Quick Start Guide- Anytone Portable- SMARC

PF3 – Toggles between no monitor, one-slot monitor and two-slot monitor. Make sure no monitor is selected when using the radio to transmit.

PF1 – Toggles TX power: T, H, M, L

PF2 – Toggles between Sub Channel ON/OFF

Menu – Allow user to access programming functions

P1 – Highlights sub-channels for transmit

PF3
PTT
PF1
PF2
Menu
P1

CHAN – Selects one of 16 chan in Zone

ON/OFF /VOL

Back

P2

Zone Rkr

Note, the display shows you the power, the analog tone on/off and what is defined as the repeater color code.

Channel Select – Knob is used to select the desired channel which may be a talk group on the selected repeater

Back – Depending on the operating mode, this button used for various functions as noted on the display

P2 – Allows changing the selected sub-channel to VFO

Zone Rocker – This button is an up down rocker switch allowing user to select the desired Zone consisting of up to 16 channels. Digital channels, this selects the desired repeater. Analog mode this selects a group of up to 16 repeaters.

Now just go ahead and turn on the radio. Wait for the boot up screen to finish. The display will look something like what is shown in the picture assuming that is how you left it the last time. If not, use the Zone Rocker switch to find the MRYVL screen, then the Channel Knob to select the M Maryville talk-group. Anytime you wish to make a DMR call, always state which talk group you are using as the other hams who might respond may be monitoring multiple talk-group and need to know which to respond to.

Next, press the P1 button and the display should show what was the sub channel. If it is not the SMARC 146.655 VHF Rptr Local, use the Zone Rocker switch to select VHF Repeaters followed by the Channel selection knob to find the SMARC 146.655 VHF Rptr. Almost done. If you want to monitor two channels, press the PF2 to select sub channel ON. Remember, to use the P1 button to choose which channel to transmit on and PF2 to turn off the sub channel if you do not want to hear both channels. Any two channels can be selected to monitor, even DMR and analog or two DMR talk groups.

1. What happens if the P2 button is pressed and you are in the VFO mode? Just press it again and you are back to preprogrammed channels.
2. How do you move to a different analog repeater such as the 146.625? Use the P1 button to highlight the VHF Rptr Local if it is not already selected and then the Channel Select Knob to change to the TopWorld 146.625. Done.
3. How do you change to a different talk-group on a DMR repeater? Use the channel selector button to find the talk group. May also need to use the PF2 to get to the correct sub channel. Again, use the Channel Section knob to choose the desired talk-group such as MRYVL M TN-SW.
4. If you would like to monitor all DMR talk-groups on a particular repeater, use the Rocker switch to find the repeater and then select two-slot monitor using the PF3 button.
5. If you hear a talk group and wish to respond, always make sure you have selected this talk-group to TX and insure you are not in two slot monitor mode. To make the change, toggle PF3 button.

Amateur Radio DMR Background Info

A. Digital Mobile Radio (DMR) was developed in Europe as an open standards-based solution to overcrowding of commercial land mobile radio (LMR) bands and has three different tiers.
   1. Tier 1: Radio to radio simplex communications (no repeater)
   2. Tier 2: Radio to radio via repeaters and/or linked repeaters
   3. Tier 3: Radio to radio via repeaters with radios and repeaters under control by a trunking controller. Multiple repeater generally operates at a repeater site.

B. With Tier 2 and Tier 3 operation, DMR can support two time slots (TS) within a 12.5 kHz channel repeater thus two simultaneous voice or one voice and one data path.

C. DMR is further divided by talk-groups (TGs) which are numerically defined within each radio using 6-7 digit-IDs with alpha naming showing up to 12 characters on a display.
   1. Repeaters do not see TG names but only their associated ID numbers.
   2. Each radio has a look up table that matches the number to a name which is displayed.
   3. Each talk-group is assigned a slot, i.e.., 1 or 2 within the radio programming.
   4. If communicating Tier 1 (simplex), then the entire 12.5 kHz channel is occupied.
   5. A repeater than support two times-slots (talk-groups) simultaneously, but only two.
   6. The radio transmitting sends the associated talk-group number followed by voice packets which have been created by AMBE+ analog to digital encoding.
   7. At the receive radio, if the selected talk-group is set, it will decode the associated talk-group number, display the incoming call, decode the audio and then send the analog audio to the speaker.

