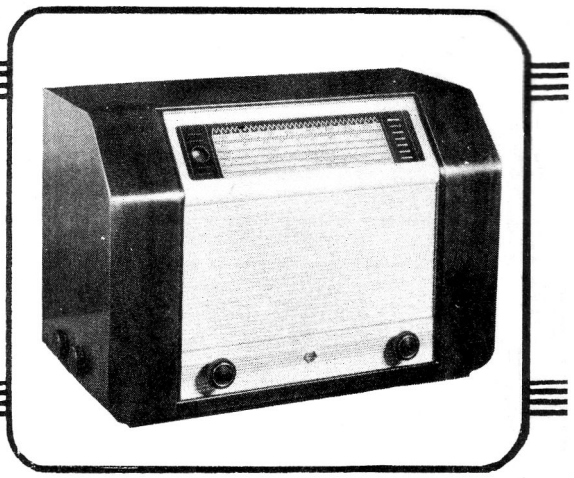
# PHILIPS
# SERVICE NOTES

# RADIO RECEIVER CM60A



## SPECIFICATIONS

**MODEL CM60A:** Is an eight tube superheterodyne receiver (including Tuning Indicator) designed for operation on A.C. lines only. Five tuning ranges cover from 13.5 to 560 meters, 22.1 Mc to 535 kc with bandspread on three short wave ranges.
**PHILIPS TUBES:** R.F. Amplifier 6SG7, Converter 6SA7, I.F. Amplifier 6SK7GT, 2nd Detector, A.V.C. & 1st A.F. Amplifier 6SQ7GT, 2nd A.F. Amplifier 6SQ7GT, Audio Output 6V6GT, Rectifier 5Y3GT, Tuning Indicator 6U5/6G5.

**RANGE SWITCH POSITIONS & TUNING RANGE:**
1st—Phonograph Position
2nd—560-170 m,—535-1750 kc (Special)
3rd—560-170 m,—535-1750 kc (Normal)
4th—123-40 m,—2.45-7.6 Mc
5th—32.5—28.8 m,—9.22—10.41 Mc Bandspread
6th—29.0—24.6 m,—10.32—12.17 Mc Bandspread
7th—20.5—13.5 m,—14.6—22.1 Mc Bandspread

**INTERMEDIATE FREQUENCY:** 455 kc.

**AUDIO OUTPUT:** 3.5 watts.

**LOUDSPEAKER:** Is an eight inch permanent magnet dynamic with a voice coil D.C. resistance of 2.9 ohms.

**ANTENNA & GROUND:** For optimum results an outside antenna is necessary. A secure ground connection should be made to a cold water pipe or to a grounding plate buried in damp ground.

**CONTROLS:** Left end to right end. (Looking at front)
1. Tone Control
2. Volume Control and "On-Off" switch
3. Performance switch
4. Wave Range and Phonograph Switch
5. Tuning Control

**PHONOGRAPH CONNECTION:** A connector is supplied to connect a pickup to the receiver. The circuit is designed to operate with a crystal or other high impedance pickup.

**EXTERNAL SPEAKER CONNECTION:** A connector is supplied for an extension speaker of the permanent magnet type having a voice coil D.C. resistance of not less than 6 ohms.

**DIAL ILLUMINATION:** The dial pointer on this receiver is a glass rod which focuses light on the dial scale. It is important when replacing dial lamps that the correct type is used.

The upper dial light uses a 6-8 volt, 0.4 amp green bulb.

The lower dial light uses a 6-8 volt, 0.4 amp red bulb.

The range indicator dial light uses a 6-8 volt, 0.25 amp green bulb.

**LINE VOLTAGE:** 115 Volts, 25 to 60 cycles

**POWER CONSUMPTION:** watts maximum

**CABINET DIMENSIONS:**
Width—21½ inches.
Height—14¾ inches.
Depth—10⅞ inches.

**WEIGHT:** Net—34¼ pounds.
Gross—44 pounds.

## SERVICE DATA

**WAVE RANGE SWITCH:** The schematic diagram shows each section of this switch in a straight line form. The short stator contacts are represented as solid squares; the long contacts as solid rectangles and the rotor contacts as bars. All sections are shown in the counter clockwise (1st or phonograph) position. As the switch rotates clockwise, the rotor contacts move downwards through the remaining Range Switch Positions as listed above. The exact location of each stator contact on its wafer is shown on a front view drawing of a switch wafer on the schematic diagram.

