Service Manual

Model R8

8 Track Recorder/Reproducer

FOSTEX

TABLE OF CONTENTS

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 R8.
  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.

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. SPECIFICATIONS / SERVICE DATA

TAPE	1/4 inch (6.35mm) tape width, 1.5 mil (35μm) base AMPEX 457 or equivalent		
FORMAT	8 track, 8 channel (8ch. record, 8ch. playback)		
HEAD	Erase 8 track		8 channel
	Record/playback 8 track		8 channel
MOTOR	Capstan motor	1 pc	FG Servo DC motor
	Reel motor	2 pcs	DC motor
	Loading motor	1 pc	DC motor
REEL SIZE	7 inch (17 cm)		
TAPE SPEED	15 ips (38cm/sec) ± 0.5%		
PITCH CONTROL	± 10 %		
LINE INPUT	-10 dBV (0.3V), imp. 30kΩ or higher, unbal.		
LINE OUTPUT	-10 dBV (0.3V), load imp. 10kΩ or higher, unbal.		
NOISE REDUCTION	Dolby C NR (ON/OFF switchable)		
EQUALIZATION	15 ips; ∞ + 35 usec (IEC-1)		
RECORD LEVEL CALIBRATION	0 dB referenced to 320 nWb/m of tape flux		
WOW AND FLUTTER	±0.08 % peak WTD (IEC/ANSI), for 15 ips, measured with flutter test tape		
FAST WIND TIME	130 seconds for 1800 ft. (549m) of tape		
FREQUENCY RESPONSE (OVERALL)	45Hz ~ 18KHz, ±3 dB for 15 ips		

S/N (OVERALL)	78dB A-WTD, 60dB UNWTD for 15 ips. referenced to 3% T.H.D. level (10dB above 0dB) at 1KHz (NR ON)
T.H.D. (OVERALL)	Less than 1 % at 1KHz, 0dB (NR OFF)
ERASURE	Better than 70dB at 1KHz (NR OFF)

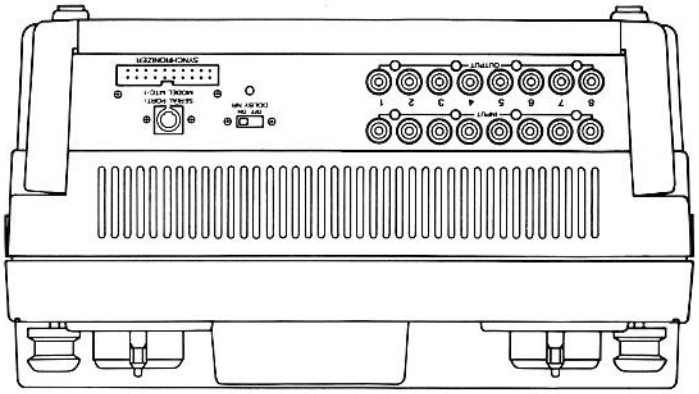
POWER REQUIREMENTS

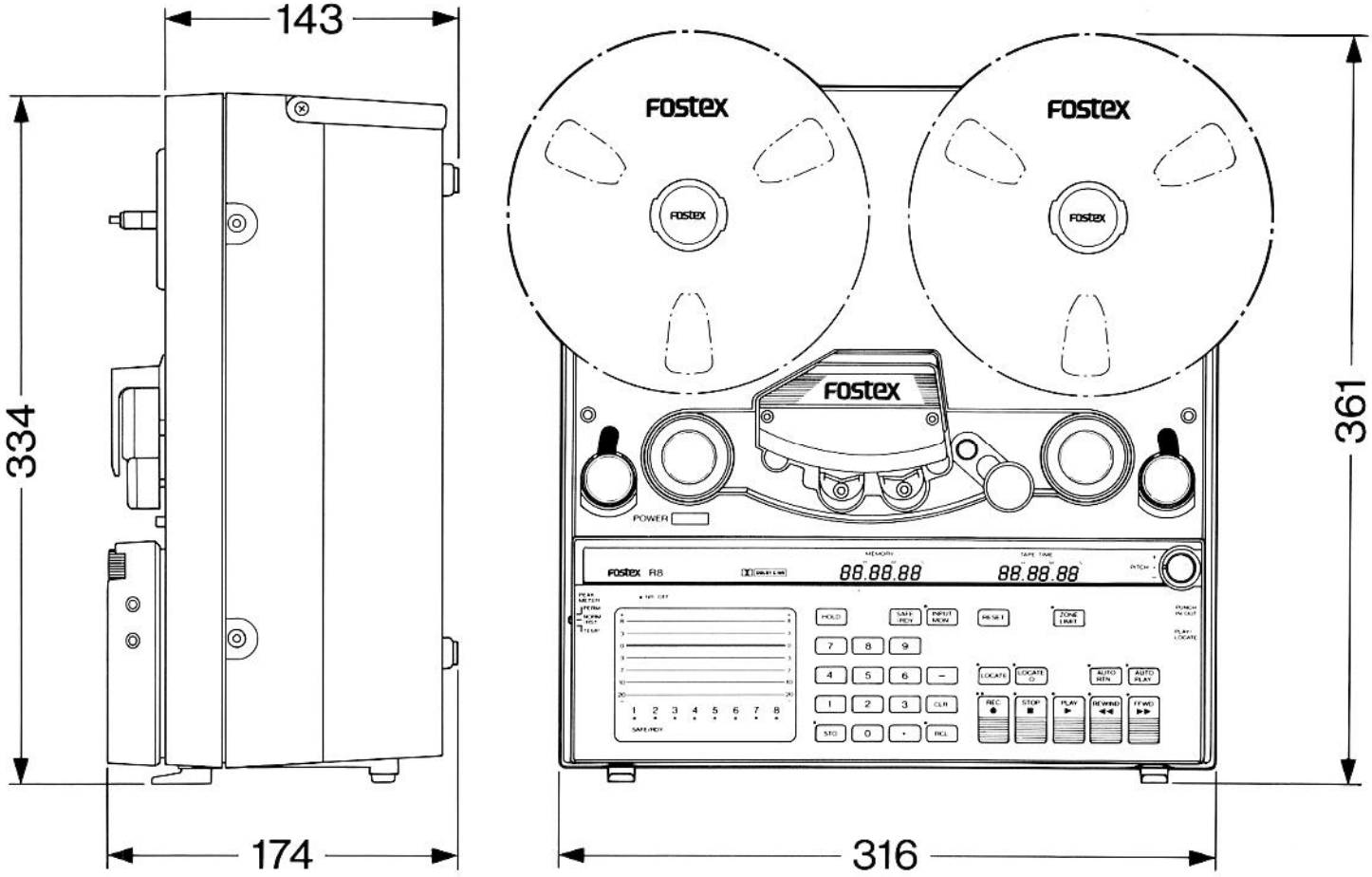
100V	50/60 Hz	50W
120V	60 Hz	55W
220V	50 Hz	55W
240V	50 Hz	55W

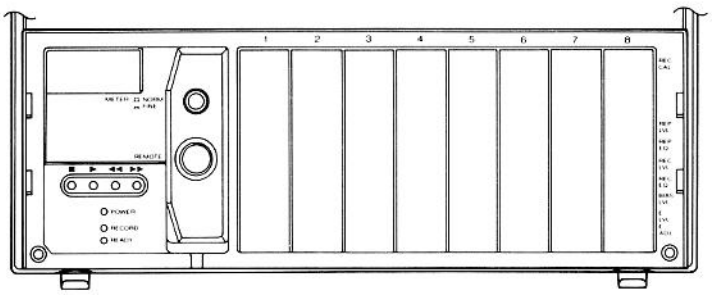
DIMENSIONS	328(H) x 316(W) x 173(D) mm 12-1/2(H) x 13-1/6(W) x 6-5/6(D) inch
WEIGHT	10 Kg 22 lbs.

Specifications subject to change without notice.

*Dolby noise reduction manufactured under license from Dolby Laboratories Licensing Corporation. "DOLBY" and the double-D symbol ⧈ are trademarks of Dolby Laboratories Licensing Corporation.



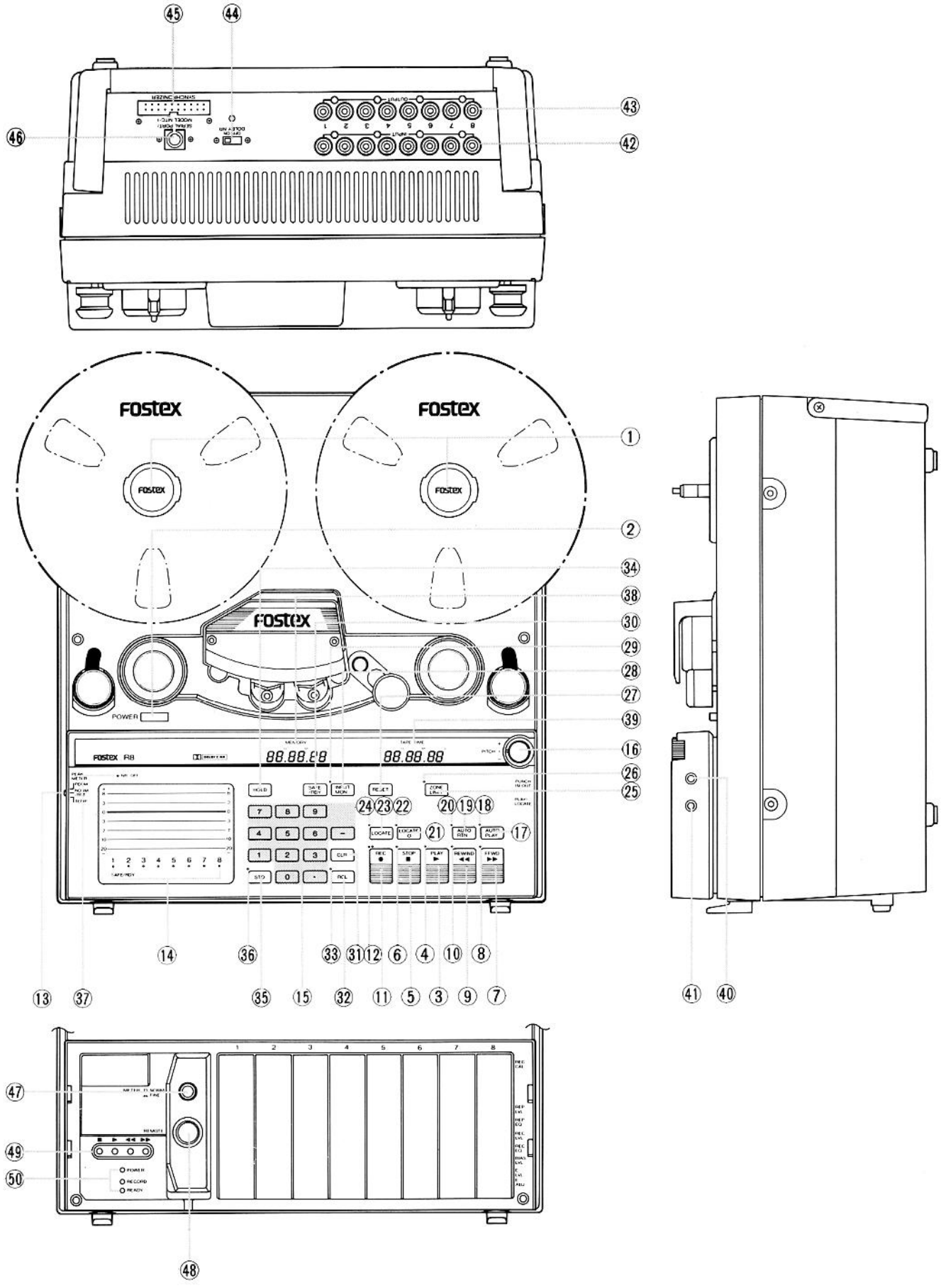




Dimention in mm

2. FUNCTIONS AND CONTROLS

1. REEL HOLDERS
2. POWER SWITCH
3. PLAY BUTTON
4. PLAY LED
5. STOP BUTTON
6. STOP LED
7. F.FWD BUTTON
8. F.FWD LED
9. REWIND BUTTON
10. REWIND LED
11. RECORD BUTTON
12. RECORD LEDS
13. PEAK METER MODE SWITCH
    (PEAK METER : PERM/NORM RST/TEMP)
14. SAFE/RDY LEDS
15. NUMERIC KEY PAD
16. PITCH CONTROL
17. AUTO PLAY BUTTON
18. AUTO PLAY LED
19. AUTO RETURN BUTTON
20. AUTO RETURN LED
21. LOCATE ZERO BUTTON
22. LOCATE ZERO LED
23. LOCATE BUTTON
24. LOCATE LED
25. ZONE LIMIT BUTTON
26. ZONE LIMIT LED
27. RESET BUTTON
28. INPUT MONITOR BUTTON
29. INPUT MONITOR LED
30. SAFE/READY BUTTON
31. CLEAR BUTTON
32. RECALL BUTTON
33. RECALL LED
34. HOLD BUTTON
35. STORE BUTTON
36. STORE LED
37. NOISE REDUCTION OFF LED
38. MEMORY DISPLAY
39. TAPE TIME DISPLAY
40. PUNCH IN/OUT JACK
41. PLAY/LOCATE JACK
42. INPUT JACKS
43. OUTPUT JACKS
44. DOLBY NOISE REDUCTION SWITCH
45. SYNCHRONIZER CONNECTOR
46. SERIAL PORT/MODEL MTC-1 CONNECTOR
47. METER NORM/FINE SWITCH
48. REMOTE CONTROL PANEL CONNECTOR
49. TAPE TRANSPORT BUTTONS
50. POWER-RECORD-READY LEDS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FOSTEX
POWER
FOSTEX R8
88.88.88
HOLD
REJECT
LOCATE
AUTO PLAY
REC
STOP
PLAY
REWIND
FF/WD
REMOTE
POWER
RECORD
READY

* Please take note the following modes on R8 as a service information since these functions are not described in the owner's manual.

1) DEMO FUNCTION MODE

The letter "FOSTEX" will be appeared on the bargraph meter when the power of R8 is turned to on.
The function of the each bargraph meter as well as the operation of CPU for bargraph meter (U 17 on Function PCB) if they are correctly in working order can be checked with this mode.

2) LED CHECK FUNCTION MODE

When the power of R8 is turned to on depressing [STOP] button, all the function LED's will be lighting in order.
The function of all LED's as well as the operation of CPU for FUNCTION (U 16 on Function PCB) if they are correctly in working order can be checked with this mode.
This mode can be cancelled by depressing [RESET] button.

3) PROHIBITION OF THE OPERATION FROM REMOTE MODE

When [·] button is depressed after both [RCL] button and [STO] button are depressed simultaneously, all the operations from the remote will be prohibited.
This mode can be cancelled when the same key operation as above is repeated.

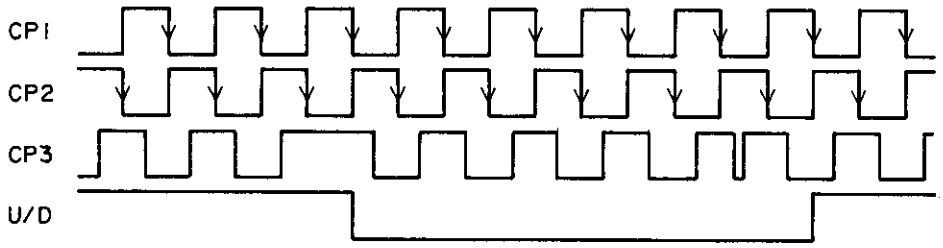
3. THEORY OF OPERATION

3.1 System Control (Refer to circuit diagram for System Control)

A large part of controlling are handled by the 4-bit C-MOS one chip CPU (U17), MN17581FTC.
Loading motor, reel motor, amplifier mode setting, etc. are controlled by the serial input from the controller and parallel input instructions from the main unit.

1) RESET (U17-2)
This is the reset pulse input pin of the CPU.
When power is switched on, Q3 is switched on by the charging current to C11, and a low level pulse is input to this pin and the CPU is reset. At this point, the transport enters the loading state. During normal operation, this RESET will be at high level.

2) CP1 (U17-11), CP2 (U17-12), CP3 (U17-13), U/D (U17-37)
These are the count pulse input pins and output pins of the up/down pulse generated from the count pulse input for the tape counter.



The 90° phase shifted count pulse generated in the count sensor is input to the #2 and #4 pins of J11, waveform shaped by Q12, Q13 and U6, and input to CP1 and CP3. CP2 is the inverted input of CP1. The CPU determines UP or DOWN from the CP1 ~ CP3 inputs, outputs HIGH level at forward, and LOW level at reverse from U/D.

3) SPLS (U17-14), TPLS (U17-15)
SPLS is the supply side and, TPLS is the takeup side reel table revolution pulse input pins. Together with the count pulse of 2), this controls the reel motor voltage at PLAY mode. It is also used for calculating ZONE LIMIT. The CPU will not respond to those revolution pulses at FF/RWD.

4) CAPS-CNT (U17-16)
In the standby mode, the capstan motor will rotate at low speed equal to a tape speed of about 19cm/sec. CAPS-CNT is the output pin for accelerating this capstan motor revolution to 38cm/sec. at PLAY. It will be low output at PLAY and high output in other modes.

5) LM1 (U17-21), LM2 (U17-22), MP (U17-54), MS (U17-55), MF (U17-56), ME (U17-57), ML (U17-58), 5 VOUT (U17-38)

MP, MS, MF, ME and ML are the transport cam position detecting input pins and the position is input at low level. 5V OUT is the output pin of the pullup power source for these input pins.

LM1 and LM2 are output pins for controlling the loading motor which rotates the cam. When LM1 goes high, U9-10 goes to high, and when U9-2 goes low, the loading motor starts rotating. When LM2 goes high, the rotation will reverse. The motor will stop when both LM1 and LM2 go to low.

When the stop button is pressed during loading of the transport, a high level is output from LM2 and the loading motor will rotate. When the cam position detecting input MS goes to low level, LM1 will go to high to apply the brake on the cam. If the MS input goes to high, both LM1 and LM2 pins will go to low and the cam will stop.

6) FF-O (U17-25), RWD-O (U17-26), PLAY-O (U17-27), STOP-O (U17-28)

These are tally output pins. High is output during the various modes.

7) PLAY-I (U17-29), PLAY-2-I (U17-30), REC-I (U17-31), EDIT (U17-32), FF-I (U17-33), RWD-I (U17-34), STOP-I (U17-35)

These are parallel input pins for the various commands. They will be input at low.

8) SHUT OFF (U17-36)

This is the shutoff pulse input pin. A low level will be input when both left and right tension arms are down. The transport will then be in the loading state.

9) $\overline{\text{REC}}$-LED (U17-39), REC-LED (U17-40)

These are output pins for REC-LED's. A low level is output from $\overline{\text{REC}}$-LED at REC standby. A low level is output from REC-LED at REC · PLAY. REC-LED is also used for the master oscillator. When REC-LED goes to LOW, the U28 OUT goes to high, Q11 is switched ON and the master oscillator is activated.

10) TR-REC (U17-41), MUTE-O (U17-42), EN/DE (U17-43), ALL-IN (U17-44)

These are output pins for controlling the amplifier. A high level is output at each mode from TR-REC (TRANSPORT-REC), MUTE-O (MUTE OUT) and ALL-IN. A high level is output from EN/DE (ENCODE/DECODE) by ENCODE, passed through U13, inverted by the open collector and output to the amplifier.

11) S/R 1CH ~ 8CH (U17-45 ~ 52)

These are output pins for switching the amplifier to RECORD SAFE/READY. A high level is output by READY to the selected channel, passed through U12, U29, inverted by

the open collector and output to the amplifier.

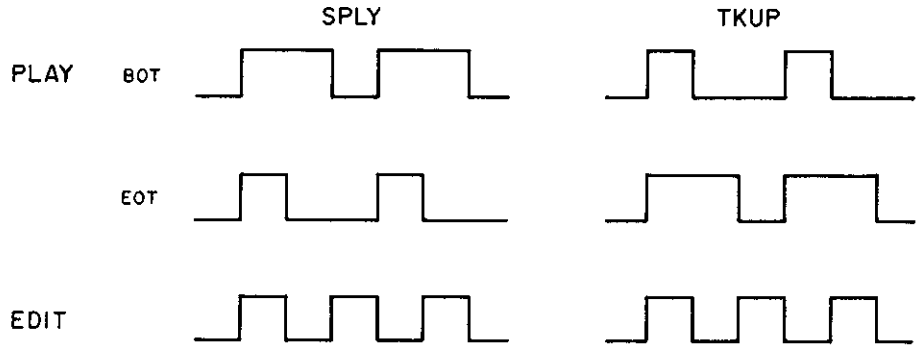
12) FRS-OFF (U17-17), REEL-STOP (U17-18), TKON (U17-19), SPON (U17-20), SPLY (U17-23), TKUP (U17-24)

These are output pins for controlling the reel motors.

REEL-STOP is the output for stopping the reel motor. When a low level is output, the U14 output goes to high, passed through D14, D15, both U10-13, U10-2 will go to about 7 volt, and U10-14, U10-1 will output a low level. As a result, Q17 and Q18 switch off and the current will stop flowing to the reel motor. On the other hand, when the FF or RWD BUTTON is continuously pressed, REEL-STOP will output erratic pulses generated by the CPU resulting in reducing the reel motor current and rotate it at low speed.

FRS-OFF, TKON and SPON are outputs for controlling the reel motor at fast winding. FRS-OFF switches ON/OFF the fast winding mode and, TKON, SPON outputs tape winding direction signals. When FRS-OFF outputs a low, U11-6 and U11-12 go to high, and the analog switch goes ON. At the same time, when TKON outputs a low and SPON a high, a high level to U10-12 and a low level to U10-3 are input, Q17 switches ON and Q18 switches OFF, the takeup reel motor rotates and tape will be wound in FF. When the opposite states are output from TKON and SPON, it will enter the FWD mode.

SPLY and TKUP are outputs for controlling the reel motors in the PLAY and EDIT modes, and the outputs are PWM (Pulse Width Modulated) signals.



BOT : Beginning of tape
EOT : End of tape

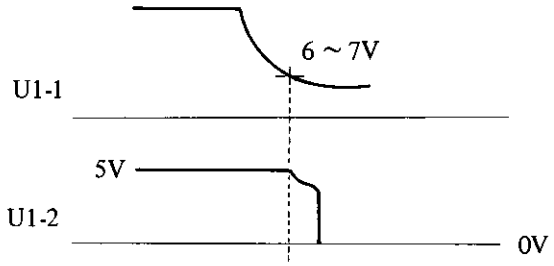
The reel table revolution is controlled by changing the modulation width of the PWM signals from the SPLY and TKUP pins. The high level width will be narrow when the tape winding diameter is small and the reel motor current will decrease. On the other hand, the high level width will be wide and the reel motor current will increase. Changes in tape tension due to changes in tape winding diameter are thus compensated.

