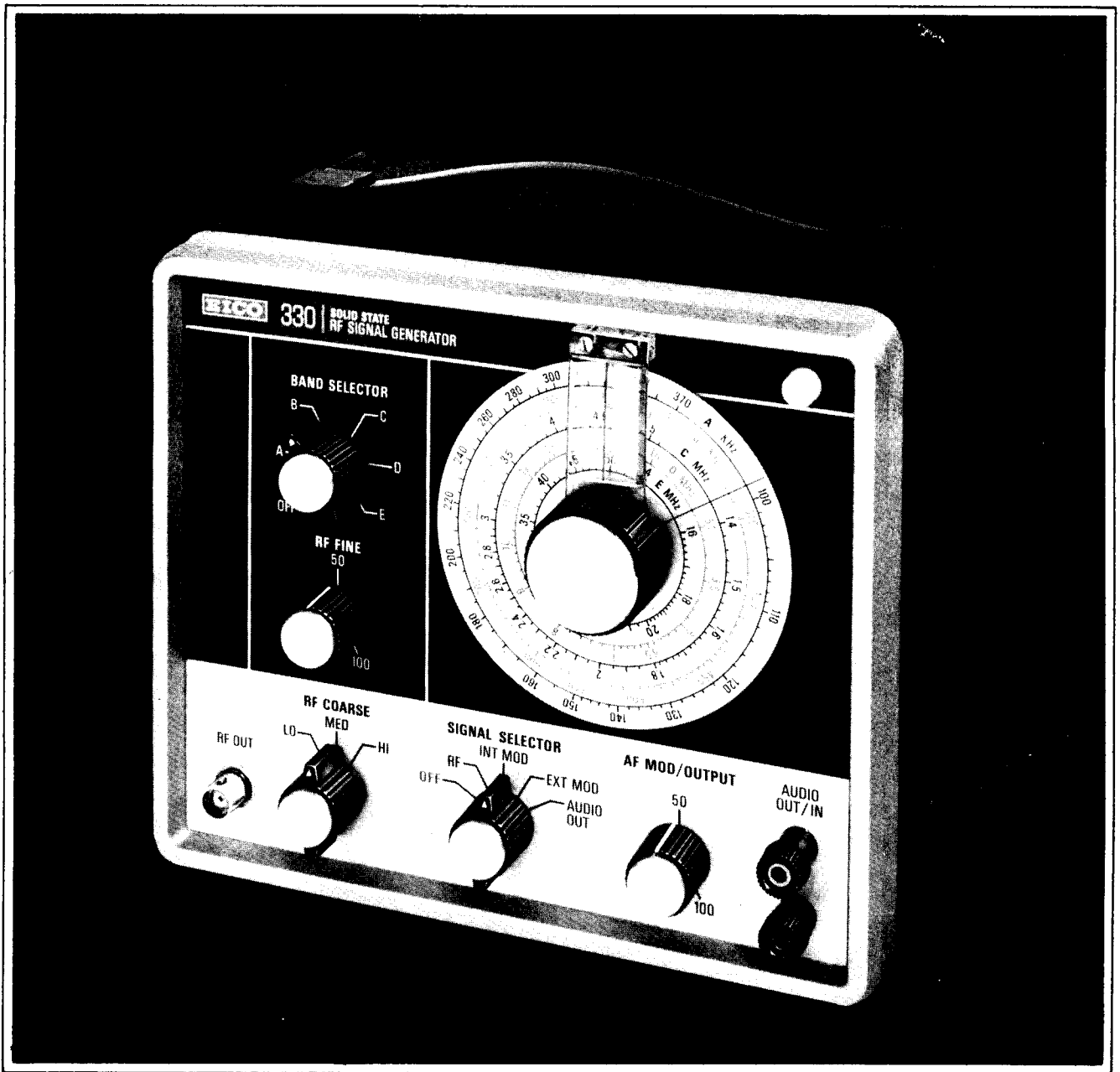




330 | Solid State RF Signal Generator



OPERATING MANUAL

GENERAL DESCRIPTION

The EICO Model 330 Solid-State RF Signal Generator is a high-quality instrument intended for general service of AM and FM radios, television receivers, and communication equipment. Covering the frequency spectrum between 100 kHz and 54 MHz in five fundamental bands, it serves as an excellent source of modulated or unmodulated RF as well as audio.

FEATURES

1. The RF oscillator consists of a bootstrap circuit that is characterized by low RF distortion. The oscillator output is buffered by an emitter-follower stage to minimize loading effects.
2. A vernier control permits any frequency to be set easily and accurately on any of the five tuning bands.
3. A self-contained, low-distortion, 400-Hz audio oscillator is included in the instrument. It may be used in conjunction with a calibrated front panel modulation control to internally modulate any frequency on the dial from 0 to 100%. The 400-Hz audio signal is also made available at front panel jack-top binding posts.
4. Input terminals are provided for modulating the RF output with an external signal.
5. Both coarse and fine RF attenuators provide smooth and efficient control of the RF output signal.
6. Each of the five tuning bands is equipped with a separate turret-mounted, slug-tuned coil and piston trimmer that are conveniently accessible to facilitate accurate frequency alignment.
7. The copper-plated chassis minimizes interference, and a coaxial output cable provides low-loss signal injection.

