

Collins 51S-1



**HF
COMMUNICATION
RECEIVER**

Collins 51S-1

*compact, lightweight, general coverage, multi-purpose
HF receiver features extreme tuning accuracy and
operational simplicity*

The completely new 51S-1 offers reception of upper sideband, lower sideband, AM or CW signals with continuous coverage of the 2-30 mc spectrum. Additional frequency coverage from 0.2-2.0 mc makes the receiver very useful in broadcast monitoring and laboratory applications. The range is covered in 30 one megacycle bands. An improved dial uses a counter type readout for megacycles and tenths of megacycles and one kc divisions on the main tuning dial. Visual setting accuracy is within one kc at any frequency within the range. Mechanical Filters employed in single sideband reception give an almost rectangular selectivity curve over a 2.4 mc bandwidth. A frequency adjustable rejection notch provides at least 40 db attenuation of unwanted heterodynes.

The high frequency accuracy and stability of the 51S-1 make it particularly suited for communication applications where pre-assigned frequencies are to be received. It may be either table or rack mounted. In remote installations the RF gain may be controlled by simplexing on the output audio line. The level meter may be switched to indicate either RF signal strength or the audio output level.

The frequency generating system includes double tuned antenna inductors which minimize spurious signal response and reject adjacent channel interference. In the 2 mc to 7 mc range, a triple conversion superheterodyne circuit is employed with crystal oscillators supplying injection frequencies

for the first two conversions and a permeability-tuned oscillator supplying injection frequencies for the third conversion. Additionally, an incoming signal in the 200 kc to 2 mc range is converted through a crystal-controlled broadband mixer to 28.2 - 30.0 mc for extended low frequency coverage. From 7-30 mc, a double conversion superheterodyne circuit is used, with a crystal oscillator for the first conversion and a permeability-tuned oscillator for the second conversion. The fixed IF signal passes through Mechanical Filters to reject adjacent channel signals. Four filters, 2.4 kc Mechanical Filters for LSB and USB, a 300 cps crystal filter for CW, and two 5 kc transformers for AM are chosen by the emission selector.

The first injection oscillator, which has the greatest effect in controlling the frequency of the 51S-1 Receiver, employs 16 crystals of high accuracy in the 8.5-16.0 mc range. Since the variable frequency injection is a relatively low frequency, and the BFO is crystal-controlled, the tuned oscillator and BFO are of secondary importance in determining the frequency accuracy of the received signal. These circuits are designed to maintain high frequency stability under varying temperature, humidity and vibration. The combined effects of all circuit components result in a total setting error and drift of less than 1.3 kc under extremes of environmental test conditions.

The easily read tuning dial which indicates fre-

quency directly is supplemented by a 100 kc crystal calibration oscillator that may be adjusted for zero beat against standard frequency transmission from WWV. A zero-set knob permits the dial to be corrected to agree with the nearest 100 kc check point obtained by this means. Interpolation accuracy between check points is approximately 400 cycles over the entire range.

In addition to the unique tuning and frequency control portions of the receiver, the 51S-1 incorporates advanced design features to increase readability and to facilitate operation. SSB signal detection is provided by a separate product detector. A very effective AGC maintains the audio output constant within 6 db over the signal input ranges of 5-50,000 uv. The fast attack, slow release time-constant provides optimum SSB performance.

