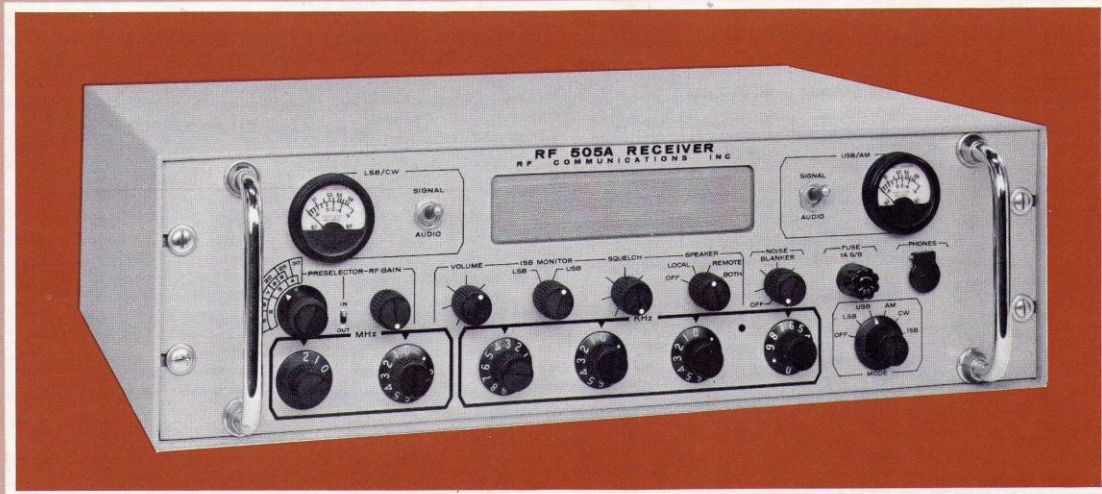


# HARRIS

Communications and  
Information Handling Equipment

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## RF-505A SSB/ISB General Purpose Receiver

### Features

VLF/LF/MF/HF

Fully Synthesized

USB/LSB/AM/CW/ISB

125dB Dynamic Range

All Electronic Switching

Built-In Speaker

All Solid State Circuitry

Versatile Power Requirements

The RF-505A is a double conversion superheterodyne receiver providing full coverage of the VLF, LF, MF and HF frequency ranges up to 30 MHz. Fully synthesized, the receiver can be digitally set to within 50 Hz of any frequency in those ranges. Modes of operation include lower sideband (LSB) upper sideband (USB), amplitude modulation (AM), continuous wave (CW) and independent sideband (ISB) for reception of voice, telegraph, teletype, facsimile and data transmissions. A universal power supply permits direct operation from a very wide range of AC and DC power sources.

Like its predecessor the RF-505, the RF-505A is totally solid state using large numbers of integrated circuits. Its design is truly state-of-the-art incorporating technological advances not even available when the original RF-505 was designed. New high linearity devices have been incorporated to improve sensitivity and to virtually eliminate spurious responses without compromising other receiver operating parameters.

The performance, reliability and construction of the RF-505A make it ideal for a wide variety of military, governmental and commercial telecommunications applications.



### FREQUENCY RANGE

The digital frequency synthesizer of the RF-505A permits selection of any frequency up to 29.9999 MHz. Full sensitivity is provided in the 2 to 30 MHz portion of that range. Below 2 MHz, where natural and man-made noise increases, the sensitivity is gradually reduced. The receiver remains usable down into the VLF frequency range.

### DIGITAL TUNING

Throughout the entire frequency range a six decade electronically switched frequency synthesizer provides simple, reliable, and accurate tuning in 100 Hz steps. In addition, by pulling out on the 1 kHz frequency control knob, a portion of the synthesizer is unlocked and the 1 kHz knob can then be used as a VFO with a 10 kHz range.

