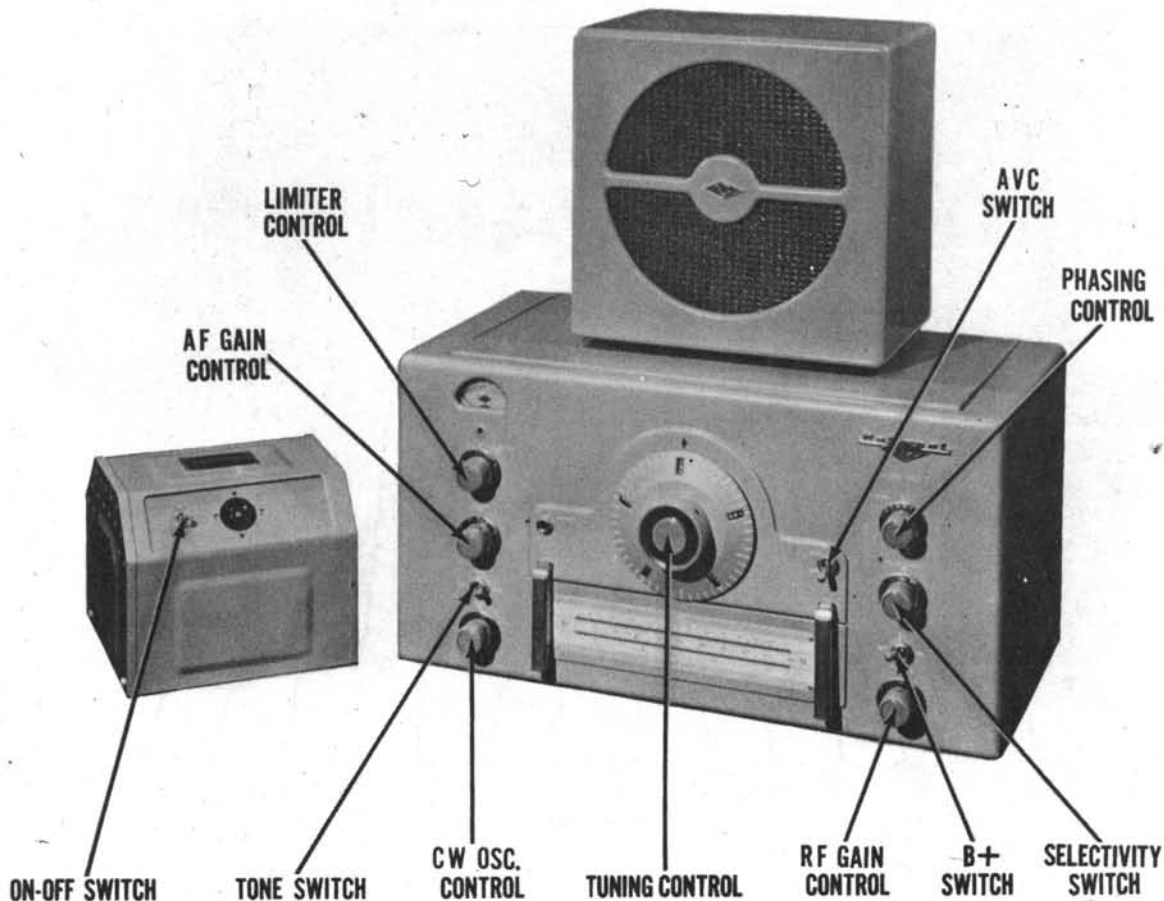


NATIONAL MODELS  
HRO-7R, HRO-7T



NATIONAL MODELS  
HRO-7R, HRO-7T

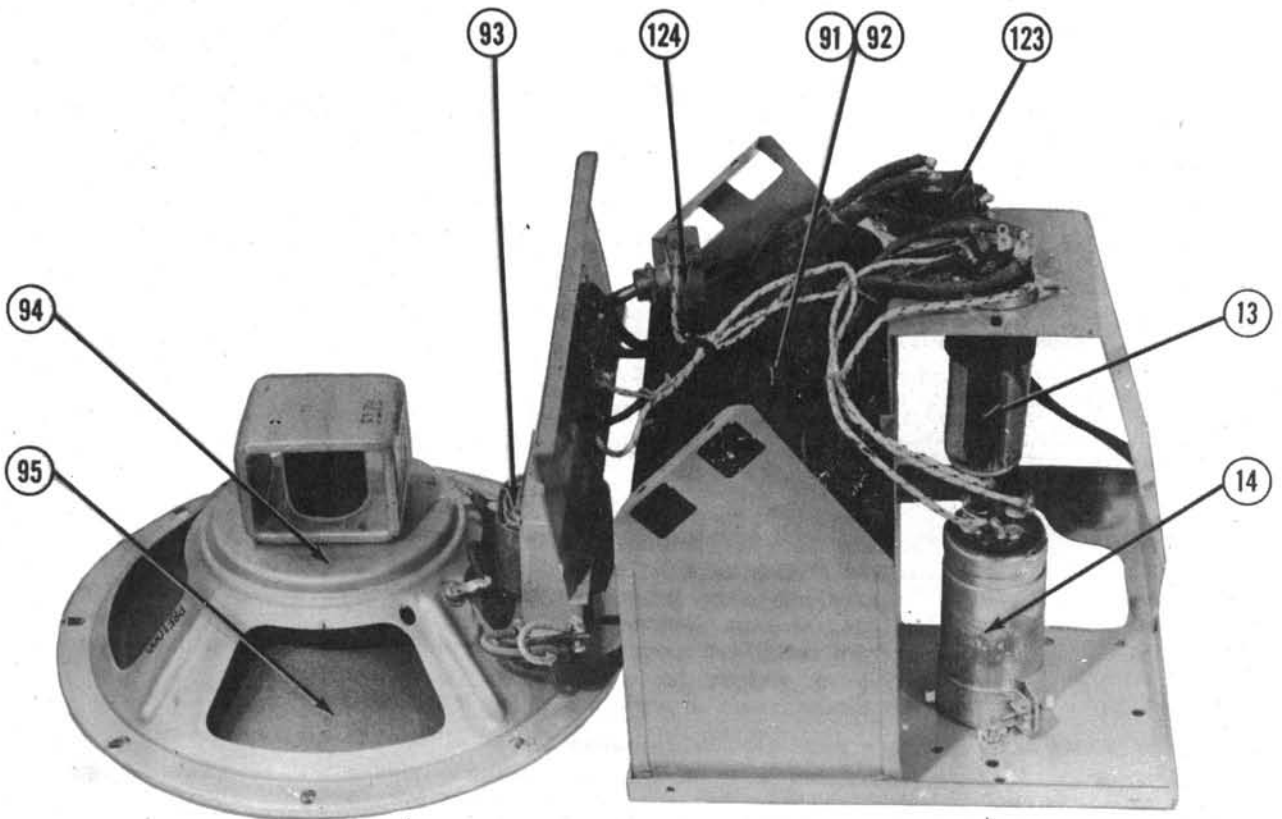
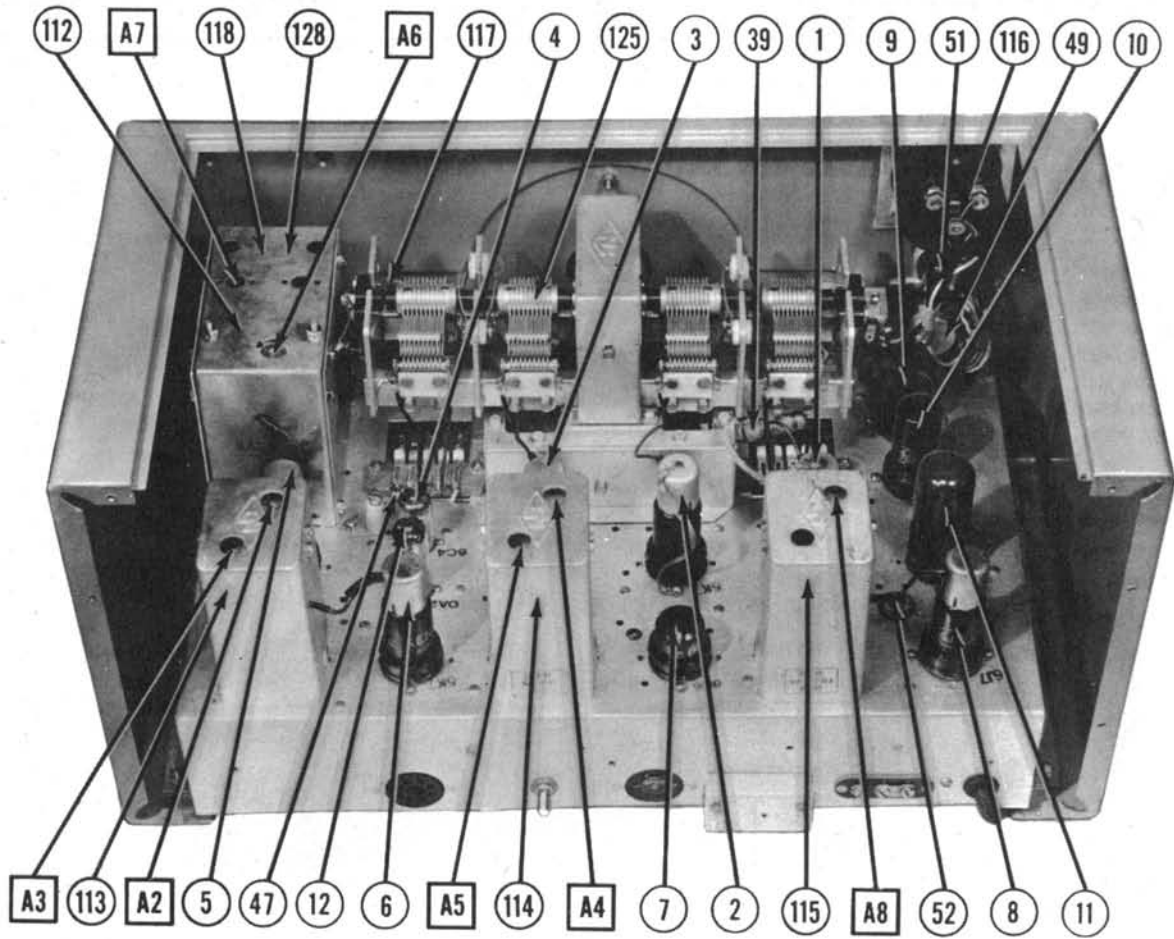
NATIONAL MODEL HRO-7T

