



Designed for Mission Critical Challenges:

Motorola APX™ Multi-Band Radios



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“Providing cross-discipline interoperability and increased functionality, APX is a cutting-edge tool for communications.”

- Eugene Vardaman,
Executive Director, North
Carolina Criminal Justice
Information Network

Whether in moments of high-stress or calm, mission critical users, such as federal and public safety professionals, require two-way radios that are easy to use, rugged and reliable, and provide exceptional audio clarity and loudness. In addition, first responder agencies are looking for communication technologies that empower their departments to perform their job duties safely and efficiently. Meeting the needs of the mission critical two-way radio user requires a solution that significantly enhances and optimizes the full spectrum of ergonomics, usability, and audio quality.

Motorola introduces the concept of mission critical-designed solutions with the APX™ P25 multi-band two-way radio. Designed using an innovative and unique user-centric process, APX provides first responders with a solution that optimizes ergonomics, multi-band interoperability, and audio while delivering intuitive performance in high stress situations. Designed with the needs of today and tomorrow in mind, APX allows mission critical users to focus on saving lives and protecting property, and not worry about their technology.

When it comes to choosing a new two-way radio, federal, state, and metropolitan agencies are looking for solutions designed with their unique needs in mind. The fact is consumer-based two-way radio or phone designs do not meet the rugged, mission critical specification requirements for public safety usage. Instead, emergency response situations demand radios designed with the user and their mission in mind, enabling users to focus on their tasks, not the technology.

Today's Mission Critical Challenges Demand a New Generation of Radios

Panicked crowds, gunfire, an officer down—anything can happen during an emergency situation. Whether facing hours of boredom or moments of terror, public safety teams rely on their two-way radios as much as they rely on their weapons. Two-way radios are the first responder's communication lifeline to the outside world. That's why today's mission critical tasks call for radios that deliver optimal functionality and performance—in both calm and stressful environments.

The pages that follow reveal how the Motorola APX P25 multi-band radio stands poised as the ultimate fusion of user-centric design and cutting-edge communication technology. The result is an innovative solution that provides anytime, anywhere connectivity, instant access to information, and easy to use controls allowing personnel to receive critical information for making smarter decisions and achieving superior results.



The Motorola APX Two-way Radio – A Synthesis of World-Class Expertise and Design Excellence

At Motorola, designing for mission critical users is serious business. When technologies converge, the key difference becomes design and usability. For over 30 years, Motorola has used a no-compromises approach to mission critical design by leveraging a world-class, award winning design team staffed by designers and social scientists—many of whom stand as acknowledged experts in both industry and academia.¹ This distinctive combination of thought leadership creates ergonomically driven iconic designs that help first responder teams stay focused on their mission.

The unmatched Motorola experience in mission critical ergonomics, usability, and functionality served as the cornerstone for the APX design process. Created with the needs of the first responder as requirement number one, APX delivers a no-compromises approach to two-way voice communications, resulting in an effective, user-centric form factor. APX incorporates multi-band frequencies, dual-sided ergonomics, and functional grouping based upon importance and relatedness.

Meeting the Mission Critical Design Challenge

In high stakes environments, one mistake can jeopardize a task. This is why the design of mission critical products is a serious and compelling undertaking. Not only must the technology deliver the right features, the products must be easy to use and fit the emergency responder's mindset. Of special significance for public safety professionals, using the radio must be secondary to the task of the moment.

To place the design challenge in perspective, consider the differences between devices targeted for consumer usage vs. first responder usage. Fashion, visual effect, and usability typically define the requirements for consumer designs. Poor usability simply causes frustration. In the mission critical market, function and user needs drive the

design process. In fact, poor usability can cause the user to take their mind off the mission to focus on using the product. Such distractions can create hazardous situations and reduce operational efficiency. The optimal mission critical product evolves from a design process that takes into account the extremes of low and high stress that users encounter daily.

Emotional Factors Drive Design

Beyond the physical environment, emotional factors are also vital. In normal circumstances, we encounter little difficulty using a piece of technology. However, in high stress conditions, most of us become situationally disabled. For the average person, the highest stress we face is when someone cuts us off on the road.

