



**CAL OES  
FIRE**

# **CAL OES FIRE & RESCUE (FIRE NET) RADIO COMMUNICATIONS**



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Telecommunications Branch  
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## OVERVIEW

The Cal OES Fire and Rescue (F&R) Branch Radio Communications System is known as OES FIRE Net. OES FIRE Net is designed and equipped to provide effective emergency communications in support of fire and rescue mutual aid operations and assumes a number of responsibilities. Consistent with the intent and provisions of the State Fire Service and Rescue Emergency Mutual Aid Plan, Cal OES assumes responsibility for providing a communications network connecting all 6 mutual aid regions, the 58 operational areas, other appropriate state agencies and Cal OES centralized communications facilities. In addition, Cal OES provides radio communications capability in its fleet of emergency apparatus and specialized mobile communications equipment to facilitate on-scene coordination of multi-agency resources at major emergencies. This system is comprised of the FIREMARS VHF & 800MHz network.

An efficient communications system is the most vital support element to the effective mobilization and coordination of the mutual aid response organization operating throughout the state – an area up to 200 miles wide and 700 miles in length. As such Cal OES F&R Branch established the FIRE NET Microwave Intertie System and the FIREMARS VHF & 800MHz Repeater System.

## NETWORK DESIGN

The Cal OES F&R Communications are designed and equipped to provide two-way communications both on Cal OES-controlled and “local” controlled frequencies. For purpose of simplification they are described as a “basic system” providing strategic command & control communications and “support system” providing tactical fire-ground communications.

### BASIC SYSTEM

This in-place system employs the use of four (4) VHF high band channels operating through a network of mountain top repeaters interconnected by the state microwave circuit. It can be described as a “strategic” system verses a “tactical” system. It’s primary use is Command & Control between ECC’s, PSAP’s, Mobile (MCC) Command Support Vehicles and Cal OES F&R Coordinators.

Repeaters and microwave interconnect switches are tone controlled. Single tone generators are required to activate the repeaters and are an integral component of all Cal OES fire radio transmitters. In addition, selected base control stations are equipped with touch-tone pads to interconnect the radio to the microwave system via the repeaters to permit communications with Cal OES headquarters or other base stations located throughout the state (see Tables 1 & 2). The OES FIRE NET has 22 interconnected mountaintop sites and operates on the frequency pairings outlined in Appendix C.

### SUPPORT SYSTEM

In addition to the “Basic System,” Cal OES provides a variety of mobile communications equipment for use in the coordination of multi-agency resources at major emergencies. This can be described as a “tactical” system verses a “strategic” system.

This equipment includes:

- Mobile multi-frequency communications units;
- Mobile repeaters (w/ frequencies on Fire Net, CAFIRE, FIREMARS); and
- Handheld (HT) caches.

### SYSTEM MANAGEMENT

Within Cal OES, the responsibility for managing the OES FIRE NET is met by two branches within the Operations Response Division; the Fire and Rescue (F&R) Branch and the Telecommunications (TComm) Branch. The Cal OES F&R Branch establishes and enforces procedures for participation in, and use of, the system. Cal OES Fire Coordinators ensure that the system’s frequencies are used properly and in a coordinated manner. The Cal OES TComm Branch is responsible for technical standards and procedures. The TComm Branch Coordinators assist and advise on technical matters, as requested and provide liaison with the Public Safety Communications Branch (PSC) radio technicians.

## OPERATIONAL STANDARDS

### CHANNEL USAGE PRIORITIES

The use of all OES FIRE NET and FIREMARS channels require prior authorization from the Cal OES F&R Branch and must be done through proper frequency coordination. To request authorization contact Cal OES Fire Duty Officer (FDO) at (916-845-8911 or [warning\\_center@oes.ca.gov](mailto:warning_center@oes.ca.gov)). For technical assistance contact the TComm Branch Telecommunications Duty Officer (TDO) via the State Warning Center.

#### **Channel Identifiers**

Only the Standard California Channel Identifiers are used for OES FIRE NET and FIREMARS. It is strictly prohibited to assign a local identifier to OES FIRE NET and FIREMARS channels.

