

INSTRUCTIONS FOR INSTALLATION, OPERATION AND SERVICE

MODEL S-31

HIGH FIDELITY TUNER FOR FREQUENCY MODULATED
AND AMPLITUDE MODULATED BROADCAST RECEPTION.



SPECIFICATIONS

Tube lineup:

- 1 - 6SK7 R. F. Amplifier
- 1 - 6SA7 Detector-Oscillator
- 1 - 1852 (6AC7) 1st I. F. amplifier (4.3 mc)
- 1 - 1853 (6AB7) 2nd I. F. amplifier (4.3 mc)
- 1 - 6SJ7 Limiter
- 1 - 6H6 Discriminator
- 1 - 6SK7 I. F. Amplifier (455 kc)
- 1 - 6SR7 2nd Detector - A. V. C. - Audio output

FREQUENCY RANGE:

- Band No. 1 - 540-1650 Kilocycles
- Band No. 2 - 40- 51 megacycles

POWER OUTPUT:

130 Milliwatts undistorted

POWER CONSUMPTION:

50 watts

POWER SOURCE:

115 volts 60 cycle A.C.

CHASSIS DIMENSIONS:

Length 16-3/4", Depth 10-3/4",
Height 8-3/8"

SENSITIVITY:

Band 1 (AM) 40 microvolts at 6 milliwatts output.
Band 2 (FM) 60 microvolts for full limiter action.

SELECTIVITY:

25 kc at 1000 times down at 1000 kc.
150 kc on #2 band (40-51 mc)

OUTPUT:

5000 ohms (for high impedance grid inputs)
500 ohms

CONTROLS - from left to right

Bandswitch - Band 1 - Amplitude modulation
Band 2 - Frequency modulation

Phono switch - Position #1 - A.C. Off.
Position #2 - Radio On.
Position #3 - Phono On.

Main Tuning Control -
Audio Gain Control - Bass compensated
Tone Control -
"S" Meter adjustment - Located on rear apron of chassis. May be moved to front if desired.

INSTALLATION

IMPORTANT: This receiver, unless otherwise marked, must be operated from 115-125 volts - 60 cycles alternating current. If you are in doubt, phone your electric light company. Be sure all tubes are in their sockets before inserting plug in receptacle.

ANTENNA: For best results an antenna should be cut to resonate at the high frequency end of the FM band. Probably the simplest and most effective antenna would be a half wave dipole consisting of two quarter wave (4-1/2 feet) rods placed end to end with a few inches space between them. Connect a twisted pair to the ends of the rods closest each other. A wire one half wave (9 feet) length long may be cut at the center and an insulator inserted between the halves. The feeders then connect to the wires at either side of the insulator. The advantage of using rods rather than wire for the antenna is that

they may more easily be mounted vertically, removing all directional properties and producing polarization corresponding to that used by FM stations. If the antenna must be horizontal it should be placed broadside to the direction of the weakest received signal.

Note: Unground A_2 when using a doublet. Antenna should be erected as high as possible above you.

The "S" meter connects to the green and orange leads - green connecting to the plus (+) terminal. With the set turned off the meter should read zero on the red scale. If not, adjustment is made on the front of the meter itself.

The meter is adjusted with the band switch on band #1. Disconnect the antenna and rotate the "S" meter adjustment on the rear of the chassis until the meter reads zero on the left side of the scale.

OPERATION

The #1 band covers frequencies used by amplitude modulated broadcast stations. The dial reads kilocycles by the addition of a zero to the numbers shown. Thus, 100 would be 1000 kilocycles.

The #2 band covers frequencies used by high fidelity frequency modulated

broadcast stations. The dial is calibrated in megacycles.

To appreciate the full capabilities of this tuner a high fidelity audio system should be incorporated. It should consist of not only a high fidelity amplifier but also a high fidelity speaker system.

Owing to the fact that most people have accustomed themselves to standard broadcast receivers it requires time before the critical listener realizes the natural tone qualities of high fidelity.

After a period of listening you will begin to compare band #1 with band #2 and readily understand why frequency modulation is becoming so popular. The noise-and static-free reception obtained is much superior to that obtainable with the old accepted standard amplitude modulation.

Fundamentally, amplitude modulation (AM) consists of adding and subtracting power from a carrier in accordance with the modulating voice or music. With frequency modulation (FM), however, the carrier is kept constant in amplitude and is shifted back and forth in frequency with modulation. The circuits involved in the reception of the two types are very much different - usually requiring two separate receivers.