## TO REMOVE CHASSIS

1. Disconnect plug from line socket.
2. Remove antenna and ground connections.
3. Remove back cover and control knobs.
4. Disconnect the drive cord from the dial pointer.
5. Remove the tuning indicator from the bracket.
6. Disconnect the speaker cable plug from the chassis.
7. Remove the screw securing the top bracket to the inside of the cabinet.
8. Remove the chassis mounting screws through the bottom of cabinet.

# TUBE SOCKET VOLTAGES

| PIN | 6SG7 | 6SA7 | 6SK7 | 6SQ7 Detector | 6SQ7 2nd A.F. | 6V6 | 5Y3 | 6U5 |
|---|---|---|---|---|---|---|---|---|
| 1 | — | — | — | — | — | — | — | 6.3 ac |
| 2 | — | — | — | — | — | — | 305 | 21 |
| 3 | — | 245 | — | 1.25 | 13.2 | 260 | — | * |
| 4 | * | 95 | * | — | — | 245 | 300 ac | 245 |
| 5 | — | — | 3 | — | — | — | — | — |
| 6 | 105 | — | 100 | 140 | 160 | — | 300 ac | — |
| 7 | 6.3 ac | 6.3 ac | 6.3 ac | 6.3 ac | 6.3 ac | 6.3 ac | — | — |
| 8 | 245 | * | 225 | — | — | 11 | 305 | — |

Note: * Bias obtained from AVC system.

Values specified obtained by using a 20,000 ohm per volt voltmeter.

All voltages measured to chassis.

All voltages are D.C. positive except where noted.

All tubes must be in their sockets during test.

Readings may vary plus or minus 10% due to mains voltage fluctuations.

# ALIGNMENT OF RECEIVER

All adjustments may be made with the receiver in the cabinet. Turn the volume control to the full clockwise position for maximum output and the tone control to the extreme counterclockwise position. Set the performance switch to the left position indicated by the red dial light. With the variable capacitor fully closed, adjust the dial pointer on the beginning of the dial scale to the left of the 550 kc calibration mark.

## Equipment Required

**OUTPUT INDICATOR:** A high resistance A.C. voltmeter and an output transformer.

**SIGNAL GENERATOR:** A Generator capable of supplying modulated signals between 455 kc and 22 Mc.

## Equipment Connections and Alignment Procedure

**OUTPUT INDICATOR:** Connect the A.C. voltmeter to the external loudspeaker connection located in the rear of the receiver. During the alignment, keep the output below 1.25 A.C. volts across this jack. If the meter used does not satisfactorily indicate 1.25 volts, connect the secondary of an output transformer to the external speaker connection and connect the A.C. voltmeter across the primary. When using the latter method, the maximum output reading should be kept below 30 A.C. volts. When the output indication increases, regulate the signal generator attenuator to restore the original indication.

**SIGNAL GENERATOR:** Connect the ground lead of the signal generator to the "ground" jack in the rear of the receiver and the output lead to the points indicated in the chart below, in series with the specified resistor or capacitor.

## DRUM SCALE DIVISIONS

| Band Switch Position | Frequency | Drum Scale Reading |
|---|---|---|
| 2 & 3 Broadcast | 570 kc | 10.6 |
| | 1000 kc | 58.4 |
| | 1600 kc | 88.9 |
| 4 Short Wave | 2.9 Mc | 22.9 |
| | 5.0 Mc | 65.1 |
| | 7.0 Mc | 88.4 |
| 7 Bandspread | 15.2 Mc | 25.9 |
| | 21.5 Mc | 90.9 |
| 6 Bandspread | 11.6 Mc | 73.7 |
| 5 Bandspread | 9.6 Mc | 46.8 |

Zero on drum scale corresponds to gang condenser fully closed.

