Los Angeles City Fire Department

TRAINING BULLETIN

DONALD O. MANNING, Chief Engineer and General Manager / Bulletin No. 24 *Date of Issue* 3-91 *Revision Date*

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TRAINING BULLETIN NUMBER 24
PART I

RADIO COMMUNICATIONS

INTRODUCTION

Radio communications are the lifeline of the Los Angeles Fire Department's emergency operations. During this last year alone, over one million radio messages were processed by the Operations Control Dispatch Section (OCDS) which accounted for over 800 hours of radio transmission time. In many instances, the outcome of an emergency is decided by either the success or failure on the part of members to communicate effectively via radio.

PURPOSE

The purpose of this bulletin is to provide a document which facilitates an ongoing, continuous update on radio communications. Part I will focus on radio communications. The mechanical operation of radio equipment, digicom, or related equipment will be contained in other parts of this training bulletin. Updates for Part I will be added to the appendices section. These updates will be effective when distributed and shall be followed by all members.

As a general rule, most members have developed their radio communications skills (or habits) by listening to radio messages, both good and bad. The results, understandably are a composite of abilities, skills, personal differences, and widely varying interpretations of what is correct.

Although many basic fireground procedures are standardized, the state of the art in electronics is changing constantly. The effect is an ever increasing change in our emergency communication procedures and equipment.

STANDARD PROTOCOLS

The reasons for standardizing radio communications are numerous. By fiscal year 1991/92, the Department will have spent approximately 67 million dollars on updating its communication system. Given this huge cost, the citizens and their elected officials have a right to expect the highest level of professionalism in radio communications. The Federal Communications Commission (FCC) issue guidelines and restrictions on the use of radio transmissions. If these guidelines and restrictions are not followed, the Department risks losing its assigned frequencies.

In the near future all members will carry portable radios. It is also projected that fire and EMS activity will continue to increase as long as the population in Los Angeles continues to swell. This increased activity and radio use by more Department members demands that radio time must be conserved much like a natural resource.

Often, the news media is present at the scene of emergencies not only to film newsworthy events, but also to collect audio background to support the film. Radio transmissions are routinely used for this purpose.

When complaints are filed with the City Attorney, the result is usually a lawsuit. Attorneys filing lawsuits against the Fire Department routinely request all written and audio tape records immediately before, during, and after the incident in litigation. Finally, standardized radio communications eliminates the need to repeat messages.

As the new system comes on line over the next four months all 18 radio channels will be recorded on a 24 hour basis. Additionally, all radios are assigned a four digit identification number which is transmitted and recorded each time a radio is keyed.

SECTION I EMERGENCY AND NON-EMERGENCY OPERATIONS

OCDS Channels shall be used by field units for communications as outlined in the Manual of Operation Section 2/1-00.00. For the most part, this includes the following types of messages:

1. Initial size-up
2. Request for additional resources
3. Request for special services and notifications, such as Los Angeles Police Department, Department of Water and Power, etc.
4. Rundown on resources responding
5. Location of command post
6. Incident command designation
7. Change of command at an emergency
8. Knockdown of fire
9. Reporting resources available

Radio Alarms

Acknowledgement - A brief response to a radio alarm, i.e., "Engine 1" or "Engine 1 responding" is sufficient acknowledgement to the dispatcher unless the address or other information clarification is required.

Standby For Dispatch - Dispatchers will, time permitting, alert units on the radio, i.e., "Engine 1, Battalion 2, standby for dispatch", allowing them to prepare for emergency responses.

Size-Up

If an emergency exists, an accurate size-up covering all pertinent information is required. If there is "nothing showing" it is only necessary to report that fact to OCDS. The fact that "people are waving" is of no value to OCDS, and information that you are "holding the assignment, will investigate, will give a report when you get more information" is all verbiage that is unnecessary and wastes radio time. No size-up is required for a single company response unless help is needed or other situational changes require it.

