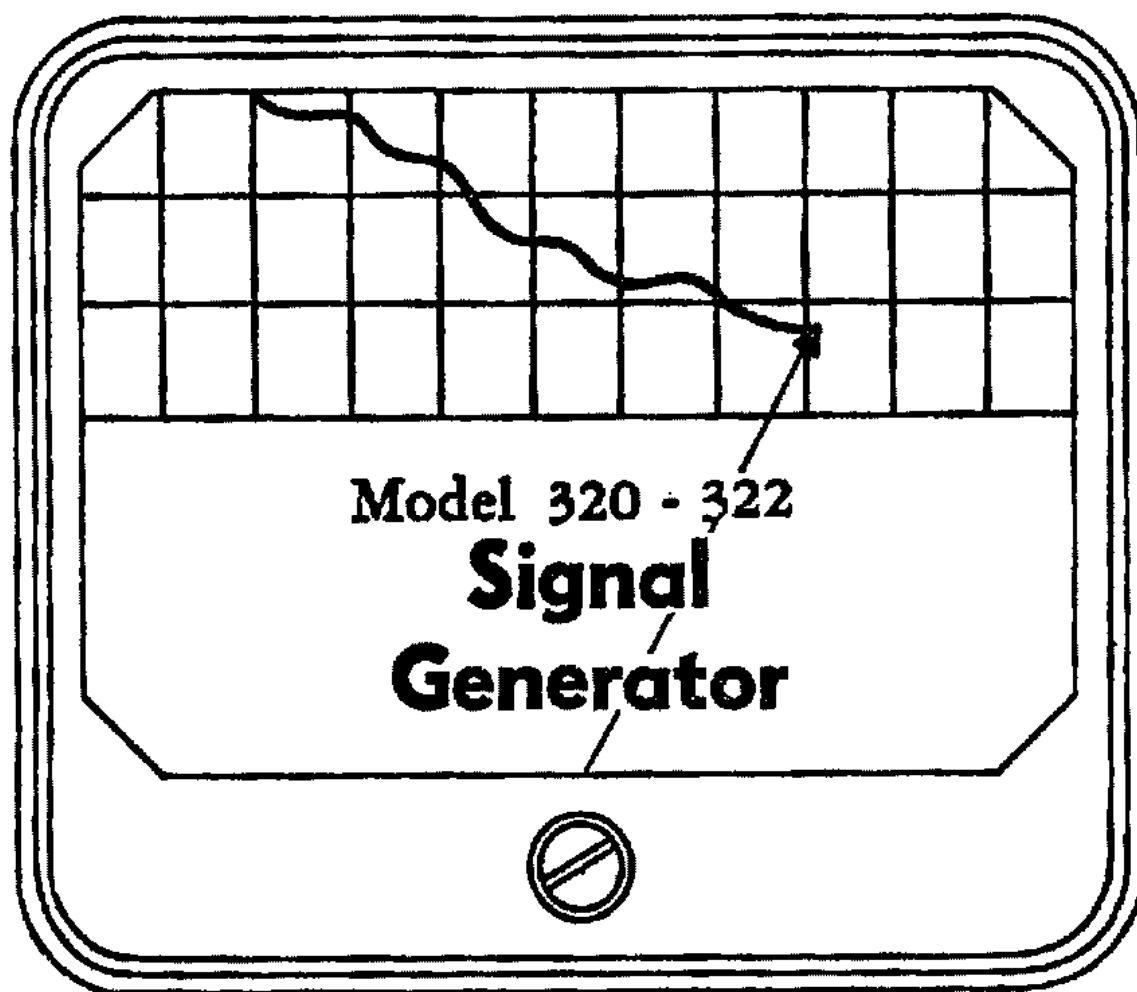
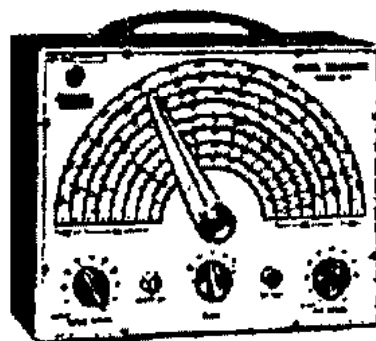


