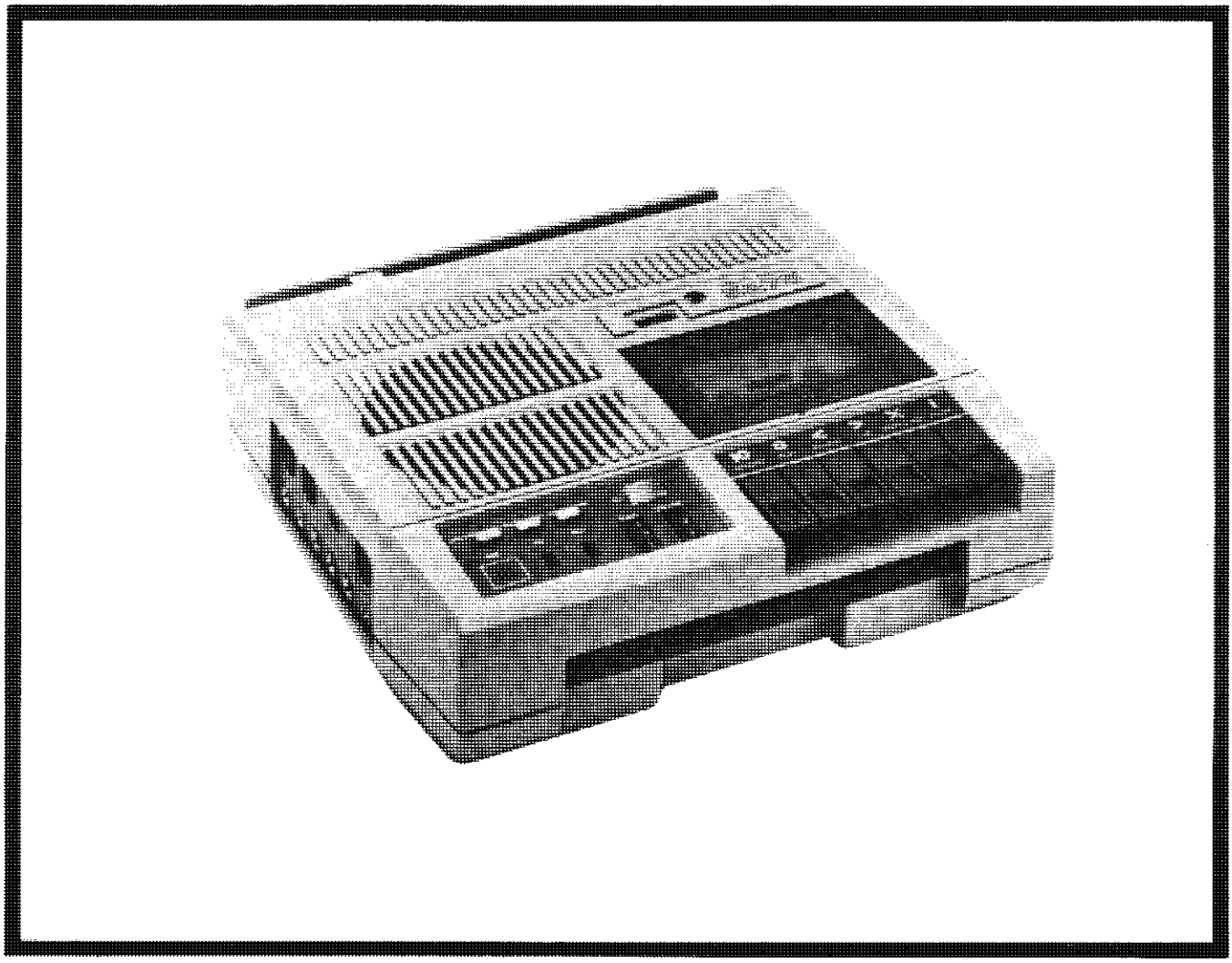
CALIFONE SERVICE MANUAL MODEL 5275



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SPECIFICATIONS

Power output:	2 watts continuous (rms) into 9 ohms at less than 5% THD,
Wow and Flutter:	Less than 0.22% wrms
Audio Frequency Response:	8Hz to 10kHz +/-3dB.
Signal to Noise Ratio:	45 dB minimum unweighted.
Mic Input:	0.25 mV sensitivity, for use with microphones with impedance ratings between 50 and 5,000 ohms.
Aux Input:	250 mV sensitivity at 15,000 ohms impedance.
Aux Output:	500 mV from 0 dB reference tape, 250 nW/m., I,000 ohms impedance
Sync Track Frequency Response:	80 Hz to 8,000Hz +/-5 dB.
Sync Input/Output:	500 mV rms referred to 250 nW/m. recorded level
Sync Tones:	150 Hz Tape Stop/Restart, 1,000 Hz Slide advance.
Fast Forward/Rewind Time:	100 seconds for C-60 cassette.
Speaker:	5" round.
Power Source:	12OV 50-60 Hz AC (240V 50-60 Hz option available) or four D-size batteries.
Dimensions:	1 1" x 1 1" x 3-1/2".
Weight:	Approximately 6.0 Ibs.

DESCRIPTION OF OPERATION

POWER SUPPLY

Power can be supplied to the 5275 either via line cord or batteries. The unit comes wired for 12OVAC but the wiring can be changed to 230VAC. Contact the factory for details. Q10 is a diode-connected germanium transistor, used to keep AC-derived power from being fed into the batteries while offering the lowest forward voltage drop from the battery supply. D21 prevents battery voltage from charging C97, eliminating the possibility of capacitor leakage causing the battery to rundown.

SW9 switches on the power whenever the tape transport is engaged. Thedifferent LEDs can be monitored by putting the transport into Play and Pause.

AUDIO RECORD/PLAYBACK

The use of an integrated circuit designed specifically for cassette systems considerably simplifies the circuitry necessary for record and playback of audio signals in the 5275. This monolithic IC contains a preamplifier circuit, an automatic level control circuit, a bridged power amplifier, and a meter drive circuit. Consequently, the external circuitry for the audio portion of the 5275 consists mainly of switching, equalization, and coupling. The only active devices are Q12 and Q13, which mute the main amp during turn-on while the preamp voltages come up and stabilize. Q14, an Aux Out buffer, and Q18, which locks the ALC circuit off in Audio Playback.

For recording, the Bias Oscillator is turned on via SW1-5 by biasing Q2 to saturation. This provides aground to the emitter of QI, which starts the Bias Oscillator.

With no external inputs connected to the unit, the Internal Microphone is automatically connected as a signal input in the Record Mode. Plugging in an Auxiliary Input disconnects the Internal Mike; connecting an External Microphone disconnects either the Internal Mike or the Aux Input. The Internal Loudspeaker is disconnected in the Record Mode to eliminate acoustic feedback. The signal being recorded can be monitored via the External Speaker Jack by headphones or by a loudspeaker placed far enough from the signal source to prevent acoustic feedback.

CAUTION: Always be sure the Red Cue (Sync) Rec/Erase light is OFF when playing an audio-only tape with material recorded on both sides.

When playing back prerecorded tapes, it is possible, under the following circumstances, to erase the side of the tape you are not listening to:

1. Sync Rec/Erase On
2. Erase Prevention Tab for other side is in place (affects homemade tapes: commercial tapes come with this tab removed).

The reason for this is that the Sync Track recorded by the 5275 corresponds to the "other side" of a normal audio-only cassette. Thus if you take a cassette you have recorded and play it on the 5275 with the Sync Record Switch on, you will erase the side you are not listening to unless me small plastic tab at the rear right has been pushed out. If the tab has not been removed, SW8 will dose. allowing SW5 to turn on the Sync Record/Erase circuitry. Commercial tapes are not subject to this problem as they come with no tab in place.

SYNCTONERECORDANDPLAYBACK

The 5275 has circuitry for sensing and recording 150 Hz and 1 kHz tones for making and using ANSI Standard synchronized slide programs using one or two slide projectors or one slide projector with a Sync (Cue) Tone to stop the cassette motor. The following description primarily concerns itself with the 150 Hz sensing circuit; the 1 kHz circuit is identical in theory, differing only in time constants, except as noted.

The heart of the circuit is a twin-T network in the feedback of IC3D. This network has medium Q and makes the IC a sensitive filter. When the Q issufficientlyincreased, the IC bewmes an oscillator. The combination of R132 and R163 makes the network have only medium Q; when Q8 shunts R163, the circuit oscillates, generating a Sync Tone.

SYNC PLAYBACK SECTION

Let's follow a prerecorded Sync Tone of 150 Hz through the unit, noting the difference between what a 150 Hz and a 1 kHz tone does

In the Playback Mode, RL-3 is off, leaving the Sync Track Erase and Record/Playback Heads connected as shown in the schematic. The signal comes off the head and is mixed with 2.3V DC from voltage divider RIO7, R108, R111 This DC voltage biases IC2A for midpoint operation. The signal is amplified and equalized by IC2A, further amplified by Q15, and goes through SW4-1 and the Sync Out Jack. The 2.3V DC level is present at the output of IC2A, and is fed through R128 to the emitter of Q4 and through R141 to the base of Q5. SW4-1 is set to either Tape Stop or Proj 2 for Sync use; the center CM position is used when playing a standard audio tape so that a 150 Hz audio tone on the cassette will not command a Motor Stop. When an output is taken from the Sync Out Jack, the Sync Tone does not proceed through the 5275, ensuring that a Motor Stop command can not stop the motor when a program tape is being copied.