SPECIFICATIONS

RF Characteristics

Frequency range:	100 kHz to 54 MHz in five fundamental bands
Tuning dial calibration accuracy:	$\pm 1.5\%$
Output voltage:	More than 300,000 microvolts into 50-ohm load on any band
Coarse attenuation:	Two steps of approximately 20 dB each
Fine attenuation:	Continuous - 0 to 100%

AF Characteristics

Internal audio oscillator frequency:	Approx. 400 Hz
Output voltage:	Approx. 2 volts rms across 100K load Approx. 1 volt rms across 10K load

Modulation Characteristics

% Modulation (internal 400 Hz signal):	0 to 100% on calibrated control
Frequency range of external signal:	20 Hz to 15 kHz
Amplitude of external 1000-Hz modulating signal for 30% modulation:	Approx. .5 volt rms

Power Requirements: 105-132 volts, 50/60 Hz, 1.7 va

Size: 7-1/2" high, 8-1/2" wide, 5" deep

Weight: 5 pounds

CIRCUIT DESCRIPTION

Basically the Model 330 consists of an RF oscillator, a buffer stage, a modulator, and an audio oscillator. As shown in the schematic diagram, transistor Q1 is connected as a bootstrap oscillator that operates at a very low level for low distortion and leakage. The entire frequency-determining tank network is in the emitter circuit. A separate LC tank circuit is utilized for each of the five bands, A through E. Feedback to sustain oscillation is taken from the high end of the tank via capacitor C3 to the base of Q1. Variable capacitor C10 is switched across the tank circuit in lower bands A and B. In band C, C10 is connected in series with C11. C10 is not used in the circuit in upper bands D and E. Both positive and negative peak limiting in the circuit is "soft," thus minimizing RF distortion. Signal amplitude is self regulated to a value that depends on the DC supply voltage.

Emitter-follower stage Q2 buffers the oscillator from the RF FINE control and modulator stage Q3. The modulator is a Vander Bjil, operating as a variable-gain, RF amplifier at the audio rate. Inductor L6, in combination with R13 and C19, equalizes the gain of the modulator stage throughout the RF range of the oscillator.

A 400-Hz audio modulating signal is generated by a low-noise transistor, Q4. Oscillation is sustained in Q4 by a parallel "T" RC network connected between collector and base. Potentiometer R24, connected in the feedback loop, sets the gain of the circuit. When R24, is properly adjusted, oscillator Q4 generates a low-distortion, 400-Hz signal.

The audio signal is fed through C20 and potentiometer R20 to terminal 3 of SIGNAL SELECTOR switch wafer S1B. Potentiometer R20 sets the level of the audio signal and is used for calibrating AF MOD/OUTPUT control R19. When the SIGNAL SELECTOR switch is set to the AUDIO OUT position, the audio signal is fed to the AUDIO OUT/IN binding posts so that it may be used externally as a source of 400-Hz audio. When the SIGNAL SELECTOR switch is set to the INT MOD position, audio is applied to modulator stage Q3 via AF MOD/OUTPUT control R19.

Transistor Q3 is connected in the Vander Bjil modulator circuit. The audio signal from Q4 is coupled through C26 and R18 to the base of Q4, which is also fed the selected RF signal from Q2. The audio signal varies the base of variable-gain, RF amplifier Q3 at an audio rate, producing the desired modulation.

When set to RF, the audio input is removed from Q3, so that Q3 behaves as a simple RF amplifier. The RF output of Q3 is coupled through RF COARSE switch S3 and a resistive attenuator network to the RF OUT terminal. The attenuator provides two coarse attenuation steps of approximately 20 dB each.

The instrument contains a transformer-powered, full-wave rectifier power supply followed by an RC pi filter.

OPERATING CONTROLS AND INDICATORS

Table 1 lists the operating controls and indicators on the Model 330 and indicates their functions.

Table 1. Controls and Indicators

Item	Function												
BAND SELECTOR switch S2	<p>In OFF position, disables RF output. In other positions, selects one of five RF frequency ranges as follows:</p> <table border="1" data-bbox="762 511 1355 734"> <thead> <tr> <th data-bbox="762 511 1047 550"><u>Band</u></th> <th data-bbox="1047 511 1355 550"><u>Range</u></th> </tr> </thead> <tbody> <tr> <td data-bbox="762 569 1047 608">A</td> <td data-bbox="1047 569 1355 608">100 kHz to 370 kHz</td> </tr> <tr> <td data-bbox="762 608 1047 647">B</td> <td data-bbox="1047 608 1355 647">370 kHz to 1400 kHz</td> </tr> <tr> <td data-bbox="762 647 1047 685">C</td> <td data-bbox="1047 647 1355 685">1.4 MHz to 5.1 MHz</td> </tr> <tr> <td data-bbox="762 685 1047 724">D</td> <td data-bbox="1047 685 1355 724">5.1 MHz to 16 MHz</td> </tr> <tr> <td data-bbox="762 724 1047 763">E</td> <td data-bbox="1047 724 1355 763">16 MHz to 54 MHz</td> </tr> </tbody> </table>	<u>Band</u>	<u>Range</u>	A	100 kHz to 370 kHz	B	370 kHz to 1400 kHz	C	1.4 MHz to 5.1 MHz	D	5.1 MHz to 16 MHz	E	16 MHz to 54 MHz
<u>Band</u>	<u>Range</u>												
A	100 kHz to 370 kHz												
B	370 kHz to 1400 kHz												
C	1.4 MHz to 5.1 MHz												
D	5.1 MHz to 16 MHz												
E	16 MHz to 54 MHz												
Tuning Dial	Sets RF output frequency within selected band (A, B, C, D, or E).												
RF COARSE switch S3	In HI position, applies full RF output to RF OUT connector (assuming that RF FINE control is set to 100). In MED position, attenuates RF output by approximately 20 dB. In LO position, attenuates RF output by approximately 40 dB.												
RF FINE control R8	Permits fine attenuation of RF output (as determined by setting of RF COARSE switch) from 0 to 100%.												
RF OUT connector	Provides RF output for shielded cable.												
SIGNAL SELECTOR switch S1	<p>Turns on instrument and controls mode of operation as follows:</p> <p>OFF position: Removes AC power from instrument.</p> <p>RF position: Disconnects internal or external audio modulating signal so that signal at RF OUT connector is unmodulated RF. AUDIO OUT/IN binding posts are disconnected from unit.</p> <p>INT MOD position: Connects internal 400-Hz signal to modulator so that signal at RF OUT connector is modulated RF with percentage of modulation determined by setting of AF MOD/OUTPUT control. AUDIO OUT/IN binding posts are disconnected from unit.</p> <p>EXT MOD position: Connects AUDIO OUT/IN binding posts to input of modulator for modulation of RF output with external audio signal. Modulation level is determined by amplitude of external signal and setting of AF/MOD OUTPUT control. Internal audio signal is disconnected.</p>												

