MEMORANDUM

DATE: April 14, 2014

TO: Michael Herring, City Administrator

FROM: Mike Geisel, Director of Public Services

RE: ECC Radios

As you know, in 2009, St. Louis County residents approved a tax to provide a county-wide interoperable radio system. Subsequently, the Emergency Communications Commission (ECC) was created for the purpose of administering an emergency communication system including an interoperable county-wide wireless radio communication network providing communications links that permit participating governmental entities to communicate within the geographic boundaries of the county. This includes the radio network, radios, towers, communication center, the emergency alert system and enhancements to the 911 system.

As you might imagine, there have been many lessons learned by communities who have experienced disasters, both natural and those initiated by humans. In virtually every incident, a coordinated, consolidated response is dependent upon successful communications across disciplines and multiple agencies. The existing communications capabilities within St. Louis County are not only aged, but few, if any interoperable capabilities exist. First responders from fire, EMS, police, public works, and health care providers each have internal communication capabilities, but no comprehensive ability to communicate globally across disciplines and across agency boundaries.

Since 2009, the ECC has made continuous progress along several fronts. A I am pleased to report that I serve on the Emergency Communications Commission Core Users group, representing public works and local government users. The Core Users Group is a management group who reports and advises the ECC Board as to policies, procedures, use, and application of the emergency communication network, hardware and operation. The Core Users Group consists of representatives from Police, Fire, EMS, Dispatch, and Public Works. I am also serving as the Chair of the Local Government Users Group (LGUG). The

LGUG is responsible for developing the agency specific, interagency, and inter-disciplinary communication channels for local governments.

Chesterfield Department of Public Services, like many municipalities, owns its own radio frequency and is licensed to operate in the 800 Megahertz bandwidth. The Department of Public Services has an inventory of 96 radios, comprised of both 35 watt mobile and 3 watt portable radios. The City leases space on the Doubletree elevator tower, where there is an antenna and repeater station. The capability of Chesterfield Department of Public Services communication system is limited to one repeater channel and one "talk around" channel. The geographic limits of our DPS communications are constrained to the immediate geographic area and there are multiple gaps in coverage.

In creating a comprehensive and truly interoperable communications system, the ECC has constructed a communications center, erected multiple additional communications towers, specified and purchased a state of the art trunked communications network, and is providing new radio hardware to ALL participating agencies in St. Louis County. **The City of Chesterfield Police and Department of Public Services will be receiving more than 200 radios, each valued between $2,500 and $4,000, at no cost to the City.** The Police radios are at the upper end of that scale and are necessarily more complex and expensive. The Department of Public Service radios (96 in the current inventory to be provided by the ECC) are at the $2,500 price point (this is the discounted contract price available through the ECC in conjunction with the purchase of approximately 10,000 radios). There are, obviously, ancillary hardware associated with the radios, such as vehicle chargers, microphones and gang chargers.

When the ECC provides these radios, and access to the overall network, the City will eliminate and dispose of our current 800 MgHz DPS radios, and our repeater. We will be able to dispose of these components and avoid the ongoing repeater maintenance, tower lease, licensing and regular annual maintenance expenses. More importantly, the City will subsequently have a truly interoperable radio system, capable of communicating with other Public Works agencies in the County, as well as the ability to communicate with Police, Fire, and EMS. The ECC network is not only more reliable, having designed redundancy, but is also designed for far more comprehensive coverage.

In conjunction with our analysis of the communications network and Chesterfield's existing capabilities, we inventoried 96 existing Department of

Public Service radios. As such, the ECC will provide 96 new radios on the new interoperable network, at no cost to the City. We initiated an internal review of our existing communications, our desired needs, our needs during an emergency response, and our needs during planned events. Through this review, we have identified a need for 21 additional radios, and a change in the composition of our radio units, requiring fewer mobile units and increasing the number of portable radios.

