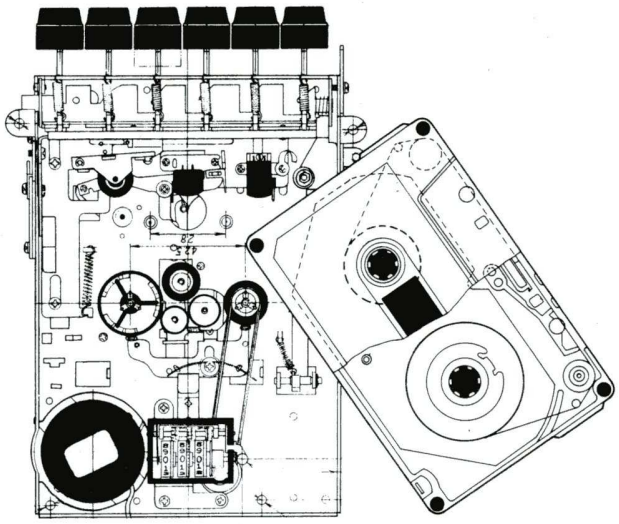
JVC

SERVICE GUIDE

BASICS OF CASSETTE MECHANISM



No. 1001
March 1976

This Service Guide describes the basics of the radio cassette recorder mechanisms together with the operation check points and measuring and repair techniques.

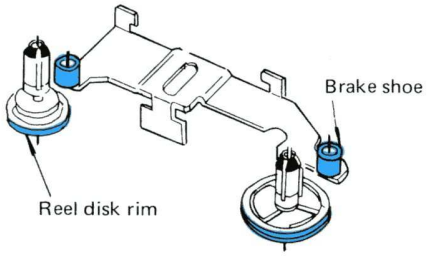
CHAPTER 1 BASICS

1.1 The Basic Functions of the Radio Cassette Recorder Mechanism

Different tape transport mechanisms are employed in different radio cassette recorders. However, their common purpose is to drive the tape at a constant speed during recording and playback. The description here deals with the mechanism used in the 9407 series of radio cassette recorders.

A. STOP

With the STOP operation the tape stops from any mode. It is essential that the tape should stop smoothly without being slackened or unusually stretched.



Brake mechanism

Fig. 2

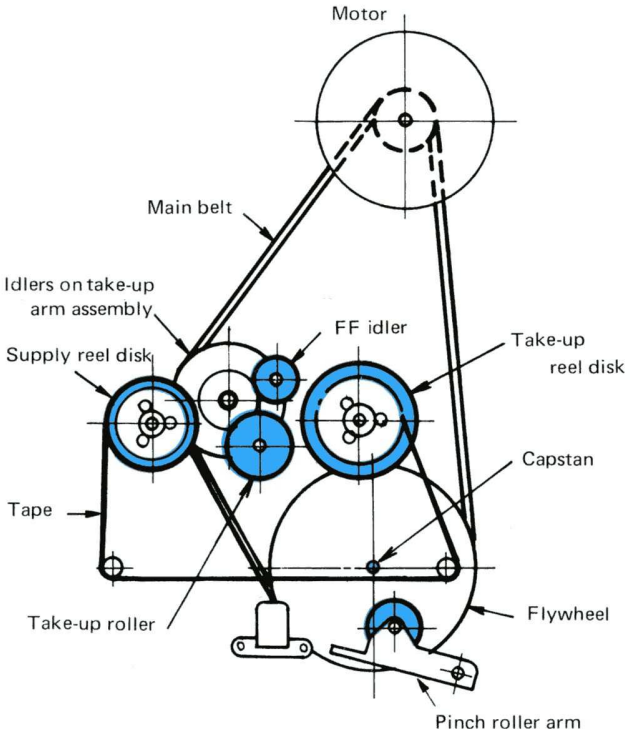


Fig. 1 STOP

In connection with Fig. 1,

a. the pinch roller must be separated from the capstan (flywheel shaft),
b. the take-up and supply reel disks must not be in contact with either of the rotating parts (roller and idler), and
c. the reel disks must be held by the brake mechanism. (They are braked by the contact of the brake shoes with their rims. See Fig. 2.)

B. PLAY and RECORD

The PLAY (or RECORD) is an operation with which the tape is transported at a constant speed in contact with the head at the proper tension. The standard speed for cassette tapes is 4.75cm/sec (1-7/8 ips).

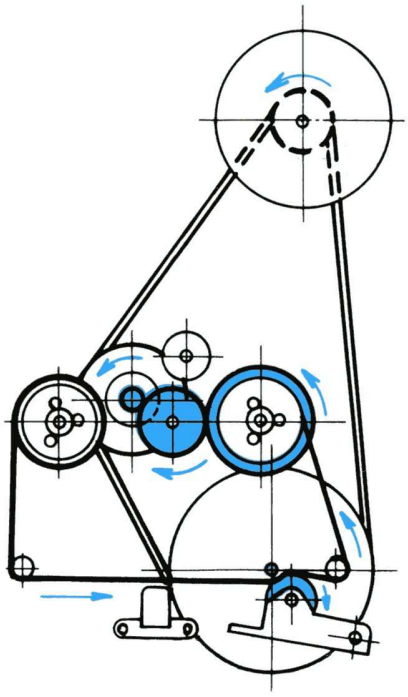
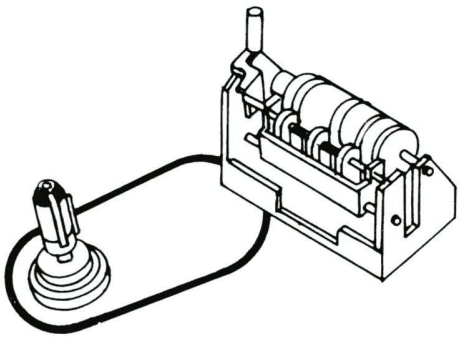


Fig. 3 PLAY/RECORD

In connection with Fig, 3,

a. the pinch roller presses against the capstan and the tape runs at a speed of 4.75cm/sec (1-7/8 ips) between them,
b. the take-up reel winds the tape, which is fed at a constant speed with the proper torque; a slip mechanism retards the reel speed as the tape proceeds (Fig. 9), and

c. back tension is applied to the supply reel disk to provide the proper tape tension. With the 9407 series, the counter belt which drives the tape counter is employed to sustain this back tension.



Back tension
Fig. 4

C. FAST FORWARD

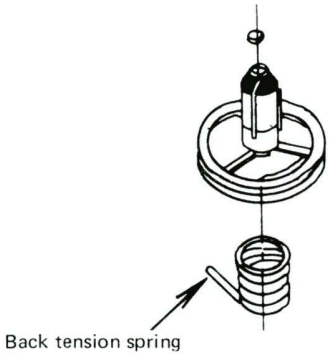
The tape runs fast in the same direction as in PLAY. The speed must be as high as possible. The tape must be separated from the head to prevent abrasion. Back tension is also necessary at the supply reel disk so that the tape is wound with the proper tightness (Fig. 4).

Referring to Fig. 5,

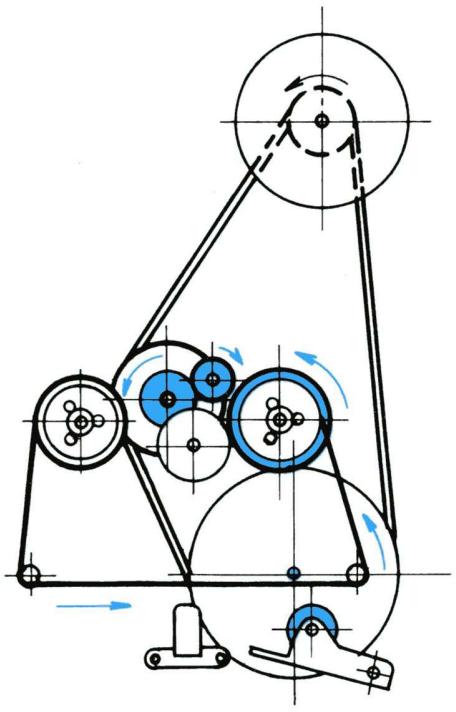
a. the pinch roller separates from the capstan,
b. motor torque is transmitted to the take-up reel disk through the take-up and FF idlers, and
c. the supply reel disk is subject only to the back tension.

D. REWIND

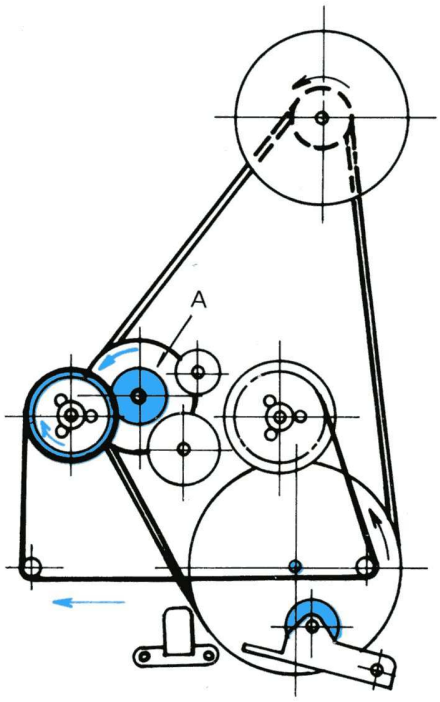
The tape runs fast in the opposite direction to that in PLAY. The speed must be as high as possible. The tape must be separated from the head. Back tension is applied to the take-up reel disk (non acting as a supply reel disk) to wind the tape with the proper tightness (Fig. 6).



Back tension elements for the take-up reel disk
Fig. 6



FAST FORWARD
Fig. 5



REWIND
Fig. 7

Referring to Fig. 7,

a. the pinch roller separates from the capstan,
b. the supply reel disk rotates, driven by idler A on the take-up arm assembly, and
c. the take-up reel disk is subject only to the back tension applied by the spring underneath (Fig. 6).

E. REVIEW

The REVIEW mechanism allows temporary rewinding of the tape leaving the PLAY button locked. While the REWIND (REVIEW) button is held down with the PLAY button locked, the head and pinch roller are separated from the tape. When the button is released, the PLAY mode is resumed. This review function does not work during recording.

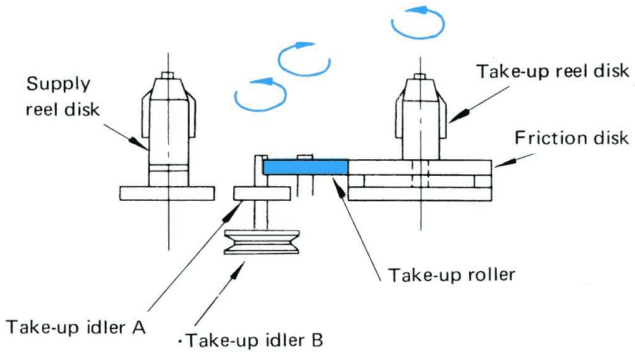
a. Operation sequence
   1) PLAY mode
   2) REVIEW (REWIND) button is pressed.
   3) Head separates from the tape and the capstan separates from the pinch roller.
   4) Both reel disks stop rotating.
   5) Rewinding takes place.
   6) REVIEW button is released.
   7) REVIEW function stops.
   8) Both reel disks start rotating for forward winding.
   9) Head comes in contact with the tape and the capstan with the pinch roller.
   10) PLAY mode

b. Confirmation
   During the REVIEW operation, if the timing is incorrect during steps 3 and 4 below, the tape may be entangled with the capstan or pinch roller. Be careful.
   1) PLAY
   2) Press REVIEW (REW) button.
   3) Head separates from tape and pinch roller from capstan.
   4) Idler A comes in contact with supply reel disk (Fig. 11).
   5) Tape is wound onto supply reel.
   6) Release REVIEW button.

1.2 Operation of Reel Disks

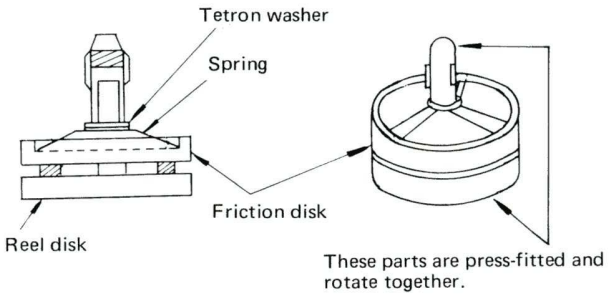
A. PLAY (or RECORD) mode

a. Motor torque is transmitted to idler B (on the take-up arm aasembly) through the main belt. (Fig. 3)
b. Rotation of the idler B is transmitted through the take-up roller to the friction disk of the take-up reel disk assembly.



During PLAY (or RECORD)
Fig. 8

c. Take-up reel disk assembly construction
The take-up reel disk assembly consists of a take-up reel disk and a friction disk separated by a felt pad. A spring presses the friction disk against the take-up reel disk, keeping them together but allowing them to slip slightly.



Construction of the take-up reel disk assembly
Fig. 9

The take-up reel disk is given forward torque by the take-up roller and winds the tape which is fed from the capstan. The supply reel disk is subject to back tension as shown in Fig. 4. The tape runs against this back tension, thereby producing tape tension and pressure contact between tape and head. The take-up torque is about 40 – 60g.cm. Because of the slip mechanism incorporated in the take-up reel disk assembly (See Fig. 9) the friction disk rotates at a constant speed, while the take-up disk rotation changes from the beginning to the end of the tape depending on the diameter of the tape wound upon the take-up reel.

