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**Service Manual**

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**Model**

**80**

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**8 Track Recorder/Reproducer**

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**Fostex**

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### NOTES

\* Adjustment procedures are given in this manual which also includes a Parts List and schematic diagrams to assist the service technician in maintaining the Model 80.

Please feel free to contact the nearest Fostex Dealer and Distributor, or write directly to a Fostex office, the addresses of which are printed on the back cover of this manual.

\* Noise Reduction System manufactured under license from Dolby Laboratories Licensing Corporation. 'Dolby' and the double-D symbol are trademarks of Dolby Laboratories Licensing Corporation.

### CAUTION

△Parts marked with this sign are safety critical components. They must always be replaced with identical components. Refer to the Fostex Parts List and ensure exact replacement.

## 1. INTRODUCTION

Fostex Model 80 is an 8 track 8 channel recorder/ reproducer which uses 1/4 inch tape and has the capability of multitrack and live recording.

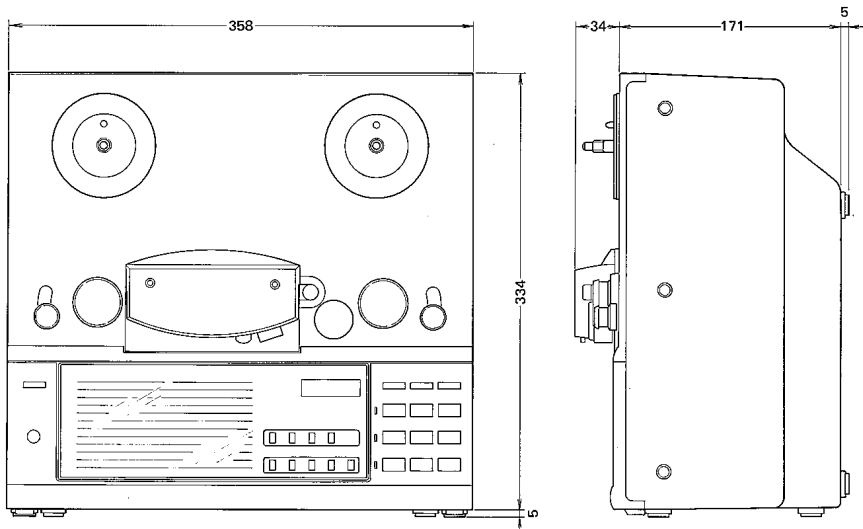
It is a compact, lightweight and designed to save energy both in use and in transit.

The features of the Model 80 are: easy switching between sync and record modes; a simple logical monitoring system; punch in/out capability without any clicks in the recording; a sophisticated transport control system using an 8 bit CPU; remote control capability by a foot pedal; and provision for use with SMPTE sync lock.

In addition, approximately 20dB of noise reduction is obtained by the built in Dolby C type noise reduction system.

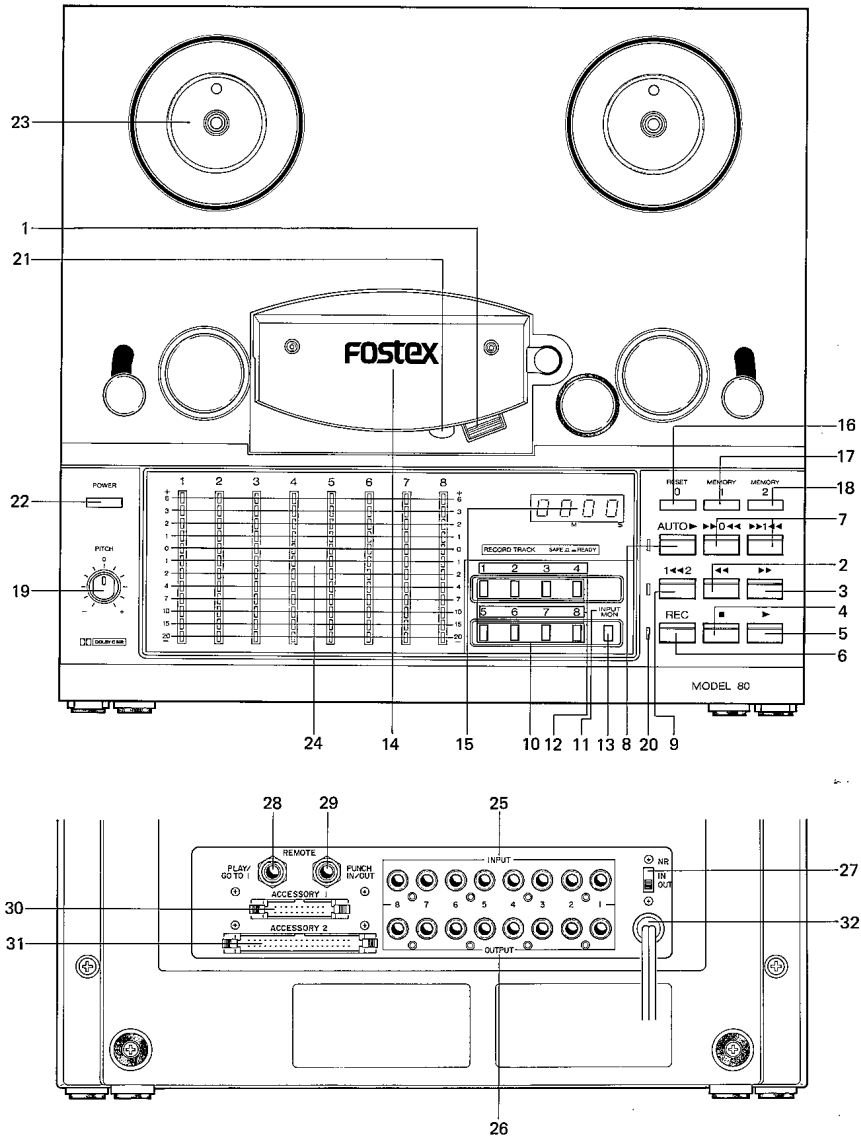
The ease of threading, location of controls and LED displays have made this multitrack recorder extremely easy to operate by the single artist working alone.

For maintenance, remove the front trim panel and bottom cover.



## 2. SPECIFICATION

TAPE	1/4 inch tape width, 1 mil base
FORMAT	8 track, 8 channel (8 ch. record, 8 ch. reproduce)
REEL SIZE	7 inch
TAPE SPEED	15 ips, $\pm 0.5\%$
PITCH CONTROL	$\pm 10\%$
LINE INPUT	-10dBV (0.3V), impedance: 30K $\Omega$ , unbalanced
LINE OUTPUT	-10dBV (0.3V), load impedance: 10K $\Omega$ or higher, unbalanced
RECORD LEVEL CALIBRATION	0dB referenced to 320 nWb/m of tape flux
EQUALIZATION	35 micro secs at 15 ips
WOW & FLUTTER	$\pm 0.06\%$ peak (IEC/ANSI), weighted for 15 ips, measured with flutter test tape
STARTING TIME	Less than 0.5 sec,
FAST WIND TIME	130 seconds for 1800 ft. of tape
FREQUENCY RESPONSE	40Hz $\sim$ 18KHz, for 15 ips $\pm 3$ dB
SIGNAL TO NOISE RATIO	72dB weighted, 60dB unweighted for 15 ips, referenced to 3% T.H.D. level (10dB above 0dB) at 1 KHz
T.H.D.	Less than 1% at 1 KHz, 0 VU
ERASURE	Better than 70dB at 1 KHz
POWER REQUIREMENTS	120V AC, 55Hz, 60W (U.S.A./Canada models) 220V AC, 55Hz, 60W (European models) 240V AC, 55Hz, 60W (UK/Australian models)
DIMENSIONS, overall	14" (W) x 13-1/2" (H) x 6-3/4" (D)
WEIGHT	29 lbs. (13Kg.)



### 3. THE CONTROLS AND THEIR FUNCTIONS

1) Head shield gate

The head shield gate is manually operated. If the gate is retracted, a short downward push of its top edge will release the lock and the gate rises by spring action. To retract it, press down until it locks.

2) Rewind button [◀◀]

Spools tape at high speed from the right reel to the left reel.

3) Fast forward button [▶▶]

Spools tape at high speed from the left reel to the right reel.

4) Stop button [■]

All modes of REWIND, F.FWD, RECORD, PLAY, LOCATE 0 and LOCATE 1 will be cancelled when the STOP mode is engaged.

5) Play button [▶]

15 ips ± variable speed control (±10%).

6) Record button [REC]

a) With more than one, and up to 8 RECORD TRACK buttons depressed, simultaneously depressing both RECORD and PLAY puts the tracks thus assigned in the record mode.

b) With more than one, and up to 8 RECORD TRACK buttons depressed, and with the transport in the PLAY mode, simultaneously depressing of both RECORD and PLAY buttons puts the tracks thus assigned to the record mode (punch in).

7) LOCATE 0 [▶▶ 0 ◀◀] and LOCATE 1 [▶▶ 1 ◀◀] button

When either the LOCATE 0 or LOCATE 1 button is depressed, the tape will search at F.FWD or RWD to the zero second position on the times; when LOCATE 0 is depressed, or when a tape position has been put into the memory by depressing the MEMORY 1 button, then the transport will enter the STOP mode upon reaching the selected position.

8) Auto Play [Auto▶] button

When this button is depressed, the LED at left of this button will be lit, and the transport automatically enters PLAY after coming to a stop by the function of the LOCATE 0, LOCATE 1 or the REPEAT button.

9) REPEAT [1◀◀2] button

When this button is depressed, the LED at left of this button will be lit, and when the tape is in the PLAY mode between MEMORY 1 and MEMORY 2, it will

automatically enter RWD upon reaching the MEMORY 2 position, and then stop at the MEMORY 1 position.

If the Auto Play button has also been depressed, the tape will automatically enter PLAY from the above stop mode.

NOTE: The MEMORY 1 tape position will normally be located ahead of MEMORY 2. If this relationship is reversed and the REPEAT button is depressed, the tape timer LED will blink to indicate an error.

#### 10) RECORD TRACK selector

These 8 pushbuttons determine whether recording can commence on a given track.

The specific function also depends on whether tape is stopped, or is advancing in the record ready mode.

a) If tape is stopped, depressing a RECORD TRACK button places the corresponding track in the record ready mode, and the LED above that RECORD TRACK button will blink.

If the RECORD button only is depressed, the meter indications and signals from the OUTPUT jacks will change from tape out to input monitor only for those channels whose RECORD TRACK buttons are depressed, and if the INPUT MON switch is not depressed, the INPUT MON LED will change to blinking. This mode will be cancelled by depressing the RECORD button again, but will not be cancelled by depressing any other button.

If the RECORD and PLAY buttons are subsequently depressed, the tape begins recording, the RECORD TRACK LED stops blinking and remains on, and the RECORD LED also lights.

Meter indications and signals from the output jacks will carry the input signal of the channel(s) which are in the record mode by this operation; the other channel(s) will remain in the tape out signal monitor mode.

b) If tape is rolling in the PLAY mode, depressing a RECORD TRACK button has the same effect as in a), above; it readies the track for recording. In this condition, meter indications and signals from the output jacks will be tape out for all channels.

c) If tape is rolling in the record ready mode (i.e. RECORD and PLAY buttons have been depressed), the RECORD LED adjacent to the RECORD button will be a green light.

Subsequent depression of a RECORD TRACK button immediately causes that

TRACK LED now remains on.

- 11) INPUT MONITOR LED
- 12) RECORD LED (Tracks 1 ~ 8)
- 13) INPUT MONITOR selector
  - a) If this switch is depressed, all channels will carry the input signal and LED (11) will light.
  - b) If this switch is not depressed, individual channels will monitor the input signal in the following way.

When the RECORD TRACK selector (10) is set to READY and when LED (12) is blinking, depressing the REC (6) button only will cause LED (12) to blink and the Model 80 output for that channel only will change from TAPE OUT to INPUT.
  - c) Subsequent depressing of the REC (6) button will change the output signal from INPUT to TAPE OUT.
  - d) Should the REC button only be depressed when the RECORD TRACK selector (10) is at SAFE, LED (11) will blink but the output signal will not change to INPUT.

NOTE: While a given channel is in the RECORD mode, depressing the RECORD TRACK selector button for another channel will put that channel in the record mode and the output signal will change to INPUT.

14) Head assembly

15) Tape timer

A four digit counter displays the minutes and seconds. For negative position display (below the zero point), a "--" is shown in front of the minute position.

16) RESET [0] button

The counter display is returned to zero by depressing this button.

17) Memory 1 button

The present time shown in the tape timer is stored in Memory 1 by depressing this button.

18) Memory 2 button

The present time shown in the tape timer is stored in Memory 2 by depressing this button.

19) Pitch control knob [PITCH]

The 12 o'clock click action stop of this knob is the normal speed position (15 ips; 38cm/s); speed can be varied -10% with full CCW rotation, and +10% with full CW rotation.

20) Record LED [REC]

This LED will light green or red depending on the following conditions.

\* With none of the RECORD TRACK buttons depressed, this RECORD LED will light green (record ready) when the RECORD and PLAY buttons are simultaneously depressed.

\* With one or more RECORD TRACK buttons depressed, this RECORD LED will light red (recording) when the RECORD and PLAY buttons are simultaneously depressed.

This LED does not light during playback/search modes.

21) Cue lever

The lifter mechanism lifts the tape away from the heads in the REWIND and F.FWD modes in order to prevent undue wear.

The cue lever is provided to allow tape cueing by defeating the lifter mechanism. Engaging the cue lever moves the lifter pins toward the head, until the tape touches the head.

22) Power switch [POWER]

AC power is applied to the unit and the VU meters light when this button is depressed.

The capstan motor will not rotate unless the takeup reel side tension arm is up --- unless the shut-off switch linked to the tension arm is on --- but the capstan motor will rotate in the EDIT mode, even though the tension arm is down.

23) Reel clamp

The reel is secured to the reel turntable by CW rotation of this clamp.

24) LED bargraph meter

These are peak reading meters. 0dB on the meter corresponds to a tape flux of 320 nWb/m.

25) INPUT jack

26) OUTPUT jack

27) NR INT/EXT switch [NR]

The integral Dolby C noise reduction system operates when this switch is set

28) GO TO 1/PLAY

The Model 8051 Foot Switch is plugged in here to control the Model 80.

When the Model 80 is in the stop mode, stepping on the foot pedal puts the transport in PLAY mode.

When in modes other than stop, the function is the same as LOCATE 1, Item 7) above, whereby the Memory 1 tape position is searched in F.FWD or RWD and stopped at the selected position.

29) PUNCH IN/OUT switch

This switch is used with the Model 8051 Foot Switch to control the Model 80 record mode.

When Model 80 is in the PLAY mode, stepping on the foot pedal once induces Punch-in; stepping on it again induces Punch-out.

With the Model 8051 plugged in, and the transport in the RECORD mode, stepping on the foot pedal induces Punch-out.

30) ACCESSORY 1

The receptacle for connecting the Synchronizer.

Please inquire at your nearest Fostex dealer or service station for details on the Synchronizer.

The Model 8031 Remote Tape Control Unit is also connected here.

31) ACCESSORY 2

This receptacle is for connecting an external operating switch for controlling the Model 80.

Please inquire at your nearest Fostex dealer or service station for details.

32) AC power cord



## 4. FUNCTION OF THE CONTROL CIRCUITS

### 4.1 System control

Control signals, the basic elements in transport control, are generated by an N-MOS one chip 8-bit CPU, U5, and the expansion I/O port IC, U6.

At system control of this unit, each signal for PLAY-O, STOP-O, FF-O, RWD-O, B-SOL-O and BOOST-O from the output pin, is used in the various control circuits. When these signals of low level are applied to the input pin of U5, the corresponding OUTPUT pin of U5 or U6 turns to low level.

#### 1) RESET (U5-4)

This is the reset signal input pin for U5. At power on, U5-4 goes to low level to reset U5, for the duration of C25 to be fully charged through the internal pull up resistor (about 50Kohm). When power is switched off, the base of Q3 goes to low, Q3 is switched on by the charged voltage of C24 which, in turn, switches on U19, resulting in a quick discharge of C25; thus preparing the circuit for the next power on.

#### 2) LOW (U5-1)

When the STOP button is depressed during the F.FWD or RWD mode, the transport temporarily goes into the reverse tape travel mode. Then, low level is applied to LOW and then into the STOP mode, to engage the mechanical brakes. When tape speed decelerates to about 38 cm/s, a low level is applied to LOW from U7-4. This is due to the nature of the circuit, such that the height of the saw tooth wave at the collector of U18 (generated by the count pulse) becomes higher with progressively slower tape speeds. The timing chart is shown in Fig. 4-1.

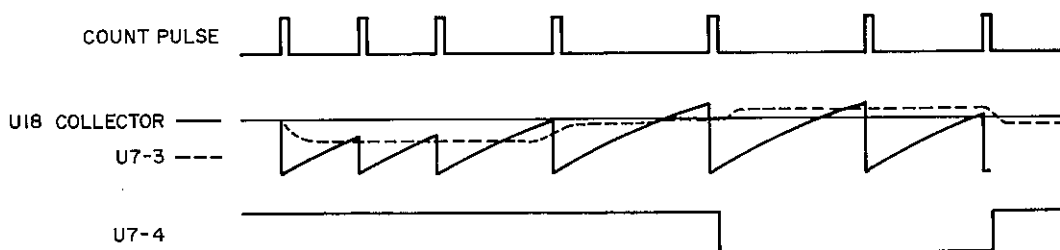


Fig. 4-1

#### 3) D-PLAY-IN (U5-28)

D-PLAY-IN is the input signal to inform U5 that the transport is in the PLAY mode. Although PLAY-O (U6-1) will be at low level during the PLAY mode, it

quickly goes to high by engaging STOP or other signals. However, the transport control output is delayed by about 100msec by the delay circuit of R110 and C39. As the transport will remain in the PLAY mode for the duration of this delay time, this information is transmitted to U5 via the D-PLAY-IN input signal, to prevent changing to the next mode.

4) PLAY 2 (U5-12)

When both the PLAY input (U5-18) and this PLAY 2 input (U5-12) are input during REC-PLAY, this mode is cancelled and reverts to the PLAY mode.

REC-PLAY will not be cancelled by PLAY input (U5-18) only.

5) GO TO 0 (U5-14), GO TO 1 (U5-13)

When these are applied, they will be LOCATED in Memory 0 or Memory 1. As the tape nears the selected address, F.FWD and RWD signals are alternately applied to slow down, and finally stop the tape at the selected address.

6) REPEAT (U5-29)

The transport will enter the AUTO RTN mode when a low level is applied to this input. Each time REPEAT is engaged, flip-flop U4-13 is alternately set and reset, the AUTO RTN LED goes on and off according to the output of U4-13, and U4-12 signals U4-29 that the transport is in the AUTO RTN mode.

7) A-PLAY-LED (U5-37)

Each time AUTO-PLAY (U5-37) is engaged, the flip-flop in U5 is alternately set and reset, and the A-PLAY-LED output (U5-37) will go to (1) high level with AUTO-PLAY is set, or (2) "L" level, when AUTO-PLAY is reset.

8) CAN-OUT (U5-36)

An "H" level is the output here for as long as these switches are engaged: GO TO 0, GO TO 1, F.FWD, RWD, PLAY, STOP and the foot switch for GO TO 1/PLAY, and for about 100 ~ 200 msec. immediately after release.

9) CAN-IN (U5-35)

This signal is applied from the remote control, etc., simultaneously with the control signals (PLAY 2, STOP, FF, RWD, REC). When this signal is input, the present modes of GO TO 0, GO TO 1, AUTO-PLAY and AUTO RTN will be cancelled and subsequently revert to the control signal mode that was input.

10) FF-O (U6-22), RWD-O (U6-23)

The signal for controlling the reel motor at F.FWD and RWD is the output here. PLAY-O (U6-1) is immediately output when PLAY is input during FF or RWD. However, even if U8-10 reverts to "H" at the completion of F.FWD or RWD, U8-1 is held at "L" level until C38 is charged (about 1 sec.), during which, the transport is kept in the STOP mode; when U8-1 turns to "H" level, it will

enter PLAY.

In addition to the above function, a voltage from U8-10 is applied to U13-12 and U13-3 of the reel motor drive circuit, via the C37 integration circuit, for about 200 msec, thus supplying torque to these motors until the mechanical brakes are applied.

11) BOOST-O (U6-5)

An "L" level pulse of about 50 msec. is the output here when FAST-SOL or PLAY-SOL is actuated. This pulse, stretched to 250 ~ 300 msec. by charge and discharge of C40, switches ON Q19 and Q20 of the solenoid intermittent circuit, thus applying a 24V intermittent voltage to the proper solenoid.

12) B-SOL-O (U6-4)

The "H" level output here at F.FWD or RWD switches ON Q26 or Q27, which pulls in the FAST-SOL.

13) EN/DE (U5-38)

This output is induced by the REC button for preload input action and will be "L" level at encode and "H" level at decode.

#### 4.2 Capstan Motor Drive Circuit

If the recorder is switched on with the tape loaded (with the left/ right tension arm in the up position), the capstan motor begins to rotate at 1,000 rpm. When put in the play mode, this rate accelerates to 2,000 rpm.

The 1,200Hz output from the TACH generator applied to U12-12 is amplified and a square wave emanates from U12-14. This square wave is differentiated by C31, R87, R88 and the plus side of this waveform switches on Q5. When the recorder is switched on, U8-5 goes to "L", Q4 and U22 switch on, and this output is applied to the integration circuit of R90, R192 and C32/C33. Therefore, a sawtooth waveform made by the signal from the integration circuit and on/off action of Q5, is applied to comparator U12-8. The rectified output from the integration circuit of R95, R96 and C34 passes through U12-7 and DC amplifier U12-1; then it is applied to Q6, which controls the current to the capstan motor.

Q7 switches on when Q6 is off, to act as a braking circuit by absorbing the counter-electromotive force from the motor.

When the PLAY button is depressed, the "L" output from U6-1 is passed through an inverter and applied to U8-5; on the other hand, as the signal to U8-6 is also "H", the output of U8-4 is an "H" which is applied to U20.

circuit of R89, R191 and C32/C33. At the same time, the "H" output of U8-4 makes the output of U7-12 revert to "L" thus switching off U22.

By this alternate switching of U21 and U22, the integration circuit constant is affected, and the output duty of comparator U12-8 is changed. As a result, the motor revolution changes from 1,000 rpm to 2,000 rpm; consequently, the TACH output of 1,200Hz rises to 2,400Hz. The TACH output at 1,000 rpm is about 350 mV.

When the shut off switch is on (left/right tension arm in down position), U24 is switched on to force the U12-1 output to "L" -- which then switches off Q6 -- and the motor is stopped.

#### 4.3 Reel Motor Drive Circuit

The takeup reel motor torque is adjusted to 300 g.cm  $\pm$ 30 g.cm (0.66 lbs/in.) by pot R193 (22K $\Omega$ ), and the supply reel motor torque to 270 g.cm  $\pm$ 30 g.cm (0.6 lbs/in.) (provided J19 is unplugged) by pot R194, 22K $\Omega$ . These adjustments result in potentials of 14.5  $\sim$  15V at U13-14, and 13.5  $\sim$  14.5V at U13-1.

U13-14, Q10, Q11 and U13-1, Q21, Q22 are constant current output circuits. As the potential across R141 and R166 changes in accordance with the motor current, these potentials are fed back to the constant current circuits of U13-14 and U13-1.

The two circuits of U13-8, Q14 and U13-7, Q18 prevent sudden high tape tension by gradually raising the voltage to the takeup reel motor at F.FWD or REWIND modes.

Consider, for example, the circuit of U13-8 and Q14. When power is switched on, the potential from the dividing resistors R137 and R140+R141 for +24V DC charges C42 via U13-8.

The integration circuits of Q17, C45, R170 are the boost circuits to prevent tape slacking at start-up in the PLAY mode.

When an "H" level is applied to C45 from U9-12, an "H" level is applied to Q17 for a certain length of time during which Q17 switches on. This action applies an "L" level to pins #13 and #2, respectively, of U13-14 and U13-1, thus raising the amplifier gain at each output. As a result, there is an increase of motor currents and, consequently, a rise in motor torque. When Q17 switches off, the voltages applied to pins #13 and #2, respectively, of U13-14 and U13-1, gradually rise, and each amplifier gain drops to its normal level.

Then, if the F.FWD button is depressed, the "L" level from U6-22 is inverted

to an "H" level and applied to the base of Q8, which switches on both Q8 and Q9.

At the switching on of Q9, the +24V DC passing through R130 and R132 further charges C42, and the voltage divided by R130 and R132 is applied to U13-14.

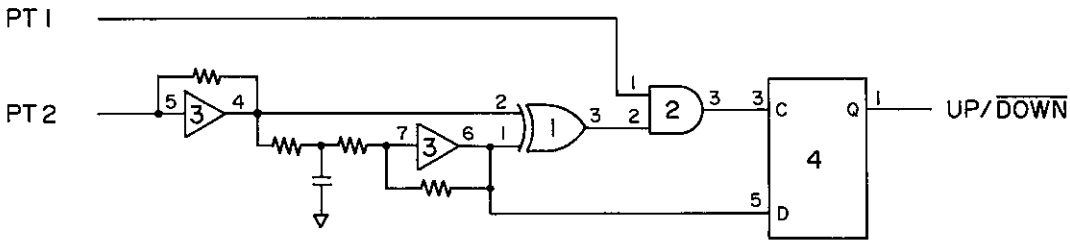
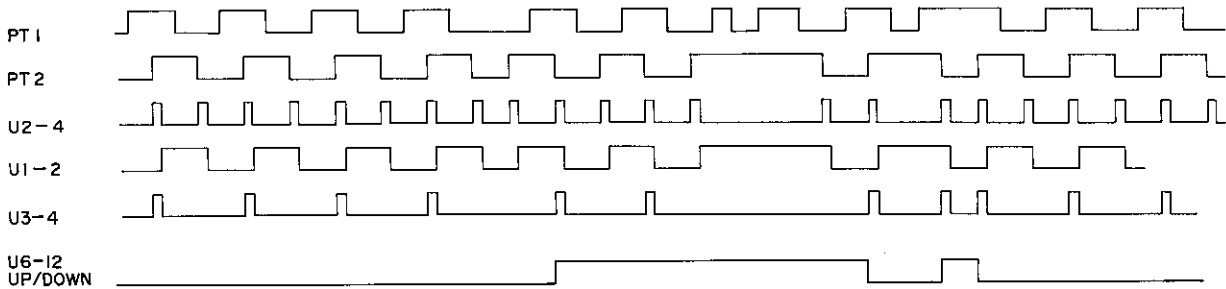
As the potential applied to U13-14 rises slowly, in step with the charging rate of C42, the motor current also rises slowly, resulting in a smooth rise in takeup reel torque.

