SERVICE MANUAL

TEAC Tascam Series

32-2

Stereo Tape Deck

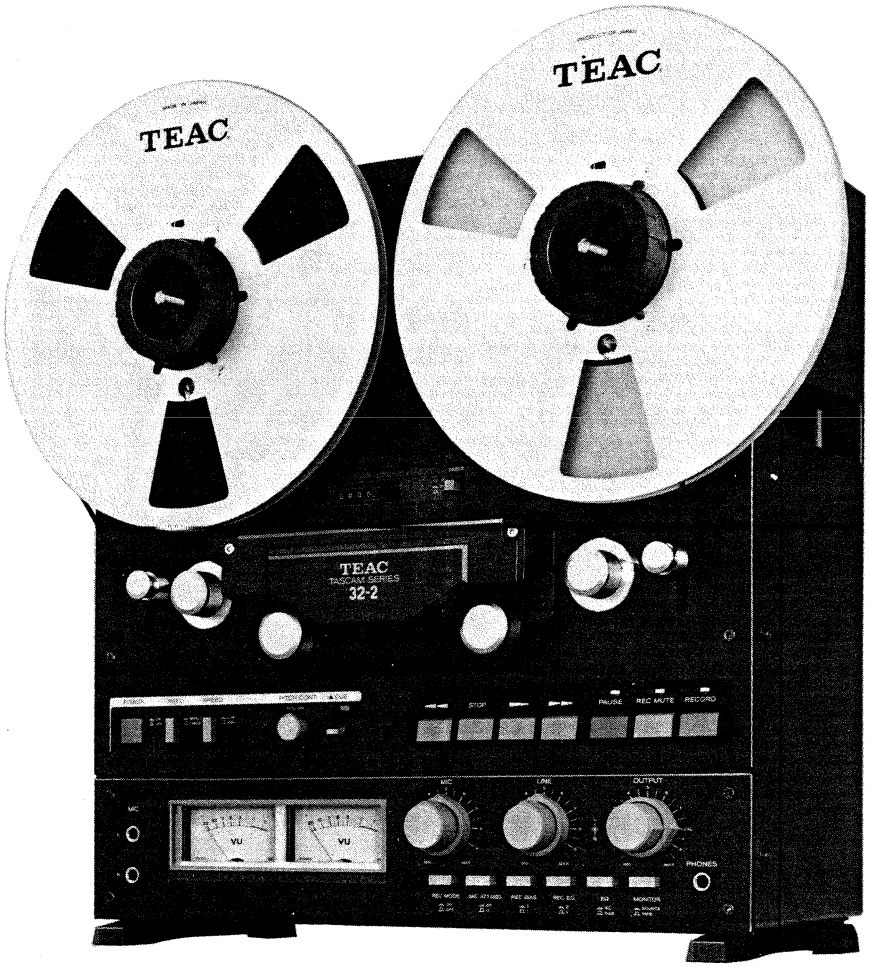
TABLE OF CONTENTS

MAIN SECTION

TABLE OF CONTENTS (Continued)

1 INTRODUCTION

The TEAC Tascam Series 32-2 is two track master stereo recorder combining professional performance and a very modest price tag. It features a dual-capstan closed-loop tape transport system giving the user the benefits of optimum tape/head contact and extremely low tape flutter figures. Full logic control is standard and a custom designed dbx noise reduction unit can be added by simply plugging into the pre-wired sockets. Other features the professional and serious amateur will appreciate include selectable IEC and NAB EQ and pitch control on both replay and record.



2 SPECIFICATIONS AND SERVICE DATA

SPECIFICATIONS

Track System	1/2 Track, 2 Channel Stereo
Head System	3 Heads: Erase, Record and Reproduce
Reel Size	10-1/2" (267 mm) and 7" (178 mm)
Tape Speed	15 ips (38 cm/s) and 7-1/2 ips (19 cm/s) (±0.5%)
Motors	Capstan Motor: DC Brush Motor with FG Servo Reel Motor: 2 DC Slotless Motors
Wow and Flutter (NAB Weighted)	0.02% at 15 ips 0.04% at 7-1/2 ips
Frequency Response (Overall)	30–30,000 Hz (±3 dB, 40–20,000 Hz) at 15 ips, OVU 30–28,000 Hz (±3 dB, 40–20,000 Hz) at 7-1/2 ips, –10 VU
Signal-to-Noise Ratio (Overall)	63 dB (3% THD Level, Weighted), NAB Equalization 65 DB (3% THD Level, Weighted), IEC Equalization
Harmonic Distortion (Overall)	0.6% at 1,000 Hz normal operating level
Stereo Channel Separation	50 dB at 1,000 Hz
Fast Winding Time	100 seconds for 1,800 feet (550 m)
Inputs	Line: 60 mV, 50 kohms Microphone: 0.25 mV/–72 dB (200 ohms or more)
Outputs	Line: 0.45V for load impedance of 10 kohms or more Headphones: 8 ohms/0.3 mV
Reproduce Equalization 15 ips	 3,180 μs + 50 μs (NAB) 3,180 μs + 35 μs (IEC)
7-1/2 ips	3,180 μs + 50 μs
Bias Frequency	100 kHz
Operating Position	Vertical, horizontal, angled
Power Requirements	100/117/220/240V, AC 50/60 Hz, 83W (General export model) 220V AC 50 Hz, 83W (Europe model) 240V AC 50 Hz, 83W (U.K./Australia model) 117V AC 60 Hz, 83W (U.S.A./Canada model)
Weight	20 kg, (44-1/16 lbs) net
Dimensions	See below.

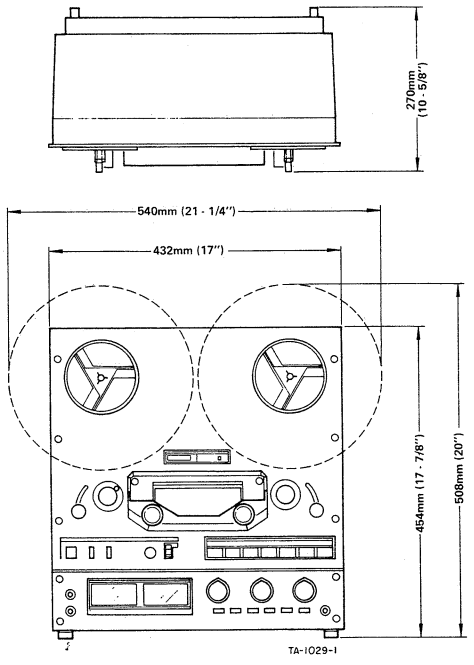


Fig. 2-1 Dimensions

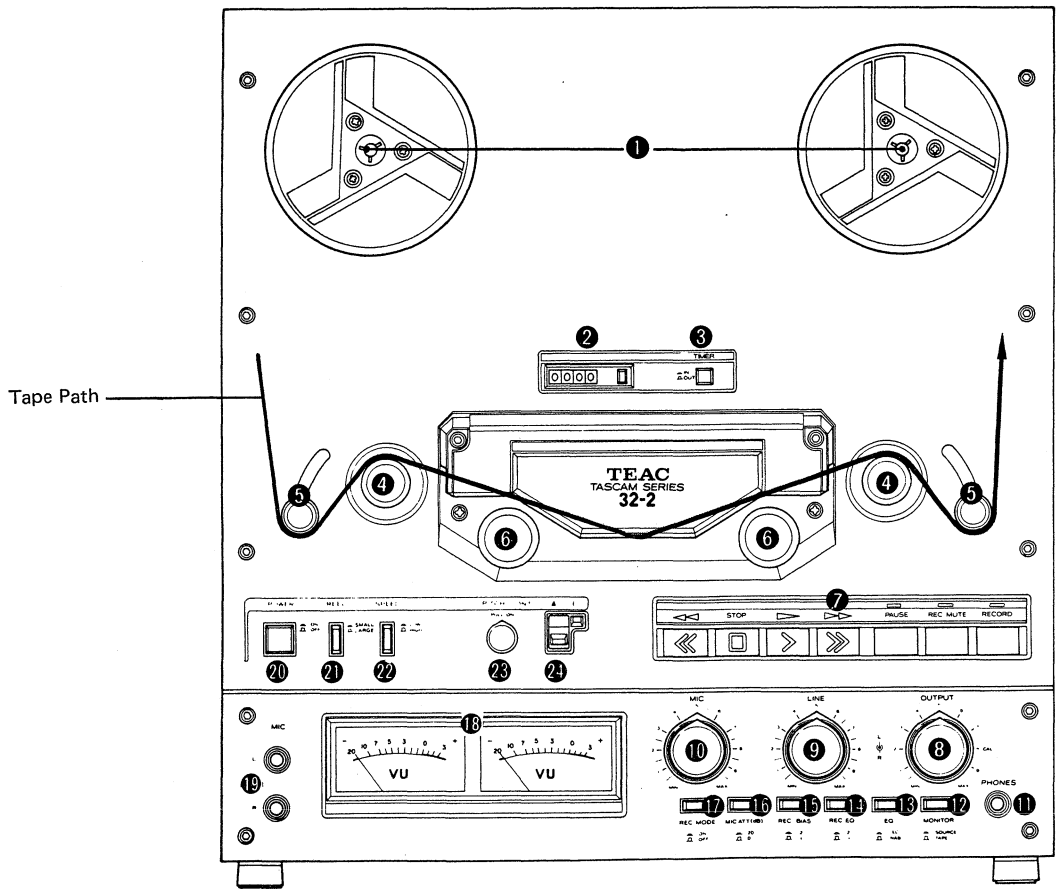
SERVICE DATA

Tape Speed Deviation	3,000 Hz ±30 Hz
Tape Speed Drift	15 Hz
Pinch Roller Pressure	1.35 kg~1.9 kg (3.0 lbs~4.2 lbs)
Reel Torque	
Play mode:	
Take-up (LARGE):	480 ±40 g-cm (6.1~7.2 oz-inch)
(SMALL):	260 ±40 g-cm (3.1~4.2 oz-inch)
Back tension (LARGE):	300 ±40 g-cm (3.6~4.7 oz-inch)
(SMALL):	180 ±40 g-cm (1.9~3.1 oz-inch)
Fast winding mode:	
Take-up:	1100 g-cm (15.3 oz-inch)
Back tension:	50 g-cm (0.7 oz-inch)
Brake Torque	
Forward direction:	1.2~1.9 kg-cm (17~26 oz-inch)
Reverse direction:	0.7 kg-cm (9.7 oz-inch) or less
Left/right deviation:	0.2 kg-cm (2.8 oz-inch) or less
Pitch Control	Standard tape speed ±6% or more
TIMER Activate Time	4 sec. ±2 sec.

- Specifications were determined using low noise high-output tape.
- Improvements may result in SPECIFICATIONS AND SERVICE DATA changes.
- **Value of "dB" in the data refers to 0 dB (1V), except where specified.**

⚠ Parts marked with this sign are safety critical components. They must always be replaced with identical components – refer to the TEAC Parts List and ensure exact replacement.

3 FUNCTION OF CONTROLS



REAR PANEL

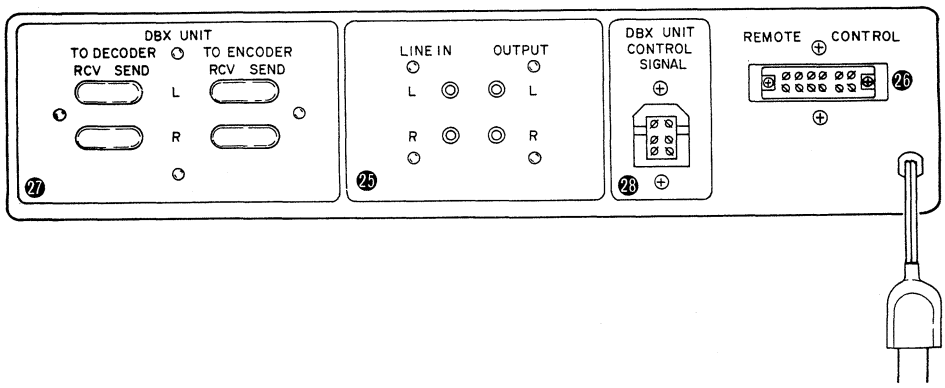


Fig. 3-1

❶ Reel Tables

These support either 7 inch reels or 10 1/2 inch reel adapters (TZ-612A) when 10-1/2 inch reel are used. 7 inch reels are clamped directly using the "QUICK-LOK" reel holders. Turning the top part of the reel holders counterclockwise lines up the tabs so that reels can be inserted and removed. Turn the top portion clockwise to "unalign" the tabs and lock the reel onto the reel table.

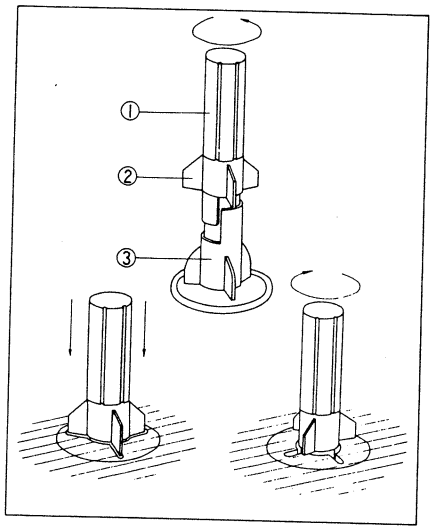


Fig. 3-2

To mount 10-1/2 inch reels, initially fit the adaptors in exactly the same way as ordinary reels, then:

1. Rotate the outer part of the adaptor fully counterclockwise. This will line up the small tabs which fit into the three notches in the reels.
2. Insert the reels and rotate the outer part of the adaptor clockwise. This will "unalign" the tabs.
3. Continue turning the outer part clockwise until the tabs are drawn down tightly onto the reels.
4. Reels can be removed by reversing the above procedure.

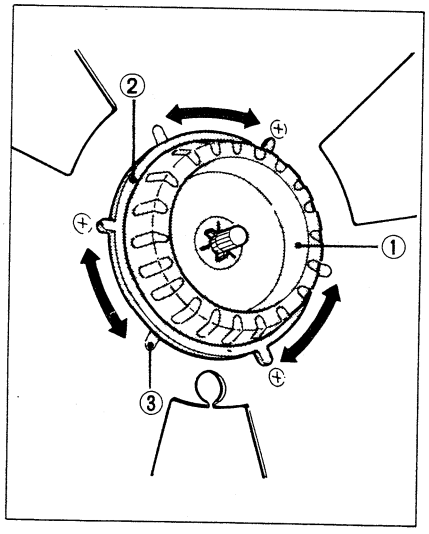


Fig. 3-3

NOTE: A metal spacer is mounted on the back of these reel adaptors and it must be in place when NAB standard 10-1/2 inch metal reels are used. For large plastic reels, this spacer must be removed. It twists out and twists in quite easily.

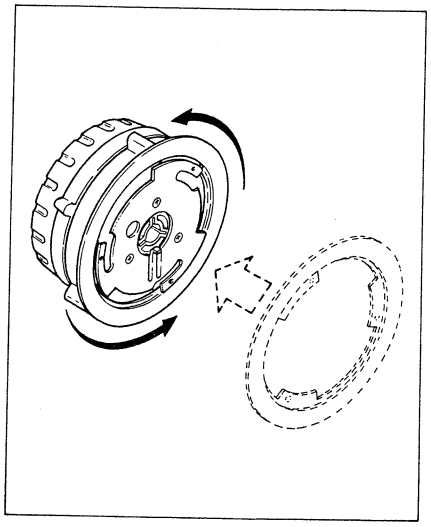


Fig. 3-4

❷ Tape Counter and Reset Button

The tape counter can be reset to 0000 at any point on the tape by simply pressing the small button located to the right of the counter.

❸ TIMER Switch

The TIMER switch enables the deck to be used with a clock controlled power source. For TIMER controlled recording, the REC MODE switch ⓱ on the deck must be set ON. If the TIMER switch is set IN, the deck will automatically go into record mode when power is applied. When the tape reaches the end, the deck will stop. TIMER controlled playback is identical except that the REC MODE switch must be set OFF.

❹ Inertia Rollers

These turn with the tape and help to stabilize tape bounce for smooth tape running.

❺ Tension Arms

These take up tape slack, stabilize tape movement and stop the deck if the tape breaks or runs out. They contribute greatly to preserving and protecting your tapes.

❻ Pinch Rollers

In the play and record modes, these pinch the tape to the capstans to drive the tape at the correct speed past the heads. They retract from the capstans very slightly when the PAUSE key is pressed, allowing the tape to stay in head contact. When the STOP key is pressed or the deck is put into fast wind, or the power is cut, the pinch rollers retract fully and the tape is lifted clear of the heads.

❼ Tape Transport Control Panel

RECORD Pressing this key by itself has no effect. This is a safety feature to help prevent accidental recording. Provided the REC MODE switch is ON the RECORD key will put the deck into record if pressed simultaneously with the ▶ key. Pressing the RECORD key and PAUSE key together puts the deck into the record stand-by mode. The record stand-by mode means that the deck is all set and ready to record as soon as the play key is pressed. It is useful for setting recording levels using the MIC or LINE controls and the VU meters. Remember to have the monitor switch in the SOURCE position. As the tape isn't moving yet, it's not possible to monitor off it.

The red LED above the RECORD key flashes to show that the REC MODE switch is ON and stays on continuously when the deck is in the record mode.

REC MUTE Pressing this key while recording will record a period of silence on the tape. Pressing the RECORD or PAUSE keys will release the mute mode to resume normal recording or enter the record-pause mode.

PAUSE Pressing this key in either the record or play modes causes the pinch rollers to retract. Tape motion stops but the selected mode is not disabled. To continue recording or playback, simply press the ▶ key. A green LED lights to indicate the pause mode.

▶▶ This is the fast forward key. Pressing it in any deck mode will cause the tape to wind rapidly from the left reel to the right reel.

▶ This is the forward play key. Pressing it in any deck mode will cause the deck to go into forward play. Pressing it together with the record key will make the deck go into the record mode if the REC MODE switch is ON. You can go directly from play into record (if the REC MODE switch is ON) by simultaneously pressing the ▶ and RECORD keys.

STOP This key stops the deck and disables the previously selected mode.

◀◀ This is the fast rewind key. Details are exactly the same as for the ▶▶ key except for the direction of tape travel.

❽ OUTPUT Control

This controls the output fed to the amplifier and to the headphone jack (PHONES). The signal will depend on the setting of the MONITOR switch. In the TAPE position the output comes from the tape (off-the-tape monitoring) and in the SOURCE position it comes directly from the input. The OUTPUT control is in fact a dual concentric type so that the left and right channels can be controlled separately.

❾ LINE Control

This knob adjusts the level of the line input signal before it is recorded on the tape. Always adjust it so that the signal gives the highest possible average reading on the VU meters in the black zone. Occasional peaks into the red area will not matter, but sustained peaks above OVU will cause distortion. As with the OUTPUT control, the left and right channels may be adjusted separately if required.

❿ MIC Control

This works just like the LINE control, except that it controls the level from the microphones plugged into the MIC jacks. Microphone signals may be combined with line signals by simply using both the MIC and LINE controls. This is known as MIC/LINE mixing.

⓫ PHONES Jack

Connect low impedance headphones for monitoring or private listening. The sound level can be controlled using the OUTPUT control.

⓬ MONITOR Switch

There are two positions, SOURCE and TAPE. The switch simply selects either the signal on the tape (TAPE) or the signal present at the LINE or MIC inputs (SOURCE). The selected signal is fed to the OUTPUT control. When the monitor switch is in the SOURCE position, the display on the VU meters is not affected by the position of the OUTPUT control. However, when the MONITOR switch is in the TAPE position the level displayed on the meters is controlled by the setting of the OUTPUT control. If the OUTPUT control is set to the CAL (calibration) position, there should be little or no difference in volume and sound quality apparent on switching between TAPE and SOURCE.

⓭ EQ

The equalization characteristics of the NAB and IEC standards are the same at 7-1/2 ips (19 cm/s) but different at 15 ips (38 cm/s) ips. Therefore, when recording at the higher speed, set this switch to IEC if making IEC standard recordings or replaying tapes recorded with that standard. When making NAB standard recordings or replaying tapes recorded with that standard. When making NAB standard recordings or replaying tapes recorded with the NAB standard, leave this switch in the NAB position.

⓮ REC EQ

⓯ REC BIAS

Different brands of tape require different degrees of bias and equalization for optimum sound quality. The tapes listed in the chart below are recommended for use with your 32-2, together with the appropriate switch settings for the EQ and BIAS switches. During playback these have no effect and may be left in any position.

⓰ MIC ATT

Microphones producing too much output signal may cause the circuitry to overload easily and make accurate level setting difficult. In this case, setting the MIC ATTenuator switch to the 20 dB position will cut the microphone signal by 20 dB. The 0 position does not attenuate the microphone signal.

⑰ REC MODE

This switch enables the recording circuitry. If it is in the OFF position, recording is not possible. If it is left in this position when timer operation is used, the deck will go into the play mode. Set to ON, it enables the deck to make recordings if the appropriate keys are pressed. Under timer controlled operation the deck will go into the record mode. When recording is not specially required it is always best to leave this switch in the OFF position.

⑱ VU Meters

These meters measure the voltage of the audio signal being fed to the tape or to the output. When the MONITOR switch is in the SOURCE position the meters measure the signal level being fed to the tape. This level is controlled by the LINE or MIC controls. The setting of the OUTPUT control does not affect the meter reading. With the MONITOR switch in the TAPE position, the meters indicate the signal coming off the tape and being fed to the output. This is controlled by the OUTPUT control and so the meter display will be affected by the setting of the OUTPUT control.

⑲ MIC Input Jacks

There are two jacks for use with 200 ohm microphones, though 150–10 kohm microphones may also be used.

⑳ POWER Switch

This controls AC power to the deck. Press for on, presss again for off. Remember to leave it in the ON position for timer controlled operation.

㉑ REEL Switch

When large diameter 10-1/2 inch reels are used greater back tension is required for correct operation. 7 inch reels require less back tension. This switch sets the correct amount of back tension; set it to suit the size of reel you are using.

㉒ SPEED Switch

LOW selects a tape speed of 7-1/2 ips (19 cm/s) and HIGH selects a tape speed of 15 ips (38 cm/s).

㉓ PITCH CONT

When this control is pressed in, the speed of the tape deck is precisely controlled. Sometimes, however, recording or playback at slightly different picthes is required. Pulling the knob (PULL ON) and rotating it to left or right enables ±6% adjustment in tape speed to be made. Leave it pressed in when this facility is not required.

㉔ CUE Lever

During fast wind or rewind pushing this lever enables the sound recorded on the tape to be monitored if the MONITOR switch is in the TAPE position. Pushing the lever just a little disables the muting on the replay amplifier and allows the tape to make contact with the heads. Pushing the lever fully up retracts the tape lifter and allows the tape to make contact fully with the replay heads for a stronger monitoring signal.

㉕ LINE IN & OUTPUT Terminals

Line level signals to the deck are connected to the LINE IN terminals. The OUTPUT terminals are used for connecting the output of the deck to your amplifier.

㉖ REMOTE CONTROL

Connect the optional RC-90 to this socket for remote control of your deck from up to 15 feet away.

㉗ DBX UNIT Terminals
㉘ DBX UNIT CONTROL SIGNAL Socket

These enable the optional DX-2A dbx noise reduction unit to be used with the 32-2 for breath-taking dynamic range and signal to noise ratio. If the dbx unit is not being used, the special shorting links must be in place as in the illustration.

BIAS and EQ Setting Chart

BRAND	TAPE DESIGNATION	SWITCH POSITION	
		REC BIAS	REC EQ
AMPEX FUJI MAXELL SCOTCH SONY TDK	456 FB UD-XL, UD, New-LN 250, MASTER DUAD, ULH, SLH L Series (AUDUA)	1	1
AMPEX BASF FUJI SCOTCH	406, 407 SPR-50LH, LGR-30P FG 206, 207	1	2
BASF SCOTCH	LP-35LH, LP-35LHS, LPR-35LH 211, 212, 228, 229	2	1
FUJI MAXELL TDK	FM LN S Series	2	2

4 PARTS LOCATION

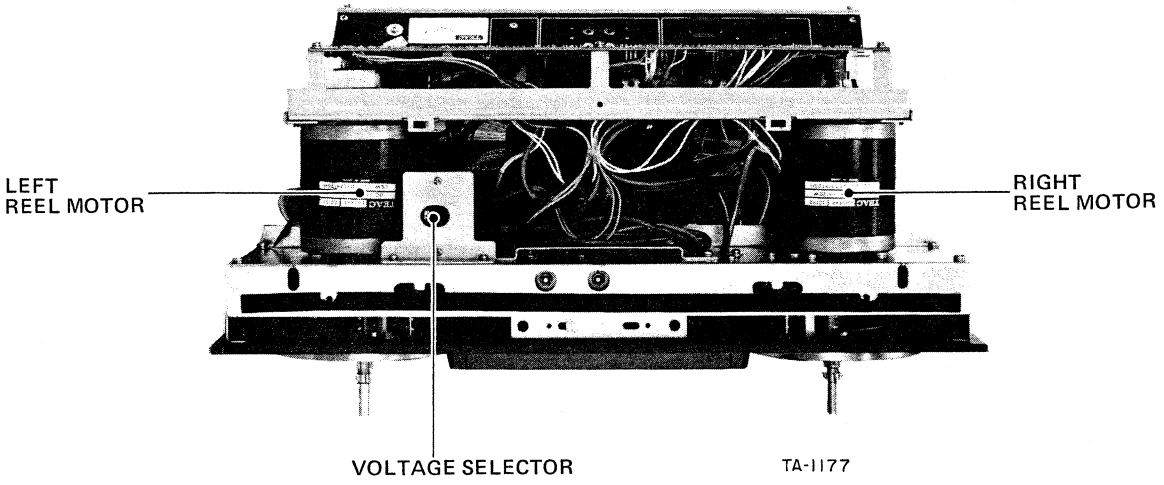


Fig. 4-1

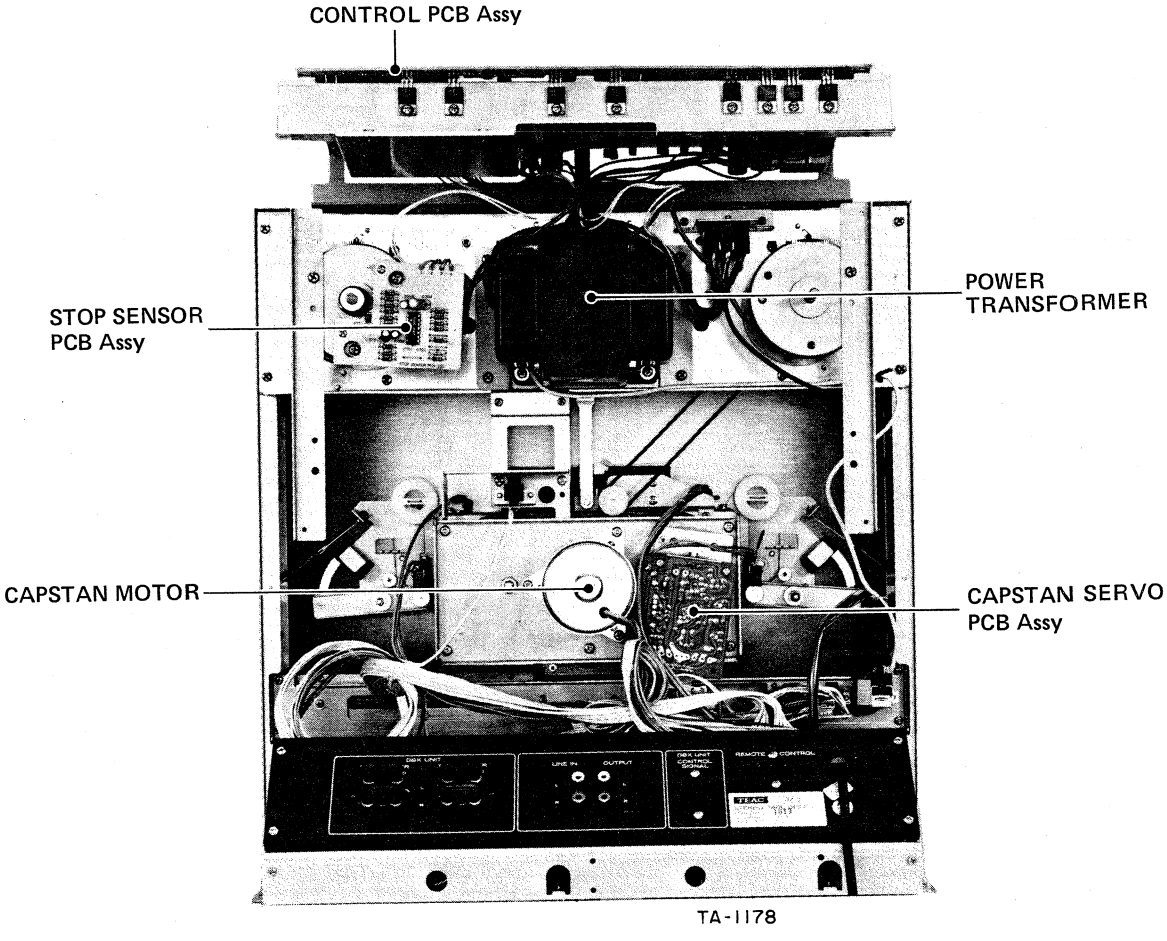


Fig. 4-2

5 REMOVAL OF EXTERNAL COMPONENTS

Disassemble in number-order

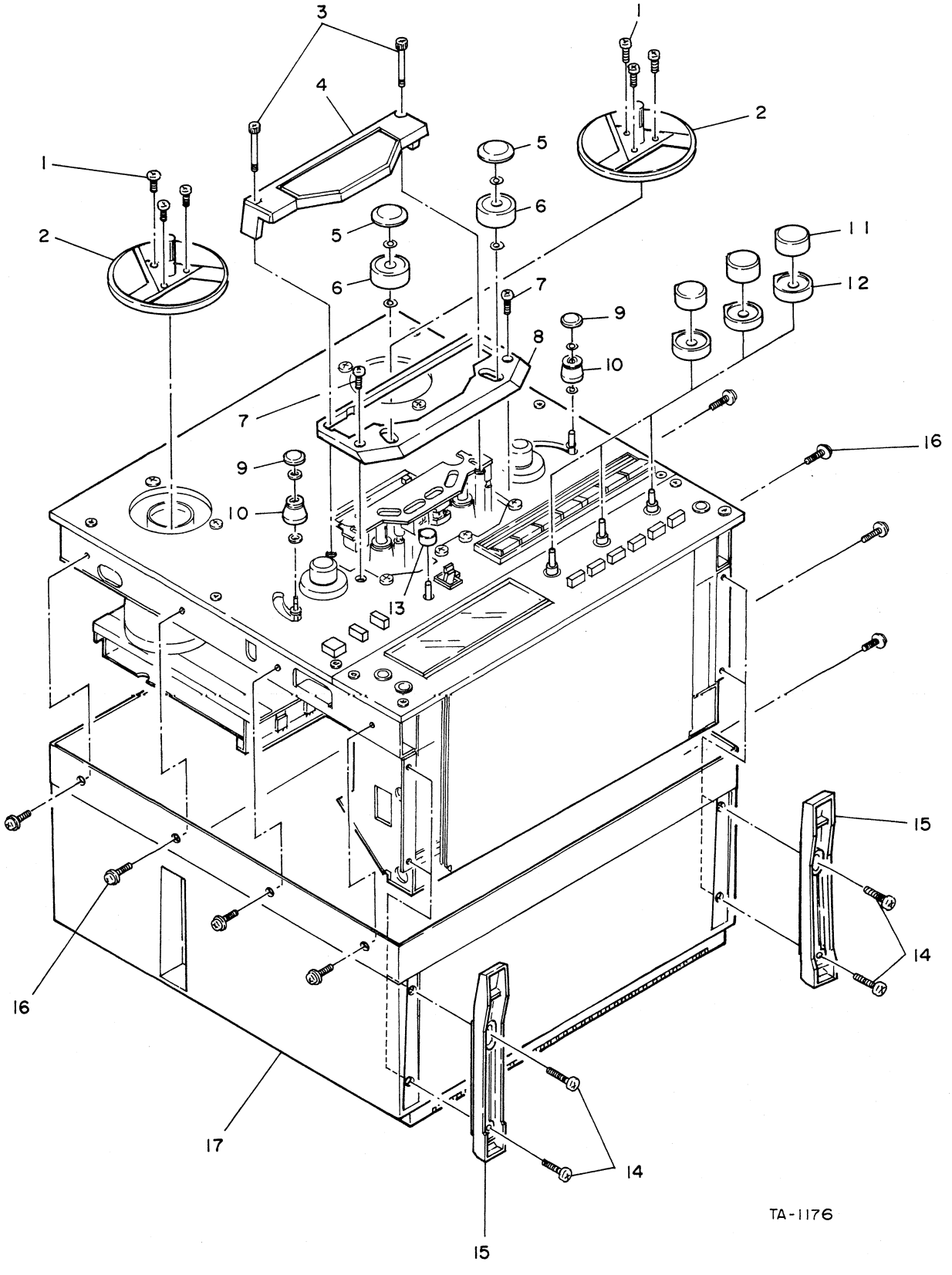


Fig. 5-1

6 MAINTENANCE

6-1 TEST EQUIPMENT

6-1-1 ORDINARY TOOLS AND EQUIPMENT

1. **Spring scale:** For pinch roller pressure check, 0~3 or 4 kg (0~7 or 9 lbs.)
   For take-up and supply torque checks, 0~500 g (0~1.5 lbs.)
   For fast winding and brake torque checks, 0~1 kg (0~2.5 lbs.)
2. **TEAC empty reel:** RE-1002 (10-1/2" or 267 mm)
   RE-701 (7" or 178 mm, large hub)
   RE-702 (7" or 178 mm, small hub)
3. **Wow/flutter reel:** MEGURO DENPA SOKKI K.K., Model MK-668D (JAPAN)
   Mincom Division, 3M Co., Model 8155 (U.S.A.)
4. **Frequency counter:** Digital type; Range: 0~1 MHz; sensitivity: 0.1 Vrms; imp.: > 1MΩ, < 25pF
5. **AF oscillator** 10 Hz to 100 kHz; Hewlett Packard, Model 204C or equivalent
6. **AC voltmeter:** Range: –80 dB~+40 dB (100 μV~100 V); imp.: >1MΩ, <25pF (Example: HP400GL)
7. **DC voltmeter:** Range: –40 dB~+40 dB (10 mV~100 V); imp.: >1MΩ, <25pF
8. **Attenuator:** General purpose
9. **Distortion meter:** Basic frequency 400 Hz/1 kHz
10. **Oscilloscope:** General purpose
11. **Band-pass filter:** 1 kHz narrow band-pass type
12. **Test load resistor:** Non inductive type 8 ohm/1W (for headphone jack checks)
13. **Plastic alignment tool:**
14. **Head demagnetizer:** TEAC E-1 or E-3 or equivalent
15. **Cleaner:** TEAC TZ-261 tape recorder cleaner kit (TZ-261A: for metal parts; TZ-261B: for rubber parts) or pure alcohol
16. **Oil:** TEAC Spindle Oil (from TEAC TZ-255 Oil Kit), Mobil D.T.E. Oil Light, etc.
17. **Bulk tape eraser:** TEAC E-2 or equivalent

6-1-2 TEAC TEST TAPES

NOTE: When ordering, allow for the longer delivery time that is required for them.

For tape speed and wow/flutter test

1. **YTT-2003:** •For reproduce method at 7-1/2 ips (19 cm/s) •3,000 Hz/–5 dB
2. **YTT-2004:** •For reproduce method at 15 ips (38 cm/s) •3,000 Hz/–5 dB
3. **YTT-8013:** •For record/reproduce method (blank tape)

For reproduce alignment

4. **YTT-1004:** •15 ips (38 cm/s) •reference flux: 185 nWb/m •equalization: NAB •3180 μs + 50 μs
5. **YTT-1003:** •7-1/2 ips (19 cm/s) •reference flux: 185 nWb/m •equalization: NAB •3180 μs +50 μs

For record alignment (blank tape)

6. **YTT-8013**

6-2 CLEANING AND DEMAGNETIZING

Always before checking both mechanically and electronically, undertake the following maintenance.

1. Cleaning the heads and tape guides
   All heads and metal parts in the tape path must be cleaned after each 6 hours of operation or before starting a new record session.
2. Cleaning the pinch roller
   Clean this at least once after each full day of use.
3. Cleaning the capstan
   Clean this at the same time the heads are cleaned.
4. Demagnetizing of heads and tape guides
   All heads and tape guides should be demagnetized every morning or before starting a new recording session.
   1) Before demagnetizing, turn deck OFF!!!
   2) Have all tapes at least 5 ~ 6 feet (1.5 ~ 1.8 m) away when demagnetizing to prevent the demagnetizer's magnetic field from erasing them.
   3) Slowly move the tip of the demagnetizer up and down in front of each head and slowly move it away (This is suggested because if you were to pull it away quickly, remagnetizing of the head would be possible). Demagnetize the second head and repeat the process, etc.

   After you have repeated this process for all heads, move the demagnetizer an arms-length away, turn it off, and unplug it.

6-3 MECHANICAL ADJUSTMENTS AND CHECKS

6-3-1 CONTROL PCB ASSY CHECK

Hooking CONTROL PCB ass'y as shown facilitates this check.

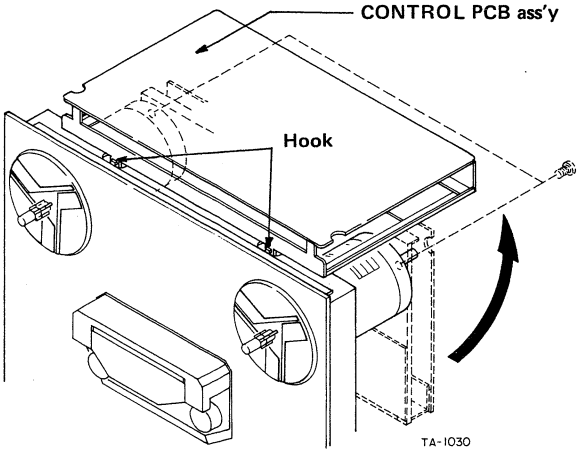


Fig. 6-1

6-3-2 BRAKE ADJUSTMENT

NOTE: The explanation and figure in this paragraph are for the left side brake, similar checks and adjustments are applicable for the right side one.

1. Adjust by moving the brake band bracket in either direction (arrow (A)) so that the reel motor chassis is in parallel with the brake arm, and so that the brake band makes proper clearance equally all around the reel table base.
2. Adjust by moving the brake solenoid in either direction (arrow (D)) so that the stroke of the solenoid plunger is about 2 mm.
3. Adjust by moving the band ass'y retaining plate as shown in (B, C, E) so that, when the plunger is pushed in the direction of the solenoid housing, the reel table base is not rubbed by the brake band and is properly spaced.

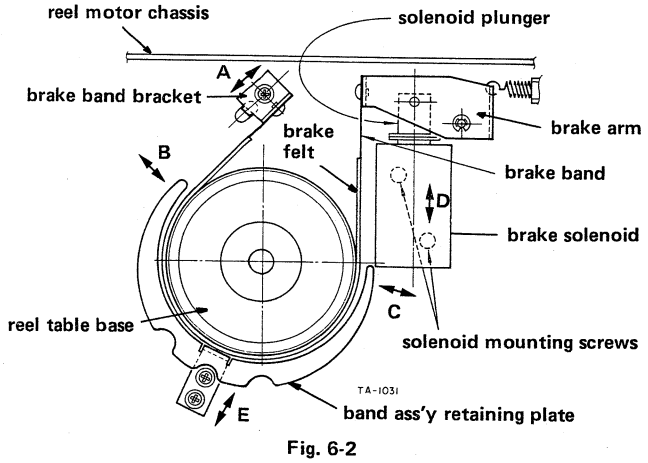
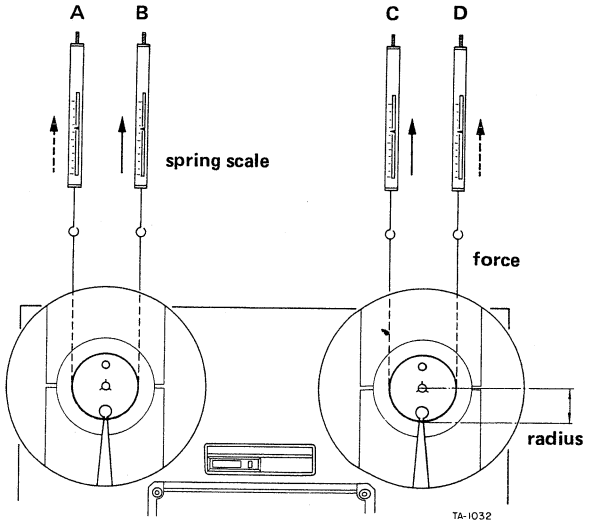


Fig. 6-2

6-3-3 BRAKE TORQUE MEASUREMENT

1. Place an empty 7" reel, connected to a spring scale by a string, on the reel table.
2. Pull the scale away from the reel and read the scale indication only when the reel table is steady motion.
3. Do steps 1 and 2 for each measuring condition, (A) through (D) in Fig. 6-3.
4. The values are as chart in Fig. 6-3.



