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TASCAM

TEAC Professional Division

BR-20Series

MAINTENANCE

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

INSTRUCTIONS FOR SERVICE PERSONNEL

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

NOTES

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

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1. PARTS LOCATIONS

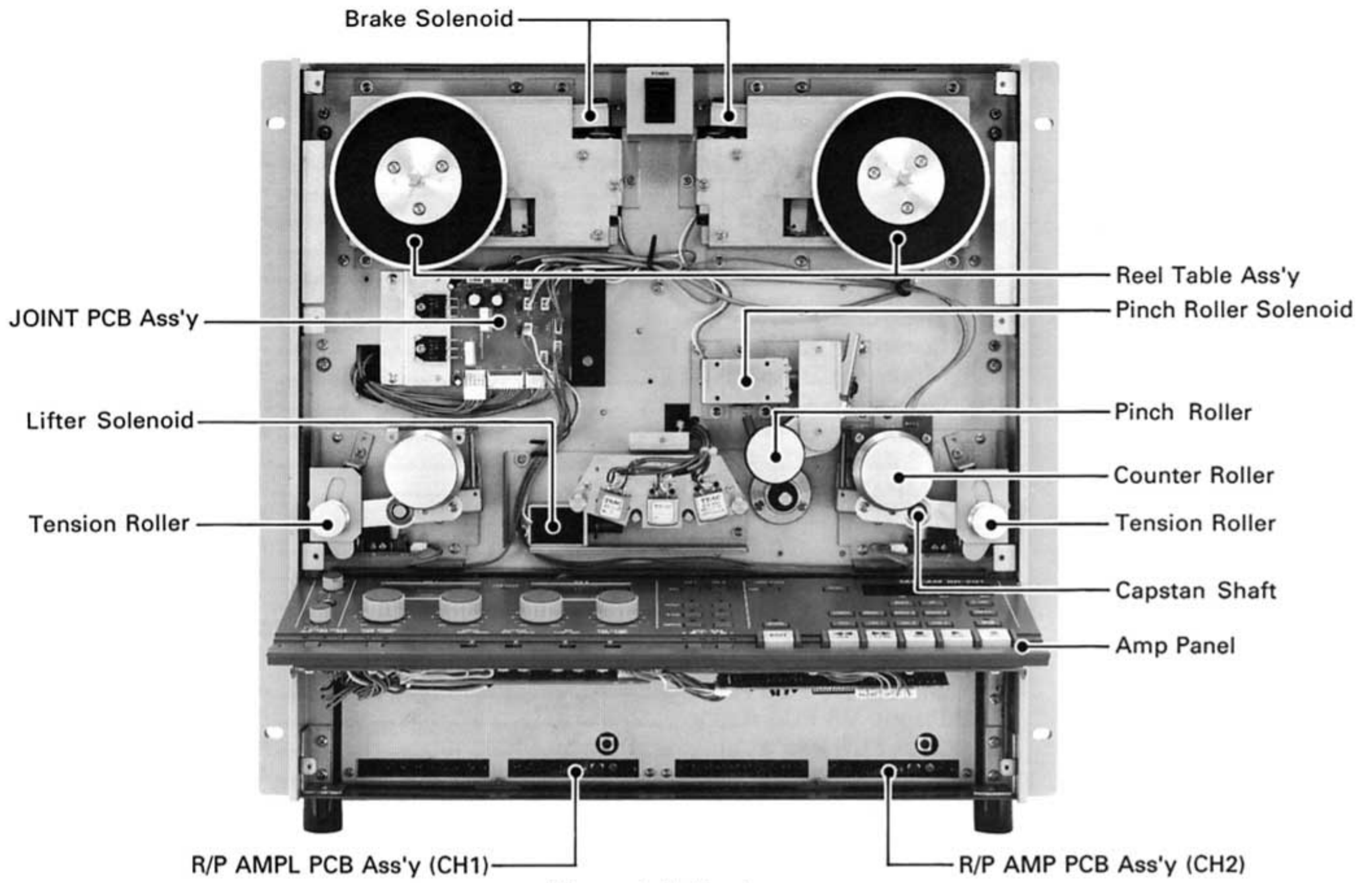


Figure 1-1. Front

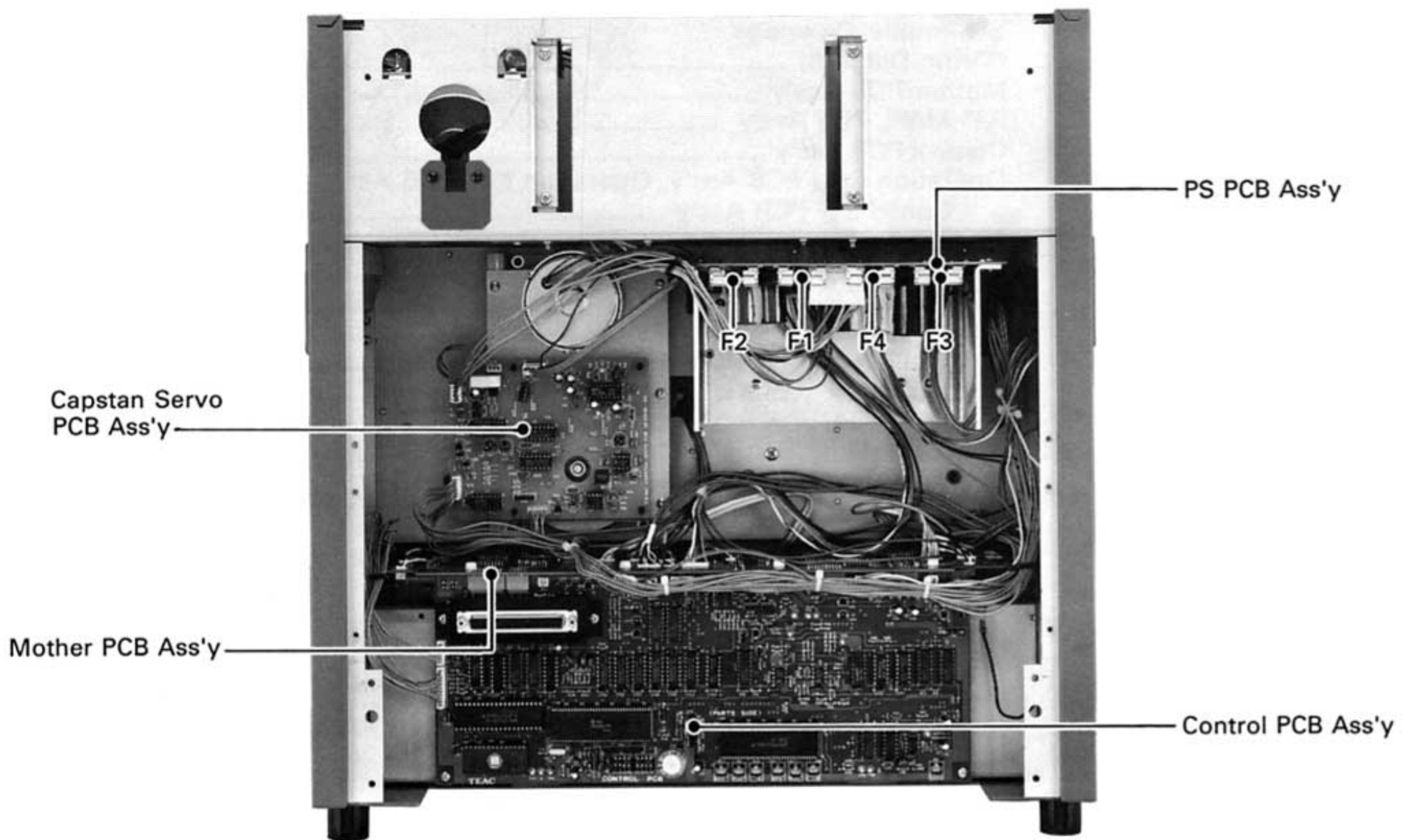


Figure 1-2. Rear

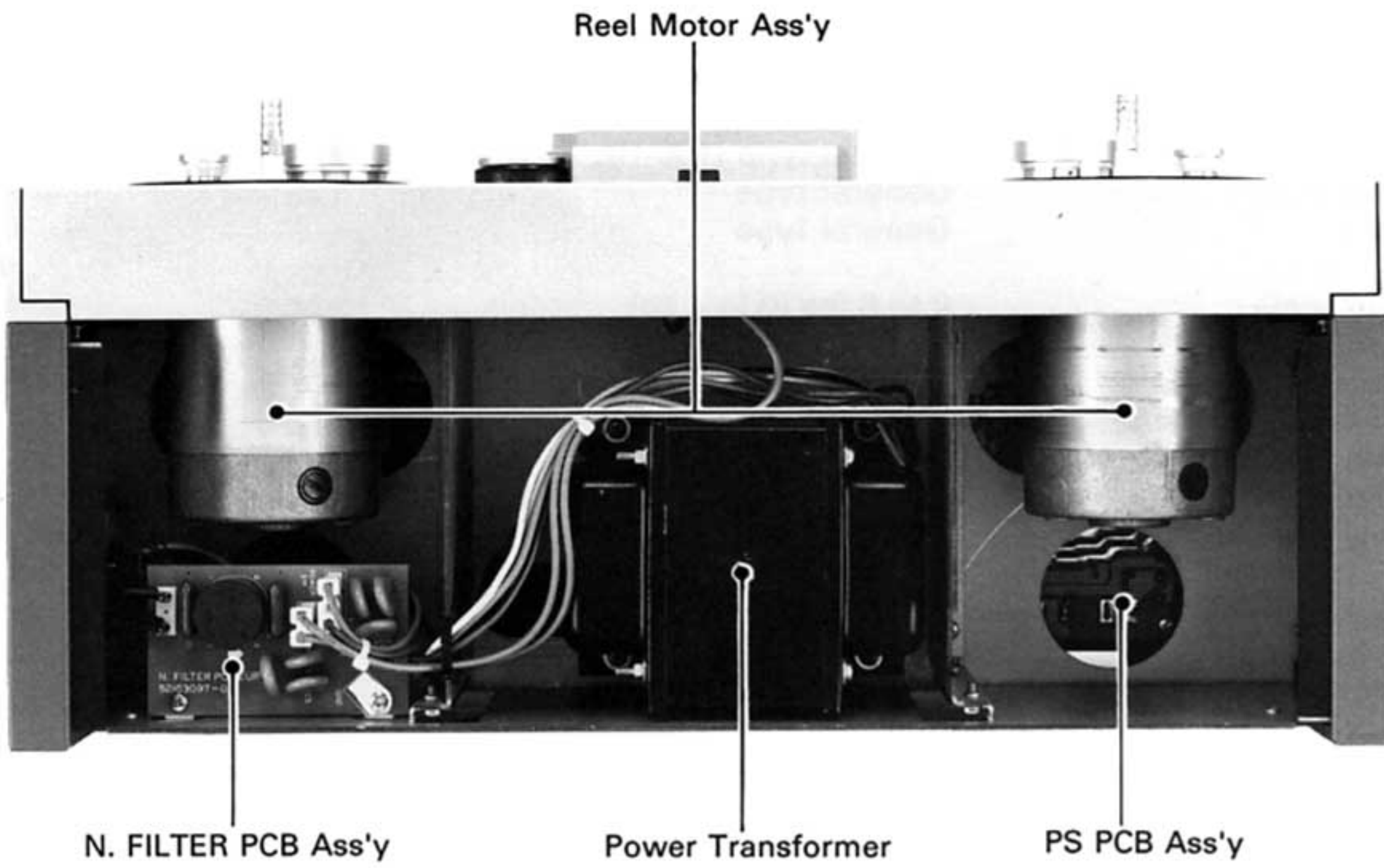


Figure 1-3. With Top Rear Panel Removed

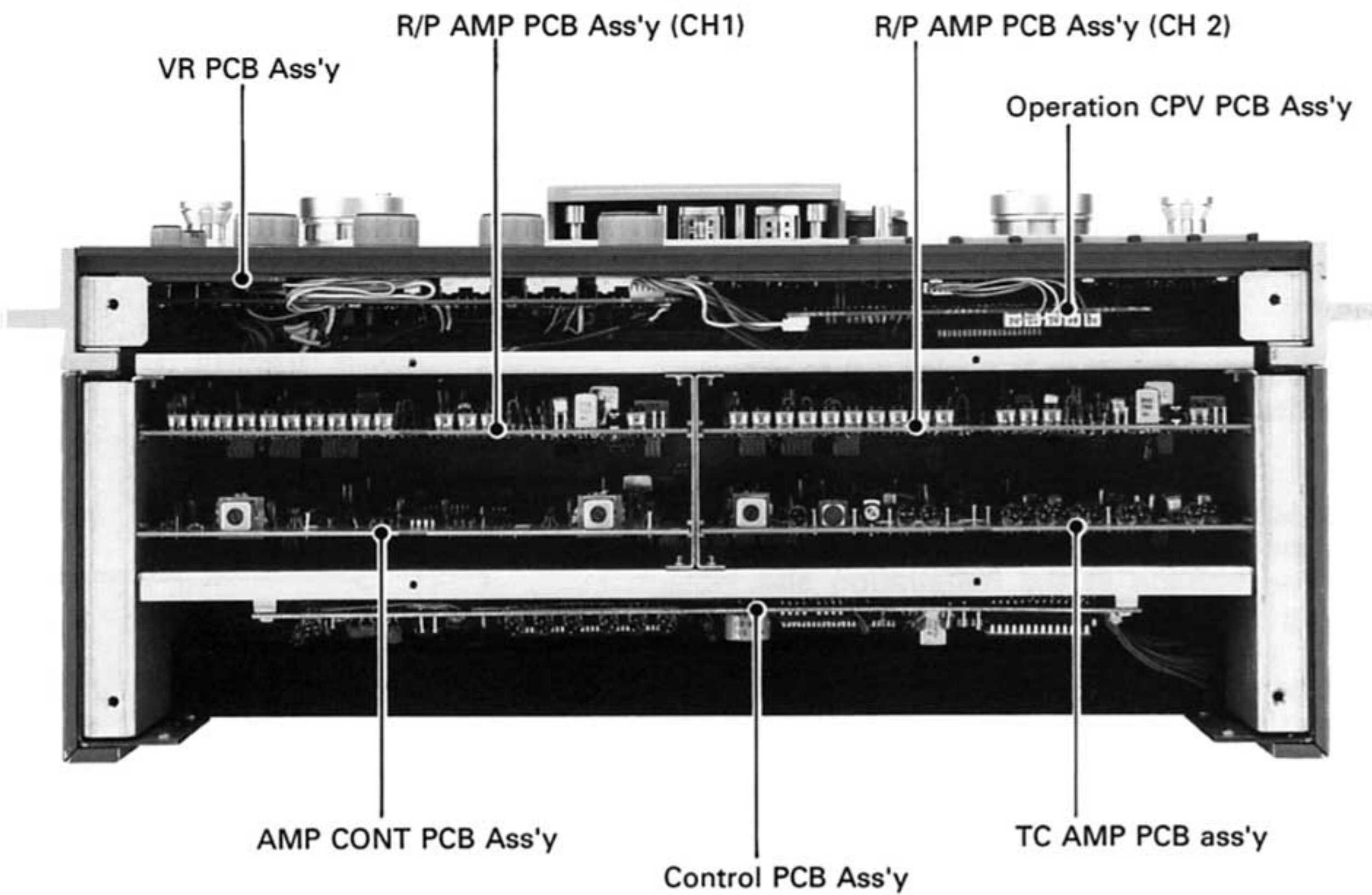


Figure 1-4. With Bottom Panel Removed

2. TEST EQUIPMENT

Wow & Flutter Meter :	Minicom Division, 3M Co., Model 8155
Audio Oscillator :	Hewlett Packard, Model 204C or equivalent
Digital Frequency Counter :	Range :10 Hz to 1 MHz; Sensitivity : 0.1 Vrms; Imp.: > 1M ohms, < 25 pF
Band-pass Filter :	1 kHz narrow band pass type
AF Level Meter :	Range : -80 dB to +40 dB ; Imp.: > 1M ohms, < 25 pF (such as HP 400GL)
Distortion Meter :	General type (400 Hz, 1 kHz)
Oscilloscope :	General type
Attenuator :	General type
Tool:	
Spring scale :	0 to 8 lbs (0 to 4 kg) 0 to 2.2 lbs (0 to 1 kg)
Tentelometer :	Model TS-H20-1 or TS-H20-M2
Hex head Allen wrenches	
Plastic alignment tool	
Cleaning Fluid :	TEAC TZ-261 or equivalent
Head Demagnetizer :	TEAC E-3 or equivalent
1/4" Test Tape :	
Tape speed/Wow flutter test tape :	TEAC YTT-2004 (for 15 ips); TEAC YTT-2003 (for 7-1/2 ips).
Reproduce alignment test tape :	NAB Equalization: TEAC YTT-1004 (for 15 ips); TEAC YTT-1003 (for 7-1/2 ips). Reference fluxivity: 185 nWb/m Time constant : 3,180 +50 usec. IEC Equalization: TEAC YTT-1064 (for 15 ips) Reference fluxivity: 320 nWb/m Time constant : ∞ +35 μsec. TEAC YTT-1063 (for 7-1/2 ips) Reference fluxivity: 320 nWb/m Time constant : ∞ +70 μsec.
Blank test tape (for recording) :	AMPEX 456

3. VOLTAGE CONVERSION

This machine is adjusted to operate on the electric voltage specified on the machine, power cord tag, or packing carton.

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

For general export models, if it is necessary to change the voltage requirements of your machine to match the line voltage at the installation site, use the following procedure.

ALWAYS DISCONNECT THE POWER LINE CORD BEFORE MAKING THESE CHANGES.

1. Remove the right side panel by removing six screws (see Figure 4-2).
2. Locate the voltage selector plug (see Figure 3-1).
3. Pull out to remove the plug, and reinsert it so that the required voltage is indicated in the cut-out section of the plug.

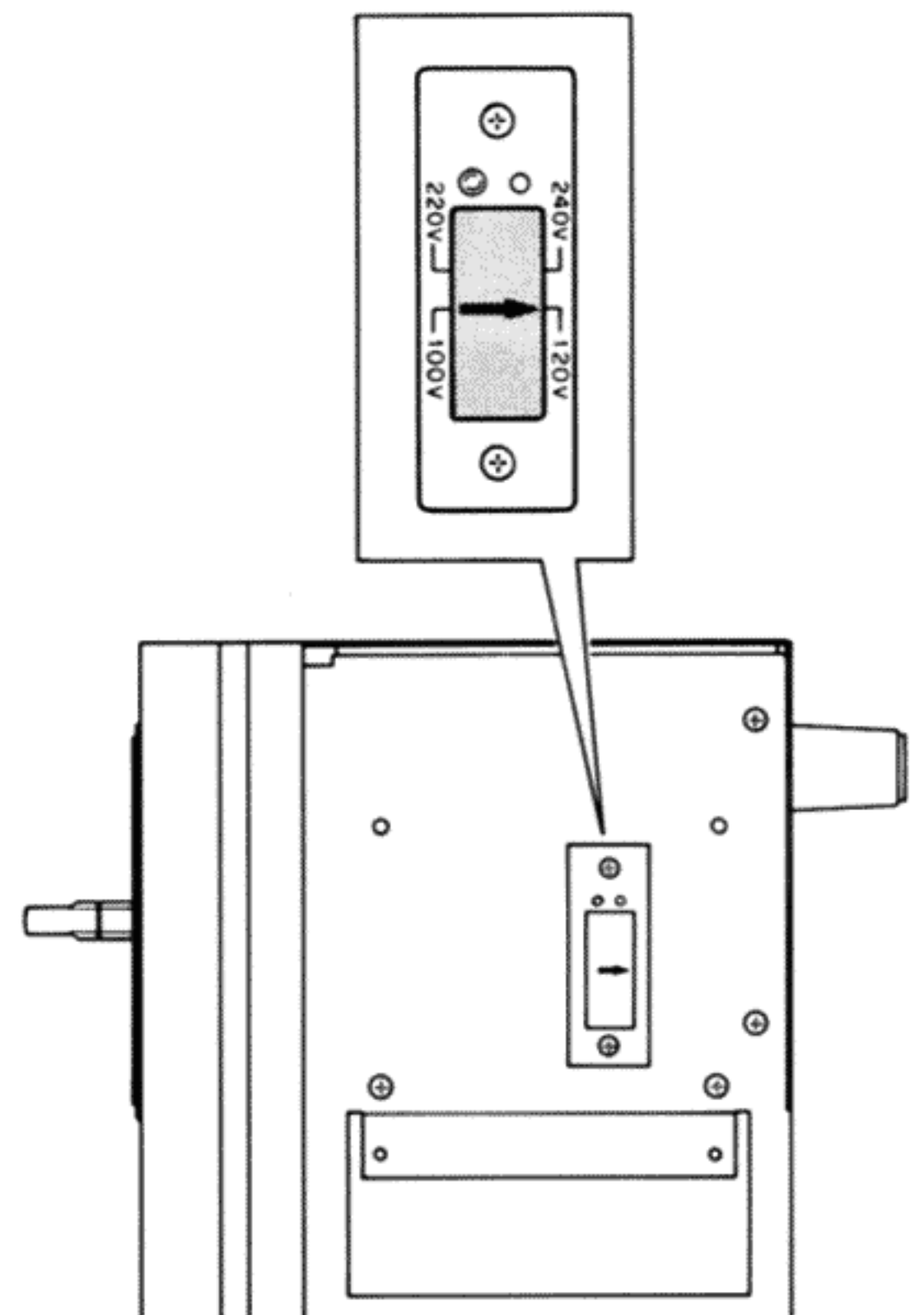


Figure 3-1. Voltage Selector Location

4. PANEL REMOVAL

WARNING : To avoid electric shock, be sure to unplug power cord prior to removing or replacing any parts.

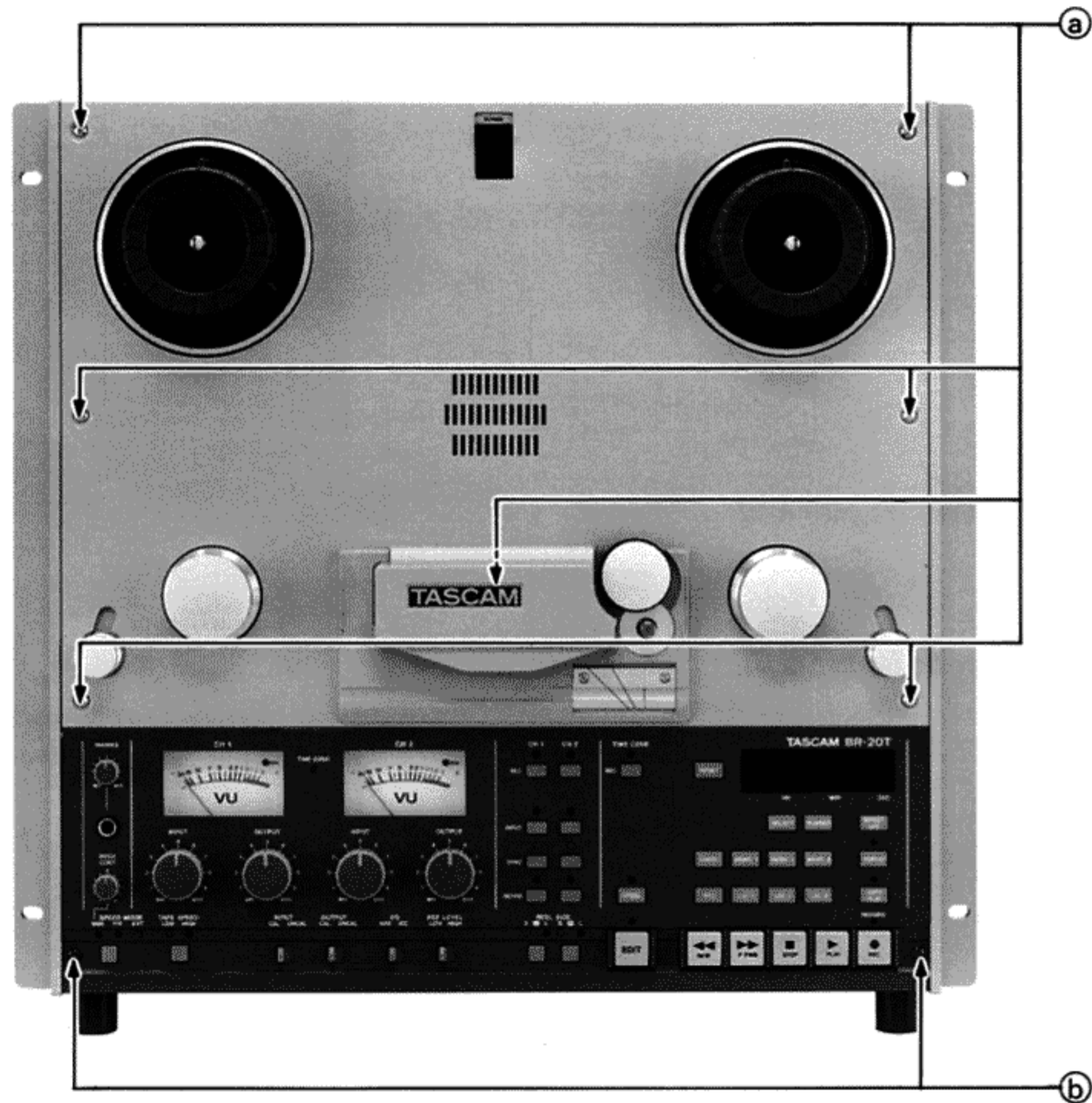


Figure 4-1. Screw Locations for Removing Front Panel and Pushing Control Panel Open

4-1. Front Panel

1. Remove the head housing (access cover) and the pinch roller as follows :

To remove the head housing, gently press the left side of the cover to the right and lift the left side up slightly. Then pull and lift to the left to release fully. When replacing the cover, first insert the tab into the slot on the right side of the head assembly, then gently press the left side in to lock it into position. **DON'T FORCE IT.** Carefully handle both in removing and replacing.

To remove the pinch roller, unscrew its cap by turning it counterclockwise and remove the cap and pinch roller.

2. Remove the seven "a" screws (Figure 4-1).

4-2. Control Panel

Remove the two "b" screws (Figure 4-1). The panel can then open as shown in Figure 1-1.

4-3. Side Panels

Remove the six "c" screws (Figure 4-2).

4-4. Top Rear Panel

Remove the four "d" screws, two of which hold the feet in place (Figure 4-3).

4-5. Connector Panel

Remove the four "e" screws (Figure 4-3).

4-6. Lower Rear Panel

Remove the four "f" screws (Figure 4-3).

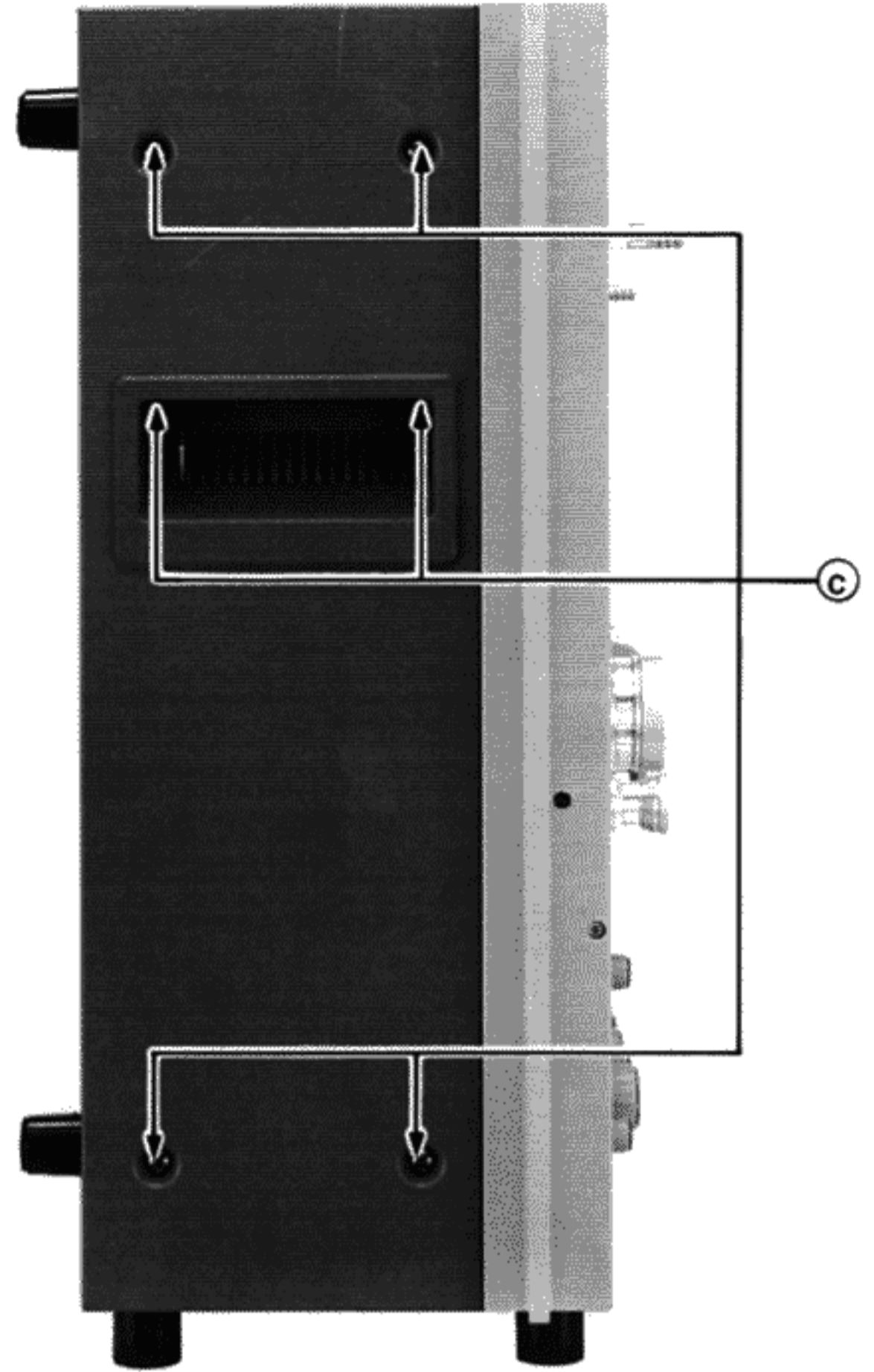


Figure 4-2. Screw Locations for Side and Top Rear Panel Removal

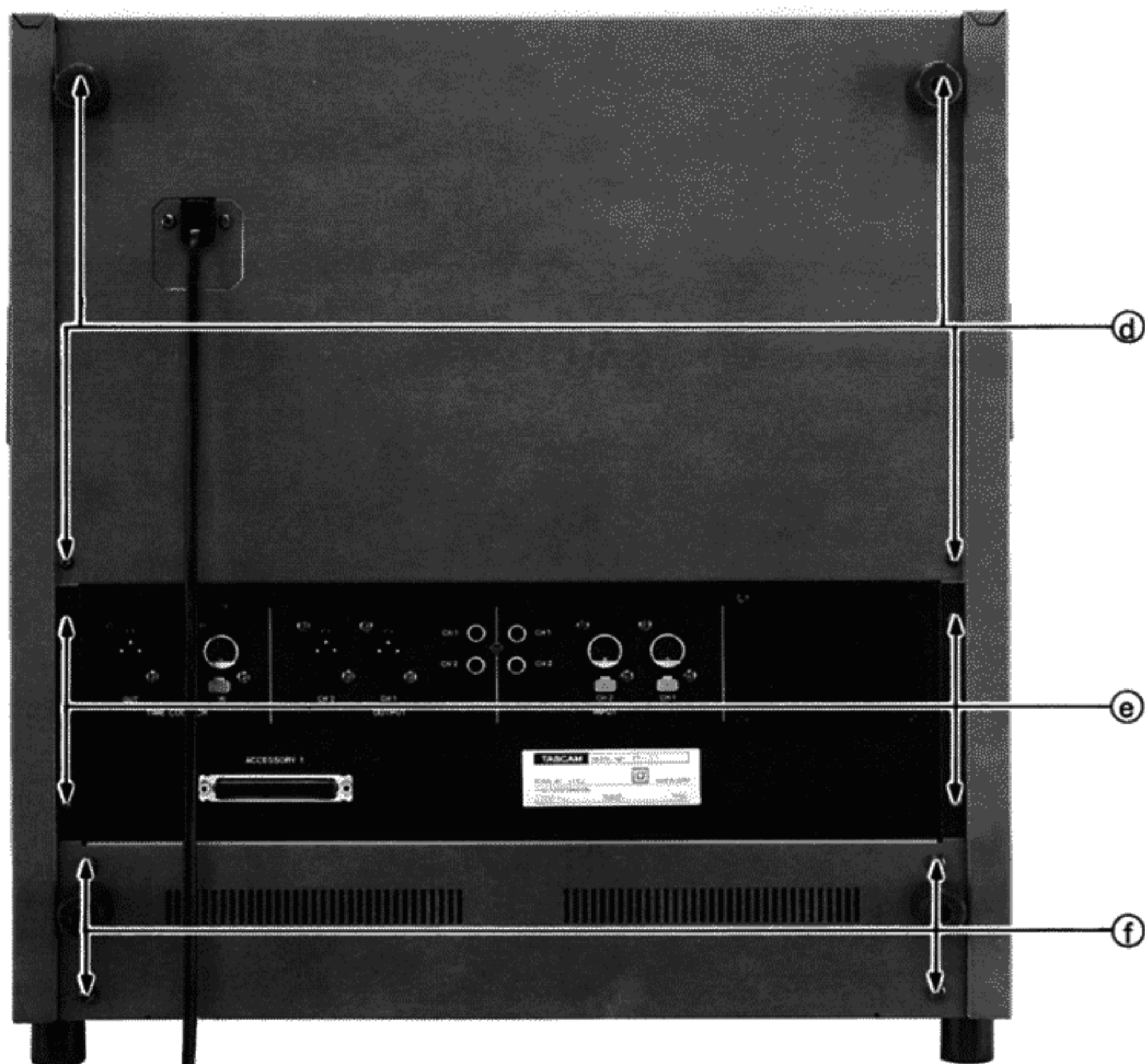


Figure 4-3. Screw Locations for Connector and Lower Rear Panel Removal

4-7. Bottom Panel

Remove the eight "g" screws, four of which hold the feet in place (Figure 4-4).

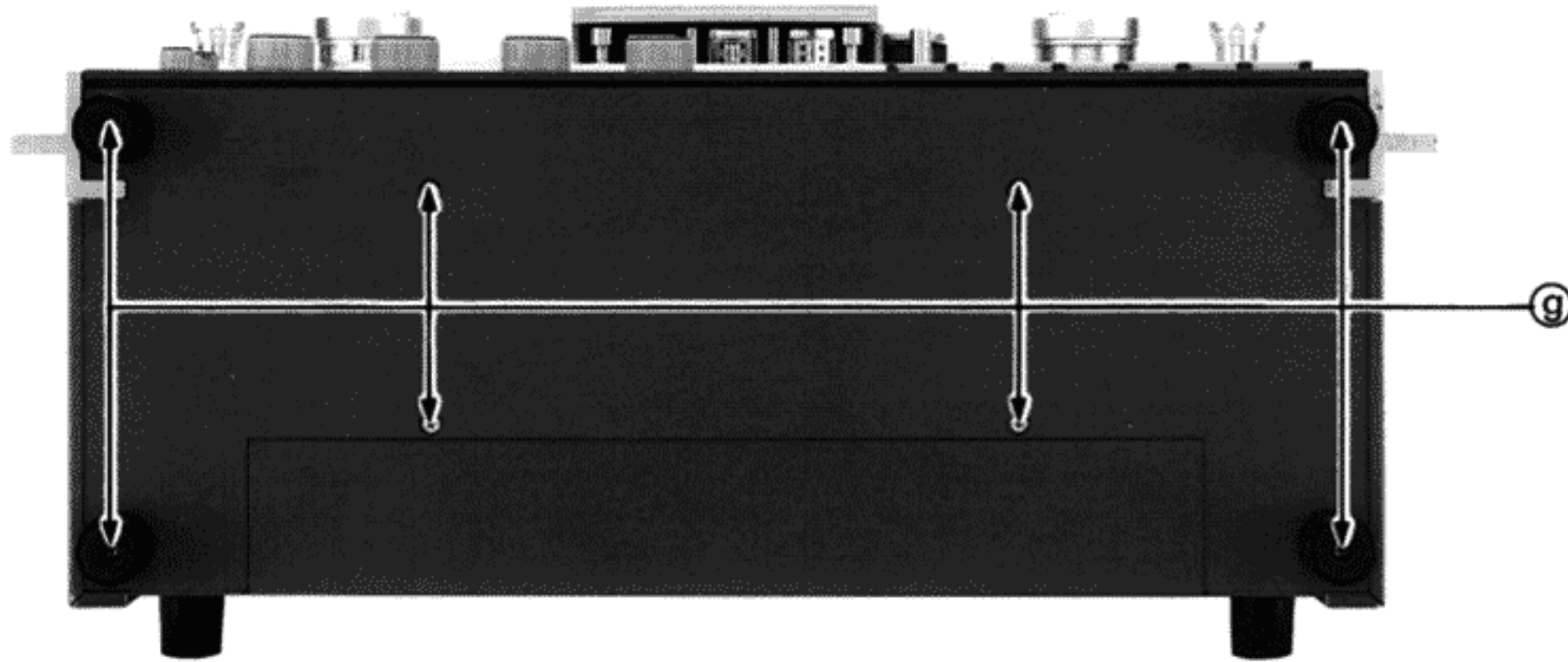


Figure 4-4. Screw Location for Bottom Panel Removal

4-8 Fuse Replacement

CAUTION : First, check to make sure the power is turned off.

If a fuse has blown, retrace the cause and eliminate it before replacing it with a new one.

NOTE : Replacement fuse must have the same amperage and other specifications as the original.

Access to the fuses (see Figure 1-2) is provided by removing the top rear panel as explained in paragraph 4-4.

5. MECHANICAL CHECKS AND ADJUSTMENTS

5-1. Brake Mechanism

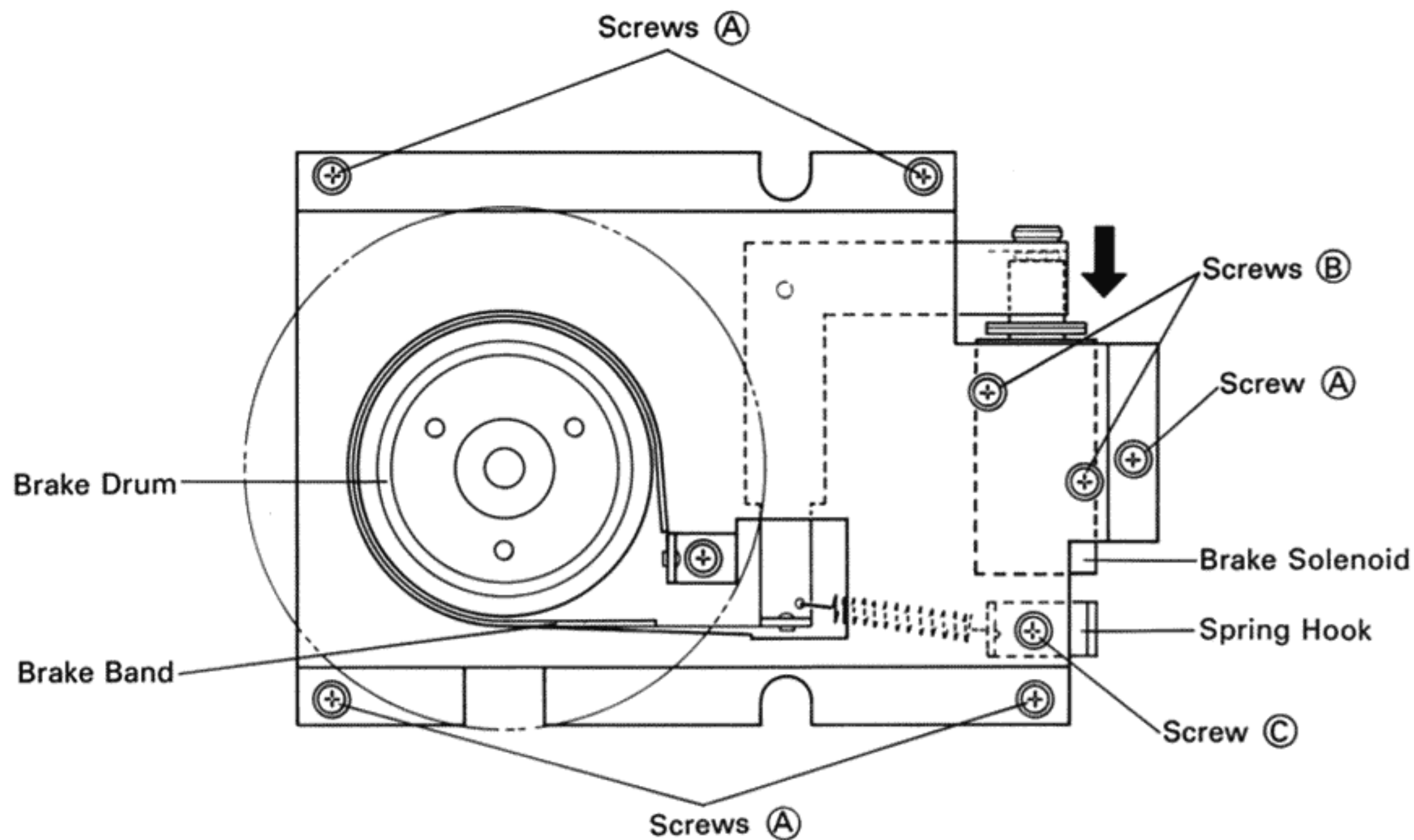


Figure 5-1. Brake Band-Drum Clearance Adjustment

Normally, the brake mechanism does not require to be checked and adjusted. However, if its mechanical parts or solenoids have been replaced, the following should be performed.

Refer to Figure 5-1.

1. Turn off power.
2. Remove both reel tables by removing three screws on each.
3. Move the brake solenoid plunger so it retracts and check for an even clearance between the brake drum and band. If necessary loosen five mount screws "A" and adjust the positioning of the brake assembly block for correct proper brake drum-band clearance.
4. Move the plunger and slightly turn the reel table, to visually check that the brake band does not contact the brake drum. Check both right and left brake assemblies.
If the brake band touches the brake drum when you move the plunger and rotate the reel table, loosen screws "B" and move the solenoid until the brake band and drum do not make contact. Adjust the solenoid position so the brake band drum clearance is as tight as possible. Don't allow too a loose clearance between the brake band and drum.

5-2. Brake Torque

Brake torque needs to be adjusted when brake related parts such as brake felt, brake arm assembly, brake spring... have been replaced or whenever the following check procedure reveals "out of spec" torque.

The following check procedure is performed with reel stopped and in the direction in which brake torque is applied.

A. Check

1. Turn off power.
2. Refer to Figure 5-2. Connect string to reel hub and wind clockwise several times around the reel hub as shown. Then, attach a spring scale to the string.
3. Slowly pull the spring scale in direction shown and note the scale when the reading becomes steady. Repeat the measurement two or three times and calculate the mean value.
The mean value of the scale readings should be within the following :

1,600 to 1,800 g.cm

Torque calculating formula : $\text{Torque (g.cm)} = \text{scale reading (g)} \times \text{reel hub radius (cm)}$

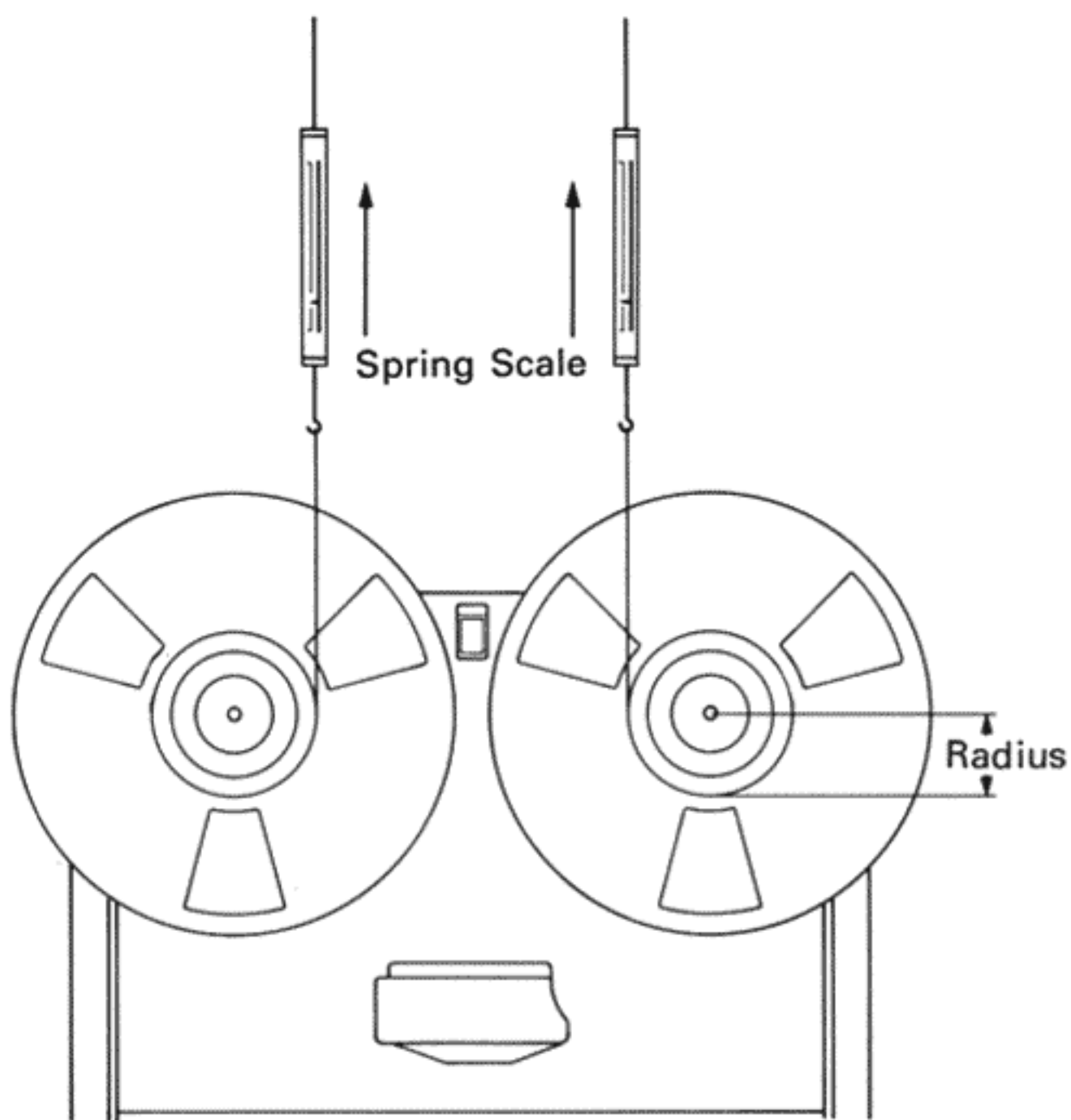


Figure 5-2. Brake Torque Measurement

B. Adjustment

1. Loosen screw "C" shown in Figure 5-2 and adjust the spring hook position.
2. Measure the torque again as explained above.

If the measurement does not still meet specifications -

Wipe off oily stains from the exterior of the brake drum using the appropriate cleaner, and replace the brake band felt with a new one.

5-3. Pinch Roller Pressure

A. Check

1. Block the right tension arm (shut-off arm) in its up/on position.
2. Attach a spring scale to the pinch roller shaft as shown in Figure 5-3.
3. Press PLAY and slowly pull the spring scale perpendicularly to the pinch roller arm as shown in Figure 5-3.
4. When the pinch roller loses contact with the capstan shaft and stops turning, slowly ease the spring scale and note the reading on the scale at the moment that the pinch roller starts again turning.

Specifications : 1.5 to 1.7 kg

B. Adjustment

Loosen the three mounting screws (Figure 5-3) in the solenoid and adjust the solenoid position.

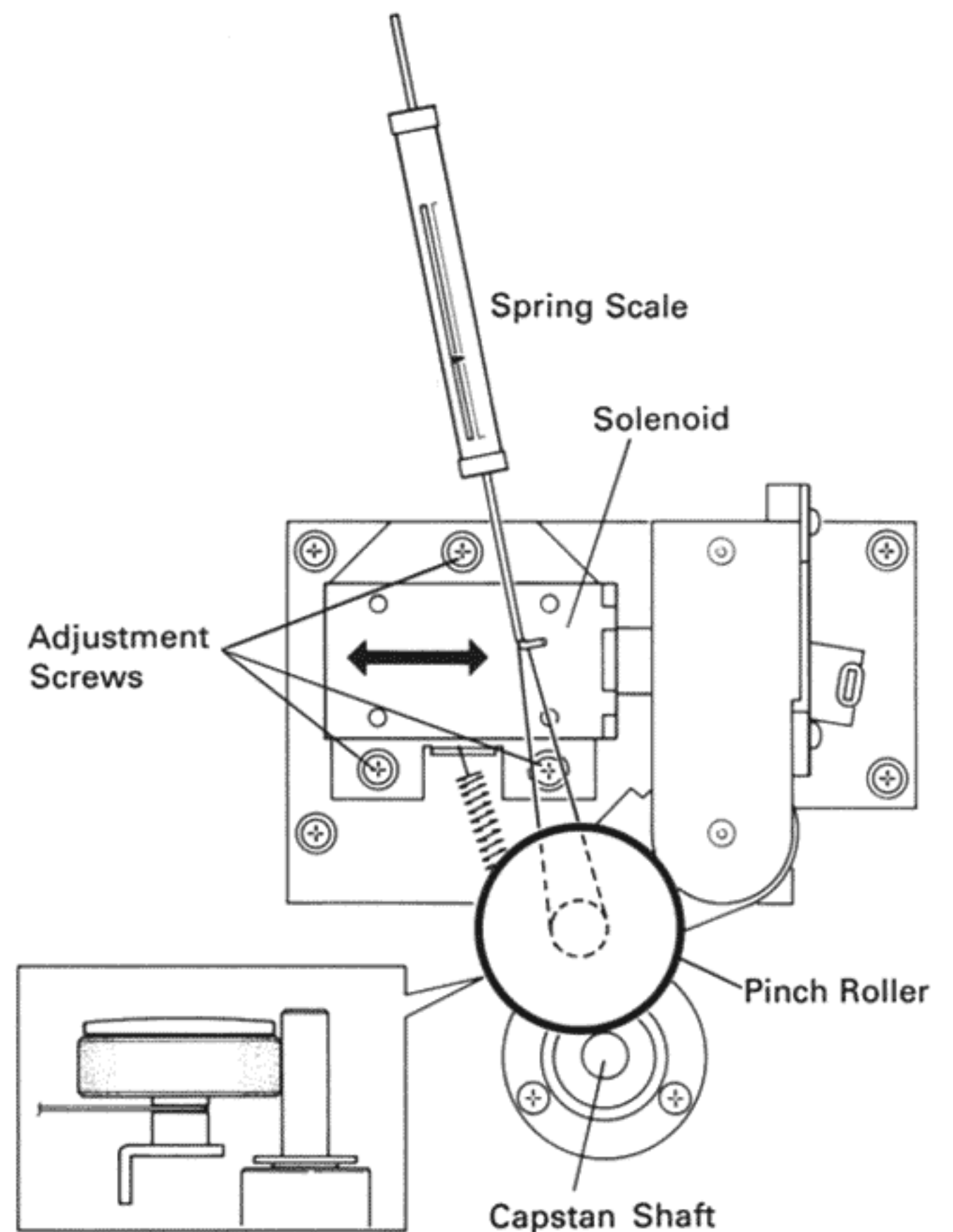


Figure 5-3. Pinch Roller Pressure Measurement and Adjustment

5-4. Capstan Shaft Tolerance

Refer to Figure 5-4 and check for a clearance of 0.1 to 0.2 mm as shown. If necessary, turn in or out the adjustment screw as shown.

