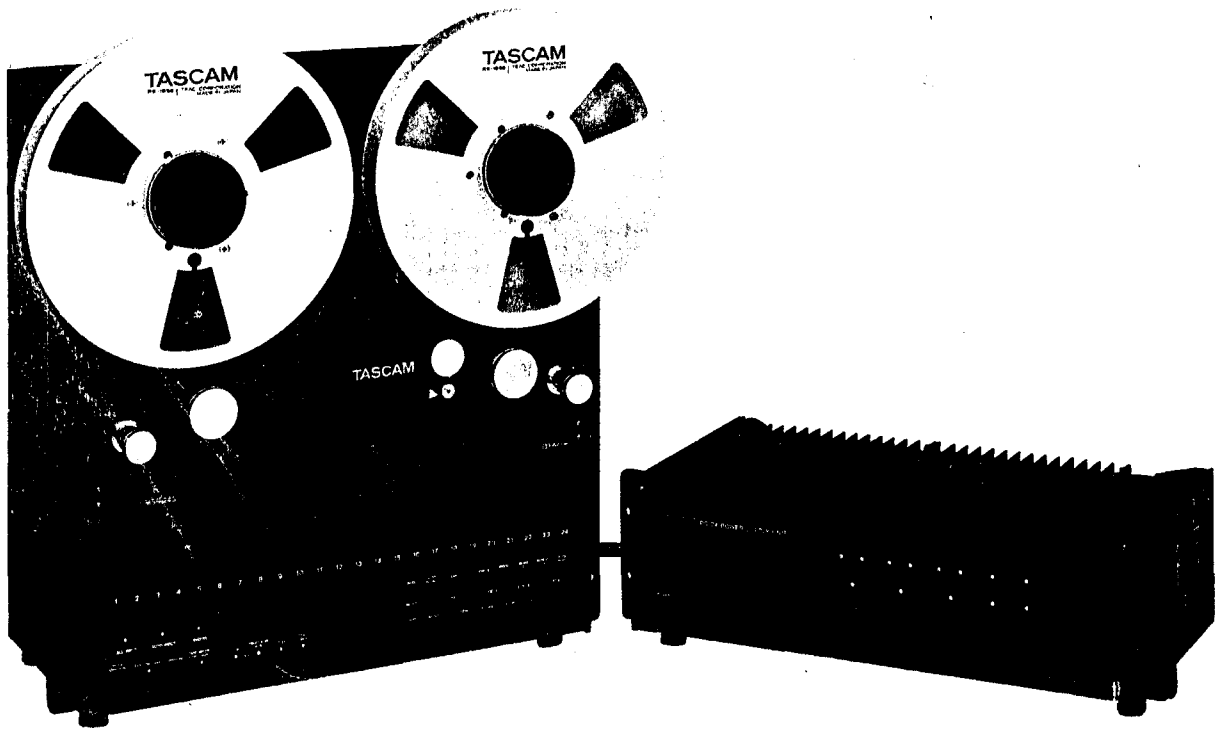
TASCAM

TEAC Professional Division

MSR-24S

1" 24-Track Recorder/Reproducer



OPERATION/MAINTENANCE

5700128500

The guarantee provided for the MSR-24S has several restrictions. The MSR-24S 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 MSR-24S, *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.

ADVARSEL!
Lithiumbatteri – Eksplosionsfare ved fejlagtig handtering. Udskiftning må kun ske med batteri af samme fabrikat og type.
Levér det brugte batteri tilbage til leverandøren.

VARNING
Explosionsfara vid felaktigt batteribyte.
Anvand samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren.
Kassera anvant batteri enligt fabrikantens instruktion.

Bescheinigung des Herstellers/Importeurs

Hiermit wird bescheinigt, daß der/die/das

MAGNETTONBANDGERÄT TASCAM MSR-24S

(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

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

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

This product is manufactured to comply with the radio interference of EEC directive "82/499/EEC."

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 numher _____
Serial number _____

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

SAFETY INSTRUCTIONS

CAUTION:

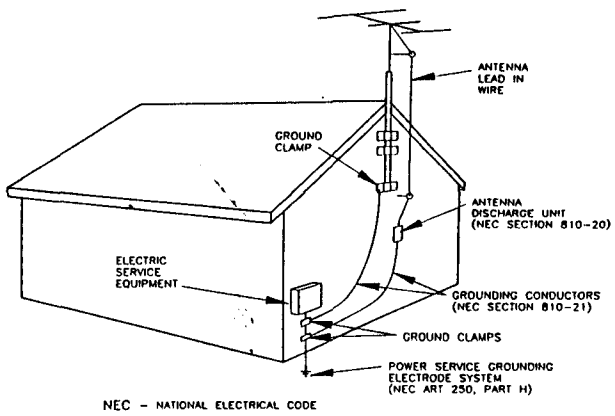
- **Read all of these instructions.**
- **Save these instructions for later use.**
- **Follow all warnings and instructions marked on the audio equipment.**

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.

EXAMPLE OF ANTENNA GROUNDING AS PER NATIONAL ELECTRICAL CODE



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 MSR-24S is an exceptionally reliable and versatile high-performance 24-track, 24-channel tape recorder/reproducer that uses 1-inch wide tape on 10-1/2-inch reels and operates at tape speeds of 15 ips (38 cm/s) and 7-1/2 ips (19 cm/s).

The MSR-24S 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 Phase Locked Loop 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 capstan motor is a Phase Locked Loop servo using a 9.6 kHz industry standard reference for precise tape speed, and control by all major brands of synchronizers. Major rotating components, including the tension arm guides and the pinch roller, are supported by ball-bearings to provide minimum friction while retaining close tolerance. In fact, the tension arm itself is ball-bearing supported for more sensitive response and greater motor and servo durability. Motion sensing logic ensures fast and smooth transition from one transport mode to another.

The MSR-24S 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); an RS-232C serial port for synchronizers with serial control (such as the TASCAM MIDIiZER); and a remote control port for the RC-424 remote control unit. The MSR-24S automatically senses when it is under external synchronizer control, switching the servo system between the external source or its internal reference. Track 24 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 Dolby S NR 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 counter alternately displays speed variation in percentages of normal speed. A maximum of +/- 15% speed variation is provided by the pitch control both in Record and Playback.

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 MSR-24S 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, for gapless "inserts".

In addition to a conventional return-to-zero function, the MSR-24S is equipped with a two-point auto locator, which also provides a repeat playback over the desired segment of the tape.

Other features include LOAD, which ensures that the tape, once it has been threaded, will never accidentally run off the reels, providing the convenience and speed of the cassette while the flexibility and fidelity of the open reel is retained; a SPOOL mode for uniform tape pack; 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.

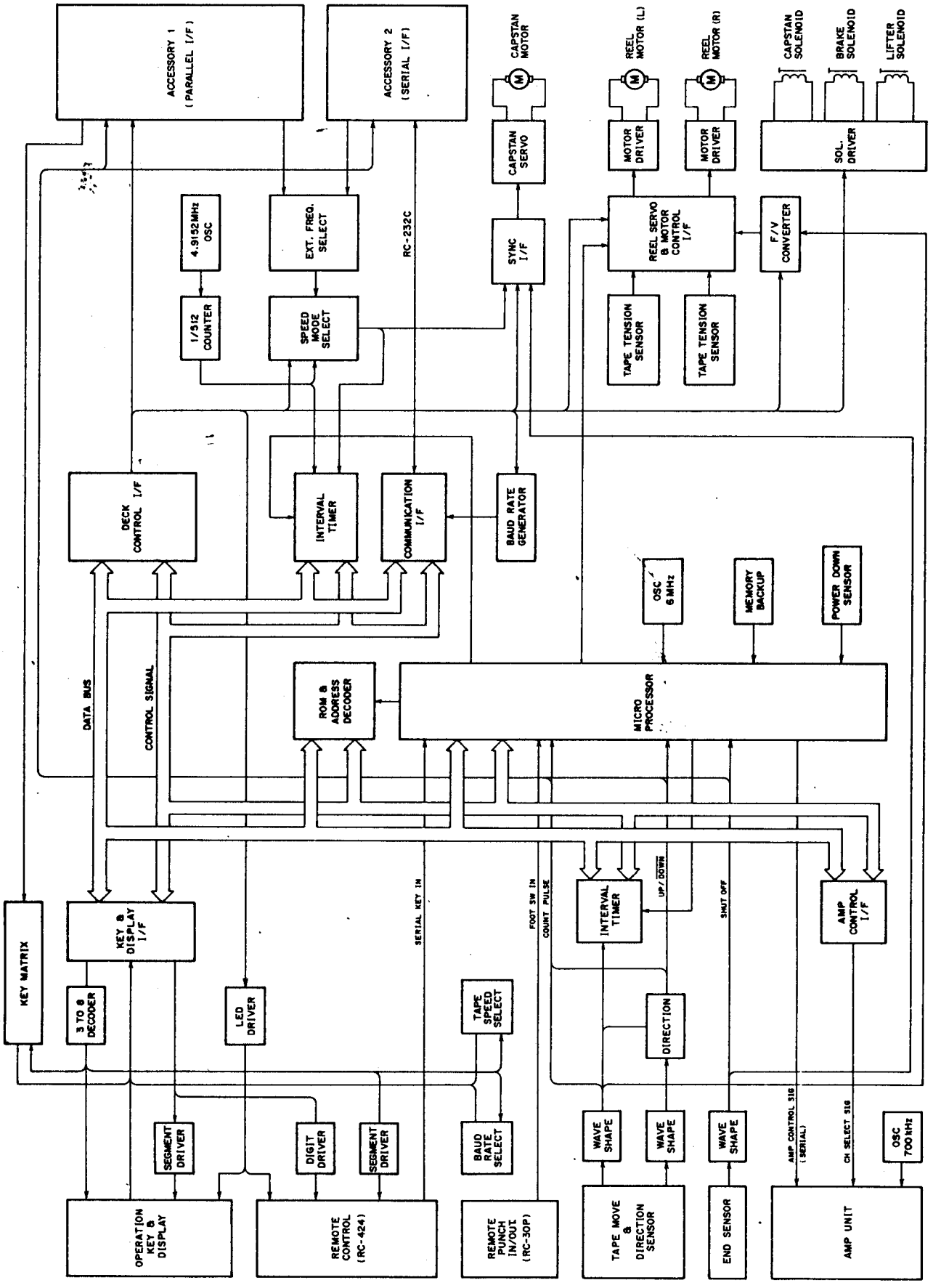
TABLE OF CONTENTS

Introduction 4
Control Signal Block Diagram 5
Specifications 6
Audio Signal Block Diagram 8
Level Diagram 8
Installations 9
Operation
- Tracking 17
- Overdubbing 19
- Punch-in or Insert Recording 20
- Rehearsal Programming and Auto-in/out Procedures 21
- Bouncing Tracks (Ping-pong) 24
- Mixdown (Remix) 26
- Recording with Tape Sync 26

Features and Controls 29
Dolby S-type NR Recording System 38
Care and Maintenance 38
Optional Equipment 39

(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 inch (25.4 mm), 1.5 mil, low noise/high output tape
Track Format:	24-track, 24-channel
Head Configuration:	1 erase, 1 record/reproduce
Motor:	
Capstan:	Phase locked loop DC direct drive motor x1
Reel:	DC motor x2
Reel:	10.5-inch, NAB hub
Tape Speed/Accuracy[3]:	15 ips (38 cm/s) and 7.5 ips (19 cm/s), ±0.2%
Pitch Control Range:	±15 %, approx. (both in Record and Reproduce)
Wow and Flutter	
15 ips:	±0.06% peak (DIN weighted)
7.5 ips:	±0.08% peak (DIN weighted)
Start Time:	0.5 sec. or less (time in which tape motion stabilizes at selected speeds)
Fast Wind Time:	120 sec. or less (10.5-inch reel, 2400-ft tape)
Spooling Time:	400 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)
Weight (net):	MSR-24: 33 kg (72-12/16 lbs) PS-24 (Power Supply Unit): 15 kg (33-1/16 lbs)

ELECTRICAL

Line Input (Unbalanced)	
Input Impedance:	50 kOhms
Maximum Source Impedance:	10 kOhms
Nominal Input Level:	-10 dBV (0.316 V)
Maximum Input Level:	+18 dBV (8.0 V)
Line Output (Unbalanced)	
Output Impedance:	220 Ohms
Minimum Load Impedance:	10 kOhms
Nominal Load Impedance:	50 kOhms
Nominal Output Level:	-10 dBV (0.316V)
Maximum Output Level:	+18 dBV (8.0V)
Bias/Erase Frequency:	145 kHz
Equalization:	
15 ips:	∞+35 μsec. (IEC/CCIR)
7.5 ips:	∞+70 μsec. (IEC/CCIR)
Record Level:	250 nWb/m (0 VU)
Power Requirements	
USA/CANADA:	120V AC, 60 Hz
U.K./AUSTRALIA:	240V AC, 50 Hz
EUROPE:	220V AC, 50 Hz
GENERAL EXPORT:	100/120/220/240V AC, 50/60 Hz
Power Consumption:	240 W

PERFORMANCE

Frequency Response[2]	
15 ips:	40 Hz to 20 kHz ±3dB (at 0 VU)
7.5 ips:	40 Hz to 16 kHz ±3dB (at -10VU)
Repro Frequency Response[1]	
15 ips:	40 Hz to 20 kHz ±3dB
7.5 ips:	40 Hz to 16 kHz ±3dB
Total Harmonic Distortion (THD)[2]:	0.8% or less at 1,000Hz, 0 VU (250 nWb/m both at 15 and 7.5 ips) (by the reproduce method)
Signal-To-Noise Ratio (ref. to 3% THD)	
15 ips:	93 dB (CCIR/ARM, with Dolby* S NR) 68 dB (CCIR/ARM, without Dolby S NR)
7.5 ips:	91 dB (CCIR/ARM, with Dolby S NR) 65 dB (CCIR/ARM, without Dolby S NR)
Crosstalk (between Adjacent Channels):	70 dB or better (1,000 Hz, 0 VU, with Dolby S NR)
Erasure:	70 dB or better (1,000 Hz, +10 VU)
Headroom (Record Amp):	28 dB or more (1,000 Hz, 0 VU)

OTHERS

Connector/Jack

Line Input/Output:	RCA jack
Remote Control:	D-sub, 25-pin
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: PS-24 Power Supply Unit, Power Cords(AC and DC), Empty Reel (RE-1050), Rubber Feet, Extension Card (for maintenance use), Operation/Maintenance Manual, Warranty Card

Option:
RC-424 Remote Control Unit
RC-30P Remote Footswitch
RE-1050 Metal Reel (10.5-inch, 1 inch)
CS-608 19" Console Rack
LA-40 Low-Impedance Adaptor

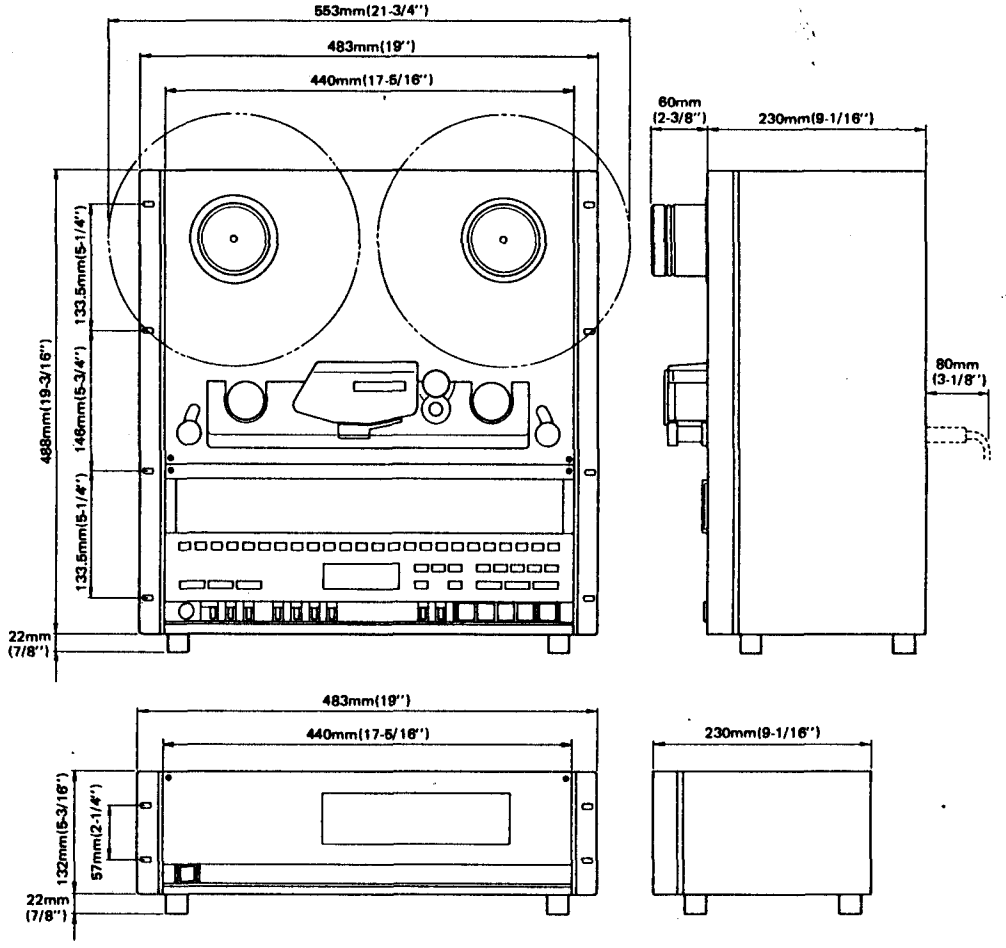
Measurements were made using the following test tapes:

1) TEAC YTT-1244 (15 ips, 38 cm/s)/MRL41T225 (7.5 ips, 19 cm/s)
2) AMPEX 456 Blank Tape
3) TEAC MRL441-570-480 (15 ips, 38 cm/s)/MRL431-570-480 (7.5 ips, 19 cm/s)

In these specifications, 0 dBV is referenced to 1.0 Volt. Actual voltage levels are also given in parenthesis. 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).

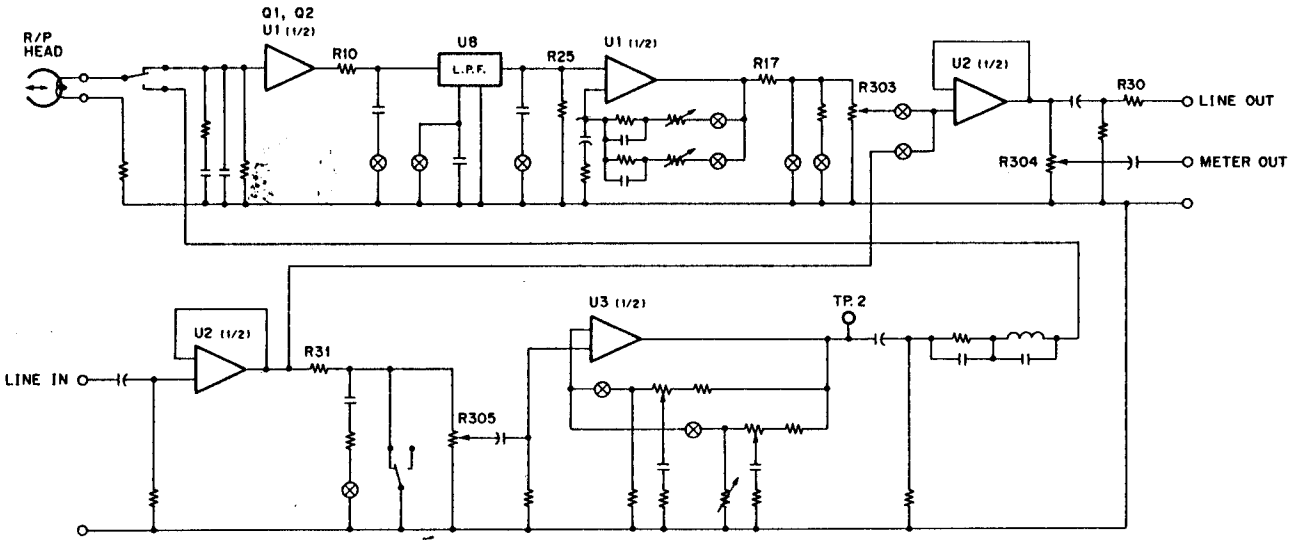
Changes in specifications and features may be made without notice and obligation.

*Noise reduction system manufactured under license from Dolby Laboratories Licensing Corporation. Dolby and the double-D symbol are trade marks of Dolby Laboratories Licensign Corporation.

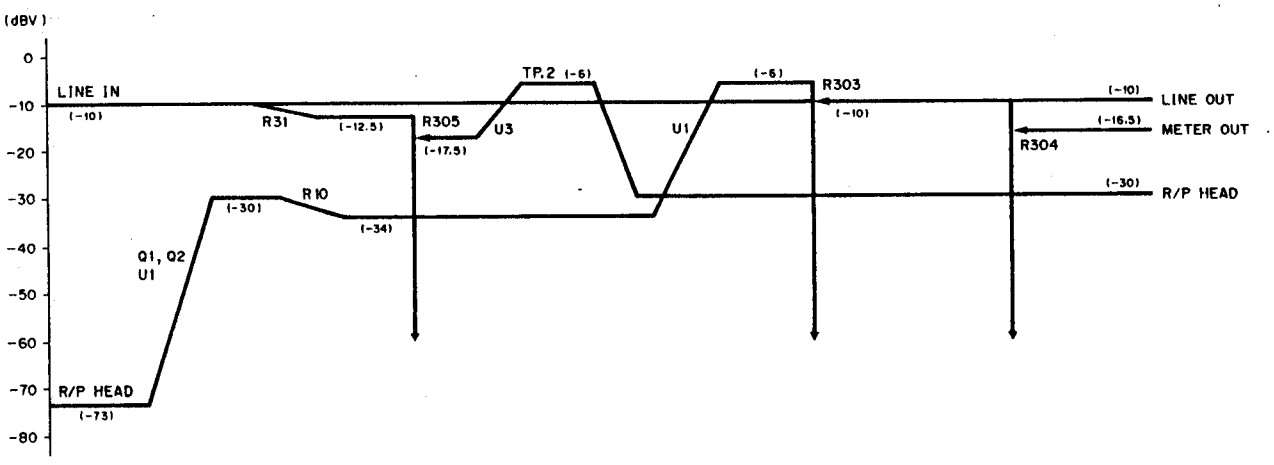


Be careful not to damage plugs when installing the machine on its back in a horizontal position.

Audio Signal Block Diagram



Level Diagram

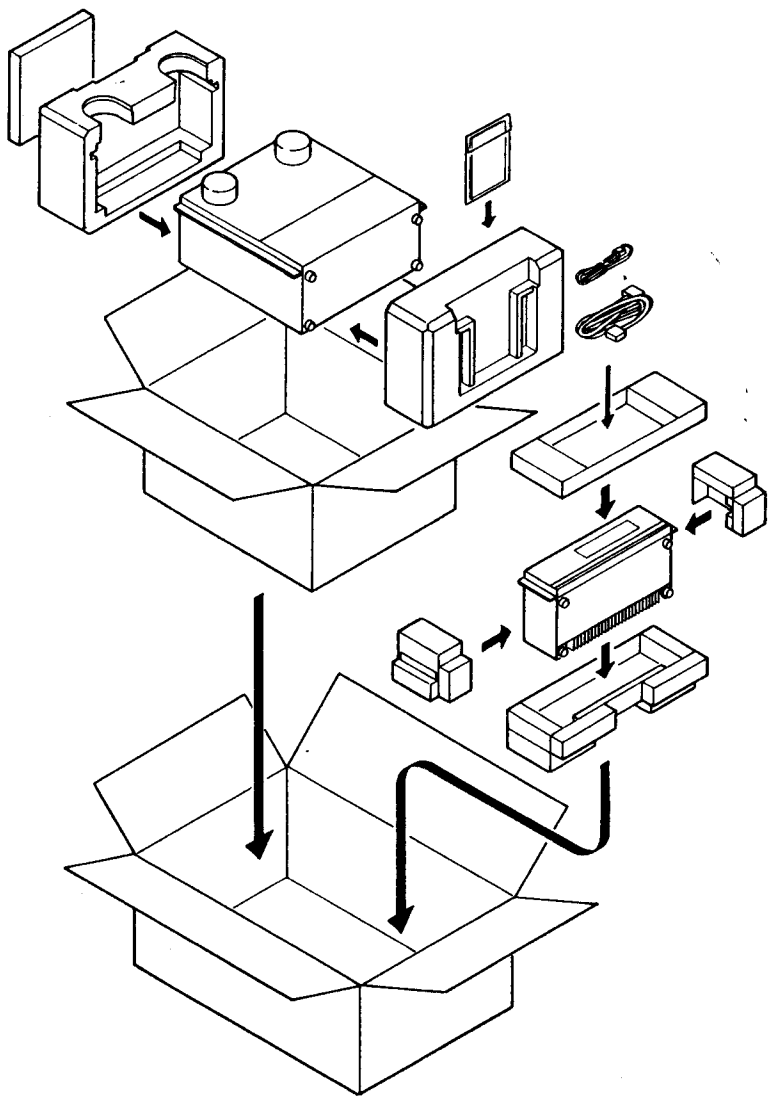


Installations

1. UNPACKING AND INSPECTION

During unpacking, be careful not to damage the MSR-24S. Save the carton and packing material as well; you may need them to transport your MSR-24S 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 MSR-24S 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).

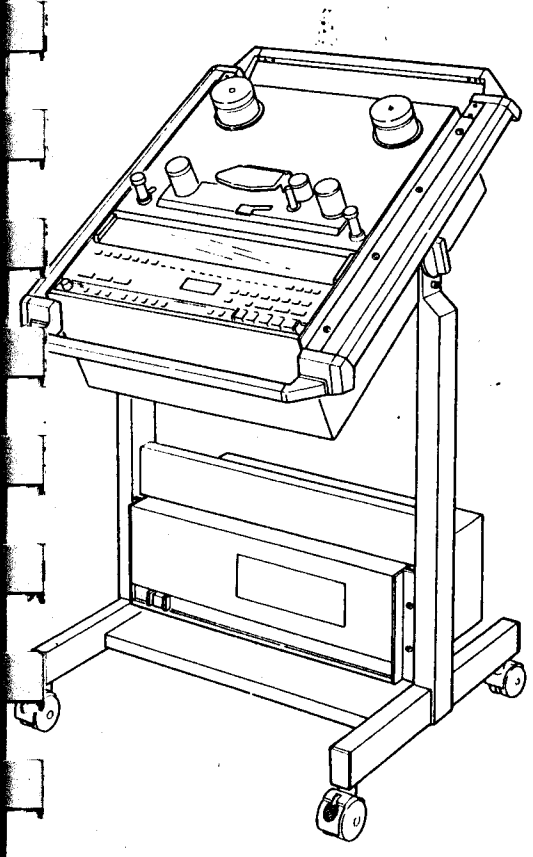
2) Relative humidity should be 30 to 90% (non-condensing).

3) Strong magnetic fields should not exist nearby.

In addition, don't install the MSR-24S directly on the PS-24 Power Supply unit.

CK MOUNTING THE MSR-24S

The MSR-24S may be mounted to a standard EIA " rack, such as the TASCAM CS-608. Before mount- ake sure the rack you are mounting the MSR-24S ot warped or bent. Screwing the MSR-24S to a dly warped surface may cause misalignment of the nsport.



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 MSR-24S 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.

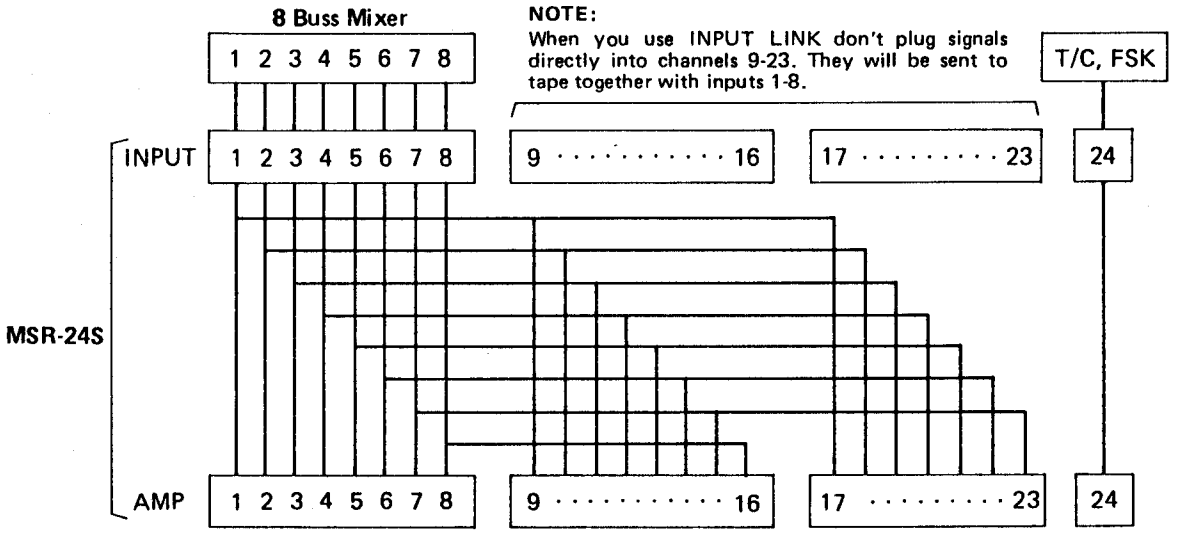
A. Input/Output Connections

The MSR-24S'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 conforming to the −10 dBV standard, the meter readings of your mixer and the MSR-24S should match, i.e., 0 VU on the mixer will read 0 dB on the MSR-24S track it's connected to. If the readings don't match, always go by the readings on the recorder.

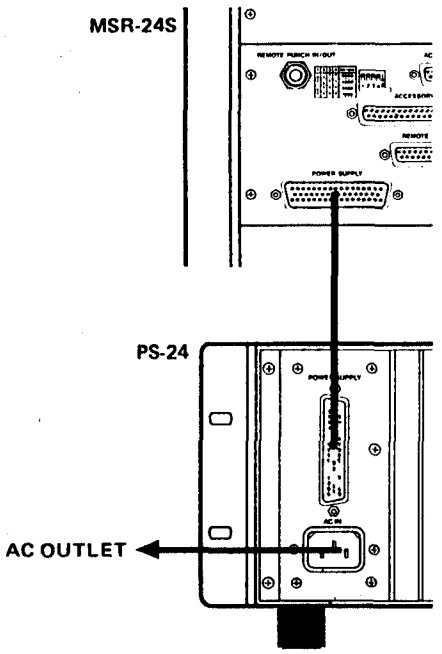
Using the **INPUT LINK** feature of the **MSR-24S:** Two INPUT LINK switches are provided on the MSR-24S's rear. When they are on, signals fed into INPUT jacks 1-8 are taken into two groups of the remaining channels, 9-16 and 17-23 (channel/track 24 is allocated for recording/playing back sync signals and, unless optionally modified, is not affected by the INPUT LINK feature — for the modification, contact TASCAM or your local TASCAM dealer). If your mixer has only 8 outputs, connect them to the MSR-24S's INPUT jacks 1-8. Then, you can repatch the mixer by simply turning on/off two switches, throughout the tracking and overdubbing procedures.



B. Power Supply Unit PS-24 and Two Supplied Power Cables

Use the provided DC power cable to establish connection between the PS-24 and MSR-24S; insert the female plug at one end of the cable into the male POWER SUPPLY connector on the rear of the PS-24 power supply unit. (Never use any other power supply with the MSR-24S). The other end of the cable may then be plugged into the female POWER SUPPLY connector on the MSR-24S's rear. Ensure a firm, stable connection by tightening the screws on each side of both POWER SUPPLY connectors. Then, to connect main AC power to the PS-24 power supply unit, insert the male plug at one end of the other supplied cable into the female AC IN connector on the PS-24's rear, and the other end of the cable into AC power outlet. Route the AC power cable where there is no possibility of stepping on it, to prevent accidental disconnection.

Don't switch on the power to the PS-24/MSR-24S until you have achieved all necessary connections.



C. Remote Control Connection and Computer/ Synchronizer Interface

On the MSR-24S'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-424 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 MSR-24S's microcomputer for external connection to a controlling computer with RS-232C serial data buss. For detailed information on the use of the ACCESSORY connections, consult TASCAM or the nearest TASCAM dealer. (See also pp. 12-14.)

5. REEL INSTALLATION

Proceed as follows:

1. Turn the holddown knob fully counter-clockwise.

2. Line up one of the slots in the supply reel hub with the locating pin on the left reel table.

3. Push the full supply reel against the reel table until it is seated.

4. Turn the holddown knob fully clockwise.

5. Repeat the procedure for the empty takeup reel.

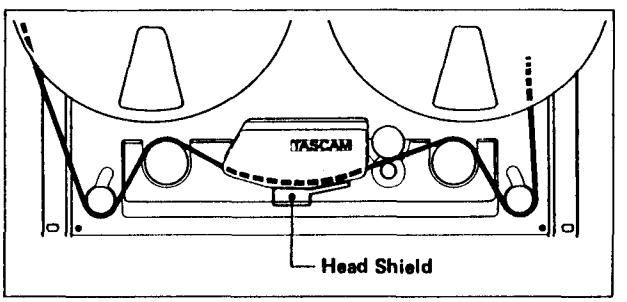
NOTE: Before running tape, make sure that the reel holddown knob is tight on both the supply and takeup reels.

6. TAPE THREADING

1. Press the Head Shield (head gate) downward toward the plate. It will latch down, revealing the heads.

2. Thread the tape exactly as shown below.

3. Replace the head shield by pressing it down lightly (it will unlatch).



7. MEMORY BACK-UP FEATURE

The settings of most major features of the MSR-24S are retained in its back-up memory for about 3 days after the power is turned off, so the MSR-24S is ready to continue to operate the moment you turn it on again. Specifically, the following are saved:

1. Tape Run Time Reading
2. TAPE SPEED and Mode (FIX/VARI) Settings
3. LOAD Points (unless you don't have the right tension arm drop to its "off" position before turning the power off)
4. MEMO 1 and MEMO 2 points
5. On/off status of these features:
   - AUTO PLAY
   - REPEAT
   - SPOOL
   - Track Record Buttons
   - DOLBY S NR (1-8, 9-16, and 17-24)
   - SYNC LOCK
   - AUTO INPUT
   - ALL INPUT
   - INSERT

ESSORY 1" PARALLEL CONNECTOR

IPTE/EBU Time Code

SMPTE is an acronym for the Society of Motion e and Television Engineers. The SMPTE Time (C98.12: time and control code for video and dio tape for 525/30 television system) was defined in 70, and it is now accepted as a universal standard.

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

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

ime code generator is used to record SMPTE code ne track of the tape. A *time code controller* can n read the code from two or more tape machines, and also servo-controlling the reel motors of those ma- bring them to specifiec cue points. A *time code onizer* further controls the capstan motors to p both of the tape machines running synchronously. ese techniques can be used to obtain more tracks for ing (two or more audio machines "locked up" to- , to mix audio signals in sync with video or film , to make complex edits by transferring material m one or more audio machines to another, and so th

nnecting a Synchronizer to the TASCAM MSR-24S

nnection between the ES-50 synchronizer/ES-51 ontroller and the MSR-24S is a plug-and-go pro- n. Pre-wired interface cables needed are available m TASCAM.

The TASCAM MSR-24S provides signals to the syn- zer (via the ACCESSORY "1" connector) which te its speed, the direction of the tape travel, and a erence power supply. Also, tally signals indicating the 24S's mode (PLAY, F. FWD, REW, STOP) are given synchronizer so it knows the current transport Inputs on the same ACCESSORY "1" connector provided for status commands from the synchronizer AY, F.FWD, REW, STOP, REC, LIFTER CONT). there is an input for a capstan drive reference fre- y signal from the synchronizer so that the actual ord/play speed can be varied to maintain synchroniz- on.

e MSR-24S will also operate satisfactorily with a of other manufacturers' synchronizer/controllers. e manual for these products should provide you with ough interface information for use with the TASCAM machines. Or else, consult the synchronizer manu- r for further details on interfacing.

USE OF THE RS-232C SERIAL INTERFACE PORT (ACCESSORY 2)

The ACCESSORY 2 connector is an interface control port that includes serial control lines complying with the RS-232C standard, plus additional analog lines for tach, direction, and external FM servo control. It allows a serial-based synchronizer such as the TASCAM MIDiiZER MTS-1000 to control the MSR-24S. With the proper software, the ACCESSORY 2 connector allows computers to control certain functions of the MSR-24S. The control messages and command structure are not interchangable with non-TASCAM machine protocols. Before attempting to connect the ACCESSORY 2 jack to any external device (including the MIDiiZER), contact TASCAM or your local TASCAM dealer for detailed technical information. For additional details about the MIDiiZER, see p. 40, "Optional Accessories".

MSR-24S in Horizontal Position

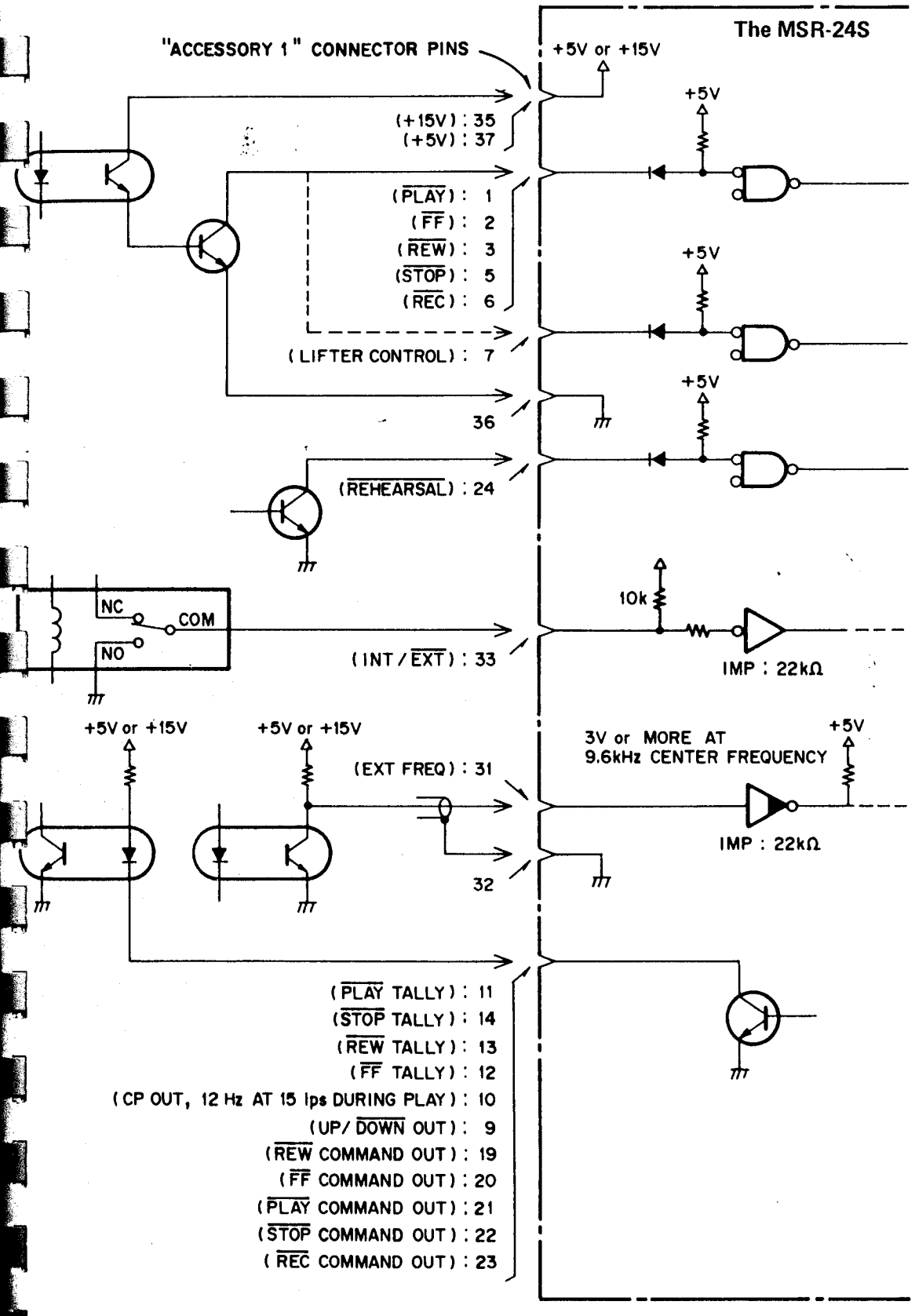
If you want to operate the MSR-24S on its back in a horizontal position, remove the screws shown below and attach the supplied rubber feet by retightening the screws.

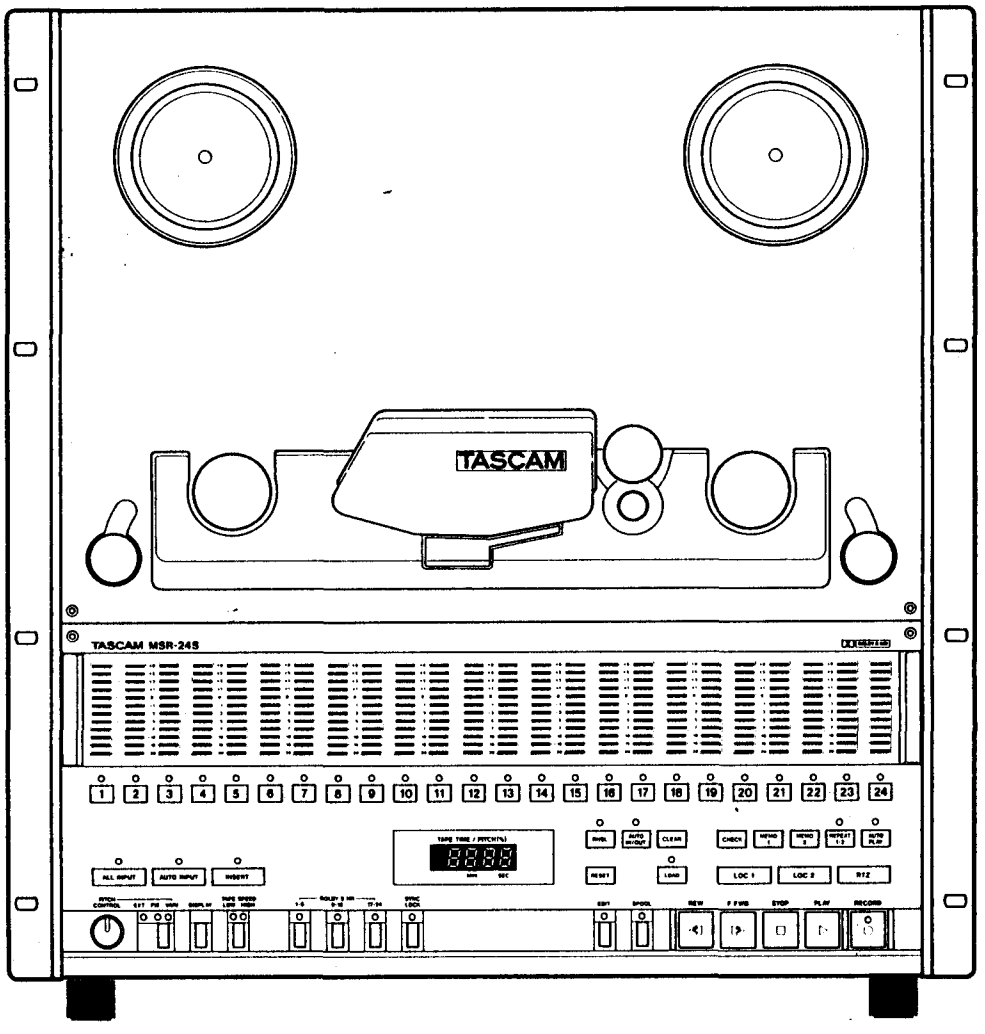
ACCESSORY 1 Pin Assignment

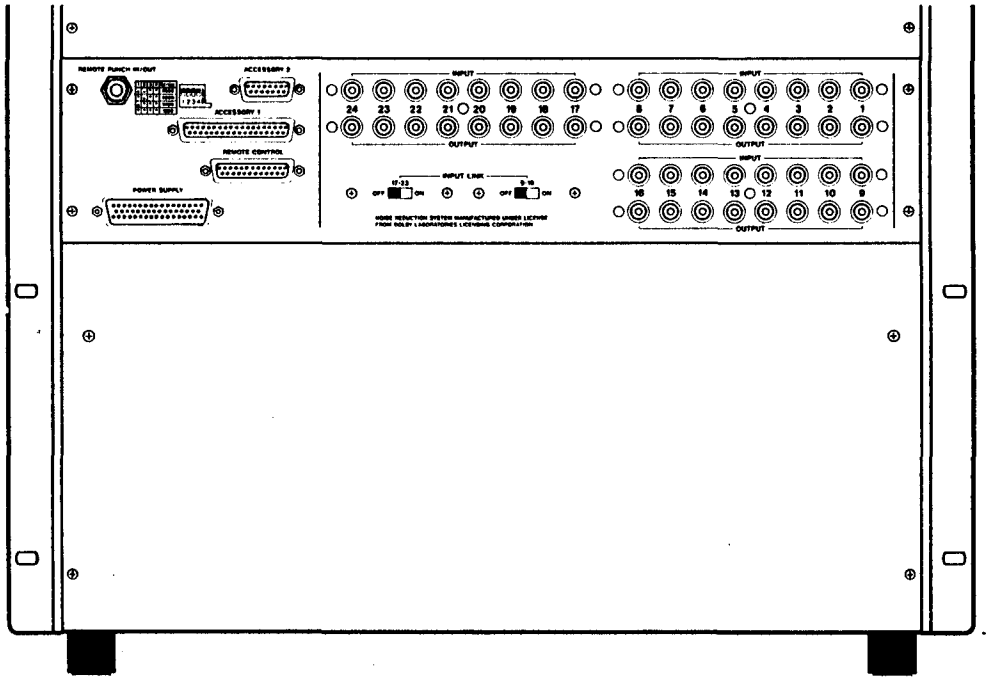
Pin #	IN(put)–OUT(put) signals		Function
1	$\overline{\text{PLAY}}$	IN	Inputs PLAY signal at L level.
2	$\overline{\text{FF}}$	IN	Inputs FF signal at L level.
3	$\overline{\text{REW}}$	IN	Inputs REW signal at L level.
4	open terminal		
5	$\overline{\text{STOP}}$	IN	Inputs STOP signal at L level.
6	$\overline{\text{REC}}$	IN	Inputs REC signal at L level.
7	$\overline{\text{LIFTER CONT}}$	IN	Inputs LIFTER shift cancellation signal at L level.
8	open terminal		
9	UP/$\overline{\text{DOWN}}$	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	$\overline{\text{PLAY}}$ TALLY	OUT	Outputs open-collector signal (Low level during PLAY mode.)
12	$\overline{\text{FF}}$ TALLY	OUT	Outputs open-collector signal (Low level during FF mode.)
13	$\overline{\text{REW}}$ TALLY	OUT	Outputs open-collector signal (Low level during REW mode.)
14	$\overline{\text{STOP}}$ TALLY	OUT	Outputs open-collector signal (Low level during STOP mode.)
15	$\overline{\text{REC}}$ TALLY	OUT	Outputs open-collector signal (Low level during record mode)
16	$\overline{\text{SHUT-OFF}}$ TALLY	OUT	Outputs open-collector signal (Low level during tape stop)
17	open terminal		
18	open terminal		
19	$\overline{\text{REW}}$ COMMAND	OUT	Outputs open-collector signal (Low level when REW is pressed)
20	$\overline{\text{FF}}$ COMMAND	OUT	Outputs open-collector signal (Low level when F. FWD is pressed)

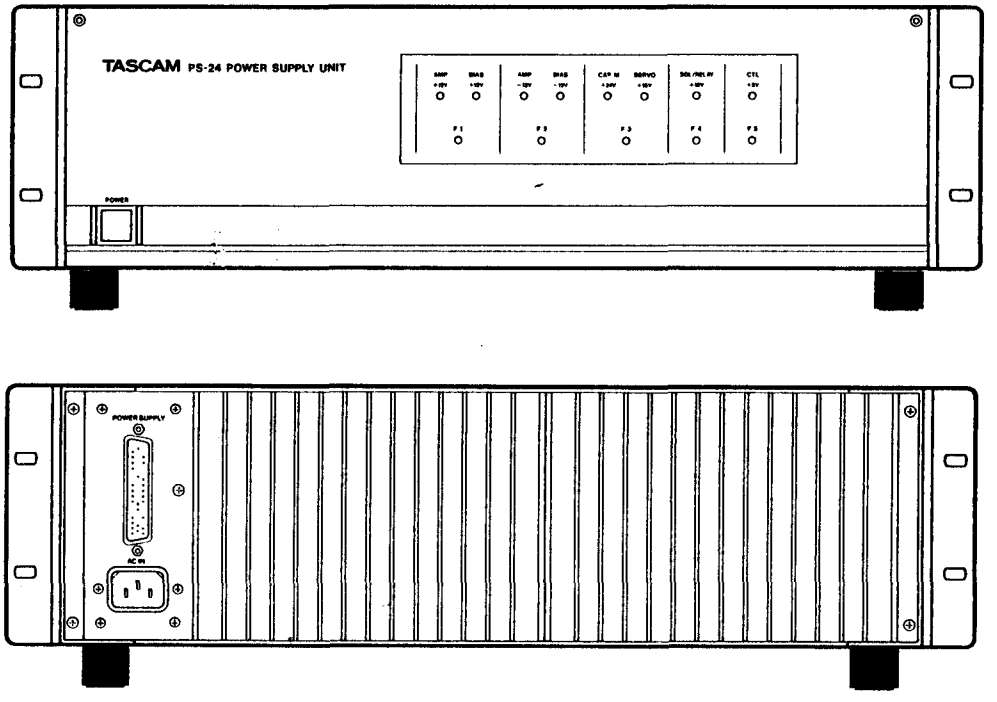
Pin #	IN(put)–OUT(put) signals		Function
21	$\overline{\text{PLAY}}$ COMMAND	OUT	Outputs open-collector signal (Low level when PLAY is pressed
22	$\overline{\text{STOP}}$ COMMAND	OUT	Outputs open-collector signal (Low level when STOP is pressed)
23	$\overline{\text{REC}}$ COMMAND	OUT	Outputs open-collector signal (Low level when REC is pressed)
24	$\overline{\text{REHARSAL MODE}}$	IN	Accepts Rehearsal enabling signal coming from a properly equipped external control unit (low level with Rehearsal In)
25			
26			
27	open terminal		
28			
29			
30			
31	EXT FREQ	IN (HOT)	Inputs speed control signal at input signal of 3.0 V or more and of 9.6 kHz, -40 to +30 %. (HOT side)
32	EXT FREQ	IN (COLO)	Inputs speed control signal (COLO side)
33	INT/$\overline{\text{EXT}}$	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

SORY 1 Connector Pins and External Signal Connections




TASCAM
TASCAM MSR-24S





OLTAGE CONVERSION

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

For general export models, if the input voltage ecified on the MSR-24S or packing carton differs from ne voltage at the installation site, please request dealer to change the voltage setting of the machine. he procedure entails the opening of the machine.

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

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

NOTE FOR U.K. CUSTOMERS

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

The wire which is coloured GREEN-and-YELLOW must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol ⏚ or coloured GREEN or GREEN-and-YELLOW.

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.

IMPORTANT

THE WIRES IN THE MAINS LEAD ARE COLOURED IN ACCORDANCE WITH THE FOLLOWING CODE:

GREEN-AND-YELLOW: EARTH
BLUE: NEUTRAL
BROWN: LIVE

WARNING: THIS APPARATUS MUST BE EARTHED.

Operation: Tracking

1. SETTING THE RECORD LEVEL

The MSR-24S 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. Swtich power on to the MSR-24S. The digital counter will indicate "-88.8.8" for a few seconds as the machine's logic circuits initialize, then the display w change to "00.00."

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

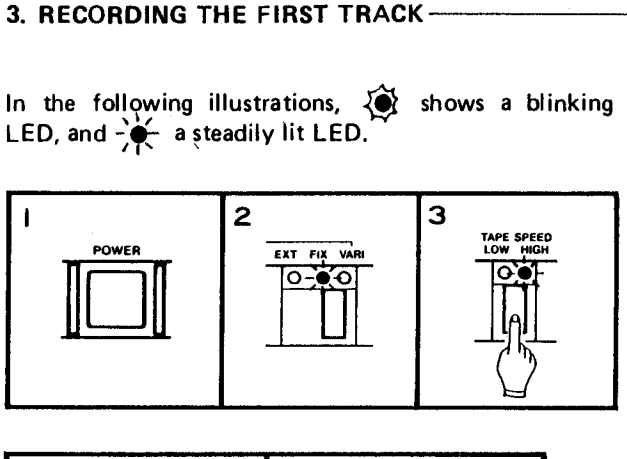
4. Play an instrument (or speak into a mic). Whi you are doing this, watch the meter on the mixer ar the track's LED meter on the MSR-24S. At the loude point, both meters should peak at the reference level "0." If not, adjust the level of the source.

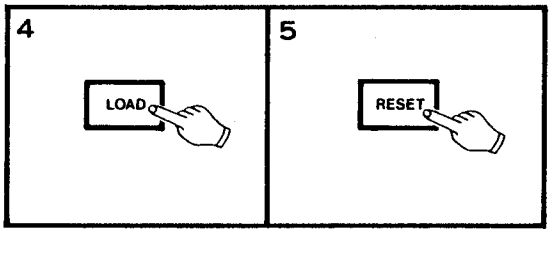
2. SETTING THE MONITOR LEVEL

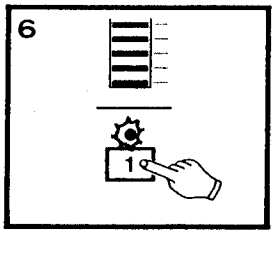
The monitoring of both the recorded material as well as the source during the recording process is accomplished through the mixer's monitor section. Refer to the mixer's manual for the correct procedure in setting u the monitoring system.

3. RECORDING THE FIRST TRACK

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







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

1. If the MSR-24S is not on, press the POWER switch

2. Check to see that the Speed Mode selector switc is set to its FIX position and its green LED is on solid. not, set it to FIX.

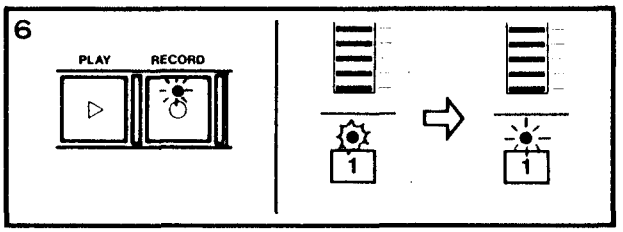
3. Set the TAPE SPEED selector switch to HIGH fo 15 ips (38 cm/s) or to LOW for 7.5 ips (19 cm/s), a desired.

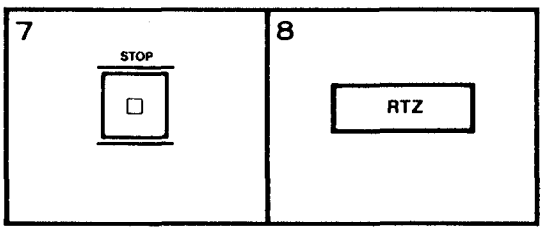
4. To prevent the tape, during later operation, fror running off the reels at either end, press LOAD. Th tape will start running, automatically stopping about minute later. This point is set as an automatic RE WIND STOP point, and a point on the tape 30 or 6 minutes ahead (depending on the TAPE SPEED selected is set as an automatic FORWARD STOP point.

You can change either or both LOAD points. For th procedure and more details about LOAD, see p. 3 "34. LOAD Switch".

5. Press RESET, so you can use RTZ ("Return T Zero") to get back to this point.

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



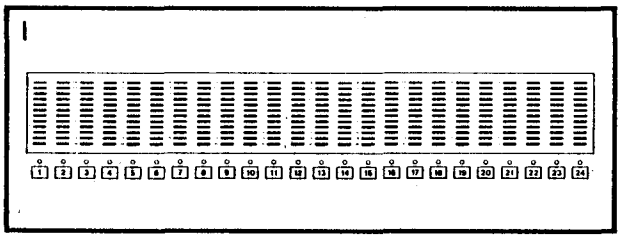


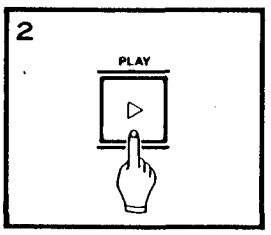
7. Press and hold down the Master RECORD button. While still holding RECORD down, press the PLAY button. The tape will begin moving in its forward direction and recording is now in progress on Track #1. The RECORD LED should light solid and the LED above the track's Record Enable button that was flashing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

8. 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.

