

TASCAM

TEAC Professional Division

TSR-8

1/2" 8-Track Recorder/Reproducer



OPERATION/MAINTENANCE

The guarantee provided for the TSR-8 has several restrictions. The TSR-8 will perform properly only if it is adjusted properly and we guarantee that such adjustment is possible. Setup is not covered by Warranty. If your attempts at internal adjustments are unsuccessful, we will charge you for readjustments.

Recording is an art as well as a science. As a result, your finished product may be judged more by artistic criteria than technical performance. Art is the province of the artist and TASCAM can make no guarantee that the TSR-8, *by itself*, will assure the quality of your work.

Your skill as a technician and your abilities as an artist will be significant factors in the results you achieve.

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CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN



CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

This appliance has a serial number located on the rear panel. Please record the model number and serial number and retain them for your records.
Model number _____
Serial number _____

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

SAFETY INSTRUCTIONS

CAUTION:

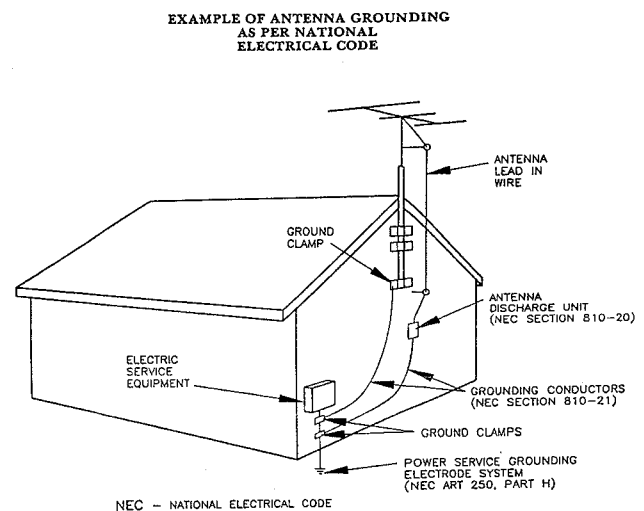
- Read all of these instructions.
- Save these instructions for later use.
- Follow all warnings and instructions marked on the audio equipment.

1. **Read Instructions** — All the safety and operating instructions should be read before the appliance is operated.
 2. **Retain Instructions** — The safety and operating instructions should be retained for future reference.
 3. **Heed Warnings** — All warnings on the appliance and in the operating instructions should be adhered to.
 4. **Follow Instructions** — All operating and use instructions should be followed.
 5. **Water and Moisture** — The appliance should not be used near water — for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.
 6. **Carts and Stands** — The appliance should be used only with a cart or stand that is recommended by the manufacturer.
- 6A. An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.



7. **Wall or Ceiling Mounting** — The appliance should be mounted to a wall or ceiling only as recommended by the manufacturer.
8. **Ventilation** — The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
9. **Heat** — The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.
10. **Power Sources** — The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
11. **Grounding or Polarization** — The precautions that should be taken so that the grounding or polarization means of an appliance is not defeated.
12. **Power-Cord Protection** — Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

13. **Cleaning** — The appliance should be cleaned only as recommended by the manufacturer.
14. **Power Lines** — An outdoor antenna should be located away from power lines.
15. **Outdoor Antenna Grounding** — If an outside antenna is connected to the receiver, be sure the antenna system is grounded so as to provide some protection against voltage surges and built up static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70 — 1984, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode. See Figure below.



16. **Nonuse Periods** — The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
17. **Object and Liquid Entry** — Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
18. **Damage Requiring Service** — The appliance should be serviced by qualified service personnel when:
 - A. The power-supply cord or the plug has been damaged; or
 - B. Objects have fallen, or liquid has been spilled into the appliance; or
 - C. The appliance has been exposed to rain; or
 - D. The appliance does not appear to operate normally or exhibits a marked change in performance; or
 - E. The appliance has been dropped, or the enclosure damaged.
19. **Servicing** — The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

Introduction

The TSR-8 is an exceptionally reliable and versatile high-performance 8-track, 8-channel tape recorder/reproducer that uses 1/2-inch wide tape on 10-1/2-inch reels and operates at tape speed of 15 ips (38 cm/s).

The TSR-8 features 8-bit microcomputer control for error-free tape operation. Each channel has its own 4-bit microcomputer to control record in/out circuitry, allowing gapless punch in and out. The transport is the "full servo" type: the capstan motor is FG servoed, and each DC brushless reel motor is under control of the 8-bit microcomputer. The tension arms have non-contacting detectors that constantly send the microcomputer information on tape tension; the microcomputer then adjusts the torque of each reel motor. The result is smooth operation, gentle tape handling, and the capability in edit mode of moving both reels manually with one hand.

The TSR-8 has three different external control interfaces. It has a parallel input port, for connection to SMPTE/EBU based synchronizers (such as the TASCAM ES-50/51); and RS-232C serial synchronizers with serial control (such as the TASCAM MIDiiZER); and a remote control port for the RC-408 remote control unit. The TSR-8 automatically senses when it is under external synchronizer control, switching the servo system between the external source or its internal reference. Track 8 is fitted with a Sync Lock feature that assures high-quality time code or FSK signals (such as those generated by the TASCAM MTS-30 MIDI Tape Synchronizer) can be recorded and played back without interruption and without dbx processing.

The digital fluorescent tape counter is tach driven, displaying in minutes and seconds the distance the tape has moved from a zero reference point.

The Rehearsal and Auto In-Out features allow automated control of punch-in and out times without external computer control. When used as the first stage of the Automated punch-in/out operation, the Rehearsal feature programs the TSR-8 to repeat a punch-in/out sequence as many times as you wish before actually executing it on tape. The distance between the erase and record heads is automatically compensated, for gapless "inserts".

In addition to a conventional return-to-zero function, the TSR-8 is equipped with a two-point auto locator, which also provides a repeat playback over the desired segment of the tape.

Other features include various EDIT and spot erase features; AUTO INPUT which facilitates communication between studio and control room through the tape returns, and more.

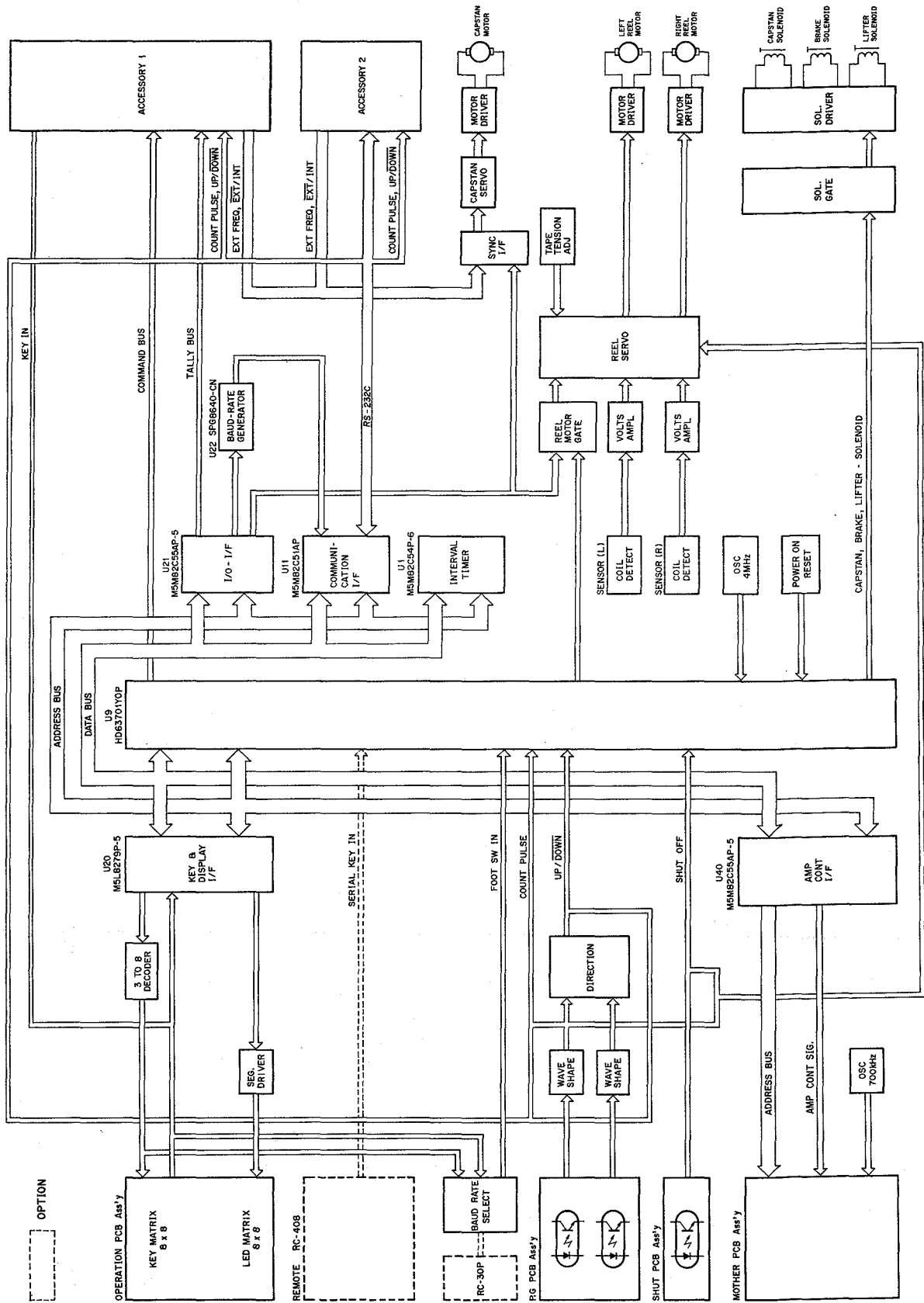
This manual has been designed to help you as you learn how to use those features. Please read it thoroughly and keep it handy as you learn the machine. Taking the time to use this manual now will save you time later on.

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(As for the contents of the Maintenance section, which provides service instructions for use by qualified personnel, see the first page of that section.)

Control Signal Block Diagram



Specifications

MECHANICAL

Tape:	1/2 inch (12.7 mm), 1.5 mil, low noise/high output tape
Track Format:	8-track, 8-channel
Head Configuration:	1 erase, 1 record/reproduce
Motor:	
Capstan:	FG servo DC motor
Reel:	DC motor x 2
Reel:	10.5-inch, NAB hub
Tape Speed:	15 ips (38 cm/s)
Pitch Control Range:	±12 % (both in Record and Reproduce)
Wow and Flutter³:	±0.06 % peak (DIN weighted)
Start Time:	0.8 sec. or less (to reach standard record/play speed)
Fast Wind Time:	120 sec. or less (10.5-inch reel, 2400-ft tape)
Cueing:	Electronically defeatable tape lifter
Motion sensing:	0.5 sec. ±0.15 sec. (delay time from stop to next motion)

ELECTRICAL

Line Input (Unbalanced)	
Input Impedance:	10 kOhms
Nominal Input Level:	
Ch. 1 – 7:	-10 dBV (0.316 V)
Ch. 8:	-10 dBV (0.316 V)/+4 dBu (1.23 V) in FIX, -30 dBV (0.03 V) to +4 dBu (1.23 V) in VARIABLE
Maximum Input Level:	
Ch. 1 – 7:	+18 dBV (8.0 V)
Ch. 8:	+18 dBV (8.0 V)/+24 dBu (12.3 V) in FIX, -10 dBV (0.316 V) to +24 dBu (12.3 V) in VARIABLE
Line Output (Unbalanced)	
Output Impedance:	100 Ohms
Minimum Load Impedance:	2 kOhms
Nominal Load Impedance:	10 kOhms
Nominal Output Level:	-10 dBV (0.316 V)
Maximum Output Level:	+18 dBV (8.0 V)
Bias/Erase Frequency:	145 kHz
Equalization:	∞ +35 μsec. (IEC/CCIR)
Record Level:	250 nWb/m (0 VU)
Power Requirements	
USA/CANADA:	120 V AC, 60 Hz
U.K./AUSTRALIA:	240 V AC, 50 Hz
EUROPE:	220 V AC, 50 Hz
GENERAL EXPORT:	100/120/220/240 V AC, 50/60 Hz
Power Consumption:	95 W

PERFORMANCE

Frequency Response²:	40 Hz to 20 kHz ±3 dB (at 0 VU)
Repro Frequency Response¹:	40 Hz to 20 kHz ±3 dB
Total Harmonic Distortion (THD)²:	0.8 % or less at 1,000 Hz, 0 VU (250 nWb/m) (by the record/reproduce method)
Signal-To-Noise Ratio (ref. to 3 % THD)²:	108 dB ("A" weighted, with DBX*) 68 dB ("A" weighted, without DBX)
Crosstalk (between Adjacent Channels)²:	82 dB or better (1,000 Hz, 0 VU, with DBX)
Erasure:	70 dB or better (1,000 Hz, +10 VU)
Headroom (Record Amp):	25 dB or more (1,000 Hz, 0 VU)

OTHERS

Connector/Jack

Line Input/Output:	RCA jack
Remote Control:	DIN, 8-pin (for RC-408)
Accessory 1 (Parallel):	D-sub, 37-pin
Accessory 2 (Serial):	D-sub, 15-pin
Punch-in/out Remote Control:	1/4" phone jack (for RC-30P)

Standard Equipment:

Empty Reel (RE-1013),
Operation/Maintenance Manual,
Warranty Card

Option:

RC-408 Remote Control Unit
RC-30P Remote Footswitch
RM-408 Rack Mount Angle
RE-1013 Metal Reel (10.5-inch, half-inch)

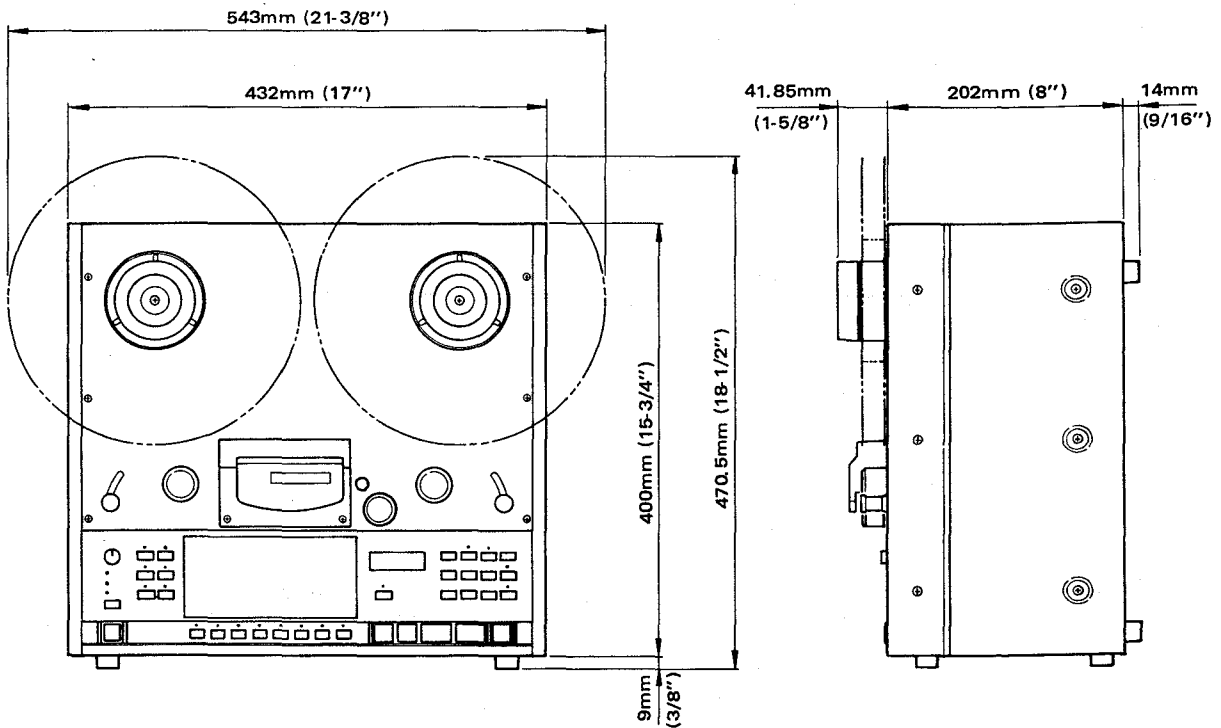
Measurements were made using the following TEAC test tapes:

- 1) TEAC YTT-11442 (15 ips, 38 cm/s)
- 2) TEAC YTT-8163 Blank Tape
- 3) TEAC YTT-2104 (15 ips, 38 cm/s)

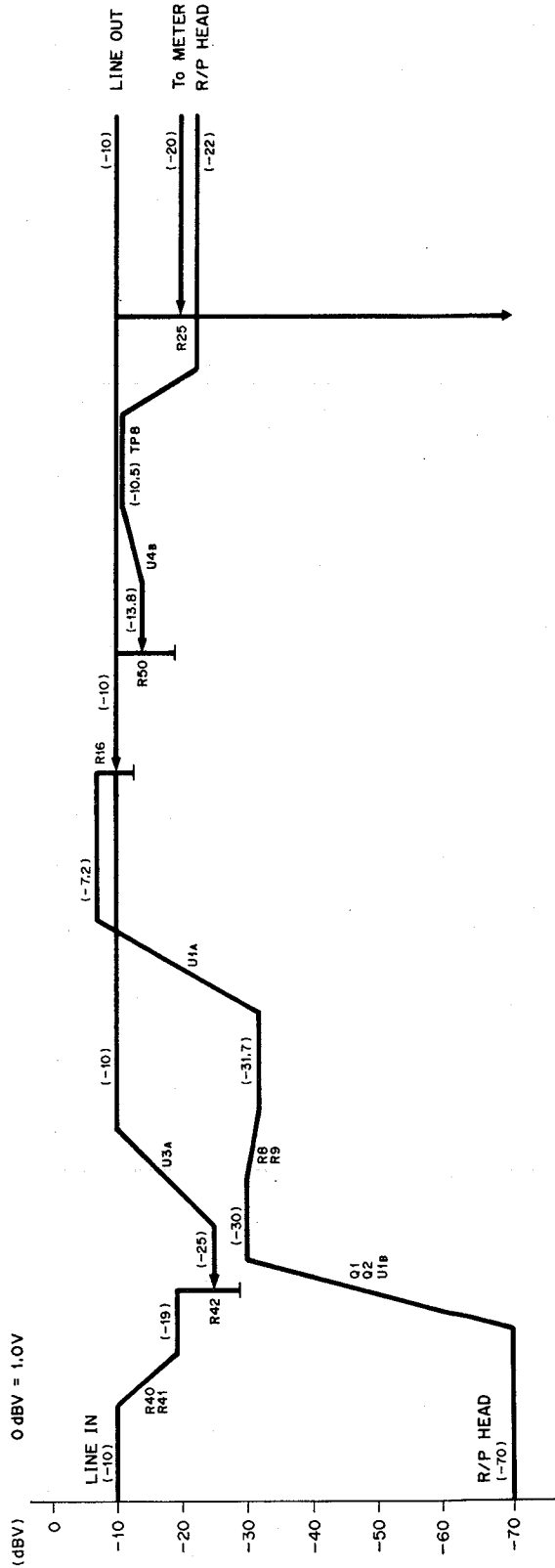
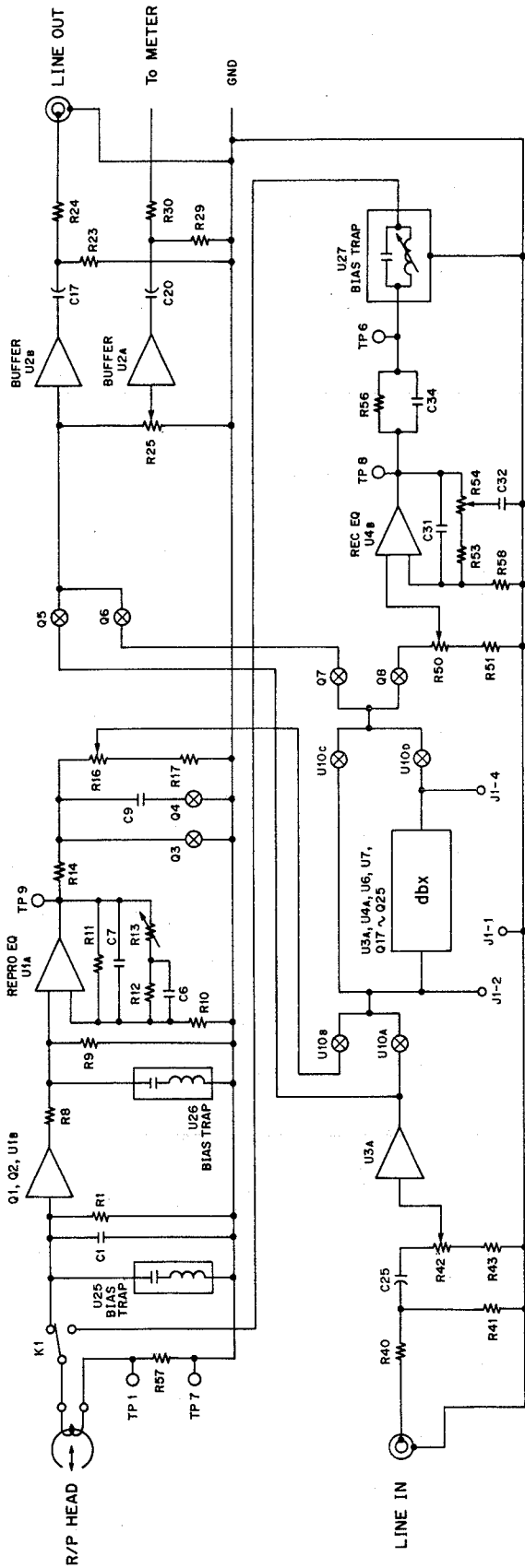
In these specifications, 0 dBV is referenced to 1.0 Volt. Actual voltage levels are also given in parentheses. To calculate the 0 dB = 0.775 Volt reference level (i.e., 0 dBm in a 600-Ohm circuit), add 2.2 dB to the listed dB value; i.e. -10 dBV re: 1 V = -7.8 dBm re: 0.775 V.

Changes in specifications and features may be made without notice and obligation.

*dbx is a registered trademark of dbx Incorporated.



Audio Signal Block / Level Diagram

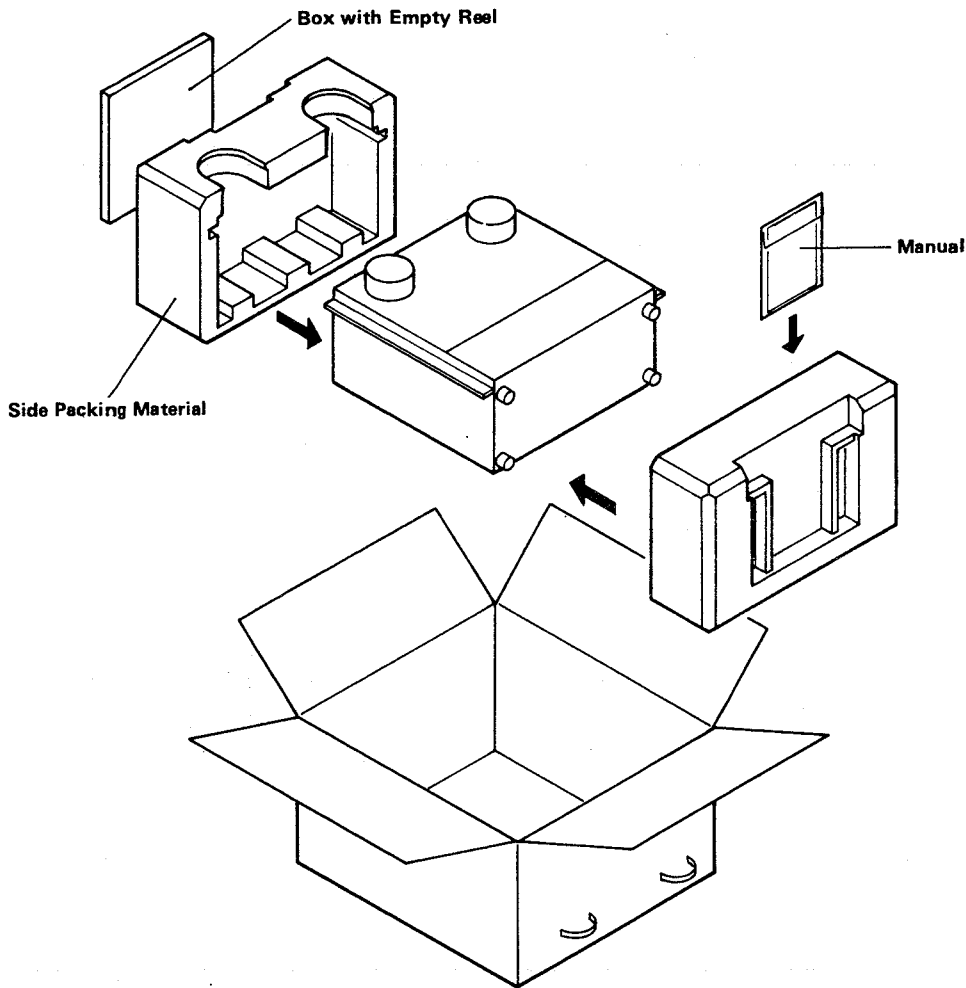


Installations

1. UNPACKING AND INSPECTION

During unpacking, be careful not to damage the TSR-8. Save the carton and packing material as well; you may need them to transport your TSR-8 sometime in the future.

After unpacking, give the machine a complete visual inspection. If there is any evidence of damage due to rough handling during transport, it is your responsibility to notify the carrier and submit a claim.



2. INSTALLATION SITE

The TSR-8 may be used in most areas, but to maintain top performance and prolong operating life, observe the following environmental limitations:

- 1) Nominal temperature should be 5 to 35 degrees C (41 to 95 degrees F).
- 2) Relative humidity should be 30 to 90% (non-condensing).

- 3) Strong magnetic fields should not exist nearby.

3. RACK MOUNTING THE TSR-8

The TSR-8 may be mounted to a standard EIA 19" rack, such as the TASCAM CS-607B. You need the optional RM-408 Rack Mount Angle. Before mounting, make sure the rack you are mounting the TSR-8 to is not warped or bent. Screwing the TSR-8 to a badly warped surface may cause misalignment of the transport.

4. INITIAL CONNECTIONS

CAUTION: Before attempting any cable connection, check to make sure that all the units involved in your system are turned off.

When connecting the TSR-8 to your system, use shielded cables that are as short as your situation will allow. We recommend low-capacitance cables with quality connectors, such as the TASCAM Pro Series. Cheaper cable has less shielding and may introduce radio frequency interference, hum and noise into your system.

A. Input/Output Connections

The TSR-8's inputs and outputs are handled by RCA jacks located on the rear connector panel of the machine.

Make the appropriate cable connections to the Program busses and Tape Returns of your mixer.

If your mixer has phono jack (RCA) outputs confirming to the -10 dBV standard, the meter readings of your mixer and the TSR-8 should match, i.e., 0 VU on the mixer will read 0 dB on the TSR-8 track it's connected to. If the readings don't match, always go by the readings on the recorder.

B. AC Power Cord

Make sure of a stable, firm connection on the mains side. Route the cord where there is no possibility of stepping on it, to prevent accidental disconnection.

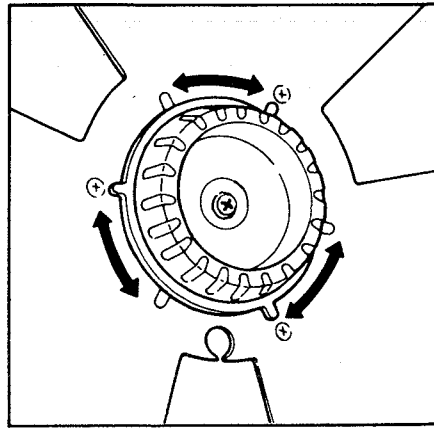
C. Remote Control Connection and Computer/Synchronizer Interface

On the TSR-8's rear panel are located a REMOTE CONTROL connector and ACCESSORY 1 and 2 connectors. The REMOTE CONTROL connection makes it possible to connect the optional RC-408 remote control unit to provide remote control of all transport functions. The ACCESSORY 1 connection is a parallel port, meaning transport controls are each brought to a separate pin of the connector for external connection to the TASCAM ES-50 or other SMPTE synchronizers. The ACCESSORY 2 is a serial port, in which fewer wires carry digital messages to and from the TSR-8's microcomputer for external connection to a controlling computer with RS-232C serial data buss. It is possible to hook up a serial-capable synchronizer (such as the TASCAM MIDIIZER) to this port for control and other advanced functions. For detailed information on the use of the ACCESSORY connections, consult TASCAM or the nearest TASCAM dealer. (Also see pp. 11-13.)

5. REEL INSTALLATION

Proceed as follows:

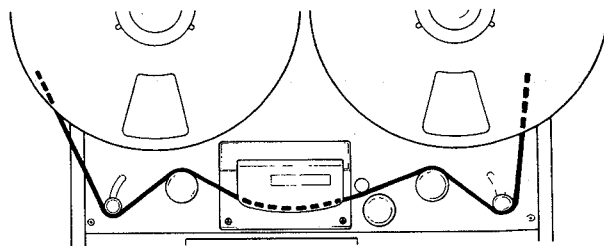
1. Turn the holddown knob until its outer and inner three detents line up with each other.
2. Line up the three notches in the full supply reel with the three detents in the holddown knob on the supply reel table and push the reel against the reel table.
3. Turn the holddown knob fully clockwise until it is firmly seated in place.
4. Repeat the procedure for the empty takeup reel.



NOTE: Before running tape, make sure that the reel holddown knob is tight on both the supply and takeup reels.

6. TAPE THREADING

Thread the tape exactly as shown below.



"ACCESSORY 1" PARALLEL CONNECTOR

SMPTE/EBU Time Code

SMPTE is an acronym for the Society of Motion Picture and Television Engineers. The SMPTE Time Code (C98.12: time and control code for video and audio tape for 525/30 television system) was defined in 1970, and it is now accepted as a universal standard.

This reference is to an 80-bit digital code developed by SMPTE and used to designate the exact location in hours, minutes, seconds and frames (24 frames/sec. for film or 30 frames/sec. for video) on a film, video tape, or audio tape. Suitable equipment can synchronize ("lock up") two or more machines by using the SMPTE time code recorded on each.

SMPTE European Standard, that refers to 25 frames per second, states the EBU (abbrev. for European Broadcasting Union) time code when it is especially necessary to distinguish from the USA Standard with 30 frames per second.

A *time code generator* is used to record SMPTE code onto one track of the tape. A *time code controller* can then read the code from two or more tape machines, and by also servo-controlling the reel motors of those machines, bring them to specific cue points. A *time code synchronizer* further controls the capstan motors to keep both of the tape machines running synchronously. These techniques can be used to obtain more tracks for recording (two or more audio machines "locked up" together), to mix audio signals in sync with video or film images, to make complex edits by transferring material from one or more audio machines to another, and so forth.

Connecting a Synchronizer to the TASCAM TSR-8

Connection between the ES-50 synchronizer/ES-51 edit controller and the TSR-8 is a plug-and-go proposition. Pre-wired interface cables needed are available from TASCAM.

The TASCAM TSR-8 provides signals to the synchronizer (via the ACCESSORY "1" connector) which indicate its speed, the direction of the tape travel, and a reference power supply. Also, tally signals indicating the TSR-8's mode (PLAY, F.FWD, REW, STOP) are given to the synchronizer so it knows the current transport status. Inputs on the same ACCESSORY "1" connector are provided for status commands from the synchronizer (PLAY, F.FWD, REW, STOP, REC, LIFTER CONT). Also, there is an input for a capstan drive reference frequency signal from the synchronizer so that the actual record/play speed can be varied to maintain synchronization. For pin assignment see page 12.

The TSR-8 will also operate satisfactorily with a variety of other manufacturers' synchronizer/controllers. The manual for these products should provide you with enough interface information for use with the TASCAM tape machines. Or else, consult the synchronizer manufacturer for further details on interfacing.

"ACCESSORY 2" SERIAL CONNECTOR

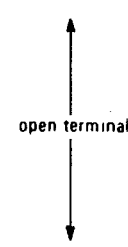
The TSR-8 operates to its full potential when interfaced with the MIDiiZER, an intelligent, highly versatile serial synchronizer, which provides a link between SMPTE/EBU based audio/video production and MIDI music creation. It shifts between time code and MIDI data to constantly adapt the TSR-8 and other associated machines/units to ever changing requirements of each application.

Specifically, advanced functions the MIDiiZER provides access to, include Record On/Off Programming (up to 16 individual tracks), 20-point Autolocation, Synchronization either referenced to time code addresses or MIDI coded bar numbers, Time code/MIDI data triggered events, MIDI Program Change which can be controlled with time code too, a "Total Time" function which accommodates your program material to the required length by automatically changing the tempo, and more. (Complete, update information about the MIDiiZER will be made available no later than its upcoming release.)

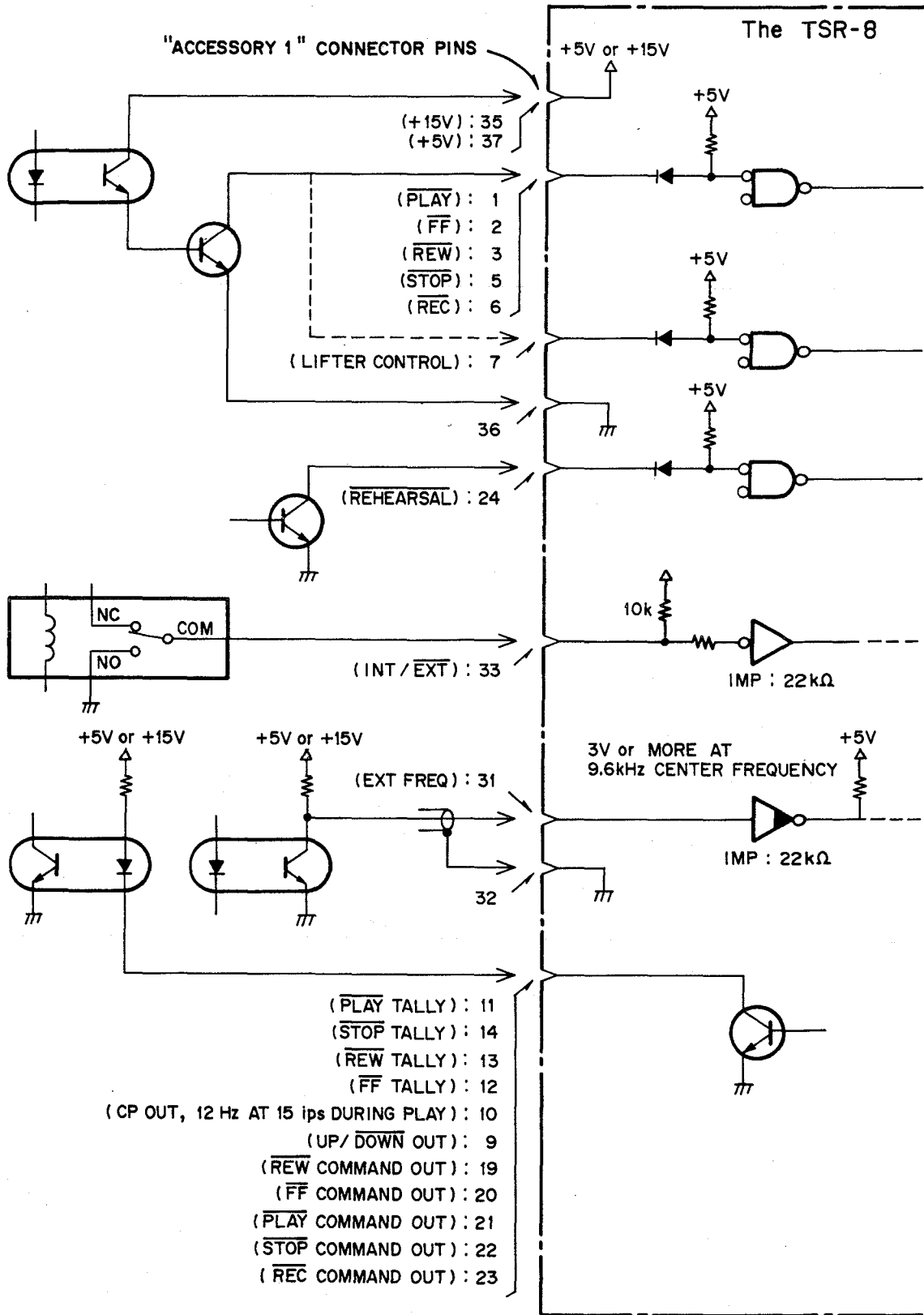
The method of communications performed in compliance with the RS-232C standard differ depending on the mechanical/electrical characteristics and system programs of the associated machines/devices, and a small error in communications thwarts the interfaced system and even causes this to run "wild." For detailed technical information about the use of the TSR-8's Serial Port consult TASCAM or your local TASCAM dealer.

ACCESSORY 1 Pin Assignment

Pin #	IN(put)-OUT(put) signals	Function
1	PLAY IN	Inputs PLAY signal at L level.
2	FF IN	Inputs FF signal at L level.
3	REW IN	Inputs REW signal at L level.
4	open terminal	
5	STOP IN	Inputs STOP signal at L level.
6	REC IN	Inputs REC signal at L level.
7	LIFTER CONT IN	Inputs LIFTER shift cancellation signal at L level.
8	open terminal	
9	UP/DOWN OUT	Outputs tape running control signal at H or L level.
10	CP OUT	Outputs open-collector signal (12 Hz pulse at 15 ips.)
11	PLAY TALLY OUT	Outputs open-collector signal (Low level during PLAY mode.)
12	FF TALLY OUT	Outputs open-collector signal (Low level during FF mode.)
13	REW TALLY OUT	Outputs open-collector signal (Low level during REW mode.)
14	STOP TALLY OUT	Outputs open-collector signal (Low level during STOP mode.)
15	REC TALLY OUT	Outputs open-collector signal (Low level during record mode)
16	SHUT-OFF TALLY OUT	Outputs open-collector signal (Low level during tape stop)
17	open terminal	
18	open terminal	
19	REW COMMAND OUT	Outputs open-collector signal (Low level when REW is pressed)
20	FF COMMAND OUT	Outputs open-collector signal (Low level when F. FWD is pressed)

Pin #	IN(put)-OUT(put) signals	Function
21	PLAY COMMAND OUT	Outputs open-collector signal (Low level when PLAY is pressed)
22	STOP COMMAND OUT	Outputs open-collector signal (Low level when STOP is pressed)
23	REC COMMAND OUT	Outputs open-collector signal (Low level when REC is pressed)
24	RHEARSAL MODE IN	Accepts Rehearsal enabling signal coming from a properly equipped external control unit (low level with Rehearsal In)
25	 open terminal	
26		
27		
28		
29		
30		
31	EXT FREQ IN (HOT)	Inputs speed control signal at input signal of 3.0 V or more and of 4.8 k to 19.2 kHz (HOT side)
32	EXT FREQ IN (COLD)	Inputs speed control signal (COLD side)
33	INT/EXT IN	Inputs internal/external speed control select signal Internal: HIGH level External: LOW level
34	open terminal	
35	+15 V supply voltage OUT	Maximum: 50 mA
36	Main unit GND	
37	+5 V supply voltage OUT	Maximum: 50 mA

ACCESSORY 1 Connector Pins and External Signal Connections



VOLTAGE CONVERSION

NOTE: Voltage conversion is not possible on models sold in the U.S.A., Canada, U.K., Australia or Europe.

For general export models, if the input voltage specified on the TSR-8 or packing carton differs from the line voltage at the installation site, please request your dealer to change the voltage setting of the machine. The procedure entails the opening of the machine.

NOTE FOR U.K. CUSTOMERS

U.K. Customers Only:

Due to the variety of plugs being used in the U.K., this unit is sold without an AC plug. Please request your dealer to install the correct plug to match the mains power outlet where your unit will be used as per these instructions.

IMPORTANT

The wires in this mains lead are coloured in accordance with the following code:

BLUE: NEUTRAL
BROWN: LIVE

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals of your plug, proceed as follows.

The wire which is coloured BLUE must be connected to the terminal which is marked with the letter N or coloured BLACK. The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or coloured RED.

Bescheinigung des Herstellers/Importeurs

Hiermit wird bescheinigt, daß der/die/das

MAGNETTONBANDGERÄT TASCAM TSR-8

(Gerät, Typ, Bezeichnung)

in Übereinstimmung mit den Bestimmungen der

AMTSBLATT 163/1984, VFG 1045/1984, VFG 1046/1984

(Amtsblattverfügung)

funk-entstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

TEAC CORPORATION

Name des Herstellers/Importeurs

THE APPLIANCE CONFORMS WITH EEC DIRECTIVE 87/308/EEC REGARDING INTERFERENCE SUPPRESSION

CONFORME AL D.M. 13 APRILE 1989
DIRETTIVA CEE/87/308

THIS DIGITAL APPARATUS DOES NOT EXCEED THE CLASS B LIMITS FOR RADIO NOISE EMISSIONS FROM DIGITAL APPARATUS AS SET OUT IN THE RADIO INTERFERENCE REGULATIONS OF THE CANADIAN DEPARTMENT OF COMMUNICATIONS.

LE PRESENT APPAREIL NUMERIQUE N'EMET PAS DE BRUITS RADIOELECTRIQUES DEPASSANT LES LIMITES APPLICABLES AUX APPAREILS NUMERIQUES DE CLASSE B PRESCRITES DANS LE REGLEMENT SUR LE BROUILLAGE RADIOELECTRIQUE EDICTE PAR LE MINISTERE DES COMMUNICATIONS DU CANADA.



Operation

1. SETTING THE RECORD LEVEL

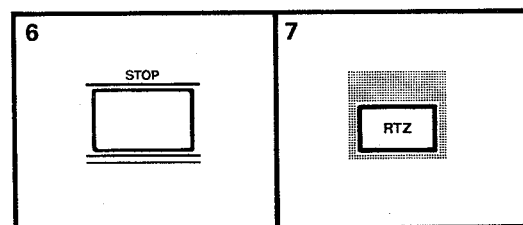
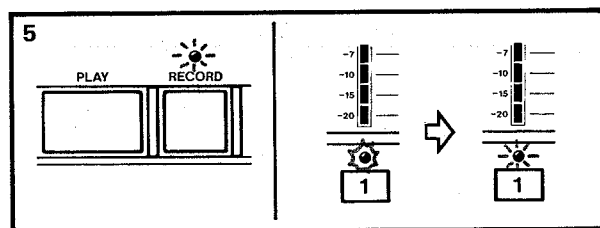
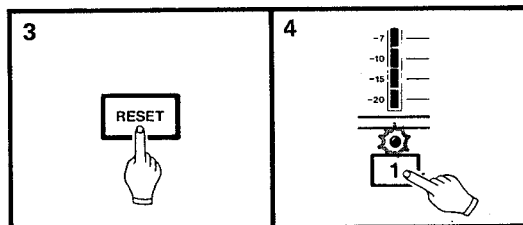
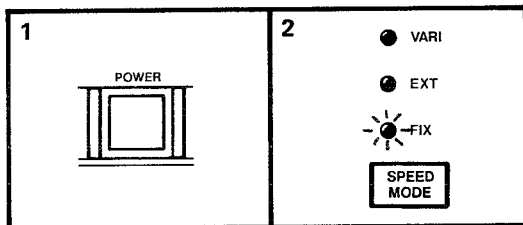
The TSR-8 does not utilize its own controls for setting the volume or "level" of the signal to be recorded. Therefore the recording level is adjusted on the mixer. The basic procedure for setting the record level is as follows:

1. Consult your mixer manual for information about setting its Input Trims, Faders, EQ's and other controls that have an effect on the output level of the mixer. Set these controls to their nominal levels on the mixer.