The needs of OCDS to obtain information from the scene of an emergency incident is limited, but of critical importance to the outcome of an incident and to the deployment of uncommitted forces. Operational needs of OCDS from field units are as follows:

1. Section 2/1-001.00 of the Manual of Operation states that a size-up shall include, but is not restricted to, the following information, as applicable:

   a. Address of location of incident
   b. Type of incident
   c. Life hazard
   d. Assistance needed
   e. Exposure problems
   f. Location of Command Post

2. Initial size-up by the first officer on-scene. Be brief and to the point. Think of what you are going to say before you start talking on the radio. The initial size-up accomplishes the following:

   a. Informs OCDS that LAFD resources are on-scene.
   b. Determines response mode for balance of the assignment.
   c. Helps OCDS handle additional calls for the same incident.
   d. Alerts OCDS to the possible need to make move ups.
   e. Alerts incoming resources of what to expect.

3. As a general rule, size-ups by Rescue Ambulances or Fire Companies responding with Rescue Ambulances are not needed unless there are extenuating circumstances or a request must be made for assistance.

   If a life threatening situation exists, i.e., CPR in progress, multiple gun shot wounds, etc., a brief size-up to an incoming company, on the EMS Tac Channel, is appropriate. With non-life threatening vital signs or no unusual situation existing, a size-up is not necessary or required.

   Extensive, detailed, or long, drawn out descriptions of the patient's symptoms are best described at the scene by a one-on-one contact.

4. A comprehensive size-up by the Incident Commander shall be made as soon as possible. This size-up includes, but is not limited to, the following:

   a. Correct address
   b. Description of incident
   c. Life hazards
   d. Assistance needed
   e. Special problems, i.e., exposures, weather, access, etc.
   f. Location of Command Post
   g. Approximate duration of incident

Updates, or a continuing size-up should be made occasionally to OCDS in order to keep them informed of the progress of the incident and resource requirements. This would include information to the PSO for media dissemination. Generally, these updates would be made at the Chief Officer level.

5. Assistance needed from outside agencies. See Manual of Operation Section 2/1-00.00. Use proper terminology, especially when requesting the police. Specify the type of problem or assistance needed, i.e., "O.C.D. from Task Force _____, we need Water and Power for high voltage wires down pole to pole"; "O.C.D. from engine _____, we need D.O.T. for traffic control"; "O.C.D. from Rescue _____, we need PD". Specify the need so that the urgency can be determined.

   When requesting resources from outside agencies, allow approximately 30 minutes before requesting ETA's.

6. Availability of resources and Chief Officers. Companies, special units, and Chief Officers are made available by the Incident Commander. When made available, the company, unit, or Chief Officer is to return to their own district unless directed otherwise by OCDS. It is not necessary nor desirable to include such comments as "Returning to quarters", "remaining on the radio", or "remaining on fire prevention." When becoming available from an incident it is not necessary for units to verbally give that information to OCDS. Utilizing the digicom is sufficient.

   Companies returning to their own quarters shall not direct OCDS. to "release the move up companies." At no time shall any member specifically cancel a resource of higher authority, i.e., "OCD from Task Force-1 cancel Battalion 1." A more appropriate message would be, "OCD from Task Force-1 we can handle."

7. A press size-up is required, as soon as conditions permit, for those incidents that are newsworthy. A complete operational size-up meets most of the requirements of a press size-up. A press size-up should emphasize those aspects of an incident which are of interest to the news media. The press size-up shall not be made at the expense of the operational requirements.

   The press size-up should be made on a channel which is not being used at the time. It should include the fact that it is a "Code 20 Incident", if appropriate. If an incident escalates to a greater alarm or larger incident, a Code 20 notification is automatic, verbal notification is not required.

Use of Tactical Channels

The purpose of Tactical Channels is to reduce the overall radio traffic on any one channel. This feature permits all units on a specific incident to communicate between themselves without interference from other field operations or OCDS.

OCDS does not normally monitor tactical channels. Therefore, they are ideally suited to handle any form of communications not affecting OCDS. However, messages should be brief and concise, and limited to essential information in order to maintain a manageable level of radio traffic.

Fireground operations shall be handled to the extent possible on the assigned "Tac Channel." Conversation on these channels can be less formal and structured, but is still required to remain businesslike.

Use of Command Channel

1. Channel 11 has been designated as the Department's Command Channel. This channel is used by Chief Officers for emergency and non-emergency operations.

