

1. Project Title: Digital Radios for Vallejo Police Department

2. Total Budget: \$270,000

3. Short Project Summary:

*We are proposing the purchase of 40 new hand-held digital radios for patrolling officers. This will help Vallejo Police Department make the switch from analogue technology to digital, which is becoming the standard for law enforcement throughout the bay area.*

4. Delegate Names:

William Richerson  
Pablo Hernandez  
Rachel Klegon  
Peter Bekker

5. Email:

6. Detailed Project Description:

We are proposing the purchase of 40 new hand- held radios as soon as possible in order to begin upgrading field communications for patrolling officers who are reliant on these not only for normal communications while away from the patrol car but also their safety during emergency situations. These new radios are modern, digital and analogue capable, and have a deployment projection in excess of 10 years. *The proposed radios' improved technology provides officers a clearer and stronger reception and transmission signal indoor or out, both important considerations given the types of scenarios the officers are likely to find themselves in during the course of executing their patrol duties. We are proposing that PB funds 40 radios to begin the transition of VPD doing a complete switch to digital.*

7. Type of Project: Capital

8. Why is this project needed?

VPD field officers are in desperate need of upgraded hand held radios while out on patrol. There are currently 122 budgeted VPD officer positions though current staffing is only 108. Field officers rely on hand held field radios once they arrive at the scene and leave their patrol car. This communication is critical to the safety of the community and officers. The currently used technology is ten years old and needs to be upgraded.

*The City of Vallejo I.T. Department, responsible for maintaining VPD communication equipment, stated that it is experiencing increasing problems in maintaining VPD's radio system due to much of*

*the equipment having reached the end of its life span. Due to some radios that have worn out and beyond repair, the VPD is currently operating without a supply of spare radios in case of emergencies.*

9. How will this project address or solve this need and/or problem?

With the purchase of these new radios, we will improve the safety of the community as well as the police officers. In the event of a major emergency or natural disaster, the digital radios will better allow police officers to communicate with all emergency responders from surrounding areas (state, federal, county, and cities).

10. Describe in detail how residents, visitors, groups, communities, geographic areas, or the City of Vallejo will benefit from this project:

Aside of the safety benefits both to the officers and the public in dealing with crimes, accidents, natural disasters through upgrading patrol communications there is also a side benefit that needs to be considered as Vallejo seeks to recruit new officers to fill its vacancies and maintain sufficient staffing in the Police Department. Among VPD's main competitors for qualified recruits, the police departments of Vacaville and Fairfield are upgrading their communication systems to include digitalhand held radios for their police officers.

11. Describe the potential challenges and/or obstacles for this project:

*Given the estimated costs of upgrading the entire patrol staff to the technology of the Motorola APX 8000 hand held radio, it might be financially necessary to phase the transformation over a period of several years.*

12. Name of Implementing Partners:

City of Vallejo I.T. Department,  
Motorola Solutions  
V.P.D.

13. Where will the project be implemented?

VPD

14. Itemized Budget:

\$270,000/40 Units

- Programming and maintenance for radios is included in this cost
- The IT department will be providing in-kind training on proper use of the radios.

The prospective vendors will be solicited, and selected in accordance with the City of Vallejo's RFQ process.

15. Describe the Project Timeline/Schedule:

Radios will be purchased as soon as funds are released by the city, possibly as soon as summer 2019. Once the radios are purchased the VPD will be able to immediately begin the phase-in use of the digital hand held radios.



# APX™ 8000 ALL-BAND P25 PORTABLE RADIO

## UNLIMITED MOBILITY. UNCOMPROMISING PERFORMANCE.

Take command with a 4-in-1 radio that offers limitless interoperability, the clearest, loudest audio and seamless Wi-Fi® connectivity. The compact, rugged and secure APX 8000 redefines mission critical communications.

### ALL BANDS, NO BOUNDARIES

With four RF bands and multi-mode system access, the APX 8000 knows no limits when it comes to interoperability. Communicate across borders using a single device. Use analog MDC 1200 or digital P25 mode, conventional or trunked operation, SmartNet or SmartZone legacy systems, clear or secure - all across 7/800MHz, VHF and UHF Range 1 & 2 bands.

