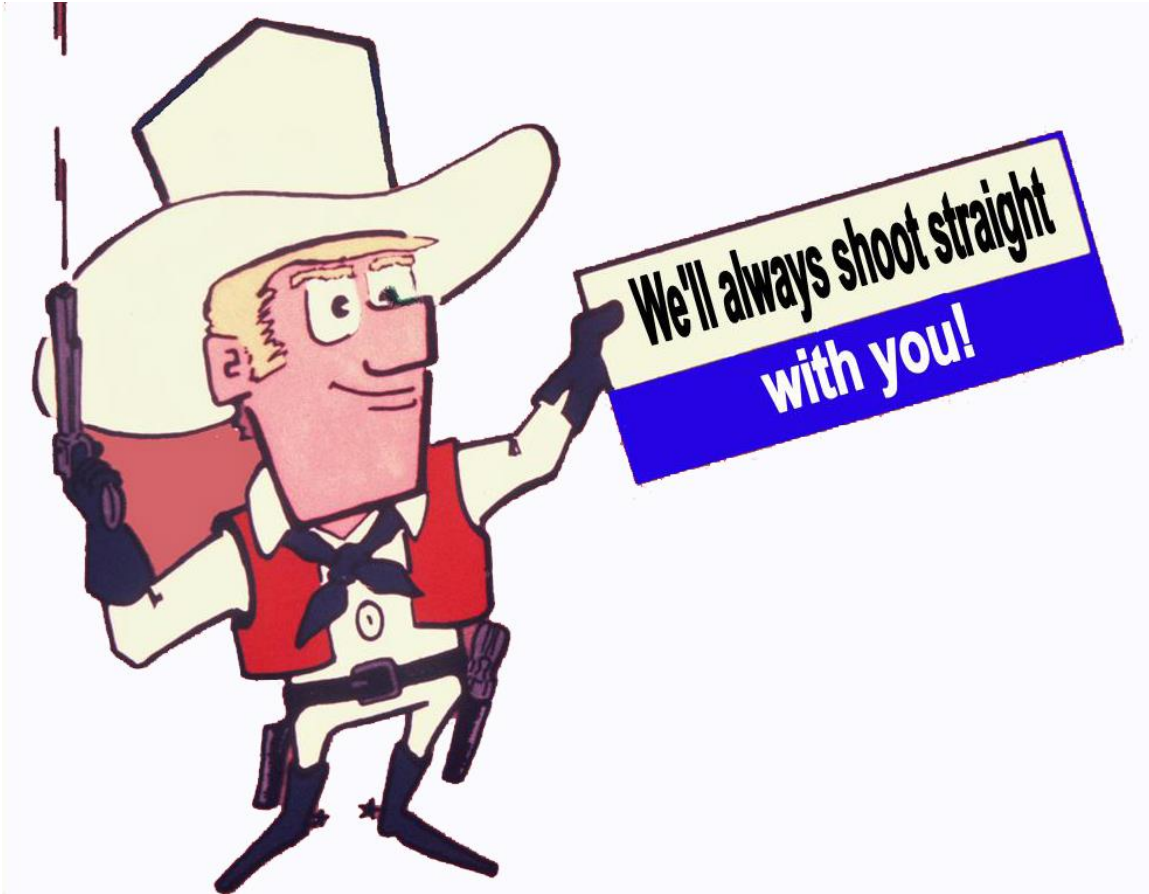


NARRROW BANDING 101 A COMMUNICATIONS PRIMER



By Burch Falkner, Founder and CEO



FALCONDIRECT

WE KEEP YOU CONNECTED!

Forward

December 31, 2012 was the last day that wide band (25 kHz) radios could be sold, used, or MANUFACTURED in the USA! All public safety and business industrial land mobile radio systems operating in the 150-174 and 421 - 470 MHz radio bands were required to cease operation on 25 kHz (wide band) technology (except where allowed by FCC rule) and begin operating using on 12.5 (narrow band) channels.

This deadline was the result of an FCC effort that began almost two decades ago to ensure more efficient use of the spectrum and greater spectrum access for public safety and non-public safety users. Migration to 12.5 kHz technology (once referred to as Refarming, but now referred to as Narrowbanding) was done to create additional channel capacity within the same radio spectrum, and support more users.

In essence, narrow banding made a lot of sense. We could have two or three times the number of channels for private communications. It was, and is, a great idea, but things haven't quite worked out as we anticipated.

Communications 101 provides a history of narrow banding, a much misunderstood term, a review of the impact on existing users, some abuses by suppliers who have taken advantage of the situation, and some common sense alternatives for those needing some straight answers.

I hope you will find this information helpful.

Burch H. Falkner
Birmingham, AL
10/15/2013



An Introduction to Flow Dynamics (As the term applies to Narrow Banding)

Much has been written about the real world effects of narrow banding on analog radios. Yet, almost without exception, users are shocked at the diminished performance that occurs when the change is made.

