

HEATHKIT "COMANCHE" MOBILE RECEIVER

MODEL MR-1



SPECIFICATIONS

8 Tube Superheterodyne Receiver with Intermediate Frequency Band-pass Crystal Filter.

Intermediate Frequency: 3 mc.

Frequency Coverage:

80 Meter Band:	3.5 - 4.0 mc.
40 Meter Band:	7.0 - 7.3 mc.
20 Meter Band:	14.0 - 14.35 mc.
15 Meter Band:	21.0 - 21.5 mc.
10 Meter Band:	28.0 - 29.7 mc.

Intermediate Frequency Crystal Filter:

Center Frequency:	3.0 mc.
Bandwidth at -6 db:	3.0 kc.
Bandwidth at -60 db:	10.0 kc maximum.
Hermetically sealed.	

Panel Controls:

BFO tuning.
 RF gain.
 AF gain - ON - OFF.
 CW - SSB - AM.
 Noise Limiter.
 AVC.
 Main tuning.
 Band switch.
 Antenna trimmer.

Tube Complement: 6BZ6 - RF amplifier.
 6EA8 - Mixer-oscillator
 6BZ6 - First IF amplifier.
 6EA8 - (1/2) Second IF amplifier.
 6EA8 - (1/2) "S" meter amplifier.
 6BE6 - Product detector.
 6T8 - First audio - Detector -
 AVC - Noise Limiter.
 6AQ5 - Audio output.
 OA2 - Voltage regulator.

Signal to Noise Ratio: 10 db at 1 microvolt sensitivity or less.

Power Required: Filaments - 12 V at 1.65 amp AC or DC.
 6V at 3.3 amp AC or DC.
 B+ Voltage - 300 V DC at 125 ma.
 Total power - 57.3 W.

Net Weight: 15 lbs.

Shipping Weight: 19 lbs.

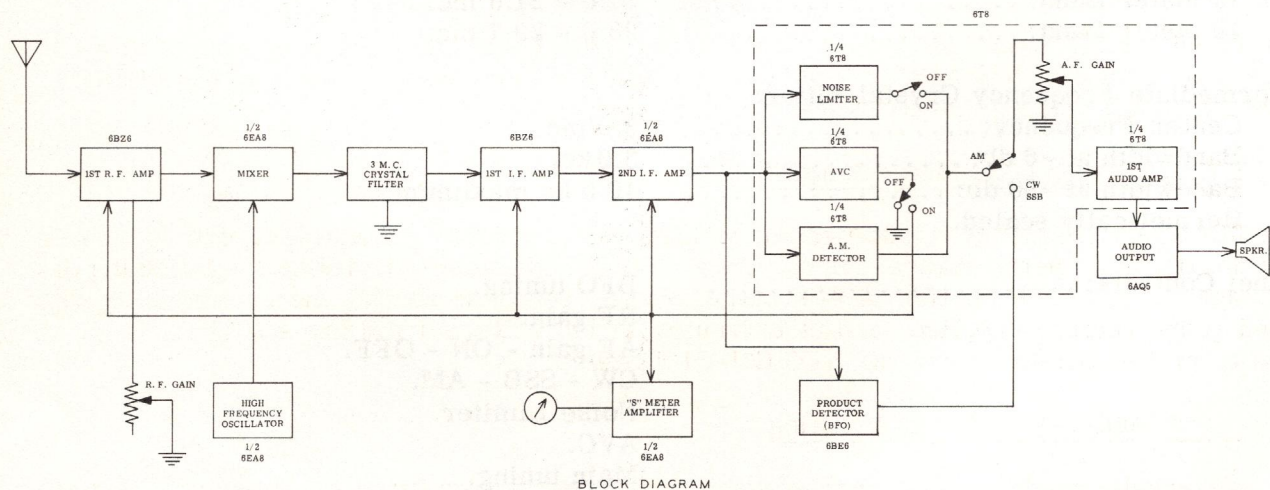
Cabinet Size: 6 1/8" H x 12 1/8" W x 9 15/16" D.

INTRODUCTION

The Heathkit MR-1 "Comanche" Receiver was designed to provide reliable reception of continuous wave amplitude modulated phone, code and single sideband signals on amateur frequencies in mobile service, under a wide variety of operating conditions.

The "Comanche" Receiver was primarily intended as a companion unit to the new Heathkit MT-1 "Cheyenne" Transmitter for mobile use; however, equally fine results may be attained in fixed station applications when the proper antenna and power sources are provided.

It is a superhetrodyne receiver having a basic sensitivity of less than 1 microvolt with a signal to noise ratio of approximately 10 db for 1 microvolt input on all bands. The receiver features a crystal lattice type filter at an intermediate frequency of 3 mc to obtain sharp selectivity and eliminate image response without resorting to double conversion.