B. FAST FORWARD mode

a. Motor torque is transmitted to the idler A through the main belt and the idler's rotation is transmitted through the FF idler to the take-up reel disk (lower disk).
b. Because the FF idler comes into contact with the take-up reel disk (not the friction disk), slip function does not take place and the tape is wound fast. The take-up torque in this case is more than 60g.cm.

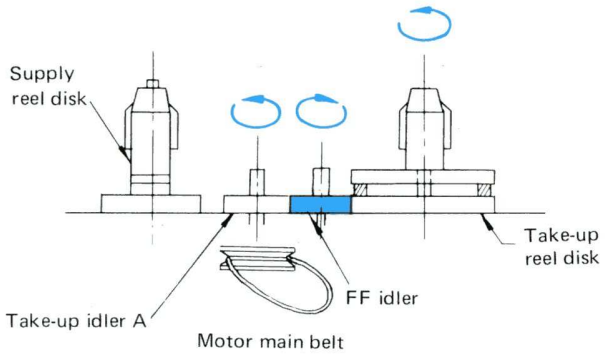


Fig. 10 F.F. mode

C. REWIND mode

The idler A on the take-up arm assembly is pressed against the supply reel disk to drive it. The take-up torque of the supply reel disk is more than 60g.cm.

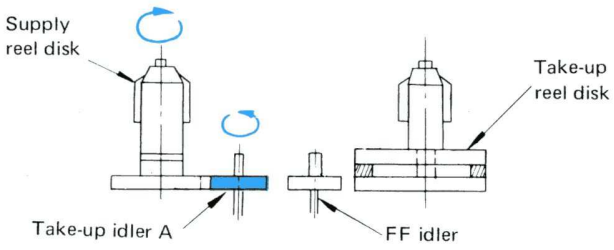


Fig. 11 REWIND mode

CHAPTER 2 MAINTENANCE AND REPAIR

Now you can understand the basic operations of the tape transport mechanism inside the radio cassette recorders. Please read further, with a radio cassette recorder close at hand, for a fuller understanding of adjustments, measurements, and repairs.

Prepare the following:

1) A radio cassette recorder of the 9407 series
2) Tools and instruments necessary for adjustment and measurement.

It will be easier to work on your cassette recorder if you remember the names of the parts and the overall structure as shown in the exploded view of the transport mechanism.

Removing the chassis (Refer to the corresponding SERVICE MANUAL)

a. Removing the rear cabinet (Fig. 12)

Remove screws (1) through (4) (SDBP3008RS) on the rear cabinet. Remove screw (5) (SDBP3008RS) in the battery compartment. Disconnect the leads from the rod antenna and the battery. The rear cabinet is now removable.

b. Removing the tuner chassis (Fig. 13)

1) Remove the tuning, volume and tone control knobs.
2) Remove screw (6) (SBSB2610Z) located on the right side panel.
   Remove stud (7) (V41952-010).
   Remove screw (8) (SBSB3010Z) and screws (9) through (11) (SBSB3008Z).
3) Pull out the 6-pin jack from the amplifier circuit board, and the tuner chassis is removable.
   Removing stud (12) will make the chassis easier to remove.

c. Removing the mechanism chassis (Fig. 13)

1) Remove studs (12) and (13) (V41952-009), stud (14) (V41576-014) and screw (15) (SBSB3008Z).
2) Desolder the leads from the condenser microphone, speaker and meter. The mechanism chassis is now removable.

d. Removing the amplifier circuit board (Fig. 13)

Remove 4 screws (16) through (19) (SPSP2606Z) and screw (20) (SBSB3006Z) on the power transistor radiation plate. Remove the circuit board.

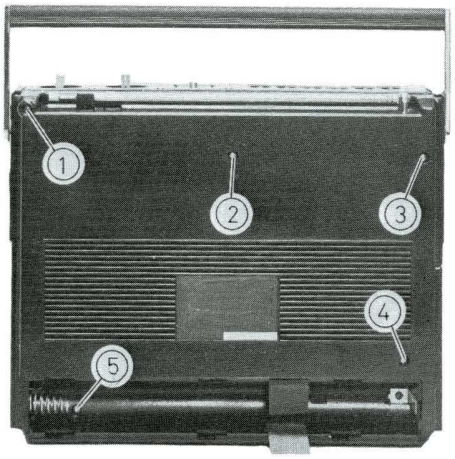


Fig. 12

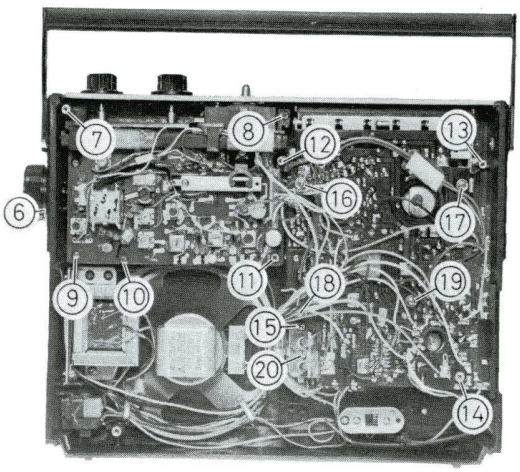


Fig. 13

Tools and instruments

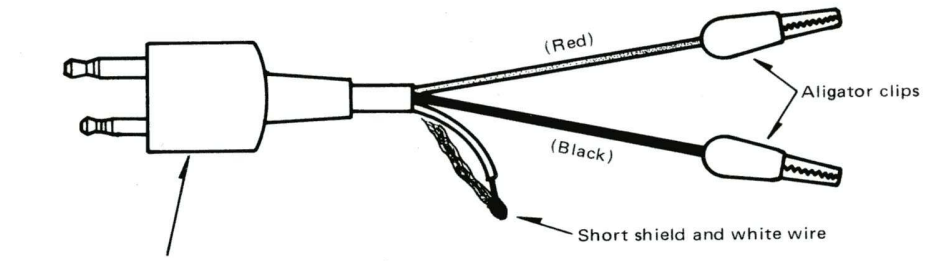
1. Measuring tapes

Tape No.	Frequency	Use
VTT-656, VTT-604 or equivalent	3kHz	For adjusting wow and flutter and tape speed.
VTT-658, VTT-615 or equivalent	10kHz	For adjusting head azimuth.

2. Instruments

Description	Remarks
Torque gauge	Must be able to measure up to 150g.cm
Wow/flutter meter	Must be able to measure tape speed as well
Multimeter or VOM	Must have a range of DC 250mA
Spring weight scale	Must be able to measure up to 700g

3. Jigs

Dental mirror	Not always necessary, but helpful
KS jig	

4. Supplies

Industrial alcohol (ethyl or methyl)	For cleaning head, idler and roller
Oil (TN#65 of GENERAL SEKIYU or equivalent)	
Grease (G-40M of SHINETSU KAGAKU or equivalent)	

2.1 Correctly Operating Mechanism

To be able to repair defective sets, you must first know the conditions and operations of a set which works correctly. This section describes the methods of measuring torques and checking the mechanical operations.

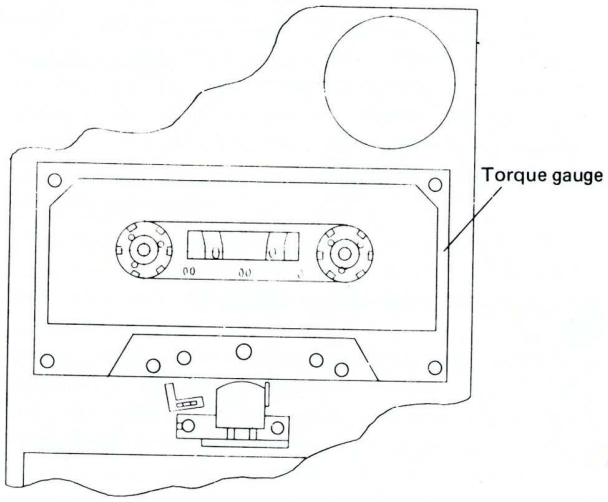
A. Measuring the torque

Before explaining the measuring methods of individual torques, we will discuss the use of the measuring tools and general measuring techniques to give you a more precise understanding of the instruments.

1. Measuring the take-up torque

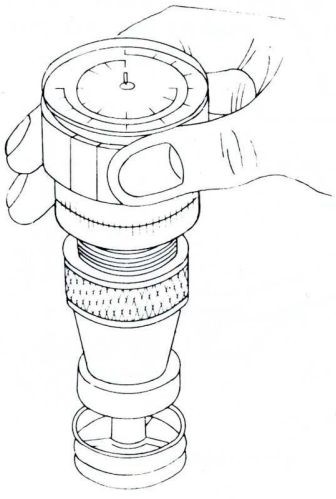
To wind up the tape smoothly in the PLAY, FF and REWIND modes, a certain range of torque is required. Use a torque dial gauge (Fig. 15) or a torque gauge (Fig. 16) to read the torque numerically. Both directly indicate torque values in g.cm. The torque gauge is a simplified instrument which lacks the precision for truly accurate torque measurement, but, it is close enough for practical use. However, after a long use, the spring inside the gauge will lose its full elasticity, reducing its accuracy. It is necessary in this case to calibrate the gauge with a good one.

To measure the torque in each mode, read the value with the corresponding button locked and take the average of three measurements as a rule.



Torque gauge

Fig. 16



Torque dial gauge

Fig. 15

(Hints)

If neither torque dial gauge nor torque gauge is available, you can use a spring weight scale to measure the torque. Make a reel 20mm in diameter and wind a thread around it. Tie the thread to the spring weight scale and hold it in line with the pull from the reel. Read the scale when the reel stops rotating. This measurement can be done either horizontally or vertically. (Fig. 17)

The best way to measure is to begin with the thread extended in the PLAY mode and gradually allow it to wind onto the 20mm reel. Draw the scale back slightly when the reel stops and then read the indication on the scale. Repeat this procedure and take the average of three measurements.

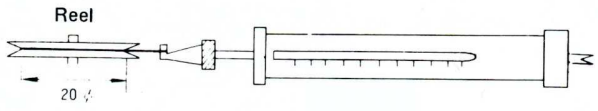
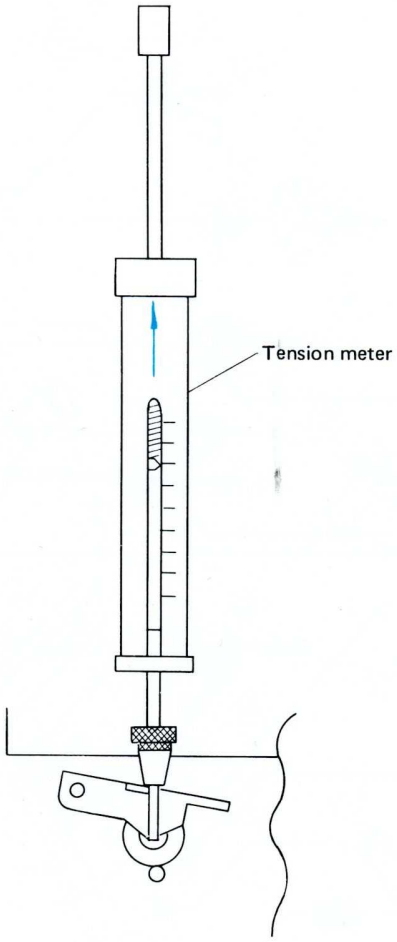


Fig. 17

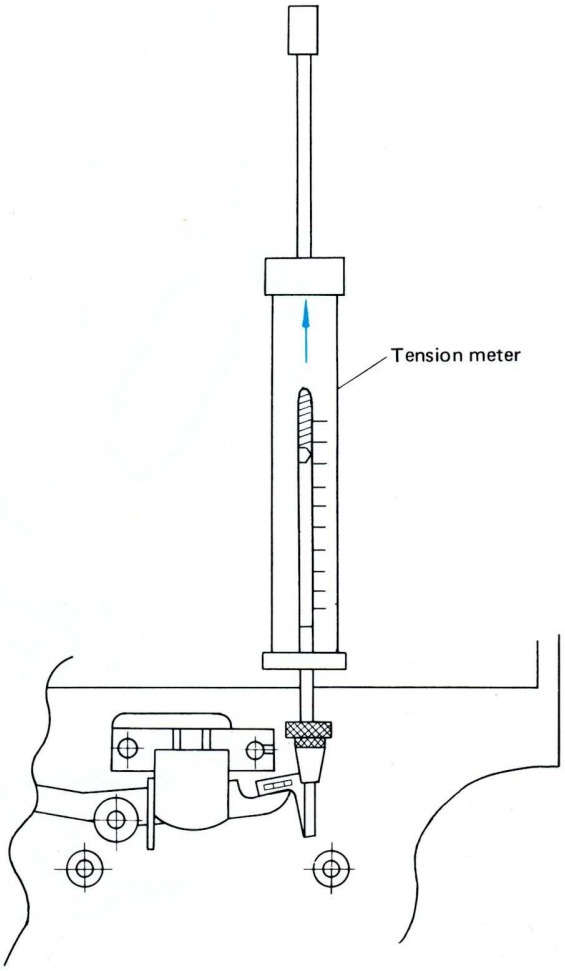
2. Measuring the pinch roller contact pressure and the auto-stop detection pressure

a. Use the spring weight scale (tension meter) to measure the contact pressure between the pinch roller and capstan. Hook the scale on the pinch roller arm and pull it in the direction of the line running between the axes of the pinch roller and capstan as shown in Fig. 18. Read the scale when the pinch roller separates from the capstan and stops. The standard pinch roller contact pressure is 500 – 650g.