Mostly, the problem is with analog portable talk-back range. They just generally don't work well after narrow banding! We have written much about this subject but many of our readers are still having a problem grasping why performance suffers. Here is an example that our fireman friends will quickly understand.

Think of standard 25 kilohertz (kHz) channel spacing (what most of us have now) as a 3" diameter hose. Now let's cut that channel spacing in half which reduces our bandwidth to 12.5 kHz (narrow band) and our hose diameter to 1.5". Question - *Can you get as much water through a 1.5" hose as a 3" hose?* We rest our case - physics is physics whether it's water or radio signals!

The good news is that we have addressed this situation and we can offer affordable alternatives to allow you to live with narrow band without reinventing the wheel. As mentioned earlier, the greatest impact is on portable radio talk-back range, so let's focus on a fix for that.



There are multiple solutions to any problem. The correction of range loss attributed to narrow banding can generally be resolved by one or more of the following solutions.

- 1) Add repeaters and/or a receiver voting system
- 2) Add vehicular repeaters or similar devices
- 3) Convert from analog to digital equipment
- 4) Live with what you have and try different antennas

We will discuss some of these solutions in more detail shortly. For now, let's be sure that we clearly understand the operational impact of narrow banding starting with a few technical issues.

One of the really tricky things is that users with FCC licenses issued before narrowing banding actually gave away some of their property. The result for analog users turned out to be less grazing land (reduced range), and less feed (noisy communications) resulting in poor radio reception (or skinny cows if you are a rancher). Let's get into a little more detail.....



It's all about migration.....

Changes are necessary. What you change and when you change is called a migration strategy.

Narrow Band Planning Demystified

The Requirement for Narrow Banding – Short Version

It sometimes appears that members of the animal kingdom are smarter than us humans. Take the geese for example. As winter approaches, the head goose knows they will get their little goose behinds frozen solid if they don't fly south, so he (and I have always assumed the goose leader to be a him, but I could be wrong) announces to the rest that it is time to go south. There is no discussion, no vote, and no dissenters. They just take off, get into formation, and get the job done.

We humans are a little more advanced. We have traditions, opinions, learning experiences, feelings, egos, agendas, power struggles, and a thousand other things that keep us from doing what we have to do when we have to do it. Our lead goose is often a government regulatory agency such as the Federal Communications Commission (FCC) that gets their authority from Congress. When the FCC speaks, we do as told or suffer the consequences. The FCC has spoken. Here is what they have said.

In the USA, if you operate a 2-way radio system in the VHF or UHF frequency bands you will have, with a few limited exceptions, converted from 25 kHz bandwidth to 12.5 kHz before the close of the day of January 31, 2012; or you should be off the air, or be liable for payment of huge fines, or lose the use of your radio system, or possibly even go to jail. The discussion is closed.

Why the FCC say Narrow Banding is required

Radio spectrum is like a ruler. There are so many inches. If we have 12 inches and only need 12 increments (or spaces), we are OK with a standard 12" ruler. However, if we need 24 spaces, we have to divide our spaces into half inch increments and if we need 48 spaces, we use quarter inch increments. The bottom line is that we get 48 spaces where we originally had only 12 but the ruler hasn't grown. It has been allocated to utilize smaller spaces. That is exactly what we do when we need more radio frequencies within the same spectrum.

An existing 25 kHz frequency can be considered to be one inch wide on our foot long ruler. If we cut each inch in half, we get two 12.5 kHz frequencies in the same space or four 6.25 kHz frequencies if we divide our one inch segments into quarter inch allocations. We have an increasing demand for frequencies within a fixed spectrum. Therefore, the logical solution is to reduce bandwidth. Simple isn't it?

So how do I begin to plan for narrow band conversion?

The very first thing you do is to address the most immediate issue – your FCC license (if you have one). The longer you wait, the harder it will be to do. You can expect the process to become more complicated with more delays, and possibly even more expense. So why wait? If you haven't already planned your migration strategy, start it now and get it done. The results will justify the effort!

Next, you take stock of your existing radios, compile a list and send them to a trusted communications supplier (like us) to determine which radios can be programmed to meet the new narrow band requirements and which will have to be replaced. This list will be used to determine your budgetary requirements over the next few years. In most cases, your repeater/base stations will not make the conversion, but this can be addressed after a review of your equipment list. As a general rule, we recommend that your first equipment purchase (if required) would be a narrow band repeater station capable of meeting your requirements.

So what happens when you switch to narrow band?

Analog wireless communications technology is based on bandwidth. Technically, the more bandwidth you have, the more audio you have and more audio equates to more range. The previous standard was 25 kHz (It wasn't that long ago that it was 100 kHz!). When we reduce that to 12.5 kHz, there will be a predictable loss of audio/range. You can also expect possible interference from digital systems occupying the same channel spacing.

Some radios have a feature called companding which compresses the voice transmission as it is sent over the air, then expands it for full fidelity when detected by the receiving radio. This technology reduces the effects of noise on the received signal which in turn maximizes narrow band analog operation. We suggest that you do not purchase replacement or additional radios that do not incorporate this capability. Or at least, remember this. ALL your analog radios must be programmed one way or the other. You can't mix compandered radios with non-compandered radios. If you do, your performance will REALLY suffer!