D. Each repeater has been assigned a unique number plus what is defined as a color code (0-9), thus, to access a repeater it is necessary to program the frequency and its color code.
   1. It is also necessary to know how the time slots are being used. (Parts of Tennessee and Oklahoma are just the opposite of everyone else.)
   2. There are numerous DMR repeaters all over the US and the world and most are interconnected via the internet, as noted in the next section.

E. It is also possible to have multiple repeaters interconnected by a central server allowing transmissions to bring up the selected repeaters on command.
   1. The two most common networks supporting ham radio DMR are Brandmeister and Mototrbo, and these two networks are interconnected with some talk-groups.
   2. Ham DMR repeaters utilize the Internet to interconnect with one of the servers.
   3. The KK4XA repeater in Maryville is supported by the Brandmeister network.
   4. By agreement, TG-9 is only supported locally on its repeater (no Internet).
   5. There are numerous TGs interconnected via the Internet such as TAC 310, TAC 311, TAC312, Worldwide 91, North America 93, etc., though not all.
   6. As an example of non-interconnected talk-group, Maryville TG only exists on the Brandmeister network. One cannot reach Maryville TG if on a Mototrbo repeater.
   7. Talk-groups supported by a repeater operator can be set as always on (static) such as with the KK4XA which has set up two, TN-SW (Tennessee Statewide) and Maryville.
   8. The DMR servers set up the connections between repeaters and tear them down.

F. Another option is to have a hot spot connected directly to the Internet. Then access for an individual radio is not using a local repeater. Busy repeaters are no longer a problem, one just needs internet access with wi-fi. Point to point private calls are then also OK.

LATEST BLOUNT CO ANYTONE CODE PLUG

ZONE	CHANNEL SELECT
MRYVL	SMARC W4OLB, TopWorld, Maryville, KK4XA, MARYVILLE, TN SW, TAC 310-312, WW91, VCAL, UCALL, DMR Simplex, MTEARS, and Weather
MARYVILLE	Maryville, TN-SW, Knox Co, Sevier Co, TG9, CACTUS, PapaSystem RT, Skywarn, Greenville, Fusion Link, AMSAT, STEM, TAC 310-312, CLEAR TGs
MRYVL ST TGs	TN-SW, AL-SW, GA SW, WI-SW, VA-SW, NW AL NET, KY-SW, OH-TAC, WV-SW, IN-SW, OH-SW, TX-SW, HI-SW, Hawaii, Hawaii Co
MRYVL W AREA	WW91, WW ENG 13, NorthAmerica 3, NatWide 3100, DMR INFO NET, HAM NAT NET, LV Hytera Net, TGIF Net, Southeast, STEM, TAC 310-312, AMERICALINK, CLEAR TGs
VHF Repeaters	SMARC W4OLB, TopWorld, Maryville, Bluff Mtn, Walland 7.3, McKinyRidge, Walland 5.33, Cross Mtn, Sharp Ridge, Wind Rock, OakRidge, Monroe Co, Cov Mtn, Cherokee
UHF Repeaters	KK4XA, KC4PDQ, WB4GBI, N4ABV, W4WVJ, W4BBB, KE4FGW, KK4DKW, W4KEV, KD4CWD
SIMPLEX	VCALL 146.520, UCALL 446,000, MTRS 147.420, 446.050, 146.505 DCS, 446.500 DCS, 146.550, 146.580, DMR: 441.000, 443.450, 446.075, 446.500, 145.510 and 145.790
Weather	All seven national weather channels
Sevier Co DMR	TN-SW, TG-9, TAC 310-312, Maryville, Southeast, Knox Co, Greenville, Sevier Co, Nat. Wide 3100, Skywarn, WW ENG TG13, N America 93, Greentop, Gatlinburg
Sharps Ridge	TN-SW, TG9, TAC 310-312, Maryville, Southeast, Knox Co., Greenville, Sevier Co, NW 3100, Skywarn, WW-English, NA TG 3, Greentop, Knox Metro
Beaver Ridge	TN-SW, TG9, TAC 310-312, Maryville, Southeast, Knox Co., Greenville, Sevier Co, NW 3100, Skywarn, WW-English, NA TG 3, Greentop, Knox Metro
Dayton, OH DA1	OH-SW, TAC 310-312, TAC 314, NA TG-3, Nat wide 3100, NA TG-93, TG-9, WW Eng TG-13, WI-SW
Dayton, OH DA2	OH-SW, TAC 310-312, TAC 314, NA TG-3, Nat wide 3100, NA TG-93, TG-9, WW Eng TG-13, WI-SW
Chattanooga	TN-SW, TG9, TAC 310-312, Maryville, Southeast, WW ENG TG13, ECHO, Knox Co, Nat Wide 3100, AL-SW, GA-SW, WI-SW, TRI-State, FL-SW
Orlando	Tri-State, TN-SW, Maryville, FL-SW, TAC 310-312, World Wide 91, WW Eng 13, Disney Net, TG-9
Columbus, GA	TN-SW, TG9, TAC 310-312, Maryville, Southeast, WW ENG TG13, ECHO, Knox Co, Nat Wide 3100, GA-SW, TRI-State, FL-SW, Columbus, Knoxville, ECHO
Dalton, GA	TN-SW, TG9, TAC 310-312, Maryville, Southeast, WW ENG TG13, ECHO, Knox Co, Nat Wide 3100, GA-SW, TRI-State, FL-SW, Columbus, Knoxville, ECHO
Atlanta, GA	TN-SW, TG9, TAC 310-312, Maryville, Southeast, WW ENG TG13, ECHO, Knox Co, Nat Wide 3100, GA-SW, TRI-State, FL-SW, Columbus, Knoxville, ECHO
Univ of Tenn	Maryville, TN-SW, BlindHam, Knox Metro, Knox Co, Clear, ECHO, TAC 310-311, WorldW 91, Worldwide TG13, NorthAmer 93, Local TG-9, Fusion Link, TG31476
Hot Spot 1 446.500	Maryville, TN-SW, TAC 310-311, WorldW 91, NorthAmer 93, Nationwide 3100, NA TG3, TGIF Net, Fusion Link, WI-Fusion, Knox Co, Knoxville
Hot Spot 2 446.526	Maryville, TN-SW, IL-SW, IA-SW, IA CHAT, IA SE 31195, Blind Ham, Knox Co, KnoxMetro, WW-E TG-13, TAC 310-312, NorthAmer 93, NA TG3, WorldW 91