When the transport is put in the REWIND mode from F.FWD, the "L" level from U6-23 is inverted to switch on Q15 and Q16, while simultaneously switching off Q8 and Q9. At the switching on of Q16, the +24V DC flows through R160 and D34 to switch on Q14; as a result, C42 is quickly discharged down to the emitter potential of Q14 (which is the output potential of U13-8).

C42 is also discharged when the transport is put in the STOP mode from F.FWD. In this case, the "L" level from U6-21 is inverted to an "H" level, applied to Q12 and Q13 to switch it on, thus feeding a base current to Q14 through R149 and D33 to switch it on, and discharging C42.

#### 4.4 Tape Counter Detecting Circuit

Rotation of the left side footage roller is detected by two photo-interrupters; their outputs are fed to the counter section. These outputs serve as the count pulse and up/down signal.



The signals from the two photo-interrupters are converted, as shown in the Signal Timing Chart of Fig. 4-2, and applied to the count pulse (U5-39) and up/down (U5-6) signal.

#### 4.5 Counter Section

1) BCD OUT (U6-17 ~ 20), DIG OUT (U6-13 ~ 16), MINUS-O (U6-3)

The four 7 segment LED displays are lit by multiplexing.

Each signal of the DIG 1 through 4 outputs is held at "L" level for a constant length of time and the output from BCD OUT is displayed as numerical information. This BCD OUT is decoded into a 7 segment signal by U10 and the resulting "H" level applied through a resistor to the a ~ g segments of the LED.

A pulse signal is the output from MINUS-O (U6-3) for minus indication of the display.

2) CLEAR (U5-27)

This is an input port for entering CLEAR, M1 and M2 by utilizing the multiplexing signal for the LED digital display.

For example, when CLEAR is depressed, CLEAR (U5-27) will go to "L" during ON of DIG4, thus resetting the counter display.

In the same way, M1 and M2 are applied when DIG3 for M1 or DIG2 for M2 is ON; the CLEAR (U5-27) INPUT will, respectively, go to "L".

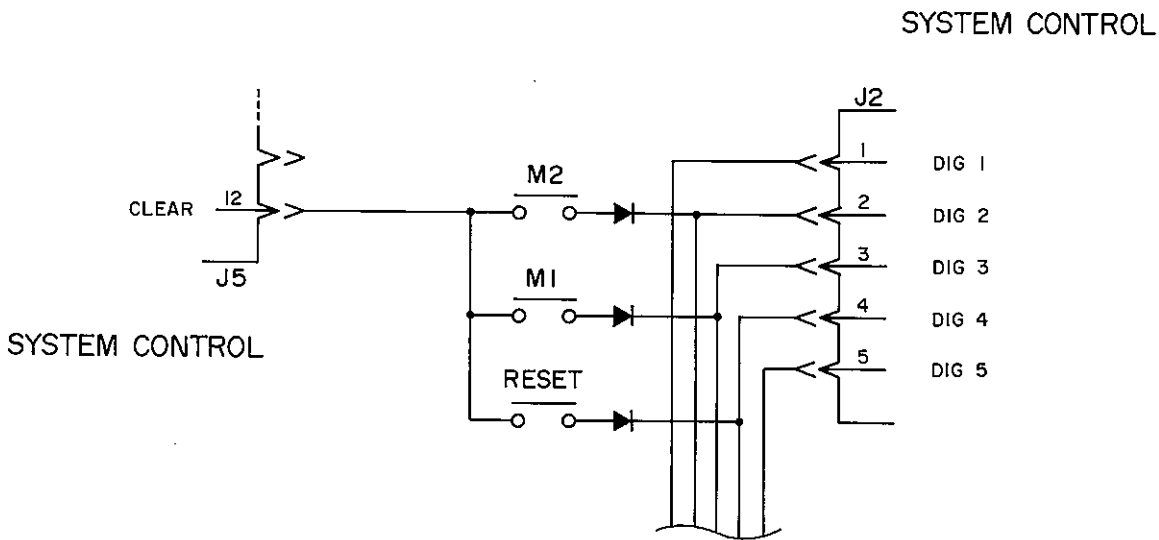


Fig. 4-3

#### 4.6 Connector Board

##### 1) R/P amplifier control circuit

Operation of channel 1 only will be explained as all 8 channels operate in the same way.

When an ENCODE signal arrives from the system control PCB, U1-8 goes to "L" level; if channel 1 of the record selector switch is depressed, U1-9 will also go to "L" level. Further, U1-10 will go to "L" level, the R/P amplifier will change to ENCODE mode and channel 1 will be in the input monitor mode. If the transport is in the REC-PLAY mode and if a TRANSPORT REC signal is applied at "L" level from the system control PCB, U1-13 goes to "L" level; when channel 1 of the record selector switch is depressed, U1-12 goes to "L" level. As a result, U1-11 goes to "L" level, and the R/P amplifier will go to the ENCODE mode.

When the transport is put in the REC mode, the MASTER OSC CONTROL signal from the R/P amplifier goes to "L" level and the master oscillator begins to oscillate. This signal passing through D3 switches OFF Q2 to switch ON the MASTER BIAS.

When either the TRANSPORT REC signal goes to "H" or the RECORD SELECTOR is switched OFF, U1-11 goes to "H", and thus the R/P amplifier REC signal goes to OFF. As a result, the R/P amplifier enters the DECODE mode.

The operation is the same for channels 2 through 8.

#### 4.7 Function switch (Function/control)

S1 through S8 are the RECORD SELECTOR switches and the numbers correspond to channel numbers 1 through 8.

D1 through D8 are the mode display LED's for the RECORD SELECTOR switches. S1 through S8 are 2-circuit 2-contact switches with one circuit used for the SAFE/RDY signal and the other used for LED control. Q1 is a constant current circuit and is controlled by the FUNCTION LED CONT signal. Q2 is for REMOTE/LOCAL switching, and when ON, the transport RECORD SELECTOR switch becomes effective.

Troubles and breakdown in the recorder can be prevented by scheduled checking and maintenance. Periodically follow the check items listed below:

a) Cleaning the heads and tape guides

All heads and guides in the tape path must be cleaned after each 6 hours of operation or before starting a new session of recording.

Cleaning fluids specially prepared for tape recorders are recommended.

b) Cleaning the pinch roller

Clean at least once after each full day of use.

A cleaning fluid which will not attack rubber must be used.

c) Cleaning the capstan

Clean this at the same time the head is cleaned.

The same cleaning fluid is recommended.

CAUTION - When deck is flat, be careful not to let cleaning fluid drip down the shaft and dissolve oil on bearing.

d) Demagnetizing of heads and tape guides

After cleaning all heads and tape guides, they should be demagnetized every morning or before starting a new session of recording.

1) Be sure to switch off the recorder.

2) Have all tapes at least 5 or 6 feet away when demagnetizing because the demagnetizer's magnetic field is very powerful.

3) Slowly wave the tip of the demagnetizer up and down in front of each head; then, slowly move it away. Slow movement is recommended as any abrupt motion can remagnetize the head. Take your time to repeat the process on the other heads and guides.

After you finish, draw the demagnetizer an arms-length away, switch it off, and unplug the cord.

e) Testing the brakes

See Item 6.3.2 Brake torque, page 24 .

f) Testing the pinch roller pressure

See Item 6.3.1 Pinch roller pressure, page 22 .

g) Testing the amplifier

Thread a blank tape on the Model 80 and record a 1KHz, 0dB signal. While the machine is in the record mode, check to see that the meters read 0dB.

If adjusting is required, refer to Item 6.4.1.

Rewind the above recording to the beginning, reset the RECORD TRACK to SAFE,



and put the machine in the PLAY mode. The LED bargraph meters should all read 0dB.

Record a 45Hz through 18KHz signal and check the overall frequency response with the LED bargraph meter to see that it is within  $\pm 3$ dB.

Disconnect any equipment plugged into the INPUT, record a length of no-signal tape, and reproduce it to check the S/N ratio.

## 6. SPECIAL MAINTENANCE

### 6.1 Test Equipment Required

Spring scale	0 ~ 8 lbs. (0 ~ 4 kg.) 0 ~ 10 ozs. (0 ~ 300 gm.)
Flutter meter	Meguro Denpa Sokki Co., Model MK-668B (Japan) or - Mincom Division, 3M Co., Model 8155 (U.S.A.)
Audio oscillator	Hewlett Packard, Model 204C or equivalent
Frequency counter	Range: 0 ~ 1MHz; sensitivity: 0.1Vrms; impedance: $>1M\Omega$ , $<25pF$
Band-pass filter	General purpose frequency analyzer
AC voltmeter	Range: -80dB ~ +40dB; impedance: $>1M\Omega$ , $<25pF$ (Example: HP400GL)
Oscilloscope	General purpose
Test tapes	For reproduce alignment: Fostex Model 9100A or - * [MRL 21J303, Magnetic Reference Lab.] * [BASF Calibration Tape (DIN 45513/2)] All specs are identical with Model 9100A. For wow/flutter measurement: Fostex Model 9102A or - * [STL #53-1, Standard Tape Lab.]
Blank tape	Ampex 457, Scotch 227 or TDK GX-90 is recommended.

## 6.2 Dismounting of Major Components

Depending on the extent of special maintenance, you may have to remove the bottom cover, trim panel, and dismount major components inside.

For the sake of efficient maintenance, please follow the procedures below. In order to fully understand the procedures, please refer to the EXPLODED VIEWS.

### 1) Bottom cover (Fig. 6-1)

The record/reproduce amplifier can be adjusted to a limited extent by removing only the Bottom Plate, but for Dolby level calibration and bias trap adjustments, the Bottom Cover must be removed.

The bottom cover can be removed by unscrewing four screws (A) on the bottom side and a total of six screws (B) from both sides. The four screws (A) are of the self tapping type.

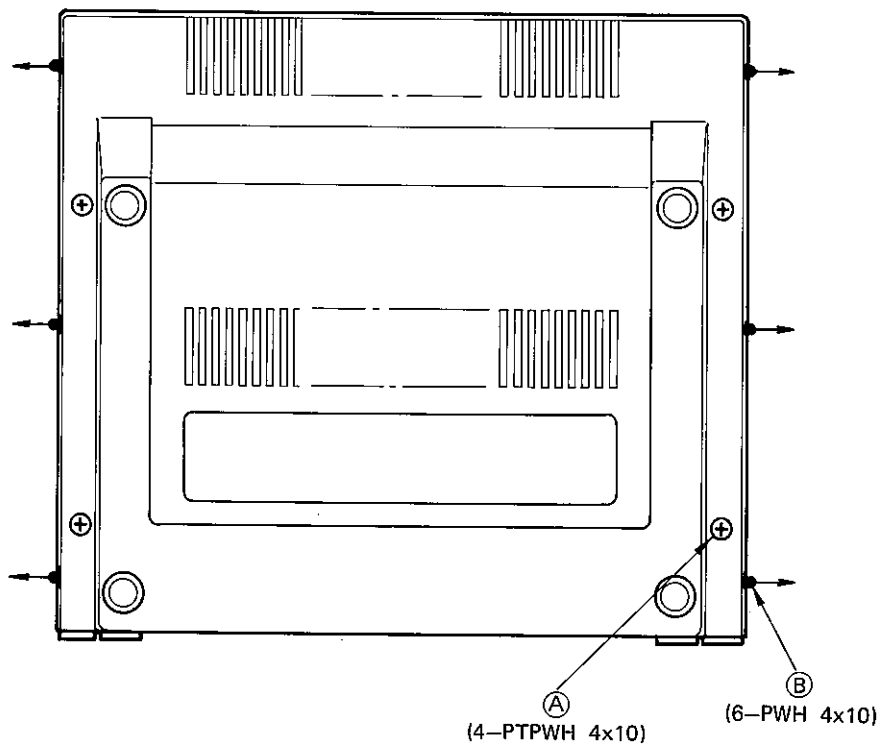
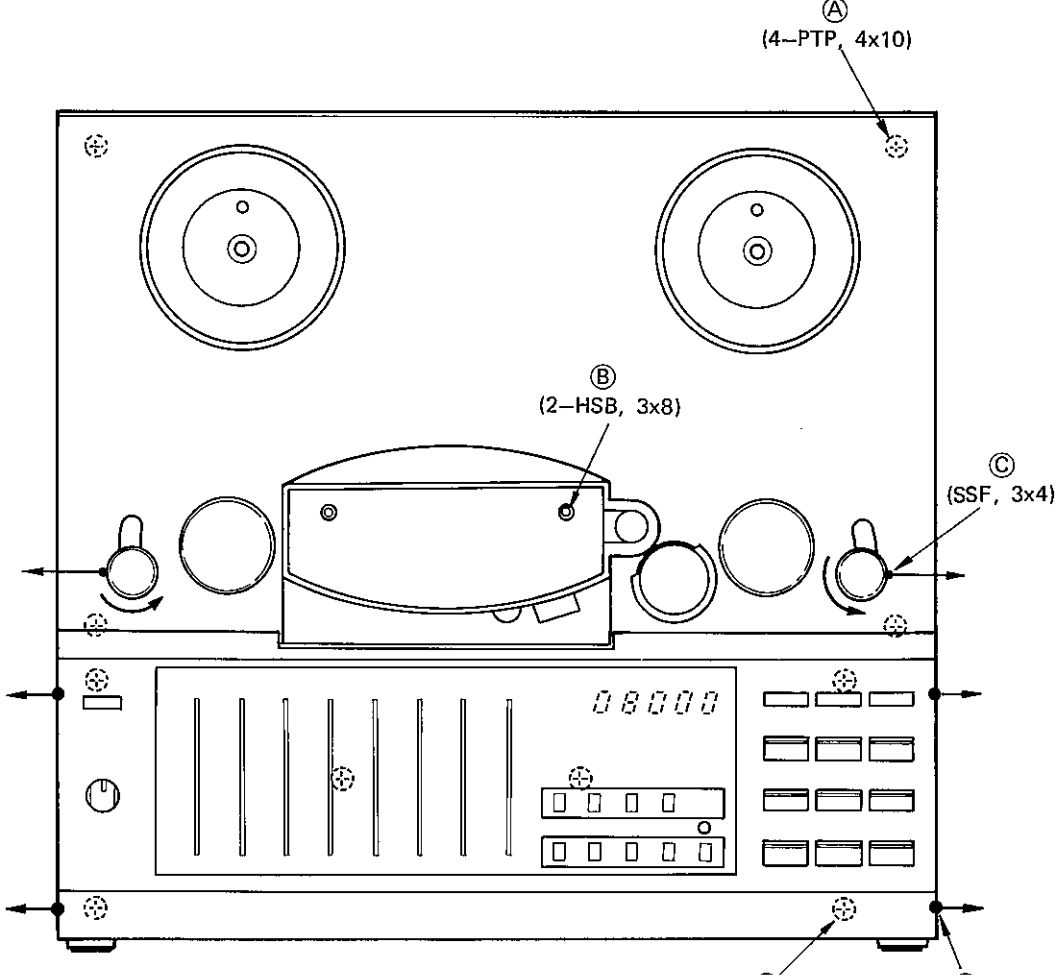


Fig. 6-1

2) Tape transport panel (Fig. 6-2)

- \* With the bottom cover removed, unscrew the four truss head 4 x 10 self tapping screws (A) from the bottom side.
- Next, from the top panel side, remove the head housing, pinch roller and the left and right roller guides.
- \* The head housing can be removed by loosening the two 3 x 8 hex socket screws (B).
- \* The rubber roller of the pinch roller can be removed by taking off the cap with a CCW rotation.
- \* After removing the left and right rollers by taking off the caps by CCW rotation, dismount the tension roller base by loosening the 3 x 4 set screws (C).
- \* With these components dismounted, the tape transport panel can be removed, thus permitting adjustments on pinch roller pressure, brake torque and tape tension.



3) Amplifier panel (Meter and control panel, Fig. 6-2)

- \* With the bottom cover removed, as in previous item 1, remove two upper and lower screws on the panel side, from among the six (D) screws on both sides of the amplifier section.
- \* Then, draw out the panel section and remove the dress panel by unscrewing the six screws (E) from the underside of the panel.

4) Record/reproduce PCB (Fig. 6-3)

- \* Regular adjustments on the record/reproduce amplifier are possible without removing the bottom cover, as previously mentioned, but for adjusting the bias trap coil or to connect an AC voltmeter and oscilloscope to the test point in adjusting trim pots, the record/reproduce PCB must be brought out by using the extender card (Fostex P/N 8286010000).
- \* Upon removing the plate holding down the PCB's by unscrewing the four screws (A), the record/reproduce PCB can be brought out by using the extender card as these are all of the plug-in type.

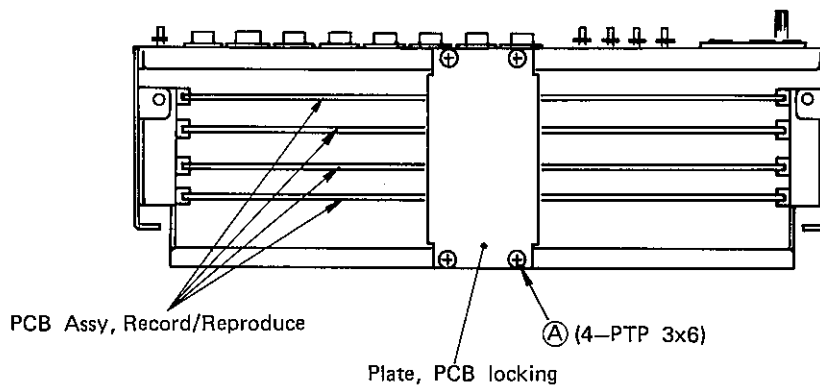


Fig. 6-3

5) Amplifier assembly (Fig. 6-4)

- \* Upon loosening a total of eight screws (A) (four each on both sides) on the side chassis of the amplifier assembly, it can be pulled out from the housing.

6) Tape transport mechanism (Fig. 6-5)

- \* Remove five screws (A) and loosen the two screws (B), securing the solenoid.
- \* Unhook the spring shown in the drawing.
- \* Remove the pinch roller rubber after taking off the cap by turning it CCW.

\* The base plate, with the capstan assembly, head assembly, roller and tension arm assembly all mounted as a single unit, can be taken out.

CAUTION: The pinch roller pressure must be adjusted to its correct value whenever this unit is removed and reinstalled.

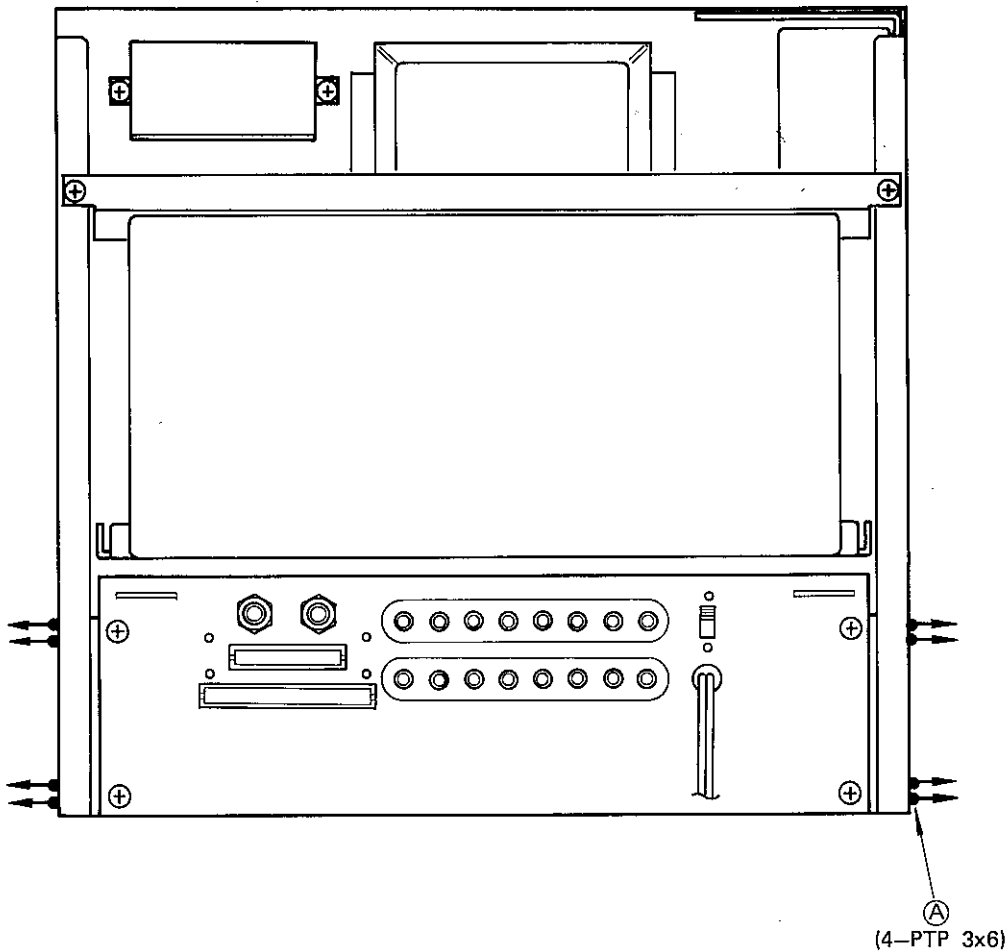


Fig. 6-4

7) System control PCB assembly (Fig. 6-6)

\* Upon removing the two screws (A), the system control PCB assembly can be swung down, pivoted on the lower two screws (B).

\* The assembly can be taken out completely if either one of the (B) screws is removed.

8) Rectifier assembly (Fig. 6-6)

\* The rectifier assembly can be removed by unscrewing the two (C) screws.

9) Regulator assembly (Fig. 6-6)

\* The regulator assembly can be removed by unscrewing the three (D) screws.

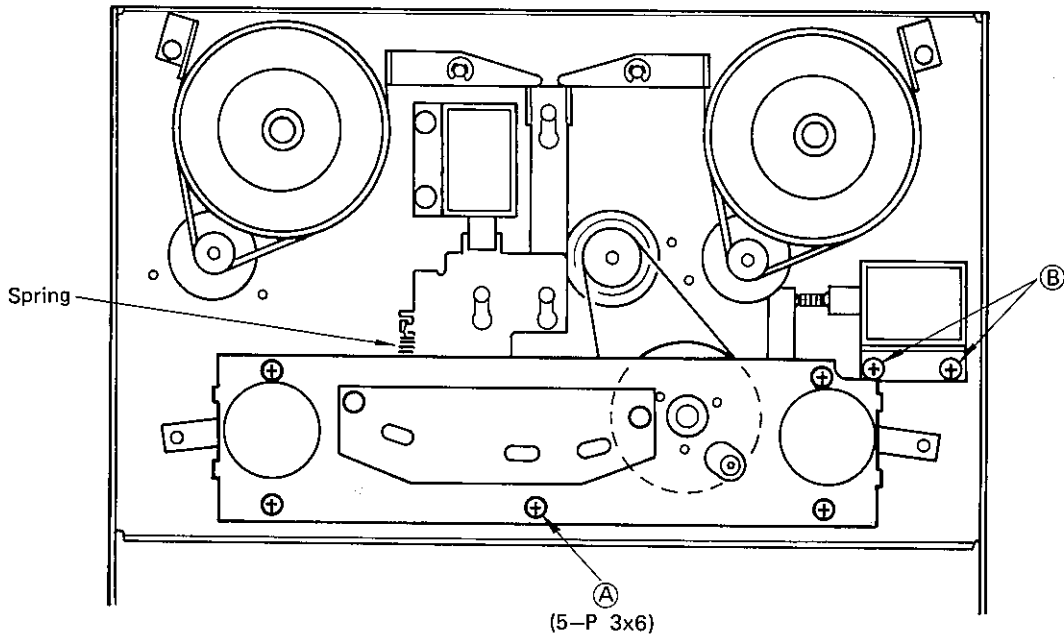


Fig. 6-5

10) Power transformer (Fig. 6-7)

- \* Remove the four (A) screws.
- \* Unsolder the primary wires at the power switch and the secondary wires at the rectifier PCB assembly.

11) Reel assembly (Fig. 6-7)

- \* Remove the three screws (B) and the reel assembly can be taken out from the front side of the recorder.

12) Reel motor assembly (Fig. 6-7)

- \* Remove the three screws (C) and the reel motor assembly can be taken out.
- \* The motor lead wires are unsoldered at the terminating PCB.

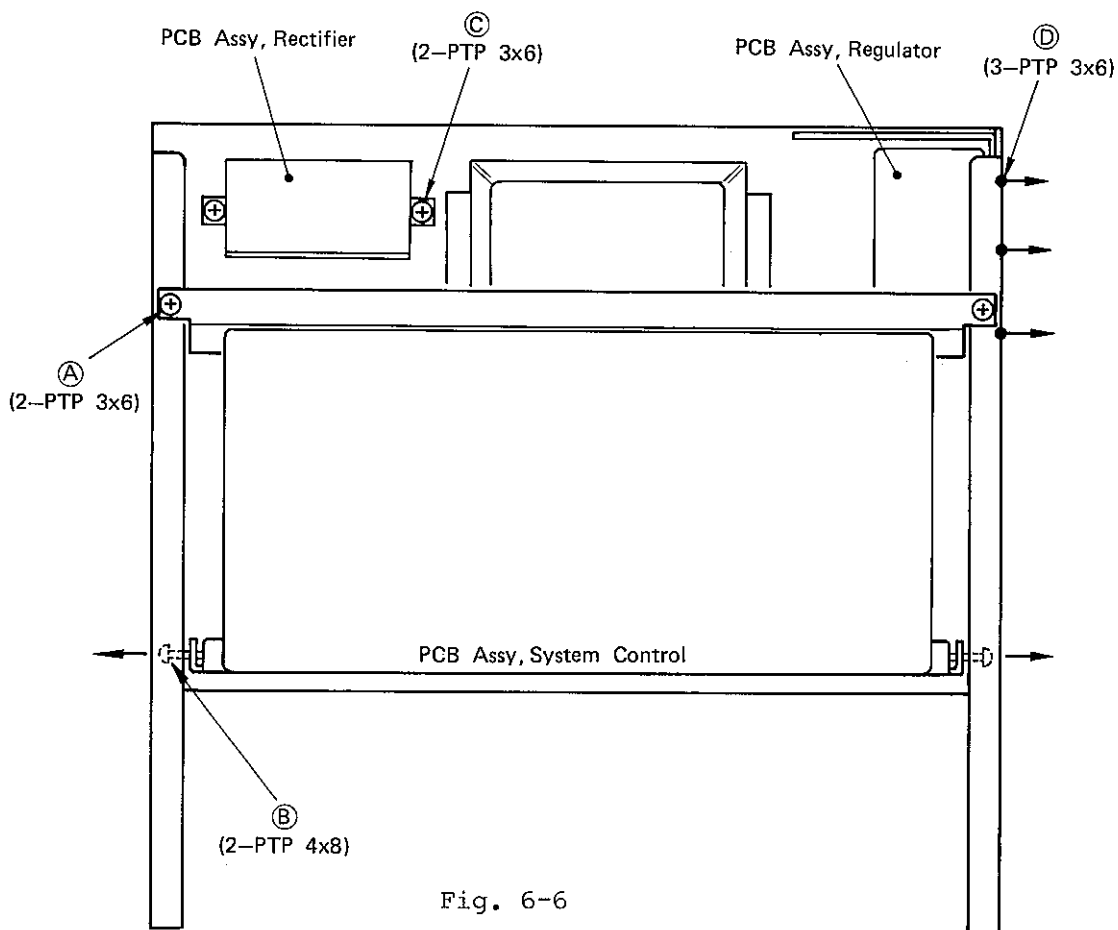


Fig. 6-6

13) Capstan motor assembly (Fig. 6-7)

- \* Remove the three (D) screws and the capstan motor assembly can be taken out.
- \* Unsolder the motor lead wires at the terminating PCB.