What happens emotionally to a first responder when a situation moves from relative calm to a threatened state? Imagine the severe stress levels when law enforcement officers come under fire or an officer is down, or when fire fighters cannot see in front of them because of smoke. When an emergency or life threatening incident occurs, the brain's scope of awareness narrows. In this state, performing anything complex is near impossible; officers do not have time to think about where their radio's push to talk (PTT) button, emergency button, or other controls such as volume or channel selection are located. At Motorola, this science of high velocity human factors (HVHF) plays a key role in the development of mission critical products like the APX two-way radio.

Since people process information differently under high stress than in calm situations, engineers must design products like the APX to operate in the customer's world. Product operation then becomes "second nature" to the user. Creating a user interface that fits the mental model of the user is one of the primary criteria for designing successful mission critical products.



***APX Two-Way Radios
are the next evolution
in mission critical
communications.***

Diving Deep to Uncover the User Experience

Motorola embraces a distinctive approach that extends traditional design boundaries into the expanding frontier of high usability. It takes more than just observation and design in a closed-loop studio to uncover the unique emotional and physical aspects of working in high-stress situations. On a regular basis, Motorola designers and researchers experience a typical day in the life of the end user of mission critical products.

Throughout their research process, Motorola designers have ridden numerous times in police cruisers around the world, eaten the smoke of fire training, and journeyed on courier trucks in zero degree weather. Some have flown in helicopters; some have walked the streets in major cities to experience firsthand how users in tough environments depend on their radios. This full immersion into understanding behavior allows Motorola designers to model, in detail, how emergency responders really use their two-way radios.

The Optimal Approach to Mission Critical Design

Within Motorola, going deeper to uncover the user experience means synthesizing the rigors of social science with the art of design. Studying how users behave in varying extremes—what people do and how they think during the routine aspects of their jobs—are often different from their behavior during a high-speed chase or a medical emergency. Designing

products based on emergency response behavior requires a unique approach that integrates several disciplines including:

- Industrial Design
- Human Factors/Ergonomics
- Cognitive Psychology
- Physical and Cultural Anthropology
- Clinical Psychology

The APX design process relied on interactive customer involvement, allowing designers to understand how emotions affect radio usability. Customers engaged in participatory design within the Motorola Design Lab, which includes discussion groups, day in the life diaries, and collages of their field experiences. These studies captured the user's response while handling a particular challenge, breaking their response into basic emotions. Motorola scientists then provided Velcro modeling sessions so that customers could define the features and physical characteristics of the radio that they considered most essential.

Throughout each phase of the cognitive modeling and product design process, Motorola optimized the APX radio's ergonomics to allow the user to concentrate on their goals—instead of enduring device interaction distraction. This integrated, evolving process allows Motorola to create devices that are not only durable, reliable, and dependable but that are also second nature to use, enabling emergency responders to focus on their mission, not the technology.





APX - The No-Compromises Two-way Radio Solution

Many people take for granted iconic design elements that result in technology that is second nature. Users assume that “it’s always been that way.” The fact is Motorola pioneered many of the ergonomic features commonly found in two-way radios. In 1983, Motorola first placed the emergency button at the base of the radio antenna so users could quickly locate the button. Today, the majority of radios used by public safety includes this feature—not just gear from Motorola—but also gear from competitors. Other iconic design elements pioneered by Motorola include angled knobs making it easier to operate with a gloved hand, exaggerated PTT buttons, and the angled “bump” on the side for easier grip.

The APX brings all of the Motorola design experience into focus. For the user, APX is the logical culmination of applying design, psychological, and anthropological tools that discover every detail about the work patterns of two-way radio users. Even though the user’s design requirements seemed contradictory—oversized controls, large display area, more space between the controls, and a smaller product—APX delivers an effective, efficient, user-centric form factor optimized for mission critical tasks.

