South Dakota
Radio System Communications
Train the Trainer Course

2012

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1. Introductions of trainers, facilities (bathroom, etc.)
2. It is the design of this course to take approximately 2-3 hours for the lecture portion with another 2-3 hours for the hands-on practical. In addition to the information provided during this session, it is our goal to familiarize each of you with radios in use across the state. Radios may be configured differently from site to site, but we will attempt to give you the background to work with agencies and help familiarize them with their equipment.
3. We will try to limit the user training to approximately one hour lecture and a process to work each user through their radios.
4. These materials will be provided to each trainer on a flashdrive.

Overview

South Dakota Interoperable Communications System Train the Trainer Course

INTENT
1. To provide a fundamental understanding of the South Dakota Interoperable Communications System.
2. To provide a higher level of technical instruction than that provided for the basic radio operator.
3. To provide a subset of this course material as a training plan for users.
4. To provide practical hands-on training with relevant communications equipment

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1. Set expectation for course. No intent to make trainers a technician, but as a training resource will need a knowledge base above what we would expect for the user training.
2. Course is primarily geared towards the statewide interoperable radio system, which is the defined standard for interoperability in the state.
3. We have narrowed the scope of this material for the user training that you will be conducting. Hopefully this material will help fill in the blanks if you have questions during your training session.
4. Our hands-on will be in more of a lab setting, but will expect that your user training be conducted on agency radios.

I. Introduction

1940's

Motorola P.8022 Control Head, Circa 1945. Used on all early FMTR. Equipment through 1950.

2012

Dating back to the 1940's the state has had a communications system based upon lowband technology (39mhz). The characteristics of lowband provide for excellent range, but lowband is very susceptible to outside interference. In the 1960's and 1970's, local governments began the migration to other spectrum such as VHF-Highband (150 MHz), UHF (450 MHz). These various bands of spectrum allow for repeater use, extending the car-to-car range, and are much less prone to outside interference. However this created an "interoperability challenge", which made it difficult to communicate between systems without maintaining multiple radios.

The state began the process of upgrading its infrastructure in 1999 to a system would be available to all levels of government. After a review process, a digital trunked radio system operating on VHF-Highband was selected, and in October of 2002 a system of 35 tower sites was turned up. The current system consists of 54 tower sites across the state networked to a controller located in Pierre that cover approximately 98% of the state geography with a mobile radio.

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South Dakota public safety communications dates back to the 1940’s. Early radios were primarily on the old low-band frequencies because many of the technical developments that allowed communications on higher frequencies were not practical to manufacture at the time.

South Dakota operated on low-band as the primary public safety communications until 2002 when we constructed the new digital system. As the technology changed and matured, many of our first responder communities converted to higher frequency bands that allowed use of repeaters to extend area of operation. As users made this transition, interoperability became an issue and many vehicles were equipped with 2 and even 3 different frequency radios.

Starting in 1999 through today, the state installed and has been upgrading a statewide system that allows communications to and from anywhere in the state. There are currently over 20,000 radio ID’s issued on the system to state, local, tribal, and federal users with over 2,000,000 calls per month flowing over the network.

II. Glossary of Terms

Affiliate -- Radios on the trunked system will send a signal with radio ID and the talkgroup selected to the central controller in Pierre. This occurs when the radio is turned on, when a new talk group is selected, or when the radio selects a new site by checking RSSI levels of tower sites.

Alert Tones:

- Busy tone similar to phone busy signal. This tone is heard when a user attempts to transmit a message on a trunked talkgroup when all frequencies are in use.
- 4 short beeps received after a busy tone. Automatic Callback – A frequency is now available for you to transmit. Press PTT and begin the transmission.
- 4 beeps every six seconds. Call Alert has been received by the radio.
- 1 beep followed by 5 beeps. The Emergency button has been pressed and was acknowledged by the system.
- 3 short rapid beeps when the "PTT" is pressed. **Talk permit tone** – The user must wait for these tones before talking on a trunked talkgroup.
- A continuous tone when pressing the PTT. **Talk prohibit** – Occurs when pressing PTT and radio is out of range of the trunked system or system is out of service.
- A continuous tone. Time out timer – This continuous tone indicates your transmission is approaching 60 seconds, and will be discontinued at the 60-second point.
- Momentary higher pitched tone. **Valid key chirp** – This tone confirms that you have selected a valid, programmed button.
- A low pitched tone every 10 seconds. **Failsoft** – Trunked system failure where multiple agencies share a conventional channel.
- Momentary lower pitched tone. **Invalid Chirp** – Indicates that you have selected an un-programmed function.
- High pitched chirp. Low battery - Portable radio's battery needs charging.

Alias -- An identifier that is displayed on dispatch's screen when a radio is transmitting on a talkgroup that is being monitored. The Alias corresponds with a specified subscriber ID.

Analog Signals -- Analog radio systems continuously transmit radio waves that are usually modulated by a voice. A typical analog voice radio consists of a transmitter and receiver.

BKLHT -- Backlight button, illuminates display.

Central Controller -- The network management equipment that directs all activities of the radio system.

Channel -- Conventional (analog) frequency programmed into a particular location (channel) in a radio.

Control Channel -- Dedicated channel on each tower site that passes information between the radio and the controller in Pierre.

Digital Signals -- A combination of zeros and ones that are transmitted. These signals must be converted by digital radios (computers) into sound that can be heard and understood.

DOT -- Department of Transportation.

Duplex Repeater -- A repeater system that uses different transmit and receive frequencies.

Frequency - Frequency is defined as the number of cycles that occur each second. Thousands of radio wave cycles usually repeat themselves each second, so engineers have adopted the practice of writing kilohertz (shortened to KHz), which means 1,000 cycles per second, megahertz (MHz), which means 1 million cycles per second, or gigahertz (GHz), which means 1 billion cycles per second, when they refer to radio frequency. Thus, 10 million cycles per second can also be written as 10 MHz. The South Dakota system is in the 150MHz range (VHF).

HP—Highway Patrol.

MON—Monitor button allows the radio to receive analog signals without protection tones.

Out of range - Indication of no service available to radio. You will hear a long tone at regular intervals.

Project 25 – A non-proprietary standard for public safety radio communications. This allows manufacturers to build equipment that is compatible.

Queue - Circumstance where user keys up on a site that is fully utilized. As all resources are in use, radio system puts the user in a "queue", or waiting line for the first open resource. User will first hear the "busy" signal followed by a chirp when a resource is available to transmit on. If system is extremely busy, each additional keying of the push-to-talk button will reset the user to the bottom of the queue.

RF - Radio frequency.

Roaming - The ability of a radio on a trunked radio system to move from site to site without any interaction by the user.

RSSI—Radio Signal Strength Indication.

RWS—Radio Wide Scan. Only scan in EF Johnson radios that can scan both analog and digital.

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This section has been added to serve as a reference for you.

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SCAN—Allows radios to search programmed channels/talkgroups for activity.

SDPSCC – South Dakota Public Safety Communications Council (PSCC).

Simplex - Non-trunked radio channel that uses the same frequency for receive and transmit.

Site busy - Indication that no repeater resources are available at the tower the radio is affiliated at. Accompanied by short repeated tones, much like telephone busy signal.

Site lock - Optional button that allows user to "lock" radio on a particular site, this prevents the radio from roaming.

Site Trunking - Indication that site connectivity to network central controller has been lost. Radio will be operational only in the coverage area of the tower affiliated on.

SRC - State Radio Communications, State 24hr dispatch: Huron, Pierre, Rapid City.

Subscriber ID - Number that system uses to identify individual radios on a trunked system. No two radios should use the same subscriber ID number.

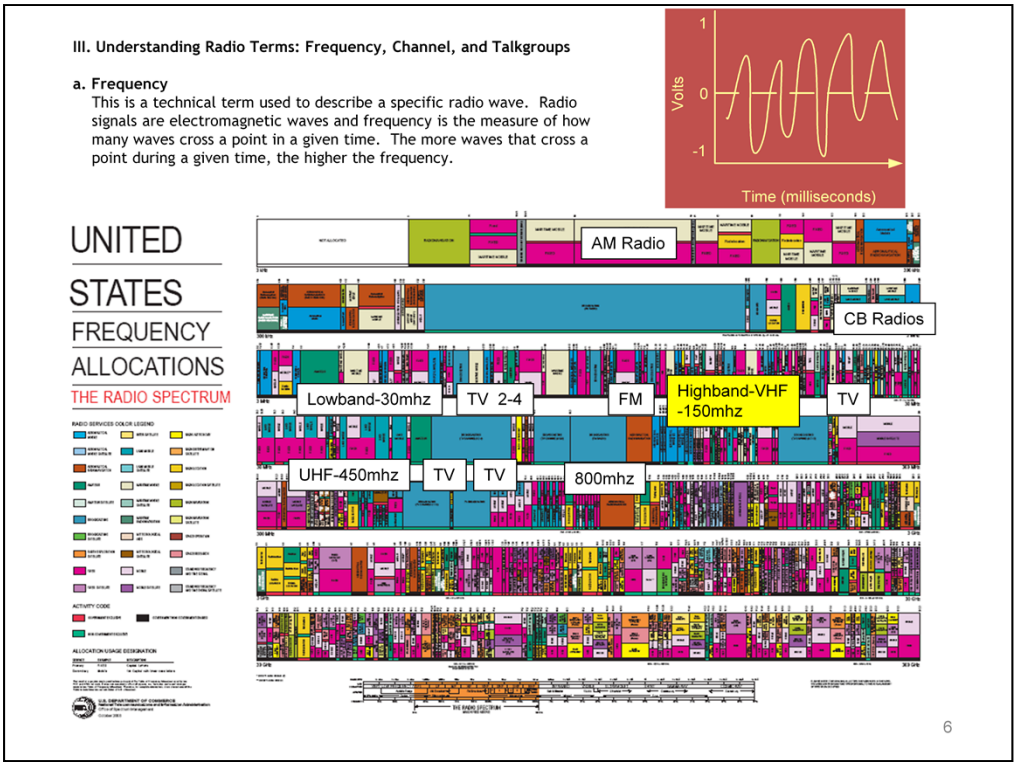
System Administrator - State of South employee responsible for the day to day operations and management of the radio network.

Talkgroup - An electronic grouping of users. Talkgroups are an electronic sectoring of users, allowing private communications for a group of radios users. This may be referred to as the conventional system equivalent of a channel.

Talk group busy - Circumstance where user keys up on a talkgroup that is already in use. Indication on EF Johnson radio is "feature disable".

Trunked - Trunking permits a large number of users to share a relatively small number of communication paths or trunks. This sharing of communication paths is managed automatically by a computer. Channel selections and other decisions normally handled by the radio user are made by a computerized switch in the central controller. Thus, the user needs only to pick up the radio and talk, just as one does an ordinary telephone. Channel assignment is automatic and completely transparent to the individual user.

Zone - A grouping of channels/talkgroups for ease of use or radio configuration. A zone in EF Johnson radios consists of up to 16 channels/talkgroups, each radio has 16 zones. Motorola radios have flexible zones and can range from 1 channel up to the full channel capacity of the radio.



This is where we begin to get into the fun part of things. Frequencies and how they operate are part of the “magic” behind the way that all radios communicate. The reason we go into this is to give you a reference of the spectrum we operate on in relation to other technologies.

The VHF spectrum is the “middle” set of 2-way radio frequencies between lowband and the 700/800 spectrum in use by cell phones and many local and wide-area radio systems.

VHF is a compromise of coverage and operation. VHF by its nature covers a larger area with fewer towers, important for rural radio systems. Operationally, the spectrum is less prone to outside interference than lowband, but is more susceptible than those in the higher frequency bands. South Dakota covers approximately 98% of the geography of the state with 54 sites, a similar system on 800MHz would take 3-4 times that many towers.

Each of these “blocks” of spectrum is broken into smaller parts or “channels”. The channels are the individual frequencies that are programmed into radios and correspond with a position on the channel selector. The channels are also specific to the tower sites on the digital radio system and how they communicate “behind the scene” to the radios.

b. Channel

Channel is a term used to describe a position on your radio selector. For example National Law is a channel label that points the radio to a specific "frequency" of 155.475MHz. We cover this terminology because the statewide interoperable system uses a different term to describe the "labels" on the radios. You will NOT get the chirp (talk permit) on a conventional channel.

c. Talkgroup

A talkgroup is a "label" used to describe a route for communications on a trunked radios system, the technology that the statewide interoperable uses. Talkgroups do not correspond to any particular frequency, but to a path through the radio network to the other users operating on that talkgroup. You WILL get the chirp (talk permit) on a talkgroup.

d. Differences

It is important to understand the differences as your radio will operate differently when you have a traditional channel selected and when you have a talkgroup selected. "Channels" are area-specific, where "talkgroups" can be used statewide. There are also issues if you try to scan both, which may result in loss of part of communications on one or both.

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We will now jump into some of the basic terminology and why it is important to understand the differences in some of the old and new terms. We don't ever expect to fully change how users refer to the programmed stops on their radios, but if we can provide a basic understanding of how the old and new systems are different, it might help make the radios easier to understand.

A channel is a familiar term, and is an industry standard for each programmed position on a radio selector knob or switch. Historically, a "channel" referred to a particular frequency that the radio was programmed with on that position. A local repeater or talk-around are examples of channels and are local only.

A talkgroup is a term used to describe a position or "channel" on a radio selector knob or switch for the statewide radio system. A talkgroup is a "path" through the network to other radios operating on the same talkgroup anywhere in the state.

A channel is local only, a talkgroup is statewide. A channel will not get the chirp a talkgroup will. It is important to understand the difference in how the two operate as most radios are programmed with both. Switching from one to the other completely changes how your radio functions.

IV. Radio Systems

a. Simplex (Non-Repeated) Channel Usage

The general purpose of a simplex (non-repeated or car-to-car) is to provide communications over a shorter distance direct handheld to handheld, mobile-to-mobile, or handheld-mobile communications. Generally the transmit distance is less than 2 miles, but maybe longer or shorter depending on terrain and other conditions. The radio signal generally does not go through any repeater or network system, and The transmit and receive frequency are the same.