The discounted raw value of the DPS radios being provided to the City of Chesterfield by the ECC (at no cost to the City) is approximately $240,000. I recommend that we be authorized to purchase the additional 21 radios, using the ECC contract pricing. **If we purchase these radios with the original ECC contract, we get the contract pricing of approximately $2,500, which is a 40% discount off of the regular government pricing from Motorola.** However, in order to obtain the ECC Discounted pricing I need to purchase these along with submitting my radio alias' as soon as practicable. **The 21 additional radios and any ancillary accessories would cost the City of Chesterfield an estimated $55,000.**

Accordingly, in order to provide for the adequate communication capabilities, not only for daily operations, but also for planned events and emergency responses; I **recommend that City Council authorize the Department of Public Services to order 21 supplemental radio units from Motorola, through the ECC contract at a cost not to exceed $55,000 using 2014 budgeted funds in the Capital Projects Fund.** There is no request for additional appropriations or fund transfers. There are existing funds available due to savings recognized in the Capital Project Fund. As was previously reported, we received very favorable bid pricing for the 2013 contracts. **Inasmuch as we are not requesting any additional appropriation or fund transfers, such authorization for the use of existing funds within the departmental budget, simply requires authorization by Council Committee. As such, I request that this item be added to the upcoming agenda of the Planning and Public Works Committee for consideration.**

If you have any questions or require additional information, please advise.

Attachments

Cc Jim Eckrich, Public Works Director\City Engineer

MOTOROLA *SOLUTIONS*

Quote Number:	QU0000260455
Effective:	17 JAN 2014
Effective To:	16 FEB 2014

Bill-To:
CITY OF CHESTERFIELD
690 CHESTERFIELD PKWY W
CHESTERFIELD, MO 63017
United States

Ultimate Destination:
CITY OF CHESTERFIELD
690 CHESTERFIELD PKWY W
CHESTERFIELD, MO 63017
United States

Attention:

Name: Mike Geisel

Email: mgeisel@chesterfield.mo.us

Sales Contact:

Name: Christy Johnson

Email: christy.johnson@motorolasolutions.com

Phone: 314-562-2367

Contract Number:	24433 - ST. LOUIS COUNTY
Freight terms:	FOB Destination
Payment terms:	Net 30 Due

Item	Quantity	Nomenclature	Description	List price	Your price	Extended Price
1	1	H51UCF9PW6AN	APX 4000 7/800 MHZ MODEL 2 PORTABLE	$1,400.00	$798.00	$798.00
1a	1	QA02756AB	ENH: 3600 OR 9600 TRUNKING BAUD SIN	$1,570.00	$894.90	$894.90
1b	1	G996AZ	ADD: PROGRAMMING OVER P25 (OTAP)	$100.00	$57.00	$57.00
1c	1	QA00782AF	INTERNAL ACTIVATION AND GPS BA	$100.00	$57.00	$57.00
1d	1	QA01648AA	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY	$5.00	$2.85	$2.85
1e	1	Q947BG	PACKET DATA (IV&D AND RS232)	$200.00	$114.00	$114.00
1f	1	QA01767AW	ENH: LINK LAYER RADIO AUTHENTICATION	$100.00	$57.00	$57.00
1g	1	H122BV	ALT: 1/4- WAVE 7/800 STUBBY (NAR659	$24.00	$13.68	$13.68
2	1	WPLN4114AR	SINGLE BASE ONLY	$160.00	$160.00	$160.00
3	1	NNTN8128AR	BATT IMP STD LI ION 1900M 2000T	$100.00	$57.00	$57.00

Total Quote in USD $2,211.43

note: Quote done under generic account. Pending tax cert to update City of Chesterfield account 1035338749

THIS QUOTE IS BASED ON THE FOLLOWING:

1 This quotation is provided to you for information purposes only and is not intended to be an offer or a binding proposal.

If you wish to purchase the quoted products, Motorola Solutions, Inc. ("Motorola") will be pleased to provide you with our standard terms and conditions of sale (which will include the capitalized provisions below), or alternatively, receive your purchase order which will be acknowledged.

Thank you for your consideration of Motorola products.