The block diagram above and the following circuit description will be invaluable to the builder in understanding the operation of the Receiver and will aid him in the later step-by-step construction of the unit.

CIRCUIT DESCRIPTION

First RF Amplifier

Coaxial connection is made to the input circuit, which was designed for 52Ω impedance. Three separate rosin-impregnated high Q coils with a cellulose-nitrate protective coating tune each band and all coils have been preset at the factory. The oscillator coils will require slight tuning to bring bandwidths and band edges into proper relation to the calibrated dial drum. The mixer coils require slight adjustment for tracking purposes only. A 6BZ6 remote cutoff pentode is used as a high gain radio frequency amplifier stage. This stage has AVC or MVC applied, a separate RF gain control in its cathode circuit, and both input and output circuits are tuned to provide maximum gain and image rejection. Antenna windings have grounded center taps with both primary and secondary windings switched for band changing. Ceramic band switch wafers are used for all band switching.

Converter

The pentode section of a 6EA8 high frequency triode-pentode is used as a mixer-oscillator. This tube provides a low mixer noise level. The triode section is used for the high frequency oscillator portion of the Receiver in a tuned-grid, tuned-plate circuit which is coupled to the mixer section only by the interelectrode capacitance of the tube, thus adding to the stability of this stage. In addition, all coils have frequency-determining capacitors mounted directly upon them, and are temperature compensated to reduce drift due to heating. This section is shielded and located away from heat producing elements. Separate coils are provided for each band so that calibration and bandspreading may be done without interaction on the other bands. Each band occupies practically the full dial scale, and a three-section, two-pole ceramic band switch provides complete coverage of amateur bands, 80 through 10 meters. All oscillators have regulated plate voltages applied from the OA2 voltage regulator stage.

IF Crystal Filter

The lattice type crystal filter, operating at an intermediate frequency of 3 mc, is directly coupled from the plate circuit of the 6EA8 mixer-oscillator stage to the input circuit of the following first IF stage. Shielding of the input and output circuits is provided by the main chassis center frame, and the unit is hermetically sealed. The band-pass characteristic of this filter is 3 kc at 6 db down and 10 kc maximum at 60 db down, with the top effectively flat and the selectivity skirts very sharp. This gives the "Comanche" a high order of selectivity.

First IF Amplifier

Another 6BZ6 remote cutoff pentode is used in the first IF amplifier stage operating at 3 mc. This high-gain amplifier has AVC or MVC applied, with its gain fixed for optimum performance. Its output circuit is impedance-coupled to the second IF amplifier.

Second IF Amplifier and "S" Meter Amplifier

Another 6EA8 high frequency triode-pentode is used in the second IF amplifier, with fixed gain adjusted for optimum performance. Its output circuit is impedance-coupled to the following detector stage. The triode section of this stage is used solely as an "S" meter amplifier with regulated plate voltage supplied, and is driven by signal voltage from the AVC line. AVC is selected by proper positioning of the AVC ON-OFF switch.

Detector-First Audio-AVC-Noise Limiting

A 6T8 triple-diode-triode is used in this stage to provide the multiple functions of AM diode detection, first audio amplification, rectified AVC voltage, and series type selectable noise limiting. When product detection is used, only the triode first audio section and AVC diode in this stage are used.

Product Detector

A 6BE6 heptode converter is used as product detector, with the IF frequency applied to its #3 grid. The #1 grid is part of a Hartley oscillator circuit which is controlled from the front panel.

The intermediate frequency and local oscillator frequency are mixed in this stage and their product appears in the output as an audio frequency. If the two are nominally zero beat with each other, the oscillator portion replaces the missing carrier for single sideband reception. If the two signals are separated by a frequency in the audible range, this results in the generation of an audible beat note for CW reception. This output is applied to the control grid of the first audio amplifier. Padding capacitors are mounted on the oscillator inductance and temperature compensation is used to hold drift to a minimum. A frequency spread of about 5 kc is available in this oscillator and the plate voltage is regulated.

Audio Output Amplifier

A 6AQ5 beam power amplifier is used in the audio output stage, working into the audio output transformer with a primary impedance of 5000 ohms, and a secondary impedance of 8 ohms for loudspeaker operation. Audio output to an 8 ohm permanent-magnet type speaker is rated at 2 watts and audio frequencies in the voice range from 300 to 3000 cycles are given preference.

Voltage Regulator

An OA2 tube, which holds the voltage (over its normal current range of 4 to 30 ma) constant at 150 volts, is used in this circuit to stabilize the HF oscillator and other circuits having critical requirements.

