



South Dakota Radio System Communications Radio User Course



2012



I. Introduction

1940's



2012

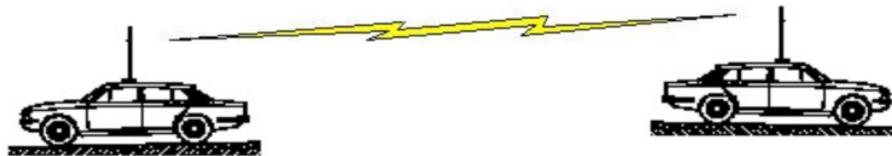


Dating back to the 1940's the state has had a communications system based upon lowband technology (39mhz). The characteristics of lowband provide for excellent range, but lowband is very susceptible to outside interference. In the 1960's and 1970's, local governments began the migration to other spectrum 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.

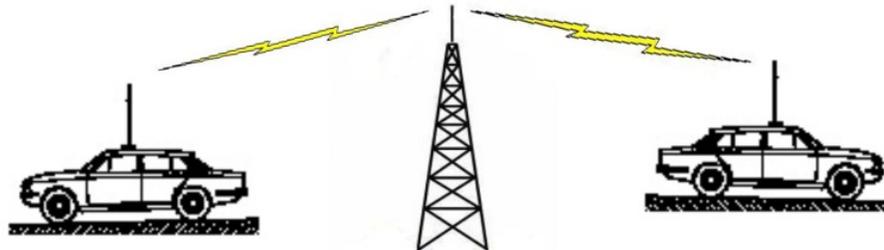
Basic Radio Technology

Starting in the late 1920's, radio technology for public safety agencies was first put into use. This technology involved the radio (base or mobile) and antenna, and a user. This basic form of communication is still in use today with fire ground channels and other car to car channels.



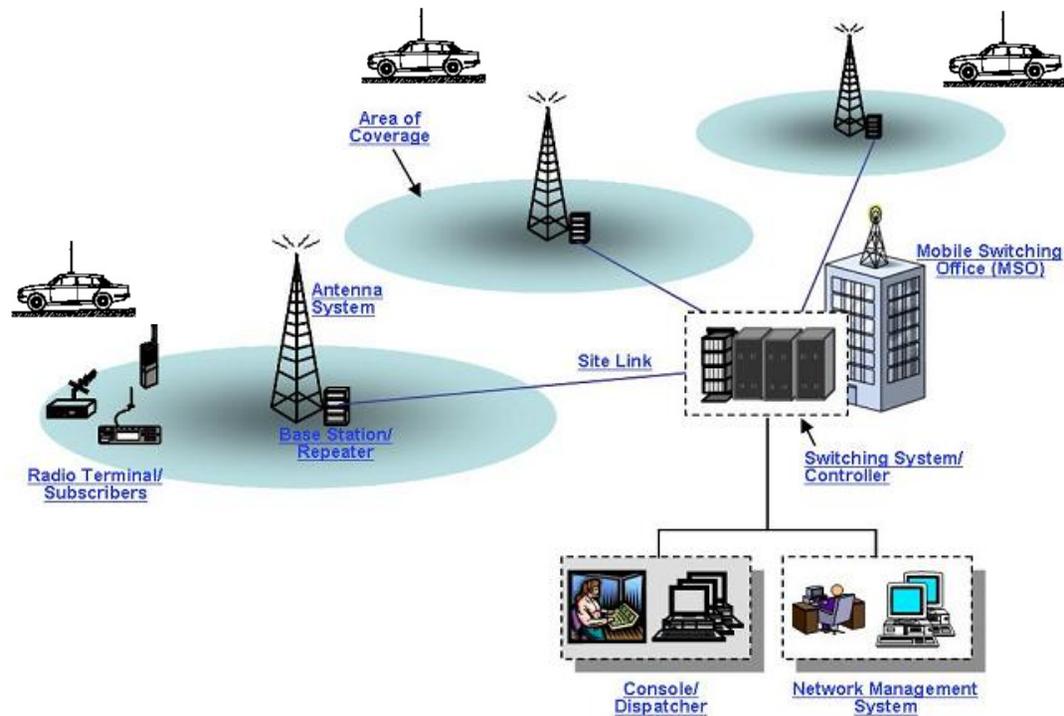
Repeater Radio Technology

Starting in the 1960's, repeater radio technology for public safety agencies was being integrated into operations that required a larger coverage footprint. This technology involved the radio (base or mobile), an antenna, a user, and a tower that "repeated" the communications over a much larger geographic area. This form of communication allowed coverage over an entire town, or even county, where the original radio technology was limited to 15 miles or less. This technology is the basis for modern communications in use today. An example of this technology might be a county Civil Defense system.



Trunked Repeater Radio Technology

Starting in the 1970's, trunked (networked) repeater radio technology was introduced to provide coverage to even larger areas, such as multiple counties or even statewide. This technology takes the repeater technology and networks the sites to a central controller that allows radio traffic to be transmitted to and from anywhere in the coverage pattern of the connected sites. The technology at the sites and at the central controller level allow radios to "roam" from tower to tower without the operator needing to change channels. This is the technology used in the South Dakota Statewide digital system.



Question:

Why Should I Know What Type of System I Am On?

Answer:

All Radios Capable of Operating on the Digital System Can Communicate on All Three Technologies. Your Radio Will Operate Differently For Each Technology. Here Are the Differences:

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Basic Radio Technology



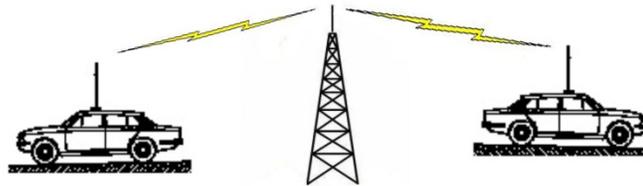
Purpose: Typically used for operations in an immediate area, such as fire ground.

Operation: Radio to radio direct.

Range: 2-15 miles depending upon radios and topography

Notes: Small area operation, when you move outside of the range of radio to radio, communications are done. If scanning in this mode, you can also monitor available repeater traffic, but not effectively trunked traffic.

Repeater Radio Technology



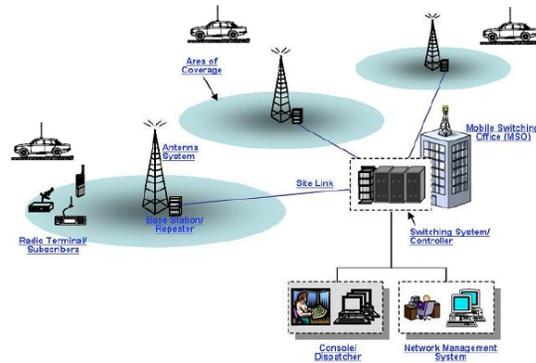
Purpose: Typically used for operations in a city or county-wide area, such as a Civil Defense system.

Operation: Radio to radio through a tower that repeats or “boosts” the signal.

Range: 15-30 miles from the repeater tower site, depending upon radios and topography.

Notes: Medium area operation, when you move outside of the range of repeater tower, communications are done. If scanning in this mode, you can also monitor available basic traffic, but not effectively trunked traffic.

Trunked Repeater Radio Technology



Purpose: Typically used for operations in a large area, such as city-wide to state-wide.

