Gateway: Analog Radio to IP
HF, VHF, UHF Radios over IP interfaces
RARG-x Series

RADITEK

TELECOM
HF VHF UHF over IP

The RARG-x Series of Radio Over IP interfaces are designed to merge the power and flexibility of IP with analog radio equipment and networks. This offers many benefits including: interoperability, scalability, low cost of ownership and ease of implementation.

The **RARG-x** Series enables you to create flexible and powerful radio networks with convenient operator access. Three key products make up the **RARG-x** Series interface family:

The **RARG-1** is a single analog audio channel to IP interface. It is equipped with a standard 4-Wire E&M analog interface.

The **RARG-4** is a four analog audio channel to IP interface providing the added ability to cross band and bridge channels in a myriad of combinations, in the convenience of a single enclosure.

The **RARG-5-SIP** – Advanced VoIP and SIP Gateway, includes the feature set with the integration of Session Initiation Protocol (SIP) allowing customers to combine their telephony PBX systems with their radio networks.

All devices use data messaging to transport signaling schemes such as SELCAL, ANI, DTMF and CTCSS overcoming the problems normally associated with losses from compression algorithms and lost packets. Voice Activity Detection (VAD) enables it to work with HF radios where a Carrier Detect input is unavailable and Silence Suppression optimizes the use of available IP bandwidth and is particularly beneficial in satellite and 3G-cellular applications.

The 4-Wire E&M analog interface is provided on RJ45 connectors conforming to International Standards. Each port provides balanced two wire 600 ohm transformer coupled TX and RX audio interfacing, isolating the IPR from the radio and virtually eliminating ground noise and induced signal interference.

The RARG-x Series can be configured within LAN, VPN or WAN environments using a standard web browser. The devices support both DES and AES encryption which can be enabled for all voice and data transmissions. Restrictions do apply regarding export of AES encryption and Export Applications would apply for AES enabled IPR Series for overseas sales.
Features of the RARG-x Series interface range:

Features:
• VoIP with unicast, multicast and IP conferencing
• 10/100 Base-T Ethernet port via RJ45 connector
• Radio or analog interface 4-Wire E&M
• Electrically isolated radio interface
• Voice Activity Detection with Silence Suppression
• Multiple codec and compression algorithm selection
• SELCAL, DTMF and CTCSS operation with compression
• RS-232 data tunneling over IP – 1200Baud to 38.4KBaud
• Site monitoring I/O on the IPR400 using SNMP
• Front panel activity and diagnostic indicators
• Built-in testing via Web browser configuration program
• Static or dynamic (LAN) IP address configuration
• UPnP for device discovery
• DES and optional AES encryption capable
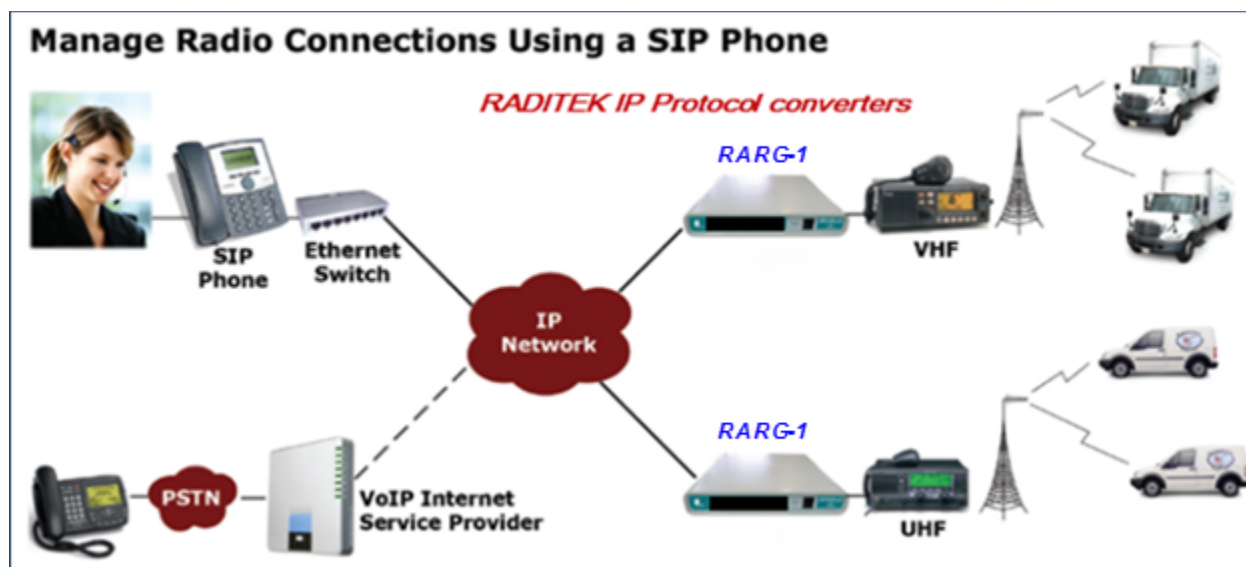• Interfaces with SIP phone and PBX compatible devices

