



The switch to digital.....

has started and it will impact every 2-way radio user in the USA over the next few years. The shift is not being driven by changes in FCC regulations although that is a part of the overall picture. The real driving force is that there are some competing reasons for switching to digital – notably, the opportunity to license new repeater systems on clear narrow band channels, better performance, privacy from scanner monitors, and the coming capability of integrating computers, the Internet, and 2-way radios.








Currently there are two available platforms. The first, developed specifically for governmental use, is known as APCO-25 or more commonly, P25. Equipment capable of operating in the advanced mode of P25 can operate at 25 or 12.5 kHz channel spacing in either an analog or digital mode. Equipment has been fairly expensive. Handheld radios and mobiles are mostly in the two thousand dollar price range while repeater stations are typically twenty five thousand dollars or more.

More recently, a more flexible and affordable platform has been introduced by ICOM. Currently this technology is available only in handheld radios, but mobiles and repeaters will be available within a year. This new platform, or format, is known as FDMA (Frequency Division Multiple Access). The price is right – less than eight hundred dollars for a radio that can operate in either an analog or digital mode at 25, 12.5, AND 6.25 kHz. This platform allows users to communicate with older 25 kHz wide band users, with P25 Phase One users operating at 12.5 kHz in the analog compared mode, and at 6.25 kHz on newly available interference free digital channels.

So how do you make the migration to digital? First determine your platform of choice, either P25 or FDMA. Then, immediately apply to the FCC for new narrow band 12.5 or 6.25 kHz channels as applicable. We can help you with this process. Next, STOP buying analog only radios! If you are planning on using the P25 platform, either purchase a full digital capable model, or at the very least, purchase a radio that can be upgraded to digital later (the ICOM F70/80 and F1721/2721 models have this capability and they cost no more than an ordinary analog radios such as the Motorola HT1250 or CDM1250).

If you are planning to build your system on the FDMA platform, you can purchase the F3061/4061 series in either an upgradeable model for under six hundred dollars or less than eight hundred dollars for a full digital model. We can help you plan for mobiles and stations as well. The main thing is to start thinking digital NOW! Additional information is available at www.falcondirect.com/digital. A comparison guide follows on the next page. We hope you find it useful. If you have any questions, just give us a call!

Burch H. Falkner
At your service!

Product Model	ICOM F3061/4061	RELM RM3000	ICOM F70/80	ICOM F1721/2721	ICOM/Daniels Repeaters
					 ICOM FR3000 Analog 12.5 kHz  Daniels AN150 P25 Digital 12.5 kHz
VHF Freq. Range	136-174 MHz	136-174 MHz	136-174 MHz	136-174 MHz	136-174 MHz
UHF Freq. Range	400-470 MHz	400-470 MHz	400-470 MHz	400-470 MHz	400-470 MHz
Operating platform	Analog/FDMA	Analog	Analog/P25	Analog/P25	See Note 1 below
6.25 kHz spacing	Optional	No	No	No	See Note 2 below
Digital upgrade capable	Yes (FDMA)	No	Yes/P25	Yes/P25	See Note 3 below
Open architecture	Yes	Yes	Yes (P25)	Yes (P25)	Yes
AA Battery holder	Optional	Not applicable	Optional	Not applicable	Not applicable
Price (Analog)	\$595	\$268	\$675 UHF add \$20	\$595 UHF add \$50	See Note 4 below
Antenna	Included	\$27	Included	\$27	See Note 5 below
On site installation	Not applicable	\$165	Not applicable	\$165	See Note 6 below
Digital upgrade adds	\$199 (FDMA)	Not available	\$899 (P25)	\$899 (P25)	Not applicable
Extend warranty	\$85 (5 years)	Not available	\$85 (5 years)	\$85 (5 years)	See Note 7 below
For more information	www.falcondirect.com/f3061	www.falcondirect.com/RELM	www.falcondirect.com/P25	www.falcondirect.com/P25	www.falcondirect.com/repeaters
Power output	5W VHF or UHF	25W VHF or UHF	5W VHF, 4 W UHF	50W VHF, 45W UHF	See Note 8 below
Channel capacity	512	128	256	256	See Note 9 below
Dimensions	5.19 x 2.10 x 1.4"	6.4" x 1.73" x 6.45"	2.31 x 5.98 x 1.5"	6.89 x 1.77 x 6.69"	19" rack mount
Weight	12.0 Oz.	2.2 lbs.	14.1 Ounces	3.3 lbs.	Under 75 lbs.
Warranty	2 years (5 Optional)	2 years	2 years (5 Optional)	2 years (5 Optional)	2 years
Moisture protection	IP54/55	IP54	IPX7 See Note 10	IP54	IP54
2 Tone Paging	Yes	Yes	Yes	Yes	Not applicable
LTR trunking capable	Yes	No	No	No	No
User Programmable	No	Yes	No	No	No

