

RACAL

RA6790/GM



HF Receiver With BITE!

Unique Features

- BITE — Built In Test Equipment finds and reports receiver operational status to the lowest replaceable unit (LRU) level with both local and remote notification.
- Single loop digital LO Synthesizer.
- Frequency control in 1 Hz tuning increments.
- 3rd Order Input Intercept Point greater than +30 dBm for exceptional signal handling capability.
- Microprocessor-based control of all receiver functions.
- Easy-to-read Liquid Crystal Displays (LCD).
- Direct module replacement without realignment.
- Complete local and remote control of receiver functions.

Options

- RS-232/RS-422/RS-432 Serial Asynchronous remote interface.
- IEEE 488C-1978 compatible.
- RF amplifier for improved sensitivity.
- Independent sideband module (ISB).
- Selectable IF bandwidths available from 100 Hz to 20 kHz (including the ISB Option).
- Other remote interfaces for your system application upon request.
- Improved internal frequency standard ± 3 parts 10^{-9} .

Standard Features

- Frequency range from 500 kHz to 30 MHz.
- AM, FM, CW, USB, LSB Reception Modes.
- Eight digit LCD frequency display readout resolution.
- Seven selectable IF bandwidth filters.
- 455 kHz second IF output.
- Fully modular construction for simplified maintenance.
- BFO synthesized tuning range of ± 8 kHz in 10 Hz increments — pushbutton selection for immediate zero reference.
- Multiple tuning rates and keypad entry of frequency.
- Internal 5 MHz frequency standard ± 5 parts in 10^{-8} per 10°C increment over the temperature range 0°C to 50°C .
- Three selectable AGC time constants.
- Selectable 1, 5, or 10 MHz reference input or output.

Extended Options

- LF/MF/HF Low Frequency, 10 kHz to 30 MHz.
- Blank front panel — remote control configuration.
- Broadband IF output.
- LED Substitute Front Panel Display.
- 100 Channel memory scanning with tune to list capability.

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Courtesy of <http://BlackRadios.terry.org>

Functional Description

The simplified block diagram illustrates the principal circuits contained in the RA6790/GM Receiver. The frequency selection information, from the front panel keypad or the tuning wheel encoder, is brought through the digital control/display logic module to the first LO module. The output signal (with a range of 40.955 MHz to 70.455 MHz) is applied to the mixer to derive the first IF of 40.455 MHz. This output is filtered, amplified and combined in the second mixer with the second LO frequency of 40 MHz to derive the 455 kHz second IF.

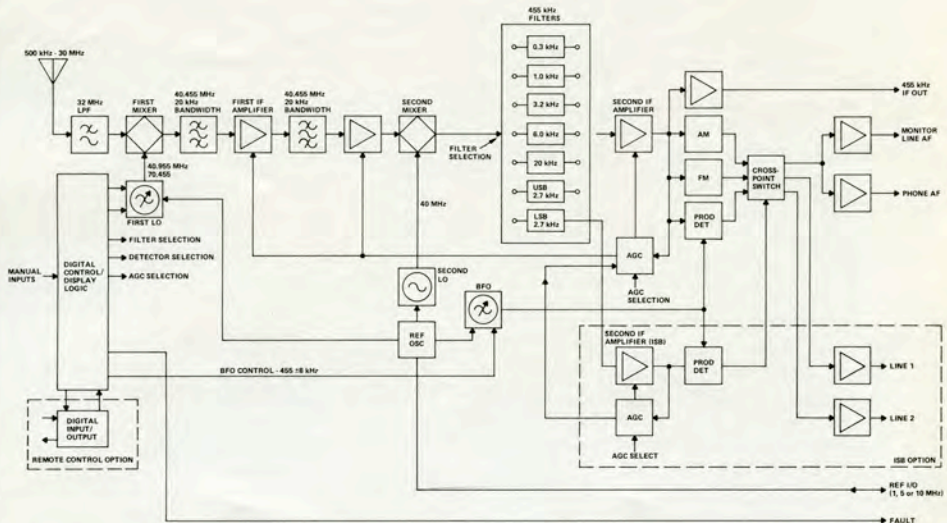
The second mixer output is brought through the selected filter, amplified, and applied to the detector circuits. The selected detector output is brought through a crosspoint switch which routes the desired signals to the output line amplifiers and phone for audio to the front panel PHONES jack and to the rear panel audio output connector. The second IF amplifier output is also applied to a 455 kHz output amplifier and to the AGC detector/control circuit.