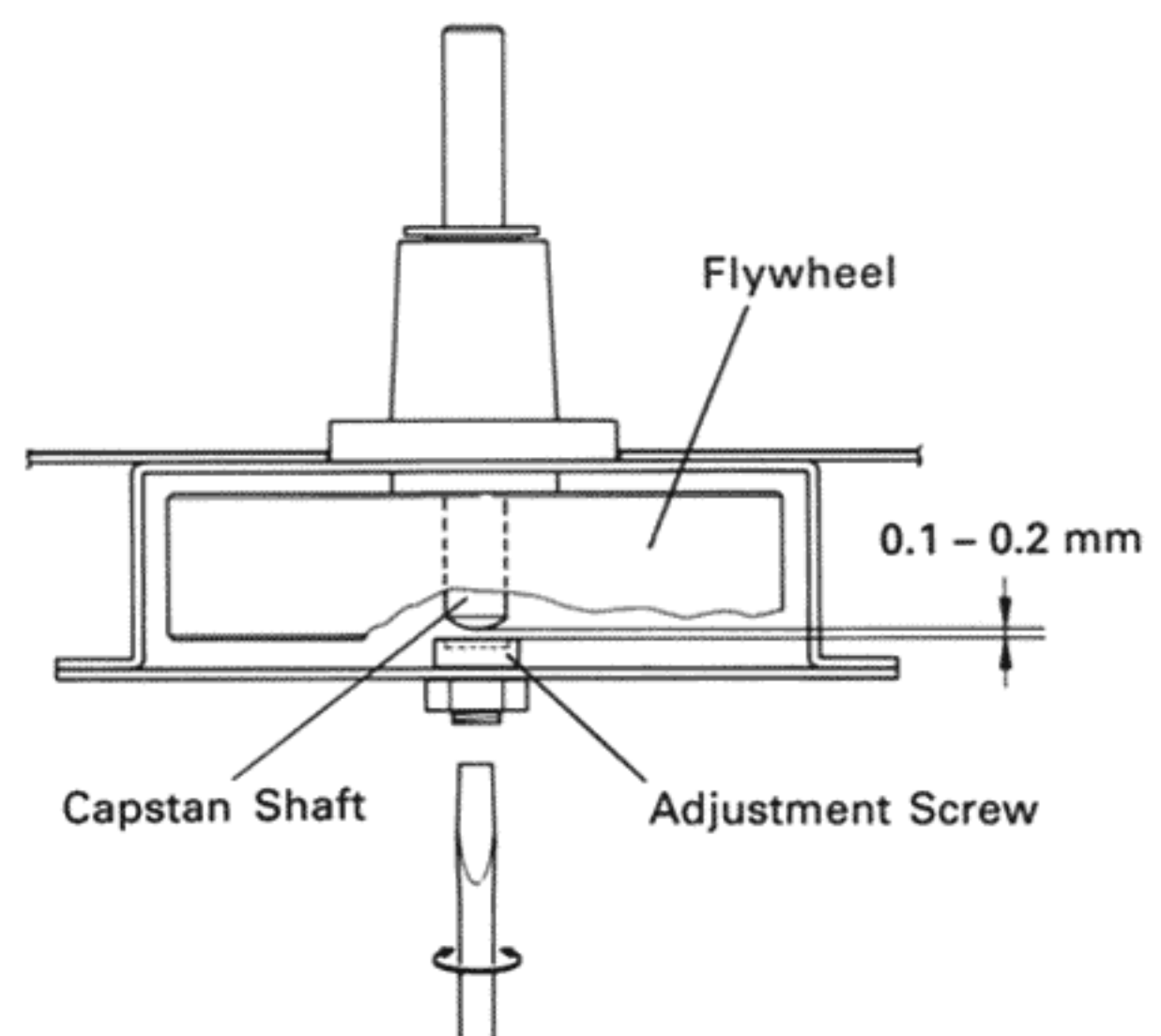


Figure 5-4. Capstan Shaft Tolerance Adjustment

5-5. Reel Table Height

The reel tables are each held to the reel motor shaft by two screws as shown in Figure 5-5. Run tape in F.FWD and REW to check to see that the tape does not rub against both reels. If adjustment is necessary, loosen the two set screws and move the reel table in and out to adjust height.

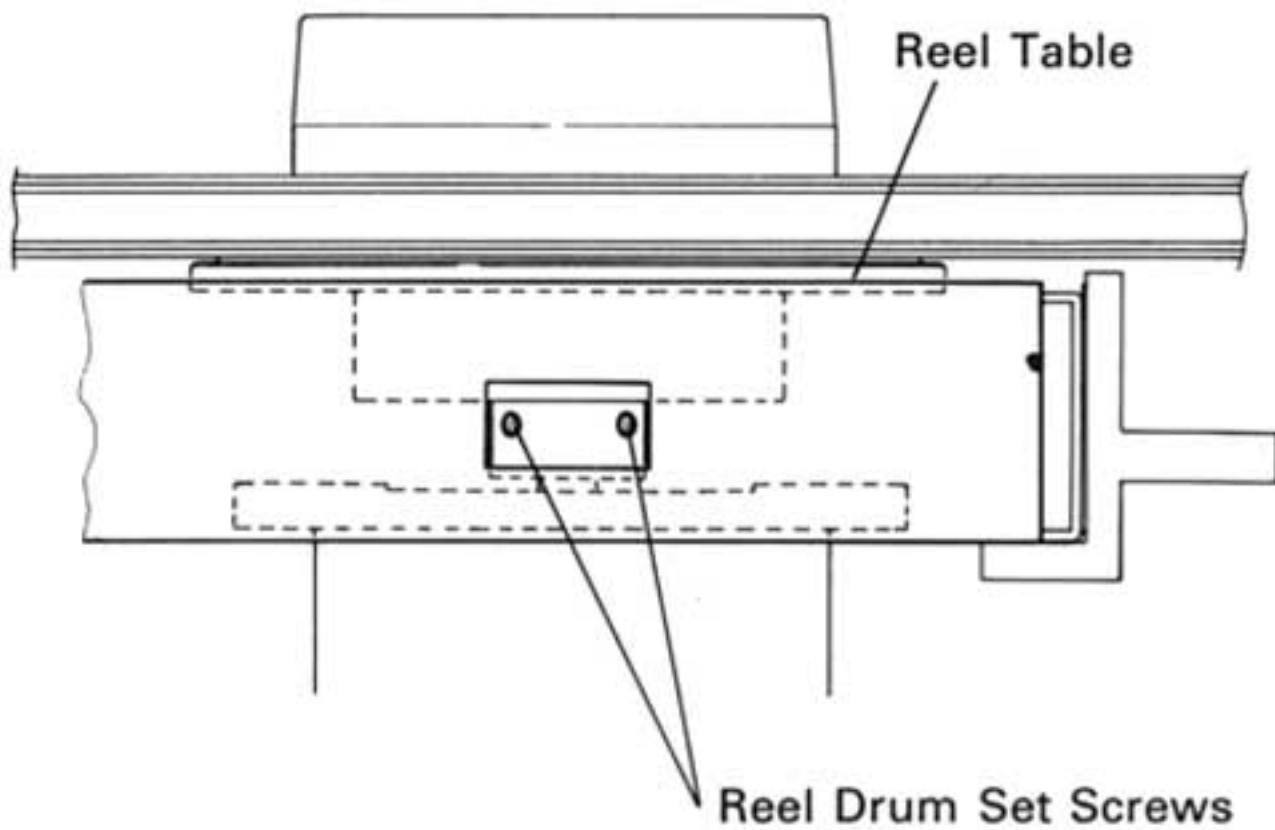


Figure 5-5. Reel Table Height Adjustment

5-6-1. Tape Tension in Edit Mode

A. Check

1. Load a blank tape and wind until there is almost the same tape pack on both reels.
2. Enter EDIT mode, and, using a tentelometer T2-H20-M2, measure tape tension both at the supply (test point A) and the takeup (test point B) side (for test point locations, see Figure 5-6). Readings should be as follows :

Specifications : 40 +/-5g, at both sides

If necessary, proceed to the next procedure.

B. Adjustment

Locate the following resistors on the Control PCB (Figure 5-7) and adjust them.

- R54 for the supply tape tension (T.T)
- R53 for the takeup tape tension (B.T)

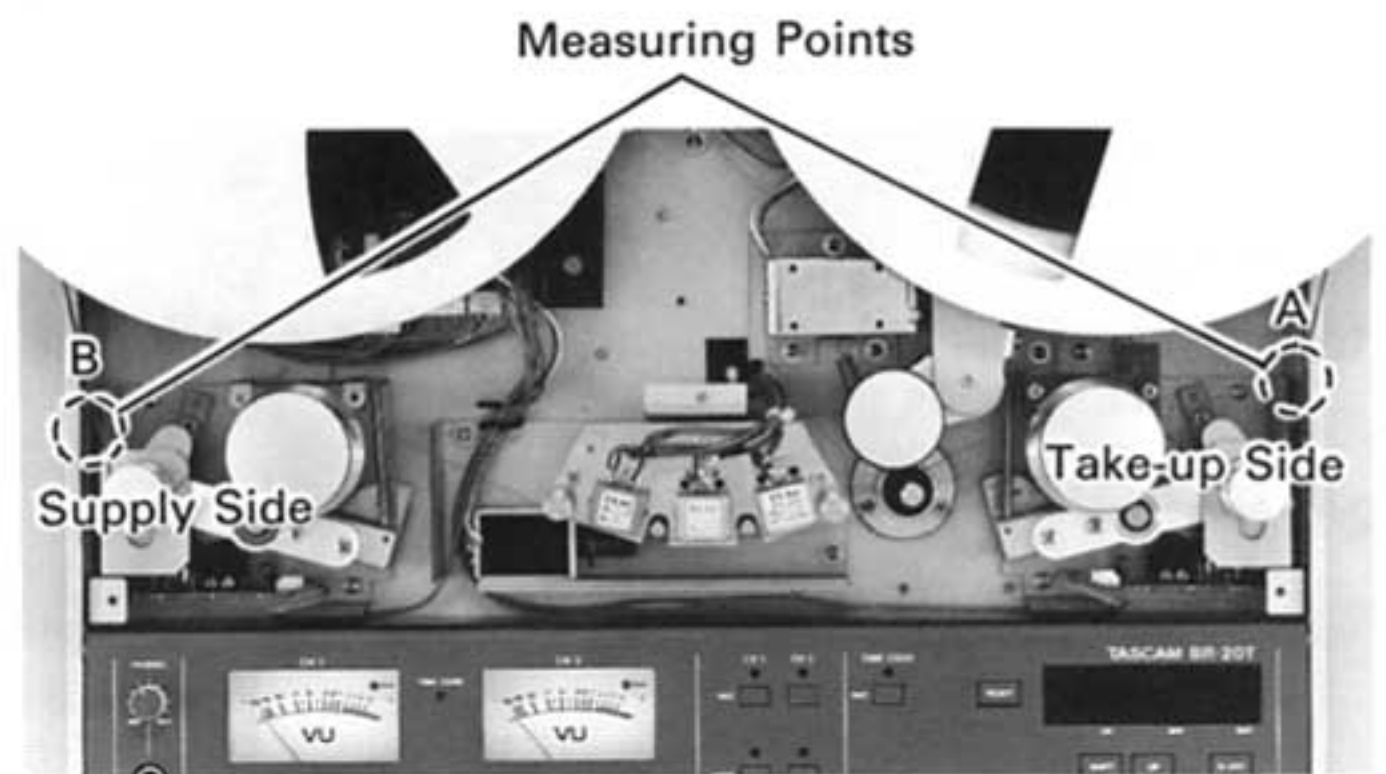


Figure 5-6. Tape Tension Measurement Points

5-6. Tape Tension Servo

Tape tension is constantly detected and controlled by the left and right tension sensor PCB assemblies inside the front panel. Both assemblies are identical in construction, each including a generator and two coils. Between the coils moves in and out an aluminum plate as tape tension varies and, accordingly, mutual inductance between the coils varies, so the tape tension arm movements are detected.

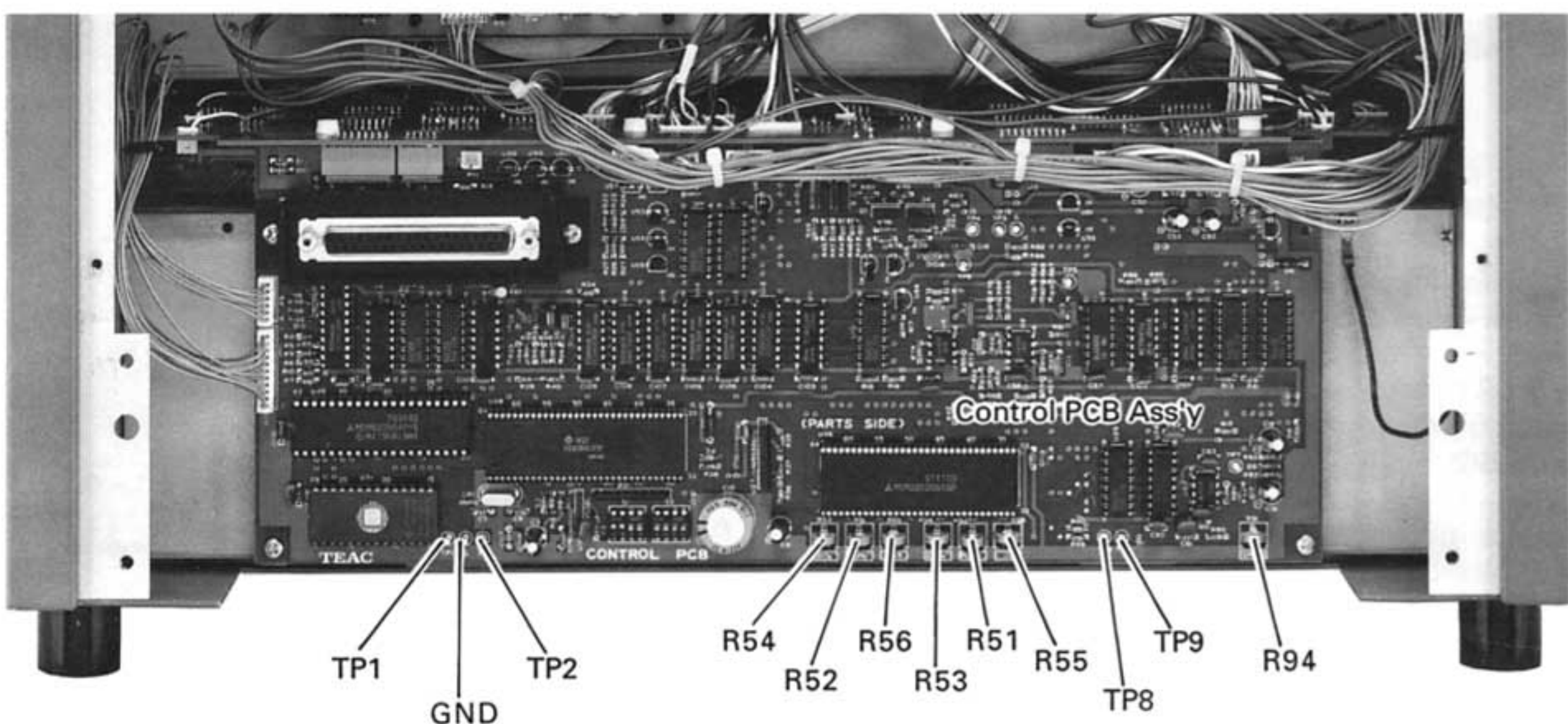


Figure 5-7. Tape Tension Adjustment Resistors

5-6-2. Play Tape Tension

A. Check

Run tape in PLAY and measure tape tension at A (takeup) and B (supply) test points shown in Figure 5-6.

Specifications : Supply side, 40 +/-5g
Takeup side, 50 +/-5g

B. Adjustment

Locate the following resistors on the Control PCB (Figure 5-7) and adjust them until tape tension is within specifications.

R52 for the supply side (T.T)
R51 for the takeup side (B.T)

5-6-3. Fast Forward/Rewind Tape Tension

A. Check

Short-circuit between TP-8 and TP-9 on the Control PCB (Figure 5-7), enter EDIT mode, and read the tentelometer at test points A (F.FWD, B.T) and B (REW, T.T) shown in Figure 5-6.

Specifications : 30 to 40 g at both test points

B. Adjustment

Locate the following resistors on the Control PCB (Figure 5-7) and adjust them until tension is within specifications.

R55 for F.FWD tension (B.T)
R56 for REW tension (B.T)

5-7. Tape Speed

Tape speed is measured using a wow/flutter test tape containing a 3000 Hz reference signal.

Tape speed is affected by pinch roller pressure, tape tension, etc.

5-7-1. "FIX" Tape Speed

A. Check

1. Connect a frequency counter to the OUTPUT connectors, and thread a test tape.
2. Set the SPEED MODE selector switch to FIX.
3. Run the tape in PLAY and read the frequency counter.
Check both at HIGH and LOW speeds.

Specifications : 3000 Hz +/-0.8%

B. Adjustment

1. Run the tape until both the left and right tape packs are almost the same, and adjust the following resistors on the Capstan Servo PCB

(Figure 5-8) until the frequency counter reads 3000 Hz.

R51 for HIGH speed
R50 for LOW speed

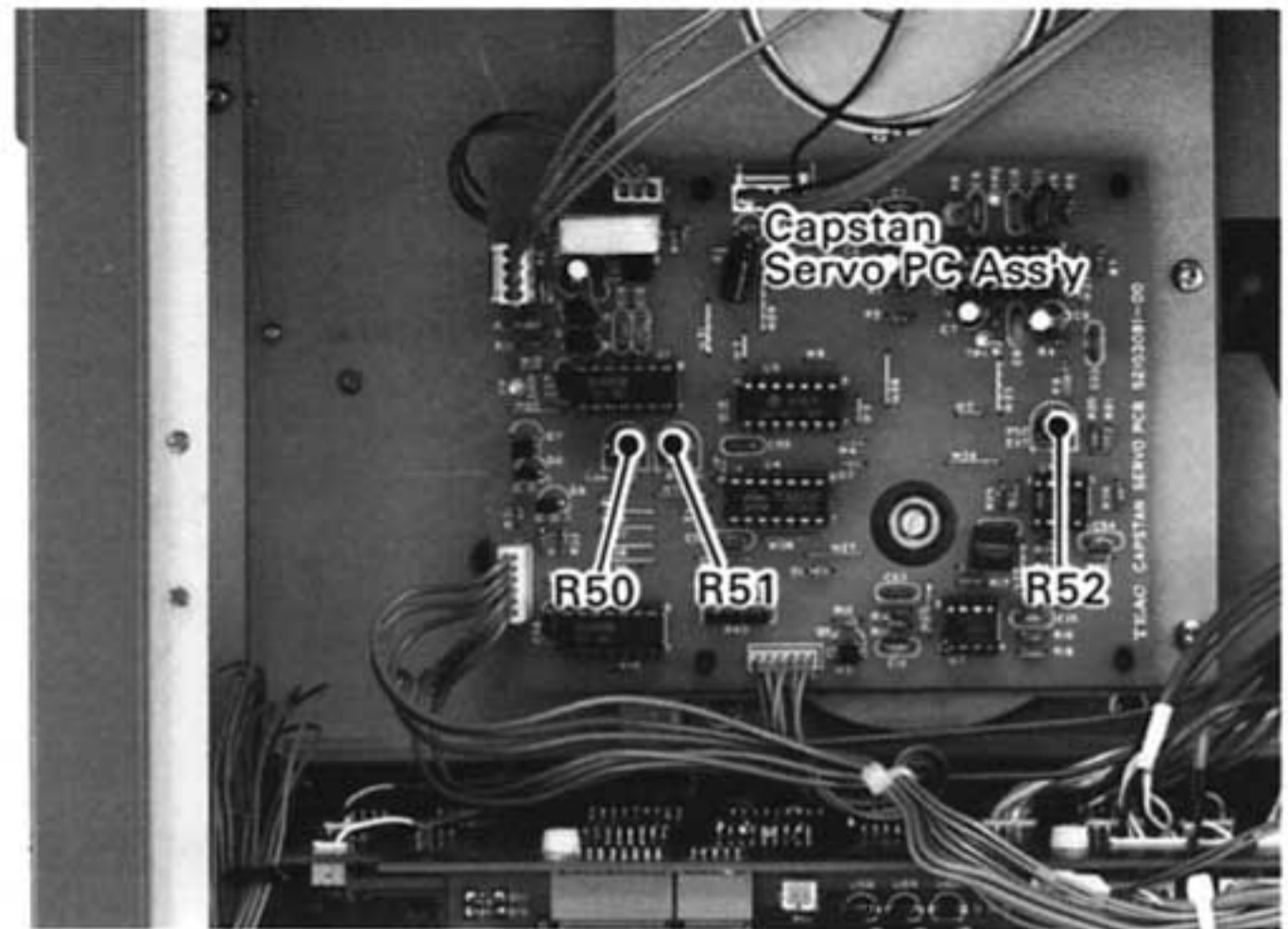


Figure 5-8. Tape Speed Adjustment Resistors

2. After the above adjustments, play the beginning (then the end) of the test tape, to check to see readings on the frequency counter are within specifications. If the readings don't meet the specifications, check Pinch Roller Pressure (paragraph 5-3) and Tape Tension (paragraph 5-6).

5-7-2. "EXT" Speed

A. Check

1. Use jumper wires to connect pin 13 of the ACCESSORY 1 connector to GND, and connect an external oscillator to pins 7 (Hot, High) and 14 (Cold, Low).
2. Play the test tape and check the frequency counter reads 3000 Hz when a 9.6 kHz pulse signal is fed into the recorder from the external oscillator.
3. Adjust the oscillator so it provides a 30 % (approx.) increment/decrement in its output frequency, to check to see tape speed varies proportionally.

B. Adjustment

Locate resistor R52 on the Capstan Servo PCB (Figure 5-8) and adjust that resistor for correct readings on the frequency counter.

5-8. Fast Winding Speeds

A. Check

1. Connect an oscilloscope between TP-1 and GND on the Control PCB (Figure 5-7).
2. Load a 10.5" reel tape, and run its mid point (approx.) to check that the TP-1 wave form shows 4.1 to 4.2 msec. cycle.

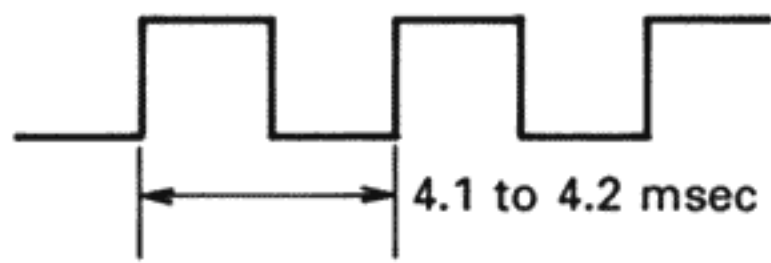


Figure 5-9. Fast Winding Speed Measurement

B. Adjustment

Adjust resistor R94 located on the Control PCB (Figure 5-7).

5-9. Wow and Flutter

Wow and flutter are effectuated by a complex, mutual influence of the transport-related various mechanical parts.

1. Connect a wow/flutter meter to the OUTPUT connectors, and load a tape speed test tape.

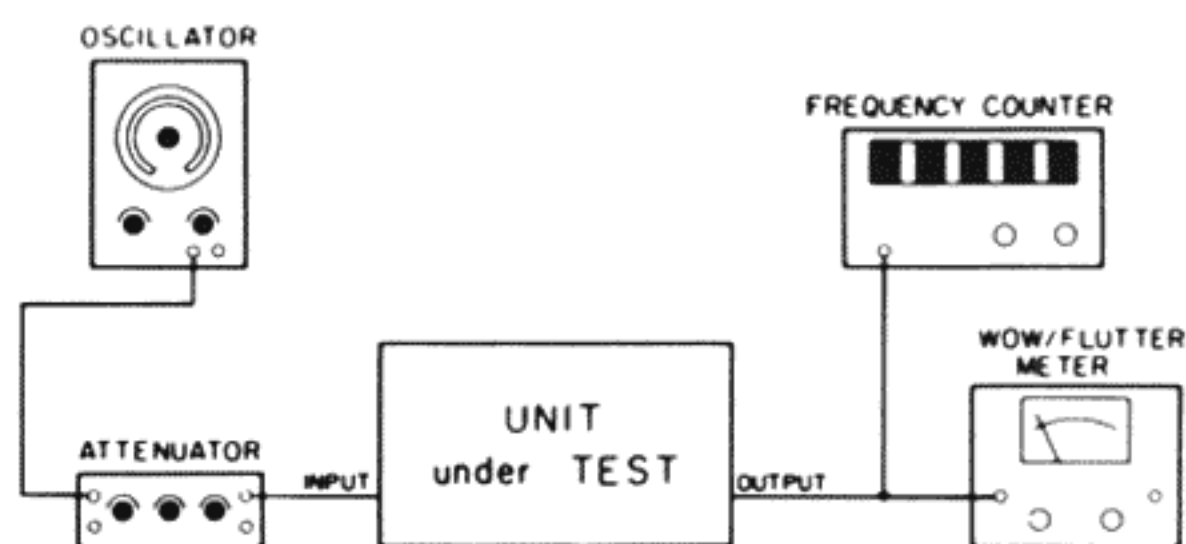


Figure 5-10. Wow/Flutter Test Connections

2. Make the following switch settings :

PITCH CONTROL to FIX ;
Output Source Selector Switch to REPRO.

3. Run the tape in PLAY and read the wow/flutter meter both at the beginning and the end of the tape.

Specifications are as follows :

DIN/IEC/ANSI (PEAK), Weighted (2σ)
HIGH : $\pm 0.06\%$
LOW : $\pm 0.09\%$

5-10. Tape Positioning, Check and Fine Adjustment

Tape positioning is influenced by various parts of these : head assembly, tension arm, pinch roller, capstan motor, etc.

The center of each head serves as the reference for correct tape running height.

Tape positioning is checked by running tape in PLAY, F.FWD and REW, to see the tape runs at the head center height, without rubbing against any tape guide edge. Proceed as follows :

A. Check

1. Thoroughly clean the heads and tape path using a good cleaner.
2. Load a blank tape on the machine, run it in PLAY, and check the tape is running at the center height of each of the three heads (at the center of the core). Repeat the check in F.FWD and REW.
3. Check also the tape is running at the center of the left and right tension rollers.

B. Fine Adjustment

Tension roller height is adjusted by first loosening the set screw with a hexagonal wrench then moving the tension roller in and out (see Figure 5-12).

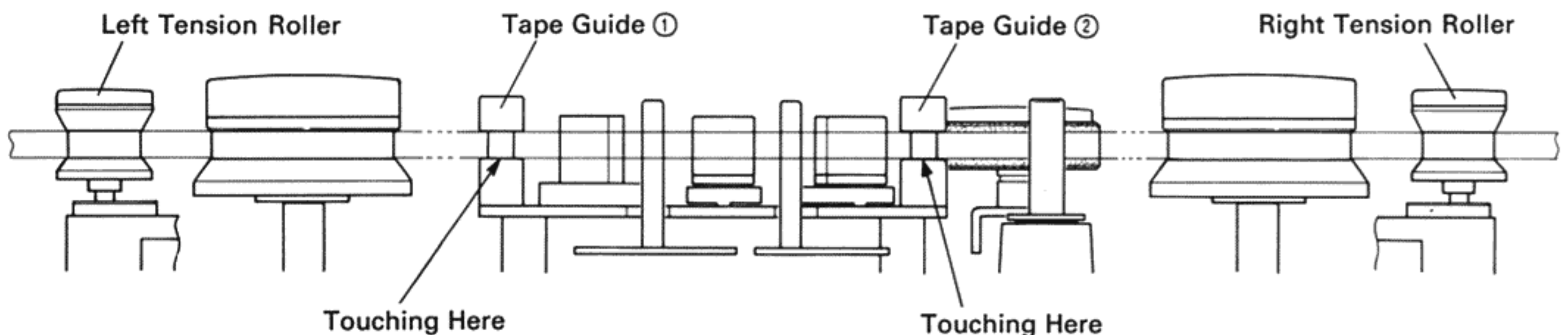


Figure 5-11. Tape Positioning

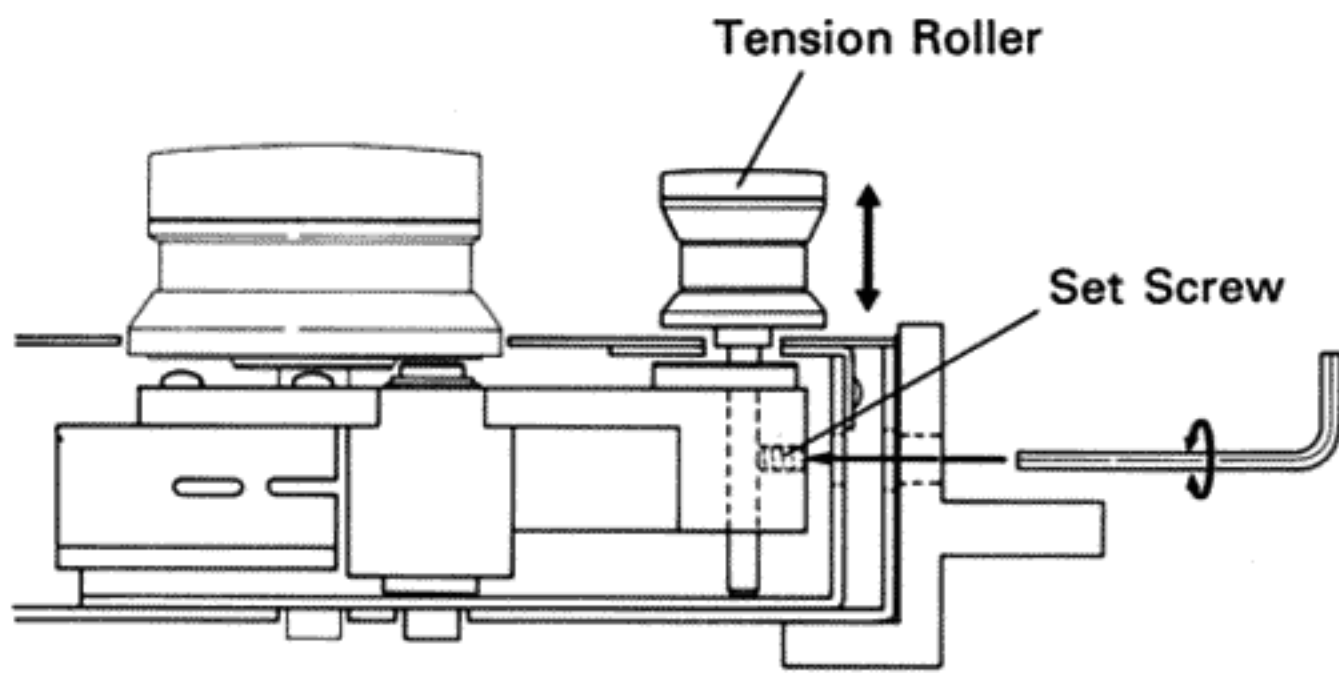


Figure 5-12. Tension Roller Height Adjustment

1. Run the tape in PLAY.
2. Refer to Figure 5-12 and adjust the height of the left and right tension rollers until the tape lower edge slightly contacts the lower flange of the tape guides "1" and "2" shown in Figure 5-11.

Repeat adjustment by running the tape in F.FWD and REW as well.

3. After adjustments, retighten the lock screw.

NOTE : Tape running height adjustments significantly affect head-tape contact. After tape running height has been adjusted, be sure to recheck these : Head-to-tape contact, Head azimuth (see below).

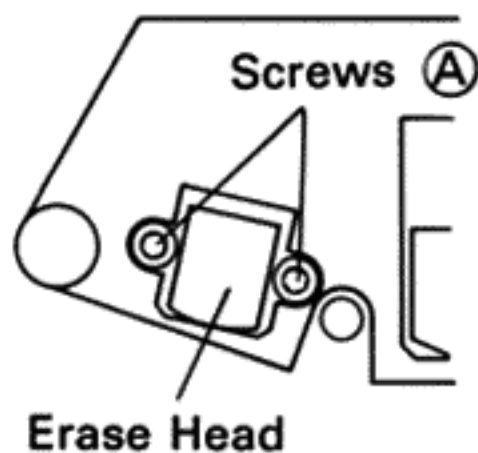
5-11. Head Alignment

5-11-1. Head-Tape Contact

A. Erase Head

The erase head requires only its tape contact adjustment and has no azimuth adjustment.

BR-20N, D



BR-20T

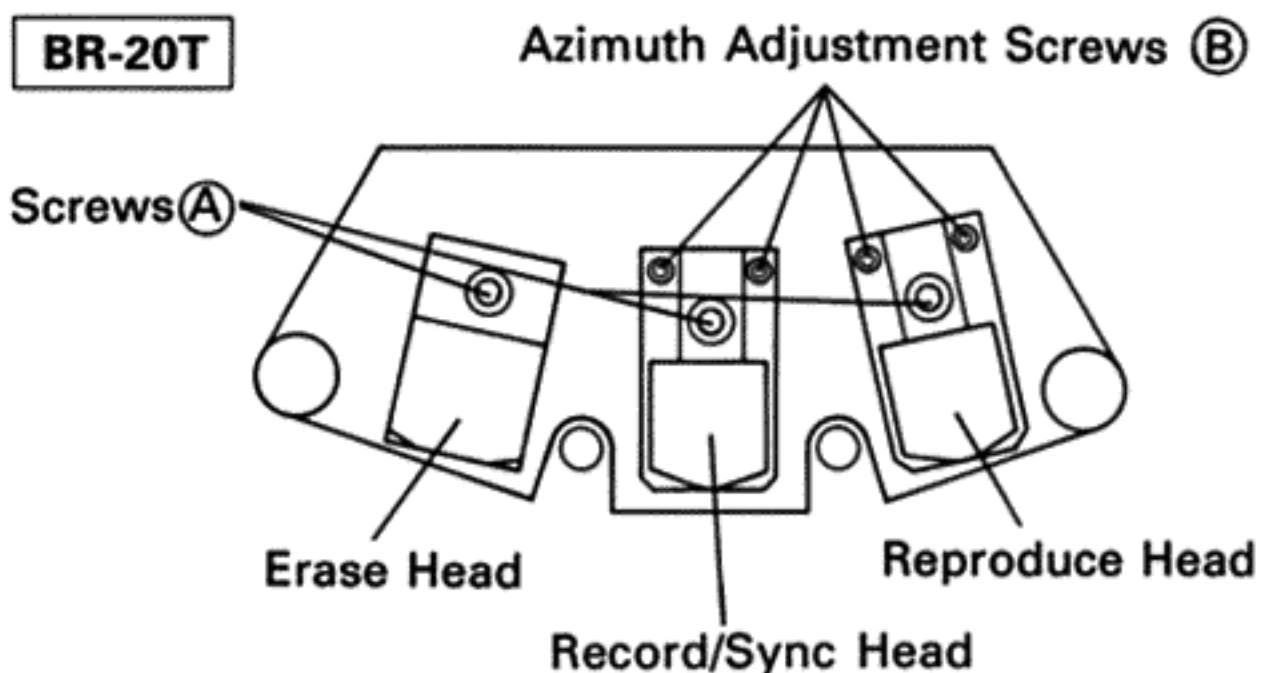


Figure 5-13. Head Adjustment Screws

The tape must contact the erase head so that the double gap is centered in the tape contact area. A poor tape contact appears as a poor erasure performance of the head.

If a poor tape contact is revealed (see 6-13, Erasure), perform the following :

1. While measuring erasure, run tape.
2. Loosen the "A" screw(s) shown in Figure 5-13, and, holding the upper area of the erase head, tilt left and right for best erasure, and retighten the "A" screw(s) to block the head where a maximum erasure is measured.
3. Recheck for best erasure.

NOTE : Erase head replacement entails the following re-adjustments :

- Bias tuning of all channels' R/P amplifiers.
- Record bias adjustment of all channels (this adjustment is not necessary for the gapless punch-in versions)

B. Record and Sync Repro Heads

Both heads are the same in characteristics. Check and adjustments are performed by reproducing a high frequency recording on a test tape (16 kHz recording), with the Output Source Selector switch set to REPRO for the reproduce head check and adjustment, and to SYNC for the rec/sync head check and adjustment. The tracks' REC switches must be set to OFF.

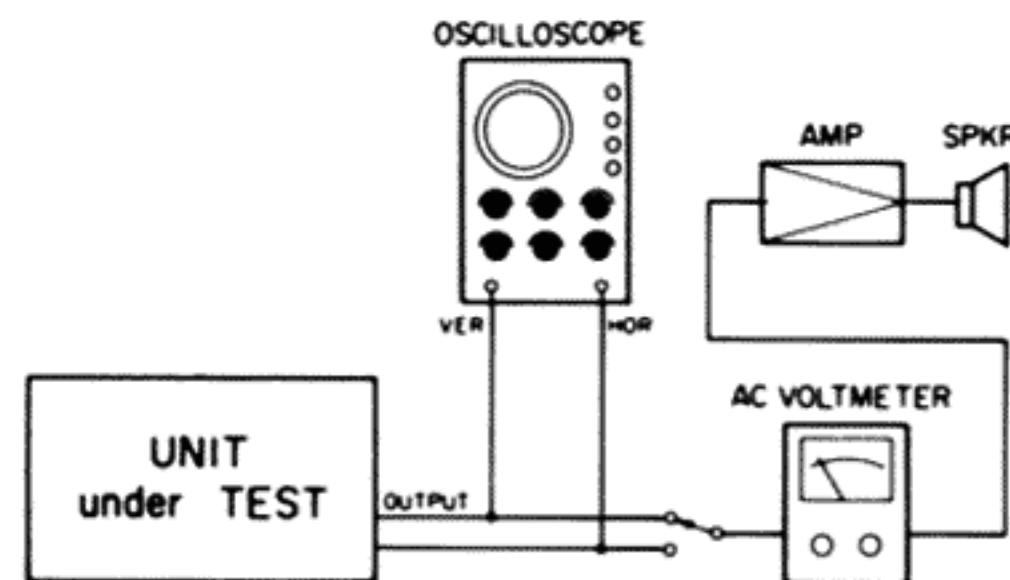


Figure 5-14. Head Alignment Test Connections

1. Connect an AC level meter to the OUTPUT connector of both channels as shown in Figure 5-14.
2. Load a frequency response test tape (YTT-1004) and reproduce its 16 kHz recording at HIGH speed.
3. Watching the output level of both channels, manually apply a slight back tension to the left reel.

If the head correctly contacts the tape, the output level must not vary when you push the reel. If the level readings increase, it shows a poor tape contact. Then, proceed to the following:

4. Refer to Figure 5-13. Loosen tape contact adjustment screw "A" and azimuth adjustment screws "B" on the head being checked.
5. Reproduce the test tape, and tilt left and right the head for highest output level, as in step 2 under paragraph 5-11-1 above.
6. Block the head where best output level is read by retightening screw "A".
7. After adjustment of head-tape contact, proceed to the following procedure to adjust azimuth.

Slightly loosen one of the "B" screws and tighten the other, inch by inch (in step 3 above), and when an optimum azimuth is obtained, tighten the two screws paying attention not to undo the adjustment as monitored by the scope.

NOTE : Be sure to perform head azimuth adjustment whenever tape contact is adjusted.

5-11-2. Head Azimuth

There is no azimuth adjustment for the erase head ; adjustment is for the reproduce and the rec/sync head only.

Check and adjustments are done by reproducing a high frequency recording on the test tape (16 kHz recording). For the reproduce head, the Output Source Selector switch is to set to REPRO, and, for the rec/sync head, to SYNC. The track REC switches must be set to OFF.

1. As shown in Figure 5-14, connect the channel 1 output to the vertical input of the oscilloscope, and the channel 2 output to the horizontal input of the scope. Also connect an AC level meter to measure the channels' output levels.
2. Load a test tape on the machine, and reproduce the 400 Hz then the 16 kHz recording on the test tape at HIGH speed.
While doing so perform the next step.
3. Adjust the azimuth adjustment screws for a phase difference of 90 degrees or less between both channel outputs (refer to Figure 5-15) and, at the same time, for highest output level readings (from both channels).

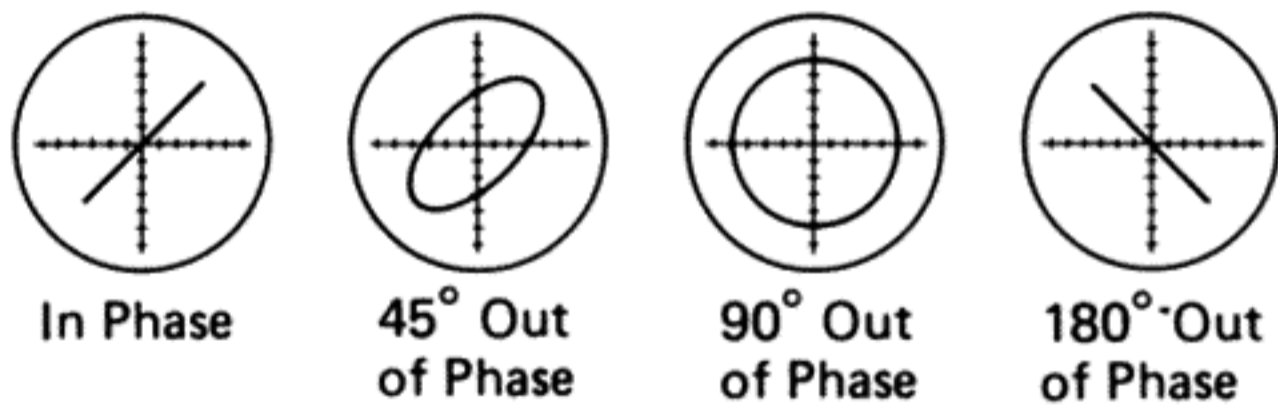


Figure 5-15. Phase Difference Between Both Channels

NOTE : If the vertical and horizontal input connections to the scope are reversed, the phase also is.

- To adjust the azimuth adjustment screws "B" shown in Figure 5-13, note the following;

6. AMPLIFIER CHECKS AND ADJUSTMENTS

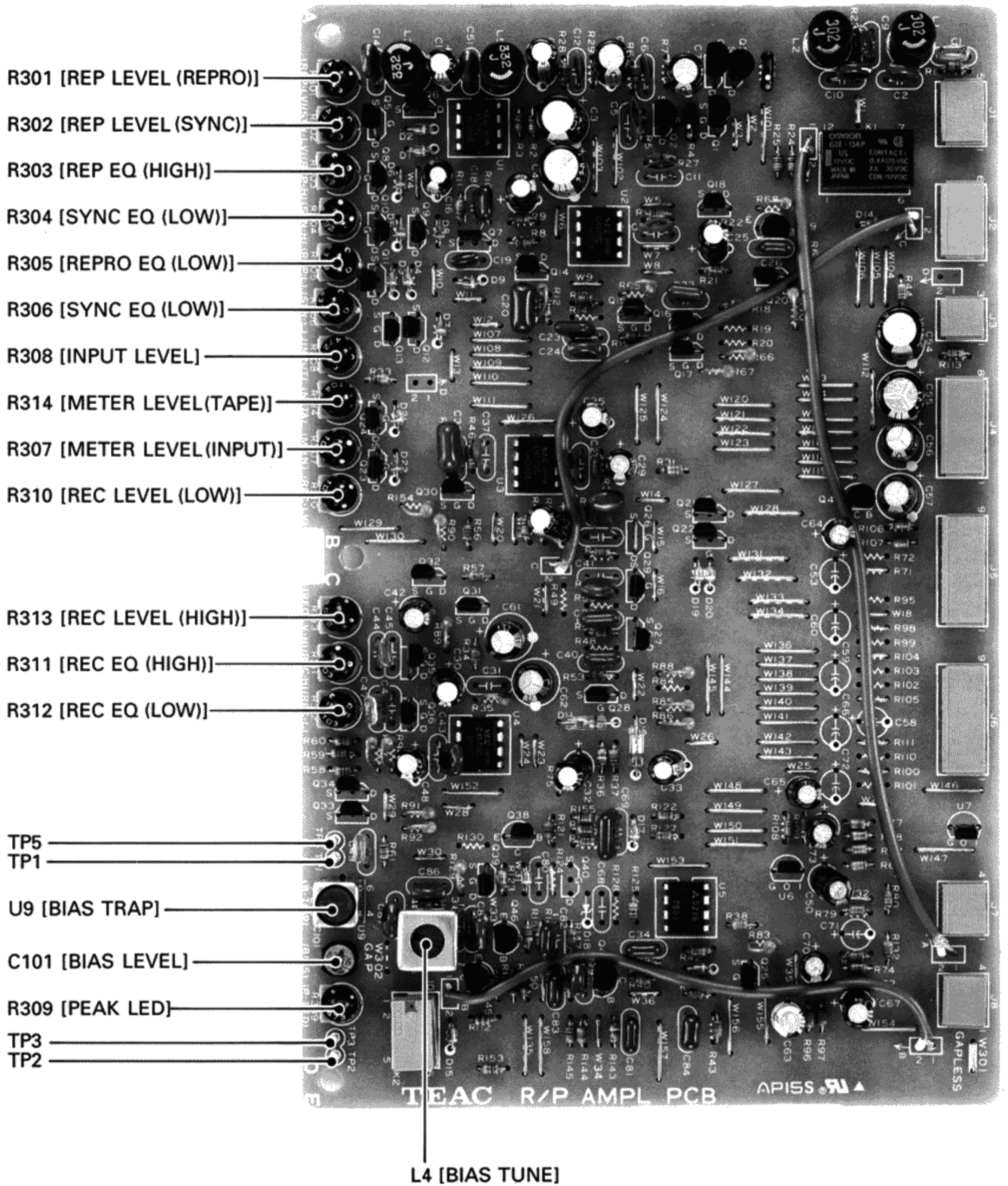


Figure 6-1. Amplifier Adjustments

6-1. Preliminary Notes

6-1-1. Nominal Input/Output Levels

In the following, we use the XLR type input and output connectors whose nominal output and input levels are +4 dBm (1.23 V).

The output level remains the same even if the XLR type input is made unbalanced, with a jumper wire connected between pin 1 (ground) and pin 2 (cold, low) or 3 (hot, high).

In addition, the RCA jacks has a nominal level of -10 dBV (0.3 V).

6-1-2. Level Controls

Although the input and output levels can be controlled by the INPUT and OUTPUT knobs, all checks and adjustments are made (unless otherwise noted) with the INPUT and OUTPUT CAL/UNCAL switches set to CAL.

6-1-3. Others

- Perform each check (and adjustment if necessary) for channel 1 first; then repeat the procedure for channel 2.
- Be sure to turn power off when replacing the REC/REPRO PCB assembly or any other electrical parts.

6-2. Input Level

Adjustment is made for nominal output level when nominal input signal is fed into the INPUT connectors.

A. Check

1. Connect test equipment as shown in Figure 6-2.

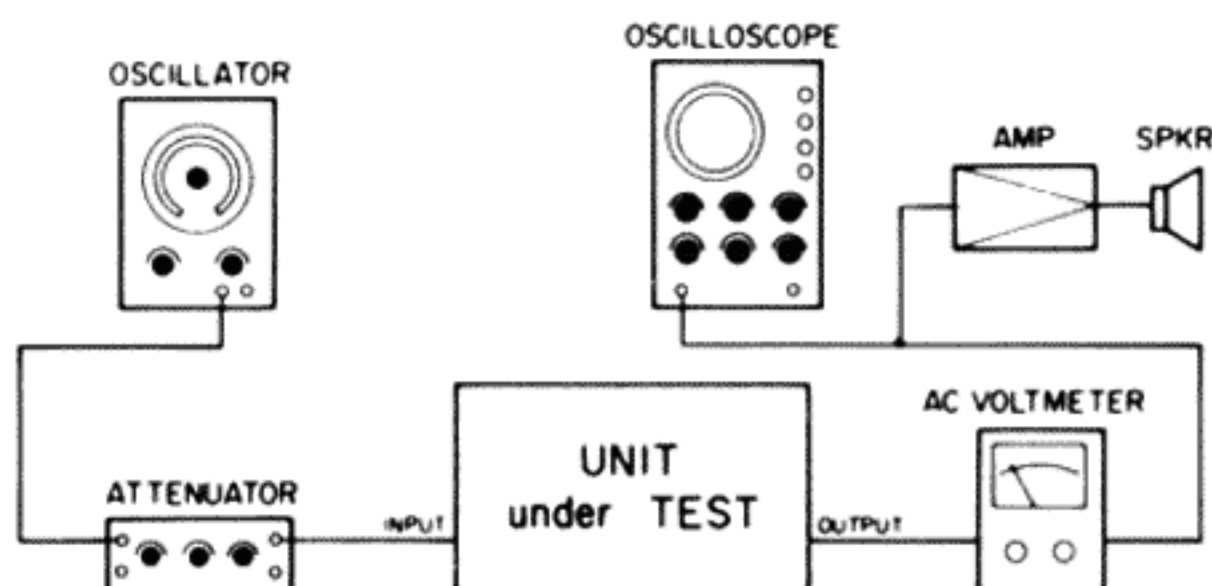


Figure 6-2. Level and Frequency Response Test Connections

2. Connect a 1 kHz, +4 dBm (1.23 V) signal to the INPUT XLR type connectors.
3. Set the Output Source Selector switch to INPUT.
4. Check for +4 dBm (1.23 V) at the OUTPUT connectors. If necessary, proceed to the next step.

B. Adjustment

Adjust resistor R308 for +4 dBm output.

6-3. VU Meters

The VU meters must read "0 VU" when fed with the nominal level input (6-2 above) and with the nominal level output (6-5 below).

A. Check

1. When the nominal input level of +4 dBm (step 4, paragraph 6-2 above) is coming into the machine, check to see the VU meters read "0 VU".
2. Check to see the VU meters read "0 VU" when a reference test tape is reproduced (step 3, paragraph 6-5 below).

NOTE : When the test tape YTT-1003 (7-1/2 inch/s, 185 nWb/m) is used — ;

The reading must be :

- 2.6 VU for the REF LEVEL of 250 nWb/m.
- 3.9 VU for the REF LEVEL of 320 nWb/m.

B. Adjustment

Adjust the following resistors :

- R307 for the input level reading
- R314 for the output level reading.

6-4. Peak LED

The peak LED is designed to light up at +12 VU for 250 nWb/m and at +10 VU for 320 nWb/m.

A. Check

With the same conditions as in paragraph 6-2 above, switch the REF LEVEL to LOW, and check the peak LED lights when the input level is increased until the VU meters read the values specified above and turns off when decreased by 1 dB.

B. Adjustment

Use resistor R309.

6-5. Reproduce Level

Reproduce level is checked by reproducing a reference record level NAB 250 nWb/m or 320 nWb/m.

A. Check

1. Connect an AC level meter and an oscilloscope to the rear OUTPUT XLR type connectors.
2. Make the following switch settings :

INPUT and OUTPUT CAL/UNCAL Switches to CAL;

Output Source Selector Switch to REPRO;
 REF LEVEL Switch to LOW;
 SPEED switch to LOW;
 EQ switch to NAB.

3. Reproduce the reference level recording on the test tape and check for nominal output level reading.

NOTE : When the test tape YTT-1003 (7-1/2 inch/s, 185 nWb/m) is used — ;

- The output level drops by 2.6 dB from the nominal level (+4 dBm) when REF LEVEL is at 250 nWb/m.
- The output level drops by 3.9 dB from the nominal level (+4 dBm) when REF LEVEL is at 320 nWb/m.

4. Set the Output Source Selector switch to SYNC, and repeat the above procedure.

B. Adjustment

Use the following resistors :

R301 for REPRO
 R302 for SYNC

6-6. Reproduce Frequency Response

A. Check

At HIGH tape speed

1. Make the following switch settings :

INPUT and OUTPUT CAL/UNCAL switches to CAL;
 Output Source Selector Switch to REPRO;
 SPEED switch to HIGH;
 EQ switch to NAB, IEC.

2. Reproduce the test tape, and check the output level readings meet specifications for each of the frequencies specified in Figure 6-3.