Operation: Radio to radio through a system of networked repeaters or “boosters. The central controller is in constant communication with the radios through the sites and directs traffic to those radios with common digital channels selected.

Range: Radios will remain connected within the entire coverage area of the connected sites.

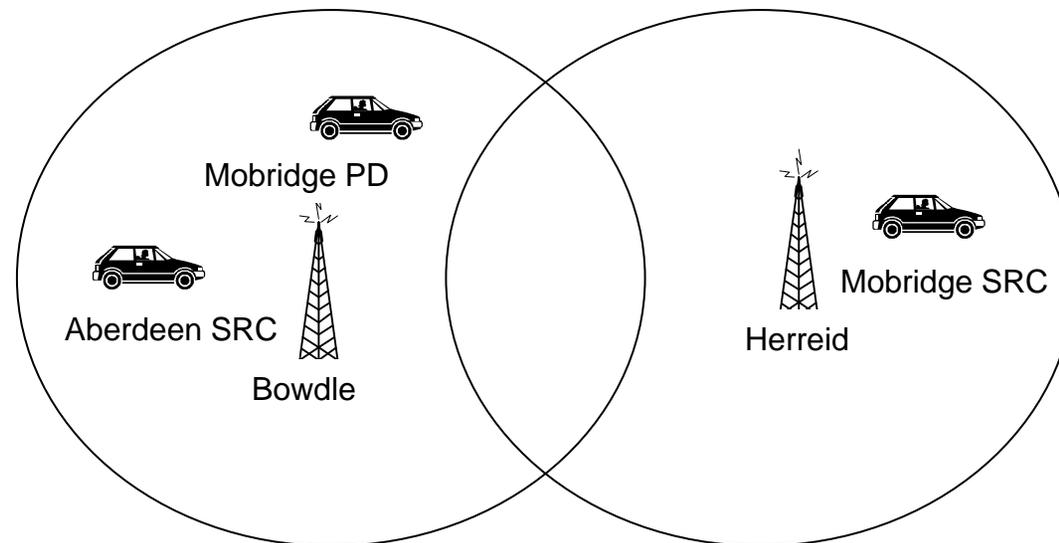
Notes: Large area operation. Your radio should roam from site to site without intervention. If scanning in this mode, you can monitor available digital traffic, but not effectively basic or repeater traffic. The following slide will try to explain

Scanning on a Trunked System

On trunked systems, as radios roam from the coverage of one tower to another, they check in on the new tower and check out from the old. The central controller tracks this as well as the digital channel selected on the radio. The central controller will route radio traffic only to sites with a radio registered that has a particular digital channel selected. As you may or may not know what tower your radio is talking to, your main concern needs to be the digital channel you have selected. If other radios are tuned to the same digital channels, you will hear them and they will hear you, anywhere in the state. Scanning other digital channels, however does depend upon which tower they are on.

In the following diagram, units with digital channels Mobridge PD and Aberdeen SRC are the only units operating on the Bowdle tower, and a unit with digital channel Mobridge SRC is the only unit on Herreid. The system will route calls to the Bowdle tower only for the Mobridge PD and Aberdeen SRC digital channels, and to Herreid only for the Mobridge SRC digital channel. The two units on Bowdle can hear each other if their scan is set up to allow that, but will not hear traffic sent to the Herreid tower. These same digital channels can be in use on towers across the state and will be routed accordingly, but for these two sites the active digital channels will be the only traffic received.

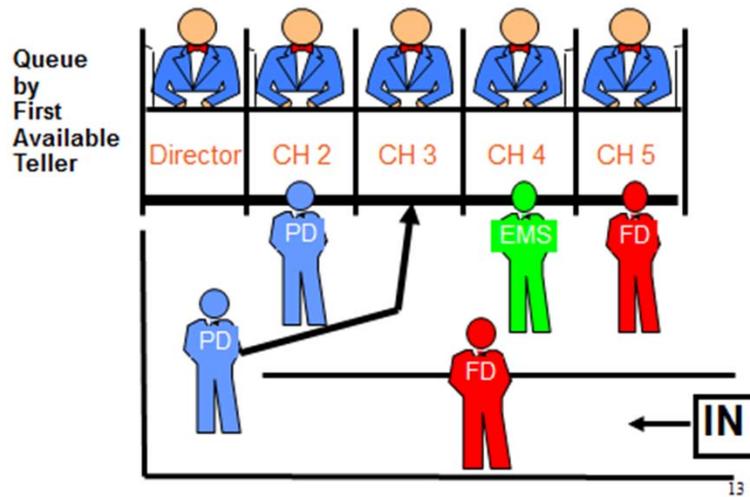
If one car from each tower drove into the overlap area, they could potentially stay registered with the same site, park next to each other and still not hear each other.



