List Pricing

P25

RELM WIRELESS

KNG Portable Radios

A Whole New RELM of Possibilities

RELM WIRELESS

KNG TMR

- Light Weight
- Battery Life > 23 hours with 5/5/90 duty cycle
- Easily Transportable
- P25 Digital and Analog Modes
- Portable and Light Weight
- Mobile Programmability
- Multi-Mode Operation
- Talkaround Mode
- Scan Mode
- Alpha-numeric Touch Screen Display

FEATURES

2048 Channels, Dynamic Zones
Custom-tailored user zones can be programmed into the KNG TMR by radio users and can also be field changed or reprogrammed whenever necessary.

USB or Mobile Programmability
Program the KNG TMR out in the field in minutes using an easy to use customize-able menu system, or simply plug in your laptop via USB port on the front of the unit.

Mixed-mode Operation
Whether analog or digital, communicate effortlessly to either mode with RELM's Mixed-mode feature.

APCO P25
The KNG TMR meets or exceeds APCO P25 specifications.

Talk Around
This feature allows you to bypass or "talk around" a repeater for a direct connection.

Channel/Priority/Zone Scan
Find an available channel for communications: scan channel, priority channel, or scan zones, one zone at a time.

Custom Menu System
Our intuitive menu system gives you full control. Fully customize the menu to fit your everyday needs.

MIL-STD 810 C/D/E/F
The KNG Portable has gone through rigorous testing and meets or exceeds military requirements.

ADVANCED FEATURES

Alpha-numeric Touch Screen Display
The first of its kind, the KNG innovative color TFT touch screen display solves many issues seen in existing mobile radio control heads. Day or night, get all the information you need right at your fingertips.

Portable Package with High Power
Only the KNG TMR offers 15 Watts of RF power in a small ruggedised case that can be redeployed anywhere.

Birdie Free
Only RELM Wireless goes the extra mile to create a truly birdie free radio, which means there are no blacked out frequencies on this mobile.

256 Programmable Quick Call ID's
Connect with select radio users easily and ASAP through RELM's Quick Call function.

Busy Channel Selections
Designed to prevent other radio communications and interference on channels being used.

Problem Prevention Features
The Keypad lock prevents you from accidentally hitting a button that may activate functions unintentionally.

DVSI AMBE+2 Version 1.60 Vocoder
The version 1.60 Vocoder provides improved RF performance in a variety of degraded signal conditions. It also provides enhanced audio signal conditioning which improves system performance in the presence of background noise.

OPTIONS

P25 Trunking
(KZA0569 - Factory Install)
(KAA0569 - Field Install)

The KNG 9600 Baud Trunking option gives you the ability to communicate without hassle and without complication. Compatible with competitor Trunking systems, RELM Wireless Trunking is P25 compliant and loaded with features, such as encryption and many unit-to-unit specializations. Best of all you get RELM's ease of use. Using our intuitive software, modifying your KNG Trunking features will be simple.

OTAR
(KZA0580 - Factory Install)
(KAA0580 - Field Install)

Over-the-air rekeying is an easy solution to efficiently change encryption keys. Completed almost effortlessly, encryption keys are changed over the air with a touch of a button.

Multicast Vote Scan
(KZA0583 - Factory Install)
(KAA0583 - Field Install)

Multicast Vote Scan capable KNG Series radios automatically select the best site to operate from in a wide area system. Channels in the multicast conventional system are added to the scan list and designated as "voted" channels. The KNG radio scans all voted channels and selects the channel with the best signal.

AES/DES ENCRYPTION
(KZA0576 - Factory Install)

AES and DES (Digital Encryption Standard) allows you to communicate with other radios that have the specific key programmed. RELM's AES/DES Encryption is NIST certified, validated FIPS 140-2 Type III encryption with a 256 key load.

BUTTONS AND FUNCTIONS

Rapid Deployment Portable Repeater

Mountain Combat: Hard to move, hard to shoot, even harder to communicate

Communicating in mountains is a challenge since there are few ideal spots for communication. FM radios, which are line of sight systems, frequently cannot communicate because their signals are absorbed by terrain folds and features. If all the force is on the same side of the mountain and the mountain forms a bowl, FM communications are usually possible. However, radios located on the same side of the mountain at different altitudes have difficulty communicating because of intervening terrain and communications dead space. If the force is deployed on the same side of a mountain which curves out, communications is especially difficult. Even FM radios located on the summit of the mountain have difficulty communicating with radios located further down the mountain slope due to dead space. Communications sites must be carefully selected–and often become key terrain. When line-of-sight communications in mountains are possible, communications are excellent, but there are few sites where line-of sight is possible to all other elements in the net. There are often only three solutions–either move the radio to where it can communicate, set up a radio retransmission site or relay messages across the net.

Radio retransmission sites are expensive in terms of personnel and equipment. TO&Es normally do not provide adequate personnel and equipment to provide several retransmission sites. Further, since the retransmission team must work away from the main body, it must have enough personnel to protect itself and haul all its gear to the retransmission location. Batteries, antennas, guy wires, rations, water, weapons, ammunition and personnel gear are heavy. Moving a site is labor intense. Maintaining a site is also a chore. Fresh batteries, chow and water have to be carried to the site and personnel rotated. If the mission is not static defense, the retransmission site has to constantly shift–to yet another site where it can adequately support its unit. Such sites are not easy to find-or reach, yet the communications teams must keep up with the advancing force which is usually moving along easier terrain.

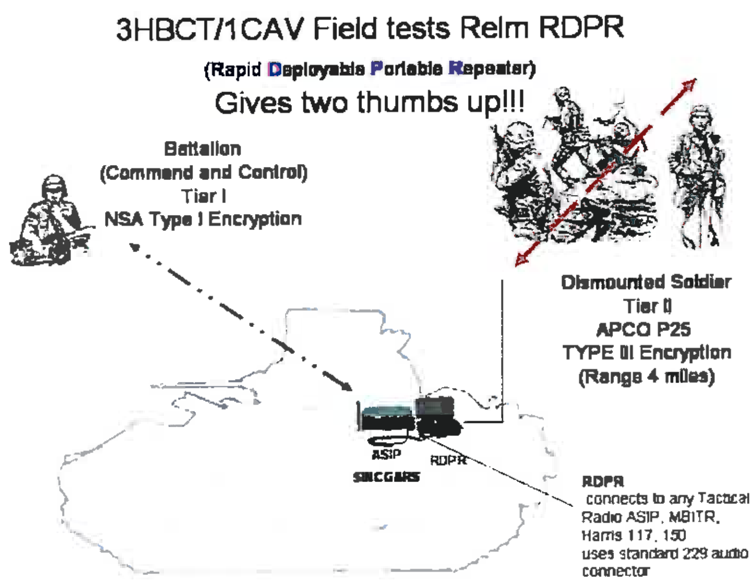
Lightweight, suitcase style repeater, the ideal solution for units that are struggling with communications in a harsh mountainous terrain like Afghanistan.

The RDPR was originally designed to aid first responders in the USA to bridge communication gaps, whether the obstacle was the need to extend range, enable cross band (VHF/UHF/800 MHz), cross mode (Analog/Digital), or cross protocol (Conventional/Trunking). This concept was not new, there are other manufacturers offering equipment that basically performs the same functions (Raytheon ACU1000, ICRI ECT...). What makes the RDPR unique is the low cost, packaged in a durable weatherproof case, small compact size, weighing only 17lbs, and extremely easy to setup and operate.

Relm modified the RDPR at the request of the US Army to include the ability to bridge Tactical radios with LMR radios.

The RDPR now enables LMR from any manufacturer, Relm, Motorola, EFJ, ICOM to communicate on the ASIPS SINCGARS network; in fact it has been proven to work with the Military TACSAT radios as well PRC117, PCS-5

A scenario could be that the RDPR w/ LMR is mounted in a Bradley connected to the ASIPS SINCGARS, dismounted soldiers would now have the ability to transmit from the individual soldier radio back to the Bradley which would then bring up the ASIPS network automatically and carry the communication 20-25 miles down range



RDPR Accessories and Options Configuration Table

RDPR-00U/B/G	Repeater, Port., w/7Ah SLA Bat., Universal **Includes:** WCRDPR
Options – Radio Interface Kits	
RIKDPH	Radio Interface Kit for D and G Series Portables
RIKKNG	Radio Interface Kit for KNG Series Portables
RIKMACOM	Radio Interface Kit for MACOM 7100 Portable
RIKRP3[1]	Radio Interface Kit for RP3000 RP3600 Portables
RIKXTS	Radio Interface Kit for Motorola XTS500 and EF7 P5100 Portables
RIKXTS2500	Radio Interface Kit for Motorola XTS2500 Portable
Options - Duplexers	
LZA3015A[2]	Duplexer, 136 – 148 MHz, Internal
LZA3015B[2]	Duplexer, 148 – 160 MHz, Internal
LZA3015C[2]	Duplexer, 160 – 174 MHz, Internal
LZA3017A[2]	Duplexer, 406 – 440MHz, Internal
LZA3017B[2]	Duplexer, 440 – 480 MHz, Internal
LZA3017C[2]	Duplexer, 480 – 512 MHz, Internal
Accessories – Antennas & Antenna Accessories	
BS4MRDPR	Tripod, Heavy Duty, 4M (13ft.), Blue Sky
USAT-1	Tripod, Aluminum, 6ft.
CABANTRDPR	Cable, RG58 Coax, 25 ft with Connectors
CABANTRDPR50	Cable, Coax, Ant., 50Ft., RG-214, RDPR
MBS	Mounting Base, Antenna
MBS-NTYPE	Mounting Base, **Antenna**, N-Type
MVW1360S	Mobile Antenna, 136 – 174 MHz, w/spring
WMU4002	Mobile Antenna, 406 - 512 MHz
WMU4002S	Mobile Antenna, 406 - 512 MHz, w/spring
Accessories – Battery Kits & Cables	
4004-40012-601	Battery, SLA, 7.5Ah, Replacement
BATTKITRDPR	Kit, Battery, SLA, 7.5Ah for 2nd Battery
EBS-RDPR	Battery System, Li-Ion, External, 40Ah **Requires:** VARDPR or CHRGCBLRDPR
CHRGCBLRDPR	Charge Cbl. Assy, EBS-RDPR to RDPR
LINKCRDPR	Cable, Mobile Extender Link, RDPR
MECRDPR	Cable, Mobile Extender, RDPR
SINCGARS_LINK	Cable Assy, Link, SINCGARS, RDPR
Accessories – Solar Panels & Chargers	
SP10WRDPR-F	Solar Panel, 10W, Foldable **Includes:** VARDPR
SP60WRDPR-F	Solar Panel, 60W, Foldable **Includes:** VASLREBS **Requires:** VARDPR
VARDPR	Vehicle Accessory Adaptor, 12V
WCRDPR	Wall Charger, AC

[1] Should not be used with LZA3017 Duplexers.
[2] Frequencies are required. Frequency separation must be greater than 5 MHz and less than 10 MHz

RDPR Accessories and Options Configuration Table

RDPR-00UM	Repeater, Port w/12.4Ah Li-Ion Bat., Mil **Includes:** WCRDPRUM SINCGARS_LINK2 DCCBLRDPRUM SLRCBLRDPRUM
Options – Radio Interface Kits	
RIKDPH	Radio Interface Kit for D and G Series Portables
RIKKNG	Radio Interface Kit for KNG Series Portables
RIKMACOM	Radio Interface Kit for MACOM 7100 Portable
RIKRP3[1]	Radio Interface Kit for RP3000/RP3600 Portables
RIKXTS	Radio Interface Kit for Motorola XTS5000 and EFJ P5100 Portables
RIKXTS2500	Radio Interface Kit for Motorola XTS2500 Portable
Options - Duplexers	
LZA3015A[2]	Duplexer, 136 – 148 MHz, Internal
LZA3015B[2]	Duplexer, 148 – 160 MHz, Internal
LZA3015C[2]	Duplexer, 160 – 174 MHz, Internal
LZA3017A[2]	Duplexer, 406 – 440MHz, Internal
LZA3017B[2]	Duplexer, 440 – 480 MHz, Internal
LZA3017C[2]	Duplexer, 480 – 512 MHz, Internal
Accessories – Antennas & Antenna Accessories	
BS4MRDPR	Tripod, Heavy Duty, 4M (13ft.), Blue Sky
CABANTRDPR	Cable, Coax, 25 ft with Connectors
CABANTRDPR50	Cable, Coax, Ant., 50Ft., RG-214, RDPR
MBS	Mounting Base, Antenna
MBS-NTYPE	Mounting Base, Antenna, N-Type
MVW1360S	Mobile Antenna, 136 – 174 MHz, w/spring
WMU4002	Mobile Antenna, 406 - 512 MHz
WMU4002S	Mobile Antenna, 406 - 512 MHz, w/spring
Accessories – Battery Kits & Cables	
4004-40012-603	Battery, Li-Ion, 12.4AH, 15V, RDPR-UM, Replacement
EBS-RDPR	**Battery** System, Li-Ion, External, 40Ah **Requires:** CHRGCBLRDPR-UM
CHRGCBLRDPR-UM	Charge Cbl, Assy, EBS-RDPR to RDPR-UM
DCCBLRDPRUM	Cable, DC, 6Ft., 18AWG, RDPRUM
SLRCBLRDPRUM	Cable, Solar, 6Ft., 18AWG, RDPRUM
Accessories – Solar Panels & Chargers	
SP20WRDPR-F	Solar Panel, 20W, Foldable **Includes: VARDPR** **Requires:** VATOUM
SP60WRDPR-F	Solar Panel, 60W, Foldable **Includes: VASLREBS** **Requires:** VATOUM
VATOUM	Vehicle Accessory Adaptor to UM Charge Cable
WCRDPRUM	Wall Charger, AC

RDPR Accessories and Options Configuration Table

RDPR-HP	Repeater, Port., High Power, Universal **Includes:** CABAUTO12VRDPR-HP
Options – Radio Interface Kits	
RIKDPH	Radio Interface Kit for D and G Series Portables
RIKKNG	Radio Interface Kit for KNG Series Portables
RIKRPJ[1]	Radio Interface Kit for RP3000/RP3600 Portables
RIKXTS	Radio Interface Kit for Motorola XTS500 and EFJ P5100 Portables
RIKXTS2500	Radio Interface Kit for Motorola XTS2500 Portable
Options – Power Amplifiers[2]	
LZA0151	Power Amp, 136 – 174 MHz, TPL PA31AC
LZA0152	Power Amp, 400 - 512 MHz, TPL PA61AC[3]
Options - Duplexers	
LZA3015A[2]	Duplexer, 136 – 148 MHz, Internal
LZA3015B[2]	Duplexer, 148 – 160 MHz, Internal
LZA3015C[2]	Duplexer, 160 – 174 MHz, Internal
LZA3017A[2]	Duplexer, 406 – 440MHz, Internal
LZA3017B[2]	Duplexer, 440 – 480 MHz, Internal
LZA3017C[2]	Duplexer, 480 – 512 MHz, Internal
Accessories – Antennas & Antenna Accessories	
BS4MRDPR	Tripod, Heavy Duty, 4M (13ft.), Blue Sky
CABANTRDPR	Cable, Coax, 25 ft with Connectors
CABANTRDPR50	Cable, Coax, Ant., 50Ft., RG-214, RDPR
MBS	Mounting Base, Antenna
MBS-NTYPE	Mounting Base, Antenna, N-Type
MVW1360S	Mobile Antenna, 136 – 174 MHz, w/spring
WMU4002	Mobile Antenna, 406 - 512 MHz
WMU4002S	Mobile Antenna, 406 - 512 MHz, w/spring
Accessories – Battery Kits & Cables	
EBS-RDPR	Battery System, Li-Ion, External, 40Ah **Requires:** PWRCBLHP
PWRCBLHP	Pwr Cbl Assy, EBS-RDPR to RDPR-HP
MECRDPR2	Cable, Mobile Extender, RDPR-HP/M
LINKCRDPR2	Cable, Mobile Extender Link, RDPR-HP/M
SINCGARS_LINK2	Cable Assy, Link, SINCGARS, RDPR-MIL
Accessories – Solar Panels & Chargers[5]	
SP20WRDPR-F[6]	Solar Panel, 20W, Foldable **Includes:** VARDPR **Requires:** VASLREBS **Requires:** EBS-RDPR
SP60WRDPR-F	Solar Panel, 60W, Foldable **Includes:** VASLREBS **Requires:** EBS-RDPR
SP90WRDPR-F	Solar Panel, 90W, Foldable **Includes:** VASLREBS **Requires:** EBS-RDPR

[1] One must be ordered with unit and factory installed.
[2] Only comes in 20 MHz bandwidths and needs to be tuned by TPL.
[3] Solar Panel is used with EBS-RDPR and not the RDPR-HP.
[4] Not recommended to be used with EBS-RDPR.

RDPR Accessories and Options Configuration Table

EBS-RDPR	External Battery System, Li Ion, 40AH **Includes:** VASLREBS WCHRGREBS
Accessories – Cables	
VASLREBS	Cable, Charging, Vehicle-Solar
WCHRGREBS	Charger, Wall, 5A, 110-220VAC, EBS-RDPR
PWRCBLHP	Pwr Cbl Assy, EBS-RDPR to RDPR-HP
VATOUM	Cable, Adaptor, Mil. Conn. to SPxxW Series Solar Panel
Accessories – Solar Panels & Chargers	
SP20WRDPR-F*	Solar Panel, 20W, Foldable **Includes:** VARDPR **Requires:** VASLREBS
SP60WRDPR-F	Solar Panel, 60W, Foldable **Includes:** VASLREBS
SP90WRDPR-F	Solar Panel, 90W, Foldable **Includes:** VASLREBS

Programming and Installation

The Following are our good faith estimates of per-unit installation and programming charges:

Local Labor $150-$225 per Mobile Radio Install Add $100 per remote head.