2 Quotes are exclusive of all installation and programming charges (unless expressly stated) and all applicable taxes.
3 Purchaser will be responsible for shipping costs, which will be added to the invoice.
4 Prices quoted are valid for thirty(30) days from the date of this quote.
5 Unless otherwise stated, payment will be due within thirty days after invoice. Invoicing will occur concurrently with shipping.
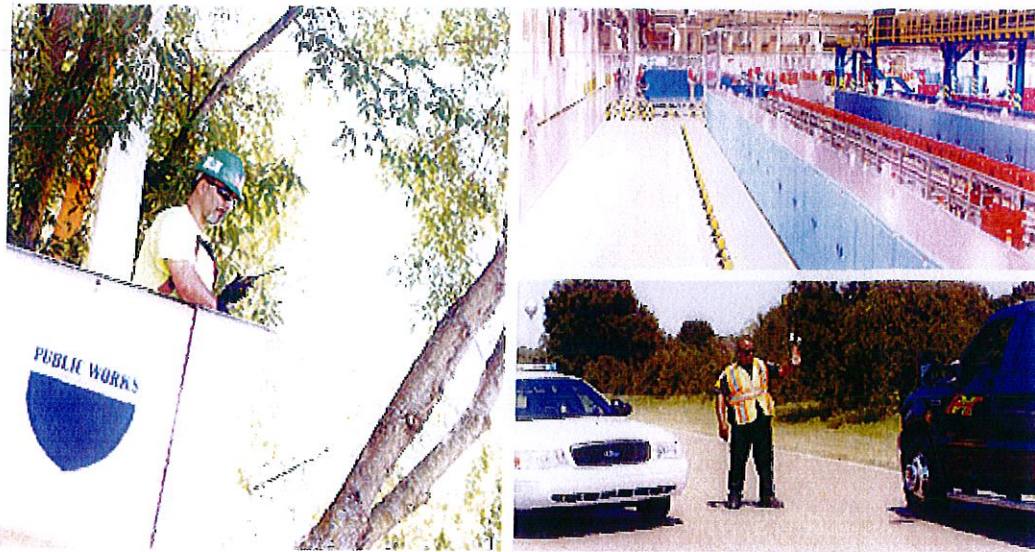
MISSION READY WHEN IT MATTERS MOST

APX™ 4000 PROJECT 25 PORTABLE RADIO

Chemical spill. Catastrophic storm. Power outage. When every minute matters, you must communicate instantly with other agencies and responders. But how do you prepare for a disaster and keep control of operating costs? That's where the APX™ 4000 P25 portable radio answers the call, expertly and affordably.

The APX 4000 delivers all the benefits of TDMA technology in the smallest P25 capable portable in the industry. Easy to use, tough as nails, a hard value to beat, it seamlessly connects public safety agencies and public works for fast, interoperable communications.

EVERY INCH AN APX

The APX 4000 leverages the leading attributes of the APX family of P25 TDMA portables. From the 2-microphone design that reduces background noise so you can speak and hear clearly over heavy equipment, diesel engines and sirens to the high-spec RF performance for excellent coverage in challenging environments.

With its easy-to-use interface, color display, intelligent lighting and radio profiles, you get all the power of APX in a compact radio. Plus, you can extend the performance of your radio with a complete portfolio of industry-leading IMPRES smart energy and audio accessories.

COMPACT AND UNCOMPROMISING

The smallest P25 Phase 2 capable portable, the APX 4000 gets the job done without getting in the way. Simplified controls and an enlarged multifunction knob are easy to turn on or off, set volume and switch talk groups. And its IP67 and MIL-STD certified to withstand dust, heat, shock, drops and water immersion, so you can count on it wherever you need it – at the factory line, power line or fire line.

P25 PERFORMANCE, INSIDE AND OUT

Loaded with key P25 features to increase safety, the APX 4000 features Mission Critical Wireless, a unique Bluetooth® solution that provides an encrypted link to a high performance earpiece, GPS for quickly locating personnel outdoors, AES encryption for improved security, and over-the-air programming to program radios in the field without interrupting voice operation.