   When a Chief Officer wishes to contact OCDS on the Command Channel, they should first contact OCDS on the OCDS channel and state: "OCD from Battalion _____, meet me on Channel 11."

2. Channel 11 should be used by Chief Officers to communicate expanded messages or comprehensive size-ups to OCDS on working emergencies after the initial size-up.

3. During greater/major incidents, Channel 11 shall be monitored by the Incident Commander and OCD until such time as both agree to discontinue its use.

SECTION II RADIO USE PROCEDURES

In addition to the use of radios at emergency incidents, radio communications play a vital role in the day to day routine of the Department. This section will also serve as a guide to non-emergency radio operations of the Department.

The Department's Radio Communication protocol is that radio communications shall be composed of plain, commonly used English. With minor exceptions this applies to all Department radio communications. However, certain code words and abbreviations are acceptable for use on the radio, they are listed below:

- "Roger" means that a radio message is understood, do not roger a message that should be answered with a yes or no.
- "Cancelled" means discontinue response, or you don't need the specific resource.
- "On the air" or "on the radio" means a particular resource is monitoring the radio.
- "Covered" means a stronger signal has interfered with and overpowered another signal, making the weaker signal unreadable.
- "Code 20" a widely used code which indicates that an occurrence has potential value to the news media.
- "A-Unit" abbreviation for Arson Unit.
- "Available" means ready for response within 60 seconds. Your either available or your not.
- "Bravo Tango" used at incidents involving bomb threats.
- "ETA" estimated time of arrival.

In addition, the Department has adopted a standard alphabetical word list known as the APCO Word List to be used when transmitting alphabetical letters to provide consistency and eliminate repeated transmissions.

- Adam	- John	- Sam
- Bravo	- King	- Tom
- Charles	- Lincoln	- Union
- David	- Mary	- Victor
- Edward	- Nora	- William
- Frank	- Ocean	- X-Ray
- George	- Paul	- Young
- Henry	- Queen	- Zebra
- Ida	- Robert	

Members shall not use LAPD Code numbers, i.e., 390 down, etc.

Members are reminded when making any radio transmission, there are four considerations:

1. Think about what you are going to say.
2. Ask yourself if the message is necessary.
3. Keep it brief.
4. When you key the mike, be prepared to speak.

Some Do's and Don'ts

Do:

1. Hold the "press to talk" button down momentarily BEFORE transmitting. This keeps the first word in the message from being "clipped." Likewise, releasing the button prematurely will "clip" the end of a transmission.
2. Keep the microphone CLOSE to your mouth - about one inch.
3. Speak into the microphone.
4. Speak in a normal, firm voice and speak clearly.
5. Give the complete message with the understanding that it will be heard. It is unnecessary and time consuming to call OCDS first, wait for a go-ahead and then give the message.
6. Listen before talking.
7. Listen for acknowledgement of radio messages to make certain message is received and understood.
8. Evaluate the importance of your message compared to others who are using the radio at the same time.
9. Relay for other units when they have repeated their message.
10. Answer for other units at the scene, if someone is trying to reach them and they do not answer.
11. Contact other mobile units directly (when possible) instead of relaying through OCDS. Monitor your designated OCDS Channel while on the radio.

12. Wait for other units that are talking to acknowledge their messages before you begin your radio message.

Don't:

1. Personal messages of a non-business nature are strictly prohibited.

2. Use of first names and/or surnames without rank is strictly prohibited.

3. Allow the "press to talk" button to be left open. (Inappropriate messages have been accidentally transmitted in this manner.)

4. Transmit too closely to another mobile unit or Handi-Talkie. This causes "feedback" and garbles your message.

5. Use profanity, exchange pleasantries, or offer personal greetings.

6. Put injured members names on the radio.

Continuing Dialogue

Once a continuing dialogue is established with the dispatcher or a Field Unit, it is not necessary to continue repeating your unit identification and other obvious information each time you key the transmitter.

Examples of improper radio communications are:

OCD from E-28 requesting Public Works to assist in securing the fire buildings.

E-28 from OCD will you be needing plywood or barricades?

OCD from E-28 we will need sheets of plywood.