2. Switch power on to the TSR-8. The digital counter will indicate "-88.8.8" for a few seconds as the machine's logic circuits initialize, then the display will change to "00.00."

In the following illustrations,  shows a blinking LED, and  a steadily lit LED.

(Recording the First Track)



3. Press the Record Enable button for a track being fed by the mixer output.

4. Play an instrument (or speak into a mic). While you are doing this, watch the meter on the mixer and the track's LED meter on the TSR-8. At the loudest point, both meters should peak at the reference level of "0." If not, adjust the level of the source.

2. SETTING THE MONITOR LEVEL

The monitoring of both the recorded material as well as the source during the recording process is accomplished through the mixer's monitor section. Refer to the mixer's manual for the correct procedure in setting up the monitoring system.

3. RECORDING THE FIRST TRACK

When all necessary level adjustments on your mixer are complete, you can go ahead with your recording. As an example, we will assume that you wish to use Track #1 as a rhythm track.

1. If the TSR-8 is not on, press the POWER switch.

2. Check to see that the SPEED MODE selector switch is set to its FIX position and its green LED is on solid. If not, set it to FIX.

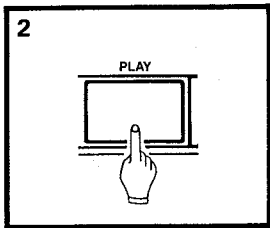
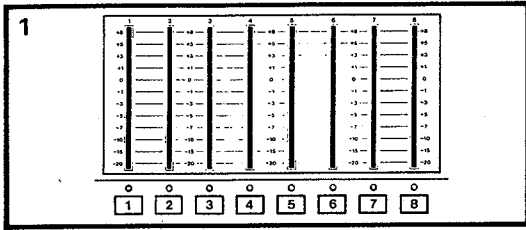
3. Press RESET so you'll know where you started from.

4. Press the Record Enable button for track #1 (track we use only as an example). A red LED will begin flashing on and off above the track's Record Enable button.

5. Press and hold down the Master RECORD button. While still holding RECORD down, press the PLAY button. The tape will begin moving in its forward direction and recording is now in progress on Track #1. The RECORD LED should light solid and the LED above the track's Record Enable button that was flashing should also now be on solid.

6. When you have finished with recording, press STOP to terminate the recording. The RECORD LED will turn off and the track's LED will begin flashing as before.

7. Press the "RTZ" (Return to Zero) button. The tape will rewind, automatically stopping at counter zero point.



First Playback

1. Release the Track 1 Record button by pressing it. Its blinking LED will go out showing that Track #1 is now in "safety" status. Check to make sure that all other tracks are also in "safety" status with their LEDs off.

2. Press PLAY. The track you just recorded can be listened (monitored) through the mixer.

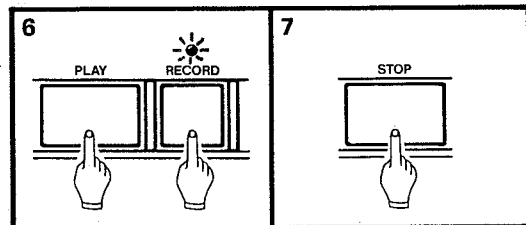
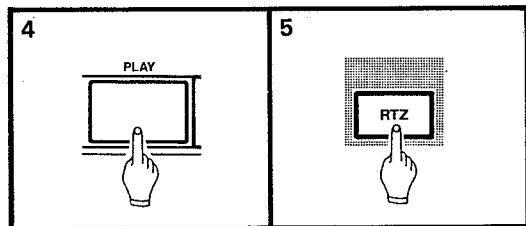
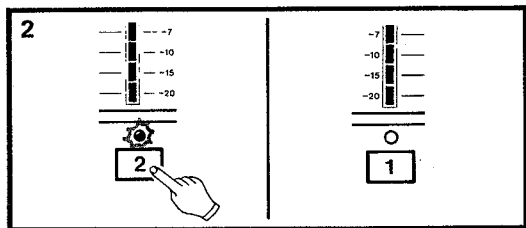
If you are not satisfied with your first take and want to re-record it (thereby erasing the first take), all you have to do is:

- Make any changes that occurred to you while you listened to the first playback.
- Press RTZ to rewind the tape to 00.00.
- Press the Track 1 Record Enable button.
- Press RECORD and PLAY together and try again.

Once you have a basic track you're satisfied with, you are ready to move on to overdubbing.

4. OVERDUBBING

There are two tasks in overdubbing. First, the new signals must be adjusted for proper level going to the TSR-8, as in tracking. Second, you must make a proper monitoring mix of the existing track(s). Here is a basic overdubbing procedure:



1. Select an open track for the overdub: Since we assume, in our example, that you have recorded your first take on track 1, you can choose any other track for the overdub. Factors affecting which track you choose include how many total parts you will record, and whether you plan to bounce ("ping-pong") tracks later. In this example, we'll assume that you choose track 2.

2. Place the track in record ready mode: Press the Record Enable button for track 2. Its LED will start blinking. Make sure that previously recorded tracks (such as track 1 in our example) are in safe mode so you don't accidentally erase them.

3. Adjust the recording level of the new sources using your mixer controls, watching the meter level on track 2.

4. Play the tape and adjust monitor levels for a proper balance of the incoming new signal with the signal being played back from track 1 in your headphones or monitor.

5. Rehearse your overdub until you feel confident that your levels are correct. Rewind to 00.00 by pressing RTZ.

6. Record the first overdub by pressing RECORD and PLAY.

7. Stop the recording by pressing STOP (or PLAY).

8. To listen to playback of the overdub, press the track 2's record enable button (to place the track in safe mode), then rewind to the beginning of the take and hit PLAY.

5. PUNCH-IN OR INSERT RECORDING

The TSR-8 can manually punch in with the master RECORD button, the Track Record Enable buttons, or the optional RC-30P footswitch. You can also program the punch-in and punch-out with the REHEARSAL and AUTO IN/OUT functions so the TSR-8 automatically punches in and out for you.

Manual Punch-In

METHOD A: Punching with the master RECORD button or footswitch

1. Make the following preliminary settings:
 - a) Press the Record Enable button of the track you intend to INSERT on. Its LED will start blinking.
 - b) Press the INSERT switch. Its LED will light solid.
 - c) Adjust the recording and monitoring levels for the desired balance.

2. Press PLAY. You can use the INSERT switch to toggle the TSR-8's meter and output between source and tape. While the tape is in PLAY and INSERT is on, you'll hear tape; while tape is stopped or INSERT is off, you'll hear source.

3. When the tape reaches the desired punch-in point, press RECORD or the footswitch to start recording. The monitor switches from tape to input on that track. The master RECORD LED and Track Record LED both stay on.

4. Punch out by pressing STOP, PLAY or the footswitch.

METHOD B: Punching with the Track Record button

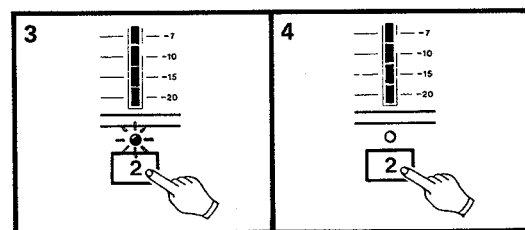
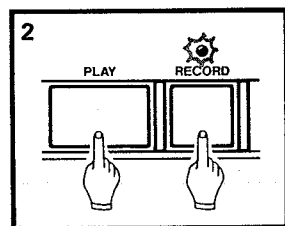
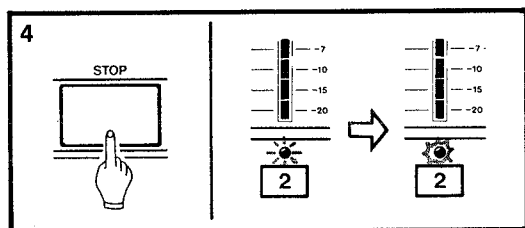
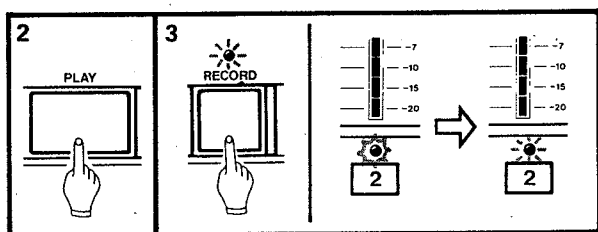
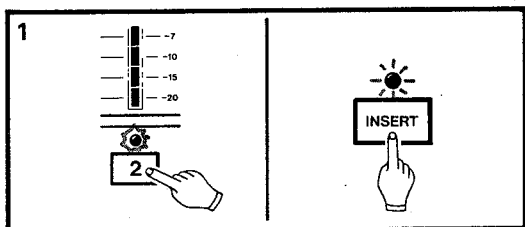
This method is sometimes called "rolling in record" and requires that you have a free hand.

1. After the recording and monitoring levels are set, make sure that all tracks are SAFE (no track LED blinking).

2. Press RECORD and PLAY together to start playing the tape. The RECORD LED will blink, showing that the TSR-8 is in record-ready mode.

3. Press the punch-in track's record button when the tape reaches the punch-in point. The master RECORD and track record LEDs will both light up steadily, showing that recording is taking place.

4. To punch out, press the Track Record button again (you could also press STOP or PLAY).

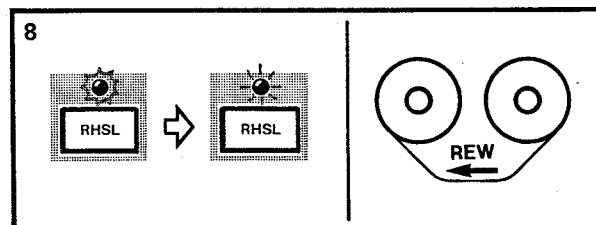
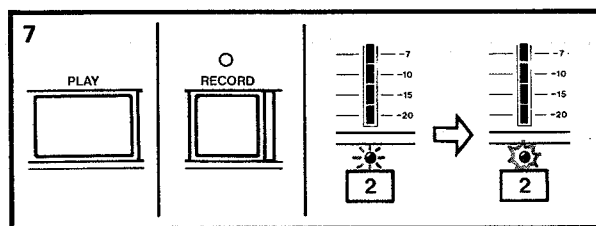
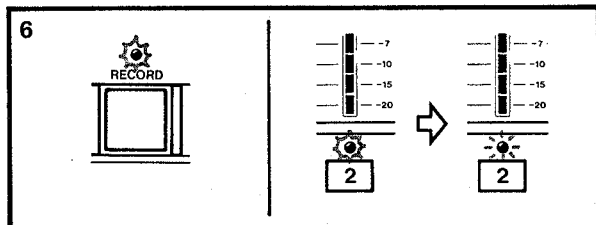
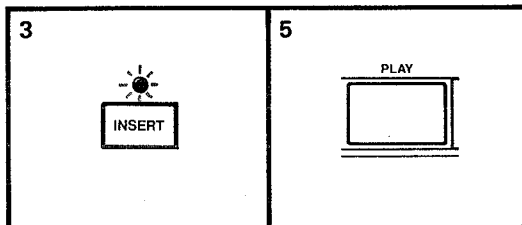
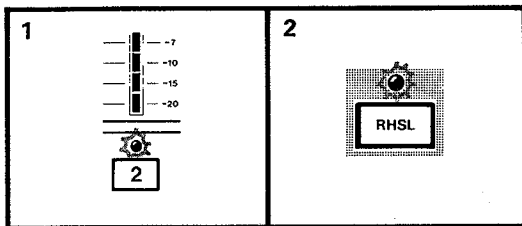


6. REHEARSAL PROGRAMMING AND AUTO IN/OUT PROCEDURES

The Auto Locator has priority over the Rehearsal and Auto In/Out modes. If LOC 1, LOC 2, REPEAT, or RTZ is pressed, the function pressed is activated erasing all the memories you have set for punch-in. The LED RHSL or AUTO IN/OUT will then blink until CLEAR is pressed.

Programmed Rehearsal of Inserts (RHSL)

Before you actually record an insert, the TSR-8 allows you to "preview" the punch-in and out points with its special REHEARSE function. During a rehearsal, the tracks in record ready mode will switch



meter and output from tape to source and back again, but won't actually record. What you hear in your monitor mix will be the same as during recording; so if the first in-out points aren't correct, you'll hear it and can CLEAR the old points and try again until you've got exactly what you want.

CAUTION: Although the advanced circuitry of the TSR-8 allows gapless punch-in on the tape, there is still the distance between the erase and record heads to be compensated for. Depending on tape speed, the time from a punch point to the actual in/out is 1/15th or 1/8th of a second. A few practice runs will get you accustomed to the timing of punching in.

Entering the Automatic Preroll and Punch-In/Out Points

NOTE: If you want to quit what you are doing at any time during the following procedures, press CLEAR.

1. Press the Record Enable button of the track you want to punch-in on. Its LED will start blinking. Check to make sure that all other tracks are in safe mode.

2. Press the RHSL switch. Its LED will begin blinking. As long as this light blinks (or stays on solid as it will do later, in step 8), you can't actually record, even though the master RECORD and track's Record LEDs may go on solid.

3. Press the INSERT switch. Its LED will light.

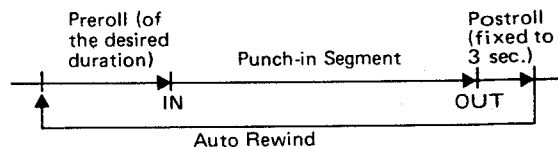
4. Adjust the record and monitoring levels on the mixer for the desired balance.

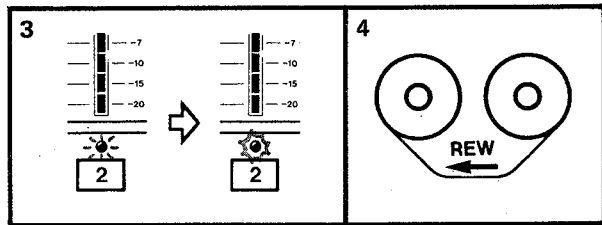
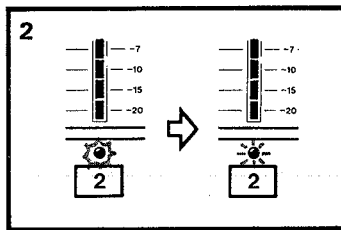
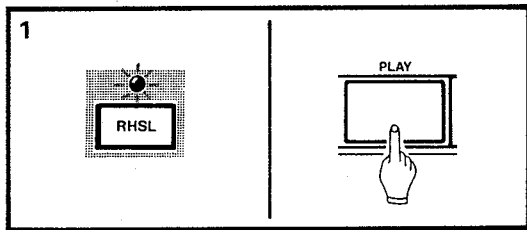
5. Press PLAY. That point on the tape will be put into memory defined as the preroll start point.

6. At the punch-in point, press RECORD or the footswitch. Your punch-in point will be put into memory. The track's record LED will light steadily, but the master RECORD LED will blink, showing that recording is not actually taking place.

7. Press PLAY or the footswitch when the tape reaches the punch-out point. That point will be put into memory. The LED for the selected track will start blinking and the RECORD LED will turn off.

8. After a 3-second postroll, the RHSL LED will go on solid, while the tape will automatically rewind, stopping at the preset start point. The TSR-8 is now in Rehearsal Ready mode.





Rehearsing the Punch-in ("Dry Run")

1. Make sure that the TSR-8 is in "Rehearsal Ready" mode with the punch-in and out points memorized and the RSHL LED on solid. Press PLAY or the RC-30P footswitch. The TSR-8 will begin playing from the preset start point.

2. When the tape reaches the preset punch-in point, the track's output will switch from tape to source. The LED for the punch-in track stops blinking and stays on, although recording is not yet taking place. Your live instrument can be heard from the output of the track.

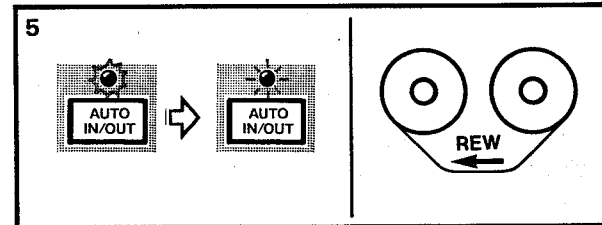
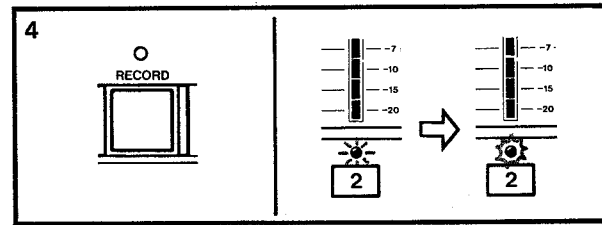
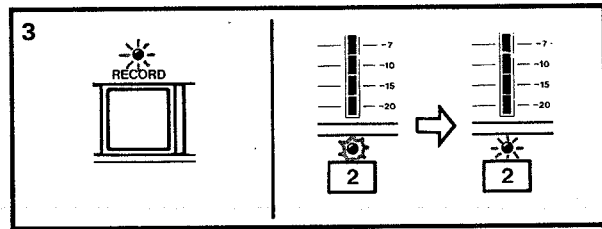
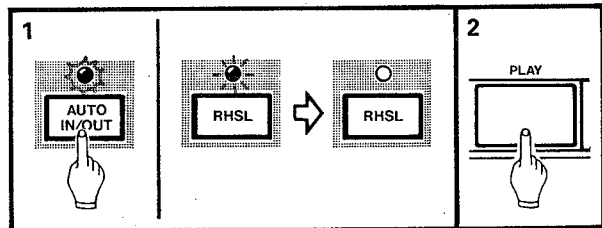
3. When the tape reaches the punch-out point, the track's output will switch back from source to tape. The LED for the punch-in track will start blinking, indicating that the "dry run" record is over.

4. After a 3-second postroll, the tape will automatically rewind to the preset start point, ready for as many rehearsals as you wish.

Practice the performance until you are sure that you will get it right when actually recording. Remember, once you punch in over existing material, that original signal is erased.

Actual, Auto Punch-In

Once you're sure your performance and the punch-in/out points selected are correct, you're ready to actually record the insert. The INSERT and RSHL LEDs should still stay on. All tracks should be in SAFE except the ones you intend to record.



1. Press the AUTO IN/OUT switch. A red LED will begin blinking above the AUTO IN/OUT switch, while the RSHL LED that was on solid will turn off, indicating that the TSR-8 is switched from REHEARSAL mode to actual, automated "punch-in ready" mode.

2. Press PLAY or the footswitch to begin the preroll from the preset point.

3. When the tape reaches the preset punch-in point, the punch-in track will automatically enter actual record mode, and the RECORD and Track LEDs will turn on solid. New material is being recorded, erasing the original part.

4. When the tape reaches the memorized punch-out point, the TSR-8 punches out of Record. The RECORD LED will turn off and the track's LED should again be blinking.

5. After a 3-second postroll, the AUTO IN/OUT LED that was blinking will turn on solid and the tape will automatically rewind to the memorized start point.

To review the result, press PLAY or the footswitch. The tape will play the entire segment and rewind to the start point.

To record again using the same memory points, press the AUTO IN/OUT switch again (its LED will again blinking), then press PLAY.

To terminate the Auto In/Out procedure, press the CLEAR switch. The AUTO IN/OUT LED which was on solid will turn off. By hitting CLEAR, you erase all of the three memory points (Preroll Start, Punch-in and Punch-Out points).

About Punching In

Setting in and out points: For both musical and technical reasons, when punching in or out of a track, you must select points that are "in the clear", i.e., in the pauses between phrases or notes. It sounds unnatural and makes the insert noticeable if you record a new note before the old one has ended, or are holding a note as you punch in or out. For this reason, some session players leave a beat or two of silence between passages they might want to edit later. Making inserts well requires some practice. Many engineers count bars and beats to keep track of the punch in and out points and hit them on cue. Because of the spacing between the erase and record heads, you may need to anticipate your

in/out points by a fraction of a second for extremely tight cues though the gapless operation and high speed of the TSR-8 makes it much easier.

External computer punching: If you need insert points that are consistently repeatable within 1/30th of a second, you may want to control the TSR-8 by an external computer device. With this method, track 8 is recorded with SMPTE time code and punch-in/out points are entered into the TSR-8 via the serial connector on the back panel. The procedure is similar to the TSR-8's built-in AUTO IN/OUT function but more accurate because the computer is reading a reference actually recorded on tape instead of tach pulses generated by the movement of the tape reels.

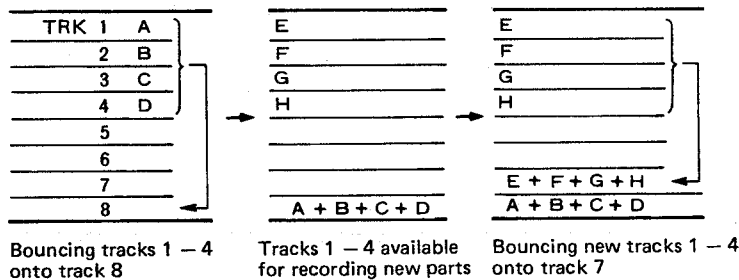
Level matching: No matter how carefully you set your punch points, if the inserted material is louder, softer, or a different tone from the original track, it will be noticeable. Set the EQ and volume settings on your mixer the same as they were during the original recording. If you make inserts immediately after recording, don't change the instrument or mixer settings at all. Keep in mind that at a certain point it's better to record the whole track over than making multiple punch-ins.

7. BOUNCING TRACKS (PING-PONG)

The recording capability of the TSR-8 is not limited to the eight tracks. As you progress with recording, you may reach a point where you need more than eight tracks of material. This is where Bouncing — also called Collapsing or Ping-ponging tracks — is invaluable. Essentially, bouncing tracks consists of a "mini mix-down": taking tracks that have already been recorded,

making a mix of these tracks and re-recording them back onto an empty track (or tracks) of the TSR-8.

With all multitrack recorders, it is possible to get feedback when a track is recording signal being bounced from the track right next to it. To eliminate feedback, it is advisable to bounce on a track away from the originals.



Other Tips About Bouncing

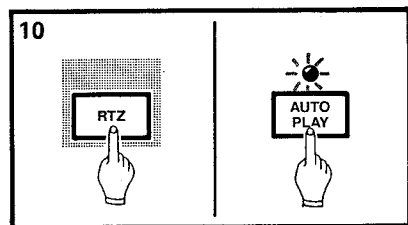
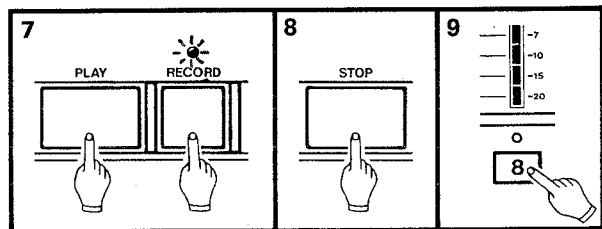
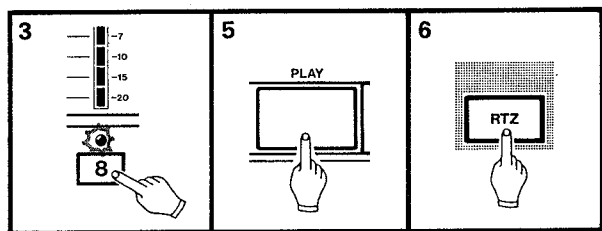
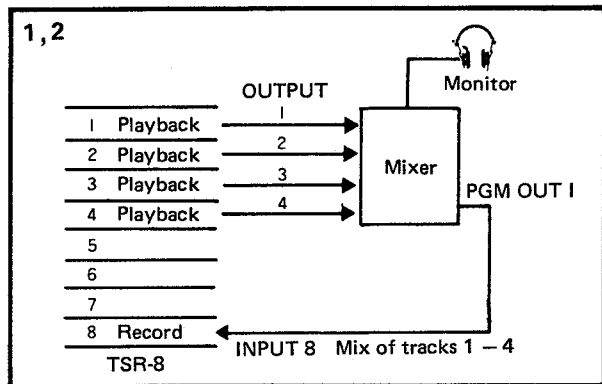
1. Before you record over the parts that have been bounced together, make certain that you're happy with the overall sound of the bounced parts, because you won't be able to change their mix or punch-in to fix errors.

2. It is possible to bounce tracks more than once, i.e., to take a bounced track and combine it yet again with other material onto another empty track. There are limits, however, just as there are anytime you make a copy of a copy. Eventually the sound will get "blurry" — treble will be decreased and added dropouts will become more noticeable. Whether the added versatility

of bouncing is worth the slight loss of sound is up to you and the demands of your project.

3. It is also possible to add new, previously unrecorded parts to the bounced material, for example to take Tracks 1-4 and mix them with additional "live" sounds onto Track 5.

4. Certain material lends itself to bouncing — vocal backgrounds, layered keyboards, etc. Main parts of the program such as lead vocals and instrumental solos are best left on their own tracks so you can control them in the final mix.



Bouncing: Example

Let's take the contents of tracks 1-4 and bounce them to track 8.

1. Set your mixer so that the main input channels 1-4 are receiving the TSR-8's tape outputs.
2. Assign channels 1-4 to the group output on the mixer connected to track 8 of the TSR-8.
3. Press the Track 8's Record Enable button (Record Ready Mode). Its LED will start blinking.
4. Make sure that the monitor section of your mixer is receiving the output from track 8 and nothing else. All other signals feeding the monitor should be turned off. This gives you an accurate monitor of the mix you're actually bouncing.

5. Start playing the tape. Slowly raise up the channel faders 1-4, and the master fader of the program group the channels are assigned to. Get the balance you want from the channel faders, then adjust the master fader for overall level until you get proper meter readings on the TSR-8.

6. Press the RTZ button to rewind the tape to counter 00.00.

7. Press PLAY and RECORD to begin recording.

8. Stop recording by pressing STOP or PLAY.

9. Press the track 8 Record button to prevent accidental erasure of the track.

10. Press RTZ then AUTO PLAY to hear the result. Make sure you've got a mix that you want to keep. If so, you're free to record over the old tracks; if not, make whatever adjustments that are necessary on your mixer and try it again.

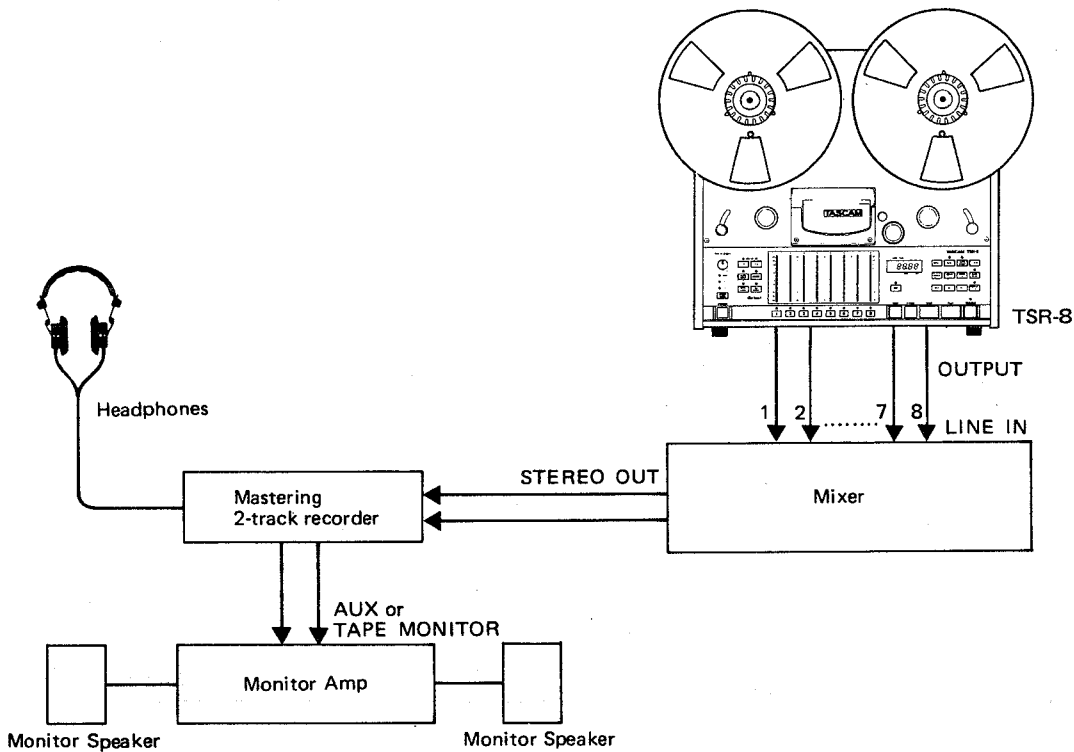
8. MIXDOWN (REMIX)

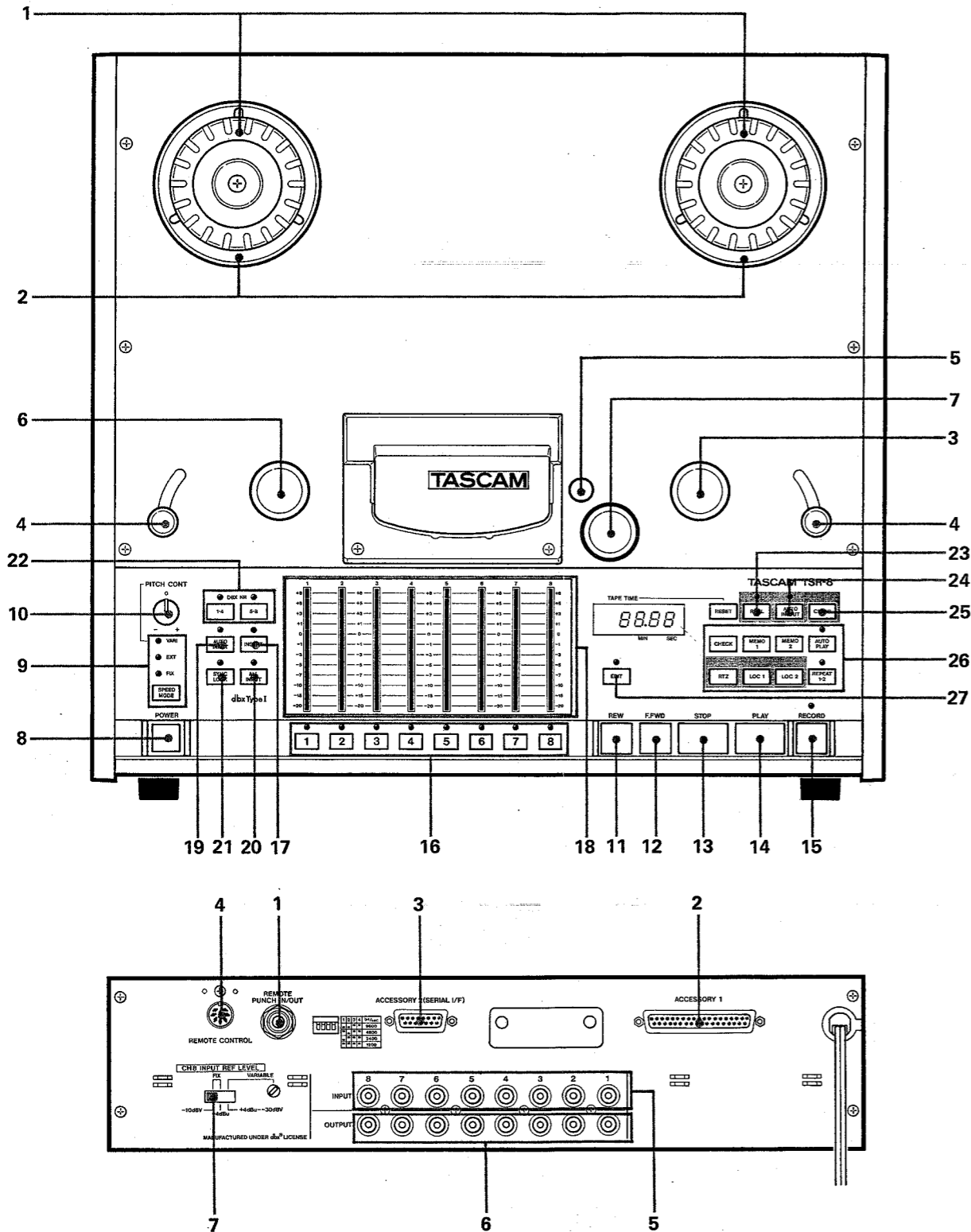
Once all the tracking and overdubbing is complete, it will be time to mixdown to stereo. At this point, the TSR-8's tracks should all be in safe mode, and the main input channels of the mixer should be switched to receive signal from the TSR-8. The stereo outputs of the mixer should be connected to your 2-track recorder, and your monitor "where from" switch should be switched to receive signal either from the 2-track outputs or the stereo output of the mixer.

NOTES:

1. If you recorded the 8-track tape with DBX noise reduction, you should play it back with DBX on. DBX is an encode/decode process. It is not possible to get a "DBX mixdown" by defeating the noise reduction on playback, mixing encoded tracks to stereo, and then playing back the 2-track master through a DBX decoder.

2. Once outputs of the TSR-8 have been decoded by the DBX unit within the the TSR-8 they behave like any other audio source, and can be mixed down to any medium: digital tape recorders, cassettes with Dolby B, C or DBX noise reduction, or the audio tracks of a VCR.





-REAR PANEL-

- 1. REMOTE PUNCH IN/OUT Jack**
This is for connection of the optional RC-30P foot-switch. Whether you're a busy engineer, producer, or a musician with both hands on an instrument, there are times when you can't drop what you are doing to press RECORD button. The RC-30P is the solution. It lets you punch-in and out of Record with a tap of your foot.
- 2. ACCESSORY 1 Connector (37-pin, D-sub)**
It has the inputs/outputs necessary for the direct interface with the TASCAM ES-50 Synchronizer or other SMPTE/EBU Synchronizers/controllers. ACCESSORY "1" is a parallel port, as opposed to the ACCESSORY "2" connector.
- 3. ACCESSORY 2 (SERIAL I/F) Connector (15-pin, D-sub)**
This is a serial I/O port conforming to the RS-232C standard for linking the TSR-8 to an external computer, or synchronizer such as the TASCAM MIDiIZER.
The dip switch adjacent to the connector is used to select the bit rate (data transmission speed) as per the diagram beside the switch.
- 4. REMOTE CONTROL Connector (8-pin, DIN)**
This is for connection of the optional RC-408 remote control unit. With the remote control unit, you can control all tape motion from a distance of up to 15 ft (5 m).
- 5. INPUT Jacks 1-8**
Each of these RCA jacks accepts a nominal input level of -10 dBV (0.316 V). The input impedance is 10 kOhms (unbalanced).
- 6. OUTPUT Jacks 1-8**
These outputs carry either the tape signal of the corresponding track, or the source (input) signals, depending on the position of various front panel controls. See the switching logic table on page 27.
The TSR-8 has no output level controls of its own and the output level is the same as the input level; that is, -10 dBV (0.316 V). The output impedance is 100 Ohms (unbalanced).
- 7. CH8 INPUT REF LEVEL Selector Switch**
Normally, set this switch to the -10 dBV (0.316 V) position to match the input reference level of the remaining channels, 1 - 7.
When you record track 8 with sync tones or time codes you can use the switch to set for +4 dBu (1.23 V) or any level between +4 dBu and -30 dBV (0.03 V) in pursuant to the sync tone/code generator in use.
Settings of the switch have effect only on track 8.

-FRONT PANEL-

- 1. Reel Holddown Knobs**
These are permanently mounted, and are used for the installation of large hub 10.5-inch reels. Clockwise rotation of the knobs tightens the reels in place.
- 2. Reel Tables**
Support 10.5-inch reels/half-inch tapes. Use the same

size and type of reels for both the supply and takeup sides.

- 3. Guide Roller**
Correctly positions the tape along its path.
- 4. Tension Arms**
The capstan servo controls the tape tension and motor torque through the use of a position sensor attached to the right tension arm. The right tension arm is also associated with a shut-off mechanism that stops all tape motion if the tape slackens or spills off the reel. The left tension arm compensates for slight irregularities in the supply reel in addition to maintaining even tape tension.
- 5. Capstan Shaft and Motor**
- 6. Counter Roller**
This measures linear tape footage, which is converted into elapsed time from whatever zero point is entered. The counter roller is associated with a tach generator to provide information about tape motion to external synchronizers during fast wind movements.

7. Pinch Roller
The TSR-8's pinch roller is a "self-centering" type for maximum tape motion consistency. A rubber coating on it is of urethane for maximum resistance both to wearing and to cracking or hardening.

8. POWER Switch
Controls AC power to the TSR-8. Pressing POWER a second time turns the machine off, and clears the MEMO 1, MEMO 2, Punch-in Rehearsal (RHSL), and AUTO IN/OUT memories.

9. SPEED MODE Selector Switch
This switch selects either FIX or VARI mode. The setting of the switch is defeated as soon as external specific signals are fed into the TSR-8 via its rear panel ACCESSORY 1 or 2 connector in which case the EXT LED will automatically turn on.

FIX: Locks tape speed to 15 ips (38 cm/s). Setting to FIX is indicated by a green LED.

VARI: Switches tape speed control to the PITCH CONTROL. "Non standard" tape speeds can then be used. Setting to VARI is indicated by a red LED.

When the TSR-8 capstan motor is under external control of a synchronizer/controller the EXT LED will light steadily in yellow. When either the control signal or 9.6 kHz reference to the TSR-8 is interrupted, the EXT LED will flash and the FIX LED will turn on solid, indicating that the FIX speed mode is active, as summed up in the table below.

FIX LED	EXT LED	ACCESSORY 1 (Parallel)		ACCESSORY 2 (Serial)	
		Ext. Cont.	9.6 kHz	Ext. Cont.	9.6 kHz
On Solid	Off	None of the above four signals is coming			
On Solid	Flashing	Only one of the four signals is coming			
Off	On Solid	Either pair of the signals (control and frequency reference) is coming			

10. PITCH CONTROL

When and only when the SPEED MODE selector switch (#9) is in its VARI position and its red LED is on solid, the PITCH CONTROL is active and provides a stepless plus or minus 12% variation to the capstan motor speed both in Record and Play modes. Turn the knob to the left to lower the motor speed, or to the right to increase the motor speed.

You can use this speed control to accommodate minor changes necessary in the length or relative pitch of your program material. If you're making a 30 second radio commercial and it runs a little long, you can speed it up enough to drop out the extra seconds, although the material on it will raise in pitch. This can sometimes be used in a creative way to save parts that are a little out-of-tune, or to create sound effects such as flanging. If you record with the PITCH CONTROL at its maximum or minimum settings, you will NOT have the ability to make further adjustment in that direction upon playback.

Before beginning to record again, check the pitch carefully with a short playback, and you will have less troubles with drift.

CAUTION: The PITCH CONTROL affects the record speed also. Check to make sure that SPEED MODE select switch is set to FIX unless you are using the PITCH CONTROL intentionally.

11. REW(ind) Button

Pressed, winds tape at high speed in reverse.

12. F.FWD Button

Pressed, winds tape at high speed in the forward direction.

13. STOP Button

Stops any tape motion, and cancels all transport modes.

To cancel RHSL and AUTO IN/OUT modes, use CLEAR. If STOP is used instead, the LED RHSL or AUTO IN/OUT blinks, not turns off though those functions are actually disabled, and to turn off the LED you have to press CLEAR anyway.

14. PLAY Button

- a) Pressing this button alone starts tape playback.
- b) Pressing the button while recording stops the recording ("punch out") without stopping the tape motion.

15. RECORD Button

Pressing the RECORD button together with the PLAY button will cause either of the following two events:

- 1) If any Track Record buttons are engaged, the LED above them as well as the RECORD LED will stay on, and recording will begin on the corresponding tracks.
- 2) If none of the Track Record buttons is engaged, the master RECORD LED will blink to indicate a record ready.

Pressing the RECORD button alone during the tape is rolling in PLAY will enable a punch-in ("insert").

The RECORD LED conveys the following messages:

- A) LED off: safe mode — no recording is taking place.
- B) LED blinking: record ready mode — tape is rolling at play speed, but no actual recording is in progress. Recording will start as soon as any Track Record button or buttons are pressed on.
- C) LED on solid: record mode — recording is taking place.

16. Track Record Buttons

Pressing any of these eight buttons puts the corresponding track into Record-Ready, or directly into Record mode if RECORD and PLAY have already been pressed.

Functions of the Track Record LEDs

- A) LED off: Safe — recording cannot occur on that track.
- B) LED blinking: Record Ready — recording on that track will occur when RECORD and PLAY are pressed.
- C) LED on solid — recording on that track is in progress (RHSL or actual).

17. INSERT Switch

INSERT determines what signal (source or tape) appears at the output of tracks placed into record ready mode by the Track Record buttons. It allows automatic monitor switching from tape to source during punch-in, and back to tape at punch-out.

- A) When INSERT is ON, the output of any tracks whose LEDs are blinking (in record ready mode) will be Tape.
- B) When INSERT is ON and RECORD mode is entered (LEDs solid), the output of the tracks being recorded will be source (Input).
- C) When INSERT is OFF, the output of any tracks whose Record Enable buttons are on will be source (Input) regardless of whether you're actually recording or not.

The INSERT button only affects tracks whose Record LEDs are on. When INSERT is off, you can use the Track Record buttons to manually toggle between tape and source, and rehearse a punch-in.

Switch Setting		Transport Mode		
Track Record Button	INSERT	STOP	PLAY	RECORD
ON	ON	—	Tape	Input
	OFF	Input		
OFF	/		—	Tape

CAUTION: When performing Spot Erasures also, the INSERT switch MUST BE ON, so you can hear the output of the tape to find the erase point. (See page 30.)

18. Peak Level Meters

These meters register the signal levels being fed to the TSR-8's OUTPUT connectors, in the limits of -20 dB to +8 dB.

19. AUTO INPUT Button

This feature automatically switches the output of tracks in REC READY mode to input during REW, F.FWD or STOP. This allows the control room to hear the talent through the tape monitor for communication, without having to change any settings on the mixer.

20. ALL INPUT Button

When ALL INPUT is pressed on, all the channels' output will carry signals derived from the input electronics regardless of the transport mode.

21. SYNC LOCK Switch

SYNC LOCK is used to "lock" track 8 to playback mode so sequencers or synchronizers can constantly read sync signals (FSK or SMPTE time codes) played back from that track. Another function the switch provides is to turn off the DBX on track 8 only, enabling sync signals to be recorded and played back without being affected by the dbx encode/decode.

When recording sync signals on track 8 be sure to press the SYNC LOCK switch AFTER the track's record enable button. A red LED will then start blinking above the SYNC LOCK switch to indicate that the DBX on track 8 is disabled.

CAUTION: If the SYNC LOCK switch is pressed when the track 8 button is in its OFF position, the SYNC LOCK LED will turn on solid, instead of blinking, to indicate that the track is "locked", and pressing the track button has no effect and any recording can't start on that track.

Once track 8 is complete, release the track button by pressing it again. This will cause the SYNC LOCK LED that was blinking to turn on solid. As the LED is on solid, the track will NOT switch to Input, regardless of the settings of ALL INPUT or AUTO INPUT.

The track 8's status is determined by the following logic.

Switch Setting		Track 8 Status	
Record Enable Button (track 8)	SYNC LOCK Switch	Recording	DBX System
ON (LED flashing or on solid)	ON (LED flashing)	Possible or Currently in progress	Ineffective*
	OFF (LED off)	Possible	Effective or Ineffective**
OFF (LED off)	ON (LED on)	Impossible	Ineffective*

*) Regardless of the setting of the DBX switch

***) Depending on the setting of the DBX switch

22. DBX NR On/Off Switches, 1-4 and 5-8

When these switches are engaged, their LEDs will light and the built-in dbx noise reduction system for each group of channels (1-4 and 5-8) is turned on. This system provides a noise reduction of about 30 dB and increase of tape saturation level (headroom) of about 10 dB, resulting in a dynamic range of more than 100 dB.