Programing Portable $25 per Unit (See Factory Option Below)

Programing Installed Mobiles $30 per Unit

Field Programming and Installation

The Following are our good faith estimates of per-unit installation and programming charges:

- Local Labor $125 for dash mount install
- Remote mount $225 per M800 mobile radio install ($75 per additional remote head)
- Programing Portable $15 per radio
- Programing Installed Mobiles $25 per unit (no extra fee for programming additional heads connected to M800)

RELM Project Management Resources

Based on the expected quantity of 520 mobile and portable radios in the RFI, we can offer factory on site project nanagement. Our good faith estimates of $45 per subscriber which includes travel, lodging and meals. This will cover our Field Application Engineer, Clinton Rowland to be onsite in Lexington for the project management to expedite the installation process. With this option he will oversee programming, oversee mobile installation and ensure optimal deployment of both factory and local installation resources in support of this project. Clint's experience leading teams on numerous large public safety projects enables him to meet the dynamic challenges of programming and installing a large fleet of radios. Prior to joining RELM, Clint served as an active duty member in the United States Air Force, specializing in trunked radio communications systems. Upon leaving the US Air Force, he began work in mission critical communications with RELM as an engineer. At RELM, He has worked on building custom trunked programming for both Local, State, Federal Agencies. As part of this we will supervise the preferred installation provider, "local service shop" in the installation of mobile radios. Targeted time frame for installing is roughly thirty (30) business days. Our mobile radios equipment is similar in size to the Harris Mobile Radios in use today. A team of four installers will be handling the 160 installs.

Factory Programming Option

Units can also be preprogrammed in our factory for a significant savings and radios will be shipped to the ocation programed and ready to go for $19.99 per radio.

Lexington-Fayette
Urban County Government

RFP #6-2014
Technical Response

Reference Number: RFP #6-2014

26 February, 2014

RELM Wireless Corporation

7100 Technology Drive,

Vest Melbourne, FL 32904

1 Contents

7. Submitter acknowledges that "knowingly" for purposes of this Affidavit means, with respect to conduct or to circumstances described by a statute or ordinance defining an offense, that a person is aware or should have been aware that his conduct is of that nature or that the circumstance exists.

Further, Affiant sayeth naught.

Shari Sharp

STATE OF Florida

COUNTY OF Brevard

The foregoing instrument was subscribed, sworn to and acknowledged before me by Shari Sharp on this the 19th day of February, 2014.

My Commission expires: 1/9/2015

NOTARY PUBLIC, STATE AT LARGE

Notary Public State of Florida
Jacqueline Cole-Hughes
My Commission EE053898
Expires 01/09/2015

2 Compliance Matrix

2.1 Mobile Radio Compliance Matrix

SPECIFICATIONS	Mobile	KNG-M800	Status
Power Requirements	11-16 Vdc, negative ground	13.8 Vdc Nominal ±20% 11.0 to 16.6 Vdc	Comply
Temperature	-30° to +60° C (Full Performance)	-30° to +60° C (Full Performance)	Comply
Humidity	95% @ 50° C	95% @ 50° C	Comply
Duty Cycle	20% Tx 100% Rx	20% Tx 100% Rx	Comply
Shock & Vibration	MIL 810 C/D/E/F/G	MIL 810 C/D/E/F/G	Comply
Transmitter Specifications			
SPECIFICATIONS	Mobile	KNG-M800	Status
Tx RF Output Power	15-30 watts	10 – 35 Watts	Exceed
Tx RF Output Impedance	50 Ω	50 Ω	Comply
Tx Frequency Stability	±0.00015% -30°/+60° C	±0.00015% -30°/+60° C	Comply
Tx Local Audio Sensitivity			
FCC Emission Designator	11K0F3E 20K0F3D	11K0F3E, 16K0F3E, 8K10F1D,8K10F1E, 8K10F1W, 20K0F1E	Exceed
Tx Audio Response	+1, -3 dB, 6 dB pre-emphasis	+1, -3 dB, 6 dB pre-emphasis	Comply
Tx Audio Distortion	≤3% @ 1 kHz	≤3% @ 1 kHz	Comply
Tx Spurious & Harmonic	≥-75 dB	≥-75 dB	Comply
Tx FM Noise	≥-40 dB @ 3.3 kHz deviation & 1.0 kHz modulation	≥-44 dB @ 3.3 kHz deviation & 1.0 kHz modulation	Exceed
Receiver Specifications			
SPECIFICATIONS	Mobile	KNG-M800	Status
Rx Frequency Stability	±0.00015% -30°/+60° C	±0.00015% -30°/+60° C	Comply
Rx Sensitivity (EIA SINAD)	0.35µV/12dB SINAD	0.25µV/12dB SINAD	Exceed
Rx Selectivity (12.5kHz Channel)	≥-63 dB	≥-67 dB	Exceed
Rx Intermod Rejection	≥-70 dB	≥-75 dB	Exceed
Rx Spurious & Image Rejection	≥-75 dB	≥-75 dB	Comply
Rx Audio Response	+1, -3 dB, 6dB/octave de-emph	+1, -3 dB, 6dB/octave de-emph	Comply
Rx Audio Output	5 or 10 watts, ≤3% distortion @ max. rated output	Dual 15 Watt, ≤3% distortion @ 15 Watts	Exceed

2.2 Portable Radio Compliance Matrix

SPECIFICATIONS	Portable	KNG-P800	Status
Power Requirements	Min choice of Ni-MH or Nickel-Cadmium, (rechargeable)	1950 mAh Li-On 3450 mAh Li-On AA-Clamshell	Exceed
Temperature	-30° to +60° C (Full Performance)	-30° to +60° C (Full Performance)	Comply
Humidity	95% @ 50° C	95% @ 50° C	Comply
Duty Cycle	10% Tx 10% Rx 80% Stby (12 hours minimum battery life)		Comply
Shock & Vibration	MIL 810 C/D/E/F/G	MIL 810 C/D/E/F/G	Comply
Transmitter Specifications			
SPECIFICATIONS	Portable	KNG-P800	Status
Tx RF Output Power	3 watts	1-3 Watts	Comply
Tx RF Output Impedance	–	50 Ω	
Tx Frequency Stability	±0.00015% -30°/+60° C	±0.00015% -30°/+60° C	Comply
FCC Emission Designator	11K0F3E 20K0F3D	11K0F3E, 16K0F3E, 8K10F1D,8K10F1E, 8K10F1W, 20K0F1E	Exceed
Tx Audio Response	+1, -3 dB, 6 dB pre-emphasis	+1, -3 dB, 6 dB pre-emphasis	Comply
Tx Audio Distortion	<5% @ 1 kHz	<3% @ 1 kHz	Exceed
Tx Spurious & Harmonic	≥-75 dB	≥-75 dB	Comply
Tx FM Noise	≥-40 dB @ 3.3 kHz deviation & 1.0 kHz modulation	≥-43 dB @ 3.3 kHz deviation & 1.0 kHz modulation	Exceed
Receiver Specifications			
SPECIFICATIONS	Portable	KNG-P800	Status
Rx Frequency Stability	±0.00015% -30°/+60° C	±0.00015% -30°/+60° C	Comply Comply
Rx Sensitivity (EIA SINAD)	0.35µV/12dB SINAD	0.25µV/12dB SINAD	Exceed
Rx Selectivity (12.5kHz Channel)	≥-63 dB	≥-67 dB	Exceed
Rx Intermod Rejection	≥-70 dB	≥-75 dB	Exceed
Rx Spurious & Image Rejection	≥-75 dB	≥-75 dB	Comply
Rx Audio Response	Describe	+1, -3 dB, 6dB/octave deemph	
Rx Audio Output	0.5 watts, ≤5% distortion @ max. rated output	0.5 watts, ≤1% distortion @ max. rated output	Exceed

2.3 Control Station Compliance Matrix

SPECIFICATIONS	CONTROL	KNG-B800	Status
Power Requirements	120 Vac, 60 Hz & 12 or 24 VDC	20 Vac, 60 Hz & 12 or 24 VDC	Comply
Temperature	-30° to +60° C (Full Performance)	-30° to +60° C (Full Performance)	Comply
Humidity	95% to 50° C	95% @ 50° C	Comply
Duty Cycle	20% Tx 100% Rx	20% Tx 100% Rx	Comply
Shock & Vibration	MIL 810 C/D/E/F/G	MIL 810 C/D/E/F/G	Comply
Transmitter Specifications			
SPECIFICATIONS	CONTROL	KNG-B800	Status
Tx RF Output Power	10-30watts	10-35 Watts	Comply
Tx RF Output Impedance	50 Ω	50 Ω	Comply
Tx Frequency Stability	±0.00015% -30°/+60° C	±0.00015% -30°/+60° C	Comply
Tx Local Audio Sensitivity	-15 dBm @ 3.3 kHz deviation		
FCC Emission Designator	11K0F3E 20K0F3D	11K0F3E, 16K0F3E, 8K10F1D,8K10F1E, 8K10F1W, 20K0F1E	Exceed
Tx Audio Response	+1, -3 dB, 6 dB pre-emphasis	+1, -3 dB, 6 dB pre-emphasis	Comply
Tx Audio Distortion	≤3% @ 1kHz	≤3% @ 1kHz	Comply
Tx Spurious & Harmonic	≥-75 dB	≥-75 dB	Comply
Tx FM Noise	≥-40 dB @ 3.3 kHz deviation &1.0 kHz modulation	≥-44 dB @ 3.3 kHz deviation & 1.0 kHz modulation	Exceed
Receiver Specifications			
SPECIFICATIONS	CONTROL	KNG-B800	Status
Rx Frequency Stability	±0.00015% -30°/+60° C	±0.00015% -30°/+60° C	Comply
Rx Sensitivity (EIA SINAD)	0.35µV/12dB SINAD	0.25µV/12dB SINAD	Exceed
Rx Selectivity (12.5kHz Channel)	≥-63 dB	≥-67 dB	Exceed
Rx Intermod Rejection	≥-70 dB	≥-75 dB	Exceed
Rx Spurious & Image Rejection	≥-75 dB	≥-75 dB	Comply
Rx Audio Response	+1, -3 dB, 6dB/octave de-emph	+1, -3 dB, 6dB/octave de-emph	Comply
Rx Audio Output	1.5 watts, min ≤3% distortion @ max. rated output	15 watts, ≤3% distortion @ max. rated output	Exceed

3 RELM/BK P25 Trunked radio subscriber units and options.

RELM/BK Radio KNG Series Project 25 radios are available in all public safety and government frequency bands for land mobile radio use. KNG Series radios meet FCC and NTIA requirements for narrowband operation. Offering a rich feature set including analog conventional, P25 digital conventional, and P25 trunked. Encryption options are available for secure tactical communications.

	Frequency Range	Full Keypad Portable	Limited Keypad Portable	Mobile Radio	Base Station
VHF FCC ID	136-174 MHz	KNG-P150 K95KNGP150	KNG-P150T2 K95KNGP150	KNG-M150 K95KNGM150	KNG-B150 K95KNGM150
UHF Range 1 FCC ID	380-470 MHz	KNG-P400 K95KNGP400	KNG-P400T2 K95KNGP400	KNG-M400 K95KNGM400	KNG-B400 K95KNGM400
UHF Range 2 FCC ID	440-520 MHz	KNG-P500 K95KNGP500	KNG-P500T2 K95KNGP500	KNG-M500 K95KNGM500	KNG-B500 K95KNGM500
700/800 MHz FCC ID	763-870 MHz	KNG-P800 K95KNGP800C	KNG-P800T2 K95KNGP800C	KNG-M800 K95KNGM800	KNG-B800 K95KNGM800

Portable Radio Options	
KZA0577	**DES / AES Encryption Includes FIPS-140-2 Approved Hardware**
KZA0578	**Project 25 Over the Air-Rekey (OTAR)**
KZA0579	**Project 25 9600 Baud Trunking – 2048 Channel**
KZA0581	**Multi-Cast Vote Scan Plus**
KZA0582	**Over the Air Reprogramming**
KZA0593	**P25 Phase II – 2 Slot TDMA Operation (Requires KZA0579)**
KZA0595	**P25 Radio Authentication (Requires KZA0577)**

Mobile Radio Options	
KZA0154	Option, High Power, 110W KNG-M150 Only
KAA0660	Remote Control Head Plug & Play KNG Mobiles
KZA0569	P25 9600 Baud Trunking
KZA0576	DES / AES Encryption Includes FIPS-140-2 Approved Hardware
KZA0580	P25 Over the Air Rekeying (OTAR)
KZA0583	Multi-Cast Vote Scan Plus
KZA0589	GPS Option for KNG Mobiles
KZA0592	Over the Air Reprogramming
KZA0594	P25 Phase II – 2 Slot TDMA Operation (Requires KZA0569)
KZA0596	P25 Radio Authentication (Requires KZA0576)
KAA0261	External Speaker 20W, 4 Ohm, W/ Mounting Bracket
KAA0276	Standard Handheld Microphone KNG-M
KAA0290	Handheld Programming Microphone

4 Capabilities of RELM/BK P25 Trunked Radios

Vocoder	DVSI IMBE/AMBE+2 Enhanced dual rate Vocoder Selectable Automatic Gain Control (AGC) Selectable Background Noise Reduction	Version 1.80
Systems	Conventional or Trunked Radio Systems	16
Channels/Groups	Total number of Channels or Talk Groups	2048
Channel ID Table	Channel Plan for VHF/ UHF Trunked Systems	16 / System
Radio ID List	Preprogrammed Radio ID Alias	1024 / System
Control Channels	Channel used to transmit and receive channel assignment data or other commands	256 / System
Sites	Fixed infrastructure Aliases	512 / System
Dynamic Site Array	Internal list of sites the trunked radio is aware of	32
Encryption Keys	AES (256 bit) or DES	128
Key Sets	Groups of Keys usually used in OTAR	2
Packet Data	Ability to receive voice and data on the same channel.	Integrated Voice and Data
Receiver Mode	Ability to receive standard P25 signals (C4FM) and simulcast (LSM) modulation	C4FM/CQPSK
Phase 1/Phase 2	Project 25 Phase 1 FDMA or Phase 2 TDMA	H-CPM/H-DQPSK
Over The Air Rekey	Ability to securely update encryption Keys	P25 OTAR
Authentication	Project 25 Link Layer Authentication for registration	AES-128
Over the Air Reprogramming	P25 Packet Data System can be utilized to update subscriber radio programming	P25 Compatible
System Redundancy	Ability for subscriber radios to continue operation during system failure	Site Trunking, Failsoft and direct mode.
System Coverage	Ability to limit P25 trunking operation on a single RF site or for automatic roaming across multiple RF sites to include multiple zones or systems	Single Site, Preferred Site or Wide Area

5 Radio Programming Software

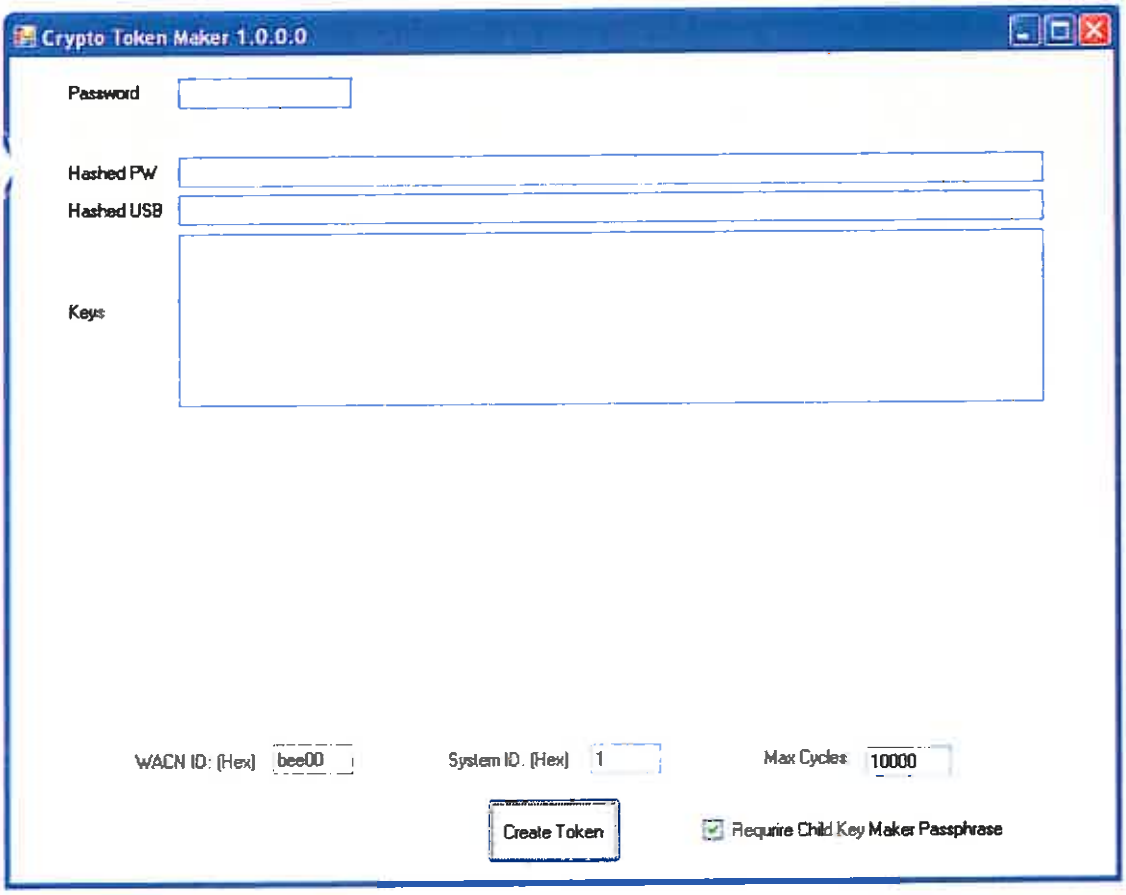
RELM/BK Radios are programmed using a Windows based radio programming application called NeoVision. NeoVision programs all KNG subscriber models including mobiles and portables. Radio codeplugs can be converted from portable to mobile automatically without the need to reenter common system information. NeoVision restricts unauthorized personnel from programming a radio for operation on a trunked radio system through the use of a 'system key'. The system key is radio system specific (System ID and WACN ID) and is required to be present to enable programming trunked radio parameters.