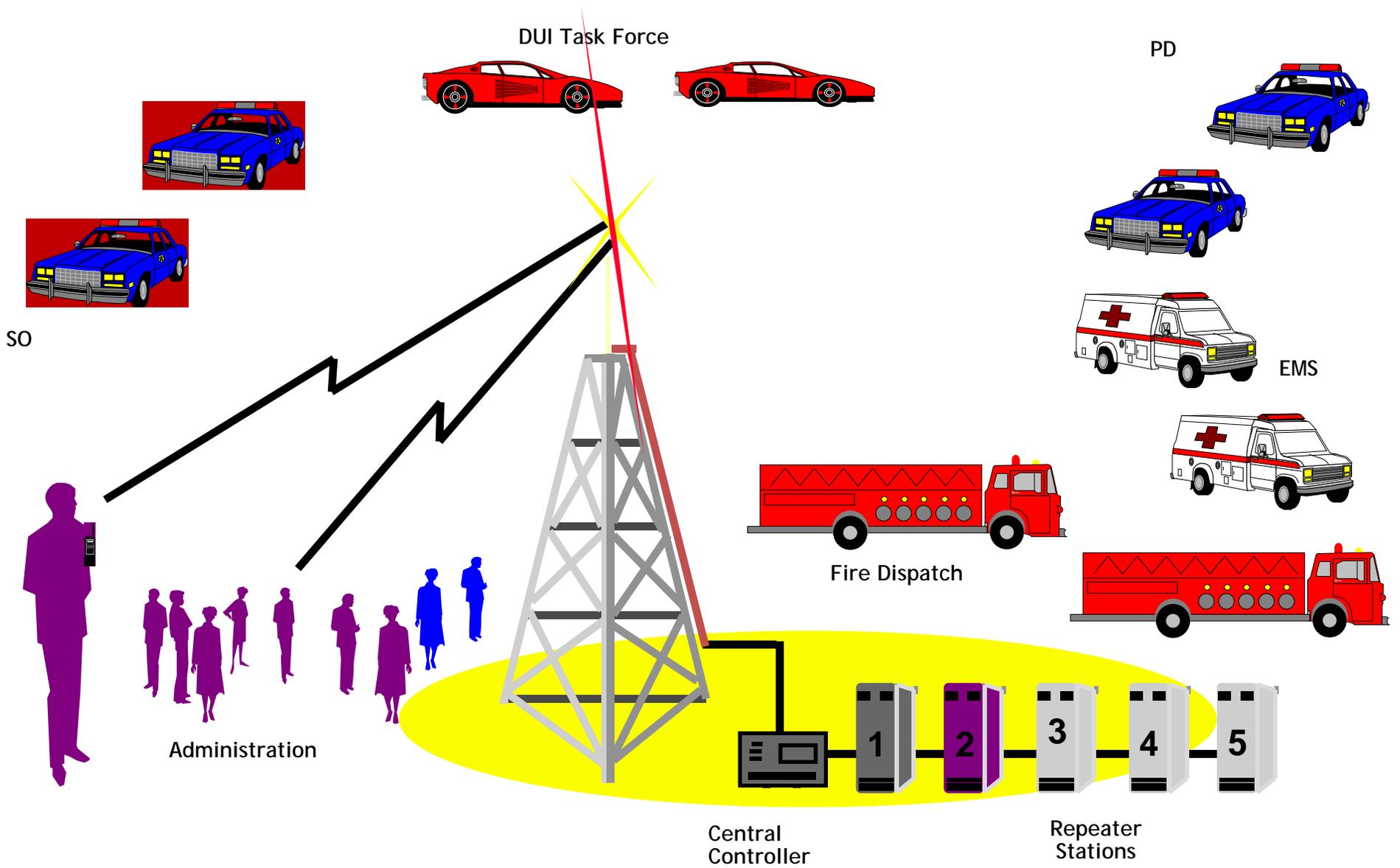
Trunked Radio Systems

Trunked radio systems were developed to make the most efficient use of the resources at the towers. Instead of having a specific base/repeater for law, fire, EMS, utilities, etc., the available repeaters at the sites (3 to 9) are “pooled” and assigned as radios key up and need a talk-path for a digital channel. The central controller also takes that traffic and routes to all other sites in the system that have that particular digital channel selected. With the South Dakota statewide system, sites are shared by local, tribal, state, and federal users, most of the time unaware that others are on the site.

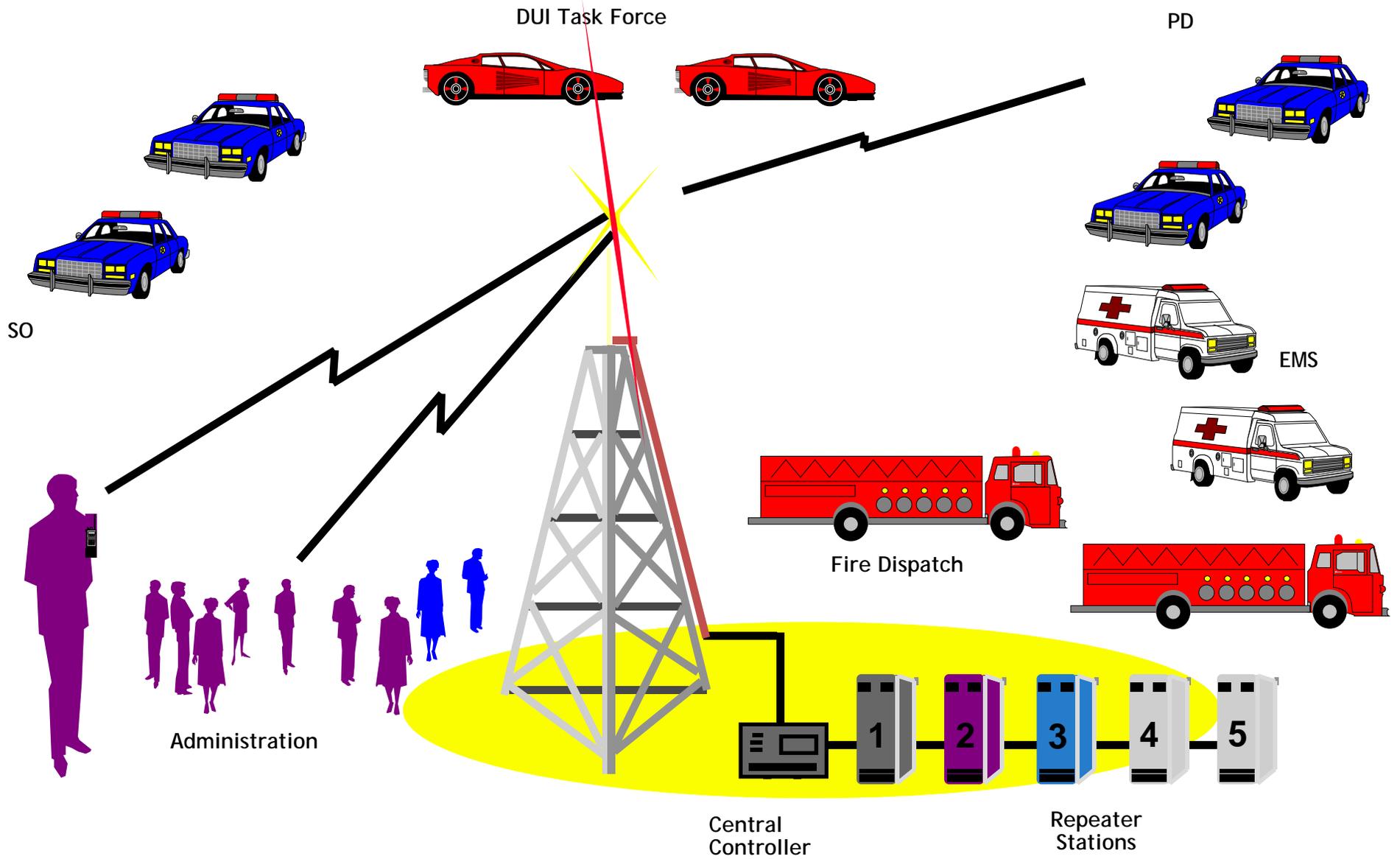
Your Bank Tellers – as “Trunked”