The bottom line is that you will experience some performance degradation when you switch to narrow band analog operation. This is not true with digital systems. However, there are some issues with digital systems, beginning with the selection of the system best suited for your use. We will discuss this in more detail on the following page with the most popular choices being DMR, NXDN, and P25.

Narrow Band Operating System Choices

In our opinion, any equipment selected for narrow band operation should have both analog and digital capability since there are some reported problems associated with the use of digital radios when used in high noise environments. While the FCC does not require the use of digital technology for 2-way radio communications, the fact remains that digital has some significant operating advantages over analog.

For this reason, the trend is toward digital as it has already been established in cellular and TV broadcast communications (with AM and FM broadcast radio close behind). The U.S. Government has already switched to digital 2-way with the established standard based on APCO-25 (P25) technology.

All agencies of the U.S. Government are required to purchase only P25 equipment. In addition to analog and P25, there are several other digital operating standards available in the USA. They are as follows:

DMR (Digital Mobile Radio). Originally a European standard, DMR is most commonly known in the USA as MotoTRBO by Motorola (We'll have more to say about this later). Other DMR manufacturers include Hytera and Tait Communications. For now, let's just accept the fact that there are other digital technologies.

NXDN (known as dPMR in Europe) is a technology jointly developed by ICOM and Kenwood. This is the only technology available today in the USA designed for single channel 6.25 kHz operation.

TETRA is one of the newer technologies in the USA. It has long been used in Europe. It requires special FCC licensing considerations and is currently suitable only for large scale private dispatch operations (such as power utilities). TETRA can not be used by public safety agencies.

Practical Interoperability

We are actually dealing with three issues at the same time – narrow banding (an unfunded mandate for all FCC licensees), interoperability (applicable essentially to the public safety community and disaster support services such as governmental administration, transportation, and utilities), and for those receiving FEDERAL grant money, with the requirement to comply with federal and state interoperability plans.

Summing it all up

Let's summarize. You should have had all your VHF or UHF 2-way radios operating on narrow band 12.5 kHz by the end of 2012. If you haven't made the switch, do it NOW! If you need some help, give us a call at 205.854.2611. If you are a public safety user and have questions on interoperability (we'll be discussing this in more detail shortly), or grant opportunities (both governmental and charitable trusts), drop us an email to ServinU@falcondirect.com.

The main point to remember is that you are on a migration path. At this point, any radio you purchase (TETRA being an exception) must operate at 12.5 kHz (narrow band). It can be analog or digital (DMR, NXDN or P25). Within the next few years, we predict that 6.25 kHz channel spacing (Very Narrow Band) will be required, possibly as soon as 2018. At that point analog radios (assuming current technology) will not work. The radios will have to be digital!

Who says our prediction is correct? Based on previous actions by the FCC, we think the chances of migrating to 6.25 kHz are very good. Only time will tell. In the meantime there are some other issues to consider.....



And the story continues,

As increasing numbers of 2-way users switch from wide to narrow band, the reports are coming in that *my radio doesn't sound as loud as it used to, and there seems to be more background noise. The worst thing is that I can't talk as far as I used to before narrow banding.*

We hate to tell you so, but that is what we have been telling those who would listen for over a decade. There are two solutions to problems associated with narrow banding - You can put in more stations/repeaters (or receivers) to compensate for deteriorating performance or you can go digital. There are no other alternatives regardless of what you may hear from the *experts*. The following analogy might make it a little easier to understand.

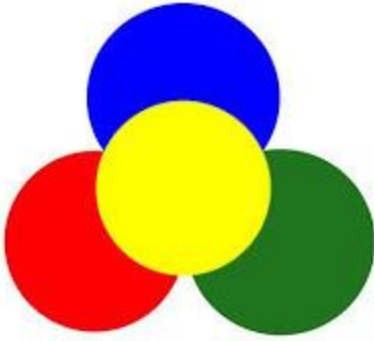
Picture yourself in a basement with no windows. Suddenly a leak develops and the basement starts to fill with water. Think of the floor of the basement as NOISE. The water is rising rapidly, but it's OK because you have a boat in the basement floating on the water, or NOISE.

When you reduce bandwidth, the water (NOISE) starts to rise. The rising water (NOISE) starts to occupy more and more of the space in the basement. You start to lose space. Think of space as operating RANGE. With no water on the floor, you are free to use the whole basement. However as the water(NOISE) begins to rise, the available space (RANGE) is reduced.

As the water continues to rise, you ultimately completely run out of space (RANGE) which is what happens when you reduce bandwidth to the next proposed level of 6.25 kHz, known as Very Narrow Band (VNB).

In our example, when water occupies too much space, YOU can no longer efficiently occupy that space. That's what happens when you convert to narrow band. The basement is still the same size, you are the same size, but the space available for your use is diminished. You have more NOISE and less RANGE.