Forward direction (B) (C)	1.2 to 1.9 kg-cm (17 to 26 oz-inch)
Reverse direction (A) (D)	0.7 kg-cm (9.7 oz-inch) or less
Left/right deviation	0.2 kg-cm (2.8 oz-inch) or less

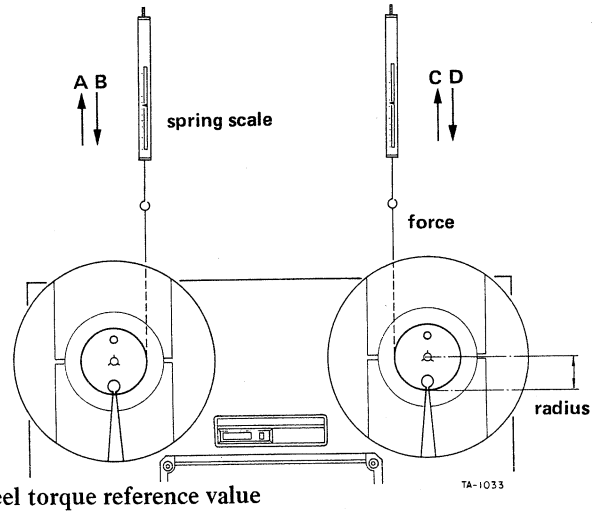
NOTES: 1. The reverse direction values are reference.
2. The specification of left/right deviation only applies for forward direction torques.

Torque calculating formulas:
(1) Torque (g-cm or oz-inch)
= Force or Weight (g or oz) x Radius (cm or inch)
(2) Conversion of g-cm to oz-inch:
g-cm x 0.0139 = oz-inch

Fig. 6-3

6-3-4 REEL MOTOR TORQUE MEASUREMENT

1. Hold both left and right tension arms in the upper position using rubber bands.
2. See Fig. 6-4. Measure torques for each operating mode with the conditions specified in the chart.
3. Since all the torque values are reference values, it is allowable that the take-up torque during the fast forward or rewind mode is 1 kg-cm or more, and that the back tension torque during these mode is good unless the left or right tension arms are shut-off.
4. There is no specially provided adjustment, so if any torque correction are needed, repair or replace defective parts(s) and/or circuit(s).



Reel torque reference value

Play mode

Mode	REEL sw.	Torque
Take-up	LARGE	480 ±40 g-cm (6.1~7.2 oz-inch)
	SMALL	260 ±40 g-cm (3.1~4.2 oz-inch)
Back tension:	LARGE	300 ±40 g-cm (3.6~4.7 oz-inch)
	SMALL	180 ±40 g-cm (1.9~3.1 oz-inch)

Fast winding mode

Mode	Torque
Take-up: (B) in REW, (D) in F.F.	1100 g-cm (15.3 oz-inch)
Back tension: (A) in F.F., (C) in REW	50 g-cm (0.7 oz-inch)

NOTES: For torque calculation, refer to Fig. 6-3.

Fig. 6-4

6-3-5 PAUSE POSITION ADJUSTMENT

1. Place the deck in the pause mode.
2. Adjust by turning the pause positioning nut so that the clearance between the capstan shaft and the tape is 0.5 mm to 1.0 mm.
3. Of the two capstan shaft/pinch rollers, adjustment is allowable only for the side having the narrower clearance.
4. Check that, by repetition of play mode to pause mode and stop mode to pause mode, there is clearance at both sides.

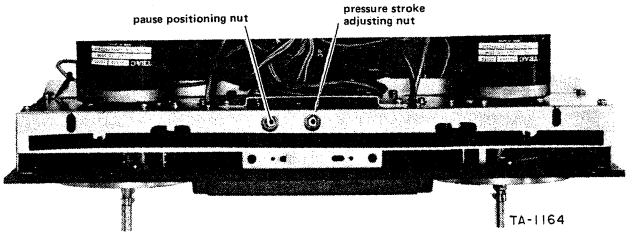
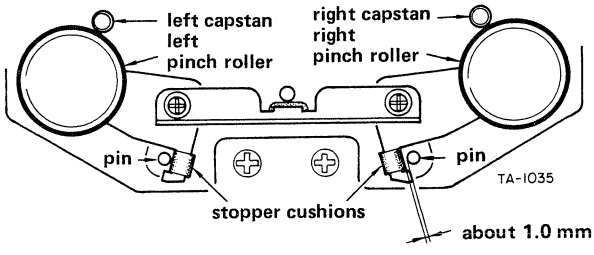


Fig. 6-5 Pause position and pinch roller pressure stroke adjustments

6-3-6 PINCH ROLLER PRESSURE STROKE ADJUSTMENT

1. Set the deck in the forward or reverse play mode.
2. Adjust by turning the pressure stroke adj. nut (Fig. 6-5) so that the clearance between the pin and the stopper cushion is about 1.0 mm.
3. Since the clearance is produced at one side (left or right), adjustment for this side only is permissible.



Either the left or right should have a clearance of about 1.0 mm.

Fig. 6-6

6-3-7 PINCH ROLLER PRESSURE MEASUREMENT

NOTES: 1. The explanation below applies to both the left and right pinch rollers.
2. Both pinch roller pressures are automatically set with equal value.

1. Hold both the left and right tension arms in the upper positions using rubber bands, string etc.
2. Set the deck in either play mode with no tape loaded.
3. Attach the spring scale to the pinch roller as shown in the figure.
4. Draw the pinch roller away from the capstan shaft (in the direciton of a line intersecting the centers of the capstan shaft and the pinch roller) until the capstan shaft and the pinch roller are separated.
5. Return the scale back until the pinch roller just begins to turn. The scale should then be reading as follow.
   Reference value: 1.35 kg to 1.9 kg. (3.0 lbs to 4.2 lbs)
6. If the reading is out of specification, replace defective part(s). There are no adjustable parts.

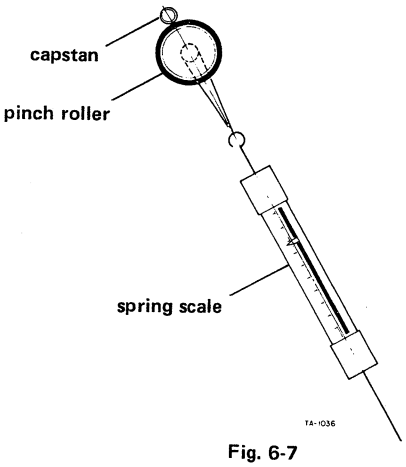


Fig. 6-7

6-3-8 TENSION ARM HEIGHT ADJUSTMENT

1. Thread any standard tape on the deck using a standard empty reels such as TEAC RE-702.
2. Set the deck in the forward or reverse play mode.
3. Stop left (right) guide roller's rotation by hand. Adjust by turning the left (right) tension arm adjusting nut (refer Fig. 6-8) so that the tape moves in the center of the guide roller.
4. Release the guide roller. Fine-adjust the adjusting nut again until there is no tape curling at the tape guide pin between the erase head and the left (right) guide roller.
5. After adjusting the height of both left and right tension arms, check that the tape running condition is good by repetition of fast forward and rewind modes.
6. If the tape running position is different when the guide roller stops and when it turns, the condition when the guide roller is rotating has priority.

6-3-9 TENSION ARM FORCE ADJUSTMENT

NOTE: The description below applies to both left and right sides.

1. Check the shut-off switch operates correctly with the deck in the horizontal and vertical positions.
2. Adjustment can be done by changing the hooking position of the tension arm spring against the spring hook.

6-3-10 DAMPER FUNCTION CHECK

NOTE: The explanation below applies to both left and right sides.

1. Check that the damper string begins to function after the tension arm has moved 10 to 15 mm from the lowest position, while the damping function is working, there is a feeling of resistance.
2. Check that the tension arm returns freely from the above position to the lowest position.

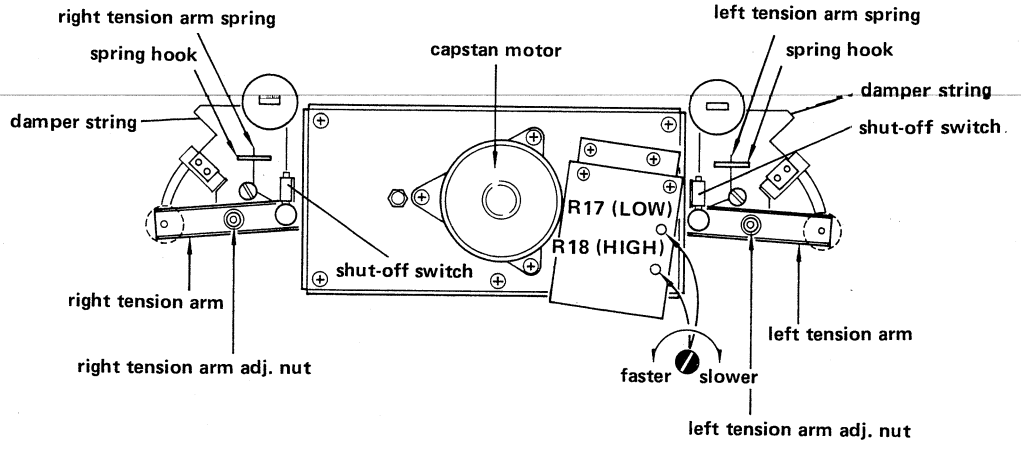


Fig. 6-8 Tension arm height, tension arm force, damper function, and tape speed

6-3-11 REEL TABLE HEIGHT ADJUSTMENT

1. Adjust the tension arm height beforehand. (See 6-3-8)
2. Check each reel table height using a TEAC RE-702 empty reel and letting the tape run in each tape operating mode.
3. If the tape rubs against the reel flanges, adjust the reel table height by means of the two reel table mounting screws.

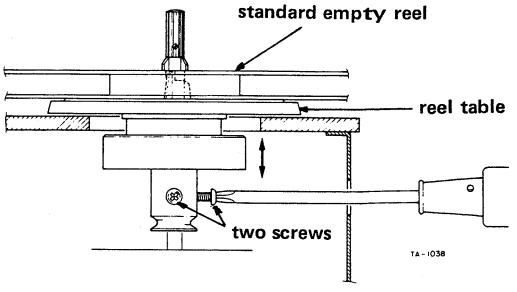


Fig. 6-9

6-3-12 STOP SENSOR ASS'Y (MAGNETIC RESISTANCE ELEMENT) POSITION ADJUSTMENT

1. Adjust by moving the stop sensor PCB ass'y so that the clearance (A) is about 1 mm ±0.5 mm.
2. Be careful not to adjust only the position of the magnetic resistance element when making this adjustment.

Photo seen from the rear of the right reel motor.

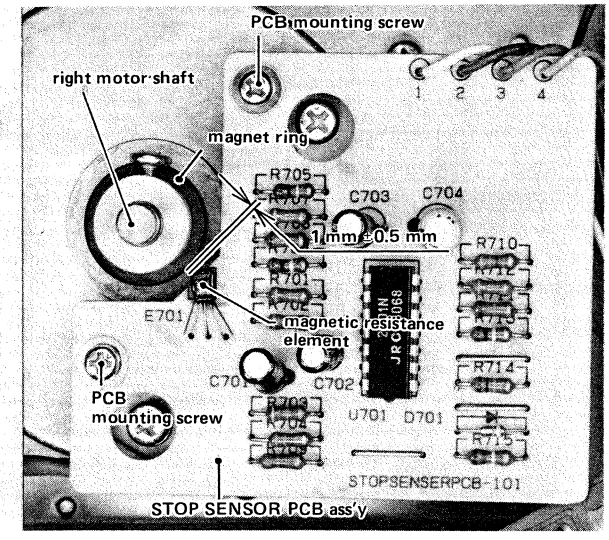


Fig. 6-10

6-3-13 ROTATING PARTS THRUST CLEARANCE CHECKS

Reference values

Capstan shaft:	0.1 mm to 0.25 mm (magnefloat type)
Guide roller:	0.05 mm to 0.3 mm
Tension arm guide roller:	0.05 mm to 0.3 mm
Reel motor:	0 (spring type)
Tension arm:	0 (spring type)

NOTE: Since the capstan shaft is a magnefloat type, check that it is forced towards the rear of the deck while rotating.

6-3-14 TAPE SPEED ADJUSTMENT

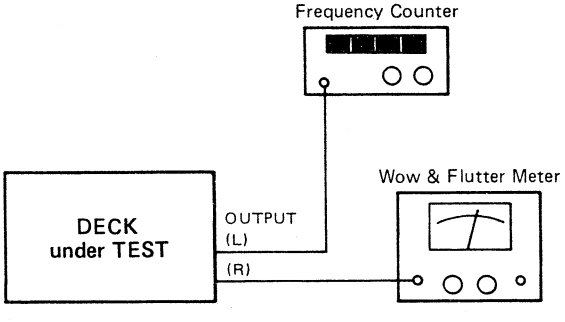


Fig. 6-11

NOTES: 1. Conduct all the following in both forward and reverse play modes.
2. When ordering test tapes, allow for the longer delivery time that is required for them.

1. Connect a frequency counter to either OUTPUT terminal.
2. Load a TEAC YTT-2004 test tape. Set the SPEED switch – HIGH, and PITCH CONT knob – OFF.
3. Play the tape. Adjust R18 (see Fig. 6-8) for a reading of 3,000 Hz ±5 Hz.
4. Check the following at the beginning and the end of the tape.

   Specifications:

   Tape Speed deviation . . . . . 3,000 Hz ±30 Hz
   Tape speed drift . . . . . 15 Hz
5. Change the test tape to a TEAC YTT-2003, and SPEED switch setting to LOW.
6. Repeat steps 3 through 4. Adjust R17 if necessary.
7. Pull the PITCH CONT knob out. Set SPEED switch HIGH. Play a YTT-2004 tape.
8. Check if the speed variation of at least 3,000 Hz ±180 Hz is obtained when the PITCH CONT knob is rotated fully in both directions.
9. Change the test tape to YTT-2003, SPEED switch setting to LOW. Repeat step 8.

6-3-15 WOW AND FLUTTER CHECKS (REPRODUCE METHOD)

NOTE: The following measurements should be made at the beginning and the end of the tape.

1. Connect the test equipment to the deck as shown in Fig. 6-11.
2. Load and play a TEAC YTT-2004 test tape for HIGH speed (38 cm/s or 15 ips), or a TEAC YTT-2003 test tape for LOW speed (19 cm/s or 7-1/2 ips).
3. Read the indication on the wow and flutter meter.

   Specifications:

   HIGH speed: 0.02% WRMS
   LOW speed: 0.04% WRMS

6-3-16 HEAD AND TAPE PATH ALIGNMENTS

NOTE: 1. For detailed alignment principles, refer to the book "Audio Fundamental -TAPE DECK-, 8. Mechanical Adjustments" published by TEAC CORPORATION.

Head adjusting screws

Erase	Record and playback
Tilt	Azimuth
Height and azimuth	Height and tilt
Tangency	Tangency

HEAD ARRANGEMENT

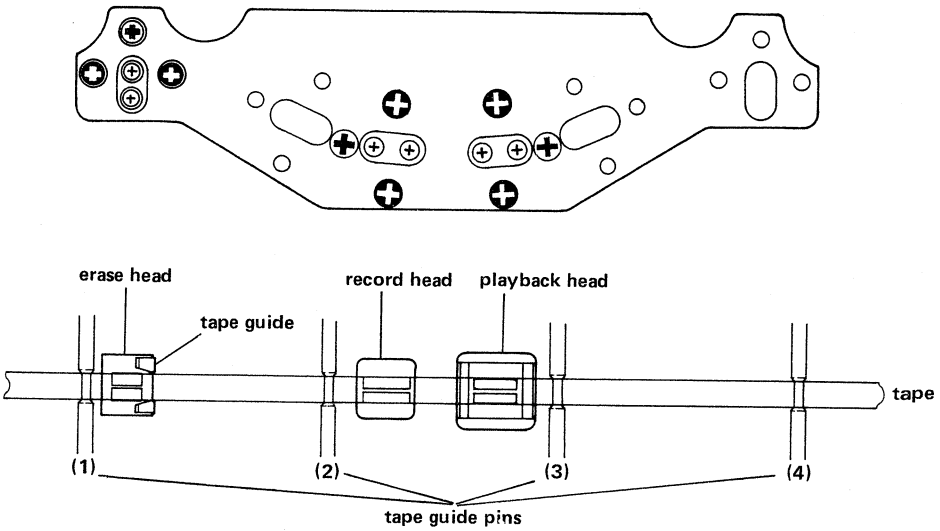


Fig. 6-12 Head arrangement

HEAD REGULATION ELEMENTS

Adjust each head to satisfy each of the following:

TILT
The head surface should be paralell to the tape guide pin surface.

AZIMUTH
The gap of the head core should be perpendicular to the tape travel.

HEIGHT
The upper core of the head should be level with the upper edge of the tape.

TANGENCY
The dotted line should be perpendicular to the surface of the tape.

Fig. 6-13 Head regulation elements

ALIGNMENT PROCEDURE

1. Visually make the tilt adjustment of each record and playback head based on nearest tape guide pin.
2. Make coarse azimuth adjustments of the record and playback heads by viewing each head from in front (without tape).
3. Adjust the erase head's azimuth as seen from the front of the head. Then adjust its tilt using an adjacent tape guide pin for reference,
4. Temporarily adjust the height of erase head visually (with no tape loaded) so that the tape guide on the erase head matches the neighboring tape guide pin. Note that unless the three adjusting screws are turned equally, the tilt and azimuth adjustments (step 3) are likely to be disturbed.
5. Thread a TEAC YTT-8013 test tape (thickness = 35 μm). With the tape running at LOW speed (thru step 13), fine-adjust the height of the erase head so that the upper edge of the tape is just in contact with the upper edge of the tape guide on the head. The lower edge of the tape should just touch the lower edge of the tape guide pin (1). See Fig. 6-14.
6. Check that the erase head core protrudes 0.1 mm above the moving tape. If not, adjust its azimuth, and recheck its tilt and height, then correct tilt and height if necessary.

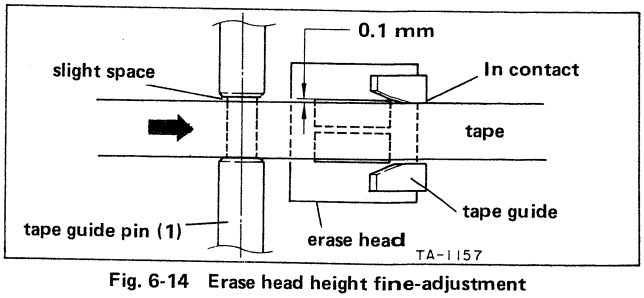


Fig. 6-14 Erase head height fine-adjustment

7. Check that, by pulling the tape away from the head assembly then setting in play mode, the tape guide on the erase head has about 1 mm clearance against the pinch roller.
8. If there is a narrower space, correct the erase head position by loosing the erase head's tangency adjusting screws and moving the head away from pinch roller.
9. Check to see if there is any tape curling at either tape guide pin in the closed loop portion of the tape (i.e. between the capstans).
10. If, during play operation, there is any tape curling at tape guide pin (2), conduct the following: Unthread the tape from the head assembly front. Remove both pinch rollers. Set the deck in the play mode. Visually line-up the capstan and pinch roller spindles.
11. If not parallel, loosen the two screws mounting the reinforcement plate then adjust using the correction jig as shown.
    Note that:
    (1) Use the jig as near as possible to the pinch roller spindle.
    (2) Do not touch the surface of spindle.
    (3) Use no other tool for this adjustment!

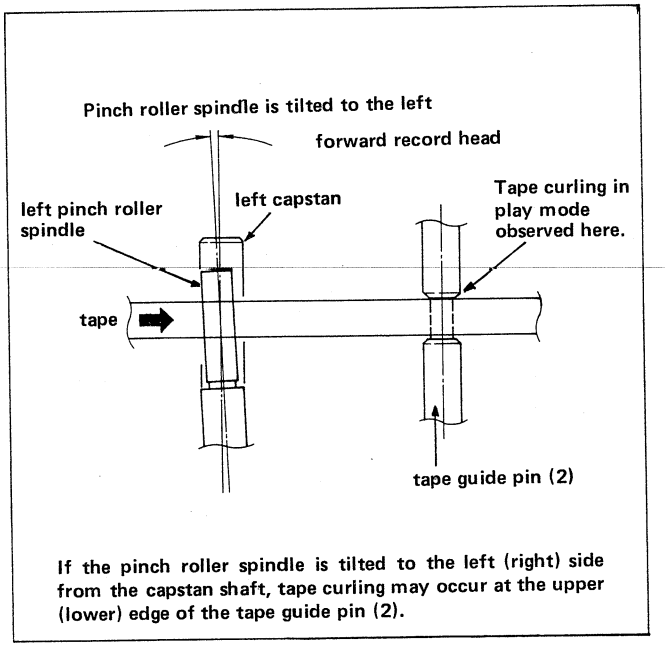


Fig. 6-15 Example of non-parallel pinch roller/capstan

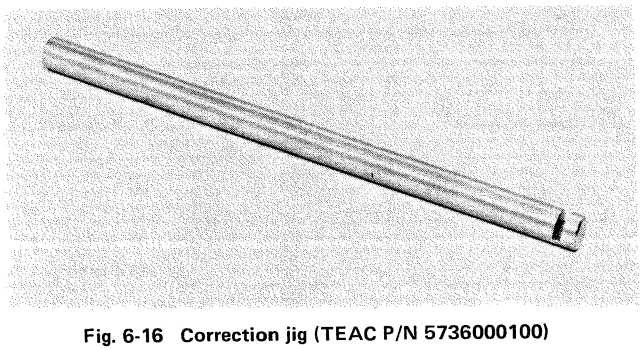


Fig. 6-16 Correction jig (TEAC P/N 5736000100)

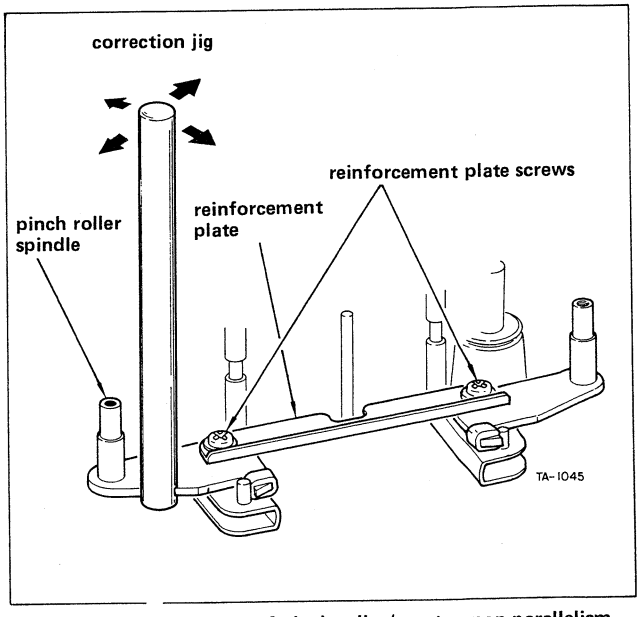


Fig. 6-17 Correction of pinch roller/capstan non-parallelism

12. After it is entirely corrected, and there is no tape curling condition at the head assembly, fine-adjust the record and playback heights so that the brass-colored spacer of the head shows above the moving tape. (About as thick as a thin pencil line). Adjustment should be done by equally turning three screws requiring correction so as not to disturb tilt and azimuth regulation conducted before.
13. Finally, if necessary, make rough tangency adjustment of respective head with tape running. After doing for erase head recheck steps 7 and 8 (erase head/pinch roller space).

6-4 VOLTAGE CONVERSION (FOR GENERAL EXPORT MODELS)

Always disconnect the power line cord before making these adjustments.

FREQUENCY CONVERSION

Since the X series uses DC motors, frequency conversion is not necessary.

VOLTAGE CONVERSION

1. First remove the two feet by removing the screws in each one.
2. Unscrew the left and right sides of the cabinet.
3. Locate the voltage selector to the right of the power transformer as seen from the rear of the deck.
4. Turn the slotted center post of the selector with a screwdriver until the desired voltage numerals appear in the cut-out section of the selector.
5. Replace the cabinet and feet.

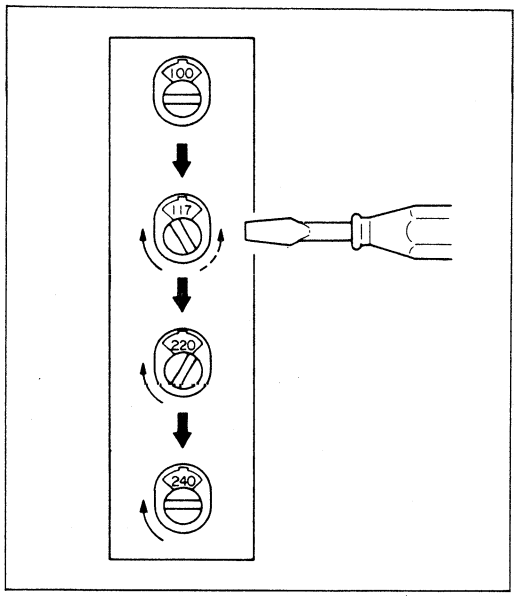


Fig. 6-18

6-5 LUBRICATION

Oiling is needed after every 1,000 hours of operation or once a year if the deck is infrequently used. Lubrication is normally not necessary except at the points shown.

1. Place the deck in the horizontal position.
2. Apply a few drops of oil to the respective spindles shown, excluding capstans, then spread the oil evenly on the spindle surfaces using a cotton cloth, etc.
3. For capstans, apply a few drops to the indicated position.
4. After oiling all the points, leave the deck for 1 to 2 hours until the oil is thoroughly absorbed.

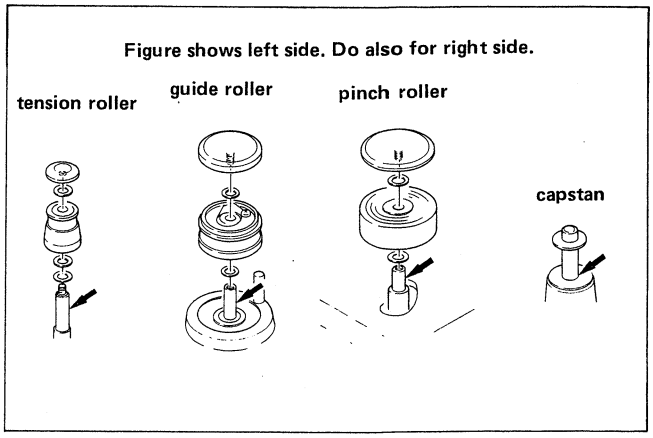


Fig. 6-19

6-6 ELECTRICAL ADJUSTMENTS AND CHECKS

6-6-1 PRECAUTIONS

1. Check that the deck is properly set for the voltage in your locality.
2. In general, adjustments and checks are done in the order of L-ch then R-ch. Double REF. Nos. indicate L-ch/R-ch. (Example: R371/R372)
3. **The value of "dB" refers to 0 dB (1 V). If an AC voltmeter calibrated to 0 dB (0.775 V) is used, appropriate compensation should be made.**
4. The AC voltmeter used in the procedures must have an input impedance of 1 M-ohms or more.

NOTE ON TEST SET-UP

5. Unless stated otherwise in the procedures, make initially the basic test set-up, where the 1 kHz filter should be bypassed.
6. When the 1 kHz filter is switched ON, observe the following:
   1) The test signal from the AF oscillator should be tuned to the filter used.
   2) Do not overlook filter loss when making measurements.
7. Note the "initial switch/control settings" at the top of each MONITOR, REPRODUCE or RECORDING PERFORMANCE. The settings must be used for all the checks on the "PERFORMANCE" concerned unless explicitly stated otherwise.

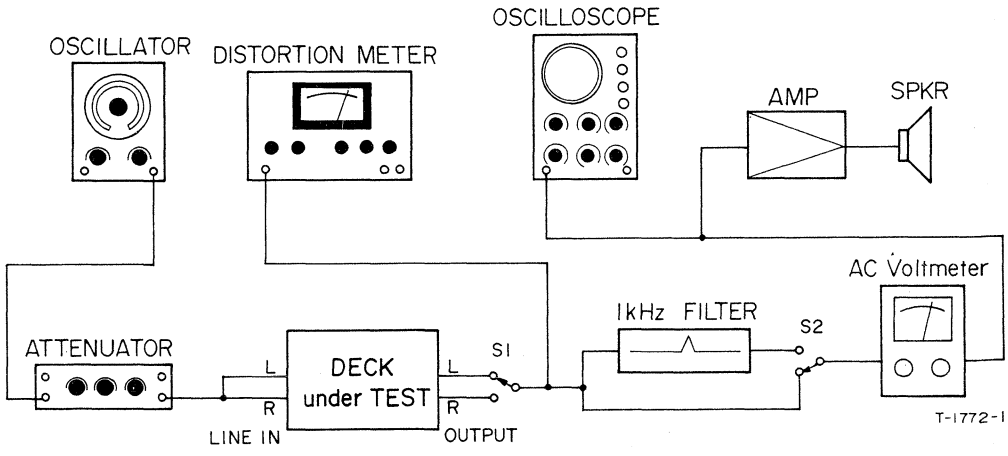


Fig. 6-20 Basic test setup

MONITOR PERFORMANCE

Initial switch/control settings:

MIC ATT switch 0
EQ switch . . . . . NAB
MONITOR switch . . . . . SOURCE
MIC control . . . . . MIN
LINE control . . . . . MIN
OUTPUT control . . . . . MIN

6-6-2 dbx LEVEL

Connection . . . . . Designated in procedure.

LINE MIN. INPUT LEVEL (L-CH)

1. Connect an oscillator through an attenuator to the LINE IN L-ch jack.
2. Connect an AC voltmeter to terminal #14 on VR PC board.
3. Set the OUTPUT controls to the CAL position, the LINE controls to the MAX position, and MIC controls to the MIN position.
4. Apply a 400 Hz, −24 dB (63.1 mV) signal.
5. Adjust R369 so that the AC voltmeter reading becomes −10 dB (316 mV).

LINE SPECIFIED INPUT LEVEL (L-CH).

6. Apply a 400 Hz, −14 dB (200 mV) signal.
7. Set LINE controls so that the AC voltmeter reading becomes −10 dB.

LINE SPECIFIED INPUT LEVEL (R-CH)

8. Change the outernal connection: LINE (L) to LINE (R), #14 terminal on VR PC board to #17.
9. Adjust R370 so that the AC voltmeter reading becomes −10 dB.

6-6-3 MONITOR OUTPUT LEVEL

10. Connect the deck and test equipment as shown in Fig. 6-20.
11. Apply a 400 Hz, −14 dB (200 mV).
12. Adjust R403/R404 so that AC voltmeter reading becomes −7 dB (447 mV).

6-6-4 VU METER – MONITOR –

13. Adjust R371/R372 so that VU meter on the deck reads 0 VU.

6-6-5 MIC INPUT LEVEL

MIC MIN. INPUT LEVEL

14. Change the attenuator connection to the MIC jacks.
15. Set the LINE controls to the MIN position, and the MIC controls to the MAX position.
16. Apply a 400 Hz, –72 dB (251 μV) signal.
17. Check that the AC voltmeter reads –7 dB ±2 dB (355 mV ~ 562 mV).

MIC SPECIFIED INPUT LEVEL

18. Apply a 400 Hz, – 62 dB (794 μV) signal.
19. Set MIC controls so that AC voltmeter reading becomes –7 dB (447 mV).
20. Set the MIC ATT (dB) switch in "20" position and check that reading from OUTPUT reduces by 20 dB ±2 dB from specified output level –7 dB.

IMPORTANT:

After checking the above, change the attenuator connection to LINE jacks again, set MIC controls to MIN. and readjust LINE control for Specified position. Do not disturb MIC, LINE or OUTPUT control during later checks.

REPRODUCE PERFORMANCE

Initial switch/control settings:

EQ switch . . . . . NAB
MONITOR switch . . . . . TAPE
MIC control . . . . . MIN
LINE control . . . . Specified position (See paragraph 6-6-2)
OUTPUT control . . . Specified CAL position (See paragraph 6-6-2)

6-6-6 REPRODUCE HEAD AZIMUTH

Connection: Fig. 6-21

NOTE: Before proceeding with the following head alignments be sure that heads have been properly mounted as to HEIGHT, TILT and TANGENCY. See pages 17 and 18.

SPEED switch . . . . . LOW

1. Thread a YTT-1003 test tape.
2. Visually check that the head wire/phase is correct.
3. Play the 16 kHz, –10 dB test tone in section 2 of the test tape.
4. Adjust the azimuth screw until the oscilloscope shows that the signals are less than 45 degree out of phase, and until the AC voltmeter approximates the maximum value at both channels.

SPEED switch . . . . . HIGH

5. Thread a YTT-1004 test tape and check the phase relationship in the same way.
6. Secure the screw with a drop of locking paint.

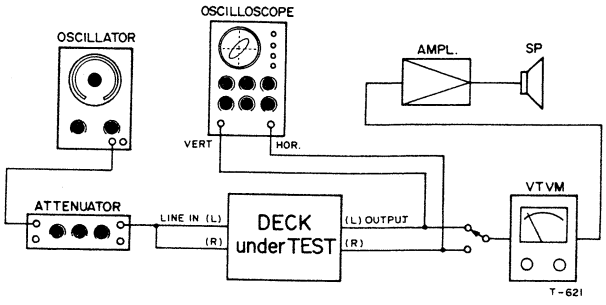


Fig. 6-21 Head phase check setup

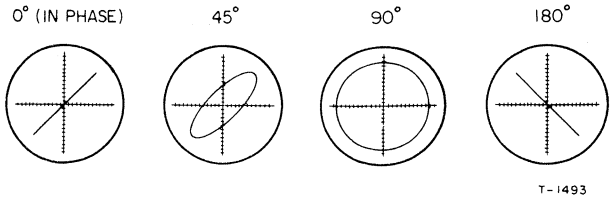


Fig. 6-22 Confirming phase relationship

6-6-7 REPRODUCE LEVEL

SPEED switch . . . . . LOW

SPECIFIED OUTPUT LEVEL

1. Play the 400 Hz, 0 dB tone in section 1 of the YTT-1003 test tape.
2. Confirm that the reference mark of the OUTPUT control is set to the CAL position.
3. Adjust R313/R314 for –7 dB (447 mV) at OUTPUT jack.

MAX. OUTPUT LEVEL

4. Turn the OUTPUT controls fully clockwise and check for –1 dB ±2 dB (708 mV ~ 1.12 V) at OUTPUT jacks.
5. Reduce OUTPUT controls until –7 dB (447 mV) is obtained at AC voltmeter.

IMPORTANT:

This is the specified reproduce level setting. Do not disturb this setting until the remaining adjustments have been completed.

6-6-8 VU METER – REPRODUCE –

6. Adjust R380/R390 for 0 VU readings on the VU meters.

6-6-9 FREQUENCY RESPONSE – REPRODUCE –

NOTE: Always adjust in order of HIGH speed then LOW speed.

SPEED switch . . . . . HIGH

7. Thread a YTT-1004 test tape on the deck.
8. Play tape and adjust R327/R328 so that the reading on the AC voltmeter is within specification.
   Specification: 30 Hz ~ 22 kHz ±3 dB (Reference: 400 Hz)

NOTE: If the response is not uniform, the head should be checked for accumulated dirt or oxide. If clean, head azimuth must be readjusted.

9. Set the EQ switch IEC position and check that 10 kHz or more output reduce 3 dB ±2 dB than above actual one.
10. Reset the EQ switch NAB position.

SPEED switch . . . . . LOW

11. Repeat the above (7 ~ 8) steps for LOW speed by changing items below.
    Test tape: TEAC YTT-1003
    Adjustment: R333/R334
    Specification: 40 Hz ~ 22 kHz ±3 dB

6-6-10 PHASE SHIFT – REPRODUCE –

Connection: Fig. 6-21

SPEED switch . . . . . HIGH

12. Thread a YTT-1004 test tape on the deck.
13. Play tape and check that the phase relationship (between L-ch and R-ch) at 50 Hz ~ 18 kHz is within 45 degrees on the oscilloscope.

SPEED switch . . . . . LOW

14. Repeat the above for LOW speed, but use a YTT-1003 test tape.

6-6-11 HEADPHONE OUTPUT LEVEL

Connection: Fig. 6-23

SPEED switch . . . . . LOW

1. Check that OUTPUT control is set at Specified CAL position (See 6-6-7).
2. Reproduce operating level 400 Hz, 0 dB in section 1 of the YTT-1003 test tape, the AC voltmeter should indicate –26 dB ±2 dB (39.8 mV ~ 63.1 mV).

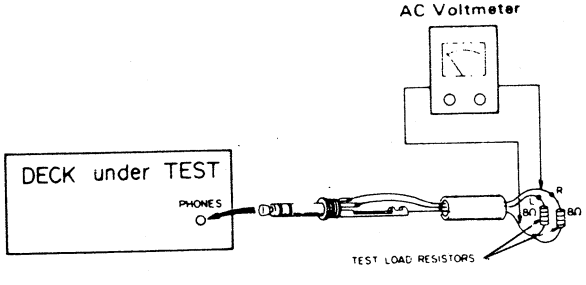


Fig. 6-23 Connection for headphone output level checks

6-6-12 SIGNAL-TO-NOISE RATIO – REPRODUCE –

NOTE: The AC line plug can be reversed in the wall socket when checking. The worse case reading should be within specification.

SPEED switch . . . . . HIGH

1. OUTPUT controls should be at the specified setting. See 6-6-7.
2. Thread a YTT-8013 test tape fully erased by bulk tape eraser.
3. Depress the PLAY button.
4. The AC voltmeter should indicate –60 dB (or more), or 1.00 mV (or less).
5. This corresponds to a signal-to-noise ratio of 53 dB. This is the difference between the residual noise –60 dB and the specified output level of –7 dB (447 mV).

SPEED switch . . . . . LOW

6. Repeat the above steps 1 ~ 3, but the residual noise should be –59 dB (or more), or 1.12 mV (or less).
7. Noise level –59 dB means a signal-to-noise of 52 dB likewise as step 5.

RECORDING PERFORMANCE

Initial switch/control settings:

REC MODE switch . . . . . ON
MIC ATT switch 0
REC BIAS switch 1
REC EQ switch 1
EQ switch . . . . . NAB
MONITOR switch . . . . . TAPE
MIC control . . . . . MIN
LINE control . . . . . Specified position (See paragraph 6-6-2)
OUTPUT cont. Specified CAL position (See paragraph 6-6-7)

6-6-13 BIAS TRAP

Connection: Designated in procedure.

1. Remove all input signals.
2. Thread a YTT-8013 test tape on the deck and depress the RECORD and PAUSE buttons.
3. Connect an AC voltmeter oscilloscope from ground to the BIAS TRAP test point.
4. Adjust L303/L304 for minimum reading on the scope or AC voltmeter. Use a plastic alignment tool.
5. Set MONITOR switch to TAPE position and change the AC voltmeter connection to the OUTPUT jacks.
6. Check that bias leakage has the following value at the OUTPUT jacks.
   Specification: Min. reading (–47 dB or more) (4.47 mV or less).
7. Check that the VU meter needle does not deflect.

