

PHILCO MODEL 070 SIGNAL GENERATOR

Philco Model 070 Signal Generator is a precision test instrument built to a high standard of accuracy, incorporating features found only in laboratory test equipment. Advanced circuit design and rigid mechanical construction insure permanent calibration under the most severe operating conditions. Every requirement necessary for accurate alignment of the Intermediate and Radio Frequency circuits of a receiver has been taken into consideration in the design of this instrument. The high quality of material and construction characteristic of Philco devices assures the serviceman of a scientific and reliable test instrument.

CIRCUIT DESCRIPTION:

One type 6J7G tube is used as an oscillator, one type 6J5G tube as the modulation generator, and one 6X5G as a rectifier. The use of separate tubes to generate the R-F and audio signals provides unusual frequency stability. The output of the generator is optionally audio frequency, modulated R.F., or unmodulated R.F. As normally used, the signal is modulated at 400 cycles (accepted throughout the radio industry as the standard test signal). A specially designed control marked "Modulation", located on the right-hand side of the generator, combines the power and modulation control switches. This control is independent of all other controls so that power may be applied to the generator, or the modulator circuit turned off without affecting the frequency of the oscillator or changing the output setting.

POWER SUPPLY:

An improved power circuit developed by Philco for operation on a 105- to 130-volt, 50 to 60 cycle power supply reduces frequency shift of the oscillator circuit due to variation of the line voltage. The power circuit is thoroughly shielded and filtered to prevent leakage of the signal from the generator into the power line.

FREQUENCY RANGE:

Six (6) accurately calibrated, full vision, overlapping scales, covering a frequency range of 115 K.C. to 70 MC. assure the complete coverage of the I.F., broadcast, and short-wave ranges of modern receivers. Each band covers a frequency range as follows:

Band "A".....	115 to 350 K.C.
Band "B".....	350 to 1050 K.C.
Band "C".....	1050 K.C. to 3.5 MC.
Band "D".....	3.4 to 12 MC.
Band "E".....	11 to 37 MC.
Band "F".....	22 to 74 MC.

Each scale is selected by means of the "Band Switch" (upper left-hand corner of the panel), which

is marked with the corresponding letters, A, B, C, D, E, and F, of the scales. The last band is calibrated from harmonics of Band "E". Precise frequency settings are made by a new magnifying NON-Radiating Pointer which has two index lines that eliminate inaccuracies in setting the pointer to the frequency desired. The pointer is rotated by a vernier ball-bearing reduction drive.

AUDIO OUTPUT:

An audio signal of 400 cycles is provided at the output terminals when the band switch is turned to the position marked "Audio". The strength of this signal is determined by the settings of the multiplier and attenuator controls. By applying this 400-cycle signal to any portion of an audio system, a thorough check of its amplifying ability is obtained.

ATTENUATOR:

Attenuation of the output signal from a maximum to a minimum value is obtained by means of a completely shielded ladder-type attenuator, marked "Multiplier", and a continuously variable "Attenuator" control. The output control provides a constant output impedance of 100 ohms between the output terminals marked "Med." and "Gnd." and provides attenuation of the signal to an extremely low value that will provide a weak input signal to the most sensitive radio receiver. A further advantage of this attenuator is that the frequency of the signal is not affected when the output controls are varied.

R-F AND I-F ADJUSTMENTS:

Adjusting Controls

1. Set the "Modulation" Control to the position marked "Mod on". The control in this position applies power to the generator and at the same time turns on the modulator tube. If an unmodulated signal is desired, turn this control to the position marked "Mod off".
2. Insert the antenna lead pin tip of the output cable in the "Med." jack. Place the ground wire tip of the cable in the jack marked "Gnd." The terminal marked "High" should be used only for preliminary padding when greater signal strength is desired. For final accurate padding the terminal marked "Med." should always be used.
3. Set the tuning indicator of the signal generator to the frequency desired; then turn the band switch to the letter of the scale on which the frequency appears.
4. Attenuation of the signal is obtained by the multiplier control marked 1, 10, 100, 1000. Set the knob at the point which will give sufficient signal input to the receiver. Complete control of this level from

maximum to minimum is then obtained by the variable "attenuator" control located above the "multiplier" control. When the "High" jack is used the multiplier control has no effect on the signal.

ALIGNING I-F CIRCUITS:

5. When adjusting I-F circuits connect a 0.1 mfd. condenser between the antenna lead of the output cable and the grid of the tube in the receiver.