14) Replacing the capstan belt

- \* Remove the four (E) screws, shown in Fig. 6-7, and after removing the capstan shaft thrust bracket, replace the belt through the cutout on the right side of the bracket.
- \* Assemble in reverse order whereby the belt is inserted through the cutout, strung on the flywheel and capstan motor pulley, then the thrust bracket reinstalled.

15) Replacing the reel motor drive belt

- \* With the top panel removed, as in Fig. 6-5, hold the brake in its released state and remove the belt through the gap between the brake drum and brake band, taking care not to bend the brake band.

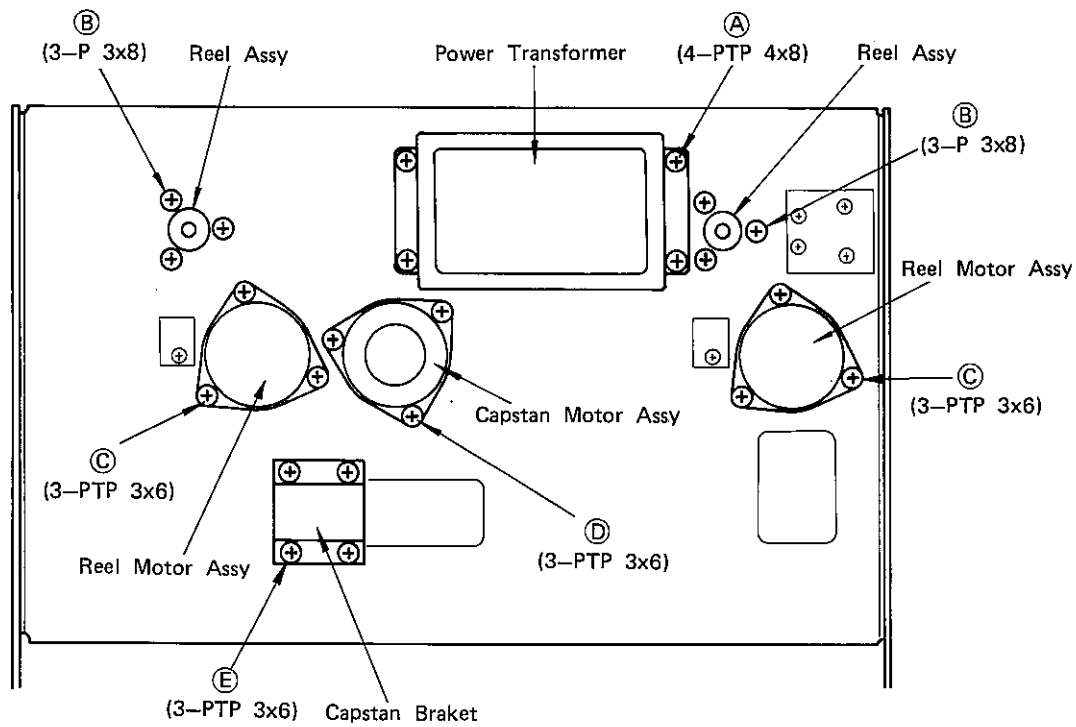


Fig. 6-7

### 6.3 Transport Check and Adjustment

#### 1) Pinch roller pressure

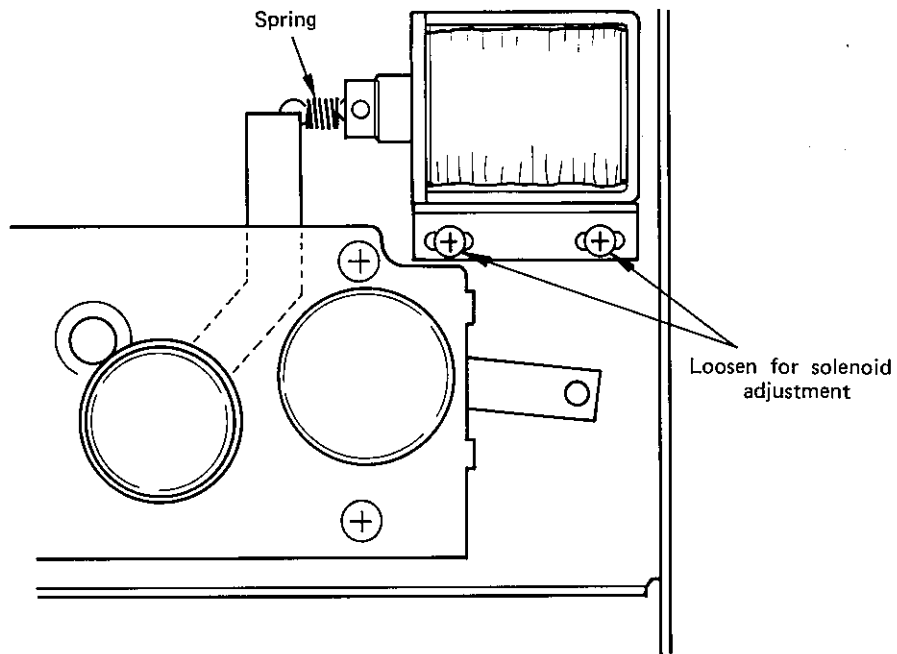
Pinch roller pressure is supplied by the Pinch Roller Pressure Spring only and it is most important that the solenoid plunger be fully bottomed before taking pressure measurement.

- a) Secure the left or right shut off arm in the ON position (tension arm raised) without loading a tape on the transport.
- b) Attach a suitable spring scale to the pinch roller shaft with a short lo of twine.
- c) Put the deck in the PLAY mode, and positioning the scale as illustrated, slowly draw it in the direction opposite the capstan until the pinch roller stops rotating.
- d) The spring scale should indicate 4.4 lbs.  $\pm 10\%$  (2.0 Kg.  $\pm 10\%$ ).
- e) If the reading is off specification, loosen the 2 screws (Refer to Fig. 6-8(A) and re-position the plunger solenoid. As the pressure will greatly change with only a slight shift in position, re-position the solenoid in small increments.

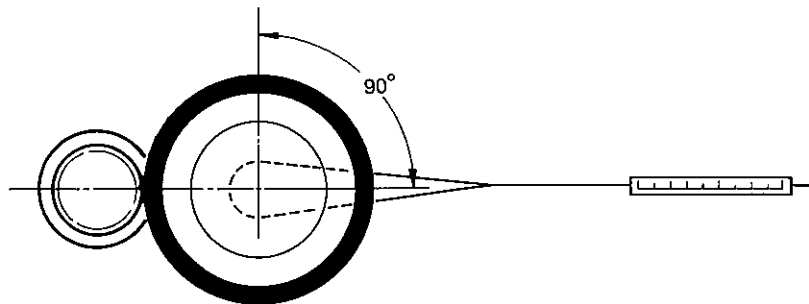
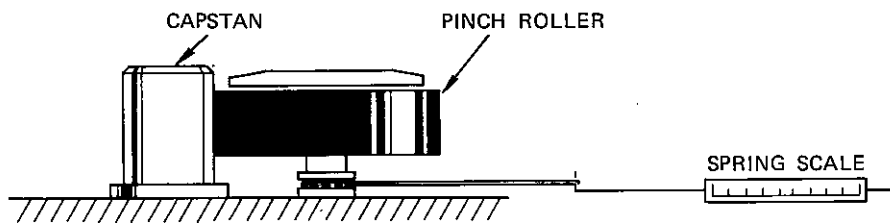


The pressure will increase by moving the solenoid in the direction away from the capstan motor.

After obtaining optimum pressure, securely tighten the screws and make a final re-check of the pressure.



(A)



(B)

f) Adjust position of the solenoid-limit so that the gap between the capstan shaft and pinch roller is approximately 4mm when the solenoid is not actuated.

The Limit is adjusted by loosening the mounting screw (A), then sliding the Limit until the proper gap is obtained.

2) Brake torque (Fig. 6-9)

Brake torque is applied mechanically. Pressure is set by variable spring force. While making these measurements and adjustments, be careful not to bend the brake bands. As brake torque will change after cleaning, brake drums and brake shoes should be cleaned only when absolutely necessary. If cleaning is required, use alcohol. After cleaning, use the machine for a month of normal operation before performing the procedures below.

Brake adjustments are made with NO power to the equipment.

a) Place an empty 2" hub reel on the left reel table, and fasten one end of a 30" length of twine to the reel anchor.

b) Wind several turns of twine CCW around the hub and attach a suitable spring scale to the free end of the twine.

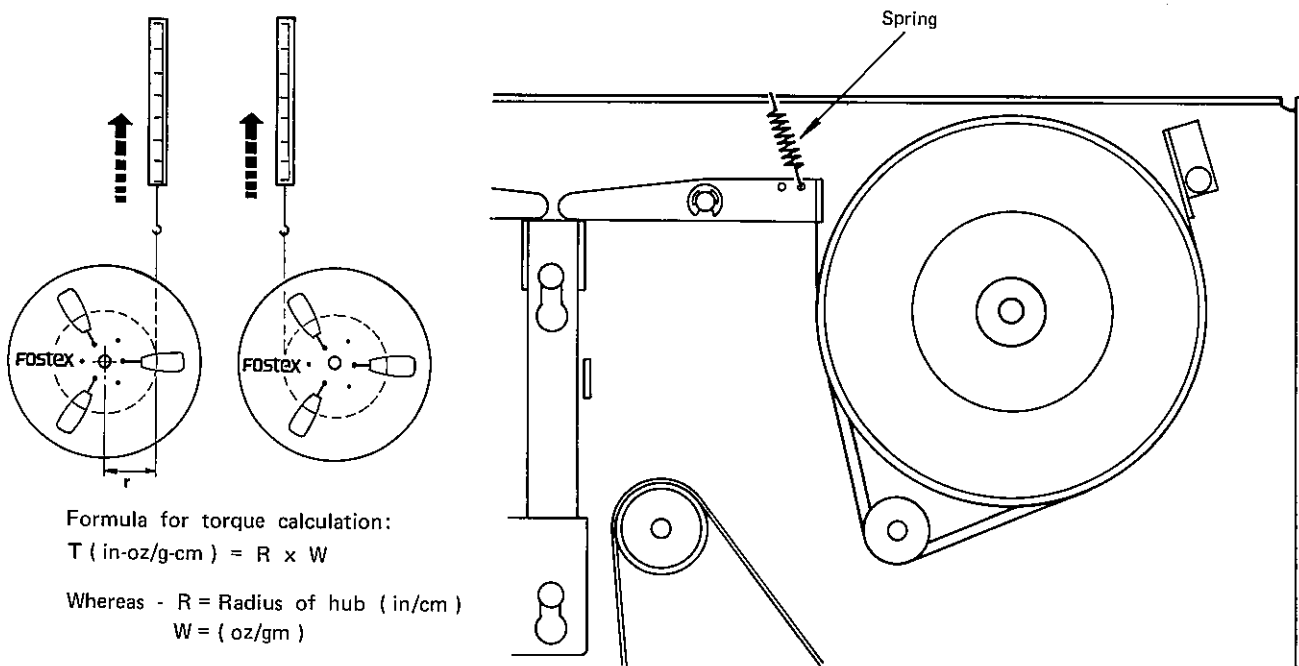


Fig. 6-9

- c) Read the scale only when the reel is in steady motion since the force required to overcome static friction will produce a false, excessively high initial reading.
- d) The reading should be 28.5 ~ 42.0 in-oz (800 ~ 1200 g-cm).
- e) If adjustment is required, hook the spring to the next hole. Torque will increase as the spring is successively hooked to holes in the outward direction.
- f) The adjustment of the right brake drum is the same, with the exception that rotations are clockwise (wind string CLOCKWISE around reel hub). The torque should be the same as for the left brake.

3) Tape tension adjustment procedures

Tape tension is adjusted in the PLAY mode only, and is fixed for the F.FWD and REWIND modes.

Tape tension is determined indirectly by measuring the torque supplied by the supply and takeup motors.

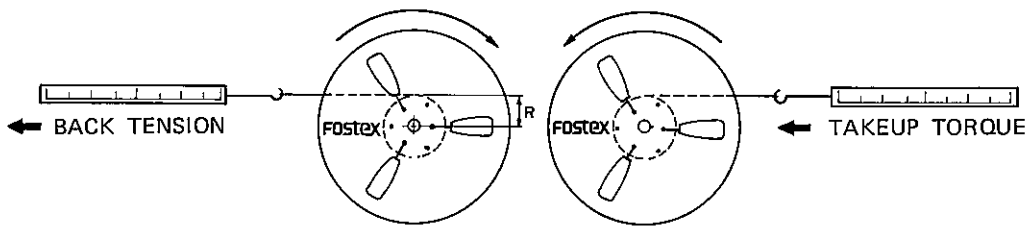


Fig. 6-10

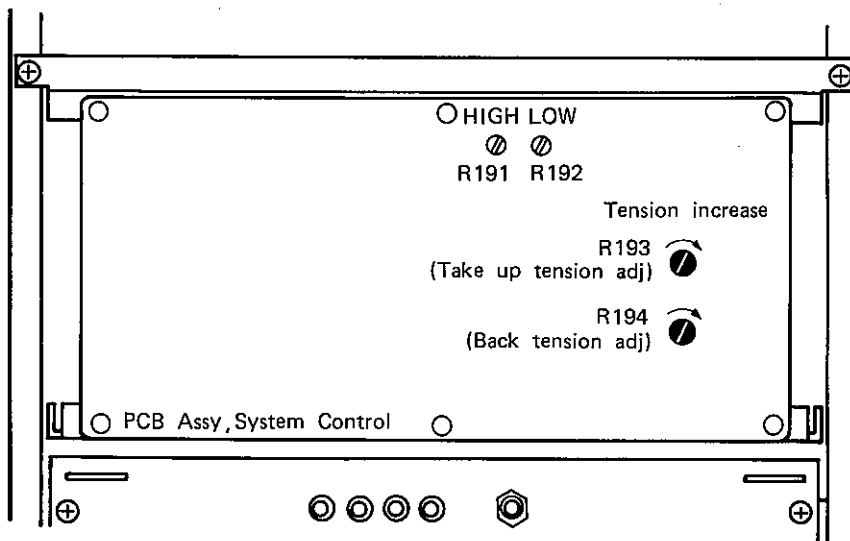
\* Back tension adjustment procedures \*

- 1) Secure the shut-off arm in the ON position and unplug J19 on the system control PCB.
- 2) Place an empty 7" reel on the left reel table.
- 3) Manually rotate the reel and wind several turns of twine around the hub. Attach spring scale to other end of the twine.
- 4) Place deck in the PLAY mode.
- 5) Pull the scale away from the reel against the motor torque with a smooth, steady motion.
- 6) Read the scale while it is in steady motion and multiply this value by the hub radius to obtain the torque.

- 7) Be sure the twine is not rubbing against the reel flange when taking measurements.
- 8) The specified torque is 270 g-cm,  $\pm 10\%$ .
- 9) If adjustment is required, adjust R194, 22K $\Omega$  pot, as required.
- 10) Plug-in J19 on the system control PCB.

\* Takeup tension adjustment procedures \*

- 1) Place an empty 7" reel, with a spring scale attached to the hub by a length of twine, on the right reel table.
- 2) Place deck in the PLAY mode.
- 3) Allow the reel to slowly wind-in the scale.
- 4) Follow the spring scale travel with enough force to allow a steady reading and multiply this value by the reel hub radius to calculate the torque.
- 5) The specified torque is 300 g-cm,  $\pm 10\%$  (0.66lbs/in.).
- 6) If adjustment is required, adjust R193, 22k $\Omega$  pot, as required.



REAR VIEW

Fig. 6-11

4) Wow and flutter

Wow and flutter measurements should be undertaken only after studying the following items and determining which method and standard will be employed.

- a) Determine whether the Reproduce Method or the Record/Reproduce Method is to be employed for measurement.

If the Reproduce Method is to be employed, a flutter test tape will be

required.

Recommended test tape: Fostex Model 9102A; Standard Tape Lab., #53-1  
or equivalent.

In the Record/Reproduce Method, a 3KHz sine wave is recorded on a blank tape, rewound to beginning of the recording and reproduced again for the measurement process.

NOTE:

When reproducing the recorded signal at measurements by the Record/Reproduce Method, adopt the maximum wow and flutter value obtained by repeated play and stop modes. Be sure that wow and flutter readings between record and reproduce do not contain phase error.

b) Determine the Standard to be used.

The wow and flutter meter is set to measure the IEC/ANSI peak value.

c) The wow and flutter meter must be calibrated for "weighted" measurements.

d) As the measured results will vary with respect to the location on the tape at which it was taken, at least two parts - at the beginning and near the end of the tape - should be selected for measurement.

NOTE:

Recommended Wow & Flutter Meter:

Meguro Denpa Sokki Co., Model MK-668C (Japan)

There will be slight differences in absolute values among other manufacturers.

IEC/ANSI (peak value)

Reproduce Method                    ±0.06%

Record/Reproduce Method           ±0.08%

5) Measuring and adjusting tape speed

Tape speed is measured by using the Flutter Test Tape which contains a highly accurate, continuous 3KHz tone.

Connect a digital frequency counter to either OUTPUT.

The indicated frequency should be 3KHz, ±0.5% for all speeds.

If tape speed is greatly offset from the specification, check pinch roller pressure and takeup tension for correct values, and see that the tape path is clean. Before adjusting, the pitch control knob must be set at the center click and tape speed trimmed by R191 (HIGH) or R192 (LOW) on the system control PCB.

## 6.4 Record/Reproduce Amplifier Checks and Adjustments

Checking and adjusting of the record/reproduce amplifiers can be speedily and efficiently carried out by following the procedures below.

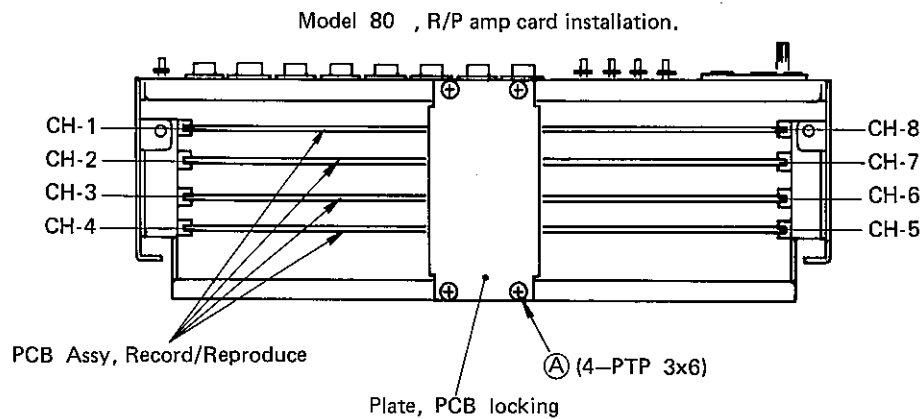


Fig. 6-12

### 6.4.1 Calibrating the Dolby encode mode and meters

- 1) Secure the left or right shut off arm in the ON position (tension arm raised) without loading tape on transport. To calibrate TRACK 1, depress the RECORD TRACK 1 button, simultaneously depress RECORD and PLAY buttons to put TRACK 1 (CHAN. 1) in the record mode.
- 2) Plug in an audio oscillator output to the recorder rear panel INPUT 1 jack and apply a 1KHz, -10dBV (0.3V) signal.
- 3) Set the NR IN/OUT switch on the recorder rear panel to OUT, connect a level meter to test point TP-101 and adjust REC CAL (R-311, 10K $\Omega$ B) so that the level here is 390mV.
- 4) On completing the above adjustments, connect the level meter to OUTPUT 1 jack on the rear panel and check that the level here is -10dBV (0.3V)  $\pm$ 1dB.
- 5) After checking the OUTPUT jack level, adjust METER CAL (R-312, 50K $\Omega$ B) for a 0dB reading on the recorder LED bargraph meter.
- 6) Calibrate tracks 2 ~ 8 in the same way.
- 7) Return the NR IN/OUT switch, on the recorder rear panel, to IN.

#### 6.4.2 Calibrating the Dolby decode mode

- 1) Set the NR IN/OUT switch on the recorder rear panel to OUT and switch off all RECORD TRACK buttons.
- 2) Playback the Reference Level Section of the Reproduce Alignment Tape.
- 3) Beginning adjustments from TRACK 1 (CHAN. 1), connect a level meter to test point TP-101 located near U106, on the CHAN 1 PCB of the record/reproduce amplifier, and adjust REP CAL (R314, 10K $\Omega$ ) so that the level is 390mV.
- 4) After these adjustments, connect the level meter to the recorder rear panel OUTPUT 1 jack and check that the level is -10dBV (0.3V)  $\pm$ 1dB.
- 5) After check of the OUTPUT jack level, confirm that the meter reading is 0dB,  $\pm$ 1dB.  
If the reading is not 0dB,  $\pm$ 1dB, repeat the adjustments in the previous section, Item 5.
- 6) Calibrate tracks 2 ~ 8 (CHAN 2 ~ 8) by the same procedures for TRACK 1, above.
- 7) On completing the above adjustments, return to IN the NR IN/OUT switch on the recorder rear panel.

#### 6.4.3 Adjusting the reproduce frequency response

- 1) Set the NR IN/OUT switch on the recorder rear panel to OUT and switch off all RECORD TRACK buttons.
- 2) Playback the Head Azimuth and Frequency Response sections of the Reproduce Alignment Tape.

The Azimuth and Phase Adjusting Screw is adjusted for this alignment as shown in Fig. 6-13.

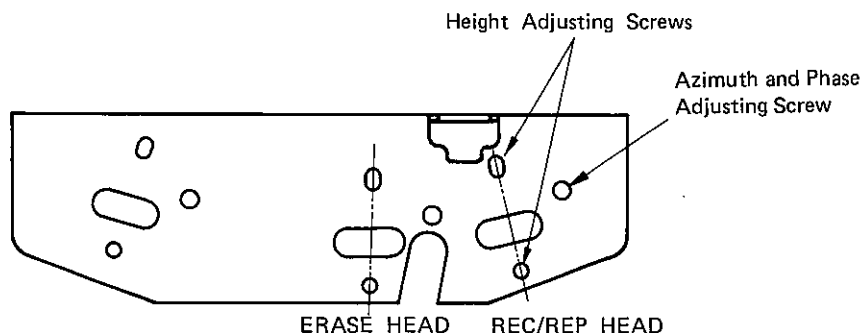


Fig. 6-13

3) Adjust the Azimuth and Phase Adjusting Screw for maximum reading on all eight LED bargraph meters of the recorder.

Then, connect the vertical input of the oscilloscope to TRACK 1 output and the horizontal input to one among TRACKS 2 ~ 8, set the oscilloscope to XY mode to obtain a lissajous waveform to check the phase.

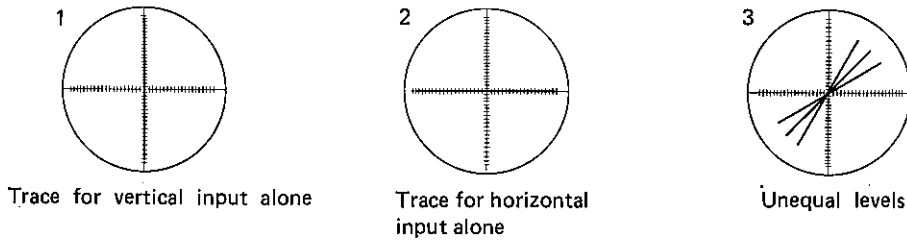


Fig. 6-14

If the trace length between (1) and (2) are not the same, it means that the two inputs are not of the same level. Correct for equal lengths by the oscilloscope controls.

If the playback head azimuth is out of alignment, the following patterns will result:

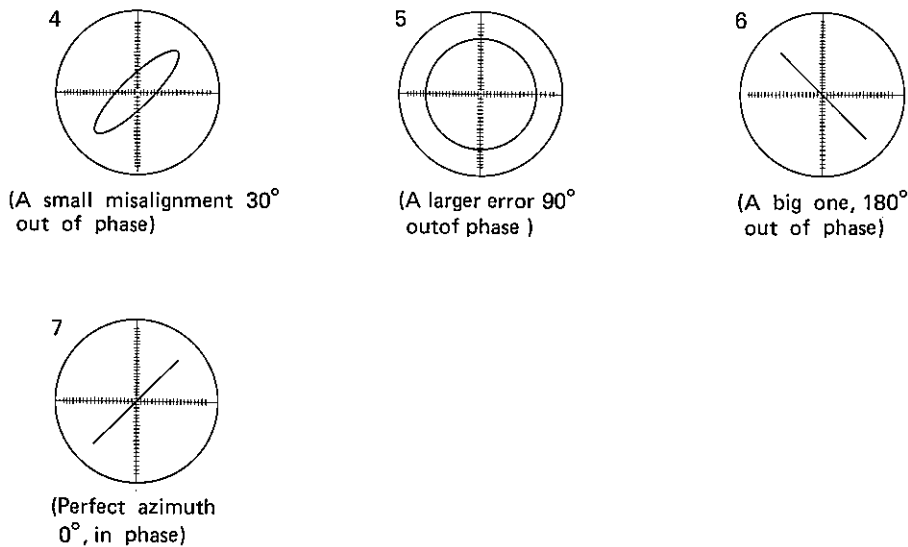


Fig. 6-15

As a result of phase check with a 10KHz signal, the adjustment is finished if the difference in phase is less than 90 degrees between tracks, and azimuth adjustment is at the best point.