Special Notes:

- The W4OLB conventional FM repeater (146.655 MHz) requires a 100 Hz tone to access. It also transmits a CTCSS tone or 167.9 Hz thus, the analog programming on the Anytone has the choice of with tone only "T" or "CT" if tone squelch is desired.
- AmericaLink TG in the MRYVL W AREA is linked to the Yaesu System Fusion Room AmericaLink.

Now a Little Deeper Drive – The Technology

As stated earlier, DMR is an open standard digital transmission mode developed in Europe and falls under the European Telecommunications Standards Institute (ETSI). The actual signal used in Tier II DMR is a four level FSK (frequency shift key) TDMA (Time Division Multiple Access) constant envelope modulation. Each packet is 30 MS (millisecond duration), 27 MS payload and 2.5 MS gap. Thus, two time slots are able to be placed within a 12.5 kHz transmission path. To make this all work timing is critical.

To get from the analog signal as picked up by the microphone, an AMBE+2 vocoder is utilized which produces the 30 MS signal to be sent. With the two-slot system using 12.5 kHz bandwidth, the FCC defines this as a 6.25 kHz equivalent narrowband solution. The following diagram shows this:
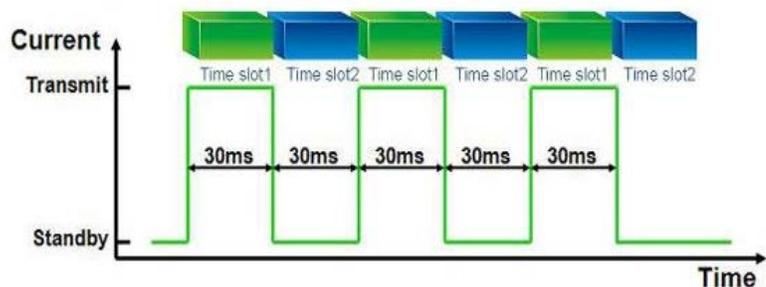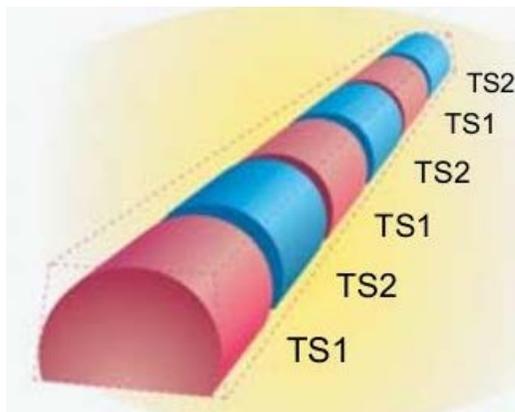
One can see from the above images, the DMR radio, when in transmit is only actually sending out RF less than ½ the time the PTT button is pressed. The other ½ time it is in receive. Thus, great battery life. DMR repeaters only pass the digital signal created from input to output via a reconstruction process but generally does not decode the signal to audio. (The KK4XA repeater also can decode.)