ALIGNING R-F CIRCUITS:

In aligning the R-F circuit of broadcast bands in receivers designed for a standard type aerial, connect a 200 mmfd. condenser between the antenna lead of the signal generator and the antenna terminal of the receiver. In aligning the short wave bands replace this condenser with a 400-ohm carbon resistor.

ALIGNING RECEIVERS WITH SPECIAL AERIAL CIRCUITS:

When aligning receivers designed for the Philco High Efficiency Aerial, or receivers using a doublet aerial system with a transmission line, connect the output cable of the signal generator directly to the transmission line terminal of the receiver. In aligning receivers of this type the output cable must be connected to the "Med." and "Gnd." jacks.

AUDIO SIGNAL TEST:

1. Turn the "Band Switch" to "Audio".
2. Set "Modulation" switch to "Mod on".
3. Insert the output cable pin tips into the "High" and "Gnd." jacks. The other end of the wire in the "High" jack is connected through a .1 mfd. condenser to any section of the audio circuit to be tested, i. e., 2nd det. grid; 1st audio grid or output tube grid.
4. Attenuation of the audio signal is then obtained by the "Attenuator" control. If a weaker audio signal is desired, insert the output pins in the "Med." and "Gnd." jacks. When the "Med." jack is used, the "Multiplier" and "Attenuator" control the audio signal.

DIAL CALIBRATION:

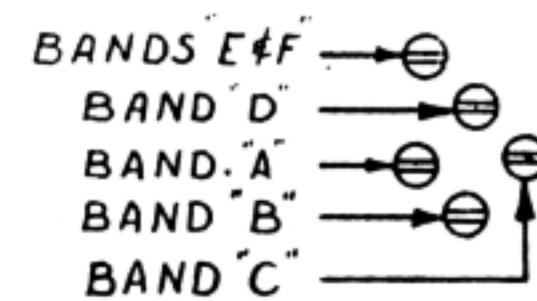
In order to calibrate the scales of the dial accurately, the dial indicator must be aligned to track properly with the tuning condenser. To do this proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed).

With the tuning condenser in this position, loosen the set screws of the indicator collar, being careful not to disturb the setting of the tuning condenser.

Then turn the indicator until the index line of the magnifying pointer is in the center of the three black dots at the left-hand side between the scales.

Tighten set screws in this position.

After the dial indicator is set, each scale of the signal generator is adjusted by the individual compensating condensers, locations of which are shown on illustration. Briefly, the method of calibration is to zero beat the generator signal against signals from



REAR VIEW OF MODEL 070
COMPENSATOR LOCATIONS

accurately controlled broadcast stations or short wave stations operating on frequencies near the high frequency end of each scale.

SCALE A: Turn modulation switch to "Mod Off" position. Connect the signal generator output lead to the radio receiver antenna terminal. Now, tune the radio receiver accurately to a station on the standard broadcast band the frequency of which is double that of any frequency between 300 KC. and 350 KC. on Scale A of the signal generator. When the station is tuned, turn the Band Switch knob to "A" and set the indicator of the signal generator to the frequency mark on Scale A that corresponds to $\frac{1}{2}$ the station frequency.

EXAMPLE:

If the station frequency is 600 KC., set the indicator of the signal generator to $\frac{1}{2}$ that frequency, or 300 KC. on Scale "A". With receiver and signal generator set in this manner, adjust the compensator for Scale "A" until a whistle or beat note is heard in the receiver. Adjust the compensator until this whistle (beat note) is eliminated, or is made as low as possible. This is the correct adjustment for Scale "A".

SCALE B: Turn the Band Switch knob to "B". Then tune the radio receiver to a station between 850 KC. and 950 KC. Set the signal generator indicator to the frequency on Scale "B" corresponding to the station. Now, adjust compensator "B" for zero beat as given above for Scale "A".

SCALES C, D, and E: These scales are adjusted by using the same procedure given for "B". The Band Switch of the signal generator, however, is turned to the letter corresponding to these scales and the radio receiver tuned to some station operating on a frequency corresponding to that shown on the high frequency end of each of these scales. On scale "C" the frequency should be between 3.0 MC. and 3.5 MC. On Scale "D" the frequency should be between 10 MC. and 11 MC., and on Scale "E", between 28 MC. and 36

MC. The "F" band is automatically calibrated when the "E" band padder is adjusted. This is due to the "F" band frequencies being a second harmonic of the "E" band.