4) Check the playback frequency response of each channel with the Frequency



Response section of the Reproduce Alignment Tape. The recorder LED bargraph meters can be used for this check but if a more accurate measurement is necessary, the level meter is plugged one by one into the recorder rear panel 1 ~ 8 OUTPUT jacks, and the levels measured here.

The normal playback frequency response should be within  $\pm 3\text{dB}$  for a frequency range of 50 ~ 18,000Hz (15 ips).

If it is not within spec, adjust REP EQ R313, 10K $\Omega$ B (track 1 ~ 4) or R323, 10K $\Omega$ B (tracks 5 ~ 8).

5) Whenever R313 and R323 are adjusted, Dolby decode must be re-calibrated, Item 6.4.2.

#### 6.4.4. Bias leakage check

Two bias trap modules are provided for each channel. One is in the first stage of the reproduce amplifier and the other in the output stage of the record amplifier.

1) Reproduce bias trap module (U104 = CHAN 1 ~ 4; U204 = CHAN 5 ~ 8)

To check bias leakage of TRACK 1, the oscilloscope probe is hooked to TP-105 and the probe ground clip to the nearest GND.

Put TRACK 1 in the reproduce mode, the adjacent TRACK 2 in the record mode and check bias leakage at TP-105. If this is less than 250mV P-P (15 ips), it is normal. (At checking TRACK 2, put adjacent track 3 in the record mode.)

If the voltage is high, it is adjusted by rotating the center core of U104. But before doing this, check the frequency (100KHz,  $\pm 0.5\text{KHz}$ ) of the erase/bias master oscillator. To check the oscillator frequency, the record/reproduce amplifier PCB is pulled out from the Model 80, and the frequency at connector pin No. 2 is checked.

If the oscillator frequency is significantly off spec, replace the erase/bias master oscillator module, U11.

2) Record bias trap module (U107 = CHAN 1 ~ 4; U207 = CHAN 5 ~ 8)

To check bias leakage of TRACK 1, the oscilloscope probe is hooked to TP-104 and the probe ground clip to GND nearest TP-102.

Put TRACK 1 in the record mode and check bias leakage at TP-104. It is normal if the voltage is 1.1V P-P.

If it is off spec, check frequency (100KHz,  $\pm 0.5\text{KHz}$ ) of the bias/erase master oscillator before rotating the center core of U107 to adjust bias leakage.

#### 6.4.5 Erase current adjustment

In adjusting the erase current, put the track to be adjusted in the record mode.

To adjust TRACK 1, for example, hook the hot side of the oscilloscope probe to TP-103 located near TP-104 and ground clip of the probe to GND pin nearest TP-102. Set the core of L-101 so that voltage at TP-103 is 1.7V P-P (15 ips).

The test point for TRACK 8 is TP-203 located near TP-204. The GND pin to be used is located near TP-202; erase current is adjusted by the core of L-201.

#### 6.4.6 Bias current adjustment

The track to be adjusted is put in the record mode.

To adjust TRACK 1, for example, hook the oscilloscope probe hot side to TP-102, located near the GND pin, and the ground clip to the GND pin.

Then, set the BIAS LVL pot, C311, 150pF. at approximately 450mV P-P.

For an accurate adjustment, load a blank tape (Ampex #457, Scotch #227) on the recorder, record a test signal, set the NR switch to IN, and trim the BIAS LVL pot so that the overall frequency response is within 3dB between 250Hz and 10KHz, or within 5dB when the higher end is 14KHz.

During this adjustment, temporarily set the screwdriver adjusting slot of REC EQ, R316, 2K $\Omega$  so that this slot is parallel with the PCB plane, then trim it for a more flat overall frequency response.

#### 6.4.7 Recording level adjustment

1) Proceed to the following adjustments only after checks and adjustments in the previous Sections 6.4.1 ~ 6.4.6 have been completed.

Set the front panel NR IN/OUT switch to OUT.

2) Load the blank tape (Ampex 457 or Scotch 227) on the transport and apply an audio oscillator output of 1KHz, -10dBV (0.3V) to the INPUT jack on the recorder rear panel.

Also, plug in a level meter to the OUTPUT jack.

Taking TRACK 1 as an example, the connector number is "1" for both INPUT and OUTPUT jacks.

3) Depress the RECORD TRACK 1 button, then, depress the RECORD and PLAY buttons to put TRACK 1 in the record mode.

When thus in the record mode, the meter will indicate the input level regardless of the position of the INPUT MON button.

Check to see that the reading of this meter is 0dB,  $\pm 1$ dB.

- 4) It will be convenient to rewind the tape to the start by using the tape index counter and reset button.
- 5) After recording a certain length of 1KHz, 0dB signal, depress the GO TO 0 RTN button to rewind tape to the starting point, put the transport in the PLAY mode and check the meter reading. The INPUT MON switch must be at INDIV. It is in normal condition if the meter reading is 0dB,  $\pm 1$ dB. If it is off spec, correct by adjusting REC LVL R315, 5K $\Omega$ B. Do the same on the remaining tracks 2 ~ 8.

#### 6.4.8 Overall frequency response

- 1) With the rear panel NR IN/OUT switch at OUT and under the measurement setup of the previous Section 6.4.7, apply signals from 40Hz through 18KHz (15 ips) at -10dBV (0.3V) to the recorder INPUT jack and set the NR switch to IN. To adjust TRACK 1, for example, apply the signal to INPUT 1 and plug in a level meter to OUTPUT jack 1. Put TRACK 1 in the record mode to record a certain length of the signal, rewind it to the start, and playback the tape. It is in normal condition if the frequency response in reference to 1KHz is within  $\pm 3$ dB. If it does not fall within spec in the high frequency region, correct it by a slight rotation of REC EQ pot R316, 2K $\Omega$ B.
- 2) Check and adjust the remaining tracks in the same way.

#### 6.4.9 Overall S/N measurement

- 1) Set the rear panel NR IN/OUT switch at IN.
- 2) Upon completing checks up to Section 6.4.8, apply a 1KHz, -10dBV (0.3V) signal to the rear panel INPUT jack 1 (for track 1), and record the signal onto a blank tape. Then, without stopping the tape, unplug the oscillator connected to the INPUT jack and further record a length of no-signal tape.
- 3) Plug a level meter into OUTPUT jack 1 and playback the recorded signal section to measure the noise level of the no-signal section against the 1KHz reference level. Calculate the difference between noise level and reference level, add 10dB to it and obtain the ratio between peak recording and noise level.

Specification: 72dB weighted, 60dB unweighted

#### 6.4.10 T.H.D. measurement

- 1) Set the rear panel NR IN/OUT switch to IN.
- 2) To adjust TRACK 1, for example, apply a 1KHz, -10dBV (0.3V) test signal to INPUT jack 1, record it, play back the recorded tape and apply its output from OUTPUT jack 1 to the distortion meter.

Specification: T.H.D. 1% or less

- 3) If it is not within spec, demagnetize the head, check the bias trap adjustment and record level.

If it still does not fall within spec after making the corrective measures above, readjust the bias current by the procedures in Section 6.4.6.

- 4) When the Section 6.4.6 adjustments are made, it is necessary to go through procedures in Sections 6.4.7 and 6.4.8.

#### 6.4.11 Erase measurement

- 1) Set the rear panel NR IN/OUT switch to IN.
- 2) To adjust TRACK 1, for example, apply a 1KHz, 0dBV (1V) signal which is 10dB higher than the reference level, to INPUT jack 1 and put TRACK 1 in the record mode.

Partially rewind the tape to retain a section of the 1KHz signal and then record over the remaining section without any signal at the input.

- 3) Rewind to the start of the recording, play back the tape and insert a 1KHz bandpass filter between OUTPUT 1 and the level meter to measure the output.
- 4) The level ratio between the 1KHz recording and the no-signal recording is the erasure figure. It is in normal condition if erasure is higher than 70dB.
- 5) If it is less than the spec, increase erase current about 10% by the procedure of Section 6.4.5. Monitor the erase current waveform on the oscilloscope at adjusting and set the core just before the waveform begins to deteriorate. A higher current will heat the erase head and result in damage to the tape.

#### 6.4.12 Sync crosstalk measurement

- 1) Sync crosstalk is the relative figure, against the reference level, on how much of the recording signal from the track in the recording mode is leaking into the track being reproduced.

When sync crosstalk is excessively high, playback output during overdubbing will sound muddy by effect of the recording signal leakage or cause oscillation at ping-pong recording (where the playback output is transferred to

another track).

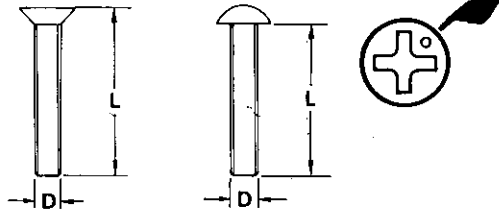
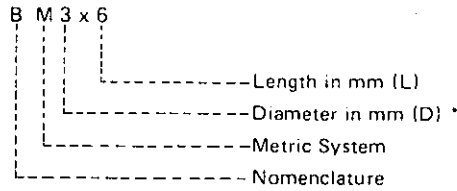
- 2) Sync crosstalk occurs in relation to the track and pitch dimensions of the head and its construction, and since this cannot be corrected without affecting its frequency response, try to be aware of how much margin there is before oscillation occurs at ping-pong recording. Sync crosstalk must be measured, of course, when the head is replaced with a new one.
- 3) It is in normal condition if sync crosstalk is 10dB or better, when either of two adjacent tracks, is put in the record mode.
- 4) To adjust TRACK 1, for example, load a blank tape on the transport, put TRACK 1 in the sync mode (playback) and TRACK 2 in the record mode. Plug in a level meter to the TRACK 1 OUTPUT jack, an audio oscillator to the TRACK 2 INPUT jack and apply a 20Hz ~ 20KHz, -10dBV (0.3V) signal to the recorder.  
The signal thus appearing at the TRACK 1 OUTPUT is sync crosstalk.  
If crosstalk from TRACK 1 OUTPUT is higher than -10dBV (0.3V), TRACK 1 cannot be played back for transferring to TRACK 2, as oscillation will occur.
- 5) As TRACKS 2 through 7 will each have two adjacent tracks, one side only is put in the record mode for taking measurements.  
It would be useful, for reference, if the figures for both tracks in the record mode were measured.

# EXPLODED VIEWS, PCB ASSEMBLIES AND PARTS LIST

## 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.

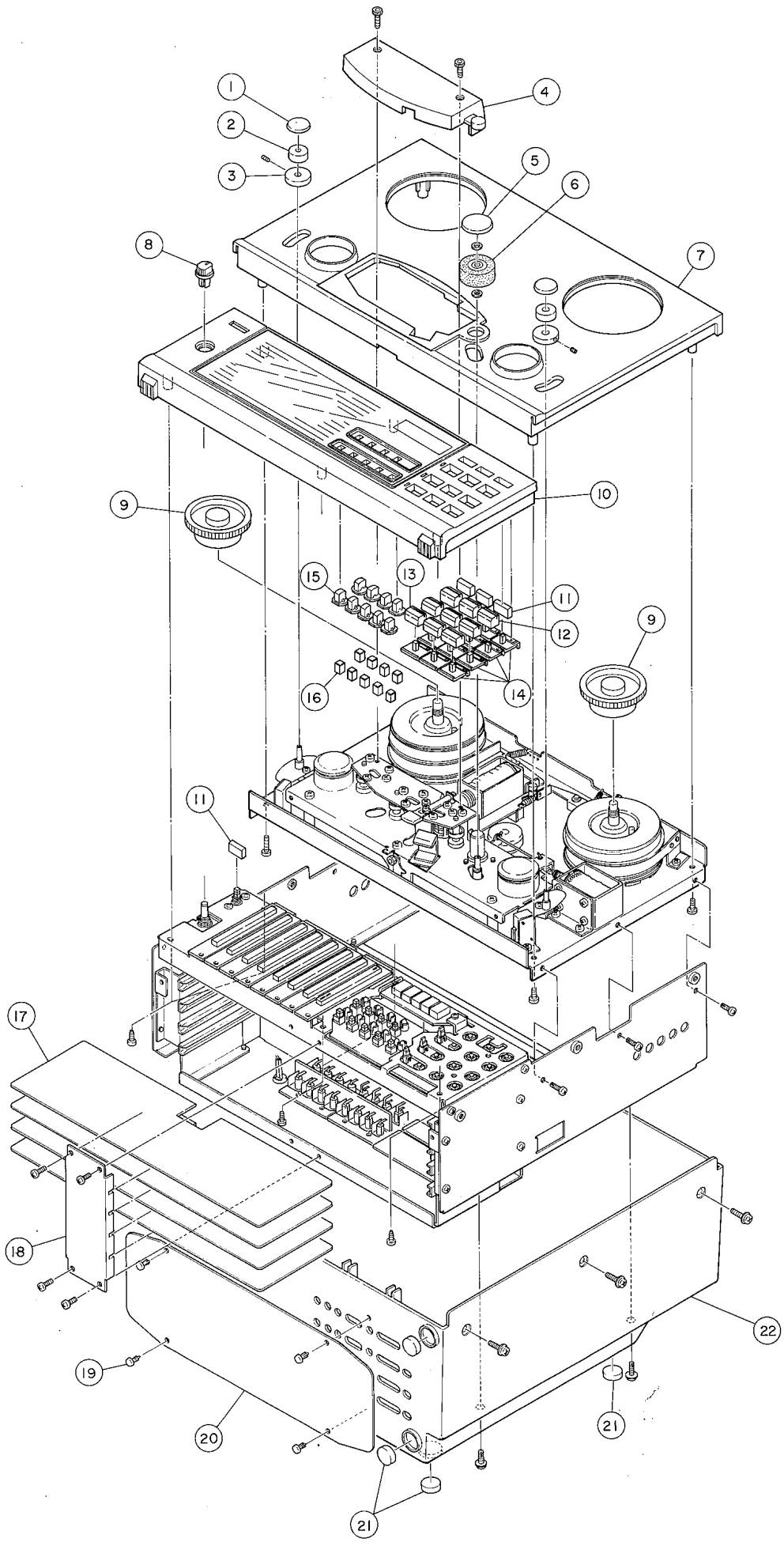
FOR EXAMPLE:



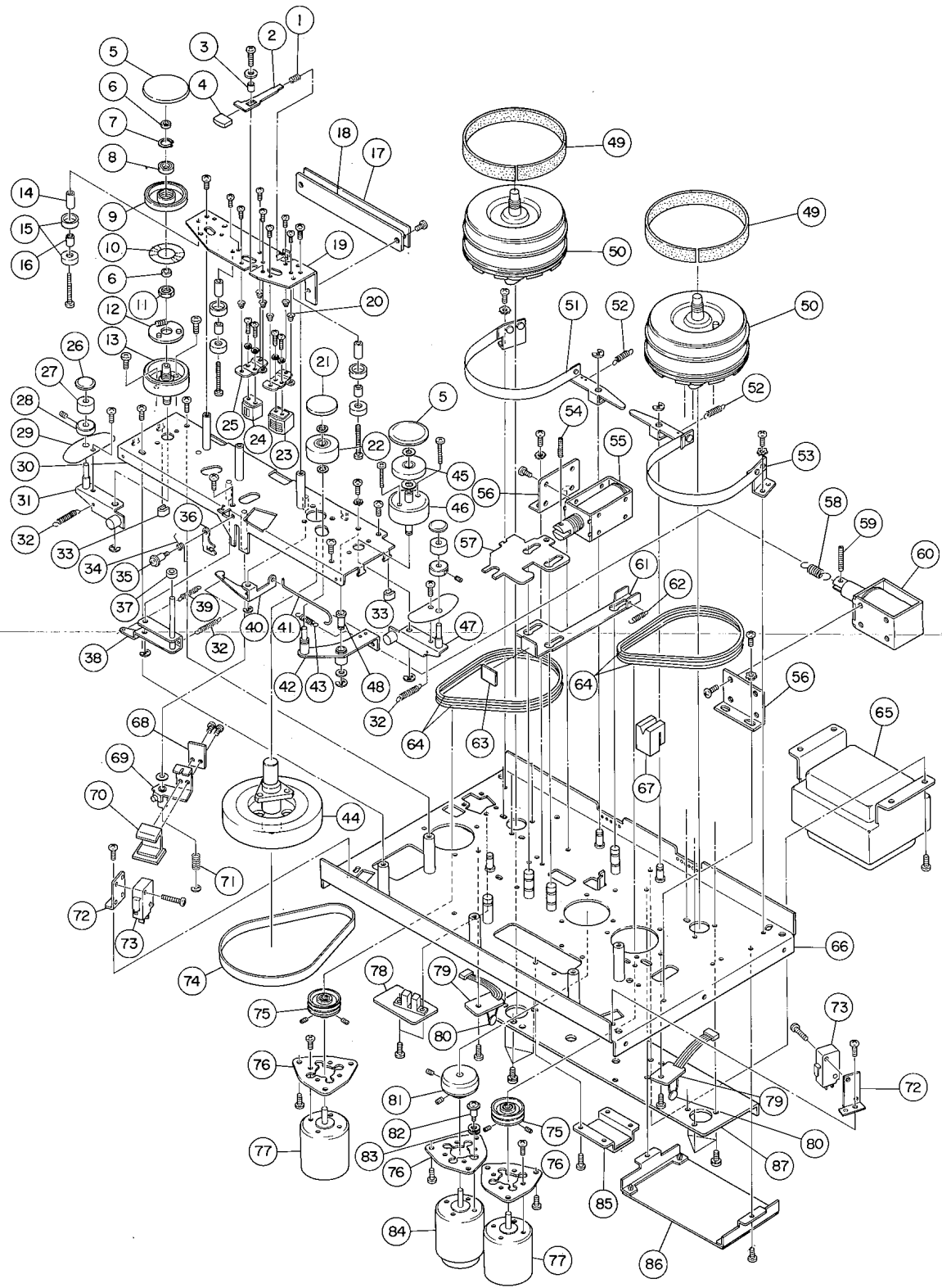
\* Inner dia. for washers and nuts

	CODE	NAME	TYPE		CODE	NAME	TYPE
MACHINE SCREW	P	Pan Head Screw		WASHER, LUG, NUT	TW	Trim Washer ( Countersunk )	
	T	Stove Head Screw (Truss)			N	Hex Nut	
	B	Binding Head Screw			L	Lug	
	F	Flat Countersunk Head Screw			THW	Thrust Washer ( Poly Washer )	
	O	Oval Countersunk Head Screw		SETSCREW	HSF	Hex Socket Setscrew ( Flat Point )	
	PWH	Pan-Washer Head Screw			HSC	Hex Socket Setscrew ( Cup Point )	
WOOD SCREW	RW	Round Head Wood Screw			SSF	Slotted Socket Setscrew ( Flat Point )	
	FW	Flat Countersunk Wood Screw		SSC	Slotted Socket Setscrew ( Cup Point )		
	OW	Oval Countersunk Wood Screw		BOLT	HSB	Hex Soked Head Bolt	
TAPPING SCREW	PTP	Pan Head Self Tapping Screw ( B type )			HB	Hex Head Bolt	
	PTPWH	Pan-washer Head Self Tapping Screw ( B type )		RING, PIN	ER	E-Ring ( Retaining Washer )	
	TTP	Stove Head Self Tapping Screw ( B type )			CRR	C-Ring ( Inner )	
	FTP	Flat Countersunk Head Self Tapping Screw ( B type )			CRS	C-Ring ( Outer )	
TAPTITE SCREW	PTT	Pan Head Tapping Screw			GR	Seeger Ring	
	PTTWH	Pan-Washer Head Tapping Screw			SP	Spring Pin	
	TTT	Stove Head Tapping Screw			SR	Snap Ring	
	FTT	Flat Countersunk Head Tapping Screw			FINISH	Zn	Zinc plating
SEMS SCREW	PS	Pan Head Screw with Spring Washer				CZn	Colored zinc plating
	PSW	Pan Head Screw with Washer and Spring Washer		BZn		Black zinc plating	
W, LUG, NUT	W	Flat Washer		Ni		Nickel plating	
	LW	Spring Washer		BNi		Black niekel plating	

Ref. No.	Parts No.	Nomenclature
1	8223 1190 00	Cap, tension roller
2	8212 0261 01	Roller, 16
3	8223 0280 00	Base, tension roller
4	8212 1210 00	Housing, head
5	8223 1170 00	Cap, pinch roller
6	8260 0180 00	Pinch roller
7	8260 1710 00	Panel assy, transport
8	8226 0350 03	Knob, EQ, C
9	8226 0211 01	Reel clamper
10	8260 1743 00	Panel assy, amplifier
11	8226 0500 00	Button, push, I
12	8226 0480 01	" " G, 01
13	8226 0480 02	" " " 02
14	8212 1230 00	Hinge, button
15	8226 0490 00	Button, push, H
16	8216 1100 00	Cap, switch
17	8273 1540 00	PCB ASSY, R/P amplifier
18	8220 0441 00	Plate, stopper, PCB
19	8207 0006 00	Plastic rivet, No. 794
20	8220 0520 02	Plate, cover
21	8216 0030 00	Foot, D16
22	8212 0330 02	Cover, bottom



