Overview

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  - Radio Basics
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Part I: Radio Basics

- "Radio" waves are only a part of the electromagnetic spectrum
- Visible light is another part of the spectrum
- Both radio waves and visible light are waveforms - it is the size of the waveform that determines whether we can see it or hear it

Radio Basics

- A radio "frequency" is determined by the number of waveforms generated per second (MHz = 1 million cycles per second)
- Low frequencies have fewer waveforms per second than higher frequencies
- The lower the frequency the longer the wave
- Wave length makes a difference in antenna length and the ability of the radio wave to bounce and bend around obstructions

Radio Basics

- The terms "frequency" and "channel" are not the same
  - again, frequency is the number of waves per second
  - a "channel" might be a single frequency, a group of frequencies, or just a way of telling your radio which digital messages to receive
  - for us, a "channel" (or "talkgroup") is simply the number on the channel selector or name for a particular function (e.g. FRDISP, FRRESP, ATAC4)

Radio Frequencies

- The pieces of the electromagnetic spectrum that interest us are:
- Low band: 30MHz - 50MHz
  - Obsolete, no longer used
- VHF High Band: 150MHz-170MHz
  - Rescue squads in surrounding counties
  - Hospitals ("EMS-1")
- UHF: 406MHz - 470MHz
  - Fire and rescue pagers in our system
- Trunked / Digital: 800MHz
  - Primary communications for ALL public safety in Albemarle County and Charlottesville City

Radio Frequencies

- Other points of reference in the spectrum include:
  - AM radio (yes, it's still there) is from 0.54 MHz to 1.7 MHz
  - FM radio is from 88 MHz to 108 MHz, between low band and VHF high band
  - Most cell phones operate at 1300MHz or higher

Radio Systems

- Simplex
  - One channel = one frequency
  - Range is limited to line-of-sight from your radio
- Repeated
  - One channel = two frequencies
  - Your radio talks to the repeater on one frequency
  - The repeater retransmits your signal at much higher power on the second frequency for everyone to hear
- Digital / Trunked
  - Hundreds of channels (talkgroups) share a few dozen frequencies
  - Digital compression and a system control computer allow everyone to share without talking over each other

Radio Guidelines

- Always listen before transmitting to make sure the channel is clear
- THINK BEFORE YOU TALK!
  - Who are you calling?
  - Which truck are you?
  - Is this information that NEEDS to be said on the radio?
  - What information is necessary to be communicated?

Radio Guidelines

- Press the PTT (push-to-talk) button and hold before talking
  - Digital: wait for beep
  - Analog: wait 2 seconds
- Hold the microphone 2 inches from your mouth and talk directly to it - not across it. Talk at a conversational level - don't shout, don't whisper

Radio Guidelines

- – Shouting actually distorts your signals
- Avoid transmitting when sirens / air horns are operating
- Speak distinctly and pronounce words carefully
- Speak at a moderate speed, using conversational tone of voice with natural emphasis and rhythm

Radio Guidelines

- Keep all transmissions brief and to the point
- Do not use phrases like "be advised" or "at this time"
- Courtesy is assumed, so there is no need to say "please", "thank you", and "you're welcome"
- "Affirmative" and "negative" are preferred over "yes" and "no"

Radio Guidelines

- What was that?
  - "Were you direct on that?" - they mean, 'Did you hear what was just said?'
    - I.e. - "ECC, Engine 85, we have an awake patient"
    - "Medic 140, were you direct?" ('did you hear Engine 85 say the patient was awake')
    - "Affirmative"

Radio Guidelines

- What was that?
  - "Did you copy the numerics?" - they mean, 'did you understand the street numbers?'
  - Numerics are the *number only*, NOT the street name
  - If you have no idea where you're going, ask for the location, not the numerics

Radio Guidelines

- During all radio operations, remain calm!
- Do **not** make uncivil, angry, abusive, derogatory or sarcastic remarks
- Above all, pay attention so you don't miss important information

Radio Guidelines

The best people on the radio are the ones you never hear. They keep transmission short and to the point and use the telephone whenever possible.