6-6-14 RECORD HEAD AZIMUTH

Connection: Fig. 6-21

SPEED switch . . . . . LOW

1. Check that the reproduce head azimuth adjustment is correct. See 6-6-6.
2. Visually check that the head wire/phase is correct.
3. Apply and record a 16 kHz, −34 dB (20.0 mV) signal on a YTT-8013 test tape.
4. Adjust azimuth screw so that the phase relationship (between L-ch and R-ch) is within 45 degree on oscilloscope, and so that approximately the maximum value is obtained on both channels on the AC voltmeter.

SPEED switch . . . . . HIGH

5. Check the phase relationship likewise as above.
6. Secure the screw with a drop of locking paint.

6-6-15 RECORD BIAS (POSITION 1)

SPEED switch . . . . . LOW

1. Apply a 7 kHz, −24 dB (63.1 mV) signal.
2. Turn C301/C302 fully counterclockwise.
3. While recording on a YTT-8013 test tape, slowly turn C301/C302 clockwise until the reading on the meter peaks, and continue turning clockwise until the reading backs off 2.7 dB (±0.5 dB).

6-6-16 RECORD LEVEL

SPEED switch . . . . . LOW

4. Check that the LINE and OUTPUT controls are still at their specified positions.
5. Apply a 400 Hz, −14 dB (200 mV) signal.
6. While recording, adjust R429/R430 for −7 dB (447 mV) at the OUTPUT jacks.

6-6-17 TOTAL HARMONIC DISTORTION

SPEED switch . . . . . HIGH

1. Thread a YTT-8013 test tape.
2. With the LINE and OUTPUT controls set to the specified position, apply a 1 kHz signal to the LINE IN jacks at −14 dB (200 mV).
3. Place the deck in the record mode for approx. 10 sec.
4. Rewind and play this recorded section of the tape.
5. The distortion factor read on the distortion meter should be 0.6% or less.

SPEED switch . . . . . LOW

6. Repeat the aboves for LOW speed.

6-6-18 SIGNAL-TO-NOISE RATIO — OVERALL —

SPEED switch . . . . . HIGH

1. Before checking, be sure the record/reproduce amplifier has been properly adjusted.
2. Record a length of 1 kHz signal at −14 dB (200 mV) on a YTT-8013 test tape, then make another "no signal" recording.
3. Rewind the recording made in step 2 to the beginning and play it back.
4. Make sure the reproduce output of the previously recorded 1 kHz, signal is −7 dB (447 mV), then raise the sensitivity of the AC voltmeter and measure the level of the no signal portion of tape.
5. Obtain the output level difference between the 1 kHz portion and the no signal portion.
6. Specification should be 48 dB min. ratio.

SPEED switch . . . . . LOW

7. Repeat the above for LOW speed.
8. Specifications are 48 dB min. ratio.

NOTE: If the output is connected to the AC voltmeter through a band pass filter (with cut-off frequencies of 20 Hz and 20 kHz) and a NAB weighting network, the signal-to-noise ratio will be improved. For example, at HIGH speed and with EQ switch set to NAB it is improved from 48 dB to 54 dB. This 54 dB corresponds to 63 dB, weighted, reference 3% THD level (9 dB above 0 VU).

6-6-19 ERASE EFFICIENCY

Connection: Fig. 6-20, but switch on 1 kHz filter.

SPEED switch . . . . . HIGH

1. Check that LINE and OUTPUT controls are set properly to their specified positions.
2. Thread a YTT-8013 test tape on the deck.
3. Apply a 1 kHz signal at 10 dB above the specified level −14 dB (200 mV), i.e. −4 dB (631 mV) (+10 VU).
4. Make a 30 sec. recording of this signal and rewind to the beginning of the recording.
5. Disconnect the 1 kHz signal source from the LINE IN jacks.
6. Put the deck in the record mode and "record" (erase) over this previous recording then rewind to beginning again.
7. Put the deck in the play mode and monitor the output on the AC voltmeter.
8. The AC voltmeter indication of the erased portion should be −67 dB (or more), or 447 μV (or less).
9. This means 70 dB (min.) ratio, i.e. the difference between reference output level +3 dB (1.41 V) and residual noise −67 dB.

6-6-20 REC MUTE FUNCTION

Connection: Fig. 6-20, but switch ON 1 kHz filter.

SPEED switch . . . . . HIGH

1. Check whether LINE and OUTPUT controls are located exactly at their specified positions.
2. Thread a YTT-8013 test tape.
3. Apply and record a 1 kHz signal at 10 dB above the specified input level −14 dB (200 mV); i.e. −4 dB (631 mV) (+ 10 VU)) for several seconds.
4. Push the REC MUTE button so that it will cause the tape to run with no incoming signal recording for several seconds.
5. Push the play button again to make a normal recording for a short while.
6. Rewind the tape to the original starting point of the 1 kHz signal recorded portion.
7. Play the tape and obtain the output level of both the recorded portion and the record muted portion.
8. Record muted portion output should be −62 dB (or more) or 794 μV (or less).
9. This coresponds to 65 dB (min.) ratio. i.e. difference between the reference output level +3 dB (1.41 V) and record muted portion output level −62 dB.

6-6-21 FREQUENCY RESPONSE – OVERALL –

SPEED switch . . . . . LOW

1. Apply a signal swept from 40 Hz to 20 kHz at −34 dB (20.0 mV) and record on a YTT-8013 test tape.
2. During recording monitor the off-tape signal, adjust L305/L306 for readings within the specification.
   Specification: 40 Hz ~ 20 kHz ±3 dB (Reference: 400 Hz)

SPEED switch . . . . . HIGH

3. Apply a signal swept from 40 Hz to 20 kHz at −14 dB (200 mV), and check that the response is within specification.
   Specification: 40 Hz ~ 20 kHz ±3 dB (Reference: 400 Hz)

NOTE: If the response is out of specification, the heads should be checked for accumulated dirt and oxide and the bias adjustment should be repeated.

6-6-22 PHASE SHIFT – OVERALL –

Connection: Fig. 6-21

SPEED switch . . . . . LOW

1. Feed a 40 Hz ~ 16 kHz swept signal at −34 dB (20.0 mV) and record it on a YTT-8013 test tape.
2. Check by oscilloscope that the phase relationship is (between L-ch and R-ch) within 45 degrees at these frequencies.

SPEED switch . . . . . HIGH

3. Repeat the above checks.

6-6-23 RECORD BIAS (POSITION 2)

SPEED switch . . . . . LOW

1. Apply and record a 10 kHz, −34 dB (20.0 mV) signal on a YTT-8013 test tape.
2. Adjust R493 so that when the REC BIAS and REC EQ switches are set from "1" to "2" respectively, output level goes up by +4 dB ±2 dB.

6-6-24 CHANNEL SEPARATION

Connection: Fig. 6-20 with 1 kHz filter switched ON.

SPEED switch . . . . . HIGH

1. Be sure that the OUTPUT and LINE controls are still at their specified positions.
2. Thread a YTT-8013 test tape.
3. Apply a 1 kHz signal at −14 dB (200 mV) to L-ch.
4. Place the deck in the record mode.
5. Measure the output from the R-ch with an AC voltmeter. The level should be −57 dB (or more) or 1.41 mV (or less). That is channel separation should be 50 dB (min.) ratio, i.e. the ratio of L-ch signal output level −7 dB (447 mV) to R-ch leakage level −57 dB.
6. Repeat the above steps, reversing the L and R channels.

6-7 ADJUSTMENT AND TEST POINT LOCATIONS

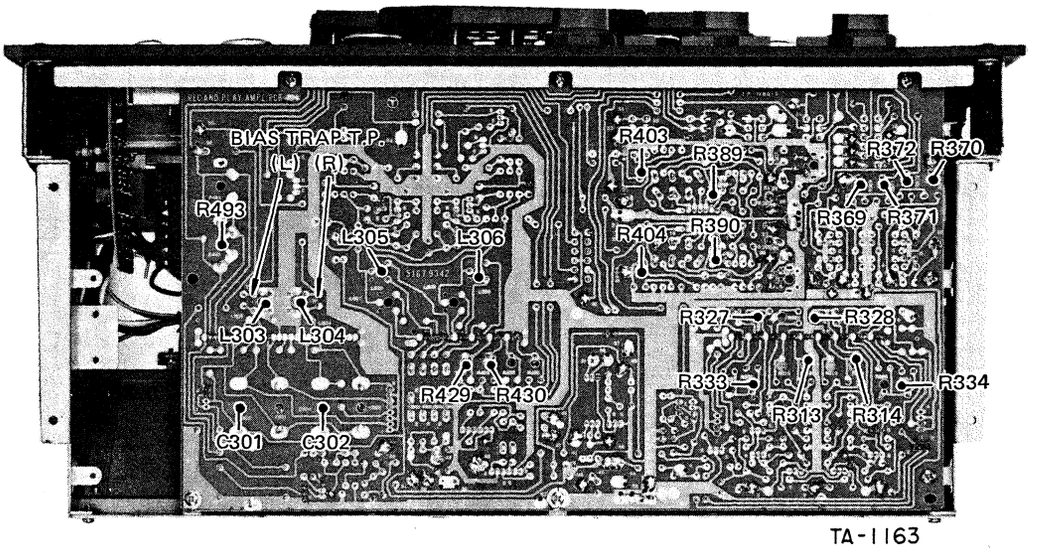
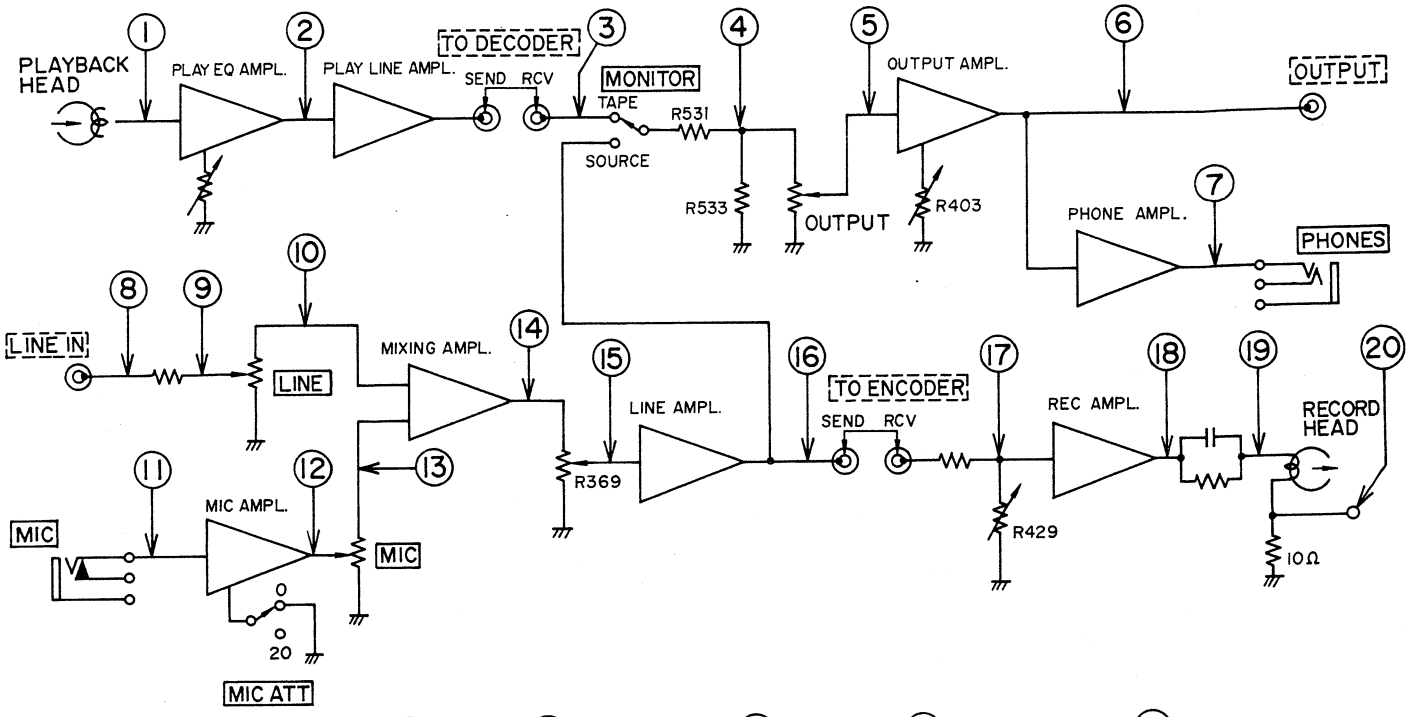


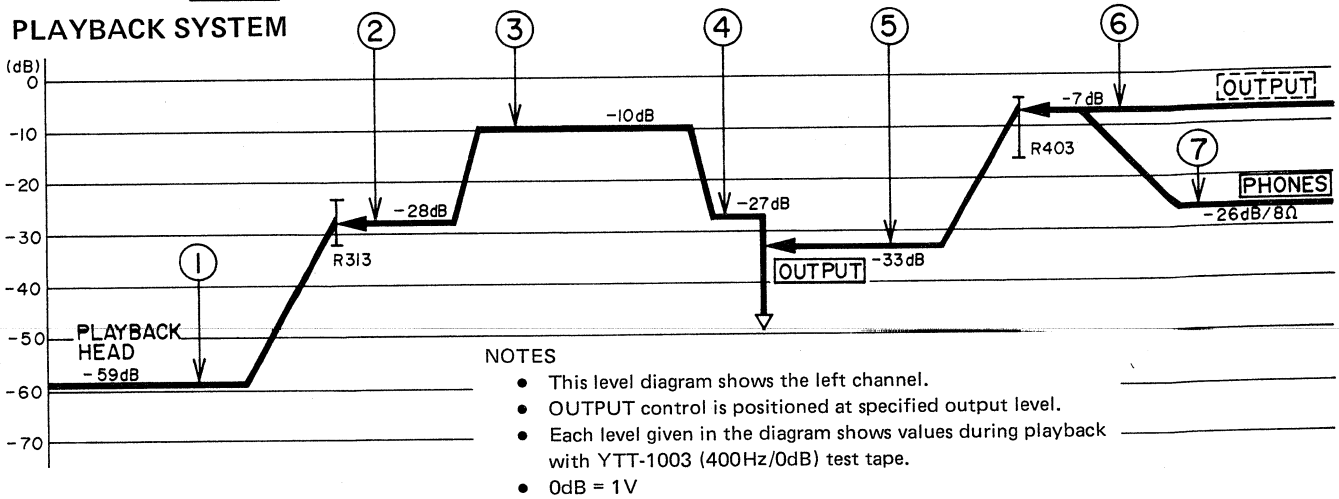
Fig. 6-24

R313/R314	Reproduce level
R327/R328	Reproduce EQ
R333/R334	Reproduce EQ (LOW)
R369/R370	dbx level (input level)
R371/R372	VU meter (monitor)
R389/R390	VU meter (reproduce)
R403/R404	Output level
R429/R430	Record level
R493	Record bias 2
L303/L304	Bias trap (record)
L305/L306	Record EQ
C301/C302	Record bias 1

6-8 LEVEL DIAGRAM



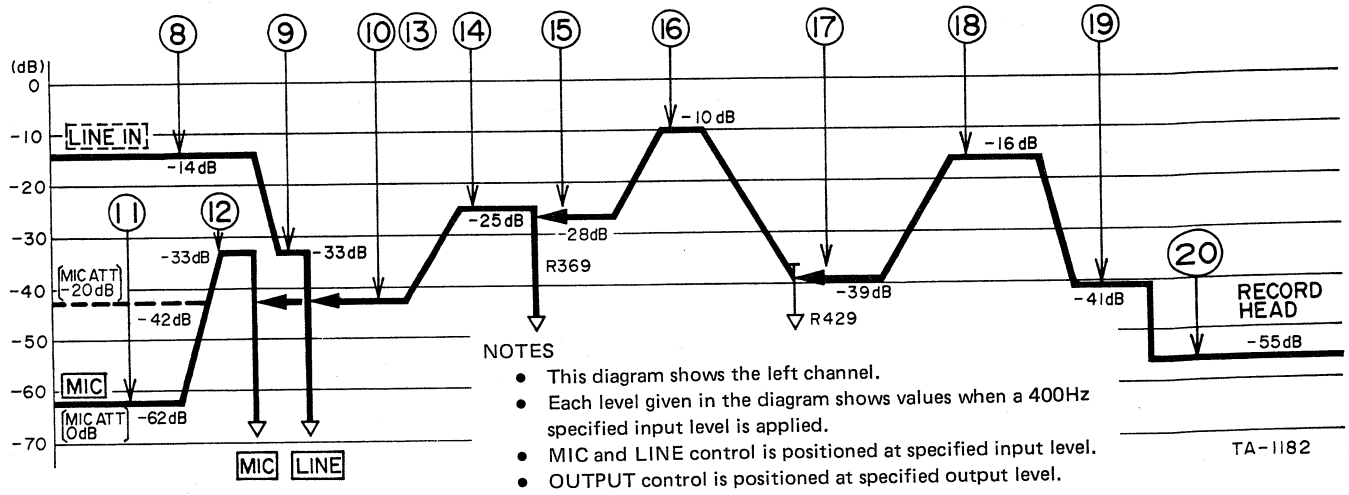
PLAYBACK SYSTEM



NOTES

- This level diagram shows the left channel.
- OUTPUT control is positioned at specified output level.
- Each level given in the diagram shows values during playback with YTT-1003 (400Hz/0dB) test tape.
- 0dB = 1V

RECORDING SYSTEM



NOTES

- This diagram shows the left channel.
- Each level given in the diagram shows values when a 400Hz specified input level is applied.
- MIC and LINE control is positioned at specified input level.
- OUTPUT control is positioned at specified output level.
- 0dB = 1V

TA-1182

Fig. 6-25

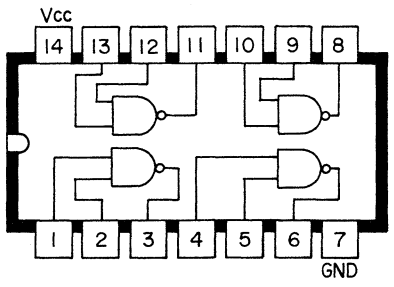
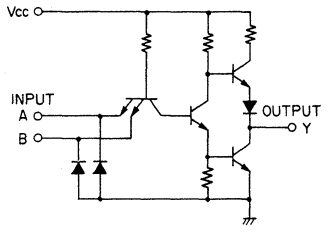
CIRCUIT DESCRIPTION SECTION

7 TAPE TRANSPORT CIRCUIT DESCRIPTION

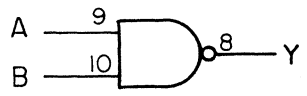
7-1 CONTROL CIRCUIT ICs

AN6251 System control IC . . . . . Refer to section 7-2

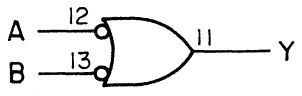
HD7400P (or SN7400N) Quad 2-input positive nand gate

CONNECTION	BASIC CIRCUIT	FUNCTION TABLE
(TOP VIEW) QUADRUPLE 2-INPUT POSITIVE NAND GATES 		IN-PUT A B / OUT-PUT Y: L L H; L H H; H L H; H H L

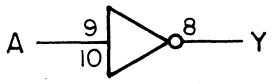
EXAMPLES OF SYMBOLS USED IN SCHEMATICS



$Y = \overline{A \cdot B}$

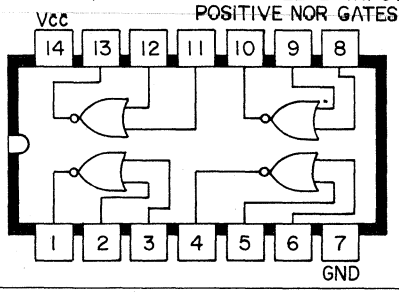
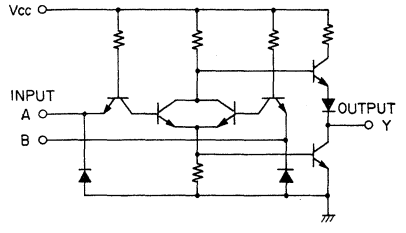


$Y = \overline{A} + \overline{B}$

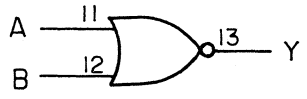


$Y = \overline{A}$

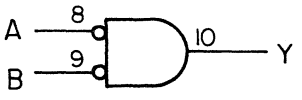
HD7402P (or SN7402N) Quad 2-input positive nor gate

CONNECTION	BASIC CIRCUIT	FUNCTION TABLE
(TOP VIEW) QUADRUPLE 2-INPUT POSITIVE NOR GATES 		IN-PUT A B / OUT-PUT Y: L L H; L H L; H L L; H H L

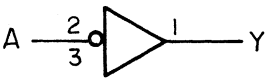
EXAMPLES OF SYMBOLS USED IN SCHEMATICS



$Y = \overline{A + B}$



$Y = \overline{A} \cdot \overline{B}$



$Y = \overline{A}$

7-2-2 THE TERMINALS AND THEIR FUNCTIONS

Pin No.	Name	Function	Active Level
1	GND	Ground	OV
2	REW IN	Rewind instruction input	L
3	F. FWD IN	Fast forward instruction input	L
4	EBR IN	*1 Electric brake reset input	L
5	CR1	*2 Power on reset input	L
6	STOP IN	Stop instruction input	L
7	REV IN	Reverse playback instruction input	Not used (open)
8	FWD IN	Forward playback instruction input	L
9	PAUSE IN	Pause instruction input	L
10	REC IN	Record instruction input	L
11	REC INH	Record inhibit instruction input	L
12	PAUSE OUT	Pause mode output	L
13	PLAY OUT	Play mode output	Not used (open)
14	REC OUT	Record mode output	L
15	CAP OUT	Capstan rotate direction output	Not used (open)
16	CR2	*2 D PLAY time constant	–
17	D PLAY OUT	Replay operate output	L
18	BRK OUT	*3 Brake release output	L
19	STOP OUT	*4 Stop mode output	L
20	TM OUT	Timer start output	L
21	CR3	*2 Timer start time constant	–
22	F. FWD OUT	Fast forward mode output	L
23	REW OUT	Rewind mode output	L
24	V_{CC}	Power supply terminal	+5 V ±0.5 V

*1 See sections 7-10 and 7-11-5
*2 See section 7-2-5
*3 When any of F. FWD OUT, REW OUT or D PLAY OUT is low, BRK OUT will also be low.
*4 When any of D PLAY OUT, F. FWD OUT, REW OUT, PAUSE OUT or REC OUT is low, STOP OUT will be high.

7-2-3 FUNCTION TABLE

The IC output terminals have levels as per the following table when the 32-2 is in the modes listed on the left.

OUTPUT PINS / MODE	pin 12 PAUSE	pin 14 REC	pin 17 D PLAY	pin 18 BRK	pin 19 STOP	pin 20 TM	pin 22 F. FWD	pin 23 REW
PLAY	H	H	L	L	H	H	H	H
F. FWD	H	H	H	L	H	H	L	H
REW	H	H	H	L	H	H	H	L
STOP	H	H	H	H	L	H	H	H
PAUSE	L	H	H	H	H	H	H	H
REC/PLAY	H	L	L	L	H	H	H	H
REC/PAUSE	L	L	H	H	H	H	H	H

7-2-4 MODE SHIFT TABLE

When another operation instruction signal is given while the 32-2 operates in a certain mode, the deck goes into modes indicated at the following table.

NOTE: IC pin 11 (REC INH) signal is assumed to be high.

DESIRED MODE / PRESENT MODE	PLAY	F. FWD	REW	STOP	PAUSE	REC/PLAY	REC/PAUSE
PLAY		*1. *2 PLAY	*1. *2 PLAY	PLAY	PLAY		REC/PLAY
F. FWD	F. FWD		*2 F. FWD	F. FWD	F. FWD	F. FWD	F. FWD
REW	REW	*2 REW		REW	REW	REW	REW
STOP	STOP	*2 STOP	*2 STOP		STOP	STOP	STOP
PAUSE	PAUSE			PAUSE		REC/PAUSE	
PLAY and REC	REC/PLAY	*1. *2. *3	*1. *2. *3	REC/PLAY	REC/PLAY		REC/PLAY
PAUSE and REC	REC/PAUSE			REC/PAUSE	REC/PAUSE	REC/PAUSE	

*1 Delay function is provided.
*2 Electric brake operation (Refer to section 7-10.)
*3 • When PLAY and REC signals are applied during electric brake operation . . . . . PLAY
• When PLAY and REC signals are applied while electric brake operation is inhibited . REC/PLAY
(Refer to section 7-11-5 for details.)
▨ Mode is not changed.

7-2-5 THE TIME CONSTANT TERMINALS

(1) CR1 . . . . . Pin 5 of U32

When the 32-2 is powered up, this terminal stays at a low level for approximately 200 msec while C53 is charged up via route (1). When CR1 becomes low, all memory circuits (flip-flops) in U32 are reset, thus the deck goes into the STOP mode. Also when power is put OFF, C53 discharges quickly through D39 and the VU meter lamps (through route 2), causing CR1 to become low. Thus the 32-2 immediately enters the STOP mode.

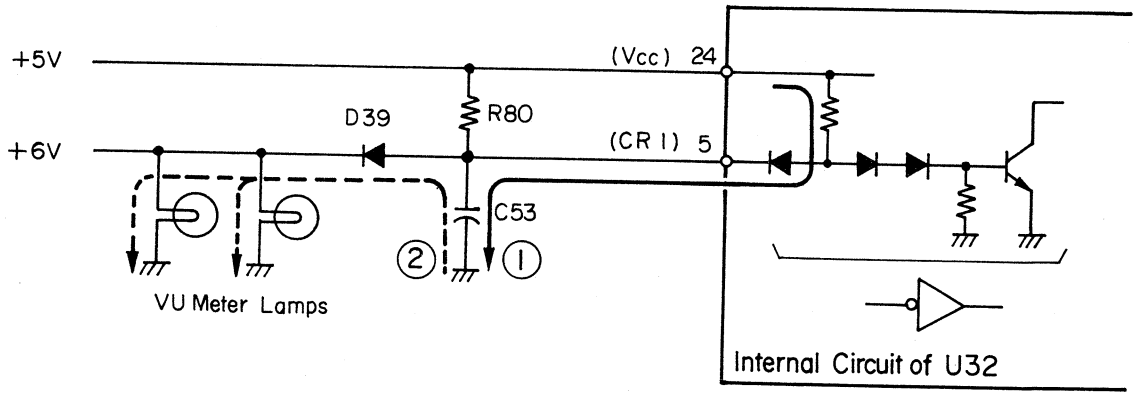


Fig. 7-3 CR1 Time constant circuit

(2) CR2 . . . . . Pin 16 of U32

As long as this terminal is at a low level, the D PLAY OUT terminal will not become low, consequently the 32-2 does not enter the PLAY mode. Terminal CR2 creates a time delay with the operations below.

- When the PLAY button is depressed during F. FWD or REW mode. (Refer to section 7-11-5.)
- When the tape speed is changed (Refer to section 7-11-6.)

(3) CR3 . . . . . Pin 21 of U32

This terminal goes low for approximately one second when the 32-2's power is put on while C58 is charged via R73 from +5V power supply. TM OUT (pin 20) of U32 goes low only while CR3 is low. This low level TM OUT signal is used as the timer start signal. Refer to section 7-9 for details on timer operations.

7-3 CAPSTAN MOTOR DRIVE CIRCUIT

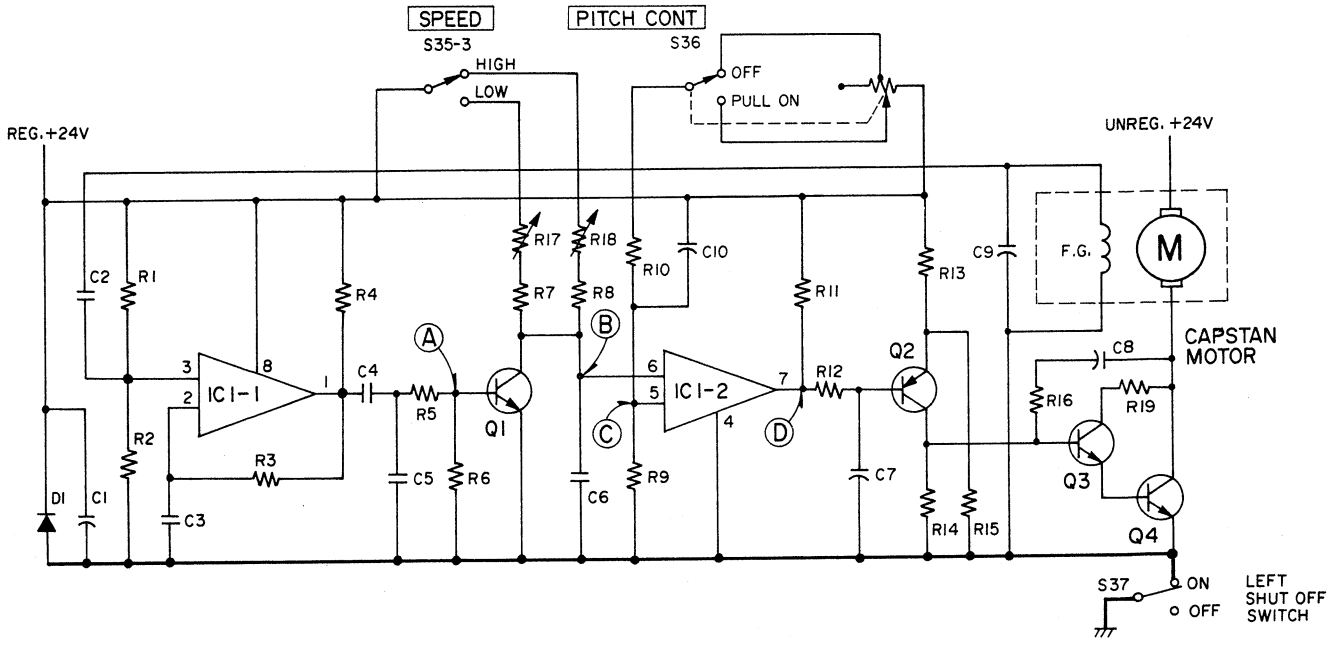


Fig. 7-4 Capstan motor drive circuit

The servo ciruit operates when the left shut-off switch is on (closed). The capstan motor is an inner-rotor type DC brush motor with an F. G. (frequency generator) coil to act as a rotational speed detector. The rotational speed depends on the F. G. coil output frequency. The F. G. coil produces a signal (sine wave) which is proportional in amplitude and frequency to the speed of rotation. This signal is amplified and shaped by IC1-1, which produces a square wave output. As the amplitude of the output signal from IC1-1 is constant, differences in the motor speed appear as changes in the signal's frequency (or period). This square wave is differentiated by C4 and operates a frequency discriminator comprising Q1 and IC1-2 (this circuit operates in the same way as a monostable multivibrator). The output of IC1-2 is smoothed by C7, passes thru Q2, a buffer amplifier, is current amplified by Q3 and Q4 and finally drives the motor. The frequency descriminator operates as follows:

Fig. 7-5 shows the waveform at various point in the discriminator circuit (though the actual waveforms would be somewhat different). The motor speed is determined by the mean DC level at point D. The mean DC level depends on the pulse width T. Put another way, changes in the pulse width, T, are able to change the motor speed.

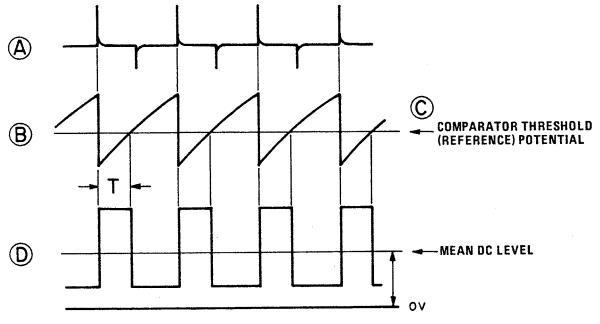


Fig. 7-5 Frequency discriminator waveforms

There are two ways whereby the pulse width of T is altered. They are:

(1) The leading edge of waveform B can be varied by changing the charging time constant of C6 – see Fig. 7-6 (A). This method is used for changing the tape running speed (HIGH/LOW).

(2) The descriminator (comparator) threshold potential (IC1-2 pin 5 potential) is changed – Fig. 7-6 (B). This method is used when manual adjustment of the tape speed (PITCH CONT) is made. When the PITCH CONT switch is operated ("PULL ON"), the range of speed control possible is approximately ±6%.

Thus far, we have seen how changes in the pulse width at point D effect a change in the motor speed. However, if the pulse width remains constant but the pulse period (duty cycle) changes, then the mean DC level will also change, changing the speed of the motor. Refer to Fig. 7-7.

Suppose that the load on the motor increases and slows the motor, the following will take place:

- The motor speed falls so the period of the output from the F.G. gets longer, as does the period of the differentiated signal at point A.
- Consequently, the waveform period at point D also gets longer. However, as the pulse width at point D remains constant but the period is longer, the mean DC level falls.
- When the mean DC level drops, the base potential on Q2 falls. Q2's collector current becomes greater, increasing the base current of Q3.
- Consequently, the collector current of Q3 (= the base current of Q4) becomes larger, increasing the collector current of Q4 and thus the motor drive current.

In this way, when the motor speed drops, the circuit operates to increase the motor current, thus maintaining the motor speed at a constant level. When the motor speed increases, the circuit works in the converse manner to reduce the motor current and maintain the speed of the motor.

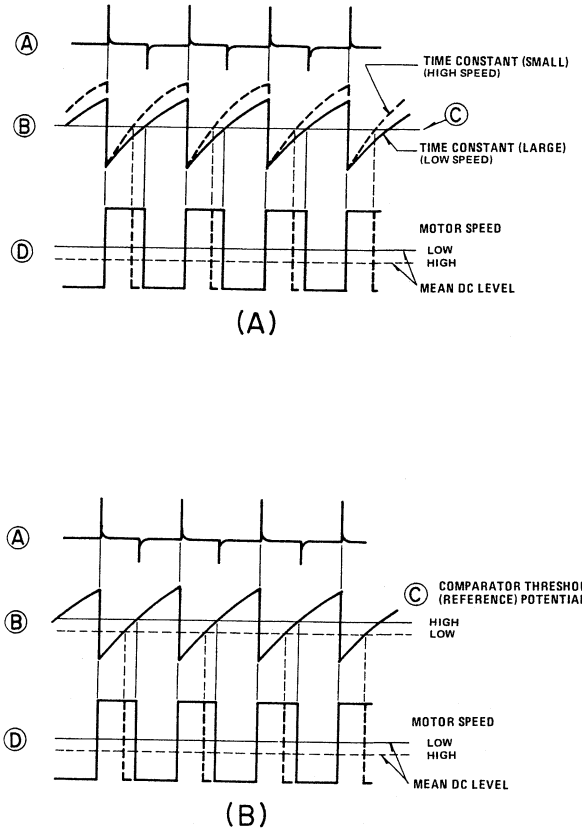


Fig. 7-6 Setting the motor speed

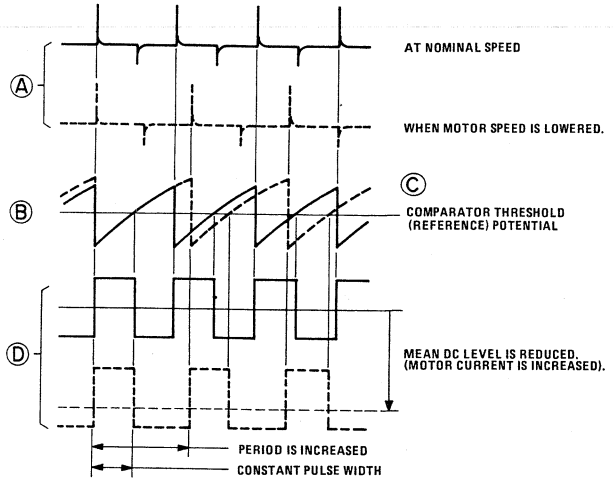


Fig. 7-7 Operation of frequency discriminator

7-4 REEL MOTOR DRIVE CIRCUIT

The reel motors are slotless DC motors. The drive circuit for them are as shown in Fig. 7-8. There are no adjustment points on the circuit.

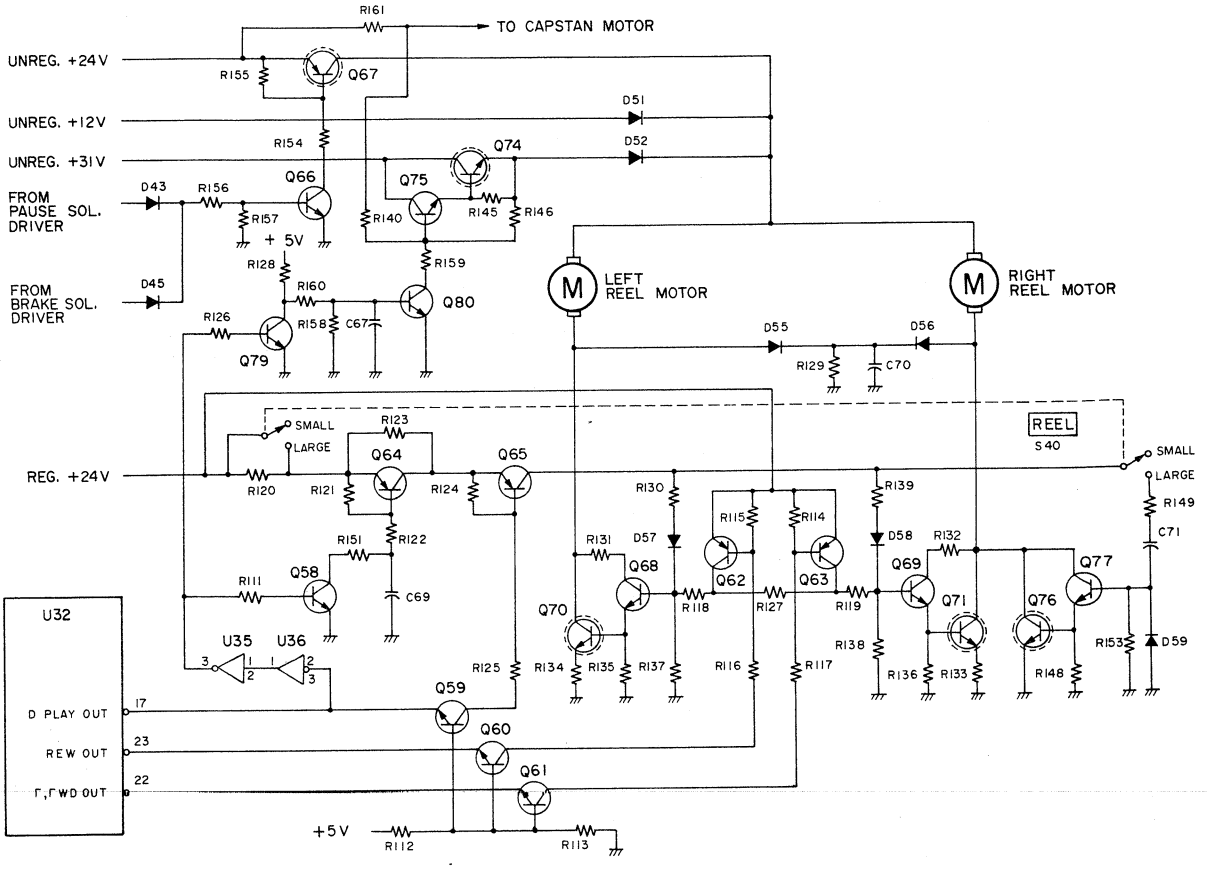


Fig. 7-8 Reel motor drive circuit

7-4-1 PLAY OPERATION

Fig. 7-9 shows the circuit relative to PLAY operation. It is taken from Fig. 7-8. In Fig. 7-9, When the 32-2 is in the STOP mode, the conditions of the IC terminals and transistors are as below.

U32 pin 17: H level U36 pin 1: L level U35 pin 3: H level Q59, Q65: OFF Q68 ~ Q71, Q77, Q76: OFF Q58, Q64: ON Q79: ON Q80: OFF Q74, Q75: ON Q66, Q67: OFF

Pushing the PLAY button sets U32 in the PLAY mode and its pin 17 goes low, to conduct the following operations.