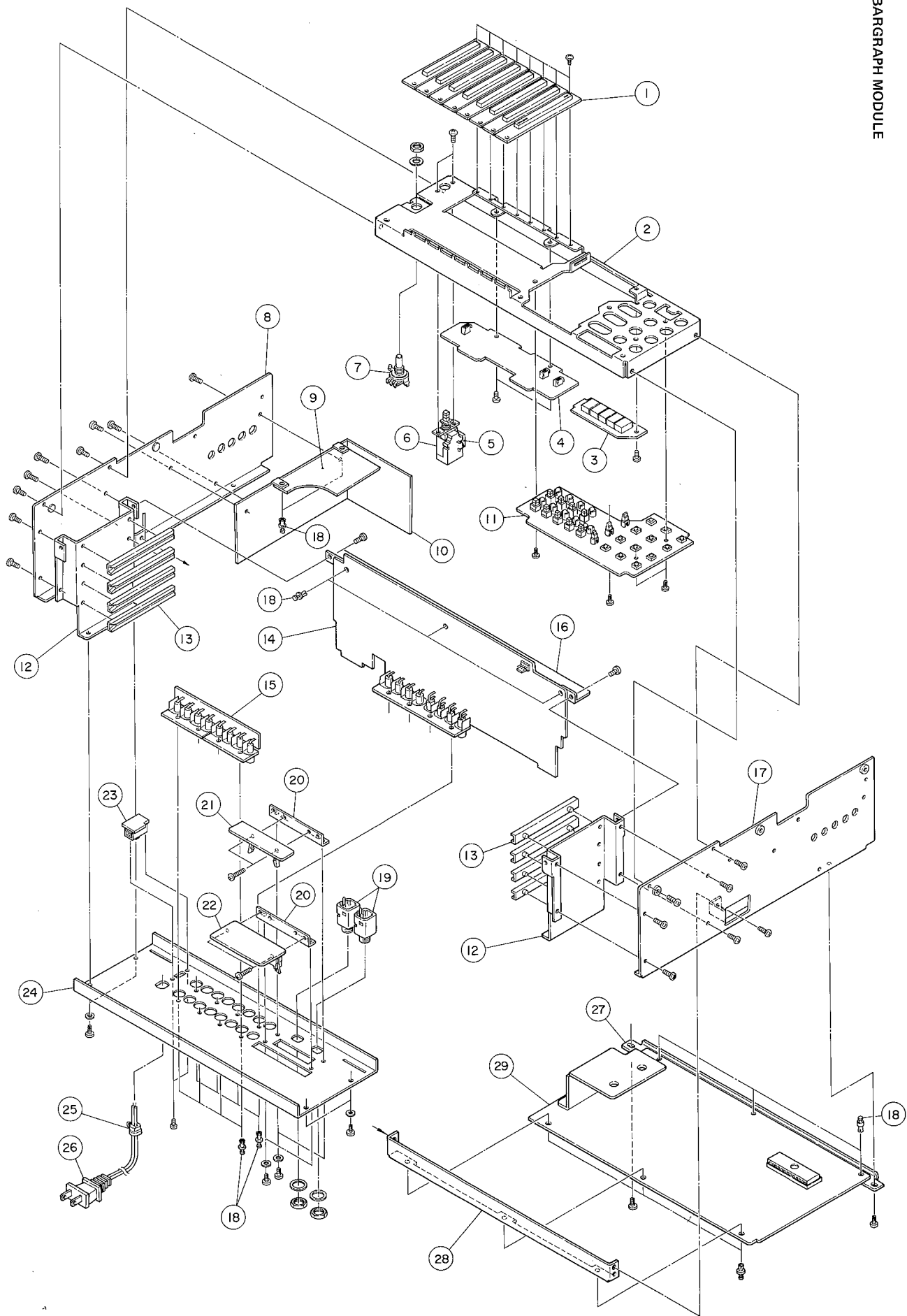


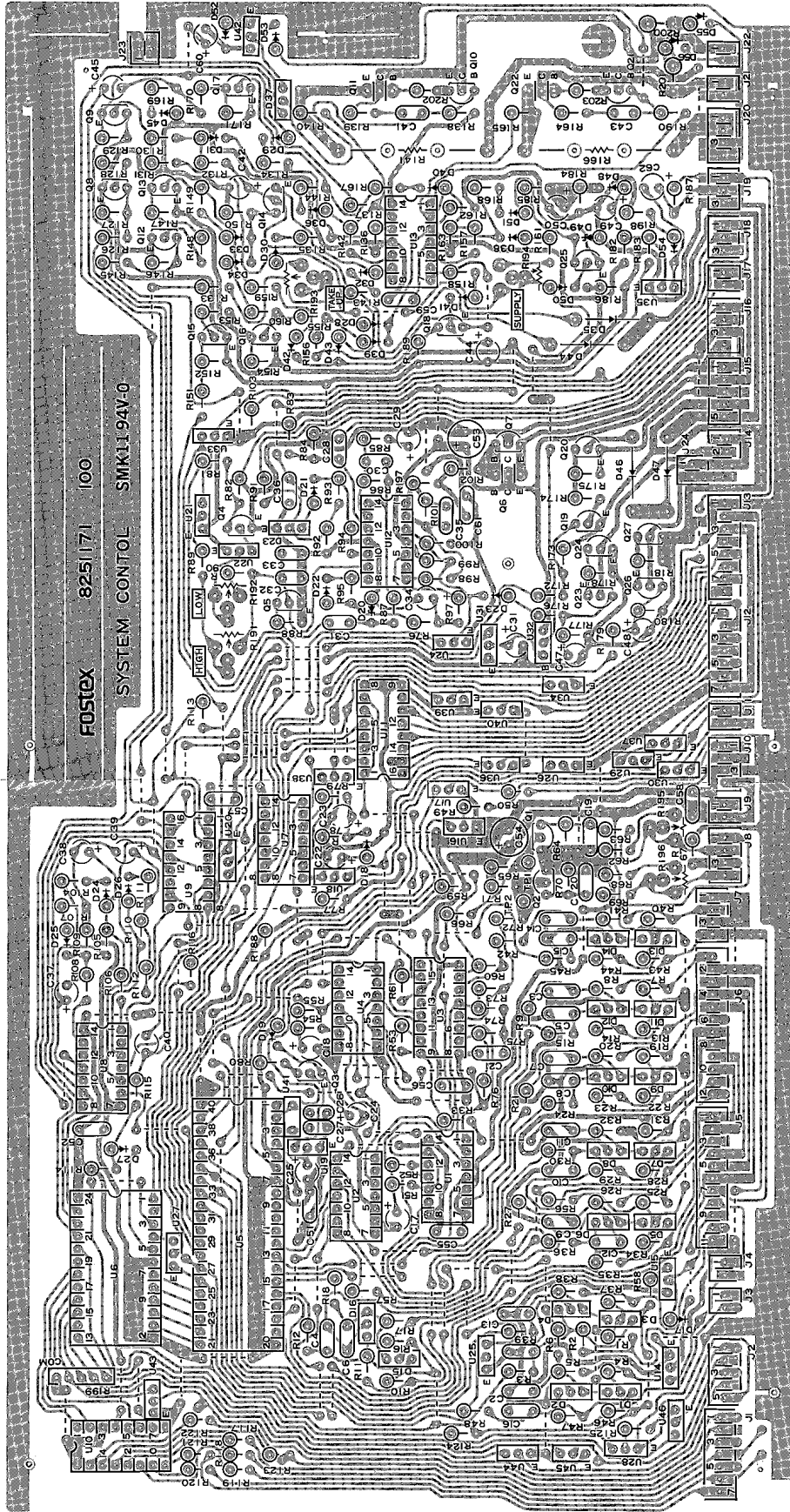


TAPE TRANSPORT ASSEMBLY

Ref. No.	Parts No.	Nomenclature	Ref. No.	Parts No.	Nomenclature
1	8214 0060 00	Spring	45	8212 0251 01	Roller, 33
2	8220 0350 00	Arm, cue	46	8260 0210 00	Base assy, roller
3	8223 0170 00	Collar, 2.6x4x1.1	47	8260 0220 00	Arm assy, tension, R
4	8226 0470 00	Knob, cue	48	8223 0070 00	Shaft, pinch roller arm
5	8223 1180 00	Cap, counter roller	49	8216 0090 00	Felt, brake
6	8223 1200 00	Spacer, counter roller	50	8260 0205 02	Reel, sub-assy
7	8204 0330 02	Ring, IRTW-12	51	8260 0302 00	Brake band assy, L
8	8204 0340 00	Bearing, 1260	52	8214 0080 00	Spring
9	8260 1721 00	Roller, counter, C	53	8260 0312 00	Brake band assy, R
10	8218 1930 00	Sticker, strobo	54	8204 0070 03	Pin, SP-3x20
11	8204 0160 00	Nut, N-M9x0.75xt2	55	8249 0020 00	Solenoid, B
12	8273 1650 00	PCB assy, count sensor	56	8220 0310 00	Bracket, solenoid
13	8260 1731 00	Base assy, count roller	57	8220 0240 00	Lever, fast wind
14	8223 0161 00	Collar, 3x6x11.58	58	8214 0120 00	Spring
15	8220 0330 00	Guide, tape, A	59	8204 0070 04	Pin, SP-3x30
16	8223 0150 00	" " B	60	8249 0050 00	Solenoid, A
17	8216 0500 00	Sheet, head shield	61	8220 0250 00	Lever, brake
18	8273 1770 00	PCB assy, head terminal	62	8214 0070 00	Spring
19	8220 0462 00	Base, head	63	8216 0840 00	Felt, stopper
20	8214 0111 00	Spring	64	8216 0860 00	Belt, reel
21	8223 1170 00	Cap, pinch roller	△ 65	8242 0711 00	Xformer, power, 100V
22	8260 0180 00	Pinch roller	△	8242 0721 00	" " 120V
23	8259 0041 00	Head, R/P, 8 trk	△	8242 0731 00	" " 220/240V
24	8259 0030 00	" E, 8 trk	66	8260 0342 00	Chassis assy
25	8220 0341 00	Bracket, head	67	8216 0410 00	Stopper
26	8223 1190 00	Cap, tension roller	68	8220 0421 00	Plate, shield
27	8212 0261 01	Roller, 16	69	8260 0260 00	Bracket assy, shield
28	8223 0280 00	Base, tension roller	70	8212 0301 02	Knob, shield
29	8216 0110 00	Screen, tension arm	71	8214 0101 00	Spring
30	8260 0351 00	Chassis assy, loading	72	8220 0300 00	Bracket, micro, SW
31	8260 0230 00	Arm assy, tension, L	73	8253 0160 00	Switch, micro
32	8214 0070 00	Spring	74	8216 0061 00	Belt, capstan
33	8216 0711 00	Cushion, felt, A	75	8260 1600 00	Pulley assy, reel motor
34	8214 0160 00	Spring	76	8220 0230 00	Bracket, motor
35	8204 0050 01	Sholdek, M2.6 L=4	77	8249 0030 00	Motor, reel
36	8220 0471 00	Lock	78	8273 1650 00	PCB assy, count sensor
37	8216 0070 00	Tube, rubber	79	8251 1720 03	PCB, terminal, reel motor
38	8260 0240 00	Lifter (A) assy	80	8232 0351 03	Cap, ceramic, 50v, 0.01mf
39	8214 0090 00	Spring	81	8223 0081 00	Pulley, capstan motor
40	8220 0410 00	Arm, joint	82	8204 0060 01	Sholdek, M3 L=4
41	8214 0140 00	Link	83	8216 0080 00	Bushing, rubber
42	8260 0190 00	Arm assy, pinch roller	84	8249 0040 00	Motor, capstan
43	8214 0310 00	Spring	85	8260 0470 00	Bracket assy, capstan
			86	8270 2620 01	Rectifier assy, FCA/CND
				8270 2620 02	" " EUR/UK/AUS

Ref. No.	Parts No.	Nomenclature
1	8256 0260 00	Module, bargraph, 12 dot
2	8220 2880 00	Chassis, amplifier
3	8273 1600 00	PCB assy, display
4	8273 1730 00	" " meter cnctr
△ 5	8256 0090 00	Sparkiller, UL
△	8256 0100 00	" CSA
△	8256 0110 03	" SEMKO
△	8256 0080 00	" DM
△ 6	8253 0140 07	Switch, power, SDL1P
△	8253 0370 00	" " SDGA3PL
7	8270 2640 00	Pot assy, pitch control
8	8260 0322 00	Chassis assy, side L
9	8270 1720 00	PCB assy, regulator
10	8220 0450 00	Heat sink, power
11	8273 1610 00	PCB assy, function/c'tri
12	8220 0480 00	Bracket, R/P, PCB
13	8212 0280 00	Guide, PCB
14	8220 0490 00	PCB assy, connector board
15	8273 1760 00	PCB assy, line out
16	8273 1620 00	Bracket, connector board
17	8260 0332 00	Chassis assy, side R
18	8207 0004 00	Plastic rivet, No. 980
19	8276 3380 00	Cable assy, foot switch
20	8220 2900 00	Bracket, connector
21	8273 1750 00	PCB assy, synchro
22	8273 1740 00	" remote
23	8273 1630 00	" NR switch
24	8220 2890 00	Panel, rear
△ 25	8207 0002 08	Bushing, SR-4N-4
△	8207 0002 14	" SR-5N-4
△ 26	8276 0040 00	Cord, power, USA
△	8276 2170 00	" " CSA
△	8276 0050 00	" " HYDRO
△	8276 0060 00	" " EUR
△	8276 0070 00	" " UK
△	8276 0080 00	" " AUS
△	8276 0030 00	" " DM
27	8220 2860 00	Bracket, control C
28	8220 0511 00	" " B
29	8273 1640 00	PCB assy, system control





SYSTEM CONTROL PCB ASS'Y, Ass'y No. 8273 1640 00

Ref. No.	Parts No.	Nomenclature
	8251 1711 00	PCB, system control
IC's		
01	8236 0032 01	Digital, CMOS, 4070B
02	8236 0040 01	" " , 4081B
03	8236 0029 01	" " , 4050B
04	8236 0007 01	" " , 4013B
05	8236 0198 00	" , 8049
06	8236 0199 00	" , 8243
07	8236 0031 01	" , CMOS, 4069UB
08	8236 0040 01	" " , 4081B
09	8236 0028 01	" " , 4049B
10	8236 0072 00	" " , 4511B
11	8236 0195 00	TR array, TD62504P
12,13	8236 0292 00	Analog, NJM3403AD
14~20	8236 0196 03	Driver, RN1003
21,22	8236 0197 04	" , RN2004
23	8236 0196 04	" , RN1004
24,25	8236 0196 03	" , RN1003
26,27	8236 0197 03	" , RN2003
28~30	8236 0196 03	" , RN1003
31	8236 0196 04	" , RN1004
32	8236 0197 03	" , RN2003
33	8236 0197 04	" , RN2004
34	8236 0197 03	" , RN2003
35	8236 0196 03	" , RN1003
36	8236 0196 04	" , RN1004
37~39	8236 0196 03	" , RN1003
40	8236 0196 04	" , RN1004
41	8239 0017 00	Ceramic resonator, 6MHz
42	8236 0196 04	Driver, RN1004
43~46	8236 0196 05	" , RN1005
TRANSISTORS		
01,02	8234 0002 03	2SC1815GR
03	8234 0003 03	2SA1015GR
04,05	8234 0002 03	2SC1815GR
06	8234 0008 02	2SD880Y
07	8234 0038 02	2SA1020Y
08	8234 0002 03	2SC1815GR
09	8234 0003 03	2SA1015GR
10	8234 0076 02	2SC1627Y
11	8234 0077 03	2SD1408Y

Ref. No.	Parts No.	Nomenclature
Q14,15	8234 0002 03	2SC1815GR
Q16	8234 0003 03	2SA1015GR
Q17~19	8234 0002 03	2SC1815GR
Q20	8234 0038 02	2SA1020Y
Q21	8234 0076 02	2SC1627Y
Q22	8234 0077 03	2SD1408Y
Q23	8234 0002 03	2SC1815GR
Q24	8234 0037 02	2SC2655Y
Q25,26	8234 0002 03	2SC1815GR
Q27	8234 0037 02	2SC2655Y
DIODES		
D01	8234 0039 00	Diode array, MA154WK
D02	8234 0040 00	" " , MA154WA
D03	8234 0039 00	" " , MA154WK
D04	8234 0040 00	" " , MA154WA
D05	8234 0039 00	" " , MA154WK
D06	8234 0040 00	" " , MA154WA
D07	8234 0039 00	" " , MA154WK
D08	8234 0040 00	" " , MA154WA
D09	8234 0039 00	" " , MA154WK
D10	8234 0040 00	" " , MA154WA
D11	8234 0039 00	" " , MA154WK
D12	8234 0040 00	" " , MA154WA
D13	8234 0039 00	" " , MA154WK
D14	8234 0040 00	" " , MA154WA
D15	8234 0039 00	" " , MA154WK
D16	8234 0040 00	" " , MA154WA
D17~19	8234 0035 00	MA150FVS
D20	8234 0019 01	Zener, 8.2V, 05Z8.2Y
D21~34	8234 0035 00	MA150FVS
D35	8234 0007 00	1N4002
D36	8234 0035 00	MA150FVS
D37	8234 0040 00	Diode array, MA150WA
D38~43	8234 0035 00	" , MA150FVS
D44	8234 0007 00	" , 1N4002
D45	8234 0035 00	" MA150FVS
D46,47	8234 0007 00	1N4002
D48	8234 0035 00	MA150FVS
D49	8234 0042 01	Zener, 8.2V, 05Z8.2Y
D50~56	8234 0035 00	MA150FVS
CARBON RESISTORS		
All resistors 1/4W, ±5% unless otherwise noted.		
R001	8230 0042 23	Vertical mtg, 22KΩ

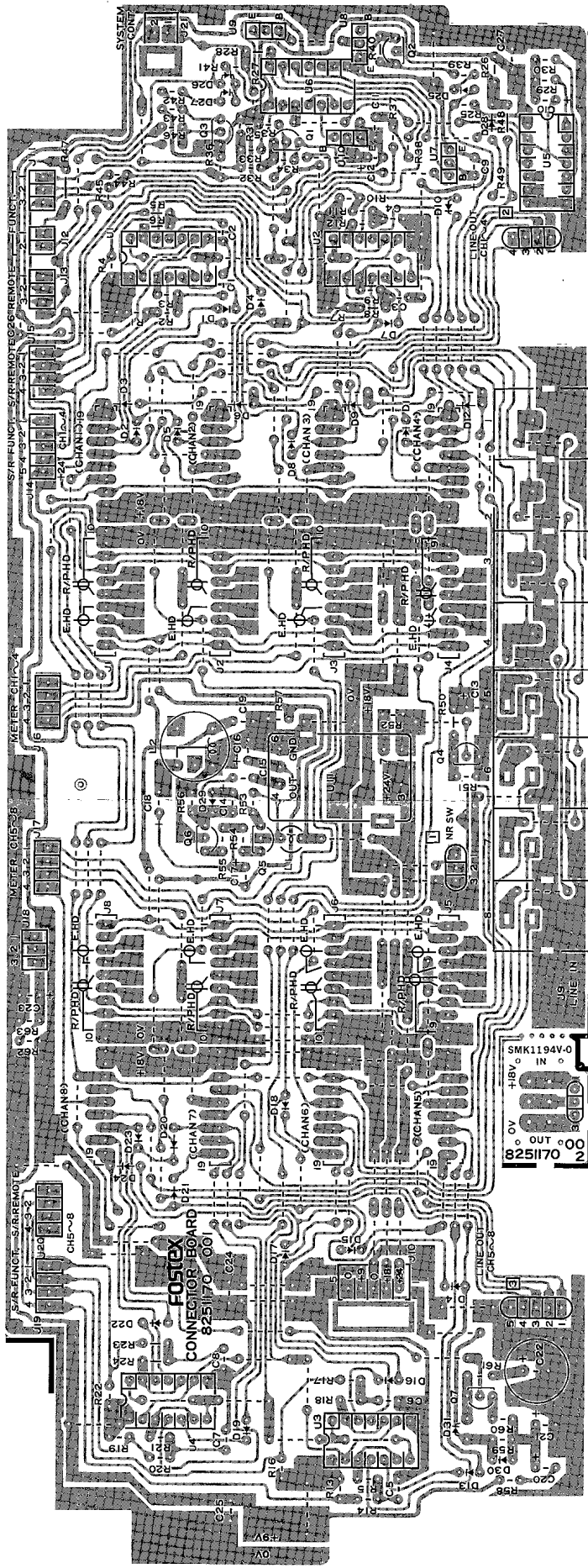
R004	8230 0043 32	"	"	3.3KΩ	R051	8230 0044 73	"	"	47KΩ
R005	8230 0041 03	"	"	10KΩ	R052	8230 0041 04	"	"	100KΩ
R006	8230 0041 04	"	"	100KΩ	R053	8230 0041 05	"	"	1MΩ
R007	8230 0042 23	"	"	22KΩ	R054	8230 0041 04	"	"	100KΩ
R008	8230 0042 21	"	"	220Ω	R055	8230 0044 73	"	"	47KΩ
R009	8230 0044 71	"	"	470Ω	R056	8230 0042 23	"	"	22KΩ
R010	8230 0042 23	"	"	22KΩ	R057	8230 0041 04	"	"	100KΩ
R011	8230 0042 21	"	"	220Ω	R058,059	8230 0041 03	"	"	10KΩ
R012	8230 0044 71	"	"	470Ω	R060,061	8230 0041 05	"	"	1MΩ
R013	8230 0042 23	"	"	22KΩ	R062		(Deleted)		
R014	8230 0041 03	"	"	10KΩ	R063~065	8230 0041 03	Vertical mtg,		10KΩ
R015	8230 0041 04	"	"	100KΩ	R066	8230 0044 73	"	"	47KΩ
R016	8230 0042 23	"	"	22KΩ	R067	8230 0041 51	"	"	150Ω
R017	8230 0042 21	"	"	220Ω	R068		(Deleted)		
R018	8230 0044 71	"	"	470Ω	R069~071	8230 0041 03	Vertical mtg,		10KΩ
R019	8230 0042 23	"	"	22KΩ	R072	8230 0041 04	"	"	100KΩ
R020	8230 0041 03	"	"	10KΩ	R073	8230 0044 74	"	"	470KΩ
R021	8230 0041 04	"	"	100KΩ	R074	8230 0042 23	"	"	22KΩ
R022	8230 0042 23	"	"	22KΩ	R075	8230 0041 04	"	"	100KΩ
R023	8230 0042 21	"	"	220Ω	R076	8230 0041 05	"	"	1MΩ
R024	8230 0044 71	"	"	470Ω	R077	8230 0041 03	"	"	10KΩ
R025	8230 0042 23	"	"	22KΩ	R078	8230 0044 74	"	"	470KΩ
R026	8230 0042 21	"	"	220Ω	R079	8230 0041 04	"	"	100KΩ
R027	8230 0044 71	"	"	470Ω	R080	8230 0041 03	"	"	10KΩ
R028	8230 0042 23	"	"	22KΩ	R081	8230 0044 73	"	"	47KΩ
R029	8230 0042 21	"	"	220Ω	R082~084	8230 0041 04	"	"	100KΩ
R030	8230 0044 71	"	"	470Ω	R085	8230 0041 02	"	"	1KΩ
R031	8230 0042 23	"	"	22KΩ	R086	8230 0042 24	"	"	220KΩ
R032	8230 0041 03	"	"	10KΩ	R087	8230 0042 22	"	"	2.2KΩ
R033	8230 0041 04	"	"	100KΩ	R088	8230 0041 03	"	"	10KΩ
R034	8230 0042 23	"	"	22KΩ	R089	8230 0047 53	"	"	75KΩ
R035	8230 0042 21	"	"	220Ω	R090	8230 0041 64	"	"	160KΩ
R036	8230 0044 71	"	"	470Ω	R091	8230 0041 23	"	"	12KΩ
R037	8230 0042 23	"	"	22KΩ	R092	8230 0047 52	"	"	7.5KΩ
R038	8230 0042 21	"	"	220Ω	R093	8230 0041 04	"	"	100KΩ
R039	8230 0044 71	"	"	470Ω	R094,095	8230 0041 03	"	"	10KΩ
R040	8230 0042 23	"	"	22KΩ	R096	8230 0041 02	"	"	1KΩ
R041	8230 0041 03	Vertical mtg,		10KΩ	R097	8230 0041 03	Vertical mtg,		10KΩ
R042	8230 0041 04	"	"	100KΩ	R098	8230 0043 32	"	"	3.3KΩ
R043	8230 0042 23	"	"	22KΩ	R099	8230 0046 82	"	"	6.8KΩ
R044	8230 0041 03	"	"	10KΩ	R100	8230 0041 83	"	"	18KΩ
R045	8230 0041 04	"	"	100KΩ	R101	8230 0041 03	"	"	10KΩ
R046	8230 0042 23	"	"	22KΩ	R102	8230 0046 81	"	"	680Ω
R047	8230 0042 21	"	"	220Ω	R103	8230 0041 52	"	"	1.5KΩ
R048	8230 0044 71	"	"	470Ω	R104	8230 0041 02	"	"	1KΩ
R049,050	8230 0041 81	"	"	180Ω	R105	8230 0044 73	"	"	47KΩ

Ref. No.	Parts No.	Nomenclature	Ref. No.	Parts No.	Nomenclature	Ref. No.	Parts No.	Nomenclature	Ref. No.	Parts No.	Nomenclature
R106	8230 0041 04	"	R167	8230 0041 53	Vertical mtg, 15KΩ	C30,31	8232 0268 22	PPR, 100V, 330pFrd, APS	0201	8245 0530 44	"
R107	8230 0041 02	"	R168	8230 0043 04	"	C32	8232 0268 22	Mylar, 50V, 0.0082mFrd, 5%	0202	8245 0530 22	"
R108,109	8230 0041 04	"	R169,170	8230 0044 73	"	C33	8232 0312 22	PPR, 100V, 0.0022mFrd, 5%	0202	8245 0530 42	"
R110	8230 0044 73	"	R171	8230 0044 74	"	C34	8232 0054 75	Elect, 35V, 4.7mFrd	0203	8245 0530 02	"
R111	8230 0041 02	"	R172	8230 0041 03	"	C35	8232 0261 52	Mylar, 50V, 0.0015mFrd, 5%	0204	8245 0530 42	"
R112	8230 0041 04	"	R173	8230 0041 02	"	C36	8232 0351 03	Ceramic, 50V, 0.01mFrd, YF			
R113	8230 0043 32	"	R174	8230 0041 02	"	C37	8232 0054 75	Elect, 35V 4.7mFrd, SM			
R114	8230 0042 23	"	R175	8230 0041 03	"	C38	8232 0022 26	"			
R115	8230 0041 02	"	R176	8230 0044 73	"	C39	8232 0063 35	"			
R116	8230 0041 04	"	R177	8230 0041 04	"	C40	8232 0051 06	"			
R117~123	8230 0041 51	"	R178	8230 0041 02	"	C41	8232 0263 33	Mylar, 50V, 0.033mFrd, 5%			
R124	8230 0041 03	"	R179	8230 0044 73	"	C42	8232 0054 76	Electrolytic, 35V, 47mF,			
R125	8230 0043 01	"	R180	8230 0041 04	"	C43	8232 0263 33	Mylar, 50V, 0.033mFrd, 5%			
R126	8230 0044 73	"	R181	8230 0041 02	"	C44,45	8232 0054 76	Elect, 35V, 4.7mFrd, SM			
R127	8230 0042 24	"	R182,183	8230 0042 23	"	C46	8232 0061 05	"			
R128~130	8230 0044 73	"	R184	8230 0044 74	"	C47	8232 0064 74	"			
R131	8230 0046 83	"	R185	8230 0044 73	"	C48	8232 0063 35	"			
R132	8230 0046 82	"	R186	8230 0042 23	"	C49,50	8232 0051 06	"			
R133,134	8230 0041 02	"	R187	8230 0044 72	"	C51,52	8232 0351 03	Ceramic, 50V, 0.01mFrd, YF			
R135	8230 0047 53	"	R188	8230 0041 04	"	C53	8232 0051 07	Elect, 35V, 100mFrd, SM			
R136	8230 0041 53	"	R189	8230 0041 03	"	C54	8232 0021 07	"			
R137	8230 0046 82	"	R190	8230 0044 33	"	C55~59	8232 0351 03	Ceramic, 50V, 0.01mFrd, YF			
R138	8230 0044 33	"	R191	8231 0012 23	Trimmer pot, 22KΩ	C60	8232 0051 06	Elect, 35V, 10mFrd, SM			
R139	8230 0041 02	"	R192	8231 0013 33	"	C61	8232 0266 83	Mylar, 50V, 0.068mFrd, 5%			
R140	8230 0041 02	"	R193,194	8231 0032 23	Carbon film, 22KΩ	C62	8232 0062 25	Elect, 50V, 2.2mFrd, SM			
R141	8230 0290 30	Metal film, 3M, 3Ω	R195,196		(Deleted)						
R142	8230 0041 03	Vertical mtg, 10KΩ	R197	8230 0041 01	Vertical mtg, 100Ω						
R143	8230 0041 02	"	R198	8230 0041 02	"	MISCELLANEOUS	8245 0530 07	Jack, 8263, 7, wht			
R144	8230 0043 92	"	R199	8230 0362 22	Res.array, 1/8W, 2.2KΩx4	0201	8245 0530 05	"			
R145	8230 0044 73	"	R200,201	8230 0078 21	" carbon, 1/2W, 820Ω	0202	8245 0530 02	"			
R146	8230 0042 24	"				0203	8245 0530 02	"			
R147,148	8230 0044 73	"	R202,203	8230 0041 01	Vertical mtg, 100Ω	0204	8245 0530 11	"			
R149	8230 0046 83	"				0205	8245 0530 12	"			
R150	8230 0041 04	"				0206	8245 0530 11	"			
R151	8230 0044 73	"				0207	8245 0530 04	"			
R152	8230 0042 24	"				0208	8245 0530 02	"			
R153~155	8230 0044 73	Vertical mtg, 47KΩ				0209	8245 0530 44	"			
R156	8230 0046 82	"				0210	8245 0530 02	"			
R157	8230 0041 03	"				0211	8245 0530 22	Jack, 8263, 2, red			
R158	8230 0041 02	"				0212	8245 0530 07	"			
R159,160	8230 0046 83	"				0213	8245 0530 08	"			
R161	8230 0048 23	"				0214	8245 0530 22	"			
R162	8230 0041 53	"				0215	8245 0530 25	"			
R163	8230 0046 82	"				0216	8245 0530 04	"			
R164,165	8230 0041 02	"				0217	8245 0530 02	"			
R166	8230 0290 30	Metal film, 3M, 3Ω				0218	8245 0530 23	"			
						0219	8245 0530 03	"			



NR SWITCH PCB ASSEMBLY

CONNECTOR BOARD PCB ASSEMBLY



R SWITCH PCB ASSEMBLY, Ass'y No. 8273 1630 00

Ref. No.	Parts No.	Nomenclature
	8251 1700 02	PCB, NR SW
001	8253 0400 04	Switch, 2-2, SSB022, L6

CONNECTOR BOARD PCB ASS'Y, Ass'y No. 8273 1620 00

Ref. No.	Parts No.	Nomenclature
	8251 1700 01	PCB, connector board
		IC's
01~04	8236 0033 01	Digital, MC14071B
05	8236 0001 01	" MC14001B
06	8236 0005 01	" MC14011B
07,08	8236 0196 04	Driver, RN1004
09	8236 0197 03	" RN2003
10	8236 0196 04	" RN1004
11	8256 0171 00	Module, OSC, 100KHz, LR

TRANSISTORS

01,02	8234 0002 03	2SC1815GR
03	8234 0003 03	2SA1015GR
04	8234 0002 03	2SC1815GR
05	8234 0037 02	2SC2655Y
06	8234 0038 02	2SA1020Y
07	8234 0003 03	2SA1015GR

DIODES

01~30	8234 0035 00	MA-150FVS
31	8234 0007 00	1N4002

CARBON RESISTORS

11 resistors 1/4W, ±5% unless otherwise noted.