Suitable Markets
• Emergency service/Public safety
• Power/Water utilities
• Telecommunications providers
• Transport industries
• Mining companies
• Government agencies

Suitable Applications
• Remote radio and operator access
• Leased line replacement
• Radio bridging over IP
• Radio or microwave link replacement
• SIP phone to radio interfacing
• Communication redundancy and rationalization

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Raditek RARG-1 interfaces can be used to create IP links between two or more radios using point to point Unicasting, point to multi point Multicasting or IP Conferencing communications. The IP Conferencing feature is a powerful protocol that provides a multicasting type feature on a network such as a DSL connection (which would normally not support multicasting). A standard TCP/IP RJ45 interface connection to the **RARG-1** provides the IP network interface.

Two analog ports are provided for the audio interface. An RJ45 with a 4-Wire E&M port allows brand independent radios to connect to an international standard. Additionally the "Handset" accessory port on the front of the **RARG-1** provides a balanced half-duplex connection for a RADITEK Handset or RADITEK Console peripheral. Multiple peripherals can be paralleled to the handset port allowing multiple operators to share the IP connection from the **RARG-1**.

This IP connection then accesses other remote RADITEK **RARG-x** Series interfaces to control the device connected at that remote location.

The series supports audio digitization compression algorithms from the standard G.711 64kbps to the GSM 13kbps.

Unique Advantages of the RARG-1:
- ➢ **Eliminates the need for expensive leased**
- ➢ **lines or maintenance hungry radio links**
- ➢ **SIP enabled open standards based connections to PBX and SIP phones**
- ➢ **Compatible with satellite communications and 3G Cellular**
- ➢ **Signaling schemes sent as data allowing full audio compression.**

Application Diagrams

Radio Access Over the Internet
An operator can control and monitor a remote transceiver across a LAN, VPN or the Internet. The IP link configured with Port Forwarding, or as a DMZ Host, will allow the two **RARG-1** devices to connect and pass voice and data packets between the two ends. SELCAL, CTCSS and DTMF are also transported reliably, regardless of the level of compression that is employed.

RADITEK handsets and consoles can be multi-dropped to allow shared access to the transceiver by a number of operators.

Leased Line Replacement
Two radios can be connected back-to-back over an IP link replacing an existing leased line. PTT and COS signals are transported over the IP link as data messages and external links enable both controls to be configured for active high, active low or contact control. Full duplex voice is supported.