- When pin 17 of U32 goes low, Q59 then Q65 go on. Q65 being on, base current of Q69 flows by route REG. +24V, R120, Q64, Q65, R139 and D58, causing Q69 and Q71 to go active. Also base current flows to Q68 via R130, D57, thus Q68 and Q70 become active. At this time, as the R139 resistance value is smaller than that of R130, a larger collector current (motor current) flows to the Q69 and Q71 side than to the Q68 and Q70 side. The Q69 and Q71 collector current creates take-up torque and that of Q68 and Q70 creates the back tension torque. When the REEL switch is set to LARGE, R120 will be shorted. This causes the Q69 and Q68 base currents to increase and raise the motor torque.
- When pin 17 of U32 goes low, pin 1 of U36 goes high, and pin 3 of U35 low. For this reason, Q58 and Q79 go off.
- Q58 being off allows charge current to flow to C69 through Q64 and R122. With the increase in C69 charge potential, Q64 gradually goes off. Therefore current flow route to Q65 side shifts from Q64 to R123. As a result, as shown in Fig. 7-9, the Q65 collector voltage is high when PLAY mode begins, then after approximately 200 msec drops to a lower level state. This gives a larger torque to the reel motors when they first start up so as to take up tape slack.

- When the deck starts the PLAY mode, a high level signal flows to Q66 base from the brake solenoid driver for approximately 800 sec., and Q66 goes on for this period. Due to Q66 going on, approximately. +22V voltage is given to the left and right motors. (As the UNREG. +24V and UNREG. +31V power supplies are not stabilized, when the load is larger at the time of PLAY mode start the voltage falls to approximate +22V.) Approximately 800 msec after starting, Q66 goes off, and Q67 becomes off.
- Meanwhile as stated before, when pin 17 of U32 goes low, Q79 will go off. From this, C67 is charged via route +5V, R128, R160. Then, when charging has ended after approximately one sec, Q80 goes on. While Q80 is off, bias is given to the Q75 base from the UNREG. +24V power supply through R161 and R140 and Q74 emitter potential is kept at approximate 22V. When Q80 goes on, Q75 base bias is potential divided by R161+R140 : R159, and the Q74 emitter potential falls to approximately 7V. At this time, because Q67 is already off, UNREG. +12 V power supply goes via D51 to the left and right reel motors. As a result, approximate +22V is applied to the reel motors for approximately one sec. when PLAY mode starts. Approximately +12V is supplied in the steady state. Also this power changeover operation is for the purpose of smoothing tape start and to take up tape slack.
- When the REEL switch is changed from SMALL to LARGE, Q77 base current flows via R149 and C71, thus for approximately 50 msec Q77 goes on then Q76 becomes on. The right reel motor torque therefore increases temporarily, taking up tape slack.

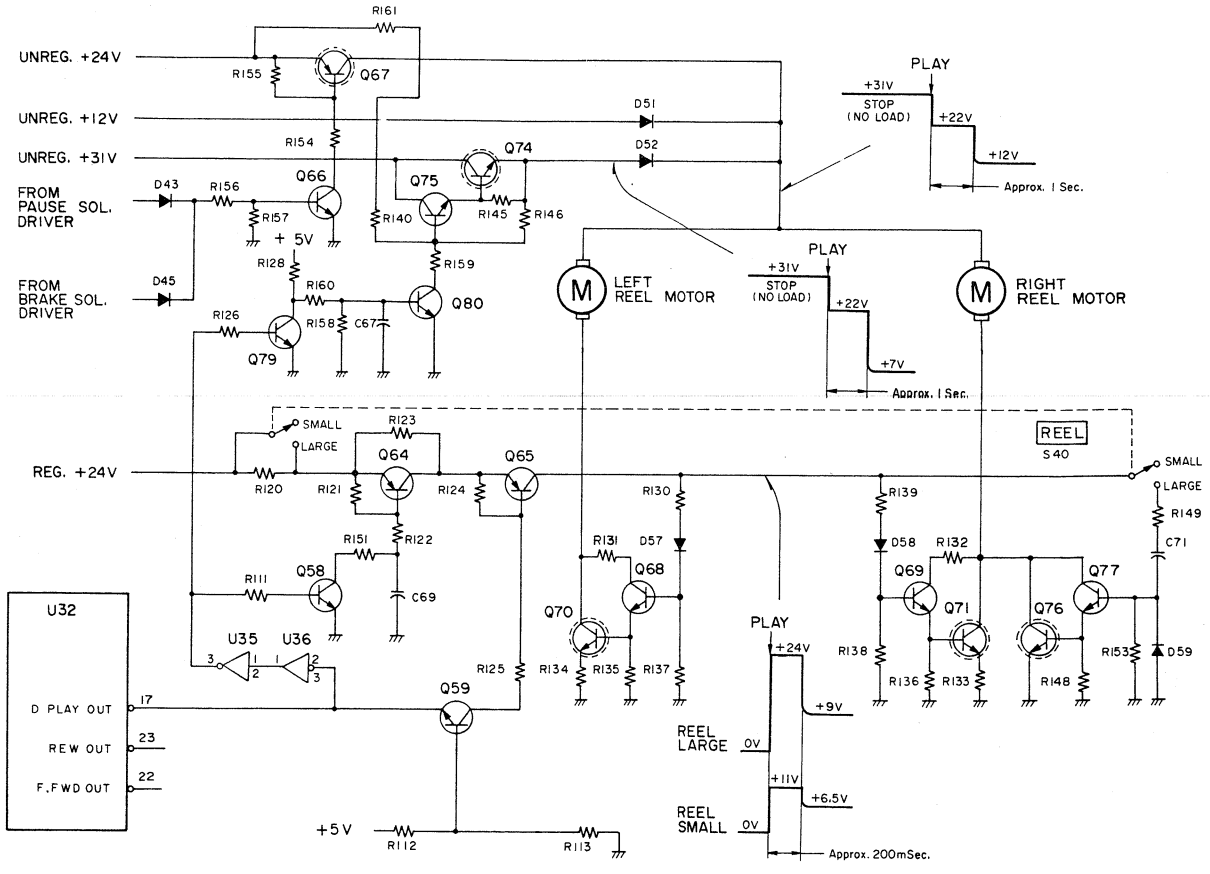


Fig. 7-9 Play operation (from Fig. 7-8)

7-4-2 F. FWD AND REW OPERATION

Fig. 7-10 shows circuit relative to F. FWD and REW operation, taken from Fig. 7-8.

- In the F. FWD mode, pin 22 of U32 goes low and Q61 goes on, followed by Q63. As Q63 goes on, base current flows to Q69 via Q63 and R119 from the REG. +24V supply. The base current at this time is larger than in the PLAY mode, and consequently the collector current (motor current) of Q69 and Q71 gets considerably larger than in the PLAY mode. Thus the right reel motor produces a large take up torque. At the same time, because Q68 base current flows through Q63, R127 and R118, slight collector current of Q68 and Q70 flows and the left reel motor produces back tension torque.
- When in the REW mode, pin 23 of U32 goes low, thereby causing Q60 then Q62 to become on. A similar process, when in the F. FWD mode, supplies the left reel motor with a large take up torque and the right one with a much smaller back tension torque.
- When the F. FWD or REW mode starts, Q66 and Q67 go on for approximate 800 msec as in the PLAY mode start, causing the left/right reel motors to be supplied with approximate +24V. Q66 and Q67 go off after 800 msec, allowing the left/right reel motors to be given approximately +18V through Q74 and D52. (This +18V means DC mean value. Since the UNREG. +31 V supply has considerable ripple due to the half-wave rectifier, the reel motor is also supplied from the UNREG. +12V supply.)
- D55, D56, C70 and R129 are provided to prevent transistors from being damaged by the reel motor's back EMF.

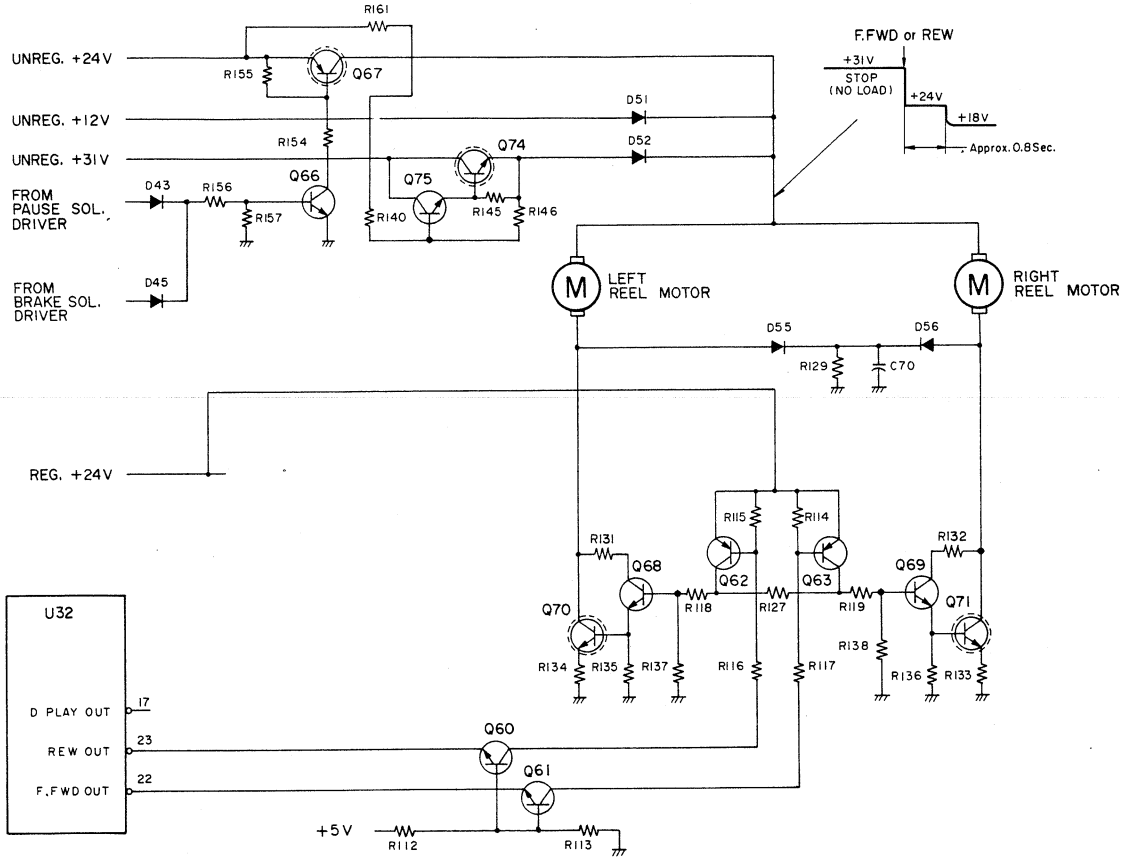


Fig. 7-10 F. FWD and REW oparations (from Fig. 7-8)

7-5 SOLENOID DRIVE CIRCUITS

The 32-2 uses four solenoids and their drive circuits are as shown in Fig. 7-11.

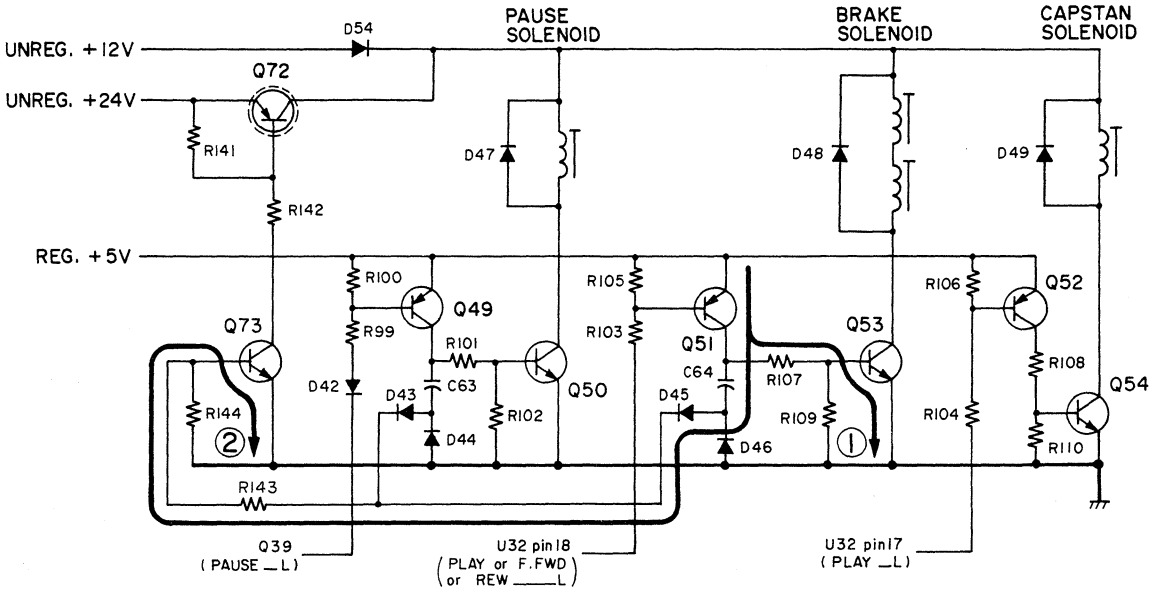


Fig. 7-11 Solenoid drive circuit

7-5-1 SOLENOID FUNCTIONS

(1) Capstan solenoid
In the PLAY mode, this solenoid operates, activating the pinch roller, the solenoid goes off in the PAUSE mode.

(2) Brake solenoid
In each of the PLAY, F. FWD and REW modes this solenoid operates and the brakes for reel motors are released. The solenoid goes off in the PAUSE mode.

(3) PAUSE solenoid
This functions in the PAUSE mode and puts the pinch roller in the stand-by position.

7-5-2 OPERATION EXAMPLE

Brake solenoid operation, as example, is explained hereunder. (Refer to Fig. 7-12.)

- When the deck is in the STOP mode and the PLAY button is pressed, pin 18 of U32 (BRK OUT) goes low.
- When pin 18 of U32 goes low, Q51 goes on and current flows thru route (1), turning on Q53.
- At the same time via route (2) C64's charge current flows and Q73 and Q72 go on for approximately 0.2 sec.
- Q72 being on supplies the brake solenoid with +24V. A large solenoid current flows and the solenoid is thus firmly and positively activated.
- C64's charge current stops flowing; when the current ceases thru route (2), Q73 and Q72 go off.
- Q72 goes off, stopping the +24V supply. +12V is supplied via D54 and the solenoid is held with a minimal voltage.

In this way the solenoid's applied voltage during activation and holding switches over, maximizing the activating force to ensure positive action but minimizing heating of the solenoid during holding. There is no direct connection between the capstan solenoid drive circuit and the voltage switching circuit (Q73,Q72), however, whenever the capstan solenoid is operated, the brake solenoid always operates simultaneously, and for this reason the circuit is omitted.

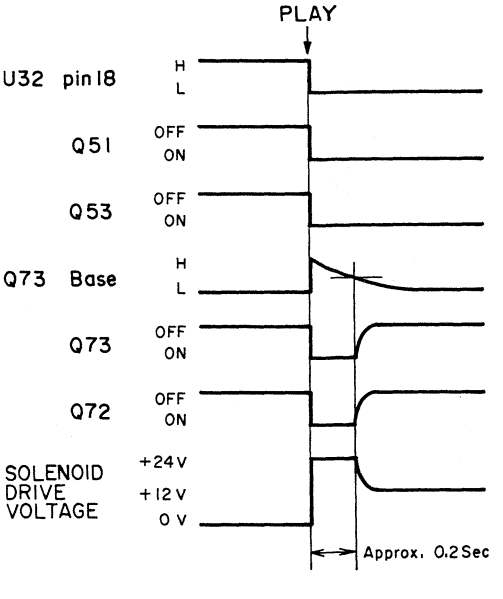


Fig. 7-12 Brake solenoid operation timing chart

7-6 DISPLAY CIRCUIT

There are 3 LEDs mounted on the 32-2 to indicate the operating condition the deck is in.

7-6-1 RECORD LED

Q34 and Q35 constitute square wave oscillator with period of approximate 0.8 sec. When the REC MODE switch S301 is on, pin 9 of U35 goes high and pin 8 outputs an alternating H/L signal. At this time pin 14 of U32 is high so the output from pin 11 of U35 also alternates between H and L, turning Q36 on and off and flashing the RECORD LED D801, indicating the REC STAND-BY mode. In the REC mode and REC PAUSE mode, pin 14 of U32 goes low and pin 11 of U35 is held high, keeping the RECORD LED permanently lit.

7-6-2 REC MUTE LED

If the REC MUTE button is pressed during REC/PLAY, pin 13 of U36 (pin 11 of U37) goes low. While pin 11 of U37 is low – in short during the REC MUTE mode – pin 13 of U37 outputs an alternating H/L signal to flash the REC MUTE LED D802.

7-6-3 PAUSE LED

In the PAUSE mode pin 12 of U32 goes low, turning Q38 off and Q39 on, lighting the PAUSE LED D803.

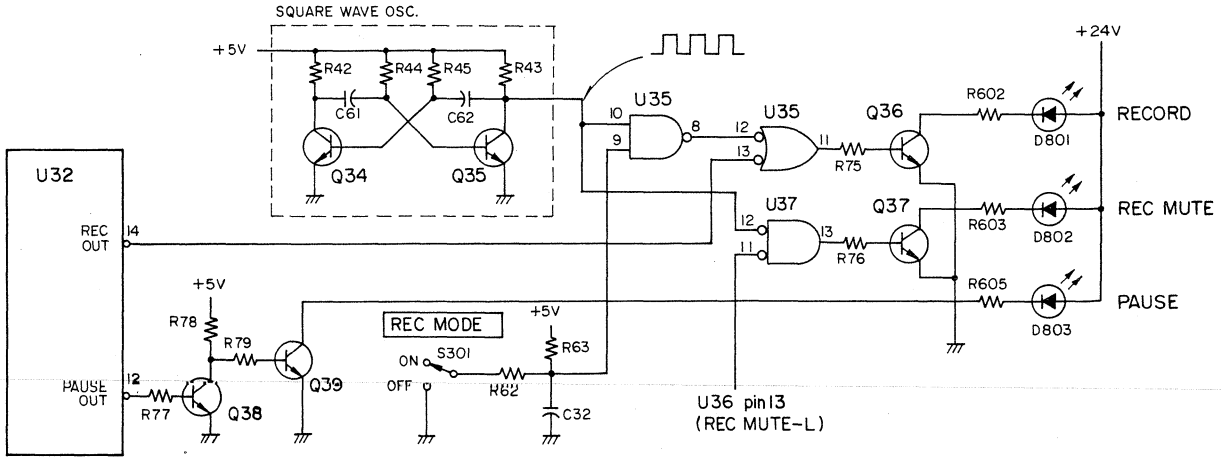


Fig. 7-13 Display circuit

7-7 REPLAY MUTING CIRCUIT

Refer to Figs. 7-14 and 7-15.

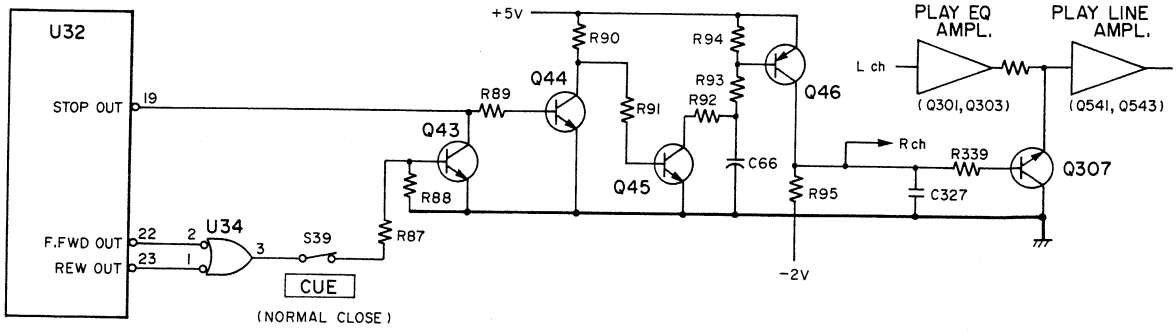


Fig. 7-14 Replay muting circuit

7-7-1 DURING PLAY OPERATION

When the deck is in the STOP mode, pin 19 of U32 is low and pins 22 and 23 are high. Thus Q43 and Q44 are off and Q45, Q46 and Q307 (in amplifier section) are on and the replay amplifier is muted. If the 32-2 is in PLAY or PAUSE mode pin 19 of U32 goes high, so Q44 goes on and Q45 goes off. When Q45 goes off, C66 starts to charge up from the +5V supply via R94, R93 and C66. As C66 charges, Q46 gradusally goes off Q307 also goes off gradually, releasing the muting of the replay amplifier.

7-7-2 DURING CUE OPERATION

When the deck is in the F. FWD (or REW) mode, pin 19 of U32 goes also high, however in this case, pin 22 (or pin 23) of U32 goes low and pin 3 of U34 goes high. This switches Q43 on, Q44 off and Q45, Q46 and Q307 on, muting the replay amplifier. Operating the CUE lever at this time opens S39 and Q43 goes off. This puts Q44 on and Q45, Q46 and Q307 off, releasing the muting function.

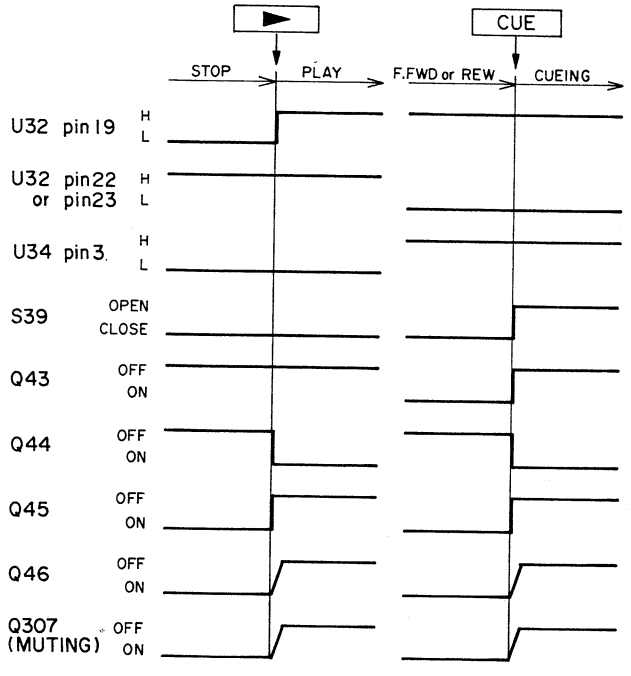


Fig. 7-15 Replay muting circuit timing chart

7-8 RECORD MUTING CIRCUIT

Refer to Figs. 7-16 and 7-17.

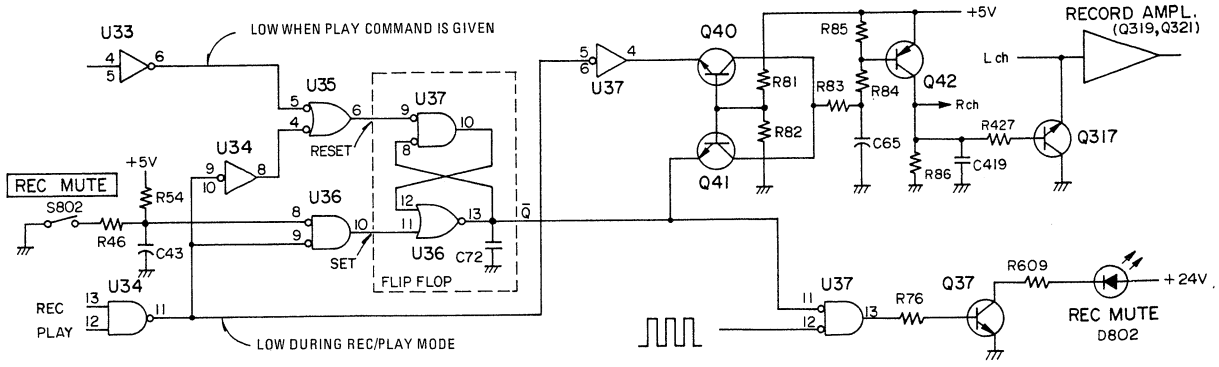


Fig. 7-16 Record muting circuit

When a high level signal is presented to the set input of the flip flop shown in the middle of Fig. 7-16, the $\overline{Q}$ output will be low. When a high level signal is presented to the reset input, the $\overline{Q}$ output will be high.

Set condition:

When the REC MUTE button is pressed when the deck is in the REC/PLAY mode.

Reset condition:

A. When the REC/PLAY mode is cancelled (i.e. when the deck goes into any of the following modes: STOP, PAUSE, F. FWD or REW.

B. When a PLAY command signal is produced (when the PLAY button is depressed.)

When the deck goes into any of the following modes; STOP, F. FWD, REW, PAUSE and REC/PAUSE, pin 11 of U34 is high and pin 4 of U37 is low. For this reason, Q40 goes on followed by Q42, Q317 (in amplifier section), causing record amplifier to be muted. During REC/PLAY mode, U34 pin 11 goes low, then U37 pin 4 goes high, while flip-flop $\overline{Q}$ output holds high. Thus Q40 thru Q42 and Q317 go off, causing record amplifier's muting to be released. When REC MUTE button is pushed during REC/PLAY operation, flip-flop is set, then its $\overline{Q}$ output becomes low. Q41, therefore goes on, followed by Q42 and Q317 (in amplifier section), muting the record amplifier. As the bias oscillator is operating because the RECORD mode is not released at this time, the tape runs in a "no signal recording" condition. In the REC MUTE mode (i.e. while flip-flops $\overline{Q}$ is low), the REC MUTE LED D802 flashes as described in section 7-6-2.

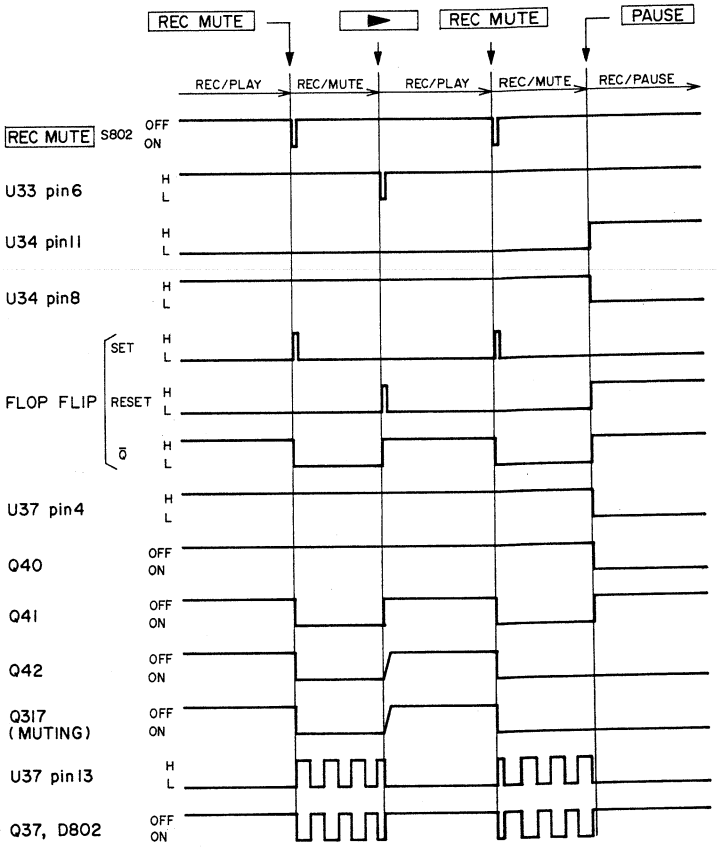


Fig. 7-17 Record muting timing chart

7-9 TIMER CIRCUIT

When timer operation takes place, if the REC MODE switch is off the deck goes into the play mode (timer play) and if the REC MODE switch is on it goes into the record mode (timer recording). In this section the operation is described with the REC MODE switch set on. When the 32-2 is powered up it is supplied directly with +5V and this charges up C58 via R73. Until C58 has finished charging, U32 pin 21 (CR3) is held low and this takes about one second. While CR3 is held at a low level, U32 pin 20 is also low and this constitutes the timer start signal (TM OUT). During this (approximate) one second period the low level timer start signal goes to pin 1 of U33 and pin 5 of U34 via S32 and R53. This is equivalent to pressing the PLAY and RECORD buttons simultaneously and the 32-2 goes into the REC/PLAY mode. Actually it takes about four sec to start the REC/PLAY mode since the 32-2 is supplied with an AC power supply. Even if during initial one sec system control, IC (U32) has memorized the REC/PLAY mode, it requires approximately four sec (due to the large charging time constant. When power goes to the ON CR2 terminal, (U32 pin 16) goes high, and during this duration tape starting is inhibited.

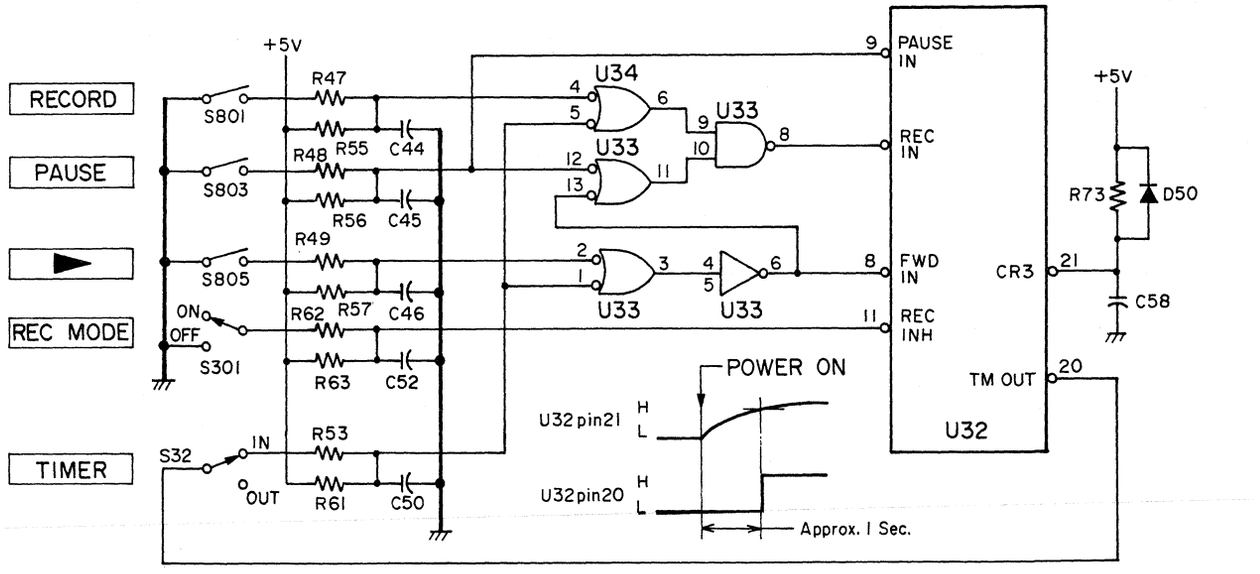


Fig. 7-18 Timer circuit

7-10 STOP SENSOR CIRCUIT

A stop sensor circuit is provided so that, when the deck is in the F. FWD mode (or REW mode) and the PLAY button is pressed, electrical braking will be applied to the reel motors, reducing the tape speed. Mechanical brakes are then applied, the tape stops and the deck then enters the PLAY mode. (Refer to section 7-11-5 for an explanation of the operation of the electrical brakes). When the stop sensor operates as noted above, it outputs a timing signal to release the electrical brakes and activate the mechanical brakes and then one to release the mechanical brakes and set the PLAY mode. This explains what happens when the PLAY button is pressed when the deck is in the REW mode. E701 is a magnetoresistive element. A ring magnet is attached to the shaft of the right reel motor and as it rotates, changes in the magnetic field are converted into a signal which is output by the sensing element. The deck is in the REW mode and while the tape is running, a sensing signal is output (detecting the rotation of the shaft). This signal is wave-shaped by comparator U701 and passes thru C703 to the (next) comparator. Pin 14 of U701 produces an alternating high/low output. When it is high C704 charges thru route R709 and R710 from the +5V supply. When it is low C704 discharges thru R710 and internally in U701 to ground. As the discharge time constant is much smaller than the charging time constant, so the short pulse duration when the tape is running at high speed means that the potential on C704 does not go up and the level on pin 6 of U701 will be low. For this reason, pin 1 of U701 (U32 pin 4) will be high. While pin 14 of U701 is high +5V flows thru R709, D701 and R715 to charge C57. However, when the deck is in the REW (or F. FWD) mode point 1 on the internal gate A in U32 is high and Q3 in gate A turns on, holding pin 16 (U32 – CR2) low so that C57 is unable to be charged. If the PLAY button is pressed when the deck

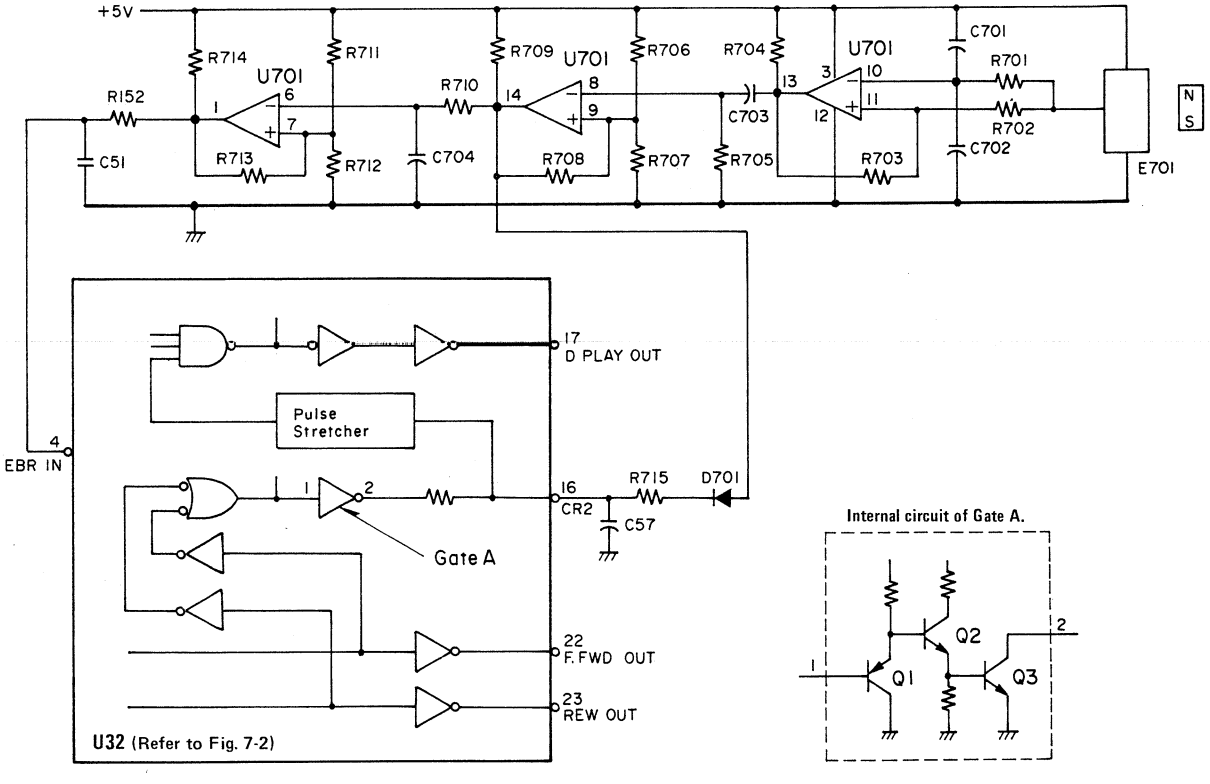


Fig. 7-19 Stop sensor circuit

is in the REW mode, pin 23 of U32 goes high, pin 22 goes low and the deck goes into the F. FWD mode. However, the PLAY mode is "memorized", internally in U32. Electric braking is then applied to the reel motors and the tape speed drops rapidly from its high level. The rotation of the reel motors therefore slows down and the rotation detection signal from E701 gradually becomes longer in period. The positive edge (i.e. the transition from low to high) of the wave-shaped rotation detection signal (U701 pin 13) is differentiated by C703 and sent to pin 8 of U701. For this reason, at pin 14 of U701 the low level time remains constant but the high level time gradually lengthens. C704 charges while pin 14 of U701 is high and discharges when it is low. Thus when the signal period is low, the potential on C704 is low and as the period increases, so the potential on the capacitor goes up. When the potential on C704 (that is to say, on U701 pin 6) is higher than that on pin 7 of U701, the output from pin 1 changes from high to low. Consequently, pin 4 of U32 (EBR IN) also becomes low. When the EBR IN signal becomes low, the electric brakes are released. The F. FWD mode is released and the mechanical brakes are applied. At the same time U32's internal gate A point 1 goes low and Q3 in gate A turns off. Q3 does not have a pull up resistor so even when it goes off, charge current does not flow to C57 and pin 16 of U32 (CR2) stays low. While CR2 stays low, the PLAY mode memorized in U32 is retained. This condition is the same as the STOP mode. When the mechanical brakes are applied to the reel motors, the tape speed drops even more. After Q3 of gate A goes off current starts to flow to C57 thru R709, D701 and R715 as long as U701, pin 14 is high. C57 charges up and pin 16 of U32 (CR2) goes high and the mechanical brakes are released. At the same time the PLAY signal (D PLAY) which has been retained in U32 is output and the deck goes into the PLAY mode.

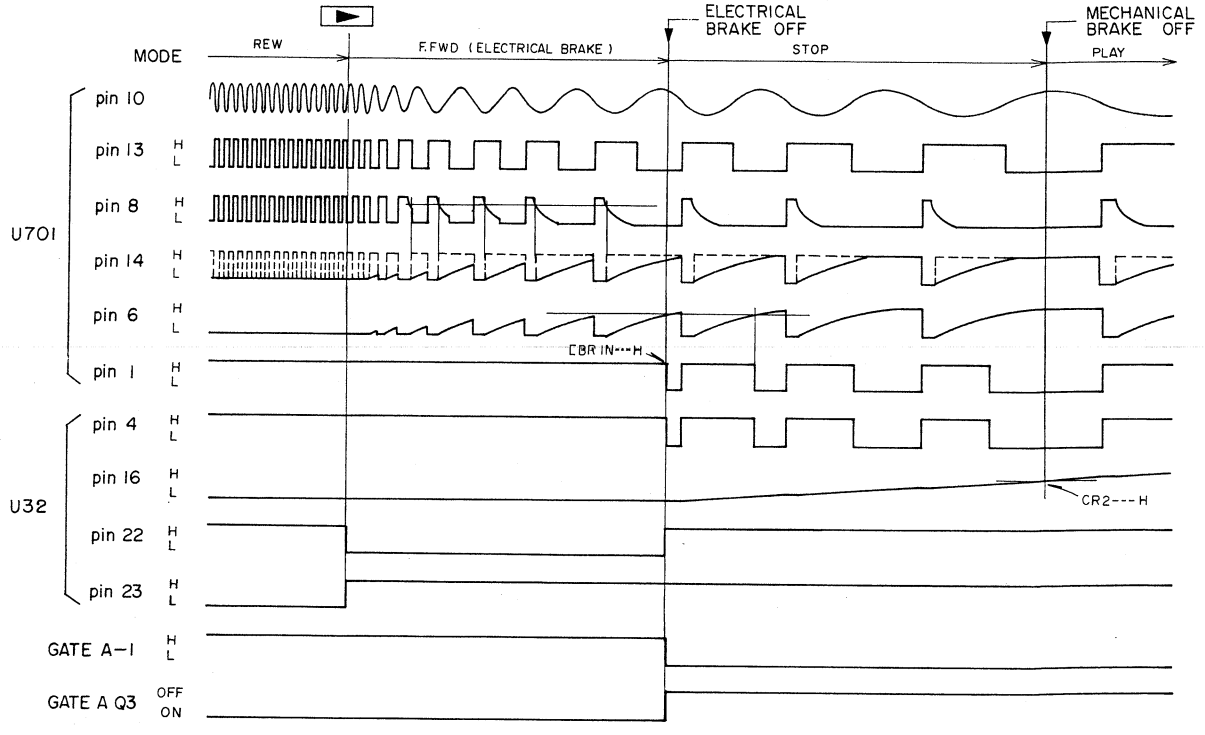


Fig. 7-20 Stop senser timing chart

7-11 DECK MODES

7-11-1 PLAY MODE

Refer to Fig. 7-21.