These channels are generally used as on scene operations to provide direct communications between radio users such as fire ground.

b. Duplex (Repeated) Channel Usage

The general purpose of a duplex (repeated) system is to provide communications over a longer distance. The radio signal generally goes through a repeater or network system on a fixed repeater frequency pair. The transmit distance maybe extended, as much as 30 miles or more, but can be affected by terrain and other conditions. This type of system is used in most stand-alone city or county-wide radio systems.

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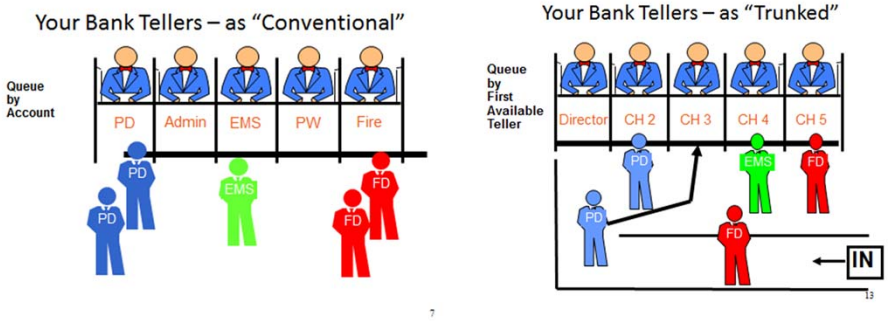
Now that we have discussed the positions on your radio, lets look at the modes or systems your radio radios operate on:

Simplex. Also known as talk-around, radio to radio, brick to brick. This is a mode in which your radio communicates with another radio directly, with no infrastructure between. This mode is usually communicated over a single frequency. Examples might be fire-ground or National Law. Range is typically limited to a few blocks to 10-15 miles depending upon location.

Duplex or “repeated” systems. Duplex systems utilize a “repeater” that extends the coverage of a radio to a wider geographic area. This type of system is typical in most city or county systems that are self-maintained. These systems utilize a different receive and transmit frequency so that the “repeater” can send traffic at the same time it is receiving it. This type of system can extend the range of a radio out 30 miles or more.

c. Trunked Radio Systems

Trunked radio systems were developed to protect the limited amount of spectrum available in the radio bands by making more efficient use of those resources. Below there are two diagrams, one illustrating a conventional system, the other showing the premise behind a trunked radio system.



Trunked radio systems require fewer system resources to service a larger number of users by using a selective process to assign an open shared resource rather than dedicating a "channel" to a particular group.

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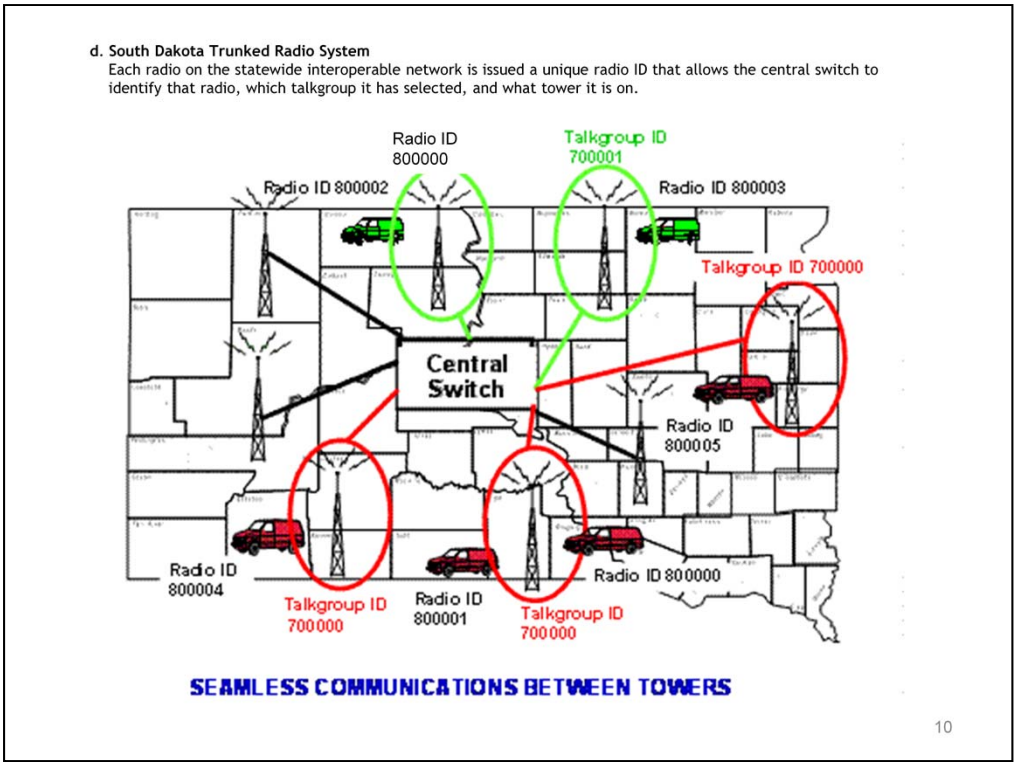
Trunked radio systems can be thought of as a duplex or repeater system on steroids. Instead of a stand-alone repeater that covers a city or county, trunked systems "network" repeaters to create a much larger communications system.

Another important distinction is that trunked radios no longer rely on a particular frequency to communicate with another user. Intelligence is programmed into the radios, the sites, and the network to set up "paths" through the network to other radios operating on that "talkgroup". This allows for a far more efficient system in which the site resources can be shared by everyone, This eliminates the need for separate hardware and frequency resources to be dedicated to each group of users.

Each time a user keys his mic to talk, the radio works with the network and sites that have users dialed into that talkgroup to assign repeaters to that conversation. When that communication is concluded, the repeater is placed back into the "pool" for assignment to someone else.

This is the technology that the statewide system uses.



A level deeper on the trunked radio operation.

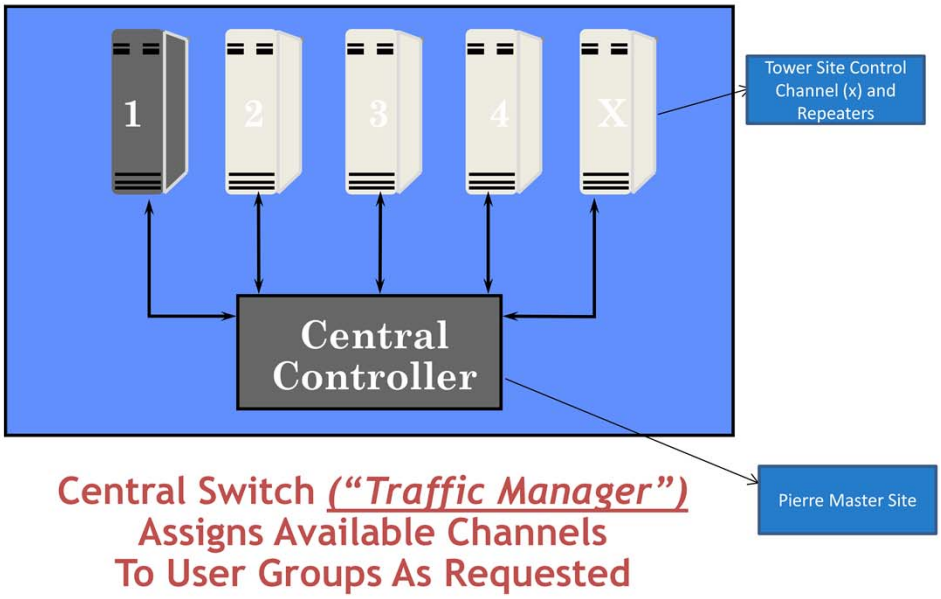
On trunked radio systems, each radio, and each digital talkgroup is assigned a unique ID. These ID's allow the central switch to "direct" calls from one site to another.

Each site has what is called a "control channel" repeater. When the radio user is turned to a digital talkgroup, the radio is operating in "trunked" mode and their radio is in constant communication with the tower and central controller through this control channel. The control channel monitors the talkgroup selected and relays that to the central controller. Any traffic on that talkgroup will be routed to that radio from anywhere in the state.

The trunked radio itself monitors the signal strength from the control channel from the site it is registered on, and all other sites it can see. When the registered site level drops too low, the radio will automatically switch to another site, and the process continues.

When the radio is not operating on a digital trunked talkgroup, the system does not see the radio, and traffic will not be routed to that radio over the system.

Trunking at the tower level



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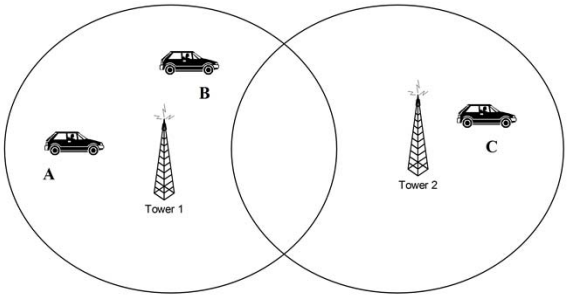
This is one more way of looking at the process from the site perspective. The site repeaters sit idle until an assignment is sent to communicate on a particular talkgroup.

e. Scanning on a Trunked System

Scanning is one of the most confusing aspects about trunked radio operation, especially for those that are accustomed to conventional radio where if you could receive the channel, you could hear it.

Trunked radio operation is all about efficiency, and traffic is only sent to towers with a particular talkgroup operational on that tower. Where this becomes confusing, and sometimes problematic is when we have overlap coverage from towers. One vehicle could be next to another, be registered on different towers, and if they are not on the same talkgroup, they will not be able to hear each other.

In the following diagram, units with talkgroups A and B are registered on tower 1, a unit with talkgroup C is registered on tower 2. If A and B have each others talkgroups in their radios they can scan and listen to each other, they will not be able to monitor unit C. C will not be able to monitor A or B unless talkgroup A or B is selected. If any of the cars drive into the overlap area, they could register with either tower, which could potentially change who can monitor them.



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Now its time to try to tie the information from the previous few slide to one of the more misunderstood aspects of the digital trunked network, scanning.

In conventional systems, your radio is simply listening out in open space for any frequency that has been programmed into the radio. If it can hear the frequency, you can hear the traffic.

On trunked systems, because the system is trying to efficiently use the resources connected to it, it will only send traffic to sites that have a particular talkgroup selected. If the system did not operate this way, calls would be sent to every tower for every conversation and system would be overwhelmed.

Normally the trunked radio scan works as desired, but can potentially be an issue when radios are operating in an area of overlap from two or more sites. In an overlap area two cars on different talkgroups could be sitting side by side, each on a different tower, and never hear each other. It is important to understand that this is the normal operating process for the system, and if different units need to work together, they should consider using common or regional talkgroups to communicate. If they are on the same talkgroup, they should always hear each other.

f. Sounds Associated With a Trunked Radio System.

The sounds associated with your radio are very important. These help you to recognize what is happening with your radio, and also when you are experiencing problems with the radio or system.

There are three radio sounds to be familiar with:

- The "Chirp" you get when you push the transmit button lets you know it is OK to talk. You need to wait for this sound before talking.

- The "long bong" give you an indication of either being out of range, or someone else is active on your talkgroup. Let go of transmit button, radio will give you the "chirp" when it is OK to transmit. If no response is heard within 10 seconds try again. This sound is not a system busy.

- The "beep, beep, beep" similar to a telephone busy is an indication that the site is being fully used and no repeaters are available. Let go of transmit button, radio will give you the "chirp" when it is OK to transmit. Do not continue to push the transmit button, as this will delay further your access to the system. If no response is heard within 10 seconds try again.

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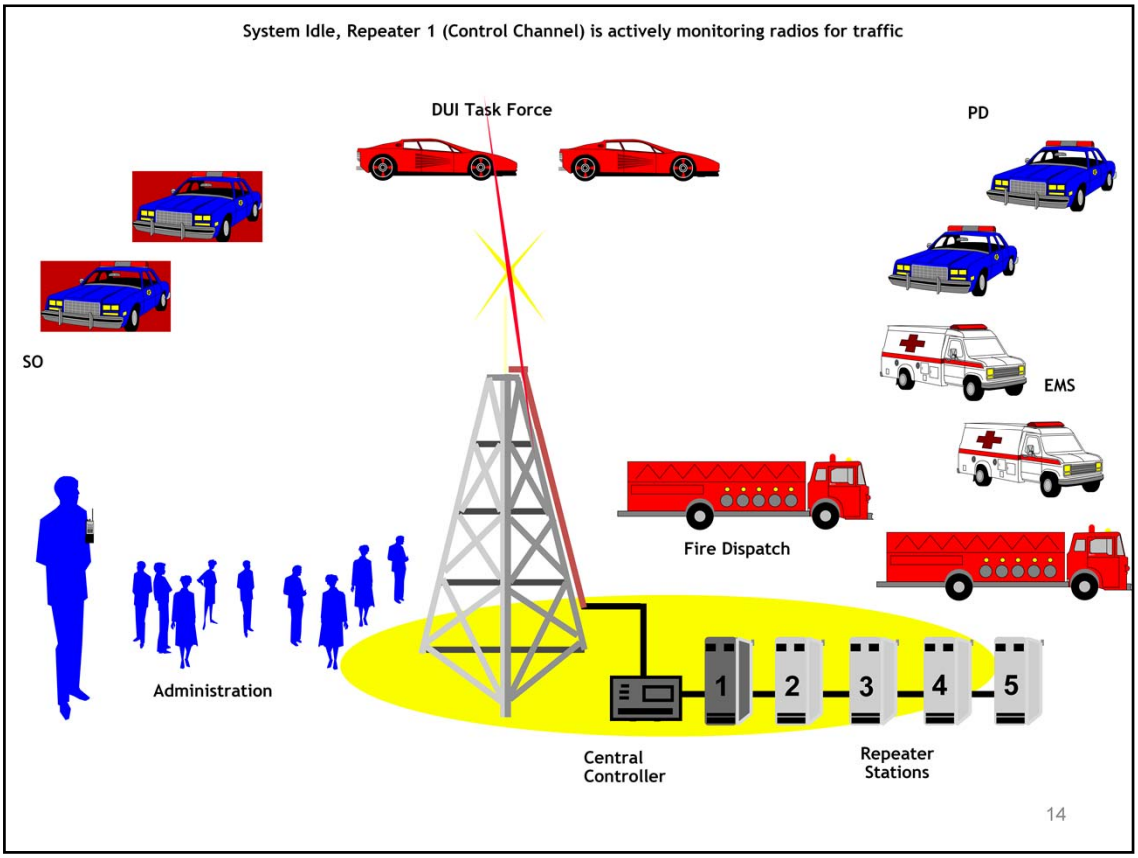
Before we get into an example of how a working trunked system operates, here are some system sounds every user should be familiar with.

