

SONY®

TROUBLESHOOTING GUIDE

WM-10 WM-20

STEREO CASSETTE PLAYER

US, Canadian Model

AEP, UK, E Model

Sony Corporation

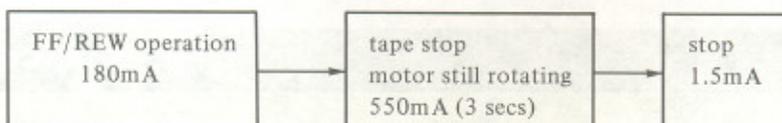
TABLE OF CONTENTS

<u>Description</u>	<u>Page</u>
General precautions for repair	2
No operation	3
Noise when battery is worn out (less than 0.9V) }	
No power	4, 5
LED does not light up	
No converter operation	
Converter board simple check method	
Motor does not stop for FF/REW STOP	6
No muting	7, 8
No sound (FWD, but no sound)	
Low level	
No Dolby	
Hum noise during playback	
Noise on L-CH	9~12
No motor rotation	
Motor coil check method	
Fast, slow speed	
No speed acceleration	13, 14
Servo board (A) (B) simple check method	
Defective tape transport I	15, 16
Defective tape transport II	17
Repair know how	17

This book is for quick and easy repairing.
File with the service manual.

(1) General Precautions for Repair

- 1) There is a safety switch built into the headphone jack, but it does not operate unless the headphone plug is plugged in.
- 2) When screwing in the control panel and audio board screws, be sure to insert a cassette tape first.
Reason: If pressure is applied to the tape transport reel chassis, its plane is affected.
- 3) When performing repair which involves the removal of the function plate block or sleeve ass'y, be sure to check shut-off for FWD.
- 4) In FF/REW mode, there is a rolling noise for about 3 seconds at tape end, then the motor stops. Check by referring to the power changes below.

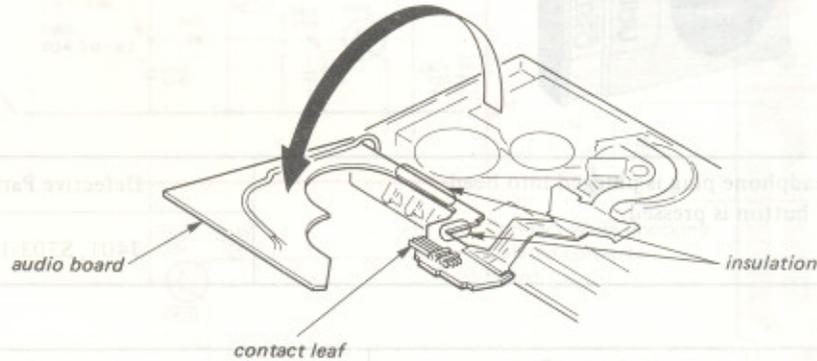


- 5) Do not reuse the capstan bush after having removed it.
- 6) By removing the audio board from the set and touching S303-1 (Power ON) the motor will rotate without pushing the FWD button (belt is on).
There will be a clicking noise, but this is not a defect, and will stop when the FWD button is pushed.
- 7) Defective soldering, pattern cuts, parts touching, etc. are not included under "Defective Parts" and "Defective Locations", but be sure to check these also.

- No Operation
- Noise when battery is worn out (less than 0.9V)

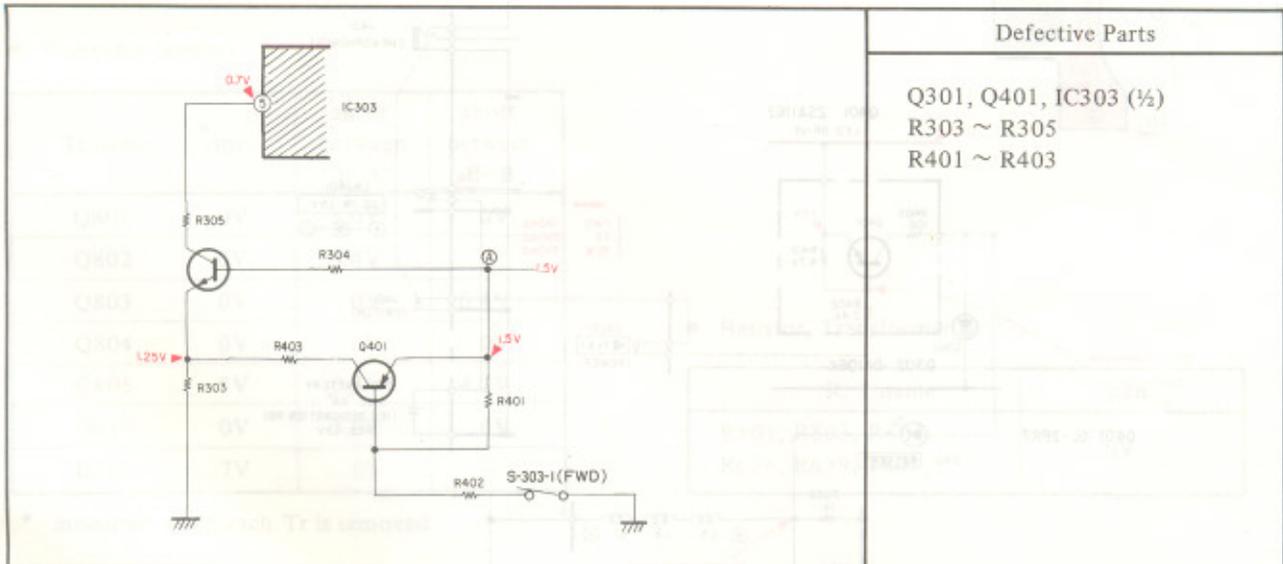
- No Operation

Cause	Defective Location
Battery worn out Battery terminal plate dirty.	Clean terminal plate (Daifron solvent)
Dirty leaf switch contact point.	S303-1 contact point cleaning (Daifron solvent)
Battery short: battery + terminal and audio board ground touched.	Stick insulation on audio board.
Short of function plate ass'y mounting screw tip and audio board pattern.	Stick insulation on audio board.



- Noise when battery is worn out

Operation: When (A) becomes 1.0V, Q401 goes off, Q301 turns on, grounds IC303 (5) and reduces buzz noise.

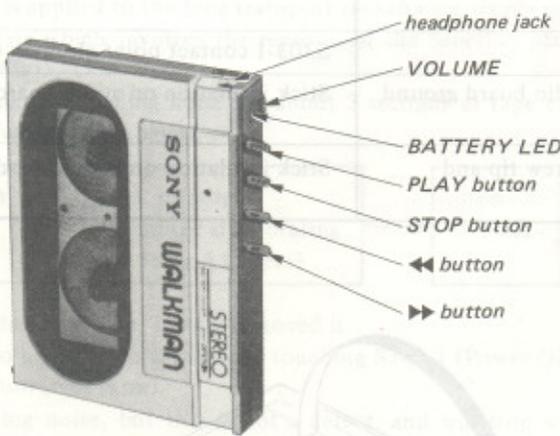


- No Power
- LED does not light up
- No converter operation
- Converter Board Simple Check Method

No Operation
 • Noise when battery is worn out (less than 0.9V)