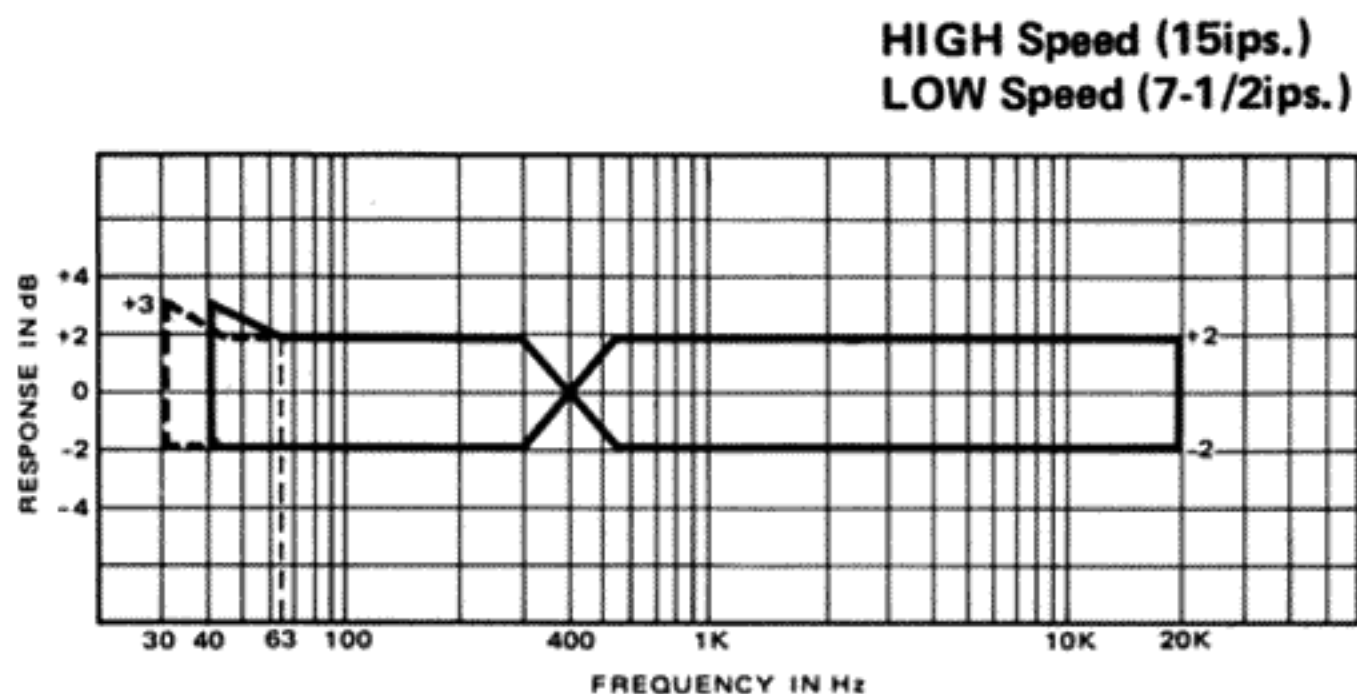


Figure 6-3. Reproduce Frequency Response

Output level from the 400 Hz recording serves as the reference. (See Figure 6-3 for specifications.)

NOTE : Use the test tape YTT-1004 (15 inch/s) when the EQ switch is set to NAB ; and the test tape YTT-1064 (15 inch/s) when the EQ switch is set to IEC.

3. Switch the output source selector from REPRO to SYNC, and repeat step 2. Specifications are the same as in step 2.

At LOW tape speed

4. Switch the SPEED switch from HIGH to LOW.

5. Reproduce the test tape, and check the output level readings are within specifications. See Figure 6-3 for specifications.

NOTE : Use test tape YTT-1003 (7-1/2 inch/s) when the EQ switch is set to NAB ; and YTT-1063 (7-1/2 inch/s) when the EQ is at IEC.

6. Switch the output source selector switch from REPRO to SYNC, and read the output levels as in step 5 above. Specifications are the same as in step 5.

B. Adjustment

Tape Speed	Adjustment REPRO	Adjustment SYNC	Adjust so that :
HIGH	R303	R304	Level at 16 kHz becomes the same as at 400 Hz.
LOW	R305	R306	Level at 16 kHz becomes the same as at 400 Hz.

If specifications are not met, check the following :

- Cleanness of the heads, correct head-tape contact
- If only either channel is out of specs, replace or repair the REC/REPRO AMP PCB of that channel.
- If both channels are out of specs, check the aging of the test tape being used, the correct power connection, etc.
- As a final measure, replace the head assembly.

6-7. Bias Tuning and Bias Trap Adjustment

Bias tuning refers to a tuning of the bias driver amplifier against the master bias signal.

Bias trap refers to a trap adjustment of the bias signal in the record amplifier.

Bias tuning and bias trap adjustment have correctly been achieved before shipment, and are necessary to be repeated only when the following are replaced :

- REC/SYNC head, or ERASE head
- Bias oscillator

6-7-1. Bias Tuning (L4)

Preliminary Notes :

- In the following, don't allow the voltmeter to show maximum reading, which overloads the bias drive amplifier, causing damage to it.
 - Use a non-inductive screwdriver (plastic or wooden).
1. Connect a DC voltmeter between TP-3 (HOT) and TP-2 (COLD) on the R/P AMP PCB.
 2. Engage the REC enable switch of both channels and put the transport into Record mode.
 3. Adjust L4 for minimum reading on the voltmeter. Reading you could achieve must be about 0.2 V.

NOTE : After adjustment of L4, wait for about 1 minute and check to see the reading remains the same.

4. (For the gapless punch-in models only) Connect the DC voltmeter between TP-1 (CH 1)/TP-2 (CH 2) on the AMP CONT PCB (Figure 6-4) and TP-2 on the R/P AMP PCB. Then, adjust L101 (CH 1)/L201 (CH 2) for minimum reading on the voltmeter.

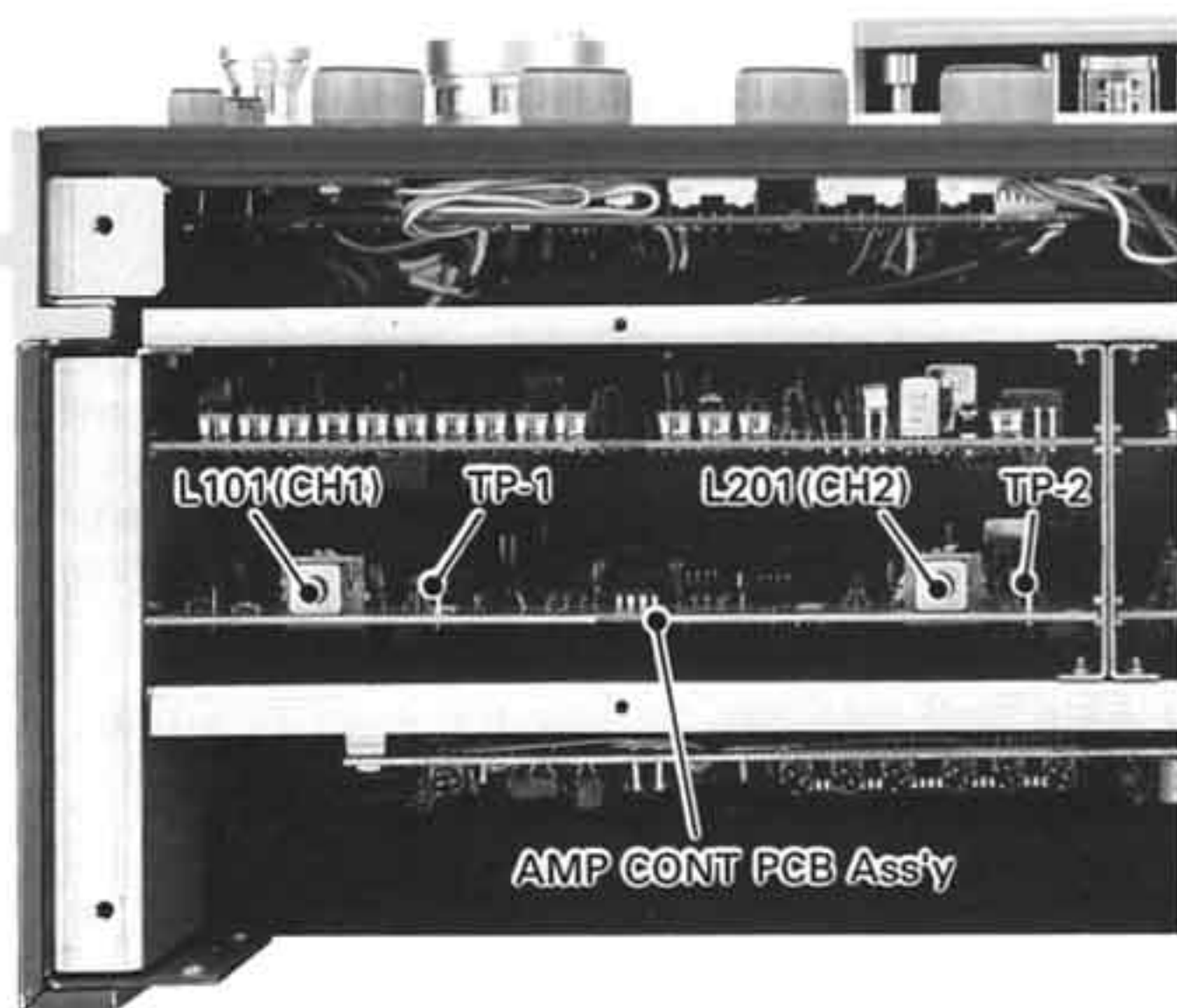


Figure 6-4. Test Points on AMP CONT PCB

6-7-2. Bias Trap Adjustment (U9)

1. Connect an AC level meter between TP-1 and TP-5 (GND) on the R/P AMP PCB of the channel to be tested.
2. Make the following switch settings :
Track REC switch to ON (both channels);
UNCAL/CAL switch to CAL (both INPUT and OUTPUT).
3. Put the transport into Record mode.

4. Increase the sensitivity of the AC level meter and adjust the trap coil U9 of the channel being tested for minimum reading on the level meter.

6-8. Record Bias

Record bias *must* be adjusted *after* the bias tuning and bias trap adjustment (see above).

Perform the following procedure when —

- It is necessary to fine adjust record bias to suit the type of tape being used for actual recording.

- The following have been replaced :

REC/SYNC head or ERASE head

Rec/repro amplifier, bias drive amplifier, master bias unit

When performing record bias adjustment, understand this : record bias has a significant effect on the high frequency response and distortion, and on the record level too.

Adjustment is done for 6.5–7.5 dB below the peak level at 10 kHz to ensure minimum distortion and optimum output level.

1. Connect test equipment to the inputs and outputs of the machine as shown in Figure 6-2.
2. Make the following switch settings :
CAL/UNCAL switch to CAL (both INPUT and OUTPUT);
Monitor Source Selector switch to REPRO;
SPEED switch to LOW;
Track REC switch to ON (both channels).
3. Apply a 10 kHz, –6 dBm (388 mV, –10 VU) input signal and start recording it on a blank tape.
4. While the recording is taking place, perform the following :

Refer to Figure 6-5. Slowly turn trim capacitor C101 clockwise until the level on the AC level meter connected to the outputs rises to a peak. Two peaks may be observable. When the second peak occurs, continue rotating C101 in a clockwise direction until reading decreases by 6.5–7.5 dB from the second peak level.

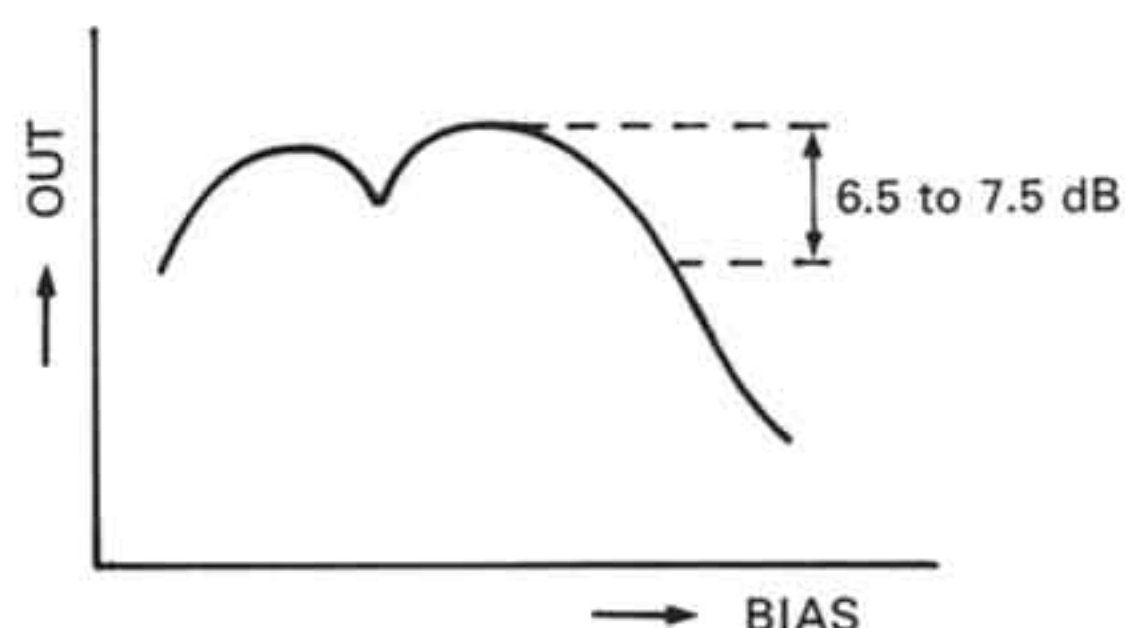


Figure 6-5. Bias Setting Adjustment

6-9. Record Level

Record level is adjusted so the nominal input level of +4 dBm causes the VU meters to read "0 VU."

The following procedure must be performed AFTER these have been adjusted : Reproduce level, Reproduce Frequency Response, Bias Tuning, Bias Trap, and Record Bias.

A. Check

1. Connect test equipment to the inputs and outputs of the machine as shown in Figure 6-2.
2. Make the following switch settings :
UNCAL/CAL switch to CAL (both INPUT and OUTPUT);
Monitor Source Selector switch to REPRO;
SPEED switch to LOW;
Track REC switch to ON (both channels).
3. Apply a 1 kHz, +4 dBm (1.23 V) signal to the inputs and record it on a blank tape.
4. While the recording is taking place, check to see the AC level meter reads +4 dBm and the VU meters read 0 VU.
5. Similarly, set SPEED to HIGH and repeat the check.

B. Adjustment

NOTE : Adjustment must first be done at LOW, then at HIGH.

Adjust resistors R310 (for LOW SPEED) and R313 (for HIGH SPEED).

As for the VU meter adjustment, see paragraph 6-3.

6-10. Overall Frequency Response

Overall frequency response affects the record bias and must be rechecked if bias adjustments (paragraphs 6-7, and 6-8) are performed.

A. Check

1. Connect test equipment as shown in Figure 6-2.

At HIGH SPEED

2. Apply a +4 dBm (1.23 V, 0 VU) signal to the XLR type INPUT of the channel being tested.
3. Make the following switch settings :

REF LEVEL switch to LOW;
UNCAL/CAL switch to CAL (both INPUT and OUTPUT);
Monitor Source Selector switch to REPRO;
SPEED switch to HIGH;
Track REC switch to ON (both channels).

4. Load a blank tape, enter Record mode and sweep the input signal frequency over the range 40 Hz to 22 kHz. While doing so, watch the voltmeter and check that the frequency response is within the tolerance specified in Figure 6-6.

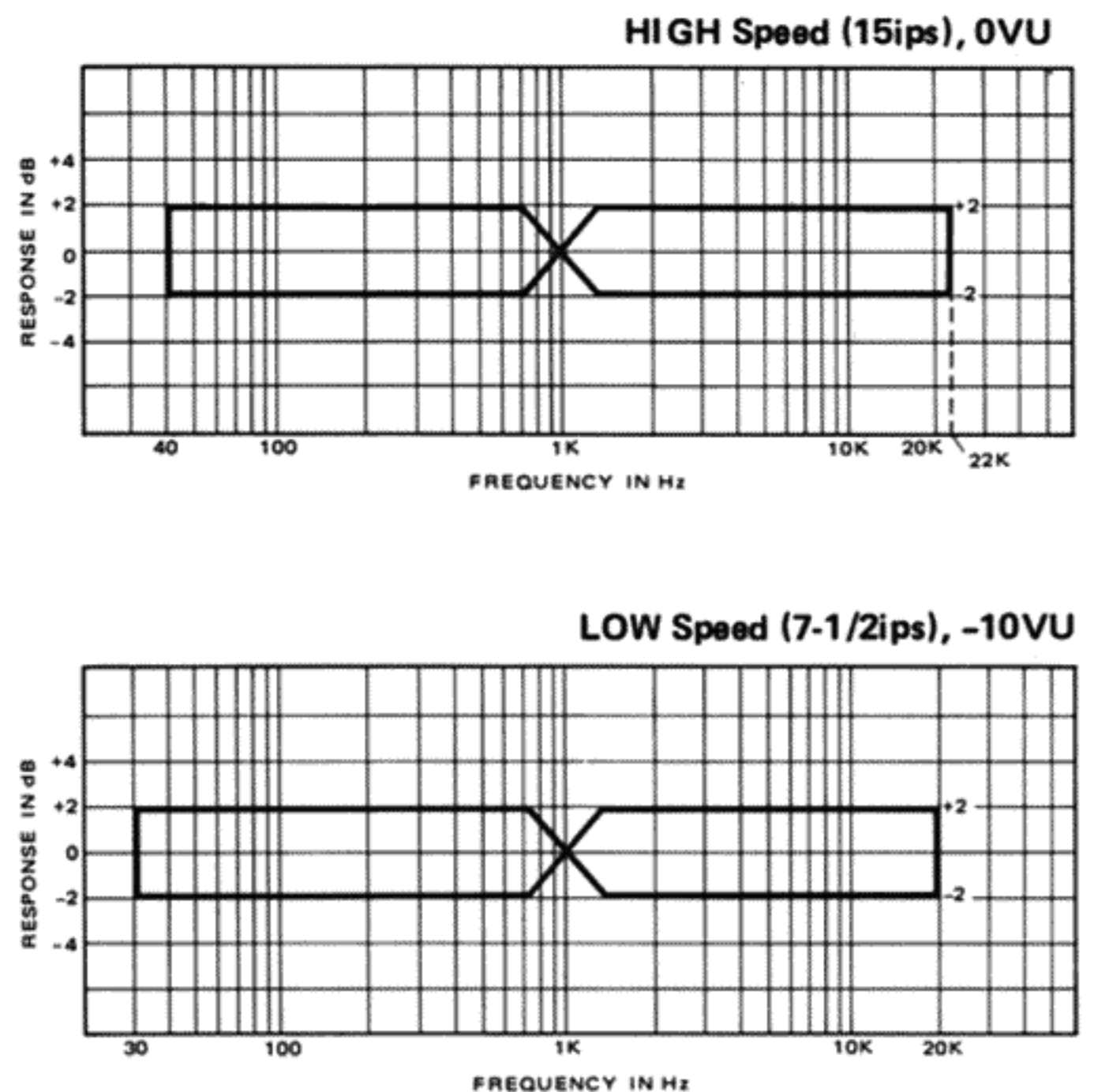


Figure 6-6. Overall Frequency Response

5. In a similar way, check frequency response for Sync Reproduce ; set the Monitor Source to SYNC and play the recording again from the beginning.

At LOW SPEED

6. Change the input signal level to -6 dBm (388 mV, -10 VU).
7. Set the SPEED switch to LOW.
8. Put the deck into record mode and sweep the input signal frequency over the range 30 Hz to 20 kHz. Rewind the tape, play the recording, watch the voltmeter and check that the frequency response is within the tolerance specified in Figure 6-6.
9. Repeat check with the Monitor Source switch set to SYNC.

B. Adjustment

If adjustment is necessary, proceed as follows :

1. Record bias check

Is record bias set as specified under paragraph 6-8? If it is, adjust the record equalizer as follows:

2. Record equalizer adjustment

At HIGH SPEED :

While recording a -6 dBm (388 mV, -10 VU), 22 kHz signal, adjust R311 for the same output level as at 1 kHz.

After adjustment, repeat check A above.

At LOW SPEED :

While recording a -16 dBm (123 mV, -20 VU), 20 kHz, adjust R312 for the same level as at 1 kHz.

After adjustment, repeat check A above.

6-11. Overall Distortion

Overall distortion is checked by recording a nominal level signal and reproducing it. Use an oscillator whose distortion is less than 0.1%

1. Connect test equipment as shown in Figure 6-7 to the inputs and outputs of the machine.

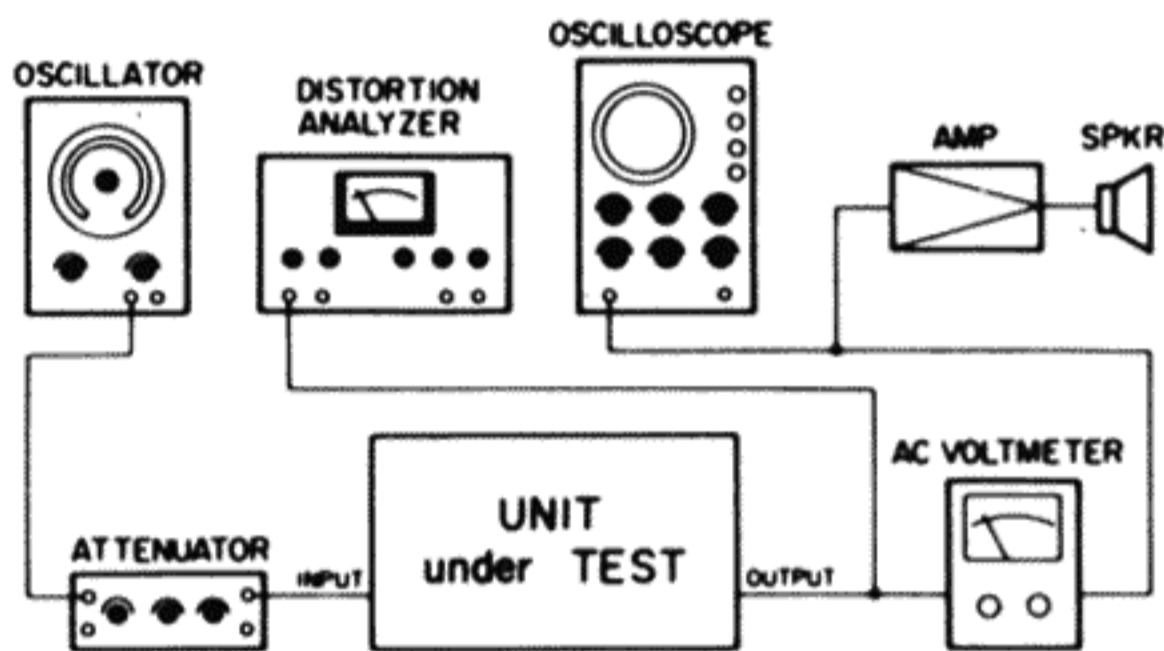


Figure 6-7. Distortion Test Connections

2. Connect a 1 kHz, -6 dBm (1.23 V) signal to the XLR type INPUT connector to be checked.
3. Make the following switch settings :
UNCAL/CAL switch to CAL (both INPUT and OUTPUT);
Monitor Source Selector switch to REPRO;
SPEED switch to HIGH;
Track REC switch to ON.
4. Record the input signal on a blank tape.
- * 5. Rewind the tape, play the recording and read the output on the distortion meter. Distortion should be 0.8% or less.
6. Set the SPEED switch to LOW and repeat the above procedure to check for distortion of 0.8% or less as at HIGH speed.
7. If distortion does not meet specifications, proceed as follows :
 - If only either channel is out of specs, check -
 1. Record bias, and
 2. Rec/repro amplifier

- If both channels are out of specs, perform the following :
 1. Head demagnetization, and
 2. +B power supply check
- As a final measure, replace the record head.

6-12. Overall Signal-To-Noise Ratio

Signal-to-noise ratio is checked by recording the nominal level signal of 4 dBm, 1 kHz and reproducing the recording to read the output level. This reading serves as a reference with which is compared the output level read when a no-signal recording is played back.

NOTE : Before performing the following procedure, be sure to demagnetize the entire tape path.

1. Connect test equipment to the inputs and outputs of the machine as shown in Figure 6-2.

Insert a 20 Hz-20 kHz band pass filter between the XLR type OUTPUT connector under test and the AC level meter.

2. Make the following switch settings :

UNCAL/CAL switch to CAL (both INPUT and OUTPUT);
Monitor Source Selector switch to REPRO;
SPEED switch to HIGH;
Track REC switch to ON.

3. Record the nominal signal of 1 kHz, +4 dBm (1.23 V), then, switch the INPUT UNCAL/CAL switch to UNCAL, turn the INPUT level control all the way to the left (to minimum), and record again.
4. Rewind the tape to the beginning of the recording, play the tape and read on the AC level meter the output level of both the "signal" and "no-signal" recordings. The level difference between the two recordings should be 50 dB or more.
5. Set the SPEED switch to LOW and repeat procedure to check for signal-to-noise ratio of 50 dB or more as at HIGH speed.
6. If adjustment is necessary, proceed as follows :
 - If only either channel is out of specs, check (and adjust if necessary) the following :
 - Record equalizer
 - Repro equalizer
 - If both channels are out of specs, check the following:
 - +B power supply
 - Head demagnetization
 - Erasure
 - If there is no problem in the machine, use a new blank tape to measure again signal-to-noise.

6-13. Erasure

The tape used for this test should be bulk erased. Any residual signal may affect the measurement.

1. Connect test equipment to the input and output of the channel being tested as shown in Figure 6-8.

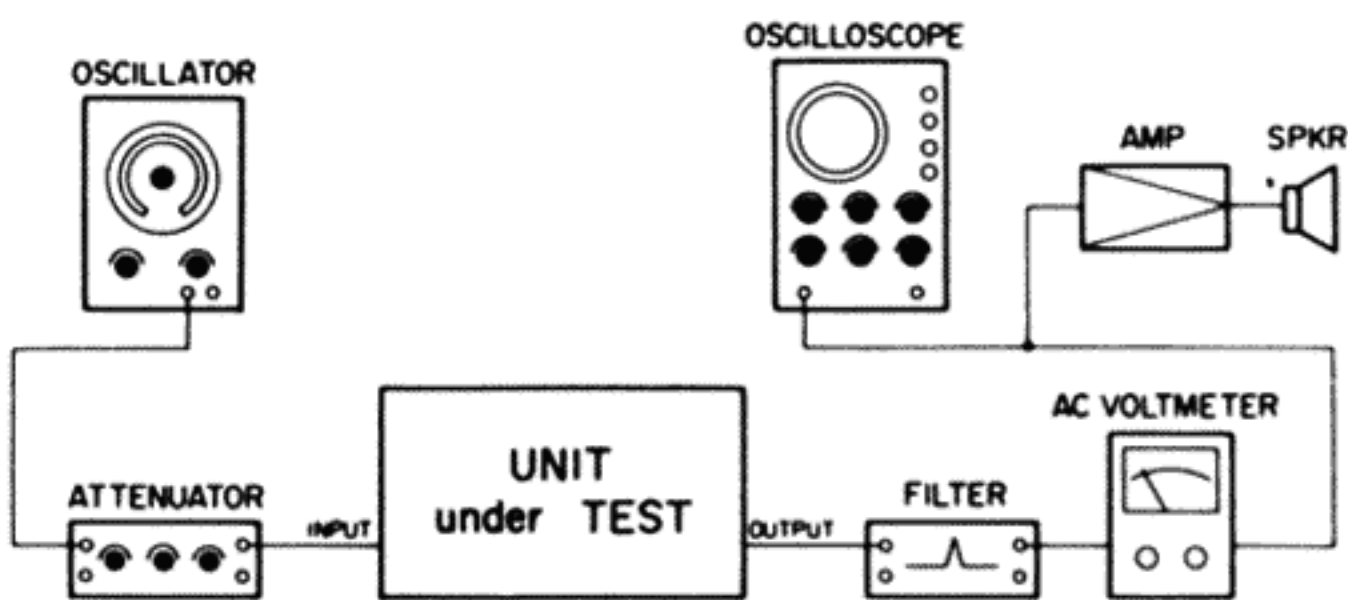


Figure 6-8. Erasure Test Connections

Insert a 1 kHz band pass filter between the OUTPUT connector and the AC level meter.

2. Make the following switch settings :

REF LEVEL switch to LOW;
UNCAL/CAL switch to CAL (both INPUT and OUTPUT);
Monitor Source Selector switch to REPRO;
Track REC switch to ON (only the switch of the channel under test).

3. Record a 1 kHz, +14 dBm (3.88 V) (i.e., 10 dB higher than the nominal +4 dBm).
4. Disconnect the oscillator.
5. Rewind the tape to about half way through the recorded portion of the tape, and enter again Record mode to erase the tape by recording through the previously recorded section with no input signal.
6. Rewind the tape all the way back to the beginning of the recording, and play the tape to compare the level on the AC level meter from the original 1 kHz signal recording with the level from the "no-signal" recording. The level difference should be 70 dB or more.
7. If adjustment is necessary, perform the following :
 - Clean the erase head
 - Check the erase head alignment
 - Check bias tuning

6-14. Headphones Output Level

1. Connect to the PHONES jack an 8-ohm load, AC level meter, and oscilloscope.
2. Set the Monitor Source Selector switch to INPUT and apply a 1 kHz, +4 dBm (1.23 V) signal to both CH 1 and CH 2 INPUTs.
3. Turn the headphone level control to maximum, and check the AC level meter reads 1.2 V \pm 2dB.

6-15. Crosstalk

1. Connect an oscillator to the INPUT of the channel which is not under test, and connect a 1 kHz band filter and AC level meter to the OUTPUT of the channel under test.

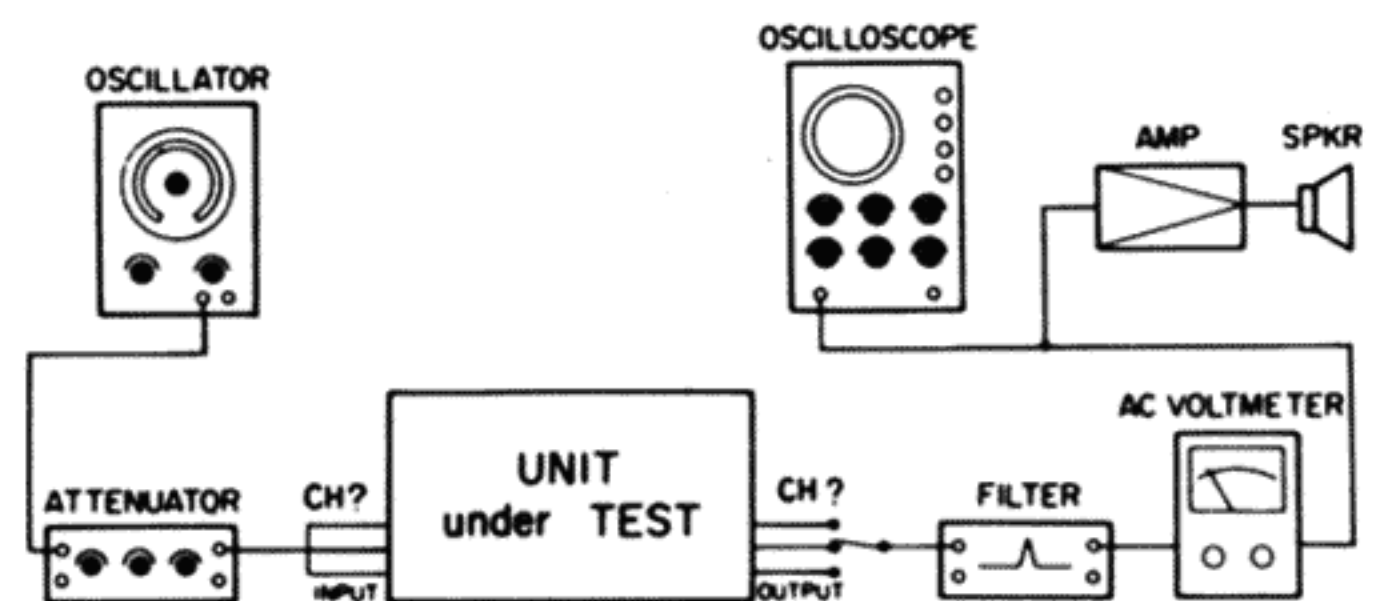


Figure 6-9. Crosstalk Test Connections

2. Load a blank tape on the machine, and make the following switch settings :

Monitor Source Selector switch to REPRO;
Track REC switch to ON (both CH 1 and CH 2).

3. Apply the nominal 1 kHz, +4 dBm (1.23 V) signal to the INPUT for the channel adjacent to the channel being tested and put the machine into Record mode. Rewind the tape and play the recording.
4. Measure the output of the channel being tested to get a level reference, then measure the output of the channel through which "no signal" was recorded.

The difference between the two channels should be 60 dB or greater on NAB and TC models and, 55 dB or greater on DIN models.

5. Rewind again the tape to the beginning of the recording.
6. Switch the monitor source from REPRO to SYNC.
7. Play the tape, and measure the output of both channels as in step 4 above.

The difference between the two channels should be 60 dB or greater on NAB and TC models and 55 dB or greater on DIN models.

6-16. Time Code Channel Adjustments (BR-20T only)

The following adjustments have been achieved before shipment and need to be performed only when — ;

- Rec/sync and/or Record heads are replaced.
- Time code amplifier is replaced.
- An error occurred in the time code recording and/or reproducing.

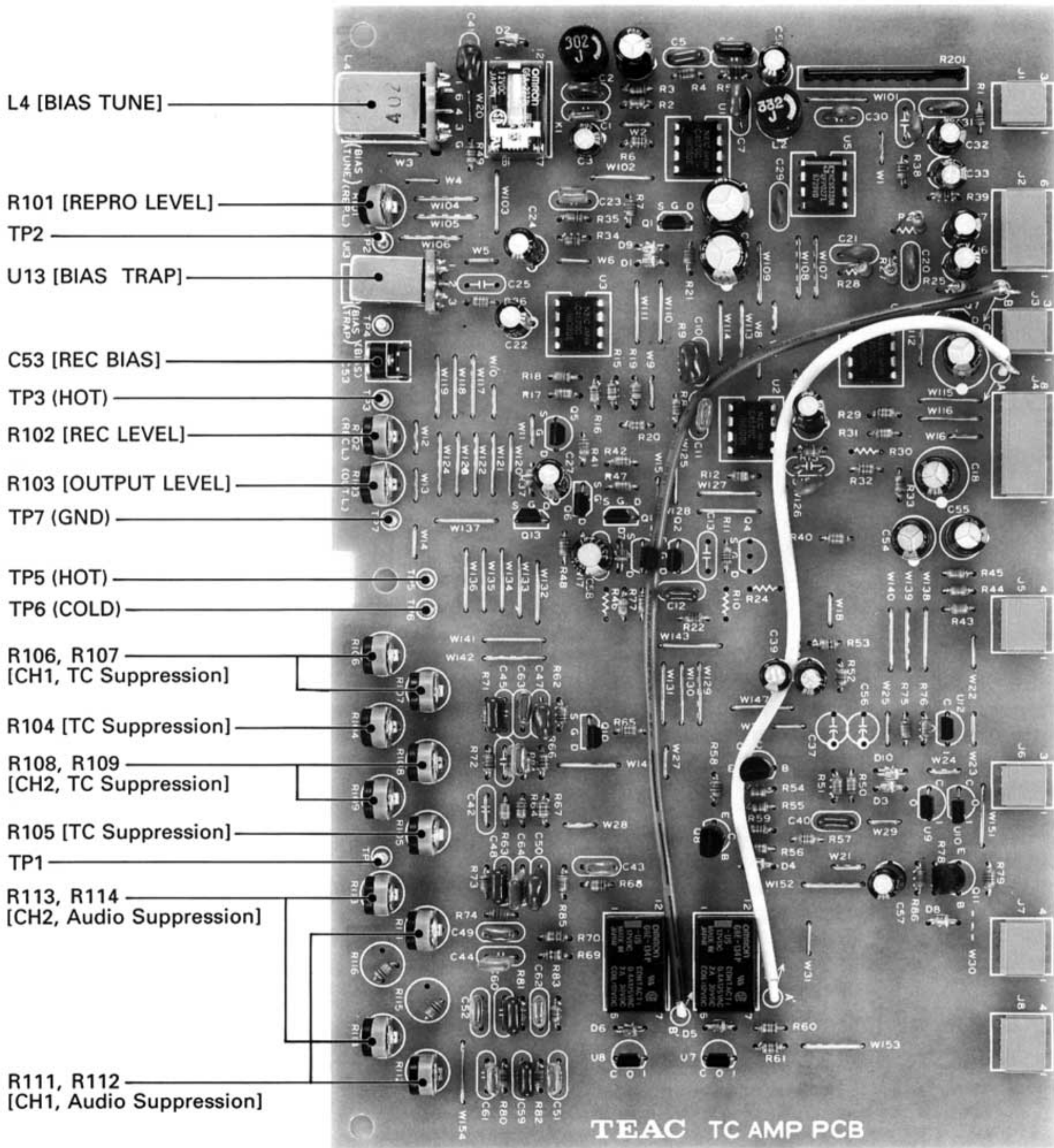


Figure 6-10. Time Code Amplifier Adjustments

6-16-1. Reproduce Level Set

1. Set the REF LEVEL switch to LOW, and the SPEED switch, to LOW.
2. Play a test tape recorded with a nominal level signal.
3. Adjust R101 on the Time Code Amp PCB for 6V p-p (-6.8 dBV) at TP-2 on the PCB.

NOTE : When the YTT-1003 test tape (7-1/2 ips, 185 nWb/m) is used, the level at TP-2 decreases by — ;

2.6 dB at 250 nWb/m of REF LEVEL
3.9 dB at 320 nWb/m of REF LEVEL

6-16-2. Output Level

With the same conditions as in 6-16-1 above, adjust R103 on the Time Code Amp PCB for 2V p-p at the XLR type connector for the TIME CODE OUTPUT.

6-16-3. Bias Tuning (L4)

Preliminary Notes :

- In the following, don't allow the voltmeter to show maximum reading, which overloads the bias drive amplifier, causing damage to it.
 - Use a non-inductive screwdriver (plastic or wooden).
1. Connect a DC voltmeter between TP-5 (HOT) and TP-6 (COLD) on the Time Code Amp PCB.
 2. Engage the TIME CODE REC switch and put the machine into Record mode .
 3. Adjust L4 on the Time Code Amp PCB for minimum reading on the voltmeter. That should be about 0.7 V.

NOTE : After adjustment of L4, leave the machine for about 1 minute to check to see no variation in the reading on the voltmeter.

6-16-4. Bias Trap (U13)

1. Connect an AC level meter between TP-3 (HOT) and TP-7 (GND) on the Time Code Amp PCB.
2. Engage the TIME CODE REC switch and put the machine into Record mode.
3. Adjust U13 on the Time Code Amp PCB for minimum reading on the AC level meter.

6-16-5. Input Level

1. Connect a square wave oscillator to the INPUT for the TIME CODE channel and an oscilloscope to its OUTPUT.
2. Engage the TIME CODE REC switch and put the machine into Record mode.

3. Watch the scope and adjust the oscillator so its output (2 kHz) varies over the range from 0.3 V p-p to 6 V p-p, to check to see a display of 2 V p-p (+/-0.5 V p-p) on the scope does not vary.

6-16-6. Record Bias

1. Connect an AC level meter between TP-1 and TP-7 (GND) on the Time Code Amp PCB.
2. With no signal connected to the INPUT for the time code channel, adjust C53 on the Time Code Amp PCB for 20 mV (2 mA) on the AC level meter.

6-16-7. Record Level

With the same conditions as in 6-16-5 above, record square wave signal from the oscillator on the time code track, rewind the tape and play the recording. Check for 6 V p-p +/-0.5 V at TP-2 on the Time Code Amp PCB. If out of specs, adjust R102 on the Time Code Amp PCB.

6-16-8. Crosstalk Suppression

I. Time Code Signal Leakage (Both Time Code and Audio Channels in Reproduce Mode)

1. Connect an AC level meter to the OUTPUT for either audio channel (CH1 or CH 2). Or, you could connect headphones to the PHONES jack. Set the Monitor Source Selector switch to SYNC.
2. Record time code on the time code track.
3. Rewind the tape, play the recording in SYNC (the audio tracks should not contain any recording), and adjust R104 on the Time Code Amp PCB for minimum reading on the AC level meter or, if you are using headphones, until the audio track output melts into the tape hiss or only faintly distinctive from the hiss.

II. Time Code Signal Leakage (Both Time Code and Audio Channels in Rec/Repro mode)

1. As in I above, connect an AC level meter or headphones, and set the Monitor Source Selector switch to REPRO.
2. Record time code on the time code track and "no signal" on the audio track. While the recording is taking place, slowly turn R105 from the leftmost position in a clockwise direction until minimum leakage is read on the AC level meter or heard in the headphones, then slightly turn R105 back. Stop R105 where the same output level as in I above is obtained.
3. Rewind the tape, switch the monitor source to SYNC and play again the recording, to check to see the same output level as in I above. If not, repeat step 2.

III. Time Code Signal Leakage (Time Code Channel In Record and Audio Channel in Repro mode)

1. As in I above, connect the AC level meter or headphones.
2. Record time code on the time code track while reproducing an audio track in SYNC.
3. Adjust R106 and R107 (for CH 1) and R108 and R109 (for CH 2) on the Time Code Amp PCB for minimum leakage.

Adjust each pair of resistors above, alternately, several times.

IV. Audio Signal Leakage (Time Code Channel in Reproduce and Audio Channel in Record)

Adjustment is repeated for each channel until minimum leakage level is read at TP-2 on the Time Code Amp PCB over the whole frequency range (100 Hz to 20 kHz).

1. Make the following switch settings :

TAPE SPEED to LOW;
Monitor Source Selector switch to INPUT;
Audio Track REC switch to ON;
Time Code Track REC switch to OFF.

2. Record a 0 VU signal on an audio track, and adjust semi-fixed resistors several times as explained below, until signal whose characteristics are shown in Figure 6-11 appears at TP-2 on the Time Code Amp PCB.

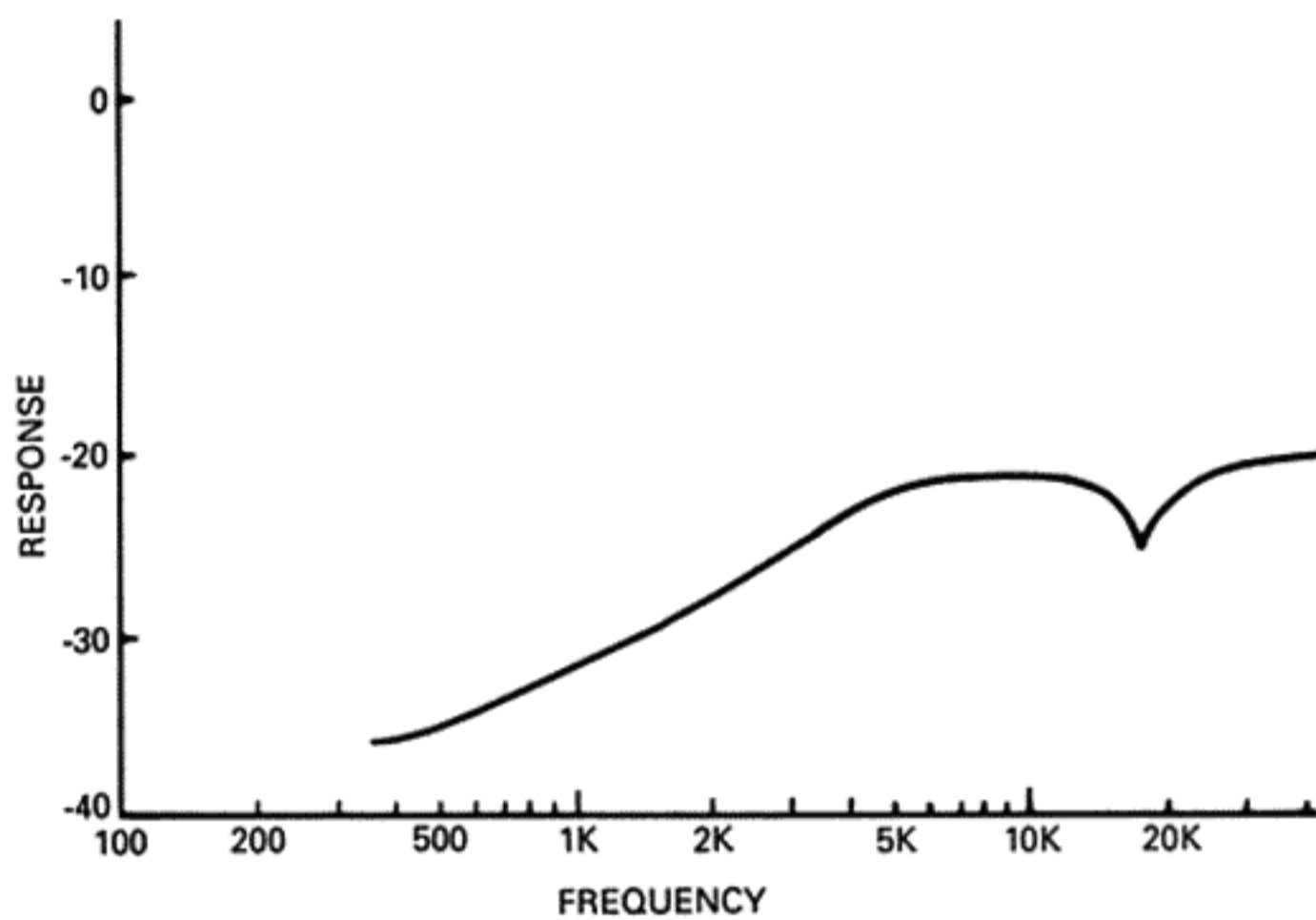


Figure 6-11. Crosstalk from Audio to Time Code Channels

As shown in the figure, TP-2 signal should present a slow upward curve starting from 1 kHz then a short downward curve bottomed out at 15 kHz point.

Adjustment Procedure

1. Suppose the level at TP-2 obtained under the same conditions as in 6-16-1 above to be 0 dB.
2. Change the audio signal frequency to 1 kHz and adjust R111 and R112 for CH 1 and R113 and R114 for CH 2 for -20 dB or less at TP-2.
3. While sweeping the audio signal frequency over the range 1 kHz to 15 kHz, adjust R111 for CH 1 and R113 for CH 2 for -20 dB or less at TP-2.
4. Change the audio signal frequency to 15 kHz and adjust R111 for CH 1 and R113 for CH 2 for around -24 dB at TP-2.
5. After adjustments, recheck the TP-2 level for the following :
 - 30 dB or less (approx.) for 1 kHz
 - 20 dB or less (approx.) for 1 kHz-15 kHz
 - Around -25 dB for 15 kHz

CHECKS AND ADJUSTMENTS CHART (1/2)

AD- JUST MENT	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	Reproduce Head Alignment	Reproduce head alignment test tape	VTVM and oscilloscope with channel 1 out to vertical in and channel 2 out to horizontal in	Reproduce at 15 ips, Output Selector at REPRO	Repro head alignment adjustment screws	Maximum output, less than 90° out of phase between both channels (at 16 kHz)
2	Record/Sync Head Alignment	Same as above	Same as above	Reproduce at 15 ips, Output Selector at SYNC	Record/sync head alignment adjustment screws	Same as above
3	Input Level	1 kHz, +4 dBm signal from oscillator connected to INPUT	VTVM connected to OUTPUT	Stop mode, Output Selector at INPUT	R308	+4 dBm (1.23 V) on VTVM
4	VU-Meter Adjustment	Same as above, plus reference level signal from test tape	VU-meter	Same as above, but Output Selector at REPRO	R307 and R314	0 VU reading on VU meter
5	PEAK LED	1 kHz, +16 dBm (250 nWb/m)/+14 dBm (320 nWb/m) from oscillator	PEAK LED	Stop mode, Output Selector at INPUT	R309	Lighting up LEDs
6	Reproduce Level (via Repro Head)	Reproduce alignment test tape (7-1/2 ips)	VTVM connected to OUTPUTs	Reproduce at 7-1/2 ips, Output Selector at REPRO	R301	+4 dBm (1.23 V) on VTVM
7	Reproduce Level (via Record/Sync Head)	Same as above	Same as above	Reproduce at 7-1/2 ips, Output Selector at SYNC	R302	Same as above
8	Reproduce EQ at 15 ips (via Repro Head)	16 kHz signal on test tape	VTVM connected to OUTPUTs	Reproduce at 15 ips, Output Selector at REPRO	R303	Same reading on VTVM as for 400 Hz signal
9	Reproduce EQ at 7-1/2 ips (via Record/Sync Head)	Same as above	Same as above	Reproduce at 15 ips, Output Selector at SYNC	R304	Same as above
10	Reproduce EQ at 7-1/2 ips (via Repro Head)	Same as above	Same as above	Reproduce at 7-1/2 ips, Output Selector at REPRO	R305	Same as above
11	Reproduce EQ at 7-1/2 ips (via Record/Sync Head)	Same as above	Same as above	Reproduce at 7-1/2 ips, Output Selector at SYNC	R306	Same as above
12	Bias tuning	No input signal	VTVM connected to test points, negative lead to TP-2, positive lead to TP-3 (For gapless punch-in models : VTVM connected between TP-1 (CH1)/TP-2 (CH2) on AMP CONT PCB and TP-2 on R/P AMP PCB)	Repro mode with no input signal	L4 L101(CH1)/L202 (CH2)	Minimum output at test points Minimum output at test points

CHECKS AND ADJUSTMENTS CHART (2/2)

AD- JUST MENT	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
13	Bias Trap Adjustment	No input signal	VTVM connected to Bias trap test points TP-1 and TP-5 (GND)	Record mode with no input signal	U9	Minimum output at bias test points
14	Bias Level Adjustment	10 kHz, -6 dBm from oscillator connected to INPUTs	VTVM connected to OUTPUTs	Recording on the same type of tape as used for actual recording, at 7-1/2 ips, Output Selector at REPRO	C101	6.5 to 7.5 dB below the "second" peak level
15	Record Level at 7-1/2 ips	1 kHz, +4 dBm (0 VU on VU meter) connected to INPUTs	VTVM connected to OUTPUTs, or VU meter instead	Recording at LOW then its playback	R310	+4 dBm on VTVM, or 0 VU on VU meter
16	Record Level at 15 ips	Same as above	Same as above	Recording at HIGH then its playback	R313	Same as above
17	Overall Frequency at 15 ips	22 kHz, -6 dBm signal from oscillator connected to INPUTs	Same as above	Same as above	R311	Same reading on VTVM as for 1 kHz
18	Overall Frequency at 7-1/2 ips	22 kHz, -16 dBm signal from oscillator connected to INPUTs	Same as above	Recording at LOW then its playback	R312	Same as above
19	Overall Signal-To-Noise Ratio	No input signal	VTVM connected to OUTPUTs	Recording at 15 or 7-1/2 ips, Output Selector at REPRO	Check only	Check for 50 dB or better
20	Erase	1 kHz, +14 dBm connected to INPUTs (i.e., +10 VU on VU meters). Apply signal for short time only.	VTVM and 1 kHz band pass filter connected to OUTPUTs	1 kHz signal recording, then no-signal recording over the 1 kHz recording. Output Selector at REPRO	Check only	Check for 70 dB or greater (through 1 kHz filter)

7. OPTIONAL MODIFICATIONS

There are two DIP-switches on the Control PC Board inside the BR-20. Their default settings and functions are as follows :

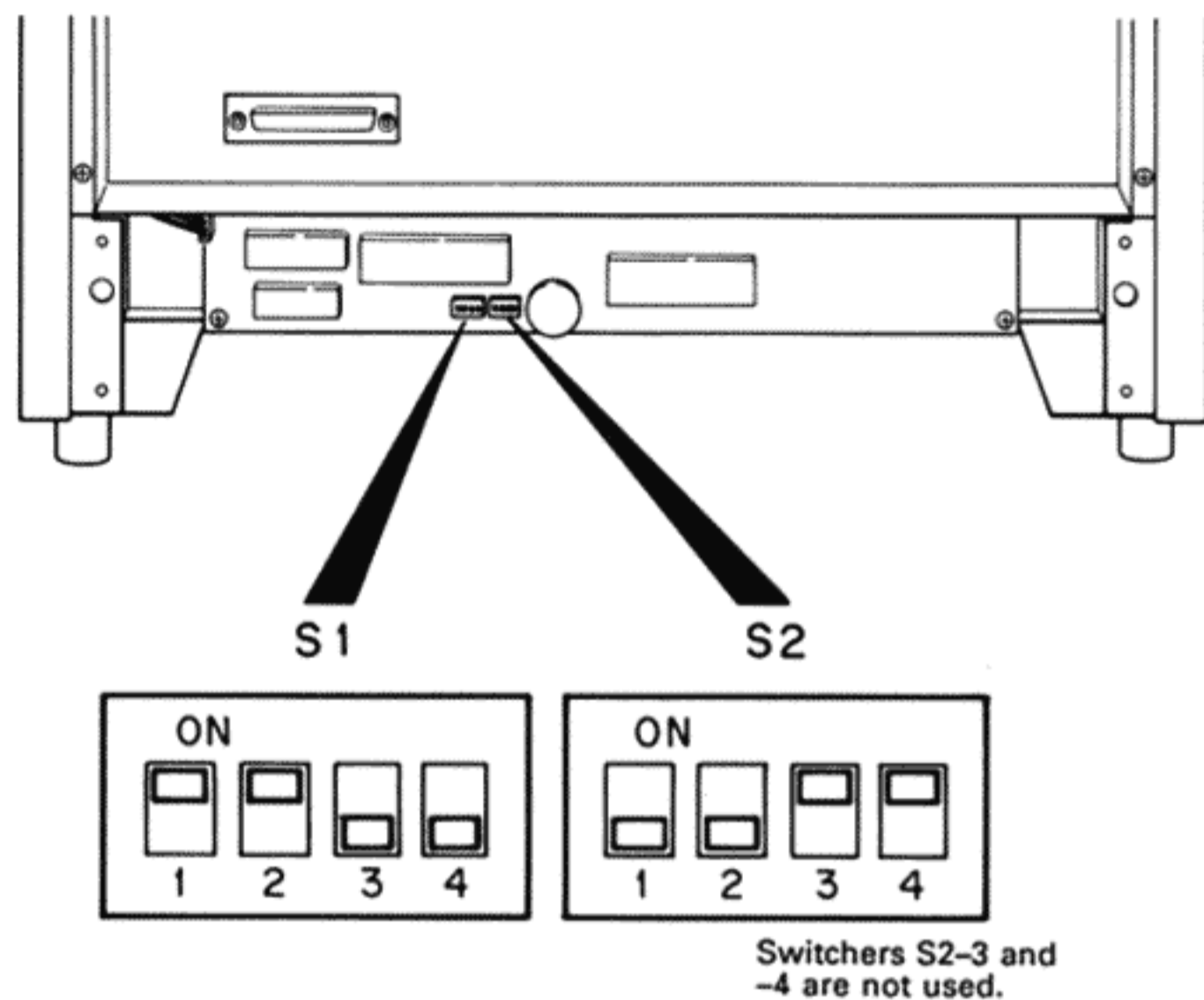


Figure 7-1. DIP-switch Locations

S1-1 : ON (Memory Back-up feature is active)

S1-2 : ON (Fader Stop function is available)

- Fader Start function can also be switched on/off. As for the procedure, see the "Features and Controls" section of this manual, item 43.

