

# *State of Tennessee*



## *State Interoperability Task Force*

### *Tennessee Radio Interoperability Guide*

*Recommendations to Promote Immediate State & Local Government  
Radio Interoperability and Mutual Aid Communications for Public Safety*

*Adopted 7-16-2007*  
*Revised 01-15-2009*

***Not for Public Distribution – Public Safety Sensitive***

# *Table of Contents*

DESCRIPTION	PAGE #
Introductory Letter	3
Memorandum of Understanding	5
Conditions for Usage	8
Appendix A – VHF Interoperability	12
Appendix B – UHF Interoperability	13
Appendix C – 800 MHz Interoperability	15
Appendix D – 700 MHz Interoperability	16
Appendix E – P25 Interoperability Technical Parameters	17
Appendix F – Mutual Aid Frequencies	19
Appendix G – Marine & Aviation Interoperability	21
Appendix H – Gateways / Cross-band Devices	22
Appendix I – NIMS	30
Appendix J – Plain Language	31
Appendix K – Phonetic Alphabet	32
Appendix L – Inter-City 155.370 DTMF Codes	33
Appendix M – Federal NTIA Interoperability	37
Appendix N – Civil Air Patrol Interoperability	39
Appendix O – Amateur Radio Interoperability	40
Appendix P – HF (2 – 30 MHz) Interoperability	41
Appendix Q – Use of Base (Fixed) Stations on Calling, Tactical & Mutual Aid Channels and Power Limitations	42
Appendix R – VTNMA & UTNMA DTMF Codes & Usage	43
Appendix S – Minimum Requirements for Interoperability Radios	44
Appendix T – TN 800 MHz Mutual Aid Channel	46
Appendix U – Minimum Channel for Radios by Discipline	47
Appendix V – Glossary	51
Appendix W – Point of Contacts	55
Appendix X – Satellite Interoperability	56
Attachment 1 – Ways to Implement the TN Interoperability Guide	57
Attachment 2 – Interoperability Continuum from Safecom	59
Changes to the Document	60

# *Tennessee State Interoperability Task Force*

To all user agencies and department:

Enclosed you will find a Memorandum of Understanding (MOU) and a copy of the established operating parameters for the Federal Communications Commission (FCC) designated multi discipline interoperability and mutual aid channels set aside by the FCC in the VHF, UHF, 700 MHz and the 800 MHz public safety radio bands. The term “multi discipline” infers that these channels, as indicated in the attached operational and technical parameters, are to be used for all public safety users to communicate to users within their discipline (Police to Police, Fire to Fire, etc) as well as cross discipline communications (Police to Fire, Fire to Local Government) between all public safety users. There are no channels set aside for individual disciplines, as different incidents require varying amounts of participation from public safety First Responders. These channels are most effective when used as a shared resource at the scene of an incident by the Incident Commander. Previously allocated FCC mutual aid channels assigned for inter-system sharing (Police Mutual Aid, Fire Mutual aid etc.) within certain disciplines should continue to be used by Tennessee’s First Responders to facilitate communications within their respective discipline.

The Tennessee Statewide Interoperability Task Force (SITF) and Statewide Interoperability Executive Committee (SIEC) requires these channels be utilized under an Incident Command (ICS)/National Incident Management System (NIMS) type management structure where channels are used as resources to accomplish the communications function at each individual incident. Eligible entities within the Public Safety Radio Pool (see FCC 90.20a) include, but are not limited to, the agencies listed below:

- Emergency Management
- Emergency Medical Service
- Fire Service
- Forestry-Conservation Agencies
- Highway Maintenance
- Law Enforcement
- Local Government Agencies
- Rescue Squads

See <http://wireless.fcc.gov/publicsafety/pspool.html> for further information on public safety radio pool eligibility.

The FCC, per the Third Report and Order, 00-348 dated October 10, 2000, allowed public safety mobile operation on the VHF and UHF interoperability channels without an individual mobile license, provided the user is otherwise licensed under Part 90 of the FCC’s rules. The FCC also adopted, by rule(87-359 paragraph 33), that mobile only operation of the five 800 MHz NPSPAC interoperability channels as well as the 700MHz interoperability channels (01-10 paragraph 29) can be used provided the user is otherwise licensed under Part 90 of the FCC’s rules. In its recommended channel parameters,

the SITF has also promoted the primary usage of these channels to mobile only tactical on-scene operations and base or repeater operation as secondary to minimize interference and maximize re-usage.

Also, for the purpose of this document, we have made a distinction between interoperability and mutual aid. Interoperability is a channel designed by the FCC and is available nationwide for interoperability purposes only by any discipline or jurisdiction. Mutual Aid may be designated by the FCC or the State, and may be primary to a specific discipline. For example 154.280 MHz is a designated fire mutual channel by the FCC. 460.400 MHz is a mutual aid channel that is only mutual aid in Tennessee.

If there is any uncertainty as to whether or not your agency is licensed under Part 90 of the rules, or you have any questions regarding the proposed use of these designated interoperability channels, please feel free to contact Tennessee Statewide Radio Interoperability Coordinator John Johnson at 615-741-3826 or by email at [jjohnson@tnema.org](mailto:jjohnson@tnema.org).

To use these channels in Tennessee, complete the attached MOU and, after saving a copy of the signed agreement, mail the original to:

Tennessee Emergency Management Agency  
Louis Friedmann  
Radio Interoperability Coordinator  
3041 Sidco Drive  
Nashville, Tennessee 37204

When the Tennessee Statewide Radio Interoperability Coordinator (RIC) has received the signed MOU, the user agency or department can then begin to use these channels in mobile only operation mode to improve public safety interoperability in your community. If your agency or department wishes to use these channels as a base station or repeater, then a separate FCC license application must be filed via a FCC designated Public Safety Frequency Coordinator with a letter of concurrence from the State RIC and license granted from the FCC before base or repeater usage can commence.

Respectfully,

James Bassham, Director, Tennessee Emergency Management Agency,  
Chairperson, Tennessee Interoperability Task Force  
January 14, 2009

### **Tennessee Interoperability Task Force**

***A committee formed to improve interoperable public safety communications for all of Tennessee's First Responder Community.***

FROM: Tennessee Emergency Management Agency, State Interoperability Task Force (STIF)  
Statewide Interoperability Executive Committee (SIEC)  
Louis Friedmann, Radio Interoperability Coordinator

SUBJECT: Memorandum of Understanding for agencies to operate FCC designated  
VHF/UHF/700/800 MHz multi-discipline interoperability channels in accordance with  
the FCC and the Tennessee Statewide Interoperability Task Force (SITF) guidelines:

**Philosophy:** The SITF's goal for interoperability in Tennessee is to establish command /  
direction and control so that an emergency or disaster can have an effective response and  
recovery.

In order for interoperability to be effective:

- Interoperability must be incorporated into the daily emergency response system
- Primary goal of interoperability is to establish command and control
- Secondary goal of interoperability is to establish on-scene tactical operations
- Radio communications training must be as important as other annual training
- Interoperability should be established on channels other than the primary dispatch channel
- Cross band devices and gateways are tools to be used when needed, not the answer
- Lastly, but most important, establish working relationships with your counter-parts in other agencies and departments. This is the KEY to successful interoperability.

Interoperability – The ability to communicate with another department or agency whether they use a similar or different radio system or the same or different radio band, as needed.

In ATTACHMENT 1, there are several suggests on ways to implement interoperability. These suggestions will help interoperability between dispatch center to dispatch center and between on-scene command and control entities.

**The long range goal will be to implement a 700 / 800 MHz P25 digital radio system across Tennessee.**

Policies and procedures specified in this MOU should compliment and not contradict the 800 MHz Region 39 Plan, the 700 MHz Region 39 Plan, nor the Tennessee EMS Telecommunications Plan.

## Memorandum of Understanding

This memorandum of understanding (hereafter referred to as MOU) shall be submitted by \_\_\_\_\_ (hereafter referred to as USER AGENCY) representing a public safety agency indicating compliance and agreement with the attached operational and technical guidelines for the use of the FCC designated VHF / UHF/ 700 / 800 MHz multi-discipline interoperability channels. By virtue of signing and submitting this MOU, USER AGENCY affirms its willingness to comply with the proper operation of the interoperability channels as dictated by the SITF.

The USER AGENCY shall abide by the conditions of this MOU, which are as follows:

- To operate by all applicable Federal, State, County, and City laws/ordinances.
- To utilize “Plain Language” for all transmissions.
- To monitor the Calling Channel(s) at an incident and coordinate the use of the Tactical Channels.
- To identify inappropriate use and mitigate the same from occurring in the future.
- To mitigate contention for channels by exercising the Priority Levels identified in this MOU.
- To share channels between all qualified public safety entities without respect to discipline and not monopolize the use of any channel.

The preceding conditions are some of the primary requirements for operation of these interoperability channels. They are not a complete list and User Agencies are referred to the complete SITF guidelines (attached) for the complete list of operational and technical requirements.

The User Agency will use these interoperability channels with \_\_\_\_\_ (**number of mobile/portable units**) and will notify the SITF if the number of radios programmed increases by more than 10% of the number of units listed above.

### Priority Levels:

1. Disaster or extreme emergency operation for mutual aid and inter-agency communications;
2. Emergency or urgent operation involving imminent danger to life or property;
3. Special event control, generally of a preplanned nature (including Task Force operations)
4. Joint training evolutions (these channels do not qualify for use by single agencies for their secondary communications purposes)

To resolve contention within the same priority, assuming all radio equipment is exercising the lowest output and effective radiated power level practicable, the channel should go to the organization with the wider span of control/authority. This shall be determined by the SITF for the operation or by the levels of authority/government identified in the contention.

For clarification purposes, and as an aid to facilitate inter-agency on-scene communications, any fixed base or mobile relay stations utilized for temporary locations (FCC station class FBT or FB2T, respectively), shall, in order to be consistent with SITF guidelines, utilize power levels sufficient to effect the necessary operation. Federal agencies are permitted access to interoperability channels only as authorized by 47 CFR 2.102 (c) & 2.103 and Part 7.12 of the NTIA Manual. Federal agencies must also adhere to the operating parameters established in the attached SITF guidelines.

Any violation of this MOU or FCC Rule shall be addressed immediately. The first level of resolution escalation shall be between the parties involved, next the SITF, and finally the FCC.

By signing this MOU, you certify that:

1. Your radio equipment is FCC Type Accept for the narrow band radio channels, if you utilize them;
2. You will use the Common Channel Names as described in this document;
3. You will use these channels for mutual aid / interoperability purposes only – no dispatching;
4. The MOU is only good for operation of mobile and portable radios;
5. Any base or repeater operation requires a FCC license;
5. You will abide by the Policies & Procedures described in this Guide.

The Tennessee Emergency Management Agency in cooperation with the SITF & SIEC will be governing body for radio interoperability for Tennessee.

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Chairperson, Tennessee Statewide Interoperability Task Force

Date

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User Agency/Department

Date

## FCC & Tennessee Designated Public Safety Interoperability & Mutual Aid Channels

### CONDITIONS FOR USE

1. The designated interoperability frequencies contained in this MOU in Appendix A, B, C, D, & F are available for assignment to Licensees under 47CFR90 to satisfy public safety incident response requirements. The frequencies are available on a shared basis and will not be authorized for the exclusive use of any one agency. Public Service entities may apply to the SITF on a case-by-case basis for permission to use these channels. Permission to access these VHF /UHF/ 700/ 800 MHz interoperability channels will only be granted to a public service entity when the application is to provide assistance and support to the public safety community in completing its mission.

The SITF recognizes the need for non-traditional responders to be integrated into incident management systems in order to operate in an effective manner. As such, local public safety entities may, through inter-local agreements, memoranda of understanding, or other formalized contractual means, extend their use of these interoperability frequency resources to organizations with established relationships to facilitate emergency operations. Such organizations shall include Radio Amateur Civil Emergency Services (RACES) programs which are official units of and under the direct oversight of the governmental entity, American Radio Relay League (ARRL) sanctioned Amateur Radio Emergency Services (ARES) programs, when acting in cooperation with and express approval of the governmental entity, locally organized search and rescue groups when acting in cooperation with and the express approval of the governmental entity, disaster relief organizations such as, but not limited, to the American Red Cross, Salvation Army Disaster Relief or other similar organizations who provide disaster relief or assistance.