• No Power

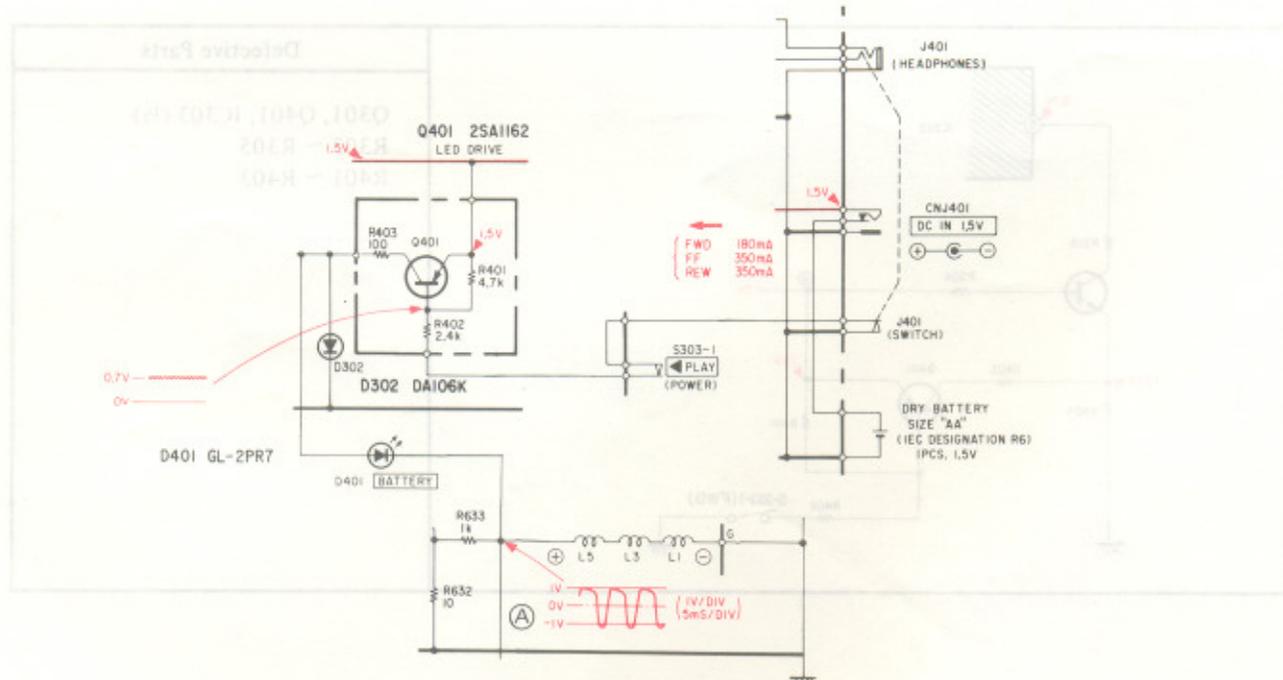
If the battery LED lights up and reel table rotates when the headphone plug is plugged into the headphone jack and PLAY button is pressed, OK.



No operation when headphone plug is plugged into headphone jack and PLAY button is pressed.	Defective Part
	J401, S303-1

• LED does not light up

Voltage, Waveform	Defective Parts	Notes
	D401, R401 ~ R403 } open Q401, L1, L3, L5 } flexible board D302 short	This LED (D401) uses motor reverse voltage, so does not light up if the motor does not rotate. Lights up at 2.5V



- No converter operation

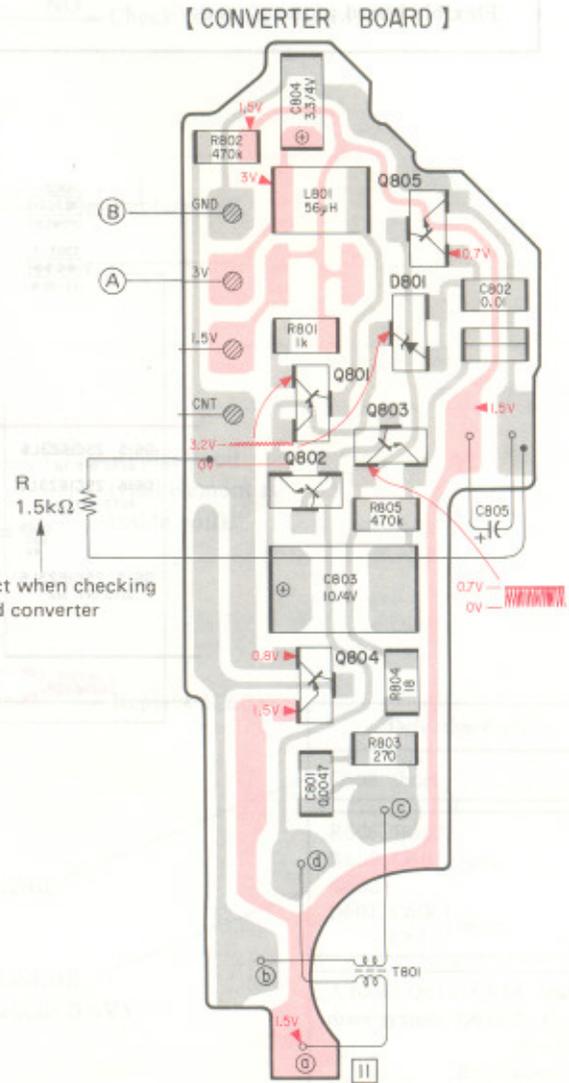
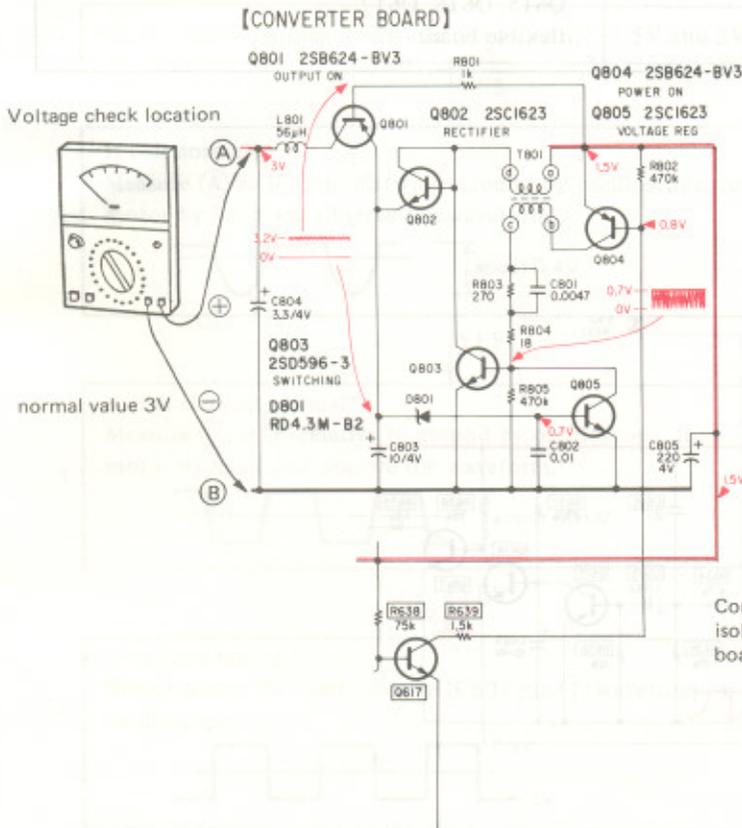
Operation:

1.5V is first made AC, raised to 3.0V, then DC 3.0V is obtained. Frequency approx. 100kHz.

- Converter Board Simple Check Method

When the converter board is on the servo board (A), check for 3V between (A) and (B).

When the converter board is by itself, solder on a 1.5kΩ resistor as shown in the figure below and check for 3V between (A) and (B).



Connect when checking isolated converter board.