Note 1 – The ICOM F3000 will operate at 25 or 12.5 kHz in the analog mode only. The Daniels Electronics AN150 will operate in either 25 or 12.5 kHz channel spacing in both analog and P25 digital modes. For an explanation of terms, see attached Glossary.

Note 2 – There will be no mobiles or handheld radios capable of 6.25 kHz digital operation until May of 2007.

Note 3 – The ICOM FR3000 is not upgradeable. The Daniels AN150 is already P25 digital capable.

Note 4 – The price of the ICOM FR3000 is \$1,995. The price of the Daniels AP150 is \$14,995 (Add \$1,000 for 100 watt upgrade if FCC authorization allows more than 30 watts (300 watts ERP).

Note 5 – Price of antenna with cable for average requirement will be \$3,000 installed (Tower not included).

Note 6 – On-site installation will vary depending on location and type of antenna structure. On average, assume \$2,000.

Note 7 – Extended warranties are not applicable to fixed station equipment due to issues relating to return to manufacturer. Most damage to base station equipment is caused by abnormal electrical voltages including lightning. Assume a cost of \$2,000 to provide minimal sag, spike, surge and lightning protection. Backup battery power is also recommended at an assumed cost of \$1,000.

Note 8 – Power rating of the FR3000 is 25/50 watts. AN150 standard model is 30 watts with 100 watts optional. Current FCC authorizations will rarely allow power ratings of more than 30 watts. Digital is more efficient with lower power requirements.

Note 9 – Repeaters stations operate on a pair of frequencies especially tuned for single channel operation.

Note 10 – Rated for full submersion at 3 feet for 30 minutes.

Glossary of Terms

AA Battery Holder – Most handheld portable radios operate from rechargeable batteries. Most of the time, this meets our average needs. However, firefighters are often required to perform their services in rural areas for extended periods of time. The availability of a AA dry cell battery back is a nice option for these situations. These battery packs are available for the BK Relm GPH radio as well as several ICOM models.

Analog – The technical word describing the platform used for radio communications for the last 100 years. In simple terms it means we modulate a radio frequency for the purpose of carrying primarily voice communications. The first cell phones were analog. Since the late 90's cell phones have almost totally switched to digital resulting in better range, voice clarity, privacy, and extended battery life. For more information on digital technology, see "Digital".

APCO-24 (P25) – One of the older digital platforms developed specifically for public safety users. The technology is expensive and has not been well accepted. This is changing as more manufacturers offer P25 digital equipment that is backwards compatible with older analog systems. Some manufacturers, such as ICOM are offering analog radios that can be upgraded (migrate) to digital. Other P25 manufacturers include BK Relm, E.F. Johnson Kenwood, MA/COM, Motorola and Vertex.

Audio Output – A measurement of loudness. A radio with a 1-watt (1000 milliwatts) audio output sounds significantly better than one with a half watt (500 milliwatts). High audio output improves range and often allows the use of lower RF power output. This results in longer battery life without sacrificing operating range.

Battery Type - Nickel Cadmium (Ni-Cd), Nickel Metal-Hydride (NiMH) and Lithium Ion (Lilon) are the most popular rechargeable batteries used in communications products. NiCd typically has the longest operating life if properly charged (incorrect charging results in a loss of capacity or "memory") NiCd batteries contain high levels of toxic metals. The NiMH battery has fewer toxic metals and is less susceptible to "memory". Lilon batteries are the least toxic, lighter in weight, have the greatest capacity, and have no memory effects. Unfortunately, the life is generally not as long as either the NiCd or NiMH batteries.

Charger Type – Chargers come in four basic versions – wall, desk, desk with rapid charge capability, and desk with rapid charge and conditioning. As a general rule a top of the line charger will pay for itself by reducing frequency of battery replacements.