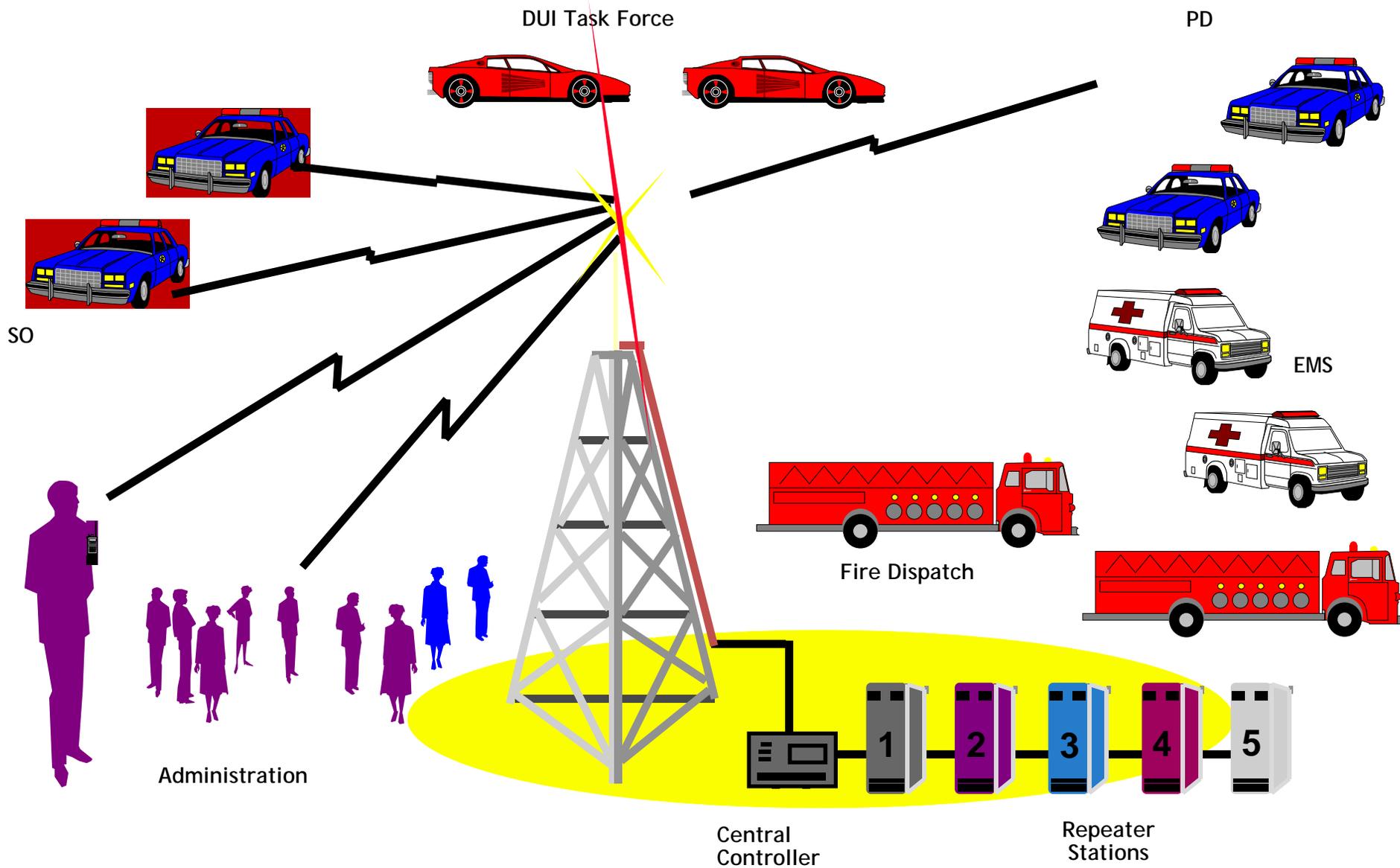
Admin radios active, central controller chooses repeater 2



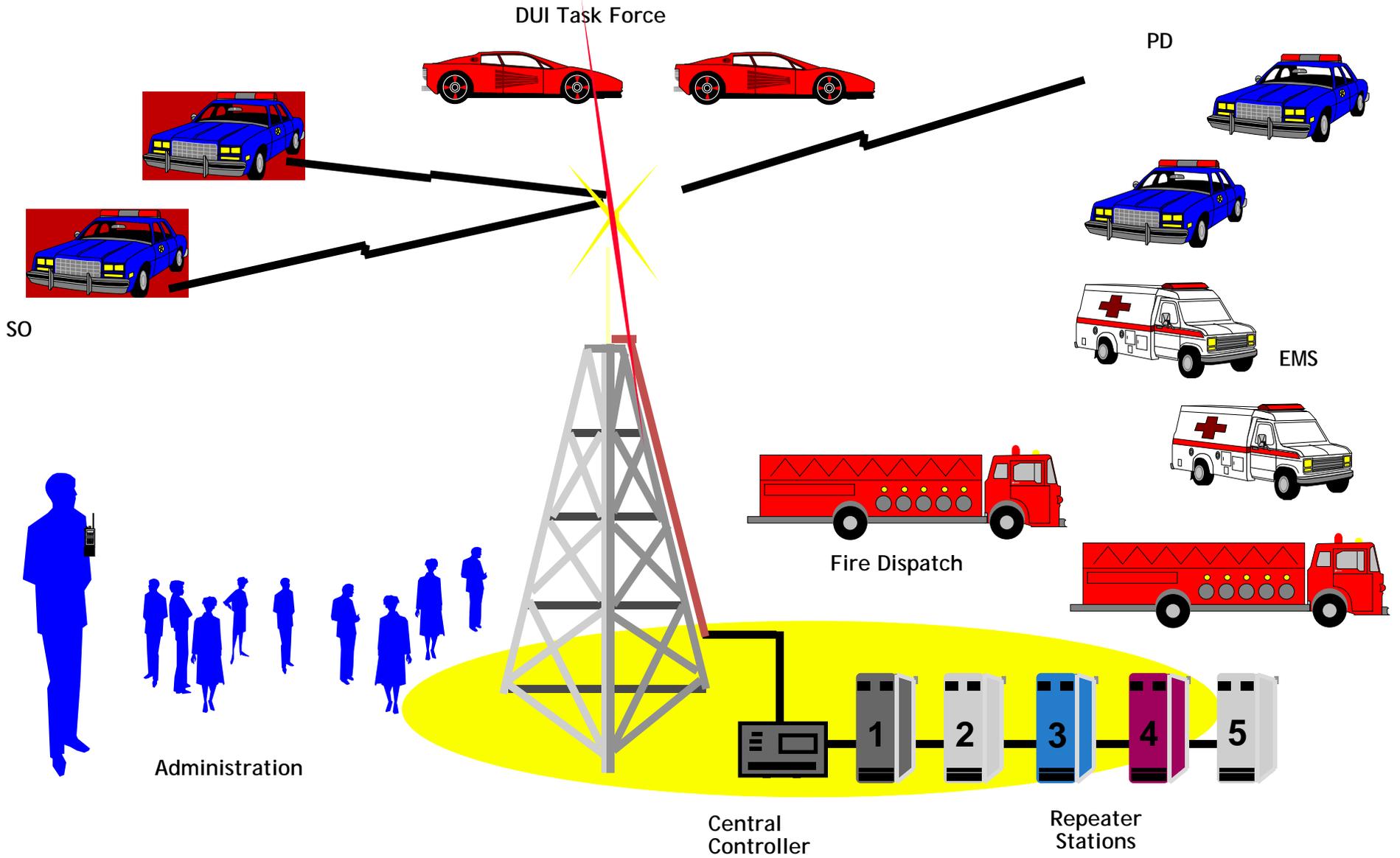
Admin radios active, central controller chooses repeater 2
PD radios active, central controller chooses repeater 3



Admin radios active, central controller chooses repeater 2
SO radios active, central controller chooses repeater 4
PD radios active, central controller chooses repeater 3



Admin radios inactive, frees up repeater 2
SO radios active, central controller chooses repeater 4
PD radios active, central controller chooses repeater 3



f. Sounds Associated With a Trunked Radio System.

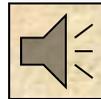
The sounds associated with your radio are very important. These help you to recognize what is happening with your radio, and also when you are experiencing problems with the radio or system.

There are three radio sounds to be familiar with:

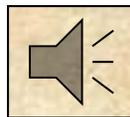
- The "Chirp" you get when you push the transmit button lets you know it is OK to talk. You need to wait for this sound before talking.



- 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.