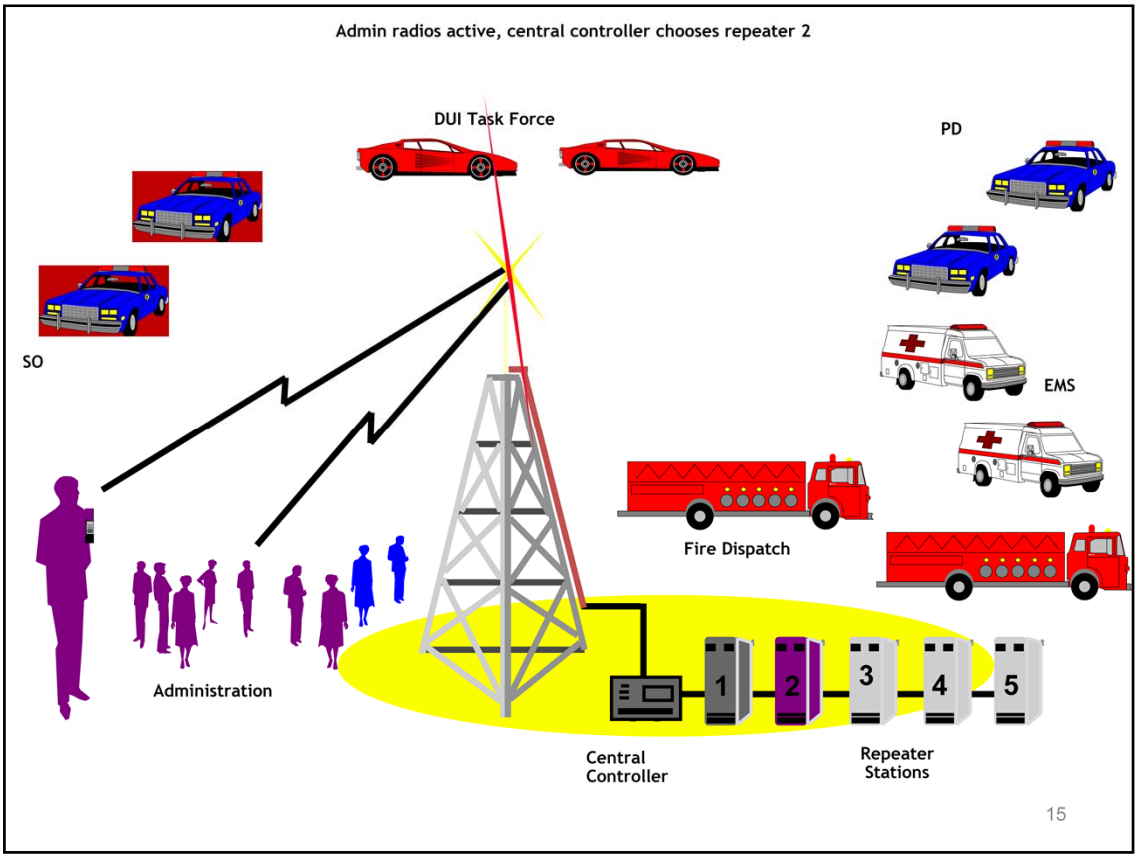
The “chirp” is an indication that the radio is ready for the user to begin talking. The chirp is typically a 300 millisecond delay, but if a user begins talking before the indication, parts of words or entire words may be cut off.

One common misconception is that a long “bong” is a busy indication. This actually indicates that for whatever reason that the radio is unable to communicate with a tower.

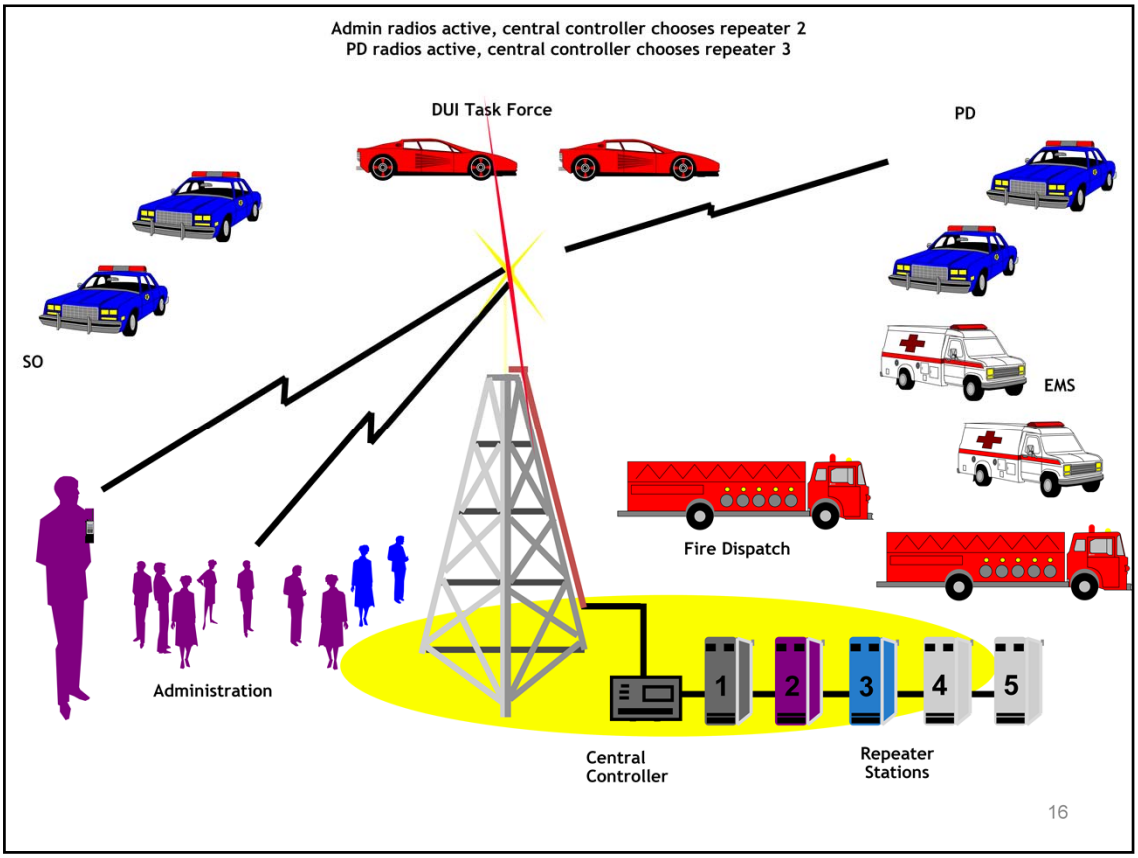
The fast beep is similar to the sound from a busy call on a telephone. This sound is typically only encountered in an emergency or situation where a large number of calls are being generated by a large number of talkgroups at the same time.



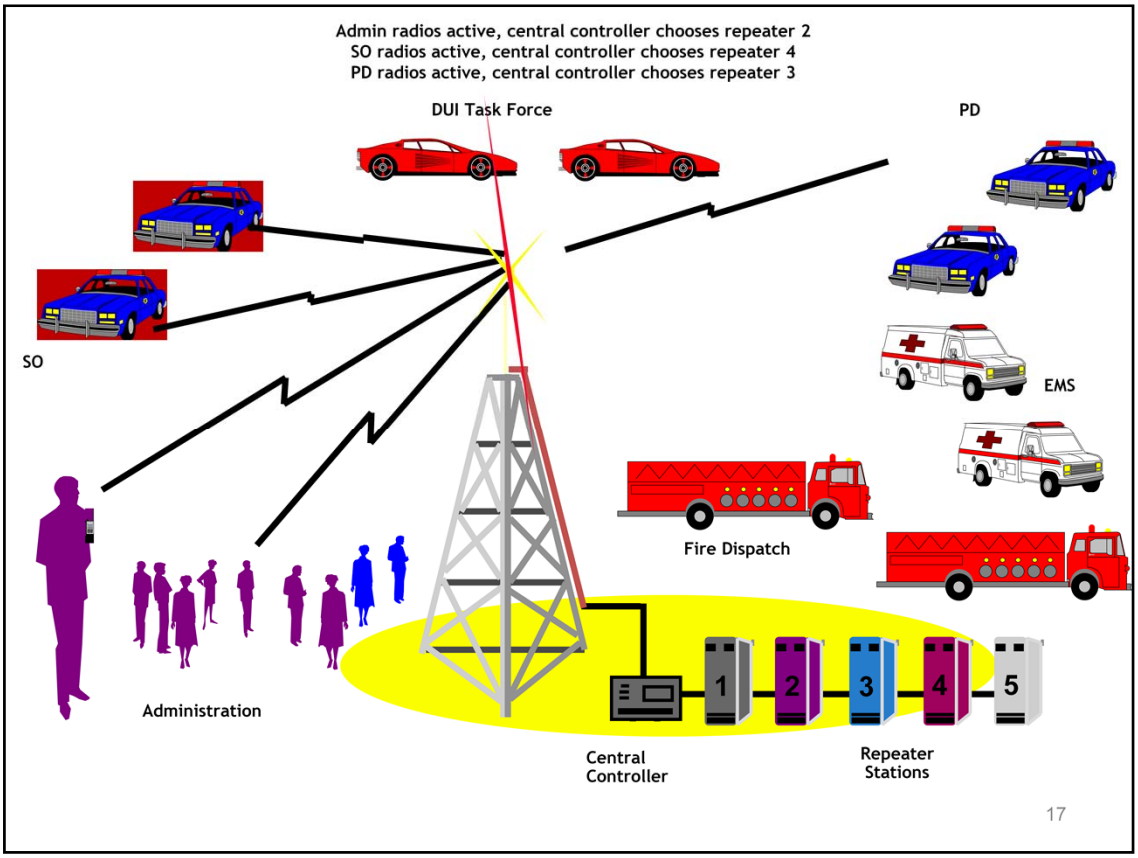
When no one is active on system, the only resources being used is the control channel (Channel 1) to send status information to and from radios.



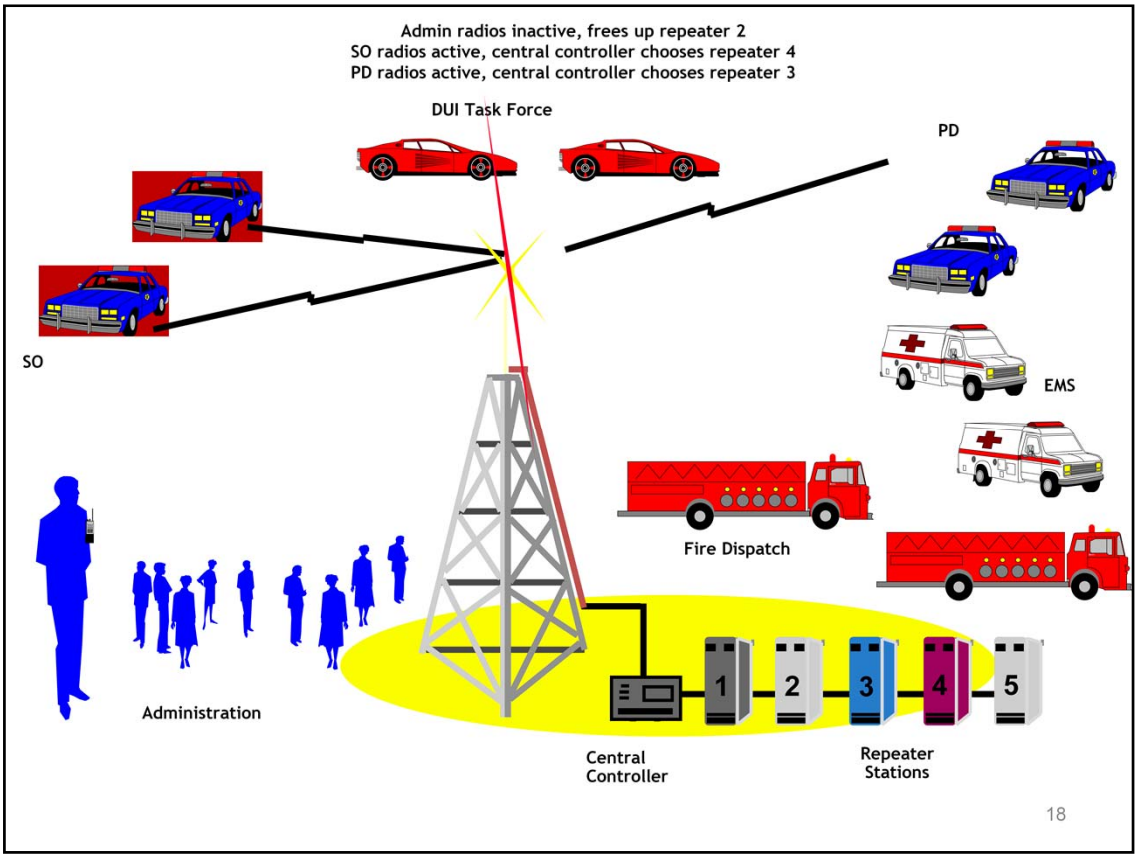
When the first talkgroup request is made (administration) repeater 2 is assigned to this traffic.