To keep everything in order, timing is critical. The repeater just resends what is hears, just like in analog with one very important difference. The repeater can be connected to the Internet which allows the signals being sent through the repeater also to be sent/received via digital packets to a remote server. This remote server acts as a digital PBX to direct packets between repeaters.

With analog, hams identify a repeater by a frequency and possibly a sub-audible tone. On our radios, we selected a channel which has been programmed with a frequency pair and possibly a tone. The repeater hears this signal, decodes the tone, and responds by retransmitting it. Now with DMR, somewhat the same happens. Each repeater has a frequency pair but to gain access a digital color code (0-9) is needed and in most cases the correct time slot (1 or 2) also assigned. The division of channels on a DMR radio thus consists of a channel name, the frequency pair, the unit ID, the color code (CC) and the ID associated with the desired group. This last item is called the Talk Group.

Every licensed ham must have a unique 7-digit ID number associated with that ham's call to operate on a DMR network. Each repeater has a unique ID number and each talk group a unique ID number. When the PTT button is pressed the radio sends out this sequence of numbers plus the digital voice payload. Receive radios then decodes the unique numbers and converts the voice packets back to analog to the speaker.

Thus, to gain access to a repeater the radio must transmit/receive the correct frequencies, the correct color code (0-15) and the correct time slot (1 or 2) plus your unique ID and the Talk Group (TG) ID. TG IDs vary from 2 to 5 digits. Repeater IDs are 6 digit and individual IDs are 7 digit.

Code Plug - Talk Groups and Zones

The Code Plug is the radio programming and it is developed using software identified as CPS. This is where all of the channel programming, TGs, Zones and ID information is stored in the radio. Prior to loading the Code Plug, the radio is basically a brick and somewhat unusable. For operator convenience, most portable two-way radios organize their channels in groups of 16 within a group called a Zone. Some call this Zone Centric. Most ham radio code plugs, the zones are associated with either a Talk Groups (TG) per channel or an analog channel. Thus, a Zone can have 16 selectable TGs, 16 channels or a combination. Due to way the memory works in the radios, the name of each channel must be unique and that is why there is a letter associated with each repeater such as "M" for Maryville and "S" for Sevier Co.

As a reminder, the radio memory uses a list of up to 16 channels per Zone selectable via the Zone Rocker switch and the Channel Select Knob. Each channel must be programmed with all of the information needed by the radio, including frequency, color code, talk group number, ID, bandwidth and time slot (if DMR) and only one frequency plus tone and bandwidth if analog. In addition, each channel has a spot for a name which can be up to 12 character long. For a particular TG, the first 1-2 characters of the ID is the Zone and then what follows is the TG name such as "M Maryville" or "M TAC 311."

Behind the scenes, in the Code Plug there is a list of all TGs with their specific associated numerical ID which is what is used in the network to connect radios together. Within the network each repeater also has a unique ID which allows for the proper re-direction of traffic between repeaters.

Once the Code Plug is loaded the radio is ready for use and the display become the user interface along with various controls. The display shows the selections:

- Each Talk Group name begins with 1-2 alpha-numeric characters. As an example, M identifies the first group of 16 TGs of the M zone. The "M" stands for Maryville. There are four established zones on the ANYTONE for KK4XA DMR repeater users thus allowing access up to 64 TGs in these four zones.
- Switch to a different talk group (using the channel knob) such as Sevier County, choose M Sevier Co or maybe M NA 93 (North America TG93).
- If in Sevier County, it is also possible to select a different repeater such as S for Sevier or even S Maryville or any other talk group. Possibly S TN-SW (Tennessee Statewide).
- Most TGs also connect to the Internet based servers to enhance interoperability, however TG9 is unique in that it is only local to the repeater. Thus, it is private to the repeater.
- The display also shows the calling station's ID plus possibly their call and name. The call and name are actually coming from a radio internal database of contacts using the DMR ID.