INSTRUCTION MANUAL FOR



**ELECTRONIC
INSTRUMENT CO., Inc.**

1-DESCRIPTION

The EICO Model 320 Signal Generator consists of a highly stable Hartly RF Oscillator, covering a frequency range of 150 kc to 34 mc, with strong harmonics to 102 mc. This entire range is calibrated on the dial in seven (7) ranges. The RF Oscillator is $\frac{1}{2}$ of a 6SN7 tube. Variable output is taken from the cathode. The other half of the 6SN7 is a colpitts type audio oscillator providing 400 cycle pure sine wave output which is also utilized to modulate the RF oscillator. An attenuator provides variable audio voltage.

2-GENERAL OPERATING INSTRUCTIONS

Before using the EICO Model 320 Signal Generator, read the instructions very carefully. The EICO Model 320 Signal Generator is designed to operate on 105 to 120 volts, 50-60 cycle alternating current. The AC power switch is located on the RF attenuator control. For best accuracy, the unit should be allowed to warm up at least 15 minutes before making any alignments. The controls and output connectors are clearly identified by the markings on the panel and serve the following purpose.

1. **BANDSWITCH**: RF oscillator range selector which selects frequencies from 150 kc to 102 mc. Bands E, F, and G are on the same switch position.

2. **R.F. ATTENUATOR**: Adjusts strength of RF signal delivered to RF output connector. When turned to the extreme counter-clockwise position, signal generator is turned off.

3. **AUDIO ATTENUATOR**: Adjusts strength of 400 cycle audio voltage delivered to audio output connector. When turned to the extreme counter-clockwise position, the audio oscillator is turned off and the RF signal is unmodulated.

4. **RF OUTPUT**: Connect coaxial cable supplied with the instrument for either modulated or unmodulated signals. **NOTE**: Put ground lead of coaxial cable to B- of receiver, which is not necessarily the chassis, depending upon the particular model. Do not confuse the RF

output connector with the audio output connector.

5. **AUDIO OUTPUT:** For 400 cycle audio signal, connect coaxial cable to audio output connector.

3-MICRO-CYCLE VERNIER TUNING

USE OF ADDITIONAL 0-100 REFERENCE SCALE - When certain applications of the signal generator require constant resetting to particular frequency, it will be advantageous to remember the setting on the 0-100 reference scale and set the pointer accordingly.

4-ALIGNMENT OF AM RECEIVERS

Modern Radio Receivers employ from two up to eight, ten or even more circuits to achieve the selectivity desired.

These circuits, however, are of little benefit unless all of them are working at their proper frequencies simultaneously. Only someone acquainted with the alignment of Receivers in a Radio Production Department, or someone engaged in Radio Service work who has adjusted a Receiver on which someone has tightened all of the adjusting screws, can realize how dead a Receiver can sound when all of its tuned circuits are out of adjustment to any considerable extent. The purpose of aligning a Receiver is two-fold to adjust it for maximum performance, and to make the dial indicate to within two or three per cent the frequency of the station being received. Since a trimmer adjustment is more sensitive when the circuit capacity is low, the trimmer adjustment is usually made near the high-frequency end of the tuning range. If the adjustment is made at the very end of the range, the maximum mistracking over the adjacent portion of the band will be greater than if an alignment point is chosen some small distance from the ex-

extreme high-frequency end of the tuning range. In the broadcast band, 1400 K.C. is usual choice and is the frequency recommended as standard by the Institute of Radio Engineers. On short-wave band on the same receiver, it is a good practice to align them at the same position on the gang condenser. Most manufacturers give the correct alignment information in the Receivers instruction book.

