# AACOG P25 Multiband Radio & Features Reference Guide

The purpose of this guide is to help decision-makers understand which models of subscriber equipment (mobile and portable radios) are designated as multiband (VHF, 700/800 MHz) models and to better understand what features should be considered when purchasing equipment. This guide does not represent every make and model available but rather identifies those that are the most prevalent within the marketplace and/or in operation throughout AACOG. The order in which they are listed is based on the predominance of radios used within the region.

**Radios**

Mobile radios are fixed mounted, typically in a vehicle but also sometimes used as control stations / base stations, whereas portable radios, as the name infers, are hand-held units. Models discontinued but still available (limited quantities) as "New Used" stock through third-party vendors are listed with a "*" notation. Links to product documentation for each model are incorporated.

**Motorola Solutions, Inc.**

| Mobile | Portable |
|---|---|
| APX 8500 | APX NEXT |
| APX 7500* | APX NEXT XE |
| | APX NEXT XN (NFPA 1802 compliant) |
| | APX 8000, APX 8000 XE, APX 8000H |
| | APX 7000*, APX 7000XE*, APX 7000L* |

**L3Harris**

| Mobile | Portable |
|---|---|
| XL 200M | XL Converge 200P |
| | XL Extreme 400P (NFPA 1802 compliant) |

**EF Johnson / JVCKenwood**

| Mobile | Portable |
|---|---|
| VM 8000 | Viking VP8000 |
| VM 7000 | |

**Tait Communications**

| Mobile | Portable |
|---|---|
| TM 9400 | TP 9900 |
| | TP 9800 |

**BK Technologies (formerly Relm)**

| Mobile | Portable |
|---|---|
| N/A | BKR 9000 |

**Features**

Features are the configured capabilities of subscriber units (mobile and portable radios). When you purchase a given model of radio, you usually pay for a base level of capabilities that usually aren't enough to really use the radio except in a very basic way. But it's a start and the easiest way to think about it is to compare it to building a house where you start with the foundation. From there, you add walls, pick appliances, argue over paint colors, and decide on a roof type. These would be the equivalent to features. Some features you have to

have while others may be nice to haves. In the world of radios, some manufacturers may bundle features together while others may treat them individually.

The features listed are categorized as "Must Have" and "Nice to Have." Some features come as part of the standard offering while others are optional. Not every feature is listed, and some may also only be available from certain manufacturers.

- Those in the "Must Have" category represent the **minimum set of features** needed to ensure full operability (the ability to perform day-to-day operations within your home system) and interoperability (the ability to communicate across different systems and between different agencies / services) with the multitude of systems (P25 VHF conventional, P25 VHF simulcast, P25 700/800 MHz trunked, and P25 700/800 MHz TDMA) operating within and adjacent to AACOG. AACOG's Alamo Area Radio Interoperability Network (AARIN) is a P25 700 MHz trunked system; it will eventually incorporate TDMA and simulcast operations, and VHF. To operate on AARIN, agencies need "Must Have" features.
- Those in the "Nice to Have" category, as the name implies, are not required for baseline operations but if deployed, could be advantageous. Some of the "Nice to Have" features are dependent on radio system infrastructure and backend systems, and therefore may not be deployable under certain conditions.

| **Must Have** | **Nice to Have** |
|---|---|
| Multiband (VHF and 700/800 MHz) | P25 Over-the-Air-Rekeying (OTAR) |
| P25 Authentication (Link Layer Authentication) | Multisystem OTAR |
| P25 Phase 2 (TDMA) | Fall Alert / Man Down |
| AES Encryption | Instant Recall Recording (IRR) |
| Multi-key Encryption | Top Display |
| Full Keypad | Color Displays |
| 2000+ Channel Capacity | Voice Annunciation |
| Noise Cancellation | P25 and Broadband Voice<br>• Voice over Wi-Fi<br>• Voice over LTE |
| Wi-Fi | Group Services |
| Integrated Bluetooth | Over-the-Air-Programming (OTAP) – Wi-Fi / LTE |

**Multiband (VHF, 700/800 MHz)** – Supports multiple spectrum bands (VHF, UHF, 700/800 MHz). VHF and 700/800 MHz are the most common to have enabled. With the exception of some school districts and public works/road and bridge entities within AACOG, UHF is not used to support public safety responders within AACOG.

**P25 Authentication** - Provides an extra level of verification every time a radio registers on the system. This enhances protection from cloned radios by requiring authentication before a radio can utilize the system.