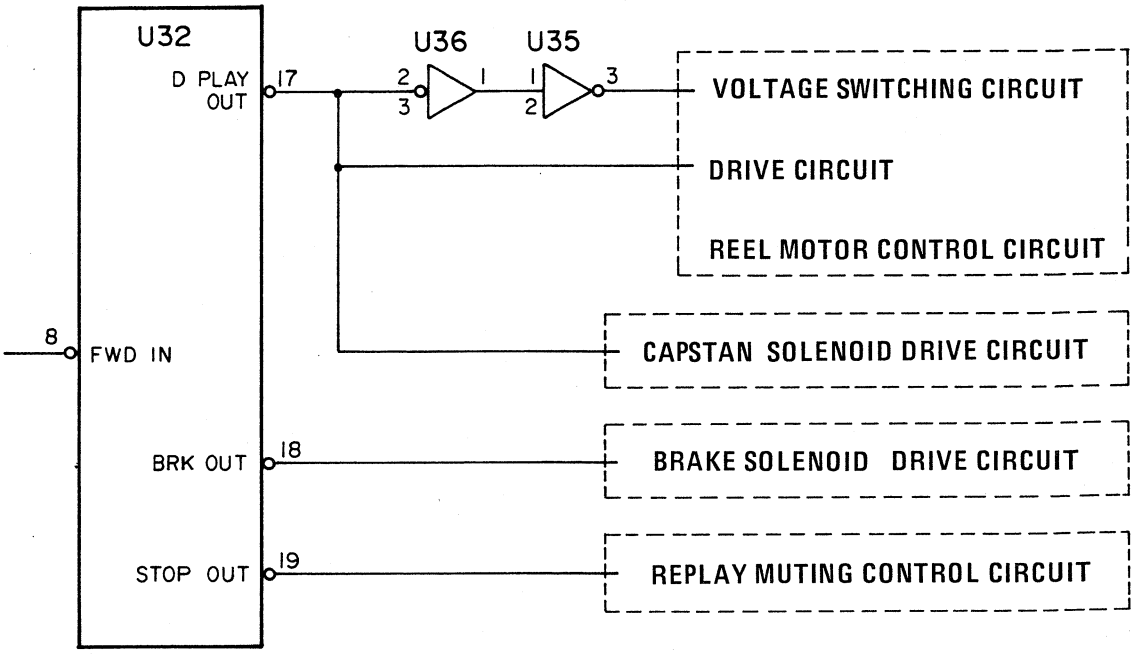


Fig. 7-21 Play mode system diagram

In the STOP mode pins 17 and 18 of U32 are high and pin 19 is low. U32 pin 8 is presented with the PLAY command signal with low level and pins 17 and 18 go low and pin 19 goes high. This results in the deck going into the PLAY mode by the following process:

- The capstan solenoid goes on and operates the pinch roller.
- The brake solenoids go on, releasing the brakes from the reel tables.
- The reel motors start working.
- The replay amp muting is released.

7-11-2 RECORD MODE

If the RECORD and the PLAY buttons are pressed at the same time, the deck goes into the REC/PLAY mode. In addition to the explanation given above for PLAY mode operation, the REC/PLAY mode has the following:

- U32 pin 14 goes low and U36 pin 4 goes high.
- Thus U34 pin 11 goes low, the REC MUTE circuit operates and the record amp muting is released.
- At the same time, Q47 and Q48 go on and the record bias oscillator starts to oscillate.

7-11-3 PAUSE MODE

Refer to Figs. 7-21 and 7-22.

If the PAUSE button is pressed when the deck is in the PLAY mode, pin 17 and 18 of U32 go high and pin 12 goes low. This means that the capstan solenoid and brake solenoids go off and the reel motors stop. Q38 and Q39 go off, the PAUSE solenoid goes on and the PAUSE LED lights up. The U32 pin 19 being low, the replay amp muting is released. If the PAUSE button is pressed when the deck is in the RECORD mode, U32 pin 14 goes low (in addition to the processes described above). Because of this, during REC/PAUSE the REC LED remains lit and the bias oscillator remains operating. However, as U32 pin 17 is high, U36 pin 1 goes low and U34 pin 11 goes high, applying muting to the record amplifier.

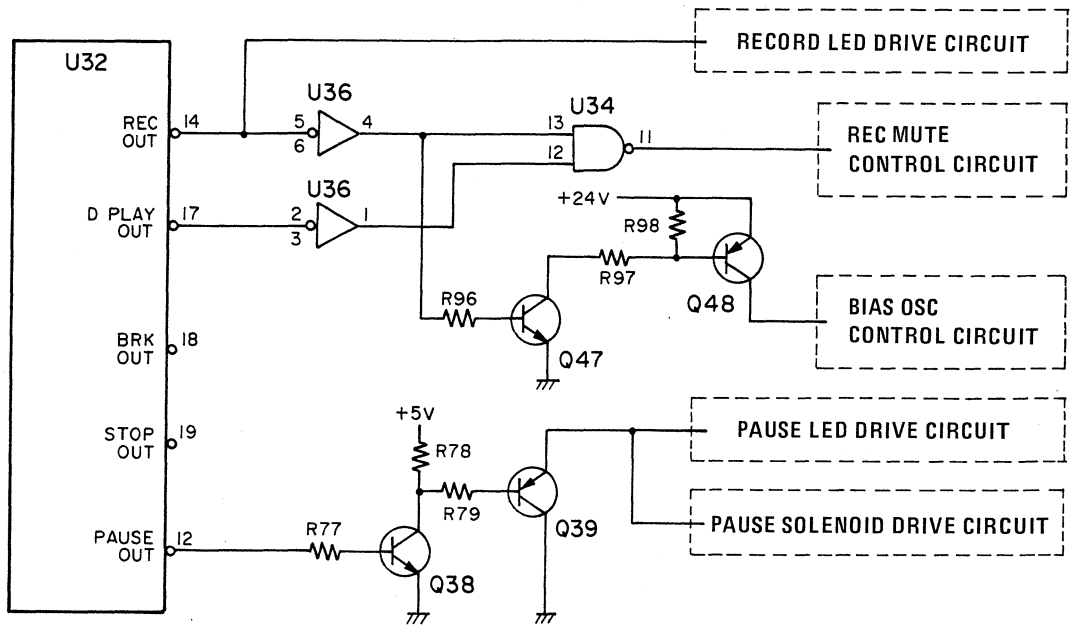


Fig. 7-22 Record mode system diagram

7-11-4 F. FWD AND REW MODES

Refer to Fig. 7-23.

When the F. FWD button (or REW button) is pressed, pin 22 of U32 (or pin 23) and pin 18 goes low and pin 19 goes high. Due to the low level on pin 22 (pin 23) of U32, the reel motor drive circuit is set in the F. FWD (or REW) mode. U34 pin 3 goes high and the replay amplifier is muted. U32 pin 18 goes low and the brake solenoid is operated.

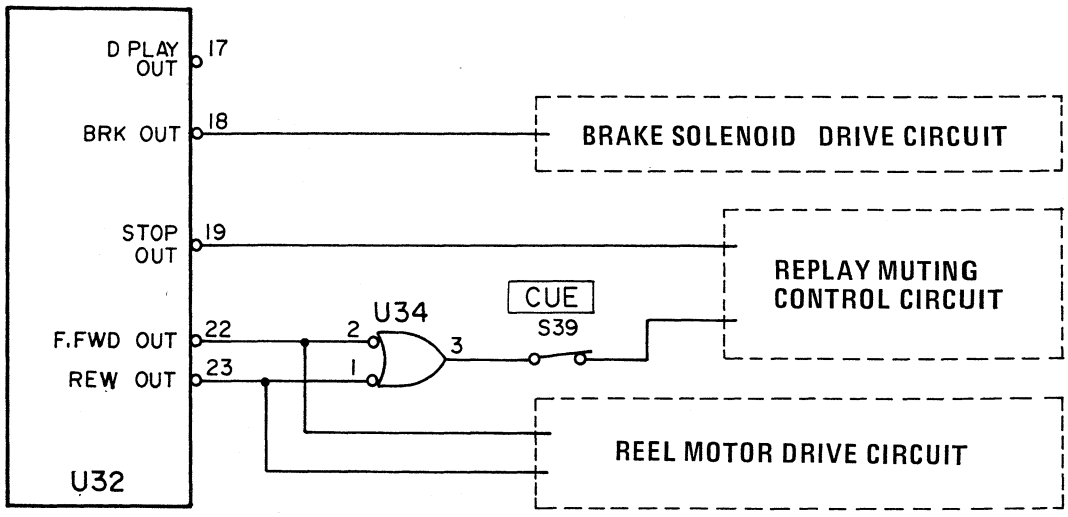


Fig. 7-23 F. FWD and REW mode system diagram

7-11-5 ELECTRIC BRAKE OPERATION

The operation of the electric braking process was described in section 7-10. Fig. 7-24 illustrates the operation of the electric braking. In case of (3) and (4) in Fig. 7-24, operation is continued. Now, for example, assume that the F. FWD button is pressed when the deck is in the STOP mode, then the STOP button is pushed before the tape begins to move in the F. FWD direction. In this case, if the electric brake circuit operates, without going into the STOP mode, the deck could go into the REW mode. To prevent this, the circuit is constructed so that the electric brake will not operate immediately after going into the F. FWD or REW mode. Refer to Fig. 7-25. The Q53 is off and the brake solenoid is not operating, a +12V supply passes thru the brake solenoids, R67 and D40 to charge C56 and Q56 goes on. Consequently, EBR IN goes low. If the deck goes into the F. FWD or REW modes, Q53 goes on and the charge in C56 discharges thru R65 and Q56. Q56 goes off after approximately one second. The electric brake will not operate unless: 1) Q56 is off and 2) the tape speed is approximately 4 times as fast as in the PLAY mode, holding the output of U701, pin 1 high. If the right shut off switch goes off while the electric brake is operating, Q57 will go on and the electric brake operation will be reset. At the same time, due to the STOP signal, the deck will immediatly enter the stop mode. Meanwhile, even though RECORD and PLAY buttons are depressed simultaneously while EBR IN terminal is high (that is when the tape speed during F. FWD or REW mode is more than about four times as fast as in the PLAY mode), the deck does not go into the REC/PLAY mode. In this case, deck goes into the PLAY mode after electric brake operation. Fig. 7-26 illustrates, by way of example, what happens going from the REW to the PLAY mode (as per the description given above).

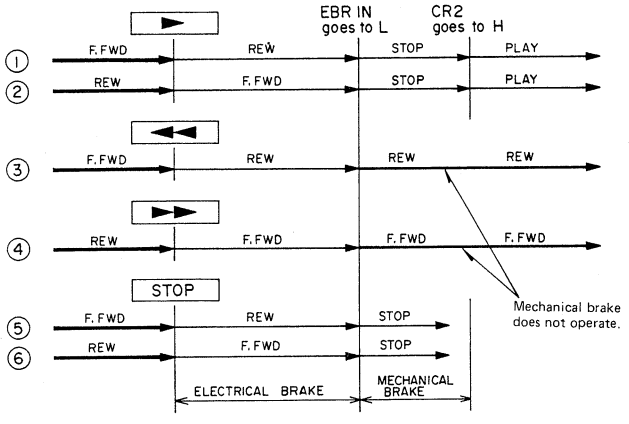


Fig. 7-24 Electric brake operation

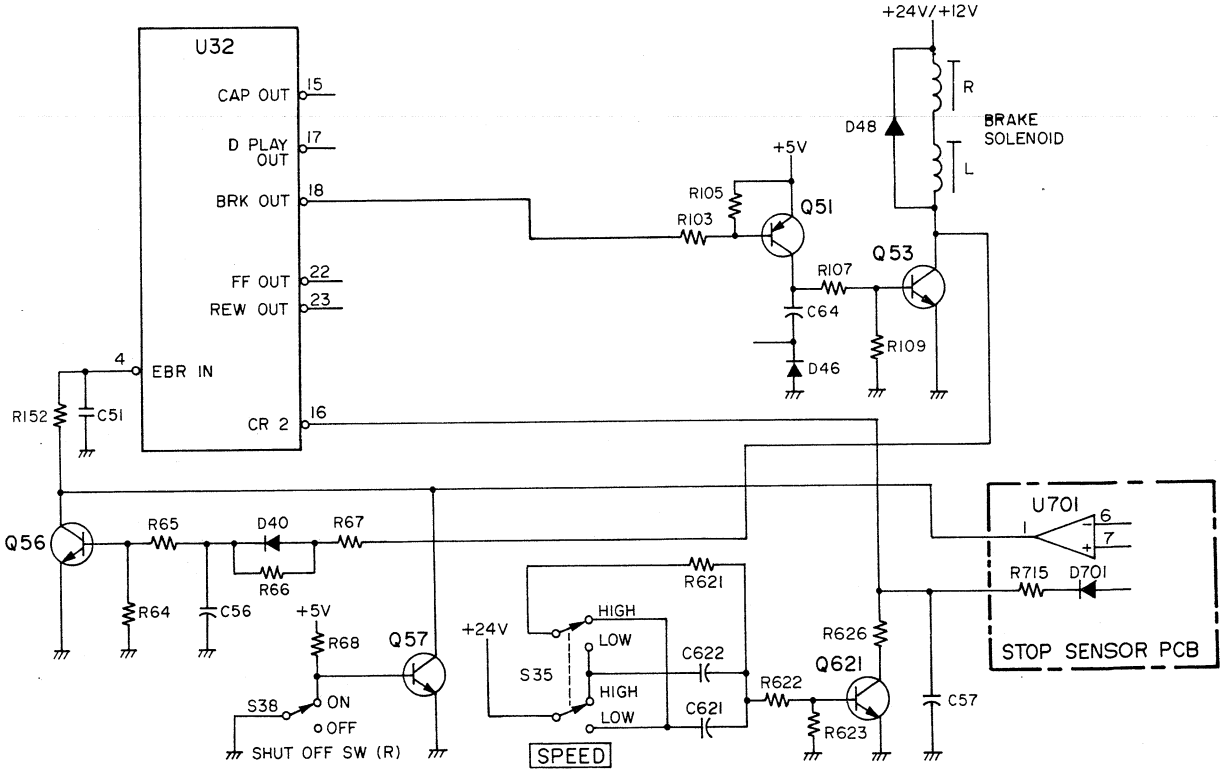


Fig. 7-25 Electric brake circuit

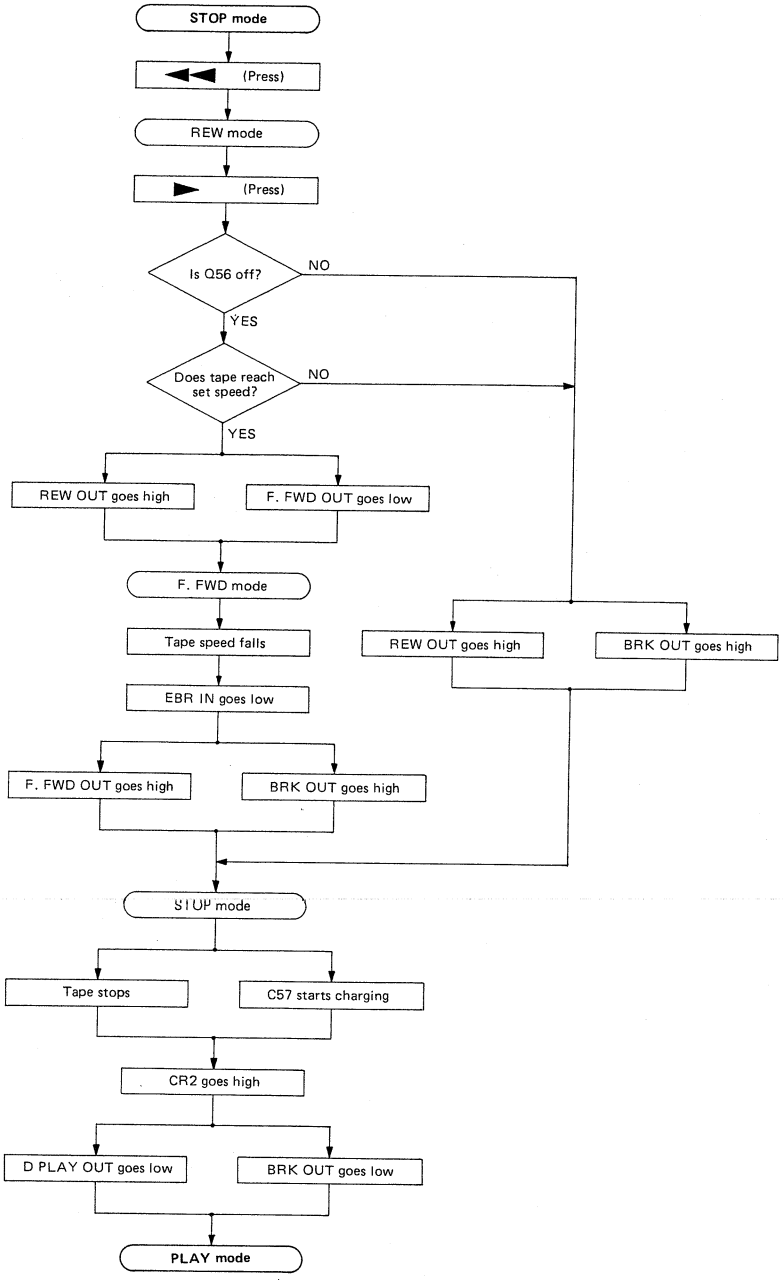


Fig. 7-26 REW → PLAY process

7-11-6 SPEED CHANGEOVER

Although changing the tape speed (capstan motor speed) was described in section 7-3-2, when the speed is changed a delay is created, causing the deck to stop momentarily. Refer to Fig. 7-25. When the speed switch is changed from HIGH to LOW (LOW to HIGH), current charges C621 (C622) then Q621 in a moment switches on. At this time C622 (C621) discharges thru R621. Except when the deck is in the F. FWD or REW modes, C57 is charged and CR2 goes high; when Q621 goes on, C57 discharges and the level on CR2 becomes low. Thus directly after tape speed is changed the deck will not enter the PLAY mode until C57 has been charged (until capstan rotation has been stabilized).

8 AMPLIFIER CIRCUIT DESCRIPTION

This description covers only the L channel with exception of the power muting circuit and bias oscillator.
In circuits where the L and R channels are independent, with exception of terminal Nos and IC U301, left channel components and right channel equivalent components are given sequential Nos; odd Nos = left channel and even Nos = right channel
Example: R307 ... L channel, R308 ... R channel

8-1 PLAYBACK EQUALIZER AMPLIFIER

See Fig. 8-1. The playback equalizer amplifier is a direct-coupled amplifier of two stages, Q301 and Q303, which has a negative feedback circuit having compensation characteristics.

- NAB characteristic
  The time constant of the NAB curve is 3,180 μsec for low frequencies and 50 μsec for high frequencies at both the HIGH speed (38 cm/sec) and LOW speed (19 cm/sec.)
  The time constant T_L of low frequencies is R325 x C319. Because of the "contour effect", frequency response is slightly higher at low frequencies when the tape speed is HIGH than when LOW. For this reason, T_L is given a value which is smaller than 3,180 μsec but does not affect response at the LOW speed.

  Time constant T_H of high frequencies is given as follows.
  T_H = C319 x R325//(R327 + R331 + (R313 +R311)// R309)
  NOTE: "//" represents the total resistance of resistors in parallel.
  R327 is variable resistor that adjusts frequency response at high frequencies.
  At LOW speed, loss rising at high frequencies is compensated for by turning on Q305 so that C323 and R333 reduce negative feedback of high frequency region. Be sure to adjust frequency response first at HIGH speed (with R327) and then at LOW speed (with R333).
- IEC characteristic
  In the 32-2, the equalizer can be switched over NAB and IEC at HIGH speed. Q333 turns on when the EQ switch is set at IEC at HIGH speed; this is when the time constant determined by R345 and C325 becomes 35 μsec.
- R313 is a variable resistor that adjusts the gain of the playback equalizer amplifier. The amplifier has a gain of about 31 dB at 400 Hz.
- The input impedance of the playback equalizer amplifier is about 200 kohms at 400 Hz and is moslty determined by R317 at high frequencies. R301 adjusts the input impedance.
- Transistor Q307 turns the muting on and off. This turns off to release the muting in the playback equalizer amplifier during the PLAY, PAUSE, REC/PLAY, and REC/PAUSE modes and when the CUE lever is raised (during cueing).

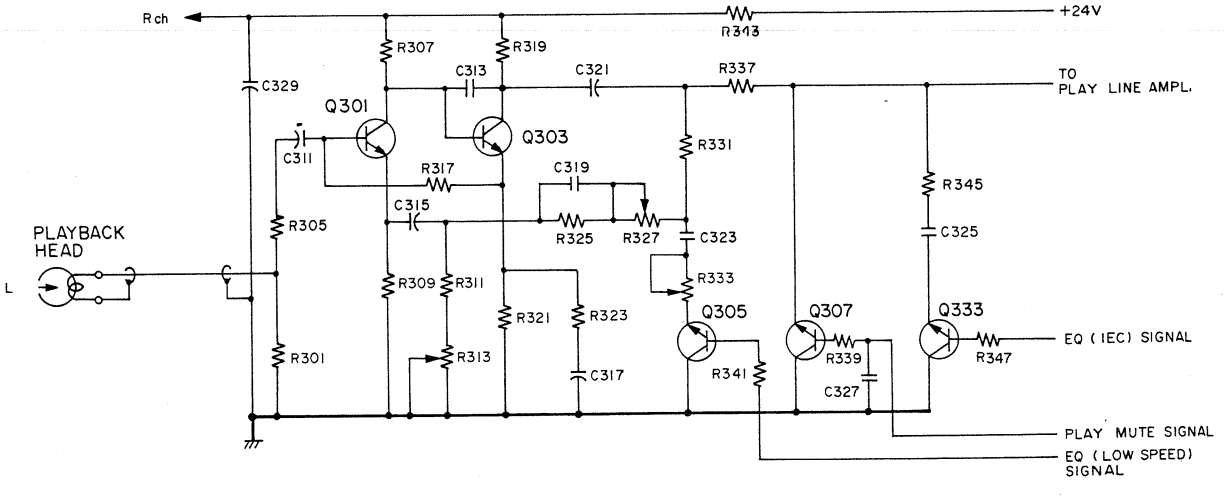


Fig. 8-1 Playback equalizer amplifier

8-2 PLAYBACK LINE AMPLIFIER

See Fig. 8-2. The 32-2 can be combined with a dbx unit (DX-2A). The reference input/output level of the DX-2A is −10 dB (0 dB = 1.0V).

The playback line amplifier raises the output level of the playback equalizer amplifier up to −10 dB. The gain of the amplifier which mostly depends on R547 and R549 is about 18 dB.

Like the playback equalizer amplifier, the playback line amplifier is a direct-coupled amplifier of two stages, Q541 and Q543 but the difference is in the use of NPN and PNP transistors. If Q541 and Q543 are both the NPN (or PNP) type in the direct-coupled amplifier, the second stage operates at a higher (or lower) DC level than the first stage. This means that the dynamic range will be narrow and distortion is more likely to affect signals unless a higher source voltage is supplied when the signal level is high. (See Fig. 8-3(A)). In the amplifier which combines the NPN and PNP types, DC levels for signals are as shown in Fig. 8-3(B). This permits use of a given source voltage effectively. Especially, a large collector-emitter voltage can be given to the first-stage transistor so that the dynamic range is wide and distortion is low. For the same reason, NPN-PNP pairs are used in the line and recording amplifiers.

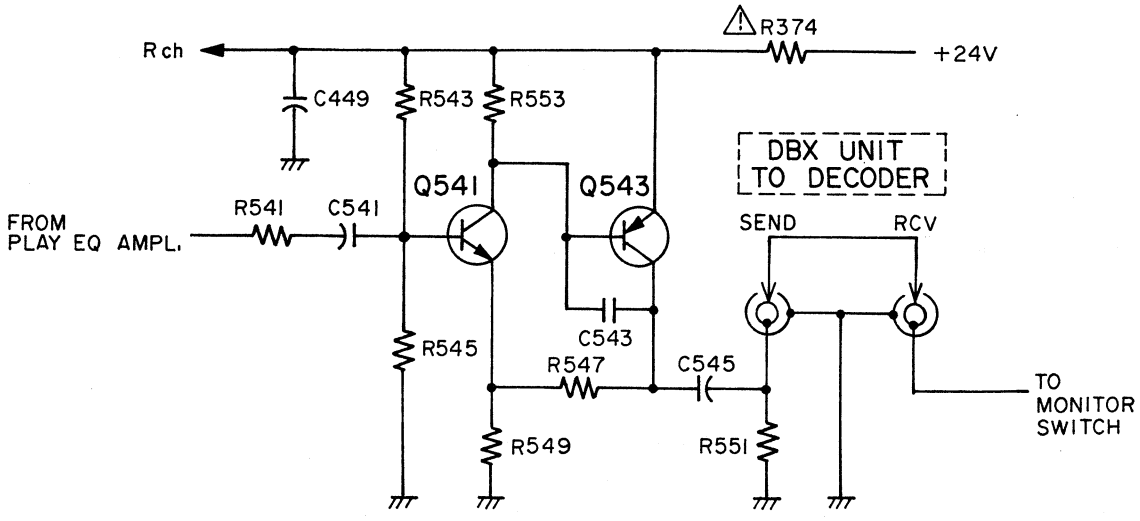


Fig. 8-2 Playback line amplifier

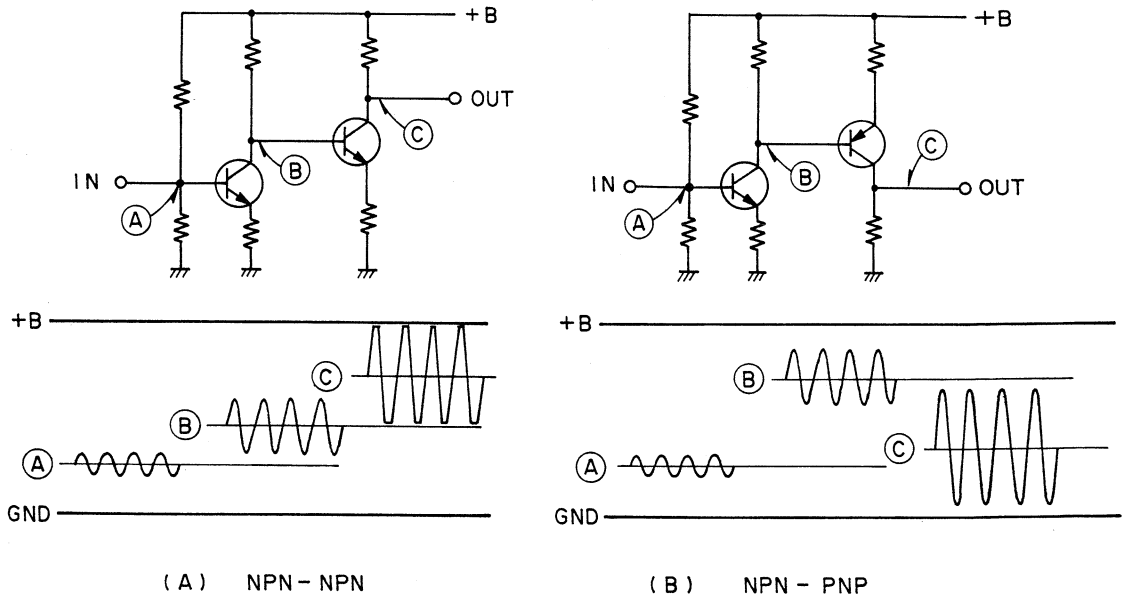


Fig. 8-3 DC signal levels in two-stage amplifiers

8-3 MONITOR AMPLIFIERS

See Fig. 8-4. IC U301 (HA11122W) is a six-circuit pack accommodating all monitor amplifiers, (output, phone, and meter amplifiers for the L and R channels).
U301 is supplied with a source power of +12V while other amplifiers are supplied with +24V. U301 has its own voltage regulating circuit consisting of Q313 and Q314, which reduces the impedance of the power line and crosstalk between circuits since the single chip contains six circuits.

8-3-1 OUTPUT AMPLIFIER

The output amplifier amplifies playback or source signals selected with the MONITOR switch and coming through the OUTPUT VR. The ouput of the output amplifier goes to the OUTPUT temrinal and phone and meter amplifiers. Variable resistor R403 adjusts the gain of the output amplifier and establishes a reference output level (−7 dB) at the OUTPUT terminal. The output amplifier has a gain of about 26 dB.

8-3-2 PHONE AMPLIFIER

This amplifier has a fixed gain. R397 is selected so that 0.3 mW is output to an 8-ohm load at the reference level (0 VU).

8-3-3 METER AMPLIFIER

When the MONITOR switch is set to TAPE, the meter reading is related with the OUTPUT VR and, at this time, R389 adjusts the level. When the MONITOR switch is set to SOURCE, the meter reading is not related with the OUTPUT VR, however related with LINE VR and MIC VR; at this time, R371 adjusts the level. R405 prevents oscillations of the meter amplifier which would otherwise occur when the non-shorting type MONITOR switch is operated and the meter amplifier's input circuit becomes open. Q331 is a buffer amplifier which prevents interference of the amplifier that is loaded with a nonlinear device, against the other amplifiers in U301. The output of Q331 is rectified by a voltage doubler to drive VU meter M301.

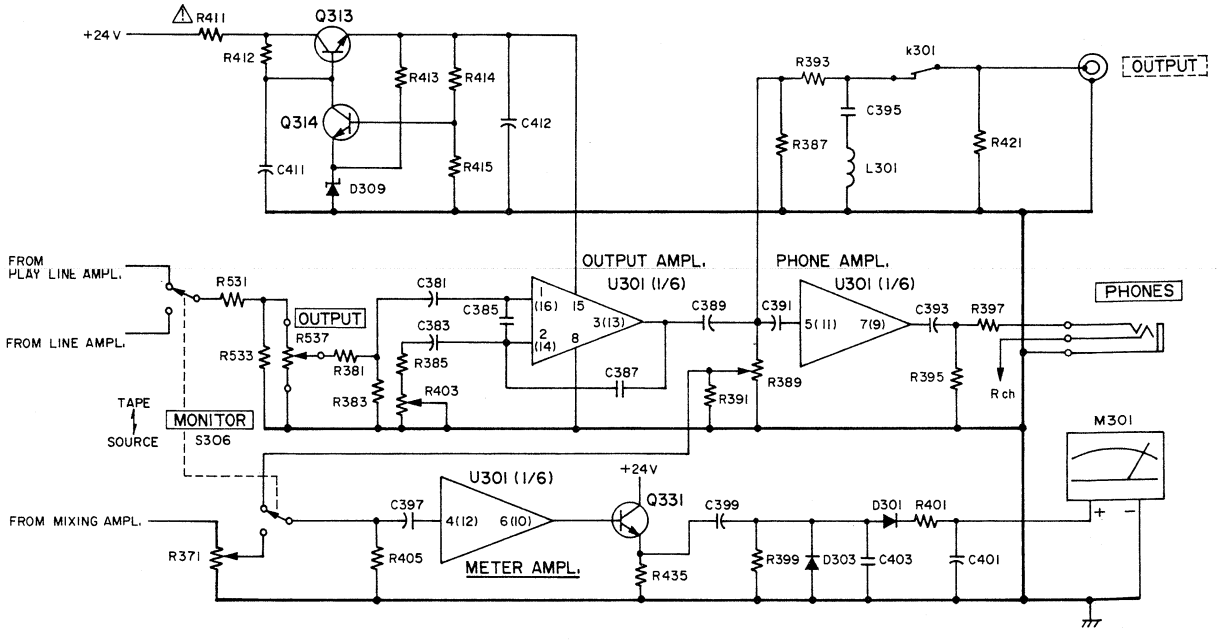


Fig. 8-4 Monitor amplifier

8-4 POWER MUTING CIRCUIT

K301 is the muting relay which protects the output line from impulse noise occuring as the power switch is turned on or off.

When the power supply starts, +6V (power of VU meter lamp) rises rapidly, charging C418 via R420 and C418. As the voltage across C418 reaches about 1.2V, Q315 turns on and K301 operates to connect the OUTPUT terminal to the output circuit of the output amplifier. It takes about 5 seconds before K301 turns on after power supply starts. During this time, the power lines of the 32-2's amplifier reach a steady state. Thus the output line is protected from transient noise.

When the power supply stops, the +6V loaded in the VU meter lamp falls rapidly and C418 discharges via D305 quickly; Q315 and K301 turn off immediately.

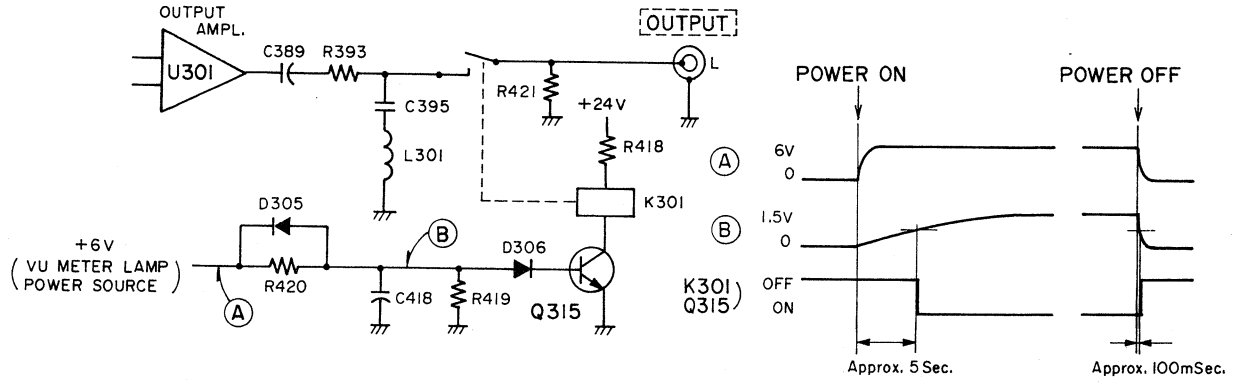


Fig. 8-5 Power muting circuit

8-5 MICROPHONE AMPLIFIER

The gain of the microphone amplifier is about 29 dB when the MIC ATT switch is set at 0 and about 9 dB when the switch is set at 20. The switch changes the resistance connected to Q511's emitter to attenuate the input level by 20 dB regardless of the microphone's impedance.

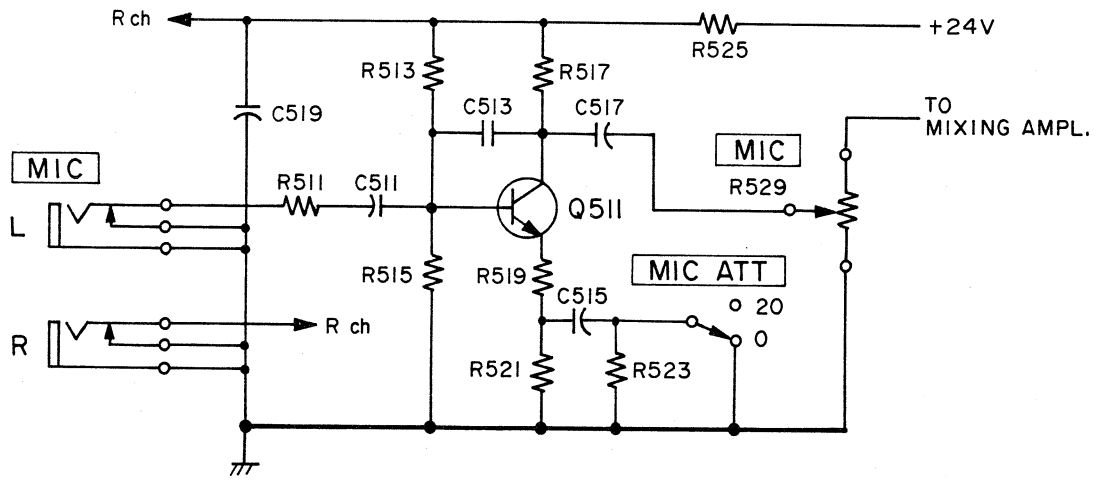


Fig. 8-6 Microphone amplifier

8-6 MIXING AMPLIFIER

See Fig. 8-7. LINE IN signal is mixed with the microphone amplifier's output by the mixing amplifier which consists of Q309 and Q311 whose collectors are connected together. This circuitry has the advantage that there is almost no interference between the lines. The mixing amplifier has a gain of about 18 dB.

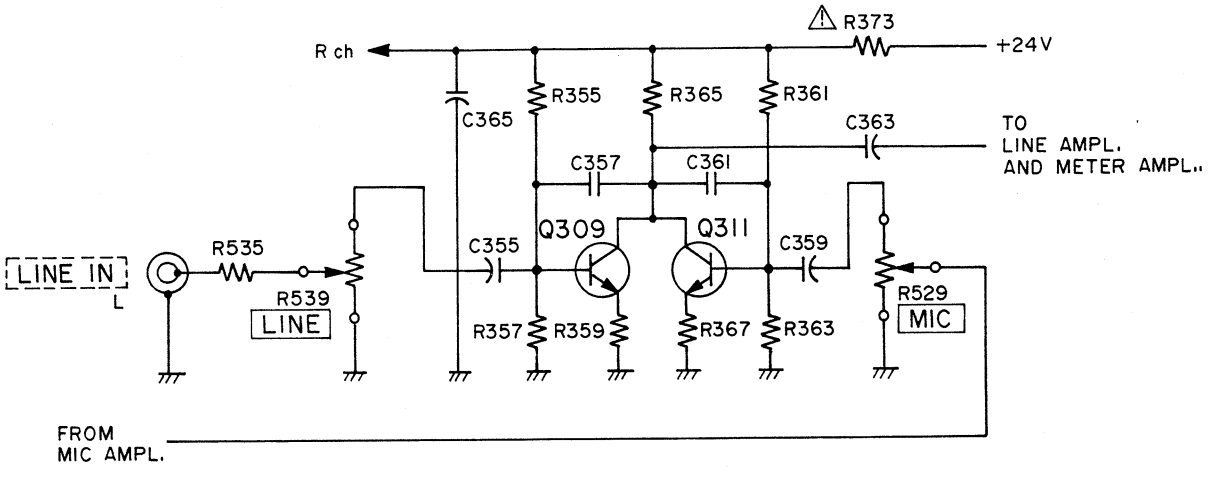


Fig. 8-7 Mixing amplifier

8-7 LINE AMPLIFIER

The line amplifier amplifies the output of the mixing amplifier up to the reference input/output level, −10 dB, of the dbx unit (DX-2A). Its circuitry is the same as that of the playback line amplifier.

8-8 RECORDING AMPLIFIER

See Fig. 8-8. The recording amplifier is basically a direct-coupled amplifier of two stages, Q319 and Q321. Functions and operation of the amplifier with its peripheral circuits are described below.

- The negative feedback circuit consisting of C435, R467 and R469 reduces the amount of feedback at low frequencies to raise the gain of the amplifier by 2 ~ 3 dB.
- Q327 turns on when the tape speed is LOW and Q325 does the same when the tape speed is HIGH. Series resonance circuits L305–C443 and L305–C441 connecting to each transistor raise the gain of the amplifier at high frequencies as the impedance of the circuits as well as the amount of negative feedback gets reduced at the resonance frequency level. Resistors R487 and R485 connected in series with each resonance circuit limit maximum compensation and prevents distortion of the signal at the resonance frequency and its proximity.
- C429 compensates gain at medium and high frequencies.
- Recording compensation done at HIGH speed will raise the level at not only high frequencies but also medium frequencies to some extent. At HIGH speed, therefore, Q335 turns on to insert R433 and C439 in the signal circuit in parallel, reducing the level at medium frequencies. In this circuit, the equlizer is switched over NAB and IEC. Q335 turns off when the EQ switch is set at IEC. At this time the level rises at medium frequencies but the amount of rise is cancelled during playback as constants are so selected that overall response becomes flat. (R345 and C325 of Fig. 8-1 have the same values as R433 and C439 of Fig. 8-8 respectively.)
- The REC BIAS and REC EQ switches adapt the 32-2 to varying types of tape. REC EQ is switched by turning on and off Q323. When the REC EQ switch is set at 2, Q323 turns on, raising response at high frequencies.
- REC MUTE transistor Q317 remains turned on except during the REC/PLAY mode. See the circuit description of the 7-8 RECORD MUTING CIRCUIT for operation of Q317. Switching transistors, except Q317, are operated by a base current of about 1 mA while Q317 is operated by a base current of about 2.5 mA for raising the REC MUTE effect.
- The parallel resonance circuit of C431 and L303 is a bias trap which prevents recording bias from entering the recording amplifier which would cause distortion.