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

4. 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.

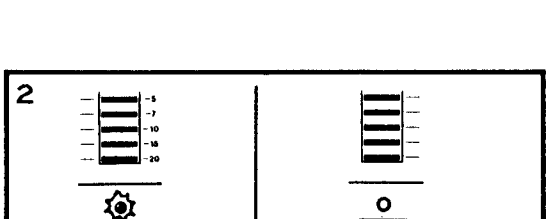
2. Press PLAY. The track you just recorded can be listened (monitored) through the mixer.

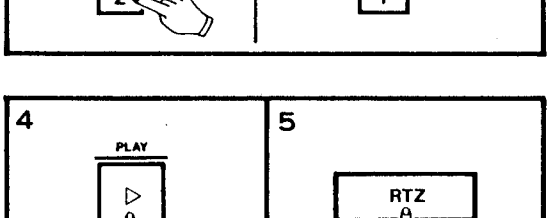
If you are not satisfied with your first take and want to re-record it (therby erasing the first take), all you have to do is:

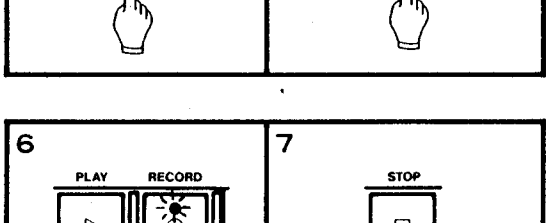
a) Make any changes that occured to you while you listened to the first playback.
b) Press RTZ to rewind the tape to 00.00.
c) Press the Track 1 Record Enable button.
d) Press RECORD and PLAY together and try again.

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

Operation: Overdubbing







There are two tasks in overdubbing. First, the ne signals must be adjusted for proper level going to th MSR-24S, as in tracking. Second, you must make a prop er monitoring mix of the existing track(s). Here is a basi overdubbing procedure:

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

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

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

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

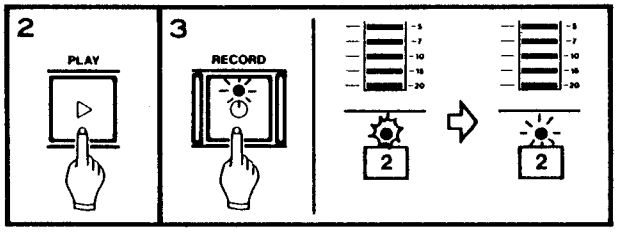
5. Rehearse your overdub until you feel confider that your levels are correct. Rewind to 00.00 by pressin RTZ.

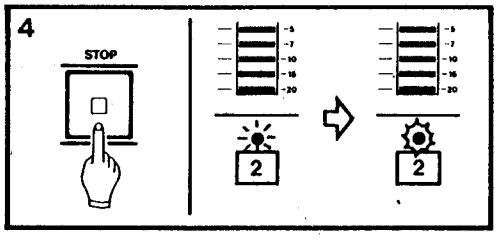
6. Record the first overdub by pressing RECORI and PLAY.

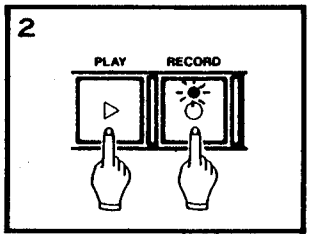
7. Stop the recording by pressing STOP (or PLAY).

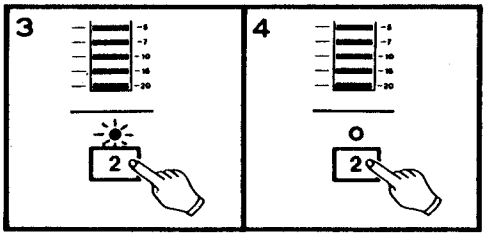
8. To listen to playback of the overdub, press th track 2's record enable button (to place the track in saf mode), then rewind to the beginning of the take and hi PLAY.

Operation: Punch-in or Insert Recording









The MSR-24S can manualy 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 MSR-24S 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 MSR-24S'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 MSR-24S 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).

CAUTION: Avoid punching in and out of a track using the Track's Record Enable button ("Method B") when its lower or higher two tracks are in Record mode (for example, punching in and out of track 3 while recording is taking place on tracks 1-2 and/or 4-5).

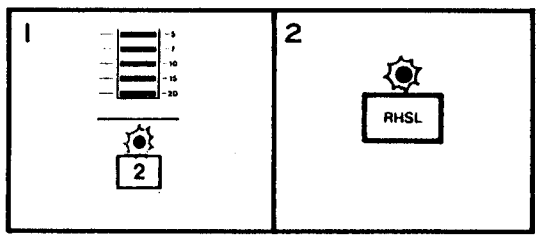
Operation: Rehearsal Programming and Auto In/Out Procedures

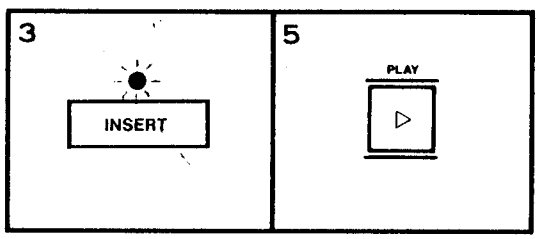
The Auto Locator has priority over the Rehearsal and Auto In/Out modes. If LOC 1, LOC 2, REPEAT, or RTZ is pressed, the function pressed is activated erasing all the memories you have set for punch-in. The LED RHSL or AUTO IN/OUT will then blink until CLEAR is pressed.

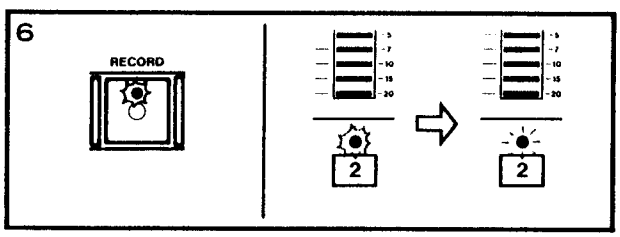
Programed Rehearsal of Inserts (RHSL)

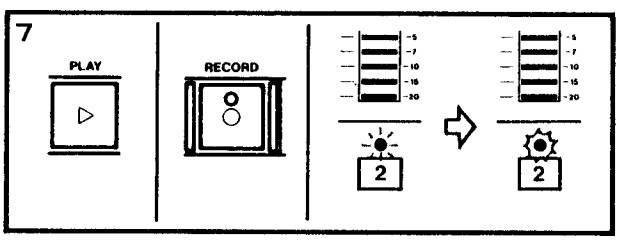
Before you actually record an insert, the MSR-24S allows you to "preview" the punch-in and out points with its special REHEARSE function. During a rehearsal, the tracks in record ready mode will switch meter and output from tape to source and back agai but won't actually record. What you hear in yo monitor mix will be the same as during recording; so the first in-out points aren't correct, you'll hear it a can CLEAR the old points and try again until you've g exactly what you want.

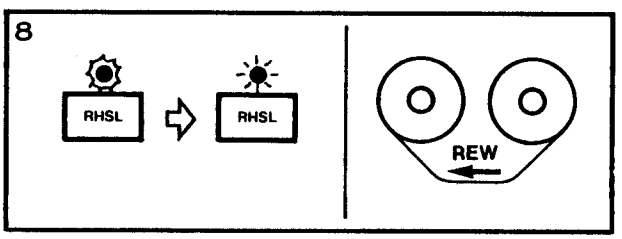
CAUTION: Although the advanced circuitry of t MSR-24S allows gapless punch-in on the tape, there still the distance between the erase and record heads be compensated for. Depending on tape speed, the ti from a punch point to the actual in/out is 1/15th 1/8th of a second. A few practice runs will get y 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 any time during the following procedures, press CLEA

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

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

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

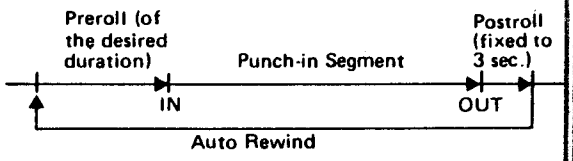
4. Adjust the record and monitoring levels for t desired balance.

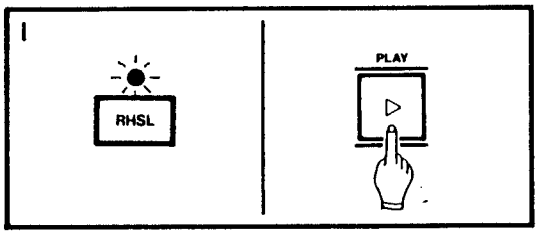
5. Press PLAY. That point on the tape will be p into memory defined as the preroll start point.

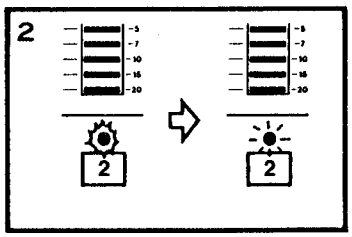
6. At the punch-in point, press RECORD or t footswitch. Your punch-in point will be put in memory. The track's record LED will light steadily, b the master RECORD LED will blink, showing th recording is not actually taking place.

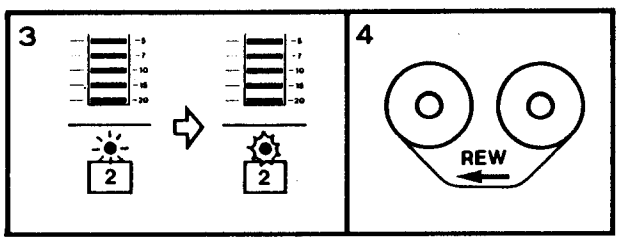
7. Press PLAY or the footswitch when the ta reaches the punch-out point. That point will be p into memory. The LED for the selected track will st blinking and the RECORD LED will turn off.

8. After a 3-second postroll, the RHSL LED will on solid, while the tape will automatically rewin stopping at the preset start point. The MSR-24S is n in Rehearsal Ready mode.









Rehearsing the Punch-in ("Dry Run")

1. Make sure that the MSR-24S is in "Rehearsal Ready" mode with the punch-in and out points memorized and the RHSL LED on solid. Press PLAY or the RC-30P footswitch. The MSR-24S 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.

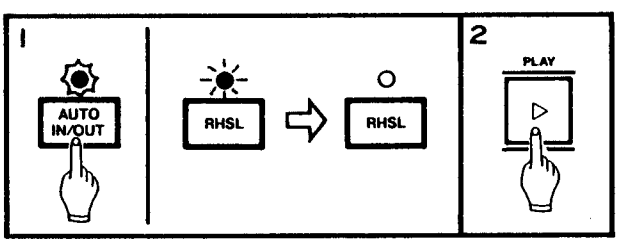
3. When the tape reaches the punch-out point, the track's output will switch back from source to tape. The LED for the punch-in track will start blinking, indicating that the "dry run" record is over.

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.

To Leave **REHEARSAL Mode:**

- To definitely QUIT rehearsal without recording at any time, press CLEAR. The RHSL memory points will be cleared and the RHSL LED will go out.
- To temporarily leave rehearsal, press STOP, REW or F.FWD. To resume rehearsal, press REW or F.FWD to locate tape the IN point, then press play. Or directly press PLAY when you are behind the IN point, then tape will start pre-roll from that point.
- To change the memory points, press CLEAR and go through the SET procedure.
- Turning the power off will clear the RHSL memory points.



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 RHSL LEDs should still stay on. All tracks should be in SAFE except the ones you intend to record.

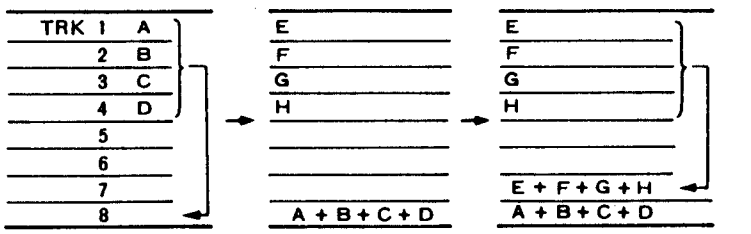
1. Press the AUTO IN/OUT switch. A red LED will begin blinking above the AUTO IN/OUT switch, while the RHSL LED that was on solid will turn off, indicating that the MSR-24S is switched from REHEARSAL mode to actual, automated "punch-in ready" mode.

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

Operation: Bouncing Tracks (Ping-Pong)

The recording capability of the MSR-24S is not limited to the twenty-four tracks. As you progress with recording, you may reach a point where you need more than twenty-four 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 MSR-24S.

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.



Bouncing tracks 1 – 4 onto track 8

Tracks 1 – 4 available for recording new parts

Bouncing new tracks 1 – 4 onto track 7

Other Tips About Bouncing

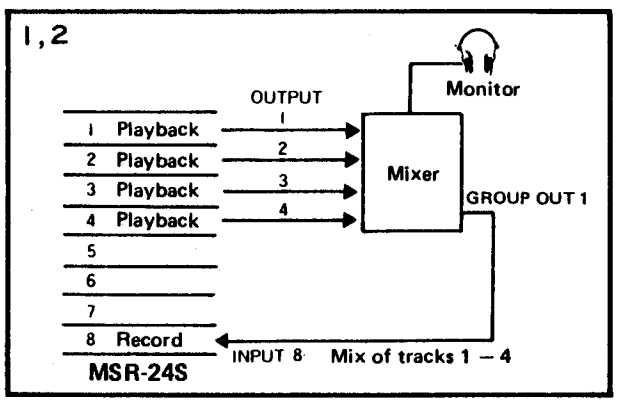
1. Before you record over the parts that have been bounced together, make certain that you're happy with the overall sound of the bounced parts, because you won't be able to change their mix or punch-in to fix errors.

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.

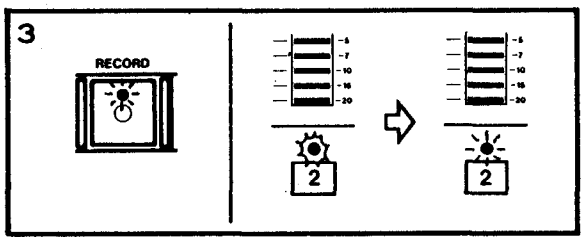
Bouncing: Example

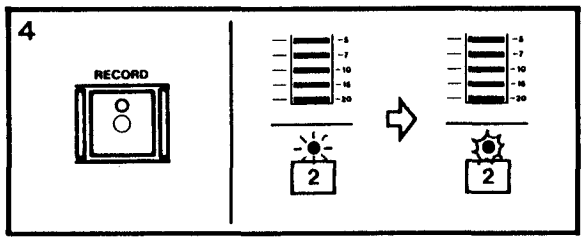


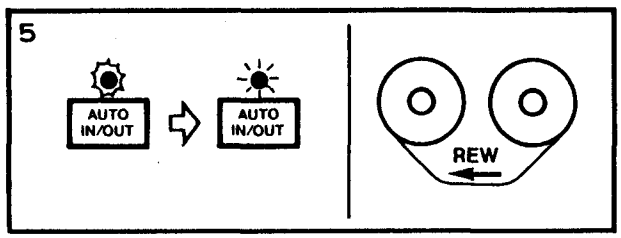
Let's take the contents of tracks 1-4 and bounce them to track 8.

1. Set your mixer so that the main input channels 1-4 are receiving the MSR-24S's tape outputs.

2. Assign channels 1-4 to the group output on the mixer connected to track 8 of the MSR-24S.







3. When the tape reaches the preset punch-in poir the punch-in track will automatically enter actual reco mode, and the RECORD and Track LEDs will turn c solid. New material is being recorded, erasing the origin part.

4. When the tape reaches the memorized punch-o point, the MSR-24S punches out of Record. The R CORD LED will turn off and the track's LED shou again be blinking.

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

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

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

To change the memory points, press RHSL a go through the SET procedure.

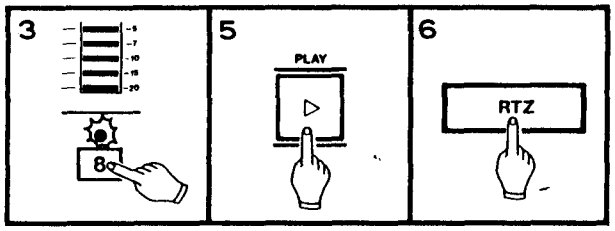
To terminate the Auto In/Out procedure, press tl CLEAR switch. The AUTO IN/OUT LED which was solid will turn off. By hitting CLEAR, you erase all the three memory points (Preroll Start, Punch-in a Punch-Out points).

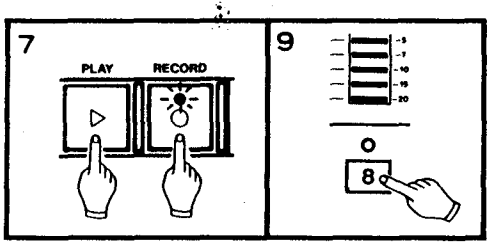
About Punching In

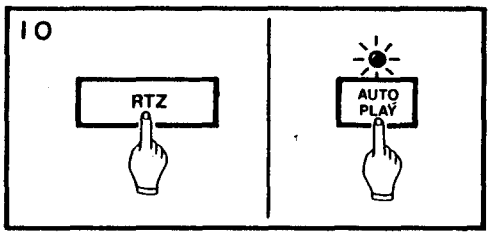
Setting in and out points: For both musical and technical reasons, when punching in or out of a track, you must select points that are "in the clear", i.e., in the pauses between phrases or notes. It sounds unnatural and makes the insert noticeable if you record a new note before the old one has ended, 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 MSR-24S 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 MSR-24S by an external computer device. With this method, track 24 is recorded with SMPTE time code and punch-in/out points are entered into the MSR-24S via the serial connector on the back panel. The procedure is similar to the MSR-24S'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 s your punch points, if the inserted material is loude softer, or a different tone from the original track, it w be noticeable. Set the EQ and volume settings on yo mixer the same as they were during the original recor ing. If you make inserts immediately after recordir don't change the instrument or mixer settings at a Keep in mind that at a certain point it's better to reco the whole track over than making multiple punch-ins.







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 MSR-24S.

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.

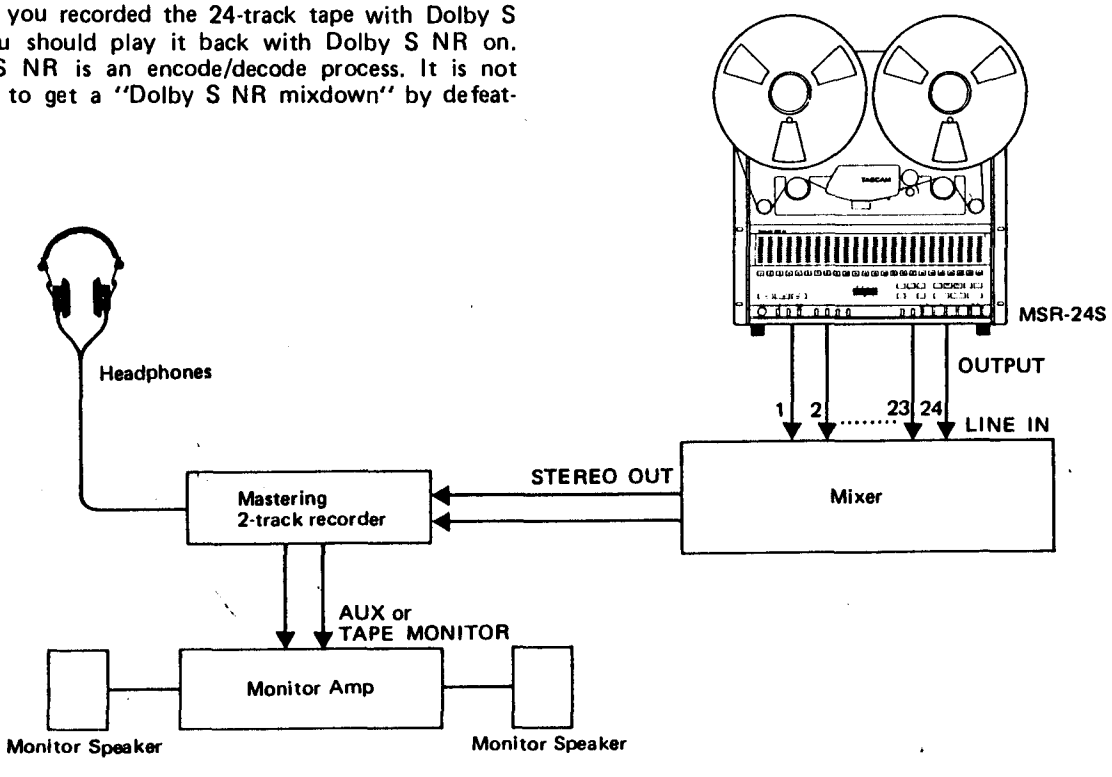
10. Press RTZ then AUTO PLAY to hear the result. Make sure you've got a mix that you want to keep. If so, you're free to record over the old tracks; if not, make whatever adjustments that are necessary on your mixer and try it again.

Operation: Mixdown (Remix)

Once all the tracking and overdubbing is complete, it will be time to mixdown to stereo. At this point, the MSR-24S's tracks should all be in safe mode, and the main input channels of the mixer should be switched to receive signal from the MSR-24S. 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 24-track tape with Dolby S NR, you should play it back with Dolby S NR on. Dolby S NR is an encode/decode process. It is not possible to get a "Dolby S NR mixdown" by defeating the noise reduction on playback, mixing encoded tracks to stereo, and then playing back the 2-track master through a Dolby S NR decoder.
2. Once outputs of the MSR-24S have been decoded by the Dolby S NR unit within the MSR-24S they behave like any other audio source, and can be mixed down to any medium: digital tape recorders, cassettes with Dolby B, C, S NR or DBX noise reduction, or the audio tracks of a VCR.



Operation: Recording with Tape Sync

Your MSR-24S has special features designed to make it an ideal recorder for use with electronic musical instruments. Track 24 is specifically designed to be used with the recordable synchronizing codes used by MIDI (Musical Instrument Digital Interface) as well as the SMPTE time code. Since MIDI itself is a computer type digital language and cannot be recorded on analog tape, it is necessary to convert MIDI timing clocks to recordable FSK (Frequency Shift Keying) signals using the TASCAM MTS-30 MIDI Tape Synchronizer or a MIDI/FSK converter. Sometimes this type of converter is built into sequencers, drum machines and computer interfaces.

If you record the sync tone at the same time as instrument tracks, processing delays in some sequencers may cause phasing or timing lags during Playback. It's good practice to record the sync tone *before* recording instruments to tape.

- Connect the FSK output (labeled "Sync Out" or "Tape Out") of your sequencer, MIDI TAPE synchronizer, or computer interface directly to the INPUT of track 24. Do not patch through your mixer. A direct connection between the sync tone generator and the MSR-24S ensures that FSK won't accidentally leak into the audio, and unwanted audio won't leak into the FSK.
- Press on the Record Enable button of Track 24 (red LED blinking).
- Turn on the SYNC LOCK switch on the front of the MSR-24S. This defeats the Dolby S NR encode/decode for track 24 only. The SYNC LOCK LED will blink.

CAUTION: *Be sure to press the track 24's Record Enable button* BEFORE *the SYNC LOCK switch. Otherwise recording is* NOT *possible on that track.*

- Consult the owner's manual of the device that is generating the sync tone to find out how to start the tone. Most units utilize a "pilot tone" that is output before the unit is started to help you set the level on the tape deck.
- Press RECORD and PLAY. After a few moments, hit START on your sequencer unit. Let the sequence play to its completion without stopping the MSR-24S.
- Once track 24 is complete, release the Track Record button by pressing it. Its LED will go out, and the SYNC LOCK LED will go on solid showing that the track is locked to play mode.

Playback of Sync Tones

- Connect the Track 24 output directly to the Sync in ("Tape in") of the sequencer or MIDI converter. Again, do not patch through the mixer.
- Consult the owner's manual of your sequencer unit for specifics of how to switch it to follow external tape or MIDI clocks, depending on whether you're using a MIDI/FSK converter.
- Rewind and play the tape. The sequencer or drum machine will start at the correct place on the tape every time and play at the same tempo that was recorded. Or your converter will translate the sync code playing back from track 24 into MIDI clock information which, in turn, will drive the MIDI program in the sequencer or drum machine. In addition, the synthesizers and other sound sources or processors connected to the sequencer will now operate in sync with the tape. In this way you can continue to record other "non-MIDI sound sources" – vocals, acoustic instruments, etc. – on the remaining tracks while listening to the MIDI instruments playing along with the sync track 24.

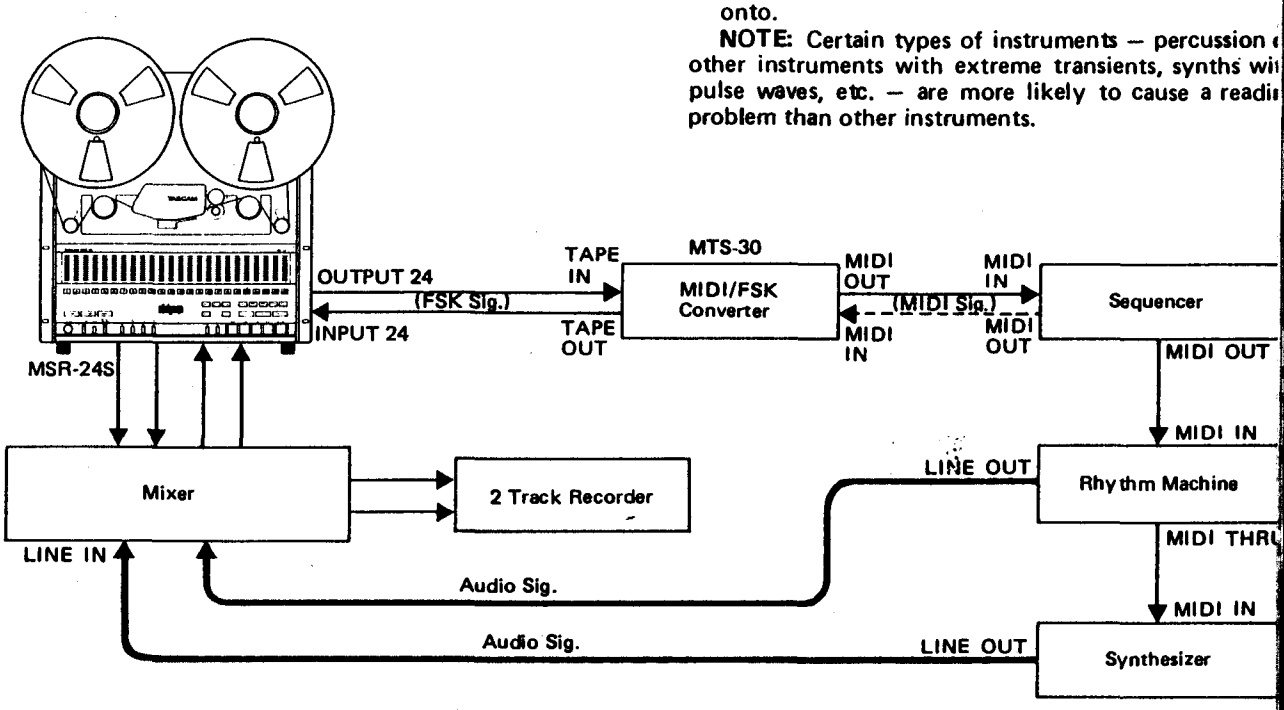
By following this procedure, the sequencer in effe uses track 24 as a "guide" track to play as mar instruments as are being controlled via MIDI from tl sequencer, creating "virtual" tracks. You may deci to actually record the audio output of some of tho tracks so you can use the instrument in a differe way on another track, or you can leave the "virtua tracks unrecorded until mixdown time. Combini virtual tracks with the normal tracking procedur used in recording makes it possible to record tremendous number of different instrument soun on a small number of tape tracks. Your only re limitation is the number of sound sources and tl capacity of your sequencer.

About Tape Sync

- It is possible to record onto track 23 while locke to time code or sync tone from track 24 without ar problem if you keep in mind that crosstalk is greate during the overdubbing of track 23, since the reco level in the head is 40 dB hotter than it is duri playback. The signal of track 23 inductively cros talks to the head windings of track 24, possibly cau ing a sequencer to miscue or a synchronizer to dr lock. If this happens, there are a few remedies:

a) Lower the record level of the signal onto Track 2
b) Insert a 10 or 20 dB pad between Track 24 o and the synchronizer. There is a point with mar units where the crosstalk is attenuated below tl "confusion threshold" of the code reader, but there still enough level on the time code for it to be read.
c) Consider recording track 23 while the virtu tracks aren't locked up. In playback, the crossta returns to a normal level, and you can lock up track 24 again. If you record code and sound simul aneously, record tracks 23 and 24 at the same time there is no sync crosstalk if 23 is never overdubbe onto.

NOTE: Certain types of instruments – percussion other instruments with extreme transients, synths wi pulse waves, etc. – are more likely to cause a readi problem than other instruments.



Recording SMPTE Time Code

The MSR-24S is equipped with a parallel interface port (ACCESSORY 1) that allows it to be either master or slave when connected to the TASCAM ES-50/51 or other synchronizers that support the TASCAM parallel interface standard. A complete explanation of procedures will be found in the manual for your synchronizer but here are a few notes about recording and playing back SMPTE that you must know.

1. Take the TIME CODE GENERATIOR OUT of the synchronizer add plug it into the INPUT #24 of the MSR-24S.

2. Press on the Record Enable button of Track 24 (red LED blinking).

3. Turn on the SYNC LOCK switch on the font of the MSR-24S. This turns off Dolby S NR on track 24 only. The SYNC LOCK LED will blink.

4. The time code generator may have its own output level control. Adjust that until the channel 24's meter of the MSR-24S reads 0 dB.

5. Press RECORD and PLAY. Press START on the time code generator.

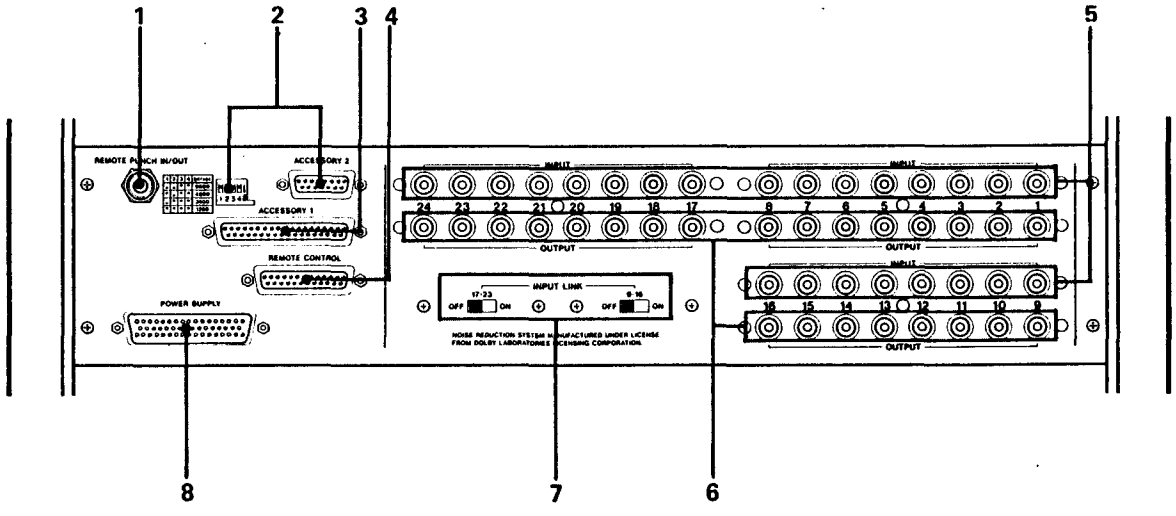
6. Once track 24 is complete, release the track's Record Enable button by pressing it. Its LED will turn off and the SYNC LOCK LED will go on solid, showing the track is locked to safety, read only status.

For playback:

7. Connect the 24 track OUTPUT to the Time Code input (either Master or Slave) of the synchronizer.

8. Press PLAY. The time code display on the synchronizer or reader should increment. To verify that the machine is getting time code (and not counting tach pulses), temporarily unplug the ACCESSORY 1 jack from the MSR-24S. If the reader still is running, and it stops and starts as you stop and play the MSR-24S, you've successfully recorded SMPTE.

Features and Controls



–REAR PANEL–

1. REMOTE PUNCH IN/OUT Jack

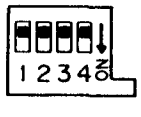
This is for connection of the optional RC-30P footswitch. Whether you're a busy engineer, producer, or a musician with both hands on an instrument, there are times when you can't drop what you are doing to press RECORD button. The RC-30P is the solution. It lets you punch-in and out of Record with a tap of your foot.

2. ACCESSORY 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 MSR-24S 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.

1	2	3	4	bit/sec
■	■	▪	▪	9600
▪	▪	▪	▪	4800
■	▪	▪	▪	2400
▪	▪	▪	▪	1200



3. 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.

4. REMOTE CONTROL Connector (25-pin, D-sub)

This is for connection of the optional RC-424 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 1-24

Each of these RCA jacks accepts a nominal inp level of –10 dBV (0.316 V). The input impedance is kOhms (unbalanced).

6. OUTPUT Jacks 1-24

These outputs carry either the tape signal of t corresponding track, or the source (input) signals, d pending on the position of various front panel contro See the switching logic table on page 27.

The MSR-24S has no output level controls of its ov and the output level is the same as the input level; th is, –10 dBV (0.316 V). The output impedance is 2 Ohms (unbalanced).

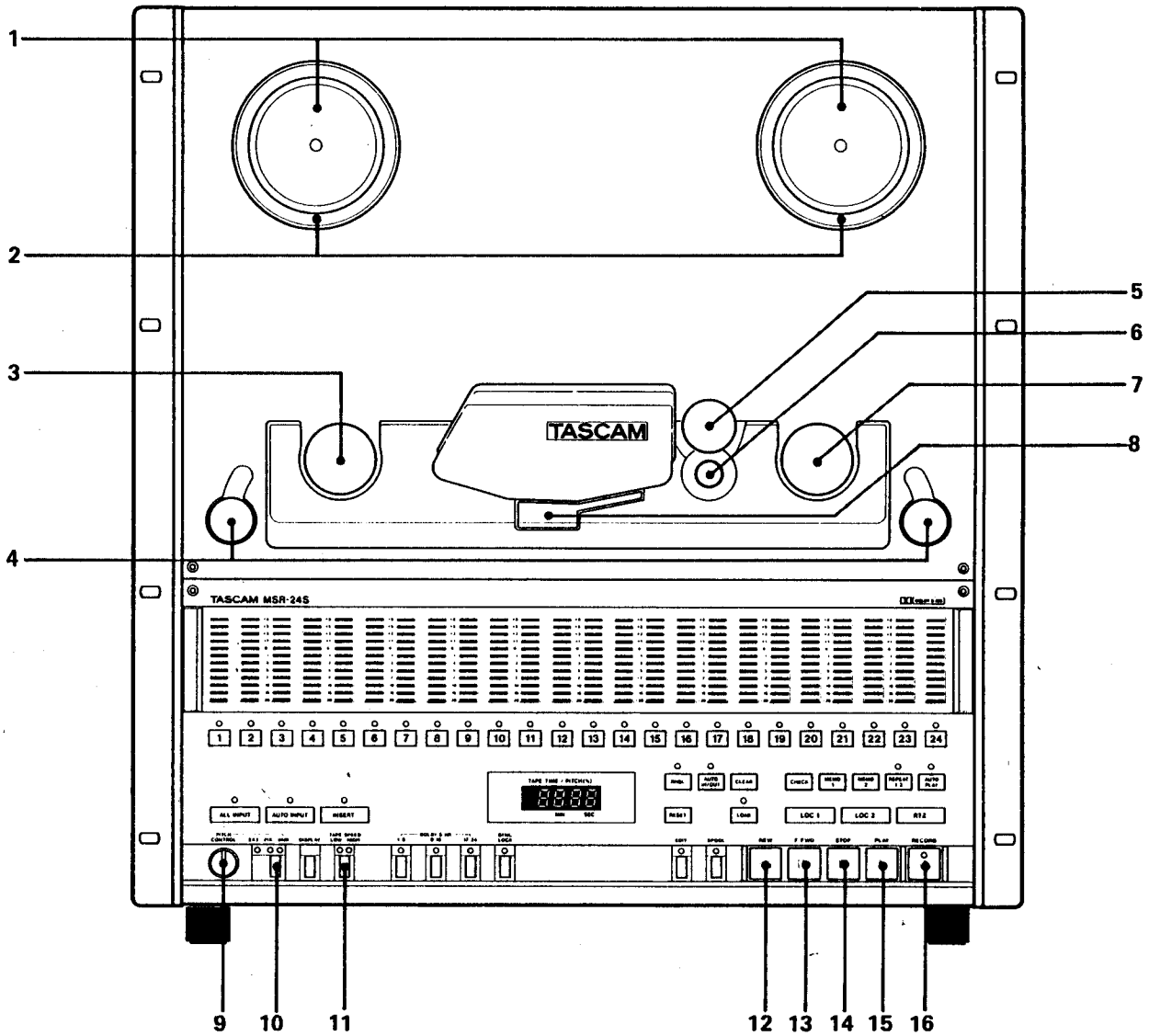
7. INPUT LINK Switches, 9-16 and 17-23

When switched on, they internally patch inpu 1-8 to channels 9-16 and inputs 1-7 into channels 17-2 respectively. Track 24 serves primarily as the "sy track" and, to allow it to be handled as such separate from other tracks, the INPUT LINK switches are n wired to channel/track 24. Optionally modifiable the switches have also effect on channel/track 24. F the modification, contact TASCAM or your neare TASCAM dealer.

Both switches have no effect when no signal is plugge into the INPUT 1-8 jacks; you can't link channels 9- to the 17-23 or vice versa.

8. POWER SUPPLY Connector

For connection of the TASCAM PS-24 power supp unit only. Two power cables are supplied; one is for co nection between the PS-24 and MSR-24S, and the oth for connection between the PS-24 and AC power outl Do not use any other power supply unit and cables wi the MSR-24S.



–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/one inch tapes. Use the same size and type of reels for both the supply and takeup sides.

3. Impedance Roller

Also referred to as "flutter filter," which insures even tape travel across the heads and low wow and flutter performance.

4. Tension Arms

The take up reel 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. Pinch Roller

The MSR-24S'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. Also, the pinch roller is, as with all other major rotating components, supported by ball-bearings to minimize friction and retain close tolerance.

6. Capstan Shaft and Motor

The DD (Direct Drive) capstan motor is controlled by a PLL (Phase Locked Loop) servo to ensure precise tape speed.

7. 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.

8. Head Shield (Head Gate)

Pushing this shield plate down into the plate provides a full access to the head block for tape threading and maintenance. It should be up during recording for lower noise.

9. PITCH CONTROL

When and only when the Speed Mode selector switch (#10) is in its VARI position and its red LED is on solid, the PITCH CONTROL is active and provides a stepless plus or minus 15% 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 may see a readout of the percentage of speed change using the DISPLAY switch (#21).

You can use this speed control to accomodate 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 litte 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 litte 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.

Also, it is recommended that you run the MSR-24S for several seconds in the play mode for the speed to stabilize, especially when the change in speed is large. 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 TAPE SPEED select switch is set to FIX unless you are using the PITCH CONTROL intentionally.

10. 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 MSR-24S via its rear panel ACCESSORY 1 or 2 connector in which case the EXT LED will automatically turn on.

FIX: Locks tape speed to LOW (7.5 ips, 19 cm/s) or HIGH (15 ips, 38 cm/s) speed, as selected by the TAPE SPEED selector switch (#11). 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 MSR-24S capstan motor is under external control of a synchronizer/controller the EXT LED will light steadily in yellow. **Only when both the control and 9.6 kHz reference signals are coming into the MSR-24S, the EXT speed mode is active.** When either signal is interrupt, the EXT LED will turn off or flash and the FIX LED will turn on solid, indicating that the FIX speed mode is active, as summed up in the table.

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

11. TAPE SPEED Selector Switch

When the switch is in its Up/HIGH position, the ta will record or play at 15 ips (38 cm/s); and when t switch is in its Down/LOW position, the tape will reco or play at 7.5 ips (19 cm/s), unless the machine is VARI or EXT speed mode.

12. REW(ind) Button

Pressed, winds tape at high speed in reverse.

13. F.FWD Button

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

14. STOP Button

Stops any tape motion, and cancels all transpo modes.

To cancel RHSL and AUTO IN/OUT modes, u CLEAR. If STOP is used instead, the RHSL or AUT LED will blink instead of turning off (although RHS or AUTO is actually disabled) and to turn off the LE you have to press CLEAR anyway.

15. PLAY Button

a) Pressing this button alone starts tape playback.

b) Pressing the button while recording stops t recording ("punch out") without stopping the ta motion.

16. RECORD Button

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

1) If any Track Record buttons are engaged, the LE above them as well as the RECORD LED will stay o and recording will begin on the corresponding tracks.

2) If none of the Track Record buttons is engage the master RECORD LED will blink to indicate a reco ready.

Pressing the RECORD button alone during the ta 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 taki place.

B) LED blinking: record ready mode – tape rolling at play speed, but no actual recording is progress. Recording will start as soon as any Trac Record button or buttons are pressed on.

C) LED on solid: record mode – recording is takir place.

23. SYNC LOCK Switch

SYNC LOCK is used to "lock" track 24 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 Dolby S NR on track 24 only, enabling sync signals to be recorded and played back without being affected by the Dolby S NR encode/decode.

When recording sync signals on track 24 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 Dolby S on track 24 is disabled.

CAUTION: If the SYNC LOCK switch is pressed when the track 24 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 24 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 24's status is determined by the following logic.

Switch Setting		Track 24 Status	
Record Enable Button (track 24)	SYNC LOCK Switch	Recording	Dolby S NR 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*

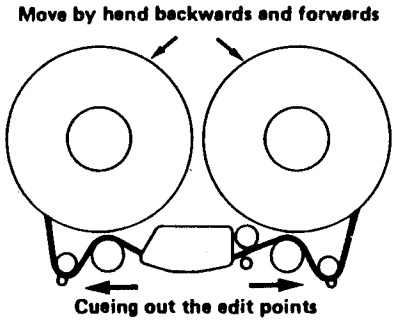
*) Regardless of the setting of the DOLBY S NR switch
**) Depending on the setting of the DOLBY S NR switch

24. 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.

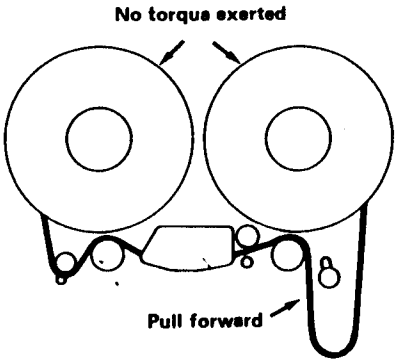


2) "Quick Cue"

While in Manual Edit mode (see above) if you hold F.FWD or REW you'll hear tape as it slowly moves. The tape will stop as you release the button, switching the transport back to the Manual Edit mode.

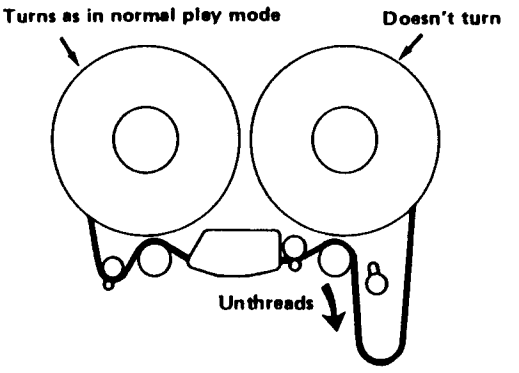
3) Stop Edit

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.

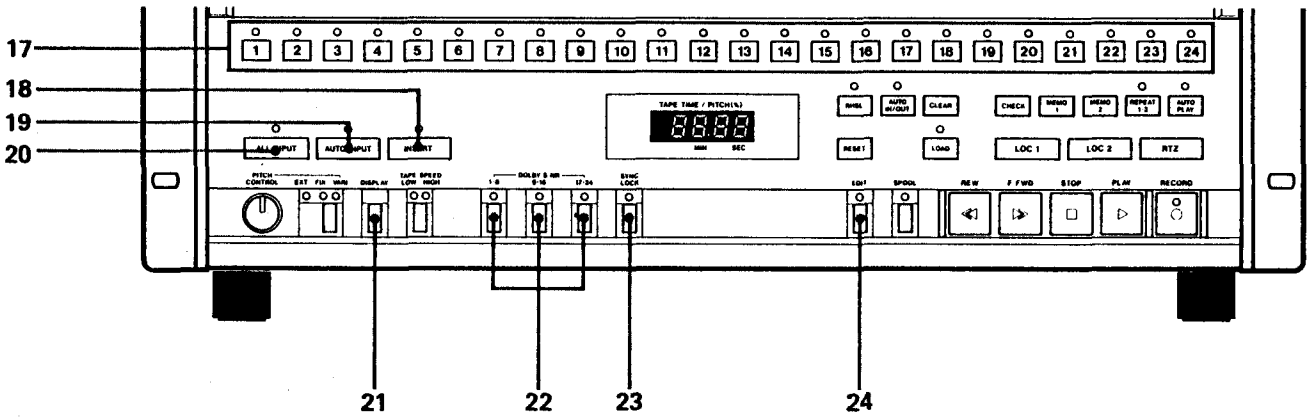


4) Dump Edit

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 you hold down EDIT while pressing PLAY. Pressing EDIT then PLAY only causes the tape to play normally. Pressing EDIT after PLAY has no effect; the tape continues to play.



17. Track Record Buttons

Pressing any of these 24 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).

18. 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 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.

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.

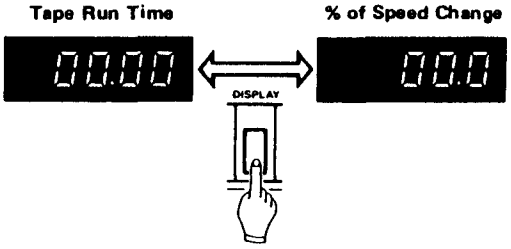
20. ALL INPUT Button

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

21. DISPLAY Switch

This switch "toggles" (switches forth and back) the digital counter between "Tape Run Time" and "% of Speed Change" displays.

When the MSR-24S is initially turned on, the counter switches to Tape Run Time mode.



22. DOLBY S NR Switches

When these switches are engaged, their green LED will light and the built-in Dolby S-type NR system for each group of channels (1-8, 9-16, and 17-24) is activated. This system provides a noise reduction of about 20 dB and allows the machine to achieve tape recordings over about a 90 dB dynamic range.

When the SYNC LOCK switch is engaged, the DOLBY S NR system for track 24 is disabled regardless of the setting of the 17-24 switch, as shown in table on the next page.

ot Erase

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

UTION: To ensure a clear erase, release RECORD nd, after a fraction of a second (technically, after 0.5 second), stop moving the tape. Releasing RE-ORD after stopping the tape may allow clicks to be ded. Too slow a tape motion (down beyond about n/sec. or 1/2 times the normal LOW speed) when elease RECORD, will also cause the problem. artly advance the tape, as constantly as possible. A practice runs will get you to acquire the knack of rasing.

Cueing

If EDIT is pressed and held down during the Fast ng modes (including SPOOL, LOC, RTZ, and AT), the tape lifters will retract so that the tape ntacts the heads, enabling high-speed tape monitoring. the cueing mode is activated, a high-cut filter is atically inserted to prevent the meter circuits and er components from being damaged by high energy dio signals.

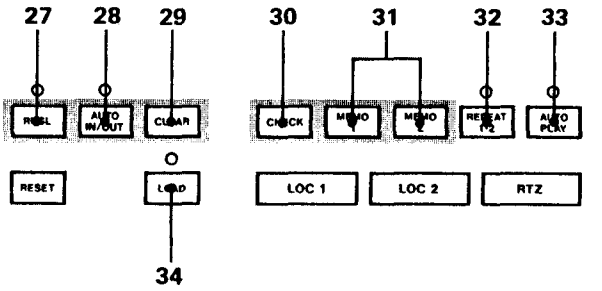
POOL Button

en the SPOOL button is pressed after (or before) W or F.FWD, the tape will begin rolling at a constant eed of approximately 80 ips (203 cm/s) which is 1/3 the normal fast wind speed, to obtain a tight, m tape pack. Generally, spooling will be done to the takeup reel at the end of a recording or editing ssion so the tape can be stored "tails out", which es audible print-through effects (pre-echoes).

A second press of SPOOL after tape starts spooling, switches the transport to the normal fast wind mode (REW or F.FWD).

26. Peak Level Meters

These meters register the signal levels being fed to the MSR-24's OUTPUT connectors, in the limits of –20 dB to +8 dB.

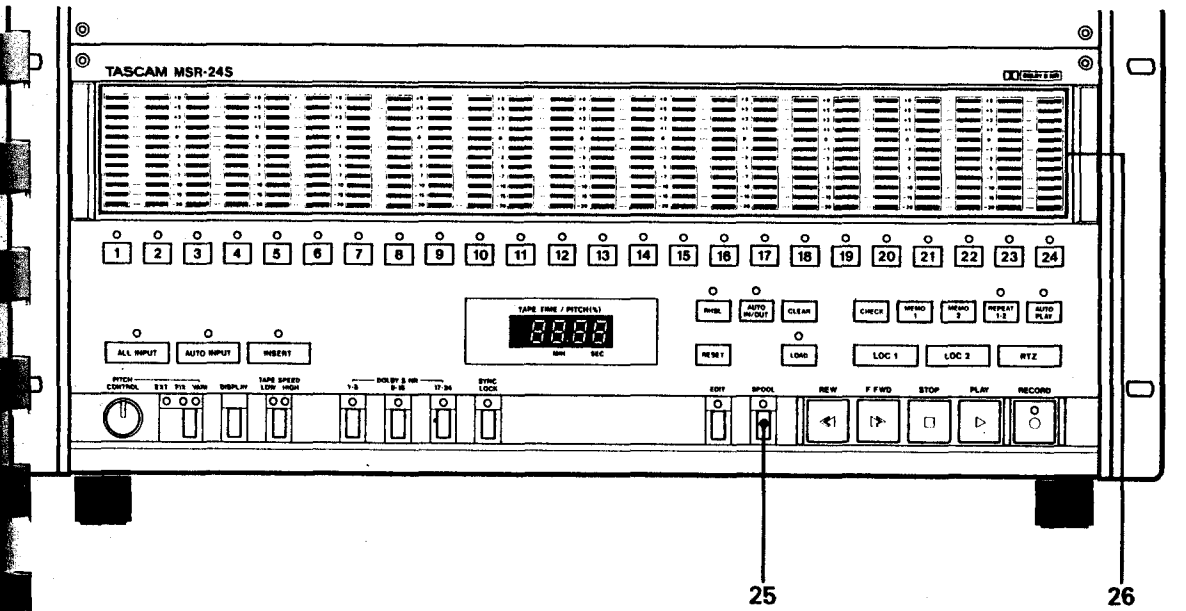


27. RHSL (Rehearsal) Button

RHSL is the first stage of an automatic punch-in recording. During Rehearsal Set mode (RHSL LED blinking), the MSR-24S 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 MSR-24S 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 MSR-24S 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.



1) Auto End Stop

To set Auto End Stop points, press LOAD. A point on the tape one minute ahead (on HIGH speed basis) will be set as the rewind end point, and a point thirty-one minutes ahead will be set as the forward end point. Both Forward and Rewind ends are set at once. You can then regard the tape as if it were a single-directional 30-minute (at HIGH) or 60-minute (at LOW) long cassette tape. When you wish to remove the tape from the deck, press SPOOL then REW (or F.FWD) to get past the LOAD point.

To change Rewind end point, move the tape to the desired point and holding LOAD press MEMO 1.

To change Forward end point, move the tape to the desired point, and holding LOAD press MEMO 2.

To check LOAD points, press CHECK. The counter display will show a broken line. Then, hold LOAD and press MEMO 1. The display will show the rewind end point. To check the forward end point, hold LOAD and press MEMO 2.

To erase LOAD points, hold LOAD and press CLEAR. Both the points will be cleared at once and the LOAD LED will turn off.

NOTE: LOAD points are also cleared when the right tension arm drops to its "off" position as in Stop Edit or Dump Edit modes (see p. 33).

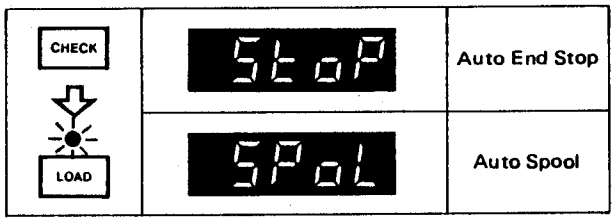
2) Auto Spool

To engage Auto Spool function, hold LOAD and press SPOOL (we suppose you have already set Auto End Stop points).

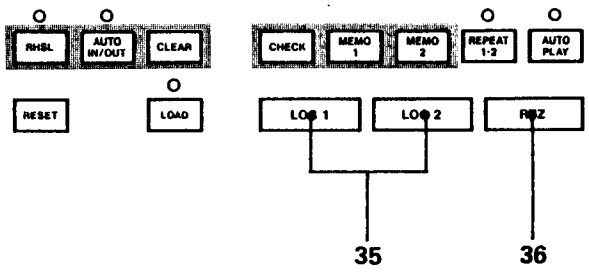
To go back to the Auto End Stop function, hold LOAD and press STOP.

NOTE: Auto Spool is activated only when tape runs either at REW or F. FWD speed.

To check which LOAD function is currently on ("Auto End Stop" or "Auto Spool"), press CHECK then LOAD.



NOTE: When the MSR-24S is first turned on, it is Auto End Stop function that is ready to be used. Only after you've set Auto End Stop points, you can switch the MSR-24S to Auto Spool position.



35. LOC 1 and LOC 2 Buttons

Pressing either of these buttons causes the tape to roll (in either F.FWD or REW) to the corresponsing MEMO point. The tape will stop when it reaches the MEMO point. If the AUTO PLAY feature is used together, the MSR-24S will automatically enter 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.

36. RTZ (Return to Zero) Button

Pressing the RTZ button will cause the MSR-24S 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 MSR-24S 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.

28. AUTO IN/OUT Button

After you have set the tape's preroll start, punch-in, and punch-out points in RHSL mode, entering the MSR-24S'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 Post-roll).

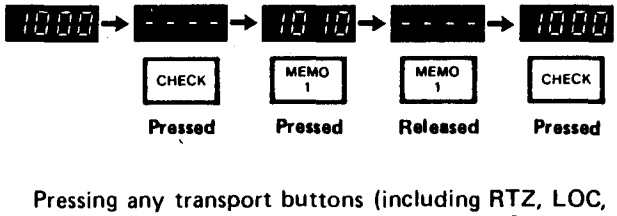
29. CLEAR Button

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

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

30. 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 or Speed Variation).



Pressing any transport buttons (including RTZ, LOC, or EDIT) will cause the display to leave CHECK mode automatically.

31. MEMO 1 and MEMO 2 Buttons

These buttons are used to establish 2 autolocation points in the MSR-24S'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 MSR-24S 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.

32. REPEAT 1-2 Button

The REPEAT function provides a "Playback Loop" or "Block Repeat" between the two programed MEMO points. Note that MEMO 2 does NOT have to be a number higher than MEMO 1.

Repeat play is accessible from any transport mode.

Depending on where you press REPEAT, the initial behavior of the tape differs:

1) If REPEAT is pressed *when the current tape* ... *tion is playing between the two MEMO points,* REPEAT LED that was off will turn on solid and tape will play to the higher MEMO location, rewin the lower MEMO location and start over.

2) If REPEAT is pressed *when the current tape* ... *tion is out of the two MEMO points,* the tape wi located to the lower MEMO point, then the REP LED will go on solid and repeat play will start.

To stop REPEAT sequence:

- Press STOP. The tape will stop, but the REP LED will stay on. Press REPEAT to turn the LE and quit the mode.

- Press REPEAT directly. Its LED will turn off an tape will continuously play or rewind.

