Pages 75-88 Courtesy of Sherwood Electronics Labs., Inc.

S-7200 TEST AND ALIGNMENT SECTION

NOTE: All references in the following material refers to Figure 1 unless otherwise indicated.

I. FM ALIGNMENT

1. Set the SELECTOR switch to "FM and the FM muting switch off. Connect a FM Generator to the 300 ohm FM antenna terminals using a matching network if necessary as shown. (Figure 2)

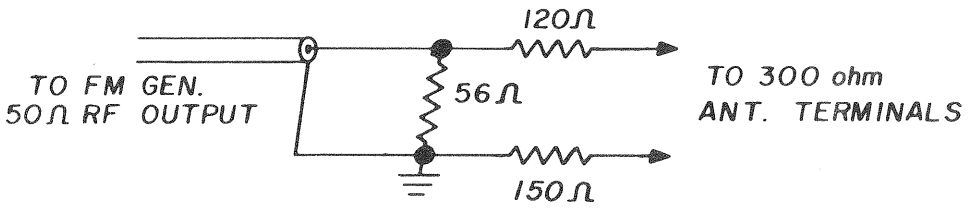


Figure 2

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 a RF detector probe to Pin 6, of the TA7061 (IC201) and center the FM IF response on the oscilloscope. The FM IF bandpass characteristics are now being displayed. Adjust transformer core, of the RF converter (T101) for maximum gain and symmetry (see Figure 3).

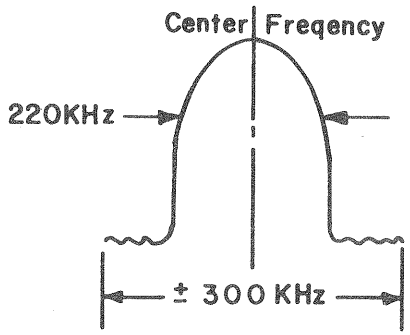


Figure 3

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 the above mentioned limit, adjust the local oscillator coil, (L103) slightly, until optimum dial calibration is obtained. Next, adjust the coils of the RF amplifiers L101 and L102, tuned circuits, for maximum gain. Tune the receiver and generator to a point of no interference near 106MHz. Check the dial calibration. If required, adjust the local oscillator trimmer (TC103) until optimum dial calibration is obtained. Now, adjust the RF amplifier trimmers TC101 and TC102 for maximum gain. Repeat alignment at 90MHz and 106MHz until no further improvement is obtained.

5. To align the FM Detector, with the FM generator connected as in Step 1, move the oscilloscope to the record output jack on rear panel. Reduce the modulation to ± 75KHz and connect a DC VTVM to the detector output (OUT 1). Adjust the top core of the detector transformer (T201) for a zero indication on the DC VTVM and the bottom core of the detector transformer (T201) for a maximum gain and linearity (see Figure 4).

6. A distortion analyzer should be used in conjunction with an oscilloscope to obtain the best linearity, using 400Hz, ± 75KHz modulation. Fine adjust top and bottom cores of the detector transformer (T201) for lowest distortion (slight adjustment only). Adjust VR201 detector load resistance for zero volts at (OUT 1) using VTVM or by observing zero indication on tuning meter

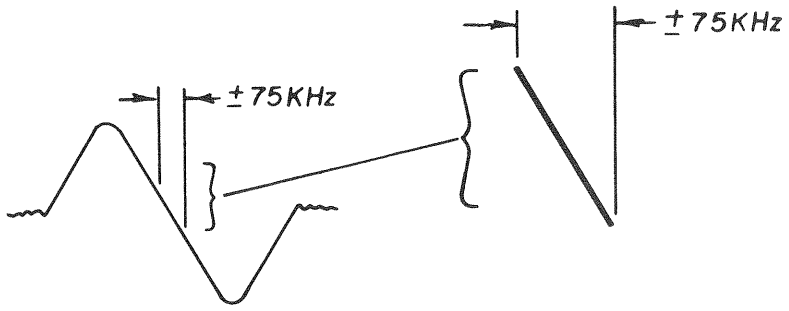


Figure 4

II. MUTING STEREO THRESHOLD ADJUSTMENT

1. This receiver is equipped with a muting circuit which automatically removes or reduces the noise (rushing sound) normally heard between broadcast channels on highly sensitive FM tuners. The noise threshold level in this electronic circuit can be adjusted with the muting threshold control, (VR203) located on the FM IF board. Normal threshold level is approximately 7 micro volts.

2. To adjust muting sensitivity, connect the FM generator and oscilloscope as in Step 5 of FM Alignment. 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 VR203 and repeating the above. The pre-adjusted narrow band gain control (VR202) may be adjusted to compensate for RF or IF gain changes if normal threshold can not be obtained with VR203.

3. If, when tuning through a station the hush/stereo threshold does not switch symmetrical, align T202 for symmetry while observing oscilloscope with probe at anode of D213.

III. MULTIPLEX ALIGNMENT

1. Set up the equipment as shown below (Figure 5) with the composite stereo generator set for pilot only. Before attempting multiplex alignment be certain that the FM I.F.'s have been properly aligned.

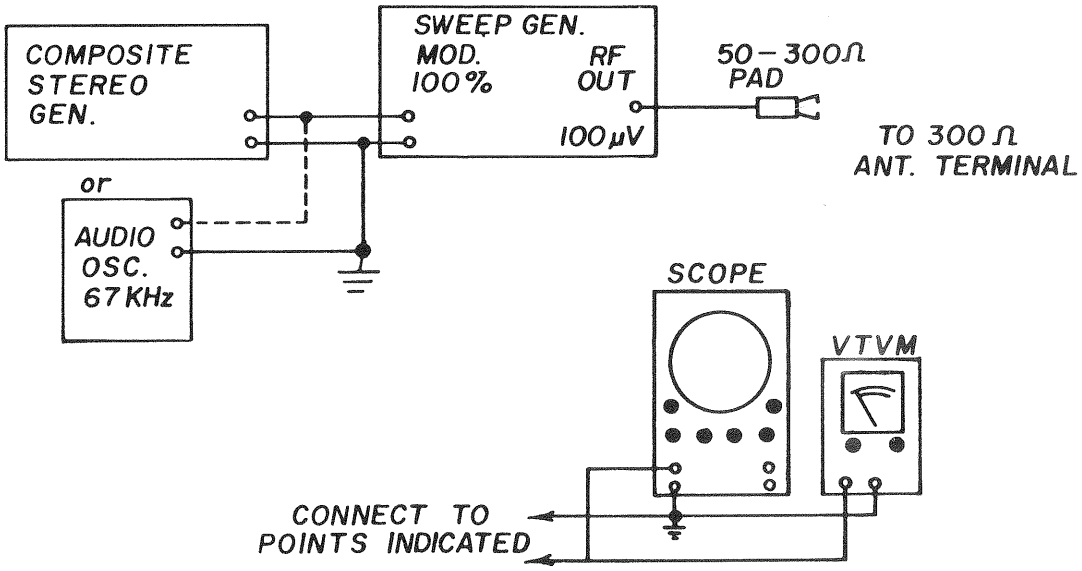


Figure 5

2. Tune the receiver to a point of no signal or interference near 90MHz and tune the FM sweep generator to this frequency.