These non-traditional responding groups must integrate and abide by all operating procedures as set forth by the SITF and formalize their operation by signing the state MOU. The signed MOU shall be submitted to the SITF for review and approval.

In all cases involving use by non-traditional responders, the governmental entity served shall be responsible for ensuring compliance with the terms of the state MOU.

In all cases, non-traditional responders shall comply with all FCC type acceptance requirements. Use of modified frequency agile VHF and/ or UHF amateur radio transceivers within this plan is not authorized.

2. Mobile stations are permitted to utilize these channels, under FCC call sign WQGI384, for activities facilitating the interoperability operations of their agencies. In all cases, priority shall be afforded to any agency with immediate operational needs to mitigate high impact incidents that threaten life, property or the environment. No one discipline, jurisdiction, agency or essential support function has precedence over another and full cooperation must be afforded during joint operations. Unified command under the ICS/NIMS shall be implemented. The agency in control of the incident, as determined in the local Emergency Operations Plan per specific incident type, shall assign channels for the duration of a defined operational period as required for incident support operations. During this period, non-participating stations within range of the incident shall not cause deliberate harmful interference to the operation.

Given adequate geographic separation, coordinated co-channel operations at separate incidents and venues may be conducted if the Effective Radiated Power (ERP) is maintained at the absolute minimum required to maintain reliable communications at each incident. All users must understand the “shared” nature of these frequencies. While coordination and pre-planning is conducted to reduce the possibility

of operational interference, ultimately, professional courtesy and cooperation is necessary at a local level to eliminate any immediate conflicts.

3. Temporary Base stations are authorized, under the State of Tennessee call sign WQGI384. On VHF/UHF Interoperability Tactical (TAC) channels, this authorization allows eligible entities to use up to 110 VHF temporary Base Stations simultaneously and 110 UHF Temporary Repeaters simultaneously throughout Tennessee while operating in a Crisis or Consequence Management environment (This is to prevent a multiplicity of temporary licenses). Eligible mobile stations, as defined in 47CFR90.20, are licensed through their agency's current Public Safety radio license in a blanket arrangement. In addition to the blanket eligibility, FCC call sign WQGI384 also permits 10,000 mobile/portable radios to operate on the VHF/UHF channels as well as 110 "temporary base" (FBT), "temporary repeater" (FB2T) and "temporary control station" (FX1T) on specified frequencies. The use of "Fixed"/permanent Base Stations (FB) or Repeaters (FB2) is not authorized on this FCC license.

4. Initial contact shall be on the "Calling Channel" established using analog FM emission 11K0F3E or 11K2F3E (narrowband emission) for the VHF/UHF channel. A CTCSS tone of 156.7 Hz will be used on the VHF / UHF "Calling" channels but each radio should have "monitor" capability to ensure access by stations from outside the normal area of operation. Both the 700 MHz and the 800 MHz calling channels will use CTCSS / DCS. See the attached Appendixes for more information. On the 800 MHz Calling Channel, the emission is 16K0F3E.

5. Temporary Base stations are permitted, under authorization by call sign WQGI384. The following restrictions apply:

Temporary Base stations operating on TAC channels and the Tennessee Common channels VTNTAC and EMS UTAC must employ means to confine their signal to the minimum ERP necessary to support the intended use. Such means may include limited height, power output, antenna gain, and antenna directional beam width.

Suggested on scene parameters are:

(a) Temporary Control Station (FX1T) equipment shall be limited to a maximum transmit antenna height of 6.1 meters, antenna gain of 3.0 dBd and power output not to exceed 50 Watts measured at the antenna feed point or 100 watts maximum ERP. Typically, this is what would be installed at a mobile or temporary command post.

(b) Temporary base stations (FBT), and Temporary mobile relays (FB2T), that are field deployed within the licensee's operational area - or are operating at an incident in an interoperable capacity - may only employ as much elevation and ERP as necessary to effectively support the incident for the duration of the operational period. Such stations must not be left in permanent operation and must be dismantled upon cessation of the incident.

(c) Where permitted by Part 90, paired frequencies may be used with temporary mobile relay facilities (FB2T). Such mobile relay facilities shall employ CTCSS or NAC access and a time out timer limiting transmitter duration to no greater than 90 seconds (1.5 minutes).

6. In areas where RFI is a concern, CTCSS may be used on the TAC channels to mask interference. The standard Tennessee statewide CTCSS shall be 156.7 Hz. All radio equipment in the region shall be programmed with CTCSS encoded on the transmit carrier whether the system operator intends for the equipment to be used in CTCSS or Carrier Squelch modes.

*An example would be: VTAC1 - Rx 151.1375 CSQ/ Tx 151.1375 – 156.7 Hz.*

7. Equipment, including temporary base station, temporary control station, mobile and portable receivers must be capable of toggled operation between CTCSS and Carrier Squelch mode if CTCSS has been employed as a means of reducing Radio Frequency Interference (RFI).

Should resources be brought in from outside of Tennessee for crisis or consequence management, it is likely these resources will not have the Tennessee CTCSS tone in their equipment. Deactivation of CTCSS on receivers would be necessary for these resources to participate under a unified command environment. It is anticipated the VHF simplex channels and UHF channel pairs listed above will be utilized in an ICS/NIMS environment, with channel use assignment being made at the scene after the incident commander or designee determine the most efficient channel allotment to effect safety of life and property issues.

By entering into this MOU, the User Agency certifies that their personnel (field, command and telecommunications) acknowledge the ICS/NIMS concept of command structure, the characteristics associated with it, and will implement it at such time as use of the interoperability channels is required.

It is conceivable that some equipment in Tennessee, operating under blanket licensing by the FCC, will be released into field operation without the Tennessee CTCSS and would require the user who employs CTCSS for RFI masking to employ Carrier Squelch to achieve interoperability.

Should CTCSS be employed on TAC channels as an RFI masking solution, the User Agency will provide an attachment addressed to the SITF certifying that all radio operators, including Telecommunications and field response personnel:

Have been trained in the differences between CTCSS and Carrier Squelch modes of operation, and understand that resources outside of Tennessee may not use the same CTCSS tone.

8. Digital modes are authorized on TAC channels.

Digital format shall be "Project 25" Phase I (Common Air Interface) CAI compliant with a network access code of 293. The implementation of additional Network Access Codes is not permitted.

Radios programmed in digital operation should also be capable of operation in analog FM as specified in Conditions 4 and 6 of this section.

9. In order to alleviate confusion, standard names will be used in all equipment to refer to individual channels. These are listed in the tables below (Table 1, 2, 3, 4, etc.). Should the equipment not be capable of alphanumeric channel names, the radio should be placarded to indicate the channel name and its corresponding position on the radio's selector switch.

10. All stations not operating in mobile relay mode, where permitted, shall employ a time out timer set to limit transmission duration to a period of no greater than 90 seconds (1.5 minutes).

11. All stations operating in mobile relay mode, where permitted, shall be configured to immediately drop transmit carrier upon cessation of input signal. Reasonable hysteresis time in squelching action of weak received signals, or in signals that have achieved a critical bit error rate (BER), is permitted. Prolonged "hang time" in excess of 1 second is not permitted.

12. Alert paging, links and SCADA operations are not permitted on “Calling”, “TAC” or designated Mutual Aid channels. Temporary base station receivers shall not be muted by either selective calling alert mechanisms or DTMF signaling devices on the Interoperability “Calling” or TAC Channels.

13. Permanent fixed Base Stations will only be permitted on the “Calling” channels as outlined in Appendix Q. The TAC channels will be reserved for on-scene usage.

14. The User Agency shall understand that, per FCC 90.20 limitations, both co-channel and adjacent channel wideband operations are “secondary” to interoperability traffic on the VHF and UHF listed channels and may cause interference to interoperability operations. If interoperability operations experience interference from either wideband adjacent channel operations or co-channel non interoperability operations, the interfering agencies should cease operation, if at all possible, and correct the interference as soon as permissible.

15. The State of Tennessee will offer frequency 159.7050 MHz as a multi-discipline, multi-agency public safety common channel to all public safety agencies and other approved entities who adhere and sign this MOU with the SITF. The channel will be referred to as the VTNTAC channel. The operating parameters for this frequency are listed below:

The statewide channel, 159.7050 MHz, will have a designated CTCSS tone of 156.7 Hz. It will be utilized as an on-scene communication “*Common Channel*”, to promote interaction and coordination between agencies in areas as ICS/NIMS is implemented. It will be used as a “Mobile Only/Fixed Base Temporary” frequency, but will have the same FBT restrictions as listed in Section 5 above.

The operational guidelines established for the VTAC/UTAC channels will apply to the VTNTAC and EMS UTAC channel. The VTNTAC channel will be utilized with a bandwidth of 20K0F3E.

Frequency 159.7050 MHz will be operated under a license held by the State of Tennessee under callsign KG3313. There will be no individual agency licensing of this frequency.

#### 16. State of Tennessee and other FCC Designated Mutual Aid Frequencies

Appendix F and Table 5 are in reference to FCC radio channels that are existing mutual aid channels currently used in Tennessee. All of these frequencies require an FCC radio license and should be operations in accordance to the FCC Rules and Regulations as well as in accordance with their respective Policies, and this document.

17. The use of interoperability devices that allow systems to be connected, cross-banded or patched together is another method of interoperability. The interoperability channels may be in both mobile and portable radio equipment or as part of a permanent fixed console. Prior to deployment or use, both planning and training on the equipment is essential. See Appendix H for more information.

#### 18. Revocation of Agreement

This MOU will be the standing agreement between the SITF and the user agency.

This MOU can be revoked with the approval of the SITF members by a majority vote at either a special or a general meeting.

# Appendix A

## VHF Interoperability

### TABLE 1 – VHF Frequencies

Frequency/Authorized Use	Channel Name	RX CTCSS	TX CTCSS	P25 NAC
155.75250 base/mobile	VCALL10	156.7 Hz	156.7 Hz	293
151.13750 base/mobile	VTAC 11	156.7 Hz	156.7 Hz	293
154.45250 base/mobile	VTAC 12	156.7 Hz	156.7 Hz	293
158.73750 base/mobile	VTAC 13	156.7 Hz	156.7 Hz	293
159.47250 base/mobile	VTAC 14	156.7 Hz	156.7 Hz	293

**Notes for Table 1: VHF**

A FCC license is not required for mobile or portable use as long as an agency has a valid Public Safety FCC radio license holder. Any use as a base station, repeater or control station requires an FCC radio license and approval from State Interoperability Coordinator.

**All frequencies are narrowband (11K0F3E) only.**

Radio channel names as listed in this Table are **required**. Interoperability channel names conform to the National Public Safety Telecommunications Council (NPSTC) Channel Naming Report, June, 2007. [www.npstc.org](http://www.npstc.org)

NOTE: The term “Mobile” refers to the FCC definition. Permanent base stations are not authorized in this document – only mobile, portable or temporary base (FBT) radio operation.

## Appendix B UHF Interoperability

### TABLE 2 – UHF Frequencies

Frequency/ Authorized Use	Channel Name	RX CTCSS	TX CTCSS	P25 NAC
453.21250 base/repeater output 458.21250 repeater input	UCALL40	156.7 Hz	156.7 Hz	Not auth.
453.21250 mobile simplex	UCALL40D	156.7 Hz	156.7 Hz	Not auth.
453.46250 base/ repeater output 458.46250 repeater input	UTAC 41	156.7 Hz	156.7 Hz	293
453.46250 mobile simplex	UTAC 41D	156.7 Hz	156.7 Hz	293
453.71250 base/repeater output 458.71250 repeater input	UTAC42	156.7 Hz	156.7 Hz	293
453.71250 mobile simplex	UTAC42D	156.7 Hz	156.7 Hz	293
453.86250 base/repeater output 458.86250 repeater input	UTAC43	156.7 Hz	156.7 Hz	293
453.86250 mobile simplex	UTAC43D	156.7 Hz	156.7 Hz	293

#### Notes for Table 2: UHF

D – Denotes low side of the frequency pair in direct (simplex) mode

A FCC license is not required for mobile or portable use as long as an agency has a valid Public Safety FCC radio license holder. Any use as a permanent base station, repeater or control station requires an FCC radio license and approval from State Interoperability Coordinator.