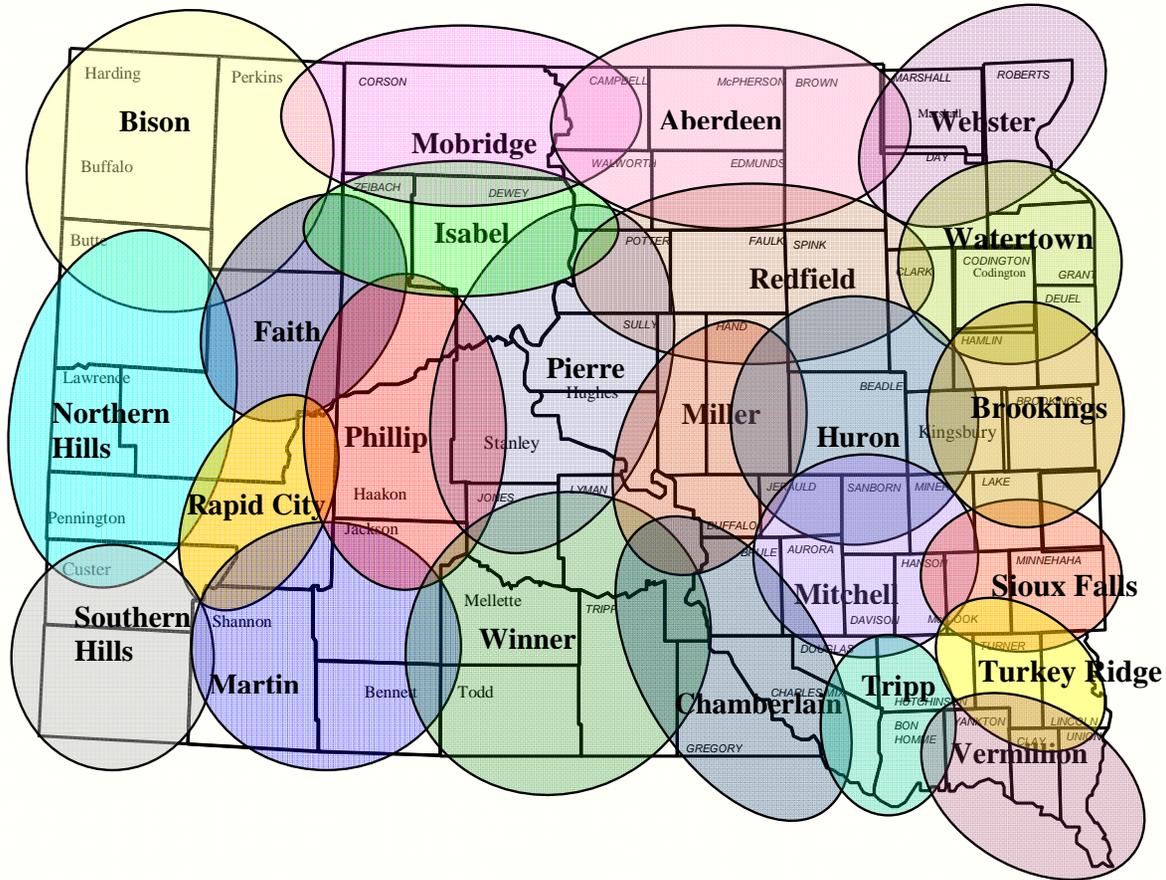


OPERATIONAL PROTOCOL SUMMARY

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.

Rough Guide for SRC/Interagency Talkgroups



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.

Statewide Digital Channels

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

2. INT (Interagency) talkgroups - are intended for any interdepartmental radio communications. Due to the potential for high 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 operational 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:

<u>Talkgroup</u>	<u>Radio Display</u>	<u>Intended Use</u>
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

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:

<u>Name</u>	<u>Requested Sites</u>
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

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:

<u>TALKGROUP</u>	<u>RADIO DISPLAY</u>	<u>INTENDED USE</u>
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

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:

<u>TALKGROUP</u>	<u>RADIO DISPLAY</u>	<u>INTENDED USE</u>
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:

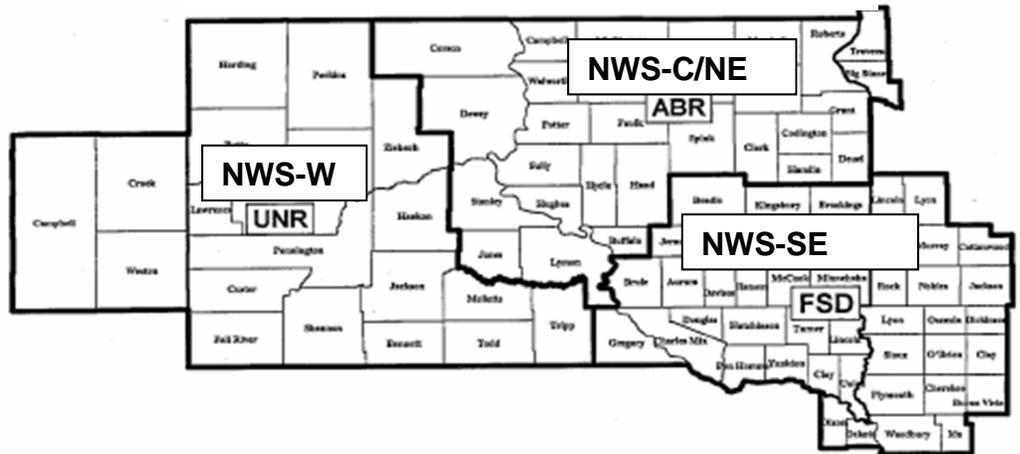
Pierre-- 605-773-3536
Huron-- 605-353-7132
Rapid City-- 605-393-8121

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:

<u>TALKGROUP</u>	<u>RADIO DISPLAY</u>	<u>INTENDED USE</u>
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



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:

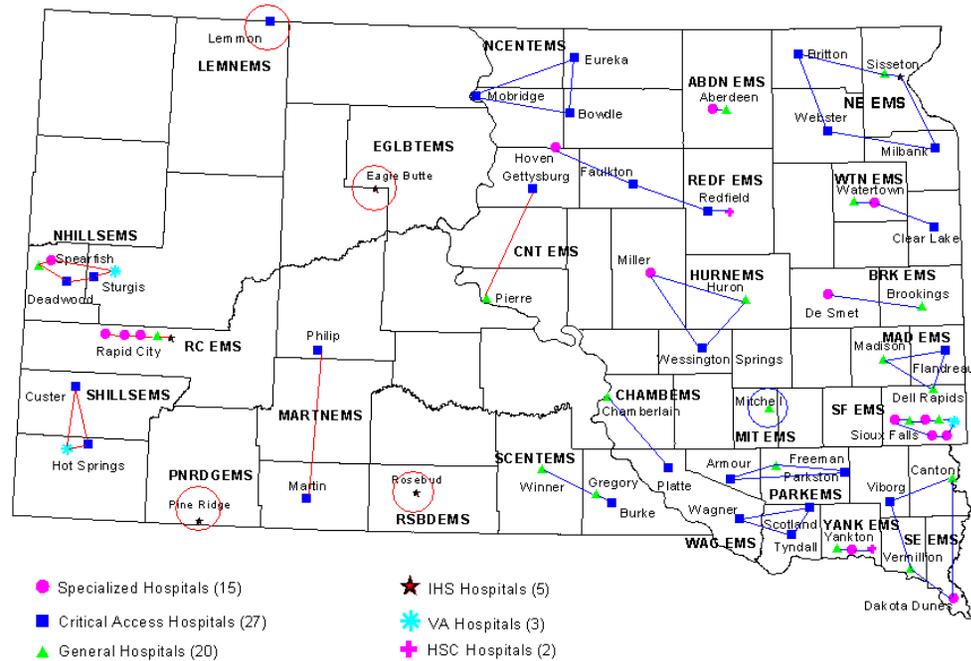
Radios provided by the South Dakota Department of Health to facilities in the state have been pre-programmed with various local and regional talkgroups. These Talkgroups are in place so public safety agencies (primarily ambulance services) would be able to predict the talkgroup the receiving facility 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.