- Transistor Section

Tr name	* open	short between E-C	short between E-B
Q801	0V	3.0V	0V
Q802	0V	0.4V	-
Q803	0V	0V	0.4V
Q804	0V	0V	0V
Q805	7V	0.5V	4.2V
Q617	0V	3.0V	0V
D801	7V	0V	-

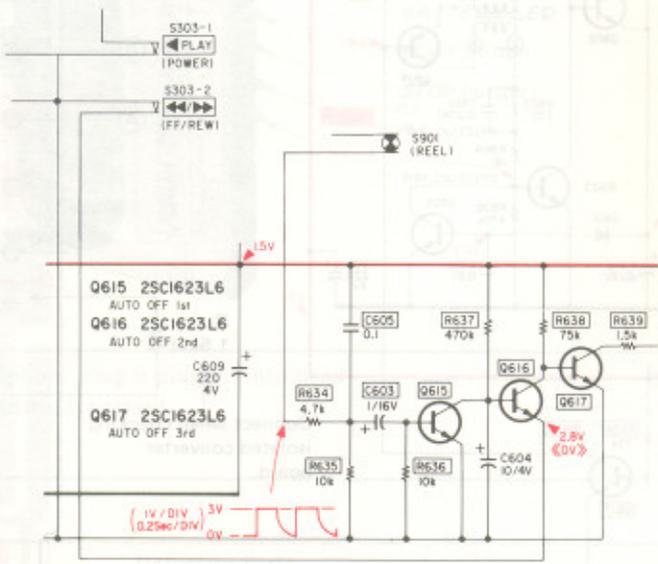
* measured when each Tr is removed.

- Resistor, Transformer Section

R, T name	open
R801, R803, R804, R638, R639, T801	0V

• Motor does not stop for FF/REW STOP

Cause	Defective Parts
Defective rotation switch (S901) contact point. Auto off circuit structural parts Flexible board pattern open	S901, R634 ~ R639, C603 ~ C605 Q615, Q616, Q617 flexible board



R-T name	Value
R601, R602, R603	10k
R604, R605, T801	10k

T name	open	between E-C	short
Q601	0V	2.0V	0V
Q602	0V	0.4V	-
Q603	0V	0.4V	-
Q604	0V	0V	-
Q605	0V	0V	-
Q617	0V	2.8V	0V
D801	1V	0V	-

- No Muting
- No Sound (FWD, but no sound)
- Low level
- No Dolby
- Hum Noise during Playback
- Noise on L-CH

- No Muting

Operation:
 Mutes click noise immediately after power on at power IC (IC303) pin ⑩.
 During FF/REW, IC303 pin ① becomes 0.2V and muting is applied.

IC303 pin ⑩

Voltage, Waveform	Defective Parts
	Q302, R307, R308 C306, IC303

IC303 pin ①

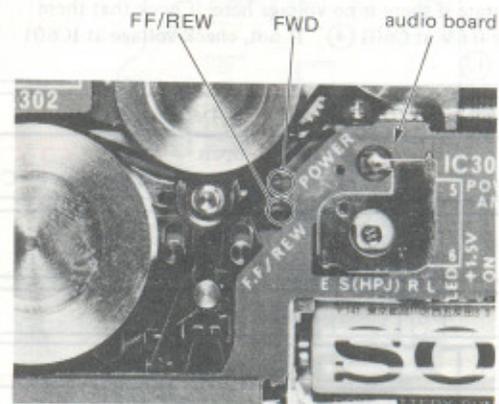
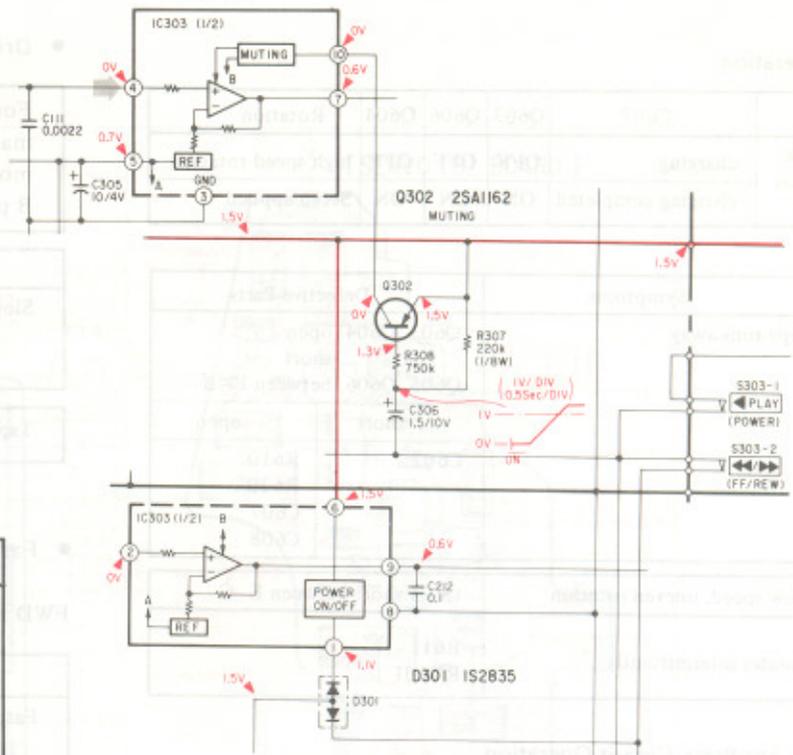
Voltage, Waveform	Defective Parts
	D301, IC303

Note: Use an oscilloscope to measure IC303 pin ① voltage.

- No Sound (FWD, but no sound)

Cause	Remedy
Head lead open, defective head contact.	Check head lead, head position.
If leaf switch S303-2 (FF/REW) is on, muting is applied.	Move audio board in direction of the arrow to change FF/REW switch contact point.
Defective preamp IC (IC301), Dolby IC (IC302), power IC (IC303), circuit structural parts, or audio volume defective.	Check IC301, IC302, IC303, Circuit parts, audio volume
Defective contact point because of ground plate solder on rear of audio board.	Check ground plate solder. (8 locations)
No playback level.	*See next page "Level".

IC303 CX-20089
POWER AMP



* Conditions

DOLBY: OFF
 TYPE: NORMAL
 standard tape: P-4-L81
 Headphone connected

HEAD IN IC301 L⑧ } 1mVp-p
 IC301 R① }
 PRE AMP IC301 L⑩ } 60mVp-p
 IC301 R⑮ }
 DOLBY OUT IC302 L⑭ } 110mVp-p
 IC302 R③ }
 Adjust so that VR OUT is 60mVp-p.
 POWER AMP IC303 L④ } 60mVp-p
 INPUT IC303 R② }
 HEADPHONE OUT 700mVp-p

● Low Level

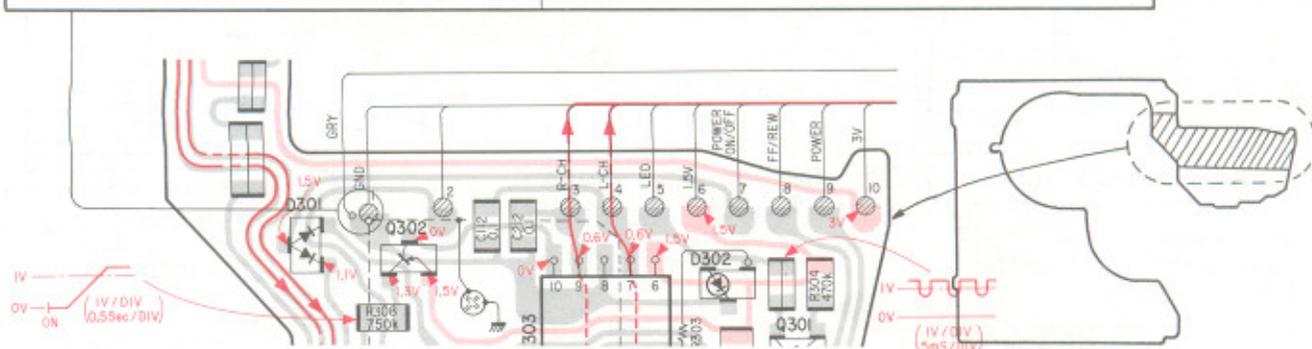
Cause	Defective Locations		
Dolby (PB) level off	Adjust variable resistors (RV101, 201) so that sound volume entrance is $-27.7\text{dBs} \pm 1\text{dB}$ when standard tape is played back.		
	-27.7dBs	actual value	$0.028\text{V} \sim 0.036\text{V}$
	$\pm 1\text{dB}$	P-P	$79.2\text{mVp-p} \sim 102\text{mVp-p}$
			Measure by VTVM
			Measure by oscilloscope