**All frequencies are narrowband (11K0F3E) only.**

Radio channel names as listed in this Table are **required**. Interoperability channel names conform to the National Public Safety Telecommunications Council (NPSTC) Channel Naming Report, June, 2007. [www.npstc.org](http://www.npstc.org)

Usage of any UHF channel in the simplex mode as base stations (FB) is preferred over their usage as repeater stations (FB2) to minimize interference.

NOTE: The term “Mobile” refers to the FCC definition. Permanent base (or repeater) stations are not authorized – only mobile, portable or temporary base (FBT) or temporary repeater (FB2T) radio operation. If only one simplex channel is to be used, the low side will be the preferred channel to use, i.e. 453.21250 MHz. The “mobile only” side would be used for repeater input.

## Appendix C

### 800 MHz Interoperability Channels

**TABLE 3A – NPSPAC 800 MHz Frequencies Pre-Rebanding**

Frequency/Authorized Use	Channel Name	RX CTCSS	TX CTCSS	P25 NAC
821.01250 repeater input 866.01250 repeater output	I CALL	156.7 Hz	156.7 Hz	Not Auth.
866.01250 mobile simplex	I CALLD	156.7 Hz	156.7 Hz	293
821.51250 repeater input 866.51250 repeater output	I TAC 1	156.7 Hz	156.7 Hz	293
866.51250 mobile simplex	I TAC 1D	156.7 Hz	156.7 Hz	293
822.01250 repeater input 867.01250 repeater output	ITAC 2	156.7 Hz	156.7 Hz	293
867.01250 mobile simplex	ITAC 2D	156.7 Hz	156.7 Hz	293
822.51250 repeater input 867.51250 repeater output	ITAC3	156.7 Hz	156.7 Hz	293
867.51250 mobile simplex	ITAC 3D	156.7 Hz	156.7 Hz	293
823.01250 repeater input 868.01250 repeater output	ITAC4	156.7 Hz	156.7 Hz	293
868.01250 mobile simplex	ITAC 4D	156.7 Hz	156.7 Hz	293

**TABLE 3B – NPSPAC 800 MHz Frequencies Post-Rebanding**

Frequency/Authorized Use	Channel Name	RX CTCSS	TX CTCSS	P25 NAC
806.01250 repeater input 851.01250 repeater output	8 CALL90	156.7 Hz	156.7 Hz	Not Auth.
851.01250 mobile simplex	8CALL90D	156.7 Hz	156.7 Hz	293
806.51250 repeater input 851.51250 repeater output	8 TAC 91	156.7 Hz	156.7 Hz	293
851.51250 mobile simplex	8 TAC 91D	156.7 Hz	156.7 Hz	293
807.01250 repeater input 852.01250 repeater output	8 TAC 92	156.7 Hz	156.7 Hz	293
852.01250 mobile simplex	8 TAC 92D	156.7 Hz	156.7 Hz	293
807.51250 repeater input 852.51250 repeater output	8 TAC 93	156.7 Hz	156.7 Hz	293
852.51250 mobile simplex	8 TAC 93D	156.7 Hz	156.7 Hz	293
808.01250 repeater input 853.01250 repeater output	8 TAC 94	156.7 Hz	156.7 Hz	293
853.01250 mobile simplex	8 TAC 94D	156.7 Hz	156.7 Hz	293

### Notes for Table 3: 800 MHz

D – Denotes direct channel (simplex), not using a repeater

A FCC license is not required for mobile or portable use as long as an agency is a valid Public Safety FCC radio license holder. Any permanent use as a base station, repeater or control station requires an FCC radio license and approval from Tennessee Region 39 NPSPAC.

The 800 MHz radio channels are governed by the FCC as well as Tennessee Region 39 800MHz Regional Planning Committee.

The FCC is currently in the process of re-banding the 800 MHz radio spectrum across the US. Tennessee's re-banding began October 2005 and should be completed with thirty-six (36) months of Regional implementation. Once re-banding is completed, Table 3A will no longer be applicable and will be deleted.

The term "mobile only" refers to FCC definition. The "mobile only" side of the frequency would be used for the repeater input.

Permanent base (or repeater) stations are not authorized under this document – only mobile, portable or temporary base (FBT) or temporary repeater (FB2T) radio operation.

Radio channel names as listed in this Table are **required**. Interoperability channel names conform to the National Public Safety Telecommunications Council (NPSTC) Channel Naming Report, June, 2007. [www.npstc.org](http://www.npstc.org)

## Appendix D

### Table 4 - 700 MHz Interoperability Frequencies Mandated in the Region 39 Plan

CHANNEL SETS	DESCRIPTION	LABEL	Base Freq	Mobile Freq
Channel 39 & 40	Calling Channel	7CALL50	769.243750	799.243750
Ch 39 & 40 Simplex	Calling Channel Direct	7CALL50D	769.243750	769.243750
Channel 119 & 120	General Public Safety Service	7TAC55	769.743750	799.743750
Ch 119 & 120 Simplex	Gen. P/S Service Direct	7TAC55D	769.743750	769.743750
Channel 303 & 304	Mobile Repeater (MO3)	7MOB59	770.893750	800.893750
Ch 303 & 304 Simplex	Mobile Repeater Direct	7MOB59D	770.893750	770.893750
Channel 319 & 320	General Public Safety /Service	7GTAC57	770.993750	800.993750
Ch 319 & 320 Simplex	Gen. P/S Service Direct	7GTAC57D	770.993750	770.993750
Channel 681 & 682	Calling Channel	7CALL70	773.256250	803.256250
Ch 681 & 682 Simplex	Calling Channel Direct	7CALL70D	773.256250	773.256250
Channel 761 & 762	General Public Safety Service	7TAC75	773.756250	803.756250
Ch 761 & 762 Simplex	Gen. P/S Service Direct	7TAC75D	773.756250	773.756250
Channel 881 & 882	Mobile Repeater (MO3)	7MOB79	774.506250	804.506250
Ch 881 & 882 Simplex	Mobile Repeater Direct	7MOB79D	774.506250	774.506250
Channel 937 & 938	General Public Safety /Service	7GTAC77	774.856250	804.856250
Ch 937 & 938 Simplex	Gen. P/S Service Direct	7GTAC77D	774.856250	774.856250

#### Notes for Table 4 – 700 MHz

Note: The above mandatory channels are to be used in the P25 Mode, 12.5 KHz channel configuration using a NAC 293.

Other 700MHz interoperability channels are available as outlined in Region 39, Tennessee 700 MHz Plan and will use P25, 12.5 KHz channel configuration, NAC 293.

For Direct / Simplex operations, use the Base Frequency.

The 700 MHz channels are governed by the FCC and the Region 39, 700 MHz Plan. The additional 700 MHz interoperability channels are listed within the 700 MHz Plan.

Radio channel names as listed in this Table are **required**. Interoperability channel names conform to the National Public Safety Telecommunications Council (NPSTC) Channel Naming Report, June, 2007. [www.npstc.org](http://www.npstc.org)

NOTE: The FCC has pending Rule Making that may change the frequency scheme in the 700 MHz band any may require a frequency change in the near future. FCC decision is expected in late summer 2007. The table will be updated when the FCC issues it's' Rule Making.

# Appendix E

## Project 25 Common Air Interface Interoperability Channel Technical Parameters

Certain common P25 parameters need to be defined to ensure digital radios operating on the 700 MHz Interoperability Channels can communicate. This is analogous to defining the common CTCSS tone used on NPSPAC analog Interoperability channels.

### Network Access Code

In the Project 25 Common Air Interface definition, the Network Access Code (NAC) is analogous to the use of CTCSS and CDCSS signals in analog radio systems. It is a code transmitted in the pre-amble of the P25 signal and repeated periodically throughout the transmission. Its purpose is to provide selective access to and maintain access to a receiver. It is also used to block nuisance and other co-channel signals. There are up to 4096 of these NAC codes. For ease of migration in other frequency bands, a NAC code table was developed which shows a mapping of CTCSS and CDCSS signals into corresponding NAC codes. Document TIA/EIA TSB102.BAAC contains NAC code table and other Project 25 Common Air Interface Reserve Values.

The use of NAC code \$293 is required for the 700 MHz Interoperability Channel NAC code.

### Talk group ID

In the Project 25 Common Air Interface definition, the Talk group ID on conventional channels is analogous to the use of talk groups in trunking. In order to ensure that all users can communicate, all units should use a common Talk group ID.

Recommendation: Use P25 default value for Talk group ID = \$0001

### Manufacturer's ID

The Project 25 Common Air Interface allows the ability to define manufacturer specific functions. In order to ensure that all users can communicate, all units should not use a specific Manufacturer's ID, but should use the default value of \$00.

### Message ID

The Project 25 Common Air Interface allows the ability to define specific message functions. In order to ensure that all users can communicate, all units should use the default Message ID for unencrypted messages of \$00000000000000000000000000000000.

### Encryption Algorithm ID and Key ID

The Project 25 Common Air Interface allows the ability to define specific encryption algorithms and encryption keys. In order to ensure that all users can communicate, encryption should not be used on the Interoperability Calling Channels, all units should use the default Algorithm ID for unencrypted messages of \$80 and default Key ID for unencrypted messages of \$0000. These same defaults may be used for the other Interoperability channels when encryption is not used.

Use of encryption is allowed on the other Interoperability channels. Regional Planning Committees need to define appropriate Message ID, Encryption Algorithm ID, and Encryption Key ID to be used in the encrypted mode on Interoperability channels.

**Notes for Table 4: 700 MHz**

The 700 MHz radio channels are governed by the FCC as well as Tennessee Region 39 700MHz Regional Planning Committee. The 700 MHz plan for Tennessee is under development at this time.

\$ - Hex code for NAC

## Appendix F Mutual Aid Channels

**TABLE 5 – VHF/UHF Mutual Aid Frequencies**  
*All Mutual Aid Base/Repeater frequencies require an FCC radio license*

### VHF TABLE

Frequency/Authorized Use	Channel Name	RX CTCSS	TX CTCSS	P25 NAC
45.8600 base/mobile <sup>1</sup>	LLAW3	156.7	156.7	N/A
45.8800 base/mobile	LFIRE4	156.7	156.7	N/A
154.280 base/mobile	VFIRE 21	156.7	156.7	293
154.265 base/mobile	VFIRE 22	156.7	156.7	293
154.295 base/mobile	VFIRE 23	156.7	156.7	293
154.27250 base/mobile <sup>4</sup>	VFIRE 24	156.7	156.7	293
154.28750 base/mobile <sup>4</sup>	VFIRE 25	156.7	156.7	293
154.30250 base/mobile <sup>4</sup>	VFIRE 26	156.7	156.7	293
155.475 mobile only <sup>1</sup>	VLAW31	156.7	156.7	293
155.48250 mobile only <sup>1,4</sup>	VLAW32	156.7	156.7	293
154.755 base/repeater output 156.015 repeater input	VTNMA	100.0	100.0	293
154.755 mobile simplex	VTNMAD	100.0	100.0	293
155.205 base/mobile <sup>3</sup>	VEMS 205	DCS 205	DCS 205	N / A
155.295 portable only <sup>3</sup>	VEMS 295	DCS 155	DCS 155	DCS 155
159.7050 base/mobile	VTNTAC	156.7 Hz	156.7 Hz	293
155.370 base only <sup>2</sup>	Inter City	CSQ	CSQ	N/A

### UHF TABLE

460.400 base/repeater output 465.400 repeater input	UTNMA	127.3	127.3	293
460.400 mobile simplex	UTNMAD	127.3	127.3	293
460.38750 base/repeater output <sup>4</sup> 465.38750 repeater input <sup>1,4</sup>	UTAC44	DCS205	DCS205	293
460.38750 mobile simplex <sup>1,4</sup>	UTAC44D	DCS205	DCS205	293
460.41250 base/repeater output <sup>4</sup> 465.41250 repeater input <sup>1,4</sup>	UTAC45	DCS155	DCS155	293
460.41250 mobile simplex <sup>1,4</sup>	UTAC45D	DCS155	DCS155	293
462.98750 base/repeater output <sup>4</sup> 467.98750 mobile only <sup>4</sup>	UEMSTAC	156.7	156.7 Hz	293
462.98750 mobile simplex <sup>4</sup>	UEMSTACD	156.7	156.7 Hz	293

## Notes for VHF/UHF Mutual Aid Table

“D” – Denotes direct / talk around channel, not using a repeater

“P” – Denotes a P25 digital channel

Footnote 1 – **Law Enforcement Only** -Base usage only by State Department of Safety unless written permission is obtained to make FCC application for communications with TN Dept. of Safety or other Law Enforcement Agency.