You also have another problem - reduced oxygen. A reduction in oxygen can cause breathing problems. Think of oxygen as AUDIO. As the water level rises, the AUDIO (think oxygen) is reduced. The higher the level of compression (water rising), the less oxygen (AUDIO) you have. Does that make things a little easier to understand? In our example, a basement is a basement. It can be a small basement or a large basement. The result is the same. The age, brand or model of your radio doesn't make any difference. The effect of narrow banding is the same - Increased noise, reduced audio, and diminished range - Guaranteed!



FCC Issues got you going around in circles?

The number one query forwarded to our web site relates to FCC licensing, closely followed by inquiries on license free communications such as [MURS](#). These questions mostly come from existing 2-way radio users.

Most users want to know: *Do I have to modify my license for narrow band, or do I only need to modify (reprogram) my existing equipment for narrow band?* The answer is that you DO have to upgrade your license. You can do it yourself and waste a lot of time, or pay an expert to do it for you. We recommend having it done by Enterprise Wireless Alliance (EWA). If EWA does the work, it costs you \$260 for non-governmental licensees or \$125 for governmental users. If you wish, you can do the work yourself and save money click [here](#) for instructions.

You will need to complete a simple one page form, available from [Enterprise Wireless Alliance](#). As you will note, non-governmental users can choose to continue operating in the analog mode, or upgrade to either DMR digital (the format used for Hytera and MotoTRBO) or NXDN digital (the format used by ICOM and Kenwood) and be licensed for BOTH analog and digital.

As a commercial user, we recommend requesting both analog and digital operating capability, even if you don't have immediate plans to upgrade to digital. Specifically, if you are upgrading a VHF system, we recommend that you check the 4K00F1E for ICOM and Kenwood radios. If you are upgrading a UHF system, we recommend that you select the 7K60FXE for Hytera and MotoTRBO radios. Government users will often apply for upgrading to P25 digital which is available in two versions. Phase One was predominant before mid year 2013. If you are applying after the 3rd quarter of 2013, you will want to apply for Phase Two P25 which has the same designation as DMR (7K60FXE). You will note that public safety users pay less, first because they are exempt for payment of FCC fees. In reality, a public safety user will pay MORE for any digital upgrade, the reason being the additional cost of third party coordinators. You can call EWA for a specific quote.

The second question is *Will upgrading from 50 to 100 watts on my base or repeater station make up for the loss I will experience by narrow banding?* The answer is YES for talk out range from the station and NO for mobiles talking back. We favor the upgrade to digital, both from the viewpoint of performance, features, and cost since a new repeater station can cost thousands of dollars and you have done nothing to improve talk back range. Going digital with a new moderately priced 50 watt repeater and digital mobiles and portables is by far the better choice for upgrading a wide area system. There are other solutions which will be discussed shortly.



The Narrow Band Deadline is now past, or is it?

Most, not all, licensees have now converted to narrow band. Most, not all, conversions have gone fairly well. There are exceptions, in particular with those that have radios capable of operating in the *companded* mode. The term *companding* may be new to you. For additional information, click [here](#).

Without getting technical, there are various operating systems used by different manufacturers. The idea is to compress and expand transmitted audio to reduce the effect of increased noise and reduced volume associated with narrow banding of 2-way radio channel bandwidth.

In theory, companding is a good thing. In reality, it is NOT such a good thing unless all of your radios are the same brand, or better yet, the same model. As you will see in the previously referenced patent information, there are numerous patent holders with Radio Shack being the originator. You don't think Motorola, Kenwood, or ICOM is going to pay Radio Shack patent royalties do you?

The result is that the companding systems apparently work only on tone squelch activated channels and only with radios of the individual manufacturer. I haven't found any evidence to support this theory except to say if you have a mixed brand radio system, it will work better if you turn the companding option OFF!

As far as reduced audio is concerned, make sure that you choose analog portable radios with the highest audio output available. 500 milliwatts (mW) is fine for wide band (25 kHz) channels or for narrow band (12.5 kHz) or very narrow band (6.25 kHz) DIGITAL channels. 500 milliwatts is not recommended for narrow band ANALOG radio systems. 700 mW's is our recommended minimum with 1000 mW being the best choice if available.



Digital Audio Processing (DAP) also improves signal quality for analog narrow band radio systems. Many of the older repeaters will convert to narrow band, but we recommend replacement with a new repeater such as the Hytera RD-982AN. You can trade in your old repeater and get a brand new 50 watt analog repeater for less than a thousand dollars! Better yet, you get a three year warranty, and this repeater can be upgraded to DMR digital when you are ready (DMR is the digital format offered by Hytera and Motorola). Give us a call at 800.489.2611. Tell us what you have to trade and we'll take it from there! In the meantime, if you are having low audio problems after narrow banding mixed brand radios, we suggest that you turn the Companding option OFF!