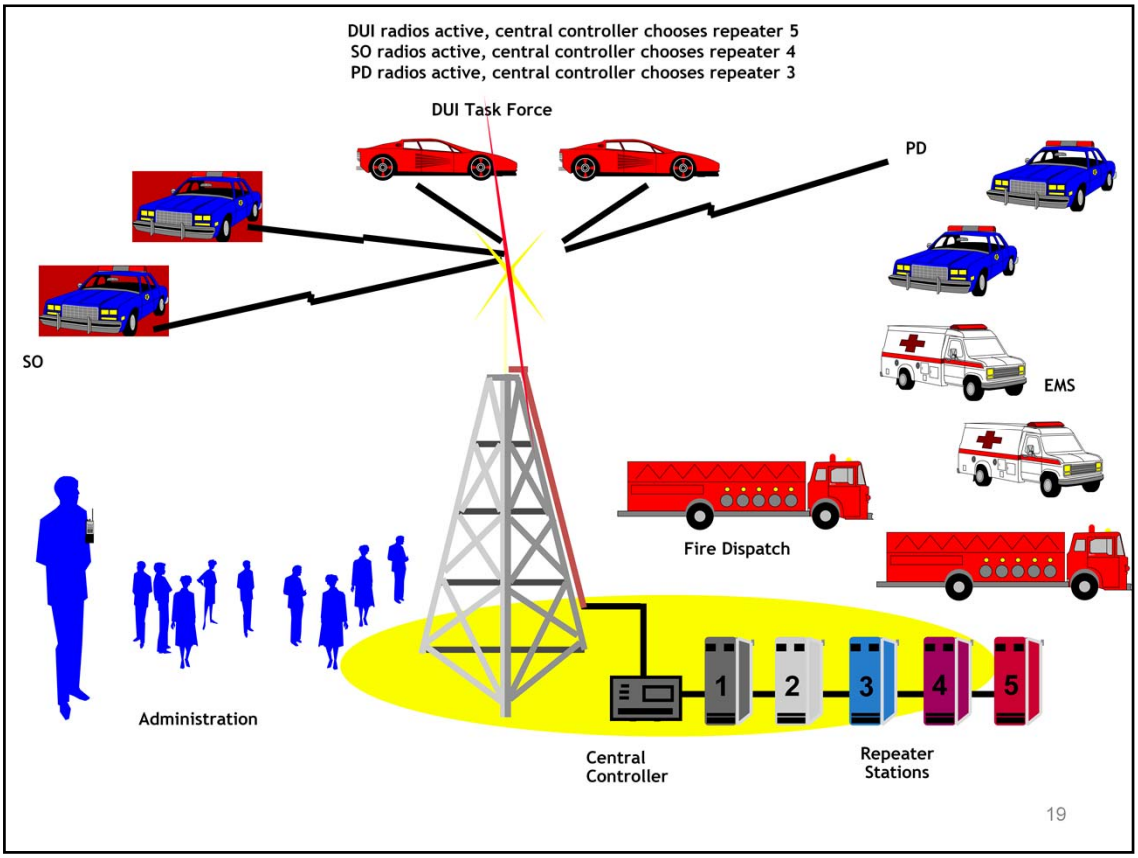
When the next talkgroup request is made (PD), repeater 3 is assigned to this traffic.



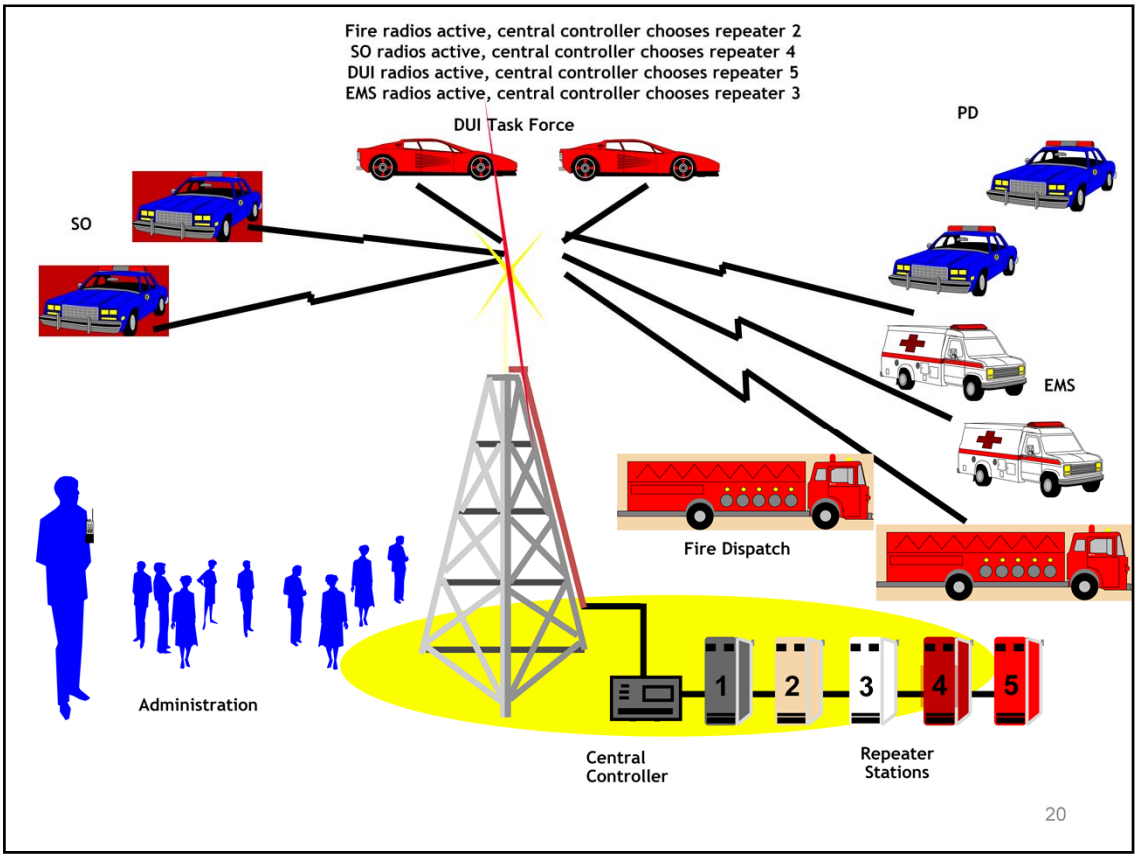
When the next talkgroup request is made (SO), repeater 4 is assigned for that traffic.



Administration is no longer active, repeater 2 is available for assignment.



DUI Task Force talkgroup is requesting resources, repeater 5 is assigned, 2 is still available for assignment.



With four agencies now requesting airtime, all resources are temporarily in use. If admin would request to talk they would get a busy signal until a repeater opens up. If all users were operating together in an emergency over a single talkgroup, only one of the four available repeaters would be used.

V. User Priorities/ID Administration

a. User Priorities

Digital System access priority can be designated by the network administration. There are different levels of system access from 1-Emergency (highest) to 10 (lowest). The access priority affects the position in a queue (if in effect). The queue is the order in which system access is granted in the case when all tower resources are occupied.

The order in which user priority is assigned is as follows:

- 1 - Emergency– Highest priority, when emergency button, if so equipped, is activated.
- 2 - State Radio, local 911 answering points, and other public safety communications centers
- 3 - Law enforcement/Parole Agents/Inmate transport
- 4 - Fire/rescue, emergency management
- 5 - EMS/Health
- 6 - Support agencies/Public Works/NWS/DOT
- 7 -
- 8 -
- 9 - Other Public Service Agencies
- 10 - Transit and other Transportation

b. ID and Alias Administration

The State Radio Communications System Administrator will furnish upon request, new subscriber ID's for radios that authorized agencies need to add to the system. In addition to this the System Administrator will also coordinate additional alias needs with the requesting agency.

- The current configuration has the alias displayed on calls received by dispatch centers that are networked.
- Every Radio User ID in the system has to be unique; there can be no duplicated IDs.
- System limitation is 14 characters.
- The only figures that the system will accept are: Upper Case Alpha, Numeric, Period, Dash, Forward slash, and number sign.
- The system Administrator is responsible for seeing that the defined Naming Standard is followed and maintained.

Each agency will have a person designated as a Point of Contact (POC) that will maintain a current call sign registry. Also a record of radio serial numbers and unit designation shall be maintained. Any additions or deletions to inventory or call sign registry must be communicated to the SRC System Administrator (State Network Manager).

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User priorities have been set by the Protocol Committee of the Public Safety Communications Council. This has been set to ensure that the most critical radio traffic has top priority to the network.

Unless the call is generated by pushing the emergency button, the system will not bump a call in progress when a site is busy, but will prioritize and push a higher priority caller through the site before a lower priority call will be allowed.

It is very important that agencies have a current list of radios by serial number and to whom those radios have been assigned. The radios can be tracked from the network switch and remotely disabled if vehicle is stolen, or if an emergency call is generated, the agency has a current of who that radio belongs to and where they are.

Failure Modes

Trunking system failures may occur due to software problems or equipment failures. Additionally, storms, vandalism, and other events can damage system equipment and support. Radio operations under the most significant Failure Mode are described below.

All system failures create significantly increased demand for radio airtime on the available channels as well as limitations in power and coverage. Radio discipline must be maintained at a high level. Radio use will be limited to emergency related and resource management traffic only during Failsoft and System Failure conditions.

Site Trunking Failure

Event: Failure of the communications link to a trunked site. Radio displays "SITE TRUNKING". Limited to coverage of the tower where affiliated.

Action:	Remain on current assigned channel. Follow local Communications Center direction.

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The site trunking failure is the only failure mode that should be seen on the system. This indicates that connectivity has been lost between the site and the Network Switch. Trunking features will only be available in the coverage area of the tower, and communications to dispatch could be lost.

What this means to the user is that if they are being dispatched from outside the area or the coverage of the tower they are registered on, that communication will be lost. Communications within the coverage area of that tower will continue as normal, with a "site trunking" indication showing on the radio.

OPERATIONAL PROTOCOL SUMMARY

ROUTINE TRAFFIC

1. All radio communication should be brief and to the point. Radio system traffic shall be limited to official business only. Agency heads are responsible for the appropriate use of the system in accordance with adopted standard protocols. Proper radio etiquette is expected on any communications system. Agency protocols will dictate operation locally.

2. Radio messages will be made and received in the following manner:

   - Caller waits for clear air time on selected talkgroup.
   - When initiating communication on the statewide radio system, the following format will be used.
     "Receiving agency/unit—sending unit— on talkgroup used".
     i.e. *"Metro-HP20 on SF Interagency"*.
   - Receiver acknowledges by stating their state assigned/approved call sign.
   - When utilizing private agency talkgroups, call sign protocol is at agency discretion.
   - All radio traffic must be conducted in a professional manner.
   - State-recognized 10 codes (Attachment 1) or clear speech will be used on system.

3. Local Operation:
   - Normal operations will be conducted on assigned agency talkgroups.
   - Interagency traffic will be conducted on the State Interagency Talkgroup for that geographic area.
   - Interagency talk groups are not to be used for normal dispatch.
   - Special Operations and State Fire 2 & 3 talkgroups must be requested and authorized by State Radio for events or incidents.

4. Operation outside of local area.
   - Users traveling outside their normal operating area will switch from their local talkgroup to the appropriate Interagency talkgroup for the geographic area you are currently in. This is needed to prevent radios from unnecessarily tying up system resources.
   - The digital trunked radio system is not currently set up to limit talkgroups to particular sites. This configuration allows necessary communications outside of the normal service area of an agency, often made necessary by prisoner transports, EMS & fire support outside of area.
   - The drawback to this wide area operation is that when a talkgroup is transported to another area of the state, all traffic associated with that talkgroup is then repeated over the local tower that the user is affiliated on. This can cause an overload situation for the local tower, especially if a large number of users are affiliated on their home talkgroups on a single tower. This may result in a busy condition for not only the local users where the outside talkgroups are brought into, but a potential talkgroup busy back in the home area of the user.

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1. Radio traffic on the system should be kept as much as possible to business. Keep in mind that you are using a shared system.
2. General radio protocol is to include called unit, calling unit, and channel/talkgroup calling on. There is a national effort to phase out use of 10-codes, as use & definition of these are inconsistent. Use common language whenever possible.
3. Normal local operation would be on assigned talkgroups. Interagency talkgroups should NOT be used for regular dispatch. The use of these talkgroups for dispatch purposes often keeps them from being used for the intended purpose, for different types of users to have a common radio meeting place.
4. One of the most important aspects to the system is the concept of the talkgroup following the radio. Even if a person is not transmitting on the talkgroup, any monitored talkgroup from outside of an area will use resources and possibly limit local use. It is very important that talkgroups from outside of the immediate service area only be monitored if absolutely necessary. Also if you are monitoring your home talkgroup outside of your working area, you may be missing emergency traffic in the area you are in. There have been a number of reports of officers being within a mile of a major accident and not knowing because they were not on a local talkgroup.

EMERGENCIES

An emergency is defined as a non-scheduled significant incident that requires the coordinated response and interoperability of multiple agencies or jurisdictions. To include incidents that move between jurisdictions.

1. When situation dictates coordinated resources from agencies without common talkgroups, communications will be on the State Interagency Talkgroup for that geographic area.
2. All responding units will monitor the Interagency talkgroup designated by the requesting agency for additional information and the initial report on conditions.
3. Special Operations talkgroup(s) will be assigned for the duration of the emergency upon request.
   - For fire operations, the Incident Commander may request additional State Fire talkgroup(s).
4. State Radio dispatch will be notified by requesting agency or Incident Commander when the talkgroup will no longer be needed.
5. If the emergency "travels" from one Interagency talkgroup area to another (i.e. a law enforcement pursuit or other events), it is recommended that the radio traffic be routed through the State Radio Dispatch Center in that area for coordinated communications.

PLANNED/SCHEDULED EVENTS

Any event, known in advance, that requires additional communications resources.

1. Special Operations talkgroup(s) will be assigned as available for the duration of the event upon request. Talkgroup assignment is subject to pre-emption if required for reassignment to an emergency incident.
   - Special Operations talkgroups should be scheduled as far in advance as possible.
2. State Radio dispatch will be notified by requesting agency or Incident Commander when the talkgroup will no longer be needed.