VR3 adjusts the level of the Sync signal going into the Tone Sense and Projector/Motor Control circuits. The signal is fed to the non-inverting input of IC3D, which is biased by RI20 and RI35. The twin-T network feeds back to IC3D all but the Sync Tone. causing the Sync Tone to be greatly amplified. Q16 is on during normal playback, so the signal proceeds to a rectifier and filter circuit which turns on IC2D, a comparator with hysteresis set to trigger with any input greater than one signal diode drop (approx. 0.2V DC). At this point several things can happen in the 150 Hz circuit; in the 1 kHz circuit, Cl3 turns on RL-1, advancing Projector 1 **one** frame.

In the 150 Hz circuit. Q6 is turned on when IC2D comes high. If SW4's in the Proj 2 position, this turns on RL1, advancing Projector 2 by one frame. If SW4 is in the Tape Stop position, Q6 brings the emitter of Q5 low in comparison with the 2.3V DC derived from IC2A, turning on Q5. The charge on C96 (at the motor) is then shunted to ground through RI 64, Q5, SW4, and Q6, turning off Q1, and the motor stops. As the charge on C67 drops to zero volts, C102 discharges and Q16 turns off. Current flows through Q4 to the base of Q6, keeping the motor off until SW7, the Tape Stop/Restart Switch, is activated.

When SW7 is activated, 5V DC is fed through D6 to the base of Q4. D25, connected from RI74 and C63 to the motor (which is now 0ff and effectively at ground), shunts this voltage away from the 150 Hz generating circuit described in the Sync Record section below, thus keeping the motor from being turned off again during the restart process. Bringing up the base of Q4 turns it off, turning off Q6, turning off Q5, allowing C96 to charge, turning on Q11 and the cassette motor. Q1 6 is already turned off, so any remaining Sync Tone on the tape can not restop the motor. The collector voltage of Q6 is pulled up by R144 and Tape Stop LED D18. C102 on Q16 is meanwhile slowly charging; about nesecond is necessary to charge this capacitor and enable the circuit to tum the motor off again.

In the Playback Mode, any external Sync In is shunted to ground through RI45, bias trap C73 and L4, and RL-3. The Sync Out Jack disconnects the sync signal from the Sync Tone Sense circuitry whenever a connector is plugged into the SyncOut Jack so that a Motor Stop command on the tape will not stop the motor while a tape is being copied.

During Audio Record, a large amount of Bias frequency signal is induced in the Sync Playback head; Q17 shunts this to ground in the Audio Record Mode to keep the electronics from being overwhelmed by this unwanted Bias signal.

SYNC RECORD SECTION

SW5 and SW6 enable the Sync (Cue) Tone Erase/Record circuitry when they are closed, biasing IC2B for midpoint operation, turning on RL-3 and Dl6, and biasing Q2 into saturation, which starts the Bias Oscillator by providing a ground for the emitter of Q1. (For audio recording, the biasoscillator is turned on by **SW1-**5 whether Sync Record is on or off.) SW6 is located in the tape transport, behind the right side of the cassette. It closes when the Erase Prevention Tab of the cassette is in place. (See the Caution in the Audio Playback section regarding accidental erasure of prerecorded tapes.) SW5 is the front panel Sync Record Switch.

When SW5 and SW6 are both closed and the transport is engaged. Sync Tones are recorded on the cassette whenever SW6, Slide Advance (Proj I), or SW7, Tape Stop/Restart (or Proi 2), is closed. Sync tones are audible through the loudspeaker during the Sync Record due to magnetic coupling between the two halves of the Record/Playback Head.

Let's follow the signals through the record circuitry of the 150 Hz section, noting the differences between the 150 Hz and 1 kHz sections. The 150 Hz section is chosen for this example as it is the more complicated circuit.

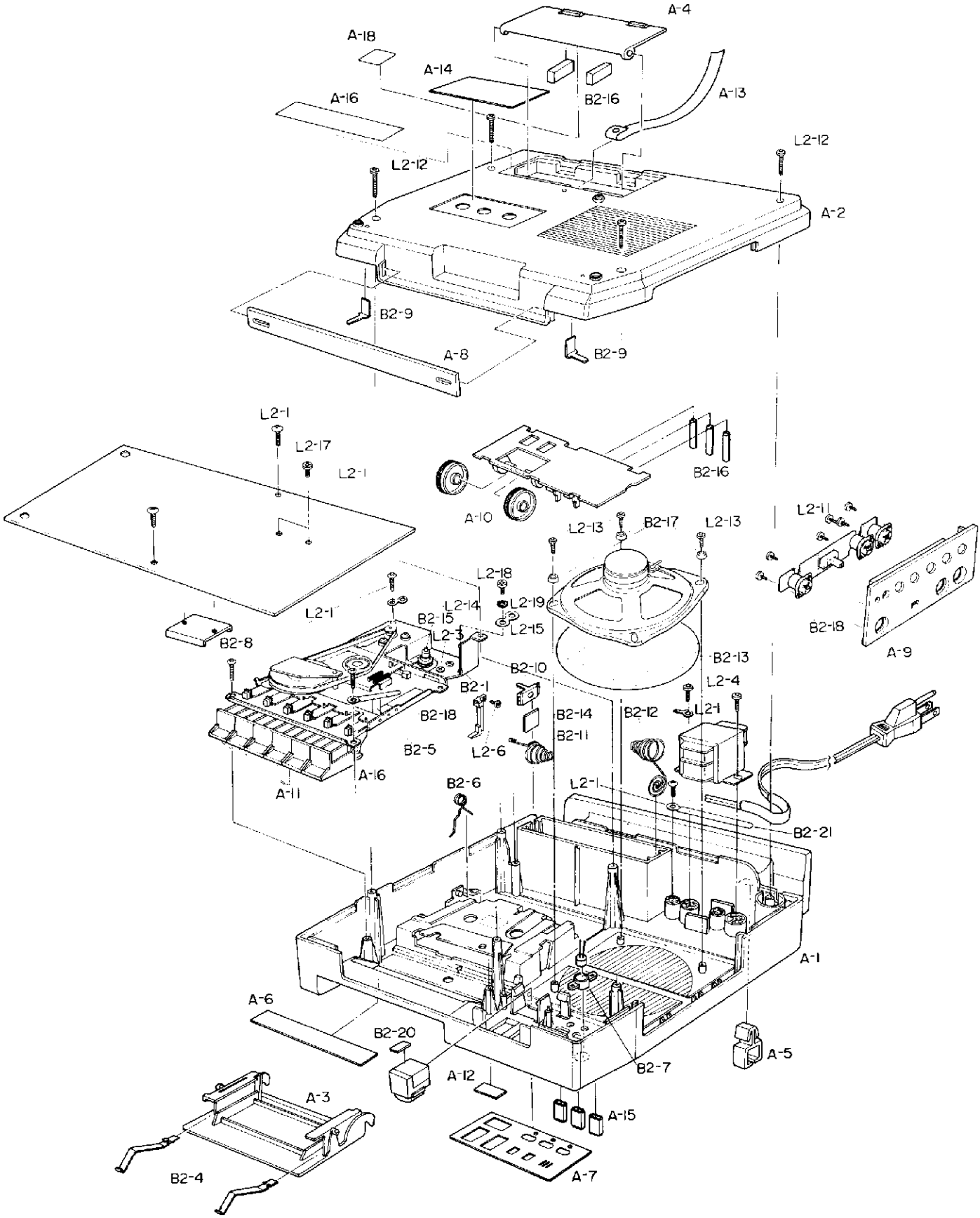
When RL-3 closes, its terminals 9 and 15 shunt to ground the 2.3 V DC bias on the non-inverting input of IC2A. This brings the DC level of IC2A's output to ground, removing this voltage from the emitter of Q4 and the base of Q5. As a result, the Sync Tones generated by the 150 Hz oscillator can not turn off the motor in the Sync Record Mode.

When the unit is in Audio Record, magnetic coupling between the two halves of the Record Head induces a very low current 60 kHz Bias voltage into the input of IC2A. Q17 shorts any resultant output to ground so that it can not be fed into the tone sense circuitry.