Taking the takeup side as an example, the takeup output pulse is integrated by R88, R90 and C37, and becomes near to a DC voltage. This voltage is compared with the reference voltage adjusted by R202 and output to U10-8. This passes through U10-12, U10-14 and Q17 to control the reel motor current. When the takeup PWM output is at high level, or

in other words, at end of the winding, the integrated DC output will be high and the reel motor current will increase.

13) S-DATA-OUT (U17-1), S-DATA-IN (U17-64), S-CLK (U17-63)
These are the communication ports for the controller and external serial connectors and are 8 bit synchronized serial ports.

14) P-OFF (U17-59)
This is the POWER OFF pulse detecting pin. When the AC power is switched OFF, the input voltage at U1-1 will become 6 ~ 7V or lower, then U1-2 5V output will be 0V as illusted below. When P-OFF goes to low, the loading motor will rotate by power from C3 to set the cam to standby or loading from any mode of the transport.



3.2 Capstan Motor Drive Circuit (Refer to the circuit diagram for system control)

If the power of R8 is switched on with the tape loaded (with the left/right tension arm in the up position), the capstan motor begins to rotate at 1,100 rpm. When put in the play mode, this rate accelerates to 2,100 rpm.
The 1,400Hz output from the TACH generator applied to U7-10 is amplified and a square wave emanates from U7-14. This square wave is differentiated by C29, R58, and the plus side of this waveform switches on Q14. When the power of R8 is switched on, U17-16 goes to "H", U21 and U22 switch on, and this output is applied to the integration circuit of R61 and C30/C31. Therefore, a sawtooth waveform made by the signal from the integration circuit and on/off action of Q14, is applied to comparator U7-1. The rectified output from the integration circuit of R66, R67 and C32 passes through U8-1, and DC amplifier U8-7, then it is applied to Q15, which controls the current to the capstan motor.
Q16 switches on when Q15 is off, to act as a baraking circuit by absorbing the counter-electro-motive force from the motor.
When the PLAY button is depressed, the "L" output from U17-16 applied to U21, U11.
U23 is then switched on and the output applied to the integration circuit of R60, R200 and C30/C31. At the same time, switching off U22.
By this alternate switching of U22 and U23, the integration circuit constant is affected, and the output duty of comparator U7-1 is changed. As a result, the motor revolution changes from 1,100 rpm to 2,100 rpm, consequently, the TACH output of 1,400Hz rises to 2,500Hz.

The TACH output at 1,100 rpm is about 350 mV.
When the shut off switch is on (left/right tension arm in down position), Q20 is switched on to force the U8-7 output to "L" – which then switches off Q15 – and the motor is stopped.

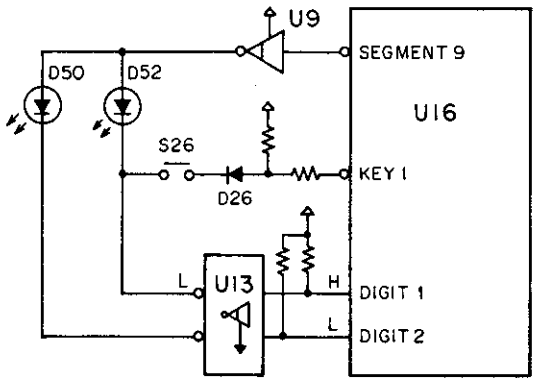
3.3 CONTROLLER (Refer to the controller circuit diagram)

The controller is comprised of two 4 bit, C-MOS one chip CPU. The function CPU (U16) MN17541FTB exchanges data between the system control CPU and, the bargraph CPU (U17) MN17541FTA exchanges data between the meter control CPU on the connector board.

1) RESET (U16-2, U17-2)
This is the pulse input pin for reset of the CPU. When power is switched on, a low level pulse is applied here for the duration in charging of C11 and C12, to reset the CPU. When charging is completed and the input goes to high, the reset is cancelled.

2) SEGMENT (U16-29 ~ 36, 45 ~ 48), (U17-21 ~ 32)
DIGIT (U16-13 ~ 24), (U17-45 ~ 52)
KEY (U16-54 ~ 57)

SEGMENT 1 ~ 8 of U16 are BCD (Binary Coded Decimal) outputs for the memory display and tape time display. SEGMENT 9 ~ 12 of U16 are the outputs for the various function LED's. SEGMENT 1 ~ 7 of U17 are the outputs for the 7 dot bargraph LED. DIGIT's are the dynamic scan time division outputs and each will output a high level in sequence starting from DIGIT 1. KEY's are the dynamic scan time division inputs and low levels are input such as from KEY SW ON.



The function of D52 (Function LED for FF) of U16 on Function PCB and S26 (PLAY button) will be explained using the circuit mentioned as above as an example.
When DIGIT 1 is ON (high), a low level is output from SEGMENT 9, and D52 is lit. At the same moment, D50 will not light as a low level is output from SEGMENT 9. Also,

when S26 is pressed while DIGIT 1 is ON, a low level will be input to the KEY.
The circuit is the same for U17.

3) MODE 1 (U17-17), MODE 2 (U17-18)
These are inputs for selecting the bargraph modes. They are input by S1 of the BAR-GRAPH PCB.

MODE	MODE 1	MODE 2
PERM	H	L
NORM	L	H
TEMP	H	H

4) NR OFF (U17-16)
This is the output pin for lighting the DOLBY NR OFF LED. The LED is lit when a low level is output.

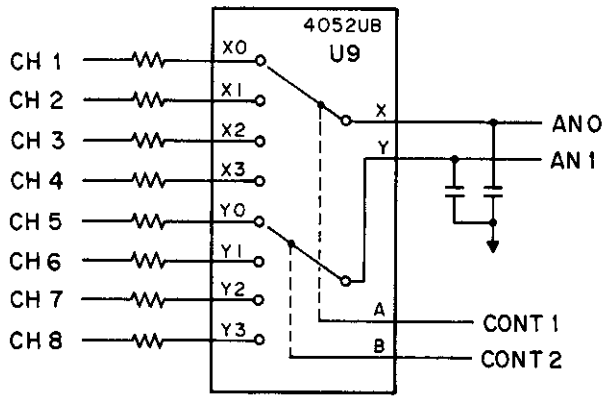
5) DEMO (U16-41), (U17-20)
These are input pins for running the DEMO PROGRAM and will be started when a low level is input here.
The DEMO of U16 is the input for the LED CHECK FUNCTION program, and the DEMO of U17 is for the FOSTEX letter display program (Refer to 2. FUNCTIONS AND CONTROLS, page 5).

6) S-CLK (U16-63)
This is the input pin for the system control serial data transmitting clock.

3.4 METER CONTROL (Refer to the circuit diagram for Meter Control)

The meter control circuit is comprised of a 4 bit, C-MOS one chip CPU (U10) μPD7533G. The CPU A/D converts the analog voltage from the R/P amplifier, then converts it to a serial data and transmit it to the controller CPU, U17.

1) AN0 (U10-14), AN1 (U10-13), CONT1 (U10-1), CONT2 (U10-44)
AN0 and AN1 are analog voltage input pins. CONT1 and CONT2 are output pins for controlling the multiplexer U9 (4052UB).



Outputs CONT1 and CONT2 controls switching of U9. The CH1 ~ CH8 analog voltages from the R/P amplifier are time divided by the switching timing of CONT1 and CONT2, and sequentially output to AN0 and AN1. The analog voltage input to AN0 and AN1 are A/D converted.

2) VAREF (U10-15)
This is the input pin for the 5V reference voltage used by the CPU for A/D conversion. The reference voltage is input to the VAREF via a noise elimination filter circuit.

3) AVSS (U10-10)
This is the input pin for the OV reference voltage used by the CPU for A/D conversion.

4) FINE (U10-24)
This is the input pin for ON/OFF switching of the METER FINE mode. It will enter the METER FINE mode when a high level is input here.

5) NR ON/OFF (U10-25)
This is the input pin for ON/OFF switching of the Dolby Noise Reduction circuit. It will enter ON when a low level is input here.

4. MAINTENANCE

4.1. Test Equipment Required

Spring Scale 0 ~ 4 Kg, (0 ~ 8 lbs.)
0 ~ 300 g, (0 ~ 100 oz.)

Wow and Flutter Meter

Audio Oscillator

Frequency Counter

Band-pass Filter

AC Volt Meter (Level meter)

Oscilloscope

Test Tape	For reproduce alignment	:	Fostex Model 9100A
	For Wow and Flutter measurement	:	Fostex Model 9102A

Blank Tape Ampex 457 is recommended.

Empty reel Small (2 inch) Hub type

Tape tension gauge Tentel Model T2-H20-ML

Reel Belt tension gauge Fostex P/N 8286018000

Extension Card Fostex P/N 8273462000

4.2 Transport Check and Adjustment

Note 1. When dismounting "Cover assy, bottom" (P/N 8260271000), leave the hooks of "Connector, Synchro" (P/N 8245067001) at unlocked position in order to avoid any damage may occur to the connector.

Note 2. When dismounting "Panel, front" (P/N 8212231000), dismount "Guide, tension roller L and R" (P/N 8212239001 and 8212239002) and also "Pinch roller" (P/N 8260285000) first for easy dismounting.

4.2.1 Reel Table height

The R-8 tape path adjustment is made based on the Reel Table height, therefore, this Reel Table height adjustment must be proceeded prior to the tape path adjustment.
The Reel Table height can be adjusted by rotating "Cap assy, housing" so that the space between the edge of Reel Table and Chassis becomes 1.5mm as shown in the Fig. 4.1 below.
Reel Table height adjustment is made with no power to R-8.
After the adjustment of the Reel Table height, apply some glue to the part of the housing screw for firm locking.

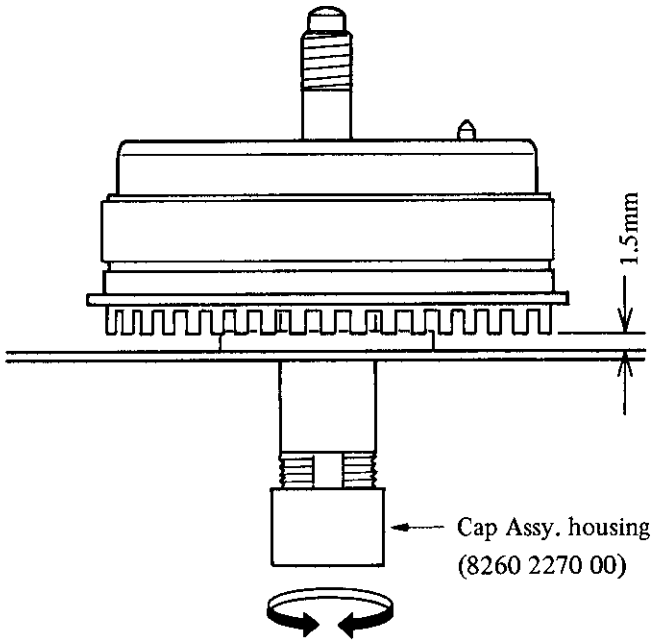


Fig. 4.1

4.2.2 Reel Belt Tension

Since the Reel Belt tension affects the tape path, the wow/flutter and increase of the mechanical noise at FF or RWD a lot, it is necessary to adjust the tension to an appropriate value.
However, there is no additional adjustment is required if the reel rotates smoothly without producing a mechanical noise at FF or RWD. The adjustment is required only when the Reel Table assy or the Reel Motor assy or the Reel Belt are replaced.
The Reel Belt tension gauge (Fostex P/N 8286018000) is required for this adjustment.
The following is an example for the Reel Belt tension adjustment at Supply Reel Table.
The Reel Belt tension adjustment is made with no power to R8.

1) Placed the R8 in horizontal position.

2) Rotate the supply Reel Table so that the center of Reel Stopper Pin comes on the extension line which being on the center of both Reel Motor shaft and Reel Table.

3) Apply the gauge as shown in the Fig. 4.2.a below.
The two contacts (A, A') between the gauge and the Reel Motor Pulley and the one contact between the gauge and Reel Table (B) must be made for measuring the Reel Belt tension.

4) With this state, the Reel Belt tension value must be 4 or slightly more than 4 in the scales as shown in the Fig. 4.2.b

5) When tightening the screws for mounting the bracket, the screws must be tightened in the order as shown in Fig. 4.3.

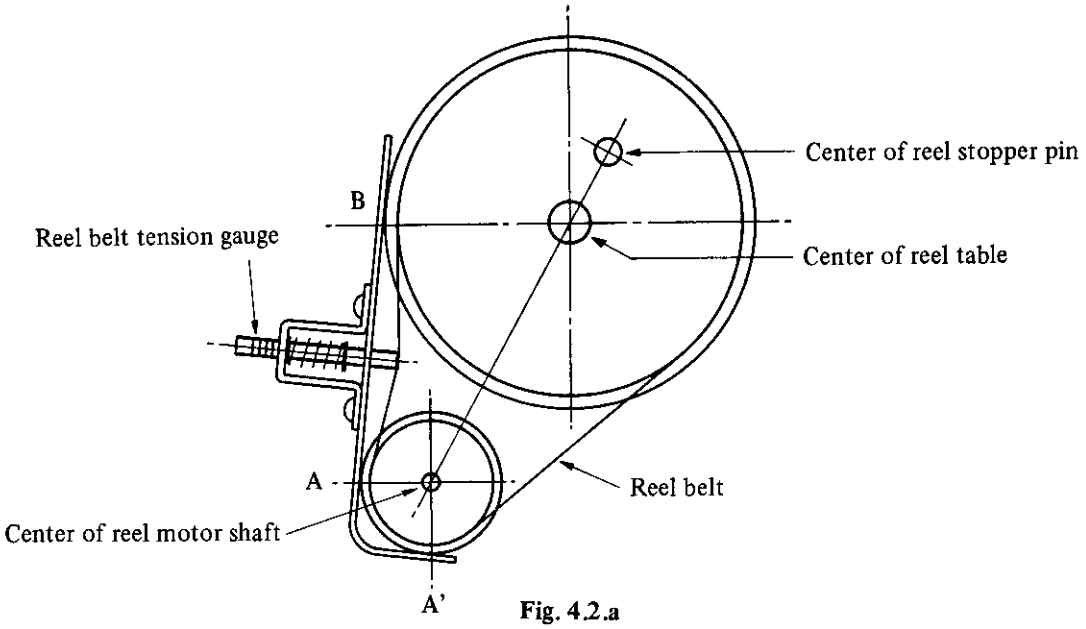


Fig. 4.2.a

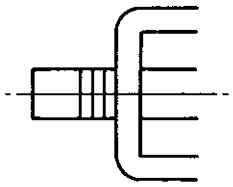


Fig. 4.2.b

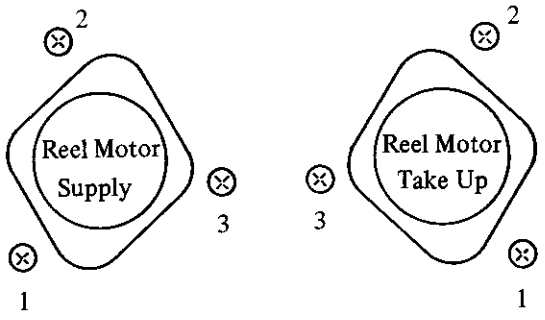


Fig. 4.3

4.2.3 Position of Brake Arm

The distance between Brake Arm and Brake Slider must be in 1 ±0.5mm as shown in the Fig. 4.4 below. The distance can be adjusted by adjusting the position of Brake arm with the screw Ⓐ.
Adjustment of position of Brake Arm is made with no power to R8.

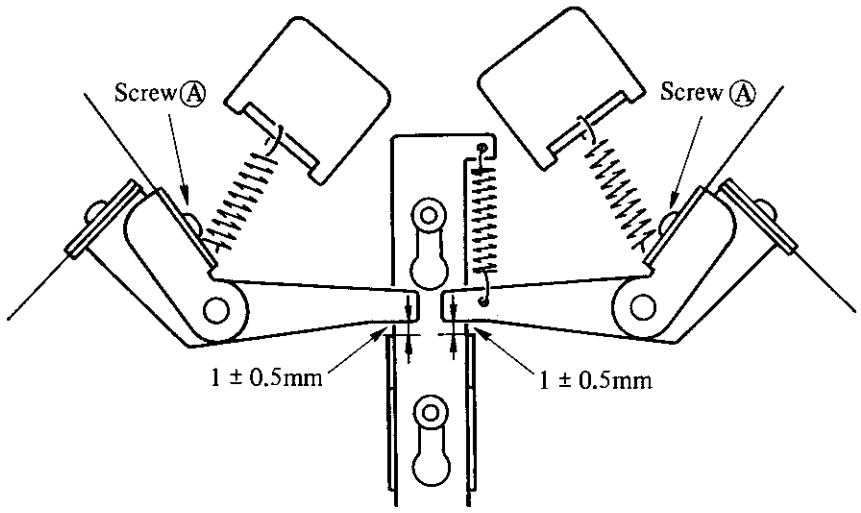


Fig. 4.4

4.2.4 Brake Torque

The Brake torque is applied mechanically. The 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.
Brake adjustment is made with no power to R8.

1) Place an empty 2″ hub reel on the left reel table, and fasten one end of a 30″ (1m) length of twine to the reel anchor.

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

3) 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.

4) The reading should be 900 g.cm ±300 g.cm (32.0 in.oz ± 10in.oz) and the difference of the torque at brake L and R is less than 20 %.

5) If adjustment is required, hook the spring to the next hole. Torque is adjusted by changing the hole hooked up the spring as shown in the Fig. 4.5.

6) The adjustment of the brake R 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 brake L.

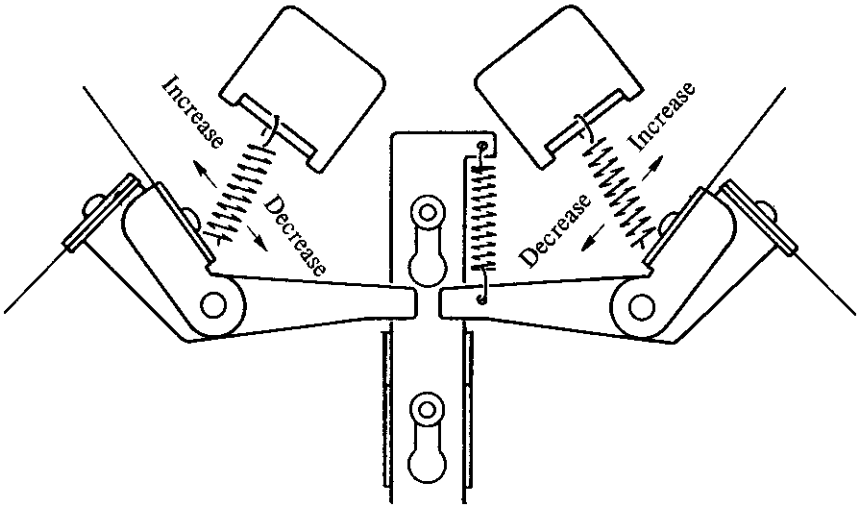
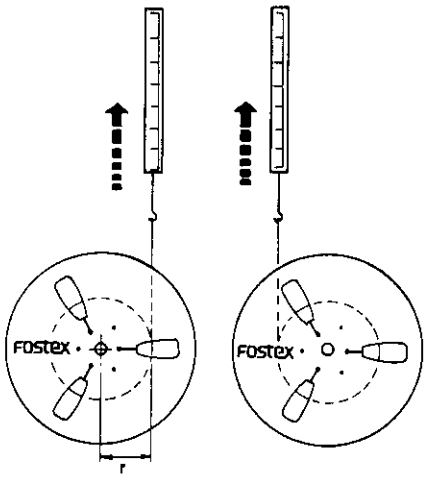


Fig. 4.5



Formular for torque calculation:
T (in-oz/g-cm) = R x W
Whereas – R = Radius of hub (in/cm)
W = (oz/gm)

Fig. 4.6

4.2.5 Pinch Roller Pressure

Pinch Roller pressure is supplied by the Pinch Roller Pressure Spring only.

1) Secure the left or right shut off arm in the ON position (tension arm raised) without loading a tape on the transport.

2) Attach a suitable spring scale to the pinch roller shaft with a short loop of twine.

3) Put the R8 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 as shown in the Fig. 4.7.

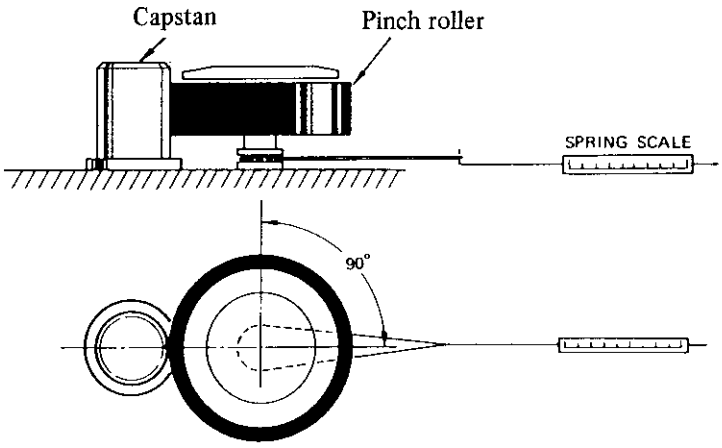


Fig. 4.7

4) The spring scale should indicate 1.7Kg ± 0.2Kg (0.8 lbs ± 0.1 lbs)

5) If the reading is off specification, the pinch roller pressure is adjusted by changing the hole hooked up the spring as shown in the Fig. 4.8.

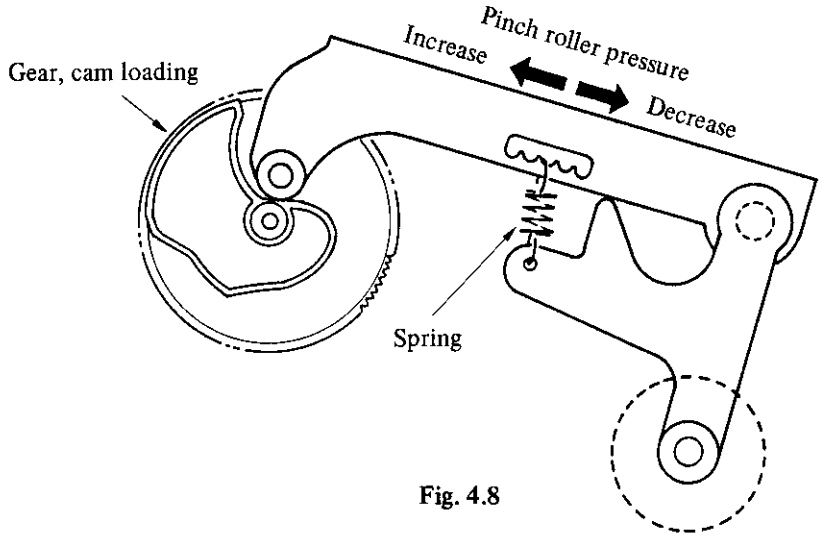


Fig. 4.8

Note: When mounting the pinch roller, put 2 pcs of "washer" (P/N 8214106102) as shown in the Fig. 4.9 below confirming the direction of sharp edge of washers.