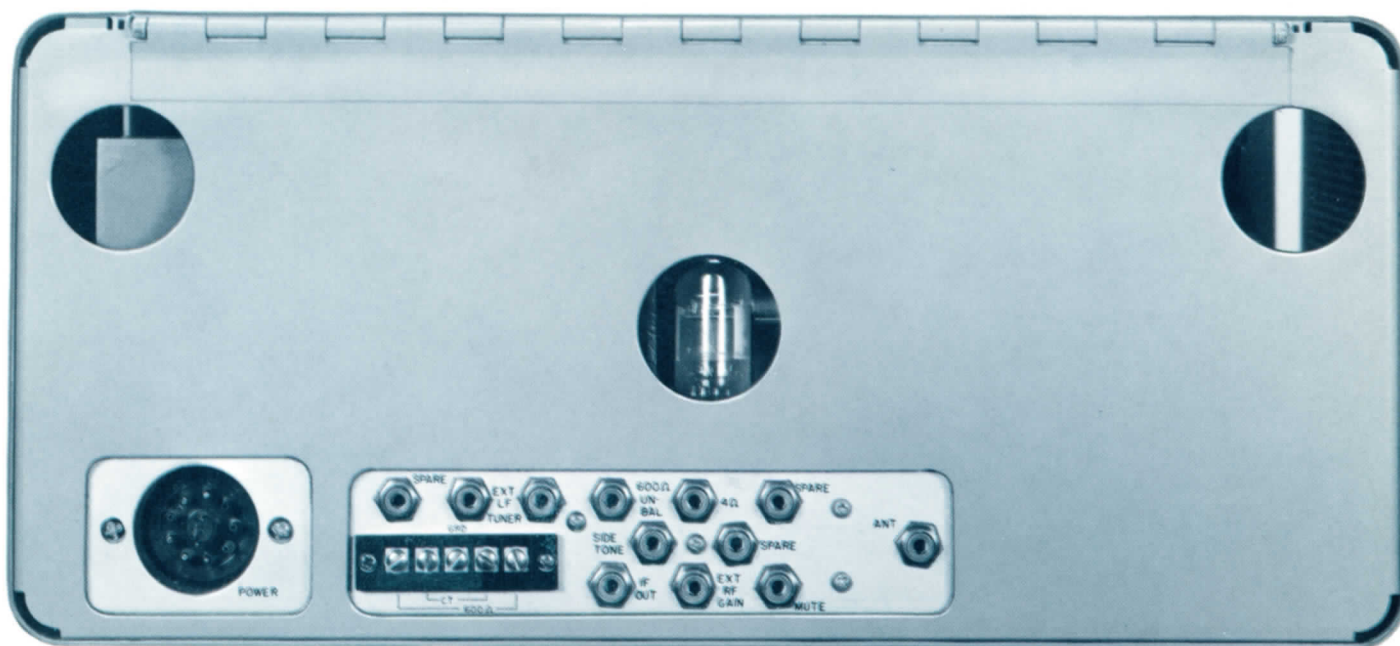
Interfering heterodynes may be easily eliminated by means of the Q multiplier which provides a very sharp null to reject the interfering carriers. CW selectivity is determined by a 300 cycle bandwidth crystal lattice filter, providing skirt selectivity previously unattainable with conventional single crystal filter circuits.

The 51S-1 may be used in laboratory applications for frequency measuring and HF spectrum

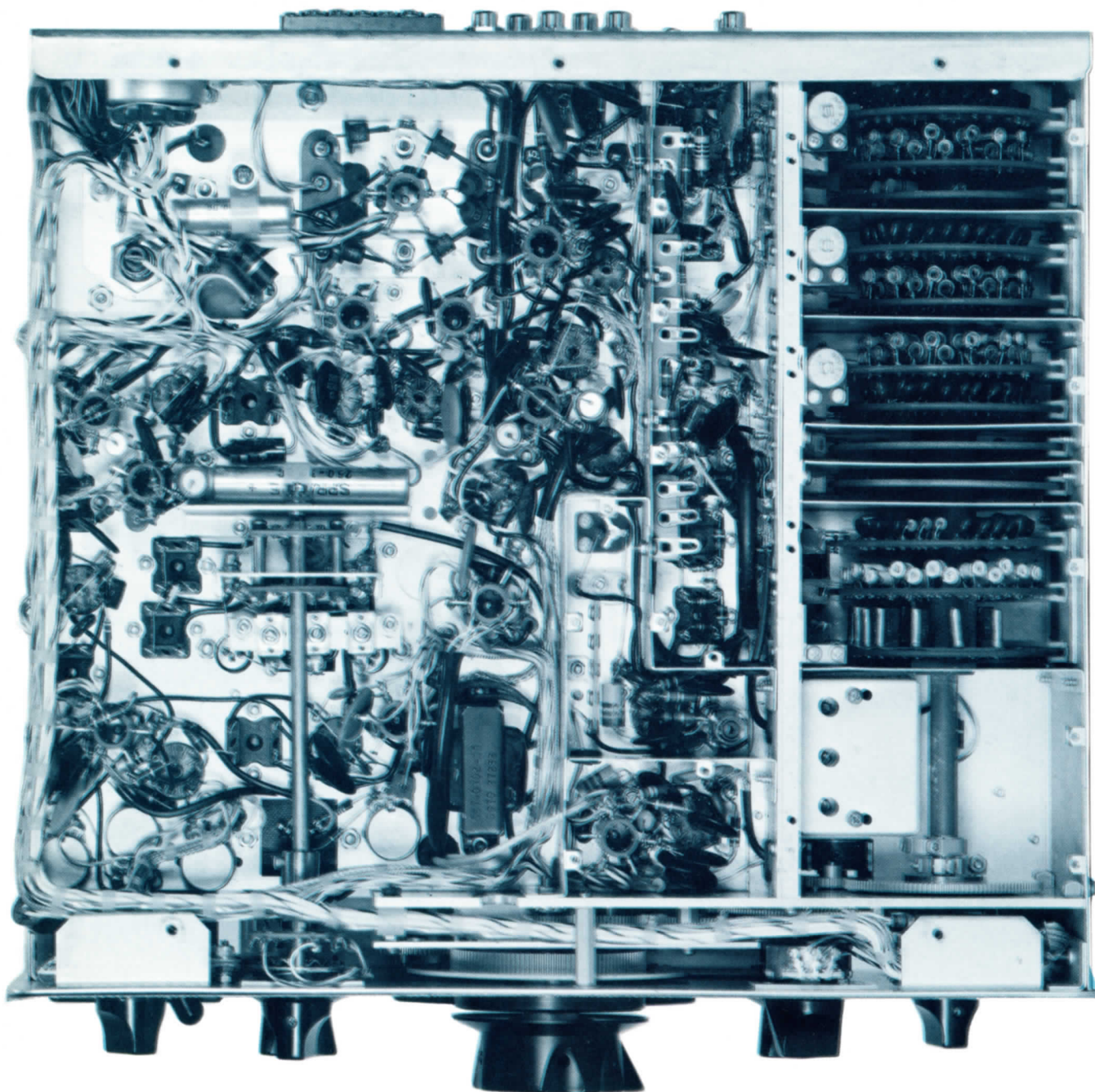
analysis. Its complete frequency coverage, lightweight and versatility enable it to be employed in large HF point-to-point communication systems using a large number of frequencies. A low distortion 0 dbm balanced 600 ohm audio output permits its use for applications requiring the signal to be fed to a telephone line. Provision has been included for operation from an optional internal dc power supply which replaces the conventional ac supply, allowing the 51S-1 receiver to be used in mobile applications.