Part II: What to say

Talking to ECC, other fire/ rescue units, and the hospitals

Part II: What to say

- For simple messages, do not call to establish contact with ECC
- When calling a station, identify the station to be called and then yourself
  - I.e., "ECC, Ambulance 141 responding to 1014 Ridge Street"
  - By doing so, you will obtain the attention of the station being called

Talking to ECC

- CORRECT PROCEDURE
  - [Unit] ECC, Medic 141 is on-scene, 1014 Ridge Street
  - [Dispatch] Okay Medic 141, 12:04
- ALWAYS use the "Ambulance" "Trauma" or "Medic" prefix
  - this informs listeners what level of care your ambulance can provide
  - this level corresponds to the highest release level of anybody on the truck, not just the AIC

Know who you're talking to

- Prefixes for unit identification (EMS)
  - Ambulance, Trauma, Medic: EMS patient transport vehicles
  - Car: Any response car (EMS or fire)
  - Squad: Heavy rescue vehicles
  - Logistics: Mass Casualty unit
  - Duty: An on-duty supervisor
  - Rescue: Usually an individual member with a radio (e.g. Rescue 101 = Chief)
    - Some other agencies use "Rescue" instead of "Ambulance" – this can cause confusion

Know who you're talking to

- Prefixes for unit identification (Fire)
  - Car: Any response car (EMS or fire)
  - Engine: Standard fire truck w/ pump, hose, etc., often used as first responder unit
  - Truck/Ladder/Tower: Ladder truck
  - Brush/Attack: Small 4-wheel drive unit
  - Tanker: Very large water tank, not much else (rarely used for EMS calls)
  - Utility: Some first responder or service vehicles
  - Chief: Any command officer
  - Phoenix: Airport crash truck

Know who you're talking to

- Portable radios for different riding positions are identified by letter
  - A (Alpha) for the driver
  - B (Bravo) for the AIC / fire officer in charge
  - C (Charlie), D (Delta), etc. for 3rd, 4th, etc.
- In general the driver handles radio traffic on scene while the AIC does patient care
- However if the crew must split up, you can communicate as follows
  - AIC: "Medic 141 Bravo to Medic 141 Alpha"
    Driver: "Medic 141 Alpha"
    AIC: [proceeds with the message]
  - This isn't something you should be doing frequently; for safety the crew should stay together whenever possible

Talking to ECC

- DO NOT add "Charlottesville" to the radio designation (except when calling the hospital)
  - Within Charlottesville/Albemarle, your prefix and number (Ambulance 141) identify you
  - "100" numbers are Charlottesville Rescue*
    - » Except Medic 111, Medic 112, Medic 121
  - "500" numbers are Western Albemarle
  - "700" numbers are Scottsville
  - Most 1 and 2 digit numbers are Fire units

Talking to ECC

- When <u>must</u> you talk?
  - When responding on a call
    - "ECC, Ambulance 141 responding to 1014 East Market St."
  - When you arrive on-scene
    - "ECC, Ambulance 141 on-scene 1014 East Market St."
  - To give a status report if necessary
    - "ECC, Ambulance 141 is OK on scene"
    - "ECC, Ambulance 141 assessing 4 patients, requesting a second ambulance."

Talking to ECC

- When you begin transport
  - "ECC, Ambulance 141 transporting 1 to U.Va."
- When you get to the hospital
  - "ECC, Ambulance 141 at U.Va."
- As soon as you are in a position to answer another call if you have to
  - this may mean you have to come back to finish paperwork, etc.
  - "ECC, Ambulance 141 available at U.Va."

Talking to ECC

- When you are returning (with status)
    - "ECC, Ambulance 141 in service", or
    - "ECC, Ambulance 141 returning, not ready, equipment", or
    - "ECC, Ambulance 141 returning driver only"
- When you get back to the building
    - "ECC, Ambulance 141 in quarters"
- If you leave quarters (errands, etc.)
    - "ECC, Ambulance 141 on the air"

Talking to ECC

- The use of plain English is preferred over the use of "10" codes and "signal" codes to avoid potential confusion
  - However, there a a few codes you need to know
    - "Signal 3" is a <u>confidential</u> emergency code that you can tell to ECC when you need <u>emergency</u> police assistance - and it better mean you are being beaten, because it is the equivalent of "officer down"