● No Dolby

Cause	Defective Parts	
Dolby circuit Dolby adjustment also should be checked	IC302	L-CH R111, R106 ~ R109, C104 ~ C109
	S302 R302	R-CH R211, R206 ~ R209, C204 ~ C209

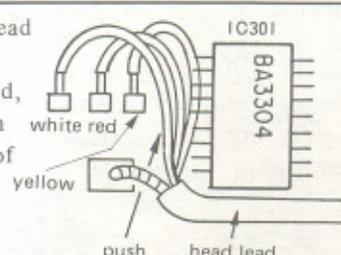
● Hum Noise during Playback

Cause	Remedy
Generated when battery voltage is down.	Replace batteries.
Defective soldering on flexible board next to Q302 (GND pattern) and GRY lead (for GND).	Repair soldering on flexible board and GRY lead.



● Noise on L-CH

Cause	Defective Location
Rotation switch (S901) noise goes onto head lead.	Change head lead positioning. Press white, red, yellow leads in the direction of the arrow.



- No Motor Rotation
- Motor Coil Check Method
- Fast, Slow Speed
- No Speed Acceleration
- Servo Board (A) (B) Simple Check Method

• Starting Circuit Operation

Q605	
Goes on by motor reverse voltage at the same time as motor rotation.	ch ch

• No Motor Rotation

1 Correct power supply voltage at servo circuit? (1.5V and 3V) NO → Check converter board.

YES

2 Is coil normal?
Measure (A) or (F) pin relative to ground by oscilloscope, turn motor by hand and observe the waveform. NO → Replace coil.



YES

3 Is Hall element normal?
Measure (C) or (E) relative to ground by oscilloscope, turn motor by hand and observe the waveform. NO → Replace coil (Hall element is inside coil).



YES

4 Switching timing
Rotate motor by hand, observe IC601 pin ① waveform on oscilloscope. NO → Replace IC601.



YES

5 Is starting circuit normal? NO → Check starting circuit.

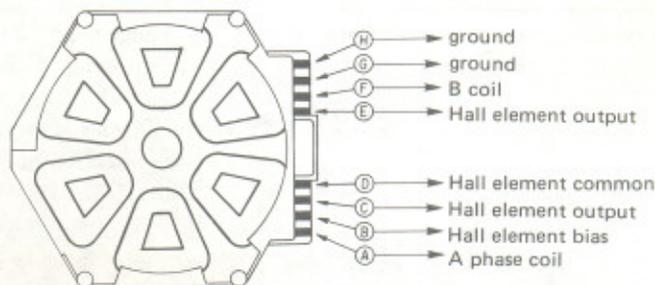
6 Is feedback circuit normal? NO → Defective control circuit. (Check Q602 E, about 0.6V)

7 Does it rotate with one phase?
Unsolder (A) (or (F)) and rotate by hand. (Judge if drive system B phase is normal, or A phase is normal.) NO → Check A phase drive system. (B phase drive system)

Defective Parts	
C608	short
R606, R607 R609, Q601 Q602 D601, C606 C610	open short
A phase Q611, Q614 drive system Q614 E-C	open short
R627	open
drive system Q608 E-C	short
C601	short
common R603, R621	open

• Motor Coil Check Method

- a. Hall element between (B) - (D) } normal value
- between (C) - (E) } 240Ω - 550Ω
- b. coil check between (A) - (G) } normal value
- between (F) - (H) } approx. 1Ω



Circuit Operation

	C607	Q603	Q606	Q604	Rotation
or reverse	charging	OFF	OFF	OFF	high speed rotation
ne time as	charging completed	ON	ON	ON	Servo applied

Symptoms	Defective Parts	
Tape runs away.	Q603, Q604	} open short between E-B
	Q605, Q606	
		short open
	C607	R610 R620 C607 C608

Slow speed, uneven rotation	Q604 short between E-C
Rotates intermittently	R611 } open RV601 }

• Feedback Circuit Operation

Motor cannot rotate if there is no voltage here. Check that there is approximately 0.6V at C601 (+). If not, check voltage at IC601 pins (10), (11), (13).

Symptoms	Defective Parts
Tape runs away	R605 open Q601, Q602 short between E-C
Tends to run slow	C606 open Q602 short between E-B
Slightly fast	D601 open
Rotation uneven	R628 open

• Drive Circuit Operation

For no rotation, unsolder A phase (or B phase) to make it open and rotate the motor by hand. If the motor rotates at high speed only for B phase only, B phase drive circuit is OK and A phase is defective.

Symptoms	Defective Parts
Slow speed	R602, R608, R624 open Q610, Q611, Q612 } short Q609, Q613 } between E-C