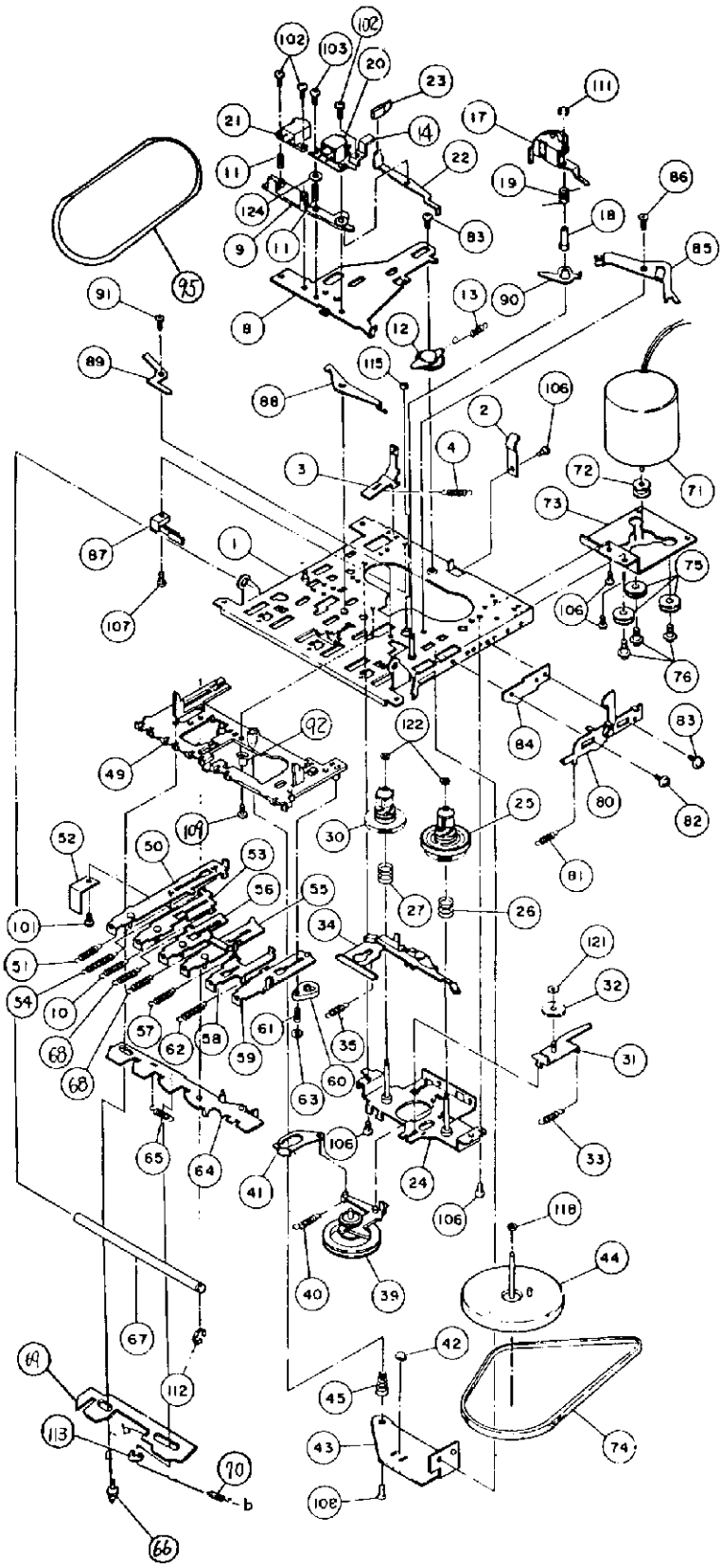
Momentary closure of Tape Stop/Restart Switch SW7 (or shorting pins 3 and 5 of the Remote Plug via a remote control unit) applies 5V DC to R174 and D8. C63 makes this into a pulse which is fed through D15 and R171 into IC3C, a one-shot with about a 0.5 second on-time. The positive output from IC3C turns on Q8, shorting R163 and greatly increasing the Q of the twin-T network. turning IC3D into an oscillator. The output of IC3D goes into IC2B through a mixing network and level set rheostat VR4. The output of IC2B is fed through the Sync In Jack. If no plug is in this jack, the signal proceeds through bias trap C73, L4 directly to the record head. Record bias is fed to the Record head through C51 and RII4.

The outputs of IC3D and IC3A are also fed into their respective rectifier networks and IC2D. It is therefore normal for Projector 1 relay RL-1 to close whenever a 1 kHz Sync Tone is recorded on the tape. If SW4 is in the Proj 2 position, RL-2 will close whenever a 150 Hz tone is recorded on the tape.

When an external Sync source is used, Sync In Jack J7 prevents any internally generated tones from reaching the Record Head. External Sync In senstivity is nominally 500mV. Connecting a plug to Sync Out Jack J6 prevents Sync Tones recorded on the tape from reaching the sensing circuitry. Sync Out signals are also nominally 500mV.



5275 ASSEMBLY



5275 TRANSPORT

TROUBLESHOOTING THE 5275

TROUBLESHOOTING SECTIONS

The Troubleshooting Information on the following pages has been divided into three sections with subsections in order to make it easier for the technician to find the particular section of interest. It is recommended that the following outline be used for troubleshooting:

1. Try out the unit, preferably with the customer's tape, until the malfunction occurs.
2. If the motor works, skip Section I, Power Supply, and go directly to the relevant section.
3. Note that the subsections are in functional order; for instance troubleshooting a problem with Audio Record means that Audio Playback must first be verified.
4. The Sections are as follows:

I. Power Supply and Motor

IIA. Audio Playback
IIB. Audio Record

IIIA. Sync Tone Generator
111B. Sync Record
IIIC. Sync Playback
IIID. Sync and Audio Record

Directions: Follow **each test in order. The correct voltage or waveform will lead** you **to the next step; an in correct rneasurement will lead you to the defective component(s). From Step 2 on, the ground connectiin is taken from the negative battery** terminal, which is located on **the left side of the unit and has a black wire connected to It.**

All voltages given are nominal, and may be 10% above or below the stated voltages.

1. POWER SUPPLY AND MOTOR

1. Measure the DC resistance across the Power Cord. It should measure between 40 and 70 Ohms.
   Yes. Plug the unit in.
   No. Check the Power Cord; check the Power Transformer by substitution.

2. Measure ABOUT 9.2V DC at the base and collector of Q10.
   Yes. Go to No. 3 Instructions.
   No. The transformer secondary should deliver approx. 7.4V AC. Check for ripple across C97. If it is 500mV. or more, check for open C97, shorted D1. If the DC voltage is too low, check for open D21, shorted C97, C53, C54. Check for a shorted or open Q10 or a shorted D21 if there are problems with battery operation.

3. Insert a Standard Level Cassette recorded at 0 VU* into the cassette compartment. Connect an 8 Ohm resistive load rated 10 watts or more to the External Speaker Jack. Put the unit into Play and Pause, with the red Cue Rec/Erase LED off. Measure 7.5V DC at the base and collector of Q10. Put the unit into Audio Record; the voltage should be 7.4V DC; push the Cue Rec/Erase button; the voltage should drop to 7.1V DC whether in Audio Record or not.
   Yes. Go to No. 4 Instructions.
   No. If the voltage is high, be sure the motor is rotating. Check for open Q9 or Q11. Check pins 14 and 16 of IC1 (see chart of proper pin voltages). If the voltage is low, check for shorted Q9, Q11, Motor, C87, C86, C95.

4. Motor circuit: There should be 6.8V DC on the base of Q1, 5.9V DC on the emitter.
   Yes. Go to No. 5 Instructions.
   No. If the Motor is operating, check for open D20, C96, shorted Q11. If the motor is stopped, check to be sure J8 (remote) is closed, check for shorted D20 or C96, open R176, shorted C87. If there is any voltage drop across R184, check to see if the Motor Stop Light is on. If it is on, tap the Motor Stop/Restart Switch and move SW4 to the Off position. If this light is off, proceed to Section IIIC, Sync Playback. Disconnect the Red Motor wire and check for about 150 Ohms resistance across the Motor.

5. Regulated DC: Measure 5.6V DC at the base, 5.0V DC at the emitter of Q9.
   Yes. Go to No. 6 Instructions.
   No. Base: Check for 5.6V DC across D19; check for shorted C84, open R182. Emitter: Check for shorted C85, hot (shorted) IC2 or IC3, hot IC1, hot R5 (indicates shorted IC1 or C4).

6. Check for a Battery/Level meter reading in the upper portion of the range.
   Yes. Power Supply tests are finished.
   No. Check SW1-8 for poor contact, R27; measure about 0.3V DC into the meter; disconnect the meter and apply 0.3V DC to it, which should give about an 80% deflection.

*The Standard Level Cassette used for 0 VU reference is the TEAC MTT112B. If a standard reference test cassette is not available, make one as follows:

1. On a properly functioning cassette recorder with a VU meter that is active in the Playback Mode, record a tone of about 315 Hz.
2. The Record Level is correct when, upon playback, the level meter reads 0 VU (or at the clear area between low and high).
3. Note that this test cassette is NOT necessarily recorded at standard 0 VU, but plays back at 0 VU on the machine you are using. Therefore, the level of the scope waveforms outlined above may not match the levels you measure. This test cassette can only be used to test for undistorted reproduction, so look for the presence of an undistorted sine wave rather than particular voltage levels when testing with a bench-made test cassette.

Most of the following tests are concerned with components connected to ICI. If, at any point, there is a performance problem and all external components check good, recheck the **DC** voltages on IC1 The following pins are all AC coupled to outside circuitry, so improper voltages on these pins, if external pads are good. suggest replacement **of** the IC:PINS 2, 3,4,6,8,13,17.18,19,20.

IIA. AUDIO PLAYBACK

1. Insert a Standard Level Cassette recorded at 0 VU* into the unit. Put the unit into Play and Pause. Be sure the red Cue Rec/Erase light is off. Check for 5V DC at Pin 11, 4.4V DC at Pin 10 of IC1.
   Yes. Go to No. 2 Instructions.
   No. Check R5, C4, measure 5V DC at the emitter of Q9 (see I.5).

2. Release the unit from Pause into the Play Mode. Measure 1.6V DC and scope for 0.38V P-P at Pin 6 of I1; measure 1.1V DC at Pin 3 of IC1.
   Yes. Go to No. 3 Instructions.
   No. Clean the tape heads and recheck. Check R10, C6, SW1-3, C12, R14. Check the continuity of the Record/Play head with a low voltage Ohmmeter. Demagnetize the head afterward. If the waveform is not a sine wave or the unit is known to have poor frequency response, check continuity of SW1-6, C13, R17, C14, C34, R15, R16, C15, R13, Bias Trap L5, C33; C35, R41, C37, R42, R30.