Table 1. Controls and Indicators (cont)

Item	Function
AF MOD/OUTPUT control	<p>AUDIO OUT position: Internal 400-Hz audio signal is connected to AUDIO OUT/IN binding posts. Instrument simultaneously supplies unmodulated RF signal to RF out connector.</p> <p>Controls percentage of modulation for either internal or external modulation. Calibrated for use with INT MOD position of SIGNAL SELECTOR switch.</p>
AUDIO OUT/IN binding posts	<p>Provides connection for externally supplied audio modulating signal (EXT MOD mode) and provides 400-Hz audio output (AUDIO OUT mode).</p>
Neon Lamp I1	<p>When lit, indicates that AC power is turned on.</p>

OPERATION

Power Application:

- a. Plug the line cord into a 105-132-volt AC, 50-to-60 Hz outlet. DO NOT plug it into a source of higher voltage, different frequency range, or into a DC outlet, since an improper power source will damage the instrument.
- b. Rotate the SIGNAL SELECTOR switch away from the OFF position so that the front panel neon lamp lights.
- c. Attach the RF cable to the RF OUT connector.

Frequency Selection:

- a. Locate the desired frequency on the dial and align it with the red index mark.
- b. Set the BAND SELECTOR switch to the band (A, B, C, D, or E) that includes the selected frequency.

Mode Selection:

- a. If an unmodulated RF carrier is desired, set the SIGNAL SELECTOR switch to RF.
- b. If a 400-Hz modulated RF signal is desired, set the SIGNAL SELECTOR switch to INT MOD. Adjust the AF MOD OUTPUT control for the desired percentage of modulation.
- c. To modulate the RF output with an external audio signal, set the SIGNAL SELECTOR switch to EXT MOD and connect the external signal to the AUDIO OUT/IN jack-top binding posts. Use the AF MOD/OUTPUT control to adjust the percentage of modulation.

NOTE

The calibration markings on the AF MOD/OUTPUT control do not apply when using an external modulating signal.

d. To use the 400-Hz output of the internal audio oscillator, set the SIGNAL SELECTOR switch to the AUDIO OUT position and connect to the AUDIO OUT/IN binding posts.

NOTE

The AF MOD/OUTPUT control has no effect at this time.

RF Output Level Control:

For full RF output (300,000 microvolts or more), set the RF COARSE switch to HI and the RF FINE control fully clockwise. Use the MED and LO settings of the switch to reduce the output level. Use the RF FINE control for fine setting the RF output level.

Terminating the RF Probe

When the Model 330 is used for alignment or signal injection (during troubleshooting), a DC blocking capacitor (0.01 mf to 0.1 mf) should be connected in series with the "hot" lead. This will protect the attenuator resistors from damage by the operating voltages of the receiver under test.

When performing receiver sensitivity measurements, a proper match should be made between the generator and receiver. At broadcast band frequencies, connect a 200 pf capacitor in series with the generator's "hot" lead. The IEEE standard dummy antenna, shown in figure 1, is ideal for use on all-wave receivers.

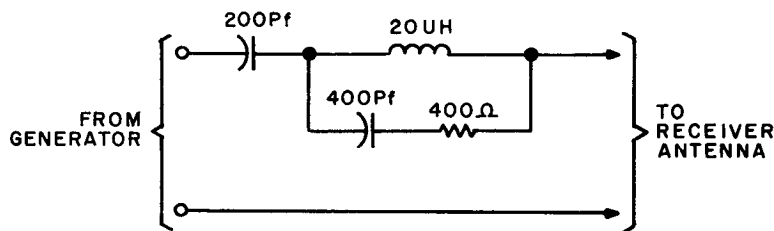


Figure 1. Standard Dummy Antenna

When connecting the Model 330 to a receiver with a 50Ω input, the generator RF cable need not be terminated. For receivers with 300Ω inputs, use two resistors as shown in figure 2.

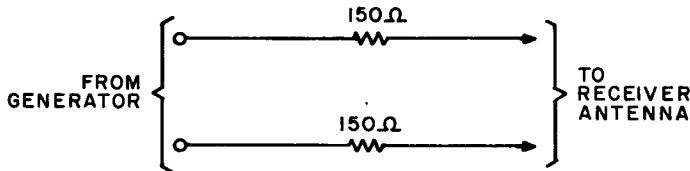


Figure 2. Connecting to 300Ω input

ADJUSTMENT AND TEST

The Model 330 is shipped fully calibrated and tested, and requires no further adjustment. If it should ever be necessary to recalibrate the unit, proceed as described below.

Audio and Modulation Adjustments

- a. Remove the four screws at the rear of the cabinet and withdraw the chassis from the cabinet.
- b. Connect the AUDIO OUT/IN binding posts to the input of a wideband oscilloscope such as the EICO Model 465.
- c. Set the SIGNAL SELECTOR switch to the AUDIO OUT position and observe the 400-Hz audio signal on the scope. Adjust potentiometer R24 on the PC board for a good sinusoidal waveform. (R24 is the potentiometer closest to the 2-gang tuning capacitor.)
- d. Set the SIGNAL SELECTOR switch to INT MOD and the AF MOD/OUTPUT control to 50. Connect the RF output of the instrument to the scope. Adjust potentiometer R20 on the PC board for a 3:1 peak-to-peak, valley-to-valley ratio on the scope as shown in figure 3.

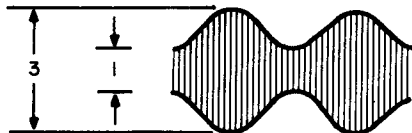


Figure 3. Scope Pattern for 50% Modulation

Individual Band Calibration. Each of the five operating bands on the Model 330 is calibrated by adjusting the coil and capacitor in an individual tank circuit. Calibration is performed by zero-beating the output of the signal generator either to an AM broadcast receiver or to a shortwave receiver, depending on the frequency required. Each band is calibrated first on the low end and then on the high end of the dial. The test setup for calibration is shown in figure 4. Set the SIGNAL SELECTOR switch to RF, the RF COARSE switch to MED, and the RF FINE control to 50.