HEAVY RADIO TRAFFIC CONDITIONS

1. If a Communications Center or an Incident Commander feels that excessive non-essential radio traffic is impacting dispatch operations or incident operations, the Incident Commander or Communications Center will make a radio traffic restriction announcement. This announcement will be made on appropriate talkgroup(s). The radio traffic restriction announcement will normally be, "All Units and Stations with non-essential radio traffic stay off the air."
   - An alternate agency talkgroup can be assigned by Communications Center for non-incident related communications.
2. When the condition is over, the Communications Center or an Incident Commander will broadcast a message announcing resumption of normal radio traffic conditions.

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This slide covers some system protocols for interagency/emergency operations:

1. For any non-scheduled event or emergency requiring mutual aid, all initial traffic will be on the Interagency (INT) for that area. This is another reason NOT to use INT for general dispatch purposes. Units responding from outside that area will turn to that talkgroup, get information on where to report and what communications group they will be part of. If the incident is organized, Special Ops talkgroups should have been requested, and assigned to the different responsibilities will be given as responders check in to the area.
2. For planned events, Special Operations talkgroups should be scheduled as far in advance as possible by calling any of the three State Radio Dispatch centers. Notify same dispatch center when event is concluded.
3. Heavy traffic conditions, the communications center involved, the incident commander (IC), or the Communications Unit Leader (COML), have the authority to restrict use of the system to essential traffic only if the non-essential traffic is interrupting response or recovery efforts.

Talkgroups

A. STATEWIDE TALKGROUPS

The following is a list of Statewide Talkgroups. It is recommended that these talkgroups be programmed as a Standardized Block within the appropriate radios to assure uniformity and interoperability across the State.

1. SRC (State Radio Communications) talkgroups – are intended for any law-enforcement communications between mobile and State Radio dispatch. All law enforcement field units will be programmed with these talkgroups. These talkgroups shall be labeled as follows:

Talk Group	Radio Display
SRC SIOUX FALLS	SRC SF
SRC TURKEY RIDGE	SRC TKR
SRC VERMILLION	SRC VERM
SRC TRIPP	SRC TRIP
SRC MITCHELL	SRC MIT
SRC BROOKINGS	SRC BRK
SRC WATERTOWN	SRC WTN
SRC WEBSTER	SRC WEB
SRC ISABEL	SRC ISAB
SRC ABERDEEN	SRC ABR
SRC REDFIELD	SRC RED
SRC HURON	SRC HUR
SRC MILLER	SRC MIL
SRC CHAMBERLAIN	SRC CHAM
SRC WINNER	SRC WIN
SRC PIERRE	SRC PIER
SRC MOBRIDGE	SRC MOB
SRC PHILLIP	SRC PHIL
SRC MARTIN	SRC MAR
SRC BISON	SRC BISN
SRC RAPID CITY	SRC RC
SRC S. HILLS	SRC SH
SRC N. HILLS	SRC NH
SRC FAITH	SRC FATH

25

SRC talkgroups are for law enforcement use to dispatch. Typically this is the primary SRC dispatch to law enforcement set of talkgroups.

2. INT (Interagency) talkgroups – are intended for any interdepartmental radio communications. Due to the potential for hi volume usage of these talkgroups, they are not intended as primary day-to-day routine dispatch operations. All multi-jurisdictional/multi-agency incidents should be initiated on the Interagency talkgroups and then moved to an operationa or user-specific talkgroup. Every radio on the system will be programmed with the 24 Regional Interagency Talkgroups. These talkgroups shall be labeled as follows:

Talkgroup	Radio Display	Intended Use
Sioux Falls Interagency	SF INT	Interagency Traffic
Turkey Ridge Interagency	TKR INT	Interagency Traffic
Vermillion Interagency	VERM INT	Interagency Traffic
Tripp Interagency	TRIPP INT	Interagency Traffic
Mitchell Interagency	MIT INT	Interagency Traffic
Brookings Interagency	BRK INT	Interagency Traffic
Watertown Interagency	WTN INT	Interagency Traffic
Webster Interagency	WEB INT	Interagency Traffic
Isabel Interagency	ISAB INT	Interagency Traffic
Aberdeen Interagency	ABR INT	Interagency Traffic
Redfield Interagency	RED INT	Interagency Traffic
Huron Interagency	HUR INT	Interagency Traffic
Miller Interagency	MIL INT	Interagency Traffic
Chamberlain Interagency	CHAM INT	Interagency Traffic
Winner Interagency	WIN INT	Interagency Traffic
Pierre Interagency	PIER INT	Interagency Traffic
Mobridge Interagency	MOB INT	Interagency Traffic
Phillip Interagency	PHIL INT	Interagency Traffic
Martin Interagency	MAR INT	Interagency Traffic
Bison Interagency	BIS INT	Interagency Traffic
Rapid City Interagency	RC INT	Interagency Traffic
Southern Hills Interagency	SH INT	Interagency Traffic
Northern Hills Interagency	NH INT	Interagency Traffic
Faith Interagency	FATH INT	Interagency Traffic

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The interagency talkgroups are the mutual aid talkgroups of the system. They are for any use where multi-agency communications or any interagency communications are required.

Again, these talkgroups are not intended to be routine dispatch talkgroups. We have many reports of actual law-enforcement mutual aid situations that were interrupted by non-essential traffic. In one case in western South Dakota a chase involving a kidnaping was interrupted by a group of firemen returning from fighting a fire. From that incident several policies have been initiated, including a marker tone on the talkgroup when an emergency situation exists, but the problem remains if this talkgroup is not properly managed.

Local dispatch is expected to be conducted on local talkgroups. If a PSAP takes on additional area, it is their responsibility to ensure that all radios to be dispatched have the correct talkgroups programmed.

Interagency talkgroups are the only talkgroups on the system configured to automatically be transmitted on multiple towers. This allows radios to drive out of the coverage area of one tower, and still be able to scan these talkgroups. The automatic operation follows the table below:

Name	Requested Sites Sites
Pierre Int Reqs.	Pierre/ Willow Creek
Aberdeen Int Reqs.	Aberdeen/ Webster/ Crandall
RC Int Reqs.	Skyline/Mt. Coolidge/ Seth Bullock
SH Int Reqs.	Mt. Coolidge/ Edgemont/Bear Mtn.
NH Int Reqs.	Terry Peak/ Enning/ Seth Bullock/ Sly Hill/ Castle Rock
Phil Int Reqs.	Billsburg/White River/Murdo/Long Valley/Wall
Bis Int Reqs.	Slim Buttes/ Shadehill
Faith Int Reqs.	Billsburg/ Faith/ Enning
Martin Int Reqs.	Murdo/ Long Valley/Wall
Cham Int Reqs.	Iona/ Billsburg/ Willow Creek/ Murdo/ Stickney/Winner
Isab Int Reqs.	Billsburg/ Isabel/ Faith/ Ridgeview/ Corson
Mob Int Reqs.	Bowdle/ Lowry/ Corson/ Agar/Herreid
Brks Int Reqs.	Brookings/ Toronto/Madison/Minnehaha/Desmet
Huron Int Reqs.	Desmet/Miller/Crandall/Huron
Miller Int Reqs.	Miller/ Huron/Orient Hills
Mitchell Int Reqs.	Mitchell/Wall Lake/Madison/ Stickney/ Turkey Ridge/Radar Hill
Red Int Reqs.	Crandall/Orient Hills
SF Int Reqs.	Wall Lake/Turkey Ridge/Madison/Sioux Falls/Beresford
Tkr Int Reqs.	Turkey Ridge/Wall Lake/Vermillion/ Yankton/Beresford
Tripp Int Reqs.	Turkey Ridge/Stickney/Radar Hill
Verm Int Reqs.	Vermillion/ Yankton/Turkey Ridge/Beresford
Web Int Reqs.	Webster/ Crandall/Summit/Hillhead
Winner Int Reqs.	Iona/ White River/ Long Valley/Winner/Wall
Wtn Int Reqs.	Toronto/ Watertown/ Desmet
NWS W Reqs.	Skyline
SF SRC Reqs.	Minnehaha
SRC Mob Reqs	Bowdle/ Lowry/Herreid
SRC Verm Reqs	Beresford
SRC SF Reqs	NONE
SRC Isabel Reqs	Faith/Slim Buttes/Shadehill
NWS C/NE Reqs	Desmet

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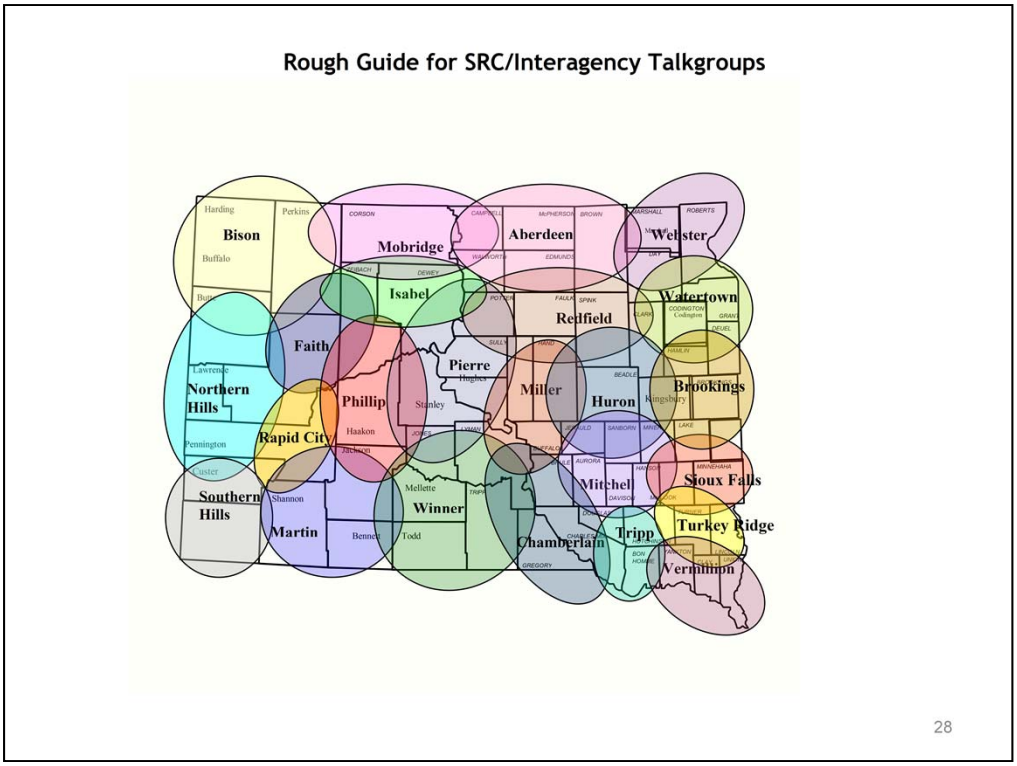
Because the Interagency talkgroups are for mutual aid, the system was designed to make these talkgroups “broadcast over additional towers to ensure that a call for help would be answered. This list outlines those sites that “broadcast” when different Interagency talkgroups are used.



This map was designed simply to give an idea of the coverage areas for particular talkgroups. There have been many requests for a visual aid to help users know when to rotate between talkgroups, and this was developed for that purpose only.

3. SP OPS (Special Operations) talkgroups – are requested talkgroups for non-routine operations. Requests for these talkgroups will be directed towards one of the three State Radio dispatch centers. All radios on the system will be programmed with these talkgroups. These talkgroups shall be labeled as follows:

TALKGROUP	RADIO DISPLAY	INTENDED USE
Special Operations 1	SP OP 1	Communications During Disasters and Special Events
Special Operations 2	SP OP 2	Communications During Disasters and Special Events
Special Operations 3	SP OP 3	Communications During Disasters and Special Events
Special Operations 4	SP OP 4	Communications During Disasters and Special Events
Special Operations 5	SP OP 5	Communications During Disasters and Special Events
Special Operations 6	SP OP 6	Communications During Disasters and Special Events
Special Operations 7	SP OP 7	Communications During Disasters and Special Events
Special Operations 8	SP OP 8	Communications During Disasters and Special Events
Special Operations 9	SP OP 9*	Communications During Disasters and Special Events
Special Operations 10	SP OP 10**	Communications During Disasters and Special Events

* Some radios labeled HP
** Some radios labeled SRC

•The Special Operations talkgroups were designed to allow for incident management communications off of the normal operating talkgroups, freeing up those talkgroups for normal operations. These are designated to be operated on in either a proactive manner, or a reactive manner, depending upon the situation.

•Special Operations talkgroups can be used for either scheduled events or emergencies, but must be reserved. Scheduled events assignments may be pre-empted by emergency situations. Special Operations talkgroups are request-only talkgroups, with request made to State Radio Dispatch via radio over any Interagency Talkgroup, or by telephone to one of the following dispatch centers:

Pierre-- 605-773-3536
Huron-- 605-353-7132
Rapid City-- 605-393-8121

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The Special OPS zone can be regarded as the emergency standby talkgroups. These can be requested for emergencies, and special events and need to be requested before use.

Contact information is listed at the bottom of the slide, the dispatch centers track assignment and use of these talkgroups.

4. State Fire (ST FIRE 2 and 3 only) talkgroups -- are intended for use as a request-mutual-aid fire talkgroup. All radios will be programmed with these talkgroups. These talkgroups shall be labeled as follows:

TALKGROUP	RADIO DISPLAY	INTENDED USE
State Fire 1	STFIRE-1	Interagency Fire related contact with Great Plains Dispatch Center in Rapid City*
State Fire 2	STFIRE-2	State Mutual Aid Fire – Special Operations Channel
State Fire 3	STFIRE-3	State Mutual Aid Fire – Special Operations Channel

that State Fire 1 is intended for interagency fire-related communications with Great Plains Dispatch Center in Rapid City and IS NOT intended for Special Operations Request-Mutual Aid from resources other than Great Plains.