5.1 System Key Generation

RELM/BK uses a Master/Child key hierarchy for system key generation. RELM/BK will provide the radio system owner with a Master Key and software utility which can be used to generate child keys.

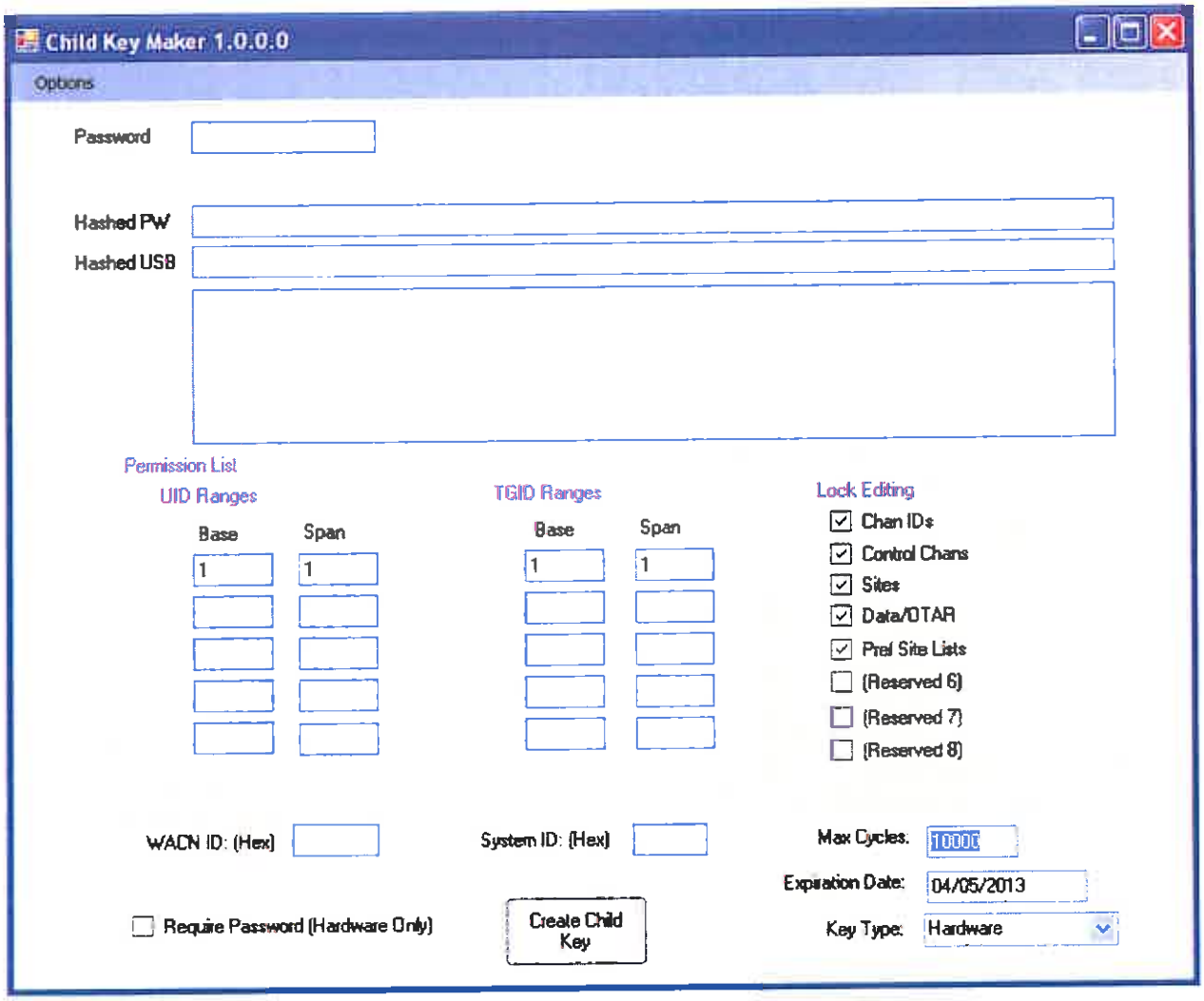
5.1.1 Master Key

The Master Key is generated by RELM/BK and is specific to a given radio system (WACN ID, System ID). This key is configured to limit the number of child keys that can be generated and can be optionally configured to require a pass phrase when generating child keys. The master key is provided to the authorized system owner in the form of a USB device.



5.1.2 Child Key

Using an appropriate Master key, the radio system owner can create Child keys. Child Keys are required by the NeoVision programming software to enable programming trunked radio parameters. The radios system owner customizes the child key to provide varying restrictions to programming trunked radio parameters.



5.1.2.1 UID Ranges

Up to 5 different ranges of radio unit IDs can be enabled. If no ranges are specified, then the child key allows for programming of any unit ID.

5.1.2.2 Talk Group ID Ranges

Up to 5 different ranges of radio unit IDs can be enabled. If no ranges are specified, then the child key allows for programming of any talk group ID.

5.1.2.3 By default, all trunked radio system parameters are locked out or prevented from being programmed. The system owner can configure a given child key to allow programming for various system options.

5.1.2.4 Max Cycles

A given child key can be configured to allow from 1 to 99,999 radio programming operations. By default, 10,000 programming operations are allowed.

5.1.2.5 Expiration Date

The system owner will provide the expiration date for the child key. After this date, NeoVision will no longer recognize the child key as valid and will prevent all trunked radio programming operations using this key. By default, the expiration date is 6 months from key creation.

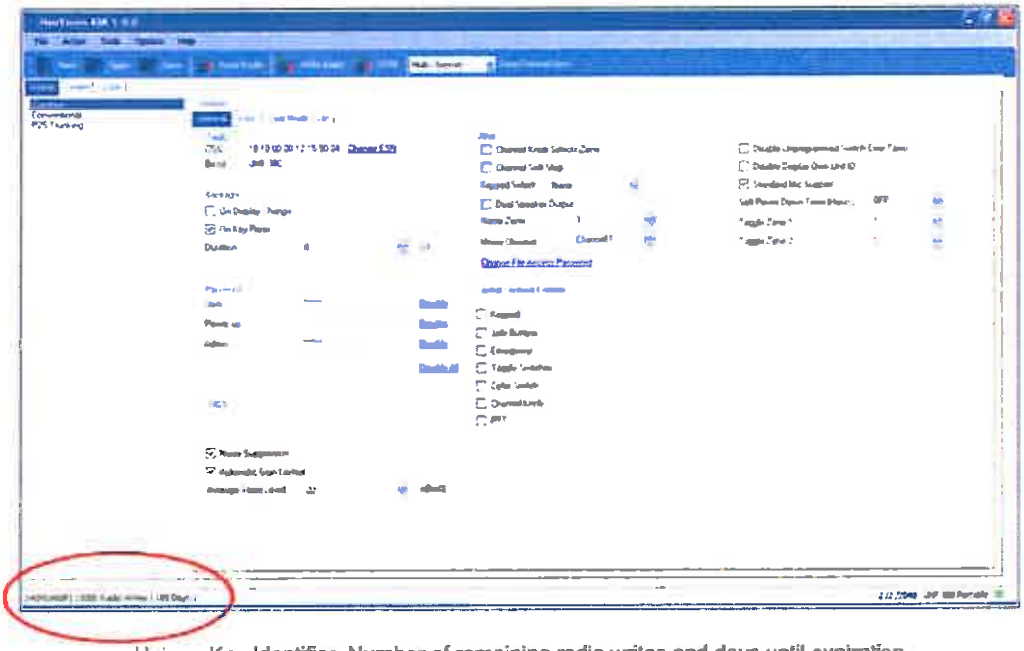
5.1.2.6 Key Type

The system owner can create the child key as either a USB hardware device (USB key devices are required) or as a software file. If the key is generated as a hardware device, then as an option, a password can be inserted. If the key is password protected, NeoVision will prompt for the password before use.

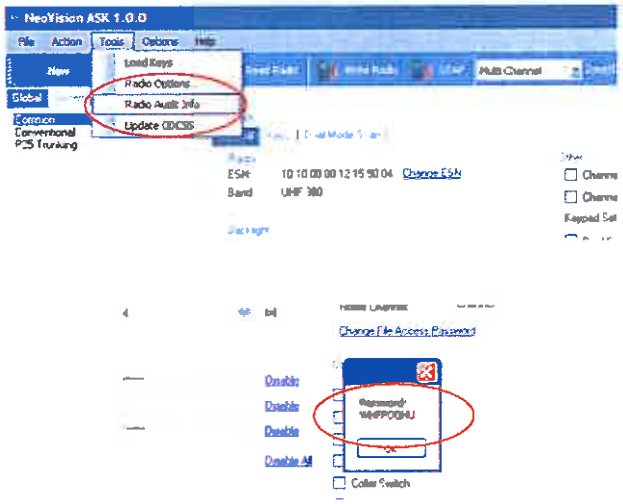
5.2 NeoVision Programming Software

RELM/BK mobile and portable radios are programmed using Windows based programming software. Interface to the radio is using a USB port and cable.

Jsing NeoVision ASK, the child key unique identifier is saved on the radio when programmed. At a later date, the radio can be read and the child key used to program the radio can be determined.

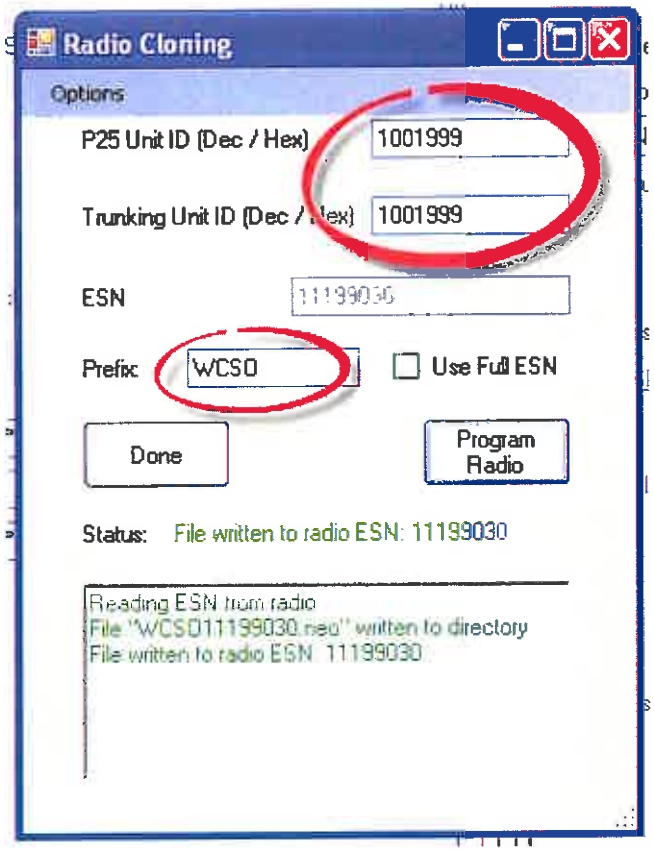


Unique Key Identifier, Number of remaining radio writes and days until expiration

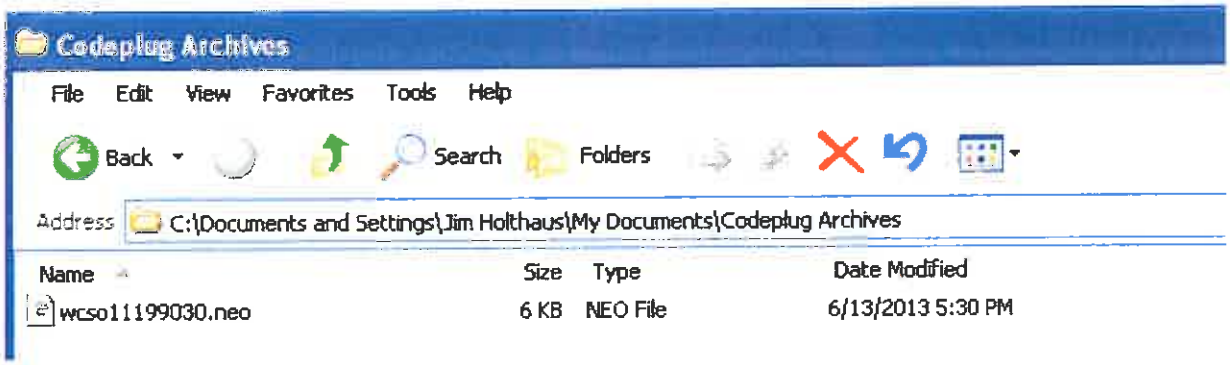


5.3 Managing Radio Codeplug Archives

NeoVision programming software provides tools to automatically archive and mange subscriber radio codeplugs.



The radio programmer enters the appropriate radio IDs for conventional and trunking systems.. An optional prefix for the radio codeplug file is entered. If it is desired to use the complete radio electronic serial number, then the use full ESN checkbox is selected. Connect a radio via USB to the computer and select Program Radio. The programming software will automatically read the radio ESN and populate the ESN field in the codeplug. The code plug is now saved using the prefix and serial number (or full ESN) as the file name. The radio is next programmed and is now ready for use. The next radio can be connected to the USB cable and programmed. Codeplugs can now be reviewed and updated as necessary.



KNG Series Portable Radios

RELM/BK Radio's second generation Project 25 digital radio is offered in four frequency bands to cover the entire Government and Public Safety equipment needs.

The KNG Series radio offers exceptional battery life in a lightweight form factor and is just the right size for covert applications. With industry leading RF and electrical specifications in a rugged, submersible housing, the KNG Series platform provides the performance needed for the most demanding applications making this the perfect radio for all aspects of government, public safety and first responder missions.

All KNG Series portables operate in Project 25 Digital Mode, Wide-Band Analog (25 KHz) Mode, and Narrow-Band Analog (12.5 KHz) Mode. Operation in Project 25 Phase 1 and Phase 2 trunking modes of operation is also supported. KNG Series portables meet FCC and NTIA Narrowband requirements. The KNG Series portables include mixed mode operation which allows reception of all communication regardless of programmed mode. Some Key Benefits of the KNG Series Portable Radios.

- **Better Battery Life.** The KNG Series radio provides up to 12 hours of battery life using the standard Lithium-Ion 1950 mAh battery. With the 3600 mAh high capacity battery, the KNG radio provides up to 22 hours of operation.
- **DHS P25 Compliance Assessment Program Tested.** Meets requirements for all completed compliance assessment bulletins (Conventional and Trunked Performance, Trunked Interoperability).
- **AMBE+2 Enhanced dual rate Vocoder.** Third Generation Enhanced IMBE Project 25 dual rate Vocoder (AMBE+2 V1.80). The Enhanced IMBE Vocoder provides more robust performance in noisy environments. The dual rate Vocoder provides P25 Phase 1 (FDMA) and P25 Phase 2 (TDMA) operation. Using PC Programming software, end users can enable advanced noise cancellation and/or automatic gain control for usage specific performance improvements.
- **Project 25 Phase 1 (FDMA) Trunking**. 9600 baud P25 Compliant Trunking. Interoperable with P25 trunking systems and radios provided by Motorola (ASTRO Smartzone 5.X and above), Harris, Cassidian, Tait, Daniels and EFJohnson systems.
- **Project 25 Phase 2 (2 Slot-TDMA) Trunking.** Provides double the voice capacity of Phase 1 systems. Dual rate subscribers operate in Phase 1 or Phase 2 mode based on system availability. Phase 2 meets FCC/NTIA requirements for 6.25 KHz equivalent spectrum utilization.
- **Environmental Reliability.** Designed and tested to MIL-STD-810 means the KNG portable radios are protected from environmental conditions encountered in demanding use scenarios. IP-67 rated, KNG portable radios are protected against blowing rain and water immersion.
- **Robust Receiver**. The KNG Series radio provides substantially better RF receive performance over competitive offerings, resulting in improved range and less susceptibility to interference.
- **NIST FIPS-140-2 Certification**. NIST Certified Cryptographic module for encrypted operation.
- **Multi-Algorithm Encryption**. AES-256 and DES algorithms provided via the Project 25 Block Encryption Protocol (ANSI/TIA-102.AAAD-A). This insures interoperability with other P25 compliant equipment.
- **Multi-Key.** Any mix of 64 AES or DES keys in two keysets is supported.
- **Encryption Key Fill**. Compliant with the Project 25 Keyfill Device Standard (TIA-102-AACD) and interoperable with commercially available keyfill devices, such as the KVL-3000+ or KVL-4000.
- **Over-the-Air Rekey.** Project 25 Over-the-Air Rekeying (OTAR) Protocol (TIA-102.AACA) provides interoperability with P25 Compliant OTAR systems. Interoperability with Motorola, Harris and Cassidian/Tait OTAR systems has been verified.
- **Radio Authentication.** Project 25 Radio Authentication per TIA-102-AACE-A is supported for robust subscriber radio authentication on trunked radio systems.
- **Voice and Data Operation**. P25 packet data operation. Compatible with dynamic or Static IP addressing. Voice communication has priority over data traffic.
- **Over-the-Air Programming (OTAP).** P25 packet data services are used to support Over-the-Air Programming.
- **GPS/Location Services.** Project 25 Location Services per TIA-102-BAJB are supported.

- **Multi-Mode Operation.** Project 25 Digital Mode, Wide-Band Analog (25 KHz) Mode, and Narrow-Band Analog (12.5 KHz) Mode. Radios meet FCC and NTIA Narrowband requirements. Mixed mode operation allows reception of all communication regardless of programmed mode
- **Simulcast Operation**. Operation in both C4FM and CQPSK modes offering robust performance even in simulcast (including LSM) systems.
- **Conventional Signaling**. MDC-1200 and Project 25 for conventional operation.
- **Multiple Scan Modes**. Conventional dual priority scan, trunked priority scan, and dual mode scan (simultaneous trunked and conventional channel scan).
- **Multi-Line Display.** Multi-line bit-mapped display provides status Icons, three customizable display lines up to 14 characters and soft key legends.
- **Warranty.** 2 Year Standard Warranty. Extended warranty available.
- **Room to Grow.** KNG Series radios utilize less than 20% of available memory and processor cycles. The KNG platform is future ready and able to expand with changing standards and mission requirements.