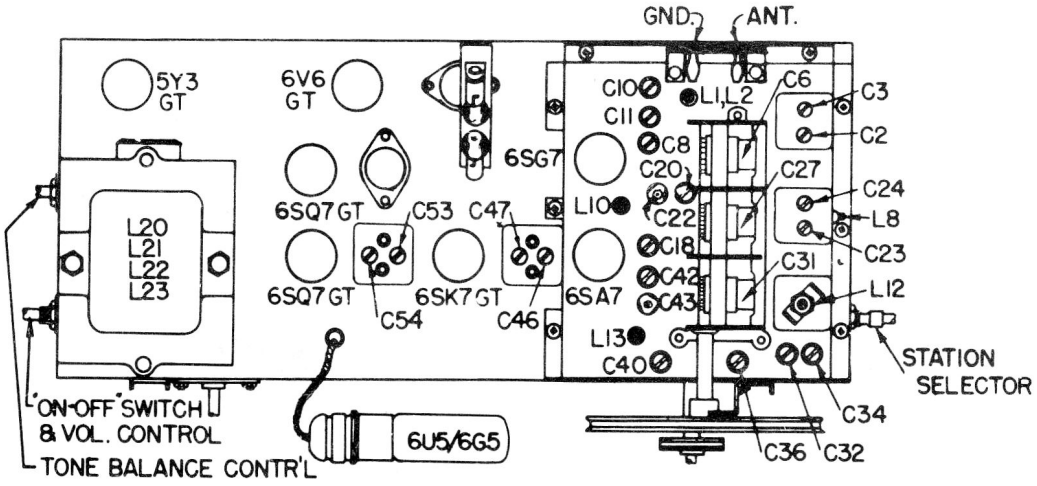
The dial of this model is permanently fastened to the cabinet, therefore, the removal of the chassis necessitates other means of calibrating the receiver. Located on the tuning drum is an 0 to 100 scale. This scale is read from the edge of the bracket near its face and is to be used in aligning the receiver, when the chassis has been removed from the cabinet.

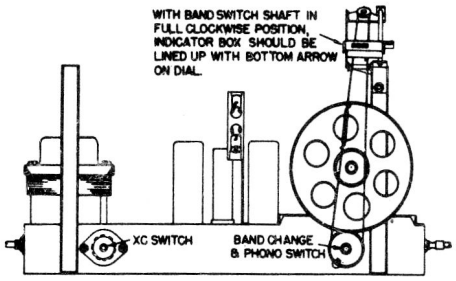
The conversion of dial scale readings to gang condenser drum scale readings for alignment frequencies is given to the left.

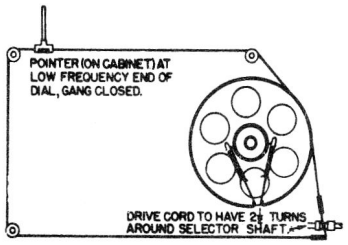
### IMAGE FREQUENCY

When the receiver is properly aligned, the maximum output corresponding to the image frequency should occur when the receiver is tuned to a frequency approximately 900 kc *lower* than the signal frequency. It may be necessary to increase the value of input signal when it is desired to make this test.

# ALIGNMENT PROCEDURE




# ALIGNMENT PROCEDURE

| SIGNAL GENERATOR | | | RECEIVER | | | |
|---|---|---|---|---|---|---|
| Operation Steps | Output Connections to Receiver | Frequency | Range Switch | Tuning Capacitor | See Notes | Adjust in stated order for Maximum Output |
| 1 | To 6SK7GT Control Grid (4) Through .05 mfd. Capacitor | 455 kc | Pos. 3 | Min. | | 2nd I.F. Trimmers C54, C53. |
| 2 | To Stator C27 Through .05 mfd. Capacitor | 455 kc | Pos. 3 | Min. | A | 1st I.F. Trimmers C47, C46. |
| 3 | To Antenna Contact Through 200 mmfd. Capacitor | 570 kc | Pos. 3 | 570 kc | | Broadcast Padder C34<br>BC-RF Coil L8 |
| 4 | To Antenna Contact Through 200 mmfd. Capacitor | 1600 kc | Pos. 3 | 1600 kc | B | BC-Osc. Trimmer C32<br>BC-RF Trimmer C23<br>BC-Ant. Trimmer C2 |
| 5 | To Antenna Contact Through 400 ohms Resistance | 7.0 Mc | Pos. 4 | 7.0 Mc | C | SW-Osc. Trimmer C36<br>SW-RF Trimmer C24<br>SW-Ant. Trimmer C3 |
| 6 | To Antenna Contact Through 400 ohms Resistance | 2.9 Mc | Pos. 4 | 2.9 Mc | D | SW-Osc. Coil L12 |
| 7 | To Antenna Contact Through 400 ohms Resistance | 21.5 Mc | Pos. 7 | 21.5 Mc | C | BS-Osc. Trimmer C43 |
| 8 | To Antenna Contact Through 400 ohms Resistance | 15.2 Mc | Pos. 7 | 15.2 Mc | D | BS-Osc. Coil L13 |
| 9 | To Antenna Contact Through 400 ohms Resistance | 21.5 Mc | Pos. 7 | 21.5 Mc | E | BS-RF Trimmer C22<br>BS-Ant. Trimmer C11 |
| 10 | To Antenna Contact Through 400 ohms Resistance | 15.2 Mc | Pos. 7 | 15.2 Mc | F | BS-RF Coil L10<br>BS-Ant. Coil L2 |
| 11 | To Antenna Contact Through 400 ohms Resistance | 11.6 Mc | Pos. 6 | 11.6 Mc | C | BS-Osc. Trimmer C42<br>BS-RF Trimmer C20<br>BS-Ant. Trimmer C10 |
| 12 | To Antenna Contact Through 400 ohms Resistance | 9.6 Mc | Pos. 5 | 9.6 Mc | C | BS-Osc. Trimmer C40<br>BS-RF Trimmer C18<br>BS-Ant. Trimmer C8 |