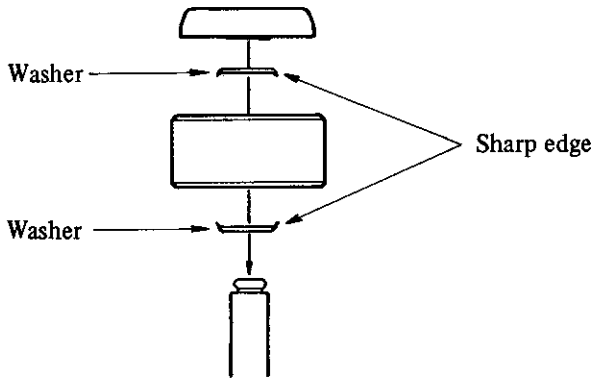


Fig. 4.9

4.2.6 Tape Tension

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

1) Load a tape on the R-8 and set BOT position (Beginning Of Tape).

2) Put the R-8 in the PLAY mode, and measure the Take Up tape tension at point Ⓐ with tape tension gauge as shown in the Fig. 4.10.
Adjust the pot R202 located on the system control PCB so that the Take Up tape tension is 40g (1.4 oz.).

3) Measure the Supply tape tension at point Ⓑ with tape tension gauge as shown in the Fig. 4.10. Adjust the pot R203 located on the system control PCB so that the Supply tape tension is 60g (2.2 ozs.).

4) Set EOT position (End Of Tape). Check and confirm that the Take Up tape tension at point Ⓐ is 60g ~ 30g (2.2 oz ~ 1.0 oz) and Supply tape tension at point Ⓑ is 70g ~ 30g (2.5 oz ~ 1.0 oz).

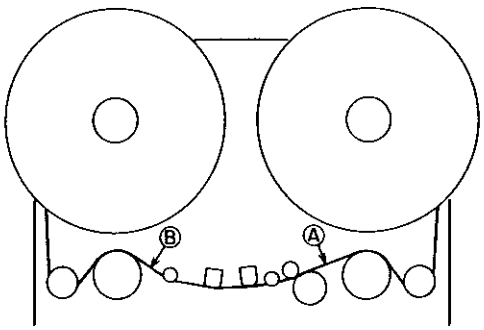


Fig. 4.10

4.2.7 Tape speed and Wow and Flutter

1) Tape speed and Wow and Flutter are measured by using the Flutter test tape such as Fostex Model 9102A.

2) Playback the 3KHz signal of the test tape and the measurement is made with a digital frequency counter and Wow and Flutter meter connected to either OUTPUT.

3) It is considered as normal condition if tape speed is measured as 3KHz ± 0.5 % and Wow and Flutter is measured as ±0.08 % peak WTD (IEC/ANSI).

4) If the measurement is greatly offset from the specs, review all check items on transport for correct values, and also see that the tape path is clean.
Since there are 2 pcs of pots (R200 and R51) provided for the tape speed adjustment, disconnect the controller from control panel connector first. Adjust the tape speed by the HI SPEED ADJ pot (R200) on the system control PCB.
Then, connect the controller and set Pitch Control Knob at centre position, and adjust the pot R51 located on the function PCB.

4.3 RECORD / REPRODUCE AMPLIFIER CHECKS AND ADJUSTMENTS

4.3.1 Checking and Adjusting of Head Azimuth and Phase

The following adjustment should be proceeded after the checks and Adjustments described at section 4.2 have been completed.

1) Connect a level meter and an oscilloscope to OUTPUT jack 1 and 8 for observing a lissajous waveform.

2) Load a Reproduce Alignment Tape, Fostex Model 9100A and playback the Head Azimuth and Frequency Response section of the test tape.
The Azimuth and Phase can be adjusted with the adjusting screw as shown in the Fig. 4.11 below.

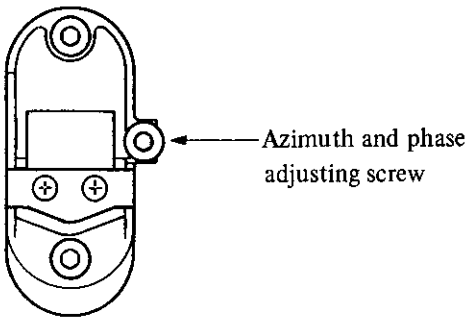


Fig. 4.11

3) Adjust the Azimuth and Phase Adjusting Screw for maximum reading on all eight LED bargraph meters of the recorder.
Then, set the oscilloscope to XY mode to obtain a lissajous waveform to check the phase.

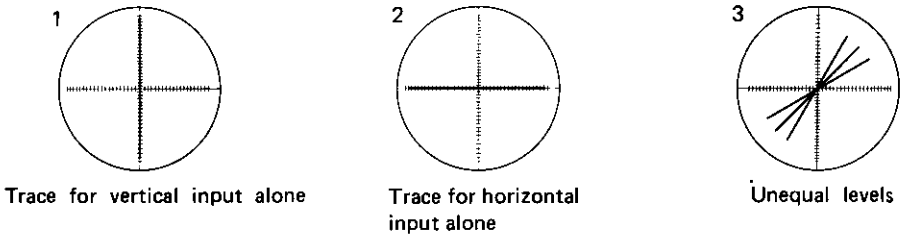


Fig. 4.12

If the trace length between (X) and (Y) 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:

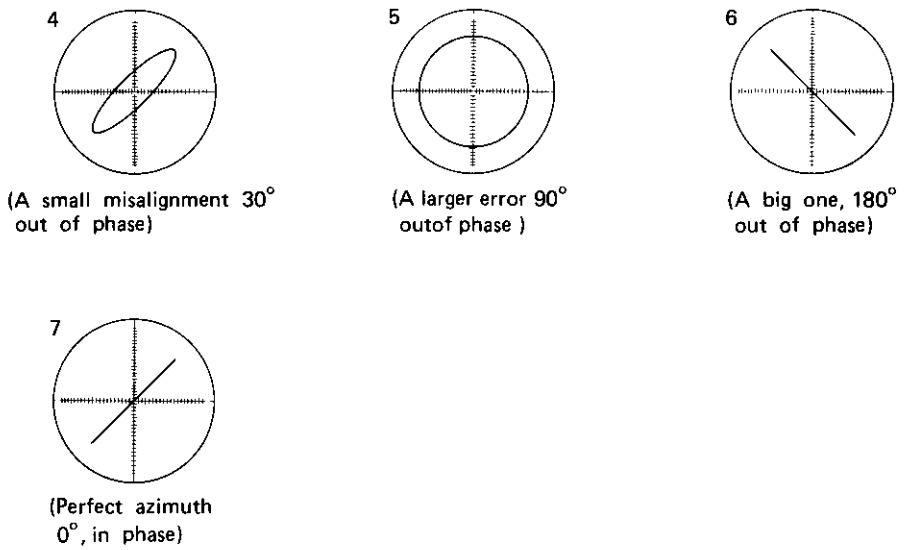


Fig. 4.13

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.

4.3.2 Input level and Meter level Calibration

1) Put Dolby NR ON/OFF switch to "OFF" position and put Input Monitor Button to on position so that the R/P amp enters into Input Monitor mode.

2) Plug in an audio oscillator output to the recorder connector panel INPUT 1 jack and apply a 1KHz, -10dBV (0.3V) signal.

3) Connect a level meter to test point TP-4 on the TRACK 1 of the R/P amplifier PCB Assy, and adjust REC CAL (R103) so that the level here is 245mV (-12.2dBV).

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) ±1dB.

5) After checking the OUTPUT jack level, put meter FINE SW to FINE and adjust METER CAL (R107) on Connector Board PCB Assy for a 0dB reading on the recorder LED bargraph meter.

6) Calibrate tracks 2 ~ 8 in the same way. (R207 ~ R807)

4.3.3 Reproduce level Calibration

1) Put Dolby NR ON/OFF SW to OFF position.

2) Playback the Reference Level Section of the Reproduce Alignment Tape, such as Fostex Model 9100A test tape.

3) Connect a level meter to test point TP-4, on the TRACK 1 of the R/P amplifier PCB Assy, and adjust REP CAL (R102) so that the level is 245mV (-12.2dBV).

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) ±1dB.

5) After checking of the OUTPUT jack level, confirm that the meter reading is 0dB ±1dB. If the reading is not 0dB ±1dB, repeat the adjustments in the previous section, Item 4.3.2, 5).

6) Calibrate tracks 2 ~ 8 in the same way.

4.3.4 Checking the reproduce frequency response

1) Put Dolby NR ON/OFF SW to OFF position.

2) Playback the Frequency Response section of the Reproduce Alignment Tape.

3) Plug in a level meter to the OUTPUT jack.

The normal playback frequency response should be within ±3dB for a frequency range of 45Hz ~ 18 kHz. If it is not within the spec, adjust REP EQ (R101).

4.3.5 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 (U3)

To check bias leakage of TRACK 1, the oscilloscope probe is hooked to TP-2 and the probe ground clip to the GND. Put TRACK 1 in the reproduce mode, the adjacent TRACK 2 in the record mode and check bias leakage at TP-2.

It is considered as normal condition if the bias leakage level is less than 280mV p-p (-20dBV).
(At checking TRACK 2, put adjacent TRACK 3 in the record mode).

If the bias leakage level is higher than the spec, it is adjusted to the minimum bias leakage level by rotating the center core of U3.

2) Record bias trap module (U7)

To check bias leakage of TRACK 1, the oscilloscope probe is hooked to TP-5 and the probe ground clip to GND. Put TRACK 1 in the record mode and check bias leakage at TP-5.

It is considered as normal condition if the bias leakage level is less than 1.1 V p-p (-10 dBV).

If the bias leakage level is higher than the spec, it is adjusted to the minimum bias leakage level by rotating the center core of U7.

4.3.6 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-6 and ground clip of the probe to GND.
Set the core of T-1 so that voltage at TP-6 reaches the peak level point.
Then adjust Erase Level (R106) so that the voltage at TP-6 is 90mVp-p (-30dBV).

4.3.7 Bias current adjustment

Put all 8 tracks in the record mode.
Hook the oscilloscope probe hot side to TP-1, and the ground clip to the GND.
Then, set the BIAS LVL pot, C101, at approximately 300mVp-p over the peak point.

Note: As a non-stopper type Trimmer is used for BIAS LVL adjustment, it might give you a confusion if it is under the peak BIAS point or over the peak BIAS point. Therefore, the adjustment position of the Trimmer should be set as shown in the Fig. 4.14 below.

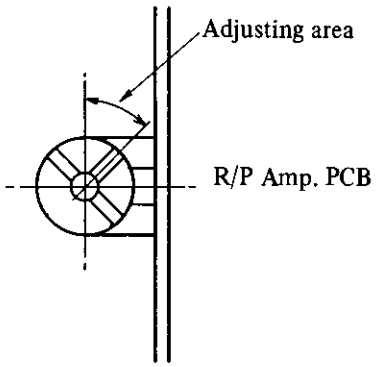


Fig. 4.14

4.3.8 Record Level Calibration

1) Put Dolby NR ON/OFF SW to OFF position.

2) Load the blank tape (Ampex 457) on the transport and apply an audio oscillator output of 1KHz, -10dBV (0.3V) to the INPUT jack on the recorder connector 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, ±1dB.

4) After recording a certain length of 1KHz, 0dB signal, rewind tape to the starting point, put the transport in the PLAY mode and check the output level. The INPUT MON switch must be at INDIV.
It is considered as normal condition if the output level is -10dBV ± 1dB.
If it is off spec, correct by adjusting REC LVL (R104).
Calibrate tracks 2 ~ 8 in the same way.

4.3.9 Overall frequency response

1) With the connector panel NR ON/OFF switch at OFF and under the measurement setup of the previous Section 4.3.8, apply signals from 45Hz through 18KHz at -10dBV (0.3V) to the recorder INPUT jack. 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 point, and playback the tape. It is considered as normal condition if the frequency response in reference to 1KHz is within ±3dB. If it does not fall within spec in the high frequency region, correct it by a slight rotation of REC EQ (R101).

2) Check and adjust tracks 2 ~ 8 in the same way.

3) Then put the Dolby NR ON/OFF SW to ON position. Apply signals from 250Hz through 14KHz at -30dBV (30mV) to the recorder INPUT jack. Record and playback the certain length of the signal. It is considered as normal condition if the frequency response is within ±3dB between 250Hz and 10KHz, and within ±5dB when the higher end is 14KHz. If it does not fall within spec in high frequency region, correct it by a slight rotation of REC EQ (R101).

4.3.10 Overall S/N Measurement

1) Put NR ON/OFF switch to ON.

2) Upon completing checks up to Section 4.3.9, apply a 1KHz, -10dBV (0.3V) signal to the connector panel INPUT jack 1, for example, 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 level and noise level.
Specification: 78dB weighted, 60 dB unweighted

4.3.11 T.H.D. Measurement

1) Put NR ON/OFF switch to ON.

2) To adjust TRACK 1, for example, apply a 1KHz, -10dBV (0.3V) test signal to INPUT jack 1, record it, playback 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 4.3.7.

4) When the Section 4.3.7 adjustments are made, it is necessary to go through procedures in Sections 4.3.8 and 4.3.9.

4.3.12 Erasure Measurement

1) Put NR ON/OFF switch to OFF.

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 point of the recording, play back the tape and insert a 1KHz band-pass 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 considered as normal condition if Erasure is higher than 70dB.

5) If it is off the spec, increase Erase current about 10% by the procedure of Section 4.3.6.
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. And check the Head touch condition of tape.

4.3.13 Sync Crosstalk Check and Adjustment

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) Put Dolby NR ON/OFF SW to OFF. To check TRACK 1, for example, apply a 20Hz ~ 20KHz, -10dBV (0.3V) signal to INPUT jack 2 for adjacent TRACK 2 and plug in a level meter to OUTPUT jack 1.

3) Keep tension arm to up position so that the function of transport is able to make. Put the R-8 to Rec-Play mode by depressing the REC and PLAY button. Then select adjacent TRACK 2 to record track so that the TRACK 2 enters Rec mode.

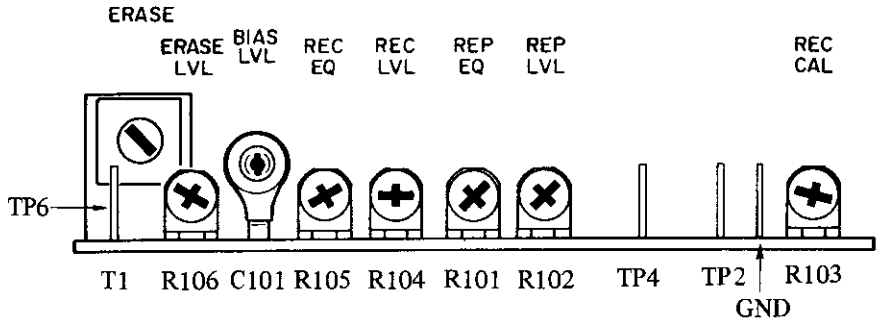
4) Measure the OUTPUT level of TRACK 1 sweeping the test signal from 20Hz to 20KHz. It is considered as normal condition if leaking is less than -30dBV at 1KHz and less than -10dBV at worst peak point in high frequency.
If it is off spec, correct by adjusting CROSSTALK ADJ pot (R51) on the connector board PCB as mentioned below.

5) The crosstalk on TRACK 1 leaked from TRACK 2 is adjusted by a pot R51. First adjust the pot roughly so that the crosstalk level reaches minimum point at 1KHz. Then adjust the pot within the spec at 20Hz ~ 20KHz input signal.

6) The remaining tracks 2 ~ 8 are adjusted in the same way.
The crosstalk from TRACK 3 to TRACK 2 is adjusted by R52,

TRACK 4	TRACK 3	R53
TRACK 5	TRACK 4	R54
TRACK 6	TRACK 5	R55
TRACK 7	TRACK 6	R56
TRACK 8	TRACK 7	R57

4.3.14 Table of Adjustment Items and the Location/Typical Adjustment position of Pots on the R/P Amp.



ADJUSTMENT ITEMS	ADJUSTING PART	REF. CLAUSE
INPUT LEVEL	REC CAL (R103)	4.3.2
METER LEVEL	METER CAL (R107–R807) ON CONNECTOR BOARD PCB	4.3.2
REPRO LEVEL	REP CAL (R102)	4.3.3
REPRO F RESPONSE	REP EQ (R101)	4.3.4
REPRO BIAS LEAKAGE	REPRO BIAS TRAP (U3)	4.3.5
REC BIAS LEAKAGE	REC BIAS TRAP (U7)	4.3.5
ERASE CURRENT	T-1, ERASE LVL (R106)	4.3.6
BIAS CURRENT	BIAS LVL (C101)	4.3.7
REC LEVEL	REC LVL (R104)	4.3.8
OVERALL F RESPONSE	REC EQ (R101)	4.3.9
SYNC CROSSTALK	X'TALK ADJ (R50–R57) ON CONNECTOR BOARD PCB	4.3.13
TAKE UP TAPE TENSION	R202 ON SYSTEM CONTROL PCB	4.2.6
SUPPLY TAPE TENSION	R203 ON SYSTEM CONTROL PCB	4.2.6
TAPE SPEED	R200 ON SYSTEM CONTROL PCB R51 ON FUNCTION PCB IN CONTROLLER	4.2.7

5. EXPLODED VIEW, PCB ASSEMBLY AND PARTS LIST

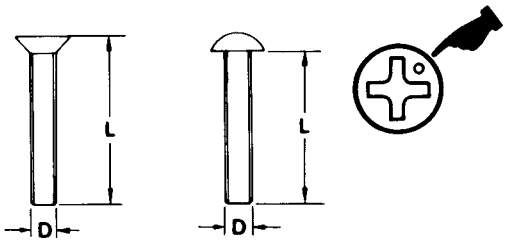
ASSEMBLING HARDWARE CODING LIST

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:

B M 3 x 6

- Length in mm (L)
- Diameter in mm (D) *
- Metric System
- Nomenclature



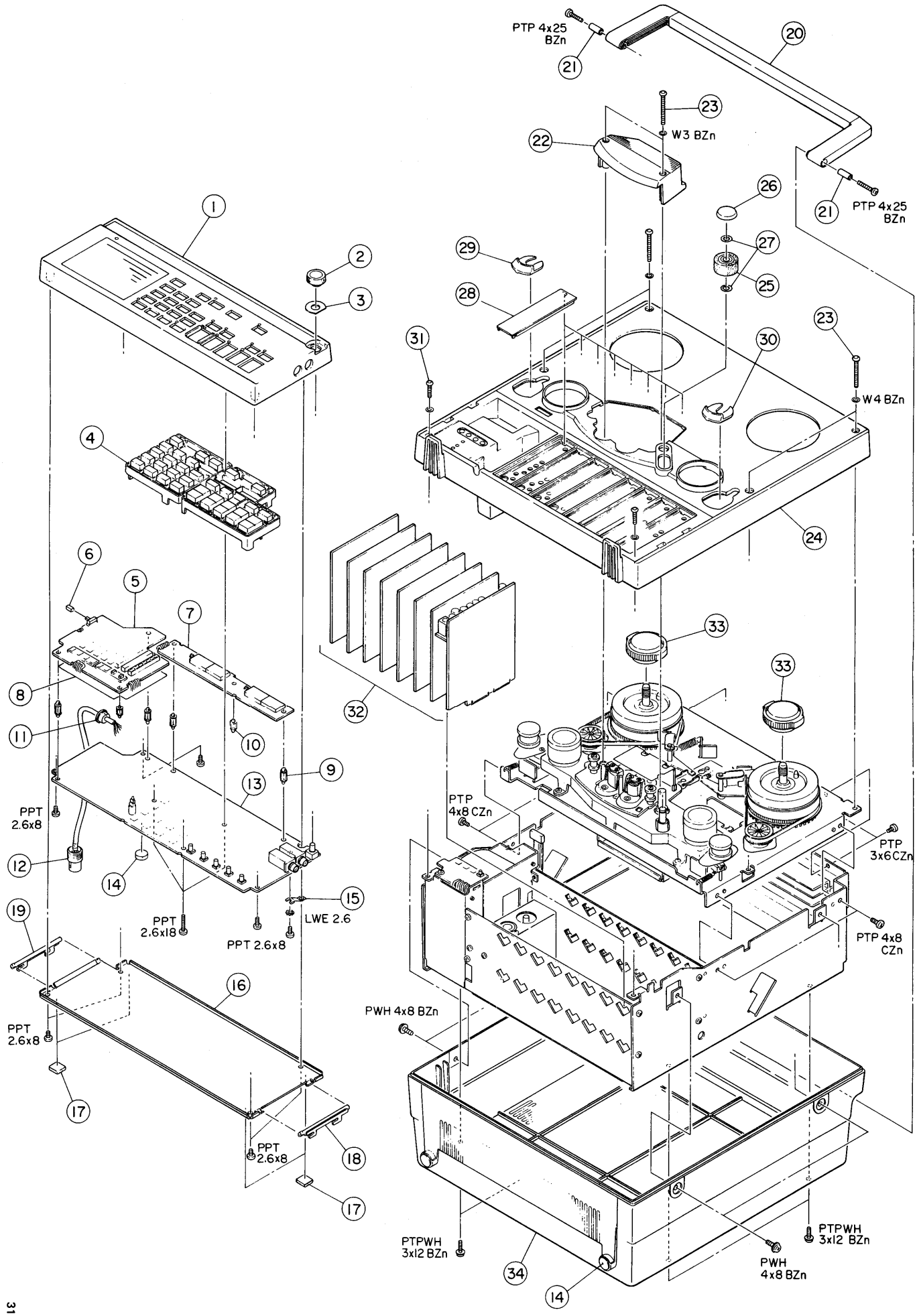
* Inner dia. for washers and nuts

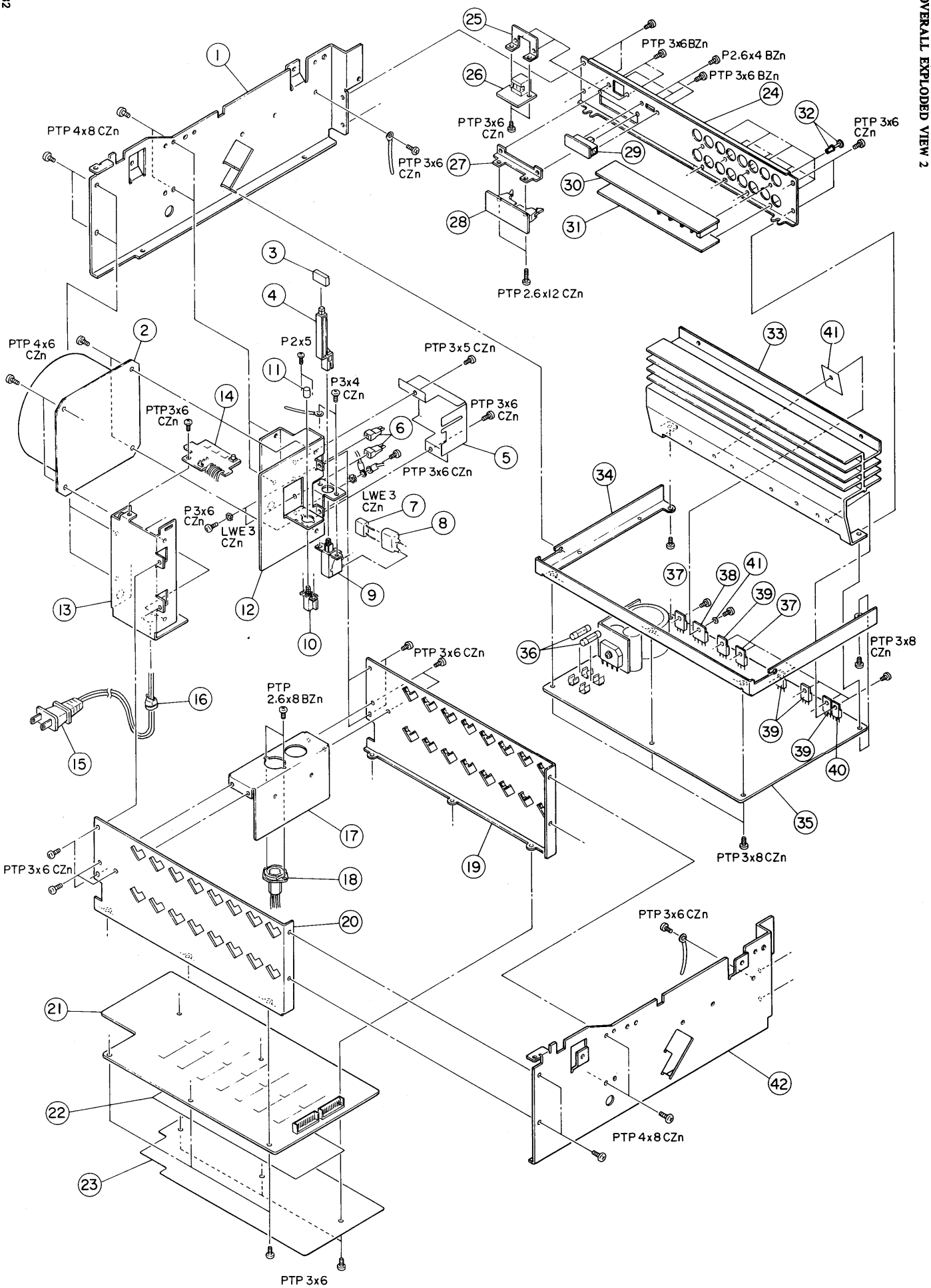
	CODE	NAME	TYPE
MACHINE SCREW	P	Pan Head Screw	
	T	Stove Head Screw (Truss)	
	B	Binding Head Screw	
	F	Flat Countersunk Head Screw	
	O	Oval Countersunk Head Screw	
	PWH	Pan-Washer Head Screw	
WOOD SCREW	RW	Round Head Wood Screw	
	FW	Flat Countersunk Wood Screw	
	OW	Oval Countersunk Wood Screw	
TAPPING SCREW	PTP	Pan Head Self Tapping Screw (B type)	
	PTPWH	Pan-washer Head Self Tapping Screw (B type)	
	TTP	Stove Head Self Tapping Screw (B type)	
	FTP	Flat Countersunk Head Self Tapping Screw (B type)	
TAPTITE SCREW	PTT	Pan Head Tapping Screw	
	PTTWH	Pan-Washer Head Tapping Screw	
	TTT	Stove Head Tapping Screw	
	FTT	Flat Countersunk Head Tapping Screw	
SEMS SCREW	PS	Pan Head Screw with Spring Washer	
	PSW	Pan Head Screw with Washer and Spring Washer	
WASHER, LUG, NUT	W	Flat Washer	
	LW	Spring Washer	
	LWI	Internal Teeth Lock Washer	
	LWE	External Teeth Lock Washer	

	CODE	NAME	TYPE
WASHER, LUG, NUT	TW	Trim Washer (Countersunk)	
	N	Hex Nut	
	L	Lug	
	THW	Thrust Washer (Poly Washer)	
SETSCREW	HSF	Hex Socket Setscrew (Flat Point)	
	HSC	Hex Socket Setscrew (Cup Point)	
	SSF	Slotted Socket Setscrew (Flat Point)	
	SSC	Slotted Socket Setscrew (Cup Point)	
BOLT	HSB	Hex Soket Head Bolt	
	HB	Hex Head Bolt	
RING, PIN	ER	E-Ring (Retaining Washer)	
	CRR	C-Ring (Inner)	
	CRS	C-Ring (Outer)	
	GR	Seeger Ring	
	SP	Spring Pin	
	SR	Snap Ring	
FINISH	Zn	Zinc plating	
	CZn	Colored zinc plating	
	BZn	Black zinc plating	
	Ni	Nickel plating	
	BNi	Black niekel plating	
	Cr	Chrome plating	
	BCr	Black chrome plating	

OVERALL EXPLODED VIEW 1

Ref. No.	Parts No.	Nomenclature
1	8260 2720 00	Panel assy, controller
2	8226 1080 00	Knob, pitch control
3	8216 2470 00	Collar, pitch control
4	8226 1070 00	Button, controller
5	8273 4400 00	PCB assy, bargraph
6	8226 1110 00	Knob, slide, E
7	8273 4410 00	PCB assy, display
8	8216 2430 00	Insulator, A
9	8207 0040 00	Stud, 5090
10	8207 0040 01	Stud, 2455
11	8207 0002 14	Bushing, SR-SN-4
12	8276 5741 01	Cable assy, controller
13	8273 4420 00	PCB assy, function
14	8216 0130 00	Foot, D-12
15	8216 2410 00	Sheet, grounding
16	8260 2730 00	Cover assy with cushion, controller
17	8216 2420 00	Cushion, controller
18	8212 2341 02	Hook R, controller
19	8212 2341 01	Hook L, controller
20	8260 3000 00	Handle assy
21	8204 0080 08	Spacer, 4x15
22	8212 2201 00	Housing, head
23	8204 0230 06	Screw, buttonhead, HSB, M3x30, BZn
24	8212 2231 00	Panel, front
25	8260 2850 00	Pinch roller
26	8260 3030 00	Cap assy, pinch roller
27	8214 1061 02	Washer, thrust, 6, t 0.4
28	8212 2440 00	Cover, R/P amplifier
29	8212 2390 01	Guide, tension roller, L
30	8212 2390 02	Guide, tension roller, R
31	8204 0230 03	Screw, buttonhead, HSB, M3x14, BZn
32	8273 4430 00	PCB assy, R/P amplifier
33	8260 2950 00	Reel clamper assy
34	8260 2710 00	Cover assy with foot, bottom


PTP 4x25 BZn
20
21
23
W3 BZn
22
26
21
PTP 4x25 BZn
1
2
29
27
3
28
25
31
30
23
W4 BZn
4
24
6
5
7
33
32
33
8
11
10
9
13
PPT 2.6x8
PTP 4x8 CZn
PTP 3x6CZn
12
14
15
19
PPT 2.6x18
LWE 2.6
PPT 2.6x8
PTP 4x8 CZn
16
PWH 4x8 BZn
PPT 2.6x8
17
PPT 2.6x8
18
17
PTPWH 3x12 BZn
PTPWH 3x12 BZn
34
PWH 4x8 BZn
14


1
PTP 4x8 CZn
25
26
PTP 3x6 CZn
27
28
PTP 3x6 CZn
PTP 3x6BZn
P2.6x4 BZn
PTP 3x6 BZn
24
32
PTP 3x6 CZn
29
30
31
PTP 2.6x12 CZn
3
4
P2x5
11
P3x4 CZn
PTP 3x5 CZn
PTP 3x6 CZn
5
6
PTP 3x6 CZn
2
PTP 4x6 CZn
14
PTP3x6 CZn
LWE 3 CZn
7
8
P3x6 CZn
LWE 3 CZn
9
10
12
13
33
41
34
37
38
41
39
37
36
PTP 3x8 CZn
39
39
40
35
PTP 3x8CZn
PTP 3x6 CZn
16
15
PTP 2.6x8 BZn
17
18
19
PTP 3x6 CZn
20
21
22
23
PTP 3x6
PTP 3x6 CZn
42
PTP 4x8 CZn

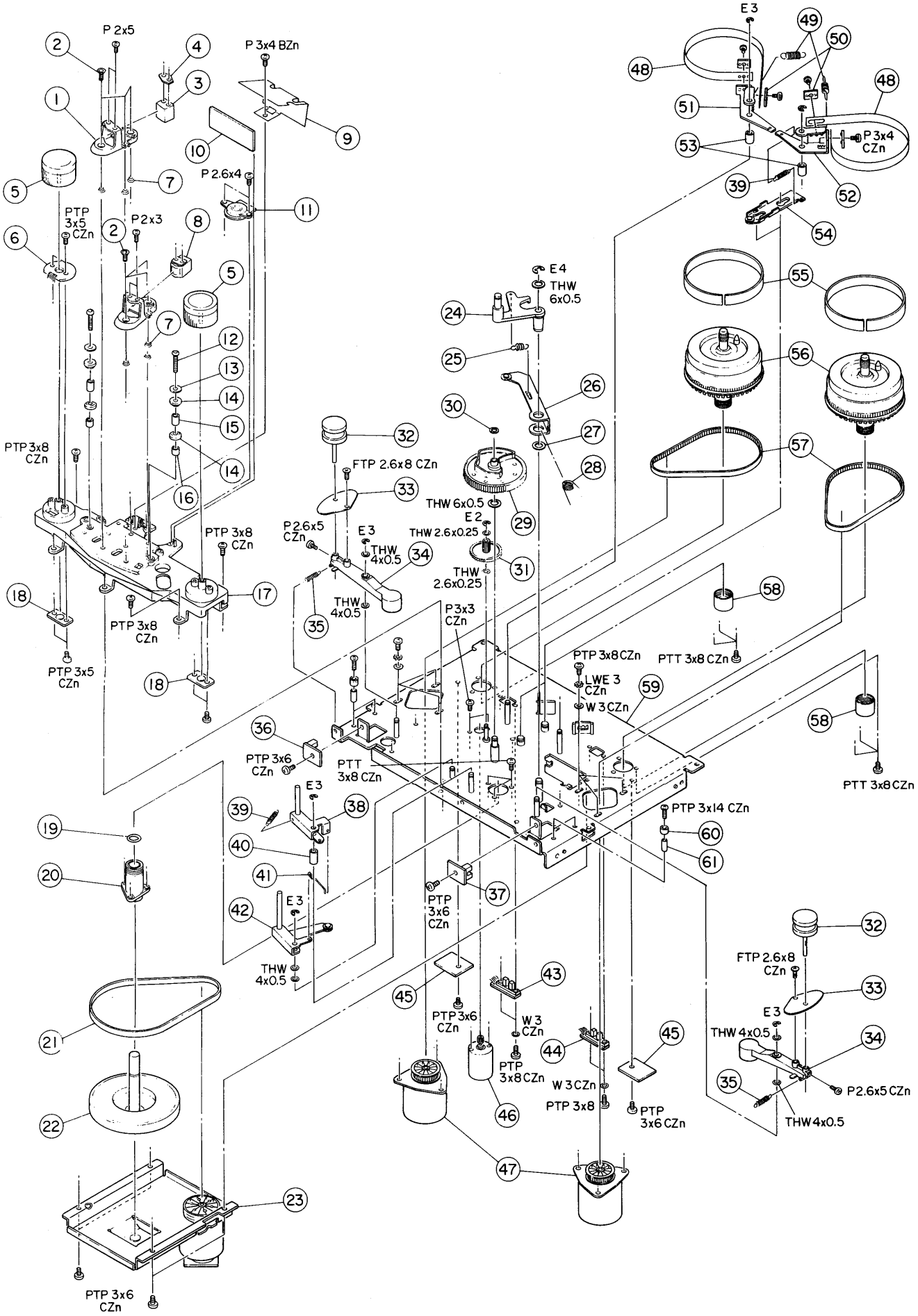
OVERALL EXPLODED VIEW 2

Ref. No.	Parts No.	Nomenclature
1	8220 5280 01	Chassis, side, L
⚠ 2	8242 1191 00	Transformer, power, 100/120V
⚠	8242 1201 00	Transformer, power, 220/240V
3	8226 0500 00	Button, push, I
4	8212 2330 00	Arm, joint
⚠ 5	8216 2311 00	Cover, switch
⚠ 6	8245 0590 00	Terminal, CV1
⚠ 7	8256 0090 00	Sparkkiller, UL, USA
⚠	8256 0100 00	Sparkkiller, CSA, CND
⚠	8256 0110 03	Sparkkiller, SEMKO, Eur/Uk/Aus
⚠	8256 0080 00	Sparkkiller, DM
⚠ 8	8207 0038 01	Cover, sparkkiller
⚠ 9	8253 0140 07	Switch, push, power, SDDLA-SPST
10	8253 1090 02	Switch, push, meter fine
11	8226 0621 00	Button, push, C-1
12	8220 5460 00	Bracket, power supply, A
13	8220 5471 00	Bracket, power supply, B
14	8273 4520 00	PCB assy, control switch
⚠ 15	8276 0040 00	Cord, power, USA
⚠	8276 2170 00	Cord, power, CSA
⚠	8276 0050 00	Cord, power, HYDRO
⚠	8276 0060 00	Cord, power, EUR
⚠	8276 0070 00	Cord, power, UK
⚠	8276 0080 00	Cord, power, AUS
⚠	8276 0030 00	Cord, power, DM
⚠ 16	8207 0002 08	Bushing, SR-4N-4
⚠	8207 0002 14	Bushing, SR-5N-4, HYDRO
17	8220 5340 00	Bracket, connector, controller
18	8276 5731 00	Cable assy, remote
19	8220 5330 01	Bracket, R/P AMP PCB, A
20	8220 5330 02	Bracket, R/P AMP PCB, B
21	8273 4450 00	PCB assy, connector board
22	8216 2440 00	Insulator, B
23	8216 2331 00	Sheet, shield, connector board
24	8220 5291 00	Panel, connector
25	8220 5511 00	Bracket, connector, 8P
26	8273 4630 00	PCB assy, serial
27	8220 5320 00	Bracket, connector, 20P
28	8273 4510 00	PCB assy, synchro
29	8273 4460 00	PCB assy, NR switch
30	8273 4490 00	PCB assy, LINE-IN
31	8273 4500 00	PCB assy, LINE-OUT
32	8207 0006 02	Plasti rivet

Ref. No.	Parts No.	Nomenclature
33	8220 5301 00	Heatsink
34	8220 5310 00	Bracket, SYS-CONT PCB
35	8273 4580 01	PCB assy, SYS-CONT, USA/CND
	8273 4580 02	PCB assy, SYS-CONT, EUR/UK/AUS
	8273 4580 03	PCB assy, SYS-CONT, DM
⚠ 36	8239 0011 80	Fuse, 8A, DM
⚠	8239 0006 80	Fuse, 8A, UL/CSA
⚠	8239 0007 63	Fuse, T6.3A, SEMKO, EUR/UK/AUS
⚠ 37	8236 0332 08	IC, Analog, L7815ML (U3, U4)
⚠ 38	8236 0331 00	IC, Analog, PQ05R04 (U1)
⚠ 39	8234 1722 00	Transistor 2SD1830 (Q2,Q15,Q17,Q18)
40	8234 1240 00	Transistor 2SB1223 (Q16)
41	8239 0010 01	TR Accessory, B-kit
42	8220 5280 02	Chassis, side, R

TAPE TRANSPORT ASSEMBLY

Ref. No.	Parts No.	Nomenclature
1	8210 0250 00	Bracket head
2	8204 0550 01	Screw, HSF3x10, BZn
3	8259 0030 00	Head, E, 8TRK
4	8220 5480 00	Spacer, Erase head
5	8260 3020 00	Roller assy, footage, S
6	8273 4570 00	PCB assy, count sensor
7	8214 0111 00	Spring
8	8259 0041 00	Head, R/P, 8TRK
9	8216 2320 00	Sheet, shield, head
10	8273 4480 00	PCB assy, head terminal
11	8270 4670 00	Switch assy, mode
12	8204 0230 07	Screw, buttonhead, HSB, M3x22, BZn
13	8214 1650 00	Washer, 3, L
14	8216 2300 00	Collar, tape guide
15	8223 0151 00	Guide, tape, B
16	8223 1630 00	Collar, 3x6x5.84
17	8260 2861 00	Base assy, loading
18	8260 3010 00	Plate assy, thrust
19	8207 0041 01	O-Ring, P7
20	8260 2762 00	Housing assy
21	8216 2290 00	Belt, capstan
22	8260 2821 00	Capstan assy
⚠ 23	8270 5010 00	Motor assy with bracket, capstan
24	8260 2830 00	Arm assy, pinch roller, A
25	8214 1611 00	Spring, pinch roller
26	8260 2840 00	Arm assy, pinch roller, B
27	8204 0530 00	Washer, thrust, 6x12x0.5
28	8214 1621 00	Spring, P
29	8260 2960 00	Cam assy, loading
30	8204 0560 02	Washer, slit, ϕ2.5
31	8212 2251 00	Gear, relay
32	8260 2790 00	Roller assy, tension
33	8216 2340 00	Screen, blind
34	8210 0241 00	Arm, tension
35	8214 1570 00	Spring, tension arm
36	8273 4560 00	PCB assy, s shut off
37	8273 4550 00	PCB assy, t shut off
38	8260 2811 00	Arm assy, lifter, B
39	8214 1560 00	Spring, slider
40	8204 0080 11	Spacer, 4x12
41	8214 1581 00	Link
42	8260 2800 00	Arm assy, lifter, A
43	8273 4540 00	PCB assy, s reel sensor
44	8273 4530 00	PCB assy, t reel sensor
45	8251 8400 05	PCB, relay, reel motor
⚠ 46	8270 4650 00	Motor assy, loading
⚠ 47	8270 4640 00	Motor assy, reel
48	8220 5360 00	Band, brake
49	8214 1551 00	Spring, brake
50	8220 5370 00	Plate, brake band
51	8220 5350 01	Arm brake, L
52	8220 5350 02	Arm brake, R
53	8204 0080 04	Spacer, 4x7
54	8260 2780 00	Slider assy, brake
55	8216 2261 00	Band, brake shoe
56	8260 2980 00	Reel table assy, B
57	8216 2270 00	Belt, Reel
58	8260 2770 00	Cap assy, housing
59	8260 2740 00	Chassis assy
60	8216 0071 00	Rubber tube
61	8204 0130 07	Spacer, 3x8


P 2x5
P 3x4 BZn
P 2.6x4
PTP 3x5 CZn
P 2x3
PTP 3x8 CZn
PTP 3x5 CZn
PTP 3x8 CZn
PTP 3x8 CZn
E 4
THW 6x0.5
FTP 2.6x8 CZn
THW 6x0.5
E 2
THW 2.6x0.25
P2.6x5 CZn
E 3
THW 4x0.5
THW 4x0.5
THW 2.6x0.25
P3x3 CZn
PTP 3x8 CZn
PTT 3x8 CZn
LWE 3 CZn
W 3 CZn
PTT 3x8 CZn
PTP 3x6 CZn
PTT 3x8 CZn
E 3
PTP 3x14 CZn
PTP 3x6 CZn
E 3
THW 4x0.5
PTP 3x6 CZn
W 3 CZn
PTP 3x8 CZn
W 3 CZn
PTP 3x8
PTP 3x6 CZn
E 3
P 3x4 CZn
FTP 2.6x8 CZn
E 3
THW 4x0.5
P2.6x5 CZn
THW 4x0.5
PTP 3x6 CZn

Ref. No.	Parts No.	Nomenclature
Q6,7	8234 0002 03	2SC1815GR
Q8	8234 0001 11	FET, 2SK117GR

DIODES

D1-4	8234 0088 00	GMB01-BT
D5	8234 0007 00	IN-4002
D7-9	8234 0088 00	GMB01-BT

CARBON RESISTORS

All resistors 1/6W, ±5% unless otherwise noted.