The 51S-1 is self-contained in a compact, semi-portable desk top cabinet with gray simulated leather panel and gray enamel finish aluminum cabinet. Power, control, accessory and antenna connections are accessible from the rear; tubes, from a cover on the top of the cabinet. A kit is available to allow mounting in a standard 19" RETMA rack.

To facilitate maintenance, all components and wiring are readily accessible from the bottom of the receiver after removal from cabinet. A turret switch using etched circuits and with the RF inductors mounted directly on removable rotor wafers simplifies inspection or repair of the RF tuned circuits.

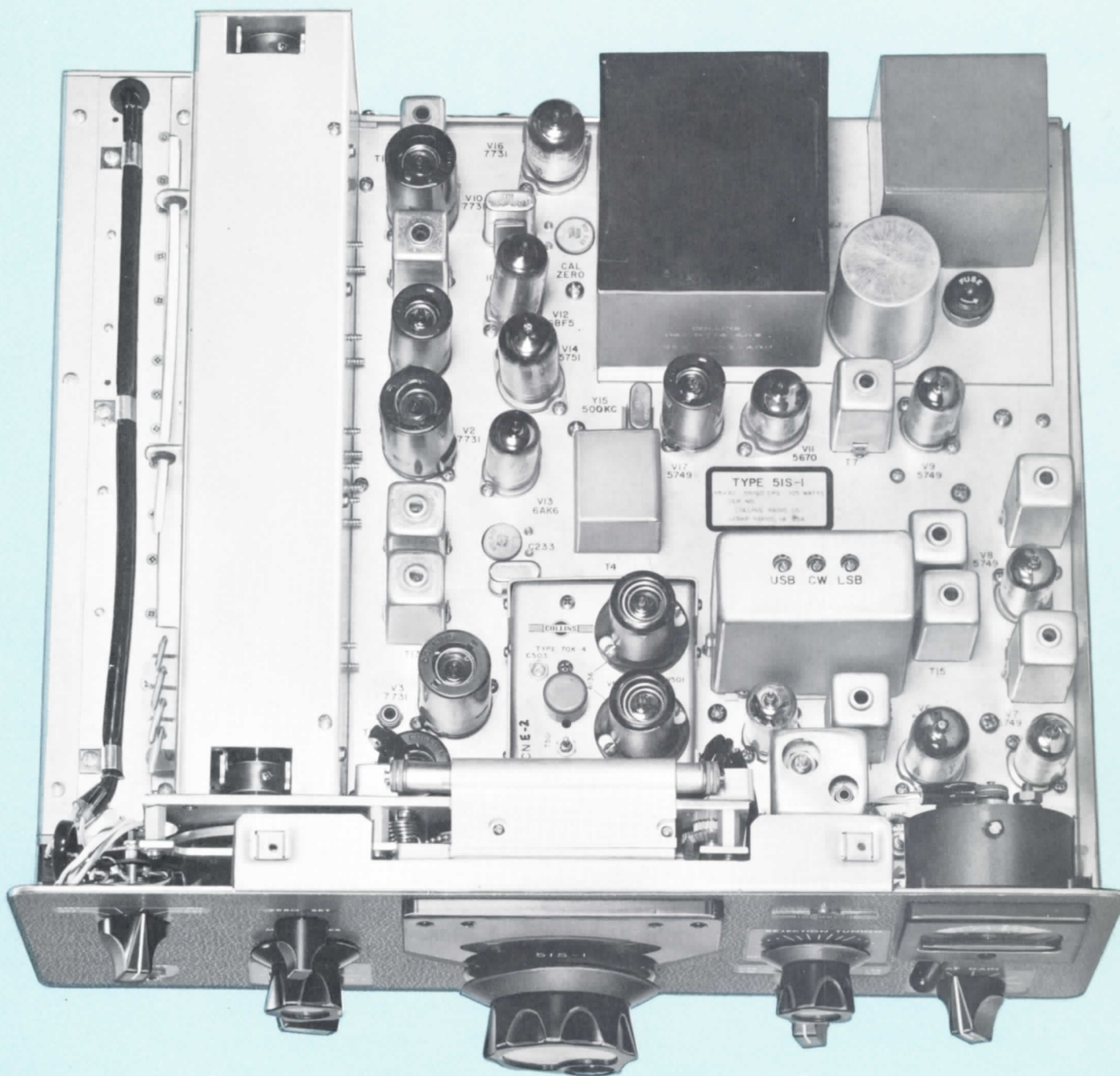


External connections are in a centralized location and all terminations except the 600 ohm remote line are of the plug-in type. Operation from either a 115 or 230 volt power source may be chosen by reconnecting a jumper on the power cord plug and replacement of the fuse.



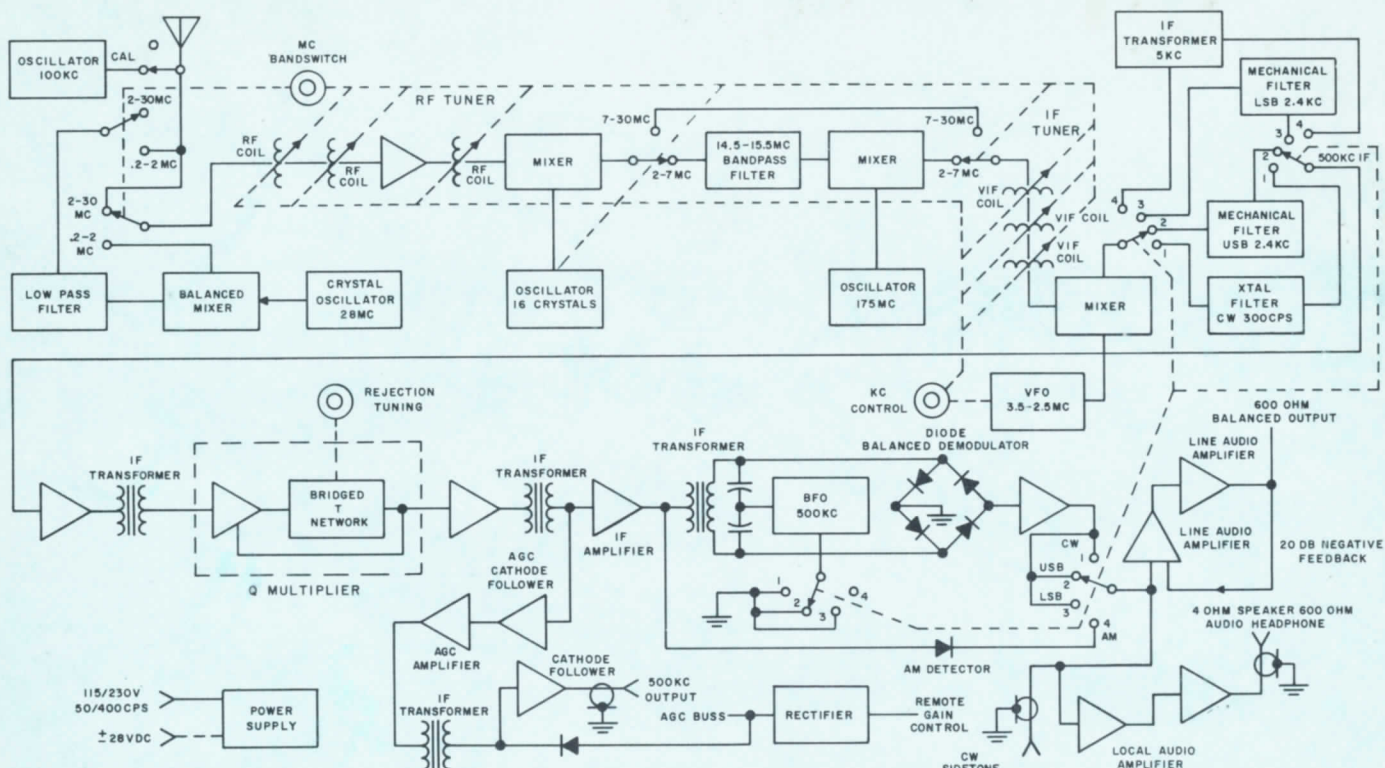
The 51S-1 is compact, lightweight and completely self-contained, except for speaker. A hinged top cover allows access to tubes, crystals and adjustments used for initial alignment. When the receiver is removed from the cabinet all other components may be easily reached with removal