When the SYNC LOCK switch is engaged, the dbx system for track 8 is disabled, as shown in the table above.

23. RHSL (Rehearsal) Button

RHSL is the first stage of an automatic punch-in recording. During Rehearsal Set mode (RHSL LED blinking), the TSR-8 memorizes the preroll, punch-in, and punch-out counter locations that are used for rehearsals and for AUTO IN/OUT.

When the desired Rehearsal points are memorized and the RHSL LED is on solid, the TSR-8 is in RHSL Ready mode, and pressing PLAY or footswitch will start a rehearsal loop. After a 3-second postroll, the tape will rewind, stopping at the preset preroll start point. The TSR-8 will again be in RHSL Ready mode. You can repeat the rehearsal sequence as many times as you wish.

In the above Rehearsal mode, the RHSL function (in combination with the INSERT feature) switches the output of tracks in record ready mode from tape to source and back again at the preset points BUT NO SIGNAL WILL BE RECORDED TO TAPE. This allows you to hear what a punch-in will sound like before you actually record it, without having to manually press any keys or footswitch.

24. AUTO IN/OUT Button

After you have set the tape's preroll start, punch-in, and punch-out points in RHSL mode, entering the TSR-8's AUTO IN/OUT mode puts it into a ready status to commit the record Punch to tape. Pressing PLAY or the RC-30P footswitch initiates the actual recording by activating the automatic Punch-In/Punch-Out sequence (Preroll, Punch-In, Punch-Out and Postroll).

25. CLEAR Button

This is used to turn off the RHSL and AUTO IN/OUT functions.

Pressing CLEAR during any other modes than RHSL and AUTO IN/OUT has no effect.

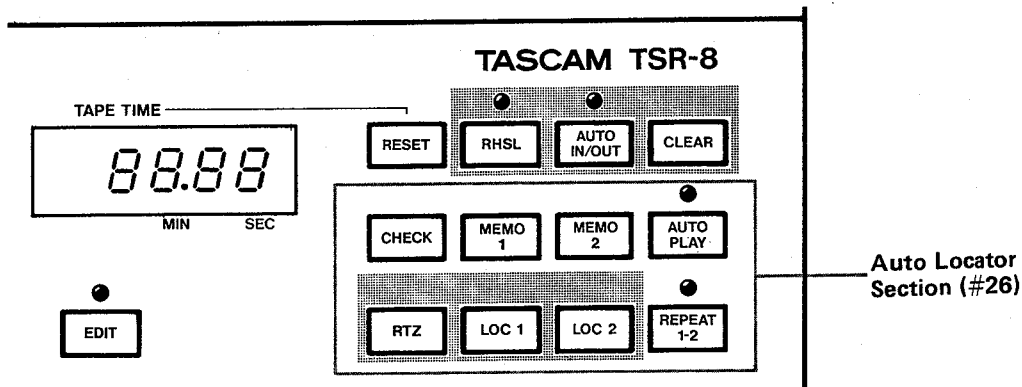
26. Auto Locator Section

Grouped to this section are the following:

- 1) MEMO 1 and 2
- 2) CHECK
- 3) LOC 1 and 2
- 4) REPEAT
- 5) RTZ
- 6) AUTO PLAY

1) MEMO 1 and MEMO 2 Buttons

These buttons are used to establish 2 autolocation points in the TSR-8's memory system. They can be used while the tape is stopped or rolling. Pressing either button at any point on the tape loads the current tape location into that memory register. Each time the button is pressed, a new MEMO point is established, erasing the previous memory in that register. Neither

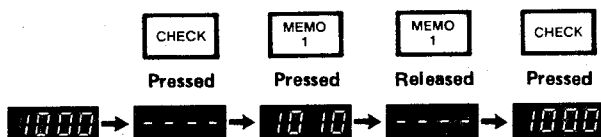


MEMO location can be used if the TSR-8 is in RHSL or AUTO IN/OUT mode. Both MEMO points are erased when power is turned off.

If the RESET button is pressed, and the counter is set to 00.00, the two MEMO points are automatically recalculated, so they stay the same relative to their original tape position.

2) CHECK Button

When the CHECK button is pressed, the digital counter shows a broken line. Pressing then the MEMO 1 or 2 button causes the counter to show, for as long as the MEMO button is held pressed down, the content of the corresponding register. As you release the MEMO button, the counter again shows the broken line. A second press of CHECK, switches the counter to the original display (Tape Run Time).



3) LOC 1 and LOC 2 Buttons

Pressing either of these buttons causes the tape to roll (in either F.FWD or REW) to the corresponding MEMO point. The tape will stop when it reaches the MEMO point. If the AUTO PLAY feature is used together, the TSR-8 will enter automatically Play mode after reaching the memorized point.

The LOC 1 and 2 buttons can safely be pressed at any time except during RHSL and AUTO IN/OUT modes; if pressed during these modes, they erase the punch-in memory points.

4) REPEAT 1-2 Button

The REPEAT function provides a "Playback Loop" or "Block Repeat" between the two programmed MEMO points. Note that MEMO 2 does NOT have to be a number greater than MEMO 1. When REPEAT is enabled and the current tape location is between the two MEMO points, the tape will play to the higher MEMO location, rewind to the lower MEMO location and start over. This cycle will repeat until STOP, or any other transport button is pressed.

If LOC or RTZ is pressed when REPEAT is on, REPEAT is cancelled and LOC or RTZ is entered, instead.

5) RTZ (Return to Zero) Button

Pressing the RTZ button will cause the TSR-8 to fast wind (FAST FORWARD or REWIND) the tape to the counter 00.00 point on the tape (even if the display isn't showing the counter). If the AUTO PLAY feature is active, the TSR-8 will automatically enter Play mode after reaching the counter zero point.

During RHSL and AUTO IN/OUT modes also, the RTZ function can be activated, but remember, the punch-in memory points are then erased.

6) AUTO PLAY Button

This feature is used together with the LOC 1 and 2 and RTZ functions. Pressing AUTO PLAY before (or after) RTZ, LOC 1 or LOC 2, will program the TSR-8 to start playback each time after it has located to the counter zero or MEMO points.

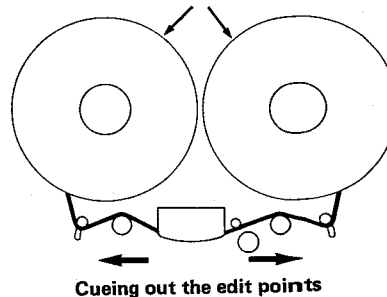
27. EDIT Button

The EDIT button provides the following five functions (all of which are disabled when STOP or any other transport buttons are pressed):

1) Manual Edit

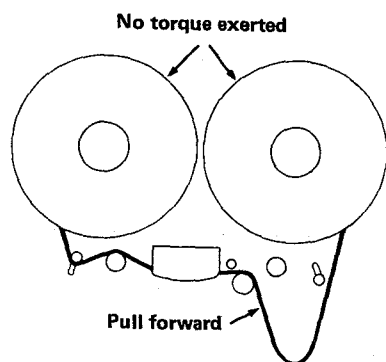
When the transport is in STOP and the right (takeup) tension arm is in its "on" position, pressing EDIT will turn its LED on and disengage the reel motor brakes, and the same amount of torque will be exerted on both reels. The reels may then be "hand rocked" to locate the exact edit points.

Move by hand backwards and forwards



2) Stop Edit

When the transport is in STOP and the right tension arm has dropped to its "off" position, pressing EDIT will turn its LED on and disable the output mute. The tape may then be pulled forward off the supply reel as you listen to it play.

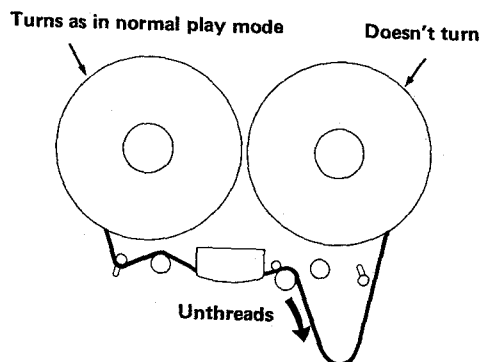


5) Cueing

If EDIT is pressed and held down during the Fast Winding modes (including LOC, RTZ, and REPEAT), the tape lifters will retract so that the tape contacts the heads, enabling high-speed tape monitoring. As the cueing mode is activated, a high-cut filter is automatically inserted to prevent the meter circuits and speaker components from being damaged by high energy audio signals.

3) Dump Edit

If EDIT and PLAY are simultaneously pressed when the transport is in STOP, the EDIT LED will turn on and the tape will begin unthreading from the supply reel as you listen to it play. The right tension arm position is disregarded by the shut-off sensing logic.



NOTE: Dump Edit can not be enabled unless EDIT and PLAY are pressed simultaneously. Pressing EDIT then PLAY only causes the tape to play normally. Pressing EDIT after PLAY has no effect; the tape continues to play.

4) Spot Erase

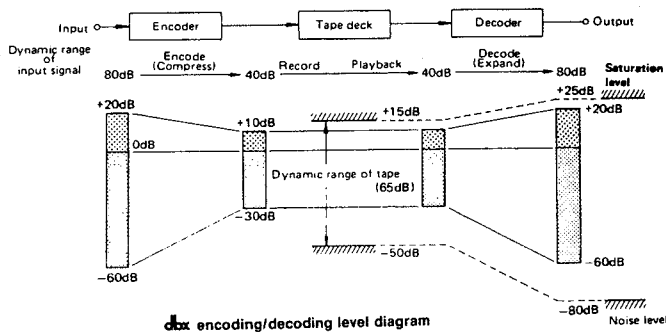
This function makes it easy to erase specific portions on a given track. First, designate the track to be erased by pressing on its Record Enable button. Press INSERT so you can hear tape, enter the Manual Edit mode as explained above and "hand rock" the reels until you cue out the spot to be erased. Then back up the tape slightly so that the portion you were hearing is now at the erase head (a china marker on the tape point is helpful for this). Press and hold RECORD while slowly moving the tape by hand. Erasure continues for as long as you advance the tape with RECORD hold down.

How the dbx Works

The DBX is a wide-band compression-expansion system which provides a net noise reduction (broad-band, not just hiss) of a little more than 30 dB. In addition, the compression during recording permits a net gain in tape headroom of about 10 dB.

A compression factor of 2:1 is used before recording; then, 1:2 expansion on reproduce. These compression and expansion factors are linear in decibels and allow the system to produce tape recordings with over a 100 dB dynamic range — an important feature, especially when you're making live recordings. The DBX employs RMS level sensors to eliminate compressor-expander tracking errors due to phase shifts in the tape recorder, and provides excellent transient tracking capabilities.

To achieve a large reduction in audible tape hiss, without danger of overload or high-frequency self-erasure on the tape, frequency pre-emphasis and de-emphasis are added to the signal and RMS level sensors.



SUBSONICS AND INTERFERENCE

The DBX incorporates an effective bandpass filter. This filter suppresses undesirable subsonic frequencies to keep them from introducing errors into the encode or decode process. However, if rumble from trains or trucks is picked up by your microphone and fed to the DBX, modulation of the program material during low level passages may occur. This low-frequency component will not itself be passed through the recorder and so, will not be present at reproduce for proper decoding. If this low-level decoding error is encountered, and subsonics are suspected, we suggest the addition of a suitable high-pass filter in the Microphone Line.

Care and Maintenance

We can't stress the importance of cleaning and demagnetizing too much. Oxide shed from the tape and accumulated on the heads and other components in the tape path and dust or debris picked up from the air can result in poor high frequency response. Also, the heads may become magnetized. This residual magnetism can increase noise and distortion, significantly degrading record/reproduce performance. Clean up and demagnetize at least every day before you start to work with the TSR-8.

CLEANING

1. Press down the head shield to get full access to the heads.
2. Apply cleaner to a cotton swab or lint-free gauze and wipe the entire surface of the tape path. Wipe off any excess cleaning fluid with a dry swab.

CAUTION: Be sure to use a good cleaner. We recommend the following:

- TEAC HC-1 (U.S. only) or TZ-261A (for heads, tape guides, guide roller, and capstan shaft); and
- TEAC RC-1 (U.S. only) or TZ-261B (for pinch roller and counter roller).

DEGAUSSING (DEMAGNETIZING)

A little stray magnetism can become quite a big nuisance in tape recording. It only takes a small amount (.2 Gauss) to cause trouble on the record head. (Gauss is the unit used to measure magnetism.) A little more than that (.7 Gauss) will start to erase high frequency signals on previously recorded tapes. You can see that it's worth taking the trouble to degauss regularly.

DEGAUSSING IS ALWAYS DONE WITH THE RECORDER TURNED OFF. If you try it with the electronics on, the current pulses produced by the degausser will look just like audio signals to the heads. These pulses are around 10,000 Gauss, and will seriously damage the electronics and/or meters. Turn off your TSR-8, then turn on the degausser at least 1 m (3 feet) away from the recorder.

Be certain that your degausser has either a plastic cover or plastic tape covering the tip. Make sure that no metal ever touches the tape heads as it will scar them and ruin them.

Slowly move in to the tape path. Move the degausser slowly back and forth, touching lightly all metal parts in the tape path. Slowly move it away again to at least 1 m (3 feet) from the recorder before turning it off.

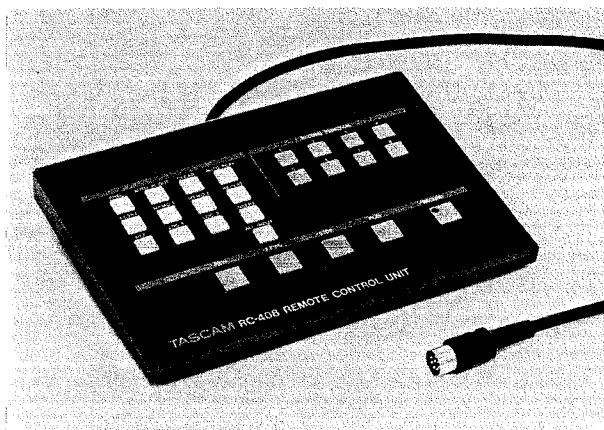
Be sure to concentrate while you are degaussing. Don't try to hold a conversation or think of anything else but the job you are doing. If the degausser is turned on or off by accident while it is near the heads, you may put a permanent magnetic charge on them that no amount of careful degaussing will remove. You will have to get the heads replaced. Make sure you are wide awake for this job.

A clean and properly demagnetized tape recorder will maintain its performance without any other attention for quite a while. It won't ruin previously recorded material, nor will getting it back to original specifications be difficult.

Optional Equipment

RC-408 Remote Control Unit

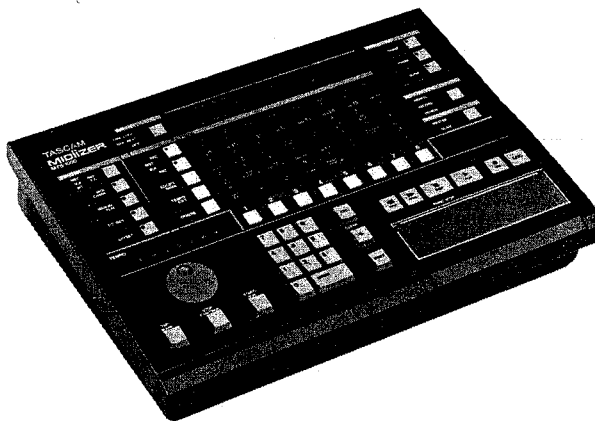
The RC-408 has duplicates of the rehearsal/auto punch-in and auto locator controls in addition to the basic transport controls. Width is 212 mm (8-3/8"), height 38 mm (1-1/2"), and depth 149 mm (5-7/8"). Cable length is 5 m (15 ft.).



MTS-1000 MIDiiZER

The MTS-1000 is a "Multi-Synchronizer" containing a SMPTE tape transport synchronizer combined with a MIDI-to-SMPTE synchronizer in a single low-cost unit. It is used to make different machines — in this case tape transports and sequencers or rhythm units — play at exactly the same rate of speed, from any desired starting point. This is called "chase-lock" capability. When the MIDiiZER is connected to these other units, it becomes the all-in-one master controller for the system.

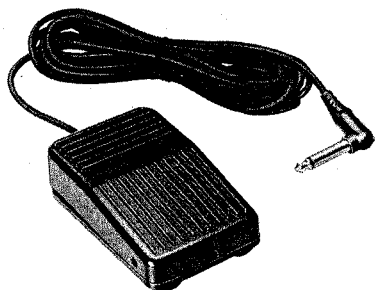
(Available Summer 1989.)



RM-408 Rack Mount Angle

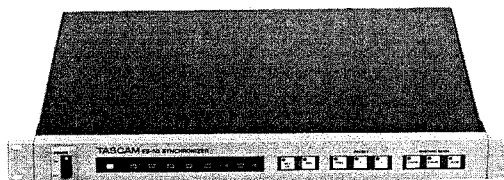
Required when mounting the TSR-8 to a 19" rack such as the TASCAM CS-607B.

RC-30P Remote Footswitch



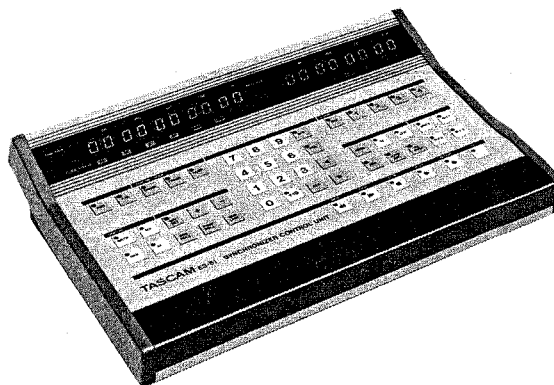
ES-50/ES-51 SMPTE Synchronizer/Controller

The TASCAM ES-50 can be used as either a stand alone chase lock synchronizer or with the TASCAM ES-51 edit controller, which gives access to more complex control/editing functions.



MTS-30 MIDI-Tape Synchronizer

The MTS-30 allows the TSR-8 to sync-up with the MIDI keyboards, drum machines, sequencers. Thanks to its unique "Song Pointer Sync" capability, the associated MIDI equipment will stay in sync and follow the tape no matter where you move the tape within a given song. The MTS-30 responds also to the PITCH CONTROL of the TSR-8. The maximum stability or resolution of the synchronization is ensured by the use of a newly developed, special error correction circuit.



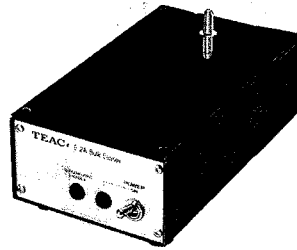
LA-40 Low-Impedance Adaptor

The LA-40 is a 4-channel low impedance adaptor which makes it possible to connect 600-Ohm balanced +4 dBm/-20 dBm XLR type connectors or 3-conductor 1/4" phone jacks to -10 dBV RCA jacks, or vice versa.

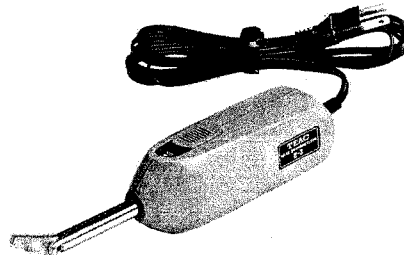
The LA-40 can be conveniently mounted on the TASCAM CS-607B or equivalent EIA standard 19-inch rack.



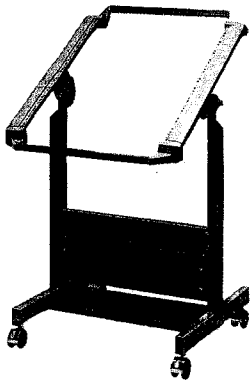
E-2A Bulk Eraser



E-3 Head Demagnetizer



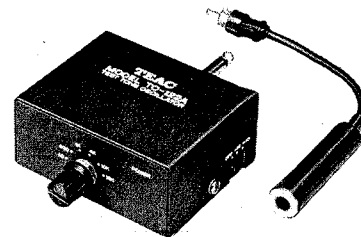
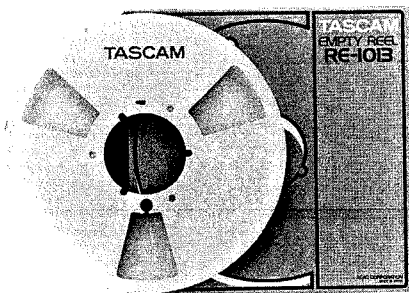
CS-607B 19" Console Rack



TO-122A Test Tone Oscillator

Useful for system calibration or level checks. Provides six frequencies: 40 Hz, 400 Hz, 1 kHz, 4 kHz, 10 kHz, and 15 kHz. Level is switchable between -10 dBV and -40 dBV. Also available is the TO-8 with three frequencies: 400 Hz, 6.3 kHz, and 12.5 kHz.

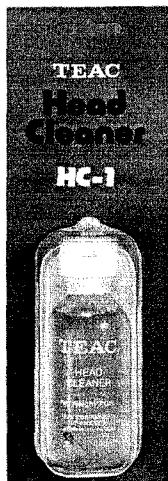
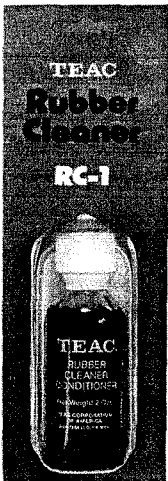
RE-1013 Metal Reel



TZ-261 Cleaning Kit (Except U.S.)



**HC Head Cleaner & RC Rubber Cleaner
(U.S. Only)**



MAINTENANCE

" CAUTION – THESE SERVICE INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL."

INSTRUCTIONS FOR SERVICE PERSONNEL

BEFORE RETURNING APPLIANCE TO THE CUSTOMER, MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT.

NOTES

- ★ Parts marked with * require longer delivery time.
- ★ All resistors are 1/4 watt, 5 % unless marked otherwise. Resistor values are in ohms (K=1,000 ohms, M=1,000,000 ohms).
- ★ All capacitor values are in microfarads (p=pico-farads).
- ★ \triangle Parts marked with this sign are safety critical components. They must always be replaced with identical components – refer to the TEAC Parts List and ensure exact replacement.
- ★ 0 dB is referenced to 1 V in this manual unless otherwise specified.
- ★ PC boards shown viewed from electro-parts side.

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TR PCB Ass'y, N. Filter PCB Ass'y, I/F PCB Ass'y, Head Connect PCB Ass'y	42/47
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Power Supply PCB Ass'y, TR PCB Ass'y, N. Filter Ass'y, Fuse PCB Ass'y	55
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1. BRIEF SIGNAL THEORY

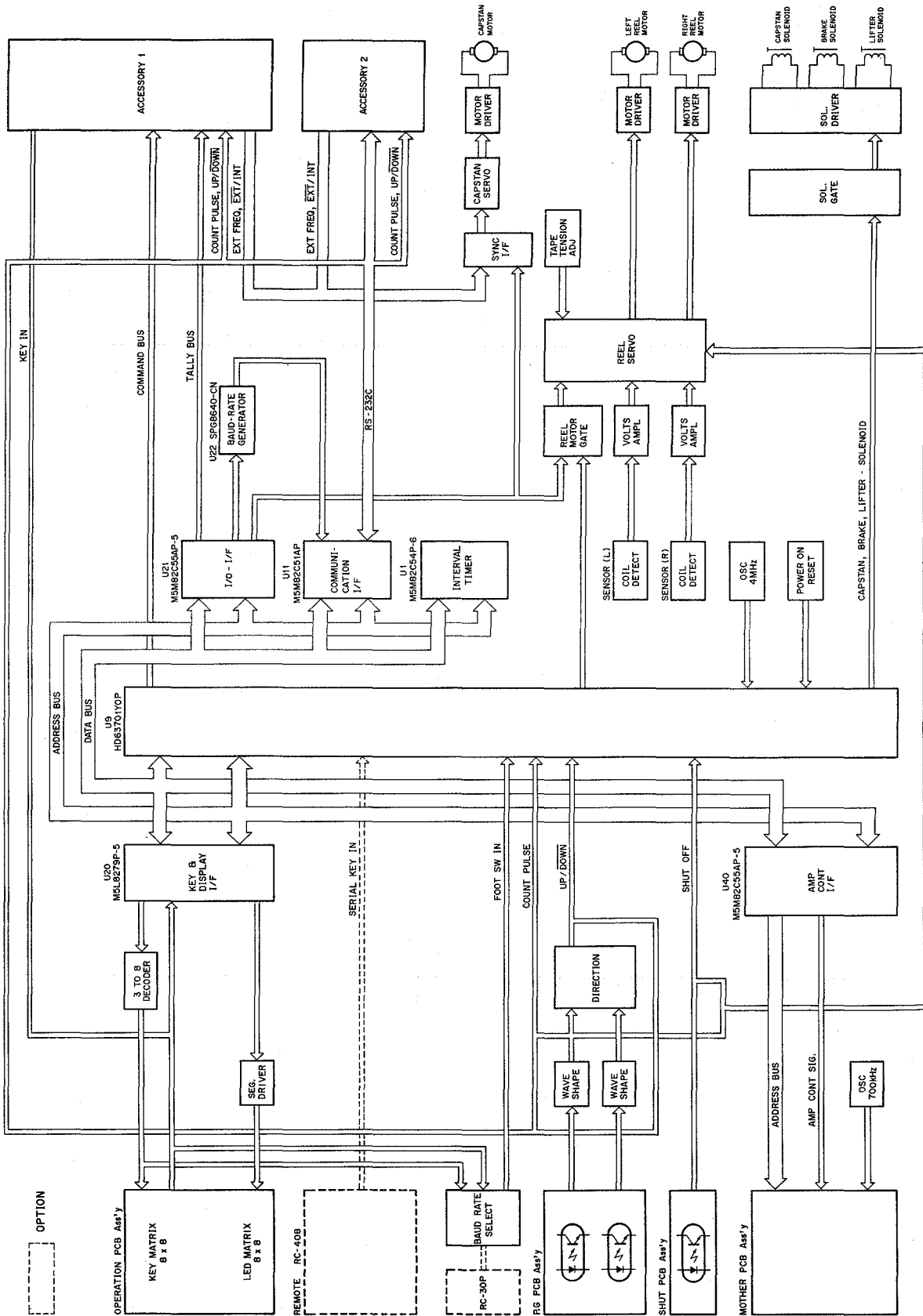


FIG. 1. CONTROL SIGNAL BLOCK DIAGRAM

1-1. Controls

Refer to the Control Signal Block Diagram (Fig. 1) and Control PCB Schematic (p. 50).

The TSR-8 uses an 8-bit micro computer U9, HD63701YOP, to control all tape motions.

Keyed-in signals are sent in parallel to U9 through the key matrix in U20. Keyed-in signals from the optional remote control unit are sent to pin 9 of U9 as a serial data.

In the P.G. PCB are generated two signals which have a phase difference of 90° each other. One of the two is that which serves as the tape count pulse. Advance/delay in phase occurred in the two signals yields the tape counter the UP/DOWN signal.

From the expander U40 are sent mode instructions and timing signals to the amplifier of each channel.

The ACCESSORY 1 connector (37-pin, D-sub) is a parallel interface port for connection to SMPTE synchronizers/controllers.

The ACCESSORY 2 connector (15-pin, D-sub) is a serial interface port complying with the RS-232C standard for connection to MIDI tape synchronizers or computers.

The GATE circuit to the reel motor generates reference voltages following the switchings of the transport mode, to accordingly control the reel servo. The SENSOR circuits "watch" the tape tension and control the reel motor so the tape runs with the optimum tension in whatever mode the transport may be.

1-2. Amplifiers

Refer to the R/P AMPL PCB Schematic (p. 51).

The TSR-8's electronics are controlled by the U86, μ PD7554CS-110, micro computer.

U86 decodes serial data (SI) from the control circuits and transmits the following signals:

(Outputs from pins 12 through 16 are active at LOW.)

Pin 5	AISO	Switches the monitor output to INPUT or SYNC. When the pin goes L, INPUT is selected.
Pin 7	ANFO	Sends out a signal controlling the on/off switching of the dbx system. At L, the dbx turns on.
Pin 8	AMTO	Sends out the play mute on/off signal. The mute is disabled as the pin goes L.
Pin 12	ARB	Controls the record bias start/stop.
Pin 13	ARRL	Energizes the record relay (K1) which is used to switch the R/P head functions. Also, connects line inputs to DBX NR circuit and puts the circuit into Encode mode.
Pin 14	AEC	Controls the erase current start/stop.
Pin 15	AERL	Energizes the erase relay (K2).
Pin 16	SE	Sends out the spot erase signal.

The gapless punch-in/out is controlled by the timing of the above ARB, ARRL, AEC and AERL signals.

2. VOLTAGE CONVERSION

NOTE: This voltage conversion is only possible on general export models and NOT on models sold in the U.S.A., Canada, U.K., or Europe.

Proceed as follows:

1. Make sure that the power cord is unplugged.
2. Remove the upper rear panel by removing four screws on the rear upper.
3. Locate the voltage selector where indicated in the illustration below and pull off the selector plug (the center shaded square piece) to reinsert it so that the arrow on it points at the required voltage values.
4. Replace the upper rear panel and fully tighten the four screws.

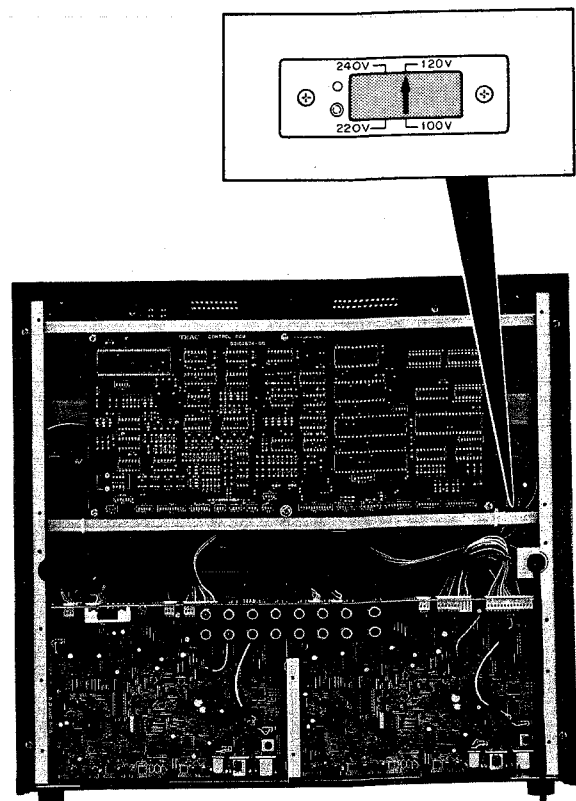


FIG. 2. VOLTAGE CONVERSION

3. CHECKS AND ADJUSTMENTS

3-1. Parts Locations

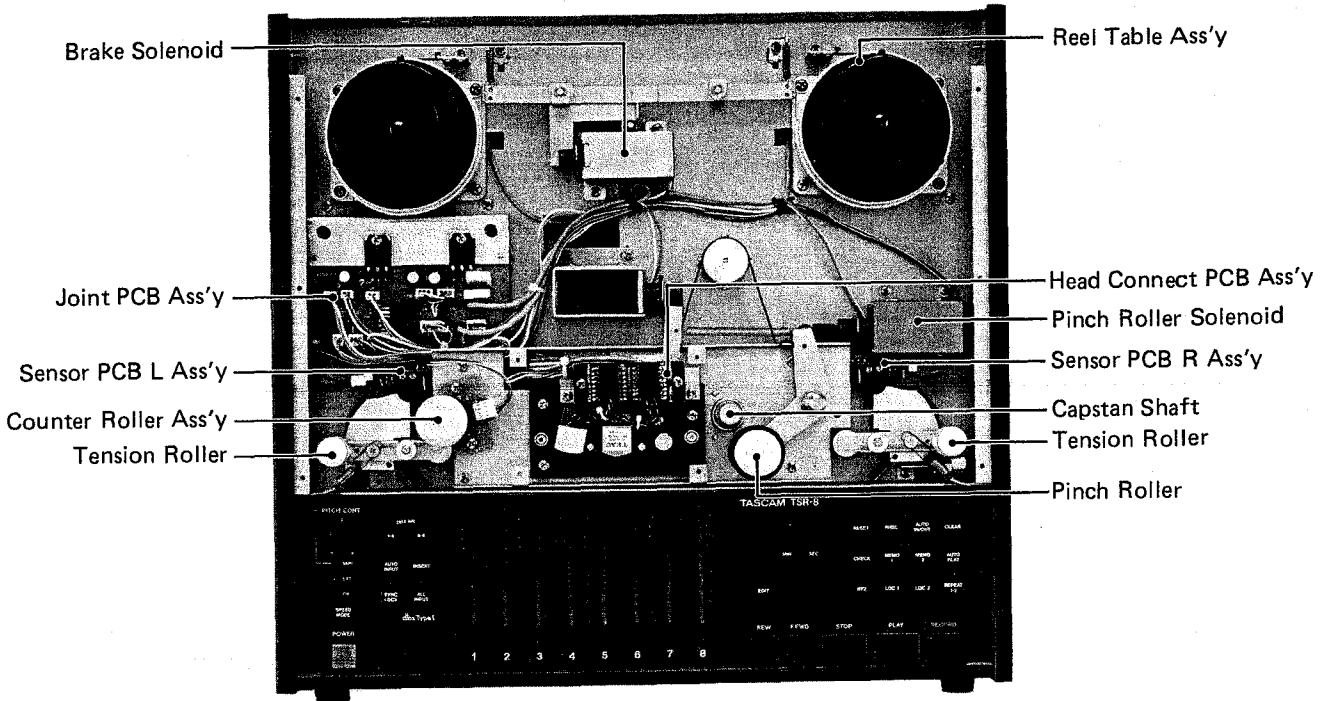


FIG. 3. WITH THE FRONT PANEL REMOVED

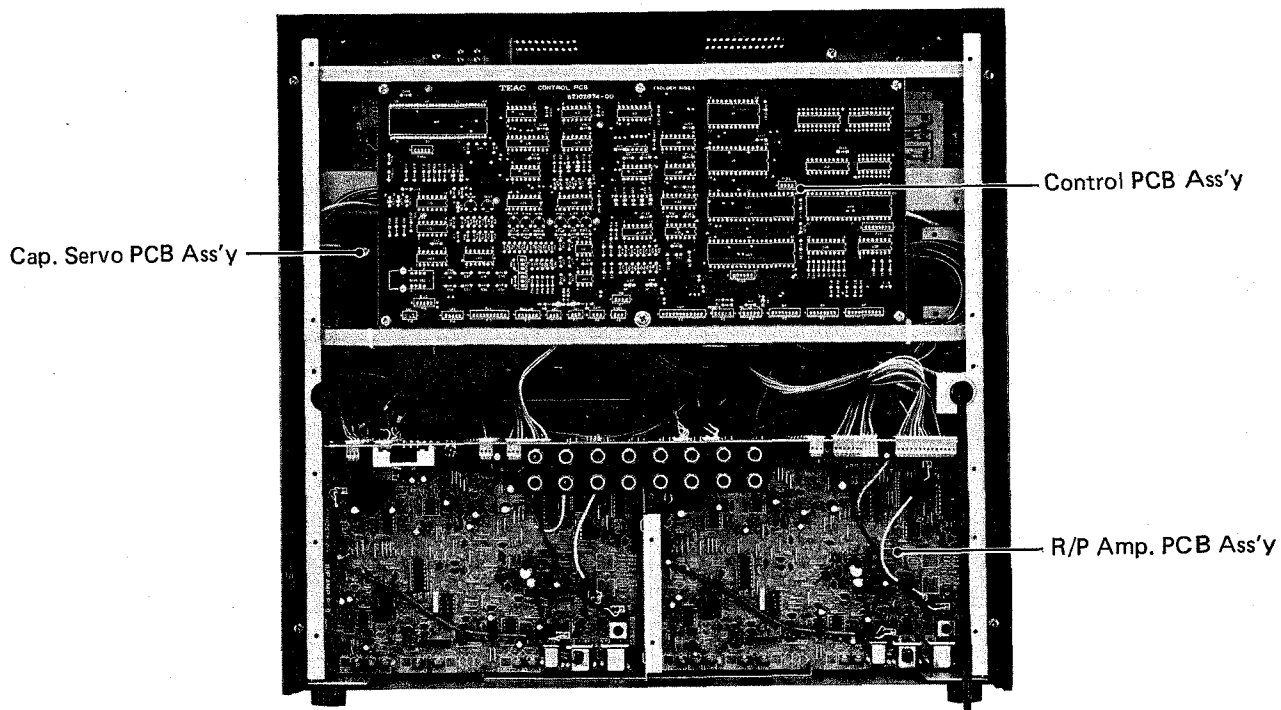


FIG. 4. WITH THE REAR PANELS REMOVED

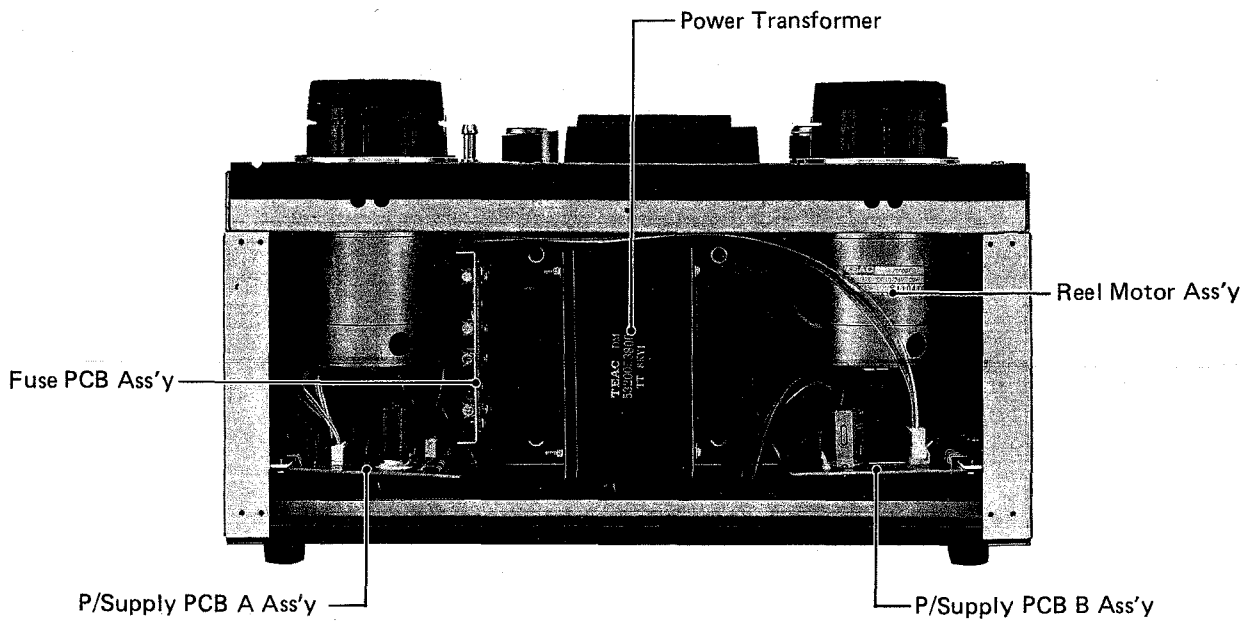


FIG. 5.

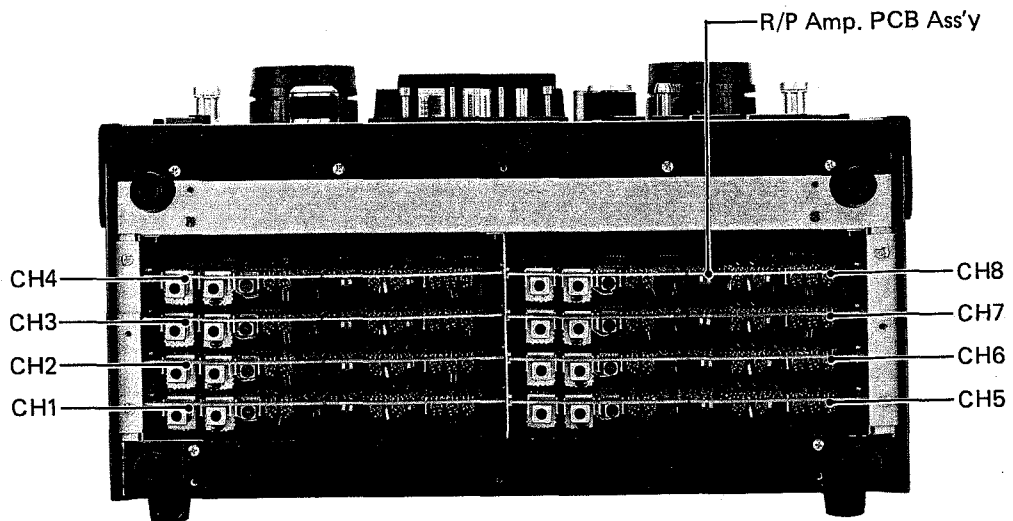


FIG. 6. WITH THE BOTTOM PANEL REMOVED

3-2. Test Equipment

Wow & flutter meter	Meguro Denpa Sokki K.K., Model MK-668C or MK-669 (JAPAN), or Mincom Division, 3M Co, Model 8155 (U.S.A.)
Audio oscillator	Hewlett Packard, Model 204C or equivalent
Digital frequency counter	Range: 10 Hz ~ 1 MHz; sensitivity: 0.1 Vrms; imp.: $> 1 \text{ M}\Omega$, $< 25 \text{ pF}$
Band-pass filter	1 kHz narrow band pass type
AF level meter	Range: -80 dB ~ +40 dB; imp.: $> 1 \text{ M}\Omega$, $< 25 \text{ pF}$ (example—HP 400GL)
Distortion meter	General purpose (400 Hz, 1 kHz)
Oscilloscope	General purpose
Attenuator	General purpose
Tools	Spring scale: 0 ~ 8 lbs (0 ~ 4 kg) 0 ~ 2.2 lbs (0 ~ 1 kg) Hex head Allen wrenches, Plastic alignment tool
Cleaning fluid:	TEAC TZ-261 or equivalent TEAC Spindle Oil TZ-255 or equivalent
Head demagnetizer	TEAC E-3 or equivalent
Test tapes	Reproduce Alignment Test Tape: TEAC YTT-11442 (for 15 ips) Equalization Standard.: IEC, CCIR. Time Constant: 15 ips = $\infty \mu\text{s} + 35 \mu\text{s}$. Wow and Flutter Test Tape TEAC YTT-2104 (for 15 ips) Blank Test Tape (Recording) TEAC YTT-8163.

3-3. Removal of Main Parts

WARNING! TO AVOID ELECTRIC SHOCK, BE SURE TO UNPLUG POWER CORD PRIOR TO REMOVE OR REPLACE ANY PARTS.

