

# RACAL

COMMUNICATIONS, INC.

The Racal R-2174(P)/URR has been selected by the Defense Department as the Tri-Service general purpose HF communications receiver to replace the aging R-390's. It has been recognized and accepted by NATO for use in fixed-ground applications.

The R-2174 is designated to be used in either a manual mode or with remote digital control operating over the 0.5 to 29.999999 MHz frequency range with tuning increments of 1 Hz. The receiver is capable of receiving and demodulating A1(CW), A2 (Modulated CW), A3 (DSB), A3J (SSB Suppressed Carrier), A3B (Independent Side Band), A4 (Facsimile), F1 (FSK), F3 (Telephony), and A4 emissions as defined in Appendix A of MIL-STD-188C. The R-2174 is capable of operating with Government Secure voice modems. The receiver is of modular construction and uses a building block approach to enhance flexibility. All modules and sub-assemblies are readily accessible and removable from chassis for ease of maintenance and testing without the use of special tools or soldering devices. The R-2174 carries an operational life cycle of 15 years.

Full data, documentation and training packages are available to support the R-2174, including a full provisioning package, long lead items list, PPL's and SERD's. Two operational and maintenance manuals have been developed: one at the Organizational and Immediate Levels and the other at the Depot Level Maintenance. Depot level maintenance is simplified through the use of specially designed test fixtures. A complete canned training package including manuals, training materials and a videotape film has been developed to acquaint users with the operation and maintenance procedures.

## R-2174(P)/URR

**The R-2174(P)/URR has been selected as THE Tri-Service replacement for R-390s. It's now in use by U.S. Forces here and abroad. Its life cycle is 15 years!**



### 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.
- Up to 7 IF crystal bandwidth filters selectable.
- Complete local and remote control of all receiver functions.
- Frequency control in 1 Hz tuning increments.
- Microprocessor-based control of all receiver functions.
- Direct module replacement without realignment.
- Easy to read illuminated Liquid Crystal Display (LCD).
- 3rd Order Input Intercept Point typically greater than +30 dBm for exceptional signal handling capability.
- Single loop digital LO Synthesizer.
- Frequency range from 500 kHz to 30 MHz.
- AM, FM, CW, USB, LSB Reception Modes.

- Eight digit LCD frequency display readout resolution.
- 455 kHz second IF output.
- Fully modular construction for simplified maintenance.
- BFO synthesized tuning range of  $\pm 8$  kHz in 10 Hz increments – pushbutton for immediate zero reference.
- Multiple tuning rates and keypad entry of frequency.
- Internal 5 MHz frequency standard 5 parts in  $10^8$  per  $10^\circ\text{C}$  increment over the temperature range  $0^\circ\text{C}$  to  $50^\circ\text{C}$ .
- Three selectable AGC time constants.
- Selectable 1, 5 or 10 MHz reference input or output.

### Options

- RS-232/RS-422/RS-423 Serial Asynchronous remote interface.
- Independent sideband module (ISB).
- Selectable IF bandwidths available from 100 Hz to 20 kHz.

---

## R-2174(P)/URR General Purpose HF Receiver National Stock Numbers Receiver Mainframe and Accessory Modules

---

Following is a complete listing of National Stock Numbers (NSN) for Rascal's General Purpose HF Receiver, type R-2174(P)/URR and accessory modules.