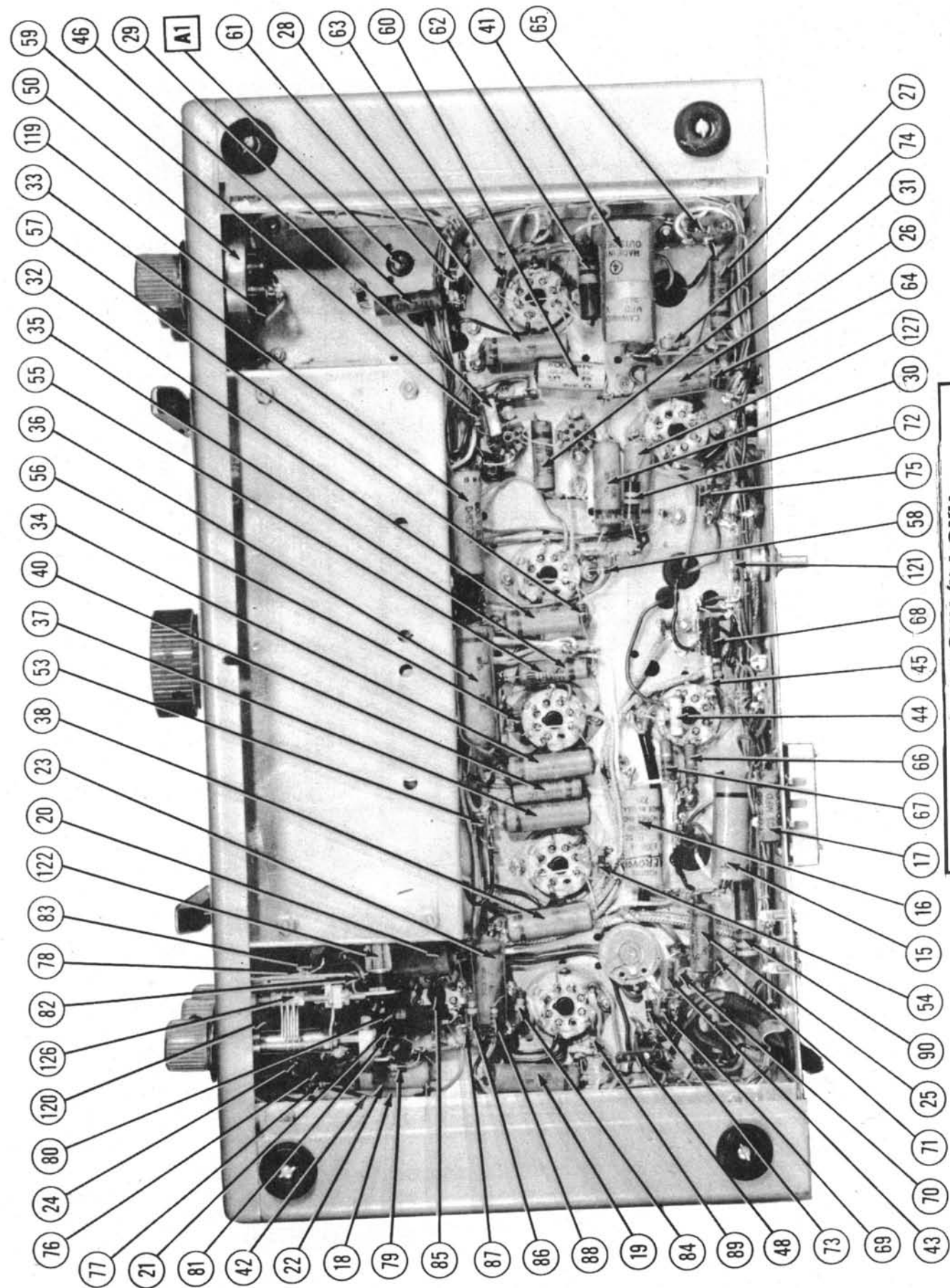
|                  |   |
|------------------|---|
| TRADE NAME       | National, Models HRO-7R, HRO-7T   |
| MANUFACTURER     | National Co., Inc., 61 Sherman St., Malden, Mass.   |
| TYPE SET         | AC or Battery Operated Commercial Type Multi-Band Superheterodyne Receiver  |
| TUBES (THIRTEEN) | Types, 6K7 1st RF Amp., 6K7 2nd RF Amp., 6J7 Mixer, 6C4 Oscillator, 6J7 or 6K7 1st IF Amp., 6K7 2nd IF Amp., 6H6 Det.-AVC, 6J7 BFO, 6H6 Noise Limiter, 6SJ7 AF Amp., 6V6GT Power Output, OA2 Voltage Regulator, 5Y3GT Rectifier.  |
| POWER SUPPLY     | 110-120 Volts AC, 220-240 Volts AC (697 Power Unit) or 6 Volt Storage Battery (686S Power Unit).  |
| TUNING RANGE     | - Band "A"-14.0-30.0MC, Band "B"-7.0-14.4MC, Band "C"-3.5-7.3MC, Band "D"-1.7-4.0MC (Following Bands available if desired)<br>Band "E"-900-2050KC, Band "F"-480-960KC, Band "G"-180-430KC, Band "H"-100-200KC, Band "J"-50-100KC. |

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# PARTS LIST AND DESCRIPTIONS

# PARTS LIST AND DESCRIPTIONS (Continued)

## TRANSFORMER (OUTPUT)

| ITEM No. | RATING    |         |                   | REPLACEMENT DATA  |                  |                | INSTALLATION NOTES |
|----------|-----------|---------|-------------------|-------------------|------------------|----------------|--------------------|
|          | IMPEDANCE | DC RES. | THORADYN PART No. | NATIONAL PART No. | STANCOR PART No. | MERIT PART No. |                    |
| 93       | 2900Ω     | 3.2Ω    | 217/2             | A-3825            | T22860           | A-2902         |                    |

## SPEAKER

| ITEM No. | RATINGS                       | REPLACEMENT DATA  |                     |               | INSTALLATION NOTES |
|----------|-------------------------------|-------------------|---------------------|---------------|--------------------|
|          |                               | NATIONAL PART No. | JENSEN PART No.     | QUAM PART No. |                    |
| 94       | FIELD<br>VC IMP.<br>3.2Ω      |                   | ST-117<br>Mod. PB-T | 8A231         |                    |
| 95       | CONE DIA.<br>VC DIA.<br>7-3/4 |                   |                     |               |                    |

## R F COILS

| ITEM No. | USE         | DC RES. |      | REPLACEMENT DATA  |                   | INSTALLATION NOTES |
|----------|-------------|---------|------|-------------------|-------------------|--------------------|
|          |             | PRI.    | SEC. | NATIONAL PART No. | MEISSNER PART No. |                    |
| 96       | Ant. Coil D | .6Ω     | .02  |                   |                   |                    |
| 97       | " " " C     | .3Ω     | .1Ω  |                   |                   |                    |
| 98       | " " " B     | .2Ω     | .1Ω  |                   |                   |                    |
| 99       | " " " A     | .2Ω     | .1Ω  |                   |                   |                    |
| 100      | 1st RF      | 14Ω     | .8Ω  |                   |                   |                    |
| 101      | " " " C     | 6.4Ω    | .2Ω  |                   |                   |                    |
| 102      | " " " B     | 3.2Ω    | .1Ω  |                   |                   |                    |
| 103      | " " " A     | .9Ω     | .02  |                   |                   |                    |
| 104      | 2nd RF      | 13.5Ω   | .9Ω  |                   |                   |                    |
| 105      | " " " C     | 6.3Ω    | .2Ω  |                   |                   |                    |
| 106      | " " " B     | .4Ω     | .02  |                   |                   |                    |
| 107      | " " " A     | .5Ω     | .02  |                   |                   |                    |
| 108      | Osc. Coil D |         | .8Ω  |                   |                   |                    |
| 109      | " " " C     |         | .2Ω  |                   |                   |                    |
| 110      | " " " B     |         | .1Ω  |                   |                   |                    |
| 111      | " " " A     |         | .02  |                   |                   |                    |
| 112      | 1st IF      | 8Ω      | 9.5Ω |                   |                   |                    |
| 113      | 2nd IF      | 8Ω      | 8Ω   |                   |                   |                    |
| 114      | 3rd IF      | 8.2Ω    | 8Ω   |                   |                   |                    |
| 115      | RF Osc.     |         |      |                   |                   | Type 47            |