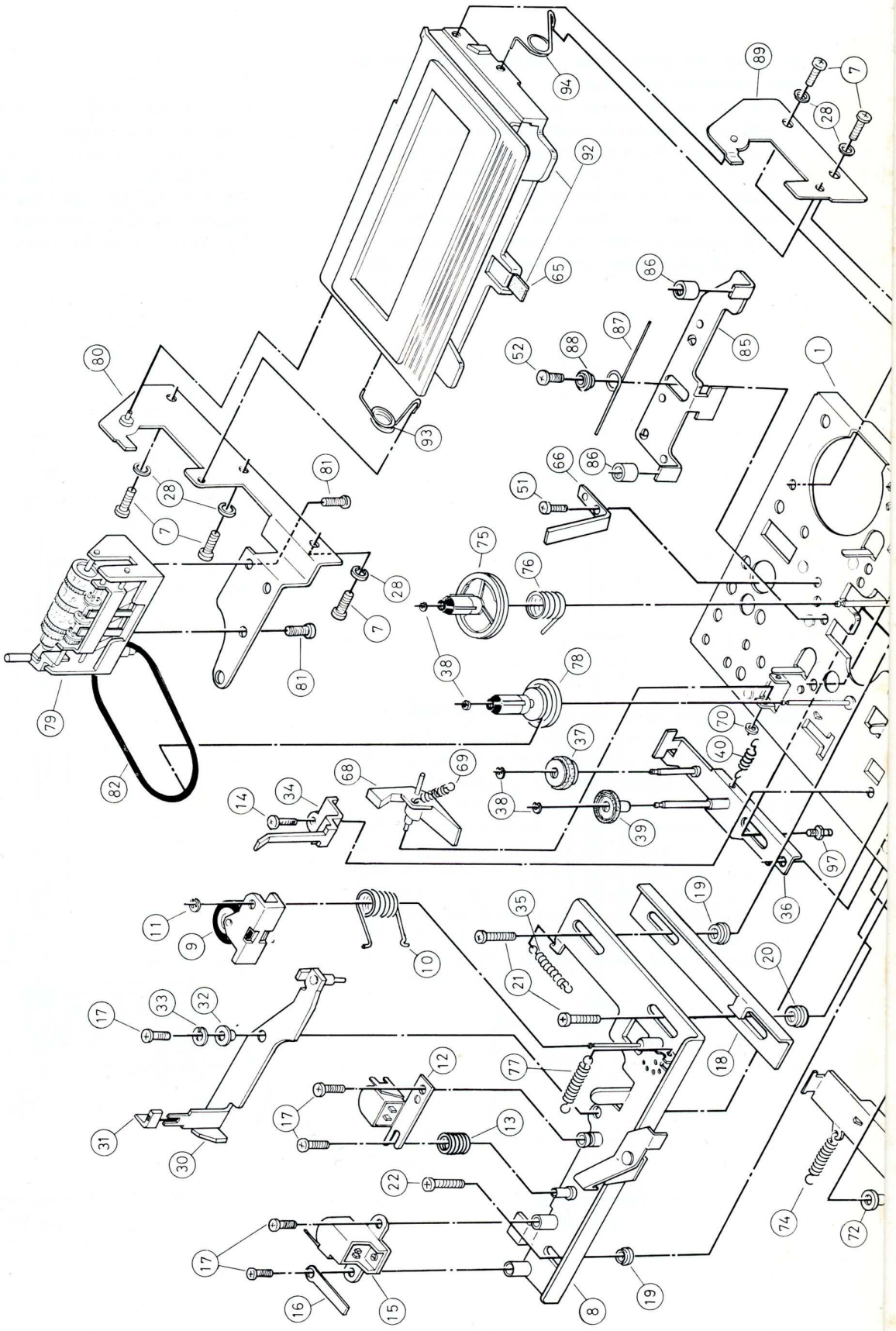
b. Use the scale (tension meter) to measure the auto-stop detection pressure. Hook the scale on the detect cap at the end of the detect plate and pull it in the direction of the plate in the PLAY mode as shown in Fig. 19 Read the tension meter when the shut-off operation takes place.
The standard detection pressure is 50 – 60g.



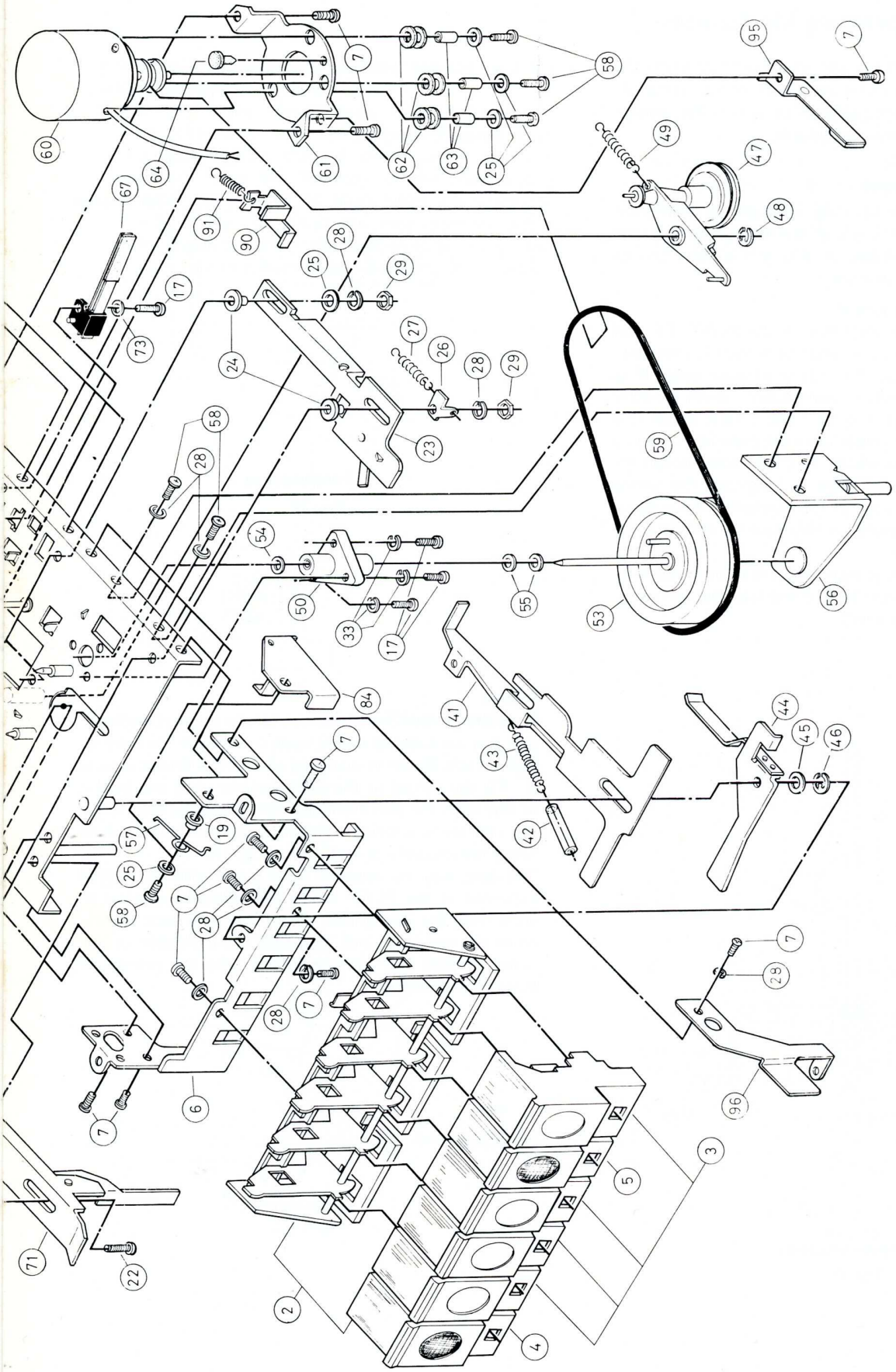
Tension meter
Fig. 18



Tension meter
Fig. 19



Exploded view of
Fig.



cassette mechanism
20

Parts list of cassette mechanism

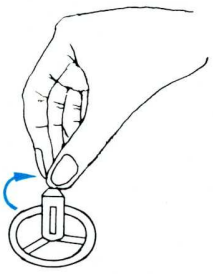
Ref. No.	Parts No.	Parts Name	Description	Q'ty
1	V30900-00A	Chassis Ass'y		1
2	V44017-00B	Lever Switch Ass'y		1
3	V30889-00A	Push Button Ass'y		4
4	V30889-00B	〃	RECORD	1
5	V30889-00C	〃	STOP	1
6	V44046-002	Button Frame (B)		1
7	SPSP2604Z	Screw		15
8	V44109-00B	Head Panel Ass'y		1
9	V42727-A	Pinch Roller Arm Ass'y		1
10	V43034-2	Pinch Roller Spring		1
11	REE1900	E-Ring		1
12	V03078-15	R/P Head		1
13	060405-T	Spring		1
14	SPSP2603Z	Screw		1
15	V03078-7	Erase Head		1
16	V42603-1	Wire Clamp		1
17	SPSP2005Z	Screw		9
18	V44044-001	Eject Plate		1
19	V43044-1	Collar		3
20	V44081-001	MCS Collar		1
21	SDSP2610Z	Screw		2
22	SDSP2606Z	〃		2
23	V44025-00A	Auto Stop Lever Ass'y		1
24	V43412-1	Collar		2
25	WNS2600Z	Washer		5
26	V44083-001	Spring Stopper		1
27	180502T	Spring		1
28	WLS2600	Lock Washer		13
29	NTB2600	Nut		2
30	V43229-B	Stop Detect Lever Ass'y		1
31	V43042-001	Stop Detect Contact		1
32	V43230-2	Collar		1
33	WLS2000	Lock Washer		4
34	V43410-1	Tape Guide		1
35	150802T	Spring		1
36	3951081ZT	FF Idler Arm Ass'y		1
37	3900802T	FF Idler		1
38	REE1200	E-Ring		4
39	2570703T	Take-up Roller		1
40	V44136-001	Spring		1
41	V44088-001	Main Plate		1
42	———	Vinyl Tube	ϕ5.5 x t0.5 x 33	1
43	T191072T-001	Spring		1
44	V44120-00B	Rewind Arm Ass'y		1
45	V44091-001	Special Washer		1
46	REE4000	E-Ring		1
47	3900991ZT	Take-up Arm Ass'y		1
48	REE2300	E-Ring		1
49	V43884-001	Spring		1
50	V43064-A	Flywheel Bushing		1
51	SBSB2604Z	Screw		1
52	SPSP2608Z	Screw		1
53	V43065-B	Flywheel Ass'y		1
54	V41750-1	Special Washer		1
55	V41750-2	〃		2
56	V44029-00C	Flywheel Bracket Ass'y		1

Ref. No.	Parts No.	Parts Name	Description	Q'ty
57	V44043-001	Spring		1
58	SPSP2606Z	Screw		6
59	T46257-001	Main Belt		1
60	MHT-5XV6	Motor		1
61	V44032-001	Motor Bracket		1
62	V43049-1	Motor Rubber		3
63	V43270-1	Collar		3
64	V43463-1	Spacer		1
65	03084-476	Felt		1
66	V43101-2	Pack Spring		1
67	V44212-001	Leaf Switch		1
68	V43941-001	Record Safety Lever		1
69	V43968-001	Spring		1
70	RDS1900S	CS-Washer		1
71	V44018-00A	Record Plate Ass'y		1
72	V43863-001	Collar		1
73	WNS2000Z	Washer		1
74	V44101-001	Spring		1
75	26811BZT	Reel Disk Ass'y		1
76	V41679-11	Spring		1
77	V44111-001	"		1
78	V44038-00A	Supply Reel Ass'y		1
79	V30712-1	Tape Counter		1
80	V44052-00B	Counter Bracket Ass'y		1
81	SPSP3006ZS	Screw		2
82	V44121-001	Counter Belt		1
83	Blank No.			
84	V44050-001	Eject Lever		1
85	V44204-001	Brake Arm		1
86	V43476-1	Brake Shoe		2
87	V44217-001	Brake Arm Spring		1
88	V44216-001	Brake Arm Metal		1
89	V44074-00A	Case Bracket Ass'y		1
90	V43840-001	Stopper		1
91	V44136-001	Spring		1
92	V30890-00A	Cassette Case Ass'y		1
93	V44077-001	Spring (R)		1
94	V44076-001	" (L)		1
95	391291T	Mat Arm Ass'y		1
96	2680806T	Amp Bracket		1
97	3951005T	FF Idler Arm Metal		1

B. STOP operation

a. The pinch roller is sufficiently away from the capstan. Its rubber roller smoothly rotates when it is turned with the finger. The rubber is properly elastic.

b. The take-up and supply reel disks rotate lightly with only slight tension when turned with the finger with the brake arm moved upward to release the brake mechanism. (Fig. 20)



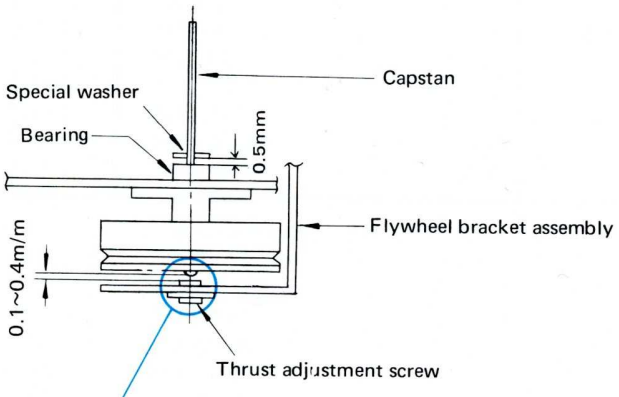
Checking the reel disk for smooth rotation by hand

Fig. 20

c. There is a certain amount of thrust clearance between the flywheel shaft bearing and special washer. You will hear a small rattle if you move the flywheel axially.