Tape runs away	R601, R604 open
----------------	-----------------

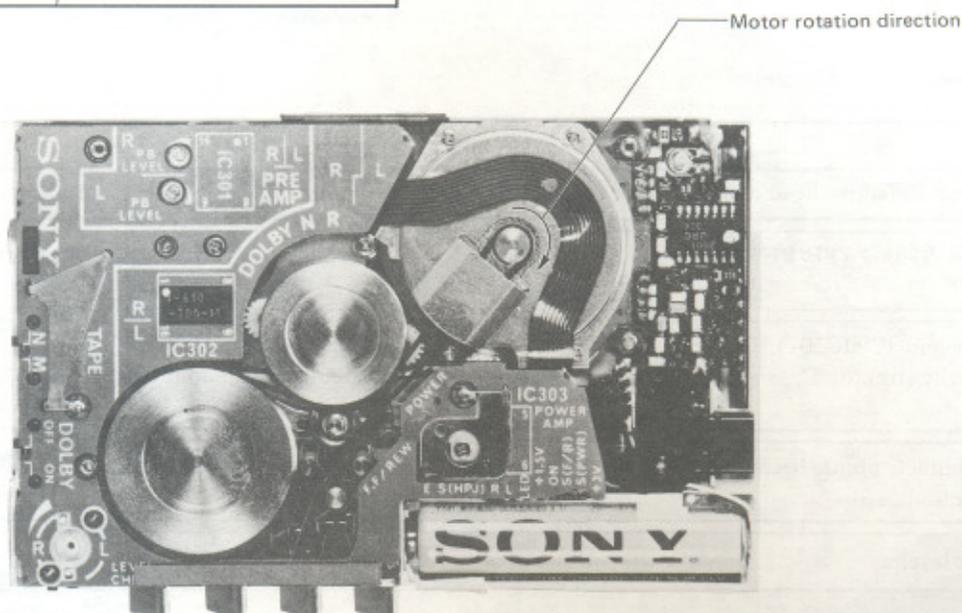
• Fast, Slow Speed

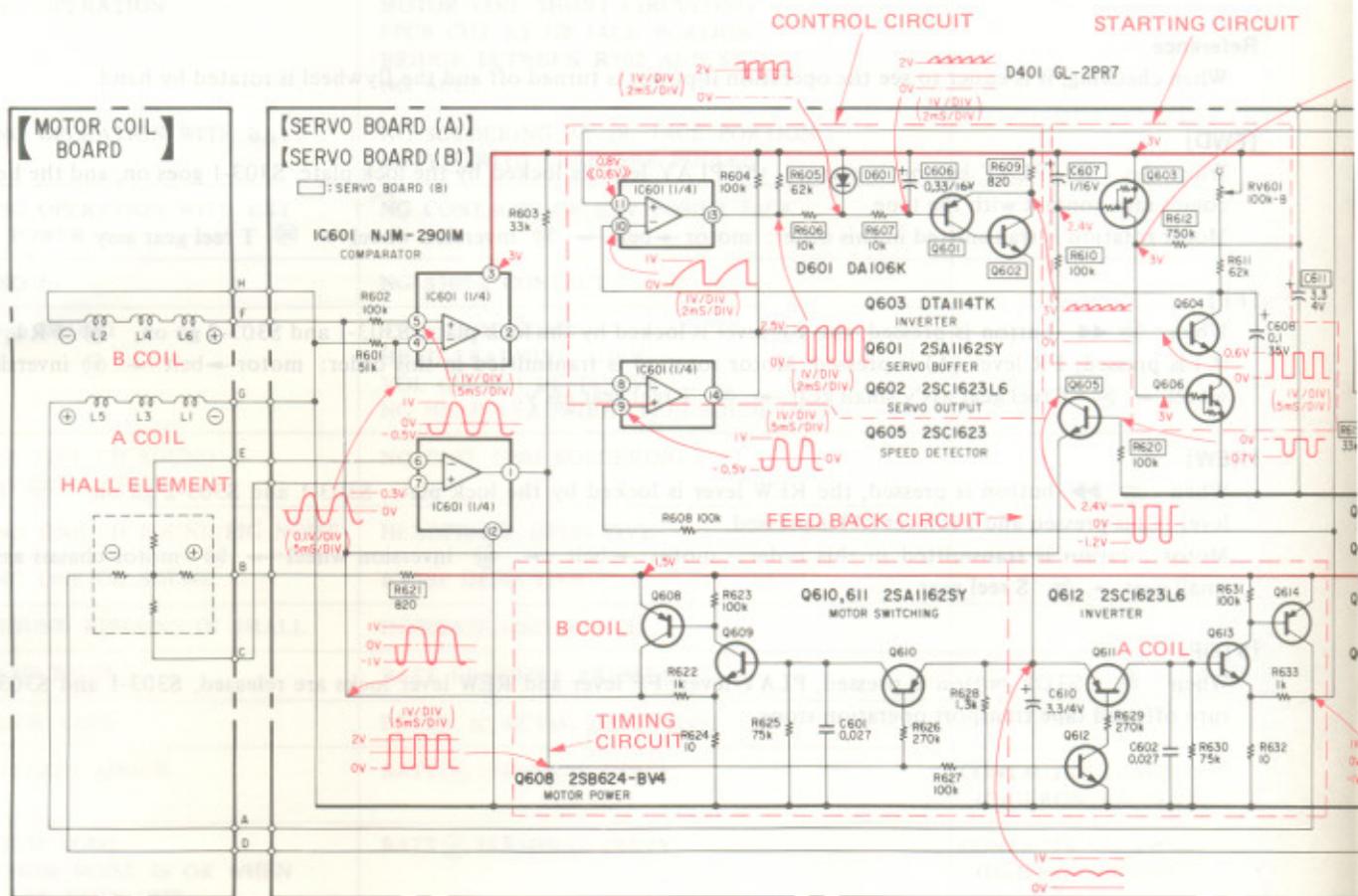
FWD mode

Symptoms	Defective Parts
Fast speed	R613, R614 } open (TH601, R640) } C612 short

Slow speed	R618 open Q607 short between E-C RV601 hits control panel.
------------	--

Slow speed, uneven rotation	R615 open
-----------------------------	-----------





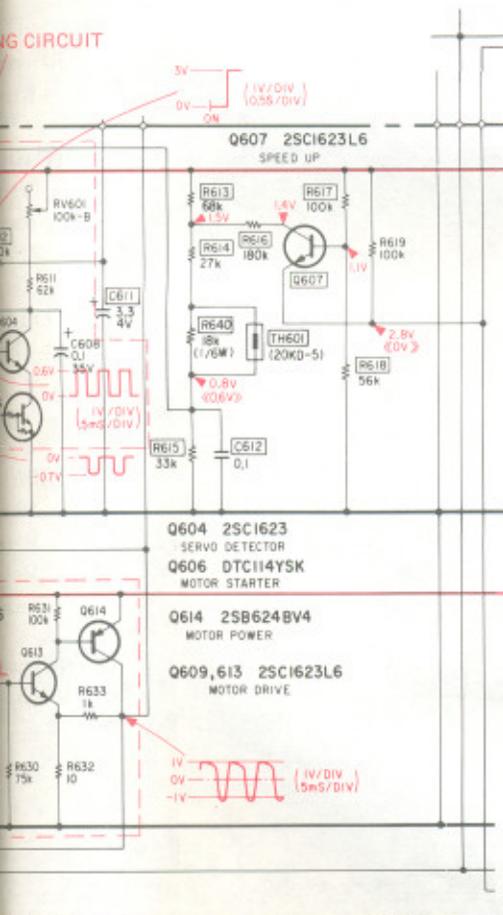
- No Speed Acceleration
- Acceleration Circuit Operation
Leaf switch S303-2 (FF/REW SW) on turns on Q607, lowering reference voltage which controls servo voltage (normally 0.8V - 0.6V), and accelerates to about 1.2 times normal speed.

- Servo Board (A) (B) Simple Check Method
Check servo board (A) motor side pins (8), A t waveforms and the voltages of each of the 8 fle board pins.
The voltages and waveforms should be as shown in figure.

• FF/REW Mode

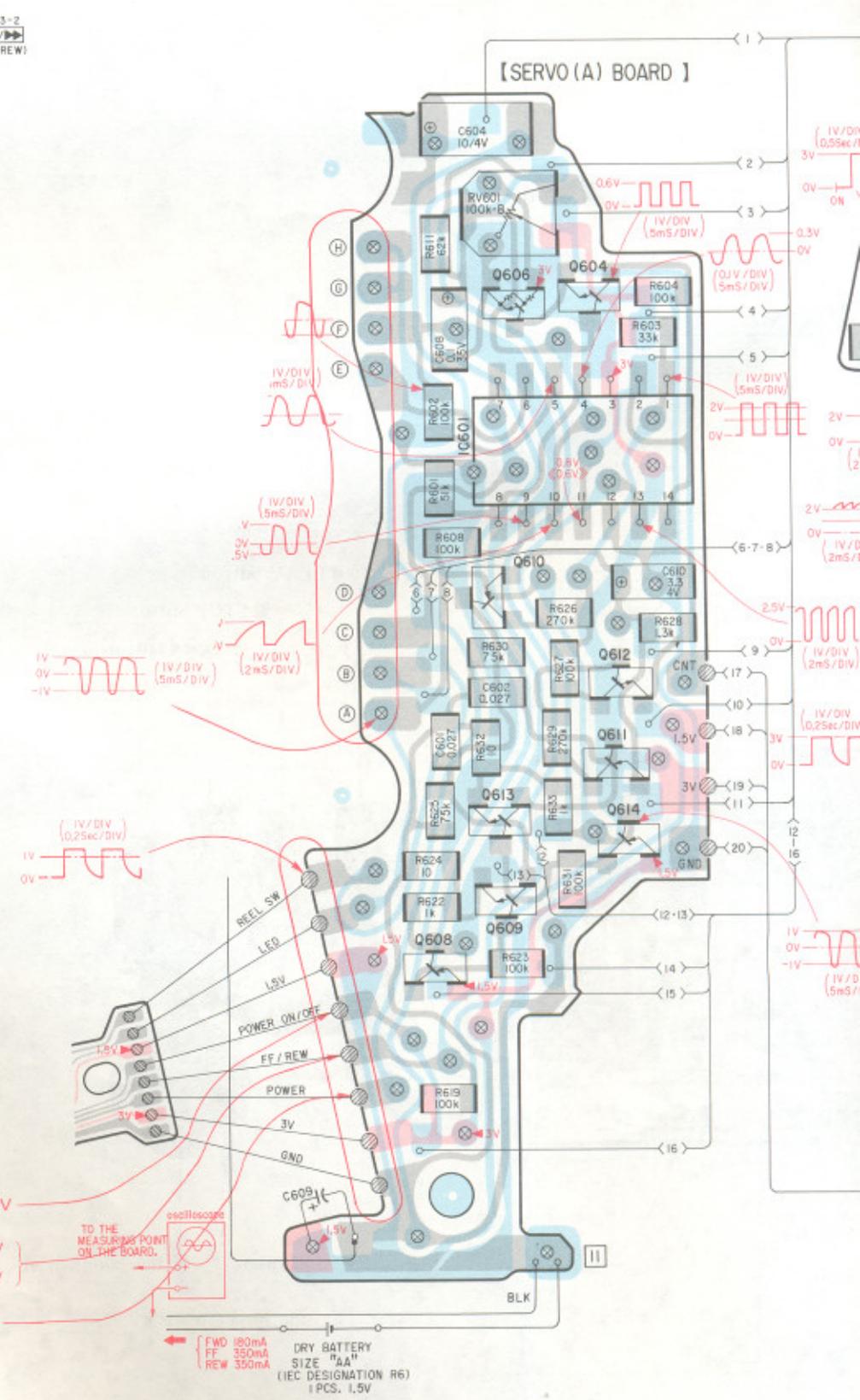
Symptoms	Defective Parts
No speed acceleration	R616, R617 } open Q607 } S303-2 } short between E-B