DUMMY ANTENNA - In order to make allowance for the effects that the outside antenna will have on the alignment of the Receiver, a substitute for the antenna called a dummy antenna representing the average antenna is used to connect the Signal Generator to the Antenna connection of the Receiver. For receiver frequency ranges up to 1700 K.C. the average antenna is essentially a capacity of 200 Micromicrofarads, if used on a high impedance primary. On frequencies above 1700 K.C. the average antenna can be represented by a 400 ohm carbon resistor.

TRF RECEIVERS - On a TRF Receiver, all tube circuits operate simultaneously at one frequency. Aligning a factory built receiver having a dial calibration to match the coils and condensers used, the dial is set to indicate the frequency at some signal of known frequency and the individual circuit adjusted to maximum performance on the signal at that setting of the condenser.

SUPER-HETERODYNE RECEIVERS - On a Super-Heterodyne Receiver, circuits must operate at three different frequencies, properly related, if satisfactory performance is to be obtained. Beginning with the circuit closest to the output tubes, the intermediate-frequency circuits must all operate at the same frequency in order to give satisfactory amplification. Actually they will work over a wide frequency range, but if they are operated very far from the intermediate frequency specified for the given dial, coils and tuning condensers, the dial indication will be in error more than the customary few percent and, in the case of Receivers employing special cut tracking plates in the Oscillator condensers, serious mis-tracking of the Oscillator with other tuned circuits will result, producing a loss in sensitivity and reduction in image-ratio.

I. F. ALIGNMENT - The first adjustment on a Super-Heterodyne Receiver is to align the intermediate-frequency amplifier at the correct frequency. The transformer should be adjusted to give the strongest signal by adjusting, in turn each of the adjustments on all of the I. F. transformers. The intermediate frequency stages should be aligned first and in their reversed order, starting at the stage immediately preceding the second detector. For this procedure the coaxial cable is connected to the grid of the tube preceding the stage under alignment, and the ground clip to the Receiver ground. Since it is essential that the operating characteristics of a stage should not be altered, this connection to the grid should be made with the grid lead in place. This procedure should be continued until all of the IF transformers have been aligned properly. When the alignment of the IF amplifier is completed, alignment of the RF and oscillator circuits should be made.

OSCILLATOR ALIGNMENT - Connect the appropriate dummy antenna between the high side of the Signal Generator output and the antenna connection of the Receiver, and set the frequency of the Signal Generator to an appropriate frequency on the band to be aligned, this is usually about 80% of the maximum frequency tunable on that band - set the Receiver dial to the corresponding frequency. Turn the volume and sensitivity controls of the Receiver full on; now turn the Generator attenuator to high output and adjust the Oscillator trimmer until a signal is heard. Reduce the signal from the Signal Generator as alignment proceeds, always using as little input as possible because weak signals permit a more accurate alignment than strong signals. Care should be taken that the alignment condenser and not the series padding condenser be used for this adjustment.

RF AND ANTENNA ALIGNMENT - Next align the RF Amplifier circuit. On the band below 6 megacycles the frequency of the RF amplifier circuit has very little effect upon the Oscillator frequency, but at higher frequencies the adjustments of the RF circuit have a slight effect upon the frequency of the Oscillator; consequently it is necessary, when align-

ing a high-frequency RF amplifier, to ROCK the gang condenser very slightly as the alignment proceeds to be sure that a shift in Oscillator frequency has not shifted the Heterodyne signal out of range of the IF amplifier. The Antenna circuit is then aligned in the conventional manner.

OSCILLATOR PADDING - Shifting the tuning dial to a point about 10% up from its lowest frequency, the Oscillator circuit should be padded for best tracking with the Antenna and RF circuits. If the Radio Set is sufficiently sensitive to produce a readily discernable hiss in the speaker, the easiest way to pad the Oscillator circuit is to adjust the padding Condenser for maximum hiss or minimum noise. When this point is padded it is well to turn to the high frequency end and re-align that part of the band.

