Fire Communications

9

San Diego County Emergency Communication Systems

Metro Zone Emergency Command & Data Center (ECDC)

Radio Communication Systems

Data & Telephone Communication Systems

Standardized Communication Signals

Revised - December 2018

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- Differentiate between a primary and secondary PSAP

- Describe other PSAP's in San Diego County

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- Identify the difference between command and tactical channels

- Describe the difference between portable and mobile radios

- Understand the function and capabilities of the 800 MHz Radio System

- Understand the function and capabilities of the VHF Radio System

- Understand the SDFD Radio Communication Procedures

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- Describe the purpose and uses of department computers, cell phones and landlines.

- Describe the standardized signals used by the SDFD

- Describe the function and purpose of the San Diego County Mutual Aid Network

- Identify the zones in the San Diego County Mutual-Aid Network

Introduction

This section covers the communication principals and equipment that are utilized during emergency and non-emergency operations by the fire service. A standardized and effective communication system is essential to the coordination and containment of an incident, as it enables firefighters to properly respond to and handle emergency situations. It is important for firefighters to understand the communication principles and techniques used in the fire service, such as how alarms are received and dispatched, communication equipment and radio procedures, as well as standard hand signals used for backing vehicles.

Effective communication by firefighters is a small part of emergency incident management, but it is a crucial part. Proper communication can mean the difference between the quick, coordinated and safe handling of an incident, or an escalating disaster.

Important San Diego County PSAP's

Name	Type	Service Areas
California Highway Patrol	Primary	Highways and State Property
Harbor PD	Primary	San Diego Port District & Airport Authority
San Diego PD	Primary	San Diego City Property
San Diego Sherriff's Office	Primary	San Diego County Property or Contract Cities
Heartland Fire	Secondary	East County Cities (El Cajon, La Mesa, etc.)
Monte Vista (MVU)	Secondary	SD County property served by CALFIRE
North Comm	Secondary	North County Cities (Del Mar, Encinitas etc.)
San Diego Lifeguards	Secondary	San Diego City Coastal Areas & Mission Bay
San Diego Fire (METRO)	Secondary	San Diego, Poway, Chula Vista, San Pasqual
USFS	Secondary	San Diego Federal Property

Public Safety Answering Points PSAP

When 911 is dialed to report an emergency, the phone call is routed to a primary Public Safety Answering Point (PSAP) based upon the location of the emergency. If the emergency is occurring in the City of San Diego, the primary PSAP receiving the call is the San Diego Police Department. In other cities and areas of the county, the primary PSAP may be the pre-designated local police department or the San Diego Sheriff's Department. Because a cell phone may not be quickly pinpointed by its geographic location, when 911 is accessed via a cell phone, the primary PSAP receiving the call is the California Highway Patrol.

The primary PSAP is responsible for triaging the phone call to determine if police, fire or medical service is required. In the City of San Diego, if it is determined that the nature of the emergency is medical or fire, the call is transferred to a secondary PSAP, which is the Metro Zone Emergency Command and Data Center (ECDC). The Metro Zone ECDC is just one of several secondary PSAP's used in San Diego County, the others being San Diego Lifeguards, Heartland Fire and North County Dispatch (North-Comm). In an effort to consolidate resources, primary and secondary PSAP's may dispatch for several agencies. For example, the Metro Zone ECDC dispatches for San Diego, Chula Vista, Poway, Coronado, and Imperial Beach Fire Departments.

NOTE: In March of 2016 the San Diego Fire Communication Center (FCC) formally changed its name to the Metro Zone Emergency Command and Data Center or ECDC. You still may see references to "San Diego" instead of "Metro" in some documents or resources, however, moving forward the proper terminology shall be the latter.

Metro Zone Emergency Command & Data Center (ECDC)

The SDFD has a Computer-Aided-Dispatch (CAD) system, primary and secondary radio communication networks, an uninterrupted power supply system (UPS) and a diesel generator to support sustained operations in the event of a catastrophic event. The Metro Zone ECDC also has a conference room which has been dubbed the "Fish Bowl" Figure 9-1. This room provides a secure environment and centralized location for Chief Officers and staff to convene in order to assist with all phases of major emergencies and disasters, special events or periods of high activity, Link 9-1.

In addition to dispatching emergencies, The ECDC is responsible for tracking and maintaining all communication devices, such as the Mobile Data Computers, VHF and 800MHz mobile and portable radios, as well as pagers.

Located within the Metro Zone Emergency Command and Data Center are the Fire Department call-takers and dispatchers, the San Diego Emergency Medical Services ALS/BLS call-takers and dispatchers, the response planning section and the SDFD Geographic Information Source representative. In addition, the communication center administration and support personnel also work at the Metro Zone ECDC.

The ECDC is under the direction of the Assistant Fire Chief of Support Services. The Communications Manager is a civilian position, equal in rank to a Deputy Chief, and is the administrator of the operations, budget, purchasing and employment of the civilian dispatchers.

Link 9-1 Operations Manual SI 2, Section 4 - DOC

Computer Aided Dispatch System

In the past, the Dispatch Center relied solely on phones and radios to dispatch and coordinate information with emergency crews. Computers have now changed the world of dispatching. The San Diego Fire-Rescue Department utilizes a state-of-the-art Computer Aided Dispatch (CAD) system. The CAD system allows the ECDC staff to initiate a response to emergency calls integrating six different technologies: Alpha-numeric paging, Fire station alerting, Mobile Data Computers (MDC), Automatic Vehicle Locators (AVL), 9-1-1 Telephone system, and the 800 MHz and VHF radio communication system.

Alpha-Numeric Paging

Each Fire Captain and Engineer on an engine or truck company, as well as each paramedic and EMT on an ambulance, wear a pager that receives emergency dispatch information, system wide messaging and single unit messages, Figure 9-1.

Figure 9-1 Alpha-Numeric Pager

Fire-Station Alerting

Fire station alerting is the audible tones that go off in the station to alert units that they have an emergency response. The audible tones can be customized for specific apparatus in the station such as an engine or truck company. The alerting tones are then followed by the opening of the station radio speakers which dispatch the information.

Mobile Data Computers

Mobile Data Computer terminals on Fire/EMS apparatus provide a direct data link to the CAD, Figure 9-2. The MDC can display an incredible amount of information; incident specific information, response history to a specific address, live simultaneous GPS/AVL positioning for every apparatus in our fleet, and computer based Pre-Fire Plans. The MDC has eliminated much of the routine radio traffic needed in the past, such as when units go responding, at scene and available. This can now be communicated digitally through the MDC and frees up the radio and dispatcher work load to ensure more time for 911 call taking.

Figure 9-2 Mobile Data Computer

The MDC also utilizes the Tritech Software product, VisiTrack Explorer. This digital mapping system has layers that can be turned on and off to show special features such as streets, fire hydrants, helicopter landing spots, hospitals and schools to name a few. The mapping software will also choose the best route of response to an incident and map the emergency vehicle while en-route.

Automatic Vehicle Locators

Automatic Vehicle Locators are GPS Satellite controlled vehicle locators, which communicate with the MDC and CAD. The AVL's display each Fire/EMS unit's location as well as their direction and speed of travel on an interactive geographical mapping system. This system allows the computer and the dispatcher to check the status and location of all vehicles and to choose the closest most appropriate unit to send for an emergency response.

Enhanced 9-1-1

The enhanced 911 system is a phone system which automatically displays the phone number and address of the calling party when 911 is called from a landline. This allows for the faster dispatch and response of resources to the incident.

800MHz & VHF Radio Systems

The SDFD utilizes two types of radio systems for verbal communication. The primary radio used by the SDFD is the 800 MHz radio, Figure 9-3. It has the ability to communicate with ECDC and other public safety agencies within the county. The VHF radio system is used primarily to communicate with agencies in the county that do not have 800 MHz radio capabilities, such as CALFIRE. The VHF radio is also available to be used as an emergency back up radio if the 800 MHz radio system should fail.

Figure 9-3 800 mhz Portable Radio

Regional CAD Interoperability Project (RCIP)

The Regional CAD Interoperability Project (RCIP) enables collaboration, situational awareness and timely distribution of critical incident information by providing a method for disparate Computer Aided Dispatch (CAD) systems to share data. This computer interface connects the CAD systems in Metro ECDC, Heartland Communications, North Comm JPA Dispatch and Monte Vista Emergency Communications Center. It allows each agency to operate according to their own requirements while seamlessly sharing incident information, Automatic Vehicle Location (AVL) data and resource requests.

The computer interface enhances coordinated operations, accuracy and consistency by automatically recommending the closest, most appropriate resource regardless of the dispatch agency. The interface recognizes whether or not auto-aid resources are available for response and replaces the manual processes for entering incident information, calling neighboring dispatch agencies that then manually enter the incident information again prior to dispatching their units.

Fire & Medical Dispatchers

All San Diego Fire/Medical Dispatchers are trained and certified as Emergency Medical Dispatchers. This training provides them with the knowledge and skills to talk callers through life saving techniques while emergency resources and equipment are on the way. When necessary, dispatchers are trained to provide instructions on performing CPR, bleeding control, childbirth and other common emergencies.

Emergency Fire/Medical Dispatchers follow a predetermined set of questions and protocols. Based on answers to these questions, they can determine the best level of care and help to send for each type of emergency. For example, a heart attack will elicit a different response level than a broken arm; a trash can fire will elicit a different response than a house fire. The following is a description of the positions staffed in our ECDC.

Call-Taker

A call-taker is responsible for answering the 911 call and obtaining the necessary information to dispatch the correct equipment and personnel to mitigate the emergency. 911 emergency call-takers work on a Computer Aided Dispatch (CAD) system, Figure 9-4, and are the answering point for all medical and fire-related 911 and non-emergency phone calls from within the City of San Diego and for any contract cities.

Dispatch Radio Operator

After the call-taker gets an address and the nature of the emergency, the information is immediately sent to the dispatch radio operator via the CAD system. The dispatch radio operator then alerts and communicates response information to the Fire/EMS crews via the radio, station alerting, and the MDC.

Medical Radio Dispatcher

The Medical Radio Dispatcher monitors ambulances and fire apparatus responding to medical emergencies. The Medical Radio Dispatcher ensures all medical calls are received and the necessary units are responding and arrive at scene. They are also responsible for assisting crews with any additional information or requests during the course of the incident. The Medical Radio Dispatcher communicates to units on the assigned command channel. Tactical channels are not used by dispatchers to communicate with units in the field.

Fire Radio Dispatcher

The Fire Radio Dispatcher monitors all units responding to fires, hazardous material problems, rescues, or any other emergency that is not a medical call. The Fire Radio Dispatcher may also serve as a back-up Call-Taker during times when there are a high volume of 911 calls. Like the Medical Radio Dispatcher, the Fire Radio Dispatcher is responsible for assisting crews with requests and additional information during the course of the incident. The Fire Radio Dispatcher communicates to units on the assigned command channel. Tactical channels are not used by dispatchers to communicate with units in the field.

System Status Controller

The System Status Controller dispatches all ambulances on "medical aid" calls and monitors the status and location of all ambulances in the City. The System Status Controller's goal is to ensure all neighborhoods in the City are covered as best as possible with the number of available resources. For example, when ambulances in the Mid-City area are all committed to responses, the system status controller may post-move an ambulance from another area of the city to the mid-city area to temporarily cover.
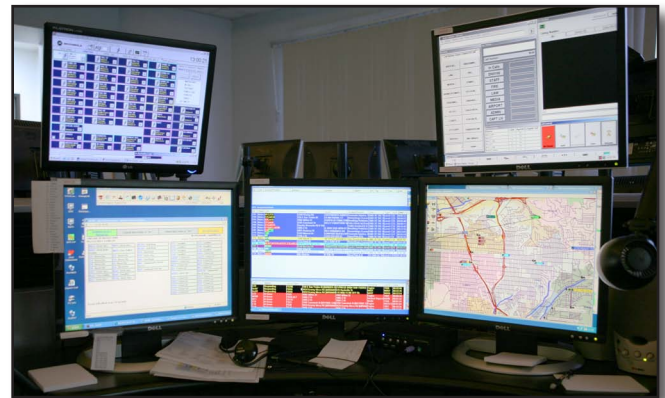

Figure 9-4 Dispatcher Work Station

Dispatch Supervisor

The Dispatch Supervisor is the direct line supervisor for all dispatchers and call-takers. The Dispatch Supervisor will also work the radio during periods of heavy call volume, large incidents, or when a dispatcher takes a break.

Command Battalion Chief

The Command Battalion Chief (ECDC BC) is an administratively assigned Battalion Chief who is responsible for the day-to-day operations of the ECDC. The Command Battalion Chief ensures the efficient operation of the Fire/EMS Communications Center as well as serves as an additional resource to dispatchers during working fires and other significant incidents.

Components of an Emergency Response

The evolution of an emergency response requires the skillful coordination of many different personnel in order to respond emergency resources as quickly as possible.

