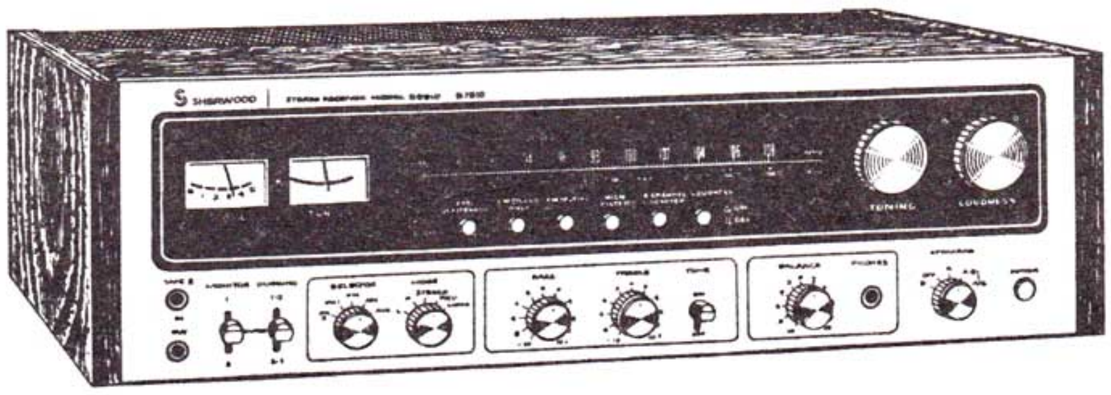
SHERWOOD SERVICE MANUAL

S7910 and S8910

SHERWOOD ELECTRONIC LABORATORIES, INC. 4300 NORTH CALIFORNIA AVENUE CHICAGO, ILLINOIS 60618

S7910 AM/FM
S8910 FM
STEREO RECEIVER



*Specifications**

PREAMPLIFIER:

BASS CONTROL: ± 14 dB @ 50 Hz (with Precision Detent Adjustment)
TREBLE CONTROL: ± 14 dB @ 15,000 Hz (with Precision Detent Adjustment)
INPUT SENSITIVITY (AND IMPEDANCE) FOR RATED OUTPUT @ 1000 Hz:
- Phono 1: 2.0 mV (50KΩ)
- Phono 2: 2.0 mV, 4.0 mV, and 8.0 mV selectable (50KΩ)
- Aux: 150 mV (50KΩ)
- Tape Monitor 1: 150 mV (100KΩ)
- Tape Monitor 2: 150 mV (100KΩ)
- Tape Dubbing: 150 mV (100KΩ)
- 4-CH Adaptor: 150 mV (100KΩ)

INPUT CAPABILITY AT 0.1% THD, 1000 Hz:
- Phono 1: 160 mV
- Phono 2: (with Input Sensitivity Selector Switch):
  - Hi: 160 mV
  - Med: 310 mV
  - Lo: 600 mV
- Aux: Greater than 6V
- Tape Monitor 1: Greater than 6V
- Tape Monitor 2: Greater than 6V
- 4-CH Adaptor: Greater than 6V

FREQUENCY RESPONSE:
- Phono 1 & Phono 2: 30-20,000 Hz ± 0.5 dB RIAA Standard.
- Aux, Tape Monitor 1, Tape Monitor 2, Tape Dubbing, & 4-CH Adaptor: 20-20,000 Hz ± 0.5 dB

OUTPUT LEVEL (AND IMPEDANCE):
- Record Out 1: 150 mV (2KΩ)
- Record Out 2: 150 mV (2KΩ)
- Record Out 2 Din Connector: 30 mV (18KΩ)
- Tape Dubbing: 150 mV (2KΩ)
- 4-CH Adaptor: 150 mV (2KΩ)
- Preamplifier: 750 mV (1KΩ)

HUM AND NOISE:

	(Signal to Noise)	(IHF "A" Weighting)
Phono 1:	-65 dB	-70dB
Phono 2:	-65 dB, -70 dB, -75 dB	-70 dB, -75 dB, -80 dB
Aux:	-85 dB	-90 dB
Volume Minimum:	-90 dB	-100 dB

TOTAL HARMONIC DISTORTION (THD):
- Less than 0.05% from 20-20,000 Hz @ 750 mV
- Less than 0.1% @ 3V, 1000 Hz

CROSSTALK: Better than -40 dB from 20-20,000 Hz
HIGH FILTER: -3 dB @ 7000 Hz, 12 dB/Octave
LOUDNESS BOOST @ -30 dB SETTING: +8 dB @ 100 Hz, +4 dB @ 10,000 Hz

POWER AMPLIFIER:

POWER OUTPUT: 60 watts per channel, minimum RMS, at 8 ohms from 20-20,000 Hz, with no more than 0.1% Total Harmonic Distortion.
INTERMODULATION DISTORTION:
- Less than 0.1% @ 8 Ω rated output
- Less than 0.03% @ 20 watts

INPUT SENSITIVITY (AND IMPEDANCE) FOR RATED OUTPUT @ 1000 Hz: 750 mV (100KΩ)
FREQUENCY RESPONSE: 5-110,000 Hz ± 1 dB
HUM AND NOISE:
- Signal to Noise: -100 dB
- IHF "A" Weighting: -110 dB

CROSSTALK: Better than -50 dB from 20-20,000 Hz; -65 dB @ 1,000 Hz
DAMPING FACTOR: 50:1 @ 8 Ω
HEADPHONE OUTPUT: 4 Ω or greater

**All specifications with 120 VAC line; specifications and design subject to possible modification without notice.*

FM TUNER:

IHF SENSITIVITY: 9.84 dBf (1.7 μV)
- Mono Sensitivity for 50 dB S/N: 13.86 dBf (2.7 μV)
- Stereo Sensitivity for 50 dB S/N: 34.77 dBf (30 μV)

TOTAL HARMONIC DISTORTION (THD) @ 1,000 Hz:
- Mono: .15% @ 100% Modulation
- Stereo: .3% @ 100% Modulation

SIGNAL TO NOISE RATIO:
- Mono: -70 dB
- Stereo: -65 dB

CAPTURE RATIO: 1.0 dB
ALTERNATE-CHANNEL SELECTIVITY (IHF): 75 dB
STEREO SEPARATION:
- Better than 45 dB @ 1,000 Hz
- Better than 30 dB @ 20-10,000 Hz

SPURIOUS RESPONSE REJECTION: -95 dB
IMAGE REJECTION: -85 dB
IF REJECTION: -95 dB
AM REJECTION: -65 dB
FREQUENCY RESPONSE (STEREO AND MONO): 20-15,000 Hz ± 1 dB
AUTOMATIC STEREO THRESHOLD: 5 μV
MUTING THRESHOLD: 5 μV
OUTPUT VOLTAGE @ 100% MODULATION (STEREO AND MONO): 1V
ANTENNA INPUTS: 300 ohm balanced and 75 ohm unbalanced.

AM TUNER:

IHF SENSITIVITY: 28.75 dBf (15 μV)
TUNING RANGE: 525-1610 KHz
SELECTIVITY: 35 bB ± 10,000 Hz
FREQUENCY RESPONSE: -6dB @ 4,000 Hz
IMAGE REJECTION: -65 dB @ 1 MHz
IF REJECTION: -65 dB @ 1 MHz
SPURIOUS RESPONSE REJECTION: -65 dB
OUTPUT VOLTAGE @ 30% MODULATION: 120 mV
ANTENNA: Ferrite Rod (rotatable); provision for external antenna.

GENERAL:

SEMICONDUCTORS (S7910): 70 transistors, 2-dual-gate MOS-FETS, 8 integrated circuits, 1 LED, 4 power diodes, 5 zener diodes, 31 signal diodes.
SEMICONDUCTORS (S8910): 69 transistors, 2-dual-gate MOS-FETS, 7 integrated circuits, 1 LED, 4 power diodes, 5 zener diodes, 31 signal diodes.
POWER REQUIREMENTS:
- Domestic: 115-125VAC, 50/60 Hz
- Export: 230VAC, 50/60 Hz

POWER FUSE:
- Domestic: 4A, 3AG (Do not use Slo-Blo fuse)
- Export: 2A, 3AG (Do not use Slo-Blo fuse)

RATED POWER CONSUMPTION (DOMESTIC AND EXPORT): 30-250 watts
AC OUTLETS:
- 2-Switched, 200 watts total
- 1-Unswitched, 100 watts

CARTON DIMENSIONS:
- 610(W), 248(H), 508(D) mm
- 24(W), 9-3/4(H), 20(D) inches

SHIPPING WEIGHT: 17.7 kg/39 lbs.
RECEIVER DIMENSIONS:
- 540(W), 149(H), 397(D) mm
- 21-1/4(W), 5-7/8(H), 15-5/8(D) inches

RECEIVER WEIGHT: 15.4 kg/34 lbs.

FURNISHED ACCESSORIES:

- 1-FM DIPOLE ANTENNA
- 1-INSTALLATION and OPERATION MANUAL

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RECEIVER SERVICE INFORMATION

CONTENTS: PAGE:

PARTS LOCATIONS (FIGURES 1A and 1B). . . . . .Inside Covers
AMPLIFIER SERVICING AND ADJUSTMENT 1
POWER SUPPLY SERVICING AND FAULT ANALYSIS 4
AMPLIFIER ELECTRONIC RELAY PROTECTION AND SPEAKER SYSTEM CHECKS. .4
FM TUNER AND IF ALIGNMENT 5
PHASE LOCK LOOP MULTIPLEX ADJUSTMENT. 6
AM TUNER AND IF ALIGNMENT (S7910 only) 6
DIAL STRINGING DETAIL. 7
ORDERING PARTS 8
PARTS LIST (See Supplements)
SCHEMATIC DIAGRAM (See Supplements)
CIRCUIT BOARD COMPONENT LAYOUTS (See Supplements)

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AMPLIFIER SERVICING AND ADJUSTMENT

NOTES:

1. For simplicity only the left channel and its related circuitry are described. The right channel is identical except for reference symbol numbers (see Schematic Diagram).
2. As a convience for fast component location, this manual contains detailed pictorials of all the printed circuit boards (shown 3/4 size). Reference to these pictorials should aid considerably in a quick, accurate fault analysis of an existing malfunction.
3. As an additional service aid, the power amplifier driver boards are of a plug-in design. To remove these and other boards and components, black plastic retaining 'pins' must first be lifted. This is easily accomplished by griping the head of the retaining pin with a long nose pliers and lifting the pin away from the component to be removed. Care should be taken so the black plastic 'sleeve' remaining after pin removal is not lost.

USE OF A VARIAC:

It is imperative that a variable voltage line source (Variac) equipped with a line wattmeter to identify abnormal power consumption be used when servicing power amplifiers and associated power supply circuitry. With the Volume (Loudness) control set at minimum, the power consumption should not exceed 40 watts as the voltage is increased by the Variac to the rated 120VAC. If the power consumption begins to exceed 40 watts, do NOT increase the line voltage any further. Determine if the malfunction is in the power supply, preamplifier, amplifiers, or tuner section of the receiver.

LINE FUSE AND INITIAL CIRCUIT CHECKS:

Verify that the line fuse is unopened and check idling power consumption. The main cause for abnormal power consumption, in order of decreasing occurance, are:

1. Open or shorted amplifier output, driver or pre-driver transistors.
2. Open or shorted power supply diodes.
3. Shorted power transformer.

AMPLIFIER FAULT ANALYSIS:

If an amplifier channel is in question, check related circuit boards for burned parts and replace. Check all the transistors with an ohmmeter* for opens or shorts and replace if defective.