REPLACING TUBES:

Remove the screws holding the front panel to the case and lift panel straight out. The tubes will be found in sockets mounted on small sub-bases. The rectifier (6X5G) is located at the top, and the 6J5G modulation generator and 6J7G oscillator tubes are at the bottom of the panel.

FAILURE IN OPERATION:

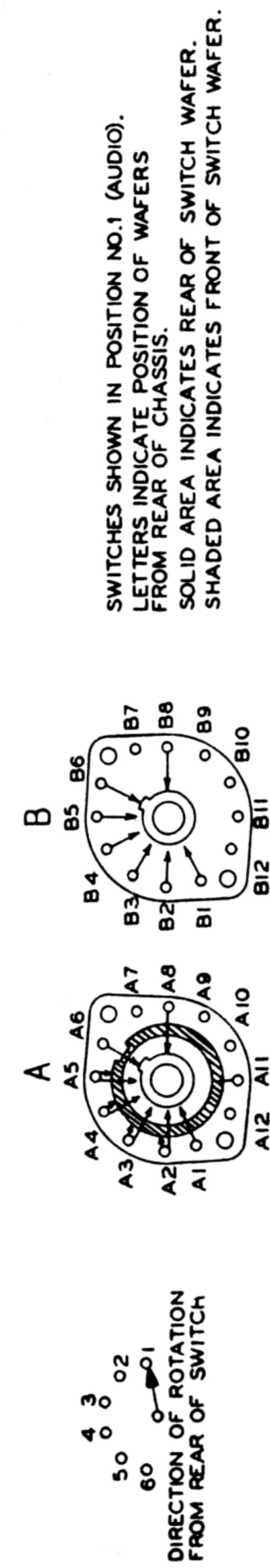
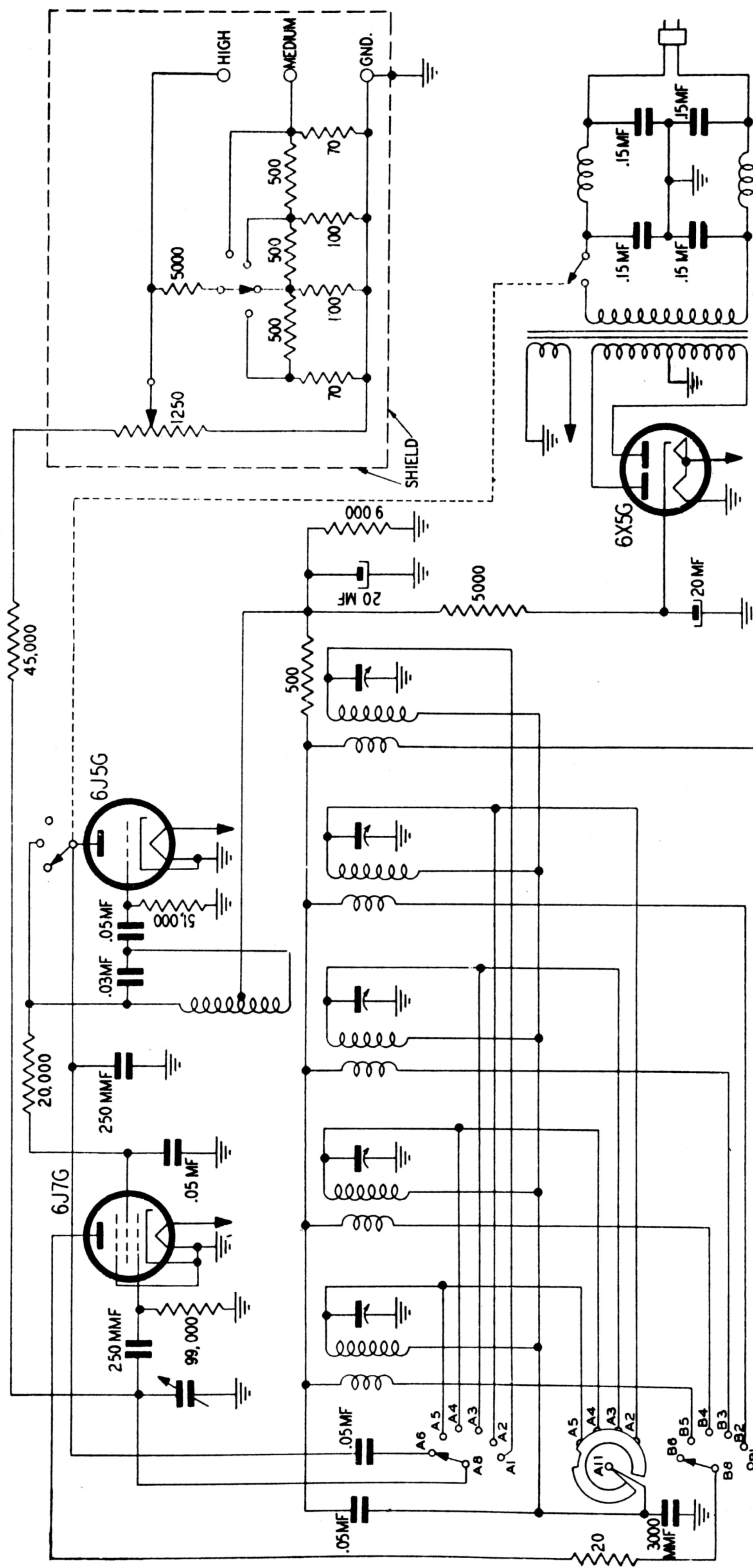
CAUTION