Footnote 2 – Mobile or portable operation not allowed – Base usage only. FCC license required.  
See Appendix L

Footnote 3 – Governed by FCC & State of TN Dept of Health EMS Telecommunications Plan.

Footnote 4 – Narrowband (11K2F3E) usage only

See Appendix L for information on DTMF code for 155.370, Inter-City

See Appendix R for information on usage of DTMF codes on VTNMA & UTNMA

NOTE: 155.340 is a designated national mutual aid channel, channel name VMED28 with a CTCSS tone of 156.7 Hz. It is not listed in this table due to it being a dedicated Ambulance to Hospital ER channel in Tennessee and is governed by the State of TN, Dept. of Health, EMS Telecommunications Regulations. FCC license is required. 155.340 = VMED28.

NOTE: All VHF and UHF radio frequencies **must** be narrowband compliant by January 1, 2013.

Radio channel names as listed in this Table are **required**. National interoperability / mutual aid channel names conform with the National Public Safety Telecommunications Council (NPSTC) Channel Naming Report, June, 2007. [www.npstc.org](http://www.npstc.org)

**NOTE: All VHF & UHF frequencies must be narrowband per the FCC mandate by January 1, 2013.**

## Appendix G Marine and Aviation

### Table 6 – Marine and Aviation Frequencies

TX/RX Frequency /Authorized Use	Channel Name	TX / RX CTCSS
156.800 – mobile to boat or ship Marine Emergency Channel	Marine 16	Not Authorized
157.100 – mobile to boat or ship Marine Calling Channel	Marine 22	Not Authorized
156.300 – TWRA Calling Channel Inter-Ship Safety	Marine 6	Not Authorized
122.925 – AM aircraft operation Mobile/portable to aircraft	Air Drop Control	Not Authorized
121.500 – AM <u>Receive Only</u>	Emergency or Distress	Not Authorized

#### NOTES for Table 6

Marine channels are governed under FCC Part 80 and a FCC Marine radio should be used.

Marine Channel 16 is the designated Emergency, Distress or Safety Channel

Marine Channel 22 is the Coast Guard Liaison Channel

A FCC marine license is required to operate on the above channels

A FCC Type accepted marine radio is required to operate on above channels

The Aviation Frequencies are governed under FCC Part 87 and a FCC Aircraft radio must be used.

The aircraft channel Air Drop Control is the FAA designated aircraft to ground control frequency and is Amplitude Modulation. A FCC aircraft radio must be used for this channel. The primary use of the channel will be during forest fire to coordinate water drops with aircraft, environmental monitoring or other FCC designated uses under FCC 87.241.

A FCC aviation license is required to operate on the above channels.

A FCC Type accepted aviation radio is required to operate on above channels

## **Appendix H**

### **Use of Interoperability Cross-band / Cross System Devices**

“Gateway” systems interconnect channels of different systems (whether on different bands, channels or modes), allowing first responders to use their existing radios and channels to be interconnected with the channels of other users outside of their agency. Use of the designated interoperability radio channels (See Tables 1, 2, 3, 4, 5, etc) is preferred over the use of an agency's primary radio channel. The Communications Unit Leader/Incident Commander must be aware that multiple gateway activations in support of an incident can result in mutual interference. Interference issues are best resolved by the technical support team assigned to the gateways. The Incident Commander or designee will determine when a situation exists that requires use of a regional interoperability resource and notify the appropriate dispatch center. The dispatch center will follow internal agency procedures to contact the Mobile Gateway Agency POC and relay pertinent information regarding the event including activation of the technical support team.

Deployment of these devices will be permitted under the following conditions:

- A. The agency that owns / operates the device (mobile or fixed) must obtain a "Frequency Usage Agreement" as required by the FCC Rule 90.421 with any agency or agencies it plans to communicate with on frequencies other than the approved interoperability frequencies listed in the tables 1, 2, 3, 4. Table 5 requires FCC license or “Frequency Usage Agreement”. It is highly encourage that these devices primarily use the designated Interoperability and Mutual Aid channels and not primary dispatch channels.
- B. Prior to implementation of the unit, the agency or agencies that will be “patched” together will be notified that the device is about to be operational;
- C. Agencies will identify themselves by agency name and designated call sign/radio designator. For example; TEMA 54 or Nashville 121.
- D. If interference occurs, and an agency requests that their channel be taken out of service, the operating agency will do so immediately;
- E. During operation of the device, personnel will have control of the device so that any interference can be mitigated;
- F. All interoperability devices will be registered with the Tennessee Emergency Management Agency, Radio Interoperability Coordinator;
- G. Any agency that purchases an interoperability device (such as the ICRI, Infinimode, MaCom Network First, Motorola MotoBridge, Raytheon JPS ACU1000, Vega Viper etc.) must have personnel trained as to the deployment and operations of the unit;
- H. Each County mobile command / communications vehicle should have at minimum the capability to establish a cross-band talk group (VHF, UHF, 800, and 700, when available) for the "Calling Channels" and one "TAC Channel" for Command and Control;

I. A Regional mobile command / communications vehicle should have at minimum the capability to establish a cross-band (VHF, UHF, 800 and 700, when available) for the "Calling Channel", one "TAC Channel" for Command and Control and one "TAC Channel" for on-scene operations;

J. If the situation necessitates additional communications resources, mobile communications vehicle will be requested and additional cross-band TAC channels established.

K. All radio traffic should be in plain language.

L. All encrypted radio users will be required to work in the "clear" mode unless otherwise arranged in advance.

M. The Dispatch Supervisor will ensure that each activated interoperability channel is monitored as needed.

**Note:** Radio Emergency Alert button ("Metro 5000") may not function properly when patched through a gateway device.

O. Example of Cross-band set-up: **(For Example Only)**

Talk Group	Radio 1	Radio 2	Radio 3	Radio 4	Radio 5
Calling Channel	V Call 10	UCall 40D	8 Call90 D	EMS 205	7CALL50
TAC 1 – Law	V TAC 11	UTAC 41D	8 TAC 91D	VTNMAD	7LAW68
TAC 2 – Fire	V TAC 12	UTAC 42D	8 TAC 92D	VFIRE23	7FIRE64
TAC 3 – C & C	V TAC 13	UTAC 43D	8 TAC 93D	V TN TAC	7TAC79
TAC 4 – EMS	V TAC 14	UEMSTACD	8 TAC 94D	EMS 295	7MED61

### Fixed Site Gateway Communications Request

The Communications Unit Leader/Incident Commander must be aware that multiple gateway activations in support of an incident can result in mutual interference. Interference issues are best resolved by the technical support team assigned to the gateways.

A radio user requiring direct communications with a user from a different agency shall follow their own agency's procedures for requesting connectivity. Typically, a user should request connectivity by contacting their agency's dispatcher.

The following information is provided by the requesting agency at the time of an activation request:

- User's agency
- On-scene agencies requiring interoperability
- Reason for request/type of event
- Equipment required
- Expected duration of event
- User/requestor and/or servicing dispatch contact phone number

At the termination of the event they should notify their agency's dispatch center.

## Fixed Site Gateway Activation

Once authorization has been granted from your agency, each agency should follow their internal procedures for activating the connectivity.

Procedures for establishing communications connectivity include:

- Selection of a channel or talk group on your home system if necessary
- Verifying system-wide availability of required resources – coordination among control point dispatchers
- Providing radio call sign/designator information to connected agencies as needed
- Assigning the requested unit/agency to that channel or talkgroup
- The control point dispatcher will connect the agency to the appropriate talkgroup
- Announcing to users that interoperability is activated
- Users should identify themselves on the interoperability channel using their agency name and unit identifier (e.g., Nashville PD 515A1, etc.)
- The dispatcher for the jurisdiction where the event is being worked shall monitor the interoperability channel to address requests as needed

## Fixed Site Gateway Deactivation

When the interoperable communications connection is no longer required, agencies should follow these deactivation procedures:

- The requesting agency/user or incident commander where the emergency event occurred shall contact their dispatcher so that the patch can be deactivated
- The dispatcher shall make an announcement on the interoperable channel/talk group indicating that the connection will be deactivated prior to the connection being disabled
- All personnel shall return to their appropriate home system channel assignments

## Problem Recognition and Resolution

During an incident:

- During activation, problems with gateways should be reported to the dispatcher who will follow standard agency procedures to resolve the problem

Following an incident or during post incident debriefing:

- Agencies may report any problems with the gateway to the appropriate POC for the testing, training, exercise or event. The POC will be responsible for ensuring effective

resolution to problems that exist with the gateway or notification of the appropriate responsible agency.

## Fixed Site Gateway Limitations

The interoperability provided through the Gateway has the ability to link participating agencies but has the following limitations:

- The number of simultaneous patches that can be supported by the gateway will be limited by gateway configuration.
- Home system coverage may limit communications: Users must be within the footprint of their coverage area.
- Radio Emergency Alert button (“Metro 5000”) may not function properly when patched through a gateway device.

## Fixed Site Gateway Test Procedures

To ensure that equipment components of the interoperability solution are operating properly, each agency should participate in regular testing as established by agreement of the agencies.

## Mobile Gateways

This section provides guidance on how to request, deploy, and use the mobile gateways during emergency response.

## Mobile Gateway Rules of Use

The following rules of use shall govern interoperable communications between agencies:

- Prior to incorporation of an outside agency, permission must be obtained by "frequency Use Agreement" as required by FCC Rule 90.421.

If possible, prior to activation, agencies being "patched " together will be notified

- Agencies will identify themselves by agency name and designated call sign / radio designator.
- All radio traffic should be in plain language.
- All encrypted radio users will be required to work in the “clear” mode unless otherwise arranged in advance
- The Incident Commander or designee will ensure that the each activated interoperability channel is monitored as needed
- If interference occurs, an agency may request they be removed from the "patch" or the "patch" deactivated.
- **Note:** Radio Emergency Alert button (“Metro 5000”) may not function properly when patched through a gateway device.

## Mobile Gateway Communications Request

The Communications Unit Leader/Incident Commander must be aware that multiple gateway activations in support of an incident can result in mutual interference. Interference issues are best resolved by the technical support team assigned to the gateways.

The Incident Commander or designee will determine when a situation exists that requires use of a regional interoperability resource and notify the appropriate dispatch center.

The dispatch center will follow internal agency procedures to contact the Mobile Gateway Agency POC and relay pertinent information regarding the event including activation of the technical support team. See **Error! Reference source not found.**

The following information is provided by the requesting agency to the Mobile Gateway Agency POC at the time of an activation request:

- User's agency
- On-scene agencies requiring interoperability
- Reason for request/type of event, e.g. tornado, etc.
- Equipment required
- Expected duration of event
- Location required/access information
- Incident point of contact
- User/requestor and/or servicing dispatch contact phone number
- The Mobile Gateway Agency coordinates the deployment by providing the contact information for the gateway to the Incident Commander or their designee.

## Mobile Gateway Activation

Mobile gateways may or may not be outfitted with agency radios before the event. Therefore, agencies may be required to bring a portable radio, connector cable, and charger to connect to the mobile gateway for the length of the operation.

The Mobile Gateway Agency POC will provide an estimated response or activation time, which will be relayed to the dispatch center of the agency having jurisdiction over the event and the Incident Commander.

The Mobile Gateway and a knowledgeable technician, operator, or other trained personnel will be sent to the incident scene. That operator will be responsible for supporting the gateway.

The **Communications Unit Leader** should follow these procedures:

- Require participating agencies to check in at the command post or other designated location and provide frequency/talkgroup channels available for use during the incident.
- Require agencies not preconfigured within a mobile gateway to provide a preprogrammed radio, connector cable, and charger.
- Confirm or assign radio call sign/designator information to connected agencies
- Instruct Mobile Gateway Operator on where to setup and operate the mobile gateway

- Inform Mobile Gateway Operator what agencies are participating
- Confer with Mobile Gateway operator concerning what command level or other specific talkgroups that need to be programmed into the mobile gateway.