*WARNING: Some ohmmeters may damage sensitive solid-state devices. Whenever possible, use a high resistance range (at least RX10).

IMPORTANT: For the following tests, an 8 ohm load resistor must be connected to each of the two power amplifier (speaker) output terminals.

Use the centerpoint voltage (measured from the + speaker terminal to ground) as a guide. The centerpoint voltage should always be Zero ±50mV. Any deviation suggests shorted or open devices.

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If channel operation is still faulty, verify that there are no shorted capacitors, open resistors, etc., on the board.

Inspect the underside of the board for shorted pads, broken connections, etc.

When the board is restored, readjust Output Bias (see below).

DISTORTION IN AMPLIFIER OUTPUT:

Distortion which exceeds the amplifier ratings (see Front Cover) may be due to the following:

1. Mismatched output transistors.
2. Defective (low-beta) driver transistors.
3. Incorrectly adjusted output transistor bias.

OUTPUT TRANSISTOR BIAS ADJUSTMENT:

Proper output transistor operation and output bias adjustment are most important to assure cool, low-distortion operation of the amplifier. Bias adjustment is necessary if the output transistors are replaced* or if any of the transistors in the driver circuitry of the amplifier exhibits one or more of the following symptoms:

1. Overheating of the output transistors under normal operating conditions. [Normal output transistor case temperatures are 30-35°C (86-95°F), quiescent operation at 25°C (77°F) ambient.]
2. Excessive low level Intermodulation Distortion (IMD) or Total Harmonic Distortion (THD) - more than 0.1% at 3.0 volts across 8 ohms.

*It is extremely important that the insulating washers used to separate the output transistors from their heat sink be unbroken and installed with silicon grease liberally applied to all surfaces in contact with each other. Make certain that the emitter and base pins of the output transistors do not touch any part of the heat sink assembly.

NOTE: For the following tests, an 8 ohm load resistor must be connected to each of the two power amplifier (speaker) output terminals.

SUGGESTED AMPLIFIER TEST BENCH SET-UP

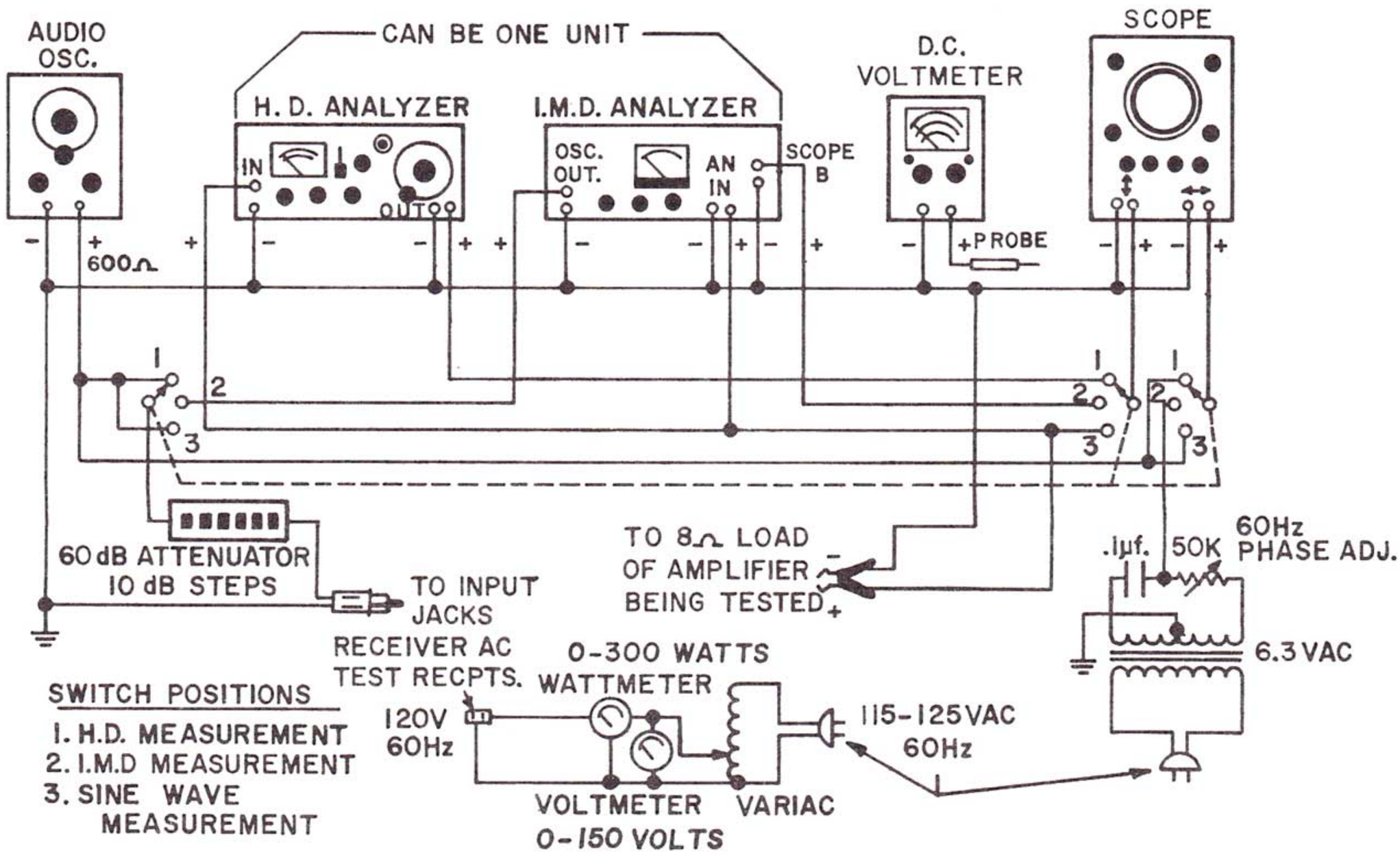


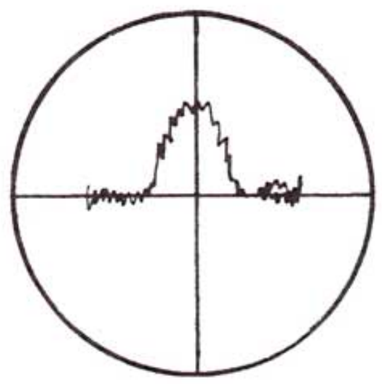
Figure 2

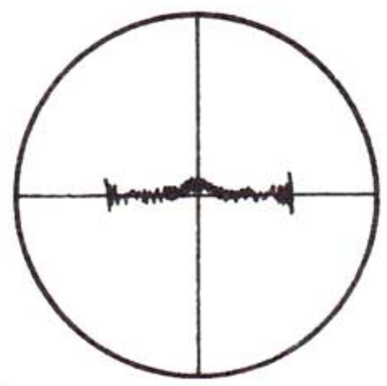
The following are four methods for adjusting output transistor bias:

BIAS ADJUSTMENT USING AN INTERMODULATION DISTORTION (IMD) ANALYZER:

1. Connect the receiver's amplifier for testing as in Figure 2.
2. Connect an Intermodulation Distortion Analyzer with a ratio of 4:1 using 60Hz and 7000Hz to the receiver's Left AUX 1 input and set the SELECTOR switch to AUX 1.
3. Set the VOLUME (LOUDNESS) control to maximum and adjust the generator for an amplifier output of 3.0 volts across the 8 ohm load of the amplifier channel under test.
4. While observing the resultant distortion waveform, adjust the left channel bias pot VR601 so that the crossover distortion is at the point of being eliminated (class "AB"). NOTE: Class "A" operation (continued CW rotation) causes the output transistors to draw excessive current and consequently overheat. Refer to Figure 3 below.
5. Repeat Steps 3 to 4 for the Right channel.

Improper Bias Adjustment





Proper Bias Adjustment

Figure 3

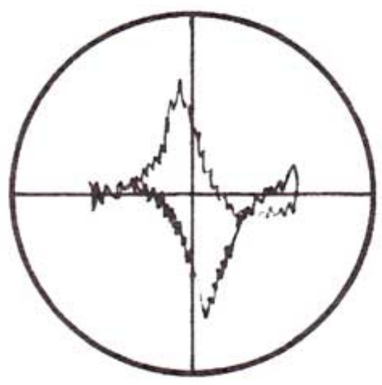
The following performance indicates a properly operating amplifier with both channels driven into 8 ohm loads:

1. Less than 0.1% Intermodulation Distortion (IMD) at 3.0V (typically 0.05%).
2. 60 watts of power per channel at no greater than 0.1% IMD.

BIAS ADJUSTMENT USING A HARMONIC DISTORTION ANALYZER:

1. Connect the receiver's amplifier for testing as in Figure 2.
2. Connect an oscillator with less than .01% distortion at 1KHz to the receiver's Left AUX 1 input and set the SELECTOR switch to AUX 1.
3. Set the VOLUME (LOUDNESS) control to maximum and adjust the oscillator for an amplifier output of 3.0 volts across the 8 ohm load of the amplifier channel under test.
4. Using the Harmonic Distortion Analyzer, looking at the distortion of the amplifier properly nulled, make the adjustment as follows: Adjust bias for class "AB" operation by turning the bias potentiometer VR601 so that the crossover is at the point of being eliminated. NOTE: Class "A" operation (continued CW rotation) causes the output transistors to draw excessive current and overheat. Refer to Figure 4 below.
5. Repeat Steps 3 and 4 for the Right channel.

Improper Bias Adjustment



Proper Bias Adjustment

Figure 4

The following performance indicates a properly operating amplifier with both channels driven into 8 ohm loads:

1. Less than 0.1% THD at 3.0 volts (typically 0.05%).
2. 65 watts per channel at no greater than 0.1% THD (1KHz).
3. 60 watts per channel at no greater than 0.1% THD (20-20,000Hz).

BIAS ADJUSTMENT USING A MILLIVOLTMETER:

If an accurate digital or analog voltmeter is available the bias pots (VR601 left and right channel) can be precisely adjusted to indicate 12mV across an output transistor's emitter resistor R651, R652, R653 or R654.

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BIAS ADJUSTMENT USING A LINE WATTMETER:

When test equipment required for previous bias adjustments is not readily available and adjustment is absolutely necessary, the following procedure may be used which requires only an accurate line wattmeter:

1. Turn the VOLUME (LOUDNESS) control to minimum.
2. Adjust the bias pots (VR601 left & right channel) one at a time to the point at which the amplifier begins to cause a very slight increase in line wattage consumption. Typical proper operation would develop a line wattage consumption of 36 watts.

POWER SUPPLY SERVICING AND FAULT ANALYSIS

Power supply malfunctions are usually due to shorted or open power diodes (located on the Rectifier P.C. Board 0046E), shorted or open zener diodes or transistors found on the Power Supply and Amp Protection P.C. Board 0046F, or a defective power transformer.

The devices may be easily checked with an ohmmeter. The transformer's operation may be checked by measuring secondary voltages with the associated circuit legs disconnected. Shorted windings can cause abnormal power consumption in a unit that otherwise functions well.

Inordinate line wattage can also be caused by a high leakage or shorted input filter capacitor C881 or C882.

AMPLIFIER ELECTRONIC RELAY PROTECTION AND SPEAKER SYSTEM CHECKS

It is absolutely necessary in the design of a high powered receiver to provide protection for both the amplifier AND the speaker load. The primary purpose of the S7910 and S8910's relay protection circuit is to disconnect the speakers if a potentially damaging situation should occur.