5.4 KNG Portable Radio Overview

The RELM Wireless Corporation KNG-P handheld portable radio is 5.5" (H) (excluding antenna) X 2.5" (W) X 1.8" (D) while weighing in at 16 oz. (1950 mAh battery). The size and weight of the KNG-P Series portable make it the smallest Class A specification P25 trunked radio available on the market today.

5.4.1 Radio Controls

The KNG Series portable radio provides 16 front keys, to include a 4x3 DTMF keypad and 4 user programmable soft keys which support a radio menu system for advanced features. A limited keypad (Tier2) version is available without the DTMF keypad, but includes the 4 user programmable soft keys.

A 16 position rotary knob is provided for channel selection. This knob has a hard stop at channel one and 16. The KNG Series portable radio provides two programmable toggle switches, an emergency button, and two side buttons. KNG-

CMD series radios feature a **Continuously Rotating Channel Knob**. Similar in operation to most mobile radio channel selector switches, this allows for a dynamic number of channels per zone. When the selector reaches the last channel programmed in the zone/group, the radio can automatically reset to the first channel with an audible tone, or an optional soft stop can be programmed. This supports zone/groups of between 1 and 200 channels.

A top mounted on/off, volume knob is provided to power the radio and to adjust the audio level.

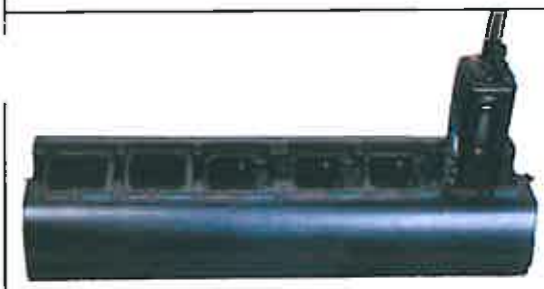
5.4.2 Radio Batteries and Charger

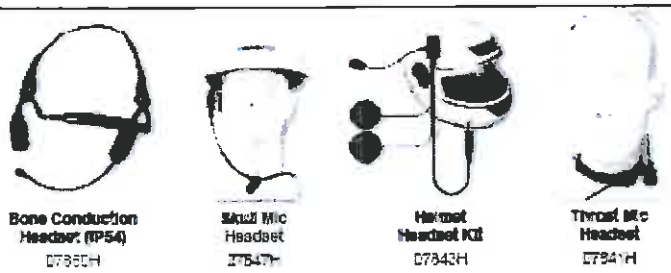
Rechargeable Lithium-Ion battery packs and AA clamshells are both available. Single unit and 6 unit charger solutions are available. Desktop and vehicular configurations are supported.

Rated battery life exceeds 10 hours with the standard Lithium-Ion 1950 mAh battery for (5-5-90) duty cycle. Extended battery life with a Lithium-Ion 3600 mAh battery is also available. Non-rechargeable battery packs are available using AA alkaline battery cells which provide in excess of 8 hours operation at (10-10-80) duty cycle.

RELM offers a complete line of charging accessories including single unit, 6 unit and vehicular battery chargers. For the standard battery, KNG Single unit chargers provide approximately 90% rated capacity after 1 hour. The high capacity battery requires 3 hours. Due to the use of Li-ON technology, fully charging in one hour can have a negative impact on product life. KNG series chargers terminate fast charge at approximately 90% capacity and switch to trickle charge mode. This operation is designed to provide a balance between charge rate and cell life cycle. KNG Series battery chargers automatically protect against overcharging.

	**KAA0100 Li-Ion 1950 mAH** ➢ **10 Hours (5/5/90)** ➢ **8 Hours (10/10/80)** ➢ 5.2" x 2.3" x 0.7" 5.6 oz. ➢ Available I/S Option

	**KAA0101 Li-Ion 3600 mAH** ➢ **18 Hours (5/5/90)** ➢ **14 Hours (10/10/80)** ➢ 5.2" x 2.3" x 0.9" 8.8 oz. ➢ Available I/S Option
	**KAA0120 AA Clamshell** ➢ **Holds 8 AA Batteries** ➢ 5.2" x 2.3" x 0.9" 8.8 oz. ➢ **8 Hours Typical Battery Life (10/10/80)** ➢ **VHF High power (6 Watts)**
	**KAA0300 Single Unit Rapid Charger** ➢ **90 Minute Charge (KAA0100 1950 mAh)** ➢ **3 Hour Charge (KAA0101 3600 mAh)** ➢ 100-240VAC
	**KAA0301 Six Unit Rapid Charger** ➢ **90 Minute Charge (KAA0100 1950 mAh)** ➢ **3 Hour Charge (KAA0101 3600 mAh)** ➢ 100-240 VAC or 12 VDC
	**KAA0355 Vehicular Rapid Rate Charger** ➢ **90 Minute Charge (KAA0100 1950 mAh)** ➢ **3 Hour Charge (KAA0101 3600 mAh)** ➢ Permanent Mounting Bracket and Power Harness ➢ CLA for Temporary Use
	**KAA0200 Speaker Microphone**

	**KAA0201 Submersible Speaker Mic**
	07841H Throat Mike with acoustic ear to H termination
	07840H Large PTT to H Termination 07890B2 H Termination adaptor for KNG portables
	07817B2 Multifunction Speaker Mike Noise Cancelling B2 termination (KNG) Front and Side PTT, Audio port in top for headset options, Vol Control, TX LED.

5.4.3 Environmental and Intrinsically Safe

The KNG portable series radios provide protection against environmental hazards yielding the reliable performance required for mission critical communications. KNG portable radios are designed and tested to meet or exceed MIL-STD-810-F, TIA102, TIA-603 and IP-67 (submersion) specifications.

KNG Series radio battery, speaker microphone and antenna are offered in Intrinsically Safe configuration. Factory Mutual Ratings are: Intrinsically Safe (IS) Class I / II / III, Division 1, Groups D, F and G.

5.4.4 Radio Display and Indicators

KNG portable radios provide a backlight Liquid Crystal Display (LCD) which provides critical context for public safety environments. Radio programming software provides the radio user flexibility in configuring the information displayed on the radio display.

KNG portable radios provide a battery gauge on the radio display, in addition to an audible warning tone and flashing yellow LED indication of low battery conditions.

KNG portables provides a RED LED to indicate active transmit and a Green LED to indicate Active Receive. Radio display provides visual indicator to indicate if TX/RX is Analog Mode or Digital Mode.

The KNG portable radio includes a three line 14 character per line alpha-numeric display. Up to three programmable Items for display are selected from the radio programming software, or radio keypad programming feature. Included are: Channel Label, Frequency, Channel Number, Unit ID, Received Talk Group ID, Receive/Transmit Pick List selections, Zone Label, Zone number and Channel number, Zone Number, and Receive/Transmit Encryption Key.

5.4.5 Radio Side Connector and Accessories

The KNG series portable provides an accessory connector that supports a speaker/microphone. The accessory connector also supports data transfers to and from the radio via a USB accessory connector.

The KNG series provides external connections for transmit and receive audio. Differential audio is available at the radio side connector. A 6 pin Hirose adapter is available as an optional accessory. The Hirose adapter provides audio connections for surveillance and other audio accessories. Audio output is specified at 500 mWatt with less than 1.5% distortion. The KNG Series radios are capable of producing higher audio power levels at a slightly higher distortion rating.

6 KNG Series Mobile Radios and Control Stations

RELM/BK Radio's second generation Project 25 digital mobile radio is offered in four frequency bands to cover the entire Government and Public Safety equipment needs.

The KNG-M Series radio offers exceptional features in a standard package for both mid and high power applications. The innovative touch screen display of the KNG-M Series radio addresses many issues seen in existing mobile radio control heads. With industry leading RF and electrical specifications in a rugged water-resistant housing, the KNG-M Series platform provides the performance needed for the most demanding applications making this the perfect radio for all aspects of government, public safety and first responder missions.

All KNG-M Series mobiles operate in Project 25 Digital Mode, Wide-Band Analog (25 KHz) Mode, and Narrow-Band Analog (12.5 KHz) Mode. Operation in Project 25 Phase 1 and Phase 2 trunking modes of operation is also supported.

The KNG Series mobiles include mixed mode operation which allows reception of all communication regardless of programmed mode. Some Key Benefits of the KNG-M Series Mobile Radios:

- **Innovative Touch Screen Display.** The touch screen display provides an unparalleled level of end-user customization and ease of use. The touch screen display also provides capability for feature expansion as new technologies are developed and integrated with Project 25 Standards
- **Water Resistant.** The KNG-M Series mobile radios are resistant to rain and blowing rain (IP-54).
- **DHS P25 Compliance Assessment Program Tested.** Meets requirements for all completed compliance assessment bulletins (Conventional and Trunked Performance, Trunked Interoperability).
- **AMBE+2 Enhanced dual rate Vocoder.** Third Generation Enhanced IMBE Project 25 dual rate Vocoder (AMBE+2 V1.80). The Enhanced IMBE Vocoder provides more robust performance in noisy environments. The dual rate Vocoder provides P25 Phase 1 (FDMA) and P25 Phase 2 (TDMA) operation. Using PC Programming software, end users can enable advanced noise cancellation and/or automatic gain control for usage specific performance improvements.
- **Project 25 Phase 1 (FDMA) Trunking**. 9600 baud P25 Compliant Trunking. Interoperable with P25 trunking systems and radios provided by Motorola (ASTRO Smartzone 5.X and above), Harris, Cassidian, Daniels and EFJohnson systems.
- **Project 25 Phase 2 (2 Slot-TDMA) Trunking.** Provides double the voice capacity of Phase 1 systems. Dual rate subscribers operate in Phase 1 or Phase 2 mode based on system availability. Phase 2 meets FCC/NTIA requirements for 6.25 KHz equivalent spectrum utilization.
- **NIST FIPS-140-2 Certification**. NIST Certified Cryptographic module for encrypted operation.
- **Multi-Algorithm Encryption**. AES-256 and DES algorithms provided via the Project 25 Block Encryption Protocol (ANSI/TIA-102.AAAD-A). This insures interoperability with other P25 compliant equipment.
- **Multi-Key.** Any mix of 64 AES or DES keys in two keysets is supported.
- **Encryption Key Fill**. Compliant with the Project 25 Keyfill Device Standard (TIA-102-AACD) and interoperable with commercially available keyfill devices, such as the KVL-3000+ or KVL-4000.
- **Over-the-Air Rekey.** Project 25 Over-the-Air Rekeying (OTAR) Protocol (TIA-102.AACA) provides interoperability with P25 Compliant OTAR systems. Interoperability with Motorola, Harris and Cassidian/Tait OTAR systems has been verified.
- **Radio Authentication.** Project 25 Radio Authentication per TIA-102-AACE-A is supported for robust subscriber radio authentication on trunked radio systems.
- **Voice and Data Operation**. P25 packet data operation. Compatible with dynamic or Static IP addressing. Voice communication has priority over data traffic.
- **Over-the-Air Programming (OTAP).** P25 packet data services are used to support Over-the-Air Programming (OTAP).
- **GPS/Location Services.** Project 25 Location Services per TIA-102-BAJB are supported.
- **Multi-Mode Operation.** Project 25 Digital Mode, Wide-Band Analog (25 KHz) Mode, and Narrow-Band Analog (12.5 KHz) Mode. Radios meet FCC and NTIA Narrowband requirements. Mixed mode operation allows reception of all communication regardless of programmed mode
- **Simulcast Operation**. Operation in both C4FM and CQPSK modes offering robust performance even in simulcast (including LSM) systems.
- **Conventional Signaling**. MDC-1200 and Project 25 for conventional operation.
- **Multiple Scan Modes**. Conventional dual priority scan, trunked priority scan, and dual mode scan (simultaneous trunked and conventional channel scan).
- **Multi-Line Display.** Multi-line bit-mapped display provides status Icons, three customizable display lines up to 14 characters and soft key legends.
- **Warranty.** 2 Year Standard Warranty. Extend warranty available.
- **Room to Grow.** KNG Series radios utilize less than 20% of available memory and processor cycles. The KNG platform is future ready and able to expand with changing standards and mission requirements.

6.1 KNG Mobile/Control Station Overview

The RELM Wireless Corporation KNG- M mobile radio is 7.25″ (W) x 9.25″(L) x2.25"(H) while weighing in at 7.5 pounds. One key advantage of the KNG mobile is that the form factor is the same regardless of the output power. The KNG mobile radio employs an innovative full color touch screen display for excellent visibility and flexibility for future configurations.

6.1.1 Radio Controls

The KNG-M Series radios use an innovative touch screen display. This display is used to both control radio functions and to provide visual feedback to the operator. Via programming software, the characteristics of the display and controls are customized for the individual radio application. The display also provides Status Icons including encryption indicator and Received Signal Strength.

The KNG Series Mobile provides for continuous backlighting, dimmed backlight and no backlight which is user selectable using a programmable key. Ambient light sensor automatically adjusts backlight levels. A surveillance mode is also available which disables lighted or audible alerts.

6.1.2 Microphones

KNG-M Series radios are available with a standard handheld microphone or a handheld programming microphone.

6.1.2.1 The standard microphone is a ruggedized IP-54 handheld unit with push-to-talk (PTT).

6.1.2.2 The handheld programming microphone is a ruggedized IP-54 handheld unit with PTT, 3 user programmable side buttons, a 3x4 DTMF style keypad and a 5 button navigation pad. The programming microphone allows the radio user greater flexibility in radio operation, including the ability to operate radio features from the microphone instead of using the radio control head.

6.1.3 Remote Control Heads

Optional remote control heads are available for the KNG-M Series radios. A total of three control heads can be supported, one transceiver mounted and two remote heads.

7 Common Features: KNG Series Mobile, Portable and Control Stations

7.1 KNG Series Overview

All KNG Series radios operate in Project 25 Digital Mode, Wide-Band Analog (25 KHz) Mode, and Narrow-Band Analog (12.5 KHz) Mode. KNG Series portables meet FCC and NTIA Narrowband requirements. The KNG Series portables include mixed mode operation which allows reception of all communication regardless of programmed mode. KNG Series radios can be programmed to transmit and receive across the full bandsplit of the subscriber radio. Direct mode channels are supported, as well as repeater talk around function key. When repeater talk around is enabled, or the radio is programmed with the same transmit and receive frequency, a status indicator is visible on the radio display.

NTIA, FCC and NPSPAC channel plans are supported. KNG radios are fully frequency synthesized. Frequency range is across the full specified band on 1.25 KHz and 3.125 KHz channel increments.

7.2 APCO P25 Trunking

KNG series radios are available with APCO Project 25 Phase I and Phase II Trunking operation.

7.2.1 Project 25 Phase i

The Project 25 Phase 1 (FDMA) Trunking option provides operation on 9600 baud trunking control channels per TIA-102 series documents. This option is DHS-P25CAP tested and approved for both performance and interoperability. P25CAP testing, customer testing and RELM's internal testing have demonstrated interoperability P25 trunking systems and radios provided by Motorola (ASTRO Smartzone 5.X and above), Harris, Cassidian, Daniels and EFJohnson systems.

7.2.2 Project 25 Phase II

The Project 25 Phase 2 (2 Slot-TDMA) Trunking adds operation on two slot Time Division Multiple Access (TDMA) trunking systems as defined in the TIA-102 series standards. TDMA operation provides double the voice capacity of Phase 1 systems. KNG radios operate as dual rate subscribers, automatically switching between Phase 1 or Phase 2 mode based on system availability. Phase 2 meets FCC/NTIA requirements for 6.25 KHz equivalent spectrum utilization.

7.3 Programming/Service Interface

KNG Series Programming and alignment software operates on an IBM compatible computer. Minimum system requirements are Windows XP, 1GB memory, 1024x800 Video Resolution, USB 1.0/2.0, and Microsoft .NET 3.5

The electrical interface between the computer and the subscriber radio is a USB interface. Mobile radios use a standard USB-to-5-Pin Mini-B Cable available at most electronic retailers. Portable subscriber radios require a side-port adaptor available from RELM Wireless (KAA0710 or KAA0587) in addition to the standard USB cable.

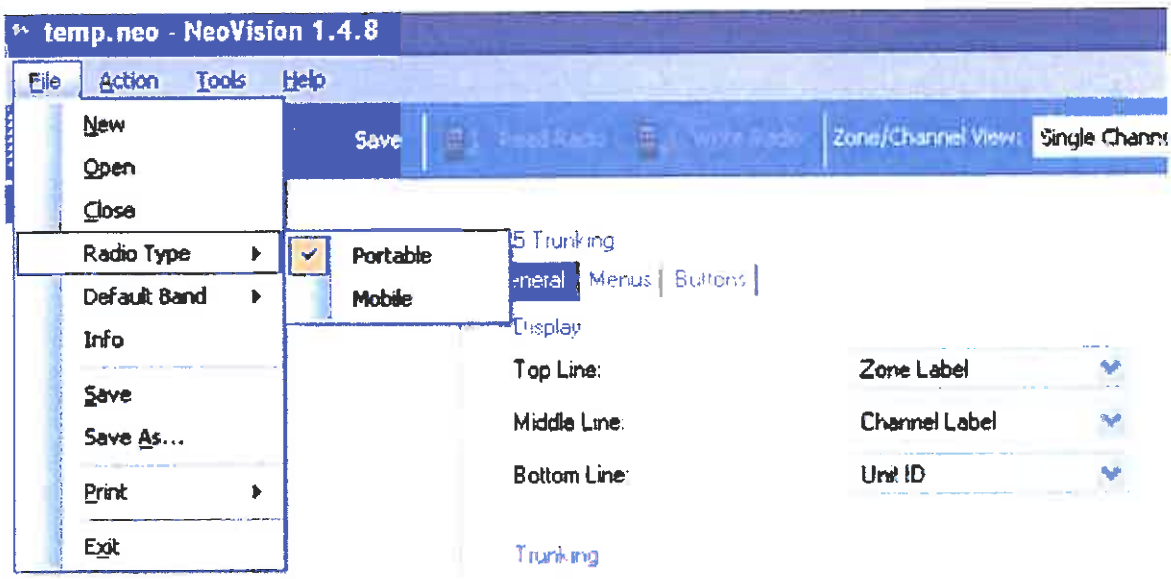
7.4 Radio Alignment and Servicing

Radio diagnostics, service and alignment is accomplished using PC based software applications and or off the shelf test equipment available. Areoflex service monitors will soon support test and alignment of KNG subscriber radios. Radio alignment software interfaces to the radio via the USB port for all KNG series radios.