## DIAL LIGHT

| ITEM No. | BASE TYPE | VOLTS | AMPS. | BEAD COLOR | REPLACEMENT DATA  |         | INSTALLATION NOTES |
|----------|-----------|-------|-------|------------|-------------------|---------|--------------------|
|          |           |       |       |            | NATIONAL PART No. | TYPE    |                    |
| 116      | Screw     | 6-8   | 0.15  | Brown      |                   | Type 47 |                    |

## MISCELLANEOUS

| ITEM No. | PART NAME         | NATIONAL PART No. | NOTES                    |
|----------|-------------------|-------------------|--------------------------|
| 117      | Switch            |                   | AVC                      |
| 118      | "                 |                   | Crystal Selectivity      |
| 119      | "                 |                   | B+                       |
| 120      | "                 |                   | Tone                     |
| 121      | "                 |                   | Radio-Phono              |
| 122      | "                 |                   | CW Osc.                  |
| 123      | "                 |                   | 115-230 Volt             |
| 124      | "                 |                   | Power                    |
| 125      | 4 Genq Var. Cap   |                   | (13-231MUF) each section |
| 126      | RF Tuning Cap     |                   |                          |
| 128      | Crystal Resonator |                   |                          |

## TUBES (SYLVANIA or Equivalent)

| ITEM No. | USE             | REPLACEMENT DATA  |                      | RMA BASE TYPE | INSTALLATION NOTES |
|----------|-----------------|-------------------|----------------------|---------------|--------------------|
|          |                 | NATIONAL PART No. | STANDARD REPLACEMENT |               |                    |
| 1        | 1st RF Amp.     | 6K7               | 6K7                  | 7R            | 6K7 All terminate  |
| 2        | 2nd RF Amp.     | 6K7               | 6K7                  | 7R            |                    |
| 3        | Mixer           | 6J7               | 6J7                  | 7R            |                    |
| 4        | Oscillator      | 6CA               | 6CA                  | 6EG           |                    |
| 5        | 1st IF Amp.     | 6J7               | 6J7                  | 7R            |                    |
| 6        | 2nd IF Amp.     | 6K7               | 6K7                  | 7R            |                    |
| 7        | Det.-AVC        | 6H6               | 6H6                  | 7Q            |                    |
| 8        | Beat Freq. Osc. | 6H6               | 6H6                  | 7Q            |                    |
| 9        | Noise Limiter   | 6S7               | 6S7                  | 7Q            |                    |
| 10       | AF Amp.         | 6X7               | 6X7                  | 8N            |                    |
| 11       | Power Output    | 6V6GT             | 6V6GT                | 7AC           |                    |
| 12       | Voltage Reg.    | 0A2               | 0A2                  | 5E0           |                    |
| 13       | Rectifier       | 5Y3GT             | 5Y3GT                | 5T            |                    |

## CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

| ITEM No. | RATING | REPLACEMENT DATA  |                  |                           |                | IDENTIFICATION CODES AND INSTALLATION NOTES |                        |
|----------|--------|-------------------|------------------|---------------------------|----------------|---|------------------------|
|          |        | NATIONAL PART No. | AEROVOX PART No. | CORNEIL DUBILIER PART No. | SOLAR PART No. |   |                        |
| 14A      | 475    |                   | E450-8-16        | UF1111451                 | D1-3X8-450#    | D9069                                       | Filter                 |
| B        | 475    |                   |                  |                           |                | TA-510                                      | Output Cathode Bypass  |
| C        | 475    |                   |                  |                           |                | TA-525                                      | AF Cathode Bypass      |
| 15       | 10     |                   | FR850/10         |                           | M-10-50        |   | RF Bypass Pwr. Supply  |
| 16       | 25     |                   | FR850/25         |                           | M-25-50        |   | AF Cathode Bypass      |
| 17       | .01    |                   | 484-1            |                           | ST-4-1         | TC-11                                       | Audio Coupling         |
| 18       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | AF Plate Decoupling    |
| 19       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | AF Screen Bypass       |
| 20       | .1     |                   | 484-1            |                           | ST-4-1         | TC-11                                       | Audio Coupling         |
| 21       | .01    |                   | 484-1            |                           | ST-4-1         | TC-1  | Limiter Filter         |
| 22       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | Audio Coupling         |
| 23       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | Audio Coupling         |
| 24       | .1     |                   | 484-1            |                           | ST-4-1         | TC-11                                       | Audio Coupling         |
| 25       | .01    |                   | 484-1            |                           | ST-4-1         | TC-1  | AVC Filter             |
| 26       | .1     |                   | 484-1            |                           | ST-4-1         | TC-11                                       | 1st IF Cathode Bypass  |
| 27       | .01    |                   | 484-1            |                           | ST-4-1         | TC-1  | AVC Filter             |
| 28       | .1     |                   | 484-1            |                           | ST-4-1         | TC-11                                       | 1st IF Cathode Bypass  |
| 29       | .01    |                   | 484-1            |                           | ST-4-1         | TC-11                                       | AVC Filter             |
| 30       | .1     |                   | 484-1            |                           | ST-4-1         | TC-11                                       | Osc. Plate Bypass      |
| 31       | .01    |                   | 484-1            |                           | ST-4-1         | TC-11                                       | Osc. Coupling          |
| 32       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | Mixer Cathode Bypass   |
| 33       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | RF Byp. Pwr. Supply    |
| 34       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | 2nd RF Cath. Byp.      |
| 35       | .01    |                   | 484-1            |                           | ST-4-1         | TC-11                                       | AVC Filter             |
| 36       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | RF Byp. Pwr. Supply    |
| 37       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | Screen Bypass          |
| 38       | .1     |                   | 484-1            |                           | ST-4-1         | TC-1  | 1st RF Cath. Byp.      |
| 39       | .01    |                   | 484-1            |                           | ST-4-1         | TC-11                                       | AVC Filter             |
| 40       | .01    |                   | 484-1            |                           | ST-4-1         | TC-11                                       | IF Plate Decoup.       |
| 41       | .25    |                   | 684-25           |                           | ST-6-25        | TC-2  | Tone Compensation      |
| 42       | 3500   |                   | 1467-003         |                           | M-5-23         | 1PW-23                                      | RF Coupling-Cer.       |
| 43       | 500    |                   | 1468-0001        |                           | M-5-31         | 1PW-31                                      | Diode Filter-Cer.      |
| 44       | 100    |                   | 1468-0002        |                           | M-5-31         | 1PW-31                                      | Osc. Grid Cap.-Cer.    |
| 45       | 270    |                   | 1468-0001        |                           | M-5-31         | 1PW-31                                      | Osc. Comp.-Cer.-Note 1 |
| 46       | 100    |                   |                  |                           | M-5-31         | 1PW-31                                      | Output Grid Byp.-Cer.  |
| 47       | 10     |                   |                  |                           | M-5-31         | 1PW-31                                      | Screen Bypass-Note 2   |
| 48       | 160    |                   |                  |                           | M-5-31         | 1PW-31                                      |                        |
| 127      | 400    |                   | 484-1            |                           | ST-4-1         | TC-1  |                        |

#Parallel sections to obtain desired capacity.

†Omit one section.

Note1-Special tolerance-(minus .00077 mmf./mmf./oc)

Note2-Not used in all models.



# PARTS LIST AND DESCRIPTIONS (Continued)

## CONTROLS

| ITEM No. | RATING        |       | REPLACEMENT DATA  |                    | INSTALLATION NOTES   |
|----------|---------------|-------|-------------------|--------------------|--|
|          | RESIST. WATTS | WATTS | NATIONAL PART No. | CLAROSTAT PART No. |  |
| 49A      | 500KΩ         | 1/2   | D18-133           | M-80-2             | AF Gain Control<br>Attach to 49A per instructions<br>RF Gain Control & "S" Meter SW.<br>Limiter Control & SW.<br>"S" Meter Control |
| B        | Smart         |       | A                 | Not Req.           |  |
| 50       | 100KΩ         | 1.5   | W-10K*            | 43-10K*            |  |
| 51       | 500KΩ         | 1/2   |                   | 43-1000            |  |
| 52       | 1000Ω         | 1/2   |                   | 43-1000            |  |

\*Use center & right hand terminals only.