The next S1-3 switch has no effect on the NAB standard U.S.A/Canada model.

S1-3 : OFF (Gapless punch-in and spot erase are active)

Note : S1-3 is a "defeat" switch and "OFF" means the function is NOT defeated.

S1-4 : OFF (Tape speed is switchable between 7.5 inch/s (19 cm/s) and 15 inch/s (38 cm/s))

- ON position is for 3-3/4 and 7-1/2 inch/s (9.5 and 19 cm/s) tape speeds. This entails installation of some internal parts. Consult TASCAM or your nearest TASCAM dealer.

S2-1 : OFF (On-the-fly tape point capture and its storage into memory are done at once by hitting a MEMO key alone.)

- With this switch set to ON, MEMO only captures the current tape point, and, when NUMBER is subsequently pressed, that point is actually memorized.

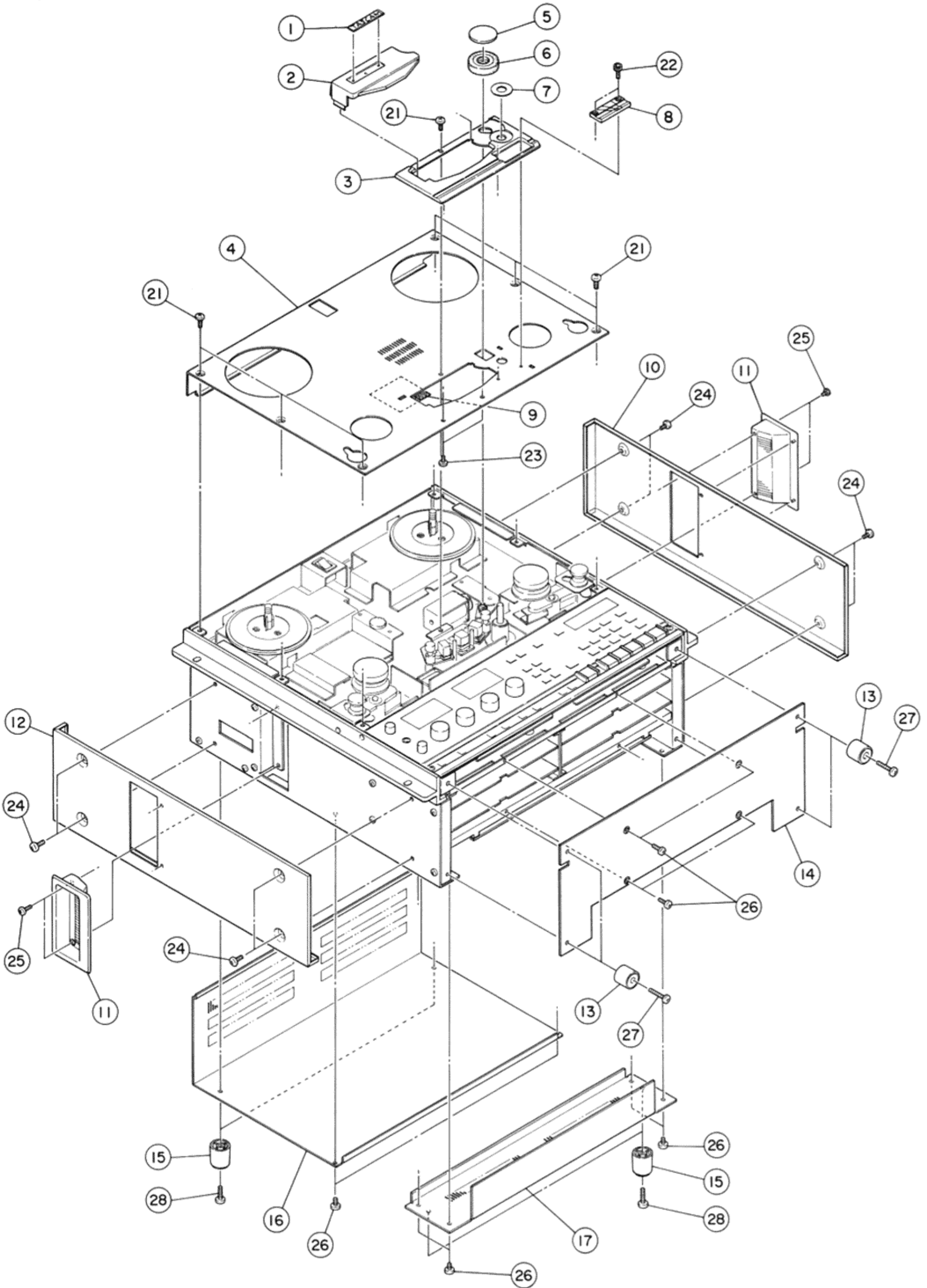
S2-2 : OFF (Monitor source : INPUT, SYNC, and REPRO, can be selected for the separate channels)

- With this switch set to ON, both channels' monitor sources are selected at once by either channel's selector switch.

8. PARTS LIST

8-1. Mechanics

Exploded View-1



EXPLODED VIEW-1

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
1- 1	*5720225800	BADGE, TASCAM	
1- 2	*5801382300	HOUSING, HEAD	
1- 3	*5801382500	BASE, HOUSING	
1- 4	*5801381500	PANEL, DRESS	
1- 5	5801377400	CAP, PINCH ROLLER	
1- 6	5801377300	ROLLER, PINCH	
1- 7	*5801382600	RING, CAPSTAN	
1- 8	*5801382700	BLOCK, SPLISING	
1- 9	*5801384000	BLIND, SP	
1-10	*5801381700	PANEL(R), SIDE	
1-11	*5801383000	HANDLE	
1-12	*5801381600	PANEL(L), SIDE	
1-13	*5801392200	FOOT(23)	
1-14	*5801387600	COVER ASSY, BOTTOM	
1-15	*5801392300	FOOT(28)	
1-16	*5801381800	COVER, TOP	
1-17	*5801381900	COVER, REAR	
1-21	*5780413006	SCREW, TRUSS M3X6(NI)	
1-22	*5781702606	BOLT, HEXAGON SKT M2.6X6(NI)	
1-23	*5783602604	SCREW, BIND P-TITE M2.6X4	
1-24	*5780424008	SCREW, TRUSS M4X8(BLK NI)	
1-25	*5780023008	SCREW, BIND M3X8(BLK NI)	
1-26	*5780023006	SCREW, BIND M3X6(BLK NI)	
1-27	*5780104012	SCREW, PAN M4X12	
1-28	*5780104020	SCREW, PAN M4X20	

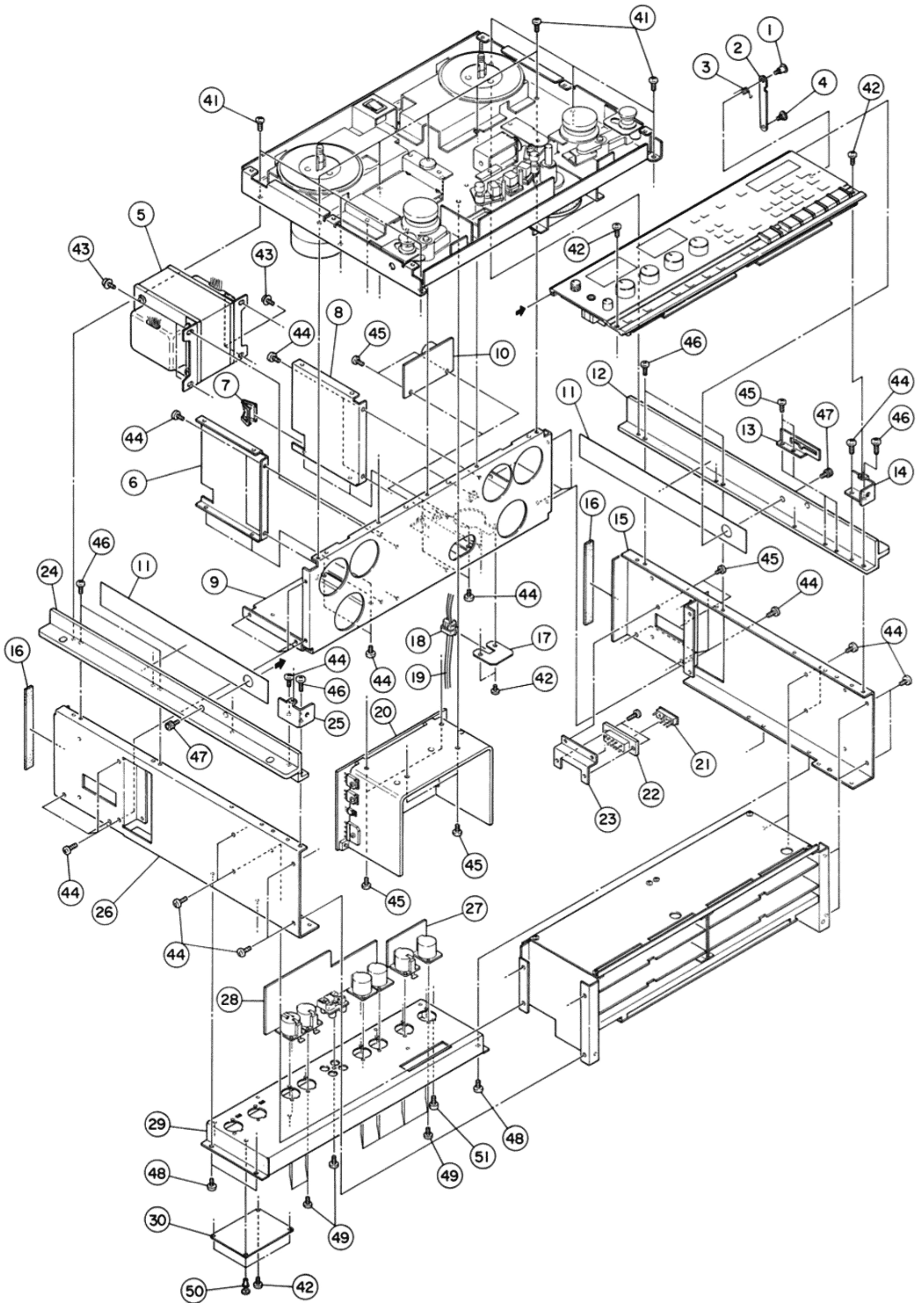
INCLUDED ACCESSORIES

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
	*5700122700	OWNER'S MANUAL [J]	
	*5700122800	OWNER'S MANUAL [EXCEPT J]	
	*5744078500	CLAMPER, REEL TZ-614	
	*5740002700	REEL, RE1004	
	*5780104030	SCREW, PAN M4X30	
	*5534659000	SPACER, CI [J]	
	*5544995000	WASHER, M5(NI) [J]	
	*5780215015	SCREW, FLAT M5X15(NI) [J]	

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Exploded View-2



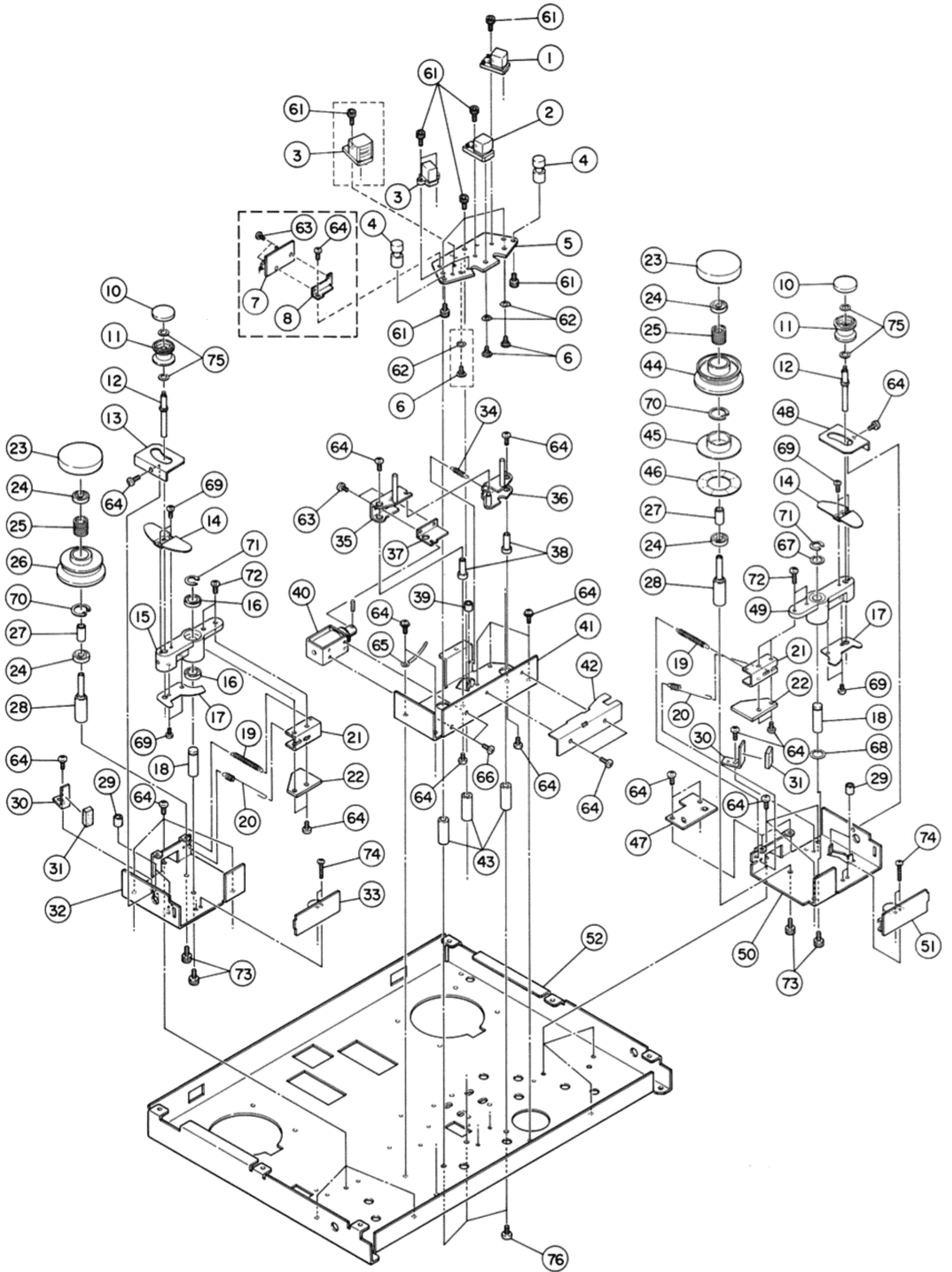
EXPLODED VIEW-2

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
2- 1	*5801367400	SCREW(J), STEP	
2- 2	*5801367100	STAY, HINGE	
2- 3	*5801367300	SPRING, HINGE	
2- 4	*5800404400	SCREW, SHOULDER(B)	
2- 5	△ 5320059100	TRANSFORMER, POWER[J]	
	△ 5320059200	TRANSFORMER, POWER[US,C]	
	△ 5320059300	TRANSFORMER, POWER[GE]	
	△ 5320059400	TRANSFORMER, POWER[E, UK, A]	
2- 6	*5801379600	PLATE(L), POWER SUPPLY REINFORCEMENT	
2- 7	*5730038500	HOLDER	
2- 8	*5801379700	PLATE(R), POWER SUPPLY REINFORCEMENT	
2- 9	*5801379500	BASE, POWER SUPPLY	
2-10	*5200309600	N FILTER PCB ASSY[J, US, C, GE]	Refer to pages 44 & 51
	*5200309700	N FILTER PCB ASSY[E, UK, A]	Refer to pages 44 & 51
2-11	*5801382100	SPACER, TRANSPORT	
2-12	*5801381100	SASH(R), SIDE	
2-13	*5801367200	GUIDE, HINGE	
2-14	*5801367000	SUPPORT(R), AMPL. PANEL	
2-15	*5801381300	CHASSIS(R), SIDE	
2-16	*5801381400	CUSHION, COVER	
2-17	*5801391600	PLATE	
2-18	△ *5317003400	BUSSING, 227I	
2-19	△ *5128027000	CORD, AC[J]	
	△ *5128047000	CORD, AC[UK]	
	△ *5350008200	CORD, AC[E]	
	△ *5350008300	CORD, AC[A]	
	△ *5350010700	CORD, AC[US, GE]	
	△ *5350012200	CODE, AC[C]	
2-20	*5200306500	PS PCB ASSY[J, US, C, GE]	Refer to pages 45 & 52
	*5200306600	PS PCB ASSY[E, UK, A]	Refer to pages 45 & 52
2-21	△ 5133014000	PLUG, VOLTAGE SELECT[GE]	
2-22	△ 5133015001	SOCKET, VOLTAGE SELECT 100-240V[GE]	
2-23	*5801391700	BRACKET, SELECTOR[GE]	
2-24	*5801381000	SASH(L), SIDE	
2-25	*5801366900	SUPPORT(L), AMPL. PANEL	
2-26	*5801381200	CHASSIS(L), SIDE	
2-27	*5200307600	TC IN/OUT PCB ASSY(-20T ONLY)	Refer to pages 48 & 54
2-28	*5200307100	IN/OUT AMPL PCB ASSY	Refer to pages 43 & 51
2-29	*5801380800	PANEL, REAR	
2-30	*5801380900	PLATE, BLIND	
2-41	*5780104008	SCREW, PAN M4X8	
2-42	*5780023006	SCREW, BIND M3X6(BLK NI)	
2-43	*5780144010	SCREW, PAN SEMS-B M4X10	
2-44	*5780104008	SCREW, PAN M4X8	
2-45	*5780003006	SCREW, BIND M3X6	
2-46	*5780104012	SCREW, PAN M4X12	
2-47	*5781703006	BOLT, HEXAGON SKT M3X6(NI)	
2-48	*5780023008	SCREW, BIND M3X8(BLK NI)	
2-49	*5783543008	SCREW, BIND P-TITE M3X8(BLK NI)	
2-50	*5786610200	RIVET, PUSH RP-3045-NB	
2-51	*5783613008	SCREW, B.CT M3X8(BLK NI)	

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Exploded View-3



EXPLODED VIEW-3

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
3- 1	5801386500	HEAD ASSY(NAB),R/P(-20N)	
	5801386600	HEAD ASSY(DIN),R/P(-20D)	
	5378302300	HEAD ASSY(NAB),R/P(-20T)	
3- 2	5801386500	HEAD ASSY(NAB),R/P(-20N)	
	5801386600	HEAD ASSY(DIN),R/P(-20D)	
	5378309200	HEAD ASSY,R/P(-20T)	
3- 3	5801386100	HEAD ASSY(NAB),ERASE(-20N)	
	5801386200	HEAD ASSY(DIN),ERASE(-20D)	
	5378309300	HEAD ASSY,ERASE(-20T)	
3- 4	5801375600	GUIDE,TAPE	
3- 5	*5801375300	BASE,HEAD	
3- 6	*5800348701	SCREW,HEAD	
3- 7	*5200310600	SPEAKER SW PCB ASSY[-20N(J,US,C),-20T(J)]	Refer to pages 47 & 54
3- 8	*5801396600	BRACKET,SP SW[-20N(J,US,C),-20T(J)]	
3- 9	Vacant		
3-10	5801382200	CAP,TENSION	
3-11	5801372800	ROLLER ASSY,TENSION	
3-12	*5801372500	SHAFT ASSY,TENSION	
3-13	*5801373200	BLIND(L),TENSION	
3-14	*5801372400	FLAG,TENSION	
3-15	*5801371900	ARM,TENSION	
3-16	1603068000	BEARING,NSK688ZZS	
3-17	*5801372300	SHUTTER	
3-18	*5801373100	SHAFT,TENSION ARM	
3-19	*5801382900	SPRING,TENSION ARM	
3-20	*5801382800	SPRING,TENSION	
3-21	*5801372100	PLATE,SPRING	
3-22	*5801372200	WEIGHT,COUNTER	
3-23	*5801373700	CAP,ROLLER	
3-24	5730038800	BEARING,NSK625ZZMC3EPS2	
3-25	*5801374100	SPRING,ROLLER	
3-26	5801373600	ROLLER	
3-27	*5801374000	SLEEVE,BEARING	
3-28	*5801373400	SHAFT,ROLLER	
3-29	*5534850000	CUSHION,STOPPER	
3-30	*5801374200	BRACKET,DAMPER	
3-31	*5801386000	SPONGE,DAMPER	
3-32	*5801371600	BASE(L),TA	
3-33	*5200308200	SENSOR L PCB ASSY	Refer to pages 47 & 53
3-34	*5801375200	SPRING,LIFTER RETURN	
3-35	*5801374400	ARM(L) ASSY,LIFTER	
3-36	*5801374800	ARM(R) ASSY,LIFTER	
3-37	*5801374700	ARM,ACTUATING	
3-38	*5801375100	SHAFT,LIFTER	
3-39	*5027569000	CUSHION	
3-40	5313004700	SOLENOID,LIFTER	
3-41	*5801374300	BASE,LIFTER	
3-42	*5801375500	PLATE(2),SHEILD	
3-43	*5801369100	STAY,HEAD BASE	
3-44	5801373500	ROLLER,F	
3-45	*5801373800	SUPPORT,DISK	
3-46	*5801373900	DISK,TG	
3-47	*5200308400	PG PCB ASSY	Refer to pages 47 & 53
3-48	*5801373300	BLIND(R),TENSION	
3-49	*5801371800	ARM ASSY,TENSION	

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EXPLODED VIEW-4

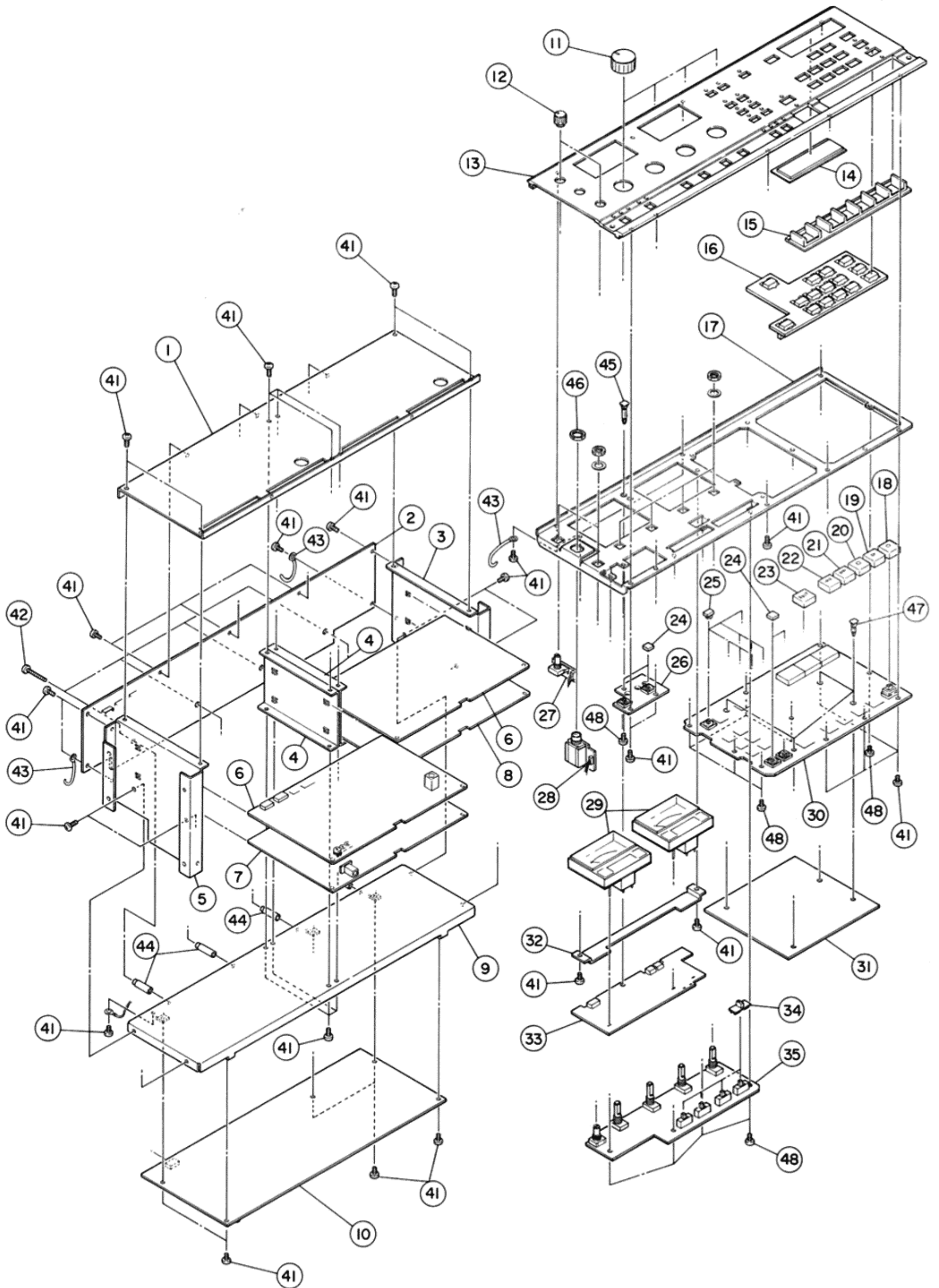
REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
4- 1	5801371500	SHEET, REEL	
4- 2	*5801383900	TAPE, REEL SHEET ADHESIVE	
4- 3	5801370900	TABLE ASSY, REEL	
4- 4	*5801391300	BASE ASSY(L), BRAKE	
4- 5	*5801370400	HOOK, SPRING	
4- 6	5313004500	SOLENOID, BRAKE	
4- 7	*5730038900	O-RING, P5	
4- 8	*5801370500	SPRING, BRAKE	
4- 9	5801369600	BAND ASSY(L), BRAKE	
4-10	5801370800	DRAM, BRAKE	
4-11	5370008400	MOTOR, REEL DC	
4-12	*5302109500	SW, SEESAW JW-MIIRKK	
4-13	△ 5267703800	C., SPARK KILL. 4700PF 400V M	
4-14	*5730007500	COVER, CAPASITOR SB-1417	
4-15	*5801379400	BRACKET, POWER SW	
4-16	*5801391400	BASE ASSY(R), BRAKE	
4-17	5801369700	BAND ASSY(R), BRAKE	
4-18	*5801376900	TRAY ASSY, ROLLER ARM	
4-19	*5801376800	SUPPORT, PLATE SPRING	
4-20	*5801376700	PLATE SPRING, PINCH ROLLER	
4-21	*5801376200	ARM ASSY, PINCH ROLLER	
4-22	*5801376600	PLATE, PINCH ROLLER OPERATING	
4-23	*5801376100	PIN, SOLENOID	
4-24	5313004600	SOLENOID, PINCH ROLLER	
4-25	*5801377500	SPRING, PINCH ROLLER RETURN	
4-26	*5801376000	BRACKET, SOLENOID	
4-27	*5534850000	CUSHION, STOPPER	
4-28	*5801375800	BASE, PINCH ROLLER	
4-29	*5801378600	SEAL, OIL	
4-30	*5801377800	HOLDER ASSY, METAL	
4-31	*5801377600	BASE, CAPSTAN BASE	
4-32	*5200310800	TRANSISTOR PCB ASSY	Refer to pages 47 & 53
4-33	*5801378200	FLYWHEEL ASSY	
4-34	5801379000	BELT, CAPSTAN	
4-35	*5801378900	PULLEY, MOTOR	
4-36	*5544003000	SCREW, BEARING	
4-37	*5555703000	WASHER, THRUST	
4-38	*5801378800	BRACKET, CAPSTAN MOTOR	
4-39	5370009600	MOTOR, CAPSTN	
4-40	*5200308100	CAPSTAN SERVO PCB ASSY	Refer to pages 44 & 51
4-41	*5801369000	BASE, TRANSPORT	
4-42	*5801369300	CUSHION, PANEL	
4-43	*5801369200	SUPPORT, PANEL	
4-44	*5200308500	JOINT PCB ASSY	Refer to pages 47 & 53
4-45	*5801396500	SPONGE, SP[-20N(J, US, C), -20T(J)]	
4-46	*5801396300	BRACKET(A), SPEAKER[-20N(J, US, C), -20T(J)]	
4-47	*15990670	SPEAKER, EAS-5P108[-20N(J, US, C), -20T(J)]	
4-48	*5730039100	O-RING, P18[-20N(J, US, C), -20T(J)]	
4-49	*5801396400	BRACKET(B), SPEAKER[-20N(J, US, C), -20T(J)]	
4-51	*5781724008	BOLTS, H. SKT BUTTON M4X8	
4-52	*5780143006	SCREW, PAN SEMS-B M3X6	
4-53	*5780143008	SCREW, PAN SEMS-B M3X8	
4-54	*5786004000	E-RING, E-4	
4-55	Vacant		

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Exploded View-5



EXPLODED VIEW-5

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
5- 1	*5801380300	CHASSIS(F),AMPRIFIER	
5- 2	*5200307200	MOTHER PCB ASSY	Refer to pages 38 & 49
	*5200307210	MOTHER PCB ASSY(-20T ONLY)	Refer to pages 38 & 49
5- 3	*5801380200	CHASSIS(R),AMPLIFIER	
5- 4	*5801380600	CHASSIS,PCB GUIDE	
5- 5	*5801380100	CHASSIS(L),AMPLIFIER	
5- 6	*5200306900	R/P AMPL PCB ASSY	Refer to pages 41 & 50
	*5200306910	R/P AMPL PCB ASSY(GAPLES)	Refer to pages 41 & 50
	*5200306920	R/P AMPL PCB ASSY(-20T ONLY)	Refer to pages 41 & 50
5- 7	*5200307300	AMP CONT PCB ASSY(GAPLES)	Refer to pages 42 & 51
	*5200307310	AMP CONT PCB ASSY	Refer to pages 42 & 51
5- 8	*5200307000	TC AMPL PCB ASSY(-20T ONLY)	Refer to pages 48 & 54
5- 9	*5801380400	CHASSIS(C),AMPRIFIER	
5-10	*5200308000	CONTROL PCB ASSY	Refer to pages 38 & 49
5-11	5801367800	KNOB(B)ASSY,VR	
5-12	5801367500	KNOB(A)ASSY,VR	
5-13	*5801366000	PANEL,AMPLIFIER	
	*5801366100	PANEL,AMPLIFIER(-20T)	
5-14	*5801366200	LENS,COUNTER	
5-15	*5801366400	ESCUTCHEON,BUTTON	
5-16	5801366300	BUTTON,OPERATION	
5-17	*5801366500	CHASSIS,AMPL. FRONT	
5-18	5801368800	BUTTON(C),REC	
5-19	5801368700	BUTTON(C),PLAY	
5-20	5801368600	BUTTON(C),STOP	
5-21	5801368500	BUTTON(C),F.FWD	
5-22	5801368400	BUTTON(C),REW	
5-23	5801368300	BUTTON(C),EDIT	
5-24	5801368200	BUTTON(B)	
5-25	5801368100	BUTTON(A)	
5-26	*5200308800	SPEED SW PCB ASSY	Refer to pages 46 & 53
5-27	*5200308900	PHONE VR PCB ASSY	Refer to pages 47 & 53
5-28	*5200307900	JACK PCB ASSY	Refer to pages 47 & 53
5-29	5296007100	METER,VU	
5-30	*5200308700	OPERATION KEY PCB ASSY	Refer to pages 39 & 50
	*5200308710	OPERATION KEY PCB ASSY(-20T ONLY)	Refer to pages 39 & 50
5-31	*5200308600	OPERATION CPU PCB ASSY	Refer to pages 40 & 50
5-32	*5801366600	SUPPORT,METER	
5-33	*5200307400	PHONE AMPL PCB ASSY	Refer to pages 46 & 52
	*5200307410	PHONE AMPL PCB ASSY(-20T ONLY)	Refer to pages 46 & 52
5-34	5801368900	KNOB,SLIDE	
5-35	*5200307500	VR PCB ASSY	Refer to pages 46 & 52
5-41	*5780003006	SCREW,BIND M3X6	
5-42	*5780103025	SCREW,PAN M3X25	
5-43	*5786713400	CLIP,HARNESS 3.2X6.0X47	
5-44	*5730038400	BUSH,SNAP COLLAR	
5-45	*5787008600	SUPPORT,PCB RSPLS-16L	
5-46	*5317003300	NUT	
5-47	*5787008300	SUPPORT,PCB RSPLS-10L	
5-48	*5780003004	SCREW,BIND M3X4	

Parts marked with *require longer delivery time.

(Continued from page 33)

EXPLODED VIEW-3

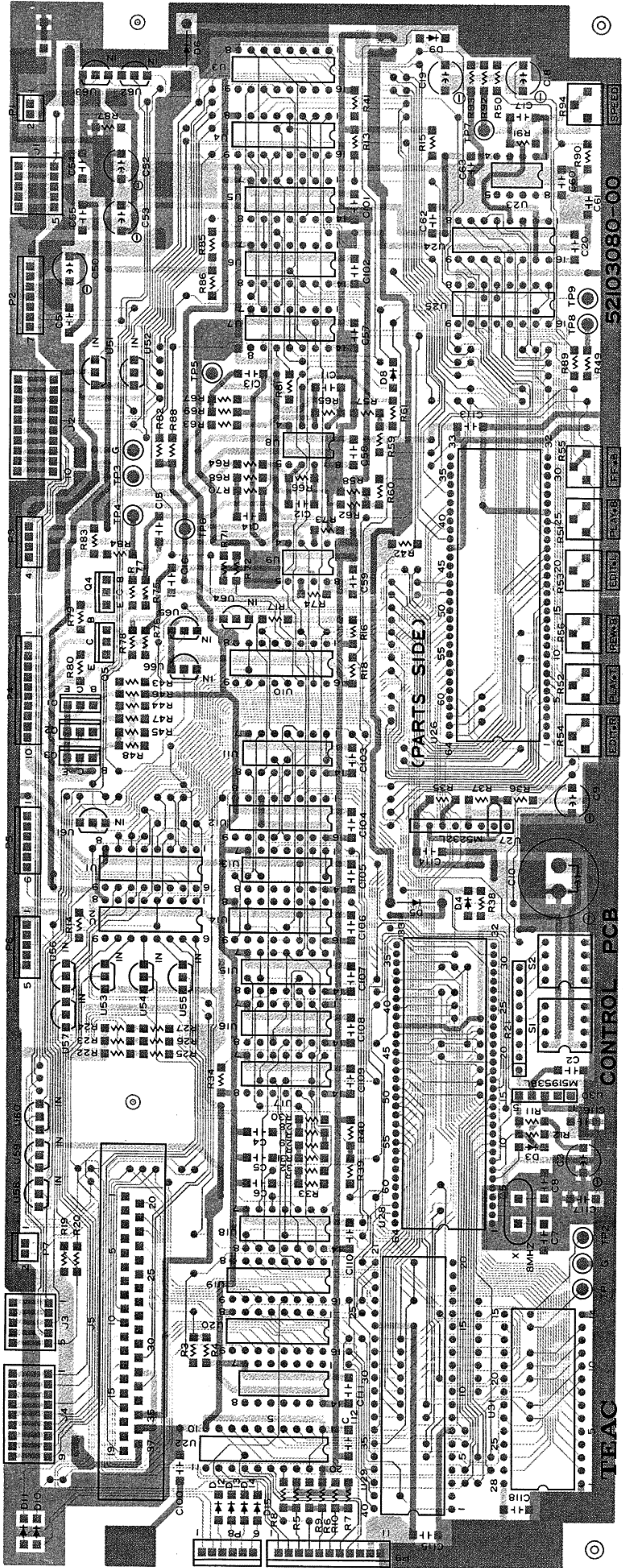
REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
3-50	*5801371700	BASE(R),TA	Refer to pages 47 & 53
3-51	*5200308300	SENSOR R PCB ASSY	
3-52	*5801369000	BASE,TRANSPORT	
3-61	*5781703008	BOLT,HEXAGON SKT M3X8(NI)	
3-62	*5785150400	WASHER,WAVE WW-04	
3-63	*5780002604	SCREW,BIND M2.6X4[-20N(J,US,C),-20T(J)]	
3-64	*5780003006	SCREW,BIND M3X6[-20N(J,US,C),-20T(J)]	
3-65	*5786713400	CLIP,HARNESS	
3-66	*5780003004	SCREW,BIND M3X4	
3-67	*5785318000	WASHER,POLYS. 8X12X0.5T	
3-68	*5785308000	WASHER,POLYS. 8X12X0.25T	
3-69	*5780002004	SCREW,BIND M2X4	
3-70	*5786151600	RING,R IRTW-16	
3-71	*5786160800	RING,S ISTW-8	
3-72	*5780003010	SCREW,BIND M3X10	
3-73	*5781774008	BOLT,HEX M4X8	
3-74	*5780002018	SCREW,BIND M2X18	
3-75	*5785304100	WASHER,POLYS. 4.1X6.5X0.25T	
3-76	*5780104008	SCREW,PAN M4X8	

(Continued from page 35)

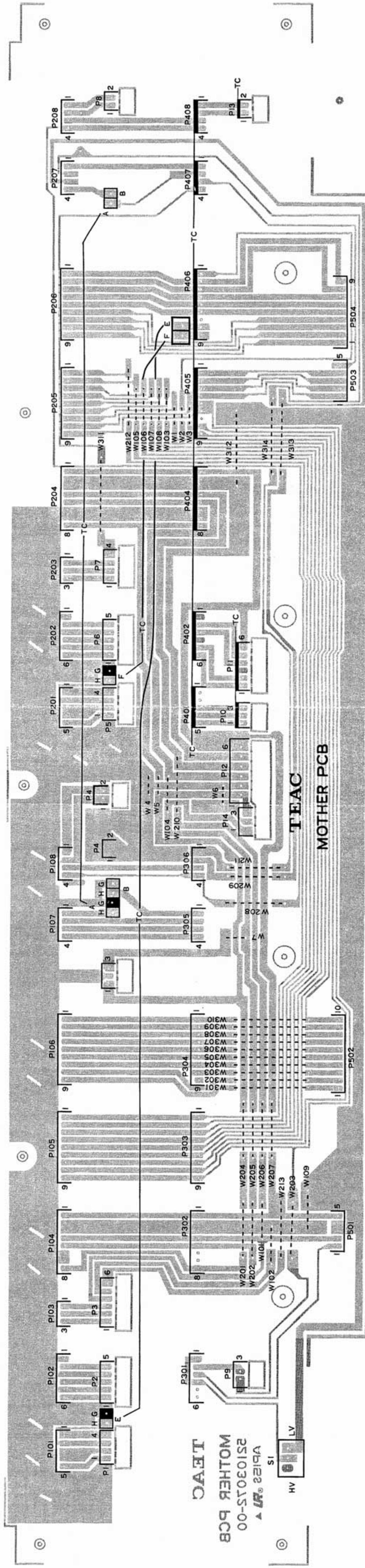
EXPLODED VIEW-4

REF.NO.	PARTS NO.	DESCRIPTION	REMARKS
4-56	*5780104012	SCREW,PAN M4X12	
4-57	*5780003006	SCREW,BIND M3X6	
4-58	*5786003000	E-RING,E-3	
4-59	Vacant		
4-60	*5781774008	BOLT,HEX. SKT M4X8	
4-61	*5780003008	SCREW,BIND M3X8	
4-62	*5787008400	SUPPORT,PCB RSPLS-12L	
4-63	*5780003004	SCREW,BIND M3X4	
4-64	*5781826000	NUT,M6	
4-65	*5785308000	WASHER,POLYS. 8X12X0.25T	

Control PCB Ass'y



Mother PCB Ass'y



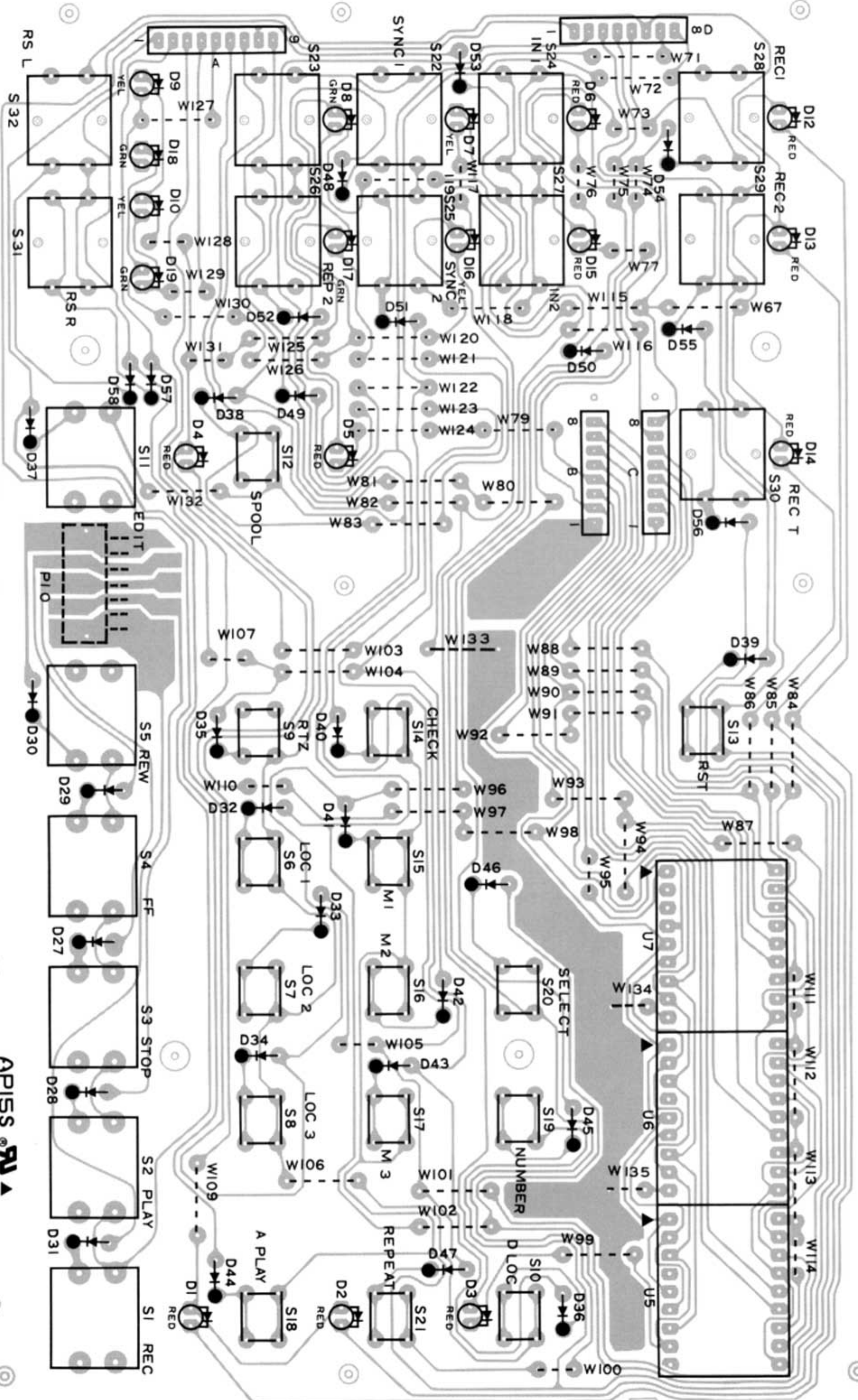
TEAC
 2510301S-00
 MOTHER PCB
 VPI&E
 00-2510301S-00