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



SDCL 34:12

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7. AGENCY TALKGROUPS

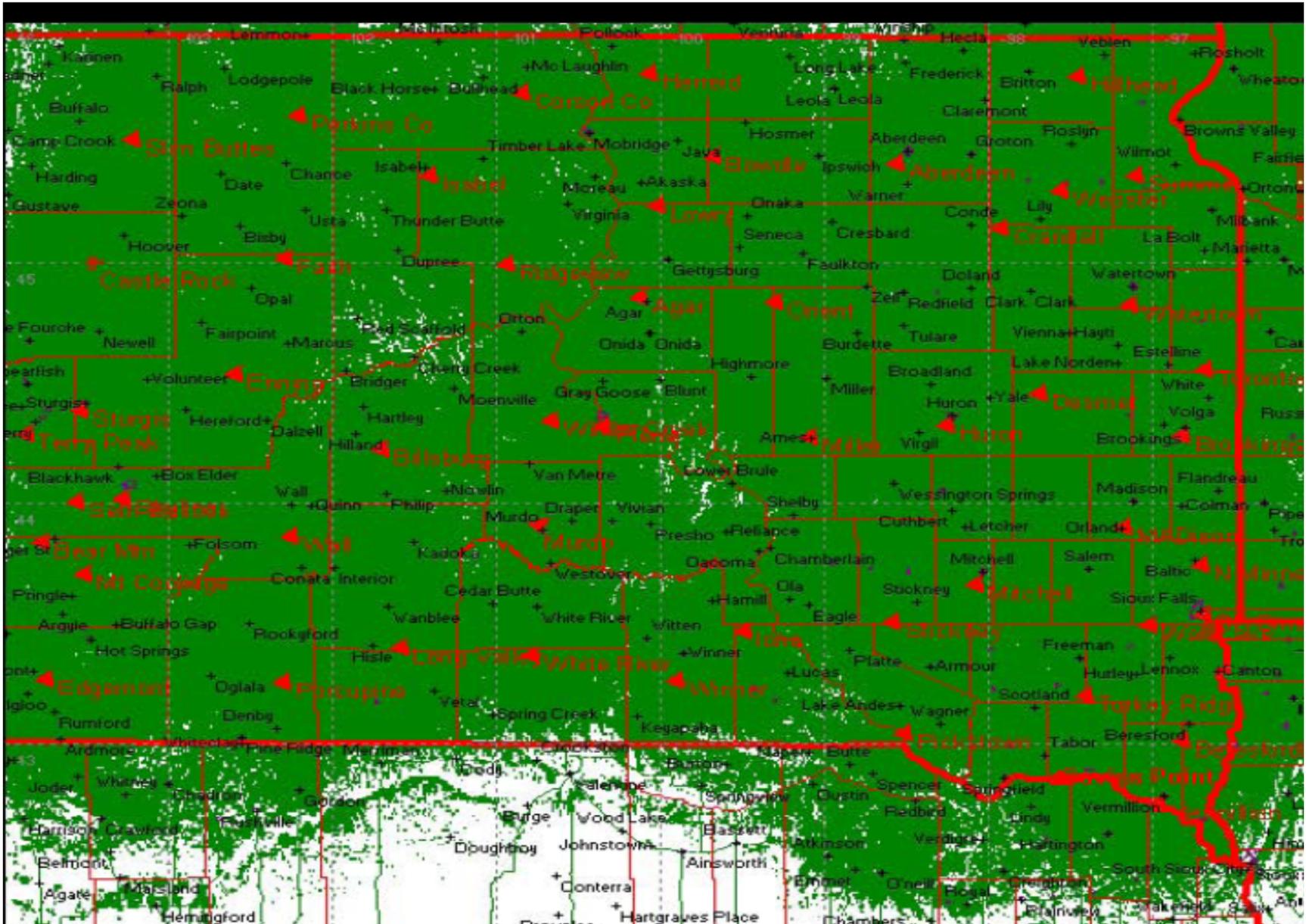
Each agency is considered as "owner" of the private talkgroup assigned to them. Agencies are expected to use the talkgroups assigned to the department for all interdepartmental traffic. Policies and procedures for the use of the agency talkgroup are at the discretion of the department, within the technical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

8. National Analog Interoperability Channels

The national interoperability channels are analog channels that are designated as national mutual aid channels. These can be programmed into radios and used without licensing with the exception of those channels below with a “repeater” in the use column. These channels were also available to be licensed before this designation, so the column to the right shows where we have those licensed and use should be limited of that channel in that area.