# ALIGNMENT NOTES

**Note "A"**—After step 2 has been completed, do not make any further adjustments to the 2nd I.F. Trimmers C54 and C53.

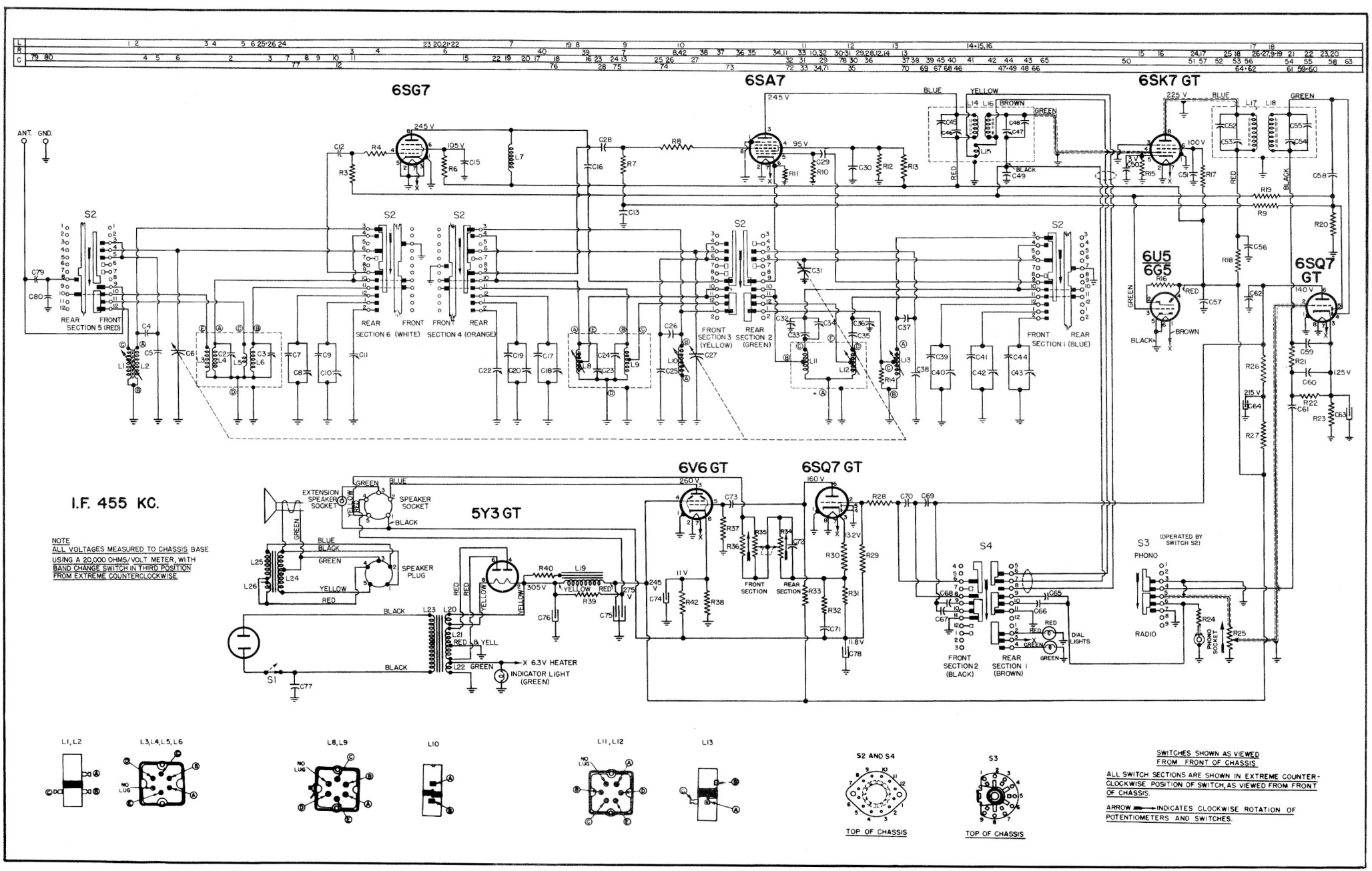
**Note "B"**—After operation 4 has been completed, return to 570 kc and repeat operation 3, then repeat operation 4.