IMPROVE RESPONSE AND EXPENSES

The APX 4000 is P25 Phase 2 capable for twice the voice capacity so you can add more users without adding more frequencies or infrastructure. And it's backwards and forwards compatible with all Motorola mission critical radio systems, so you can interoperate with confidence while you improve operating expenses

POWER UP WITH APX 4000 ACCESSORIES

- Designed, tested and certified for optimum performance with your radio

- Complete portfolio of remote speaker microphones, headsets and Mission Critical Wireless Bluetooth® accessories

- High-powered IMPRES™ batteries that have a slim design to fit the compact radio size

FEATURES AND BENEFITS:

Available in 700/800 MHz, VHF, UHF R1, UHF R2 and 900 MHz bands

Trunking standards supported:
- Clear or digital encrypted ASTRO®25 Trunked Operation
- Capable of SmartZone®, SmartZone Omnilink, SmartNet®

Analog MDC-1200 and Digital APCO P25 Conventional

System Configurations

Narrow and wide bandwidth digital receiver
(6.25 kHz equivalent / 12.5 kHz / 30 kHz / 25 kHz)[1]

Embedded digital signaling (ASTRO & ASTRO 25)

Man Down

Available in 2 models

Integrated GPS capable

Lightbar with Intelligent Lighting

Radio Profiles

Unified Call List

User programmable Voice Announcement

Meets Applicable MIL-STD-810C, D, E, F and G

IP67 standard
(submersible 1 meter, 30 minutes)[2]

Superior Audio Features:
- 0.5 W high audio speaker
- 2-mic noise canceling technology

Utilizes Windows XP, Vista and Windows 7 Customer Programming Software (CPS)
- Supports USB communications
- Built in FLASHport™ support

Full portfolio of accessories including IMPRES batteries, chargers and audio devices[3]

OPTIONAL FEATURES:

Mission Critical Wireless

AES Encryption

Programming Over Project 25

Text Messaging

[1] Per the FCC Narrowbanding rules, new products (APX4000 VHF, UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25KHz for United States - State & Local Markets only.

[2] Radios meet industry standards (IPx7) for immersion.

[3] Chargers and batteries for the APX 4000 radios do not interoperate with other APX radios.

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2	900 MHz
Frequency Range/ Bandsplits	700 MHz	763-776, 793-806 MHz	136-174 MHz	380-470 MHz	450-520 MHz	896-901, 935-940 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	12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj[1]		1-3 Watts Max	1-5 Watts Max	1-5 Watts Max	1-5 Watts Max	1-2.5 Watts Max
Frequency Stability[1] ($-30°C$ to $+60°C$; $+25°C$ Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Modulation Limiting[1]		±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	±2.5 kHz
Emissions (Conducted and Radiated)[1]		−75 dB	−75 dB	−75 dB	−75 dB	−75 dB
Audio Response[1]		+1, −3 dB	+1, −3 dB	+1, −3 dB	+1, −3 dB	+1, −3 dB
FM Hum & Noise	25 kHz	−47 dB	−47 dB	−47 dB	−47 dB	
	12.5 kHz	−45 dB	−47 dB	−45 dB	−45 dB	−45 dB
Audio Distortion[1]	25 kHz	1.00%	1.00%	1.00%	1.00%	1.00%
	12.5 kHz					

BATTERIES FOR APX 4000

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES 1900 mAh IP67	114.5x55.04x17.85	150 grams	NNTN8128A	1900 mAh
Li-Ion IMPRES 2300 mAh IP67 Non-FM	114.5x55.04x23.15	160 grams	PMNN4424AR	2300 mAh
Li-Ion IMPRES 2300 mAh IP67 FM	114.5x55.04x23.15	160 grams	NNTN8129A	2300 mAh