## RESISTORS

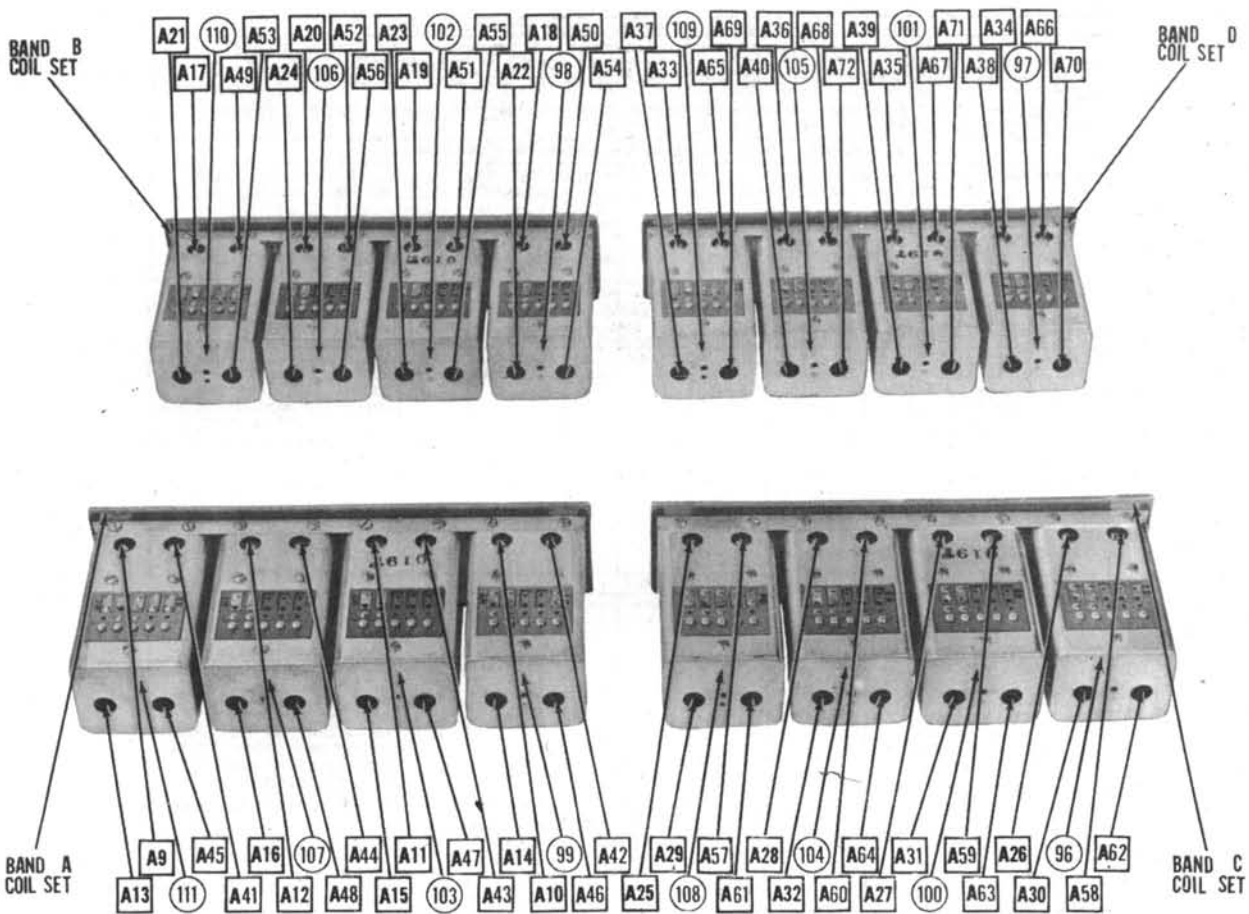
| ITEM No. | RATING     |       | REPLACEMENT DATA  |              | IDENTIFICATION CODES                  |
|----------|------------|-------|-------------------|--------------|---------------------------------------|
|          | RESISTANCE | WATTS | NATIONAL PART No. | IRC PART No. |                                       |
| 53       | 470KΩ      | 1/2   |                   | B7S-470K     | V1-V1-V1. AVC Network                 |
| 54       | 330Ω       | 1/2   |                   | B7S-470K     | Or.-Or.-Br. 1st RF Cathode            |
| 55       | 470KΩ      | 1/2   |                   | B7S-470K     | V1-V1-V1. AVC Network                 |
| 56       | 330Ω       | 1/2   |                   | B7S-470K     | Or.-Or.-Br. 2nd RF Cathode            |
| 57       | 470Ω       | 1/2   |                   | B7S-4700     | V1-V1-Red Mixer Cathode               |
| 58       | 100KΩ      | 1/2   |                   | B7S-100K     | Br.-Blk.-Yl. Mixer Screen             |
| 59       | 22KΩ       | 1/2   |                   | B7S-22K      | Red-Red-Or. Osc. Grid                 |
| 60       | 2500Ω      | 1/2   |                   | AB-2500      | Voltage Dropping                      |
| 61       | 470KΩ      | 1/2   |                   | B7S-470K     | V1-V1-V1. AVC Network                 |
| 62       | 27KΩ       | 1/2   |                   | B7S-27K      | Red-V1-Or. Screen Bleeder             |
| 63       | 1200Ω      | 1/2   |                   | B7S-1200     | Br.-Red-Red 1st IF Cathode            |
| 64       | 330Ω       | 1/2   |                   | BM-#330      | Or.-Or.-Br. 2nd IF Cathode            |
| 65       | 470KΩ      | 1/2   |                   | B7S-470K     | V1-V1-V1. AVC Network                 |
| 66       | 1.5 Meg.   | 1/2   |                   | B7S-1.5 Meg. | Br.-Grn.-Grn. "S" Meter Network       |
| 67       | 1.5 Meg.   | 1/2   |                   | B7S-1.5 Meg. | Br.-Grn.-Grn. "S" Meter Shunt         |
| 68       | 4.3Ω       | 1/2   |                   | BM-1-4.3     | Yl.-Or.-Gold Fil. Dropping            |
| 69       | 220KΩ      | 1/2   |                   | B7S-220K     | Red-Red-Yl. BFO Voltage Dropping      |
| 70       | 100KΩ      | 1/2   |                   | B7S-100K     | Br.-Blk.-Yl. BFO Screen Dropping      |
| 71       | 100KΩ      | 1/2   |                   | B7S-100K     | Br.-Blk.-Yl. BFO Voltage Bleeder      |
| 72       | 15KΩ       | 1/2   |                   | B7S-15K      | Br.-Grn.-Or. Screen Dropping          |
| 73       | 1800Ω      | 1/2   |                   | B7S-1800     | Br.-Gray-Red "S" Meter Network        |
| 74       | 270Ω       | 1/2   |                   | BM-#270      | Red-V1-Br. "S" Meter Shunt            |
| 75       | 2200Ω      | 1/2   |                   | B7S-2200     | Red-Red-Red 2nd IF Plate Decoupling   |
| 76       | 22KΩ       | 1/2   |                   | B7S-22K      | Red-Red-Or. Diode Load                |
| 77       | 470KΩ      | 1/2   |                   | B7S-470K     | V1-V1-V1. Diode Load                  |
| 78       | 220KΩ      | 1/2   |                   | B7S-220K     | Red-Red-Yl. Limiter Threshold Filter  |
| 79       | 220KΩ      | 1/2   |                   | B7S-220K     | V1-Or.-Gold Limiter Filament Dropping |
| 80       | 4.3Ω       | 1/2   |                   | BM-1-4.3     | Red-Red-Yl. Limiter Cathode           |
| 81       | 220KΩ      | 1/2   |                   | B7S-220K     | V1-Or.-Gold Limiter Filament Dropping |
| 82       | 220KΩ      | 1/2   |                   | B7S-220K     | Red-Red-Yl. Lim. Plate Divider        |
| 83       | 470KΩ      | 1/2   |                   | B7S-470K     | V1-V1-V1. Lim. Plate Load             |
| 84       | 820KΩ      | 1/2   |                   | B7S-820K     | Gray-Red-Yl. Lim. Plate Decoupling.   |
| 85       | 2200Ω      | 1/2   |                   | B7S-2200     | Red-Red-Red AF Cathode                |
| 86       | 820KΩ      | 1/2   |                   | B7S-820K     | Gray-Red-Yl. AF Cathode               |
| 87       | 100KΩ      | 1/2   |                   | B7S-100K     | Br.-Blk.-Yl. AF Screen                |
| 88       | 47KΩ       | 1/2   |                   | B7S-47K      | V1-V1-Or. AF Plate Load               |
| 89       | 470KΩ      | 1/2   |                   | B7S-470K     | V1-V1-V1. AF Decoupling               |
| 90       | 330Ω       | 1/2   |                   | BM-2-330     | Or.-Or.-Br. Output Cathode            |

## TRANSFORMER (POWER)

| ITEM No. | RATING                           |         |                | REPLACEMENT DATA  |                  |                |
|----------|----------------------------------|---------|----------------|-------------------|------------------|----------------|
|          | PHI                              | SEC. 1  | SEC. 2         | NATIONAL PART No. | STANCOR PART No. | MERIT PART No. |
| 91       | 250V AC capped @ 117V AC @ 9.5VA | 5.1V AC | 6.2V AC @ 3.3A |                   |                  |                |

## FILTER CHOKE

| ITEM NO. | RATINGS              |                  |                               | REPLACEMENT DATA  |                  |                | INSTALLATION NOTES |
|----------|----------------------|------------------|-------------------------------|-------------------|------------------|----------------|--------------------|
|          | TOTAL DIRECT CURRENT | D. C. RESISTANCE | INDUCTANCE (μ CURRENT 1000.1) | NATIONAL PART NO. | STANCOR PART NO. | MERIT PART No. |                    |
| 92       | .095A.               | 250Ω             | 17 Henry-tes                  |                   |                  |                |                    |



**ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT**

Controls should be set as follows except where noted otherwise: Limiter control to "Off" AF Gain at "10", tone switch at "High", CWO control at "OFF", RF Gain control at "9", B+ switch at "ON", Selectivity switch at "Off", Phasing control at "Zero" and AVC switch at "OFF".

Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment tool for all adjustments.

**IF ALIGNMENT CHECK TO BE MADE PRIOR TO ALIGNMENT.**

- (a) Set Selectivity Switch to 5, AVC to "Off", RF Gain at "9", Phasing Control at zero and CWO Control to "On". Vary CWO Control to point of lowest background noise and note setting, which should occur near 9.
- (b) Set Selectivity Switch to "Off" and vary CWO control to point of lowest background noise and note setting which should occur near 9.
- (c) If IF Alignment is correct the two settings from (a) to (b) should coincide and Steps 1, 2 and 3 may be omitted.

**IF ALIGNMENT**

| DUMMY ANTENNA | SIGNAL GENERATOR COUPLING  | SIGNAL GENERATOR FREQUENCY                                  | COIL SET | RADIO DIAL SETTING      | OUTPUT METER      | ADJUST             | REMARKS   |
|---------------|--|---|----------|-------------------------|-------------------|--------------------|---|
| 1 Direct      | High side to grid cap. of 6J7 Mixer Tube (3). Low side to chassis. | Approx. 456KC (Unmodulated)                                 | Band "5" | Tuning cap. fully open. | Across voice coil | A1, A2, A3, A4, A5 | Set selectivity switch at "5". Turn CWO "ON". Adjust sig. gen. frequency for maximum output. Adjust "CWO" control to give approximately 400 $\mu$ note. Adjust A1 thru A5 for maximum output.   |
| 2 Direct      | "  | Tune 3 or 4KC to either side of freq. determined in Step 1. | "        | "                       | "                 | A6                 | Set selectivity switch to 1. Adjust A6 for maximum output. Return selectivity switch to "OFF".  |
| 3 Direct      | "  | Exact freq. determined in Step 1                            | "        | "                       | "                 | A7, A8             | Adjust A7 for maximum output. Check CWO tuning per part (B) of IF Alignment check in prealignment instructions. If setting of CWO control does not occur near "9" set CWO control at "9" and adjust A8 for lowest background noise. If setting is at or near "9" then A8 is adjusted correctly. |

**GENERAL COVERAGE ALIGNMENT**

| DUMMY ANTENNA              | SIGNAL GENERATOR COUPLING   | SIGNAL GENERATOR FREQUENCY | COIL SET | RADIO DIAL SETTING       | OUTPUT METER      | ADJUST             | REMARKS  |
|----------------------------|---|----------------------------|----------|--------------------------|-------------------|--------------------|--|
| 4 400 $\Omega$ carbon res. | High side to ant. terminal "A". Low side to center ant. terminal with link connected. | 30.0MC                     | Band "A" | 485                      | Across voice coil | A9                 | Adjust for maximum output. Tune sig. gen. to 30.9MC. If signal is not heard, retune sig. gen. to 30.0 MC and open A9 to next peak. Adjust for maximum output and recheck for image.  |
| 5 "                        | "   | "                          | "        | Tune for maximum output. | "                 | A10, A11, A12      | Rock tuning cap. and adjust for maximum output.  |
| 6 "                        | "   | 14.4MC                     | "        | 54                       | "                 | A13, A14, A15, A16 | Adjust for maximum output. Repeat Steps 4, 5 & 6 until no further improvement can be made, making Step 5 last step.  |
| 7 "                        | "   | "                          | Band "B" | 485                      | "                 | A17                | Adjust for maximum output. Tune sig. gen. to 15.3MC. If signal is not heard, retune sig. gen. to 14.4 MC and open A17 to next peak. Adjust for maximum output and recheck for image. |
| 8 "                        | "   | "                          | "        | Tune for maximum output. | "                 | A18, A19, A20      | Rock tuning cap. and adjust for maximum output.  |
| 9 "                        | "   | 7.0MC                      | "        | 28                       | "                 | A21, A22, A23, A24 | Adjust for maximum output. Repeat Steps 7, 8 & 9 until no further improvement can be made, making Step 8 last step.  |
| 10 "                       | "   | 7.3MC                      | Band "C" | 490                      | "                 | A25                | Adjust for maximum output. Tune sig. gen. to 8.2MC. If signal is not heard, retune sig. gen. to 7.3 MC and open A25 to next peak. Adjust for maximum output and recheck for image.   |
| 11 "                       | "   | "                          | "        | Tune for maximum output. | "                 | A26, A27, A28      | Rock tuning cap. and adjust for maximum output.  |
| 12 "                       | "   | 3.5MC                      | "        | 23                       | "                 | A29, A30, A31, A32 | Adjust for maximum output. Repeat Steps 10, 11 & 12 until no further improvement can be made, making Step 11 last step.  |
| 13 "                       | "   | 4.0MC                      | Band "D" | 490                      | "                 | A33                | Adjust for maximum output. Tune sig. gen. to 4.9MC. If signal is not heard, retune sig. gen. to 4.0MC and open A33 to next peak. Adjust for maximum output and recheck for image.    |
| 14 "                       | "   | "                          | "        | Tune for maximum output. | "                 | A34, A35, A36      | Rock tuning cap. and adjust for maximum output.  |
| 15 "                       | "   | 1.8MC                      | "        | 36                       | "                 | A37, A38, A39, A40 | Adjust for maximum output. Repeat Steps 13, 14 & 15 until no further improvement can be made, making Step 14 last step.  |

**BANDSPREAD ALIGNMENT**

General coverage alignment should be completed before bandspread alignment. Tracking of RF stages at low frequency end of each band may be checked as follows: After adjustments of padders is completed attempt to peak each stage with its associated high freq. trimmer. Any change in capacitance should cause a decrease in output if that stage is tracking correctly. This checking procedure will misalign the high frequency trimmers, therefore they should be repeated at the high frequency end of the band per alignment instructions.

| DUMMY ANTENNA | SIGNAL GENERATOR COUPLING | SIGNAL GENERATOR FREQUENCY | COIL SET | RADIO DIAL SETTING       | OUTPUT METER      | ADJUST             | REMARKS  |
|---------------|---------------------------|----------------------------|----------|--------------------------|-------------------|--------------------|--|
| 16            | 400Ω carbon res.          | 30.0MC                     | Band "A" | 450                      | Across voice coil | A41                | Adjust for maximum output. Tune sig. gen. to 30.9MC. If signal is not heard retune sig. gen. to 30.0 MC and open A41 to next peak. Adjust for maximum output and recheck for image.  |
| 17            | "                         | "                          | "        | Tune for maximum output. | "                 | A42, A43, A44      | Rock tuning cap. and adjust for maximum output.  |
| 18            | "                         | 27.2MC                     | "        | 61                       | "                 | A45, A46, A47, A48 | Adjust for maximum output. Repeat Steps 16, 17 & 18 until no further improvement can be made, making Step 17 last step.  |
| 19            | "                         | 14.4MC                     | Band "B" | 450                      | "                 | A49                | Adjust for maximum output. Tune sig. gen. to 15.3MC. If signal is not heard, retune sig. gen. to 14.4 MC and open A49 to next peak. Adjust for maximum output and recheck for image. |
| 20            | "                         | "                          | "        | Tune for maximum output. | "                 | A50, A51, A52      | Rock tuning cap. and adjust for maximum output.  |
| 21            | "                         | 14.0MC                     | "        | 50                       | "                 | A53, A54, A55, A56 | Adjust for maximum output. Repeat Steps 19, 20 & 21 until no further improvement can be made, making Step 20 last step.  |
| 22            | "                         | 7.3MC                      | Band "C" | 450                      | "                 | A57                | Adjust for maximum output. Tune sig. gen. to 8.2MC. If signal is not heard, retune sig. gen. to 7.3MC and open A57 to next peak. Adjust for maximum output and recheck for image.    |
| 23            | "                         | "                          | "        | Tune for maximum output. | "                 | A58, A59, A60      | Rock tuning cap. and adjust for maximum output.  |
| 24            | "                         | 7.0MC                      | "        | 50                       | "                 | A61, A62, A63, A64 | Adjust for maximum output. Repeat Steps 22, 23 and 24 until no further improvement can be made, making Step 23 last step.  |
| 25            | "                         | 4.0MC                      | Band "D" | 450                      | "                 | A65                | Adjust for maximum output. Tune sig. gen. to 4.9MC. If signal is not heard, retune sig. gen. to 4.0 MC and open A65 to next peak. Adjust for maximum output and recheck for image.   |
| 26            | "                         | "                          | "        | Tune for maximum output. | "                 | A66, A67, A68      | Rock tuning cap. and adjust for maximum output.  |
| 27            | "                         | 3.5MC                      | "        | 50                       | "                 | A69, A70, A71, A72 | Adjust for maximum output. Repeat Steps 25, 26 & 27 until no further improvement can be made, making Step 26 last step.  |