#### **Conceptual Use/Dispatch Procedures**

All Cal OES F&R communications equipment is designed and purchased to support the Statewide Fire and Rescue Mutual Aid System. Thus, all mobile (transportable) equipment is available to any fire agency (department) upon request. Requests for Cal OES F&R communications equipment must be processed through the established mutual-aid system, the same as engines, support vehicles, etc.

#### **“Local” to “Area” to “Region” to “State”**

Inventory lists of Cal OES F&R equipment are maintained at all Operational Area, Region and State dispatch centers. Cal OES field and headquarters staff are available to present orientation and specialized training programs covering all aspects of the program from “request procedures” to “operator training.”

#### **Permitted Uses**

OES FIRE NET communications network is provided for use by the fire service and for official mutual-aid communications use only. Participation in OES FIRE NET is open to all California fire mutual aid cooperators at the State, Regional, and Operational Area levels. It is primarily designed as a Command and Control microwave intertie system for strategic communications.

The FIREMARS System is comprised of one VHF pair for portable repeater applications and several fixed repeater sites on the 800MHz band. The 800MHz repeaters are located in the San Francisco Bay Area and Southern California.

Cal OES is licensed by the Federal Communications Commission to operate on all fire frequencies in California during an emergency. All communications on the OES FIRE NET and FIREMARS frequencies must be in accordance with Part 90, Subpart B of FCC Regulations (Public Safety Radio Pool). Cal OES F&R communications participants transmit communications essential to official activities during an emergency. Unofficial communications on all Cal OES Fire & Rescue communications systems are prohibited.

#### **Prohibited Uses**

OES FIRE NET shall only be used when authorized during a mutual aid emergency and by Command, Control and Communications Centers, Mobile Support Units, and Cal OES Coordinators.

#### **Identification**

##### Mobile Units

1. Mobile units identify the unit or station they wish to contact and identify themselves by using their agency-assigned unit designator. These are not shortened and include the entire set of letters and/or numbers. For example: "Engine 21, this is Grass 20".
2. During interagency operations mobile units identify their agency in addition to their agency-assigned unit designator. For example: "Cal OES 5201, this is CAL FIRE BC-12."

### Base Stations

Base stations identify themselves by using their agency name along with any other usual identifier. Base stations must use the FCC call sign shown on their OES FIRE NET license at least once every 30 minutes or at the end of a contact. For example: "California KVZ29."

### Channel Use Priorities

OES FIRE NET and FIREMARS use is governed by a system of priorities that must be respected at all times:

- **Priority 1:** Disaster and extreme emergency operations for mutual aid and interagency communications.
- **Priority 2:** Emergency or urgent operations involving imminent danger to the safety of life or property.
- **Priority 3:** Special Events, Drills, Tests & Exercises. (Under strict coordination by Cal OES F&R.)

### Message Precedence

Message Precedence is a classification system that establishes the priority of message content while a channel is in use – i.e., it helps determine which message has precedence over another on a channel. It is used for both verbal and written message traffic. The order of precedence of messages is:

1. **New Incident:** Messages pertaining to a new incident. Once the new incident is addressed, it no longer has precedence unless it has a higher priority.
2. **Emergency:** Messages involving the imminent safety of life or protection of property, including messages to request supplies, materials or instructions vital to relief of emergency operations.
3. **Priority:** Messages that are official and time-bound, but are not covered in the emergency category. Priority messages may include notice of deaths or injury in a disaster area.
4. **Welfare:** Messages involving the health and welfare of an individual in a disaster area.
5. **Routine:** Messages pertaining to routine operations.

### Plain Language

All communications on OES FIRE NET and FIREMARS are in plain language. Radio codes, acronyms, and abbreviations are to be avoided as they may cause confusion between agencies and disciplines and jeopardize officer safety.

### Voice Privacy

The use of OES FIRE NET or FIREMARS channels for transmission of encoded, encrypted, digital, or scrambled message is prohibited. All inquiries and questions should be addressed to the Cal OES Fire Duty Officer at (916-845-8911 or [warning\\_center@oes.ca.gov](mailto:warning_center@oes.ca.gov)).