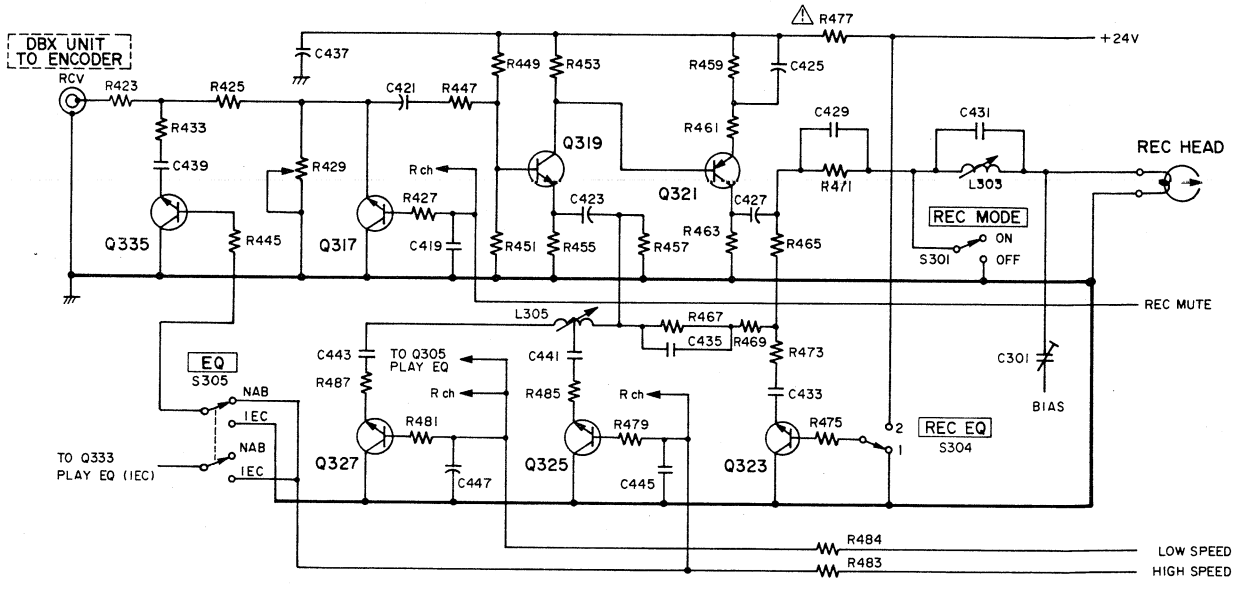


Fig. 8-8 Recording amplifier

8-9 BIAS OSCILLATOR

See Fig. 8-9 and 8-10. Q329 and Q330 are switching transistors which turn the bias oscillator on and off. When the REC MODE switch is turned ON and the deck is set in the REC/PLAY or REC/PLUSE mode, REC SIG of +24V comes to (B) from the control unit. The signal charges C306 via R501 and R497. As the voltage across C306 becomes about 1V, Q329 and Q330 turn on and the bias oscillator begins to oscillate. It takes about 60 msec for the bias oscillator to rise completely. The bias waveform rises rather slowly. By this slow-start feature of the bias oscillator, bias is gradully applied after tape travel becomes steady in the REC/PLAY mode, preventing any click noise from being recorded on the tape.

When the REC/PLAY mode is changed to the STOP mode, C306 discharges via D308–R500 and R498–Q329–Q330, and Q329 and Q330 turn off slowly. The bias signal, therefore, vanishes gradually. This prevents the recording and erase heads from getting magnetized and any click noise from being recording on the tape.

When the 32-2 is supplied with power, +6V (power of the VU meter lamp) is applied to (A) and C305 is charged. If the power supply stops when the deck is in the REC/PLAY mode, +6V which supplies the VU meter lamp falls rapidly and, at this time, C305 and C306 discharge via the path of C306, R496, D307, C305, and (A). Since the plus side of C305 becomes zero potential, its minus side becomes negative. This accelerates C306 to discharge. Because of this, Q329 and Q330 turn off in about half of the time it would take if C305 is not provided. Thus, when the power supply has stopped, the bias oscillator stops immediately, preventing noise from being recorded on the tape. The REC BIAS and SPEED switches vary the source voltage supplied to the OSC unit to vary its output level and supply the recording head with proper bias.

In Fig. 8-10, voltages and times are given simply for reference.

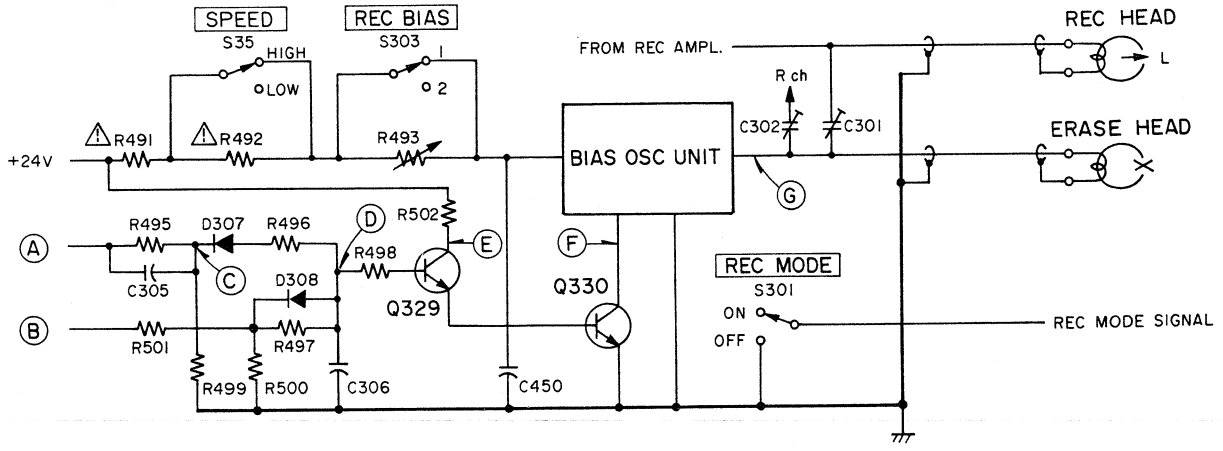


Fig. 8-9 Bias oscillator and associated circuitry

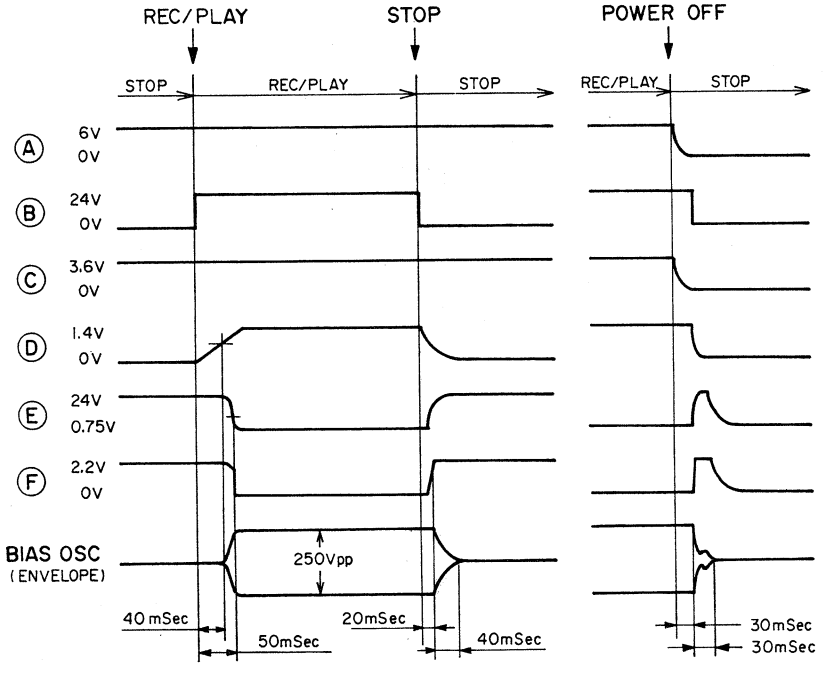
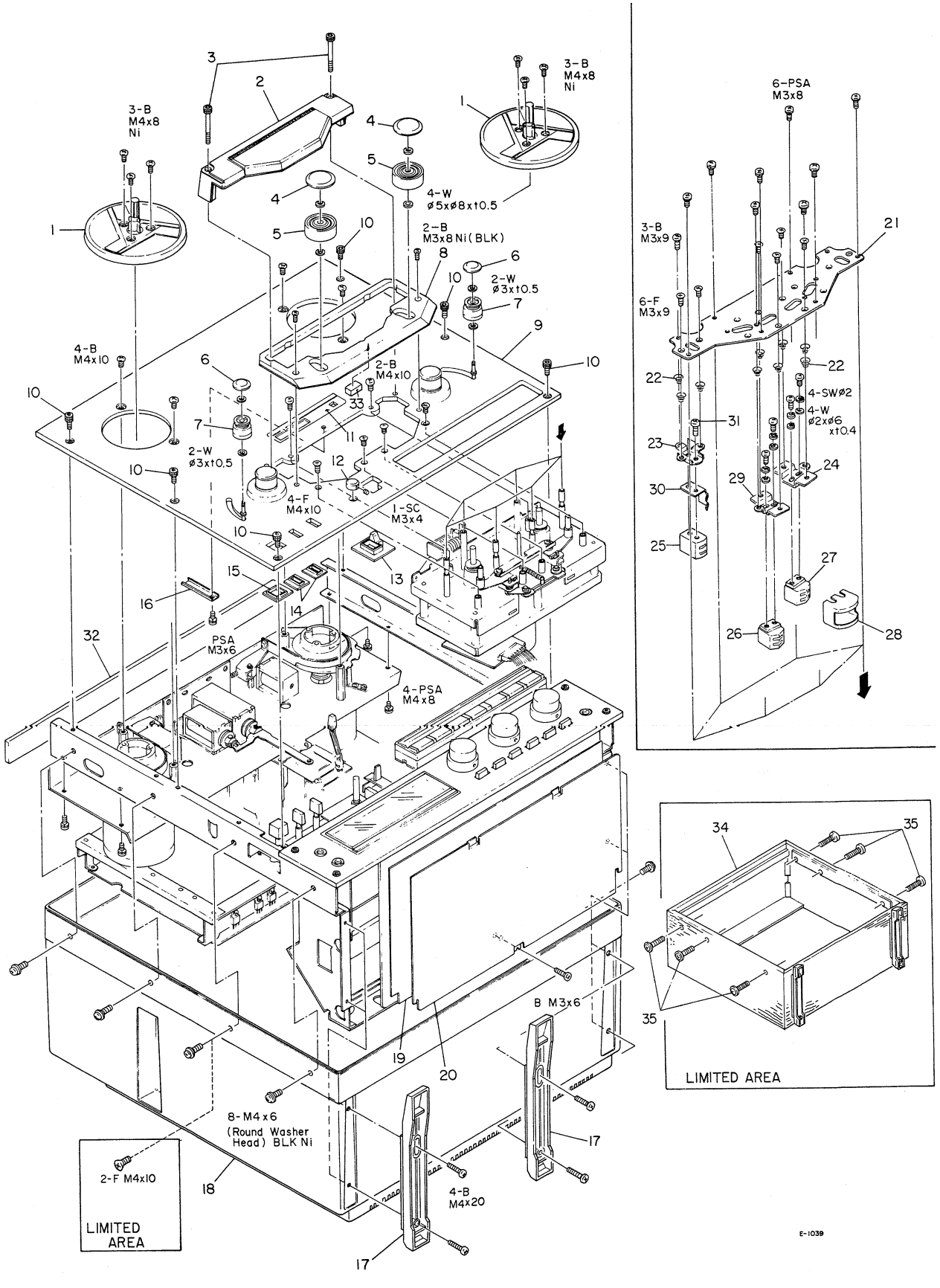


Fig. 8-10 Bias ossilator timing chart

PARTS LIST SECTION

9 EXPLODED VIEWS AND PARTS LIST

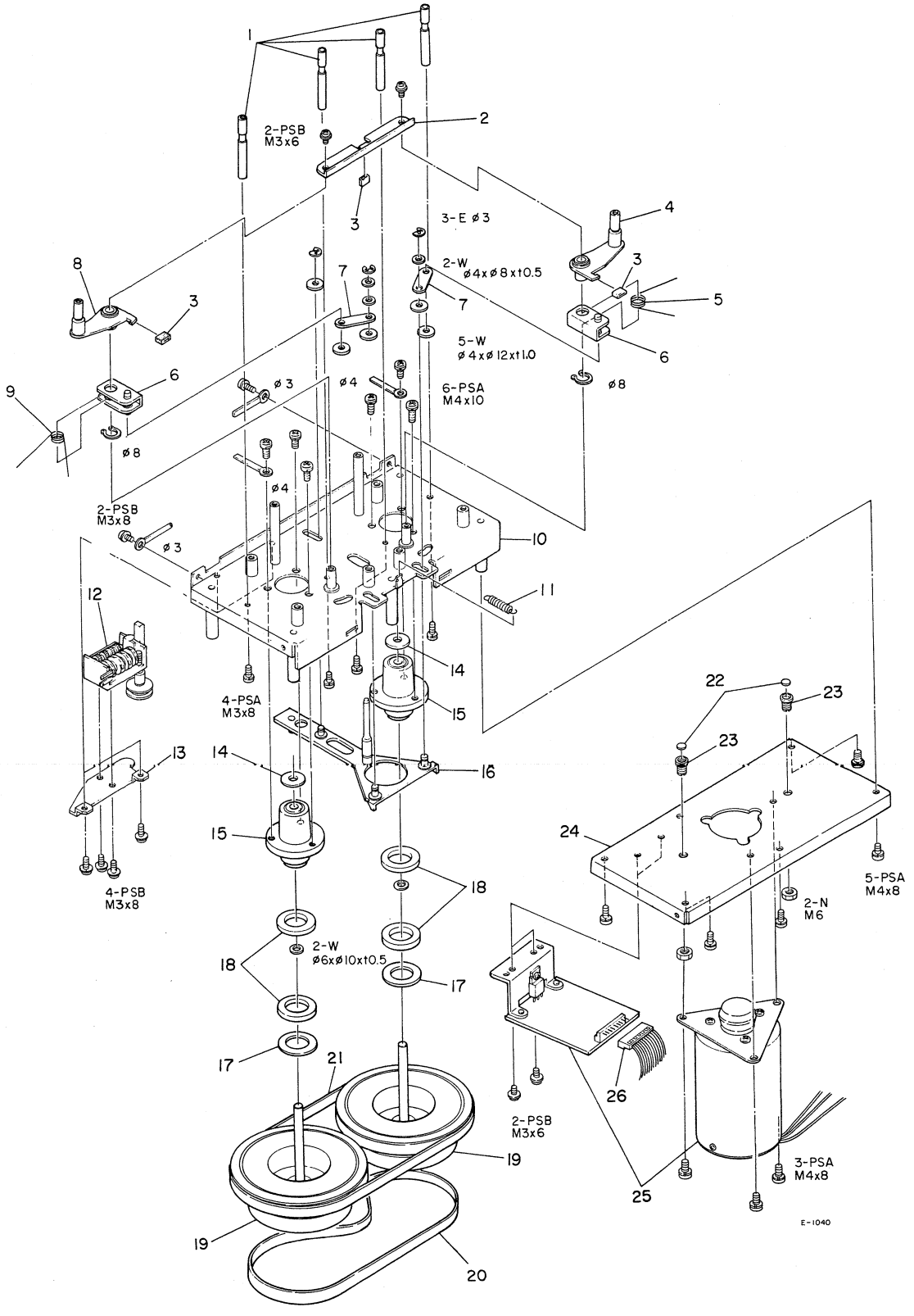
EXPLODED VIEW - 1



Parts marked with *require longer delivery time than regular parts.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
1 - 1	5504744000	Reel Table Assy	
1 - 2	5533214000	Head Housing	
1 - 3	5581065000	Screw, Head Housing; A	
1 - 4	5545014000	Cap, Pinch Roller	
1 - 5	5534691100	Pinch Roller	
1 - 6	5545009000	Cap, Tension Roller	
1 - 7	5504718100	Roller Assy, Tension	
1 - 8	*5532096000	Cover, Head Base Plate; B	
1 - 9	*5553374000	Panel, Top; E	
1 - 10	*5581073000	Screw, Top Panel; C	
1 - 11	*5534721001	Escutcheon, Counter; P7	
1 - 12	5534705000	Knob, VR; C	
1 - 13	*5534708000	Escutcheon, Cue	
1 - 14	*5534706000	Escutcheon, Button	
1 - 15	*5534707000	Escutcheon, Power Switch	
1 - 16	*5555698000	Plate, Escutcheon, Pressure	
1 - 17	*5533190000	Foot	
1 - 18	*5800002800	Case Assy, Deck	
1 - 19	*5553308001	Paper, Ampl. Insulating	
1 - 20	*5553306000	Plate, Ampl. Shield	
1 - 21	*5553289100	Plate, Head Base	
1 - 22	*5022050000	Spring, B	
1 - 23	*5555674100	Bracket, Erase Head	
1 - 24	*5555673000	Bracket, Head; R	
1 - 25	5569210000	Head, Erase; 2T	
1 - 26	5569204000	Head, Record; 2T	
1 - 27	5569205000	Head, Playback; 2T	
1 - 28	*5013389100	Head Shield, A	
1 - 29	*5555672000	Bracket, Head; L	
1 - 30	*5555669100	Guide, Tape; F	
1 - 31	*5581071000	Screw, B M2 x 4	
1 - 32	*5555887000	Cushion, Case	
1 - 33	*5800002700	Cushion, Head Base Plate Cover	
1 - 34	*5502277000	Case Assy, Wooden	LIMITED AREA
1 - 35	*5504499000	Screw Assy, Case	LIMITED AREA

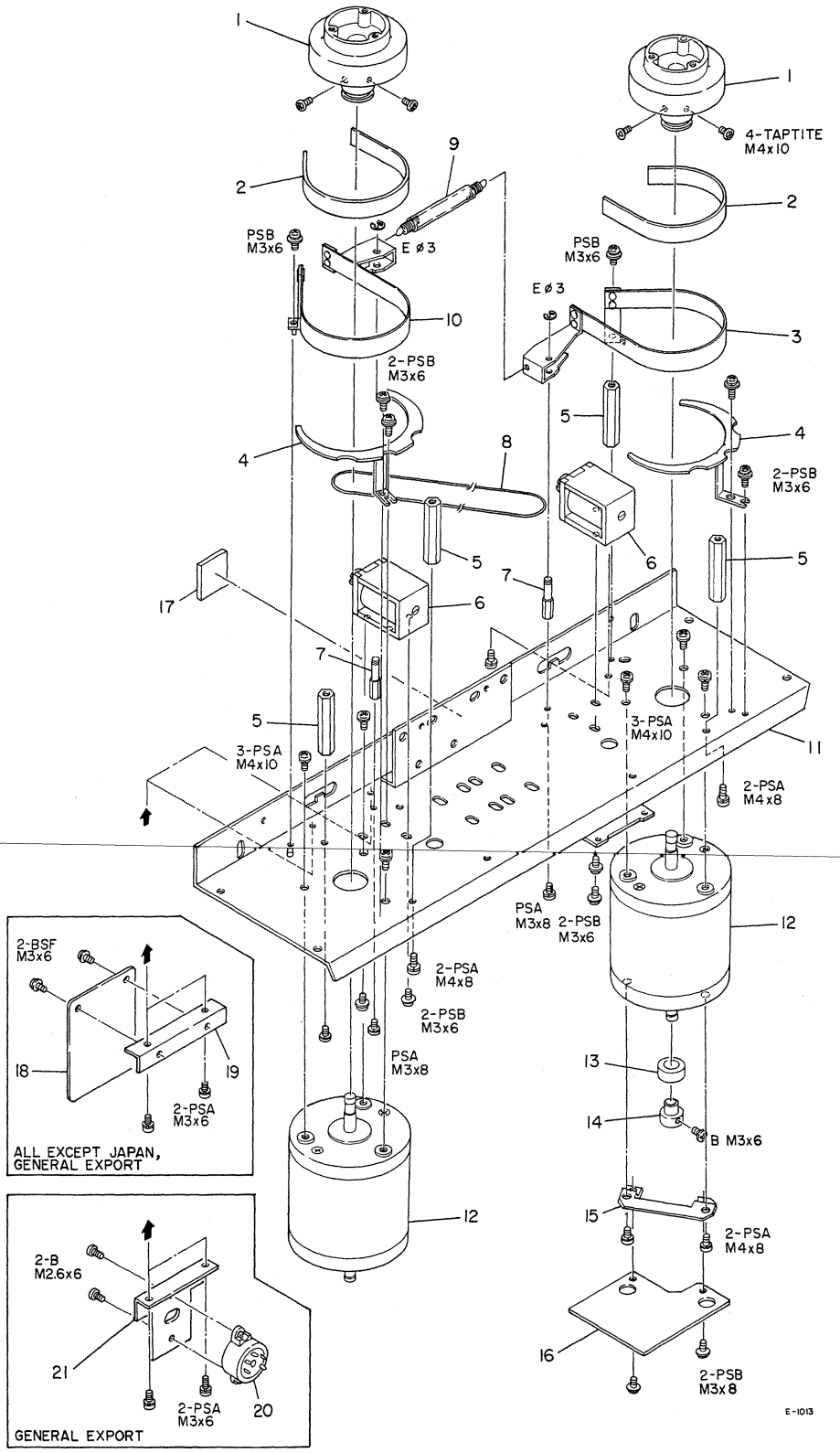
EXPLODED VIEW - 2



Parts marked with *require longer delivery time than regular parts.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
2 - 1	*5545023000	Pin, Tape Guide	
2 - 2	*5555666000	Plate, Reinforcement	
2 - 3	*5534694000	Cushion, Stopper	
2 - 4	*5504729000	Arm Assy, Pinch Roller; R	
2 - 5	*5524216000	Spring, Pinch Roller; R	
2 - 6	*5504731000	Bracket Assy, Pinch Roller Arm	
2 - 7	*5555667000	Plate, Joint	
2 - 8	*5504730000	Arm Assy, Pinch Roller; L	
2 - 9	*5524217000	Spring, Pinch Roller; L	
2 - 10	*5503196000	Chassis, Capstan	
2 - 11	*5524219000	Spring, Slide Plate	
2 - 12	*5504725000	Counter Assy, Index; B	
2 - 13	*5555665000	Bracket, Counter Assy	
2 - 14	*5534695000	Washer, Oil Retaining	
2 - 15	5504726100	Housing Assy, Capstan Flywheel	
2 - 16	*5504733000	Plate Assy, Slide	
2 - 17	*5555704000	Tape, Adhesive	
2 - 18	*5534715000	Ring, Magnet; Thrust	
2 - 19	5504749000	Flywheel Assy	
2 - 20	5534690000	Belt, Capstan Drive	
2 - 21	5534693000	Belt, Flywheel	
2 - 22	*5555703000	Bearing	
2 - 23	*5544003000	Screw, Bearing	
2 - 24	*5553290000	Bracket, Motor Mounting	
2 - 25	7105021000	DC Motor Assy, Capstan; F	
	*5168886000	PCB Assy, CAPSTAN SERVO	Part of 2 - 25
2 - 26	*5122172000	Connector Socket, 10P	

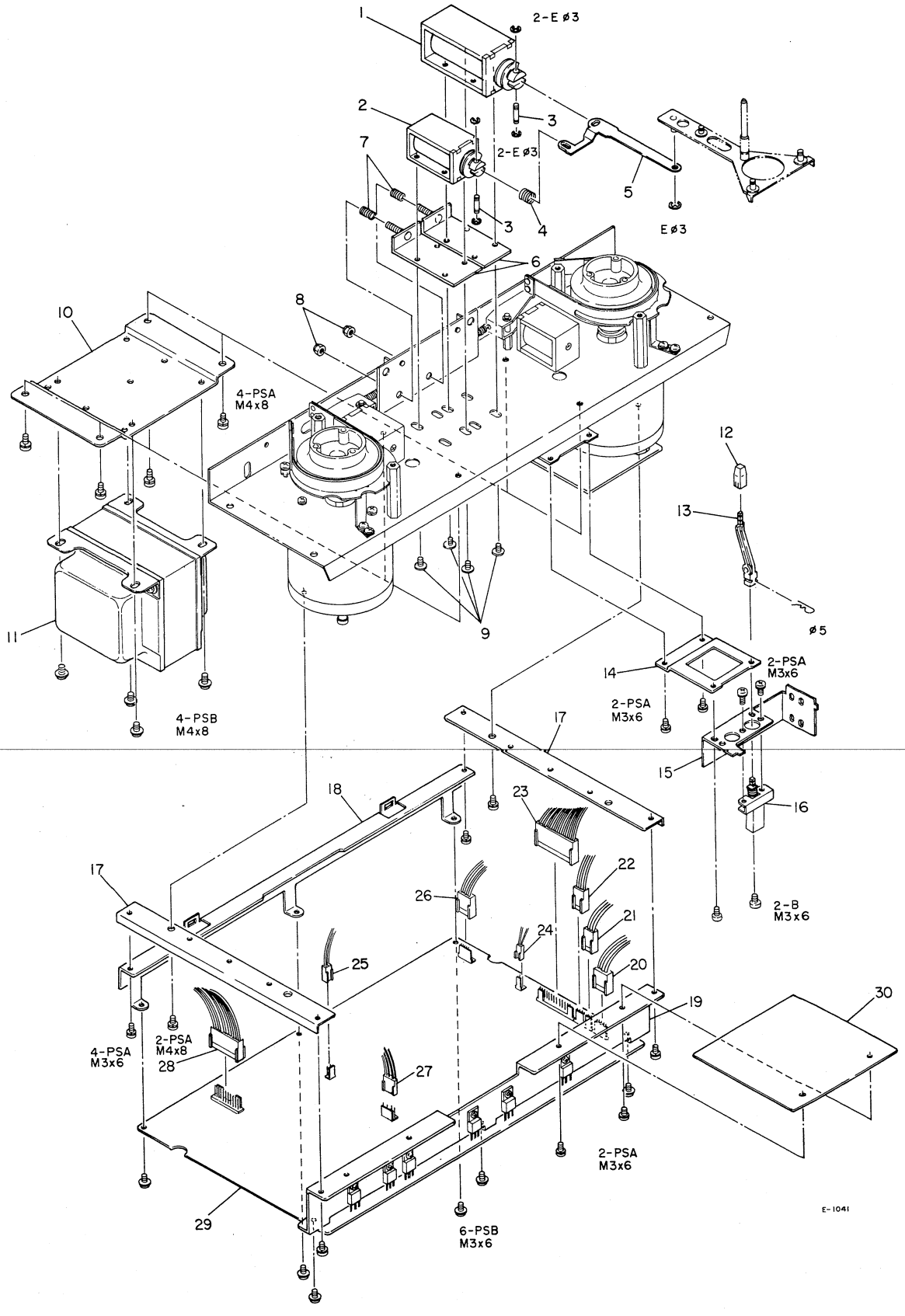
EXPLODED VIEW - 3



Parts marked with *require longer delivery time than regular parts.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
3 - 1	*5533189000	Base Assy, Reel Table	
3 - 2	5555274000	Shoe, Brake	
3 - 3	5504736000	Band Assy, Brake; R	
3 - 4	*5555685000	Plate, Band Assy Retaining	
3 - 5	*5544916000	Stay, Top Panel	
3 - 6	5163044000	Solenoid, Brake	
3 - 7	*5545033000	Shaft, Brake Band	
3 - 8	5534370000	Belt, Counter	
3 - 9	*5524294000	Spring, Brake	
3 - 10	5504735000	Band Assy, Brake; L	
3 - 11	*5503194000	Chassis, Reel Motor	
3 - 12	7105019000	Motor, DC; Reel	
3 - 13	*5534487000	Ring, Magnet	
3 - 14	*5545036000	Collar, Magnet Ring	
3 - 15	*5555695100	Bracket, PCB	
3 - 16	5168940000	PCB Assy, STOP SENSOR	
3 - 17	5555570000	Cushion	

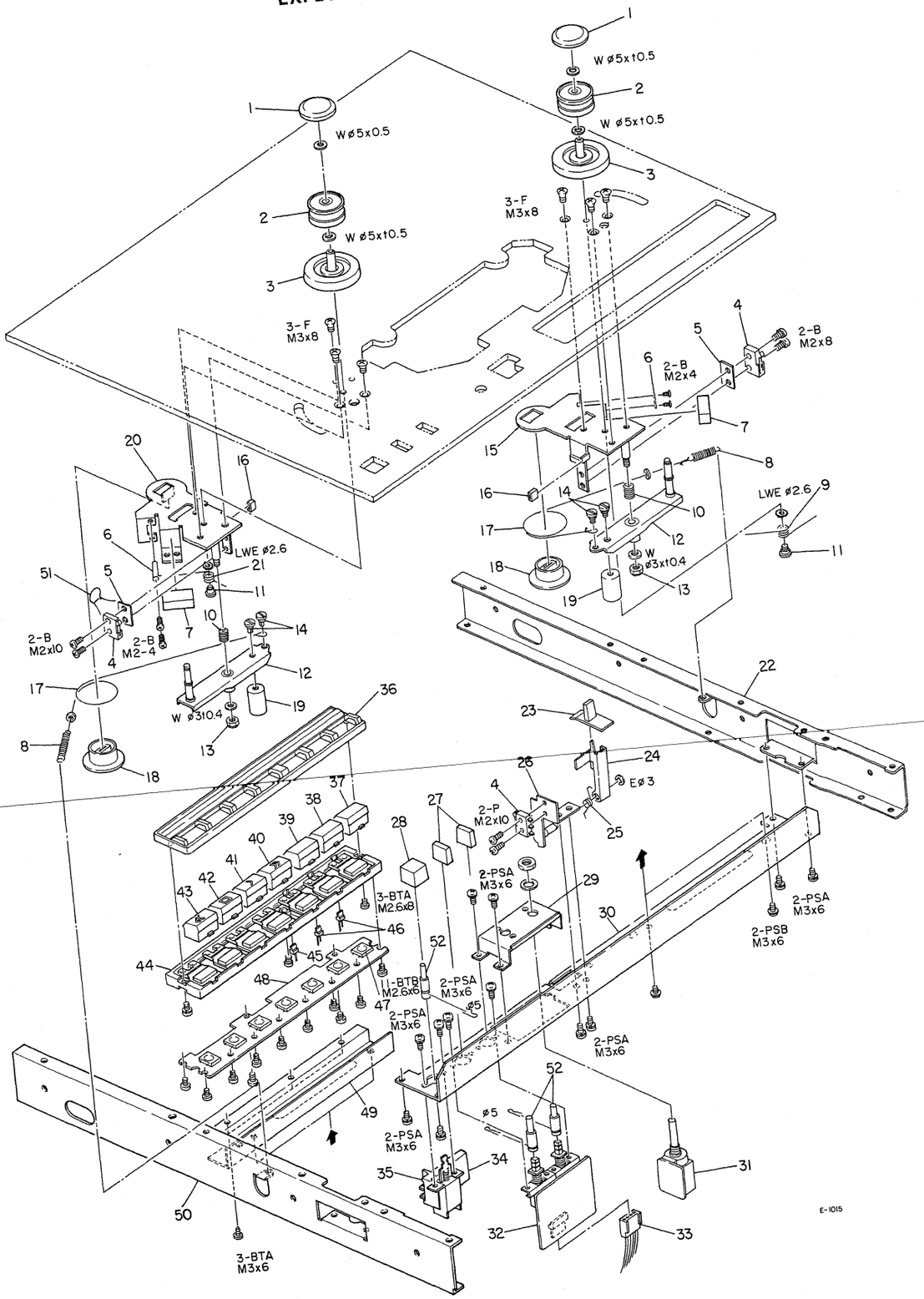
EXPLODED VIEW - 4



Parts marked with *require longer delivery time than regular parts.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
4 - 1	5163041000	Solenoid, Pinch Roller	
4 - 2	5163042000	Solenoid, Pause	
4 - 3	*5545022000	Pin, Solenoid	
4 - 4	*5524071000	Spring, Solenoid	
4 - 5	*5555668000	Plate, C	
4 - 6	*5504732000	Plate Assy, Solenoid	
4 - 7	*5524218000	Spring, Pinch Roller Pressure	
4 - 8	*5581066000	Nut, Nylon; M4	
4 - 9	*5800002600	Screw, Shoulder; F	
4 - 10	*5555681100	Bracket, Power Transformer	
4 - 11	5152192000	Transformer, Power	
	5152225000	Transformer, Power	U.S.A., CANADA
	5152226000	Transformer, Power	GENERAL EXPORT
	5152239000	Transformer, Power	EUROPE, U.K., AUSTRALIA
4 - 12	5534714000	Button, B	
4 - 13	*5534685000	Rod, Switch	
4 - 14	*5555664000	Plate, Joint	
4 - 15	*5555671100	Bracket, Timer Switch	
4 - 16	5134115000	Switch, Push	
4 - 17	*5553296000	Frame, Joint	
4 - 18	*5552390000	Frame, PCB	
4 - 19	*5552391000	Frame, HS	
4 - 20	*5122166000	Connector Socket, 4P	
4 - 21	*5122165000	Connector Socket, 3P	
4 - 22	*5122222000	Connector Socket, 3P (Black)	
4 - 23	*5122174000	Connector Socket, 12P	
4 - 24	*5122221000	Connector Socket, 2P (Black)	
4 - 25	*5122164000	Connector Socket, 2P	
4 - 26	*5122167000	Connector Socket, 5P	
4 - 27	*5122301000	Connector Socket, 4P (Red)	
4 - 28	*5122171000	Connector Socket, 9P	
4 - 29	*5158155000	PCB Assy, CONTROL	JAPAN, GENERAL EXPORT
	*5200004000	PCB Assy, CONTROL	U.S.A., CANADA
	*5200004010	PCB Assy, CONTROL	EUROPE, AUSTRALIA, U.K.
4 - 30	*5555888000	Heat Sink, C	

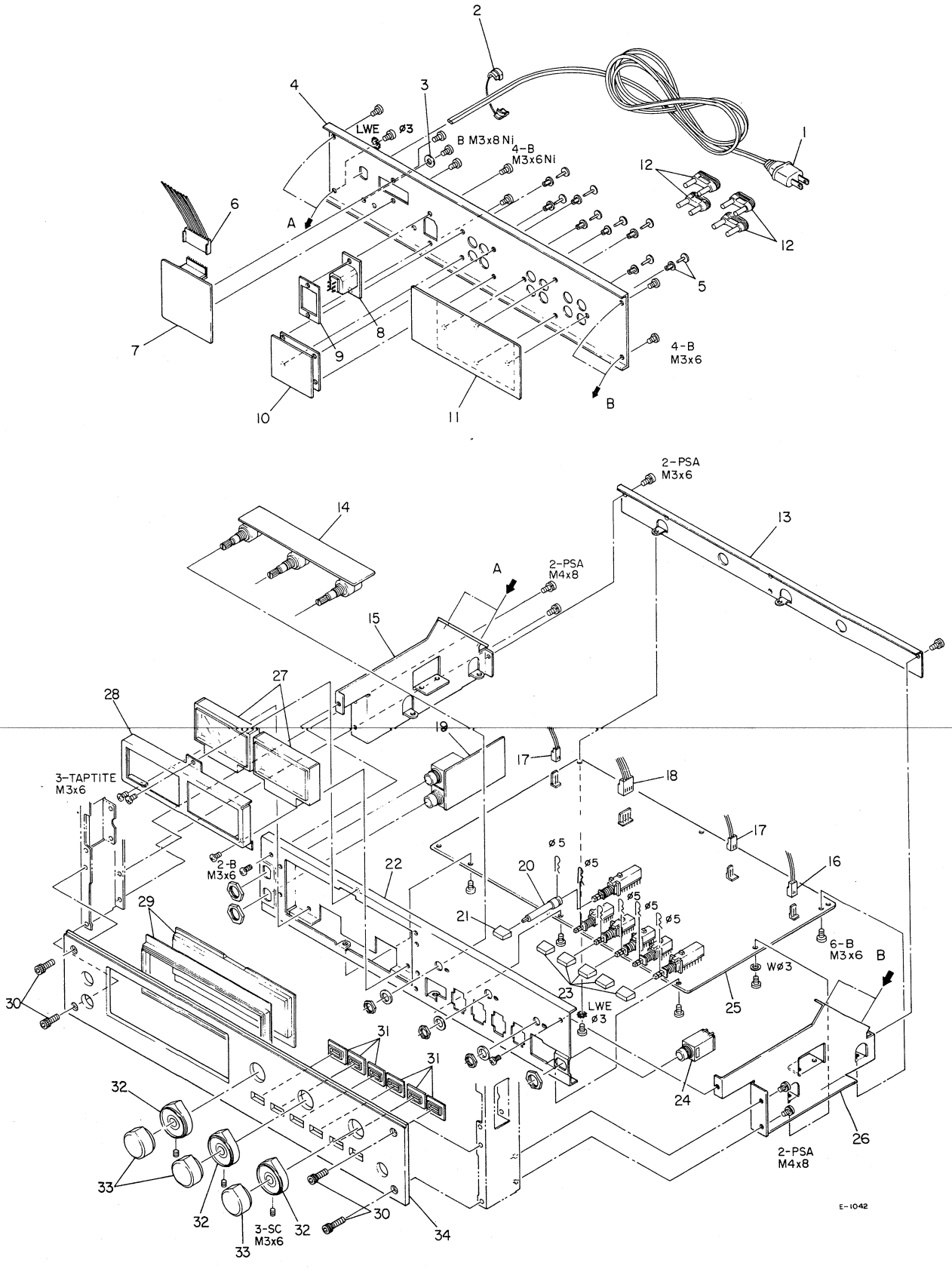
EXPLODED VIEW - 5



Parts marked with *require longer delivery time than regular parts.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
5 - 1	5545037000	Cap, Roller	
5 - 2	*5504743000	Roller Assy, B	
5 - 3	*5504742000	Base Assy, Roller; B	
5 - 4	5130003000	Switch, Micro	
5 - 5	*5550025100	Plate, Insulating	
5 - 6	*5524215000	Wire, String Stopper	
5 - 7	*5534686000	Cushion	
5 - 8	*5524183000	Spring, Motor Switch Lever	
5 - 9	*5524230001	Spring, Tension Arm; R	
5 - 10	*5524069000	Spring, Roller Arm	
5 - 11	*5581064000	Screw, Shoulder; E	
5 - 12	*5504723000	Arm Assy, Tension	
5 - 13	*5581045000	Nut, Nylon	
5 - 14	*5800002600	Screw, Shoulder; F	
5 - 15	*5504720100	Base Assy, Shut off; R	
5 - 16	*5027699000	Collar, Rubber	
5 - 17	*5504721000	String Assy, Damper	
5 - 18	*5534684000	Drum, Damper	
5 - 19	*5545010000	Weight, Counter	
5 - 20	*5504719100	Base Assy, Shut off; L	
5 - 21	*5524229001	Spring, Tension Arm; L	
5 - 22	*5552393100	Angle, Side; R	
5 - 23	*5534703000	Knob, Cue	
5 - 24	*5555697000	Lever, Cue	
5 - 25	*5524223000	Spring, Cue	
5 - 26	*5504737000	Bracket Assy, Cue	
5 - 27	5534701000	Button, Switch	
5 - 28	5534702000	Button, Power Switch	
5 - 29	*5555699000	Bracket, Speed Switch	
5 - 30	*5552392001	Chassis, Control	
5 - 31	*5168938000	PCB Assy, PITCH CONT	
	*5167938000	PCB, PITCH CONT	Part of 5 - 31
	5150239000	Var. Res., w/Switch; 5 k ohm - B	Part of 5 - 31
5 - 32	*5168927200	PCB Assy, SPEED SW	
5 - 33	*5122168000	Connector Socket, 6P	
5 - 34	5052907000	Spark Killer, 0.01 mfd + 300 ohm 400V	JAPAN, GENERAL EXPORT, AUSTRALIA
	5052910000	Spark Killer, 0.033 mfd + 120 ohm 125VAC	U.S.A.
	5052911000	Spark Killer, 0.033 mfd + 120 ohm 250VAC	CANADA
	5052908000	Spark Killer, 4700 pfd 250VAC	EUROPE, U.K.
5 - 35	5134036000	Switch, Power	GENERAL EXPORT
	5300017900	Switch, Power	JAPAN
	5134037000	Switch, Power	U.S.A., AUSTRALIA
	5134018000	Switch, Power	CANADA
	5134011000	Switch, Power	EUROPE, U.K.
5 - 36	*5533265000	Escutcheon, Button; Operation	
5 - 37	5533199000	Button, G	
5 - 38	5533219000	Button, H	
5 - 39	5533198000	Button, F	
5 - 40	5533195000	Button, C	
5 - 41	5533193000	Button, A	
5 - 42	5533197000	Button, E	
5 - 43	5533196000	Button, D	
5 - 44	*5503205000	Base Assy, Button; Operation	
5 - 45	5143139000	LED (Green)	
5 - 46	5143140000	LED (Red)	
5 - 47	5138011000	Switch, Tact	
5 - 48	*5168930000	PCB Assy, OPERATION SW	
	*5167930000	PCB, OPERATION SW	Part of 5 - 48
5 - 49	*5553300000	Angle, Button Base; A	
5 - 50	*5552394100	Angle, Side; L	
5 - 51	*5054230000	Capacitor, Ceramic; 0.047 mfd 50V	
5 - 52	*5534713000	Rod, Switch; C	

EXPLODED VIEW - 6

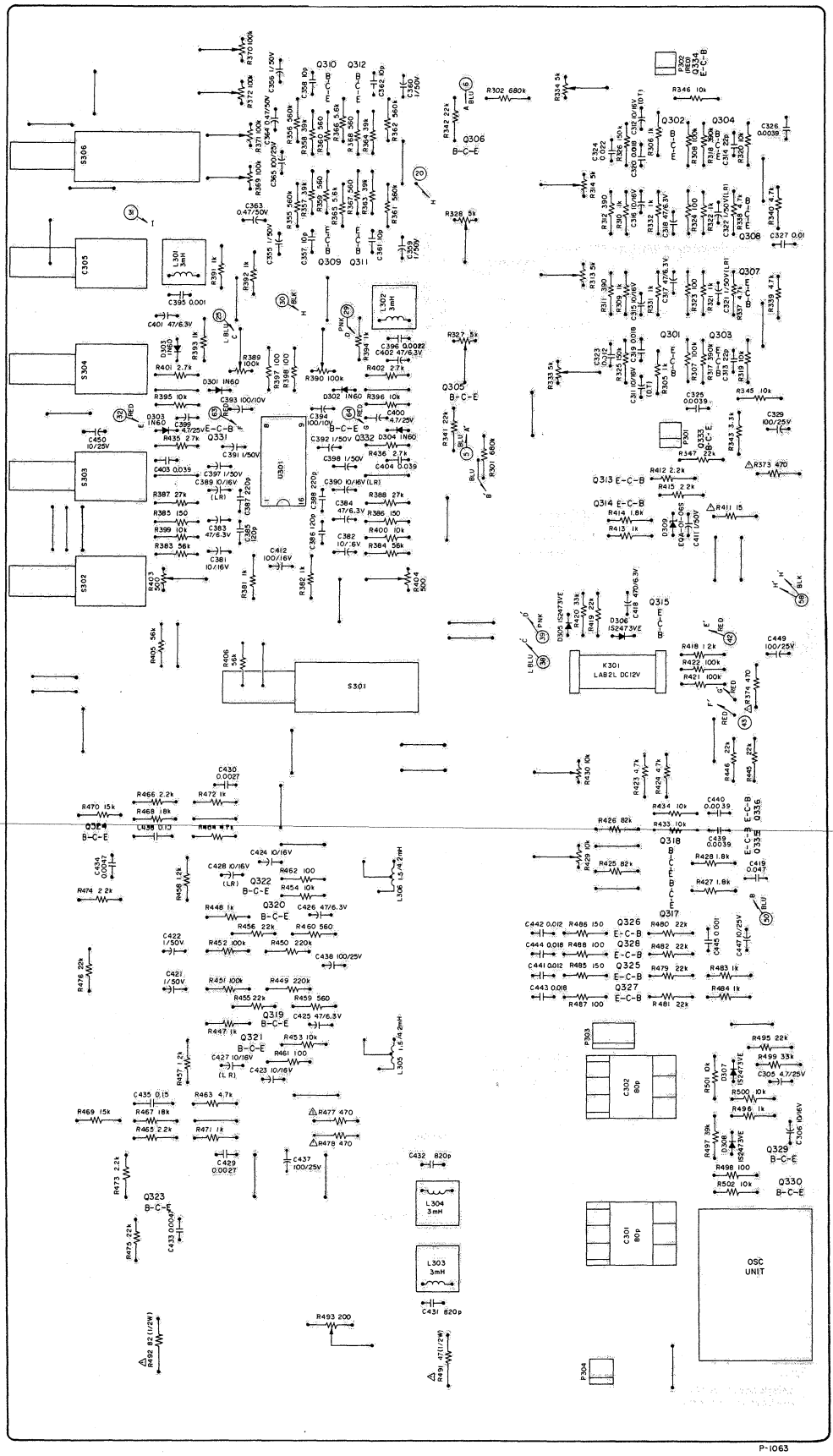


Parts marked with *require longer delivery time than regular parts.