Operation Key PCB Ass'y

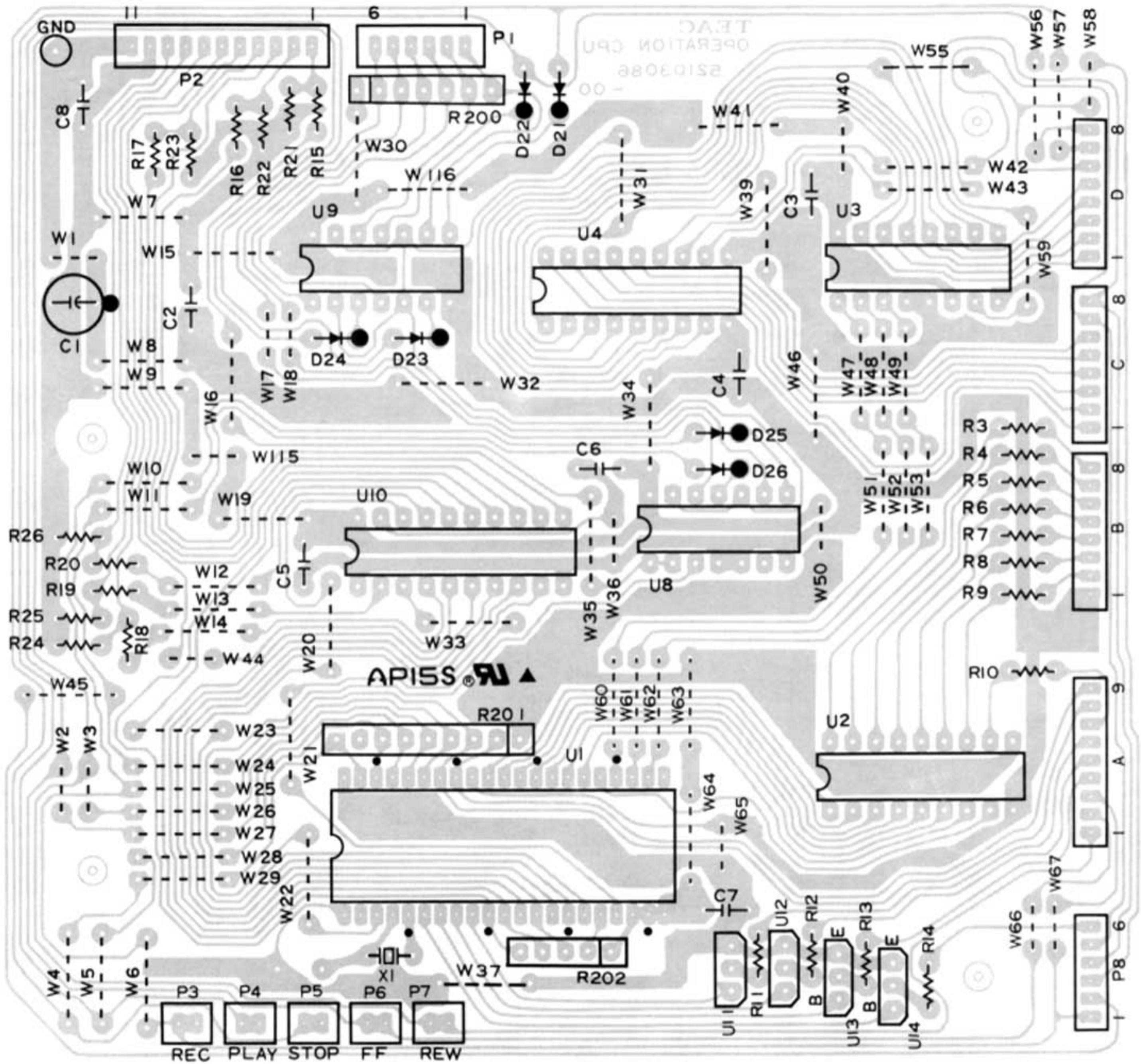
00-780301S2 B3P YAK HOITAP390

CAETT

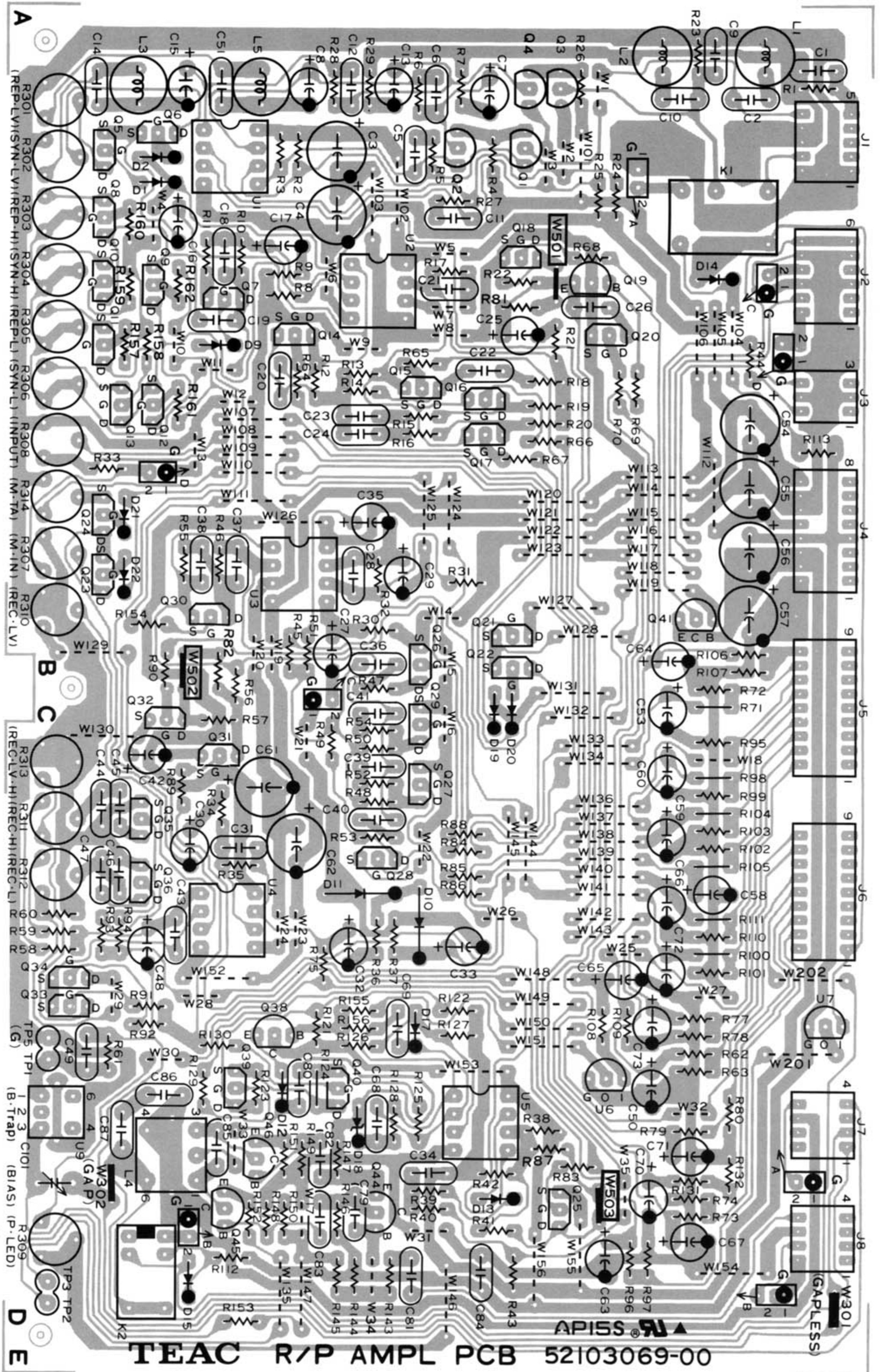
APISS 



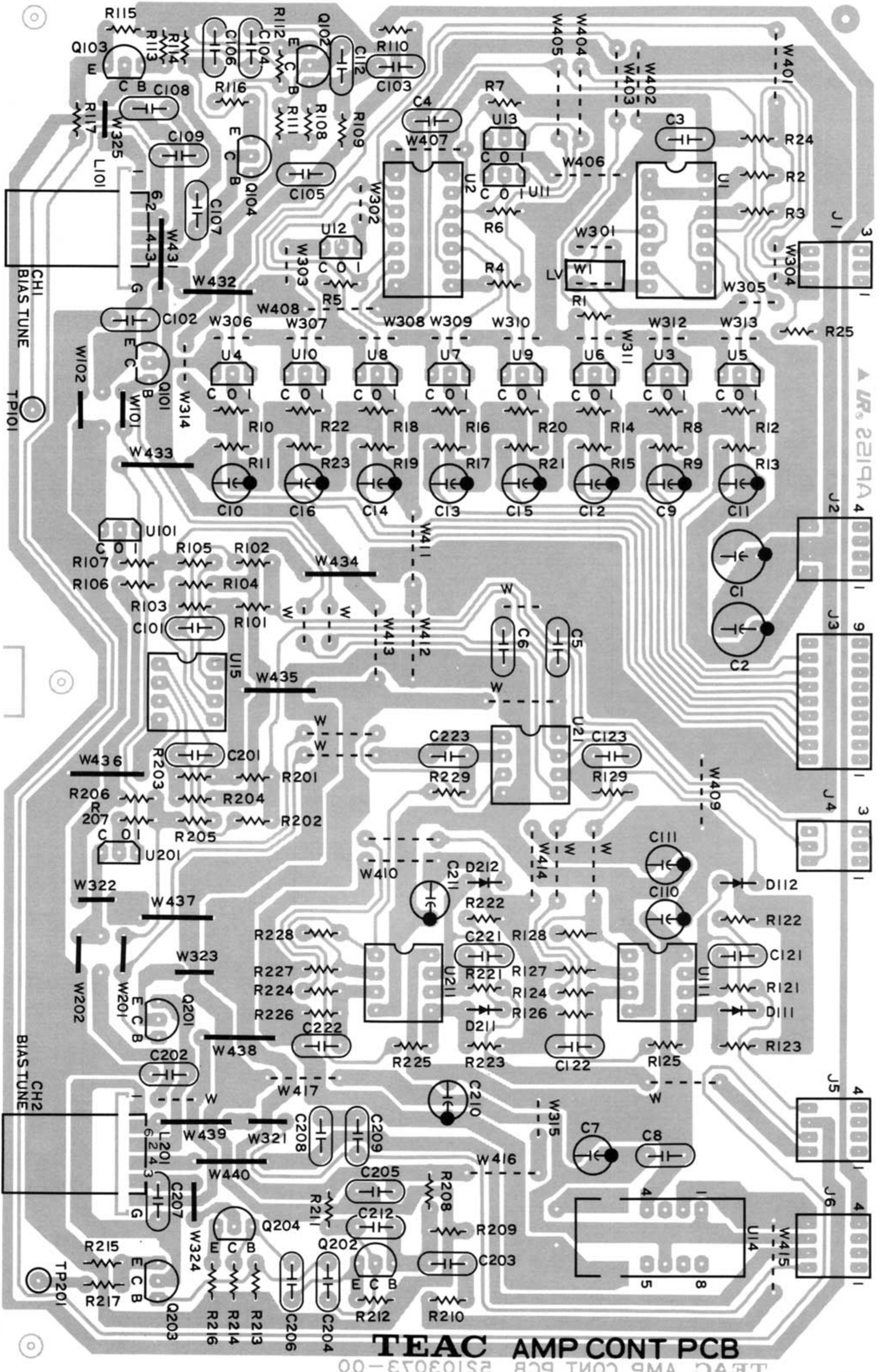
Operation CPU PCB Ass'y



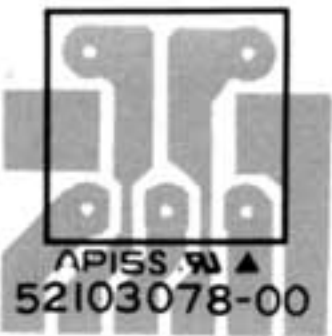
R/P AMPL PCB Ass'y



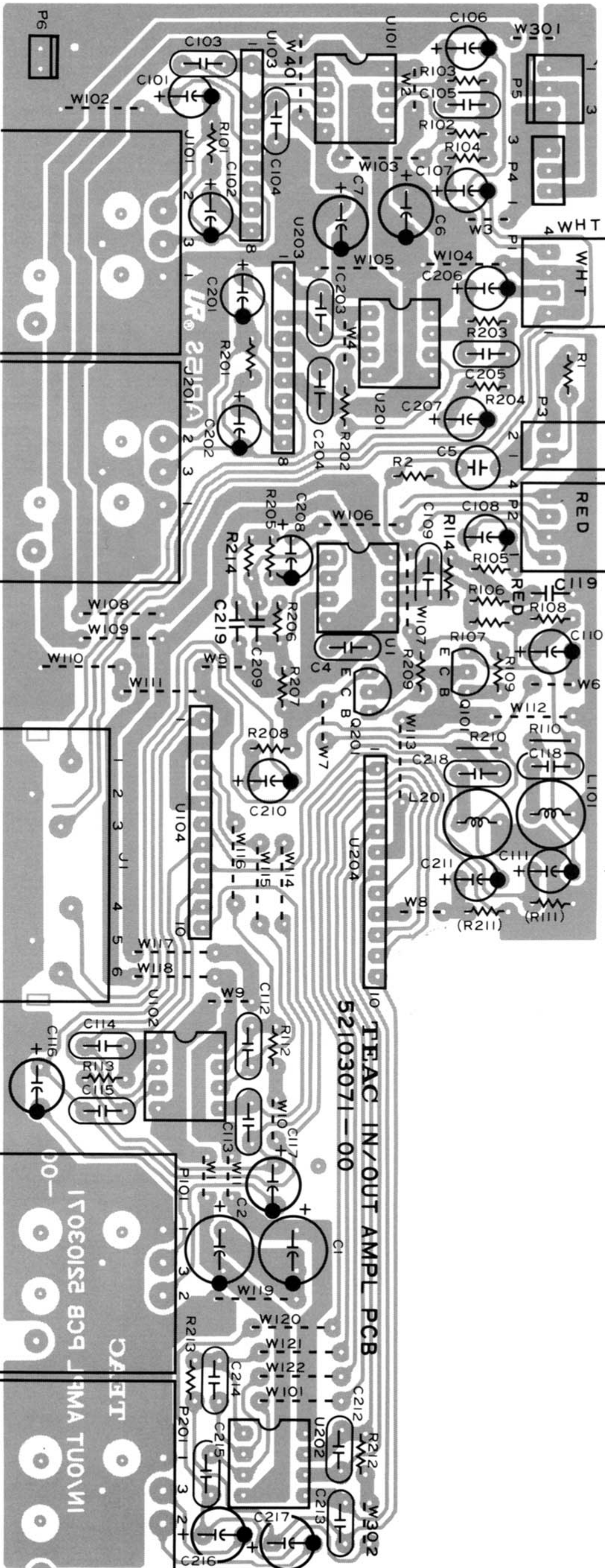
AMP CONT PCB Ass'y



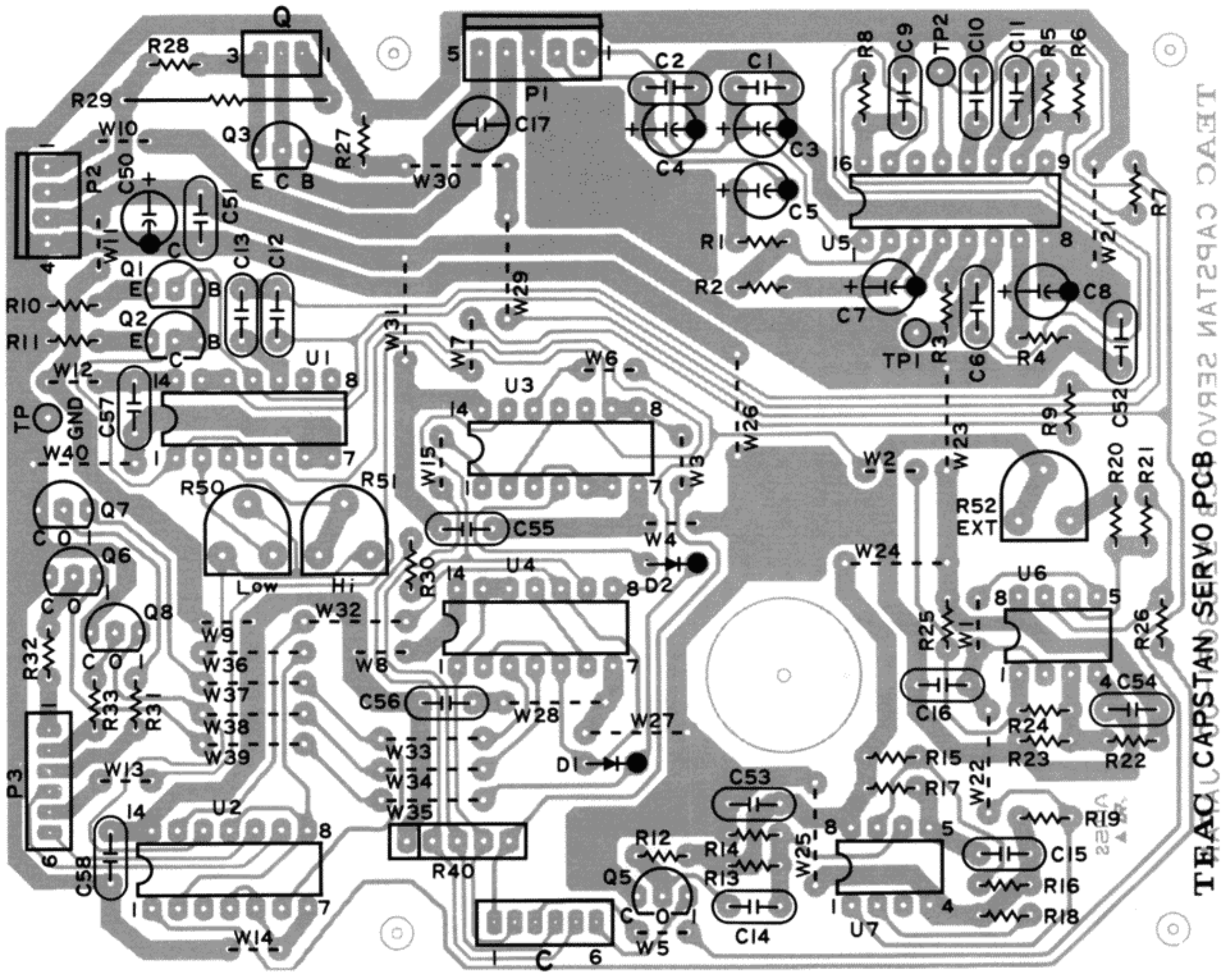
Coil PCB



IN/OUT AMPL PCB Ass'y

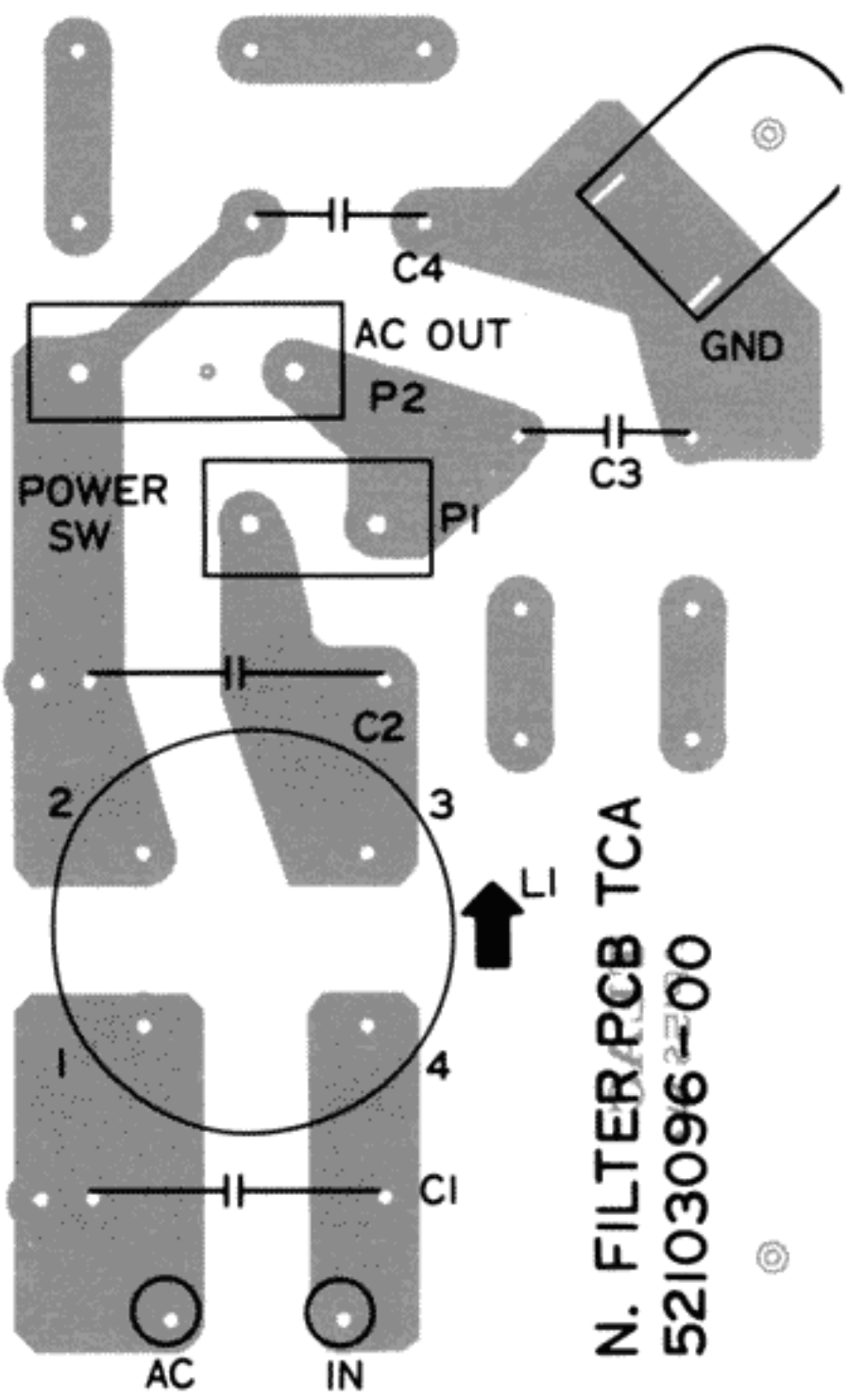


Capstan Servo PCB Ass'y



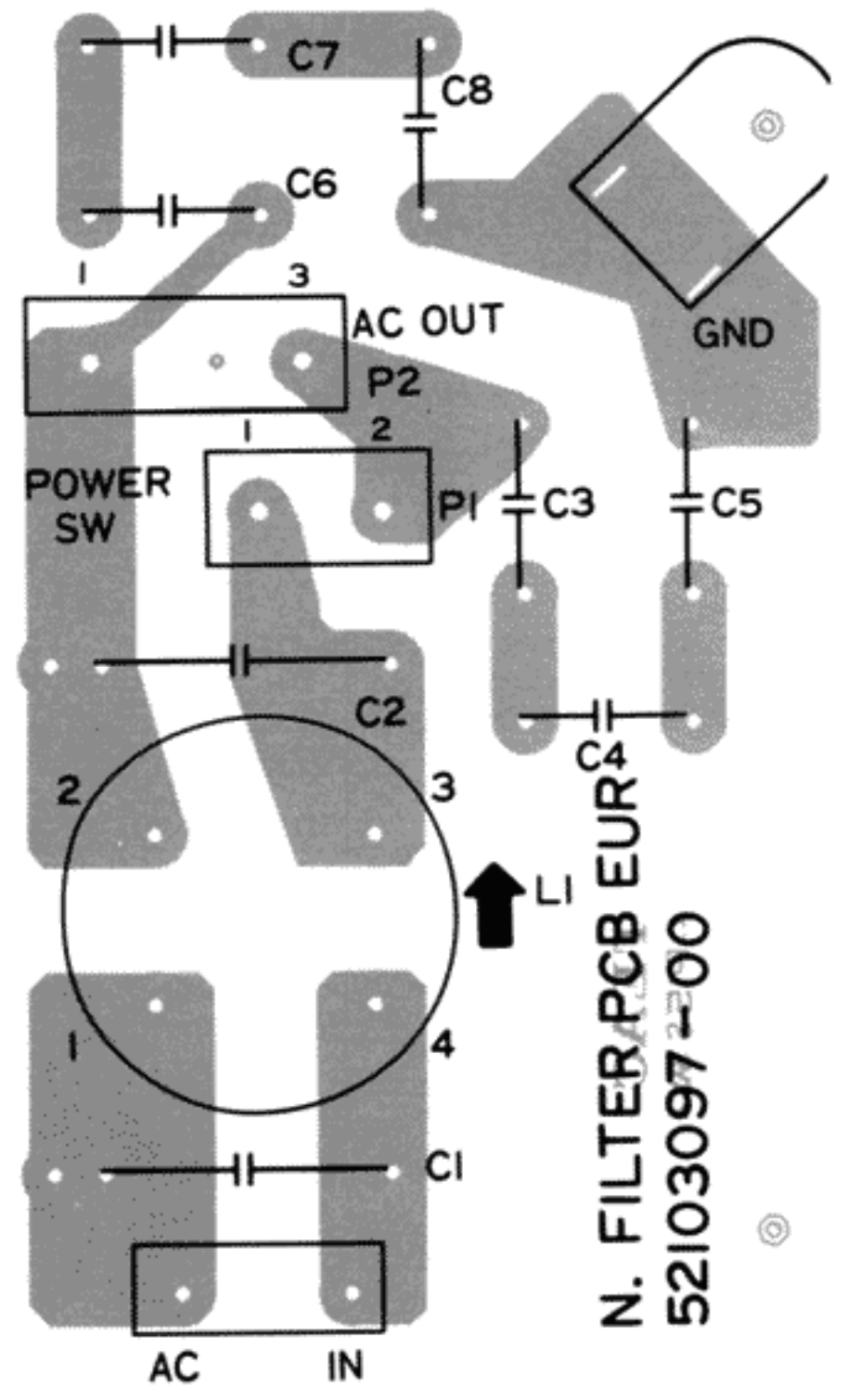
TEAC CAPSTAN SERVO PCB 0VR32 MAT2PAC 0AET

N Filter PCB Ass'y (J, US, C, GE)



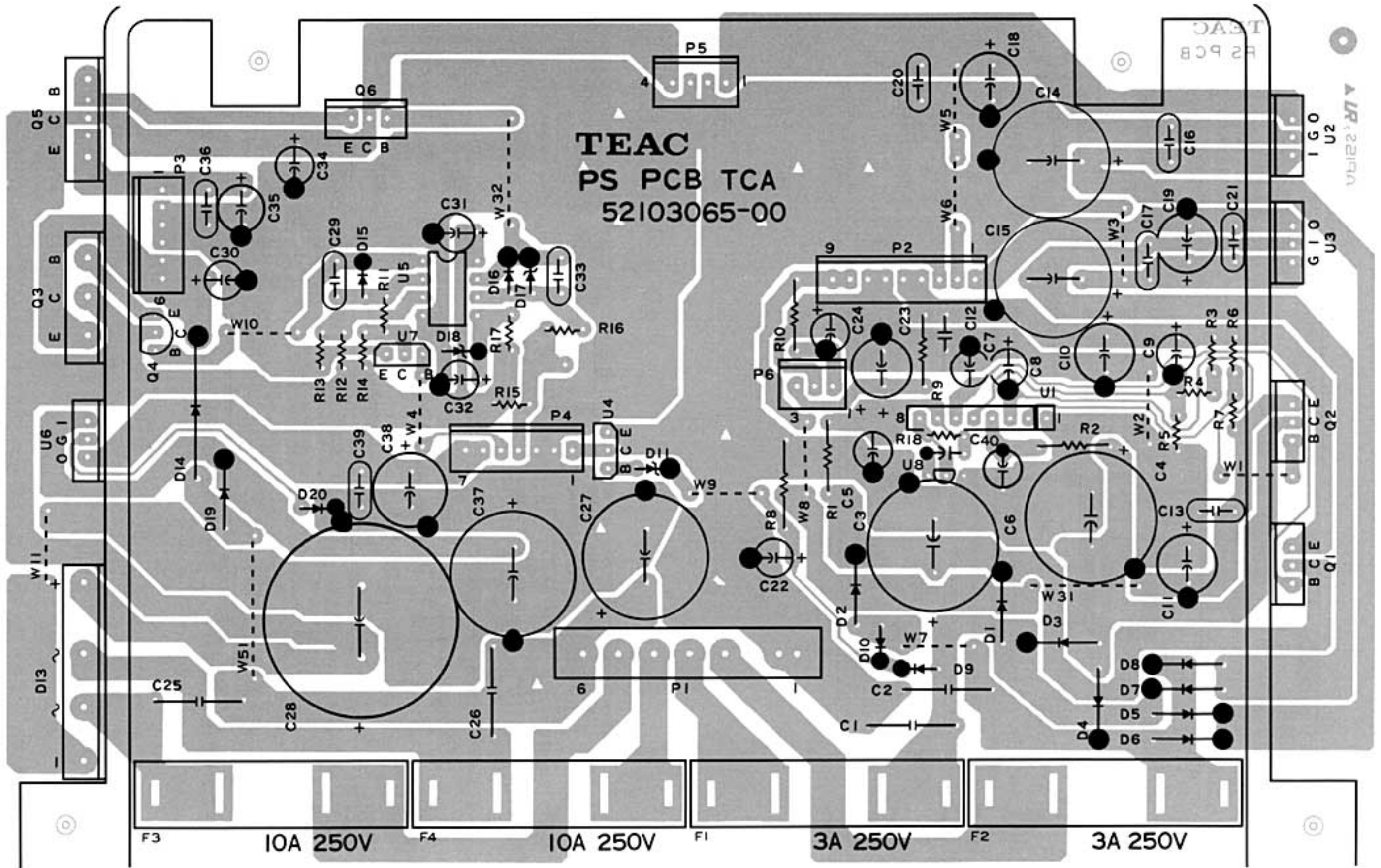
N. FILTER PCB TCA
52103096-00

(E, UK, A)

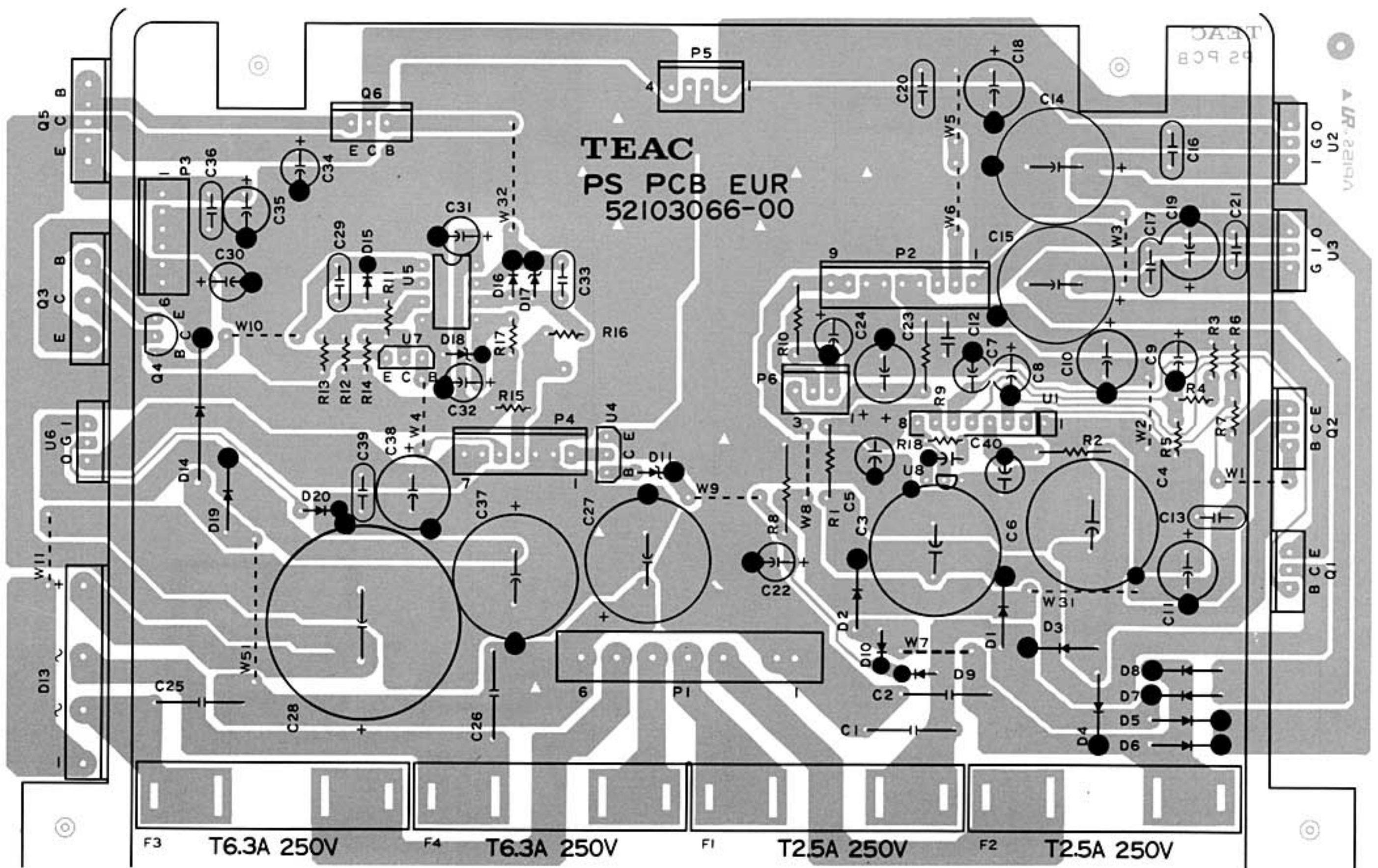


N. FILTER PCB EUR
52103097-00

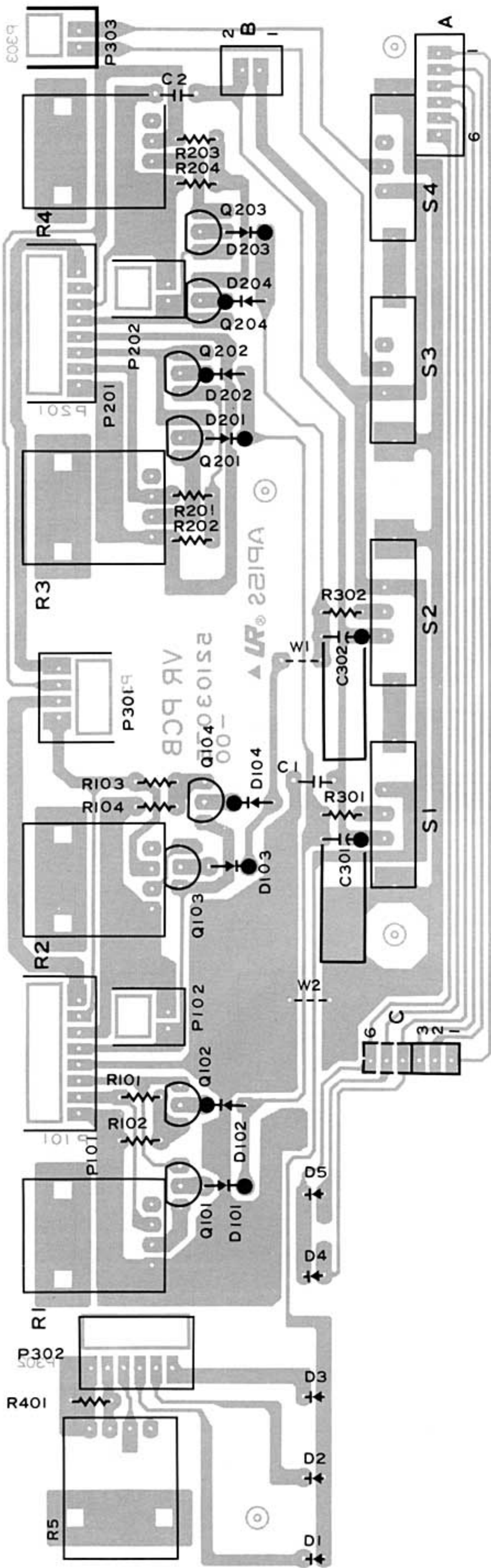
PS PCB Ass'y (J, US, C, GE)



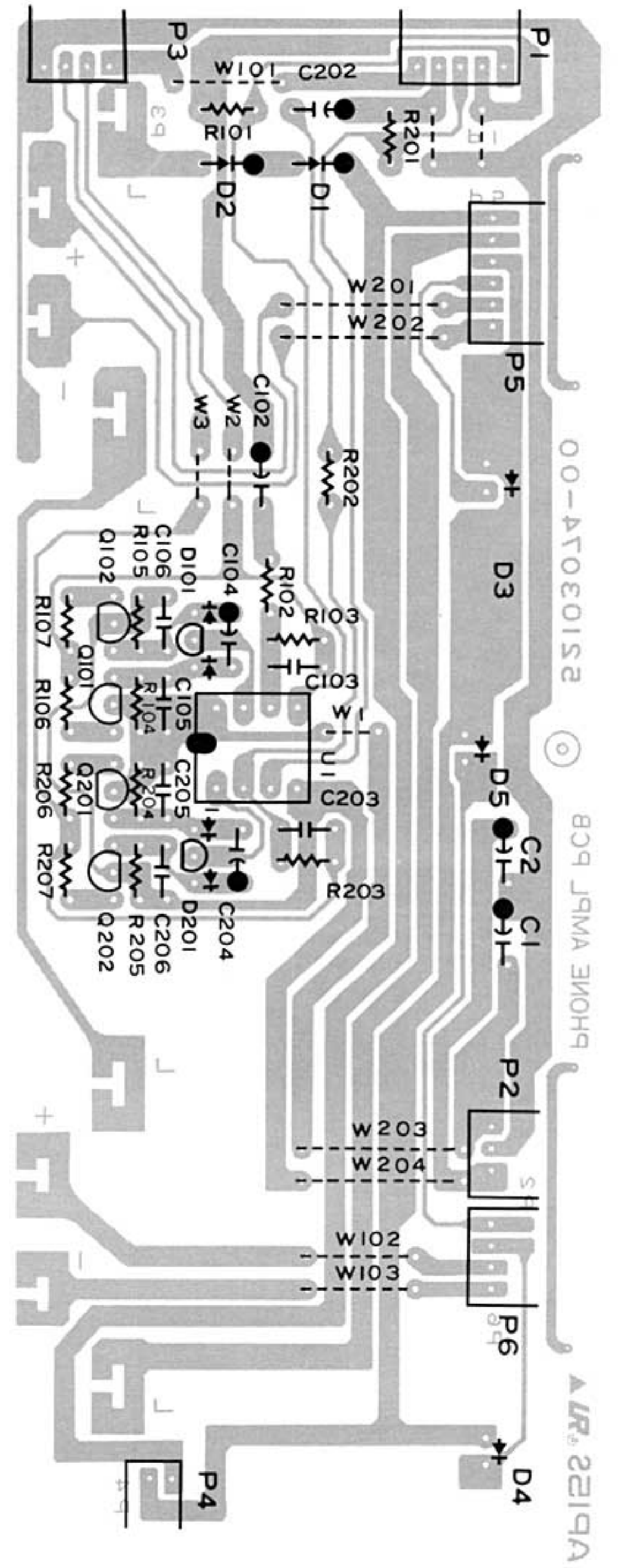
(E, UK, A)



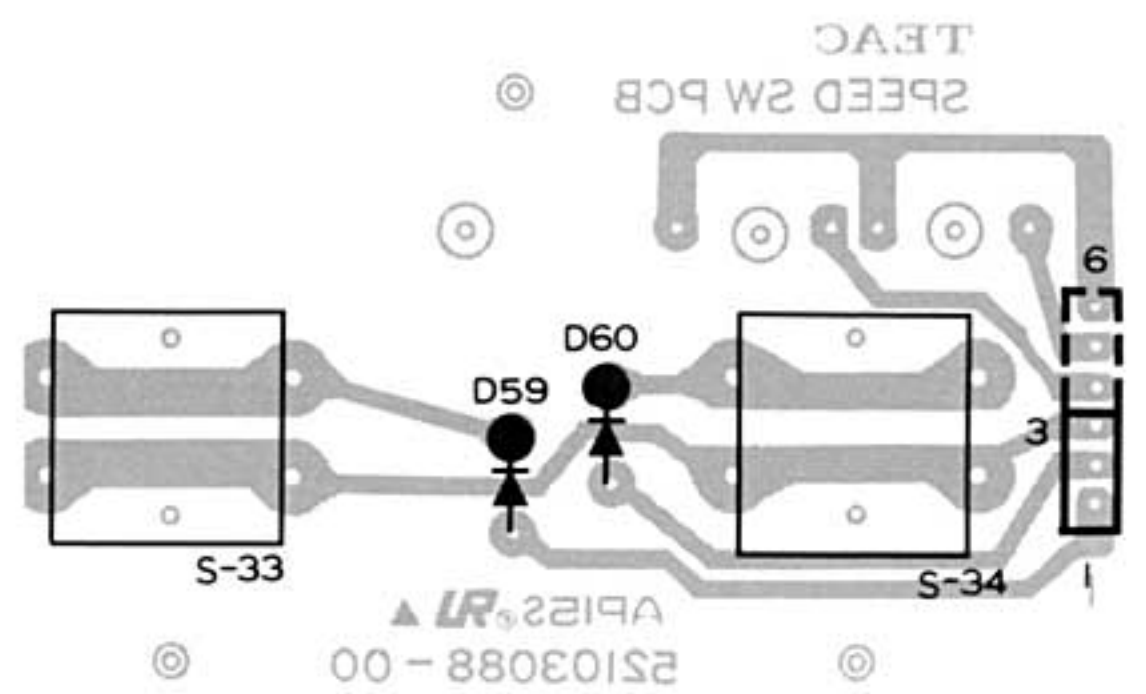
VR PCB Ass'y



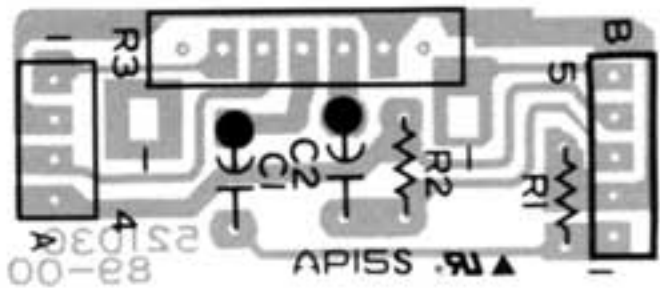
Phone AMPL PCB Ass'y



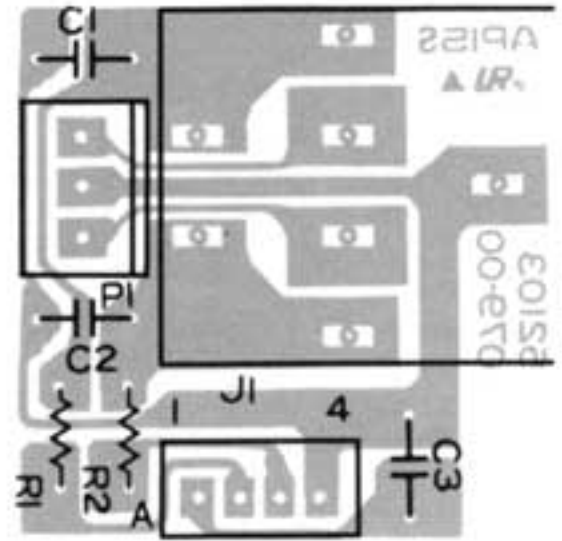
Speed SW PCB Ass'y



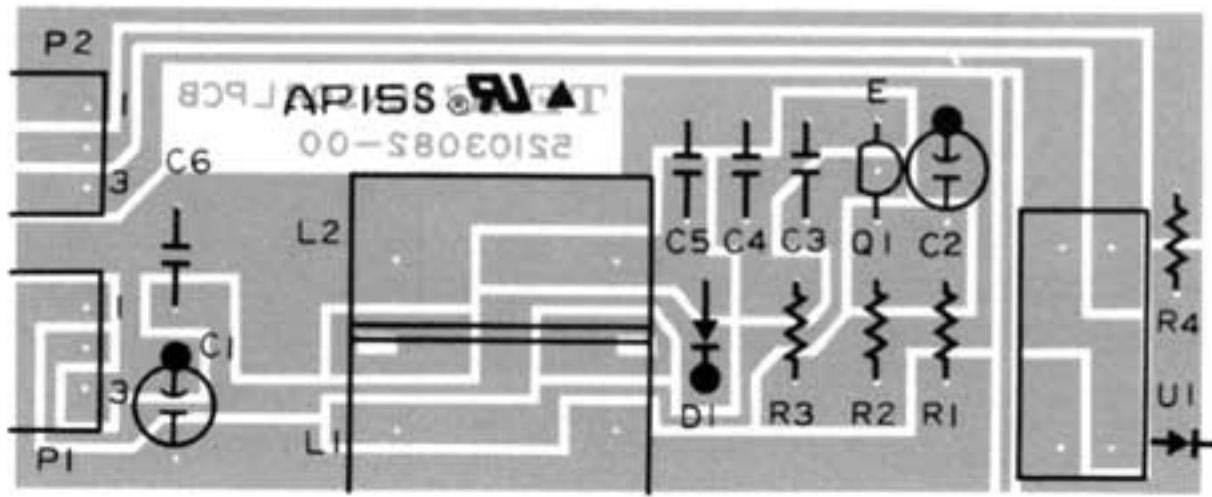
Phone VR PCB Ass'y



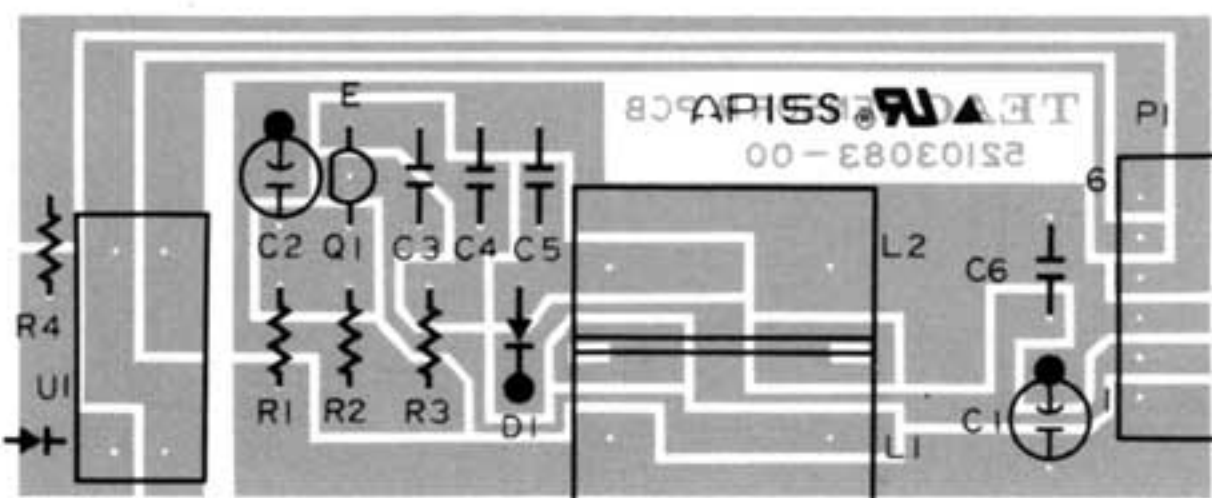
Jack PCB Ass'y



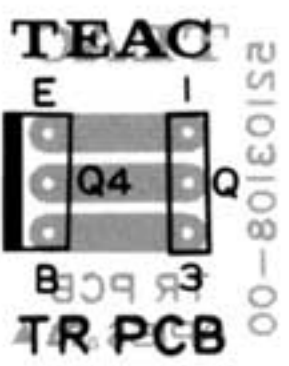
Sensor L PCB Ass'y



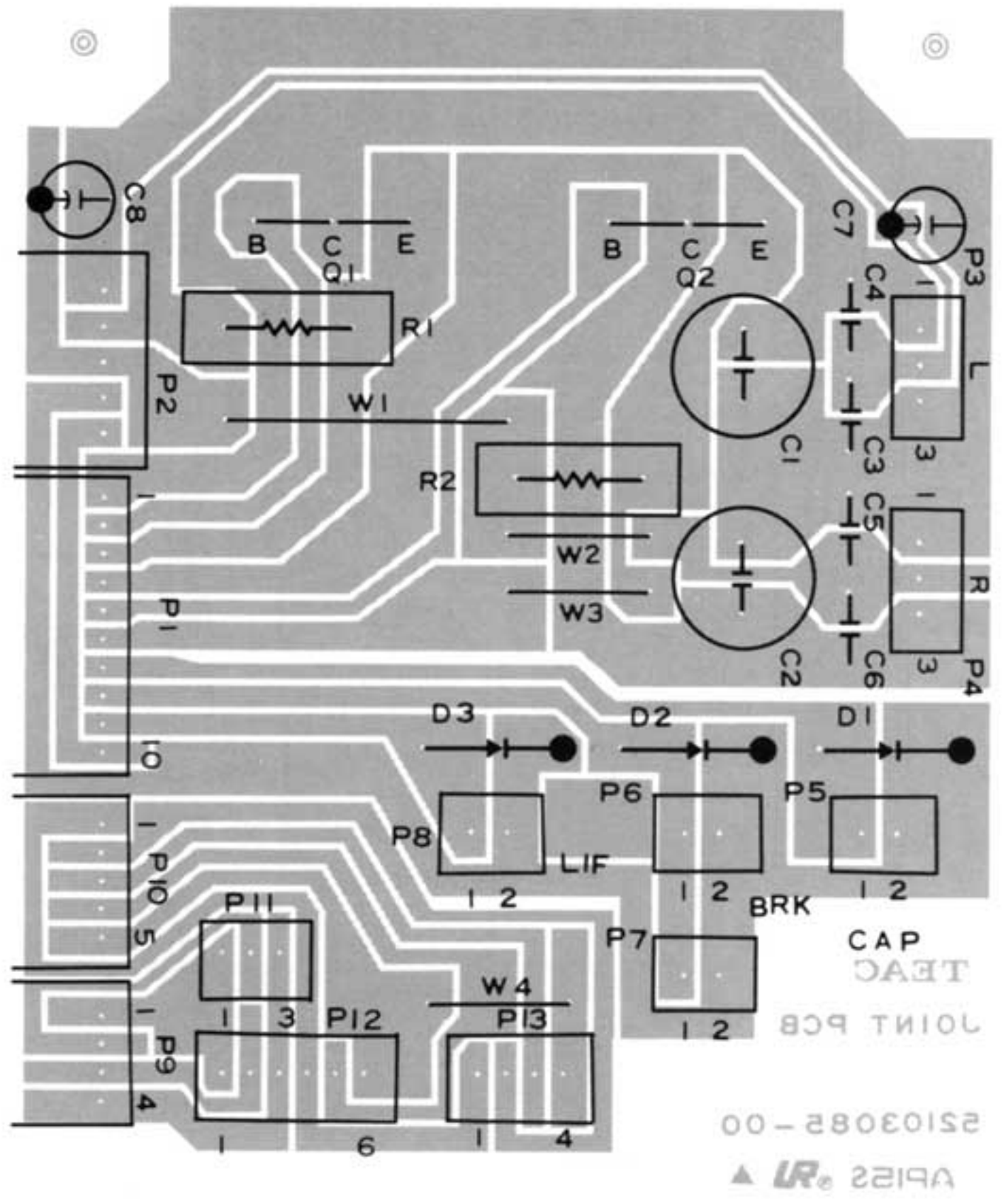
Sensor R PCB Ass'y



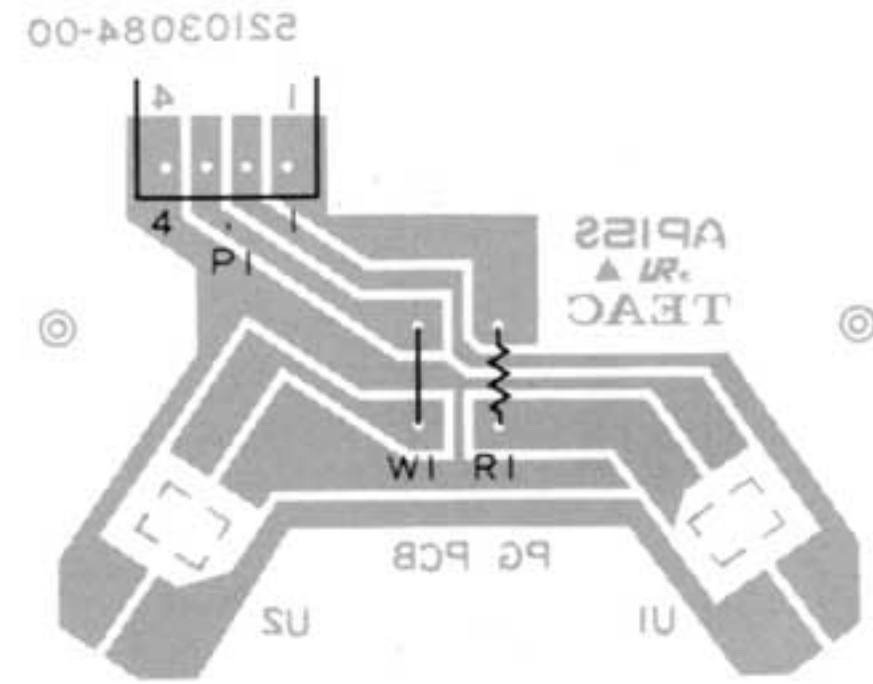
Transistor PCB Ass'y



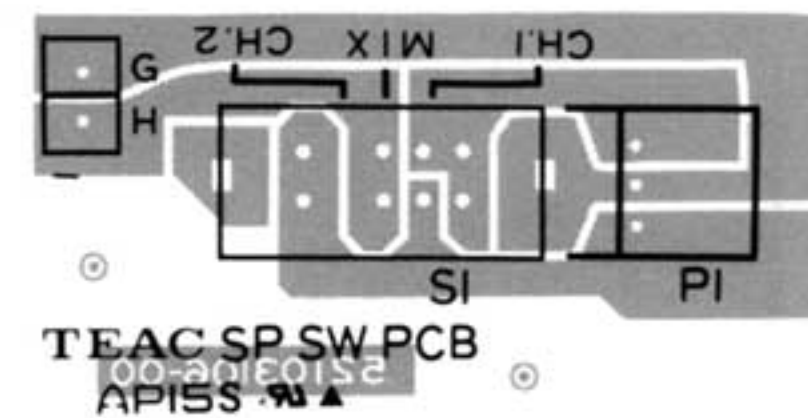
Joint PCB Ass'y



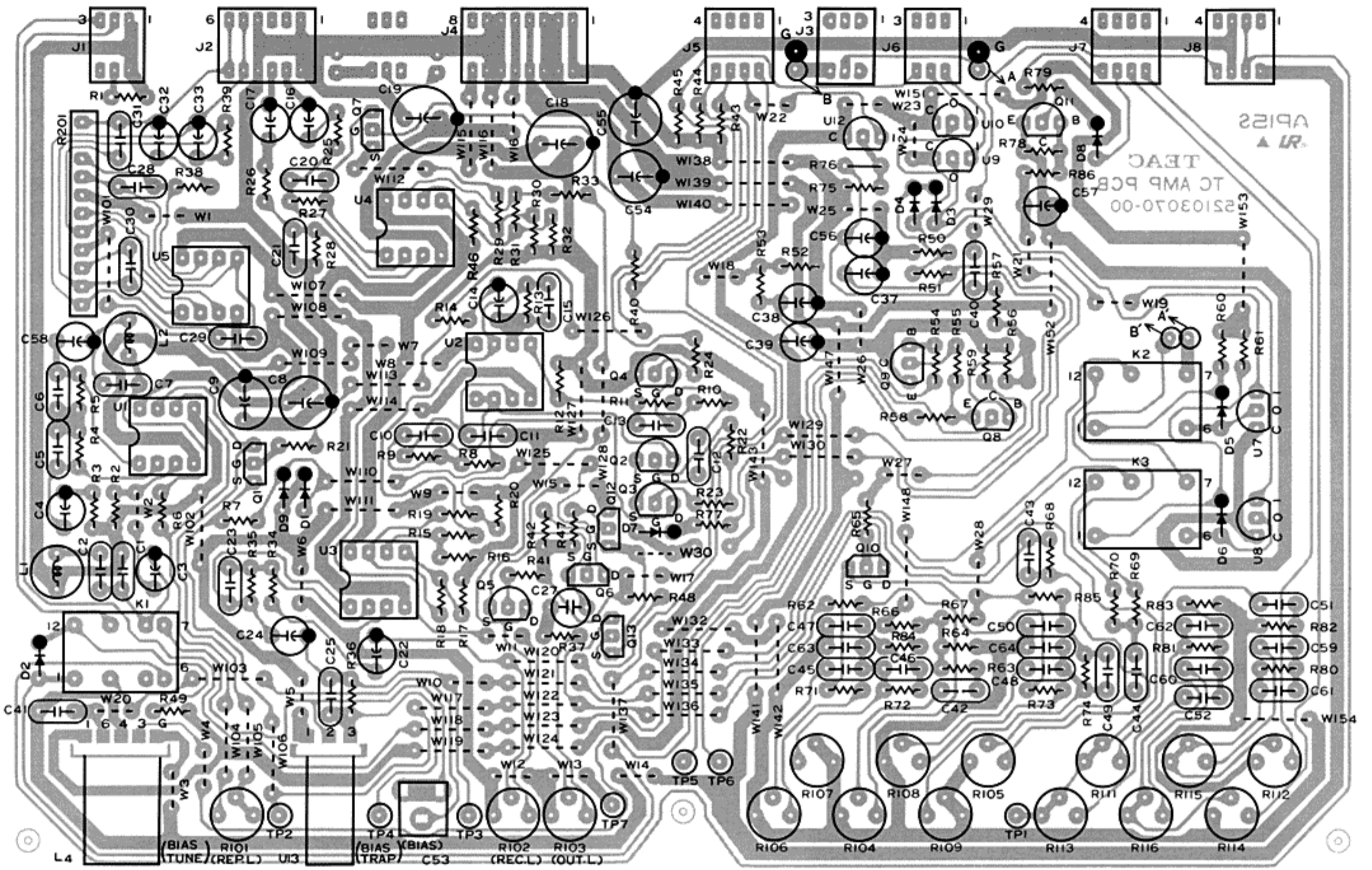
PG PCB Ass'y



**Speaker SW PCB Ass'y
[BR-20N (US, C, J), -20T (J)]**

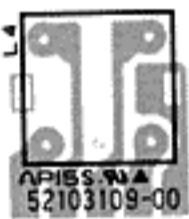


TC AMPL PCB Ass'y [-20T ONLY]