### Supervisory Responsibility

Each agency manager and supervisor bears the responsibility for the compliance of operations on OES FIRE NET and FIREMARS to the Cal OES Fire Plan. Violations are reported to Cal OES F&R who will contact the violating agency's executives to assist in correcting problems or deficiencies. See Appendix A for the complaint procedure.

## TECHNICAL STANDARDS AND PROCEDURES

### **Voice Privacy**

Speech scrambling, digital voice privacy [DVP], digital encryption [DES/AES], inversion, and other forms of scrambling are not permitted on any FIRE NET or FIREMARS channels.

### **Paging or Signaling**

Tone or digital signaling, paging and/or alerting is not permitted on any FIRE NET or FIREMARS channels. However, it is permitted to sound simple alert tones [attention beeps] prior to broadcasts. Automatic station identification is also permitted.

### **Data Transmission**

Transmission of data is not permitted on FIRE NET nor FIREMARS channels.

### **Interoperability Operation**

In the event of a public safety Priority 1 or 2 emergency, and in keeping with appropriate FCC Rules, a FIRE NET or FIREMARS channel may be *temporarily* cross-banded through automatic or manual equipment with another channel. A cross-band or use of a gateway switch must be discontinued when the operation requiring its use is finished. Refer to Cal OES's Statewide Gateway Units Standard Operating Procedure for more information on gateway procedures.

### **FCC Call Sign Announcements**

All stations must identify in accordance with FCC Rules and Regulations, Part 90.425. Each station or system must be identified by transmission of its FCC callsign:

- During each transmission, or exchange of transmissions, -or-
- Once each 30 minutes during periods of continuous operation.

The call sign is the FCC-assigned set of letters and numbers found on the license authorization. Mobiles and Portables must identify with their agency assigned unit or officer number. Violations may result in revocation of the operating authority for the offending agency.

## ESSENTIAL INTEROPERABILITY GUIDELINES CHECKLIST

- ✓ **OBEY PRIORITIES:** When a higher priority use is required, all lower priority traffic yields the frequency immediately.
- ✓ **USE PLAIN LANGUAGE AT ALL TIMES.**
- ✓ **IDENTIFY WITH FULL AGENCY UNIT DESIGNATOR AND FCC CALL-SIGNS (BASE STATIONS AND MOBILES).**
- ✓ **MONITOR THE CHANNEL PRIOR TO TRANSMITTING.**
- ✓ **USE APPROPRIATE CODED SQUELCH:** Do not use local tones on interoperability channels without the capability of monitoring the mutual aid tone (156.7/\$293) and turning the tone protection off.
- ✓ **USE THE CHANNEL'S STANDARD ID:** Program the standard California channel ID into your radio's display.
- ✓ **DO NOT SCRAMBLE OR ENCRYPT MESSAGES.**
- ✓ **DO NOT PERMINENTLY OR SEMI-PERMANENTALLY LINK MUTUAL AID CHANNELS TO EACH OTHER OR TO LOCAL AGENCY CHANNELS.**

**Respect the policies and procedures set forth in each interoperability system's plan to ensure the interoperability channels are available for use in emergency situations.**

## APPENDIX A: COMPLAINT PROCEDURES

Report all operations on FIRE NET & FIREMARS Channels that are detrimental to first responder safety or to the management of an incident, that fails to follow the procedures outlined in the Cal OES Fire & Rescue Plan, that causes interference to other users, or that violates FCC Regulations 90.20 and 90.405.

To report flagrant violations that endanger first responder safety, immediately contact the FDO or the TDO via the California State Warning Center (CSWC) (Telephone: 916-845-8911).

To report interference issues from outside sources and other misuses of FIRE NET or FIREMARS:

1. Attempt to identify the offending station.
2. Contact the chief executive of that department.
3. If the problem persists, contact the Cal OES FDO or TDO via the CSWC.  
(916-845-8911 or [warning\\_center@oes.ca.gov](mailto:warning_center@oes.ca.gov)) and relay the following information:
  - The date and time of the problem
  - The circumstances regarding the interference or misuse
  - Information detailing how the misuse interfered with operations or safety
  - Information (identification, call signs, etc.) that would help locate the offending agency.
4. Keep audio logging tapes, tape cassettes, or digital files recording the misuse to send to Cal OES. [If requested, Cal OES will return the tape after its investigation.]