**Note "C"**—Unscrew oscillator trimmer capacitor to minimum capacity (counter clockwise). Turn adjustment clockwise until first output peak is obtained. Make adjustments using this peak.

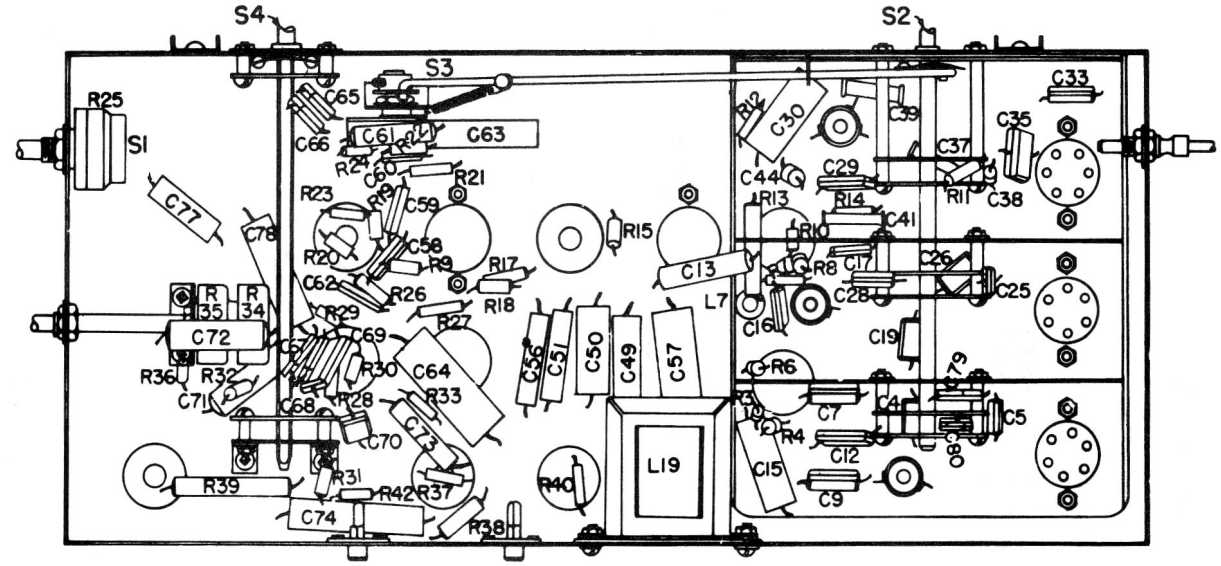
**Note "D"**—Check high frequency end of dial for accuracy, adjust oscillator trimmer slightly if necessary.