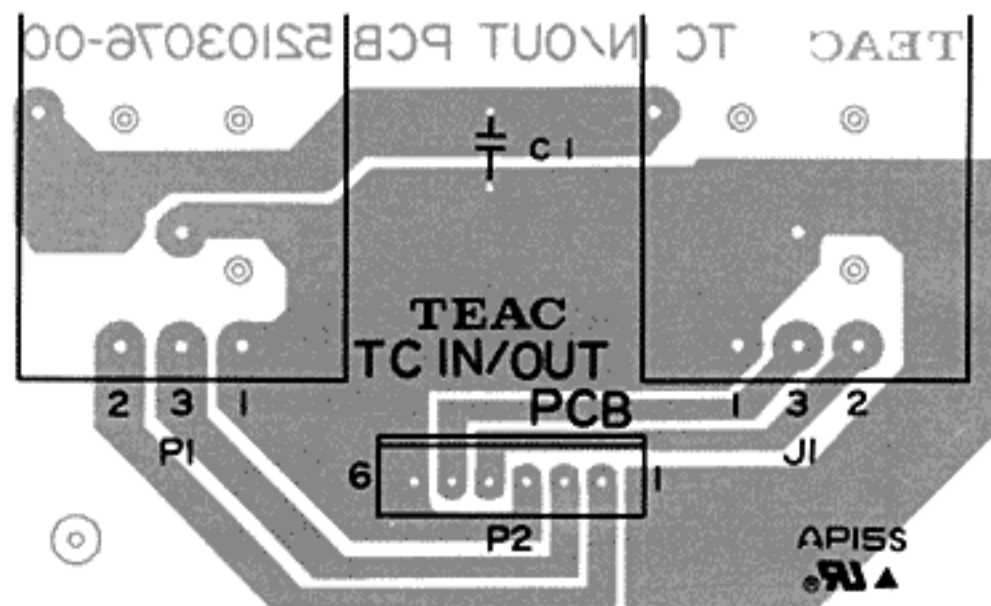


Coil A PCB

Coil B PCB



TC IN/OUT PCB Ass'y [-20T ONLY]



CONTROL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308000	CONTROL PCB ASSY
	*5210308000	CONTROL PCB
	*13443075	IC.,HN27C256G-20 EP-ROM
	*5332020900	SOCKET,IC 28P C47-28-11
	*5334066600	CONNECTOR,D-000-N03
	*5801380700	PLATE,D-SUB
	*5302104700	SW.,DIP 4GANG JKS1120
	*5317002100	PIN,DH CHECK IPS-1136
	*5780023008	SCREW,BIND M3X8(BLK NI)
	*5783613008	SCREW,B.CT M3X8(BLK NI)
D3,4	5224015020	DIODE,ISS133T-77
D5	5224016810	DIODE,DINS4 P10
D6	5224013210	DIODE,DS135D FA4 FF
D8-15	5224015020	DIODE,ISS133T-77
J1	5336281500	SOCKET,CONN. 1L-SDD-5S-S2L2
J2	5336282000	SOCKET,CONN. 1L-SDD-10S-S2L2
J3	5336281500	SOCKET,CONN. 1L-SDD-5S-S2L2
J4	5336281900	SOCKET,CONN. 1L-SDD-9S-S2L2
J5	5334067500	D-SUB,CONN. YG01411
P1	5336249200	PLUG,CONN. B02B-PH-K-S(WHT)
P2	5336249700	PLUG,CONN. B07B-PH-K-S(WHT)
P3	5336249400	PLUG,CONN. B04B-PH-K-S(WHT)
P4	5336250000	PLUG,CONN. B10B-PH-K-S(WHT)
P5	5336251600	PLUG,CONN. B06B-PH-K-R(RED)
P6	5336249500	PLUG,CONN. B05B-PH-K-S(WHT)
P7	5336251200	PLUG,CONN. B02B-PH-K-R(RED)
P8	5336249600	PLUG,CONN. B06B-PH-K-S(WHT)
P9	5336250100	PLUG,CONN. B11B-PH-K-S(WHT)
Q1-3	5231755400	TR.,2SD794Q
Q4,5	5145077000	TR.,2SD-600
R21	5242118600	R.,ARRAY RMLS 8J103
R51-56	5280036100	R.,TRIMMER 4.7KB
R94	5280036900	R.,TRIMMER 100KB
U1-4	5293000900	TR.,ARRAY TD62504P
U10	5293000900	TR.,ARRAY TD62504P
U11	5220051800	IC.,TC74HC04P
U12	5220055900	IC.,TC74HC138P
U13	5220056200	IC.,TC74HC393P
U14	5220052900	IC.,TC74HC390P
U15	5220051600	IC.,TC74HC00P
U16	5220040800	IC.,TC74HC74P
U17	5220052200	IC.,TC74HC86AP
U18	5220051900	IC.,TC74HC14P
U19,20	5293000900	TR.,ARRAY TD62504P
U22	5220052600	IC.,TC74HC244P
U23	5220418800	IC.,M5218P
U24	5220054700	IC.,HA17008RP
U25	5293000900	TR.,ARRAY TD62504P
U26	5220088100	IC.,M5M82C255ASP
U27	5220423600	IC.,M5232L
U28	5220814500	IC.,HD63B03Y
U29	5220815900	LSI.,M5M82C55AP-2
U30	5220430600	IC.,M51953BL
U31	5220824000	IC.,PROGRAMABLE ROM(CNTL)
U5	5220051800	IC.,TC74HC04P
U51-66	5232254820	TR.,DIGI. DTA124ES
U6	5220051700	IC.,TC74HC02P
U7	5220013400	IC.,TC4066BP
U8,9	5220419500	IC.,LA6358
X1	5347001700	OSC.,CRYSTAL 8MHZ MC-18C

MOTHER PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200307200	MOTHER PCB ASSY
	*5200307210	MOTHER PCB ASSY(-20T ONLY)
	*5210307200	MOTER PCB
P1	5336330400	PLUG,CONN. 53025-0410
P2	5336330500	PLUG,CONN. 53025-0510
P3	5336330600	PLUG,CONN. 53025-0610
P4	5336330200	PLUG,CONN. 53025-0210
P5	5336330400	PLUG,CONN. 53025-0410
P6	5336330500	PLUG,CONN. 53025-0510
P7	5336330400	PLUG,CONN. 53025-0410
P8,9	5336330200	PLUG,CONN. 53025-0210
P10	5336330300	PLUG,CONN. 53025-0310 (-20T ONLY)
P11	5336330600	PLUG,CONN. 53025-0610 (-20T ONLY)
P12	5336212600	PLUG,CONN. 5089-6A
P13	5336330200	PLUG,CONN. 53205-0210 (-20T ONLY)
P14	5336330300	PLUG,CONN. 53025-0310
P101,201	5336279500	PLUG,CONN. 1L-SDD-5P-S2T
P102,202	5336279600	PLUG,CONN. 1L-SDD-6P-S2T
P103,203	5336279300	PLUG,CONN. 1L-SDD-3P-S2T
P104,204	5336279800	PLUG,CONN. 1L-SDD-8P-S2T
P105,205	5336279900	PLUG,CONN. 1L-SDD-9P-S2T
P106,206	5336279900	PLUG,CONN. 1L-SDD-9P-S2T
P107,207	5336279400	PLUG,CONN. 1L-SDD-4P-S2T
P108,208	5336279400	PLUG,CONN. 1L-SDD-4P-S2T
P301	5336279600	PLUG,CONN. 1L-SDD-6P-S2T
P302	5336279800	PLUG,CONN. 1L-SDD-8P-S2T
P303,304	5336279900	PLUG,CONN. 1L-SDD-9P-S2T
P305,306	5336279400	PLUG,CONN. 1L-SDD-4P-S2T
P401	5336279500	PLUG,CONN. 1L-SDD-5P-S2T (-20T ONLY)
P402	5336279600	PLUG,CONN. 1L-SDD-6P-S2T (-20T ONLY)
P403	5336279300	PLUG,CONN. 1L-SDD-3P-S2T (-20T ONLY)
P404	5336279800	PLUG,CONN. 1L-SDD-8P-S2T (-20T ONLY)
P405,406	5336279900	PLUG,CONN. 1L-SDD-9P-S2T (-20T ONLY)
P407,408	5336279400	PLUG,CONN. 1L-SDD-4P-S2T (-20T ONLY)
P501	5336279500	PLUG,CONN. 1L-SDD-5P-S2T
P502	5336280000	PLUG,CONN. 1L-SDD-10P-S2T
P503	5336279500	PLUG,CONN. 1L-SDD-5P-S2T
P504	5336279900	PLUG,CONN. 1L-SDD-9P-S2T

Parts marked with *require longer delivery time.

OPERATION KEY PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308700	OPERATION KEY PCB ASSY
	*5200308710	OPERATION KEY PCB ASSY (-20T ONLY)
	*5210308700	OPERATION KEY PCB
	*5801199600	SPACER,LED L=3.5
	*5801291200	SPACER,LED L=5.0
	*5787008300	SUPPORT,PCB RSPLS-10L
D1-5	5225022000	LED,SLP-135(RED)
D12,13	5225022000	LED,SLP-135(RED)
D14	5225022000	LED,SLP-135(RED) (-20T ONLY)
D18,19	5225022100	LED,SLP-235(GRN)
D27-58	5224015020	DIODE,ISSI33T-77
D6,15	5225022000	LED,SLP-135(RED)
D7,16	5225022200	LED,SLP-435(YEL)
D8,17	5225022100	LED,SLP-235(GRN)
D9,10	5225022200	LED,SLP-435(YEL)
P10	5336341700	PLUG,CONN. S7B-PH-SM
S1-5	5300056300	SW.,PUSH I-I SKEUAC
S11	5300056300	SW.,PUSH I-I SKEUAC
S12-21	5302109600	SW.,TACT SKHHAR
S22-29	5302109700	SW.,TACT SKHCAC
S30	5302109700	SW.,TACT SKHCAC (-20T ONLY)
S31,32	5302109700	SW.,TACT SKHCAC
S6-10	5302109600	SW.,TACT SKHHAR
U5-7	5225018800	LED,GL7D201

OPERATION CPU PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308600	OPERATION CPU PCB ASSY
	*5210308600	OPERATION CPU PCB
	*5317002100	PIN,DH CHECK IPS-1136
D21-26	5224015020	DIODE,ISSI33T-77
P1	5336249600	PLUG,CONN. B06B-PH-K-S(WHT)
P2	5336250100	PLUG,CONN. B11B-PH-K-S(WHT)
P3-7	5336287200	PLUG,CONN. S2B-PH-K-S(WHT)
P8	5336287600	PLUG,CONN. S6B-PH-K-S(WHT)
R200	5242110400	R.,ARRAY 4.7KX6
R201	5242110600	R.,ARRAY 4.7KX8
R202	5242110200	R.,ARRAY 4.7KX4
U1	5220822900	MICROCOM.,UPD75004CU-073
U10	5220052600	IC.,TC74HC244P
U11-14	5232255720	TR.,DIGI. DTC124ES
U2	5232256900	TR.,ARRAY M54585P
U3	5220055900	IC.,TC74HC138P
U4	5232257600	TR.,ARRAY M54581P
U8 U9	5220052000	IC.,TC74HC32P
X1	5347012000	OSC,CERAMIC CST4.19MHZ

Parts marked with *require longer delivery time.

R/P AMPL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200306900	R/P AMPL PCB ASSY
	*5200306910	R/P AMPL PCB ASSY(GAPLES)
	*5200306920	R/P AMPL PCB ASSY (-20T ONLY)
	*5210306900	R/P AMPL PCB
C101	5267206600	C.,TRIMMER 100P VCT51J
D1-2	5224015020	DIODE,ISSI33T-77
D9	5224015020	DIODE,ISSI33T-77
D10,11	5224015400	DIODE,1K60
D12	5224015020	DIODE,ISSI33T-77
D13-15	5224015020	DIODE,ISSI33T-77
D17	5224015020	DIODE,ISSI33T-77
D19-22	5224015020	DIODE,ISSI33T-77
J1	5336281500	SOCKET,CONN. 1L-SDD-5S
J2	5336281600	SOCKET,CONN. 1L-SDD-6S
J3	5336281300	SOCKET,CONN. 1L-SDD-3S
J4	5336281800	SOCKET,CONN. 1L-SDD-8S
J5,6	5336281900	SOCKET,CONN. 1L-SDD-9S
J7,8	5336281400	SOCKET,CONN. 1L-SDD-4S
K1	5290013900	RELAY,12V G6E-134P-US
K2	5290013700	RELAY,SY-12W-K
L1,2	5286007600	COIL,CHOKE 3.0MH J
L3	5286007700	COIL,CHOKE 3.3MH
L4	5320059500	TRANS.,ERASE
L5	5286007700	COIL,CHOKE 3.3MH
Q1-4	5232009500	FET,2SK170BL
Q11,12	5232008420	FET.,2SK381D
Q13,14	5232007920	FET.,2SJ-40(D)
Q15-17	5232008420	FET.,2SK381D
Q18	5232007920	FET.,2SJ-40(D)
Q19	5230775020	TR.,2SC2878-B
Q20	5232008420	FET.,2SK381D
Q21	5232007920	FET.,2SJ-40(D)
Q22,23	5232008420	FET.,2SK381D
Q24,25	5232007920	FET.,2SJ-40(D)
Q27-30	5232008420	FET.,2SK381D
Q31	5232008420	FET.,2SK381D
Q32	5232008420	FET.,2SK381D
Q33	5232007920	FET.,2SJ-40(D)
Q34-36	5232008420	FET.,2SK381D
Q38	5230780920	TR.,2SC2603F
Q39	5232007920	FET.,2SJ-40(D)(GAPLES)
Q41	5230782000	TR.,2SC2062B
Q44-46	5230782200	TR.,2SC2002L
Q5	5232008420	FET.,2SK381D
Q6,7	5232007920	FET.,2SJ-40(D)
Q8	5232008420	FET.,2SK381D
Q9,10	5232007920	FET.,2SJ-40(D)
R301,302	5280021100	R.,TRIMMER 4.7KB
R303-306	5280021000	R.,TRIMMER 3.3KB
R307	5280021900	R.,TRIMMER 100KB
R308	5280021100	R.,TRIMMER 4.7KB
R309	5280021700	R.,TRIMMER 47KB H.
R310-312	5280021300	R.,TRIMMER 10KB H.
R313	5280021200	R.,TRIMMER 6.8KB
R314	5280021900	R.,TRIMMER 100KB
TP1-3	5317002100	PIN,DH CHECK IPS-1136
TP5	5317002100	PIN,DH CHECK IPS-1136
U1-4	5220439600	IC.,UPC4570C
U5	5220418800	IC.,M5218P

R/P AMPL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
U6	5232255720	TR.,DIGI. DTC124ES (NO GAPLES)
U7	5232254820	TR.,DIGI. DTA124ES
U9	5286037300	COIL,TRAP VARIABLE 145KHZ

AMP CONT PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200307300	AMP CONT PCB ASSY
	*5200307310	AMP CONT PCB ASSY(GAPLES)
	*5210307800	COIL PCB(GAPLES)
J1	5336281300	SOCKET,CONN. 1L-SDD-3S
J2	5336281400	SOCKET,CONN. 1L-SDD-4S
J3	5336281900	SOCKET,CONN. 1L-SDD-9S
J4	5336281300	SOCKET,CONN. 1L-SDD-3S
J5,6	5336281400	SOCKET,CONN. 1L-SDD-4S
L101,201	5320059500	TRANS.,ERASE(GAPLES)
Q101,201	5230780920	TR.,2SC2603F(GAPLES)
Q102,202	5230782200	TR.,2SC2002L(GAPLES)
Q103,203	5230782200	TR.,2SC2002L(GAPLES)
Q104,204	5230782200	TR.,2SC2002L(GAPLES)
TP101,201	5317002100	PIN,DH CHECK IPS-1136 (GAPLES)
U1,2	5220019100	IC.,TC4011BP
U101,201	5232255720	TR.,DIGI. DTC124ES(GAPLES)
U11-13	5232255720	TR.,DIGI. DTC124ES
U14	5292210200	OSC,MODULE 145KHZ 30V
U15	5220419500	IC.,LA6358(GAPLES)
U3-10	5232254820	TR.,DIGI. DTA124ES

IN/OUT AMPL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200307100	IN/OUT AMPL PCB ASSY
	*5210307100	IN/OUT AMPL PCB
J1	5330509500	JACK,4P YKC21-0062
J101,201	5334042200	SOCKET,XLR CONN. XLB3-31
L101,201	5286007700	COIL,CHOKE 3.3MH
P1	5122147000	PLUG,CONN. 5046-04A(WHT)
P101,102	5334042100	PLUG,XLR CONN. XLB3-32
P2	5122455000	PLUG,CONN. 5046-04A(RED)
P3	5122145000	PLUG,CONN. 5046-02A(WHT)
P5	5336107300	PLUG,CONN. 5045-03A(YEL)
P6	5122183000	PLUG,CONN. 5045-02F(BLK)
Q101,102	5230775020	TR.,2SC2878-B
U1	5220439600	IC.,UPC4570C
U101,201	5220439600	IC.,UPC4570C
U102,202	5220433500	IC.,NJM5532DD
U103,203	5242127400	R.,ARRAY RMHZ6 648
U104,204	5242117800	R.,ARRAY RMN Z8178

CAPSTAN SERVO PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308100	CAPSTAN SERVO PCB ASSY
	*5210308100	CAPSTAN SERVO PCB
	*5317002100	PIN,DH CHECK IPS-1136
D1-2	5224015020	DIODE,ISS133T-77
P1	5122129000	PLUG,CONN. 5045-05A(WHT)
P2	5122128000	PLUG,CONN. 5045-04A(WHT)
P3	5336249600	PLUG,CONN. B06B-PH-K(WHT)
Q1-3	5230778320	TR.,2SC2320F
Q5-8	5232255720	TR.,DIGI. DTC124ES
R29	△ 5184550000	R.,INCOMBUS. 2W 1.0 OHM J
R40	5242110200	R.,ARRAY 4.7KX4
R50	5280216100	R.,TRIMMER 10KB
R51	5280216100	R.,TRIMMER 10KB
R52	5280216100	R.,TRIMMER 10KB
U1,2	5220013400	IC.,TC4066BP
U3	5220019100	IC.,TC4011BP
U4	5220019000	IC.,TC4001BP
U5	5220426600	IC.,UPC1043C
U6	5220419500	IC.,LA6358,
U7	5220092600	IC.,NJM4151D

N FILTER PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200309600	N FILTER PCB ASSY [J,US,C,GE]
	*5200309700	N FILTER PCB ASSY[E,UK,A]
	*5210309600	N FILTER PCB[J,US,C,GE]
	*5210309700	N FILTER PCB[E,UK,A]
	*5555590000	PLATE(A),EARTH
	*5327007200	TERMINAL,2P
C1,2	△ 5267704000	SPARK KILL.,0.0047UF 250V
C3,4	△ 5267703800	SPARK KILL.,4700PF 400V
C5-8	△ 5267703800	SPARK KILL.,4700PF 400V [E,UK,A]
L1	△ 5292806300	FILTER,NOISE FK0816MH3
P1	5334074300	PLUG,CONN. 2P RTB-1,5-2V
P2	5334074400	PLUG,CONN. 3P RTB-1,5-3V

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

Parts marked with *require longer delivery time.

PS PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200306500	PS PCB ASSY[J,US,C,GE]
	*5200306600	PS PCB ASSY[E,UK,A]
	*5210306500	PS PCB[J,US,CGE]
	*5210306600	PS PCB[E,UK,A]
	*5041237000	HOLDER,FUSE[J,US,C,GE]
	*5332014200	HOLDER,FUSE[E,UK,A]
	*5801379800	HEATSINK(B)
	*5033291000	PLATE,INSULATE
	*5033295000	TUBE,INSULATE
	*5780003006	SCREW,BIND M3X6
	*5780003008	SCREW,BIND M3X8
C1,2	△ 5263164500	C.,METAL 0.047UF/250V [E,UK,A]
C3,4	△ 5260466310	C.,ELEC. 220UF/35V
C5,6	△ 5260463910	C.,ELEC. 220UF/35V
C14,15	△ 5260466310	C.,ELEC. 220UF/35V
C16,17	△ 5263167923	C.,METAL 0.10UF/50V
C25,26	△ 5263164500	C.,METAL 0.047UF/250V [E,UK,A]
C27	△ 5260467310	C.,ELEC. 4700UF/25V
C28	△ 5262015600	C.,ELEC. 6800UF/35V
C31	△ 5260461120	C.,ELEC. 1UF/50V
C37	△ 5260467310	C.,ELEC. 4700UF/25V
D1-8	△ 5224013210	DIODE,DS135D FA4 FF
D9,10	5224015700	DIODE,ISS130
D11	5224589321	DIODE,ZENER RD15ESB2 FT
D13	△ 5228010000	SILICON STACK,D5SB20
D14	5224014700	DIODE,S3V20H
D15,16	5224015020	DIODE,ISS133T-77
D17	5224585621	DIODE,ZENER RD6.2ESB1 FT
D18	5224589021	DIODE,ZENER RD 13ESB3 FT
D19	△ 5224013210	DIODE,DS135D FA4 FF
D20	5224015020	DIODE,ISS133T-77
F1 F2	△ 5307004300	FUSE,3A-250V[J,US,C,GE]
	△ 5142190000	FUSE,2.5A-250V[E,UK,A]
F3 F4	△ 5307046200	FUSE,10A-250V[J,US,C,GE]
	△ 5142194000	FUSE,6.3A-250V[E,UK,A]
P1	5334074700	PLUG,CONN. 6P RTB-1,5-6V
Q1	△ 5231762800	TR.,2SD1913R
Q2	△ 5230509700	TR.,2SB1274R
Q3	△ 5145165000	TR.,2SD-7160
Q4	5230780920	TR.,2SC2603F
Q5	△ 5145087000	TR.,2SD-313E
Q6	5230780920	TR.,2SC2603F
R1,2	△ 5184249000	R.,INCOMBUSTIBLE 100 OHM
R9,10	△ 5184217000	R.,INCOMBUSTIBLE 4.7 OHM
U1	5220425800	IC.,M5230LA
U2	△ 5220434900	IC.,M5F7815L
U3	△ 5220435800	IC.,M5F7915L
U4,7	5232255720	TR.,DIGI. DTC124ES
U5	5220418800	IC.,M5218P
U6	△ 5220434400	IC.,M5F7805L

VR PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200307500	VR PCB ASSY
	*5210307500	VR PCB
	*5801336200	SPACER,LED
D1	5225022000	LED.,SLP-135(RED)
D2	5225022100	LED.,SLP-235(GRN)
D3	5225022200	LED.,SLP-435(YEL)
D4	5225022200	LED.,SLP-435(YEL)
D5	5225022100	LED.,SLP-235(GRN)
D101-104	5224015020	DIODE,ISS133T-77
D201-204	5224015020	DIODE,ISS133T-77
P101 P201	5336330800	PLUG,CONN. 53025-0810
P102 P202	5336330200	PLUG,CONN. 53025-0210
P301	5336330400	PLUG,CONN. 53025-0410
P302	5336330600	PLUG,CONN. 53025-0610
P303	5336330200	PLUG,CONN. 53025-0210
Q101,201	5232008420	FET.,2SK381D
Q102,202	5232007920	FET.,2SJ-40(D)
Q103,203	5232008420	FET.,2SK381D
Q104,204	5232007920	FET.,2SJ-40(D)
R1-4	5282022600	VR.,20KA ISIUVR II
R5	5282023400	VR.,ISIUVR II 20KB 10%
S1-4	5300917300	SW.,SLIDE 1-2 N SSSU01

PHONE AMPL PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200307400	PHONE AMPL PCB ASSY
	*5200307410	PHONE AMPL PCB ASSY (-20T ONLY)
	*5210307400	PHONE AMPL PCB
	*5801336200	SPACER,LED
	*5730039400	SPACER,LED(-20T ONLY)
D1,2	5224015020	DIODE,ISS133T-77
D3,4	5225022000	LED.,SLP-135(RED)
D5	5225022100	LED.,SLP-235(GRN) (-20T ONLY)
D101,201	5224015320	DIODE,MC931
P1	5336287500	PLUG,CONN. S5B-PH-K-S(WHT)
P2	5336287300	PLUG,CONN. S3B-PH-K-S(WHT)
P3	5336287400	PLUG,CONN. S4B-PH-K-S(WHT)
P4	5336287200	PLUG,CONN. S2B-PH-K-S(WHT)
P5	5336287600	PLUG,CONN. S6B-PH-K-S(WHT)
P6	5336291400	PLUG,CONN. S4B-PH-K-R(RED)
Q101,201	5230773800	TR.,2SC2655-Y
Q102,202	5230014000	TR.,2SA1020-Y
R106,206	△ 5183542000	R.,INCOMB. 3.3 OHM J FR
R107,207	△ 5183542000	R.,INCOMB. 3.3 OHM J FR
U1	5220439600	IC.,UPC4570C

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

Parts marked with *require longer delivery time.

SPEED SW PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308800	SPEED SW PCB ASSY
	*5210308800	SPEED SW PCB
D59,60	5224015020	DIODE,ISSI33T-77
S33,34	5302109700	SW.,TACT SKHCAC

PHONE VR PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308900	PHONE VR PCB ASSY
	*5210308900	PHONE VR PCB
R3	5282417500	VR.,50KAX2 1S2UVR 14

JACK PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200307900	JACK PCB ASSY
	*5210307900	JACK PCB
J1	5330011400	JACK,3P B11-5005
P1	5336126300	PLUG,CONN. 8263-0312(WHT)
R1,2	5181986000	R.,INCOMB. 33

JOINT PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308500	JOINT PCB ASSY
	*5210308500	JOINT PCB
	*5801379300	HEETSINK(A)
	*5780003008	SCREW,BIND M3X8
D1-3	5224013200	DIODE,DS135D FR
P1	5336288000	PLUG,CONN. S10B-PH-K(WHT)
P2	5122148000	PLUG,CONN. 5045-05A(WHT)
P3,4	5336202300	PLUG,CONN. 5483-03A(WHT)
P5-8	5336202200	PLUG,CONN. 5483-02A(WHT)
P9	5336287400	PLUG,CONN. S4B-PH-K(WHT)
P10	5336287500	PLUG,CONN. S5B-PH-K-S(WHT)
P11	5336249300	PLUG,CONN. B03B-PH-K(WHT)
P12	5336249600	PLUG,CONN. B06B-PH-K(WHT)
P13	5336249400	PLUG,CONN. B04-PH-K-S(WHT)
Q1,2	5231758800	TR.,2SD1047-E
R1 R2	△ 5185202000	R.,METAL PLATE 0.47 5W

SENSOR L PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308200	SENSOR L PCB ASSY
	*5210308200	SENSOR L PCB
	*5801138800	SPACER,SENSOR COIL
D1	5224015010	DIODE,ISSI33HV
L1,2	5160038000	COIL,DETECTOR
P1	5336287300	PLUG,CONN. S3B-PH-K(WHT)
Q1	5145036000	TR.,2SC-945LK

SENSOR R PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308300	SENSOR R PCB ASSY
	*5210308300	SENSOR R PCB
	*5801138800	SPACER,SENSOR COIL
D1	5224015010	DIODE,ISSI33HV
L1,2	5160038000	COIL,DETECTOR
P1	5336287600	PLUG,CONN. S6B-PH-K-S(WHT)
Q1	5145036000	TR.,2SC-945LK
U1	5228016500	PHOTO INTERRUPTER,SPI-216

PG PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200308400	PG PCB ASSY
	*5210308400	PG PCB
P1	5336287400	PLUG,CONN. S4B-PH-K-S(WHT)
U1 U2	13419359	PHOTOELECTRON,GP2S06

TRANSISTOR PCB ASSY

REF.NO.	PARTS NO.	DESCRIPTION
	*5200310800	TRANSISTOR PCB ASSY
	*5210310800	TRANSISTOR PCB
Q4	5231762800	TR.,2SD1913R

Parts marked with *require longer delivery time.

TC AMPL PCB ASSY(-20T ONLY)

REF.NO.	PARTS NO.	DESCRIPTION
	*5200307000	TC AMPL PCB ASSY
	*5210307000	TC AMPL PCB
	*5210310900	COIL A PCB
	*5210311000	COIL B PCB
C53	5267206200	C., TRIMMER 100PF CTZ-53
D1-9	5224015020	DIODE, ISS133T-77
J1	5336281300	SOCKET, CONN. 1L-SDD-3S
J2	5336281600	SOCKET, CONN. 1L-SDD-6S
J3	5336281300	SOCKET, CONN. 1L-SDD-3S
J4	5336281800	SOCKET, CONN. 1L-SDD-8S
J5	5336281400	SOCKET, CONN. 1L-SDD-4S
J6	5336281300	SOCKET, CONN. 1L-SDD-3S
J7,8	5336281400	SOCKET, CONN. 1L-SDD-4S
K1	5290012700	RELAY, 12V G5A-237PL
K2,3	5290013900	RELAY, 12V G6E-134P-US
L1	5286007600	COIL, CHOKE 3.0MH J
L2	5286007700	COIL, CHOKE 3.3MH J
L4	5320059600	TRANS., ERASE TC
Q1	5232007920	FET., 2SJ-40(D)
Q2	5232008420	FET., 2SK-381 D
Q3	5232007920	FET., 2SJ-40(D)
Q5	5232008420	FET., 2SK-381 D
Q6	5232007920	FET., 2SJ-40(D)
Q7	5232008420	FET., 2SK-381 D
Q8,9	5230782200	TR., 2SC2002L
Q10	5232008420	FET., 2SK-381 D
Q11	5230782000	TR., 2SC2062 B
Q12	5232008420	FET., 2SK-381 D
Q13	5232007920	FET., 2SJ-40(D)
R201	5242117800	R., ARRAY RMN Z8178
R101	5280036900	R., TRIMMER 100KB
R102	5280036300	R., TRIMMER 10KB
R103, 104	5280035700	R., TRIMMER 1KB
R105	5280036900	R., TRIMMER 100KB
R106	5280035700	R., TRIMMER 1KB
R107	5280036900	R., TRIMMER 100KB
R108	5280035700	R., TRIMMER 1KB
R109	5280036900	R., TRIMMER 100KB
R111	5280036700	R., TRIMMER 47KB
R112	5280035900	R., TRIMMER 2.2KB
R113	5280036700	R., TRIMMER 47KB
R114	5280035900	R., TRIMMER 2.2KB
TPI-7	5317002100	PIN, DH CHECK IPS-1136
U1-4	5220439600	IC., UPC4570C
U5	5220433500	IC., NJM5532D-D
U7,8	5232255720	TR., DIGI DTC124ES
U9,10	5232254820	TR., DIGI DTA124ES
U12	5232254820	TR., DIGI DTA124ES
U13	5286037300	COIL, TRAP(145KHz)

SPEAKER SW PCB ASSY[BR-20N(US,C,J),-20T(J)]

REF.NO.	PARTS NO.	DESCRIPTION
	*5200310600	SPEAKER SW PCB ASSY [US,C,J]
	*5210310600	SPEAKER SW PCB[US,C,J]
PI	5336287300	PLUG, CONN. S3B-PH-K-S(WHT) [US,C,J]
SI	5300917700	SW., SLIDE 1-3 SSSS92 [US,C,J]

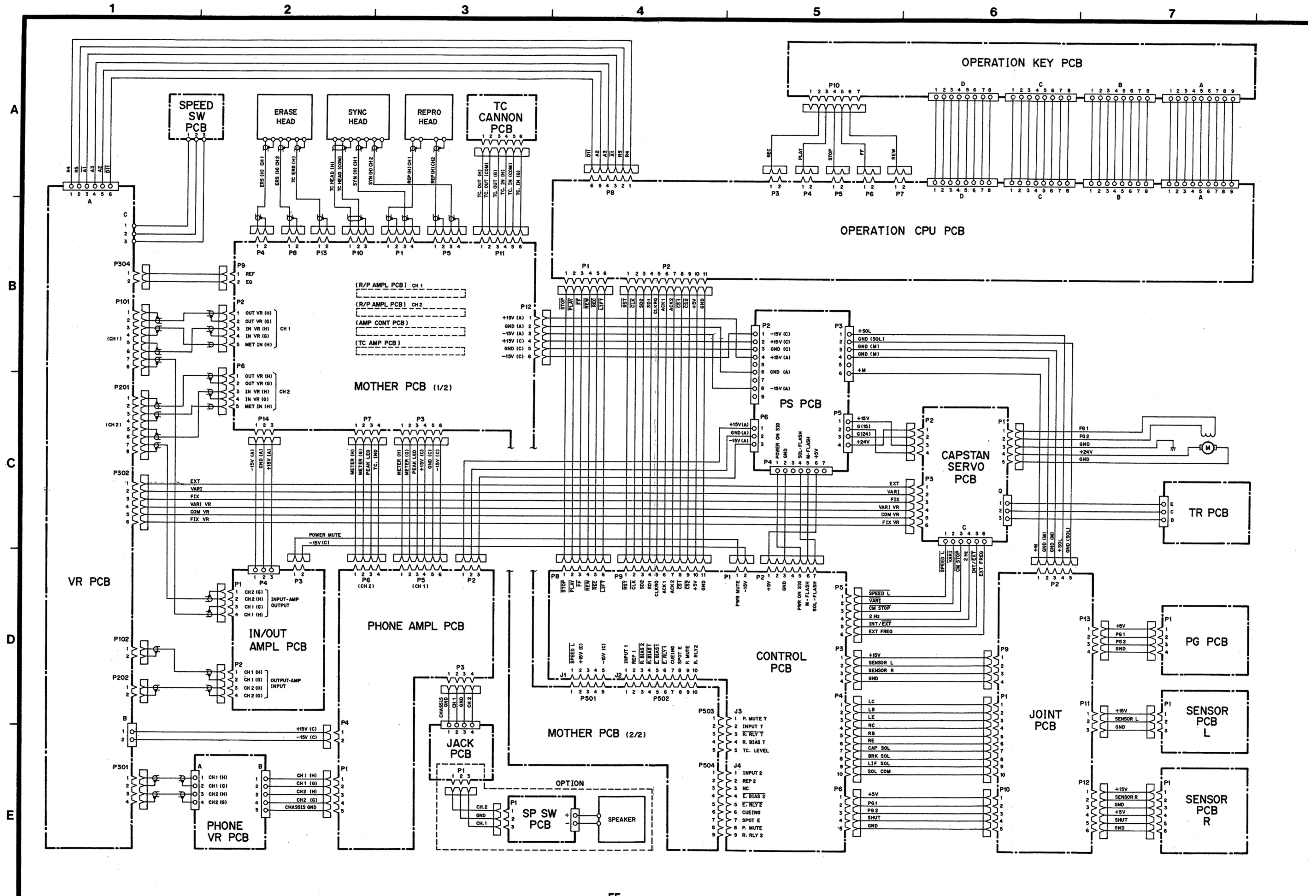
TC IN/OUT PCB ASSY(-20T ONLY)

REF.NO.	PARTS NO.	DESCRIPTION
	*5200307600	TC IN/OUT PCB ASSY
	*5210307600	TC IN/OUT PCB
J1	5334042200	SOCKET, XLR CONN. XLB3-31
PI	5334042100	PLUG, XLR CONN. XLB3-32
P2	5122130000	PLUG, CONN. 5045-06A(WHT)

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

Parts marked with *require longer delivery time.

8-3. Schematic Drawings
Wiring Diagram



1

2

3

4

5

6

7

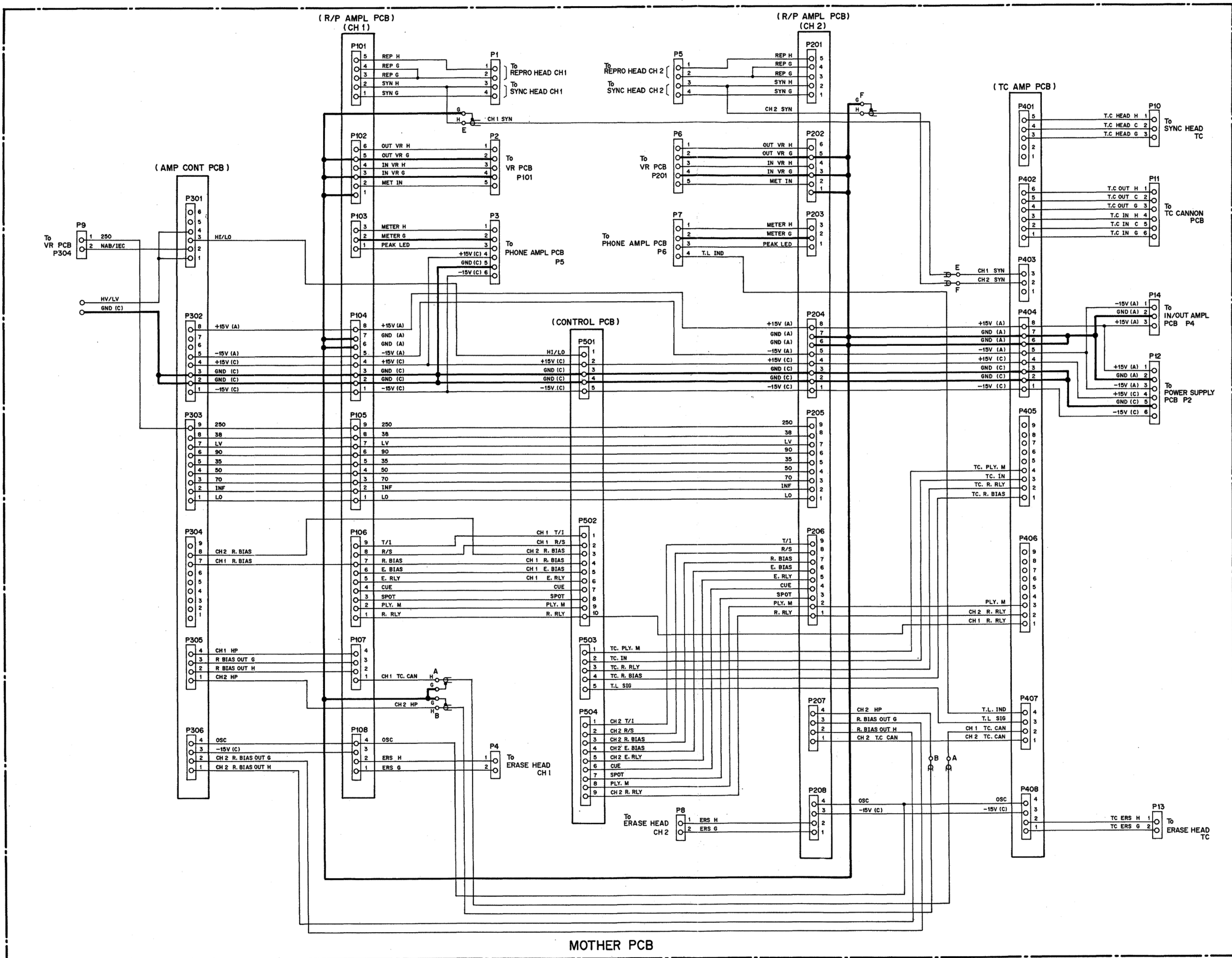
A

B

C

D

E



MOTHER PCB

1 2 3 4 5 6

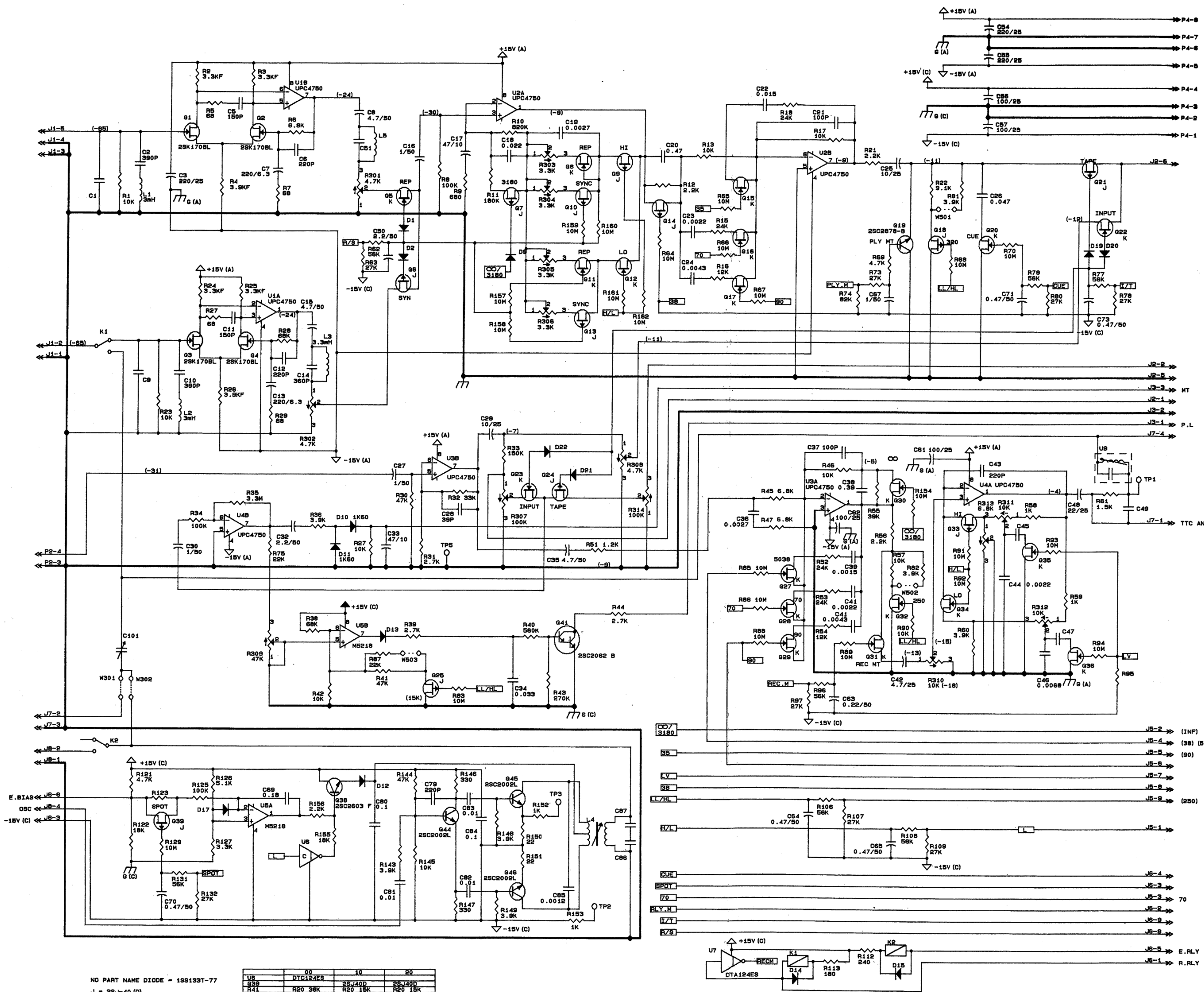
A

B

C

D

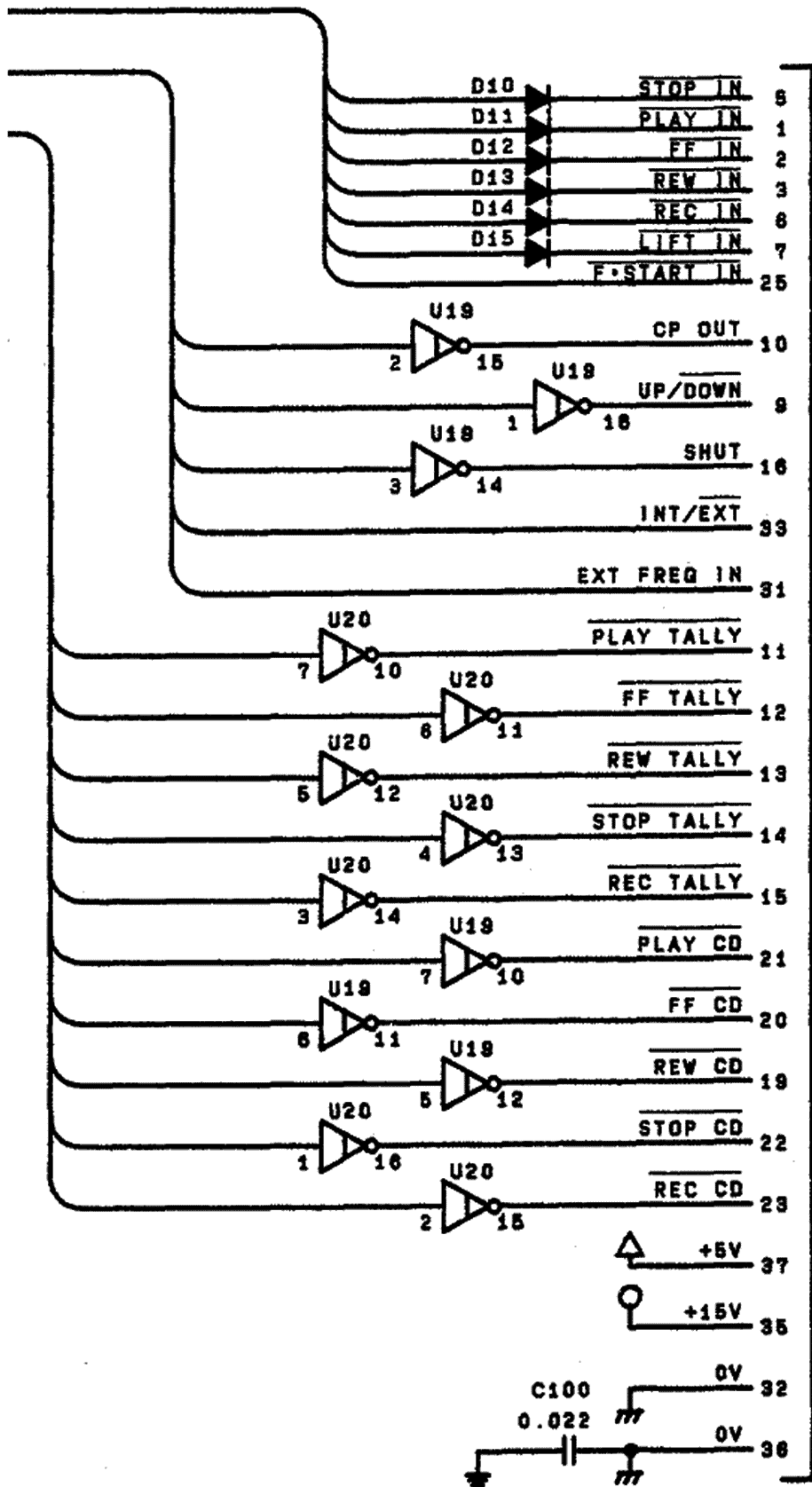
E



NO PART NAME DIODE = 189133T-77

J = 25J-40 (D)
K = 25K-381 D

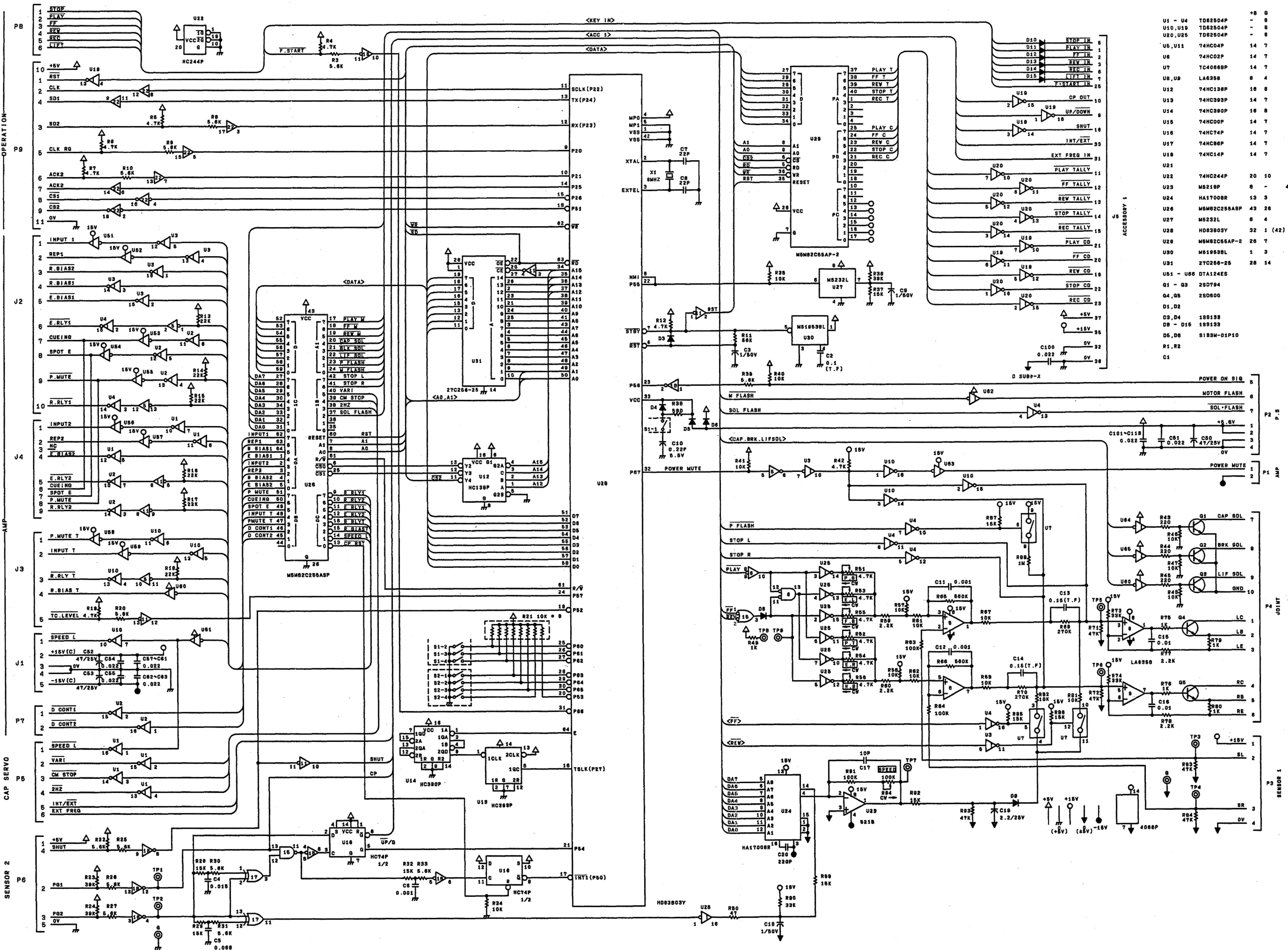
Q1	Q2	Q3	Q4
U6 DTA124ES	2S140D	2S140D	2S140D
R44 RED 56K	RED 15K	RED 15K	RED 15K
R47 RED 3.3K	RED 3.3K	RED 3.3K	RED 3.3K
R123 JUMPER	470K	470K	470K
R129	RED 10M	RED 10M	RED 10M
R134	RED 56K	RED 56K	RED 56K
R132	RED 27K	RED 27K	RED 27K
R155	18K	18K	18K
C1	0.0039	0.0039	0.0039
C3	0.0039	0.0039	0.0039
C18	0.0027	0.0027	0.0027
C19	0.0039	0.0039	0.0039
C24	0.0043	0.0043	0.0043
C66 C67	0.0043	0.0043	0.0043
M30	P=9.0	P=9.0	P=9.0
M302	P=9.0	P=9.0	P=9.0