3. Connect a CRO or AC VTVM to the collector of TR303. Adjust T301, T302 and T303 for maximum 38KHz output.

4. Move probe to the junction of R312 and R313. Adjust L301 for minimum 19KHz output.

5. Set the stereo generator for 67KHz, SCA signal. Adjust L302 for minimum output.

6. Set the generator for a composite, LEFT channel only, multiplex signal. Move probe to "REC OUT" jack of the unmodulated (RIGHT) channel. Adjust, VR551 for minimum 400Hz output. The null should be greater than -40dB from the modulated (LEFT) channel output. Potentiometer, VR551, is located on the chassis near the multiplex board.

7. Check RIGHT channel separation. Usually there will be some difference in the required VR551 adjustment. Re-adjust VR551 for minimum difference between the left and right separation.

8. Check RIGHT and LEFT RECord output jacks on the rear panel for 19KHz/38KHz residual output. It should be a minimum of -40dB below audio reference.

9. Stereo threshold adjustment: To test for correct automatic stereo threshold of 7uV, reduce the FM/MX generator to zero. While observing the stereo light slowly increase the generator output to the threshold level.

10. To set the threshold to the desired signal level, adjust potentiometer, VR203. Note: Potentiometer, VR203 is located on the FM IF board. Again slowly increase the generator output from zero and observe stereo threshold signal level.

IV. AM 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 RECord output jack. Connect the AM Generator output to the receiver AM antenna terminal through a 330 ohm resistor.

2. Adjust the AM Generator to 455KHz RF output, modulated 400Hz, 50%. Tune the AM converter (T401 & T402), 1st AM I.F., (T403), and the 2nd AM I.F. (T404) cores for maximum audio output.

3. Adjust the AM generator for 600KHz. If required, adjust the AM oscillator coil (L401), so that the generator signal is received by the receiver at 600KHz, as indicated on the dial glass. Adjust the rod antenna core (located at the end of the antenna rod assembly) for maximum output as indicated 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, (TC105) for optimum dial calibration. Adjust the antenna trimmer, (TC104) for maximum output.

5. Repear Steps 3 and 4 until no further improvement is obtained.

V. AMPLIFIER SERVICING AND ADJUSTMENT

NOTE: To simplify the following descriptions only the left channel and its related circuitries are described. The right channel is identical except for reference symbol numbers. (see schematic diagram) All reference numbers refer to Figure 1 unless otherwise specified.

Preliminary checks of the dc voltages present at various points in your receiver can indicate whether a transistor is open, shorted, or functioning. Fault isolation in the preamplifier, tone amplifier, and driver stages can generally be isolated by checking the dc voltages or by comparing gain measurements at 1KHz as indicated on the schematic or by comparing the operating channel with the defective channel.

FUSE AND SPEAKER SYSTEM CHECKS:

Your receiver incorporates two speaker fuses and an over-load protection circuit, one for each channel. If the fuse opens, check the speaker connections for shorted wires or a shorted speaker. (The speaker resistance should not be less than 4 ohms.) If the speaker and connections are not shorted replace the fuse with the proper value as marked on the rear panel. If the speaker fuse still opens your receiver needs servicing.

While servicing the receiver it will be valuable to operate the receiver using a veriable voltage power line (VARIAC) equipped with a line wattmeter to identify abnormal power consumption. Increase the power line voltage upward while observing the wattmeter. Power consumption should not exceed 10-20 watts (loudness control volume minimum) as the voltage is increased to the rated 120VAC. If the power consumption begins to exceed 20 watts, do NOT increase the power line voltage any further and determine whether the malfunction is in the power supply, tuner, or amplifier section.

If the power amplifier is suspected, verify the center-point voltage at the + speaker terminal for a ZERO-voltage ± 0.2V reading. If the center-point voltage reads high + voltage, suspect a shorted top side driver transistor (TR607a) or a shorted top side output transistor (TR609a) (schematic shows transistors as the top devices in each channel). If the center-point voltage reads - voltage suspect a shorted bottom side driver transistor (TR608a) or a shorted bottom side output transistor (TR610a).

Remove both driver transistors from their sockets. If power consumption drops considerably, then faulty driver transistors should be suspected. If power consumption remains unusually high, then faulty output transistors should be suspected. If

not, suspect pre-driver or pre-driver transistors or associated components.

If the fault still exists, then varify that capacitors are not shorted, circuit board contains no solder shorts, open resistors, poor solder connections, or broken pads. (Note: a small error voltage at the pre-driver base and/or emitter will greatly disrupt the operation of the driver and output transistors.)

If the center-point voltage reads zero voltage in accordance with the above check, apply audio signal to the channel or channels being tested and measure distortion. Distortion which exceeds amplifier ratings may be due to one of the following:

1. Output transistors are not matched beta.
2. Output bias requires readjustment.
3. Driver transistor has low beta.

The following performance indicates a properly operating amplifier with an 8 ohm resistive load.

Less than 0.15% IM or Harmonic (1KHz) Distortion at 2.0V

Typically 0.2% IM or Harmonic (1KHz) Distortion at 10V

Typically 40 Watts Dual Channel at 0.7%

Typically 44 Watts Single Channel at 0.7%

OUTPUT TRANSISTOR BIAS:

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

1. Overheating of the output transistors under normal operating conditions.
2. Excessive low level Intermodulation or Harmonic Distortion-more than 0.3% at 2.0 volts across 8 ohms.