- Press RTZ, REW or F.FWD. The function pr will be activated, and when you get past the b ning or end of your loop, the REPEAT LED start blinking.

  To resume REPEAT after you've got out of loop in this way, press the LOC 1 or 2 button. tape will locate to either MEMO point. If loc to the higher MEMO point, it will rewind bac the lower MEMO point to start playing. If the ta first located to the lower MEMO point, it will dir start playing from that point.

  Instead of LOC you can press PLAY when yo behind the lower MEMO point. The tape will pla to the higher MEMO point, then rewind to the l MEMO point to start playing again.

NOTE: During REPEAT (its LED on solid or blink pressing EDIT has no effect.

33. AUTO PLAY Button

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

34. LOAD Switch

LOAD provides two functions:

1) Auto End Stop: This feature stops tape be reaching either its rewind or forward end, no m what transport mode it is in (except Record and S modes).

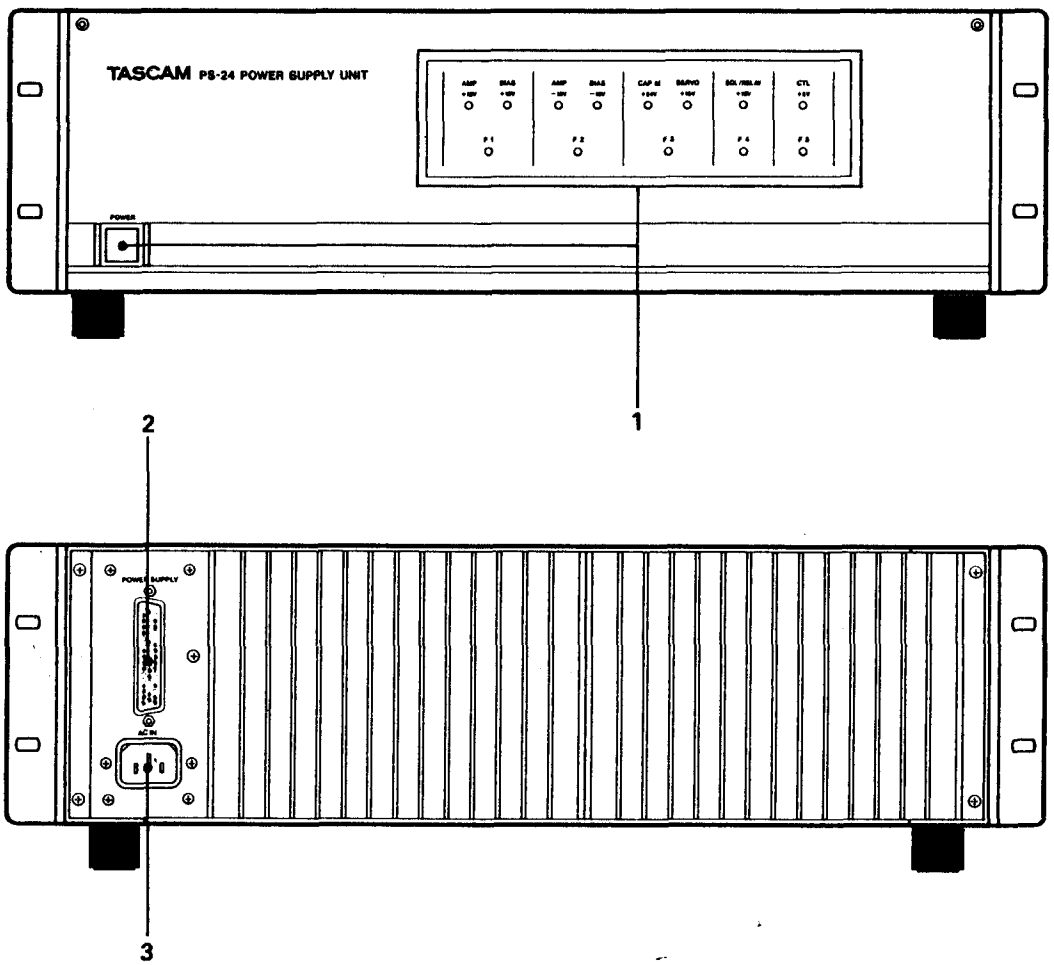
2) Auto Spool: This feature causes the REWindi F.FWDing tape to slow down when its end approa (one minute ahead of the preset points) and sm spool off the reel.

Both Auto End Stop and Auto Spool funct rely on the same LOAD points, and you can switch l and forth between the two LOAD functions at time (except when tape is moving in whatever mode)

The LOAD points don't move even if the count subsequently reset to zero elsewhere on the tape.

- Programming and editing of the LOAD funct are possible only when tape is stopped.

PS-24 POWER SUPPLY UNIT



— Front Panel —

1. POWER Switch and Power Supply Pilot Lamps

POWER is used to switch on power to the MSR-24S. When switched on, the power supply pilot lamps will light on solid, indicating the corresponding power supplies are in proper working order.

> **CAUTION:** If any of these lamps are not turned on or are flickering, immediately switch off power to the MSR-24S, and contact TASCAM or the nearest TASCAM dealer. Never ignore a problem, or potential problem. They don't go away, they get worse.

— Rear Panel —

2. POWER SUPPLY Connector

For connection of the PS-24 to the MSR-24S the supplied DC cable.

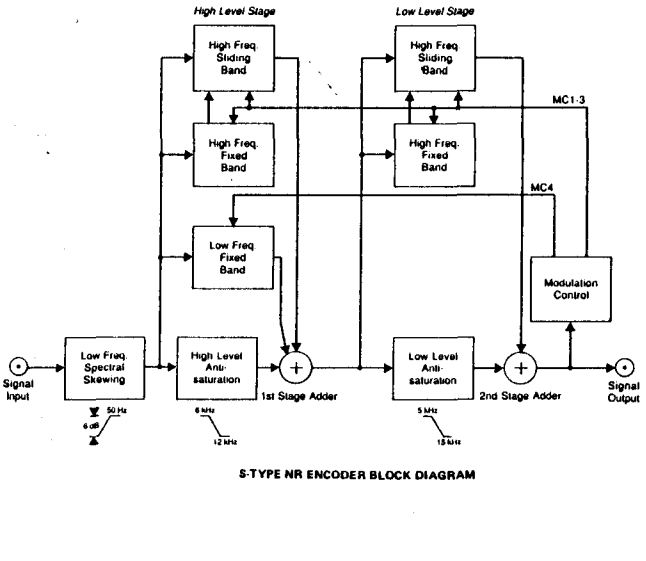
3. AC IN Connector

For connection of the PS-24 to power outlet the supplied AC cable.

Dolby S-type NR Recording System

The Dolby S-type NR System is a newly developed recording system, and its features include the following:

- Dolby S-type NR is based on the same operating principles as Dolby SR NR, the professional Spectrum Recording system, and enhances the quality of audio recordings.
- The system boosts low-level signals during recording and cuts them during playback, providing a noise reduction of 10 dB at low frequencies and a 24 dB at the higher frequencies.
- To prevent side effects such as noise modulation, Dolby S-type NR operates with what is called *the principle of least treatment* and applies constant gain wherever there are no high-level signals, even if such signals exist somewhere else inside the spectrum.
- A fixed band NR at low frequencies and a combination of fixed and sliding band NR at high frequencies operate to complement each other in a technique known as *action substitution* and gives less overall noise modulation.
- *Antisaturation* provides a wide headroom both at low and high frequencies and less distortion.



S-TYPE NR ENCODER BLOCK DIAGRAM

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 MSR-24S.

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, impedance 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 MSR-24S, 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.

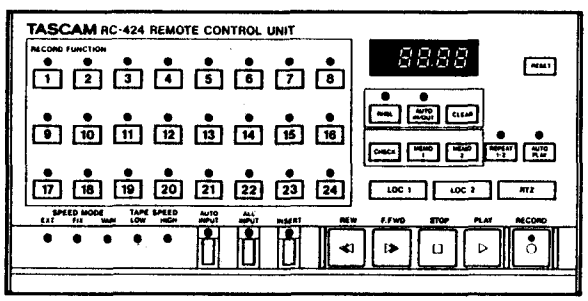
A clean and properly demagnetized tape recorder will maintain its performance without any other attention for quite a while. It won't ruin previously recorded material, nor will getting it back to original specifications be difficult.

Optional Equipment

RC-424 Remote Control Unit

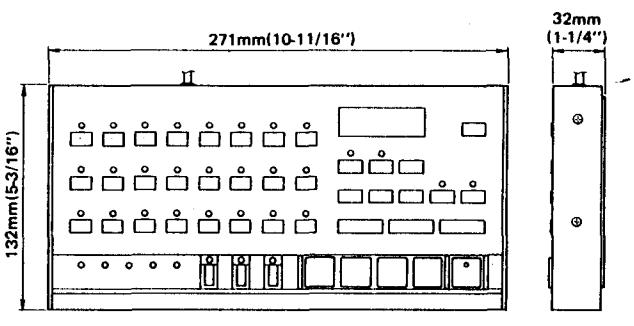
The RC-424 remote control unit comes equipped with a 15-feet (5-meter) cable that plugs into the REMOTE CONTROL connector of the MSR-24S.

The RC-424 has duplicates of all the transport functions except Pitch Control, Edit and Spool modes. Indicator lamps on the remote control unit indicate tape speed (LOW or HIGH) and speed mode (EXT, FIX or VARI) as selected on the MSR-24S. The RC-424 also provides the capability of programming a punch-in rehearsal sequence, locating the MSR-24S to a specific location stored in two memory registers, repeating playback of a selected portion of a tape, and more (see *Specifications* below).

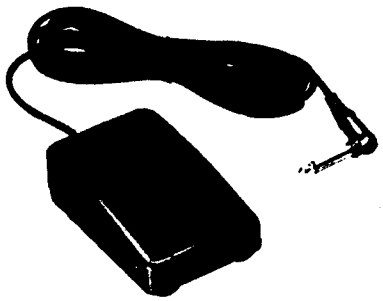


RC-424 Specifications

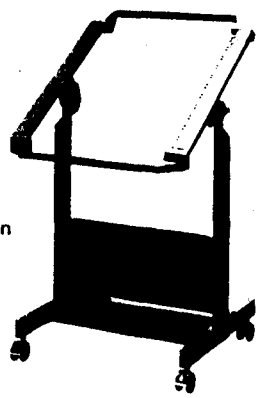
Transport	: PLAY, STOP, F.FWD, REW, RECORD
Autolocator	: RTZ (Return to Zero), MEMO 1, MEMO 2, LOC 1, LOC 2, REPEAT, AUTO PLAY
Counter Display	: 4-digit digital counter with RESET, switchable between "Tape Run Time" and "% of Speed Change"
Punch-In/Out	: RHSL (Rehearsal), AUTO IN/OUT, CLEAR
Track Select	: RECORD FUNCTION (tracks 1-24), ALL INPUT, AUTO INPUT, INSERT
Speed Mode/Tape Speed Indicators	: EXT, FIX, VARI/LOW, HIGH
Others	: Connection cable (15 ft/5 m length, 25-pin D-sub connector)
Dimensions (WxHxD)	: 10-11/16" x 1-1/4" x 5-3/16" (271 x 32 x 132 mm)
Weight	: 3.53 lbs. (1.6 kg)



RC-30P Remote Footswitch



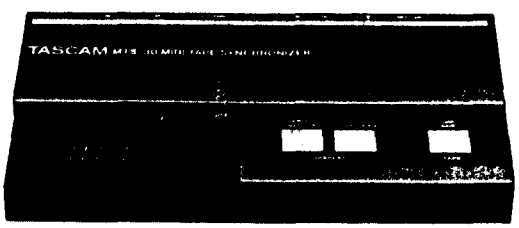
CS-608 19" Console Rack



(Dimensional drawings shown on page 42)

MTS-30 MIDI-Tape Synchronizer

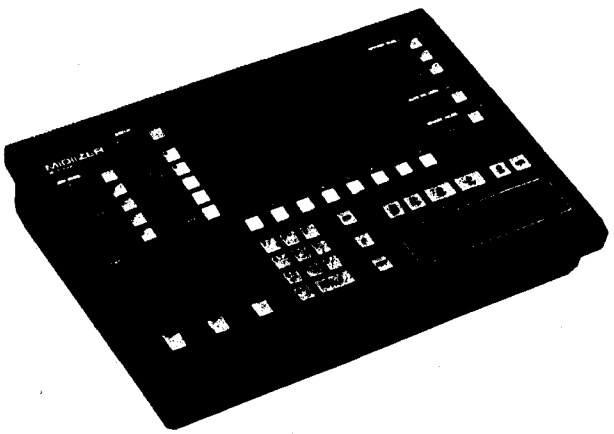
The MTS-30 allows the MSR-24S to sync-up with t MIDI keyboards, drum machines, sequencers. Than to its unique "Song Position Pointer Sync" capability, t associated MIDI equipment will stay in sync and follo the tape no matter where you move the tape within given song. The MTS-30 responds also to the PITC CONTROL of the MSR-24S. The maximum stability resolution of the synchronization is ensured by the u of a newly developed, special error correction circuit.



MIDiiZER

The MIDiiZER 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.

(Some early MIDiiZERs are not compatible with the MSR-24S. When ordering the MIDiiZER, specify your intention to use it together with the MSR-24S, or if you have it already and are in doubt, contact TASCAM or your local TASCAM dealer.)



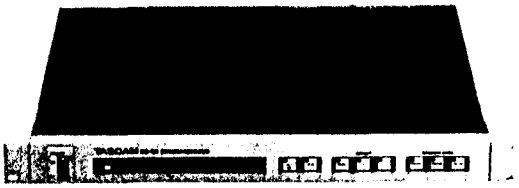
LA-40 Low-Impedance Adaptor

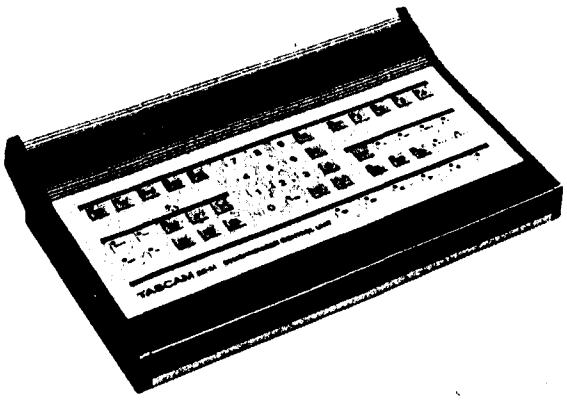
The LA-40 is a 4-channel low impedance adaptor which makes it possible to connect 600-Ohm balanced +4 dBm/–20 dBm XLR type connectors or 3-conductor 1/4" phone jacks to -10 dBV RCA jacks, or vice versa.

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

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.





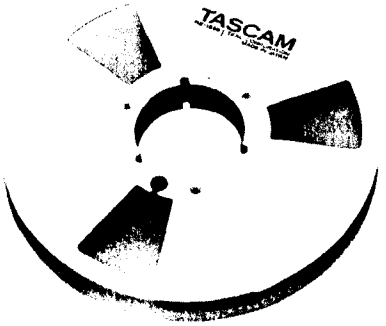
TASCAM ES-50 SYNCHRONIZER FEATURES

* Battery backed up Auto-Calibration.
* Newly developed high speed timecode reader LSI reads timecode from 1/20 to 100 times play speed.
* Compatible with all SMPTE/EBU timecode standards, 29.97 fps, 30 fps, 24 fps, and 25 fps.
* Timecode generator integrated for Re-start/Jam.
* External Reference input.
* Code Only Master operation.
* DC or FM servo control available.
* RS-232C interface port allows remote computer/editor control via serial data buss.
* Digital servo control ensures lock stability of better than ±50 μsec with most tape transports.
* Multi-CPU distributed intelligence for faster operation.
* All circuit functions are digitally controlled, eliminating the need for adjustments.

TASCAM ES-51 CONTROLLER FEATURES

* Cue points can be entered into memory from the keypad or by capturing timecode numbers on the fly.
* Master/Slave Autolocator with 20 scratchpad memories.
* Automated Punch-In Punch-Out facilities.
* Pre-settable End Limit points to prevent accidental tape wind off.
* Pre-roll time is programmable from 0 frame to 36 minutes.
* Sub-frame accurate (1/100 frame) offset trimming.
* Five programmable timecode triggered events, including Record In/Out. Events can be entered using the keypad or on the fly.

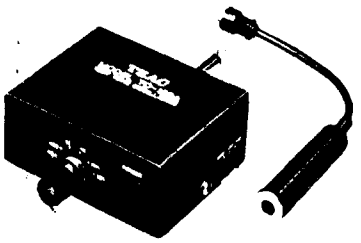
RE-1050 Metal Reel



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

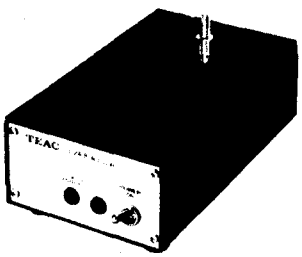
TO-122A Test Tone Oscillator

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.

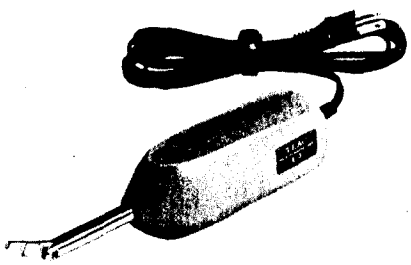


HC Head Cleaner & RC Rubber Cleaner (U.S. Only)

Bulk Eraser



Head Demagnetizer



CS-608 DIMENSIONS

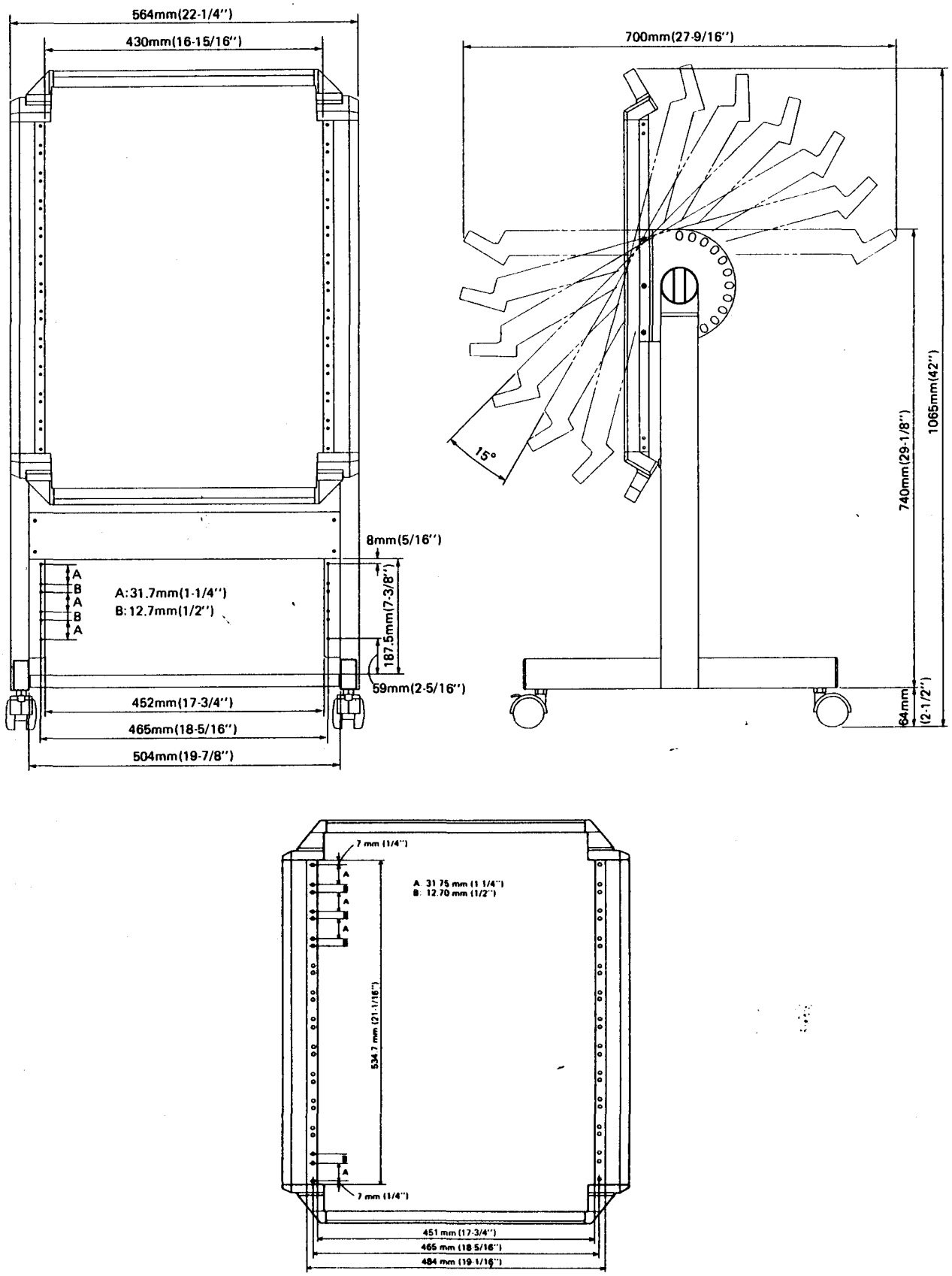


TABLE OF CONTENTS

1. Brief Signal Theory 4
   1-1. Controls 5
   1-2. Amplifiers 5
2. Voltage Conversion 5
3. Checks and Adjustments
   3-1. Parts Locations 6
   3-2. Test Equipment 7
   3-3. Removal of Main Parts
      3-3-1. Front trim panel 8
      3-3-2. Control panel 8
      3-3-3. Top rear panel 9
      3-3-4. Connector panel 9
      3-3-5. Bottom lower rear panel 9
      3-3-6. Control PCB 10
      3-3-7. Amplifier PCBs 10
   3-4. Transport Alignment
      3-4-1. Brake mechanism 11
      3-4-2. Brake torque 11
      3-4-3. Pinch roller pressure 12
      3-4-4. Tape tension servo 13
      3-4-5. Reel table height 14
      3-4-6. Tape speed 14
      3-4-7. Tape travel 15
      3-4-8. Wow and flutter (reproduce method) 16
      3-4-9. Capstan servo 16
   3-5. Audio Alignment 17
      3-5-1. Preliminary procedure (Head azimuth adjustment) 18
      3-5-2. Input level check 18
      3-5-3. Meter setting (input signal reading) 18
      3-5-4. Reproduce level 18
      3-5-5. Reproduce frequency response 18
      3-5-6. Bias tuning and bias trap adjustments 19
      3-5-7. Record bias adjustment 19
      3-5-8. Record level 19
      3-5-9. Dolby S NR IN/OUT level 20
      3-5-10. Overall frequency response 20
      3-5-11. Overall signal-to-noise ratio 20
      3-5-12. Overall distortion check 20
      3-5-13. Erasure 21
      3-5-14. Channel crosstalk 21
      3-5-15. Sync crosstalk 21
   3-6. Dolby S NR PCB Adjustments 22
      3-6-1. Adjustments location 23
      3-6-2. Decode level 23
      3-6-3. Encode level 23
      3-6-4. Encode performance 23
      3-6-5. Dynamic offset 23

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 APPLICANCE 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=picofarads).
- ★ ⚠ Parts marked with this sign are safety critical components. They must always be replaced with idential 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.

1. BRIEF SIGNAL THEORY

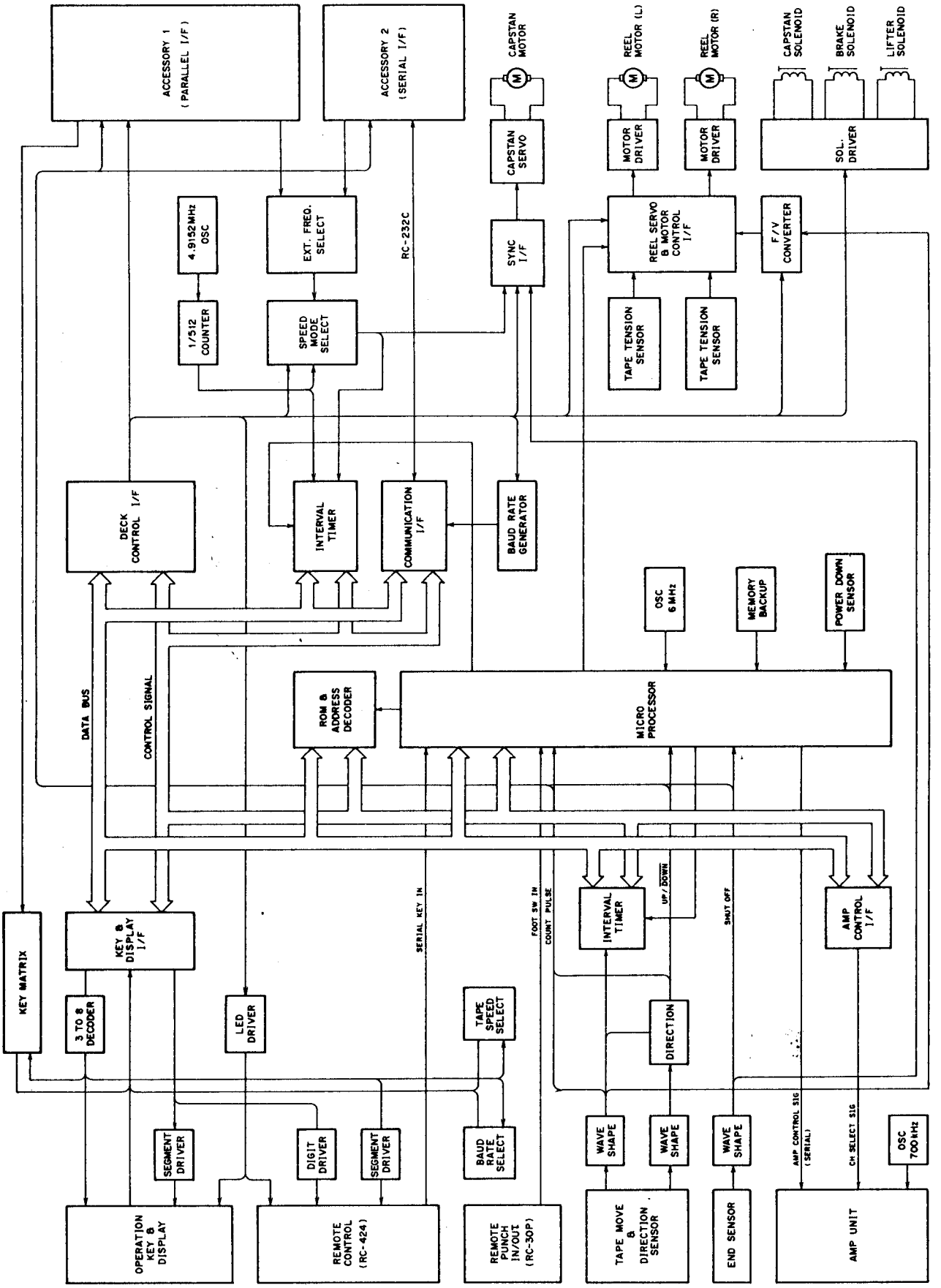


FIG. 1. CONTROL SIGNAL BLOCK DIAGRAM

4. PARTS LISTS

4-1. Mechanics

Exploded View-1 25
Exploded View-2 27
Exploded View-3 29
Exploded View-4 31
Exploded View-5 33
Exploded View-6 35
Exploded View-7 37

4-2. Electronics

Control PCB Ass'y 40/54
Operation PCB Ass'y 42/56
Mother PCB Ass'y 44/56
R/P PCB Ass'y 46/55
Dolby S NR PCB Ass'y 47/58-a
Power Supply PCB A Ass'y 48/58
Power Supply PCB B Ass'y 48/58
Capstan Servo PCB Ass'y 49/55
Fuse PCB Ass'y 50/58
VR/OSC PCB Ass'y 51/56
P. Joint PCB Ass'y, Joint PCB Ass'y, In/Out PCB Ass'y, Band Rate PCB Ass'y,
PG PCB Ass'y, SW A PCB Ass'y, SW B PCB Ass'y, Shut PCB Ass'y 52/56, 57
Sensor L PCB Ass'y, Sensor R PCB Ass'y, Filter PCB ass'y, Head PCB Ass'y,
P Monitor PCB Ass'y, D PCB, TR PCB, Doide PCB 53/57, 58

4-3. Schematic Drawings

Control Section Wiring Diagram 59
Amplifier Section Wiring Diagram 60
Control PCB Ass'y 61
Amplifier PCB Ass'y 62
Mother PCB Ass'y 63
Power Supply PCB Ass'y 64
Dolby S NR PCB Ass'y 65
Capstan Servo PCB Ass'y 66
Operation PCB Ass'y 67

4-4. IC Internal Block Diagrams 68

3. CHECKS AND ADJUSTMENTS

3-1. Parts Locations

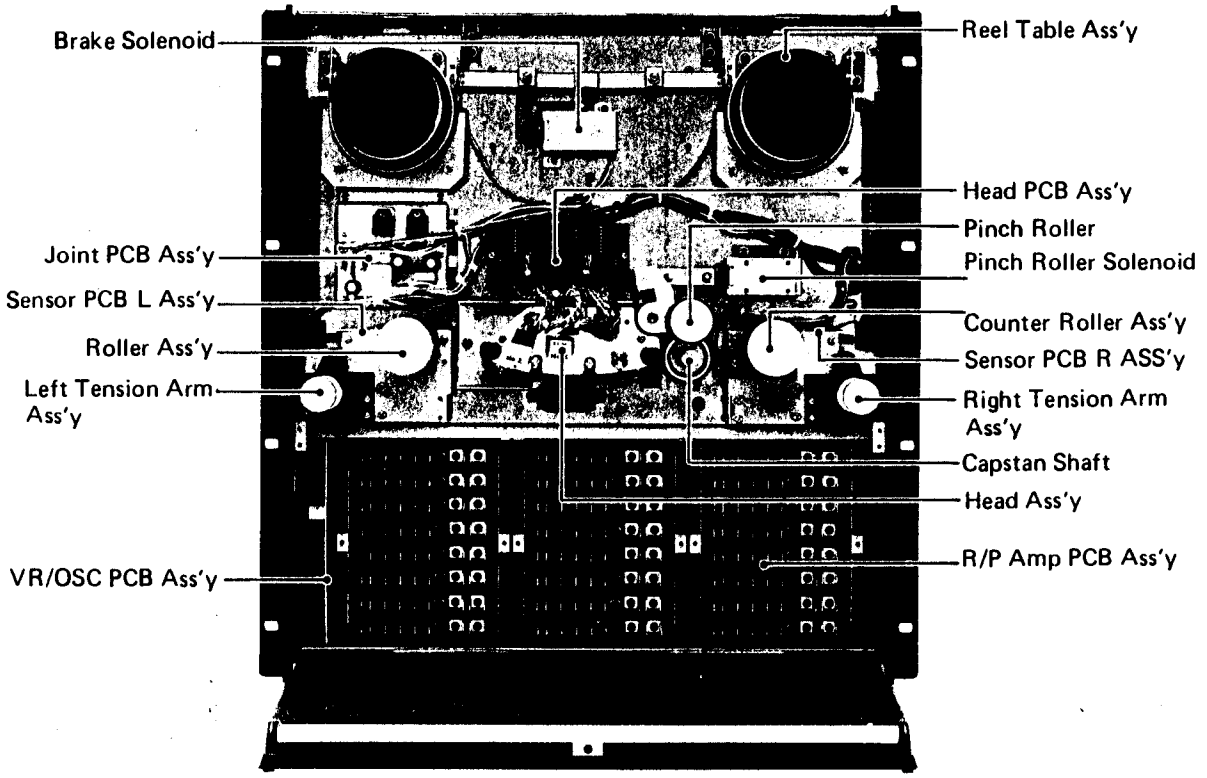


FIG. 3. WITH THE FRONT AND AMPLIFIER PANELS REMOVED

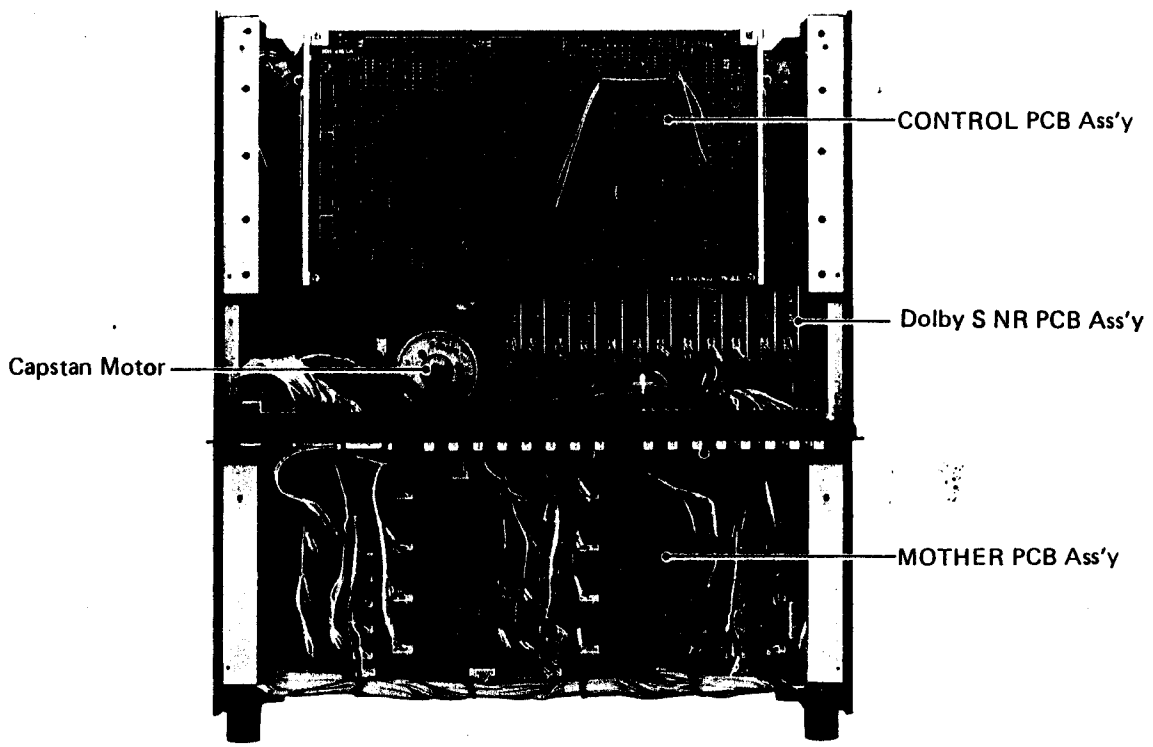


FIG. 4. WITH THE REAR PANELS REMOVED

1-1. Controls

Refer to the Control Signal Block Diagram and Control PCB Schematic (p. 61).

The MSR-24S uses an 8-bit microcomputer to control all tape motions.

Keyed-in signals are sent in parallel to the microcomputer through a key matrix. Keyed-in signals from the remote control unit are sent to the microcomputer as a serial data.

In the P.G. PCB (Tape Motion/Direction Sensor) 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 occured in the two signals yields the tape counter the UP/DOWN signal.

From the microcomputer and the AMP CONT I/F 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 capstan motor is controlled using the 9.6 kHz reference which is obtained by dividing by 512 the frequency signal from a quartz oscillator.

Switching between VARI/FIX/EXT is controlled by the SYNC I/F circuit.

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 Amplifier PCB Schematic (p. 62).

The MSR-24S's electronics are controlled by the U6, μPD7554CS-100, micro computer.

U6 decodes serial data 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 6	AHLD	This is a tape speed signal and used to select the record/reproduce equalizers and cut-off frequencies of LPF (U8), and optimize record bias. The pin goes L when the tape speed is set to 38 cm/s.
Pin 7	ANFO	Sends out a signal controlling the on/off switching of the Dolby S NR system. At L, the Dolby S NR 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 and release the record mute.
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 timi the above ARB, ARRL, AEC and AERL signals. circuit made up of U3 (2/2), R43-49, and C33-37 sync crosstalk cancel circuit which is activated one channel is in record and any other channels a playback, to deafeat record signals leaking onto playback channels. The CANCEL 1 and 2 signals effect on directly surrounding playback tracks (chan and the CANCEL 3 and 4 on the next far away rounding playback tracks (channels).

2. VOLTAGE CONVERSION

NOTE: This voltage conversion is only possibl general export models and NOT on models sold i U.S.A., Canada, U.K., Australia, or Europe.

Proceed as follows:

1. Make sure that the AC power cord is unplugged.
2. Remove the two upper corner screws and pull the front panel of the Power Supply Unit as s below.
3. Locate the voltage selector where indicated i illustration below and pull off the selector plug center shaded square piece) to reinsert it so tha arrow on it points at the required voltage values.
4. Replace the panel and fully tighten the two screv

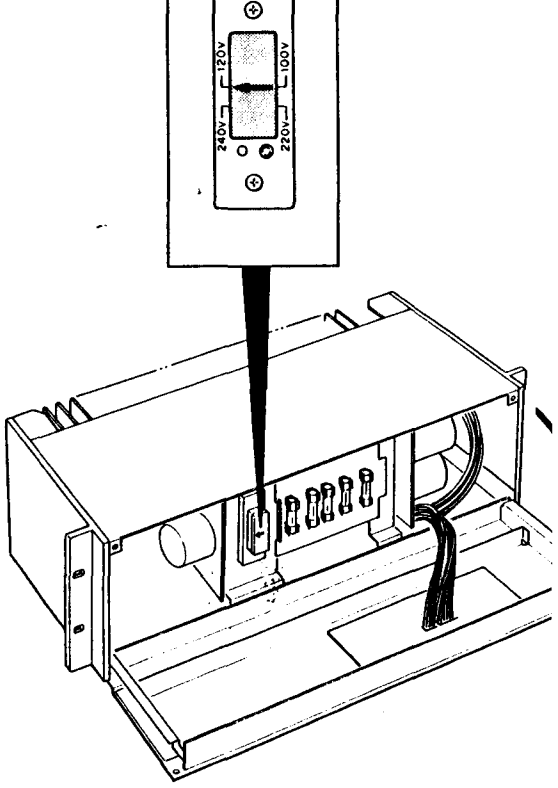


FIG. 2. VOLTAGE CONVERSION

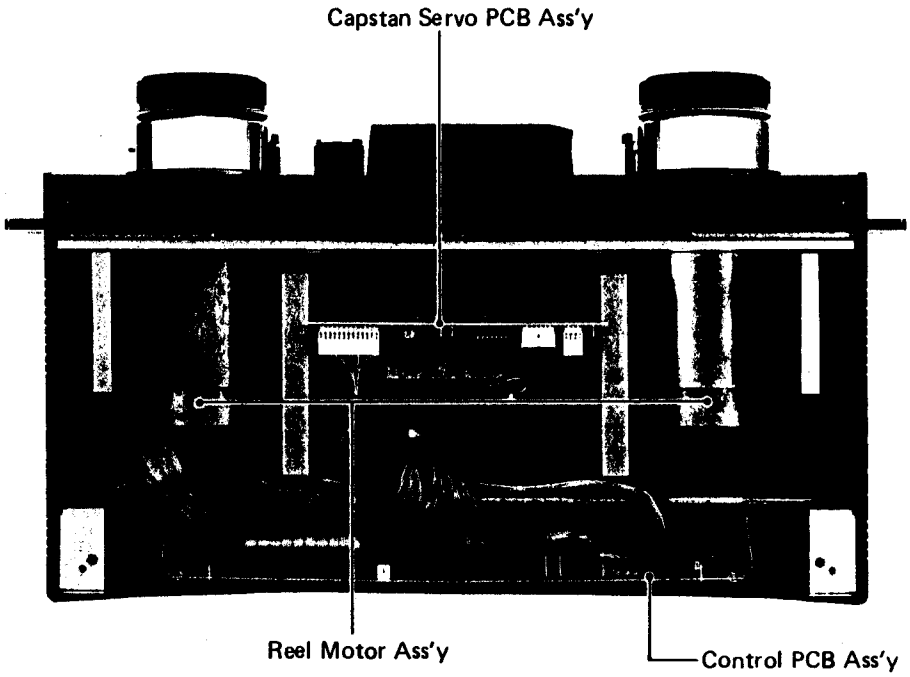


FIG. 5. BENEATH THE TRANSPORT

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 MΩ, < 25 pF
Band-pass filter	1 kHz narrow band pass type
AF level meter	Range: -80 dB ~+40 dB; imp.: > 1 MΩ, < 25 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 Level Test Tape: TEAC YTT-5234 (for 15 ips) TEAC YTT-5233 (for 7.5 ips) Frequency: 0 dB = 400 Hz Reference Fluxivity: 250 nWb/m Frequency Response Test Tape: TEAC YTT-1244 (for 15 ips) MRL41T225 (for 7.5 ips) Equlization Standard: IEC, CCIR. Time Constant: 15 ips = ∞ μs +35 μs 7.5 ips = ∞ μs +70 μs Reference Fluxivity: 250 nWb/m Wow and Flutter Test Tape MRL #441-570-480 (for 15 ips) MRL #431-570-480 (for 7.5 ips) Blank Test Tape (Recording) AMPEX 456

3-3. Removal of Mains Parts

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

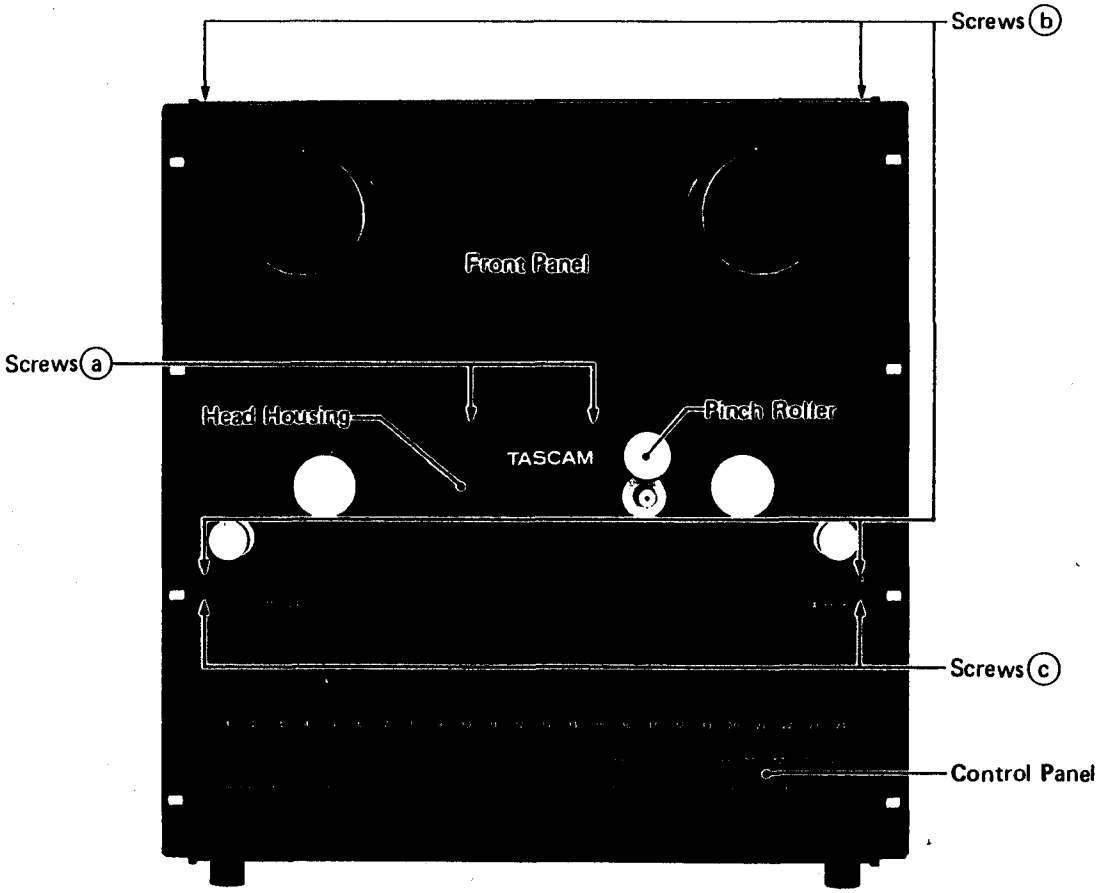


FIG. 6. FRONT VIEW

3-3-1. Front trim panel

CAUTION: When removing hex head screws in the following procedure, use care not to lose washers under them.

1. Remove the head housing by removing the two hex head screws marked (a) in Fig. 6.
2. Remove the pinch roller by removing the retaining screw in the top center of the roller (counterclock rotation).
3. Remove the four hex head screws marked (b) in Fig. 6.

3-3-2. Control panel

Remove the two hex head screws (c) in Fig. 6 and the control panel can be opened by pulling it toward you.

The control panel need be opened when performing tape tension and tape speed adjustments, in addition to amplifier adjustments.

3-3-6. Control PCB

Remove the two screws shown in Fig. 8, slide the control PCB assembly up, then pull the assembly toward you as shown in Fig. 9.

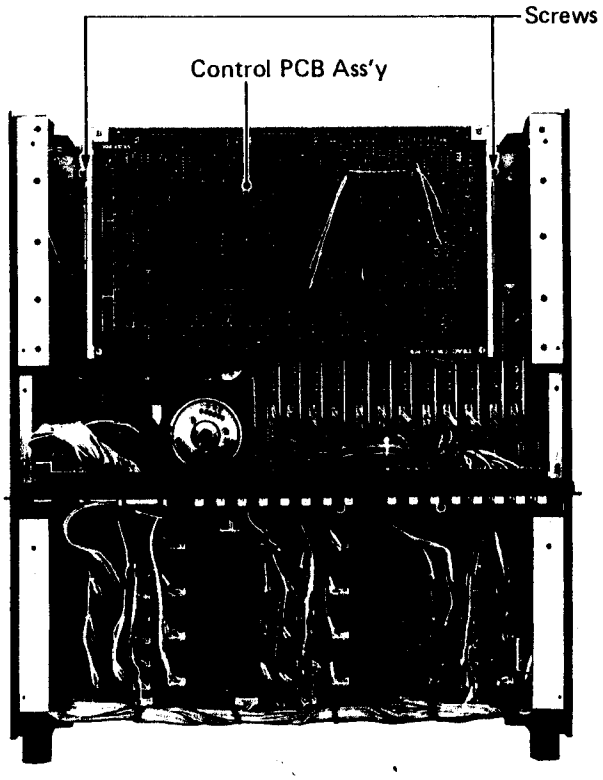


FIG. 8. CONTROL PCB INSIDE THE TOP REAR PANEL

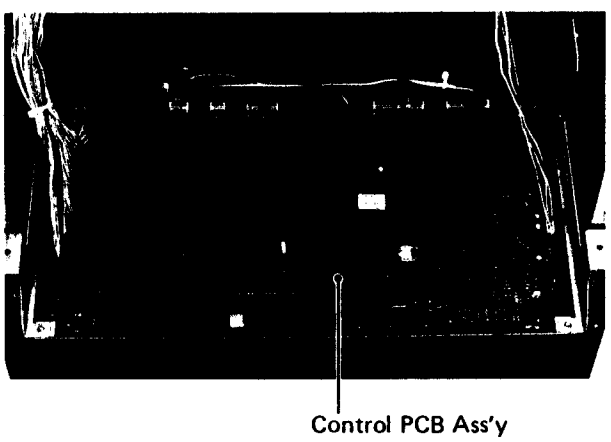


FIG. 9. CONTROL PCB PULLED TOWARD YOU

3-3-7. Amplifier PCBs

Remove the control panel (see 3-3-2), then use the provided "card puller" (a hook) to withdraw the amplifier PCB cards.

3-4. Transport Alignment

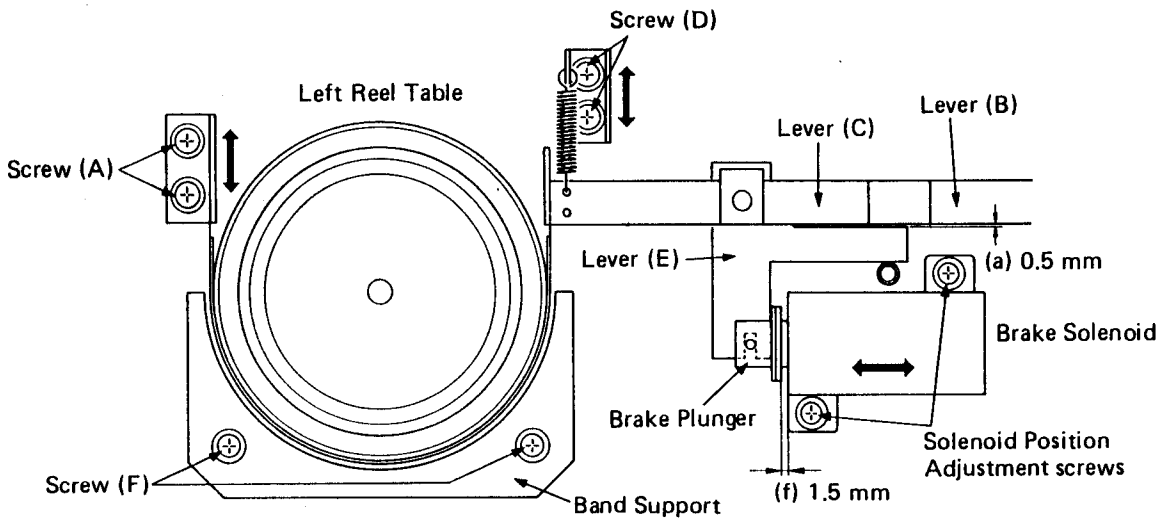


FIG. 10. BRAKE MECHANISM & TORQUE ADJUSTMENTS

3-4-1. Brake mechanism

Generally, the brake mechanism needs to be adjusted only when its mechanical parts or solenoid has been replaced.

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

1. Refer to Fig. 10 and adjust screw (A) so clearance (a) is 0.5 mm.
2. Adjust the position of the brake solenoid until plunger washer and solenoid clearance (f) is 1.5 mm.
3. Adjust screw (A) of the right brake assembly (not shown in the figure) so lever (B) is parallel to lever (C).
4. Manually activate the brake solenoid (by pushing the brake plunger) and check that reel table and band support clearance is even and the brake band doesn't come in contact with the reel table. If necessary, loosen screw F and adjust the band support position.

3-4-2. Brake torque

NOTE: When the brake felt pad is replaced, repeat PLAY-STOP sequence 30 times at a rate of 4 times a minute before attempting to recheck 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. 11.
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 two measurements A and B shown in Fig. 11. The proper torque values are shown below the figure.
3. If forward brake torque is not within specifications, adjust the spring hanger hooking position by loosening screw (D) shown in Fig. 10. If this adjustment has no effect, 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

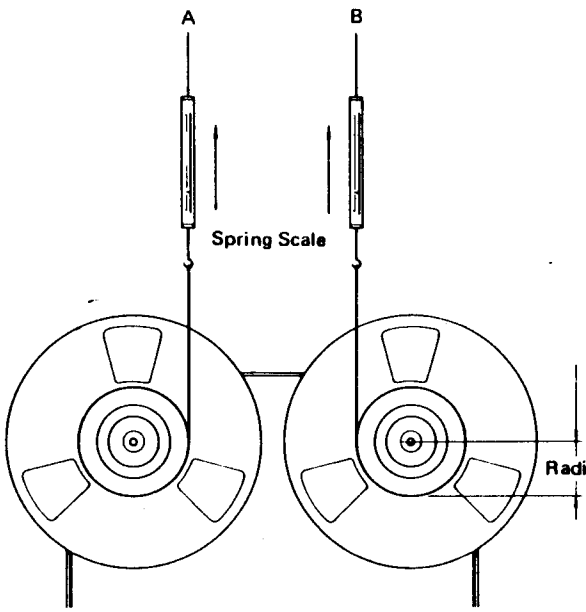


FIG. 11. BRAKE TORQUE MEASUREMENT

A & B readings	4000 – 4500 g-cm (55.6 – 62.6 oz-inch)
Difference between A & B	400 g-cm (5.6 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-cm x 0.0139 = 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. 12.
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 1.0 kg to 1.6 kg (2-3/16 lbs to 3-8/16 lbs), and there should be a clearance of approx. 0.5-1 mm at "A".
5. If necessary, loosen the adjustment screws shown in Fig. 12 and move the solenoid mounting plate until pressure and tolerance "A" are both within specifications.

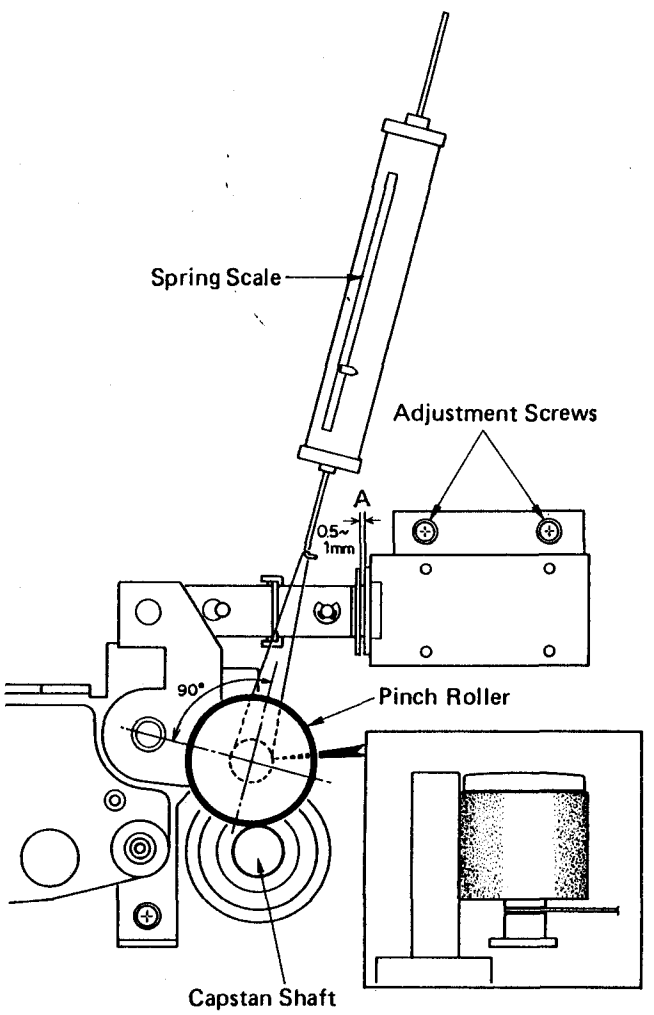


FIG. 12. PINCH ROLLER PRESSURE ADJUSTMENT

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.

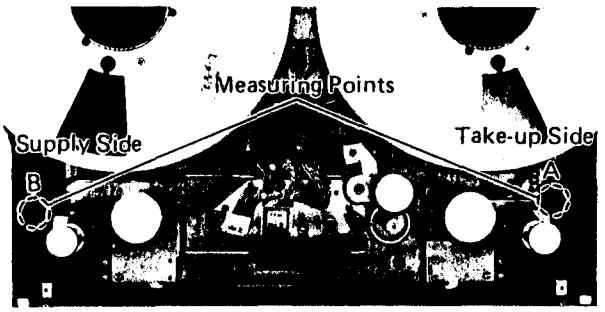


FIG. 13. TAPE TENSION MEASUREMENT POINTS

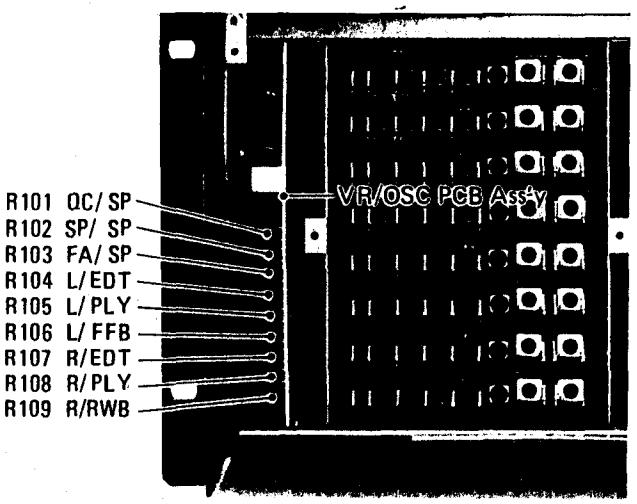


FIG. 14. TAPE PENSION ADJUSTMENT RESISTORS

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 analizer or tentelometer, measure take-up tension at test point A and back tension at test point B (Fig. 13).
   Both readings should be 140 ±10 g. If not, adjust R107 (for take-up tension) and/or R104 (for back tension). Refer to Fig. 14 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 analizer or tentelometer at test points A (take-up tension) and B (back tension). Take-up tension should be 160 ±10 g, and back tension 140 ±10 g. If either or both readings are not within the limits, adjust R108 (for take-up tension) and/or R105 (for back tension). Refer to Fig. 14 for locations of adjustment resistors.