7.5 Radio Programming

All KNG series radio utilize a common programming software application. This allows creation of a common programming file. Files are converted from mobile to portable via a menu selection. This is shown in Figure 1 Programming Radio Type.

Figure 2 Programming Radio Type



7.6 User Selectable Features

KNG Series radios can be configured to provide radio users flexibility to meet mission requirements for both conventional and trunked operation. Table 1 provides a listing of features that can be assigned to radio softkeys, buttons, and switches or selected from a menu type list.

Table 1 Available user functions

KNG Series Available User Functions		
Conventional		Trunked
Backlight	Picklist -Talkgroup ID	Backlight
Busy Channel	Picklist -TxCxCSS	Call Alert
Call Alert	Picklist -TxNAC	Channel Select
Channel Scan	Priority Channel Select	Control Lock
Channel Scan List Edit	Priority Scan	Contrast
Channel Select	Radio Check	Dual Mode Scan
Cloning	Radio Info	Dual Mode Scan List View/Edit
Contrast	Rekey Request	Dynamic Regrouping
Control Lock	Repeater Talkaround	Emergency Call
DTMF	Squelch Adjust	Emergency Alarm
Dual Priority Scan	Surveillance Mode	Emergency Revert
Dual Mode Scan	System Test	Emergency Hot Mic
Dual Mode Scan List View	Text Messaging	Inhibit / Un-inhibit
Dual Mode Scan List Edit	Time Out Timers	Keyset Select
Emergency Call	TxDigital	Over-the-Air Programming (OTAP)
Emergency Alarm	TxPower	Over-the-Air Rekeying (OTAR)
Emergency Revert	Tx Secure	Preferred Site
Emergency Hot Mic	Two-Tone Siganlling	Priority Scan (Three Level)
Nuisance Channel Delete	Uninhibit	Priority Scan List View/Edit
P25 Tier 1 Location Services	Unit (Private) Call	Radio Check
Inhibit	User Status	Radio Info
Keyset Select	Version	Site Display
Monitor	Vote Scan	Site Lock

MDC-1200	Voice Mute	Site Search
OTAR	Zeroize Keys	Surveillance Mode
Picklist-Key	Zone Scan	System Test
Picklist -Rx CxCSS	Zone Scan List Edit	Tx Power (Low/High/Automatic)
Picklist -RxNAC	Zone Select	Tx Secure/Clear
Integrated Voice and Data		Unit (Private) Call
Keypad Programming		Version
Call List	NAC Picklist	Zeroize Keys
CxCSS Picklist	Talkgroup ID Picklist	Zone Select
Keypad		P25 AgileSite(Single Site, Wide Area and/or Multizone Roaming)
		Integrated Voice and Data

7.7 Voice Coding and Audio Signaling

The KNG Series radio uses the Third Generation Enhanced IMBE Project 25 Vocoder (AMBE+2 V1.80). The Enhanced dual rate IMBE Vocoder provides more robust performance in high background acoustic noise environments as well as degraded RF environments. The dual rate Vocoder supports both P25 Phase II and P25 Phase ii Operation. Using PC Programming software, end users can enable advanced noise reduction and/or automatic gain control for usage specific performance improvements. Testing by the US Department of Commerce's Public Safety Communications Research Program has shown that the AMBE+2 v1.80 Vocoder has provided substantial improvement in intelligibility in high-background-noise environments.

7.7.1 Digital Audio Conditioning

KNG Series radios incorporate Digital Voice System Incorporated's (DVSI) AMBE+2 Dual Rate Vocoder Software. The Dual Rate Vocoder is compatible with Phase I and Phase 2 trunking systems. KNG Radios currently implement the version 1.80 AMBE release. Audio intelligibility testing conducted by the Public Safety Communications Research (PSCR) Laboratory located in the Department of Commerce Labs in Boulder Colorado has shown that the DVSI AMBE+2 Vocoder release 1.80 provides audio quality performance on par with analog radio systems. Testing was conducted with a variety of public safety operating conditions to include background noise sources (power equipment and low pressure alarms) and masks. PSCR testing also included RF propagation degradation. Across the public safety operating spectrum, PSCR test results show that the DVSI AMBE+2 Vocoder provides substantially improved audio performance in background noise over that offered by the standard P25 IMBE Vocoder.

KNG Series radios using the AMBE+2 v1.80 Vocoder have improved noise filtering designed to provide improved operation with background noise such as a PASS alarm. In addition, using NeoVision Programming software, programmers can enable advanced noise reduction software and/or automatic gain control for usage specific performance improvements. Automatic Gain Control (AGC) is selectable to optimally condition audio signals to best match the Vocoder dynamic range requirements. Software based noise cancellation can also be selected to reduce environmental noise prior to vocoding. Both features are highly integrated and matched to the P25 Vocoder to provide overall system level performance.

PSCR testing over various public safety use cases has also led to some recommendations for best practices. PSCR testing has shown that audio quality is significantly improved when an internal microphone is used with a mask as opposed to using the VOX port. To this end, RELM currently offers two configurations that use a bone conduction microphone which is compatible with most masks available today.

KNG Series audio inputs and outputs are consistent with other audio accessories and can easily be integrated for interoperability with fire masks currently used by a variety of fire departments. RELM can provide a solution for existing audio interfaces on a case-by case basis.

7.7.2 Audio Signaling

KNG Series radios support generation of DTMF over dial in both analog and digital mode. In addition, the AMBE+2 dual rate Vocoder is compatible with additional audio signaling such as Knox Box tones and console generated supervisory and alert tones.

7.8 Radio Power Up

7.8.1 Power up Self Test

On initial power, KNG series radios execute a series of self diagnostic tests to verify the integrity of the radio hardware and software. KNG radios will display any failure states so that appropriate service can be obtained.

7.8.2 Initialization

On completion of the power up self test, the KNG radio will load the radio code plug and be ready for customer use. If the radio is configured for trunked operation, the radio will perform a trunked system registration followed by the appropriate talk group affiliation. At this time the radio is now ready for operation.

7.8.3 Power up timing

KNG Series portable radios complete the power up self test, code plug initialization and trunked registration and talk group affiliation in five seconds for portable radios and in eight seconds for mobile and control station radios. These timings assume the radio is properly configured for the trunked radio system (preloaded with site control channels and not using full spectrum scan) and there is no significant delay from the trunked system in processing the registration and affiliation requests.

7.8.4 Stand By Mode

KNG Series portables can be configured to enter a standby mode when the on/off selector is switched to the off position. The standby mode causes the radio to appear to be turned off with no audio, lights or other visible activity. While in stand-by mode, the radio does remain affiliated to trunked radio systems and will respond to system commands and roam to adjacent sites. To exit stand-by mode, the radio operator simply switches the on/off knob back

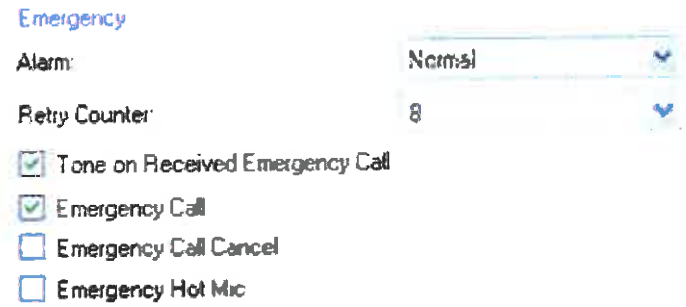
to on, and the radio is immediately fully functional again, without having to go through a full power-up sequence. This saves the radio operator valuable time under duress situations. A programmable power down timer is provided to insure the radio powers off if it remains in the stand-by mode for the selected time period. This time period ranges from 15 minutes to 16 hours in 15 minute increments. A programmable power down function key can be configured using radio programming software to provide the user a means to force the radio to power off while in the stand-by mode.

7.9 Emergency Calls

KNG series radios support emergency calls and emergency alerts. Emergency status with Unit ID/Alias is supported during emergency modes. Emergency mode is supported in both conventional (Figure 2 Conventional Emergency Programming) and trunked (Figure 3 Trunked Emergency Programming) operation. Emergency revert and hot microphone is supported from programming software.

Figure 3 Conventional Emergency Programming

Figure 4 Trunked Emergency Programming



7.9.1 Emergency Acknowledge

KNG Series radios provide indication when the emergency has been acknowledged by the radio system or console operator.

7.9.2 Emergency Cancel

KNG Series radios allow the radio user to cancel the emergency alarm by holding the emergency button for an extended period (approximately 2 seconds) of time. This prevents the user from having to power cycle the radio to clear the alarm. For infrastructure systems that support emergency call cancel from the subscriber radio, the KNG radios can be programmed to transmit the emergency call cancel message.

7.10 Lighting and Displays

7.10.1 Backlight

Backlight can be set to toggle on/off with a programmable function control. Programmable backlight timer is available. Backlight enable on key press is a programmable option. Backlight enable on display change is a programmable option.

7.10.2 **Indicators**

KNG Radios provide a RED LED to indicate active transmit and a Green LED to indicate Active Receive. The Radio display provides visual indicator to indicate if TX/RX is Analog Mode or Digital Mode. A surveillance mode is programmable to disable all light or audio alerts.

7.10.3 **Radio Display**

In addition to the three line by 14 character display, KNG radios provide status icons, including received signal strength indication and programmable soft keys to tailor radio operation for the mission at hand.

The KNG Series radios provide visual indication when in repeater talk around (direct) mode. CTCSS/CDCSS or NAC will be transmitted consistent with the values programmed for the receive channel to allow other radios to properly hear the transmission.

7.10.4 **Radio Display ICONS**

KNG Series radios provide a number of visual indicators to indicate the operating status of the subscriber unit. These display ICONS are noted in Table 2.

Table 2 Radio display Icons.

Display ICON	Meaning
C	Indicates Channel Scan is active (used in conjunction with the scan icon).
☑	Indicates the Channel is currently included in the scan list. Used with the channel scan list edit function
⇌	Indicates the radio is currently operating on the trunked data channel
D	Indicates Dual Mode Scan is active (used in conjunction with the scan icon)
∅	Encrypted Icon. Radio is currently set to transmit in encrypted mode.
P_1	Indicates the currently selected channel is designated as the Priority 1 Channel.
P_2	Indicates the currently selected channel is designated as the Priority 2 Channel
P	Indicates Priority Scan is active (used in conjunction with the scan icon).
RXA	Radio is receiving an analog channel
RXD	Radio is receiving a digital channel
Z	Scan Icon, indicates scan is active.
Z✓	Scan is active and the currently selected channel is in the scan list
✓	Currently selected channel is in the scan list
	Signal strength indicator
iP	Indicates the radio is registered with the trunked data system, and an IP address is assigned to the radio
	Open monitor condition (radio is unmuted)
	Monitor condition. Radio unmutes for all carrier (no call guard for analog channels, or NAC/TG for digital channels). (Icon Solid)
(flashing)	Normal monitor condition Digital and mixed mode channels only TG ignored, but NAC must match to unmute (Flashing Icon).
|→|	Repeater talk around (direct mode) is enabled
TXA	Radio is transmitting in analog mode
TXD	Radio is transmitting in digital mode
H	Radio is set to transmit on high power
L	Radio is set to transmit on low power
☐	Indicates the Channel is currently NOT included in the scan list. Used with the channel scan list edit function
Z	Indicates Zone Scan is active (used in conjunction with the scan icon)

7.10.5 Received Unit ID Signaling (Enhanced ID)

In accordance with the P25 standard, KNG radios include the unit ID with each radio transmission.KNG Series portables provide the UNIT ID of calling radios. If the Unit ID is stored in the alias table, the KNG portable will display the alias in place of the unit ID. This feature applies to Group Calls, Announcement Group Calls, Emergency Calls, Emergency Alarms, and Call Alerts.

7.11 Keypad/Function Lockout

The KNG Series radios provide keypad lockout. This function allows just the keypad to be locked out, or keypad and all buttons to be disabled. When the user presses a locked out control, the display provides an indication that control lock is enabled, and instructions on how to disable control lock. Control lock can be assigned to function button or a

programmable switch. Using a programmable switch for lockout provides a single keystroke activation/deactivation of keypad lockout.

7.12 Multi-Mode Operation (Conventional)

The receiver and transmitter are capable of operating in analog mode (narrowband and wideband) and TIA-102 digital mode. The receiver can be programmed for only analog, only digital or multi-mode operation. The transmitter can be programmed to automatically change modes of transmission to operate in the last received mode (either analog or digital) with a revert timer.

7.13 Scan

The KNG Series portable radio provides an active Scan Icon. Individual radio channels will indicate if they are in the scan list. The KNG Series radio supports dual priority scan and nuisance scan delete. Radio scan list can be edited from the radio key pad if enabled in programming. KNG series radios support multiple scan modes as follows:

7.13.1 Priority Scan (Trunked)

Priority Scan provides up to two priority channels that will be scanned at programmable times. Radio traffic on priority channels will have precedence over non-priority channels. Three levels of priority scan are available: Priority 1; Priority 2 and normal. Any channel in the scan list can be designated as the priority channel, including the selected channel. Up to 255 scan lists can be created with a maximum of 16 channels per list.

7.13.2 Priority Scan List Edit/View (Trunked)

Function keys or menu items can be configured allowing the end user to view or edit the trunked priority scan list. This feature allows the radio operator the ability to determine which channels are currently configured for trunking scan. Radio operators can also add or delete channels to the trunked priority scan list in the field. This allows operators the ability to change the scan list based on current situations from the radio keypad.

7.13.3 Nuisance Channel Delete

KNG series radios provide the ability to program a user selectable nuisance Channel Delete function which will temporarily remove the currently selected channel from the scan list. KNG radios will revert to the currently saved scan list once the radio has been power cycled.

7.13.4 Dual Mode Scan (Conventional and Trunked)

Dual Mode Scan provides the ability to scan across both trunking and conventional channels. The dual mode scan list is limited to 16 channels and trunked channels must be from a single trunking system. For optimum performance, RELM recommends the number of conventional channels in the dual mode scan list be limited to 6.

7.13.5 Dual Mode Scan List Edit/View

Function keys or menu items can be configured allowing the end user to view or edit the dual mode scan list. This feature allows the radio operator the ability to determine which channels are currently configured for dual mode scan. Radio operators can also add or delete channels to the dual mode scan list in the field. This allows operators the ability to change the dual mode scan list based on current situations from the radio keypad.

7.13.6 Vote Scan (Conventional)

Vote Scan allows for selection of the best transmitter site in conventional operation.

7.13.7 Channel Scan (Conventional)

Channel Scan allows all channels in the current zone which have been designated as scan channels to be sampled for :tivity. Three levels of priority scan are available: Priority 1; Priority 2 and normal. Any channel in the scan list can be designated as the priority channel, including the selected channel.

7.13.8 Zone Scan (Conventional)

Zone Scan allows all channels marked for scan in designated zones to be scanned.

7.14 Surveillance Mode

KNG Series radios offer surveillance modes which will turn off all lighted indicators and audible tones. These can be configured from programming software on a channel by channel basis or by use of a dedicated function key.

7.15 Transmit Timers

Transmit timeout timers are separately programmable for trunked and conventional operation. Timers can be set in 15 seconds intervals up to 240 seconds. KNG radios provide a short warning tone five seconds before expiration of the time out timer. Once the timeout timer expires, KNG radios provide an audio alternating tone to indicate the transmit time out timer has expired and the radios ceases transmitting. Upon release of PTT, the transmit timeout timer is reset and the radio can resume transmitting immediately.

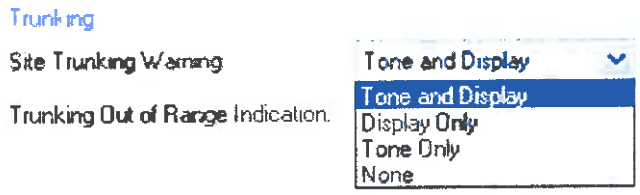
7.16 Trunking System Failure Modes

KNG Series radios support trunking system degraded modes of operation.

7.16.1 Site Trunking

In the event that a trunked radio system site looses connectivity with the trunked system controller and reverts to Site Trunking operation, the KNG series radio will continue to operate in trunking mode. Programming software allows for visual and/or audible warning indicators as noted in Figure 4. While in Site Trunking mode and if configured for Wide Area Coverage, KNG radios will search for an adjacent site that is not in site trunking and will switch if signal conditions permit. If programmed for tone inidcation, the radio will emit a periodic site trunking audible indicator to alert the user the radio is operating in site trunking mode.

Figure 5 Site Trunking Indicators



7.16.2 Failsoft Operation

Failsoft is a fallback means of communication if a site or subsystem cannot perform wide-area or site-trunking operations. In this case, the radio site reverts to conventional operation, transmitting a signal indicating the repeaters are operating in failsoft mode. KNG series radios decode this signal and will automatically revert to conventional operation if programmed for failsoft operation. While in Failsoft, KNG radios display 'FAILSOFT' on the radio display and emit a short audio tone as triggered by the repeater. Once the system outage has been repaired, KNG series radios will automatically resume trunked operation.

KNG Series radios support failsoft by personality. In this mode, the designated failsoft channel used will be the last valid trunking control channel. This mode provides failsoft operation for multi-site trunking systems, where the transmit/receive frequencies are not consistent from site to site.