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

SUGGESTED AMPLIFIER TEST BENCH SET-UP *Sherwood S-7200*

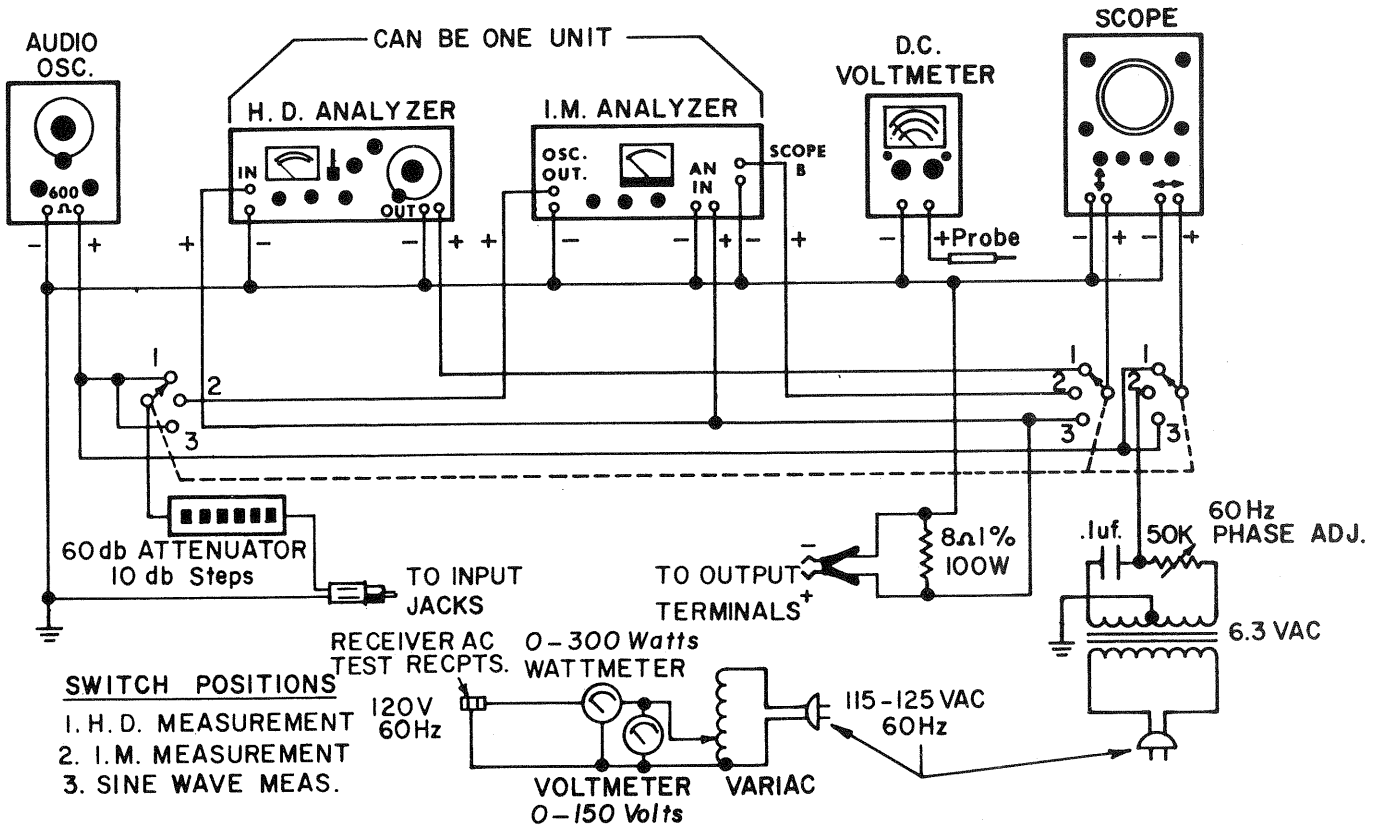


Figure 6

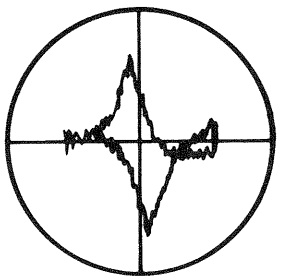
OUTPUT AND BIAS ADJUSTMENT USING AN INTERMODULATION DISTORTION ALALYZER

1. Connect the receiver for testing similar to Figure 6.

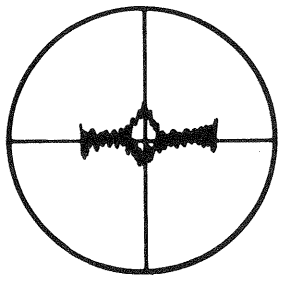
2. Connect an Intermodulation Distortion Analyzer with a ratio of 4:1 using 60Hz and 7000Hz to the receiver (AUX) input and set the selector switch to AUX.

3. Set the volume control to maximum and adjust the generator for a receiver output of 2.0 volts across 8 ohms.

4. While observing the resultant distortion waveform, adjust the bias potentiometer (VR601a) so that the crossover distortion is at a point of being eliminated. (Class "AB") Note: Class "A" operation (continued CW rotation) causes output transistors to overheat and draw excessive current. Refer to diagrams below:



IMPROPER BIAS ADJUSTMENT



PROPER BIAS ADJUSTMENT

5. Repeat Steps 3 to 4 for the opposite channel.

The following performance indicates a properly operating amplifier with an 8 ohm load.

Less than 0.25% IM Distortion at 2.0V
Typically 0.20% IM Distortion at 10V
40 Watts of power per channel at clipping

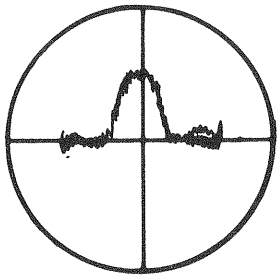
If an Intermodulation Distortion analyzer is not available an oscillator and a Harmonic Distortion analyzer may be used for adjustment of the output transistor bias as follows:

1. Connect the receiver for testing similar to Figure 6.

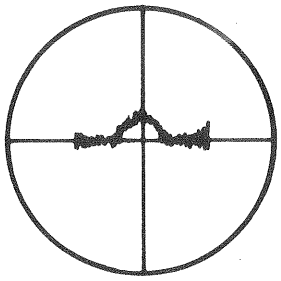
2. Connect an oscillator with less than .05% distortion at 1KHz to the receiver (AUX) input and set the selector switch to AUX.