R1	8230 1385 10	Flat mtg., 51Ω
R2	8230 1381 00	Flat mtg., 10Ω
R3	8230 1383 32	Flat mtg., 3.3kΩ
R4	8230 1381 83	Flat mtg., 18kΩ
R5	8230 0235 12	Vertical mtg., 5.1kΩ, 1%, Metal, 1/4W
R6	8230 0232 21	Vertical mtg., 220Ω, 1%, Metal, 1/4W
R7	8230 1383 33	Flat mtg., 33kΩ
R8	8230 1383 91	Flat mtg., 390Ω
R9	8230 1383 94	Flat mtg., 390kΩ
R10	8230 1383 32	Flat mtg., 3.3kΩ
R11	8230 1384 71	Flat mtg., 470Ω
R12	8230 1388 23	Flat mtg., 82kΩ
R13	8230 1381 33	Flat mtg., 13kΩ
R14	8230 1383 33	Flat mtg., 33kΩ
R15	8230 1382 73	Flat mtg., 27kΩ
R16	8230 1389 12	Flat mtg., 9.1kΩ
R17	8230 1385 12	Flat mtg., 5.1kΩ
R18	8230 1385 62	Flat mtg., 5.6kΩ
R19	8230 1385 12	Flat mtg., 5.1kΩ
R20	8230 1388 21	Flat mtg., 820Ω
R21	8230 1389 12	Flat mtg., 9.1kΩ
R22	8230 1386 82	Flat mtg., 6.8kΩ
R23	8230 1386 81	Flat mtg., 680Ω
R24	8230 1381 04	Flat mtg., 100kΩ
R25	8230 1384 71	Flat mtg., 470Ω
R26	8230 1382 22	Flat mtg., 2.2kΩ
R27	8230 1381 53	Flat mtg., 15kΩ
R28	8230 1388 21	Flat mtg., 820Ω
R29	8230 1381 53	Flat mtg., 15kΩ
R30	8230 1383 92	Flat mtg., 3.9kΩ
R33	8230 1381 53	Flat mtg., 15kΩ
R34	8230 1384 72	Flat mtg., 4.7kΩ
R36	8230 1381 52	Flat mtg., 1.5kΩ
R37	8230 1381 03	Flat mtg., 10kΩ
R38	8230 1384 73	Flat mtg., 47kΩ
R39	8230 1383 92	Flat mtg., 3.9kΩ
R40	8230 1383 32	Flat mtg., 3.3kΩ

Ref. No.	Parts No.	Nomenclature
R41	8230 1383 93	Flat mtg., 39kΩ
R42	8230 1381 09	Flat mtg., 1Ω
R43	8230 1381 03	Flat mtg., 10kΩ
R44	8230 1382 72	Flat mtg., 2.7kΩ
R45	8230 1383 33	Flat mtg., 33kΩ
R46	8230 1381 04	Flat mtg., 100kΩ
R47	8230 1382 72	Flat mtg., 2.7kΩ
R48	8230 1382 22	Flat mtg., 2.2kΩ
R49	8230 1383 33	Flat mtg., 33kΩ
R50	8230 1383 32	Flat mtg., 3.3kΩ
R51	8230 1381 53	Flat mtg., 15kΩ
R52	8230 1382 20	Flat mtg., 22Ω
R53	8230 1382 23	Flat mtg., 22kΩ
R54	8230 1381 53	Flat mtg., 15kΩ
R55	8230 1381 53	Flat mtg., 15kΩ
R57	8230 1381 81	Flat mtg., 180Ω
R59	8230 1385 62	Flat mtg., 5.6kΩ
R60	8230 1381 03	Flat mtg., 10kΩ
R61	8230 1382 03	Flat mtg., 20kΩ
R62	8230 1384 72	Flat mtg., 4.7kΩ
R63	8230 1384 73	Flat mtg., 47kΩ
R65	8230 1383 33	Flat mtg., 33kΩ
R66	8230 1381 53	Flat mtg., 15kΩ

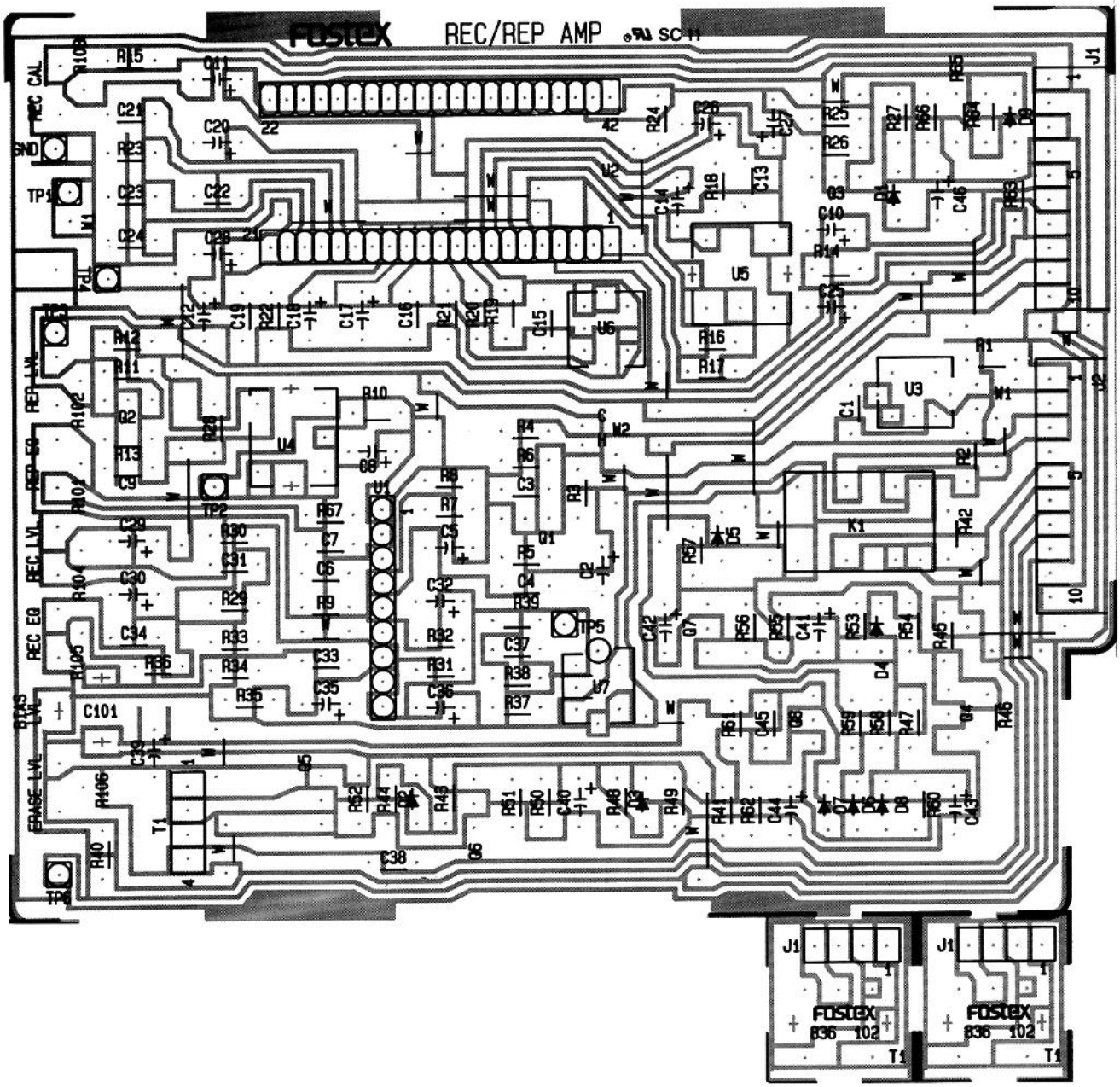
CARBON POTS

R101-103	8231 0151 03	Pot., semi-fixed, Ver., 10kΩ
R104	8231 0154 72	Pot., semi-fixed, Ver., 4.7kΩ
R105	8231 0151 03	Pot., semi-fixed, Ver., 10kΩ
R106	8231 0152 21	Pot., semi-fixed, Ver., 220Ω

CAPACITORS

ALU = Electrolytic type
CER = Ceramic type
PES = Mylar type
PPR = Polypropylene type

C1	8232 0318 21	PPR, 100V, 820pF, 5%, APS
C2	8232 1432 27	ALU, 16V, 220μF, 20%, SME-VB
C3	8232 8021 01	CER, 50V, 100pF, 10%, SL
C5	8232 1423 36	ALU, 10V, 33μF, 20%, SME-VB
C6	8232 9011 53	PES, 50V, 0.015μF, 5%, AMZV
C7	8232 8022 20	CER, 50V, 22pF, 10%, SL



R/P AMPLIFIER PCB ASSEMBLY

PCB Ass'y No. 8273 4430 00

Ref. No.	Parts No.	Nomenclature
	8251 8362 01	Plain PCB, R/P Amplifier
		IC's
U1	8236 0315 00	Analog, NJM 4560SD
U2	8236 0329 00	Analog, Dolby, CX20187
U3	8256 0520 00	Module, trap, S, 100kHz, 3mH
U4,5	8256 0540 00	Module, LP filter, 22.5kHz
U6	8256 0460 00	Module, skewing
U7	8256 0530 00	Module, trap, S, 100kHz 10mH
		TRANSISTORS
Q1	8234 0091 01	FET, 2SK170GR
Q2,4	8234 0002 06	2SC1815Y, GR, BL
Q3	8234 0006 02	2SC2878B
Q5	8234 0076 02	2SC1627Y

Ref. No.	Parts No.	Nomenclature
C8	8232 1431 06	ALV, 16V, 10μF, 20%, SME-VB
C9	8232 9011 82	PES, 50V, 0.0018μF, 5%, AMZV
C10	8232 1464 75	ALU, 50V, 4.7μF, 20%, SME-VB
C11	8232 1462 25	ALU, 50V, 2.2μF, 20%. SME-VB
C12	8232 1462 25	ALU, 50V, 2.2μF, 20%, SME-VB
C13	8232 9011 82	PES, 50V, 0.0018μF, 5%, AMZV
C14	8232 1462 25	ALU, 50V, 2.2μF, 20%, SME-VB
C15	8232 0313 31	PPR. 100V, 330pF, 5%, APS
C16	8232 0304 72	PPR. 100V, 0.0047μF, 2%, APS
C17	8232 1464 74	ALU, 50V, 0.47μF, 20%, SME-VB
C18	8232 1461 54	ALU, 50V, 0.15μF, 20%, SME-VB
C19	8232 9011 53	DES, 50V, 0.015μF, 5%, AMZV
C20	8232 1462 24	ALU, 50V, 0.22μF, 20%, SME-VB
C21	8232 9016 83	PES, 50V, 0.068μF, 5%, AMZV
C22	8232 9014 73	PES, 50V, 0.047μF, 5%, AMZV
C23	8232 0306 82	PPR. 100V, 0.0068μF, 2%, APS
C24	8232 9011 03	PES, 50V, 0.01μF, 5%, AMZV
C25	8232 1434 76	ALU, 16V, 47μF, 20%, SME-VB
C26	8232 1422 27	ALU, 10V, 220μF, 20%, SME-VB
C27	8232 1022 26	ALU, 10V, 22μF, 20%, LL
C30	8232 1433 36	ALU, 16V, 33μF, 20%, SME-VB
C31	8232 9013 93	PES, 50V, 0.039μF, 5%, AMZV
C33	8232 0323 30	CER, 50V, 33pF, 5%, NPO
C34	8232 9012 72	PES, 50V, 0.0027μF, 5%, AMZV
C36	8232 1031 06	ALU, 16V, 10μF, 20%, LL
C37	8232 9011 22	PES, 50V, 0.0012μF, 5%, AMZV
C38	8232 0316 82	PPR, 100V, 0.0068μF, 5%, APS
C39	8232 1464 75	ALU, 50V, 4.7μF, 20%, SME-VB
C40	8232 1424 76	ALU, 10V, 47μF, 20%, SME-VB
C41	8232 1431 06	ALU, 16V, 10μF, 20%, SME-VB
C42	8232 1464 74	ALU, 50V, 0.47μF, 20%, SME-VB
C43	8232 1431 06	ALU, 16V, 10μF, 20% SME-VB
C44	8232 1431 06	ALU, 16V, 10μF, 20%, SME-VB
C45	8232 9013 33	PES, 50V, 0.033μF, 5%, AMZV
C46	8232 1464 75	ALU, 50V, 4.7μF, 20% SME-VB
C101	8256 0250 01	Trimmer, CTZ83k, 150pF

MISCELLANEOUS

J1,2	8245 0880 10	Connector, jack, 5244-10AHPB wht.
K1	8248 0070 00	Relay, G5A-1002H
	8276 0020 02	Wire, jumper, 5mm, IPS-1041-2
	8276 0020 04	Wire, jumper, 10mm, IPS-1041-4
	8276 1570 14	Wire, wht., 140mm
	8276 8100 07	Cable, 2P, twist, 70mm
TP	8276 0010 00	Pin, header

ERASE PCB ASSEMBLY

PCB Ass'y No. 8273 4440 00

Ref. No.	Parts No.	Nomenclature
	8251 8361 02	Plain PCB, Erase
J1	8245 0360 04	Connector, jack, 3094-4A, wht.
T1	8242 0920 00	Transformer, erase, A

BARGRAPH PCB ASSEMBLY

PCB Ass'y No. 8273 4400 00

Ref. No.	Parts No.	Nomenclature
	8251 8381 01	Plain PCB, bargraph
		IC's
U1-7	8236 0510 06	Digital, Driver, UN1116
U8	8236 0534 00	Digital, Driver, array, TD62381P
		DIODES
D1-8	8234 0195 00	Opt., LED, bargraph 7 dot, GL-107SIZ
D9-16	8234 0193 00	Opt., LED, grn.-red, GL8ED5 (SAFE/RDY)
D17	8234 0100 00	Opt., LED, org. GL-2HD6 (NR OFF)
		CARBON RESISTORS
	All resistors 1/6W, ±5% unless otherwise noted.	
R1-7	8230 1381 01	Flat mtg., 100Ω
R8-11	8230 1384 71	Flat mtg., 470Ω
R12,14	8230 1382 23	Flat mtg., 22kΩ
R13,15	8230 1381 04	Flat mtg., 100kΩ
R16	8230 1382 22	Flat mtg., 2.2kΩ
R17	8230 0833 32	Array, 1/8W, 3.3kΩ×8, 5%, RKL
		CAPACITORS
	CER = Ceramic type	
C1	8232 0401 04	CER, 12V, 0.1μF, 20%, Y5U
		MISCELLANEOUS
S1	8253 6540 00	Switch, slide, 1-3, SSSS9
	8276 0020 04	Wire, jumper, 10mm
	8276 0020 02	Wire, jumper, 5mm
	8212 2360 00	Spacer, LED, S/R
	8214 0170 05	Washer, fiber, blk., ϕ3

DISPLAY PCB ASSEMBLY

PCB Ass'y No. 8273 4410 00

Ref. No.	Parts No.	Nomenclature
	8251 8381 02	Plain PCB, Display
		DIODES
D1-4	8234 0194 00	Opt., LED, 7 segment, red, GL-3P305
D5,6	8234 0192 00	Opt., LED, red, GL-8PR29
		MISCELLANEOUS
	8276 0020 04	Wire, jumper, 10mm
	8276 0020 02	Wire, jumper, 5mm
	8214 0170 05	Washer, fiber, blk., ϕ3

FUNCTION PCB ASSEMBLY

PCB Ass'y No. 8273 4420 00

Ref. No.	Parts No.	Nomenclature
	8251 8381 03	Plain PCB, Function
		IC's
U1-12	8236 0510 06	Digital, Driver, UN1116
U13,14	8236 0517 00	Digital, Driver, array, TD62306P
U15	8236 0028 01	Digital, CMOS, 4049UB
U16	8236 0537 00	Digital, Function R, MN17541 FTB
U17	8236 0538 00	Digital, Bargraph R, MN17541 FTA
		TRANSISTORS
Q1	8234 1422 01	2SC752G-Y
Q2,3	8234 1000 04	2SA608SPA-G
		DIODES
D1-15	8234 0088 00	GMB01-BT
D17-34	8234 0088 00	GMB01-BT
D35,36	8234 0039 00	Array, MA154WK
D37,38	8234 0040 00	Array, MA154WA
D43	8234 0100 00	Opt., LED, org., GL-2HD6 (STO)
D44	8234 0100 00	Opt., LED, org., GL-2HD6 (RCL)
D45	8234 0100 00	Opt., LED, org., GL-2HD6 (IN MON)
D46	8234 0100 00	Opt., LED, org., GL-2HD6 (ZONE LIMIT)
D47	8234 0100 00	Opt., LED, org., GL-2HD6 (REC)
D48	8234 0196 00	Opt., LED, yel., GL-2HY6 (REC-STAND BY)
D49	8234 0191 00	Opt., LED, grn., GL-2EG6 (STOP)
D50	8234 0191 00	Opt., LED, grn., GL-2EG6 (PLAY)

Ref. No.	Parts No.	Nomenclature
D51	8234 0191 00	Opt., LED, grn., GL-2EG6 (RWD)
D52	8234 0191 00	Opt., LED, grn., GL-2EG6 (FF)
D53	8234 0191 00	Opt., LED, grn., GL-2EG6 (LOCATE)
D54	8234 0191 00	Opt., LED, grn., GL-2EG6 (LOCATE O)
D55	8234 0191 00	Opt., LED, grn., GL-2EG6 (A. RTN)
D56	8234 0191 00	Opt., LED, grn., GL-2EG6 (A. PLAY)

CARBON RESISTORS

All resistors 1/6W, unless otherwise noted.

R9-12	8230 1381 01	Flat mtg., 100Ω
R17-18	8230 1382 23	Flat mtg., 22kΩ
R19,20	8230 1381 04	Flat mtg., 100kΩ
R21,22	8230 1381 05	Flat mtg., 1MΩ
R23,24	8230 1381 04	Flat mtg., 100kΩ
R25,33	8230 1387 53	Flat mtg., 75kΩ
R26,34	8230 1381 02	Flat mtg., 1kΩ
R27,35	8230 1381 02	Flat mtg., 1kΩ
R28,36	8230 1382 21	Flat mtg., 220Ω
R29,37	8230 1382 21	Flat mtg., 220Ω
R30	8230 1381 01	Flat mtg., 100Ω
R31	8230 1382 42	Flat mtg., 2.4kΩ
R32	8230 1386 82	Flat mtg., 6.8kΩ
R38,39	8230 1381 03	Flat mtg., 10kΩ
R40	8230 0950 01	Array, 1/8W, 22kΩ/100kx4, 5%, RKL-E
R41,42	8230 0823 32	Array, 1/8W, 3.3kΩx6, 5% RKL
R43,44	8230 0921 51	Array, 1/5W, 150Ωx4, 5%, RKL-S

CARBON POTS

R50	8240 1510 01	Pot., 9 flat, 10kΩB, 15mm, click
R51	8231 0141 03	Pot., semi-fixed, flat, 10kΩ

CAPACITORS

ALU = Electrolytic type
CER = Ceramic type
PES = Mylar type
PPR = Polypropylene type

C1-6	8232 0401 04	CER, 12V, 0.1μF, 20%, Y5U
C7-10	8232 0323 00	CER, 50V, 30pF, 5%, NPO
C11,12	8232 0064 74	ALU, 50V, 0.47μF, 20%, SM
C13	8232 0401 04	CER, 12V, 0.1μF, 20%, Y5U

Ref. No.	Parts No.	Nomenclature

MISCELLANEOUS

X1,2	8256 0550 00	Ceramic resonator, 8MHz
J1,2	8245 3320 02	Connector, phone jack, LGR 4512-5000R
	8212 2410 00	Spacer, LED, 12.3
S1-15	8253 1130 11	Switch, tact, SOA-142HS
S17-30	8253 1130 11	Switch, tact, SOA-142HS
W1	8276 5741 01	Cable ASSY, controller, 12P, 40mm (to CONNECTOR REMOTE)
W2	8276 3726 06	Cable, flat #26, 6P, 60mm (to BARGRAPH W6)
W3	8276 3726 20	Cable, flat #26, 6P, 200mm (to DISPALY W3)
W4	8276 3726 15	Cable, flat #26, 6P, 150mm (to DISPLAY W4)
W5	8276 3726 15	Cable, flat #26, 6P, 150mm (to DISPLAY W1)
W6	8276 3724 15	Cable, flat #26, 4P, 150mm (to DISPLAY W2)
W7	8276 3724 13	Cable, flat #26, 4P, 130mm (to BARGRAPH W1)
W8	8276 3723 14	Cable, flat #26, 3P, 140mm (to BARGRAPH W2)
W9	8276 3726 20	Cable, flat #26, 6P, 200mm (to BARGRAPH W3)
W10	8276 3724 20	Cable, flat #26, 4P, 200mm (to BARGRAPH W4)
W11	8276 3723 16	Calbe, flat #26, 3P, 160mm (to BARGRAPH W5)
W12	8276 3723 14	Cable, flat #26, 3P, 140mm (to FUNCTION W13)
	8276 0020 04	Wire, jumper, 10mm
	8276 0020 02	Wire, jumper, 5mm

TAKE UP REEL SENSOR PCB ASSEMBLY

PCB Ass'y No. 8273 4530 00

Ref. No.	Parts No.	Nomenclature
	8251 8381 06	Plain PCB, Reel sensor
U1	8234 0197 00	Opt., photo-interrupter, GP-IS50
W1	8276 2810 30	Cable ASSY, 3P, yel., 300mm (to SYSTEM CONTROL J3)

SUPPLY REEL SENSOR PCB ASSEMBLY

PCB Ass'y No. 8273 4540 00

Ref. No.	Parts No.	Nomenclature
	8251 8381 06	Plain PCB, Reel sensor
U1	8234 0197 00	Opt., photo-interrupter, GP-IS50
W1	8276 2300 40	Cable ASSY, 3P, blk., 400mm (to SYSTEM CONTROL J12)

CONTROL SWITCH PCB ASSEMBLY

PCB Ass'y No. 8273 4520 00

Ref. No.	Parts No.	Nomenclature
	8251 8381 07	Plain PCB, Control switch
D1	8234 0100 00	Opt., LED, org., GL-2HD6 (POWER)
D2	8234 0100 00	Opt., LED, org., GL-2HD6 (REC)
D3	8234 0196 00	Opt., LED, yel., GL-2HY6 (READY)
S1-4	8253 1130 08	Switch, tact, SOA-132HS
W1	8276 3260 45	Cable ASSY, 8P, wht., 450mm (to SYSTEM CONTROL J7)
		Washer, THW3x0.5mm

TAKE UP SHUT OFF PCB ASSEMBLY

PCB Assy No. 8273 4550 00

Ref. No.	Parts No.	Nomenclature
	8251 8381 05	Plain PCB, Shut off
U1	8234 0198 00	Opt., photo-interrupter, GP-IS52
W1	8276 2400 30	Cable ASSY, 3P, red, 300mm (to SYSTEM CONTROL J14)