The State Fire 2 and 3 talkgroups are request-only talkgroups, with requests being made to State Radio Dispatch via radio over any Interagency Talkgroup, or by telephone to one of the following dispatch centers:

Pierre-- 605-773-3536
Huron-- 605-353-7132
Rapid City-- 605-393-8121

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The STFIRE talkgroups are another set of talkgroups that can be reserved for emergencies. STFIRE1 is used by Wild Land Fire to direct resources upon request, and can be used to contact that center directly.

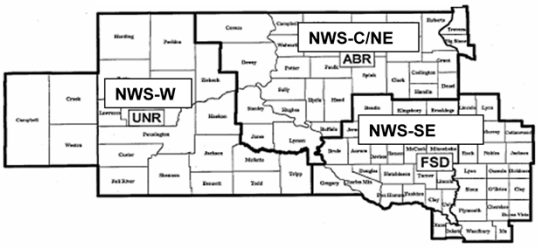
STFIRE 1 & 2 can be set aside for mutual aid firefighting with a call to one of the dispatch centers listed above.

5. NWS Talkgroups – The NWS talkgroups are a direct link to the National Weather Service Offices in Rapid City, Aberdeen, and Sioux Falls. These Talkgroups are to be used for communications with NWS when relaying weather spotter, fire conditions and other weather related information from the field. All radios on the system will be programmed with these talkgroups. These talkgroups shall be labeled as follows:

TALKGROUP	RADIO DISPLAY	INTENDED USE
National Weather Service	NWS-W	Weather Related Reporting to NWS – Western, South Dakota
National Weather Service	NWS-C/NE	Weather Related Reporting to NWS – Central/Northeastern South Dakota
National Weather Service	NWS-SE	Weather Related Reporting to NWS – Southeastern, South Dakota

South Dakota

National Weather Service Areas



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National Weather Service talkgroups are a direct link to the centers located in Rapid City, Aberdeen, and Sioux Falls. This will be an invaluable tool for spotters and emergency personnel in severe weather conditions.

6. EMS (Hospital) Talkgroups

This public safety radio system is in place to support the day-to-day operations of South Dakota's various public safety agencies. Law Enforcement, Fire Departments, Ambulance Services, and Department of Transportation are but a few of the many different agencies that will be using this technology to complete their tasks.
South Dakota's facilities are included in this plan for these primary reasons.

- Ambulance services throughout the state will be using this technology to communicate with hospitals to obtain online medical control, and relay pertinent patient information.
- Provide air to ground communications during emergencies
- Provide communications to referring facilities during inter-facility transport.
- Provide contact for dispatch/communications centers during flight following procedures when traditional duplex communication is not possible.
- Hospital laboratories that are designated by the State as surge laboratories must have access to the system during bio-terror threats or other mass casualty events for surveillance purposes.

Procedure:
Radios provided by the South Dakota Department of Health to facilities in the state have been pre-programmed with various local and regional talkgroups. These Talkgroups are in place so public safety agencies (primarily ambulance services) would be able to predict the talkgroup the receiving facility would be operating when transporting a patient. This principle will apply to all hospitals in the state that have obtained the state public safety radio system. Hospitals should monitor the talkgroup of which they are a member according to the following map entitled "SOUTH DAKOTA HOSPITAL TALKGROUPS".

Example:
According to the following map, hospitals in Madison, Flandreau, and Dell Rapids are connected on the MAD EMS talkgroup. This must be the talkgroup monitored by these facilities since ambulances coming from other areas will expect to contact them here. Hospitals in Spearfish, Deadwood, and Sturgis are connected on the NHILLS EMS talkgroup. Public safety agencies need to be able to contact these facilities in emergencies, and a statewide plan that can be predicted by all agencies will be the most effective. Hospitals in Parkston, Freeman, and Armour are connected via the PARK EMS talkgroup; a helicopter responding to a call to transport needs to be able to contact these facilities, and when the plan is followed, can predict which talkgroup the facility will be monitoring. If the hospital in Faulkton has a patient to be transferred, a helicopter called to transport would be able to select the REDF EMS talkgroup in order to make landing arrangements, and so on. If an ambulance is called to transport a patient from Phillip to a hospital in Rapid City, that ambulance would be able to select the RC EMS talkgroup to relay pertinent information to the receiving facility in Rapid City.

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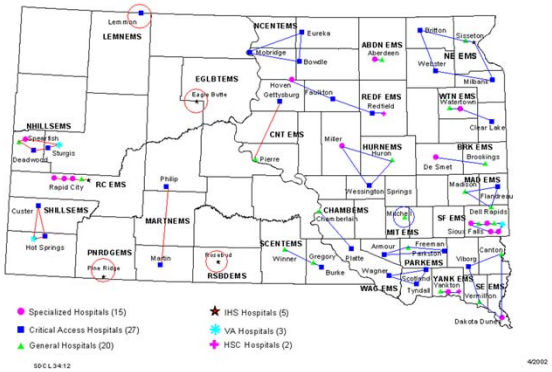
The EMS talkgroups were developed by the Department of Health to logically group hospitals and allow scene to ER communications. These talkgroups can be used for ambulance response runs, transports, and flight following.

Hospitals are expected by the Department of Health to monitor the talkgroups and quarterly roll-calls to try to enable ongoing compliance.

Talkgroup	Radio Shows
SOUTH CENTRAL EMS	SCENTEMS
CHAMBERLAIN EMS	CHAMBEMS
WAGNER EMS	WAG EMS
PARKSTON EMS	PARKEMS
YANKTON EMS	YANK EMS
SOUTH EAST EMS	SE EMS
SIOUX FALLS EMS	SF EMS
MADISON EMS	MAD EMS
MITCHELL EMS	MIT EMS
HURON EMS	HURNEMS
BROOKINGS EMS	BRK EMS
WATERTOWN EMS	WTN EMS
NORTH EAST EMS	NE EMS
ABERDEEN EMS	ABDN EMS
REDFIELD EMS	REDF EMS
NORTH CENTRAL EMS	NCENTEMS
CENTRAL EMS	CNT EMS
ROSEBUD EMS	RSBDEMS
MARTIN EMS	MARTNEMS
PINERIDGE EMS	PNRDGEMS
SOUTHERN HILLS EMS	SHILLSEMS
RAPID CITY EMS	RC EMS
NORTHERN HILLS EMS	NHILLSEMS
LEMMON EMS	LEMMEMS
EAGLE BUTTE EMS	EGLBTEMS

SOUTH DAKOTA HOSPITAL TALK GROUPS



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This is a map of the layout of the talkgroups and the approved naming convention of the talkgroups.

7. AGENCY TALKGROUPS

Each agency is considered as "owner" of the private talkgroup assigned to them. Agencies are expected to use the talkgroups assigned to the department for all interdepartmental traffic. Policies and procedures for the use of the agency talkgroup are at the discretion of the department, within the technical limitations set forth in previous information regarding use outside of your home area.

Requests for Additional Talkgroups

Requests for new talkgroups will be submitted to the System Administrator using Attachment 2.

Authorization of private talkgroups for operations and monitoring of other agencies will be processed through the System Administrator. Attachment 2 will be filled out for each authorization, a copy kept on file, and another copy sent to:

State Radio Communications
Attn: System Administrator
500 E Capitol
Pierre, SD 57501

Or Faxed To: 605-773-4629

Authorization/Revocation for Sharing of Talkgroups

To access non-agency talkgroups, written authorization from the "owner" of that talkgroup must be obtained and also supplied to the system administrator. Authorization of private talkgroup to operate/monitor on that talkgroup may be rescinded by the talkgroup "owner" by written notice.

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Agencies are to consider their talkgroup as their own resource. Permission for access to their talkgroup should be granted only after careful review, and no other agency should program these talkgroups without agency permission.

Agencies and local dispatch centers are expected to maintain internal communications within their assigned talkgroups. Use of talkgroups such as the Interagency group are in place to facilitate communications with those operating outside of their internal talkgroups.

8. National Analog Interoperability Channels

The programming of these channels in radios are encouraged. Most of these channels are nationally designated for emergency use for first responders and can provide a common channel for operations such a fire ground & other emergency situations. Keep in mind that these channels are also licensed public safety frequencies and as such are also used in some cases on the statewide system. We have listed some known areas of frequency conflicts, but the potential may exist for other areas as well. If you are causing interference on one of these channels with the statewide system, you will need to move operations to another channel.

Channel Name	Use	RX Frequency	Tone	TXFrequency	Tone	Limitation (No in red areas)
M/A RPTR	Off-net mutual aid repeater	156.0150	100.0	149.8375	100.0	Where available
M/A DIR	Car to Car	156.0150	100.0	156.0150	100.0	
VCALL10	National emergency car to car	155.7525	none	155.7525	156.7	
VTAC11	National emergency car to car	151.1375	none	151.1375	156.7	Pickstown, Rapid City, Summit
VTAC12	National emergency car to car	154.4525	none	154.4525	156.7	Summit
VTAC13	National emergency car to car	158.7375	none	158.7375	156.7	
VTAC14	National emergency car to car	159.4275	none	159.4275	156.7	Edgemont, White River, Huron
VTAC17	National emergency repeater	161.8500	none	157.2500	156.7	Aberdeen, Bear Mtn, Rapid City, Toronto, Vermillion *
VTAC17D	National emergency car to car	161.8500	none	161.8500	156.7	See VTAC17
VTAC33	National Tactical Repeater	159.4275	none	151.1375	136.5	Edgemont, White River, Huron, Pickstown, Rapid City Summit*
VTAC34	National Tactical Repeater	158.7375	none	154.4525	136.5	Summit*
VTAC35	National Tactical Repeater	159.4725	none	158.7375	136.5	Beresford, Long Valley, Miller*
VTAC36	National Tactical Repeater	151.1375	none	159.4725	136.5	Pickstown, Rapid City, Summit, Beresford, Long Valley, Miller *
VTAC37	National Tactical Repeater	154.4525	none	158.7375	136.5	Summit *
VTAC38	National Tactical Repeater	158.7375	none	159.4725	136.5	Pickstown, Rapid City, Summit, Beresford, Long Valley, Miller *
VFIRE21	National Fire Mutual Aid	154.2800	none	154.2800	156.7	
VFIRE22	National Fire Mutual Aid	154.2650	none	154.2650	156.7	
VFIRE23	National Fire Mutual Aid	154.2950	none	154.2950	156.7	
VFIRE24	National Fire Mutual Aid	154.2725	none	154.2725	156.7	
VFIRE25	National Fire Mutual Aid	154.2875	none	154.2875	156.7	
VFIRE26	National Fire Mutual Aid	154.3025	none	154.3025	156.7	
VMED28	National EMS Mutual Aid	155.3400	none	155.3400	156.7	
VMED29	National EMS Mutual Aid	155.3475	none	155.3475	156.7	
VLAW31	National Law Mutual Aid	155.4750	none	155.4750	156.7	
VLAW32	National Law Mutual Aid	155.4825	none	155.4825	156.7	
SAR1 or SARNFM	Search and Rescue Channel	155.1600	none	155.1600	156.7	Not a national channel

* Only where set up

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Listed here are the nationally recognized interagency analog channels. These can be programmed without licensing in mobiles/portables, but cannot be used as a base without licensing.

As these frequencies are for the most part in the normal pool of available frequencies, many of these have been used on the statewide system and use should be avoided in the red areas.

These channels are intended for interagency use and should not be utilized as normal tactical channels. These channels fit in well with ground operations where off-net communications are required between different agencies or disciplines.

Attachment 2

South Dakota Interagency Communications System

AUTHORIZATION FOR NEW TALKGROUP OR SYSTEM ACCESS

Date: _____

Requesting Agency: _____

Type of Request

- ☐ New Talkgroup Request
- ☐ New User
- ☐ Other _____

Type of Agency

Public Safety

- ☐ Law Enforcement
- ☐ Fire Department
- ☐ Emergency Medical Service
- ☐ Emergency Management
- ☐ Communications Center
- ☐ Other_____

Public Service

- ☐ Transportation
- ☐ Support
- ☐ Weather Service
- ☐ Public Works
- ☐ Court Services
- ☐ Regulatory
- ☐ Other_____

IV. Reason for Request

_____

(Attach supporting documentation)

Name of individual completing application_____

Address_____

Phone_____

E-mail address_____

State Radio Communications
Attn: System Administrator
1302 E Hwy 14
Pierre, SD 57501
Fax 605-773-4629

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This form is required when an agency is requesting a new talkgroup or is requesting ID's or access to the system. This is a record of the request, contact information, etc. that the system manager can use to contact the agency if issues arise.

Attachment 3 Page 1

South Dakota Interagency Communications System

AUTHORIZATION TO USE TALK GROUPS
NOT OWNED BY THE REQUESTING AGENCY

Date: _____

Requesting Agency: _____

Authorizing Agency: _____

Reason for Request
- ☐ Add Talk Group(s) to Radios
- ☐ Scan Talk Group(s)
- ☐ Other _____

I. Request permission to ADD the following talk groups

Talk Group	To Be Installed in: (i.e., Portable, Mobile, Command Post)	For the following Work Units:

II. Request permission to SCAN/ MONITOR the following talk groups

Talk Group	To Be Installed in: (i.e., Portable, Mobile, Command Post)	To be monitored by the following positions:	Request for Receive Only

III. Other Request/ Requirements (Explain)

_____

IVI. Reason for Request

_____

(Attach supporting documentation)

Name of individual completing application_____

Address_____

Phone_____ E-mail address_____

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This form is used by an agency to request access to another agencies talkgroups. A signed form should be retained by the requesting and authorizing agency, and a copy sent to the system manager as a permanent record.

