TEAC®

# SERVICE MANUAL

# A-6600

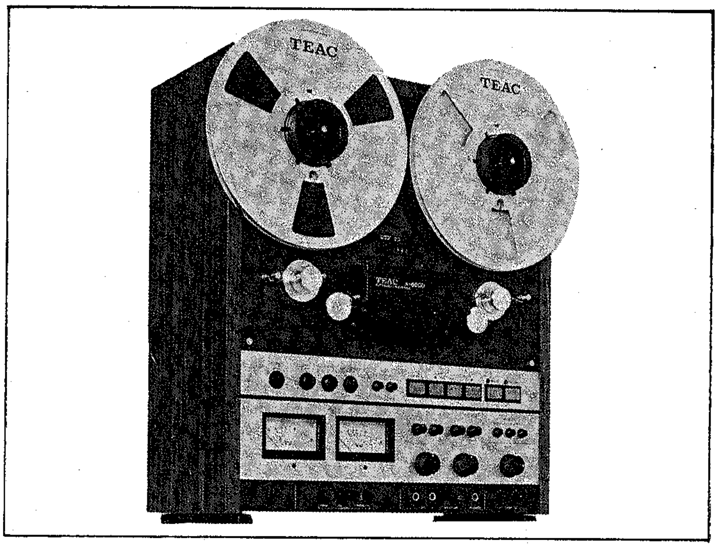
Stereo Tape Deck


TEAC CORPORATION

51032140

# 1. GENERAL DESCRIPTION

The TEAC A-6600 open reel tape deck is a 1/4 track, 2 channel (stereo) tape deck which has forward record/play capability and also reverse play capability. The A-6600 operates at two selectable speeds, 7-1/2 ips and 3-3/4 ips. It can be used with reels up to a maximum 10-1/2" diameter. It employs a DC Servo Controlled capstan motor and has dual pinch roller and capstan systems and dual impedance rollers.

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# 2. SPECIFICATIONS AND SERVICE DATA

## 2-1 SPECIFICATIONS

| | |
|---|---|
| Track System | 1/4 track, 2 channel stereophonic<br>1/4 track, 1 channel monophonic |
| Heads | Four; Erase, Record, Forward Play and Reverse Play |
| Reel Size | 10-1/2" and 7" |
| Tape Speed | 7-1/2 ips and 3-3/4 ips |
| 3 Motors | 1 DC Servo Controlled Capstan Motor,<br>2 Eddy Current Induction Reel motors |
| Input<br>(Level and Impedance) | MIC: Specified; –60 dB (0.774 mV)/10k ohms<br>Minimum; –70 dB (0.244 mV)<br>LINE: Specified; –12 dB (194 mV)/50k ohms<br>Minimum; –22 dB (61.5 mV) |
| Output<br>(Level and Load Impedance) | LINE: Specified; –5 dB (435 mV)/10k ohms<br>Maximum; +1 dB (869 mV)<br>Headphone out: –19 dB (86 mV)/8 ohms |
| Playback Equalization | 7-1/2 ips: 3180 μ sec + 50 μ sec (NAB)<br>3-3/4 ips: 3180 μ sec + 90 μ sec (NAB) |
| Bias Frequency | 100k Hz (±5k Hz, push-pull oscillator) |
| Power Requirement and Consumption | 100. 117, 220, 240 V AC 50/60 Hz (General Export model), 144W<br>117 V AC 60 Hz (U.S.A. and Canada Model), 154W |
| Weight | 30.5 kg (67 lbs) net |
| Dimensions (WHD) | 476 x 549 x 258 mm (18-3/4" x 21-5/8" x 10-3/16") |

## 2-2 SERVICE DATA –MECHANICAL–

| | |
|---|---|
| Tape Speed Deviation and Drift | 3,000 Hz ±30 Hz, within 15 Hz |
| Wow and Flutter | Playback: 0.18% (RMS) at 7-1/2 ips<br>0.20% (RMS) at 3-3/4 ips<br>Overall: 0.20% (RMS) at 7-1/2 ips<br>0.25% (RMS) at 3-3/4 ips |
| Pinch Roller Pressure | 2.2 kg (4.8 lbs) |
| Reel Torque | |

Auto specer time:

Min. – 3 sec
Max. – 10 sec

| | REEL SW | TAKE UP VALUES |
|---|---|---|
| FWD | LARGE | 680 to 720 g-cm (9.5 to 10 oz-inch) |
| | SMALL | 350 to 450 g-cm (5.0 to 6.3 oz-inch) |
| REV | LARGE | 650 to 750 g-cm (9.0 to 11 oz-inch) |
| | SMALL | 350 to 450 g-cm (5.0 to 6.3 oz-inch) |

| | REEL SW | BACK TENSION VALUES |
|---|---|---|
| FWD | LARGE | 380 to 420 g-cm (5.3 to 6.0 oz-inch) |
| | SMALL | 230 to 270 g-cm (3.2 to 4.0 oz-inch) |
| REV | LARGE | 350 to 450 g-cm (5.0 to 6.3 oz-inch) |
| | SMALL | 200 to 300 g-cm (3.0 to 4.0 oz-inch) |

| | |
|---|---|
| Brake Torque | 1,600 to 2,000 g·cm (22.4 to 28.0 oz-inch) |
| F.F/REW Time | 160 seconds for 1,800 foot tape |

## 2-3 SERVICE DATA –ELECTRICAL–

| | |
|---|---|
| Frequency Response | Refer to Frequency Response Limits charts in this manual |
| Signal-To-Noise Ratio | Overall: 49 dB at 7-1/2 ips<br>46 dB at 3-3/4 ips |
| Erase Efficiency | 70 dB at 1k Hz signal<br>(Measurement with input 10 dB higher than the Specified Input level) |
| Cross Talk Rejection | 40 dB adjacent track at 125 Hz |
| Stereo Channel Separation | 50 dB Channel to Channel at 1k Hz |
| Total Harmonic Distortion | Overall: 0.8% at 1k Hz signal at 0 VU. |

**NOTE:** As a result of continuing changes and improvements during the production run, minor differences may be found between early and later machines. Value of "dB" in this manual refers to 0 dB = 0.775V.

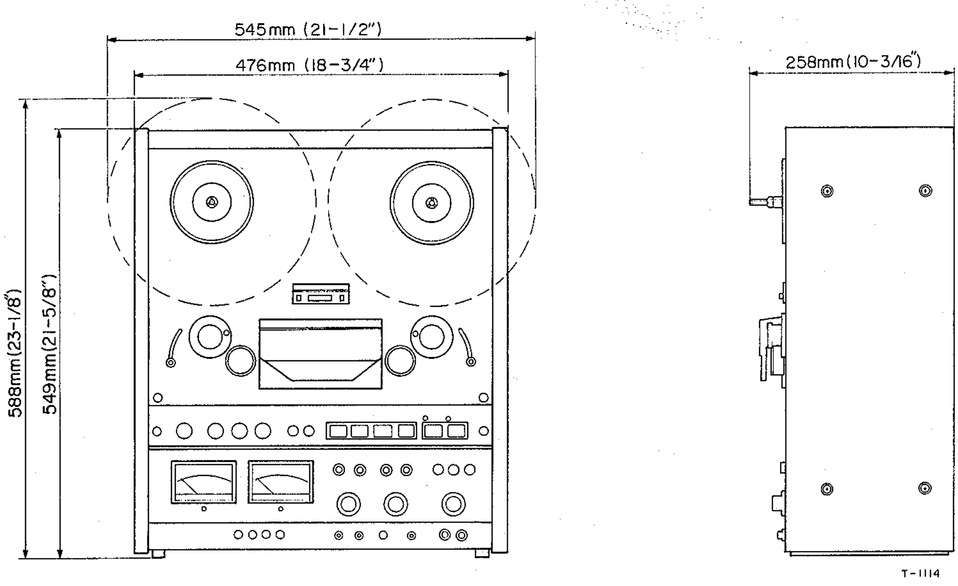



Fig. 2-1 Dimensions

# 3. TOOLS FOR TESTING AND MAINTENANCE

A minimum of the following tools and test instruments are required for measuring and adjusting to obtain optimum performance. Regular maintenance tools will be adequate for those not listed here. If any test instrument listed here is not available, a close equivalent can be used.

SPRING SCALE . . . . . . . . . . . . . . . . . . 0–4 kg (0–8 lbs)
0–300 g (0–10 oz)
FLUTTER METER . . . . . . . . Meguro Denpa Sokki K.K., Model MK-668C
DIGITAL COUNTER . . . . . . . . . Range; 0 Hz–100 kHz
BANDPASS FILTER . . . TEAC MODEL M-206A (1 kHz)
VTVM (AC) . . . . . . . Hewlett-Packard Co., Model 400E
AF OSCILLATOR . . . . . . . . . . . . . . . 10 Hz–100 kHz
ATTENUATOR . . . . . . . . . . . . . . . . . . General purpose
OSCILLOSCOPE . . . . . . . . . . . . . . . . General purpose
BLANK TAPE . . . . . . . TEAC YTT-8023, 8013 and 8003
TEAC TEST TAPE . . . . YTT-1003 (7-1/2 ips), YTT-1002 (3-3/4 ips) for Playback Alignment test

YTT-2003 (7-1/2 ips), YTT-2002 (3-3/4 ips) for Tape Speed and Wow and Flutter test
TEAC EMPTY REEL . . . . . . . . . RE-702 (2.5" dia, hub)
RE-701 (4" dia, hub)
TOOLS . . . . . . . . . . . . . . . . . . . . . . . . . . . . General
2 mm nut driver
Hex Head Allen Wrench
Plastic alignment tool
Load resistor non inductive type 8 ohm/1 W
DEMAGNETIZER . . . . . . . . . . TEAC E-3 or equivalent

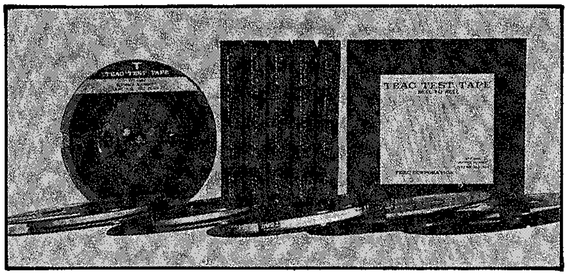


Fig. 3-1 TEAC Test Tape

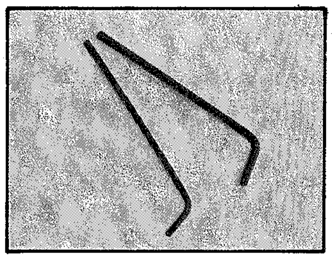


Fig. 3-2 Hex Head (Allen) wrench

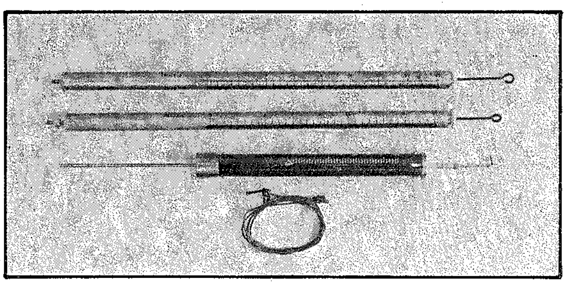


Fig. 3-3 Spring Scales

# 4. PARTIAL DIS-ASSEMBLY

## 4-1 OUTER CASE AND PANEL REMOVAL

Remove necessary panels as shown in the illustration.
Unplug the power cord before removing any panel or internal parts.

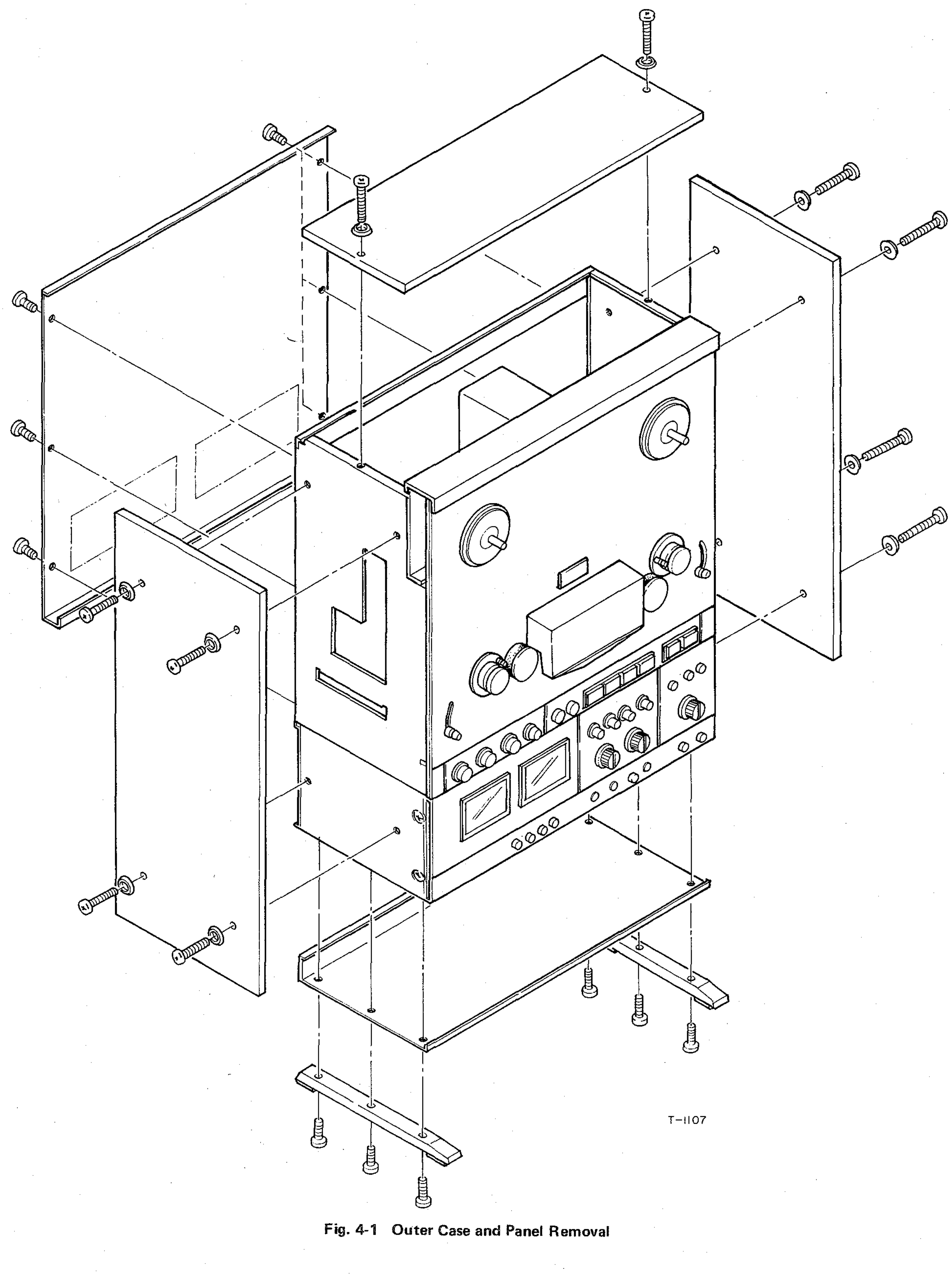



**Fig. 4-1 Outer Case and Panel Removal**

## 4-2 CAPSTAN MOTOR, FLYWHEEL AND CAPSTAN ASS'Y REMOVAL

1. Unscrew (by hand ) the capstan dust cap (H).
2. Remove 2 screws from capstan thrust angle (B) and remove it.
3. Remove flywheel (C) by loosening 2 hex head set screws and removing drive belt (D).
4. Remove capstan motor (A) by removing 3 screws.
5. Disconnect 3 wires to capstan motor from PC Board.

**–CAPSTAN ASS'Y REMOVAL (E)–**

6. Remove arm Support plate (F) and capstan ass'y (E) by removing 3 screws.

**NOTE:** When replacing parts make sure belt and capstan shaft are clean and free of oil. Clean these parts if necessary. Also make sure belt is installed properly as shown in the figure.

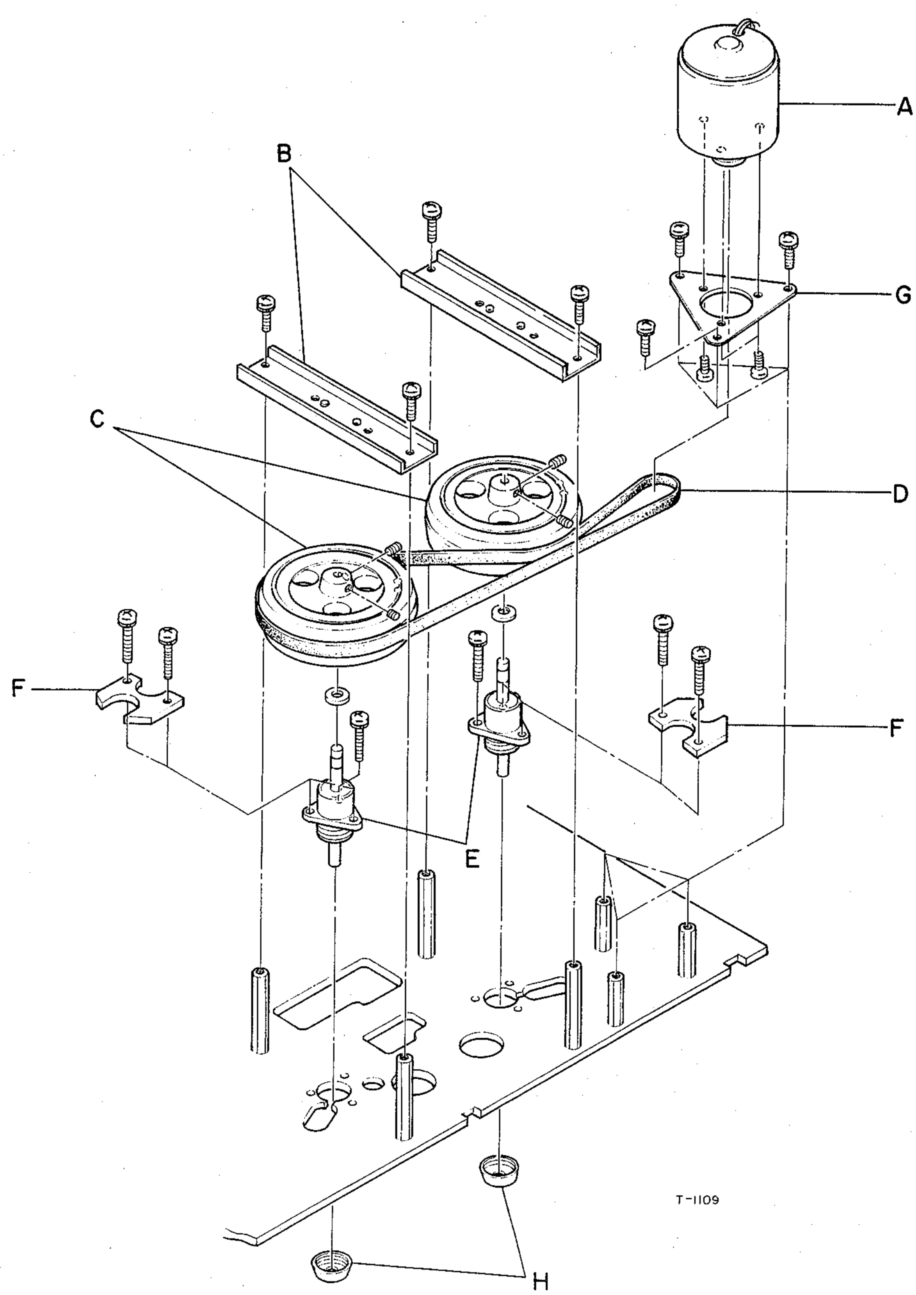



**Fig. 4-2 Capstan Motor, Flywheel and Capstan Ass'y Removal**

## 4-3 REEL MOTOR REMOVAL

1. Remove wire harness straps (X3) and P.C. Board Retainer (B) (1 screw).
2. Disconnect the 4 motor wires from terminals on P.C. Board and release wire harness straps.
3. Loosen 2 set screws (hex head) in brake drum (A) and 2 in the reel turntable ass'y (F) at front of the reel motor.
   Lift off these parts.
4. Remove 4 screws securing the brake ass'y (D) to the motor.
   Carefully lift off the brake ass'y (D).
   Do not remove wires connected to the brake solenoid (C).
5. Remove 4 screws securing reel motor (E) to chassis through the front panel.

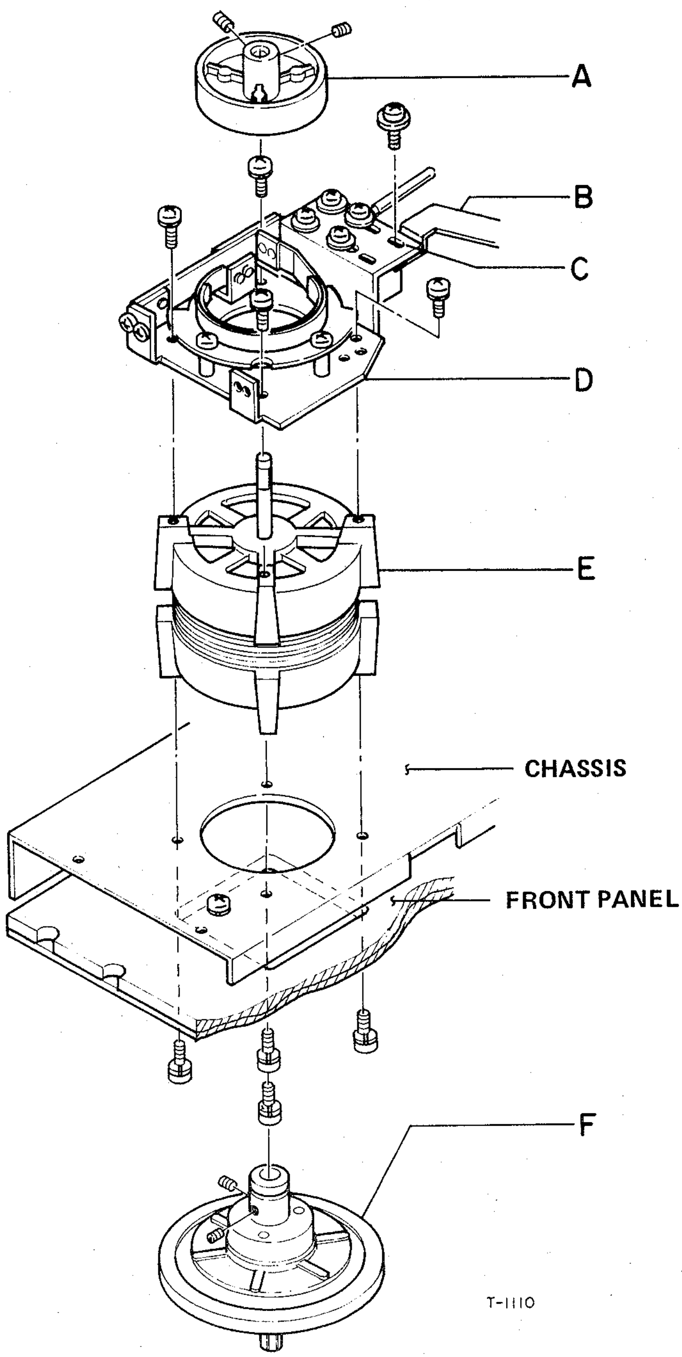



Fig. 4-3 Reel Motor Removal

## 4-4 TENSION ARM REMOVAL

1. Loosen set screw in tension arm ass'y (F) and remove tension arm guide (D).
2. Disconnect one end of spring (H).
3. Loosen set screw in thrust boss (G) and remove thrust boss and washer. Then remove tension arm ass'y (F).

**–GUIDE ROLLER REMOVAL– (A)**

4. Loosen set screw in roller bearing (E) and remove it and the washers.
5. Lift out guide roller ass'y (A). Watch for the washer.

**–METAL HOLDER ASS'Y REMOVAL– (B)**

7. Remove 1 screw from inside of front panel to right pole. When removing screw, roller base ass'y(C) will also be free, so remove it at the same time.