Call Taking

When a call is received, either directly from the caller or from a PSAP, the call is answered by the call-taker who triages the call. For medical related emergencies, as soon as the caller's address and phone number have been verified, the information is sent to the system status controller in order to dispatch an immediate ambulance response. The call-taker will then continue to acquire additional information using a CAD-based medical triaging system (Medical Priority Dispatch System) that assists dispatchers in determining the nature and extent of the request, the priority of the problem and the need for fire or additional medical resources.

The call-taker will then categorize the medical emergency into one of the following categories:

- Level 1 Response - ALS ambulance and Fire Unit, Code 3 response.

- Level 3 Response - ALS ambulance only, "No-Code" response.

- Level 4 Response - Advanced Life Support ambulance (ALS) or a Basic Life Support ambulance (BLS), whichever is closest, "No-Code" response.

For fire or rescue related emergencies, the following information is obtained by the call-taker and entered into the CAD system.

- The nature of emergency

- The address of the incident

- The telephone number from which the caller is phoning from

- Nearest street intersection

- Any additional information that may be pertinent to the incident (e.g., industry name, floor the fire is on, type of fire)

Media 9-1 Audio of Fire Dispatch

Once all the information has been acquired by the call-taker, the incident is sent to the System Status Controller and Fire Radio Operators.

Dispatching a Response

The Dispatch Radio Operator will activate the station alerting system followed by a verbal dispatch, Media 9-1. The call information is also simultaneously sent to the unit's pagers and MDC.

The content of the dispatch announcement provides dispatched units with eight basic pieces of information needed for the response.

- Engine district

- Type of incident

- Command radio channel

- Tactical radio channel

- Units dispatched

- Incident address

- Nearest cross streets to the incident

- Description of problem

EXAMPLE: (Station Tones] [Three beeps] "Engine 5, Structure Commercial,

Command 8G, Tac 8H, Engine 5, 3, 8, 14, Truck 14,Truck 10, Battalion 2, Battalion 1 at 3910 Georgia Street, cross University, reports of smoke from the windows."

Response

Once the dispatch radio operator announces the incident, the fire or medical radio dispatcher takes control of the incident and communicates with responding units and the Incident Commander. The fire or medical radio dispatcher checks to ensure all units have received the incident dispatch and are responding to the incident.

After receipt of the incident notification by field units, companies will push the Responding [RSP] status key on their Mobile Data Computer (MDC) to acknowledge the response. If no MDC is available or it fails to accept the status change, the unit will acknowledge receipt of the incident by informing the fire radio operator on the assigned command channel and stating:

- Unit number

- Where they are responding from

  ○ If Available In Quarters (AIQ) state "From quarters".

  ○ If Available on Radio (AOR) state the closest intersection to present location.

At Scene

When a unit arrives at scene, the AVL incorporated in the MDC should put you at scene automatically. While units are at the scene of an incident, all radio communications with the dispatch center should be handled on the assigned command channel. Be aware that the fire radio operator may be handling several incidents simultaneously. More than one incident may be handled on a single command channel in addition to the fact that the radio dispatcher may be handling other calls on several different radio channels.

Media 9-2 Audio of Fire Size Up

Size Up

A size up is a verbal report given to the Fire Radio Operator (ECDC) when the first unit arrives at scene, Media 9-2. A size up is given at all fire related calls (Structure, Vegetation, Gas leaks and Rescues). A verbal size up gives the

dispatcher an initial report on conditions when you arrive allows them to make preparations for move ups. The size up also allows additional responding units to hear and gather information while still en route. Information given on a size up will vary depending on the type of incident being responded to, however all size-ups should contain the following at a minimum:

- Description of occupancy or scene (1 story house, 2 story apartment complex, hi-rise etc.)

- Obvious signs or status (nothing showing, smoke showing, fully involved etc.)

- Actions being taken (investigating, attacking the fire, performing rescue etc.)

- Assuming or Passing I.C. (incident command)

Link 9-2 July 2012 Command/Tac Policy Changes

Command Channel Usage

Units shall use the command channel for communication with FCC and each other while responding and staged at scene awaiting an assignment by the IC

Tactical Channel Usage

Once assigned a task by the IC, units shall use the tactical channel for communication with the IC and other units currently operating at the incident

Effective July 1, 2012

Incident Communications

As units are dispatched they are given an assigned Command and Tactical channel(s) for that incident. All units responding to that incident will monitor both the Command and Tactical channels. All communication occurs on the assigned Command channel until the unit(s) arrive at scene. As units arrive at scene they notify the Incident Commander (IC) on the command channel of their location and status and wait for direction from the IC.

Once the IC has given a unit an assignment at an incident, that unit will now conduct all routine radio traffic on the tactical channel. This includes radio traffic to the IC and between other units assigned a task on the incident.

The IC must monitor both command and tac channels during the entire incident. It is recommended that the IC use two separate radios to avoid missing any communication.

Report on Conditions

After the initial attack has begun, and time is available, the Incident Commander will contact the fire radio operator and give a report on conditions. This will enable dispatch to update Senior Staff, the Public Information Officer (PIO) and prepare for any additional resources that might be needed.

Going Available

Once the incident has concluded, all units assigned will go available via their MDC. If an Incident Command structure had been created, the I.C. will communicate any necessary information to the Fire Radio Operator, complete a fire-log documenting their actions via the MDC and terminate I.C. Once a

unit has gone available, they will be placed back into the pool of available resources for the fire dispatchers to utilize again.

San Diego City Communication Zones

Due to the large size of the City of San Diego, the ECDC has divided the city into 2 distinct geographical zones, north of Interstate 8 and south of Interstate 8. This was done to provide some consistency whan assigning radio channels for fire incidents and allowing the CAD to automatically assign radio channels to save time during the call taking process.

South of I-8

For non medical related incidents south of Interstate 8 the following command and tactical radio channels shall be assigned:

- Primary - 8A/8B

- Secondary - 8G/8H

- Tertiary - 8D/8E

North of I-8

For non medical related incidents north of Interstate 8 the following command and tactical radio channels shall be assigned:

- Primary - 9A/9B

- Secondary - 9G/9H

- Tertiary - 9D/9E

Every attempt shall be made by ECDC to assign channels according to this guideline, however due to othe incidents in the city, crews must always verify radio channels enroute from the MDC and maintain the flexibility to change channels if necessary.

VHF Radio Communication Systems

Figure 9-5 Repeater Antenna

The Kenwood TK-790 Mobile and Bendix King portable radios are examples of very high frequency, or VHF, communications systems. The VHF radio frequency range is between 30 and 300 MHz. High frequencies, or HF, range from 3 MHz to 30 MHz. SDFD does not use HF communication systems. Ultra high frequencies, or UHF, range from 300 MHz to 3 GHz (or 3000 MHz). The Motorola XTS 5000 is an 800 MHz frequency radio and thus falls into the UHF category.

Whereas the 800 MHz radios are generally the system of choice in urban environments, The State of California, through FIRESCOPE, has made the VHF radio the industry standard. VHF radios are ideal for communicating over long distances, the technology is simple, units are field programmable, and the radios are affordable. VHF is most typically used when crews travel out of county for wildland strike team assignments. SDFD also maintains a VHF system for back up to use in case of an 800MHz failure.

All SDFD fire apparatus are equipped with one Kenwood TK-790 mobile and at least one Bendix King portable radio at all times.

VHF System Components

To properly communicate using the VHF radio, you must have an understanding of how the radio organizes, transmits, and receives frequencies. The following is a brief description of the main components and functions of the VHF radio system.
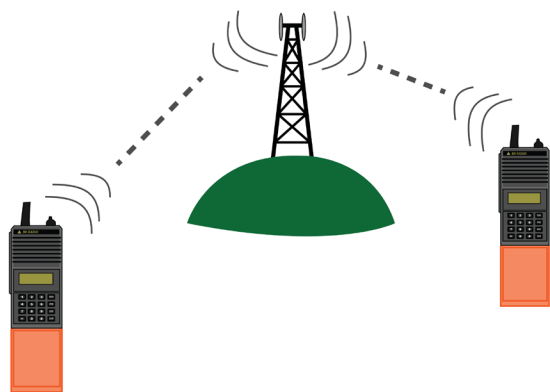
Direct Mode

"Direct" mode simply describes a signal transmitted directly from one radio to another, without the use of a repeater. "Direct" mode should be used with extreme caution because your radio transmission distance is greatly reduced and may be limited to your line of sight. If using the direct mode, other companies may not be able to receive your radio transmissions if they are not within the range of the signal. All VHF tactical channels are pre-programmed to work in direct mode.

Repeater

A repeater is an automatic radio-relay station, usually located on a mountain top, tall building, or radio tower, Figure 9-5, Figure 9-7. It allows communication between two or more base, mobile or portable radios that are un-

Talk-Around/Direct Mode

Figure 9-6 Talk-Around/Direct Mode

Repeater Mode

Figure 9-7 Repeater Mode (Default Mode)

able to communicate directly with each other due to distance or obstructions between them.

Since the repeater is usually located at an elevation higher than the other radios using it, their range is greatly extended. There are several repeater stations located throughout San Diego County (see map).

Talk Around

Talk Around is a feature that allows the user to manually overide a channel that has been pre-programmed to use a repeater in order to use the direct mode. Figure 9-6.

Note - Talk Around/Direct Mode has currently been disabled from the Bendix King GPH portable radio, but is available on the Kenwood Mobile Radio.

Frequencies

Radio signals are transmitted and received using specifically measured frequencies. For example, 154.310 MHz is a tactical frequency used for crew to crew communication on the VHF system. VHF radio frequencies are managed by the Federal Communication Commission, or FCC. A limited band of these VHF frequencies is allotted for firefighting purposes, while other frequencies are leased to the government, communication companies, and private industry.

Channel Numbers and Names

VHF radio channel numbers and names are used to give a simple identifier to a frequency. Because using the frequency number, 154.310, can be a bit confusing and difficult to remember, the frequency is given a channel name when programmed into the user's radio. For example, 154.310 has been named - "XSD TAC4."

Groups

Since the VHF radios can store over 200 radio channels, the channels have been grouped together in "Groups" to keep the information organized and manageable. A talk group consists of 16 channels (20 channels in some newer radios) bundled together, typically by organization or function.
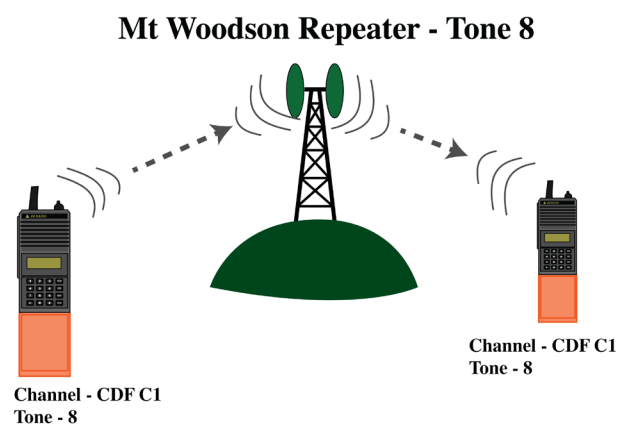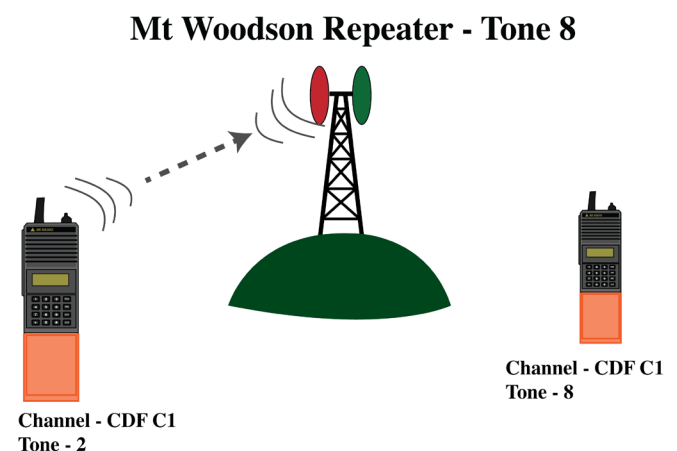
Mt Woodson Repeater - Tone 8

Channel - CDF C1
Tone - 8

Channel - CDF C1
Tone - 8

Figure 9-8 Correct Tone Selected

Mt Woodson Repeater - Tone 8

Channel - CDF C1
Tone - 2

Channel - CDF C1
Tone - 8

Figure 9-9 Wrong Tone Selected

Transmit Tones

Because there is only a limited number of frequencies that can be used for firefighting purposes, the same frequency may actually be used more than once by other organizations within the state. For example, 154.310 is used by San Diego for as a VHF tactical channel, but 154.310 may also be used by Ventura County Fire Department as an air to ground channel. To prevent hearing unwanted radio traffic from another agency using the same frequency, transmit tones are used. Transmit Tones are a type of password to access a radio antenna repeater, Figure 9-8. Without the correct transmit tone selected in your VHF radio, the radio antenna repeater will not accept your radio transmission and won't pass it along to others listening in, Figure 9-9.
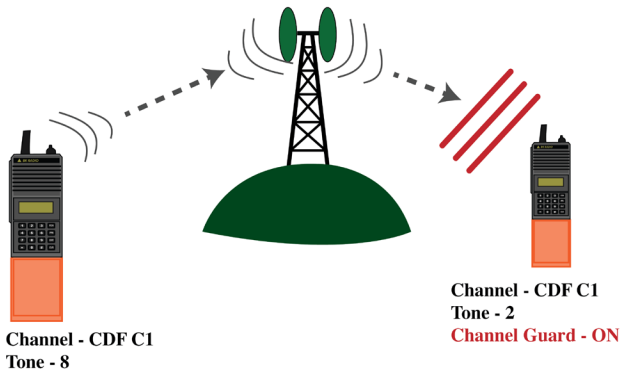
Because San Diego is located so closely to Mexico, it is common to hear radio traffic coming from taxi cabs and other agencies who use similar frequencies. The use of transmit tones helps prevent much of this interfering radio traffic.