E-28 from OCD are you requesting this or is Building and Safety requesting it?

OCD from E-28 Building and Safety is requesting it.

E-28 from OCD Roger.

The proper use of radio time would be:

> OCD from E-28 Building and Safety is requesting that Public Works deliver to the fire building 20 sheets of plywood to secure the building.
>
> Roger.

Limiting Messages During High Activity

All members shall be aware that during periods of high activity careful thought must be given to all necessary messages for clarity and brevity.

SECTION III APPENDICES

Los Angeles City Fire Department

TRAINING BULLETIN

JOHN C. GERARD, Chief Engineer and General Manager

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TRAINING BULLETIN #24

PART II

THE RADIO SYSTEM

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THE RADIO SYSTEM

The Los Angeles Fire Department's radio system is composed of several distinct components. The most important of those components, the operator, will be discussed later. A basic understanding of how the major components function and relate to each other is important if the desired results are to be achieved.

Base Station Transmitters -

There are six remote, strategically located transmitter sites serving the L.A.F.D. radio system (Fig. 1). While each of these sites appear different to the eye, their basic functions are the same.

Each transmitter receives a signal, either by wire and/or microwave, from O.C.D. or one of the backup signal offices, or through a repeater, and amplifies that signal to a predetermined level as it is broadcast out over a geographic area. For example, the geographic area served by the Oat Mountain Transmitter site is the general San Fernando Valley and likewise with the San Pedro Transmitter site in the San Pedro area. Each transmitter site is capable of broadcasting only those frequencies which are wired or microwaved into it from the control center. In other words, all transmitter sites are not capable of transmitting all frequencies.

Now, why not just one transmitter for the entire city instead of six? There are four basic reasons:

1. Signal Strength.

   The F.C.C. limits transmitter power to a level that would not adequately cover the entire City even if it were relatively flat.

2. Geographic and Topographic.

   The mountains, valleys, and distances involved impose limitations on the effectiveness of radio wave behavior.

3. Radio Wave Behavior.

L.A.F.D. radio transmitters amplify signals to a maximum of 155 watts ERP (effective radiated power). Contrast that to KMPC-AM, for example, which transmits with 50,000 watts of broadcast power. Yet, there are areas "behind" mountains, buildings, up canyons, etc., which cannot receive even these signals. Therefore in order to cover the City as well as reasonably possible, the L.A.F.D. radio system is built around multiple transmit/receive sites. Also, radio signals radiate out from the transmitters in different ways. For example, "low band" (33.00 MHz) signals tend to "crawl" over hills, up canyons, etc., somewhat like an incoming fog, while UHF signals are more limited to line-of-sight travel.

4. Technical Limitations.

The system must be designed around the allotted frequencies, F.C.C. power limitations and equipment technology, all of which limit the end result.

Base Station Receivers

Each transmitter site has a companion receiver site. In some cases, such as Mt. Lee, the two are closely located. At other locations, the transmitter and receiver sites are some distance apart, such as at Oat Mt. For technical reasons, transmitters and receivers must be separated as a means of minimizing interference between the two. There are two basic means of achieving the required separation -- vertical, as at Mt. Lee; and horizontal, as at Oat Mt.

When a "mobile radio" unit transmits, all receiver sites that detect the signal will in turn relay that signal to the control center (OCD). A special device at OCD compares the signal sources, selects the best signal (best signal to noise ratio), then links the best signal to the dispatcher consoles.

Control Centers -

The various transmitter sites can be "accessed" at the control center (OCD) by means of a radio switching network. Limited radio control facilities are maintained at the old Westlake, San Pedro, and Coldwater Signal Offices.

The dispatch consoles at OCD provide the means for dispatchers to switch from one transmitter site to another, depending on the area of the City that a given radio message is intended. For example, a dispatcher would use the Oat Mt. transmitter site for units in the San Fernando Valley and the San Pedro transmitter site for companies in that area even though companies in both areas were on the same frequency. It is important to understand that a given transmitter may be used to transmit over only those frequencies for which it is equipped, and controlled by wire or microwaved circuits. When a particular transmitter site has been selected the dispatcher has in effect linked himself to the transmitter by means of a long microphone cord. When he switches transmitter sites in effect he removes his mike cord from one site and plugs in into another site.