3. Turn the Volume Control full up. Check for about 120mV P-P at Pin 20 of IC1. Some 60 Hz may be present in this stage. Lower the Volume Control.
   Yes. Go to No. 4 Instructions.
   No. Check the Volume Control, R47, R21, SW1-7, C8, C9. Check the Muting Circuit, Q12, Q13. Measure about 4V DC at the Cathode of D22 and the emitter of Q12. Measure 0V DC at the collector of Q12. Check R35, C17, R33, R34, C19, R36, R32. Check Q12, Q13 by substitution.

4. Adjust the volume for a 10V P-P sine wave across R29.
   Yes. Go to No. 5 Instructions.
   No. Check Main Amp feedback components R26, C26, R25, C24, C25; check C27, C28, C29, C30.

5. Lift the scope ground. Adjust the Volume Control to measure at least 16V P-P, before visible distortion occurs, from Pin 14 to Pin 16 of IC1.
   Yes. Go to No. 6 Instructions.
   No. Put the unit into Pause. Verify 5.0V DC at Pin 11, 4.4V DC at Pin 10, 7.3V DC at Pins 14 and 16 of IC1. Check C100 for a short.

6. Reduce the volume and remove the 8 Ohm load from the Speaker Jack. Increase the volume to a comfortable level and listen for an undistorted sine wave through the internal loudspeaker.
   Yes. Go to No. 7 Instructions.
   No. Check the Internal Speaker.

7. Stop the cassette, remove it, and replace it with a cassette recorded with music. Play back the music and verify that moving the Tone Control to the 0 position cuts off high frequencies.
   Yes. Go to Section IIB.
   No. Check C20, Tone Control Potentiometer (VR2).

IIB AUDIO RECORD

1. Set the Volume Control to Maximum, PA Off, ALC Off. Insert a blank cassette; depress the Pause, Record, and Play buttons. Apply a 1 kHz signal into the Mic In jack at a level which sets the Level Meter in the clear area between Low and High (about 0.3mV AC). Do not use an 8 Ohm load for these tests. Scope for a sine wave.
   Yes. Go to No. 2 Instructions.
   No. Check SW1-8 to be sure the meter is connected; check R24, R18, C16, C36; if no signal is found at C16, check for signal across R29, go back to Section IIA and verify Playback performance, check SW1-9; if these are good, remove the VU Meter from the circuit, apply 0.3V DC to it and check for about 80% deflection.

2. Remove the input from Mic In. Apply a signal to Aux In at a level which sets the Level Meter in the clear area between Low and High (approx. 40-80mV AC).
   Yes. Go to No. 3 Instructions.
   No. Check the switch on the Auxiliary In Jack, R4, Mic In Jack Switch.

3. Scope about 4V P-P across R29. Some 50 kHz bias may be present.
   Yes. Go to No. 4 Instructions.
   No. Check R7, R22, SW1-3. Verify Playback.

4. Check the Bias Oscillator. Use a 10 Megohm, X10 scope probe for waveforms, measuring to ground. Measure 4.8V DC across C90, scope about 85V P-P, about 60 kHz (17 microsec/cycle) at Pin 6 of T3 (across C71). Look for a good sine wave shape.
   Yes. Go to No. 5 Instructions.
   No. Check SW1-5 for continuity; look for 0.7V DC at the base and an AC ground at the collector of Q2; check R101, R177, C90, R178, R179, R180, C91, C92; remove the Erase head plug (near R101, R127) from the PC board to see if the problem is in the heads; check C71, check Q1, T3 by substitution.

5. Measure about 35V P-P at Pin 5 of T3 and at the Erase Head Plug, Pin 2 (Pin 5 is closest to Bias Oscillator), scope about 9V P-P across L1. Voltage on Pin 1 of the Erase Head Plug is irrelevant as it is voltage induced in the Cue Erase Head.
   Yes. Go to No. 6 Instructions.
   No. Be sure the Red Cue Rec/Erase light is off. Check SW1-1 for continuity. Check for 0.5 Ohms or less across L1, about 3 Ohms across the Erase Head.

6. Momentarily short the signal input. Measure about 42V P-P, 60 kHz across the Record/Play Head.
   Yes. Go to No. 7 Instructions.
   No. If the bias is low, check VR5, C10, R10, SW1-2, SW1-3, Bias Trap L3, C5. If the bias is high, check for open R10, about 170 Ohms across the Record/Play Head, openR10. Demagnetize afterward.

7. ALC Section: Play back a Standard Level Cassette* and set the Volume Control to give an audio output of +4dBm. Put a blank cassette in the unit, put the unit into Record and Pause, and adjust a 1 kHz Auxiliary input to give an audio output of +4dBm (about –7dBm in). Switch on the ALC; the audio output will decrease by about 2 dB. Increase the input signal by 10 dB, then by another 10 dB. Each increase should give no more than a 3 dB increase in output level. Some audio noise will be visible on the waveform.
   Yes. Go to No. 8 Instructions.
   No. Check SW3, R19, C18, R46, R47, R30, R42. Otherwise IC1 is not operating properly.

8. Turn off the ALC. Release Pause and make a sample recording with an External Microphone. With the Volume Control in the Maximum position, supply a 1 kHz signal into the Aux In Jack at a level which sets the VU Meter into the clear area between low and high (approx. 40-80mV). Make a sample recording with the Internal Microphone.

9. Lower the Volume Control, play back the test recording, and check for undistorted sound.
   Yes. Go to No. 10 Instructions.
   No. Check the External Microphone In Jack. Check R1, R2, C2, C1, R3, the switch on the Aux In Jack, SW1-4, the Mic In Jack.

10. While playing a tape, preferably of speech, push the PA Switch to the On position. Plug in an External Microphone and speak into the microphone. The unit should act as a PA, mixing the microphone signal with the playback signal. It is normal for the microphone signal to come through lower in level than the playback signal, especially with a recording of music.
    Yes. Go to No. 11 Instructions.
    No. Check R45, SW-2, C38.

11. Rewind the tape you have just made to the beginning. Remove all signal sources and install a shorting plug into the Aux In Jack. Place the unit into the Record Mode for several seconds, being sure to go well past the leader tape. Rewind the tape, play it back, and verify that the tape has been erased.
    Yes. Audio Record Tests are finished.
    No. Be sure that the Erase Head is clean. Check SW1-1; check the Erase Head by substitution.

Review the Sync Tone Record and Playback section of the General Description; your troubleshooting will be facilitated by understanding the description of operation given there.

After Step 1, the following text deals directly with the 150 Hz section. Component designations for the 1 kHz section are in parenthesis where the two sections have common parts.

IIIA. SYNC TONE GENERATORS

1. Insert a blank cassette with BOTH Erase Prevention Tabs in place. Put the unit into Play and Pause. Slide SW4 to the Proj 2 position. Test each Sync Tone generator by depressing first the Slide Advance (Proj 1) switch, SW6, then the Tape Stop/Restart (Proj 2) Switch, SW7. In each case, the respective LED should light and a relay click should be heard.
   Yes, No. Go to No. 2 Instructions.

2. Slide SW4 to the Tape Stop Position. Release the tape into the Play Mode. Push the Tape Stop button. The motor should stop and the Orange LED remain on. Push the Tape Stop button again. The motor should restart.
   Yes. Go to No. 2 Instructions.
   No. Go to No. 3 Instructions.

3. Scope a 0.5 second pulse of 0.7V DC at the base of Q8 (Q7) and 3.6V DC at Pin 8 (Pin 7) of IC3.
   Yes. Go to No. 6 Instructions.
   No. Go to No. 4 Instructions.

4. Check for 5V DC at the switch side of R174 (R161) upon closure of the switch.
   Yes. Go to No. 5 Instructions.
   No. Check Power Supply voltages. Check continuity across the switch.

5. Scope a 1.8 DC pulse at Pin 10 (Pin 5) of IC3 upon switch closure.
   Yes. Go to No. 6 Instructions.
   No. Check progression of the voltage from SW7 (SW6) through R174, C83, D15, R171; be sure R173, R172, R170 are not open (through R161, C81, D13, R156; R160, R159, R157).

6. Scope a 3.0V P-P 150 Hz (1 kHz) pulse at Pin 14 (Pin 11) of IC3.
   Yes. Go to No. 7 Instructions.
   No. Short R163 (R152), scope for tone; tone indicates Q8 (Q7) is open. Verify Tone Playback sensitivity (Section IIIC.). Measure 2.0V DC on Pin 3 (Pin 12) of IC3. Check the same-value components of the Twin-T network, which must match closely for oscillation to occur.

7. Scope a 0.7V DC pulse at the base of Q6 (Q3).
   Yes. Go to No. 8 Instructions.
   No. Scope 0.25V DC bias at Pin 13 (Pin 9), a 0.45V DC pulse at Pin 12 (Pin 10), and a 3.5V DC pulse at Pin 14 (Pin 8) of IC2. If there is no 0.45V pulse, trace back through the rectifier circuit to find where it was stopped. Be sure SW4 is in the Proj 2 position; verify 0.7V DC at the base of Q16; check to see that signal goes through Q16 from Pin 14 of IC3 to C70.