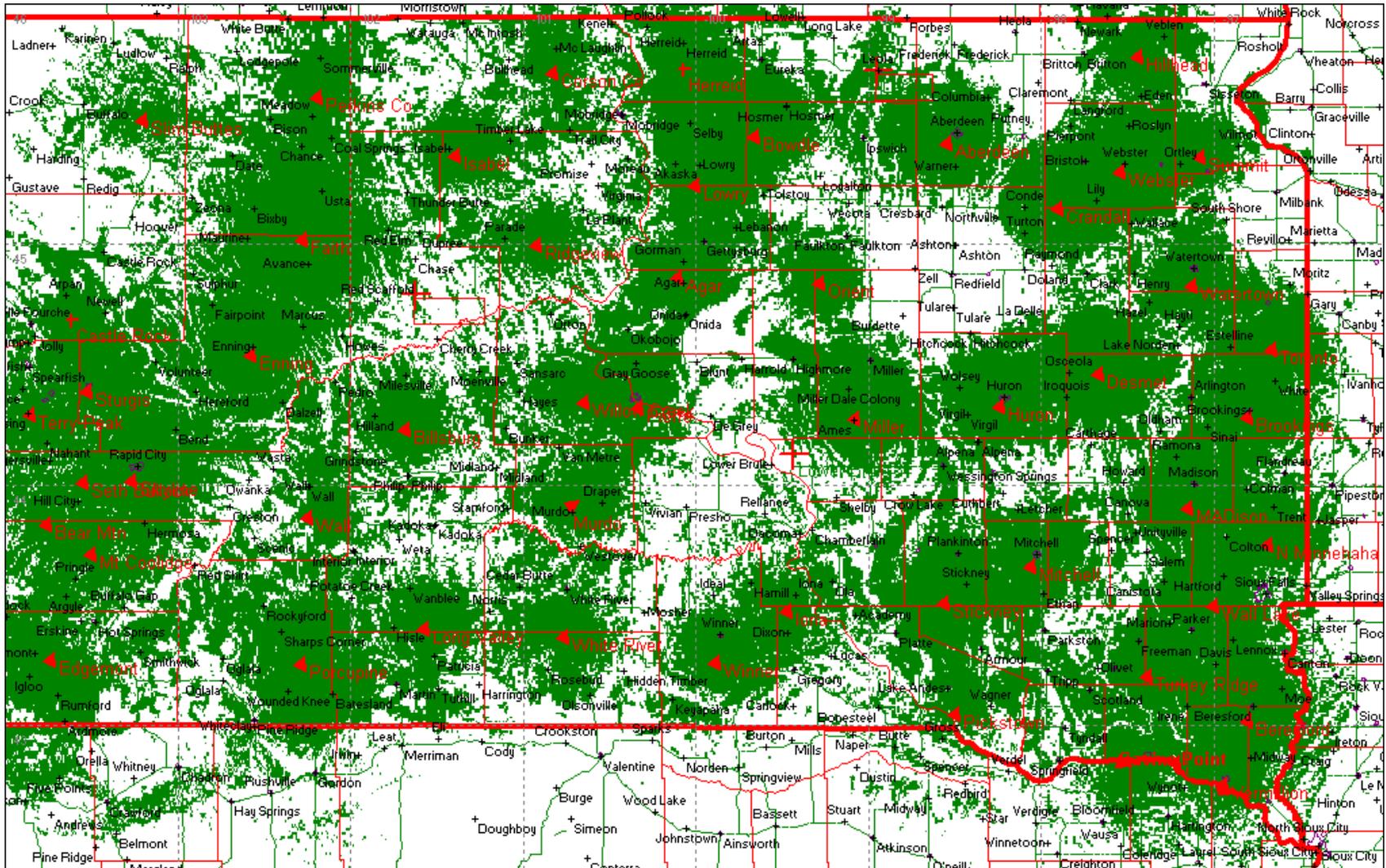
Channel Name	Use	RX Frequency	Tone	TXFrequency	Tone	Limitation (No in red areas)
M/A RPTR	Off-net mutual aid repeater	156.0150	100.0	149.8375	100.0	Where available
M/A DIR	Car to Car	156.0150	100.0	156.0150	100.0	
VCALL10	National emergency car to car	155.7525	none	155.7525	156.7	
VTAC11	National emergency 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 Aberdeen, Bear Mtn, Rapid City,
VTAC17	National emergency repeater	161.8500	none	157.2500	156.7	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* Pickstown, Rapid City, Summit,
VTAC36	National Tactical Repeater	151.1375	none	159.4725	136.5	Beresford, Long Valley, Miller *
VTAC37	National Tactical Repeater	154.4525	none	158.7375	136.5	Summit * Pickstown, Rapid City, Summit, Beresford, Long Valley, Miller *
VTAC38	National Tactical Repeater	158.7375	none	159.4725	136.5	
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

2012 Sites Mobile Coverage

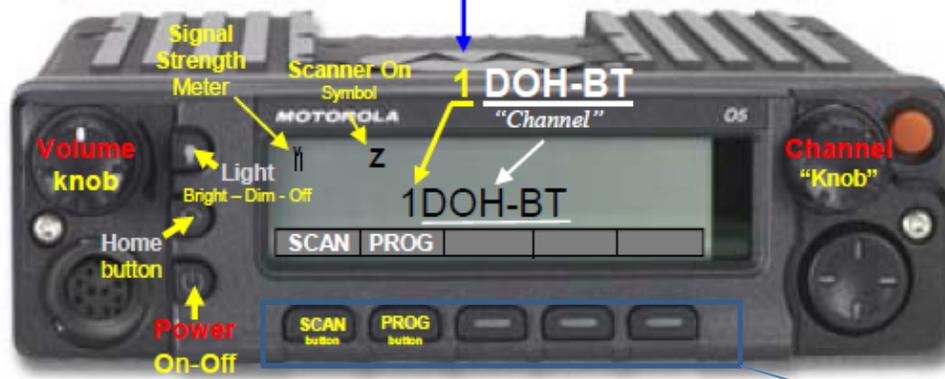


Attachment 10

Predicted Portable Coverage



The First symbol in the display is the **Zone #** followed by the **Talkgroup** or **Channel** selected



Option Buttons

Motorola XTS-5000 "Quick-Guide" DOH Portable Digital Radio

On-Off Volume knob

Turn the **"Zone knob"** to change **"Zones"** (1,2,3, etc.)

○ Scanner **on**
 ∅ Scanner **off**

A-B-C switch used to select which **"talk-groups"** to scan

Screen Light on & off

Push to Talk

Scan On

Speaker-mic. has a Rotating **"Swivel Clip"** in the back

Speaker -Microphone Volume knob

time Z battery
 signal strength
 1 DOH-BT

Zone # **Talk Group**

How to Change "Talk Groups" and "Channels"

1. Turn the **Zone knob** to the **"Zone"** where that Talk Group is located.
2. Press the button (you will see a "talk group" blinking).
3. Click the 4-way **Toggle Switch** **"left or right"** to change **"Talk Groups"**.
4. When you get to the channel you want press the **"home"** button and your **"Talk Group / Channel"** is now changed.

4-way Toggle Switch to change **"Talk Groups"** or **"Channels"**

On-Off
Volume knob



Turn the "Zone knob" to change "Zones" (1,2,3, etc.)

A-B-C rotating plate used to set-up a "custom" scan

1. Keep on "A" for normal operations
2. The "noogie" to rotate the plate is found on the back part of the plate.



Speaker-mic. has a Rotating "Swivel Clip" in the back

Speaker -Microphone Volume knob

Push to Talk

Zone #

Signal Strength Scan On

time Y III Z battery
1 DOH-BT
CLCK CHAN SCAN

Talk Group Or Channel

Screen Light On & Off

4-way Toggle Switch to change "Talk Groups" or "Channels"

Scanner Tips:

- Each Zone has a pre-programmed scan list installed by the dealer for your agency.
- Just turn to that zone & put "On" the scanner to scan those channels.
- You have a few seconds to talk directly to a channel that pops up on your scanner, before it reverts back to scanning channels again.

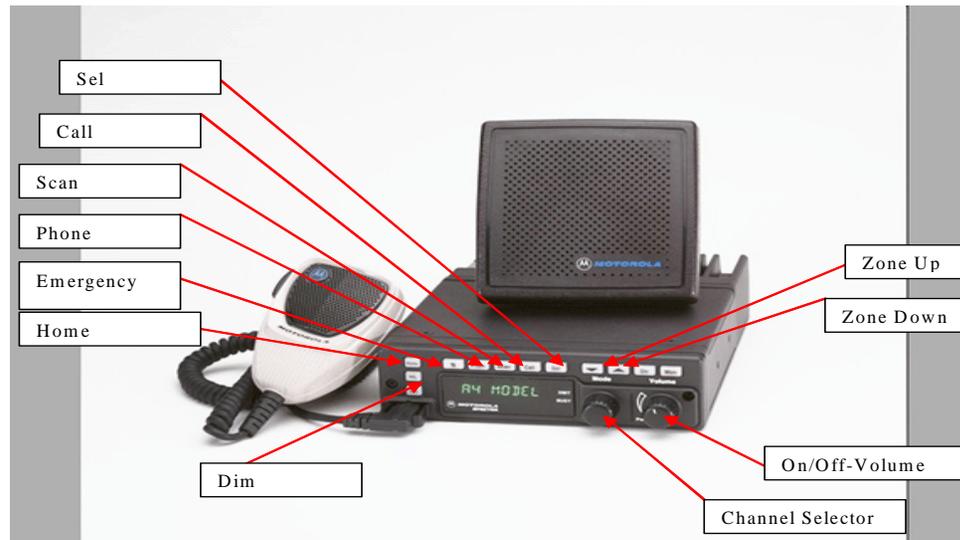
How to Change "Talk Groups" OR "Channels")

1. Turn the Zone knob to the "Zone" where that Talk Group is located.
2. Press the  button (you will see a "talk group" blinking).
3. Click the 4-way Toggle Switch "left or right" to change the "Talk Group".
4. When you get to the channel you want press the  "home" button and your "Talk Group / Channel" is now changed.