If there is no output to the speaker, first check the speaker connections for shorted wires or a shorted speaker (speaker load resistance should not indicate less than 4 ohms resistance on an ohmmeter). If the relay protection circuit is suspect, the following explanation of its normal operational characteristics may be helpful.

The parallel complementary output transistors are load line limited, with the maximum current limited to 6.5A peak (equivalent to 85 watts @ 4 ohms). Signal voltages developed across the output transistor's emitter resistors R651a, R652a, R653a and R654a forward-bias transistors TR606a and TR607a shunting the output transistor's base drive signal.

The amplifier protection circuit (P.C. Board 0046F) in normal operation is set so that transistor TR806 is reverse biased and non-conducting. This allows base current drive to the darlington relay transistors TR807 and TR808 through resistor R818 from the 58 volt supply. The relay is thereby activated and connects the speaker loads to the amplifier. Also, because of the turn-on 'delay' caused by the RC time constant of resistor R818 and capacitor C804 at the base of the relay driver, the AC Power turn-on pulse (speaker pops) are eliminated.

Transistors TR801 and TR802 constantly monitor the negative and positive current swings of the respective left and right channel parallel complementary output transistors. As the load impedance is reduced with a signal applied, a point is reached where, for example, if the left channel's output exceeds its rated power level, transistor TR801 becomes forward biased. Its collector current passes through diode D805, switching transistor TR805 and consequently transistor TR806 into conduction. TR806's resultant low collector voltage (V_{CE} saturation) clamps the darlington relay driver off, deactivating the relay and disconnecting the potentially dangerous load condition. Also, this simultaneously activates the front panel LED protection warning light.

The protection circuit constantly resets itself (reconnects the speakers) as it continually samples the existing load condition and amplifier power requirements; therefore, the protection light will continue to flash on and off until the abnormal load condition is corrected.

The LED protection warning light system is automatically tested for operation each time the receiver's AC Power switch is turned on. This happens because the LED driver transistor TR815 is momentarily forward biased until the relay driver saturates (as determined by the previously mentioned RC time constant which establishes the relay turn-on delay). Until saturation occurs, the LED protection warning light illuminates (for approximately 4 seconds) each time the AC Power switch is activated.

Loudspeaker protection is also provided in the event that either a positive or negative

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DC voltage becomes present at the amplifier speaker terminals.

Positive Voltage Protection: An amplifier malfunction resulting in a positive DC voltage at the speaker terminals causes transistor TR803 to conduct. Base current now activates TR805, which in turn drives the base of transistor TR806 whose collector switches low, clamping off the relay driver transistor thereby disconnecting the speaker load.

Negative Voltage Protection: If a negative voltage were to appear at the speaker terminals (such as would occur when a negative side driver or output transistor fails in a short mode), transistor TR804 will conduct. As was the case with the positive voltage protection, base current is now fed to transistor TR806, causing its collector to switch low, clamping off the relay driver transistor and disconnecting the speaker.

FM TUNER AND IF ALIGNMENT (Refer to Figure 1A for parts locations)

1. Set the SELECTOR switch to FM and turn the FM MUTING switch off. Connect an FM generator to the 300 ohm antenna terminals using a matching transformer with a 1:1 voltage ratio or, if necessary, use a 2:1 ratio resistive network as shown below in Figure 5.

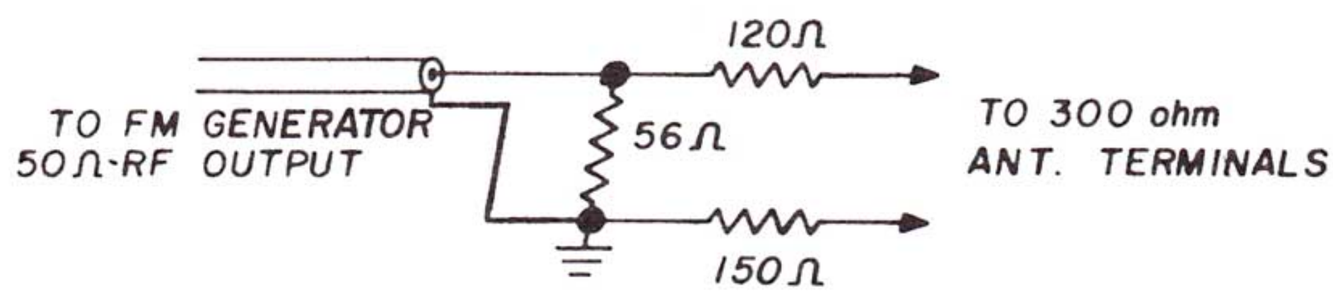

Figure 5

2. Tune the receiver to a point of no signal or interference near 90MHz.
3. Tune the FM Generator, modulated ±300KHz @ approximately 20uV output level, to the receiver frequency. Connect an RF Detector Probe to Pin 1 of IC204 (LA1230) and center the FM IF response on the osciloscope. The FM IF bandpass characteristics are now being displayed. Adjust the primary and secondary cores of the converter FM IF output transformer T101 for maximum gain and symmetry (Figure 6).

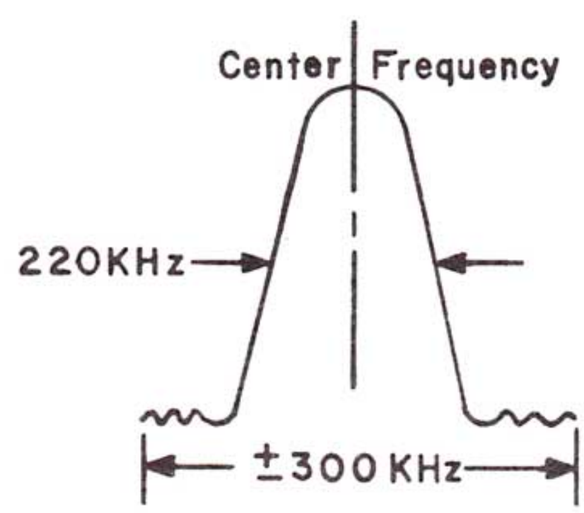

Figure 6

4. The FM front end alignment can also be determined while observing the oscilloscope display of Step 3. Tune the receiver and generator to a point of no interfering signal near 90MHz. Check that the receiver dial pointer indicates within ±100KHz from the generator frequency. (If the generator output frequency is not accurately calibrated, a FM station can be used as a calibration reference.) If the dial deviation exceeds 100KHz, adjust the local oscillator coil L104 slightly, until optimum dial calibration is obtained. Next, adjust the antenna and RF amplifier coils L101, L102 and L103 for maximum gain. Tune the receiver and the generator to a point of no interference near 106MHz. Check the dial calibration. If required, adjust the local oscillator trimmer TC104 until optimum dial calibration is obtained. Now, adjust the antenna and RF amplifier trimmer capacitors TC101, TC102 & TC103 for maximum gain. Repeat alignment at 90MHz and 106MHz until no further improvement is obtained.
5. ZERO CENTER TUNING METER ADJUSTMENT: To adjust for the correct zero indication, leave the FM Generator connected as in step 1 and tune the receiver to a point of no signal or interference.
   A. Connect a DVM or VOM across resistor R220 (6.8K ohm) on Tuner P.C. Board 0035. These two test points are also identified as "TP" on the tuner board and the schematic.

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B. Tune the core of transformer T201 for a zero DC voltage indication on the voltmeter.
C. Adjust the printed circuit board potentiometer VR203 for a zero (center scale) indication on the zero center tuning meter. The zero center tuning meter should now provide precise center-of-channel station tuning.

6. SIGNAL STRENGTH TUNING METER ADJUSTMENT: Decrease the FM signal generator output to zero. The meter pointer should indicate near zero. Now, increase the generator output to 100mV and if necessary adjust potentiometer VR201 for a meter indication of $4\frac{1}{2}$. The signal meter adjustment is now complete.

7. FM DIGITAL DETECTOR: Basically, the digital detector converts the Frequency Modulation of the received station into audio. In this system there are no coils or tuned circuits that require exacting frequency and distortion alignment, such as are necessary in the conventional discriminator, ratio detector and quadrature detector circuits.

   The monostable multivibrator IC205 is locked into operation by the modulation of the transmitted signal itself - tuned circuits are unnecessary. Since the received signal controls the detection process the recovered audio is essentially as distortion free as the signal itself.

   The 10.7MHz ±75KHz IF signal (approximately 1.5V p-p) drives pin 5 of the integrated circuit IC205. Its complementary pulsed output (4V p-p) appears out of phase at pins 1 and 5. It is frequency divided (f/2) to 5.35MHz ±75KHz and is pulse position modulated as established by the incoming signal. The pulse duration is fixed by the IC and the external timing components R228 (6.8K) and C226 (15pf). The charge and discharge of the integrating capacitors, C229 and C230, now occurs at the modulating audio rate.

   The recovered out-of-phase audio signal is applied to the differential inputs of IC206, resulting in a 0.8V p-p (0.3V rms) audio signal at its pin 7 output.

8. MUTING STEREO THRESHOLD ADJUSTMENT: This receiver is equipped with a muting circuit which automatically removes or reduces the noise (rushing sound) normally heard between broadcast channels on a highly sensitive FM receiver. The noise threshold level can be adjusted with the Muting Threshold Control VR202 located on the tuner board 0035. The normal threshold level is 5 microvolts.

   To adjust the muting sensitivity, connect the FM Generator and oscilloscope as in Step 1 and move the oscilloscope lead to the REC Output jack on the back panel. With the MUTING switch in, slowly increase the generator output from zero to the automatic muting threshold level. Audio can now be observed on the oscilloscope. The desired threshold level can be set by adjusting VR202 and repeating the above.

PHASE LOCK LOOP MULTIPLEX ADJUSTMENT

NOTE: This receiver utilizes an integrated circuit phase lock loop (PLL) stereo modulator. The phase lock loop is essentially a free-running 76KHz oscillator (subsequently divided down to 38KHz and 19KHz) which locks onto the stereo pilot tone of the transmitted signal, enabling accurate signal decoding. Proper adjustment of the free-running oscillator control VR301 is essential for stability and proper channel separation.

PLL ADJUSTMENT USING A DIGITAL FREQUENCY COUNTER AND AN FM STEREO GENERATOR: Tune the receiver to a point of no signal or interference. Tune the generator to the receiver frequency and adjust it for an unmodulated signal at 100 microvolt output. With the digital frequency counter probe attached to Pin 10 (test pin provided) of IC301, adjust VR301 for 19KHz ±10Hz. Using a stereo test signal, adjust VR302 for best total separation and minimize differences in the left-to-right and right-to-left separation. The separation should be 40dB minimum in reference to a 100% modulated audio at 1KHz.

If 40dB is not obtainable, apply the pilot signal only and check the left and right multiplex outputs for 19KHz/38KHz residual. It should be a minimum of -60dB below audio reference.

PLL ADJUSTMENT USING AN FM STEREO GENERATOR:
With the receiver tuned to a stereo signal, adjust VR301 to determine the endpoints for stereo lock-in and set VR301 halfway between these end-points. Using a stereo test signal, adjust VR302 for best separation.

AM TUNER AND IF ALIGNMENT

1. Set the receiver SELECTOR switch to AM. Tune the receiver to a point of no signal or interference near 600KHz. Connect the scope/VTVM to the REC output jack. Connect the AM Generator output to the receiver AM Antenna terminal through a 330 ohm resistor.

