

# RA6775-6 Microprocessor Controlled LF/MF/HF Receivers



The RA6775-6 LF/MF/HF receiver is a fully synthesized, microprocessor based receiver designed for communication or monitoring over the frequency range of 15 kHz to 30 MHz.

Designed for manual and/or computer control, the receiver permits the man/computer interface to be interactive. Control capability is firmware adaptable to conform to your system requirements.

## Features

- Frequency range of 15 kHz to 30 MHz
- Programmable microprocessor design
- Local, remote, computer and interactive operational modes
- Up to 50 channel memory of all receiver parameters
- Power failure retention of operational parameters
- Complete computer/man interactive control capability
- RS-232-C or MIL-STD-188C control formats as standard
- Firmware adaptable to existing or customized data formats
- Frequency entry by keyboard, or shaft encoder
- Handoff to or input from out station processors
- Selectable data rates of 9.6K baud or 19.2K baud
- Fully synthesized
- Tuning increments in 10 Hz steps or fast tuning rate in 100 Hz steps switch selectable together with keyboard entry of required frequency
- Synthesized BFO tuning in 10 Hz steps over  $\pm 8$  kHz range
- LED tuned frequency and BFO displays
- Standard detection modes are AM, FM, CW, LSB, USB
- Five selectable crystal IF filters
- Three selectable AGC time constants
- Fully modular construction for ease of maintenance
- Direct module replacement without realignment
- Frequency stability of  $\pm 1$  part in  $10^6$  is provided as standard,  $\pm 1$  part in  $10^7$  optional

**RACAL**  
COMMUNICATIONS, INC.

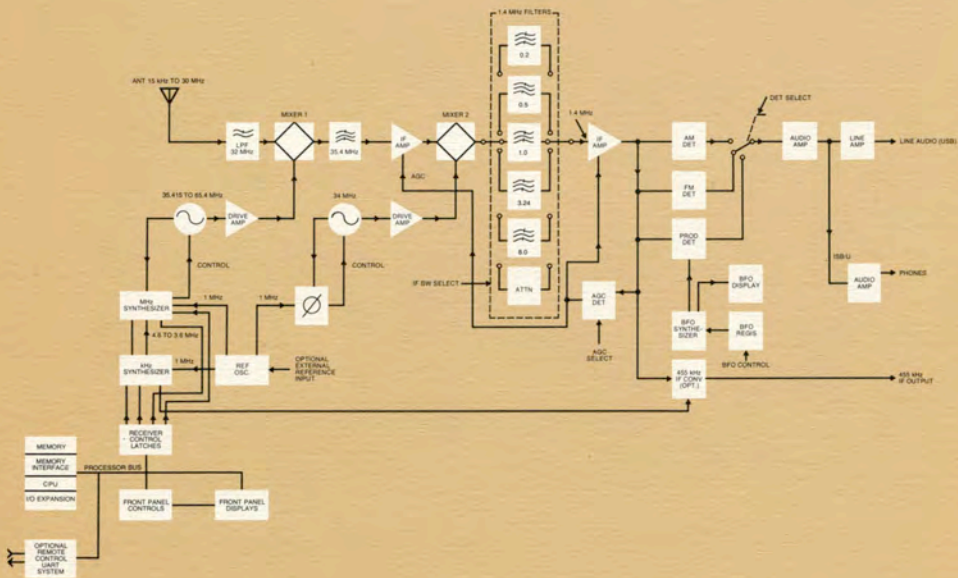


Figure 1. Simplified Block Diagram, RA6775-6 Receiver

## Functional Description

Figure 1 is a simplified block diagram of the RA6775-6 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 and BFO (LLO) frequency.

The RA6775-6 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, and with 10 bits of latched ancillary system data.

The input signal from the antenna is applied through a 32 MHz low pass filter, or in the case of the RA6775-6A, an RF amplifier, to the first mixer, when it is combined with the variable frequency output from the synthesizer. This frequency, in the 35.415 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 from the

local 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, is present for FM reception.

In addition, the 1.4 MHz IF is converted to 455 kHz and brought out a rear panel connector for those applications requiring external demodulation.

# Technical Specifications

## Frequency Range

15 kHz to 30 MHz

## Frequency Selection

10 Hz increments

## Frequency Tuning

By keyboard entry or continuous tuning with selectable rates, FAST (100 Hz) and SLOW (10 Hz) increments. BFO continuous in 10 Hz increments.

## Frequency Indication

- (a) 7 digit electronic readout of tuned frequency to 10 Hz.
- (b) 3 digit and sign readout of BFO relative to IF center  $\pm 8$  kHz.

## Frequency Stability

$\pm 1$  part in  $10^6$  using internal 5 MHz reference oscillator. Provision for an external 5 MHz reference input. 0 dBm nominal into 50 ohms.

## Modes of Operation

USB/A3J Upper Side Band; LSB/A3J Lower Side Band; ISB/A3B Independent Side Band (optional); CW/A1 Continuous Wave; AM/A3 Amplitude Modulation; FM Frequency Modulation.

