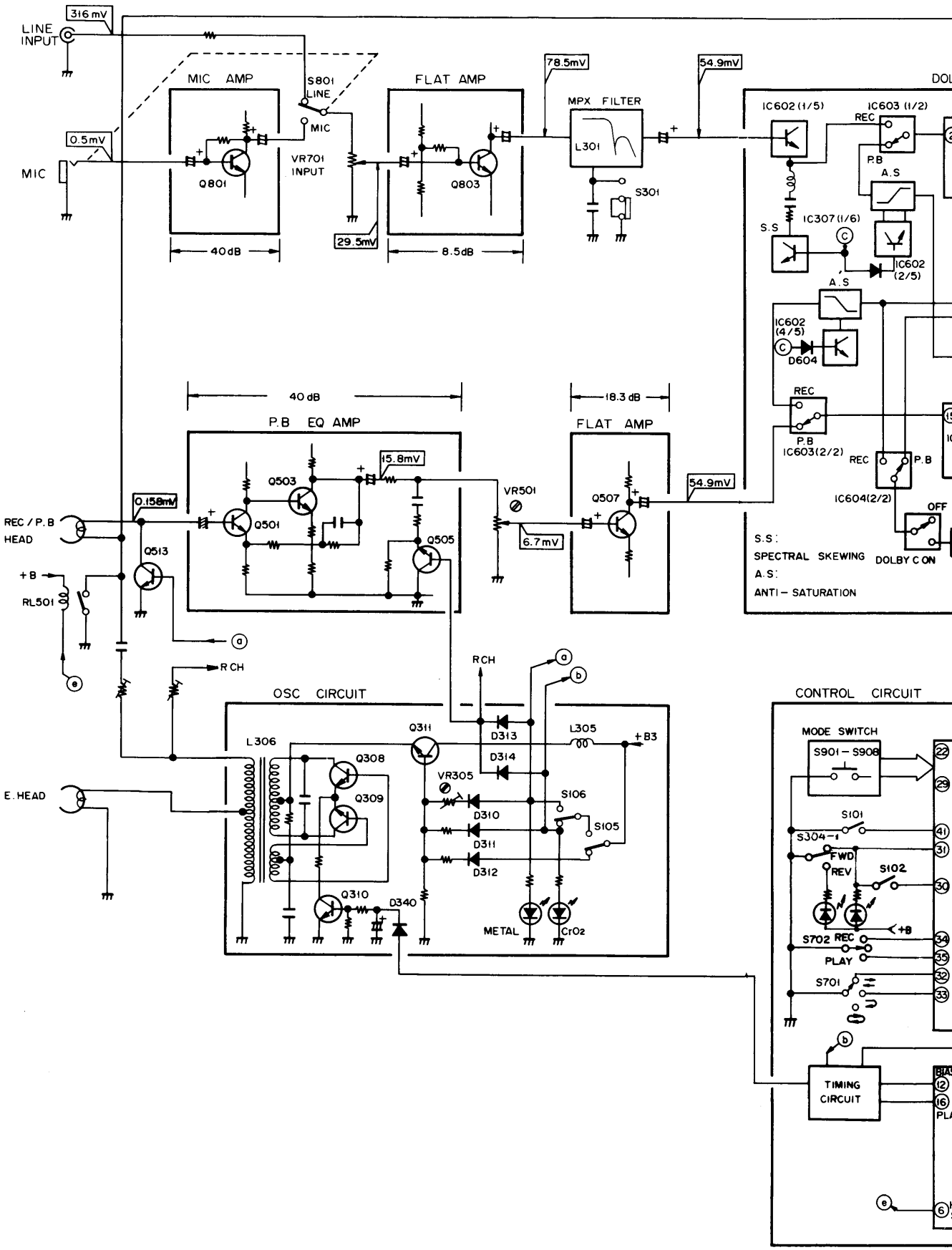


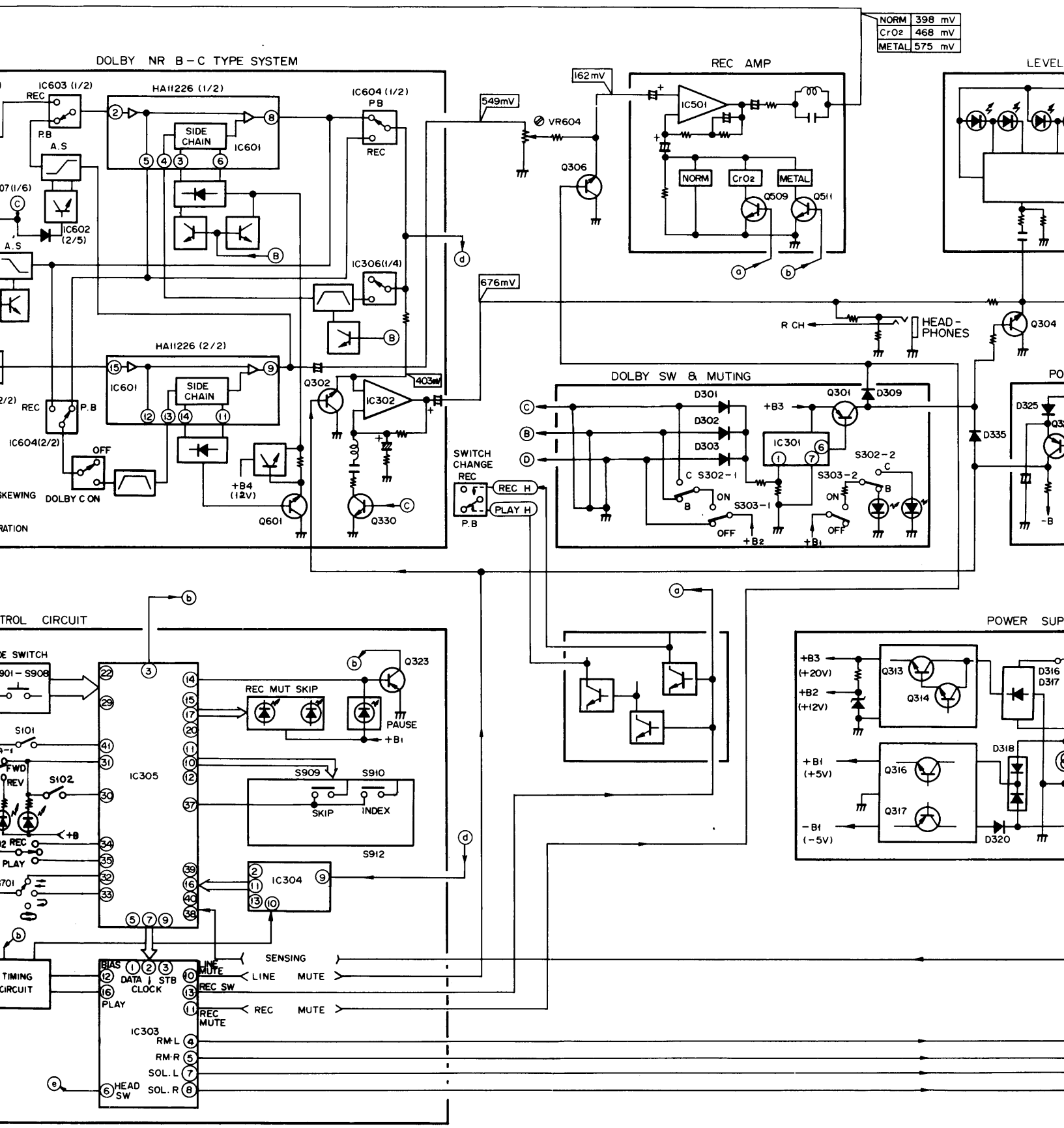




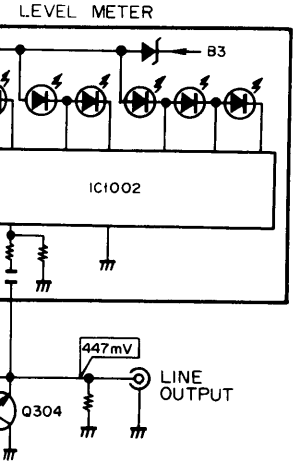


■ **CT-6R**


316mV
LINE INPUT
0.5mV
MIC
MIC AMP
S801
LINE
MIC
VR701
INPUT
Q801
40dB
29.5mV
FLAT AMP
Q803
8.5dB
78.5mV
MPX FILTER
L301
S301
54.9mV
IC602 (1/5)
IC603 (1/2)
REC
P.B
A.S
S.S
IC307 (1/6)
IC602 (2/5)
IC602 (4/5)
D604
REC
P.B
IC603(2/2)
REC
P.B
IC604(2/2)
OFF
S.S:
SPECTRAL SKEWING
DOLBY C ON
A.S:
ANTI – SATURATION
40 dB
P.B EQ AMP
15.8mV
Q503
Q501
Q505
VR501
6.7mV
18.3 dB
FLAT AMP
Q507
54.9mV
0.158mV
REC / P.B
HEAD
Q513
+B
RL501
RCH
E.HEAD
OSC CIRCUIT
L306
Q308
Q309
Q310
Q311
D340
D313
D314
L305
+B3
VR305
S106
S105
D310
D311
D312
METAL
CrO2
RCH
CONTROL CIRCUIT
MODE SWITCH
S901 – S908
S101
S304-1
FWD
REV
S102
+B
S702
REC
PLAY
S701
TIMING
CIRCUIT


