

RA3701 RA3702

MODULAR HF RECEIVERS



KEY FEATURES

- Frequency range 15kHz to 30MHz.
- High RF performance.
- Modular construction.
- Wide range of optional modules.
- Automatic scanning of channels and frequency.
- Serial ASCII or IEEE 488 control.
- Controller of slave receivers.
- Simple to operate.
- Comprehensive BITE.

DESCRIPTION

This family of high performance HF receivers covers the frequency range 15kHz to 30MHz.

Using a highly modular design, the same frame and modules can be configured to assemble receivers to meet a variety of different applications.

The family includes single and dual receivers and a range of optional modules may be fitted to enhance the receiver facilities. The following receivers are available:-

RA3701 Single HF Receiver with front panel controls.

RA3702 Dual HF Receiver with front panel controls.

Each of the receivers includes, as standard, a serial ASCII remote control interface with a built-in multi-addressing capability of up to 100 receivers. Alternatively, an IEEE 488 interface may be fitted. Slave receivers may be controlled in a number of ways: by computer; by using the RA3700 receiver control unit; or by the RA3701 and RA3702 receivers, which have built-in controller facilities. All front panel operating functions except power on/off switching can be controlled remotely.

Single function buttons control the most commonly used operations and four keys control the receivers' many special facilities by means of a menu system.

Comprehensive built-in test equipment (BITE), locates faults to module level and may be controlled remotely as well as locally from the front panel.

The RA3701 is a registered design in the UK (1003864) and the Federal Republic of Germany (UR41416/96).

The frequency synthesizer is patented in the UK (2026268) and the US (4304174).



RACAL COMMUNICATIONS

RA3701 RA3702

TECHNICAL SPECIFICATION

Frequency range

15kHz to 30MHz in 3Hz or 30Hz steps.

Tuning

By numeric keypad or single spinwheel tuning knob with selective tune rate.

Modes of operation

CN 414
RDS 426
AM 432
FM 438
LSB/USB 424, 426A, 426B, 432, 432A, 432B

Options

ISO 87C, 88C, 89C (RA3701)
FSK 118

BFO

Tunability ± 0.5 99kHz in 10kHz steps using the main tuning knob or by keypad entry.

Channel store

100 frequencies in non-volatile EEPROM memory with associated mode, bandwidth, AGC and BFO settings. Data memory of the memory is protected from the front panel or remotely.

Scan modes

- Channel scan between designated channels with selected dwell time at each channel (0.1s to 5.99s).
- Frequency sweep between any two frequencies with selected step size (from 0.1kHz to 999.9kHz) and sweep rate (from 1.0Hz/s to 999.9Hz/s).

In either raster scanning may be halted on detection of a signal above a threshold set at the front panel with the RF gain control.

Frequency stability

One of the following optional frequency standards may be fitted:-

- TCXO**
Accuracy ± 0.5 in 10^5
- 9442 ovened oscillator***
Temperature stability ± 0.5 in 10^5 per °C.
Ageing ± 0.5 in 10^5 per day after 3 months continuous operation.
- 9420 ovened oscillator***
Temperature stability ± 0.5 in 10^5 per °C.
Ageing ± 0.5 in 10^5 per day after 5 months continuous operation.

*Full details in Rascal Data Publications 825-2 and 827-2.

Sensitivity

For the frequency range 0.5 - 30MHz:
500 C/N: A signal of -11.5 dBm (1 μ V rms) in a 2.7kHz bandwidth gives an S+N ratio of 16dB (70dB) with the RF amplifier on and 10dB (13dB) with the RF amplifier off.
AM: A signal of -13 dBm (1 μ V rms) 70% modulated at 1kHz, via 400Hz bandwidth, gives an S+N ratio of 16dB (70dB) with the RF amplifier on and 10dB (13dB) with the RF amplifier off.

Selectivity

The following bandwidths are standard:

USB 2.7kHz
LSB 2.7kHz
Symmetrical 30Hz
30Hz
2.7kHz
60Hz
124Hz

Other filters are available as options. A total of 11 filters (giving 7 bandwidths) is fitted in the basic receiver. The optional IF Filter Module allows a further 7 filters to be added.

Reciprocal mixing

With a wanted signal of -13 dBm (1 μ V rms) in a 2.7kHz bandwidth, an unwanted signal 20kHz removed must be greater than 94dB (100dB) above the wanted signal to give a noise level equal to the noise produced by the wanted signal. At 20kHz removed the difference in level must be greater than 104dB (114dB).