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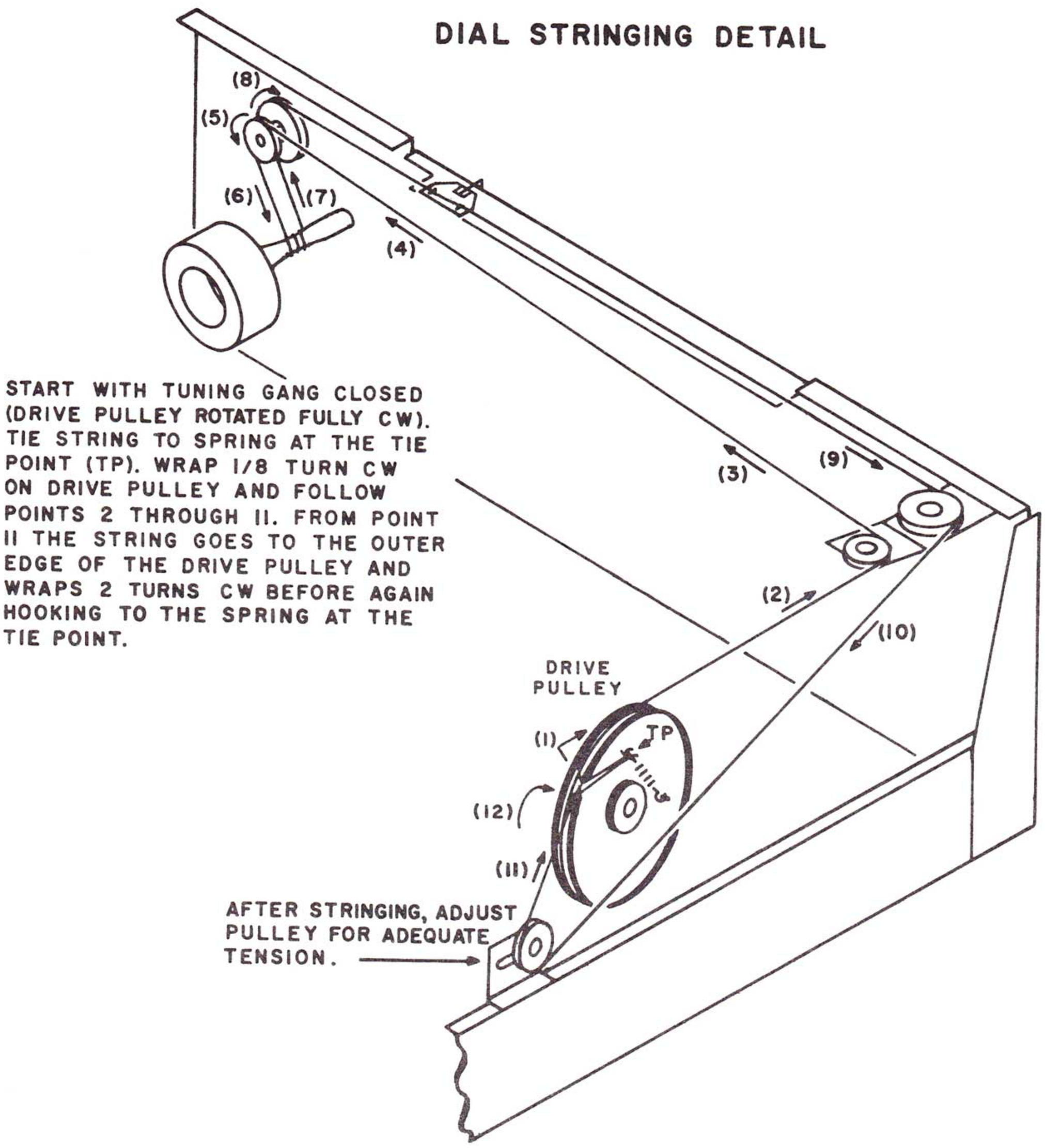
2. Adjust the AM Generator for 455KHz RF output, modulated @ 400Hz, 50%. Tune the AM Converter (AM IFT-1 coil) and the 2nd AM IF (AM IFT-2) core for maximum audio output.
3. Adjust the AM Generator for 600KHz. If required, adjust the AM Oscillator L402 so that the generator signal is received by the receiver at 600KHz, as indciated on the dial scale. Adjust the Rod Antenna core L451 located at the end of the antenna rod assembly and AM RF coil L401 for maximum output as indciated on the scope/VTVM.
4. Tune the receiver and generator to a point of no interfering signal near 1400KHz. Check the dial calibration and if necessary adjust the AM Oscillator Trimmer TC107 for optimum dial calibration. Adjust the Antenna Trimmer TC105 and the 2nd RF Amplifier Trimmer TC106 for maximum output.
5. Repeat Steps 3 and 4 until no further improvement is obtained.

SIGNAL METER CALIBRATION: Adjust potentiometer VR401 for a 4½ division meter deflection with a 10KuV signal generator input.

AM OUTPUT LEVEL: When all AM adjustments are completed, adjust VR402 for an output of 120mV (30% modulation) at any REC Out jack.



ORDERING PARTS

When ordering replacement parts, always include part numbers (see Parts List).

When defective parts are returned for replacement under warranty (Authorized Service Stations only) include a list, by part number and value, of the parts returned. Request either credit or replacement parts.

The return of entire circuit boards for replacement is not covered by the warranty except where component failure has resulted in physical damage to the board itself.

If a set or board cannot be repaired, return the complete receiver to the Sherwood Factory Service Laboratory, 4300 N. California Ave., Chicago, Illinois 60618. Include a complete description of the malfunction.

N O T E S

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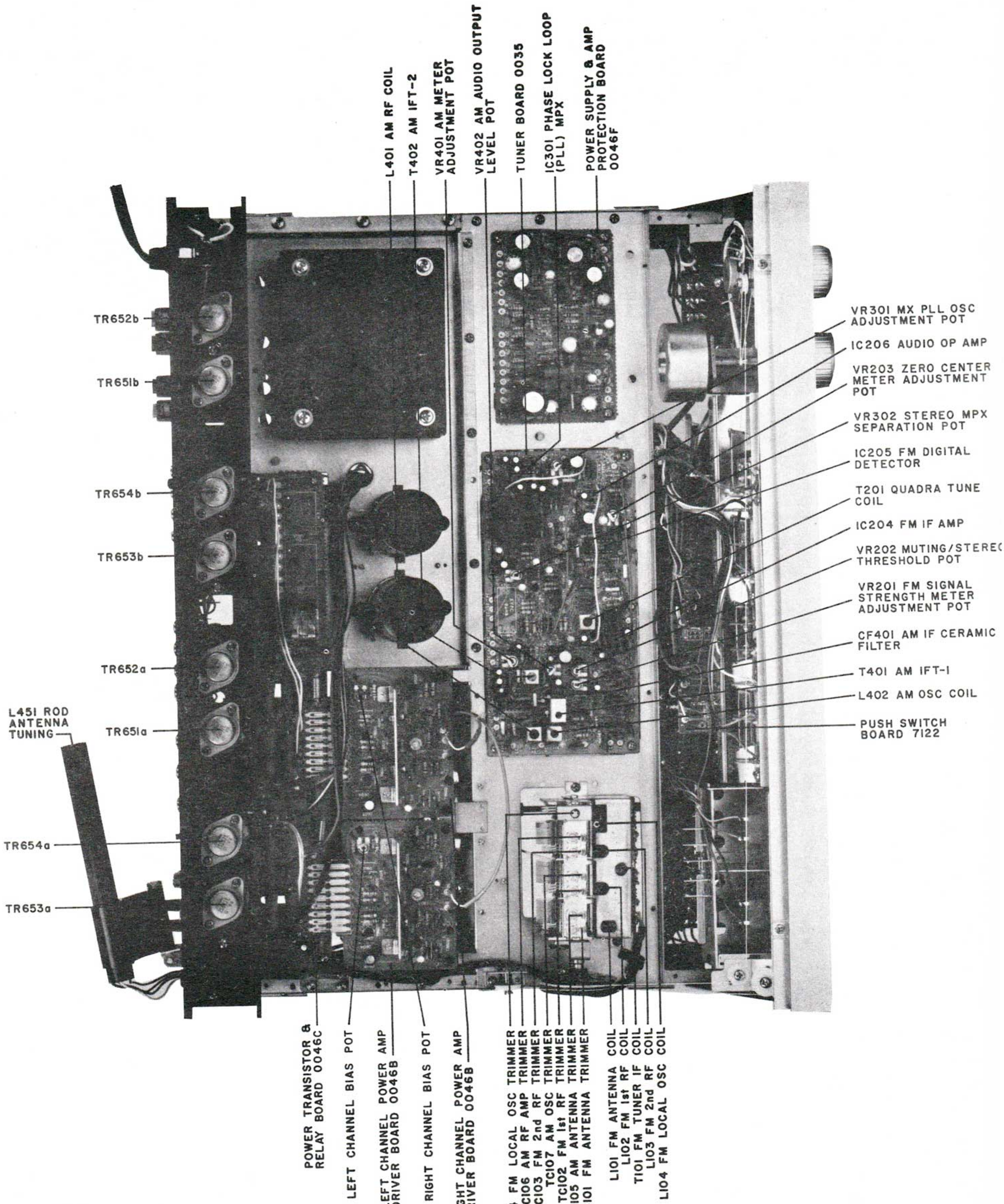

FIGURE 1A
TOP VIEW WITH TUNER SECTION SHIELD REMOVED

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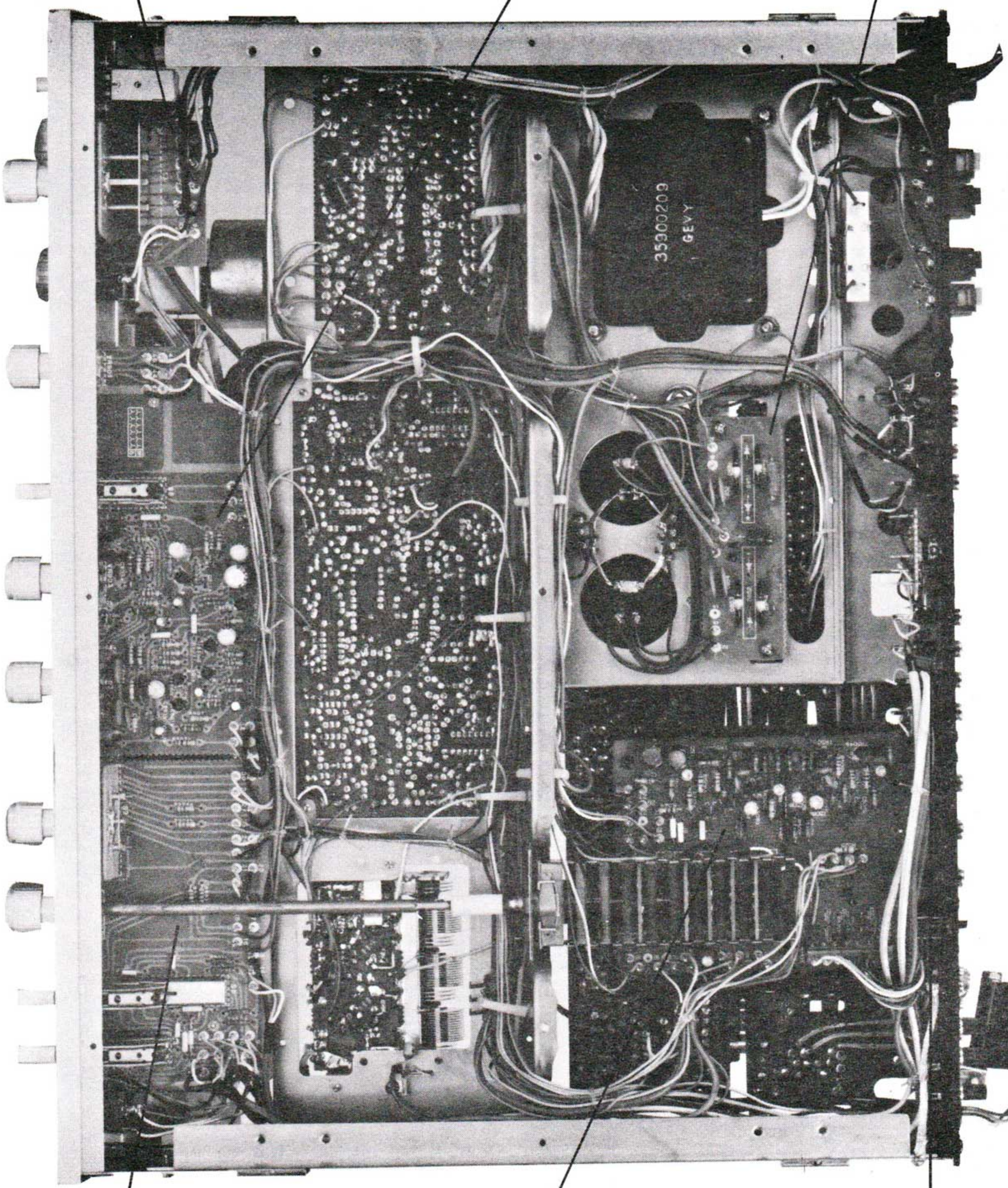