5-ALIGNMENT OF FM RECEIVERS

The first step is to align the primary and secondary trimmers of the discriminator transformer. To do this connect the output cable of the signal generator between grid and ground the limiter tube. If two limiter tubes are used the signal generator is connected across the grid circuit of the second limiter tube. The VOM is now connected across both cathodes of the discriminator. A VTVM may also be used for this purpose. With the signal generator set for an unmodulated signal at the IF frequency specified by the manufacturer, the Primary trimmer is first adjusted for Maximum output on the indicating meter. Following this the Secondary trimmer is adjusted for minimum output on the meter scale. It may be found that when adjusting the secondary three positions of the trimmer will result in a minimum reading. The correct position is the one where a slight rotation of the trimmer in either direction of the minimum position increases the meter reading.

The VOM is now connected in series with the ground return of the grid resistor of the limiter, with the instrument set at the most suitable micro-

amp range. If a VTVM is used the meter is connected across this grid resistor, using the lowest scale that will render satisfactory readings. The IF trimmers of the various stages are now aligned for maximum output starting with the last IF stage and proceeding to the first as in the conventional superheterodyne. The setting of the signal generator must not be disturbed from the original position of the dial setting where the original discriminator adjustments were made.

In some receivers it will be found that the IF transformers are overcoupled to obtain a broad band-pass characteristic. When aligning this type of IF transformer it will be found that two consecutive peaks are obtained when each trimmer is rotated. The procedure in this case is to adjust each trimmer for a dip between these peaks. This occurs when both adjustments result in the same output meter readings. It is advisable at this point to repeat all the foregoing adjustments, starting with the discriminator and ending with the first IF. This is to insure symmetry of response in the discriminator and in the IF stages.

In order to check response asymmetry in the IF stages, the signal generator is shifted 50 to 100 kc on each side of resonance, at the same time observing the grid current in the limiter stage. Symmetrically aligned IF transformers will give fairly equal but opposite readings for equal and opposite frequency deviations from resonance. The linearity of the discriminator is checked in a similar manner, the voltmeter being connected now across both diodes of the discriminator.

ALIGNMENT OF FM OSCILLATOR CIRCUIT - The alignment of the oscillator and RF trimmers is conventional. The signal generator is set at approximately 100 mc. and the receiver dial to this same setting. Then, with the output indicating meter connected in the grid circuit of the limiter, the oscillator and RF trimmers are tuned consecutively for maximum output.

It will be observed that the procedure varies insofar as the discriminator transformer is first de-

tuned, thereby permitting all adjustments to be observed on the meter connected across the diode cathode connections of the discriminator. This is a timesaving procedure. Notice that the final adjustment is made on the discriminator transformer.

FM RATIO DETECTOR ALIGNMENT - The alignment of FM receivers employing ratio detectors.

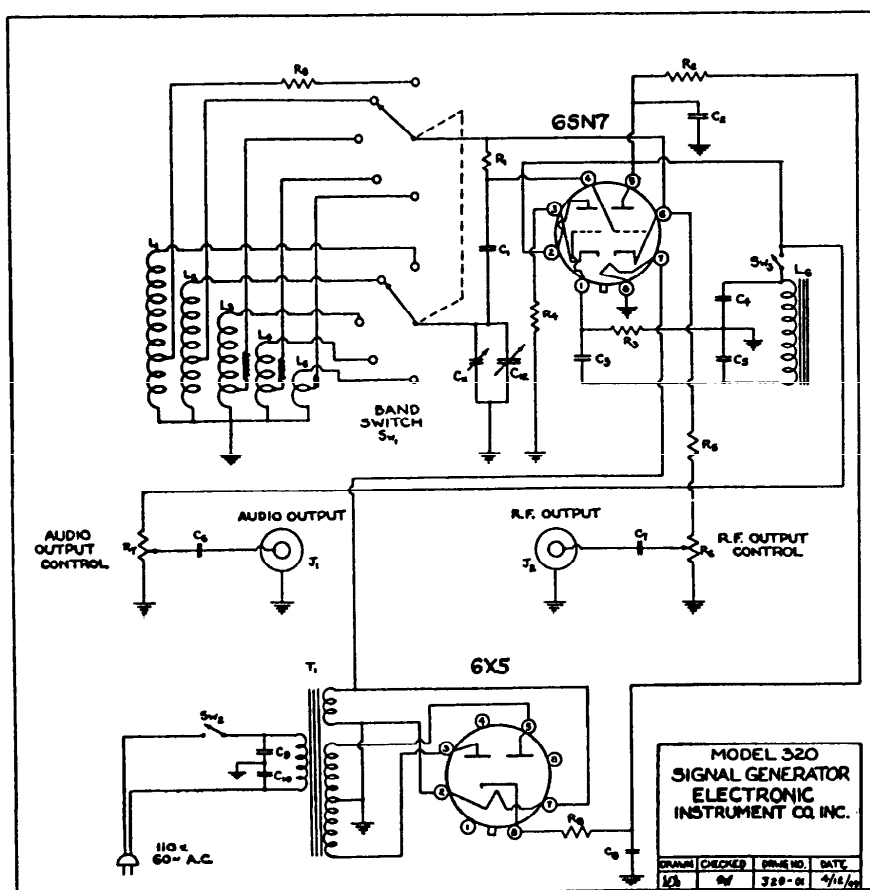
Equipment necessary: RF Signal Generator and VTVM