8. The DC voltage on the collector of Q6 (Q3) should be sitting at 7.5V DC until SW7 (SW6) is closed; it then falls to about 100mV. This will light D18, the Orange LED (D17 the Green LED).
   Yes. Go to No. 9 Instructions.
   No. Be sure SW4 is in the Proj 2 position; check it for continuity. Check relay coils for continuity, observing the polarity of the spike-suppression diode. D9 (D4) could be shorted; Q6 (Q3) could be open, especially if D9 (D4) is open.

9. 150 Hz Circuit Only: Put SW4 in the Tape Stop position. Pulse SW7. The motor should stop. Pulse SW7 again after about one second; the motor should start again.
   Yes. Go to No. 10 Instructions.
   No. Review the Description of Operation of this section. Check for 2.3V DC on the emitter of Q4 and the base of Q5 (Motor on). Check for 4.8V DC at the base of Q4, through D8, when holding down SW7 on restart. Other Q4 base voltages: 3.7V DC, motor on; 0.5V DC, motor off; 1.9V DC, SW4 in Proj 2 position. When the motor is turned off, D25 (s5227B) and Q16 ensure that no tone pulse will restop the motor during restart.

10. Slide SW4 to the Proj 2 position. Measure the resistance from Pin 2 to Pin 5 of Kodak Type Projector Connector J10 (J9); this resistance should go from infinite to zero on closure of the relay.

11. Measure 0.48V P-P, 150 Hz, 0.44V P-P, 1 kHz, at C76. This is the tone output of both stages, mixed, ready to go to the Cue Record Amp.
    Yes. Go to Section IIIB.
    No. Verify Step 5 above; check for open R129, R130, R149, R150, shorted C77, C78.

IIIB. SYNC RECORD

1. Verify the performance of the Sync Tone generators according to Section IIIA above, then insert a blank cassette with BOTH Erase Prevention Tabs in place into the unit. Put the unit into Play and Pause. Push down on SW5, the Cue Record Switch. D16, the Red LED, will light. Switch SW4 to the Proj 2 position. Release the unit into Play, and push each Sync Tone button several times, allowing at least one second between pushes. Play back the tape, listening for relay closures and watching for the Orange and Green LEDs to light for the proper cue signal. Go to Step 2.

2. Slide SW4 to the Tape Stop/Restart position. Play back the tape again. When the Orange LED comes on, it should stay on and the motor should stop until SW7 is pushed again.
   Yes, No. Go to No. 3 Instructions.

3. Turn the cassette over and play it back in the Audio Section. Check for the presence of 150 Hz and 1 kHz tones.
   Yes. Go to No. 4 Instructions.
   No. Go to Section IIIC, Sync Playback.

4. When the Red LED is lit, the Bias Oscillator will turn on, and RL-3 will close.
   Yes. Go to No. 5 Instructions.
   No. Verify the 7.5V DC Power Supply voltage, which drops to 7.1V DC when the unit is in Sync Record, about 5V DC across R151 on the Volume/Tone circuit board; go to Step 5.

5. Check the Bias Oscillator. Use a 10 Megohm, X10 scope probe for waveforms, measuring to ground. Measure 4.8V DC across C90, measure about 85V P-P and scope for approximately 60 kHz (17 microsec/cycle) at Pin 6 of T3 (across C71). Look for a good sine wave shape.
   Yes. Go to No. 6 Instructions.
   No. Check D26, R194 for continuity; look for 0.7V DC at the base and an AC ground at the collector of Q2; check R101, R177, C90, R178, R179, R180, C91, C92; remove the Erase Head Plug (near R101, R127) from the PC board to see if the problem is in the heads; check C71, check Q1, T3 by substitution.

6. Scope about 35V P-P at Pin 5 of T3 and 25V P-P at the Erase Head Plug, Pin 5 (Pin 5 is at the end closest to the Bias Oscillator). Voltage on Pin 2 of the Erase Head Plug is irrelevant as it is only voltage induced in the Audio Erase Head.
   Yes. Go to No. 7 Instructions.
   No. Be sure you are not in Audio Record. Check for a signal ground at Pin 2 of RL-3 (the pins are numbered like a 16-pin DIP); check for 0.5 Ohms or less across L1, about 3 Ohms across the Erase Head.

7. Scope about 1.2V P-P, 150 Hz, 1.0V P-P, 1 kHz, at Pin 7 of IC2 when the respective Sync Tone buttons are pushed.
   Yes. Go to No. 8 Instructions.
   No. Verify the input to IC2B (see Section IIIA.11 above); verify 2.5V DC bias at pin 5 and on pin 7 of IC2.

8. Check for Sync Tones at the input to the Bias Trap; look for about 100 mV P-P Bias with no Sync Tones, 200-300 mV P-P modulated Bias when the Sync Tones are on.

   Yes. Go to No. 9 Instructions.
   No. Check the continuity of J7, R145, measure about 55 Ohms across L4 when the positive meter lead is at the junction of L4 and R145; verify that Pin 15, not Pin 16, of RL-3 is at ground. Lift C93 and C94 to see if they are shorted.

9. Measure the signal level at the Sync Out Jack during Sync Playback; it must be at least 500mV RMS, and will typically be 600mV or more.
   Yes. Go to No. 10 Instructions.
   No. Go to Section IIIC.

10. Make a recording with the Sync In Jack, using 150 Hz and 1 kHz tones. The nominal signal level required to make a usable Sync Recording is 500mV RMS, although units typically make usable recordings with as low as 250mV inputs. Go back to Steps 1 and 2 for playback procedure.
    Yes. Go to IIIC, Sync Playback.
    No. Check Playback performance per Section IIIC. Troubleshoot the Record Section.

IIIC. SYNC PLAYBACK

1. Make a sample Sync tape by recording short pulses of 150 Hz and 1 kHz at 0 dB re 250 nW/m on a cassette, or take a known good Sync tape and play it on the unit. Be sure the red Cue Rec/Erase light is off, and test the recorder according to Sections IIIB.1 and IIIB.2.
   Yes. The unit appears good.
   No. Go to No. 2 Instructions.

2. Insert a Standard Level Cassette (see Audio Playback, Section IIA) into the unit. Make sure that SW4 is not in the Off position. Measure 0.7V P-P, 315 Hz, at the Sync Out Jack.
   Yes. Go to No. 3 Instructions.
   No. Scope 250mV P-P, 315 Hz, at Pin 1 of IC2, 2.0V P-P at the collector of Q15. Measure 0V DC at the base of Q17. Scope 300mV P-P at Pins 3 and 12 of IC3.

IIID. SYNC AND AUDIO RECORD

The Model 5275 should give the same performance whether recording the Sync and Audio tracks separately or at the same time. Should a problem arise in this area, however, the following will be of help.

1. Record a 1 kHz tone on the Audio track at such a level that the record meter is set in the space between low and high. At the same time, push the Cue Rec/Erase button a few times to switch the Cue Record circuits on and off. Rewind and listen to or scope the audio tone. There will be clicks resulting from turning Sync Record On and Off, but little change in recorded level. Distortion should change only very slightly, not audibly.

2. Verify the wiring of the Erase Head Plug as follows, Pins 1 through 5 (Pin 1 is on the end nearest to the Record Switch):
   Pin 1: Green
   Pin 2: White
   Pin 3: Shield with insulation
   Pin 4: Blue
   Pin 5: Pink

SWITCH DESIGNATIONS

SW Function	Location
SW1 REC/PLAY, shown in Play	Main PC Board
SW2 PA	Front Panel
SW3 ALC	Front Panel
SW4 Tape Stop/Off/Proj. 2	Jack Panel
SW5 Sync Record/Erase	Front Panel
SW6 Slide (1) Advance	Front Panel
SW7 Tape Stop/Restart, Slide (2) Advance	Front Panel
SW8 Anti-Sync Record	Transport, right rear
SW9 Main Power	Transport