7.17 KNG Roaming Operation

This section provides background operation on roaming operation for KNG series radios

7.17.1 Dynamic Site Array

KNG Series radios store adjacent site information obtained from the trunking systems adjacent status broad cast messages. This allows the KNG radio to maintain an updated list of available sites. Sites are continuously ranked by received signal strength and other operational parameters. The highest ranked site is the site the radio will affiliate to. The dynamic site array is zeroed anytime a codeplug is written to the radio. The site array is saved on radio power down to improve system acquisition time on power up. KNG radios allow 32 sites in the dynamic site array.

7.17.2 Preprogrammed Control Channels

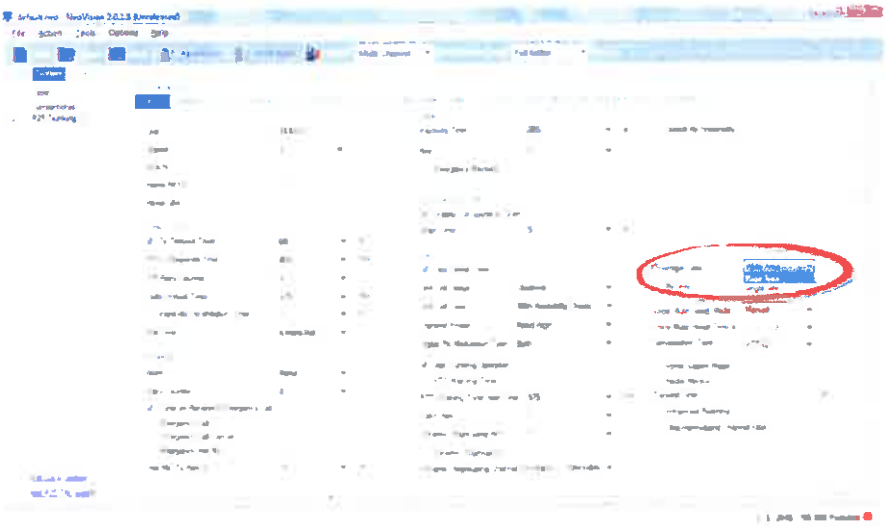
In the event that the dynamic site array is empty, or does not contain a valid control channel, KNG radios allow use of a preprogrammed control channel list. Frequencies in the pre-programmed list are searched for a valid control channel. The pre-programmed list can be used to improve system acquisition time by preprogramming the known control channels.

7.17.3 Full Spectrum Scan

KNG radios can be optionally programmed for full spectrum control channel scan. This allows the radio to search all potential frequencies in the radio band for a valid control channel. Full Spectrum Scan is interrupted at the programmed scan time so that the preprogrammed control channel list can be checked. Once the control channel list has been searched, full spectrum scan resumes.

7.17.4 Coverage Type

KNG series radios support both single site operation and wide area operation.



7.17.4.1 Single Site Coverage Type

If single site coverage is selected, then the radio will not process any adjacent status broadcast messages, and will restrict operation to the currently identified radio site. In this mode, it is important to turn off full spectrum scan and to only populate the control channel list with the intended sites frequencies.

7.17.4.2 Wide Are Coverage Type

If wide area coverage is selected, then the radio will process adjacent status broadcast message and will roam to any available site based on the radio's roaming algorithm. Adjacent status broadcast information is used to populate the dynamic site array.

7.17.4.3 Enhanced Roaming

If enhanced roaming is enabled, then the KNG radio will switch to the site with the strongest received signal strength. If not selected, the radio will remain on the currently selected site until the received signal strength falls below the acceptable signal level threshold.

7.17.4.4 Preferred Site Operation

Preferred site operation allows the radio to be configured to prefer or avoid particular sites for multi-site systems. Site preferencing is used to push particular sites up or down in the site ranking algorithm. Preferred Site options are as follows:

None – No preference is applied to this site.
Least - This site would receive a site ranking deduction. In rural areas, this might speed up roaming to another site as it comes into range. In urban areas, it should be more apparent that this site is never accessed unless for some reason all of the other sites drop out completely.
Preferred - This site would receive a site ranking addition, which means that as long as it is able to transmit and receive fine on this site, it will stay on this site. If an ISP retries to completion or a loss of bit sync occurs or the user selects a new one, then it will move to another site, but RSSI changes won't affect it (unless it becomes less than acceptable).
Always – In this case, the radio will remain on this site until control channel sync is lost.

7.17.5 Site Display

Activation of the Site Dispaly function key or menu item will display the radios currently affiliated site. If the site information has been preprogrammed into the radio site alias table, then in addition to displaying the current site's RFSS ID and Site Number, the corresponding site alias will be displayed. Site display will also provide a received signal strength indication (RSSI) in dBm. This value will be displayed from approximately -88 dBm to -106 dBm. Outside of this range, the RSSI cannot be accurately measured in dBm.

7.17.6 Site Search

Activation of the Site Search function key or menu item will allow the radio operator to scroll through all sites currently known by the radio. These sites are generally the systems included in the adjacent site status broadcast messages transmitted by the currently affiliated site. Each site will also provide the RFSS ID and Site Number, Alias (if programmed) and RSSI for the site.

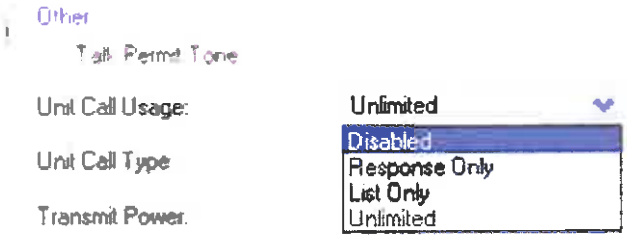
7.17.7 Site Lock

Activation of the Site Lock function key or menu item will allow the radio operator to scroll through the sites that are contained in the currently affiliated site's adjacent site status broadcast messages. The radio will display each site's RFSS ID, Site number, alias (if preprogrammed) and RSSI. The radio operator can choose to lock the radio to any site with acceptable RSSI in the list. When site locked, the RSSI ICON will flash to indicate the radio is locked to the current site.

7.18 Individual Calls

KNG Series radios can be programmed to enable unit-to-unit (individual) calls, restrict the use of unit calls or prevent unit calls as noted in Figure 5.

Figure 6 Unit-to-Unit Call Programming



KNG radios will display the unit ID of the originating radio and provide the radio user the ability to answer the unit to unit call.

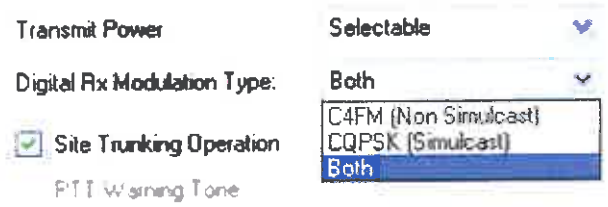
7.18.1 Call Alert(Page)

KNG radios can be programmed to send P25 Call Alert (pages) to other P25 subscriber radios. End users can select from a preprogrammed Unit ID List, or can enter a Unit ID from the radio keypad. Receiving radios indicate that an alert(page) was received. KNG radios will display the unit ID of the originating radio.

7.19 Digital Modulation Mode

KNG Series radios are programmable for non-simulcast (C4FM) and simulcast (CQPSK) modulation as noted in Figure 6.

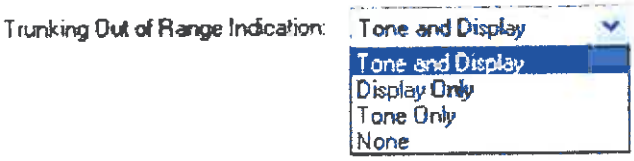
Figure 7 Digital Modulation



7.20 Out of Range

In the event that a KNG subscriber radio goes 'out-of-range' with the trunked radio system, programming software allows for visual and/or audible warning indicators as noted in Figure 7. If enabled, the audible out of range indicator repeats approximately every 10 seconds.

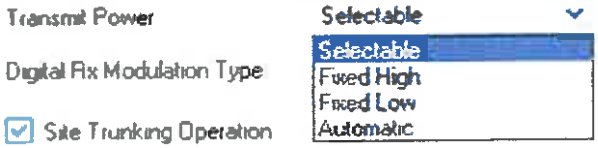
Figure 8 Programming out of Range Indication



7.21 Transmit Power Level

KNG Series radios support fixed power levels (high or low), user selectable (high or low) and automatic power level based on received signal strength. High/low power levels are band dependent.

Figure 9 Transmit Power Level



7.22 Other Trunked Radio Features

7.22.1 Busy Queuing

KNG Series radios support trunked radio system busy queuing. In the event that the trunked radio system is busy and cannot process a call request from a KNG Series subscriber unit, the radio will display a busy indication and produce an audible busy alert tone. Once the trunked system resources are available to process the subscriber request, the KNG series radios will automatically proceed with the call request. The radio will emit a call proceed tone and the radio will auto key for a period of two seconds. Auto keying is desired so that the trunked system resource can be immediately acquired without the risk of another busy condition. The radio operator will need to continue the call resources by pressing the push-to-talk key within the two second window, or the radio will release the trunking traffic channel.

7.22.2 System Inhibit/Uninhibit

KNG Series radios are compatible with system level inhibit commands. Thus if the trunking system operator issues an inhibit command to a KNG series radio, the KNG radio will revert to a non-operational state with a blank display and no TX or RX operation. KNG series radios also support the enable function and can be restored to operational status if previously inhibited. When inhibited, KNG radios will affiliate to talk group zero as described in the P25 Standard. By affiliating to TG 0, the radio system will not have to dynamically allocate talk group activity to a site solely on the basis of an inhibited radio.

KNG Series radios will appear to be turned off when in the inhibited state. KNG radios will maintain inhibit after a radio power cycle. The initial power up cycle will occur with the radio displaying the power-up splash screen. Once the radio has fully powered up, the radio will revert to the inhibited mode as described above.

7.22.3 Radio Check

KNG radios will respond to a P25 radio check command. This allows system operators to query the radio and determine which site and talk group the radio is currently affiliated with.

7.22.4 Radio Monitor

7.22.5 Status Messages/Updates

7.22.6 Talk Group Patches

KNG series radios support system initiated talk group patches. Thus if the radio system temporarily patches two or more talk groups together via a console or system initiated patch, the KNG series radios will properly process the resulting 'super group' calls. This allows the trunked radio system to conserve channel resources by combining two or more talk groups on a single repeater.

7.22.7 Home Channel

KNG radios provide the ability to assign a home channel function key. They home channel can be preprogrammed using radio programming software, or set by the end user in the field.

A short press of the home channel function key will result in the radio switching to the home channel. For portable radios, this will override the channel selector knob until the radio is power cycled, or the channel selector knob is switched.

A press & hold (1 sec) of the home channel function key will reassign the home channel to the currently selected channel. An audible indicator and display message will indicate when the home channel has been reassigned.

7.22.8 Access Priority Levels

KNG Series radios operate with system assigned priority access levels. By default, KNG radios initiate all traffic requests at the P25 default priority level of 4 (on a scale of 0 to 7). When the radios system grants the traffic request, the radio system will assign a priority level for traffic. KNG series radios will use the system assigned priority level for the duration of the traffic. KNG Series radios support use of system assigned priority levels from 0 to 7.

7.22.9 Continuous Assignment Updating (Late Entry)

KNG Series radios continuously monitor trunking control channels during idle mode. This insures that the radio will participate in an in-progress talk group that might occur if the radio just powers up or is switched to a new talk group.

While participating in a talk group call, KNG radios continuously monitor the link control word contained in all traffic channel messages. This allows the radio to determine if traffic channel activity matches the currently selected talk group. If such a mismatch occurs, KNG series radios revert back to the control channel. Extensive forward error correction (soft decision error correction for improved performance) and cyclic redundancy checking are utilized by KNG series radios to substantially reduce the likelihood of incorrect call handling.

7.22.10 Dynamic Regrouping

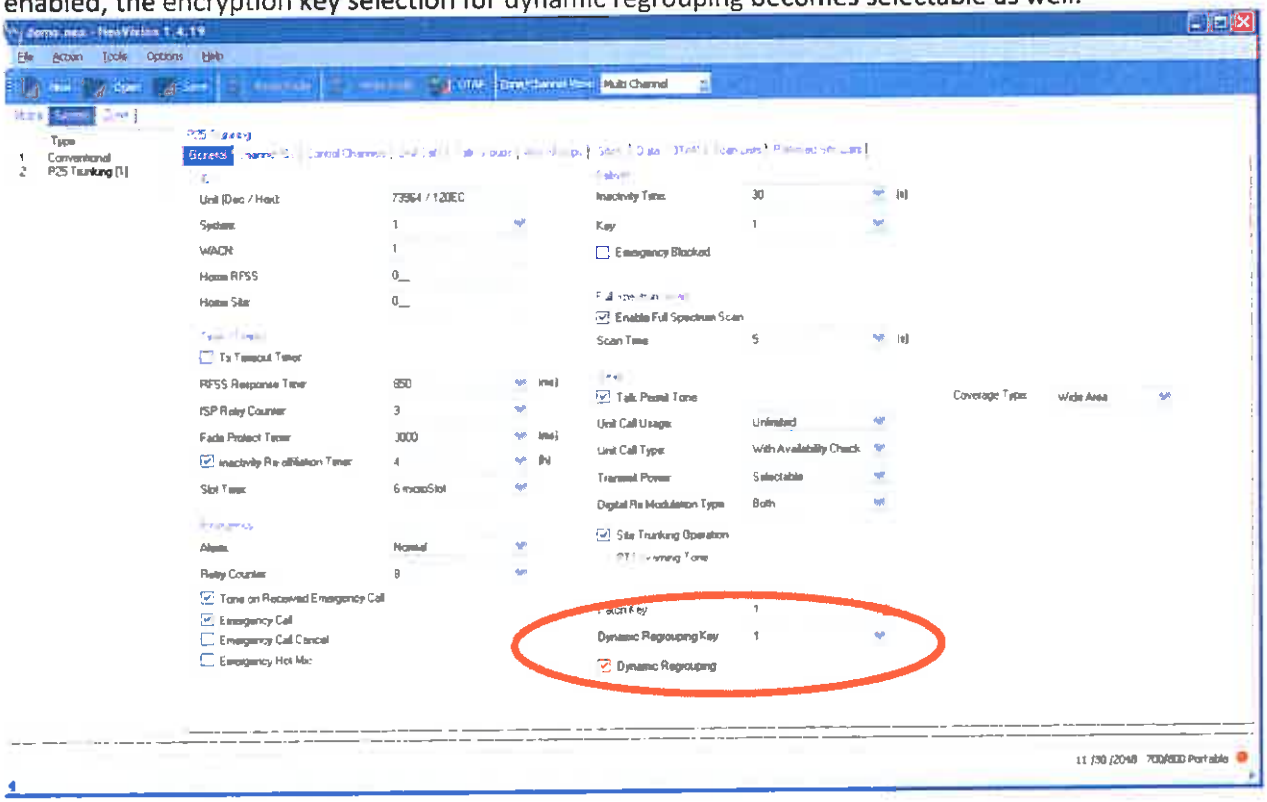
KNG subscriber radios support individual regrouping and talk group regrouping.

Individual regrouping allows a console operator or system administrator to temporarily cause the KNG radio to affiliate to a new talk group.

If the radio has been programmed with a channel marked for "Dynamic Regrouping", then the radio will operate on this channel when regrouped by the system, regardless of the channel knob selection. In this case, the radio will use the emergency group for the dynamic regrouping channel (not the emergency group for the selected channel). KNG radios support 'selector lock', which if activated prevents the radio from being changed from the dynamic regrouping channel until the regrouping incident has been cancelled.
If the user changes channels while not selector locked, the radio can reacquire the dynamic regroup talk group ID by turning to the Dynamic Regrouping channel.

When the radio has not been regrouped, the dynamic regrouping channel is not active. In this case, the radio will emit an audible error tone to indicate this status if the regroup channel is selected.

Dynamic regrouping is enabled on the General Tab of the P25 Trunking System Page. When Dynamic Regrouping is enabled, the encryption key selection for dynamic regrouping becomes selectable as well.



A channel is designated as a dynamic regrouping channel on the Zone Page by using the drop down box to select yes in the Dynamic regrouping column.

If there is no channel marked for "Dynamic Regrouping" (checkbox on trunking channels), then the radio can receive a regroup command, but the radio will use the currently selected channel's emergency group for any emergency alarms/calls. In this case, selector lock is not supported. If the radio operator changes the selected talk group or powers off the radio, then the regrouping channel information is lost and cannot be restored.

KNG radios also support talk group regrouping (group regrouping). This mode of dynamic regrouping is initiated by a console operator or administrator and is designed to allow inter-talk group communication. Group regrouping works more efficiently than a simple talk group patch. A simple talk group patch will bring up a separate RF channel for each talk group. Talk group regrouping is done by signaling the new regrouping information to SUs currently affiliated to the affected talk groups. The talk groups are grouped together into a larger talk group (called a 'super group') whereby one of the affected talk group IDs is used as the ID of the super group.

7.22.11 Over the Air Programming

OTAP is supported from customer programming software Neo Vision to a radio via the P25 trunking system. This feature requires an IP based interface to the P25 system. This requires the radios to have an IP address assigned. Dynamic and static IP addresses are supported. Data packets are routed to the radios via the underlying trunking infrastructure on the basis of this radio IP address. Complete file downloads are supported, not partial files or particular features only. The KNG radio must initially be configured via USB to operate on the P25 trunking system. Over the air programming will not alter any encryption keys currently loaded in the subscriber radio.

7.23 Encrypted Operation

RELM KNG Series radios implement FIPS-140-2 approved encryption and are compliant with TIA-102 Advanced Encryption Standard and TIA-102 DES-OFB Encryption.

7.23.1 Encryption Algorithms

RELM provides both Advanced Encryption Standard (AES) 256 bit key length encryption as well as Data Encryption Standard (DES) 56 bit key length encryption to maintain legacy interoperation. AES 128 bit keys are supported for radio authentication.