On receipt of a complaint, Cal OES will conduct an investigation.

## APPENDIX B: ACRONYM LIST

**AES:** Advanced Encryption Standard

**ANSI:** American National Standards Institute

**Cal-IFOG:** California Interoperability Field Operations Guide

**CALCORD:** California On-Scene Emergency Coordination System

**Cal OES:** California Governor's Office of Emergency Services

**CalSIEC:** California Statewide Interoperability Executive Committee

**CSWC:** California State Warning Center

**CTCSS:** Continuous Tone-Coded Squelch System

**DCS:** Digital Coded Squelch

**DES:** Data Encryption Standard

**DVP:** Digital voice privacy

**FCC:** Federal Communications Commission

**FDO:** Cal OES Fire & Rescue Branch Duty Officer

**FIREMARS:** 800MHz Fire Mutual-Aid Radio System – 800MHz & VHF

**OES FIRE NET:** Microwave Intertie of four VHF Frequency Pairs

**FIRESCOPE:** Firefighting Resources of California Organized for Potential Emergencies

**F&R:** Fire and Rescue Branch – Cal OES Operations Response Division

**NPSTC:** National Public Safety Telecommunications Council

**PSC:** Public Safety Communications Branch – Cal OES Logistics Division

**TComm:** Telecommunications Branch – Cal OES Operations Response Division

**TDO:** Cal OES Telecommunications Branch Duty Officer

## APPENDIX C: CAL OES FIRE NET & FIREMARS FREQUENCIES AND USAGE

### OES FIRE NET & FIREMARS CHANNELS

The following channels are authorized for Fire operations in California as noted prior. The VHF Band frequencies are narrowband FM with 12.5kHz authorized bandwidth. The designation “N” for narrowband is noted after each TX/RX frequency. The Fire Net repeaters have different tones for input based on locations (Table 1 & 2). It is permissible to use CSG or carrier squelch in direct channels on the user’s mobile/portable equipment. When no coded squelch is used, it is identified as “CSQ”. The VHF FIREMARS is only authorized on portable “tactical” repeaters. The 800 FIREMARS are located in the San Francisco Bay and Los Angeles Areas only (Table 3).

#### FIRE NET VHF INTERTIE SYSTEM

CHANNEL ID	RX FREQ	RX CTCSS	TX FREQ	TX CTCSS	Notes
OES FIRE 1A	154.1600 N	CSQ	159.1350 N	OST	Repeater, Portable Repeater, Fixed Base, Mobile, Portable Priority: 1, 2, 3
OES FIRE 1B	154.1600 N	CSQ	159.1950 N	OST	Repeater, Portable Repeater, Fixed Base, Mobile, Portable Priority: 1, 2, 3
OES FIRE 2A	154.2200 N	CSQ	159.1350 N	OST	Repeater, Portable Repeater, Fixed Base, Mobile, Portable Priority: 1, 2, 3
OES FIRE 2A	154.2200 N	CSQ	159.1950 N	OST	Repeater, Portable Repeater, Fixed Base, Mobile, Portable Priority: 1, 2, 3

#### FIREMARS VHF

CHANNEL ID	RX FREQ	RX CTCSS	TX FREQ	TX CTCSS	Notes
FIREMARS VHF	153.8300 N	CSQ	154.2950 N	OST	Portable Repeater, Mobile, Portable Priority: 1, 2, 3

#### FIREMARS 800

CHANNEL ID	RX FREQ	RX CTCSS	TX FREQ	TX CTCSS	Notes
FIREMARS 800	853.9875 W	156.7	808.9875 W	156.7	Portable Repeater, Mobile, Portable Priority: 1, 2, 3
FIREMARS 2 800	851.9125 W	156.7	806.9125 W	156.7	Portable Repeater, Mobile, Portable Priority: 1, 2, 3

# TABLE 1: CAL OES FIRE NET MAP

STATE OF CALIFORNIA  
GOVERNOR'S OFFICE OF EMERGENCY SERVICES



## Fire and Rescue Radio Network Mountain Top Repeaters - Microwave Circuit



**Notes:**

1. MW path remains open for 6 minutes for voice communications.
2. Confidence Tone is heard every second.
3. There is no transmit CTCSS.