**1<sup>ST</sup> RF STAGE ALIGNMENT WITH LOW IMPEDANCE TRANSMISSION LINE.**

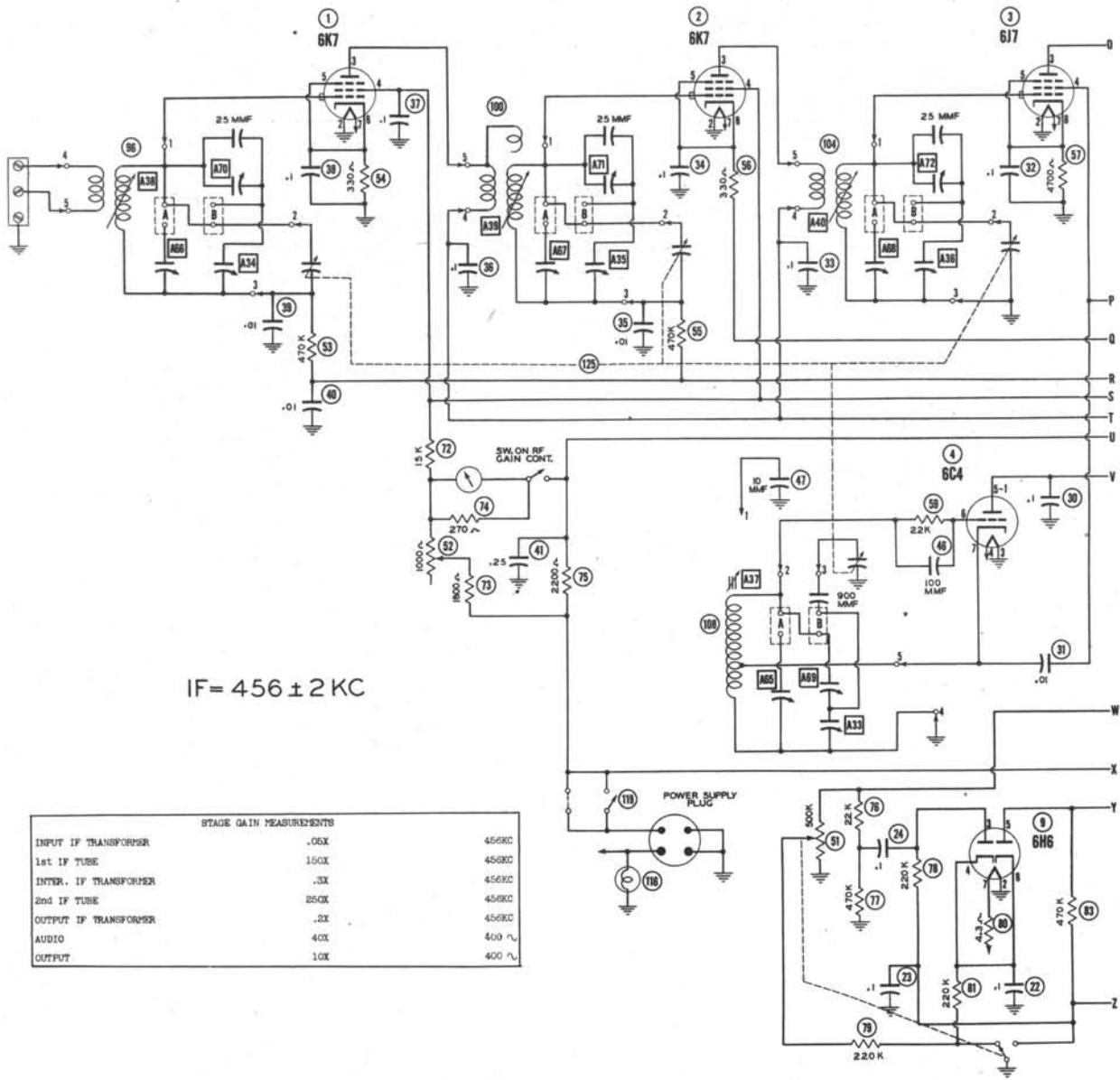
If a low impedance transmission line is to be used with the receiver it may be necessary to realign the first RF amplifier at the high frequency end of each band.

**GENERAL COVERAGE**

| DUMMY ANTENNA | SIGNAL GENERATOR COUPLING   | SIGNAL GENERATOR FREQUENCY | COIL SET | RADIO DIAL SETTING       | OUTPUT METER      | ADJUST | REMARKS                    |
|---------------|---|----------------------------|----------|--------------------------|-------------------|--------|----------------------------|
| 28            | Antenna feeders must be connected. (Use radiated signal from sig. gen. with no direct connection) | 30.0MC                     | Band "A" | Tune for maximum output. | Across voice coil | A10    | Adjust for maximum output. |
| 29            | "   | 14.4MC                     | Band "B" | "                        | "                 | A18    | " " " " " "                |
| 30            | "   | 7.3MC                      | Band "C" | "                        | "                 | A26    | " " " " " "                |
| 31            | "   | 4.0MC                      | Band "D" | "                        | "                 | A34    | " " " " " "                |

**BANDSPREAD ALIGNMENT**

| DUMMY ANTENNA | SIGNAL GENERATOR COUPLING   | SIGNAL GENERATOR FREQUENCY | COIL SET | RADIO DIAL SETTING       | OUTPUT METER      | ADJUST | REMARKS                    |
|---------------|---|----------------------------|----------|--------------------------|-------------------|--------|----------------------------|
| 32            | Antenna feeders must be connected. (Use radiated signal from sig. gen. with no direct connection) | 30.0MC                     | Band "A" | Tune for maximum output. | Across voice coil | A42    | Adjust for maximum output. |
| 33            | "   | 14.4MC                     | Band "B" | "                        | "                 | A50    | " " " " " "                |
| 34            | "   | 7.3MC                      | Band "C" | "                        | "                 | A58    | " " " " " "                |
| 35            | "   | 4.0MC                      | Band "D" | "                        | "                 | A66    | " " " " " "                |

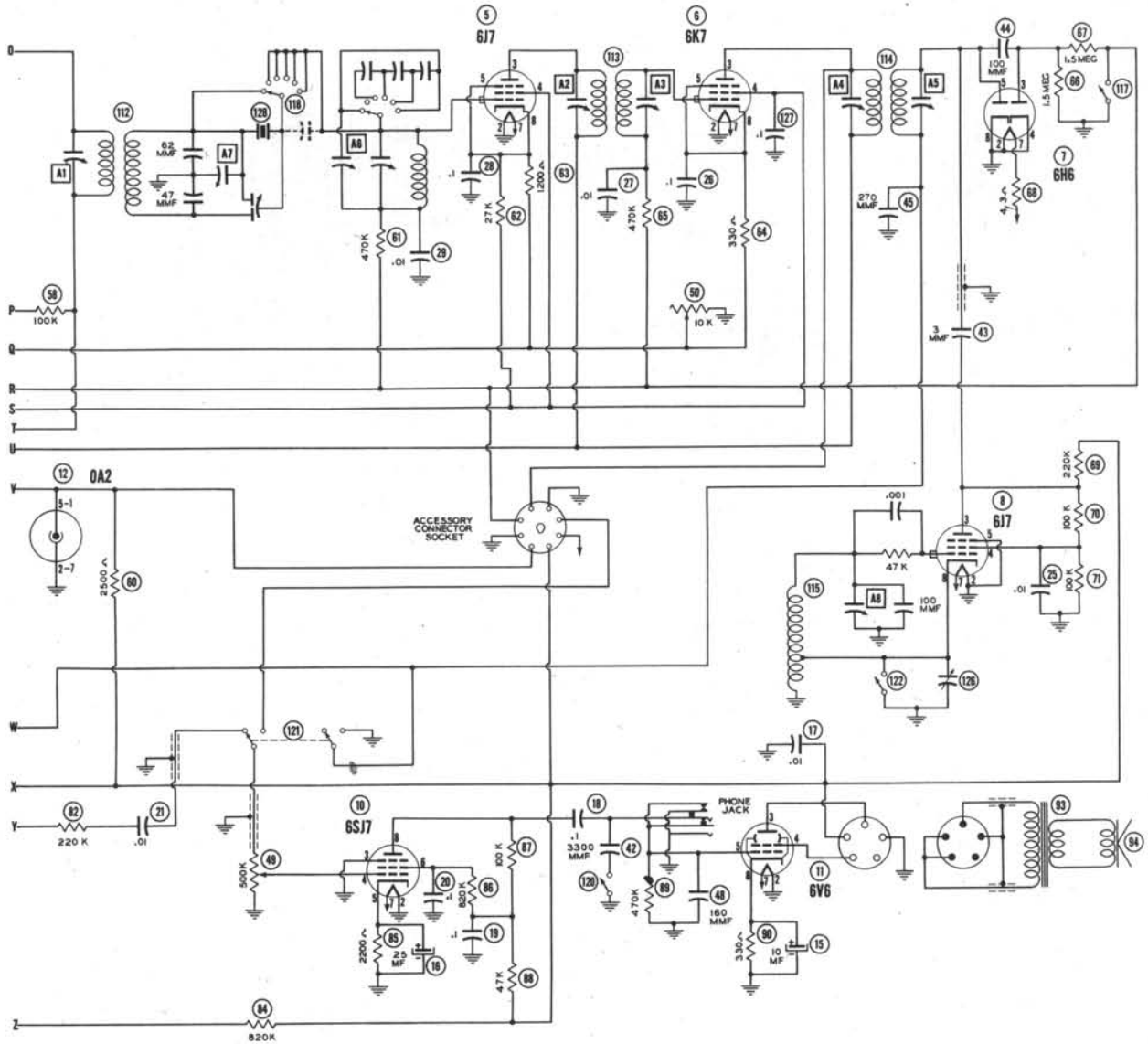


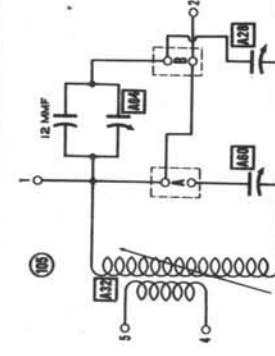
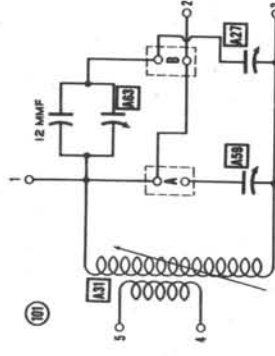
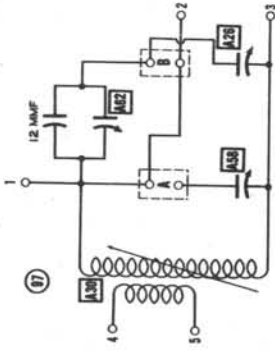
IF = 456 ± 2 KC