**NOTE:** Roller sheet (J) will remain attached to front panel.

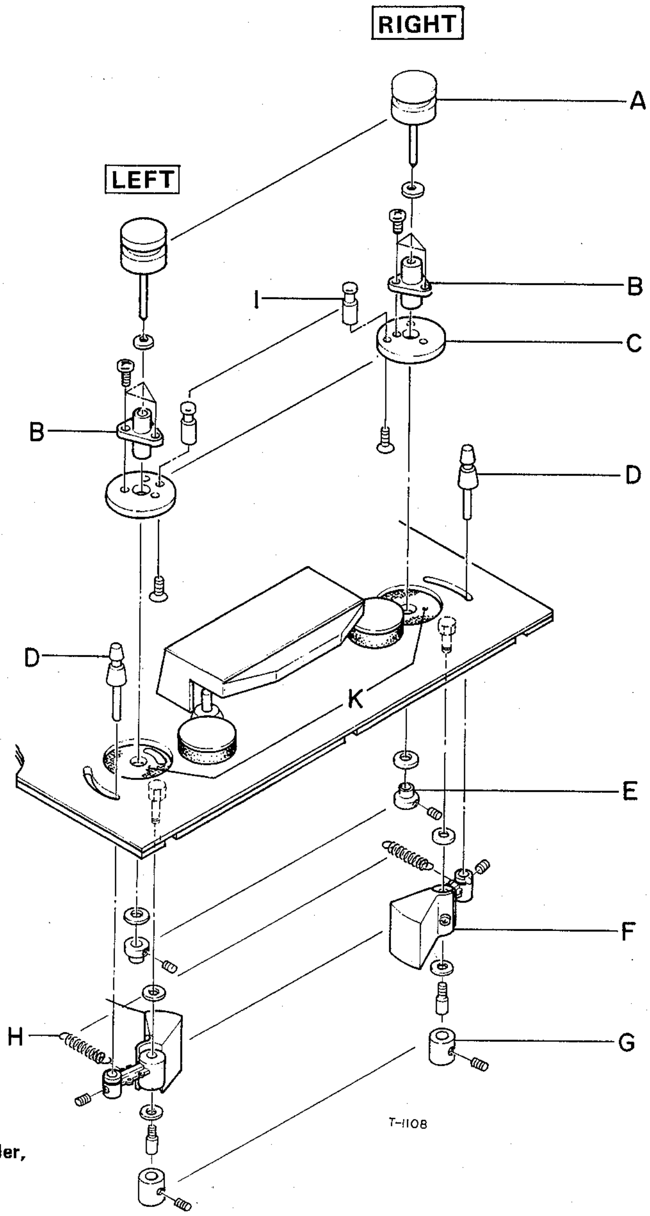



**Fig. 4-4 Tension Arm, Guide Roller, Metal Holder Ass'y and Right Pole Removal**

## 4-5 TRANSFORMER REMOVAL

1. Remove 4 screws from FUSE PCB (A) and move it back out of the way.
2. Remove 4 screws from transformer cover (B).
3. Disconnect 4 wires from transformer to voltage selector SW. (General Export Model)

Note location and color code of wires to voltage selector SW.

## 4-6 HEAD ASSEMBLY REMOVAL

1. Remove the 2 screws in the top of the head cover and lift it off.
2. Remove 3 screws holding head base plate (with heads).
3. Remove 2 mounting nuts through access slot in head base plate and dis-connect head wires. See Fig. 6-4.

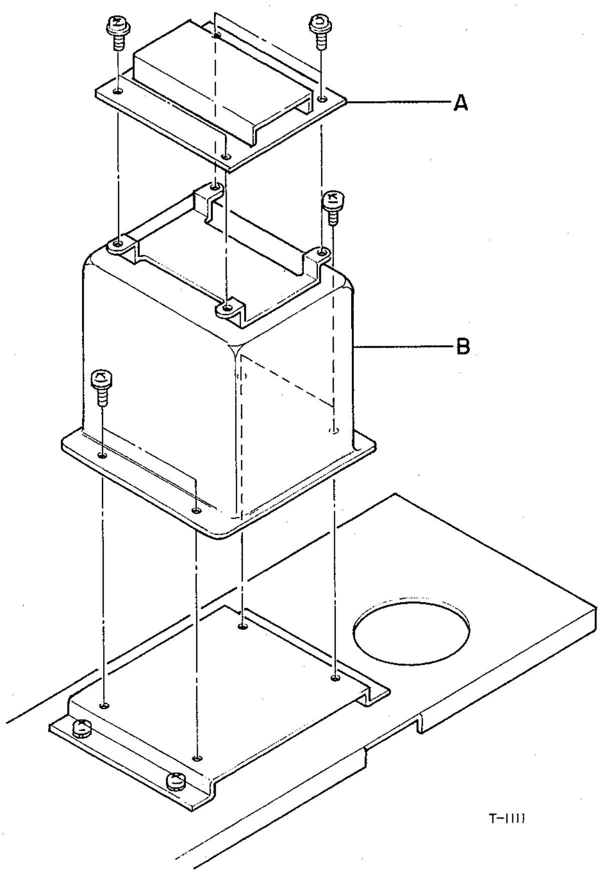



Fig. 4-5 Transformer Removal

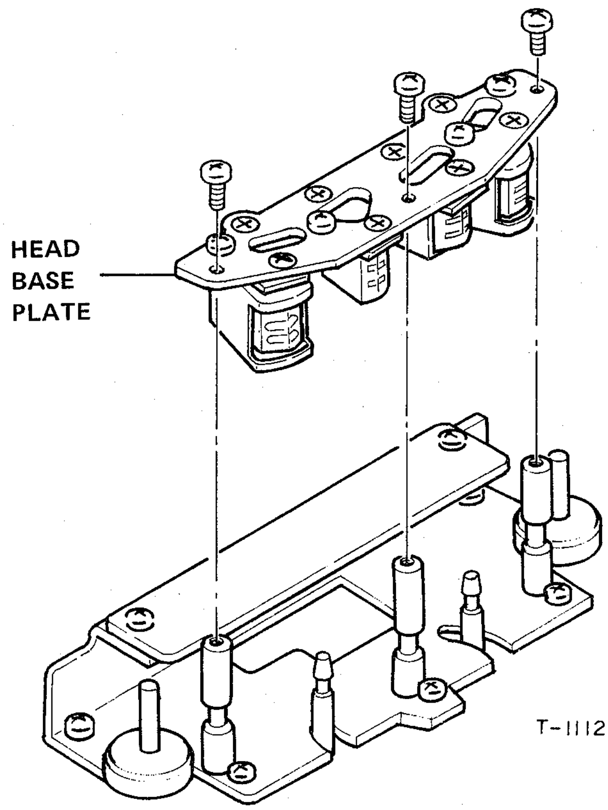



Fig. 4-6 Head Ass'y Removal

# 5. TAPE TRANSPORT PARTS LOCATION

## – REAR VIEW –

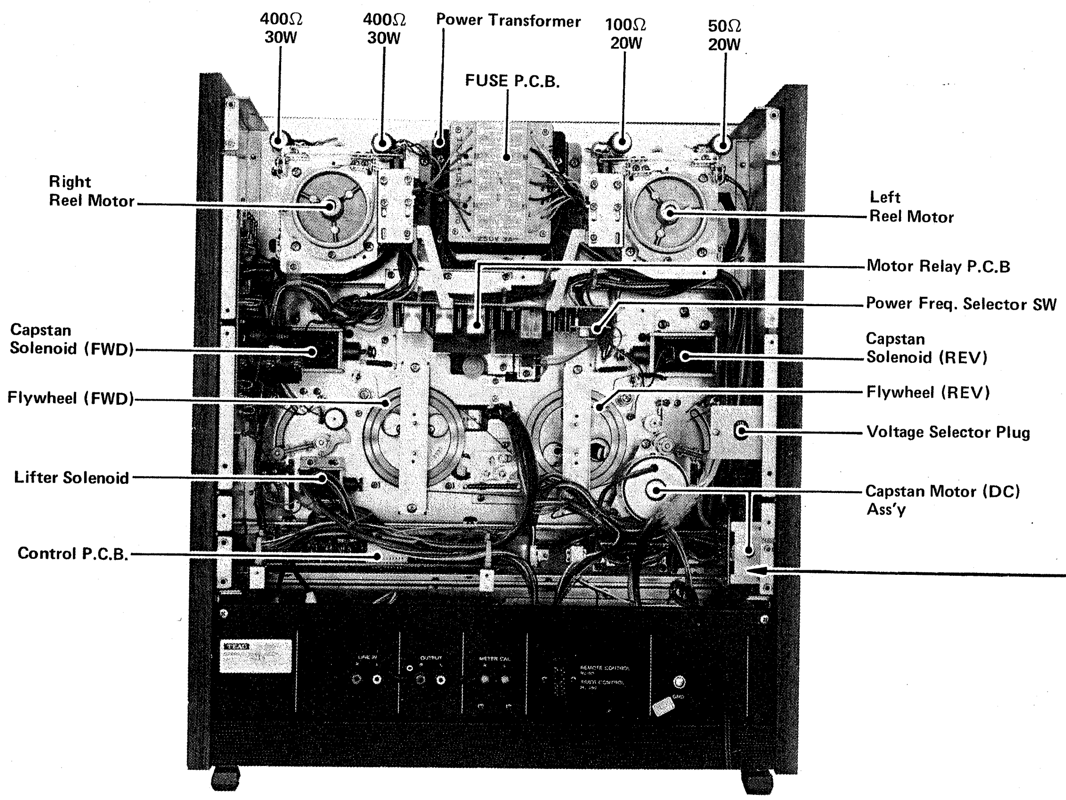
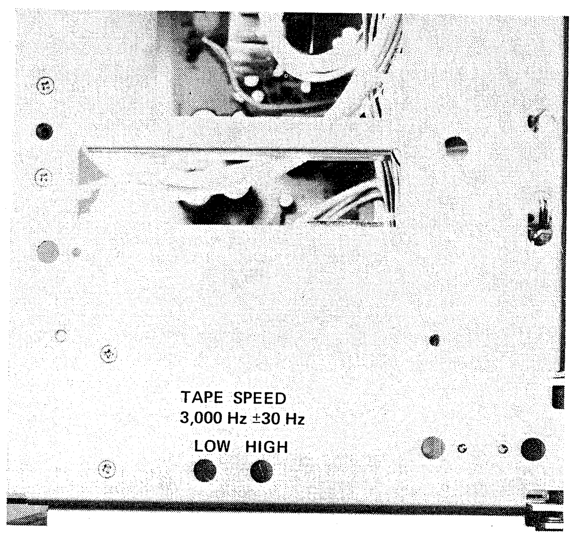



Fig. 5-1 Tape Transport Parts Location



# 6. HEAD REPLACEMENT AND ALIGNMENT
## – MECHANICAL –

### 6-1 HEAD REPLACEMENT

To replace a single head a special 2 mm nut driver is required. Remove the 2 nuts (A) on the defective head through the access hole provided. This releases the head from the mounting plate. Note the position of the wires on the circuit board. Connect the new head in the same manner. Replace the nuts securing the new head to the plate. Perform head alignment before operation.

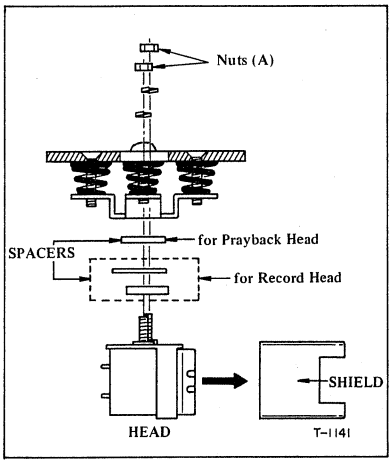



Fig. 6-1 Head Replacement

### 6-3 VISUAL HEAD ALIGNMENT

Since the head alignment critically affects the frequency response on both playback and recording, the head alignment should be done carefully. The head can be adjusted in TILT, TANGENCY, HEIGHT and AZIMUTH.
For head alignment, perform the following coarse adjustments first. Then fine alignment should be accomplished electrically while playing back the Test Tape.

**Coarse Adjustment:**
Without Tape
TILT .......... By Height and Tilt screws
This alignment is performed by viewing from the side without tape threaded.
Check that the head surface is parallel to the tape guide surface.
With Tape
TANGENCY ..... By Head mounting nuts
Loosen the head mounting nuts. Adjust the head so that the vertical alignment of the head gap is perpendicular to the surface of the tape, then tighten the head mounting nuts.
HEIGHT ........ By Height and Tilt screws
This alignment is checked visually by looking at the position of the head.
The head core for track-1 (inner core) should be even with the inner edge of the tape.
AZIMUTH ...... By Azimuth adj. Screw
Adjust the azimuth adj. screw so that the gap of the head is perpendicular to the tape travel.

**NOTE:** After this coarse adjustment is made, the adj. screws and the Head mounting nuts should be realigned according to electrical head alignment paragraph which follows in this Service Manual.

### 6-2 HEAD ADJ. SCREWS AND ALIGNMENT

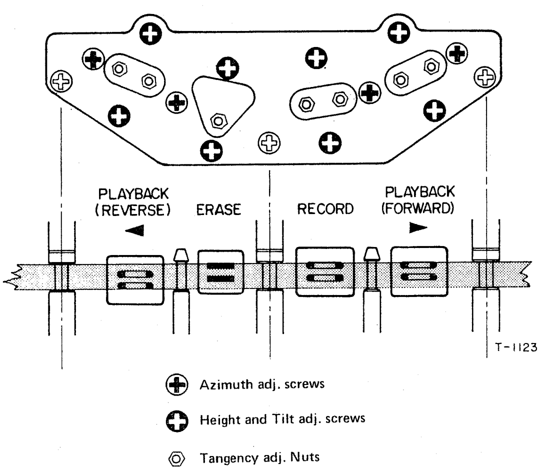



Fig. 6-2 Head Adjustment Screws and Alignment

### 6-4 MIS-ALIGNMENT OF THE HEADS

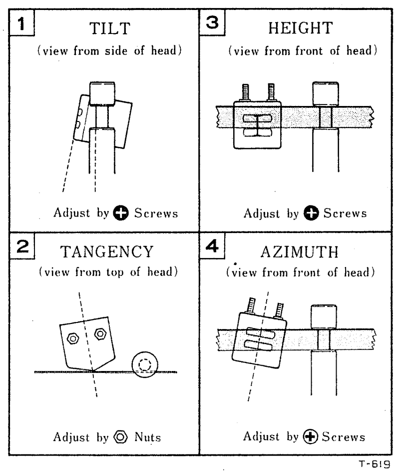



Fig. 6-3 Head Mis-Alignment – Examples –

# – HEAD WIRING –

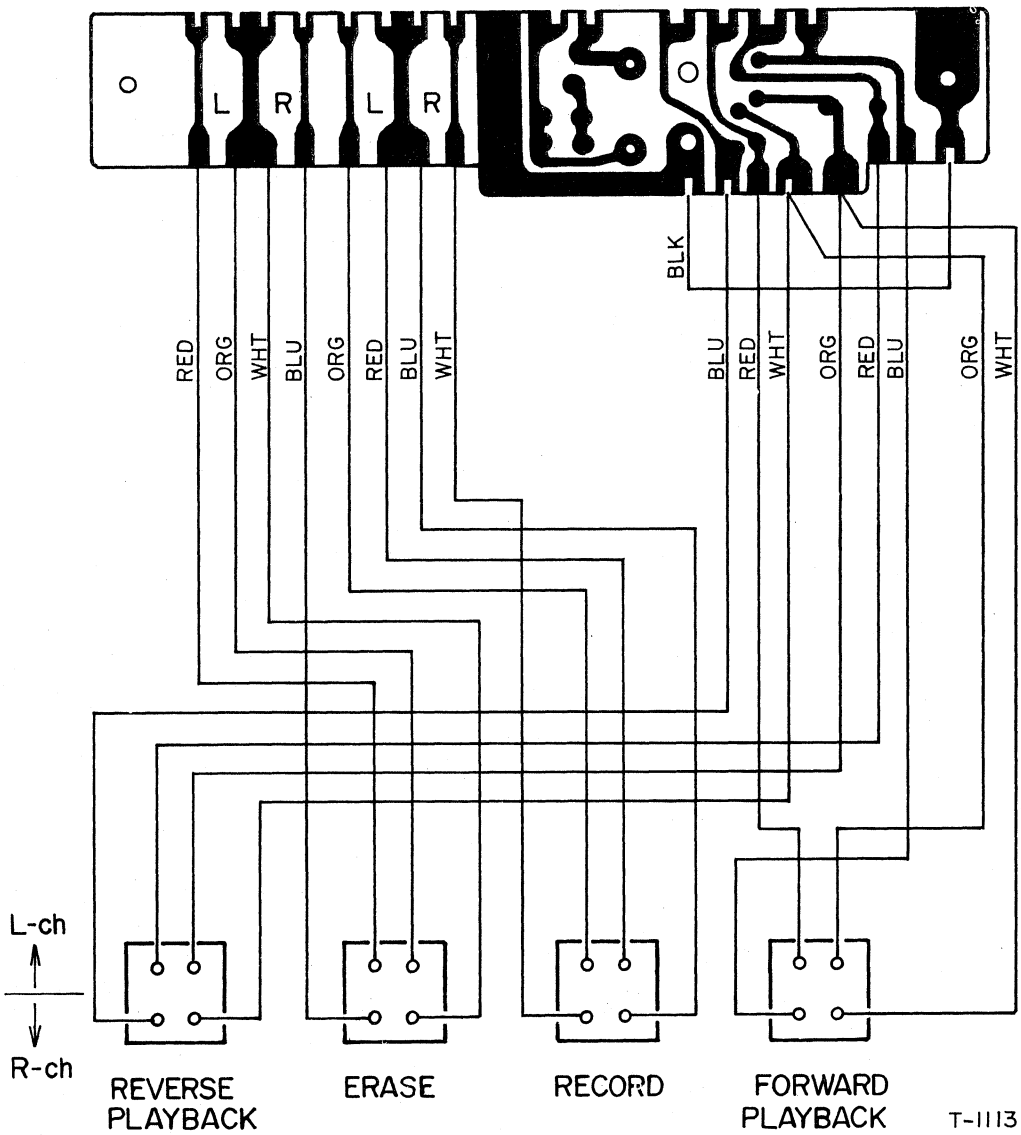



Fig. 6-4 Head wiring

# 7. MEASUREMENT AND ADJUSTMENT
## – MECHANICAL –

### 7-1 PINCH ROLLER PRESSURE CHECK

**NOTE:** Pinch roller pressure is supplied by the pinch roller spring arms and it is most important that the solenoid plungers be fully bottomed before taking pressure measurements.

1. Load tape or block the shut-off arm in the ON position.
2. Attach a suitable spring scale to the right side pinch roller shaft.
3. Place the deck in the Play (►) mode, and holding the spring scale as illustrated, slowly draw it away from the pinch roller.
4. Do not allow the spring to rub against the pinch roller.
5. Note the reading on the spring scale at the instant the pinch roller stops rotating.
6. The scale should indicated 2.1 to 2.3 kg (4.6 to 5.0 lbs)
7. If adjustment is necessary, loosen the 3 screws on the capstan solenoid and position the solenoid for optimum pressure.
8. Adjust solenoid-limit position so that the gap between capstan shaft and pinch roller is approx. 7mm when solenoid is not actuated. Also make sure pinch roller shaft does not contact Spring Arm (B). Limit is adjusted by loosening the mounting screw (A), then sliding limit until proper position is obtained.
9. Repeat this procedure for the reverse play (◄) operation measuring the left side pinch roller pressure.

### 7-2 BRAKE TORQUE MEASUREMENT

**NOTE:** The brake torque is actuated mechanically. Torque is set by the variable Leaf Spring Force. While making these measurements and adjustments, be careful not to be bend the brake bands. Brake shoes should be cleaned only when absolutely necessary. If cleaning is required, use TEAC cleaner TZ-261A. After cleaning, operate the brakes by depressing the play and STOP buttons several times to completely dry out the brakes before performing the following procedure. Brake torque measurement is made with Power OFF.

1. Place an empty large hub reel on the left reel table, and fasten one end of a 30" length of string to the reel anchor.
2. Wind several turns of string counter clockwise around the hub and attach a suitable spring scale to the free end of the string.
3. Pull on the spring scale and take a reading only when the reel is in steady motion since the force required to overcome static friction will produce a false, excessively high initial reading.
4. The reading should be 1600 to 2000 g-cm (22.4 to 28.0 oz inch).
5. If adjustment is required, loosen the 3 screws shown and position the brake for optimum pressure.
6. The adjustment of the right brake is the same, with the exception that rotations are clockwise. (wind string CLOCKWISE around reel hub)

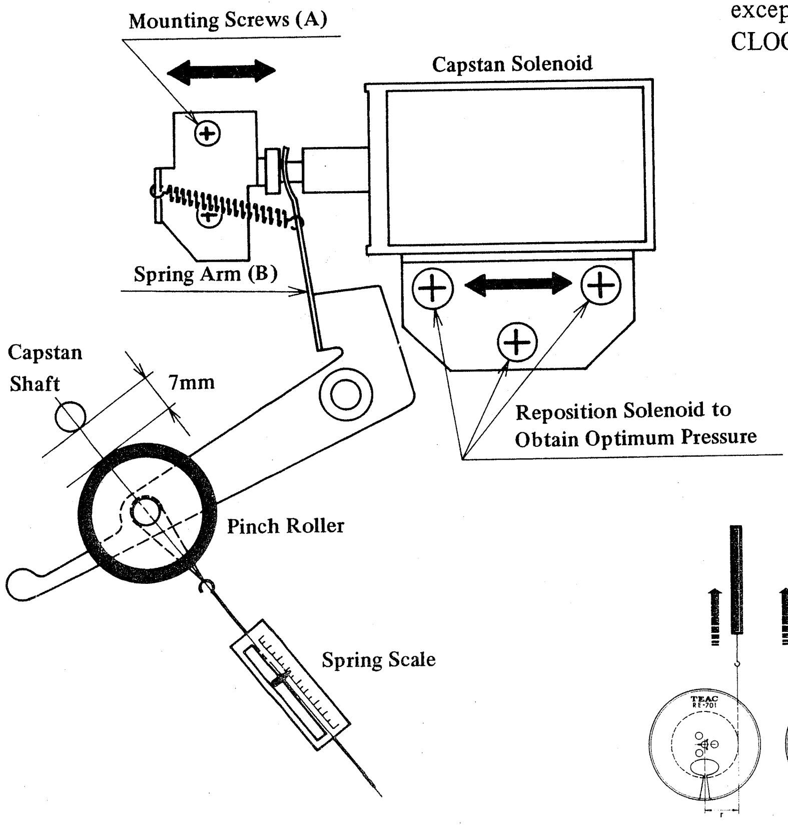



Fig. 7-1 Pressure Measurement and Adj. Location

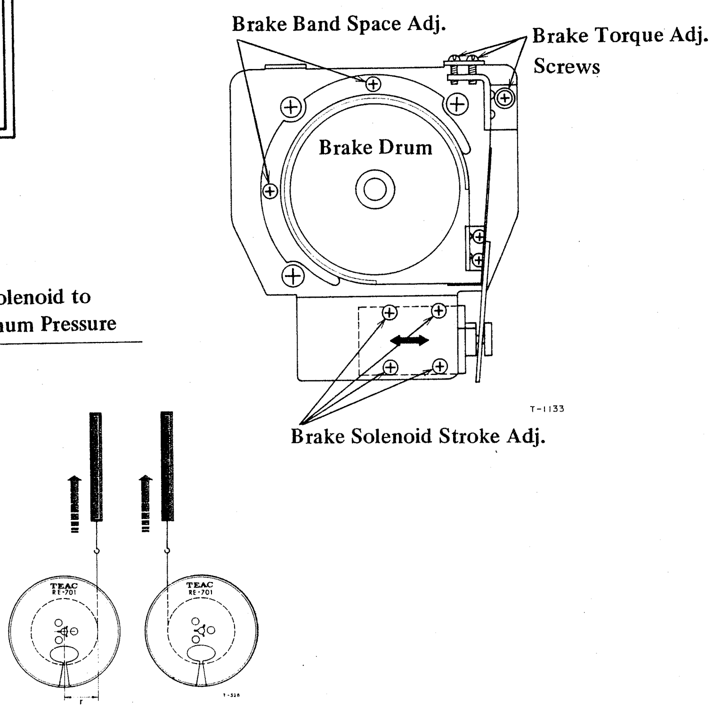



Fig. 7-2 Torque Measurement and Adj. Location

# TORQUE MEASUREMENT PROCEDURE

**NOTE:** The following torque measurements should be made with a spring scale that is calibrated to read Torque in gram-cm. for a 7" reel with a small reel hub. If the spring scale you are using is calibrated to read Force or Weight in grams the Torque must be calculated using the Formula:

**Torque (in gm·cm or oz·in) =**
**Weight or Force (in gr. or oz.) x**
**radius of hub (in cm or inches)**

If you are using a reel with other than the standard 2.5" or 6.0 cm (approx.) diameter hub, the Torque must be calculated using the same formula and substituting the actual radius and Weight or Force reading.

All Torque and Tension measurements must be made with the automatic shut-off switch (right or left tension arm) held in the ON position.

Brake Torque Measurement should be made using large hub reel with a hub diameter of 4" or 10.2 cm.