Motorola XTS-2500 "Quick-Guide" for DOH Portable Digital Radios

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 temporarily 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.

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:

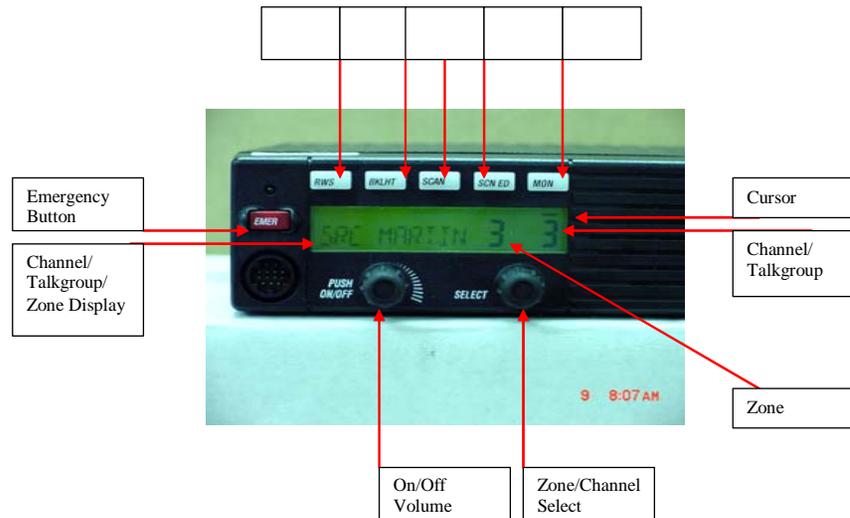
Note: if you do not see the desired item in your menu selections use the arrow keys until it is displayed

- **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.

Attachment 8

EF Johnson 5300

The EF Johnson 5300 radio is a 50-watt dual mode VHF 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.

Attachment 8

EFJ 5300 Operating Instructions

RADIO TURN-ON

TO TURN ON THE POWER, PRESS THE ON/OFF VOLUME SWITCH. THE VERSION, FOLLOWED BY THE ZONE AND CHANNEL NUMBER WILL BE DISPLAYED.



CHANGING CHANNELS/TALKGROUP

TO SELECT TALKGROUP OR CHANNEL WITHIN THE ZONE SELECTED, ROTATE SELECT KNOB



CHANGING ZONES-2

TO CHANGE ZONES, PRESS THE SELECT BUTTON(1) & Rotate(2)
THE SELECTED ZONE WILL SHOW FOR 5 SECONDS--



CHANGING ZONES-3

AND THEN THE TALKGROUP/CHANNEL WITHIN THAT ZONE WILL SHOW, ROTATE TO CHANNEL/TALKGROUP DESIRED.



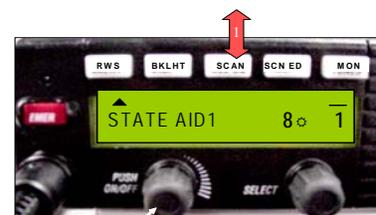
RADIO-WIDE-SCAN(RWS)

PRESSING THE RWS BUTTON WILL ENABLE A PRESET SCAN LIST OF 16 CHANNELS/TALKGROUPS. THE ONLY SCAN THAT WILL SCAN BOTH ANALOG AND TRUNKED



NUISANCE CHANNEL DELETE

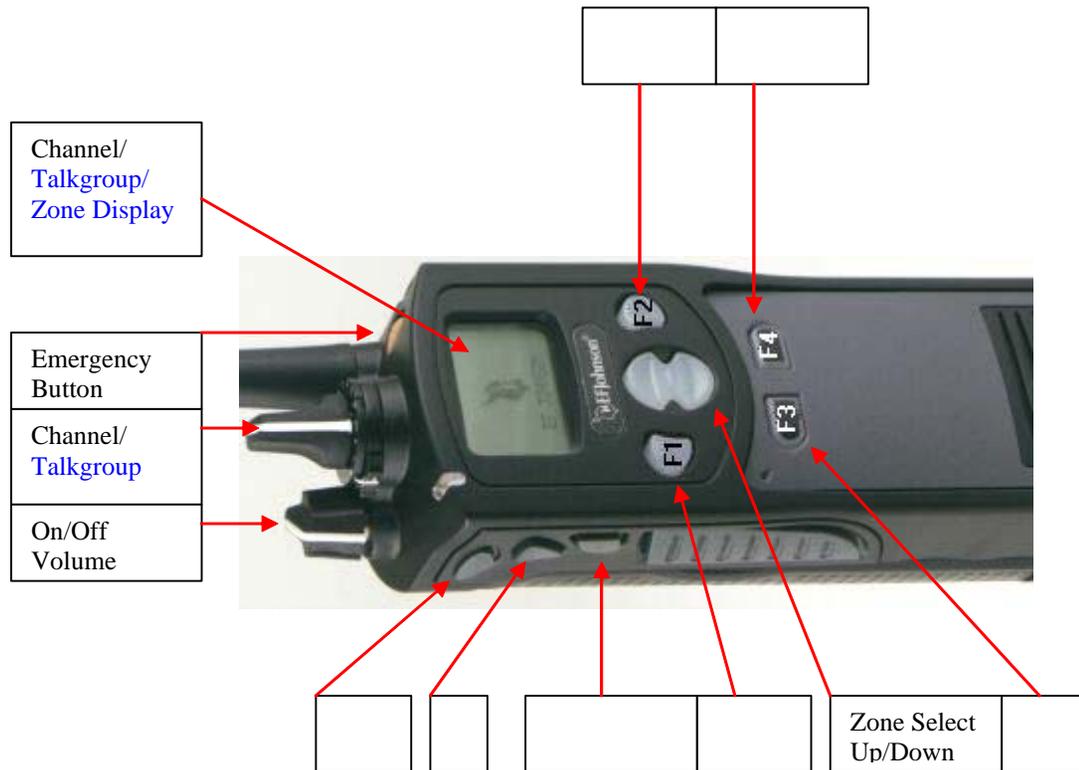
1. AS NUISANCE CHANNEL IS ACTIVE, PRESS SCAN AND HOLD SCAN BUTTON FOR 3 SECONDS



Attachment 9

EF Johnson 5100

The EF Johnson 5100 radio is a dual mode VHF 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.