DRIVE CIRCUIT

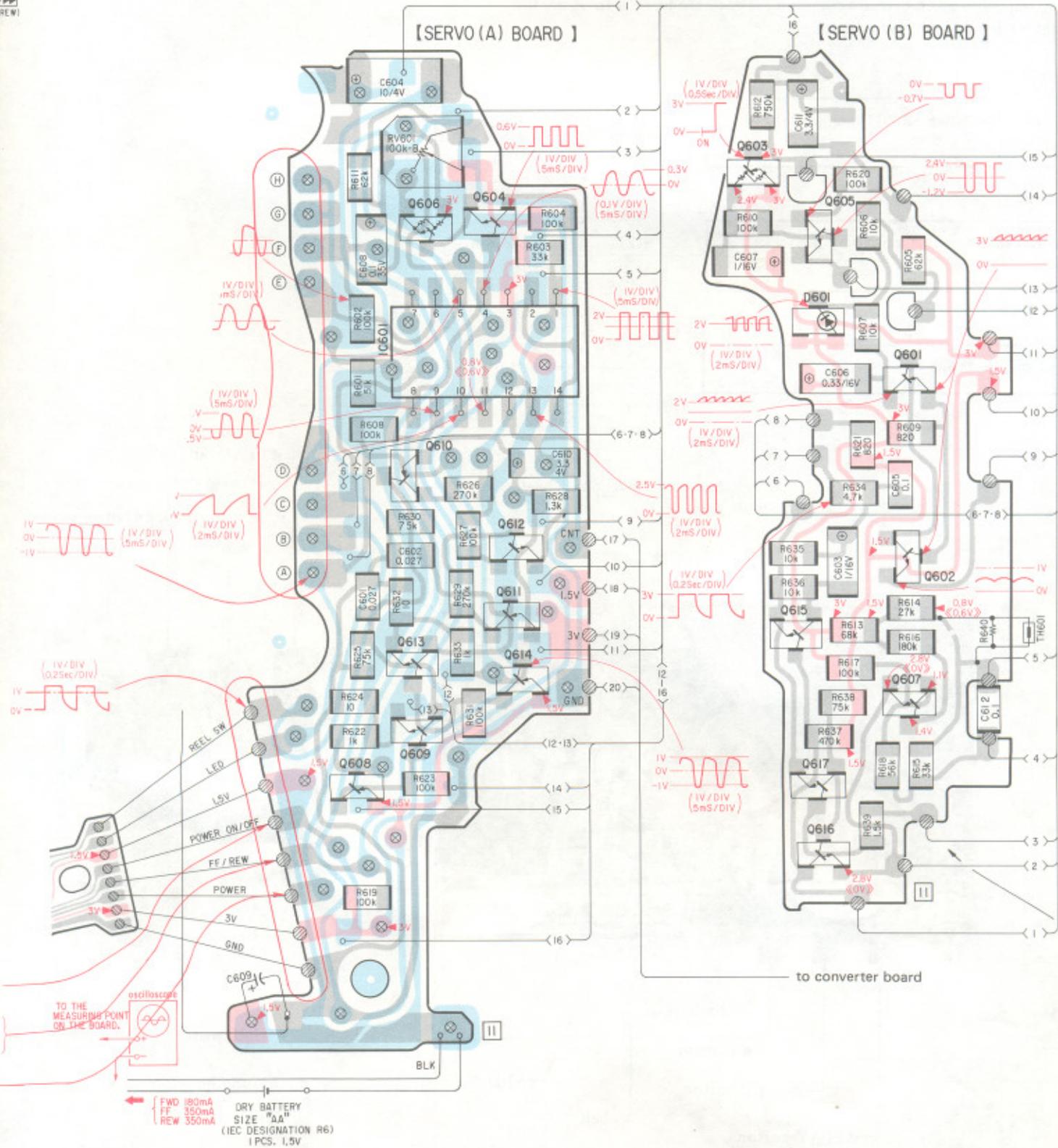


Back Method
side pins (8), A to F
each of the 8 flexible
could be as shown in the

[SERVO (A) BOARD]



1003-2
 REW



(• Defective Tape Transport I)

- Belt must be strung properly.
- The 3 operations given here are common for each mode, so if these are not normal, each mode will not operate.

Operation 1:

Does motor rotate when S303-1 (leaf switch) is turned on by hand?

NO → { motor, S303-1

Operation 2:

YES

Is the button (any button) locked by the lock plate when pressed?