J5
ACCESSORY 1

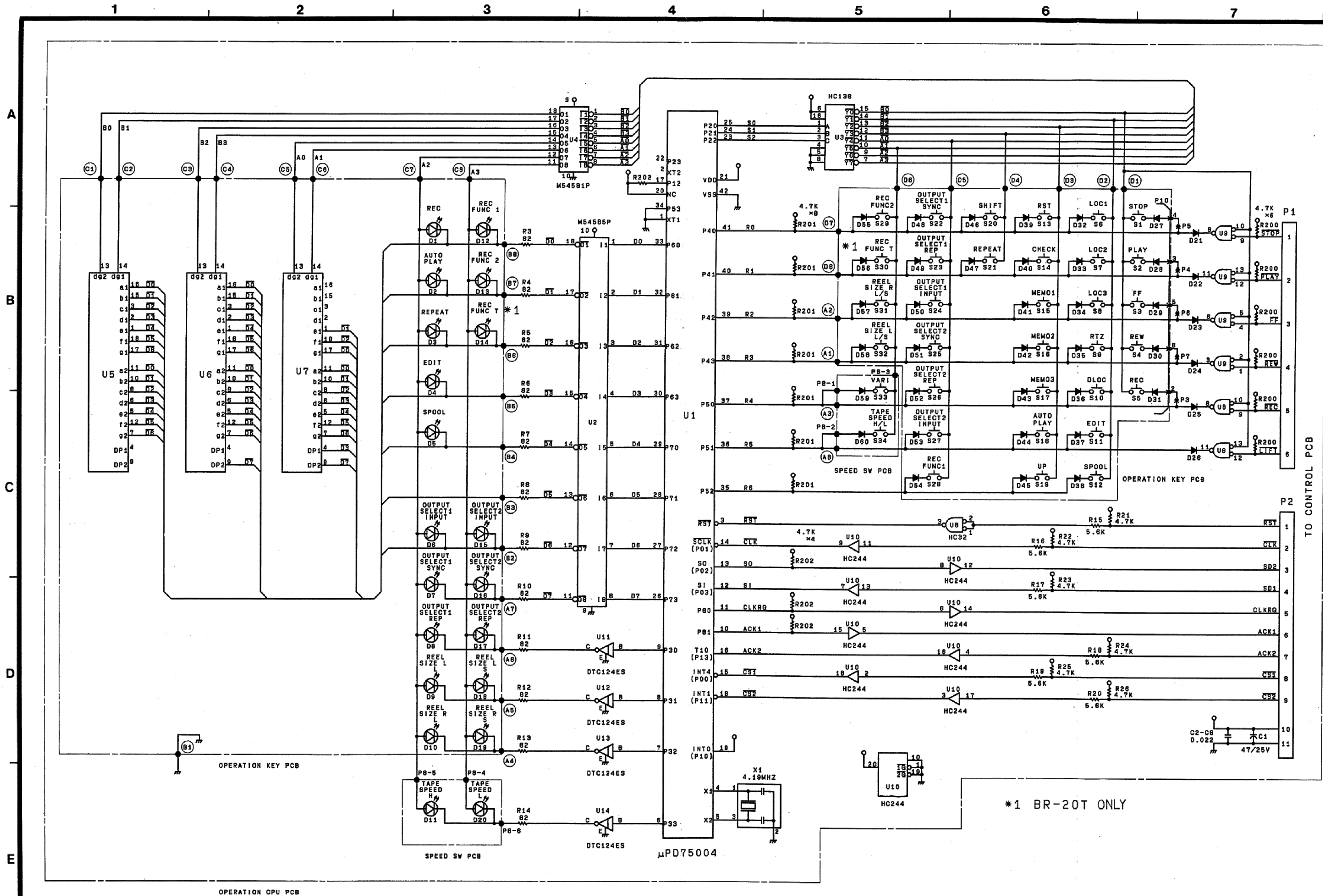
1 2 3 4 5 6 7

A
B
C
D
E



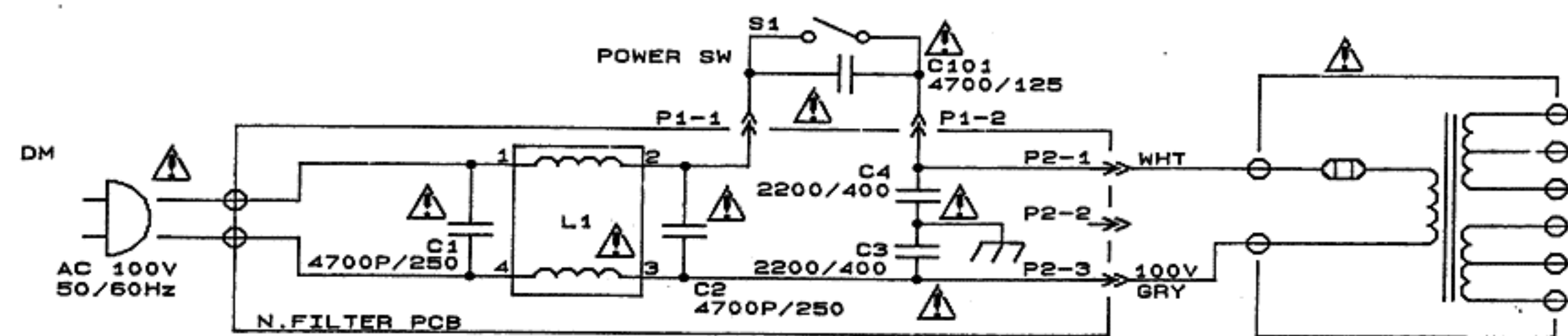
U1 - U4	780504P	+8	8
U10, U19	74HC04P	-	8
U20, U25	780504P	-	8
U6, U11	74HC04P	14	7
U8	74HC02P	14	7
U7	74HC06BP	14	7
U8, U9	LA8358	8	4
U12	74HC138P	10	8
U13	74HC393P	14	7
U14	74HC390P	18	8
U16	74HC00P	14	7
U18	74HC74P	14	7
U17	74HC86P	14	7
U18	74HC14P	14	7
U21			
U22	74HC244P	20	10
U23	MS218P	8	4
U24	HA1700BR	13	3
U28	MS82C256AP-2	43	28
U27	MS232L	8	4
U28	H093B03Y	32	1 (42)
U29	MS82C256AP-2	26	7
U30	MS1959BL	1	3
U31	27C256-25	28	14
U51 - U58	DTA124ES		
Q1 - Q3	2SD794		
Q4, Q5	2SD600		
D1, D2			
D3, D4	180133		
D5 - D15	180133		
D5, D6	S18M-D1P10		
R1, R2			
C1			

Operation CPU PCB Ass'y, Operation Key PCB Ass'y, Speed SW PCB Ass'y

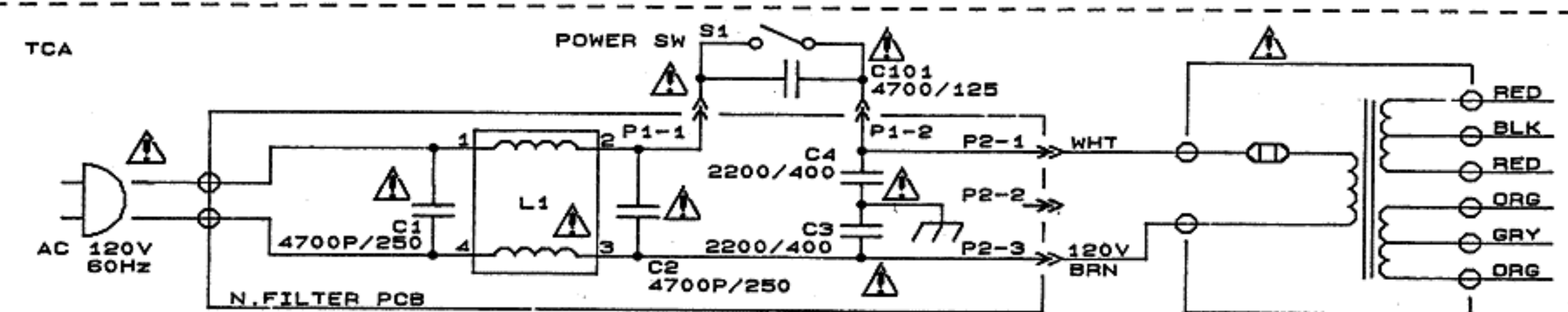


1 2 3 4 5 6 7

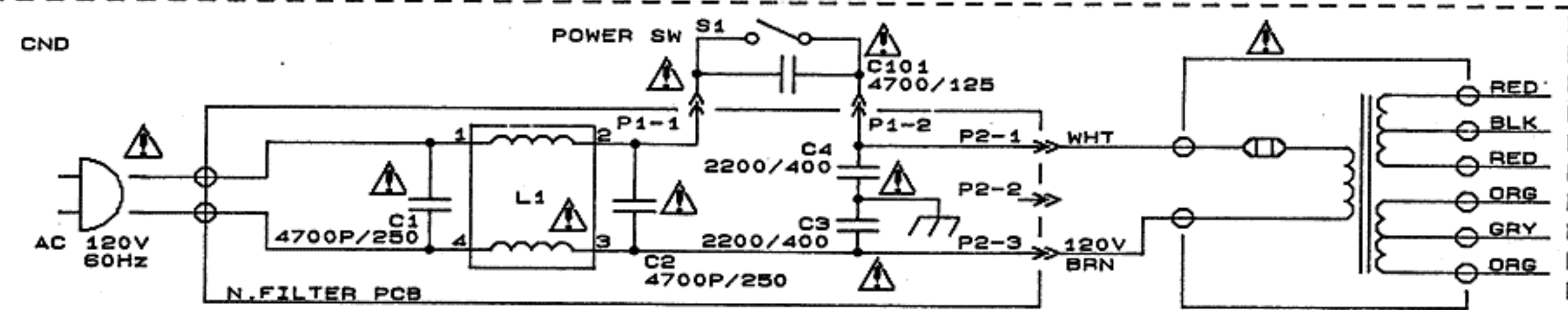
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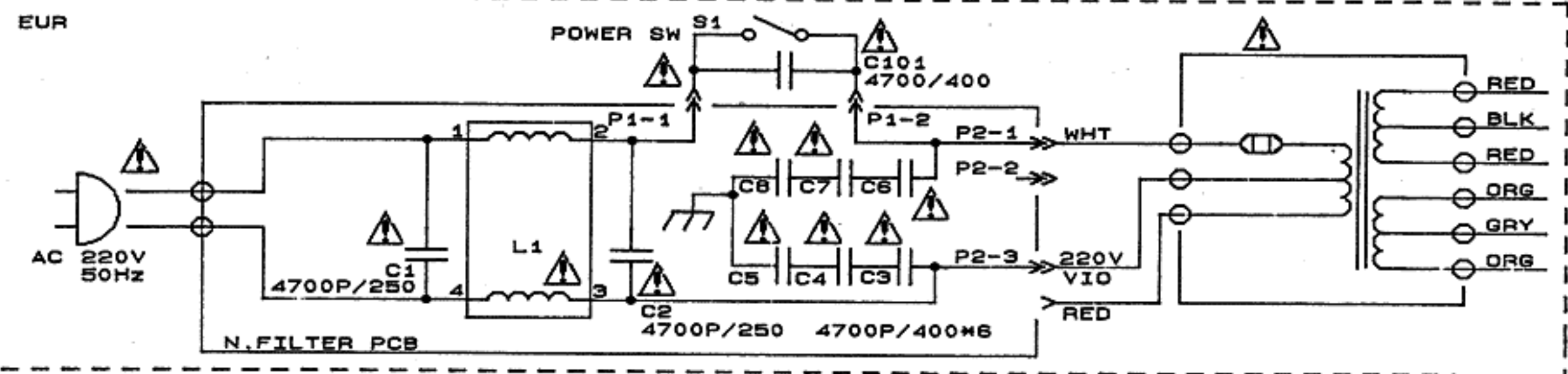
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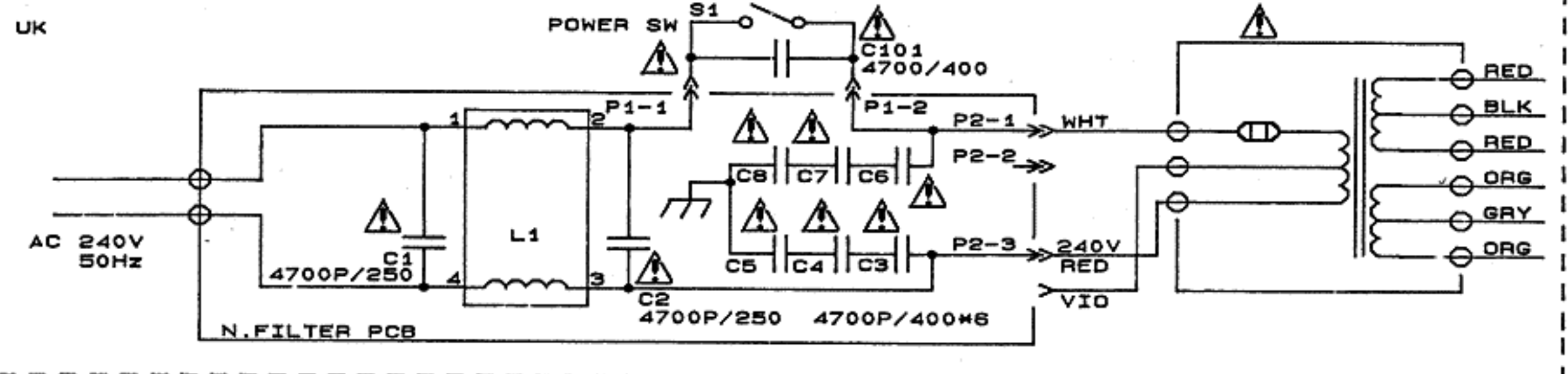
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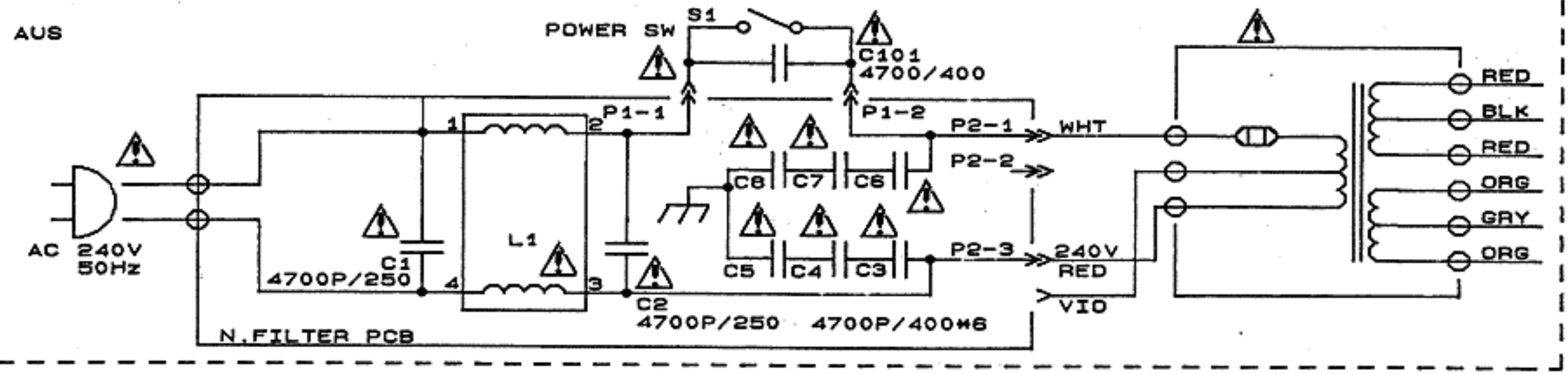
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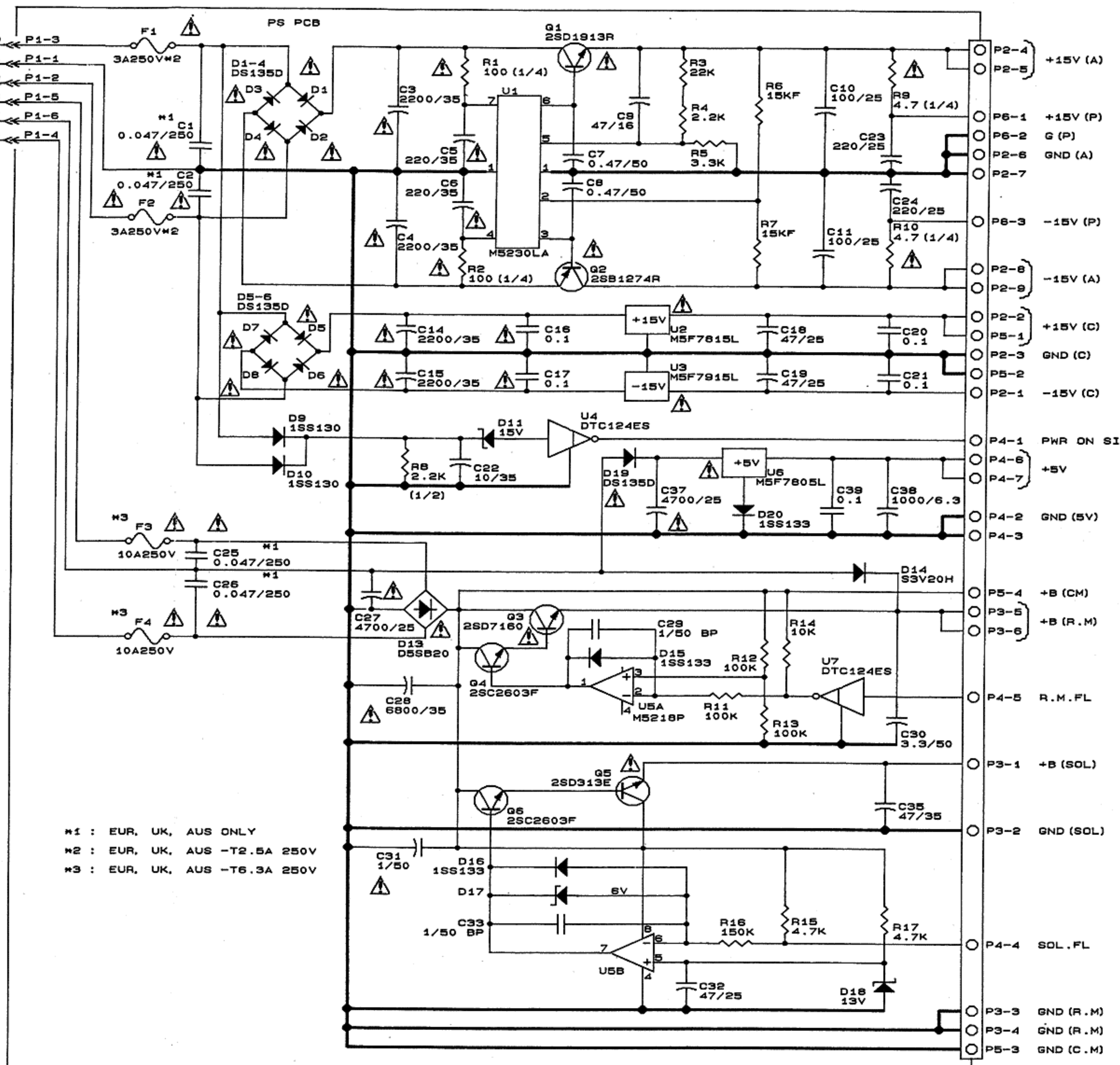
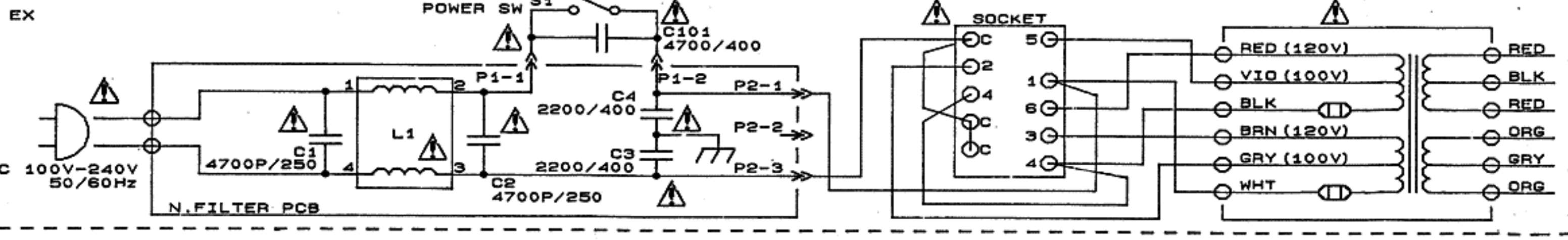
D



D

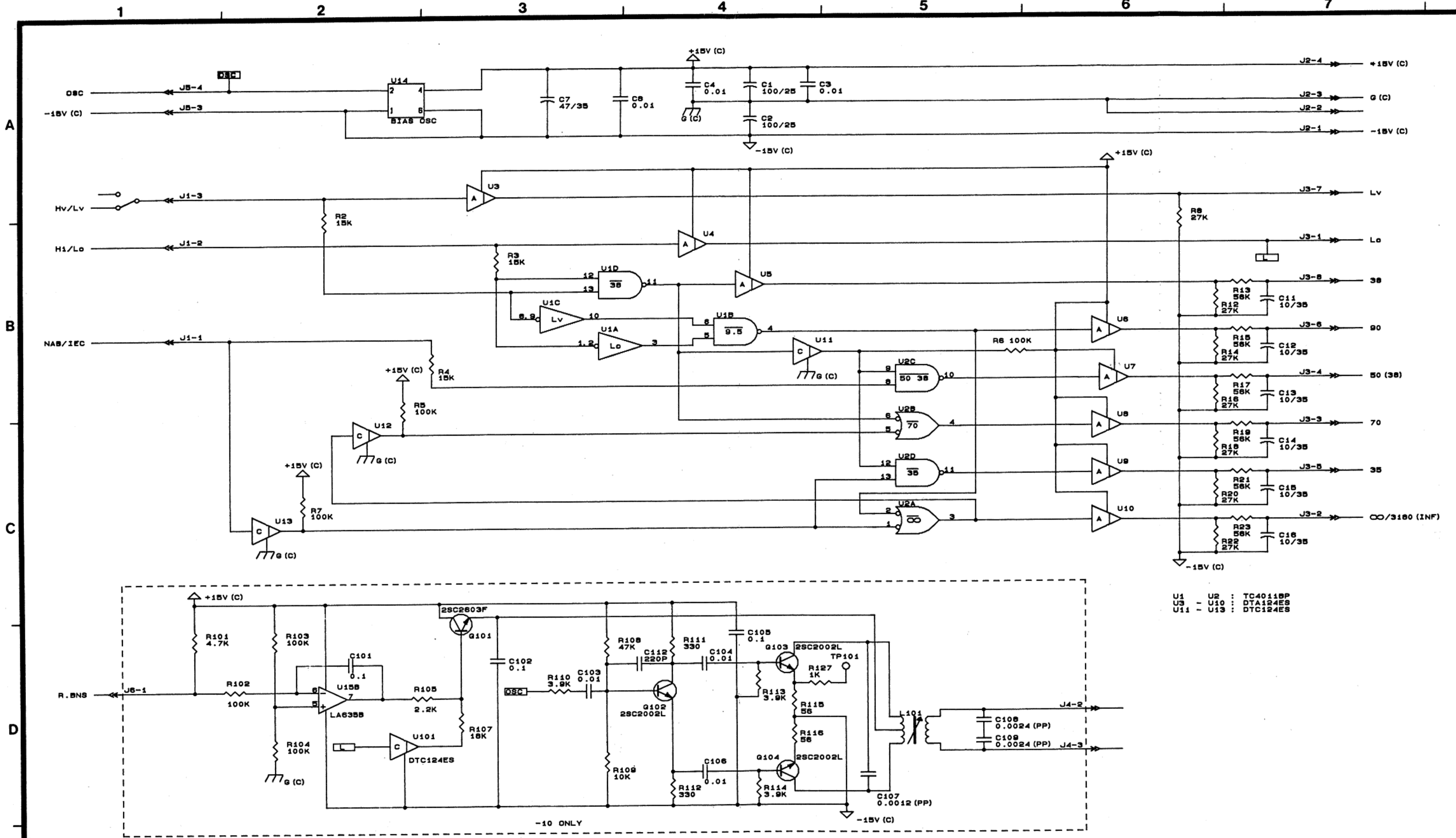


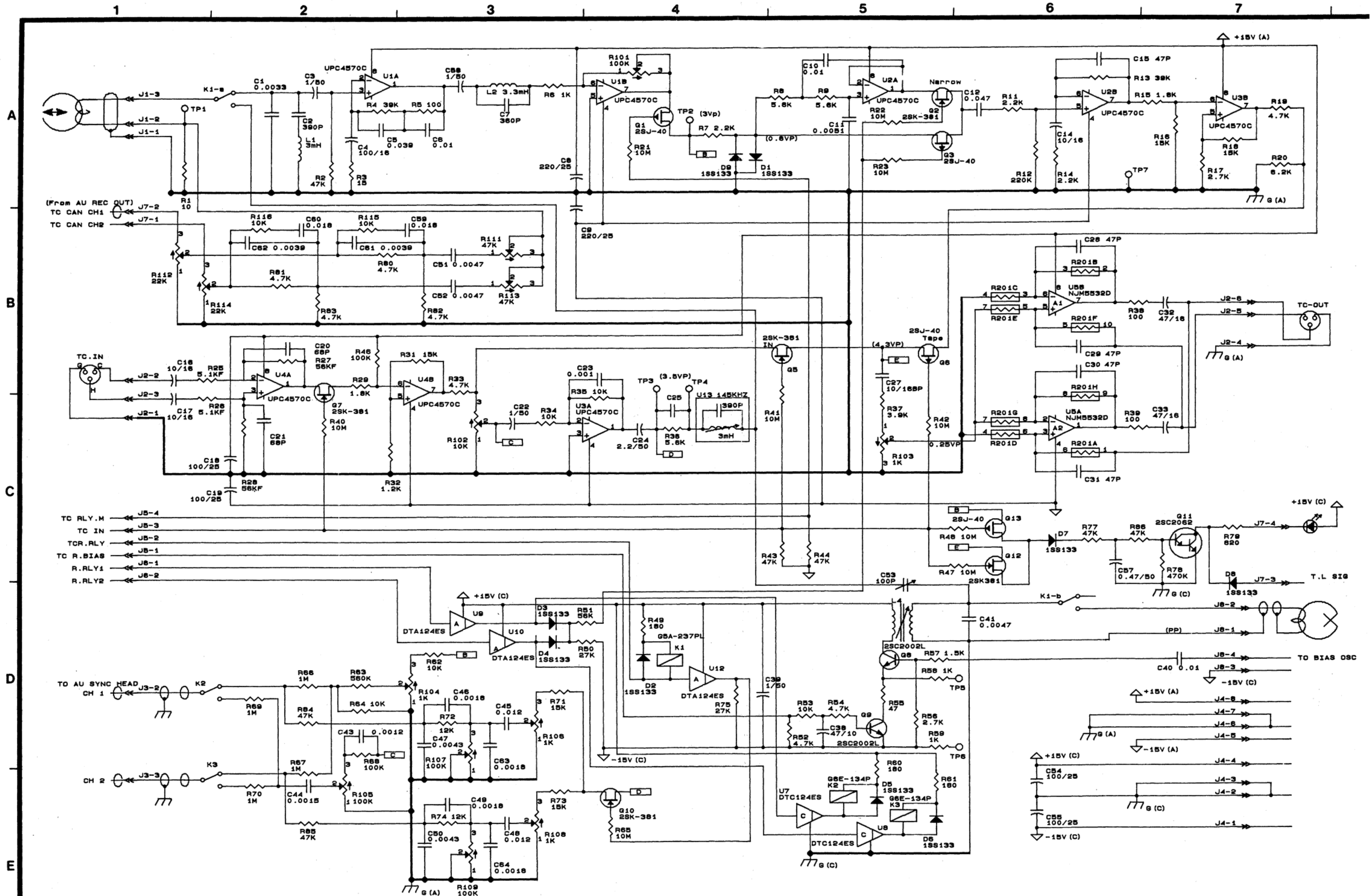
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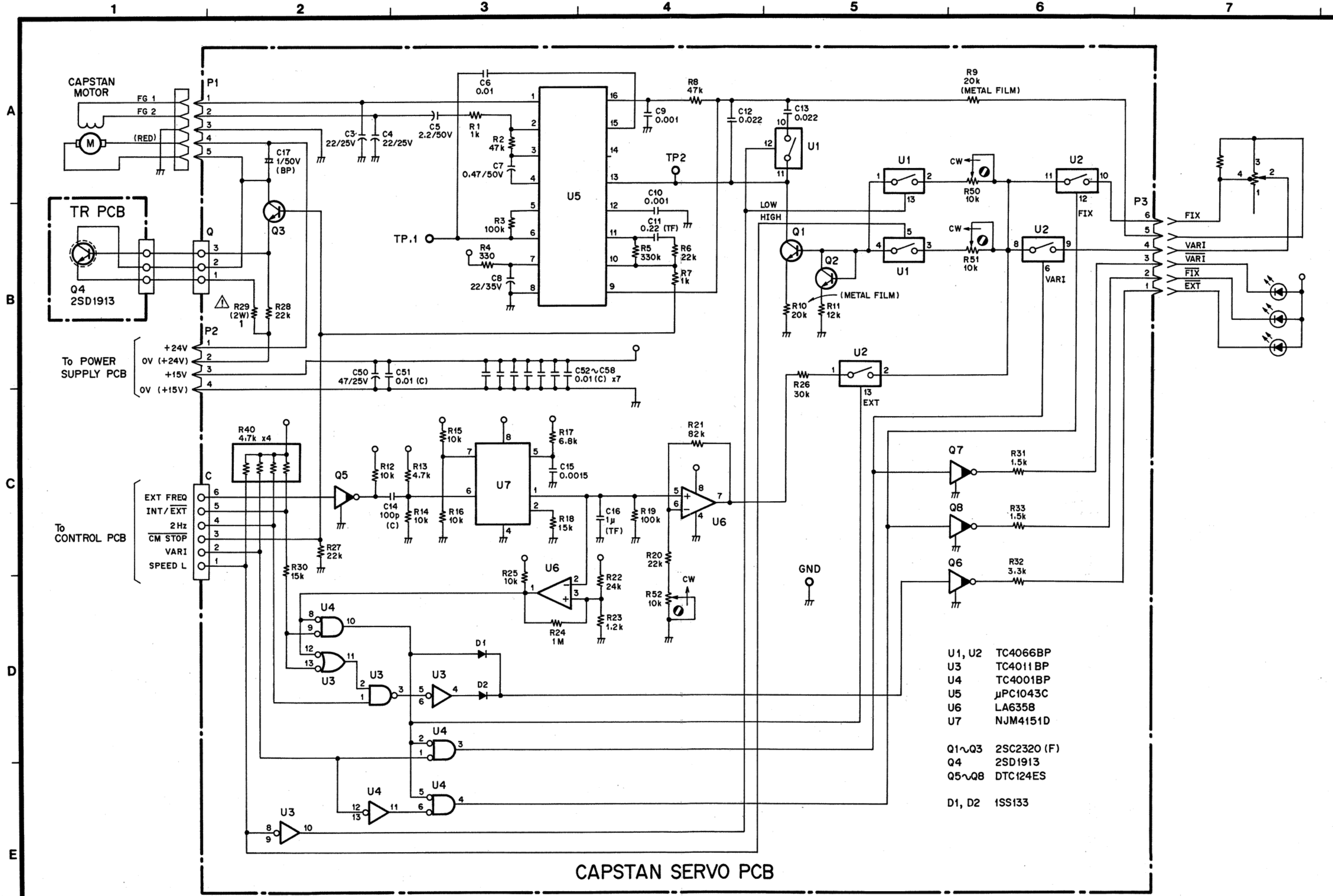


W1 : EUR, UK, AUS ONLY
W2 : EUR, UK, AUS -T2.5A 250V
W3 : EUR, UK, AUS -T6.3A 250V

PARTS - PAGE 52







CAPSTAN SERVO PCB

1 2 3 4 5 6 7

A

B

C

D

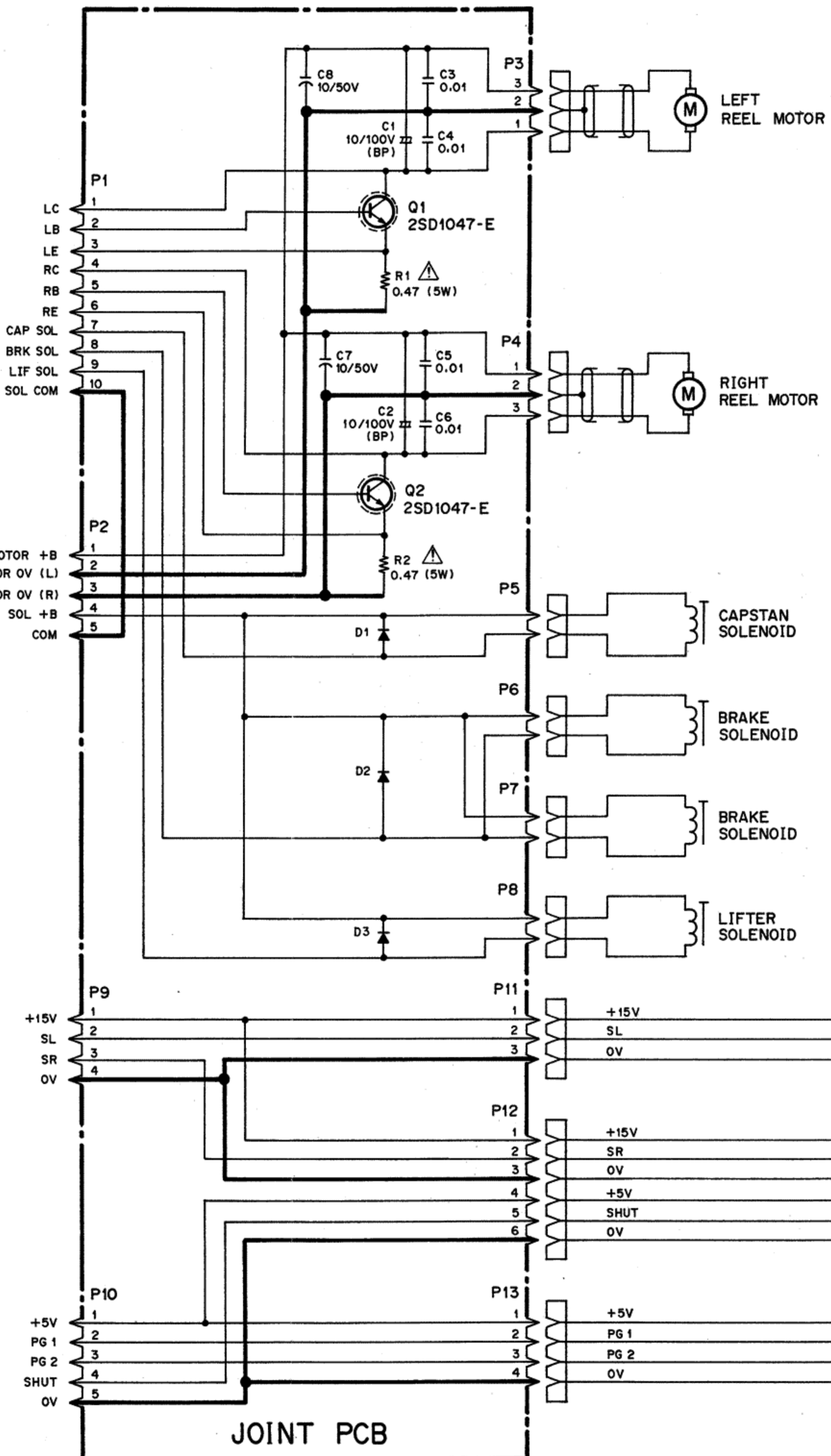
E

To CONTROL PCB

To POWER SUPPLY PCB

To CONTROL PCB (SENSOR 1)

To CONTROL PCB (SENSOR 2)



LEFT REEL MOTOR

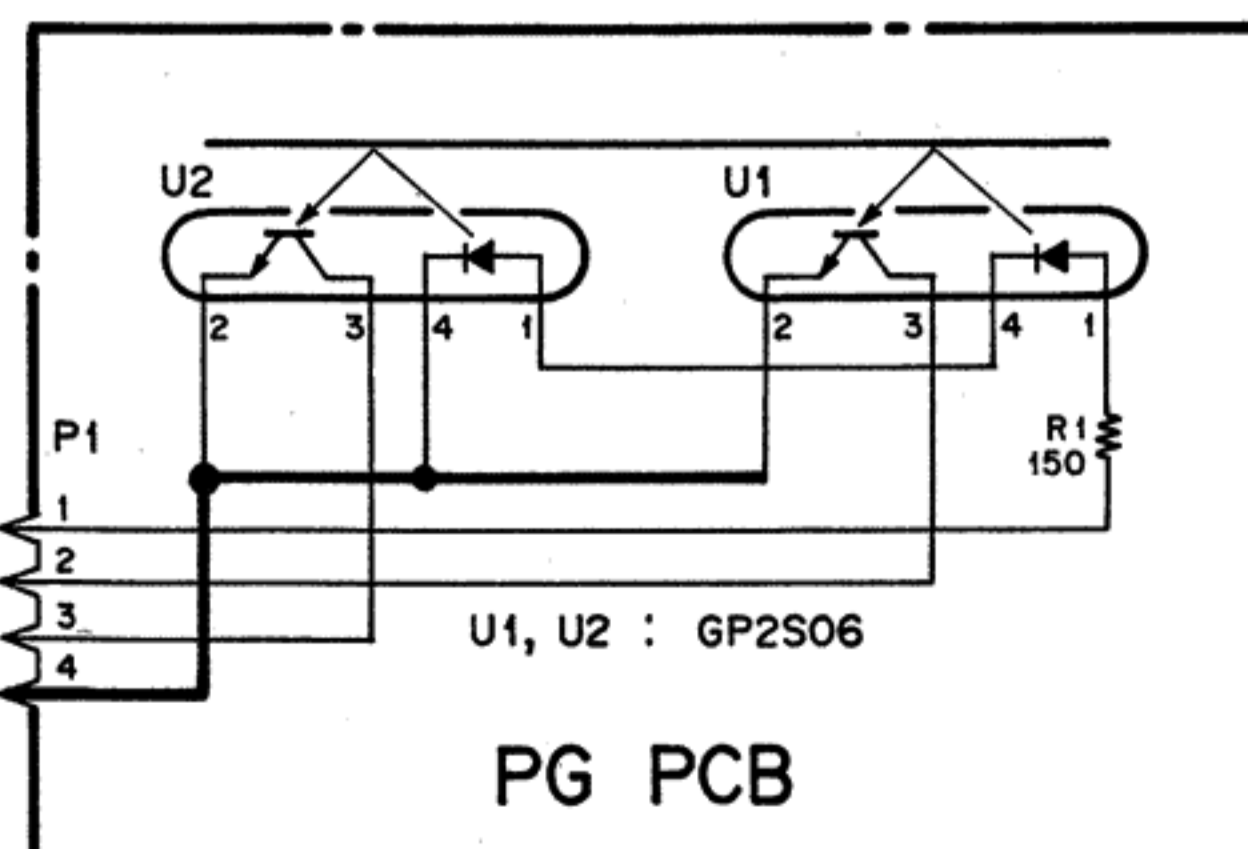
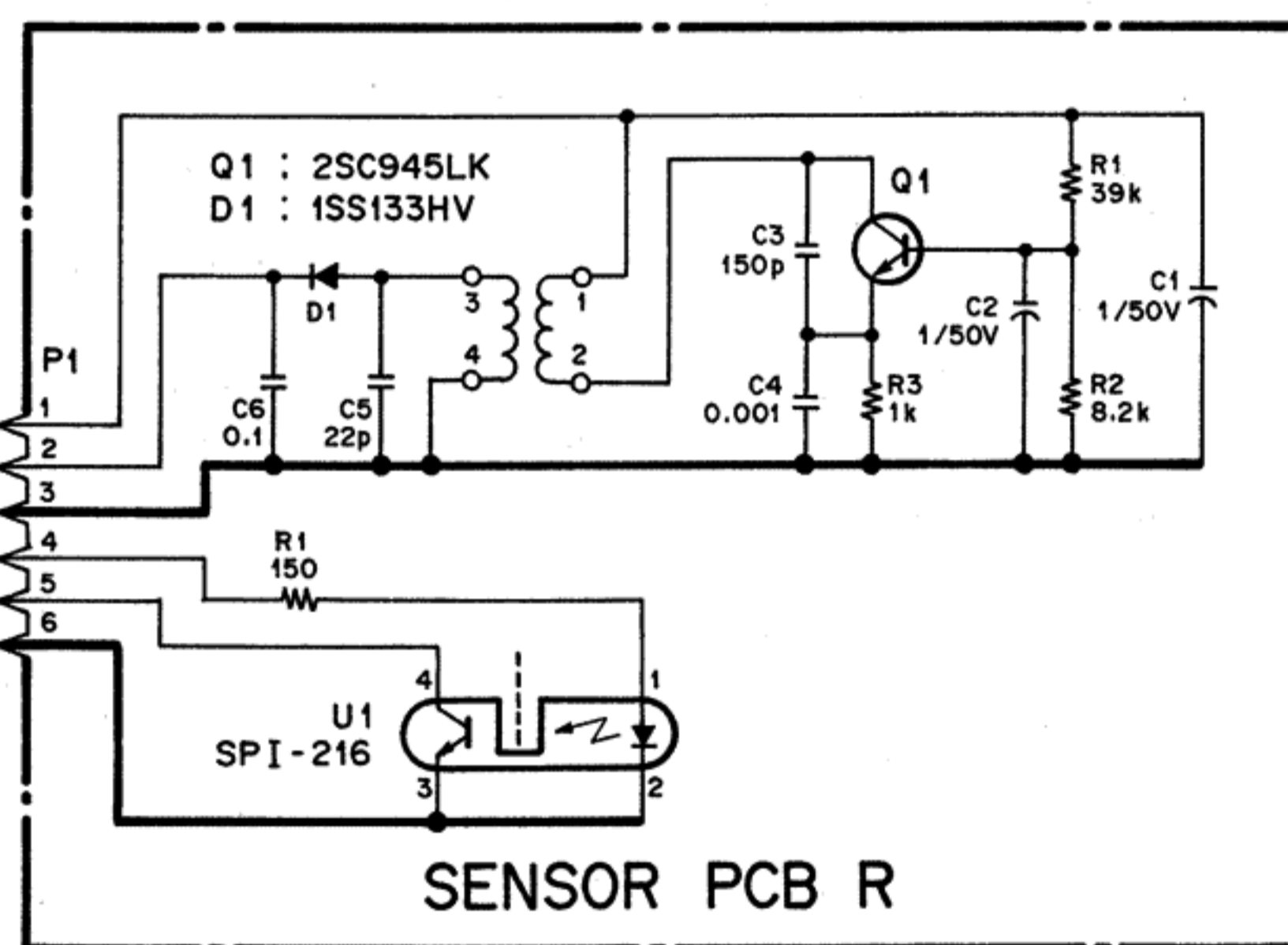
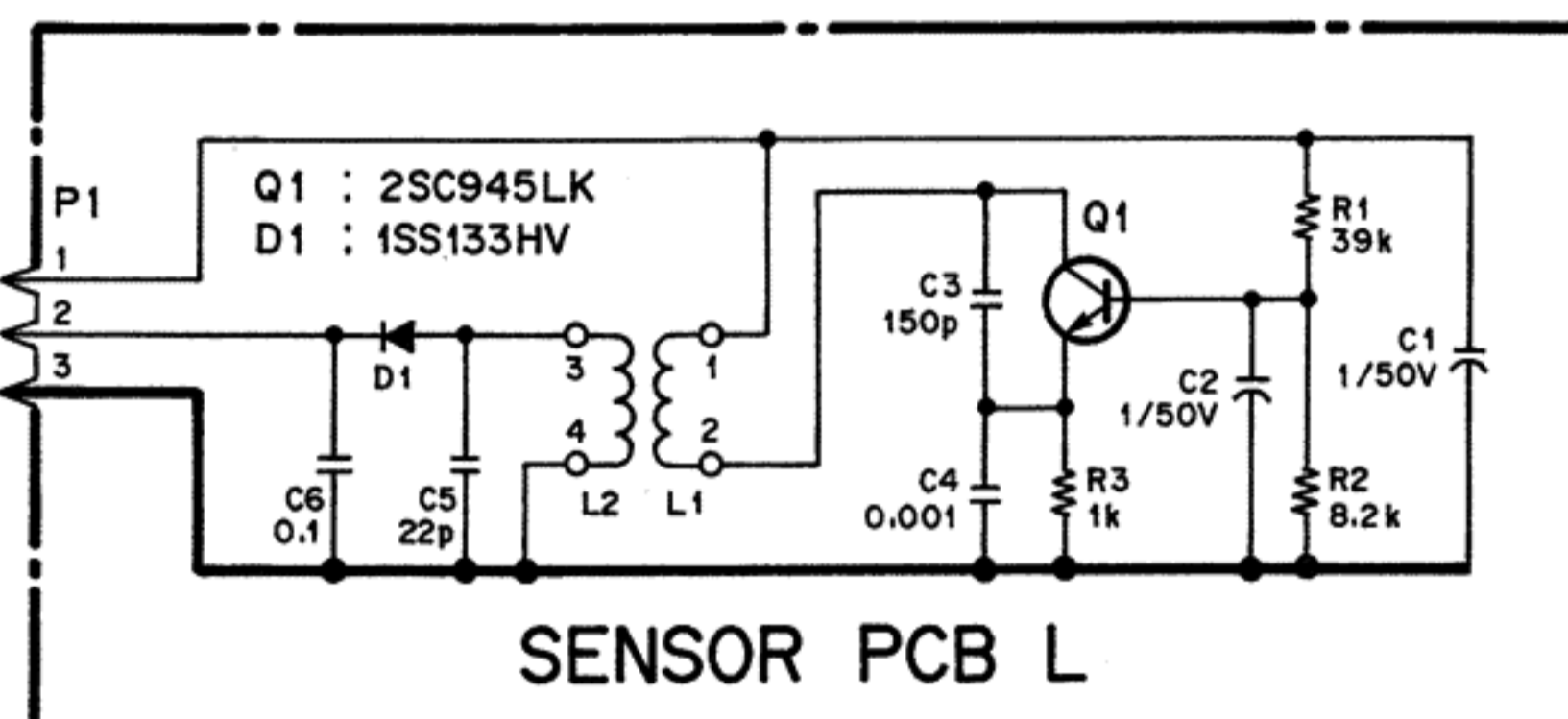
RIGHT REEL MOTOR