A recent article comment by a competing dealer suggested that many VHF and UHF 2-way radio dealers were being misled by other dealers who were persuading users to move from analog to digital. A copy of the dealer comments is available by clicking [here](#).
Burch Falkner, CEO

While I acknowledge that digital provides a higher level of locking in a customer to a particular system or technology, I have to also consider that the equipment providers that will be most adversely affected will be the discount Internet retailers. Admittedly, the features available in digital radios require higher level programming and system integration than is applicable to analog radios, but this is no reason to disqualify the benefits of digital.

My real issue with those who criticize the efforts of others is that the writer of the article neglected to mention any positive solutions for the alleged victims, other than contacting him for help. Somehow, I think existing 2-way radio users have the intelligence required to make a rational decision IF they are provided with factual information. My comments to the publisher are as follows.

While I appreciate the opportunity given by your publication to allow article submissions and comments, I feel compelled to address the recently published comments by another dealer. Rule #1 in communications is to never defend, never attack, and always clarify. To publish generalized statements by dissident competitors contributes nothing to the benefit of those who are allegedly being misled by certain awful people who might be taking advantage of an uninformed public.

Although I am not one of those awful people, I see no value in simply stomping the ground and telling everyone that they should come to you for guidance and assistance. I see nothing wrong with offering services, but the offer should be extended on the basis of merit, not emotion. What the writer offered was nothing more than assuming prospective buyers were incapable of making a decision. I beg to differ. The buyers with whom I deal with on a face to face basis are very capable of analyzing the offerings of various equipment providers. While it may be true that a local equipment provider may have the edge over an Internet discounter, it is equally true that facts beat feelings every time!

To logically address the assumed problem of unscrupulous equipment providers misleading consumers, it seems to me that one should provide the information required to allow the prospective consumer to make an informed decision. That is why we have an extensive library of articles on the subject of narrow banding that is freely offered to all who are interested. Perhaps the most useful is a link to the FCC web site which allows an existing user to check for themselves whether their equipment is narrow band capable.

If you have not yet converted to narrow band, the next step would normally be one of determining if your equipment can be converted.



Unfortunately, there are those in our industry who will try to scare users into making unnecessary purchases or converting from analog to digital on the premise that “you’ve got to”.

Let’s make one point VERY clear. There is NO requirement for VHF or UHF systems to convert to digital. There are some very good reasons for moving up to digital but there is no requirement!

The real issue is determining whether your radios can be converted to narrow band or if they must be replaced. Don’t take someone else’s word. Check it out for yourself! Here’s how!

Click [here](#) to go to a special FCC Office of Technology web site that can be used to quickly determine whether or not an existing radio can be converted to narrow band. Find the FCC ID number on your radio. On mobiles, it will be found on a label on the outside of the radio (generally on the side or back). You will need to remove the battery on a portable radio which will allow you to view the label inside the radio. Let’s check out the popular Motorola GP300. We start by removing the battery. Inside, we see a label indicating this radio was made in the USA by Motorola (that statement alone will generally tell you that the radio is too old to be capable of being narrow banded, but that’s another story). You will see an FCC ID number. In this example, the number is ABZ99FT4010. The first three digits (ABZ) indicate Motorola. The remaining digits (99FT4010) designate the Product Code.

At the top of the page on the line marked Grantee Code, enter ABZ in the space provided. On the line below marked Product Code, enter the remaining digits of 99FT4010. Now scroll down to the bottom of the page and click on Start Search.

Now, click on the Check Mark below the Display Grant column (3rd column from the left). On the far left hand side you will see a column marked Emission Designator. In this example, the first two digits of 16 appear. This equipment is capable ONLY of 20/25 kHz operation. It is NOT approved for narrow band (12.5 kHz operation). This radio can no longer be used after December 31, 2012.

Radios capable of narrow band operation may be approved for both 25 KHz (16) AND 12.5 kHz narrow band, which will have the first two digits listed as (11). The ICOM F50V is such a radio (FCC ID AFG306000). The Hytera PD782 and other radios with both analog and digital capabilities will have both the 16 and 11 Emission designators as well as the single digit 7 or 8. This would apply to other DMR radios as well as radios utilizing IDAS, NEXEDGE, or P25 digital platforms. The main thing to remember, if the radio you are checking has ONLY the first two digits of 20 or 16, it is NOT convertible for narrow band operation. For an efficient and affordable migration solution, there is only one name you need to know and that name is Falcon Direct!



Narrow Band Nightmare!

With the deadline for narrow banding already past, the horror stories related to this required change intensify. Worse yet, as government at all levels is forced to cut back on services, reducing work force, and delaying needed projects, the old traditions of squander and waste continue.

Case in point. We recently received notice that one of our ambulance customers was required to convert their radios to narrow band in order to continue communications with county dispatch. How much notice did we have? THREE DAYS and that was on a Thursday meaning that the work had to carry on into the weekend. This could have been done much less expensively with good planning and communications. As it turned out, the customer was financially penalized for lack of advance notice from the county dispatch center

A more graphic example is the case of the county communications dispatch center that relies on good old "xx", the local radio man who always takes care of them. He *takes care* of them by CHARGING the 911 board for *helping* them plan a migration to narrow band. The 911 director REFUSED to hear proposals from anyone other than good old "xx" even though we perform such services at no charge.