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<table>
<tr><td colspan="3">**RADIO MODELS**</td></tr>
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	MODEL 2	**MODEL 3**
Display	Full bitmap color LCD display 3 lines of text x 14 characters 1 line of icons 1 menu line x 3 menus White backlight	Full bitmap color LCD display 3 lines of text x 14 characters 1 line of icons 1 menu line x 3 menus White backlight
Keypad	Backlight keypad 3 soft keys 4 direction Navigation key Home and Data buttons	Backlight keypad 3 soft keys 4 direction navigation key 4x3 keypad Home and Data buttons
Channel Capacity	512	512
FLASHport Memory	64 MB	64 MB
700/800 MHz (763-870 MHz)	H51UCF9PW6AN Q360GK	H51UCH9PW7AN Q360GK
VHF (136-174 MHz)	H51KDF9PW6AN Q360GX	H51KDH9PW7AN Q360GX
UHF Range 1 (380-470 MHz)	H51QDF9PW6AN Q360GL	H51QDH9PW7AN Q360GL
UHF Range 2 (450-520 MHz)	H51SDF9PW6AN Q360HA	H51SDH9PW7AN Q360HA
900 MHz (896-940 MHz)	H51WCF9PW6AN Q360JF	H51WCH9PW7AN Q360JE
Buttons & Switches	Large PTT button ▪ Multi-function knob ▪ Orange emergency button ▪ 3 programmable side buttons	

TRANSMITTER CERTIFICATION

700/800 (764-869 MHz)	AZ489FT7049
VHF (136-174 MHz)	AZ489FT3828
UHF Range 1 (380-470 MHz)	AZ489FT4905
UHF Range 2 (450-520 MHz)	AZ489FT4910
900 MHz (896-901, 935-940 MHz)	AZ489FT5864

FCC EMISSIONS DESIGNATORS

FCC Emissions Designators	11K0F3E, 16K0F3E, 8K10F1D, 8K10F1E, 8K10F1W, 20K0F1E*
FCC Emissions Designators for 900 MHz	11K0F3E, 8K10F1D, 8K10F1E, 8K10F1W

POWER SUPPLY

Power Supply	One rechargeable Li-Ion 1900 mAh battery standard, or 2300 mAH highcap Li-Ion.

<table>
<tr><td colspan="6">**RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS**</td></tr>
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		700/800	**VHF**	**UHF Range 1**	**UHF Range 2**	**900 MHz**
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz	935-940 MHz
Channel Spacing		25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz	12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at Rated[1]		500mW	500mW	500mW	500mW	500mW
Frequency Stability[1] (−30°C to +60°C; +25°C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Analog Sensitivity[3]	12 dB SINAD	0.266µV	0.216µV	0.234µV	0.234µV	0.236µV
Digital Sensitivity[4]	1% BER (800 MHz) 5% BER	0.400µV 0.266µV	0.277µV 0.188µV	0.307µV 0.207µV	0.307µV 0.207µV	0.33µV 0.222µV
Selectivity[1]	25 kHz channel 12.5 kHz channel	-76 dB -67 dB	-76 dB -70 dB	-76 dB -67 dB	-76 dB -67 dB	 -67 dB
Intermodulation		-75 dB	-76 dB	-77 dB	-77 dB	-75 dB
Spurious Rejection		-76.6 dB	-85 dB	-80.3 dB	-90 dB	-80 dB
FM Hum and Noise	25 kHz 12.5 kHz	-53 dB -47 dB	-51 dB -45 dB	-50 dB -45 dB	-50 dB -45 dB	 -47 dB
Audio Distortion[1]		1.00%	1.00%	1.00%	1.00%	1.00%

MOTOROLA

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/Basic Hot	501.5	I/A1, II/A2
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
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	5.26	133
Width Push-To-Talk button	2.37	60.2
Depth Push-To-Talk button	1.72	43.6
Width Top	2.56	65
Depth Top	2.13	43
Weight of the radios without battery	9.17 oz	260 g

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	−159 dBm
Accuracy[5]	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

ENCRYPTION

Supported Encryption Algorithms	AES and ADP
Encryption Algorithm Capacity	Single Algorithm
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3; FIPS 197

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature[6]	-30°C / +60°C
Storage Temperature[6]	-40°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP67
Housing Availability	Black only

R3-4-2050B

MOTOROLA

APX™ 4500 PROJECT 25 MOBILE RADIO

A downed power line or the city transit system coming to a halt during rush hour, when the unexpected strikes, you must interoperate seamlessly and securely with other agencies and responders – often across multiple Project 25 (P25) systems. You need to instantly connect and be informed to make better decisions and respond effectively. While the advanced technology of APX™ radios expertly equips you for the unexpected, your organization may be challenged to improve operating expenses.