| STAGE GAIN MEASUREMENTS |      |       |
|-------------------------|------|-------|
| INPUT IF TRANSFORMER    | .06X | 456KC |
| 1st IF TUBE             | 150X | 456KC |
| INTER. IF TRANSFORMER   | .3X  | 456KC |
| 2nd IF TUBE             | 250X | 456KC |
| OUTPUT IF TRANSFORMER   | .2X  | 456KC |
| AUDIO                   | 40X  | 400 ~ |
| OUTPUT                  | 10X  | 400 ~ |

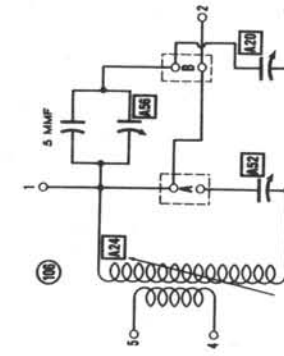
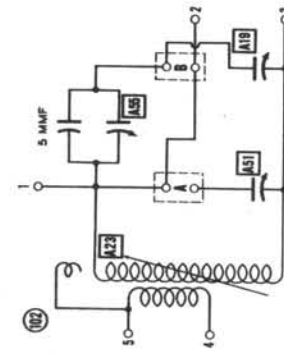
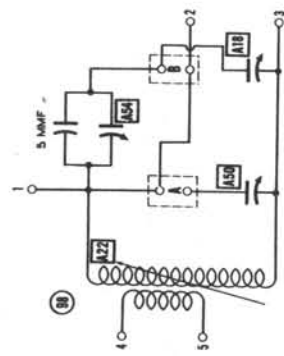
The stage gain measured values listed above are approximate values for an average operative stage, rather than an absolute value. It should be borne in mind that it is possible to introduce so many variables into the measurement operation, such as, type of equipment used for measuring, handling and placement of probes, the accuracy of alignment, etc., that an absolute reading is impractical. AVC is made inoperative and 3-volt battery bias substituted for measurement.



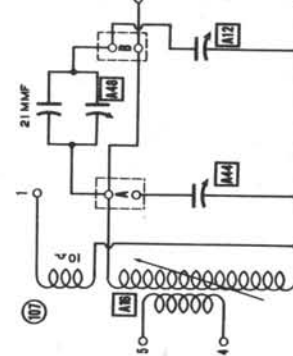
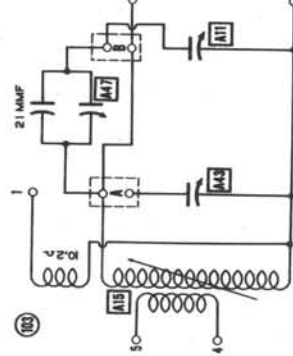
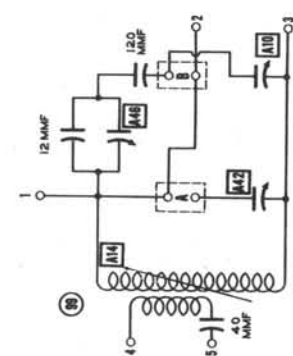




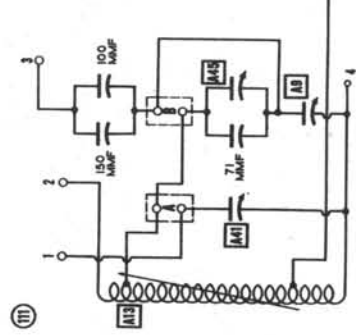
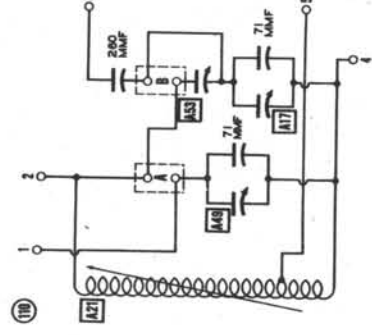
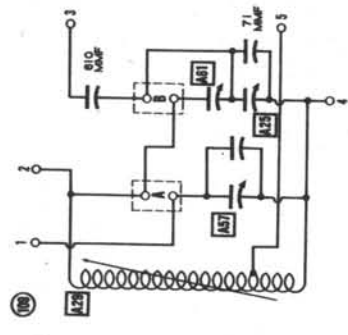
BAND C

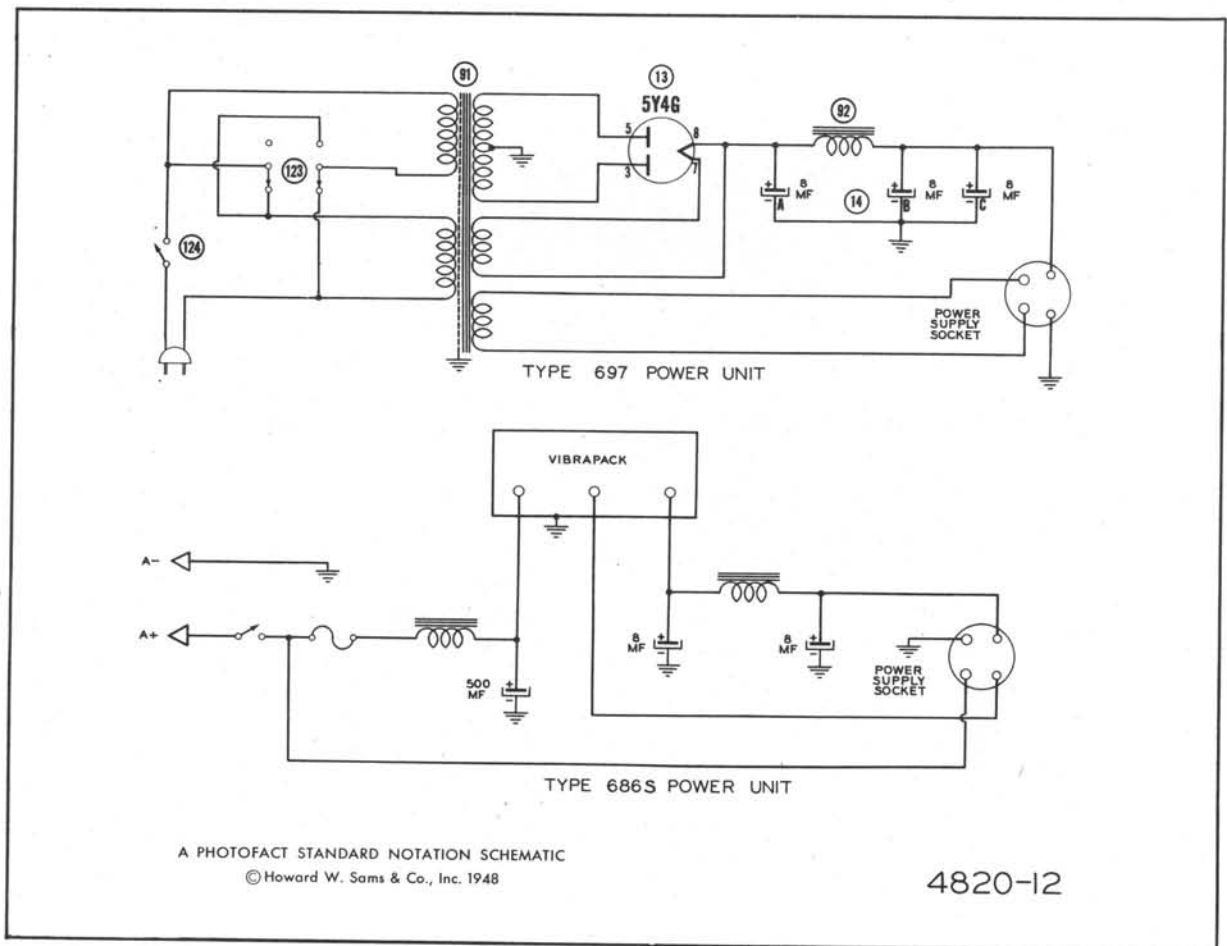


BAND B



BAND A





#### MAIN TUNING DIAL

The main tuning dial should normally give no trouble. If, however, the dial should become removed from the Receiver it should NOT be operated until mounted on the condenser shaft WITH SET-SCREWS TIGHT. This is because the dial is only designed to rotate for ten revolutions (0 to 500) and if turned farther than this the mechanism will be damaged. When mounted on the condenser, limit stops protect the dial provided the assembly is properly done. The procedure for re-mounting the dial is as follows:

(a) Place dial on condenser shaft, tighten set-screws and turn dial counter-clockwise to fully mesh condenser rotor plates so that the tips of the rotor plates are flush with the edge of the stator plates.