RARG-x Analog Radio Gateway-t19   Specifications may be subject to change   **09/26/16**

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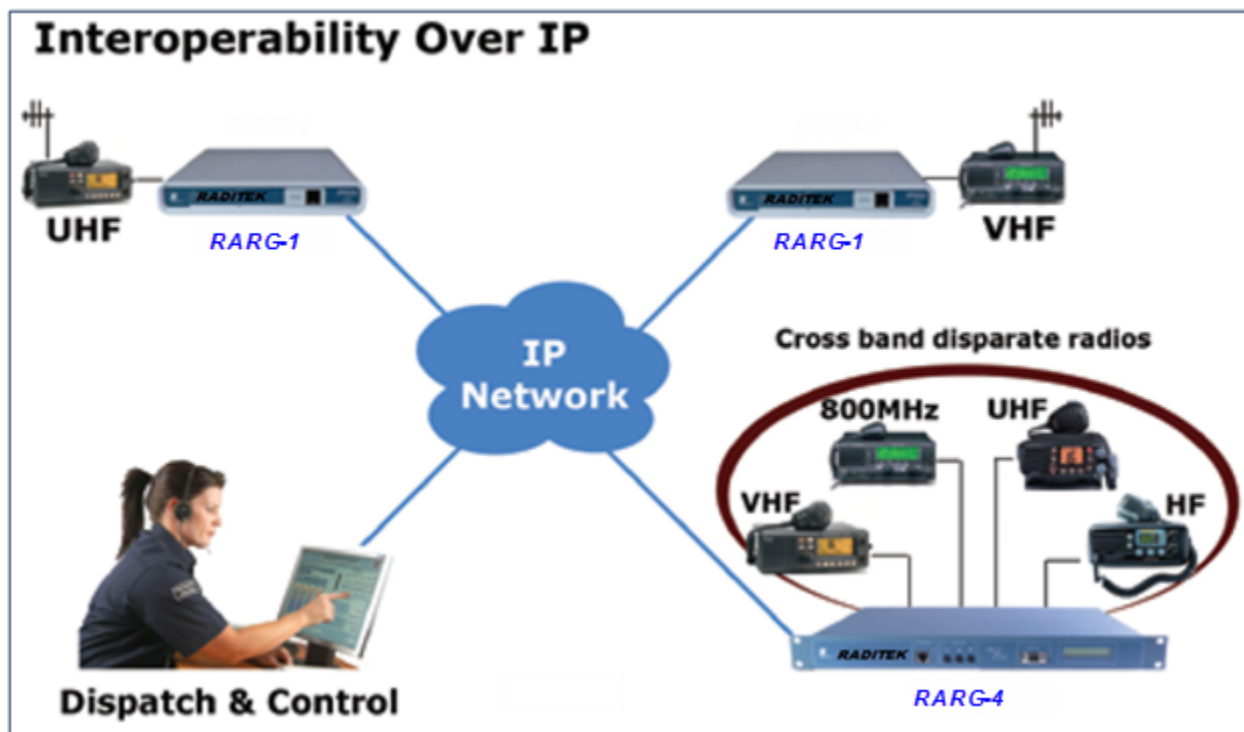**2 of 6**

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<u>**The RARG-4 is a four-port VoIP Gateway. It is designed to provide Voice over IP extensions for analog radio equipment and to facilitate interoperability between different radio systems such as UHF, VHF, HF and Trunking.**</u> The device supports up to four VoIP channels which can be mapped to its four radio channels. This provides the means to link together groups of radios and VoIP channels in many combinations. The device is ideally suited for repeater site applications and accessing those sites from dispatch consoles. In built compression algorithms ensure efficient and minimal use of IP bandwidth and corporate IP Networks. SNMP provides analog and digital site monitoring of the **RARG-4**. This enables network managers to readily interrogate network hubs, control remote functions or monitor system health and integrity.

Unique Advantages of the RARG-4:
- Radio cross banding and audio bridging with
- IP access
- Facilitates inter-agency interoperability
- SNMP monitoring and control
- **Application Diagrams**

- *Control and Monitor Repeater Sites*
- This illustration demonstrates a repeater site with two UHF and two VHF transceivers, belonging to two different agencies. The **RARG-4** acts as the IP gateway for the analog
- radios. Any audio that is received from either of the four radios will be multicast to the VLAN. Dispatch systems such as the DX64 will receive and process the audio. This means that dispatch operators at the different agencies can monitor and control all communications through that repeater site.
- *Interoperability Over IP*
- The **RARG-x** products enable interoperability with point to point or point to multipoint connections using either unicast or multicast IP addressing. The **RARG-1** and **RARG-4** both allow multiple and different transceivers such as VHF, UHF and trunking to be interconnected over an IP network in various combinations.