01,02	8230 0041 03	Vertical mtg, 10KΩ
03	8230 0041 04	" " 100KΩ
04,05	8230 0041 03	" " 10KΩ
06	8230 0041 04	" " 100KΩ
07,08	8230 0041 03	" " 10KΩ
09	8230 0041 04	" " 100KΩ
10,11	8230 0041 03	" " 10KΩ
12	8230 0041 04	" " 100KΩ
13,14	8230 0041 03	" " 10KΩ
15	8230 0041 04	" " 100KΩ

Ref. No.	Parts No.	Nomenclature
R18	8230 0041 04	Vertical mtg, 100KΩ
R19,20	8230 0041 03	" " 10KΩ
R21	8230 0041 04	" " 100KΩ
R22,23	8230 0041 03	" " 10KΩ
R24	8230 0041 04	" " 100KΩ
R25	8230 0044 73	" " 47KΩ
R26,27	8230 0041 03	" " 10KΩ
R28	8230 0041 04	" " 100KΩ
R29	8230 0041 64	" " 160KΩ
R30	8230 0041 63	" " 16KΩ
R31	8230 0041 03	" " 10KΩ
R32,33	8230 0041 04	" " 100KΩ
R34	8230 0044 74	" " 470KΩ
R35~37	8230 0041 03	" " 10KΩ
R38	8230 0041 04	" " 100KΩ
R39	8230 0041 03	" " 10KΩ
R40	8230 0042 23	" " 22KΩ
R41	8230 0041 03	" " 10KΩ
R42,43	8230 0042 23	" " 22KΩ
R44,45	8230 0041 01	" " 100Ω
R46,47	8230 0044 71	" " 470Ω
R48	8230 0041 23	" " 12KΩ
R49	8230 0041 51	" " 150Ω
R50	8230 0041 03	" " 10KΩ
R51	8230 0041 04	" " 100KΩ
R52	8230 0042 20	" " 22Ω
R53	8230 0045 62	" " 5.6KΩ
R54,55	8230 0041 09	" " 1Ω
R56	8230 0045 62	" " 5.6KΩ
R57	8230 0041 04	" " 100KΩ
R58	8230 0047 51	" " 750Ω
R59	8230 0041 24	" " 120KΩ
R60	8230 0044 73	" " 47KΩ
R61	8230 0041 01	" " 100Ω
R62	8230 0041 23	" " 12KΩ
R63	8230 0046 82	" " 6.8KΩ

CAPACITORS

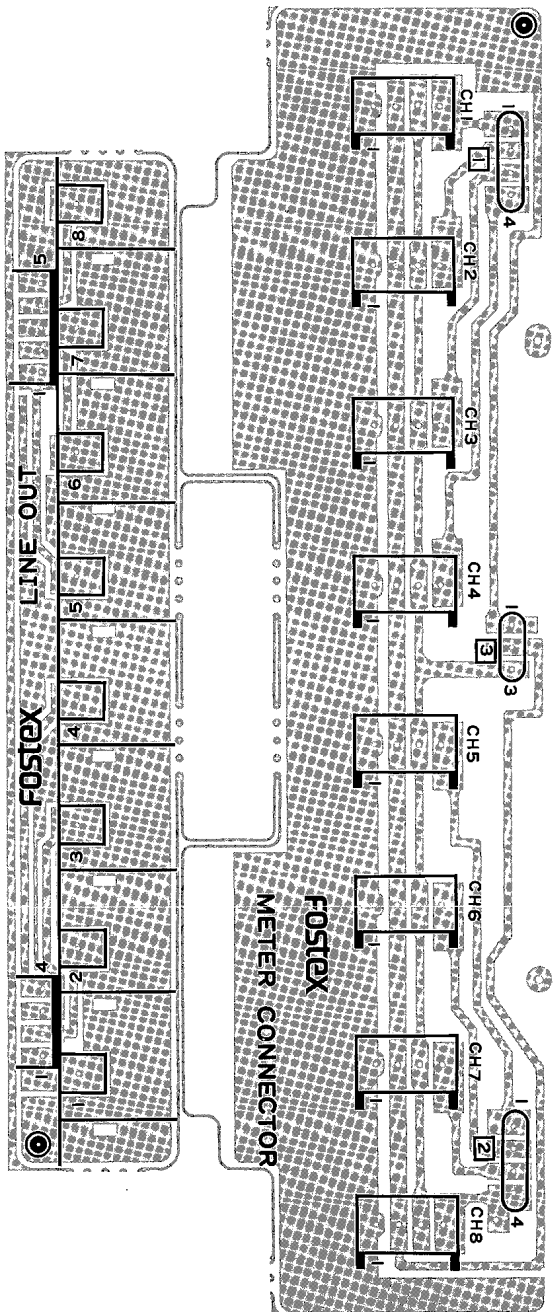
C01~08	8232 0351 03	Ceramic, 50V, 0.01mf, YF
C09	8232 0061 05	Elect, 50V, 1mf, 20%, SM
C10	8232 0032 26	" 16V, 22mf, " "
C11	8232 0351 03	Ceramic, 50V, 0.01mf, YF
C12	8232 0061 05	Elect, 50V, 1mf, 20%, SM
C13	8232 0024 76	" 10V, 47mf, " "
C14	8232 0064 74	" 50V, 0.47mf, 20%

C16	8232 0041 00	Elect, 25V, 100mf, 20%, 5%
C17	8232 0034 76	" 16V, 47mf, " "
C18	8232 0031 06	" " 10mf, " "
C19	8232 0313 91	PPR, 100V, 390pf, 5%, APS
C20	8232 0722 26	Elect, 25V, 22mf, 20%
C21		(Deleted)
C22	8232 0041 07	Elect, 25V, 100mf, 20%
C23	8232 0021 07	Elec, 10V, 100mf, 20%
C24~27	8232 0351 03	Ceramic, 50V, 0.01mf, YF

MISCELLANEOUS

J01~08	8245 0490 19	Jack, 5256-19A, wht
J09A	8245 0720 00	" RCA, 4P, blk, w/SW
J09B	8245 0800 00	" " " " , wo/SW
J10	8245 0070 05	" 5129-5A
J11	8245 0530 03	" 8263, 3, wht
J12	8245 0530 02	" " 2, "
J13	8245 0530 23	" " 3, red
J14	8245 0530 05	" " 5, wht
J15	8245 0530 24	" " 4, red
J16	8245 0530 04	" " " wht
J17	8245 0530 44	" " " blk
J18	8245 0530 63	" " 3, yel
J19	8245 0530 04	" " 4, wht
J20	8245 0530 24	" " " red
J21	8245 0070 02	" 5129-2A
	8276 1600 14	Cable, 3 cond, 140mm
	8276 2360 12	Cable assy, 4P wht, 120mm
	8276 2370 23	" " 5P, " 230mm

METER CONNECTOR PCB ASSEMBLY  
 LINE OUT PCB ASSEMBLY

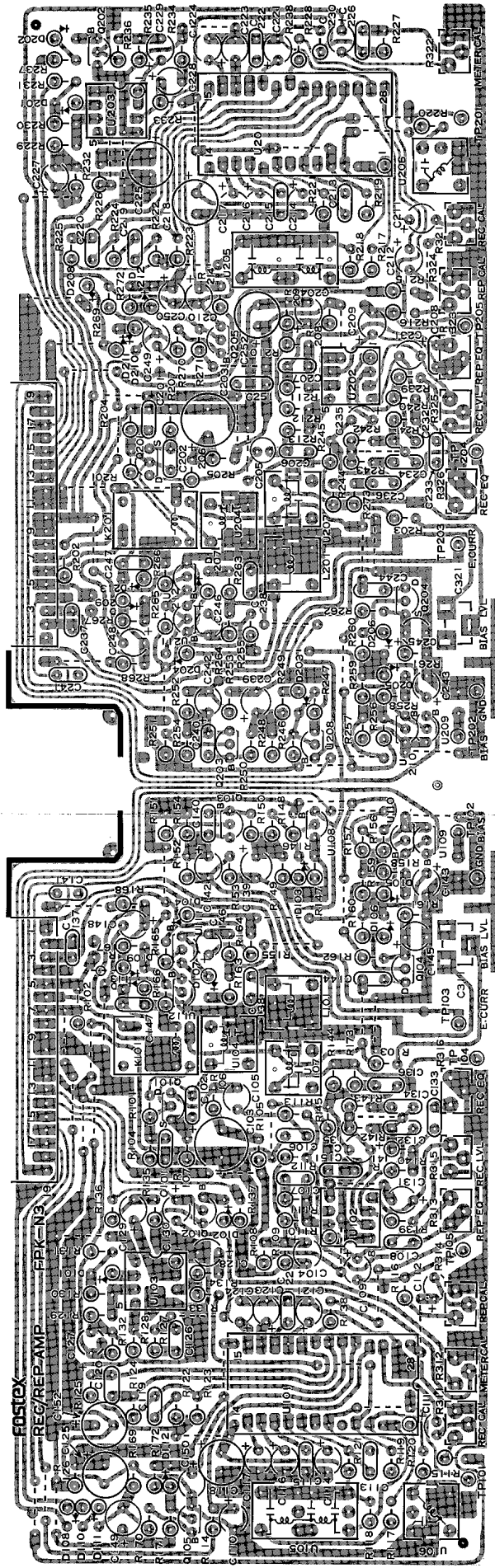


METER CONNECTOR PCB ASS'Y, Ass'y No. 8273 1730 00

LINE OUT PCB ASSEMBLY, Ass'y No. 8273 1760 00

Ref. No.	Parts No.	Nomenclature
	8251 1720 01	PCB, meter connector
8245 0020 04	Jack, 302A-4CH, wht	
8276 2360 24	Cable, 4P, wht, 240mm	
8276 2820 20	" " b1k, 200mm	
8276 2810 30	" " 3P, ye1, 300mm	

Ref. No.	Parts No.	Nomenclature
	8251 1720 02	PCB, line out
8245 0800 00	Jack, RCA, 4P, b1k	
8245 0530 04	" " 8263, 4, wht	
0001	" " " 5, "	
0002	8245 0530 05	



R/P AMPLIFIER PCB ASSEMBLY, Ass'y No. 8273 1540 02

Ref. No.	Parts No.	Nomenclature
	8251 1621 00	PCB, R/P amplifier
		IC's
1101,201	8236 0291 00	Analog, Dolby, TEA0665
1102,202	8236 2100 00	" " NJM4559DD
1103,203	8236 0283 00	" " NJM3404AD
1104,204	8256 0150 00	Module, trap, S, 100KHz
1105,205	8256 0130 00	" LP filter, 25KHz
1106,206	8256 0120 00	" skewing
1107,207	8256 0140 00	" trap, P, 100KHz
1108~112	8236 0196 03	Driver, RN1003
1208~212	"	"
		TRANSISTORS
1101,201	8234 0001 09	FET, 2SK117Y-3
1102,202	8234 0006 02	2SC2878B
1103,203	"	"
1104,204	8234 0001 11	FET, 2SK117GR
1105,205	8234 0002 03	2SC1815GR
		DIODES
1101~112	8234 0035 00	MA-150FVS
1201~212	"	"
113,213	8234 0007 00	1N4002
		CARBON RESISTORS
11 resistors 1/4W, ±5% unless otherwise noted.		
101,201	8230 0041 00	Vertical mtg, 10Ω
102,202	8230 0041 01	" " 100Ω
103,203	8230 0043 92	" " 3.9KΩ
104,204	8230 0041 03	" " 10KΩ
105,205	8230 0046 82	" " 6.8KΩ
106,206	8230 0235 62	" " 5.6KΩ, 1%
107,207	8230 0042 21	" " 220Ω
108,208	8230 0042 73	" " 27KΩ
109,209	8230 0041 03	" " 10KΩ
110,210	8230 0043 91	" " 390Ω
111,211	8230 0043 94	" " 390KΩ
112,212	8230 0044 73	" " 47KΩ
113,213	8230 0043 31	" " 330Ω
114,214	8230 0044 73	" " 47KΩ
115,215	8230 0042 73	" " 27KΩ

Ref. No.	Parts No.	Nomenclature
R117,217	8230 0043 32	" " 3.3KΩ
R118,218	8230 0045 62	" " 5.6KΩ
R119,219	8230 0043 32	" " 3.3KΩ
R120,220	8230 0041 02	" " 1KΩ
R121,221	8230 0238 23	" " 82KΩ
R122,222	8230 0235 12	" " 5.1KΩ
R123,223	8230 0046 83	" " 68KΩ
R124,224	8230 0232 22	" " 2.2KΩ, 1%
R125,225	8230 0238 23	" " 82KΩ, "
R126,226		(Deleted)
R127,227	8230 0041-83	" " 18KΩ
R128,229	8230 0044 73	" " 47KΩ
R129,229	8230 0042 22	" " 2.2KΩ
R130,230	8230 0042 23	" " 22KΩ
R131,231	8230 0041 01	" " 100Ω
R132,232	8230 0041 84	" " 180KΩ
R133,233	8230 0043 32	" " 3.3KΩ
R134,234	8230 0041 53	" " 15KΩ
R135,235	8230 0041 04	" " 100KΩ
R136,236	8230 0042 01	" " 200Ω
R137,237	8230 0041 53	" " 15KΩ
R138,238	8230 0048 21	" " 820Ω
R139,239	8230 0043 92	" " 3.9KΩ
R140,240	8230 0049 12	" " 9.1KΩ
R141,241	"	" " "
R142,242		(Deleted)
R143,243		( " )
R144,244	8230 0044 72	Vertical mtg, 4.7KΩ
R145,245	8230 0041 23	" " 12KΩ
R146,246	8230 0044 72	" " 4.7KΩ
R147,247	8230 0041 83	" " 18KΩ
R148,248	8230 0041 52	" " 1.5KΩ
R149,249	"	" " "
R150,250	8230 0043 02	" " 3KΩ
R151,251	8230 0042 03	" " 20KΩ
R152,252	8230 0047 51	" " 750Ω
R153,253	8230 0042 00	" " 20Ω
R154,254	8230 0042 23	" " 22KΩ
R155,255	8230 0041 04	" " 100KΩ
R156,256	8230 0042 73	" " 27KΩ
R157,257	8230 0041 33	" " 13KΩ
R158,258	"	" " "
R159,259	8230 0045 62	" " 5.6KΩ
R160,260		(Deleted)
R161,261	8230 0042 72	" " 2.7KΩ

R100,200	8230 0041 22	"	"	1.2KΩ
R164,264	8230 0042 43	"	"	24KΩ
R165,265	8230 0042 23	"	"	22KΩ
R166,266	8230 0043 61	"	"	360Ω
R167,267	8230 0042 23	"	"	22KΩ
R168,268	"	"	"	"
R169,269	8230 0044 72	"	"	4.7KΩ
R170,270	8230 0045 61	"	"	560Ω
R171,271	8230 0042 73	"	"	27KΩ
R172,272	8230 0048 23	"	"	82KΩ
R173,273	8230 0044 73	"	"	47KΩ

CAPACITORS

C101,201	8232 0261 02	Mylar, 50V, 0.001mf, 5%
C102,202	8232 0511 01	Ceramic, 50V, 100pf, 10%
C103,203	8232 0032 27	Elec, 16V, 220mf, 20%
C104,204	8232 0033 36	" " 33mf, "
C105,205	8232 0851 05	" 50V, 1mf, 20%
C106,206	8232 0342 71	Ceramic, 50V, 270pf, 10%
C107,207	8232 0261 53	Mylar, 50V, 0.015mf, 5%
C108,208	8232 0512 20	Ceramic, 50V, 22Pf, 10%
C109,209	8232 0031 06	Elec, 16V, 10mf, 20%, SM
C110,210	8232 0054 75	" 35V, 4.7mf, " "
C111,211	8232 0061 05	" 50V, 1mf, " "
C112,212	"	" " " " " "
C113,213	8232 0304 72	PPR, 100V, 0.0047mf, 2%
C114,214	8232 0031 06	Elec, 16V, 10mf, 20%, SM
C115,215	8232 0264 73	Mylar, 50V, 0.047mf, 5%
C116,216	8232 0062 24	Elect, " 0.22mf, 20%
C117,217	8232 0066 84	" " 0.68mf, "
C118,218	8232 0022 27	" 10V, 220mf, "
C119,219	8232 0301 03	PPR, 100V, 0.01mf, 2%
C120,220	8232 0304 72	" 50V, 0.0047mf, "
C121,221	8232 0031 06	Elect, 16V, 10mf, 20%, SM
C122,222	8232 0264 73	Mylar, 50V, 0.047mf, 5%
C123,223	8232 0062 24	Elect, " 0.22mf, 20%
C124,224	8232 0066 84	" " 0.68mf, "
C125,225	8232 0041 07	" 25V, 100mf, "
C126,226	8232 0318 21	PPR, 100V, 820pf, 5%, APS
C127,227	8232 0032 26	Elect, 16V, 22mf, 20%, SM
C128,228	8232 0033 36	" " 33mf, " "
C129,229	8232 0711 06	" " 10mf, "
C130,230	8232 0054 75	" 35V, 4.7mf, " SM
C131,231	8232 0033 36	" 16V, 33mf, " "
C132,232	8232 0511 00	Ceramic, 50V, 10pf, 10%
C133,233	8232 0263 32	Mylar, 50V, 0.0033mf, 5%

C134,234	(Deleted)
C135,235	8232 0724 75 Elect, 25V, 4.7mf, 20%
C136,236	8232 0262 72 Mylar, 50V, 0.0027mf, 5%
C137,237	8232 0312 72 PPR, 100V, " "
C138,238	8232 0313 92 " " 0.0039mf, "
C139,239	8232 0021 07 Elect, 10V, 100mf, 20%
C140,240	8232 0262 23 Mylar, 50V, 0.022mf, 5%
C141,241	8232 0266 83 " " 0.068mf, "
C142,242	8232 0054 75 Elect, 35V, 4.7mf, 20%
C143,243	8232 0031 06 " 16V, 10mf, "
C144,244	8232 0263 33 Mylar, 50V, 0.033mf, 5%
C145,245	8232 0054 75 Elect, 35V, 4.7mf, 20%
C146,246	8232 0042 26 " 25V, 22mf, "
C147,247	8232 0351 03 Ceramic, 50V, 0.01mf, YF
C148,248	8232 0031 06 Elect, 16V, 10mf, 20%, S
C149,249	8232 0721 06 " 25V, " "
C150,250	8232 0061 05 " 50V, 1mf, " S
C151,251	8232 0351 03 Ceramic, 50V, 0.01mf, YF
C152,252	8232 0041 07 Elect, 25V, 100mf, 20%
C311,321	8256 0250 01 Cap, trim, 150pf, CTZ83K

CARBON POTS

R311,321	8231 0041 03	Trimmer, 10KΩ, B
R312,322	8231 0005 03	" 50KΩ, "
R313,323	8231 0041 03	" 10KΩ, "
R314,324	8231 0041 03	Trimmer, 10KΩ, B
R315,325	8231 0045 02	" 5KΩ, "
R316,326	8231 0042 02	" 2KΩ, "

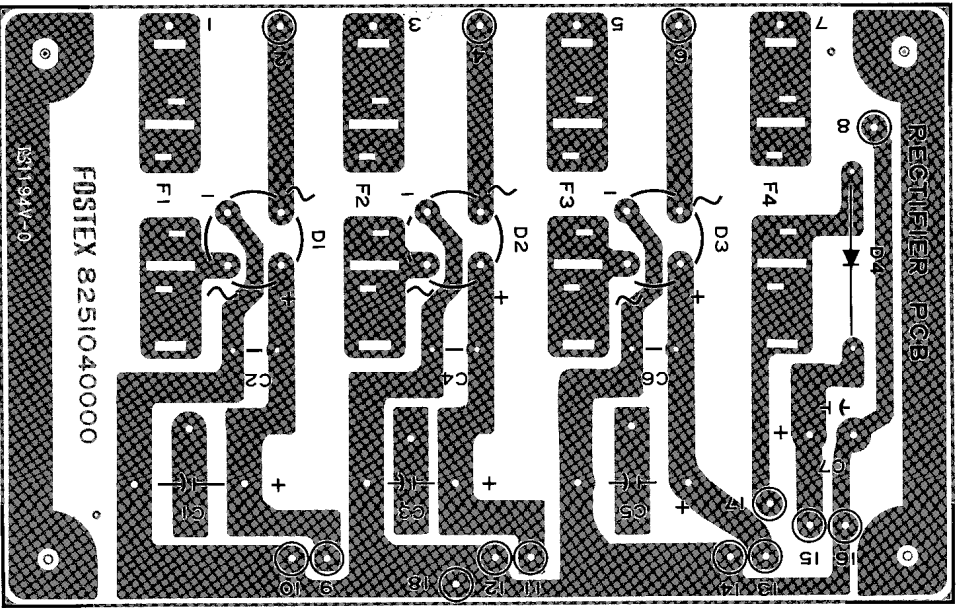
MISCELLANEOUS

8276 0010 00	Pin, header
8276 1281 03	Cable, shield, 110mm
8220 1670 00	Cover, relay shield
J101,201	8245 0880 19 Jack, 5244-19AHPB, wht
K101,201	8248 0080 06 Relay, G2E-187P-H
L101,201	8242 0660 00 Inductor, 0.8MH

RECTIFIER PCB ASSEMBLY

RECTIFIER PCB ASSEMBLY, Ass'y No. 8273 1710 01 FCA/CND  
 8273 1710 02 EUR/UK/AUS  
 8273 1710 03 DM

Ref. No. Parts No. Nomenclature  
 8251 0400 00 PCB, rectifier



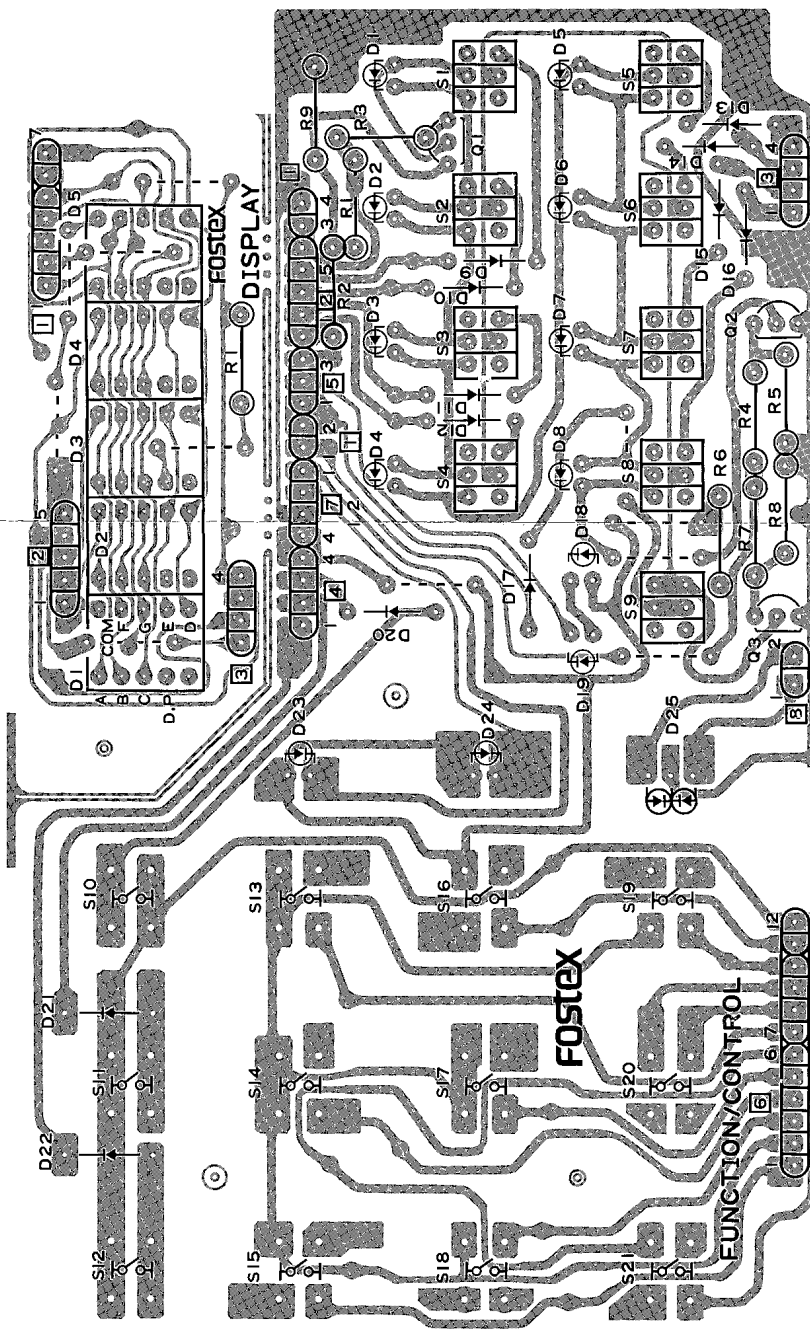
Ref. No.	Parts No.	Nomenclature
△ D001	8234 0016 02	Diode stack, 2M02
△ D002, 003	8234 0017 03	" " M02

CAPACITORS		
C001	8232 0784 78	Elect., 50V, 4700mfd, SM
C002	8232 0351 03	Ceramic, 50V, 0.01mfd, YF
C003	8232 0773 38	Elect., 35V, 3300mfd, SM
C004	8232 0351 03	Ceramic, 50V, 0.01mfd, YF
C005	8232 0792 28	Elect., 63V, 2200mfd, SM
C006	8232 0351 03	Ceramic, 50V, 0.01mfd, YF

MISCELLANEOUS		
△	8239 0001 00	Holder, Fuse, SWS051
△	8239 0012 00	" " SWS056
△ F001	8239 0005 40	Fuse, Dentori, 4A, 250V
△ "	8239 0003 40	" UL/CSA, 4A, 250V
△ "	8239 0007 40	" SEMKO, 4A, 250V
△ F002	8239 0005 20	Fuse, Dentori, 2A, 250V
△ "	8239 0003 20	" UL/CSA, 2A, 250V
△ "	8239 0007 20	" SEMKO, 2A, 250V
△ F003	8239 0005 20	Fuse, Dentori, 2A, 250V
△ "	8239 0003 20	" UL/CSA, 2A, 250V
△ "	8239 0007 20	" SEMKO, 2A, 250V



DISPLAY PCB ASSEMBLY  
 FUNCTION/CONTROL PCB ASSEMBLY



DISPLAY PCB ASSEMBLY, Ass'y No. 8273 1600 00

Ref. No.	Parts No.	Nomenclature
8276 2790 30	"	2P, " "
8276 2360 10	"	4P, " 100mm
8276 2820 40	"	4P, blk, 400mm

Ref. No.	Parts No.	Nomenclature
8251 1590 02	PCB, display	
01~05	8234 0045 00	LED, 7 segment, GL-8P03
01	8230 0062 21	Res, 1/4W, 5%, 220Ω
	8276 2860 30	Cable, 7P, wht, 300mm
	8276 2370 30	" 5P, " "

FUNCTION/CONTROL PCB ASS'Y, Ass'y No. 8273 1610 00

Ref. No.	Parts No.	Nomenclature
8251 1590 01	PCB, function/control	

TRANSISTORS

01	8234 0003 03	2SA1015GR
02,03	8234 0002 03	2SC1815GR

DIODES

01~8	8234 0061 00	LED, red, GL-5HD22
09~17	8234 0018 00	MA-150
18,19	8234 0061 00	LED, red, GL-5HD22
20~22	8234 0018 00	MA-150
23,24	8234 0062 00	LED, grn, GL-9NG24
25	8234 0063 00	" grn-red, GL-9ND24

CARBON RESISTORS

11 resistors 1/4W, ±5W, unless otherwise noted.