NORM 398 mV
CrO2 468 mV
METAL 575 mV
DOLBY NR B-C TYPE SYSTEM
REC AMP
LEVEL
IC603 (1/2)
REC
P.B
A.S
HA11226 (1/2)
SIDE CHAIN
IC601
IC604 (1/2)
P.B
REC
IC602 (2/5)
IC306(1/4)
HA11226 (2/2)
IC604(2/2)
OFF
DOLBY C ON
+B4 (12V)
Q601
Q330
Q302
IC302
403mV
549mV
VR604
Q306
162mV
IC501
NORM
CrO2
METAL
Q509
Q511
676mV
R CH
HEAD-PHONES
Q304
DOLBY SW & MUTING
D301
D302
D303
C S302-1
S303-1
ON
OFF
+B2
IC301
+B3
Q301
D309
S302-2
S303-2
+B1
D335
D325
SWITCH CHANGE
REC
REC H
PLAY H
P.B
TROL CIRCUIT
POWER SUP
IC305
S101
S102
FWD
REV
REC
PLAY
+B
REC MUT SKIP
Q323
PAUSE
S909
S910
SKIP
INDEX
S912
IC304
TIMING CIRCUIT
BIAS
DATA
CLOCK
STB
PLAY
IC303
REC MUTE
REC SW
LINE MUTE
SENSING
RM-L
RM-R
SOL. L
SOL. R
HEAD SW
+B3 (+20V)
+B2 (+12V)
+B1 (+5V)
-B1 (-5V)
Q313
Q314
Q316
Q317
D316
D317
D318
D320

LEVEL METER

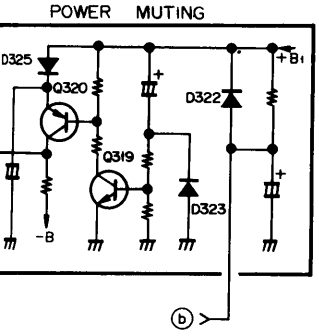


SWITCHES :

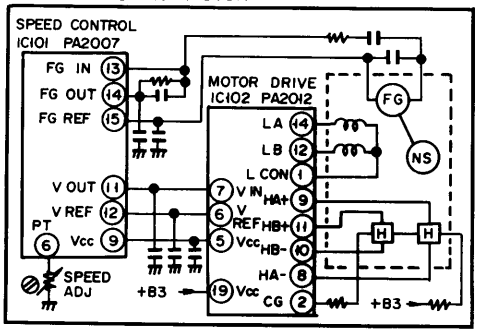
S1 : POWER	ON – OFF	S901 : REC MUTE	ON – OFF
S2 : TAPE COUNTER	ON – OFF	S902 : REC	ON – OFF
S301 : MPX FILTER	ON – OFF	S903 : PLAY	ON – OFF
S302 : DOLBY NR	TYPE B – TYPE C	S904 : PAUSE	ON – OFF
S303 : DOLBY NR	ON – OFF	S905 : FF	ON – OFF
S304 : FWD/REV SELECTOR	FWD – REV	S906 : REW	ON – OFF
S305 : MEMORY	ON – OFF	S907 : STOP	ON – OFF
S701 : MODE	⇄ – ↻ – ↻	S908 : DIRECTION	ON – OFF
S702 : TIMER	REC – OFF – PLAY	S909 : SKIP	ON – OFF
S801 : INPUT SELECTOR	LINE – MIC	S910 : INDEX SCAN	ON – OFF

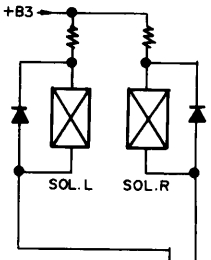
The underlined indicates the switch position.

POWER MUTING

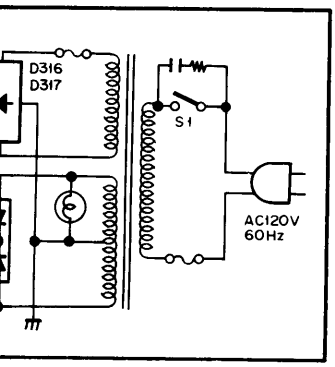


CAPSTAN MOTOR





ER SUPPLY



REEL MOTOR