Interoperability Over IP — UHF / RARG-1 / IP Network / RARG-1 / VHF / Cross band disparate radios (800MHz, UHF, VHF, HF) / RARG-4 / Dispatch & Control

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The RARG-5-SIP is an Advanced VoIP and SIP Gateway that extends the feature set of the RARG-1 with three major additional features:
1. Interface to an organization's PBX and SIP phone users
2. Interfaces mobiles and portables in the field with an organization's PBX and SIP phones.
3. Provides a serial channel change control and VoIP interface for remote base stations.

The gateway enables users to connect to remote radio networks from their existing office based SIP compatible PBX systems, and gives users of two-way radios the ability to dial SIP phones or telephone extensions from the field.

The **RARG-5-SIP** has the ability to configure DTMF or SELCALL (5-Tone) tone sequences to manage connections and control radio functions.

Radio users can establish a phone call by keying a pre-set DTMF or SELCALL sequence. On the radio side, the status of a SIP call, whether incoming or outgoing, is translated into familiar tones for the radio user.
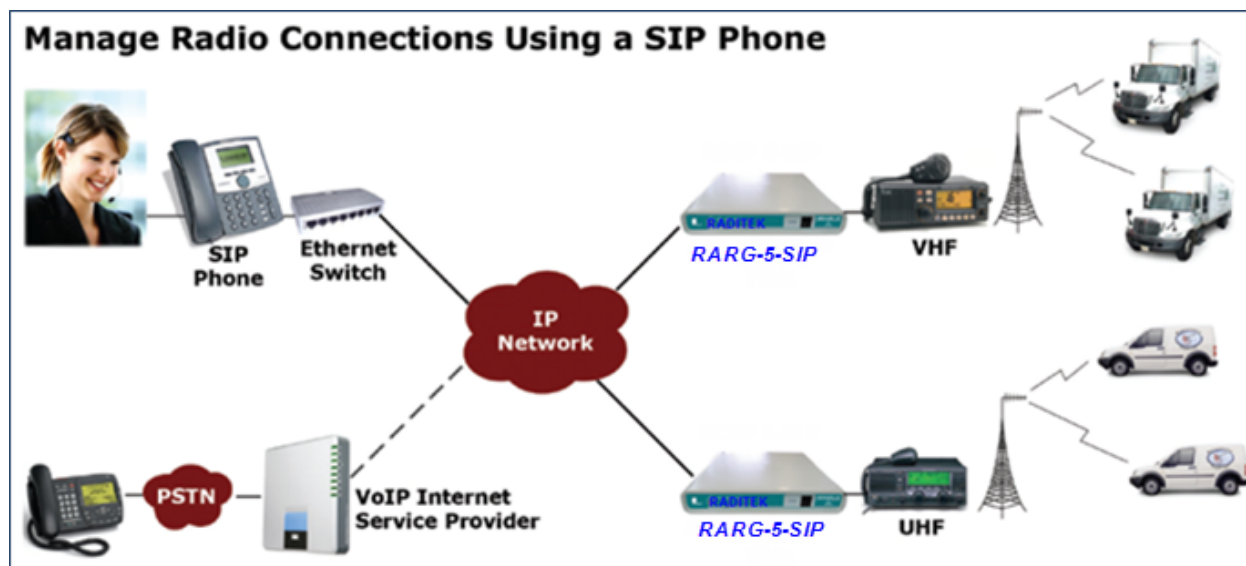
The **RARG-5-SIP** also includes a Channel Change (frequency) mode. This enables a remote operator with a DTMF keypad to change the frequency of the attached radio. Channel change occurs via the serial port. For example, an operator with a SIP phone can establish a connection to a radio then change the channel on that radio. The **RARG-5-SIP** supports the feature set of the **RARG-1** in addition to the above capabilities.