FIGURE 1B
BOTTOM VIEW

SERVICE MANUAL M680-07 LITHO IN USA SEPTEMBER 1976

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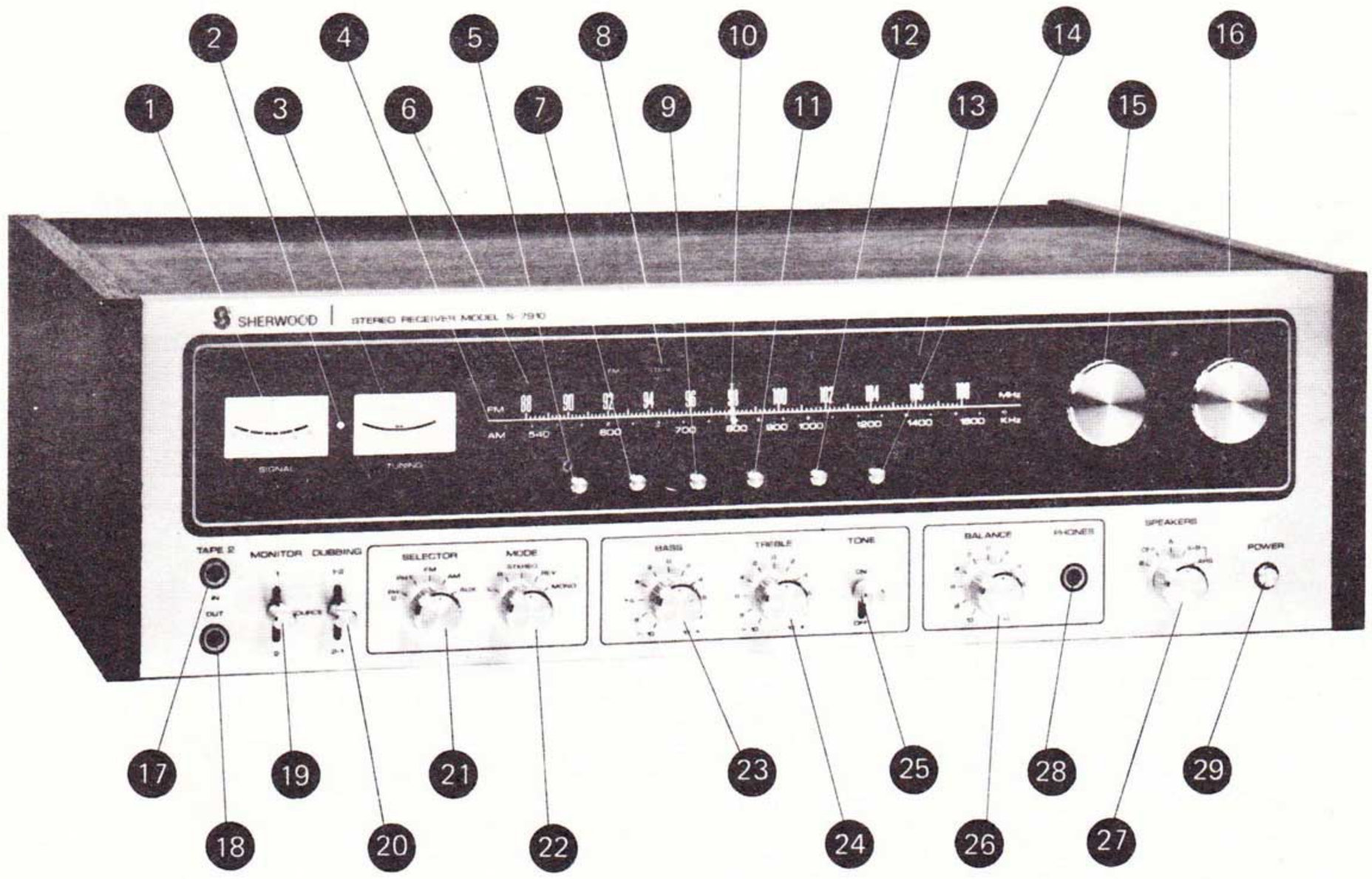
Front Panel Features



1. **Signal Strength Meter:** Indicates the relative signal strength of the FM (or AM) channel selected.
2. **Positune Light (LED):** Illuminates when an FM station is properly tuned.
3. **FM Zero Center Tuning Meter:** Indicates accurate FM center-channel tuning.
4. **Illuminated Tuning Scales.**
5. **FM Deemphasis Switch:** Selects proper deemphasis for either normal FM transmission or 25 μ sec. specially encoded broadcasts.
6. **Source Indicator Lights:** Visually indicates the selected input source.
7. **FM Stereo Only Switch:** Mutes mono transmission; permits listening of stereo stations only.
8. **Stereo FM Indicator Light.**
9. **FM Muting Switch:** Removes FM interstation noise.
10. **Dial Pointer:** Illuminates in FM (and AM) mode.
11. **High Filter Switch:** Cuts out 'scratch' from records or background 'hiss' from noisy FM stations
12. **4-Channel Adapter Switch:** Activates external 4-channel decoder or other external processing unit; also serves as an additional Tape Monitor.
13. **Protection Light:** Illuminates when automatic protection circuit is engaged.
14. **Loudness Switch:** Activates loudness control compensation circuit.
15. **Tuning Control:** Counterbalanced for easy tuning of FM (and AM) stations.
16. **Loudness Control:** Volume control that automatically adds bass and treble compensation at low levels when the Loudness Switch is depressed.
17. **Tape-2 In Jack:** Convenience front panel Tape-2 Input.
18. **Tape-2 Out Jack:** Convenience front panel Tape-2 Record Output.
19. **Tape Monitor Switch:** Selects either Tape-1 or Tape-2 as the listening source.
20. **Tape Dubbing Switch:** Permits duplication from Tape-1 to Tape-2, or 2-1.
21. **Selector Switch:** Selects your listening source: Phono 2, Phono 1, FM, AM (S7910), or Aux.
22. **Mode Switch:** Provides for selection of Left or Right Channel only, Stereo, Stereo Reverse, or Mono.
23. **Bass Control:** Varies low frequency levels as much as ± 14 dB.
24. **Treble Control:** Varies high frequency levels as much as ± 14 dB.
25. **Tone Defeat Switch:** Disables tone controls and establishes a flat frequency response regardless of the tone control settings.
26. **Balance Control:** Balances the relative volume levels of the left and right speakers.
27. **Speaker Selector Switch:** Selects desired combination of speakers or switches speakers off (for headphone listening).
28. **Stereo Headphone Jack.**
29. **Main Power Switch.**

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SHERWOOD Models S7910 & S8910 Replacement Parts List

ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE

TRANSISTOR'S & FET'S	REFERENCE	PART NO.	LIST PRICE
2SA640	TR303, 305	30000241	$ .98
2SA733Q	TR306, 307, 607 a,b; 812, 816	30000423	.98
2SA750	TR805	30000371	.75
2SA841BL	TR501a,b; 502a,b; 504a,b; 902a,b	30000442	.75
2SA794	TR609a,b	30000413	2.08
2SA858	TR604a,b	30000523	1.76
2SB531 [PNP OUTPUT]	TR653a,b; 654a,b	30100073	4.89
2SB560	TR811	30100041	1.43
2SC536F,G	TR202, 204, 301	30200131	.65
2SC710D	TR103	30200382	.72
2SC869C	TR801, 802	30201251	.96
2SC930D	TR201, 203	30200271	.72
2SC945K,L-P	TR401, 606a,b; 806, 810, 814, 815	30201031	.62
2SC1222	TR302, 304	30200662	.74
2SC1400	TR803, 804, 807	30201191	.75
2SC1439	TR605a,b	30201273	1.56
2SC1567R	TR601a,b	30201023	1.88
2SC1583G	TR601a,b	30201172	1.57
2SC1681BL	TR901a,b; 903a,b	30201132	.68
2SC1708F	TR503a,b; 602a,b	30201231	.75
2SD325E	TR813	30300151	1.85
2SD371 [NPN OUTPUT]	TR651a,b; 652a,b	30300212	4.32
2SD438	TR808, 809	30300250	1.24
3SK45 [MOS-FET]	TR101, 102	30400081	3.97

INTEGRATED CIRCUIT'S			
HA1156 [Pll MPX]	IC301	30900260	6.64
HA1197 [AM RF/IF]	IC401	30900400	6.29
LA1230 [FM IF, AGC]	IC204	30900380	8.07
RC4558DN[Dual OP Amp]	IC206, 207		2.88
TA7060P [FM IC]	IC201, 202, 203	30900300	1.77
74121 [Digital Det.]	IC205	30900390	5.54

DIODE'S, SIGNAL, POWER, ZENER & LED			
1N60	D201, 202, 203	30600010	.31
1S2473	D205, 210, 301, 303, 304, 520, 602a,b; 603a,b; 802, 803, 804, 805, 806	30600410	.31
KB169	D206	30600670	.49

DIODE'S (Cont.)	REFERENCE NO.	PART NO.	LIST PRICE
KB269	D204	30600580	$ .55
GM-3Z [2.7A, 200 PIV]	D851, 852, 853, 854	30600891	1.11
LR64R [LED, 3V, 50mW]	LED	30600961	1.15
RD6.2EB[6.2VZ, 400mW]	D601a,b	30600691	.68
RD13EB [13VZ, 500mW]	D812	30600331	.75
RD18EB [18VZ, 500mW]	D808	30600630	.75
SR1K-2 [1.6A,100 PIV]	D652, 807, 810, 811	30600540	.55
STV-3H [1.6V Ref.]	D651a,b	30600881	1.71
WZ-050 [5VZ, 500mW]	D208	30600931	.67
WZ-090 [9VZ, 500mW]	D211	30600530	.78
WZ-140 [14VZ, 500mW]	D809	30600911	.75