### HEAR AND BE HEARD MORE CLEARLY

Whether it's loud or windy, whether you whisper or yell, the APX 8000 adaptive audio engine and ultra-loud speaker brings clarity into every conversation. The radio dynamically changes the level of noise suppression, microphone gain, windporting and speaker equalization on the fly to consistently produce the loudest, clearest audio in any environment.

### VOICE AND DATA, ALL AT ONCE

With Wi-Fi® access, the APX 8000 can quickly receive new codeplugs, firmware and software features, as users keep talking without interruption. You can even connect to a broadband LTE network using the Data Modem Tethering feature. Mission-Critical Wireless Bluetooth® connects you quickly and securely with remote speaker microphones, surveillance kits and LEX Mission-Critical LTE devices for radio remote control.

### FIT FOR THE MISSION

Intuitively designed with a familiar look and feel, the compact APX 8000 is always comfortable to use, from your holster to your grip. It contains 4 radio bands packaged into the award-winning design of the APX 6000. The all-band antenna is flexible so it doesn't get in the way.

### RUGGED, ROBUST & RELIABLE

With a water-tight seal, drop-resistant dual battery latch, pressure-tested tempered glass display and a shock-absorbing aluminum alloy endoskeleton, the APX 8000 is ready for unpredictable environments. It can survive 2 meter water submersion for 2 hours (IP68) and Motorola's renowned Accelerated Life Test.

### DESIGNED TO SECURE & PROTECT

The APX 8000's voice and data is secured by multiple hardware encryption algorithms (AES, DES, ADP), up to 128 keys and the ability to re-key over the air so that sensitive information stays protected from scanners and eavesdroppers. P25 Radio Authentication ensures only valid users can access the system while two-factor authentication allows users to securely log in to databases.



**RF BANDS:**

700/800 MHz, VHF, UHF Range 1 & 2

**OPERATION MODES:**

9600 Baud Digital APCO P25 Phase 1 FDMA and Phase 2 TDMA Trunking  
3600 Baud SmartNet®, SmartZone®, SmartZone, Omnilink Trunking  
Digital APCO 25, Conventional, Analog MDC 1200, Quick Call II System Configurations  
Narrow and wide bandwidth digital receiver  
(6.25 kHz equivalent/25/20/12.5 KHz)

**STANDARD FEATURES:**

Mission Critical Wireless Bluetooth*	ISSI 8000 Roaming
ASTRO 25 Integrated Voice & Data	Radio Profiles, Dynamic Zone
Integrated GPS/GLONASS for outdoor location tracking	Intelligent Lighting
Intelligent Priority Scan	Single-key ADP Encryption
Software Key	IP68 submersion (2 meters, 2 hours)
Text-Messaging	IMPRES 2 Battery
Voice Announcements	LEX L10 Collaboration
Instant Recall	

**ADAPTIVE AUDIO ENGINE:**

3 Watt Speaker with Adaptive Equalization  
Adaptive Dual-sided Operation  
Adaptive Noise Suppression Intensity  
Adaptive Gain Control  
Adaptive Windporting

**PROGRAMMING:**

Utilizes Windows 7 & 8 Customer Programming Software (CPS) with Radio Management

**OPTIONAL FEATURES:**

Wi-Fi® 802.11 b/g/n  
Data Modem Tethering  
RFID Volume Knob  
Multi-key for 128 keys and multi-algorithm  
Programming Over Project 25 (OTAP)  
Over the Air Rekey (OTAR)  
Digital Tone Signaling  
P25 Authentication  
Man Down Sensor  
IP68 (2m/4hr), Mil Std 512.X Delta - T  
Listed by UL to non-incendive standards: ISA 12.12.01-2015 and CAN/CSA C22.2 No. 213-15 as safe for use in Class I, Division 2, Groups A,B,C,D; Class II, Division 2, Groups F,G; Class III, Division 2 Hazardous (Classified) Locations. Non-Incendive (Non Incendiaire) when used with Motorola Battery: PMNN4504A (Rated 7.4 V, 3400 mAh) or PMNN4505A (Rated 7.4 V, 4850 mAh)



\* Compatible with BT 2.1, HSP, PAN, DUN and SPP Profiles found in off-the-shelf BT accessories and BT 4.x



### TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

	700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	764-776, 794-806 MHz 806-825, 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj <sup>1</sup>	700 MHz: 1-2.5 Watts 800 MHz: 1-3 Watts	1-6 Watts	1-5 Watts	1-5 Watts
Frequency Stability <sup>1</sup> (-30°C to +60°C; +25°C Ref.)	+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm
Modulation Limiting <sup>1</sup>	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz
Emissions (Conducted and Radiated) <sup>1</sup>	-75 dBc	-75 dBc	-75 dBc	-75 dBc
Audio Response <sup>1</sup>	+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB
FM Hum & Noise (25kHz / 12.5kHz) <sup>1</sup>	700 MHz 800 MHz	-49 dB/-47 dB -49 dB/-46 dB	-51 dB/-51 dB	-51 dB/-47 dB
Audio Distortion (25kHz / 12.5kHz) <sup>1</sup>	700 MHz 800 MHz	0.90 % / 0.90 % 0.60 % / 0.90 %	0.50 % / 0.90 %	0.60 % / 0.90 %

### BATTERIES FOR APX 8000

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES 2, 3400 mAh**	3.4" x 2.3" x 1.7"	6.5 oz	PMNN4486	3400 mAh
Li-Ion IMPRES 2, 4850 mAh	5.0" x 2.3" x 1.7"	11.0 oz	PMNN4487	4850 mAh
Li-Ion IMPRES 2, 5100 mAh	5.0" x 2.3" x 1.7"	11 oz	PMNN4494	5100 mAh
Li-Ion IMPRES UL2054 Div 2 Rugged 3400 mAh IP68***	3.4" x 2.3" x 1.7"	6.5 oz	PMNN4504	3400 mAh
Li-Ion IMPRES UL2054 Div 2 Rugged 4850 mAh IP68***	5.0" x 2.3" x 1.7"	10 oz	PMNN4505	4850 mAh

\*\*Ships standard with radio

\*\*\*Listed by UL to non-incendive standards: ISA 12.12.01-2015 and CAN/CSA C22.2 No. 213-15 as safe for use in Class I, Division 2, Groups A,B,C,D; Class II, Division 2, Groups FG; Class III, Division 2 Hazardous (Classified) Locations.



RADIO MODELS			
	MODEL 1.5	MODEL 2.5	MODEL 3.5
Display	Full bitmap monochromatic LCD top display 1 line text x 8 characters 1 line of icons No menu support Multi-color backlight	<b>Top display plus:</b> Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight	<b>Top display plus:</b> Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight
Keypad	none	Backlit keypad 3 soft keys 4 direction Navigation key Home and Data buttons	Backlit keypad 3 soft keys 4 direction navigation key 4x3 keypad Home and Data buttons
Channel Capacity	1200	3000	3000
FLASHport Memory	2 GB	2 GB	2 GB
700/800 MHz (764-870 MHz)			
VHF (136-174 MHz)	H91TGD9PW5AN	H91TGD9PW6AN	H91TGD9PW7AN
UHF Range 1 (380-470 MHz)			
UHF Range 2 (450-520 MHz)			
Buttons & Switches	Large PTT button ■ Angled On/Off volume control ■ Orange emergency button ■ 16 position top-mounted rotary switch ■ 2-position concentric switch ■ Multi-color backlight ■ 3-position toggle switch ■ 3 programmable side buttons		
<b>Regulatory Information</b>			
FCC ID	AZ489FT7061		
Industry Canada	109U-89FT7061		
Emission Designators	LMR: 8K10F1D, 8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E***, 20K0F1E*** Bluetooth: 852KF1D, 1M17F1D, 1M19F1D WLAN (Wi-Fi®): 13M7G1D, 17M0D1D, 18M1D1D		

\*\*\* In accordance with FCC mandate, the APX 8000 all band radio is restricted to 12.5kHz operation only and does NOT support 25kHz in the VHF and UHF Bands (excluding T-Band). This applies to customers under Rule Part 90.



#### RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS

	700	800	VHF	UHF
Frequency Range/Bandsplits	764-776 MHz	851-870 MHz	136-174 MHz	380-520 MHz
Channel Spacing	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at Rated <sup>1</sup>	1 Watt	1 Watt	1 Watt	1 Watt
Frequency Stability <sup>1</sup> (-30°C to +60°C; +25°C Ref.)	+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm
Analog Sensitivity <sup>1</sup>	12 dB SINAD	0.224 $\mu$ V	0.168 $\mu$ V	0.199 $\mu$ V
Digital Sensitivity <sup>2</sup>	1% BER	0.316 $\mu$ V	0.251 $\mu$ V	0.282 $\mu$ V
	5% BER	0.211 $\mu$ V	0.149 $\mu$ V	0.158 $\mu$ V
	5% BER Faded	0.562 $\mu$ V	0.562 $\mu$ V	0.530 $\mu$ V
Selectivity (25 kHz / 12.5 kHz) <sup>1,5</sup>	79 dB / 72 dB	78 dB / 72 dB	82 dB / 77 dB	80 dB / 74 dB
Intermodulation Rejection <sup>1</sup>	81 dB	80 dB	82 dB	80 dB
Spurious Rejection <sup>1</sup>	98 dB	98 dB	92 dB	98 dB
FM Hum and Noise (25 kHz / 12.5 kHz) <sup>1</sup>	-55 dB / -53 dB	-54 dB / -52 dB	-57 dB / -55 dB	-56 dB / -54 dB
Audio Distortion <sup>1</sup>	0.9 %	0.9 %	0.9 %	0.9 %



PORTABLE MILITARY STANDARDS 810 C, D, E, F & G										
	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	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	500.5	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	501.5	I/A1, II/A1
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temperature Shock	503.1	I	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand	1 Proc	1 Proc	510.2	II	510.3	II	510.4	II	510.5	II
Submersion <sup>6</sup>	512.1	I	512.2	I	512.3	I	512.4	I	512.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI
Shock (Drop)	516.2	II	516.2	IV	516.4	IV	516.5	IV	516.6	IV

## DIMENSIONS OF THE RADIOS WITHOUT BATTERY

	Inches	Millimeters
Length	5.47	139
Width Push-To-Talk button	2.39	60.7
Depth Push-To-Talk button	1.40	35.6
Width Top	2.98	75.7
Depth Top	1.58	40.1
Depth Bottom of Battery	1.24	31.5
Weight of the radios without battery	11.25 oz	319 g

## ENCRYPTION

Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL, Localized Algorithm
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 128 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 360 mSec
Encryption Keying	Key Loader and Over the Air Rekeying (OTAR)
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital and SecureNet
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

## GPS/GNSS SPECIFICATIONS

Constellations	GPS & GLONASS
Tracking Sensitivity	-164 dBm
Accuracy <sup>2</sup>	<5 meters (95%)
Cold Start <sup>3</sup>	<60 seconds (95%)
Hot Start <sup>3</sup>	<5 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted)

## ENVIRONMENTAL SPECIFICATIONS

Operating Temperature <sup>4</sup>	-30°C / +60°C
Storage Temperature <sup>4</sup>	-40°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP68 (2 meters, 2 hours)

## RUGGED OPTION SPECIFICATIONS

Leakage (submersion) <sup>6</sup>	MIL-STD-810 C, D, E, F and G Method 512.X Procedure I, IP68 (2 meters, 4 hours)
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## HOUSING COLOR

Black (Standard), Public Safety Yellow, and High Impact Green

<sup>1</sup> Measured conductively in analog mode per TIA / EIA 603 under nominal conditions.

<sup>2</sup> Measured conductively in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.

<sup>3</sup> Measured conductively with >6 satellites visible at a nominal -130 dBm signal strength. Specs provided are 95th percentile values.

<sup>4</sup> Temperatures listed are for radio specifications. Battery storage is recommended at 25°C, ±5°C to ensure best performance.

<sup>5</sup> Measured using the TIA-603 single-tone method.

<sup>6</sup> Rugged option only. Specifications subject to change without notice.

All specifications shown are typical.  
Radio meets applicable regulatory requirements.

## WIRELESS CONNECTIVITY & SECURITY

Frequency Range/Bandsplits:

Bluetooth: 2402 - 2480 MHz, WLAN (Wi-Fi®): 2400 - 2483.5 MHz

WLAN (Wi-Fi®) 802.11 b/g/n supports WPA-2, WPA, WEP security protocols; radio can be pre-provisioned with up to 20 SSIDs

Mission Critical Wireless Bluetooth 2.1 uses 96 bit encryption for pairing & 128 bit encryption for voice, signaling and data. The radio BT supports up to 6 data connections and 1 audio connection.

Bluetooth Low Energy uses 128-bit AES-CCM encryption



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