RA6772E (R-2130/GRR) Manual, Remote, Computer Controlled HF Receiver

The RA6772E HF Communications Receiver is a fully synthesized, tunable, solid state receiver, suitable for all forms of reception and monitoring over the frequency band of 1.0 to 30 MHz.

Designed specifically for surveillance and communication applications and site update programs, this receiver is easily integrated into existing operator controlled systems while simultaneously providing the capability for full computer controlled system architecture.

Features

- Frequency range of 1.0 MHz to 30 MHz
- 3rd order input intercept point greater than +35 dBm
- 2nd order input intercept point greater than +60 dBm
- Fully synthesized
- Tuning increments in 10 Hz steps; fast tuning rates in 100 Hz or 1 MHz are switch selectable
- RS-232-C or MIL-STD-188C serial asynchronous computer interface available by the addition of two printed circuit boards
- Synthesized BFO tuning in 10 Hz steps over ±8 kHz range
- LED tuned frequency and BFO displays
- Standard detection modes are AM, FM, CW, LSB, USB
- Five selectable crystal IF filters
- Selectable AGC time constants
- Fully modular construction for ease of maintenance
- Direct module replacement without realignment
- Frequency stability of ±1 part in 10^6 is provided as standard

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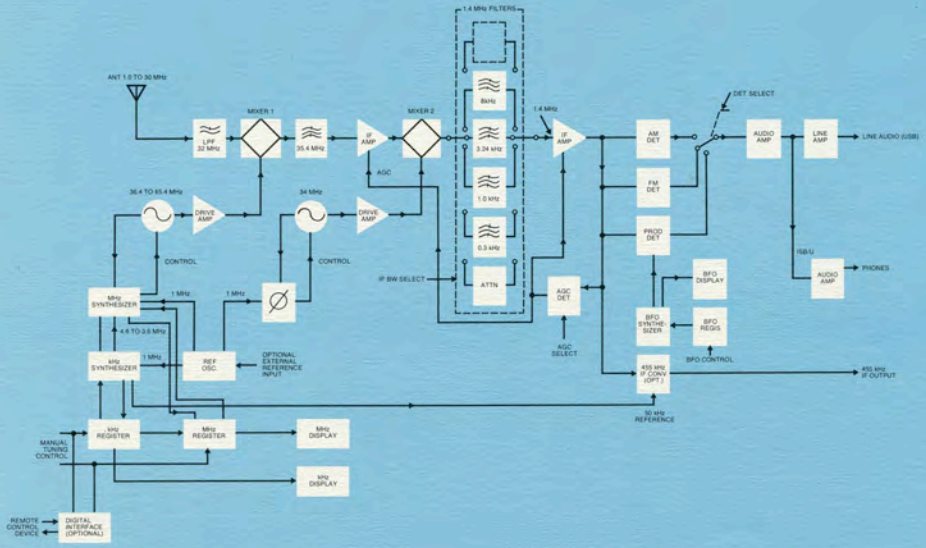

Figure 1. Simplified Block Diagram, RA6772E Receiver

Functional Description

Figure 1 is a simplified block diagram of the RA6772E Receiver. The digital or manual inputs discretely select the receiver tuned frequency in 10 Hz increments, AGC ON/OFF, AGC time constants, the detection mode, IF Bandwidth, BFO frequency and receiver gain.

The commands for these functions may be transmitted to the optional receiver control module (A6) through the input/output connector from a digital computer or from a Racal MA6003 Command Control Unit.

The input signal from the antenna is applied through a 32 MHz low pass filter to the first mixer, where it is combined with a variable frequency output from the synthesizer. This frequency, in the 36.4 to 65.4 MHz range, is selected by external controls, and is dependent on the frequency of operation. The synthesizer is tuned in 10 Hz or greater steps by a command word from the manual or remote tuning control logic.

The IF output from the first mixer is fed via a 35.4 MHz band pass filter and an IF amplifier to the second mixer, where it is combined with a 34 MHz output from the synthesizer to provide a 1.4 MHz IF output. Dependent upon the mode selected, the 1.4 MHz signal is then fed to the SSB or IF selectivity filters.

The output from the selected filter passes via the main IF amplifier to an AGC amplifier and detector, which controls the gain of the various IF amplifier stages, and to the detector stage. A product detector is provided for the CW/SSB modes, an envelope detector for DSB and an FM detector.

The RA6772E Receiver may be controlled via a character-oriented, serial asynchronous command message as an option. The receiver has been fully wired with an external I/O connector, ready to receive the necessary plug-in modules.

Options Available

A variety of options are available to derive numerous versions of the RA6772E receiver. These options include, but are not limited to:

- Alternate IF bandwidth filters
- IF output frequencies of 455 kHz, 100 kHz, or 15 kHz
- Alternate detection modes such as ISB
- Higher stability frequency standards are available
- Remote control via a Racal MA6003 command control unit
- Computer Control. The basic receiver is fully wired for computer control including an I/O connector on the rear panel, and connectors for the installation of printed circuit assemblies.
- Computer control formats. Serial asynchronous RS-232-C MIL-STD-188C. Many other special formats are available on request.

Maintenance

The fully modular construction of the receiver allows simple first line maintenance by module replacement. Like modules are interchangeable without need of adjustment and with no performance degradation.

Construction

A rigid, cast, full width chassis provides the basis for the receiver main frame, the general construction is highly resistant to the effects of shock and vibration.

Technical Specifications

Frequency Range
1.0 MHz to 30 MHz.