(b) Loosen set-screws and rotate dial slowly until dial reading has decreased to zero.

(c) Tighten the set-screws.

(d) Check position of rotor plates at zero. The tips of the rotor plates should be flush with the edge of the stator plates at zero. A slight adjustment may be necessary and this is done by loosening the set-screws, adjusting the position of the dial and tightening the set-screws again.

If it is necessary to remove the dial at any future time, turn to 250 before removing the dial, and do not disturb the setting of either the dial or condenser until reassembled. If in doubt about the correct position, inspect the springs on the back of the dial. When the dial reads 250 these springs should be straight-up-and-down, they must not be tipped to one side.

It is important that the backplate and dial do not become separated.

The backplate is held in place by two springs so that its gear teeth mesh with the dial gear teeth in correct relationship for proper dial operation. If this backplate should be sprung out of place, it may return to an incorrect position and the proper dial numbers will not appear in the windows when the dial is used. To ascertain that the two parts are in correct position, proceed as follows:

(a) Locate small window near outer periphery of dial backplate and also locate dial number window on face of dial which is 180° removed from the small backplate window.

(b) Hold dial so backplate lies flat in palm of left-hand and with right hand rotate dial knob until 250 appears in previously located dial window.

(c) If dial is properly adjusted it will be noted that the pointer at the outer edge of the small window lines up with a marked tooth on the dial itself. It will be found that the dial and backplate can be moved so that the backplate pointer will mesh between teeth at points equi-distant from marked tooth in either direction.

(d) If by checking as in paragraph (c), the dial is found not properly adjusted, it will be necessary to separate the backplate from the dial far enough to bring the two gears out of mesh and then re-mesh the two parts until the proper setting is found. A number of trials may be required before the correct mesh is found.

#### BANDSPREAD SWITCHING PROCEDURE

The bandspread switch for bands A, B, C and D are located on each coil set. Inspection of the coil set terminal panels will show several small rectangular metal pieces. There are two of these metal pieces or terminal blocks on each coil which are tapped and countersunk for a flat-head machine screw. It will be noted that these terminal blocks correspond to contacts numbered 1 and 2 on the antenna and RF coils and to contacts numbered 2 and 3 on the oscillator coils. Looking at the coil forms from the front and top the bandswitch screws must be in the left-hand position (in line with contact #2 of the antenna and RF coils and contact #3 of the oscillator coil) for general coverage tuning. On the schematic diagram and the circuit diagrams of the individual coils this position is designated with the letter "B". The coil range will be shown on the top scale of the calibration chart on the front of each coil set. To change to bandspread it is necessary to move the screw to the right-hand position (in line with contact #1 on the antenna and RF coils and contact #2 on the oscillator coil). On the schematic diagram and the circuit diagrams of the individual coils this position is designated with the letter "A". The coil range will be shown on the bottom scale of the calibration chart on the front of each coil set. The numbers shown on the schematic diagram and the circuit diagrams of the individual coils correspond to the contacts as they are numbered on each coil set.

VOLTAGE AND RESISTANCE TAKEN WITH AC LINE SET AT 115V AC.  
 VOLTAGE AND RESISTANCE TAKEN ON BAND "D".  
 SELECTIVITY CONTROL IN OFF POSITION.  
 TONE CONTROL SET AT HIGH POSITION.  
 RF GAIN SET AT MAXIMUM. AF GAIN SET AT MINIMUM.  
 PHASING CONTROL AT 0. AVC ON. B+ SWITCH ON.  
 RADIO-PHONO SWITCH IN RADIO POSITION.

VOLTAGE READINGS

| Item | Tube  | Pin 1  | Pin 2  | Pin 3  | Pin 4  | Pin 5  | Pin 6  | Pin 7  | Pin 8   |
|------|-------|--------|--------|--------|--------|--------|--------|--------|---------|
| 1    | 6K7   | 0V.    | 0V.    | 220VDC | 85VDC  | 2.6VDC | 0V.    | 6.2VAC | 2.6VDC  |
| 2    | 6K7   | 0V.    | 0V.    | 220VDC | 85VDC  | 2.6VDC | 0V.    | 6.2VAC | 2.6VDC  |
| 3    | 6J7   | 0V.    | 0V.    | 220VDC | 180VDC | 8VDC   | 0V.    | 6.2VAC | 8VDC    |
| 4    | 6C4   | 150VDC | 0V.    | 0V.    | 6.2VAC | 150VDC | -25VDC | 0V.    | -       |
| 5    | 6J7   | 0V.    | 0V.    | 205VDC | 85VDC  | 4VDC   | 0V.    | 6.2VAC | 4VDC    |
| 6    | 6K7   | 0V.    | 0V.    | 205VDC | 85VDC  | 2.6VDC | 0V.    | 6.2VAC | 2.6VDC  |
| 7    | 6H6   | 0V.    | 0V.    | 0V.    | 0V.    | -.1VDC | -.1VDC | 5VAC   | 0V.     |
| 8    | 6J7   | 0V.    | 0V.    | 50VDC  | 20VDC  | 0V.    | 0V.    | 6.2VAC | 0V.     |
| 9    | 6H6   | 0V.    | 0V.    | 0V.    | 0V.    | 0V.    | 0V.    | 5VAC   | 0V.     |
| 10   | 6SJ7  | 0V.    | 0V.    | 0V.    | 0V.    | 1.6VDC | 45VDC  | 6.2VAC | 115VDC  |
| 11   | 6V6GT | 0V.    | 0V.    | 210VDC | 220VDC | 0V.    | 0V.    | 6.2VAC | 12.5VDC |
| 12   | 0A2   | 150VDC | 0V.    | 0V.    | 0V.    | 150VDC | 0V.    | 0V.    | -       |
| 13   | 5Y3GT | 0V.    | 250VDC | 0V.    | 295VAC | 0V.    | 295VAC | 0V.    | 250VDC  |

‡ TAKEN WITH VACUUM TUBE VOLTMETER.

RESISTANCE READINGS

| Item | Tube  | Pin 1 | Pin 2 | Pin 3   | Pin 4 | Pin 5 | Pin 6    | Pin 7 | Pin 8 |
|------|-------|-------|-------|---------|-------|-------|----------|-------|-------|
| 1    | 6K7   | 0Ω    | 0Ω    | 40KΩ    | 30KΩ  | 330Ω  | INF.     | .1Ω   | 330Ω  |
| 2    | 6K7   | 0Ω    | 0Ω    | 40KΩ    | 30KΩ  | 330Ω  | INF.     | .1Ω   | 330Ω  |
| 3    | 6J7   | 0Ω    | 0Ω    | 40KΩ    | 140KΩ | 4.7KΩ | INF.     | .1Ω   | 4.7KΩ |
| 4    | 6C4   | 40KΩ  | INF.  | 0Ω      | .1Ω   | 40KΩ  | 22KΩ     | .4Ω   | -     |
| 5    | 6J7   | 0Ω    | 0Ω    | 40KΩ    | 30KΩ  | 1.2KΩ | INF.     | .1Ω   | 1.2KΩ |
| 6    | 6K7   | 0Ω    | 0Ω    | 40KΩ    | 30KΩ  | 330Ω  | INF.     | .1Ω   | 330Ω  |
| 7    | 6H6   | 0Ω    | 0Ω    | 1.5 Meg | 0Ω    | 120KΩ | 120KΩ    | 4.4Ω  | 0Ω    |
| 8    | 6J7   | 0Ω    | 0Ω    | 130KΩ   | 100KΩ | 0Ω    | INF.     | .1Ω   | 0Ω    |
| 9    | 6H6   | 0Ω    | 0Ω    | 220KΩ   | 700KΩ | 460KΩ | 1.5 Meg. | 4.4Ω  | 220KΩ |
| 10   | 6SJ7  | 0Ω    | 0Ω    | 0Ω      | 500KΩ | 2.2KΩ | 1 Meg.   | .1Ω   | 170KΩ |
| 11   | 6V6GT | 0Ω    | 0Ω    | 40KΩ    | 40KΩ  | 470KΩ | INF.     | .1Ω   | 330Ω  |
| 12   | 0A2   | 40KΩ  | 0Ω    | INF.    | 0Ω    | 40KΩ  | 0Ω       | 0Ω    | -     |
| 13   | 5Y3GT | INF.  | 40KΩ  | INF.    | 340Ω  | INF.  | 355Ω     | INF.  | 40KΩ  |

\*LIMITER CONTROL ON.

#CWO ON.

RESISTANCE READINGS IN THE B+ CIRCUITS MAY VARY WIDELY  
 ACCORDING TO THE CONDITION OF THE FILTER CAPACITORS

- DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms.
- Socket connections are shown as bottom views.
- Measured values are from socket pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
- Volume control at maximum, no signal applied for voltage measurements.