This tuner, however, combines both circuits and changes from FM to AM with the bandswitch.

A complete explanation of the differences in FM and AM can hardly be accomplished in such a few words, but if you are further interested, your serviceman or dealer will gladly explain it to you or recommend literature.

TO TUNE A SIGNAL - On band #1 (AM) tune the desired signal for a maximum reading on the carrier indicator. Calibration of this meter is in "S" units from 1 to 9, then DB over 99. This gives an accepted arbitrary comparison of signal strength.

On band #2 (FM) the needle will rest at the red zero with either no signal or a signal in perfect tune. Upon tuning thru a signal, the pointer will first swing to one side, then to zero, then to the other side. Retune for zero deflection.

ALIGNMENT PROCEDURE

Equipment needed and preliminary adjustments:

An all wave signal generator which will provide an accurately calibrated signal at test frequencies listed.

Output indicating meter.

Non-metallic screw driver.

Dummy antennas 100 ohm, and 0.1 mfd. Volume control - Maximum all adjustments.

Tone control - Extreme clockwise position.

Connect output meter across primary of output transformer.

Allow chassis and signal generator to "heat up" for several minutes.

Connect low side of generator to chassis (Gnd)

Set gang condenser at minimum capacity for all I.F. adjustments.

1 - 100,000 ohm resistor.

1 - .002 mfd condenser.

1 - 100 mfd condenser.

A.K. BROADCAST (BAND #1) ALIGNMENT. INTERMEDIATE FREQUENCY, (455 KC.)

- 1 - Tune signal generator to 455 kc.
- 2 - Connect signal generator thru 0.1 condenser to 6BK7 I.F. (455 kc.) tube.
- 3 - Align T_7 for maximum output.
- 4 - Connect generator to either stator lug on center section of gang condenser thru a 0.1 mfd. condenser.
- 5 - Align T_8 and T_9 for maximum output. (Do not realign T_7).

R.F. STAGES.

- 1 - Tune signal generator to 1400 kc.
- 2 - Connect signal generator thru 100 ohms to A_1 - Ground A_2 .
- 3 - Set receiver dial at 1400 kc (140)
- 4 - Adjust C_A , C_B and C_C for maximum output.
- 5 - Set generator at 600 kc.
- 6 - Set dial at 600 kc. (60)
- 7 - Adjust C_D for maximum output.
- 8 - Repeat steps 3 and 4.

F.W. BROADCAST (Band #2) ALIGNMENT.

- 1 - Disconnect lead from high side of volume control.
- 2 - Set bandswitch on #2 (FM) band.
- 3 - Disconnect discriminator plate lead (white blue tracer) from plate (pin #8) of 6SJ7 limiter tube.
- 4 - Connect a 100,000 ohm resistor and a .002 mf. condenser in series from plate (pin #8) of limiter to grid (pin #2) of 6SR7 audio amplifier.
- 5 - Connect 100 mf from (pin #2) grid of 6SR7 to chassis.
- 6 - The 6SJ7 will now operate as an amplitude modulation detector.
- 7 - Set signal generator at 4.3 mc.
- 8 - Connect signal generator thru 0.1 mf. condenser to lug on small stator center section of gang condenser.
- 9 - Adjust T_1 , T_2 and T_3 for maximum output keeping the signal generator at as low an output possible.
- 10 - Connect signal generator thru 100 ohm resistor to A_1 - ground A_2 .
- 11 - Tune signal generator to 49 megacycles.
- 12 - Set receiver dial at 49 megacycles.
- 13 - Adjust C_B , C_P , and C_G for maximum output. NOTE: The oscillator tunes to the low frequency side of the signal.
- 14 - Tune signal generator to 43 megacycles.
- 15 - Set dial at 43 mc.
- 16 - Adjust positions of coil leads for maximum output.
- 17 - Repeat steps 11, 12 and 13.
- 18 - Replace the wire on the volume control. Remove the resistor-condenser combination from limiter, and connect the wires as they were.
- 19 - Reconnect signal generator as for I.F. alignment and tune to 4.3 mc.
- 20 - Set signal generator for strong output signal.
- 21 - Adjust S_1 on T_4 until a null is obtained as indicated both by the meter and aurally.
- 22 - Detune signal generator 100 kilocycles.
- 23 - Tune S_2 for maximum output.
- 24 - Tune signal generator back thru resonance and 100 kc to the other side of the I.F. frequency. The output should first drop and then rise to a value equal on both sides of the dip.
- 25 - If the output is not equal on both sides of resonance, readjust S_2 .
- 26 - If the output is still not equal on either side of resonance a slight shift of the null point obtained with S_1 may be necessary.