3. Set the volume control to maximum and adjust the oscillator for a receiver output of 2.0 volts across 8 ohms.

4. Using the Harmonic Distortion Analyzer looking at the distortion of the receiver output, properly nulled, make the adjustment as follows: Adjust the bias for Class"AB" operation by turning the bias potentiometer (VR601a) so that the crossover is at a point of being eliminated. Note: Class "A" operation (continued CW operation) causes the output transistors to draw excessive current and overheat. Refer to diagrams below:



IMPROPER BIAS ADJUSTMENT

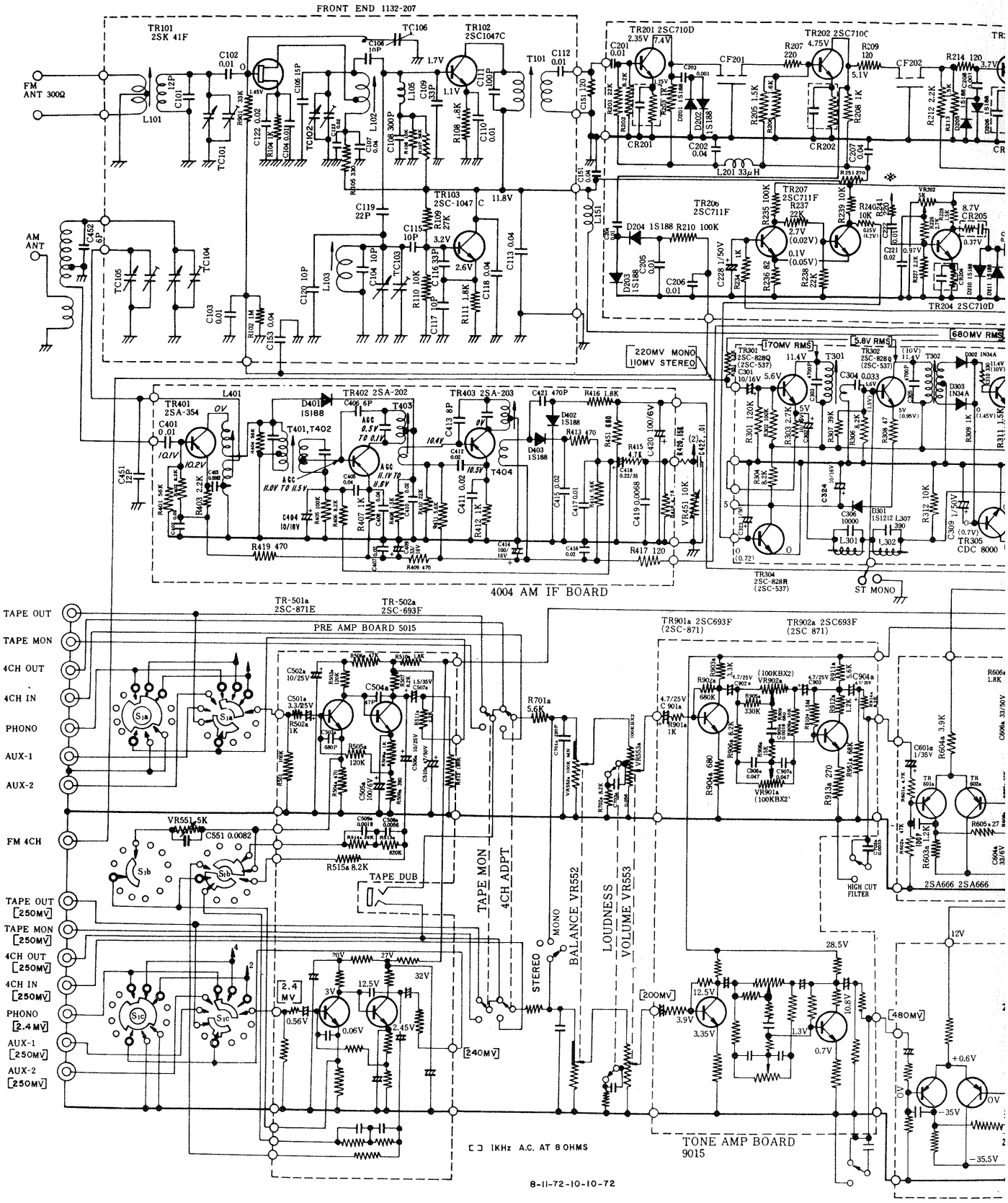


PROPER BIAS ADJUSTMENT

5. Repeat Steps 3 to 4 for the opposite channel.

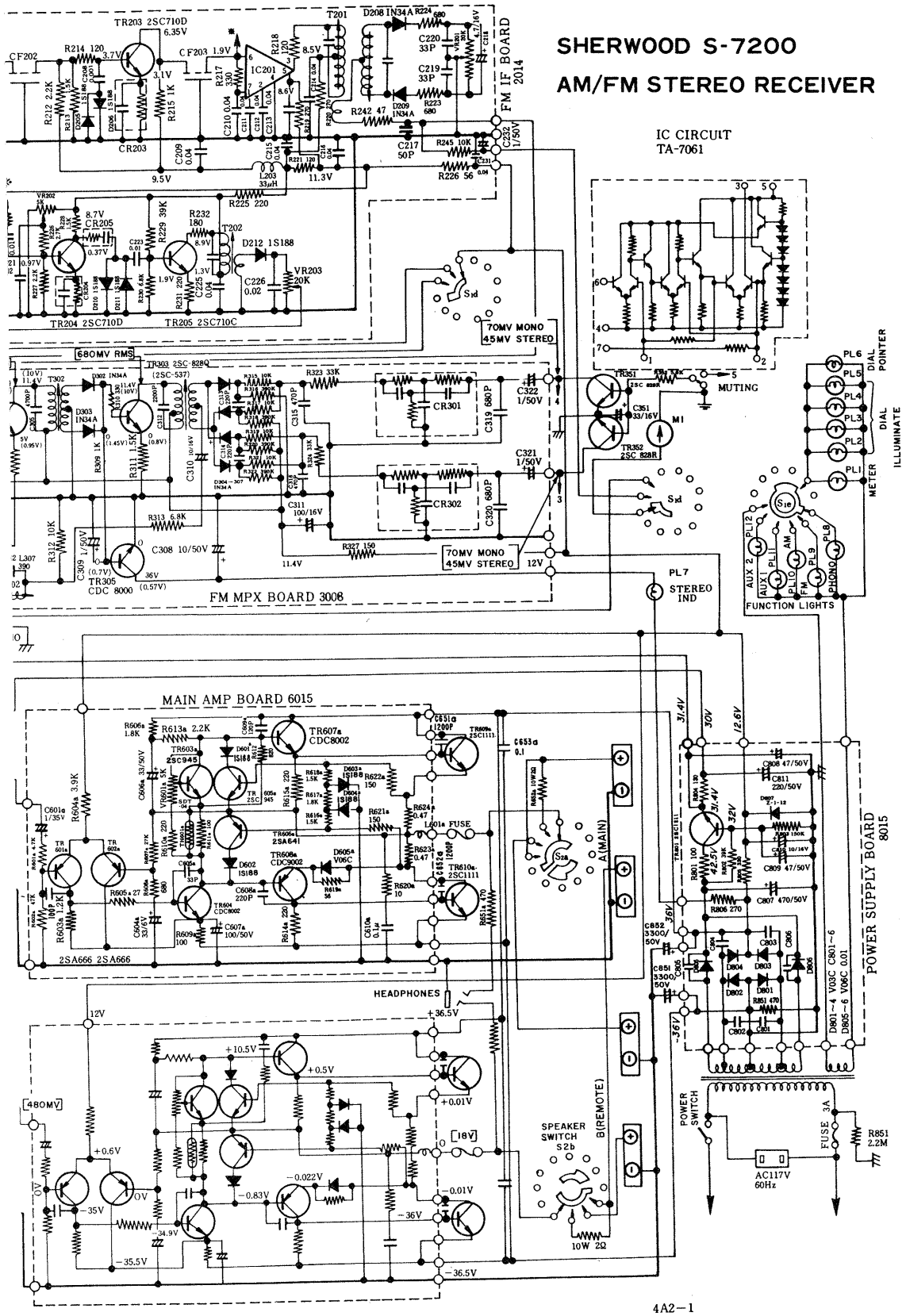
The following performance indicates a properly operating amplifier with an 8 ohm load @ 1KHz.