That's where the APX 4500 P25 mobile radio fits the bill perfectly. It delivers all the benefits of TDMA technology in a compact P25 capable mobile. The APX 4500 brings together powerful technology in an easy-to-use radio that's easy on your budget. It seamlessly unifies public works, utility, rural public safety and transportation users to first responders so they can communicate effectively in the moments that matter.

CONVENIENTLY SMALL, EASY TO INSTALL
The APX 4500 is designed to get the job done without getting in the way. A simplified dash mount design makes installation quick and easy, fitting into the existing XTL™ footprint so you can reuse mounting holes and cables.

Count on the APX 4500 to withstand wet, dusty and hazardous conditions, too. Its IP56 durability rating is the highest level of certification for uncompromising durability and world class quality in a mobile performer you can hose down.

KEEPS CREWS IN TOUCH, AND UP TO THE MINUTE
Safety runs in the APX family and the APX 4500 mobile is no exception. Like all our APX P25 radios trusted by responders worldwide, the APX 4500 mobile redefines safety. Your crews can count on quick, seamless interoperability and extended range – whether they are talking from the top of a pole or the bottom of a trench. You can depend on AES encryption for secure, tamperproof voice and data communications every time they connect.

With integrated GPS in the APX 4500, you can keep an eye on workers and assets you can't see, tracking their locations continuously. The O2 control head with color display is easy to read and operate in all lighting conditions, from bright sunlight to dark streets. The intelligent lighting on the O2 control head notifies your workers when a call is received, an emergency arises, or when they are out of range. Plus, an enlarged multifunction knob makes it easy to use talk-group and volume settings when they're wearing gloves.

Over-the-air programming on the APX 4500 keeps your crews current in the field. You can update the latest mobile without interrupting voice communications while they work.

SIZED RIGHT FOR YOUR BUDGET
The APX 4500 lets you reuse many accessories which utilize the O5 and O3 control heads on XTL radios, so you can maximize your investment while you benefit from the latest technology. Since the APX 4500 is P25 Phase 2 capable for twice the voice capacity, you can add more users without adding more frequencies or infrastructure. It is backwards and forwards compatible with all Motorola mission critical radio systems, so you can interoperate with confidence while you improve operating expenses.

APX 4500 SPECIFICATIONS

FEATURES AND BENEFITS:

Available in 700/800 MHz, VHF, UHF R1 and UHF R2 frequency bands

Channels: Standard 512

Trunking Standards supported:
- Clear or digital encrypted Trunked Operation
- Capable of SmartZone®, SmartZone Omnilink, SmartNet®

Analog MDC-1200 and Digital APCO P25 Conventional System Configurations

Narrow and wide bandwidth digital receiver (6.25kHz/12.5kHz/25kHz/30 kHz)

Embedded digital signaling (ASTRO and ASTRO 25)

Integrated GPS capable

Integrated Encryption Hardware

Intelligent lighting

Radio profiles

Unified Call List

Meets applicable MIL-STD 810C, D, E, F, G

Ships standard IP56

Utlizes Windows XP, Vista and Windows 7 Customer Programming Software (CPS)

- Supports USB Communications
- Built in FLASHport™ support

Re-use of most XTL™ accessories, plus new IMPRES accessories

OPTIONAL FEATURES:

AES Encryption

Programming over Project 25 (POP25)

Text Messaging

12 character RF ID asset tracking

Tactical OTAR

O2 RUGGED CONTROL HEAD

- Large color display with intelligent lighting
- 3 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Built in 7.5 watt speaker
- Multifunction volume/channel knob
- Night/day mode button