Channel Guard

Channel guard is a feature on the radio which uses receive tones (not to be confused with transmit tones) to prevent unwanted radio transmissions from entering your radio. When channel guard is turned on, only radios that have your proper tone code can transmit to you, Figure 9-10. Channel guard should be used with extreme caution. If the radio is bumped and the tone is accidentally changed or other users do not have your tone code, you will not be able to receive or transmit radio communications with them. For this reason, it is SDFD policy to not use CG on any Initial Attack period of a fire.

Mt Woodson Repeater - Tone 8

Channel - CDF C1
Tone - 8

Channel - CDF C1
Tone - 2
Channel Guard - ON

Media 9-3 VHF Tone Explanation

Figure 9-10 Channel Guard in the On position may prevent you from hearing important radio transmissions.

VHF Radio Scanning

Another feature of the VHF radios is the ability to listen to multiple channels at one time, called "Scanning." Individual users can program their own scan lists for any channel within a talk group (you can only scan multiple groups using the GPH Commander Radios). Programming a scan list is covered in the following sections.

Media 9-4 VHF Fleet Map Explanation

VHF Radio Fleet Maps

Because the VHF radio system contains over 200 channels, keeping track of and finding frequencies in the radio can become difficult without out some type of index or guide. The VHF Radio Fleet Map serves this purpose. The fleet map is a spreadsheet listing all VHF frequencies, channels, groups, and tones programmed into the VHF radios used by SDFD, Figure 9-2. Also included with the fleet map are the names and locations of all VHF repeaters in the County.

Commonly Used VHF Channels

SDFD Back-Up Channels

* XSD CMD4

* XSD TAC3

* XSD TAC4

Air Guard - Emergency Channel

Air/Ground - Air to ground is used for communicating with aircraft

* XSD A/G

* CDF A/G2

CESRS - Travel Channel

Link 9-3 VHF Radio Fleet Map

Media 9-5 VHF Air Guard Explanation

VHF Portable Radio - Bendix King GPH

The most commonly used Bendix King portable radio has 15 different groups each with 16 channels, for a total of 240 channels, however, future radios may allot for additional groups and channels Figure 9-11. These Bendix King radios are field programmable, which means that the different groups and channels can be programmed in the field. It is narrowband compatible.

Bendix King GPH VHF portable radio features

Antenna
The antenna maximizes the strength of the radio's signal, both for transmitting and receiving radio traffic. The regular antenna is the standard-issue antenna and provides up to three watts of transmission power.

Whip Antenna Connection
This accessory is issued to units that respond to wildland areas that need to communicate over greater distances. The whip antenna provides up to five watts of transmission power.

Transmit/Low Batter Indicator
The Transmit/Low Battery Indicator features a red light that illuminates when transmitting and remains lit when the battery is low.

Hi/Lo Power Toggle
The Hi/Lo power toggle was used to allow the user to select the transmitting power of the radio. It is currently disabled.

Scan Toggle
The Scan toggle simply turns the scan function on and off.

The ON position is when the toggle is switched away from the user, closest to the antenna and squelch. The OFF position is when the toggle is switched toward the user, away from the antenna and squelch features.

Priority Toggle
The Priority switch turns the priority function on and off. The ON position is when the toggle is switched away from the user, closest to the antenna and squelch. The OFF position is when the toggle is switched toward the user, away from the antenna and squelch features.

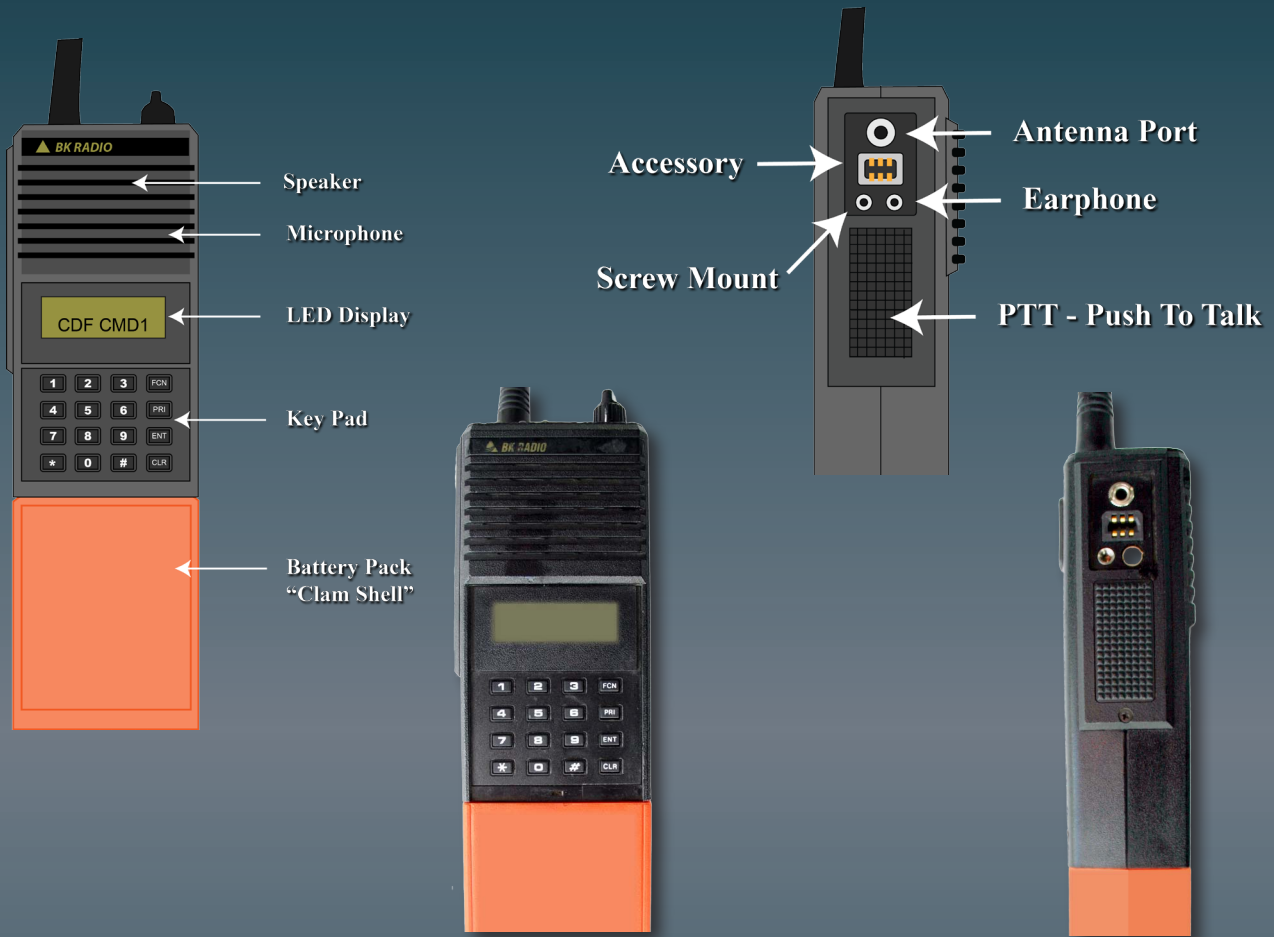Figure 9-11 VHF Portable Radio - Bendix King GPH

Media 9-6 The future of the Bendix King GPH Radio

Figure 9-12 Toggles in the Off/Normal Position

VHF Portable Radio - Bendix King GPH

Speaker

Microphone

LED Display

CDF CMD1

Key Pad

Battery Pack
"Clam Shell"

Antenna Port

Accessory

Earphone

Screw Mount

PTT - Push To Talk

Antenna

Transmit Indicator

Channel Guard/ Squelch

ON/OFF /Volume

Channel Selector

Low Battery/Busy Channel/Priority

Priority Scan

Scan Switch

Hi/Low Power

The priority function is an added benefit of the scan function. While scanning the desired scan list, the user can select one channel on the scan list that has priority over all other scanned channels. When both the Scan and Priority toggles are on, the setting of the Channel Selector determines the priority channel.

This combination of features indicates that the user is scanning everything in the scan list, but giving priority to any transmission received on the channel selected by the Channel Selector. Therefore, anytime a signal is detected on the priority channel, the radio picks up that channel regardless what other channels might have a signal. This allows the user to hear transmissions on the selected priority channel regardless of what other radio traffic there may be on other channels.

For example, crews should monitor their assigned division tactical channel for direction by their Strike Team Leader or Division Group Supervisor as the priority channel while also scanning their Branch or Incident Command, and air to ground channels.

To continue scanning the scan list without giving priority to any particular channel, simply turn the priority switch to off. In this case, when the scan comes to a channel with a signal, it stops and remains on that channel for the duration of the transmission. If other channels have a signal the scan will not pick this up until it releases from the current channel and begins scanning again.

Note - When programming the VHF radios, the Hi/Lo toggle, scan and priority toggles should be in the off position away from the antenna and squelch. Before starting normal operations it is critical to lock the keypad to prohibit inadvertently changing any of the selected groups or tones. To lock the keypad, simply turn the scan, priority or both features on.

Priority LED
The Priority LED is a light that illuminates when the priority function is on.

Channel Selector
The Channel Selector, is the knob used to select the desired radio channel, and/or priority scan channel.

On/Off Volume Control
To turn the radio on, turn the knob clockwise until there is a click. To turn the volume up, continue to turn the knob clockwise. To turn the radio off, continue to turn the knob counterclockwise until it clicks into the off position.

Channel Guard/Squelch (CG-SQ)
Squelch is an electric circuit built into the radio that enables the user to control the sensitivity of the radio's receiver. When there is no radio traffic (no input signal), setting the squelch enables this electrical circuit to turn off the radio speaker in order to eliminate unnecessary background noise. Backing off the control increases the receiver's sensitivity, and the operator will hear white noise (also called squelch noise) if there is no signal present. When there is

radio traffic, squelch activates the radio's receiver and relays the traffic to the listener. An effectively set squelch function finds the proper balance between eliminating white noise and opening the radio's speaker when pertinent radio traffic is being transmitted.

In order to properly set the squelch, turn the squelch knob on clockwise until it reaches the point at which white noise is heard. The user then must back off the control just past the point at which the white noise shuts off (turning the knob counter-clockwise). At this point, only a small signal is needed to turn on the speaker. If there is an intermittent weak signal that is distracting or annoying to the listener, the operator can adjust the squelch to open only when stronger signals are received by turning the knob further counter-clockwise.

The middle rotating knob can also turn CG (channel guard) on. CG tone protects the radio itself. This function tells the radio to filter out any radio traffic that does not include the correct "tone" or "password." Turn CG on by turning the knob all the way counter-clockwise until the knob clicks. This function is independent from accessing repeaters that are tone protected.

San Diego Fire-Rescue policy is to "never use the radios with CG mode during initial attack."

There are several reasons for this:

1. Other agencies may not be using the same tones or they may not be using tones at all. Consequently, if the radio's CG was on, your radio would filter out their traffic.

2. It is too easy to bump the keypad and change the tone accidentally. If a different tone is used in either the "transmit" or receive radio, the traffic would be filtered out.

3. Even if two units are right next to each other, the users may have chosen different mountaintops and subsequently different tones. Again, this would filter out each other's radio traffic.

The middle knob should be used to set the squelch for the radio and left in that position during all initial attacks. This may result in the reception of some interference and unwanted radio traffic, but it eliminates the possibility of missing essential radio traffic for the reasons described above.

During an extended attack, a communications unit leader can program all the radios used on an incident so that all personnel use the same tones. This eliminates user select-ability and variation in tone selection, at which time radio CG can be used.