CIRCUIT DIAGRAM



GRAM

SHERWOOD S-7200
AM/FM STEREO RECEIVER



Less than 0.25% THD at 2.0V
Typically 0.20% THD at 10V
40 Watts of power per channel at clipping

Bias can also be adjusted by using a VARIC equipped with a line wattmeter:

1. Turn the loudness control to minimum.

2. Adjust the bias potentiometer (VR601a & VR601b), to the point at which the receiver begins to cause a very slight increase in line wattage consumption.

PUSH BUTTON SWITCH REPAIR PROCEDURE

To repair a defective section of the push button assembly proceed as follows:

I. Disassembly of Button:

1. Each button may be disassembled individually.

2. Remove the push button cover.

3. Hold your finger on the plunger so that the plunger can not push outward and by using a long nose pliers move the plunger spring away from the switch body until the locking pin can be removed.

4. Remove locking pin and slowly release the push button plunger and remove it from the assembly.

II. Repairing:

1. Locate the malfunction and repair the defect by referring to the push button detail for disassembly and reassembly of various sections.

III. Reassembly of Button:

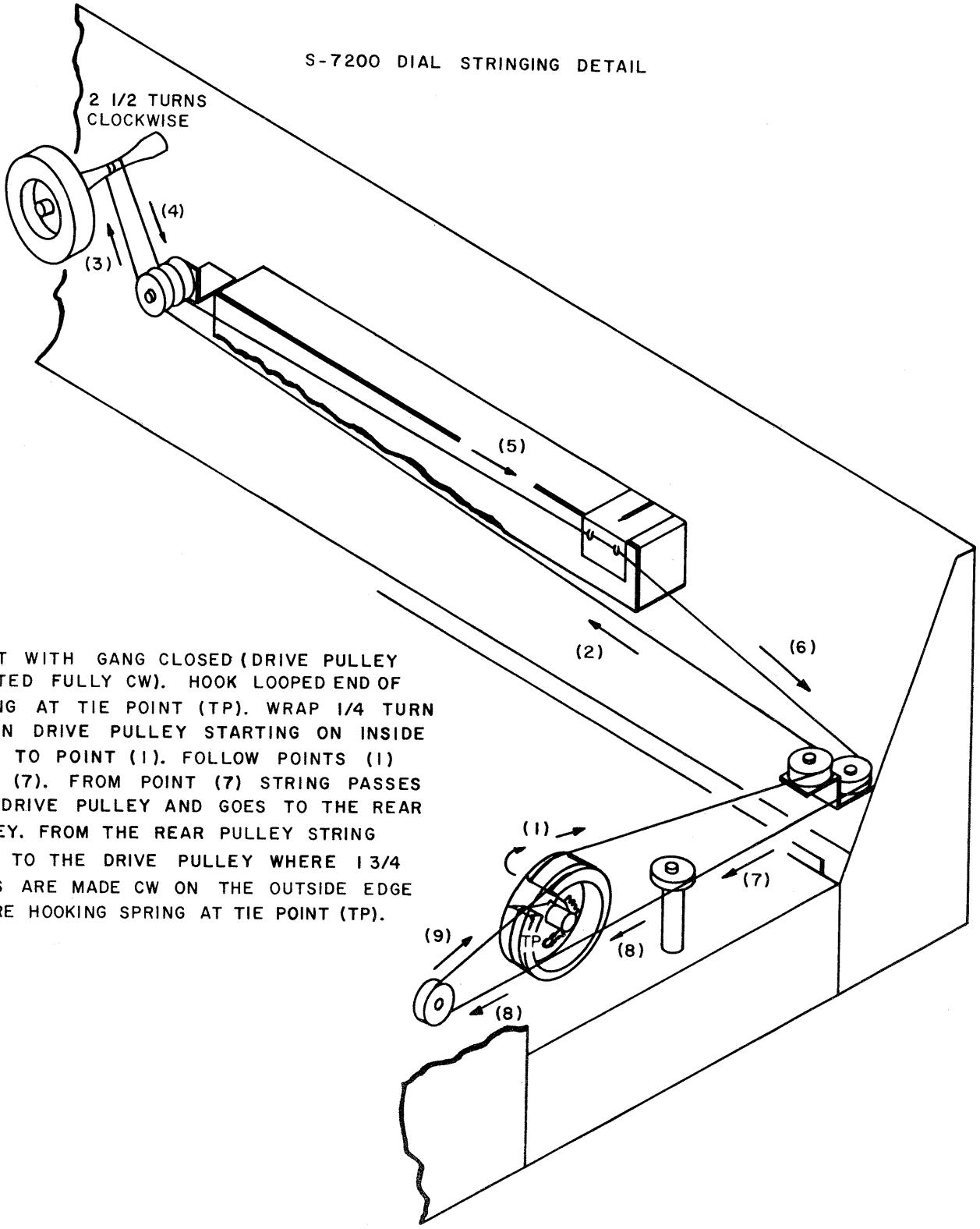
1. Replace the plunger spring and slowly insert the push button plunger into the switch assembly holding it in about the normal out position.

2. Carefully grasp the locking pin at its front edge with long nose pliers and slowing compress the plunger spring until the locking pin can be inserted in the switch body.