1) The thrust clearance between the tip of flywheel's shaft and the thrust adjustment screw (acting as a thrust bearing) is 0.1 – 0.4mm when measured with a clearance gauge.

2) The special washer is not in contact with the bearing, but 0.5mm above it.
The flywheel rotates for a while by inertia when turned with the belt removed. At that time the capstan should not wobble.



* Adjust with the thrust adjustment screw so that the clearance between this screw and the flywheel is 0.1 – 0.4mm.

* No clearance leads to increased wow and flutter.

Flywheel thrust adjustment

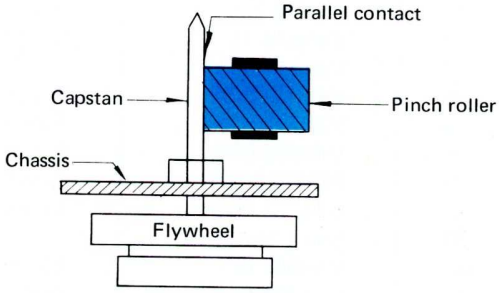
Fig. 21

C. PLAY (RECORD) operation

a. The pinch roller is made of rubber having a suitable hardness (50 – 70°) and finished by precision grinding. In order for the tape to be transported smoothly, the pinch roller must be pressed against the capstan in parallel and with uniform pressure. The main problems to check for are out-of-roundness of the capstan and irregular tape stretch.

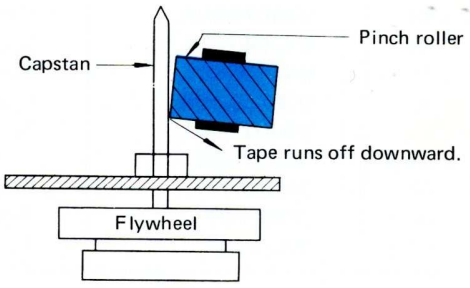
b. The flywheel assembly consists of a capstan which comes in contact with the tape to drive it, a bearing for the shaft and a flywheel which turns the shaft at a constant speed.
The diameter of the capstan directly determines the tape speed. Of all the components in the radio cassette recorder mechanism, the highest accuracy is required of the capstan. Any out-of-roundness in the capstan has a direct effect on the wow and flutter. Therefore, it is essential that it is always clean and correctly centered. Also, it should rotate quietly.

(Correct)

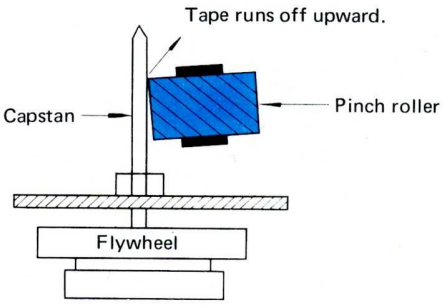


(a)

(Incorrect)



(b)



(c)

Tape stretch caused by inclined pinch roller

Fig. 22

(Hints)

Tape stretch:

This means that the tape moves upward or downward or gets out of the pinch roller because of inaccurate contact between the pinch roller and capstan. When you replace the pinch roller or capstan, check that they are parallel with each other referring to Fig. 22. Fig. 22 (b) and (c) are examples of bad contact.

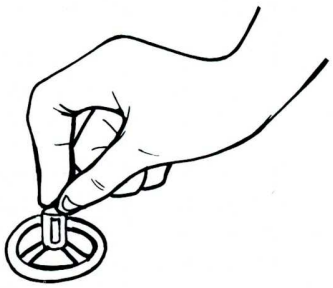
Checking the possibility of tape stretch:

Play back a cassette tape with its pad removed.

If the tape does not move up or down, tape stretch will not occur.

c. The take-up reel disk assembly consists of a reel disk and a friction disk as shown in Fig. 9. Rotation is transmitted through the friction disk to the reel disk, giving the proper torque (PLAY torque) via the slip mechanism. If you hold the end of the reel disk shaft while the recorder is in the PLAY mode with no cassette, the friction disk still rotates. (See Figs. 8 and 9.)

The rated PLAY torque is 40 – 60g.cm and fluctuations of about 10g.cm in this range are normal.

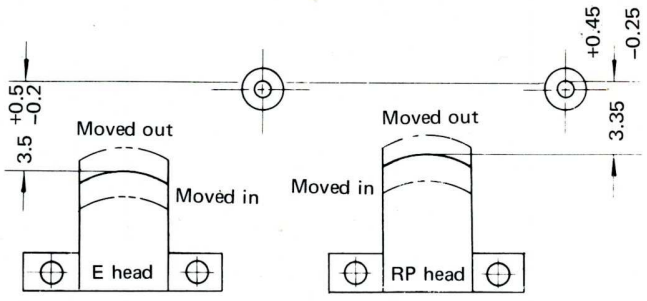


Checking the slip function in the friction disk

Fig. 23

d. The supply reel disk is subject only to back tension and with the 9407 series the tape counter moves smoothly.

e. The play/record head and erase head are held in position as shown in Fig. 24 with a positioning jig in the factory, so that they do not contact the inside of the cassette.



Positioning the heads

Fig. 24

D. FF and REWIND operation

The disks rotate without slipping. However, when the take-up or supply reel disk is stopped by hand, the motor pulley and belt may slip slightly or the motor may turn slowly. (Fig. 10)

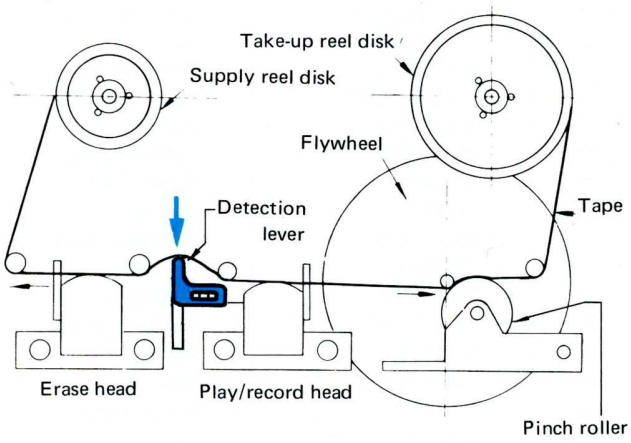
Note: To prolong the battery life and the prevent trouble from overloading the motor, the motor pulley and belt are constructed to slip slightly against each other.

E. Auto-stop mechanism

There are two systems of auto-stop mechanism; mechanical and electronic. The 9407 series employs the mechanical auto-stop system.

When the tape reaches its end in the PLAY (or RECORD) mode, it is stretched between the supply reel disk where it is fixed and the pinch roller/capstan where it is driven. The stretched tape moves a detect lever (the detect cap) in the direction of the arrow in Fig. 25. This movement corresponds to the difference in position of the running (slackened) and stretched tapes. The detect lever then slides the auto-stop lever, causing the kick lever attached thereon to strike against the pin on the flywheel.

This moves the pushbutton actuator plate to release the PLAY button lever, allowing the shut-off operation.



Mechanical shut-off (auto-stop) mechanism

Fig. 25

1. Movement of the detect lever (detect cap)

The movement of the auto-stop detect lever is normally 0.8 – 1.8mm from the axis of the guide pin on the chassis. Measure with a jig or a gauge. (Fig. 26)

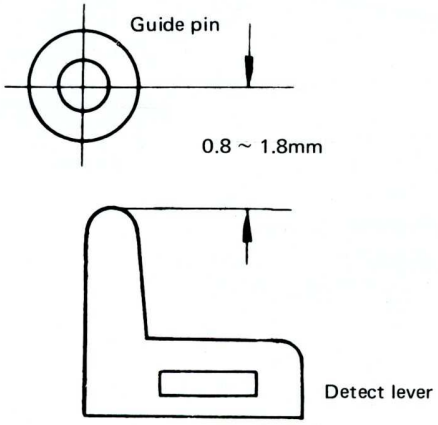


Fig. 26

2. Position of the detect lever in the PLAY (or RECORD) mode

The lever should be within 0.5mm from the axis of the guide pin. (Fig. 27)

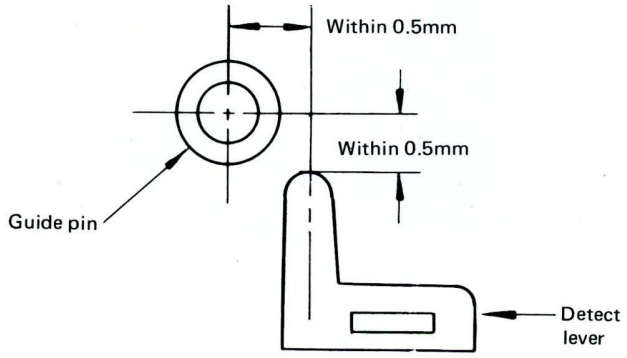
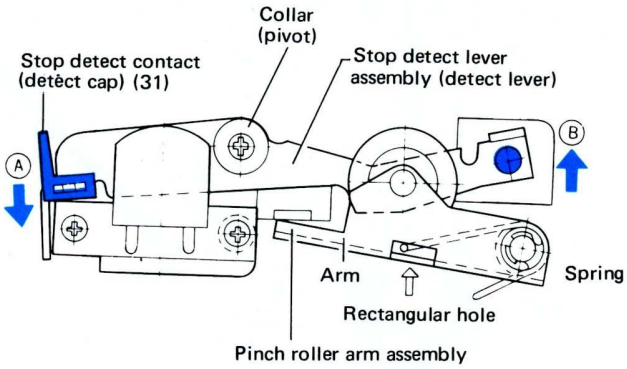


Fig. 27

3. Principles of auto-stop operation



Auto-stop mechanism (A)

Fig. 28

a. At the end of the tape the detect cap is pushed by the tape tension in the direction of (A).
b. When the detect cap is pushed in the direction of (A), the stop detect lever turns about the pivot so that the part (B) moves in the direction of the arrow.
c. The stud (C) in the Fig. 29 moves the auto-stop lever assembly, which is attached underneath the chassis, in the direction of (D) as shown in Fig. 30.

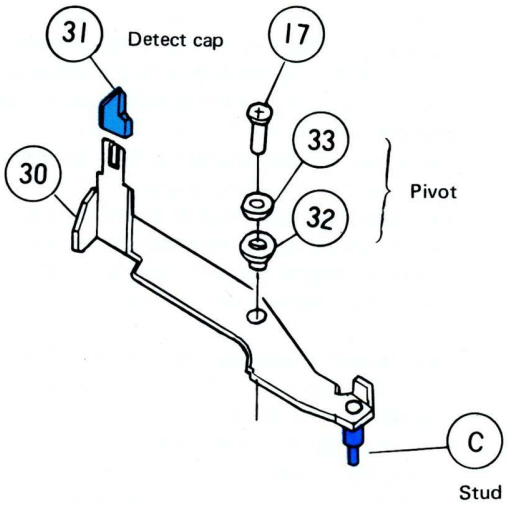


Fig. 29

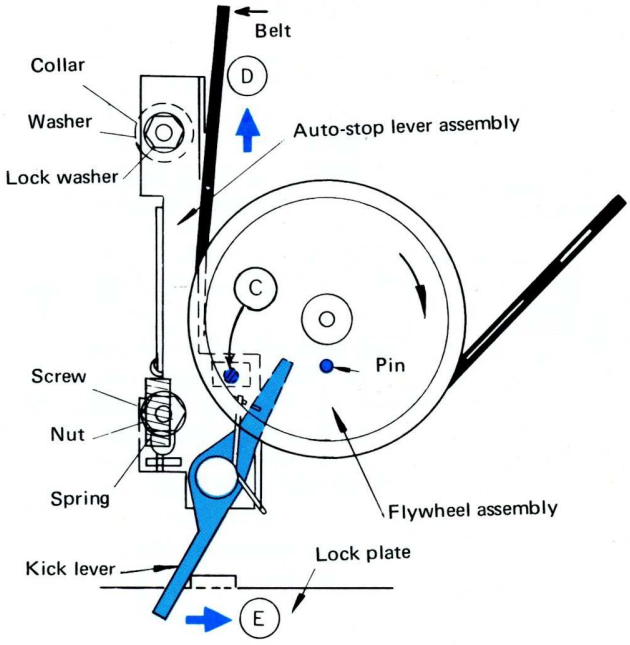


Fig. 30 Auto-stop mechanism (B)

d. The kick lever attached to the auto-stop lever assembly strikes against the pin on the flywheel.
e. The kick lever is kicked by the inertia of the flywheel in the direction of the arrow (E), thereby moving the lock plate of the push button assembly and releasing the PLAY (or RECORD) mode to STOP.

4. Mechanical full auto-stop mechanism

a. The 9475 series employs the mechanical full auto stop system.
When the tape reaches its end in all modes: PLAY RECORD, F.F. and REWIND, the mechanism stops and the respective control buttons return to their normal position.
b. The detection of the tape end is done by whether the take-up reel disk is turning or not.
1) The detection cam located under the take-up reel disk is pressed against the reel disk by the spring as shown in Fig. 31 and it swings to the rotating direction of the reel disk by the friction of the reel disk.
2) The shut-off assembly which consists of the gear with an eccentric pin and the detect lever assembled with the lever with the sectral teeth is located under the mechanism chassis.
3) In the every modes, the gear is turning with the speed reduced by the worm gear which is driven by the motor through the belt.

