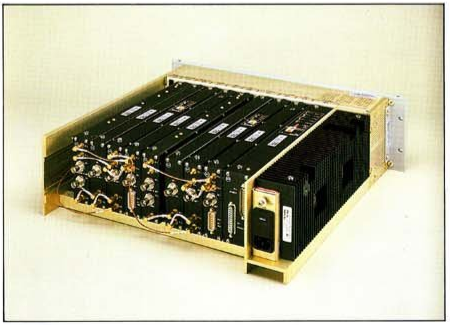
# RA3701 RA3702

## 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 MA3700 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 (1033864) and the Federal Republic of Germany (URA1416/86).

The frequency synthesizer is patented in the UK (2026268) and the US (4204174).

# RA3701 RA3702

## TECHNICAL SPECIFICATION

***Frequency range***
15kHz to 30MHz in 1Hz or 10Hz steps.

***Tuning***
By numeric keypad or single spinwheel tuning knob with selectable tune rate.

***Modes of operation***

| | |
|---|---|
| CW | A1A |
| MCW | A2A |
| AM | A3E |
| FM | F3E |
| USB/LSB | R2A, H2A, J2A, R3E, H3E, J3E |
| *Options:* | |
| ISB | B7E, B8E, B9E (RA3701) |
| FSK | F1B |

***BFO***
Tunable +/–9.99kHz in 10Hz steps using the main tuning knob or by keypad entry.

***Channel Store***
100 frequencies in non-volatile EEROM memory with associated mode, bandwidth, AGC and BFO settings. Bulk erasure of the memory is possible from the front panel or remotely.

***Scan modes***
**(a)** Channel scan between designated channels with selected dwell time on each channel (0.1s to 9.99s).
**(b)** Frequency sweep between any two frequencies with selected step size (from 0.1kHz to 999.9kHz) and sweep rate (from 10Hz/s to 999.99kHz/s).
In either mode scanning may be halted on detection of a signal above a threshold set at the front panel with the IF gain control.

***Frequency stability***
One of the following optional frequency standards may be fitted:–
**(a) TCXO**
Accuracy $\pm 1.5$ in $10^6$
**(b) 9442 ovened oscillator***
Temperature stability $\pm 3$ in $10^9$ per °C.
Ageing
$\pm 3$ in $10^9$ per day after 3 months continuous operation.
**(c) 9420 ovened oscillator***
Temperature stability $\pm 6$ in $10^{10}$ per °C.
Ageing
$\pm 5$ in $10^{10}$ per day after 3 months continuous operation.
**Full details in Racal Dana Publications 825-2 and 827-2.*

***Sensitivity***
For the frequency range 0.5 – 30MHz.
SSB/CW: A signal of –113dBm ($1\mu$V emf) in a 2.7kHz bandwidth gives an S+N/N of 16dB [19dB] with the RF amplifier on and 10dB [13dB] with the RF amplifier off.
AM: A signal of –103dBm ($3\mu$V emf) 70% modulated at 1kHz, in a 6kHz bandwidth, gives an S+N/N of 16dB [19dB] 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 | 300Hz |
| | 1kHz |
| | 2.7kHz |
| | 6kHz |
| | 12kHz |

Other filters are available as options. A total of 5 filters (giving 7 bandwidths) are 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 –113dBm ($1\mu$V emf) in a 2.7kHz bandwidth, an unwanted signal 20kHz removed must be greater than 96dB [102dB] above the wanted signal to give a noise level equal to the output produced by the wanted signal. At 80kHz removed the difference in level must be greater than 106dB [115dB].

***Out of band intermodulation products***
RF amplifier on:
With two –13dBm (100mV emf) signals separated and removed from the wanted signal by 25kHz, the third order intermodulation products will be not less than 70dB [76dB] below either of the interfering signals. Third order intercept point not less than +22dBm [+25dBm].
RF amplifier off:
Third order intercept point typically not less than +32dBm.

***In band intermodulation products***
Two in band signals of –13dBm (100mV emf) with 600Hz spacing produce third order intermodulation products not greater than –50dB [–55dB] at the IF output and line output.

***Blocking***
With a wanted signal of –53dBm (1mV emf), an unwanted signal more than 20kHz removed must be greater than +7dBm [+13dBm] to reduce the output by 3dB.

***Cross modulation***
With a wanted signal of –53dBm (1mV emf) in a 2.7kHz bandwidth, an unwanted signal 30% modulated, more than 20kHz removed must be greater than +1dBm [+7dBm] to produce an output 20dB below the output produced by the wanted signal.

***External spurious responses***
Spurious response rejection not less than 80dB [90dB].

***Image and IF rejection***
Image and IF rejection not less than 90dB [100dB].

***Internal spurious responses***
Typically fewer than 5 internal spurious responses give an output more than 3dB above the receiver noise level in a 2.7kHz bandwidth. None give an output more than 6dB above the receiver noise level in a 2.7kHz bandwidth.

***Antenna input***
**(a)** Input impedance 50 ohms nominal.
**(b)** The receiver will withstand, without damage, input signals of up to 50V emf continuously.
**(c)** Re-radiation from antenna input:
0–30MHz: Not greater than –87dBm ($10\mu$V pd).
30–100MHz: Not greater than –67dBm [–87dBm].

***AGC***
An increase in input of 120dB above –107dBm ($2\mu$V emf) produces an output change of less than 2dB.
Short, medium and long decay times may be selected from the front panel. When the mode is changed the receiver automatically selects the last time constant used in that mode.

***IF gain control***
The IF gain control may be used to set:
**(a)** Receiver gain
**(b)** AGC threshold
**(c)** Squelch threshold
The control range is 120dB.

***Note***
Figures in [ ] are typical values.

***AF outputs***
**(a)** 200mW into the internal loudspeaker. Adjustable using the front panel volume control. May be switched off from the front panel.
**(b)** 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.
**(c)** Front panel headphone output. Adjustable using front panel volume control. Maximum output 200mW into 16 ohms or 1mW into 600 ohms. Plugging in headphones disables the internal loudspeaker.
**(d)** Rear panel line output –20dBm to +10dBm into 600 ohms balanced. Level adjustable by means of a preset control mounted on top of the receiver.

***IF outputs***
**(a) Narrow**
Centre frequency 1.4MHz.
Bandwidth determined by IF filter selected.
Level –7dBm into 50 ohms.
(Optional module provides 100kHz IF output).
**(b) Wide**
Centre frequency 1.4MHz.
–3dB bandwidth not less than 12kHz.

***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:-
**(a)** Serial ASCII complying with CCITT recommendation V10 and EIA Standard RS423-A. Compatible with V28/RS232-C. Data rate may be preset in the range 50 baud to 9600 baud.
**(b)** IEEE 488 complying with ANSI/IEEE Std 488-1978.

***Power supply***
100, 120, 220, 240V. 45-65Hz.
Operates to full specification over the range –15% to +10% relative to taps. Withstands a mains surge of $\pm 50\%$ for up to 1 second without damage.
Power consumption approximately 60W for the basic RA3701 receiver.
Power consumption approximately 90W for the RA3702 receiver.

***Environmental***
The full Environmental Specification is given in Racal Document ES20 (Issue 5.1) available on request. The equipment is suitable for operation in fixed or transportable installations.

| | |
|---|---|
| Operating temperature | –10°C to +55°C. |
| Storage temperature | –40°C to +70°C. |
| Relative humidity | 95% at 40°C. |

***Dimensions***
Height 133mm (5.25 in)
Width 483mm (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 plug-in optional modules. One plug-in optional module may be fitted to the RA3702.
Please consult Racal for details of optional modules.

RACAL

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