Accessory Port
This is the port the communications unit leader and the radio shop use to program the radio.

Mount Socket
The Mount Socket is a screw-in mount for semi-permanent accessories using the above mentioned port.

Earphone Jack

The Earphone Jack allows the user to plug in earphones to assist in hearing radio transmissions.

Push To Talk

The Push to Talk, or PTT, button enables the person speaking into the radio to transmit his or her message. In order to utilize this function, push the PPT button, wait one second, then relay the necessary radio traffic. The reason for waiting one second before speaking is that there is often a delay in picking up the PTT signal. Therefore, if the person sending the message speaks immediately after pushing the PTT button, the beginning part of the radio traffic may not be transmitted due to the delay. This is important because at the beginning of most radio transmissions, the speaker identifies his or her unit designator as well as the unit that the message is intended for. If this information is not relayed, the entire message may go unnoticed or unintentionally disregarded.

The Transmitter Indicator glows red when the PTT button engages the transmitter. With the red LED illuminated, simply talk in a normal voice with the speaker one to two inches from your mouth. If the transmit LED does not glow and a tone is heard, the channel selected is "receive only" and the user cannot transmit messages out on this channel. Additionally, if the length of a message exceeds the preset time out timer setting, the transmitter will automatically shut off and a tone will be heard.

Priority/Busy/Low Battery Indicator

Priority/Busy/Low Battery Indicator, flashes yellow when the battery is low, or is steady yellow if the radio is receiving a signal (either on the selected channel or on the priority channel).

Battery Clamshell

The Bendix King VHF portable radio should be stored with the "AA" battery clamshell on, Figure 9-13. Crews should rotate the batteries every month when not in continuous use. To remove the clamshell, turn the radio off, press the metal tab on the side, twist the battery ¼ turn in either direction, and remove the clamshell. Then remove the batteries by opening the clamshell and change the batteries. Do not remove the installed spacer as it will over-volt and damage the radio. The spacer is there to ensure the radio operates at 12 volts. 9 "AA" batteries together add up to 12 volts.

There is another consideration regarding battery life that the user should take into account while using the Bendix King VHF portable radio. The user must understand that use of the scan feature can affect battery life. The amount of radio traffic you select to hear affects battery life. This means that an increase of channels in the scan list results in a decrease of battery life. Therefore, on incidents of long duration, scan only those channels needed for the incident.

Figure 9-13 VHF Battery Clamshell - 9 AA Batteries

Bendix King GPH VHF Portable Radio Operations

Channel Selection

To select a channel, simply turn the channel knob on the top of the radio. The name of your channel will appear in the display area of the radio as you turn the channel knob.

Group Selection

There are 16 channels per group. To change from one group to another, do the following:

1. Press the "#" key [yellow]

2. Enter the selected group number (i.e., press "1" for group 1, press "12" for group 12. [blue]

3. Press the "ENT" (enter) key [green]

To confirm that the correct group was entered, turn the radio off and then back on. The current group will display during the first second the radio boots up.

Figure 9-14 Selecting a Group

Tone Selection

Selecting tones on the King radio is very easy. Simply press the number corresponding to the tone required on the keypad when the toggles are in the normal (off) position. That is all that is required. To ensure you have selected the correct tone, turn the radio off and back on and it will show the tone and the group the radio is currently set to. "CG" will also be displayed. To turn off or deselect tones altogether, press the "0" (there is no zero tone) and the "CG" will disappear from the display.

Squelch Function

To operate the manual squelch function on the Bendix King VHF Portable Radios:

1. Rotate the Squelch knob clockwise until a rushing noise is heard.

2. Rotate the Squelch knob backward (counter-clockwise) until the noise stops.

3. The radio has now been set to monitor the radio frequency with the least amount of background noise.

4. Use caution as the squelch setting directly impacts the radio's ability to receive radio transmissions. Setting the squelch too low (counter-clockwise) reduces the capacity to receive transmissions.

Scan Function

To operate the Scan function on the Bendix King VHF Portable Radios:

1. Place the Scan toggle switch in the on or scan position.

2. After scan is enabled, two flashing bars on the right side of the display indicate the radio is scanning. Scan operation only occurs while the radio is receiving.

3. When a signal is detected, scanning stops and the signal being received is heard, with the active channel shown on the right side of the display.

4. The radio receiver stays on that channel until activity ceases and resumes scanning after the "scan delay time".

5. To transmit on the last active channel (right side of display), turn the Channel Select Knob on top of the radio to match that channel.

6. When the PTT button is pressed while in the scan mode, the radio transmits on the "transmit" (left side of display) channel.

7. Upon release of PTT button, the radio receiver will hold on that channel. If no activity occurs during the "scan delay time," the radio resumes scanning.

To create a Scan List on the Bendix King VHF Portable Radios:

1. Turn off the Hi/Lo, SCAN, and PRI functions (toward the user and away from antenna).

2. Turn the Channel Select Knob to the channel desired to be entered.

3. Press the ENT button on the keyboard.

4. Beep will sound.

5. Display will indicate SCAN above channel description.

6. To scan channels in the scan list, turn Scan toggle on.

7. Scan only works within the same group. It is not possible to scan across groups.

8. Common channels to place into the Scan List are Command, Tactical, Air to Ground, and Air Tactics.

To clear a channel from the Scan List on the Bendix King VHF Portable Radios:

1. Turn off the SCAN and PRI functions.

2. Turn the Channel Select Knob to the channel desired to be cleared.

3. To clear a channel from the scan list, press the CLR key.

4. A short beep will be heard.

5. SCAN in the display will disappear.

Figure 9-15 Create a scan list
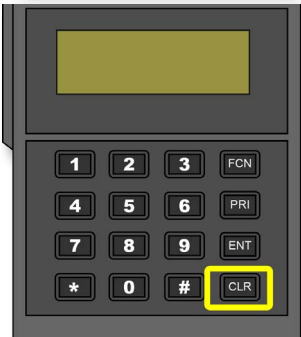
Figure 9-16 Delete a channel from scan list

VHF Portable Radio Cloning

Typically, when a fire crew responds to a multi-agency wildland fire, the crew will have to program, or clone their VHF portable radios to the communications plan of that incident. Group 15 is reserved for this purpose in the Bendix King. The clone group will have the command channels, tactical channels and the corresponding tones established by the Communications Unit Leader. Fire crews should coordinate the programming, or cloning, with the Communications Unit upon reporting to the incident base.

If the Bendix King VHF portable radio is cloned by the Communications Unit at an incident in any group other than Group 15, it is important to reprogram the radio with SDFD's data file upon returning from the incident. This ensures that all of the programming parameters are returned to their original settings.

Bendix King GPH -Commander VHF Portable Radio

As the GPH Radio nears the end of its service life, it is being replaced by the GPH Commander radio. During this transition phase, SDFD will continue to use both radios in operations. It is advisable that the Captain or Officer always use the GPH Commander if they have the option. The easiest way to tell the difference between the two radios is that the GPH Commander has round buttons instead of square.

The operations of the two radios are almost identical, however, the GPH Commander has the ability to create a customized command group. This feature allows the user to, in effect, be able to scan across multiple groups of the radio, which the GPH cannont do.

To create and view a command group:

- Turn the radio to the desired channel
- Press * to add the channel to your command group
- Press # # to Access and view your command group
- Press * to remove the channel from your command group

VHF Mobile Radio - Kenwood TK-790

The Kenwood Model TK-790 (Cal Fire Version software) was developed specifically for Cal Fire based on operational needs. Many North Zone Fire Departments utilize these radios in their mobile equipment. The TK-790 is a 254 channel radio with several modifications that are specific to California.

Some of the radio features are:

- 254 Channels

- Alpha-numeric display

- 45 Watts power output

- 1 group user modifiable (COMMAND GROUP)

- 16 Repeater tones available

- User modifiable scan with 2 levels of priority

- 1 Direct access channel button (Home Channel)

- Display Dim Button

The 254 channels are divided into 20 plus groups and attempt to mimic each agency's VHF radio channel configuration. In addition to the 20 plus groups, there is a "Command Group." This command group can be any number of channels and the frequencies that are taken from any of the individual groups. The command group can be created or deleted at any time by the user.

Kenwood TK-790 Radio Button Features

Kenwood TK-790 Radio Button Features

1 - Power [POWER]

Push this button once to turn on the radio and push again to turn off. Note: The Kenwood Mobile radio is designed not to lose any operator selectable features on power down. The radio will "remember" what it is last told to do upon re-power. This means that it will be on the same tone, group, and channel as well as retain the same scan list as when it was turned off.

2 & 3 - Group Selection [▲/▼]

These two buttons control the group locations and are located next to the power button in the upper left corner of the radio. Press the up arrow to go up from groups 1 thru 20. Press the down arrow to go from groups 20 down to 1. Pushing again below group 1 puts you into the "Command Group" (if the command group has been created by the operator).

4 - Monitor [MON] Button

Used with the [SCN] button to define Priority 2 channels. Priority 2 channels are described in more depth later in this chapter. Ensure MON button is pressed/on or else it may act like a channel guard and you will not hear traffic.

5 - Scan [SCN] Button

Press [SCN] to start or stop the scanning sequence. You can only scan one group at a time, which means that you cannot scan across multiple groups. When you activate scan, a tone sounds, and the SCAN icon appears on the display. When a signal is received while scanning, the scan will halt, the audio is un-muted, and the channel name appears in the display.

6 - [DIM] Button
Used to dim or brighten the display.

7 - Delete/Add [D/A] Button
This radio has the capability to add or delete any channel to a scan list. From within the same group, rotate the channel selector knob to the desired channel you want to add (or delete) in scan and press the [D/A] (Delete/Add) button. Press once to add a channel and press once again to remove the channel from scan.

8 & 9 - Tone Selection [▲/▼]
The TK-790 mobile radio uses the two up/down arrow keys, (upper right hand corner of radio), to cycle thru up to 16 custom encoded tones for access to re-peaters. For safety, the radio operating system does not permit OST (Operator Selectable Tone) on channels that have been pre-assigned a transmit tone via programming.

10 - Auxiliary Command [AUX C] Button
Press to add/delete channels to your custom Auxiliary Command Group.

11 - Squelch [SQL] Button
To adjust the squelch, press the [SQL] button. The squelch can then be adjusted by turning the channel selector. Once the squelch is set, press the [SQL] button again to resume normal operation.

12 - Blank - No Function

13 - Talk Around [TA]
To talk directly to another radio without using a repeater (car to car), press the [TA] button. Notice the TA symbol in the display.

14 - Home Channel [HC]
Pressing this button will take you directly to your Home Channel from any group in the radio. When this button is pushed again, it takes you back to the last group and channel you were on.

15 - Channel Selector Knob
Turn knob to select channels within a group.

16 - Volume Control Knob
Adjusts volume level.

17 - Microphone plug
Plug for microphone.

18 - Busy LED
Channel is busy when light is illuminated.

19 - TX LED
 Message transmission in progress when light is illuminated.

Kenwood TK-790 Radio Display Features
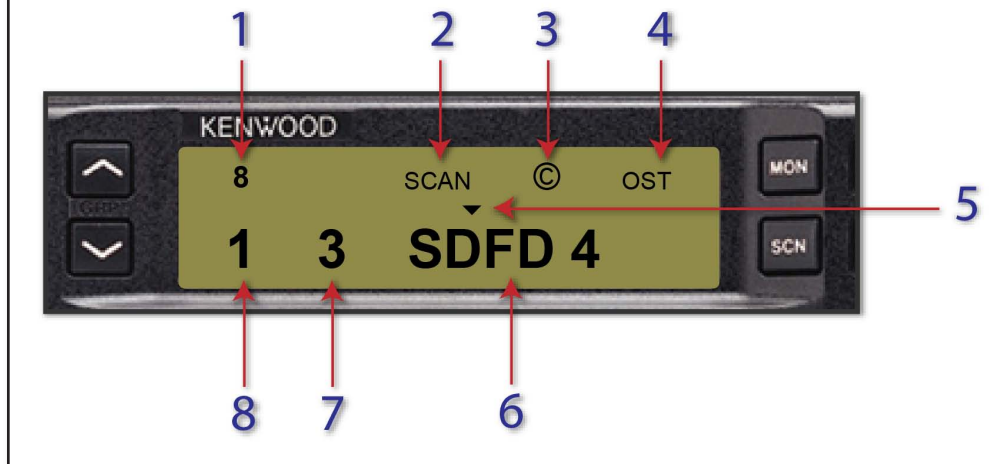
TK-790 Radio Display Features

1 - Tone #
This number shows which tone the radio is using. This is also where "P1" would display if the channel is assigned as Priority 1 (not visible in this graphic).

2 - SCAN
Indicates that the scan function is turned on.

3 - ©
Shows Command group is currently selected.

4 - OST
Indicates that an Operator Selected Tone has been inputted.