Here's another gem! In another county, the local 2-way shop charges \$35 per radio for narrow banding, which is highway robbery compared to the rates of other service providers. The customers have no choice since this service shop, the champion of reducing cost to the consumer, *takes care* of their customers by password protecting their radios. This assures that unauthorized personnel cannot make unauthorized programming changes. The tragedy is that they don't throw him out and get competitive bids for service.

This narrow banding issue is not going to get better unless we all start using our heads and working together for the common good of all concerned. The good old days are over! The bright new day of common sense, cost efficiency, and better resource management is here. Are you ready to change the way that YOU do business? If so, give us a call at 800.489.2611. Do it today. You'll be glad you did!

BTW, if matters were not complicated enough already, we now have to tell you that even though your radios can be converted to narrow band, it is entirely possible that they cannot work on the new frequencies that were created by narrow banding.

We'll be telling you more about the Narrow Band Two Step on the following page.



Have you heard about the Narrow Band Two Step?

The two step is well known to beginning dancers. It is the foundation for later success in the art of navigating around the dance floor. It is also important that you know about two stepping when you get ready to narrow band existing VHF or UHF 2-way radios. Contrary to what you may think, just converting from 25 to 12.5 kHz or technically, 15 to 7.5 kHz channel spacing does not always satisfy your needs, either operationally or in compliance with FCC Regulations.

The problem is that your mobile, portable, or even your base or repeater radio may not be able to operate on new narrow band frequencies even if it is narrow band capable! In simple terms, if your new VHF narrow band frequency is a seven digit number that ends in a "5" (151.4525 for example), your radios must be capable of something MORE than narrow banding. UHF users have fewer issues than VHF users.

The question is, just exactly what is meant by "narrow banding"? For VHF users, it means channel spacing between existing channels will be reduced from 15 kHz to 7.5 kHz which will allow the creation of two "new" frequencies in between the two channels on either side of an existing channel.

For example, let's say that you are currently licensed to operate on 155.760 MHz. The adjacent channel below is 155.745 MHz (15 kHz down from your frequency). The upper adjacent channel is 15 kHz higher (155.775 MHz). Now, if we split that 15 kHz separation in half (7.5 kHz), we have two "new" frequencies (155.7525 on the lower side and 155.7675 on the upper side).

All radios sold in the USA after January 1, 2000 were required to be narrow band compatible (i.e. capable of operating with 15 or 7.5 kHz channel spacing). So far, so good. That means that a ten year old Kenwood or Motorola radio should be capable of being converted to narrow band. As far as it goes, this statement would be true, BUT.....

There is another condition, not so well publicized, that is causing a problem for many users who have paid to have their radios narrow banded only to find out that they sound terrible. The most common complaint is noisy, or "fuzzy". The range isn't what it was and the radios sound terrible. We all know that the simple act of narrow banding typically reduces range 10% or more than what it was when operated at 15 kHz channel spacing. But the condition being reported is worse - MUCH worse! We call the problem *two stepping*, and it's not a dance!

Without getting too technical, let us just say that there is a circuit used in the manufacture of current vintage 2-way radios called a synthesizer. The function of this gadget is to produce the desired operating frequency. The concept is kind of like building blocks. By adding building blocks, you can create a word, structure, or both. In the case of the synthesizer, the frequency is developed in steps (think blocks if you prefer). These blocks (or steps) normally come in four sizes - 15.0, 5.0, or 2.5 kHz.

Technically, all current VHF frequency channel spacing can be created by a synthesizer operating with 5 kHz steps. However, the new narrow band frequencies created by the FCC required a synthesizer step capable of being equally divided into the frequency in 2.5 kHz steps. Now we've got a problem!

If you are simply converting an existing frequency to narrow band (7.5 kHz channel spacing), a 5 kHz step is OK since the "old" frequency channel spacing, based on 15 kHz can be equally be divided by 5. However, if you plan to add additional channels, like the national Homeland Security "Call" and "TAC" channels, there is a problem. For example, the first national emergency channel is 155.7525. As you will note, this frequency has FOUR digits, ending in a "5" after the decimal. That tells us that this is a narrow band frequency with 7.5 kHz channel spacing.

Now we can see the problem. 15 can be divided by 5 with the answer being 3. 7.5 can NOT be divided by a whole number of 5 (actually 5.0). The divisor has to be a lesser number than 7.5. The largest number that can equally divide 7.5 is 2.5 (the smallest would be .5).

So, what we are saying is that your radio must be capable of being programmed in 2.5 kHz steps. If the radio is only capable of 5.0 kHz steps, it cannot be properly programmed for any of the NEW narrow band frequencies. It CAN be used to narrow band original or primary channels (frequencies ending in three digits after the decimal)

If your mobile or portable radios are not capable of programming in 2.5 kHz steps, the net result is DISASTER! When trying to program a frequency based on 2.5 kHz steps (156.1725 for example), the synthesizer cannot produce the required equal division and will round off the frequency to 156.170. This means the mobile or portable is "off frequency" which creates the VERY poor performance.