SUPPLY SHUT OFF PCB ASSEMBLY

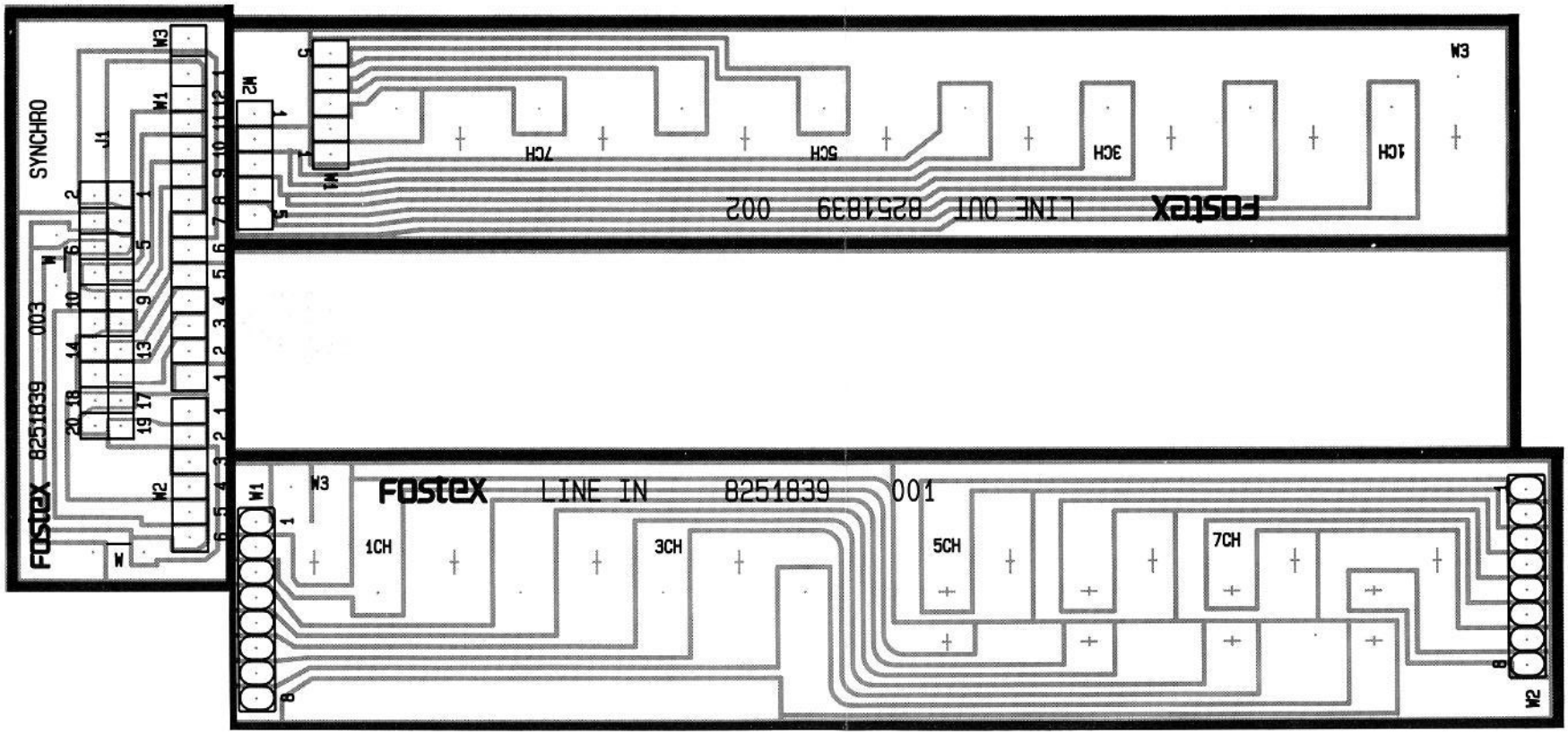
PCB Ass'y No. 8273 4560 00

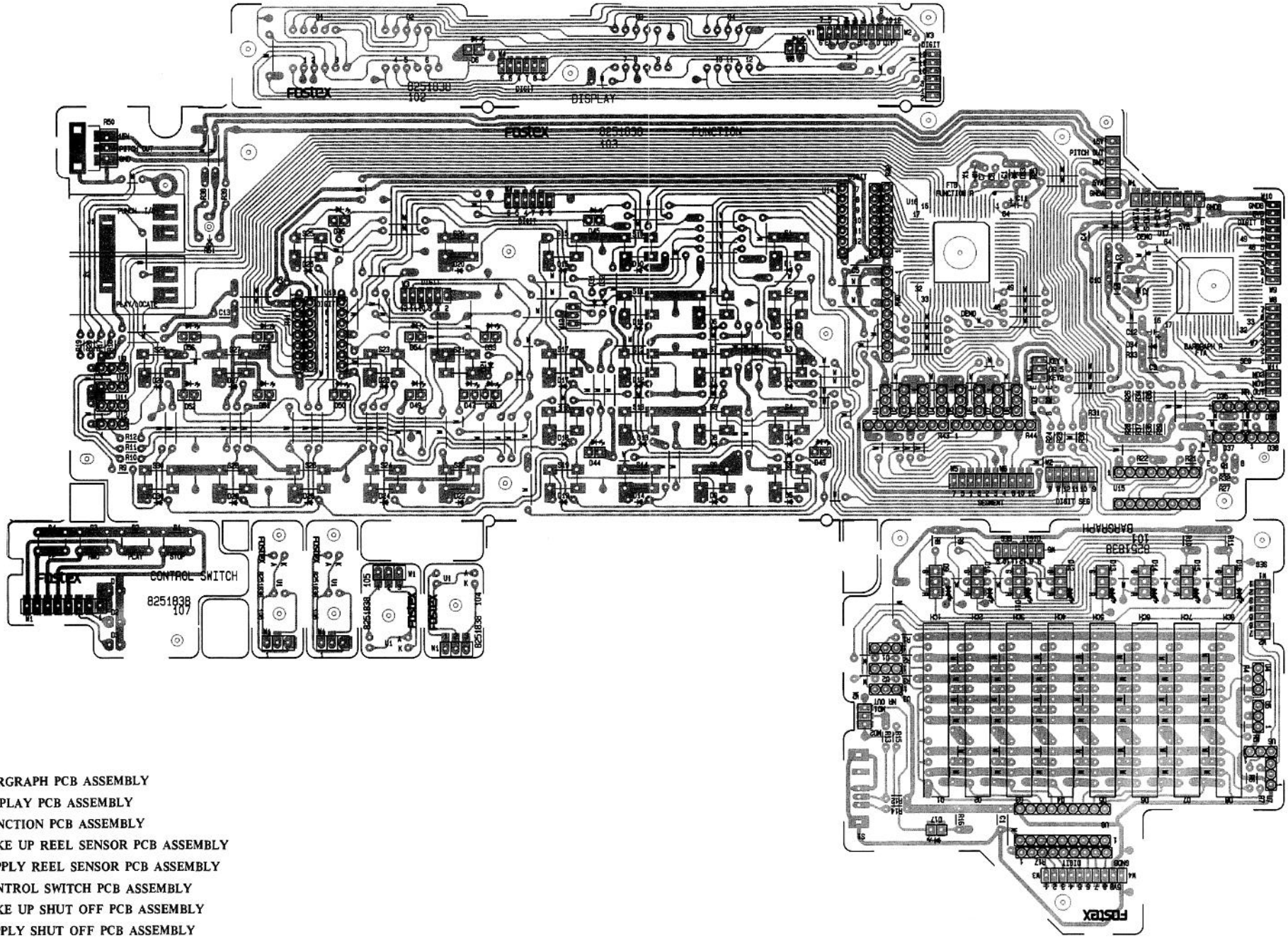
Ref. No.	Parts No.	Nomenclature
	8251 8381 04	Plain PCB, Shut off
U1	8234 0198 00	Opt., Photo-interrupter, GP-IS52
W1	8276 2400 45	Cable ASSY, 3P, red, 450mm (to SYSTEM CONTROL J15)

LINE IN PCB ASSEMBLY

LINE OUT PCB ASSEMBLY

SYNCHRO PCB ASSEMBLY





BARGRAPH PCB ASSEMBLY
DISPLAY PCB ASSEMBLY
FUNCTION PCB ASSEMBLY
TAKE UP REEL SENSOR PCB ASSEMBLY
SUPPLY REEL SENSOR PCB ASSEMBLY
CONTROL SWITCH PCB ASSEMBLY
TAKE UP SHUT OFF PCB ASSEMBLY
SUPPLY SHUT OFF PCB ASSEMBLY

LINE-IN PCB ASSEMBLY

PCB Ass'y No. 8273 4490 00

Ref. No.	Parts No.	Nomenclature
	8251 8390 01	Plain PCB, LINE-IN
J1	8245 0800 00	Connector, jack, RCA, 4P, blk.
J2	8245 0720 00	Connector, jack, RCA, 4P, blk.
W1	8276 5790 50	Cable ASSY, Shield, 8P, red, 500mm (to CONNECTOR BOARD J19)
W2	8276 5710 35	Cable ASSY, Shield, 8P, wht. 350mm (to CONNECTOR BOARD J17)

LINE-OUT PCB ASSEMBLY

PCB Ass'y No. 8273 4500 00

Ref. No.	Parts No.	Nomenclature
	8251 8390 02	Plain PCB, LINE-OUT
J1,2	8245 0800 00	Connector, jack, RCA, 4P, blk.
W1	8276 2370 30	Cable ASSY, 5P, wht., 300mm (to CONNECTOR BOARD J18)
W2	8276 2830 45	Cable ASSY, 5P, red, 450mm (to CONNECTOR BOARD J20)
W3	8276 1570 08	Wire wht., 80mm (to LINE-IN GND)

SYNCHRO PCB ASSEMBLY

PCB Ass'y No. 8273 4510 00

Ref. No.	Parts No.	Nomenclature
	8251 8390 03	Plain PCB, Synchro
J1	8245 0670 01	Connector, jack, FC. 20P
W1	8276 3000 40	Cable ASSY, 12P, wht. 400mm (to SYSTEM CONTROL J8)
W2	8276 2850 55	Cable ASSY, 6P, wht. 550mm (to SYSTEM CONTROL J10)
W3	8276 2790 10	Cable ASSY, 2P, wht. 100mm (to SERIAL J2)
	8276 0020 02	Wire jumper, 5mm, IPS-1041-2

CONNECTOR BOARD PCB ASSEMBLY

PCB Ass'y No. 8273 4450 00

Ref. No.	Parts No.	Nomenclature
	8251 8400 01	Plain PCB, Connector board
		IC's
U1-4	8236 0033 01	Digital, 4071B
U5-8	8236 0283 00	Analog, NJM3404AD
U9	8236 0328 00	Analog, multiplexer, 4052B
U10	8236 0536 00	Digital, meter con. R, μPD7533G
		TRANSISTORS
Q1,2	8234 0003 03	2SA1015GR
Q3	8234 0096 02	2SC732TM-BL
		DIODES
D1,3	8234 0088 00	GMB01-BT
D2	8234 0007 00	IN-4002
D4-30	8234 0088 00	GMB01-BT
D101-801	8234 0088 00	GMB01-BT
		CARBON RESISTORS
		All resistors 1/6W, ±5% unless otherwise noted.
R1	8230 1387 51	Flat mtg., 750Ω
R2	8230 1381 24	Flat mtg., 120kΩ
R3	8230 1381 04	Flat mtg., 100kΩ
R4	8230 1381 01	Flat mtg., 100Ω
R5	8230 1381 04	Flat mtg., 100kΩ
R6	8230 1381 04	Flat mtg., 100kΩ
R7	8230 1384 72	Flat mtg., 4.7kΩ
R8	8230 1382 22	Flat mtg., 2.2kΩ
R9-15	8230 1381 02	Flat mtg., 1kΩ
R16	8230 1381 03	Flat mtg., 10kΩ
R17-19	8230 0362 23	Array, 1/8W, 22kΩx4 RKC
⚠ R20	8230 0394 70	Flat mtg, 47Ω, 1/4W, unflammable
R21-R28	8230 1381 03	Flat mtg., 10kΩ
R29	8230 1381 02	Flat mtg., 1kΩ
R30	8230 1381 04	Flat mtg., 100kΩ
R31	8230 1385 13	Flat mtg., 51kΩ
R32	8230 1382 42	Flat mtg., 2.4kΩ
R33	8230 1382 42	Flat mtg., 2.4kΩ
R34	8230 1381 03	Flat mtg., 10kΩ
R35	8230 1382 23	Flat mtg., 22kΩ
R50	8230 1385 10	Flat mtg., 51Ω
R101-801	8230 1381 83	Flat mtg., 18kΩ
R102-802	8230 1384 73	Flat mtg., 47kΩ
R103-803	8230 1382 22	Flat mtg., 2.2kΩ
R104-804	8230 1382 23	Flat mtg., 22kΩ
R105-805	8230 1381 01	Flat mtg., 100Ω
R106-806	8230 1381 84	Flat mtg., 180kΩ
		CARBON POTS
R51-57	8231 0142 21	Pot., semi-fixed, flat, 220Ω
R107-807	8231 0144 73	Pot., Semi-fixed, flat, 47kΩ
		CAPACITORS
		ALU = Electrolytic type
		CER = Ceramic type
		PES = Mylar type
		PPR = Polypropylene type
C1	8232 1033 36	ALU, 16V, 33μF, 20%, LL
C4	8232 1431 07	ALU, 16V 100μF, 20%, SME-VB
C5	8232 1461 05	ALU, 50V, 1μF, 20%, SME-VB
C6	8232 1434 76	ALU, 16V, 47μF, 20%, SME-VB
C7-13	8232 9011 23	PES, 50V, 0.012μF, 5%, AMZV
C14	8232 1434 76	ALU, 16V, 47μF, 20%, SME-VB
C15	8232 1431 06	ALU, 16V, 10μF, 20%, SME-VB
C20, 21	8232 8011 81	CER, 50V, 180pF, 5%, SL
C22, 23	8232 8011 01	CER, 50V, 100pF, 5%, SL
C24, 25	8232 0401 04	CER, 12V, 0.1μF, 20%, Y5U
C26	8232 0401 04	CER, 12V, 0.1μF, 20%, Y5U
C27	8232 0061 05	ALU, 50V, 1μF, 20%, SM
C101-801	8232 9011 02	PES, 50V, 0.001μF, 5%, AMZV
C103-803	8232 1431 06	ALU, 16V, 10μF, 20%, SME-VB
		MISCELLANEOUS
	8276 0020 02	Wire, jumper, 5mm
	8276 0020 04	Wire, jumper, 10mm
W1	8276 2360 18	Cable ASSY, 4P, wht, 180mm (to SYSTEM CONTROL J5)
W2	8276 2950 15	Cable ASSY, 4P, yel. 150mm (to SYSTEM CONTROL J6)
W3	8276 3540 18	Cable ASSY, 8P, red, 180mm (to SYSTEM CONTROL J2)

Ref. No.	Parts No.	Nomenclature
W1-16	8245 0890 10	Connector, jack, 5245-10A
J17	8245 0530 08	Connector, jack, 8263, 8, Straight, wht.
J18	8245 0530 05	Connector, jack, 8263, 5, Straight wht.
J19	8245 0530 28	Connector, jack, 8263, 8, Striaght red
J20	8245 0530 25	Connector, jack, 8263, 5, Straight red
J21	8245 0530 24	Connector, jack, 8263, 4, Straight, red
J22	8245 0530 03	Connector, jack, 8263, 3, Straight, wht.
J23	8245 0530 43	Connector, jack, 8263, 3, Straight, blk.
L1	8242 1180 00	Transformer, bias
X1	8256 0560 00	Ceramic resonator, 500kHz

SERIAL PCB ASSEMBLY

PCB Ass'y No. 8273 4630 00

Ref. No.	Parts No.	Nomenclature
	8251 8400 06	Plain PCB, Serial
J1	8245 1700 01	Connector, socket, 8P, CMS5008-0303
J2	8245 0530 02	Connector, jack, 8263, 2P, Straight, wht.
W1	8276 2370 30	Cable ASSY, 5P, wht., 300mm (to SYSTEM CONTROL J21)

NR SWITCH PCB ASSEMBLY

PCB Ass'y No. 8273 4460 00

Ref. No.	Parts No.	Nomenclature
	8251 8400 02	Plain PCB, NR Switch
S1	8253 0400 04	Switch, Slide, 2-2, non-shorting, SSB022, L6
W1	8276 2800 40	Cable ASSY, 3P, wht., 400mm (to CONNECTOR BOARD J22)

FINE SWITCH PCB ASSEMBLY

PCB Ass'y No. 8273 4470 00

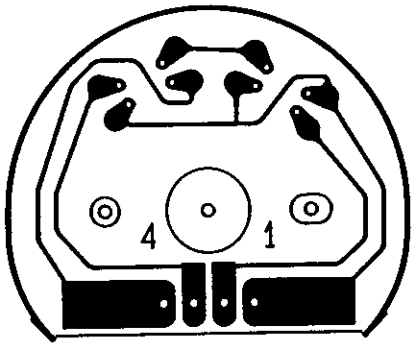
Ref. No.	Parts No.	Nomenclature
	8251 8400 03	Plain PCB, FINE switch
S1	8253 1090 02	Switch, push 2-2, self-lock, non-shorting, SPPJ2-M
W1	8276 2300 12	Cable ASSY, 3P, blk., 120mm (to CONNECTOR BOARD J23)
	8226 0621 00	Button, push, C-1

HEAD TERMINAL PCB ASSEMBLY

PCB Ass'y No. 8273 4480 00

Ref. No.	Parts No.	Nomenclature
	8251 8400 04	Plain PCB, Head terminal
W1,2	8276 5720 00	Cable ASSY, Shield head, R-8 (to CONNECTOR BOARD J1,7,9,15,2,8,10,16)

COUNT SENSOR PCB ASSEMBLY

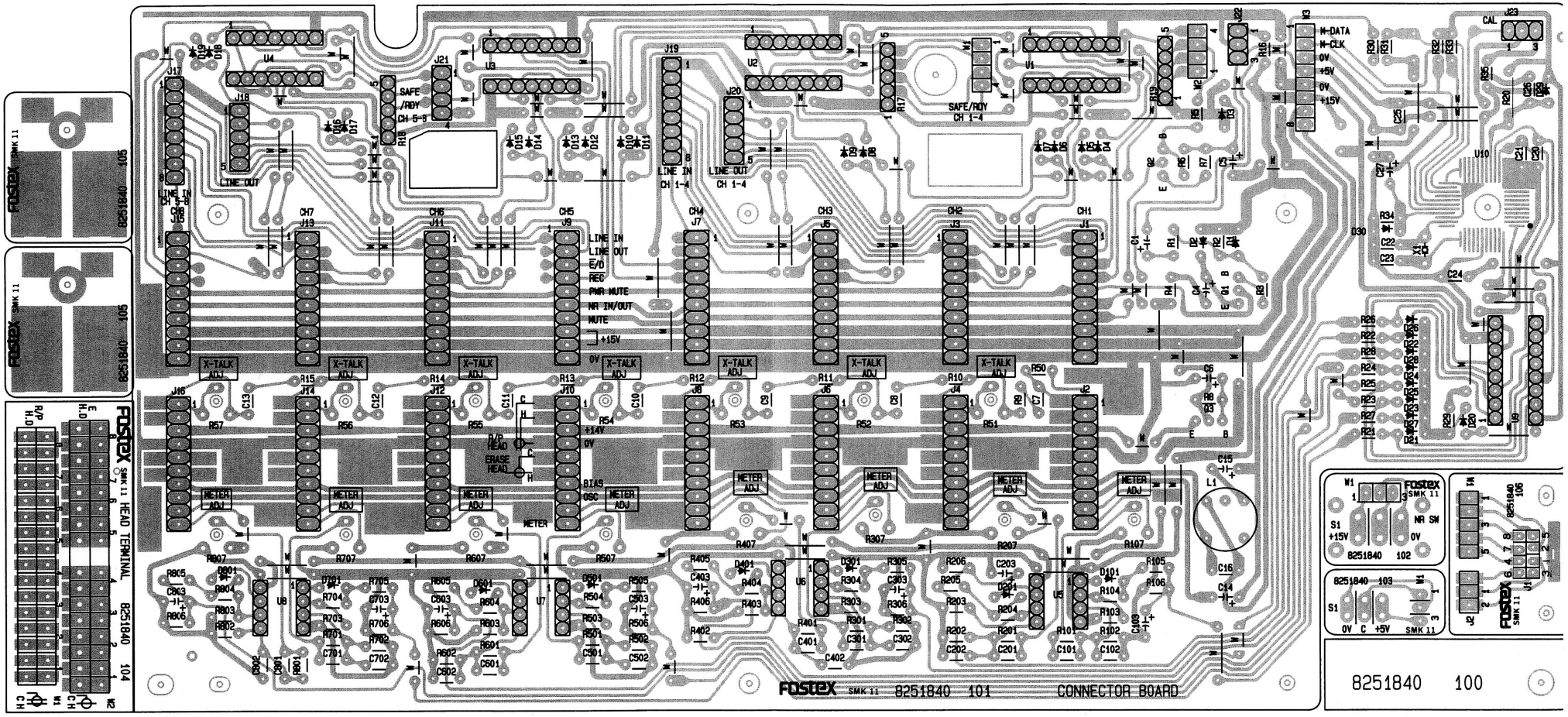


COUNT SENSOR PCB ASSEMBLY

PCB Ass'y No. 8273 4570 00

Ref. No.	Parts No.	Nomenclature
	8251 3121 00	Plain PCB, Count sensor
U1,2	8234 0182 04	Opt., photo-interrupter, GP-2S04, B
W1	8276 2820 45	Cable ASSY, 4P, blk., 450mm (to SYSTEM CONTROL J11)

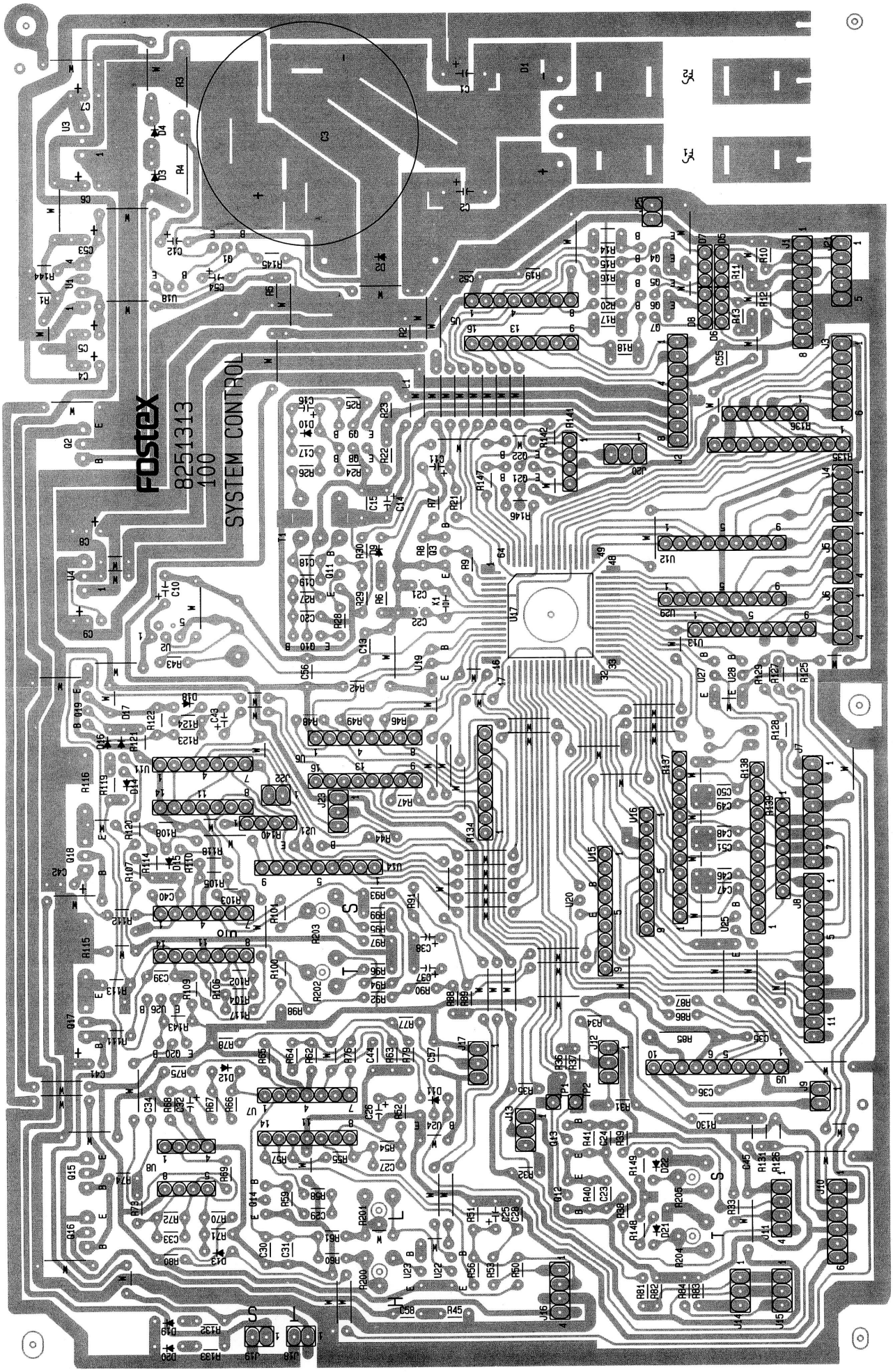
CONNECTOR BOARD PCB ASSEMBLY
SERIAL PCB ASSEMBLY
NR SWITCH PCB ASSEMBLY
FINE SWITCH PCB ASSEMBLY
HEAD TERMINAL PCB ASSEMBLY