C. Fast Winding Back Tension

Tape tension in fast winding modes is measured without having tape run.

Connect TP-8 to GND located on the Control PCB (Fig. 15), and press the EDIT button, then read the tentelometer, at point B for fast forwarding tension and at point A for rewinding tension.

Specifications (both in F.FWD and REW) are 100 ± 10 g. If necessary, adjust the following resistor(s):

R106 for F.FWD Back Tension

R109 for REW Back Tension

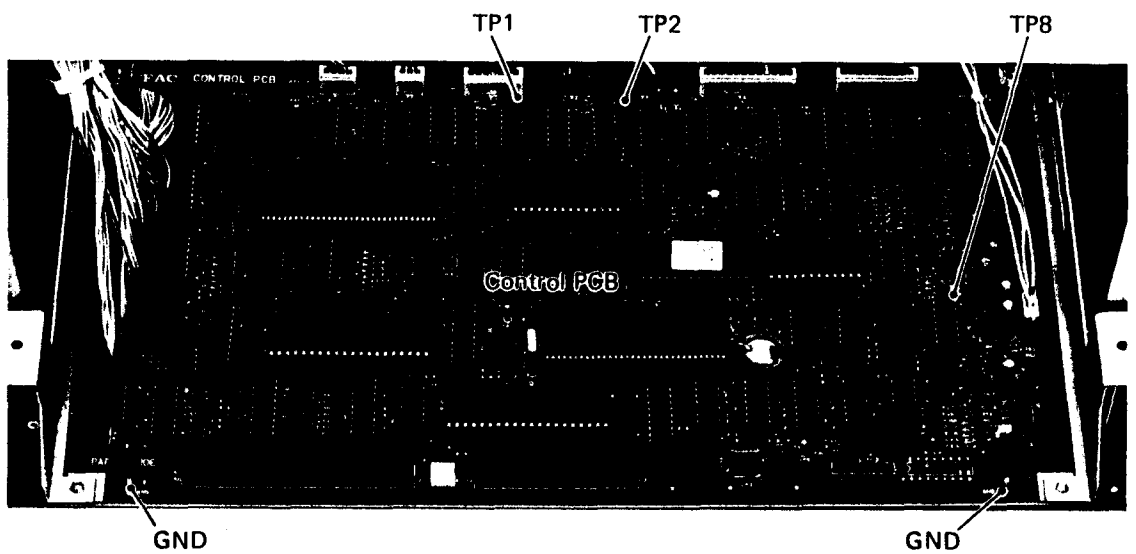


FIG. 15. TEST POINTS ON CONTROL PCB ASS'Y

Reel table height

el height adjustment is required only when reel motor een replaced or tape rubs excessively against the anges.

Remove the front trim panel as described in paragraph 3-3-1.

psen the two set screws (a) (only one is shown in . 16).

rn the hex. head screw (b) counterclockwise to move the reel table in or turn the screw clockwise to ve the table out.

ighten the set screws (a).

n tape in PLAY to check for the correct height of the right reel table. Run tape in REW SPOOL to check the left reel table height. Check also by having e run in F.FWD and REW alternately.

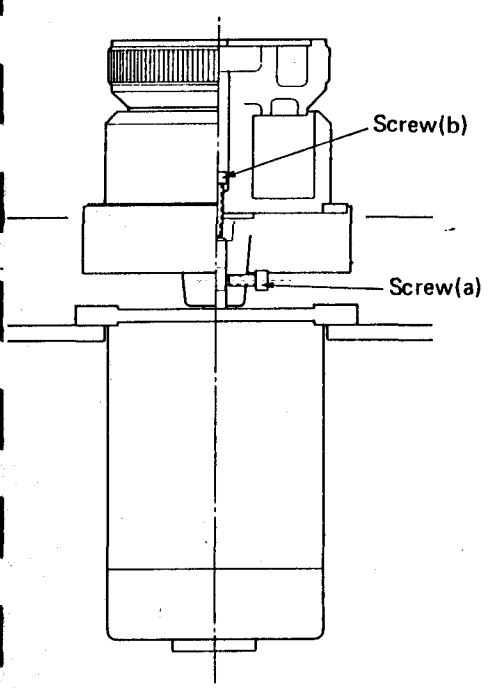


FIG. 16. REEL HEIGHT ADJUSTMENT

Tape speed

speed is measured by using a Flutter Test Tape ning a highly accurate, continuous 3150 Hz tone to page 7).

X" Tape Speed (Play)

nect a digital frequency counter to any OUTPUT, the SPEED MODE switch on the deck to FIX.

ying the beginning of the test tape, check for 3150 ±0.2 % on the frequency counter. Then fast forrd the tape, stop it when its end nears, and play it k to check that the deck output is within the its as before.

mits are exceeded, check pinch roller pressure and up tension, clean tape path, and capstan servo.

t Winding and Spooling Tape Speeds

are measured with an oscilloscope connected to r TP-2 on the Control PCB (see Fig. 15). Adjustpoints are provided on the VR/OSC PCB (see Fig. ge 13). Measurements are taken by having tape s middle portion.

Fast winding speeds

1. Run tape in F.FWD and adjust R103 until "T" is 4.2 msec. (that corresponds to about 7.5 m/s). Then, run tape in REW to check for the same "T" value.

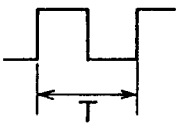


FIG. 17.

Spooling speeds

2. Press F.FWD and SPOOL buttons and adjust R102 until "T" is 12.5 msec. (that corresponds to about 2.5 m/s). Then, run tape in reverse spool to check for the same "T" value.

"Quick Cue" speed

3. Press EDIT, hold F.FWD and adjust R101 until "T" is 42 msec. (that corresponds to about 76 cm/s). Then, hold REW to check for the same "T" value.

C. "VARI" Tape Speed

CHECK

1. Make the following settings:
   SPEED MODE switch to VARI;
   PITCH CONTROL knob to center;
   DISPLAY switch for "% of tape speed change" display.
2. Run the appropriate test tape in PLAY and check for 00.0 (%) in the counter display window. Then turn the PITCH CONTROL knob fully left to check that the percentage reading drops to −15 (or lower), and turn the knob fully right to check that the reading goes up to +15 (or higher). If readings don't meet specifications, proceed as follows:

ADJUSTMENT

1. Check to make sure that the deck is set as in step 1 under the previous paragraph, CHECK.
2. Open the control panel (refer to paragraph 3-3-2).
3. Locate R21 and R22 on the DISPLAY PC Board (refer to Fig. 18) and set them to mechanical center.
4. Run the tape in PLAY and, while it plays, adjust R21 for less than 1 % display, then adjust R22 for 00.0 % display.

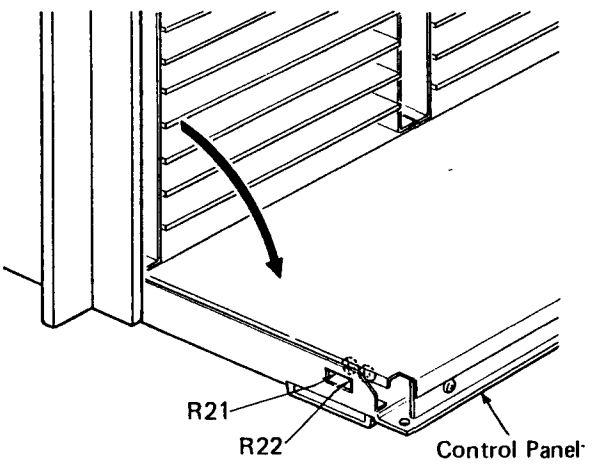


FIG. 18. "VARI" SPEED ADJUSTMENTS

3-4-7. Tape travel

After replacement or adjustment of heads, tension arm, pinch roller, capstan motor or any other parts that contact tape, it is essential to check for correct tape travel.

A. Tension Roller Height (Fig. 19a)
Run tape in PLAY to check to see whether or not the tape rubs on the lower flange of the left and right tape guides. Repeat the check in F. FWD and REW. If adjustment is necessary, proceed as follows:

1. Using a good cleaner, thoroughly clean pinch roller, capstan shaft and all other parts in the tape path.
2. Remove the left tape guide cap using a 3-mm hex wrench. Unscrew the left tension roller cap by turning it counterclockwise with your fingers.
3. Run the tape in PLAY and turn the adjustment screw located in the top center of the left tension roller in or out so the tape lower edge nearly touches the left tape guide lower flange (no tape curl must be observable).
4. Reinstate the two caps.
5. Similarly, remove the cap from both the right tape guide and the right tension roller, and run the tape in Reverse Spool mode to adjust the right tension roller height.
6. Reinstate the caps.

After performing the above steps, be sure to check for correct height of both the left and right reel tables (paragraph 3-4-5).

B. Tension Base Assembly Tilt (Fig. 19a and b)
Removal of either or both the left and right tension base assemblies entails their tilt adjustment.
Tilt adjustment must also be made if any of the tilt adjustment screws are turned in or out by accident or not.

After installing tension base assemblies (replacement or original), first visually check parallelism between the tension base assembly and transport panel, the best is use a separately available service tool (part no. 5801316300) which is actually the same piece as the Base Stay shown in Fig. 19a (see also Exploded View-2, Ref. No. 2-48, page 27).

Then, proceed as follows:
1. Run tape in REW/SPOOL, and turn the left tilt adjustment screw in or out until the tape lower edge nearly touches the left tape guide lower flange. To prevent tape slippage at the impedance roller during adjustment, slightly increase tape tension by applying a light downward finger pressure to the *right* tension roller.
2. Run tape in F.FWD/SPOOL, and turn the right tilt adjustment screw in or out until the tape lower edge nearly touches the right tape guide lower flange.
3. Switch the transport between F.FWD, REW and STOP to check for no tape curl at any points. Repeat the check several times. If necessary, repeat steps 1 and 2 above, and adjust tension roller height as per the "A" instructions.

C. Capstan Zenith (Fig. 20)
If necessary, tape running height at the *right* tape guide can further be adjusted by adjusting capstan zenith.

Before performing the procedure that follows, perform the Tension Roller Height Adjustment (procedure "A") if you didn't yet.

1. Locate the capstan zenith adjustment screw by referring to Figure 20.
2. Run tape in PLAY. Slightly turn the screw in or out until the tape lower edge nearly touches the lower flange of the right tape guide. Turn the screw clockwise to lower the tape running height, or counterclockwise to raise the tape running height.

NOTE: Upon completion of adjustments, be sure to check head azimuth by referring to paragraph 3-5-1.

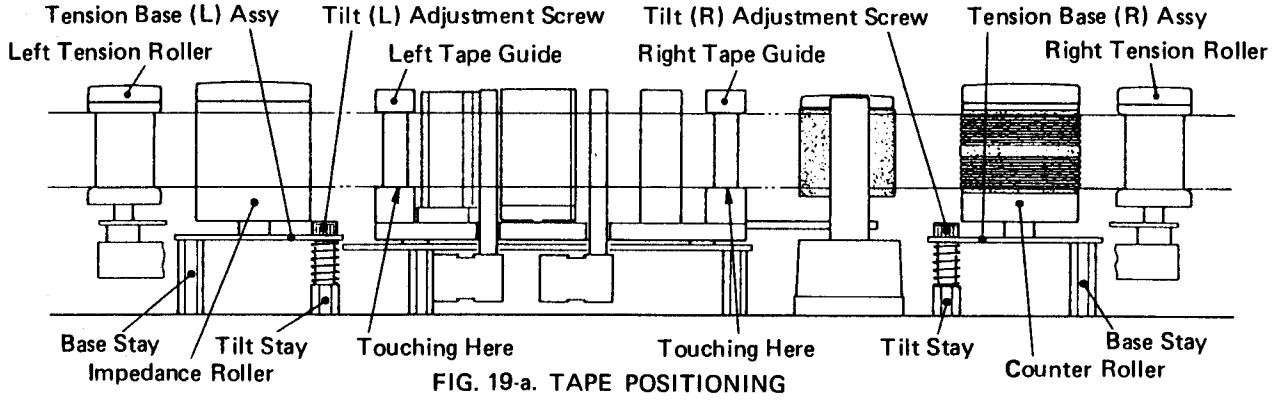


FIG. 19-a. TAPE POSITIONING

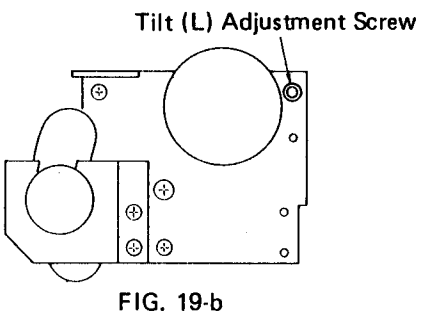


FIG. 19-b

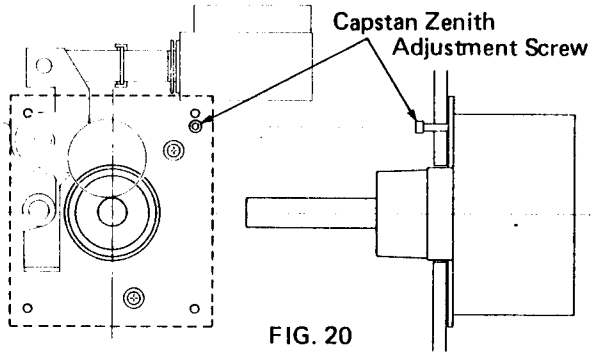
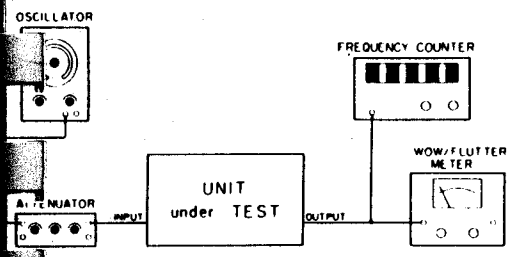


FIG. 20

ow and flutter (reproduce method)

nnect a wow and flutter meter to any channel's ITPUT jack on the deck. Set the wow and flutter for "weighted" readings. Check to make sure he meter is properly calibrated.
y the appropriate wow and flutter test tape (see e 7) at normal "FIX" speed.
the wow and flutter meter. Values should be as s:
DIN/IEC/ANSI (Peak Value, Weighted)
HIGH Speed: ±0.06 %
LOW Speed: ±0.08 %



1. WOW AND FLUTTER MEASUREMENT SET-UP

E: As the measured results may vary with respect cation on the tape at which the measurement is least two locations – the beginning and end of pe – should be checked. There may also be a slight ence in measured absolute values, depending on the meter being used.

Capstan servo

inary
nnect an oscilloscope between TP-1 and GND on e Capstan Servo PCB.
ave INPUT/$\overline{\text{EXT}}$ signal go low (switching to short-circuit between pins 33 and 36 of the CESSORY 1 connector (or pins 13 and 8 of the CCESSORY 2).
ect a generator that can provide a 30 % higher ency signal than the 9.6 kHz reference (signal of ut 12.5 kHz) and a 40 % lower frequency signal an the reference (signal of about 5.7 kHz) to CESSORY 1's pins 31 (Hot) and 32 (Cold), or use ESSORY 2's pins 7 (Hot) and 14 (Cold).

letion of steps 2 and 3 above can be confirmed by ED MODE "EXT" LED and the digital counter to its PITCH (%) display mode. As a simple ou you can use the +/–15 % variable range of H CONTROL (in which case you'll neglect steps 2 ove), but the best is use the appropriate external o ensure a precise measurement/adjustment.

B. Adjustment

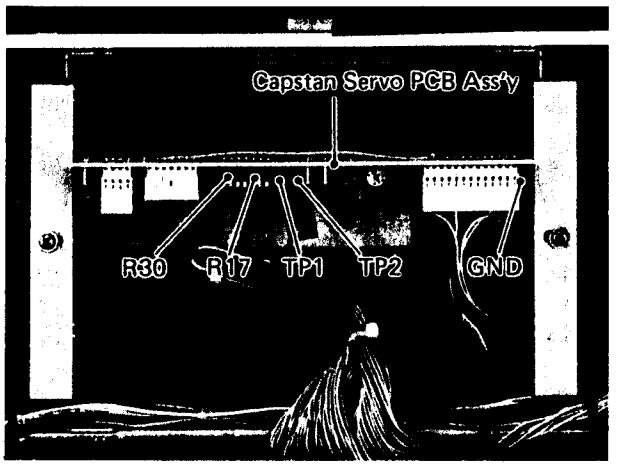


FIG. 22. CAPSTAN SERVO ADJUSTMENTS & TEST POINTS

1. Temporarily set R30 to the 10 o'clock position.
2. Apply a 9.6 kHz reference signal (or, if you are using PITCH CONTROL, set the knob to the center position) and play tape at HIGH speed, then adjust R17 until duty factor is about 25 %.

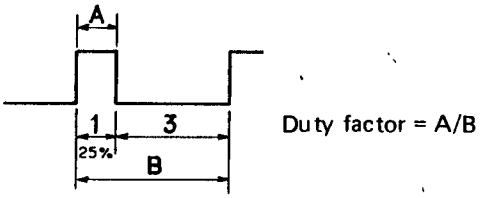


FIG. 23. R17 ADJUSTMENT

3. Apply a 30 % higher frequency signal and adjust R30 until duty factor is 10 to 20 % (centered to 15 %) (or turn PITCH CONTROL fully right to the +15 % position and adjust R30 for a duty factor of 20 to 25 %).
4. Switch the external signal back to 9.6 kHz (or set PITCH CONTROL back to the center position) and adjust R17 until duty factor is 50 %.

C. Check

By switching the external signal between the "-40 %" and "+30 %" frequencies, check for the following duty factors (the values shown are not absolute but reference):

80 % (approx.) with "-40 %" frequency signal
30 % (approx.) with "+30 %" frequency signal

(When using PITCH CONTROL)
65 % (approx.) at -15 % position
40 % (approx.) at +15 % position

Repeat procedure at LOW speed.

3-5. Audio Alignment

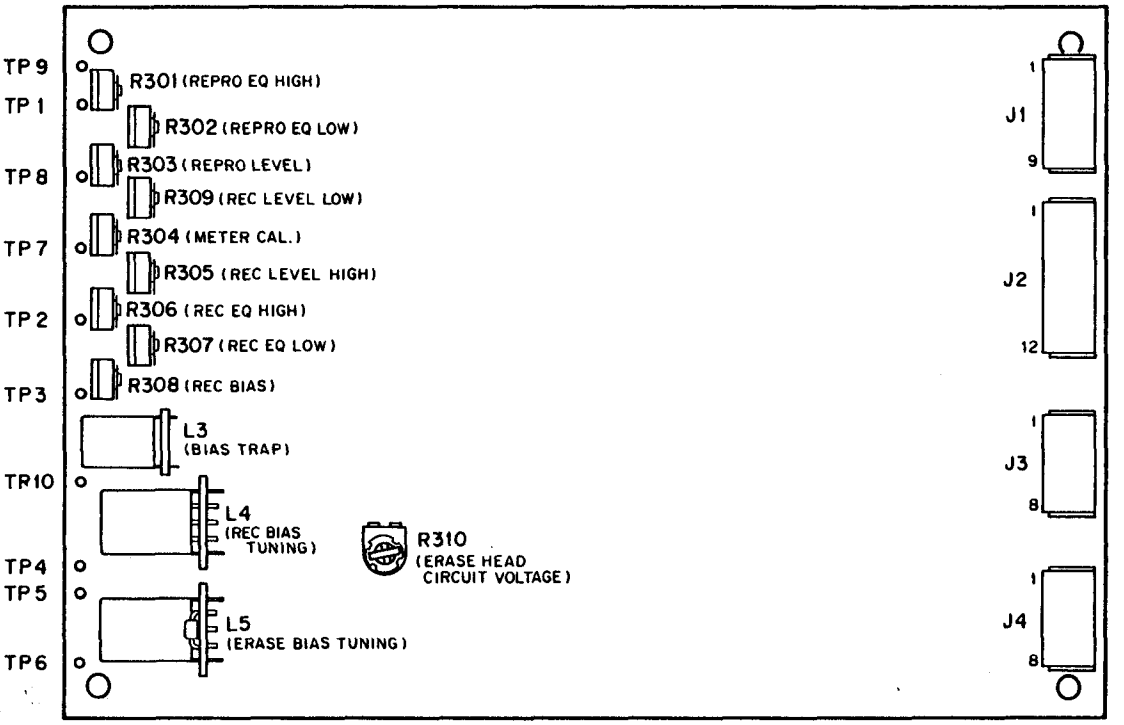


FIG. 24. LOCATIONS OF ELECTRICAL ADJUSTMENTS & TEST POINTS

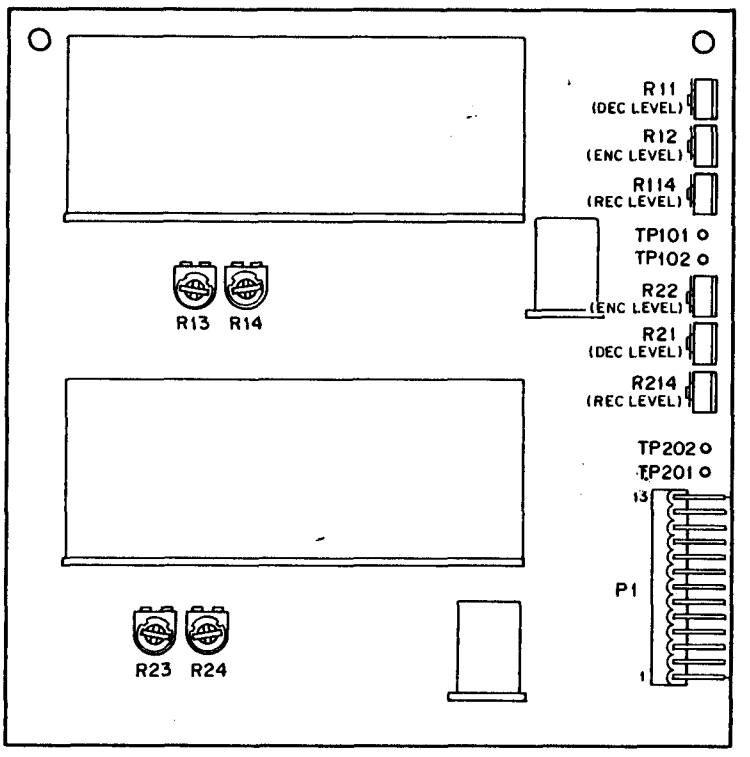


FIG. 25. DOLBY S NR ADJUSTMENTS AND TEST POINTS

3-5-1. Preliminary procedure (Head azimuth adjustment)

Before proceeding to audio alignment, be sure to check and adjust head azimuth as follows (only the record/repro head need be checked and adjusted; the erase head is fixed and has no adjustment):

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

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

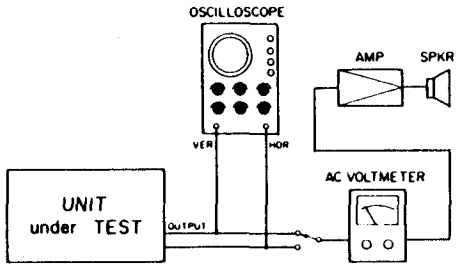


FIG. 26. HEAD AZIMUTH TEST SET-UP

2. Set the tape speed to HIGH, play the 10 kHz signals on the test tape (see page 7) 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:

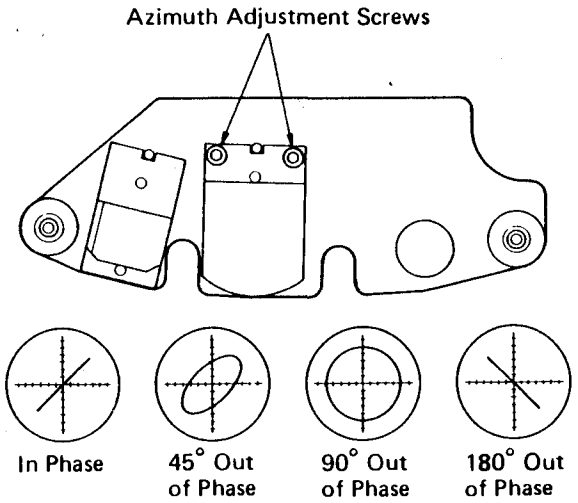


FIG. 27. HEAD AZIMUTH ADJUSTMENTS

a. Connect the scope to outputs 2 and 23 and play the 16 kHz signals on the test tape.
b. Adjust the azimuth adjustment screw shown in Fig. 27 (by slightly loosening one while tightening the other, alternately) until channels 2 and 23 are in phase as seen on the scope and, at the same time, the voltmeter provides maximum reading.

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 azimuth is 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. 28.
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.

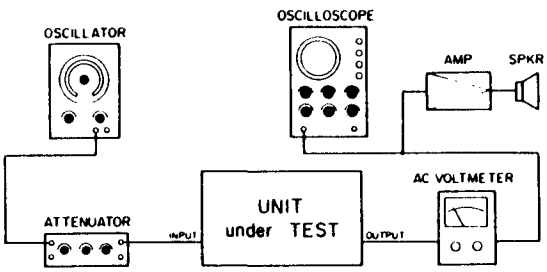


FIG. 28. SET-UP FOR LEVEL & FREQUENCY RESPONSE CHECKS

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 R304 on the R/P AMPL PCB of channel being checked and adjust R304 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 for HIGH speed use (refer to page 7) and reproduce the 400 Hz 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 R303 on the R/P AMPL PCB of the channel concerned.
3. Similarly, switch the tape speed to LOW, play the 400 Hz signal on a low speed test tape, and check for an output level of −10 dBV.
4. Repeat procedure for the remaining channels.

3-5-5. Reproduce frequency response

1. Load the appropriate test tape (refer to page 7) on the deck.
2. Check to make sure that ALL INPUT is not engaged (LED off), then press PLAY.

). Dolby S NR IN/OUT level

hen record level is adjusted (paragraph 3-5-9), per- the following:

nnect a 400 Hz, −10 dBV (316 mV) signal to the INPUT jack of channel 1.
Record the input signal on a blank tape, first with the lby S NR switch (1-24) turned on, then with the lby S NR switch turned off.
Rewind the tape and play the recording, to check that the OUTPUT level from the recording made with lby S NR is −10 dBV ±0.5 dB, and the level from recording without Dolby S NR is exactly −10 dBV.
Similarly, check the remaining channels.

. Overall frequency response

SPEED

With the same connections as in paragraph 3-5-9, nge the input signal to 20 kHz, −10 dBV (316) and connect this signal to channel 1 INPUT jack.
king sure that the TAPE SPEED selector switch is set to HIGH, record the input signal, then rewind the e and play the recording, to check for −10 dBV 6 mV) at the channel 1 OUTPUT jack. If neces- y, adjust R306 on the R/P AMPL. PCB.
Initiate again record mode and sweep the signal quency over the range of 40 Hz to 20 kHz. Then ind the tape and play the recording. Measure the put level over the specified frequency range and check that the tolerance meets the specifications own in Fig. 30.

SPEED

Set the TAPE SPEED selector to LOW, change the ut signal to 16 kHz, −20 dBV (100 mV), initiate ord mode, rewind the tape, and play the recording, to check for −20 dBV at the OUTPUT jack. If neces- sary, adjust R307 on the R/P AMPL. PCB.
tiate again record mode and sweep the signal quency over the range of 40 Hz to 16 kHz. Then

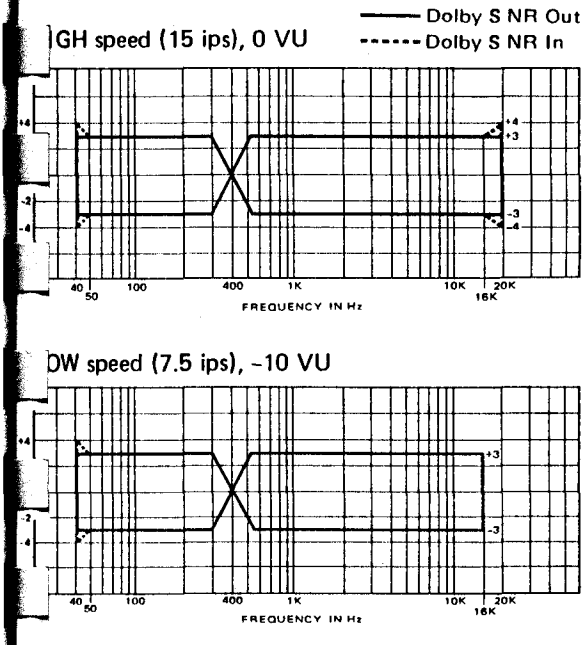


FIG. 30. OVERALL FREQUENCY RESPONSE

rewind the tape and play the recording. Measure the output level over the specified frequency range and check that the tolerance meets the specifications shown in Fig. 30.
6. Repeat the procedure for the remaining channels.

3-5-12. 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. Also, make sure the head shield is in its Up position (unlatched).

1. Turn DOLBY S NR *off* and 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 48 dB or greater (HIGH speed)/46 dB or greater (LOW speed).
4. Repeat the procedure with DOLBY S NR *on*, to check that the S/N ratio is 20 dB or more better (both at HIGH and LOW speeds) than the ratio obtained without DOLBY S NR.

   If difference is below specifications, perform the following:
   a. Demagnetize heads and other metal parts in the tape path.
   b. Check Erasure (paragraph 3-5-14).
   c. Check and adjust Record Bias (paragraph 3-5-8).
   Then repeat the procedure above using another blank test tape.

3-5-13. Overall distortion check

1. Connect test equipment as shown in Fig. 31.
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 3-5-8).
   – Demagnetize the erase and record/repro heads.
   – As a final measure, replace the record/repro head.

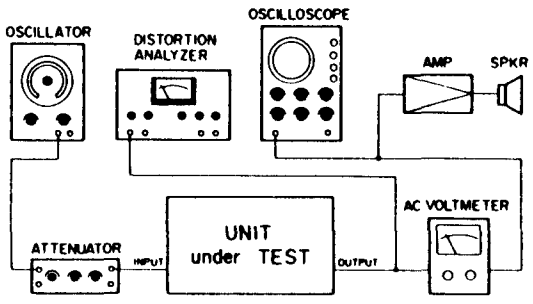


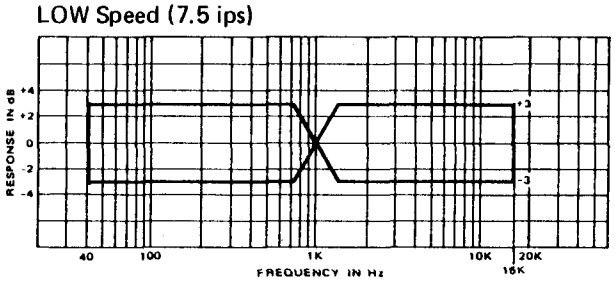
FIG. 31. DISTORTION TEST SET-UP

3. Measure the output signal and check that the frequency range is within the limits shown in Fig. 29. If necessary, adjust the following pots on the R/P AMPL PCBs:
   R301 for response at HIGH;
   R302 for response at LOW.

   If adjustments of the pots 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.

LOW Speed (7.5 ips)



HIGH Speed (15 ips)

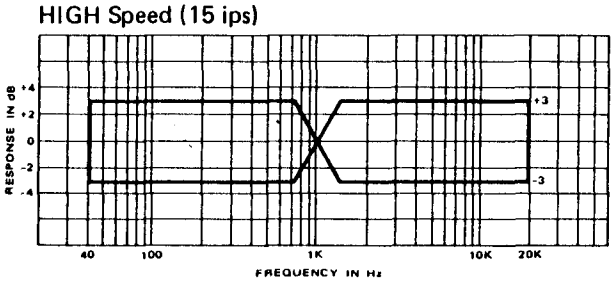


FIG. 29. REPRODUCE FREQUENCY RESPONSE

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.

A. ERASE HEAD BIAS TUNING (L5)

1. Connect a DC voltmeter between TP-5 (Hot) and TP-6 (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 L5 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 (L4)

1. Connect a DC voltmeter between TP-4 (Hot) and TP-6 (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. Turn R308 on the R/P AMPL. PCB fully clockwise.
4. Use an insulated screwdriver to adjust L4 on the same amplifier PC board until the DC voltmeter shows minimum reading.
5. Repeat the procedure for the remaining channels.

C. RECORD BIAS TRAP (L3)

1. Connect an AC voltmeter between TP-3 and TP-5 (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 L3 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. Adjustment of the erase head circuit voltage

1. Making sure that adjustment A under paragraph 3-5-6 has been completed, connect a DC voltmeter between TP-10 (Hot) and TP-6 (Cold).
2. Check that the voltmeter reads 15 V ±0.5 V.
3. If necessary, adjust R310.
   NOTE: Use the provided Extension Card.

3-5-8. Record bias adjustment

1. Load a blank test tape AMPEX 456 on the deck.
2. Set the TAPE SPEED selector switch to LOW.
3. Connect an AC voltmeter between TP-1 and TP-9 on the R/P AMPL. PCB.
4. Initiate Record mode.
5. Adjust R308 on the R/P AMPL. PCB for a 24 mV ± 2 mV reading on the voltmeter.
6. Similarly, check for 26 mV (approx.) at HIGH speed.

3-5-9. Record level

The following procedure MUST be performed AFTER completion of the bias adjustment. Also, be sure to check and adjust at HIGH speed first then at LOW speed. Don't reverse.

1. Set the TAPE SPEED selector switch to HIGH.
2. Connect test equipment to the tape deck as in paragraph 3-5-2.
3. Apply a 400 Hz, -10 dBV (316 mV) signal to the channel 1 INPUT jack.
4. Load a blank test tape AMPEX 456 on the deck.
5. Record the 400 Hz, -10 dBV signal. Then rewind the tape and play the recording, to check for -10 dBV (316 mV) ±0.5 dB at the OUTPUT jack. If necessary, adjust R305 on the R/P AMPL. PCB.
6. Set the TAPE SPEED selector switch to LOW and repeat procedure. If necessary adjust R309.
   Check and adjust all the channels in the same way.
   The level difference between channels should be less than 0.5 dB.

NOTE: The above check should be performed at HIGH speed *first,* and if any channel output level is adjusted, be sure, thereafter, to repeat the check (and the adjustment if necessary) at LOW speed.

6. Dolby S NR PCB Adjustments

Dolby S NR PCBs have been properly adjusted e shipped and the following adjustments need be med only when components on the PCBs are re-aced because damaged.

TION: Prior to removing or replacing Dolby S NR check to make sure that the deck is turned off.

Preliminary procedure

1. Apply +12 V to P1-3 and −12 V to P1-1 on the Dolby S NR PCB.
2. Set all the adjustment resistors to center (Fig. 25, page 17).

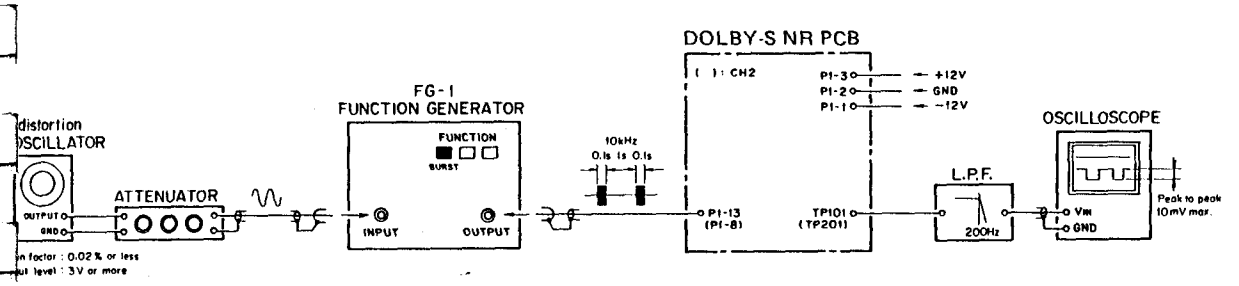


FIG. 34. DYNAMIC OFFSET ADJUSTMENT

3-5-14. Erasure

1. Connect test equipment as shown in Fig. 32. The filter to be used is a 1 kHz B.P.F.
2. Set the oscillator to apply a 1 kHz, 0 dBV (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).

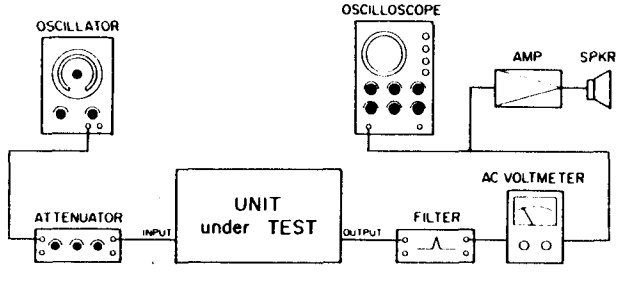


FIG. 32. ERASURE TEST SET-UP

3-5-15. Channel crosstalk

1. Connect test equipment as shown in Fig. 33. The filter to be used is a 1 kHz B.P.F.
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).

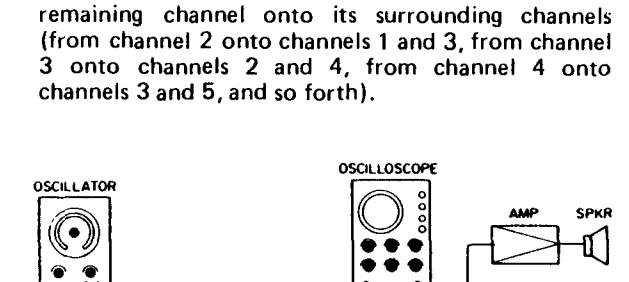


FIG. 33. CROSSTALK TEST SET-UP

3-5-16. Sync crosstalk

Sync crosstalk refers to the crosstalk occured durin sync recordings (overdubs) because record signal leak from a channel set for record onto its surroundin channels set for playback.
Test set-up is the same as in paragraph 3-5-15 (with a kHz B.P.F inserted).

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

3-6-1. Adjustments location

Refer to Fig. 25, page 17.

3-6-2. Decode Level

1. Using oscillator, connect a 400 Hz, −7.6 dBm signal to P1-13 (for CH1 IN)/P1-8 (for CH2 IN).
2. To enter Decode mode, open P1-9 (CH1 E/D)/P1-4 (CH2 E/D).
3. Check that the output level at TP101 (CH1 LINE OUT)/TP201 (CH2 LINE OUT) as seen on a digital voltmeter is -6 ±0.1 dBm. If necessary, adjust R11 (CH1)/R21 (CH2).
4. Check for -7.7 ±0.2 dBm at decode output P1-11 (CH1 OUT)/P1-6 (CH2 OUT).

3-6-3. Encode Level

1. Using oscillator, connect a −7.8 dBm signal to P1-13 (CH1 IN)/P1-8 (CH2 IN).
2. To enter Encode mode, connect P1-9 (CH1 E/D)/ P1-4 (CH2 E/D) to P1-2 (GND).
3. Check that the output level at TP101 (CH1 LINE OUT)/TP201 (CH2 LINE OUT) as seen on the digital voltmeter is -6 ±0.1 dBm. If necessary, adjust R12 (CH1)/R22 (CH2).
4. Adjust R114 (CH1)/R214 (CH2) for -7.7 ±0.1 dBm at encode out P1-11 (CH1 OUT)/P1-6 (CH2 OUT).

3-6-4. Encode Performance Check

1. With the same conditions as in step 4 under "Encode Level", switch the oscillator output to -47.8 dBm (40 dB below nominal).
2. Check that the output level at P1-11 (CH1 OUT)/ P1-6 (CH2 OUT) for each frequency is as shown below.

   50 Hz: +7.5 dB +0.5/-1.5 dB with respect to -47.8 dBm
   300 Hz: +16.3 dB +1.2/-0.8 dB with respect to -47.8 dBm
   2 kHz: +16.5 dB +1.2/-0.8 dB with respect to -47.8 dBm
   12 kHz: +14.2 dB +1.5/-0.5 dB with respect to -47.8 dBm

3-6-5. Dynamic Offset Adjustment

1. Connect test equipment as shown in Fig. 34; connec a L .P.F. (f=200 Hz, 24 dB/OCT) to C106 (CH1 RE OUT)/C206 (CH2 REC OUT), and a storage oscill scope to the output of the L.P.F.
2. To enter Encode mode, connect P1-9 (CH1 E/D P1-4 (CH2 E/D) to P1-2 (GND).
3. Switch the oscillator output to −37.8 dBm (30 d below nominal). Apply a tone burst signal of 10 kH 100 msec On, 1 sec Off as shown in Fig. 34, to P1-1 (CH1 IN)/P1-8 (CH2 IN).
4. Watch the oscilloscope and adjust the oscillator ou put for a maximum amplitude of waveform (in ge eral, this should be from −37.8 to −47.8 dBm: 30 40 dB below nominal).
5. Set R14 (CH1)/R24 (CH2) to the mechanical cent position.
6. Watch the scope and adjust R13 (CH1)/R23 (CH for a minimum peak-to-peak display, then similar adjust R14 (CH1)/R24 (CH2).
7. Fine adjust R13 (CH1)/R23 (CH2) again for a mir mum peak-to-peak display on the scope. The displa ed value must be 10 mV or less.

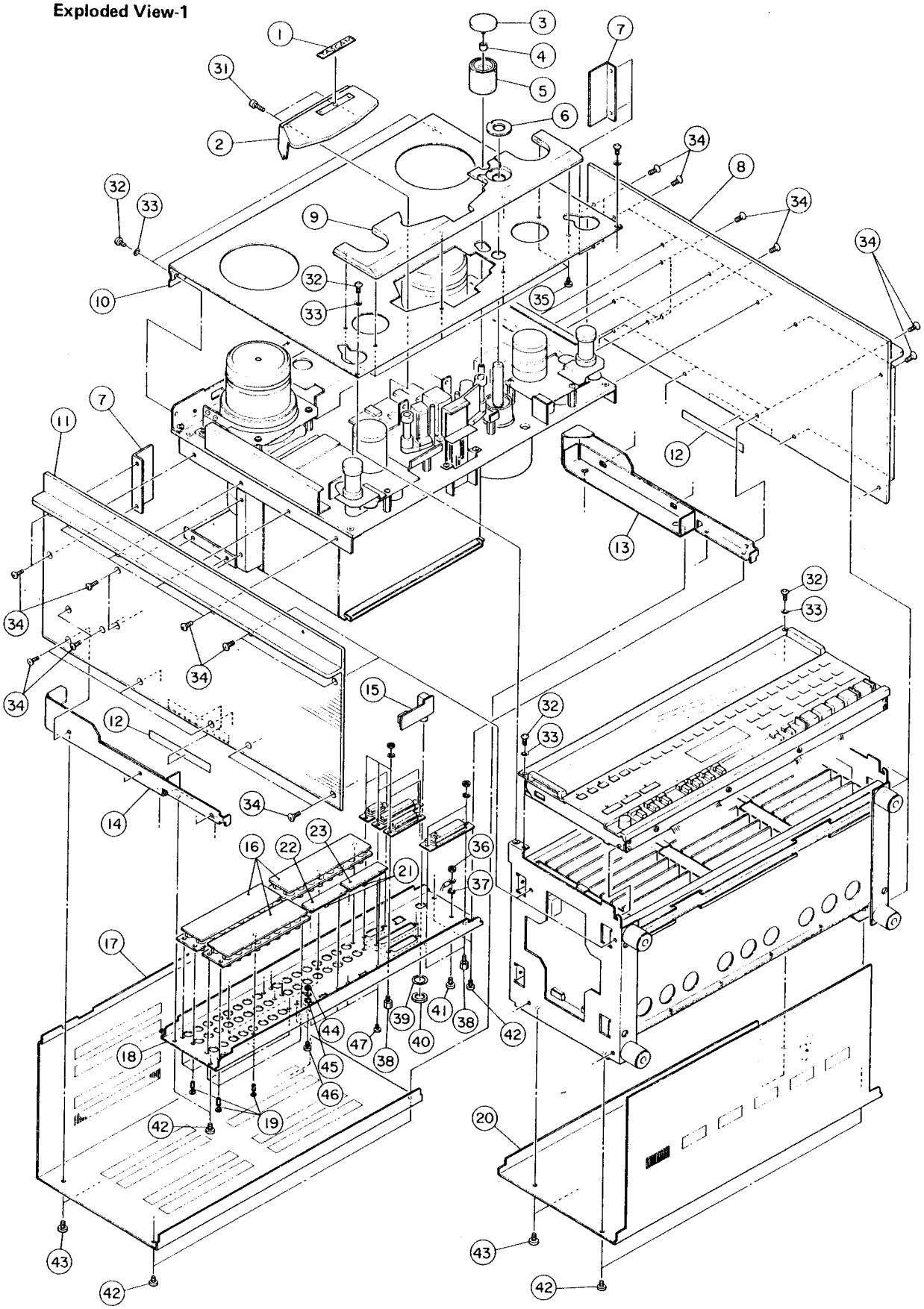
CHECKS AND ADJUSTMENTS CHART

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.	Check only	−10 dBV (316 mV) on VTVM
2	Meter (Input)	Same as above	LED meter	Same as above	R304	0 dB on LED meters.
3	Reproduce Head Alignment	16 kHz, nominal level signal contained in test tape for HIGH speed use. See p. 7, "Test Equipment".	VTVM and oscilloscope with vertical and horizontal inputs connected to OUTPUT CH2 and 23.	Reproduce at HIGH speed with ALL INPUT disengaged.	Repro head azimuth adjusting screw.	Maximum output, in phase of Trk 2 & 23 outputs (at 16 kHz).
4	Reproduce Level at High speed	Nominal level signal contained in test tape (p. 7)	VTVM connected to OUTPUT jack.	Reproduce at High speed with ALL INPUT disengaged.	R303	−10 dBV (316 mV) on VTVM.
5	Reproduce EQ (High frequency) at High speed.	20 kHz signal contained in test tape (p. 7)	VTVM connected to OUTPUT jack.	Reproduce at High speed with ALL INPUT disengaged.	R301	Same reading on VTVM as for 1 kHz signal.
6	Reproduce EQ (High frequency) at Low speed.	16 kHz signal contained in test tape.	Same as above	Reproduce at Low with ALL INPUT disengaged.	R302	Same as above
7	Bias Trap Adjustment	No input signal	VTVM connected to Bias Trap test points TP-3 and TP-9.	Recording with no signal connected.	L3	Minimum output at Bias Trap test point.
8	Bias Level Adjustment	No input signal	VTVM connected between TP-1 & TP-9.	Record at LOW onto the same type of tape as used for the actual recording.	R308	24 mV ± 2 mV on VTVM
9	Recording Level at High speed	400 Hz, -10 dBV signal connected to INPUT jack.	VTVM connected to OUTPUT jack.	Recording at HIGH then its playback.	R305	−10 dBV (316 mV) at OUTPUT jack.
10	Recording Level at Low speed	Same as above	Same as above	Record at Low then its playback	R309	Same as above
11	Overall Frequency at High speed. (HIGH-FREQ)	20 kHz signal connected to INPUT jack (at −10 dBV).	Same as above	Same as above	R306	Within the limits given in Fig. 30.
12	Overall Frequency at Low speed. (HIGH-FREQ)	16 kHz signal connected to INPUT jack (at −20 dBV).	Same as above	Same as above	R307	Same as above
13	Overall Signal-to-Noise Ratio	No input signal	VTVM connected to OUTPUT jacks.	Recording at HIGH then at LOW, with ALL INPUT disengaged.	Check	Check for 48 dB or better (for HIGH speed)/46 dB or better (for LOW speed)
14	Overall Distortion	1 kHz signal, -10 dBV connected to INPUT jack	VTVM connected to OUTPUT jacks	Recording at High & Low then its playback	Check	Less than 0.8 %
15	Erasure	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.	Check	70 dB or greater (through 1 kHz filter). (Refer to paragraph 3-5-14.)

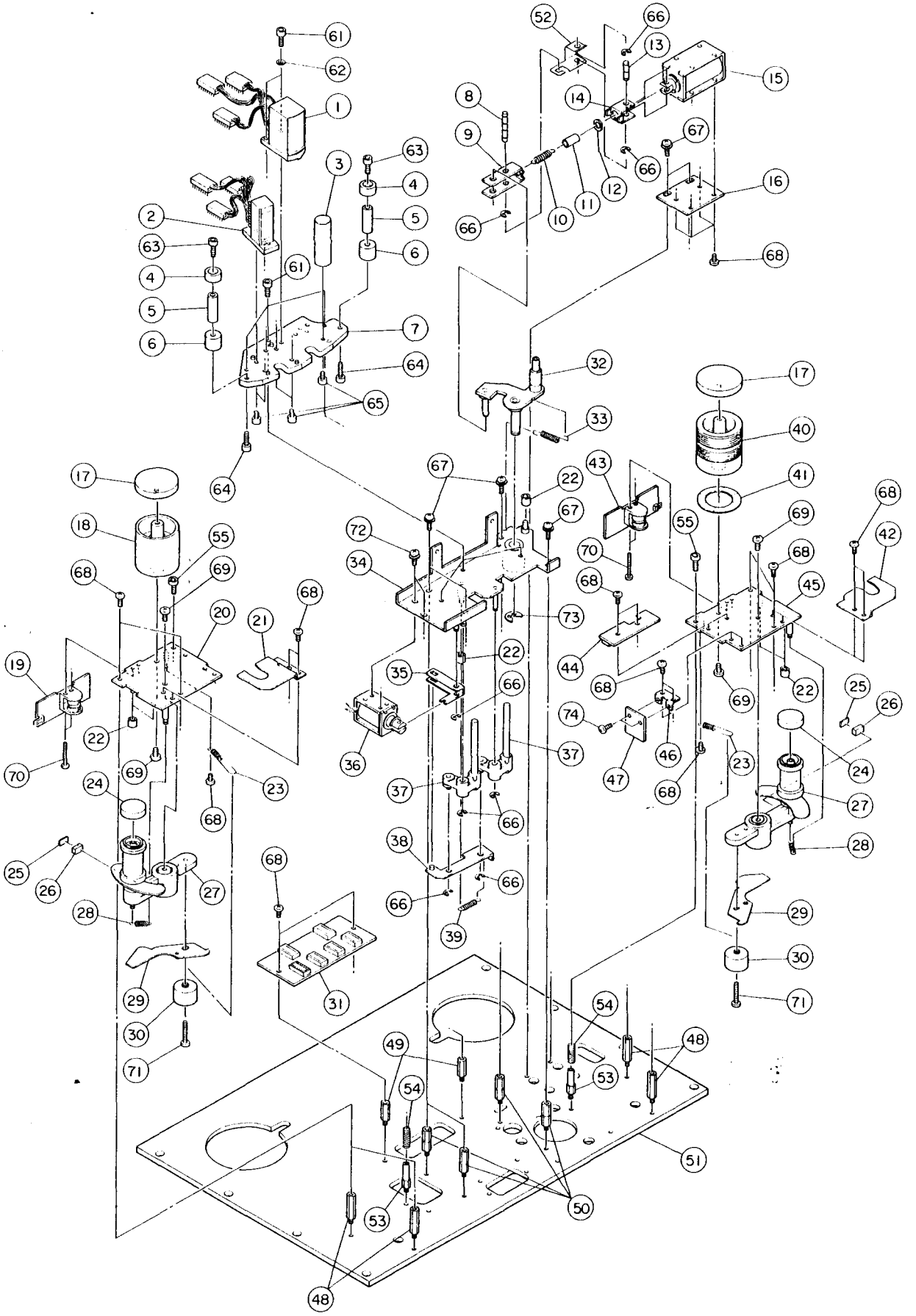
4. PARTS LISTS

4-1. Mechanics

Exploded View-1



Exploded View-2



EXPLODED VIEW-1

REF.NO.	PARTS NO.	DESCREPTION	REMARKS
1- 1	*5720201400	BADGE,TASCAM	
1- 2	*5801323400	HOUSING,HEAD	
1- 3	5801144400	CAP,PINCH ROLLER	
1- 4	5801318800	COLLER,PINCH ROLLER	
1- 5	5801311800	PINCH ROLLER ASSY	
1- 6	*5801144200	RING(A),DRESS	
1- 7	*5801315800	PLATE,REINFORCEMENT	
1- 8	*5801313000	PANEL(R),SIDE	
1- 9	*5801132300	BASE,HOUSING	
1-10	*5801141201	PANEL,FRONT	
1-11	*5801312900	PANEL(L),SIDE	
1-12	*5801322000	PROTECTOR	
1-13	*5801168700	ANGLE(R) ASSY,REAR	
1-14	*5801168800	NAGLE(L) ASSY,REAR	
1-15	*5200298000	BAUD RATE PCB ASSY	Refer to pages 52 & 57
1-16	*5200296700	IN/OUT PCB ASSY	Refer to pages 52 & 57
1-17	*5801141700	COVER,TOP	
1-18	*5801451000	PANEL,CONNECTOR	
1-19	*5534878000	RIVET,PUSH B M144	
1-20	*5801321900	COVER,BOTTOM	
1-21	*5300910600	SW.,SLIDE SSB082	
1-22	*5210296500	SW A PCB	Refer to page 52
1-23	*5210296600	SW B PCB	Refer to page 52
1-31	*5781773010	SCREW,HEX. M3X10	
1-32	*5781783006	SCREW,PHA3*6FNB	
1-33	*5785223000	WASHER,FIBER 3X6X0.5T	
1-34	*5780324010	SCREW,OVAL COUNTERSUNK M4X10(BLKNI)	
1-35	*5781002606	SCREW,PAN TAPPING M2.6X6	
1-36	*5781814000	NUT,M4	
1-37	*5785124000	WASHER,LOCK M4.0	
1-38	*5730015900	POST,JUCK D20418-J3F	
1-39	*5785309100	WASHER,POLIS. 12X16X0.25T	
1-40	*5781851200	NUT,M12	
1-41	*5780024008	SCREW,BIND M4X8(BLK NI)	
1-42	*5783593006	SCREW,B. C-TITE M3X6	
1-43	*5780024006	SCREW,BIND M4X6(BLK NI)	
1-44	*5781813000	NUT,M3	
1-45	*5785123000	WASHER,TOOTHED B-TYPE 3MM	
1-46	*5780023008	SCREW,BIND M3X8(BLK NI)	
1-47	*5780122604	SCREW,PAN M2.6X4(BLK NI)	

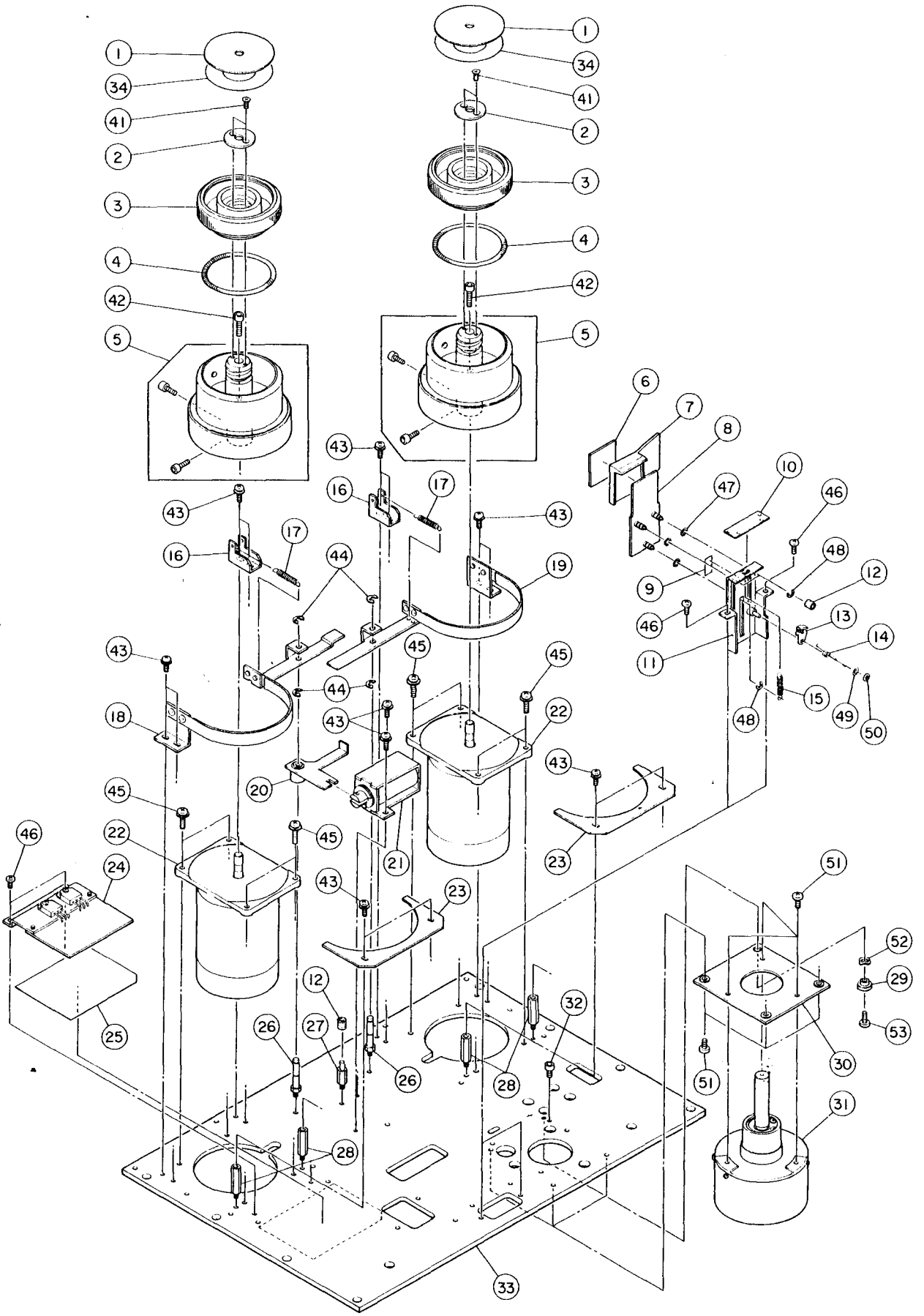
Parts marked with *require longer delivery time.