Talking to ECC

- "10-33" means "emergency", and is used by the police (but not generally by us)
- "10-55" means "drunk driver", and is used by the police (but not generally by us)
- "10-56" means "drunk", and is used by the police (but not generally by us)
- "10-96" means "psychiatric case" and is also used by the local police
- All the "10" codes should be known by ECC if you use one, like 10-96, to talk about someone you don't want to call a psychiatric case to their face

Talking to ECC: Priority Traffic

- "ECC, Ambulance 141 with priority traffic"
  - Only say this if you have a highly urgent, time-sensitive message and immediately need the undivided attention of whoever you're calling
    - E.g. You/other responders are in danger
  - "An *imminent danger to life, limb, or property exists; not used simply due to heavy radio traffic or to relay routine radio traffic to the ECC*"

Talking to ECC: Priority Traffic

- If you are told to "stand by unless priority" or "hold traffic"…
  - ECC is getting ready to dispatch a call, or the dispatcher is answering a 911 call, etc.
- Do not transmit unless you have a "priority traffic" situation
- Wait until ECC finishes dispatching or tells you "go ahead" / "resume normal traffic"

Hospital Communications

- When an ambulance transports a patient to the hospital, they are required to call that hospital and give a radio report on the nature and condition of the patient
- The radio report must give as much advance notice as possible
  - in fact, if you have a Priority Red patient or multiple patients, give a heads-up from the scene

Hospital Communications

- When calling a hospital, identify the station to be called and then identify yourself and the channel
  - "U.Va. MEDCOM this is <u>Charlottesville</u> Ambulance 141 on EMS-1"
    - Use "Charlottesville" because other transporting agencies have similar numbers to ours
    - You say the channel (EMS-1) because at U.Va. They have numerous radio channels that they monitor and they need to know on which to talk back to you

Hospital Communications

- On the back VHF radios
  - U.Va. MEDCOM is Channel 1
  - Martha Jefferson Hospital is Channel 2
  - Remember - it's the same frequency, different PL
- On the 800 portable radios
  - U.Va. MEDCOM is UEMS (Zone 1 ch. 13)
  - Martha Jefferson is MJEMS (Zone 1 ch. 14)
  - To reduce confusion, identify the channel as "800 UEMS" or "800 MJEMS" when calling

Hospital Communications

- When asked for a <u>brief report</u> by a receiving facility (e.g., UVA MEDCOM), simply give the age, sex, and chief complaint of your patient and your ETA
- Otherwise, add pertinent history, brief treatment, brief physical assessment findings

Hospital Communications

- Don't forget the pertinent information
  - For MVA's
    - high or low speed?
    - loss of consciousness?
    - seat belts and/or air bag ?
    - A, B or C problems?
    - CNS deficits?

Hospital Communications

- For MJH to take a trauma patient YOU need to paint a clear picture that proves this patient does <u>not</u> meet trauma triage criteria, (or they must go to the Level 1 trauma center) I.e.,
  - low speed accident
  - lack of any head injury indications (no loss of consciousness, did not hit head, memory of event intact, etc.)
  - lack of MOI for serious internal injuries
  - CNS intact

Hospital Communications

- When calling your base hospital for consultation and/or orders ("medical command"), MAKE SURE you have done a complete assessment, provided all immediate care measures, and have your thoughts organized to "paint the picture" for the Medical Command Physician (MCP)

Hospital Communications

- If you request medical command, be ready to give report when you are informed the physician is standing by
- It is VERY annoying to busy ER physicians to be called for consult to be told to "stand by" -- YOU should be ready for the consultation
- Use the telephone whenever possible

Part III: Our 800MHz System

Specifics of our system &
the XTS5000 portable radio

800 Digital Trunked System

- All agencies share the system
  - Police, Fire, Rescue, Jail, Airport
- Uniform Equipment
  - Everyone has identical Mobiles, Portables, MDTs
- Uniform Design
  - Zones 1 and 2 are customized for each agency
  - Zone 3 has interoperability talkgroups
  - Zones 3 and above are the same on EVERY radio

800 Digital Trunked System

- 22 Zones (Groups of Talkgroups)
  - Zones are just a convenient way of keeping related talkgroups together
- 16 Talkgroups (Channels) per zone
  - Each agency gets a zone
  - The same talkgroup may be found in multiple zones
    - 1 FRDISP and 2 FRDISP are the same