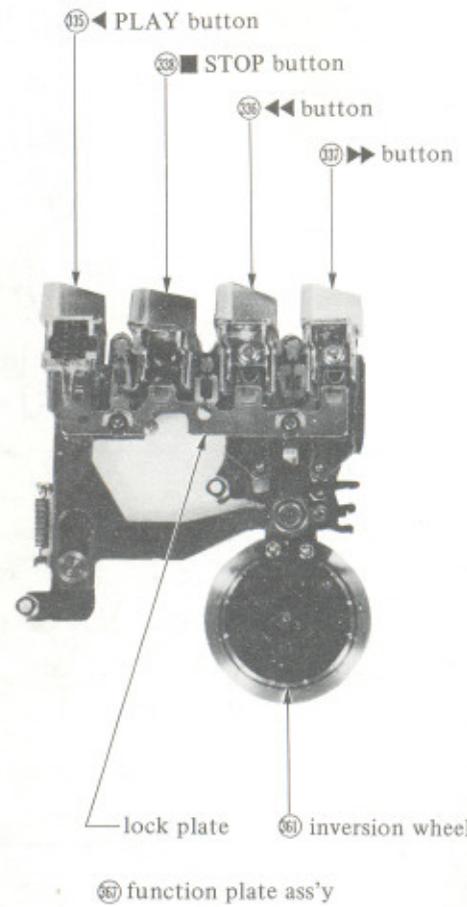
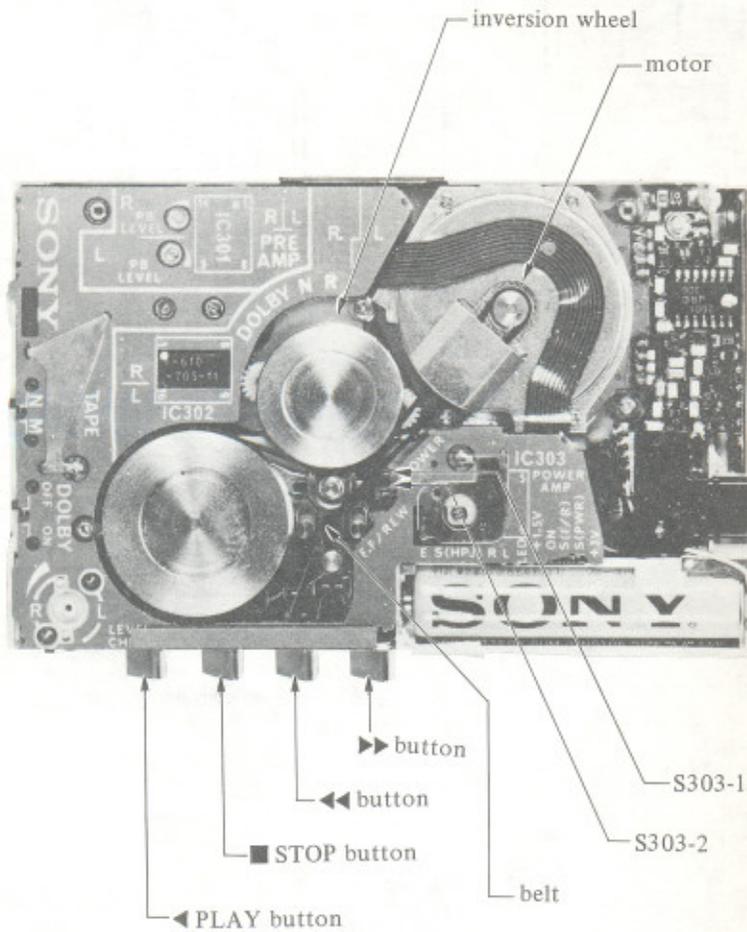
NO → { function plate ass'y

Operation 3:

YES

Is capstan shaft rotating?

NO → { belt off



Reference

When checking, it is easier to see the operation if power is turned off and the flywheel is rotated by hand.

[FWD]

When the ③⑤ PLAY button is pressed, the PLAY lever is locked by the lock plate, S303-1 goes on, and the head comes into contact with the tape.

Motor rotation is transmitted in this order: motor → belt → ③⑥ inversion wheel → ③⑦ T reel gear ass'y

[FF]

When ③⑧ ◀ button is pressed, the FF lever is locked by the lock plate, S303-1 and S303-2 go on, ③⑩ FR lever (C) is pressed, FR lever (A) is pressed. Motor rotation is transmitted in this order: motor → belt → ③⑥ inversion wheel → ③④ T reel gear ass'y small gear → ③③ T reel gear ass'y.

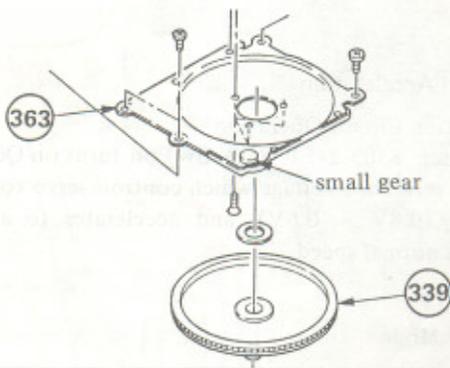
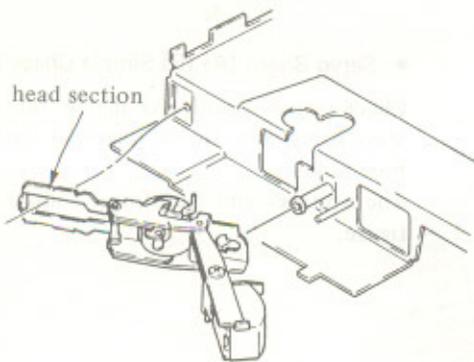
[REW]

When ③⑨ ▶ button is pressed, the REW lever is locked by the lock plate, S303-1 and S303-2 go on, ③⑩ FR lever (C) is pressed and FR lever (A) is pressed.

Motor rotation is transmitted in this order: motor → belt → ③⑥ inversion wheel → ③③ motor chassis ass'y small gear → ③⑩ S reel gear.

[STOP]

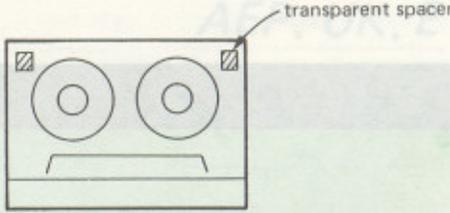
When ③⑪ STOP button is pressed, PLAY lever, FF lever and REW lever locks are released, S303-1 and S303-2 turn off, and tape transport operation stops.



• Defective Tape Transport II

- Defective tape transport
- Noise
- Wow/flutter
- No shut-off
- Shuts off during tape transportation
- Defective button operation
- Tape winds around pinch roller during FWD
- Tape is damaged during ejection

• Defective tape transport

Cause	Defective Location
1) Capstan shaft and roller not parallel. 2) Cassette inserted position not good.	 <p>Stick transparent spacers (Luminer) at left or right, or both. Luminer No. 3-315-483-01 (5x5x0.35)</p>

• Noise

Cause	Defective Location
1) Foreign object in gears. 2) ③⑩ T reel shaft bent. 3) ③⑨ S reel table warped.	Replace parts. Rotate T, S reel tables and check that there is no noise or catching.

• Wow/Flutter

Cause	Defective Location
1) Imperfection in ③⑩ capstan bush. 2) Not enough oil between ③⑩ capstan bush and ③⑨ sleeve. 3) ③⑨ pinch roller dirty. 4) No ③⑦ flywheel thrust play.	1) Replace parts. 2) Lubricate, but be careful not to apply too much. 3) Cleaning. But be careful that the shut-off lever spring under pinch roller does not come off. 4) Play is lost when mounting the capstan bush; pull the flywheel gently to get clearance.

• No Shut-off

Cause	Defective Location
1) Defective positioning between ③⑤ shut off lever (pinch roller) and ③⑥ shut-off gear C (sleeve ass'y). 2) ③⑦ function plate ass'y lock plate release operation heavy.	1) Move ③⑥ sleeve ass'y to the right as seen from the rear. 2) Replace ③⑦ function plate ass'y.

• Shuts off during tape transportation

Cause	Defective Location
1) Play lever and lock plate lock separates during FWD. 2) ③⑥ shut-off lever return spring comes off.	1) Replace ③⑦ function plate ass'y. Check: With power off, lock FWD, then if button is released when the pinch roller is pushed to the button side, the lock is defective. 2) Replace ③⑥ shut-off lever return spring or ③⑤ shut-off lever (pinch lever ass'y)