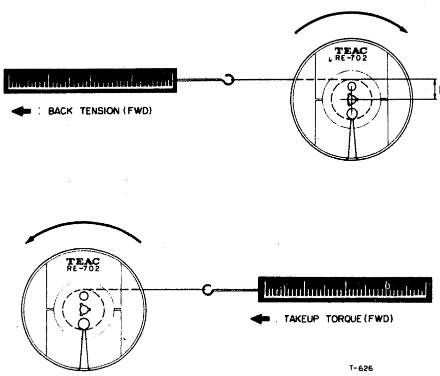



Fig. 7-3 Torque Measurement

## 7-3 TAKE-UP TORQUE

1. Place the empty reel on the right reel table and attach spring scale.
2. Place the deck in the Play mode.
3. Allow the rotation of the reel to slowly draw the scale toward the hub.
4. Hold the spring scale with enough force to allow a steady reading.
5. Repeat the procedure for the Reverse (◀) Play.
6. **The reading or calculated value should be approx.:**

| | REEL SW | TAKE UP VALUES |
|---|---|---|
| FWD | LARGE | 680 to 720 g-cm (9.5 to 10 oz-inch) |
| | SMALL | 350 to 450 g-cm (5.0 to 6.3 oz-inch) |
| REV | LARGE | 650 to 750 g-cm (9.0 to 11 oz-inch) |
| | SMALL | 350 to 450 g-cm (5.0 to 6.3 oz-inch) |

## 7-4 BACK TENSION

1. Place an empty 7" reel with small hub on the left reel table and fasten one end of a 30" length of string to the reel anchor.
2. Wind several turns of string counter-clockwise around the hub. Attach spring scale to string.
3. Place the deck in the Play mode.
4. Pull the scale away from the reel against the motor torque with a steady, smooth motion.
5. Note the scale reading while it is in steady motion. (The string must not rub the reel flanges)
6. Repeat the procedure for the Reverse (◀) Play.
7. **The reading or calculated value should be approx.:**

| | REEL SW | BACK TENSION VALUES |
|---|---|---|
| FWD | LARGE | 380 to 420 g-cm (5.3 to 6.0 oz-inch) |
| | SMALL | 230 to 270 g-cm (3.2 to 4.0 oz-inch) |
| REV | LARGE | 350 to 450 g-cm (5.0 to 6.3 oz-inch) |
| | SMALL | 200 to 300 g-cm (3.0 to 4.0 Oz-inch) |

**Adjustment Location**

If necessary, adjust slider of the resistors until you have the correct scale reading for optimum torque. Refer to adj. location below.

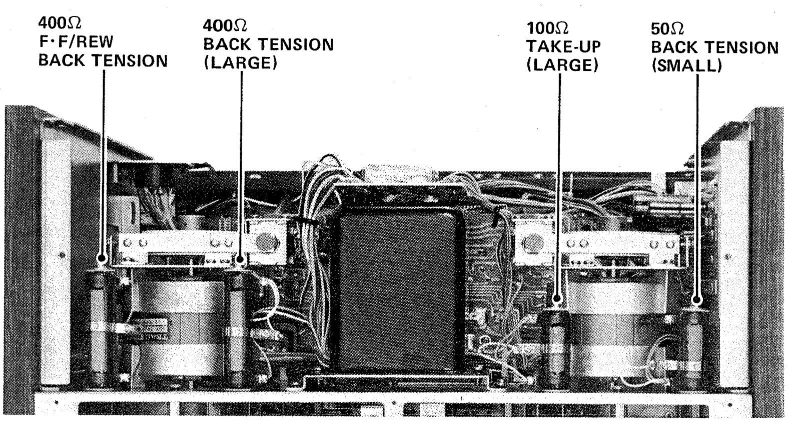



Fig. 7-4 Resistors Adj. Location

## 7-5 FAST FORWARD AND REWIND TORQUE SPECIFICATION

2000 g·cm (28 oz-inch), or more at F.F.
2000 g·cm (28 oz-inch), or more at REW

## 7-6 TENSION GUIDE HEIGHT ADJUSTMENT

1. Check that there is a clearance of approx. 1 mm between tension arm and surface of the tape deck face plate.
2. Thread Tape on the deck and run it in both directions to check that tape moves in the center of the guide.
3. If adjustment is necessary, loosen the screw and move tension arm. Then tighten screw and repeat step 1 and 2.

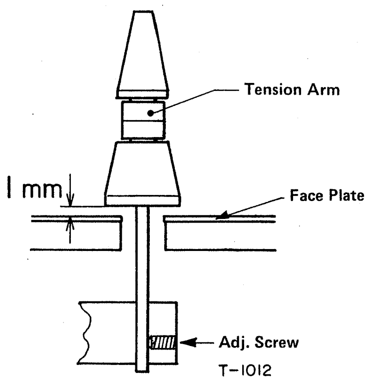



**Fig. 7-5 Tension Guide Height Adj.**

## 7-7 SENSING ASS'Y POSITION ADJUSTMENT

1. Check that the brush of the sensing ass'y lightly contacts the guide bearing.

   **CAUTION:** If the brush contacts the guide bearing too firmly, the guide roller will not rotate.

2. Check that Auto Reverse playback can be initiated using sensing foil affixed to the tape.

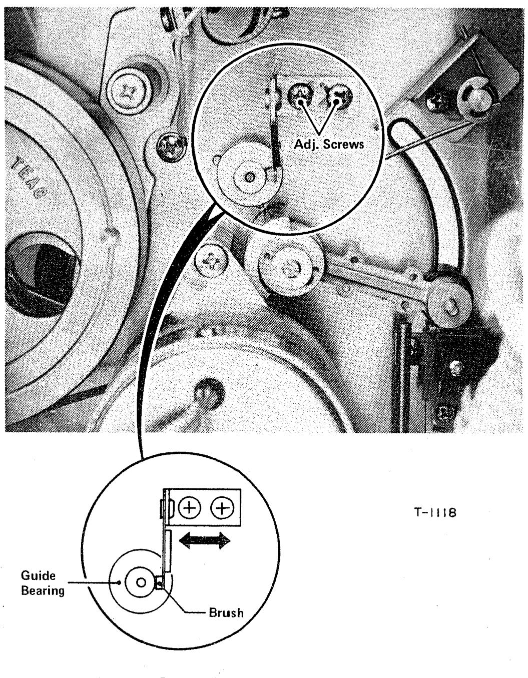



**Fig. 7-6 Sensing Ass'y Position Adj.**

## 7-8 MAGNETIC RESISTNACE ELEMENT (SENSER ASS'Y) POSITION ADJ.

1. Adjust Screws (A) for a space (B) of approx. 1mm.
2. Check that there is no delay time when changing from F.F. (or REW) to Play mode.

Location; On Left side when viewed from the rear.

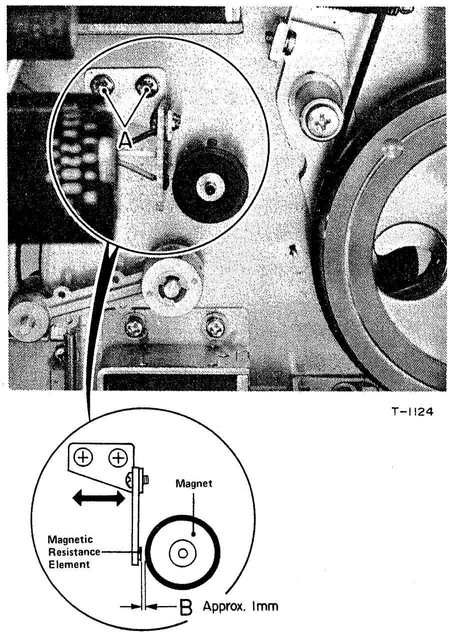



**Fig. 7-7 Magnetic Resistance Element (Senser Ass'y) Position Adj.**

## 7-9 LIFTER SOLENOID ADJUSTMENT

1. Make sure Power is turned off.
2. Depress the solenoid plunger until it is fully bottomed in the solenoid and check that there is no clearance between the lifter connecting lever and the solenoid plunger. See illustration (A).

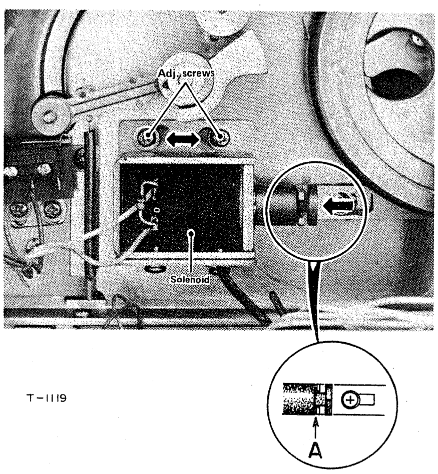



**Fig. 7-8 Lifter Solenoid Adj.**

## 7-10 TAPE SPEED

The tape speed should be measured using TEAC flutter free tape, Model YTT-2003 (7-1/2 ips), YTT-2002 (3-3/4 ips). These tapes contain a highly accurate 3,000 Hz tone. Connect a digital frequency counter to either line OUTPUT jack. The indicated frequency should be 3,000 Hz ±30 Hz for both speeds and both directions. If neccessary, adjust Tape speed adjusters on the capstan servo P.C.Bd. See Fig. 5-1 on page 11 PARTS LOCATION Section.

## 7-11 WOW AND FLUTTER CHECK

**NOTE:** Before performing this measurement, clean the head and Tape run guides, also check pinch roller pressure, etc.
Use new Test Tape if possible for following adjustments.
Values obtained with different standards of equipment cannot be compared.

**PLAYBACK**

1. Connect Test equipment to the deck as shown in Fig. 7-9 (Except oscillator).
2. Load TEAC YTT-2003 (for HIGH, 7-1/2 ips) or YTT-2002 (for LOW, 3-3/4 ips) and playback tape.
3. Read the indication on the Wow and Flutter meter.
4. The Wow and Flutter should be

| | HIGH (7-1/2 ips) | LOW (3-3/4 ips) |
|---|---|---|
| WRMS | 0.08% or less | 0.10% or less |
| RMS | 0.10% or less | 0.20% or less |

**OVERALL**

1. Connect Test equipment to the deck as shown in Fig. 7-9
2. Load TEAC YTT-8003 Test Tape (blank tape) on the deck and Record a 3,000 Hz input signal.
3. Rewind and playback the recorded signal.
4. The reading on the Meter should be
   0.20% (RMS) for 7-1/2 ips
   0.25% (RMS) for 3-3/4 ips

**NOTE:** These figures apply to any tape position (such as full take-up reel, full supply reel or about mid-point).

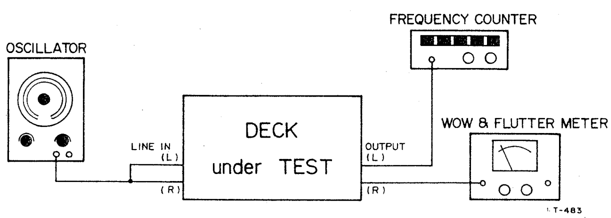



**Fig. 7-9 Test Connections for Wow/Flutter and Tape Speed Test**

## 7-12 VOLTAGE AND FREQUENCY CONVERSION (Export Model only)

This deck is adjusted to operate on an electric power source of the voltage and frequency specified on the reel tag and packing carton. If it is necessary to change the frequency or voltage requirements of this deck to match your area, use the following procedures.
Always Disconnect Power Line Cord before making these changes.

**Frequency Conversion:**

1. Remove the right side wood panel (4 screws), then the rear/top metal panel (6 screws).
2. Set the power frequency selector slide switch to the 50 or 60 position to match the power line frequency in your area. (See Location below).

**NOTE:** This deck uses a DC Servo controlled capstan motor so it is not necessary to change the capstan drive belt.

**Voltage Conversion:**

The deck may be set for 100, 117, 220 or 240 volts. To change the voltage, unscrew, the voltage selector plug. Pull out the plug and reinsert it so the desired voltage shows in the cutout. (See Location below).

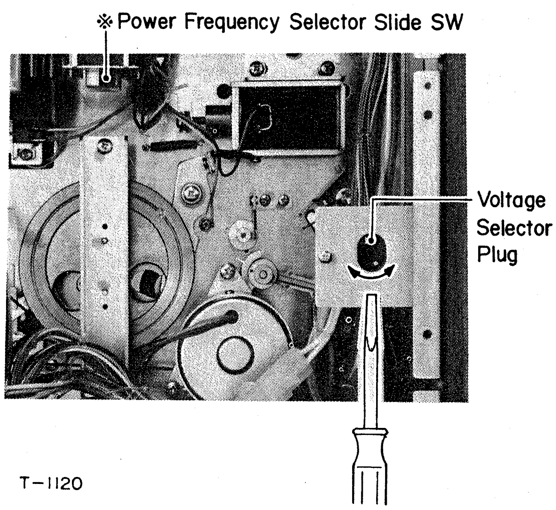



**Fig. 7-10 Voltage and Frequency Conversion Locations**

# 8. MEASUREMENT AND ADJUSTMENT
## – ELECTRICAL –

- Before performing maintenance on this deck, thoroughly clean and demagnetize the entire Tape path,TEAC maintenance equipment to be used:
  TEAC TZ-261 A/B for cleaning
  TEAC E-3 or equivalent for demagnetizing
- Service Data were determined using TEAC YTT Series Test Tape.
- The deck must be matched to the voltage and frequency of your locality.
- Most amplifier checks and adjustments can be made from the bottom with the (bottom) metal panel removed.
- The procedures for checks and adjustments are normally done for the left and right channels and at both speeds. The adjustment locations such as R263/264 indicate left channel/right channel adjustments. Reverse playback should also be checked where indicated.

## 8-1 ADJUSTMENT LOCATIONS AND ADJUSTMENT POINTS

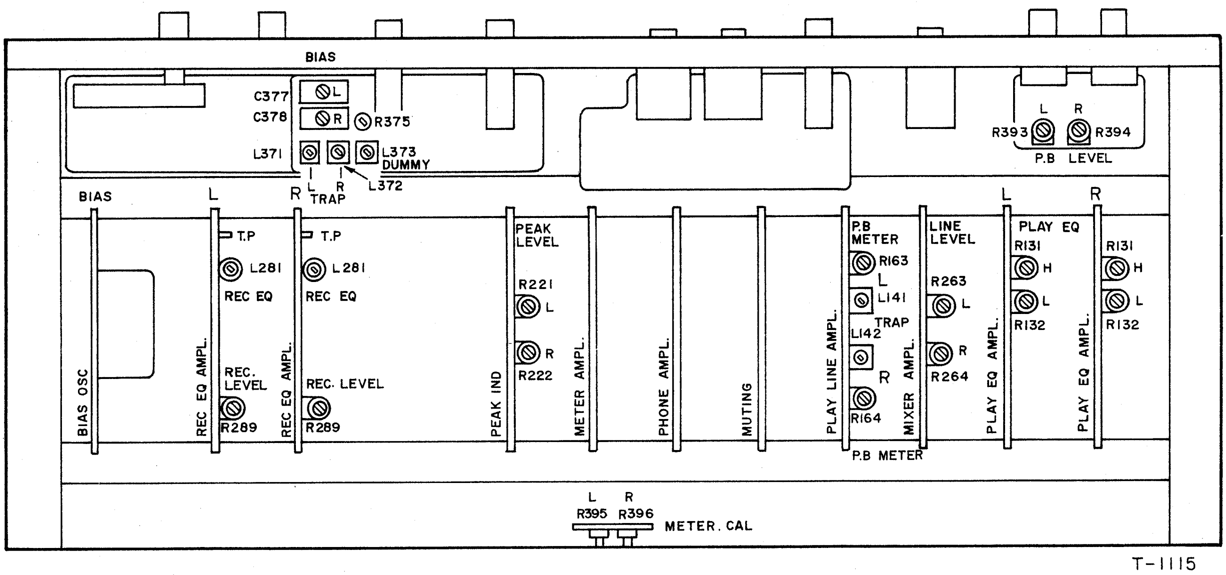



Fig. 8-1 Adjustment Locations and Adjustment Points

## 8-2 ADJUSTMENT SEQUENCE CHART

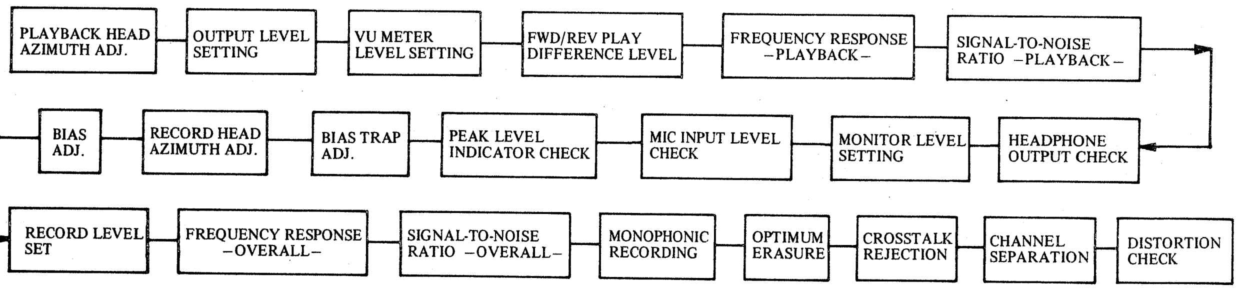



**Fig. 8-2 Adjustment Sequence Chart**

*PLAYBACK PERFORMANCE*

## 8-3 PLAYBACK HEAD AZIMUTH ADJ.

**NOTE:** Before proceeding with the following head alignments be sure that heads have been properly mounted as to HEIGHT, TILT and TANGENCY. See page 12.

**MONITOR SW . . . . . . . . TAPE CAL**
**SPEED Selector SW . . . . HIGH (7-1/2 ips)**
**REEL Size Selector SW . . SMALL**
**TRIM controls (L and R) . Click position (center)**
**OUTPUT Level Control . . 0 VU**

**– Fine Adjustment–**

1. Connect a VTVM to the OUTPUT jacks.
2. Remove the Head Housing by removing 2 screws.
3. Thread the TEAC YTT-1003 Test Tape on the deck.
4. Play (►) the 16 kHz/–10 dB test tone in section 2 of the test tape.
5. Slowly rotate the Azimuth screw until maximum signal is read on the VTVM.
6. Connect an oscilloscope to the OUTPUT jacks.
7. Adjust the azimuth screw (if necessary) until the oscilloscope shows that the signals are less than 45° out of phase for 18 kHz signal. Check this using the 18 kHz signal from the frequency response section of the test tape.
8. Secure the screw with a drop of locking paint.
9. Depress the (◄) button and turn the azimuth adjusting screw for the reverse playback head (see Fig. 6-2 ) for maximum indication on the VTVM. Repeat steps 6 to 8 above for reverse playback head.

## 8-4 OUTPUT LEVEL SETTING

**– SPECIFIED OUTPUT LEVEL –**

10. Play the 400 Hz/0 dB tone in section 1 of the YTT-1003 Test Tape.
11. Set the reference mark of the OUTPUT Level Control to the 8 (0 VU) position.
12. Adjust P.B LEVEL R393/394 for –5 dB (435 mV) at OUTPUT jacks.

**– MAX. OUTPUT LEVEL –**

13. Turn the OUTPUT Level Control fully clockwise (max.) and check for + 1 dB ±2 dB at OUTPUT jacks.
14. Reduce OUTPUT Level Control until –5 dB (435 mV) is obtained on the output VTVM.

**NOTE:** This is the Specified Output level setting. Do not disturb this setting until the remaining adjustments have been completed.

The minimum TRIM controls limits are $^{+3}_{-2}$ dB from click position.

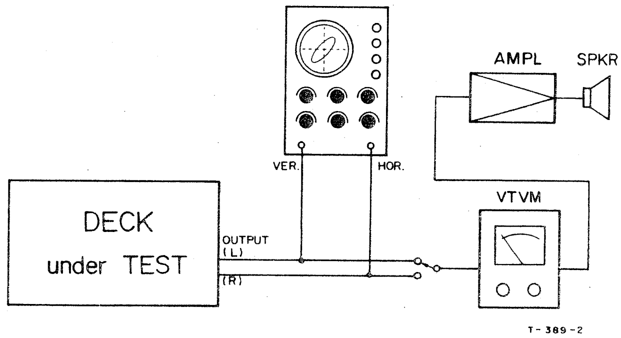



**Fig. 8-3 Head Alignment Fine Adjustment Set-up and Test Connections (PLAYBACK)**

## 8-5 VU METER LEVEL SETTING

15. Adjust METER CAL R395/396 (on rear panel) for 0 VU reading on VU Meters.

    **MONITOR SW . . . . . . TAPE OUT**

16. Adjust P.B.METER R163/164 for 0 VU reading on VU Meters.

## 8-6 FWD and REV PLAY DIFFERENCE LEVEL

17. With the controls set as described in item 8-4, Check that the difference in the playback level between Forward play and Reverse play is within the following limits:

    ±2 dB or less

    Also check that the difference between channels is within 2 dB or less.

## 8-7 FREQUENCY RESPONSE – PLAYBACK–

18. Thread TEAC YTT-1003 on the deck.
19. Play Tape and compare reading on VTVM with the response limits given in Fig. 8-4 (A).
20. If adjustment is required, adjust PLAY EQ H R131 for High speed.
21. Thread the TEAC YTT-1002 on the deck and set the SPEED switch to LOW.
22. Play the tape and compare the readings on the VTVM with the response limits given in Fig. 8-4 (B).
23. If adjustment is required, adjust PLAY EQ L R132 for LOW speed.
24. Depress Reverse Play (◀) button and check for suitable output from both channels. If necessary adjust height and azimuth adjustment screws (see Fig. 6-2) of Reverse Playback head for best output.

**NOTE:** Check azimuth for LOW speed at 10 kHz reference frequency.
If the frequency response does not meet specified response limits, especially at the high-end of the spectrum, head should be checked for accumulated dirt or oxides. If clean, head azimuth must be readjusted.

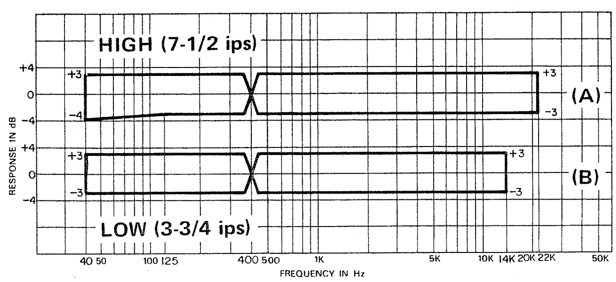



Fig. 8-4 Frequency Response – PLAYBACK –

## 8-8 SIGNAL-TO-NOISE RATIO – PLAYBACK –

1. OUTPUT Level Control should be at the Specified Output level setting.
2. Remove Test Tape from deck. Hold Shut-off arm, left or right, to ON position.
3. Depress the Play (▶) button.
4. The VTVM connected to the OUTPUT jacks should indicate listed value below.

   **–56 dB, or more . . . . HIGH (7-1/2 ips)**
   **–53 dB, or more . . . . LOW (3-3/4 ips)**

**NOTE:** This correponds to Signal-to-Noise Ratio of 51 dB (for HIGH) and 48 dB (for LOW): Difference between residual noise of –56 dB/–53 dB and specified output level of –5 dB.

## 8-9 HEADPHONE OUTPUT CHECK

1. Connect an 8 ohm non-inductive resistor across the headphone (PHONES) jack.
2. Connect VTVM across the resistor. While playing back operating level (400 Hz) on Test Tape VTVM should indicate – 19 dB ±2 dB (69 mV ~ 109 mV).

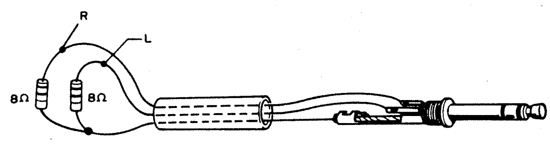



**Fig. 8-5 Test Connections for Headphone output check**

## 8-10 MONITOR LEVEL SETTING (LINE INPUT)

**MONITOR SW . . . . . . SOURCE**
**LINE Level Controls . . MAX.**
**MIC Level Controls . . . MIN.**

1. Apply a 400 Hz/–22 dB (61.5 mV) signal from AF oscillator to LINE IN jacks.
2. Adjust LINE LEVEL R263/264 for –5 dB (435 mV) at the OUTPUT jacks.
3. Change the Input Signal to –12 dB (194 mV).
4. Adjust LINE Level Controls (small knobs) L and R for –5 dB (435 mV) at the OUTPUT jacks (VU Meters will read 0 VU ±0.5 VU). This is the specified setting of the LINE Level Controls. Do not move this setting until the adjustment procedure is finished.

## 8-11 MIC INPUT LEVEL CHECK

**MIC ATT (dB) . . . . . . 0**
**MIC Level controls . . . MAX.**
**LINE Level controls . . MIN.**

5. Apply a 400 Hz signal at –70 dB (0.244 mV) to the MIC Input jacks. (on front panel).
6. Check for –5 dB ±2 dB (345 mV ~ 548 mV) at OUTPUT jacks.
7. Change the Input signal to –60 dB Level (0.774 mV).
8. Adjust MIC Level controls (Small Knobs) L and R for –5 dB (435 mV) at the OUTPUT jacks.