The solution is to replace the 5 kHz step radio with one capable of producing 2.5 kHz steps. If you are looking at new radios, be sure and pick one capable of programming in 2.5 kHz steps. There are two exceptions:

- 1) If you only intend to program an existing primary channel to narrow band, you can save yourself a lot of money by purchasing radios at closeout prices that are not capable of 2.5 kHz programming.

- 2) The aforementioned information applies only to VHF radios. It does NOT apply to UHF radios which have 12.5 kHz channel spacing which has been available in all radios since 2010 (for some models, even earlier).

There are some other factors that you may want to consider. For example, UHF repeaters use paired frequencies with 5 MHz separation between transmit and receive. This makes UHF far less susceptible from distant station interference.

One last tip - when selecting a new radio, always be sure that you choose one with the highest number value when evaluating the Adjacent Channel Selectivity (i.e. 90 dB is MUCH better than 80 db in terms of performance, for narrow band radios). See www.adcommeng.com/Narrowbanding_for_Technicians.pdf for more information. Got more questions? Need some help? Give us a call at 800.489.2611.



Who says you have to narrow band pagers!

The that fact is that you DON'T have to narrow band pagers, but this could be a good time to look at your requirements.

Think of the world's most popular fire pager! Now, think about price and features you would like. As a fire and rescue volunteer first responder, we would think that you would need at least two channels - one for dispatch and one for use on the fireground. Scan would also be nice.

Obviously, you need good clear audio and selectable audible or vibrate alert. That's a given! Good battery life, light weight and compact size is an absolute requirement. Low operational cost is on our wish list. Reliability is on the top of the list along with good operating range, rugged MIL-SPEC construction and water resistance are required as well.

If we are looking at a new pager, it should be comparable to the pager that we have used over the years. We know we have to upgrade to a pager with narrow band capability, but we don't want to change functionality or even the alerting sounds. And one final item - we would like to be able to record and playback messages since alert calls are known to come in at the absolute most inopportune times, like when we are asleep, in church, in a restaurant, or a few other places and in situations that are well known to us all.

Now, what's all that going to cost you? Our search on the Internet reveals that the best advertised price is \$407 for a Minitor V with free shipping and a one year warranty. You have a choice of purchasing a programmer (average price \$249) or having the pager programmed for \$10 additional. Adding a five year warranty will cost you another \$78. Want to add a 5 watt transmitter? Just add \$92.

Yes, you read it right - the pager of your dreams WITH a 5 watt transmitter for 2-way communications for only \$92 more than the lowest advertised price on a two frequency tone/vibrate alert pager with stored voice (message record and playback). Want to see one? Click [here](#)! Now let's return to some more horror stories!



Brevisfasciasyndroma reported at mountain top repeater sites!

Our radio doctor friends know that *brevisfasciasyndroma* (or narrow band syndrome to our non Latin speaking friends) is a serious malady affecting 2-way radio users who have switched to narrow band. First reported by portable users and rural fire departments (Click [here](#) for details), the condition was later reported by Midwestern farmers (Click [here](#) for details). Fortunately, cures were found for both outbreaks. Now we have new reports from repeater users that they are experiencing *brevisfasciasyndroma* symptoms.

The first reported repeater case was by a county school bus radio transportation director who discovered that the repeater they were using could not be upgraded to narrow band. Replacement costs for narrow band capable repeaters ranged from several thousand dollars up to twenty thousand dollars plus service contracts ranging from a hundred dollars per month to nearly two hundred dollars a month. Fortunately, they checked with us before purchasing a new repeater with a service contract.

We've got a better idea. We call it the *Service Lease Program*. Here's how it works! We replace your old repeater with a new narrow band repeater. You have a choice of analog, DMR (Hytera and MotoTRBO), or NXDN (ICOM or Kenwood). All are nominally rated at 45/50 watts depending on whether VHF or UHF is applicable. The cost is just \$100 per month, payable annually, then renewable on annual, semi-annual, quarterly, or monthly terms as you choose.

\$100 per month is all you pay for equipment AND on-site maintenance. You can cancel at any time. There is no up front cost and no long term contract. There are no hidden costs. If you have a problem, we fix it within 24 hours! Want to know more? Call us at 205.854.2611. Do it today. You'll be glad you did!

It should be safe to say that you now know a lot more about narrow banding than you did before reading this material. Now it's time to switch gears and focus on what we can do with the options available. As you may recall, for many users, the best choice may be to continue using analog. If that is your choice, the major consideration is now that of getting the best value for your money. We have a special web site at www.bestradios.us where you can find the best radios at the best prices, with the lowest operating costs available anywhere. If you are planning to upgrade an old system or purchase a new system, a few minutes of your time will be well invested by visiting this site. If you are planning to upgrade analog or go digital, please continue for some very enlightening information.



Since narrow banding, many analog users have requested information on how to recover the operating range that was lost as a result of the change. There is no single answer. For some, a simple vehicular repeater such as the TM8000R may satisfy the need (Click [here](#) for more information). For others, a product such as the *AlphaMic* system could be the solution (Click [here](#) for more information).