## Selectivity

|          |  |
|----------|--|
| SSB/ISB: | (3.24 kHz bandwidth)<br>>180 to 3420 Hz @ -3 dB<br><-350 to 3950 Hz @ -60 dB |
| CW1:     | >200 Hz @ -3 dB<br><2500 Hz @ -60 dB   |
| CW2:     | >500 Hz @ -3 dB<br><2000 Hz @ -60 dB   |
| CW3:     | >1000 Hz @ -3 dB<br><4000 Hz @ -60 dB  |
| AMI:     | >3.24 kHz @ -3 dB<br><4.3 kHz @ -60 dB                                       |
| AM2:     | >8.0 kHz @ -3 dB<br><30 kHz @ -60 dB   |
| AM3:     | >16 kHz @ -3 dB<br><32 kHz @ -60 dB  |

## Input Impedance

50 ohms nominal, 2:1 VSWR; Type BNC Connector

## AGC

Range: An increase in input of 90 dB above 2 microvolt will produce an output change of less than 3 dB. Time Constants (USB/LSB/ISB): Attack: <20 msec. Decay: Short <30 msec; Med 200  $\pm$  50 msec; Long 4  $\pm$  1 sec.

## Dynamic Range

120 dB minimum

## Image/Spurious Rejection

80 dB. 20 kHz or more removed from tuned frequency.

## Internal Spurious Responses

Not greater than 3 dB above noise level in a 3 kHz bandwidth.

## 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  $\mu$ V. (-107 dBm).

## Sensitivity (100 kHz to 30 MHz)

- (a) RA6775-6A  
SSB. 0.3  $\mu$ V (-117 dBm) for 10 dB S+N/N ratio.  
AM. 1.6  $\mu$ V (-103 dBm) for 30% modulated 10 dB S+N/N ratio in 8 kHz bandwidth.
  - (b) RA6775-6B  
SSB. 0.5  $\mu$ V (0113 dBm) for 10 dB S+N/N ratio.  
AM. 2.5  $\mu$ V (-99 dBm) for 30% modulated 10 dB S+N/N ratio in 8 kHz bandwidth.
- NOTE: Below 100 kHz the sensitivity will not degrade by more than 6 dB per octave.

## Intermodulation (In band)

Better than -50 dB for -36 dBm input signals when measured at the IF or line AF output.

## Intermodulation (Out of band)\*

- (a) RA6775-6A  
Third order intercept point greater than +20 dBm. Second order intercept point greater than +50 dBm.
- (b) RA6775-6B  
Third order intercept point greater than +35 dBm. Second order intercept point greater than +60 dBm.  
\*Below 1.5 MHz these limits may be exceeded.

## Cross Modulation

- (a) RA6775-6A  
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 0.5 volts (+7 dBm).
- (b) RA6775-6B  
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

- (a) RA6775-6A  
No blocking effect is discernible on a 30% modulated on-tune signal when in the presence of a 1 volt (+13 dBm) unmodulated carrier 50 kHz off-tune.
- (b) RA6775-6B  
No blocking effect is discernible on a 30% modulated on-tune signal when in the presence of a 3-volt (+23 dBm) unmodulated carrier 50 kHz off-tune.

## Outputs

Switched AF to internal loudspeaker.  
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.  
IF Output: -10 dBm nominal into 50 ohm load. Carrier frequency optional 1.4 MHz, 455, 100 or 15 kHz.

## Rear Panel Connectors

Antenna Input Connector (BNC) J1  
IF Output Connector (BNC) J5  
5 MHz REF Input Connector (BNC) J6  
Power Input Connector  
Ground Terminal  
Digital I/O Connector J2  
AUX SW/AF Output Connector J4  
ANT SW Select Connector J3

### Remote Control

Full remote control of the following receiver parameters by serial asynchronous, character oriented data at 9.6 of 19.2 kilobands, selectable MIL-STD-188C or RS-232 compatible.

- (a) Tuned Frequency
- (b) BFO Tuning
- (c) Bandwidth
- (d) Detection Mode
- (e) AGC Time Constants
- (f) Memory Load
- (g) Antenna Select (TTL compatible output to external devices)
- (h) Auxiliary Select (TTL compatible output to external devices)

### Status Indication

Front panel indication of status under remote control, remote indication of status under local or remote control.

### Front Panel Controls and Indicators

Frequency control keyboard.  
kHz/BFO frequency control (rotary).  
Tuning selector keys, FAST/SLOW, LOCK and BFO with LED indicators.  
MHz/kHz 7 digit decimal display.  
BFO 3 digit decimal display with sign.  
AGC selector key OFF, SHORT, MEDIUM, and LONG with LED indicators.  
MODE selector key USB, LSB, CW, AM and FM with LED indicators.  
FILTER selector key 0.2, 0.5, 1, 3.2, 8 and 16 kHz with LED indicator.  
MEMORY selector key with 2 digit decimal display of location  
+ Memory increment  
- Memory decrement  
LOAD memory load  
RECALL memory recall

LOCAL/REMOTE key with LED indicator  
AF GAIN control  
RF GAIN control  
Meter  
METER Switch AF/RF  
AF Level Line level pre-set control  
Speaker  
SPEAKER OFF/ON switch  
PHONES jack  
FAULT LED indicator  
POWER 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,  $\pm 10\%$ , 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.)