EXPLODED VIEW-2

REF.NO.	PARTS NO.	DESCREPTION	REMARKS
2- 1	5378308800	HEAD,R/P	
2- 2	5378308900	HEAD,ERASE	
2- 3	*5801319100	POLE,DUMMY	
2- 4	5801134000	CAP,GUIDE	
2- 5	5801319000	GUIDE,TAPE	
2- 6	*5801134100	BASE,GUIDE	
2- 7	*5801133700	BASE ASSY,HEAD	
2- 8	*5801136900	SHAFT(B),JOINT	
2- 9	*5801136700	LINK(B)	
2-10	*5801137200	SPRING,PINCH ROLLER	
2-11	*5785606020	SPACER,6.2X7.8X20	
2-12	*5801137000	CUSION	
2-13	*5801136800	SHAFT(A),JOINT	
2-14	*5801136600	LINK(A)	
2-15	5313004000	SOLENOID,PINCH ROLLER	
2-16	*5801137100	BRACKET,SOLENOID	
2-17	5801138700	CAP,ROLLER	
2-18	5801306900	ROLLER ASSY	
2-19	*5200297800	SENSOR L PCB ASSY	Refer to pages 53 & 57
2-20	*5801310801	BASE(L) ASSY,TENSION	
2-21	*5801138400	MASK(A)	
2-22	*5800496100	STOPER	
2-23	*5801318200	SPRING,SERVO	
2-24	5801138600	CAP,TENSION ROLLER	
2-25	*5800298500	PLATE,DAMPER	
2-26	5800298400	DAMPER	
2-27	5801306800	ARM ASSY,TENSION	
2-28	*5801318300	SPRING,SUB	
2-29	*5801138300	PLATE,SERVO	
2-30	*5801138200	WEIGHT,COUNTER	
2-31	*5200292300	HEAD PCB ASSY	Refer to pages 53 & 57
2-32	*5801318600	ARM ASSY,PINCH ROLLER	
2-33	*5801146600	SPRING,RETURN	
2-34	*5801309900	CHASSIS ASSY,SUB	
2-35	*5801312800	LINK(A)	
2-36	5313004101	SOLENOID,LIFTER	
2-37	*5801312100	LIFTER ASSY	
2-38	*5801312500	LINK(B) ASSY	
2-39	*5801318900	SPRING,LIFTER	
2-40	5801318500	ROLLER ASSY,COUNTER	
2-41	*5801318400	ENCODER	
2-42	*5801138500	MASK(B)	
2-43	*5200297900	SENSOR R PCB ASSY	Refer to pages 53 & 57
2-44	*5200291400	PG PCB ASSY	Refer to pages 52 & 57
2-45	*5801310901	BASE(R) ASSY,TENSION	
2-46	*5801311100	BRACKET,SENSOR	
2-47	*5200291500	SHUT PCB ASSY	Refer to pages 52 & 57
2-48	*5801316300	STAY,TENSION BASE	
2-49	*5801316500	STAY,HEAD PCB	
2-50	*5801316400	STAY,SUB CHASSIS	
2-51	*5801315100	CHASSIS,MAIN	
2-52	*5801177300	LIMITER	
2-53	*5801391500	STAY,TILT	
2-54	*5800502700	SPRING	
2-55	*5800528200	SCREW,LONG LOCK M3X10	

Parts marked with *require longer delivery time.

Exploded View-3



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MSR-24S

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RC-424 REMOTE CONTROL UNIT

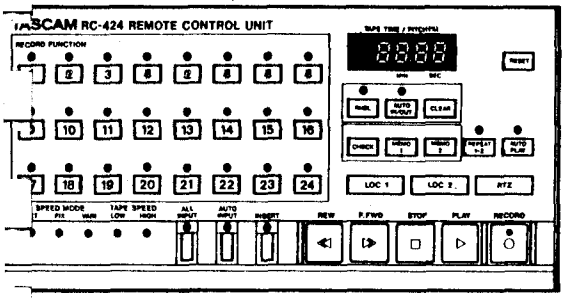
MSR-24専用のワイヤード・リモート・コントロール・ユニットです．このRC-424は，MSR-24のトランスポート部のリモート・コントロールをはじめ，レコード・ファンクション(1～24トラック)，リハーサルおよびオート・イン／アウト，リピート，オート・プレイ，ロケート(1，2)，RTZ(リターン・トゥ・ゼロ)，オール・インプット，オート・インプット，インサートなど，MSR-24本体についているほとんどのスイッチやボタンを装備し，約5m離れた位置から遠隔操作することができます．また，スピード・モードやテープ・スピードの設定表示ランプおよびテープの現在の走行位置を確認するためのデジタル・テープ・カウンターも装備しています．

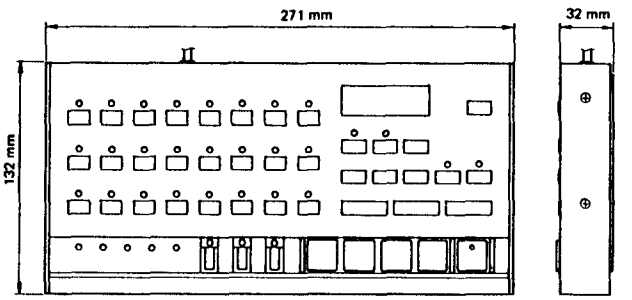
RC-424 仕様

トランスポート・モード：	PLAY, STOP, F.FWD, REW, RECORD
ファンク・ロケーター：	RTZ(リターン・トゥ・ゼロ), MEMO 1, MEMO 2, LOC1, LOC2, REPEAT, AUTO PLAY
カウンター・ディスプレイ：	4桁デジタル・カウンター（テープ・タイム・モードとスピード・モードの切替），RESET
パンチ・イン/アウト：	RHSL（リハーサル），AUTO IN/OUT, CLEAR
トラック・セレクト：	RECORD FUNCTION(トラック1～24), ALL INPUT, AUTO INPUT, INSERT
スピード・モード/テープ・スピード・インジケーター：	EXT, FIX, VARI/LOW, HIGH
接続ケーブル：	約5m (D-sub コネクター，25ピン)
外形寸法：	幅271mm×高さ32mm×奥行132mm
重さ：	1.6kg

RC-424使用上の御注意

1. RC-424の操作ボタン(但し、RECORDボタンとPLAYボタンを除く)を2つ(またはそれ以上)同時に押すと、いずれの動作も行いません。また、あるボタンを押しながら別のボタンを押しても、後から押されたボタンの動作は行われません。複数のボタンを同時に押す必要がある場合は、MSR-24本体の操作ボタンを御使用下さい。
2. リモコンを操作してから本体(MSR-24)が動作するまでに若干の時間差が生じますが、これはシリアル通信を使用しているためで、故障ではありません。





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サービスに関するお問合わせは，最寄りの営業所等へご連絡ください．営業所にはサービス・センターが併設されています．	札幌営業所 ☎ (011)521-4101(代)	〒064	札幌市中央区南7条西2－2 くぼたビル
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	名古屋営業所 ☎ (052)782-4581(代)	〒464	名古屋市千種区東山通り3－2－3
	京都サービス ☎ (075)871-8730(代)	〒616	京都市右京区常盤窪町19 西垣ビル
	大阪営業所 ☎ (06) 384-5201(代)	〒564	吹田市垂水町3－34－10
	岡山サービス ☎ (0862)25-8601	〒700	岡山市新保1142－6
	広島営業所 ☎ (082)294-4751(代)	〒730	広島市中区西川口町13－19
	福岡営業所 ☎ (092)431-5781(代)	〒812	福岡市博多区東光2－2－24
	福岡サービス ☎ (092)936-5672	〒811-22	福岡県粕屋郡志免町志免1041
	沖縄サービス ☎ (09889)2-2020(代)	〒901-22	沖縄県宜野湾市字喜友名229
	サービス一課 ☎ (0425)60-8918	〒190-12	東京都武蔵村山市伊奈平2－11－1

営業所またはサービス・センターの電話番号や住所などは，予告なく変更する場合が有りますのであらかじめ御了承下さい．

TASCAM
TEAC Professional Division

5700117800

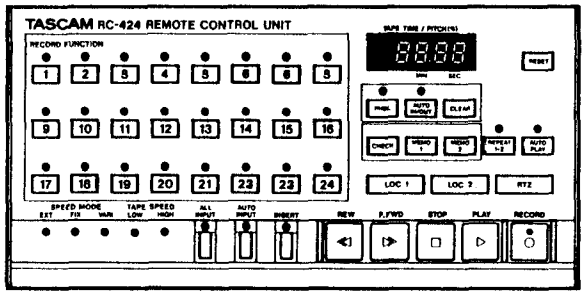
RC-424 REMOTE CONTROL UNIT

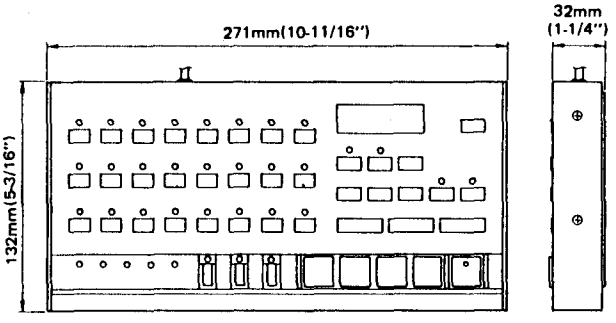
The RC-424 remote control unit comes equipped with a 15-feet (5-meter) cable that plugs into the REMOTE CONTROL connector of the MSR-24.

The RC-424 has duplicates of all the transport functions except Pitch Control, Edit and Spool modes. Indicator lamps on the remote control unit indicate tape speed (LOW or HIGH) and speed mode (EXT, FIX or VARI) as selected on the MSR-24. The RC-424 also provides the capability of programming a punch-in rehearsal sequence, locating the MSR-24 to a specific location stored in two memory registers, repeating playback of a selected portion of a tape, and more (see *Specifications* on the right).

RC-424 Specifications

Transport	: PLAY, STOP, F.FWD, REW, RECORD
Autolocator	: RTZ (Return to Zero), MEMO 1, MEMO 2, LOC 1, LOC 2, REPEAT, AUTO PLAY
Counter Display	: 4-digit digital counter with RESET, switchable between "Tape Run Time" and "% of Speed Change"
Punch-In/Out	: RHSL (Rehearsal), AUTO IN/OUT, CLEAR
Track Select	: RECORD FUNCTION (tracks 1-24), ALL INPUT, AUTO INPUT, INSERT
Speed Mode/Tape Speed Indicators	: EXT, FIX, VARI/LOW, HIGH
Others	: Connection cable (15 ft/5 m length, 25-pin D-sub connector)
Dimensions (WxHxD)	: 10-11/16" x 1-1/4" x 5-3/16" (271 x 32 x 132 mm)
Weight	: 3.53 lbs. (1.6 kg)





Remember,

1) if you press two buttons (or more) on the RC-424 at the same time (except RECORD and PLAY), any function won't be activated. If you hold one and press another, only the function first pressed is effective. All buttons on the RC-424 have effect only when pressing individually, except RECORD and PLAY.
2) connection between the RC-424 and the MSR-24 is achieved serially and it is normal for the MSR-24 to respond more quickly to the front panel controls than to the remote.

TEAC CORPORATION	MAIN OFFICE: 3-7, Nakacho 3-chome, Musashino, Tokyo 180, Japan Phone: (0422) 53-1111 SALES OFFICE: 19-18, Nakacho 1-chome, Musashino, Tokyo 180, Japan Phone: (0422) 52-5081
TEAC AMERICA, INC.	7733 Telegraph Road, Montebello, California 90640 Phone: (213) 726-0303
TEAC UK LIMITED	5 Marlin House, Marlins Meadow, The Croxley Centre, Watford, Herts., WD1 8YA, U.K. Phone: 0923-225235
TEAC DEUTSCHLAND GmbH	Bahnstraße 12, 6200 Wiesbaden-Erbenheim, West Germany Tel.: 06121-71580
TEAC CANADA LTD.	340 Brunel Road Mississauga, Ontario L4Z 2C2, Canada Phone: 416-890-8008
TEAC AUSTRALIA PTY., LTD.	106 Bay Street, Port Melbourne Victoria 3207, Australia Phone: 646-1733

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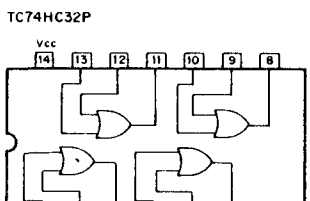

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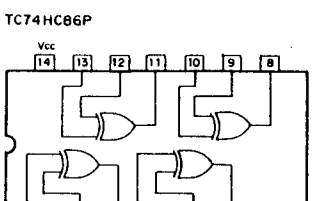

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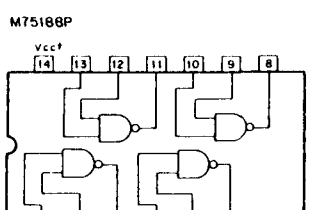

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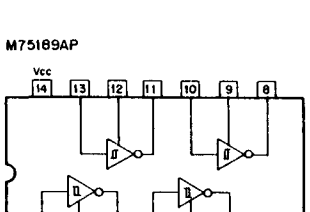

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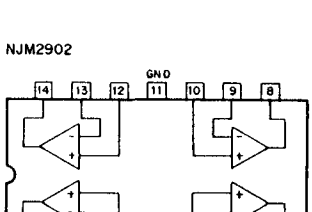

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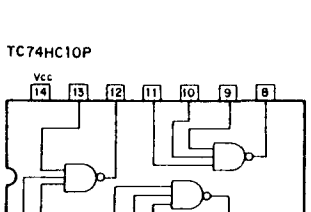

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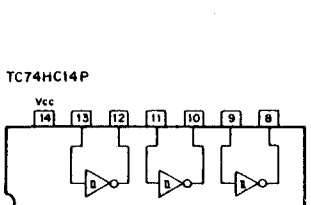

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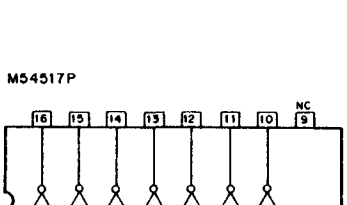

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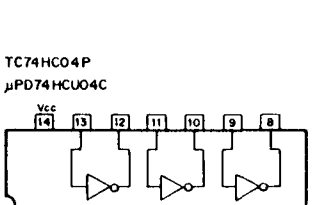

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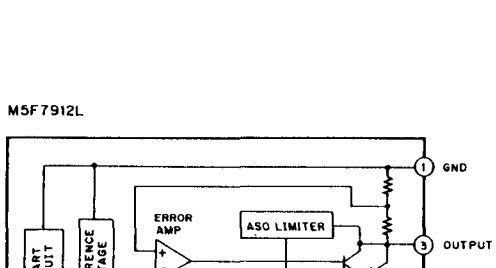

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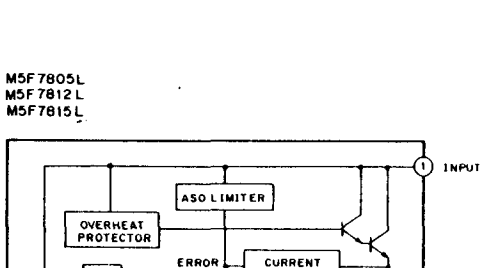

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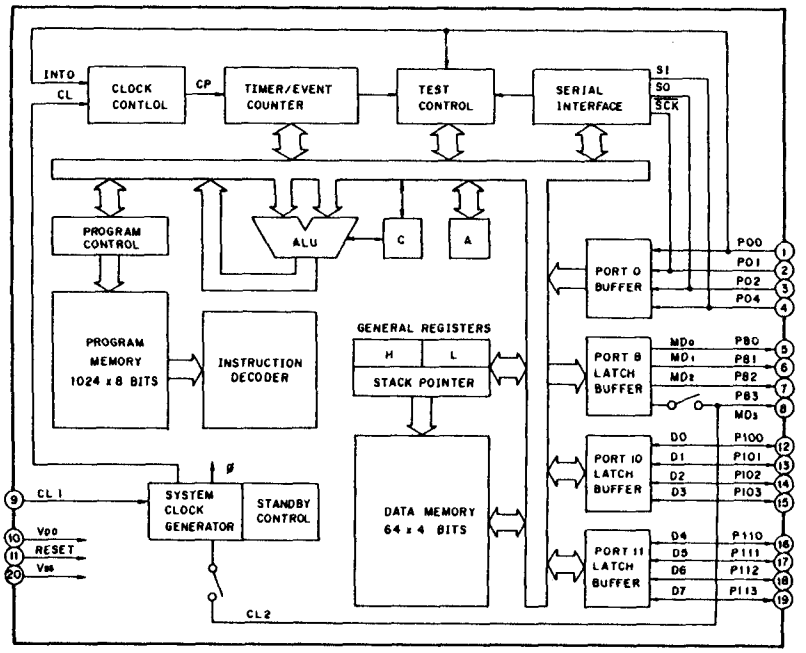

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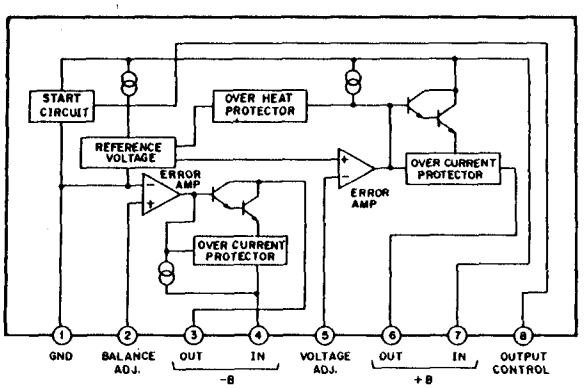

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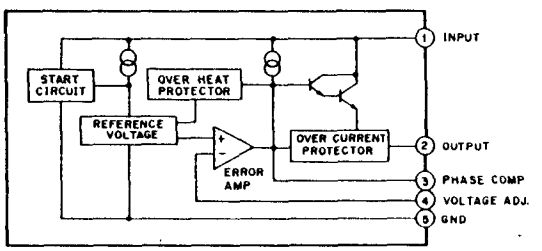

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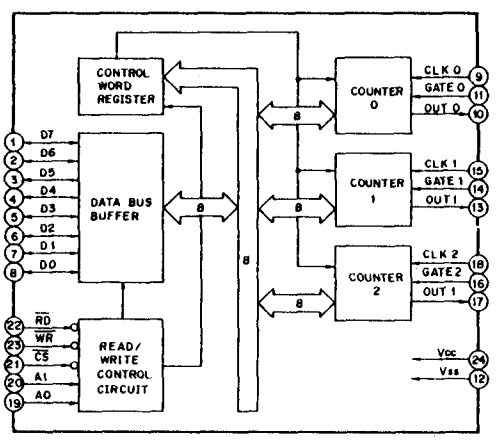

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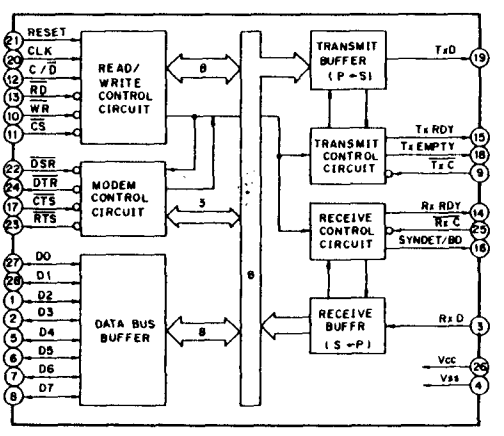

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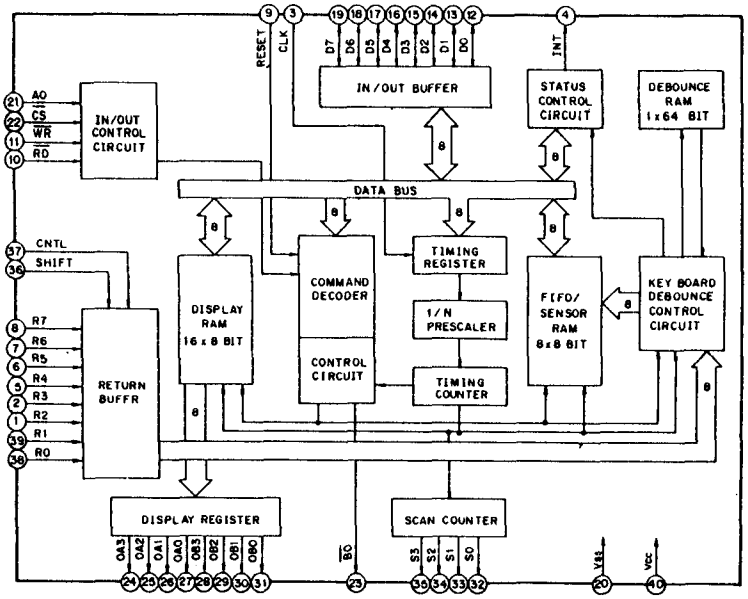

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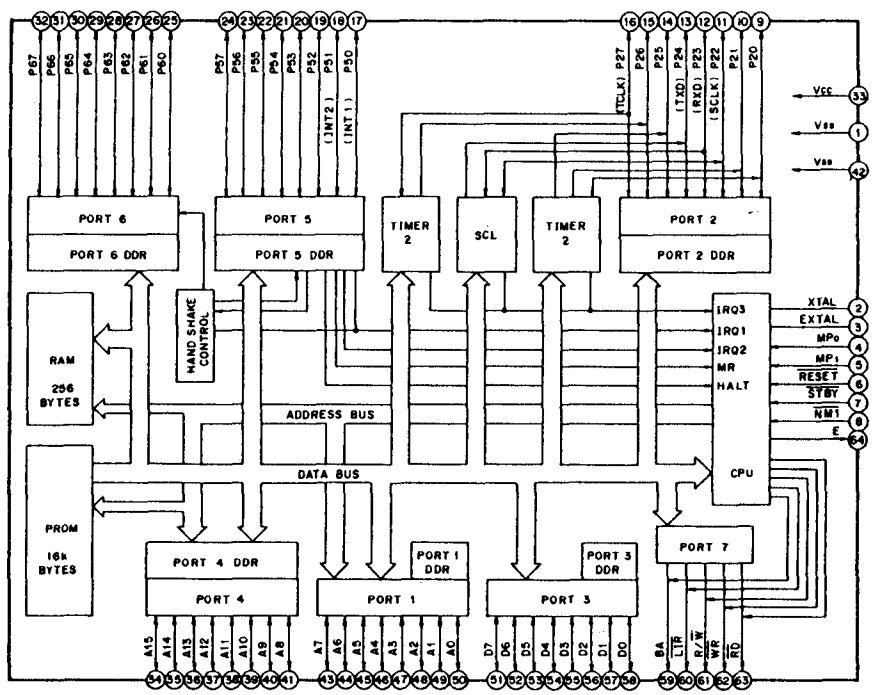

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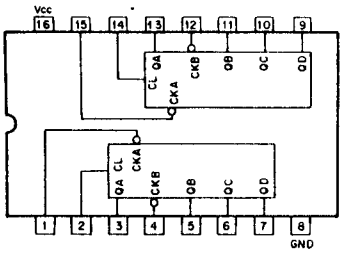

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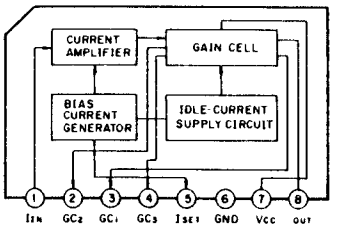

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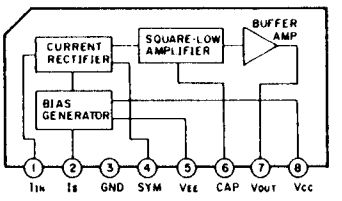

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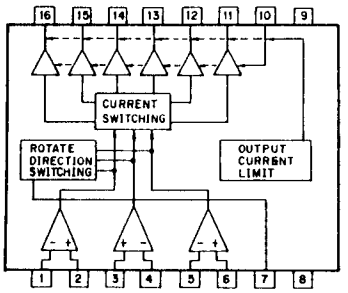

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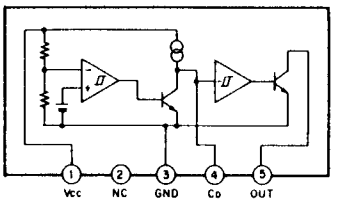

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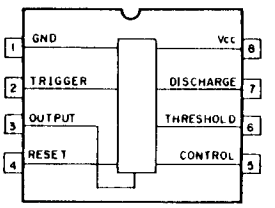

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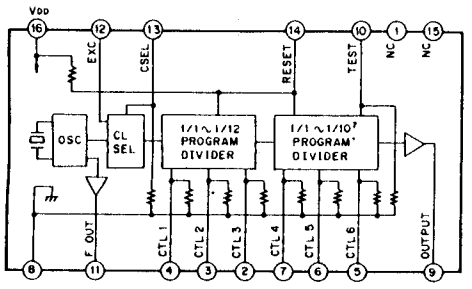

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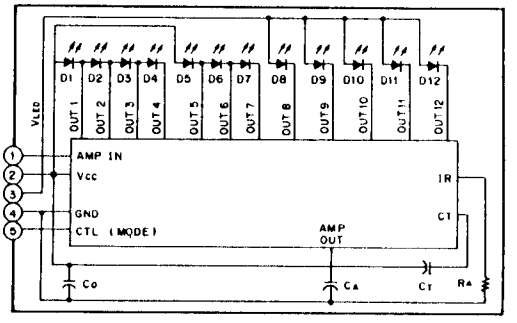

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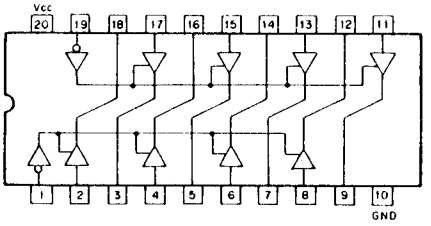

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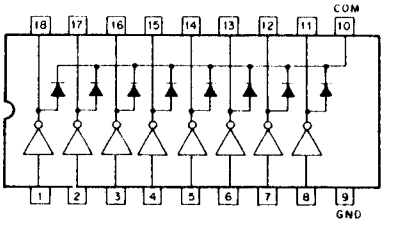

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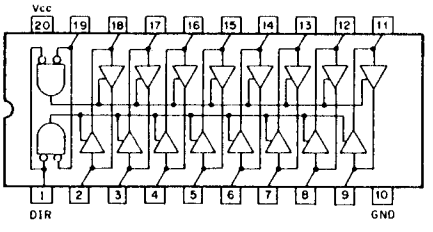

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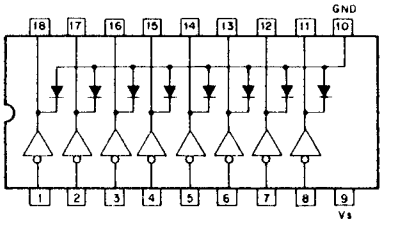

4-4. IC Internal Block Diagrams

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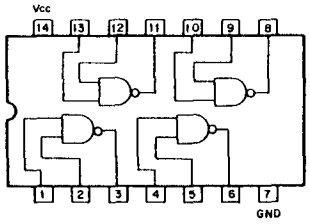

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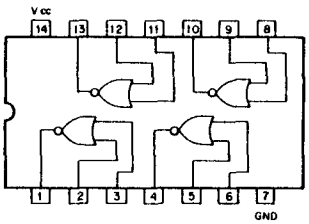

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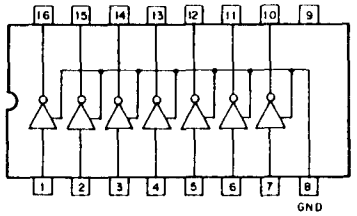

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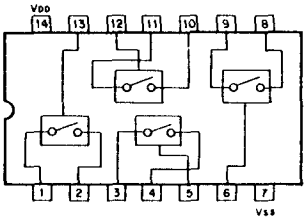

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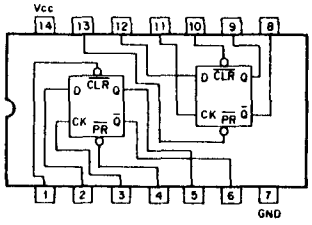

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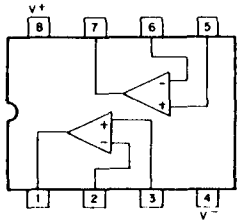

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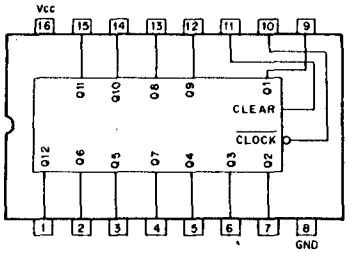

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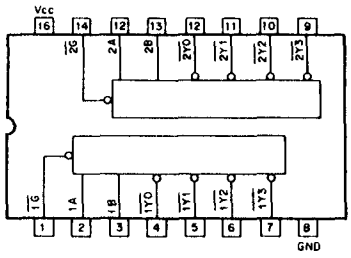

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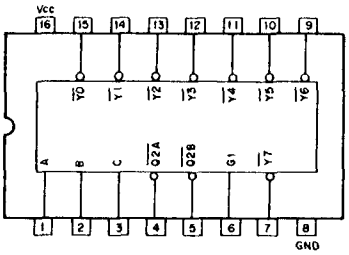

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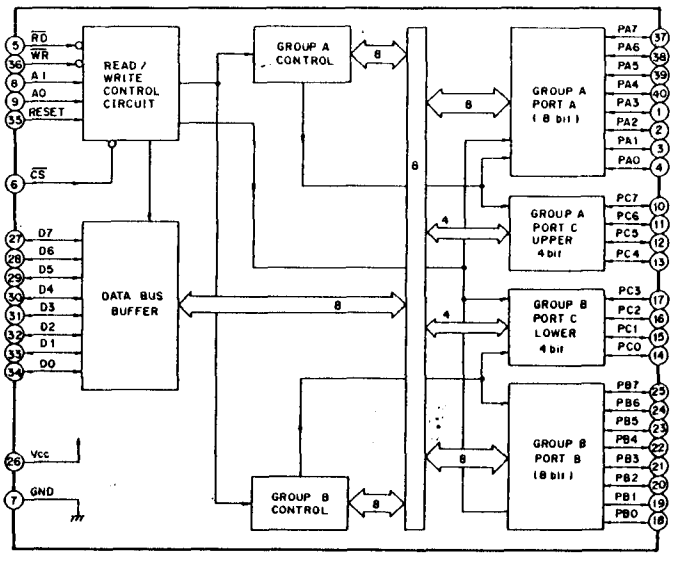

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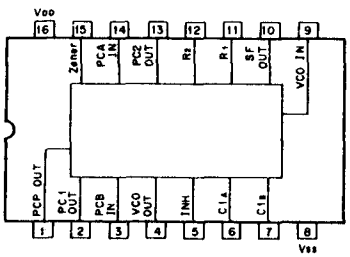
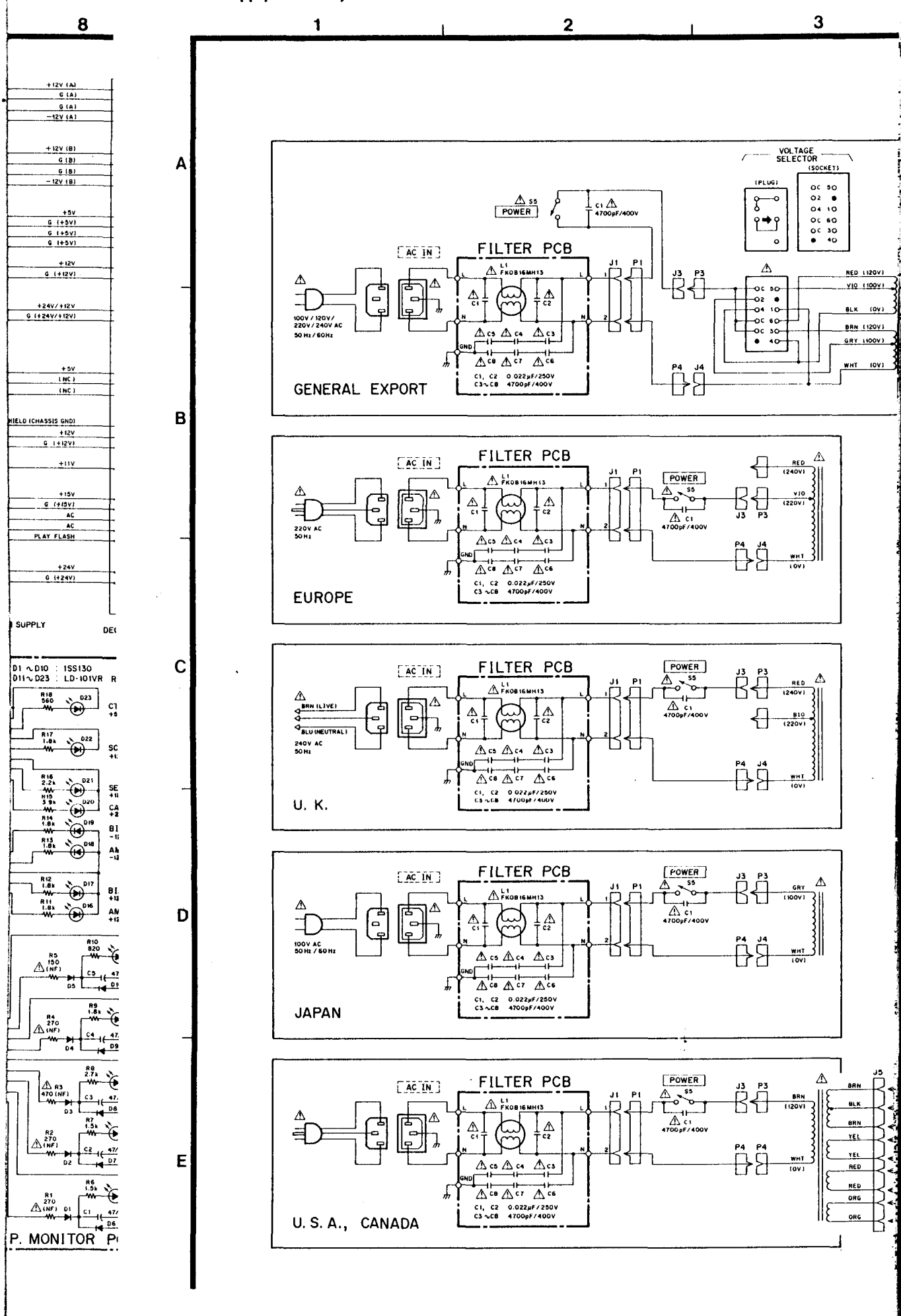
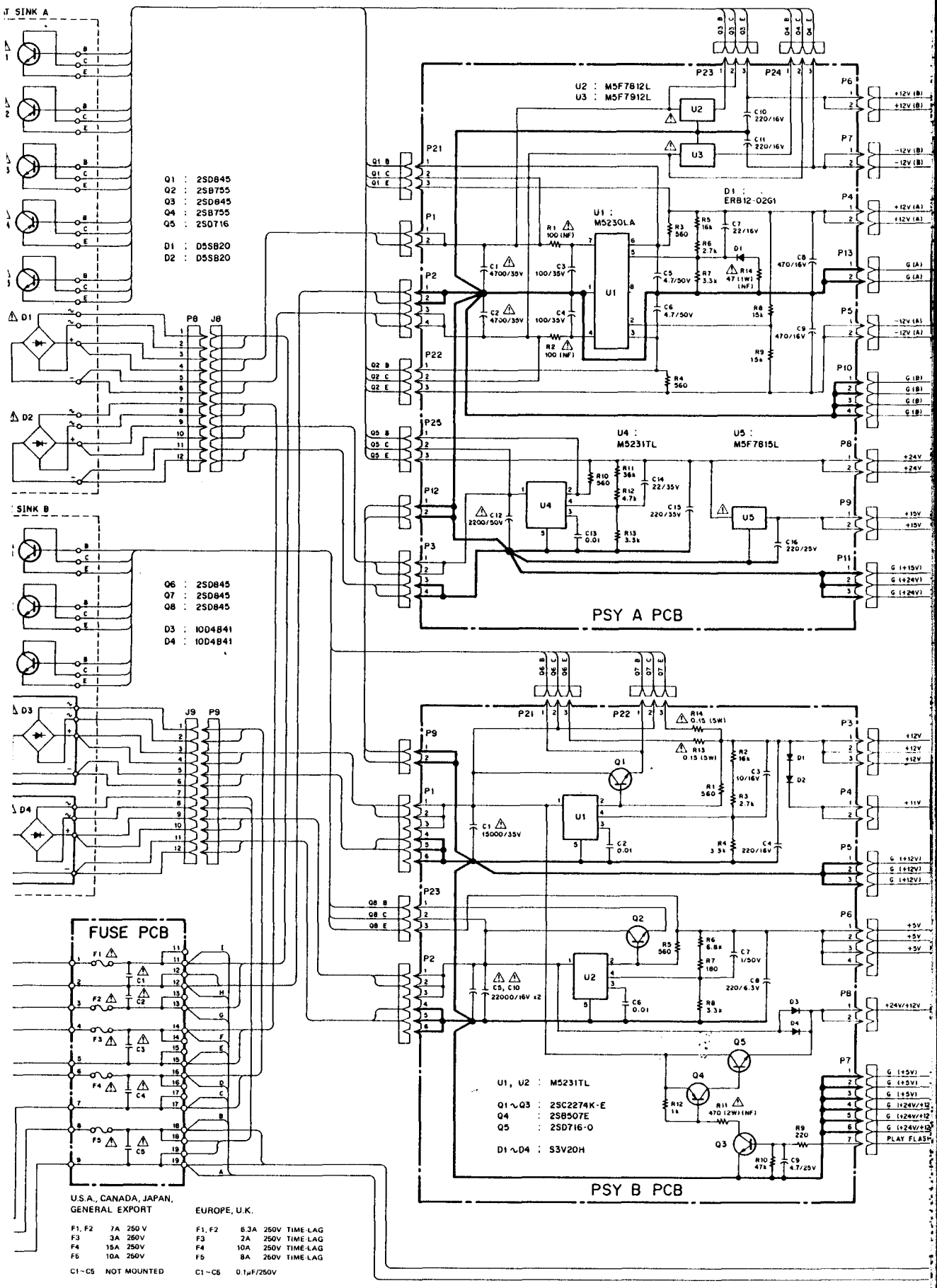


Power Supply PCB Ass'y

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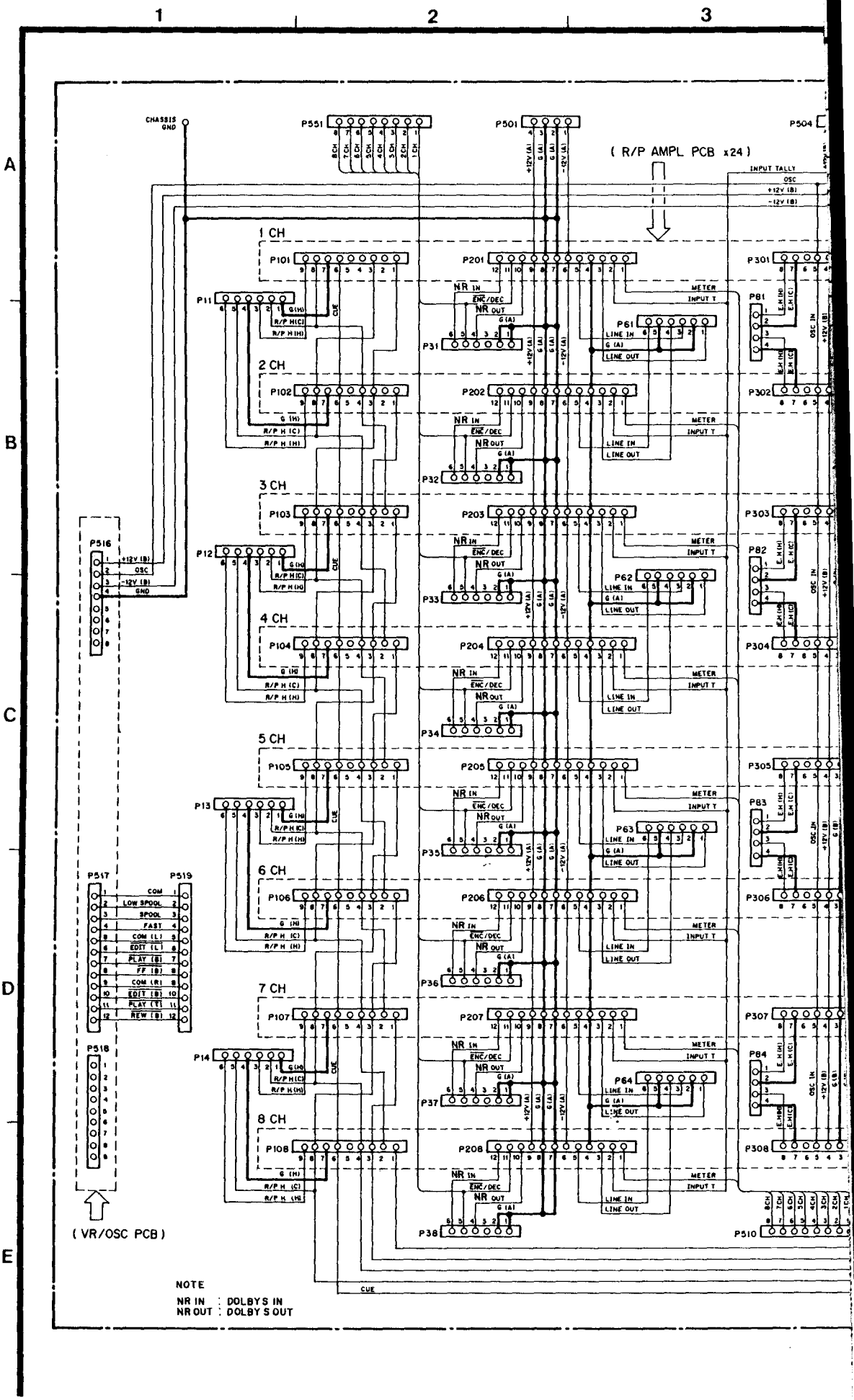
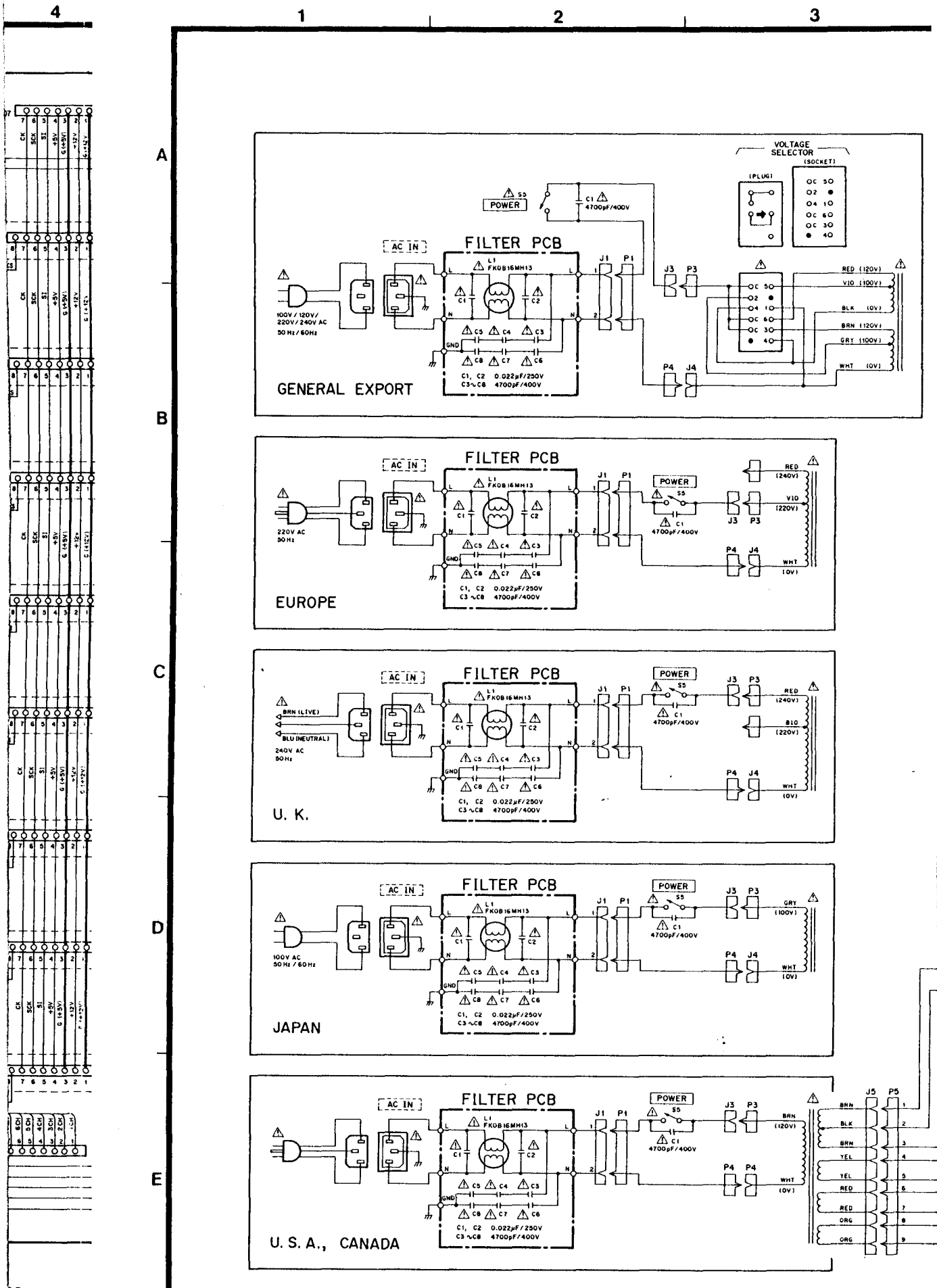
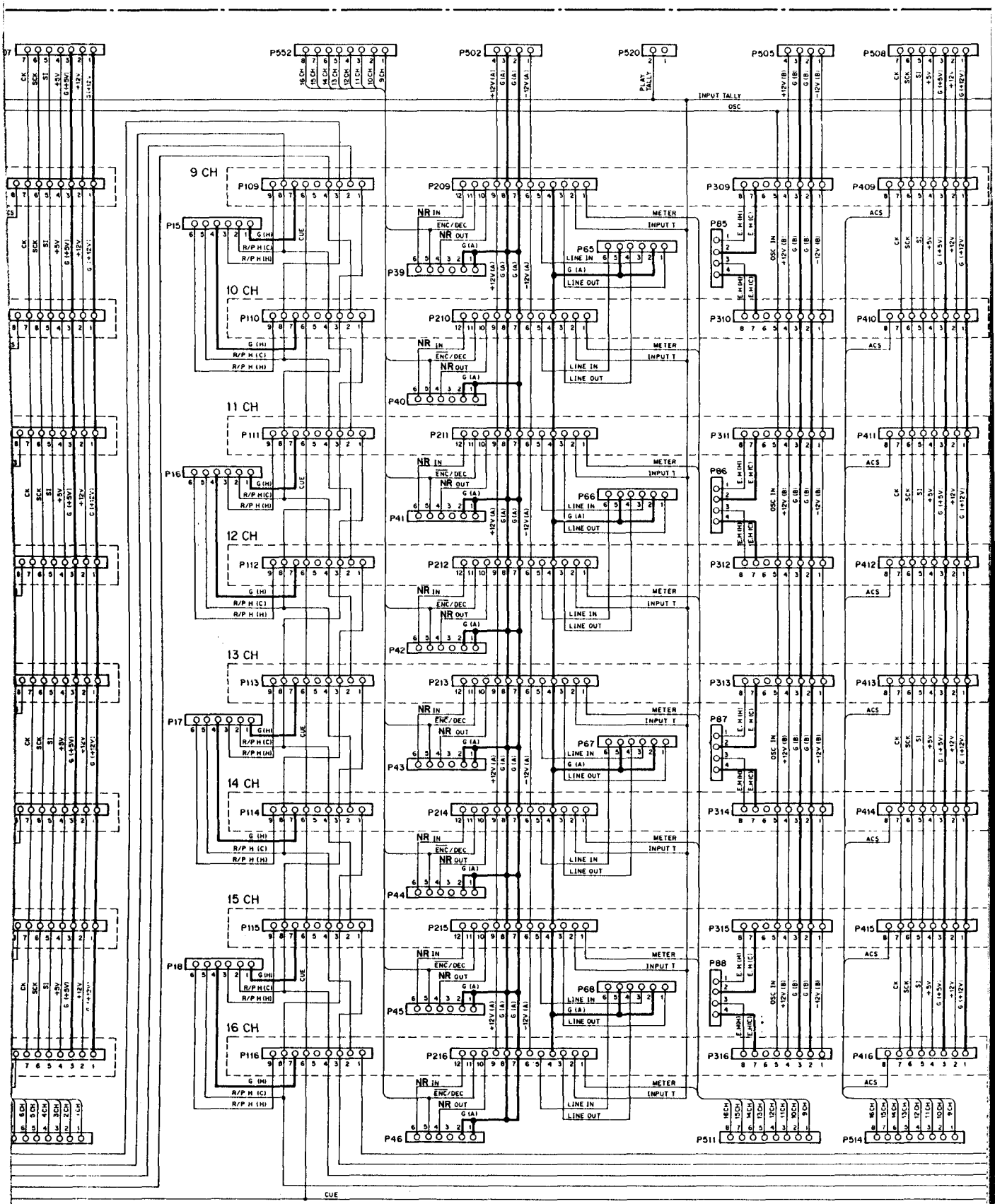
Q2 : 2SB755
Q3 : 2SD845
Q4 : 2SB755
Q5 : 2SD716
D1 : D5SB20
D2 : D5SB20
Q6 : 2SD845
Q7 : 2SD845
Q8 : 2SD845
D3 : 10D4B41
D4 : 10D4B41
U2 : M5F7812L
U3 : M5F7912L
D1 : ERB12-02G1
U1 : M5230LA
U4 : M5231TL
U5 : M5F7815L
PSY A PCB
U1, U2 : M5231TL
Q1 ~ Q3 : 2SC2274K-E
Q4 : 2SB507E
Q5 : 2SD716-O
D1 ~ D4 : S3V20H
PSY B PCB
FUSE PCB
U.S.A., CANADA, JAPAN, GENERAL EXPORT
F1, F2 7A 250 V
F3 3A 250V
F4 15A 250V
F5 10A 250V
C1 ~ C5 NOT MOUNTED
EUROPE, U.K.
F1, F2 6.3A 250V TIME-LAG
F3 2A 250V TIME-LAG
F4 10A 250V TIME-LAG
F5 8A 250V TIME-LAG
C1 ~ C5 0.1μF/250V