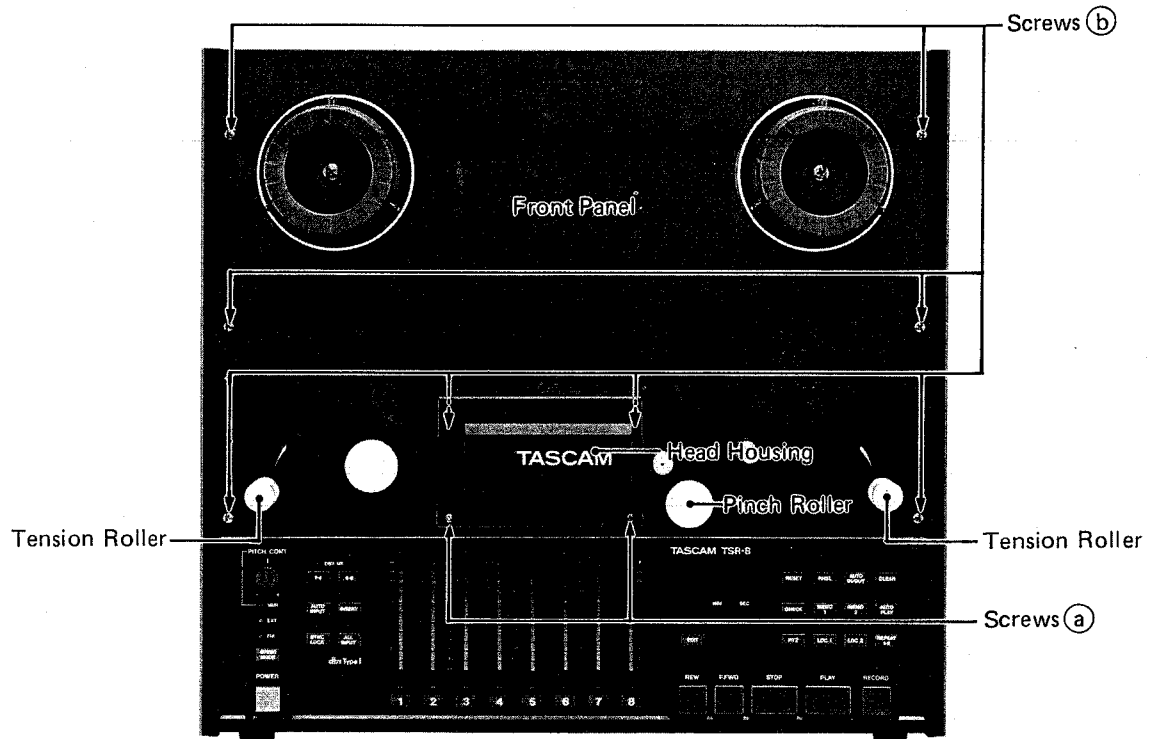


FIG. 7. FRONT VIEW

3-3-1. Panel removal

1) Front trim panel

1. Remove the head housing by removing the two "a" screws (Fig. 7), then remove the pinch roller and tension roller by unscrewing their caps (counterclockwise rotation).

2. Remove the eight "b" screws.

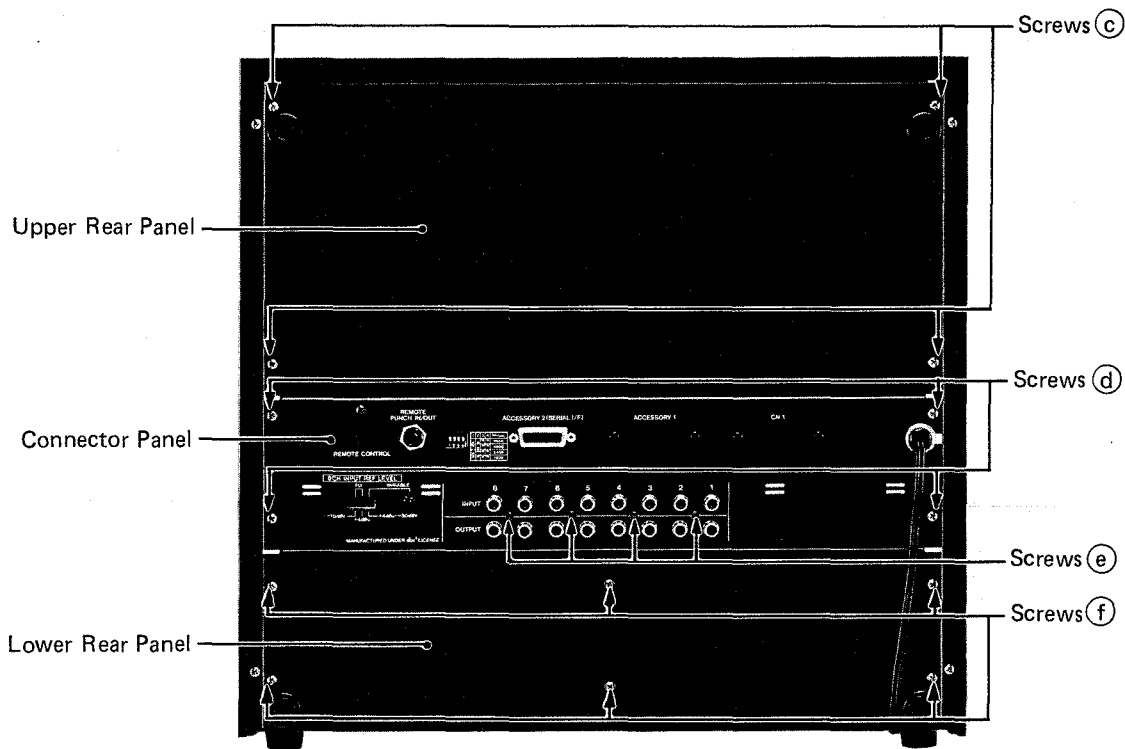


FIG. 8. REAR VIEW

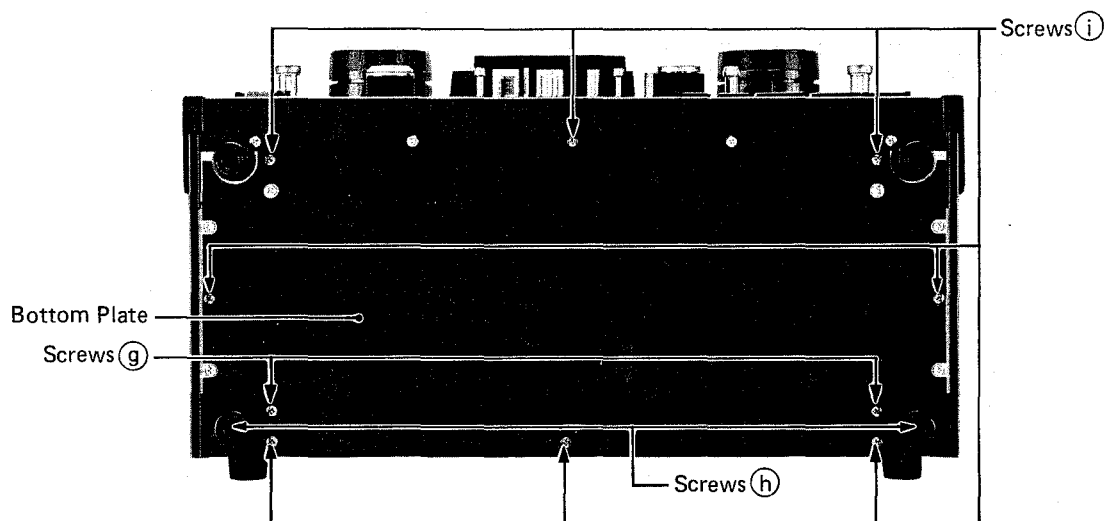


FIG. 9. BOTTOM VIEW

2) Upper rear panel

To remove the upper rear panel remove the four "c" screws shown in Fig. 8.

3) Connector panel

Remove the four "d" and four "e" screws shown in Fig. 8 and pull the connector panel toward you.

4) Lower rear panel

1. Remove the bottom panel (next paragraph).
2. Remove the six "f" screws shown in Fig. 8.
3. Remove the two "g" screws shown in Fig. 9, and loosen the "h" screws to remove the feet.

5) Bottom panel

To remove the bottom panel remove the eight "i" screws shown in Fig. 9.

3-3-2. Removal of Main PCB Assemblies

1) Control PCB

Remove the three screws indicated in Fig. 10, the control PCB can then be pulled open.

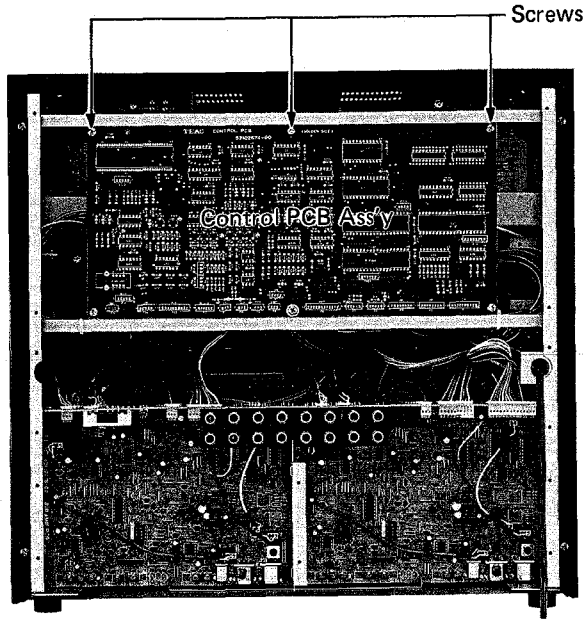


FIG. 10. CONTROL PCB ASS'Y REMOVAL

2) Amp PCBs

Remove the bottom panel as per 5), 3-3-1, then use the provided "card puller" (a hook) to withdraw the amp PCBs.

3-3-3. Fuses

When fuses have blown, fix the problem before replacing them.

CAUTION: When replacing fuses, check to make sure that the power cord is unplugged, and, be sure to use fuses with the same specifications as the originals.

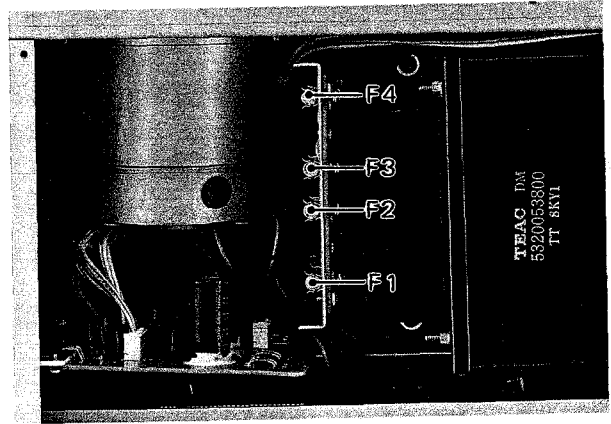


FIG. 11.

3-4. Transport Alignment

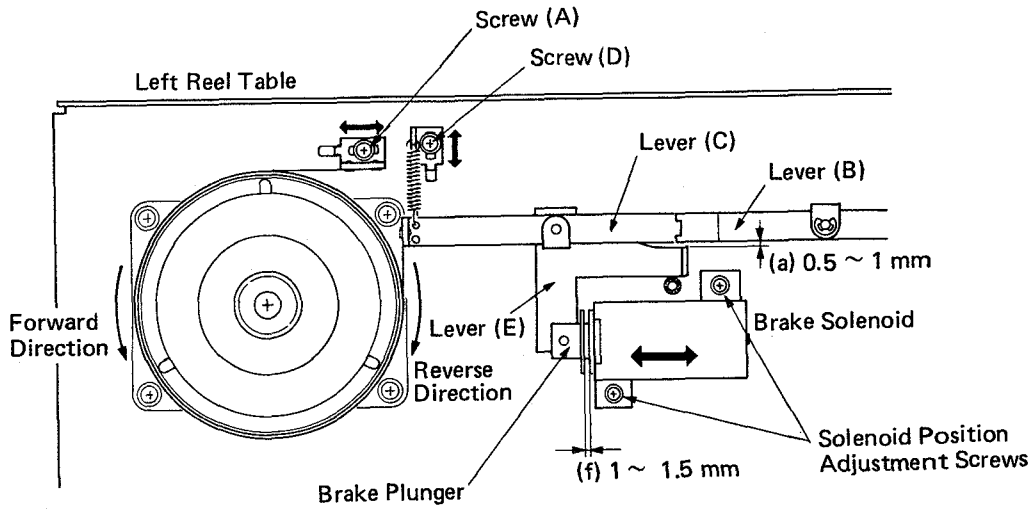


FIG. 12. BRAKE MECHANISM & TORQUE ADJUSTMENTS

3-4-1. Brake mechanism

CAUTION: Make sure that no power is applied to the deck before performing the following.

1. Refer to Fig. 12. Adjust the (A) screw so clearance (a) is within 0.5 and 1 mm.
2. Adjust the solenoid position so that, when you

slightly push the brake plunger until there is no (a) clearance, plunger and washer distance (f) is within 1 and 1.5 mm.

3. Adjust the (A) screw of the right brake assembly (not shown in the figure) so lever (B) is parallel to lever (C).

3-4-2. Brake torque

CAUTION: Make sure that no power is applied to the deck before performing the following.

1. Mount an empty 10-1/2" reel onto either reel table and attach a spring scale to the reel with a string. See Fig. 13.
2. Smoothly pull the scale away from the reel under test and note the torque value when the reading on the scale is steady. Take the four measurements A through D shown in Fig. 13. The proper torque values are shown in table below.
3. If forward brake torque is not within specifications, adjust the spring hanger hooking position by loosening screw (D) shown in Fig. 12. If this adjustment has no effect or
4. If reverse brake torque does not meet specifications, perform the following:
 - a) After cleaning brake belt inner side with an alcohol cleaning solution, replace brake felt pad with a new one.
 - b) Recheck brake mechanism, paragraph 3-4-1.

If the above procedure has no effect, replace reel table(s).

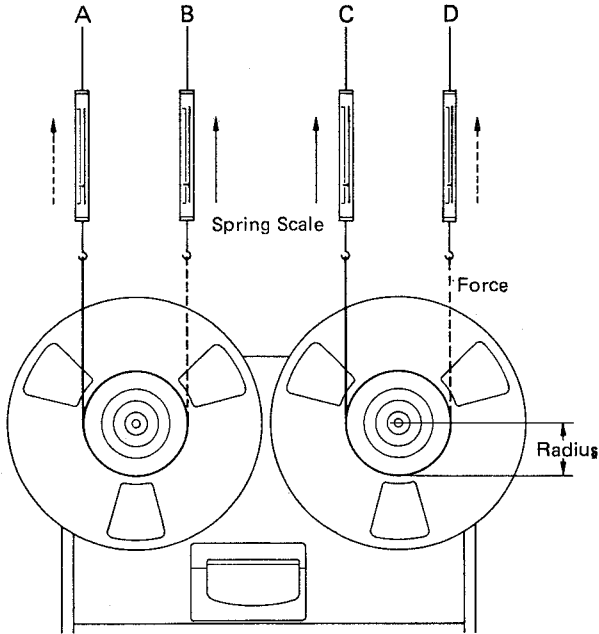


FIG. 13. BRAKE TORQUE MEASUREMENT

Forward Torque; B & C in Fig. 13	2300 – 2700 g-cm (32.0 – 37.5 oz-inch)
Reverse torque; A & D (approx. <i>reference</i> values)	800 – 950 g-cm (11.1 – 13.2 oz-inch)

Torque calculating formulas:

1. Torque (in g-cm or oz-inch)
= Force or Weight (in g or oz) x Radius
(in cm or inch)
2. Conversion of g-cm to oz-inch:
 $g\text{-cm} \times 0.0139 = \text{oz-inch}$

3-4-3. Pinch roller pressure

NOTE: Pinch roller pressure is supplied by the pinch roller spring arm, and it is most important that the solenoid plunger be fully bottomed before taking any pressure measurements.

1. Hold the right tension arm up with a rubber band, string, etc.
2. Place the deck in reproduce mode, without threading tape.
3. Attach a spring scale to the pinch roller as shown in Fig. 14.
4. Pull the spring scale perpendicularly to the pinch roller arm as shown in the figure below, until the pinch roller just stops turning. The scale should then read 1.2 kg to 1.5 kg (2-10/16 lbs to 3-5/16 lbs).

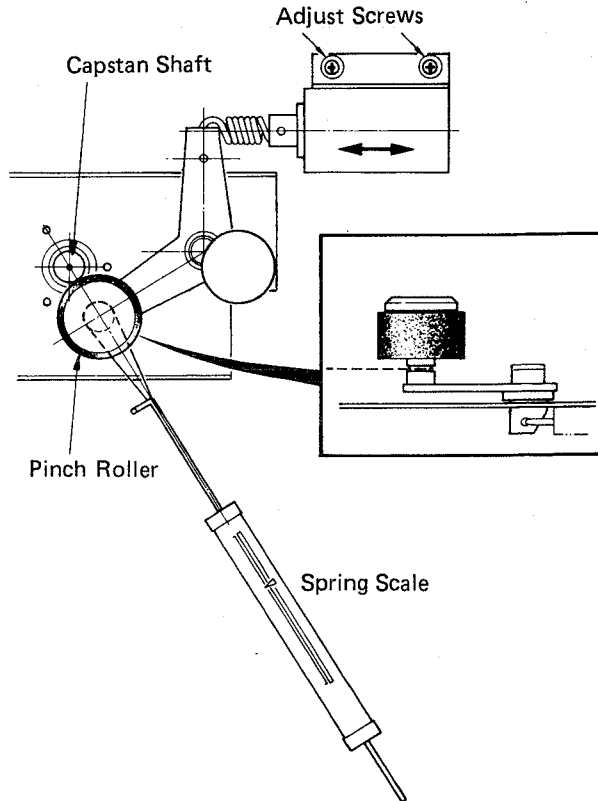


FIG. 14. PINCH ROLLER PRESSURE ADJUSTMENT

3-4-4. Capstan thrust clearance

Check for a clearance of 0.05 to 0.15 mm between the capstan shaft and thrust plate. If necessary, loosen the two adjustment screws on the flywheel, correct the clearance, then retighten the screws.

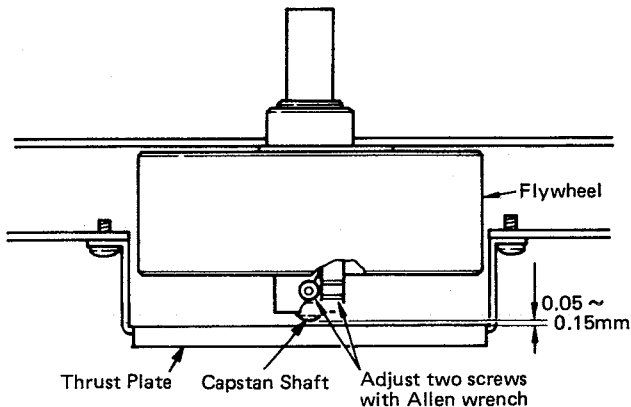


FIG. 15. ADJUSTMENT OF CAPSTAN SHAFT AND THRUST PLATE CLEARANCE

3-4-4. Tape tension servo

Tension Arm Positions and their Detection

The tape tension servo detects and controls the tape tension through either left or right tension sensor assemblies located under the front transport panel. The left and right servos function exactly the same.

The assembly includes two coils with an aluminum plate inserted between them. The aluminum plate moves as tape tension varies and, accordingly, mutual inductance between the coils varies. This causes the sensor oscillation frequency and output voltage to vary proportionately. Variation of the output voltage is used to detect the movement of the tension arm.

A. Tape Tension in Edit

1. Remove the front panel as described in 3-3-1.
2. Thread a blank tape onto the machine and wind half of the tape onto the take-up reel so that there is an equal amount of tape on both reels. Press STOP then EDIT to put the transport into Manual Edit mode.
3. Using a tension analyzer or tentelometer; measure take-up tension at test point A and back tension at test point B (Fig. 16). Both readings should be 60 ± 5 g. If not, adjust R102 (for take-up tension) and/or R101 (for back tension). Refer to Fig. 17 for locations of adjustment resistors.

B. Tape Tension in Reproduce

1. Load a blank tape and wind half of it onto the take-up reel so that there is an equal amount of tape pack on both reels.
2. Press PLAY to roll the tape in reproduce mode.

3. While the tape is rolling in reproduce mode, take a reading from a tension analyzer or tentelometer at test points A (take-up tension) and B (back tension). Both readings should be 75 ± 5 g. If either or both readings are not within the limits, adjust R104 (for take-up tension) and/or R103 (for back tension). Refer to Fig. 17 for locations of adjustment resistors.

C. Fast Winding Back Tension

1. Load a blank tape and run it to about half way so that there is an equal amount of tape pack on both reels.
2. Run the tape in F. FWD and hold the right, take-up reel with hand to take a reading from the tension analyzer or tentelometre at B shown in Fig. 16. Similarly, check REW back tension at A (holding the left, take-up reel). Specifications are 40 ± 5 g both in F.FWD and REW. If necessary adjust the following:
R105 for F.FWD Back Tension
R106 for REW Back Tension.

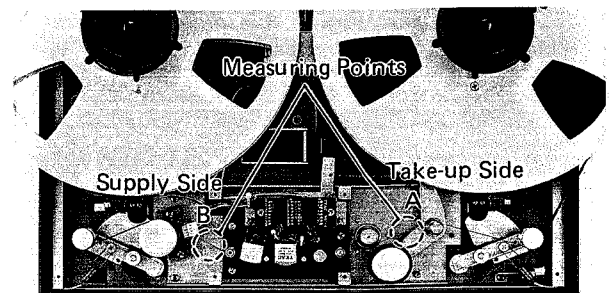


FIG. 16. TAPE TENSION MEASUREMENT POINTS

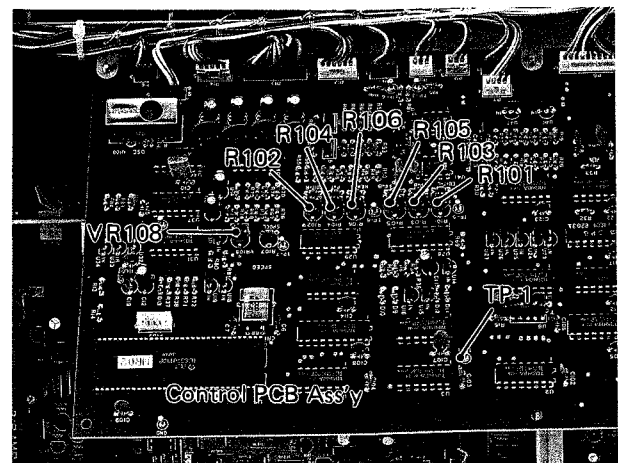


FIG. 17. TAPE TENSION ADJUSTMENT RESISTORS

3-4-5. Reel table height

Reel height adjustment is required only when reel motor has been replaced or tape rubs excessively against the reel flanges.

1. Remove the front trim panel as described in paragraph 3-3-1.
2. Loosen the two set screws shown in Fig. 18.
3. Move the reel table in and out to adjust height.
4. Tighten the set screws and run tape to check the adjustment.

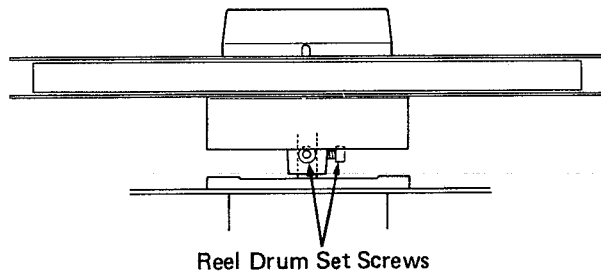


FIG. 18. REEL HEIGHT ADJUSTMENT

3-4-6. FIX/EXT tape speed

Tape speed is measured by using a Flutter Test Tape containing a highly accurate, continuous 3 kHz tone.

A. "FIX" Tape Speed

1. Connect a digital frequency counter to any OUTPUT, set the SPEED MODE switch on the deck to FIX.
2. Playing the beginning of the test tape, check for 3000 Hz \pm 0.8 % on the frequency counter. Then fast forward the tape, stop it when its end nears, and play it back to check that the deck output is within the limits as before.
3. If limits are exceeded, adjust R51 on the Capstan Servo PCB.

B. "EXT" Tape Speed

1. Connect pin 13 of ACCESSORY 2 connector to GND (pin 8), and connect an external oscillator to ACCESSORY 2's pins 7 (hot) and 14 (cold).

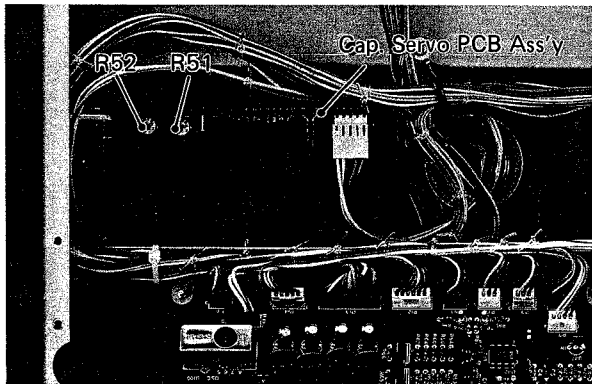


FIG. 19. TAPE SPEED ADJUSTMENTS

2. Play the test tape and check to see the frequency counter reads 3000 Hz when a pulse signal of 9.6 kHz is fed into the machine.
3. Adjust the external oscillator for a plus or minus 30 % (approx.) variation in its output frequency and check that the tape speed varies proportionally.

If necessary adjust R52 on the Capstan Servo PCB (Fig. 19).

3-4-7. Fast Winding Speed

1. Connect an oscilloscope between TP-1 on the Control PCB (Fig. 17) and GND.
2. Run tape in F.FWD and check for a signal cycle of 4.1 to 4.2 msec as seen on the scope.

If necessary adjust R108 on the Control PCB.

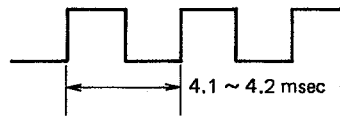


FIG. 20. TP-1 SIGNAL

3-4-8. Wow and flutter (reproduce method)

1. Connect a wow and flutter meter to any channel's OUTPUT jack on the deck. Set the wow and flutter meter for "weighted" readings. Check to make sure that the meter is properly calibrated.
2. Playback the appropriate wow and flutter test tape, at normal "FIX" speed.
3. Read the Flutter meter.
Spec: \pm 0.06 % DIN/IEC/ANSI (Peak Value, Weighted)

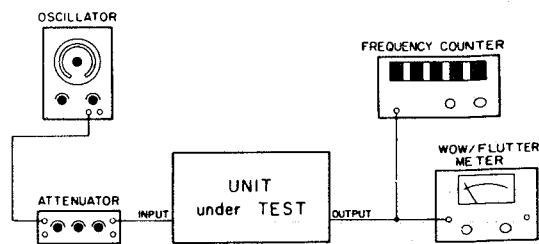


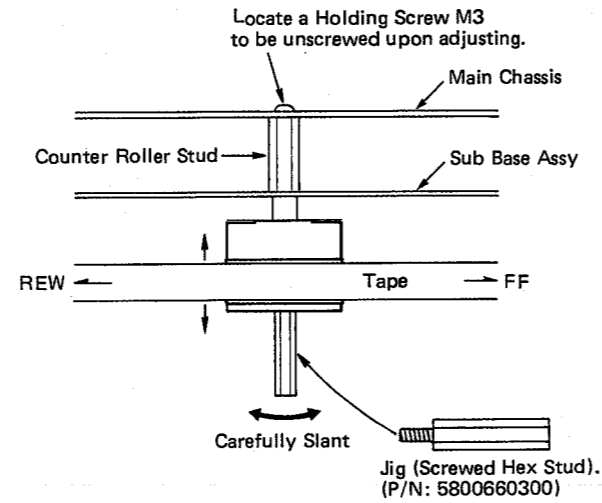
FIG. 21. WOW AND FLUTTER MEASUREMENT SET-UP

NOTE: As the measured results may vary with respect to the location on the tape at which the measurement is taken, at least two locations — the beginning and end of the tape — should be checked. There may also be a slight difference in measured absolute values, depending on the brand of meter being used.

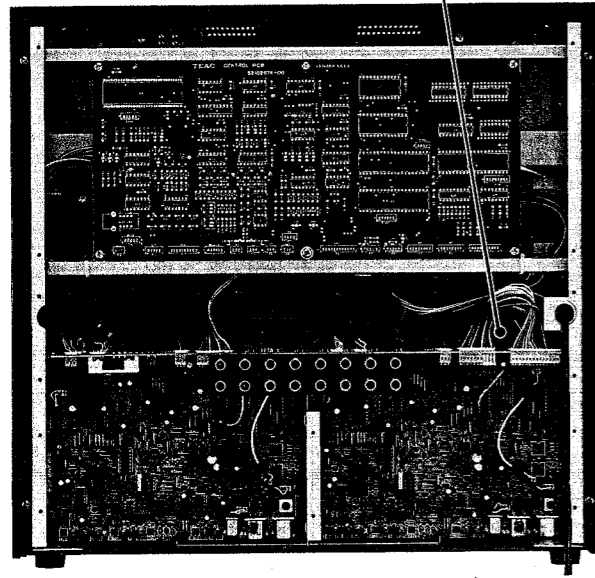
3-4-9. Tape path

After replacement counter roller, it is essential to check for correct tape path.

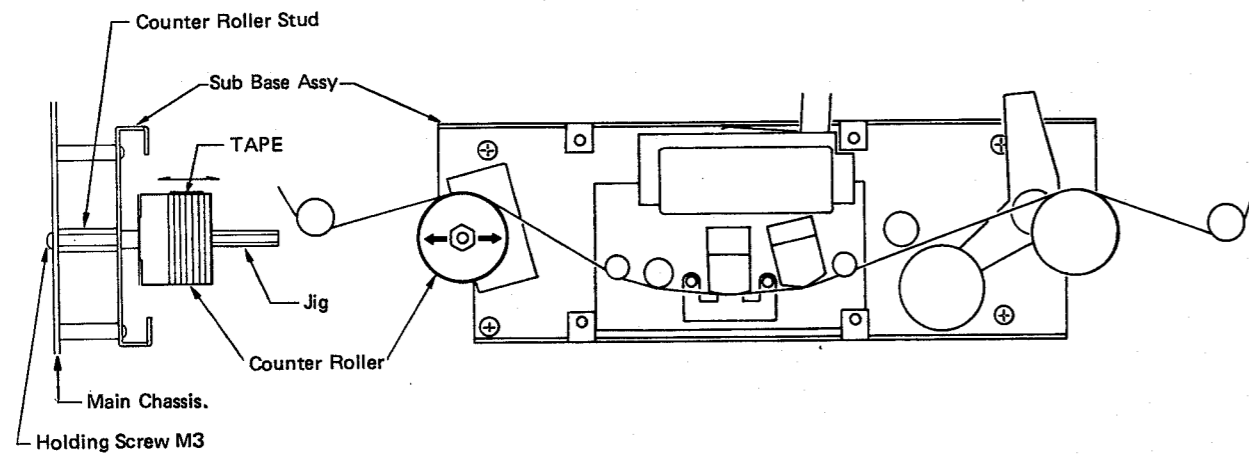
- 1) Remove the Connector Panel at rear side.
- 2) Locate a holding screw M3 of the Counter Roller Stud on the rear side of the Main Chassis.
- 3) Slightly unscrew the holding M3 screw.
- 4) Replace the Counter Roller Cap with attached Jig (Screwed Hex Stud) (P/N: 5800660300) so that the Counter Roller tangency becomes adjustable by hand within the clearance of the holding screw hole.
- 5) Thread tape and power on the unit.



Locate a Holding Screw M3 on the Main Chassis from here.



- 6) Observe tape travel on the Counter Roller while repeating FF and RWD mode. Slightly slant the Jig by hand, left or right so that the tape upward or downward movement on the Counter Roller upon tape direction change becomes minimal. This slanting should be achieved very carefully otherwise tape comes off the Roller, result in a tape damage.
- 7) Locate an optimum tangency of the Counter Roller where the tape travel becomes identical between FF and RWD. The upward and downward tape travel upon change tape direction should be less than 0.3 mm (1/3 of the rubber groove).
- 8) Tighten the holding screw M3 from the rear on the Main Chassis and check that the tape travel is not affected from the optimum running.



3-5. Audio Alignment

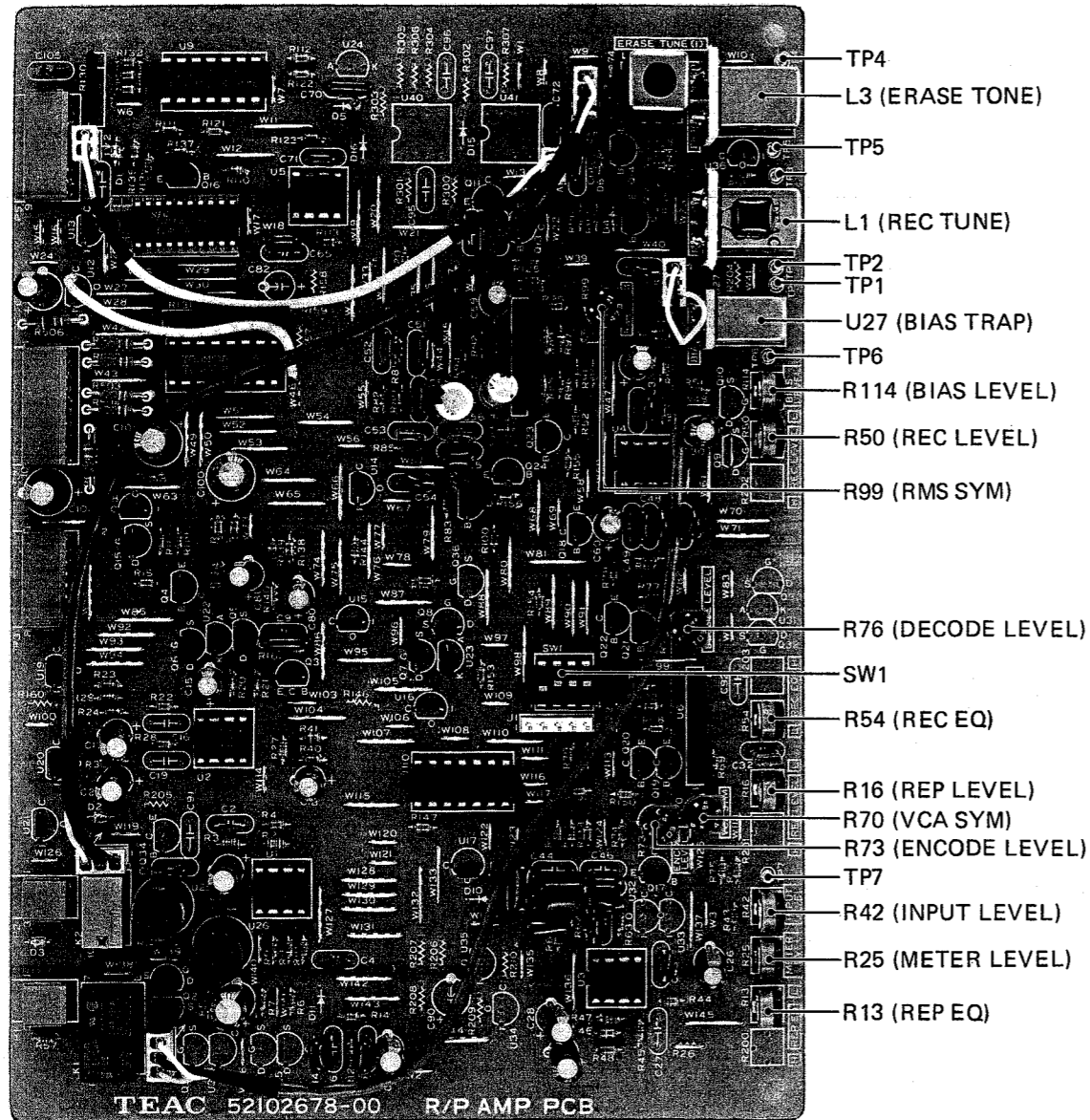


FIG. 22. LOCATIONS OF ELECTRICAL ADJUSTMENTS & TEST POINTS

3-5-1. Preliminary procedure

Before proceeding to audio alignment, be sure to check and adjust tape-head contact and rec/repro head azimuth as follows.

Before anything else, demagnetize and clean the heads and tape path.

• Head Contact

1. Play the 16 kHz signals on the test tape.
2. Apply a slight finger tip pressure to the running tape to check to see no variation in the peak level meter reading. If the reading varies stop the tape and turn power off, then loosen retaining screw A on the rec/repro head (shown in Fig. 24.) and adjust the head direction for a full tape contact. Erase head-tape contact can be checked by checking erasing efficiency.

• Head Azimuth

1. Select any pair of outputs and connect test equipment as shown below:

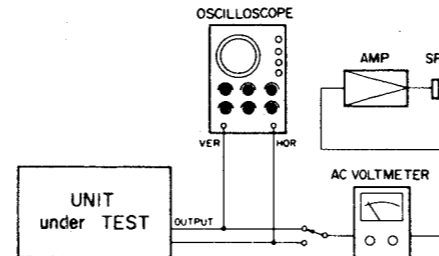


FIG. 23. HEAD AZIMUTH TEST SET-UP

2. Play the 10 kHz signals on the test tape and check to see that the scope shows less than 90° out of phase between the two outputs selected. Repeat the procedure for other several pairs of outputs (1/3, 1/4, 2/6... any combinations). If the reading does not meet spec, perform the following:

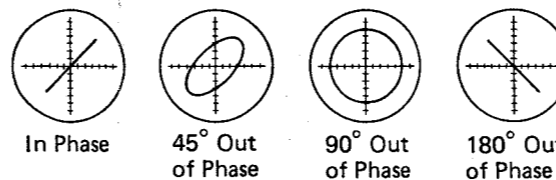
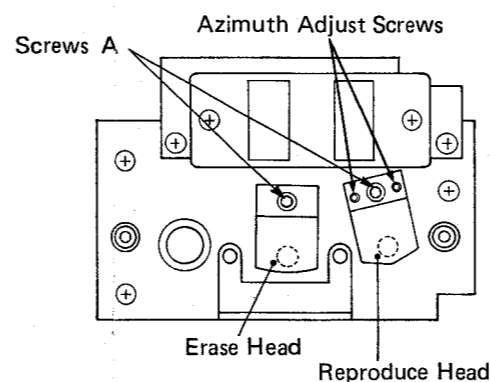


FIG. 24. HEAD AZIMUTH ADJUSTMENTS

- a. Connect the scope to outputs 2 and 7 and play the 16 kHz signals on the test tape.
 - b. Adjust the azimuth adjustment screw shown in Fig. 24 (by slightly loosening one while tightening the other, alternately) for less than 90° phase discrepancy between channels 2 and 7 as seen on the scope and, at the same time, for maximum reading on the voltmeter.
3. Upon completion of adjustments, retighten the two adjustment screws, evenly. Watch the oscilloscope to be sure that the adjustment you've achieved is not undone by unevenly retightening the screws.

Once head contact and azimuth are aligned, you are ready to move on to electronics adjustments. Observe the following:

- Perform each check (and adjustment when necessary) for channel 1 first, then repeat procedure for all the remaining channels.
- Before removing and reinstalling any PCB cards, check to make sure that power is turned off.

In the following, 0 dBV is referenced to 1 V.

3-5-2. Input level check

1. Connect test equipment to the channel 1 input and output jacks of the deck as shown in Fig. 25.
2. Set the oscillator to apply a 1 kHz, -10 dBV (316 mV), and engage ALL INPUT.
3. Check for -10 dBV (316 mV) on the AC voltmeter.
4. Repeat procedure for the remaining channels. If necessary adjust R42.

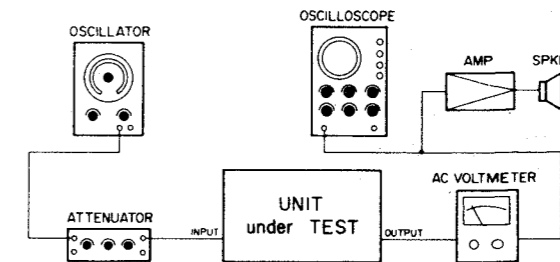


FIG. 25. SET-UP FOR LEVEL & FREQUENCY RESPONSE CHECKS

3-5-3. Meter setting (input signal reading)

1. Apply the nominal -10 dBV level to input jacks and check that the corresponding channels' LED meters read 0 dB. If not, proceed to the next step.
2. Locate R25 on the R/P AMPL PCB of channel being checked and adjust R25 until the meter reads 0 dB.

3-5-4. Reproduce level

1. If the ALL INPUT is engaged (LED on), release it (LED off).
2. Load a reproduce alignment test tape (refer to page 8) and reproduce the 1 kHz signal contained in the tape, to check for -10 dBV (316 mV) on the AC voltmeter connected to the channel 1 output jack of the deck. Also check that the LED meter on the deck reads 0 dB. If necessary, adjust R16 on the R/P AMPL PCB of the channel concerned.
3. Repeat procedure for the remaining channels.

3-5-5. Reproduce frequency response

1. Load the appropriate test tape (refer to page 8) on the deck.
2. Check to make sure that ALL INPUT is not engaged (LED off), then press PLAY.
3. Measure the output signal and check that the frequency range is within the limits shown in Fig. 26. If necessary, adjust R13 for 0 dB at 16 kHz, then again check that the frequency range is within the limits.

If adjustments of R13 have no effect, perform the following:

- a. If specific channel or channels don't meet specifications, replace the R/P AMPL PCB of the corresponding channels.
- b. If all the channels don't meet specifications, check power supplies, head alignment, and clean and demagnetize tape path. If, for all that, every channels remain out of specs, the record/repro head must be replaced.

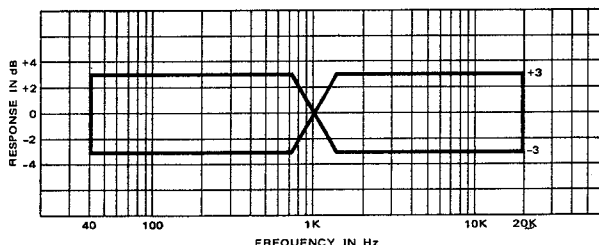


FIG. 26. REPRODUCE FREQUENCY RESPONSE

3-5-6. Bias tuning and bias trap adjustments

Generally, erase bias tuning need be adjusted only when erase head is replaced, and record bias trap only when R/P AMPL PCBs or record/repro head are replaced.

Precautions

Observe the following:

- Be sure to use a non-conductive screwdriver (i.e., wooden, plastic).
- For bias level measurements (paragraph 3-5-7), use an AC voltmeter whose input has a floating capacitance of less than 100 pF.

The following three (A, B, and C) are performed with a blank tape loaded on the machine.

A. ERASE HEAD BIAS TUNING (L3)

CAUTION: Do not short-circuit between TP-5 and GND during the following procedure.

1. Connect a DC voltmeter between TP-4 (Hot) and TP-5 (Cold) on the CH 1 R/P AMPL. PCB.
2. Press the "Rec Function" switch of channel 1 then the master RECORD and PLAY buttons to initiate Record mode.
3. Use an insulated screwdriver to adjust L3 on the same amplifier PC board until the DC meter shows minimum reading.
4. Repeat the procedure for the remaining channels.

B. RECORD HEAD BIAS TUNING (L1)

CAUTION: Do not short-circuit between TP-5 and GND during the following procedure.

1. Connect a DC voltmeter between TP-2 (Hot) and TP-5 (Cold) on the CH 1 R/P AMPL. PCB.
2. Press the "Rec Function" switch of channel 1 then the master RECORD and PLAY buttons to initiate Record mode.
3. Use an insulated screwdriver to adjust L1 on the same amplifier PC board until the DC voltmeter shows minimum reading.
4. Repeat the procedure for the remaining channels.

C. RECORD BIAS TRAP (U27)

1. Connect an AC voltmeter between TP-6 and TP-7 (GND) on the CH 1 R/P AMPL. PCB.
2. Press the channel 1 "Rec Function" switch then the master RECORD and PLAY buttons to initiate Record mode.
3. Adjust U27 on the CH 1 R/P AMPL. PCB for minimum reading on the voltmeter.
4. Repeat the procedure for the remaining channels.