The **Mobile Gateway Operator** should follow these procedures:

- Obtain agency radios and connect to the mobile gateway with associated cables
- Select the channel or talkgroup assigned by the agency
- Assign the requested unit/agency to that channel or talkgroup as designated by the Incident Commander.

## Mobile Gateway Deployment Procedure

Upon receiving a request for the deployment of a mobile gateway, the following guidelines should be followed.

The **Dispatcher** should follow these deployment procedures:

- Contact the on-call mobile gateway operator/technician responsible for mobile gateway deployment
- Dispatch Mobile Gateway Operator or Technician to the incident scene
- Inform the requesting user that the mobile gateway is en route

The **Mobile Gateway Operator or Technician** should follow these deployment procedures:

- Respond to dispatcher with estimated time to retrieve mobile gateway and estimated time to arrive on the incident scene
- Drive dedicated vehicle and mobile gateway to the incident scene
- Report to the Incident Commander on arrival

## Mobile Gateway Deactivation

When interoperable communications is no longer required, agencies should follow these guidelines. Participating agencies are responsible for retrieving the portable radio provided during the operation.

The **Radio Communications Unit Leader** or designee should follow these deactivation procedures:

Make an announcement on the command channel to all commanders to advise them the mobile gateway is going to be deactivated at a designated time.

Make an announcement on any patched tactical nets to advise them the mobile gateway is going to be deactivated at a designated time.

Contact the Mobile Gateway Operator or Technician to shut down the mobile gateway.

The **Mobile Gateway Operator or Technician** should follow these deactivation procedures:

Ensure agencies retrieve portable radios

Take inventory of equipment and note any needing repair or replacement

Return to pre-response location and make mobile gateway ready for service.

## Problem Recognition and Resolution

During an incident:

- Problems should be reported to the Communications Unit Leader or to the technician/operator deployed with the gateway.

Following an incident or during post incident debriefing:

- Agencies using the mobile gateway may report any problems with the gateway to the appropriate POC for that agency listed in **Error! Reference source not found.** The POC will be responsible for ensuring effective resolution to problems that exist with the mobile gateway.

## Mobile Gateway Limitations

The interoperability provided through the mobile gateway has the ability to link participating agencies but has the following limitations:

Deployment time for a mobile gateway is typically one (1) hour plus response time to the incident scene.

System coverage may limit communications.

For fastest results, interoperability connectivity needs to be planned in advance. For agencies to have quick interoperability on the scene of an incident they would need to have provided a donor radio or have made arrangements with the gateway POC in advance of the situation.

- The number of simultaneous patches that can be supported by the gateway will be limited by gateway configuration.
- Radio Emergency Alert button (“Metro 5000”) may not function properly when patched through a gateway device.

## Mobile Gateway Test Procedures

To ensure that equipment components of the interoperability solution are operating properly, each agency will participate in the following testing procedure:

Representatives from each agency should meet on a regular basis to test the interoperability solution.

Testing should include deployment, setup operation, and deactivation of the mobile gateway. Agency representatives should arrive at the test location to test their ability to communicate with other agencies utilizing the mobile gateway.

If an issue or problem is identified during the testing procedure, personnel shall determine who will take corrective action. If the issue or problem can not be identified, personnel shall contact the appropriate technical personnel to address the issue or problem.

# **Appendix I**

## **National Incident Management System (NIMS)**

The State of Tennessee will use NIMS as part of the overall interoperability plan. The Governor's Executive Order 23, June 28, 2005, establishes NIMS as the framework for management of all emergency incidents within the state.

It is recommended that all take NIMS / ICS courses to familiarize yourself with the NIMS / ICS structure.

Recommended FEMA Independent Study Program Courses:

IS 700

IS 800b

IS 100

IS 200

IS 300 – Classroom Course

IS 400 – Classroom Course

For more information contact your local or State Emergency Management Agency or FEMA's web site <http://training.fema.gov/IS/>

Communications Unit Leader training will also be offered for those who desire to be Comm Unit Leaders and meet the criteria for Comm Unit Leader.

## **Appendix J**

### **Plain Language**

Plain language will be used as required by NIMS. English will be the spoken language.

## Appendix K Phonetic Alphabet

A	ALFA
B	BRAVO
C	CHARLIE
D	DELTA
E	ECHO
F	FOXTROT
G	GOLF
H	HOTEL
I	INDIA
J	JULIET
K	KILO
L	LIMA
M	MIKE
N	NOVEMBER
O	OSCAR
P	PAPA
Q	QUEBEC
R	ROMEO
S	SIERRA
T	TANGO
U	UNIFORM
V	VICTOR
W	WHISKEY
X	X-RAY
Y	YANKEE
Z	ZULU

## Appendix L

### Inter-City 155.370 DTMF Encode / Decode

<b>County Name</b>	<b>County #</b>	<b>24 Hr Warning Point Code</b>
Anderson	01	0101
Bedford	02	0201
Benton	03	0301
Bledsoe	04	0401
Blount	05	0501
Bradley	06	0601
Campbell	07	0701
Cannon	08	0801
Carroll	09	0901
Carter	10	1001
Cheatham	11	1101
Chester	12	1201
Claiborne	13	1301
Clay	14	1401
Cocke	15	1501
Coffee	16	1601
Crockett	17	1701
Cumberland	18	1801
Davidson	19	1901
DeKalb	20	2001
Decatur	21	2101
Dickson	22	2201
Dyer	23	2301
Fayette	24	2401
Fentress	25	2501
Franklin	26	2601
Gibson	27	2701
Giles	28	2801
Grainger	29	2901
Greene	30	3001
Grundy	31	3101
Hamblen	32	3201
Hamilton	33	3301
Hancock	34	3401
Hardeman	35	3501
Hardin	36	3601
Hawkins	37	3701
Haywood	38	3801
Henderson	39	3901
Henry	40	4001
Hickman	41	4101

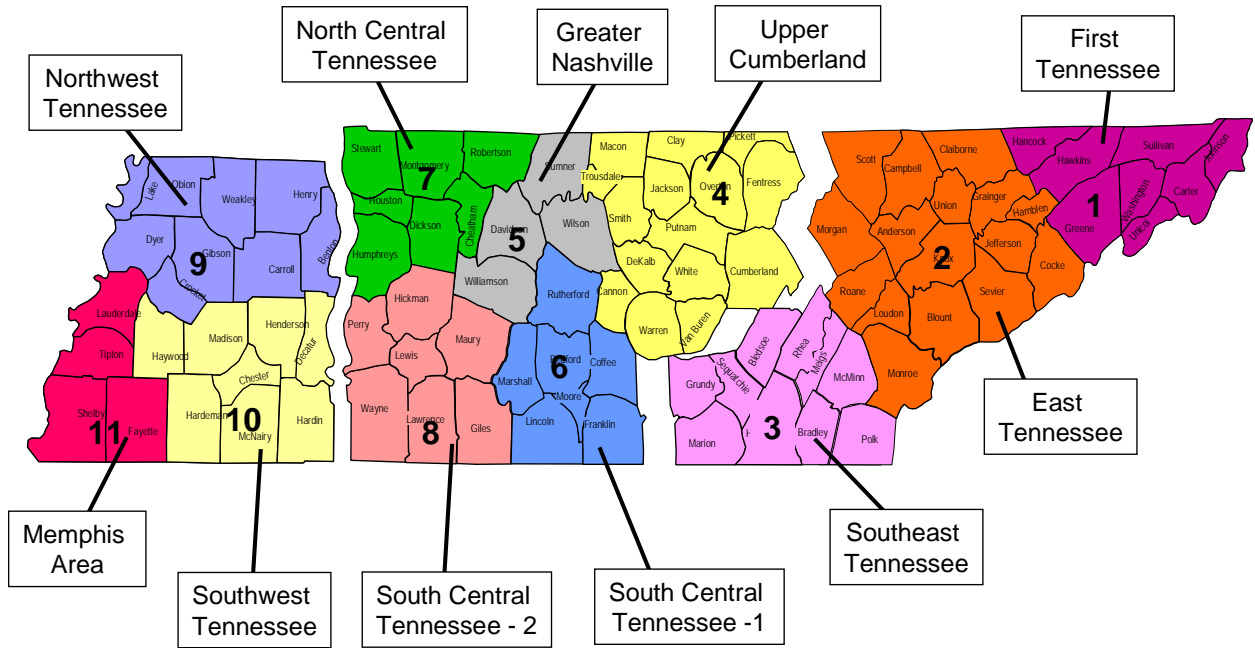
<b>County Name</b>	<b>County #</b>	<b>24 Hr Warning Point Code</b>
Houston	42	4201
Humphreys	43	4301
Jackson	44	4401
Jefferson	45	4501
Johnson	46	4601
Knox	47	4701
Lake	48	4801
Lauderdale	49	4901
Lawrence	50	5001
Lewis	51	5101
Lincoln	52	5201
Loudon	53	5301
McMinn	54	5401
McNairy	55	5501
Macon	56	5601
Madison	57	5701
Marion	58	5801
Marshall	59	5901
Maury	60	6001
Meigs	61	6101
Monroe	62	6201
Montgomery	63	6301
Moore	64	6401
Morgan	65	6501
Obion	66	6601
Overton	67	6701
Perry	68	6801
Pickett	69	6901
Polk	70	7001
Putnam	71	7101
Rhea	72	7201
Roane	73	7301
Robertson	74	7401
Rutherford	75	7501
Scott	76	7601
Sequatchie	77	7701
Sevier	78	7801
Shelby	79	7901
Smith	80	8001
Stewart	81	8101
Sullivan	82	8201
Sumner	83	8301
Tipton	84	8401
Trousdale	85	8501
Unicoi	86	8601
Union	87	8701

<b>County Name</b>	<b>County #</b>	<b>24 Hr Warning Point Code</b>
Van Buren	88	8801
Warren	89	8901
Washington	90	9001
Wayne	91	9101
Weakley	92	9201
White	93	9301
Williamson	94	9401
Wilson	95	9501
Reserved	96	
Reserved	97	
Reserved	98	
All Calls	99	
HSD 1 All Call		9901
HSD 2 All Call		9902
HSD 3 All Call		9903
HSD 4 All Call		9904
HSD 5 All Call		9905
HSD 6 All Call		9906
HSD 7 All Call		9907
HSD 8 All Call		9908
HSD 9 All Call		9909
HSD 10 All Call		9910
HSD 11 All Call		9911
THP Knoxville	47	4750
THP Chattanooga	33	3350
THP Nashville	19	1950
THP Memphis	79	7950
THP Fall Branch	90	9050
THP Cookeville	71	7150
THP Lawrenceburg	50	5050
THP Jackson	57	5750
TEMA State EOC	19	1960
TEMA Alcoa	05	0560
TEMA Jackson	57	5760

State Agencies should use the code of the county in which they are located. For example:  
Nashville THP would be 1950  
TEMA West Regional Office in Jackson 5760

Agencies do not have to have DTMF decode on their receivers if they elect to monitor in the clear without DTMF.

# Homeland Security Districts



# Appendix M

## Federal Government NTIA Interoperability Channels

### CONDITIONS FOR USE

1. The frequencies shown in this plan are available for assignment to all Government agencies to satisfy intermittent law enforcement and public safety incident response requirements. Non-Government agencies may use these frequencies only in cooperation with agencies of the Federal Government. Federal agencies will provide written certification to non-Government agencies indicating that the non-Government operation is necessary. Non-Government entities will be advised in the written certification that under Federal law they are **required to obtain a license from the Federal Communications Commission (FCC)** for such operations, and that the FCC File Number for the license, once obtained, will be provided to the Government agency providing the written certification. A copy of this certification will also be submitted to the NTIA Public Safety Program Office. Federal agencies shall comply with the requirements of Section 2.3.12 of this Manual. The frequencies are available on a shared basis and will not be authorized for the exclusive use of any one agency.
2. All Government operations shall be authorized in accordance with Chapter 9 of this Manual. The FCC will submit all non-Government applications to the Frequency Assignment Subcommittee (FAS) for approval.
3. Base stations are authorized use of the mobile transmit frequencies for access to fixed stations, e.g., repeaters. Mobile stations are permitted to use fixed station transmit frequencies for talk-around communications.
4. The following restrictions apply:
  - (a) the minimum ERP necessary to support the intended use shall be employed;
  - (b) the maximum base or mobile transmitter output power shall not exceed 125 Watts; and
  - (c) the gain of the base station antenna shall not exceed 6 dBi.
5. Exceptions to the above restrictions will be considered by the FAS on a case-by-case basis.