Frequency Selection
10 Hz increment.
Tuning Rates:
SLOW—2.5 kHz/turn, 10 Hz steps
FAST—50 kHz/turn, 100 Hz steps
SWITCH Selection of 1 MHz steps

Frequency Stability
± 1 part in 10^6. (Standard) High stability options available.

Modes of Operation
USB/A3J Upper Side Band; LSB/A3J Lower Side Band; CW/A1 Continuous Wave; AM/A3 Amplitude Modulation; FM Frequency Modulation.

Sensitivity
SSB/ISB: 0.5 μV (−113 dBm) for 10 dB S+N/N ratio.
AM: (8 kHz bandwidth) 2.5 μV (−99 dBm) for 30% modulated 10 dB S+N/N ratio.

Image/Spurious Rejection
80 dB.

Intermodulation (Out of band)
Third order intercept point greater than +35 dBm.
Second order intercept point greater than +60 dBm.

(In-band)
−50 dB for two −30 dBm in band signals.

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 2.5 Volts (+21 dBm).

Blocking
No blocking effect is discernible on a 30% modulated on-tune signal when in the presence of a 3-volt (+22.5 dBm) unmodulated carrier 50 kHz off-tune.

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 1.0 μV (−107 dBm).

IF Bandwidths
Standard IF filters are 300 Hz, 1 kHz, 3.2 kHz, 8 kHz and 16 kHz.

Selectivity

SSB/ISB:	(3.24 kHz bandwidth)
	>180 to 3420 Hz @ −3 dB
	<−350 to 3950 Hz @ −60 dB
CW1:	>200 Hz @ −3 dB
	<2500 Hz @ −60 dB
CW2:	>1000 Hz @ −3 dB
	<4000 Hz @ −60 dB
AM1:	>3.24 kHz @ −3 dB
	<4.3 kHz @ −60 dB
AM2:	>8.0 kHz @ −3 dB
	<30 kHz @ −60 dB
AM3:	>16 kHz @ −3 dB
	<32 kHz @ −60 dB

BFO
±8 kHz synthesized in 10 Hz steps and displayed with sign on a 3 digit LED display.

Input Impedance
50 ohms nominal, 2.1 VSWR; Type BNC Connector.

AGC
Range: An increase in input of 90 dB above 2 microvolts (−101 dBm) will produce an output change of less than 3 dB. Time Constants: Attack: <20 msec. Decay: Short <30 msec; Med 200 ±50 msec; Long 4 ±1 sec.

Dynamic Range
120 dB minimum.

Outputs
Phone Output: 10 mw nominal into 600 ohms at 1% distortion.
Line Output: Independently adjustable to plus 6 dBm into 600 ohm balanced load.
Distortion 0.3% maximum.
1.4 MHz IF output.

Rear Panel Connectors
Antenna Input Connector (BNC)
IF Output Connector (BNC) 50 ohms, level −10 dBm nominal.
5 MHz REF Input Connector (BNC) 50 ohms, level 0 dBm nominal.
Power Input Connector
Digital I/O Connector
AF Output Connector
Ground Terminal

Technical Specifications continued

Front Panel Controls and Indicators

MHz Frequency Control (rotary switch)
kHz/BFO Frequency Control (rotary control)
MHz/kHz 7-digit Decimal Display
BFO 3-digit Decimal Display with Sign
Tuning Mode Switch (FAST/SLOW/LOCK/BFO/REMOTE)
AGC Selector (OFF/SHORT/MEDIUM/LONG)
Mode Selector: LSB, USB, CW, AM, FM
Filter Selector: 0.3, 1.0, 3.2, 8, 16 kHz
AF Gain Control
IF Gain Control
Meter
Meter Switch
Line Level Preset Adjuster
Phone Jack
"Out of Lock" Warning Indicator Light
Power On/Off Switch
Circuit Breaker

Environment

a. Operating Temperature: 0° to +50°C.
b. Storage Temperature: −40° to +71°C.
c. Humidity: 10% to 95% at 40°C.
d. Bench Handling: MIL-T-4807, Method 4A.
e. Vibration: MIL-STD-810B, Method 514, Procedure XI, Part 1.
f. Altitude: Operation to 10,000 ft.

Primary Power

120/240 volts, ±10%, 48 − 420 Hz, single phase.

Power Consumption

75 watts (nominal).

Dimensions

Suitable for 19 in. (48.3 cm.) rack or desk top console mounting.
Height: 8.75 in. (22.2 cm.)
Width: 19 in. (48.3 cm.)
Depth: 19.9 in. (50.6 cm.)

Weight (approx.)

45 lbs. (20.3 kg.)

Specifications subject to change without notice

COMMAND/STATUS WORD

CHARACTER								
1	SYNC							BYTE
2	STATUS OUT	STATUS REQ.	ADDRESS					
3	FREQUENCY 10 MHz							FREQUENCY 1 MHz
4	FREQUENCY 100 kHz							FREQUENCY 10 kHz
5	FREQUENCY 1 kHz							FREQUENCY 100 Hz
6	FREQUENCY 10 Hz							MODE
7	0	SYNTH. LOCK	AGC	AGC				BANDWIDTH
8	BFO 100 Hz							BFO 10 Hz
9	GAIN							BFO 1 kHz

Command Word Format

The RA6772E Receiver can be controlled via a character oriented serial asynchronous command word. The receiver also provides monitoring of all command information when requested by the computer. Receiver address decoding and data rate selection is by means of jumper pins in the external I/O connector. This feature permits the receiver to be installed in any assigned position.

The above table depicts the command word format. Data levels are selectable MIL-STD-188C or RS-232-C. Control of the receiver may also be furnished by a local or remotely located MA6003 Receiver Command Control Unit.

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