3-5-7. Record bias adjustment

1. Load a blank test tape YTT-8163 on the deck.
2. Connect an AC voltmeter between TP-1 and TP-7 on the R/P AMPL. PCB.
3. Initiate Record mode.
4. Adjust R114 on the R/P AMPL. PCB for 35 mV \pm 2 mV reading on the voltmeter.

3-5-8. Record level

The following procedure MUST be performed AFTER completion of the bias adjustment.

1. Connect test equipment to the tape deck as in paragraph 3-5-2.
2. Apply a 1 kHz, -10 dBV (316 mV) signal to the channel 1 INPUT jack.
3. Load a blank test tape YTT-8163 on the deck.
4. Record the 1 kHz, -10 dBV signal. Then rewind the tape and play the recording, to check for -10 dBV (316 mV) at the OUTPUT jack. If necessary, adjust R50 on the R/P AMPL. PCB.
5. Check and adjust all the channels in the same way.

3-5-9. DBX IN/OUT levels

When record level is adjusted (paragraph 3-5-8), perform the following:

1. Play the 1 kHz, -10 dB signals on the test tape.
2. Toggle the DBX IN/OUT switches on and off, to check that the output level does not vary exceeding the limits of ± 1 dB. If necessary adjust R76.
3. Set the DBX switches to IN, record a nominal level signal, and play the recording to check for an output of -10 dB ± 1 dB. If necessary adjust R73.

3-5-10. Overall frequency response

1. With the same connections as in paragraph 3-5-8, change the input signal to 16 kHz, -10 dBV (316 mV) and connect this signal to channel 1 INPUT jack.
2. Record the input signal, then rewind the tape and play the recording, to check for -10 dBV (316 mV) at the channel 1 OUTPUT jack. If necessary, adjust R54 on the R/P AMPL. PCB.
3. Initiate again record mode and sweep the signal frequency over the range of 40 Hz to 22 kHz. Then rewind the tape and play the recording. Measure the output level over the specified frequency range and check that the level falls within ± 3 dB (without DBX). (With DBX, the tolerance is ± 6 dB.) There is no adjustment.

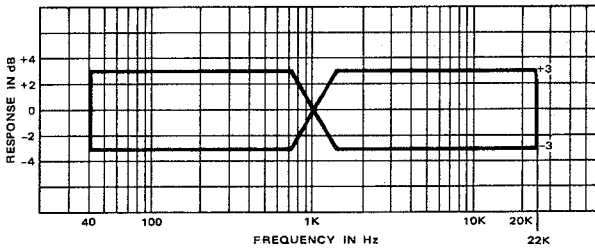


FIG. 27. OVERALL FREQUENCY RESPONSE

3-5-11. Overall signal-to-noise ratio

The following procedure necessitates connecting a 20 Hz-20 kHz band pass filter between the deck's OUTPUT jacks and AC voltmeter.

1. Record on a blank test tape a 1 kHz, -10 dBV (316 mV) signal for a while, then disconnect the input signal and initiate again record mode.
2. Stop the tape and rewind it to the beginning of the 1 kHz recording.
3. Play the tape and compare the level on the voltmeter from the 1 kHz recording with the level from the "no-signal" recording. The level difference should be 50 dB or greater.

If difference is below specifications, perform the following:

- a. Demagnetize heads and other metal parts in the tape path.
 - b. Check Erasure (paragraph 3-5-13).
 - c. Check and adjust Record Bias (paragraph 3-5-7).
- Then repeat the procedure above using another blank test tape.

3-5-12. Overall distortion check

1. Connect test equipment as shown in Fig. 28.
 2. Set the oscillator to provide a 1 kHz, -10 dBV (0.3 V) signal, and record this signal.
 3. Play back the recording to read the distortion analyzer.
- Reading should be less than 0.8%. If values are greater than this specification, the following may fix the problem:
- Repeat the record bias adjustment procedure (paragraph 3-5-7).

- Demagnetize the erase and record/repro heads.
- As a final measure, replace the record/repro head.

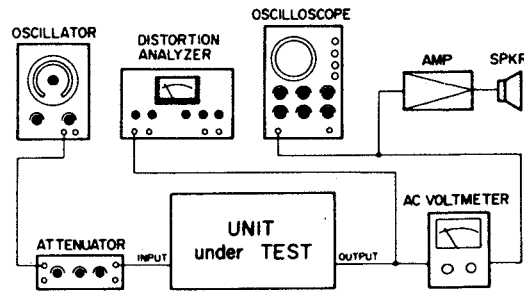


FIG. 28. DISTORTION TEST SET-UP

3-5-13. Erasure

1. Connect test equipment as shown in Fig. 29.
2. Set the oscillator to apply a 1 kHz, 0 dB (1 V) signal to the deck, record this signal, rewind the tape to the beginning of the recording, then play it back to measure the output level.
3. Rewind again the tape to the beginning of the recording, disconnect the input signal, then put the deck again into Record mode.
4. Rewind the tape to the beginning of the "no-signal" recording, and play it back to measure the output level. Compare the level from the original 1 kHz recording with the level from the "no-signal" recording. The level difference should be 70 dB or greater. If not, perform the following:
 - a. Clean tape path.
 - b. Check transport performance (section 3-4).

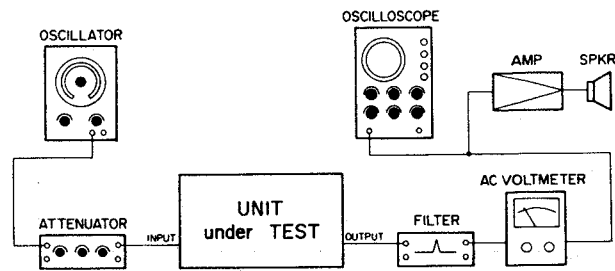


FIG. 29. ERASURE TEST SET-UP

3-5-14. Channel crosstalk

1. Connect test equipment as shown in Fig. 30.
2. Connect a 1 kHz, -10 dBV (316 mV) signal to the input connector of channel 1 and record this signal on track 1.
3. Rewind the tape to the beginning of the recording.
4. Play back the recording and first measure the output of channel 1 to get a level reference. Then measure the output of channel 2. The difference should be 50 dB or greater.
5. Repeat procedure to check crosstalk from each remaining channel onto its surrounding channels (from channel 2 onto channels 1 and 3, from channel 3 onto channels 2 and 4, from channel 4 onto channels 3 and 5, and so forth).

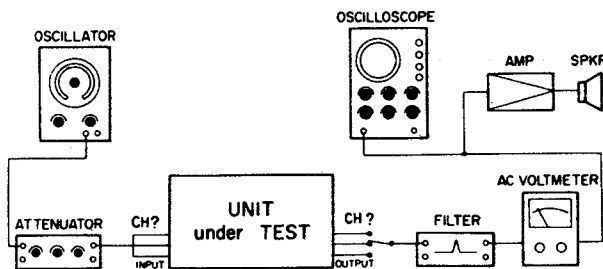


FIG. 30. CROSSTALK TEST SET-UP

3-5-15. Sync crosstalk

Sync crosstalk refers to the crosstalk occurred during sync recordings (overdubs) because record bias signal leaks from a channel set for record onto its surrounding channels set for playback.

Test set-up is the same as in paragraph 3-5-14.

1. Apply a 1 kHz, -10 dBV (316 mV) signal to the channel 1 INPUT jack and start recording.
2. While the recording is taking place, measure the output of channel 1 to get a reference level. Then measure the output of channel 2. The difference between the channels should be 10 dB or greater.
3. Repeat procedure to check sync crosstalk from each remaining channel onto its surrounding channels (from channel 2 in record onto channels 1 and 3 in play, from channel 3 in record onto channels 2 and 4 in play, from channel 4 in record onto channels 3 and 5 in play, and so forth).

3-6. DBX System Adjustments

The DBX system has been properly adjusted before shipped and the following adjustments need be performed only when components in the system are replaced because damaged.

Adjustments are performed with the DBX NR switches pressed on and using the extension card.

CAUTION: Prior to removing or replacing DBX components, check to make sure that the deck is turned off.

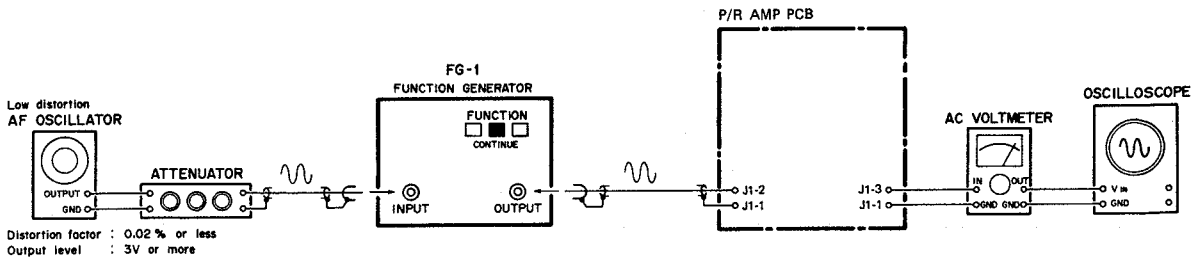


FIG. 31. RMS SYMMETRY & LEVEL ADJUSTMENTS

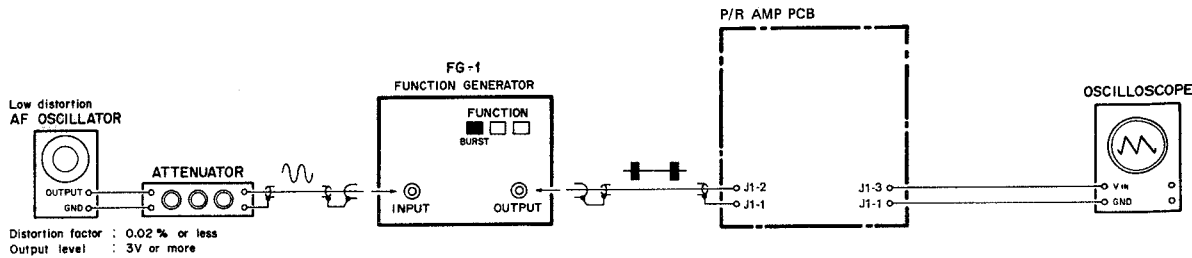


FIG. 32. RELEASE RATE ADJUSTMENT

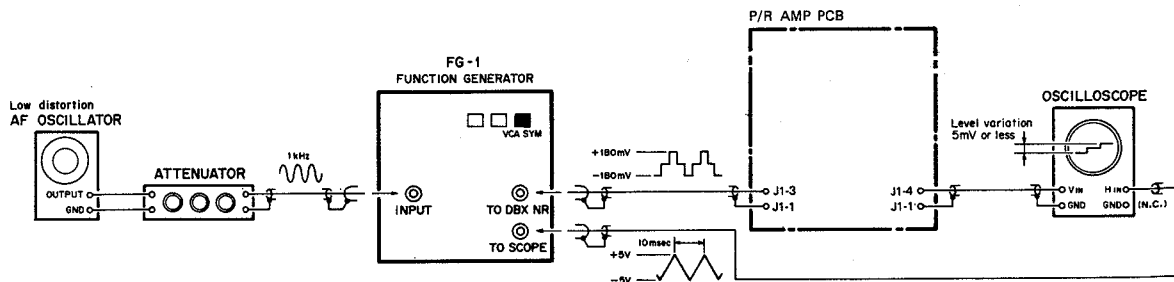
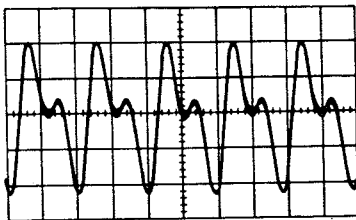
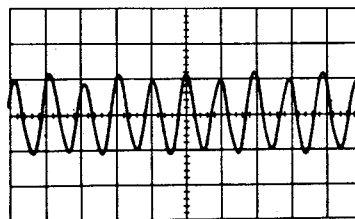


FIG. 33. VCA SYMMETRY ADJUSTMENT



Misaligned



Properly Aligned

FIG. 34. RMS SYMMETRY

3-6-1. Adjustments location

Refer to Fig. 22, page 15.

3-6-2. Decoder

The following checks/adjustments, A thru F, are performed with the deck set to Play mode and SW1-3 and SW1-4 set to On. As for SW1-1 and SW1-2 set each as per instructions.

A. RMS Symmetry Adjustment (Connections: Fig. 31)

1. Turn off SW1-1 and SW1-2.
2. Apply a 100 Hz, 316 mV signal to J1-2 terminal.
3. Adjust R99 to obtain a clean 200 Hz sinewave at J1-3 (see Fig. 22)

B. VCA Symmetry Adjustment (Connections: Fig. 33)

1. Turn on SW1-1 and turn off SW1-2.
2. Apply a staircase wave signal to J1-3, and a triangle wave signal to the horizontal input terminal on the oscilloscope.
3. Adjust R70 for a relatively straight horizontal line display on the oscilloscope. (Level deviation: 5 mV or less)

C. Decoding Level (Connections: Fig. 31 — AC voltmeter connected to J1-4 (not J1-3 as shown) and J1-1)

1. Turn off SW1-1 and SW1-2.
2. Apply a 1 kHz, 316 mV signal to terminal.
3. Adjust R76 for a 240 mV reading at J1-4 terminal.

D. Frequency Response (Connections: Fig. 31 — AC voltmeter connected to J1-4 (not J1-3 as shown) and J1-1)

1. Vary the signal frequency to 50 Hz (316 mV) and then to 10 kHz (316 mV).
2. Read the output level at the J1-4 terminal for each frequency. The output level should be within the following limits with reference to level at 1 kHz.
50 Hz: +5 dB \pm 1 dB (380 mV to 479 mV)
10 kHz: +9.4 dB \pm 1 dB (631 mV to 795 mV)

E. Release Rate Check (Connections: Fig. 32)

1. Turn off SW1-1 and SW1-2.
2. Apply a 1 kHz tone burst wave signal with 8 cycles on and 128 cycles off.
3. Confirm that release rate is less than 750 mV \pm 10%.

F. Decode Effect Check (Connections: Fig. 31)

1. Turn off SW1-1 and SW1-2.
2. Apply a 1 kHz, -20 dB signal to J1-2 terminal.
3. Confirm that the level at J1-4 terminal is -30 dB \pm 0.5 dB (i.e., -20 dB against -10 dB (316 mV) reference level).
4. Apply a 1 kHz, 0 dB signal to J1-2 terminal.
5. Confirm that the level at J1-4 terminal is +10 dB \pm 0.5 dB (i.e., +20 dB against -10 dB (316 mV) reference level).

3-6-3. Encoder

The following checks/adjustments, A thru F, are performed with the deck set to Record and SW1-3 and SW1-4 set to On. As for SW1-1 and SW1-2 set each as per instructions.

A. RMS Symmetry Adjustment (Connections: Fig. 31)

1. Turn off SW1-1 and SW1-2.
2. Apply a 100 Hz, 316 mV signal to J1-2 terminal.
3. Check for clean 200 Hz sinewave at J1-3 (see Fig. 22).

B. VCA Symmetry Adjustment (Connections: Fig. 33)

1. Turn on SW1-1 and turn off SW1-2.
2. Apply a staircase wave signal to J1-3, and a triangle wave signal to the horizontal input terminal on the oscilloscope.
3. Confirm that J1-4 supplies a relatively straight horizontal line on the oscilloscope (level deviation: 10 mV or less).

C. Encoding Level (Connections: Fig. 31 — AC voltmeter connected to J1-4 (not J1-3 as shown) and J1-1)

1. Turn off SW1-1 and SW1-2.
2. Apply a 1 kHz, 316 mV signal to J1-2 terminal.
3. Adjust R73 for a -10 dB reading at J1-4 terminal.

D. Frequency Response (Connections: Fig. 31 — AC voltmeter connected to J1-4 (not J1-3 as shown) and J1-1)

1. Vary the signal frequency to 50 Hz (316 mV) and then to 10 kHz (316 mV).
2. Read the output level at the J1-4 terminal for each frequency. The output level should be within the following limits with reference to level at 1 kHz.
50 Hz: -2.5 dB \pm 1 dB (213 mV to 240 mV)
10 kHz: -4.8 dB \pm 1 dB (166 mV to 186 mV)

E. Release Rate Check (Connections: Fig. 32)

1. Turn off SW1-1 and SW1-2.
2. Apply a 1 kHz tone burst wave signal with 8 cycles on and 128 cycles off.
3. Confirm that release rate is less than 750 mV \pm 10%.

F. Encode Effect Check (Connections: Fig. 31)

1. Turn off SW1-1 and SW1-2.
2. Apply a 1 kHz, -70 dB signal to J1-2 terminal.
3. Confirm that the level at J1-4 terminal is -40 dB \pm 0.5 dB (i.e., -30 dB against -10 dB (316 mV) reference level).
4. Apply a 1 kHz, +10 dB signal to J1-2 terminal.
5. Confirm that the level at J1-4 terminal is 0 dB \pm 1 dB (i.e., +10 dB against -10 dB reference level).

CAUTION: After completion of adjustments be sure to turn Off SW1-1 and turn On SW1-2, SW1-3 and SW1-4.

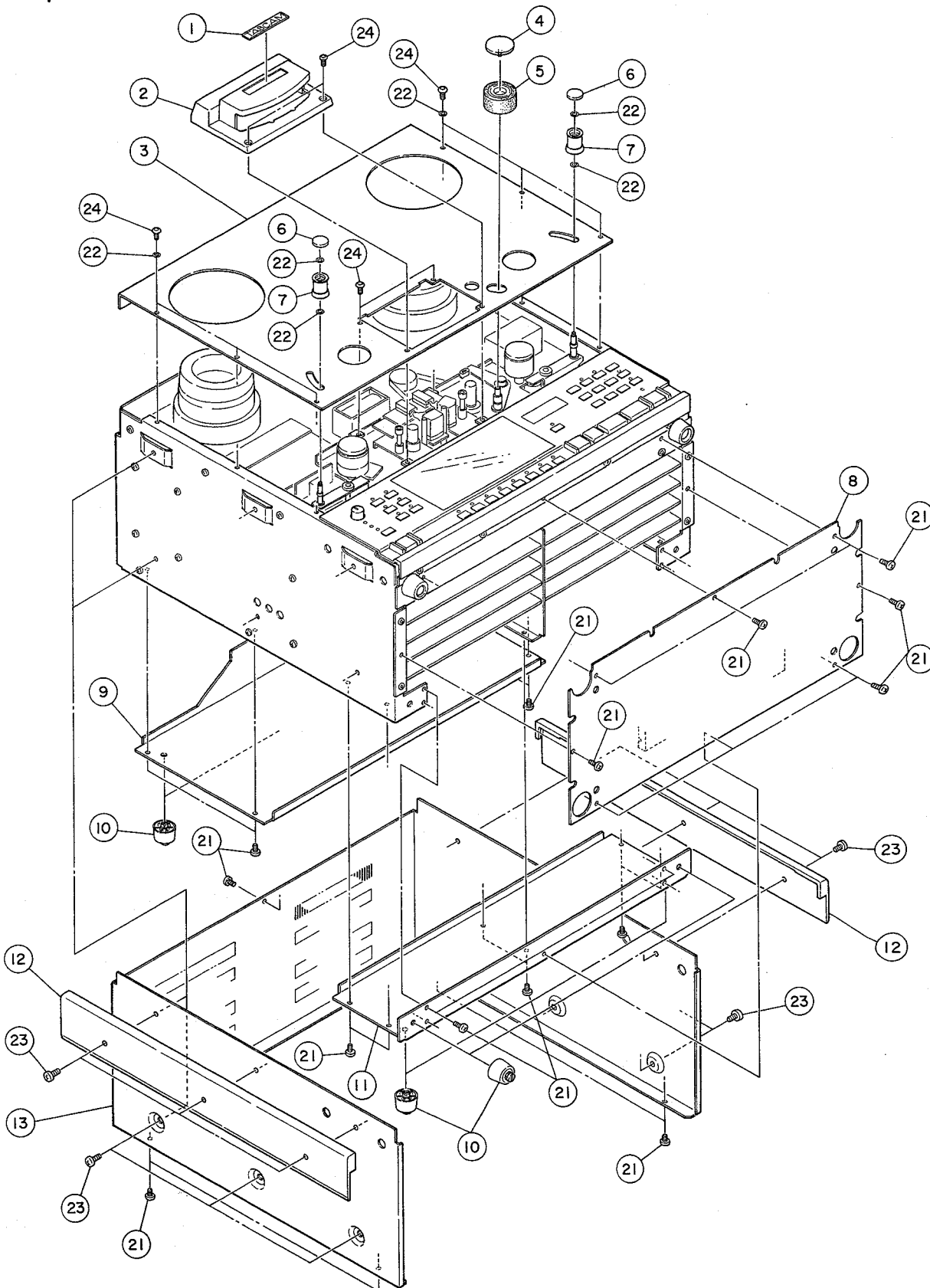
CHECKS AND ADJUSTMENTS CHART

ADJUST STEP	WHAT IS IT CALLED	SIGNAL SOURCE AND AMOUNT	WHAT TEST GEAR TO USE	WHAT IS THE RECORDER DOING	POINT TO ADJUST	WHAT READING TO ADJUST FOR
1	Input Level	1 kHz signal at -10 dBV from oscillator connected to INPUT jack	VTVM connected to OUTPUT jack	Stop mode with ALL INPUT engaged.	R42	-10 dBV (316 mV) on VTVM
2	Meter (Input)	Same as above	LED meter	Same as above	R25	0 dB on LED meters.
3	Reproduce Head Alignment	16 kHz, nominal level signal contained in test tape use. See p. 8, "Test Equipment".	VTVM and oscilloscope with vertical and horizontal inputs connected to OUTPUT CH2 and 7.	Reproduce with ALL INPUT disengaged.	Repro head azimuth adjusting screw.	Maximum output, less than 90° out of phase of Trk 2 & 7 outputs (at 16 kHz).
4	Reproduce Level	Nominal level signal contained in test tape (p. 8)	VTVM connected to OUTPUT jack.	Reproduce with ALL INPUT disengaged.	R16	-10 dBV (316 mV) on VTVM.
5	Reproduce EQ	16 kHz signal contained in test tape (p. 8)	VTVM connected to OUTPUT jack.	Reproduce with ALL INPUT disengaged.	R13	Same reading on VTVM as for 1 kHz signal.
6	Bias Trap Adjustment	No input signal	VTVM connected to Bias Trap test points TP-6 and TP-7.	Recording with no signal connected.	U27	Minimum output at Bias Trap test point.
7	Bias Level Adjustment	No input signal	VTVM connected between TP-1 & TP7.	Record onto the same type of tape as used for the actual recording.	R114	35 mV ± 2 mV on VTVM
8	Recording Level	1 kHz signal at -10 dBV connected to INPUT jack.	VTVM connected to OUTPUT jack.	Recording then its playback.	R50	-10 dBV (316 mV) at OUTPUT jack.
9	Overall Frequency	16 kHz signal connected to INPUT jack (at -10 dBV).	Same as above	Same as above	R54	Within the limits given in Fig. 27.
10	Overall Signal-to-Noise Ratio	No input signal	VTVM connected to OUTPUT jacks.	Recording with ALL INPUT disengaged.		Check for 50 dB or better
11	Erase	1 kHz signal, 0 dBV connected to INPUT jack. Apply signal for short time only.	VTVM and 1 kHz band pass filter connected to OUTPUT.	1 kHz recording then no-signal recording through the 1 kHz recorded section. Playback to measure the level difference.		70 dB or greater (through 1 kHz filter). (Refer to paragraph 3-5-13.)
12	DBX Adjustment DECODER	Same as step 4	Same as step 4	dBx IN and OUT.	R76	-10 dBV (316 mV) on VTVM
13	DBX Adjustment ENCODER	Same as step 8	Same as step 8	Same as above	R73	Same as above

4. PARTS LISTS

4-1. Mechanics

Exploded View-1



EXPLODED VIEW-1

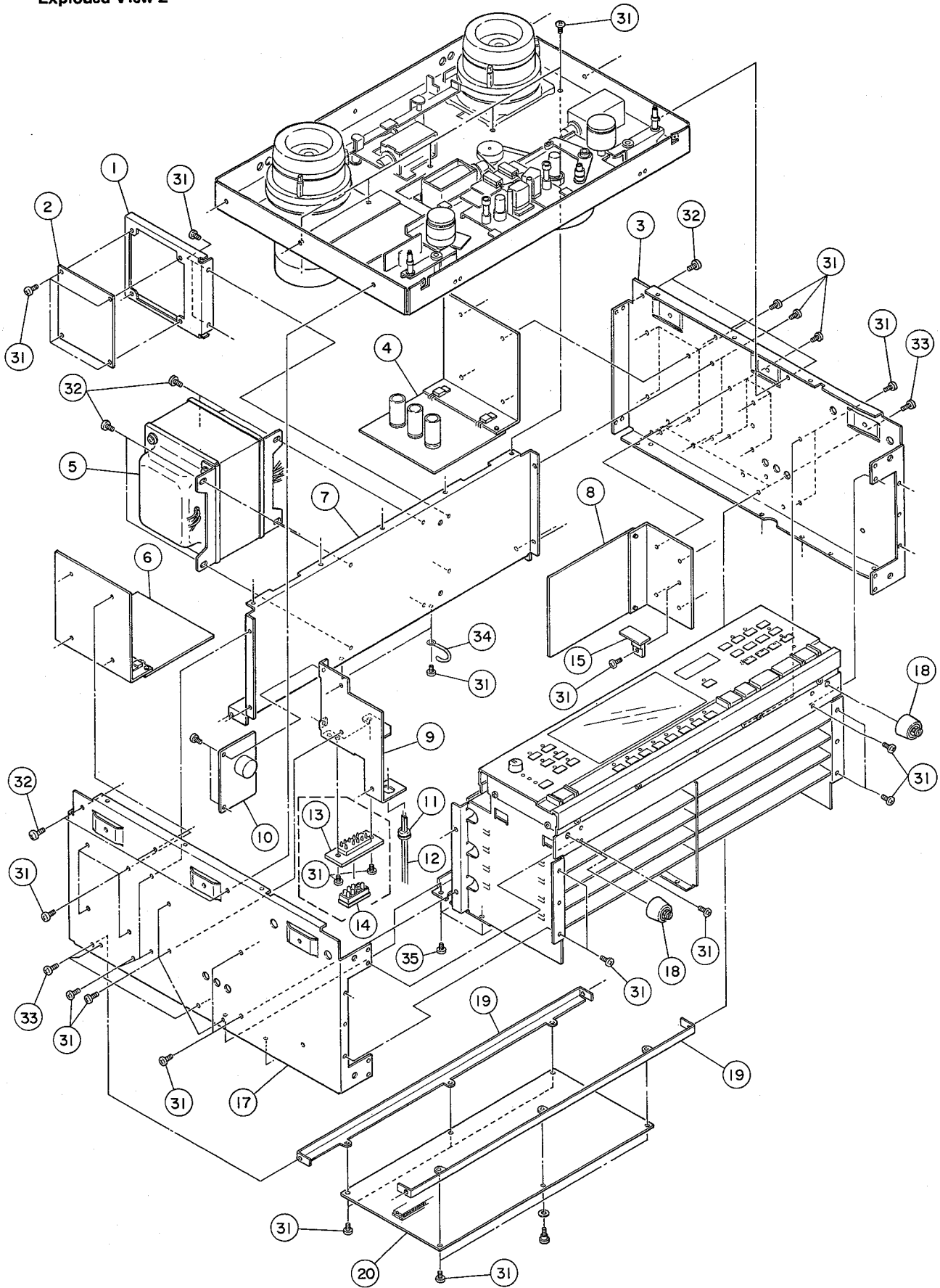
REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
1- 1	*5720201400	BADGE, TASCAM	
1- 2	*5801193900	HOUSING, HEAD	
1- 3	*5801191900	PANEL, TRANSPORT	
1- 4	5801144400	CAP, PINCH ROLLER	
1- 5	5800291500	PINCH ROLLER	
1- 6	5801271000	CAP, TENSION ROLLER	
1- 7	5800297800	ROLLER ASSY, TENSION	
1- 8	*5801194000	PLATE, BOTTOM	
1- 9	*5801193400	PANEL(1), REAR	
1-10	*5730002900	FOOT, FF-001	
1-11	*5801193500	PANEL(2), REAR	
1-12	*5801193801	ESCUTCHEON, SIDE	
1-13	*5801193702	BONNET	
1-21	*5780023006	SCREW, BIND M3X6 (BLK N1)	
1-22	*5785303100	WASHER, POLYS. 3X6X0.25T	
1-23	*5780024008	SCREW, BIND M4X8 (BLK N1)	
1-24	*5781783006	SCREW, BUTTON HEAD M3X6 (BLK N1)	

INCLUDED ACCESORIES

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
	*5740002300	REEL, RE-1013	
	*5700112700	OWNER'S MANUAL [J]	
	*5700112800	OWNER'S MANUAL [EXCEPT J]	

Parts marked with *require longer delivery time.

Exploded View-2



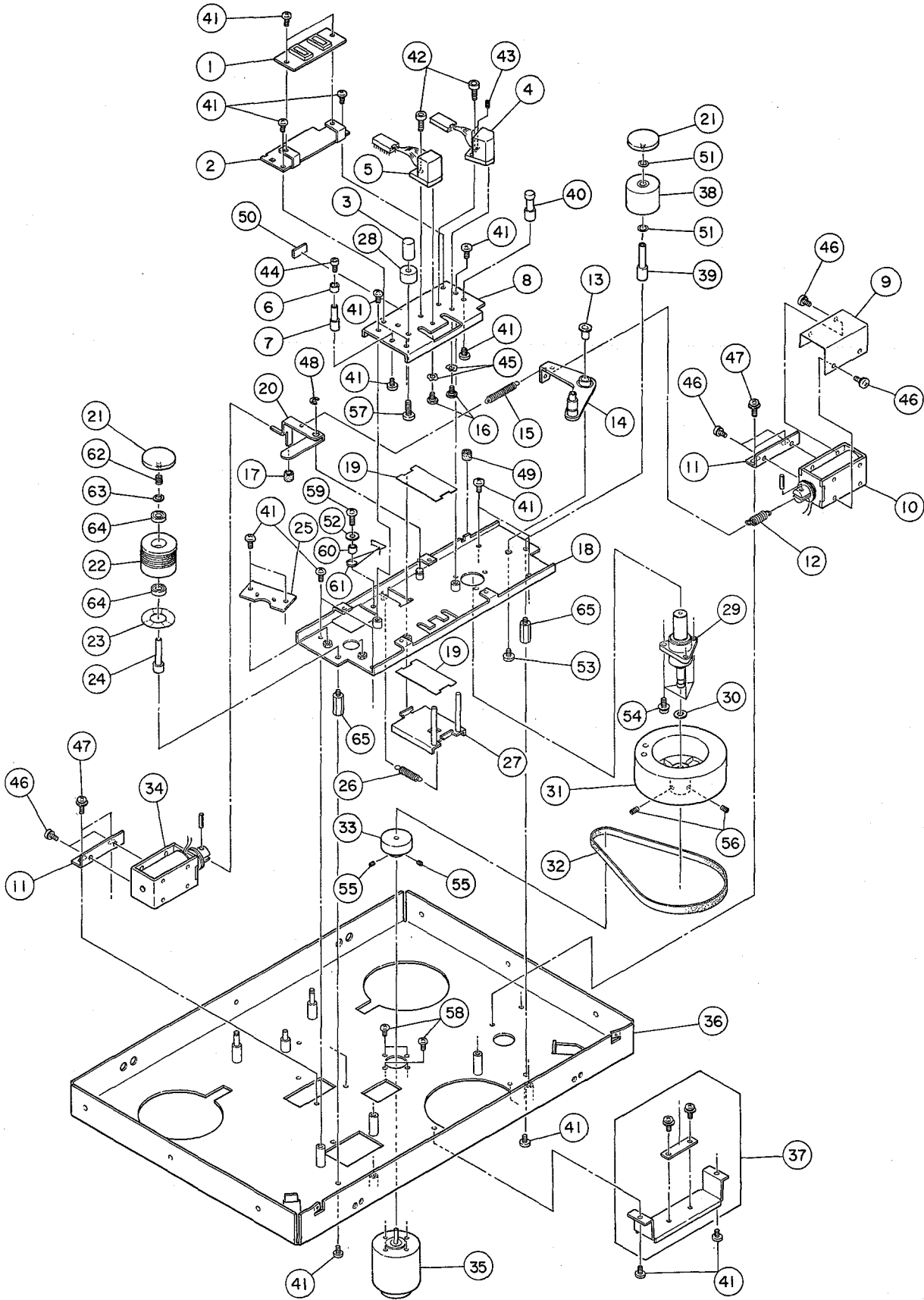
EXPLODED VIEW-2

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
2- 1	*5801196200	BRACKET,FUSE	
2- 2	*5200268100	FUSE PCB ASSY [US,C,J,GE]	Refer to pages 40 & 45
	*5200268200	FUSE PCB ASSY [E,UK]	Refer to pages 40 & 45
2- 3	*5801188502	CHASSIS(R),SIDE	
2- 4	*5200267900	POWER SUPPLY PCB A ASSY	Refer to pages 39 & 45
2- 5	△ 5320053800	TRANSFORMER,POWER [J]	
	△ 5320053900	TRANSFORMER,POWER [US,C]	
	△ 5320054000	TRANSFORMER,POWER [GE]	
	△ 5320054100	TRANSFORMER,POWER [E,UK]	
2- 6	*5200268000	POWER SUPPLY PCB B ASSY	Refer to pages 39 & 45
2- 7	*5801188600	CHASSIS,TRANS.	
2- 8	*5200267501	CAPSTAN SERVO PCB ASSY	Refer to pages 38 & 45
2- 9	*5801196300	BRACKET,AC	
2-10	*5200283900	N.FILTER PCB ASSY [US,C,J,GE]	Refer to pages 42 & 47
	*5200283910	N.FILTER PCB ASSY [E,UK]	
2-11	△ *5534660000	BUSHING,CODE 4N-4 [E,J]	
	△ *5317001700	BUSHING,CODE 4N-5 [US,UK,GE]	
	△ *5534663000	BUSHING,CODE 6W-1 [C]	
2-12	△ *5128027000	CORD,AC [J]	
	△ *5350010700	CORD,AC [US,GE]	
	△ *5350012200	CORD,AC [C]	
	△ *5128047000	CORD,AC [UK]	
2-13	△ 5133015001	SOCKET,VOLTAGE SELECT 100-240V [GE]	
2-14	△ 5133014000	PLUG,VOLTAGE SELECT BX500 [GE]	
2-15	*5200239430	TR PCB ASSY(4)	Refer to pages 42 & 47
2-16	Vacant		
2-17	*5801188402	CHASSIS(L),SIDE	
2-18	*5730002900	FOOT,FF-001	
2-19	*5801189200	FRAME,PCB	
2-20	*5200267400	CONTROL PCB ASSY	Refer to pages 33 & 43
2-31	*5780003006	SCREW,BIND M3X6	
2-32	*5780004008	SCREW,BIND M4X8	
2-33	*5783033008	SCREW,BIND S-TITE M3X8	
2-34	*5786713000	CLIP,HARNESS 3.0X9.1X50	
2-35	*5780023006	SCREW,BIND M3X6(BLK N1)	

[US]:U.S.A. [E]:EUROPE [UK]:U.K. [C]:CANADA [J]:JAPAN
[GE]:GENERAL EXPORT

Parts marked with *require longer delivery time.

Exploded View-3



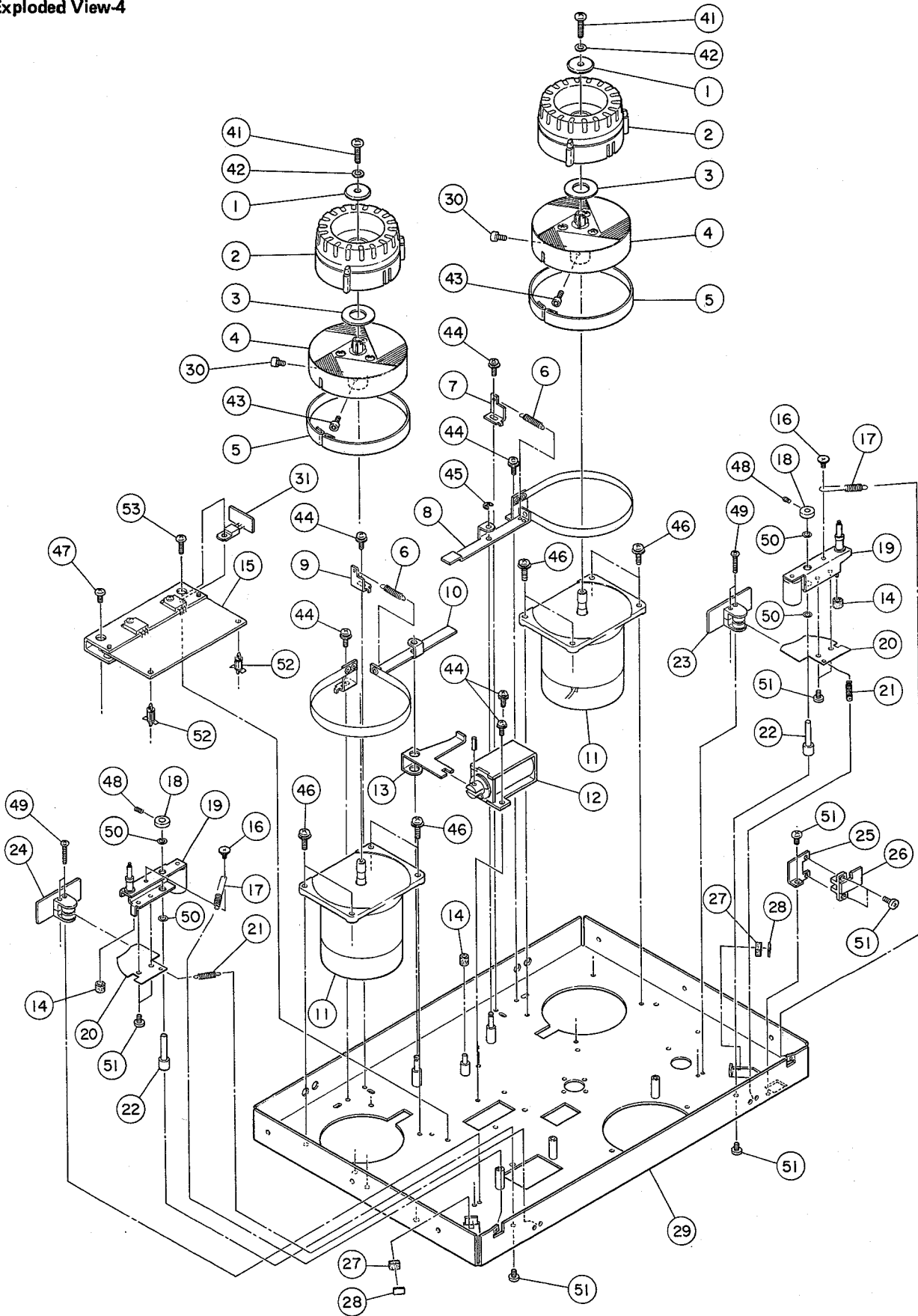
EXPLODED VIEW-3

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
3- 1	*5200177200	HEAD CONNECT PCB ASSY	Refer to pages 42 & 47
3- 2	*5801191700	BRACKET, HEAD PCB	
3- 3	*5801280200	POLE, DUMMY (A)	
3- 4	5378300400	HEAD, REC/REPRO	
3- 5	5378300200	HEAD, ERASE	
3- 6	5800296300	CAP, GUIDE	
3- 7	5800296200	GUIDE, TAPE	
3- 8	*5801190100	BASE, HEAD	
3- 9	*5800317700	PLATE, SOLENOID SHIELD	
3-10	5313004200	SOLENOID	
3-11	*5800171000	BRACKET, SOLENOID	
3-12	*5524286001	SPRING, PRESSURE	
3-13	*5801275800	SHAFT, PINCH ARM	
3-14	*5801270800	ARM ASSY, PINCH ROLLER	
3-15	*5801199000	SPRING, T(PINCH RETURN)	
3-16	*5800348701	SCREW, HEAD	
3-17	*5801291000	CUSHION, STOPPER	
3-18	*5801190700	SUB BASE ASSY	
3-19	*5801191100	SHEET, LIFTER	
3-20	*5801195900	LEVER, LIFTER	
3-21	5801191500	CAP, COUNT ROLLER	Refer to pages 41 & 46
3-22	5801302200	COUNT ROLLER ASSY	
3-23	*5801190400	PLATE, PG	
3-24	*5801195801	SHAFT, COUNT ROLLER	
3-25	*5200268500	PG PCB ASSY	
3-26	*5801198801	SPRING, T(LIFTER RETURN)	
3-27	*5801190900	LIFTER ASSY	
3-28	*5801280301	POLE, DUMMY (B)	
3-29	*5800291301	CAPSTAN ASSY	
3-30	*5800397300	WASHER, THRUST	
3-31	*5800397200	FLYWHEEL	
3-32	5800698201	BELT, CAPSTAN	
3-33	*5801190500	PULLEY, MOTOR	
3-34	5313004200	SOLENOID	
3-35	5370008600	MOTOR, DC(FG)	
3-36	*5801189401	MAIN CHASSIS ASSY	
3-37	*5504834000	THRUST TRAY ASSY	
3-38	5801276000	GUIDE ROLLER ASSY	
3-39	*5801276200	SHAFT, GUIDE ROLLER	
3-40	*5801290700	GUIDE, TAPE	
3-41	*5780003006	SCREW, BIND M3X6	
3-42	*5781733010	BOLT, HEX. SKT M3X10	
3-43	*5782003006	SCREW, HEX. M3X6	
3-44	*5781733006	BOLT, HEX. SKT M3X6	
3-45	*5785150400	WASHER, WAVED WW-04	
3-46	*5780143006	SCREW, PAN SEMS-A M3X6	
3-47	*5780143006	SCREW, PAN SEMS-B M3X6	
3-48	*5786003000	E-RING, E-3	
3-49	*5801270600	CUSHION, TUBE	
3-50	*5801276300	CUSHION, LIFTER	
3-51	*5785305000	WASHER, POLYS. 5X8X0.25T	
3-52	*5785003000	WASHER, FLAT 3X8	
3-53	*5780004008	SCREW, BIND M4X8	
3-54	*5780003008	SCREW, BIND M3X8	
3-55	*5782003004	SCREW, HEX. SET M3X4	
3-56	*5782004006	SCREW, HEX. SET M4X6	
3-57	*5780004018	SCREW, BIND M4X18	

(Continued on page 30)

Parts marked with *require longer delivery time.