### INCIDENT RESPONSE PLANS

1. Frequencies 169.5375 MHz, paired with 164.7125 MHz, and 410.2375 MHz, paired with 419.2375 MHz, are designated as the calling channels for initial contact and will be identified in the radio as indicated in paragraph 2. Initial contact will be established using analog FM emission (11KF3E). CTCSS will not be used on the calling channels to ensure access by stations from outside the normal area of operation. The agency in control of the incident will assign specific operational channels as required for incident support operations.
2. The Interoperability frequencies will be identified in mobile and portable radios as follows in the Table below:
3. All applications using these allotted frequencies shall be affixed with Record Note Sxxx - This assignment is for a joint incident response requirement pursuant to Section 4.3.X of this Manual.

**Table of Federal Interoperable Frequencies**  
**Awaiting Federal Channel Name Standardized Assignment**

**Incident Response Plans**

VHF Plan		
Identifier	Mobile Transmit (MHz)	Mobile Receive (MHz)
VHF Calling	164.7125	169.5375
VHF 1	165.2500	170.0125
VHF 2	165.9625	170.4125
VHF 3	166.5750	170.6875
VHF 4	167.3250	173.0375
VHF 5	169.5375 (S)	169.5375
VHF 6	170.0125 (S)	170.0125
VHF 7	170.4125 (S)	170.4125
VHF 8	170.6875 (S)	170.6875
VHF 9	173.0375 (S)	173.0375

UHF Plan		
Identifier	Mobile Transmit (MHz)	Mobile Receive (MHz)
UHF Calling	419.2375	410.2375
UHF 1	419.4375	410.4375
UHF 2	419.6375	410.6375
UHF 3	419.8375	410.8375
UHF 4	413.1875 (S)	413.1875
UHF 5	413.2125 (S)	413.2125
UHF 6	410.2375 (S)	410.2375
UHF 7	410.4375 (S)	410.4375
UHF 8	410.6375 (S)	410.6375
UHF 9	410.8375 (S)	410.8375

(S) - Simplex

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Last Updated: March 21, 2003

From NTIA Red Book

## **Appendix N**

### **Civil Air Patrol**

Interoperability with the Civil Air Patrol (CAP) will be permitted when requested by the Incident Commander. CAP will provide radio channels as needed.

## **Appendix O**

### **Amateur Radio (HAM)**

The use of Amateur Radio (HAM) frequencies is governed under FCC Part 97 and permissible to facilitate interoperability or to support Public Safety under the following conditions:

1. The need is requested by the Incident Commander;
2. An ARES / RACES representative will provide frequencies to be used;
3. A licensed Amateur Radio operator is present and acting as a control operator at all times.
4. Suggested simplex channels:

Frequency/Authorized Use	Channel Name	RX CTCSS	TX CTCSS
146.5200 base/mobile	146.520	CSQ	CSQ
446.0000 base/mobile	446.000	CSQ	CSQ

## Appendix P

### HF (2 – 30 MHz) Interoperability

The State of Tennessee Operation Secure Plan will govern the usage of HF on the State assigned frequencies. It is also recognized that the FEMA SHARES, Military MARS, Amateur Radio and other HF channels may be used as deemed necessary during disasters.

To operate on the State licensed channels, the local EMA must sign a separate Frequency Usage Agreement (FUA) with TEMA. FCC type accepted radio equipment must be used and radio equipment with Automatic Link Establishment is encouraged but not required. State equipment may be used on Amateur (HAM) channels if it is operated by a duly authorized Amateur Operator.

#### HF 2 MHz – 30 MHz Public Safety Radio Frequencies 90.264 FCC Public Notice 2419

Carrier MHz	Assigned MHz	Power Limit PEP W	Emission	Class of Station	Area of Use
2.3260	2.32740	1KW	2.8J3E	FB, FX, ML	Day & Night, interstate coordination only
2.4190	2.42040	1KW	2.8J3E	FB, FX, ML	Day & night
2.4740	2.47540	1KW	2.8J3E	FB, FX, ML	Day & night
5.1350	5.13640	1KW	2.8J3E	FX	Day & night, alternate
5.1400	5.14140	1KW	2.8J3E	FX	Day & Night, alternate, interstate coordination only
5.1950	5.19640	1KW	2.8J3E	FX	Day & Night, interstate coordination only
7.4800	7.48140	1KW	2.8J3E	FX	Day & Night, Alternate
7.8050	7.80640	1KW	2.8J3E	FX	Day & Night, interstate coordination only
7.9320	7.93340	1KW	2.8J3E	FX	Day & Night

FX = Fixed (Point to Point or Base to Base)

FB = Base to mobile

ML = Land Mobile or Mobile unit

For definitions of the terms above, see Section 2.1 of the Commission's Rules and Regulations

## Appendix Q

### Use of Fixed Stations on Calling, Tactical, and Mutual Aid Channels, and Power Limitations

Fixed (permanent) station operation (FB – Base Stations or FB2 – Repeaters) on Interoperability Calling channels or Mutual Aid channels is permissible under the following conditions and limitations. These limitations are necessary to minimize interference to other agencies using the same frequency or channel and to maximize effectiveness of the channels.

1. Power – the minimum power necessary should be used to cover the agency’s jurisdictional area plus five miles. The base or repeater power level at the five mile boundary beyond the jurisdictional boundary should not exceed the following power limits:

Band	Limitation dBu	Limitation microvolts
VHF	19dBu	2.3 uV
UHF	21dBu	1 uV
700	22dBu	.6 uV
800	22dBu	.6 uV

2. Antenna Gain – The use of lower gain antennas is strongly encouraged to keep as much signal in the jurisdictional area as possible and minimize interference to other co-channel users.

3. Antenna heights should be kept as low as possible to keep power levels within the above parameters.

4. An exception would be made if two or more entities or counties utilized a common site.

NOTE: The dBu / Microvolt limitations are base on FCC interference contour values.

## **Appendix R**

### **Use of DTMF Encode / Decode on VTNMA and UTNMA**

The usage of DTMF encode and decode on VTNMA and UTNMA is encouraged. This would allow counties to implement these channels with minimum interference. For example, UTNMA deployed in Hamilton Co. would be accessed by DTMF code 33. VTNMA deployed in Davidson Co. would be accessed by DTMF code 19.

Cross-banding of the VHF to the UHF would be permissible and the same code would access both systems.

Since these are Mutual Aid channels, not every radio would need to have a DTMF mic or keypad. The dispatcher could encode activate the system and deactivate the system when no longer needed.

Each station would need two different DTMF codes. One code, such as 57 (Madison Co), would activate the repeater with a seven second squelch tail. As long as the repeater is active without a seven second delay in transmission, units can talk without having to encode the two digit DTMF code. Once seven seconds of inactivity lapses, the repeater resets itself into DTMF mode.

The second DTMF code would be a longer three to four digit code. This code would put the repeater in full time repeat mode and not require the DTMF code. If an event occurred that required the repeater system, the dispatcher or a supervisor could activate the repeater for full time repeat. The code for example using Madison County would be 5\*7. When the event is over and the repeater is no longer needed, the code 5\*7# could be sent to return the repeater to DTMF mode.

The use of VHF Law Enforcement Mutual Aid and UHF Law Enforcement Mutual Aid would no longer be just for law enforcement, but for emergency or disaster usage by any Public Safety “first responder” agencies. To reflect this change, VLAWMA would be changed to VTNMA and ULAWMA would be changed to UTNMA.

An FCC radio license is required to operate on these channels.

# **Appendix S**

## **Minimum Radio Requirements for Interoperability**

### **Low Band Radio (33 MHz – 50 MHz)**

Must be FCC Type Accepted  
Must operate minimum 42 – 47 MHz  
Must have minimum eight character Alpha-numeric display (mobile / portable only)  
Minimum power 60 watts power for mobile  
Minimum of 64 channels

### **VHF High Band Radio (150 – 162 MHz)**

Must be FCC Type Accepted  
Must be FCC Narrowband 11K0F3E emission as well as 20K0F3E emission  
Must have minimum eight character alpha numeric display (mobile / portable only)  
Minimum 32 channels (mobile or portable)  
Minimum 25 watts power for mobile radio and 5 watts portable

Note: VHF radio does not have to be P25 unless they will be operating on a P25 system or radio installed into a Regional Mobile Command Post or will need to interface into a P25 system outside of the home county.

### **UHF Band Radio (450 – 470 MHz)**

Must be FCC Type Accepted  
Must be FCC Narrowband 11K0F3E emission as well as 20K0F3E emission  
Must have minimum eight character alpha numeric display (mobile / portable)  
Minimum 32 channels (mobile or portable)  
Minimum 25 watts power for mobile radio and 4 watts portable

Note: UHF radio does not have to be P25 unless they will be operating on a P25 system or radio installed into a Regional Mobile Command Post or will need to interface into a P25 system outside of the home county.

### **800 MHz TMAC Conventional Radio (851 – 870 MHz)**

Must be FCC Type Accepted  
Must be FCC NPSPAC 16K0F3E emission as well as 20K0F3E emission  
Must have minimum eight character alpha numeric display  
Minimum 32 channels in conventional mode  
Minimum 15 watts power for mobile radio and 3 watts for portable  
To be compatible with TEMA system must have the following:  
    DTMF microphone  
    MDC1200 encoding – TEMA will provide code

Note: An 800 MHz radio does not have to be P25 unless they will be operating on a P25 system or radio installed into a Regional Mobile Command Post or will need to interface into a P25 system outside of the home county.

**800 MHz Trunking Radio (851 – 870 MHz)**

Must be FCC Type Accepted

Must be FCC NPSPAC 16K0F3E emission as well as 20K0F3E emission

Must have minimum eight character alpha numeric display

Should have trunk system compatible software used within county or district;

For example, a Motorola or MACOM trunking radio will need the appropriate operating system to work with the radio systems you have permission to utilize

Minimum 15 watts power for mobile

**700 MHz Radio**

Must be FCC Type Accepted

Must have minimum eight character alphanumeric display

Must be P25 Common Air Interface CAI

Other minimum standards will be added as equipment becomes available.

**HF Radio Equipment (2 – 30 MHz)**

Must be FCC Type accepted if operating on Public Safety frequencies

Automatic Link Establishment recommended

Minimum 100 watts power

Must be able to work on all channels from 2 – 30 MHz

WinLink Email Software

HF Modem for WinLink

## Appendix T

### Tennessee 800 MHz Mutual Aid Channel (TMAC)

TMAC is a statewide 800 MHz analog and conventional radio communications system managed by the TN Emergency Management Agency and is open to all State, Local, Federal government agencies and designated critical infrastructure operators to coordinate with the State Emergency Operations Center, Local Emergency Operations Center and TEMA field units. Radio site access requires DTMF encoding and MDC1200 signaling is required on the end of the PTT for unit ID.

*A separate Frequency Usage Agreement is required.* To participate in the TMAC system, please send a written request to your TEMA Regional office or to TEMA Communications, 3041 Sidco Drive, Nashville, TN, 37204 or email your request to [jjohnson@tnema.org](mailto:jjohnson@tnema.org).