Portable Radios – Fleet Map

	Zone 1 (A)	Zone 2 (B)	Zone 3 (C)
Talkgroup 1	FRDISP	FRDISP	TA1D
Talkgroup 2	FRRESP	FRRESP	TA2D
Talkgroup 3	ATAC3	BTAC3	EVENT3
Talkgroup 4	ATAC4	BTAC4	EVENT4
Talkgroup 5	ATAC5	BTAC5	EVENT5
Talkgroup 6	ATAC6	BTAC6	EVENT6
Talkgroup 7	ATAC7	BTAC7	EVENT7
Talkgroup 8	ATAC8	BTAC8	EVENT8
Talkgroup 9	ATAC9	BTAC9	EVENT9
Talkgroup 10	ATAC10	BTAC10	EVENT10
Talkgroup 11	ATAC11	BTAC11	EVENT11
Talkgroup 12	ATAC12	BTAC12	EVENT12
Talkgroup 13	UVA EMS	FRADM	8CALL90
Talkgroup 14	MJH EMS	(Blank)	8CALL90D
Talkgroup 15	(Obsolete)	CTYCMD	8TAC91
Talkgroup 16	FRRESP	FRRESP	8TAC91D

Digital Trunking

- Unique Radio ID's
  - Each radio has a unique identifier
  - Visible during transmissions
  - Each radio must be added to system
    - If you buy an 800 radio on eBay, there is no way to make it talk on our system
  - Radios can be deleted on the fly
    - Lost, stolen or nuisance radios

Portable Radios

- Motorola XTS 5000 – Model II
  - Expensive ($3750 each)
  - Must remain with its assigned unit
  - The radio must be in your physical possession, or in the truck at all times, no exceptions
  - Notify crew captain and DO *immediately* if a radio is missing

Radio Sounds

Click the speaker next to each description to hear the sound

Tone Name	Tone Information
Button Press	A valid key was pressed on the keypad
Emergency	Emergency alarm was sent from your radio
Failsoft	Radio has lost communication with the central controller
Low Battery	Weak battery indication
No Acknowledge	A call to the central controller was not acknowledged
Out of Range	Radio is out of range of the system
Power-up	Radio has successfully powered on
Prohibit	Talkgroup or channel is not accessible
System Busy	Channel, system or target radio is busy
Talk Permit	Channel is ready to use
Time-out Timer	Time-out timer limit has been reached

Portable Radios

Scan On or Off

Channel/Mode Select

Power On/Off
Volume Control

Control Top

A B C

Q

Zone Select

Emergency

Portable Radios

Side Buttons

Monitor

Side Button 1 (not programmed)

Nuisance Channel Delete

Push-To-Talk (PTT) Button

Portable Radios

Z 1AFRCOM
ENG111A

ZONE

Zone Select

Menu Options

Portable Radios

Portable Radios

	Received Signal Strength Indication (RSSI) The received signal strength for the current site, for trunking only. The more stripes in the symbol, the stronger the signal.
	Battery · Conventional = flashes when battery is low · Smart = the number of bars (0-3) shown indicates the charge remaining in your battery; flashes when battery is low
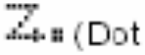
Portable Radios

	Talkaround
╟	**Talkaround** · On = you are talking directly to another radio, not through a repeater, during conventional operation only · Off = you are talking through a repeater
▷	**Monitor (Carrier Squelch)** The selected channel is being monitored during conventional operation only.
✿	**Secure Operation** · On = secure operation · Off = clear operation · Flashing = receiving an encrypted voice call
Z	**Scan** The radio is scanning a scan list.
Z (Dot Flashing)	**Priority-One Channel Scan** One channel is assigned as the priority channel during scan operation.
Z # (Dot Steady)	**Priority-Two Channel Scan** Two channels are assigned as the priority channels during scan operation.

Portable Radios

RED
- **Solid**
  - PTT is pressed; radio is transmitting
- **Flashing**
  - Channel Busy
  - Low Battery (lights while transmitting)

RED LED

GREEN
- **Solid**
  - Self-test being performed

GREEN LED

Portable Radios - Antenna

DON'T USE AS A HANDLE!