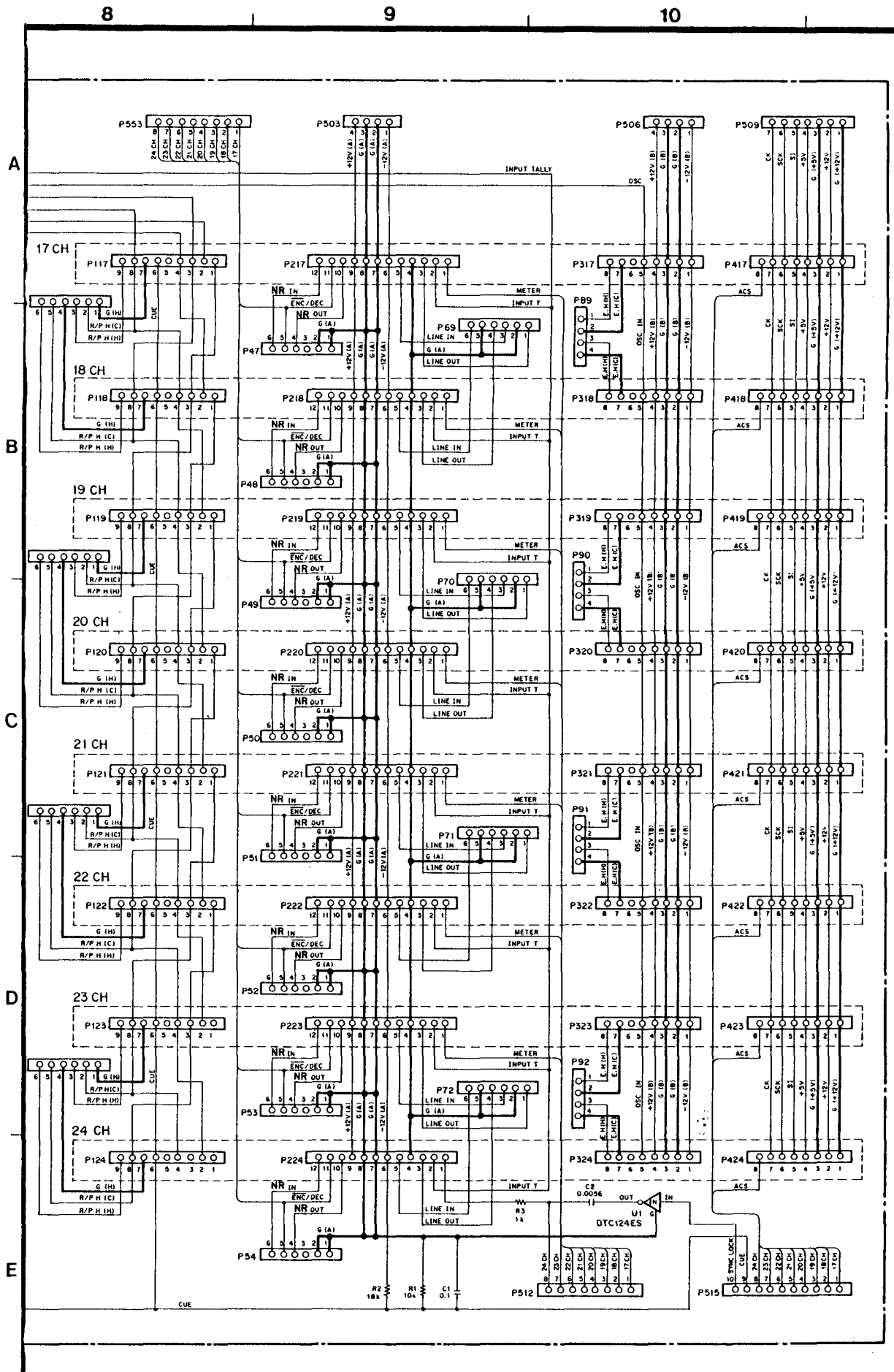
Mother PCB Ass'y



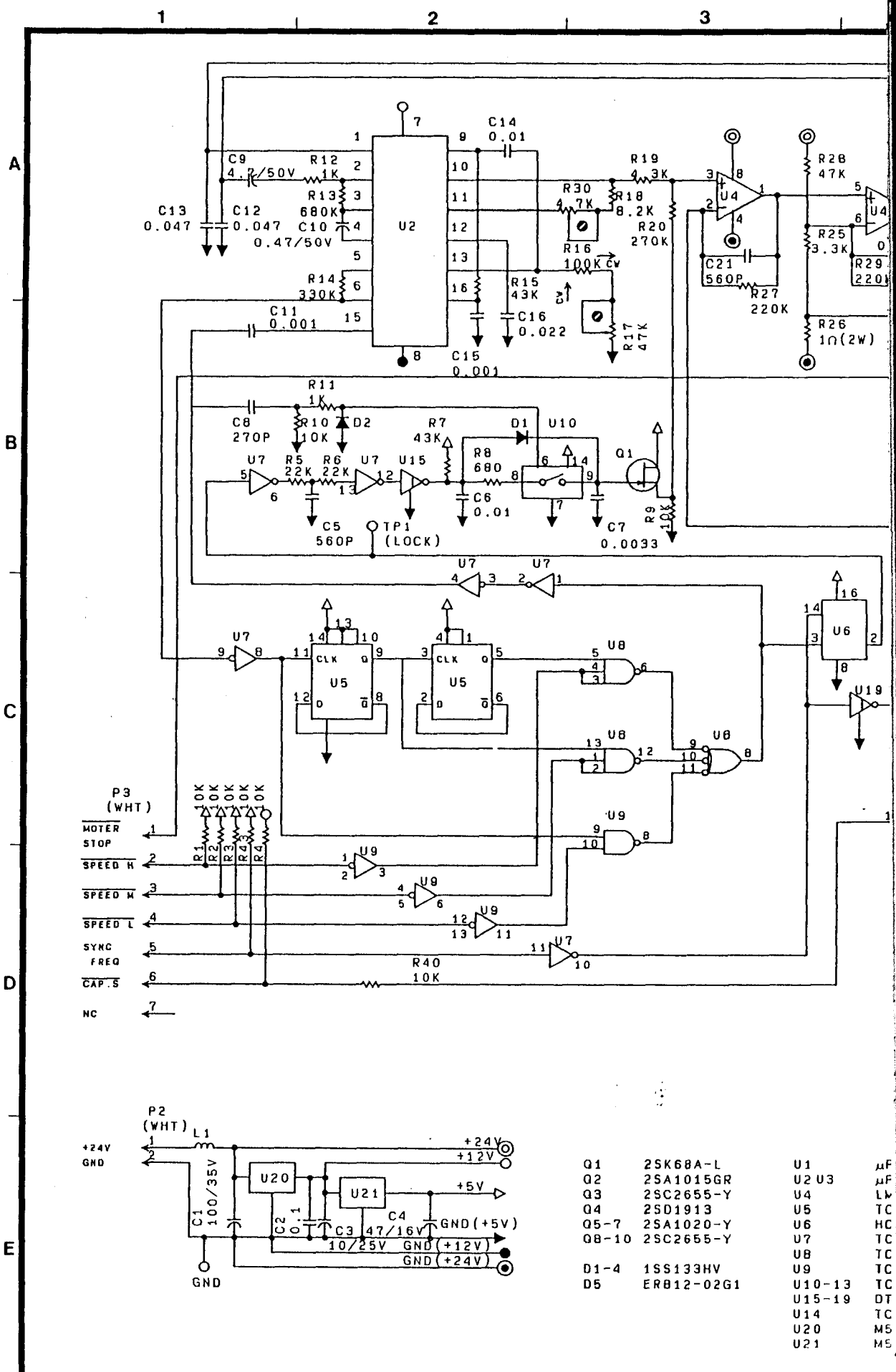
Power Supply PCB Ass'y



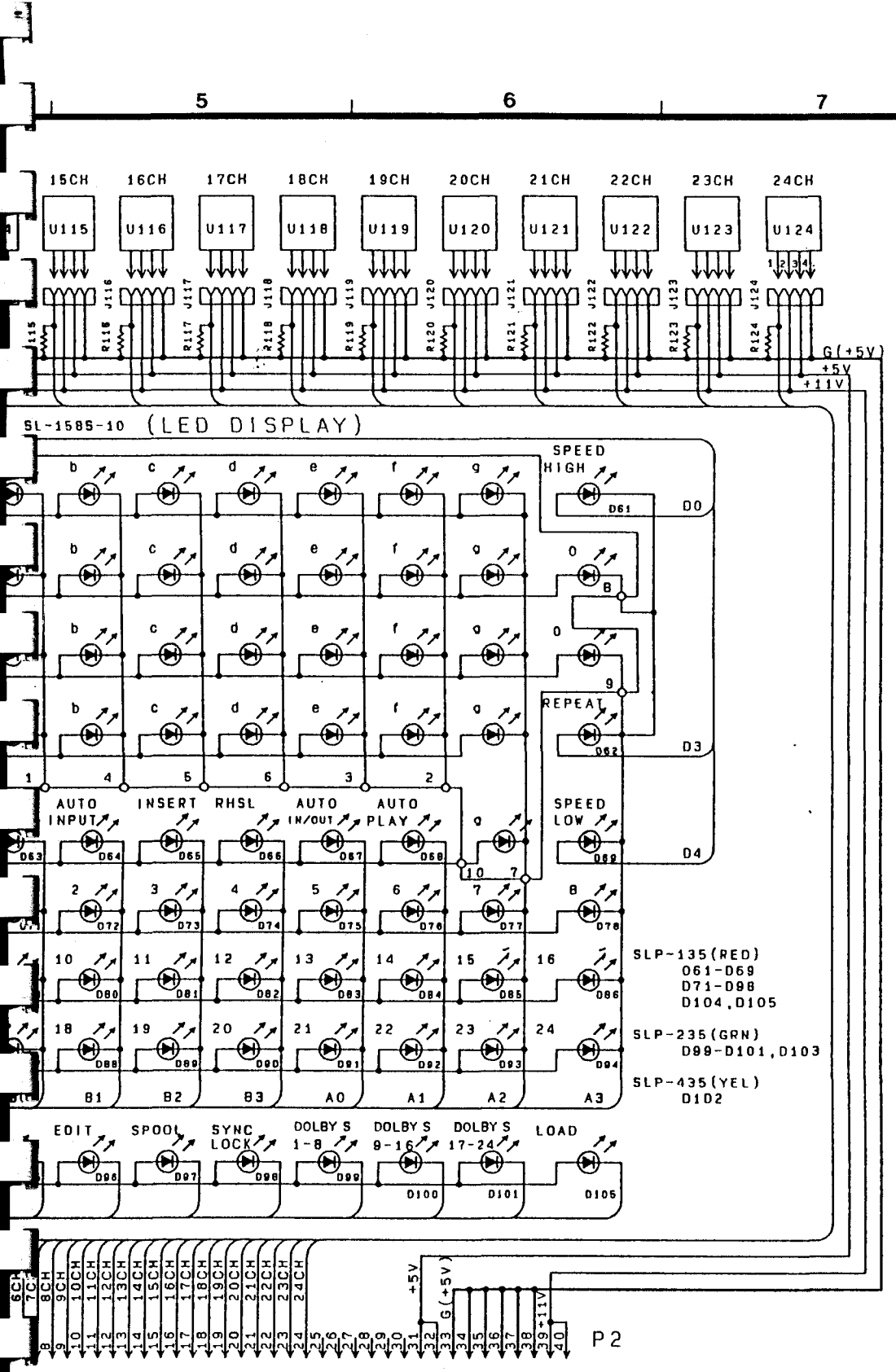

P552
P502
P520
P505
P508
INPUT TALLY
OSC
9 CH
10 CH
11 CH
12 CH
13 CH
14 CH
15 CH
16 CH
P109
P110
P111
P112
P113
P114
P115
P116
P209
P210
P211
P212
P213
P214
P215
P216
P309
P310
P311
P312
P313
P314
P315
P316
P409
P410
P411
P412
P413
P414
P415
P416
P15
P16
P17
P18
P39
P40
P41
P42
P43
P44
P45
P46
P65
P66
P67
P68
P85
P86
P87
P88
P511
P514
NR IN
NR OUT
ENC/DEC
METER
INPUT T
LINE IN
LINE OUT
CUE
ACS
MOTHER PCB


8
9
10
A
B
C
D
E
17 CH
18 CH
19 CH
20 CH
21 CH
22 CH
23 CH
24 CH
P553
P503
P506
P509
P117
P118
P119
P120
P121
P122
P123
P124
P217
P218
P219
P220
P221
P222
P223
P224
P317
P318
P319
P320
P321
P322
P323
P324
P417
P418
P419
P420
P421
P422
P423
P424
P47
P48
P49
P50
P51
P52
P53
P54
P69
P70
P71
P72
P89
P90
P91
P92
P512
P515
INPUT TALLY
OSC
CUE
NR IN
NR OUT
ENC/DEC
METER
INPUT T
LINE IN
LINE OUT
OSC IN
ACS
U1
DTC124ES
R1
R2
R3
C1
C2

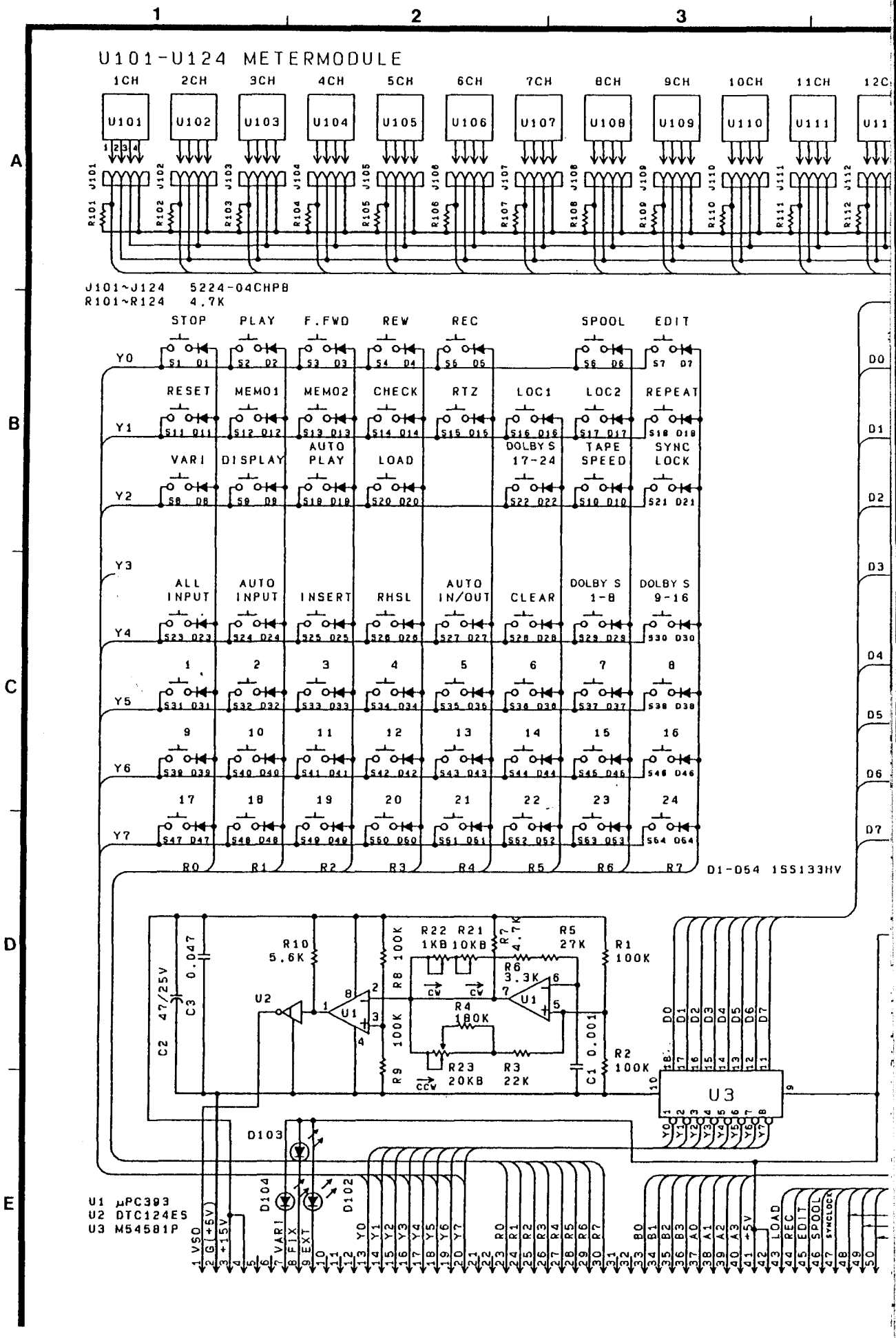
Capstan Servo PCB Ass'y

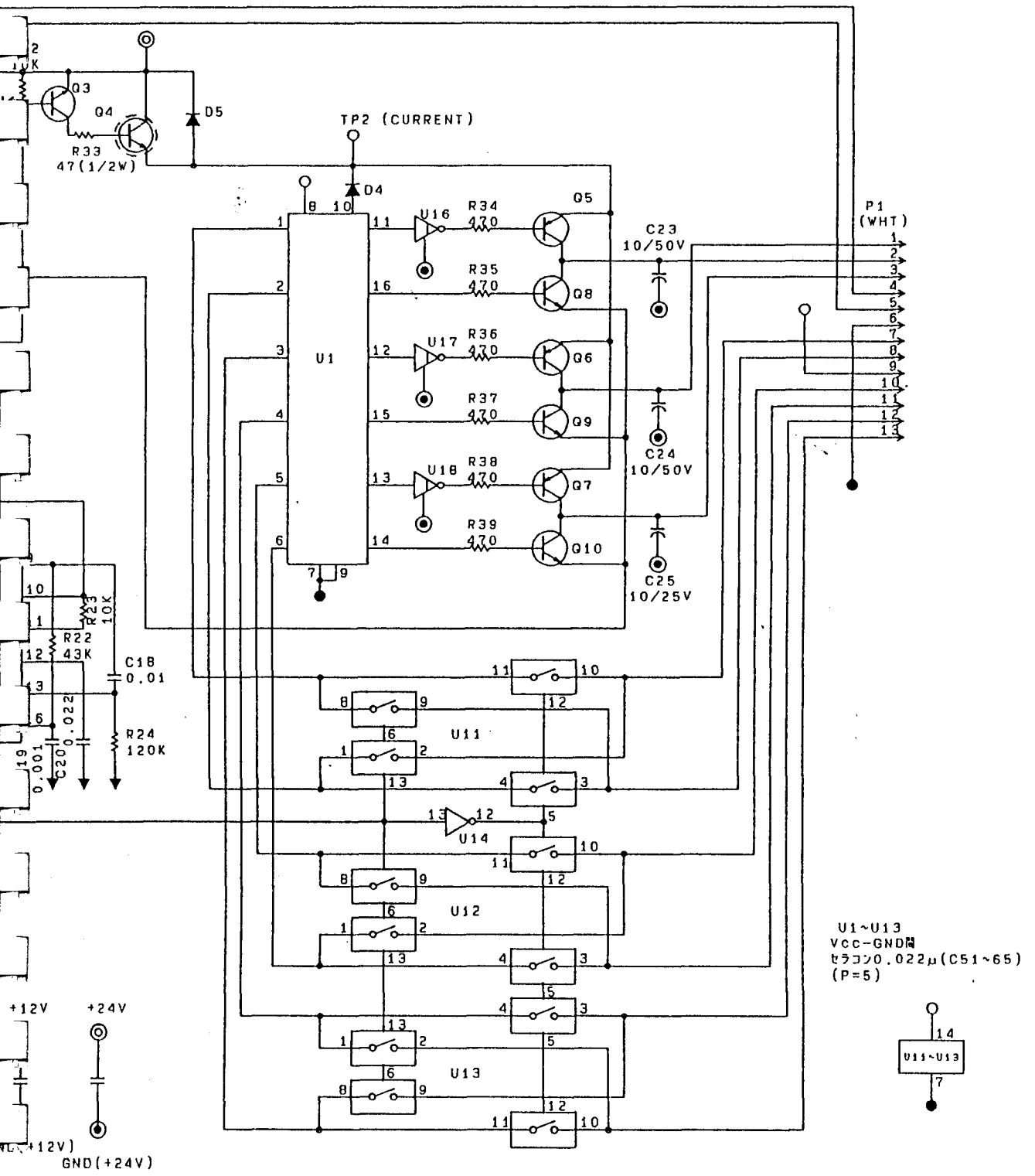


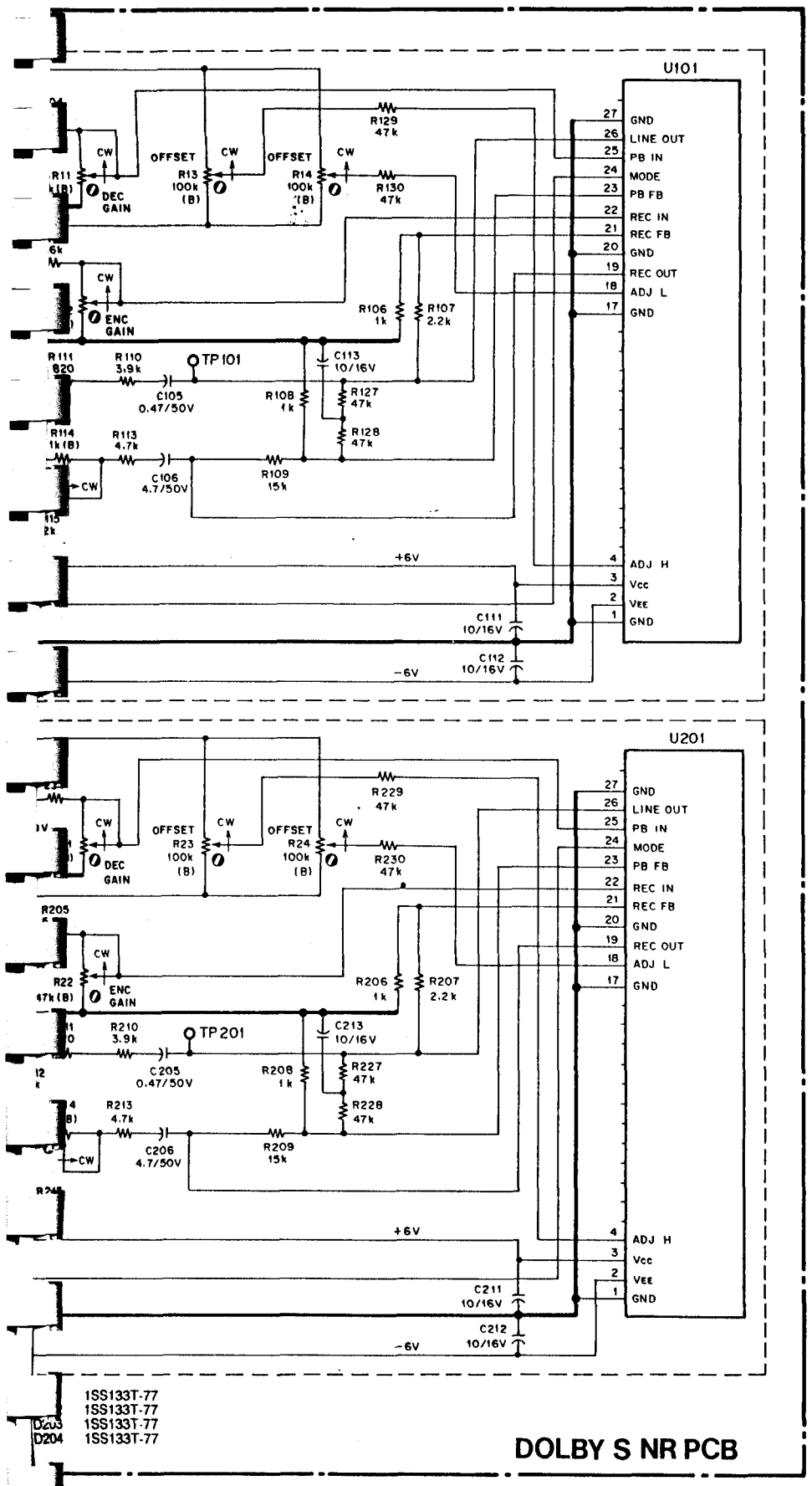
Q1	2SK68A-L	U1	μP
Q2	2SA1015GR	U2 U3	μP
Q3	2SC2655-Y	U4	LM
Q4	2SD1913	U5	TC
Q5-7	2SA1020-Y	U6	HC
Q8-10	2SC2655-Y	U7	TC
		U8	TC
D1-4	1SS133HV	U9	TC
D5	ERB12-02G1	U10-13	TC
		U15-19	DT
		U14	TC
		U20	MS
		U21	MS


5
6
7
15CH
16CH
17CH
18CH
19CH
20CH
21CH
22CH
23CH
24CH
U115
U116
U117
U118
U119
U120
U121
U122
U123
U124
G(+5V)
+5V
+11V
SL-1585-10 (LED DISPLAY)
SPEED HIGH
REPEAT
SPEED LOW
AUTO INPUT
INSERT
RHSL
AUTO IN/OUT
AUTO PLAY
EDIT
SPOOL
SYNC LOCK
DOLBY S 1-8
DOLBY S 9-16
DOLBY S 17-24
LOAD
B1
B2
B3
A0
A1
A2
A3
SLP-135(RED)
D61-D69
D71-D98
D104,D105
SLP-235(GRN)
D99-D101,D103
SLP-435(YEL)
D102
P2

Operation PCB Ass'y



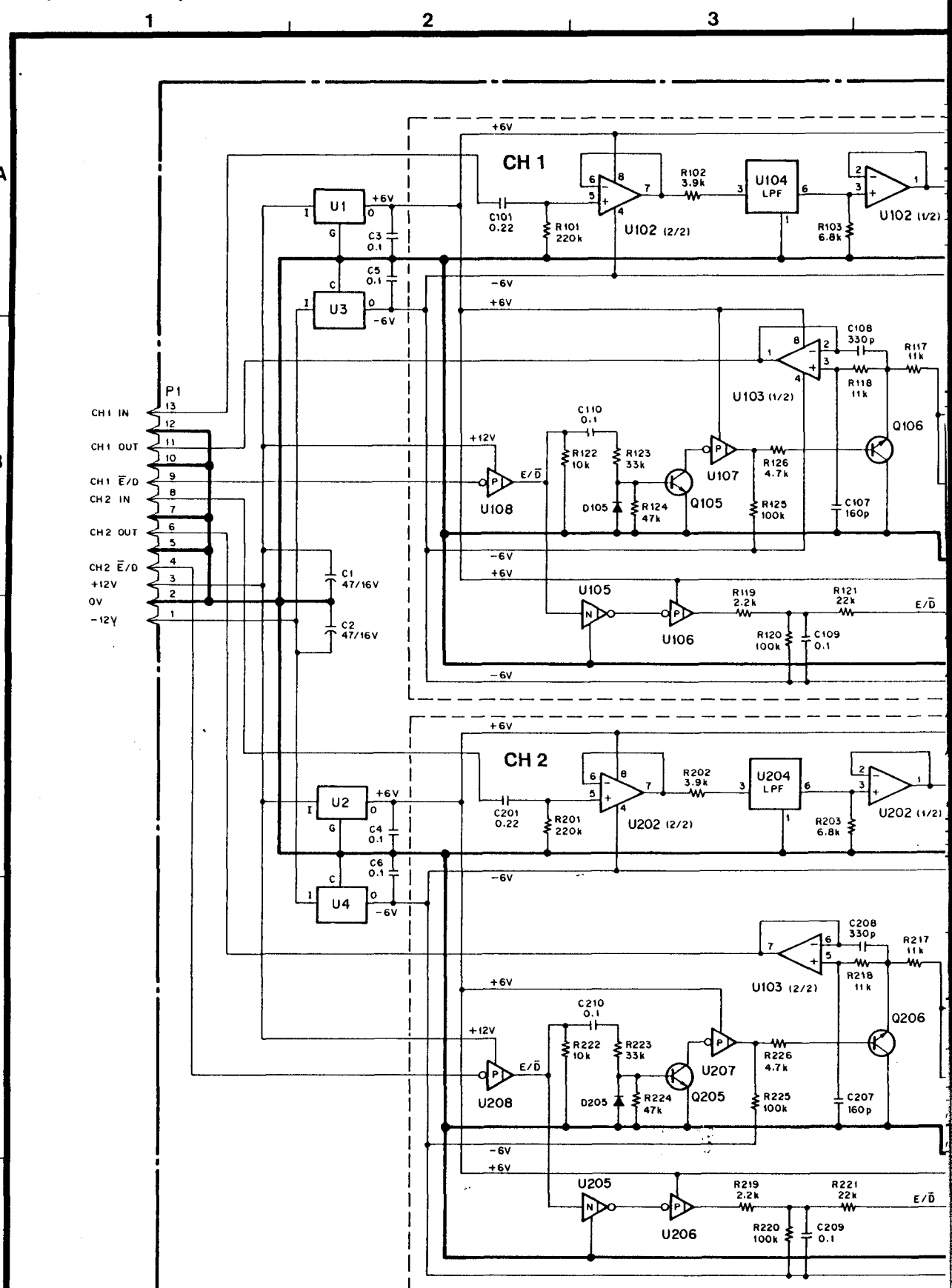

Q3
Q4
R33
47(1/2W)
D5
TP2 (CURRENT)
D4
U1
U16
U17
U18
R34
R35
R36
R37
R38
R39
470
Q5
Q8
Q6
Q9
Q7
Q10
C23
10/50V
C24
10/50V
C25
10/25V
P1
(WHT)
R23
10K
R22
43K
C18
0.01
C20
0.022
0.001
R24
120K
U11
U12
U13
U14
+12V
+24V
GND(+24V)
U1~U13
Vcc-GND間
セラコン0.022μ(C51~65)
(P=5)
U11~U13



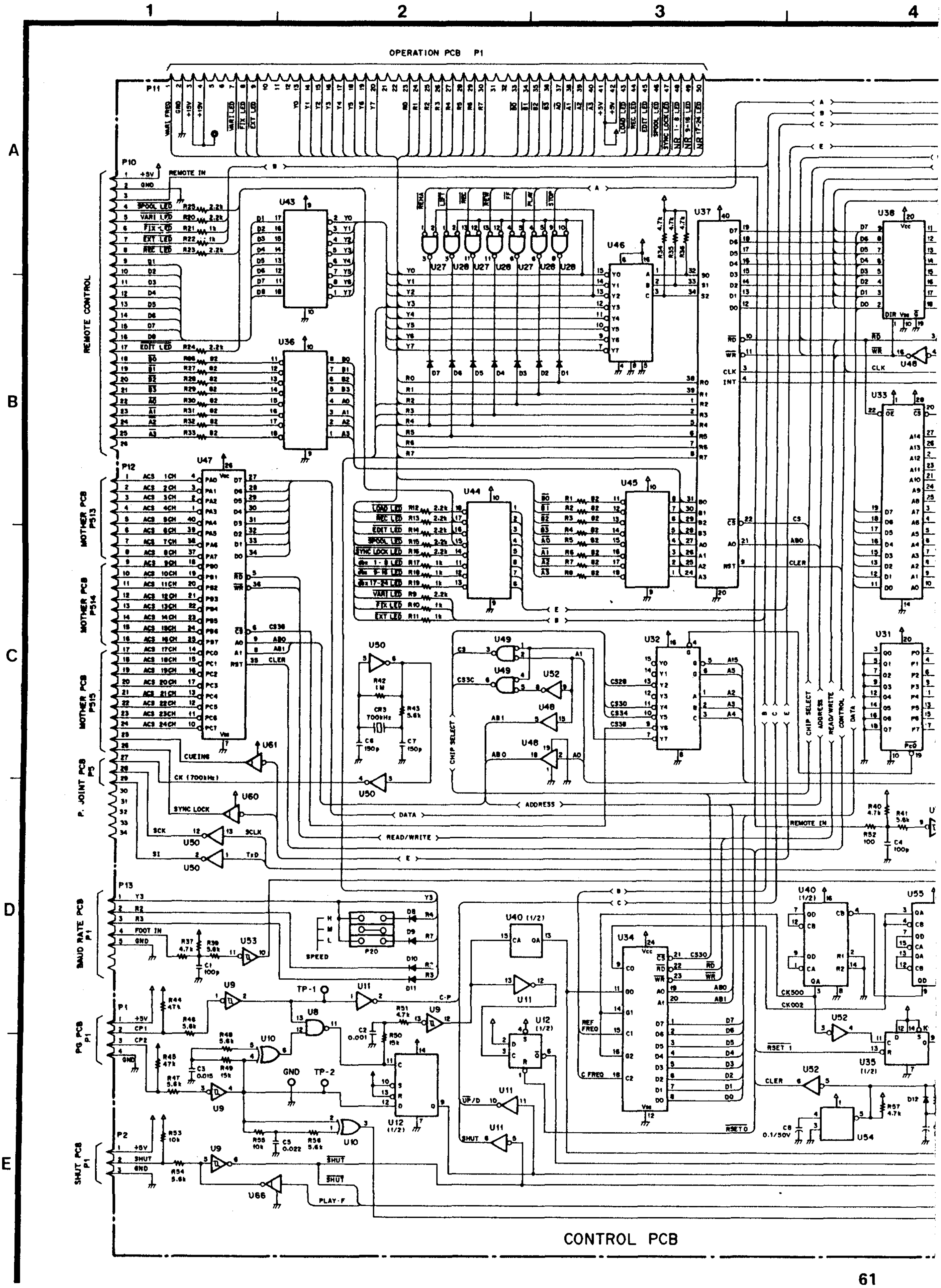
1SS133T-77
1SS133T-77
D203 1SS133T-77
D204 1SS133T-77

DOLBY S NR PCB

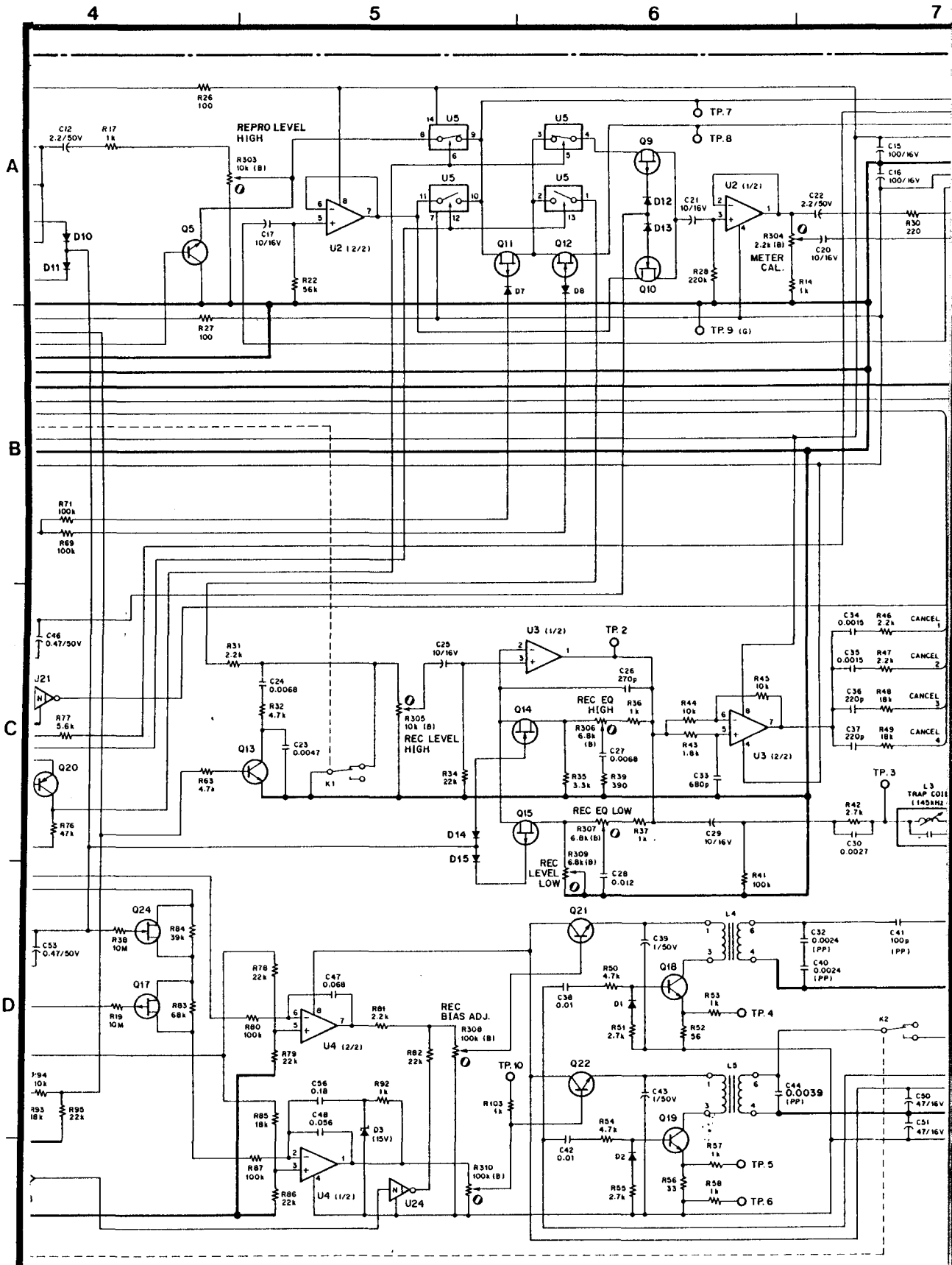
Dolby S NR PCB Ass'y



U1	U2	NJM78L06A	U101	U201	SBX1654-01	U105	U205	DTC124ES	Q101	Q201
U3	U4	NJM79L06A	U102	U202	5218	U106	U206	DTA124ES	Q102	Q202
			U103		5218	U107	U108	DTA124ES	Q103	Q203
			U104	U204	Low Pass Filter	U108	U208	DTA124ES	Q104	Q204
									Q105	Q205

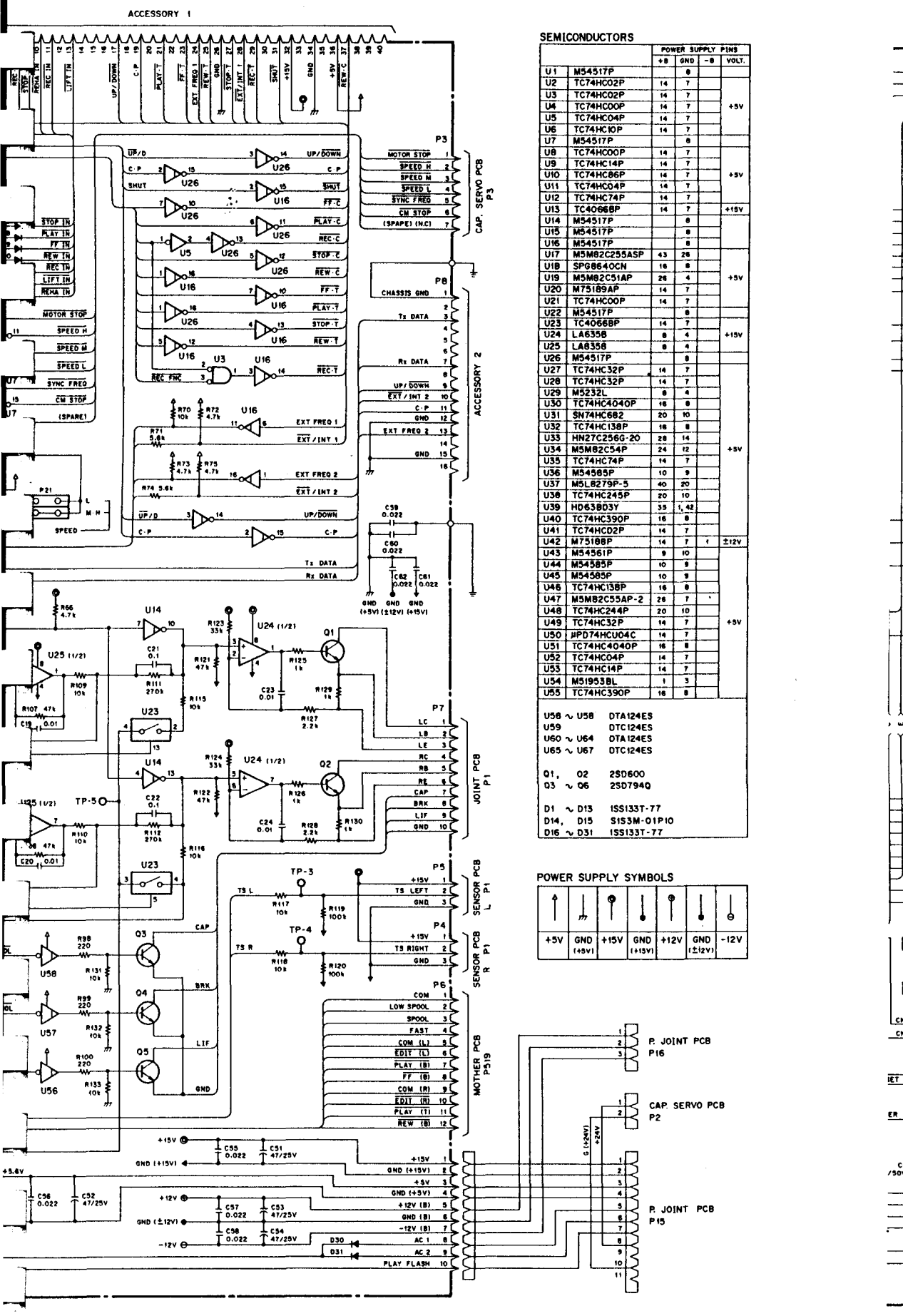

OPERATION PCB P1
REMOTE CONTROL
MOTHER PCB P513
MOTHER PCB P514
MOTHER PCB P515
P. JOINT PCB P5
BAUD RATE PCB P1
PG PCB P1
SHUT PCB P1
CONTROL PCB

Cor



D1, D2 1SS133T-77
D3 RD15EB1
D4, D5 1SS133T-77
D6 RD3.0EL2
D7, D8 1SS133T-77
D10~D15 1SS133T-77

R/P AMPL PCB



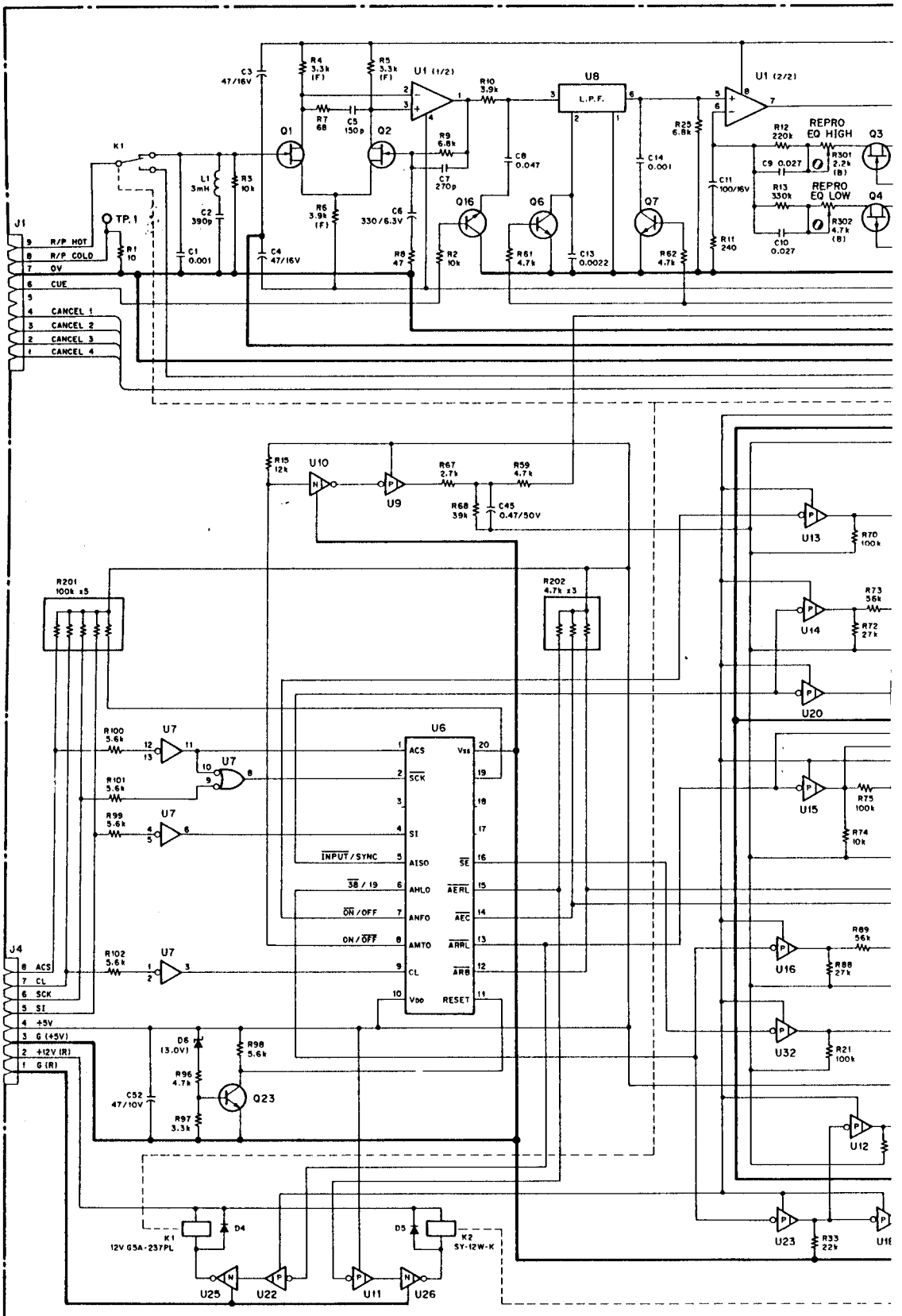
SEMICONDUCTORS

		POWER SUPPLY PINS			
		+B	GND	-B	VOLT.
U1	M54517P		8		
U2	TC74HC02P	14	7		
U3	TC74HC02P	14	7		+5V
U4	TC74HC00P	14	7		
U5	TC74HC04P	14	7		
U6	TC74HC10P	14	7		
U7	M54517P		8		
U8	TC74HC00P	14	7		
U9	TC74HC14P	14	7		
U10	TC74HC86P	14	7		+5V
U11	TC74HC04P	14	7		
U12	TC74HC74P	14	7		
U13	TC40668P	14	7		+15V
U14	M54517P		8		
U15	M54517P		8		
U16	M54517P		8		
U17	M5M82C255ASP	43	26		
U18	SPG8640CN	16	8		
U19	M5M82C51AP	28	4		+5V
U20	M75189AP	14	7		
U21	TC74HC00P	14	7		
U22	M54517P		8		
U23	TC40668P	14	7		
U24	LA6358	8	4		+15V
U25	LA8358	8	4		
U26	M54517P		8		
U27	TC74HC32P	14	7		
U28	TC74HC32P	14	7		
U29	M5232L	8	4		
U30	TC74HC4040P	16	8		
U31	SN74HC682	20	10		
U32	TC74HC138P	16	8		
U33	HN27C256G-20	28	14		
U34	M5M82C54P	24	12		+5V
U35	TC74HC74P	14	7		
U36	M54585P	10	9		
U37	M5L8279P-5	40	20		
U38	TC74HC245P	20	10		
U39	HD63B03Y	35	1, 42		
U40	TC74HC390P	16	8		
U41	TC74HC02P	14	7		
U42	M75188P	14	7	1	±12V
U43	M54561P	9	10		
U44	M54585P	10	9		
U45	M54585P	10	9		
U46	TC74HC138P	16	8		
U47	M5M82C55AP-2	28	7		
U48	TC74HC244P	20	10		
U49	TC74HC32P	14	7		+5V
U50	μPD74HCU04C	14	7		
U51	TC74HC4040P	16	8		
U52	TC74HC04P	14	7		
U53	TC74HC14P	14	7		
U54	M51953BL	1	3		
U55	TC74HC390P	16	8		

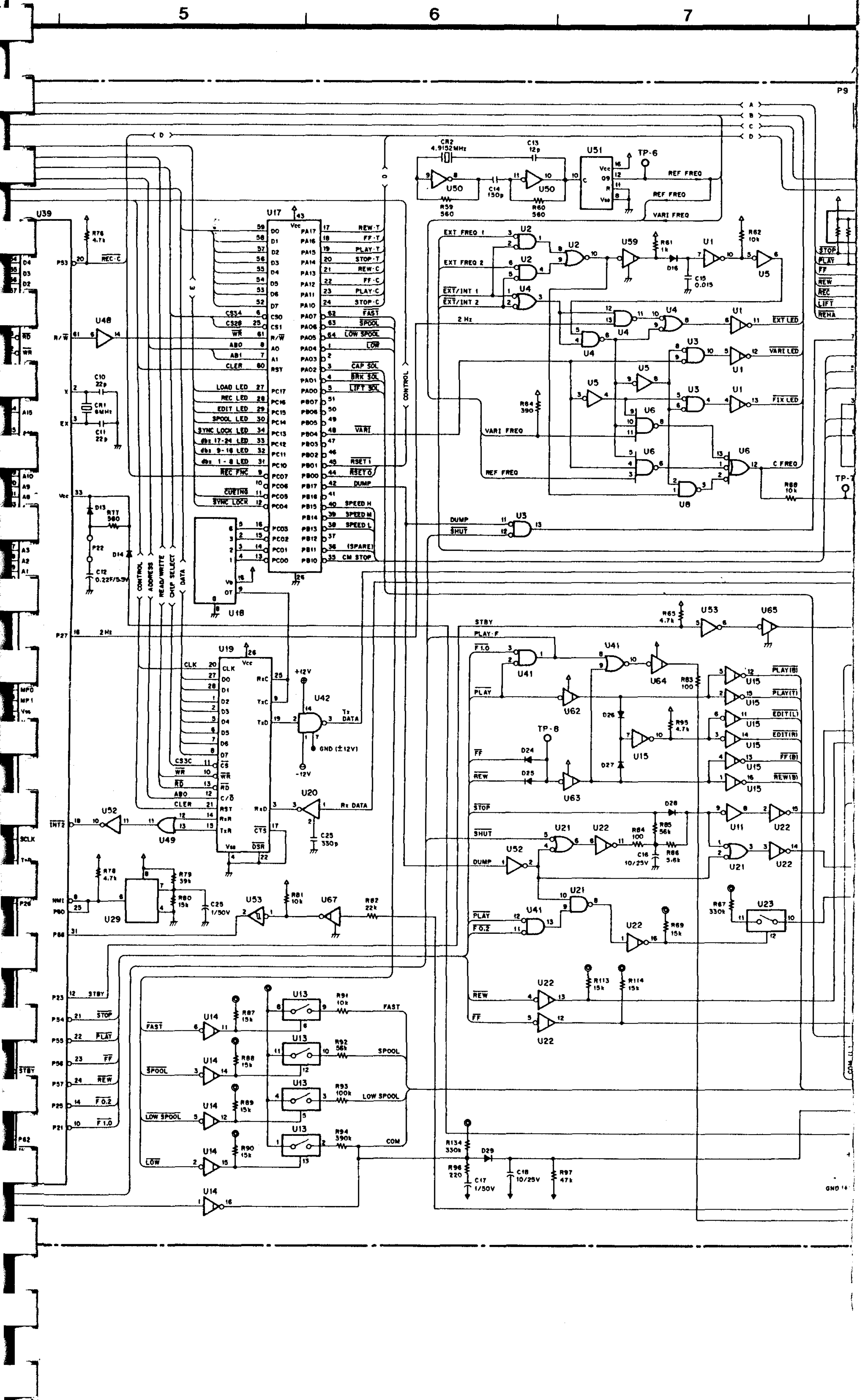
U56 ∿ U58	DTA124ES
U59	DTC124ES
U60 ∿ U64	DTA124ES
U65 ∿ U67	DTC124ES
Q1, Q2	2SD600
Q3 ∿ Q6	2SD794Q
D1 ∿ D13	1SS133T-77
D14, D15	S1S3M-01P10
D16 ∿ D31	1SS133T-77

POWER SUPPLY SYMBOLS

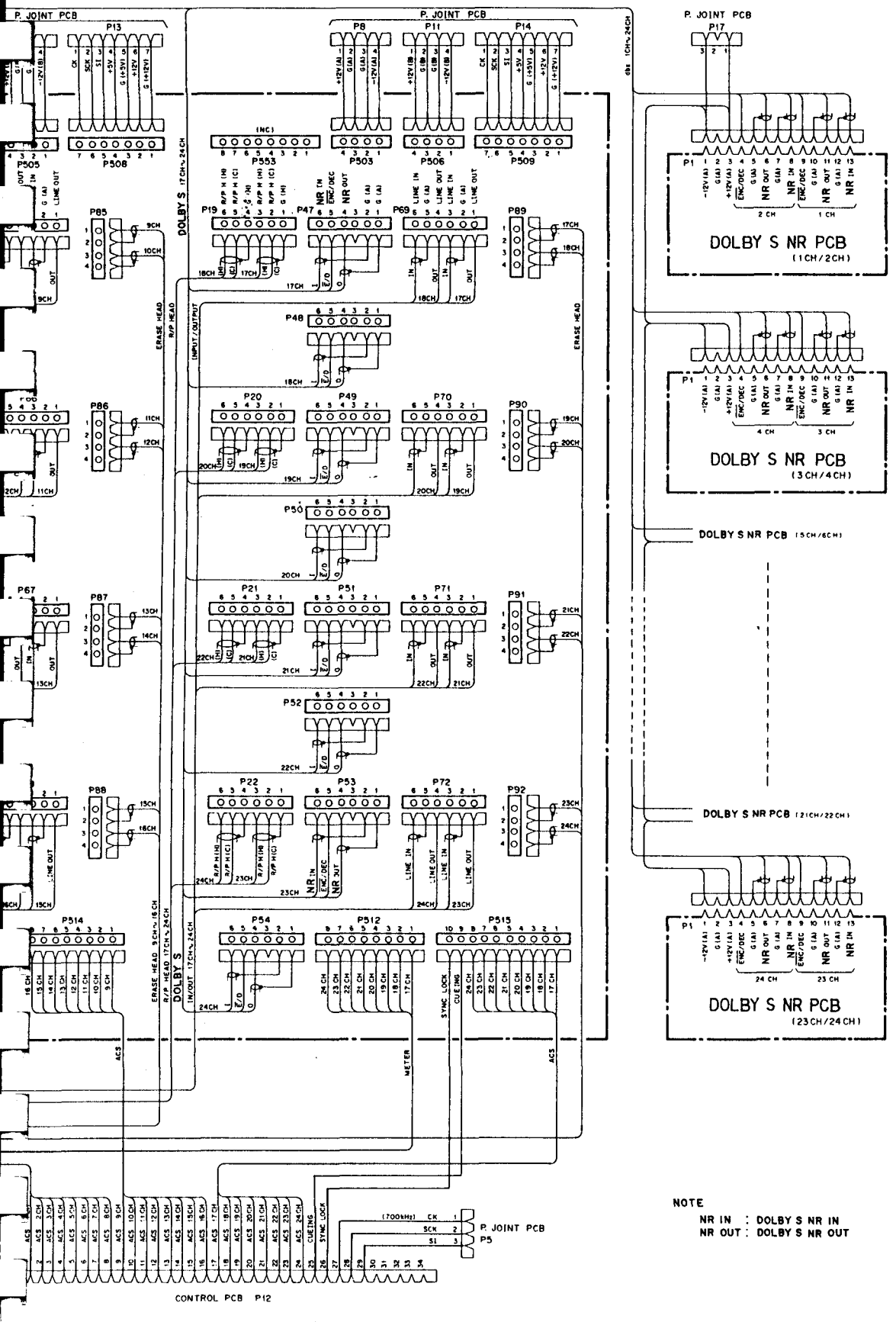
+5V	GND (+5V)	+15V	GND (+15V)	+12V	GND (±12V)	-12V



U1	μPC4570C	U18	DTA124ES	Q1, Q2	2SK170BL	Q13	2SC1815GR
U2 ∿ U4	M5218P	U20	DTA124ES	Q3	2SK381D	Q14	2SK381D
U5	LC4966	U21	DTC124ES	Q4	2SJ40 (E)	Q15	2SJ40 (E)
U6	μPD7554CS-100	U22, U23	DTA124ES	Q5	2SC2878-B	Q16	2SC1815GR
U7	TC74HC00AP	U24∿U26	DTC124ES	Q6, Q7	2SC1815GR	Q17	2SJ40 (E)
U8	L.P.F. (20kHz/26kHz)			Q9	2SJ40 (E)	Q18, Q19	2SC2002L
U9	DTA124ES			Q10	2SK381D	Q20	2SA1015GR
U10	DTC124ES	U32	DTA124ES	Q11	2SJ40 (E)	Q21∿Q23	2SC1815GR
U11 ∿ U16	DTA124ES			Q12	2SK381D	Q24	2SK361D