Exploded View-4



EXPLODED VIEW-4

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
4- 1	5800324901	WASHER, CLAMP A	
4- 2	5740003400	CLAMPER, REEL	
4- 3	5800326600	SPACER, REEL	
4- 4	5801270700	REEL TABLE ASSY	
4- 5	*5800295700	FELT, BRAKE	
4- 6	*5800301700	SPRING(B), BRAKE	
4- 7	*5800295801	HOOK, SPRING	
4- 8	5800295301	BAND ASSY(R), BRAKE	
4- 9	*5555929000	HOOK, SPRING	
4-10	5800295201	BAND ASSY(L), BRAKE	
4-11	5370008400	MOTOR, REEL DC	
4-12	5313003900	SOLENOID, BRAKE	
4-13	*5800299001	PLATE, BRAKE ACTUATING	
4-14	*5801290900	CUSHION, STOPPER	
4-15	*5200268700	JOINT PCB ASSY	Refer to pages 41 & 46
4-16	*5581056000	SCREW, SHOULDER(A)	
4-17	*5801198701	SPRING, T(TENSION ARM)	
4-18	*5801189900	HOLDER, ARM	
4-19	*5801189600	TENSION ARM ASSY	
4-20	*5801191600	SHUTTER	
4-21	*5801198801	SPRING, T(ARM RETURN)	
4-22	*5801190000	SHAFT, TENSION ARM	
4-23	*5200270200	SENSOR PCB R ASSY	Refer to pages 41 & 46
4-24	*5200268600	SENSOR PCB L ASSY	Refer to pages 41 & 46
4-25	*5801196100	BRACKET, SENSOR	
4-26	*5200268800	SHUT PCB ASSY	Refer to pages 41 & 46
4-27	*5800298400	DAMPER	
4-28	*5800298500	PLATE, DAMPER	
4-29	*5801189400	MAIN CHASSIS ASSY	
4-30	*5800678500	SCREW, BALL POINT	
4-31	*5200293400	CV PCB ASSY	Refer to page 47
4-41	*5780005025	SCREW, BIND M5X25(BLK)	
4-42	5785225000	WASHER, FIBER(BLK)	
4-43	*5781704008	BOLT, HEX M4X8	
4-44	*5780143008	SCREW, PAN SEMS-B M3X8	
4-45	*5786003000	E-RING, E-3	
4-46	*5780144010	SCREW, PAN SEMS-B M4X10	
4-47	*5780003008	SCREW, BIND M3X8	
4-48	*5782003004	SCREW, HEX. M3X4	
4-49	*5780002018	SCREW, BIND M2X18	
4-50	*5785305000	WASHER, POLYS. 5X8X0.25T	
4-51	*5780003006	SCREW, BIND M3X6	
4-52	*5787035400	SUPPORT, PCB	
4-53	*5780003010	SCREW, BIND M3X10	

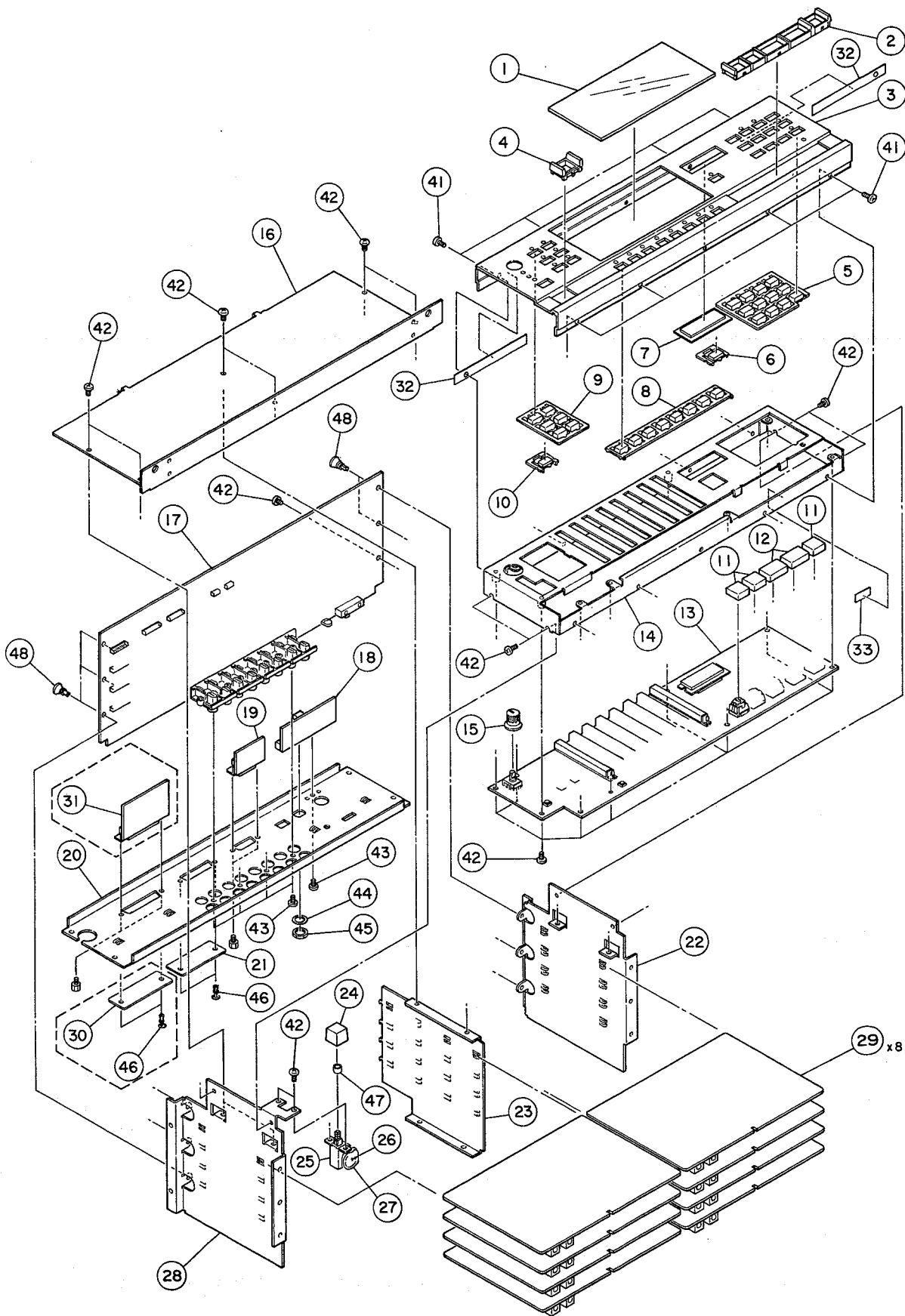
(Continued from page 28)

EXPLODED VIEW-3

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
3-58	*5780003004	SCREW, BIND M3X4	
3-59	*5780003010	SCREW, BIND M3X10	
3-60	*5785603030	BUSHING M3X3	
3-61	*5801291701	SPRING, JOINT	
3-62	*5801302600	SPRING, C	
3-63	*5785315000	WASHER, POLYS. 5X8X0.5T	
3-64	*1603091000	BEARING, MR105ZZ	
3-65	*5801285900	STUD, SUB BASE	

Parts marked with *require longer delivery time.

Exploded View-5

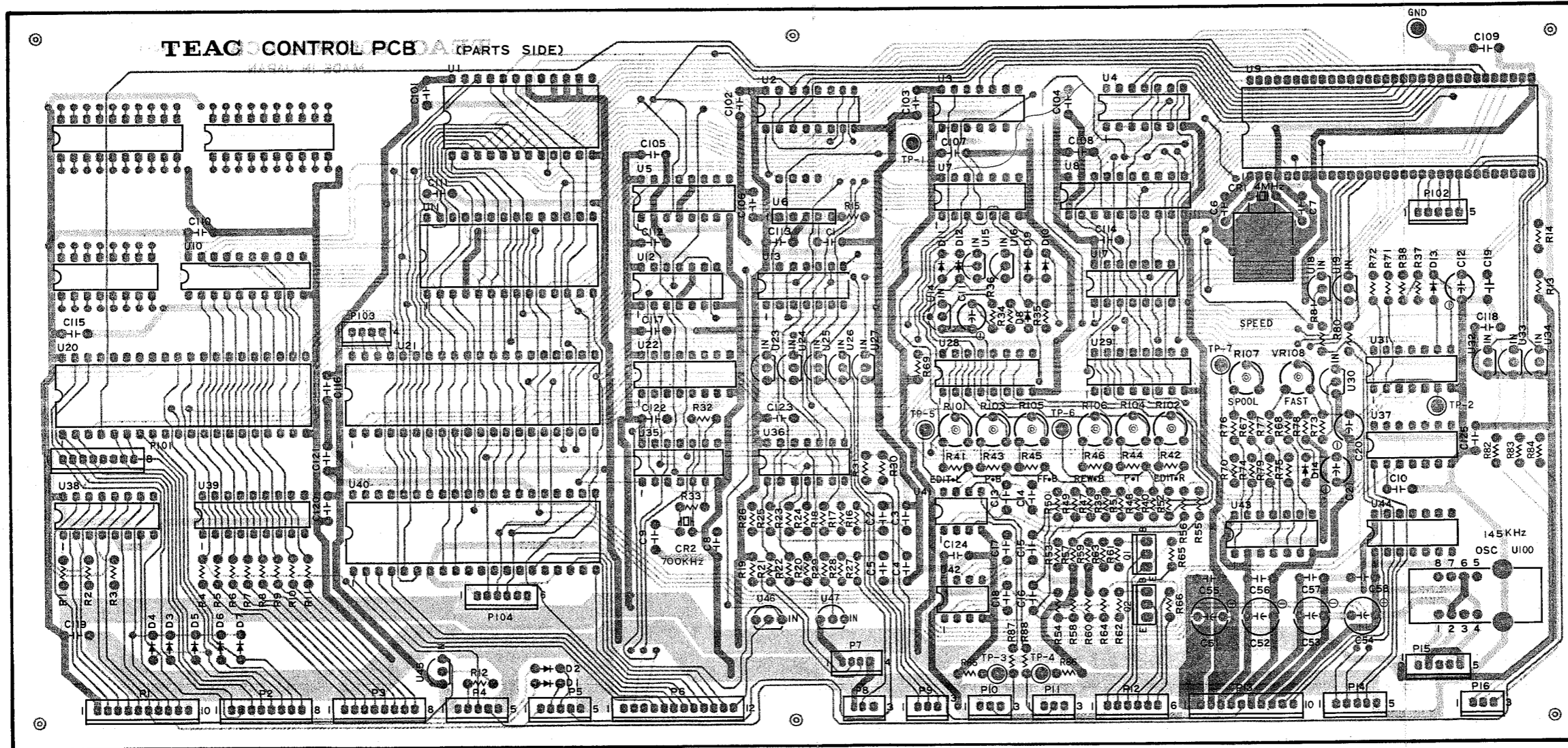


EXPLODED VIEW-5

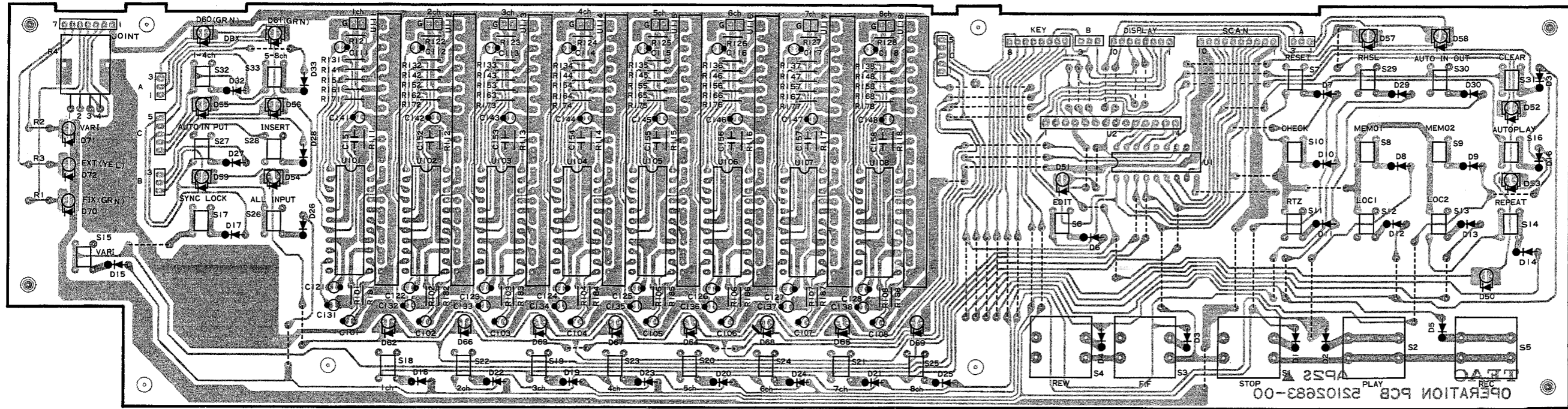
REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
5- 1	*5801193100	WINDOW,METER	
5- 2	*5801192901	ESCUTCHEON,BUTTON	
5- 3	*5801192100	PANEL,FRONT	
5- 4	*5801193001	GUIDE,P BUTTON	
5- 5	5801192200	BUTTON(A),CONTROL	
5- 6	5801192700	BUTTON,EDIT	
5- 7	*5801128700	LENS,COUNTER	
5- 8	5801192500	BUTTON,FUNCTION 1-8	
5- 9	5801192300	BUTTON(B),CONTROL	
5-10	5801192800	BUTTON,SPEED	
5-11	5801194100	BUTTON,OPERATION C	
5-12	5801194200	BUTTON,OPERATION D	
5-13	*5200268300	OPERATION PCB ASSY	Refer to pages 35 & 43
5-14	*5801189100	CHASSIS ASSY,FRONT	
5-15	5801131900	KNOB,PITCH CONTROL	
5-16	*5801188901	CHASSIS(F),AMP.	
5-17	*5200267600	MOTHER PCB ASSY	Refer to pages 35 & 44
5-18	*5200268900	REMOTE PCB ASSY	Refer to pages 41 & 46
5-19	*5200270300	D SUB PCB ASSY	Refer to pages 41 & 46
5-20	*5801193201	PANEL,CONNECTOR	
5-21	*5801193300	PLATE,BLIND	
5-22	*5801188800	CHASSIS(R),AMP.	
5-23	*5801189000	CHASSIS(C),AMP.	
5-24	5800173100	BUTTON,POWER	
5-25	△ 5300030900	SW.,POWER SDLA1P	
5-26	△ 5267703800	SPARK KIL.4700PF 400V M	
5-27	*5730007500	COVER,CAPASITOR SB-1417	
5-28	*5801188700	CHASSIS(L),AMP.	
5-29	*5200267800	R/P AMP PCB ASSY	Refer to pages 37 & 44
5-30	*5801276400	PLATE,BLIND(B) [J]	
5-31	*5200287000	I/F PCB ASSY [EXCEPT J]	Refer to pages 42 & 47
5-32	*5801189300	SPACER	
5-33	*5800298500	PLATE,DAMPER	
5-41	*5780023006	SCREW,BIND M3X6(BLK NI)	
5-42	*5780003006	SCREW,BIND M3X6	
5-43	*5781103008	SCREW,TAPPING(I) M3X8	
5-44	*5785290100	WASHER	
5-45	*5317003300	NUT	
5-46	*5786610200	RIVET,PUSH RP-3045-NB	
5-47	*5785605035	SPACER 5.0X3.5MM	
5-48	*5786618000	RIVET,PUSH T-3545-NB	

Parts marked with *require longer delivery time.

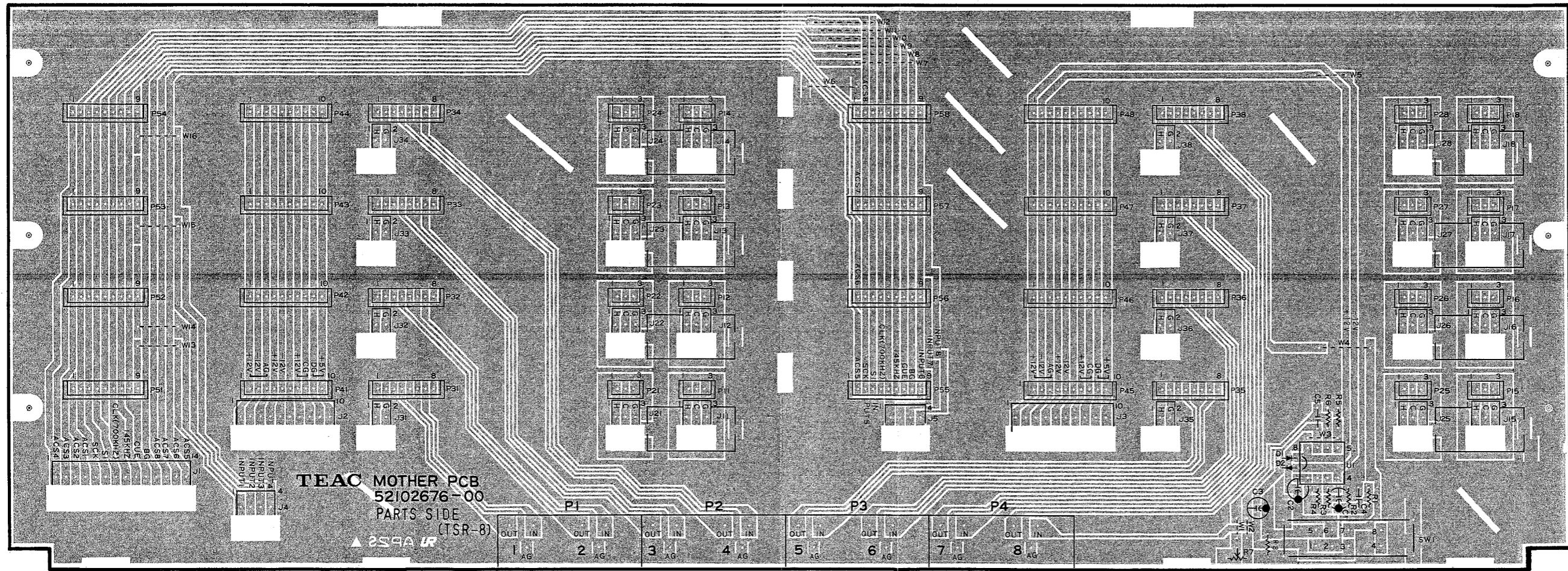
Control PCB Ass'y



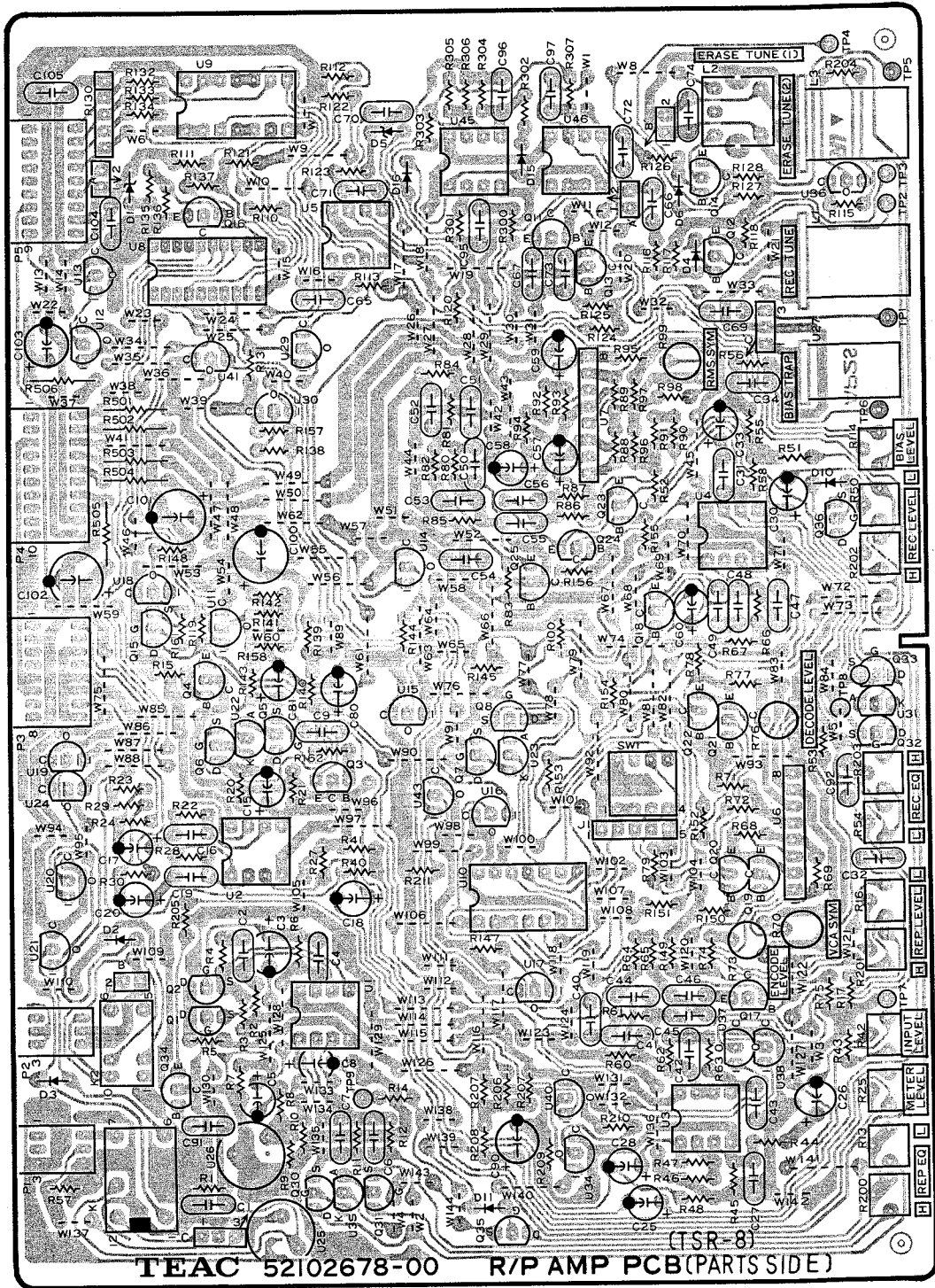
Operation PCB Ass'y



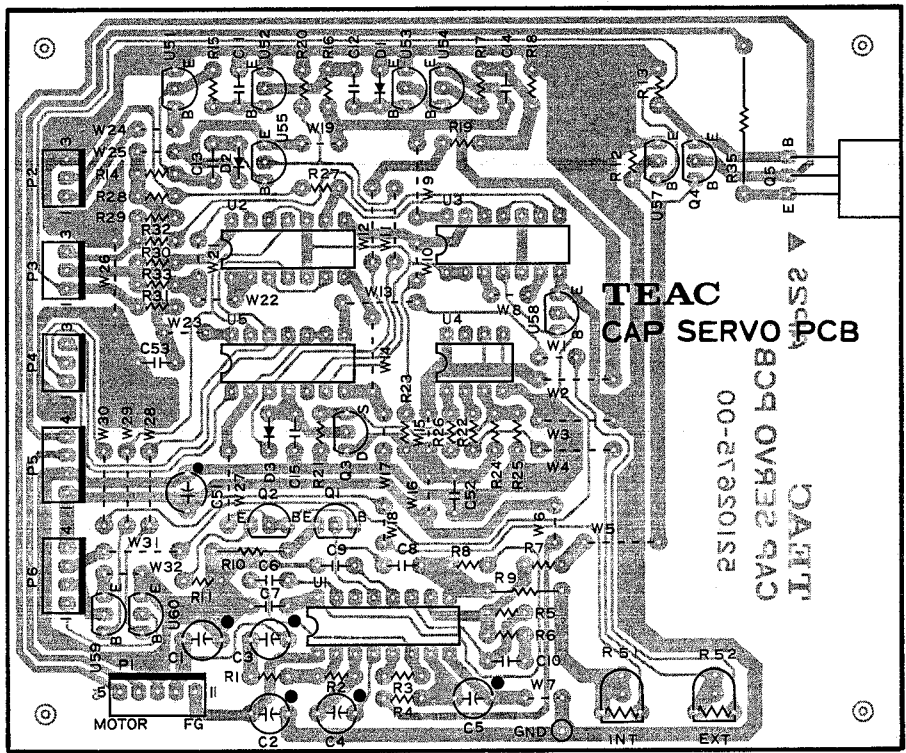
Mother PCB Ass'y



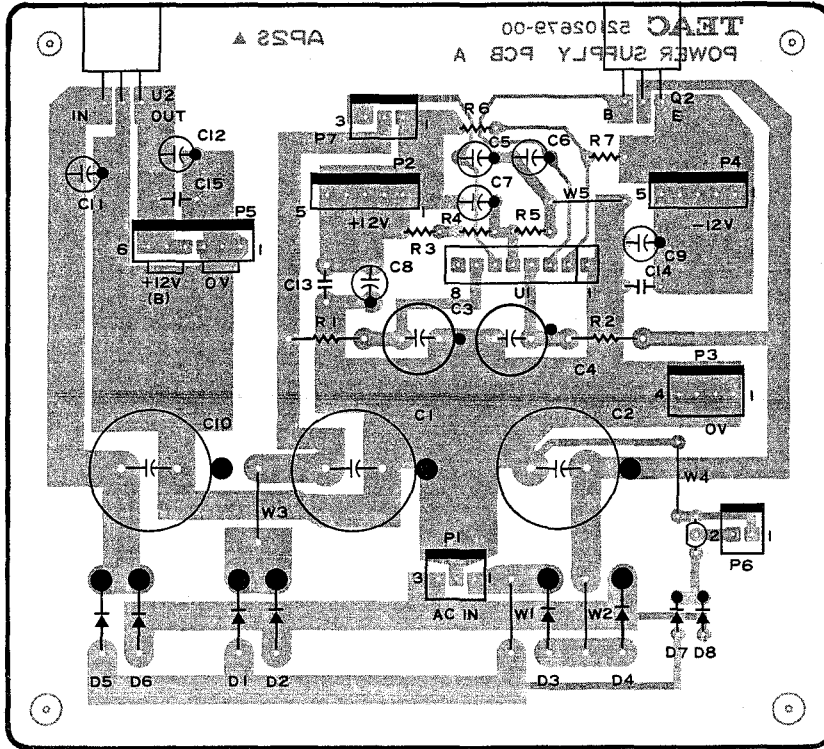
R/P PCB Ass'y



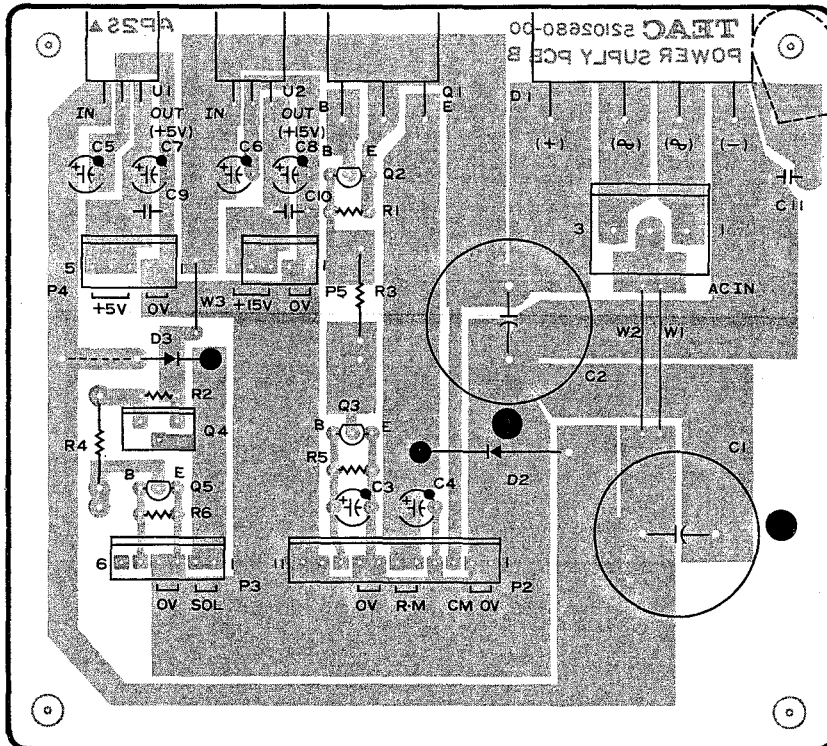
Capstan Servo PCB Ass'y



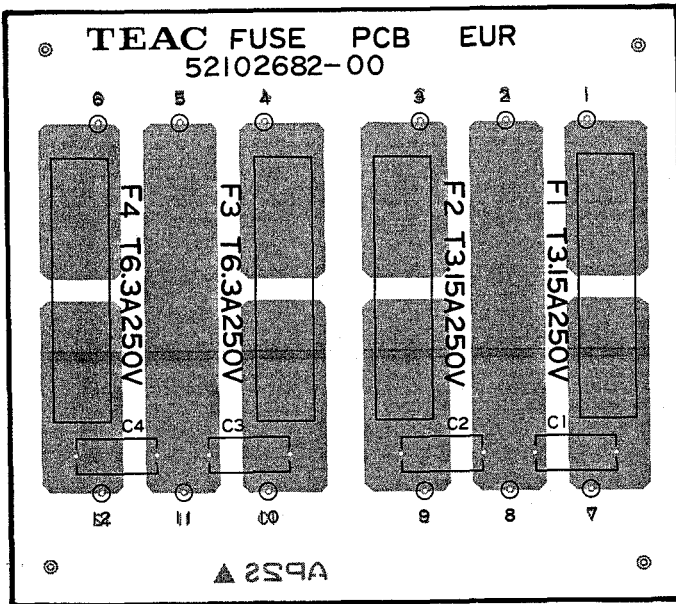
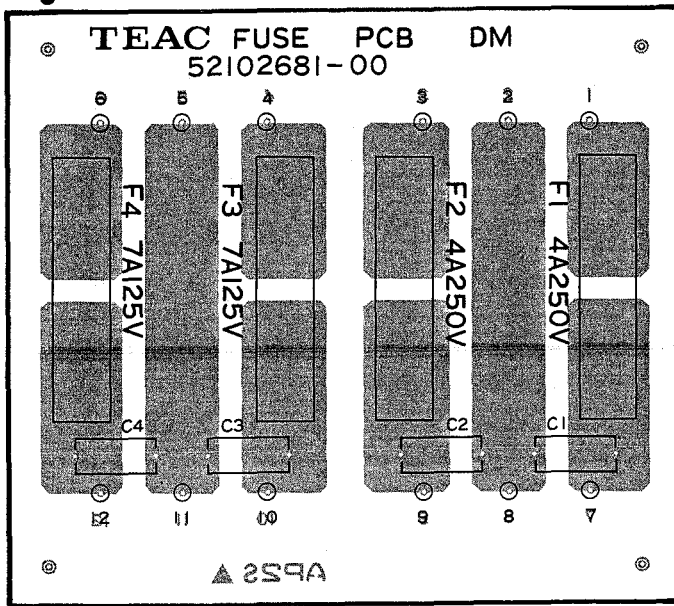
Power Supply PCB A Ass'y



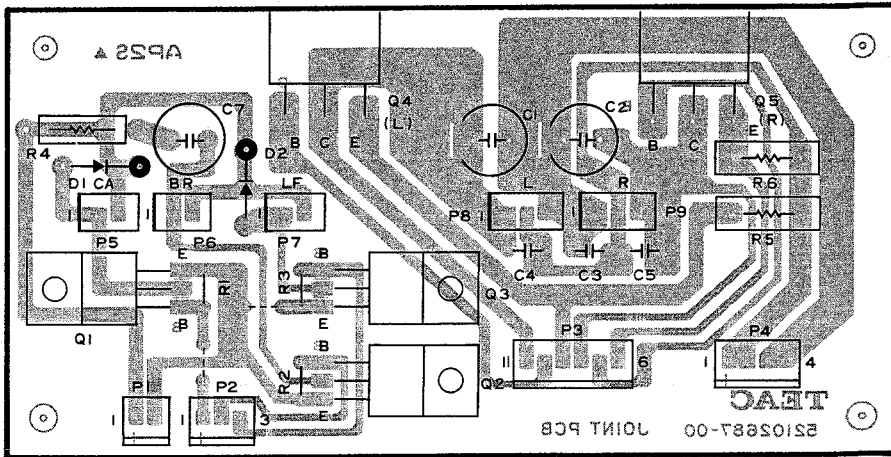
Power Supply PCB B Ass'y



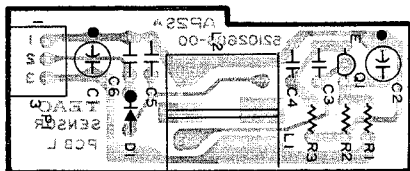
Fuse PCB Ass'y



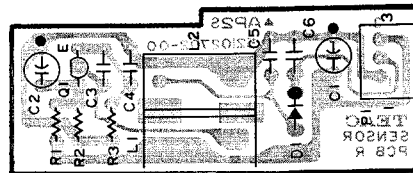
Joint PCB Ass'y



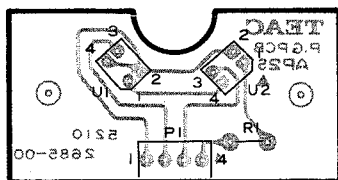
Sensor PCB L Ass'y



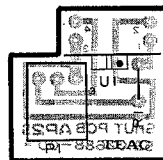
Sensor PCB R Ass'y



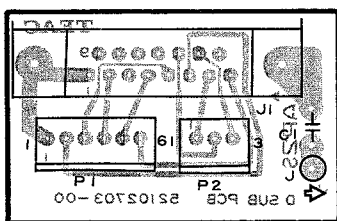
PG PCB Ass'y



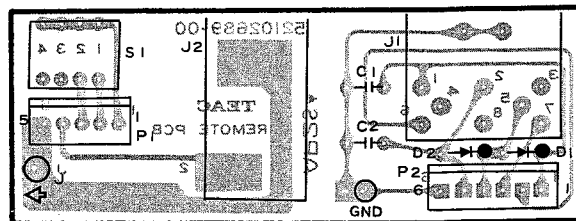
Shut PCB Ass'y



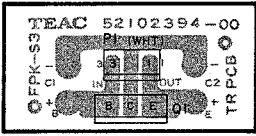
D Sub PCB Ass'y



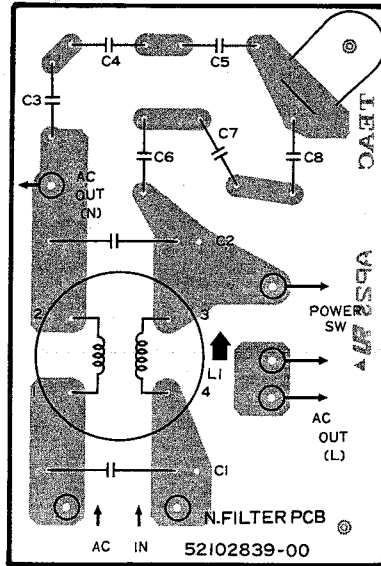
Remote PCB Ass'y



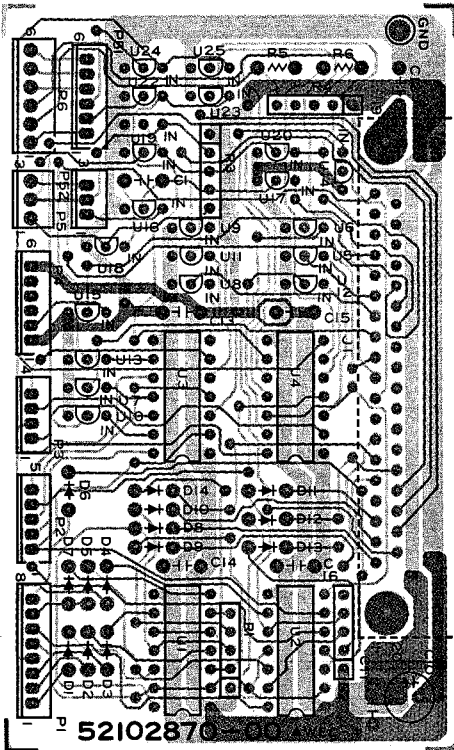
TR PCB Ass'y (4)



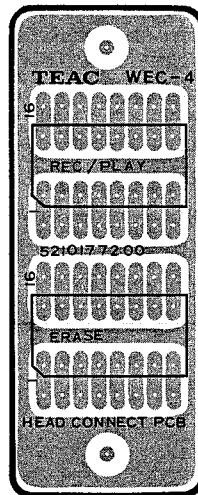
N. Filter PCB Ass'y



I/F PCB Ass'y



Head Connect PCB Ass'y



CONTROL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200267400	CONTROL PCB ASSY
	*5210267401	CONTROL PCB
	*5317002100	PIN, DH CHECK IPS-1136
CR1	*5332016900	IC., SOCKET 64P
	5347004700	OSC., CRYSTAL 1.8434MHZ
CR2	5347011300	OSC., CERAMIC 700KHZ
D1-3	5224015020	DIODE, ISS133T-77
D5 D6	5224015020	DIODE, ISS133T-77
D8-14	5224015020	DIODE, ISS133T-77
P1	5336250000	PLUG, CONN. B10B-PH-K-S(WHT)
P2	5336249800	PLUG, CONN. B08B-PH-K-S(WHT)
P3	5336251800	PLUG, CONN. B08B-PH-K-R(RED)
P4	5336249500	PLUG, CONN. B05B-PH-K-S(WHT)
P5	5336251500	PLUG, CONN. B05B-PH-K-R(RED)
P6	5336250200	PLUG, CONN. B12B-PH-K-S(WHT)
P7	5336249400	PLUG, CONN. B04B-PH-K-S(WHT)
P8	5336255300	PLUG, CONN. B03B-PH-K-K(BLK)
P9	5336253300	PLUG, CONN. B03B-PH-K-Y(YEL)
P10	5336249300	PLUG, CONN. B03B-PH-K-S(WHT)
P11	5336251300	PLUG, CONN. B03B-PH-K-R(RED)
P12	5336249600	PLUG, CONN. B06B-PH-K-S(WHT)
P13	5336252000	PLUG, CONN. B10B-PH-K-R(RED)
P14	5336253500	PLUG, CONN. B05B-PH-K-Y(YEL)
P15	5336255500	PLUG, CONN. B05B-PH-K-K(BLK)
P16	5336255300	PLUG, CONN. B03B-PH-K-K(BLK)
P101	5336251800	PLUG, CONN. B08B-PH-K-R(RED)
P102	5336249500	PLUG, CONN. B05B-PH-K-S(WHT)
P103	5336249400	PLUG, CONN. B04B-PH-K-S(WHT)
P104	5336249600	PLUG, CONN. B06B-PH-K-S(WHT)
Q1 Q2	5145077000	TR., 2SD-600
R103-106	5280021100	R., TRIMMER 4.7KB
R108	5280021700	R., TRIMMER 47KB
U1	5220815800	IC., M5M82C54P
U2	5220052300	IC., TC74HC139P
U3	5220055700	IC., TC74HC10P
U4, 13	5220051700	IC., TC74HC02P
U5	5220052900	IC., TC74HC390P
U6	5220430600	IC., M51953BL
U7, 35	5220051800	IC., TC74HC04P
U8	5220052600	IC., TC74HC244P
U9	5220815102	IC., PROGRAMED HD63701YOP
U10	5220052700	IC., TC74HC245P
U11	5220810600	LSI., M5M82C51AP
U12	5220040800	IC., TC74HC74P
U14	5232255720	TR., DIGI. DTC124ES
U15, 16	5232254820	TR., DIGI. DTA124ES
U17	5220051600	IC., TC74HC00P
U18	5232254820	TR., DIGI. DTA124ES
U19	5232254820	TR., DIGI. DTA124ES
U20	5220805800	IC., M5L8279P-5
U21, 40	5220815900	IC., M5M82C55AP-2
U22	5220063700	IC., DIGI. SPG8640CN
U23-27	5232255720	TR., DIGI. DTC124ES
U28, 29	6048661000	IC, M54517P
U30, 47	5232255720	TR., DIGI. DTC124ES

CONTROL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
U31	5220020200	IC., TC4030BP
U32, 33	5232254820	TR., DIGI. DTA124ES
U34	5232254820	TR., DIGI. DTA124ES
U36	5220051900	IC., TC74HC14P
U37	5220062700	IC., M75189AP
U38	5220055900	IC., TC74HC138P
U39	5232256900	TR., ARRAY M54585P
U41, 42	5220419500	IC., LA6358
U43	5220013400	IC., TC4066BP
U44	5220062400	IC., M75188P
U45, 46	5232254820	TR., DIGI. DTA124ES
U100	5292209600	MODULE, MASTER OSC

OPERATION PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200268300	OPERATION PCB ASSY
	*5210268300	OPERATION PCB
	*5181761000	JUMPER, P=5.0
	*5181763000	JUMPER, P=10.0
	*5181767000	JUMPER, P=20.0
	*5122366000	PLUG, CONN. 3022-14AD
	*5801196000	SPACER, METER
	*5801157900	SPACER, LED L=2.5
	*5800897200	SPACER, LED L=8.5
C151-158	12906819	C., CC 50V 18PF 5%
D1-33	5224015010	DIODE, ISS133HV
D50, 51	5225022000	LED, SLP-135(RED)
D52-59	5225021500	LED, SLP177B-50
D60, 61	5225021600	LED, SLP277B-50
D62-69	5225022000	LED, SLP-135(RED)
D70	5225022100	LED, SLP-235(GRN)
D71	5225022000	LED, SLP-135(RED)
D72	5225022200	LED, SLP-435(YEL)
R4	5282019900	SIUVR 11, 20KB CT CC
S1-5	5300052400	SW., PUSH SKPAAB
S6-17	5302103200	SW., TACT KHH10910
S18-25	5302103200	SW., TACT KHH10910
S26-33	5302103200	SW., TACT KHH10910
U1	5232257600	TR., ARRAY M54581P
U2	5225021900	LED, DISPLAY
U101-108	5220439400	IC., LB1412
U111-118	5296007700	LEVEL METER UNIT, GL112J13

Parts marked with *require longer delivery time.