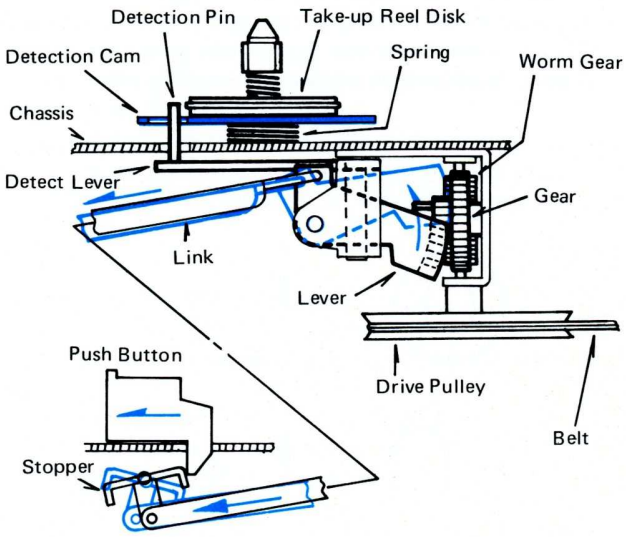


Fig. 31

c. In the PLAY, RECORD and F.F. modes :
1) The take-up reel disk turns to the **A** direction and the detection cam swings to the **D** dierction as shown in Fig. 32.

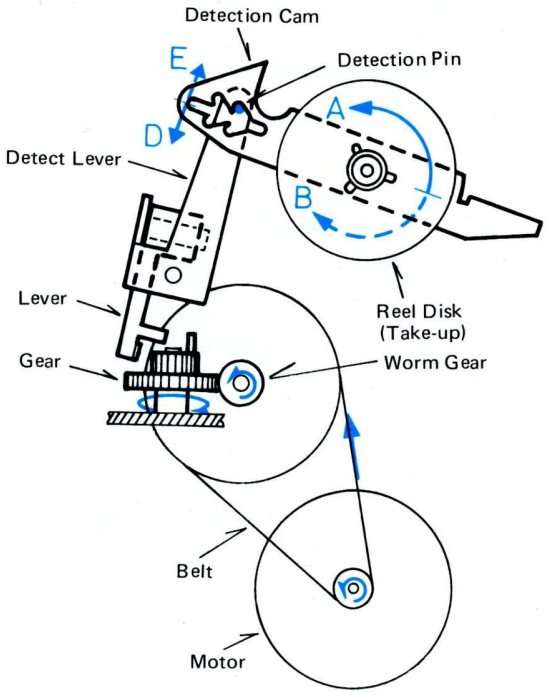


Fig. 32

2) The lever is moved by the eccentric pin of the gear and the detect lever assembled with the lever moves to the arrow direction as shown in Fig. 33.

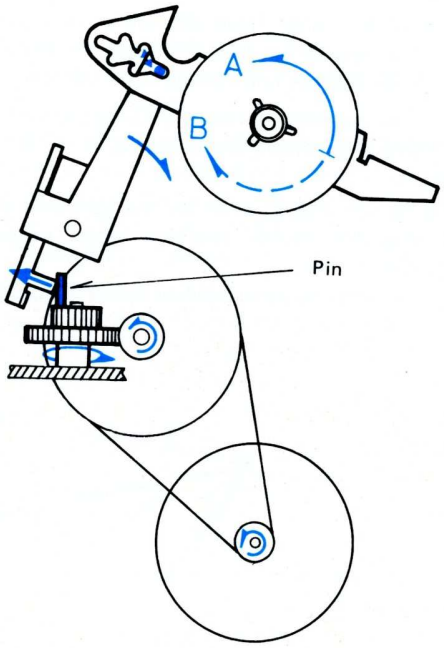
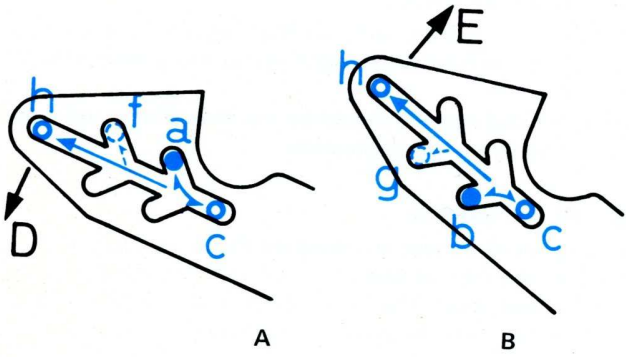


Fig. 33

3) The detection pin mounted on the detect lever moves reciprocally between the positions **a** and **c** of the inside groove of the detection cam as in Fig. 34-A.



A : in the RECORD, PLAY and F.F. mode
B : in the REWIND mode

Fig. 34

4) When the tape is reached its end, the take-up reel disk stops turning and the detection cam stops swinging.
The detection pin moves from the **c**-position to the **h**-position as shown in Fig. 34-A.
The sectral teeth of the lever is engaged with the gear as shown in Fig. 35.

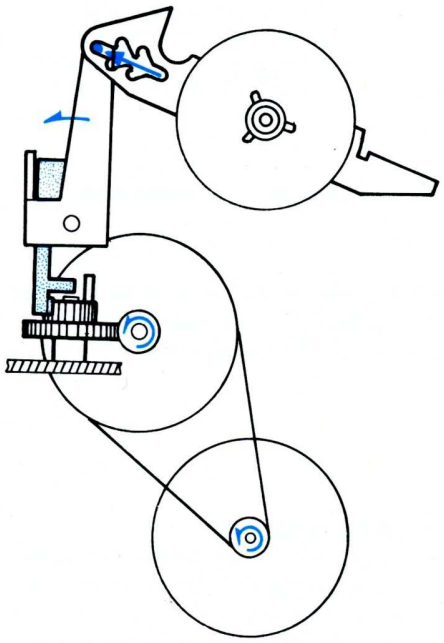


Fig. 35

The lever presses the link to move the stopper and the stopper release the control buttons, as shown in Fig. 31, then the mechanism stops completely.

d. In the REWIND mode :
   1) The take-up reel disk turns to the **B** direction and the detection cam swings to the **E** direction as shown in Fig. 32.
   2) The detection pin moves reciprocally between the positions **b** and **c** as shown in Fig. 34-B.
   3) When the tape reaches its end, the detection pin moves from the **c**-position to the **h**-position (Fig. 34-B).
   The lever presses the link and the REVIEW button is released.

e. The midway positions **f** and **g** of the detection cam as shown in Fig. 34 are the safe guard for preventing the auto stop mechanism to operate at the intermediate position of the tape.

F. Accidental erasure prevention mechanism

Cassettes are provided with safety tabs, one for each side, to prevent accidental erasure of the recordings. If these tabs are broken away, the erasure prevention mechanism operates to block the RECORD button.

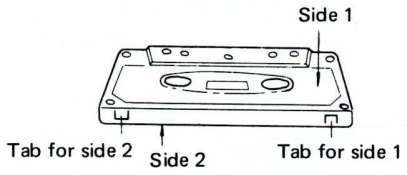
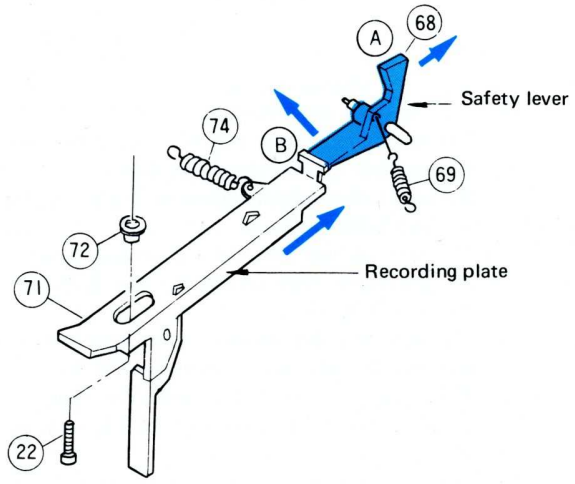


Fig. 36 Cassette tape

Note: When a new recording is to be made on a cassette from which the tabs have been broken, reseal the holes with plastic tape or paper.

Operation (Refer to Fig. 37)

When the safety tab is not broken, it pushes the safety lever (A) in the direction of the arrow, moving the part (B) and keeping the recording plate movable.
Therefore, the RECORD button can be pressed in.



Accidental erasure prevention mechanism

Fig. 37

2.2 Motor Current for Different Modes

A. Measuring the motor current

a. Disconnect the leads from the motor and connect an ammeter as shown in Fig. 39. Set the ammeter to a range of DC 250mA and measure the current. (Fig. 39)

b. Connect the ammeter through a KS jig connected to the microphone and remote control jacks. (Fig. 38)

(Hints)

The KS jig can also be used for the following purposes:

1) To stop the motor rotation when repairing the amplifier.
2) To check erasing by using it as a shorting plug.

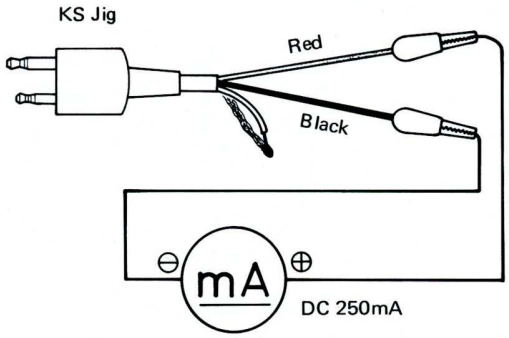


Fig. 38 Measuring the motor current

Notes:

If connected with the wrong polarity, the needle deflects in the opposite direction. First set the range of the ammeter to a greater value and make sure that the polarity is correct. Then change the range to one that is easy-to-read.

B. Non-load current

Measure the current with no load applied. To do this, remove the belt from the motor pulley and press the PLAY button.
The non-load current should be less than 60mA and there should be no current fluctuation.

C. PLAY current

Load a new C-60 tape and press the PLAY button.
Measure the current when the tape is fully wound onto the take-up reel disk. The PLAY current should be less than 150mA and there should be no current fluctuation.

D. FF and REWIND current

Load a new C-60 tape and press the FF or REVIEW button.
Measure the FF current when the tape is fully wound onto the take-up reel disk. Then fully rewind the tape and measure the REWIND current. This is to measure each current in the most extreme condition.
The FF and REWIND current should be less than 210mA.

2.3 Troubleshooting

A. Checking when the tape does not run

When the tape does not run, first check if the power supply voltage is sufficient. If you have replaced the betteries with new ones or are using AC power, it is unnecessary to check the power supply voltage.

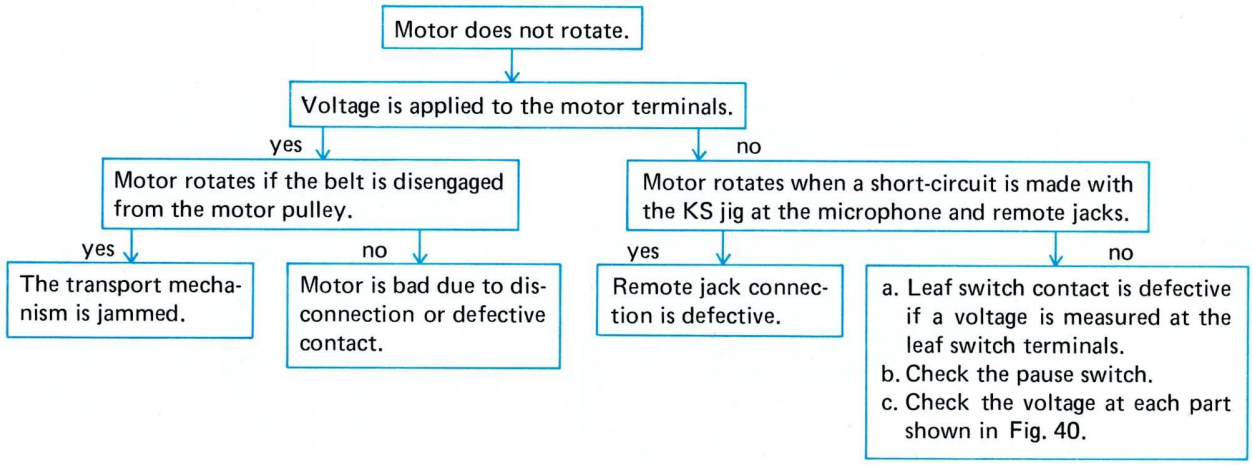
a. Check if the radio and amplifier operate normally.
If the radio functions normally, then the power supply circuit is OK. If the radio does not function correctly, then the AC/DC selector is defective or the amplifier is bad. Check the voltage at each part. (Refer to Fig. 40)

b. Checking the pause switch
The pause switch is for stopping the tape temporarily during recording or playback. By setting the switch to ON, the tape can be stopped.
When operating the unit make sure that this switch is set to OFF.

While other cassette recorders are equipped with a mechanical pause, the 9407 Series is paused by stopping the motor.

c. Checking the motor voltage
If there is no voltage available at the motor, make sure that the leaf switch and remote jack connections are properly made.
If there is voltage available at the motor, remove the belt from the motor pulley and check if the motor rotates. If the malfunction is in the transport mechanism the motor will rotate. If the motor itself is defective it will not rotate.

The pattern below is a troubleshooting chart.