INTEGRATED CIRCUIT FUNCTIONS

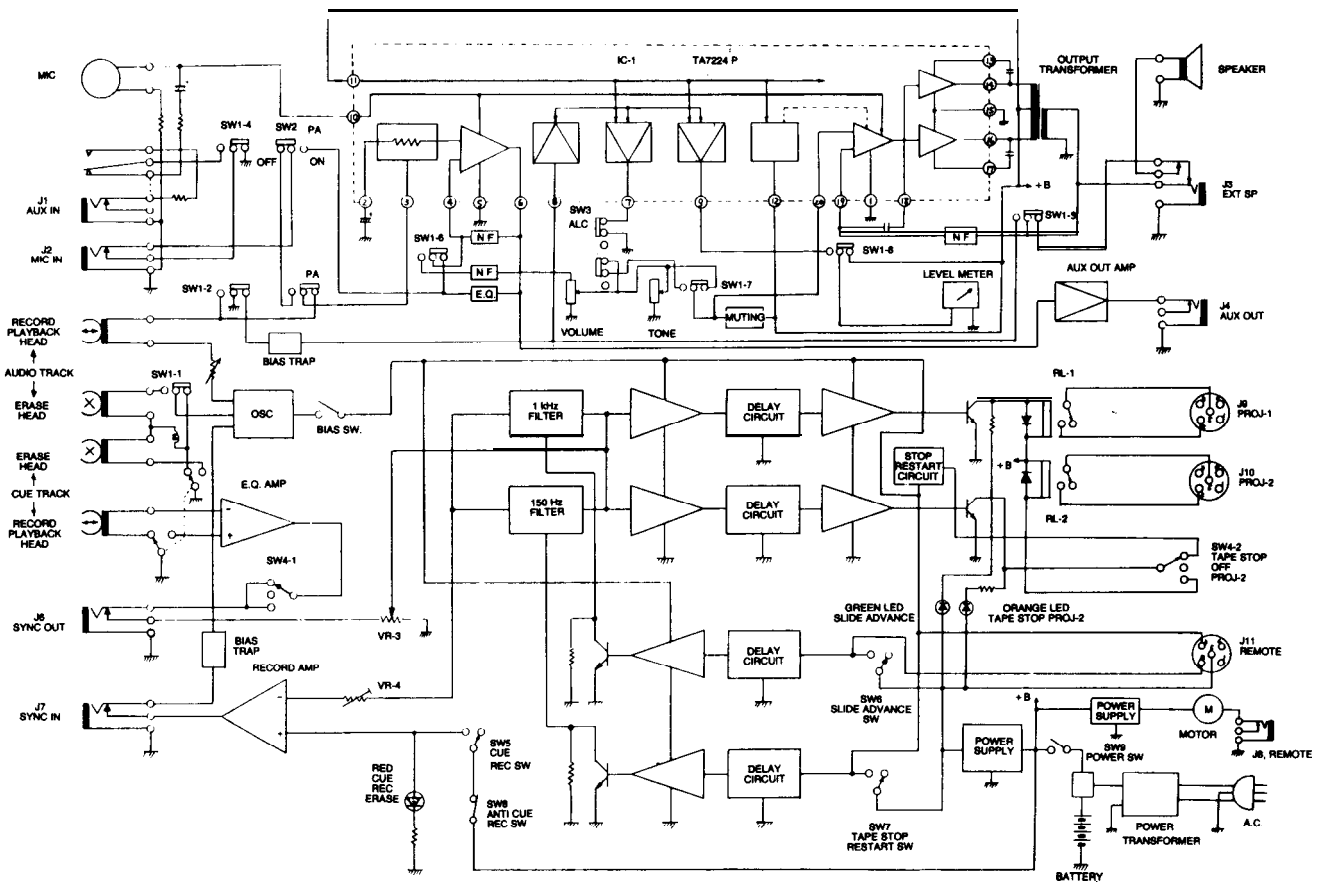
ICl	TA7224P	Preamp, ALC, Main Amp, Meter Drive
IC2	TA75324P	A: Sync Playback/EQ B: Sync Oscillator Out c: Proj 1 Drive Comparator D: Proj 2 Drive Comparator
IC3	TA75324P	A: 1 kHz Filter/Oscillator B: 1 kHz Oscillator Start c: 150 Hz Oscillator Start D: 150 Hz Filter/Oscillator

TRANSISTOR FUNCTIONS

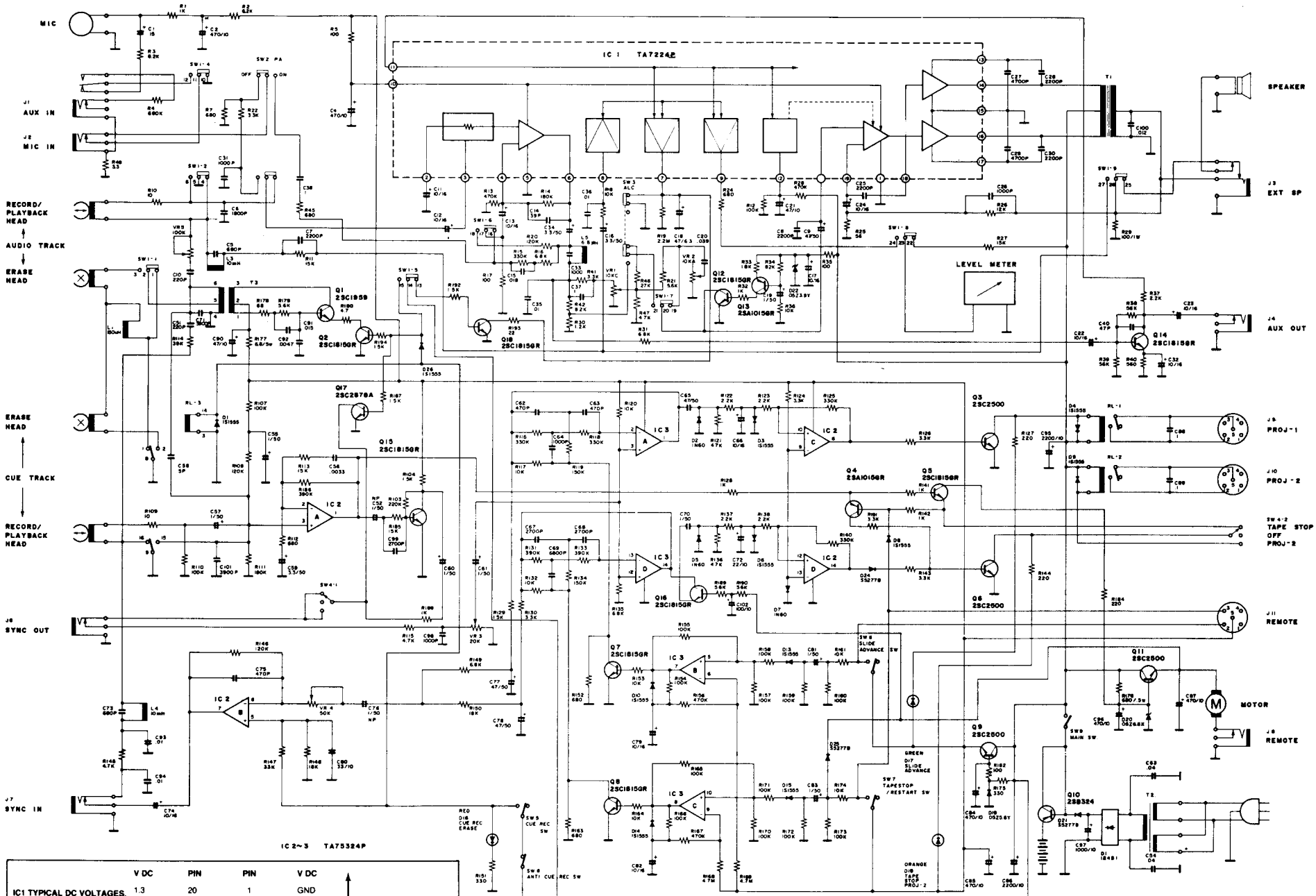
Q 1 Bias Oscillator
Q 2 Bias Oscillator Enable
Q 3 Projector 1 Relay Drive
Q 4 Motor Restart
O 5 Motor Stop Control
Q 6 Projector 2 Relay Drive, Motor Stop
Q 7 1 kHz Oscillator Start
Q 8 150 Hz Oscillator Start
Q 9 5.0V DC Regulation
Q10 Battery Diode
Q11 Motor Supply Regulation/Shutoff
Q12 Power-up Audio Mute Circuit
Q13 Power-up Audio Mute Circuit
Q14 Aux Out Buffer
Q15 Sync Playback
Q16 Motor Restart Tone Interrupt
Q17 Sync Out Shunt
Q18 Playback ALC Defeat