5 - ▼
Down arrow indicates that this channel is in the current scan list.

6 - Channel Name Display

7 - Channel # within that group

8 - Group #
Can be group 1 through 25.

Kenwood TK-790 Mobile Radio Operations

Scanning Feautre

As previously mentioned, this radio is capable of scanning up to 16 channels at one time, however it not able to scan across multiple groups. Crews should select the channels in their scan lists based on the ICS-206, Communications plan, which is distributed by the Communications Unit Leader.

To Program a Scan List:

1. Select group you want to scan
2. Press [SCN] to turn off scan
3. Select the channel you want to scan
4. Press [D/A] button to add or remove channel from list
5. Select next channel you want to add (repeat 4 & 5)
6. Press [SCN] to turn on scan and begin scanning

Priority Scan Mode

This radio has the capability of two levels of Priority Scanning. They are called Priority 1 and Priority 2. Priority 1 takes precedence over all other scanned channels in the group including Priority 2. Priority 2 takes precedence over all scanned channels except Priority 1. This means you can scan 16 channels and have two levels of priority.

An example of this would be setting up a scan group on an incident with Command and Tactical channels as Priority 1 and 2 and other lesser priority channels in the Scan group. The Priority 1 channel is by default the channel you have selected in the display before pressing the scan button. In other words, when you want a specific channel to be priority, rotate the channel selector to that channel, stop, and press [SCN]. This channel is now your Priority 1 channel. The radio will always transmit on the priority channel when in scan mode.
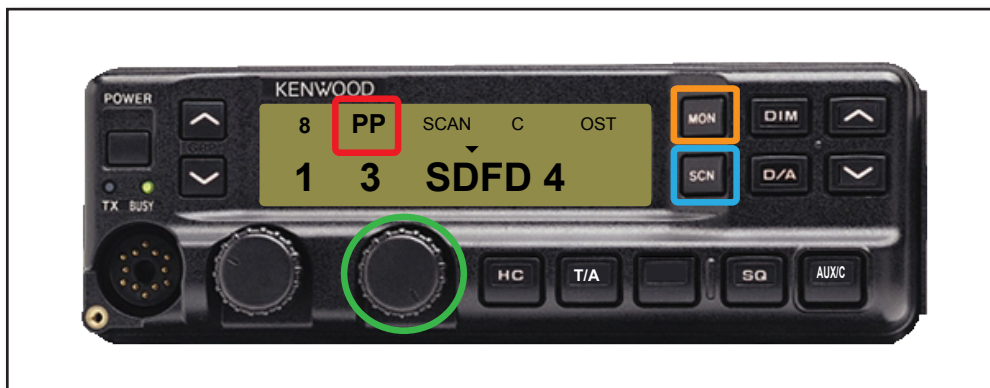
Program Priority 1 Channel:

1. Select channel you want as P1

2. Press [SCN] to turn on (this is your P1 Channel)

Program Priority 2 Channel:

1. Press [SCN] to turn off scan

2. Select channel you want to scan as P2

3. Press and hold [SCN]. With [SCN] depressed, proceed to step four.

4. Press [MON] twice

5. PP should be displayed indicating this is your P2. Release both [SCN] and [MON] buttons.

To delete Priority 2 - Repeat steps 4 & 5

Command Group [AUX C]

Press this button to add or delete a channel from the command group. This radio has the ability setup a custom group of channels called the "command group." This command group can be a combination of any channel from any group programmed into your radio. This custom command group can be viewed by moving one talk group below "Group 1" using the group selection arrows. See below for details on how to set up your command group.

It is important to understand that this command group is user programmable. You define what you want in this group. This group will in most cases be your own day to day operating group. When you go out of county, you can add channels you need based upon the incident you are operating at.

Programming the Command Group:

1. Press [SCN] to turn off scan

2. Select the channel you want to add to your command group

3. Press and hold the [AUX C] button until you hear a short beep and a momentary © icon appears in the display. That channel has now been placed into your auxiliary command group.

4. Repeat steps 2 and 3 until you have created your auxiliary command group with all desired channels.

5. When finished selecting channels for your command group, press the group arrow down until the © icon appears indicating you are now in your custom command group.

You may now set up a scan list within your command group

Removing the Command Group:

1. Press [SCN] to turn off scan

2. Select the channel you want to remove from your command group

3. Press and hold the [AUX C] button until you hear a short beep the channel disappears from the display

If you are successful, the radio will revert to Group 1

San Diego 800 MHz Radio System

The City of San Diego uses UHF (ultra high frequency) radios as the primary means of 2-way radio communication on . The UHF radio system uses a wide range of frequencies, however, the FCC has set aside frequencies in the 800 MHz band to be primarily used for public safety 2-way radio traffic. The 800 MHz radio system is preferable over the VHF system for urban areas where long range transmissions are not necessary because it has better reception from within buildings and confined areas.

Frequencies

Radio signals are transmitted and received using specifically measured frequencies, just like a frequency on your FM radio. The City of San Diego has been allotted 20 individual 800 MHz frequencies by the Federal Communication Commission to use for all of its operations (fire, police, lifeguards, EMS, trash, parks & recreation, etc.). Its important to note that these 20 frequencies are shared equally across the entire city infrastructure. For example, the SDFD shares these 20 frequencies that range from 856-862 MHz in order to dispatch calls, communicate at a fire, and share information between fire apparatus and ambulances.

Channel Letters and Names

Radio channel letters and names are used to give a simple identifier to any particular frequency in use. It should also be noted that the term "talk group" is commonly used for referring to channels in the 800 mhz system. This should not be confused with "groups" in the VHF system, which are entirely different.

San Diego City Trunked 800 MHz System

You may be wondering how it is possible that the entire City of San Diego only uses 20 individual frequencies, yet has the ability to use more than 100 radio channels. The reason is because unlike the VHF radio system, the 800 MHz system has the ability to trunk its radio channels. In a trunked 800 MHz system, the particular radio channel number and name are not permanently assigned a radio frequency. For example, when you transmit a radio call on channel "7E," a computer searches the pool of 20 radio frequencies assigned to the City for one that is not in use. It then sends your radio traffic via one of the frequencies that is not in use. When the other person responds on channel "7E," the computer begins a new search for an available frequency, which may be different from the first. Because radio channels are not always being used, this method of "trunking" radio channels maximizes the use of the limited number of frequencies that are available to the public safety sector. Because the 800 MHz system is trunked, "ADMIN 7A" will actually be any available frequency the computer selects between 856 and 862 MHz.

One of the drawbacks to using a trunked system with only 20 frequencies is

that there may be times when all 20 frequencies are being used. In this event, you will get a "busy signal" tone when pressing the push to talk (PTT) button on the radio. Once the computer finds an open radio frequency, you will get a series of chirps indicating that it has found an open frequency and you can press the PTT button once again to transmit your message.

The San Diego City Trunked radio frequencies can be found in zones 7, 8, 9, and 16 through 20.

Zones

The 800 MHz radio channels have been grouped together in "Zones" to keep the information organized and manageable. A zone consists of 16 individual channels bundled together, typically by organization, geographical area, or function. Zones are identified by a number. For example, zone 17 in San Diego's 800 MHz system contains all the channels assigned for lifeguard operations in the city. Zones 7, 8, and 9 contain the channels used for SDFD operations. Zones are similar to Groups in the VHF system. A channel letter and name are always preceded by a zone number.

Example 1
7 - A - ADMIN 7A

Zone # - 7

Channel Letter – A

Channel Name – ADMIN 7A (Admin)

Example 2
8 - D - 8D

Zone # - 8

Channel Letter – D

Channel Name –8D

RCS 800MHz Trunked System

The RCS, or Regional County System, 800 MHz trunked system is an entirely separate system from that of San Diego City. It has been assigned its own specific set of 800 MHz frequencies to operate on for other county agencies. SDFD 800 MHz radios are programmed for, and can easily utilize the RCS system for mutual aid and mass casualty incidents. However, it must be noted that you cannot scan across systems. You may only scan channels within one system at a time.

Conventional 800MHz System

In a conventional 800 MHz system, each individual channel is assigned a permanent frequency and does not rely on a computer to trunk or search for an open frequency. SDFD 800 MHz radios have been programmed with a small set of conventional frequencies, which can be found in Zones 12 and 13. This system may also be utilized in an emergency situation where you cannot hit the mountain top repeaters, such as a high rise building or working over the edge of a cliff.

SDFD 800 MHz Radios

San Diego Fire-Rescue Department apparatus are in a transitional period for 800 MHz mobile radios. As new apparatus are purchased, they are outfitted with the Motorola XTL 5000 mobile radios. Older apparatus can also still be found with the Motorola Spectra C9 mobile radios. For this reason, both mobile radios shall be covered in this section.

800 MHz Radio Fleet Maps

Link 9-4 800 MHz Radio Fleet Map

The 800 MHz radio fleet maps can be found by clicking on the referenced link, Link 9-4, or on the departments "S" drive folder "Radio Training," then "Fleet Maps."

Commonly Used 800MHz Channels

Channel	Description
ADMIN 7A	Non-Incident related radio communication
DISP 7B	Exclusively used to dispatch incidents, no other radio transmission should occur on this channel
SSC 7C	Ambulance System Status Controller
7E / 7F	Command / Tac channel for all EMS incidents
7H / 7I	Command / Tac channel for all traffic accidents
8L, 9L	RIC / Rapid Intervention Crew Operations
8M, 9M	Air to Ground Channel - Copter 1 & 2
7N, 8N, 9N	SDMA10, 20, 30 (Mutual Aid Channels)
7O / 8O / 9O	SND8DIR - Direct Conventional Channel
EMG 7P, 8P, 9P	Designated Emergency Activation Channel
8A / 8B	Primary Fire Channels for South of I-8
8D / 8E	Third Fire Channels for South of I-8
8G / 8H	Secondary Fire Channels for South of I-8
9A / 9B	Primary Fire Channels for North I-8
9D / 9E	Third Fire Channels for North of I-8
9G / 9H	Secondary Fire Channels for North of I-8
TAC 16 A,B,C,D,E,F,G	Battalion Training Channels for B1 - B7 Respectively

Refer to bulletin 16-122 for additional information

Motorola XTL 5000 – Mobile Radio

This is the primary mobile radio used by the SDFD. It is programmable up to 512 Channels with 32 separate radio zones. It can scan up to 16 channels at a time within each 800 MHz system.

Motorola XTL - 5000 Features

1 - Volume Knob

2 - Display Backlight Button
Three levels of backlight display brightness.

3 - Home Button
Takes you to the department specified home channel (7A SDFD ADM).

4 - Rotary Selector Knob
Used to navigate through channels and zones.

5 - Emergency Button
Activates the emergency alert system. Hold down for 2 seconds to activate, hold down for 4 seconds to reset.

6 - 4 Way Selector Button
Used to navigate through zones when building a scan list.

7 - F/R Soft Key
Allows the user to switch between Front and Remote radio consoles when two radios heads are installed in one vehicle.

8 - VIEW Soft Key
Allows the user to view the current channels selected in the scan list.

9 - SCAN Soft Key
Turns the scan feature ON/OFF.

10 - PROG Soft Key
Takes the user to a secondary screen which allows the user to Select or Delete channels from the scan list.

11 - ZONE Soft Key
Allows the user to switch zones.

12 - Power Button
Button has been disconnected so that the radio turns on automatically when the aparatus bateries are turned on.