1. Connect VTVM from ground to audio lead of radio detector (discriminator). Connect generator tuned to 10.7 mc to grid of third FM i-f tube through .01 mfd capacity. Use minimum signal necessary for good indication in all following:
2. Turn secondary slug of ratio detector transformer (top slug) out as far as it will turn.
3. Tune primary for maximum output.
4. Connect generator to grid of second FM i-f tube.
5. Tune primary and secondary of third FM i-f transformer for maximum output.
6. Connect generator to grid of first FM i-f tube.
7. Tune primary and secondary of second FM i-f transformer for maximum output.
8. Connect generator to converter grid through 10,000 ohm resistor and .1 mfd. capacitor.
9. Tune primary and secondary of first FM i-f transformer for maximum output.
10. Tune secondary of ratio detector transformer for zero of minimum output.
11. After all adjustments, the signal generator should be tuned 50-100 kc on each of 10.7 mc. If equal deflections of opposite polarity on the VTVM are shown, the i-f system is aligned. Deflections unequal by more than 10% or so indicate inaccurate alignment.

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GUARANTEE

This instrument is guaranteed to be free from defects in material and workmanship in accordance with the terms of the Standard RMA Warranty.



ITEM	PART #	SPECIFICATION
R1	19	100 K RESISTOR
R2	20	5600 OHM RESISTOR
R3	21	65 K RESISTOR
R4	22	10 K OHM RESISTOR 2.0
R5	23	10 K RESISTOR
R6	24	10 K POT WITH SWITCH
R7	25	500 K POT WITH SWITCH
R8	27	5000 OHM RESISTOR
R9	26	2700 OHM RESISTOR
C1	7	50 MFD MICA COND.
C2	8	.002 MFD. COND.
C3	9	.05 MFD. COND.
C4	10	.25 MFD. COND.
C5	11	.50 MFD. COND.
C6	12	.01 MFD. COND.
C7	12	.01 MFD. COND.
C8	14	16 MFD. OR OVER ELECTROLYTIC
C9	15	.1 MFD. COND.
C10	15	.1 MFD. COND.
C11	17	50 MMFD AIR TRIMMER
C12	18	360 MMFD TUNING COND.
T1	6	POWER TRANSFORMER
SW1	30	BANDSWITCH
SW2	24	PART OF R6
SW3	25	PART OF R7
L1	31	BAND A COIL - RED DOT
L2	32	BAND B COIL - BLUE DOT
L3	33	BAND C COIL - GREEN DOT
L4	34	BAND D COIL - WHITE DOT
L5	35	BAND E, F, G, COIL YELLOW DOT
L6	36	AUDIO OSCILLATOR CHOKE