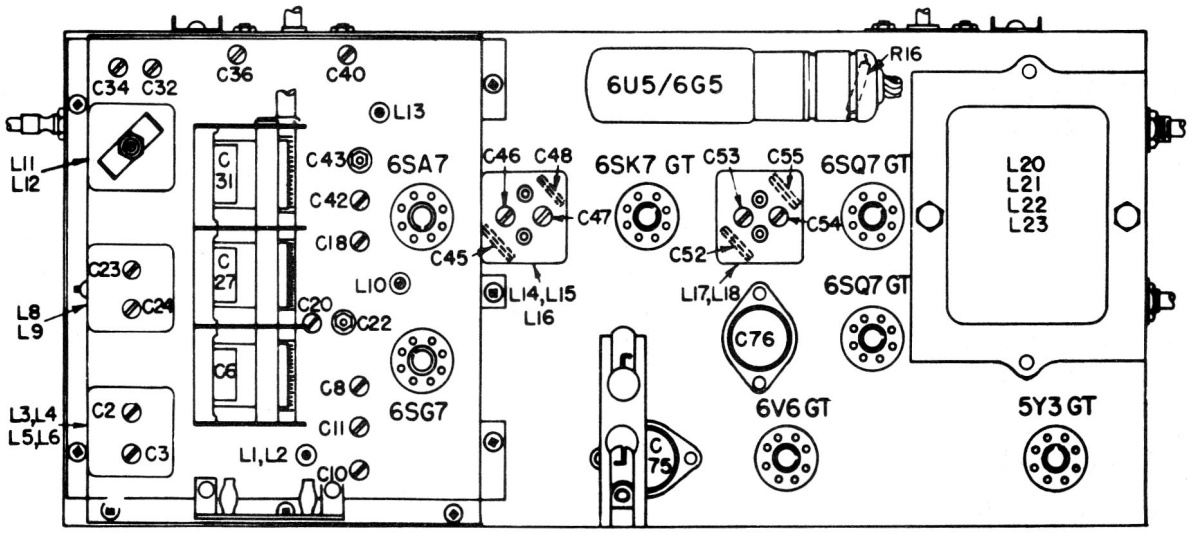
**Note "E"**—Rock tuning capacitor while adjusting antenna trimmer for maximum output.

**Note "F"**—Repeat operation 9.


6SG7
6SA7
6SK7 GT
6U5
6G5
6SQ7
GT
6V6 GT
6SQ7 GT
5Y3 GT
ANT.
GND.
S1
S2
S3
S4
245 V
105 V
95 V
225 V
100 V
140 V
260 V
160 V
305 V
275 V
215 V
125 V
13.2V
11 V
11.8V
REAR SECTION 5 (RED)
FRONT SECTION 5 (RED)
REAR SECTION 6 (WHITE)
FRONT SECTION 6 (WHITE)
FRONT SECTION 4 (ORANGE)
REAR SECTION 4 (ORANGE)
FRONT SECTION 3 (YELLOW)
REAR SECTION 2 (GREEN)
FRONT SECTION 1 (BLUE)
REAR SECTION 1 (BROWN)
FRONT SECTION 2 (BLACK)
FRONT SECTION
REAR SECTION
EXTENSION SPEAKER SOCKET
SPEAKER SOCKET
SPEAKER PLUG
INDICATOR LIGHT (GREEN)
X 6.3V HEATER
DIAL LIGHTS
PHONO
RADIO
PHONO SOCKET
(OPERATED BY SWITCH S2)
I.F. 455 KC.
NOTE
ALL VOLTAGES MEASURED TO CHASSIS BASE USING A 20,000 OHMS/VOLT METER, WITH BAND CHANGE SWITCH IN THIRD POSITION FROM EXTREME COUNTERCLOCKWISE.
L1, L2
L3, L4, L5, L6
L8, L9
L10
L11, L12
L13
S2 AND S4
S3
TOP OF CHASSIS
TOP OF CHASSIS
SWITCHES SHOWN AS VIEWED FROM FRONT OF CHASSIS.
ALL SWITCH SECTIONS ARE SHOWN IN EXTREME COUNTER-CLOCKWISE POSITION OF SWITCH, AS VIEWED FROM FRONT OF CHASSIS.
ARROW → INDICATES CLOCKWISE ROTATION OF POTENTIOMETERS AND SWITCHES.

# LOCATION OF PARTS




# REPLACEMENT PARTS

FOR DEPENDABLE REPAIRS, USE ONLY GENUINE PHILIPS REPLACEMENT PARTS. When ordering always give description and code number and model of receiver.