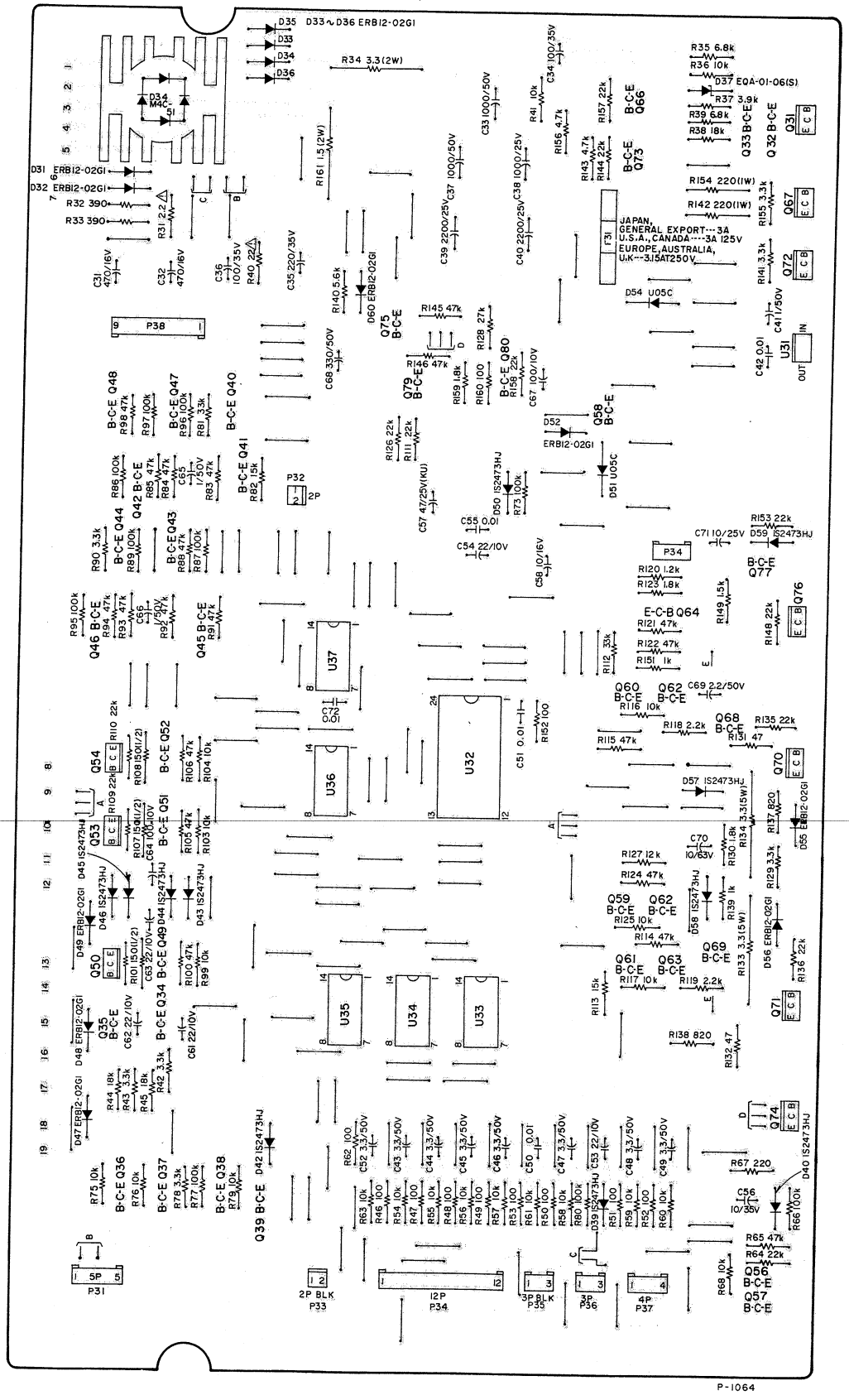
REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
6 - 1	*5128027000	Cord, AC Power	JAPAN, GENERAL EXPORT
	*5128075000	Cord, AC Power	U.S.A., CANADA
	*5128018000	Cord, AC Power	EUROPE
	*5128031000	Cord, AC Power	AUSTRALIA
	*5128047000	Cord, AC Power	U.K.
6 - 2	*5534660000	Strain Relief, AC Power Cord	All except AUSTRALIA, U.K.
	*5534663000	Strain Relief, AC Power Cord	AUSTRALIA
	*5534661000	Strain Relief, AC Power Cord	U.K.
6 - 3	*5555063000	Washer, GND	
6 - 4	*5552395000	Panel, Ampl.; Rear	
6 - 5	*5534118000	Push Rivet	
6 - 6	*5122174000	Connector Socket, 12P	
6 - 7	*5168002000	PCB Assy, CONNECTOR	
6 - 8	*5122339000	Connector Socket, 6P	
6 - 9	*5555700000	Nut, Plate	
6 - 10	*5168937201	PCB Assy, IN/OUTPUT	
	*5167937101	PCB, IN/OUTPUT	Part of 6 - 10
	*5124058000	Jack, Pin; 4P	Part of 6 - 10
	5183124000	Carbon Res., 56 k ohm ¼W 5% (R535, R536)	Part of 6 - 10
6 - 11	*5168936000	PCB Assy, IN/OUTPUT; DBX	
6 - 12	*5124051000	Plug, Short Pin	
6 - 13	*5553297100	Bracket, REC AND PLAY AMPL PCB	
6 - 14	*5168939101	PCB Assy, VR	
6 - 15	*5553294100	Frame, Ampl.; L	
6 - 16	5122280000	Connector Socket, 2P (Red)	
6 - 17	5122164000	Connector Socket, 2P	
6 - 18	5122166000	Connector Socket, 4P	
6 - 19	*5158165000	PCB Assy, MIC AMPL	
6 - 20	*5534712000	Rod, B	
6 - 21	5534701000	Button, Switch	
6 - 22	*5503195100	Chassis, Ampl.; A	
6 - 23	*5534740000	Button	
6 - 24	5124026000	Jack, PHONES	
6 - 25	*5158164000	PCB Assy, REC AND PLAY AMPL	
6 - 26	*5553295100	Frame, Ampl.; R	
6 - 27	5165068000	Meter, VU	
6 - 28	*5553293000	Plate, Meter	
6 - 29	*5504748001	Cover Assy, Meter	
6 - 30	*5581073000	Screw, Ampl. Panel; C	
6 - 31	*5534706000	Escutcheon, Button	
6 - 32	5534704000	Knob, VR; B	
6 - 33	5533188000	Knob, VR; A	
6 - 34	*5552385000	Panel, Ampl.; 2T	JAPAN
	5552495000	Panel, Ampl.; E	All except JAPAN

10 PC BOARDS AND PARTS LIST

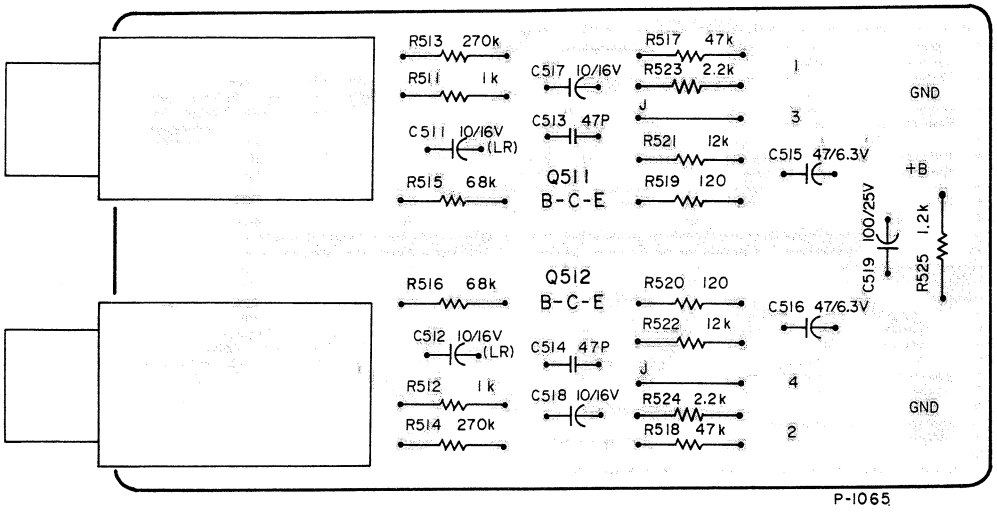
REC AND PLAY AMPL PCB ASSY



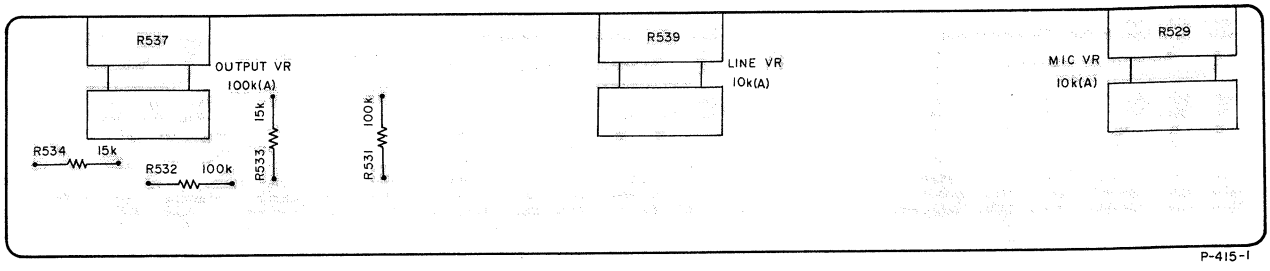
CONTROL PCB ASSY



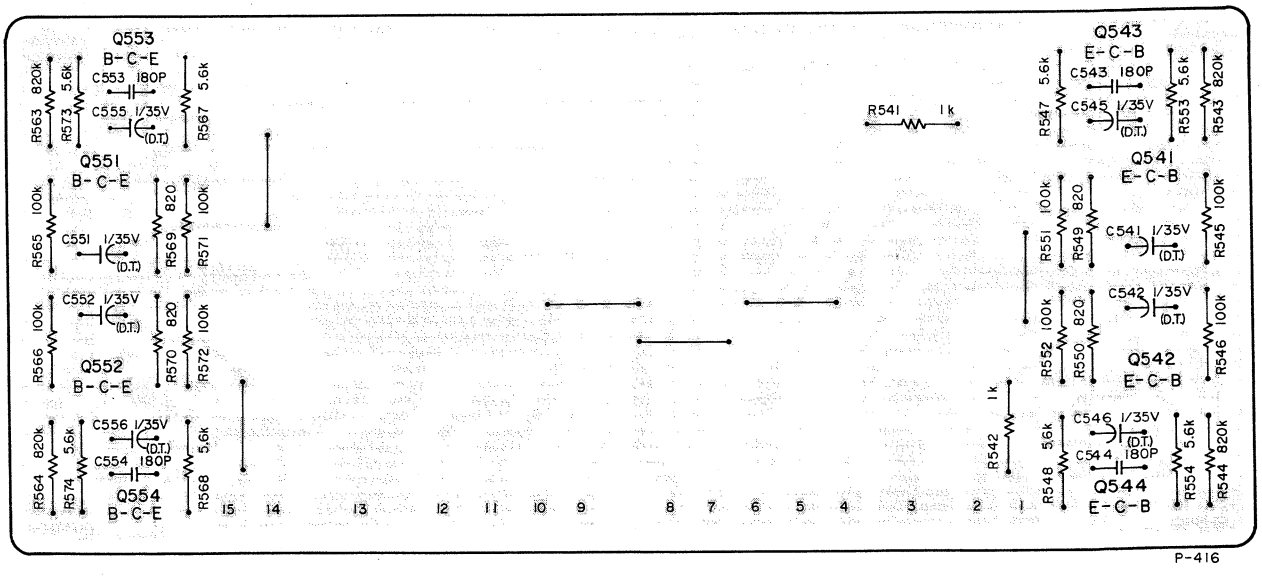
MIC AMP PCB ASSY



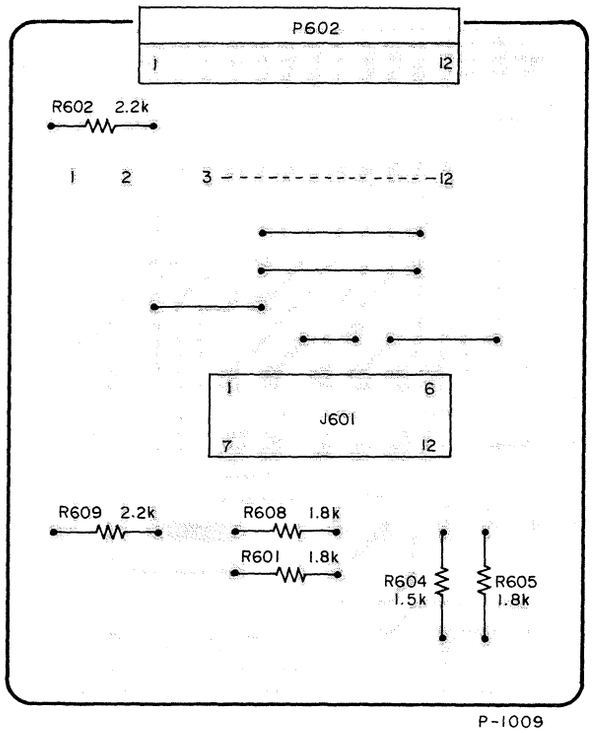
VR PCB ASSY



IN/OUTPUT PCB ASSY (DBX)

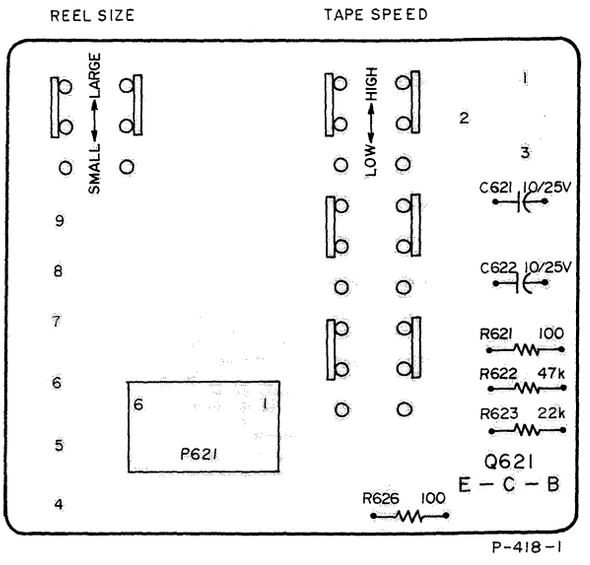


CONNECTOR PCB ASSY



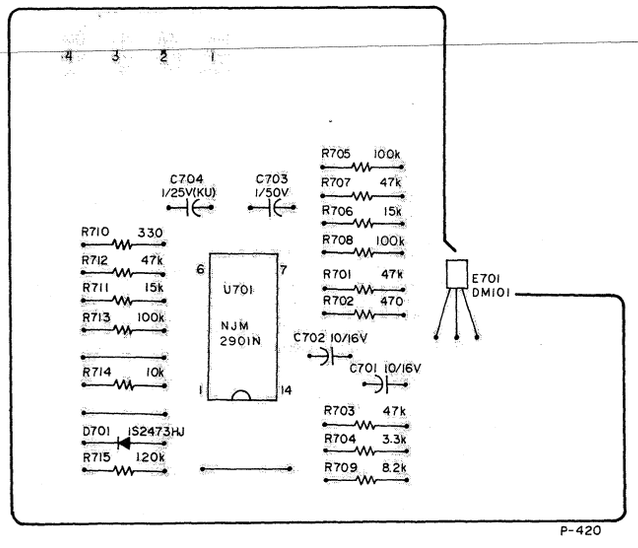
P-1009

SPEED SW PCB ASSY



P-418-1

STOP SENSOR PCB ASSY



P-420

REC AND PLAY AMPL PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	5158164000	PCB Assy
	5167984000	PCB
	IC	
U301	5147053000	HA11122W
	TRANSISTORS	
Q301, Q302	5042461000	2SC1327(T)
Q303, Q304	5145036000	2SC945LK
Q305, Q306	5145036000	2SC945LK
Q307, Q308	5145036000	2SC945LK
Q309, Q310	5145092000	2SC1740LN(S)
Q311, Q312	5145092000	2SC1740LN(S)
Q313	5145135000	2SD400E
Q314	5145036000	2SC945LK
Q315	5145092000	2SC1740LN(S)
Q317, Q318	5145185000	2SD655(E)
Q319, Q320	5145036000	2SC945LK
Q321, Q322	5145095000	2SA826LN(S)
Q323, Q324	5145036000	2SC945LK
Q325, Q326	5145036000	2SC945LK
Q327, Q328	5145036000	2SC945LK
Q329	5145092000	2SC1740LN(S)
Q330	5145185000	2SD655(E)
Q331, Q332	5145036000	2SC945LK
Q333, Q334	5145036000	2SC945LK
Q335, Q336	5145036000	2SC945LK
	DIODES	
D301, D302	5042213000	1N60
D303, D304	5042213000	1N60
D305, D306	5042517000	1S2473VE
D307, D308	5042517000	1S2473VE
D309	5143154000	Zener, EQA-01-06S
	RESISTORS	
	All resistors are rated ±5% tolerance, ¼ watt and of carbon type unless otherwise noted.	
R301, R302	5181550000	680 k ohm
R305, R306	5181482000	1 k ohm
R307, R308	5181530000	100 k ohm
R309, R310	5181482000	1 k ohm
R311, R312	5181472000	390 ohm
R317, R318	5181544000	390 k ohm
R319, R320	5181506000	10 k ohm
R321, R322	5181482000	1 k ohm
R323, R324	5181458000	100 ohm
R325, R326	5181534000	150 k ohm
R331, R332	5181482000	1 k ohm
R337, R338	5181498000	4.7 k ohm
R339, R340	5181498000	4.7 k ohm
R341, R342	5181514000	22 k ohm
R343	5181494000	3.3 k ohm
R345, R346	5181506000	10 k ohm
R347, R348	5181514000	22 k ohm
R355, R356	5181548000	560 k ohm
R357, R358	5181520000	39 k ohm
R359, R360	5181476000	560 ohm

REF. NO.	PARTS NO.	DESCRIPTION	
R361, R362	5181548000	560 k ohm	
R363, R364	5181520000	39 k ohm	
R365, R366	5181500000	5.6 k ohm	
R367, R368	5181476000	560 ohm	
R373	⚠5184265000	470 ohm	Non Flammable
R374	⚠5184265000	470 ohm	Non Flammable
R381, R382	5181482000	1 k ohm	
R383, R384	5181524000	56 k ohm	
R385, R386	5181462000	150 ohm	
R387, R388	5181516000	27 k ohm	
R391, R392	5181482000	1 k ohm	
R393, R394	5181482000	1 k ohm	
R395, R396	5181506000	10 k ohm	
R397, R398	5181458000	100 ohm	
R399, R400	5181506000	10 k ohm	
R401, R402	5181492000	2.7 k ohm	
R405, R406	5181524000	56 k ohm	
R411	5184229000	15 ohm	Non Flammable
R412	5181490000	2.2 k ohm	
R413	5181482000	1 k ohm	
R414	5181488000	1.8 k ohm	
R415	5181490000	2.2 k ohm	
R418	5181484000	1.2 k ohm	
R419	5181514000	22 k ohm	
R420	5181518000	33 k ohm	
R421, R422	5181530000	100 k ohm	
R423, R424	5181498000	4.7 k ohm	
R425, R426	5181528000	82 k ohm	
R427, R428	5181488000	1.8 k ohm	
R433, R434	5181506000	10 k ohm	
R435, R436	5181492000	2.7 k ohm	
R445, R446	5181514000	22 k ohm	
R447, R448	5181482000	1 k ohm	
R449, R450	5181538000	220 k ohm	
R451, R452	5181530000	100 k ohm	
R453, R454	5181506000	10 k ohm	
R455, R456	5181514000	22 k ohm	
R457, R458	5181484000	1.2 k ohm	
R459, R460	5181476000	560 ohm	
R461, R462	5171458000	100 ohm	
R463, R464	5181498000	4.7 k ohm	
R465, R466	5181490000	2.2 k ohm	
R467, R468	5181512000	18 k ohm	
R469, R470	5181510000	15 k ohm	
R471, R472	5181482000	1 k ohm	
R473, R474	5181490000	2.2 k ohm	
R475, R476	5181514000	22 k ohm	
R477, R478	⚠5184265000	470 ohm	Non Flammable
R479, R480	5181514000	22 k ohm	
R481, R482	5181514000	22 k ohm	
R483, R484	5181482000	1 k ohm	
R485, R486	5181462000	150 ohm	
R487, R488	5181458000	100 ohm	
R491	⚠5181990000	47 ohm	½W Non Flammable
R492	⚠5181996000	82 ohm	½W Non Flammable
R495	5181514000	22 k ohm	
R496	5181482000	1 k ohm	
R497	5181520000	39 k ohm	
R498	5181458000	100 ohm	
R499	5181518000	33 k ohm	
R500	5181506000	10 k ohm	
R501	5181506000	10 k ohm	
R502	5181506000	10 k ohm	

REF. NO.	PARTS NO.	DESCRIPTION		
	CAPACITORS			
C305	5055435000	Elec.	4.7 mfd	25V
C306	5055405000	Elec.	10 mfd	16V
C311	5172110000	Dip. Tant.	10 mfd	16V
C312	5172111000	Dip. Tant.	10 mfd	16V
C313, C314	5172204000	Ceramic	22 pfd	50V
C315	5171314000	Elec.	10 mfd	16V
C316	5171315000	Elec.	10 mfd	16V
C317	5171344000	Elec.	47 mfd	6.3V
C318	5171344000	Elec.	47 mfd	6.3V
C319, C320	5054897000	Mylar	0.018 mfd	50V 5%
C321	5170086000	Elec.	1 mfd	50V(LR)
C322	5170086000	Elec.	1 mfd	50V(LR)
C323, C324	5171858000	Mylar	0.012 mfd	50V 5%
C325, C326	5054890000	Mylar	0.0039 mfd	50V 5%
C327	5054877000	Mylar	0.01 mfd	50V 5%
C329	5055417000	Elec.	100 mfd	25V
C355	5171284000	Elec.	1 mfd	50V
C356	5171285000	Elec.	1 mfd	50V
C357, C358	5172200000	Ceramic	10 pfd	50V
C359	5171285000	Elec.	1 mfd	50V
C360	5171284000	Elec.	1 mfd	50V
C361, C362	5172200000	Ceramic	10 pfd	50V
C363	5171280000	Elec.	0.47 mfd	50V
C364	5171281000	Elec.	0.47 mfd	50V
C365	5055417000	Elec.	100 mfd	25V
C381	5055405000	Elec.	10 mfd	16V
C382	5055405000	Elec.	10 mfd	16V
C383	5055403000	Elec.	47 mfd	6.3V
C384	5055403000	Elec.	47 mfd	6.3V
C385, C386	5172213000	Ceramic	120 pfd	50V
C387, C388	5172316000	Ceramic	220 pfd	50V
C389	5170077000	Elec.	10 mfd	16V (LR)
C390	5170077000	Elec.	10 mfd	16V (LR)
C391	5171285000	Elec.	1 mfd	50V
C392	5171284000	Elec.	1 mfd	50V
C393	5171357000	Elec.	100 mfd	10V
C394	5171356000	Elec.	100 mfd	10V
C395, C396	5170352000	Mylar	0.001 mfd	50V 5%
C397	5055454000	Elec.	1 mfd	50V
C398	5055454000	Elec.	1 mfd	50V
C399	5171305000	Elec.	4.7 mfd	25V
C400	5171304000	Elec.	4.7 mfd	25V
C401	5171345000	Elec.	47 mfd	6.3V
C402	5171344000	Elec.	47 mfd	6.3V
C403, C404	5054924000	Mylar	0.039 mfd	50V 5%
C411	5171285000	Elec.	1 mfd	50V
C412	5055420000	Elec.	100 mfd	16V
C418	5055460000	Elec.	470 mfd	6.3V
C419	5054738000	Mylar	0.047 mfd	50V 5%
C421	5171285000	Elec.	1 mfd	50V
C422	5171285000	Elec.	1 mfd	50V
C423	5171315000	Elec.	10 mfd	16V
C424	5171315000	Elec.	10 mfd	16V
C425	5171345000	Elec.	47 mfd	6.3V
C426	5171345000	Elec.	47 mfd	6.3V
C427	5170077000	Elec.	10 mfd	16V (LR)
C428	5170077000	Elec.	10 mfd	16V (LR)
C429, C430	5170362000	Mylar	0.0027 mfd	50V 5%
C431, C432	5054344000	Polyst.	820 pfd	50V 5%
C433, C434	5170368000	Mylar	0.0047 mfd	50V 5%
C435, C436	5054930000	Mylar	0.15 mfd	50V 5%

REF. NO.	PARTS NO.	DESCRIPTION		
C437, C438	5055417000	Elec.	100 mfd	25V
C439, C440	5054890000	Mylar	0.0039 mfd	50V 5%
C441, C442	5054895000	Mylar	0.012 mfd	50V 5%
C443, C444	5054887000	Mylar	0.015 mfd	50V 5%
C445	5170352000	Mylar	0.001 mfd	50V 5%
C447	5171316000	Elec.	10 mfd	25V
C449	5055417000	Elec.	100 mfd	25V
C450	5171316000	Elec.	10 mfd	25V
	VARIABLE RESISTORS			
R313, R314	5150097000	Semi-fixed, 5 k ohm		
R327, R328	5150097000	Semi-fixed, 5 k ohm		
R333, R334	5150233000	Semi-fixed, 20 k ohm		
R369, R370	5150096000	Semi-fixed, 100 k ohm		
R371, R372	5150096000	Semi-fixed, 100 k ohm		
R389, R390	5150096000	Semi-fixed, 100 k ohm		
R403, R404	5150240000	Semi-fixed, 500 ohm		
R429, R430	5150092000	Semi-fixed, 10 k ohm		
R493	5053902000	Semi-fixed, 200 ohm		
	TRIMMER CAPACITORS			
C301, C302	5054707000	Max. 80 pfd		
	COILS			
L301, L302	5056659000	Trap, 3 mH		
L303, L304	5056659000	Trap, 3 mH		
L305, L306	5056667000	Record, EQ; 1.5/4.2 mH		
	MISCELLANEOUS			
S301, S306	5134095000	Switch, Push; 4PDT		
S302, S305	5134094000	Switch, Push; DPDT		
S303, S304	5134094000	Switch, Push; DPDT		
P301, P304	5122126000	Connector Plug; 2P		
P302	5122299000	Connector Plug; 2P (Red)		
P303	5122128000	Connector Plug; 4P		
K301	5061137000	Relay, Reed; LAB-2L DC12V		
	5122171000	Connector Socket; 9P		
	5122168000	Connector Socket; 6P		
	5040090000	OSC Unit		

CONTROL PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	5158155000	PCB Assy (JAPAN, GENERAL EXPORT)
	5200004000	PCB Assy (U.S.A., CANADA)
	5200004100	PCB Assy (EUROPE, AUSTRALIA, U.K.)
	5167933002	PCB
	ICs	
U31	⚠5147058000	NJM78M05A
U32	5147054000	AN6251
U33～U35	5147056000	HD7400P
	5042712000	SN7400N
U36, U37	5147057000	HD7402P
	5042713000	SN7402N
	TRANSISTORS	
Q31	⚠5145087000	2SD313(E)
Q32	5042625000	2SC1318(S)
Q33～Q41	5142383000	2SC536(F)
Q42	5042553000	2SA733(P)
Q43～Q45	5042383000	2SC536(F)
Q46	5042553000	2SA733(P)
Q47	5042383000	2SC536(F)
Q48, Q49	5042553000	2SA733(P)
Q50	5042564000	2SC1061(C)
Q51, Q52	5042553000	2SA733(P)
Q53, Q54	5042564000	2SC1061(C)
Q56～Q61	5042383000	2SC536(F)
Q62～Q65	5042553000	2SA733(P)
Q66	5042625000	2SC1318(S)
Q67	5145129000	2SB507(E)
Q68, Q69	5042625000	2SC1318(S)
Q70, Q71	5145087000	2SD313(E)
Q72	5145192000	2SB507(E)
Q73	5042625000	2SC1318(S)
Q74	5145087000	2SD313(E)
Q75	5042625000	2SC1318(S)
Q76	5145087000	2SD313(E)
Q77	5042625000	2SC1318(S)
Q79	5042383000	2SC536(F)
Q80	5042383000	2SC536(F)
	DIODES	
D31～D36	5143243000	ERB12-02G1
D37	5143154000	Zener, EQA01-06S
D38	5143142000	M4C-51
D39, D40	5143118000	1S2473HJ
D42～D46	5143118000	1S2473HJ
D47～D49	5143243000	ERB12-02G1
D50	5143118000	1S2473HJ
D51	5143071000	U05C
D52	5143243000	ERB12-02G1
D54	5143017000	U05C
D55, D56	5143243000	ERB12-02G1
D57, D58	5143118000	1S2473HJ
D59	5143118000	1S2473HJ
D60	5143243000	ERB12-02G1

REF. NO.	PARTS NO.	DESCRIPTION	
	RESISTORS	**All resistors are rated ±5% tolerance, ¼ watt and of carbon type unless otherwise noted.**	
R31	⚠5184109000	2.2 ohm	Non Flammable
R32	5181472000	390 ohm	
R33	5181478000	680 ohm	
R34	5184306000	Cement, 3.3 ohm 2W	
R35	5181502000	6.8 k ohm	
R36	5181506000	10 k ohm	
R37	5181496000	3.9 k ohm	
R38	5181512000	18 k ohm	
R39	5181502000	6.8 k ohm	
R40	5184133000	22 ohm	Non Flammable
R41	5181506000	10 k ohm	
R42, R43	5181494000	3.3 k ohm	
R44, R45	5181512000	18 k ohm	
R46～R53	5181458000	100 ohm	
R54～R61	5181506000	10 k ohm	
R62	5181458000	100 ohm	
R63	5181506000	10 k ohm	
R64	5181514000	22 k ohm	
R65	5181522000	47 k ohm	
R66	5181530000	100 k ohm	
R67	5181538000	220 ohm	
R68	5181506000	10 k ohm	
R73	5181530000	100 k ohm	
R75, R76	5181506000	10 k ohm	
R77	5181530000	100 k ohm	
R78	5181494000	3.3 k ohm	
R79	5181506000	10 k ohm	
R80	5181530000	100 k ohm	
R81	5181518000	33 k ohm	
R82	5181510000	15 k ohm	
R83～R85	5181522000	47 k ohm	
R86	5181530000	100 k ohm	
R87	5181530000	100 k ohm	
R88	5181522000	47 k ohm	
R89	5181530000	100 k ohm	
R90	5181494000	3.3 k ohm	
R91～R94	5181522000	47 k ohm	
R95～R97	5181530000	100 k ohm	
R98	5181522000	47 k ohm	
R99	5181506000	10 k ohm	
R100	5181522000	47 k ohm	
R101	5180062000	150 ohm	½W
R102	5181514000	22 k ohm	
R103, R104	5181506000	10 k ohm	
R105, R106	5181522000	47 k ohm	
R107, R108	5180062000	150 ohm	½W
R109～R111	5181514000	22 k ohm	
R112	5181518000	33 k ohm	
R113	5181510000	15 k ohm	
R114, R115	5181522000	47 k ohm	
R116, R117	5181506000	10 k ohm	
R118, R119	5181490000	2.2 k ohm	
R120	5181484000	1.2 k ohm	
R121, R122	5181522000	47 k ohm	
R123	5181488000	1.8 k ohm	
R124	5181522000	47 k ohm	
R125	5181506000	10 k ohm	
R126	5181514000	22 k ohm	
R127	5181508000	12 k ohm	

REF. NO.	PARTS NO.	DESCRIPTION
R128	5181516000	27 k ohm
R129	5181494000	3.3 k ohm
R130	5181488000	1.8 k ohm
R131, R132	5181450000	47 ohm
R133, R134	5184410000	Cement, 3.3 ohm 5W
R135, R136	5181514000	22 k ohm
R137, R138	5181480000	820 ohm
R139	5181482000	1 k ohm
R140	5181500000	5.6 k ohm
R141	5181494000	3.3 k ohm
R142	5184763000	Metal Film, 220 ohm 1W
R143	5181498000	4.7 k ohm
R144	5181514000	22 k ohm
R145, R146	5181522000	47 k ohm
R147	5181514000	22 k ohm
R148	5181514000	22 k ohm
R149	5181486000	1.5 k ohm
R151	5181482000	1 k ohm
R152	5181458000	100 ohm
R153	5181514000	22 k ohm
R154	5184763000	Metal Film, 220 ohm 1W
R155	5181494000	3.3 k ohm
R156	5181498000	4.7 k ohm
R157, R158	5181514000	22 k ohm
R159	5181488000	1.8 k ohm

CAPACITORS

C31, C32	5055440000	Elec.	470 mfd	16V
C33	5172973000	Elec.	1000 mfd	50V
C34	5055463000	Elec.	100 mfd	35V
C35	5055438000	Elec.	220 mfd	35V
C36	5055463000	Elec.	100 mfd	35V
C37, C38	5172973000	Elec.	1000 mfd	50V
C39, C40	5055714800	Elec.	2200 mfd	25V
C41	5171284000	Elec.	1 mfd	50V
C42	5172236000	Ceramic	0.01 mfd	50V
C43～C49	5171299000	Elec.	3.3 mfd	50V
C50, C51	5172236000	Ceramic	0.01 mfd	50V
C52	5171299000	Elec.	3.3 mfd	50V
C53, C54	5171325000	Elec.	22 mfd	10V
C55	5172236000	Ceramic	0.01 mfd	50V
C56	5171319000	Elec.	10 mfd	35V
C57	5054969000	Elec.	4.7 mfd	25V(KU)
C58	5171314000	Elec.	10 mfd	16V
C61～C63	5171325000	Elec.	22 mfd	10V
C64	5173192000	Elec.	100 mfd	10V
C65, C66	5171284000	Elec.	1 mfd	50V
C67	5172933000	Elec.	100 mfd	10V
C68	5172955000	Elec.	330 mfd	50V
C69	5171291000	Elec.	2.2 mfd	50V
C70	5171323000	Elec.	10 mfd	63V
C71	5173143000	Elec.	10 mfd	25V
C72	5172236000	Ceramic	0.01 mfd	50V

MISCELLANEOUS

5122126000	Connector Plug, 2P
5122127000	Connector Plug, 3P
5122128000	Connector Plug, 4P
5122129000	Connector Plug, 5P
5122133000	Connector Plug, 9P
5122136000	Connector Plug, 12P

REF. NO.	PARTS NO.	DESCRIPTION
	5122184000	Connector Plug, 3P (Black)
	5122183000	Connector Plug, 2P (Black)
	5122301000	Connector Plug, 4P (Red)
	5147041000	Socket, IC; 24P
	5033291000	Plate, Insulating
	5033295000	Tube, Insulating
	5555888000	Heat Sink, C
	5553296000	Frame, Joint
	5552390000	Frame, PCB
	5552391000	Frame, Heat Sink
	5142087000	Holder, Fuse
	5142231000	Fuse, 3A (JAPAN, GENERAL EXPORT)
	5307027100	Fuse, 3A (U.S.A., CANADA)
	5142191000	Fuse, 3.15AT (EUROPE, AUSTRALIA, U.K.)