NATIONAL STOCK NUMBER	P/N	DESCRIPTION
5820-01-092-0435	08450	R-2174(P)/URR Receiver Mainframe
5820-01-094-9394	08391	Remote Control Module
5820-01-095-6780ZX	08390	ISB Module
5915-01-094-8749ZX	08406	Filter, Std. IF BW 0.4 kHz
5915-01-094-8750ZX	08407	Filter, Std. IF BW 1.2 kHz
5915-01-095-2256ZX	08408	Filter, Std. IF BW 6.8 kHz
5915-01-094-8851ZX	08409	Filter, Std. IF BW 3.24 kHz (LSB/ISB)
5915-01-094-8852ZX	08410	Filter, Std. IF BW 3.24 kHz (USB/ISB)
5915-01-095-2257ZX	08411	IF Filter 0.4 kHz 3dB BW; 1.0 kHz 60dB BW
5915-01-094-8751ZX	08412	IF Filter 1.2 kHz 3dB BW; 3.0 kHz 60dB BW
5915-01-094-8748ZX	08413	IF Filter 3.24 kHz 3dB BW; 4.30 kHz 60dB BW
5915-01-094-8752ZX	08414	IF Filter 6.8 kHz 3dB BW; 13.6 kHz 60dB BW
5915-01-094-8753ZX	08415	IF Filter 16.0 kHz 3dB BW; 32.0 kHz 60dB BW
5915-01-094-8754ZX	08416	IF Filter 0.5 kHz 3dB BW; 3.0 kHz 60dB BW
5915-01-094-8755ZX	08417	IF Filter 1.0 kHz 3dB BW; 6.0 kHz 60dB BW
5915-01-094-8756ZX	08418	IF Filter 2.0 kHz 3dB BW; 12.0 kHz 60dB BW
5915-01-094-8757ZX	08419	IF Filter 3.0 kHz 3dB BW; 18.0 kHz 60dB BW
5915-01-094-8758ZX	08420	IF Filter 6.0 kHz 3dB BW; 36.0 kHz 60dB BW

---

## R-2174(P)/URR General Purpose HF Receiver Test Fixtures

---

Rascal's dedicated test fixtures are specifically designed to support maintenance and repair of receiver modules. Following is a listing of available test fixtures. Also available is a depot level (TRC) manual which addresses maintenance of the R-2174 receiver using Rascal's unique test fixtures.

PART NUMBER	DESCRIPTION
TF315	Test Fixture – A1 Low Pass Module
TF316	Test Fixture – A2 First Mixer
TF317	Test Fixture – A3 Second Mixer
TF318	Test Fixture – A4 Main IF
TF319	Test Fixture – A5 ISB IF
TF320	Test Fixture – A6A1 Interface
TF321	Test Fixture – A6A2 Microprocessor
TF322	Test Fixture – A7 1st LO Synthesizer
TF323	Test Fixture – A8 2nd LO BFO Synthesizer
TF324	Test Fixture – A9 Receiver Interface
TF325	Test Fixture – A10 Power Supply

---

## Technical Specifications

### FREQUENCY RANGE

500 kHz to 29.999999MHz

### 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  $\pm 8.0$  kHz.

### FREQUENCY STABILITY

5 parts in the  $10^9$  per  $10^{\circ}\text{C}$  temperature increment over the range  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  using internal 5 MHz reference oscillator. Provision for an external 1, 5 or 10 MHz reference input/output. 0 dBm nominal into 50 Ohms.



## Technical Specifications (Cont.)

### 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

<16 dB from 0.5 MHz to 1.4999999 MHz  
<13 dB from 1.5 MHz to 29.9999999 MHz

### AGC

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

Time Constants:

Attack: <20 msecs

Decay: Short <30 msecs

Medium 200 ±100 msecs

Long 3.75 seconds ±1.25 seconds

### OVERALL SELECTIVITY

A wide variety of crystal filters is available for optional requirements such as general purpose, low ripple, low shape factor, controlled delay, or linear phase.

The standard range of filters providing 15 bandwidths is tabulated below:

Bandwidth	Shape Factor	Special Features
400 Hz	6.2:1	
1200 Hz	6:1	
6.8 kHz	3.3:1	
2.7 (ISB/LSB)	1.6:1	Per MIL-STD-188C Figure 18
2.7 (ISB/LSB)	1.6:1	
0.4 kHz	2.5:1	Defined Delay
1.2 kHz	2.5:1	Defined Delay
3.24 kHz	1.4:1	Defined Delay
6.8 kHz	2:1	Defined Delay
16.0 kHz	2:1	Defined Delay
0.5 kHz	6:1	Linear Phase
1.0 kHz	6:1	Linear Phase
2.0 kHz	6:1	Linear Phase
3.0 kHz	6:1	Linear Phase
6.0 kHz	6:1	Linear Phase

### 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 100 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 +20 dBm. Second order intercept point is greater than +60 dBm.