Remember, all of the information that shows up on the display is actually coming from the Code Plug and everything going on in the network is digital addressing and packetized voice. When you see someone's call information, that is coming from the radio's contact database.

Static vs. Dynamic TGs

Repeater operators typically have assigned a couple of TGs as static with the remaining TGs being dynamic. So, what does this mean? With a static TG, if anyone talks on this TG it will be repeated locally and sent out via the Internet to any other repeaters or hot spots where this TG is active. The normal convention is for local traffic to use TS2 while TS1 is used for dynamic TGs.

The way Brandmeister and DMR-MARC use TGs are different with DMR-MARC specifying which TGs can be used on which Time Slots.

If the desired TG is dynamic, then the process is a little different. A user calls up a TG such as TAC 311 and assuming the repeater is not in use at the time, this TG is given a 15-minute window for it to be active before it drops. On another repeater, a different ham also calls up and transmits on TAC 311. In the background over the network, the two repeaters are now interconnected and the QSO can start. About 15 minutes after the QSO ends, the repeaters go back to supporting the defined static TGs.

In each state many times the particular defined state-wide TG is assigned a certain time spot as static. If anyone elects to talk on this TG, every non-busy repeater where it is static will transmit this TG. Most TG are not assigned static and as such a local user must bring up a selected TG for it to become active on a repeater or hot spot, i.e., a dynamic TG. Once active it will typically stay active up to 15 minutes after the last transmission. Thus, if two hams want to meet say on TAC 310 at a scheduled time, they must each bring up TAC 310 on their local repeater and begin to converse.

For the KK4XA repeater, there are only two static TGs: **M Maryville and M TN-SW**.

Talk-listen Operation

So, you elect to place a DMR call after you hear someone on a particular TG. Select that TG with the rocker switch and channel selector plus turn off the monitor function (PF3). Now key and listen for an opportunity to jump in. Make your announcement, including your call and the TG name, then wait.

The repeater decodes these various numbers associated with the channel (TG & TS), it knows what to do with the signal such as send it to its output and possibly out to other repeaters via its Internet connection. If the ham wants to talk on multiple TGs, then each channel of the radio must be properly programmed and this program, just as with analog, it is called a code plug (or configuration file). Multiple hams can all access the TG for a multi-way conversation that could be on all supporting repeaters. The repeater itself is somewhat of a dumb device as the Brandmeister server is doing the redirecting of packets via the Internet.

DMR Networks

There are primarily three ham DMR networks: DMR-MARC, DMRplus and Brandmeister. The most open network is Brandmeister supporting both repeaters and hot spots. Some of the talk groups are interconnected between these networks.

In addition, there are TGs interconnected with D-Star, P25 and Fusion. All of these interconnects are via the Internet. Here in Blount County, SMARC has interconnected the W4OLB repeater and the KK4XA DMR Maryville TG. Thus, anyone using either will have their audio heard on both, defined as multicast. Thus if desired to reach the W4OLB repeater while outside the area, use DMR Maryville TG.

DMR Etiquette

Just as with any other shared network or repeater, every user needs to be courteous. When getting on a specific TG, always listen a bit before talking to make sure the resource is not in use by someone else. Then, when you are ready place your call and include the name of the TG you are using so persons hearing your call out know which TG to respond on.

Also, remember there are longer delays (latency) at times for these interconnections, so leave enough time between transmissions for the answer you are looking for. In addition, keep in mind this is a public channel that may reach hundreds of end points simultaneously such as TN-SW TG.

So, listen to see if anyone is using any of these TGs on the KK4XA repeater, turn on the PF3 two slot button and your radio will be in the monitor mode. If you wish to join the call, turn off the monitor mode and set your radio to the TG being used by use the rocker button and the channel knob and then announce yourself using the PTT. Remember TGs (channels) are grouped into Zones on the radio with up to 16 channels per zone. The TG you are looking for may be in a different Zone.

Different Repeaters or Group of Talk Groups/Channels

Typically, the code plug of the radios programmed to operate on repeaters are set up to allow users to access multiple talk groups. Specifically, look for the ZONE designator and each talk-group (Channel) that begins with a M for Maryville or M - TN-SW or M – TG9. The alpha-numeric before each identifier of a channel is a short cut to the particular DMR repeater choice. It is used ahead of the identifier for each DMR TG. For analog channels, there are no TGs, thus the Zones are identified as VHF, UHF, simplex, etc. with the 16 channels being various repeaters.