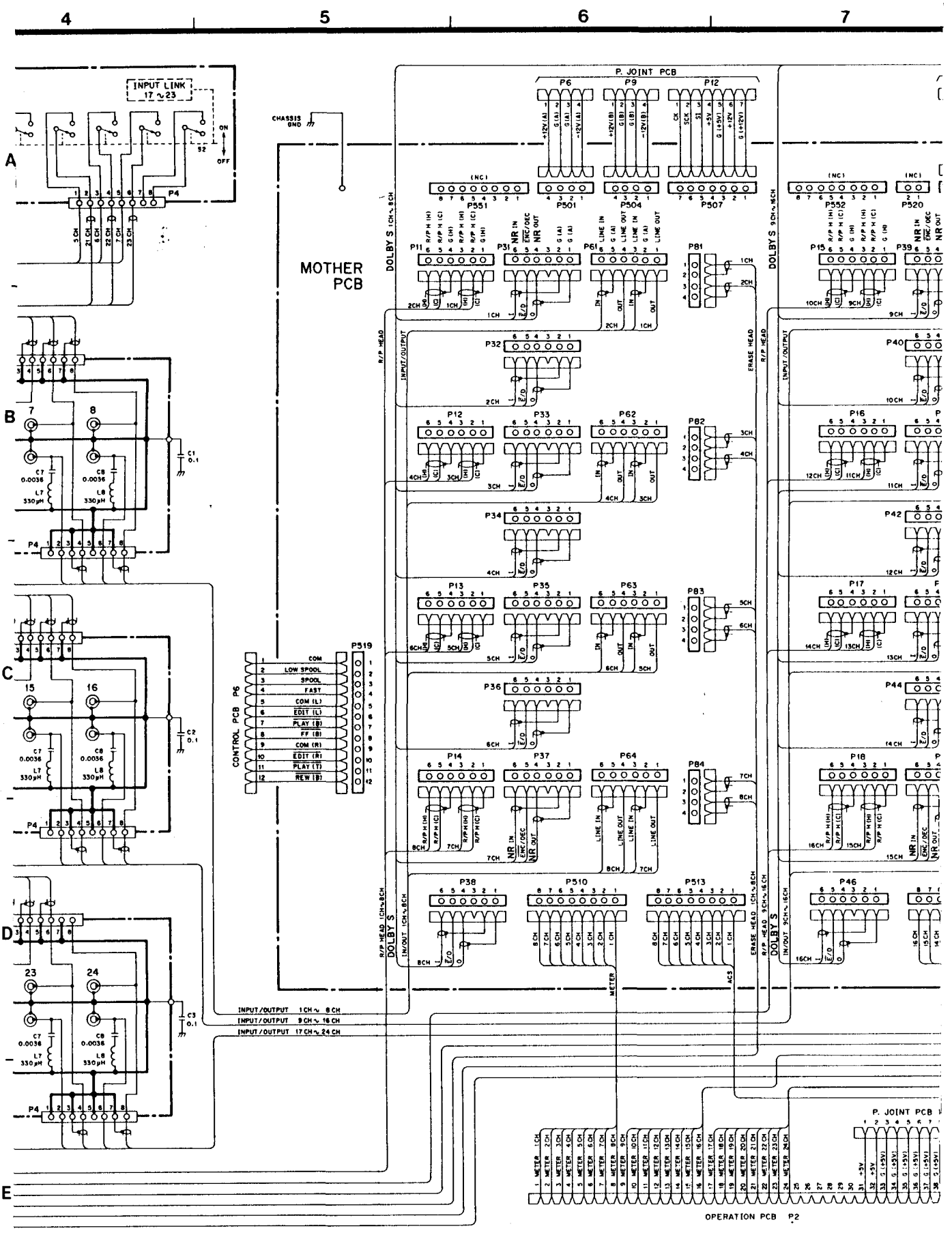


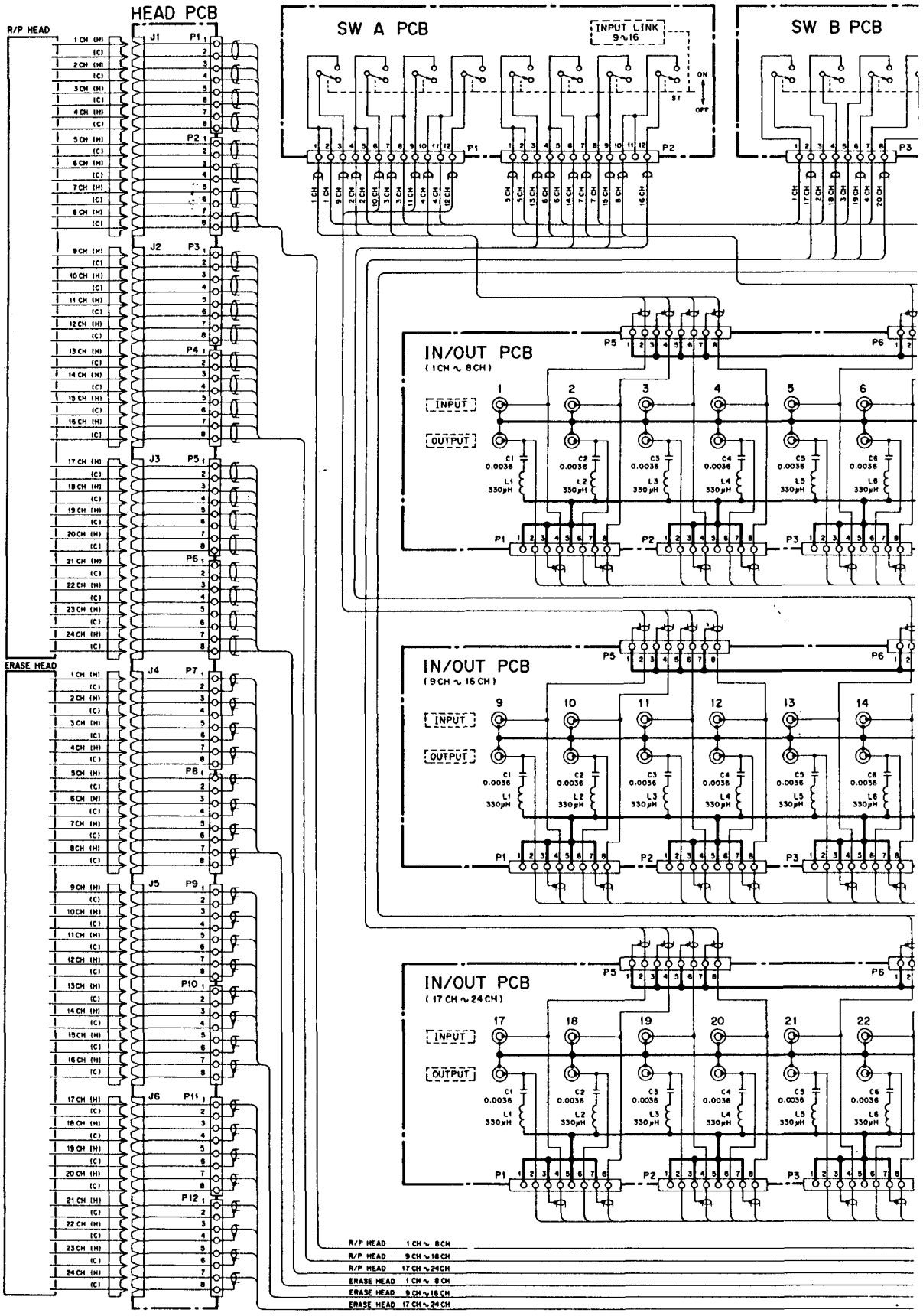
5
6
7
P9
U39
U17
U48
U18
U19
U42
U20
U52
U49
U29
U53
U67
U13
U14
CR2 4.9152MHz
C13 12p
U51
TP-6
U50
REF FREQ
VARI FREQ
EXT FREQ 1
EXT FREQ 2
EXT/INT 1
EXT/INT 2
2 Hz
U2
U4
U59
U1
U5
U3
U6
U8
EXT LED
VARI LED
FIX LED
C FREQ
TP-7
DUMP
SHUT
STBY
PLAY·F
F1.0
PLAY
FF
REW
STOP
U41
U64
U62
U63
U15
TP-8
PLAY(B)
PLAY(T)
EDIT(L)
EDIT(R)
FF(B)
REW(B)
U11
U21
U22
U23
U65
F0.2
CONTROL
ADDRESS
READ/WRITE
CHIP SELECT
DATA
REW·T
FF·T
PLAY·T
STOP·T
REW·C
FF·C
PLAY·C
STOP·C
FAST
SPOOL
LOW SPOOL
LOW
CAP SOL
BRK SOL
LIFT SOL
VARI
RSET 1
RSET 0
SPEED H
SPEED M
SPEED L
(SPARE)
CM STOP
LOAD LED
REC LED
EDIT LED
SPOOL LED
SYNC LOCK LED
REC FNC
CUEING
SYNC LOCK
Tx DATA
Rx DATA
GND (±12V)
+12V
-12V
COM

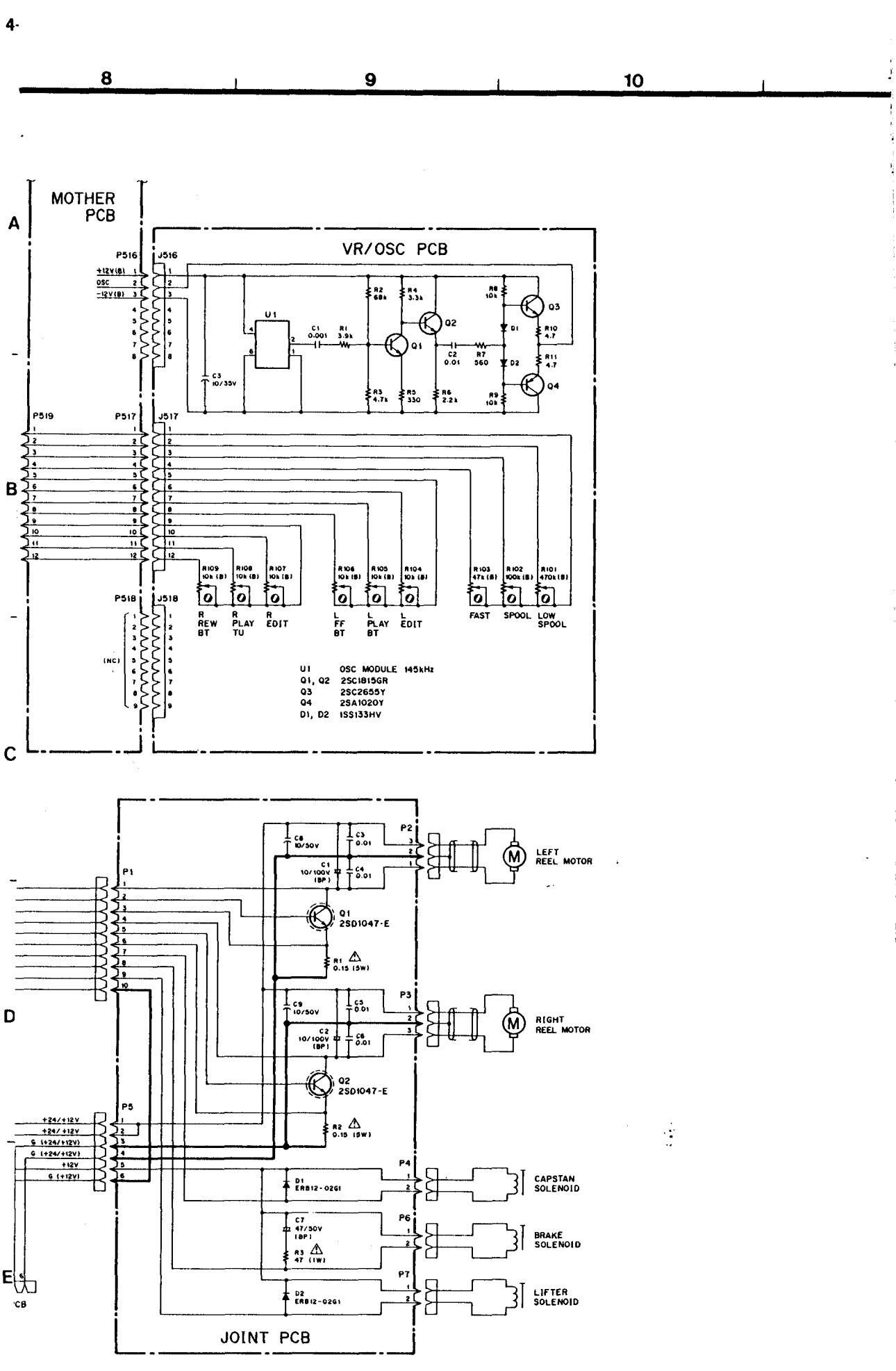


NOTE

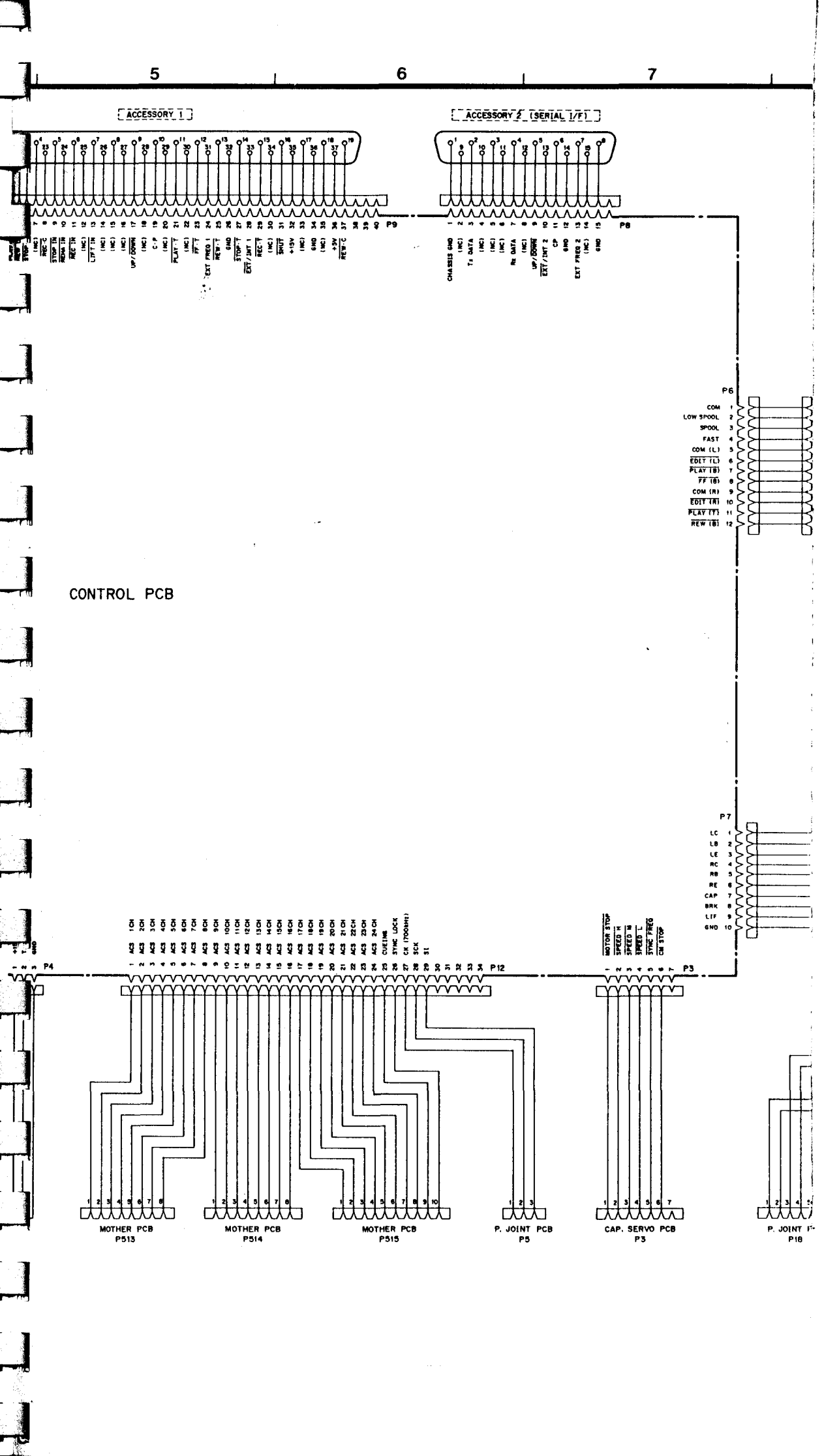
NR IN : DOLBY S NR IN
NR OUT : DOLBY S NR OUT


4
5
6
7
INPUT LINK 17~23
ON
OFF
S2
P4
A
B
C
D
E
CHASSIS GND
MOTHER PCB
P. JOINT PCB
P6
P9
P12
P551
P501
P504
P507
P552
P520
P11
P31
P61
P81
P15
P39
P32
P40
P12
P33
P62
P82
P16
P34
P42
P13
P35
P63
P83
P17
P36
P44
P14
P37
P64
P84
P18
P38
P510
P513
P46
DOLBY S 1CH~8CH
DOLBY S 9CH~16CH
R/P HEAD
ERASE HEAD
INPUT/OUTPUT
CONTROL PCB P6
P519
COM
LOW SPOOL
SPOOL
FAST
COM (L)
EDIT (L)
PLAY (L)
FF (L)
COM (R)
EDIT (R)
PLAY (R)
REW (L)
C1 0.1
C2 0.1
C3 0.1
C7 0.0036
C8 0.0036
L7 330μH
L8 330μH
INPUT/OUTPUT 1CH~8CH
INPUT/OUTPUT 9CH~16CH
INPUT/OUTPUT 17CH~24CH
METER
ACS
OPERATION PCB P2


1
2
3
11
HEAD PCB
R/P HEAD
ERASE HEAD
SW A PCB
INPUT LINK 9~16
SW B PCB
IN/OUT PCB
(1CH ~ 8CH)
IN/OUT PCB
(9CH ~ 16CH)
IN/OUT PCB
(17CH ~ 24CH)
INPUT
OUTPUT
R/P HEAD 1CH ~ 8CH
R/P HEAD 9CH ~ 16CH
R/P HEAD 17CH ~ 24CH
ERASE HEAD 1CH ~ 8CH
ERASE HEAD 9CH ~ 16CH
ERASE HEAD 17CH ~ 24CH

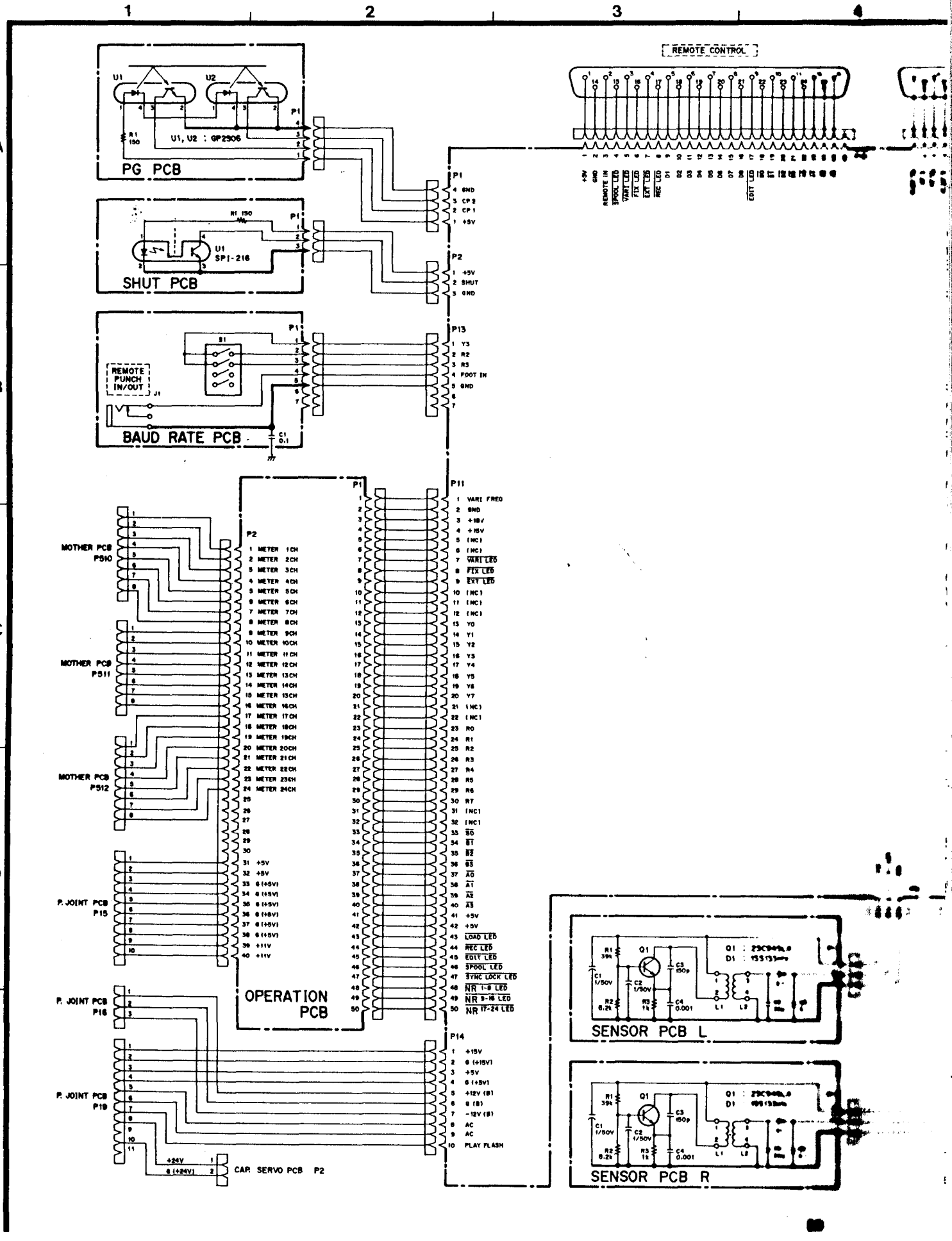


MSR-24 CONTROL SECTION WIRING DIAGRAM


5
6
7
ACCESSORY 1
ACCESSORY 2 (SERIAL I/F)
P9
P8
P6
COM 1
LOW SPOOL 2
SPOOL 3
FAST 4
COM (L) 5
EDIT (L) 6
PLAY (B) 7
FF (B) 8
COM (R) 9
EDIT (R) 10
PLAY (T) 11
REW (B) 12
CONTROL PCB
P7
LC 1
LB 2
LE 3
RC 4
RB 5
RE 6
CAP 7
BRK 8
LIF 9
GND 10
P4
P12
P3
MOTHER PCB
P513
MOTHER PCB
P514
MOTHER PCB
P515
P. JOINT PCB
P5
CAP. SERVO PCB
P3
P. JOINT P
P18

4-3. Schematic Drawings

Control Section Wiring Diagram



OPERATION PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200291200	OPERATION PCB ASSY
	*5210291200	OPERATION PCB
	5780102605	SCREW,PAN M2.6X5
	5801142100	SUPPORT,SW
	5801129100	SPACER,LED
D1-54	5224015010	DIODE,1SS133HV
D61-69	5225022000	LED,SLP-135(RED)
D71-94	5225022000	LED,SLP-135(RED)
D96-98	5225022000	LED,SLP-135(RED)
D99-101	5225022100	LED,SLP-235(GRN)
D102	5225022200	LED,SLP-435(YEL)
D103	5225022100	LED,SLP-235(GRN)
D104,105	5225022000	LED,SLP-135(RED)
J4	5336116400	SOCKET,CONN. 3024-14CHPB
J101-124	5336331400	SOCKET,CONN. 5224-04CHPB
P1	5334046900	SOCKET,CONN. 5342-50GS1
P2	5334046800	SOCKET,CONN. 5342-40GS1
P3	13150500	CONNECTOR,3022-14A (SD-3022)
R21	5280191700	R.,TRIMMER 10KB V.METAL
R22	5280191100	R.,TRIMMER 1.0KB V.METAL
R23	5282021700	R.,TRIMMER 20KB
S1-4	5300033900	SW.,PUSH SKCCAC038A
S5	5300040700	SW.,PUSH KCC11921
S6-10	5300028100	SW.,PUSH SPH122A
S11-20	5302107700	SW.,TACT SKHHAP0001
S21,22	5300028100	SW.,PUSH SPH122A
S23-28	5302107700	SW.,TACT SKHHAP0001
S29,30	5300028100	SW.,PUSH SPH122A
S31-54	5302107700	SW.,TACT SKHHAP0001
U1	*5220012500	IC.,UPC393C
U2	*5232255720	TR.,DIGI. DTC124ES
U3	*5232257600	TR.,ARRAY M54581P
U4	*5225021900	LED,DISPLAY
U101-U124	*5292209201	MODULE,LEVEL METER

P.JOINT PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200291900	P.JOINT PCB ASSY
	*5210291900	P.JOINT PCB
	5555590000	EARTH PLATE(A)
D1,2	5224016510	DIODE,SIS3M-01P10 VF
P1	5336052800	PLUG,CONN. 5273-08A
P2	5336052700	PLUG,CONN. 5273-07A
P3	5336052400	PLUG,CONN. 5273-04A
P4	5122132000	PLUG,CONN. 5045-08A(WHT)
P5	5336249300	PLUG,CONN. B03B-PH-K-S(WHT)
P6-8	5336251400	PLUG,CONN. B04B-PH-K-R(RED)
P9-11	5336249400	PLUG,CONN. B04B-PH-K-S(WHT)
P12-14	5336249700	PLUG,CONN. B07B-PH-K-S(WHT)
P15	5336250000	PLUG,CONN. B10B-PH-K-S(WHT)
P16	5336255300	PLUG,CONN. B03B-PH-K-K(BLK)
P17	5336251300	PLUG,CONN. B03B-PH-K-R(RED)
P18	5122130000	PLUG,CONN. 5045-06A(WHT)
P19	5122135000	PLUG,CONN. 5045-11A(WHT)
TP1	5317002100	PIN,DH CHECK IPS-1136

MOTHER PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200292000	MOTHER PCB ASSY
	*5210292000	MOTHER PCB
P11-22	5336249600	PLUG,CONN. B06B-PH-K-S(W
P31-54	5336253600	PLUG,CONN. B06B-PH-K-Y(
P61-72	5336255600	PLUG,CONN. B06B-PH-K-K(E
P81-92	5336251400	PLUG,CONN. B04B-PH-K-R(R
P101-124	5336279900	PLUG,CONN. 9P IL-SDA-P
P201-224	5336280200	PLUG,CONN. 12P IL-SDA-P
P301-324	5336279800	PLUG,CONN. 8P IL-SDA-P
P401-424	5336279800	PLUG,CONN. 8P IL-SDA-P
P501-503	5336251400	PLUG,CONN. B04B-PH-K-R(R
P504-506	5336249400	PLUG,CONN. B04B-PH-K-S(W
P507-509	5336249700	PLUG,CONN. B07B-PH-K-S(W
P510-512	5336251800	PLUG,CONN. B08B-PH-K-R(R
P513,514	5336249800	PLUG,CONN. B08B-PH-K-S(W
P515	5336250000	PLUG,CONN. B10B-PH-K-S(W
P516	5336279800	PLUG,CONN. 8P IL-SDA-P
P517	5336280200	PLUG,CONN. 12P IL-SDA-P
P518	5336279900	PLUG,CONN. 9P IL-SDA-P
P519	5336250200	PLUG,CONN. B12B-PH-K-S(W
P520	5336249200	PLUG,CONN. B02B-PH-K-S(W
P551,552	5336253800	PLUG,CONN. B08B-PH-K-Y(
P553	5336254000	PLUG,CONN. B10B-PH-K-Y(
U1	5232255720	TR.,DIGI. DTC124ES

VR/OSC PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200292200	VR/OSC PCB ASSY
	*5210292200	VR/OSC PCB
D1,2	5224015020	DIODE,1SS133T-77
J516	5336281800	SOCKET,CONN. 8P IL-SDA-S
J517	5336282200	SOCKET,CONN. 12P IL-SDA-
J518	5336281900	SOCKET,CONN. 9P IL-SDA-S
Q1	5230779520	TR.,2SC1815GR
Q2	5230779520	TR.,2SC1815GR
Q3	5230773800	TR.,2SC2655-Y
Q4	5230014000	TR.,2SA1020-Y
R101	5280037300	R.,TRIMMER 470KB
R102	5280036900	R.,TRIMMER 100KB
R103	5280036700	R.,TRIMMER 47KB
R104	5280036300	R.,TRIMMER 10KB
R105	5280036300	R.,TRIMMER 10KB
R106	5280036300	R.,TRIMMER 10KB
R107	5280036300	R.,TRIMMER 10KB
R108	5280036300	R.,TRIMMER 10KB
R109	5280036300	R.,TRIMMER 10KB
U1	5292209300	MODULE,OSC. 145KHZ

Parts marked with *require longer delivery time

JOINT PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200297700	JOINT PCB ASSY
	*5210297700	JOINT PCB
	5801142600	HEATSINK(C)
	5780103006	SCREW,PAN M3X6
	5780103008	SCREW,PAN M3X8
D1,2	5143243000	DIODE,ERB12-02G1
P1	5336203000	PLUG,CONN. 5483-10A(WHT)
P2,3	5336202300	PLUG,CONN. 5483-03A(WHT)
P4	5336202200	PLUG,CONN. 5483-02A(WHT)
P5	5336202600	PLUG,CONN. 5483-06A(WHT)
P6,7	5336202200	PLUG,CONN. 5483-02A(WHT)
Q1,2	5231758800	TR.,2SD1047-E
R1,2	⚠ 5241262100	R.,METAL PLATE 5W 0.15
R3	⚠ 5241217110	R.,INCOMB. 1W 47 J

IN/OUT PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200296700	IN/OUT PCB ASSY
	*5210296700	IN/OUT PCB
	5330509900	JACK,PIN 16P
L1-8	5286020400	COIL,CHOKE 330UH K VR

BAUD RATE PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200298000	BAUD RATE PCB ASSY
	*5210298000	BAUD RATE PCB
	5801196500	PLATE,ELECTRIC
J1	5330012600	JACK,3P FJ332DB-M
P1	5336202700	PLUG,CONN. 5483-07A(WHT)
S1	5302107800	SW.,DIP 4P

PG PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200291400	PG PCB ASSY
	*5210291400	PG PCB
P1	5336202400	PLUG,CONN. 5483-04A(WHT)
U1,2	13419359	PHOTOELECTRIC ELEMENT(GP2S06)

SHUT PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200291500	SHUT PCB ASSY
	*5210291500	SHUT PCB
P1	5336128300	PLUG,CONN. 8263-0311(WHT)
U1	5228016500	PHOTO-INTERRUPTER,SPI-216

SENSOR L PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200297800	SENSOR L PCB ASSY
	*5210297800	SENSOR L PCB
	5801138800	SPACER,SENSOR COIL
D1	5224015010	DIODE,1SS133HV
L1,2	5160038000	COIL,DETECTOR
P1	5336128300	PLUG,CONN. 8263-0311(WHT)
Q1	5145036000	TR.,2SC-945LK

SENSOR R PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200297900	SENSOR R PCB ASSY
	*5210297900	SENSOR R PCB
	5801138800	SPACER,SENSOR COIL
D1	5224015010	DIODE,1SS133HV
L1,2	5160038000	COIL,DETECTOR
P1	5336139300	PLUG,CONN. 8263-0311(RED)
Q1	5145036000	TR.,2SC-945LK

HEAD PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200292300	HEAD PCB ASSY
	*5210292300	HEAD PCB
J1-4	5332015300	SOCKET,IC. 16P

P.MONITOR PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200291800	P.MONITOR PCB ASSY
	*5210291800	P.MONITOR PCB
D1-5	5224015700	DIODE,1SS130
D6-10	5224015700	DIODE,1SS130
D11-23	5225015500	LED,LD-101VR RED
P1	5336330900	PLUG,CONN. 53025-0910
P2	5336330800	PLUG,CONN. 53025-0810
P3	5336330500	PLUG,CONN. 53025-0510
R1,2	⚠ 5183588000	R.,INCOMB. F25 270 J FR
R3	⚠ 5183594000	R.,INCOMB. 470 1/4W
R4	⚠ 5183588000	R.,INCOMB. F25 270 J FR
R5	⚠ 5183582000	R.,INCOMB. 1/4 150

Parts marked with *require longer delivery time.

DOLBY S NR PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200320100	DOLBY S NR PCB ASSY
	*5210320100	DOLBY S NR PCB
	*5210325100	HIC PCB
	*5210325200	COIL PCB
C3-6	5263167923	C.,METAL 0.1UF 50V
C101,201	5263168323	C.,METAL 0.22UF 50V
C107,207	5263105920	C.,POLYP. 160PF 100V
C108,208	5263106620	C.,POLYP. 330PF 100V
C109,209	5263167923	C.,METAL 0.1UF 50V
C110,210	5263167923	C.,METAL 0.1UF 50V
D101-105	5224015020	DIODE,1SS133T-77
D201-205	5224015020	DIODE,1SS133T-77
P1	5122156000	PLUG,CONN. 5046-13A(WHT)
Q101,201	5232008020	FET.,2SJ-40(E)
Q102,202	5232008420	FET.,2SK-381D
Q103,203	5232008020	FET.,2SJ-40(E)
Q104,204	5232008420	FET.,2SK-381D
Q105,205	5230779520	TR.,2SC-1815GR
Q106,206	5230775020	TR.,2SC2878-B
R11,21	5280036100	R.,TRIMMER 4.7KB
R12,22	5280036700	R.,TRIMMER 47KB
R13,23	5280021900	R.,TRIMMER 100KB
R14,24	5280021900	R.,TRIMMER 100KB
R110,210	5241459620	R.,METAL FILM 3.9K
R111,211	5241458020	R.,METAL FILM 820
R112,212	5241461420	R.,METAL FILM 22K
R113,213	5241459820	R.,METAL FILM 4.7K
R114,214	5280035700	R.,TRIMMER 1KB
R115,215	5241461420	R.,METAL FILM 22K
TP101,201	5317002100	PIN,DH CHECK 1PS-1136
U1,2	13447982	IC.,NJM78L06A
U3,4	13447992	IC.,NJM79L06A
U101,201	5220446500	IC.,SBX1654
U102,202	5220418800	IC.,M5218P
U103	5220418800	IC.,M5218P
U104,204	5292810200	FILTER,LOW PASS
U105,205	5232255720	TR.,DIGI. DTC124ES
U106,206	5232254820	TR.,DIGI. DTA124ES
U107,207	5232254820	TR.,DIGI. DTA124ES
U108,208	5232254820	TR.,DIGI. DTA124ES

Parts marked with *require longer delivery time.

PSY A PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200291600	PSY A PCBA
	*5210291600	PSY A PCB
	5780103006	SCREW,PAN M3X6
	5780103008	SCREW,PAN M3X8
	6045030000	HEATSINK
C1,2	⚠ 5262013400	C.,ELEC. 4700UF 35V(SME) VR
C12	⚠ 5262013300	C.,ELEC. 2200UF 50V(SME) VR
D1	5143243000	DIODE,ERB12-02G1
P1	5336249200	PLUG,CONN. B02-PH-K-S(WHT)
P2	5336249400	PLUG,CONN. B04B-PH-K-S(WHT)
P3	5336251400	PLUG,CONN. B04B-PH-K-R(RED)
P4	5336052200	PLUG,CONN. 5273-02A
P5	5336052200	PLUG,CONN. 5273-02A
P6	5336052200	PLUG,CONN. 5273-02A
P7	5336052200	PLUG,CONN. 5273-02A
P8	5336249200	PLUG,CONN. B02B-PH-K-S(WHT)
P9	5336251200	PLUG,CONN. B02B-PH-K-R(RED)
P10	5336052400	PLUG,CONN. 5273-04A
P11	5336255300	PLUG,CONN. B03B-PH-K-K(BLK)
P12	5336255200	PLUG,CONN. B02B-PH-K-K(BLK)
P13	5336052200	PLUG,CONN. 5273-02A
P21	5122184000	PLUG,CONN. 5045-03A(BLK)
P22	5122127000	PLUG,CONN. 5045-03A(WHT)
P23	5122127000	PLUG,CONN. 5045-03A(WHT)
P24	5122184000	PLUG,CONN. 5045-03A(BLK)
P25	5122300000	PLUG,CONN. 5045-03A(RED)
R1,2	⚠ 5183578000	R.,INCOMB. 1/4W 100
R5	5241461120	R.,METAL FILM 16K F FT
R6	5241459220	R.,METAL FILM 2.7K F FT
R7	5241459420	R.,METAL FILM 3.3K F FT
R8,9	5241461020	R.,METAL FILM 15K F FT
R11	5241461920	R.,METAL FILM 36K F FT
R12	5241459820	R.,METAL FILM 4.7K F FT
R13	5241459420	R.,METAL FILM 3.3K F FT
R14	⚠ 5241217110	R.,IMCOMB. 1W 47
U1	5220425800	IC.,M5230LA
U2	⚠ 5220434800	IC.,M5F7812L
U3	⚠ 5220435700	IC.,M5F7912L
U4	5220442700	IC.,M5231TL
U5	⚠ 5220434900	IC.,M5F7815L

PSY B PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200291700	PSY B PCB ASSY
	*5210291700	PSY B PCB
	5800178700	HEATSINK(A)
	5780103006	SCREW,PAN M3X6
	5780103010	SCREW,PAN M3X10
C1	⚠ 5262013500	C.,ELEC. 15000UF 35V(SME) VR
C5,10	⚠ 5262013600	C.,ELEC. 22000UF 16V(SME) VR
D1-4	5224014700	DIODE,S3V20H
P1	5336249600	PLUG,CONN. B06B-PH-K-S(WHT)
P2	5336251600	PLUG,CONN. B06B-PH-K-R(RED)

Parts marked with *require longer delivery time.

PSY B PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
P3	5336052300	PLUG,CONN. 5273-03A
P4	5336249200	PLUG,CONN. (WHT)
P5	5336052300	PLUG,CONN. 5273-03A
P6	5336052400	PLUG,CONN. 5273-04A
P7	5336052700	PLUG,CONN. 5273-07A
P8	5336052200	PLUG,CONN. 5273-02A
P9	5336255200	PLUG,CONN. B02B-PH-K-K(B
P21,22	5122127000	PLUG,CONN. 3P
P23	5336052300	PLUG,CONN. 5273-03A
Q1	5230771000	TR.2SC2274-KE
Q2	5230771000	TR.2SC2274-KE
Q3	5230771000	TR.2SC2274-KE
Q4	5145129000	TR.2SB-507
Q5	5145165000	TR.2SD-7160
R2	5241461120	R.,METAL FILM 16K F FT
R3	5241459220	R.,METAL FILM 2.7K F FT
R4	5241459420	R.,METAL FILM 3.3K F FT
R6	5241460220	R.,METAL FILM 6.8K F FT
R7	5241456420	R.,METAL FILM 180 F FT
R8	5241459420	R.,METAL FILM 3.3K F FT
R11	⚠ 5241224510	R.,INCOMB. 2W 470 J FF
R13,14	⚠ 5241262100	R.,METAL PLATE 5W 0.15K
U1,2	5220442700	IC.,M5231TL

FILTER PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200298100	FILTER PCB ASSY
	*5210298100	FILTER PCB
C1,2	⚠ 5267704400	SPARK KIL. 0.022UF 250V
C3-C8	⚠ 5267703800	SPARK KIL. 4700PF 400V M
L1	⚠ 5292806300	FILTER,NOISE FKOB16MH13

FUSE PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200298502	FUSE PCB ASSY [J,US,C,GE
	*5200298601	FUSE PCB ASSY [E,UK]
	*5210298502	FUSE PCB [J,US,C,GE]
	*5210298601	FUSE PCB [E,UK]
	5041237000	HOLDER,FUSE [J,US,C,GE]
	5332014200	HOLDER,FUSE [E,UK]
C1-5	⚠ 5263164900	C.,METAL 0.1MF/250V [E,U
F1,2	⚠ 5307004600	FUSE,7A-250V [J,US,C,GE]
F1,2	⚠ 5142194000	FUSE,MINI;T 6.3A-250V [E
F3	⚠ 5307004300	FUSE,3A-250V [J,US,C,GE]
F3	⚠ 5142189000	FUSE,MINI;T 2A-250V [E,U
F4	⚠ 5307042200	FUSE,15A-250V [J,US,C,GE
F4	⚠ 5307042600	FUSE,MINI;T 10A-250V [E,
F5	⚠ 5307046200	FUSE,10A-250V [J,US,C,GE
F5	⚠ 5307044100	FUSE,MINI;T 8A-250V [E,U

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

.CONTROL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200291101	CONTROL PCB ASSY
	*5210291100	CONTROL PCB
	5332020900	SOCKET,IC. C47-28-11
	5334042400	SOCKET,CONN. DSP01
	5317002100	PIN,DH CHECK IPS-1136
	5780103006	SCREW,PAN M3X6
	5801143000	HOLDER,BRACKET
CR1	5347016600	OSC.,CRYSTAL 6MHZ
CR2	5347001600	OSC.,CRYSTAL 4.9152MHZ
CR3	5347011300	OSC.,CERAMIC 700KHZ
D1-13	5224015020	DIODE,1SS133T-77
D14,15	5224016510	DIODE,S1S3M-01P10 VF
D16-31	5224015020	DIODE,1SS133T-77
P1	5336202400	PLUG,CONN. 5483-04A(WHT)
P2	5336206300	PLUG,CONN. 5483-03A(BLK)
P3	5336202700	PLUG,CONN. 5483-07A(WHT)
P4	5336204300	PLUG,CONN. 5483-03A(RED)
P5	5336202300	PLUG,CONN. 5483-03A(WHT)
P6	5336203200	PLUG,CONN. 5483-12A(WHT)
P7	5336203000	PLUG,CONN. 5483-10A(WHT)
P8	5336213400	SOCKET,CONN. 5332-16GS1
P9	5336213800	SOCKET,CONN. 5332-40GS1
P10	5336213600	SOCKET,CONN. 5332-26GS1
P11	5336213900	SOCKET,CONN. 5332-50GS1
P12	5336213700	SOCKET,CONN. 5332-34GS1
P13	5336204700	PLUG,CONN. 5483-07A(RED)
P14	5336205000	PLUG,CONN. 5483-10A(RED)
P20	5334042700	PLUG,CONN. DSP02-006-431T
P21	5334042600	PLUG,CONN. DSP02-004-431T
P22	5334042500	PLUG,CONN. DSP02
Q1,2	5145077000	TR.,2SD-600
Q3-5	5231755400	TR.,2SD794Q
R63	5242118600	R.,ARRAY RMLS 8J103
U1	6048661000	IC,M54517P
U2,3	5220051700	IC.,TC74HC02P
U4	5220051600	IC.,TC74HC00P
U5	5220051800	IC.,TC74HC04P
U6	5220055700	IC.,TC74HC10P
U7	6048661000	IC,M54517P
U8	5220051600	IC.,TC74HC00P
U9	5220051900	IC.,TC74HC14P
U10	5220052200	IC.,TC74HC86P
U11	5220051800	IC.,TC74HC04P
U12	5220040800	IC.,TC74HC74P
U13	5220013400	IC.,TC4066BP
U14-16	6048661000	IC,M54517P
U17	5220088100	IC.,M5M82C255ASP
U18	5220063700	IC.,SPG8640CN
U19	5220810600	LSI.,M5M82C51AP
U20	5220062700	IC.,M75189AP
U21	5220051600	IC.,TC74HC00P
U22	6048661000	IC,M54517P
U23	5220013400	IC.,TC4066BP
U24,25	5220419500	IC.,LA6358
U26	6048661000	IC,M54517P

CONTROL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
U27,28	5220052000	IC.,TC74HC32P
U29	5220423600	IC.,M5232L
U30	5220053100	IC.,TC74HC4040P
U31	5220090300	IC.,SN74HC682
U32	5220055900	IC.,TC74HC138P
U33	5220818401	IC.,ROM (HN27C256G-20)
U34	5220815800	LSI.,M5M82C54P
U35	5220040800	IC.,TC74HC74P
U36	5232256900	TR.,ARRAY M54585P
U37	5220805800	IC.,M5L8279P-5
U38	5220052700	IC.,TC74HC245P
U39	5220814500	IC.,HD63B03Y
U40	5220052900	IC.,TC74HC390P
U41	5220051700	IC.,TC74HC02P
U42	5220062400	IC.,M75188P
U43	5232257600	TR.,ARRAY M54581P
U44,45	5232256900	TR.,ARRAY M54585P
U46	5220055900	IC.,TC74HC138P
U47	5220815900	LSI.,M5M82C55AP-2
U48	5220052600	IC.,TC74HC244P
U49	5220052000	IC.,TC74HC32P
U50	5220040900	IC.,UPD74HCU04C
U51	5220053100	IC.,TC74HC4040P
U52	5220051800	IC.,TC74HC04P
U53	5220051900	IC.,TC74HC14P
U54	5220430600	IC.,M51953BL
U55	5220052900	IC.,TC74HC390P
U56-58	5232254820	TR.,DIGI. DTA124ES
U59	5232255720	TR.,DIGI. DTC124ES
U60-64	5232254820	TR.,DIGI. DTA124ES
U65-67	5232255720	TR.,DIGI. DTC124ES

R/P AMPL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200292101	R/P AMPL PCB ASSY
	*5210292101	R/P AMPL PCB
	*5210292700	COIL A PCB
	*5210292800	COIL B PCB
	*5210272400	TRAP PCB
	*5801325600	SHIELD,RELAY
D1,2	5224015020	DIODE,1SS133T-77
D3	5224543601	DIODE,ZENER RD15EB1
D4,5	5224015020	DIODE,1SS133T-77
D6	5224571801	DIODE,ZENER RD3.0FL2
D7,8	5224015020	DIODE,1SS133T-77
D10-15	5224015020	DIODE,1SS133T-77
J1	5336281900	SOCKET,CONN. 9P IL-SDA-S
J2	5336282200	SOCKET,CONN. 12P IL-SDA-S
J3,4	5336281800	SOCKET,CONN. 8P IL-SDA-S
K1	5290012700	RELAY,12V G5A-237PL
K2	5290013700	RELAY,SY-12W-K
L1	5286007600	COIL,CHOKE 3.0MH
L3	5286037300	COIL,TRAP VARIABLE 145kHz
L4	5320051500	TRANS.,BIAS
L5	5320058000	TRANS.,ERASE
Q1,2	5232009500	FET.,2K170BL
Q3	5232008420	FET.,2SK381D
Q4	5232008020	FET.,2SJ-40(E)
Q5	5230775020	TR.,2SC2878-B
Q6,7	5230779520	TR.,2SC1815GR
Q9	5232008020	FET.,2SJ-40(E)
Q10	5232008420	FET.,2SK381D
Q11	5232008020	FET.,2SJ-40(E)
Q12	5232008420	FET.,2SK381D
Q13	5230779520	TR.,2SC1815GR
Q14	5232008420	FET.,2SK381D
Q15	5232008020	FET.,2SJ-40(E)
Q16	5230779520	TR.,2SC1815GR
Q17	5232008020	FET.,2SJ-40(E)
Q18,19	5230782200	TR.,2SC2002L
Q20	5230012920	TR.,2SA1015GR
Q21-23	5230779520	TR.,2SC1815GR
Q24	5232008420	FET.,2SK381D
R26,27	5183578000	R.,INCOMB. 1/4W 100
R201	5242126500	R.,ARRAY RMLS5 104J
R202	5242126700	R.,ARRAY RMLS3 472J
R301	5280035900	R.,TRIMMER 2.2KB
R302	5280036100	R.,TRIMMER 4.7KB
R303	5280036300	R.,TRIMMER 10KB
R304	5280035900	R.,TRIMMER 2.2KB
R305	5280036300	R.,TRIMMER 10KB
R306,307	5280036200	R.,TRIMMER 6.8KB
R308	5280036900	R.,TRIMMER 100KB
R309	5280036200	R.,TRIMMER 6.8KB
R310	5280021900	R.,TRIMMER 100KB
TP1-6	5317002100	PIN,DH CHECK 1PS-1136
TP8-10	5317002100	PIN,DH CHECK 1PL-1136
U1	5220439600	IC.,UPC4507C
U2-4	5220418800	IC.,M5218P

R/P AMPL PCB ASSY

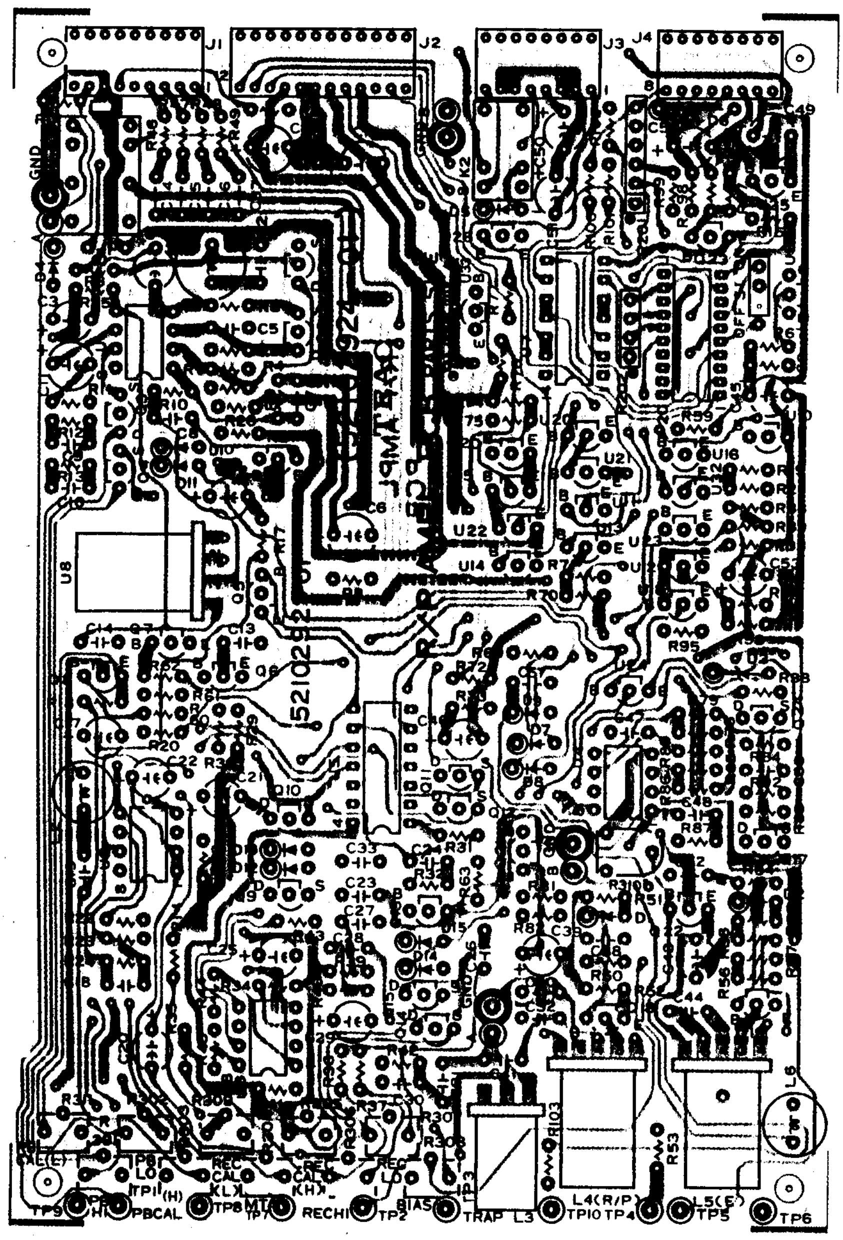
REF.NO.	PARTS NO.	DESCRIPTION
U5	5220036200	IC.,LC4966
U6	5220813800	IC.,UPD7554CS
U7	5220051600	IC.,TC74HC00P
U8	5292809000	FILTER,L.PASS 20kHz/26kHz
U9	5232254820	TR.,DIGI. DTA124ES
U10	5232255720	TR.,DIGI. DTC124ES
U11-16	5232254820	TR.,DIGI. DTA124ES
U18,20	5232254820	TR.,DIGI. DTA124ES
U21	5232255720	TR.,DIGI. DTC124ES
U22,23	5232254820	TR.,DIGI. DTA124ES
U24-26	5232255720	TR.,DIGI. DTC124ES
U32	5232254820	TR.,DIGI. DTA124ES

CAPSTAN SERVO PCB ASSY

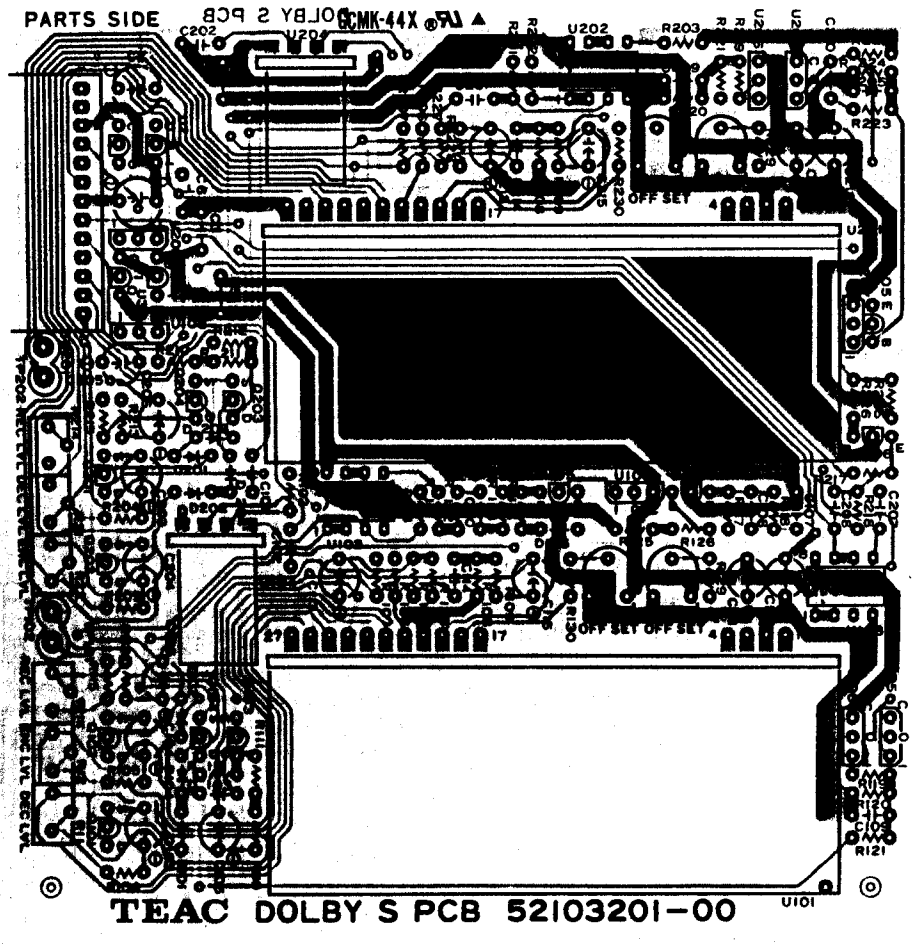
REF.NO.	PARTS NO.	DESCRIPTION
	*5200291300	CAPSTAN SERVO PCB ASSY
	*5210291300	CAPSTAN SERVO PCB
	5317002100	PIN,DH CHECK 1PS-1136
	5801319300	HEATSINK,SERVO
	5780103006	SCREW,PAN M3X6
D1-4	5224015010	DIODE,1SS133HV
D5	5143243000	DIODE,ERB12-02G1
L1	6046628000	COIL,CHOKE
P1	5122137000	PLUG,CONN. 5045-13A(WHT)
P2	5122299000	PLUG,CONN. 5045-02A(RED)
P3	5122131000	PLUG,CONN. 5045-07A(WHT)
Q1	5145102000	FET,2SK-68A-L
Q2	5145150000	TR.,2SA-1015GR
Q3	5230773800	TR.,2SC2655-Y
Q4	5231762800	TR.,2SD1913R
Q5-7	5230014000	TR.,2SA1020-Y
Q8-10	5230773800	TR.,2SC2655-Y
R17	5280211300	R.,TRIMMER 47KB
R26	⚠ 5184550000	R.,INCOMB. 1/1W J
R30	5280211000	R.,TRIMMER 4.7KB
U1	5220440000	IC.,UPC1246C
U2,3	5220426600	IC.,UPC1043C
U4	5220407200	IC.,LM2904
U5	5220040800	IC.,TC74HC74P
U6	5220016700	IC.,HD14046BP
U7	5220051900	IC.,TC74HC14P
U8	5220055700	IC.,TC74HC10P
U9	5220051600	IC.,TC74HC00P
U10-13	5220013400	IC.,TC4066BP
U14	5220019400	IC.,TC4069UBP
U15-19	5232255720	TR.,DIGI. DTC124ES
U20	5220434800	IC.,M5F7812L
U21	5220434400	IC.,M5F7805L

Parts marked with *require longer delivery time.