Channel Name	HLS Division	NPSPAC Division	Mobile Transmit	Mobile Rx	FCC Ch.#
Bristol TMAC	1	1	823.35000	868.35000	779
Knox TMAC	2	2	821.37500	866.37500	629
Chattanooga TMAC	3	3	822.15000	867.15000	687
Crossville TMAC	4	4	821.83750	866.83750	664
Nashville TMAC	5	5	821.35000	866.35000	627
Lynchburg TMAC	6	6	823.06250	868.06250	756
Clarksville TMAC	7	5	823.42500	868.42500	785
Lawrence TMAC	8	6	822.22500	867.22500	693
Gibson TMAC	9	7	821.40000	866.40000	631
Jackson TMAC	10	8	822.55000	867.55000	717
Memphis TMAC	11	8	822.15000	867.15000	687

**NOTE: These are the frequencies prior to 800 MHz re-banding. Post re-banding, they will be 15 MHz lower.**

## Appendix U

### Minimum Interoperability and Mutual Aid Radio Channels by Discipline and Radio Band

#### Law Enforcement / Correction VHF Radio Channels

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	NOTES
155.75250	155.75250	156.7	156.7	VCALL10	Narrowband	Calling Channel
151.13750	151.13750	156.7	156.7	VTAC11	Narrowband	Tactical
154.45250	154.45250	156.7	156.7	V TAC12	Narrowband	Tactical
158.73750	158.73750	156.7	156.7	V TAC13	Narrowband	Tactical
159.47250	159.47250	156.7	156.7	V TAC14	Narrowband	Tactical
156.015	154.755	100.0	100.0	VTNMA	Wideband	With Direct / TA
155.475	155.475	156.7	156.7	VLAW31	Wideband	National Law Enforcement Emergency Channel
155.48250	155.48250	156.7	156.7	VLAW32	Narrowband	National Law Enforcement Emergency Channel

#### Fire Department VHF Radio Channels

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	NOTES
154.2650	154.2650	156.7	156.7	VFIRE22	Wideband	TN Command/Control
154.27250	154.27250	156.7	156.7	VFIRE24	Narrowband	Tactical / Fire Ground
154.2800	154.2800	156.7	156.7	VFIRE21	Wideband	Tactical / Fire Ground
154.28750	154.28750	156.7	156.7	VFIRE25	Narrowband	Tactical / Fire Ground
154.2950	154.2950	156.7	156.7	VFIRE23	Wideband	TN Fire Mutual Aid
154.30250	154.30250	156.7	156.7	VFIRE26	Narrowband	Tactical / Fire Ground
155.75250	155.75250	156.7	156.7	VCALL10	Narrowband	National Calling Channel
151.13750	151.13750	156.7	156.7	V TAC 11	Narrowband	Tactical
154.45250	154.45250	156.7	156.7	V TAC 12	Narrowband	Tactical
158.73750	158.73750	156.7	156.7	V TAC 13	Narrowband	Tactical
159.47250	159.47250	156.7	156.7	V TAC 14	Narrowband	Tactical
156.015	154.755	100.0	100.0	VTNMA	Wideband	With Direct / TA

**NOTE: All VHF & UHF frequencies must be narrowband per the FCC mandate by January 1, 2013.**

**EMS / Rescue VHF Radio Channels**

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	NOTES
155.205	155.205	D205	D205	VEMS 205	Wideband	TN Mutual Aid / Calling
155.295	155.295	D155	D155	VEMS 295	Wideband	Staging Area
155.75250	155.75250	156.7	156.7	VCALL10	Narrowband	National Calling Channel
151.13750	151.13750	156.7	156.7	V TAC 11	Narrowband	Tactical
154.45250	154.45250	156.7	156.7	V TAC 12	Narrowband	Tactical
158.73750	158.73750	156.7	156.7	V TAC 13	Narrowband	Tactical
159.47250	159.47250	156.7	156.7	V TAC 14	Narrowband	Tactical
156.015	154.755	100.0	100.0	VTNMA	Wideband	With Direct / TA

**Emergency Management VHF Radio Channels**

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	NOTES
154.2650	154.2650	156.7	156.7	VFIRE22	Wideband	FD Command/Control
154.27250	154.27250	156.7	156.7	VFIRE24	Narrowband	FD Tactical / Fire Ground
154.2800	154.2800	156.7	156.7	VFIRE21	Wideband	FD Tactical / Fire Ground
154.28750	154.28750	156.7	156.7	VFIRE25	Narrowband	FD Tactical / Fire Ground
154.2950	154.2950	156.7	156.7	VFIRE23	Wideband	FD TN Fire Mutual Aid
154.30250	154.30250	156.7	156.7	VFIRE26	Narrowband	FD Tactical / Fire Ground
155.75250	155.75250	156.7	156.7	V CALL10	Narrowband	National Calling Channel
151.13750	151.13750	156.7	156.7	V TAC 11	Narrowband	Tactical
154.45250	154.45250	156.7	156.7	V TAC 12	Narrowband	Tactical
158.73750	158.73750	156.7	156.7	V TAC 13	Narrowband	Tactical
159.47250	159.47250	156.7	156.7	V TAC 14	Narrowband	Tactical
159.705	159.705	156.7	156.7	VTNTAC	Wideband	Tactical
156.015	154.755	100.0	100.0	VTNMA	Wideband	With Direct / TA
155.205	155.205	D205	D205	VEMS 205	Wideband	TN EMS Mutual Aid
155.295	155.295	D155	D155	VEMS 295	Wideband	EMS Staging (Portable)

**Public Works / Utilities / Highway Maintenance VHF Radio Channels**

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	NOTES
155.75250	155.75250	156.7	156.7	V CALL10	Narrowband	Calling Channel
151.13750	151.13750	156.7	156.7	V TAC11	Narrowband	Tactical
154.45250	154.45250	156.7	156.7	V TAC12	Narrowband	Tactical
158.73750	158.73750	156.7	156.7	V TAC13	Narrowband	Tactical
159.47250	159.47250	156.7	156.7	V TAC14	Narrowband	Tactical
156.015	154.755	100.0	100.0	VTNMA	Wideband	With Direct / TA

**NOTE: All VHF & UHF frequencies must be narrowband per the FCC mandate by January 1, 2013.**

**Fire / EMA / Rescue / First Responder UHF Radio Channels**

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	Notes
458.21250	453.21250	156.7	156.7	UCALL 40	Narrowband	With Direct
458.46250	453.46250	156.7	156.7	UTAC41	Narrowband	With Direct
458.71250	453.71250	156.7	156.7	UTAC42	Narrowband	With Direct
458.86250	453.86250	156.7	156.7	UTAC43	Narrowband	With Direct
467.98750	462.98750	156.7	156.7	UEMSTAC	Narrowband	EMS Primary
465.400	460.400	127.3	127.3	UTNMA	Wideband	With Direct / TA

**Law Enforcement / Corrections UHF Radio Channels**

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	Notes
458.21250	453.21250	156.7	156.7	UCALL40	Narrowband	With Direct / TA
458.46250	453.46250	156.7	156.7	UTAC41	Narrowband	With Direct / TA
458.71250	453.71250	156.7	156.7	UTAC42	Narrowband	With Direct / TA
458.86250	453.86250	156.7	156.7	UTAC43	Narrowband	With Direct / TA
465.38750	460.38750	156.7	156.7	UTAC44	Narrowband	With Direct / TA
465.41250	460.41250	156.7	156.7	UTAC45	Narrowband	With Direct / TA
465.40000	460.40000	127.3	127.3	UTNMA	Wideband	With Direct / TA

**EMS UHF Radio Channels**

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	Notes
458.21250	453.21250	156.7	156.7	UCALL40	Narrowband	With Direct / TA
458.46250	453.46250	156.7	156.7	UTAC41	Narrowband	With Direct / TA
458.71250	453.71250	156.7	156.7	UTAC42	Narrowband	With Direct / TA
458.86250	453.86250	156.7	156.7	UTAC43	Narrowband	With Direct / TA
467.98750	462.98750	156.7	156.7	UEMSTAC	Narrowband	With Direct / TA
465.40000	460.40000	127.3	127.3	UTNMA	Wideband	With Direct / TA

**Note: EMS units that transport to hospitals are encouraged to obtain and FCC license for usage of the UHF MED Channels.**

**NOTE: All VHF & UHF frequencies must be narrowband per the FCC mandate by January 1, 2013.**

**800MHz Radio User Channels (Pre-Rebanding)**

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	Notes
821.01250	866.01250	156.7	156.7	I CALL	16K0F3E	With Direct / TA
821.51250	866.51250	156.7	156.7	I TAC 1	16K0F3E	With Direct / TA
822.01250	867.01250	156.7	156.7	I TAC 2	16K0F3E	With Direct / TA
822.51250	867.51250	156.7	156.7	I TAC 3	16K0F3E	With Direct / TA
823.01250	868.01250	156.7	156.7	I TAC 4	16K0F3E	With Direct / TA

After Rebanding / Reconfiguration all frequencies will be 15 MHZ lower.

**800MHz TMAC Radio User Channels (Pre-Rebanding)**

MO TX	MO RX	TX Tone	RX Tone	Ch. Name	Emission	Notes
821.01250	866.01250	156.7	156.7	I CALL	16K0F3E	With Direct / TA
821.51250	866.51250	156.7	156.7	I TAC 1	16K0F3E	With Direct / TA
822.01250	867.01250	156.7	156.7	I TAC 2	16K0F3E	With Direct / TA
822.51250	867.51250	156.7	156.7	I TAC 3	16K0F3E	With Direct / TA
823.01250	868.01250	156.7	156.7	I TAC 4	16K0F3E	With Direct / TA
823.35000	868.35000	DPL205	DPL205	Bristol TMAC	16K0F3E	With Direct / TA
821.37500	866.37500	DPL205	DPL205	Knox TMAC	16K0F3E	With Direct / TA
822.15000	867.15000	DPL205	DPL205	Chattanooga TMAC	16K0F3E	With Direct / TA
821.83750	866.83750	DPL205	DPL205	Crossville TMAC	16K0F3E	With Direct / TA
821.35000	866.35000	DPL205	DPL205	Nashville TMAC	16K0F3E	With Direct / TA
823.06250	868.06250	DPL205	DPL205	Lynchburg TMAC	16K0F3E	With Direct / TA
823.42500	868.42500	DPL205	DPL205	Clarksville TMAC	16K0F3E	With Direct / TA
822.22500	867.22500	DPL205	DPL205	Lawrence TMAC	16K0F3E	With Direct / TA
821.40000	866.40000	DPL205	DPL205	Gibson TMAC	16K0F3E	With Direct / TA
822.55000	867.55000	DPL205	DPL205	Jackson TMAC	16K0F3E	With Direct / TA
822.15000	867.15000	DPL205	DPL205	Memphis TMAC	16K0F3E	With Direct / TA

After Rebanding / Reconfiguration all frequencies will be 15 MHZ lower  
 TMAC Channels should be programmed with Direct / TA

## **Appendix V**

### **Acronyms & Glossary**

700 MHz – The Public Safety frequency spectrum from 746 MHz – 805.98750 MHz

800 MHz – The Public Safety frequency spectrum from 806 MHz – 870 MHz. After rebanding, the frequency range will be from 806 – 860.98750 MHz

Analog FM emission – Not digital, Frequency Modulated radio transmission

ARES – Amateur Radio Emergency System – The non-governmental organization within the American Radio Relay League (ARRL) for providing emergency Amateur Radio Communications. Also see RACES

CAI – Common Air Interface – The Project 25 designation for the analog to digital voice radio conversion. The CAI for P25 is the Improved Multi-Band Excitation (IMBE) vocoder. Vocoders work by using a speech analyzer to convert analog speech waveforms into a digital data stream.

CAP – Civil Air Patrol - A volunteer auxiliary of the United States Air Force which provides assistance in search and rescue operations.

Command & Control – Also Direction & Control – The responsible person or group responsible for the overall management, policy and response function of a disaster or emergency

CSQ – Carrier Squelch – no sub audible tone on either the receiver or transmitter

CTCSS – Continuous tone coded squelch system

dB – Decibel -A unit for measuring the power of an electromagnetic signal; equal to the logarithm of the ratio of the measured signal to that of an arbitrary standard.

dBd – Abbreviation (decibels related to dipole antenna) is a measure of the gain of an antenna system relative to a dipole antenna at radio frequency.

dBi – Abbreviation. In the expression of antenna gain, the number of decibels of gain of an antenna referenced to the zero dB gain of a free-space isotropic radiator

dBu – Abbreviation - Equal to a dBm if the impedance is 600 ohms. In other words, 0.775 volts across 600 ohms equals 1 milliwatt.

DCS – Digital Coded squelch

DTMF - Abbreviation for dual-tone multi-frequency (signaling)

EOC – Emergency Operations Center

EMA – Emergency Management Agency

EMS – Emergency Medical Service

ERP – Effective Radiated Power – The actual power being radiated out of an antenna

FB – FCC designation for Fixed Base – referring to radio equipment used for base to mobile operations typically installed in a permanent configuration.

FBT – FCC designation for Fixed Base Temporary – radio equipment used at a temporary location for base to mobile operations

FB2 – FCC designation for mobile relay or repeater

FB2T – The FCC designation for mobile relay or repeater in a temporary operation

FCC – Federal Communications Commission

FX1 – The FCC designation for a control station

FX1T – The FCC designation for a control station in a temporary operation

HD – High side of the frequency used for direct communication

Hz - Hertz

Hysteresis – The lag between making a change, such as increasing or decreasing power, and the response or effect of that change.