13 - Microphone Connection

Motorola XTL 5000 - Radio Button Features

SD7 7A SDFD ADM

ZONE | PROG | SCAN | VIEW | F / R
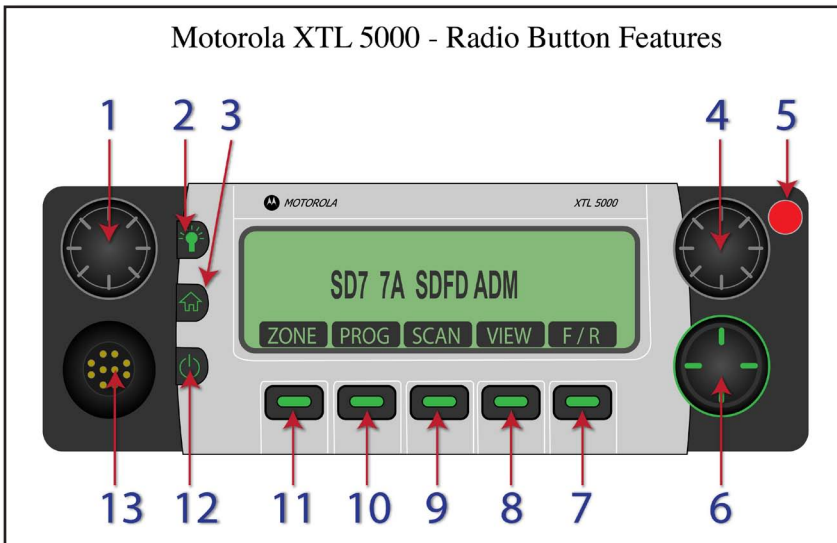
Changing Zones
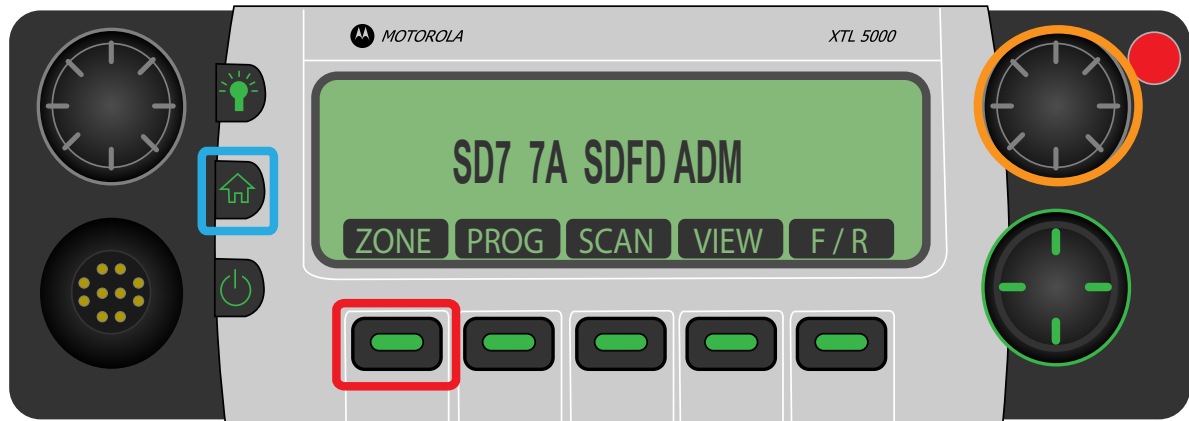
To Change Zones:

5. Press the "Zone" soft key

6. Rotate knob to view different zones

7. Press the "Home" key to select the desired zone

8. Rotate knob to view different channels within the zone

Programming Scan Lists
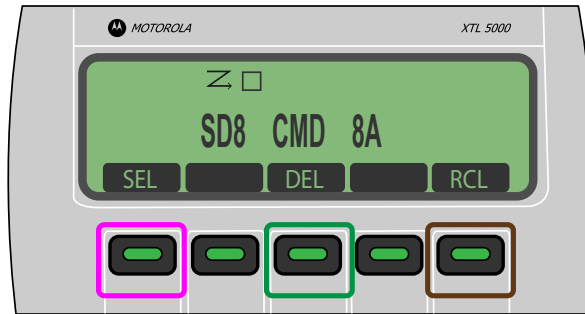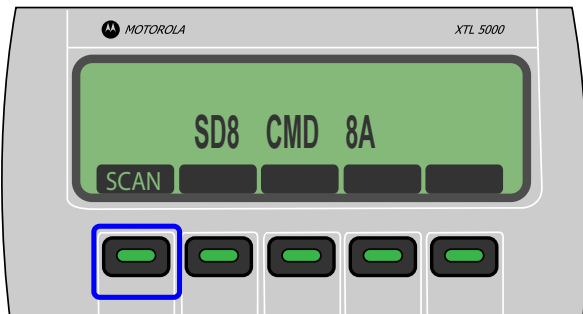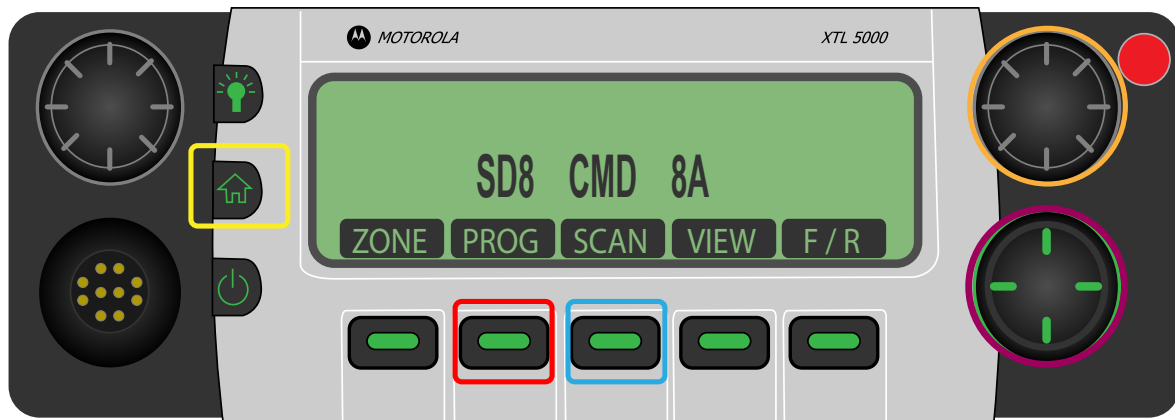
To Program a Scan List:

1. Turn off SCAN
2. Press "PROG" soft key
3. Press "SCAN" soft key
4. Use 4 way selector to go to zone you want to scan
5. Use rotary knob to select channel you want to scan
6. Press "SEL" soft key to add channel to scan list
7. Press "DEL" soft key to delete channel from scan list
8. Press "RCL" soft key to view channels in scan list
9. Press "Home" button to complete scan list and return

Motorola Spectra C9 – Mobile Radio
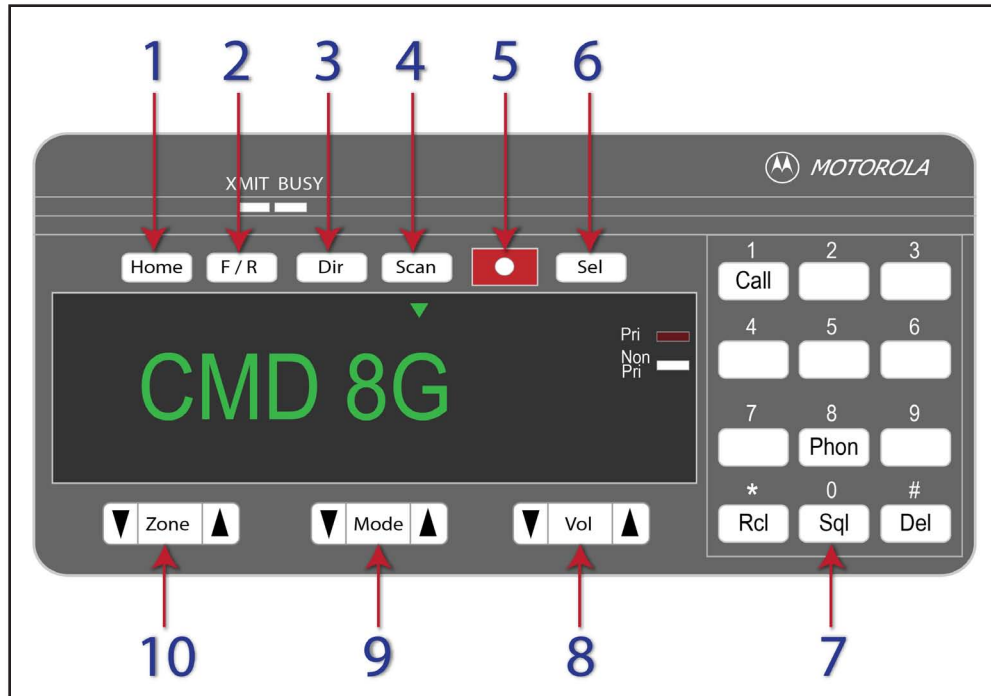
1 - Home Button
Takes you to the department specified home channel (7A SDFD ADM).

2 - F/R Button
Allows the user to switch between Front and Remote radio consoles when two radios heads are installed in one vehicle.

3 - Dir Button
Changes the radio between direct and repeater mode. Direct mode only works for frequencies found in the conventional system.

4 - Scan Button
Turns the scan feature ON/OFF.

5 - Emergency Button
Activates the emergency alert system. Hold down for 1.5 seconds to reset.

6 - Sel Button
Used to add a channel to the scan list

7 - Key Pad

8 - Volume Up/Down Button

9 - Mode Up/Down Button
Used to navigate through channels.

10 - Zone Up/Down Button
Used to navigate through zones.

Programing Scan Lists
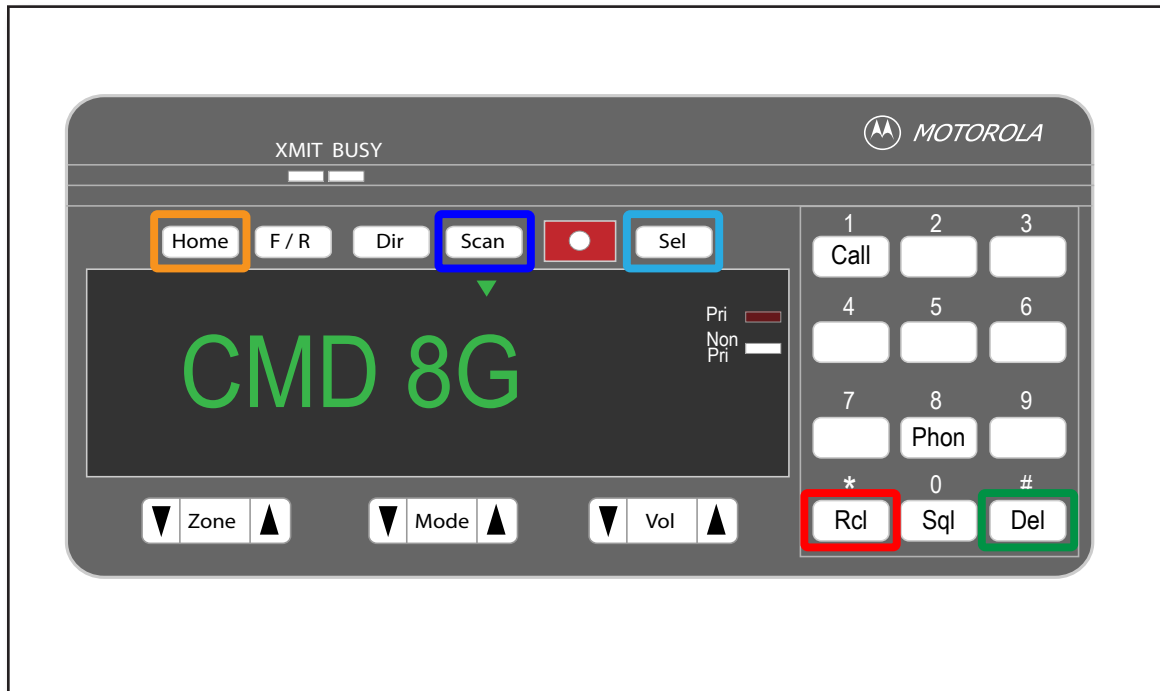
To Program a Scan List:

1. Press and hold the [Scan] button until you hear a beep, "SEL MODE" will appear in the display

2. Press [Rcl] button to view the channels in your scan list

3. Press [Sel] button to add a channel to the scan list

4. Press [Del] button to remove a channel from the scan list

5. Press [Home] button to return to normal operations

6. Press [Scan] button to turn scan on/off

Note: When you have created a scan list, it can only be scanned while in the zone you were in when you created it.

Motorola XTS 5000 - Portable Radio

SDFD utilizes the Motorola XTS 5000 portable radio for all fire operations on the 800 MHz radio system. All front line apparatus are outfitted with one radio per firefighter. Each radio is specifically assigned to a dedicated position on the apparatus for accountability purposes and should not be changed. To help identify which radio belongs to which position, a colored band is attached to the antenna of each portable radio.