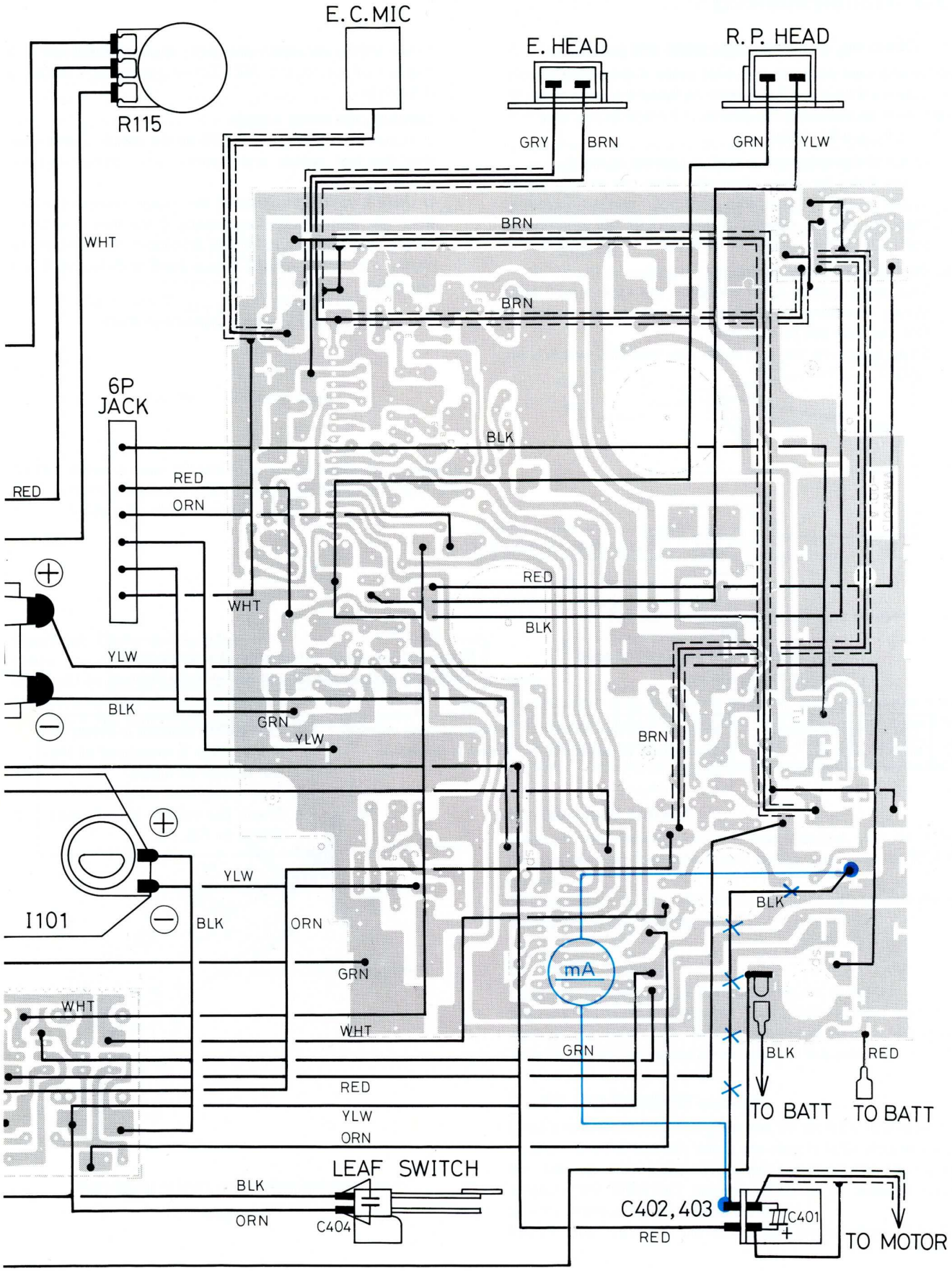

E.C.MIC
E. HEAD
R.P. HEAD
R115
GRY
BRN
GRN
YLW
WHT
BRN
BRN
6P
JACK
BLK
RED
RED
ORN
RED
WHT
BLK
YLW
BLK
GRN
YLW
BRN
I101
YLW
BLK
ORN
GRN
mA
BLK
WHT
WHT
GRN
BLK
RED
TO BATT
TO BATT
RED
YLW
ORN
LEAF SWITCH
BLK
ORN
C404
C402, 403
C401
RED
TO MOTOR

Fig. 39

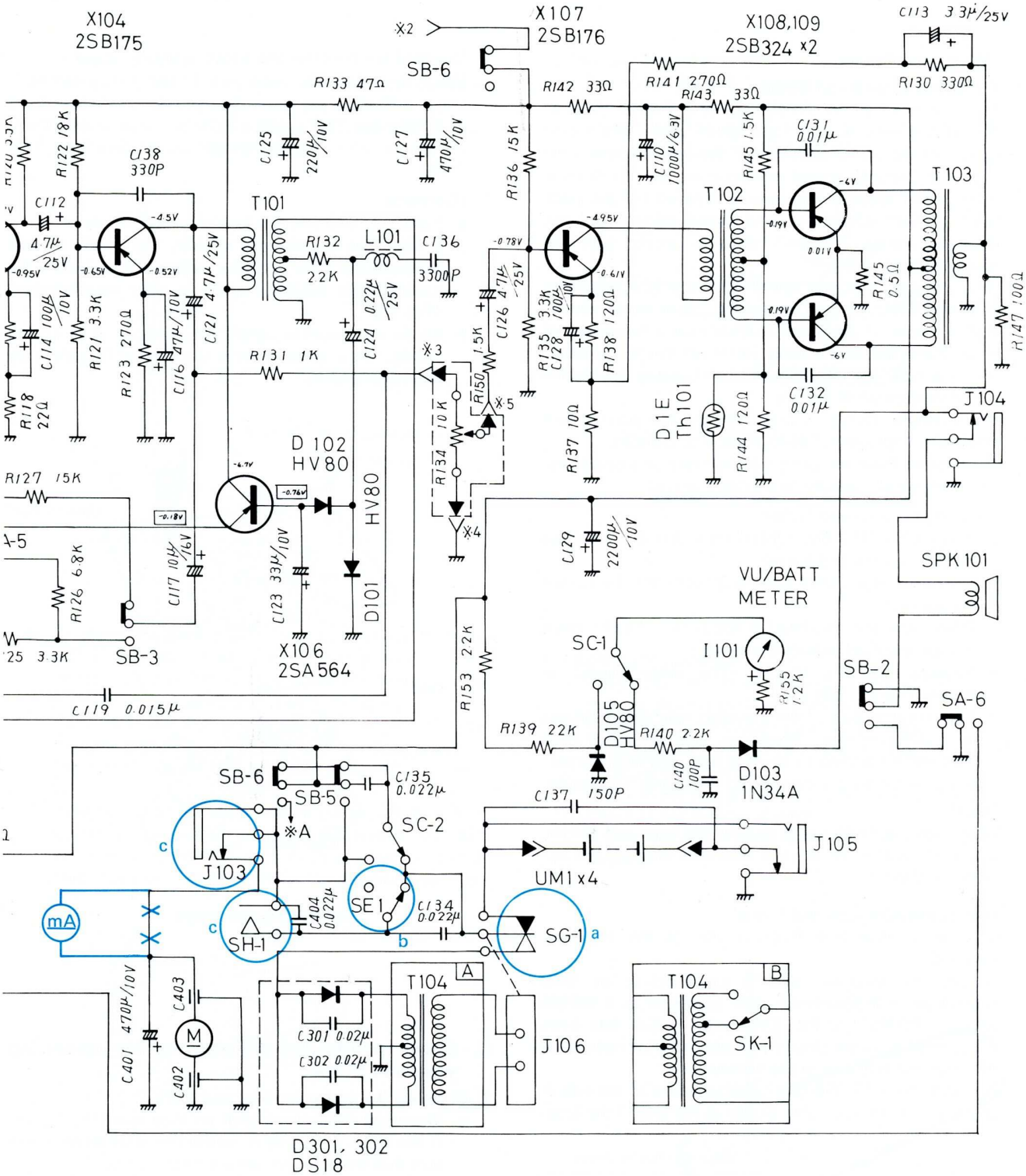

X104
2SB175
X107
2SB176
X108,109
2SB324 x2
SB-6
T101
T102
T103
D102
HV80
D101
HV80
X106
2SA564
SB-3
D1E
Th101
J104
SPK 101
VU/BATT
METER
I101
SC-1
SB-2
SA-6
D105
HV80
D103
1N34A
SB-5
SC-2
J103
J105
UM1x4
SE1
SH-1
SG-1
mA
T104
A
B
J106
SK-1
D301, 302
DS18

Fig. 40

B. Wow and flutter

1. The causes of wow and flutter

The tape must to be transported at the rated speed of 4.74cm/sec. An uneven tape speed causes the sound quality of the unit to deteriorate. Wow and flutter is the term for unstable sound reproduction due to fluctuations in the speed of the tape as it passes the playback head. "Wow" refers to uneven reproduction in the low frequency range, "flutter" refers to uneven high frequency reproduction.

Wow occurs if the tape speed fluctuates at a frequency of below 20Hz, causing an audible "wow wow" sound. And it occurs if the speed fluctuates at a frequency of above 20Hz, causing a harsh, indistinct sound. Trouble-shooting wow and flutter is difficult because it is caused by a combination of factors.

For example, flutter is produced by the parts which rotate at a high speed, like the motor or capstan.

Wow comes from the parts which rotate at a considerably lower speed, like the pinch roller or reel.

Checking for wow and flutter:

a. Play back a VTT-656 (3kHz) tape, which is used for measuring wow and flutter.
b. Listen to the 3kHz tone and note the frequency variations.
   (Make sure that the head is not dirty. If dirty, clean it with specified industrial alcohol.)
c. Measure the play torque. (The range should be between 40 and 60g.cm.)
d. Each rotating part of the transport mechanism rotates at a different rate. Therefore, you can check each part while listening to the test tape, and find the part whose rotation corresponds to the sound fluctuation.

(Hint)

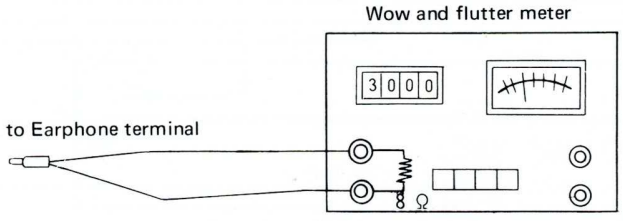
When you locate the part causing the wow and flutter, use a felt marker to mark a reference spot on the flywheel or idlers.

2. How to measure wow and flutter

Connect a wow and flutter meter to the eraphone terminal.

Usually the metered value is expressed as an RMS percentage, but sometimes it is expressed as a WRMS value. "WRMS" is the RMS value which has been "weighted" to more closely indicate just how noticeable the wow and flutter is to the human ear.

Playback the VTT-656 test cassette tape with the side A and measure the wow and flutter at the end of the tape.



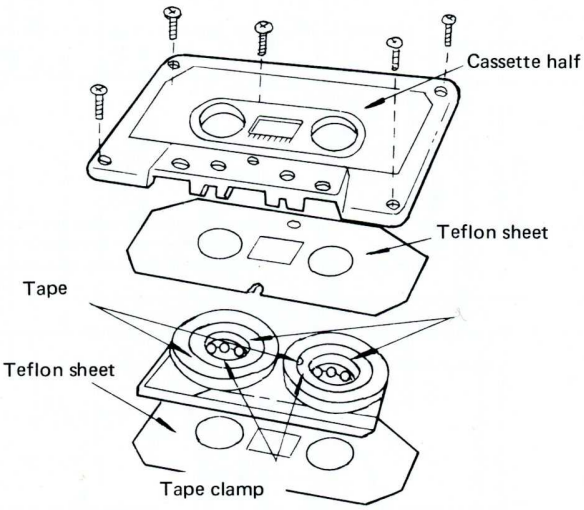
How to measure wow and flutter
Fig. 41

3. Standard for the wow and flutter and tape speed

Make sure that the wow and flutter measurement is taken with the deck running at the standard tape speed of 4.75cm/sec ±3.0% with a 3kHz test tape. Under these conditions wow and flutter should be less than 0.4% RMS.

(Cautions)

a. Make sure that the test tape is wound evenly.
   If the tape is unevenly wound, too much friction between the tape and the teflon sheets inside the cassette will cause an error in your measurement. (Fig. 42)
b. Shake the cassette lightly to check if it is wound evenly. In a good cassette the reels will rattle back and forth slightly.



Cassette tape structure
Fig. 42

C. Check points and adjustments for correcting wow and flutter

1. Checking the motor for wow and flutter

a. Measuring the current with no load using the KS jig.
   If the value measured is within the rated range, make sure that there are no current fluctuations.
   Irregularities are usually caused by the malfunction of the motor governer.
   The non-load current should be less than 60mA.
b. Measuring the PLAY current
   When there are no irregularities in the no-load current, but the play current is uneven, check the rotating parts. The one which corresponds to the current fluctuation is the culprit.
   The rotating parts may be overloaded if the PLAY current is regular but is more than the rated value.
   The PLAY current should be less than 150mA.

2. Checking the belt

a. Belt surface should be clean. If the belt has polished spots it may be slipping during operation.
Clean it with specified industrial alcohol if it slips or if the belt is dirty. (See Fig. 43.)