Interoperability - An essential communications link within public safety and public service wireless communications systems which permits units from two or more different entities to interact with one another and to exchange information according to a prescribed method in order to achieve **predictable** results.

LD – Low side of the frequency used for direct communication

MED Channels – Radio channels set aside by the FCC for use by the Emergency Medical Service

MHz – Megahertz – One million hertz

Mobile – A radio either carried by a person (portable) or mounted in a vehicle

Mobile Only – FCC reference to a radio frequency that is only to be used in a mobile or portable radio. Not intended for use in base configuration or mobile relay or repeater output

Mobile Command Post – A command and control location in a temporary location

NAC – Network Access Code – a digital code used to decode or open a receiver

Narrowband – used in reference to the narrowing of a frequency. The FCC has mandated all radio spectrum below 512 MHz and above 150 MHz be narrowed or the space the frequency occupies to be cut in half. The deadline to narrowband radio equipment is January 1, 2013. The FCC analog voice emission for narrowband is 11K0F3E and all public safety VHF and UHF radio equipment must conform to this by January 1, 2013.

NCC – National Coordinating Committee

NTIA - National Telecommunications and Information Administration – Similar to the FCC but for Federal Government agencies

Operation Secure - Operation SECURE is a frequency allocation and assignment program initiated by the Federal Communications Commission (FCC) and administered by FEMA. Operation SECURE provides each state emergency management agency the opportunity to obtain an FCC license for emergency management communications in the 2-10 MHz high frequency range. Local emergency management agencies may be authorized by states to operate on these state assigned frequencies.

P25 – Refers to the Association of Public-Safety Communications Officials (APCO) project to establish digital radio standards.

Part 90 FCC Rules – The Federal Communications Commission rule section that governs Public Safety / Land Mobile radio operations

Plain Language – as opposed to codes or Ten Codes

RACES – Radio Amateur Civil Emergency System – The organization defined in the FCC rules for providing Amateur Radio communications by and for governments during emergencies. These rules do not prevent the use of ARES communicators when the State and Local Plans recognize the ARES organization.

Rebanding – The FCC mandated moved of spectrum.

Region 39 – The FCC designated regions for planning and management of the 700MHz and 800MHz radio spectrum in Tennessee

REOC – Regional Emergency Operations Center

RFI – Radio Frequency Interference

SEOC – State Emergency Operations Center

SHARES – SHARed RESources (SHARES) High Frequency (HF) Radio Program. The purpose of SHARES is to provide a single, interagency emergency message handling system by bringing together existing HF radio resources of Federal, state and industry organizations when normal communications are destroyed or unavailable for the transmission of national security and emergency preparedness information.

Simplex – Direct radio to radio communications with a mobile relay or repeater

TAC – Tactical channel

Talk Around (T/A) – same as simplex or direct mode

TMAC – TEMA Mutual Aid Channels – 800 MHz system used for mutual aid / interoperability to establish command and control. System is open to local, state, federal and designated critical infrastructure operators.

UHF – Ultra High Frequency – FCC designation of the radio spectrum in the 300 MHz to 3000MHz band

uV – Microvolt abbreviation – measurement of receiver signal strength

VHF – Very High Frequency – FCC designation of the radio spectrum from 30 MHz to 300 MHz.

## **Appendix W**

### **Agency Contact Information**

Please provide below agency contacts and radio communications contacts. The contacts should include persons that have the authority to deploy communication resources, personnel that will be sent to deploy communications assets, and have knowledge of your radio system.

Name:  
Agency:  
Title / Position:  
Agency Address:  
Phone #:  
Email Address:

Name:  
Agency:  
Title / Position:  
Agency Address:  
Phone #:  
Email Address:

Name:  
Agency:  
Title / Position:  
Agency Address:  
Phone #:  
Email Address:

Name:  
Agency:  
Title / Position:  
Agency Address:  
Phone #:  
Email Address:

Please send a copy of this information along with the MOU.

## **Appendix X**

### **Satellite Interoperability**

Interoperable PTT talk groups have been established for those utilizing the Mobile Satellite Venture, now Sky Terra, PTT feature.

Currently there are four Satellite Mutual Aid Radio Talkgroups (SMART) PTT Talk Groups that cover Tennessee:

#### Tennessee 1 Talk Group

This talk group is open to all Public Safety agencies in Tennessee for Command & Control, on scene coordination, planned events, coordination with SEOC and other dispatch centers that monitor this group. The Net Control will be the State EOC and they will have the responsibility to monitor this Talk Group. Requests to join this talk group will be sent to TEMA, Director of Operations & Communications, Email: [lfriedmann@tnema.org](mailto:lfriedmann@tnema.org)

#### CUSEC-1 - Central United States Earthquake Consortium Talk Group

This talk group is open to all entities that are in the CUSEC partner states. The Net Control and manager for this talk group is the State of Indiana and requests to join this group should be sent to [CUSEC-1@cusec.org](mailto:CUSEC-1@cusec.org)

#### SE-SMART Talk Group

This talk group is made up of the Southeastern states, AR, AL, FL, GA, KY, LA, MS, NC, SC, TN, VA & WV. Net Control and manager for this talk group is Fairfax County, VA OEM / Public Safety Communications. Email: [SESMART@fairfaxcounty.gov](mailto:SESMART@fairfaxcounty.gov)

#### J-SMART – Justice Smart

J SMART is for Public Safety agencies, but more focused on the law enforcement community. The manager for J SMART is the Department of Justice. To request to join, Email: [SMART@usdoj.gov](mailto:SMART@usdoj.gov)

# Attachment 1

## Ways to Implement the Tennessee Interoperability Guidance

The goal of interoperability in TN is to establish command and control so that an emergency or disaster can have an effective response and recovery.

In order for interoperability to be effective:

- Interoperability must be incorporated into the daily emergency response system.
- Radio communications training must be as important as other annual training
- Interoperability should be established on channels other than the primary dispatch channel
- Cross band devices and gateways are tools to be used when needed, not the answer
- Establish working relationships with other agencies and departments. This is the key to effective interoperability.

Interoperability – The ability to communicate with another department or agency whether they use a similar or different radio system or are on the same or different radio band, when needed.

1. Install an 800 MHz control station in the 24 hour warning point / EOC / Mobile Command Post to access the TEMA 800 TMAC system. This radio must have DTMF encoding and MDC1200 signaling. The MDC burst will be at the end of the transmission. Coordinate this with TEMA.

2. Re-establish Inter-City, 155.370 for dispatch center to dispatch center radio communications. An FCC license is required plus DTMF can be added for encode and decode.

3. Utilize the TN Emergency Warning System (TEWS) and NAWAS in each county at the primary 24 hour warning point.

4. Program the FCC designated Interoperability channels into your VHF and UHF narrowband radios - must be a narrowband(11K0F3E) radio as approved by the FCC. The 800 Interoperability channels should be added to the 800 MHz radios.

5. Obtain an FCC license and install a VHF (154.755) / UHF (460.400) mutual aid repeater with DTMF control (like the TEMA system operates) in each county. The two repeaters can be cross banded.

6. Obtain an FCC license and install the TN Mutual Aid channels in the radio such as Fire Mutual Aid, EMS 155.205, etc. These can be used in older or newer narrowband radios.

7. Install the 800 MHz Interoperability repeaters. This must be done in accordance with the 800 MHz Region 39 Plan.

8. Install the VHF / UHF Interoperability Calling Channel at the 24 hour warning point and EOC. FCC license and TEMA coordination required.

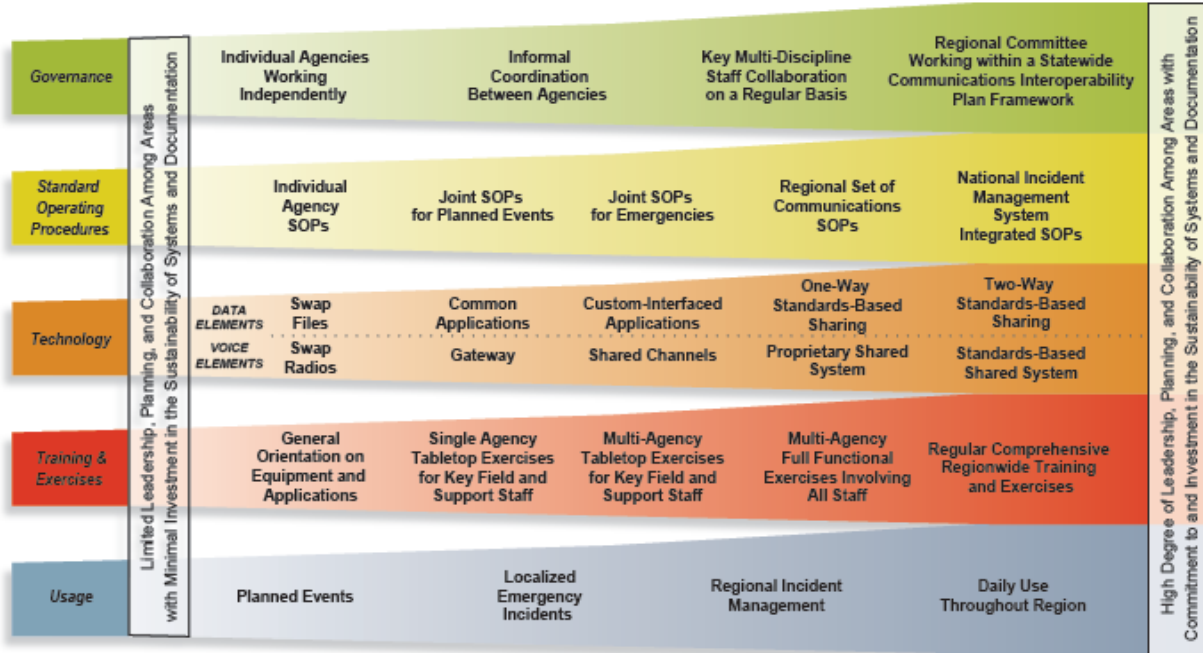
9. Support the development of a Tennessee Interoperable Radio System.

10. Sign the MOU for interoperability and participate in fostering interoperability.

The VHF high band and UHF radio spectrum is very saturated or depleted in most areas in Tennessee. In most areas there is not enough radio spectrum available to create individual agency interoperability systems in the VHF or UHF band until Public Safety completely moves to narrowband, and then there will be very little usable additional frequencies. 800 MHz also has its limitations due to the Re-configuration process, but should be completed by 2009. 700 MHz is available now in Tennessee.

# ATTACHMENT 2

## Interoperability Continuum



## Changes to the Guide

DATE	PAGE / APPENDIX	CHANGES MADE TO DOCUMENT
1/03/2008	Appendix C	Revised post rebanding channel names to conform with NPSTC Command Channel Name Plan
1/03/2008	Appendix D	Revised 700 MHz frequencies to match new FCC Band Plan
1/03/2008	Appendix H	Revised Channel Names
1/03/2008	Appendix I	Added IS – 400
1/03/2008	Appendix P	Changed Army MARS to Military MARS
1/03/2008	Appendix S	Updated HF radio requirements
1/03/2008	Appendix T	Updated TMAC channel names
1/03/2008	Appendix U	Updated TMAC & I Call / I TAC channel names
2/20/08	Appendix U	Corrected EMS Med 9 & Med 10 frequencies
2/20/08	Various locations	Added Notice of VHF & UHF Narrowband Mandate
6/12/08	Appendix U	Corrected typo with V Fire 21 and V Fire 22
11/25/08	Appendix U	Update UHF Fire, UHF EMS tables
11/25/08	Appendix F	Added footnote to UTAC 44 & UTAC45 – Law Enforcement Usage only
11/25/08	MOU	Added certification language to MOU
11/25/08	Attachment 2	Replaced Continuum with new version
1/15/09	P.4	Changed Radio Interoperability Coordinator
1/15/09	Appendix F	Added CTCSS tone to V FIRE and V LAW
1/15/09	Appendix U	Added CTCSS tone to V FIRE and V LAW
1/15/09	Appendix X	Added Appendix X – Satellite Interoperability