The Filter/Detector/AGC selection commands from the front panel push-buttons are brought through the digital control/display logic module and applied to the appropriate selection control circuits. If the receiver is operated from a remote control device, the optional digital I/O module receives the command word from the remote device and provides the required commands to the digital control/display logic module.

HF Receiver Series

The RA6790 Series has been developed and manufactured to meet the requirements for a digitally controlled state-of-the-art general purpose, low-cost HF receiver. The RA6790 Series is designed to provide HF receiver users with maximum flexibility for applications requiring search, collection, analysis, master/slave or D.F. receivers. Cost effectiveness and flexibility of configuration is accomplished by providing maximum commonality of modules throughout the receiver Series. Modular interchangeable units allow you custom tailoring to your specific HF receiver needs, while minimizing life-cycle costs. Racal's technical excellence and rigid quality control assure you of outstanding HF receiver performance. The RA6790 Series includes:

- RA6790/GM General-Purpose Receiver
- R-2174 (P)/URR MIL Nomenclatured Version
- RA6791 LED Front Panel
- RA6793 Channel Scanning Receiver
- MA6004 Receiver Control Unit



Technical Specifications

Frequency Range

500 kHz to 30 MHz

Frequency Selection

1 Hz increment

Frequency Tuning

By keyboard entry or continuous tuning with selectable rates, FAST (1000 Hz), SLOW (30 Hz), and FINE (1 Hz) increments; BFO continuous in 10 Hz increments.

Frequency Indication

8 digit electronic readout of tuned frequency to 1 Hz; 3 digit and sign readout of BFO relative to IF center ± 8.0 kHz

Frequency Stability

± 5 parts in the 10^6 per 10°C temperature increment over the range 0°C to 50°C using internal 5 MHz reference oscillator. Provision for an external 1, 5 or 10 MHz reference input/output. 0 dBm nominal into 50 Ohms.

Modes of Operation

CW/A1 Continuous Wave; CW/A2 Modulated Continuous Wave; USB/LSB (upper/lower sideband) A3A, A3H, A3J, A2A, A2H, A2J; AM/A3 Amplitude Modulation; A4 (Facsimile) ISB/A3B Independent Side Band (optional); FM/F3 Telephony.

Input Impedance

50 ohms nominal, 2:1 VSWR Type N Connector

Noise Figure

< 15 dB

Sensitivity (500 kHz to 30 MHz)

- SSB - 113 dBm ($0.5 \mu\text{V}$) for 10 dB (S+N)/N Ratio.
- AM -99 dBm ($2.5 \mu\text{V}$) for 10 dB (S+N)/N Ratio in a 6 kHz bandwidth

Overall Selectivity

Nominal Bandwidth Selectivity (Capability of selecting and operating with any of the standard or optional IF Bandwidth Filters)

SSB/ISB	>450 to 3000 Hz @ -3 dB
	<-600 to 4300 Hz @ -60 dB
CW1	>300 Hz @ -3 dB
	<2000 Hz @ -60 dB
CW2	>1000 Hz @ -3 dB
	<4500 Hz @ -60 dB
AM1	>3.2 kHz @ -3 dB
	<8.0 kHz @ -60 dB
AM2	>6.0 kHz @ -3 dB
	<14.0 kHz @ -60 dB
AM3	>20 kHz @ -3 dB
	<80 kHz @ -60 dB

Dynamic Range

- RF: > 180 dB/Hz
- Instantaneous: > 105 dB/Hz

AGC

Control Range: An increase of 110 dB above AGC threshold will result in a change of output of less than 3 dB.

Threshold Range (preset): -113 dBm to -100 dBm

Time Constants:

Attack: 20 msec

Decay: Short < 30 msec

Medium 200 \pm 100 msec

Long 3.75 seconds \pm 1.25 msec

Manual/Automatic Gain Control

Provision is made on the front panel to select, and by use of the RF Gain Control, to manually control the AGC threshold anywhere within the range of 110 dB above the preset AGC threshold level.

Intermodulation (Out of Band)*

For signals 100 kHz or more from receiver tuned frequency the third order intercept point is greater than +30 dBm. Second order intercept point is greater than +60 dBm.

*Below 1.5 MHz these limits may be exceeded.

Intermodulation (In Band)

Better than -50 dB for two -10 dBm input signals within the IF passband when measured at the IF or line AF output.

Cross Modulation

The level of a 30% modulated signal, 50 kHz off-tune necessary to cross modulate an on-tune carrier to a depth of 3% shall be greater than +21 dBm (2.5 volts)

Blocking

- On Tune: Less than 10% distortion for +13 dBm (1 volt) 30% Modulated AM input signals.
- Off Tune: No blocking effect is discernible on a 30% modulated on-tune signal when in the presence of a +23 dBm (3 volt) unmodulated carrier 50 kHz off-tune.