**P25 Phase 2 (TDMA)** - Provides P25 TDMA (2-slot on 12.5 kHz channel) digital voice trunking. The Alamo Area Regional Radio System (Bexar County/CoSA) and LCRA systems require TDMA.

**AES Encryption** - AES was adopted by APCO as the P25 encryption standard in 2002. AES offers 256-bit encryption and is defined in Federal Information Processing Standard 197 (FIPS-197). Radios purchased using grant funds must use this type of digital encryption.

**Multi-key Encryption** - Allows multiple encryption keys and multiple encryption algorithms to be loaded into a radio. These keys could be for different types of encryption algorithms or different keys associated with different talk-groups, personalities, or channels.

**Full Keypad** – Allows specific number keys to be programmed, either as part of the radio codeplug or dynamically by the user, to perform certain radio operations such as quickly switching to a different zone/channel/talkgroup or turning scan on/off.

**2000+ Channel Capacity** – To support local operations but also include all of the State and regional interoperability channels and other talkgroups from other programmed systems, the days of getting by with just 1000 channels are long gone. The more capacity you have the better; it will ensure full interoperability across all systems without worrying about running out of space. For perspective, there are over 150 interoperability channels in VHF and 700/800 MHz as defined in the Texas Statewide Interoperability Channel Plan (TSICP).

**Noise Cancellation** – Using two or more microphones on the radio, background noise is reduced or eliminated to ensure optimum voice clarity. Different radios use different technologies to achieve this.

**Wi-Fi** - Enables the Wi-Fi capability on your radio that allows you to update radios more efficiently by eliminating the downtime associated with taking the radio to a service facility for reprogramming. Quickly update codeplug, firmware and features using Wi-Fi.

**Integrated Bluetooth** - Allows for the use of external Bluetooth accessories without having to connect a separate Bluetooth receiver to the radio. This is typically standard feature.

**P25 Over-the-Air-Rekeying (OTAR)** - Provides encrypted systems with the ability to quickly deliver new encryption keys to secure radios over-the-air via a radio channel from a centralized key management server using a P25 standards-based interoperable solution. This allows system security administrators to efficiently and securely redistribute encryption keys on systems with highly sensitive voice and data communications, making it more difficult to eavesdrop, intercept, or hack communications.

**Multisystem OTAR** - Multi-System Over-the-air Rekeying (OTAR) extends OTAR functionality from a Single Key Management Facility (KMF) server OTAR solution to Multiple KMF Servers.

**Fall Alert / Man Down** - Allows portable radios to automatically send an Emergency Alarm or Emergency Call when the radio is motionless and horizontal.

**Instant Recall Recorder (IRR)** - Incoming voice transmissions are recorded and stored on the radio for "instant recall" by the user by selecting a programmed function key. The number of recordings vary by radio model.

**Top Display** - Allows the user to easily see what zone/channel/talkgroup they have selected along with other icons and alerts without taking the radio out and looking at the front display. Some top displays also support color and/or use color to further identify certain conditions.

**Color Displays** - Used to identify specific zone/channel/talkgroup selections and/or identify certain conditions such as if the radio or the selected channel/talkgroup is in an emergency status. Color displays allow for more information to be represented and are easier to see than traditional black and white displays.

**Voice Annunciation** - Voice files are incorporated into the programming of the radio so that when a user selects a specific zone/channel/talkgroup, a voice file plays to confirm to the user that they are on the intended zone/channel/talkgroup. Not all radios support this, and the feature must be supported by the radio services entity who programs the radios.

**P25 and Broadband Voice** – Supports the use of broadband, either via LTE or Wi-Fi, to augment voice communications in areas that lack sufficient RF coverage. In L3Harris radios, this is referred to as BeOn, and in

Motorola radios, this is referred to as SmartConnect. The feature is dependent on the radio system infrastructure supporting it, and whether the capability is available for use by the system owner.

**Group Services** - Delivers data to a whole talkgroup. This is a quick and efficient way to disseminate data to many radios at once.

**Over-the-Air-Programming (OTAP)** - Provides radio configuration over-the-air using a P25 Integrated Voice and Data channel. OTAP can also be achieved using Wi-Fi and/or LTE. This enables system administrators to update the radio remotely, avoiding the downtime associated with pulling radios from the field. OTAP may require the Group Services feature.

If you have questions or need help in deciphering the radio "nerd speak," please contact one of the following members of the AACOG Interoperable Communications Committee. They are here to help.

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