MOTOROLA

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	764-776 MHz 794-806 MHz	806-824 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing	25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj*	10-30 Watts	10-35 Watts	10-50 Watts	10-40 Watts	10-45 Watts (450-485 MHz) 10-40 Watts (485-512 MHz) 10-25 Watts (512-520 MHz)
Frequency Stability* (−30°C to +60°C; +25°C Ref.)	±0.00015 %	±0.00015 %	±0.0002 %	±0.0002 %	±0.0002 %
Modulation Limiting*	±5 kHz / ±2.5 kHz	±5 kHz/±4 kHz (NPSPAC)/±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz
Modulation Fidelity (C4FM) 12.5kHz Digital Channel	±2.8 kHz	±2.8 kHz	±2.8 kHz	±2.8 kHz	±2.8 kHz
Emissions*	Conducted+ −75/−85 dBc Radiated+ −20/−40 dBm	Conducted −75 dBc Radiated −20 dBm	Conducted −85 dBc Radiated −20 dBm	Conducted −85 dBc Radiated −20 dBm	Conducted −85 dBc Radiated −20 dBm
Audio Response*	+1, −3 dB (EIA)	+1, −3 dB (EIA)	+1, −3 dB (EIA)	+1, −3 dB (EIA)	+1, −3 dB (EIA)
FM Hum & Noise 25 & 20 kHz / 12.5 kHz	−50 dB −48 dB	−50 dB −48 dB	−53 dB −52 dB	−53 dB −50 dB	−53 dB −50 dB
Audio Distortion*	2 %	2 %	2 %	2 %	2 %

RECEIVER – TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF		UHF Range 1		UHF Range 2	
Frequency Range/Bandsplits	764-776 MHz	851-870 MHz	136-174 MHz		380-470 MHz		450-520 MHz	
Channel Spacing	25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz		25/12.5 kHz		25/12.5 kHz	
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit		Full Bandsplit		Full Bandsplit	
Audio Output Power at 3% distortion*	7.5 W or 15 W ++	7.5 W or 15 W ++	7.5 W or 15 W ++		75 W or 15 W ++		7.5 W or 15 W ++	
Frequency Stability* (−30°C to +60°C; +25°C Ref.)	±0.00008%	±0.00008%	±0.00008%		±0.00008%		±0.00008%	
			Pre-Amp	Standard	Pre-Amp	Standard	Pre-Amp	Standard
Analog Sensitivity* 12 dB SINAD	−121 dBm	−121 dBm	−123 dBm	−119 dBm	−123 dBm	−119 dBm	−123 dBm	−119 dBm
Digital Sensitivity 5% BER	−121.5 dBm	−121.5 dBm	−123 dBm	−119 dBm	−123 dBm	−119 dBm	−123 dBm	−119 dBm
Intermodulation 25 kHz	82 dB	82 dB	84 dB	86 dB	82 dB	86 dB	82 dB	86 dB
12.5 kHz	82 dB	82 dB	85 dB	86 dB	83 dB	85 dB	83 dB	85 dB
Spurious Rejection	91 dB	91 dB	95 dB		93 dB		93 dB	
Audio Distortion at rated*	1.20%	1.20%	1.20%		1.20%		1.20%	
Selectivity* 25 kHz	85 dB	85 dB	85 dB		85 dB		85 dB	
12.5 kHz	75 dB	75 dB	75 dB		75 dB		75 dB	
30 kHz	—	—	90 dB		—		—	

DIMENSIONS

	Inches	Millimeters
Mid Power Radio Transceiver	2 x 7 x 6.4	50.8 x 178 x 163
O2 Control Head	2.7 x 8.1 x 2.1	69 x 207 x 53
Mid Power Radio Transceiver and O2 Control Head - Dash Mount	2.7 x 8.1 x 8.8	69 x 207 x 223
Mid Power Radio Transceiver and O2 Control Head Weight	5.28 lbs	2.45 kg

RADIO MODELS

700/800 (763-870 MHz)	M24URS9PW1AN
VHF (136-174 MHz)	M24KSS9PW1AN
UHF Range 1 (380-470 MHz)	M24QSS9PW1AN
UHF Range 2 (450-520 MHz)	M24SSS9PW1AN

SIGNALING (ASTRO MODE)

Signaling Rate	9.6 kbps
Digital ID Capacity	10,000,000 Conventional / 48,000 Trunking
Digital Network Access Codes	4,096 network site addresses
ASTRO® Digital User Group Addresses	4,096 network site addresses
Project 25 – CAI Digital User Group Addresses	65,000 Conventional / 4,094 Trunking
Error Correction Techniques	Golay, BCH, Reed-Solomon codes
Data Access Control	Slotted CSMA: Utilizes infrastructure-sourced data status bits embedded in both voice and data transmissions.