Phase Jitter

Total RMS deviation of a signal, due to the addition to Phase noise of the receiver local oscillators is less than 0.15 Hz at a frequency 1500 Hz from the center frequency and .3 Hz at a frequency 250 Hz from the center.

Reciprocal Mixing

The apparent noise appearing at the receiver input when in a 3 kHz bandwidth, caused by a 0 dBm signal 100 kHz off tune shall be less than -100 dBm.

Image and Spurious Rejection

Greater than 80 dB, for signals at least ± 50 kHz from tuned frequency

Internal Spurious Responses

< -124 dBm.

Technical Specifications (Cont.)

Outputs

1. IF: Frequency 455 kHz, Impedance 50 Ohms. Level -10 dBm nom. Connector BNC.
2. Following outputs available at rear panel audio connector (25 pin Type D). AF: 100 Hz to 16 kHz for -3 dB.
 - a. 1W nominal into 8 Ohm load. Distortion < 3% at 500 mW.
 - b. Monitor: Metered Line output for non ISB receivers. Distortion < 2%.
 - c. Line 1. Line output for non ISB modes when ISB installed. 1 mW at 600 Ohms balanced. Distortion < 2%.
 - d. Line 2. Line output for LSB in ISB mode. 1 mW at 600 Ohms balanced. Distortion < 2%.AGC: Diversity Connection with ground which provides dc voltage 10 volts to 4 volts to signal levels between threshold and +110 dB. Similar connection for ISB channel when fitted.
Fault: Indication of fault condition is available at the rear panel.
3. Phone: 30 mW into 600 Ohm load. Distortion < 3% at 10 mW.
Connector: Front Panel Phone Jack

Status Indication

Front panel indication of status under local and remote control, remote indication of status under local and remote control; BITE (Built-In Test Equipment) finds and reports receiver operational status to the lowest replaceable unit level (LRU) with both local and remote notification.

Front Panel Controls and Indicators

Frequency control keyboard. Main Tuning control (rotary shaft encoder); TUNE RATE control (fast, slow, fine); LOCK control (disables frequency tuning); BFO. BFO CENTER; ENTER control (frequency); LOCAL/REMOTE control; AM, CW, USB, LSB, FM, ISB U/L. IF BW (5 filter selectors); METER RF/AF select; MAN (manual gain control); SHORT, MED, LONG (AGC TIME CONSTANTS); IF Gain control; AF Gain control; MAIN LINE LEVEL (preset control); ILSB LINE LEVEL (preset control); POWER, On/Off.

Indicators

FREQUENCY MHz (8 digits); BFO kHz (3 digits, ± sign); RF Meter indication; AF Meter Indication; Bandwidth displays; AGC display; Mode display; Tuning Rate display; BFO tone indication; Remote indication; Fault indicator (LED).

Rear Panel Connectors

Antenna Input Connector (Type-N); IF Output Connector (BNC); Power Input Connector; Digital Input/Output Connector - optional; REF Input/Output Connector (BNC); Ground Terminal/Audio Output Connector (Type-D).

Remote Control (Optional)

- Full remote control of all receiver parameters by either:
1. Serial asynchronous, ASCII character oriented with strap selectable baud rate of 50 baud to 19.2 kilobaud, selectable MIL-STD-188C or EIA Standard RS-232-C/RS-422/RS-423 compatible, 2 byte-serial.
 2. Byte-serial bit-parallel IEEE standard 488C-1978 compatible, or
 3. other, user specified, interface formats.

Environmental

1. Operating Temperature: 0°C to 50°C
2. Operating Humidity: 10% to 95% non-condensing.
3. Altitude: Operation to 15,000 ft.
4. Bench Handling: MIL-STD-810C, Method 516.2, Procedure V.
5. Vibration: MIL-STD-810C, Method 514.2, Procedure X.
6. Storage Conditions:
 - a. Temperature Range: -40°C to +70°C
 - b. Relative Humidity: 10% to 95% non-condensing
 - c. Altitude: Up to 40,000 feet
 - d. Fungus: Fungi identified in MIL-STD-810, Method 508.1, Procedure I.

Primary Power

115/230 V ±10%, 48 Hz to 420 Hz, single phase

Power Consumption

Less than 40 Watts (nominal)

Dimensions

Suitable for 19 inch (48.3 cm) rack or desk top console mounting:

Height: 5¼ in. (13.33 cm)

Width: 19 in. (48.3 cm)

Depth: 18.5 in. (47 cm)

Weight (approx.)

30 lbs (13.5 kg)

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