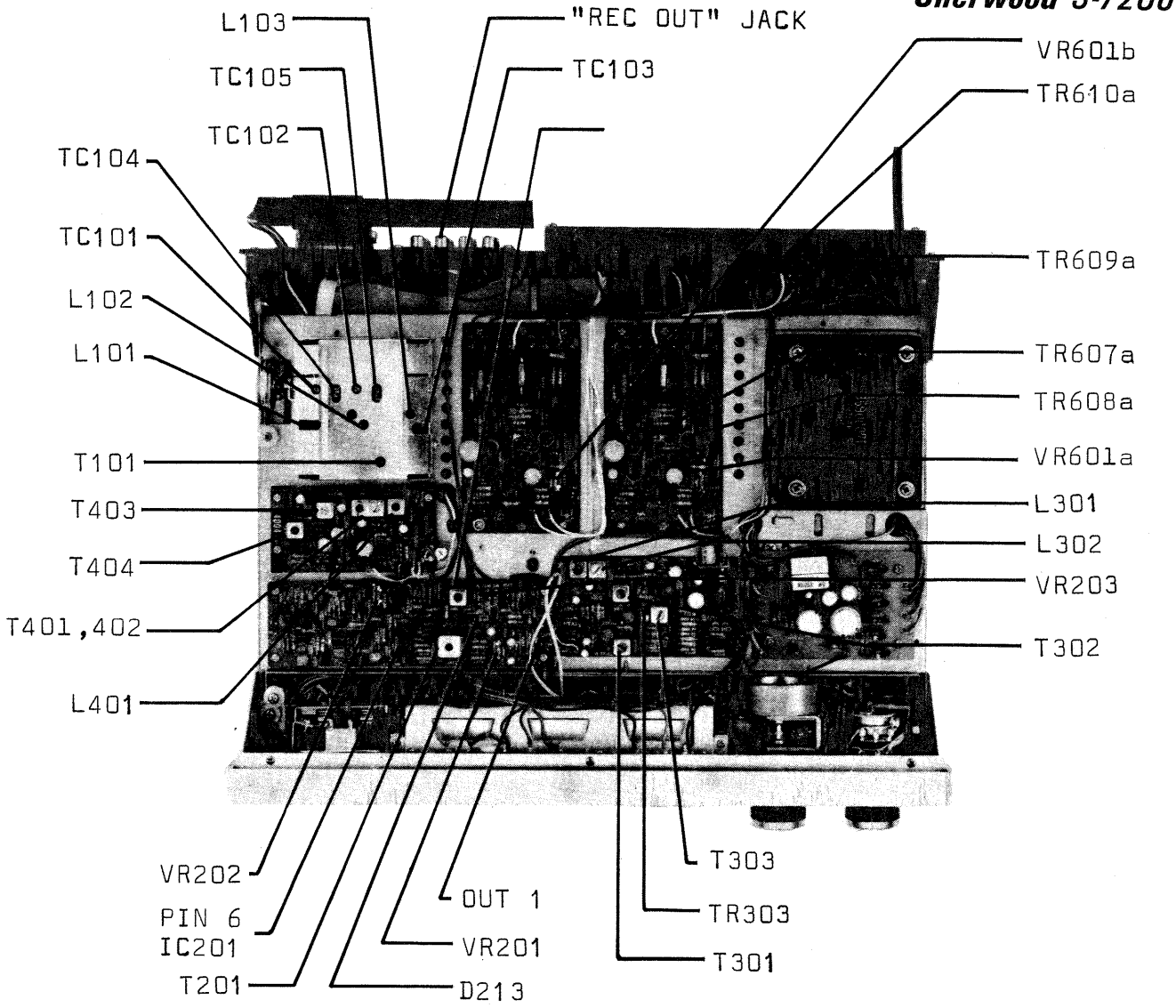
3. Release the spring being careful of correct assembly.

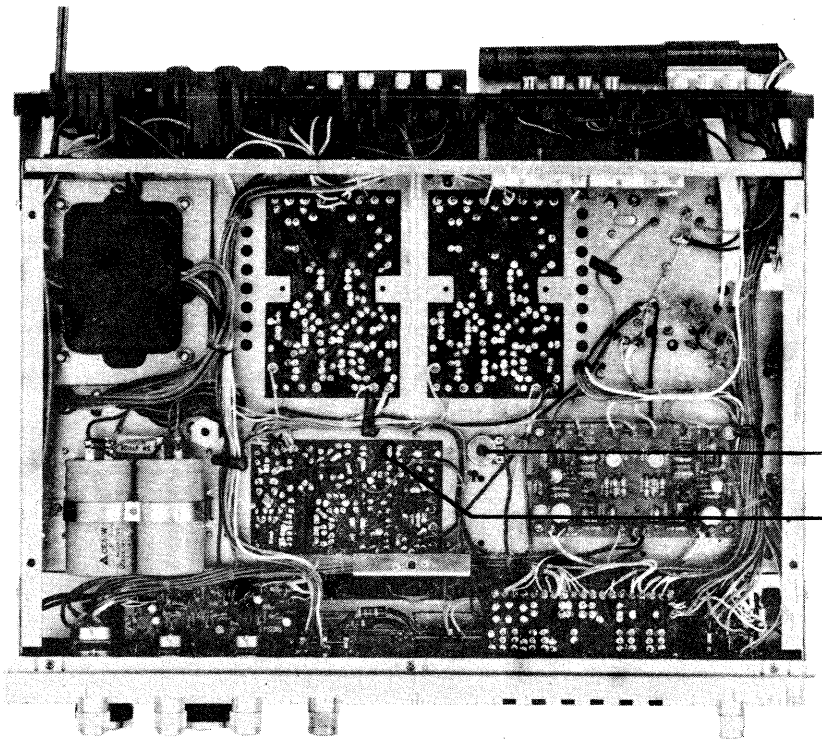
4. Replace the push button cover.