Red – Captain

Green – Engineer

Yellow – FF #3 (Linebreaker)

Blue – FF #4 (Drop-off)

Reference: SI 01, Section 6, Page 9 of 9

Motorola XTS 5000 Operations

To Change Zones:

1. Press the "Zone" soft key

2. Use the arrow key pad to move through the zones, or, enter the number of the zone

3. Press the "Home" key to enter that zone and resume normal operations

800 MHz Portable Radio - Motorola XTS 5000

Speaker & Mic

LCD Display

Soft Selection Keys

Selection Pad

Home Button

LCD Backlight On/Off

Volume Check

Radio Coding Info

Push To Talk Button

Removable Battery

Scan On/Off Switch

Channel Selector

On/Off & Volume

Scan On/Off Indicator

Not Used

Emergency Button
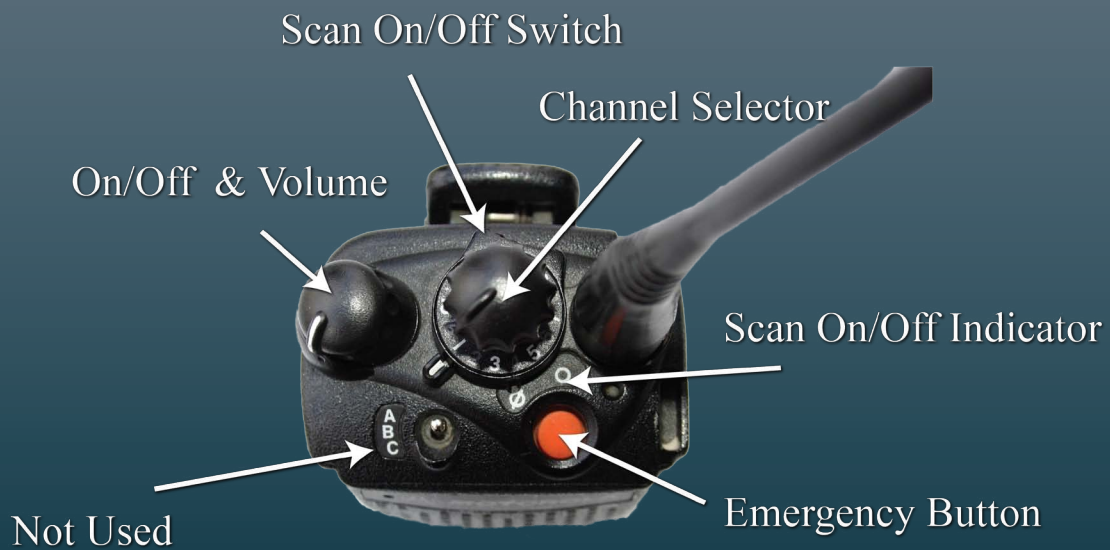
Programing Scan Lists

Setting up a scan list on the XTS 5000 is fairly simple. *See diagram above.*

The XTS 5000 radio will allow you to scan up to 16 channels per system (either the San Diego City trunked system, RCS trunked system, or Conventional system). This means that you can have a scan list set up for monitoring channels in multiple zones, as long as it is within the same system (either the San Diego City trunked system, RCS trunked system, or Conventional system). If you are unable to add a channel to your scan list and you hear a "beep," this indicates that your scan list is full (16 channels). Simply delete any non-essential channels from your scan list and attempt to add your desired channel.

Another common issue that may be encountered with the XTS 5000 is the occurrence of a steady tone when changing to a new system. If you change to a new system with your scan on, and you do not have any channels programmed into your scan list for that new system, you will get this steady tone. To resolve this, simply turn your scan knob off or create a scan list in the new system.

To Program a Scan List:

1. Press "PROG" soft key

2. Press "SCAN" soft key

3. Use arrow key to select zone

4. Turn channel selector knob on top of radio to desired channel (not pictured)

5. Press "SEL" or "DEL" soft keys

6. Press "Home" key

Indicates Scan is ON

Motorola APX 6000 - Portable Radio

In 2015 San Diego Fire-Rescue Department began purchasing the Motorola APX 6000 Portable Radio to replace the Motorola XTS 5000. The basic operation of the APX 6000 portable radio is very similar to the XTS 5000 radio with the following added features.

- Dual speakers - both sides of radio
- A digital read out screen on the top of the radio
- Larger buttons/knobs for changing channels with gloves on
- Audible announcement when changing channels
- Collar Mic with volume and digital read out

Link 9-5 APX 6000 Portable Radio Power Point Presentation - Overview
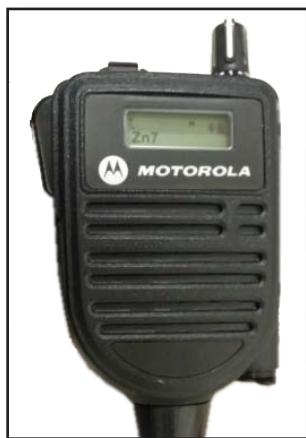
SDFD Radio Procedures

The San Diego Fire Department utilizes clear text language when communicating on the radio, with a few exceptions. Clear text language means speaking in commonly used, easy to understand English, eliminating slang and codes. Clear text has been adopted in an effort to maximize both ease of transmitting and understanding of radio messages. This form of communication is widely accepted throughout California.

The following are exceptions to the "Clear Text" language:

- 11-44 - When responding to an incident involving a death, the radio code "11-44" may be used.

- 51-50 - When a fire company encounters the need for the Police Department or an ambulance to respond for a psychiatric patient, the radio code "51-50" may be used.

- 10-88 - Occasionally a fire unit will need a police unit for immediate assistance or protection. The code "10-88" or "Cover Now" will be used. When transmitting a "10-88" or "Cover Now," give any additional information you can: number of people, type of weapons, shots fired, etc., to enable police dispatchers to advise their units.

- Emergency Button - An "Emergency Notification" can be made using the radio's emergency button. Pressing this button will alert dispatchers of an emergency situation, and it also transmits the unit and user ID. This function is important because it enables field units to report emergencies without voice communications, in the case that voice communications would threaten the safety of the first responders.

International Phonetic Alphabet

The SDFD uses the International Phonetic Alphabet when referencing letters over the radio. This eliminates any confusion with letters that may sound similar such as "B" and "D." Although the International Phonetic Alphabet is the standard for all fire departments across the nation, be aware that police officers do not use the same system.

Radio Call Signs

In an effort to standardize departmental radio communications, radio assignments are described below. The Captain carries the unit identification. The Engineer will be assigned by unit and position. The Firefighters will be assigned by unit, position, and last name. For example:

Captain – "Engine 12"

Engineer – "Engine 12 Engineer"

Firefighter #3 – "Engine 12 Firefighter Chamberlain"

Firefighter #4 – "Engine 12 Firefighter Penolio"

Radio Message Format

When initiating a call, always identify the unit or facility you are attempting to contact first, then identify yourself by unit and give the channel you are transmitting on. As a general rule, units should identify their unit preceded by the phrase "this is" to reduce confusion.

In the following example, Engine 12 is calling to Engine 11 on Command channel 8D:

"Engine 11, this is Engine 12 on Command 8 Delta"

Answer promptly and courteously. For example:

"Engine 12, this is Engine 11, go ahead"

In the following example, Firefighter Joe Penolio from Engine 12 is calling the Captain on Engine 12 on Tac channel 8E:

"*Engine 12, this is Engine 12 Firefighter Penolio on Tac 8 Echo*"

Two-Call Rule

Due to the chaotic and load environment found on the fire ground, calls over the radio may often go unheard or unanswered. If you hear a call on the radio two or more times for a unit or individual with no response, and you have the ability to communicate directly with that person, you shall:

- Answer the radio traffic and pass on the information in person to the individual or

- Notify the individual that they are being hailed on the radio and have them come up on the proper radio channel.

Radio Traffic (Message) Modes

The following communications traffic modes is to be used by all agencies working in the San Diego County operational area:

- Administrative traffic

- Incident traffic

- Priority traffic

- Emergency traffic

Administrative Traffic (mode)

Administrative Traffic is defined as radio traffic used to manage fire department/agency resources outside of active incidents, to include but not limited to move ups, out of service requests, etc. This traffic typically occurs on the department/agencies administrative, call or dispatch channel.

Incident Traffic (mode)

Incident Traffic is defined as radio traffic that routinely occurs while managing, responding and operating during an incident. This typically occurs on the command and/or tactical channels, regardless of their assigned usage.

Priority Traffic (mode)

Priority Traffic is defined as radio traffic that is of an urgent but non-emergency nature, such as but not limited to: initial report of an incident or fire incident not previously reported, report of a injury/non-injury traffic accident involving a fire agency apparatus. Priority traffic occurring on the department/agencies administrative, call or dispatch channel takes precedence over administrative traffic. Priority traffic may also be used while on an incident to convey an important message that must take priority over other incident traffic but is not yet of an emergency nature, such as reporting imminent collapse or changing modes from offensive to defensive.

Emergency Traffic (mode)

Emergency Traffic is traffic that occurs when a firefighter(s) is in immediate peril of injury, is injured, lost and/or unaccounted, entrapped, or any other situation that could result in the loss or serious injury of a firefighter. Emergency traffic can be initiated by any personnel on or off the incident ground using terms such as "mayday," "firefighter down," "help," etc. The use or activation of an emergency button shall also initiate this mode. Emergency traffic should first be initiated on the tactical or command channels, but can also occur on the department's emergency channel and/or administrative channels. Regardless of where the initiation occurs, Emergency traffic will take precedence over all other traffic and the channel emergency traffic is initiated on shall be cleared for the handling of this traffic.

"EMER" Button Activations

The "EMER" button should be pressed in any emergency situation where verbal communication is not possible on the assigned tactical or administrative channels. If the "EMER" button is activated on the 800 MHz radio, it will emit a single beep tone followed by five more beep tones to signify that the system has acknowledged the emergency. The radio display will now alternate between the channel that the radio is set to and the word "EMERGENCY."

All the users radio transmissions will now occur on the designated Emergency Channel, not what is in the display. If operating in zones 1 thru 10, when pressed, the radio will revert to the Emergency Channel (The last channel in the zone, 1P EMG – 10P EMG). When the "EMER" button is pressed, it also alerts Fire Dispatch. Fire Dispatch shall respond with the following command:

> ***"Unit with administrative traffic"***

If this was an accidental activation, come up on the radio and advise "Metro" immediately and reset your radio. If this is an actual emergency, you do not have to answer if it will compromise your safety. If no response is received by "Metro" from the user, emergency notifications will begin to be made. Warn-

Emergency Channels 1P through 10P are all the same. A user on Channel 3P will hear emergency traffic on Channel 7P.

ing - If the radio is in any other RCS/SDFD non specific agency zone (RMA, TRF, EMS, CNV, AND IFM), the radio will not go into emergency mode.

General Radio Guidelines

The following practices should be adhered to when operating a radio. This will ensure that communications are clear and understood. These practices will also eliminate any confusion which could arise through an incorrect interpretation.

- When working in another fire agencies' jurisdiction, you should always identify the agency you are calling followed by your agency and your unit designator. For example, "Heartland from San Diego Engine 10, can you repeat that address".

- Use proper language. Slang, swearing, derogatory and obscene language is prohibited and illegal.

- Think about the message before speaking, be concise but explicit.

- Do not think on the air.

- Do not say "please" or "thank you", politeness and courtesy are assumed.

- Do not use "CB" terminology, aircraft terminology, or slang (e.g., roger, over, clear, etc.).

- When spelling, the letter "O" is pronounced "oh" while the number "0" is pronounced "zero."

- Pronounce words distinctly and at normal volume while holding the mike at a 45 degree angle and about 1" to 2" from your mouth.

- Always hold a portable radio in a vertical position as the antenna puts out the strongest signal when held upright.

- Speak clearly, at a constant speed, and with the rhythm of ordinary conversation, approximately 125 words per minute.

- When the message to be sent is complex, carefully write it out before sending it.

- For greater clarity, most numbers should be transmitted as separate digits. For example, "three - six" for 36 and "one - four - seven" for 147. The exceptions to this practice are:

  ○ Whole units of 1000 - say "one thousand," "two thousand."

  ○ Day of the month - say "January twenty-one," "September seventeenth."

  ○ For measurements of time, use military time - say "twenty-three hours, thirty minutes."

- The names of victims, fire department personnel, and civilians should never be stated over the radio. Use a telephone, cellular phone or the MDC to transmit this type of information.

International Phonetic Alphabet

A - Alpha	N - November
B - Bravo	O - Oscar
C - Charlie	P - Papa
D - Delta	Q - Quebec
E - Echo	R - Romeo
F - Foxtrot	S - Sierra
G - Golf	T - Tango
H - Hotel	U - Uniform
I - India	V - Victor
J - Juliet	W - Whiskey
K - Kilo	X - Xray
L - Lima	Y - Yankee
M - Mike	Z - Zulu

Data & Telephone Systems

Mobile Data Computers

As previously mentioned, the mobile data computers, also known as MDC's, are mounted in the cab of all ambulances, engines, trucks, B.C. vehicles and select staff vehicles. These computers provide an alternative means of communication between Fire Dispatch and other units in the system, as well as creating a means of obtaining additional information without tying up the radio air waves. Listed below are some of the main features and benefits of using the MDC's:

- Incident Information, Figure 9-18
  - Address & Map Pages
  - Responding units
  - Radio channel information
  - Additional notes
- Viewing Pre-Fire Plans/Maps
- Live tracking of units
- Detailed Maps, Figure 9-17

- Canyons
- Schools
- Heli-spots
- Routes of response
- Sending/receiving messages
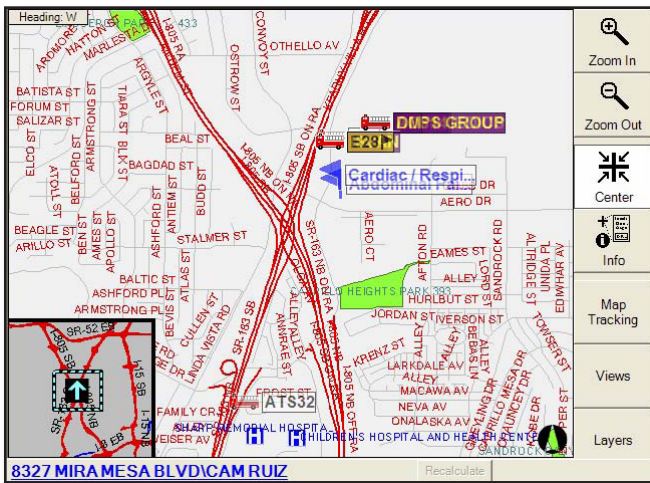
Firefighters must ensure that they are logged on to the MDC at the start of every shift in order for proper documentation and crew tracking to be complete.