Mobile Unit Radios

Radios installed in department vehicles have the same basic features and requirements that base stations have but are much more limited in ability. Mobile units transmit at 40 watts on the "UHF bands" and 60 watts on the "low bands". There is minimal opportunity to separate transmitters from receivers. To achieve separation, the receiver is automatically turned off when the transmit unit is keyed. Because antenna locations are limited to the vehicle; buildings, trees, hills, overpasses, other apparatus, etc., interfere with performance quality. Parking apparatus with consideration for radio communications at emergency incidents receives low priority. Mobile unit radios detune easily, etc.

Portable Radios or "Handi-Talkies" -

Portable radios again have the same basic features as the mobile units and base stations but are even more limited in ability, especially in the transmit phase. L.A.F.D. portable radios transmit at 2 or 4 watts of power (depending on model) and have a transmit range of up to about 2-3 miles under the best of conditions. Portability rather than transmit power is the primary value of portable radios.

RADIO FREQUENCIES

The system operates on three different "bands" or groups of compatible frequencies. Since one mobile radio can be tuned to only one "band", and in the past only four frequencies could be jammed into a single radio, it necessitated installing more than one radio in an apparatus when more than four frequencies, or when frequencies from different "bands" were desired in the same

apparatus. With the current practice of the F.C.C. allocating part of the Ultra-High Frequency (UHF) band for the public safety services, it is now possible to put up to twelve frequencies in one radio, so long as they are all in the UHF "band." The three "bands" are:

1. Very High Frequency (VHF) Low Band, which is the 33.00 MHZ (megahertz) band. Channels 7 - 14 are all in this band.

2. VHF High Band, which is in the 154 MHz and 155 MHz band. The HEAR Radio 1, and HEAR Radio 2, networks are in this band.

3. Ultra-High Frequency (UHF) band, which is in 506 MHz through 510 MHz band. Channels 1 - 6 are in this band.

There are three basic modes of operation for a radio system: "Simplex", "Duplex", and "Duplex/Repeated". In "Simplex", all receivers and transmitters are tuned to the same frequency, and when one unit is transmitting, all other units in the area are able to receive but not transmit. In this mode, mobile units and base stations listen to each other without any problem. Every unit hears and can converse with every other unit within range.

In the "Duplex" mode, two frequencies are used, one for mobile to base, and another for base to mobile. If mobile-to-mobile contact is desired, the mobile unit's transmission must be "repeated" over the base transmitter's frequency. When this is done by automatic equipment, it is called the "Duplex/Repeated" mode. All of the new UHF frequencies are designed to operate in the "Duplex" mode or the "Duplex/Repeated" mode, and when an F.C.C. allocation is made, it is made for two ("paired") frequencies. The mobile to base frequency is called the "up" leg, and the base to mobile frequency called the "down" leg. For instance, Channel 1 is assigned 506.3125 MHz for the "down" leg, and 509.3125 MHz for the "up" leg. The Department's "low band" channels are operated in the "Simplex" mode. The "UHF" channels are operated in the "Duplex/Repeated" mode along with a capability of switching to "Simplex" when conditions warrant.

The Fire Department radio system includes special radio capability for special problems. Fire Boats have marine radio and marine radar. Helicopters, crash apparatus, and ambulances all have special radios as needed, and our communications vans have L.A.P.D. and other agencies' radios.

O.C.D. also has special radio capabilities for mutual aid purposes. This includes radios on the fire mutual aid "white" channel and the three primary L.A. County Fire Department dispatch channels. O.C.D. can also access both channels on the State Fire

Net, which has repeaters throughout the state for interdepartmental coordination, and for communications with State Office of Emergency Services (OES) pumpers. Other channels available at O.C.D. are HEAR 1 and HEAR 2 (Hospital Emergency Administrative Radio) for coordination with hospitals. The City Civil Defense channel available at O.C.D. is used in disaster operations to contact the Mayor, City Council and their staffs as well as other persons with key positions in disaster operations and for coordination with dispatch centers maintained by other City departments. O.C.D. can also receive but not transmit, L.A.P.D. Channels TAC 1 and TAC 2.