To install the antenna:

1. Turn the radio off.

2. Screw the antenna (clockwise) into the antenna receptacle on top of the radio.

3. Tighten the antenna firmly with your fingers.

To remove the antenna:

1. Turn the radio off.

2. Unscrew the antenna (counter-clockwise) and remove it from the antenna receptacle on top of the radio.

Portable Radios - Batteries

To install the battery:

1. Turn the radio off

2. Hold the radio with the back facing upward.

3. Align the three slots at the top of the battery with the three tabs on the back of the radio.

4. Push the battery down toward the radio until the battery clicks into place.

To remove the battery:

1. Turn the radio off.

2. Hold the radio with the back of the radio facing upward.

3. Push the battery release button on the bottom of the radio.

4. Lift the battery away from the radio and remove.

Portable Radios - Zones

Zone Name

Z 1AFRCOM
ENG111A

ZONE

Zone Select Switch

To select a zone:

Toggle the Priority Zone Select switch to select the desired zone.

For our radios, the settings are as follows:
- Position A – Zone 1(ACFR Main)
- Position B – Zone 2 (ACFR other)
- Position C – Zone 3 (City Main)

For Albemarle County, the primary zone that will be used is zone 1 (for both fire and ems agencies)

Portable Radios - Zones

Zone Name

Z 1AFRCOM
ENG111A
ZONE

Push-to-Talk
(PTT)

To select a zone:

1. Press the button directly below ZONE. *The zone name flashes on the display.*

2. Press the right side of the 4-way Navigation button to find the zone you want. *If the zone you selected is unprogrammed, repeat step 2.*

3. Press the Home button to confirm the displayed zone and channel.

Portable Radios - Channels

Channel
Name

Channel
Select Knob

Z 1AFRCOM
ENG111A

PAGE

To select a channel:

Turn the Channel/Mode Select knob to select the desired channel/mode.

The new name will appear on the display.

If the channel/mode you selected is unprogrammed, repeat the above step.

If channel announcement is enabled on your radio for this channel/mode, you will hear a voiced confirmation of your selected channel/mode.

Portable Radios – P.T.T.

To transmit:

1. Select the desired zone/channel.

2. Listen for ongoing conversations; if the channel becomes clear, proceed with your call.

3. Press and hold the PTT button to transmit and wait for the "Talk Permit" tone. The LED will light red. When speaking, keep the microphone 1-2" from your mouth.

4. Release the PTT button to receive (listen).

LED

Push-to-Talk (PTT)

Portable Radios – Talk Around

Use of the Talk Around channel:

The Talk Around channel is designed for when the 800 MHz radio system is not able to connect. This feature converts the radio into a conventional radio.

1. When in need of the Talk Around channel, the IC can request that either a single unit switch, or all personnel at the incident.
   - Regardless, it is the responsibility of the IC to announce this decision to ECC, who will document the location and follow up.
2. Stations will need to test their radio signal strength at every opportunity (i.e. preplan trouble areas, and report any coverage lapses to the Chief of the station.

Channel Select Knob

Portable Radios - Scan

Scan
Switch

The scan on/off position is predetermined by your administrator.

Z 1AFRCOM
ENG111A
ZONE

The scan feature allows you to monitor traffic on different channels by scanning a preprogrammed list of channels. Your radio can have several different scan lists. These lists must be enabled by a qualified radio technician.

To turn scan on:

Turn the Scan switch to the predetermined position to enable scan.

The scan symbol ( ) will be displayed, indicating scan is active.

To turn scan off:

Turn the Scan switch to the predetermined position to disable scan.

The scan symbol ( ) will no longer be displayed, indicating scan has been deactivated.

Portable Radios – Nuisance

Nuisance Delete Button

Z 1AFRCOM
ENG111A
ZONE

When the radio scans to a channel that you do not wish to hear (nuisance channel), you can temporarily delete the channel from the scan list.

To delete a nuisance channel:

1. When the radio is locked onto the channel to be deleted, press the Nuisance Delete button. Repeat this step to delete more channels.

Note: You cannot delete priority channels ($Z_{+\#}$) or the designated transmit channel.

The radio continues scanning the remaining channels in the list.