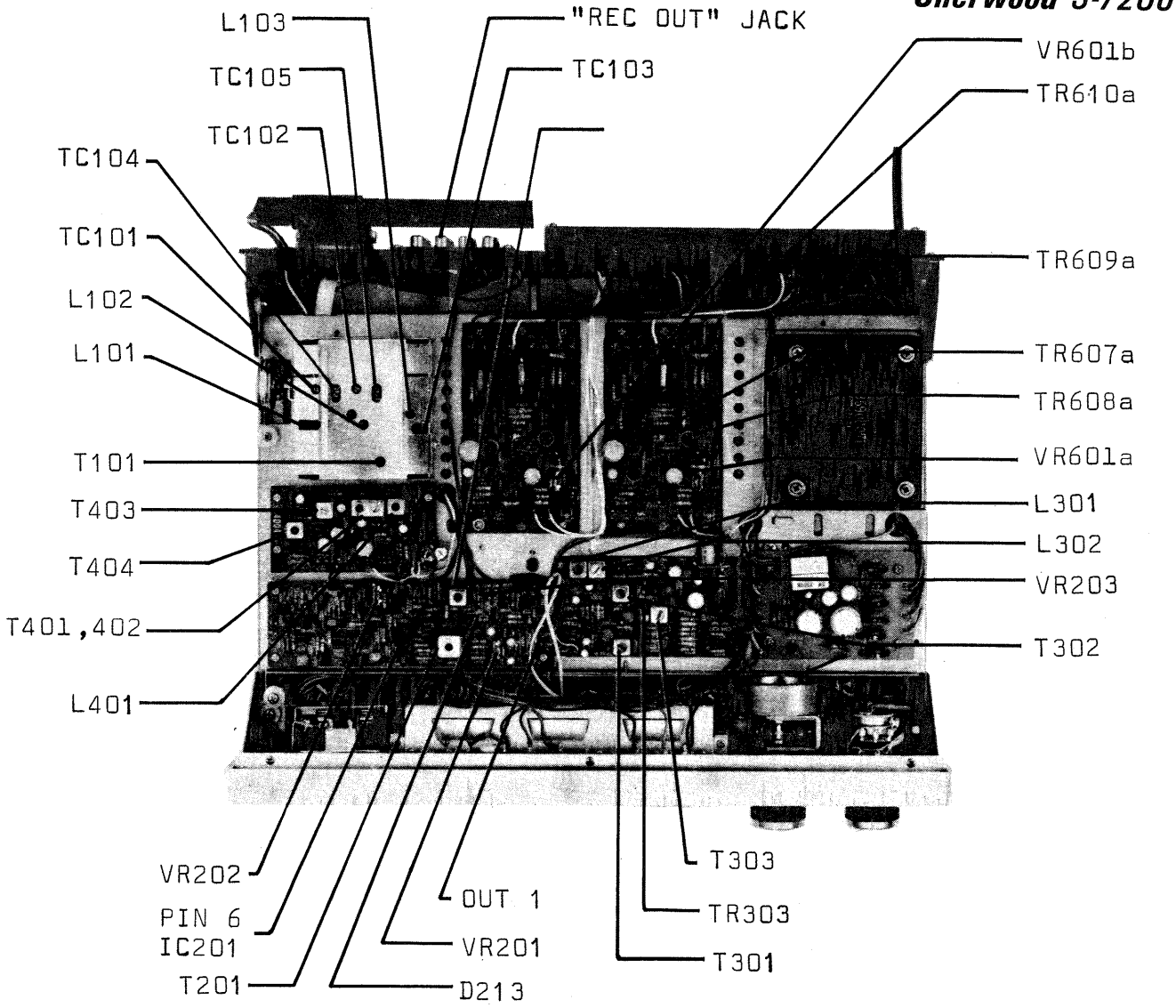
S-7200 DIAL STRINGING DETAIL

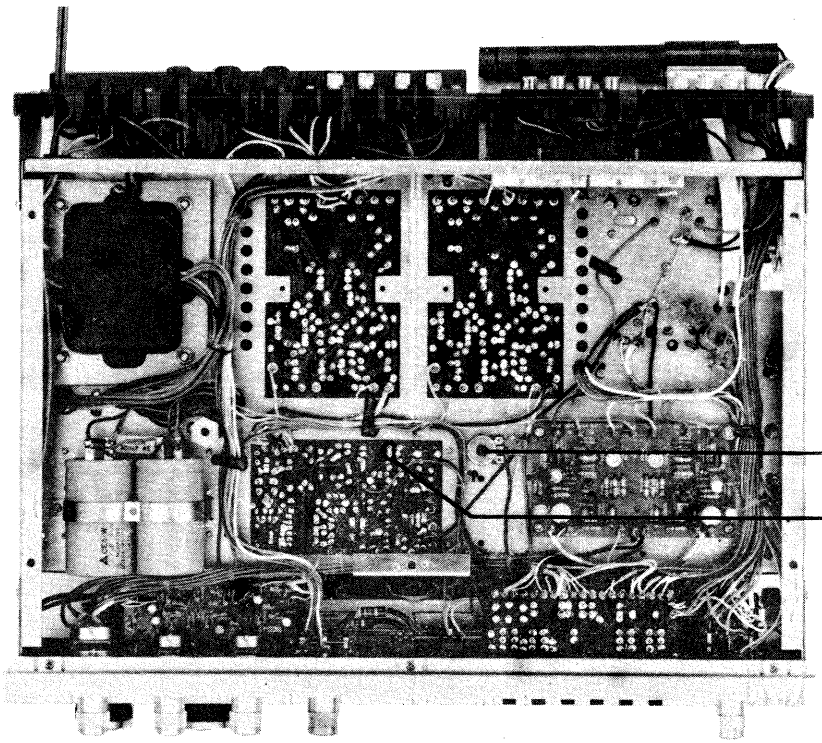


START WITH GANG CLOSED (DRIVE PULLEY ROTATED FULLY CW). HOOK LOOPED END OF STRING AT TIE POINT (TP). WRAP 1/4 TURN CW ON DRIVE PULLEY STARTING ON INSIDE EDGE TO POINT (1). FOLLOW POINTS (1) THRU (7). FROM POINT (7) STRING PASSES THE DRIVE PULLEY AND GOES TO THE REAR PULLEY. FROM THE REAR PULLEY STRING GOES TO THE DRIVE PULLEY WHERE 1 3/4 TURNS ARE MADE CW ON THE OUTSIDE EDGE BEFORE HOOKING SPRING AT TIE POINT (TP).


L103
"REC OUT" JACK
TC105
TC103
TC102
TC104
TC101
L102
L101
T101
T403
T404
T401,402
L401
VR601b
TR610a
TR609a
TR607a
TR608a
VR601a
L301
L302
VR203
T302
VR202
PIN 6
IC201
T201
OUT 1
VR201
D213
T303
TR303
T301


VR 551
JUNCTION
OF R312,313


L103
"REC OUT" JACK
TC105
TC103
TC102
TC104
TC101
L102
L101
T101
T403
T404
T401,402
L401
VR601b
TR610a
TR609a
TR607a
TR608a
VR601a
L301
L302
VR203
T302
VR202
PIN 6
IC201
T201
OUT 1
VR201
D213
T303
TR303
T301