MOTHER PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200267600	MOTHER PCB ASSY
	*5210267600	MOTHER PCB
	*5181761000	JUMPER,P=5.0
	*5181762000	JUMPER,P=7.5
	*5181763000	JUMPER,P=10.0
	*5181764000	JUMPER,P=12.5
	*5181765000	JUMPER,P=15.0
D1,2	5224015010	DIODE,ISS133HV
J1	5336318400	PLUG,CONN. 5089-14A
J2,3	5336213000	PLUG,CONN. 5089-10A
J4,5	5336212400	PLUG,CONN. 5089-4A
J11-18	5336212300	PLUG,CONN. 5089-3A
J21-28	5336212300	PLUG,CONN. 5089-3A
J31-38	5336210200	PLUG,CONN. 5129-2A
P1-4	5330507200	JACK,PIN 4P
P11-18	5336279300	PLUG,CONN. 3P 1L-SDA-P
P21-28	5336279300	PLUG,CONN. 3P 1L-SDA-P
P31-38	5336279800	PLUG,CONN. 8P 1L-SDA-P
P41-48	5336280000	PLUG,CONN. 10P 1L-SDA-P
P51-58	5336279900	PLUG,CONN. 9P 1L-SDA-P
R7	5280036700	R.,TRIMMER 47KB
SW1	5300917100	SW.,SLIDE SSSB2-3
U1	5220439600	IC.,UPC4570C

R/P AMP PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200267800	R/P AMP PCB ASSY
	*5210267801	R/P AMP PCB
	*5210259600	COIL PCB
	*5210272400	TRAP PCB
	*5242117400	JUMPER,JPW-L5
	*5242117500	JUMPER,JPW-L10
C67	12906562	C.,CC 50V IMF Z
C73	12906562	C.,CC 50V IMF Z
D1	5224571801	DIODE,ZENER RD3.0FL2 FR
D2	5224015020	DIODE,ISS133T-77
D3	5224015020	DIODE,ISS133T-77
D4	5224015020	DIODE,ISS133T-77
D5	5224573801	DIODE,ZENER RD6.2EL2 FR
D6	5224015020	DIODE,ISS133T-77
J1	5122357000	PLUG,CONN. 3022-05AD
K1	5290013900	RERAY,12V G6E-134P-US
K2	5290013700	RELAY,SY-12W-K
L1	5320051600	TRANS,ERASE
L2	5320051500	TRANS,BIAS
L3	5286037200	COIL,700UH
P1,2	5336281300	SOCKET,CONN. 3P 1L-SDA-S
P3	5336281800	SOCKET,CONN. 8P 1L-SDA-S
P4	5336282000	SOCKET,CONN. 10P 1L-SDA-S
P5	5336281900	SOCKET,CONN. 9P 1L-SDA-P
Q1,2	5232009500	FET.,2SK170BL

R/P AMP PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
Q3,4	5231762520	TR.,2SD1915TA
Q5	5232005200	FET.,2SK246GR
Q6	5232008100	FET.,2SJ-103GR
Q7	5232007920	FET.,2SJ-40(D)
Q8	5232008420	FET.,2SK381D
Q11	5230779520	TR.,2SC1815GR
Q12	5230782200	TR.,2SC2002L
Q13	5230779520	TR.,2SC1815GR
Q14	5230782200	TR.,2SC2002L
Q15	5232007920	FET.,2SJ-40(D)
Q16	5230779520	TR.,2SC1815GR
Q17-24	5231762520	TR.,2SD1915TA
Q25	5230779520	TR.,2SC1815GR
R2,3	5241459420	R.,METAL FILM 3.3K
R5	5241459620	R.,METAL FILM 3.9K
R13	5280035500	R.,TRIMMER 470B
R16	5280036300	R.,TRIMMER 10KB
R25	5280036700	R.,TRIMMER 47KB
R42,50	5280036300	R.,TRIMMER 10KB
R54	5280036300	R.,TRIMMER 10KB
R70	5280021700	R.,TRIMMER,47KB
R73,76	5280021300	R.,TRIMMER 10KB
R99	5280021700	R.,TRIMMER,47KB
R114	5280036300	R.,TRIMMER 10KB
R130	5242119200	R.,ARRAY RMLS-4J223
R501-505	△ 5183538000	R.,INCOMB. 1/4W 2.2
R506	△ 5183546000	R.,INCOMB. 4.7 OHM
SW1	5302104700	SW.,DIP 4GANG JKS1120
TP1-9	5317002100	PIN,DIH CHECK IPS-1136
U1-4	5220439600	IC.,UPC4570C
U5	5220438500	IC.,UPC358C
U6	5220414501	IC.,UPC1252H-2
U7	5220414601	IC.,UPC1253H-2
U8	5220816300	IC.,UPD7554CS-110
U9	5220051600	IC.,TC74HC00P
U10	5220036200	IC.,LC4966
U11,12	5232254820	TR.,DIGI. DTA124ES
U13	5232255720	TR.,DIGI. DTC124ES
U14	5232254820	TR.,DIGI. DTA124ES
U15	5232255720	TR.,DIGI. DTC124ES
U16	5232254820	TR.,DIGI. DTA124ES
U17	5232255720	TR.,DIGI. DTC124ES
U18,19	5232254820	TR.,DIGI. DTA124ES
U20,21	5232255720	TR.,DIGI. DTC124ES
U22,23	5224015320	DIODE,MC931
U24	5232254820	TR.,DIGI. DTA124ES
U25,26	5286037400	TRAP COIL,FIX(145KHZ)
U27	5286037300	TRAP COIL,VARIABLE(145KHZ)
U29	5232255720	TR.,DIGI. DTC124ES
U30	5232254820	TR.,DIGI. DTA124ES

Parts marked with *require longer delivery time.

CAP SERVO PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200267500	CAP SERVO PCB ASSY
	*5210267501	CAP SERVO PCB
	*5181761000	JUMPER,P=5.0
	*5181763000	JUMPER,P=10.0
	*5317002100	PIN,DH CHECK IPS-1136
	*5801195600	HEAT SINK(SERVO)
	*5780003006	SCREW,BIND M3X6
D1-3	5224015010	DIODE,ISS133HV
P1	5122129000	PLUG,CONN. 5045-05A(WHT)
P2	5336126300	PLUG,CONN. 8263-0312(WHT)
P3	5336137300	PLUG,CONN. 8263-0312(BLK)
P4	5336145300	PLUG,CONN. 8263-0312(YEL)
P5	5336126400	PLUG,CONN. 8263-0412(WHT)
P6	5336137400	PLUG,CONN. 8263-0412(BLK)
Q1,2	5230778320	TR.,2SC2320F
Q3	5145102000	FET,2SK-68A-L
Q4	5230778320	TR.,2SC2320F
Q5	5231762800	TR.,2SD1913R
R9	5241011200	R.,METAL FILM 18K
R10	5241011300	R.,METAL FILM 25 20K
R35	△ 5052747000	R.,METAL OXIDE 3.3,2W
R51	5280211200	R.,TRIMMER 22KB
R52	5280211200	R.,TRIMMER 22KB
U1	5220426600	IC.,UPC1043C
U2	5220019000	IC.,TC4001BP
U3	5220019100	IC.,TC4011BP
U4	5220012500	IC.,UPC393C
U5	5220013400	IC.,TC4066BP
U51-53	5232255720	TR.,DIGI. DTC124ES
U54,55	5232254820	TR.,DIGI. DTA124ES
U57-60	5232255720	TR.,DIGI. DTC124ES

POWER SUPPLY PCB A ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200267900	POWER SUPPLY PCB A ASSY
	*5210267900	POWER SUPPLY PCB A
	*5801195500	HEAT SINK(POWER)
	*5780003006	SCREW,BIND M3X6
D1-6	△ 5224013210	DIODE,DS135D
D7,8	△ 5224015700	DIODE,ISS130
P1	5336126300	PLUG,CONN. 8263-0312(WHT)
P2	5336135500	PLUG,CONN. 8263-0512(RED)
P3	5336137400	PLUG,CONN. 8263-0412(BLK)
P4	5336145500	PLUG,CONN. 8263-0512(YEL)
P5	5336126600	PLUG,CONN. 8263-0612(WHT)
P6	5336126200	PLUG,CONN. 8263-0212(WHT)
P7	5336145300	PLUG,CONN. 8263-0312(YEL)
Q2	△ 5230509700	TR.,2SB1274R
R1,2	5184249000	R.,INCOMBUSTIBLE 100 OHM
U1	5220425800	IC.,M5230LA
U2	△ 5220434800	IC.,M5F7812L
U3	5232255720	TR.,DIGI. DTC124ES
W1-5	5181763000	JUMPER,P=10.0

POWER SUPPLY PCB B ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200268000	POWER SUPPLY PCB B ASSY
	*5210268000	POWER SUPPLY PCB B
	*5181763000	JUMPER,P=10.0
	*5181767000	JUMPER,P=20.0
	*5801195500	HEAT SINK(POWER)
	*5780003008	SCREW,BIND M3X8
D1	△ 5228010000	SILICON STACK,D5SB20
D2	△ 5224014700	DIODE,S3V20H
D3	△ 5224013210	DIODE,DS135D
P1	5336090300	PLUG,CONN. 5281-03A
P2	5336127100	PLUG,CONN. 8263-1112(WHT)
P3	5336126600	PLUG,CONN. 8263-0612(WHT)
P4	5336126500	PLUG,CONN. 8263-0512(WHT)
P5	5336126400	PLUG,CONN. 8263-0412(WHT)
Q1	△ 5145165000	TR.,2SD-716 0
Q2	5230016000	TR.,2SA950 0
Q3	5145151000	TR.,2SC-1815GR
Q4	5230509700	TR.,2SB1274R
Q5	5145151000	TR.,2SC-1815GR
R3	△ 5241220110	R.,INCOMB. 1W 820 OHM
R4	△ 5241219510	R.,INCOMB. 1W 470 OHM
U1	△ 5220434400	IC.,M5F7805L
U2	△ 5220434900	IC.,M5F7815L

FUSE PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200268100	FUSE PCB ASSY [US,C,J,GE]
	*5210268100	FUSE PCB [US,C,J,GE]
	*5041237000	HOLDER,FUSE PCB [US,C,J,GE]
	*5200268200	FUSE PCB ASSY [E,UK]
	*5210268200	FUSE PCB [E,UK]
	*5332014200	HOLDER,FUSE [E,UK]
F1 F2	5307004400	FUSE,4A-250V [US,C,J,GE]
F1 F2	5142191000	FUSE,3.15A-250V T;MINI [E,UK]
F3 F4	5307004700	FUSE,7A-125V [US,C,J,GE]
F3 F4	5142194000	FUSE,6.3A-250V SLOW B [E,UK]

[US]:U.S.A. [E]:EUROPE [UK]:U.K. [C]:CANADA
[J]:JAPAN [GE]:GENERAL EXPORT

Parts marked with *require longer delivery time.

JOINT PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200268700	JOINT PCB ASSY
	*5210268700	JOINT PCB
	*5181761000	JUMPER,P=5,0
	*5801195700	HEAT SINK(JOINT)
	*5780003008	SCREW,BIND M3X8
D1,2	5224013210	DIODE,DS135D
P1	5336126200	PLUG,CONN. 8263-0212(WHT)
P2	5336126300	PLUG,CONN. 8263-0312(WHT)
P3	5336126600	PLUG,CONN. 8263-0612(WHT)
P4	5336126400	PLUG,CONN. 8263-0412(WHT)
P5-7	5336202200	PLUG,CONN. 5483-02A(WHT)
P8,9	5336202300	PLUG,CONN. 5483-03A(WHT)
Q1-3	5231762800	TR.,2SD1913R
Q4,5	5145171000	TR.,2SD-718 0
R4	△ 5241217110	R.,INCOMB. 1W 47 OHM
R5,6	△ 5185202000	R.,METAL PLATE 0.47 5W

PG ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200268500	PG PCB ASSY
	*5210268500	PG PCB
P1	5336128400	PLUG,CONN. 8263-0411(WHT)
UI,2	5228010200	PHOTO INTERRUPTER,GP2S04B

SHUT PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200268800	SHUT PCB ASSY
	*5210268800	SHUT PCB
P1	5336128300	PLUG,CONN. 8263-0311(WHT)
UI	5228009600	PHOTO INTERRUPTER,SP1-208

SENSOR PCB L ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200268600	SENSOR PCB L ASSY
	*5210268600	SENSOR PCB L
	*5801138800	SPACER,SENSOR COIL
D1	5224015010	DIODE,ISS133HV
LI,2	5160038000	COIL,DETECTOR
P1	5336128300	PLUG,CONN. 8263-0311(WHT)
Q1	5145151000	TR.,2SC-1815GR

D SUB PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200270300	D SUB PCB ASSY
	*5210270300	D SUB PCB
J1	5334055000	SOCKET,CONN. 15P
P1	5336126600	PLUG,CONN. 8263-0612(WHT)
P2	5336126300	PLUG,CONN. 8263-0312(WHT)

REMOTE PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200268900	REMOTE PCB ASSY
	*5210268900	REMOTE PCB
	*5302107800	SW.,DIP 4P
	*5317003300	NUT
	*5330014800	JACK,SINGLE POLE YKB21-5014
D1 D2	*5334045400	SOCKET,DIN 8P YKF51-5001
P1	5224015010	DIODE,ISS133HV
P1	5336126500	PLUG,CONN. 8263-0512(WHT)
P2	5336126600	PLUG,CONN. 8263-0612(WHT)

Parts marked with *require longer delivery time.

SENSOR PCB R ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200270200	SENSOR PCB R ASSY
	*5210270200	SENSOR PCB R
	*5801138800	SPACER,SENSOR COIL
D1	5224015010	DIODE,ISS133HV
LI L2	5160038000	COIL,DETECTOR
P1	5336139300	PLUG,CONN. 8263-0311(RED)
Q1	5145151000	TR.,2SC-1815GR

TR PCB ASSY(4)

REF.NO.	PARTS NO.	DESCRIPTION
	*5200239430	TR PCB ASSY(4)
	*5210239400	TR PCB
PI	5336126300	PLUG,CONN. 8263-0312(WHT)
Q1	△ 5231762800	TR.,2SD1913R

CV PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200293400	CV PCB ASSY
	*5210239400	TR PCB
UI	5220434800	IC,M5F7812L
DI	5224013200	DIODE,DS135 D
PI	5336202200	PULUG,CONN. 5483-02A(WHT)

N.FILTER PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200283900	N.FILTER PCB ASSY [US,C,J,GE]
	*5200283910	N.FILTER PCB ASSY [E,UK]
	*5210283901	N.FILTER PCB
	△ 5292806300	FILTER,NOISE FKOBI6MH13
	5555590000	PLATE(A),EARTH
	5327007200	RAPPING,TERMINAL [E,UK]
C1,2	△ 5267704000	SPARK KILLER 0.0047UF250V
C3-8	△ 5267703800	SPARK KILLER 4700PF 400V

I/F PCB ASSY (EXCEPT J)

REF.NO.	PARTS NO.	DESCRIPTION
	*5200287000	I/F PCB ASSY
	*5210287000	I/F PCB
	*5780003006	SCREW,BIND M3X6
	*5317002100	PIN,DH CHECK IPS-1136
CI	5263167623	C.,METAL 0.056UF 50V
DI-14	5224015010	DIODE,1SS133HV
J1	5334047100	SOCKET,CONN. DCLCJ37SAF
P1	5336251800	PLUG,CONN. B08B-PH-K-R(RED)
P2	5336249500	PLUG,CONN. B05B-PH-K-S(WHT)
P3	5336249400	PLUG,CONN. B04B-PH-K-S(WHT)
P4	5336249600	PLUG,CONN. B06B-PH-K-S(WHT)
P5	5336126600	PLUG,CONN. 8263-0612(WHT)
P6	5336126300	PLUG,CONN. 8263-0312(WHT)
P51	5336251600	PLUG,CONN. B06B-PH-K-R(RED)
P52	5336249300	PLUG,CONN. B03B-PH-K-S(WHT)
R1-4	5242110200	R.,ARRAY 4.7K
U1,2	5220052000	IC.,TC74HC32P
U3,4	5220051800	IC.,TC74HC04P
U5-20	5232255720	TR.,DIGI. DTC124ES
U22-25	5232255720	TR.,DIGI. DTC124ES

HEAD CONNECT PCB ASSY

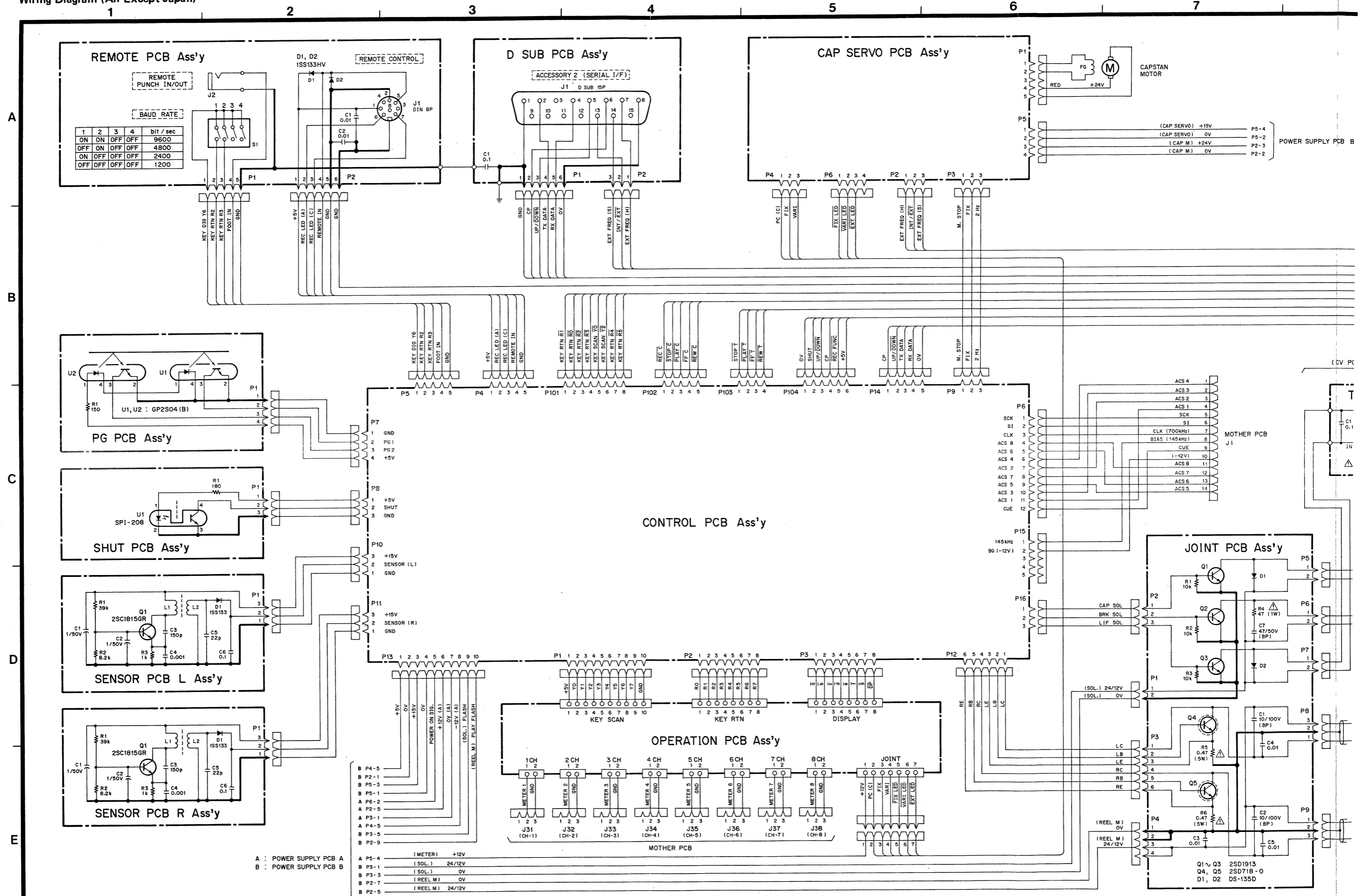
REF.NO.	PARTS NO.	DESCRIPTION
	*5200177200	HEAD CONNECT PCB ASSY
	*5210177200	HEAD CONNECT PCB
J001,002	5332015300	SOCKET,IC 16P

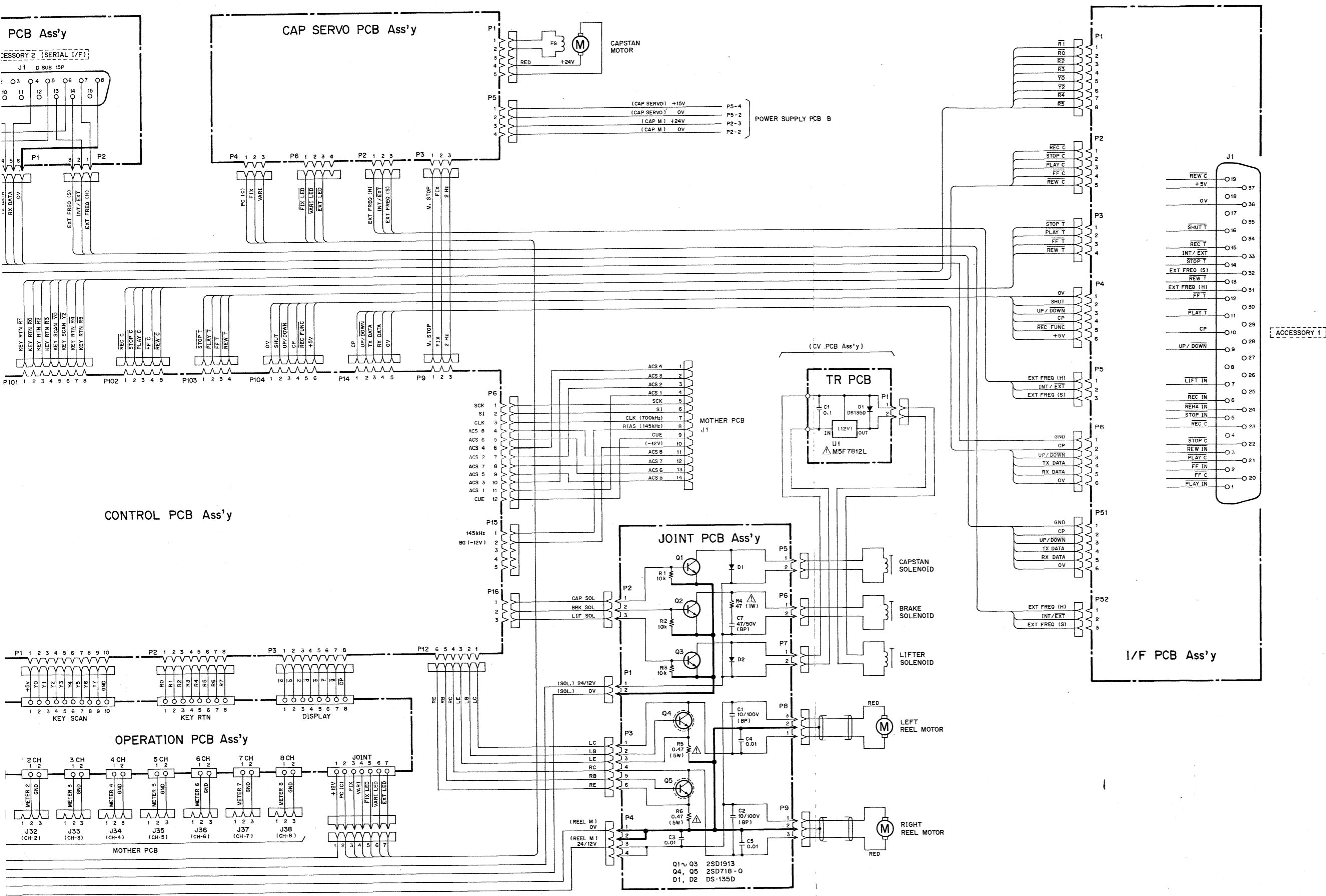
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 [J]:JAPAN [GE]:GENERAL EXPORT

Parts marked with *require longer delivery time.

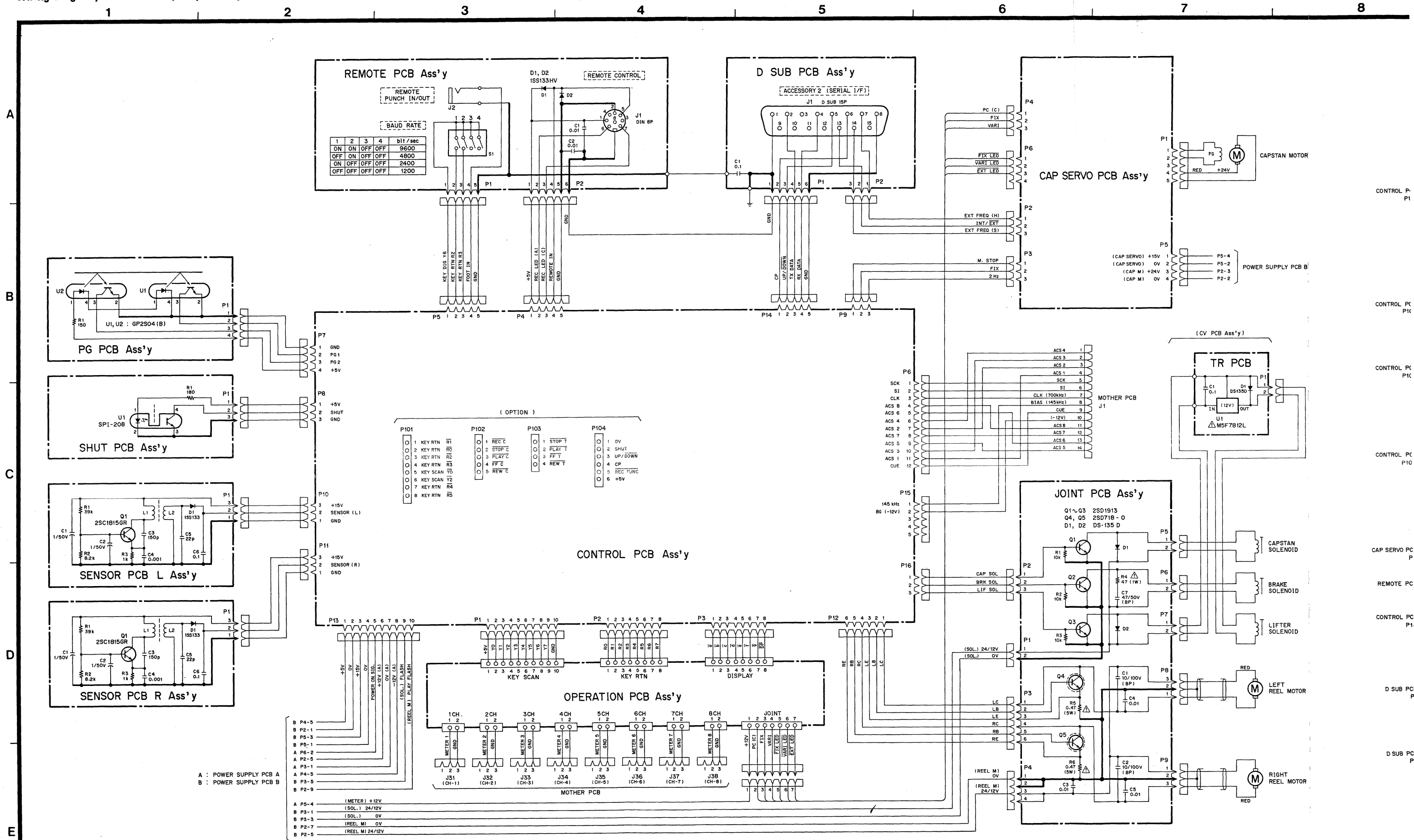
4-3. Schematic Drawings

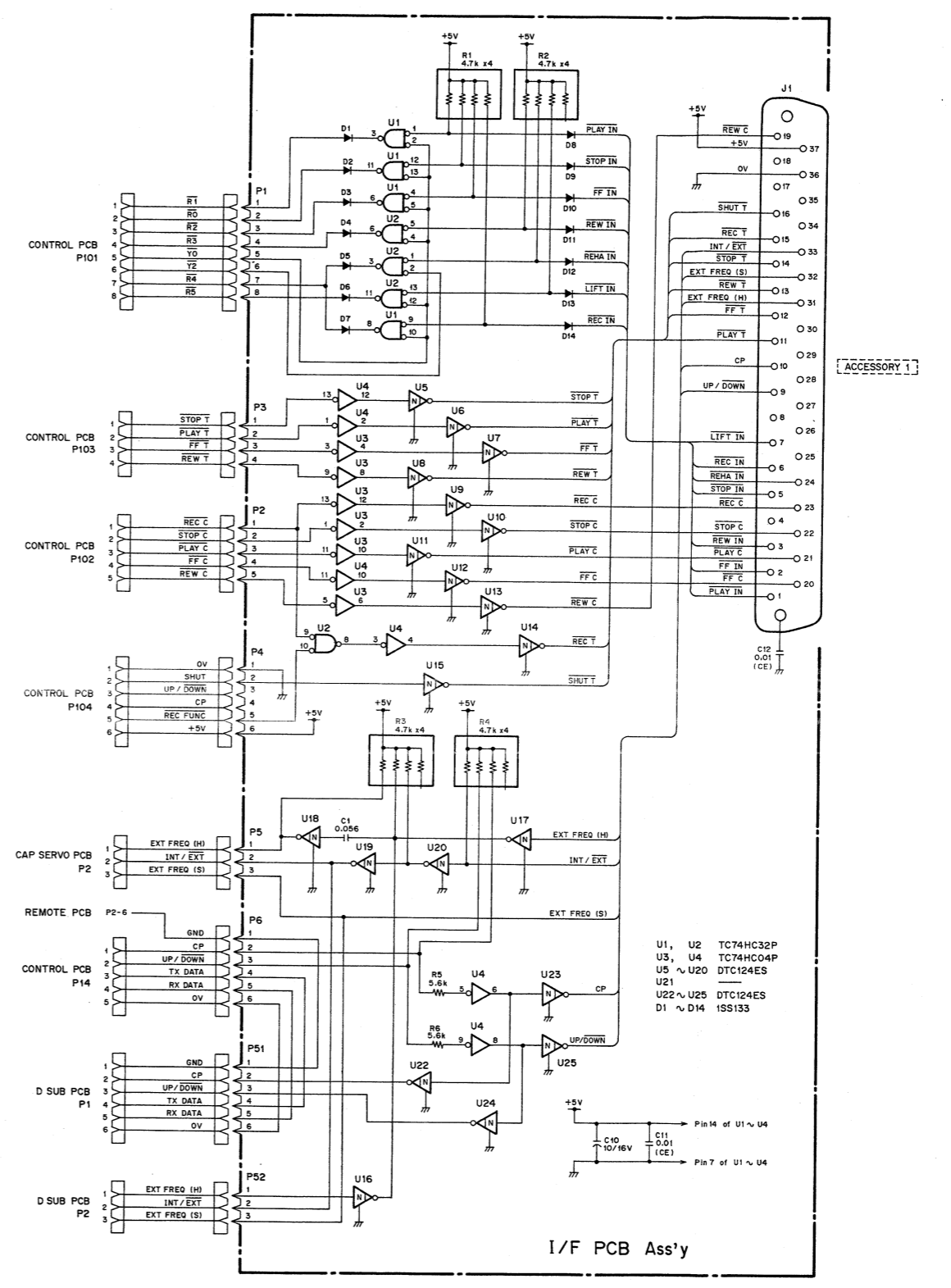
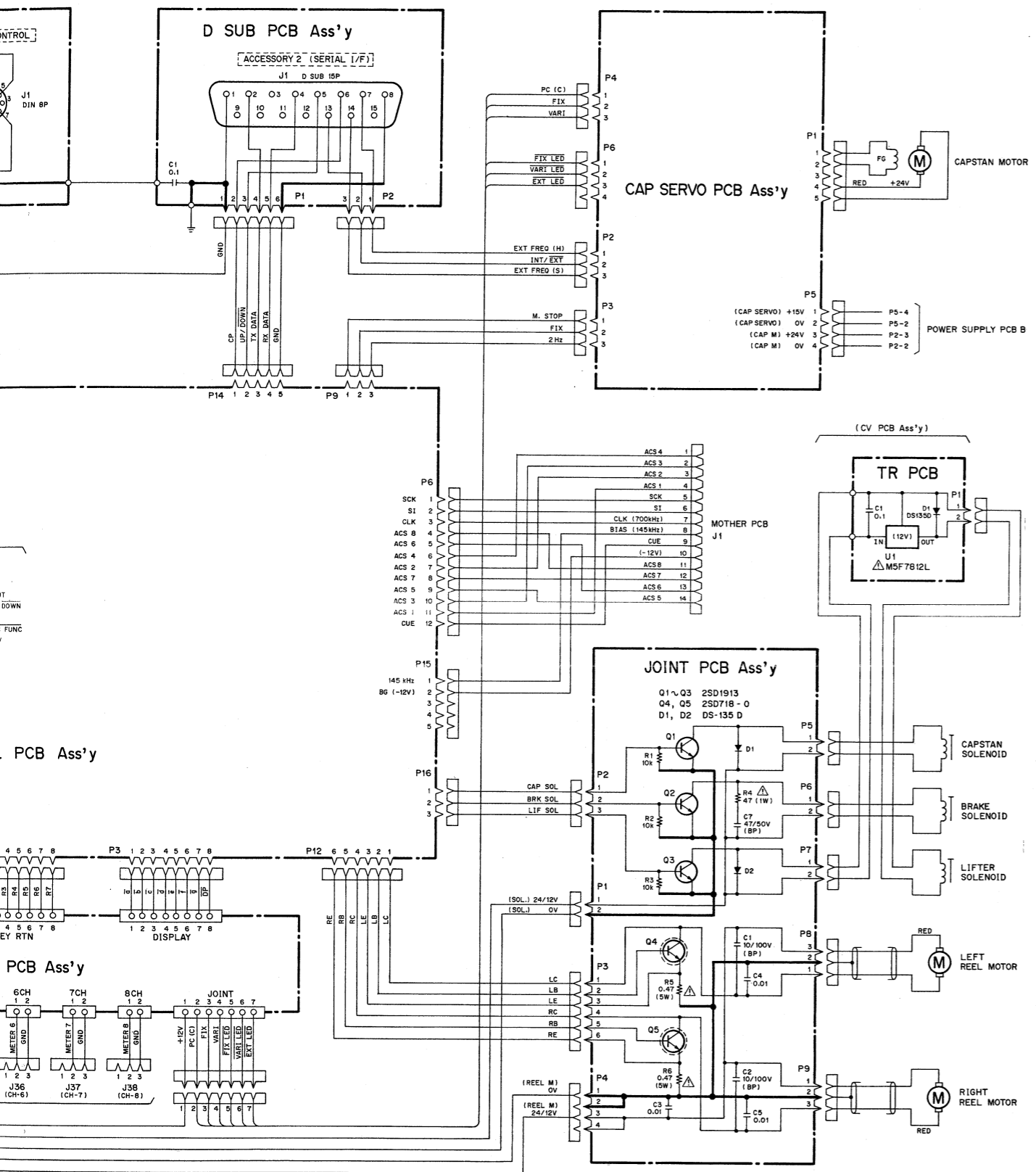
Wiring Diagram (All Except Japan)



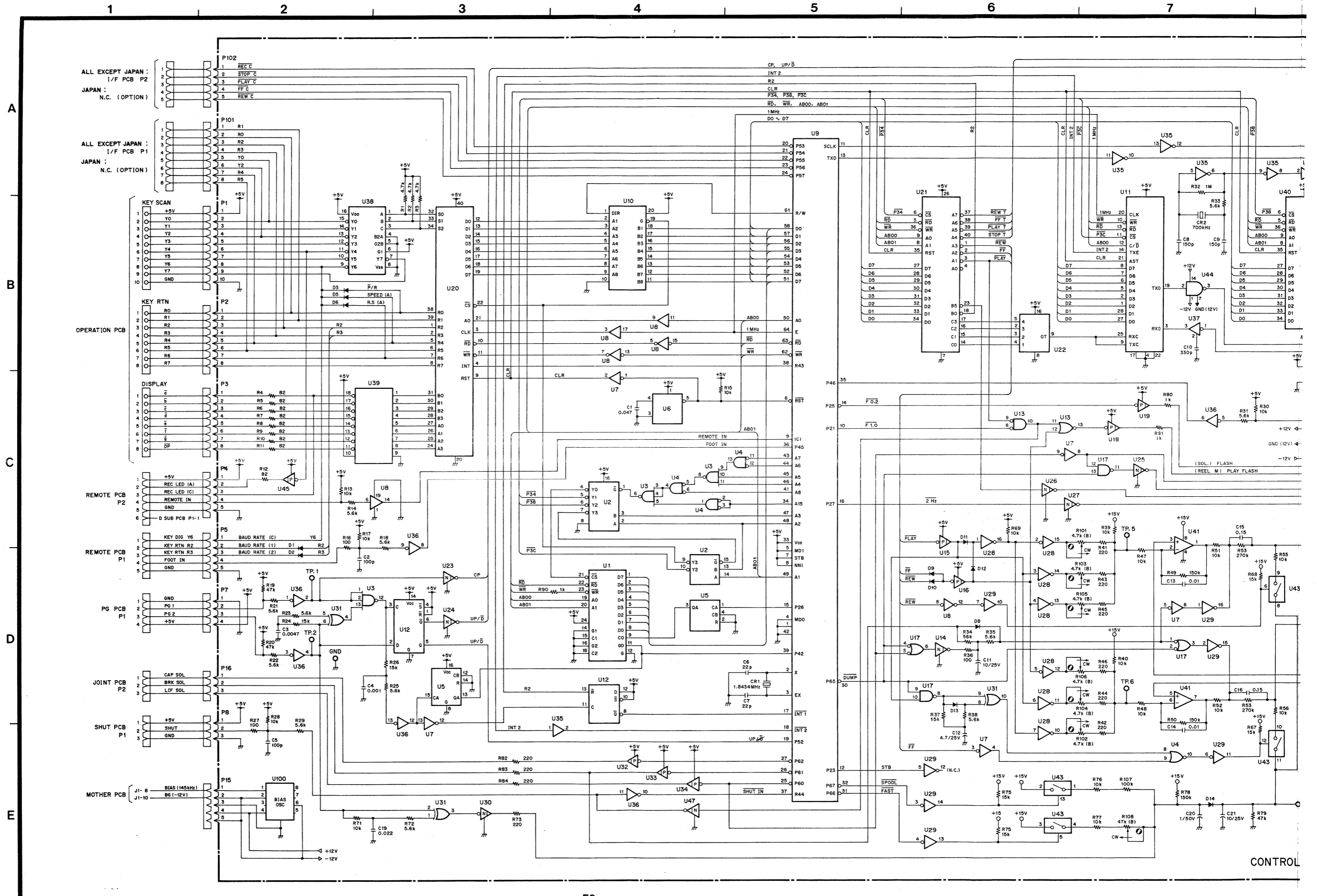


ACCESSORY I

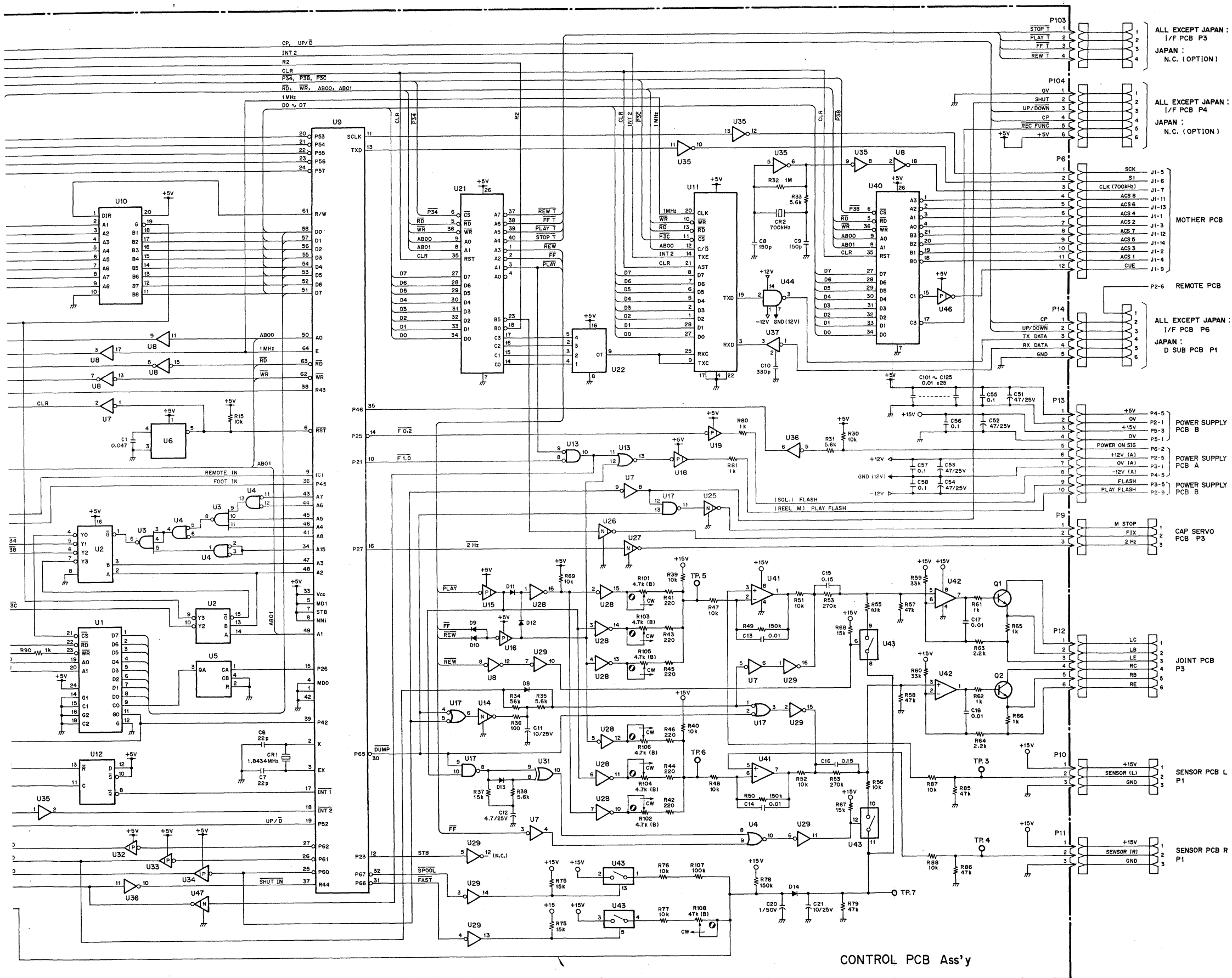




Control PCB Ass'y



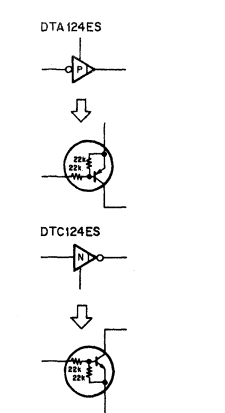
CONTROL



CONTROL PCB Ass'y

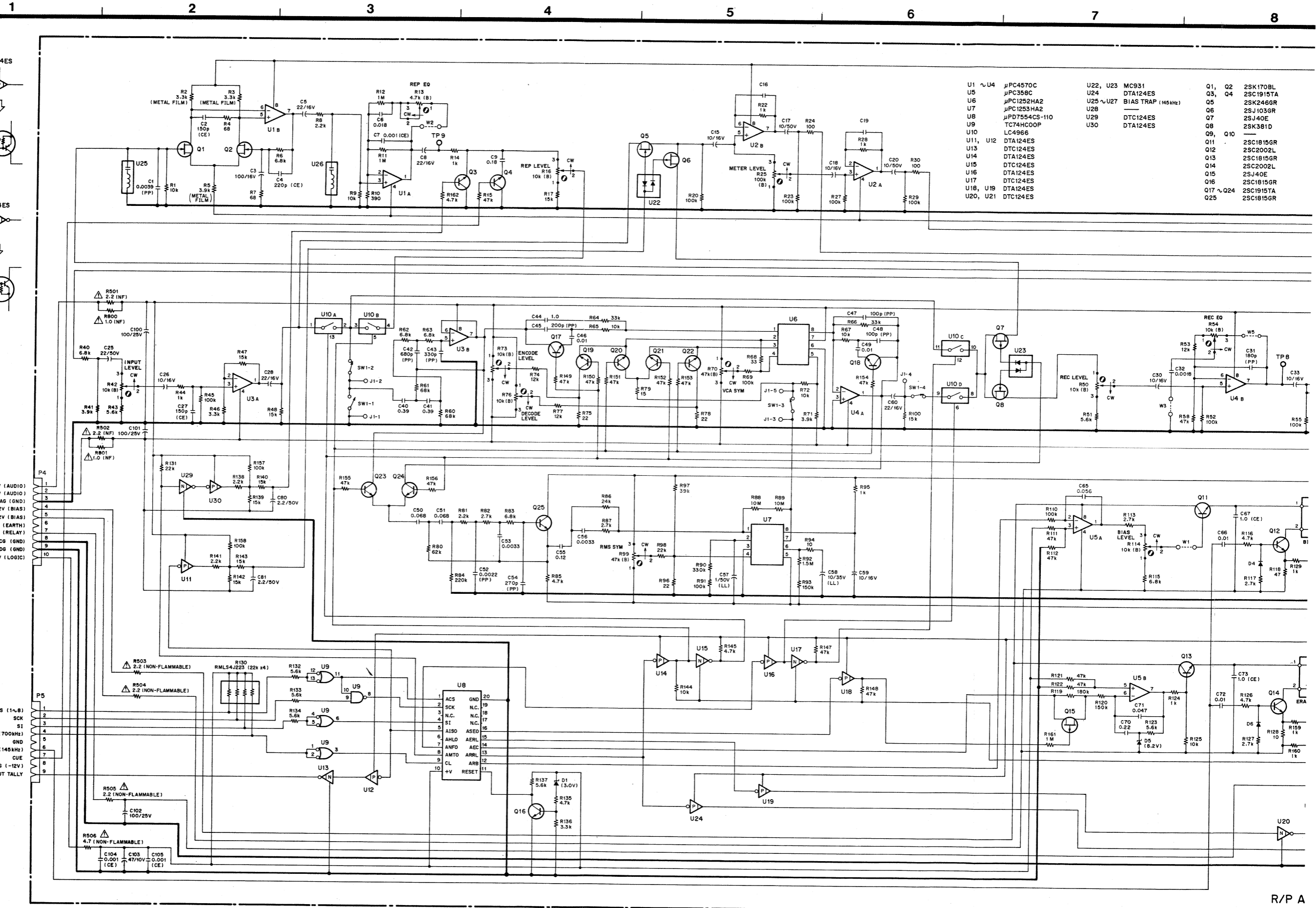
- U1 M5M82CP54P6
- U2 TC74HC139P
- U3 TC74HC10P
- U4 TC74HC02P
- U5 TC74HC390P
- U6 M51953BL
- U7 TC74HC04P
- U8 TC74HC244P
- U9 HD63701Y0
- U10 TC74HC245
- U11 M5M82C51AP
- U12 TC74HC74P
- U13 TC74HC02P
- U14 DTC124ES
- U15, U16 DTA124ES
- U17 TC74HC00P
- U18, U19 DTA124ES
- U20 M5L8279P-5
- U21 M5M82C55AP-5
- U22 SP08640CN
- U23~U27 DTC124ES
- U28, U29 M54517P
- U30 DTC124ES
- U31 TC4030BP
- U32~U34 DTA124ES
- U35 TC74HC04P
- U36 TC74HC14P
- U37 M75188AP
- U38 TC74HC13B
- U39 M54585
- U40 M5M82C55AP-5
- U41, U42 LA6358
- U43 TC4066BP
- U44 M75188P
- U45, U46 DTA124ES
- U47 DTC124ES
- U100 BIAS OSC (145KHz)

- Q1, Q2 2SD600
- D1 ~ D3 1SS133HV
- D4 1SS133HV
- D5, D6 1SS133HV
- D7 1SS133HV
- D8 ~ D14 1SS133HV



- ADJUST POINTS
- R101 EDIT L TENSION
 - R102 EDIT R TENSION
 - R103 PLAY BACK TENSION
 - R104 PLAY TAKE-UP TENSION
 - R105 F.FWD BACK TENSION
 - R106 REW BACK TENSION
 - R108 FAST SPEED
- Viewed from foil side.