### STABILITY AND ACCURACY

With all synthesizer frequencies derived from a frequency standard source, the stability and accuracy of the RF-505A Receiver is limited only by that of the standard. Unlike most synthesized receivers, the RF-505A uses a crystal referenced voltage controlled oscillator to provide exceptionally high stability while in the VFO continuous tuning mode.

The normally supplied internal frequency standard is a Temperature Compensated Crystal Oscillator (TCXO). This standard requires no warm-up and provides  $\pm 1$  part in  $10^6$  accuracy throughout the operational temperature range. An optional higher stability oven/standard, the RF-508, can be supplied to provide  $\pm 1$  part in  $10^8$  stability. In addition to these two standards, the RF-505A can be operated from an external standard or can distribute the output of its internal standard to as many as three additional RF-505A receivers.

### PERFORMANCE

Careful attention has been given to the "front-end" signal handling characteristics of the RF-505A. Emphasis has been placed on obtaining the high level of sensitivity required to achieve excellent weak signal performance, while at the same time providing an extraordinarily wide dynamic range (minimizing crossmodulation and intermodulation). To meet this requirement, the RF-505A now contains a built-in active preselector incorporating new high linearity silicon devices in a unique feedback configuration. This stage is followed by a Hot Carrier Diode first mixer to further assure linearity and low noise, with large signal inputs. The mixer up-converts signals to VHF frequencies to provide an unusually high level of spurious signal rejection. A monolithic VHF crystal filter at this stage rejects all "out-of-band" signals before their further amplification can cause non-linearities. The IF amplifier and down-converter stages which follow use Field Effect Transistors to assure continued linearity.

The final IF stages utilize a frequency of 500 kHz permitting high "skirt" selectivity. Mechanical sideband filters in this stage provide more than 50 dB attenuation to the opposite sideband assuring the exceptional channel isolation required for ISB operation. The overall dynamic range of the receiver is more than 125 dB.

The phase-locked digital frequency synthesizer employed in the RF-505A provides high stability and quick settling time. Careful synthesizer design and a recently developed phase detector circuit have been employed to virtually eliminate all internally generated spurious responses.

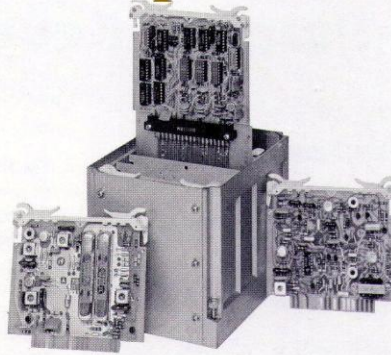
### PRESELECTOR

The RF-505A now contains an active preselector providing additional front-end gain and selectivity over the range of 2-30 MHz. Only fine

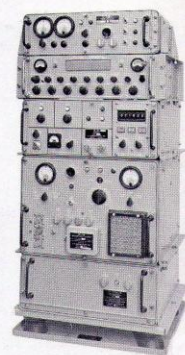
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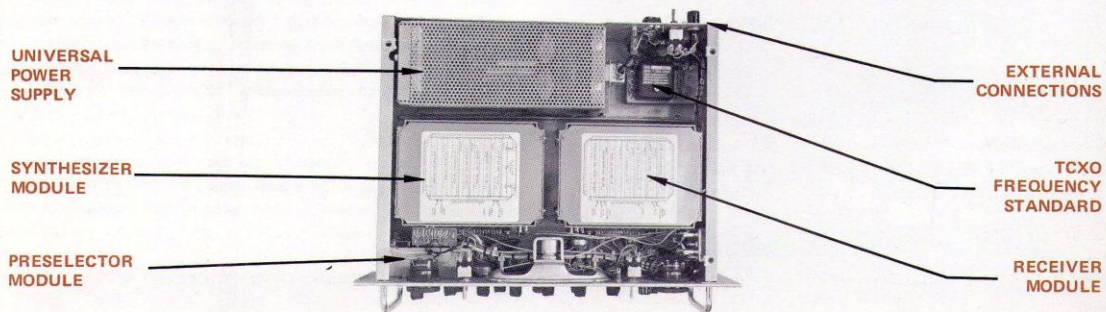
RF-505A/RF-507 TWO CHANNEL RATT RECEIVING SYSTEM