ELECTROLYTIC CAPACITOR'S [PC unless otherwise specified]			
0.22 @ 50V[Non-Polar]	C303, 305	64535224	.86
0.47 @ 50V	C217, 222, 316, 415, 416, 604a,b; 803	640X5474	.33
0.47 @ 50V[Non-Polar]	C304	64535474	.86
0.47 @ 50V[Low-Leakg]	C501a,b; 901a,b	68145474	.66
0.47 @ 100V[Low-Leak]	C655b	640X8474	.55
0.68 @ 50V[Low-Leakg]	C911a,b	68145684	.66
1 @ 50V	C236, 237, 309, 310, 313, 314	640X5105	.33
1 @ 50V [Low-Leakage]	C509a,b	68145105	.66
2.2 @ 25V	C246, 601a,b	640X3225	.45
3.3 @ 25V	C220	640X3335	.45
4.7 @ 25V	C241, 307, 308, 405, 406, 414, 913a,b;	640X3475	.71
10 @ 16V	C233, 317, 418, 520, 820, 902a,b	640X2106	.52
10 @ 16V [Non-Polar]	C311	64532106	.87
10 @ 16V[Low-Leakage]	C902a,b	68142106	.66
10 @ 25V	C806, 820	640X3106	.47
22 @ 10V	C232	640X1226	.48
22 @ 16V[Low-Leakage]	C508a,b	68132226	.66
22 @ 25V	C905a,b	640X3226	.44
33 @ 16V	C821	640X2336	.50
33 @ 16V [Non-Polar]	C603a,b	64532336	.62
47 @ 10V	C228	640X2476	.52
47 @ 35V	C809, 813	640X4476	.60
47 @ 50V	C805	640X5476	.71
100 @ 6.3V	C607a,b	640X0107	.54
100 @ 16V	C814, 818	640X2107	.57
100 @ 16V[Non-Polar]	C801	64532107	1.09

(Over)

ELECTROLYTIC'S (Cont.)	REFERENCE NO.	PART NO.	LIST PRICE
100 @ 35V	C510, 511, 914	640X4107	$ .87
100 @ 50V	C810	640X5107	1.08
220 @ 6.3V	C229	640X0227	.55
220 @ 16V	C315, 417, 804, 819,	640X2227	.84
2200 @ 35V	C817	640X4228	2.53
12,000 @ 50V [Can]	C856, 857	64235129	12.48

COIL'S & TRANSFORMER'S

AM ROD ANTENNA	L451	35400461	5.99
COIL, RF CHOKE, 18uH	L201	35500310	.41
COIL, AM RF	L401 #124B	35501242	.91
COIL, AM OSCILLATOR	L402 #402L	35504026	.98
COIL, RF CHOKE,.82uH	L461	35500290	.41
COIL, RF CHOKE, 3uH	L651a,b	35500300	.74
COIL, 39mH	L701a,b	35500190	1.09
TRANSFORMER, QUADRA-TURE	T201 #217D	35702174	1.31
TRANSFORMER, FM BALUN	T151	35500060	.90
TRANSFORMER, & FILTER	T401 [SFL-455A]	35300016	3.03
TRANSFORMER, AM(IFT-2)	T402 #406B	35704062	.98
TRANSFORMER, POWER	T1	35900209	64.80
TRANSFORMER, POWER	T1[120/234V AC]	35900233	**

ELECTRONIC COMPONENTS

CERAMIC FILTER [CFSA-10.7M]	CF201, 202, 203, 204	35300015	1.56
CERAMIC FILTER [SFD-455C4]	CF401	35300017	2.54
FILTER, MPX LOW PASS	LPF 301, 302	35000070	4.43
METER, ZERO-CENTER	M1	60100018	9.61
METER, SIG. STRENGTH	M2	60200017	9.61
PILOT LIGHT, 8V/0.25A		37008019	.82
PILOT LIGHT, 8V/.050A		37008035	.88
POTENTIOMETER, 100KX2	VR951a,b[Volume]	28000127	6.65
POTENTIOMETER, 100KX2 & 50K	VR901a,b [Bal.]	28000131	7.94
POTENTIOMETER, 100KX2	VR902a,b; 903a,b; 905a,b [Tone]	28000129	2.65
RELAY, 3PDT[Protect.]	K1	82000040	10.23
SWITCH, LEVER	S4 [Tape Mont'r]	27600024	2.90
SWITCH, LEVER	S5 [Tape Dubbing]	27600025	3.26
SWITCH, LEVER	S14 [Tone On-Off]	27600029	3.12
SWITCH, LEVER	S16 [Power]	27200082	4.44
SWITCH, 4 PUSH-BUTTON	S9, 10, 12, 13	27200083	4.94
SWITCH, 2 PUSH-BUTTON	S6, 7	27200085	2.39
SWITCH, ROTARY	S3 [Spkr. Sel.]	27100135	4.21
SWITCH, ROTARY(S8910)	S1 [Selector]	27100134	4.42
SWITCH, ROTARY(S7910)	S1 [Selector]	27100132	4.42
SWITCH, ROTARY	S2 [Mode]	27100132	4.44

ELECTRONIC COMPONENTS	REFERENCE NO.	PART NO.	LIST PRICE
SWITCH, SLIDE	S8 [Pre-A/Main]	27300011	$1.17
SWITCH, SLIDE	S11 [Phono Sens.]	27300012	1.48
TRIMMER RESISTOR, 1K	VR203, 401	28100059	.86
TRIMMER RESISTOR,100K	VR202	28100063	.66
TRIMMER RESISTOR, 5K	VR301	28100060	.66
TRIMMER RESISTOR, 50K	VR302	28100096	.66
TRIMMER RESISTOR, 10K	VR201, 401	28100061	.66
TRIMMER RESISTOR, 300	VR601a,b	28100094	.66
TUNER ASSEMBLY, FM	[FL512U]	95023001	60.22

MECHANICAL COMPONENTS

ESCUTCHEON ASSEMBLY (S8910)	10194003	39.05
ESCUTCHEON ASSEMBLY (S7910)	10193001	39.05
DIAL DRUM	21012001	1.06
DIAL POINTER ASSY., ILLUMINATED	25043001	3.67
DIAL SCALE	20095001	5.69
DIAL SHAFT AND FLYWHEEL	23046001	6.40
FEET, PLASTIC	84251001	.41
FUSE HOLDER [Line Fuse]	34032001	1.81
JACK, PHONE [Tape In-Out]	33031500	2.46
JACK, PHONE [Stereo Headphones]	33031600	1.36
KNOB, LARGE, WITH INDICATOR [Loudness]	29235001	5.01
KNOB, LARGE, WITHOUT INDICATOR [Tune]	29236001	5.34
KNOB, LEVER [Lever Switches]	29232001	2.71
KNOB, PUSH-BUTTON [Power Switch]	29234001	1.23
KNOB, PUSH-BUTTON [Push-Button Sw.]	29233001	1.23
KNOB, SMALL, WITH INDICATOR [Sw, Tone]	29229001	2.46
RECEPTACLE, AC	34049001	.92
RECEPTACLE BOARD, 1 PHONO JACK [4CH]	33010440	.74
RECEPTACLE, 5 PIN "DIN"	34057001	1.17
RECEPTACLE BOARD, 8 PHONO JACKS	33081340	4.19
RECEPTACLE BOARD, 6 PHONO JACKS(PC MTG.)	33060450	3.32
SOCKET, POWER TRANSFORMER	34061002	.73
TERMINAL BOARD, 8 SPRING POSTS [Spkr's]	53082430	6.97
WOODEN CABINET	85070901	28.00
CARTON, SHIPPING WITH POLYFORMS	86209001	5.00
OWNER'S MANUAL		2.50

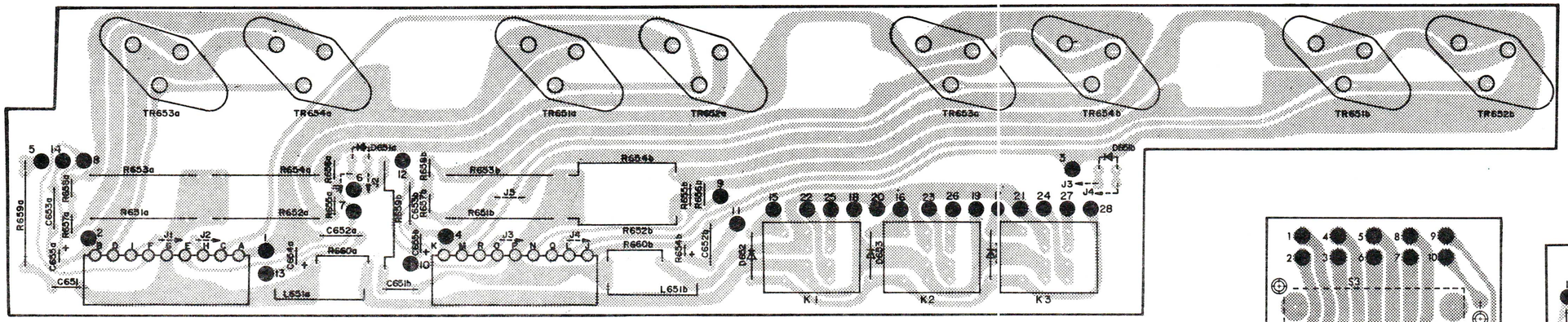
**Request quotation from Sherwood Factory Service Dept. on trade-in/installation price.

Litho in U.S.A. 8/76

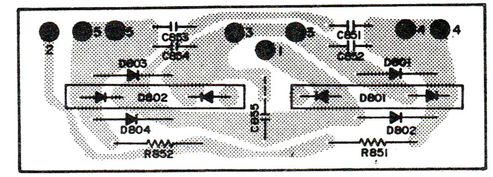
SHERWOOD ELECTRONIC LABORATORIES, INC., 4300 N. CALIFORNIA AVE., CHICAGO, ILLINOIS 60618 312-478-7300

S7910 & S8910 PRINTED CIRCUIT BOARD ASSEMBLIES

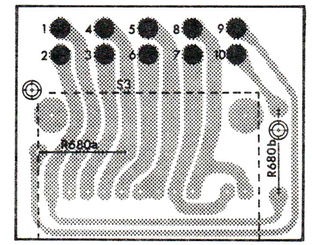
CIRCUIT BOARDS ARE SHOWN FROM THE COMPONENT SIDE; FOR A VIEW FROM THE COPPER SIDE, TURN THIS SHEET OVER AND HOLD UP TO A LIGHT.