2. To resume scanning the deleted channel, change channels or turn scan off and then back on again.

Portable Radios – Volume Set

Volume Set Tone

Push-to-Talk
(PTT)

Z 1AFRCOM
ENG111A
ZONE

To use the Volume Set Tone
Press the Volume Set Tone to check the volume of your portable.

Portable Radios - EMERGENCY

Emergency Button

EMERGENCY
ID: 733056

ZONE

Portable Radios - Emergency

To send an emergency alarm:

1. With the radio turned on, press the Emergency button.

   The current zone/channel is displayed alternately with EMERGENCY, the LED lights red, and you hear a group of short, medium-pitched tones.

   If the selected channel does not support emergency, the display shows NO EMERGENCY. Select a channel that does show EMERGENCY.

   Note: To exit emergency at any time, press and hold the Emergency button for about a second.

2. When you receive the dispatcher's acknowledgment, you see ACK RECEIVED, four tones sound, the alarm ends, and the radio exits the emergency mode.

   If no acknowledgment is received, you see NO ACKNOWLDG, the alarm ends, and the radio exits the emergency mode.

EMERGENCY
ID: 733056
ZONE

LED

Emergency
Button

Portable Radios - Emergency

This type of dispatch gives your radio priority access on a channel. The radio operates in the normal dispatch manner while in emergency call, except, if enabled, it will return to one of the following:

- *Tactical/Non-Revert — You talk on the channel you selected before you entered the emergency state.*
- *Non-Tactical/Revert — You talk on a preprogrammed emergency channel. The emergency alarm is sent on this same channel.*

To send an emergency call:

1. With the radio turned on, press the Emergency button.

The current zone/channel is displayed alternately with EMERGENCY, the LED lights red, and you hear a group of short, medium-pitched tones.

If the selected channel does not support emergency, the display shows NO EMERGENCY. Select a channel that does show EMERGENCY.

Continued...

LED

Emergency
Button

EMERGENCY
ID: 733056

ZONE

Portable Radios - Emergency

Push-to-Talk
(PTT)

Note: To exit emergency at any time, press and hold the Emergency button for about a second.

2. Press and hold the PTT button and announce your emergency into the microphone.

3. Release the PTT button to end the transmission and wait for a response from the dispatcher.

4. Press and hold the Emergency button for about a second to exit emergency.

EMERGENCY
ID: 733056

ZONE

Emergency Button Usage

- Activate the emergency button if you are in danger and need immediate assistance
  - Unable to talk due to danger
    - Push button, turn volume down
    - ECC will call you for a status check, if no response, police will be sent
  - Any other emergency
    - BE SPECIFIC as to what help you need (police for a fight, ambulance for injured member, etc.)
    - You get priority, cannot be interrupted
    - Gets everyone's attention – every radio will BEEP when you transmit an emergency message

Policies & Procedures

- Dispatch Talkgroup – FRDISP
  - All fire and EMS calls are dispatched on FRDISP
  - Also used for radio traffic not related to a dispatched incident, such as administrative messages
  - To avoid switching talkgroups all the time, most people leave their radio on FRRESP and keep a pager turned up so they can hear FRDISP

Policies & Procedures

- Response Talkgroup – FRRESP
  - All fire and EMS responses are on FRRESP unless directed otherwise
  - Mark responding, on scene, enroute hospital, at hospital, and in service on FRRESP
  - Remember to monitor FRDISP (either on your pager, or on a radio) whenever you are in service

Policies & Procedures

- Tactical talkgroups (A/B Tac 3-12)
  - Named using the phonetic alphabet
    - For example, ATAC4 is "Alpha Tac 4"
  - Assigned for multi-company incidents
    - Structure fires, extrications, etc.
  - May be assigned by ECC or requested
    - ECC does not always monitor Tac talkgroups
    - Mark on scene on FRRESP, then switch to assigned TAC talkgroup, *unless* instructed by ECC to switch while responding
    - PAY ATTENTION!

Policies & Procedures

- Talkgroups Summary
  - You will be dispatched on FRDISP
  - Mark up on FRRESP when responding to a call
  - If a TAC talkgroup is announced for your incident, switch upon arrival
  - If no talkgroup assigned, stay on FRRESP
  - Listen to FRDISP when in service

The End

Questions?