CIRCUITRY MOUNTED ON EASILY ACCESSIBLE PC BOARDS



RF-130/RF-505A/RF-601 1 KW TRANSCEIVING SYSTEM



TOP VIEW OF CHASSIS



tuning is required since the proper preselector band is automatically selected by the frequency dials. A defeat switch is provided to by-pass the internal preselector if an external unit is used or if broadband tuning is required in search or remote applications. The companion RF-507 Preselection and Protection Unit is available to permit the RF-505A to operate in close proximity to transmitting equipment.

### SQUELCH

A front panel adjustable Squelch Control is supplied as standard equipment with the RF-505A. When the control is set fully clockwise the RF-505A is always unsquelched.

### ISB OPERATION

The RF-505A is equipped, as a standard feature, with full independent sideband (ISB) capabilities. The ISB mode provides simultaneous reception of two transmitted sideband signals on a single channel frequency. Two independent automatic gain control (AGC) loops assure a constant output for each channel even though the individual signal strengths may vary considerably. Depending on the system application; voice, teletype, facsimile, or digital data terminal equipment can be connected to either or both of the balanced 600 ohm audio channel outputs. In this manner two independent information channels can be received simultaneously on a single receiver.

### POWER SUPPLY

The RF-505A is supplied with a unique, versatile, power supply. Continuous operation is provided, without switching, from AC primary power sources of 100 to 260 VRMS at 48 to 1000 Hz. DC operation can be selected by a rear panel switch for power sources of 10 to 40 volts. Full protection from reverse polarity is provided. The power supply operates at virtually constant efficiency over the full input

voltage range on either AC or DC. This universal power supply provides far more versatility in operation than is permissible with any other receiver.

### MAINTENANCE

To avoid problems resulting from motors, chains, gears or other cumbersome mechanisms, all switching (including frequency selection) is done electronically. Modular construction, utilizing plug-in printed circuit sub-assemblies, provides for ease of troubleshooting and maximum serviceability. All modules are accessible by removing the unit's top cover plate. Fault isolation can be easily accomplished through the use of test points located on each sub-assembly.

RF Communications offers a complete repair service which provides, at a nominal charge, a fast and reliable means of repairing printed circuit sub-assemblies which are inoperable or out of specification. Using specially designed mailers provided with each RF-505A, the customer mails the defective sub-assembly to our repair service. A replacement is immediately mailed upon receipt of the defective unit or verbal request.

### REMOTE CONTROL

Since frequency and mode determining functions are electronically switched, the RF-505A can be easily adapted to a variety of remote and computerized control systems. For example, the RF-780 Remote Control System can be configured to simultaneously control a bank of RF-505A Receivers, a receiver antenna switching matrix, a quantity of RF-130/735/745 HF-SSB/ISB Transmitters, the associated transmitter antenna switching matrix and other necessary communications station functions. Please contact our sales department for complete details.