For a complete guide to the operation and usage of the MDC, refer to the MDC Manual, Link 9-6.

Figure 9-17 Live maps/tracking of units

Station Computers

Every fire station is provided with desktop computers which are to be used for departmental training, communication and documentation only. Some of the many applications and resources available through the use of these computers include:

- Connection to CAD

- Fire RMS - Used to comply with federal guidlines for reporting incidents to the National Fire Incident Reporting System (NFIRS). Also used for fire inspections.

- Tele-Staff - Staffing and scheduling software program

- One SD - City Payroll System

- Target Safety - Website used to deliver and document all department related training. www.targetsafety.com/sdfd

- "S" Drive - A network drive installed for storing department files

- "M" Drive - A network drive installed for storing department manuals

- Microsoft Outlook - City email and calendar software

- Microsoft Office - Word, Excel, Power-Point

The City of San Diego Administrative Regulation 90.62 specifically details the employees responsibility for using the city's computers for email and internet purposes, Link 9-7. All employees are required to check their department email on a daily basis.

Link 9-7 A.R. 90.62, Email and Internet Usage Policiy

Station Telephones

Fire stations have two types of phone lines, administrative and nickel lines. The administrative line, or admin, is used for fire department business only. Phone conversations on admin line are intended to be for the company officer and shall be kept brief. The nickel line may be used for an employee's personal calls, however, toll calls must be reported and paid for by the employee.

The proper phone etiquette when answering a telephone call is to give the unit number, rank, and surname, i.e.,

Link 9-8 Ops Manual SI 03, Section 03, Telephone Communications

> *"Station 1, Captain Doe"*

The person calling shall identify in a similar manner.

Emergency Red Phone
Outside of every fire station is a red emergency phone for public use should the fire company not be in quarters. This phone is a direct line to fire dispatch. The emergency red phone is to be tested by fire station personnel on a monthly basis, as directed by the ECDC.

Additional information on the usage of phones may be found in the Operations Manual, Standard Instruction 03, Section 03, Link 9-8.

Mobile Phones

Mobile phone usage is prohibited by all personnel during a code response, unless required for incident management. Drivers of all emergency apparatus/vehicles are prohibited from using a mobile phone while driving. The only exception is for personnel driving staff apparatus (sedans, pick-ups and SUV's) that have mobile phones equipped with "hands free" systems. Unless required for incident management, personal mobile phones shall be turned off or placed in silent mode during an incident.

Employee Phones

Each employee is required to maintain a personal telephone. Any change of address or telephone number must be faxed on an FD-7 to payroll and changed in the Staff Management section of their Telestaff account within 24 hours following the change.

Fireground Hand Signals
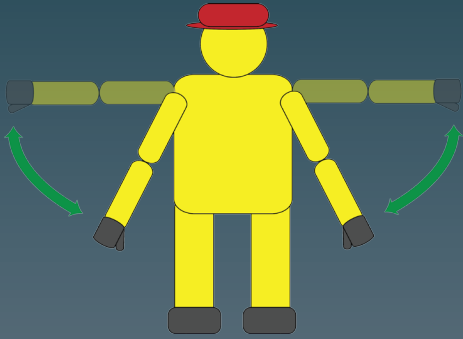
Decrease Pressure
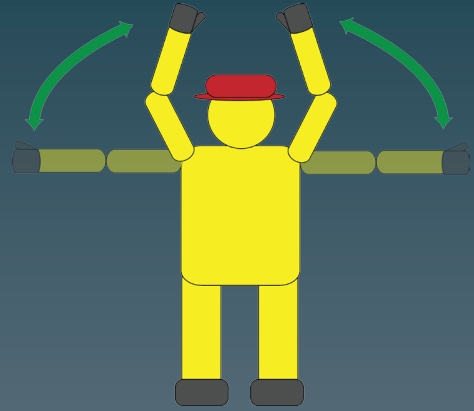
Charge Line /
Increase Pressure
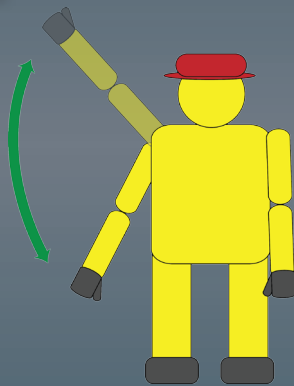
Acknowledge /
Lay a Line
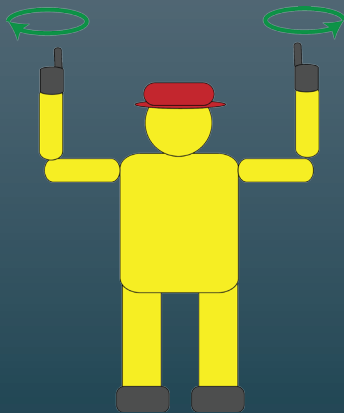
Shutdown
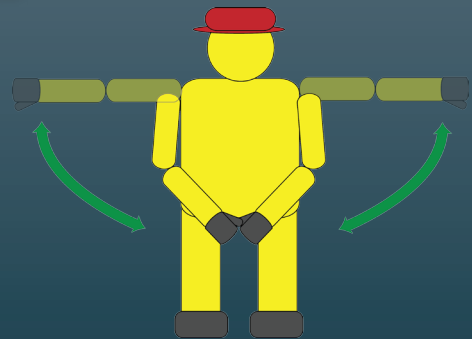
Shutdown/Pick Up

Standardized Communication Signals

Horn Signals

Horn signals may be used in two separate circumstances; when maneuvering an apparatus and to alert firefighters of a hazard.

When maneuvering an apparatus using horn signals, it is important to remember that the signal should be followed by an acknowledgment from the firefighter outside of the apparatus. This is accomplished by the acknowledgment hand signal (see below) and should be done before the apparatus is moved.

The following horn signals are appropriate for maneuvering an apparatus:

* The following horn signals are appropriate for maneuvering an apparatus:

* Long horn blast - STOP

* 1 Short horn blast - Apparatus is moving forward (used primarily on the fire ground when laying hose)

* 2 Short horn blasts - Apparatus is moving backward

* 3 Long & continuous horn blasts - IMMEDIATELY EVACUATE THE STRUCTURE OR IDLH AREA

Hand Signals

Hand signals can be an effective means of communication when voice and/or radio communications are not practical. However, in order for communication with hand signals to be safe and effective, they must be performed according to a standardized method.

Hand Signals for Directing Vehicles

When firefighters use hand signals to guide the driver of an apparatus, they should first make sure they can be seen by the driver. They need to position themselves so they are behind the apparatus, can be seen in the rear view mirror, and are safe from injury. A good rule of thumb is if the firefighter can see the driver in the mirror then the driver can see the firefighter.

Signals given at night require the use of lighted wands so they can be seen and understood correctly by the driver. Each apparatus shall carry, as standard equipment, a minimum of two battery-powered red wands to provide greater visibility of hand signals at night. These wands should be easily accessible and must always be used when directing apparatus maneuvers at night.

Figure 9-18 Backing Hand Signals to Left and Right

Verbal communication should be utilized in situations where the hand or horn signals are not appropriate.

Turn Rear to the Left, Turn Rear to the Right, Figure 9-18
Point arm, held parallel to the ground, in the direction the rear of the apparatus is to move. Hold other arm overhead perpendicular to the ground. No movement of arms is necessary.

Come Straight Back, Figure 9-19
Both arms over head, moving forward and backward

Stop, Figure 9-20
Cross both arms or wands over head

Fire Ground Hand Signals

Fireground hand signals are a very effective tool for communicating. Often times, the distance between the pump and the scene, and/or excessive noise, may make verbal communication impossible. Under these circumstances, hand signals will be the quickest, most practical, and most effective means of communication. The person signaling should face the person being signaled. Both communicators must stand where each can be easily seen and make sure each has the other's attention.

Lay a Line
Raise and lower one arm repeatedly, with the arm held straight in front of the body. Person receiving all signals shall acknowledge by raising and lowering one arm held at the side, not in front of the body.

Charge Line or Increase Pressure
To call for an increase in pressure, start with arms held horizontal and bring them over head until the hands touch, then back down to horizontal. Repeat until acknowledged.

Decrease Pressure
To call for a decrease in pressure, raise arms to horizontal position and bring them straight down to the side. Repeat until acknowledged.

Shut down & Pick up the hoseline
To signal that you want to shut down the hose line and begin picking up the hose, extend your arms outward to a horizontal position and lower them down in front of you body. Be sure to cross your hands in front of you body when lowering them. Repeat until acknowledged.

Shut down & don't pick up the hoseline
To signal that you want to shut down the hose line and leave the hose in place, raise both hands to just above head level and make a circular motion with your index fingers.

Figure 9-19 Backing Hand Signals - Straight Back
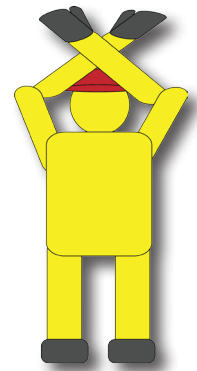
Figure 9-20 Backing Hand Signals - Stop

OATH

The acronym OATH has been widely adopted as a guide for comunicating simple, non-verbal messages where radio or face to face communication is not feasible. OATH can be used for communicating through rope tugs, light signals, or rapping/tapping on an object. Situations where this type of communication may be neccessary include confined space rescue, swiftwater rescue, search and rescue of large areas with a tag line, or over the side rope rescue.

O = OK
1 Tug/Flash/Tap indicates all is OK

A = Advance
2 Tugs/Flashes/Taps tells the other person to advance the retrieval line

T = Take Up
3 Tugs/Flashes/Taps tells the other person that the line needs to be taken up

H = Help
4 Tugs/Flashes/Taps tells the other person they they need help

It is important to review with all rescuers these standardized signals prior to using them for a rescue situation. This simple briefing will minimize any confusion and allow for a safer operation.

Summary

Fire communications is a complex and constantly evolving area of the fire service. It is critical that all firefighters, new and experienced, dedicate the time necessary to learn and train with all the types of radios, computers, pagers, phones and signaling devices that are used in everyday situations.

Understanding the rouitng and dispatching of an incident helps firefighters have a better idea of how to prepare for the dangers and incidents that they will be responding too. Becoming proficient in the use of all radio devices, portable and mobile, is critical. Not having a complete understanding of the capabilities and limitiations of each of these radios may cause you to miss important radio traffic, which may put you or your crew's life in jeopardy.

In addition to radio usage, the MDC and other computer devices have become more of a fixture in the fire service. Take the time to ensure that all crew members have a thorough understanding of how each of these devices work and understand the policies and regulations that are associated with them.

Media & Link Index

- Audio of Dispatch

- Audio of Size Up

- An Explanation of Tones

- An Explanation of VHF Fleet Map

- An Explanation of Air Guard

- Update on the future of the Bendix King GPH Portable Radio

- Operations Manual SI 2, Section 4 - Department Operations Center

- 800 MHz Radio Fleet Map

- VHF Radio Fleet Map

- MDC Manual

- A.R. 90.62 Email & Internet Usage Policy

- Operations Manual SI 3, Section 3 - Telephone Communications

- July 2012 Command/Tac Radio Policy Changes

Additional Links

- Motorola XTL 5000 Mobile Radio Training PPT

- Motorolla XTS 5000 Portable Radio - Owners Manual

- Kenwood TK-9 VHF Mobile Radio Training PPT

- Bendix King VHF Portable Radio Training PPT

- San Diego MVU Repeater Map 2011

References

1. SDFD Drill Manual, 1994, Firefighter Safety
2. SDFD 72nd Academy - Fire Communications PPT - Matt Nilsen, Dave Allen
3. SDFD Wildland Refresher Guide - VHF Radio Usage
4. SDFD Fire Communications - "S" Drive folder resources
5. SDFD Operations Manual Standard Instruction 03 - Communications

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NOTE: If you have any additional information or content that you feel would be appropriate to contribute to this Chapter or would like to report any errors or misrepresentations, please contact the SDFD Training Division or email the Drill Manual Revision Staff at

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Revisions/Updates

Date	Revision/Update Description