Unique Advantages of the RARG-5-SIP:
- Conveniently connect to and from SIP Phones and SIP PBX's
- Operates like a phone system where calls are initiated by either the SIP phone or the radio user
- Easy to install and begin using straight away with minimal training

Application Diagram
Managing Radio Connections from a SIP Phone is unique in that office based SIP phone users can conveniently communicate with remote radio users. Likewise two-way radio users have the ability to dial SIP phones or telephone extensions from the field. The diagram below demonstrates how an Operations Manager can directly communicate with transport vehicles from the convenience of their desk.

Manage Radio Connections Using a SIP Phone

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Specifications:	RARG-1 / RARG-5 SIP	RARG-4
Power		
Voltage	12Vdc (11.5V to 13.8Vdc)	12Vdc (11.5V to 13.8Vdc)
Current	300mA	500mA
Radio Port		
Number of channels	1	4
Connector	8-way US modular (RJ45)	8-way US modular (RJ45)
Configuration	Four wire E&M fully isolated	Four wire E&M fully isolated
Input Impedance	600 ohms	600 ohms
Output Impedance	600 ohms	600 ohms
Input Levels	-27dBm to +4dBm (-10dBm nominal)	-27dBm to +4dBm (-10dBm nominal)
Output Levels	-27dBm to +4dBm (-10dBm nominal)	-27dBm to +4dBm (-10dBm nominal)
Software level attenuation	0 to –18dB in 3dB steps	0 to –18dB in 3dB steps
Frequency Response	300 to 3000 Hz (within 1 dB)	300 to 3000 Hz (within 1 dB)
E-Input Lead	Opto coupled @ 5 to 50Vdc. Link config. for voltage contact, switched ground or switched power.	
M-Output Lead	Relay contacts limited to 30W (30Vdc or 1A). Link configurable for voltage, contact, switched ground or switched power	
Handset/Console Port		
Connector	6-way US modular	
Configuration	Two wire balanced half duplex audio, power, E&M control	
Input Impedance	50K ohms	
Output Impedance	500 ohms	
Input Level Range	-27dBm to +4dBm (-10dBm nominal)	
PTT Input	Contact to 0Vdc	
Busy Output	+12Vdc	
RS-232 Port		
Number of channels	1 (VOIP-1)	4(VOIP-4)
Connector	DB9 Female (DCE)	DB9 Female (DCE)
Serial Data range	1200 baud - 38400 baud	
Network Interface		
Connector	8-way RJ45	8-way RJ45
Interface	10 BASE-T or 100 BASE-TX Ethernet with auto detect	
Protocol RTP	Unicast, Multicast, Conferencing	Unicast, Multicast
Vocoders	G.711, G.726 ADPCM, GSM (13Kbps)	
Site Monitoring I/O		
Analog inputs		8 + temperature
Digital I/O		2 opto inputs, 2 relay outputs
Front Panel Facilities		
2 line by 16 character LCD		System status, RS232 activity, radio activity
User push buttons		Menu control, user commands

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Specifications:	RARG-1 / RARG-5 SIP	RARG-4
Front Panel Indicators		
System	Power OK, CPU RUN, VoIP Link OK	
RS-232 Activity		
Radio	Port PTT output active, COS input active	
Ethernet	10Mbps/100Mbps, Link Active, Activity	
Physicals and Environmental		
Style	Desk mount	1RU 19 inch rack mount
Weight	0.7 kg/1.54lb	1.7 kg/3.75lb
Shipping Weight	1.4kg/3.09lb	3.5kg/7.72lb
Dimensions	270mm (W) x 35mm (H) x 230mm (D)	484mm (W) x 44mm (H) x 265mm (D)
	8.66"(W) x 1.37"(H) x 9.05"(D)	19.06"(W) x 1.73"(H) x 10.43"(D)

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