RELAY FUNCTIONS

RL 1 Projector 1 Advance
RL 2 Projector 2 Advance
RL 3 Sync Record



5275 BLOCK DIAGRAM

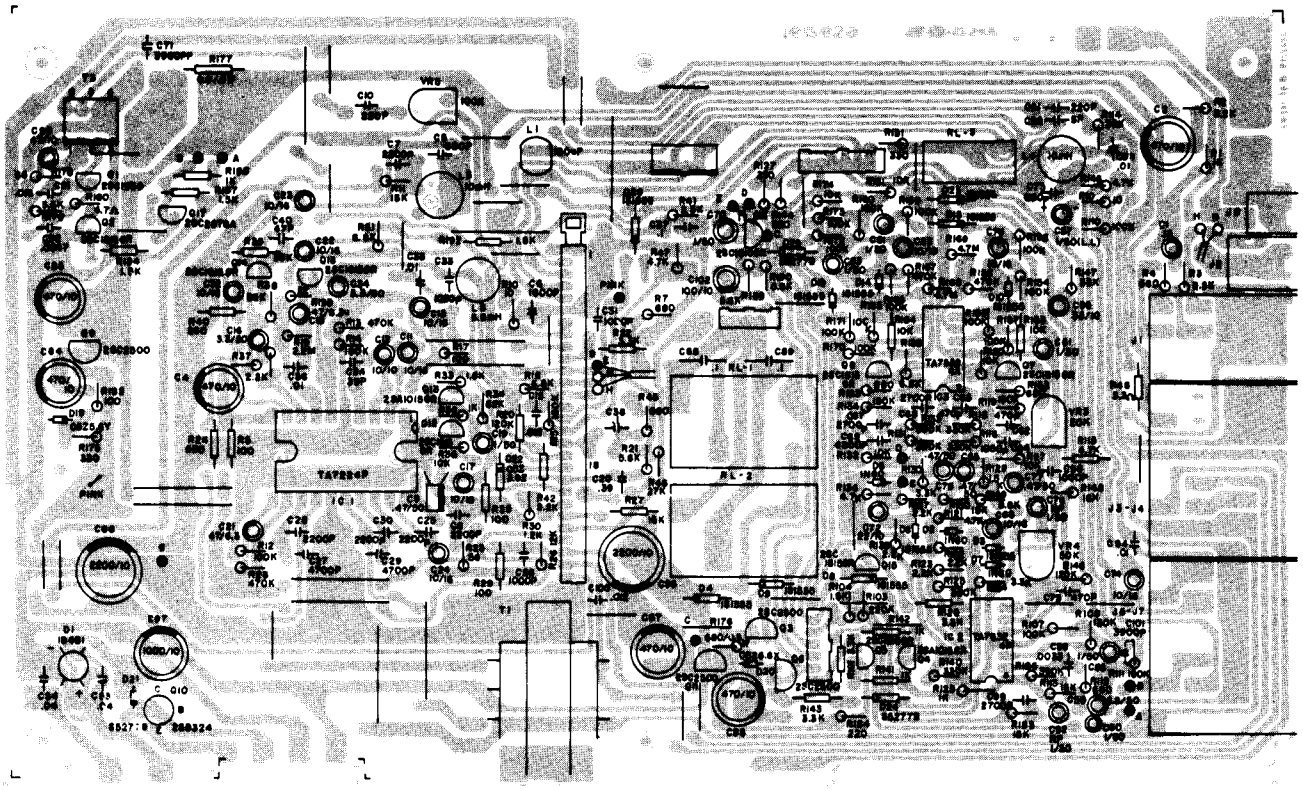


	V DC	PIN	PIN	V DC
IC1 TYPICAL DC VOLTAGES,	1.3	20	1	GND
MODEL 5275,	1.3	19	2	1.1
FOIL SIDE VIEW	1.3	18	3	1.1
	1.3	17	4	1.1
	7.2	16	5	GND
	GND	15	6	1.6
	7.2	14	7	GND
	1.3	13	8	0.6
	1.9	12	9	0
	7.2	11	10	5.3