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## Accessories

<b>RF-506 NOISE BLANKER</b>	Provides substantial suppression of impulse noise such as automobile ignition, etc. Blanking threshold is adjustable from the front panel.
<b>RF-507 PRESELECTION AND PROTECTION UNIT</b>	Permits use of the RF-505A in duplex systems or, in general, when operation is required in close proximity to transmitting antennas. See our RF-507 Data Sheet for further details.
<b>RF-508 HIGH STABILITY STANDARD</b>	Replaces TCXO with a high stability standard accurate in 1 part in 10 <sup>8</sup> . The entire assembly consisting of crystal oven and oscillator is mounted internally. When the RF-508 is installed, the RF-505A will operate only from 115/230 volt ( $\pm 10\%$ ) 48-65 Hz sources.
<b>RF-509 CW FILTER</b>	500 Hz bandwidth mechanical filter providing additional selectivity for reception of CW stations.
<b>RF-511 REMOTE MONITOR SPEAKER</b>	High quality speaker mounted in a rugged case. Permits remote monitoring of RF-505A audio output.
<b>RF-512 DESK TOP CASE</b>	Gray metal enclosure 5.625 inches (14.3 cm) in height for use with the RF-505A in table or desk top applications.
<b>RF-513 STACK MOUNTING BRACKETS</b>	These brackets permit use of the RF-505A in stack mounted configurations.
<b>RF-514 RACK MOUNTING BRACKETS WITH SLIDES</b>	Includes adapter brackets and slides for use of the RF-505A applications where rack mounting is required.
<b>RF-518 HEADSET</b>	High quality headset recommended for private listening or reception in areas with high noise levels.
<b>RF-520 MUTING CONVERSION MODULE</b>	Permits the RF-505A to be used in conjunction with transmitters such as the RF-130.
<b>RF-522 RECEIVER PROTECTOR</b>	Protects the receiver from damage due to high level RF signals which may be accidentally applied or induced into the antenna circuit. See our RF-522 Data Sheet for further details.
<b>RF-523 WIDE SHIFT RATT FILTER</b>	Optional mechanical filter provides optimum selectivity for reception of 850 Hz shift teletype signals.
<b>RF-524 NARROW SHIFT RATT FILTER</b>	Optional mechanical filter provides optimum selectivity for reception of 170 Hz shift teletype signals.
<b>RF-525 A &amp; B WIDE BAND FILTERS</b>	Optional 6 kHz SSB filters; A for USB, B for LSB.
<b>RF-505A/RSK RUNNING SPARE PARTS KIT</b>	Spare components for the RF-505A which can readily be replaced in the field.
<b>RF-505A/DSK DEPOT SPARE PARTS KIT</b>	Spare components necessary to maintain up to five RF-505A receivers for a period of 3 or 5 years. Includes plug-in boards and certain sub-assemblies for convenient substitution.
<b>RF-505A/CSK COMPREHENSIVE DEPOT SPARE PARTS KIT</b>	Includes the contents of the RF-505A/DSK plus a complete set of replaceable modules.