7.23.2 FIPS-140-2 Approved

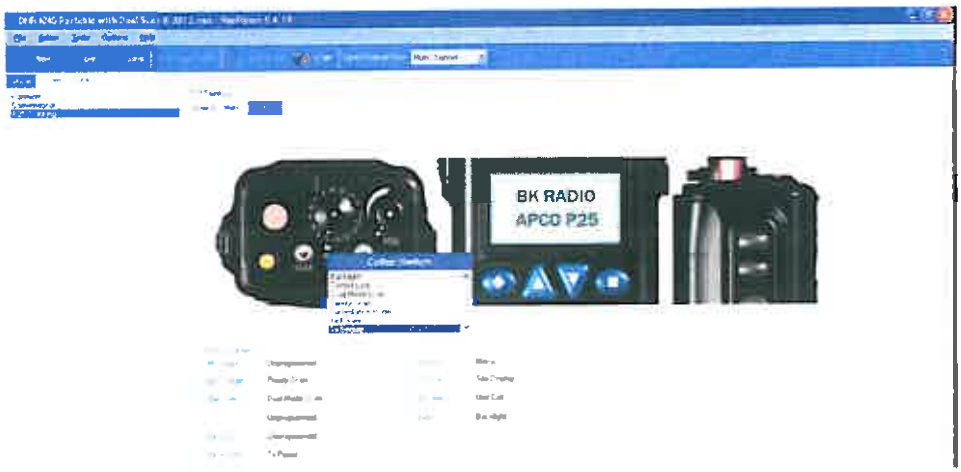
KNG Series radios employ cryptographic modules that have been validated by an independent third party and approved by the National Institutes of Standards and Technology as compliant to FIPS-140-2.

7.23.3 Encryption Keyloading

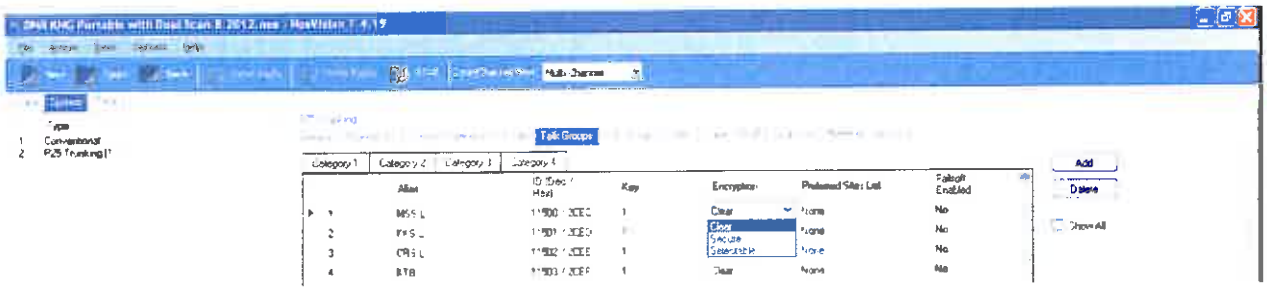
RELM KNG Series radios are compliant to TIA-102,AACD, Project 25 Key Fill Device Interface Protocol. Any key loading device that implements this standard can be used to load KNG radios utilizing RELM cables. Specifically, KNG series radios have been demonstrated to be interoperable with commercially available keyload devices from Motorola (KVL-3000plus, KVL-4000).

7.23.4 Encrypted Operation

Conventional channels or trunked talk groups can be programmed for clear only, user selectable clear/encrypted or encrypted only. If the channel is configured as selectable, customer programming software is used to program the clear/secure activation key (Tx Secure). For the portable, a concentric switch located at the base of the channel select knob is intended for this function; however any of the programmable keys or switches can be utilized. Tx Secure can also be included in the radio menu.



Trunked system talk groups can be programmed to transmit clear, secure or selectable using the programming software as shown below.



KNG Series radios utilize an encryption ICON (Ø) in the radio display to indicate if the currently selected channel is configured to transmit in encrypted mode. Programming software allows configuration of an optional transmit clear alert tone which will provide feedback to the user when the radio is transmitting in clear mode. During receive operation, the encryption ICON (Ø) will flash to indicate the received message is encrypted. If the ICON is not displayed, the received message is unencrypted.

Customer programming software links the channel/talk group with a predefined (default) key. For conventional channels, the key picklist function can be used to select a different key for transmit. For receive operation, the radio will automatically select the correct key provided it is available in the radio.

7.23.5 Encryption Key Management

7.23.5.1 KNG Series radios support multiple encryption keys. Currently up to 64 keys can be loaded into a KNG radio. KNG radios support DES (56 bit key) or AES (256 and 128 bit) keys. Voice encryption can use either DES keys or AES-256 bit keys. Radio Authentication utilizes AES 128 bit keys.

7.23.5.2 Manual Key Management

KNG Series implement infinite key retention which preserves encryption keys in the event of power loss to the radio unit. KNG Series radios provide for a programmable function key and/or a menu item which allows all keys in the radio unit to be deleted or zeroized. Encryption keys may also be deleted using a keyload device. KNG Series radios have been proven compatible with the Motorola KVL-3000+ series keyload devices available from Motorola.

7.23.5.3 Over the Air Rekey

KNG Series radios are also compatible with Project 25 Standards for Over-the-Air Rekeying (OTAR). This option allows for an infrastructure system to maintain encryption keys in a KNG Series radio. Once an initial encryption key configuration has been downloaded to the radio, an OTAR system can manage encryption keys wirelessly without physical contact with the radio. Management of keys can include downloading new keys or deleting existing keys in the radio. This option supports best practice for secure operation.

7.23.6 Radio Authentication

Project 25 Radio Authentication per TIA-102-AACE-A is supported for robust subscriber radio authentication on trunked radio systems. KNG Series radios with encryption can be optionally configured to support radio authentication. The authentication service is applicable to FDMA and TDMA trunking systems using an FDMA trunking control channel. Unit authentication and mutual authentication are supported. Unit authentication is the process that allows a subscriber to prove to the network it is valid. Mutual authentication is a process where the subscriber proves to the network it is valid and the network proves to the subscriber it is also valid. Not all trunked infrastructure systems support mutual authentication.

Authentication uses a 128 bit AES encryption key. Authentication keys are loaded using a P25 Standards based key fill device, such as a KVL.

7.24 Passwords

KNG programming software supports a variety of passwords to protect various

features.

7.24.1 User Password

Used to protect zones and to prevent unauthorized keypad programming operation

7.24.2 Power up Password

The power up password is used to prevent unauthorized radio access. Radio will not complete the power up process until the correct password is entered.

7.24.3 Administrator password

The administrator password overrides all User and Power up passwords.

7.24.4 File Access Password

The file access password prevents the radio code plug from being uploaded without first entering the proper password. f so programmed, this password will also be required to write a code plug to the radio.

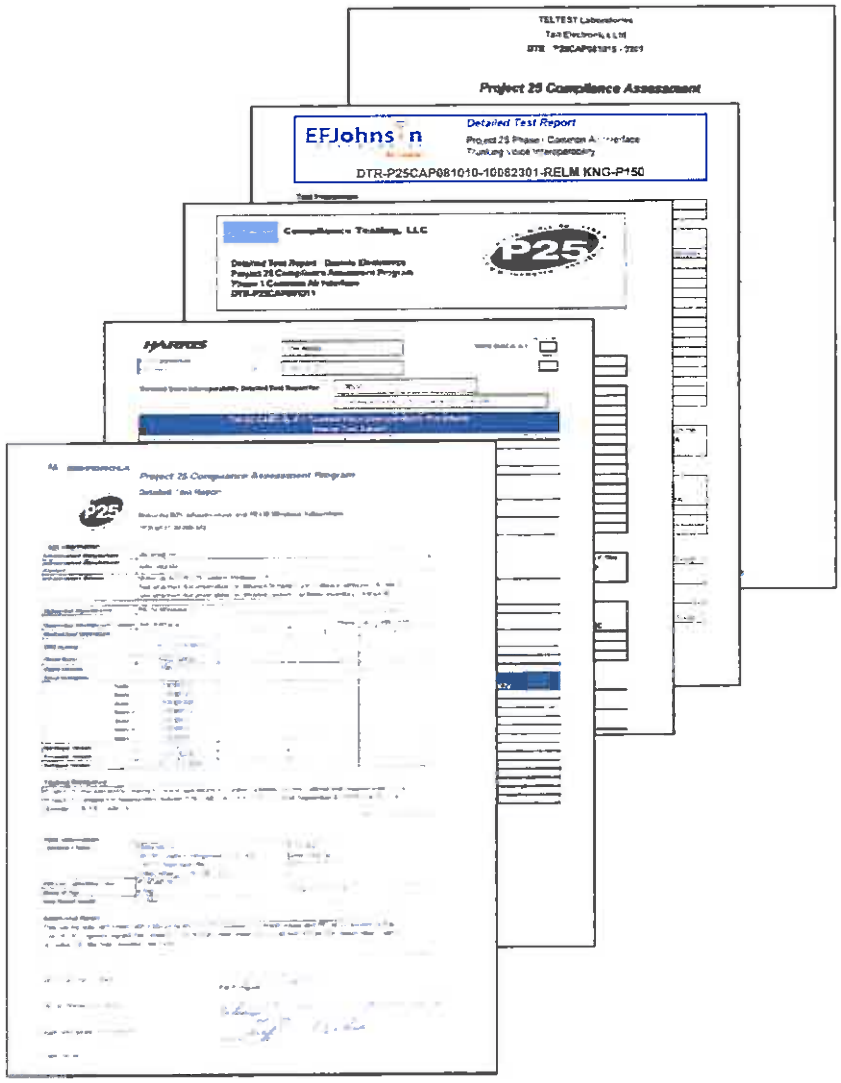
7.24.5

8 Compliance Assessment Testing

KNG Series radios have been tested in accordance with the Department of Homeland Security P25 Compliance Assessment Program (P25CAP). P25CAP testing requirements are specified in the P25 Compliance Assessment Bulletins (CABs). The current CABs address conventional performance, trunked performance and trunked interoperability. KNG Series radios have been independently tested and passed all tests identified in the CABs. KNG series radios meet the interoperability and performance requirements identified and are eligible for purchase using federal grant funding.

KNG Series Radios have been tested in accordance with the Department of Homeland Security's Compliance Assessment Program (CAP) for trunked interoperability. Testing was conducted at DHS recognized laboratories and RELM/BK KNG Series radios have successfully passed this testing on five different manufacturers' infrastructure systems. This satisfies the P25CAP Governing Boards 'rule of three' for trunked interoperability.

DHS-CAP Trunked Interoperability has been validated on five trunked system vendors equipment: Motorola, Harris, Daniels, EFJohnson and Tait/EADS.



8.1 KNG Series Model Class

For the purposes of DHS CAP testing, The KNG Series Model class is defined in Table 3.

Table 3 KNG Series Model Class

Model Class: BK Radio KNG Series Subscriber	
Product Name, Definition and Unique ID	**Model Number and Installed Options**
KNG-P150 VHF Portable Release 1.2.1.1 thru 1.4.5.4	**KNG-P150, KNG-P150T2** Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-P400 380-470 MHz Portable Release 1.2.1.1 thru 1.4.5.4	**KNG-P400, KNG-P400T2** Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-P500 440-520 MHz Portable Release 1.2.1.1 thru 1.4.5.4	**KNG-P500, KNG-P500T2** Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-P800 700/800MHz Portable Release 1.2.1.1 thru 1.4.5.4	**KNG-P800, KNG-P800T2** Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-M150 VHF Mobile Release 2.2.1.1 thru 2.4.5.4	**KNG-M150, KNG-B150** Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-M400 380-470 MHz Mobile Release 2.2.1.1 thru 2.4.5.4	**KNG-M400, KNG-B400** Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-M500 440-520 MHz Mobile Release 2.2.1.1 thru 2.4.5.4	**KNG-M500, KNG-B500** Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-M800 700/800MHz Mobile Release 2.2.1.1 thru 2.4.5.4	**KNG-M800, KNG-B800** Options: Trunking (KZA0579) and Encryption (KZA0577)

9 Cassidian Interoperability Program

RELM KNG Series radios have successfully completed Cassidian Communications Interoperability Program Testing.

RELM WIRELESS

Makers of Baim and BK Radio

Company Contact:
RELM Wireless Corporation
David P. Storey, President & CEO
(321) 984-1414

RELM successfully completes Project 25 interoperability testing with Cassidian Communications.

WEST MELBOURNE, FL, March 8, 2013 – RELM Wireless Corporation (NYSE Amex: RWC) announced today that RELM's KNG Series Trunked Radios have successfully completed Cassidian Communications' Interoperability Program (IOP). The Cassidian Communications Interoperability Program (IOP) is an extensive testing program that simulates scenarios and conditions encountered in both mobile situations and in the field – ensuring that first responders have powerful, flexible and reliable communications tools they can count on.

IOP tests the ability of third-party P25 components to work with the Cassidian Communications COR(™) digital trunked radio system. Successful completion of the IOP is significant in that it affords public safety agencies the freedom to select RELM KNG Series Trunked radio products with confidence – knowing that testing has confirmed that the RELM components will successfully interoperate with the COR(™) system in all normal and abnormal conditions. IOP, which takes place in the Cassidian Communications R&D Centre in Gatineau, Quebec, Canada, is a key step in building multi-vendor ecosystems and best-in-class communications networks.

"Cassidian Communications is committed to providing open, standards-based radio network solutions that support the APCO Project 25 goals of component interoperability, greater competition and lower costs" said Bill Beck, Cassidian Communications, LMR product line manager. "We are pleased that RELM shares this commitment and that its KNG Series Trunked Radios have successfully completed IOP testing.

RELM/BK Radio KNG Project 25 Portable Radio

The KNG Series radio offers exceptional performance in a lightweight form. With industry leading RF and electrical specifications in a rugged, submersible housing, the KNG Series platform provides the performance needed for the most demanding applications making this the perfect radio for all aspects of government, public safety and first responder missions.

Some Key Benefits:

- **Exceptional Battery Life.** Up to 12 hours with standard and 22 hours with high
- **Enhanced Voice Quality.** The KNG Series radio uses the Third Generation Enhanced IMBE Project 25 dual rate Vocoder (AMBE+2 V1.80) for robust performance in noisy environments. Software based noise cancellation preserves situational awareness lost with dual microphone systems.
- **5 Line Bitmap Display.** Status Icons, three customizable display lines of 14 characters and soft key legends.
- **Environmental Reliability.** Designed and tested to MIL-STD-810 **and** IP-67 rated.
- **DHS P25 Compliance Assessment Program Tested and Approved Public Safety Grade (TIA Class A).**
- **Greater Transmit Power.** Up to 1 watt more transmit power for increased range and building penetration
- **Robust Receiver**. Improved range and less susceptibility to interference.
- **Simulcast Operation**. C4FM and CQPSK modes for robust performance in simulcast (including LSM) systems.
- **Conventional Signaling.** Analog MDC-1200 and digital APCO Project 25 for conventional operation.
- **Scan Modes.** Dual priority scan, trunked priority scan, and dual mode scan
- **NIST FIPS-140-2 Certification**. The KNG Series radios employ a NIST Certified Cryptographic module.
- **Multi-Key/Multi-Algorithm Encryption and Over-the-Air Rekey**
- **Encryption Key Fill**. TIA-102-AACD compliant and interoperable with commercially available keyfill devices.
- **Project 25 9600 Baud Trunking**. The KNG Series radio operates on 9600 baud P25 Compliant Trunking Systems and has been Project 25 Compliance Assessment Program (P25CAP) tested and proven interoperable.
- **OTAP.** KNG Series radios support Over-the-Air Programming (OTAP) for operational efficiency.
- **Phase 2 Ready.** KNG Series platforms are Project 25 Phase 2 (TDMA) ready supporting double the voice capacity of Phase 1 trunking systems
- **Radio Authentication.** Project 25 Radio Authentication per TIA-102-AACE-A is supported
- **GPS/Location Services.** Project 25 Location Services per TIA-102-BAJB are supported.
- **Room to Grow.** Currently uses less than 20% of available memory and processor cycles.

The KNG platform meets today's demanding mission critical voice requirements is future ready and able to expand with changing standards and mission requirements.