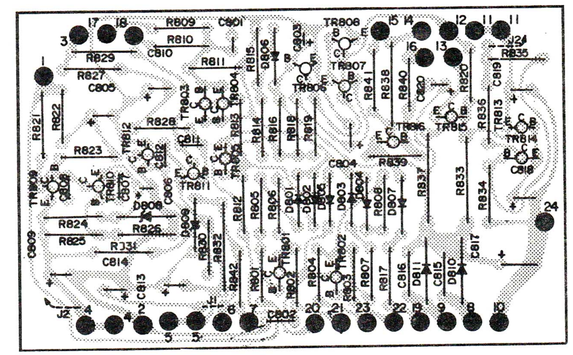
POWER TRANSISTOR and RELAY BOARD 0046C



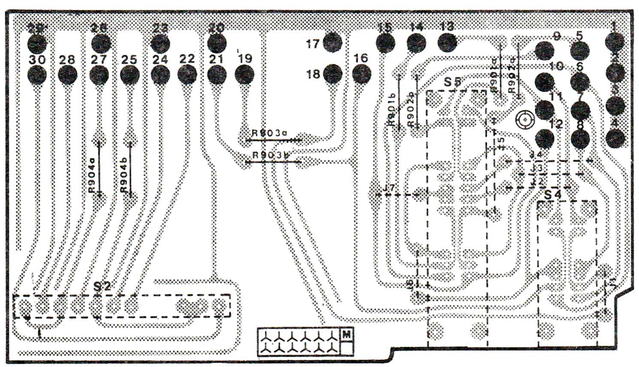
RECTIFIER BOARD 0046E



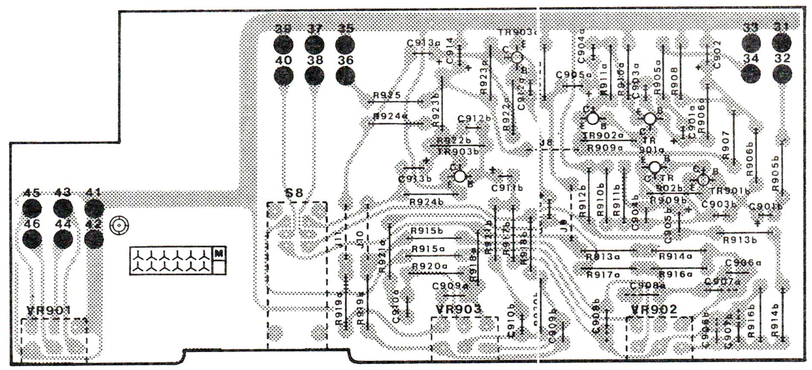
SPEAKER SELECTOR SWITCH BOARD



POWER SUPPLY and AMP PROTECTION BOARD 0046F

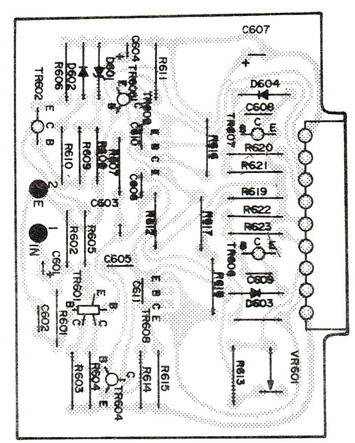


TAPE/MODE BOARD 9029A-1

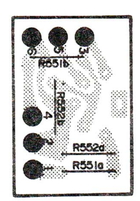


TONE CONTROL BOARD
S7910: 9029B-1
S8910: 9029A-1

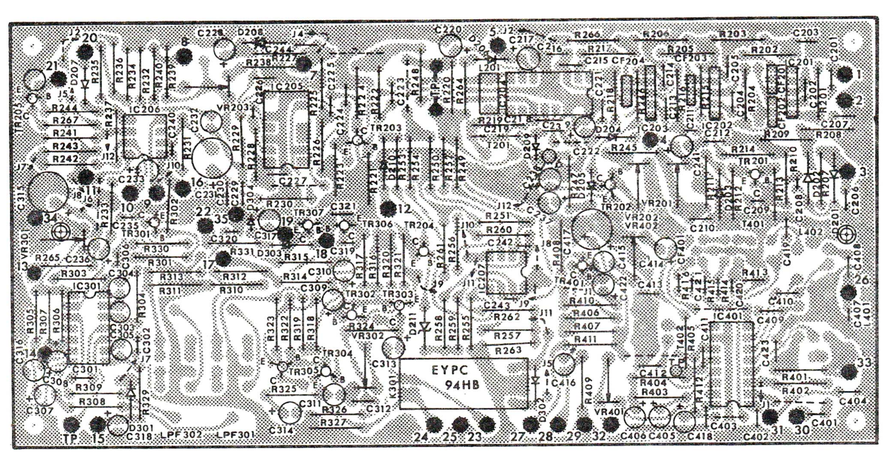
SHERWOOD ELECTRONIC LABORATORIES, INC.
4300 NORTH CALIFORNIA AVENUE
CHICAGO, ILLINOIS 60618



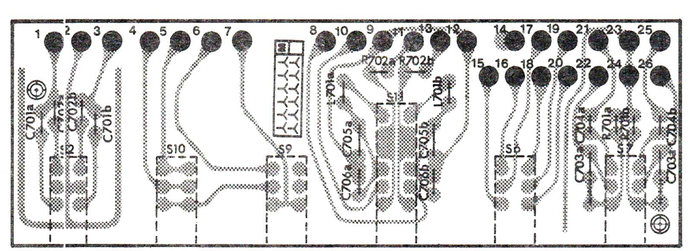
POWER AMP DRIVER BOARD 0046B
(TWO REQUIRED; ONE PER CHANNEL)



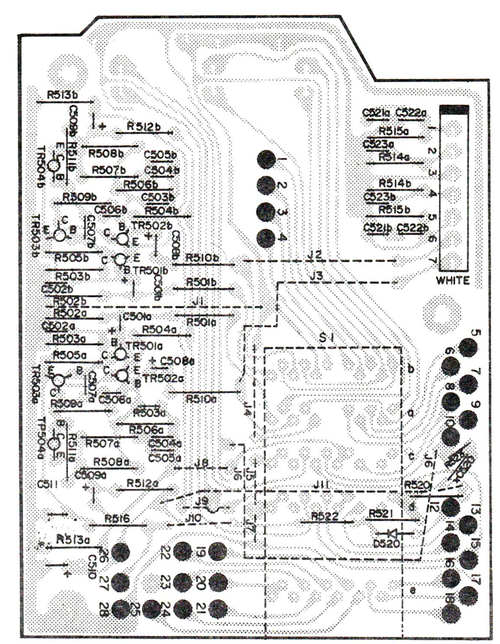
DIN JACK BOARD
0046D



TUNER BOARD 0035

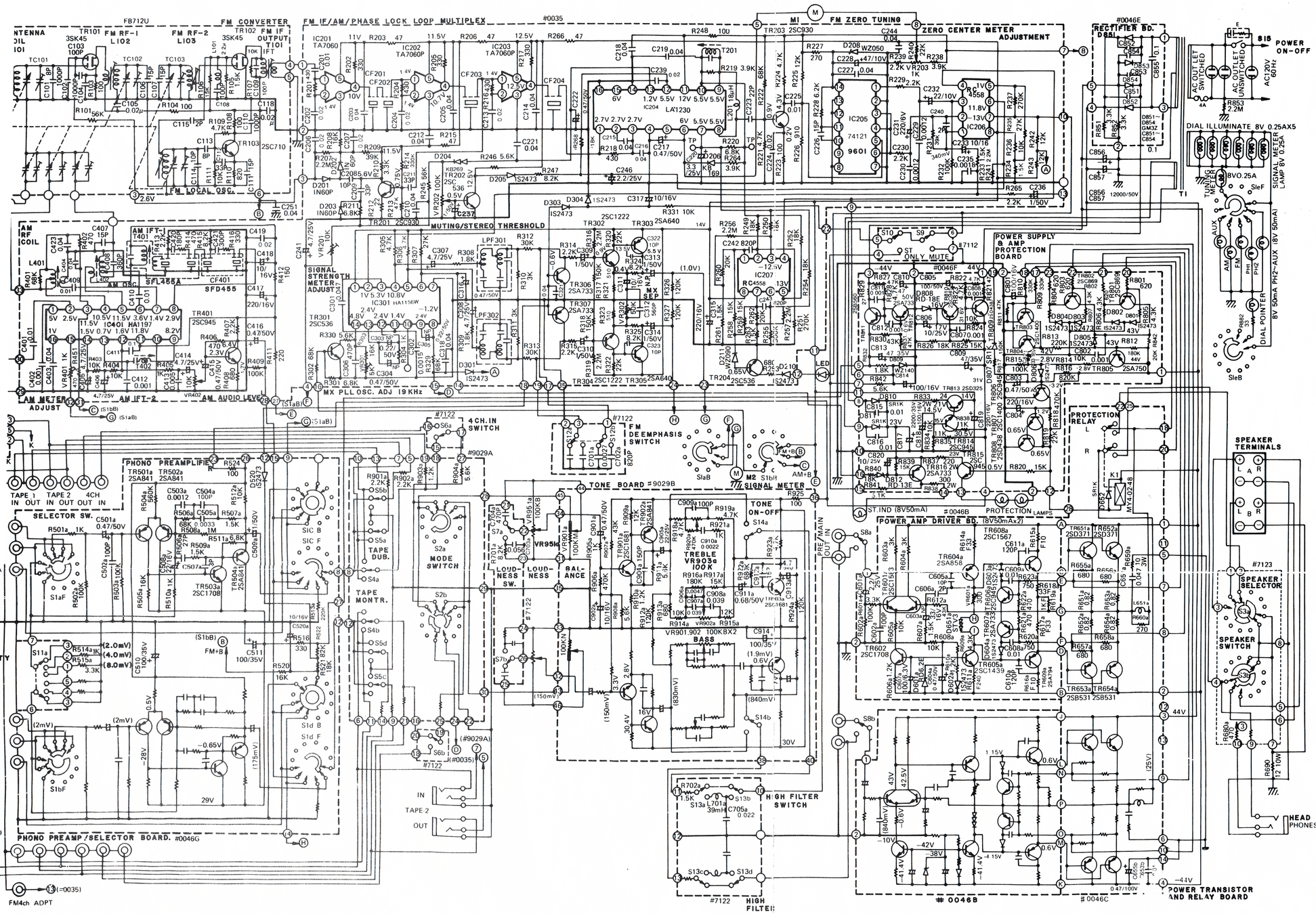


PUSH SWITCH BOARD 7122



PHONO PREAMP/SELECTOR BOARD
7910: 0046G; 8910:.0046H

SCHEMATIC DIAGRAM



SHERWOOD
MODEL S-7910
AM/FM STEREO RECEIVER

SWITCHES

S1: SELECTOR
1. PH2
2. PH1
3. FM
4. AM
5. AUX

S2: MODE
1. L
2. R
3. STEREO
4. REV
5. MONO

S3:SP SELECTOR
1. B
2. OFF
3. A
4. A+B
5. ARS

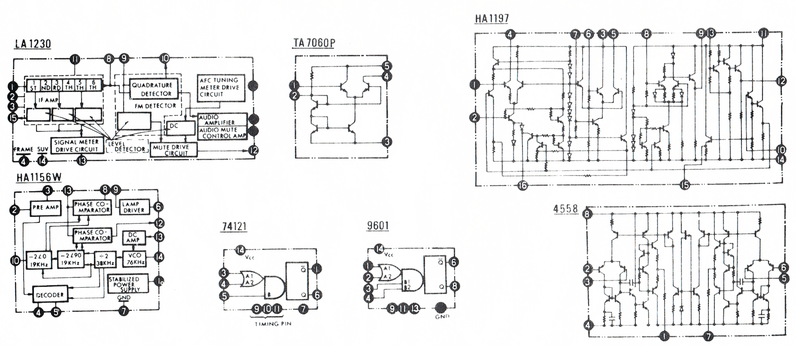
S4: TAPE MON
1. TAPE1
2. SOURCE
3. TAPE2

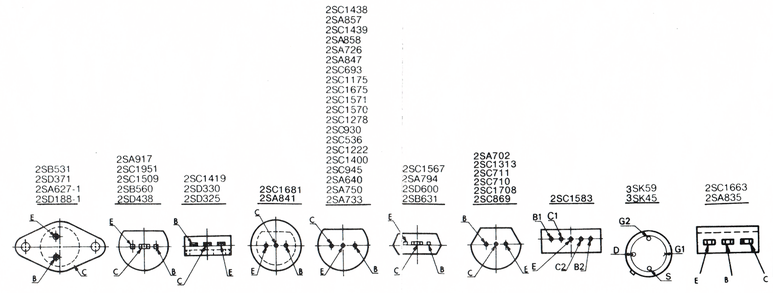
S5: TAPE DUB
1. TAPE 1→2
2. SOURCE
3. TAPE 2→1