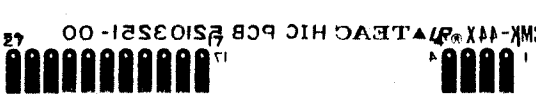
R/P PCB Ass'y



Dolby S NR PCB Ass'y

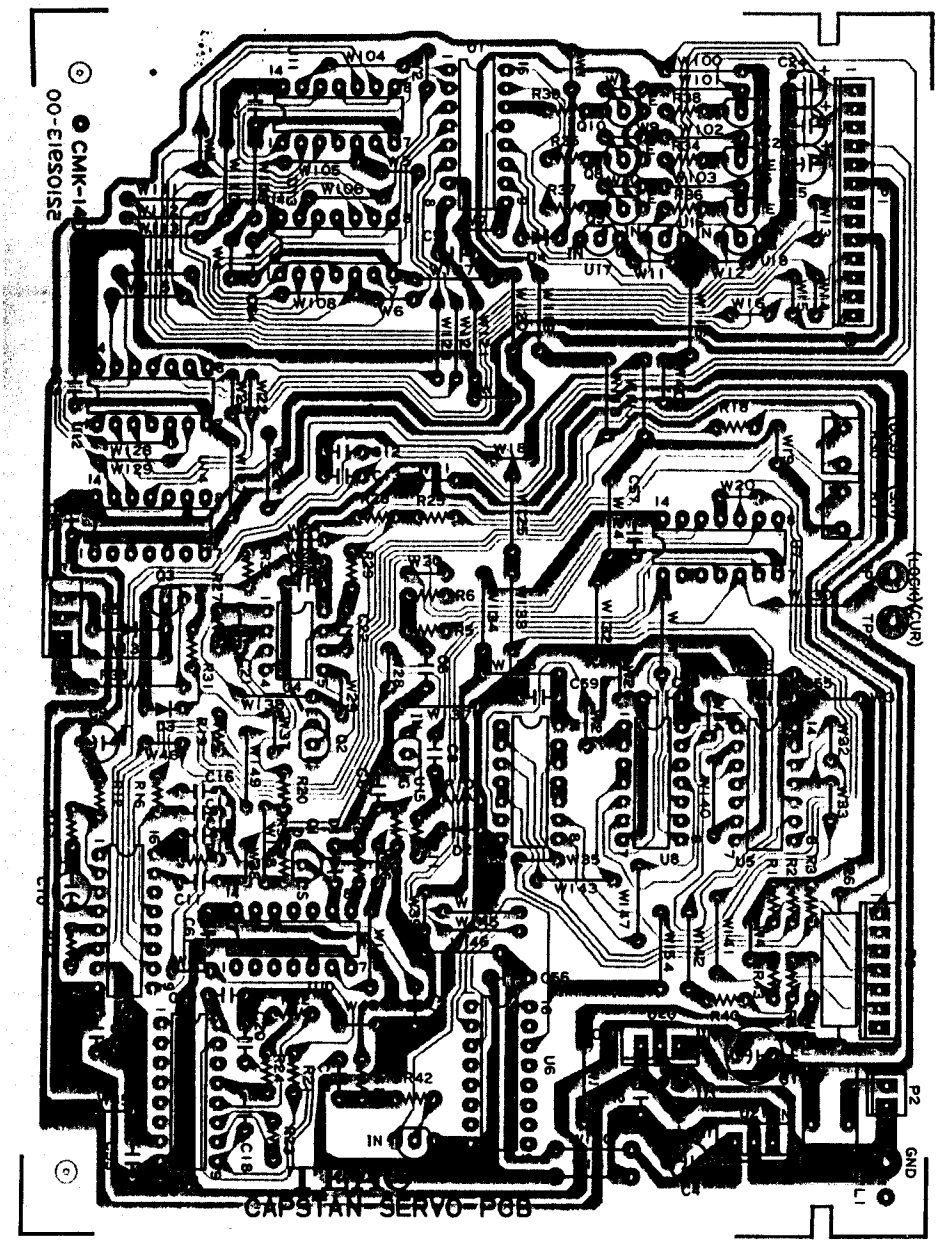


HIC PCB

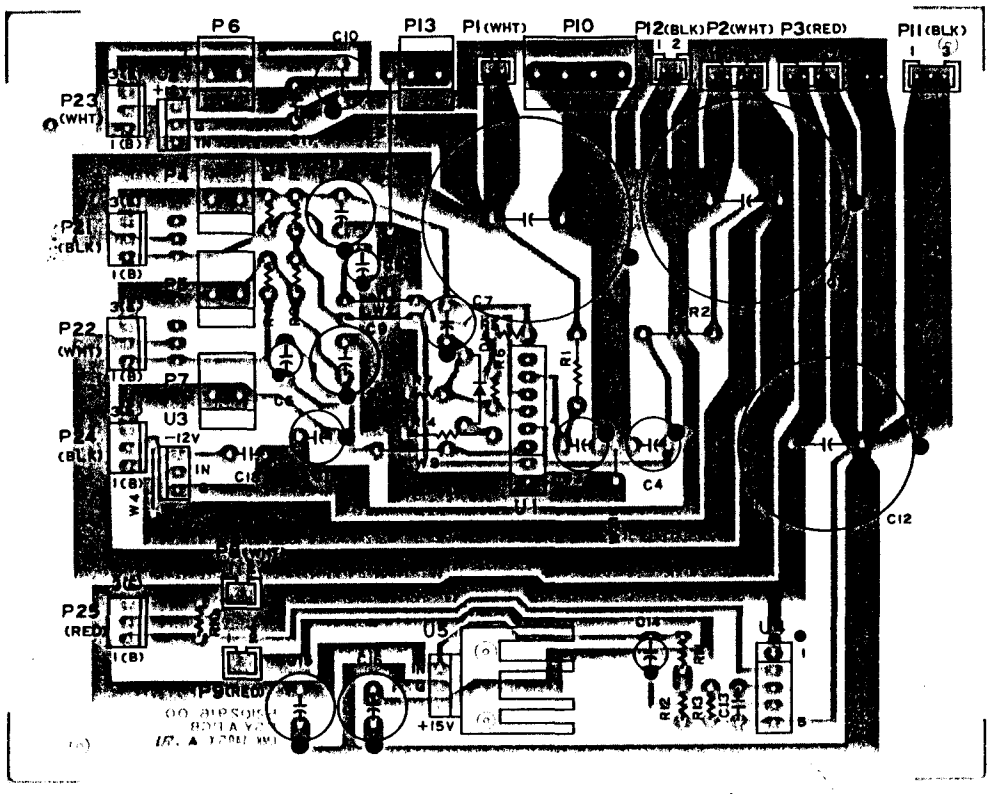


Coil PCB

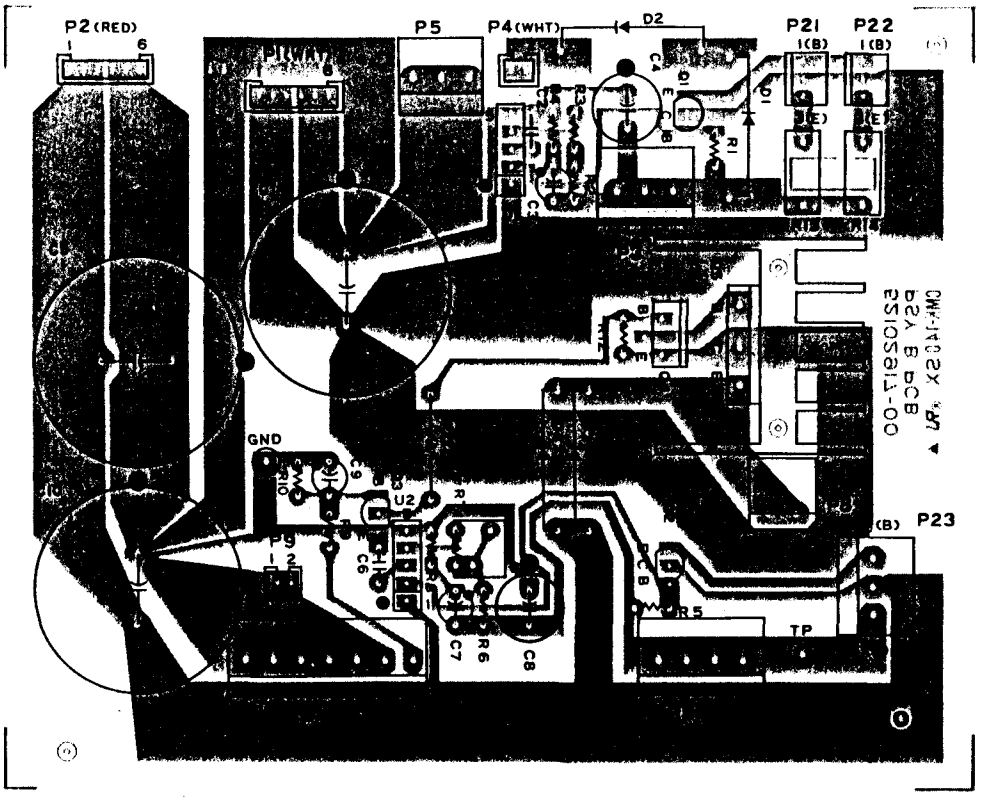
Capstan Servo PCB Ass'y



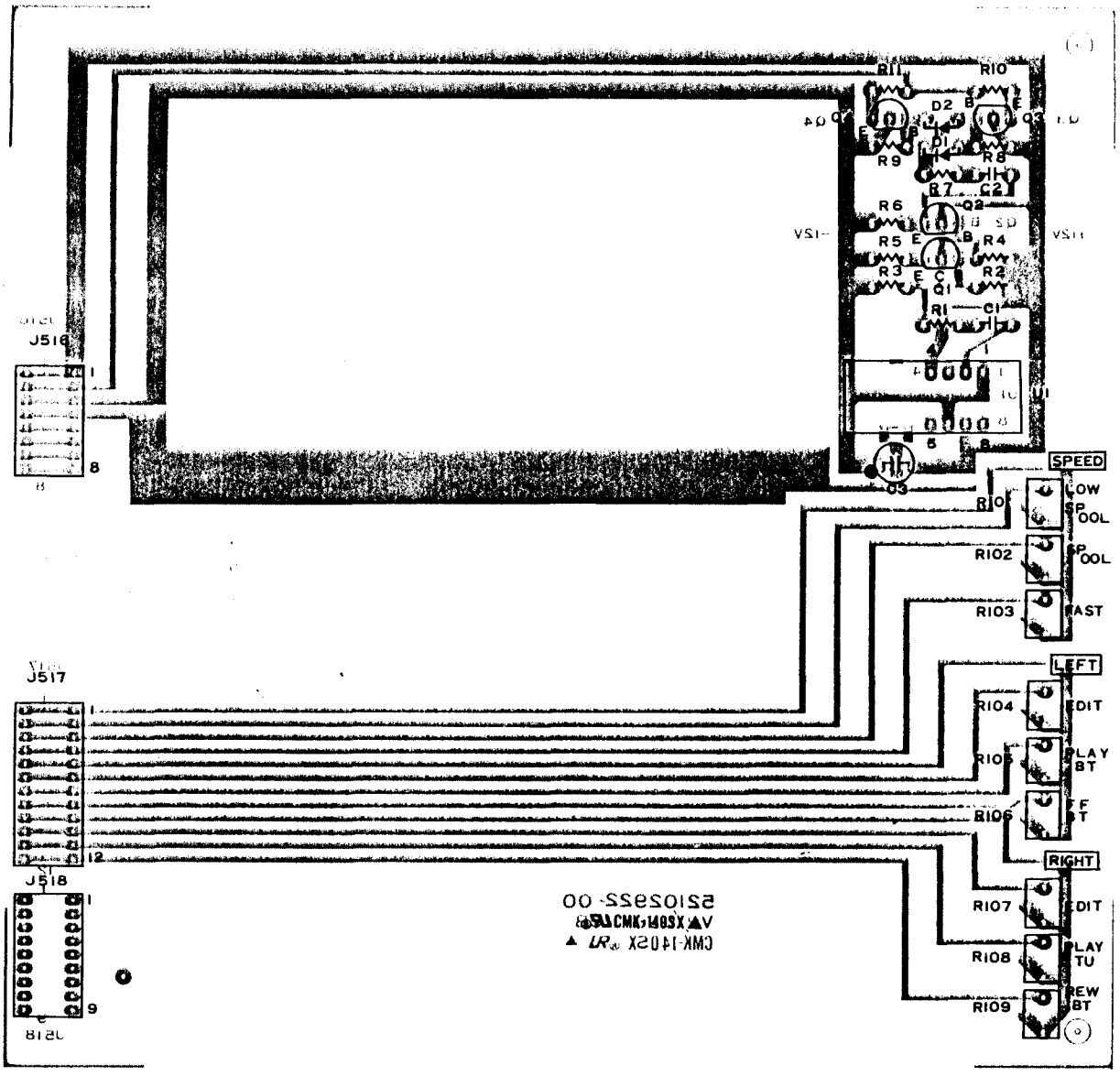
PSY A PCB Ass'y

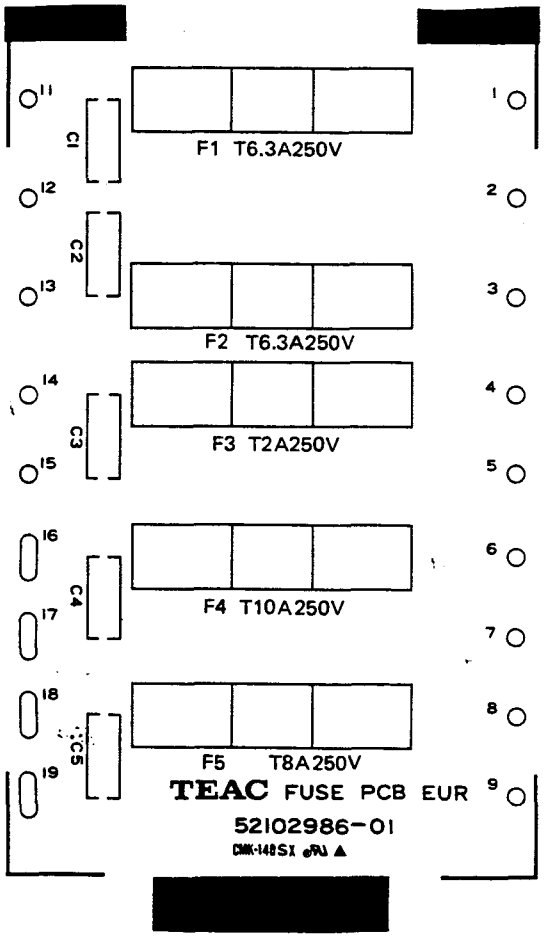


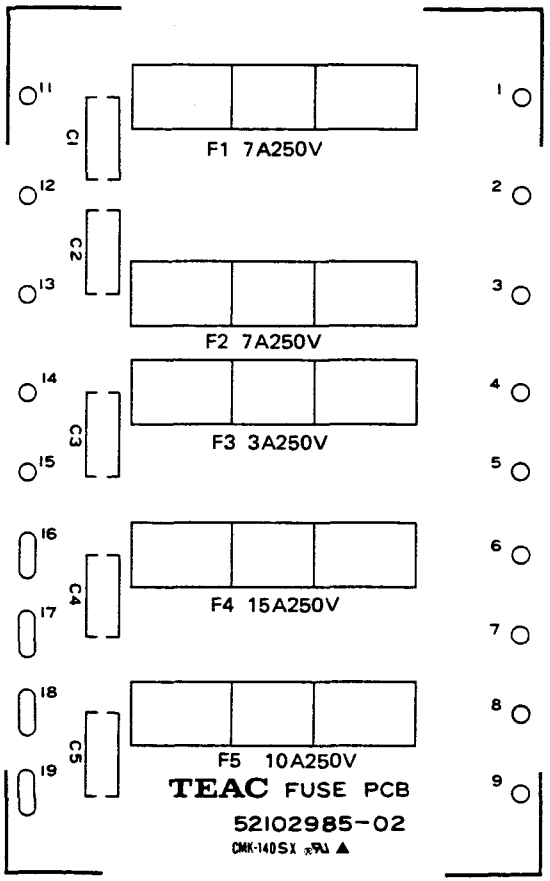
PSY B PCB Ass'y



VR/OSC PCB Ass'y

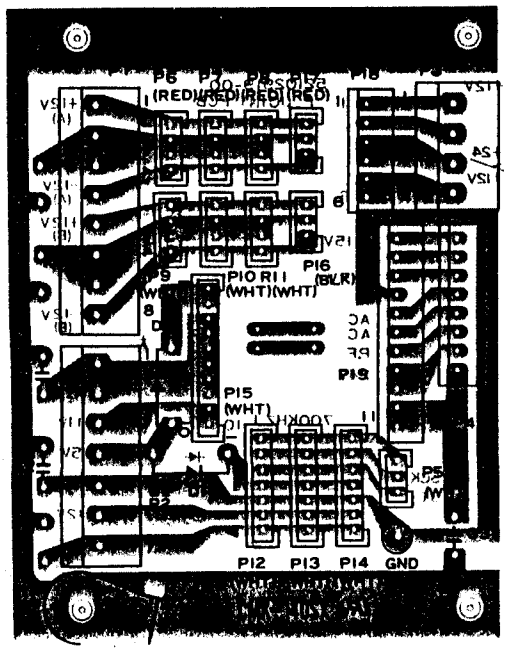




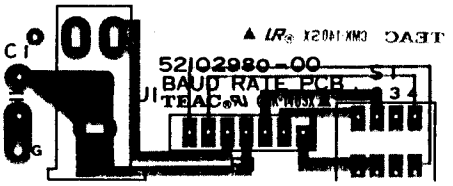


Fuse PCB Ass'y

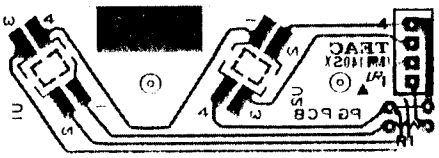
P. Joint PCB Ass'y



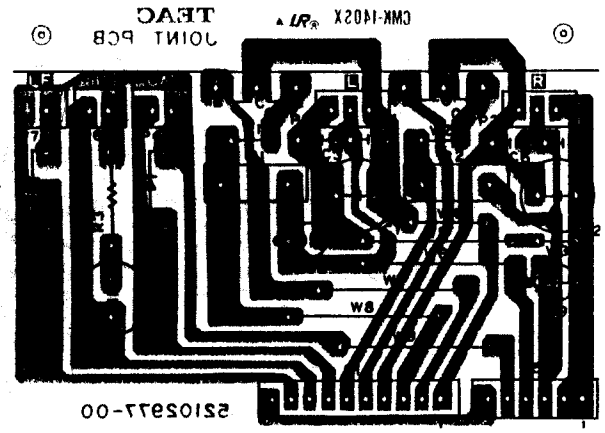
Baud Rate PCB Ass'y



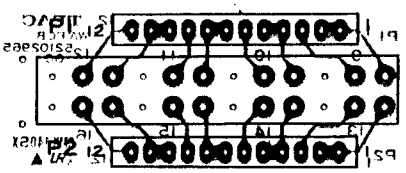
PG PCB Ass'y



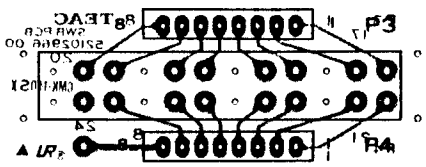
Joint PCB Ass'y



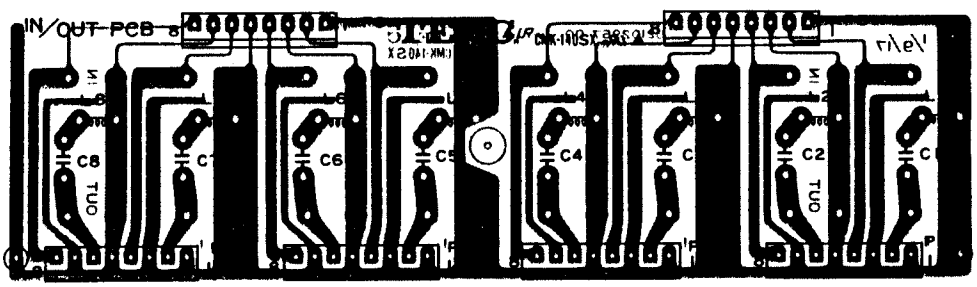
SW A PCB



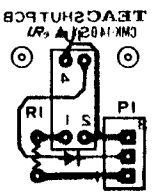
SW B PCB



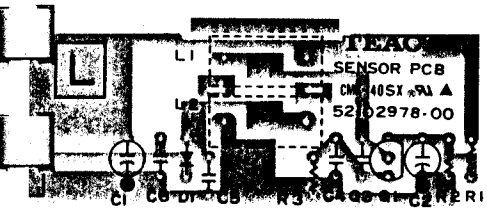
In/Out PCB Ass'y



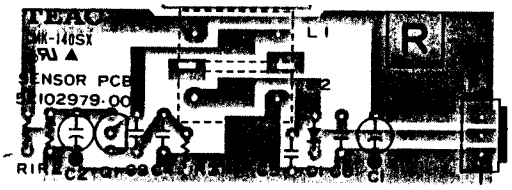
Shut PCB Ass'y



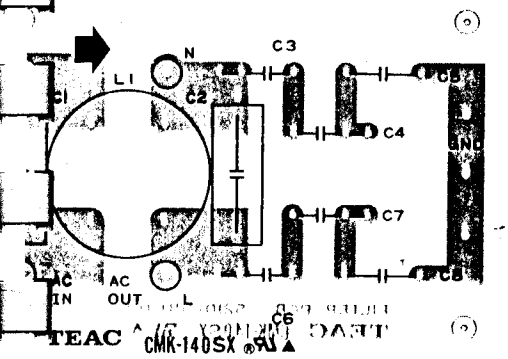
sor L PCB Ass'y



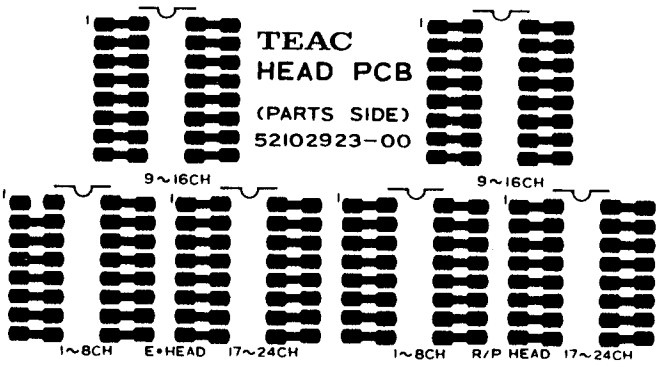
Sensor R PCB Ass'y



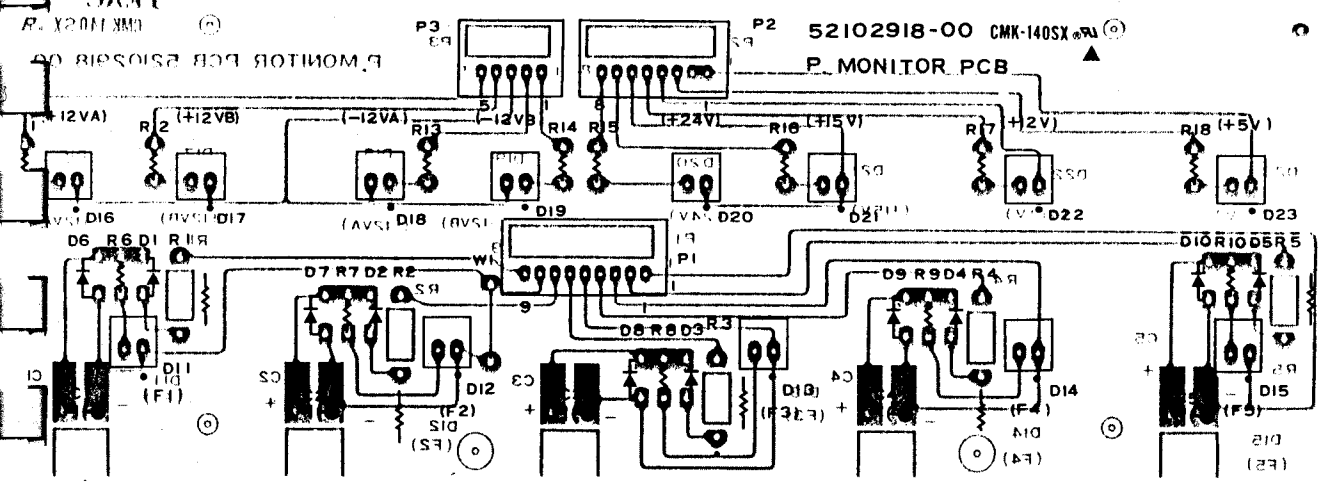
er PCB Ass'y



Head PCB Ass'y



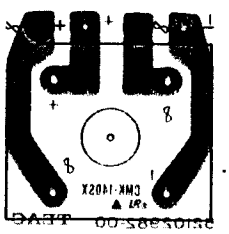
Monitor PCB Ass'y



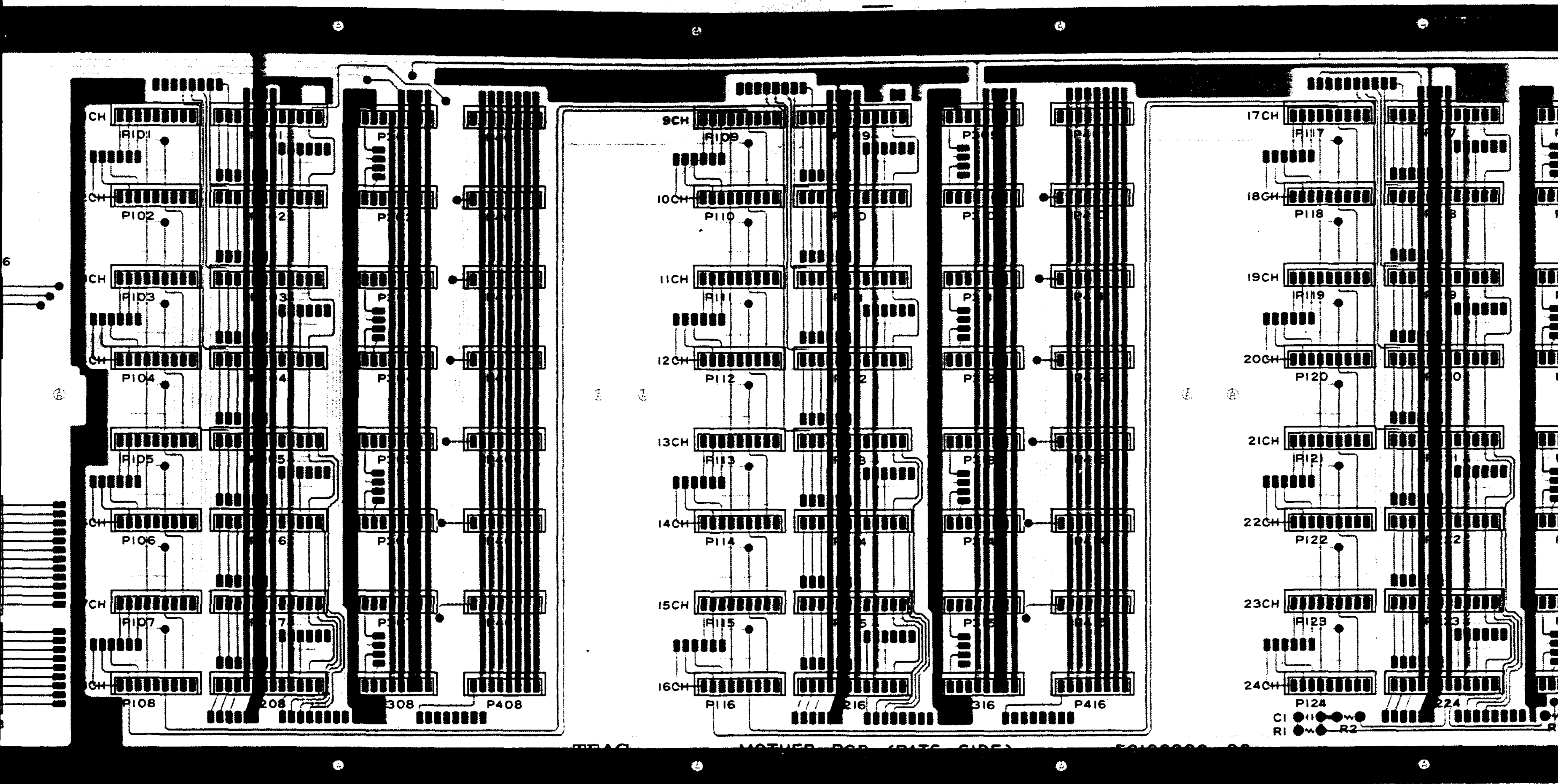
D PCB

TR PCB

Diode PCB

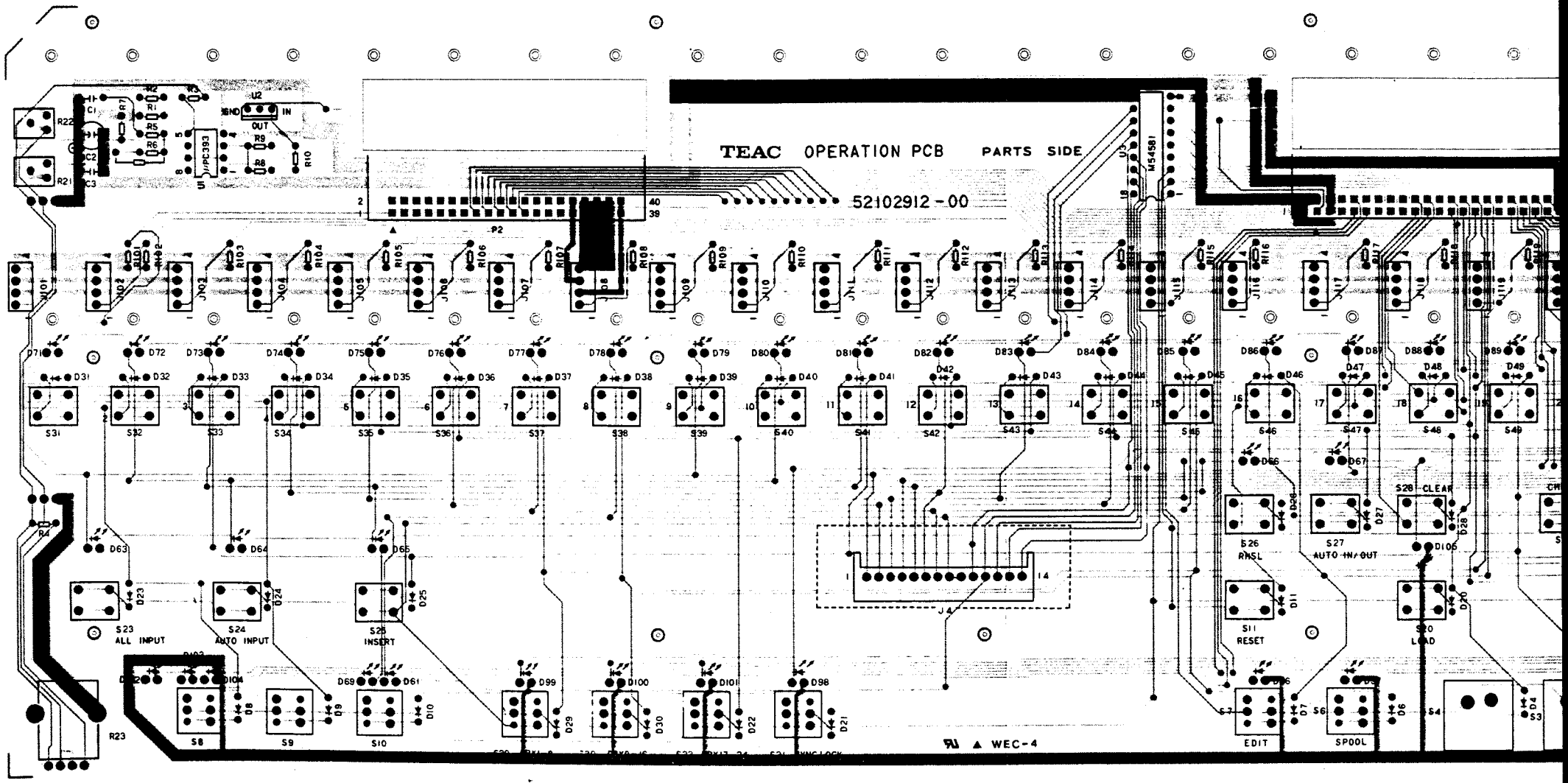


CB Ass'y

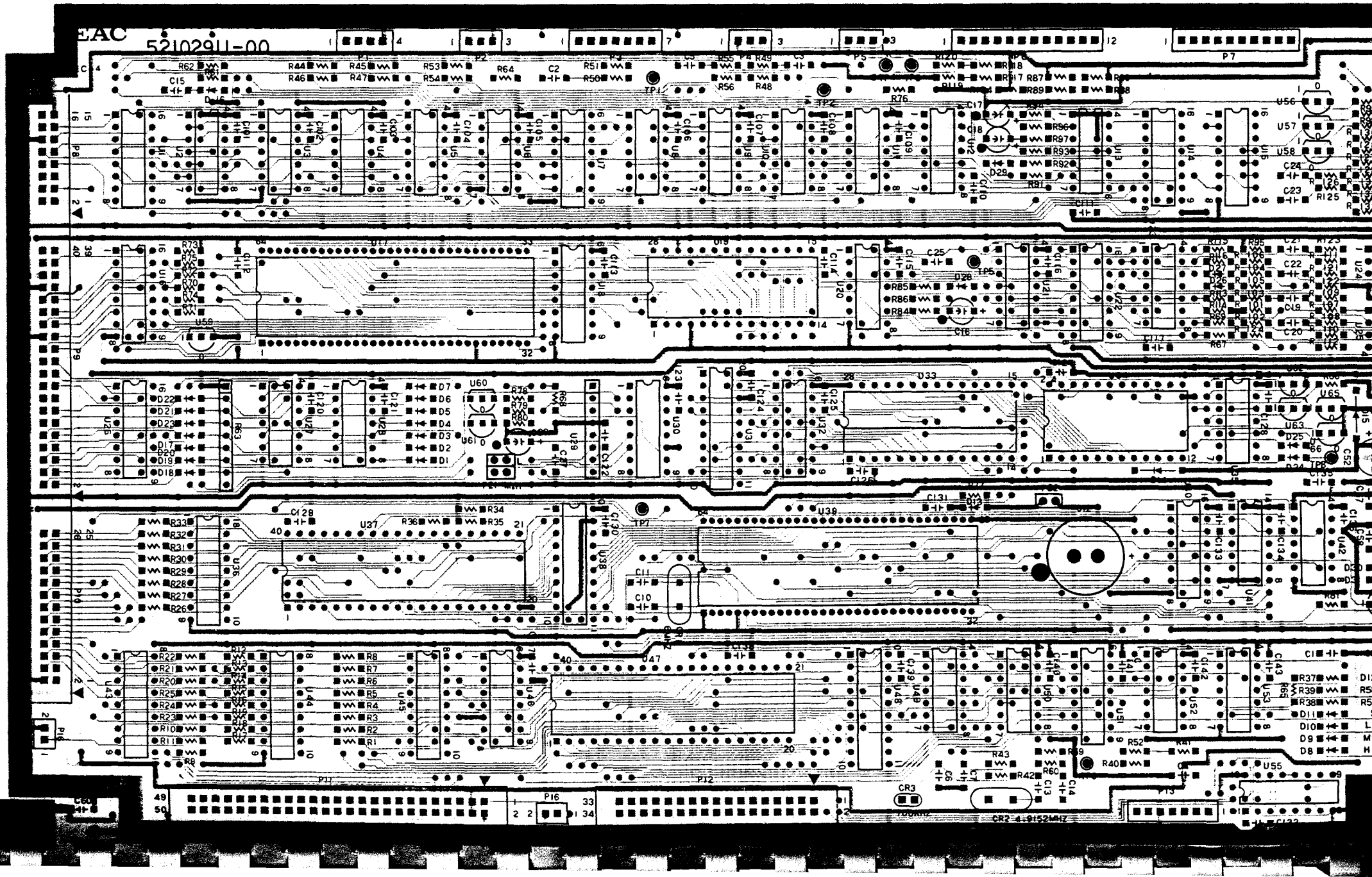


P101
P102
P103
P104
P105
P106
P107
P108
208
308
P408
9CH
10CH
11CH
12CH
13CH
14CH
15CH
16CH
P109
P110
P111
P112
P113
P114
P115
P116
216
316
P416
17CH
18CH
19CH
20CH
21CH
22CH
23CH
24CH
P117
P118
P119
P120
P121
P122
P123
P124
224
C1
R1
R2

Operation PCB Ass'y



Control PCB Ass'y



EXPLODED VIEW-7

REF.NO.	PARTS NO.	DESCREPTION	REMARKS
7- 1	*5801322100	CHASSIS(A),POWER SUPPLY	
7- 2	*5801322800	ANGLE(R),FOOT	
7- 3	*5800307100	FOOT(A),COLLAR	
7- 4	*5801322700	ANGLE(L),FOOT	
7- 5	*5801322900	HEATSINK	
7- 6	*5801323000	PANEL(B),CONNECTOR	
7- 7	*5332019500	SOCKET,AC 3P	
7- 8	*5801323100	BRACKET,FILTER PCB	
7- 9	*5200298100	FILTER PCB ASSY	Refer to pages 53 & 58
7-10	*5801313100	PANEL,SIDE	
7-11	⚠ 5231758400	TR.,2SD845-O	
7-12	⚠ 5230506400	TR.,2SB755-O	
7-13	⚠ 5228013900	SILICON STACK,10D4B41	
7-14	⚠ 5228010000	SILICON STACK,D5SB20	
7-15	⚠ 5145165000	TR.,2SD-7160	
7-16	*5200291600	PSY A PCB ASSY	Refer to pages 48 & 58
7-17	*5801322300	GUIDE,POWER SUPPRY PCB	
7-18	⚠ 5320057600	TRANSFORMER,POWER [J]	
	⚠ 5320057700	TRANSFORMER,POWER [US,C]	
	⚠ 5320057800	TRANSFORMER,POWER [GE]	
	⚠ 5320057900	TRANSFORMER,POWER [E,UK]	
7-19	*5801322400	BRACKET,TRANS.	
7-20	*5200291700	PSY B PCB ASSY	Refer to pages 48 & 58
7-21	⚠ 5300040100	SW.,POWER TV-5	
7-22	⚠ 5267703800	C.,SPARK KIL. 4700PF 400V M	
7-23	*5730007500	COVER,CAPASITOR SB-1417	
7-24	*5801322600	BRACKET,SW	
7-25	*5801322200	CHASSIS(B),POWER SUPPRY	
7-26	*5801322500	BRACKET,FUSE PCB	
7-27	⚠ 5133015001	SOCKET,VOLTAGE SELECT 100-240V [GE]	
7-28	⚠ 5133014000	PLUG,VOLTAGE SELECT BX500 [GE]	
7-29	*5200298502	FUSE PCB ASSY [J,US,C,GE]	Refer to pages 50 & 58
	*5200298601	FUSE PCB ASSY [E,UK]	Refer to pages 50 & 58
7-30	*5801139400	ANGLE(R) ASSY,SIDE	
7-31	*5801323200	BRACKET,LED	
7-32	*5200291800	P.MONITOR PCB ASSY	Refer to pages 53 & 57
7-33	*5801139300	ANGLE(L) ASSY,SIDE	
7-34	*5801139900	BUTTON ASSY,POWER	
7-35	*5801313600	PANEL,POWER SUPPLY	
7-36	*5801323300	COVER,MONITOR	
7-37	*5210296300	TR PCB	Refer to page 53
7-38	*5210296400	D PCB	Refer to page 53
7-39	*5210298200	DIODE PCB	Refer to page 53
7-41	*5780223006	SCREW,FLAT M3X6(BLK NI)	
7-42	*5780124010	SCREW,PAN M4X10(BLK NI)	
7-43	*5780024008	SCREW,BIND M4X8(BLK NI)	
7-44	*5780023006	SCREW,BIND M3X6(BLK NI)	
7-45	*5730015900	POST,JUCK D20418-J3F	
7-46	*5780103010	SCREW,PAN M3X10	
7-47	*5780103006	SCREW,PAN M3X6	
7-48	*5785124000	WASHER,LOCK M4.0	
7-49	*5781814000	NUT,M4	
7-50	*5780103015	SCREW,PAN M3X15	

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

Parts marked with *require longer delivery time.

D VIEW-7

PARTS NO.	DESCREPTION	REMARKS
*5780024020	SCREW,BIND M4X20(BLK NI)	
*5780324010	SCREW,OVAL COUNTERSUNK M4X10(BLKNI)*	
*5780144010	SCREW,PAN SEMS-B M4X10	
*5783003006	SCREW,PAN S-TITE M3X6	
*5780103008	SCREW,PAN M3X8	
*5785223000	WASHER,FIBER 3X6X0.5T	
*5781783006	SCREW,RHA3*6FNB	

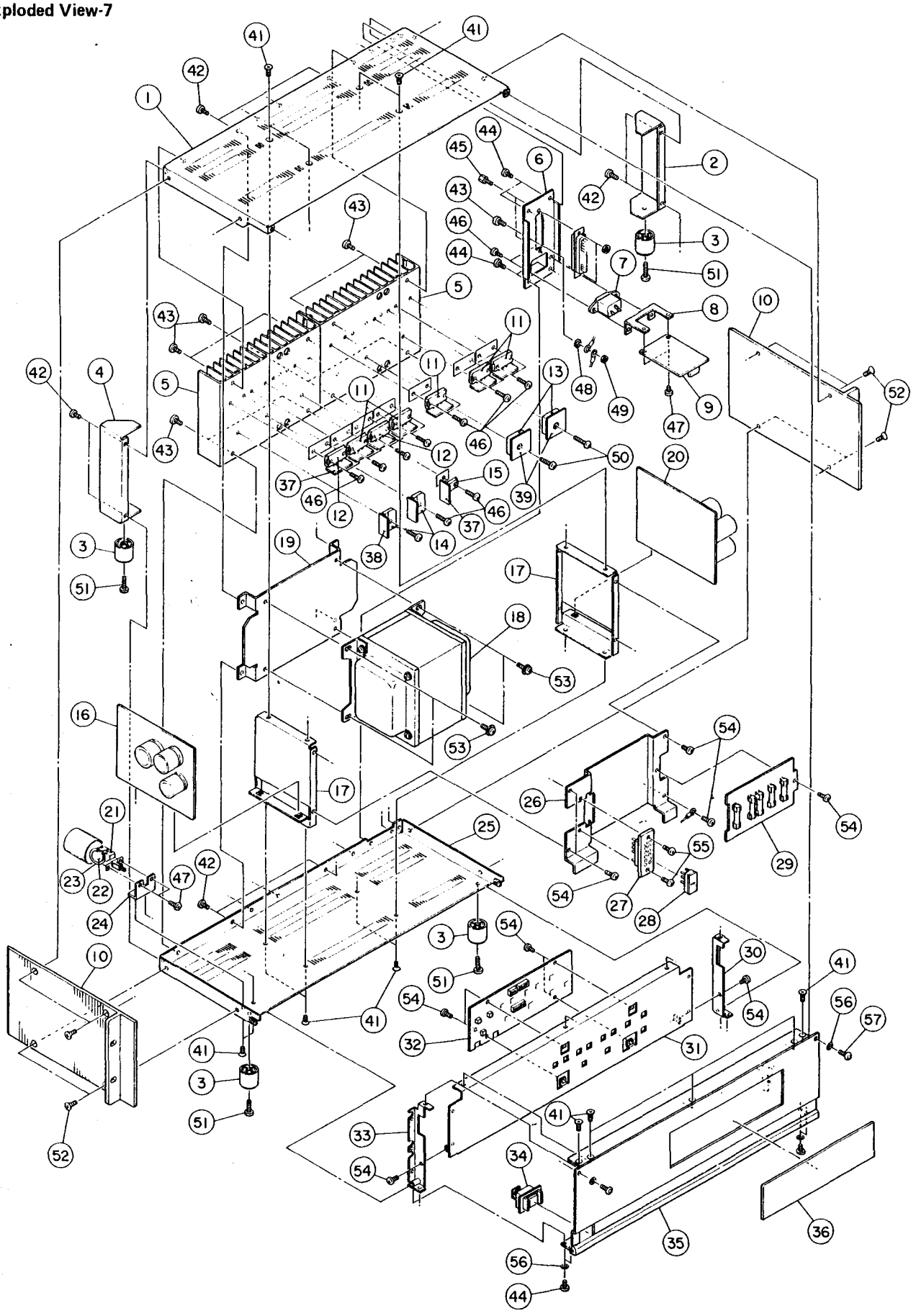
) ACCESORIES

PARTS NO.	DESCRIPTION	REMARKS
⚠ *5350014800	AC CORD [J]	
⚠ *5350008000	AC CORD ASSY [US,C,GE]	
⚠ *15922303	AC CORD [E]	
⚠ *5350015900	AC CORD [UK]	
*5200259800	EXTENTION PCB ASSY	
*5800307100	FOOT(A),COLLAR	
*5780024020	SCREW,BIND M4X20 (BLK NI)	
*5534580000	BELT,MINI C	
*5801280400	PULLER(B),CARD	
*5744023600	REEL RE1050	
*5350512900	CABLE,POWER [J,C]	
*5700128400	OWNER'S MANUAL [J]	
*5700128500	OWNER'S MANUAL [EXCEPT J]	
*5700128600	OWNER'S MANUAL [E,GE]	

A. [E]:EUROPE [UK]:U.K. [C]:CANADA [J]:JAPAN
RAL EXPORT

ked with *require longer delivery time.

Exploded View-7

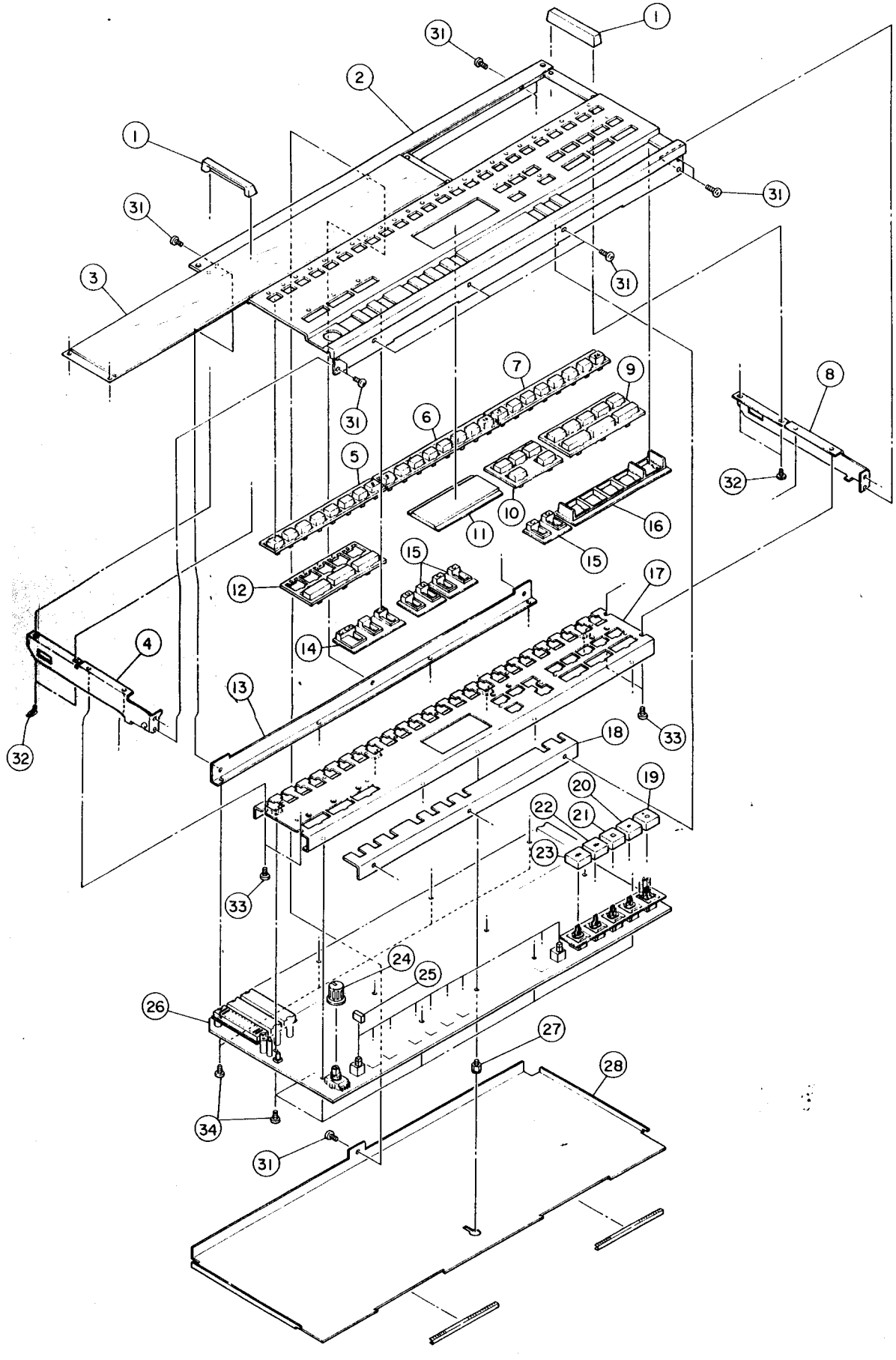


EXPLODED VIEW-6

REF.NO.	PARTS NO.	DESCREPTION	REMARKS
6- 1	*5801324300	HANDLE	
6- 2	*5801450600	PANEL,CONTROL	
6- 3	*5801325900	COVER ASSY,METER	
6- 4	*5801320900	ANGLE(L) ASSY,SIDE	
6- 5	5801323700	BUTTON,FUNCTION(1-8)	
6- 6	5801323800	BUTTON,FUNCTION(9-16)	
6- 7	5801323900	BUTTON,FUNCTION(17-24)	
6- 8	*5801321000	ANGLE(R) ASSY,SIDE	
6- 9	5801313400	BUTTON,LOCATE	
6-10	5801313300	BUTTON,MODE	
6-11	*5801320600	LENS,COUNTER	
6-12	5801323600	BUTTON,INPUT	
6-13	*5801321700	ANGLE,PCB	
6-14	*5801131500	ESCUTCHEON(A)	
6-15	*5801131600	ESCUTCHEON(B)	
6-16	*5801131400	ESCUTCHEON,OPERATION BUTTON	
6-17	*5801320800	PANEL,SUB	
6-18	*5801321600	SUPPORT,ESCUTCHEON	
6-19	5801131300	BUTTON,REC	
6-20	5801131100	BUTTON,PLAY	
6-21	5801131200	BUTTON,STOP	
6-22	5801130900	BUTTON,FF	
6-23	5801131000	BUTTON,REW	
6-24	5801131900	KNOB,PITCH CONTROL	
6-25	5801128800	BUTTON,SW	
6-26	*5200291200	OPERATION PCB ASSY	Refer to pages 42 & 56
6-27	*5801321500	SPACER,COVER	
6-28	*5801321400	COVER,OPERATION PANEL	
6-31	*5780123006	SCREW,PAN M3X6(BLK NI)	
6-32	*5781002608	SCREW,PAN TAP M2.6X8	
6-33	*5780103004	SCREW,PAN M3X4	
6-34	*5783003006	SCREW,PAN S-TITE M3X6	

Parts marked with *require longer delivery time.

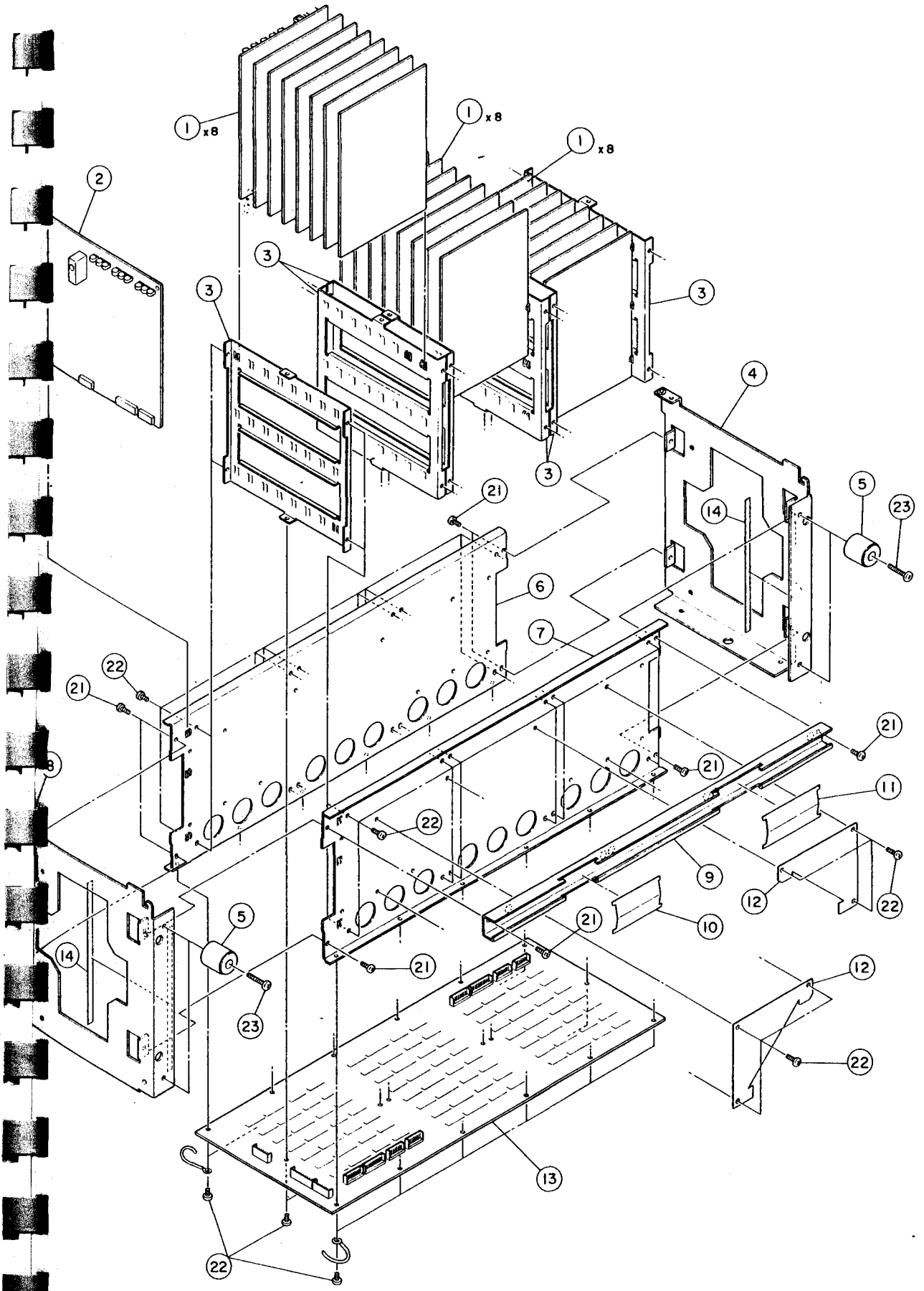
Exploded View-6



EXPLODED VIEW-5

REF.NO.	PARTS NO.	DESCREPTION	REMARKS
5- 1	*5200292101	R/P AMPL PCB ASSY	Refer to pages 46 & 54
5- 2	*5200292200	VR/OSC PCB ASSY	Refer to pages 51 & 56
5- 3	*5801319800	GUIDE,PCB	
5- 4	*5801320000	FRAME(R),SIDE	
5- 5	*5800307100	FOOT(A),COLLAR	
5- 6	*5801320100	CHASSIS(A),AMPL.	
5- 7	*5801320200	CHASSIS(B),AMPL.	
5- 8	*5801319900	FRAME(L),SIDE	
5- 9	*5801320500	GUIDE,CABLE	
5-10	*5801320300	SUPPORT(A),CABLE	
5-11	*5801320400	SUPPORT(B),CABLE	
5-12	*5801324700	SUPPORT,CABLE	
5-13	*5200292000	MOTHER PCB ASSY	Refer to pages 44 & 56
5-14	*5801159001	PROTECTOR,PANEL	
5-21	*5780103008	SCREW,PAN M3X8	
5-22	*5783003006	SCREW,PAN S-TITE M3X6	
5-23	*5780024020	SCREW,BIND M4X20(BLK NI)	

Parts marked with *require longer delivery time.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EXPLODED VIEW-4

REF.NO.	PARTS NO.	DESCREPTION	REMARKS
4- 1	*5800501800	SCREW,STEP	
4- 2	*5801315900	BRACKET,PANEL	
4- 3	*5801315100	CHASSIS,MAIN	
4- 4	*5801146101	SUPPORT,PANEL	
4- 5	*5801315700	ANGLE,TRANSPORT	
4- 6	*5801160200	PLATE(A),REINFORCEMENT	
4- 7	*5801324400	HOLDER,PCB	
4- 8	*5200291900	P.JOINT PCB ASSY	Refer to pages 52 & 56
4- 9	*5801315600	COVER,HEAD CORD	
4-10	*5801315500	STOPER,SERVO PCB	
4-11	*5200291300	CAPSTAN SERVO PCB ASSY	Refer to pages 49 & 55
4-12	*5801315400	GUIDE(R),SERVO PCB	
4-13	*5801315300	GUIDE(L),SERVO PCB	
4-14	*5801315200	CHASSIS,POWER SUPPLY	
4-15	*5801143000	HOLDER,BRACKET	
4-16	*5801142800	BRACKET(L)	
4-17	*5801142900	BRACKET(R)	
4-18	*5581055000	SCREW,STEP	
4-19	*5200291101	CONTROL PCB ASSY	Refer to pages 40 & 54
4-20	*5801319400	CHASSIS(A),DBX	
4-21	*5801336700	FRAME,DBX	
4-22	*5801319700	STOPER,PCB	
4-23	*5801319500	CHASSIS(B),DBX	
4-24	*5200320100	DOLBY S NR PCB ASSY	Refer to pages 47 & 55
4-25	*5801319600	STOPER	
4-31	*5780104010	SCREW,PAN M4X10	
4-32	*5780103006	SCREW,PAN M3X6	
4-33	*5783003006	SCREW,PAN S-TITE M3X6	
4-34	*5780204010	SCREW,FLAT M4X10	
4-35	*5780143008	SCREW,PAN SEMS-B M3X8	

EXPLODED VIEW-2

REF.NO.	PARTS NO.	DESCREPTION	REMARKS
2-61	*5781773010	SCREW,HEX. M3X10	
2-62	*5785003000	WASHER,PLAIN M3X0.5T	
2-63	*5781773008	SCREW,HEX. M3X8	
2-64	*5781773020	SCREW,HEX. M3X20	
2-65	*5781773006	SCREW,HEX. M3X6	
2-66	*5786003000	E-RING,E-3	
2-67	*5780143008	SCREW,PAN SEMS-B M3X8	
2-68	*5780103006	SCREW,PAN M3X6	
2-69	*5780104008	SCREW,PAN M4X8	
2-70	*5780102020	SCREW,PAN M2X20	
2-71	*5780103020	SCREW,PAN M3X20	
2-72	*5780143006	SCREW,PAN SEMS-B M3X6	
2-73	*5786007000	E-RING,E-7	
2-74	*5783003006	SCREW,PAN S-TITE M3X6	

Parts marked with *require longer delivery time.

Exploded View-4