Compander – Think of a compander as a pair of electronic funnels. Recent FCC rules increasing require the use of radios channels operating with a bandwidth of 12.5 kHz. Historically, we have always used 25 kHz. Reducing the bandwidth is comparable to reducing a four-lane highway to two lanes and expecting the same efficiency in traffic flow. In radio communications, the "traffic flow" is the audio message quality. In theory, a compander shrinks a 25 kHz signal to 12.5 kHz, transmits it over the air, the rebuilds it to 25 kHz at the receiving end. It's great in theory. The fact is that it doesn't work. Users forced to operate at 12.5 kHz can only expect communications that "sound good" if they use digital radios. By definition, we are saying that to meet the audio quality of a 25 kHz channel, you cannot expect a compander to perform this task on a 12.5 kHz channel. Conversely, a 12.5 kHz digital radio can actually sound BETTER than a 25 kHz analog radio.

CTCSS/DCS – Continuous Tone Coded Squelch (CTCSS) and Digital Coded Squelch (DCS) are used to block out interference for co-channel or adjacent channel users. CTCSS is analog and DCS is digital. Both work well and the choice is generally based on compatibility with existing radio systems. Both are standard features in most radios.

Digital – Voice and data is converted from its original format to a digital format by a device known as a Vocoder. On the receiving end, the Vocoder converts the digital data back to its original format. There are a number of different platforms used in communications including CDMA, FDMA (Frequency Division Multiple Access used on the ICOM F3061/4061 series), FHSS used on the Motorola DTR model as well as a modified type of TDMA used for P25.

DTMF – Dual Tone Multiple Frequency (DTMF) is the technical description of what most of us know as “Touchtone”. DTMF keypads are offered on several ICOM radios for a variety of functions including pump control by golf courses.

Field Programming without a PC – See also OVER THE AIR CLONING. Some radios can be programmed without a PC. Generally done by using a programming module that snaps into the microphone connector. In some cases, it can be done by entering a special code, but the function is the same. Field programming provides the flexibility of changing or adding frequencies when needed for mutual aid and interoperable communications.

Frequency Bands – The two most common bands are VHF (136-174 MHz) and UHF (400-470 MHz). Whenever possible it is always advisable to purchase equipment capable of covering the entire band as applicable.

High Security encryption - The more easily understood word for encryption is “scrambling”. In other words, encryption is the process of making your communications and/or your data more secure. There are all kinds of encryption technologies ranging from a simple inversion scrambler available at no cost on analog radios such as the Ritron SLX series and many ICOM models. More advanced forms on analog voice scrambler involve the use of rolling codes and masking. With each level of additional security, cost goes up and performance goes down. This is an option that should be carefully chosen. For military and high level government operations, an even higher level of security is available for P25 digital radios. Know simply as AES and DES, the main point to remember is that these options have very little practical value for most users. They are EXPENSIVE! For most of us, digitizing speech and data is sufficient for practical security requirements.

Intrinsically Safe (IS) – A term applied to equipment that has been certified and insured not to create a spark that might ignite gases, dust, fumes or other incendiary atmospheres. Generally IS is a requirement in petrochemical operations. Also known as Factory Mutual (FM) approved. Factory Mutual is a major insurer used by radio communications manufacturers.

IP54 - IP54 is a standard of verifying the ability of a radio to withstand operation in duty or humid environments. IP55 is a somewhat higher standard that is preferred if available. IPX7 provides the capability of full immersion in water of depths of several feet for up to a half hour. MIL-SPEC is another standard used to verify testing in various types of rigorous conditions. Generally, the better radios will meet MIL-SPEC C, D, and E. Some even meet the F standard.

Man Down Alarm – An optional board available for some radios that automatically sends an alert signal if a user does not move from a horizontal position for a preset time (typically 45 minutes). This is a very useful feature for firefighters.

NAC Codes – In the simplest terms, this is the digital equivalent of Continuous Tone Coded Squelch (CTCSS). NAC Codes are associated only with APCO-25 (P25) radios. The primary advantage of these codes over CTCSS or DCS is the availability of larger numbers of individual codes. CTCSS codes are limited to less than 50. DCS codes are less than a thousand. There are THOUSANDS of NAC Codes, which provides a great deal of interoperability capability for public safety users. There is little benefit to commercial users.