GUARANTEE

This receiver is guaranteed to be free from any defect in workmanship and material that may develop within a period of ninety (90) days from date of purchase, under the terms of the standard guarantee, as designated by the Radio Manufacturers Association. Any part or parts that prove defective within this period will be replaced without charge when subjected to examination at our factory, providing such defect, in our opinion, is due to faulty material or workmanship, and not caused by tampering, abuse or normal wear. All such adjustments to be made FOB the factory.

Should this receiver require any adjustments, your dealer or distributor has complete technical service in-

formation, or the factory will be glad to assist you in any problem direct.

Should it be necessary to return any part or parts to the factory, a "Return Material Permit" must be obtained in advance by first writing the Adjustment Department, who will issue due authorization under the terms of the guarantee.

The Hallicrafters, Inc., reserve the right to make changes in design or add improvements to instruments manufactured by them, without incurring any obligation to install the same in any instrument previously purchased.

All Hallicrafters receivers are built under patents of Radio Corporation of America and Hazeltine Corporation.

PARTS LIST S-31

CONDENSERS

NO.	CAPACITY	VOLTAGE	TYPE	NO.	CAPACITY	VOLTAGE	TYPE
C ₁	Tuning Condenser 6 Section.						
2	.05 mfd	200	Paper	C ₂₃	500 mmf		Mica
3	.05 mfd	200	Paper	24	Pad Band #1		
4	.02 mfd	400	Paper	25	.02 mfd	400	Paper
5	.02 mfd	400	Paper	26	2.5 mmf		Twisted Pair
6	25 mmf		Mica	27	.05 mfd	200	Paper
7	.05 mfd	200	Paper	28	.1	400	Paper
8	.02 mfd	400	Paper	29	.02	400	Paper
9	.01 mfd	400	Paper	30	25 mmf		Mica
10	.05 mfd	200	Paper	31	25 mmf		Mica
11	.02 mfd	400	Paper	32	10 mfd	25	Elect.
12	.02 mfd	400	Paper	33	25 mmf		Mica
13	.01 mfd	400	Paper	34	.05 mfd	400	Paper
14	.05 mfd	200	Paper	35	10 mfd	350	Elect.
15	.02 mfd	400	Paper	36	.02 mfd	400	Paper
16	.02 mfd	400	Paper	37	.1 mfd	400	Paper
17	.1 mfd	400	Paper	38	.05 mfd	200	Paper
18	50. mmf		Mica	39	10 mfd	350	Elect.
19	2000. mmf		Mica	40	30 mfd	350	Elect.
20	.02 mfd	400	Paper	41	.01 mfd	600	Paper
21	75 mmf		Mica	42	.01 mfd	600	Paper
22	100 mmf		Mica	43	Oscillator drift compensator		
				44	50 mmf		Mica

RESISTORS

NO.	OHMS	WATTAGE	NO.	OHMS	WATTAGE
R ₁	150	1/3	R ₂₄	100,000	1/3
2	100,000	1/3	25	100,000	1/3
3	1,000	1/3	26	200,000	1/3
	500	1/3	27	500	1/3
5	7,500	3	28	8	1/3
6	1,000	1/3	29	200,000	1/3
7	35	1/3	30	1,000	1/3
8	20,000	1/3	31	200,000	1/3
9	8	1/3	32	300	1/3
10	1,000	1/3	33	2,000,000	1/3
11	100,000	1/3	34	35	1/3
12	150	1/3	35	50,000	1/3
13	40,000	1/2	36	250,000	1/3
14	500	1/3	37	1,000	1/3
15	150	1/3	38	1,000,000	1/3
16	25,000	1/2	39	100,000	Tone Control
17	500	1/3	40	100,000	1/3
18	50,000	1/3	41	2,000	1/3
19	100,000	1/3	42	1,000,000	vol. Cont. tap at 20,000 Ohms
20	500,000	1/3	43	4,000	1/3
21	4,000	1/2	44	1,500	*5" meter adjustment band #1
22	15,000	1/2	45	250,000	1/3
23	15,000	1/3			

150 MILLIAMPERE PILOT LIGHTS