**Table 1: Repeater Frequencies (MHz)**

FIRENET Channel	TX Frequencies	RX Frequencies
OES-1A	154.160	159.135
OES-1B	154.160	159.195
OES-2A	154.220	159.135
OES-29	154.220	159.195

**Table 2: CTCSS Tones (Hz)**

CTCSS #	Frequencies (Hz)
①	110.9
②	123.0
③	131.8
④	136.5
⑤	146.2
⑥	156.7
⑦	167.9
⑧	103.5

**Table 3: Microwave Routes**

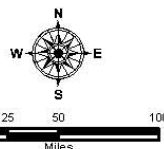
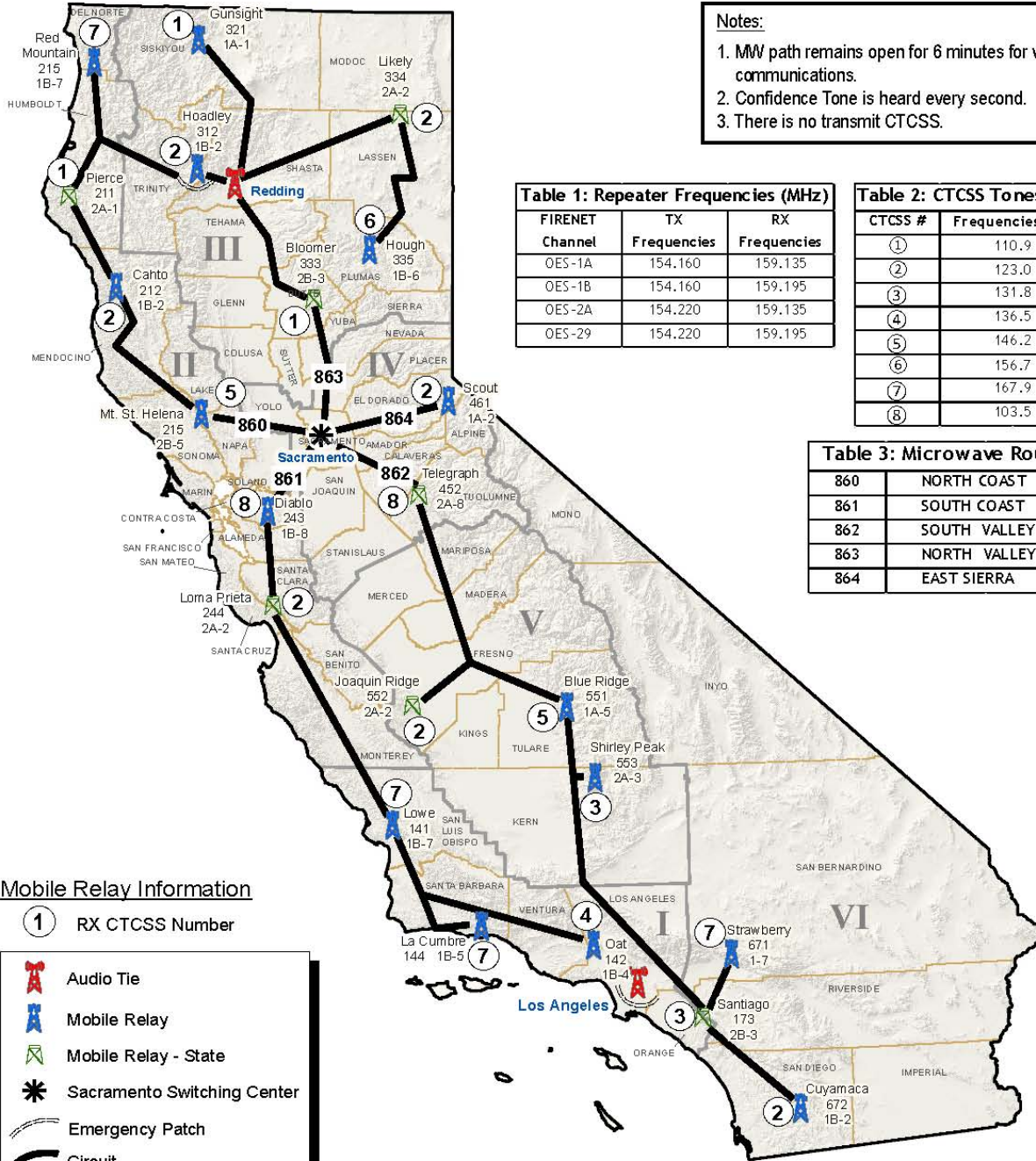
860	NORTH COAST
861	SOUTH COAST
862	SOUTH VALLEY
863	NORTH VALLEY
864	EAST SIERRA