The system is very complex and is only one of several radio systems which are utilized by various City departments.

LOS ANGELES FIRE DEPT.
TRANSMITTER & RECEIVER SITES

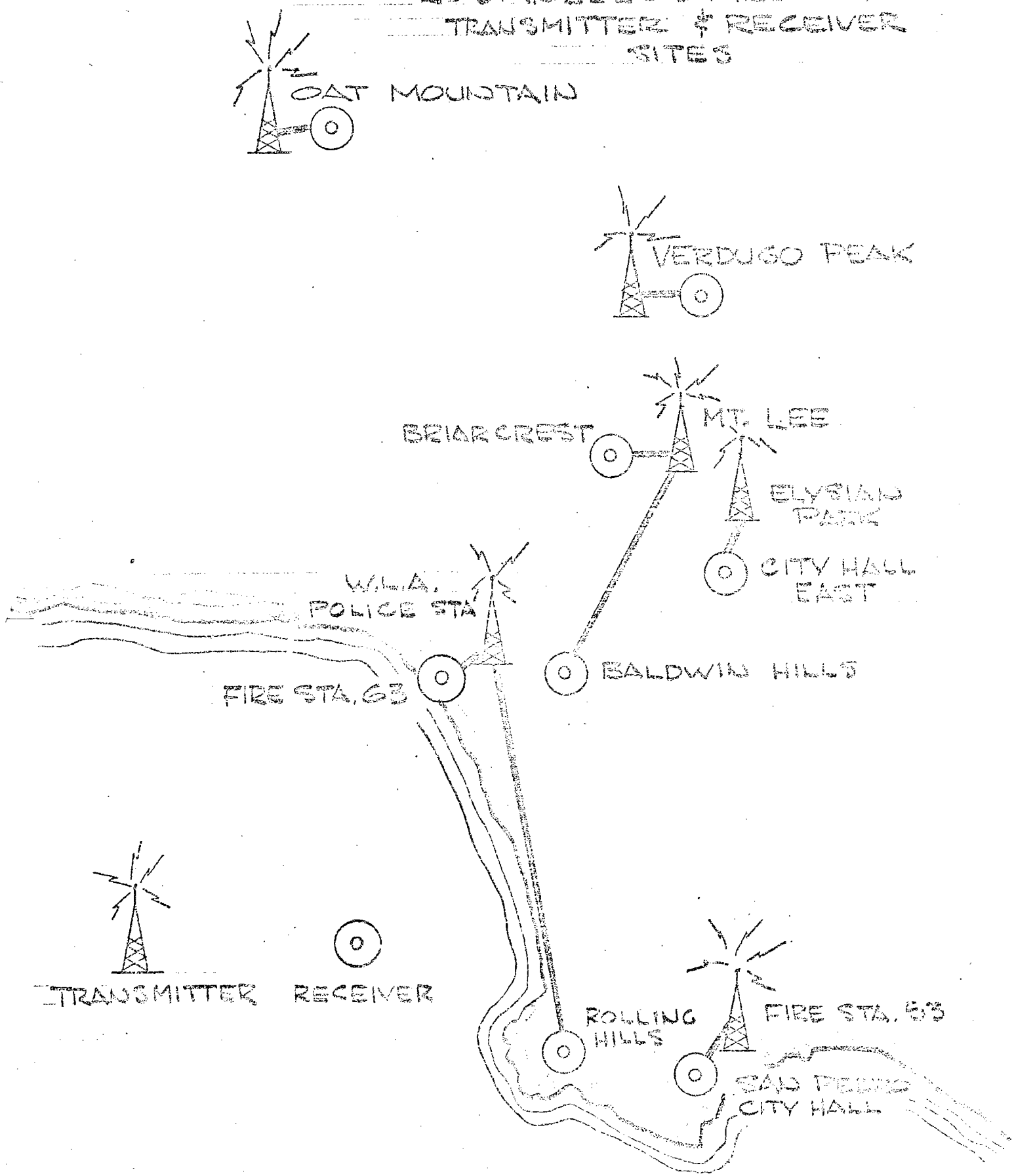

FIG. 1