Use of the ZONE UP/DOWN ROCKER SWITCH

The Anytone code plug in your Anytone has many DMR repeaters programmed for use. Use the Zone up /down button to find the one desired. Programmed repeaters are as follows but note there are four zones for the KK4XA (Maryville) and a total of 27 selectable ZONES. After selecting the ZONE, the use the CHANNEL selector knob to select the desired DMR talk-group.

DMR Repeaters (Zones)	Analog Channels/Repeaters Zones
1. M Maryville (KK4XA) Four Zones: MRYVL LOCAL, MARYVILLE DMR, MRYVLE STATE TGS, & MRYVLE WIDE AREA 2. S Sevier Co, TN 3. Knoxville Area: Sharps Ridge, and Beaver Ridge 4. DA1-DA2 Dayton, OH 5. CH Chattanooga, TN 6. OR Orlando, FL 7. CG Columbia, GA 8. DAL Dalton, GA 9. A1 Atlanta, GA 10. HS1 Hot Spot 446.500 11. HS2 Hot Spot 446.526	A. VHF Local Repeaters, total of 16 B. UHF Local Repeaters, total of 10 C. Simplex Channels, mix of VHF, UHF and DMR D. NOAA Weather, 5 Channels E. VHF Repeaters Group 1, total of 16 repeaters in a 45 mile radius F. VHF Repeaters Group 2, total of 16 repeaters in a 45 mile radius G. MTEARS 1 UHF Repeaters, total of 16 as located throughout TN H. MTears 2 UHF Repeaters, total of 14 as located throughout TN (Maryville area #47) I. FRS Group 1 (1-7, 14-22) J. FRS Group 2 (8-13)

Local KK4XA DMR Repeater and the Anytone HTs

The KK4XA repeater is a 50W Hytera co-located with the SMARC W4OLB VHF analog repeater. The DMR repeater operates on UHF and is part of the Brandmeister amateur radio DMR network. It is hybrid, in that it also supports analog repeating when not being used for DMR.

The KK4XA repeater, when using a portable, has a rough outdoor coverage of the Maryville area as shown by the light green.
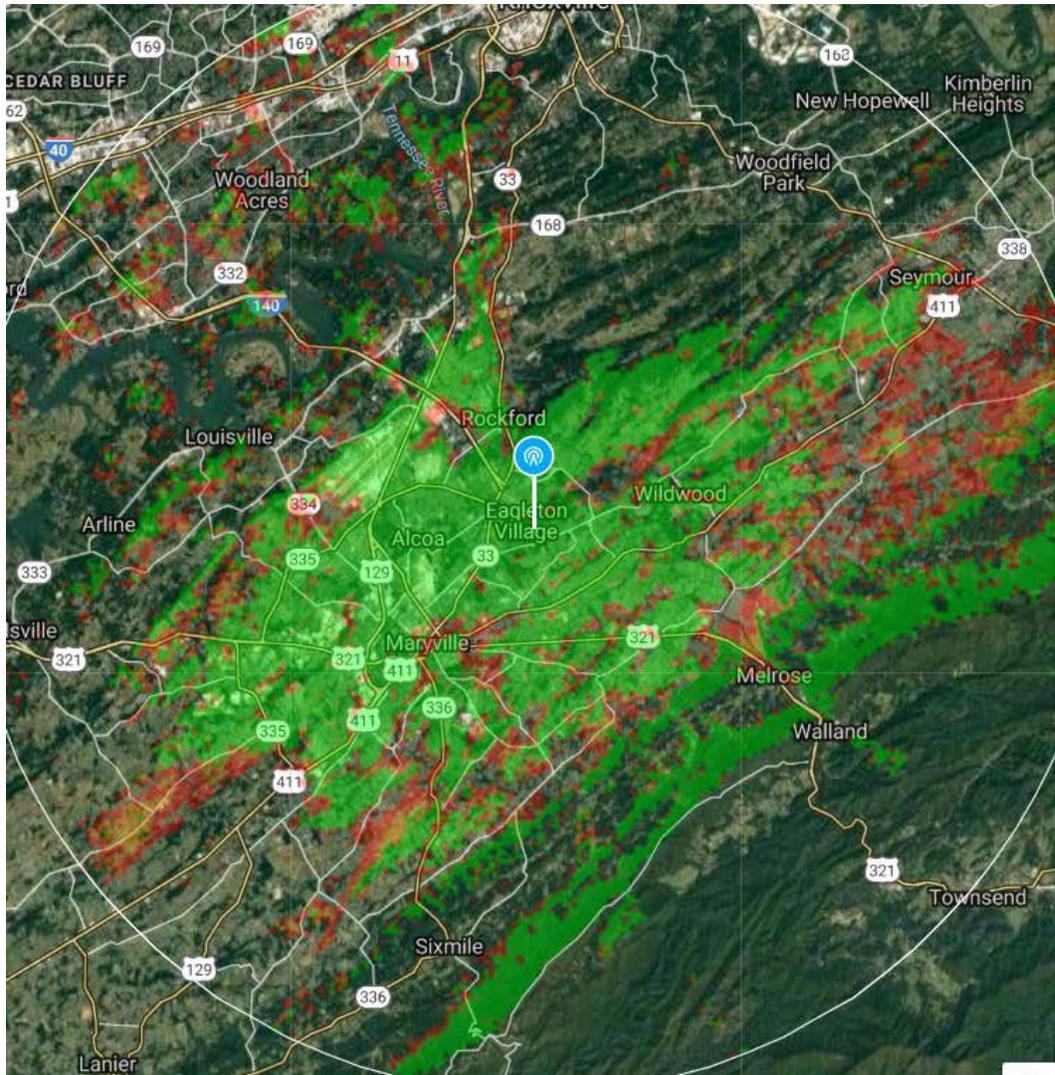
The red area should also have limited indoor light building coverage.