When lifting the front panel of the instrument from the case, do not shift it from side to side. Unless it is lifted straight out, the oscillator transformer ("A" and "B" bands) may be damaged.

If instrument fails, check for faulty 6J7, 6J5, or 6X5 tube, shorted 20-mfd. filter condenser, open audio transformer, open oscillator transformer, or open 5000-ohm, 2-watt filter resistor.

REPLACEMENT PARTS

<i>Schem. No.</i>	<i>Description</i>	<i>Part No.</i>	<i>Schem. No.</i>	<i>Description</i>	<i>Part No.</i>
1	Tuning Condenser	31-2074	24	Attenuator	33-5265
2	Condenser 250 mmf. mica	30-1032	24X	Multiplier Switch	42-1331
3	Resistor (99,000 ohms, 1/2 W)	33-399339	25	Resistor (1,000 ohms, 1/2 W)	33-210339
4	Condenser (.05 mf. tubular)	30-4444	26	Resistor (70 ohms, 1/2 W)	33-070339
5	Condenser (.05 mf. tubular)	30-4444	27	Resistor (500 ohms, 1/2 W)	33-150339
6	Condenser (3000 mmf. mica)	30-1028	28	Resistor (100 ohms, 1/2 W)	33-110339
7	Resistor (20 ohms, 1/2 W)	33-020339	29	Resistor (100 ohms, 1/2 W)	33-110339
8	Osc. Trans. (Range "A" and "B")	32-2677	30	Resistor (70 ohms, 1/2 W)	33-070339
9	Osc. Trans. (Range "C")	32-2680	31	Resistor (500 ohms, 1/2 W)	33-150339
10	Osc. Trans. (Range "D")	32-2681	32	Resistor (500 ohms, 1/2 W)	33-150339
11	Osc. Trans. (Range "E")	32-2682	33	Power Transformer	32-7842
12	Compensators (Ranges "A" and "B")	31-6120	34	Power and Mod. Switch	42-1332
13	Compensators (Ranges "C", "D", "E")	31-6149	35	Line Choke	32-1281
14	Condenser (.05 mf. tubular)	30-4444	36	Condenser (.15-.15 mf. bakelite)	6287DG
ff 14X	Condenser 250 mmf. mica	30-1032	37	Condenser (.15-.15 mf. bakelite)	6287DG
15	Resistor (20,000 ohms, 1/2 w)	33-320339	38	Line Choke	32-1281
16	Condenser (.05-.03 mf. bakelite)	3615YU		Wave Switch	42-1419
17	Audio Osc. Trans.	32-7450		Cable	L-1455
18	Resistor (51,000 ohms, 1/2 w)	33-351339	X Run 2.	Changed from 30-2203 to 30-2251.	
19	Resistor (45,000 ohms, 1/2 w)	33-345339	ff Run 3.	Added 250 mmfd. Part No. 30-1032.	
20	Resistor (500 ohms, 1/2 w)	33-150339	* Run 4.	Changed Resistor from 6000 ohms, Part No. 33-260439 to 9000 ohms, Part No. 33-290539.	
X 21	Electrolytic Condenser (16-16 mf.)	30-2268		Also changed on the run electrolytic condenser (21) from 30-2251 to 30-2268.	
* 22	Resistor (9,000 ohms, 2 w)	33-290539			
23	Resistor (5,000 ohms, 2 W)	33-250539			



PHILCO MODEL 070 SIGNAL GENERATOR (SCHEMATIC DIAGRAM)