### INTERMODULATION (IN BAND)

Better than -50 dB for two -36 dBm input signal within the IF passband when measured at the IF or line AF output.

### CROSS MODULATION

The cross modulation appearing on a -45 dBm unmodulated tuned signal due to a 30% AM signal which is no closer to the tuned signal than 100 kHz will be less than 10% if the level of the interfering signal is +15 dBm.

### TEST TONE TO TOTAL DISTORTION RATIO

The receiver TTDR is greater than 33 dB for an AM signal modulated at 1 kHz to a depth of 75%, or any level between -83 dBm and -10 dBm, when a 6.8 kHz IF bandwidth (optional Special Filter No. 4) is used.

### RECIPROCAL MIXING

The apparent noise at the input receiver with a 3.24 kHz IF bandwidth will be less than -113 dBm when the receiver is subjected to the following interfering signal conditions.

- 15 kHz offset from the receiver tuned frequency at a level of -23 dBm.
- 500 kHz offset from the receiver tuned frequency at a level of +2 dBm.

### INTERNAL SPURIOUS RESPONSES

<-124 dBm (except for 1 spurious per MHz not greater than -116 dBm).

### PRIMARY POWER

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

### POWER CONSUMPTION

Less than 40 Watts.

### 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).

### IMAGE AND SPURIOUS REJECTION

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

### OUTPUTS

- 1F: Frequency 455 kHz, Impedance 50 Ohms. Level -10 dBm nom. Connector BNC.
- AF: The following outputs available at rear panel audio connector (25 pin Type D). AF: The -3 dB bandwidth is 100 Hz to 16 kHz.
  - 1W nominal into 8 Ohm load. Distortion <3% at 500 mW.
  - Monitor: Metered AF line output. 1 mW, 600 ohms balanced <2% distortion. All receiver modes selectable at front panel.
  - Line 1. AF line output. 1 mW, 600 ohms balanced <2% distortion. Operable only with ISB option. All modes selectable at front panel except LSB.
  - Line 2. AF line output. 1 mW, 600 Ohms balanced <2% distortion. Operable only with ISB option, LSB mode.

## Technical Specifications (Cont.)

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.

### 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.
7. RF/EMI: Meets specification MIL-STD-461.

### 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); I-LSB 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 tune indication; Remote indication; Fault indicator (LED).

### REMOTE CONTROL (OPTIONAL)

Full remote control of all receiver parameters by: Serial asynchronous, ASCII character oriented with strap selectable baud rate of 50 baud to 19.2 kilobaud, EIA Standard RS-232-C/RS-422/RS-423 compatible, 2 byte-serial via 26 pin MIL-STD Circular Connector located on rear panel of receiver. Mating Connector #M83723-02R 162 6N.

### DIMENSIONS

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

Height: 5 1/4 in. (13.33 cm)

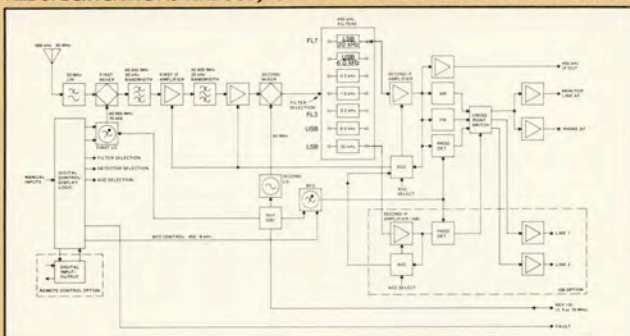
Width: 19 in. (48.3 cm)

Depth: 18.5 in. (47 cm)

### WEIGHT (Approx.)

32 lbs. (14.5 kg)

### ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTIFICATION



**RACAL**  
COMMUNICATIONS, INC.

R-2174(P) URR Functional Block Diagram

WEST COAST OFFICE  
1044 Renoir Court  
Sunnyvale, California 94087  
(408) 773-8778/79

5 Research Place, Rockville, Md. 20850 (301) 948-4420 Telex 898-456 Cable RACAL USA

DATE: 5/85

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