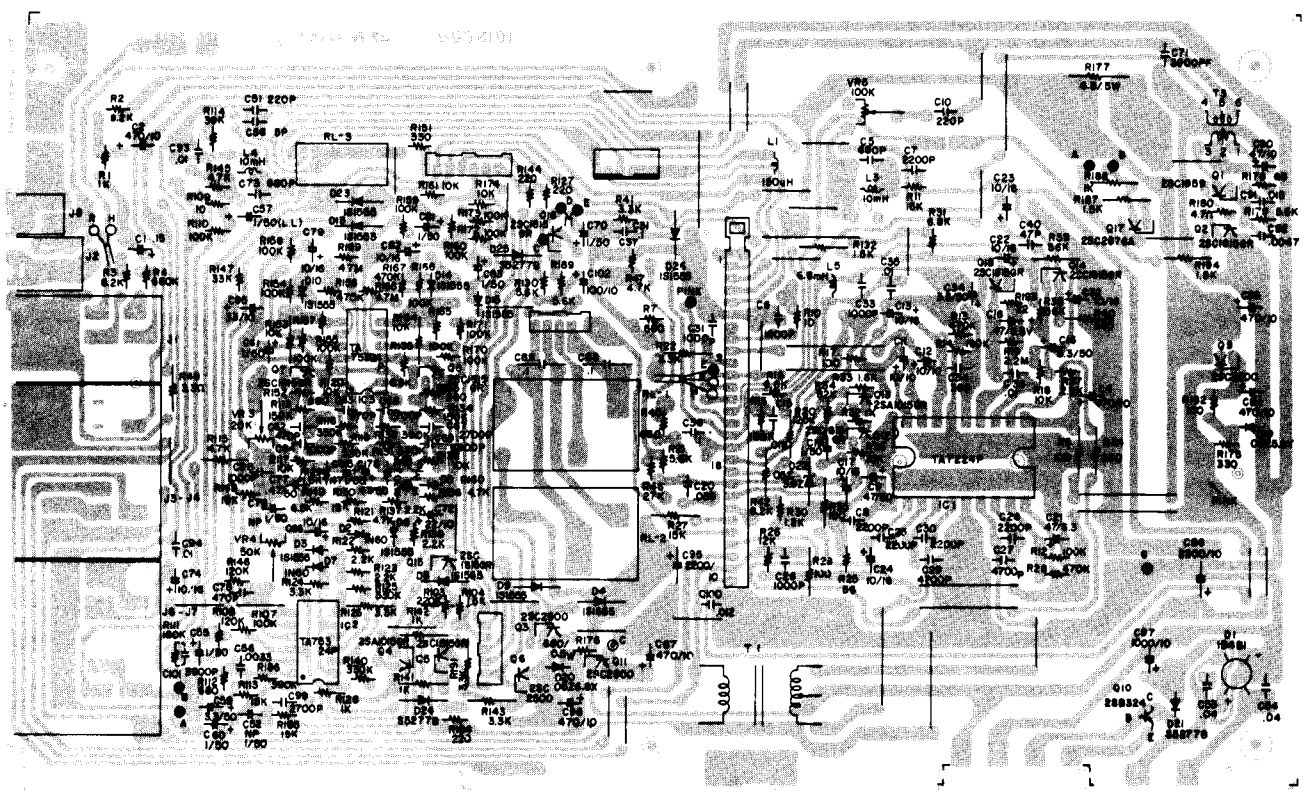
TO JACK PANEL

FRONT OF UNIT

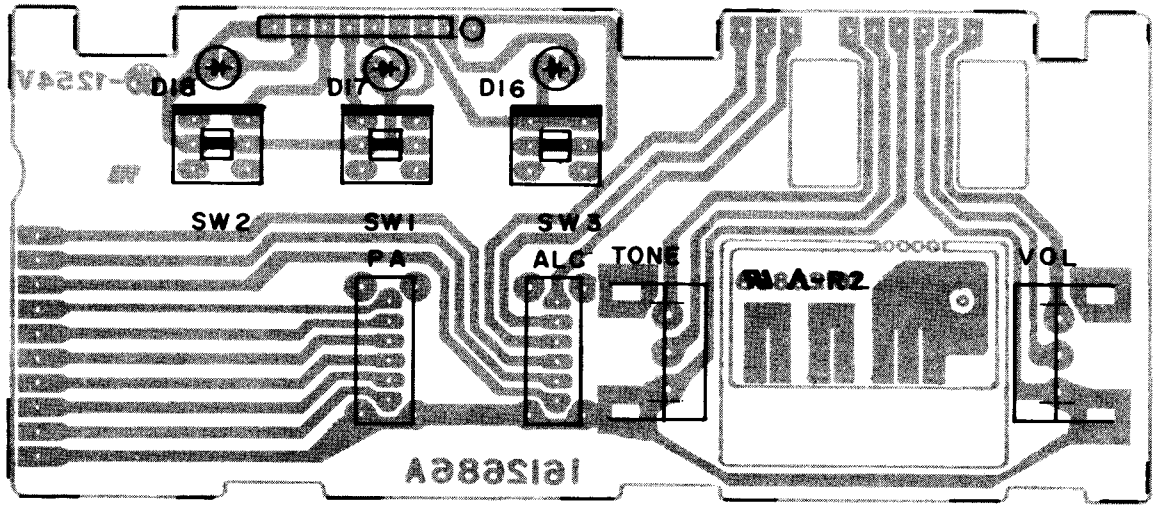
5275 SCHEMATIC



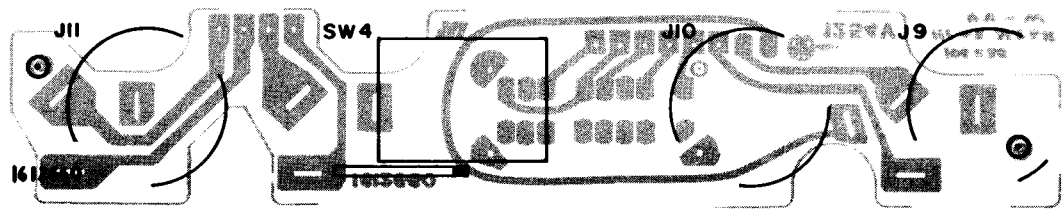
5275 PC BOARD, COMPONENT SIDE



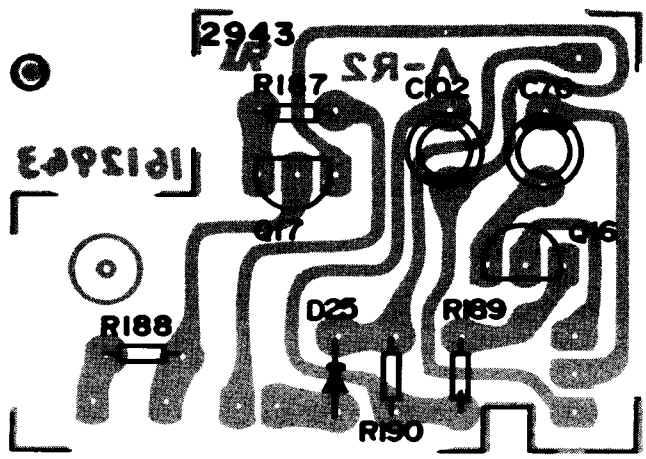
5275 PC BOARD, FOIL SIDE



CONTROL PCB



JACK PCB

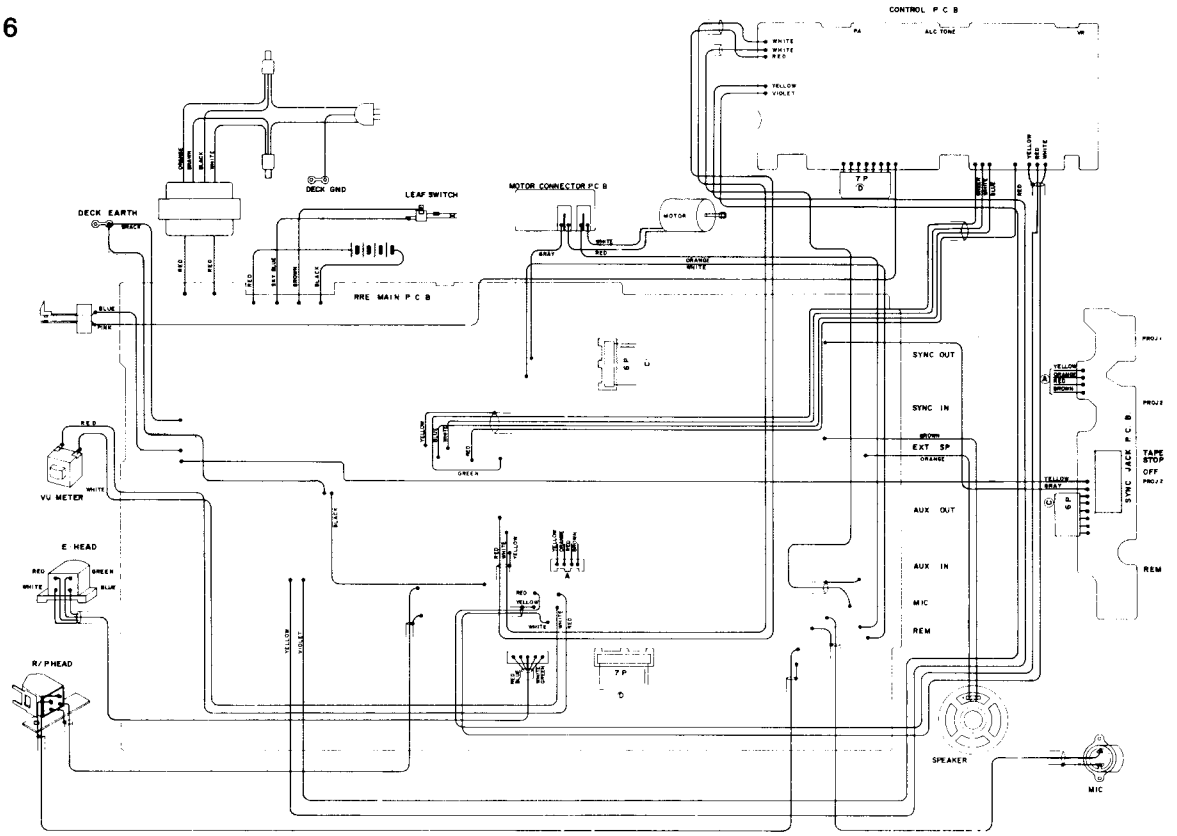


MODIFICATION PCB

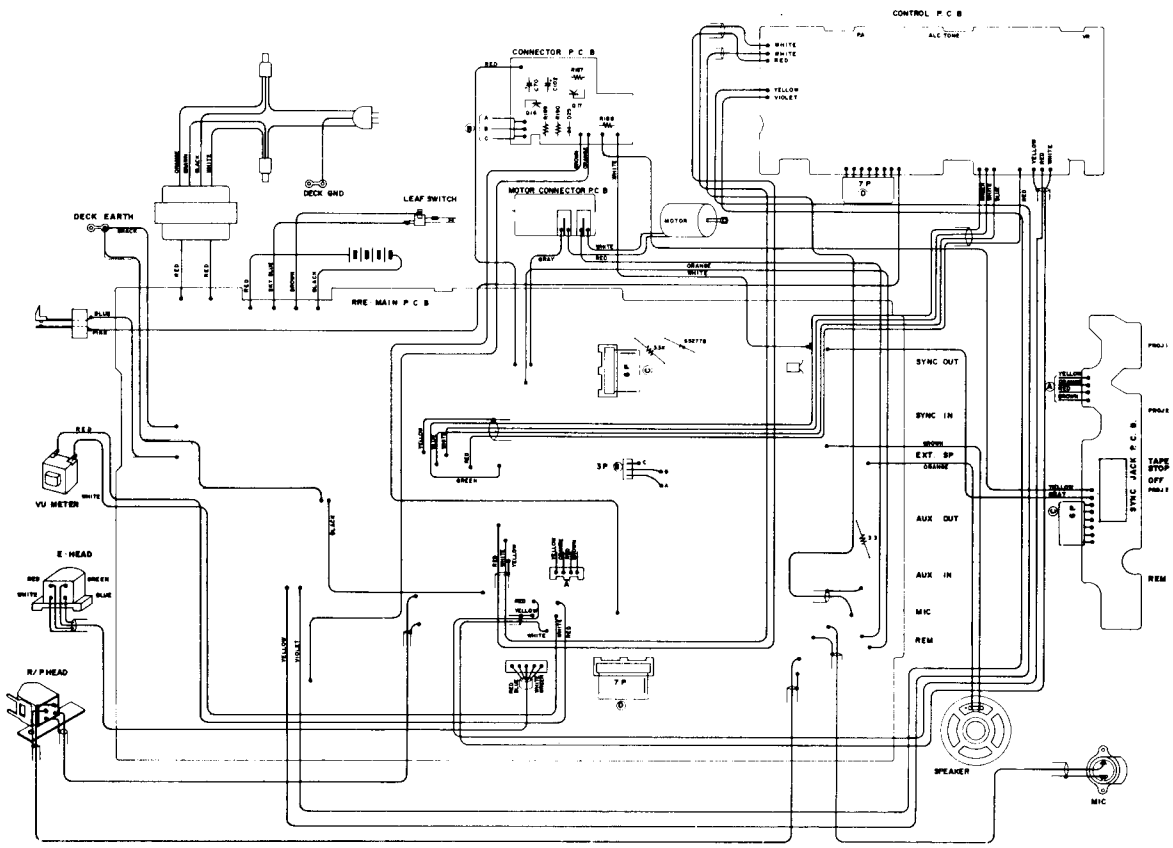
on units before serial no. GB31229 (USA), GB30425 (Canada)

PARTS LIST

ITEM	DWG REF	CALIFONE P/N	REF P/N
CASE			
Case Top Assembly, USA*	A-1	607-0295-03	21C7483X
Escutcheon, Top Cover, USA*	A-6	608-0083-00	23M8119
Case Bottom Assembly, USA*	A-2	607-0295-02	21C7480X
Name Plate A, USA*	A-14	608-0084-00	23M8124
Warning Label	A-17	608-0085-00	24L7916
Carrying Handle	A-8	662-0022-23	27H7008
Handle Holder	B2-9	662-0022-24	23X8714
Cassette Door Assembly	A-3	662-0022-16	21D7249X
Cassette Holding Spring	B2-4	662-0022-25	23X8707
Battery Compartment Cover	A-4	662-0022-14	21B7025
Power Cord Retainer	A-5	662-0022-15	21W7819
ASSEMBLY PARTS			
Door Opening Spring	B2-6	662-0022-26	26W7866
Tape Counter	B2-15	662-0022-10	1670148
LED Holder	B2-16	662-0022-27	21W7822
Push Button	A-15	662-0022-28	21N8129
Record Button	A-16	662-0022-18	21N8188
Gray Key	A-11	662-0022-17	21N8127
Control Knob	A-10	662-0022-01	21N8128
TRANSPORT			
Record/Play Head	R/P	662-0022-29	165M207
Erase Head	E	662-0022-30	165M206
Motor	71	662-0022-07	1640195
Drive Belt	74	662-0022-08	1352-09-01
Counter Belt	95	662-0022-09	1239-14-08
Counter	B2-15	662-0022-10	1670148
Supply Reel Assembly	30	662-0022-11	1700-05-93
Take-up Reel Assembly	25	662-0022-12	1700-05-92
FF Idler Assembly	31	662-0022-13	1700-05-87
Pinch Roller Assembly	17	662-0022-22	1510-04-91
Flywheel	44	662-0022-31	1510-07-02
Clutch Assembly	39	662-0022-32	1700-06-96
Clutch Spring	40	662-0022-33	1700-06-18
Actuator Plate	64	662-0022-34	1700-09-257
Sub Actuator	69	662-0022-35	1700-09-380
ELECTRONIC PARTS			
Main PC Board		607-0298-00	1612659A
Control PC Board		607-0299-00	1612686
Sync Jack PC Board		607-0300-00	1612660
Phone Jack w/switch, Aux In	J1	629-0033-00	1630215
Microphone Jack, 3.5 mm	J27	629-0034-00	1630254
Phone Jack, 6.4mm, Ext Sp	J3	629-0035-00	1630214
Phone Jack, 6.4 mm, Aux Out	J4	629-0035-00	1630214
Phone Jack, 6.4 mm, Sync Out	J6	629-0035-00	1630214
Phone Jack, 6.4 mm, Sync In	J7	629-0035-00	1630214
Remote Jack, 2.5 mm	J8	629-0036-00	1630168
5 Pin Jack, Proj 1	J9	629-0037-00	1720053
5 Pin Jack, Proj 2	J10	629-0037-00	1720053
5 Pin Jack, Remote	J11	629-0037-00	1720053
Condenser Mic	MIC	615-0012-00	153C106
Output Transformer	T1	618-0169-00	116E150
Volume Control 10K, C	VR1	613-0187-00	539N271
Tone Control 10K, A	VR2	613-0188-00	539N272



WIRING DIAGRAM



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