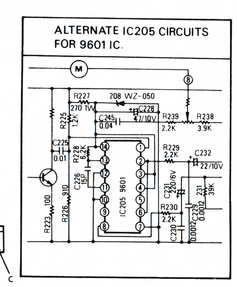
S6: 4CH IN
S7: LOUDNESS
S8: PRE. MAIN SEPARATE
S9: MUTE
S10: ST ONLY
S11: PH-2 SENS
S12: FM EMPHASIS
S13: HIGH FIL.
S14: TONE
S15: POWER

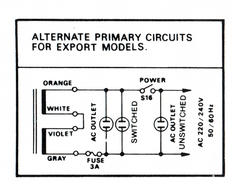
Note:
1. Resistance values are indicated in ohms unless otherwise specified (K=1,000, M=1,000,000)
2. Capacitance values are shown in microfarads unless otherwise noted (P=micro-microfarads)
3. Component values are subject to change without notice.
4. DC voltages are referenced to ground under the following condition
   No. signal.
   V·····DC
   (V)·····AC

Ref. No.	Type No.	Substitute
TR101, 102	3SK45	2SK59
TR103	2SC710	2SC1342
TR201, 203	2SC930	2SC710, 2SC1675
TR202, 204, 301	2SC536	2SC945, 2SC711
TR302, 304	2SC1222	2SC1313, 2SC1571, 2SC1570
TR303, 305	2SA640	2SA726, 2SA702, 2SA841
TR401	2SC945	2SC693
TR501, 502, 504	2SA841	2SA847, 2SA750
TR503	2SC1708	2SC1681, 2SC1400
TR601	2SC1583	2pcs of 2SC1681, 2SC1400, 2SC17
TR602	2SC1706	2SC1681, 2SC1400
TR604	2SA858	2SA857, 2SA917
TR605	2SC1439	2SC1438, 2SC1951
TR606	2SC945	2SC536, 2SC711
TR607,306,307	2SA733	2SA678
TR608	2SC1567	2SC1663, 2SD600
TR609	2SA794	2SA835, 2SB631
TR651, 652	2SD371	2SD188-1
TR653, 654	2SB531	2SA627-1
TR801, 802	2SC869	2SC1278
TR803, 804	2SC1400	2SC1708
TR805	2SA750	2SA847
TR806, 810	2SC945	2SC711A, 2SC536
TR807	2SC1400	2SC1708
TR808	2SD438	2SC1509
TR809	2SD438	2SC1509, 2SD330
TR811	2SB560	
TR812, 816	2SA733	2SA678
TR813	2SD325	
TR814, 815	2SC945	2SC1175
TR901, 903	2SC1681	2SC1313, 2SC1708, 2SC1222
TR902	2SA841	2SA726, 2SA640, 2SA847

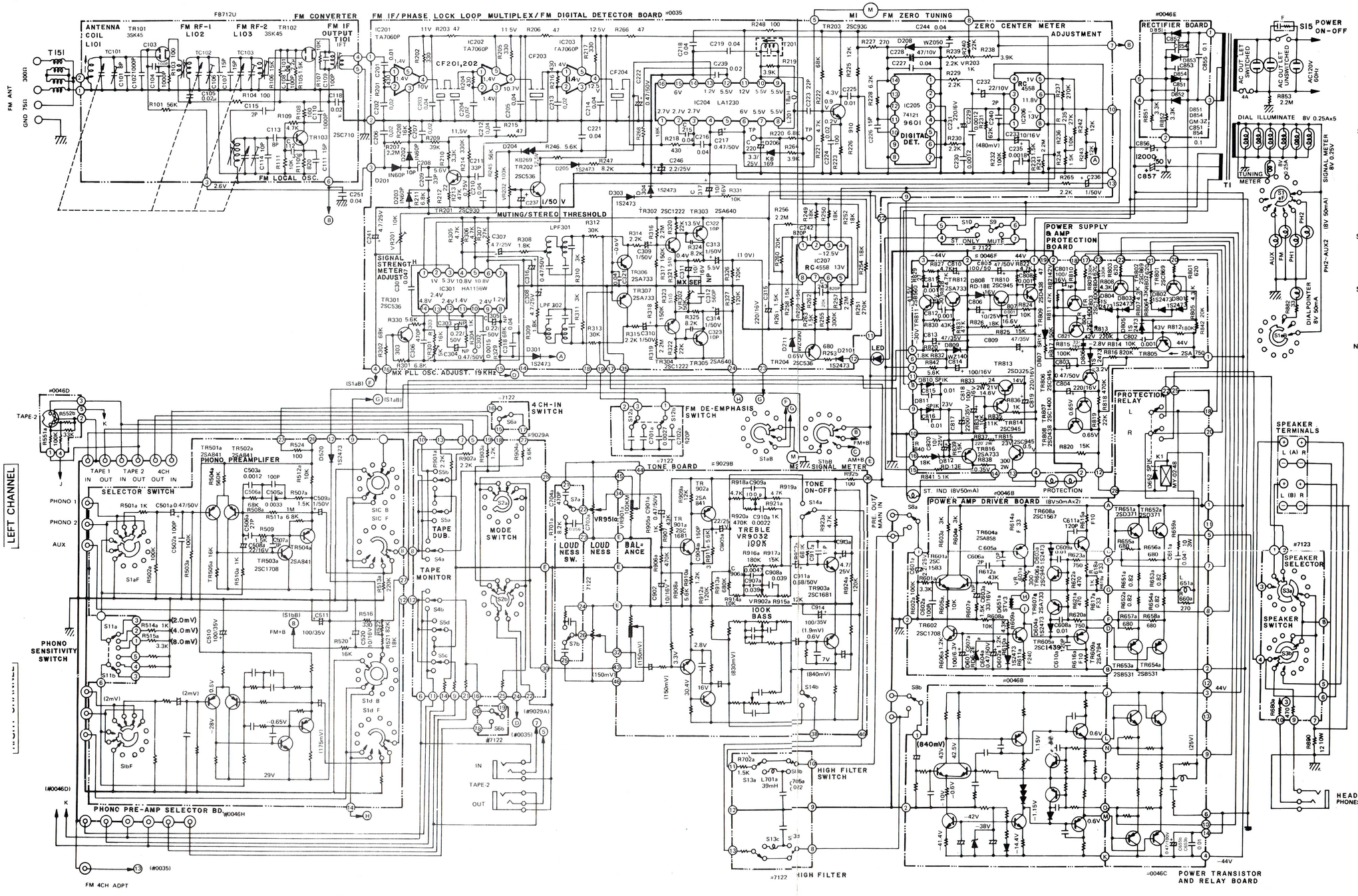








SCHEMATIC DIAGRAM



SHERWOOD
MODEL S-8910
AM/FM STEREO RECEIVER

SWITCHES

S1: SELECTOR
1. PH2
2. PH1
3. FM
4. AUX

S2: MODE
1. L
2. R
3. STEREO
4. REV
5. MONO

S3: SP SELECTOR
1. B
2. OFF
3. A
4. A+B
5. ARS

S4 TAPE MON
1. TAPE 1
2. SOURCE
3. TAPE 2

S5: TAPE DUB.
1. TAPE 1→2
2. SOURCE
3. TAPE 2→1

S6: 4CH IN

S7: LOUDNESS

S8: PRE, MAIN SEPARATE

S9: MUTE

S10: STEREO ONLY

S11: PH-2 SENS

S12: FM EMPHASIS

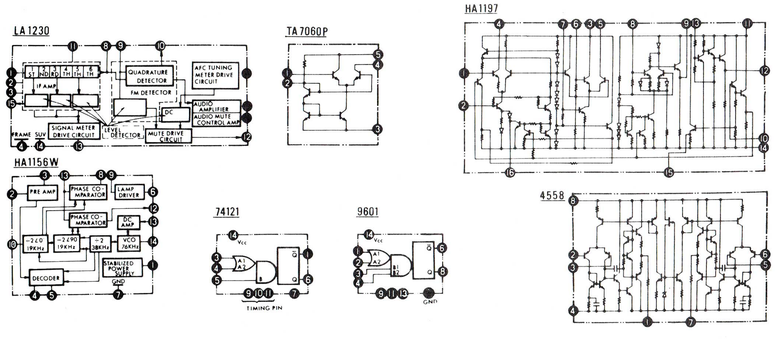
S13: HIGH FIL.

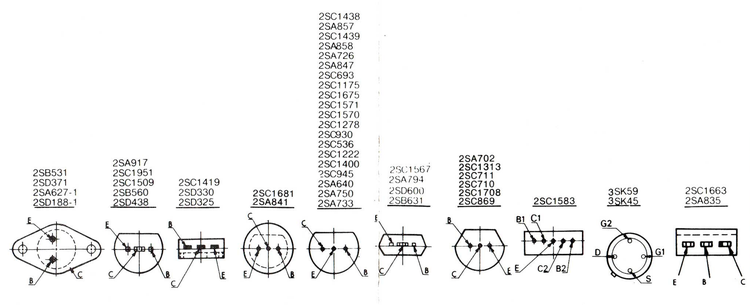
S14: TONE

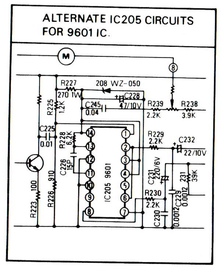
S15: POWER

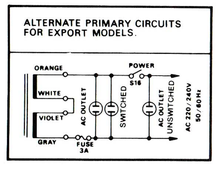
Note:
1. Resistance values are indicated in ohms unless otherwise specified (K=1,000, M=1,000,000)
2. Capacitance values are shown in microfarads unless otherwise noted (P=micro—microfarads)
3. Component values are subject to change without notice.
4. DC voltages are referenced to ground under the following conditions.
   No. signal.
   V·····DC
   (V)·····AC

PEF. NO	TYPE NO	SUBSTITUTE
TR101, 102	3SK45	3SK59
TR103	2SC710	2SC1342
TR201, 203	2SC930	2SC710 2SC1675
TR202, 204 TR301	2SC536	2SC536 2SC711
TR302, 304	2SC1222	2SC1313, 2SC1517 2SC1571, 2SC1570
TR303, 305	2SA640	2SA726, 2SA702, 2SA841
TR501,502 TR504	2SA841	2SA847, 2SA750
TR503	2SC1708	2SC1681, 2SC1400
TR601	2SC1583	2PCS of, 2SC1681 2SC1400, 2SC1708
TR602	2SC1708	2SC1681, 2SC1400
TR604	2SA 858	2SA857, 2SA917
TR605	2SC1439	2SC1438, 2SC1951
TR606	2SC945	2SC536, 2SC711
TR607,306,307	2SA733	2SA678
TR608	2SC1567	2SC1663, 2SD600
TR609	2SA794	2SA835, 2SB631
TR651, 652	2SD371	2SD188 -1
TR653, 654	2SB531	2SA627 -1
TR801, 802	2SC869	2SC1278
TR803, 804	2SC1400	2SC1708
TR805	2SA750	2SA847
TR806, 810	2SC945	2SC711A, 2SC536
TR807	2SC1400	2SC1708
TR808	2SD438	2SC1509
TR809	2SD438	2SC1509 2SD330
TR811	2SB560	
TR812, 816	2SA733	2SA678
TR813	2SD325	
TR814, 815	2SC945	2SC1175
TR901, 903	2SC1681	2SC1313, 2SC1708 2SC1222
TR902	2SA841	2SA726, 2SA640, 2SA847









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