SYSTEM CONTROL PCB ASSEMBLY

PCB Ass'y No. 8273 4580 01 FCA/CND
PCB Ass'y No. 8273 4580 02 EUR/UK/AUS
PCB Ass'y No. 8273 4580 03 DM

Ref. No.	Parts No.	Nomenclature
	8251 3131 00	Plain PCB, System control
		IC's
⚠ U1	8236 0331 00	Analog, PQ05R04
⚠ U2	8236 0330 02	Analog, L78LR05-MA
⚠ U3	8236 0332 08	Analog, L7815 ML
⚠ U4	8236 0332 08	Analog, L7815 ML
U5	8236 0028 01	Digital, CMOS, 4049UB
U6	8236 0029 01	Digital, CMOS, 4050B
U7	8236 0292 00	Analog, NJM3403AD
U8	8236 0215 00	Analog, NJM2904D
U9	8236 0302 00	Analog, motor driver, LB1645N
U10	8236 0292 00	Analog, NJM 3403AD
U11	8236 0270 00	Analog, Switch, 4066B
U12	8236 0508 03	Digital, driver, array, TD62554S
U13	8236 0508 02	Digital, driver, array, TD62553S
U14	8236 0508 02	Digital, driver, array, TD62553S
U15	8236 0508 02	Digital, driver, array, TD62553S
U16	8236 0508 02	Digital, driver, array, TD62553S
U17	8236 0535 00	Digital, system control R, MN17581FTC
U19	8236 0196 03	Driver, RN1003
U20	8236 0196 03	Driver, RN1003
U21	8236 0196 03	Driver, RN1003
U22	8236 0197 04	Driver, RN2004
U23	8236 0197 04	Driver, RN2004
U24	8236 0196 03	Driver, RN1003
U25	8236 0196 04	Driver, RN1004
U26	8236 0196 03	Driver, RN1003
U27	8236 0197 01	Driver, RN2001
U28	8236 0197 01	Driver, RN2001
U29	8236 0508 03	Digital, driver, array, TD62554S
		TRANSISTORS
⚠ Q2	8234 1722 00	2SD1830
⚠ Q3	8234 0002 06	2SC1815Y/GR/BL
Q4-7	8234 1422 01	2SC752G-Y
Q8	8234 0037 02	2SC2655-Y
Q9	8234 0038 02	2SA1020-Y
Q10	8234 0002 07	2SC1815GR/BL
Q11	8234 0002 06	2SC1815Y/GR/BL
Q12,13	8234 0002 07	2SC1815GR/BL
Q14	8234 0002 07	2SC1815GR/BL
Q15	8234 1722 00	2SD1830
Q16	8234 1240 00	2SD1223
Q17,18	8234 1722 00	2SD1830
Q19	8234 0002 07	2SC1815GR/BL
Q20	8234 0002 07	2SC1815GR/BL
		DIODES
⚠ D1	8234 0175 02	Stack, KBU8D
⚠ D2	8234 0160 02	DSC30TC-FD1
⚠ D3	8234 0162 02	DSK10C
⚠ D4	8234 0162 02	DSK10C
D5,6	8234 0039 00	Array, MA154WK
D7,8	8234 0040 00	Array, MA154WA
⚠ D9,20	8234 0088 00	GMB01-BT
		CARBON RESISTORS
		All resistors 1/6W, ±5% unless otherwise noted.
R1	8230 1381 03	Flat mtg., 10kΩ
R2	8230 1381 03	Flat mtg., 10kΩ
⚠ R3	8230 0414 71	Flat mtg., 470Ω, unflammable 1/2W
⚠ R4	8230 0414 71	Flat mtg., 470Ω, unflammable 1/2W
R5	8230 1381 03	Flat mtg., 10kΩ
R6	8230 1381 02	Flat mtg., 1kΩ
R7	8230 1381 03	Flat mtg., 10kΩ
R8	8230 1381 03	Flat mtg., 10kΩ
R9	8230 1384 73	Flat mtg., 47kΩ
R10	8230 1382 21	Flat mtg., 220Ω
R11	8230 1382 21	Flat mtg., 220Ω
R12	8230 1382 21	Flat mtg., 220Ω
R13	8230 1382 21	Flat mtg., 220Ω
R14	8230 1386 82	Flat mtg., 6.8kΩ
R15	8230 1386 82	Flat mtg., 6.8kΩ
R16	8230 1386 82	Flat mtg., 6.8kΩ
R17	8230 1386 82	Flat mtg., 6.8kΩ
R18	8230 1386 82	Flat mtg., 6.8kΩ
R19	8230 1381 03	Flat mtg., 10kΩ
R20	8230 1381 03	Flat mtg., 10kΩ
R21	8230 1382 23	Flat mtg., 22kΩ
R22	8230 1381 09	Flat mtg., 1Ω
R23	8230 1381 09	Flat mtg., 1Ω



SYSTEM CONTROL PCB ASSEMBLY

Ref. No.	Parts No.	Nomenclature
R24	8230 1385 62	Flat mtg., 5.6kΩ
R25	8230 1385 62	Flat mtg., 5.6kΩ
R26	8230 1385 60	Flat mtg., 56Ω
R27	8230 1381 24	Flat mtg., 120kΩ
R28	8230 1382 20	Flat mtg., 22Ω
R29	8230 1381 03	Flat mtg., 10kΩ
R30	8230 1381 03	Flat mtg., 10kΩ
R31	8230 1384 71	Flat mtg., 470Ω
R32	8230 1384 71	Flat mtg., 470Ω
R33	8230 1382 21	Flat mtg., 220Ω
R34	8230 1382 23	Flat mtg., 22kΩ
R35	8230 1382 23	Flat mtg., 22kΩ
R36	8230 1382 23	Flat mtg., 22kΩ
R37	8230 1382 23	Flat mtg., 22kΩ
R38	8230 1381 03	Flat mtg., 10kΩ
R39	8230 1381 03	Flat mtg., 10kΩ
R40	8230 1381 03	Flat mtg., 10kΩ
R41	8230 1381 03	Flat mtg., 10kΩ
R42	8230 1382 23	Flat mtg., 22kΩ
R43	8230 1381 52	Flat mtg., 1.5kΩ
R44	8230 1383 32	Flat mtg., 3.3kΩ
R46	8230 1381 05	Flat mtg., 1MΩ
R47	8230 1381 05	Flat mtg., 1MΩ
R48	8230 1381 05	Flat mtg., 1MΩ
R49	8230 1381 05	Flat mtg., 1MΩ
R50	8230 1381 03	Flat mtg., 10kΩ
R51	8230 1381 03	Flat mtg., 10kΩ
R52	8230 1382 22	Flat mtg., 2.2kΩ
R53	8230 1381 03	Flat mtg., 10kΩ
R54	8230 1384 73	Flat mtg., 47kΩ
R55	8230 1381 03	Flat mtg., 10kΩ
R56	8230 1381 03	Flat mtg., 10kΩ
R57	8230 1381 04	Flat mtg., 100kΩ
R58	8230 1382 22	Flat mtg., 2.2kΩ
R59	8230 1381 03	Flat mtg., 10kΩ
R60	8230 0234 33	Vertical mtg., 43kΩ, Metal 1/4W, 1%
R61	8230 1381 04	Flat mtg., 100kΩ
R62	8230 1383 03	Flat mtg., 30kΩ
R63	8230 0233 03	Vertical mtg., 30kΩ, Metal, 1/4W, 1%
R64	8230 1382 23	Flat mtg., 22kΩ
R65	8230 1382 22	Flat mtg., 2.2kΩ
R66	8230 1381 03	Flat mtg., 10kΩ
R67	8230 1381 02	Flat mtg., 1kΩ
R68	8230 1381 03	Flat mtg., 10kΩ
R69	8230 1381 02	Flat mtg., 1kΩ
R70	8230 1381 23	Flat mtg., 12kΩ
R71	8230 1381 23	Flat mtg., 12kΩ
R72	8230 1381 03	Flat mtg., 10kΩ
R73	8230 1381 02	Flat mtg., 1kΩ
R74	8230 1381 02	Flat mtg., 1kΩ
R75	8230 1381 05	Flat mtg., 1MΩ
R76	8230 1381 04	Flat mtg., 100kΩ
R77	8230 1381 03	Flat mtg., 10kΩ
R78	8230 0231 04	Vertical mtg., 100kΩ, Metal, 1/4W, 1%
R79	8230 0231 04	Vertical mtg., 100kΩ, Metal, 1/4W, 1%
R80	8230 1382 23	Flat mtg., 22kΩ
R81	8230 1381 04	Flat mtg., 100kΩ
R82	8230 1382 23	Flat mtg., 22kΩ
R83	8230 1384 71	Flat mtg., 470 Ω
R84	8230 1384 71	Flat mtg., 470Ω
⚠ R85	8230 0411 00	Flat mtg., 10Ω unflammable, 1/2W
R86	8230 1381 03	Flat mtg., 10kΩ
R87	8230 1381 03	Flat mtg., 10kΩ
R88	8230 1384 72	Flat mtg., 4.7kΩ
R89	8230 1384 72	Flat mtg., 4.7kΩ
R90	8230 1384 73	Flat mtg., 47kΩ
R91	8230 1384 73	Flat mtg., 47kΩ
R92	8230 1384 73	Flat mtg., 47kΩ
R93	8230 1384 73	Flat mtg., 47kΩ
R94	8230 1381 02	Flat mtg., 1kΩ
R95	8230 1381 02	Flat mtg., 1kΩ
R96	8230 1386 21	Flat mtg., 620Ω
R97	8230 1386 21	Flat mtg., 620Ω
R98	8230 1381 14	Flat mtg., 110kΩ
R99	8230 1381 14	Flat mtg., 110kΩ
R100	8230 1381 23	Flat mtg., 12kΩ
R101	8230 1381 23	Flat mtg., 12kΩ
R102	8230 1382 03	Flat mtg., 20kΩ
R103	8230 1382 03	Flat mtg., 20kΩ
R104	8230 1382 24	Flat mtg., 220kΩ
R105	8230 1382 24	Flat mtg., 220kΩ
R106	8230 1384 73	Flat mtg., 47kΩ
R107	8230 1384 73	Flat mtg., 47kΩ
R108	8230 1381 02	Flat mtg., 1kΩ
R109	8230 1382 23	Flat mtg., 22kΩ
R110	8230 1384 72	Flat mtg., 22kΩ
R111	8230 1384 72	Flat mtg., 4.7kΩ
R112	8230 1384 72	Flat mtg., 4.7kΩ
R113	8230 1382 22	Flat mtg., 2.2kΩ
R114	8230 1382 22	Flat mtg., 2.2kΩ
R115	8230 0321 09	Flat mtg., 1Ω Cement, 5W, 10%

Ref. No.	Parts No.	Nomenclature
R116	8230 0321 09	Flat mtg., 1Ω Cement, 5W, 10%
R117	8230 1381 04	Flat mtg., 100kΩ
R118	8230 1381 04	Flat mtg., 100kΩ
R119	8230 1383 62	Flat mtg., 3.6kΩ
R120	8230 1381 03	Flat mtg., 10kΩ
R121	8230 1384 73	Flat mtg., 47kΩ
R122	8230 1384 73	Flat mtg., 470kΩ
R123	8230 1384 73	Flat mtg., 47kΩ
R124	8230 1381 02	Flat mtg., 1kΩ
R125	8230 1384 71	Flat mtg., 470Ω
R126	8230 1382 23	Flat mtg., 22kΩ
R127	8230 1384 71	Flat mtg., 470Ω
R128	8230 1384 71	Flat mtg., 470Ω
R129	8230 1384 71	Flat mtg., 470Ω
R130	8230 1381 04	Flat mtg., 100kΩ
R131	8230 1381 03	Flat mtg., 10kΩ
R132	8230 0572 01	Carbon, 200Ω, 1/2W, Straight
R133	8230 0572 01	Carbon, 200Ω, 1/2W, Straight
R134	8230 0381 04	Array, 1/4W, 100kΩ×4, 5%, RKC-S
R135	8230 0681 04	Array, 1/4W, 100kΩ×5, 5%, RKC-S
R136	8230 0522 23	Array, 1/8W, 22kΩ×5, 5%, RKC
R137	8230 0691 04	Array, 1/4W, 100kΩ×6, 5%, RKC-S
R138	8230 0691 03	Array, 1/4W, 10kΩ×6, 5%, RKC-S
R139	8230 0592 23	Array, 1/8W, 22kΩ×6, 5%, RKC
R140	8230 0604 72	Array, 1/8W, 4.7kΩ×3, 5%, RKC
R141	8230 0603 31	Array, 1/8W, 330Ω×3, 5%, RKC
R142	8230 1382 23	Flat mtg., 22k
R143	8230 1382 23	Flat mtg., 22k
R144	8230 1384 74	Flat mtg., 470k

CARBON POTS

R200	8231 0011 53	Pot., semi-fixed, metal, flat, 15kΩ, B
R202	8231 0031 02	Pot., semi-fixed, carbon, flat, 1kΩ, B
R203	8231 0031 02	Pot., semi-fixed, carbon, flat 1kΩ, B

Ref. No.	Parts No.	Nomenclature

CAPACITORS

ALU = Electrolytic type
CER = Ceramic type
PES = Mylar type
PPR = Polypropylene type

C1	8232 0962 28	ALU, 25V, 2200μF, 20%, SME
C2	8232 0973 38	ALU, 35V, 3300μF, 20%, SME
C3	8232 1341 59	ALU, 35V, 15000μF, 20%, SME-LISN-40C
C4	8232 1461 05	ALU, 50V, 1μF, 20%, SME
C5	8232 1434 76	ALU, 16V, 47μF, 20%, SME
C6	8232 1461 05	ALU, 50V, 1μF, 20%, SME
C7	8232 1461 05	ALU, 50V, 1μF, 20%, SME
C8	8232 1461 05	ALU, 50V, 1μF, 20%, SME
C9	8232 1461 05	ALU, 50V, 1μF, 20%, SME
C10	8232 1461 05	ALU, 50V, 1μF, 20%, SME
C11	8232 1464 74	ALU, 50V, 0.47μF, 20%, SME
C12	8232 0972 27	ALU, 35V, 220μF, 20%, SME
C13	8232 8031 03	CER, 50V, 0.01μF, $^{+80}_{-20}$, YF
C14	8232 1433 36	ALU, 16V, 33μF, 20%, SME
C15	8232 8031 03	CER, 50V, 0.01μF, $^{+80}_{-20}$, YF
C16	8232 1464 74	ALU, 50V, 0.47μF, 20%, SME
C17	8232 9011 03	PES, 50V, 0.01μF, 5%, AMZV
C18	8232 0318 22	PPR, 100V, 0.0082μF, 5%, APS
C19	8232 9011 02	PES, 50V, 0.001μF, 5%, AMZV
C20	8232 9014 72	PES, 50V, 0.0047μF, 5%, AMZV
C21	8232 0323 00	CER, 50V, 30pF, 5%, NPO
C22	8232 0323 00	CER, 50V, 30pF, 5%, NPO
C23	8232 9011 03	PES, 50V, 0.01μF, 5%, AMZV
C24	8232 9011 03	PES, 50V, 0.01μF, 5%, AMZV
C25	8232 1434 76	ALU, 16V, 47μF, 20%, SME
C26	8232 1461 05	ALU, 50V, 1μF, 20%, SME
C27	8232 0313 31	PPR, 100V, 330pF, 20%, APS
C28	8232 9011 03	PES, 50V, 0.01μF, 5%, AMZV
C29	8232 0313 31	PPR, 100V, 330pF, 5%, APS
C30	8232 0313 32	PPR, 100V, 0.0033μF, 5%, APS
C31	8232 9016 82	PES, 50V, 0.0068μF, 5%, AMZV
C32	8232 1464 75	ALU, 50V, 4.7μF, 5%, SME
C33	8232 9011 52	PES, 50V, 0.0015μF, 5%, AMZV

Ref. No.	Parts No.	Nomenclature
C35	8232 8001 04	CER, 16V, 0.1μF, $^{+80}_{-20}$, YF
C36	8232 8031 03	CER, 50V, 0.01μF, +30 -20% YF
C37	8232 1431 06	ALU, 16V, 10μF, 20%, SME
C38	8232 1431 06	ALU, 16V, 10μF, 20%, SME
C39	8232 9011 53	PES, 50V, 0.015μF, 5%, AMZV
C40	8232 9011 53	PES, 50V, 0.015μF, 5%, AMZV
C41	8232 0952 26	ALU, 16V, 22μF, 20%, SME
C42	8232 0952 26	ALU, 16V, 22μF, 20%, SME
C43	8232 1462 25	ALU, 50V, 2.2μF, 20%, SME
C44	8232 9011 03	PES, 50V, 0.01μF, 5%, AMZV
C45-51	8232 8031 03	CER, 50V, 0.01μF, $^{+80}_{-20}$, YF
C52	8232 8031 03	CER, 50V, 0.01μF, $^{+80}_{-20}$, YF
C53	8232 1464 75	ALU, 50V, 4.7μF, 20%, SME
C55-57	8232 8031 03	CER, 50V, 0.01μF, $^{+80}_{-20}$, YF