UHF Digital Expanded Coverage

Due to fact it is UHF, in-building penetration is quite good and with a mobile antenna even extends further. In addition, because DMR is digital, the coverage is better than that of analog. See the greyed area in the diagram on the next page for the normal improvement over analog. For analog, this area would be lots of noise with some discernable signal. Inside a vehicle in Blount Co using a portable, the DMR seems to work better than the W4OLB in most areas. Remember, these two repeaters are linked.
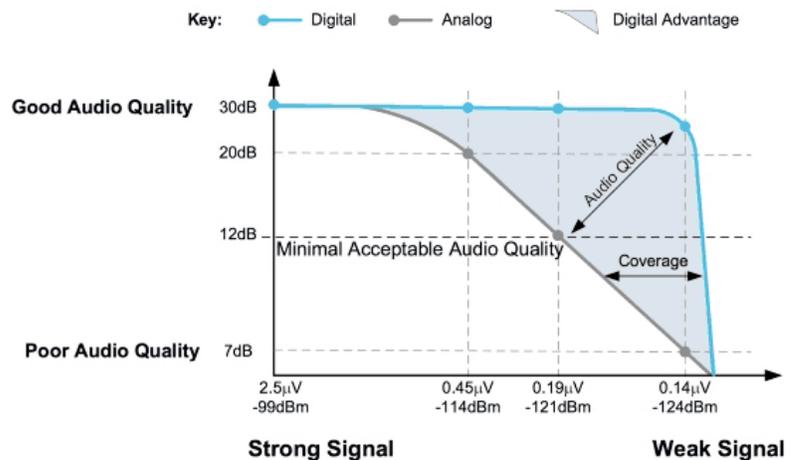
Getting Even Deeper into DMR

Theory of DMR Operation

DMR is a form of Time Domain Multiple Access (TDMA) with two time slots on one RF channel. Take a look at what is happening with a PTT of the radio. A 264-bit burst of data is created to be transmitted consisting of a 108-bit payload, followed by 48 bits of sync/signaling and ending with another 108- bit payload. The payload bursts are made up of 20 ms vocoder frames carrying 72-bit frames of data which include forward error correction (FEC). This is the entire transmitted frame data representing the signaling and the voice for only the selected time slot. Every 360 ms another sync signal is sent to maintain radio/repeater synchronization.

From the repeater, both time slots are sent to the radio and its digital frame is 60 ms. Each time slot carries its payload and sync/embedded signaling which makes up the frame. There is 2.5 ms between each of these bursts that contain frame numbering and channel access indicators. The radio needs the sync information to assure its proper decoding takes place.

One must understand that during a transmit cycle the radio is not constantly sending RF but actually does a quick TX/RX to maintain necessary synchronization. The repeater transmits and receives simultaneously thus it is constantly maintaining synchronization with each radio. Each burst of sync defines the TG and TS number.