• Defective Button Operation

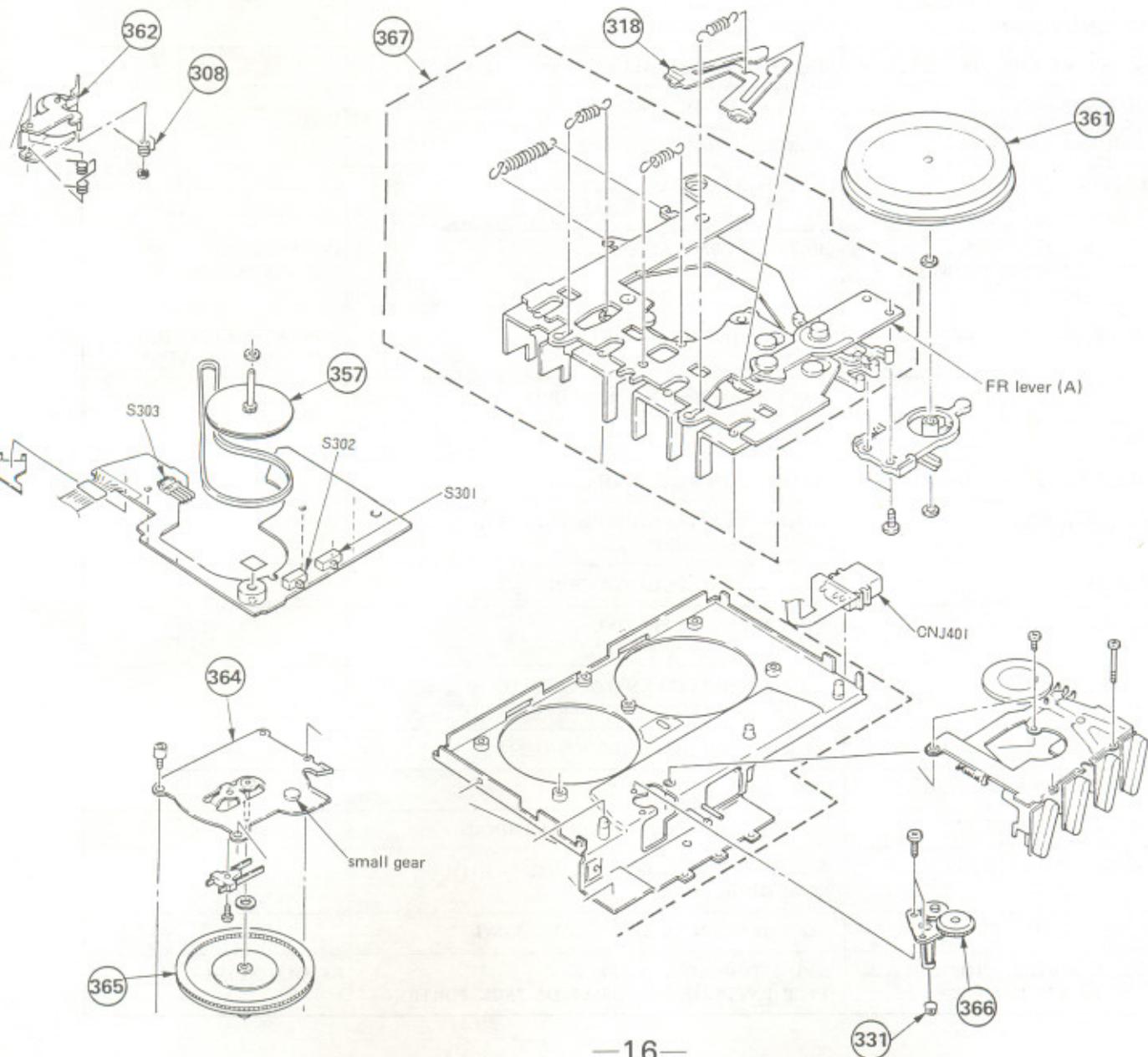
Cause	Defective Location
Lock plate plane and button lever bent.	Replace ③⑥⑦ function plate ass'y.

• Tape winds around pinch roller during FWD

Cause	Defective Location
The inversion wheel has vertical play, so because of shock, etc. there is a gear behind the inversion wheel, but that gear disengages with the other gear.	FR lever (A) bending adjustment as shown below (for better gear engagement).

• Tape is damaged during ejection

Cause	Defective Location
Tape catches because of imperfection on part of ②⑥ sleeve comp ass'y.	Replace ②⑥ sleeve comp ass'y.



REPAIR KNOW HOW

DESCRIPTION	CAUSE	REPAIR
NO OPERATION	MOTOR COIL SHORT CIRCUITING FPCB CUT AT HP JACK PORTION BRIDGE BETWEEN R302 AND S302 NG BELT	
NO OPERATION WITH BATT	NG SOLDERING AT DC JACK PORTION BATT⊕ WITH LEADWIRE PULLED	
NO OPERATION WITH EXT POWER	NG CONTACTS OF EXT POWER JACK	
NO FF	NG S303-2 CONTACT	
NO SOUND	S303-2 TOUCHING HEAD LEADWIRE TORN VOL (RV301) DEFECTIVE NG HEAD LEADWIRE (YEL) SOLDERING	
NO ONE CH SOUND (OSCILLATION)	NG C102, C202 SOLDERING	
NO ONE CH SOUND/BIG NOISE	HEADPHONE DEFECTIVE	
NO ONE CH SOUND	RV301 DEFECTIVE	
SOUND REMAINS IN SMALL	INCREASE C303 VALUE	
AMP NOISE	BATT LEADWIRE PRESSED	
L-CH NOISE	POWER IC (IC303) DEFECTIVE	
BUZZER SOUND	BATT⊕ TERMINAL DIRTY	CONTACTS CLEANING (DAIFRON SOLVENT)
HUM NOISE HUM NOISE IS OK WHEN LED GOES OUT	BATT⊕ TERMINAL DIRTY	CONTACTS CLEANING (DAIFRON SOLVENT)
INTERMITTENT SOUND	BATT⊖ TERMINAL DIRTY	CONTACTS CLEANING (DAIFRON SOLVENT)
LOW POWER NOISE INTERMITTENT SOUND OR NOISE WITH SHOCK	BATT TERMINAL NO RESILIENT	
NOISE WHEN PRESSING UNIT	NG GROUND PLATE SOLDERING	
MOTOR NOISE	MOTOR WHEEL AND COIL TOUCHING NO C305 SOLDERING	
FRICTION NOISE	MAGNET AND COIL TOUCHING	
MONOURAL SOUND WHEN TURNING VOL	VOL (RV301) DEFECTIVE	
OSCILLATION	AUDIO PCB PATTERN TOUCHES TO REW. BUTTON/ NG GROUND PLATE SOLDERING	
BATT HEAT	MOTOR COIL (HALL DEVICE OPEN)	
SLOW SPEED WITH SHOCK	COIL SHORTCIRCUITING	
TOO FAST SPEED	NG SOLDERING AT MOTOR TERMINAL	
NO FF/REW ROTATION	ROTATION SW SHORT CIRCUITING WITH SOMETHING	
FF/REW AUTO-OFF	NG ROTATION SW (S901) SOLDERING	
NO STOP WHEN STOP BUTTON RELEASED	S303-1 TOUCHING TO FPCB FPCB PATTERN BRIDGE AT DC JACK PORTION	RESOLD S303-1

• Defective button operation

• Tape winds around pinch roller during FWD

• Tape is damaged during ejection

Defective Location	Cause
Pinch roller	1) Capstan shaft and roller not parallel
Pinch roller	2) Capstan inserted position not good

• Defective tape transport

Defective Location	Cause
Pinch roller	1) Foreign object in gear
Pinch roller	2) T-tact shaft bent
Pinch roller	3) S-tact table warped

• View/Buffer

Defective Location	Cause
View/Buffer	1) Insufficient in capstan drive
View/Buffer	2) Not enough oil between capstan head and sleeve
View/Buffer	3) Pinch roller dirty
View/Buffer	4) No S-tact table play

• No Shut-off

Defective Location	Cause
Shut-off lever	1) Defective positioning between shut-off lever (back) roller and shut-off lever C (sleeve ass'y)
Shut-off lever	2) Function plate ass'y lock with release operation heavy

• Shut-off during tape transportation

Defective Location	Cause
Shut-off lever	1) Play lever and back plate lock separates during FWD
Shut-off lever	2) Shut-off lever return spring comes off

Defective Location	Cause
Shut-off lever	1) Play lever and back plate lock separates during FWD
Shut-off lever	2) Shut-off lever return spring comes off