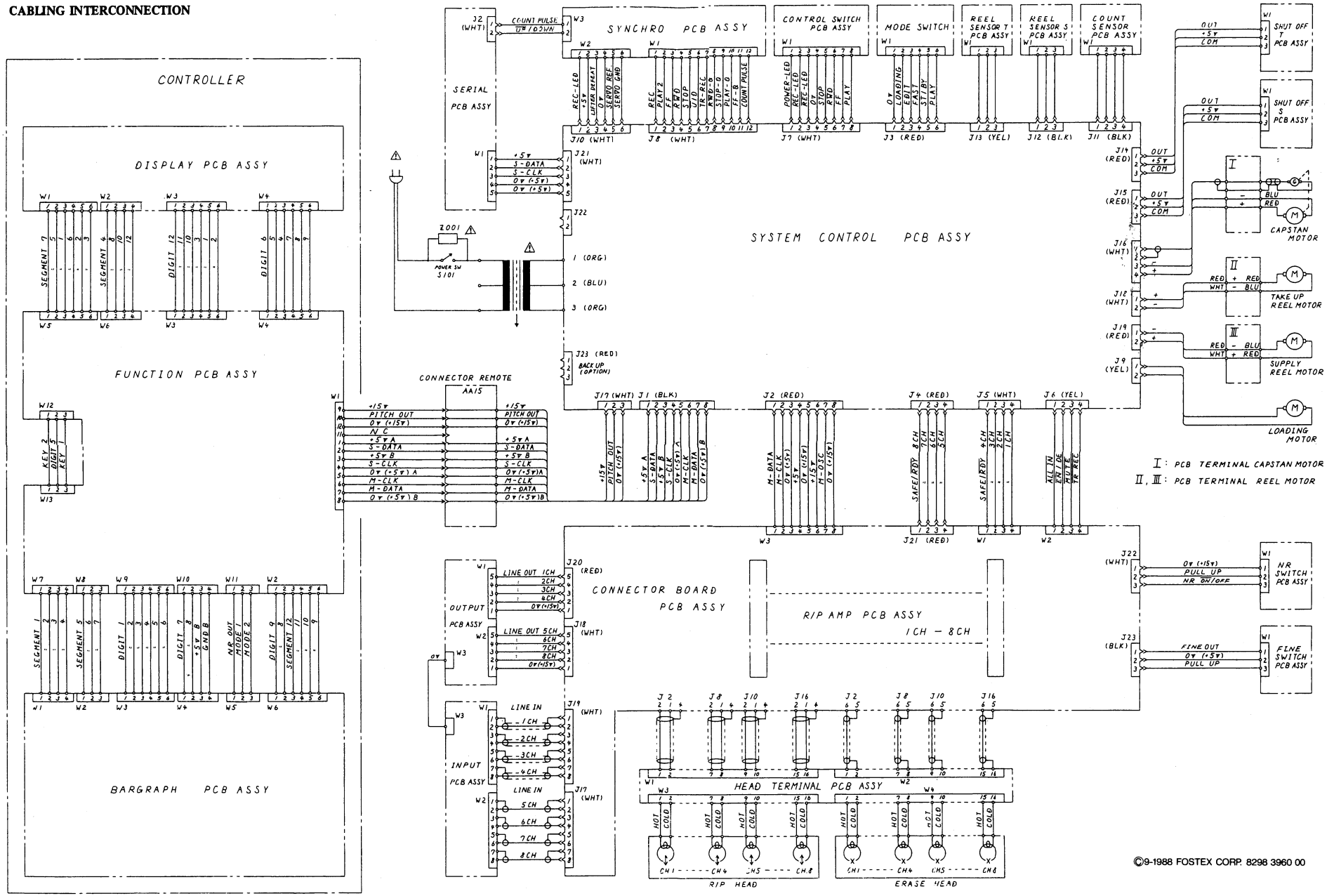
MISCELLANEOUS

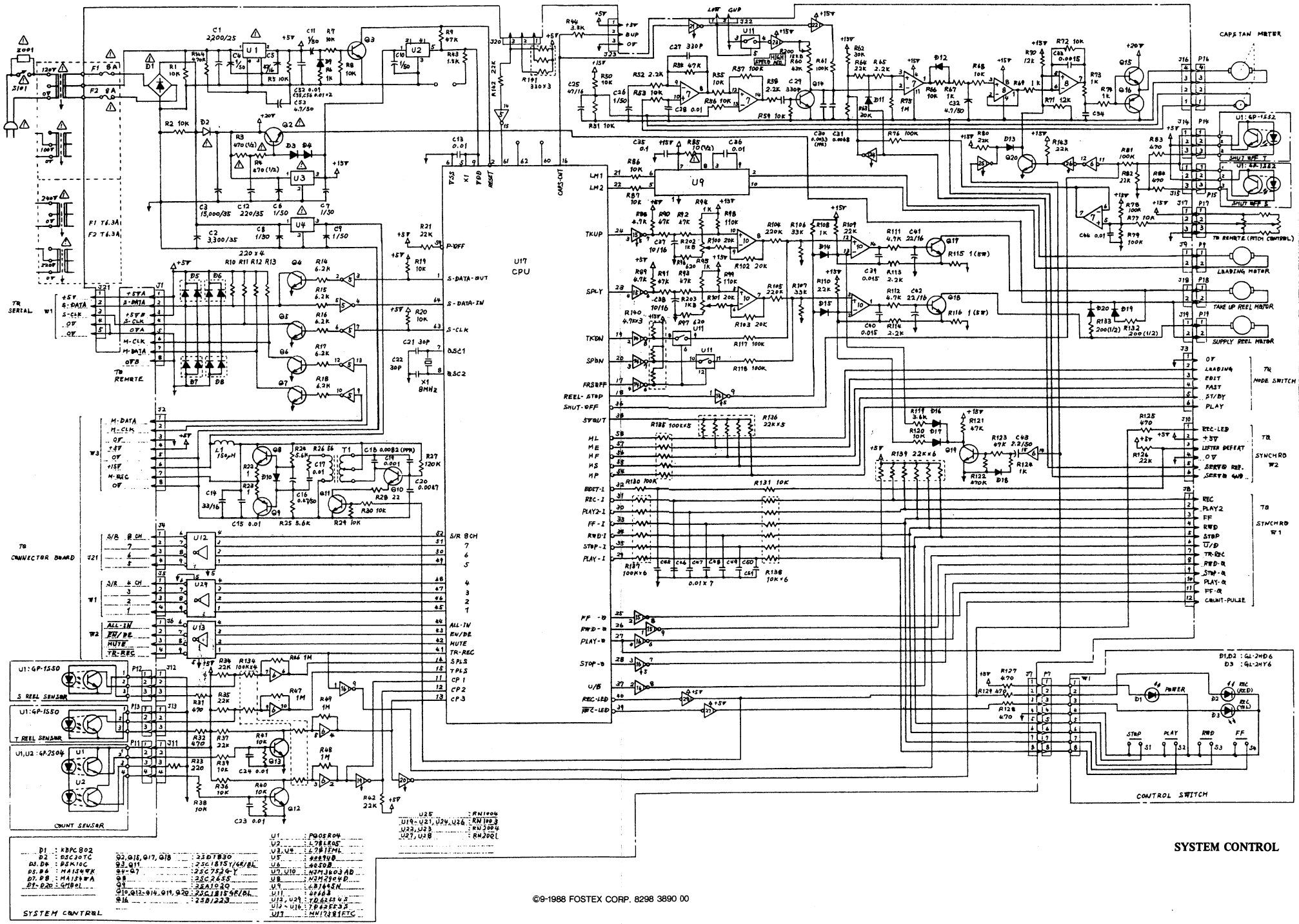
⚠ F1	8239 0011 80	Fuse, DM, anti-rush, 8A
⚠ F1	8239 0006 80	Fuse, UL/CSA, anti-rush, 8A
⚠ F1	8239 0007 63	Fuse, SEMKO, time lag, 6.3A
⚠ F2	8239 0011 80	Fuse, DM, anti-rush, 8A
⚠ F2	8239 0006 80	Fuse, UL/CSA, anti-rush, 8A
⚠ F2	8239 0007 63	Fuse, SEMKO, time-lag, 6.3A
⚠	8239 0001 00	Holder,fuse,SN5051,FCA/CND/DM
⚠	8239 0012 00	Holder,fuse,SN5056,EUR/UK/AUS
⚠	8218 0980 63	Label, fuse, T6.3A
J1	8245 1750 01	Connector, plug, IMSA-9206-H-T
J1	8245 0530 48	Connector, jack, 8263, 8P, Straight, blk.
J2	8245 0530 28	Connector, jack, 8263, 8P, Straight, red
J3	8245 0530 26	Connector, jack, 8263, 8P, Straight, red
J4	8245 0530 24	Connector, jack, 8263, 4P, Straight, red
J5	8245 0530 04	Connector, jack, 8263, 4P, Straight, wht.
J6	8245 0530 64	Connector, jack, 8263, 4P, Straight, yel.
J7	8245 0530 08	Connector, jack, 8263, 8P, Straight, wht.
J8	8245 0530 12	Connector, jack, 8263, 12P, Straight, wht.
J9	8245 0530 62	Connector, jack, 8263, 2P, Straight, yel.

Ref. No.	Parts No.	Nomencalture
J10	8245 0530 06	Connector, jack, 8263, 6P, Straight, wht.
J11	8245 0530 44	Connector, Jack, 8263, 4P, Straight, blk.
J12	8245 0530 43	Connector, Jack, 8263, 3P, Straight, blk.
J13	8245 0530 63	Connector, Jack, 8263, 3P, Straight, yel.
J14	8245 0530 23	Connector, Jack, 8263, 3P, Straight, red
J15	8245 0530 23	Connector, Jack, 8263, 3P, Straight, red
J16	8245 0530 04	Connector, Jack, 8263, 4P, Straight, wht.
J17	8245 0530 03	Connector, Jack, 8263, 3P, Straight, wht.
J18	8245 0530 02	Connector, Jack, 8263, 2P, Straight, wht.
J19	8245 0530 22	Connector, Jack, 8263, 2P, Straight, red
J21	8245 0530 05	Connector, jack, 8263, 5P, Straight, wht.
J22	8245 1761 02	Connector, jack, IMSA-9202B-1-O2-T
J23	8245 0530 23	Connector, jack, 8263, 3P, Straight, red
L1	8242 0530 00	Coil, 150μH
T1	8242 0940 00	Transformer, master OSC
X1	8256 0550 00	Ceramic resonator, 8MHz
	8276 0020 04	Wire jumper, 10mm, IPS-1041-4
	8276 0020 02	Wire jumper, 5mm IPS-1041-2
	8239 0010 01	TR accessory, kit
	8220 5491 00	Heat sink, diode
		Screw, PTT3x12 CZn
		Washer, W3 CZn
		Washer, LW3

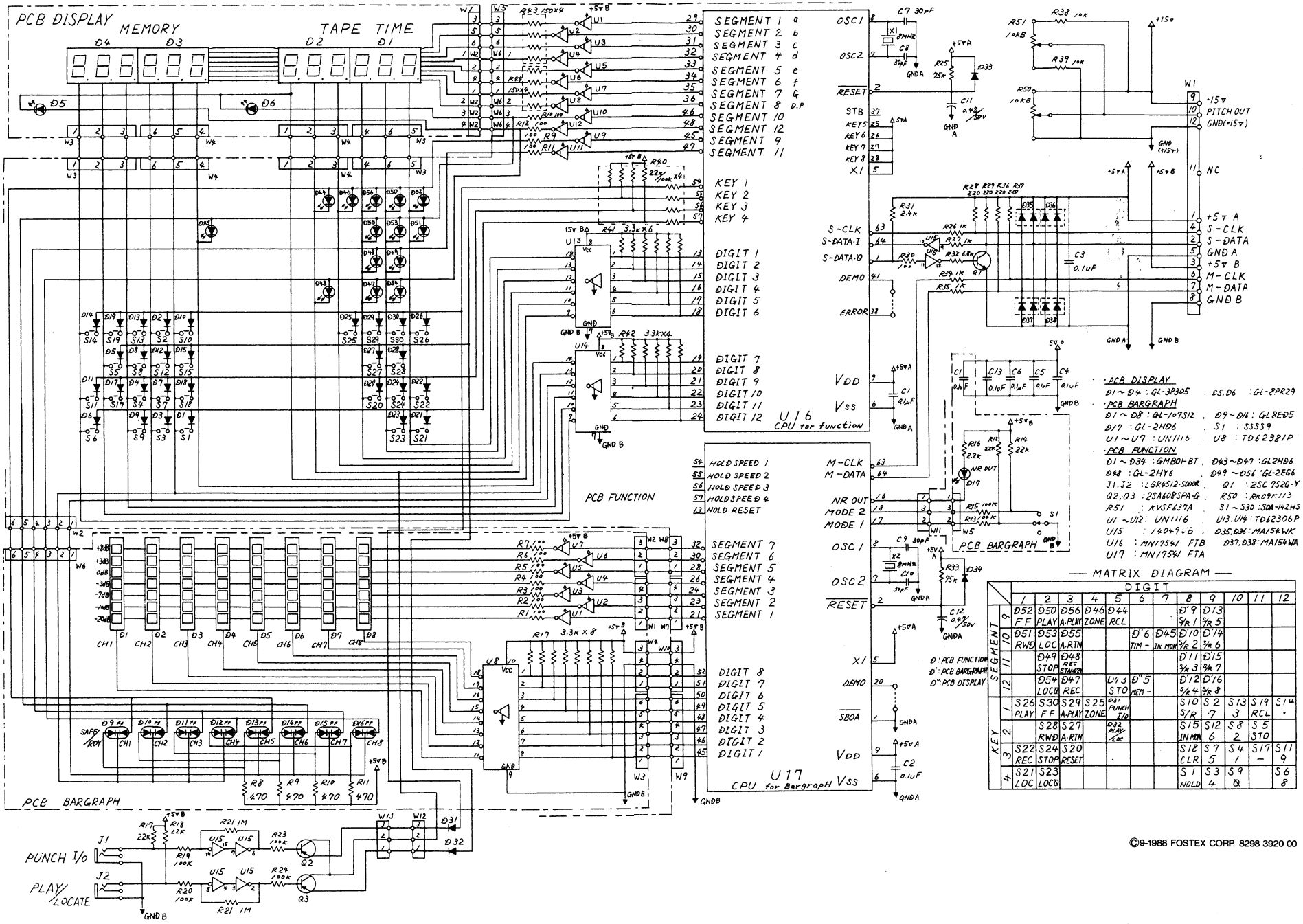
6. CIRCUIT DIAGRAM

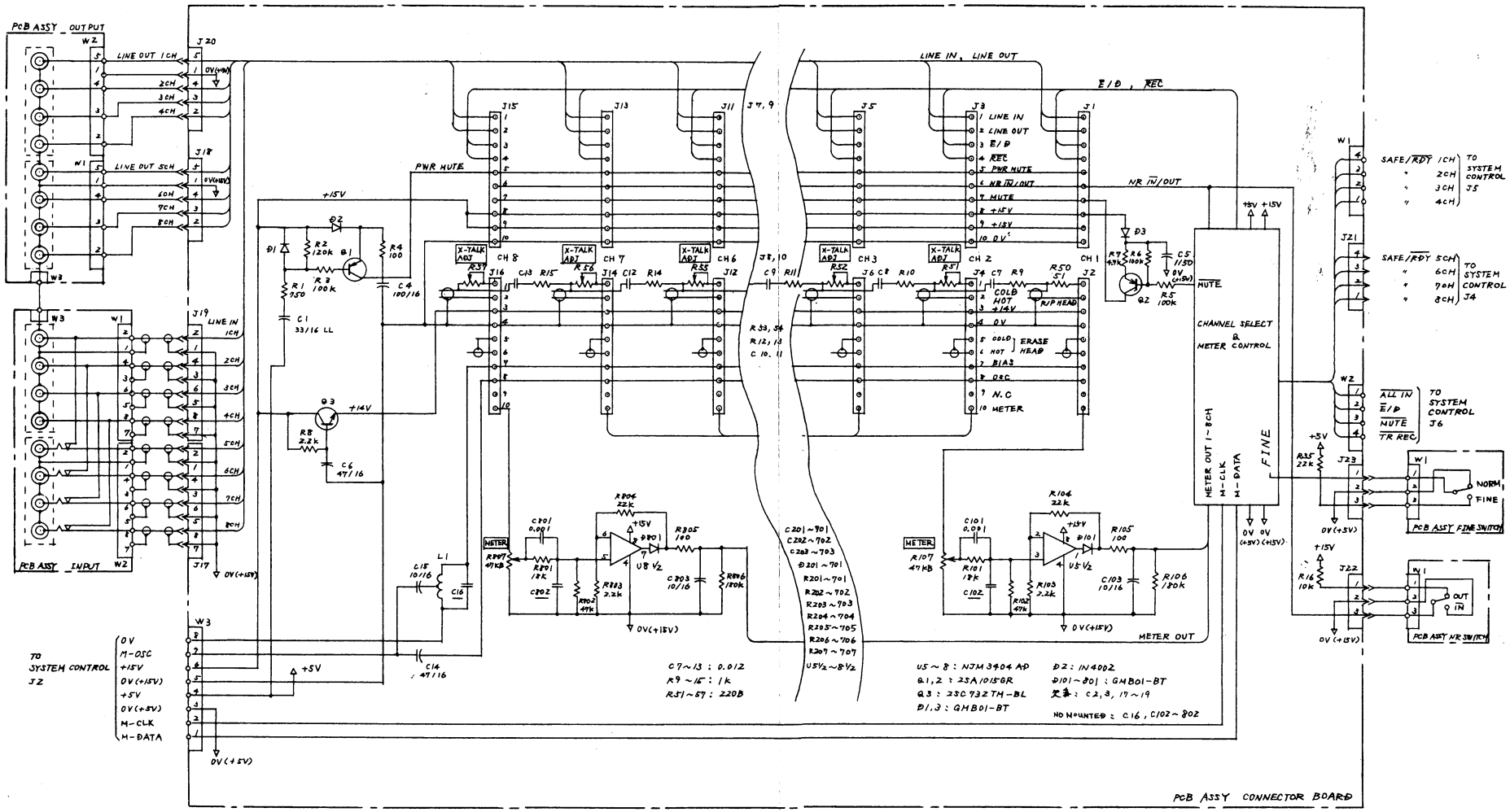
CABLING INTERCONNECTION



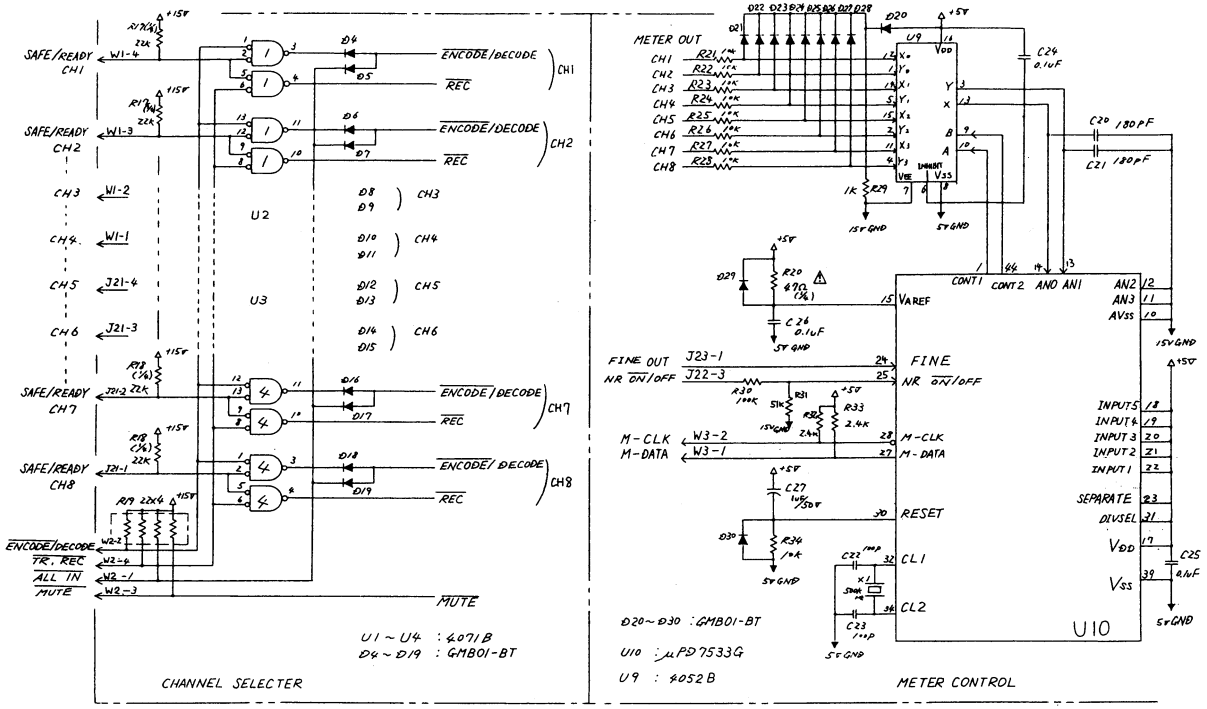


SYSTEM CONTROL

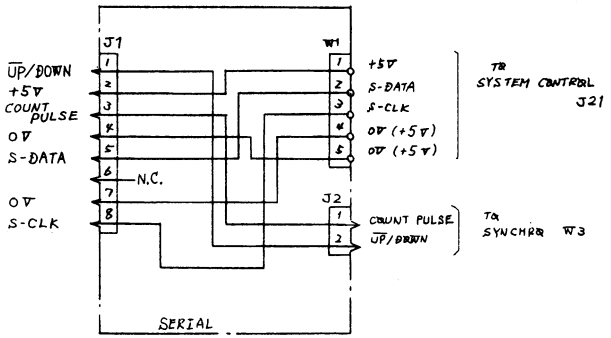




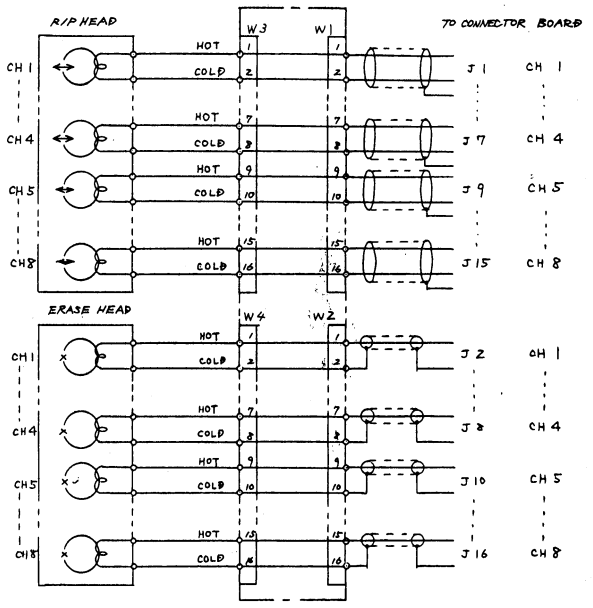
CHANNEL SELECTOR/METER CONTROL



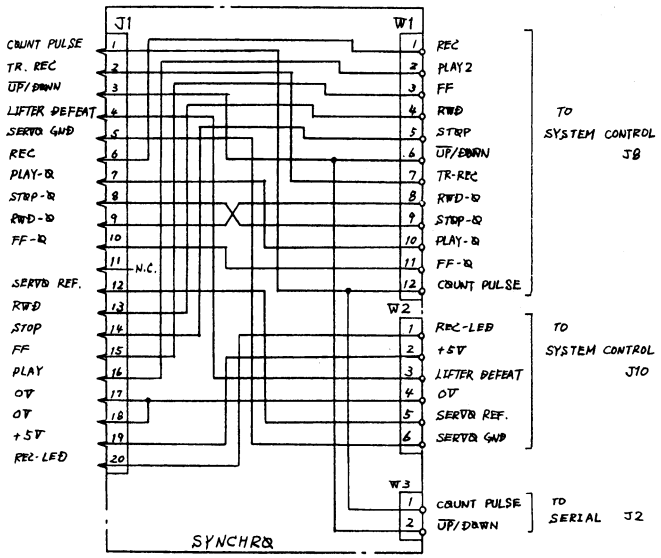
SERIAL

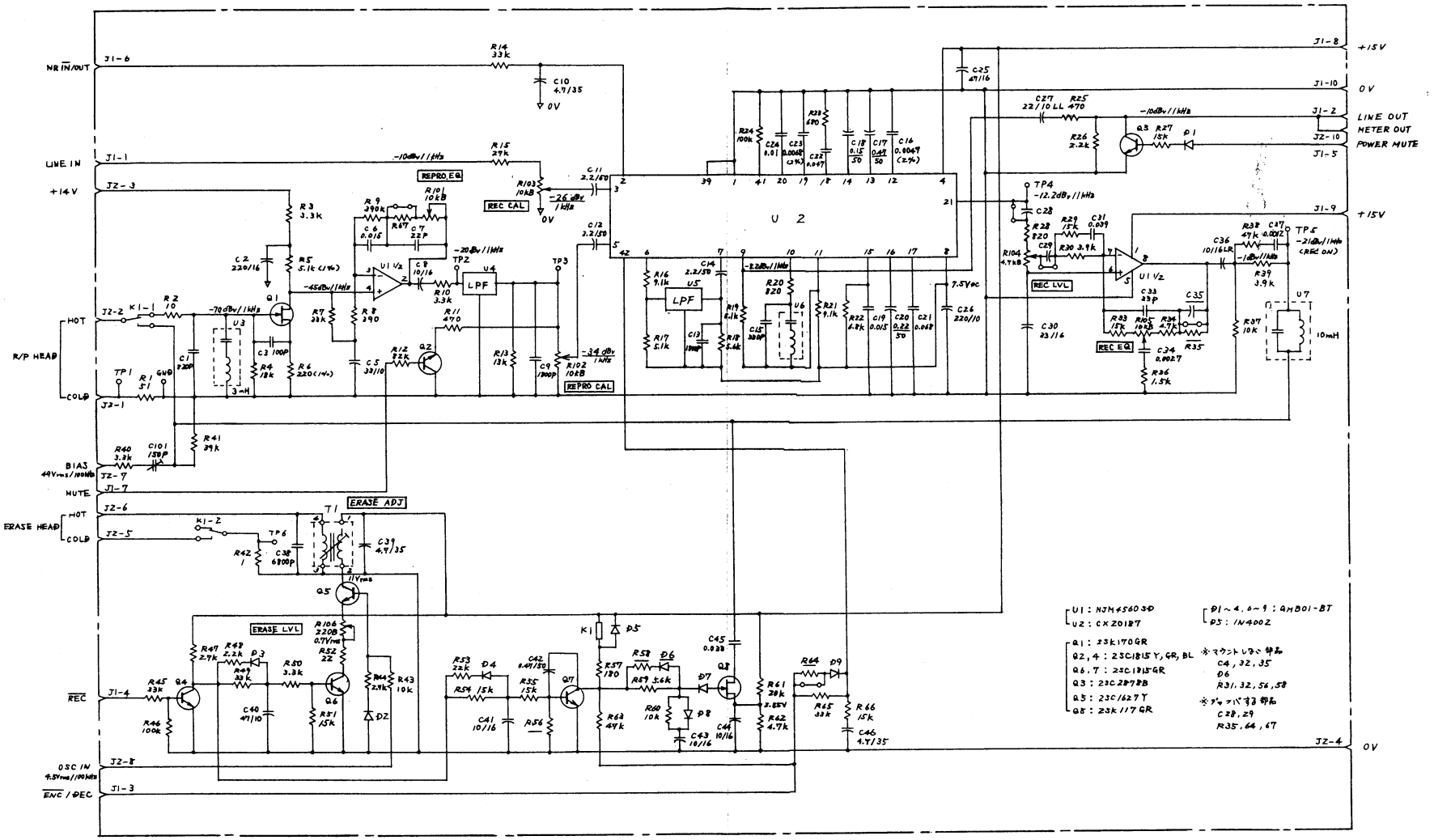


HEAD TERMINAL



SYNCHRO





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