MIC AMP PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	5158165000	PCB Assy
	5167935000	PCB

TRANSISTOR

Q511, Q512	5042461000	2SC1327(T)

CARBON RESISTORS

All resistors are rated ±5% tolerance and ¼ watt.

R511, R512	5181482000	1 k ohm
R513, R514	5181540000	270 k ohm
R515, R516	5181526000	68 k ohm
R517, R518	5181522000	47 k ohm
R519, R520	5181460000	120 ohm
R521, R522	5181508000	12 k ohm
R523, R524	5181490000	2.2 k ohm
R525	5181484000	1.2 k ohm

CAPACITORS

C511, C512	5170077000	Elec.	10 mfd	16V(LR)
C513, C514	5172208000	Ceramic	47 pfd	50V
C515, C516	5172134000	Dip. Tant.	47 mfd	6.3V
C517, C518	5055405000	Elec.	10 mfd	16V
C519	5055417000	Elec.	100 mfd	25V

MISCELLANEOUS

5123045000	Jack, MIC

VR PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	5168939100	PCB Assy
	5167939001	PCB
R531, R532	5183130000	Res., Carbon; 100 k ohm
R533, R534	5183110000	Res., Carbon; 15 k ohm
R529	5150236000	Var. Res., 10 k ohm - A x 2
R537	5150237000	Var. Res., 100 k ohm - A x 2
R539	5150236000	Var. Res., 10 k ohm - A x 2

IN/OUTPUT PCB ASSY (DBX)

REF. NO.	PARTS NO.	DESCRIPTION
	5168936000	PCB Assy
	5167936000	PCB
	TRANSISTORS	
Q541, Q542	5145036000	2SC945L(K)
Q543, Q544	5145095000	2SA826LN(S)
Q551, Q552	5145036000	2SC945L(K)
Q553, Q554	5145095000	2SA826LN(S)
	CARBON RESISTORS	
	All resistors are rated ±5% tolerance and ¼ watt.	
R541, R542	5183082000	1 k ohm
R543, R544	5183152000	820 k ohm
R545, R546	5183130000	100 k ohm
R547, R548	5183100000	5.6 k ohm
R549, R550	5183080000	820 ohm
R551, R552	5183130000	100 k ohm
R553, R554	5183100000	5.6 k ohm
R563, R564	5183152000	820 k ohm
R565, R566	5183130000	100 k ohm
R567, R568	5183100000	5.6 k ohm
R569, R570	5183080000	820 ohm
R571, R572	5183130000	100 k ohm
R573, R574	5183100000	5.6 k ohm
	CAPACITORS	
C541, C542	5054670100	Dip. Tant. 1 mfd 35V
C543, C544	5172315000	Ceramic 180 pfd
C545, C546	5054670100	Dip. Tant. 1 mfd 35V
C551, C552	5054670100	Dip. Tant. 1 mfd 35V
C553, C554	5172315000	Ceramic 180 pfd
C555, C556	5054670100	Dip. Tant. 1 mfd 35V
	MISCELLANEOUS	
	5126035000	Terminal Assy, DBX

CONNECTOR PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	5158002000	PCB Assy
	5167931000	PCB
	CARBON RESISTORS	
	All resistors are rated ±5% tolerance and ¼ watt.	
R601	5183088000	1.8 k ohm
R602	5183090000	2.2 k ohm
R604	5183086000	1.5 k ohm
R605	5183088000	1.8 k ohm
R608	5183088000	1.8 k ohm
R609	5183090000	2.2 k ohm
	MISCELLANEOUS	
J601	5122336000	Connector Socket, 12P
P602	5122155000	Connector Plug, 12P
	5554099100	Bracket, Connector

SPEED SW PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	5168927200	PCB Assy
	5167927100	PCB
	TRANSISTOR	
Q621	5042383000	2SC536(F)
	CARBON RESISTORS	
	All resistors are rated ±5% tolerance and ¼ watt.	
R621	5057058000	100 ohm
R622	5057122000	47 k ohm
R623	5057114000	22 k ohm
R626	5057058000	100 ohm
	CAPACITORS	
C621, C622	5055404000	Elec. 10 mfd 25V
	MISCELLANEOUS	
P621	5122149000	Connector Plug; 6P
	5134093000	Push Switch, 6PDT
	5134092000	Push Switch, DPDT

STOP SENSOR PCB ASSY

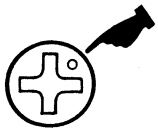
REF. NO.	PARTS NO.	DESCRIPTION		
	5168940000	PCB Assy		
	5167940000	PCB		
		IC		
U701	5147039000	NJM2901N		
		DIODE		
D701	5143118000	1S2473HJ		
		CARBON RESISTORS		
		All resistors are rated ±5% tolerance and ¼ watt.		
R701	5183122000	47 k ohm		
R702	5183074000	470 ohm		
R703	5183122000	47 k ohm		
R704	5183094000	3.3 k ohm		
R705	5183130000	100 k ohm		
R706	5183110000	15 k ohm		
R707	5183122000	47 k ohm		
R708	5183130000	100 k ohm		
R709	5183104000	8.2 k ohm		
R710	5183070000	330 ohm		
R711	5183110000	15 k ohm		
R712	5183122000	47 k ohm		
R713	5183130000	100 k ohm		
R714	5183106000	10 k ohm		
R715	5183132000	120 k ohm		
		CAPACITORS		
C701, C702	5055405000	Elec.	10 mfd	16V
C703	5055454800	Elec.	1 mfd	50V
C704	5054966000	Elec.	1 mfd	25V(KU)
		MISCELLANEOUS		
E701	5143105000	Magnetic Resistance Element, DM-101		

INCLUDED ACCESSORIES

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
	5128093000	Cord, Input-output Connection	
	5598054000	Reel Adapter, Clamp (TZ-612A)	
	RE-1002	Empty Reel, 10 inch	
	5062962000	Splicing Tape	
	5700002900	32-2 Owner's Manual (U.S.A. only)	
	5700003000	32-2 Owner's Manual (All except U.S.A.)	

ASSEMBLING HARDWARE CODING LIST

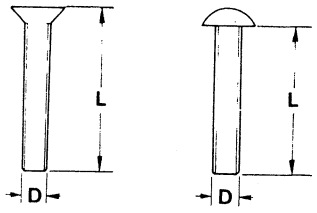
All screws conform to ISO standards, and have crossrecessed heads, unless otherwise noted. ISO screws have the head inscribed with a point as in the figure to the right.



FOR EXAMPLE:

B M 3 x 6

- B — Nomenclature
- M — Metric System
- 3 — Diameter in mm (D) *
- 6 — Length in mm (L)

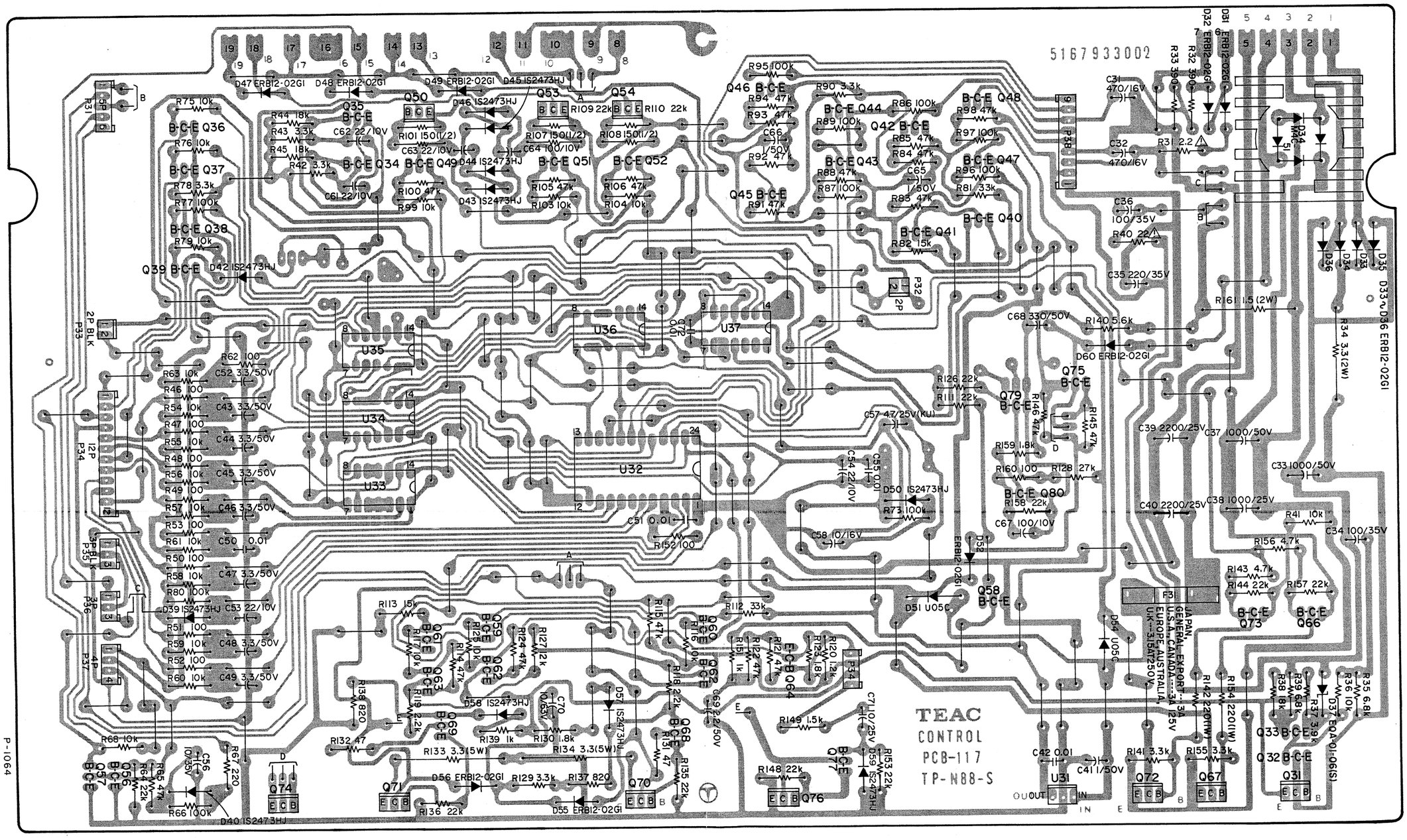


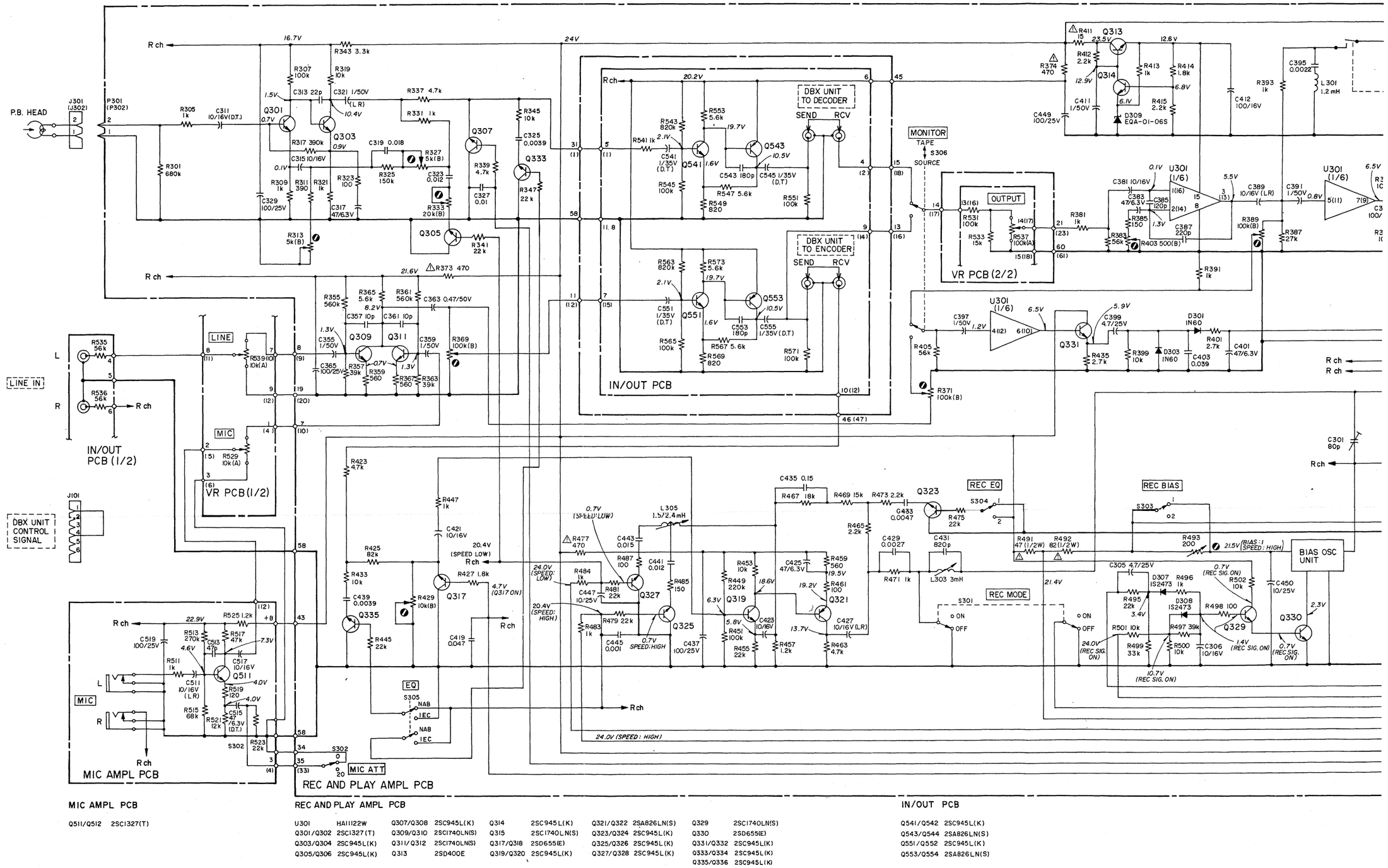
* Inner dia. for washers and nuts

	Code	Name	Type
MACHINE SCREW	R	Round Head Screw	
	P	Pan Head Screw	
	T	Stove Head Screw (Truss)	
	B	Binding Head Screw	
	F	Flat Countersunk Head Screw	
	O	Oval Countersunk Head Screw	
WOOD SCREW	RW	Round Head Wood Screw	
TAPTITE SCREW	PTT	Pan Head Taptite Screw	
	WTT	Washer Head Taptite Screw	
SEMS SCREW	BSA	Binding Head SEMS Screw(A Type)	
	BSB	Binding Head SEMS Screw(B Type)	
	BSF	Binding Head SEMS Screw(F Type)	
	PSA	Pan Head SEMS Screw(A Type)	
	PSB	Pan Head SEMS Screw(B Type)	

	Code	Name	Type
TAPPING SCREW	BTA	Binding Head Tapping Screw(A Type)	
	BTB	Binding Head Tapping Screw(B Type)	
	RTA	Round Head Tapping Screw(A Type)	
	RTB	Round Head Tapping Screw(B Type)	
SETSCREW	SF	Hex Socket Setscrew(Flat Point)	
	SC	Hex Socket Setscrew(Cup Point)	
	SS	Slotted Socket Setscrew(Flat Point)	
WASHER	E	E-Ring (Retaining Washer)	
	W	Flat Washer (Plain)	
	SW	Lock Washer (Spring)	
	LWI	Lock Washer (Internal Teeth)	
	LWE	Lock Washer (External Teeth)	
	TW	Trim Washer (Countersunk)	
NUT	N	Hex Nut	

CONTROL PCB ASSY





MIC AMPL PCB

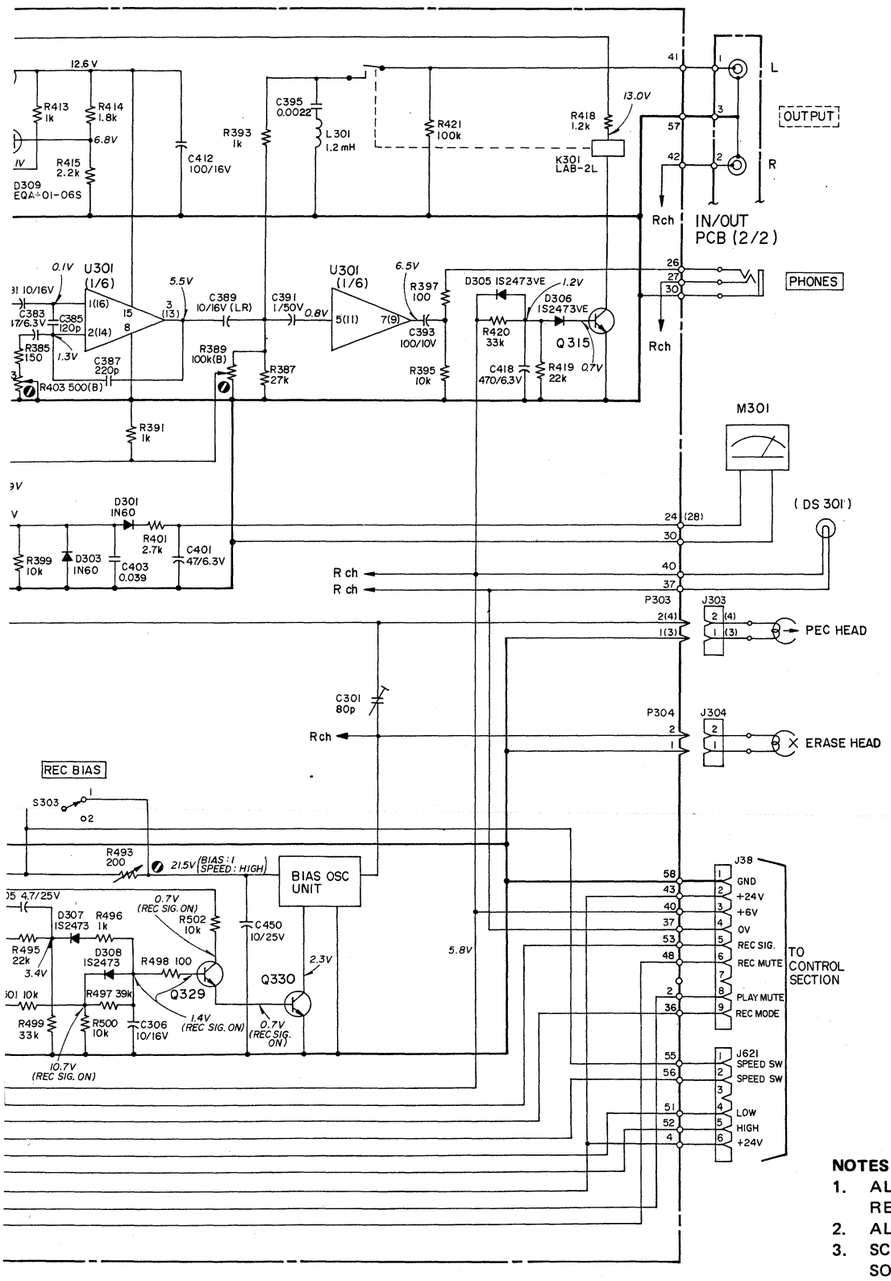
Q511/Q512 2SC1327(T)

REC AND PLAY AMPL PCB

U301	HA11122W	Q307/Q308	2SC945L(K)	Q314	2SC945L(K)	Q321/Q322	2SA826LN(S)	Q329	2SC1740LN(S)
Q301/Q302	2SC1327(T)	Q309/Q310	2SC1740LN(S)	Q315	2SC1740LN(S)	Q323/Q324	2SC945L(K)	Q330	2SD655(E)
Q303/Q304	2SC945L(K)	Q311/Q312	2SC1740LN(S)	Q317/Q318	2SD655(E)	Q325/Q326	2SC945L(K)	Q331/Q332	2SC945L(K)
Q305/Q306	2SC945L(K)	Q313	2SD400E	Q319/Q320	2SC945L(K)	Q327/Q328	2SC945L(K)	Q333/Q334	2SC945L(K)
								Q335/Q336	2SC945L(K)

IN/OUT PCB

Q541/Q542	2SC945L(K)
Q543/Q544	2SA826LN(S)
Q551/Q552	2SC945L(K)
Q553/Q554	2SA826LN(S)

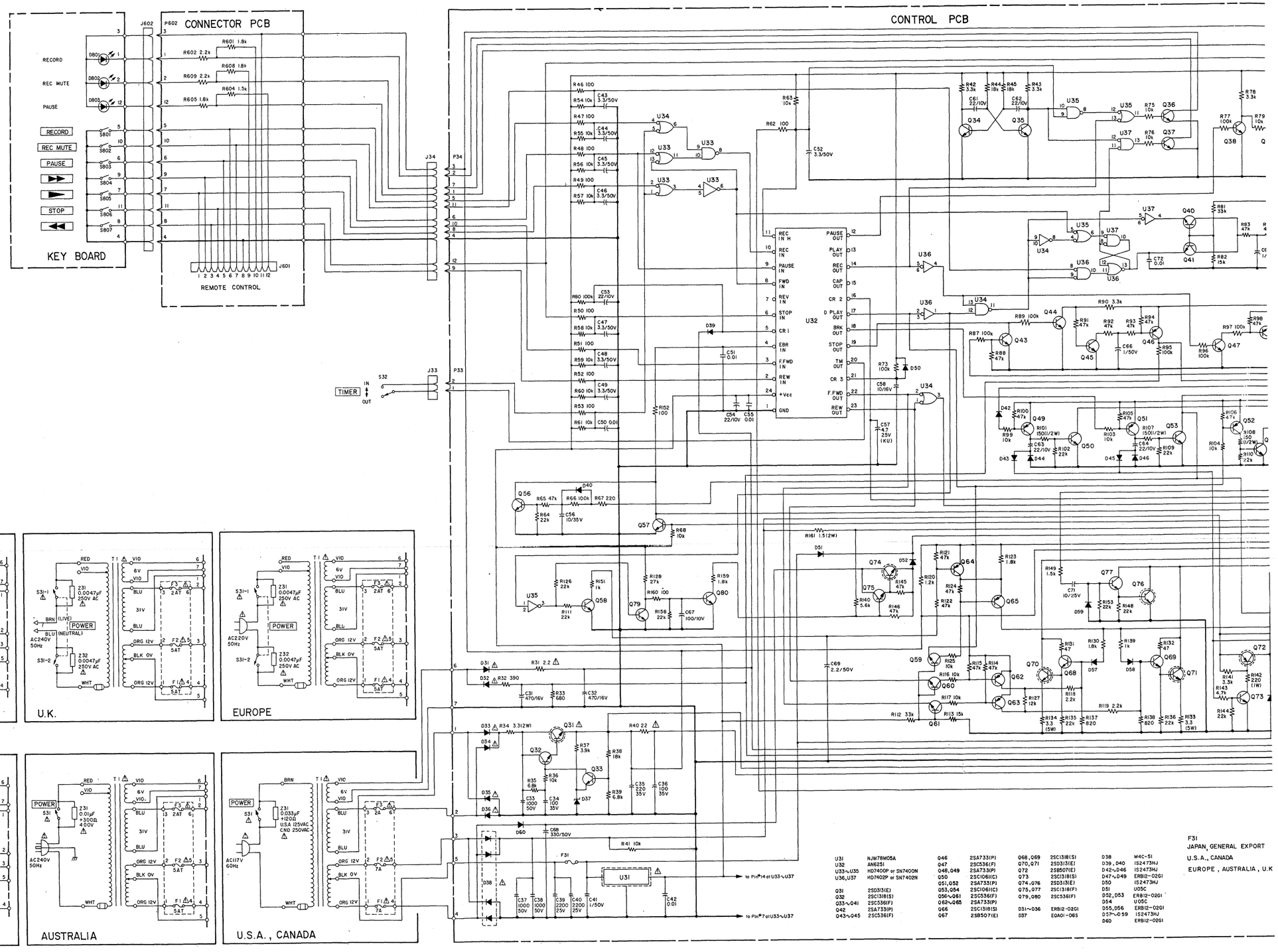


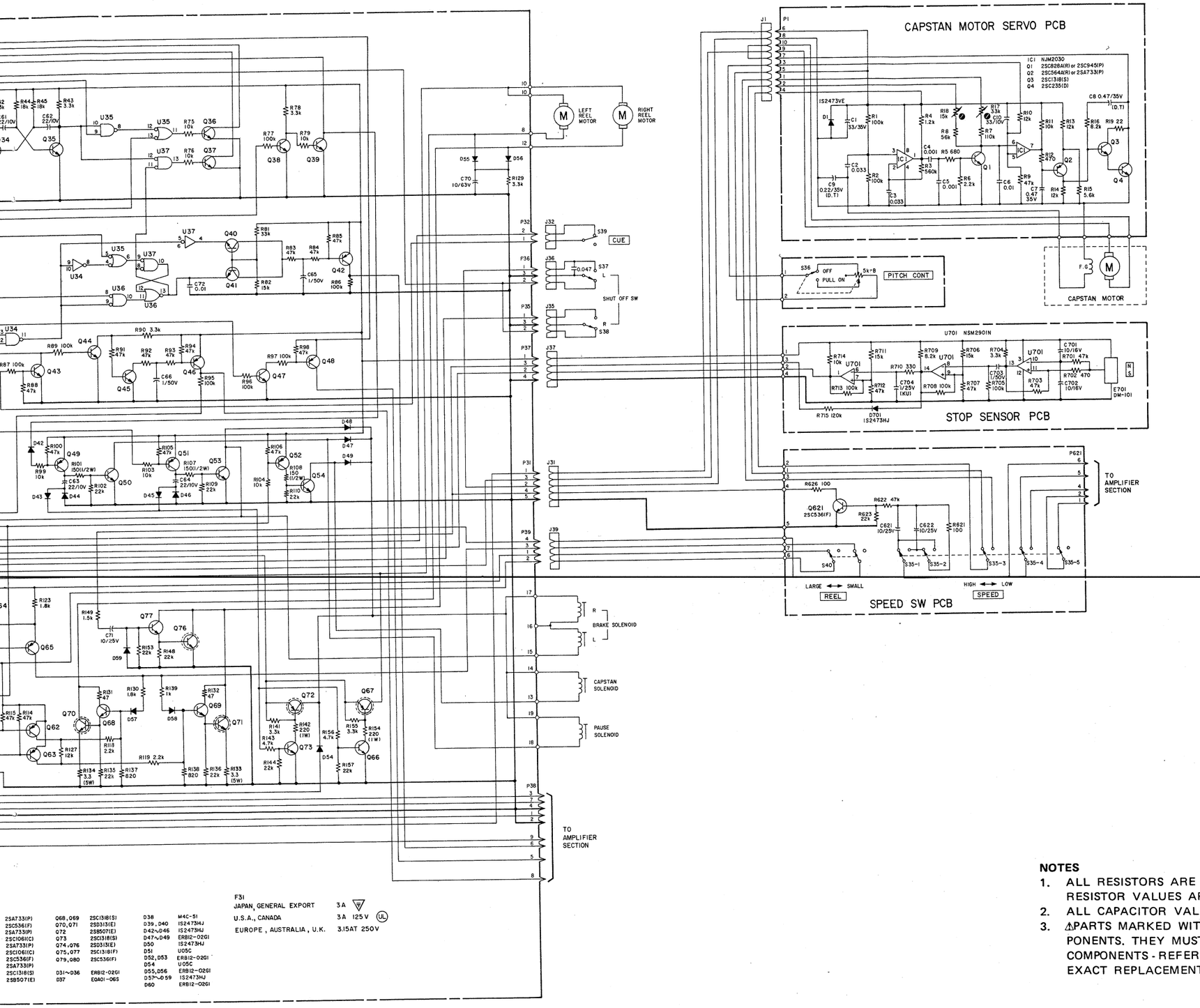
NOTES

1. ALL RESISTORS ARE ¼ WATT, 5%, UNLESS MARKED OTHERWISE. RESISTOR VALUES ARE IN OHMS (k = 1,000 OHMS, M = 1,000,000 OHMS).
2. ALL CAPACITOR VALUES ARE IN MICROFARADS (p = PICOFARADS).
3. SCHEMATIC DIAGRAM SHOWN FOR LEFT CHANNEL EXCEPT FOR SOME OF THE COMPONENTS.
4. DC VOLTAGES WERE MEASURED DURING RECORD PAUSE MODE UNLESS OTHERWISE NOTED.
5. ⚠PARTS MARKED WITH THIS SIGN ARE SAFETY CRITICAL COMPONENTS. THEY MUST ALWAYS BE REPLACED WITH IDENTICAL COMPONENTS - REFER TO THE TEAC PARTS LIST AND ENSURE EXACT REPLACEMENT.

1 2 3 4 5 6 7 8

A B C D E



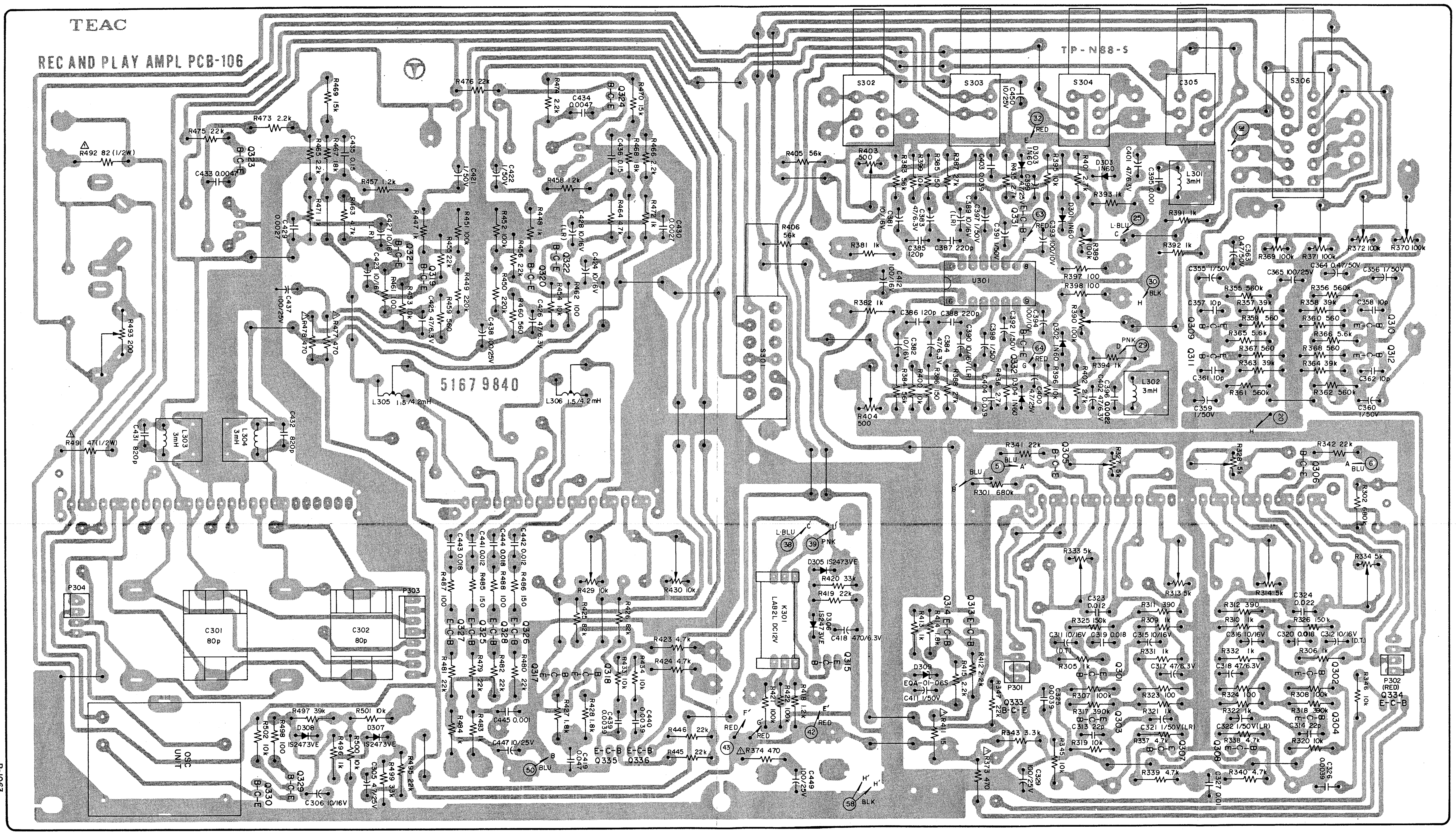


2SA733(P)	Q68,069	2SC1318(S)	D38	M4C-51	
2SC536(F)	Q70,071	2SD313(E)	D39,040	IS2473HJ	
2SA733(P)	Q72	2SB507(E)	D42~D46	IS2473HJ	
2SC1061(C)	Q73	2SC1318(S)	D47~D49	ERB12-02GI	
2SA733(P)	Q74,076	2SD313(E)	D50	IS2473HJ	
2SC1061(C)	Q75,077	2SC1318(F)	D51	U05C	
2SC536(F)	Q79,080	2SC536(F)	D52,053	ERB12-02GI	
2SA733(P)			D54	U05C	
2SC1318(S)	D31~D36	ERB12-02GI	D55,056	ERB12-02GI	
2SB507(E)	D37	EQA01-06S	D57~D59	IS2473HJ	
			D60	ERB12-02GI	

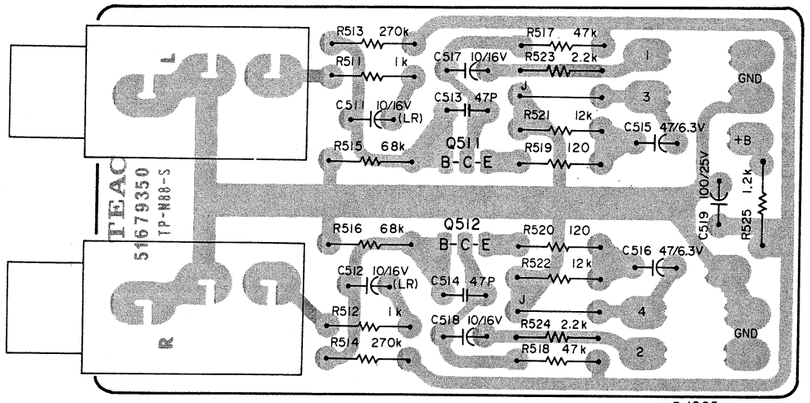
NOTES

1. ALL RESISTORS ARE ¼ WATT, 5%, UNLESS MARKED OTHERWISE. RESISTOR VALUES ARE IN OHMS (k = 1,000 OHMS, M = 1,000,000 OHMS).
2. ALL CAPACITOR VALUES ARE IN MICROFARADS (p = PICOFARADS).
3. ⚠PARTS MARKED WITH THIS SIGN ARE SAFETY CRITICAL COMPONENTS. THEY MUST ALWAYS BE REPLACED WITH IDENTICAL COMPONENTS - REFER TO THE TEAC PARTS LIST AND ENSURE EXACT REPLACEMENT.

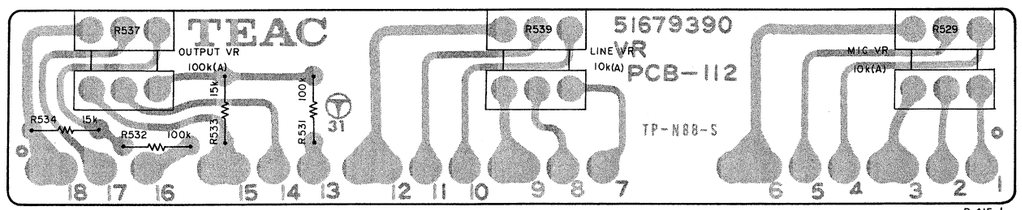
REC AND PLAY AMPL PCB ASSY



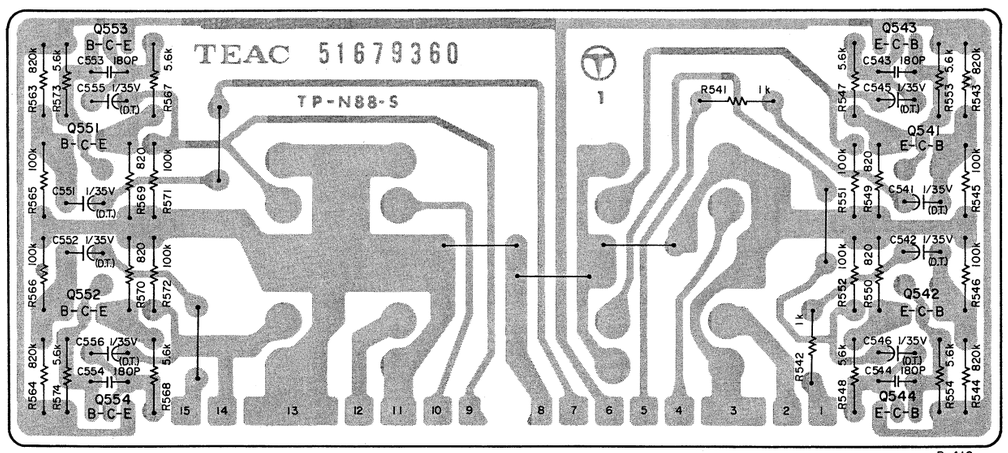
MIC AMP PCB ASSY



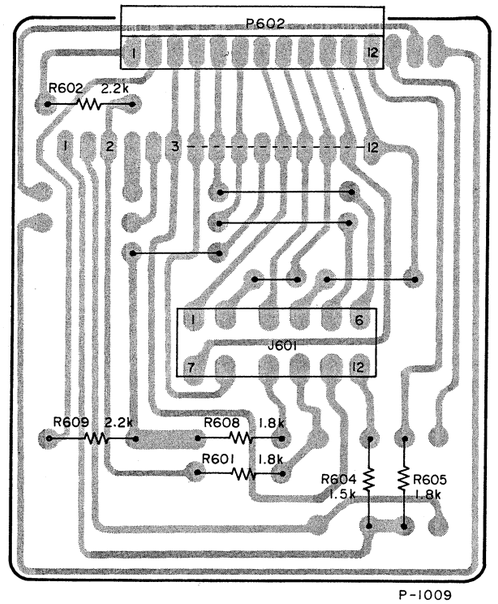
VR PCB ASSY



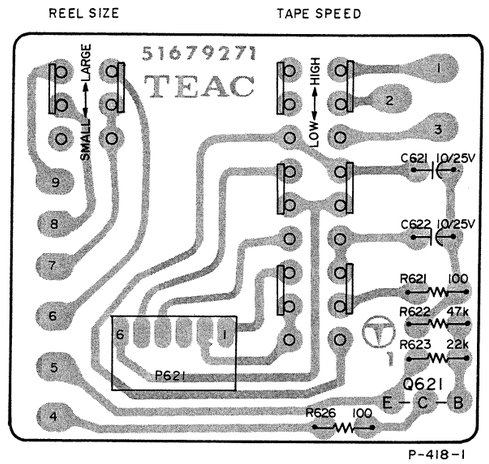
IN/OUTPUT PCB ASSY (DBX)



CONNECTOR PCB ASSY



SPEED SW PCB ASSY



STOP SENSOR PCB ASSY