The repeater also controls when a radio can transmit as if the selected TS is busy when the PTT button is pressed on the radio, that particular burst on that timeslot will not be allowed to interfere with another transmission on the same repeater (Polite). If however the repeater is connected to another repeater, it is likely there will be a collision of packets and one transmission will loose out and be lost in the TCP/IP ether (Impolite). There are back-off timing of retransmission constantly occurring, thus more latency. Pages 41-43 of the standard (see URL below) shows diagrams of how the sync timing works.
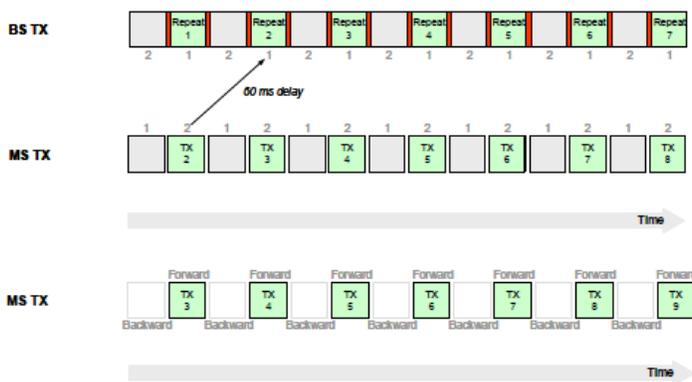
To the left you can see why there is a 30 -60 ms delay through a repeater (BS) as the signal is received, buffered and then re-transmitted. The delay amount is whether the repeater uses aligned or offset method. The short red vertical lines indicate sync/timing and other data used to maintain the connection.

To the left shows a radio operating in the Tier 1 direct radio to radio mode. The signaling is established radio to radio and only one time slot is used.

If you are interested in delving deeper into the technology of how DMR work, please see the link below and note the diagrams above are from ETSI the standard which is available for download.

https://www.etsi.org/deliver/etsi_ts/102300_102399/10236101/01.04.05_60/ts_10236101v010405p.pdf

Reprogramming the AT-868, AT-878 or AT-578 Radios

The following is the method that seems to work all the time:

NOTE: This operation allows the transfer of code plugs between different model and versions of radios. Though, remember the AT-578 is a triband radio and the other two are dual band thus adjustment will be needed to the code plugs (step 10).

1. Open the CPS programming software and open the desired code plug or read the radio code plug from the radio you are trying to clone.
2. Go to the tab [Tool], then [Export] and look at the top of the window that opens. Look for the [Export All] at the top of the screen and click it.
3. Give your export a name and then click [Save]. This will export all your frequencies, contacts, zones, etc. to xxx.csv files to the folder you select. WARNING: This could take a few minutes. Just wait until an Export Complete! message is shown. If you get impatient and try it again you may get a not responding message. Just wait for the action to complete.
4. Be aware some radio settings do not export and will require manual action in the CPS Optional Settings area. Highly suggest either taking screen shot of these pages, taking photos or writing down the settings, or take screen shots for future reference.
5. Connected the radio you are trying to program to the computer with the programming cable and using the CPS programming software, read from the radio. Note this is the code plug in this radio.
6. Use the menu [Tool] and [Import] to look at the top of the window that opens. Use the [Import from File List] button. Click it. Just wait for the action to complete.
7. Find the file you saved / exported in step 3 and click [Open]. This will import all your frequencies, contacts, zones etc. to xxx.csv files. Again, wait until the Import Complete! message is shown.
8. Go to the [Optional Setting] and verify restore all your settings as they were before, referring to your notes, screenshots or photos from step 4.
9. Go to the [Digital Settings] tab and insert/verify your call and DMR ID
10. If you wish to add or make any changes to the code plug, do that now. Remember adding new Talk Groups and/or Channels is only the first step and it is also necessary to add to or create a Zone to be able to access the new or modified channels.
11. Save your newly rebuilt code plug with a new name, possibly including the date.
12. Write the new fully rebuilt code plug to the radio.

The information contained in this white paper has been assembled for Smoky Mountain Amateur Radio Club ham operators who primarily use the KK4XA repeater located in Maryville, TN and been pulled together by Dave Kaun, N9KMY. Routine upgrades are being developed to the code plug and to the repeater which make this a dynamic document. Dated 10-12-2020.

Dave Kaun, N9KMY   N9KMY@ARRL.NET