Attachment 3 Page2

This Side for Authorizing Agency use Only

South Dakota Interagency Communications System

AUTHORIZATION TO USE TALK GROUPS
NOT OWNED BY THE REQUESTING AGENCY

Request Approved_____ Approved with Conditions_____ Denied_____

Conditions:

_____

_____

_____

_____

_____

Authorized Signature: _____

Name of Authorizing Individual _____

Address_____

Phone_____ E-mail address_____

State Radio Communications
Attn: System Administrator
1302 E. Hwy 14
Pierre, SD 57501

Fax 605-773-4629

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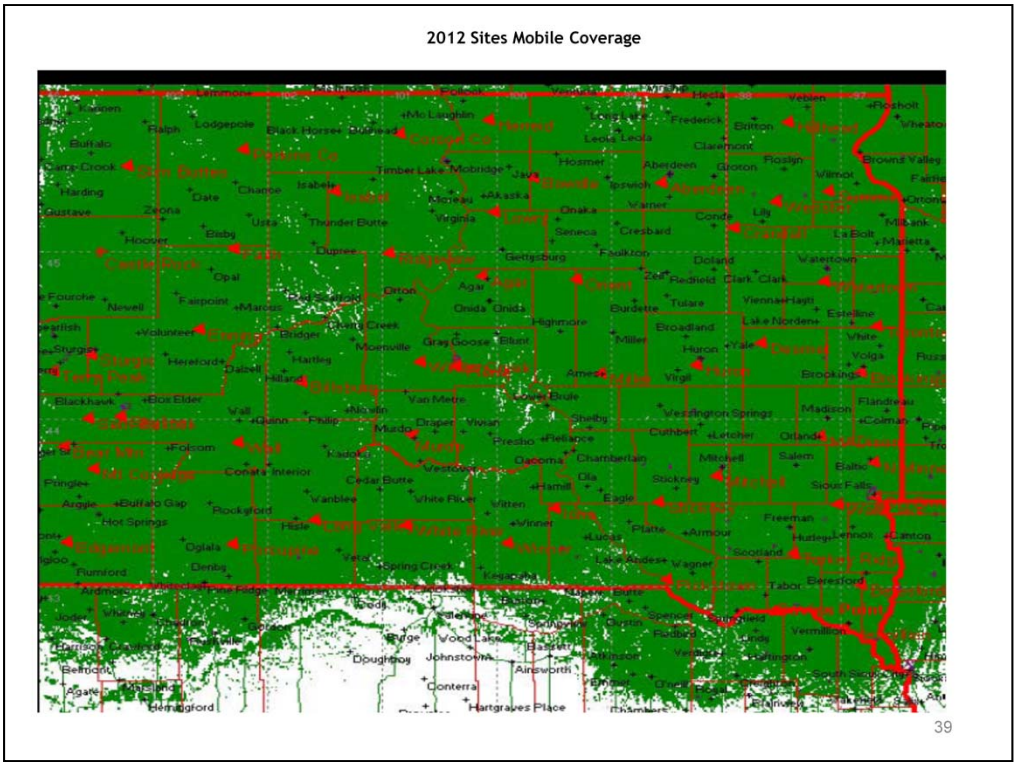
This is the authorization form allowing programming of an agency talkgroup by another agency. This form completes the record trail, and should be maintained by the authorizing agency, requesting agency, and a copy sent to the system manager.



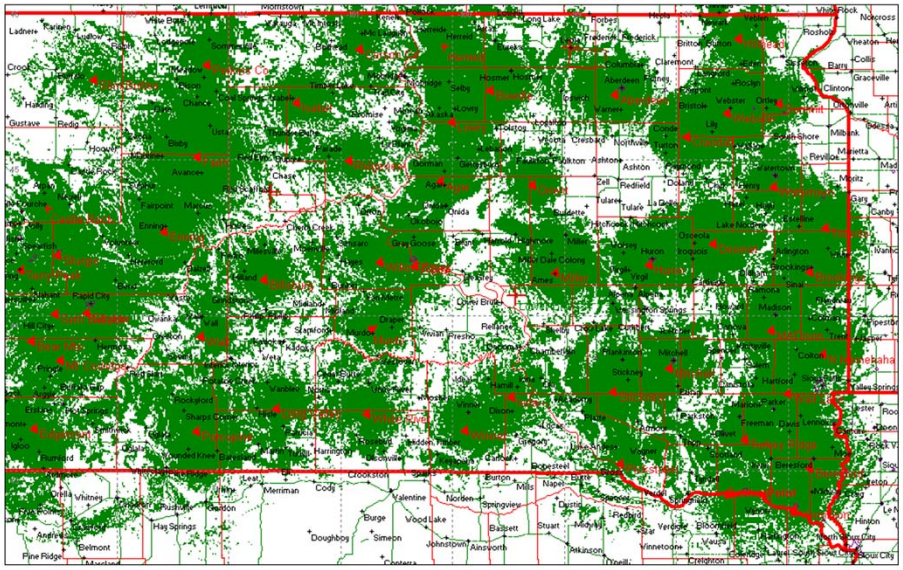
This is a map generated by a program that predicts system coverage. The software relies on equipment at the tower sites and mobiles/portables that are properly installed and functioning properly.

The green is the expected coverage to a mobile radio with an external antenna that is properly functioning. The most common issue encountered when a user has an issue with coverage where predicted is the antenna system.

The system covers approximately 98% of the geography of the state. To put that in perspective, that 2% is an area about the size of Hand County if all of the white areas were condensed to a single area. Efforts continue to improve coverage in areas that are not served as well as others.

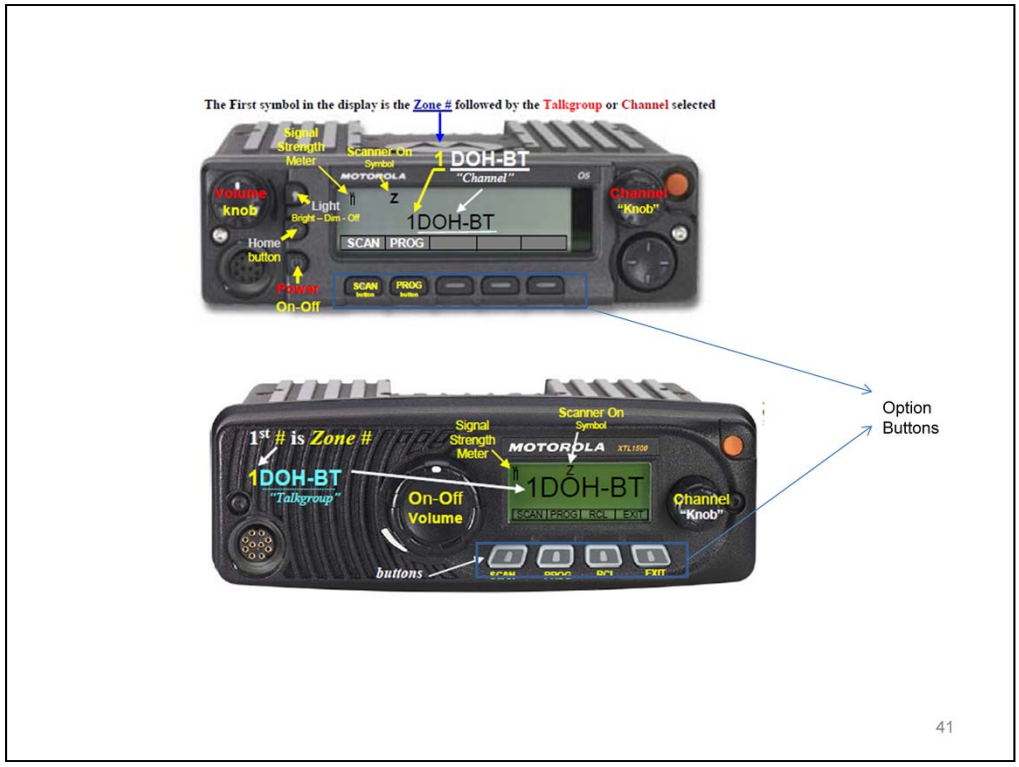
Attachment 10

Predicted Portable Coverage



40

This is a map of the expected handheld (portable radio) coverage generated by the same program. Again this relies on a functioning portable radio, fully charged batter (5 watts output), and held at head level. Body attenuation for radios worn in a holster at the side presents a significant amount of loss to the efficiency of the antenna and resulting coverage. If the radio is at the side, inside of a vehicle, this can result in another significant reduction in coverage.

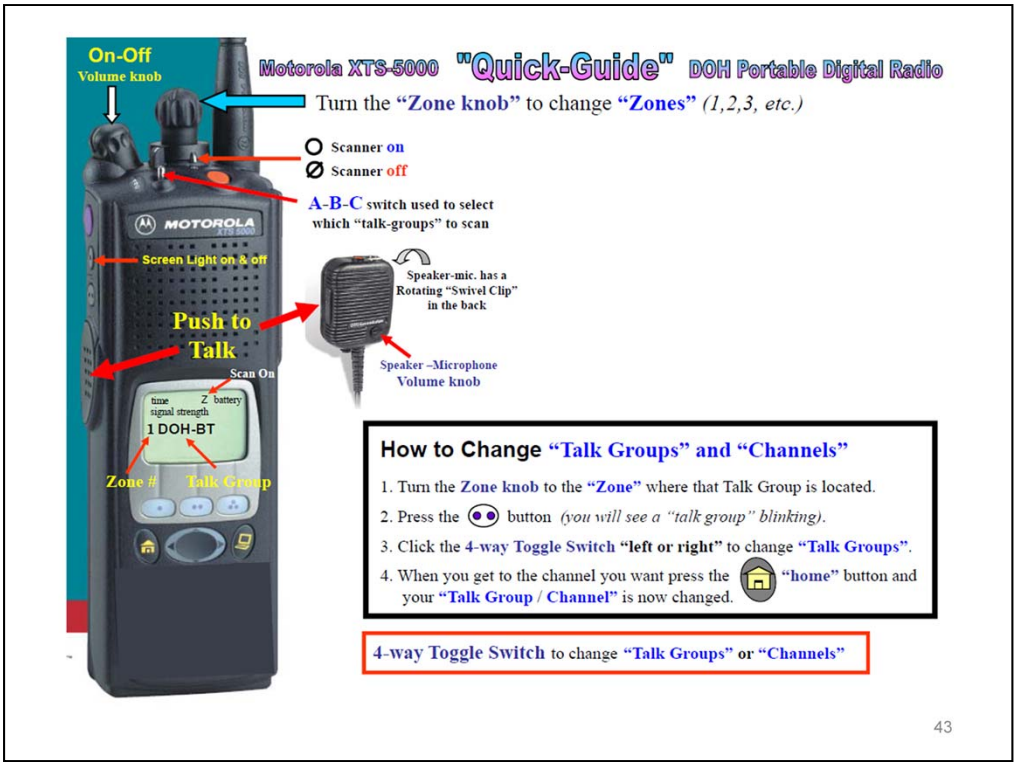


These are radio diagrams provided by the SD Department of Health from their training program. The pictured radios XTL2500/5000 (top) and XTL1500 (bottom) are highly flexible from a programming perspective, but with the on-screen menu, are getting easier to find the functions.

SELECTIONS:	AVAILABLE to the RADIO-USER WHEN:
CALL	When the Trunking Personality, Private Call Type field is **not** set to "Disabled".
CHAN (Channel)	Always available.
CHDN (Channel Down)	When the radio is model/option capable.
CHUP (Channel UP)	When the radio is model/option capable.
COLR (Color)	When the radio is model/option capable.
DIM	When the radio is model/option capable.
DYNP (Dynamic Priority)	When the Scan List, Dynamic Priority field is enabled.
ERAS (Erase)	When the Radio Wide, Secure Equipped field is enabled.
H/L (Horn & Lights)	When the Radio Wide, Horn & Lights field is enabled.
IP (Internet Protocol) Address	When the radio is model/option capable.
IINTC (Intercom)	When the Multi Control Head field is enabled, **and** when the Multiple Control Head Style field is set to "All Active", **and** when the radio is model / option capable.
KSET (Keyset)	When the Secure Configuration, PID Key Management Mode field is enabled, **and** when the Secure Configuration, Keyset - User Selectable is enabled.
MUTE	When the Radio Wide, Selectable Keypad Mute field is enabled.
Msg (Message)	When the Trunking dispatch Message fields are enabled.
NUIS (Nuisance Delete)	When the Scan Configuration, Nuisance Mode Delete field is enabled, **and** when the radio is model-option capable.
P1	When the Home Mode Selection field is enabled, **and** when the radio is a XTL 1500 model
PAGE	When the Trunking Personality, Call Alert Page Operation field is set to "List Only" or "Unlimited".
PHON (Phone)	When the Trunking Personality, Phone Interconnect field is **not** set to "Disabled".
PROG (Program)	When the Trunking Personality, Phone Interconnect field is **not** set to "Disabled", **or** when the Trunking Personality, Scan List Selection is **not** set to "None", **or** when the Trunking Personality is capable of Trunking Calls/Pages .
PWR (Power)	Always available.
REKY (Rekey)	When the Secure Configuration, User Selectable Rekey Request is **not** set to "Disabled".
RPGM (Reprogram)	When the Dynamic Regrouping field is enabled.
RSSI	
SCAN	When the Trunking Personality, Automatic Scan field is disabled.
SEC (Secure)	(When the Trunking Personality, Secure/Clear AG Strapping field is set to "Select", **or** when the Trunking Personality, Talkgroup Strapping field is set to "Select"), **and** when the radio is model/option capable.
SIG1 - SIG4/DISP (One Touch)	When the Trunking System, One Touch Page's... One Touch 1 Feature , **or** One Touch 2 Feature , **or** One Touch 3 Feature , **or** One Touch 4 Feature are **not** set to "Disabled", **and** when the radio is model/option capable.
SITE	When the Trunking System, Site Aliasing field is enabled.
STS (Status)	When the Trunking dispatch Status fields are enabled.
TCH1- TCH4 (One Touch)	When the Trunking System, One Touch Page's... One Touch 1 Feature , **or** One Touch 2 Feature , **or** One Touch 3 Feature , **or** One Touch 4 Feature are **not** set to "Disabled", **and** when the radio is model/option capable.
TMS (Text Messaging Service)	When the Trunking System Text Messaging Service field is enabled.
TX_2 (Tx on Both)	When the Radio Wide Multi Radio System Tx Scope field is set to "Tx on Both Radios"
USER	When the Radio Wide, ARS User Login Enable field is enabled.
VIEW	When the Trunking Personality, Phone Interconnect field is **not** set to "Disabled", **and** when the Scan List Selection field is **not** set to "None".
VMUTE (Voice Mute)	When the Trunking Personality In-Call User Alert field is enabled for the radio's current operating channel.
VRS	When the radio is model/option capable, **and** (when the DVRS Hardware Enabled field is enabled, **Or** when the VRS-EP Option field is enabled.)
ZONE	When the radio is model/option capable
ZNUP (Zone Up)	When the radio is model/option capable.
ZNDN (Zone Down)	When the radio is model/option capable.