of simple shield plates. Important circuit test points are also readily available for electrical measurements. RF inductors and capacitors are mounted directly on the band-switch rotor wafers and may be removed quickly for inspection or maintenance.



The 51S-1 Receiver has a functional chassis layout. RF and variable IF circuit components are located in a shielded switching turret. Band changing is accomplished by step differential positioning of tuning cores in each coil until the inductance limit is reached, then changing and repeating throughout the frequency range. A sealed

permeability-tuned oscillator incorporates all possible stabilizing measures. Tuning elements are mechanically loaded to insure reset accuracy and virtually eliminate the effects of shock and vibration. An improved dial uses counter readout for megacycle divisions and main tuning dial for one kilocycle increments.



Functional Circuits

SPECIFICATIONS

Frequency Range: 2-30.0 mc continuous coverage. Additional coverage from 0.2-2 mc for monitoring or laboratory use.

Type of Reception: AM, upper or lower sideband and CW.

Calibration: 1 kc per dial division. Direct reading in megacycles and kilocycles. One turn of main tuning dial covers 100 kc on all bands.

Circuit compensation for crystal finishing tolerances minimizes the need for recalibration when switching bands.

Tuning: Linear, divided into 30 one megacycle bands.

Frequency Stability: After 20 minute warm-up and calibration to the nearest 100 kc point, over-all stability due to temperature, humidity, pressure and voltage variation will be 200 ppm $\pm$ 400 cps for carrier frequencies from 2-7 mc and 30 ppm $\pm$ 400 cps for carrier frequencies above 7 mc.

Sensitivity: SSB and CW — 0.6 for NLT 10 db carrier on, carrier off (2-30 mc).

3 uv for NLT 10 db carrier on, carrier off (.05-2.0 mc).

4 uv for NLT 10 db carrier on, carrier off (0.2-0.5 mc).

AM — 3 uv for NLT 10 db $\frac{S+N}{N}$ (2-30 mc).

15 uv for NLT 10 db $\frac{S+N}{N}$ (0.5-2.0 mc).

20 uv for NLT 10 db $\frac{S+N}{N}$ (0.2-0.5 mc).

AGC Time Constants: Rise time — 0.8 millisecond.
Decay time — 0.3 second.

AGC Characteristics: Audio output variation less than 6 db for RF inputs from 5-50,000 uv. Not more than 3 db change in audio output with RF signals from 50,000 uv to 1 v.

Rejection Notch: Not less than 40 db.

BFO: Supplied by 500 kc crystal.

Image Rejection: Not less than 50 db.

Input-Output Meter: Input calibrated in decibels above AGC threshold. Output level calibrated for either 0 dbm or +10 dbm.

IF Output: 50 ohm impedance, 500 kc.

Audio Output: 4 ohm and 600 ohm, unbalanced 1.0 watt, distortion less than 10%. 600 ohm, balanced, 0 dbm for connection to telephone line. Distortion less than 1%.

RF Input: 50 ohm, unbalanced.

Ambient Temperature Range: 0° C to 50° C.

Ambient Humidity: Up to 90%.

Power Requirements: 125 watts, 115 v or 230 v, 50-400 cps. For 28 v dc operation, the internal ac supply unit is replaced by an optional dc unit.

Dimensions: 14 $\frac{3}{4}$ " W, 6-9/16" H, 13-1/64" D. Mounting kit available for 19" RETMA rack.

Weight: 26 lbs.



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