Out of band intermodulation products

RF amplifier on:
Wanted -13 dBm (100mV rms) signals separated and removed from the wanted signal by 25kHz, the third order intermodulation products will be not less than 70dB (70dB) below either of the interfering signals. Third order intercept point not less than $+23$ dBm ($+25$ dBm).
RF amplifier off:
Third order intercept point typically not less than $+32$ dBm.

In band intermodulation products

Two in band signals of -13 dBm (100mV rms) with 600Hz spacing produce third order intermodulation products not greater than -50 dB (-50 dB) at the IF output and line output.

Mixing

With a wanted signal of -53 dBm (1mV rms) an unwanted signal more than 20kHz removed must be greater than -9 dBm (-5 dBm) to reduce the output by 3dB.

Cross modulation

With a wanted signal of -53 dBm (1mV rms) in a 2.7kHz bandwidth, an unwanted signal 30% modulated, more than 20kHz removed must be greater than $+3$ dBm ($+7$ dBm) to produce an output 20dB below the output produced by the wanted signal.

External spurious responses

Spurious response rejection not less than 60dB (60dB).

Image and IF rejection

Image and IF rejection not less than 90dB (90dB).

Internal spurious responses

Typically there than 1 internal spurious responses, give an output more than 30dB above the receiver noise level in a 2.7kHz bandwidth. None give an output more than 60dB above the receiver noise level in a 2.7kHz bandwidth.

Antenna input

- Input impedance 50 ohms nominal.
- The receiver will withstand, without damage, input signals of up to 50V and continuous 60V.
- Reconnection from antenna input:
0-30MHz: Not greater than -67 dBm (10 μ V rms).
30-300MHz: Not greater than -61 dBm (-63 dBm).

AGC

An increase in input of 120dB above -20 dBm (1 μ V rms) produces an output change of less than 3dB.

Short, medium and long decay times may be selected from the front panel. When the mode is changed the receiver automatically selects the best time constant, used in that mode.

IF gain control

The IF gain control may be used to set:

- Receiver gain
 - AGC threshold
 - Squish threshold
- The control range is 120dB.

Noise

Figures in () are typical values.

AF outputs

- 300mV into the internal loudspeaker.
Adjustable using the front panel volume control. May be switched off from the front panel.
- Rear panel connection for external loudspeaker. Level adjustable using the front panel volume control. Maximum output 1W into 8 ohms or 200mW into 16 ohms.
- Front panel headphone output.
Adjustable using front panel volume control. Maximum output 200mV into 16 ohms or 1W into 400 ohms. Plugging a headphones disables the internal loudspeaker.
- Rear panel line output -20 dBm to $+10$ dBm into 600 ohms balanced. Level adjustable by means of a preset control mounted on top of the receiver.

IF outputs

1) Narrow

Centre frequency 1.4MHz.
Bandwidth determined by IF filter selected.
Level -7 dBm into 50 ohms.
Optional module provides 100mV IF output.

2) Wide

Centre frequency 1.4MHz.
 -10 dB bandwidth not less than 12MHz.

Metering

The front panel bar-graph meter may be switched to meter either RF signal level or AF line level.

Remote Control

One of the following interfaces is fitted:-

- Serial RS232C complying with EIA/RS232C recommendation V.22 and V.23 Standard 9600 baud. Compatible with V.22/V.23/C. Data rate may be preset in the range 50 baud to 9600 baud.
- RS232C complying with ANSI/IEEE Std 488-1978.

Power supply

100, 120, 220, 240V, 45-65Hz.
Operates to full specification over the range $\pm 15\%$ to $\pm 10\%$ relative to tags. Withstands a mains surge of 1.50kV for up to 1 second without damage.
Power consumption approximately 65W for the basic RA3701 receiver.
Power consumption approximately 92W for the RA3702 receiver.

Environmental

The full Environmental Specification is given in Rascal Document 8250 (Issue 5, 1) available on request. The equipment is suitable for operation in fixed or transportable installations.
Operating temperature -10°C to $+55^{\circ}\text{C}$.
Storage temperature -40°C to $+70^{\circ}\text{C}$.
Relative humidity 95% at 40°C .

Dimensions

Height 133mm (5.25 in)
Width 482mm (19 in)
Depth 450mm (17.7 in) behind front panel

Weight

Approximately 14 kg (31 lb) for the basic RA3701 receiver.
Approximately 20 kg (44 lb) for the RA3702 receiver.

Optional modules

The RA3701 may be fitted with up to 5 plugin optional modules. One plugin optional module may be fitted to the RA3702.
Please consult Rascal for details of optional modules.

RACAL

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