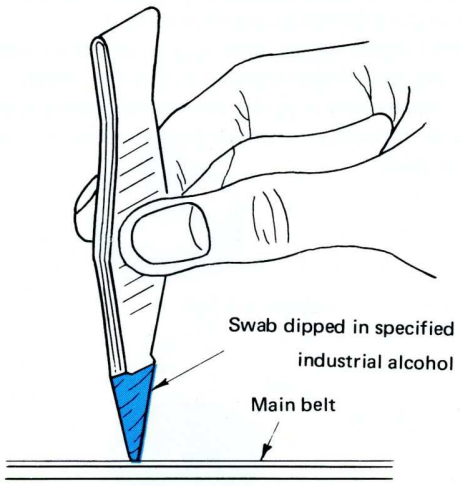


Fig. 43 Cleaning belt

b. To check for normal belt tension, stop the flywheel with your fingers while the mechanism is in the play mode. The belt should slow down but keep running if it is at the proper tension PLAY mode.
Make sure that the belt is correctly engaged in the pulley groove and not twisted.

c. Check if the wheel belt groove is dirty. If it is, clean it.

d. Make sure that the spring which presses the idler arm against the take-up roller has enough tension and that the idler is not dirty. If it is dirty, clean it with a swab dipped in specified industrial alcohol. (See Fig. 44.)

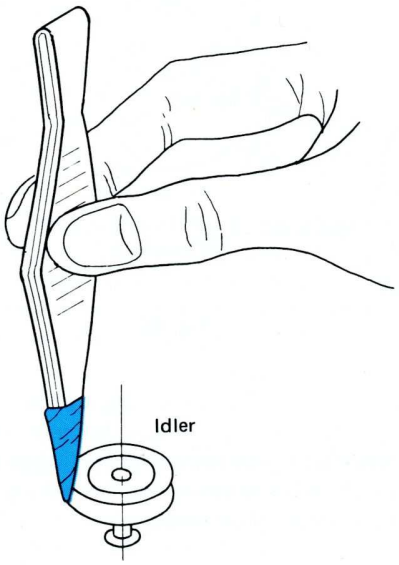


Fig. 44 Cleaning the idler

3. Checking the take-up arm

a. Disengage the belt from the wheel and make sure that the idler A rotates freely.

b. Check that the idler B (where the belt is engaged) is perfectly horizontal. (See Fig. 45.)

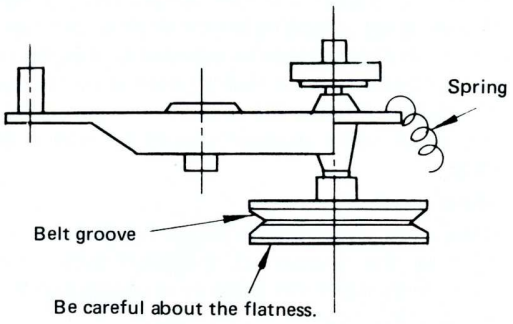


Fig. 45 Take-up arm assembly

4. Checking the flywheel

a. Check that the thrust is correct (refer to Fig. 21) and that the shaft is perfectly centered.

b. Disengage the belt and rotate the flywheel.
It should turn freely and keep turning for a while under its own inertia.

c. Check if the belt groove of the flywheel is clean.

d. Check if the capstan is clean.
If they are dirty, clean them with specified industrial alcohol.

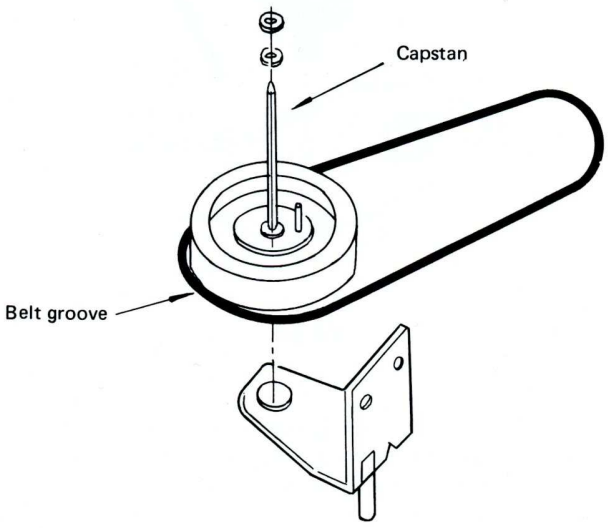


Fig. 46 Flywheel mechanism

5. Checking the pinch roller

a. The auto stop mechanism is normal if it operates automatically when the supply disk is stopped while in the play mode.
If the auto stop mechanism does not work, check if the tape slips due to a dirty pinch roller or dirty capstan. If it does, clean the pinch roller and capstan.

b. Measuring and adjusting the pinch roller pressure
The pinch roller should be adjusted so that the rubber part of pinch roller is slightly dented by the capstan (the flywheel shaft).
The pinch roller pressure should be within 500 – 600g.
(Hint)
Make sure that the pinch roller bracket is not touching the stopper of the head panel assembly when the pinch Roller pressure is normal but the tape transport is unstable.

c. Care and adjustment of the pinch roller
The pinch roller pressure should be kept in the rated range 500 – 600g in order to facilitate the operation of the auto stop mechanism.
When the pinch roller pressure is too high, the detect lever does not operate at the end of the tape.
On the other hand, when the pinch roller pressure is too high, wow and flutter occurs, the tape speed becomes unstable, and the PLAY current increases.
When the pinch roller pressure is in correct, adjust it by moving the spring to a different hole, as in Fig. 42.

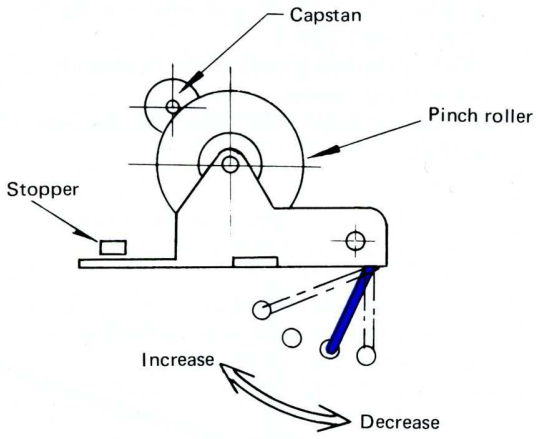


Fig. 47

6. Replacing parts in the rotating mechanism

One of the causes of the wow and flutter is that the take-up roller is worn. Since the parts in the rotating mechanism should be replaced with care, especially those parts related to the take-up reel disk, the procedures for the replacements is discribed below.

a. Replacing the take-up arm assembly
When replacing the take-up arm assembly, remove the E-ring and set the recorder in the F.F. mode.
To make removing the arm easier, swing it back and forth horizontally as you pull it up to the top of the arm shaft.

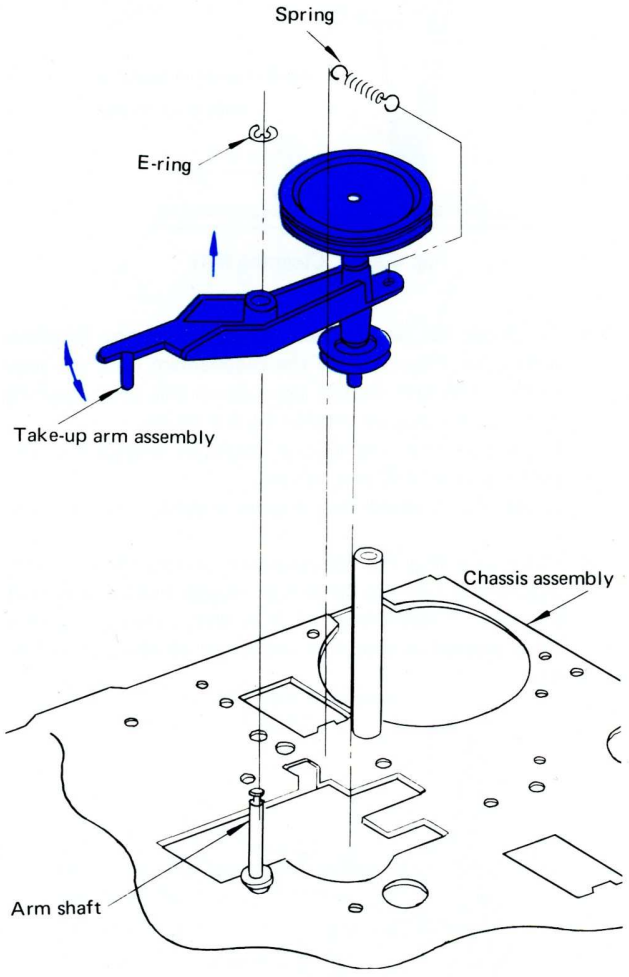


Fig. 48

Note:
Be careful not to stretch out the spring at the end of the arm. If it is stretch, replace it with a good one in order to maintain good torque.

b. Replacing the Reel disk assembly
Remove the E-ring from the reel shaft, grasp the top of reel disk with your fingers and then pull it up to take it off the shaft. When replacing the reel disk assembly, apply silicon grease to the reel disk seat if there is little or no grease there already. (See Fig. 49)

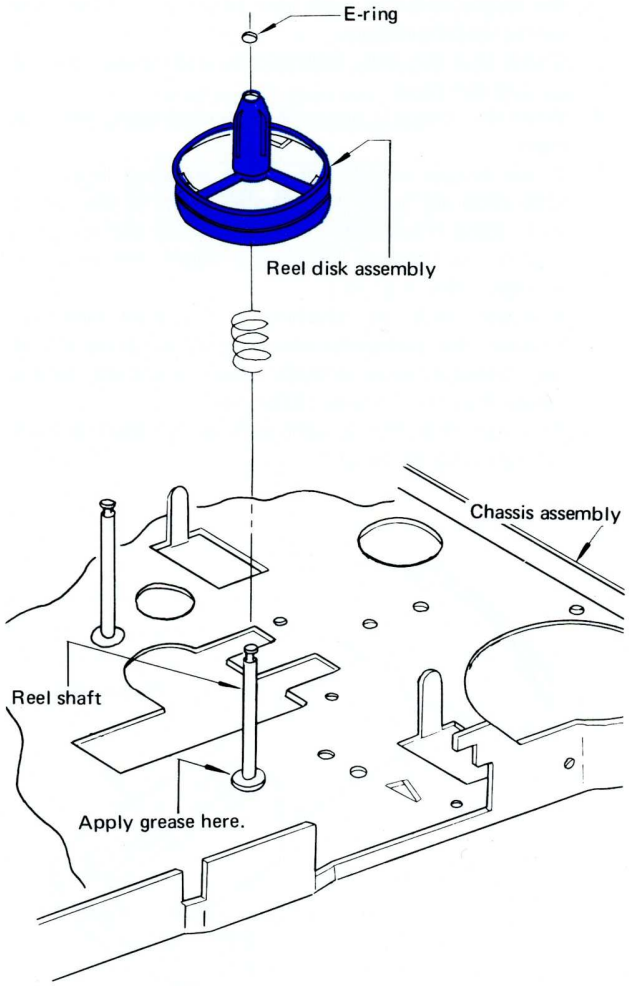


Fig. 49

Note:
If you have widened the E-ring when removing it, it may slip off of the shaft when re-attached. In this case replace the E-ring. If the E-ring rotates, it may cause mechanical noise. Be sure to adjust and confirm the torque after replacement.

c. Adjusting the playing torque
When the playing torque is stronger than the standard, cover the centre shaft of the reel disk with a cap of fountain-pen, and press lightly to reduce the contact pressure equally.
When the torque is weaker than the standard, turn the three-flap leaf spring from 1 to 4 as shown in Fig. 50 to achieve the correct torque.

After completing the torque adjustment, check that the friction between the reel disk and friction disk is normal during playback. Also check that the contact parts of the reel disk, take-up roller or take-arm assembly roller do not slip when playing back.

Note:
After replacing the reel disk, make sure to measure the torque with a torque dial gauge or torque gauge and adjust it in a range of 40 – 60g.cm.

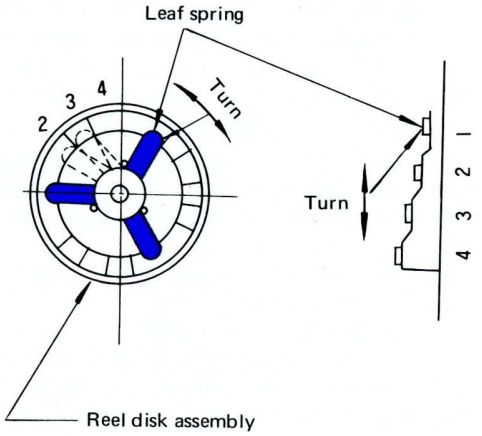


Fig. 50

d. Take-up roller replacement
Take the E-ring off of the roller shaft, and pull up to remove the take-up roller from the shaft. When replacing the roller, be sure to apply oil if needed.

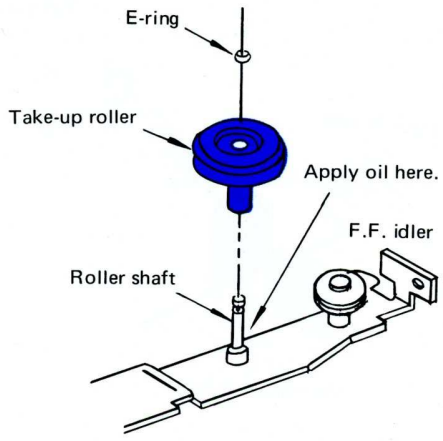


Fig. 51

Note:
Be careful not to damage the circumference of the roller shaft or the part where the E-ring is fixed. If they are damaged, removing the roller may become difficult and its rotation may be irregular. If the E-ring is widened when you remove it, it may slip off of the shaft when you reattach it.