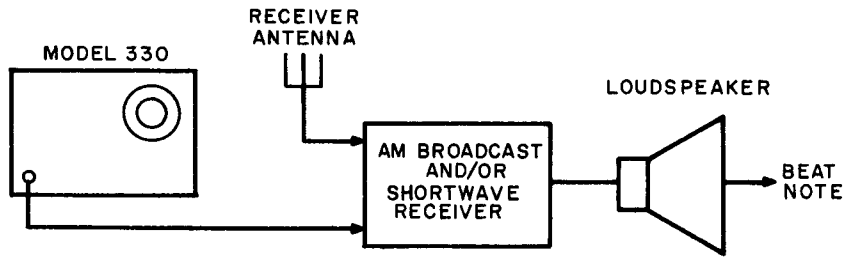


Figure 4. Calibration Test Setup

a. Band A Calibration.

1. Set BAND SELECTOR switch to A.
2. Tune AM broadcast receiver to a station of known frequency at low end of broadcast band.
3. Set tuning knob on Model 330 to exactly half the known broadcast station frequency and adjust coil L1 (shown in figure 5) for a zero beat.

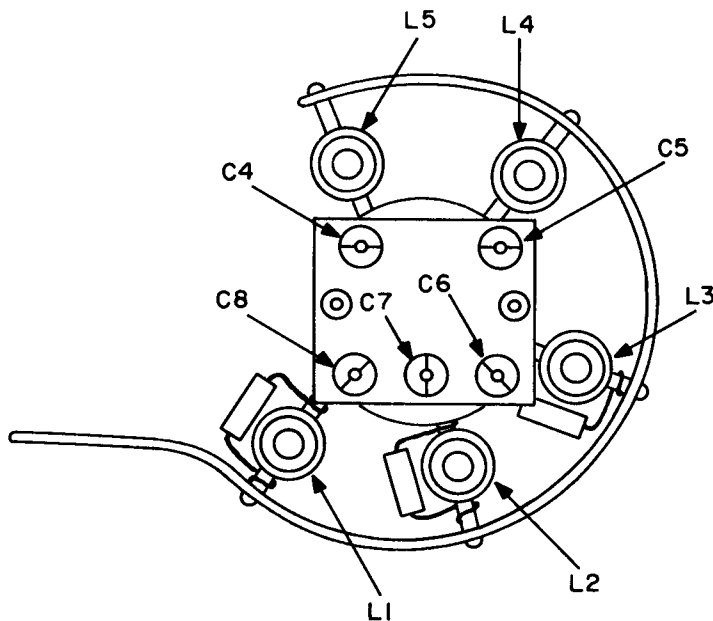


Figure 5. Location of Band Adjustments

NOTE

Approach of the zero-beat point is indicated by a squeal from the radio receiver which progressively drops in pitch. At zero beat, the tone is at its lowest pitch or becomes completely silent, with the tone rising at either side of this setting. At the zero-beat point, the signal generator frequency (or in this case, the second harmonic of the signal generator frequency) is the same as, or very close to, the broadcast station carrier frequency.

4. Tune AM receiver to a station whose carrier frequency is in the vicinity of 700 kHz.
5. Set Model 330 tuning knob to exactly half the broadcast station frequency; then tune capacitor C8 (figure 5) for a zero beat.
6. Repeat steps 2 and 3.
7. Repeat steps 4 and 5.

b. Band B Calibration.

1. Set BAND SELECTOR switch to B.
2. Tune AM receiver to a station whose carrier frequency is in the vicinity of 800 kHz.
3. Set Model 330 tuning knob to exactly half the broadcast station frequency and adjust coil L2 (figure 5) for a zero beat.
4. Reset receiver to a station in the vicinity of 1300 kHz.
5. Set Model 330 tuning knob to the same frequency as in step 4; then adjust capacitor C7 for zero beat.
6. Repeat steps 2 and 3.
7. Repeat steps 4 and 5.

c. Band C Calibration.

1. Set BAND SELECTOR switch to C.
2. Tune receiver to a station near 1.5 MHz.
3. Set Model 330 to same frequency and adjust coil L3 (figure 5) for zero beat.
4. Tune shortwave receiver to a station near 4.5 MHz.
5. Set Model 330 tuning knob to the same frequency as in step 4 and adjust capacitor C6 for zero beat.
6. Repeat steps 2 and 3.
7. Repeat steps 4 and 5.

d. Band D Calibration.

1. Set BAND SELECTOR switch to D.
2. Tune shortwave receiver to a station in the vicinity of 6 MHz.
3. Set Model 330 tuning knob to same frequency and tune coil L4 (figure 5) for zero beat.
4. Tune shortwave receiver to a station near 14 MHz.
5. Set Model 330 tuning knob to the same frequency as in step 4; then adjust capacitor C5 for zero beat.
6. Repeat steps 2 and 3.
7. Repeat steps 4 and 5.

e. Band E Calibration.

1. Set BAND SELECTOR switch to E.
2. Tune shortwave receiver to station in vicinity of 18 MHz.
3. Set Model 330 tuning knob to the same frequency and tune coil L5 (figure 5) for zero beat.
4. Tune shortwave receiver to a station near 50 MHz.
5. Set Model 330 tuning knob to the same frequency as in step 4; then adjust capacitor C4 for zero beat.
6. Repeat steps 2 and 3.
7. Repeat steps 4 and 5.

USING THE MODEL 330 FOR ALIGNMENT

General Notes

1. When connecting the RF lead to the circuit being aligned, always make the ground connection as close to the circuit input as possible.
2. Always follow the manufacturers' recommended procedures for the receiver to be aligned. Set all receiver controls at their recommended operating positions.
3. Be sure that the receiver is in good operating condition before attempting to align it. Often, a defective tube or component is the real cause of trouble.
4. If the receiver power supply is a transformer-less type, always use an isolation transformer.
5. Be careful not to overload the receiver with too strong a signal. Set the output to the level specified by the manufacturer.