**MIC ATT (dB) . . . . . . 20**

9. Change the Input signal to –40 dB (7.74 mV).
10. Check for –5 dB ±2 dB (345 mV ~ 548 mV) at OUTPUT jacks.
11. Return MIC Level controls fully counter clockwise (min.) to prevent noise insertion during following steps.

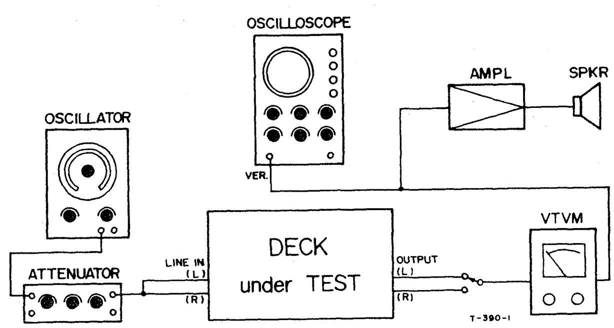



**Fig. 8-6 Test Connections for Monitor Check**

## 8-12 PEAK LEVEL INDICATOR CHECK

12. With the controls set as described in 8-10, check that the PEAK level indicator lights at full intensity at the following levels:

| Tape Speed | Full Intensity Level |
|---|---|
| HIGH | + 10 dB ±1 dB |
| LOW | + 8 dB ±1 dB |

If adjustment is necessary, adjust PEAK level R221/222. Also check that the PEAK Level lamp goes out when the level is +9 dB (at HIGH) and at +7 dB (at LOW).

**CAUTION:** Apply this high level signal for only a few seconds to avoid damaging the VU meters.

## 8-13 BIAS TRAP ADJUSTMENT

**MONITOR SW . . . . . . . . . . . SOURCE**
**RECORD MODE SW. (L, R) . . ON**

1. Remove all Input signals.
2. Thread Blank Test Tape on the deck and depress RECORD and PAUSE button.
3. Connect a VTVM or oscilloscope to Test Point and ground. See Fig. 8-7.
4. Adjust TRAP L371 (L-ch) and L372 (R-ch) for minimum reading on VTVM or scope.
   Use Plastic alignment tool.

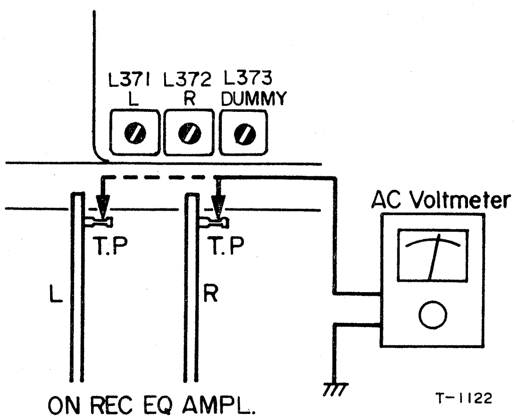



Fig. 8-7 Bias Trap Test Point

**MONITOR SW . . . . . . . . TAPE OUT**

5. Adjust TRAP L141 (L-ch) and L142 (R-ch) for minimum reading at OUTPUT jacks.
   Spec. –45 dB or less with OUTPUT Level Control at O VU position.

## 8-14 RECORD HEAD AZIMUTH ADJ.

**NOTE:** The effect of turning the azimuth screw will register on the VTVM.
A slight delay will be noticed. Therefore, the screw must be rotated slightly with a pause to see the effect.

**–Fine Adjustment–**

6. Connect a VTVM to the OUTPUT jack and an AF oscillator to the LINE IN jacks.
   Set the oscillator to 10 kHz at –22 dB (61.5 mV).
7. Begin recording (Depress RECORD and Play buttons).
8. While recording and monitoring the tape play back adjust the azimuth screw for maximum reading on the VTVM.

**NOTE:** It is absolutely essential to accomplish the above adjustment before performing the following adj. to avoid phase errors greater than 45°.

9. Sweep the oscillator frequency from 40 Hz to 16 kHz (for HIGH), 40 Hz to 10 kHz (for LOW) and check that phase difference between channels is 45° or less.
10. Secure the screw with insulating locking paint.

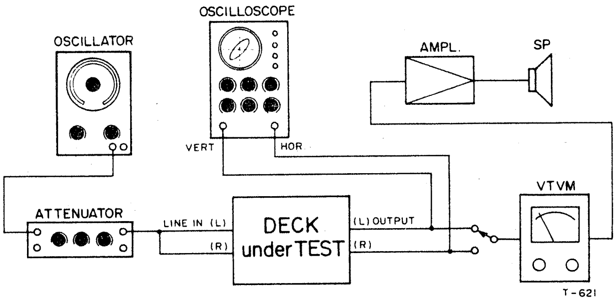



Fig. 8-8 Test Connection for Recording Check

## 8-15 BIAS ADJUSTMENT (BIAS #1)

**SPEED Selector SW . . LOW (3-3/4 ips)**
**BIAS SW . . . . . . . . . . 1**
**EQ SW . . . . . . . . . . . 1**

Be sure the Bias Trap has been adjusted per section 8-13 before proceeding.

11. Apply 7 kHz signal at –22 dB (61.5mV) to the LINE IN jacks.
12. While recording on the YTT-8013 Test Tape, adjust Trimmer Condenser BIAS C377/378 for peak reading on the VTVM, then turn the Trimmer Condenser clockwise until decrease of 2 dB "Over-bias" from the peak is obtained.

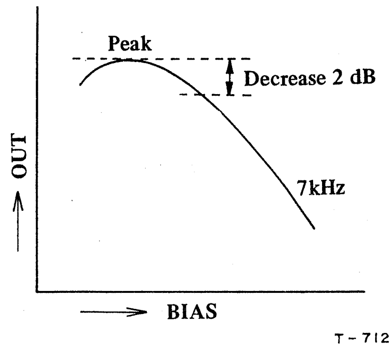



Fig. 8-9 Bias Limits Chart

## 8-16 RECORD LEVEL SET

**SPEED Selector SW . . HIGH (7-1/2 ips)**

13. Apply 400 Hz signal at –12 dB (194 mV) to the LINE IN jacks.
    Be sure the Line and Output Level Controls are still at their specified positions (see 8-4 and 8-10).
14. Begin recording.
15. Adjust REC LEVEL R289 for –5 dB (435 mV) at OUTPUT jacks.

## 8-17 FREQUENCY RESPONSE –OVERALL–

**NOTE:** To avoid saturation of the tape these checks should be made at least 10 dB below (for HIGH Speed) and 20 dB below (for LOW Speed) the specified input level.
Any Bias signal feeding into the test equipment should be filtered out by adjusting the external Bias Trap.

16. Apply signal swept from 40 Hz to 20 kHz, –22 dB (61.5 mV) to the LINE IN jacks and record on a blank TEAC YTT-8013 Test Tape.
17. During recording, monitor the Tape signal and adjust equalization REC EQ L281 for readings within the Response Limits charts. See Fig. 8-10 (A) below.

**SPEED Selector SW . . . LOW(3-3/4 ips)**

18. Apply signal swept from 40 Hz to 16 kHz, –32 dB (19.4 mV) and while monitoring the off-the-tape signal check for readings within the Response Limits charts.
See Fig. 8-10 (B) below.

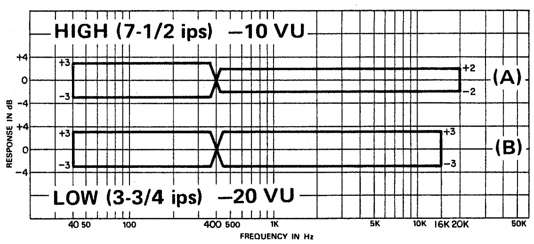


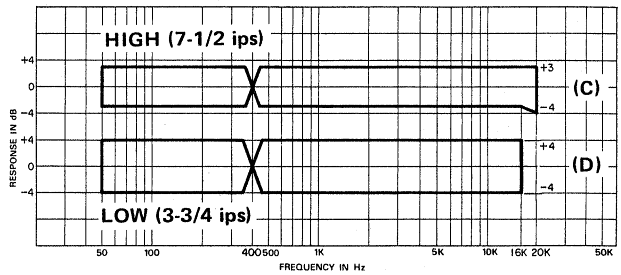

**Fig. 8-10 Frequency Response – OVERALL – 1**

**–BIAS #2 ADJUSTMENT–**

**SPEED Selector SW . . HIGH (7-1/2ips)**
**BIAS SW . . . . . . . . . . 2**
**EQ SW . . . . . . . . . . . 1**

19. Apply signals swept from 40 Hz to 20 kHz –22 dB (61.5 mV) to the LINE IN jacks while recording on a blank TEAC YTT-8003 Test Tape.
20. Adjust equalization R375 for readings within the response limits charts.
See Fig. 8-10 (A) above.
21. Repeat the above procedure for LOW, using a signal swept from 40 Hz to 16 kHz.
Refer to Response Limits in Fig. 8-10 (B) above.
22. Repeat the above procedure using YTT-8023 blank Test Tape.
**BIAS SW . . . . . . . . . . 2**
**EQ SW . . . . . . . . . . . 2**
Check the HIGH and LOW speed Frequency Response, are within the Response limits charts. See Fig. 8-11 (C), (D) below.

**NOTE:** If the response is not uniform, the head should be cleaned of accumulated oxide and dirt. Then repeat the Bias adjustment procedure.




**Frequency Response – OVERALL – 2**

## 8-18 SIGNAL-TO-NOISE RATIO –OVERALL–

1. Output and Line controls should be at the specified positions.
2. Remove the AF oscillator from the LINE IN jacks.
3. Place the deck in the Record mode with "no signal" applied.
4. Note the point on the index counter where recording begins.
5. Rewind the recorded tape to the beginning point and play it back.
6. The noise level as indicated on the VTVM should be readings listed below.

**–54 dB (1.54mV) or more . . . . HIGH (7-1/2 ips)**
**–51 dB (2.18mV) or more . . . . LOW (3-3/4 ips)**

**NOTE:** This –54 dB/–51 dB corresponds to the Signal-to-Noise ratio of 49 dB/46 dB (minimum); the difference between residual noise of –54 dB/–51 dB and specified output level –5 dB.

**NOTE:** Since this measurement method and the measurement methods used to obtain the catalog and owner's manual S/N spec. are different, the values here and in the catalog and Owner's manual will be different.

## 8-19 MONOPHONIC RECORDING CHECK

**SPEED Selector SW . . HIGH (7-1/2 ips)**

1. Place the RECORD MODE SW L (or R, not both) to ON and R (or L) to the OFF position.
2. Apply signals swept from 40 Hz to 20 kHz at –22 dB (61.5 mV) to LINE IN jacks and Record.
3. Check that output in within limits given in Fig. 8-10 (A), (B).
4. If adjustment is necessary, adjust DUMMY coil L373 for best response.
5. Repeat the LOW Speed check for best response.
   Use signals swept from 40 Hz to 16 kHz at –32 dB (19.4 mV).
   Check only. No adjustment is provided.

## 8-20 OPTIMUM ERASURE

**SPEED Selector SW . . HIGH (7-1/2 ips)**
**BIAS SW . . . . . . . . . . 2**
**EQ SW . . . . . . . . . . . 2**

1. Thread the YTT-8023 Test Tape on the deck.
2. Apply a 1 kHz signal at 10 dB above the operating level of –12 dB (194 mV) to the LINE IN jack.
3. Make a 30 seconds recording of the above signal while reading and noting the level of output, then rewind to beginning of this recording.
4. Disconnect the 1 kHz signal source (AF oscillator) from the LINE IN jack.
5. Connect a VTVM to the OUTPUT jack, through a 1 kHz Narrow Band Pass Filter.
6. Put deck in the Record mode and "record" (erase) over this previous recording, then rewind to beginning again.
7. Put deck in Play mode and monitor the output on the VTVM.
8. Difference in output level, between the 1 kHz signal and the "no signal" section level should be more than 70 dB.

**NOTE:** Filter loss should be considered.

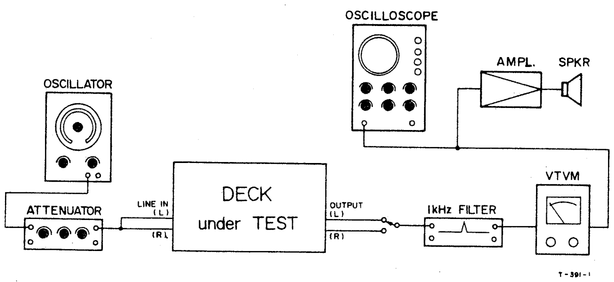



**Fig. 8-11 Test Connections for Erase measurement**

## 8-21 CROSSTALK REJECTION (TRACK-TO-TRACK)

9. Thread a blank or completely bulk erased YTT-8023 test tape on the deck.
10. Apply a 400 Hz (or 1kHz) signal at –12 dB (194 mV) to the left and right channels.
11. Make a 30 second recording of the above signal and while recording measure the off-the-tape output level (MONITOR SW at TAPE OUT).
12. Stop the tape and interchange the right and left reels and rethread the tape on the deck.
13. Playback the tape and measure the OUTPUT from the left and right channels (tracks 2 and 4). Compare these levels to the levels measured in step 3.
14. The difference between the two measurements should be 40 dB or more for the 125 Hz signal and 50 dB or more if the 1 kHz signal was recorded.

## 8-22 CHANNEL SEPARATION

**SPEED Selector SW . . HIGH (7-1/2 ips)**
**BIAS SW . . . . . . . . . . 1**
**EQ SW . . . . . . . . . . . 1**

1. Be sure tape YTT-8013 is completely bulk erased prior to doing these checks.
2. Apply a 1 kHz signal at –12 dB (194 mV) to L chan.
3. Place deck in Record mode.
4. While recording measure the OUTPUT on R chan with VTVM connected through a 1 kHz Band Pass Filter.
5. Reading should be 50 dB, or more.

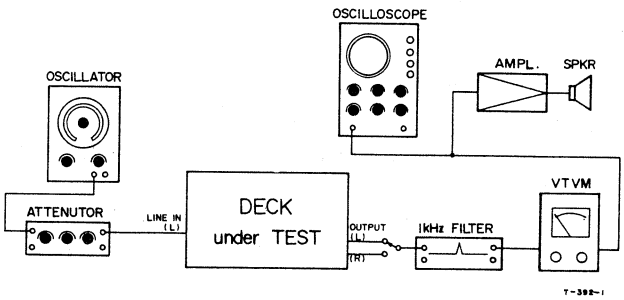



**Fig. 8-12 Test Connections for Channel separation check**

## 8-23 DISTORTION CHECK

6. Thread the YTT-8013 test tape on the deck.
7. Apply a 1 kHz signal to the LINE IN jacks at 0 VU.
8. With the Line and Output Level Controls set to the specified position, place the deck in the record mode for approx 10 seconds.
9. Rewind and play this recorded section of the tape.
10. The distortion factor read on the distortion analyzer should be 0.8% or less.

# 9. SERVICING AND MAINTENANCE

## 9-1 CLEANING:

TEAC TZ-261A for Head cleaning and TZ-261B for Rubber cleaning should be used. Use for following places.

| TZ-261B | TZ-261A |
|---|---|
| Pinch roller rubber<br>Capstan belt<br>Counter belt | Motor pulley<br>Heads, Brake drums<br>Capstan shaft<br>Tape run guides |

## 9-2 LUBRICATION:

Under normal operating conditions, lubrication is required only once each year. Before lubricating, clean the drive belt and drive pulley... etc. Operate the deck for 30 minutes to 1 hour immediately prior to oiling. After oiling, keep the deck in the upright position for 3 to 4 hours to allow thorough absorption of the oil.

Approximately once each year or after 2000 hours of use, apply TEAC TZ-255 or equiv. Lubricating Oil to the following places only;

– Pinch roller shaft . . . . . . . . . . . . . . . . . . . . . 1 drop
– Capstan shaft . . . . . . . . . . . . . . . . . . . . . . . 2 drops
(Remove the dust cap for access to the oil pit)

**NOTE:** Excessive oiling will scatter oil inside the deck. This oil will cause drive belt slippage and other difficulties. Check for slippage and clean all parts inside the deck before operating after lubrication. Check for oil emission after operation and before returning deck to the customer.

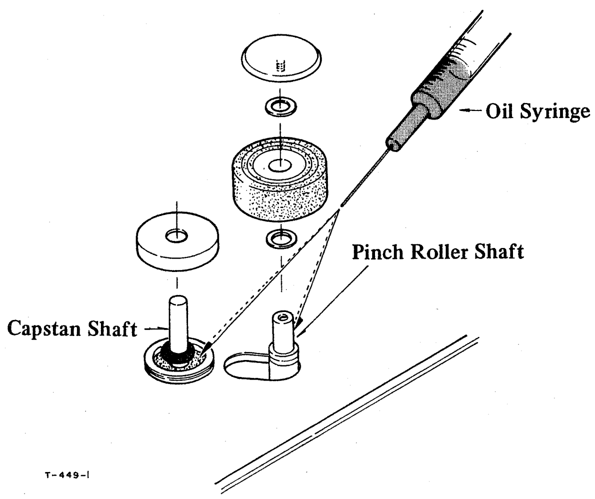



**Fig. 9-1 Capstan Shaft and Pinch Roller Shaft Oiling Points**

## 9-3 TEAC MAINTENANCE FLUIDS


**Fig. 9-2 TZ-255 Oil Kit**

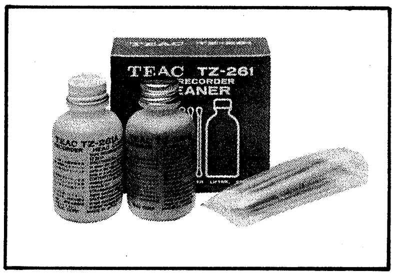



**Fig. 9-3 TZ-261 Tape Recorder Kit**

## 9-4 DEMAGNETIZATION OF HEADS

If the record or Playback heads become magnetized, noise will increase and tonal fidelity will deteriorate. For this reason it is advisable to use non-magnetic tools when working near the heads. If the heads have had any contact with current or magnetized metal parts, demagnetize them with a TEAC E-3 eraser or Equivalent.

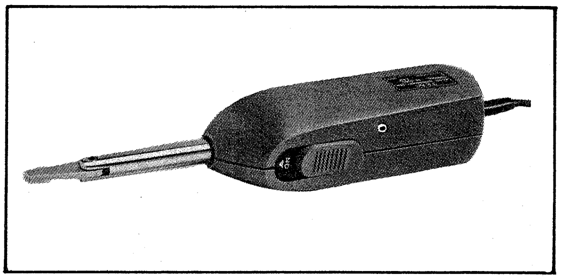


**Fig. 9-4 TEAC E-3**

# 10. SIMPLIFIED SCHEMATIC AND LEVEL DIAGRAMS

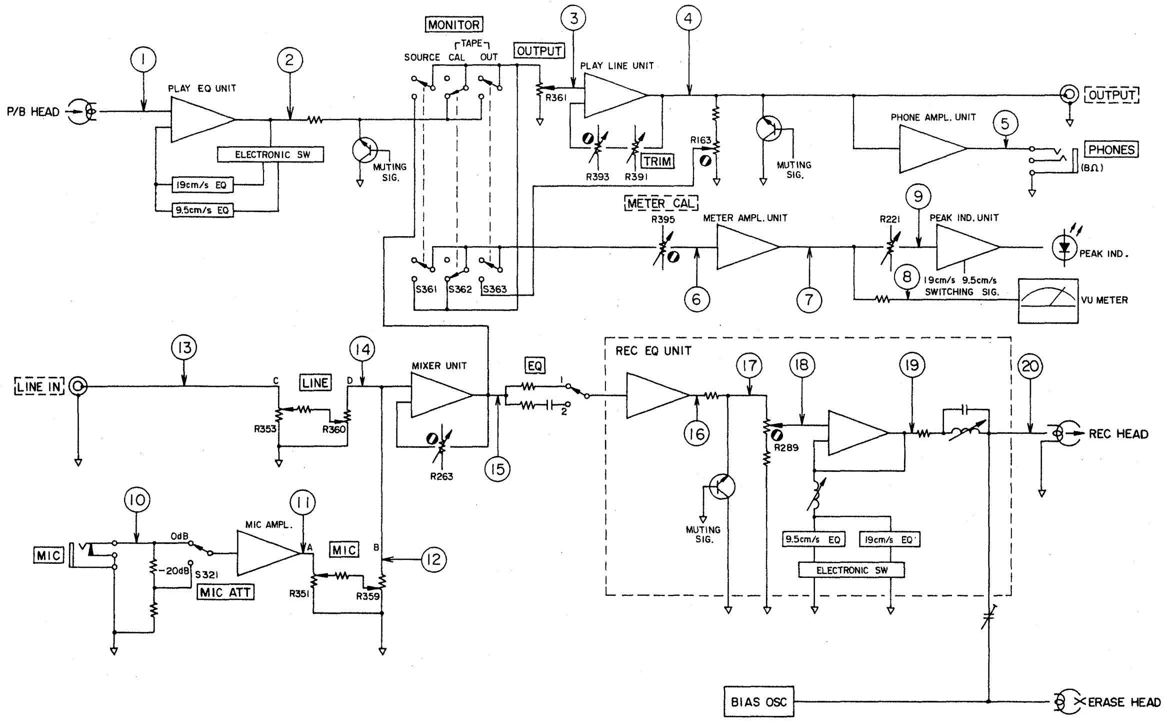
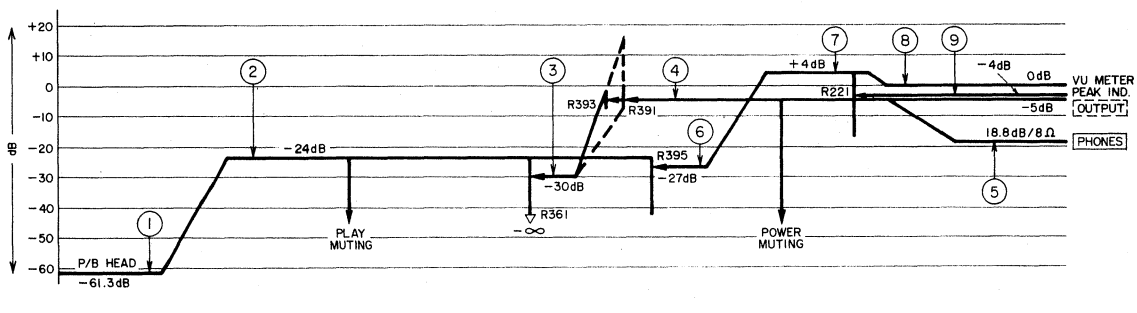
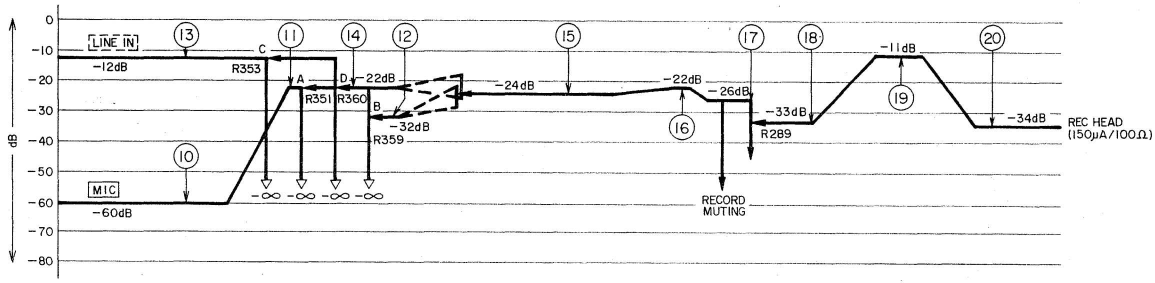



**Fig. 10-1 Simplified Schematic Diagram**

## PLAYBACK




## RECORD




**NOTE:**
- Playback and Record Controls are Positioned at specified level.
- Each level given in the diagram shows values when 400 Hz specified level is applied.
- 0 dB = 0.775 V
- Ref. Nos. shown in the diagram relate only to the left channel.

**Fig. 10-2 Level Diagrams**

# 11. THEORY OF OPERATION

## – TABLE OF CONTENTS –

# TAPE TRANSPORT CIRCUIT DESCRIPTION

In the tape transport section of the Model A-6600, a DC Servo Controlled Motor is employed for capstan drive and AC Eddy Current Induction Motors are used for reel drive. The tape transport control section is made up of discrete circuits built with transistors and diodes.
Reel motor control, however, is operated by switching action of relay circuits because the reel motors are driven by AC.

## 1 CONTROL UNIT

Each basic circuit function is explained in this section. Then, in the following sections, overall operation descriptions are given. For the following explanations of the Control Unit, the initial state for all circuits will be stop condition, unless otherwise noted.