Addressing the need for more range at the mobile is an affordable and efficient solution for small law enforcement agencies, volunteer fire departments, utilities, and various commercial repair services can be accomplished by some unique devices. The newest of the devices available for mobile use is our own *BlueBox* which can control a mobile radio from distances of up to a mile away from the associated vehicle (Click [here](#) for more information).

In some cases, adding one or more fixed station repeaters may be the best solution. There are essentially two repeater types available for VHF or UHF analog operation. Known as Bypass and Zone repeaters, these units allow a user to fill in wide area dead spots at reasonable cost. We have prepared a new version of our Repeater Planner that will provide more information by clicking [here](#). Check it out. Hopefully it will give you some good ideas and budgetary costs.



Our public safety friends, in particular, those in Mississippi that are looking at the MISWIN 800 MHz statewide trunked system, are looking forward to the move from P25 Phase One to Phase Two. The problem is that P25 Phase Two radios are expensive. In fact, these radios used to cost around five thousand dollars each until the new technical standards allowed free competition. The net result is that in less than a year, the cost came down by over 50%!

Still, the price on a portable can eat up a two thousand dollar bill and mobiles are even more. On average, you can figure between four and five thousand dollars to equip a law enforcement vehicle and a portable radio for the patrol officer. Worse yet, the range of the portable is nowhere near as good as the mobile. When an officer or incident commander is out of the vehicle and on foot, it is just as important to be able to talk as it is when they are in the vehicle.

We developed the *Blue Box* to address this issue. A Blue Box complete with a handheld personal 2-way radio is well under a thousand dollars. A top quality mobile comes in at around twenty two hundred dollars (assuming a mobile with P25 Phase Two capability).

Better yet, our portable has the same range as the mobile, PLUS it can talk over the 800 MHz mobile radio as well as direct to VHF and UHF system users. This equates to significant cost savings plus longer range and more flexibility for the portable.

And now, we are offering the *Blue Box Base*, the perfect solution for volunteer fire department users. The picture above tells the story. We take a good quality American made P25 Phase Two capable mobile radio such as the BK Relm Wireless Model KNG-M800, add an AC power supply, connect the Blue Box (that's it sitting on the top of the mobile radio behind the speaker). When connected to an outside antenna, either VHF or UHF radios can connect to the MSWIN 800 MHz system from anywhere in the fire district for LESS than the cost of a pair of portables! Want to know more? Give us a call at 800.489.2611. Now let's turn to some digital solutions.



Think about this question. Would you buy a product that wouldn't work with any other product (a tire for instance), that really didn't meet your needs, could only be maintained by a single provider who dictated the price you pay, the cost of service, and has the power to change the technical specifications at any time to require that you pay for a mandatory upgrade that you neither need or want?

If your answer is Yes, then there is no need to read any further. If your answer is No, and you are considering the purchase of a MotoTRBO or a P25 ASTRO radio system from Motorola, you need to seriously consider the following:

MotoTRBO is based on a technical standard called DMR. Motorola P25 ASTRO is based on a technical standard called P25. Both systems "could be" compatible with other open standards based equipment, but are normally configured NOT to be compatible with any radios other than Motorola. In the case of MotoTRBO, conventional single site systems are "protected" by advanced encryption. Multi site systems such as Capacity Plus utilize a proprietary platform that restricts use only to Motorola radios. Motorola P25 ASTRO equipment is non-compliant with open technical standards. (Click [here](#) for more information).

So, the bottom line is that Motorola can provide both DMR and P25 open standard equipment, but they will do so only by customer insistence. If you are considering the purchase of either a MotoTRBO or P25 ASTRO digital radio system, INSIST that it be provided based on open standards (DMR in the case of MotoTRBO or CAI in the case of P25). Otherwise, welcome to the world of the square tire! Drop us an email to ServinU@falcondirect.com if you would like more information. We'll tell you about some neat things like a DMR radio that can be upgraded to P25 or how you can purchase radios that cost about the same as other radios that provide free batteries, 24/7 service, and free maintenance for 10 years, plus a free radio upgrade at the 5th year.

Get all the facts, not just a razzle dazzle demonstration by a salesman who more than likely will not be there when needed. As a final point, you may have heard that there is a Phase One P25 standard and the Phase Two standard. Want to know what the difference is and how it could be important to you? If so, click [here!](#)

Now let's recap everything that we have said thus far by referring to a single document that sums up everything, well, almost everything! Click [here](#) for the recap.

Now, we said we had covered ALMOST every narrow band alternative. The fact is that we left out the choice of abandoning voice communications altogether in favor of using a tiny belt work device known as a RESPONDER. This amazing new technology puts 2-way messaging capability in a tiny cigarette pack sized communicator that allows workers to contact others at the push of a button.

This is actually a subject for another time, but if you would like to know more about this amazing technology, just scan the image below with your smart phone camera. Or, if that doesn't work for you, give us a call at 800.489.2611.



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