NOTE

The alignment instructions that follow are intended to provide a general understanding of the connections and use of your RF generator for aligning receivers. When available, follow the manufacturers' suggested procedure for the particular receiver to be aligned.

Aligning an AM Broadcast Band Receiver

a. IF Amplifier Alignment

1. If the receiver is an AC/DC type, BE SURE TO USE AN ISOLATION TRANSFORMER.
2. Disable the oscillator, either by removing the oscillator tube (AC sets only) or by placing a short across the oscillator coil.
3. If you have a VTVM, set it to a low AC voltage scale and connect it across the speaker voice coil. As an alternative, use the speaker as the output indicator.
4. Connect the RF output cable to the control grid of the RF stage through a .02 mf, 400-volt capacitor.
5. Set the Model 330 tuning dial to 455 kHz (band B), the SIGNAL SELECTOR switch to INT MOD, and the AF MOD/OUTPUT control to approximately 30.
6. Set the volume control on the receiver at a normal listening level setting and adjust the RF COARSE switch and RF FINE control on the Model 330 for only enough output to produce an indication on the VTVM or speaker.
7. Using a tuning wand, adjust the secondary of the output IF transformer for maximum output. Reduce the generator output, if necessary, to prevent the receiver from overloading.
8. Tune the primary of the output IF transformer for maximum output. Reduce the generator output if necessary.
9. Connect the RF cable to the grid of the mixer tube through a .02 mf, 400-volt capacitor.
10. Reducing the generator output as necessary, tune the secondary winding, then the primary winding of the input IF transformer for maximum output.
11. Touch up the output IF transformer as necessary, for maximum output.
12. Touch up the input IF transformer, as necessary, for maximum output.

b. Oscillator and RF Trimmer Alignment

1. Restore operation of the oscillator.
2. Set the tuning dial on the receiver to 600 kHz.
3. Tune the Model 330 to 600 kHz (band B).
4. Connect the RF cable to the receiver's antenna.

5. Adjust the oscillator trimmer on the receiver for maximum output.
6. Set the tuning dial on the receiver to 1500 kHz.
7. Tune the Model 330 to 1.5 MHz (band C).
8. Adjust the RF trimmer on the receiver for maximum output.
9. Repeat steps 2 through 8.

Aligning 10.7 MHz IF and Foster-Seeley Discriminator. (See figure 6.)

To align the IF stages and Foster-Seeley discriminator in an FM broadcast band receiver, proceed as follows:

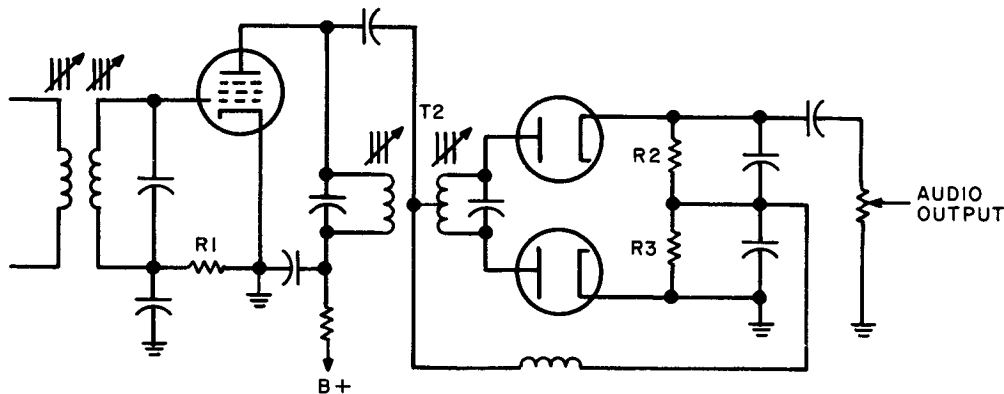


Figure 6. Basic Foster-Seeley Discriminator Circuit

1. Tune the receiver to a dead spot near the low end of the FM broadcast band.
2. Connect the "hot" lead of the generator to the grid of the first IF stage. Set the generator tuning knob to 10.7 MHz (band D) and the SIGNAL SELECTOR switch to RF.
3. Connect a VTVM across the limiter stage grid resistor (R1 in figure 6).
4. Using just enough RF output to produce a usable meter reading, adjust the output IF transformer primary and secondary cores for a peak indication on the meter.
5. Connect the generator "hot" lead to the signal grid of the FM mixer through a 10 pf capacitor. Reduce the signal generator output as required and adjust the primary and secondary cores of the input IF transformer for a peak indication on the VTVM.
6. Touch up the output IF transformer windings, then the input IF transformer windings.
7. Shift the VTVM leads to measure the DC voltage across either resistor R2 or R3; then adjust the primary winding of the discriminator transformer for a maximum reading on the VTVM.

8. Shift the VTVM leads to measure the DC voltage across R2 and R3 in series. Zero-center the VTVM; then adjust the secondary of the discriminator transformer until a zero reading is obtained. The proper zero reading is obtained when movement of the secondary winding core in either direction produces an increasing indication (in one direction or the other).

Aligning 10.7 MHz IF and Ratio Detector. (See figure 7.)

In an FM broadcast band receiver that utilizes a ratio detector, calibration can be performed as follows:

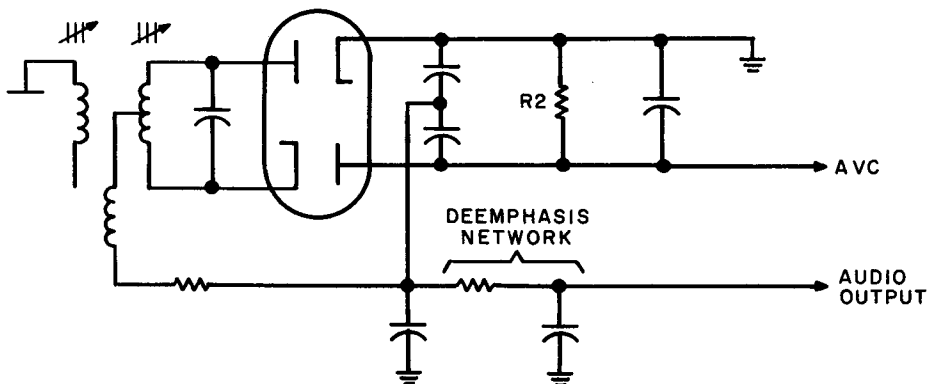


Figure 7. Basic Ratio Detector Circuit

1. Tune the receiver to a dead spot near the low end of the FM broadcast band.
2. Connect the "hot" lead of the generator to the grid of the last IF stage. Set the generator tuning knob to 10.7 MHz (band D) and the SIGNAL SELECTOR switch to RF.
3. Connect a VTVM across the AVC line (across resistor R2 in the circuit shown in figure 7).
4. Adjust the primary of the ratio detector transformer for a maximum DC reading on the VTVM.
5. Move the generator "hot" lead to the grid of the first IF stage. Reduce the signal generator output as required and adjust the primary and secondary cores of the output IF transformer for a peak indication on the meter.
6. Connect the generator "hot" lead to the signal grid of the FM mixer through a 10 pf capacitor. Reduce the signal generator output as required and adjust the primary and secondary cores of the input IF transformer for a peak indication on the VTVM.
7. To align the secondary of the ratio detector transformer, connect the VTVM across the output of the deemphasis network or other point in the circuit recommended by the manufacturer.

8. Zero-center the VTVM; then adjust the secondary core of the ratio detector transformer for a zero reading. The VTVM reading should increase in one direction or the other when the core is moved in either direction from the proper zero reading.

MAINTENANCE

To gain access to the chassis, remove the four screws at the rear of the chassis. (Two of these support the line cord while in storage.) Slide the chassis out from the front of the cabinet by pulling on the frame around the front panel.

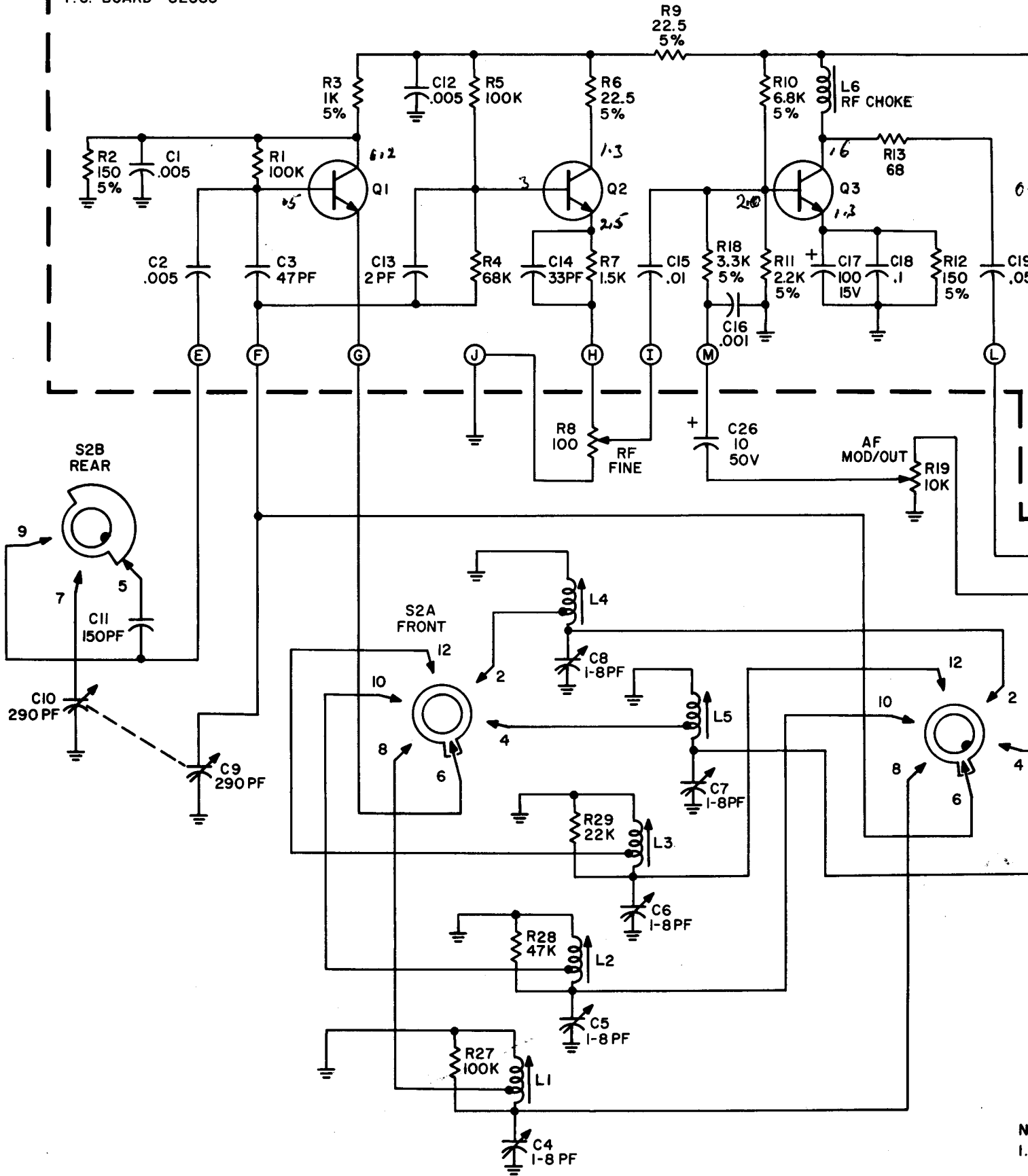
Visually inspect the parts on the printed circuit board for evidence of arcing or overheating. Make sure that the plates on the two-gang tuning capacitor are not bent and shorting.