Advanced Ergonomics, Cutting-edge Communications

Even as technology becomes more complex, Motorola doesn’t compromise usability by making controls smaller or burying them in a menu. Because of the emotional importance to public safety users, APX contains an exaggerated T-grip control top with large knobs for volume and channel selection enhanced for gloved use, and an exaggerated PTT with highlighted ring for low light conditions. By using the T-grip flared out housing, the APX design maximizes real estate while integrating high clarity multi-band analog and digital voice audio with cutting-edge data communication features.

The APX capitalizes on dual-sided ergonomics (audio, data) and functional grouping based upon importance, relatedness, and intuitive access. This approach decouples the “need it now” audio controls like the PTT, volume control, and channel selection from the controls on the data side. In addition, the audio section includes an angled eight character top display positioned for easy reading at all times—even when a user wears the radio on their utility belt. On the data side, the APX employs a large colored LCD for optimum clarity, eliminating the rainbow effect typically experienced with traditional plastic LCD lenses.

Dual Microphone and Speaker Channels Deliver Superior Audio

To improve voice transmit clarity, the APX™ audio architecture combines an adaptive, dual-microphone approach with advanced DSP technology. The APX radio contains two independent, highly sensitive microphone channels, one on the audio side, and one on the data side. APX aggressively removes noise from the audio source and distinguishes speech characteristics, yielding a highly effective and efficient noise suppression solution—even in high wind conditions.

On the receive side, users face an added challenge when trying to differentiate voice sources, and distinguish conversations while scanning multiple frequencies. Meeting these needs, APX contains two custom-designed loudspeakers—a large speaker on the audio side for high clarity and loudness, and a small speaker on the data side for fill-in audio. With APX, users experience optimal sound quality from virtually any listening angle. With two speakers pumping out sound, APX audio volume is extremely loud, significantly louder than any Motorola two-way mission critical radio. For the officer on the beat, APX audio stands out when other radios wash out from high background noise.*

*Recent studies have shown communication systems can be affected by certain high noise sources such as alarm systems in self-contained breathing apparatus or chainsaws in fireground environments.

The APX Advantage

Optimized Mechanical Design Balances Ruggedness with Comfort

While on the mission, extreme heat, cold, or sweat can make holding a radio difficult. Built with a rugged endoskeleton chassis, the APX employs an immersion-sealed metal housing encased in high-grade polymer for best comfort across a wide range of conditions. This fusion of materials delivers superior electrical shielding and mechanical rigidity, while providing shock absorption and abrasion resistance to the bumps and scrapes that mission critical radios encounter in everyday use. To help users maintain a secure grip on their APX radio, the T-grip housing delivers an optimized girth aspect ratio (width and depth). In addition, the APX incorporates a balanced center of gravity with an intuitive, “click and secure” battery mounting inspired by portable power tools.

Your Two-way Voice Communication Lifeline

APX provides users the connection to the people who keep them safe through the highly accessible PTT, the exaggerated volume control, and the exceptionally loud and clear audio. Each APX design element works together—ergonomics, mechanical footprint, and functionality—to deliver a high emotional resonance tailored for mission critical users. The APX design stands as a platform solution, setting the stage for future designs targeted at the unique ergonomic needs of law enforcement, fire departments, and federal agencies.

With the APX P25 multi-band two-way radio, Motorola has once again revolutionized mission critical communications technology. Now, more than ever, first responders can rest assured that their two-way radios stand ready to maintain their communication lifeline, freeing them up to focus on their mission, empowered with technology that is second nature.



MOTOA⁴

Mission Critical Portfolio

Technology That's Second Nature™

The APX P25 Multi-Band Radios are part of the MOTOA4 Mission Critical Portfolio of products that offer seamless connectivity between first responders. Motorola puts real-time information in the hands of public safety personnel to provide better information that enables better decisions for better outcomes. It's Technology That's Second Nature.

APX P25 Multi-Band Radios

Additional information and resources such as product information, brochures, and white papers are available on the APX product website found at motorola.com/apx.



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1. Design team awards and recognitions include; 2004 IF Award, International Design Award Forum; 2000 National Design Triennial for leading design, Cooper Hewitt Museum/Smithsonian Museum; 2000 Design of the Decade Industrial Design Excellence, Business Week/Industrial Designers Society of America.

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