**Mobile Relay Information**

- ① RX CTCSS Number

- Audio Tie
- Mobile Relay
- Mobile Relay - State
- Sacramento Switching Center

- Emergency Patch
- Circuit
- State Boundary
- Mutual Aid Region Boundary
- County Boundary



Created by Cal-EMACS, K. Higgs, E. Simpson  
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data/Culture/Communications/Cal-OES\_T.Comms/  
Fire\_repeater\_20151208.mxd

**TABLE 2: CAL OES FIRE NET MICROWAVE DIALING GUIDE**

**OES Fire Network Dialing Guide**

Mobile Relay	County	Channel	Tone	Access
<b>North Coast</b>	<b>Route - 860</b>			
Mt. St. Helena	Sonoma	2B	5	215
Cahto Peak	Mendocino	1B	2	212
Mt. Pierce	Humboldt	2A	1	211
Red Mt.	Del Norte	1B	7	216
<b>North Valley</b>	<b>Route - 863</b>			
Mt. Bloomer	Butte	2B	3	333
Hoadley Peak	Trinity	1B	2	312
Gunsite Peak	Siskiyou	1A	1	321
Likely Mt.	Lassen	2A	2	334
Mt. Hough	Plumas	1B	6	335
<b>South Coast</b>	<b>Route - 861</b>			
Mt. Diablo	Contra Costa	1B	8	243
Loma Prieta Peak	Santa Cruz	2A	3	244
Mt. Lowe	San Luis Obispo	1B	7	141
La Cumbre Peak	Santa Barbara	1B	5	144
Oat Mt.	Los Angeles	1B	4	142
<b>South Valley</b>	<b>Route - 862</b>			
Telegraph Peak	Tuolumne	2A	8	452
Joaquin Ridge	Fresno	2A	2	552
Blue Ridge	Tulare	1A	5	551
Shirley Peak	Kern	2A	3	553
Santiago Peak	Riverside	2B	3	173
Strawberry Peak	San Bernardino	1B	7	671
Cuyamaca Peak	San Diego	1B	2	672
<b>East Sierra</b>	<b>Route - 864</b>			
Scout Peak	El Dorado	1A	2	461

**Frequencies:** 1A - TX 159.135, RX 154.160, 1B - TX 159.195, RX 154.160  
2A - TX 159.135, RX 154.220, 2B - TX 159.195, RX 154.220

**Tones:** Base, Mobile and Portable Radio CTSS Tones (in Hz) – Standard Tones for Transmit:  
Tone 1 – 110.9, Tone 2 – 123.0, Tone 3 – 131.8, Tone 4 – 136.5, Tone 5 – 146.2,  
Tone 6 – 156.7, Tone 7 – 167.9 and Tone 8 – 103.5

**Notes:**

1. FIRE NET CURRENTLY USES "\*" FOR SWITCHBOARD ACCESS
2. Dial "\*88" to shut off all repeater sites.
3. "Repeater Time Out": timers are set for approximately 4 minutes.

**TABLE 3: FIREMARS 800MHZ REPEATER MAP**