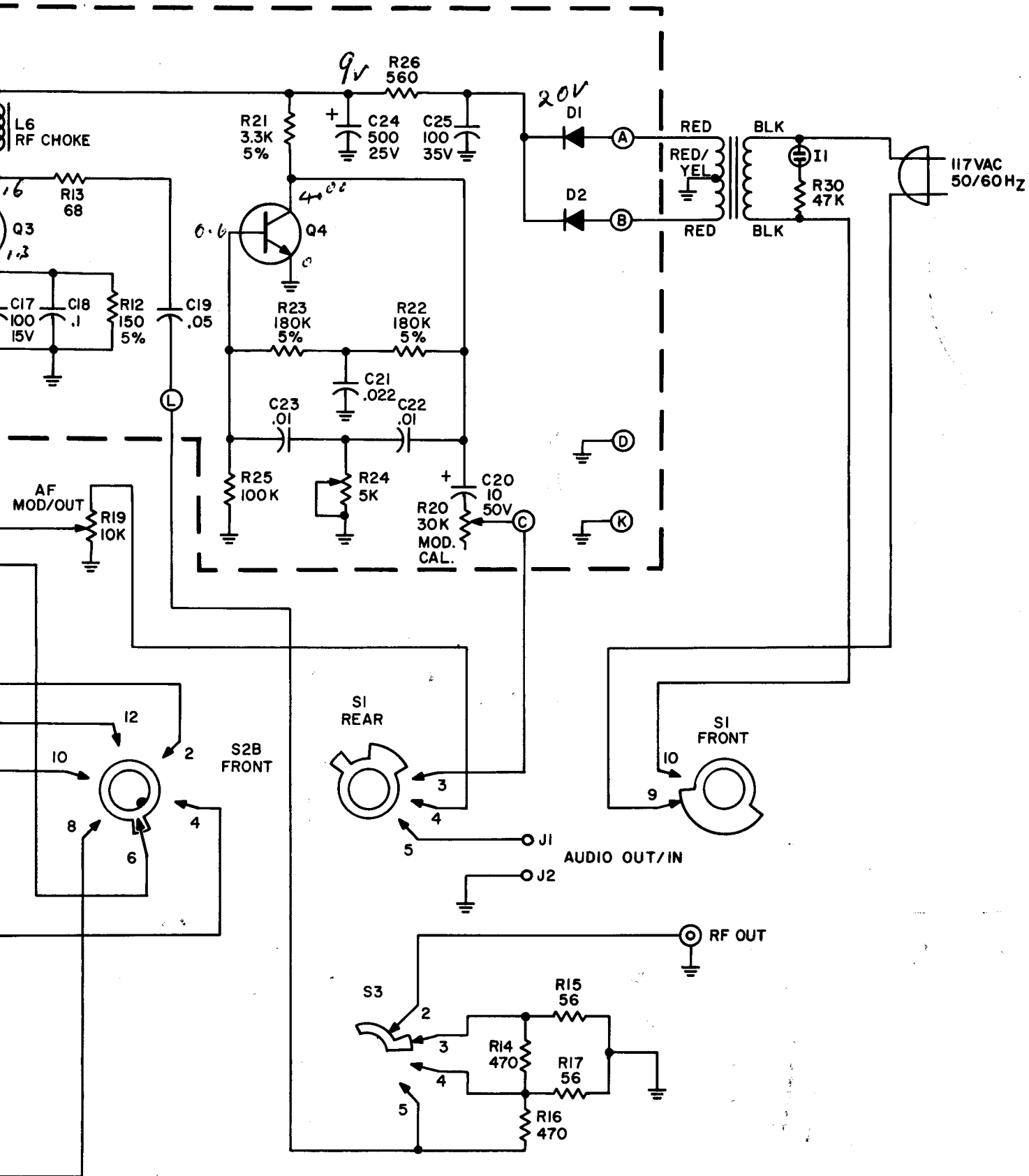
With the Model 330 set to some medium modulated frequency, use a VTVM to compare the voltages at the transistor terminals with those listed in table 2. All voltages are measure with respect to ground. Some minor variations in voltage readings can be expected as a result of line voltage variations or small changes in component tolerances.

Table 2. Voltage Measurements

Transistor	Emitter	Base	Collector
Q1	0	0.5	1.2
Q2	2.5	3.0	9.0
Q3	1.3	2.0	8.5
Q4	0	0.6	4.0
Common cathodes of diodes CR1 and CR2:			20.0
Collector supply (measured across C24):			9.0

Each part is identified on the PC board by a reference designation. Use the overall schematic diagram as a troubleshooting aid. An understanding of circuit operation (see CIRCUIT DESCRIPTION) will facilitate trouble localization.





NOTES:

1. ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, 10% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
3. THE ROTORS OF S2B FRONT AND S2B REAR ARE CONNECTED.

SCHMATIC DIAGRAM

<u>PRICE</u>	<u>STOCK</u>	<u>SYM.</u>			
<u>EA.</u>	<u>NO.</u>	<u>NO.</u>	<u>DESCRIPTION</u>	<u>QTY</u>	

RESISTORS

.08	10410	R1,5, 25,27	carbon, 100K, 1/2W, 10%	4
.09	10422	R4	carbon, 68K, 1/2W, 10%	1
.11	10424	R29	carbon, 22K, 1/2W, 10%	1
.09	10428	R28,30	carbon, 47K, 1/2W, 10%	2
.08	10429	R14,16	carbon, 470 ohms, 1/2W, 10%	2
.09	10433	R26	carbon, 560 ohms, 1/2W, 10%	1
.08	10437	R15,17	carbon, 56 ohms, 1/2W, 10%	2
.08	10442	R7	carbon, 1.5K, 1/2W, 10%	1
.08	10448	R13	carbon, 68 ohms, 1/2W, 10%	1
.22	10502	R18,21	carbon, 3.3K, 1/2W, 5%	2
.22	10522	R11	carbon, 2.2K, 1/2W, 5%	1
.22	10525	R2,12	carbon, 150 ohms, 1/2W, 5%	2
.09	10559	R3	carbon, 1K, 1/2W, 5%	1
.05	10569	R10	carbon, 6.8K, 1/2W, 5%	1
.00	11503	R6,9	car., dep., 22.5 ohms, 1/2W, 5%	2
.13	11537	R22,23	car., dep., 180K, 1/2W, 5%	2