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	−153 dBm
Accuracy*	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

MOTOROLA

PRODUCT SPEC SHEET
APX™ 4500 MOBILE RADIO

POWER AND BATTERY DRAIN

Model Type	136-174 MHz, 380-470 MHz, 450-520 MHz, 764-870 MHz
Minimum RF Power Output	10-35 Watt (764-870 MHz), 10-50 Watts (136-174 MHz), 10-40W (380-470 MHz), 10-45Watts (450-485 MHz), 10-40Watts (485-512 MHz), 10-25Watts (512-520 MHz)
Operation	13.8V DC ±20% Negative Ground
Standby at 13.8V	0.85A (764-870 MHz), 0.85A (136-174 MHz), 0.85A (380-470 MHz), 0.85A (450-520 MHz)
Receive Current at Rated Audio at 13.8V	3.2A (764-870 MHz), 3.2A (136-174 MHz), 3.2A (380-470 MHz), 3.2A (450-520 MHz)

Transmit Current (A) at Rated Power

136-174 MHz (10-50 Watt)	13A (50W)	8A (15W)	764-870 MHz (10-35 Watt) 12A (35W)	8A (15W)
380-470 MHz (10-40 Watt)	11A (40W)	8A (15W)		
380-470 MHz (10-40 Watt)	11A (45W)	8A (15W)		

MOBILE 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 Storage	501.1	I	501.2	I/A1	501.3	I/A1	501.4	I/Hot	501.5	I/A1
High Temperature Operation	501.1	II	501.2	II/A1	501.3	II/A1	501.4	II/Hot	501.5	II
Low Temperature Storage	502.1	I	502.2	I/C3	502.3	I/C3	502.4	I/C3	502.5	I/C3
Low Temperature Operation	502.1	I	502.2	II/C1	502.3	II/C1	502.4	II/C1	502.5	II
Temperature Shock	503.1	-	503.2	I/A1-C3	503.3	I/A1-C3	503.4	I/Hot-C3	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain Blowing	506.1	I	506.2	I	506.3	I	506.4	I	506.5	I
Rain Steady	506.1	II	506.2	II	506.3	II	506.4	III	506.5	III
Humidity	507.1	II	507.2	II	507.3	II	507.4	-	507.5	II-Aggravated
Salt Fog	509.1	-	509.2	-	509.3	-	509.4	-	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand		-	510.2	II	510.3	II	510.4	II	510.5	II
Vibration Min. Integrity	514.2	VIII/F, Curve-W	514.3	I/10	514.4	I/10	514.5	I/24	514.6	I-Cat.24
Vibration Loose Cargo	514.2	XI	514.3	II/3	514.4	II/3	514.5	II/5	514.6	-
Shock Functional	516.2	I	516.3	I	516.4	I	516.5	I	516.6	I, V, VI

ENCRYPTION

Supported Encryption Algorithms	AES and ADP
Encryption Algorithm Capacity	Single
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing, OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology(NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

= Measured in the analog mode per TIA/EIA 603 under nominal conditions
= = Accuracy specs are for long-term tracking (95th percentile values >5 satellites visible at a nominal −130 dBm signal strength)
+ Specs includes performance for the non-GNSS/GNSS bands
++ Output power in to 8 and 3 2 Ohm external speakers respectively

Specifications subject to change without notice. All specifications shown are typical. Radio meets applicable regulatory requirements.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-30°C / +60°C
Storage Temperature	-40°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP56, MIL-STD

TRANSMITTER CERTIFICATION

700/800 (764-775, 793-805, 806-824, 851-869 MHz)	AZ492FT7055
VHF (136-174 MHz)	AZ492FT4916
UHF R1 (380-470 MHz)	AZ492FT3826
UHF R2 (450-520 MHz)	AZ492FT4915

FCC EMISSIONS DESIGNATORS

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

R3-1-2053B

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