R/P Amp PCB Ass'y



U1 ~ U4	μPC4570C	U22, U23	MC931	Q1, Q2	2SK170BL
U5	μPC358C	U24	DTA124ES	Q3, Q4	2SC1915TA
U6	μPC1252HA2	U25 ~ U27	BIAS TRAP (145kHz)	Q5	2SK2466R
U7	μPC1253HA2	U28	—	Q6	2SJ1036R
U8	μPD7554CS-110	U29	—	Q7	2SJ40E
U9	TC74HC00P	U30	DTA124ES	Q8	2SK381D
U10	LC4966			Q9, Q10	—
U11, U12	DTA124ES			Q11	2SC18156R
U13	DTC124ES			Q12	2SC2002L
U14	DTA124ES			Q13	2SC18156R
U15	DTC124ES			Q14	2SC2002L
U16	DTA124ES			Q15	2SJ40E
U17	DTC124ES			Q16	2SC18156R
U18, U19	DTA124ES			Q17 ~ Q24	2SC1915TA
U20, U21	DTC124ES			Q25	2SC18156R

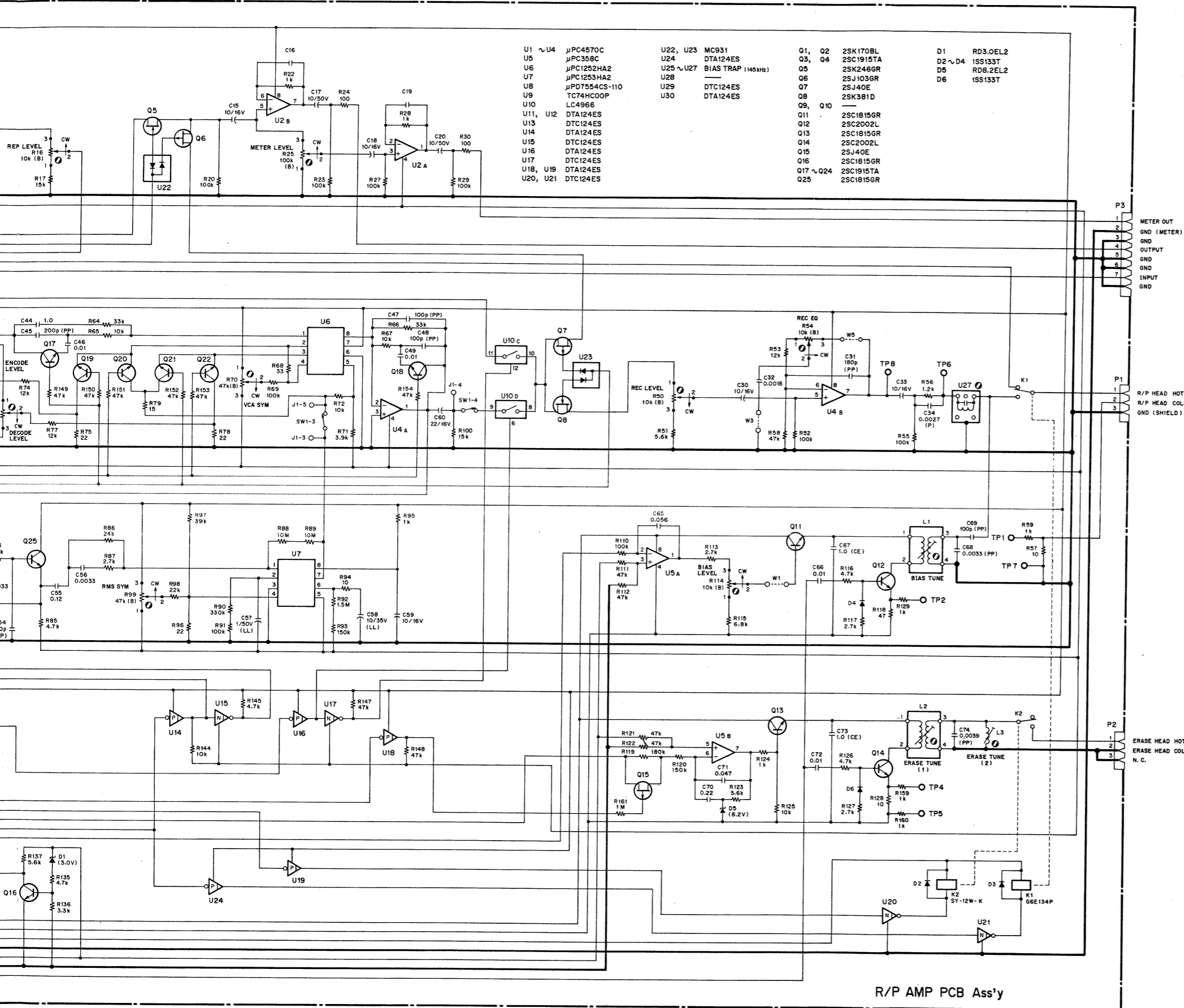
DTA124ES

DTC124ES

- +12V (AUDIO)
- 12V (AUDIO)
- AG (GND)
- +12V (BIAS)
- 12V (BIAS)
- GND (EARTH)
- +12V (RELAY)
- CG (GND)
- DG (GND)
- +5V (LOGIC)

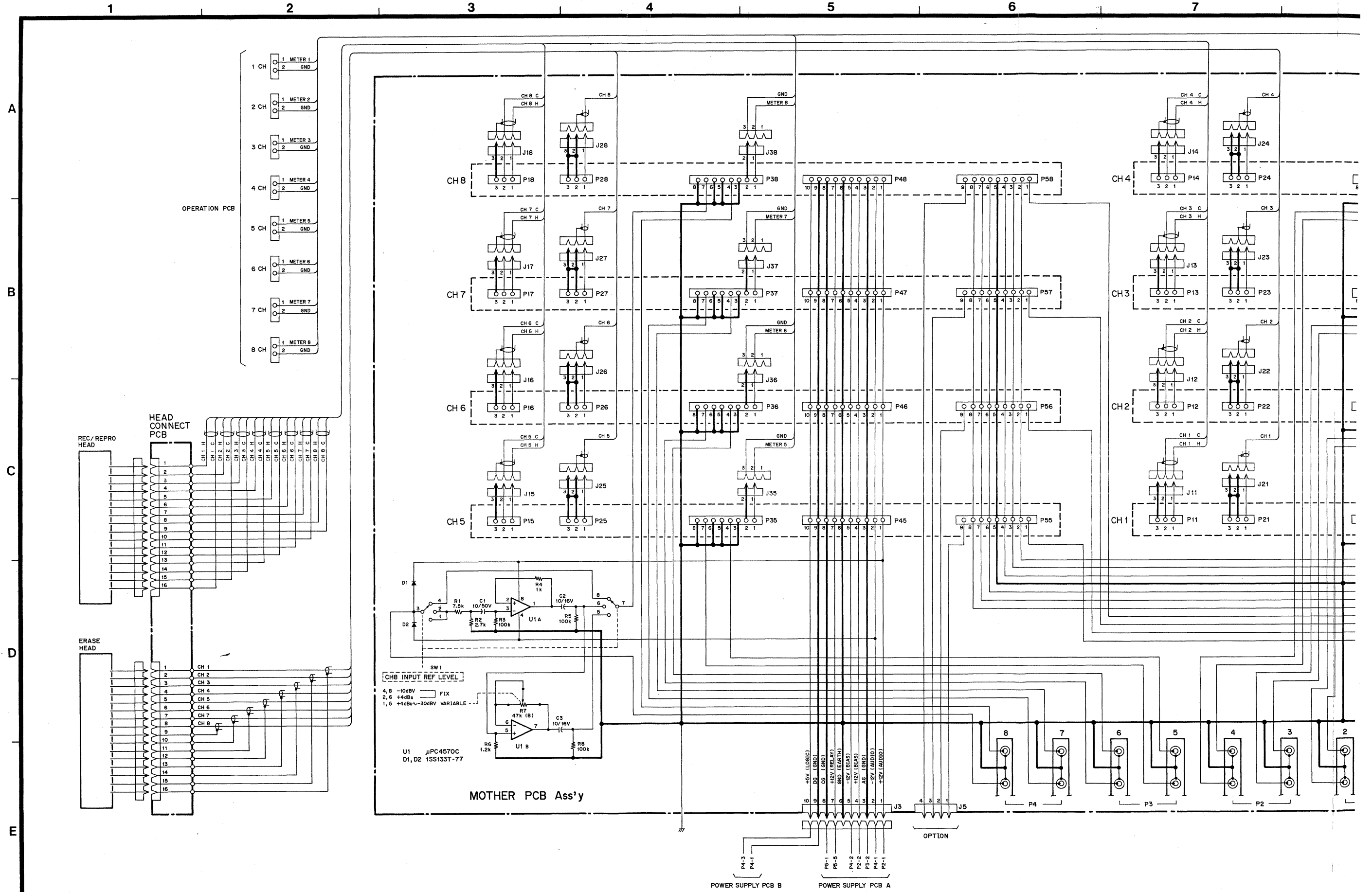
- ACS (1~8)
- SCK
- SI
- CLK (700kHz)
- GND
- BIAS (145kHz)
- CUE
- BG (-12V)
- INPUT TALLY

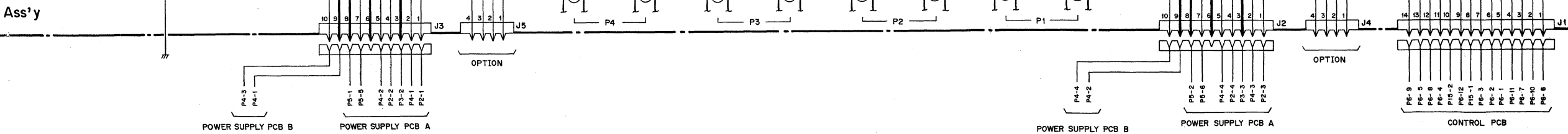
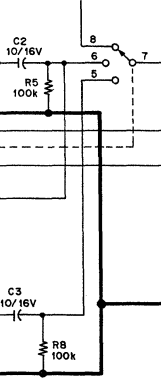
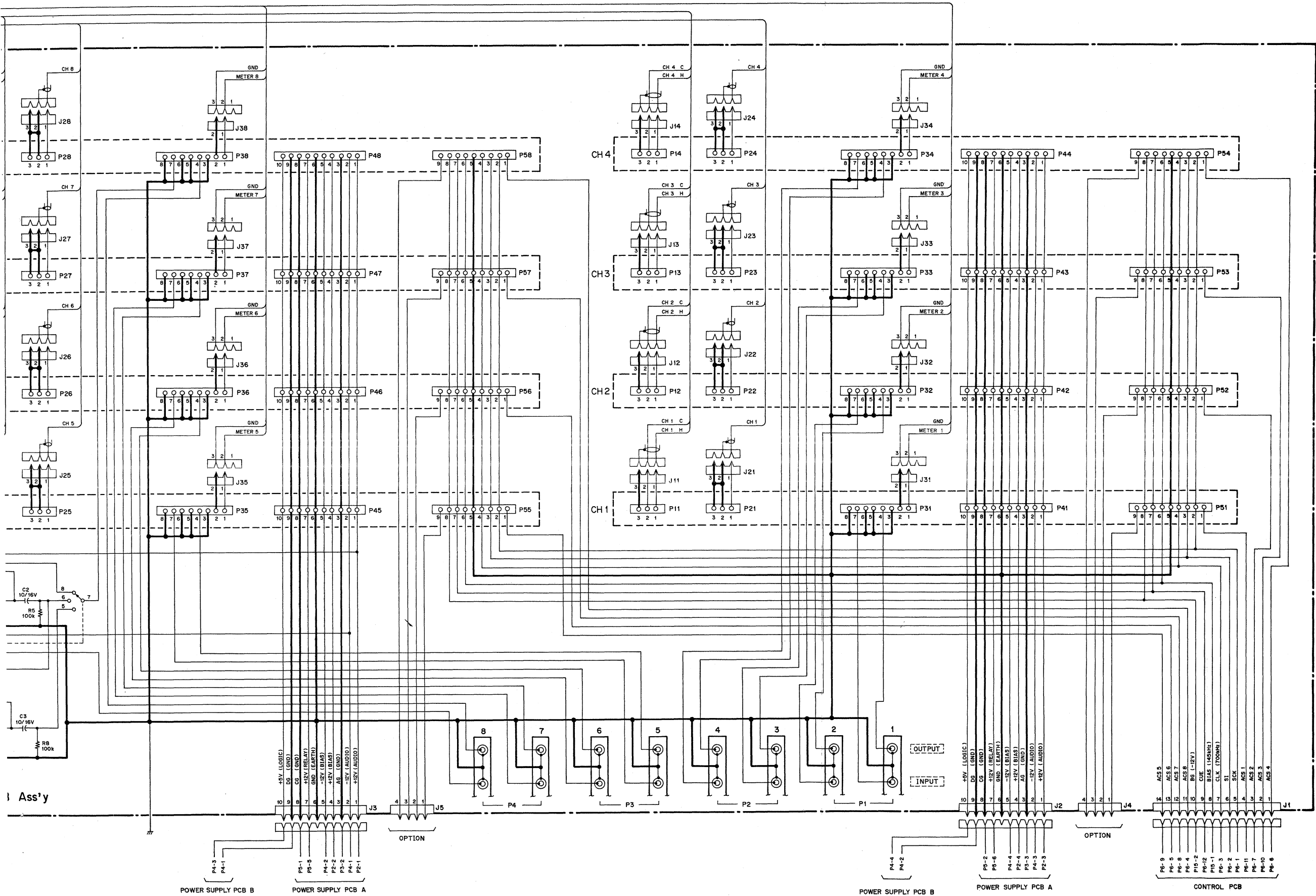
R/P A

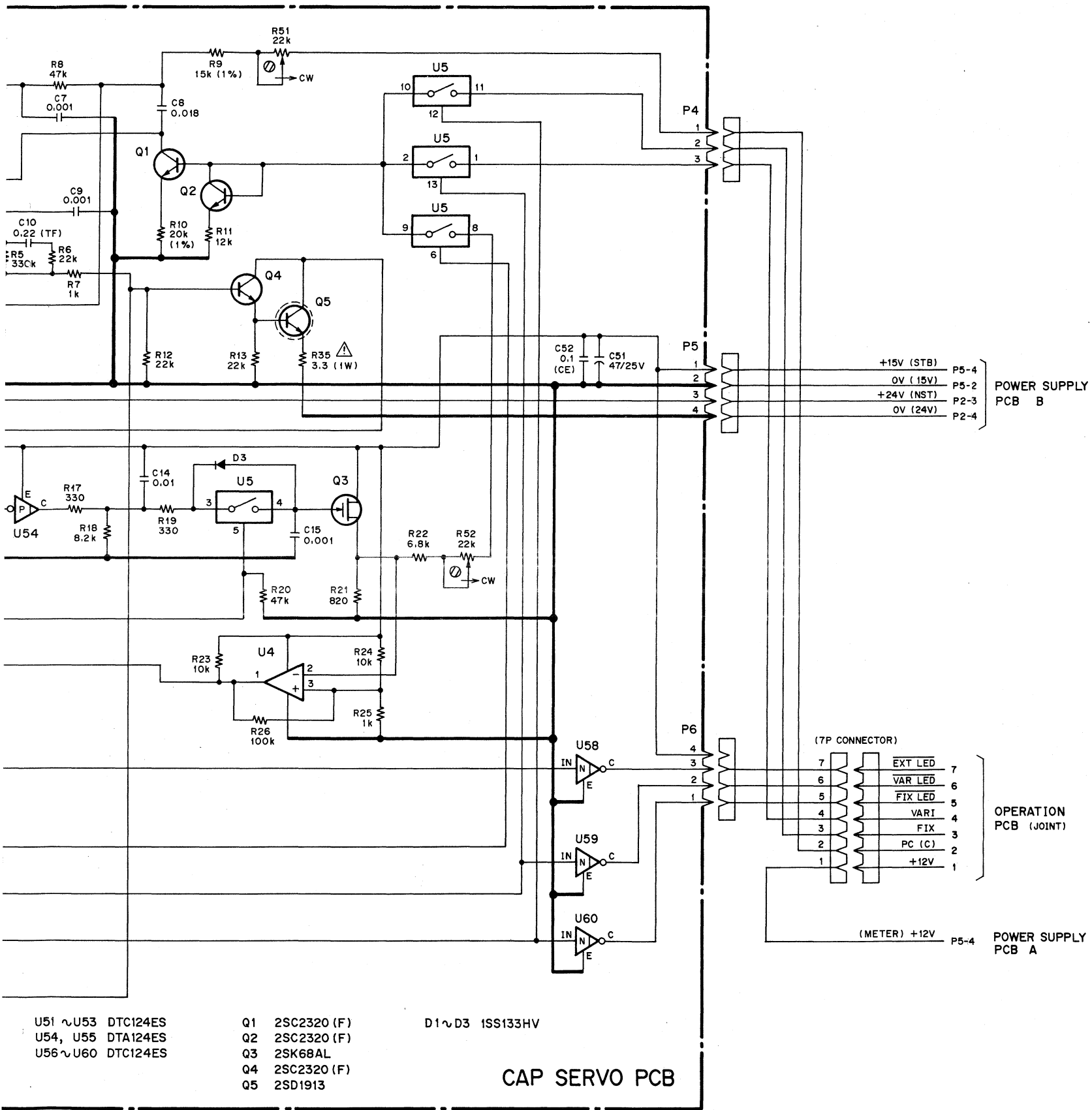


R/P AMP PCB Ass'y

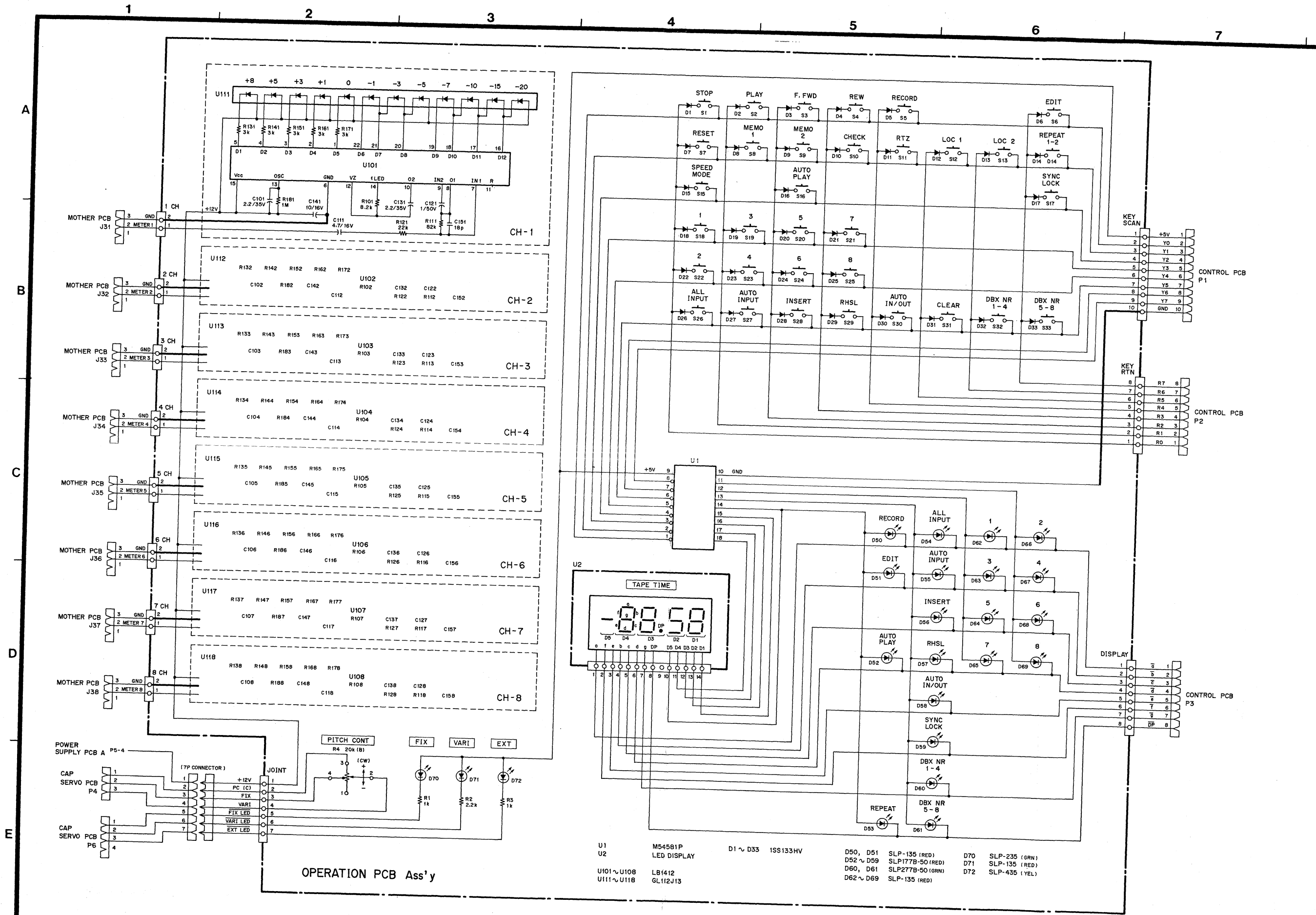
Mother PCB Ass'y





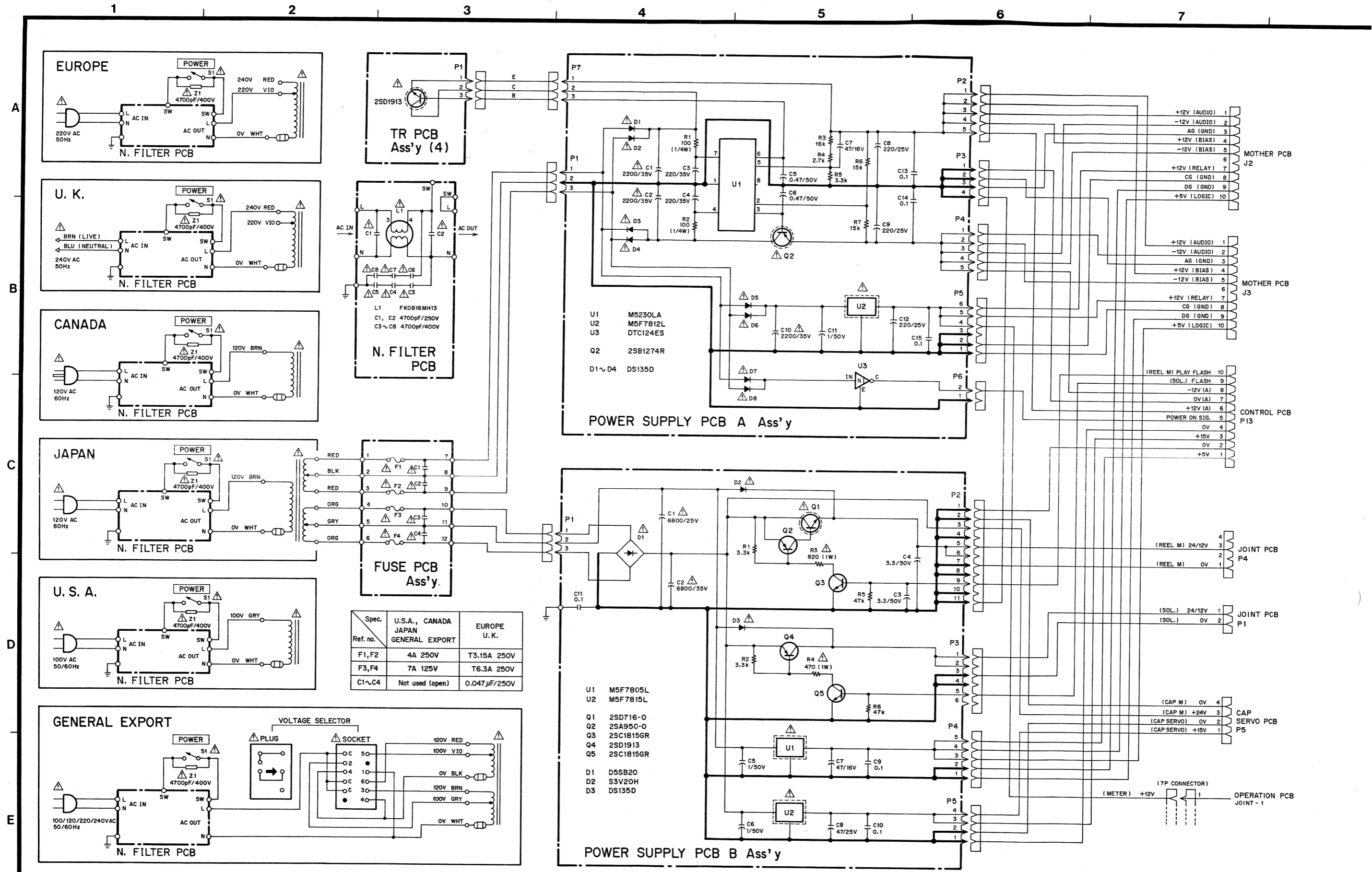


Operation PCB Ass'y



OPERATION PCB Ass'y

- U1 M54581P
- U2 LED DISPLAY
- D1 ~ D33 1SS133HV
- D50, D51 SLP-135 (RED)
- D52 ~ D59 SLP177B-50 (RED)
- D60, D61 SLP277B-50 (GRN)
- D62 ~ D69 SLP-135 (RED)
- D70 SLP-235 (GRN)
- D71 SLP-135 (RED)
- D72 SLP-435 (VEL)
- U101 ~ U108 LB1412
- U111 ~ U118 GL112J13

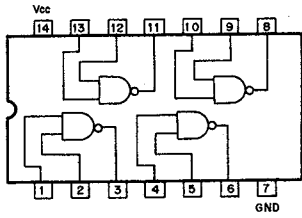


Spec. Ref. no.	U.S.A., CANADA JAPAN GENERAL EXPORT	EUROPE U.K.
F1, F2	4A 250V	T3.15A 250V
F3, F4	7A 125V	T6.3A 250V
C1~C4	Not used (open)	0.047µF/250V

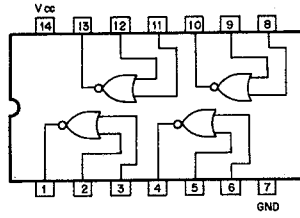
- U1 M5F7805L
- U2 M5F7815L
- Q1 2SD716-0
- Q2 2SA950-0
- Q3 2SC1815GR
- Q4 2SD1913
- Q5 2SC1815GR
- D1 D5SB20
- D2 S3V20H
- D3 DS135D

4-4. IC Internal Block Diagrams

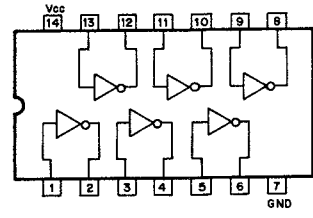
TC74HC00P



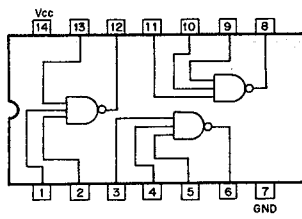
TC74HC02P



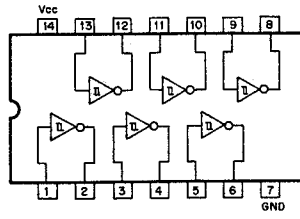
TC74HC04P



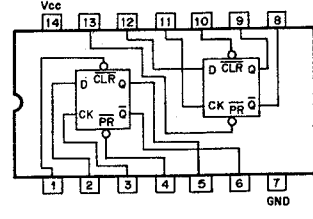
TC74HC10P



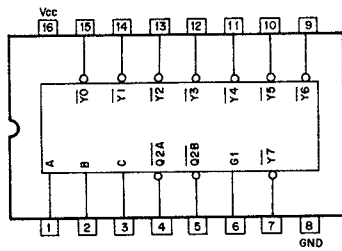
TC74HC14P



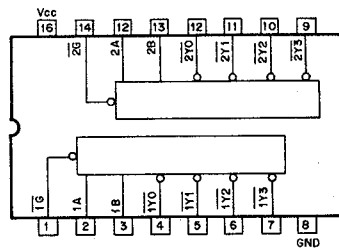
TC74HC74P



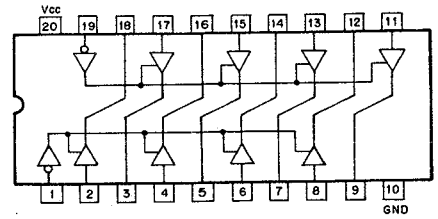
TC74HC128P



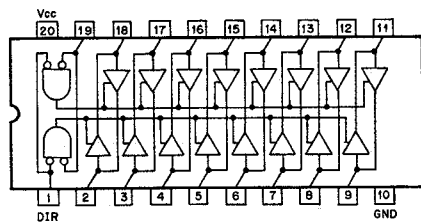
TC74HC139P



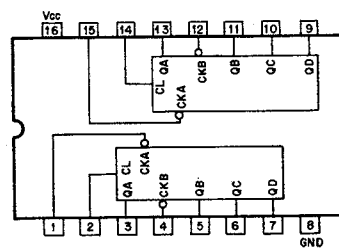
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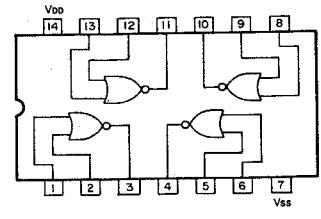
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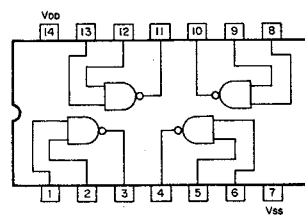
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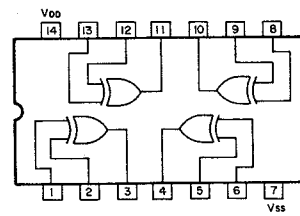
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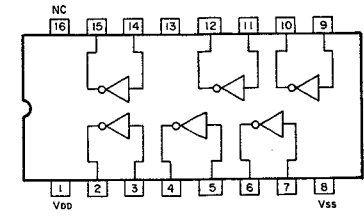
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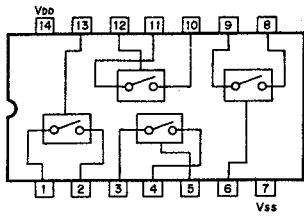
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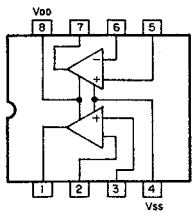
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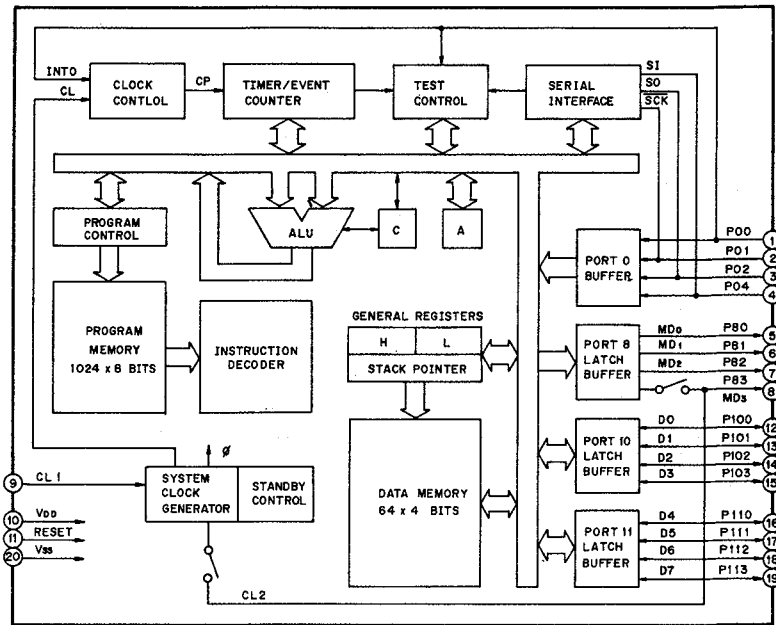
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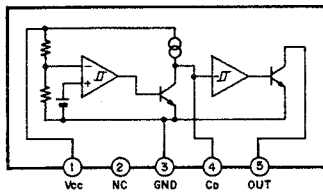
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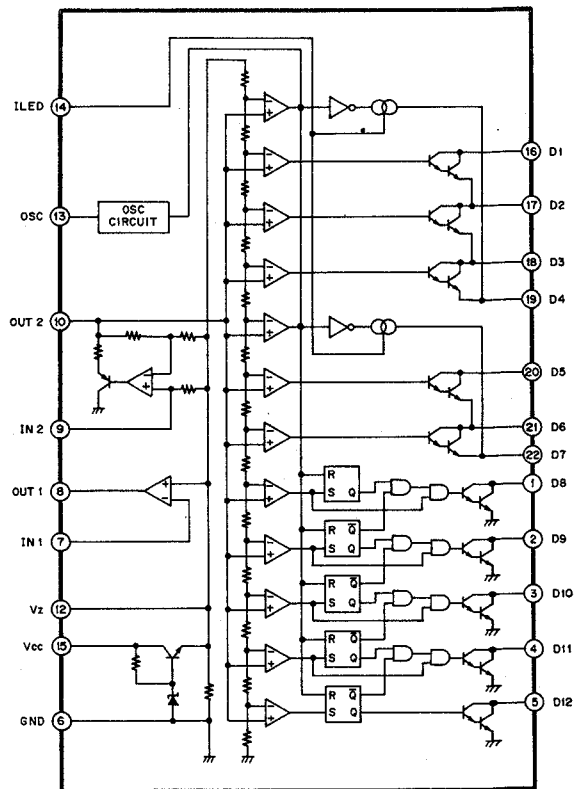
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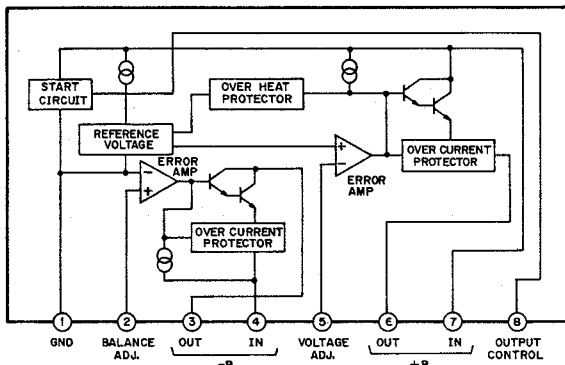
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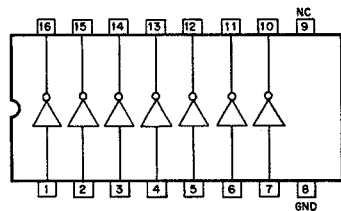
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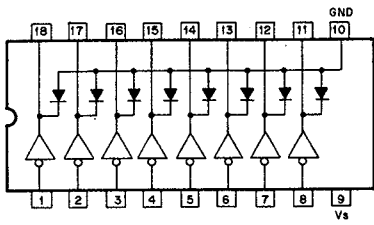
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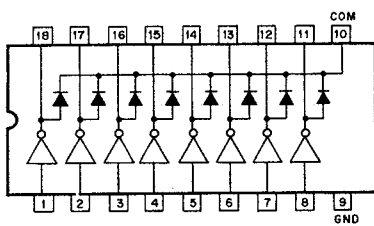
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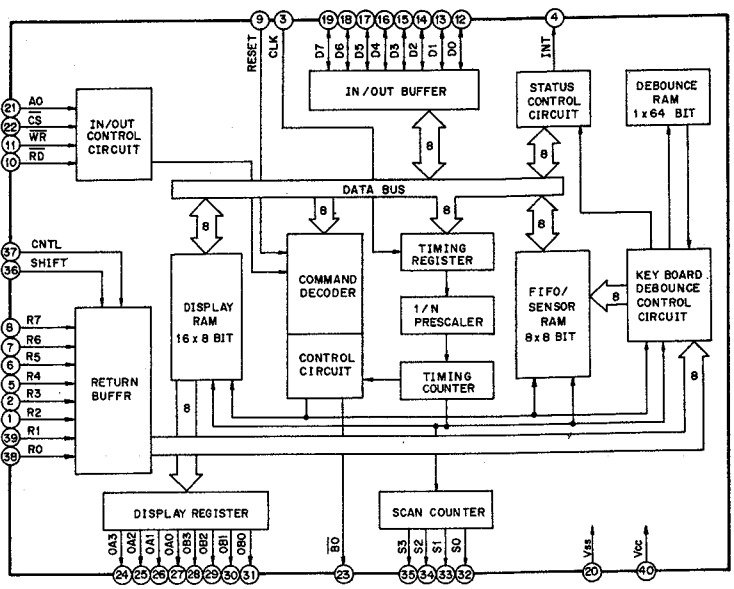
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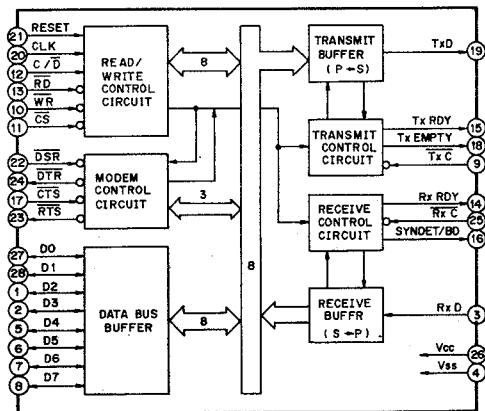
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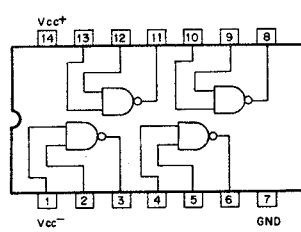
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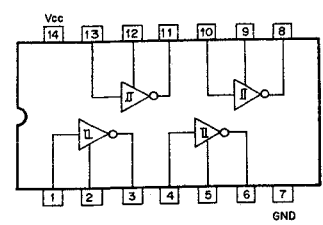
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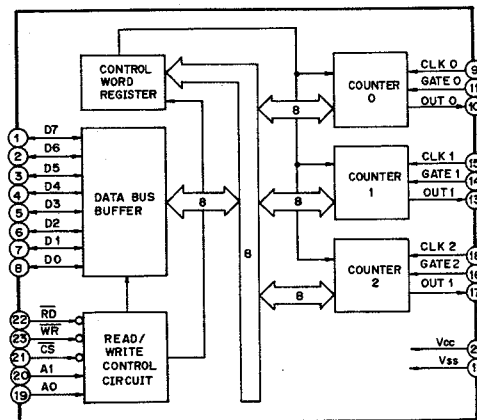
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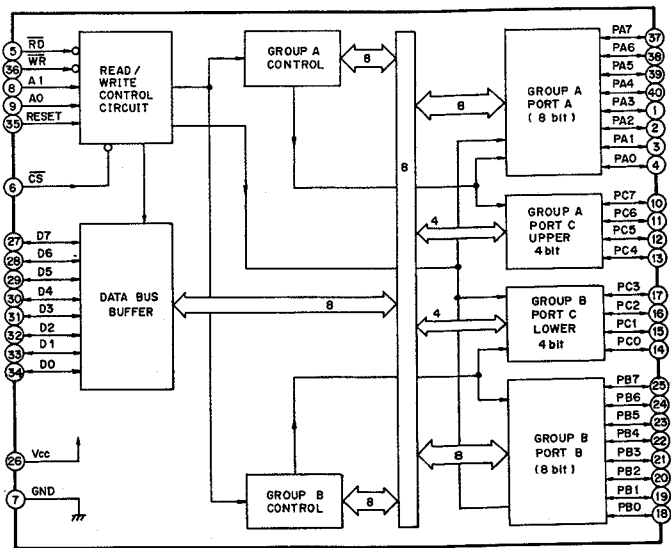
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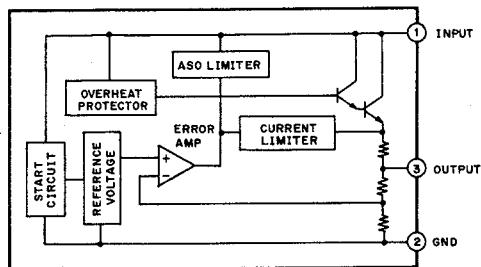
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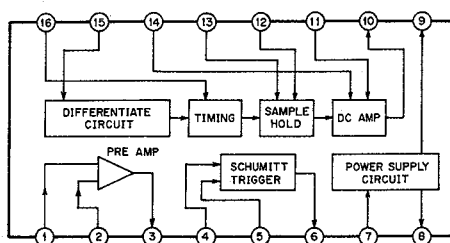
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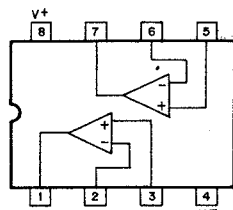
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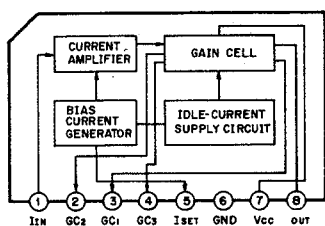
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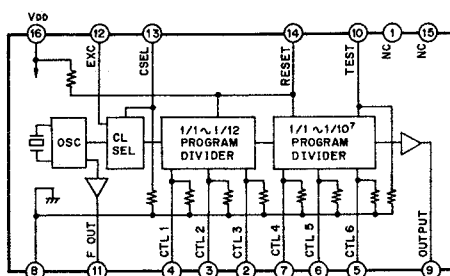
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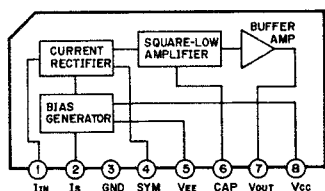
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