POTENTIOMETERS

.95	18107	R19	10K, 20%, linear	1
1.01	18163	R24	5K, 30%, p.c. bd. type	1
2.57	18195	R8	100 ohms, 1/2W	1
2.57	18197	R20	30K, p.c. bd. type	1

CAPACITORS

.30	20109	C21	mylar, .022 mfd	1
.33	22023	C13	cer., 2pf, ± .25pf, NPO	1
.11	22521	C16	disc., cer., 1000pf, 500V 10%	1
.14	22529	C11	disc., cer., 150pf, 500V, 10%	1
.12	22533	C3	disc., cer., 47pf, 500V 10%	1
.15	22562	C1,2, 12	disc., cer., .005 mfd, 25V, 10%	3
.19	22563	C15,22, 23	disc., cer., .01mfd, 25V, 10%	3

<u>PRICE</u>	<u>STOCK</u>	<u>SYM.</u>			
<u>EA.</u>	<u>NO.</u>	<u>NO.</u>	<u>DESCRIPTION</u>	<u>QTY</u>	

CAPACITORS (cont)

.23	22586	C19	disc., cer., .05mfd, 10V, 10%	1
.24	22591	C18	disc., cer., .1mfd, 10V, GMV	1
.15	22603	C14	disc., cer., 33pf, 500V, 5%	1
.65	23031	C17	elec., 100mfd, 15V	1
1.50	23050	C24	elec., 500mfd, 25V	1
.58	23065	C20,26	elec., 10mfd, 50V	2
1.00	23079	C25	elec., 100mfd, 35V	1
7.98	29031	C9,10	var., dual, 290pf	1
.50	29528	C4,5, 6,7,8	var., piston, 1-8pf	5

TRANSFORMER & COILS

4.20	*30108	T1	transformer, power	1
.81	35034	L6	coil, RFC, 1mh, 125ma, A. L.	1
.75	36081	L1	R. F. Coil, "A"	1
.75	36082	L2	R. F. Coil, "B"	1
.75	36083	L3	R. F. Coil, "C"	1
.75	36084	L4	R. F. Coil, "D"	1
.75	36085	L5	R. F. Coil, "E"	1

(*31108 - for export)

JACKS, KNOBS & TERMINAL STRIPS

2.10	50047		jack, BNC connector, RF	1
2.10	51018		plug, BNC connector, RF	1
.18	51505		clip, alligator, miniature	2
.50	52001	J2	binding post, #8, 5 way, black	1
.50	52002	J1	binding post, #8, 5 way, red	1
.86	53101		knob, tuning	1
.01	53108		knob, 3/4"	2
.01	53109		knob, bar	3
1.14	53514		dial pointer	1
.10	54002	TB1	terminal strip, 1 post right, w/gnd	1
.11	54025	TB2	terminal strip, 4 post, 3 right	1

PRICE EA.	STOCK NO.	SYM. NO.	DESCRIPTION	QTY
<u>SWITCHES</u>				
2.55	60208	S1	switch, rotary, 5 pos'n, signal sel.	1
4.80	60209	S2	switch, rotary, 6 pos'n, band sel.	1
1.80	60229	S3	switch, rotary, 3 pos'n, RF coarse	1

DIODES & TRANSISTORS

1.68	93056	D1,2	diode	2
.75	94048	Q4	transistor, GE2N3391	1
1.14	94074	Q1,2,3	transistor, MPS6513	3
.72	97736	J1	neon bulb assembly, 7" leads	1

SHEET METAL & MISCELLANEOUS

.77	57004		linecord	1
1.50	66215		manual, operating	1
2.00	66476		manual, assembly	1
4.02	80235		front panel	1
2.50	81590		trimmer mounting bracket	1
3.66	81591		chassis	1
.10	82101		line cord clamp	1
2.52	82583		p.c. board	1
3.00	83000		coupling, insulated	1
4.05	84000		ball drive, 6:1	1
2.25	86016		frame	1
1.31	87016		handle	1
.90	88174		cabinet	1
n/c	89427		label, nomenclature	1
.07	89672		sleeve, miniature, black	1
.07	89673		sleeve, miniature, red	1
n/c	89858		handle end cap	2
2.58	89868		dial	1

PRICE EA.	STOCK NO.	DESCRIPTION	QTY
<u>HARDWARE</u>			
.01	40000	nut, hex, #6-32 x 1/4	4
.02	40001	nut, hex, #3/8-32 x 1/2	5
.01	40007	nut, hex, #4-40 x 1/4	4
.01	40022	nut, hex, #4-40 x 3/16	2
.01	40045	nut, hex, #8-32 x 5/16	4
.01	41000	screw, #6-32 x 1/4, b.h.	3
.01	41073	screw, #6 x 1/4, P. K., b.h., type A, black oxide	2
.01	41075	screw, #4-40 x 3/8, b.h.	2
.01	41086	screw, #6-32 x 5/16, b.h.	4
.01	41090	screw, #4-40 x 5/16, b.h., cad. plated	4
.01	41095	screw, #2-56 x 1/4, b.h.	2
.01	41140	screw, #6-32 x 1/4, type F, r.h. phillips	10
.01	41191	screw, #6 x 1", b.h., self tap, black oxide	2
.04	41194	screw, #2 x 3/8, b.h., self tap, type B	2
.02	42000	washer, lock, 3/8	1
.01	42001	washer, flat, 3/8	5
.01	42002	washer, lock, #6	7
.04	42006	washer, fibre, shoulder, #6	2
.01	42007	washer, lock, #4	6
.01	42046	washer, flat, #8	2
.04	42084	washer, #6, 13/32 O.D., black	2
.02	42511	retainer, plastic pilot light	1
.02	43001	lug, pot, ground, 3/8	1
.03	43019	lug, ground, #8	2
.24	44011	spacer, black oxide	3

Prices and specifications subject to change without notice. To order replacement parts, remit with order; specify part number and description. Add \$1.00 for mailing and handling; if a power transformer is included in the order, add \$1.50 for mailing and handling.