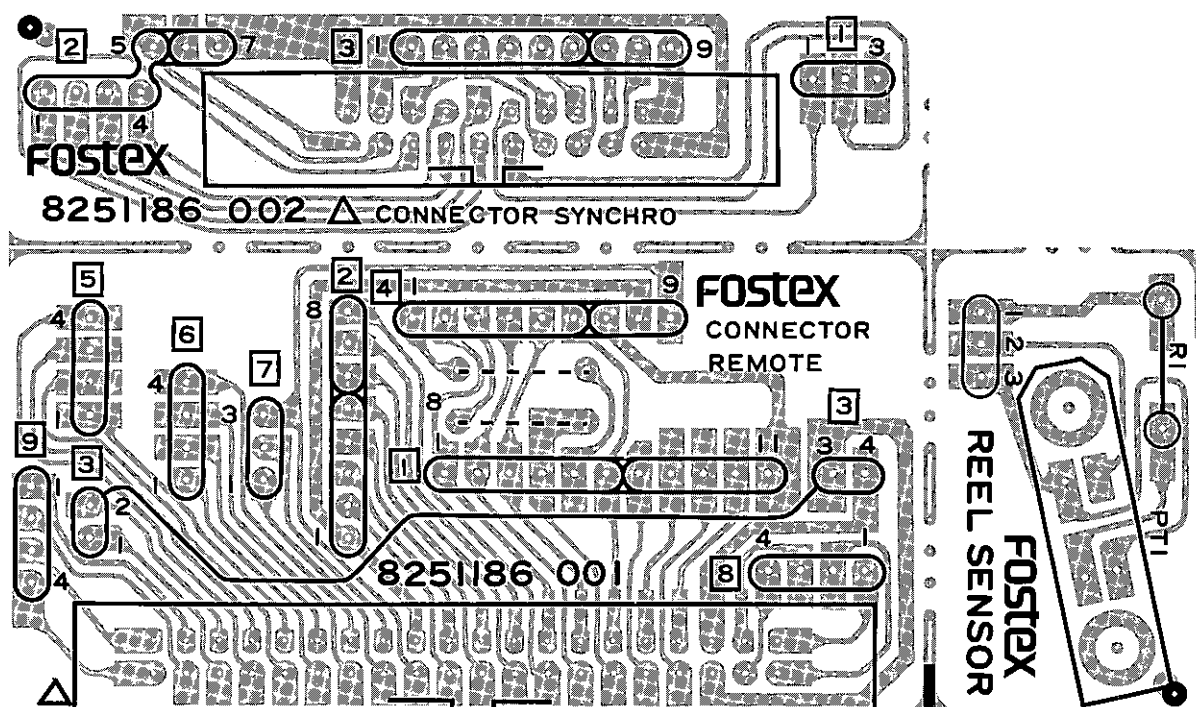
001	8230 0061 52	Flat mtg., 1.5KΩ
002	8230 0061 63	" " 16KΩ
003	8230 0061 61	" " 160Ω
004	8230 0002 23	" " 22KΩ
005	8230 0002 24	" " 220KΩ
006	8230 0061 02	" " 1KΩ
007	8230 0002 23	" " 22KΩ
008	8230 0002 24	" " 220KΩ
009	8230 0062 43	" " 24KΩ

MISCELLANEOUS

01~09	8253 0480 00	Switch, push, SPH221H
10~21	8253 0490 00	" " KHH10910
	8276 2370 25	Cable, 5P, wht, 250mm
	8276 2360 29	" 4P, " 290mm
	8276 2800 30	" 3P, " 300mm

REEL SENSOR PCB ASSEMBLY

REMOTE PCB ASSEMBLY



SYNCHRO PCB ASSEMBLY, Ass'y No. 8273 1750 00

REMOTE PCB ASSEMBLY, Ass'y No. 8273 1740 00

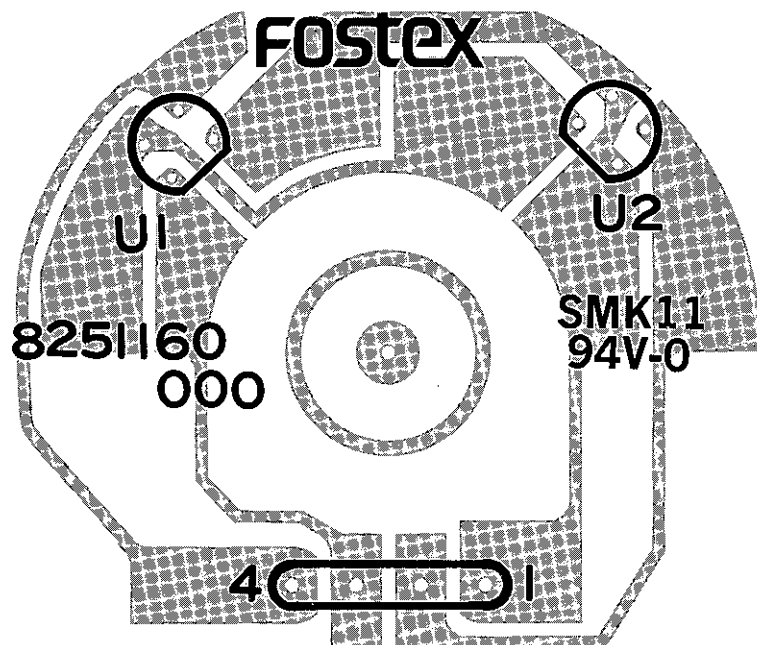
Ref. No.	Parts No.	Nomenclature
	8251 1860 02	PCB, connector, synchro
	8245 0670 01	Jack, FC, 20P
	8276 3090 43	Cable assy, 3P red, 430mm
	8276 2860 48	" " 7P wht, 480mm

Ref. No.	Parts No.	Nomenclature
	8251 1186 01	PCB, connector, remote
	8245 0670 02	Jack, FC, 40P
	8276 2890 30	Cable, 11P wht, 300mm
	8276 3260 45	" " 8P wht, 450mm
	8276 2410 60	" " 4P red, 600mm
	8276 2410 44	" " " " 440mm
	8276 2400 60	" " 3P " 600mm
	8276 2060 12	" " 4P wht, 320mm
	8276 3040 32	" " 4P " 320mm
	8276 2060 12	Cable, 4 cond, 120mm
	8276 2070 12	" 5 " "

REEL SENSOR PCB ASSEMBLY, Ass'y No. 8273 1700 00

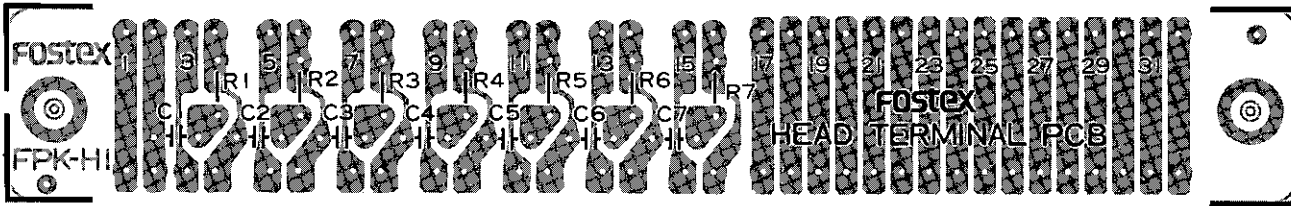
Ref. No.	Parts No.	Nomenclature
	8251 1860 03	PCB, reel sensor
Q001	8234 0047 00	Photo-interrupt, GP-IS0IF
R001	8230 0061 81	Resistor, 1/4W, 5%, 180Ω
	8276 2800 27	Cable assy, 3P, wht, 270mm

# COUNT SENSOR PCB ASSEMBLY



COUNT SENSOR PCB ASSEMBLY, Ass'y No. 8273 1650 00

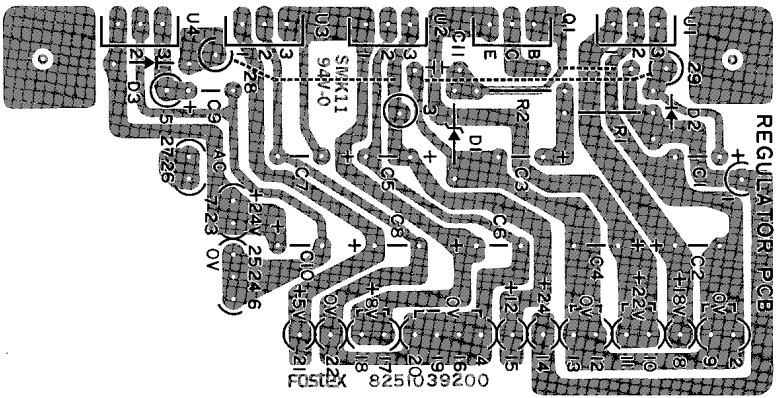
<u>Ref. No.</u>	<u>Parts No.</u>	<u>Nomenclature</u>
	8251 1600 00	PCB, count sensor
U1,2	8234 0048 01	Photo-interrupt, GP-2S02AB
	8276 2410 36	Cable assy,4P, red, 360mm



HEAD TERMINAL PCB ASSEMBLY, Ass'y No. 8273 1770 00

Ref. No.	Parts No.	Nomenclature
	8251 1210 00	PCB, head terminal
R01~07	8230 0341 02	Res, 1/6W, ±5%, 1KΩ
C01~07	8232 0261 23	Cap, Mylar, 50V, 0.012mf, 5%
	8276 3410 00	Cable assy, shield, head

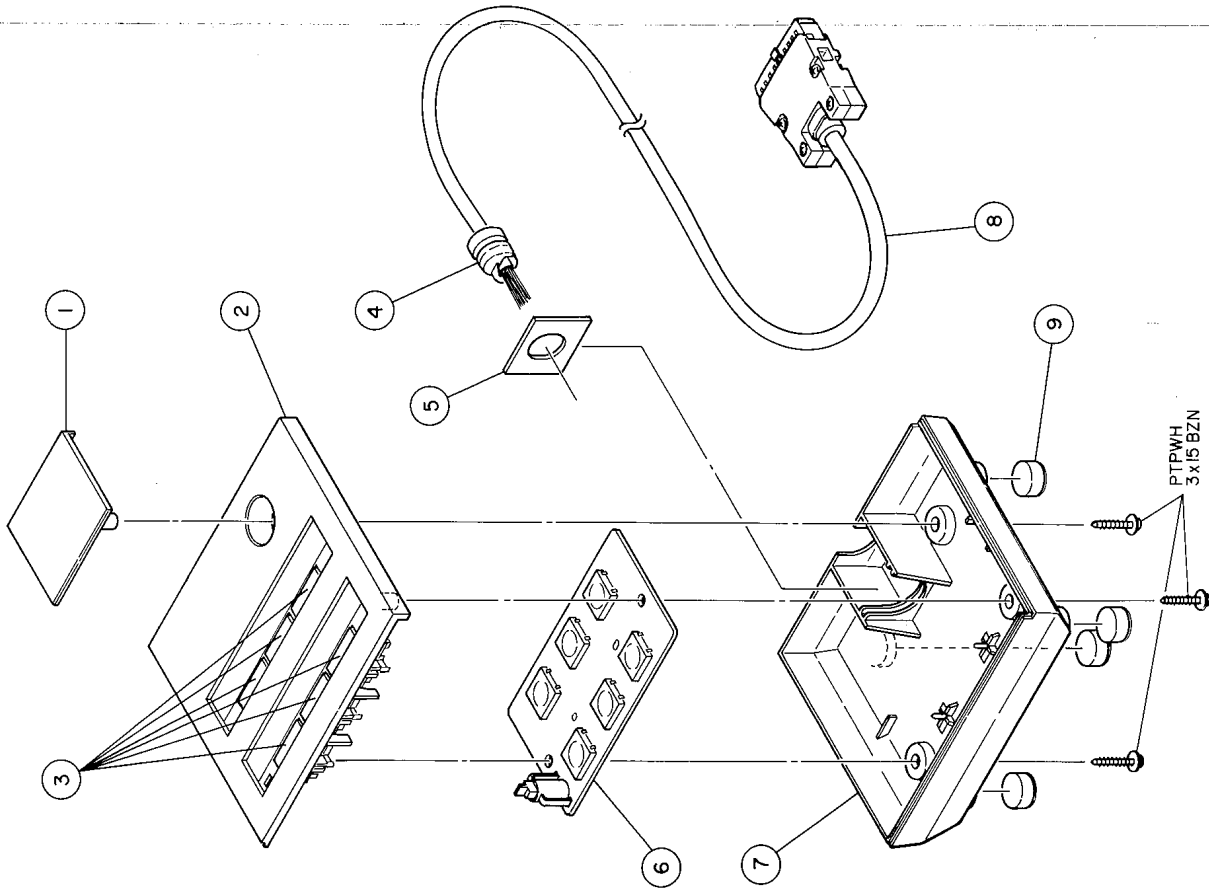
REGULATOR PCB ASSEMBLY



REGULATOR PCB ASSEMBLY, Ass'y No. 8273 1720 00  
 Ref. No. 8251 0392 00 PCB, regulator  
 Parts No. Nomenclature

U001	8236 0260 00	IC's	Analog, regulator, 7818A
U002	8236 0284 00	"	7809A
U003	8236 0262 00	"	7805A
U004	8236 0263 00	"	7824A
Q001	8234 0034 00	TRANSISTORS	2SD6986
	8239 0010 01	Tr- mtg, B kit	
D001	8234 0019 57	DIODES	Zener, WZ240
D02	8234 0007 00		1M4002
R01	8230 0062 21	RESISTOR	Resistor, 1/4W, 5%, 220Ω
C001	8232 0061 05	CAPACITORS	Elect., 50V, 1mfd, SM
C002	8232 0051 07		Elect., 35V, 100mfd, SM
C003	8232 0064 76	"	50V, 47mfd, SM
C004	8232 0051 07	"	35V, 100mfd, SM
C005	8232 0061 05	"	50V, 1mfd, SM
C006	8232 0031 07	"	16V, 100mfd, SM
C007	8232 0061 05	"	50V, 1mfd, SM
C008	8232 0031 07	"	16V, 100mfd, SM
C009	8232 0061 05	"	50V, 1mfd, SM
C010	8232 0051 07	"	35V, 100mfd, SM
C011	8232 0271 04		Mylar, 50V, 0.1mfd, 10%
MISCELLANEOUS			
	8276 1560 07	Wire, gr'y, 70mm	
	8276 2790 40	Cable assy, 2P wht, 400mm	
	8276 2830 30	" " " 5P red, 300mm	
	8276 2820 26	" " " 4P blk, 260mm	
	8276 3390 56	" " " 5P wht, 560mm	

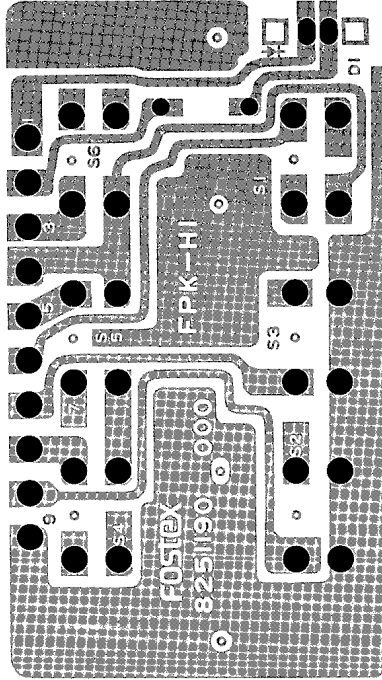
EXPLODED VIEW REMOTE CONTROL



EXPLODED VIEW (Remote control)

Ref. No.	Parts No.	Nomenclature
1	8212 0451 00	Cap, remote control
2	8260 0790 01	Panel assy, remote control
3	8226 0150 00	Button, control
4	8207 0002 13	Strain relief, SREM3
5	8220 0830 00	Plate, remote control
6	8273 1840 00	PCB assy, remote switch
7	8212 0440 01	Cover, remote control, B
8	8276 3490 00	Cable assy, rem. control
9	8216 0130 00	Foot, D12
		Screw, PTPWH, 3x15, BZn

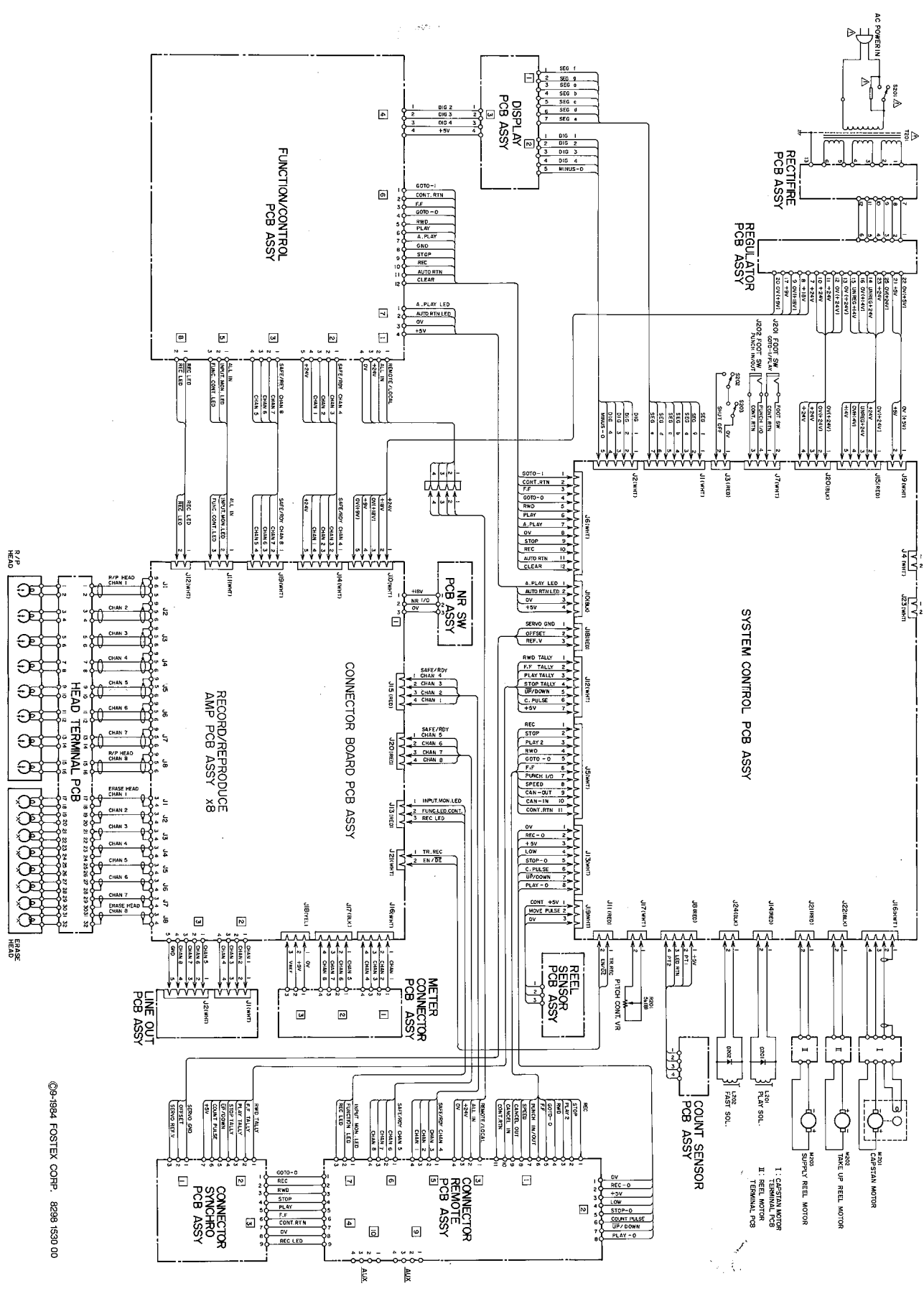
REMOTE SWITCH PCB ASSEMBLY



REMOTE SWITCH PCB ASS'Y, Ass'y No. 8273 1840 00

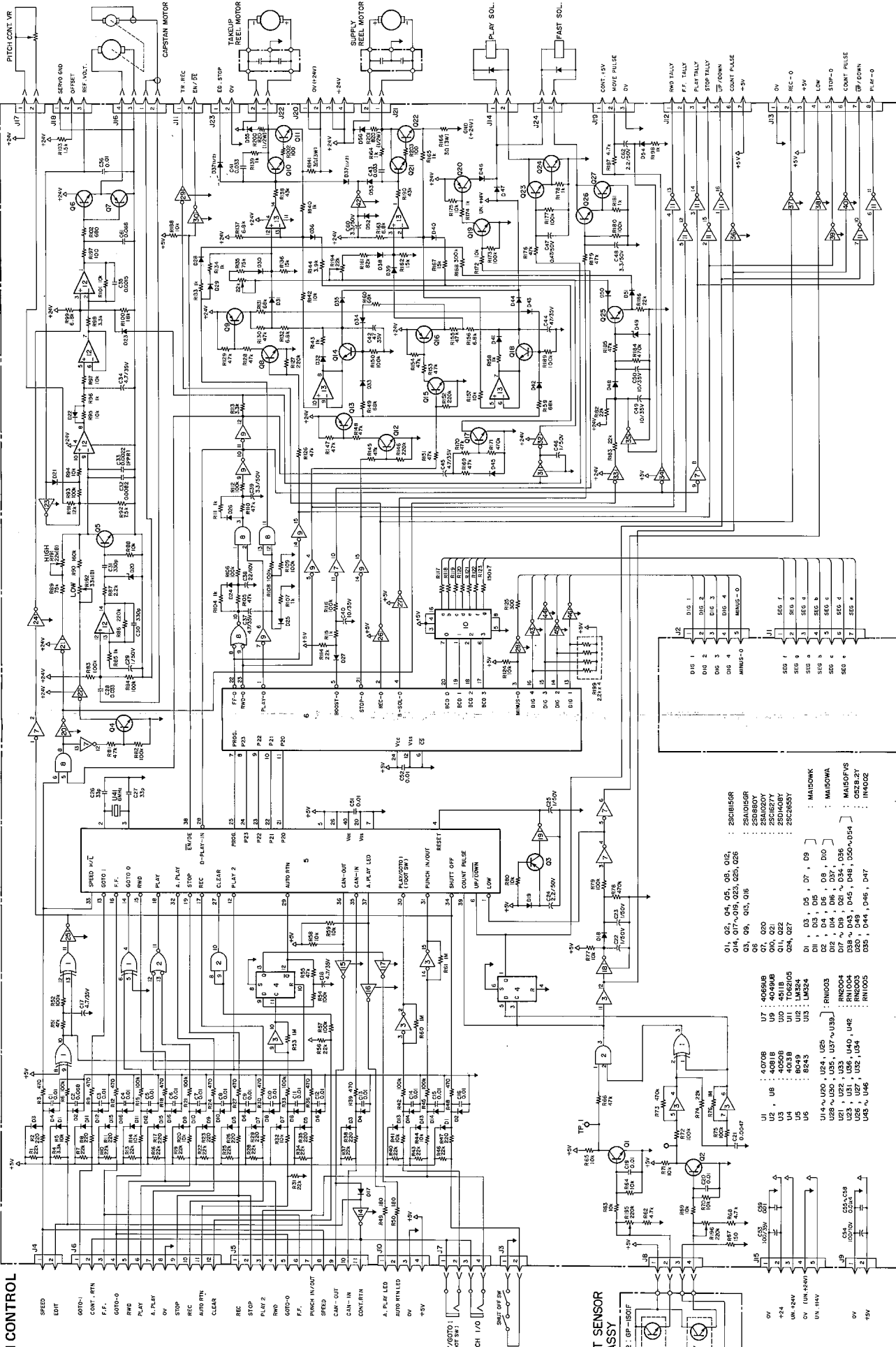
Ref. No.	Parts No.	Nomenclature
	8251 1900 00	PCB, remote switch
D001	8234 0015 01	LED, LM233RP
	8212 0040 00	Holder, LED
R001	8230 0064 71	Res, carbon, 1/AW, ±5%, 470Ω
S01~06	8253 0040 00	Switch, TACT, KHGT091