42

This slide is a screenshot of the potential for the controls on the mobile radios shown on the previous slide.



Another slide from the DOH training program. The XTS5000 is another flexible programming radio. Agency radios may be programmed differently.

Another slide from the DOH training program. The XTS2500 is another flexible programming radio. Agency radios may be programmed differently.

Attachment 6

Motorola Mobile (W4 Model)
Write in options programmed into your radio

RADIO BUTTONS:

Emergency (only used on law enforcement radios) - Sends an emergency message back to dispatch. Dispatch will automatically know that it was your radio that sent the message. To engage emergency alarm temporarily push the emergency button, your radio will flash emergency and send it to dispatch. Note: radios that have been reprogrammed recently are set up so you need to hold the emergency button for .5 seconds to activate it. To disable an emergency call hold your emergency button in until an alert tone sounds, your radio should quit flashing emergency at this time, and dispatch will be able to reset their end.

Site/phon - Tells you the number of the site you are on, it also tells the RSSI (receive signal strength indicator). A RSSI of 87 is max signal, most vehicles should work down into the forties or below however.

Scan- Press the scan and you should see a triangle below the scan button, this means you're scanning. There can be up to 10 channels in each scan list. To see what channels are programmed into the scan list for a certain channel, select that channel and hold the scan button, your radio will beep then you will see n pri in the top of the display, then turn your channel / mode selector to other channels any one that you see the n pri on is in that scan list.

Call - This button can be used to see your radios unit id. To do this press the call button then turn the mode knob until you see my id, your radio will then flash a 6 digit number always starting with a 7. This is your radios unit id in the system.

Del/sel - Allows you to temporally delete a channel from your scan list. This channel will be back in your scan list if you either turn scan off & on, turn your radio on & off, or change channels. To delete a channel from the scan list push this button while receiving traffic on the undesired channel.

Zone up/ Zone down - Allows you to select other groups of channels that are called zones.

45

The Spectra Astro was the initial radio issued to the majority of state users. This is an older generation radio that is being phased out, but there is still a significant number in the field used by agencies such as DOT.

Attachment 7

Motorola Handheld Radio Operation

Write in options programmed into your radio

The following is an example of typical programming in some Motorola portable radios. Your radio configuration may be different. Please consult your service provider for your programming configuration.

TOP CONTROLS:

- **Volume control:** Left knob
- **Zone Selection:** Rotary switch (center)
- **Scan on and off**: Two position concentric switch (under rotary switch) – Note: there will be a Z with an arrow in the display when scan is on.
- **ABC switch -** position C locks the keypad

SIDE BUTTONS:

- **Volume set tone:** Large purple button- Note: to set the volume hold this button in and adjust the volume to desired level.
- **Display light:** Side button 1 (single dot) –
- **Site display/search:** Side button 2 (two dot) –. A momentary press of the site button shows the current site the radio is tracking and the RSSI (received signal strength indicator), and a RSSI of 87 is max signal. You can also force the radio to look for a different site by holding the site button until the display says scanning.

MENU SELECTED ITEMS:

Note: if you do not see the desired item in your menu selections use the arrow keys until it is displayed

- **CHAN** – To select a channel press the [-] key below CHAN and then use your arrow keys to change channels, when you get to the channel you want momentarily press the home key to get out of the channel selection mode.

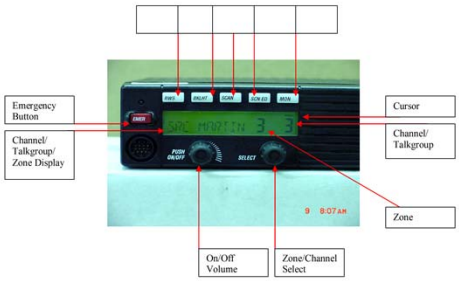
46

Like the Spectra Astro, the XTS3000 was the initial radio issued to the majority of state users. This is an older generation radio that is being phased out, but there is still a significant number in the field and is the primary radio in the state radio cache.

Attachment 8

EF Johnson 5300

The EF Johnson 5300 radio is a 50-watt dual modeVHF analog/trunked mobile radio, capable of 256 channels/talkgroups. **Write in options programmed into your radio.**



On/Off-Volume--Press knob in to turn radio on/off. Rotate for volume control.

Zone/Channel Select--Press knob in to move cursor over zone or channel. Rotate knob to select zone/channel.

Zone Display--A zone is a group of channels or talkgroups, radio has capability of 16 zones with 16 channels each.

Channel Display--Displays selected conventional channel or trunked talkgroup.

Cursor--Displays over which position the selector knob is active. Zone or channel/talkgroup.

Monitor Button(Conventional)--Enables/disables tone protection on conventional channels.
Scan List Select(Trunked)--Displays user editable scan lists(up to 16) when in trunked operation.

Scan Edit Button--Enables user to edit 16 scan lists of 16 channels each. By list either trunked or conventional.

Scan List Select(Conventional)--Displays user editable scan lists(up to 16) when in conventional operation.
Scan Button(Trunked & Conventional)--Enables/disables scan function on radio.

Backlighting--Allows user to change display lighting.

RWS(Radio-Wide Scan)--The only scan list that will scan both conventional and trunked channels. 16 ch fixed.

Emergency Button(Man down button)--Alerts dispatch centers and surrounding radio units of an emergency.

Display--Visual indication of channel/talkgroup/zone name presently selected.

47

EF Johnson has a line of radios that are currently the only other brand compatible with the statewide system. The new 5300 mobile radio maintains the same easy user interface in a highly improved radio.

Backlight - allows to adjust the back on the display in three (3) different adjustments
(off, medium, and high)

Emergency - self explanatory

External PA - can activate an PA speaker so you can listen to the radio outside the vehicle

Hi/Lo Power - ability to switch the radio from hi to low power when needed.

Home Zone - if someone should start going through the different channels or zones, allows and doesn't remember how to get back, you can push one button to get back to where you need to be.

Radio Wide Scan (RWS) - allows you scan a combination of 16 analog and digital channels

Remote Access - Allows you to turn on and off for example your Pyramid Repeater

RWS List Edit - allows you to edit you radio wide scan list

Scan - you could have 16 scan list with 16 channels per scan list on both analog or digital

Scan List Edit - allows you to edit your analog or digital scan list

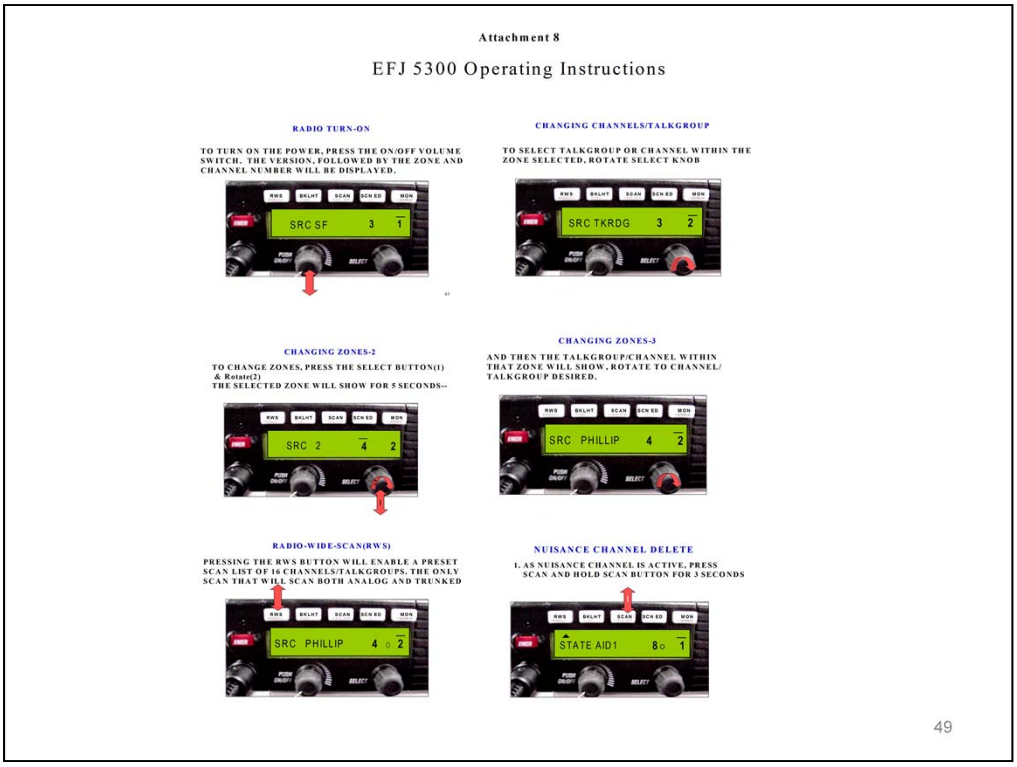
Scan List Select - allows you to select which scan list you would like to scan

Site Lock Function - allows you to lock the radio onto a pacific tower site

Site Search - allows you to check and see which tower you might be working off of, and what the tower strength is (RSSI Level)

48

This slide outlines some of the options for button programming on the EF Johnson mobile radios.

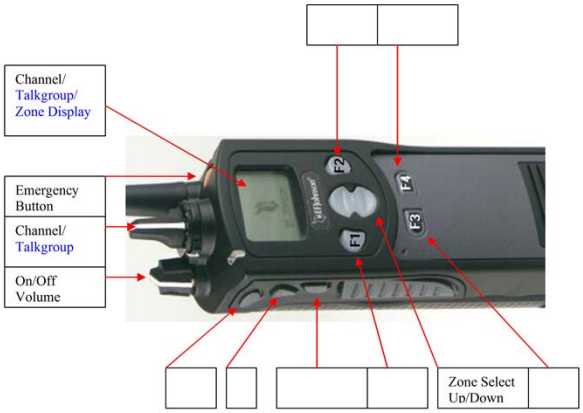


This is a basic overview of the functions of the EFJ 5300 mobile radio.

Attachment 9

EF Johnson 5100

The EF Johnson 5100 radio is a dual modeVHF analog/trunked portable radio, capable of 256 channels/talkgroups.
Write in options programmed into your radio



On/Off-Volume-- Rotate knob in to turn radio on/off. Rotate for volume control.

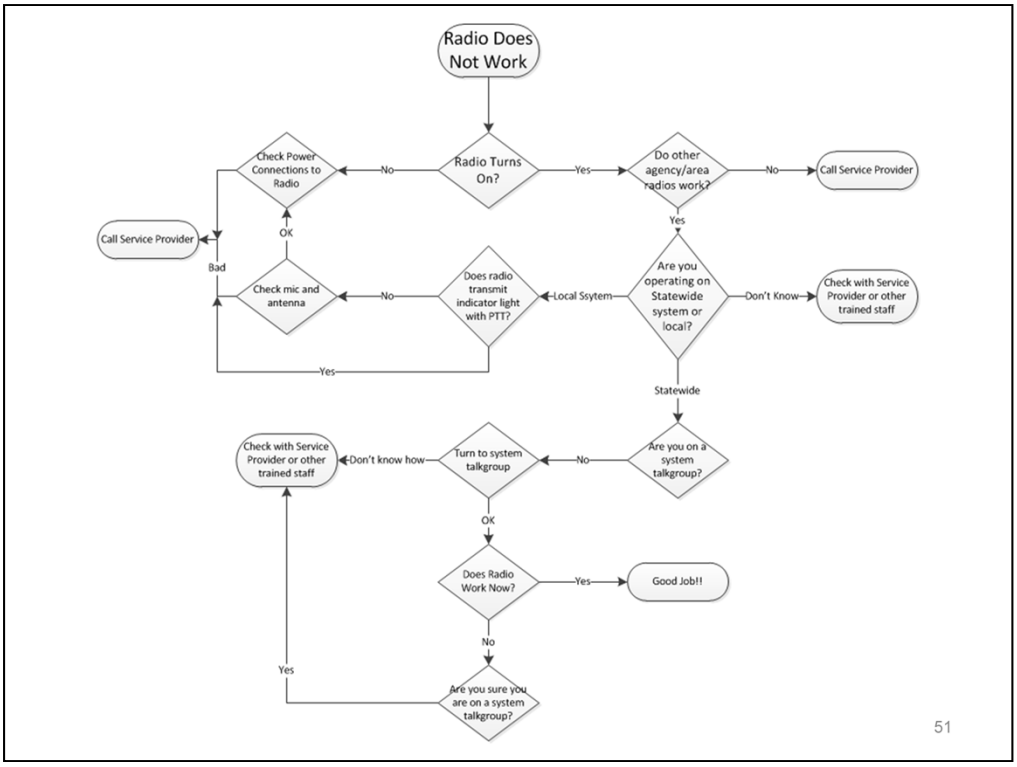
Zone Select--Press up/down to select zone. Rotate knob to select channel/talkgroups.

Emergency Button-- Alerts dispatch centers and surrounding radio units of an emergency.

Display--Visual indication of channel/talkgroup/zone name presently selected.

50

This is an overview of the EFJ 5100 portable. The radio button programming is flexible to meet the users needs.



There are some basic troubleshooting steps users should take before calling in the service shop. Many basic issues are easily addressed in the field and will keep downtime to a minimum.

Antenna issues and power connections comprise a significant amount of the issues encountered during radio repairs. A degraded or malfunctioning antenna will significantly reduce your available coverage, and a corroded power connection reduces the current capacity of the wire to the radio, reducing available power to be transmitted.

The single approach that will help you isolate your radio issues is ask around if other radios are working. If all of your department radios are not working, it could be an install or programming issue, ask other departments. Check with HP or DOT to see if their experience is the same as yours, as those radios get more maintenance than most. If some work and some don't it is probably not a system issue. If all radios have the same issue as yours, please check with dispatch or the system manager to see if there are system issues.