### (1) INVERTER

This circuit has the function to invert any signal into the opposite condition.

| A | B |
|---|---|
| L | H |
| H | L |

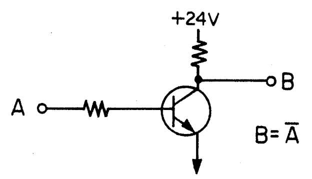
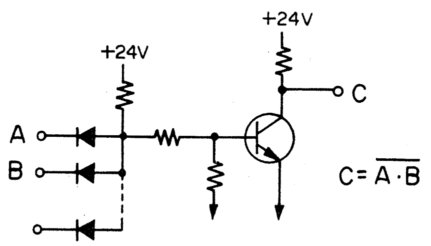



Fig. 1

### (2) NAND GATE

This circuit has two or more inputs. The output will become L only when all inputs go H.

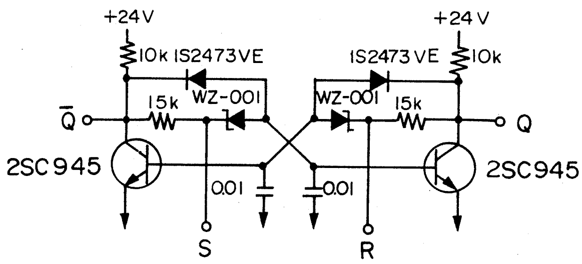



| A | B | C |
|---|---|---|
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

Fig. 2

### (3) SET-RESET FLIP FLOP

Job of this circuit is to maintain a stable active output once an active input signal is applied, and memorize that state even though this input signal is removed. In the schematic, this circuit is indicated as U1–U5.




| S | R | Q | Q̄ |
|---|---|---|---|
| L | L | H | H |
| L | H | H | L |
| H | L | L | H |
| H | H | Qn-1 | Qn-1 |

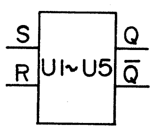



Fig. 3

### (4) MULTIVIBRATOR

This circuit generates alternate H and L signals with approx. 0.7 sec interval and is used to flash RECORD LED and PAUSE LED.

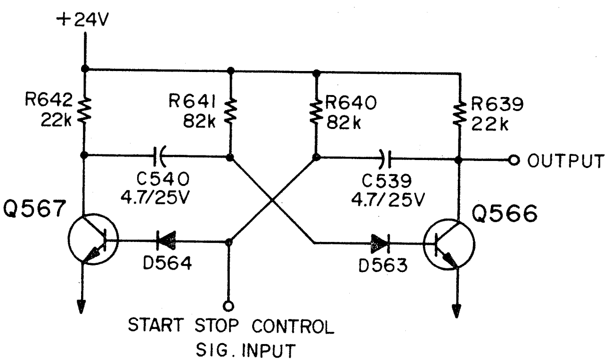



Fig. 4

## (5) MONOSTABLE (ONE-SHOT) MULTIVIBRATOR

Two kinds of circuits are employed. MONO-MULTI (A) will be triggered when tape motion direction is changed from Forward to Reverse, or from Reverse to Forward, and produces approx. 0.5 sec width signal. MONO-MULTI (B) is provided for Auto Spacing function. Its final stage works as an inverter. When MONO-MULTI (B) is triggered, OUTPUT will send out L level signal. This signal width is variable within the range of approx. 2 to 7 sec using AUTO SPACER control.

MONO-MULTI (A)

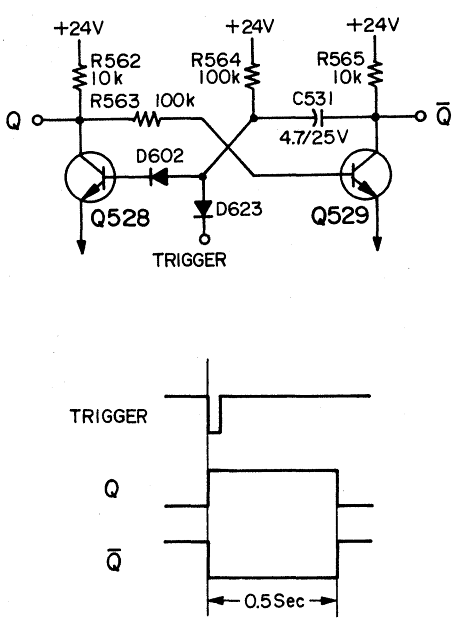



Fig. 5

MONO-MULTI (B)

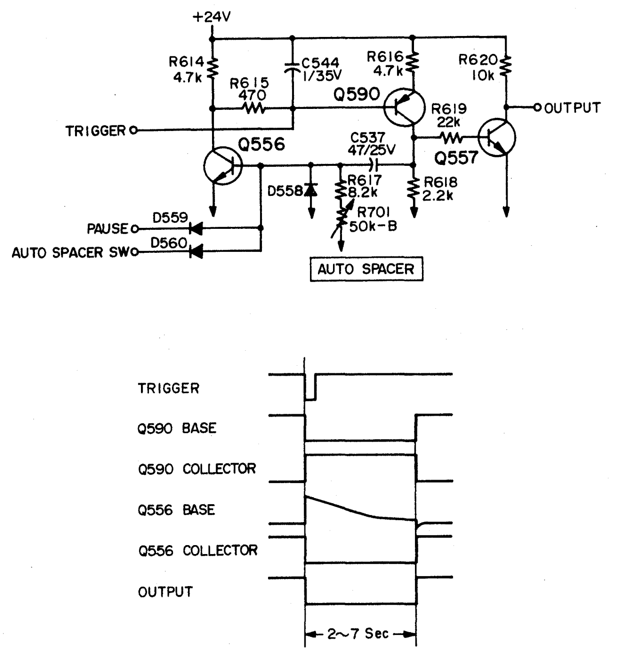



Fig. 6

## 1-1 FWD PLAY AND REV PLAY OPERATION

Fig. 7 shows partial circuit related to Forward Play and Reverse Play operations. When Forward button is depressed, Flip Flop U1 will be set. Then, since $\overline{Q}$ output of U1 changes H to L, Q532 is turned OFF and the collector of Q532 will be changed L to H. At this time, since Q537 is OFF and its collector is H, the emitter of Q538 will go to H and Q584 will go to ON state to energize Forward Capstan Solenoid which works to press right hand side pinch roller against right hand side capstan. Also, at the same time that Q532 is turned OFF, Q534 is turned OFF and its collector goes from L to H. Since, at this time, Q544 is OFF and its collector is at H, the emitter of Q545 will go to H and Q586 will go ON. As a result of this, BRAKE Solenoid is driven to release brake function. Also, together with Q586, Q535 will go to ON state so that OPERATION RELAY (K735) is activated to apply voltages to reel motors. By the operation of each of these things mentioned above, deck will be set in Forward Play Mode. SOL. FLASHING signals which control voltages applied to solenoids are simultaneously sent out together with drive signals for each solenoid, and Forward (Reverse) Capstan Solenoid and Brake Solenoid are energized by short term drive circuit operation so that they are driven by 48V for approx. 300 mSec after SOL. FLASHING signals are applied, then are held by 24V. This operation is explained in paragraph 4-4. Reverse Play works with almost all the same process as Forward Play. When going to Reverse Play mode, outputs different from Forward Play are the following three points:

1. Reverse Capstan Solenoid is substituted for Forward Capstan Solenoid.
2. Reverse Relay action is added by ON state of Q541. The take up torque and back tension functions of the reel motors are reversed by the reverse relay from those performed during Forward Play.
3. Head Relay operation is added by means of ON state of Q558.
   The Head Relay changes the Forward Playback Head for playback of forward tracks (1–3) to the Reverse Playback Head for playback of the reverse tracks (2–4).

When Play operation is changed from Forward to Reverse, or from Reverse to Forward, differentiation circuit will work to trigger Monostable Multivibrator consisting of Q528 and Q529.

Output from Monostable Multivibrator causes deck to go momentarily to STOP mode, then to go to Reverse Play mode from Forward Play mode, and vice versa. If Forward and Reverse buttons are depressed at the same time, U1 and U2 will both be in reset states, and their outputs $\overline{Q}$ will both be at H. For the above reason, Q534 will go to ON state, which thus Q586 and Q535 both to be turned OFF in order to release BRAKE Solenoid and OPERATION RELAY. Also, since Q532 and Q533 are ON, Q584 and Q585 will go into OFF states to release both Capstan Solenoids. Accordingly deck will be put in Stop state. When the Forward Play and Reverse Play buttons are released almost at the same time, whether the deck goes into Forward Play or Reverse Play depends on which button is released last. Fig. 8 shows Timing Chart for Forward Play and Reverse Play modes.

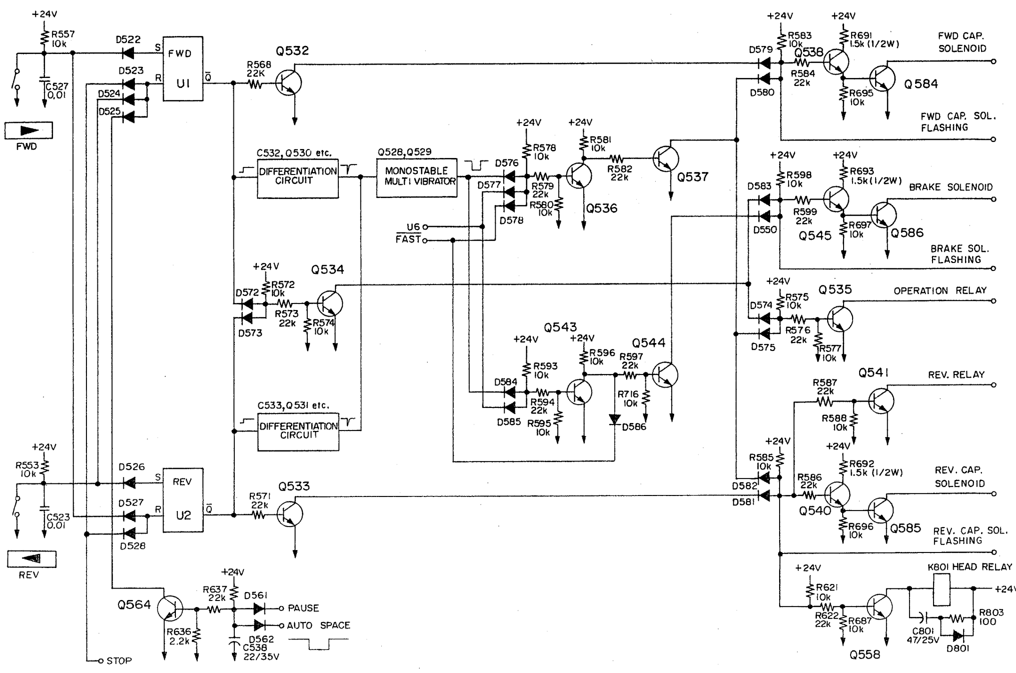



Fig. 7

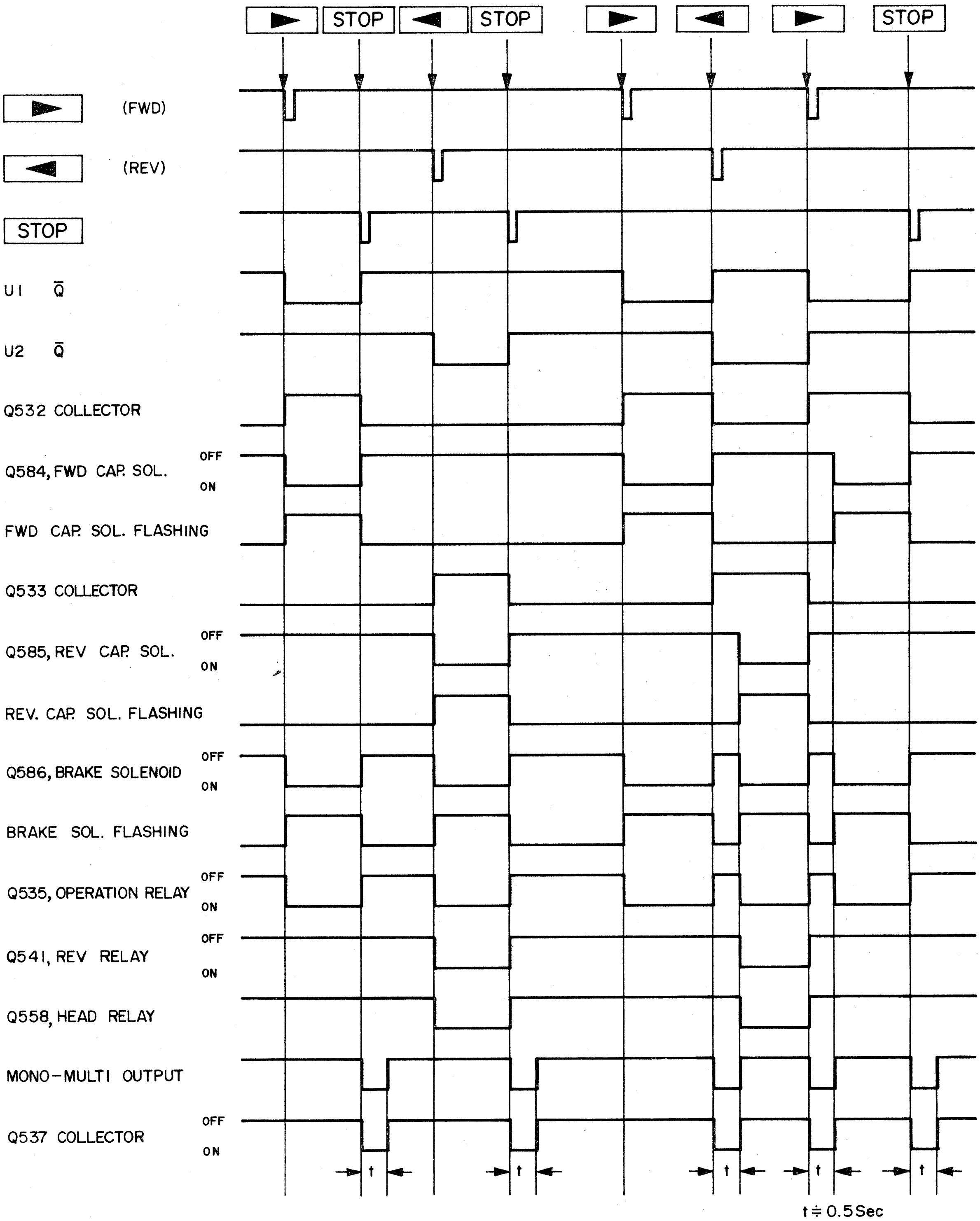

STOP
STOP
STOP
STOP
(FWD)
(REV)
STOP
U1 $\bar{Q}$
U2 $\bar{Q}$
Q532 COLLECTOR
Q584, FWD CAP. SOL.
OFF
ON
FWD CAP. SOL. FLASHING
Q533 COLLECTOR
Q585, REV CAP. SOL.
OFF
ON
REV. CAP. SOL. FLASHING
Q586, BRAKE SOLENOID
OFF
ON
BRAKE SOL. FLASHING
Q535, OPERATION RELAY
OFF
ON
Q541, REV RELAY
OFF
ON
Q558, HEAD RELAY
MONO-MULTI OUTPUT
Q537 COLLECTOR
OFF
ON
t
t ≑ 0.5 Sec

**Fig. 8**

## 1-2 FAST MODE (F. FWD AND REW)

Fig. 9 is partial schematic related to Fast Forward and Rewind operation. Timing Chart for this operation is indicated in Fig. 10. To set deck in Fast mode, there are the following two ways.

1. Depressing Forward (or Reverse) and FAST buttons simultaneously.
2. Depressing FAST button during Forward Play mode or Reverse Play mode.

When in Forward Play mode, U1-$\overline{Q}$ will go L and when in Reverse Play mode, U2-$\overline{Q}$ will go L. In either case, Q534 and Q539 will go to OFF States, and their collectors will go to H. When Q539 is OFF, if the FAST button is depressed Q591 will go ON and its collector will go L, which sets the Fast Flip Flop U3. When $\overline{Q}$ of U3 goes L if turns OFF Q542 and then its collector will go H. At that time, if FWD (U1) has been put in set state, Q550 will go to ON state and F.FWD Relay K733 will be energized to set deck in Fast Forward mode. In the same way as explained above, if the REV (U2) has been set, Q551 will go to ON state to energize REWIND Relay (K732), which sets deck in Rewind mode. F.FWD and REWIND Relays are provided for converting reel motor voltages. This operation is depicted in paragraph 3. When U3-$\overline{Q}$ is at L, both input and output of U6 will go L, and Q552 will be turned OFF. Then emitter of Q553 goes H, which makes Q587 go to ON state to activate Lifter Solenoid. Lifter Solenoid is provided to separate tape from head when in Fast Wind mode. Brake Solenoid action when going into Fast Wind mode is as follows. If the deck was in Forward Play or Reverse Play just prior to the time that the FAST button was depressed, the U6 output and MONO MULTI output (collector of Q529) would both have been H and Q543 would be in ON state and Q554 would be in OFF state. Since Q544 together with Q534 were OFF state, emitter of Q545 has been at H and Q586 has then been ON state, consequently Brake Solenoid has already been in operation. If the deck was in STOP mode just before the time that the deck is put in Fast Wind mode, Q586, because of ON state of Q534, would have been truned OFF, so that Brake Solenoid would have been de-enegized. When FAST button is depressed simultaneoulsy together with Forward or Reverse button, Q534 goes to OFF state and $\overline{Q}$ of U3 to L, accordingly Q544 becomes OFF state and Brake Solenoid will be operated. During Fast Winding mode, the deck can be changed to Fast Forward or Rewind mode by depressing only the Forward or Reverse button, respectively. Also, of Forward and Reverse buttons are simultaneously depressed, brake will function to set deck in STOP mode as explained in paragraph 1-1. When buttons are released, Fast Wind mode direction will be in accordance with the button which is released last. When Cue switch button is depressed while in Fast Wind mode, Lifter Solenoid will be released to put deck in Cue condition. Regardless of tape travel direction, when TRACK 1-3 or 2-4 CUE button is depressed, tracks number 1-3 or 2-4 can be put in Cue condition, respectively.

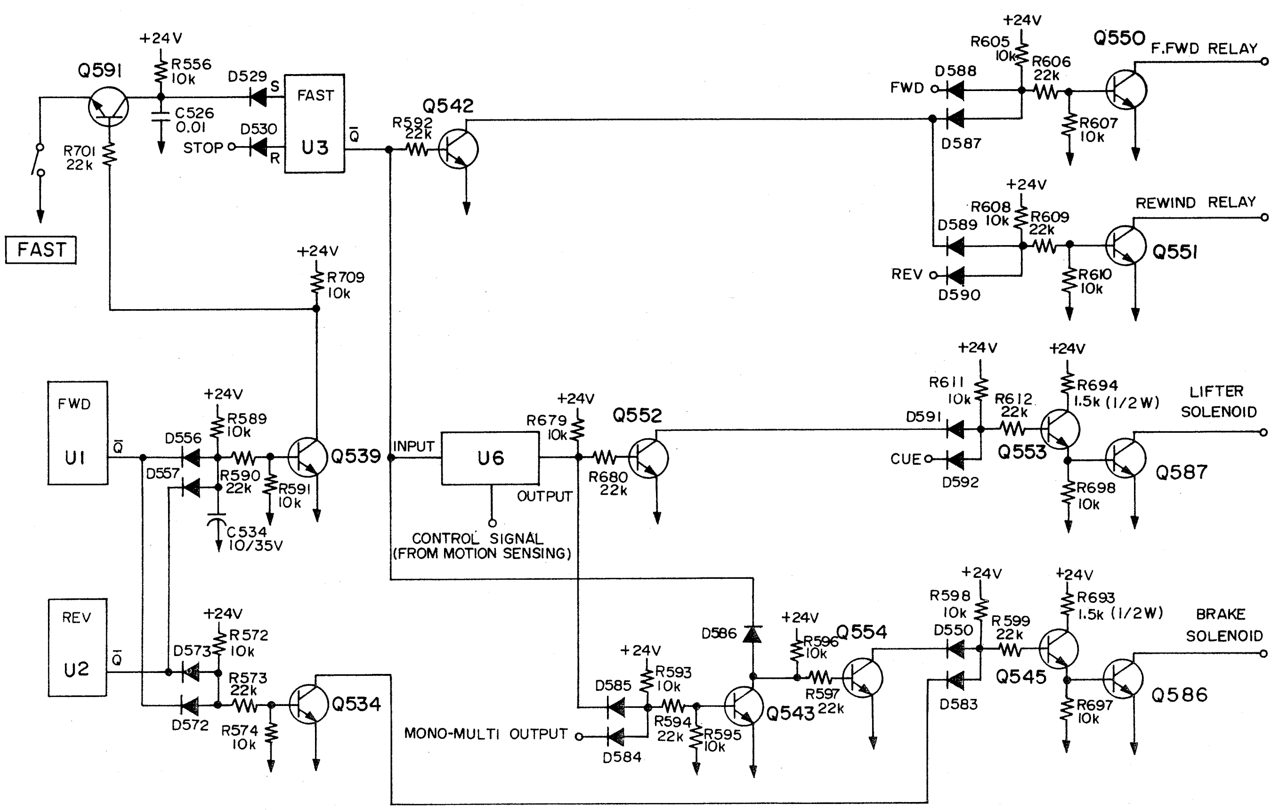



Fig. 9

## 1-3 MODE CHANGE FROM FAST WIND TO PLAY

Mode change directly from Fast Forward or Rewind mode to Forward Play or Reverse Play mode cannot be done. When doing so, STOP button should always be depressed to momentarily reset Fast Flip Flop U3. When depressing STOP button then Forward or Reverse button during Fast Forward or Rewind mode, initially, Fast Flip Flop U3 will be in reset state which makes U3-$\overline{Q}$ become H. When U6 input changes from L to H, its output will go from L to H, after a slight delay time. (This delay time is determined by Motion Sensing Circuit operation which works to set deck in Play mode after tape motion is completely halted. Refer to paragraphs 2-1 and 2-2 for the explanation on this.) Since U6 output is still kept L at the instant U3-$\overline{Q}$ goes into H, collector of Q543 will go into H, which lets Q544 be turned ON. The result is that Brake Solenoid is de-energized to activate brake function. After tape movement is completely stopped, U6 output will go from L to H. Therefore Q543 will go ON, thereby Q544 goes to OFF. Since, up to this time, Q534 has gone to OFF state due to U1-$\overline{Q}$ or U2-$\overline{Q}$ output (because Forward or Reverse button is already depressed), Q586, when Q544 is turned OFF, will go to ON state to drive Brake Solenoids which release Brakes. On the other hand, when U6 output goes to H, Q552 will go to ON state which causes Q587 to go OFF. The result is that Lifter Solenoid will also be released. As a result of the above, deck is set in Forward or Reverse Play mode. For timing of these operation, refer to Fig. 10.