D. Checking the F.F. and REWIND torque

1. In the F.F. mode motor torque is transmitted to the idler A through the main belt and the idler's rotation is transmitted to the take-up reel disk through the F.F. idler. The back tension applied to the supply reel disk prevents excess tension which in rare cases may arise when the F.F. is stopped.
   Here are the checking procedures for when the torque is not at the correct standard or if it fluctuates.
   a. Set the mode to F.F., and stop the rotation of the take-up reel disk with your finger to find the place where slipping occurs. Check that the belt, take-up arm, F.F. idler, and take-up reel disk are not difective. Torque fluctuations are usually caused by slipping in one or more of these parts.
   b. When the torque is not at the standard level, clean the main belt and idler with a swab of cotton cloth dipped into alcohol to increase torque. (See Figs. 43, 44)
      Clean the flywheel and motor pulley at the same time for more effective results.
      If the torque does not reach the standard level even after cleaning the above-mentioned parts, adjust the standing arm on the mechanical chassis where the spring from the take-up arm assembly is hooked. Bend it with pliers toward "Increase" if the torque is weaker, or towards "Decrease" if the torque is stronger. (See Fig. 52.)
      However, such an adjustment is seldom necessary because comprehensive quality controls during the manufacturing process assure standard torque unless the parts become defective. Be aware that this is used only as the final measure for adjusting the torque.

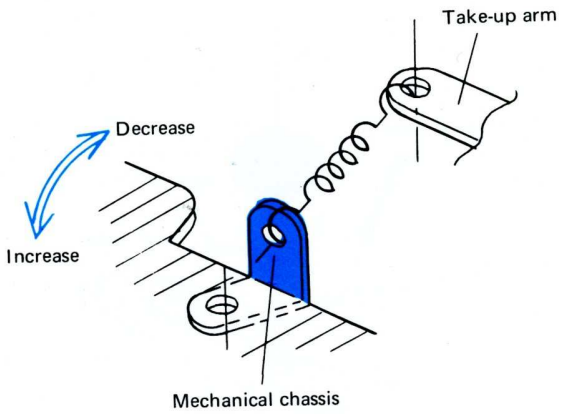


Fig. 52

2. In the REWIND mode, motor torque is transmitted to the take-up arm through the main belt, and the take-up arm's rotation is transmitted to the supply reel disk. The back tension applied to the take-up reel disk prevents excess tension which in rare cases may arise when rewinding is stopped.
   a. Set the mode to REWIND, and stop the rotation of the supply reel disk with your finger to find the place where slipping occurs.
      Check that the belt, take-up arm and supply reel disk are not defective.
   b. When the torque is not at the standard level, clean the parts.
      If the torque is still not at the standard level even after cleaning, bend the adjustable part of the rewind arm. Bend it towards "Increase" when the torque is weaker, or towards "Decrease" when the torque is stronger. (See Fig. 53.)
      However, such an adjustment is seldom necessary because the comprehensive quality controls during the manufacturing process assure standard torque unless the parts become defective.
      Be aware that this is used only as the final measure for adjusting the torque.

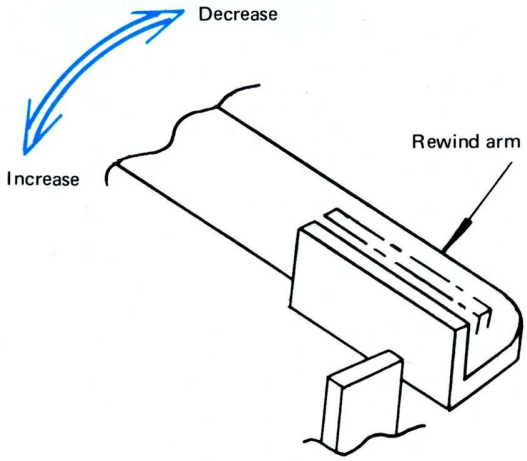


Fig. 53

E. Checking and repairing the auto-stop

When the tape comes to the end in the PLAY (RECORD) mode, the tape end fixed to the side of supply reel becomes taut from the pull of the pinch roller and capstan. The detect cap at the end of the detect plate is pressed as the tape becomes taut and the detect plate operates the auto-stop lever which presses the kick lever fixed at the auto-stop lever against the pin of the flywheel. The pin which is pressed slides the operation plate of the push button with a help of flywheel inertia to release the PLAY push button, shutting off the deck. Here are the checking procedures for the atuo stop mechanism.

In the PLAY mode, check that auto stop operates when the counter pulley is stopped with the finger. (Cassette tape must be loaded for this test.)

If auto-stop operates when the counter pulley is stopped with the finger, but it does not operate in the leader part of the tape when the tape comes to the end, clean the flywheel shaft (capstan) and pinch roller.

Lowered contact pressure of pinch roller. (Specified pressure: 500 – 650g) Replace the pinch roller if its rubber has become hard.

Before running these checks, make sure that the detect lever is at the correct position. (Refer to Fig. 27.)

Check with your fingers that the detect lever moves smoothly without being snagged.
Check that the auto-stop operates when the lever is pushed about 1.8mm.

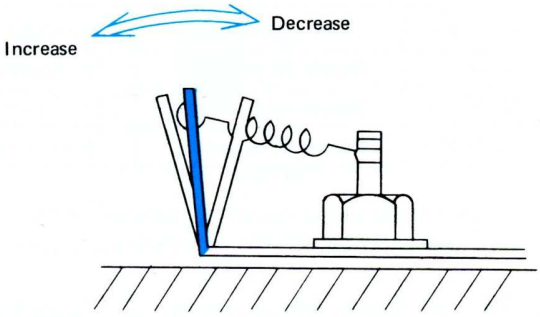
When the detect lever does not move smoothly, apply a little silicon grease to the contact part between the lever and the chassis.

The detect lever pressure should be 50 – 70g. Measure and confirm the pressure.

1. Adjusting the detect lever pressure

Maintain the detect lever pressure within a range of 50 – 70g to assure accurate auto-stop operation. If the detect lever pressure is too strong, it will not be in conformity with the pinch roller pressure, and will not operate when the end of the tape has been reached.

If the pressure is too weak, the detect lever may be activated by a shock generated during tape transportatioon or by the splice connecting the leader to the tapes. When the detect lever pressure is not at the specified level, bend the arm of the lever at which the spring is hooked to adjust the pressure. (See Fig. 54.)



Shut-off (auto-stop) operation adjustment
Fig. 54

2. Adjusting the detect lever pin

If the auto-stop does not operate, but only makes a kicking sound at the end of the tape, bend the lever to SLOW with pliers. (See Fig. 55.)

If the auto-stop operates halfway through the tape transportation or the kicking sound is heard when the PLAY button is pressed, bend the lever to FAST as in Fig. 55.

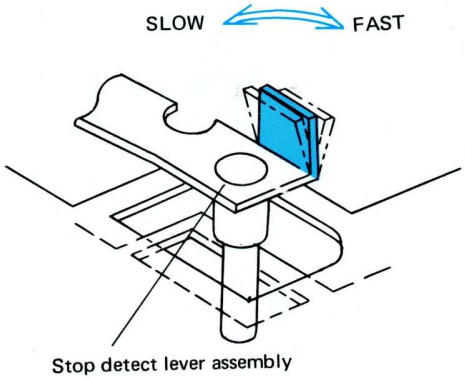


Fig. 55

F. Preventing tape stretch

1. Tape stretch is caused by up-and-down movement of the tape at the capstan and pinch roller. If tape stretch occurs, the tape is probably not wound smoothly in the cassette, or it may be wound around the pinch roller or capstan.
   Tape stretch causes sharp high frequency sound fluctuations, or wow and flutter.
   Note: Stretched tape is easily folded at its edge, twisted, or creased. This tape, like C-120, is easily stretched, so we recommend that you use C-60 or C-90 tape.

(Hints) Tape thickness

Cassette	Regulation	Standard
C-60	Below 20 microns	18 microns
C-90	Below 13.5 microns	12 microns
C-120	Below 10 microns	8 microns

To confirm if stretching is occurring, take off the pressure pad in the cassette and watch the tape during playback.

Note:
Check that the tape in the cassette before loading it into the machine.
The tape is poorly wound, if you use an eased tape.

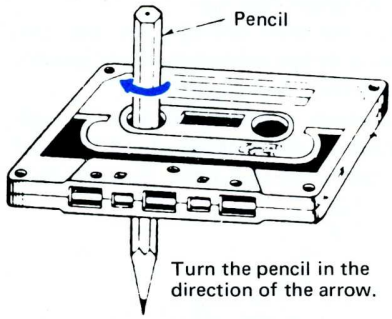


Fig. 56

2. Tape stretching causes
   There are many tape stretching causes, and the followings are major ones.
   a. Take-up torque is too strong.
   b. Pinch roller is inclined. (See Fig. 22.)
   c. Tape guide of head is deformed.
      Replace the head. (See Fig. 57.)
      Note: The Record/Playback head is often deformed.
   d. Auto-stop detect lever is not parallel with the tape.
   e. Pressure pad in the cassette is deformed. (See Fig. 58.)
   f. Back tension is too weak.
      Loose counter belt may be the cause.

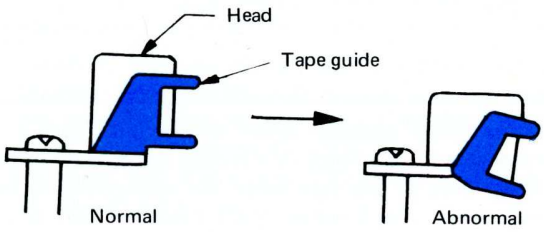


Fig. 57

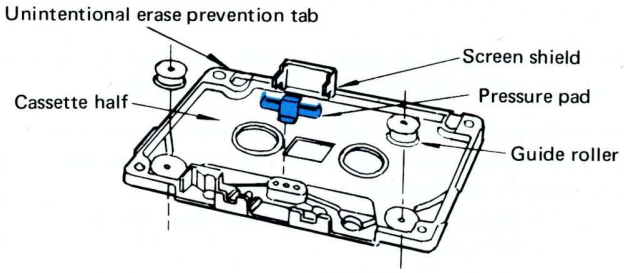


Fig. 58

G. Azimuth adjustment of the recording head

1. When you replace the recording head if its vertical position is not correctly set, the high frequency output will be reduced. To adjust the head properly, turn the screw (B) in Fig. 59 clockwise or counter-clockwise with a screw driver to adjust the vertical angle of the head (azimuth adjustment).

   Adjustment proceudre:
   a. Connect the vacuum tube voltmeter (VTVM) to the speaker terminal.
   b. Play back the head angle adjustment test tape (VTT-658, 10kHz).
   c. Turn the screw (B) so that the output is maximum, and fix it at that position to finish the adjustment.
   d. After adjustment, point the screws (A) and (B) to lock them in place.

   Note:
   Always keep magnetized screw drivers and other metalic tools away from the head.

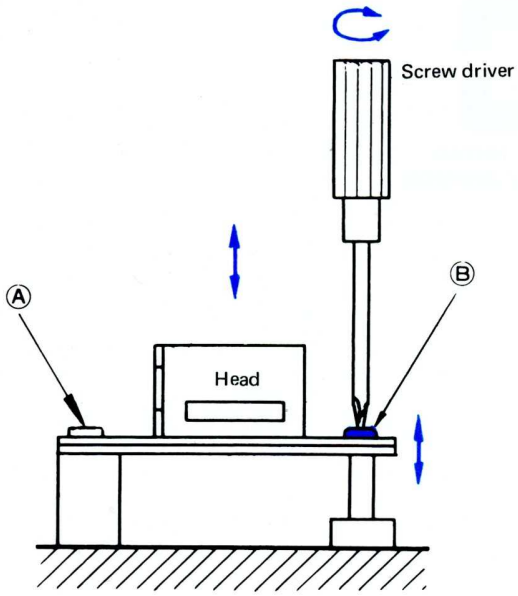


Fig. 59

2. Adjusting the recording bias
   a. Plug the shorting plug into the microphone terminal and set to the recording mode.
   b. Connect oscilloscope or VTVM to the both terminals of the speaker.
   c. Adjust L201 so that the wave form on the oscilloscope or the indication on the VTVM is minimized. Set the sound volume and tone to their maximum positions. (See Fig. 60.)

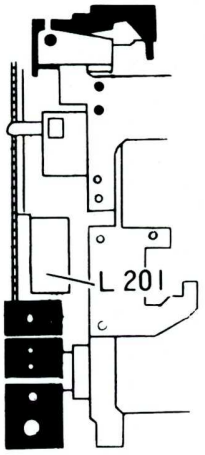


Fig. 60

3. Head replacement
   a. Erasing head
      Remove the two screws (C), (D) to take off the erase head.
   b. Record/Playback head
      Remove the two screws (A), (B).

   Note:
   1. Be careful not to heat the head too much when soldering
   2. Always keep magnetized screw drivers and other metalic tools away from the head.

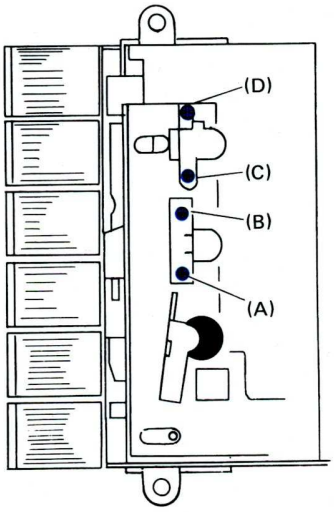


Fig. 61

JVC

VICTOR COMPANY OF JAPAN, LIMITED
RADIO & RECORDING MACHINE DIVISION

Printed in Japan
– 5103 – O –