CAPSTAN SOLENOID

BRAKE SOLENOID

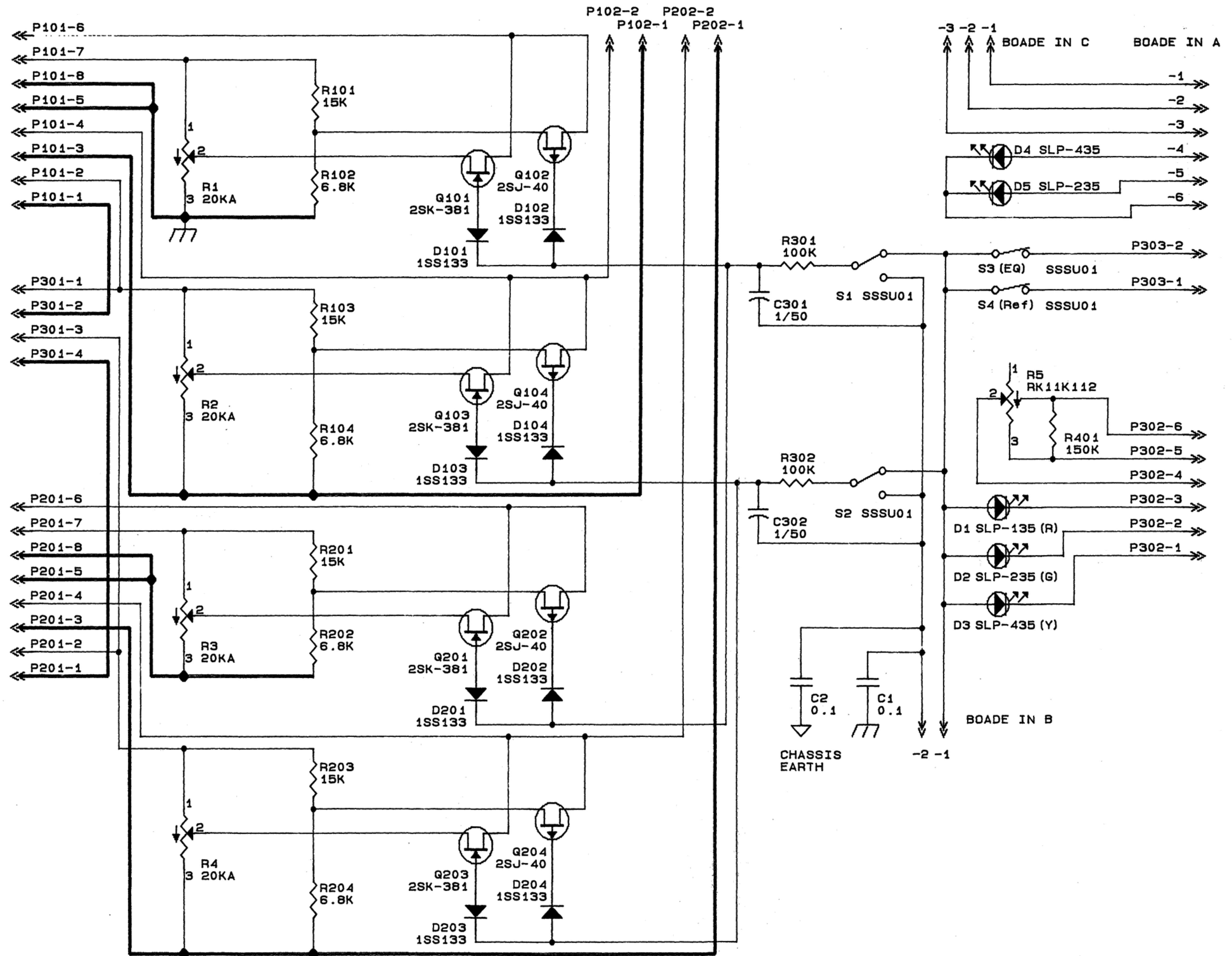
BRAKE SOLENOID

LIFTER SOLENOID



1 2 3 4 5 6

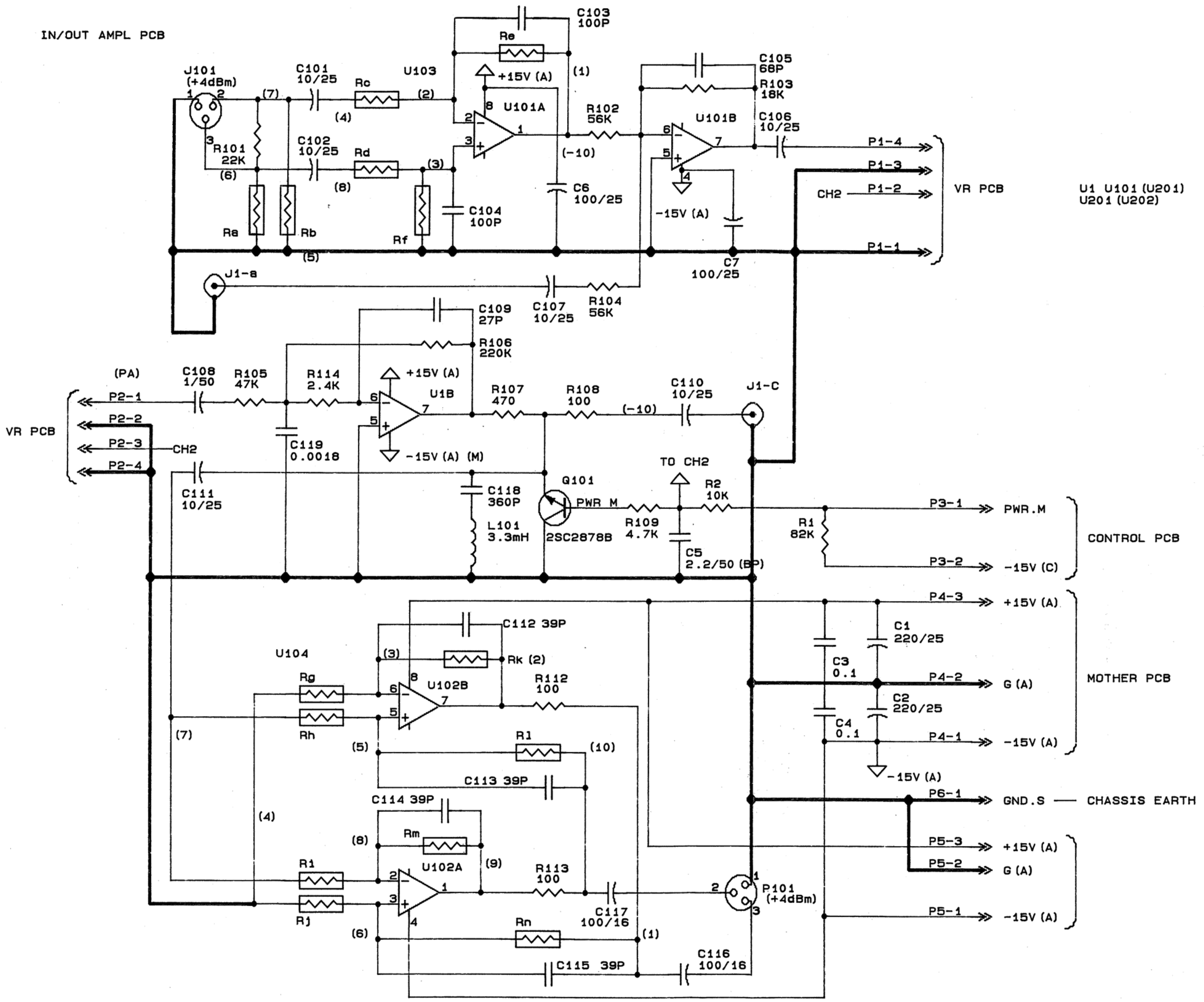
A
B
C
D
E



1 2 3 4 5 6

A
B
C
D
E

IN/OUT AMPL PCB



U1 U101 (U201) uPC4570C
U201 (U202) NJM5532D

1 2 3 4 5 6 7

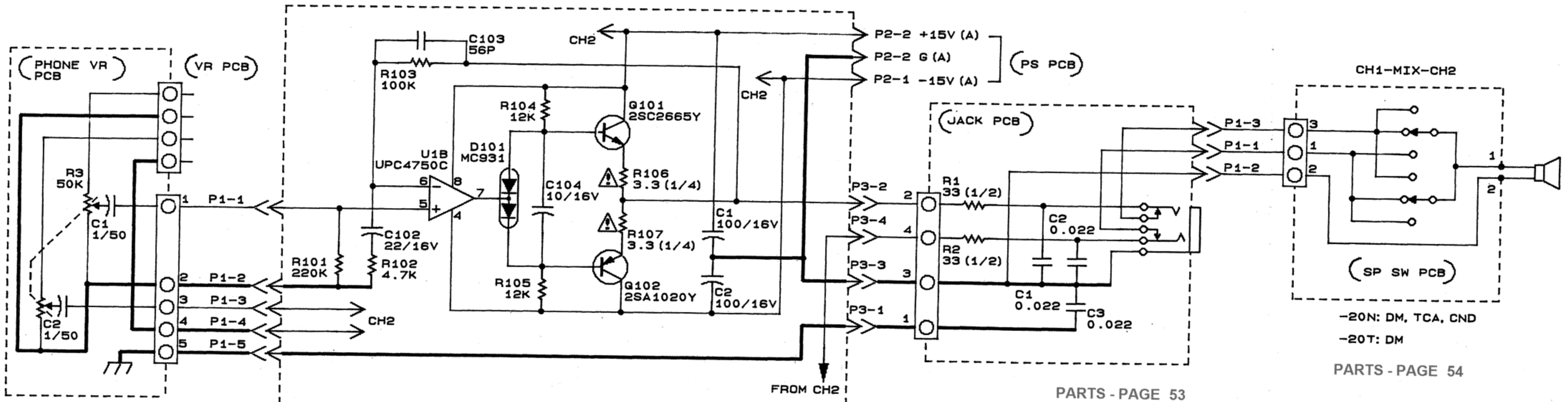
A

B

C

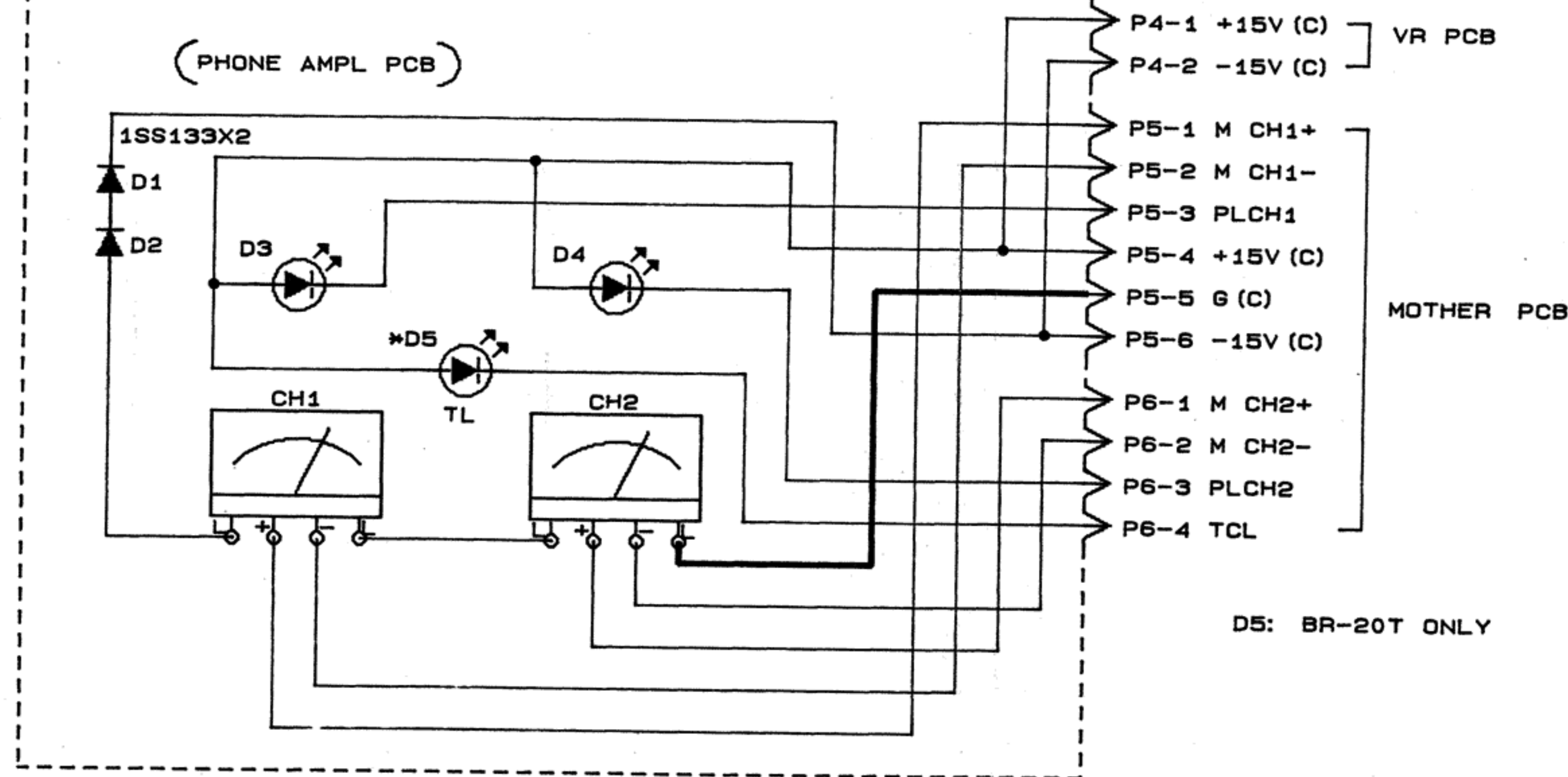
D

E



PARTS - PAGE 53

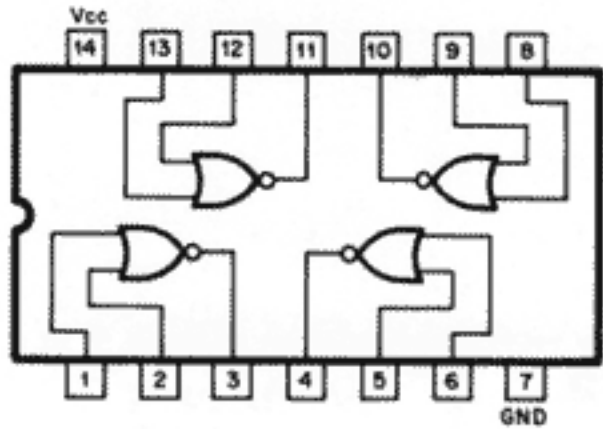
PARTS - PAGE 53



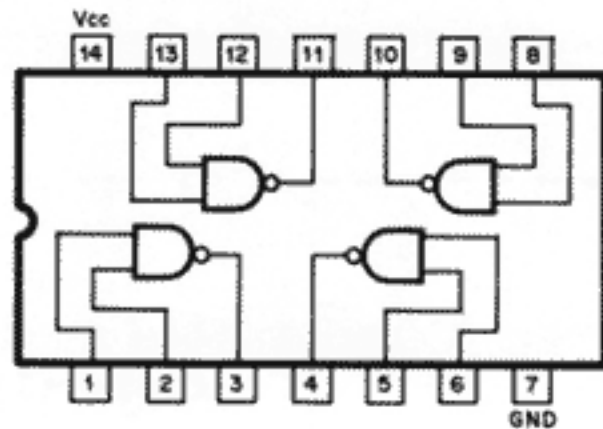
PARTS - PAGE 52

8-4. IC Internal Block Diagrams

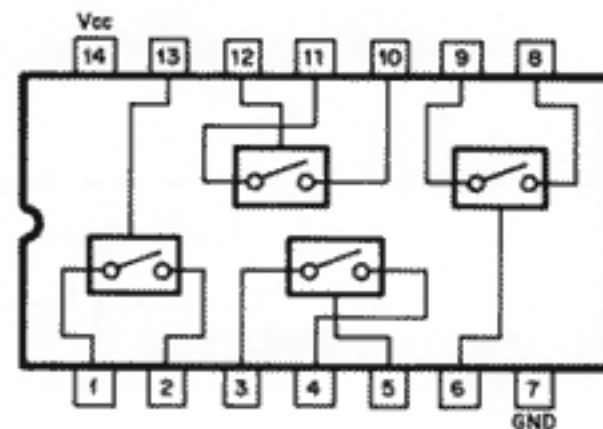
TC4001BP
QUAD 2-INPUT NOR GATES



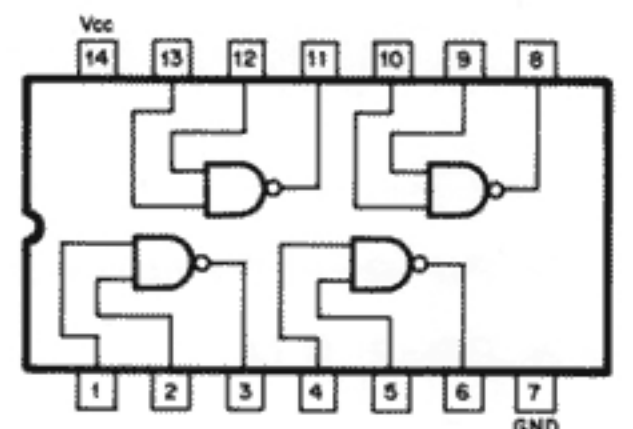
TC4011BP
QUAD 2-INPUT NAND GATES



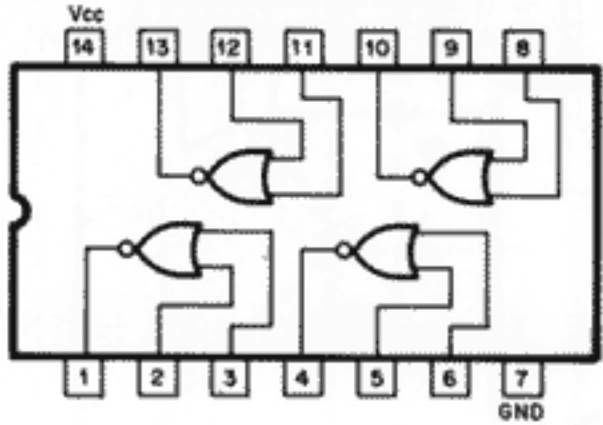
TC4066BP
QUAD BILATERAL SWITCHES



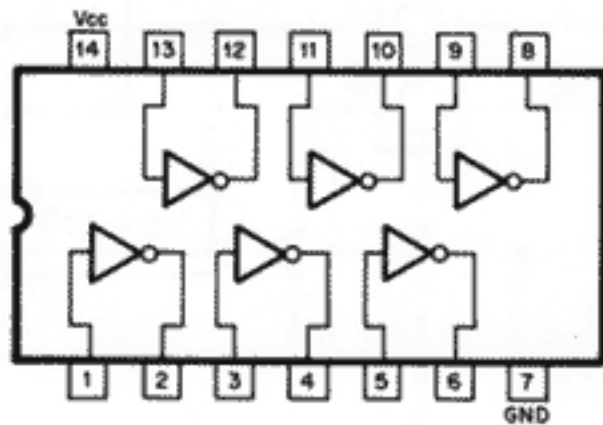
TC74HC00P
QUAD 2-INPUT NAND GATES



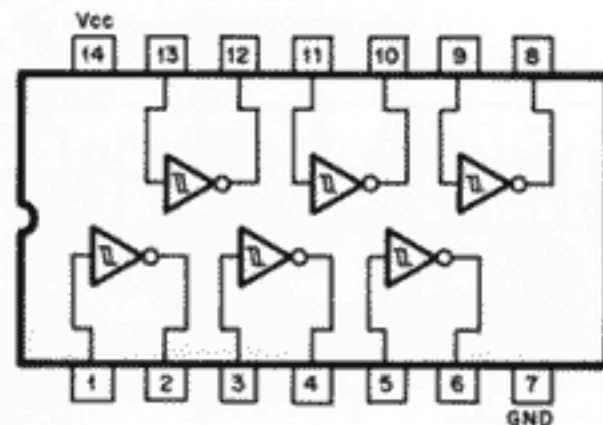
TC74HC02P
QUAD 2-INPUT NOR GATES



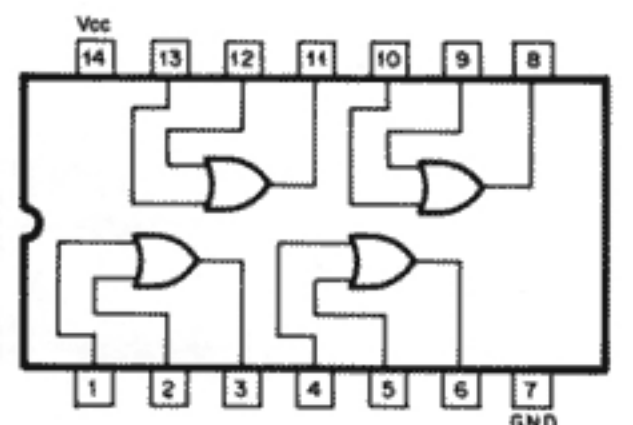
TC74HC04P
HEX INVERTERS



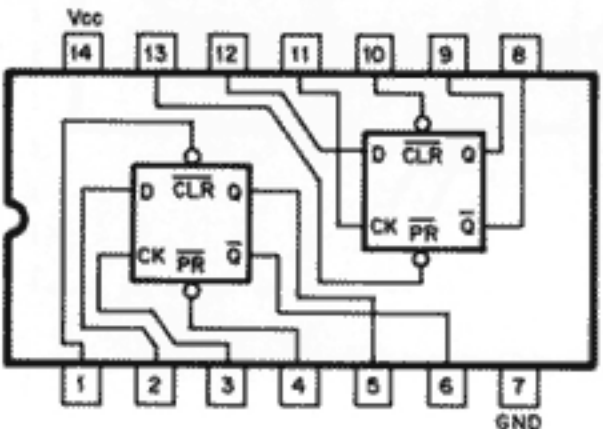
TC74HC14P
HEX SCHMITT INVERTERS



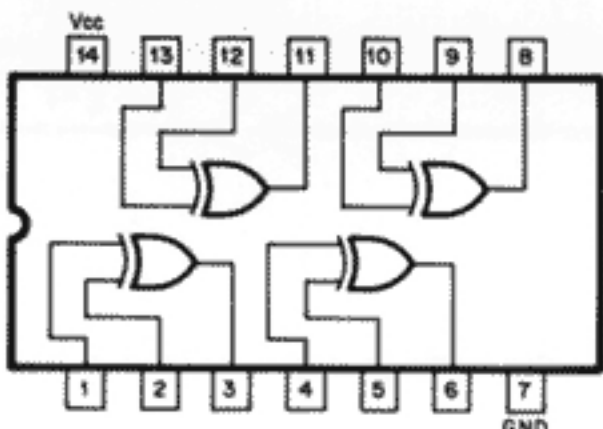
TC74HC32P
QUAD 2-INPUT OR GATES



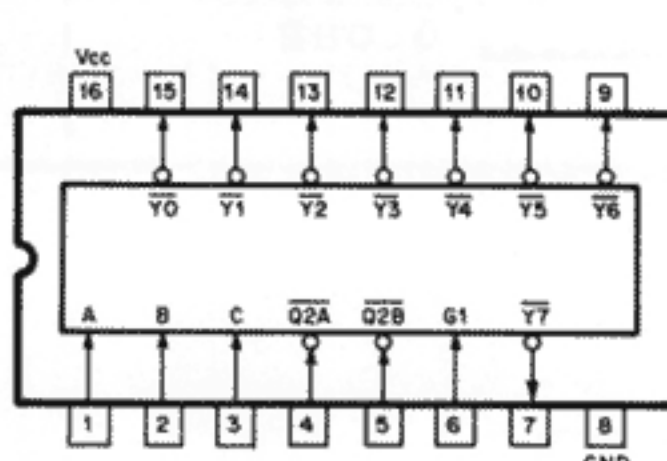
TC74HC74P
DUAL D FLIP-FLOP
WITH PRESET AND CLEAR



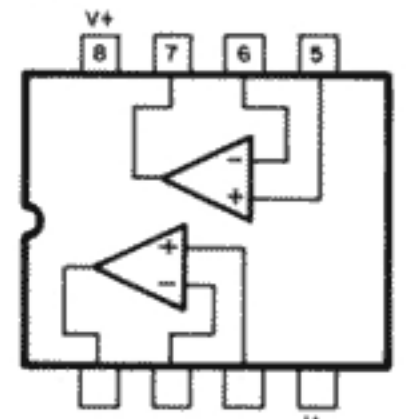
TC74HC86P
QUAD 2-INPUT
EXCLUSIVE OR GATES



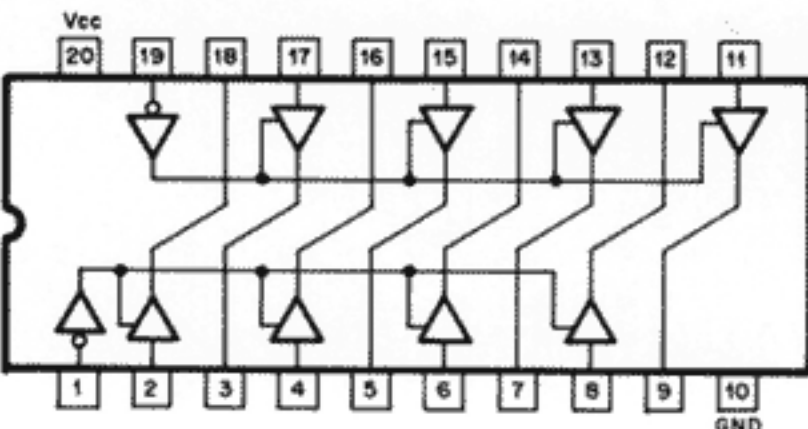
TC74HC138P
3-TO-8 LINE DECODER



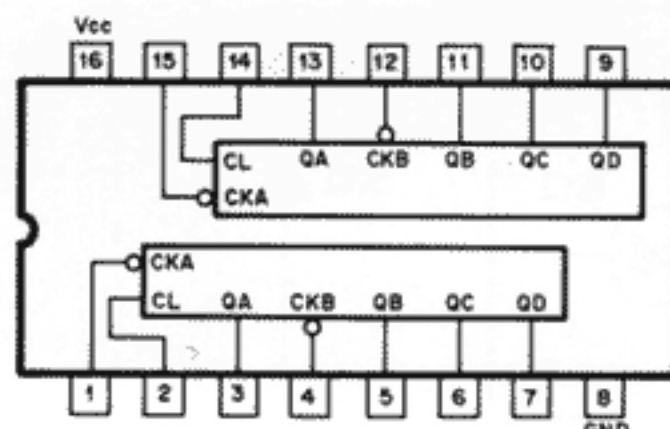
M5218P
μPC4570C
DUAL OPERATIONAL
AMPLIFIERS



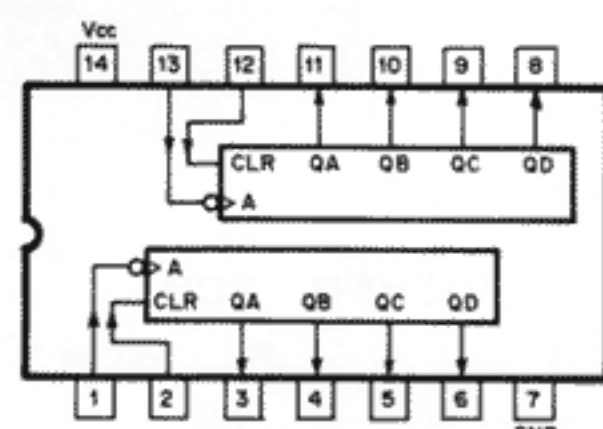
TC74HC244P
OCTAL BUS BUFFER
NON-INVERTED, 3-STATE



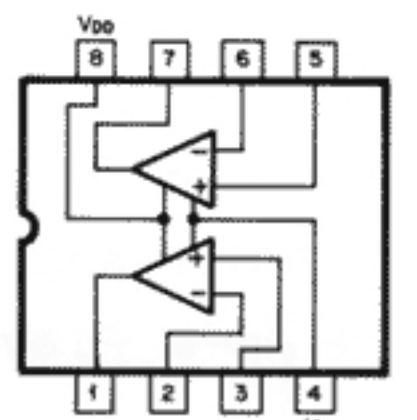
TC74HC390P
DUAL DECADE COUNTER



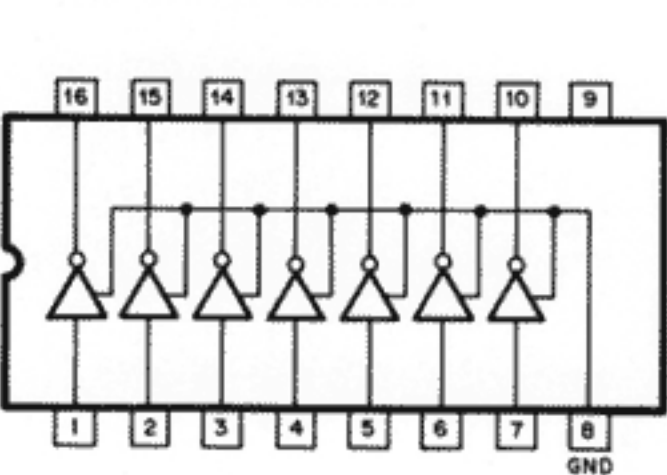
TC74HC393P
DUAL 4-BIT BINARY COUNTERS



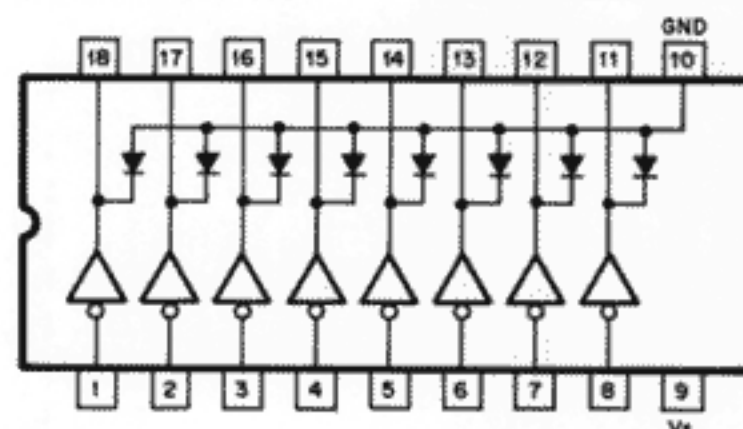
NJM5532D-D
DUAL OPERATIONAL
AMPLIFIERS



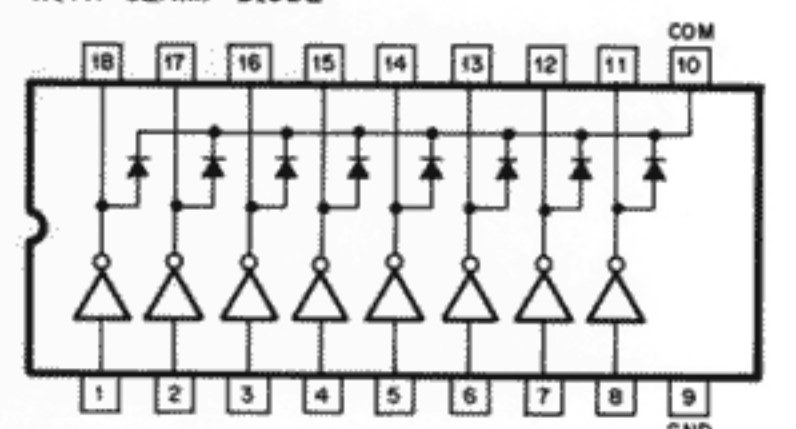
TD62504P
7-UNIT TRANSISTOR ARRAY



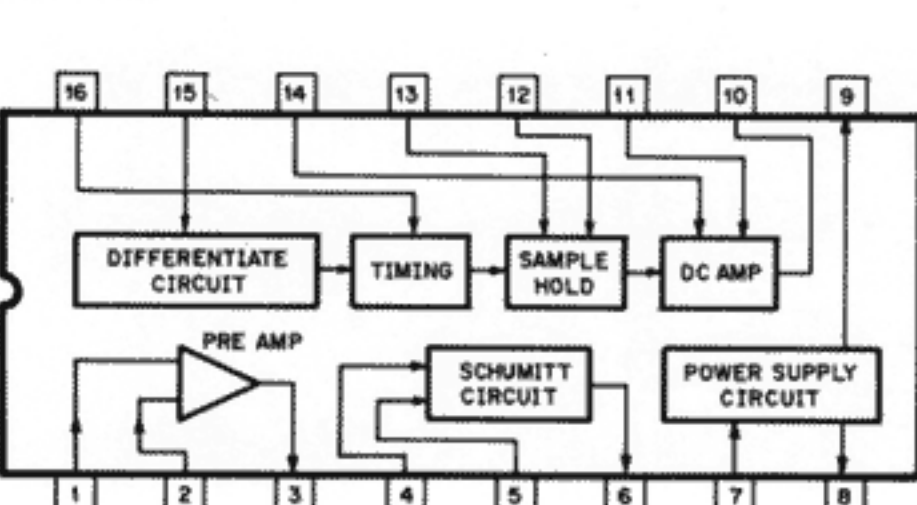
M54581P
8-UNIT 500mA DARLINGTON TRANSISTOR ARRAY
WITH CLAMP DIODE



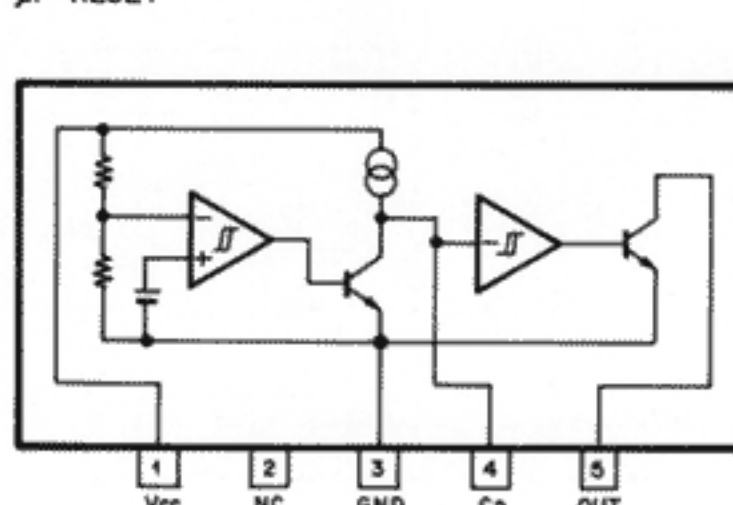
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WITH CLAMP DIODE



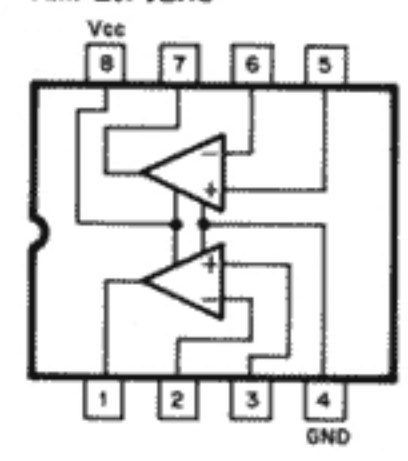
μPC1043C
F. G. SERVO



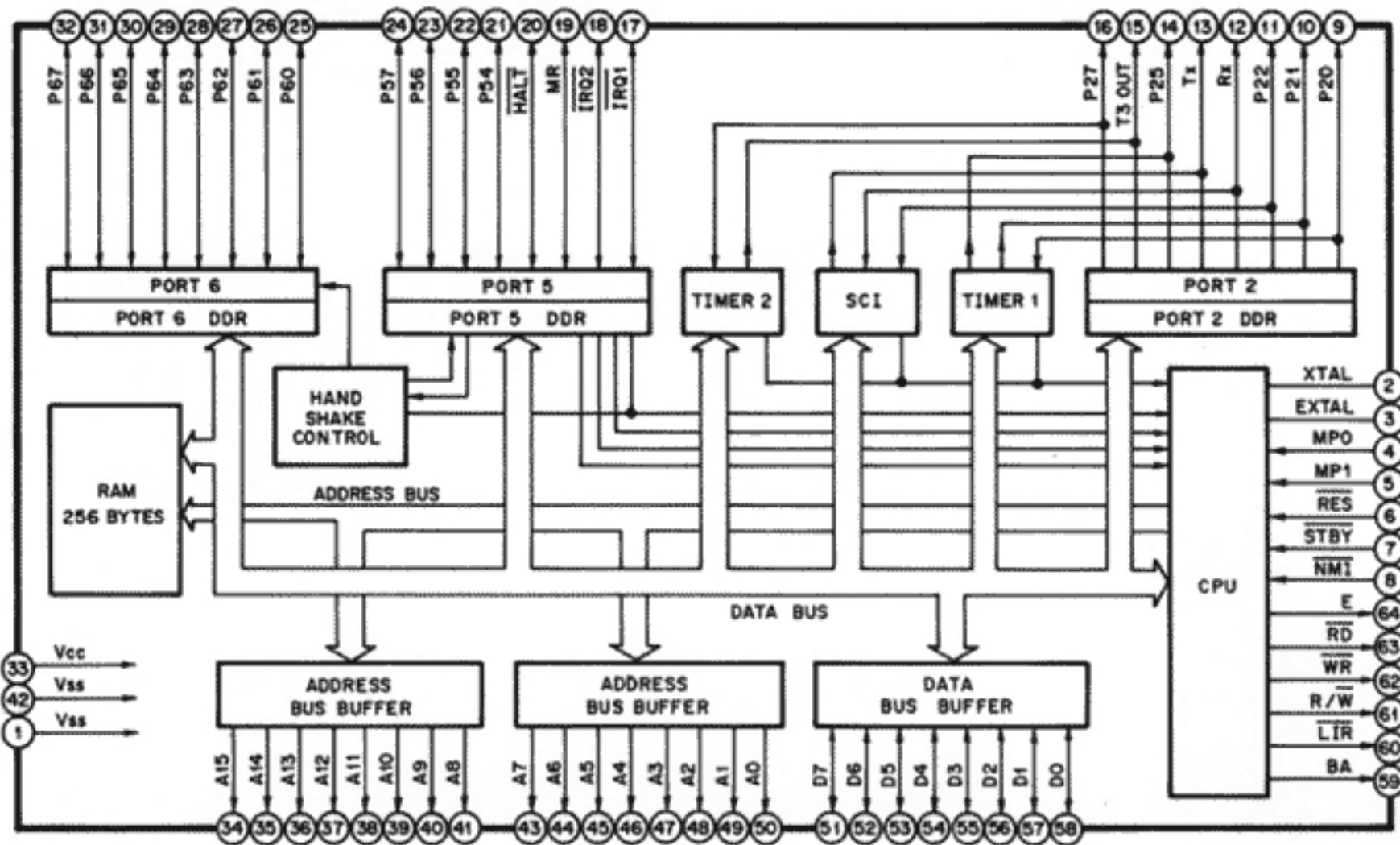
M51953BL
μP RESET



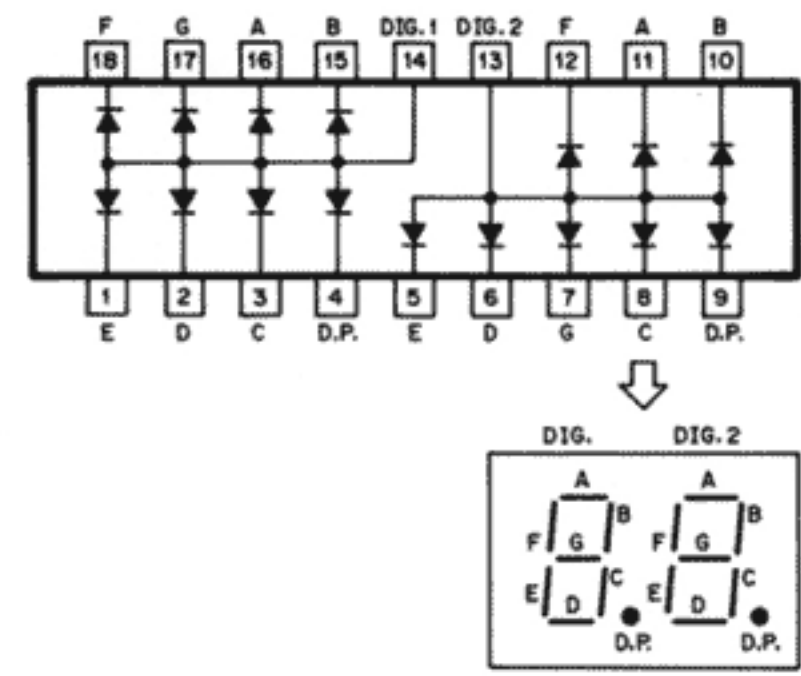
LA6358
DUAL OPERATIONAL
AMPLIFIERS



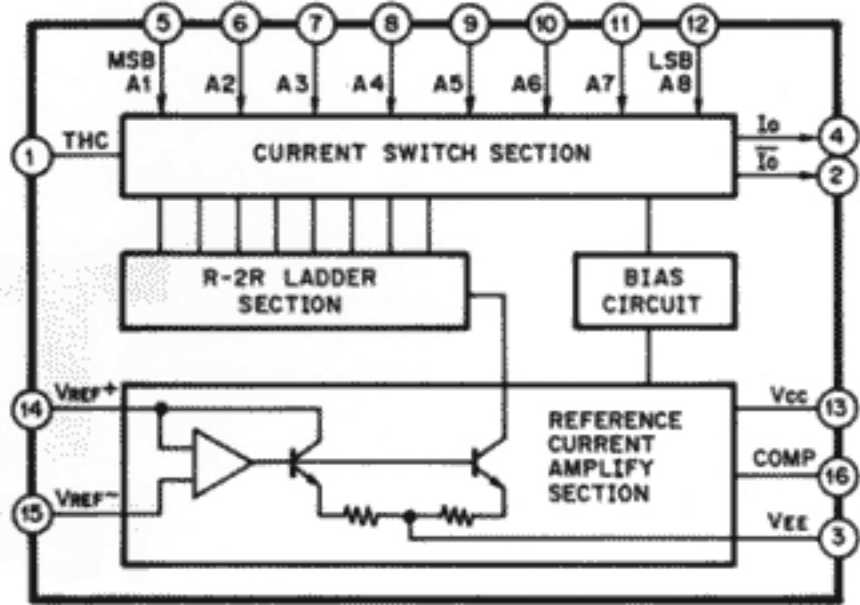
HD63B03YP
CMOS MPU



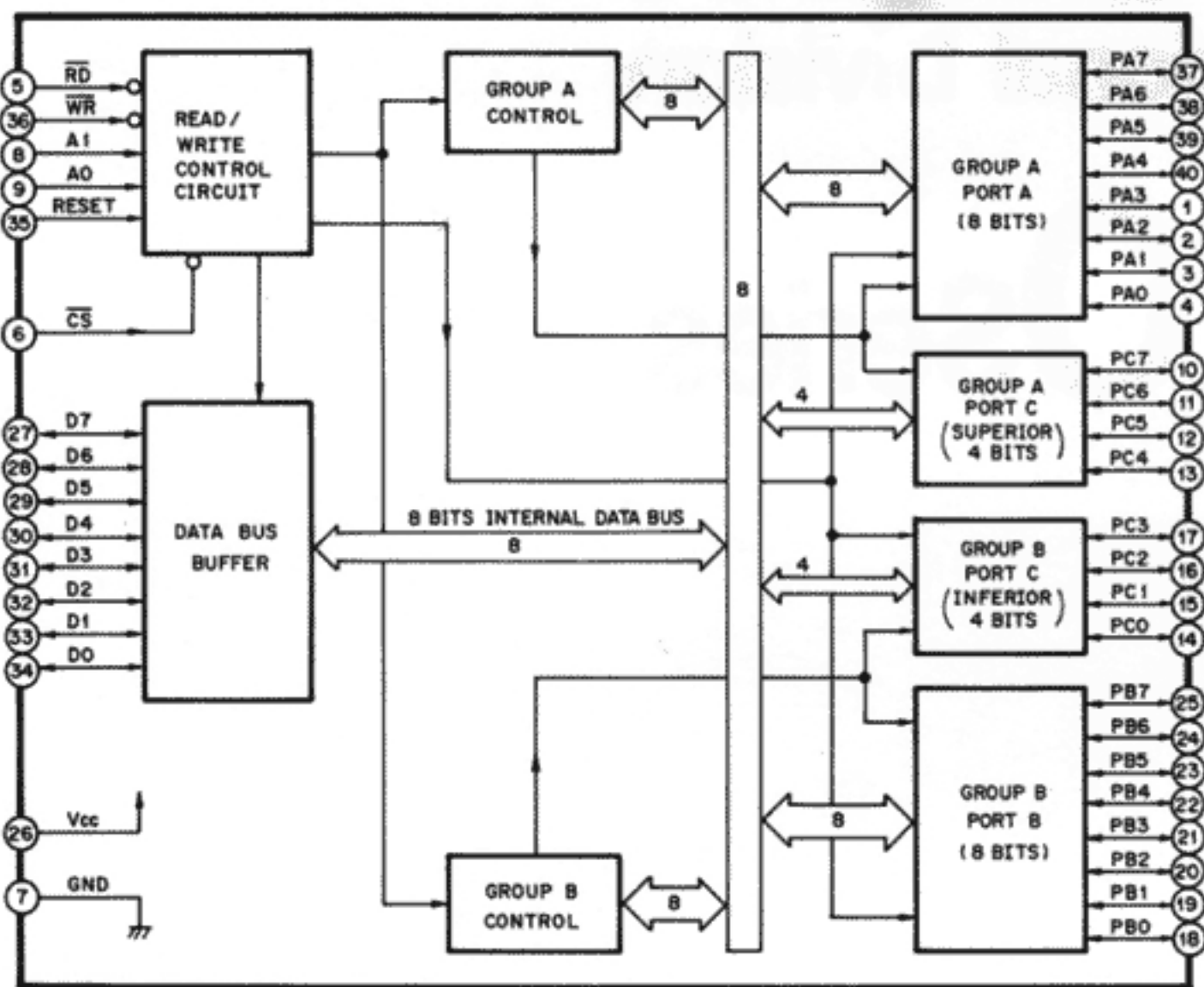
GL-7D201
NUMERAL DISPLAY



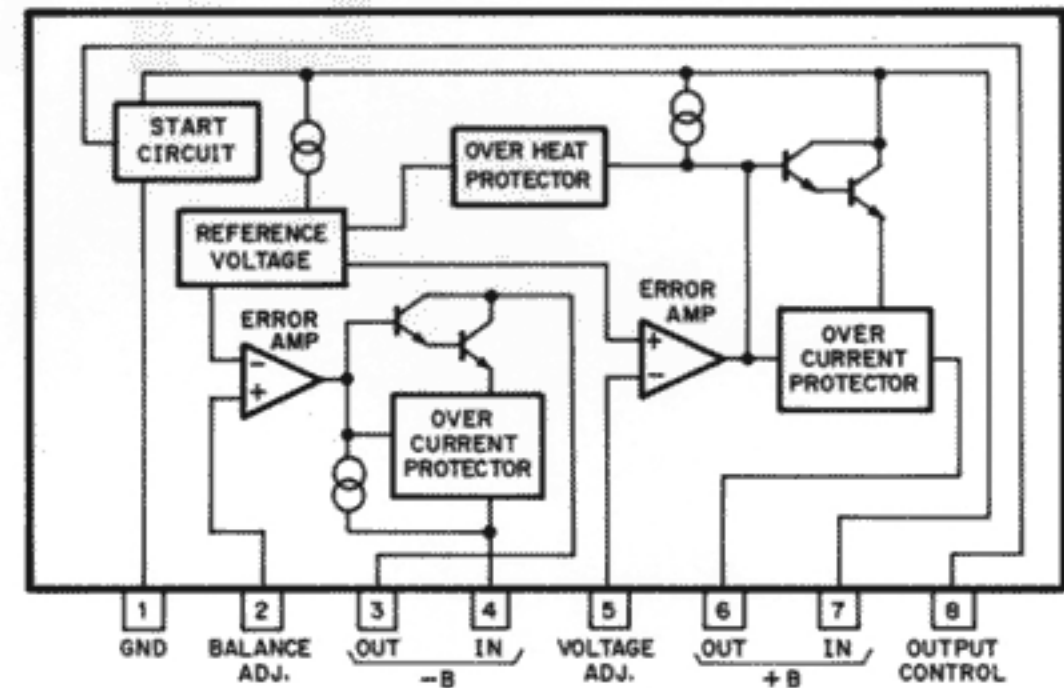
HA17008RP
8-BIT MULTIPLYING DIGITAL-TO-ANALOG CONVERTER



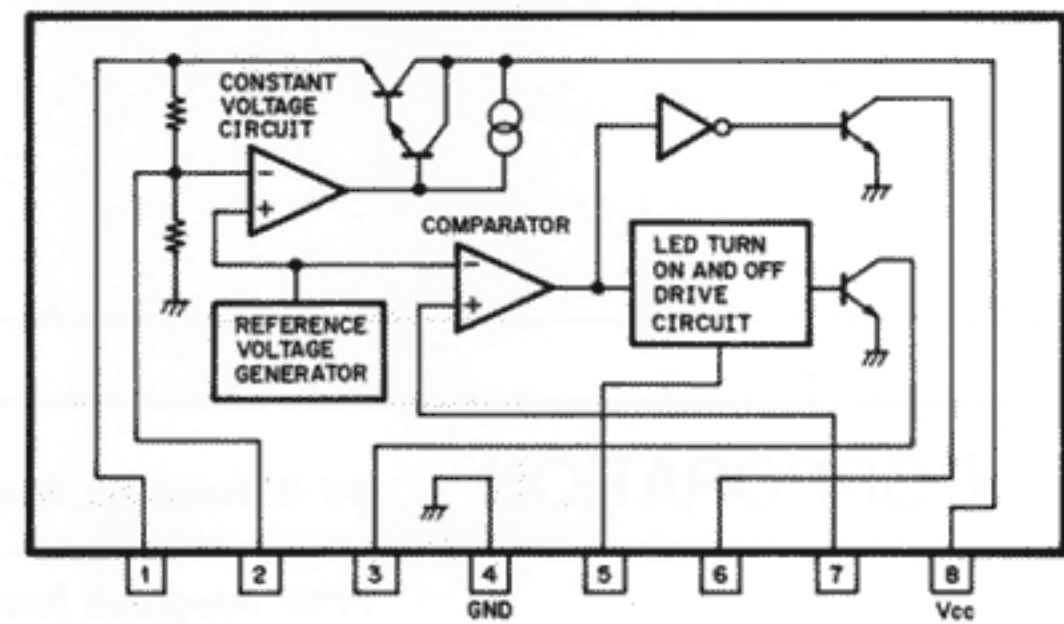
M5M82C55AP-2
CMOS PROGRAMMABLE PERIPHERAL INTERFACE



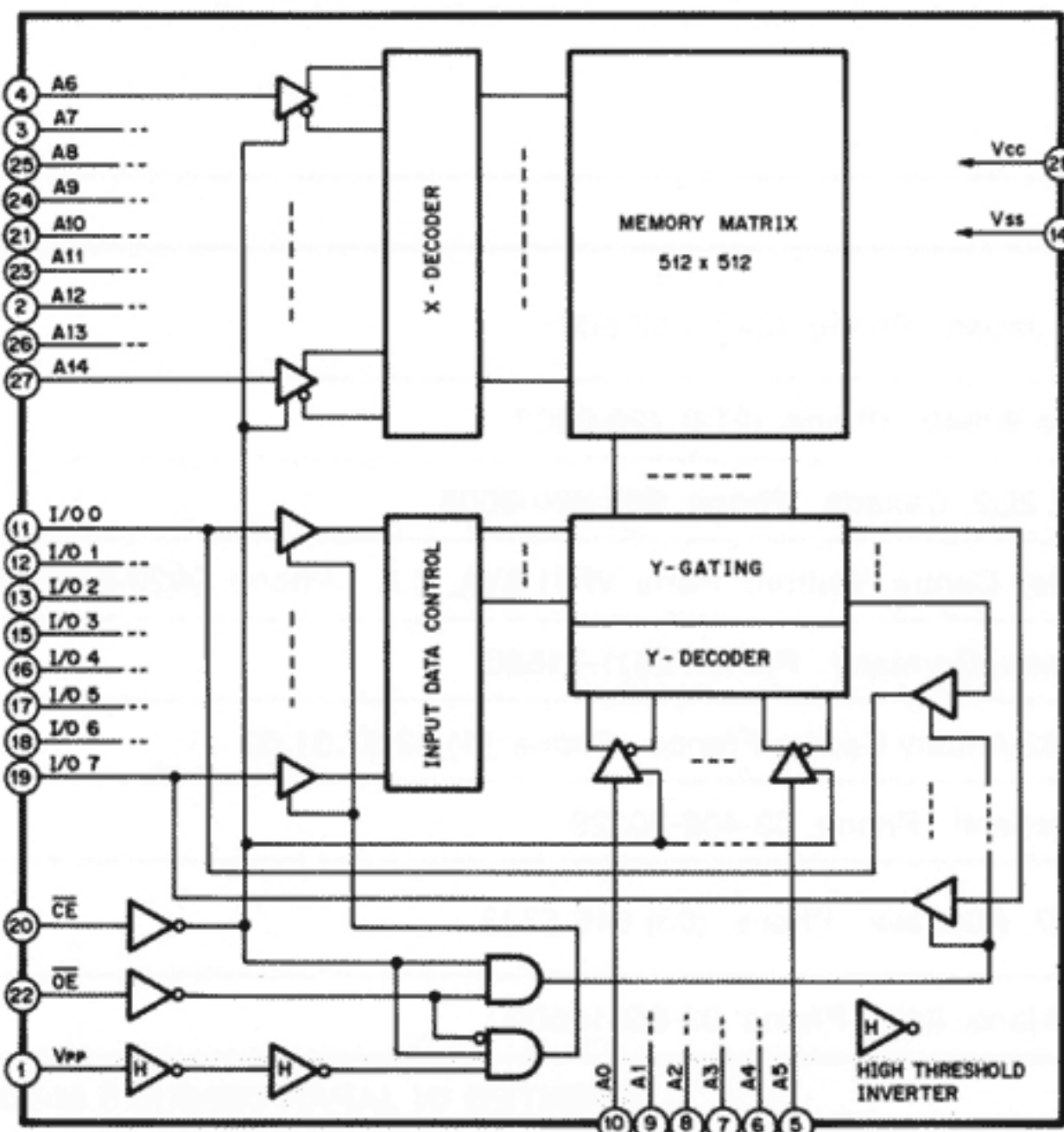
M5230LA
REGULATED VOLTAGE SUPPLY



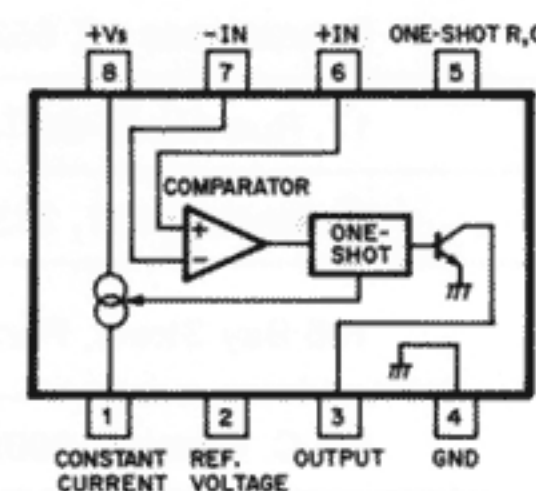
M5232L
VOLTAGE DETECT ALARM CIRCUIT



HN27C256G-20
32768-WORD x 8-BIT UV ERASABLE AND PROGRAMMABLE ROM



NJM4151D
V-F/F-V CONVERTER



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