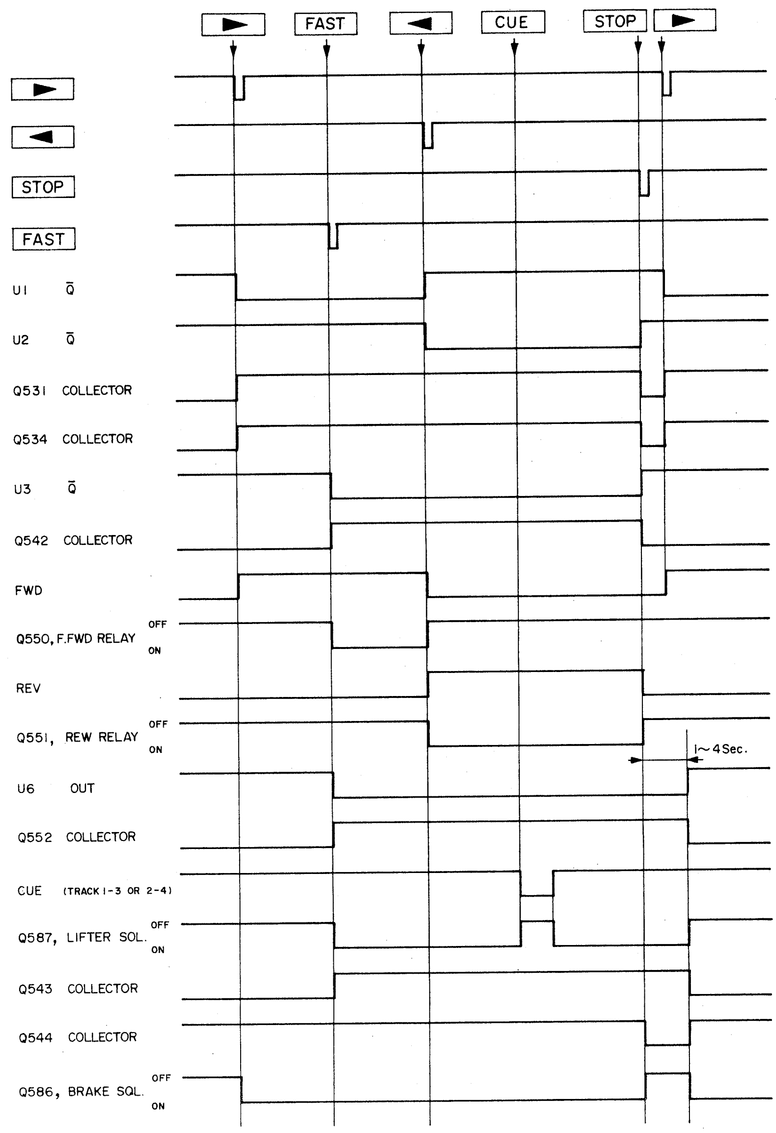



Fig. 10

## 1-4 RECORD MODE

Fig. 11 is partial circuit related to RECORD mode. Fig. 12 is Timing Chart for the circuit. When both RECORD MODE buttons, L and R, are switched OFF, REC. Flip Flop U4 and Multivibrator (consisting of Q566 and Q567) are reset. When REC MODE switch, L and/or R-ch, are depressed to ON, reset state of U4 will be released, and simultaneously Multivibrator will begin oscillation. This oscillation output allows Q582 to go ON-OFF alternately for blinking of RECORD LED (colored with RED). Now, assume that RECORD and Forward buttons are pressed down at the same time. By depressing Forward button, deck will be put in Forward Play operation as mentioned previously. Simultaneously, U4 will go into set state, which inverts U4-$\overline{Q}$ output from H to L. For this reason, Q549 will be switched OFF, and its collector, in turn, will go H, and this H makes Q561 go to ON state, and RECORD LED, as a result, will be lighted. Since Q output of mono-multivibrator (Q528, Q529) is normally L, Q581 will be OFF and U6 output will remain H. Therefore, when Q549 is turned OFF, Q562 will go ON and Q563 will go OFF. With Q563 OFF its collector will go H, which allows Q563 to transmit REC SIGNAL, and the Bias Oscillator begins Oscillation. In addition to the above, Q565 and K511 will be operated. K511 is provided for connecting Record Head to Record EQ Amplifier output circuit. Furthermore, since the Q563 collector leg and the FWD leg (coming from collector of Q532) of the NAND gate are both H (AUTO SPACE signal leg is normally H also), REC MUTE signal will go H. When REC MUTE signal is H, Muting function for Record EQ Amplifier is released. Record mode will be released when either STOP, Reverse or FAST button is depressed. Also, when PAUSE button is depressed, deck will be set in Record Pause mode.

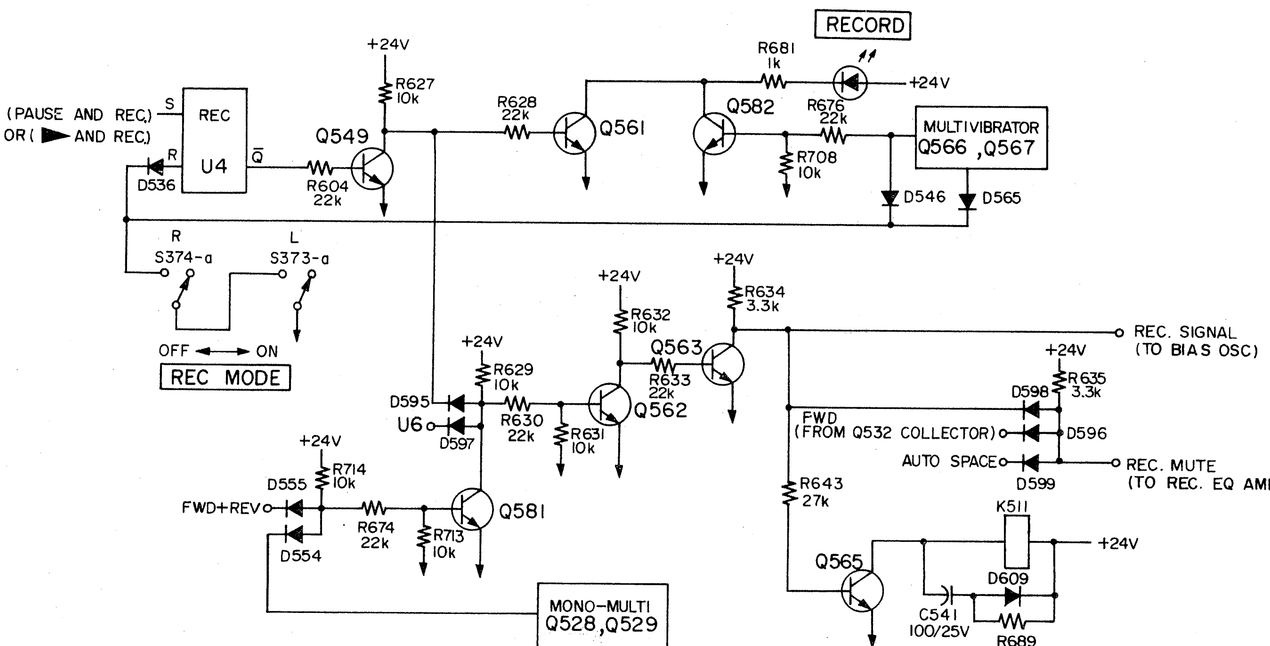



Fig. 11

## 1-5 RECORD PAUSE MODE

This deck will go to Record Pause mode when RECORD and PAUSE buttons are pressed at the same time during STOP or Forward Play mode, or when the deck is already in Record mode and then PAUSE button in pressed. Referring to Fig. 11, when RECORD and PAUSE buttons are pressed at the same time while RECORD MODE switch(es) is positioned at ON, REC. Fiip Flop U4 is put in set state, which allows Q549 to be in OFF state. Q561 will be turned ON to steadily light RECORD LED. In addition, as with Record mode, REC SIGNAL will go into H so that Bias Oscillator will be activated. Furthermore Q565 and K511 will both be in ON state for Record Head to be connected with Record EQ Amplifier output. Since, however, FWD signal is at L, REC. MUTE signal will be L, so Record EQ Amplifier does not operate. On the other hand, referring to Fig. 13, when PAUSE Flip Flop U5 is put in set state, and thus makes Q560 go OFF, Q571 will be switched ON so that PAUSE LED (green) will be lighted steadily. During Record Pause mode, since OPERATION signal is L which makes Q569 go OFF, and Q568 is set in OFF state due to L output of U4-$\overline{Q}$, Q570 will go to ON state. The result is that PLAY MUTE signal will be L. For this reason, Muting function is provided to Play EQ Amplifier. When Forward button is depressed during Record Pause mode, PAUSE Flip Flop will be put in reset state, thereby causing extinguishing of PAUSE LED. And then, each Muting function will be released and deck will be set in RECORD mode as REC Flip Flop still remains in set state. Fig. 14 indicates Timing Chart associated with Record Pause function.

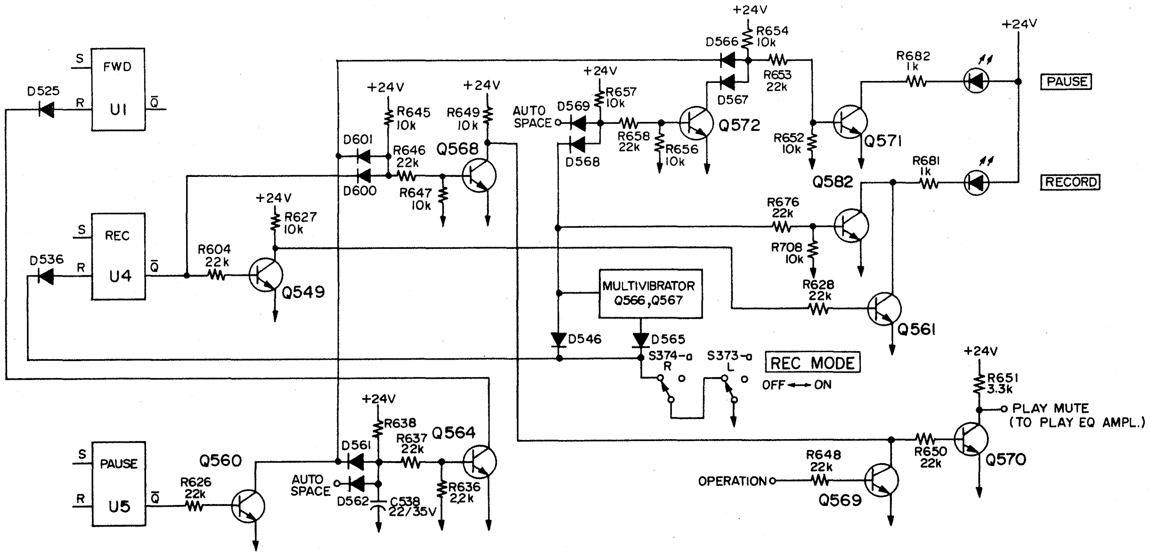



Fig. 12

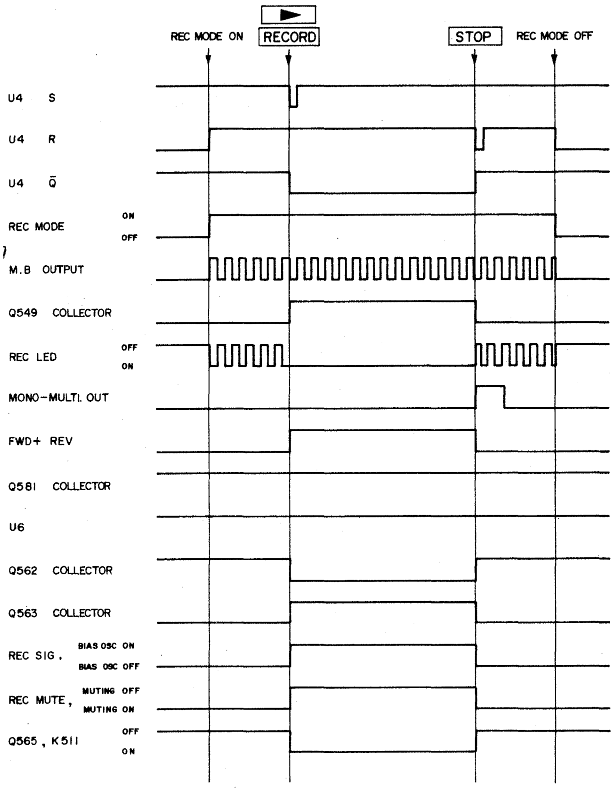



Fig. 13

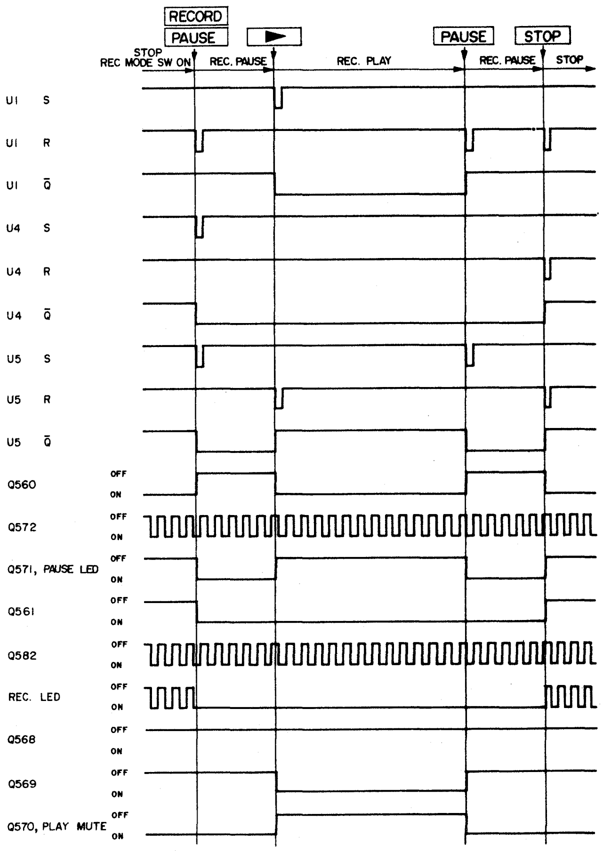



Fig. 14

## 1-6 AUTO SPACER MODE

AUTO SPACER function is provided for making non-recorded signal portions (spaces), for example, between some musical selections to be recorded on the tape. Now, let us assume that AUTO SPACER Switch (S701) is pulled out (ON position) with deck in RECORD mode. Refer to Fig. 15. Up to this time, U4-$\overline{Q}$ has been at L, so collector of Q549 has gone H; while U1-$\overline{Q}$ has been at L, thus it results that collector of Q532 is in H state. Since, however, U5-$\overline{Q}$ was H and Q560 collector was L, point A would go L. For this reason, Q554 has gone to OFF. Furthermore Q556, Q590 and Q557 have been at OFF state. Since collector of Q557 was H, also REC and FWD signals were H together, REC MUTE signal has been H, accordingly Muting function of Record EQ Amplifier has been released. Also since Q560 was switched ON, subsequently Q571 went into OFF state, PAUSE LED would be extinguished. When PAUSE button is depressed with these conditions, U5-$\overline{Q}$ will go L, and Q560 will be switched OFF, then point A will become H. This H signal at point A passes through C536, and a moment later makes Q554 go ON and the Mono-multi is triggered. When Mono-multivibrator is triggered, Q590 and Q556 will both go to ON state, and will make Q557 go to ON state which causes L level from Q557 to be sent to point B as AUTO SPACE signal. This signal returns to H after a period of time determined by AUTO SPACER control R701 (approx. 2 to 7 seconds). Since REC MUTE signal is L as long as point B is at L, Muting signal is applied to Record EQ Amplifier. In addition to above, for that duration, since Q573 is in OFF state, Q572 and Q571 will be turned ON-OFF by the Multivibrator (Q556 and Q567) output which creates flashing ON-OFF of PAUSE LED. When point B goes to H, the H on the collector of Q560 makes the output of the AND gate H, Q564 is turned ON and the FWD Flip Flop, U1, is reset. When U1 is reset, the tape movement is stopped and the deck goes to the Record Pause mode. In other words, during RECORD mode, after the PAUSE button is depressed until the time that U1 is reset, a no-signal recording is being made on the tape. Fig. 16 denotes Timing Chart for AUTO SPACER operation.

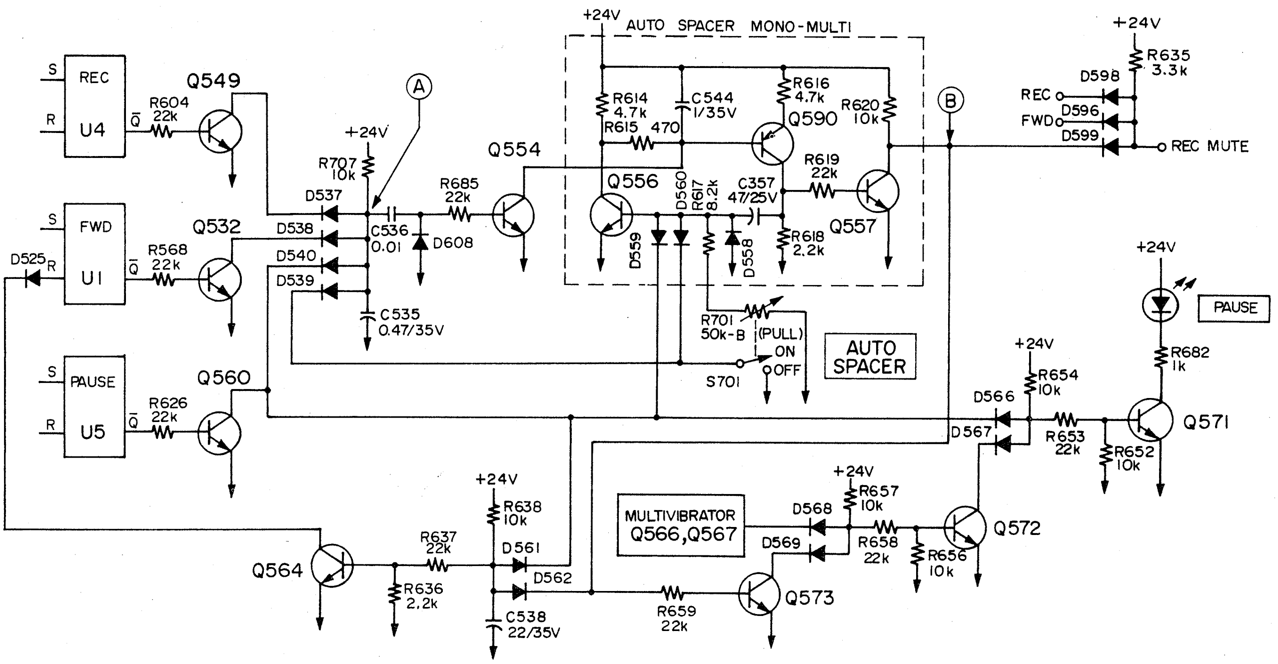
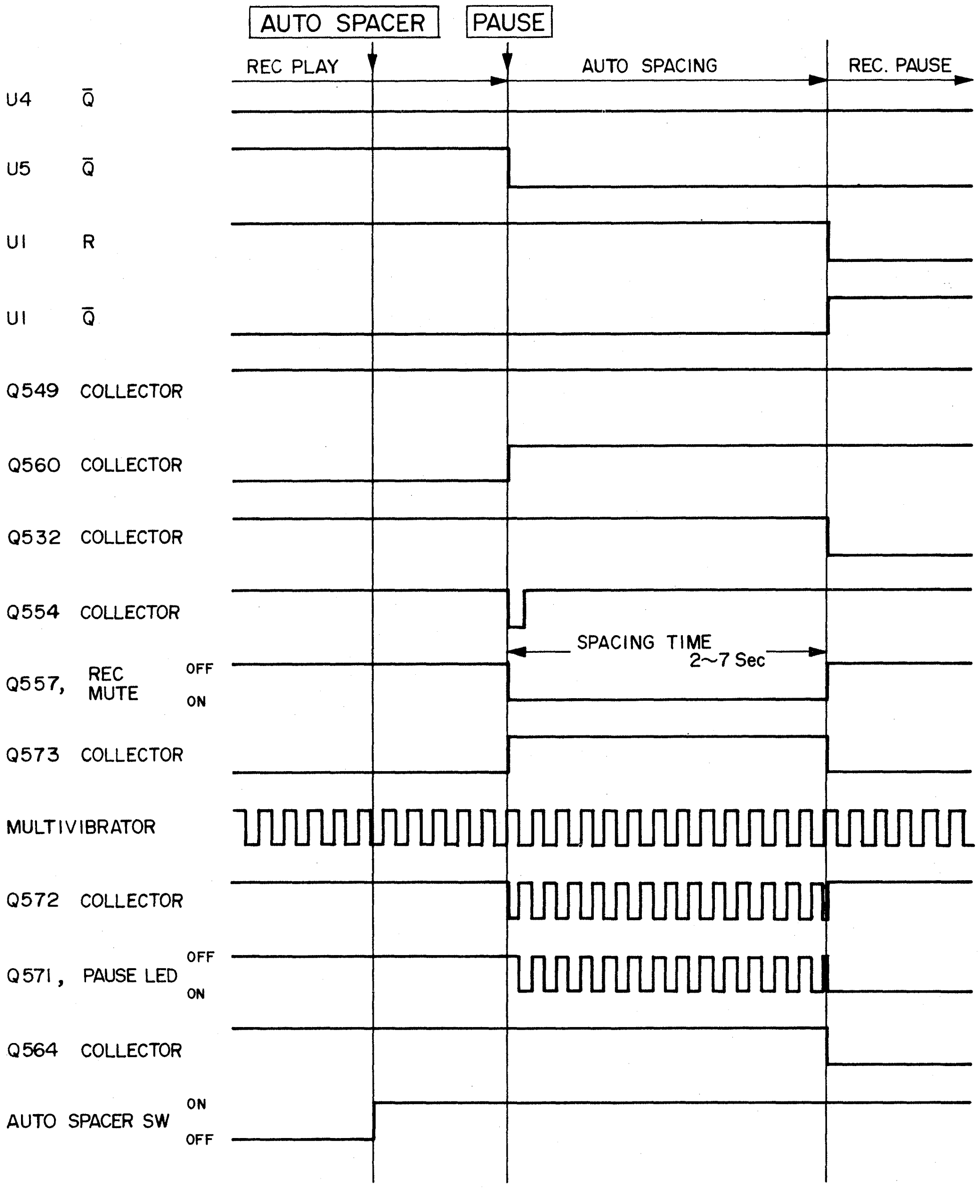



Fig. 15



AUTO SPACER
PAUSE
REC PLAY
AUTO SPACING
REC. PAUSE
U4 Q̄
U5 Q̄
UI R
UI Q̄
Q549 COLLECTOR
Q560 COLLECTOR
Q532 COLLECTOR
Q554 COLLECTOR
SPACING TIME
2~7 Sec
Q557, REC MUTE
OFF
ON
Q573 COLLECTOR
MULTIVIBRATOR
Q572 COLLECTOR
Q571, PAUSE LED
OFF
ON
Q564 COLLECTOR
AUTO SPACER SW
ON
OFF


**Fig. 16**

## 1-7 SENSING REVERSE

Refer to Fig. 17 and 18. When Sensing Foil which was affixed beforehand on the tape is detected during Forward Playback operation, Q575 will go to OFF state. Since $\overline{\text{FAST}}$ signal and FWD + REV signal are H together, Q574 will go to ON state. This ON state of Q574 permits reset state of FWD Flip Flop U1 and set state of REV Flip Flop U2, consequently deck will be put in Reverse Play mode. Since $\overline{\text{FAST}}$ signal is L during Fast Wind mode, Q574 will not go ON even though Sensing Foil is detected.

## 1-8 COUNTER REPEAT

REPEAT switch (S782) and switch (S783) that is closed during the time that counter is at "9000" to "9999" are installed on the counter of this deck.
During Reverse Play, if the REPEAT Switch is ON, when the counter changes from "0000" to "9999" and S783 closes, the electric charge on C530 will flow through R670 to the base of Q579 making Q579 go ON momentarily. Q576 will go OFF and its collector will go H. Since FWD + REV and $\overline{\text{FAST}}$ are H, Q527 will go ON, REV Flip Flop, U2, will reset and at the same time FWD Flip Flop, U1, will be set.
As a result of this, deck mode is changed from Reverse Play to Forward Play. By means of the combination of this operation and Sensing Reverse operation, Repeat operation is conducted. Since during Fast Wind mode, $\overline{\text{FAST}}$ signal is L, Q527 will maintain OFF state. The circuit and Timing Chart regarding this section are shown in Fig 17 and 18.

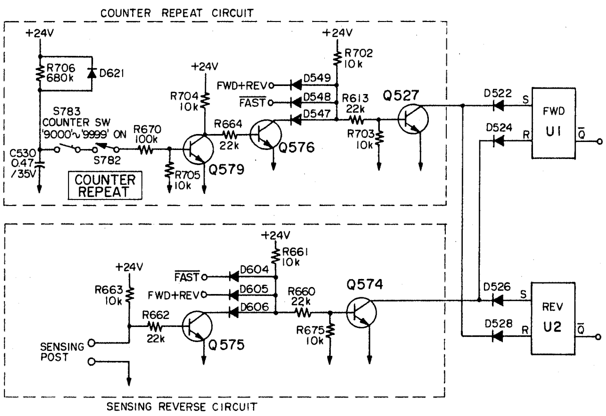



Fig. 17

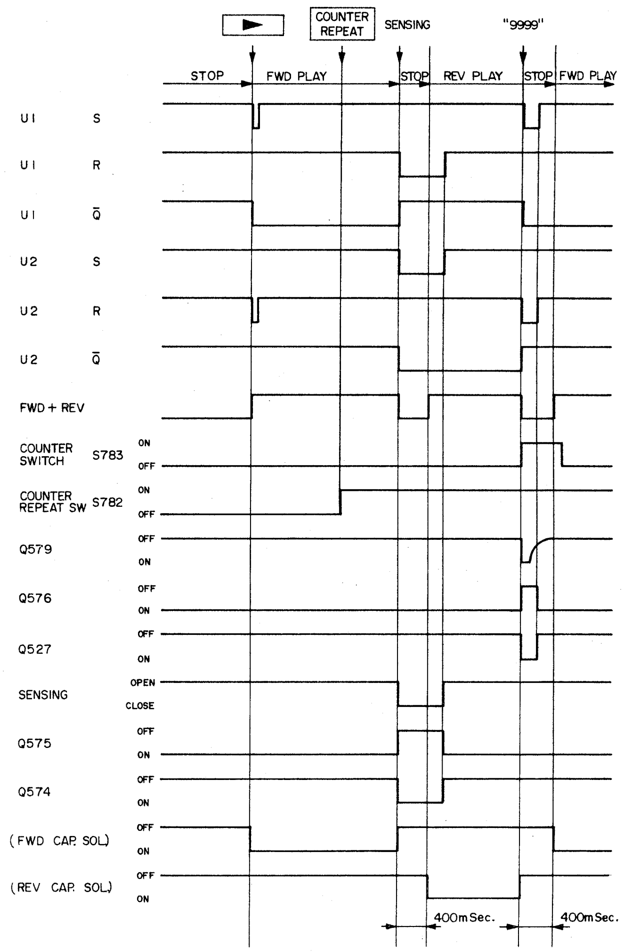



Fig. 18

## 1-9 STOP OPERATION

Fig. 19 is the circuit for STOP operation. STOP signal is transmitted by any of the following conditions: STOP button is depressed, or both left and right Tension Arms are positioned down, POWER switch is turned ON and OFF. STOP signal is applied to reset inputs of each Flip Flop and has priority over any operation signals. Since S784 and S785 are grounded when both left and right Tension Arms are lowered, Q583 will be switched OFF, then Q580 will be turned ON, the resulting STOP signal L is sent out from collector of Q580. At this time, MOTOR STOP signal goes to H, this controlling Capstan Motor Power Supply circuit to prevent the Motor from being supplied voltage.