Portable Radio Options	
KZA0577	DES OFB / AES Encryption Includes FIPS-140-2 Approved Hardware
KZA0578	Project 25 Over the Air-Rekey (OTAR)
KZA0579	Project 25 9600 Baud Trunking – 2048 Channel
KZA0581	Multi-Cast Vote Scan Plus
KZA0582	Over the Air Reprogramming
KZA0593	P25 Phase II – 2 Slot TDMA Operation (Requires KZA0578)
KZA0595	P25 Radio Authentication (Requires KZA0577)

TRANSMITTER – MINIMUM PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHZ	763-776, 793-806 MHz 806-824,851-870 MHz	136-174 MHz	380-470 MHz	440-520 MHz
Channel Spacing		25/12.5 KHz	30/25/12.5 KHz	25/12.5 KHz	25/12.5 KHz
Maximum Frequency Separation		Full Band	Full Band	Full Band	Full Band
Rated RF Output Power		1-3 Watts	1-6 Watts	1-5 Watts	1-5 Watts
Frequency Stability (-30°C to +60°C, +25°C Reference)		±.00015%	±.00015%	±.00015%	±.00015%
Modulation Limiting		±5/4/2.5 KHz	±5/2.5 KHz	±5/2.5 KHz	±5/2.5 KHz
Emissions (Conducted and Radiated)		-75 dB	-75 dB	-75 dB	-75 dB
Audio Response		+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB
FM Hum & Noise	700 MHz 800 MHZ	-49 / -43 dB -49 / -43 dB	-50 / -44 dB	-50 / -44 dB	-50 / -44 dB
Audio Distortion	700 MHz 800 MHZ	3%	3%	3%	3%

KNG SERIES BATTERIES

Battery Capacity / Type	Diminsions (HxWxD)	Weight	Part Number	Capacity
Li-Ion Smart 1950 mAh	5.2" x 2.3" x 0.7"	5.6 oz.	KAA-0100	1950 mAh - Up to 12 Hours
Li-Ion Smart 3600 mAh	5.2" x 2.3" x 0.7"	8.8 oz.	KAA-0101	3600 mAh – Up to 22 Hours
Li-Ion Smart 1950 mAh FM-IS	5.2" x 2.3" x 0.9"	5.6 oz.	KAA-0100IS	1950 mAh – Up to 8 Hours
Li-Ion Smart 3600 mAh FM-IS	5.2" x 2.3" x 0.9"	8.8 oz.	KAA-0101IS	3600 mAh – Up to 16 Hours
AA Clamshell	5.2" x 2.3" x 0.9"	8.8 oz.	KAA-0120	

KNG SERIES RADIO MODELS

	 **KNG T2**	 **KNG**
Display	5 Line, full bitmapped monochromatic backlight display. 3 lines x 14 characters of customizable text 1 line of status Icons 1 line of Soft Key legends	5 Line, full bitmapped monochromatic display. 3 lines x 14 characters of customizable text 1 line of status Icons 1 line of Soft Key legends
Keypad	Backlight keypad with 4 customizable softkeys	Backlight keypad with 4 customizable softkeys 4 row by 3 column DTMF style keypad
Channel Capacity	2048	2048
Memory	64 MB Volatile 256 MB Non-Volatile (Flash)	64 MB Volatile 256 MB Non-Volatile (Flash)
700/800 MHz	KNG-P800T2	KNG-P800
VHF	KNG-P150T2	KNG-P150
UHF Range 1	KNG-P400T2	KNG-P400
UHF Range 2	KNG-P500T2	KNG-P500
Buttons and Switches	Oversized PTT, On/Off volume Control, Orange emergency button, 16 position rotary switch, 2-postion concentric switch, two 2-position toggle switches, 2 Programmable side buttons	

Transmitter Certifications

700/800 MHz (FCC/IC)	K95KNGP800C / 2116A-KNGP800C

VHF (FCC/IC/JF-12/NTIA)	K95KNGP150 / 2116A-KNGP150 / JF12-09552 / SPS-18031
UHF Range 1 (FCC/IC/JF-12/NTIA)	K95KNGP400 / 2116A-KNGP400 / JF12-09552 / SPS-18031
JHF Range 2 (FCC/IC)	K95KNGP500 / 2116A-KNGP500

FCC Emission Designators

FCC Emission Designators	11K0F3E, 16K0F3E, 8K10F1D,8K10F1E, 8K10F1W, 20K0F1E

Power Supply

Power Supply	Rechargeable Li-Ion or AA-Alkaline Battery Pack

RECEIVER – MINIMUM PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz	763-776, 793-806 MHz	136-174 MHz	380-470 MHz	440-520 MHz
	800 MHZ	806-824,851-870 MHz			
Channel Spacing		25/12.5 KHz	30/25/12.5 KHz	25/12.5 KHz	25/12.5 KHz
Maximum Frequency Separation		Full Band	Full Band	Full Band	Full Band
Audio Output Power at Rated		500 mW	500 mW	500 mW	500 mW
Frequency Stability (-30°C to +60°C, +25°C Reference)		±.00015%	±.00015%	±.00015%	±.00015%
Analog Sensitivity	12dB SINAD	0.25µV	0.20µV	0.25µV	0.25µV
Digital Sensitivity	1% BER	0.35 µV	0.30 µV	0.30 µV	0.35 µV
	5% BER	0.25 µV	0.20 µV	0.25 µV	0.25 µV
Selectivity	25 KHz	75 dB	80 dB	78 dB	77 dB
	12.5 KHz	67 dB	70 dB	67 dB	67 dB
Intermodulation		-75 dB	-78 dB	-75 dB	-75 dB
Spurious Rejection		-75 dB	-80 dB	- 80 dB	- 80 dB
FM Hum and Noise	25 KHz	-50 dB	-50 dB	-50 dB	-50 dB
	12.5 KHz	-44 dB	-44 dB	-44 dB	-44 dB
Audio Distortion		1%	1%	1%	1%

PORTABLE MILITARY STANDARDS 810 C, D, E, F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F	
	Method	Proc. /Cat.	Method	Proc. /Cat.	Method	Proc. /Cat.	Method	Proc. /Cat.
Low Pressure	*500.1*	I	500.2	II	500.3	II	500.4	II
High temperature	*501.1*	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Hot
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1

Temperature **Shock**	503.1	–	503.2	I/A1C3	503.3	I/A1C3	503.4	I
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	–
alt Fog	509.1	–	509.2	–	509.3	–	509.4	–
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I
Blowing Sand								
Immersion	512.1	I	512.2	I	512.3	I	512.4	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24
Shock	516.2	I, II	516.3	I, IV	516.4	I/IV	516.5	I, IV
Shock (Drop)								

DIMENSIONS with Battery

	Inches	Millimeters
Width	2.5	63.5
Depth	1.8	45.7
Height	5.5	139.7
Weight (w/o battery)	9.6 oz.	
Weight (1950 mAh battery)	15.2 oz.	
Weight (3600 mAh battery)	18.4 oz	

ENCRYPTION

Supported Algorithms	AES-256, AES-128, DES
Algorithm Capacity	Unlimited
Encryption Keys	64 Storage Location Number (SLN)/Common Key Reference (CKR)
Frame Re-sync Interval	P25 Common Air Interface 300 mS
Keyloading	IAW TIA-102-AACD (KVL-3000/4000)
Synchronization	OFB – Output Feedback
Vector Generator	National Institutes of Standards and Technology (NIST) approved random number generator
Type	Digital Encryption
Key Storage	Non-Volatile
Key Erasure	Keyboard Command and KMF
,tandards	FIPS-140-2 FIPS 197

Other Certifications	
P25 Compliance Assessment (P25CAP) Performance	Trunked and Conventional Performance Class A
P25 Compliance Assessment (P25CAP) Interoperability	Motorola, Harris, EFJohnson, Tait, Cassidian and Daniels
Cassidian Interoperability	Cassidian Communications Interoperability Program (IOP)
National Interagency Fire Certification (VHF and UHF)	KNG-P150 and KNG-P400
Intrinsically Safe/Non-Incendiary	Class I / II / III, Division 1, Groups D, F and G. Class I / II / III, Division 2, Groups A – G, TC3

RELM/BK Radio KNG Project 25 Mobile Radio

The KNG Series radio offers exceptional performance in a lightweight form. With industry leading RF and electrical specifications in a rugged, water resistant housing, the KNG Series platform provides the performance needed for the most demanding applications making this the perfect radio for all aspects of government, public safety and first responder missions.

Some Key Benefits:

- **Innovative Touch Screen Display.** Touch screen display provides unparalleled level of end-user customization, ease of use, and expansion as new technologies are integrated with Project 25 Standards
- **Enhanced Voice Quality.** The KNG Series radio uses the Third Generation Enhanced IMBE Project 25 dual rate Vocoder (AMBE+2 V1.80) for robust performance in noisy environments. Software based noise cancellation preserves situational awareness lost with dual microphone systems.
- **5 Line Color Bitmap Display.** Status Icons, three customizable display lines of 14 characters and soft key legends.
- **Environmental Reliability.** Designed and tested to MIL-STD-810 **and** IP-54 rated.
- **DHS P25 Compliance Assessment Program Tested and Approved Public Safety Grade (TIA Class A).**
- **Robust Receiver.** Improved range and less susceptibility to interference.
- **Simulcast Operation.** C4FM and CQPSK modes for robust performance in simulcast (including LSM) systems.
- **Conventional Signaling.** Analog MDC-1200 and digital APCO Project 25 for conventional operation.
- **Scan Modes.** Dual priority scan, trunked priority scan, and dual mode scan
- **NIST FIPS-140-2 Certification.** The KNG Series radios employ a NIST Certified Cryptographic module.
- **Multi-Key/Multi-Algorithm Encryption and Over-the-Air Rekey**
- **Encryption Key Fill.** TIA-102-AACD compliant and interoperable with commercially available keyfill devices.
- **Project 25 9600 Baud Trunking.** The KNG Series radio operates on 9600 baud P25 Compliant Trunking Systems and has been Project 25 Compliance Assessment Program (P25CAP) tested and proven interoperable.
- **OTAP.** KNG Series radios support Over-the-Air Programming (OTAP) for operational efficiency.
- **Phase 2 Ready.** KNG Series platforms are Project 25 Phase 2 (TDMA) ready supporting double the voice capacity of Phase 1 trunking systems
- **Radio Authentication.** Project 25 Radio Authentication per TIA-102-AACE-A is supported
- **GPS/Location Services.** Project 25 Location Services per TIA-102-BAJB are supported.
- **Room to Grow.** Currently uses less than 20% of available memory and processor cycles.

The KNG mobile platform meets today's demanding mission critical voice requirements is future ready and able to expand with changing standards and mission requirements.

Mobile Radio Options	
KZA0154	Option, High Power, 110W
KAA0660	Remote Control Head
KAA0670	Handheld Control Head
KAA/KZA0569	P25 9600 Baud Trunking
KZA0576	DES OFB / AES Encryption FIPS-140-2
KAA/KZA0580	P25 Over the Air Rekeying (OTAR)
KAA/KZA0583	Multi-Cast Vote Scan Plus
KAA/KZA0589	GPS Option for KNG Mobiles
KAA/KZA0592	Over the Air Reprogramming
KAA/KZA0594	P25 Phase II – 2 Slot TDMA Operation
KAA/KZA0596	P25 Radio Authentication
KAA0261	External Speaker 20W, 4 Ohm
KAA0276	Standard Handheld Microphone KNG-M
KAA0290	Handheld Programming Microphone

TRANSMITTER – MINIMUM PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHZ	763-776, 793-806 MHz 806-824,851-870 MHz	136-174 MHz	380-470 MHz	440-520 MHz
Channel Spacing		25/12.5 KHz	30/25/12.5 KHz	25/12.5 KHz	25/12.5 KHz
Maximum Frequency Separation		Full Band	Full Band	Full Band	Full Band
Rated RF Output Power		10-35 Watts	10-50 Watts 25-100 Watts	10-50 Watts	10-50 Watts
Frequency Stability (-30°C to +60°C, +25°C Reference)		±.00015%	±.00015%	±.00015%	±.00015%
Modulation Limiting		±5/4/2.5 KHz	±5/2.5 KHz	±5/2.5 KHz	±5/2.5 KHz
Emissions (Conducted and Radiated)		-75 dB	-75 dB	-75 dB	-75 dB
Audio Response		+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB
FM Hum & Noise	700 MHz 800 MHZ	-50 / -44 dB -50 / -44 dB	-50 / -44 dB	-50 / -44 dB	-50 / -44 dB
Audio Distortion	700 MHz 800 MHZ	3%	3%	3%	3%

DIMENSIONS

	Inches	Millimeters
Mid Power Transceiver	2.5 x 6.5 x 8.5	63.5 x 165.1 x 215.9
High Power Transceiver	2.5 x 6.5 x 8.5	63.5 x 165.1 x 215.9
Remote Control Head	2.5 x 6.5 x 1.5	63.5 x 165.1 x 38.1
Mid/High Power Transceiver Weight	7.5 lbs	3.4 kg

HHC – Hand Held Control

- Full Color Touch screen
- 5 Lines: 3 Lines text (14 Characters), 2 Lines Icons, programmable touch keys
- Smartphone Style Contextual Display
- Built in Speaker

Standard Control Head

- Full Color Touch screen
- 5 Line display: Status Icons, three customizable display lines of 14 characters, 4 programmable touch keys and menu touch key
- 3 x 4 Keypad microphone with navigation keys and 3 programmable function keys
- Dash and Remote Mount Configurations
- Multiple Control Heads supported: Single, dual and triple allow full control of the transceiver from multiple positions

RECEIVER – MINIMUM PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz	763-776, 793-806 MHz	136-174 MHz	380-470 MHz	440-520 MHz
	800 MHZ	806-824,851-870 MHz			
Channel Spacing		25/12.5 KHz	30/25/12.5 KHz	25/12.5 KHz	25/12.5 KHz
Maximum Frequency Separation		Full Band	Full Band	Full Band	Full Band
Audio Output Power at Rated		500 mW	500 mW	500 mW	500 mW
Frequency Stability (-30°C to +60°C, +25°C Reference)		±.00015%	±.00015%	±.00015%	±.00015%
Analog Sensitivity	12dB SINAD	0.25µV	0.20µV	0.25µV	0.25µV
Digital Sensitivity	1% BER	0.32µV	0.27µV	0.32µV	0.32µV
	5% BER	0.25 µV	0.20 µV	0.25 µV	0.25 µV
Selectivity	25 KHz	75 dB	80 dB	78 dB	77 dB
	12.5 KHz	67 dB	70 dB	67 dB	67 dB
ntermodulation		-75 dB	-78 dB	-75 dB	-75 dB
Spurious Rejection		-75 dB	-80 dB	- 80 dB	- 80 dB
FM Hum and Noise	25 KHz	-50 dB	-50 dB	-50 dB	-50 dB
	12.5 KHz	-44 dB	-44 dB	-44 dB	-44 dB
Audio Distortion @ 15 Watts		3%	3%	3%	3%

SIGNALING

Signaling Rate	9.6Kbps(FDMA) / 12Kbps(TDMA) / 1.2Kbps (MDC)
Digital ID Capacity	16,777,216 (Conventional and Trunking)
Network Access Codes	4096 per TIA 102
Project 25 Talk Group IDs	65,535 (Conventional and Trunking)
Error Correction	Soft Decision, Golay, BCH, Reed-Solomon
Modulation	FM, C$FM, C-QPSK, H-CPM, H-DQPSK

GPS SPECIFICATIONS

Channels	50
Tracking Sensitivity	<–155 dBm
Accuracy	<6 meters (95%)
Cold Start	<32 seconds (95%)
Hot Start	<1 second (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

Power and Current Drain

Power Supply	13.8 V DC ±20% Negative Ground
Transient Protection	Per EIA-374-A
Standby Current @ 13.8 V	0.15A All models
Receive Current Rated Audio @ 13.8 V	2.5A All Models
Transmit Current @ Rated Power	VHF (50 W) 15A, VHF(110 W) 22A, UHF (50W) 15A, 700/800 MHz 10 A

MOBILE MILITARY STANDARDS 810 C, D, E, F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F	
	Method	Proc. /Cat.	Method	Proc. /Cat.	Method	Proc. /Cat.	Method	Proc. /Cat.
Low Pressure	*500.1*	I	500.2	II	500.3	II	500.4	II
High temperature	*501.1*	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Hot
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1
Temperature Shock	503.1	–	503.2	I/A1C3	503.3	I/A1C3	503.4	I
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	–
Salt Fog	509.1	–	509.2	–	509.3	–	509.4	–
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24
Shock	516.2	I, II	516.3	I, IV	516.4	I/IV	516.5	I, IV

RELM Capability Form

CAPABILITY FORM			
Company Name: RELM COMMUNICATIONS, INC.	SOCIO-ECONOMIC PROGRAMS		
Address: 7100 Technology Drive, W. Melbourne, FL 32904	Small	Yes __X__	No____
Contact's Name: John Murray	Small Disadvantaged	Yes ____	No__X__
Telephone Number: (713)922-5660	8(a)	Yes ____	No__X__
Email Address: jmurray@relm.com	Women Owned	Yes ____	No__X__
Website: www.relm.com	HUBZone	Yes ____	No__X__
Fax Number: 321-676-4403	Veteran Owned	Yes ____	No__X__
DUNS Number: 006418933	Service Disabled Veteran	Yes ____	No__X__
Cage Code: 62720 TAX ID 35-0827418	Other: ISO9001/2 certified, NIST Approved, FM Approved APCO P25 manufacturer of American Made Two Way radios for First Responders, DOD, State & Local Public Safety APCO P25 Portables, Mobiles, Base Stations & Repeaters.		

SERVICES/PRODUCTS	NAICS	
•	Code	DESCRIPTION
• Tactical Communications • Land Mobile Radios (LMR) • P25 Digital Radios/Narrowband Radios • Encrypted Radios/OTAR	• 334220 Size Standard	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing $ - None / 750 Employees
• Land Mobile Radios (LMR) • P25 Digital Radios/Narrowband Radios • Encrypted Radios/OTAR	• 334290 Size Standard	Other Communications Equipment Manufacturing $ - None / 750 Employees
• Land Mobile Radios (LMR) • P25 Digital Radios/Narrowband Radios • Encrypted Radios/OTAR	• 335929 Size Standard	Other Communication and Energy Wire Manufacturing $ - None / 1000 Employees
• GS35F0133L	NIST	FIPS-140-2
• HSSS01-12-D-0028	DHS	
• GS-TFMG-BPA-09-0011	NIFC	Wildland Fire Certification

MAJOR PAST PERFORMANCES	REFERENCES
• NIFC center has a cache of over 6,000 BK radios in place for incident command teams for fighting forest fires, natural disasters or national incidents. • Department of Interior • Digital Narrowband Radio APCO P25 • ID/IQ Firm Fixed Price	National Interagency Fire Center (NIFC) 3833 S. Development Avenue Boise, Idaho 83705-5352 Shannon Tippitt 208-387-5977 Shannon_Tippitt@NIFC.BLM.GOV
• FEDSIM- USDA Forest Service • Narrowband APCO P25 Radios • Firm Fixed Price • February 2010 purchased $6.4 Million variety of our Two-way Equipment / APCO P25	USDA-USFS Michael S. DeSouto U.S. Forest Service 3162 Valleypointe Roanoke, VA 24109 540-265-5171 mdesouto@fs.fed.us
• #12/0244 / 2012 • Encrypted APCO P25 Digital radios / Phase II TDMA • Firm Fixed Price • $1.5M • Handhelds, Mobiles, base Stations and Repeaters	Harris County Patty Kenyon 1001 Preston, Suite 670 Houston, Texas 77002 713-755-7909