## Specifications

<p><b>Frequency Range</b> <b>Frequency Stability</b></p> <p><b>Modes of Operation</b> <b>Type of Circuit</b></p> <p><b>Sensitivity: 2.0000 to 29.9999 MHz</b></p> <p><b>RF Input Attenuator</b> <b>Dynamic Range</b> <b>IF and Image Rejection</b> <b>Internal Spurious Response</b> <b>In-Band Intermodulation</b> <b>Cross Modulation</b></p> <p><b>Blocking (Desensitization)</b></p> <p><b>Input Impedance</b></p> <p><b>IF Frequencies</b> <b>Selectivity</b></p> <p><b>Automatic Gain Control (AGC)</b></p> <p><b>AF Response</b> <b>AF Output</b></p> <p><b>Temperature</b> <b>Humidity</b> <b>Vibration</b> <b>Shock</b></p> <p><b>Input Power</b></p> <p><b>Size</b></p> <p><b>Weight</b></p>	<p><b>GENERAL</b> Up to 29,9999 MHz in synthesized 100 Hz steps. VFO continuous tuning with 10 kHz range also provided. ± 1 part in 10<sup>6</sup> Standard (5 MHz TCXO) ± 1 part in 10<sup>8</sup> Optional (with RF-508 High Stability 5 MHz Oven) USB, LSB, AM, CW, ISB (A1 A3A, A3B, A3G, A3H) RATT FAX, DATA With external modems. Double conversion, Superheterdyne.</p> <p><b>RF CHARACTERISTICS</b> SSB/ISB: .25 uV maximum for 10 dB S+N/N in a 3 kHz bandwidth. AM: 1.5 uV maximum, 30% modulated for 10 dB S+N/N in a 10 kHz bandwidth. CW: 12 uV maximum for a 10 dB S+N/N in a 500 Hz bandwidth. <b>Note:</b> Below 2 MHz sensitivity is gradually reduced. For example, typical SSB sensitivity at 100 kHz is 2 uV for 10 dB S+N/N.</p> <p>0 to 20 dB, continuous. 125 dB, independent of RF gain control setting. 70 dB Almost negligible, 99.5% below .3 uV equivalent signal at the antenna terminals. At least 45 dB below the level of two 20,000 uV emf signals in the receiver passband. An unwanted signal of 60,000 uV 30 kHz removed and modulated at 30% will produce cross modulation greater than 20 dB down from a desired signal of 100 uV rms, exclusive of preselection or RF gain control action. This cross modulation specification will typically remain greater than 20 dB down for all desired signals from 1 to 1,000 uV An undesired signal of 20,000 uV emf 30 kHz removed shall produce less than a 6 dB degradation of receiver sensitivity to the desired signal. 50 ohms resistive, nominal Less than 3:1 VSWR.</p> <p><b>IF CHARACTERISTICS</b> FIRST 156 MHz. SECOND 500 kHz. SSB: Desired Sideband - 300 to 3300 Hz at 6 dB; at 5000 Hz, at least 50 dB down. Carrier At least 25 dB down. Entire Opposite Sideband At least 50 dB down. AM: Nominally 6 dB at 10 kHz. At least 60 dB at 20 kHz. CW: (with optional CW filter) 6 dB at 500 Hz. At least 60 dB at 2 kHz. Threshold: Nominally 10 uV (internally adjustable). Range: Less than 12 dB change in output for an input signal variation of 100 dB (5 uV to 500 mV) at the input. Attack Time: 5 milliseconds nominal. Release Time: 1 second nominal.</p> <p><b>AF CHARACTERISTICS</b> Determined by the IF Filter in use. MONITOR a) 3 watts at 5% distortion into internal speaker (3.2 ohms). b) Speaker/Headphone monitor selection of either LSB/CW or USB/AM from the front panel. c) Connections for remote 3.2 ohm speaker (such as the RF-511). CHANNEL OUTPUTS a) Two 600 ohm balanced outputs (one for each channel). Each is adjustable to 0 dBm at 5% maximum audio distortion with 10 uV input in the receiver passband. b) Individual front panel meters are provided to monitor the audio output level or signal strength of each channel.</p> <p><b>ENVIRONMENT</b> STORAGE -55 to +75 degrees C. OPERATING -28 to +65 degrees C. 95 percent Per MIL-STD-167 Type 1 Per MIL-STD-202C, Method 205C</p> <p><b>INSTALLATION REQUIREMENTS</b> AC or DC, selectable by rear panel switch. AC: 100 to 260 volts, single phase, 48 to 1,000 Hz. DC: 10 to 40 volts, positive or negative ground. CONSUMPTION: 60 watts at 3 watts audio output. a) BASIC UNIT: 5.25 H x 19 W x 13.875 D in. (13.3 H x 48.3 W x 35.2 D cm) b) WITH DESK TOP CASE (RF-512): 6 H x 19.375 W x 15 D in. (15.2 H x 49.2 W x 38.1 D cm) c) WITH STACK MOUNT (RF-513): 5.25 H x 19.5 W x 13.875 D in. (13.3 H x 49.3 W x 35.2 D cm) a) BASIC UNIT: 29.25 pounds (13.25 kg) b) WITH DESK TOP CASE (RF-512): 33.9 pounds (15.36 kg) c) WITH STACK MOUNT (RF-513): 36 pounds (16.3 kg)</p> <p>Specifications subject to change without notice.</p>
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RF-505A (7-71)



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