Power Reset Circuit is provided for transmitting STOP signal when POWER switch is turned ON and OFF.

When +24V rises as main power is switched ON, C543 will be quickly charged through D571, the resultant rise of Q577 emitter potential will be obtained.

C547, since it is charged via R665, will charge slowly compared to C543.

Until C543 is sufficiently charged, that is, during the time potential at Q577 base is lower than potential at its emitter, Q577 will be in ON state. Therefore, for this period, Q578 will also go to ON state, thus STOP signal will be sent out.

When POWER switch is shut off, +24V will drop relatively quickly. Electric charge of C547 is discharged via D570 at the same time as +24V falls off. Since, however, C543 is inhibited by D571, it does not discharge toward +24V side. Accordingly since potential at base of Q577 is lower than potential at its emitter, Q577 will be ON and also Q578 will be ON state, and STOP signal will be sent out.

Fig. 20 is Timing Chart for STOP operation.

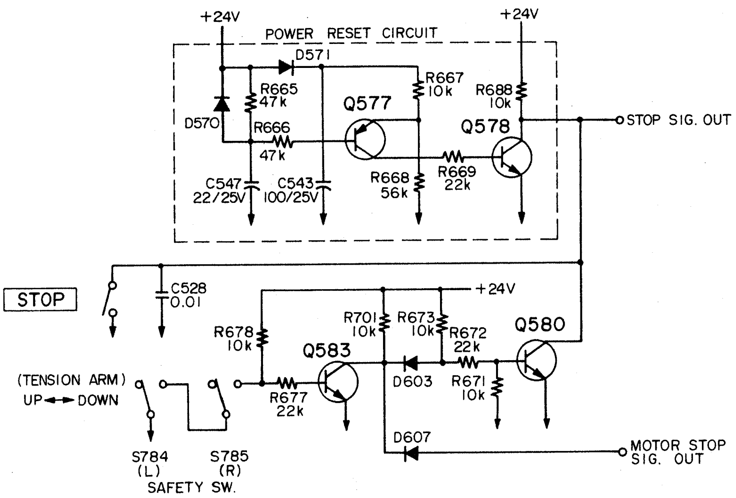



Fig. 19

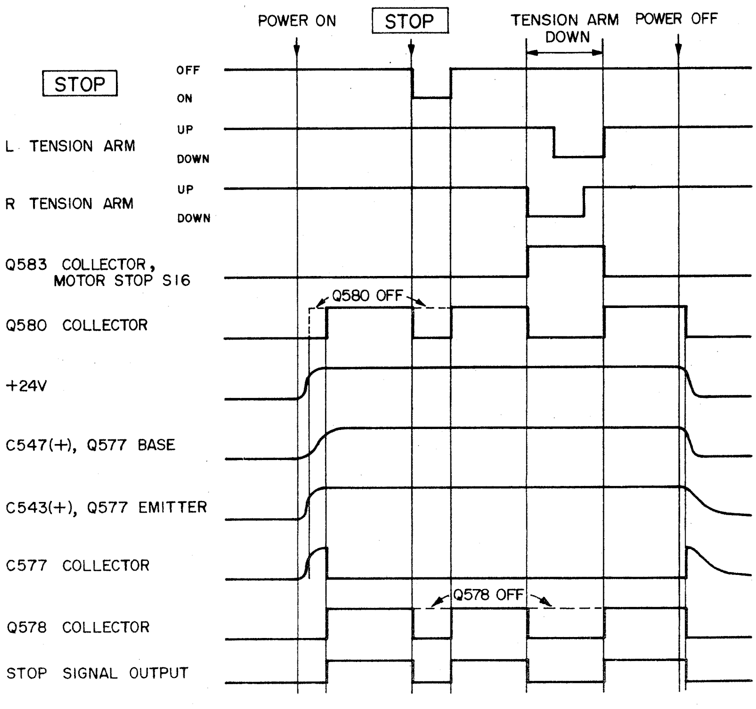



Fig. 20

## 2 MOTION SENSING

This deck is designed so that, during Fast Wind mode, STOP button is depressed then, immediately after which Forward or Reverse button is pressed down, the deck, after tape motion is completely halted, will conduct next operation, Forward Play or Reverse Play.

Motion Sensing circuit is designed for detecting whether this tape is completely stopped or not, and then controlling the next operation.

### 2-1 MOTION SENSING SIGNAL GENERATING CIRCUIT

Ring Magnet shown in Fig. 21 is installed on Guide Roller shaft on tape transport. Since Guide Roller does not rotate while deck is in STOP state, Ring Magnet mounted on its shaft will also be stopped. As a consequence, Magnetic Resistance Element will not generate a signal. Therefore Q751 does not operate, that is, does not amplify the signal, and Q752 is in OFF state. C757 and C754 are charged and Q753 is in ON state. During each Play, Fast Forward and Rewind mode, Ring Magnet is rotating and a signal is generated by Magnetic Resistance Element. This signal will be amplified by Q751.

Due to output from Q751, Q752 goes ON-OFF repeatedly. For this reason, electric charges on C757 and C754 are discharged; and because base potential of Q753 is L while Q752 goes repeatedly ON and OFF, Q753 will be switched OFF. As a result of this, output from Q753 collector will go into H while Guide Roller is turning (in other words tape is moving) and will go L while deck is stopped. See Fig. 23 for Timing Chart of this section.

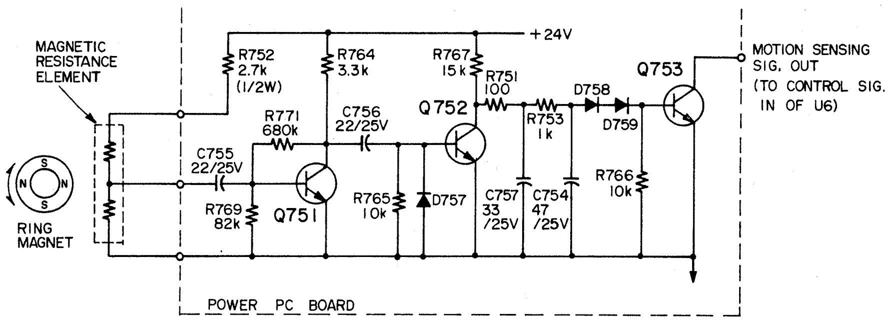



Fig. 21

### 2-2 MOTION SENSING CONTROL SECTION

See Fig. 22. At U6 input terminal, L is applied when in Fast Wind mode, and H when in the other modes. Now suppose that deck is changed from STOP or PLAY mode to Fast Wind mode, then since U6 input goes L, Q521 will go to OFF state. Current flowing through R542, C521, D615 and Q523 turns ON Q523 for a certain time.

Also, current flowing through R542, R543 and Q522 makes Q522 go ON. Emitter currents of Q522 and Q523 charge C522, and then raise base potential of Q524. When Base potential at Q524 increases past a certain value, Q524 will go to ON state then Q525 will go to OFF state, finally Q526 will be switched ON.

As a result of this, output terminal of U6 goes into L, thus sending out the signal which is necessary for Fast Wind mode.

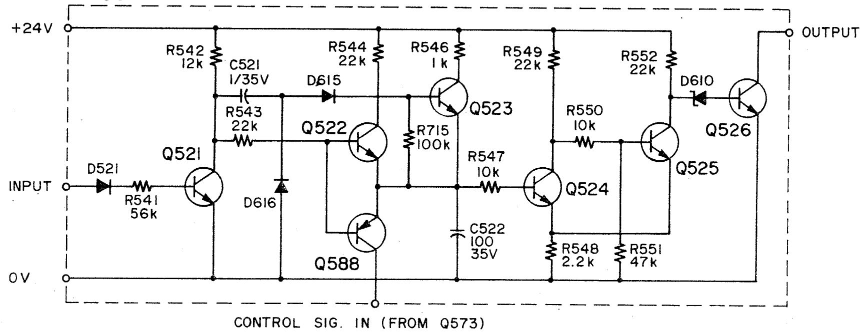



Fig. 22

When STOP button is depressed during Fast Wind mode, U6 input will be inverted to H, and Q521 will go to ON, Q522 OFF and Q588 ON. In addition to the above, when STOP button is depressed, deck will be put in STOP mode and Brake Solenoid will be de-energized to activate Brake function to Reel Motors. However, Reels continue to turn for a while due to the effect of inertia during which time tape is traveling.

Since, as previously described in paragraph 2-1, the Guide Roller is rotating as long as tape is running, Q753 is in OFF state, the result is that current does not flow even though Q588 connected to Q753 goes to ON. For this duration, charged voltage potential on C522, as the current does not flow to Q588, will gradually flow to Q524, which therefore remains switched ON, and Q525 will be kept OFF and Q526 ON. Since when tape motion is stopped, Q753 goes ON, electric charge of C522 will be discharged via Q588 and Q753.

For the above reason, Q524 is switched OFF, Q525 ON and Q526 OFF in order.

When U6 output goes to H due to Q526 going OFF, deck can be changed to the next mode. In Fig. 22, Schmitt circuit comprised of Q524 and Q525 gives snap characteristic to switching of transistor. D610 is zener diode for level shifting and its purpose is to make Q526 action stable. Fig. 23 is Timing Chart related to Motion Sensing operation.

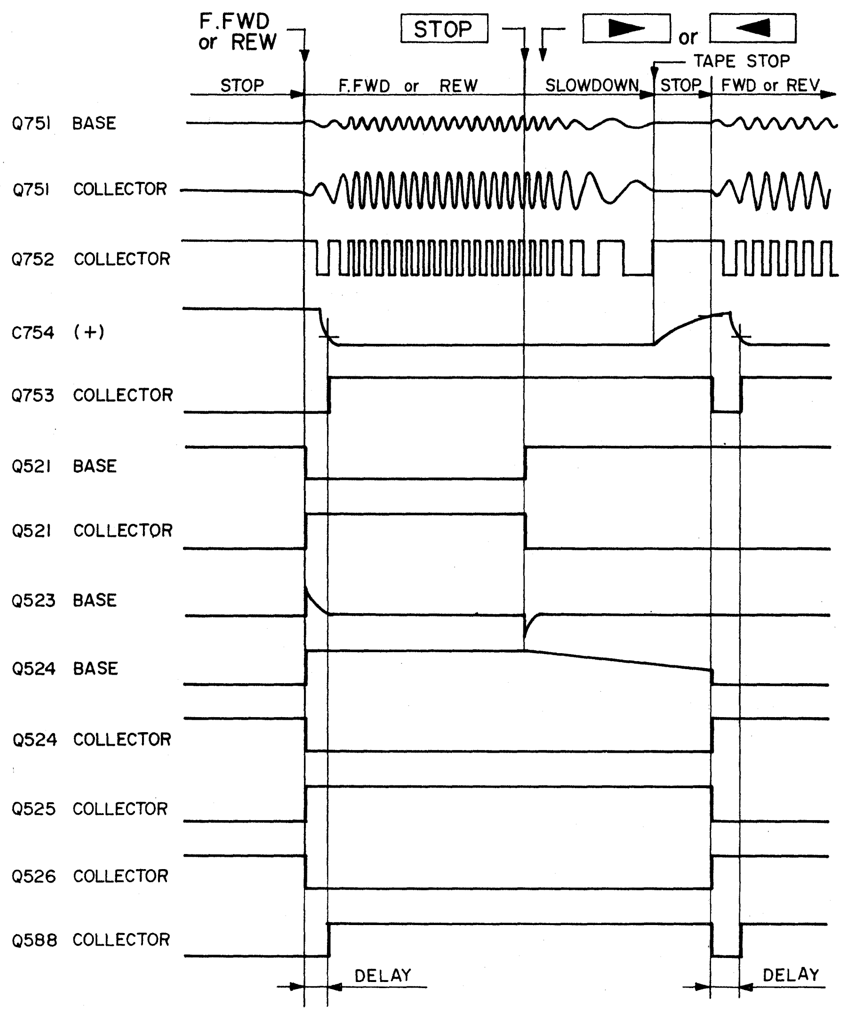



Fig. 23

## 3 REEL MOTOR DRIVE SECTION

Fig. 24 shows partial schematic for Reel Motor operations. 117 VAC power supply is used for Fast Winding mode, and 77 VAC is used for Play mode. If REEL size switch is set to SMALL for small reels (7" dia. reel), 77 VAC is applied to Reel Motors via R401 which decreases voltage.

The following explanation is for the case when the REEL size switch is set to LARGE for large reels (10-1/2" dia. reel). When in Forward Play mode, OPERATION signal L and MOTOR FLASHING signal H will be given from Control section. Since Relay K735 is operated by OPERATION signal, 77 VAC will be fed through R403 to right reel motor, and through R402 to left Reel Motor. At this time, Relay K734 is ON for a short while through MOTOR FLASHING signal, so that during that time, 77 VAC is directly applied to right Reel Motor. By means of this FLASHING function, motor torque at the moment of motor starting is increased to improve acceleration of Motor. When in Reverse Play mode, OPERATION and REV signals will both be L, and FLASHING signal H. As Relay K731 is energized by REV signal, 77 VAC will be supplied through R402 to right Reel Motor, and through R403 to left Reel Motor. In other words, torque relationship between left and right reel motors is inverted from that of Forward Play mode. When changing Forward Play to Reverse Play, or Reverse Play to Forward Play, deck will be momentarily stopped, then will be changed to next operation. Also MOTOR FLASHING signal is momentarily returned to L, then after approx. 0.5 sec. it goes to H. Consequently, when changing from Forward (or Reverse) Play to Reverse (or Forward) Play, Reel Motor will be accelerated the same as when changing from STOP to Forward (or Reverse) Play. When in Fast Forward mode, F. FWD signal will go to L, thereby activating K733. 117 VAC is directly applied to right Reel Motor, and to left Reel Motor, 117 VAC is supplied via R404 which reduces the voltage. When in Rewind mode, REW signal will go L and will operate K732. The result will be that 117 VAC is fed to left Reel Motor and voltage for back tension is supplied to right Reel Motor.

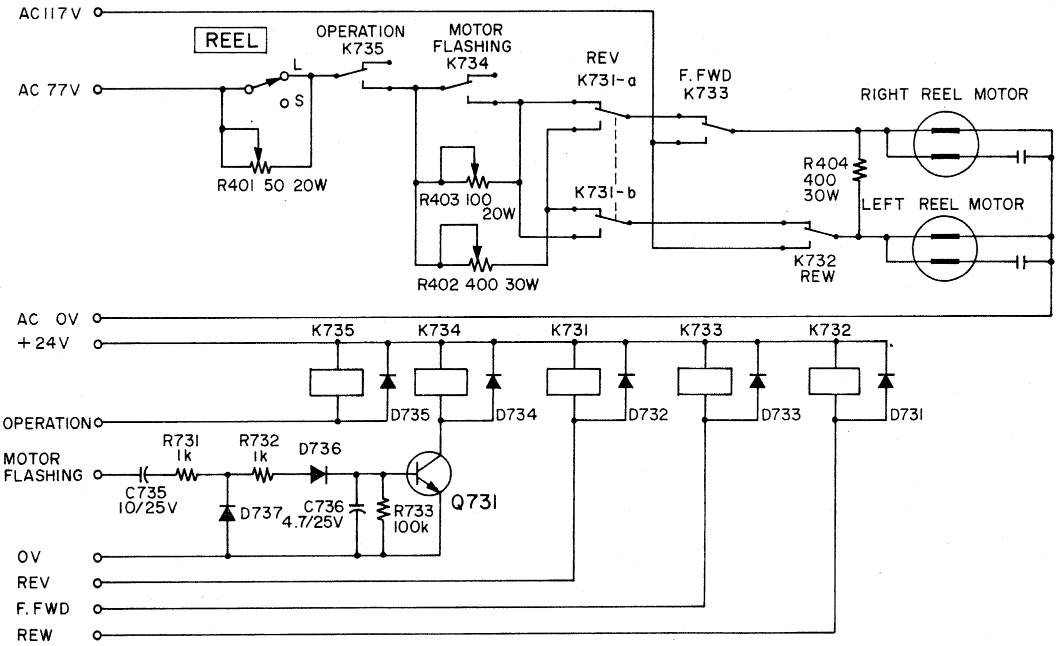



Fig. 24

## 4 POWER SUPPLY CIRCUIT (Refer to Power Supply circuit in supplied schematics)

(1) +7V POWER SUPPLY FOR LAMP

AC input voltage is half-wave rectified by D755 then, is filtered by C759.

(2) +24V POWER SUPPLY FOR AMPLIFIER

AC input voltage is bridge rectified by D751, is filtered by C760, then is stabilized by power supply IC U751 in order.

(3) +24V POWER SUPPLY FOR CONTROL AND FOR CAPSTAN MOTOR

AC input voltage is rectified by D753 and D754, is filtered by C765 and is stabilized by power supply IC U752.

This power supply is directly fed to Control Amplifier, while it is applied to Capstan Motor via Q756. Base of Q756 is connected to MOTOR STOP signal via R761, and when both Tension Arms are dropped downward, MOTOR STOP signal will be H to stop motor rotation.

(4) POWER SUPPLY FOR SOLENOIDS

Voltages of +24V and +48V are obtained as Power Supply for Solenoids making use of Full Wave Rectifier circuit and center tap of Power Transformer. When BRAKE SOL. FLASHING signal arrives, it will flow through C751, R754, R757 and D763 in order and then will enters into base of Q754. Accordingly, when Q754 is switched ON, Q755 will be biased in forward direction, thus it will go into conduction. +48V is applied to Solenoids for approx. 0.3 sec., then after charging of C751 is finished, Q754 and Q755 will go to OFF states, and as a result +24V will be supplied via D756 to the solenoids. Also +24V of Anode side of D756 is supplied to Lifter Solenoid which does not need Flashing function.

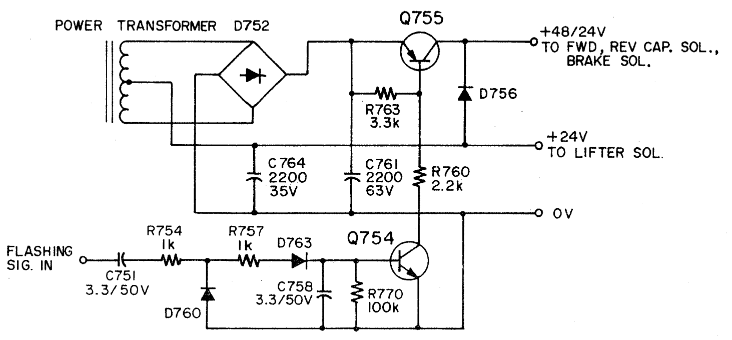



Fig. 25

## 5 SPEED CHANGE AND REEL SIZE CHANGE CIRCUIT (Refer to Speed Switch PC Board section in supplied schematics)

When using 10-1/2" dia. reels, higher voltage to Reel Motors can be obtained by means of by-passing the Wire-wound Resistor with S711 for voltage adjustment of Reel Motor that is being used for take-up function which depends on direction of tape movement. In such a way, take-up torques for 10-1/2" dia. reels and 7" dia. ones will be compensated respectively. Switch S712 is provided for tape speed conversion between 19 cm/s and 9.5 cm/s, and it works to change Capstan Motor speed, and also simultaneously to change Amplifier Equalizer Changing signal and voltage for Bias Oscillator.

# AMPLIFIER CIRCUIT DESCRIPTION

The amplifier section uses an operational amplifier IC. The special features of it are effectively used to form a well designed circuit.
The stability and high performance of the operational amplifiers used up to this time have been proven by their use in existing analog computers and other equipment.
The A-6600 has been developed for audio use by employing the operational amplifier as a central part. Our company selected this component.
The features of each circuit of this amplifier will be explained later.
Up to now, our company's existing decks had no OUTPUT switch TRIM or CAL controls. Heretofore, when the output level was too low, the OUTPUT control was moved to adjust for a suitable level. But when the OUTPUT control was moved from the calibrated position the VU meter would indicate a different level than was actually recorded on the tape. This would result in an inconvenient situation. In the A-6600, in order to resolve this inconvenience, A CAL switch position has been added to the MONITOR switch so that even if the OUTPUT control is moved the VU meter indication will not change. Due to this, when the MONITOR switch is in CAL position, normally the VU meter will indicate the level of the signal that is recorded on the tape.
Also the TRIM control can be used to compensate for the slight differences in levels on playback tape.
The preceding is a summary of the new features. Next, special features and operation of other circuits, etc. will be explained.
Almost without fail explanation will be for the L channel only.

Amplifier is constructed as shown in Fig. 1.

## AMPLIFIER BLOCK DIAGRAM

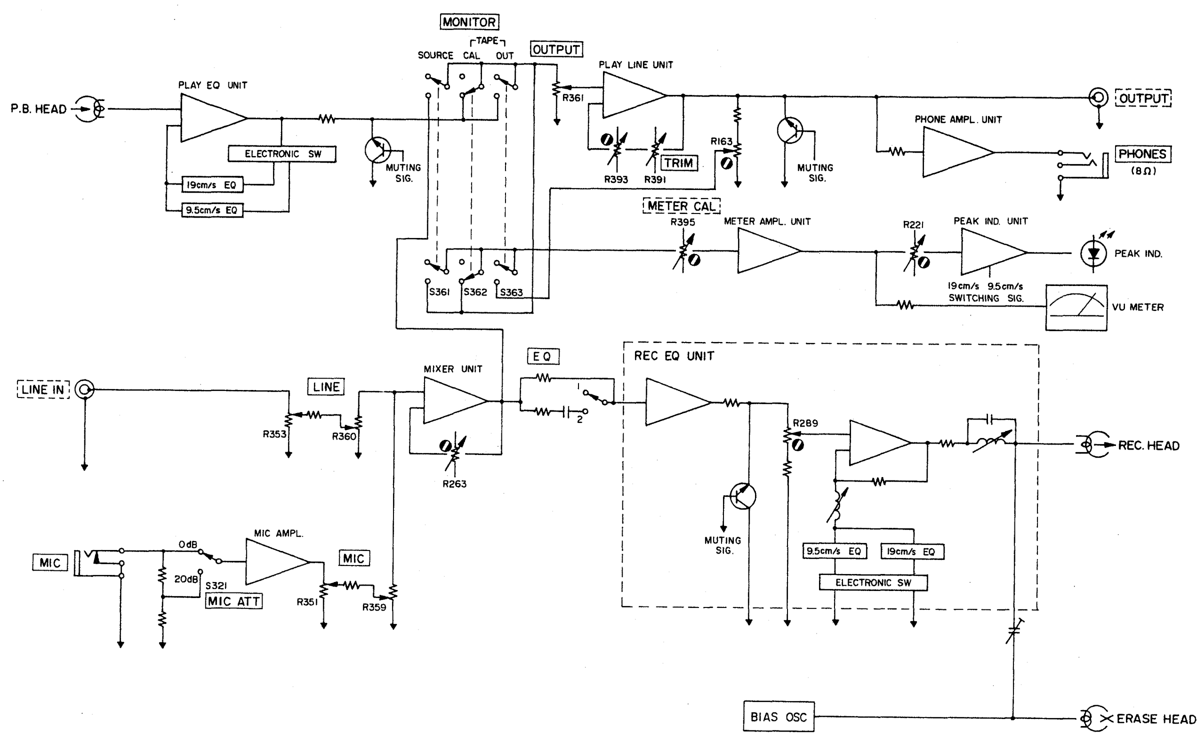



Fig. 1

## 1. PLAY EQ UNIT

Herein, explanations of the changes in the equalization depending on the tape speed and performed by the electronics switches and the Muting circuit are given.