## CAPACITORS

| | | | Code No. |
|---|---|---|---|
| C2, C23 | 1.6-18 mmf. | Trimmer | 511-015 |
| C3, C24, C32, C36 | 3-35 mmf. | Trimmer | 511-004 |
| C4, C26 | 150 mmf. ±5% | Silver Mica | 513-003 |
| C5, C25 | 10 mmf. | Silver Mica | 513-011 |
| C6, C27, C31 | 10.3-492.7 mmf. | 3-Gang Tuning | 510-006 |
| C7, C17 | 200 mmf. | Silver Mica | 513-006 |
| C8, C10, C18, C20, C40, C42 | 10-160 mmf. | Trimmer | 511-008 |
| C9, C19 | 150 mmf. | Silver Mica | 513-004 |
| C11 | 4-70 mmf. | Trimmer | 511-010 |
| C12, C16, C28, C29, C60, C65, C66 | 100 mmf. | Mica | 512-001 |
| C13, C49 | .05 mfd. | 400 V. | 515-405 |
| C15, C30, C57 | .05 mfd. | 600 V. | 515-619 |
| C22, C43 | 3-30 mmf. | Trimmer | 511 014 |
| C33 | 500 mmf. ±5% | Silver Mica | 513-001 |
| C34 | 10-160 mmf. | Trimmer | 511-005 |
| C35 | 2340 mmf. ±3% | Silver Mica | 513-009 |
| C37, C41 | 150 mmf. ±5% | Ceramicon | 514-001 |
| C38 | 15 mmf. | Ceramicon | 514-002 |
| C39 | 200 mmf. | Ceramicon | 514-003 |
| C44 | 15 mmf. | Silver Mica | 513-014 |
| C45, C48 | 75 mmf. | Silver Mica | 513-007 |
| C46, C47, C53, C54 | 7-45 mmf. | Dual Trimmer | 511-011 |
| C50 | 0.1 mfd. | 200 V. | 515-210 |
| C51, C56, C61, C73 | .01. mfd. | 600 V. | 515-614 |
| C52, C55 | 140 mmf. ±5% | Silver Mica | 513-008 |
| C58, C59 | 50 mmf. | Mica | 512-011 |
| C62, C80 | 200 mmf. | Mica | 512-006 |
| C63, C74, C78 | 25 mfd. | 25 V. | 516-003 |
| C64 | 4 mfd. | 350 V. | 516-010 |
| C67 | 400 mmf. | Mica | 512-009 |

# REPLACEMENT PARTS

## CAPACITORS—Cont.

| | | | Code No. |
|---|---|---|---|
| C68 | 500 mmf. | Mica | 512-021 |
| C69 | 2000 mmf. | Mica | 512-027 |
| C70 | 1000 mmf. | Mica | 512-020 |
| C71 C72 | .05 mfd. | 400 V. | 515-410 |
| C75 | 20-20 mfd. | 450 V. | 516-008 |
| C76 | 40 mfd. | 450 V. | 516-009 |
| C77 | .005 mfd. | 600 V. | 515-612 |
| C79 | 10 mmf. | Mica | 512-018 |

## RESISTORS

| | | | |
|---|---|---|---|
| R3, R7, R16, R40 | 1 Megohm | ½ watt | 501-010 |
| R4, R8 | 68 ohms | ½ watt | 501-507 |
| R6 | 39000 ohms | 1 watt | 502-015 |
| R9, R19 | 3.3 Megohms | ½ watt | 501-046 |
| R10 | 22,000 ohms | ½ watt | 501-002 |
| R11 | 47,000 ohms | ½ watt | 501-020 |
| R12, R37 | 470,000 ohms | ½ watt | 501-004 |
| R13 | 15,000 ohms | 2 watt | 503-001 |
| R14 | 1000 ohms | ½ watt | 501-037 |
| R15 | 390 ohms | ½ watt | 501-047 |
| R17 | 68,000 ohms | ½ watt | 501-032 |
| R18 | 3300 ohms | ½ watt | 501-025 |
| R20 | 2.2 Megohms | ½ watt | 501-006 |
| R21, R26, R33 | 220,000 ohms | ½ watt | 501-018 |
| R22, R24 | 270,000 ohms | ½ watt | 501-016 |
| R23 | 3900 ohms | ½ watt | 501-017 |
| R25 | 500,000 ohms | Volume Control | 505-003 |
| R27 | 68,000 ohms | ½ watt | 501-009 |
| R28 | 680,000 ohms | ½ watt | 501-038 |
| R29 | 330,000 ohms | ½ watt | 501-044 |
| R30, R31 | 2200 ohms | ½ watt | 501-039 |
| R32 | 1200 ohms | ½ watt | 501-035 |
| R34 | 100,000 ohms | Dual Tone | 506-010 |
| R35 | 25,000 ohms | Control | |
| R36 | 10,000 ohms | ½ watt | 501-023 |
| R38 | 270 ohms | 1 watt | 502-011 |
| R39 | 680 ohms | 2 watt | 503-002 |
| R42 | 2200 ohms | ½ watt | 501-027 |