8. CIRCUIT SHEMATICS CABLING INTERCONNECTION

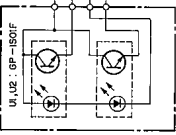




**SYSTEM CONTROL**



**COUNT SENSOR PCB ASSY**

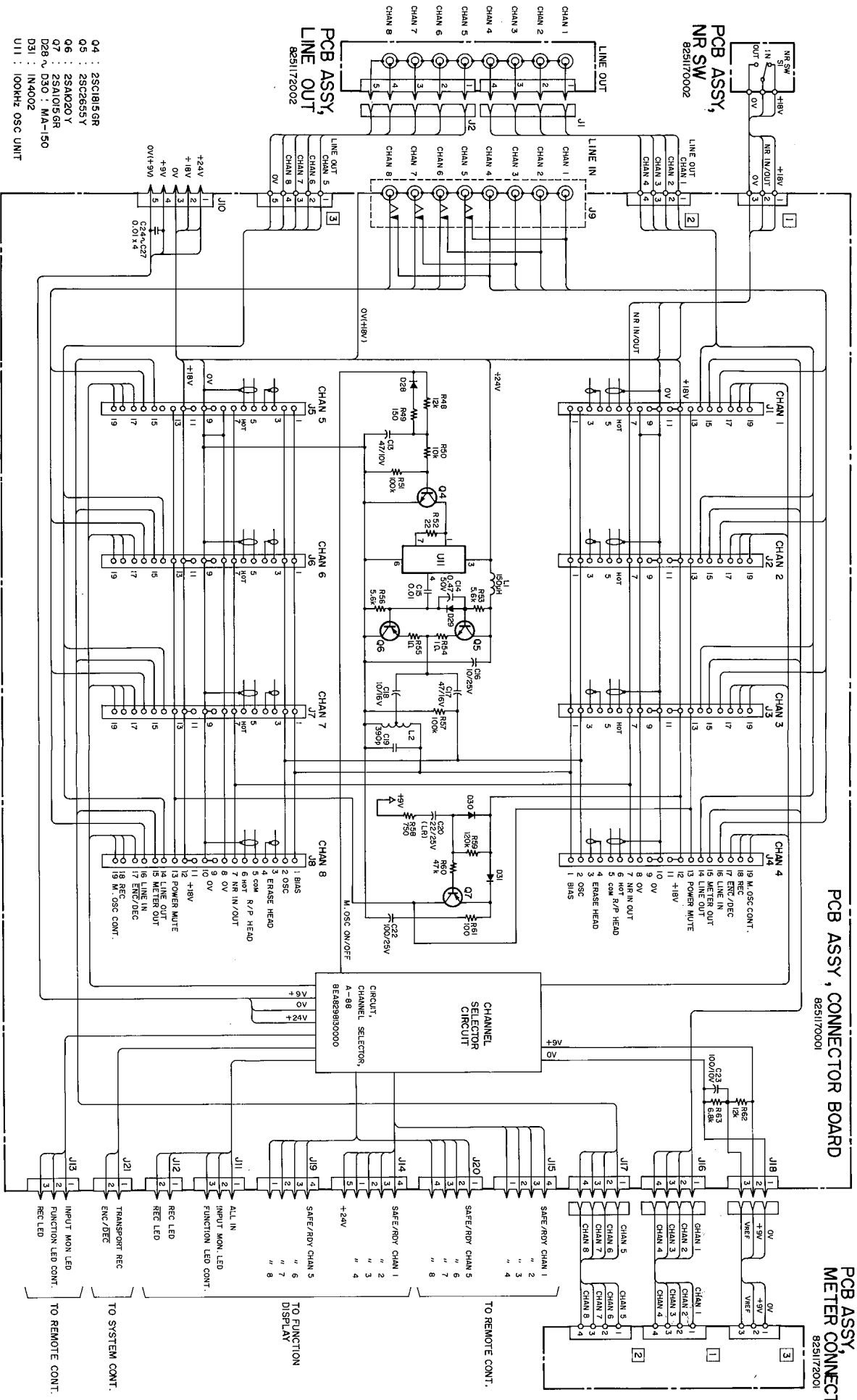


- U1 : 40708
- U2 : UB
- U3 : 40490B
- U4 : 4013B
- U5 : 8049
- U6 : 8243
- U7 : 4068NB
- U8 : 40490B
- U9 : 4013B
- U10 : 4013B
- U11 : 7082005
- U12 : LM324
- U13 : LM324
- U14 ~ U20 : U84, U25
- U21 ~ U23 : U35, U37 ~ U39
- U24 : U33
- U25 : U33
- U26 : U45, U46, U42
- U27 : U33, U34
- U28 ~ U34 : U44
- U35 ~ U46 : U44
- U47 : 4068NB
- U48 : 40490B
- U49 : 4013B
- U50 : 8049

CONNECTOR BOARD

PCB ASSY, CONNECTOR BOARD  
8251170001

PCB ASSY, METER CONNECTOR  
8251172001

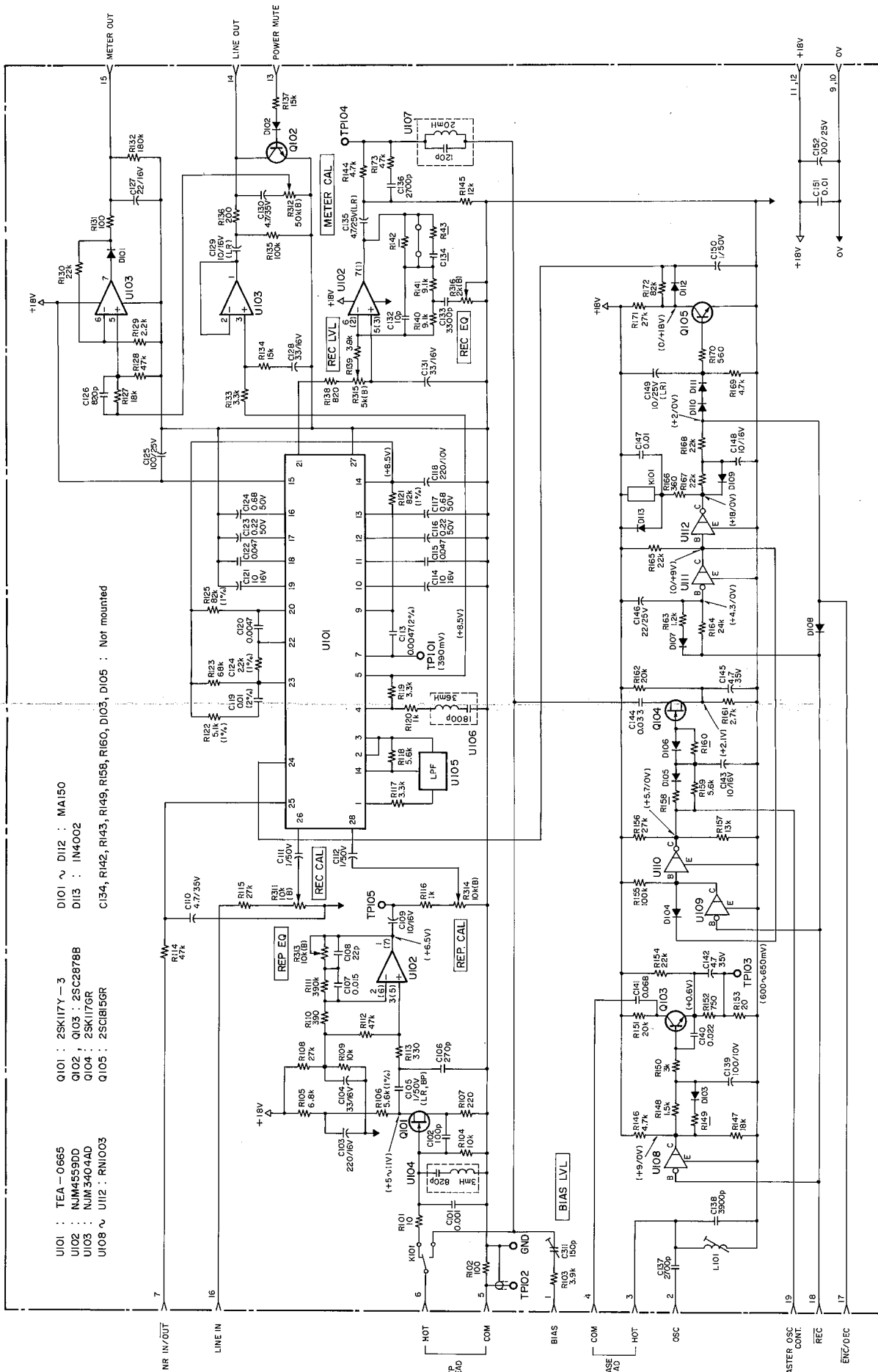


PCB ASSY,  
NR SW  
8251170002

PCB ASSY,  
LINE OUT  
8251172002

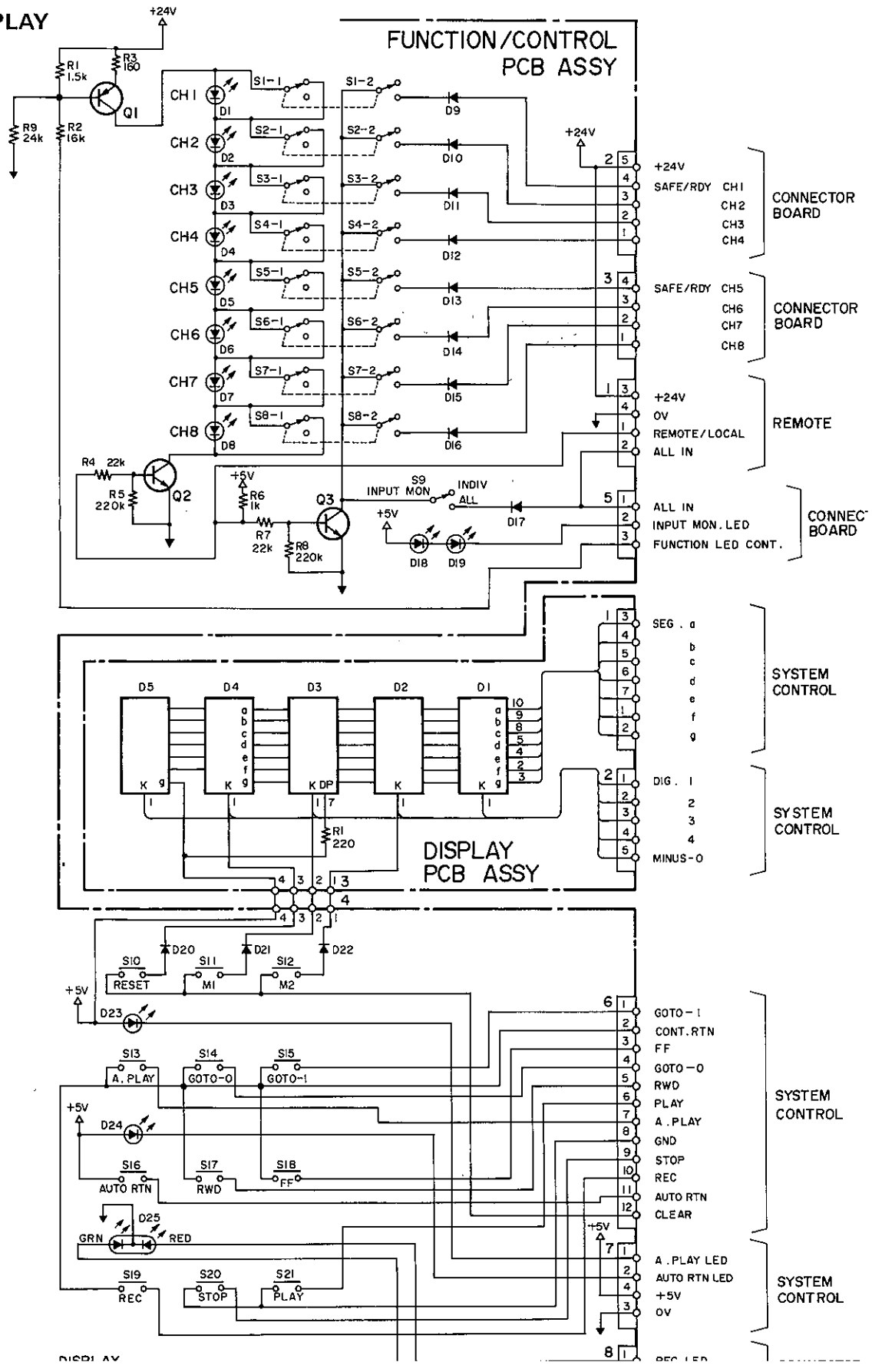
- 04 : 2SC1815GR
- 05 : 2SC2655Y
- 06 : 2SA1020Y
- 07 : 2SA1015GR
- D28 ~ D30 : MA-150
- D31 : IN4002
- U11 : 100KHZ OSC UNIT

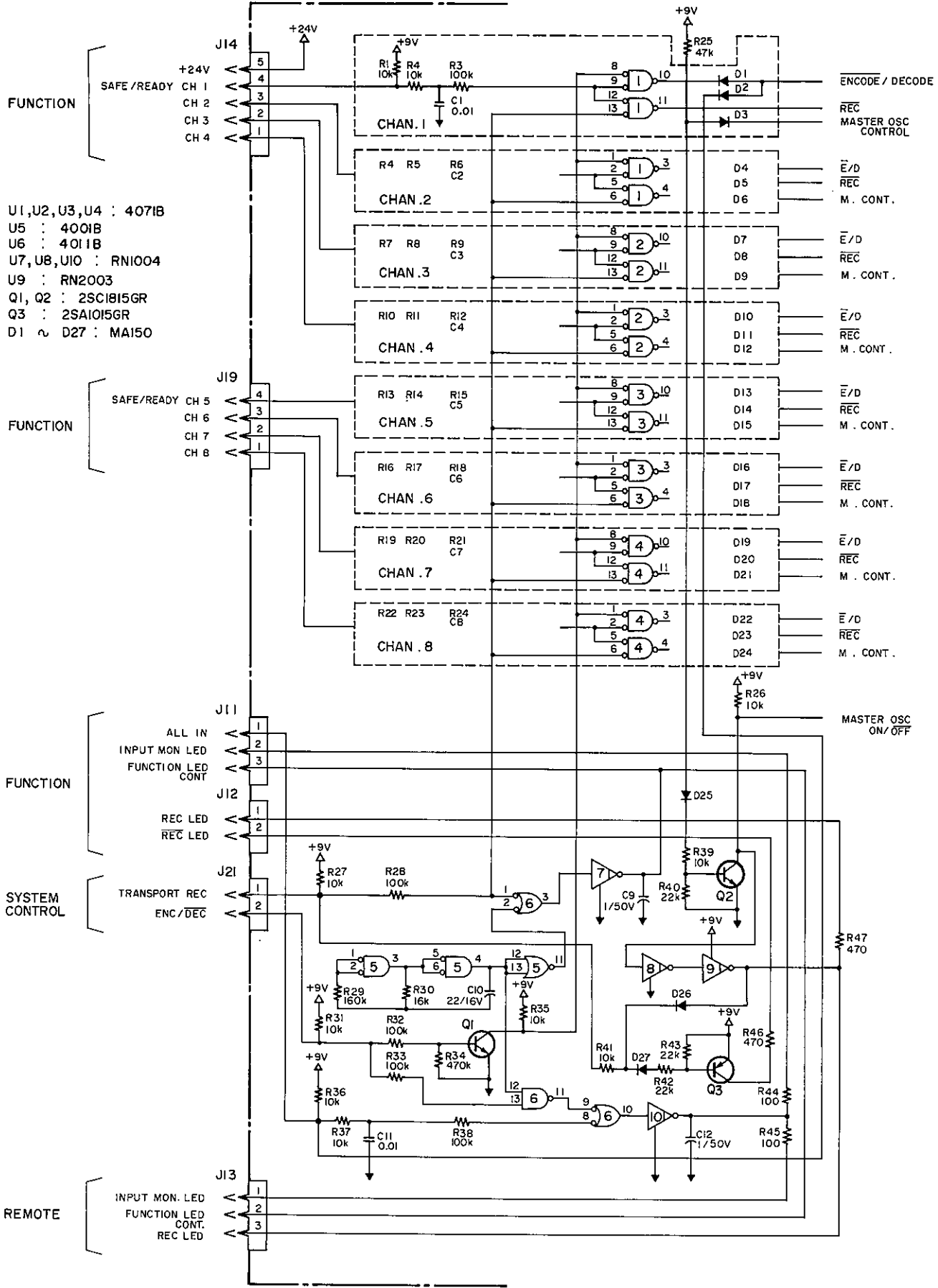
RECORD/REPRODUCE AMPLIFIER



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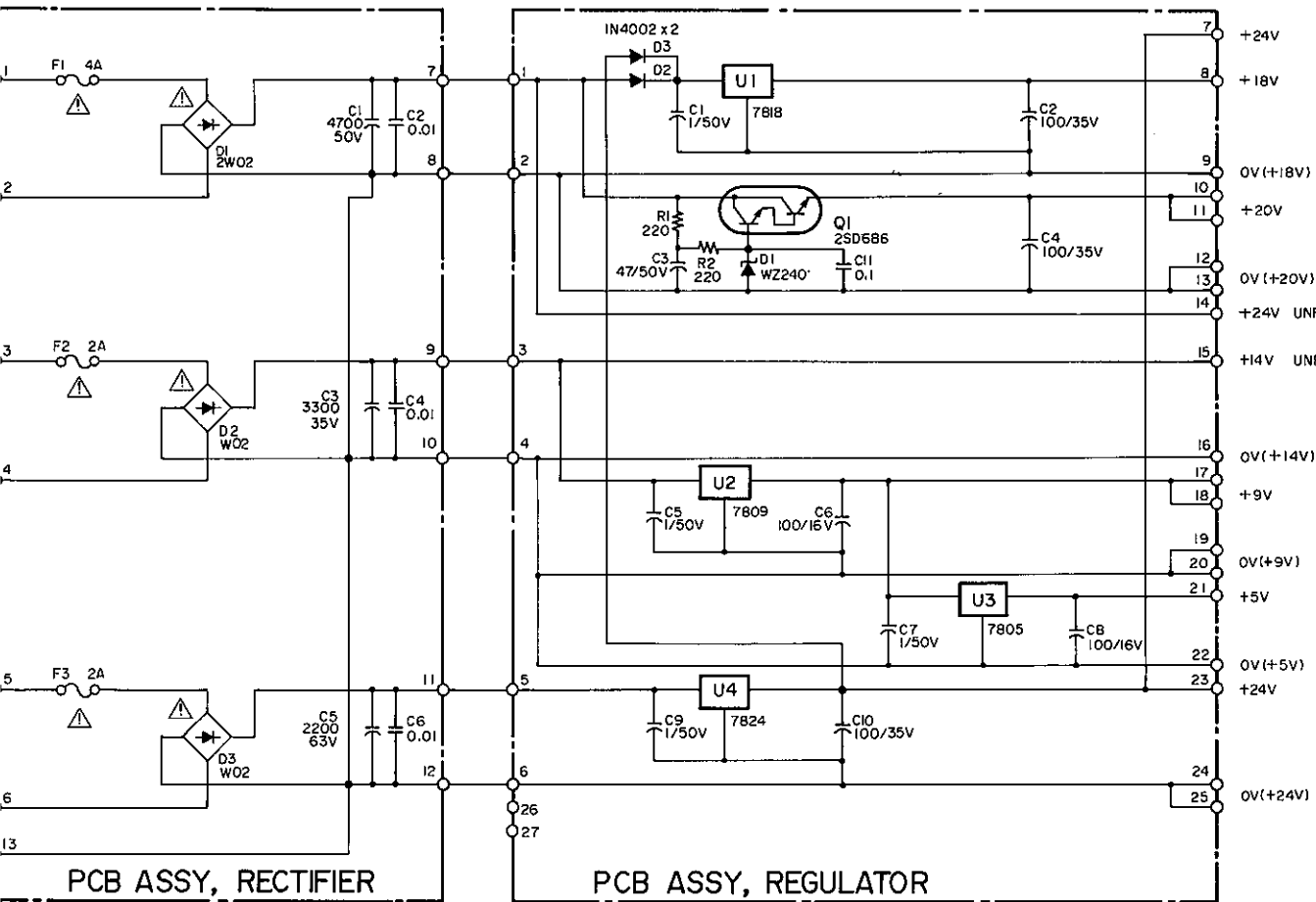
FUNCTION/DISPLAY

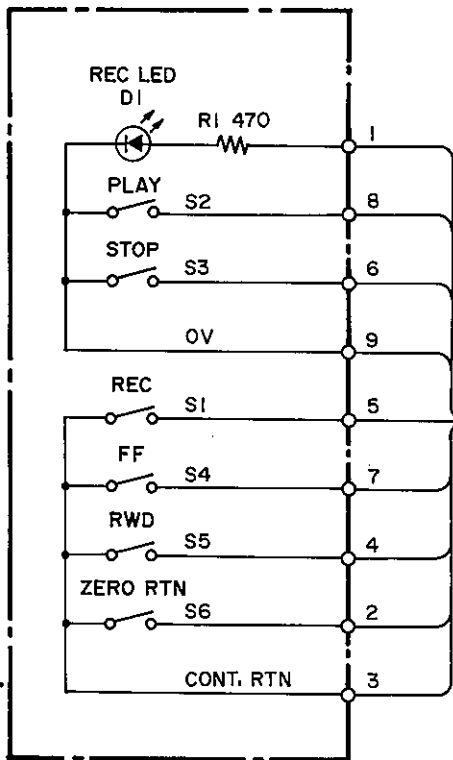




U1,U2,U3,U4 : 4071B  
 U5 : 4001B  
 U6 : 4011B  
 U7,U8,U10 : RN1004  
 U9 : RN2003  
 Q1, Q2 : 2SC1815GR  
 Q3 : 2SA1015GR  
 D1 ~ D27 : MA150

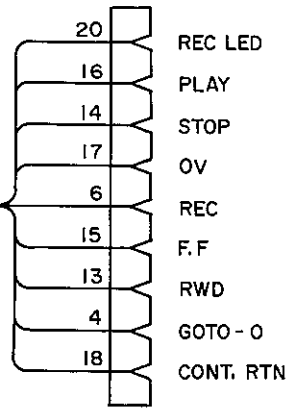
**OWER SUPPLY**



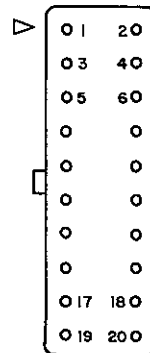


8273184000  
REMOTE SWITCH PCB ASSY.

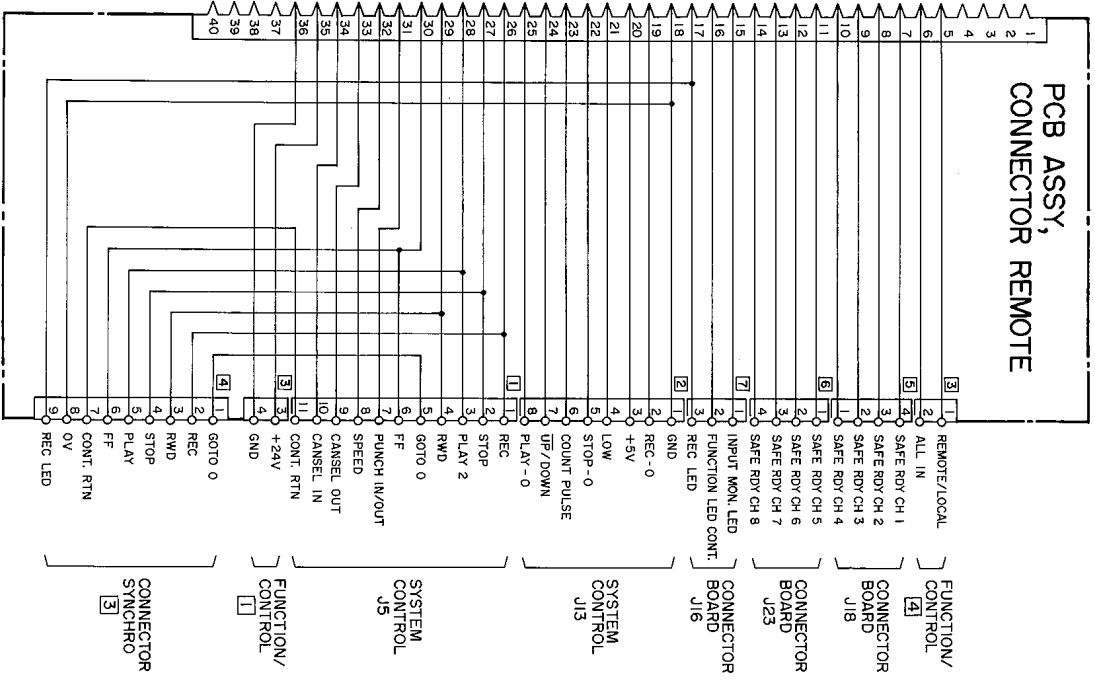
8276349000  
CABLE ASSY, REMOTE CONTROL, 8031



TO RECORDER

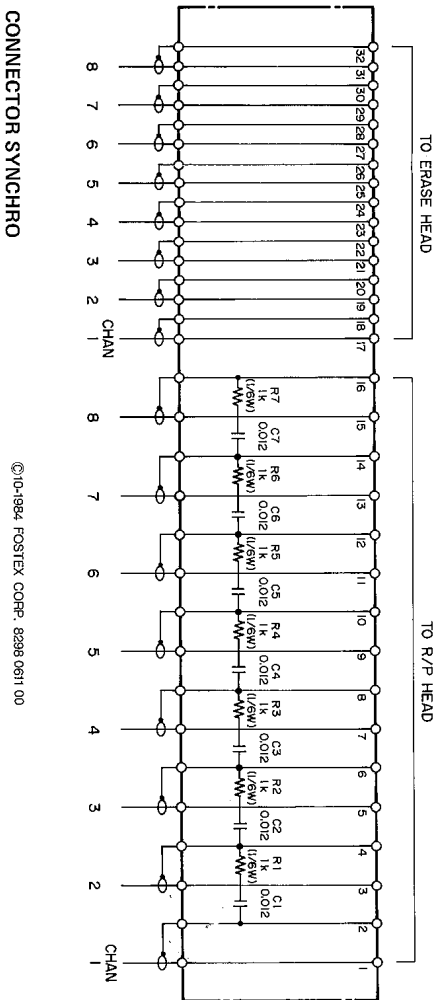


CONNECTOR REMOTE

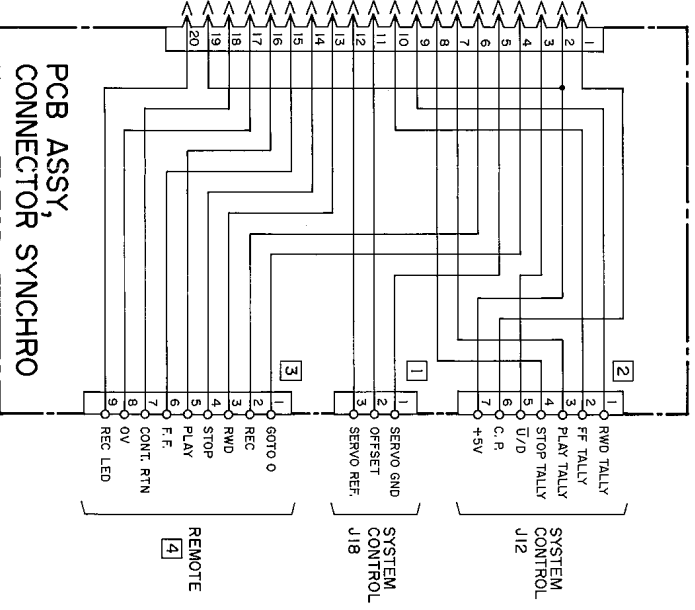


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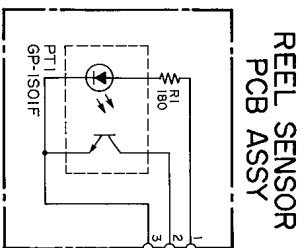
HEAD TERMINAL



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