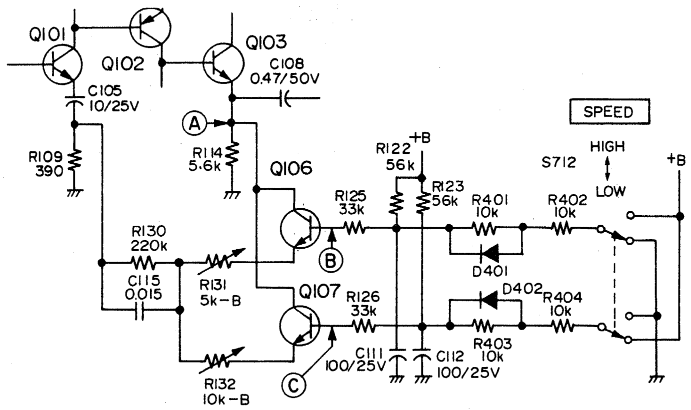



Fig. 2

### 1-1 EQ SWITCH

The playback equalization time constants at 19 cm/s (7-1/2 ips) are 3180 $\mu$s + 50 $\mu$s and at 9.5 cm/s (3-3/4 ips) are 3180 $\mu$s + 90 $\mu$s. Q106 and Q107 make up an electronic switch which is used to select the resistors R131 or R132 for the high region time constant of 50 $\mu$s.

Now as shown in Fig. 2, the potential at point Ⓐ is approx. 12 V, point Ⓑ is approx. 10 V and point Ⓒ is approx. 12.6 V. With these conditions the collector-emitter junction of Q107 has a low resistance. High region feedback current passes through R132 and is added in. By changing the SPEED switch. (S712), conducting condition of Q106 and Q107 are changed and the feedback circuit is formed by R131.

In this switching circuit, by using the transistor base current to control the resistance across the collector-emitter junction, a small current (compared to that which is necessary for mechanical switching) is used for control, R122, R123, C111, C112, D401, D402, etc., are used to reduce click noise during switching and to insure stable switch operation.

### 1-2 MUTING UNIT

This circuit, in addition to eliminating drop-outs and level wavering during tape acceleration in Play mode, also eliminates unwanted noise during any mode other than Play mode.

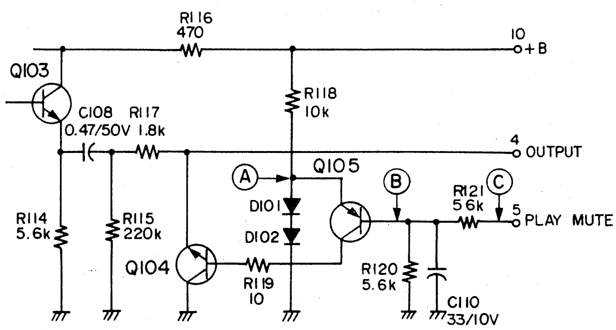



Fig. 3 (On play EQ unit)

Point Ⓐ of Fig. 3 requires a voltage potential of 2 times the forward direction voltage drop of the silicon diodes (D101, D102) of 0.6 V (total 1.3 V) to maintain its state. This is the emitter voltage to stabilize Q105 and opposes the Muting Signal. This signal stabilizes the Muting signal during repeated ON/OFF operations. When point Ⓒ is approx 0 V, the base current of Q105 flows from the emitter through R120 and Q105 goes ON. The collector current of Q105 becomes the base current of Q104 and Q104 also goes ON. The Playback output signal depends on the ratio of the resistance of R117 and the impedance of Q104. (When Q104 is ON, Z ≅ 0 ohms). At this time Muting is ON. (Output signal is shorted to ground). Then when approx. +24 V is supplied to point Ⓒ, the voltage at point Ⓑ ($V \text{ point } B \doteqdot \frac{24\text{ V} \times R120}{R120 + R121}$) is applied. Since the voltage potential is high, Q105 goes OFF. Then Q104 also goes OFF and muting is released. C110 opposes the muting signal so that the muting effect change will occur smoothly. Also it serves to make muting OFF occur slowly and muting ON occur quickly.

## 2. PLAY LINE UNIT

The front stage of this circuit uses an operational amplifier and therefore the operational amplifier and its basic usage will be explained.

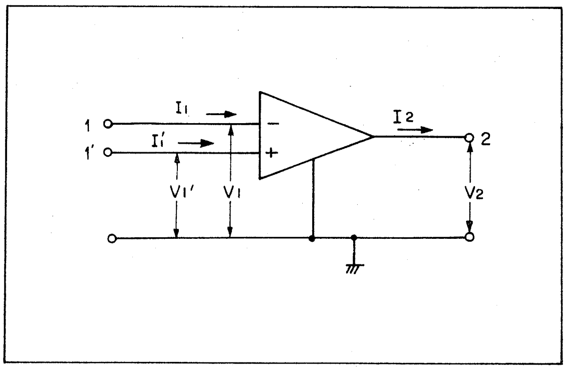



Fig. 4 Operational Ampl.

## 2-1 STANDARD OPERATIONAL AMPLIFIER

The standard operational amplifier, as shown in Fig. 4, has balanced differential input terminals 1, 1' (referenced to ground) and single ended output terminal 2.

## 2-2 IDEAL RESPONSE

Ideally the response is as shown in ⓐ to ⓓ, but of course, usually all of these response characteristics are not completely achieved. Usually these limits present no problem.

ⓐ Voltage Gain:
Differential gain = $-Ad = V2/(V1 - V1')$, $Ad = \infty$ (inf)
Phase gain = $Ac = V2/\frac{(V1 + V1')}{2}$, $Ac = 0$
ⓑ Input Response: Input Current $I1 = I1' = 0$
ⓒ Output Response: Input impedance = $\infty$ (inf)
Output Impedance = 0
ⓓ Frequency Response:
Amplifier Frequency Band = $\infty$ (inf)
Response time = 0

Above explanation was based on ideal response. Basic usage (application) will now be explained.

## 2-3 INVERTING AMPLIFIER

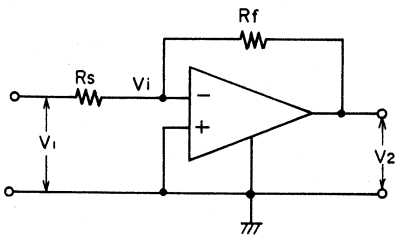



Fig. 5

If the gain of the circuit in Fig. 5, $Ad = \infty$ and if the input impedance = $\infty$ (inf),

$$Vi = V2/-Ad \quad \cdots\cdots \quad (A)$$

$$Vi = V1 \cdot \frac{Rf}{Rs + Rf} + V2 \cdot \frac{Rs}{Rf + Rf} \quad \cdots\cdots \quad (B)$$

From formula (A) and (B)

$$V2 = V1 \cdot \frac{-\frac{Rf}{Rs + Rf}Ad}{1 + \frac{Rs}{Rs + Rf}Ad} \quad \cdots\cdots \quad (C)$$

From formula (C), if $Ad = \infty$ (inf)

$$V2 = V1 \cdot \frac{-Rf}{Rs}, \quad G = \frac{V2}{V1} = \frac{-Rf}{Rs}$$

On the one hand if Ad approaches, $\infty$ from formula (A) we get V1 goes to 0. Therefore, even if the input impedance of the operational amplifier is limited, V1 will be 0 and input current to the operational amplifier will not flow. That is, the junction of Rs and Rf of the inverting amplifier can be considered as ground. This will be an imaginary ground. Also, since V1 = 0 V, the input current of the amplifier circuit all flows through Rs. In other words, the input impedance Z= Rs.

## 2-4 NON-INVERTING AMPLIFIER

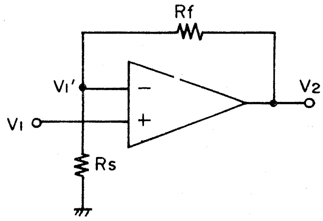



Fig. 6

Refer to Fig. 6. When V1 = V1'

$$V1' = V2 \cdot \frac{Rs}{Rs + Rf}, \quad \frac{V2}{V1} = G = \frac{Rs + Rf}{Rs} = 1 + \frac{Rf}{Rs}$$

Then: $Zin \fallingdotseq \infty$

## 2-5 PLAY LINE UNIT –FRONT STAGE–

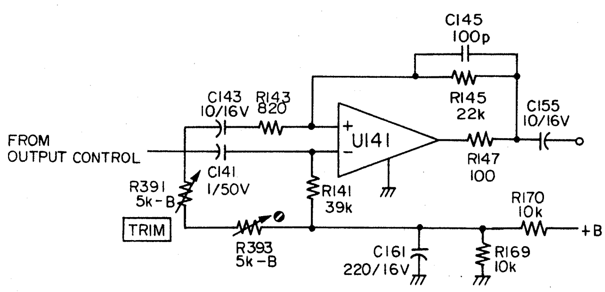



Fig. 7

If we look at Fig. 7 as a DC circuit, since one input is cut off by C143, the Rs of the non-inverting amplifier = $\infty$. That is, G = 1. Then, the voltage +B·R169/(R170 + R169) is applied at the input and output terminals. Then, if R170 = R169, the voltage $V_{cc}/2$ will appear at the input and output terminals. This voltage potential becomes the bias which is used to amplify the AC signal. Then, looking at the circuit in terms of AC, $G = 1 + \frac{R145}{R145 + R348 + R391}$. R393 is used for gain adjustment and R391 is used as a level trimmer (TRIM).

C145 gives –6 dB/octave (at the frequency determined by $\frac{1}{2\pi \cdot C145 \cdot R145}$) high band reduction to reduce unwanted noise.

The purpose of R147 is to provide protection in case the output terminals are shorted.

### 2-6 PLAY LINE UNIT –BACK STAGE–

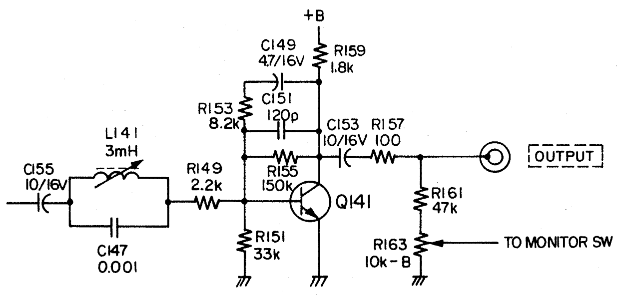



Fig. 8

Fig. 8 is a self-biased, one transistor amplifier which has a buffer to the output terminals.

As AC feedback becomes deeper, output impedance becomes lower and distortion is suppressed. The effect of the bias trap toward lowering the input impedance is very great due to the parallel resonance of L141 and C147.

## 3. PHONE AMPL. UNIT

This circuit supplies 1 mW into 8 ohms. Also, this circuit has a fixed electric current characteristic and it will supply the same sound level even if the headphone load impedance varies.

## 4. METER AMPL. UNIT

This circuit uses a linear IC for wide range and low distortion. It drives both the VU meters and the peak indicators.

## 5. PEAK IND. UNIT

Basically this is a mono-stable multivibrator type indicator. This circuit changes the ignition level depending on the tape speed.

## 6. MIC AMPL. UNIT

This amplifier is a high stability, low distortion, high dynamic range, low noise, 2-stage, directly connected amplifier. The input has a 20 dB pad to reduce the microphone signal by 20 dB.

## 7. MIXER UNIT

Basically, the circuit is constructed as shown in Fig. 9.

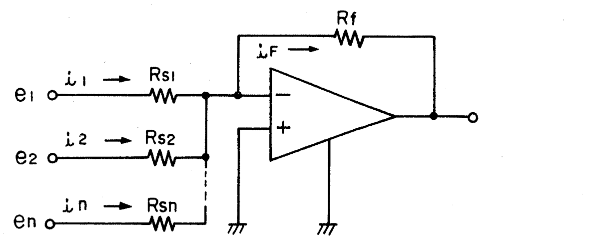



Fig. 9

Fig. 9 is an inverting amplifier since the minus (–) terminals have an imaginary ground. The input impedance seen from e1, Zin1, and the input inpedance seen from e2, Zin2, are Zin1 = $R_{S1}$ and Zin2 = $R_{S2}$. That is, since the gain for each input is determined by Rs only, there is no mutual interaction between each input.

Input current $i_1$ and $i_2$: $i_1 = \frac{e_1}{R_{S1}}$, $i_2 = \frac{e_2}{R_{S2}}$, $in = \frac{en}{Rsn}$

$$i_f = i_1 + i_2 + \ldots\ldots + in$$

Therefore: $Vo = -Rf \cdot if$

(but, minus (–) terminal is imaginary ground)

$$Vo = (\frac{Rf}{R_{S1}} e_1 + \frac{Rf}{R_{S2}} e_2 + \ldots\ldots + \frac{Rf}{Rsn} en)$$

That is to say, that the gain of each input signal is independently determined by input resistor Rs which allows (proper) mixing.

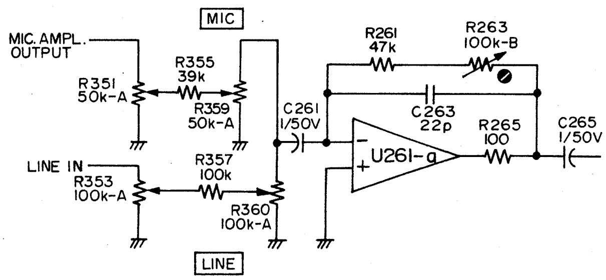



Fig. 10

To restrict the gain of each input to 0, Rs must be increased towards ∞. Actually as shown in Fig. 10, Rs is determined so that e can be changed. For the inverting amplifier shown in Fig. 10, you can see that Rf = R261 + R263 and Rs = R359 and R360. In this way, after setting the LINE and MIC controls carefully for each input, L and R levels, the MASTER control can be used to fade the L and R inputs at the same time.

## 8. RECORD AMPLIFIER

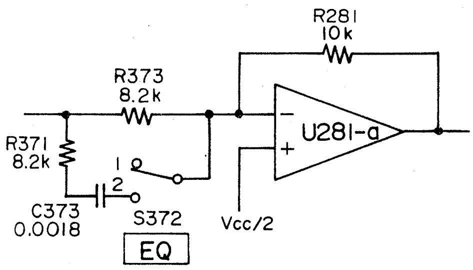



Fig. 11

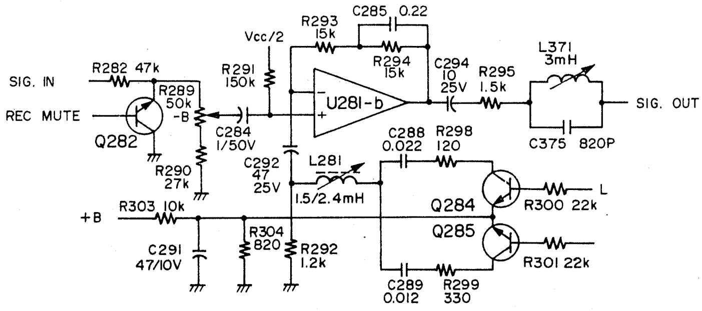



Fig. 13 (On play EQ unit)

### 8-1 RECORD AMPLIFIER – FRONT STAGE –

Fig. 11 is an inverting amplifier for the purpose of changing the EQ according to the type of tape. Characteristics are shown in Fig. 12.

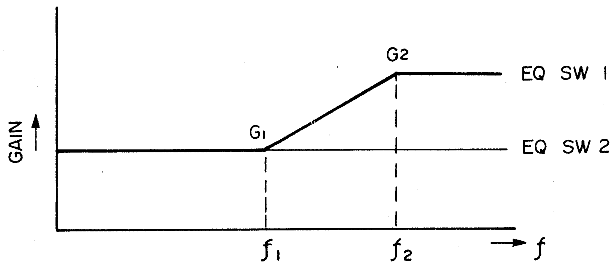



Fig. 12

$$G1 = \frac{R281}{R373} \qquad f1 = \frac{1}{2\pi \cdot C373 \cdot R371}$$

$$G2 = \frac{R281}{\left(\frac{R373 \cdot R371}{R373 + R371}\right)} \qquad f2 = \frac{1}{2\pi C373 \cdot \left(\frac{R371 \cdot R373}{R371 + R373}\right)}$$

This circuit boosts the signals over 10 kHz by approx 3 dB.

### 8-2 RECORD EQ UNIT

Q282 shown in Fig. 13 is in the record muting circuit and works during auto spacing, etc. Circuit operation is the same as Playback muting.

C285 is for low band compensation. L281, C288, etc. are for high band peaking. Record EQ also receives a signal from the speed switch to change the electronic switch made up of Q284 and Q285.

R303, R304 provide +3 V bias to the emitter of Q284 and Q285 to make sure that they go OFF.

## 9. MUTING UNIT (POWER)

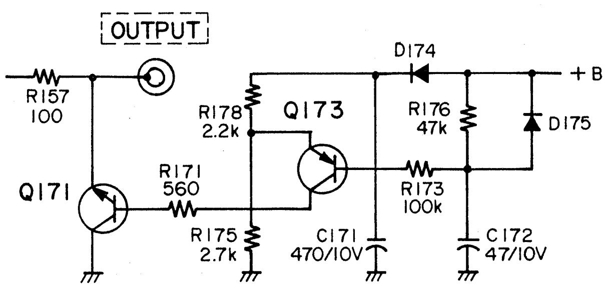



Fig. 14

In Fig. 14, the approx. +7 V is quickly applied to use as power muting when power is turned ON or OFF.

This muting is applied to the output terminals during power ON/OFF to prevent unwanted noise.

Now when power is applied C171 charges through D174 and a certain potential is applied to the emitter of Q173 but since the charge time of C172 is long, the base potential of Q173 is lower than the emitter and Q173 turns ON. At that time muting is applied. After several seconds, when each amplifier settles down to normal operation, the charge voltage on C172 increases and Q173 goes OFF and muting is released. Then, when current is cut off and approx. +7 V decreases by a large amount, the electric charge on C172 discharges quickly through D175. Since one discharge path for C171 through D174 is slow, during this interval the emitter potential is higher than the base potential, Q173 goes ON and also Q171 goes ON and muting goes on.

Refer to next page Fig. 15. Timing Chart.

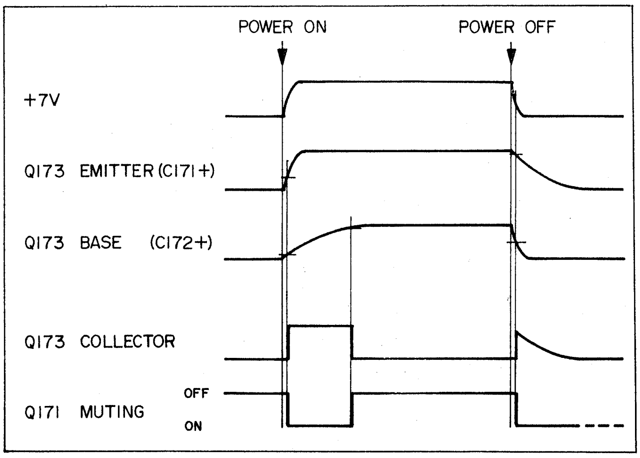



Fig. 15

## 10. BIAS OSC UNIT

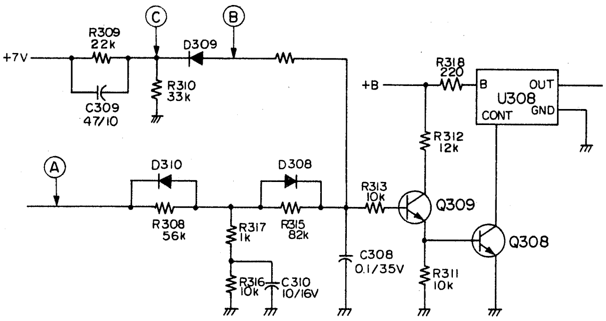


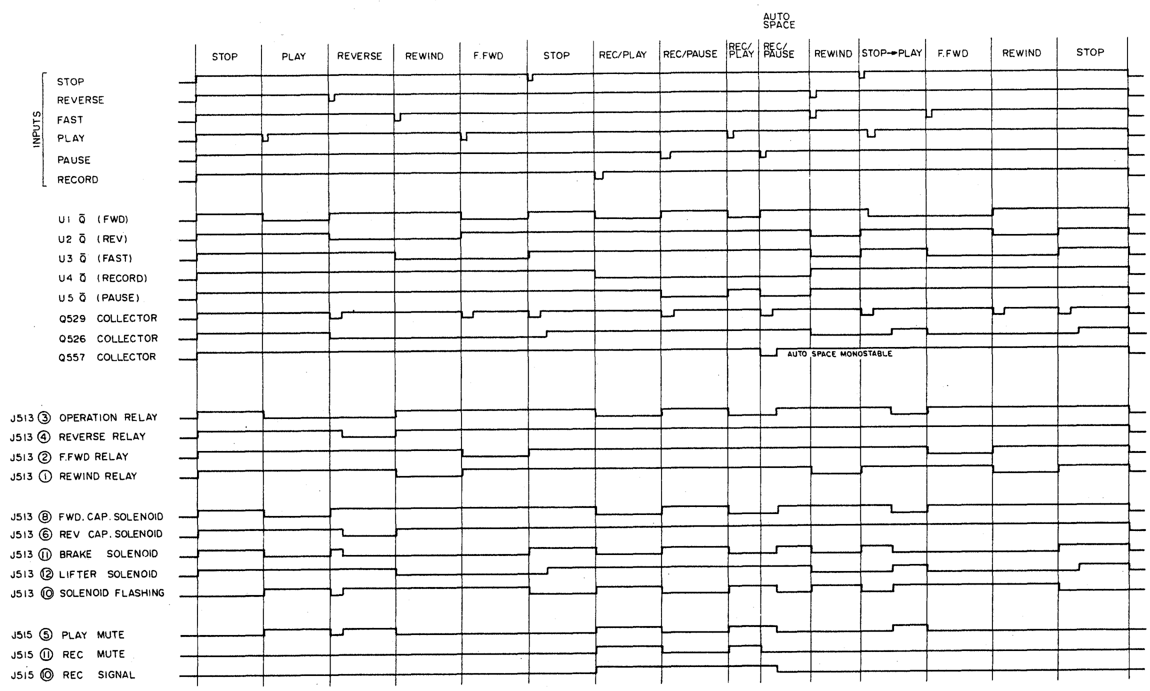

Fig. 16

Fig. 16 is the Bias Oscillator Circuit. With approx. 24 V applied to point Ⓐ, due to the ratio of R308 and R317, point Ⓑ will have a lower potential. Then, after a short period of time, when C310 which is connected across R316 finishes charging, the potential at point Ⓑ rises. Current flow through D308 and R313 begins and the Darlington circuit of Q309 and Q308 begins to close. Then, this smooth rise characteristic saturates and oscillation continues.

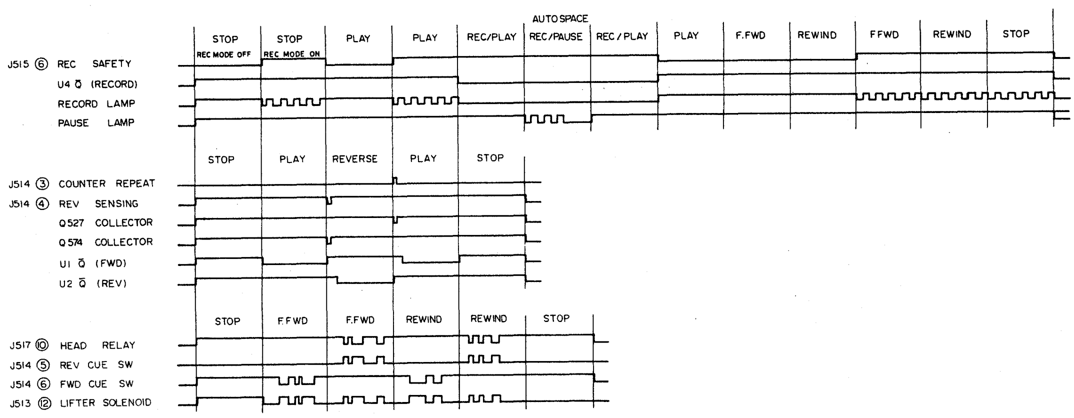
The reason the start of oscillation is delayed by C310 is to delay the start of recording until after the record relay energizes in order to reduce click noise. Then when point Ⓐ goes to 0 V, the charge on C310 discharges through D310. Also the charge on C308 discharges slowly through R315. Then the Bias Oscillator output goes to 0 V before the Record Relay is released.

In order to reduce the noise recorded on the tape when power is cut off during recording the circuit consisting of R309, R310, C309 and D309 which normally supplies approx. +7 V is used. During the discharge of C309, point Ⓒ becomes a negative voltage which is used to quickly cut-off the oscillator signal.

## 11. BASIC TIMING CHART




T-995




T-996

**Fig. 17**

## AN AFTERWORD

This deck uses varios methods to reduce each type of click noise. Especially at interstage connections, low noise, low leakage current chemical capacitors are effectively arranged to obtain low values of click noise.

# A-6600 Stereo Tape Deck

TEAC

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