## TRANSFORMERS & COILS

| | | |
|---|---|---|
| L1, L2 | B.S. Ant. Coil Assembly | 070-056 |
| L3, L4, L5, L6 | B.C. & S.W. Ant. Transf. Assembly | 060-023 |
| L7 | R.F. Plate Choke Assembly | 070-062 |
| L8, L9 | B.C. & S.W. R.F. Transf. Assembly | 060-024 |
| L10 | B.S. - R.F. Coil Assembly | 070-055 |
| L11, L12 | B.C. & S.W. Osc. Transf. Assembly | 060-025 |
| L13 | B.S. Osc. Coil Assembly | 070-054 |
| L14, L15, L16 | 1st. I.F. Transformer | 060-015 |
| L17, L18 | 2nd. I.F. Transformer | 060-016 |
| L19 | Filter Choke Assembly 30 H. | 050-028 |
| L20, L21, L22, L23 | Power Transformer | 050-012 |
| L24, L25, L26 | Output Transformer | 050-025 |

## MISCELLANEOUS

| | Code No. |
|---|---|
| Antenna—Ground Plate | 120-094 |
| Antenna—Ground Banana Plugs | 571-113 |
| Back Cover | 303-059 |
| Back Cover Retaining Clip | 300-245 |
| Cabinet | 030-034 |
| Dial Glass, Standard Scale | 331-016 |
| Dial Lamp 6-8V. .25 amp. Green | 643-005 |
| Dial Lamp 6-8V. .4 amp. Green | 643-006 |
| Dial Lamp 6-8V. .4 amp. Red | 643-007 |
| Dial Lamp Holder Assembly (Range Indicator) | 110-118 |
| Dial Lamp Socket Assembly (Range Indicator) | 570-106 |
| Dial Lamp Socket Assembly (Green) | 570-107 |
| Dial Lamp Socket Assembly (Red) | 570-108 |
| Dial Pointer & Slider Assembly (Glass) | 120-187 |
| Dial Drive Cord 3 yards | 595-002 |
| Dial Drive Cord Pulley | 310-010 |
| Dial Drive Cord Spring | 310-052 |
| Iron Core Adjustment for L1, L2, L10, L13 | 609-003 |
| Knob—(Side) Volume, Tone, Tuning | 572-015 |
| Knob—(Front) Performance & Range Switches | 572-016 |
| Knob—Set Screw | 524-503 |
| Line Cord & Plug | 100-003 |
| Line Switch S.P.S.T. on Volume Control Part of | 505-003 |
| Performance Switch, Section 1 Brown | 080-035 |
| Performance Switch, Section 2 Black | 080-036 |
| Performance Switch Clicker Plate & Shaft Assembly | 080-038 |
| Phonograph Connector, Male | 571-107 |
| Phonograph Connector, Female | 571-128 |
| Phonograph Switch | 080-033 |
| Phonograph Switch Link Assembly | 110-111 |
| Phonograph Switch Extension Spring | 310-076 |
| Range Switch, Section 1 Blue | 080-027 |
| Range Switch, Section 2 Green | 080-028 |
| Range Switch, Section 3 Yellow | 080-029 |
| Range Switch, Section 4 Orange | 080-030 |
| Range Switch, Section 5 Red | 080-031 |
| Range Switch, Section 6 White | 080-032 |
| Range Switch Clicker Plate & Shaft Assembly | 080-037 |
| Range Switch Drum & Hub Assembly | 110-116 |
| Range Switch Drum & Hub Set Screw | 524-502 |
| Range Switch Drive Cord Spring | 310-082 |
| Speaker, 8 inch P.M. | 041-019 |
| Speaker Grille | 627-005 |
| Speaker Plug | 571-118 |
| Speaker Socket | 571-119 |
| Speaker Socket Contacts | 571-105 |
| Tube Grid-Plate Shield Assembly | 120-021 |
| Tube Socket Octal | 570-004 |
| Tube Socket 6-Prong | 570-006 |
| Tuning Drum & Scale Assembly | 120-127 |
| Tuning Shaft | 310-080 |
| Tuning Indicator Mounting Clip | 300-152 |
| Tuning Indicator Thumb Screw | 525-006 |
| Tuning Indicator Socket & Cable Assembly | 120-125 |

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