Nuisance Channel Scan Delete – There are a number of different names for this feature, but they all means essentially the same thing. If you are using your radio in the scan mode and a particular channel becomes a nuisance because of abnormal activity, it may be desirable to temporarily disable that channel for a particular length of time. Changing channels or turning the radio off and back on will restore the “deleted “ channel.

Open architecture – This is a term that applies to products that can be produced by competing manufacturers building to a common or “open” standard. Tires for example are built to a common standard. This allows you to mix Firestone and Goodrich tires on the same vehicle.

Generally, conventional 2-way analog radios are built to a common architecture. This allows as user to operate Motorola, ICOM, and other brands on the same system. This is NOT the case with digital radios. Even though the APCO-25 “standard” was supposed to accomplish this objective – it failed.

The reason it failed is because a manufacturer can claim compliance with the basic standard but still have the option of adding “enhanced” capabilities. These enhanced capabilities effectively lock out other competitors. Life is not necessarily fair! For what it’s worth, BK Relm, EF Johnson, ICOM, Kenwood and MA/COM do offer P25 compatible equipment.

Over the Air Cloning – Most of us know that cloning means to reproduce an identical copy. In radio communications, the term applies to duplicating the programming information in a host or original radio to other radios by sending the information over the air. No computers or special programs are required. The process is fast and efficient. This feature is one of the reasons why the BK Relm GPH radio is the radio of preference by firefighters who work with the U.S. Forest Service (USFS). The Forest Service has standardized on the Relm radio because of this feature. Participating fire departments equipped with GPH radios can be quickly brought into service through over the air cloning of frequencies and NAC Codes used locally by the USFS.

Over the Air Stun/Kill – In the event a radio is lost or stolen, it is often desirable to disable the radio to prevent unauthorized use. A radio with Over the Air Stun/Kill capability can be temporarily or permanently disabled using this feature.

Paging – A technical term for selective calling between radios. Allows a specific user or group to be addressed without disturbing others. Two types are offered – 2 tone and 5 tone. 5 tone is fast and flexible and recommended for new system. 2-tone is primarily used by volunteer fire and rescue agencies.

Platform – This is the term describing the technology used to describe the compatibility standard. For example a P25 digital radio of any brand should be able to talk to another radio using the P25 platform. The exception is when a manufacturer “adds” something to the standard. For example, the Motorola DTR Series radio uses a platform known as Frequency Hopping Spread Spectrum (FHSS), a platform commonly used in cordless phones, and Wi-Fi wireless networks. Again, all FHSS systems are not alike. It appears the standard is “no standard”. The one notable exception is Frequency Division Multiple Access (FDMA). This is an open platform currently offered by ICOM, Kenwood, and Trident Microsystems.

RF Power Output – The prevailing thought is that the higher the power, the better the performance. The accepted standard for optimum performance is 5 watts for VHF and 4 watts for UHF. The fact is that a 1-watt radio with an audio output of 1 watt will often outperform a 5-watt radio with a ½ watt audio output. The reason is that the communications cycle consists of both transmit and receiver power. By using a lower transmit power, battery life is extended and potential health hazards are minimized. Most radios offered by Falcon Direct have selectable power outputs. Whenever possible, we always recommend the lowest acceptable power setting.

Scan – Scanning is the function of momentarily sampling a list of frequencies (channels) for the purpose of being alerted to activity on different radio channels. Although very desirable for users who work with others, there is a tradeoff. While in the scan mode, you risk the possibility of missing an important call of your primary channel. For that reason, most radios can be programmed with one or more “priority channels”. The more channels programmed into a scan list, the more your chances for missing a call. Unless it is absolutely essential, we recommend that you do not use this feature.

Trunking – It is possible to combine multiple stations controlled by a trunking interface to allow better channel utilization through the use of dynamic channel assignment. Call us at 1.800.489.2611 for more information.

Upgradeable – This means (in radio language) that an analog radio can be upgraded to digital through the addition of firmware, flash upgrades, software or combinations. The ICOM F3061/4061 can be upgraded to the FDMA platform. The BK Relm GPH, ICOM F70/80 and F1721/1821 series can be upgraded to the P25 platform.

Warranty – Much confusion exists on the subject of warranties. A warranty is an agreement by the manufacturer to repair or replace a defective product. The product must be returned to the manufacturer's designated repair facility at user expense. The manufacturer typically repairs or replaces defective products depending on workload with the average being between 3 and 10 working days. The manufacturer generally pays return shipping.