VR 551
JUNCTION
OF R312,313

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D201	1S188	30600260
D202	1S188	30600260
D203	1S188	30600260
D204	1S188	30600260
D205	1S188	30600260
D206	1S188	30600260
D208	1N34A	30600020
D209	1N34A	30600020
D210	1S188	30600260
D211	1S188	30600260
D212	1S188	30600260
D301	1S1212	30600090
D302	1N34A	30600020
D303	1N34A	30600020
D304	1N34A	30600020
D305	1N34A	30600020
D306	1N34A	30600020
D307	1N34A	30600020
D401	1S188	30600260
D402	1S188	30600260
D403	1S188	30600260
D601a	1S188	30600260
D601b	1S188	30600260
D602a	1S188	30600260
D602b	1S188	30600260
D603a	1S188	30600260
D603b	1S188	30600260
D604a	1S188	30600260
D604b	1S188	30600260
D605a	V06C	30600030
D605b	V06C	30600030
D801	V03C	30600040
D802	V03C	30600040
D803	V03C	30600040
D804	V03C	30600040
D805	V06C	30600030
D806	V06C	30600030
D807		30600300
IC201	TA-7061	30900040
TR101	2SK41E	30400032
TR102	2SC1047	30200461
TR103	2SC1047	30200461
TR201	2SC710D	30200382
TR202	2SC710C	30200381
TR203	2SC710D	30200382
TR204	2SC710D	30200382
TR205	2SC710C	30200381
TR206	2SC711F	30200362
TR207	2SC711F	30200362
TR301	2SC828Q	30200241
TR302	2SC828Q	30200241
TR303	2SC828Q	30200241
TR304	2SC828R	30200242
TR305	CDC8000	30300053
TR351	2SC828R	30200242
TR352	2SC828R	30200242
TR401	2SA354A	30000010
TR402	2SA202B	30000021
TR403	2SA203B	30000032
TR501a	2SC871E	30200301
TR501b	2SC871E	30200301
TR502a	2SC693F	30200124
TR502b	2SC693F	30200124
TR601a	2SA666	30000131
TR601b	2SA666	30000131
TR602a	2SA666	30000131
TR602b	2SA666	30000131
TR603a	2SC945	30200522
TR603b	2SC945	30200522
TR604a	CDC8002	30200542
TR604b	CDC8002	30200542
TR605a	2SC945	30200522
TR605b	2SC945	30200522
TR606a	2SA641	30000111
TR606b	2SA641	30000111
TR607a	CDC8002	30200542
TR607b	CDC8002	30200542
TR608a	CDC9002	30000182
TR608b	CDC9002	30000182
TR609a	2SC1111	30200611
TR609b	2SC1111	30200611
TR610a	2SC1111	30200611
TR610b	2SC1111	30200611
TR801	2SC1211	30200421
TR901a	2SC693F	30200124
TR901b	2SC693F	30200124
TR902a	2SC693F	30200124
TR902b	2SC693F	30200124

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C228	1uF 50V	64045105
C232	1uF 50V	64045105
C301	10uF 16V	64042106
C302	10uF 16V	64042106
C308	10uF 50V	64045106
C309	1uF 50V	64045105
C310	10uF 16V	64042106
C311	100uF 16V	64042107
C321	1uF 50V	64045105
C322	1uF 50V	64045105
C323	1uF 50V	64045105
C324	10uF 16V	64042106
C351	33uF 16V	64042336
C404	10uF 16V	64042106
C409	33uF 16V	64042336
C414	100uF 16V	64042107
C418	.22uF 35V	66064224
C420	100uF 6.3V	64040107
C501a	3.3uF 25V	66063335
C501b	3.3uF 25V	66063335
C502a	10uF 25V	64043106
C502b	10uF 25V	64043106
C505a	100uF 6.3V	64040107
C505b	100uF 6.3V	64040107
C506a	10uF 25V	64043106
C506b	10uF 25V	64043106
C507a	1.5uF 35V	66064155
C507b	1.5uF 35V	66064155
C510a	47uF 50V	64045476
C510b	47uF 50V	64045476
C601a	1uF 35V	66064105
C601b	1uF 35V	66064105
C604a	33uF 6.3V	64040336
C604b	33uF 6.3V	64040336
C606a	33uF 50V	64045336
C606b	33uF 50V	64045336
C607a	100uF 50V	64045107
C607b	100uF 50V	64045107
C807	470uF 50V	64045477
C808	47uF 50V	64045476
C809	47uF 50V	64045476
C810	10uF 16V	64042106
C811	220uF 50V	64045227
C851	3300uF 50V	64345338
C852	3300uF 50V	64345338
C901a	4.7uF 25V	64043475
C901b	4.7uF 25V	64043475
C902a	4.7uF 25V	64143475
C902b	4.7uF 25V	64043475
C903a	4.7uF 25V	64043475
C903b	4.7uF 25V	64043475
C904a	4.7uF 25V	64043475
C904b	4.7uF 25V	64043475

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
TH601a	Thermistor	30700030
TH601b	Thermistor	30700030
VR201	Zero Adj. Control, 20K	28100008
VR202	Gain Control, 5K	28100034
VR203	Stereo Threshold Control, 20K	28100008
VR451	AM Level Control, 10K	28100067
VR551	Separation Adjust Control, 5K	28100032
VR552	Balance Control, 100K	28000008
VR553	Loudness Control, 100K	28000051
VR601a	Bias Adjustment Control, 5K	28100034
VR601b	Bias Adjustment Control, 5K	28100034
VR901	Tone Controls, 100K	28000040
VR902	Tone Controls, 100K	28000040

COILS/TRANSFORMERS

ITEM	PART NO.
Bar Antenna	35400121
Power Transformer	35900071
L101	35501071
L102	35501022
L103	35501066
L105	35500070
L201	35500090
L203	35500090
L301	35603135
L302	35603125
L401	35504026
T101	35701061
T201	35702114
T202	35702045
T301	35603111
T302	35603092
T303	35603054
T401	35704011
T402	35704011
T403	35704012
T404	35704014

MISCELLANEOUS

ITEM	NAME	PART NO.
CR201	CR Network	43000011
CR202	CR Network	43000011
CR203	CR Network	43000011
CR204	CR Network	43000011
CR205	CR Network	43000001
M1	Meter, Tuning	60075007
S1	Switch, Selector	27100049
S2	Switch, Speaker	27100044
	Switch, Push Assembly	27200020
	Fuse, Power-3A	38300030
	Fuse, Speakers-3A	38000030
	Ceramic Filter (1)	35300006

(1) When ordering filters be sure to indicate color code needed; black, red, yellow, white, or blue.

CABINET PARTS

NAME	PART NO.
Escutcheon	10080001
Cabinet, Wood	85030001
Dial Glass	20043001
Dial Pointer	25015001
Knob, Small	29066001
Knob, Large with Mark	29068001
Knob, Large without Mark	29067001